

503.227.1800 2000 SW First Avenue Suite 410 Portland, OR 97201

July 26, 2023

Jesse Winterowd Winterbrook Planning 610 SW Alder Street, Suite 810 Portland, OR 97205

Subject: Supplemental Information **Re:** Land Use Permitting

Dear Jesse:

This letter provides additional information regarding expansive soils within the property upon which the Portland Water Bureau Filtration Facility is proposed (the "Filtration Facility Site") and the Filtration Facility Site septic system in response to comments on those issues included in a memorandum prepared by True North Geotechnical dated June 28, 2023 (Exhibit E.21).

Expansive Soils at Filtration Facility

Delve Underground performed an extensive geotechnical exploration program, consisting of 16 deep soils borings at and adjacent to the proposed structures on the Filtration Facility Site with all relevant soil layers identified with recommendations for design and construction provided to the Portland Water Bureau and design team. The location map and detailed logs of these 16 borings (FF-B-201, 202, 204 through 209, 212, 214 through 217, FF-SC-203, 213 and 218) are included in the attachment of this letter. The conclusion provided in Exhibit A.81 that "Based on the geotechnical investigations and evaluation performed for the project, the site is suitable for the intended development and the risks from the geologic and seismic hazards are low and can be mitigated with appropriate foundations and site developments." remains valid.

"Fat Clay", if composed of high content of expansive minerals, can be prone to large volume changes (expansion and shrinkage) that are directly related to changes in water content. The effects of the expansive soils are typically limited to at-grade, light-weight structure foundations and slabs for which moisture contents of the soils fluctuate drastically between seasons and the loads of the structures are not sufficient to counterbalance the swelling pressure from the expansive soil.

During the planning and design phases, the geotechnical and geologic studies did not identify that the existing structures in the surrounding area of the Bull Run Filtration Program have experienced expansive soil issues.

In particular for the Bull Run Filtration Facility geotechnical study, the "Fat Clay" is identified to be located generally from 15' to 35' deep within the proposed Filtration Facility structures, except for FF-SC-203 located at the southeast corner of the Flocculation and Sedimentation Basin (at approximately 15 to 20 feet deep structure) where the "Fat Clay" was noted from ground surface to 30' deep. The "Fat Clay" is mainly in a moist condition.

"Fat Clay" will not affect the at-grade structures and shallow structures since it is well below their installation depths and the nature water content of the "Fat Clay" will not be affected. For deep structures (including the Flocculation and Sedimentation Basin), mat foundations will be situated on the "Fat Clay", however, the groundwater and moisture conditions are also not expected to change because no significant dewatering efforts are anticipated, the clayey subgrade will be protected by a thick crushed rock working mat during construction and by well-compacted backfill and low-permeability cap layer at the surface after the construction. Furthermore, the deep structures are also heavy water-holding structures and their loads (weights) will likely be more than the swelling pressure if "Fat Clay" expands.

Additionally, the pipeline components connected to the Filtration Facility are installed at depths ranging from 10 to 30 feet deep. Their construction will not affect the nature moisture contents of the "Fat Clay" (if encountered) with the similar reasons for the deep structures mentioned above. Also, these welded steel pipes are very strong and flexible, and are expected to accommodate the swelling pressure even if the "Fat Clay" were to expand.

Therefore, we do not expect that the "Fat Clay" layer is a concern for the Filtration Facility. This is the reason why expansive index testing was not performed during the geotechnical evaluation.

Septic System

Prior geotechnical engineering analysis (identified that the slope stability concern at the site is from shallow landslides occurring at or near the surface of the slope (Geohazard Zone). The risk for deep seated landslides (a much larger global failure extending to Sandy River) is low as indicated by a high factor of safety of greater than 1.5. The drain field is located approximately 70 to 80 feet from the edge of the Geohazard Zone. At this distance and combined with the clayey/silty soils it will not increase the groundwater conditions at the Geohazard Zone and negatively affect the stability of the slopes within the Geohazard Zone. For the deep seated failure scenario, because of the high factor of safety, infiltration from drain field will not impact the deep seated failure mode. Therefore, the drain field is not anticipated to have a negative effect to the site slope stability.

Sincerely,

Yuxin Lang Digitally signed by Yuxin Lang Date: 2023.07.27 17:01:14 -07'00'

Yuxin "Wolfe" Lang, PE, GE, P.Eng Principal Engineer

cc: File

Attachments

Bull Run Filtration Facility Geotechnical Data Report Site Plan Logs of Borings*:

- FF-B-201
- FF-B-202
- FF-B-204
- FF-B-205
- FF-B-206
- FF-B-207
- FF-B-208
- FF-B-209
- FF-B-212
- FF-B-214
- FF-B-215
- FF-B-216
- FF-B-217
- FF-SC-203
- FF-SC-213
- FF-SC-218

* Locations of these borings are highlighted in green in the site plan.



Log of Boring

Project N	lumber	: 608	4.0	_						FF-I	B-201	
Date(s) Drilled	04/12/20)21 - (04/13/2021		Client	Portla	nd W	Vater Bureau	Final Depth	80.4 ft bş	gs	
Coordinates	7740379	9.2 E,	661243.8 N	1	Geotechnical Consultant	Lacan	nas C	onsulting	Method/ Rig Type	Mud Ro	tary/CME 800 Tra	ck
Surface Elevation	707.4 ft	•			Drilling Contractor	Western	States	Soil Conservation, Inc.	Hole Diameter	5.00 in		
Location	Carpen	ter La	ane Nurse	ry	Logged by/ Checked by	Susan	Bedn	arz / Susan Bednarz	Hammer Type	140 lb / 3	30 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT)	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	IETRATION BISTANCE WWS/FT 0 30 40 H H ER CONTEN RBERG LL/P 0 60 80		USCS	MATERIAL D	escripti	ON	REMARKS AND TESTS	BACKFILL/INSTALL.
703	SPT_ 1	100	2-3-5 (N=8)	E C				Medium stiff, moist, or SILT (MH); high plastici Residual Soil of the S	ty.		Grass-covered plowed field at ground surface.	
698 10	SPT_ 2	100	4-4-4 (N=8)	• 0			мн					
693 15	SPT_ 3	100	4-6-9 (N=15)	D				Becomes stiff at 15.0	feet.		Lost 100 gallons of drilling mud at 15-20 feet likely due to clay "collar" blocking fluid	
688 20	SPT_ 4	100	5-7-9 (N=16)	•				Becomes very stiff at	20.0 feet.		return. Stiffer drilling at 17 feet.	
683 25	SPT_ 5 SPT_ 6	100 100	4-7-10 (N=17) 4-6-9 (N=15)				СН	Very stiff, moist, gray, o CLAY (CH); high plastic Residual Soil of the S <i>Becomes stiff at 25.0</i>	ity. Springwate			
678	SPT_ 7	100	5-9-11 (N=20)	1-1				Becomes very stiff at	27.5 feet.		SPT_7: Oven Dried PI=50.1 (PL, LL = 25.7, 75.8).	
DE			NOTES: Location and El Vertical Datum: Coordinate Syst	Portland Ve	ertical			5 3601 Feet	В	•	FF-B-201 t 1 of 3	

Log of Boring

Project	Nu	mber	: 608	34.0								FF-I	B-201	
Date(s) Drilled	04	4/12/20)21 -	04/13/2021		Client	Por	tlan	nd W	later Bureau	Final Depth	80.4 ft bş	<u>g</u> s	
Coordinates	77	740379).2 E,	661243.8 N	J	Geotechnical Consultant	Lac	ama	as C	onsulting	Method/ Rig Type	Mud Ro	tary/CME 800 Tra	ck
Surface Elevation	70	07.4 ft	•			Drilling Contractor	West	ern S	tates	Soil Conservation, Inc.	Hole Diameter	5.00 in		
Location	С	arpen	ter L	ane Nurse	ry	Logged by/ Checked by	Sus	an E	Bedn	arz / Susan Bednarz	Hammer Type	140 lb / 3	0 in / Automatic	
ELEV. (FT) WATER LEVEL DFPTH (FT)	SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	NETRATION BISTANCE DWS/FT 0 30 40 H H H ER CONTEI RBERG LL/I 0 60 80			USCS	MATERIAL D	escriptio	NC	REMARKS AND TESTS	BACKFILL/INSTALL.
673		SPT_ 8 SPT_ 9	100 100	5-10-10 (N=20) 3-5-8 (N=13)		0			СН	Very stiff, moist, gray, o CLAY (CH); high plastici Residual Soil of the S <i>Becomes stiff at 32.5</i>	ity. Springwater		Lost 300 gallons of drilling mud at 30 feet. Casing borehole to 10 feet stopped mud loss.	
668 40		SPT_ 10 SPT_ 11 SPT_	100 100 100	2-3-4 (N=7) 3-5-7 (N=12) 4-3-11		0 H 0	·····		МН	Medium stiff, wet, gray and black, ELASTIC SILT plasticity, relict texture Sensitive Saprolite o Formation Becomes stiff at 37.5 Becomes not sensitiv	with sand e, sensitive. f the Spring feet.	(MH); high water	SPT_11: Oven Dried PI=11.5 (PL, LL = 33.0, 44.5).	
663 45		12 SPT_ 13 SPT_ 14	100 100	(N=14) 9-11-38 (N=49) 17-18-28 (N=46)	0				ML	Hard, moist, gray-brow low plasticity, fine to co texture. Less Weathered Spri Dense, moist to wet, g with cobbles (SM); fine coarse gravel, low plass Less Weathered Spri	oarse sand, ngwater Fo ray-brown, e to coarse s ticity fines.	relict rmation Silty SAND sand, few		
658 50		SPT_ 15	100	29-41-36 (N=77)	0				SM	Becomes very dense at 50.0 feet.	-			
653 55		SPT_ 16	200	50/3" (Refusal)	0			· · · · · · · · · · · · · · · · · · ·					Small cobbles from 55 to 60 feet.	
648	-								CL	Stiff, moist, gray and or low plasticity. Less Weathered Spri	-		Softer drilling at 59 feet.	
DE				NOTES: Location and El Vertical Datum Coordinate Sys	: Portland Ve	ertical						oring	FF-B-201 t 2 of 3	

Log of Boring

Project Nu	ımber	: 608	34.0							ГГ-]	B-201	
Date(s) Drilled 0	4/12/20)21 -	04/13/2021		Client]	Portla	nd V	Vater Bureau	Final Depth 8	0.4 ft bş	gs	
Coordinates 7	740379	9.2 E,	661243.8 N	J	Geotechnical [Consultant]	Lacam	as C	onsulting	Method/ Rig Type	lud Ro	tary/CME 800 Tra	ck
Surface Elevation 7	07.4 ft	•			Drilling Contractor	Western	States	Soil Conservation, Inc.	Hole Diameter 5.	.00 in		
Location C	Carpen	ter L	ane Nurse	ry	Logged by/ Checked by	Susan	Bedn	arz / Susan Bednarz	Hammer Type 1 4	40 lb / 3	0 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	NETRATION SISTANCE DWS/FT 0 30 40 H H ER CONTENT RBERG LL/PL 0 60 80	0 0	NSCS	MATERIAL D	DESCRIPTION		REMARKS AND TESTS	BACKFILL/INSTALL.
	SPT_ 17	100	4-5-9 (N=14)		D		CL	Stiff, moist, gray and o low plasticity. Less Weathered Spri				
643 65	SPT_ 18	120	15-22-50 /3" (Refusal)		0		SM	Very dense, moist, grav SAND (SM), fine to me plasticity fines. Less Weathered Spri	dium sand, low	I	Harder drilling at 64 feet. No cobbles from 65 to 70 feet.	
638 70 _	SPT_ 19	200	50/3" (Refusal)				SM	Very dense, moist, grav with gravel (SM); fine t coarse sand, low plasti Less Weathered Spri	co coarse grave city fines.	l, fine to		
633 75 - 628	20	132	50/3" (Refusal)				GP	Very dense, moist, grav GRAVEL with sand (GP fine to coarse sand, tra Less Weathered Spri); fine to coarse ace low plastici	e gravel, ty fines.	"Gravelly" drilling from 75 to 80 feet.	
80	<u>SPT</u> 21	119	50/5" (Refusal)				<u>SP-</u> SM	Very dense, moist, red SAND with silt (SP-SM) low plasticity fines. Less Weathered Spri	; fine to mediu	ım sand,	Borehole completed at 80.4 feet below ground surface (bgs).	
623 85											Boring backfilled with bentonite grout.	
618												
DEL			Vertical Datum	Portland Ve	rce: PWB Survey ertical 983 StatePlane O			1 5 3601 Feet	Boı	U	FF-B-201 t 3 of 3	

Log of Boring

Project	Number	: 608	4.0							FF-	B-202	
Date(s) Drilled	04/19/20	021 - (04/20/2021		Client	Portla	nd W	later Bureau	Final Depth	81.2 ft bg	gs	
Coordinates	7740578	8.6 E,	661126.9 N	V	Geotechnical Consultant	Lacan	nas C	onsulting	Method/ Rig Type	Mud Ro	tary/CME 55	
Surface Elevation	710.6 ft	•			Drilling Contractor	Western	States	Soil Conservation, Inc.	Hole Diameter	5.00 in		
Location	Carpen	ter La	ine Nurse	ry	Logged by/ Checked by	Susan	Bedn	arz / Susan Bednarz	Hammer Type	140 lb / 3	30 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT)	SAMPLE TYPE SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	NETRATION SISTANCE DWS/FT 0 30 40 H H H ER CONTEN RBERG LL/P 0 60 80	0 0	USCS	MATERIAL D	DESCRIPTI	NC	REMARKS AND TESTS	BACKFILL/INSTALL.
706 5 701 10 696 15	SPT_1 SPT_2 SPT_3	100 100 100	1-3-3 (N=6) 2-4-5 (N=9) 5-6-8 (N=14)				мн	Medium stiff, moist, or SILT (MH); high plastici Residual Soil of the S <i>Becomes stiff at 10.0</i>	ity. Springwater		Flush-mount monument installed. VWP installed at 41 feet and grouted into borehole. S/N: 2113123 Plowed field at ground surface.	
691 20-	SH_4 SPT_ 5	50 100	6-8-12 (N=20)	0				Becomes very stiff, or brown, and dark brow			SH_4 advanced at 400 psi form 20 to 20.5 feet and at 750 psi from 20.5 to 20.83 feet.	
⁶⁸⁶ 25	SPT_ 6	100	5-8-11 (N=19)				СН	Very stiff, moist, orang (CH); high plasticity. Residual Soil of the S			Too stiff for Shelby tube.	
681	SPT_ 7	100	5-6-10 (N=16))							
	LVI		Vertical Datum	: Portland Ve	rce: PWB Surve ertical 983 StatePlane			5 3601 Feet	В	•	FF-B-202 t 1 of 3	

Log of Boring

Project	Number	: 608	34.0							FF-I	B-202	
Date(s) Drilled	04/19/2	021 -	04/20/2021		Client	Portl	and V	Vater Bureau	Final Depth	81.2 ft bg	gs	
Coordinates	7740578	8.6 E,	661126.9 N	N	Geotechnical Consultant	Laca	mas C	consulting	Method/ Rig Type	Mud Ro	tary/CME 55	
Surface Elevation	710.6 ft	•			Drilling Contractor	Wester	n States	Soil Conservation, Inc.	Hole Diameter	5.00 in		
Location	Carpen	ter L	ane Nurse	ry	Logged by/ Checked by	Susar	n Bedr	narz / Susan Bednarz	Hammer Type	140 lb / 3	30 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT)	SAMPLE TYPE SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	NETRATION SISTANCE DWS/FT 0 30 40 H H H ER CONTEN RBERG LL/PI 0 60 80	U U U	USCS	MATERIAL D	DESCRIPTIC	Ν	REMARKS AND TESTS	BACKFILL/INSTALL.
676	SH_8 SPT_ 9	80 100	3-4-5 (N=9)	• F	0 		СН	Very stiff, moist, orang (CH); high plasticity. Residual Soil of the S <i>Becomes stiff, gray a</i>	Springwater	Formation		
35-	SH_1 0	42					мн	sensitive.	T CLAY (CH); medium san	high d,	SH_10 advanced at 300 psi from 35 to 36 feet and at 350 psi from 36 to 37 feet.	
671 40	SPT_ 11 SPT_ 12	100 100	3-4-9 (N=13) 5-5-10 (N=15)		0		SM	Sensitive Saprolite o Formation Medium dense, wet, S plasticity, sensitive. Sensitive Saprolite o Formation	ilty SAND (SN	//); low	Gravelly drilling at 38 feet. SPT_12: Oven Dried PI=4.6 (PL, LL = 27.4, 32.0).	
666 45	SPT_ 13 SPT_ 14	100 73	(N=13) 16-17-36 (N=53) 32-50/5" (Refusal)	0				Color becomes gray- gravel at 40.0 feet. Very dense moist, gray (SM); fine to coarse sa gravel, low plasticity fi Less Weathered Spri Grades to Silty SAND 45.0 feet.	-brown, Silty nd, trace fine nes. ngwater For	SAND to coarse mation		
661 50	SPT_ 15	30	22-32-50 /5" (Refusal)	0			SM	Becomes gray-brown SAND (SM) with trac				
656 ₅₅	SPT_ 16		30-50/6" (Refusal)	O				/Very stiff, moist, gray, I plasticity.	EAN CLAY (C	L); low	Chattering on gravel at 55 feet. Soft drilling at 59	
651							CL	Less Weathered Spri	ngwater For	mation	feet.	
	rgrour		Vertical Datum	: Portland Ve	rce: PWB Surve ertical 983 StatePlane (S 3601 Feet	Bo	U	FF-B-202 t 2 of 3	

Log of Boring

FF-B-202 inal Depth Date(s) Client 04/19/2021 - 04/20/2021 **Portland Water Bureau** 81.2 ft bgs Drilled Coordinates Geotechnical /lethod/ 7740578.6 E, 661126.9 N Lacamas Consulting Mud Rotary/CME 55 Consultant Rig Type Surface Drilling Hole 710.6 ft. 5.00 in Western States Soil Conservation, Inc. levatior ontracto Diameter ocation _ogged by/ Hammer **Carpenter Lane Nursery** Susan Bednarz / Susan Bednarz 140 lb / 30 in / Automatic Checked by SAMPLE NUMBER PENETRATION BACKFILL/INSTALL. GRAPHIC (%) SAMPLE TYPE RESISTANCE WATER LEVEI DEPTH (FT) BLOW COUNTS BLOWS/FT ELEV. (FT RECOVERY REMARKS USCS 10 20 30 40 MATERIAL DESCRIPTION AND O WATER CONTENT USCS (TESTS (MC) ATTERBERG LL/PL 20 40 60 80 Very stiff, moist, gray, LEAN CLAY (CL); low 3-7-11 SPT 100 Ð plasticity. 17 (N=18) Less Weathered Springwater Formation CL Very dense, moist, gray-brown and orange, 646 65 Silty SAND (SM); fine to medium sand, trace SPT 18: 49.8% fines by ASTM D1140 100 19-19-42 gravel, low plasticity fines. SPT Less Weathered Springwater Formation 18 (N=61) 641 70 Chattering on gravel Becomes Silty SAND with gravel (SM); fine SPT 106 28-40-50 0 at 70 feet. to coarse sand at 70.0 feet. /5" 19 (Refusal) SM 636 75 🛨 SPT_ Cobbly and gravelly 168 50/3" Becomes Silty SAND with gravel and drilling 75 - 79 feet. 20 (Refusal) cobbles (SM) at 75.0 feet. 631 80 SPT 114 17-42-50 0 /2" 21 Borehole completed (Refusal) at 81.2 feet below ground surface (bgs). 626 85 621 NOTES: Boring FF-B-202 DEI



Location and Elevation Source: PWB Survey 5-13-2021 Vertical Datum: Portland Vertical Coordinate System: NAD 1983 StatePlane Oregon North FIPS 3601 Feet Soring FF-B-20 Sheet 3 of 3

Log of Boring

Project Numl	ber: 608	34.0						FF-	B-204	
Date(s) Drilled 04/0	9/2021			Client	Portl	and V	Vater Bureau	Final Depth 80.4 ft b	gs	
Coordinates 7740	583.9 E,	660880.2 ľ	J	Geotechnical Consultant	Lacar	mas C	onsulting	Method/ Rig Type Mud Ro	otary/CME 55	
Surface 703.	6 ft.			Drilling Contractor	Wester	n States	Soil Conservation, Inc.	Hole 5.00 in		
Location Carr	penter L	ane Nurse	ry	Logged by/ Checked by	Susar	n Bedr	arz / Susan Bednarz	Hammer Type 140 lb / S	30 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 0 WATE (MC) ATTEF	NETRATION SISTANCE DWS/FT 20 30 40 H H H ER CONTEI RBERG LL/I 40 60 80	명 국] USCS GRAPHIC	USCS	MATERIAL D	ESCRIPTION	REMARKS AND TESTS	BACKFILL/INSTALL.
699 5 SP	T_ 95 L	2-5-5 (N=10)	e le			МН	Stiff, moist, orange-brc (MH); high plasticity. Residual Soil of the S	wn, ELASTIC SILT	Plowed field at ground surface. SPT_1: Oven Dried PI=16.6 (PL, LL = 25.9, 42.5).	
694 10 SP	T_ 100	4-6-8 (N=14)			·····					
689 15 SP	T_ 100	6-10-12 (N=22)	0				Very stiff, moist, gray a (CH); high plasticity. Residual Soil of the S	nd orange, FAT CLAY		
684 20 SP	T_ 100	5-8-13 (N=21)		D		сн	Color changes to oral at 20.0 feet	nge-brown and gray		
SP	T_ 100	5-8-11 (N=19)	H	•			Color changes to gray feet.	y and red at 22.5		
679 25 SP	5	2-2-2 (N=4) 2-2-5		0		SM	Moisture become we to gray and orange-b Medium stiff, wet, oran ELASTIC SILT (MH) inte Silty SAND (SM); fine to plasticity fines, relict to	nown at 25.0 feet. nge, gray, and brown, rbedded with loose o coarse sand, high exture, sensitive.		
674	7	(N=7)			·····		Sensitive Saprolite or Formation	f the Springwater		
DELN		NOTES: Location and E Vertical Datum Coordinate Sys	: Portland V	ertical			·	0	FF-B-204 t 1 of 3	

Log of Boring

Project Nu	umber:	6084.0						FF-	B-204	
Date(s) Drilled 0	4/09/202	1		Client	Portla	nd W	Vater Bureau	Final Depth 80.4 ft b	ogs	
Coordinates 7	740583.9	E, 660880.2	N	Geotechnical Consultant	Lacan	nas C	onsulting	Method/ Rig Type Mud Ro	otary/CME 55	
Surface 7 Elevation	'03.6 ft.			Drilling Contractor	Western	States	Soil Conservation, Inc.	Hole 5.00 in		
Location C	Carpente	r Lane Nurs	ery	Logged by/ Checked by	Susan	Bedn	arz / Susan Bednarz	Hammer Type 140 lb /	30 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%) BLOW COUNTS	RES BLC 10 2 WATE (MC)	NETRATION SISTANCE DWS/FT 20 30 40 H H H ER CONTENT RBERG LL/PL 40 60 80	U U	USCS	MATERIAL D	DESCRIPTION	REMARKS AND TESTS	BACKFILL/INSTALL.
	SPT_ 1 8	00 2-2-2 (N=4)		0		SM	Loose, wet, orange, bro SAND (SM); fine to coa plasticity fines, relict te Sensitive Saprolite o	rse sand, high exture, sensitive.		
669 35 V	9	00 3-5-8 (N=13)		0		мн	Formation Stiff, wet, gray-brown, (MH); high plasticity, fi relict texture, sensitive Sensitive Saprolite o	ne to coarse sand,	Gravel at 34.0 feet. SPT_10: Oven Dried PI=4.9	
	10	00 3-3-10 (N=13)					Formation Minor sensitivity and feet.		(PL, LL = 24.9, 29.8). Harder drilling at 37.0 feet.	
664 40 X		38 16-36-50 /4" (Refusal) 72 36-38-41 (N=79)				ML	Hard, wet, gray-brown gravel (ML); low plastic gravel, fine to coarse sa Less Weathered Spri Becomes moist at 40	city, fine to coarse and. ngwater Formation	,	
659 ₄₅	SPT_ 1 13	42 25-35-50 /0" (Refusal)				SM	Very dense, moist, gray with gravel (SM); fine t coarse sand, low plasti Less Weathered Spri	to coarse gravel, fine to city fines.	SPT_13: 25.6% fines by ASTM D1140	
654 50	SPT_ 1 14	00 0-3-4 (N=7)	• 	þ	··· ·· ··	ML	Medium stiff, moist, gr (ML); low plasticity. Less Weathered Spri		feet.	
649 55	SPT_ 1 15	00 28-15-23 (N=38)	\$ 	⊢_⊖]∎		МН	Hard, wet, gray and ora SILT (MH); high plastici trace fine to coarse gra sensitive. Sensitive Saprolite w Springwater Formation Hard, moist, gray-brow low plasticity, fine to co gravel, overconsolidate	ty, fine to coarse sand, avel, relict texture, rithin Less Weathered <u>n</u> rn, Sandy SILT (ML); parse sand, trace	Hard drilling at 54.0 feet. SPT_15: Oven Dried PI=12.9 (PL, LL = 39.2, 52.1).	
644		NOTES				ML	Less Weathered Spri		feet.	
DEL		Vertical Datur	n: Portland V	irce: PWB Survey 'ertical 983 StatePlane C			S 3601 Feet	0	FF-B-204 et 2 of 3	

Log of Boring

Project Number: 6084.0				8-204
Date(s) Drilled 04/09/2021	Client Portlan	d Water Bureau	Final Depth 80.4 ft bg	<u>g</u> s
^{Coordinates} 7740583.9 E, 660880.2 N	Geotechnical Consultant Lacama		Method/ Rig Type Mud Rot	tary/CME 55
Surface 703.6 ft.	Drilling Contractor Western St		Hole 5.00 in	
Location Carpenter Lane Nursery	Logged by/ Checked by Susan B		Type 140 lb / 3	0 in / Automatic
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE SAMPLE NUMBE AMPLE NUMBE COUNTS COUNTS COUNTS	IETRATION OH SISTANCE OH SISTANCE OH WS/FT OH 0 30 40 ER CONTENT SO RBERG LL/PL OH 0 60	S) MATERIAL D	ESCRIPTION	REMARKS AND TESTS BACKHIT/INSTALL
639 oc		Hard, moist, gray-brow low plasticity, fine to co gravel, overconsolidate Less Weathered Sprin Few gravel, cobbles, c	oarse sand, trace d. agwater Formation	Large cobble at 64.0 feet.
05 ▼ SPT_ 200 50/3" 17 (Refusal)		feet.		Boulder from 66.0 to 68.0 feet.
034 70 ▼ SPT_ 179 50/5" ○ 18 18 (Refusal) ○		ML Becomes Sandy SILT w 70.0 feet.	vith gravel (ML) at	Hard drilling from 70.0 to 75.0 feet.
629 75 SPT_ 200 50/3" 19 (Refusal)				
624 80 x SPT 138 50/5" 0				
619 ₈₅				Borehole completed at 80.4 feet below ground surface (bgs).
614				
DELVE underground NOTES: Location and Elevation Sou Vertical Datum: Portland Vi Coordinate System: NAD 19	,		e	FF-B-204 : 3 of 3

Log of Boring

Project ate(s) rilled			05/15/2021		Client	Por	land	Water Bureau	Final Depth	80.7 ft b	gs	
oordinates			660838.9 N		Geotechnical Consultant			Consulting	Method/ Rig Type		tary/CME 800 Tra	ac
rface	692.3 f				Drilling			es Soil Conservation, Inc.	Hole	5.00 in		
vation cation			ane Nurse	rv	Contractor Logged by/			dnarz / Susan Bednarz	Diameter Hammer Type		30 in / Automatic	
					Checked by	N			Туре			
VVATER LEVEL DEPTH (FT)	SAMPLE TYPE SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	BLC 10 2 O WATE (MC)	SISTANCE DWS/FT 0 30 40 						REMARKS AND TESTS	
- - - - - - - - - - - - - - - - - - -	SPT_	. 100	2-4-4			······		Medium stiff, moist, or SILT (MH); high plasticit Residual Soil of the S	zy.		Flush-mount monument installed. VWP installed at 20 feet and grouted into borehole. 350 kPa Rating S/N: 2113126 Grass-covered field at ground surface.	
33 10-	1 SPT_2	. 100	(N=8) 3-5-5 (N=10)	• 0			м	H Becomes stiff at 10.0	feet.			
78 15-	SPT_ 3	100	0-1-2 (N=3)		I —−þ	·····		Soft, wet, orange, gray, Sandy ELASTIC SILT (MH to medium sand, relict Sensitive Saprolite of Formation	l); high plas texture, sen	ticity, fine sitive.	SPT_3: Oven Dried PI=27.3 (PL, LL = 35.6, 62.9).	
73 20-	SPT_ 4	100	1-2-1 (N=3)		0		м	H At 20.0 feet, becomes	aray brown	sand		
-	SPT_ 5	61	1-1-3 (N=4)		C			becomes fine to coars		<i>, sunu</i>		111111
8	SPT_ 6	100	1-2-8 (N=10)		Ð		٥j	Becomes stiff with tro 22.5 feet; color becom yellow.	nes gray-bro	wn- /	SPT_6: Oven Dried PI=6.5 (PL, LL = 35.1, 41.6).	
25-	SPT_ 7	22	26-21-25 (N=46)	Ō			G	Dense, wet, gray, brow GRAVEL with sand and gravel (broken), fine to plasticity fines, sensitiv Sensitive Saprolite of Formation Large cobbles from 22	cobbles (GN medium sar e elastic silt the Spring	1); coarse nd, high matrix. water	Bouncing on gravel at 25 feet.	
63 DE	LV	E	NOTES: Location and El	evation Sou	rce: PWB Sur	vey 5-13-	2021	Large cobbles from 2:			FF-B-205	_

Log of Boring

Street OB/14/2021 - 05/15/2021 Journey Control Portland Water Bureau Interview 80.7 ft bgs Transmer 7740391.6 E, 66038.9 N Entry Lanzanas Consulting testword Schule Sch	Project	Num	nber	: 608	34.0								FF-	B-205	
Character Lackmare Lackmare Lackmare Construction Multice Source 500 In Carpenter Lane Nursery Carpenter Suites Sait Conservation. Inc. Source 500 In REMARKS Current Lane Nursery Carpenter Lane Nursery Carpenter Suites Sait Conservation. Inc. Number Source 140 Ib / 30 in / Automatic USATE Source Source Source Source 140 Ib / 30 in / Automatic USATE Source Source Source Source Number Source 140 Ib / 30 in / Automatic USATE Source Source Source Source Source Number Source Source Number Source Numer Source Numer Source		05/	14/20)21 -	05/15/2021		Client	Po	rtla	nd W	later Bureau	Final Depth	80.7 ft bg	gs	
Distance	Coordinates	774	0391	.6 E,	660838.9 N	J		La	carr	nas C	onsulting		Mud Ro	tary/CME 800 Tra	ck
Carpender Lade Vursery Detector Sustan Bednarz /		692	2.3 ft.	,				We	stern	States	Soil Conservation, Inc.		5.00 in		
SPT_ 120 26-50/4" Very dense, moist, gray-brown, Silty SAND with gravel (SM); fine to coarse gravel, fine to gravel from 30 to 33.5 feet. Hard, slow drilling in gravel from 30 to 33.5 feet. 658 35 SPT_ 161 36-50/2" O SM 653 9 161 36-50/2" O SM SM 653 40 SPT_ 100 1-7-10 SM SM 653 40 SPT_ 100 1-7-10 CL Very stiff, moist, gray, LEAN CLAY (CL); low plasticity. Softer drilling at 39.5 feet. 648 45 SPT_ 100 7-10-29 H=1 M Hard, moist to wet, gray and orange. Sandy ELASTIC SUT (MH); high plasticity, fine to medium sand, relist to xet, gray and orange. Sandy ELASTIC SUT (MH); high plasticity, fine to coarse sand. SPT_ 11: Oven Dried P=18.0 643 50 SPT_ 109 19-25-50 M ML Sandy SUT (ML); low plasticity, fine to coarse sand. Set "Artier" indicates gravel at 48.5 feet. 633 SPT_ 109 19-25-50 O M ML Sing Support (Sing Support) Sing Cartery <t< td=""><td>Location</td><td>Ca</td><td>rpen</td><td>ter L</td><td>ane Nurse</td><td>ry</td><td></td><td>Su</td><td>san</td><td>Bedn</td><td>arz / Susan Bednarz</td><td></td><td>140 lb / 3</td><td>30 in / Automatic</td><td></td></t<>	Location	Ca	rpen	ter L	ane Nurse	ry		Su	san	Bedn	arz / Susan Bednarz		140 lb / 3	30 in / Automatic	
8 (Refusal) with gravel (SM); fine to coarse gravel, fine to 30 to 39.5 feet. 658 35 SPT_ 161 36-50/2" SM 653 40 SPT_ 161 36-50/2" SM 653 40 SPT_ 100 1-7-10 SM 643 50 SPT_ 100 1-7-10 CL Less Weathered Springwater Formation 648 45 SPT_ 100 7-10-29 I-O-I Image: Close Springwater Formation Softer drilling at 39.5 feet. 648 45 SPT_ 100 7-10-29 Image: Close Springwater Formation Softer drilling at 39.5 feet. 643 50 SPT_ 100 7-10-29 Image: Close Springwater Formation Softer drilling at 39.5 feet. 643 50 SPT_ 100 7-10-29 Image: Close Springwater Formation Softer drilling at 39.5 feet. 643 50 SPT_ 100 19-25-50 Image: Close Springwater Formation Softer drilling at 30.5 feet. 633 SPT_ 141 24-50/4" Image: Close Springwater Formation Softeet drilling at 30.5 feet.	ELEV. (FT) WATER LEVEL DEPTH (FT)	SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	SISTANCE DWS/FT 0 30 40 H H ER CONTEN RBERG LL/P			USCS	MATERIAL D	escripti	ON	AND	BACKFILL/INSTALL.
35 X SPT_ 9 161 36-50/2" (Refusal) SM Softer drilling at 39.5 feet. 653 40 X SPT_ 10 100 1-7-10 (N=17) Very stiff, moist, gray, LEAN CLAY (CL); low plasticity. Less Weathered Springwater Formation Softer drilling at 39.5 feet. 648 45 X SPT_ 11 100 7-10-29 Hort Hard, moist to wet, gray and orange, Sandy ELASTIC SLIT (MH); high plasticity, fine to Sensitive Saprolite within Less Weathered SPT_11: Oven Dried Plasticity. Sensitive Saprolite within Less Weathered SPT_11: Oven Dried Plasticity, fine to coarse sand. Less Weathered Springwater Formation SPT_11: Oven Dried Plasticity, fine to coarse sand. Less Weathered Springwater Formation SPT_11: Oven Dried Plasticity, fine to coarse sand. Less Weathered Springwater Formation 643 50 SPT_ 12 109 19-25-50 0 MIL Hard, moist, light brown, Sandy SUT (ML); low plasticity, fine to coarse sand. Less Weathered Springwater Formation Rod "chatter" indicates gravel at 48.5 feet. 633 SPT_ 13 141 24-50/4" 0 Very dense, moist, gray-brown, Silty SAND (SM); fine to coarse sand, low plasticity fines; soil exhibits minor sensitivity. Less Weathered Springwater Formation Rot Silter Hole Shate Soil exhibits minor sensitivity.		S	-	120	-	O					with gravel (SM); fine t coarse sand, low plasti	o coarse gr city fines.	avel, fine to	gravel from 30 to	
40 SPT_10 100 1-7-10 • Sector Sec		X s	-	161	-	O				SM					
45 SPT_11 100 7-10-29 Hert MH ELASTIC SILT (MH); high plasticity, fine to medium sand, relict texture, sensitive. Sensitive Saprolite within Less Weathered Springwater Formation SPT_11: Oven Dried PI=18.0 (PL, LL = 29.5, 47.5). 643 50 SPT_12 109 19-25-50 Image: Sensitive Support of the texture indicates gravel at 48.5 feet. 638 55 SPT_12 109 19-25-50 Image: MH ML Hard, moist, light brown, Sandy SILT (ML); low plasticity, fine to coarse sand. Less Weathered Springwater Formation Rod "chatter" indicates gravel at 48.5 feet. 638 55 SPT_13 141 24-50/4" Image: MH Very dense, moist, gray-brown, Silty SAND (SM); fine to coarse sand, low plasticity fines; soil exhibits minor sensitivity. Less Weathered Springwater Formation SM Very dense, moist, gray-brown, Silty SAND (SM); fine to coarse sand, low plasticity fines; soil exhibits minor sensitivity. Less Weathered Springwater Formation SM SM Boring FF-B-205			-	100						CL	plasticity.			39.5 feet. Switched to 4-inch tricone bit below 40	
643 50 SPT_109 19-25-50 Image: space spac			-	100		ŀ	⊖-] ■			мн	ELASTIC SILT (MH); hig medium sand, relict te Sensitive Saprolite w	h plasticity, xture, sensi vithin Less V	fine to tive.	PI=18.0	
55 SPT_1 141 24-50/4" Image: Construction of the second se			_	109	/5"	0		····		ML	low plasticity, fine to co	oarse sand.		indicates gravel at	
NOTES: Location and Elevation Source: PWB Survey 5-13-2021 Vertical Datum: Portland Vertical	55-		_	141	-	0				SM	(SM); fine to coarse sat soil exhibits minor sen	nd, low plas sitivity.	sticity fines;		
underground Coordinate System: NAD 1983 StatePlane Oregon North FIPS 3601 Feet Sheet 2 of 3	DE				Location and El Vertical Datum	Portland Ve	ertical				5 3601 Feet	В	U		

Log of Boring

Project N	umber	r: 608	34.0							FF-	B-205	
Date(s) Drilled ()5/14/2	021 -	05/15/2021		Client	Portla	and V	Vater Bureau	Final Depth	80.7 ft bş	gs	
Coordinates	7740392	1.6 E,	660838.9 N	N	Geotechnical Consultant	Lacan	nas C	onsulting	Method/ Rig Type	Mud Ro	tary/CME 800 Tra	ck
Surface Elevation	592.3 ft	•			Drilling Contractor	Western	1 States	Soil Conservation, Inc.	Hole Diameter	5.00 in		
Location	Carpen	ter L	ane Nurse	ry	Logged by/ Checked by	Susan	Bedr	arz / Susan Bednarz	Hammer Type	140 lb / 3	30 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 • • • • • • • • • • • • • • • • • • •	NETRATION SISTANCE DWS/FT 0 30 40 H H H ER CONTEN RBERG LL/P 0 60 80	U U	USCS	MATERIAL D	DESCRIPTIO	N	REMARKS AND TESTS	BACKFILL/INSTALL.
628 65	14	31	50/5" (Refusal)					Very dense, moist, ligh SAND with gravel (SM) trace fine to coarse gra overconsolidated fines Less Weathered Spri	; fine to coars avel, low plast	e sand, icity,	Rod "chatter" indicates gravel at 66 feet.	
623	SPT_ 15	171	35-50/4" (Refusal)	O								
618 70	SPT_ 16	212	48-50/2" (Refusal)	0			SM	No gravel at 70.0 fee Few coarse gravel at			Lost drilling circulation and 50 gallons of drilling mud at 74 feet. SPT_17: 24.1% fines by ASTM D1140 Poor circulation; lost 100 gallons of	
613 80	SPT_ 17	94	16-39-50 /5" (Refusal)	0							drilling mud between 75 and 80 feet. Mud loss may be due to squeezing clay or clay collar forming around drill rods preventing circulation return.	
	18	95	41-50/3" (Refusal)			• • • • • • • • • • • • • • • • • • •					Borehole completed at 80.7 feet below ground surface	
608 85											(bgs).	
603												
			NOTES: Location and E Vertical Datum Coordinate Sys	: Portland V				S 3601 Feet	Во	U	FF-B-205	<u> </u>

Log of Boring

Project	Nu	mber	: 608	4.0								ГГ-]	B-206	
Date(s) Drilled	04	4/15/20)21 - (04/16/2021		Client	Р	ortla	nd W	later Bureau	Final Depth	80.3 ft bş	gs	
Coordinates	72	740484	.3 E,	660667.1 N	N	Geotechnical Consultant	L	acan	nas C	onsulting	Method/ Rig Type	Mud Ro	tary/CME 800 Tra	ıck
Surface Elevation	70	02.3 ft				Drilling Contractor	W	/estern	States	Soil Conservation, Inc.	Hole Diameter			
Location	С	arpen	ter La	ane Nurse	ry	Logged by/ Checked by	S	usan	Bedn	arz / Susan Bednarz	Hammer Type	140 lb / 3	30 in / Automatic	
ELEV. (FT) WATER LEVEL DFPTH (FT)		SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	NETRATIC SISTANCI DWS/FT 0 30 4 H H ER CONT RBERG LI 0 60 8	E 40 ENT L/PL	USCS GRAPHIC	USCS	MATERIAL D	DESCRIPT	ION	REMARKS AND TESTS	BACKFILL/INSTALL.
698 5		SPT_ 1	100	1-2-3 (N=5)		5 5				Medium stiff, moist, or SILT (MH); high plastici Residual Soil of the S	ty.		Grass-covered plowed field at ground surface.	
- 693 - 10 -		SPT_ 2	100	2-2-3 (N=5)	■ le	}]			мн					
688 . 15		SPT_ 3	100	4-5-9 (N=14)						Becomes stiff at 15.0	feet.			
683 _ 20		SPT_ 4	100	12-5-6 (N=11)	0				СН	Stiff, moist, gray and o high plasticity. Residual Soil of the S				
678 25		SPT_ 5 SPT_	100 100	1-1-2 (N=3) 2-1-2		⊢ ा			мн	Soft, wet, gray-brown- SILT (MH); high plastici sand, relict texture, ser Sensitive Saprolite o Formation At 25.0 feet, become.	ty, fine to nsitive. f the Sprir s brown, o	medium gwater range, and	SPT_5: Oven Dried PI=28.8 (PL, LL = 36.4, 65.2).	
673		6 SPT_ 7	100	(N=3) 2-2-3 (N=5)		(0		10111	black; sand becomes At 27.5 feet, become orange and brown.	-		Rod "chatter" indicating gravel at	
DE			d	NOTES: Location and E Vertical Datum Coordinate Sys	: Portland Ve	ertical				5 3601 Feet	E	Ŭ	FF-B-206 t 1 of 3	

Log of Boring

Project N	umbei	r: 608	34.0								FF-I	B-206	
Date(s) Drilled (04/15/2	021 -	04/16/2021		Client	Port	la	nd W	Vater Bureau	Final Depth	80.3 ft bş	gs	
Coordinates	7740484	4.3 E,	660667.1 N	J	Geotechnical Consultant	Laca	m	as C	onsulting	Method/ Rig Type	Mud Ro	tary/CME 800 Tra	ck
Surface Elevation	702.3 ft	•			Drilling Contractor	Weste	rn S	States	Soil Conservation, Inc.	Hole Diameter			
Location	Carpen	ter L	ane Nurse	ry	Logged by/ Checked by	Susa	m	Bedn	arz / Susan Bednarz	Hammer Type	140 lb / 3	80 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLF TYPF	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 • • • • • • • • • • • • • • • • • • •	NETRATION SISTANCE DWS/FT 0 30 40 H H H ER CONTENT RBERG LL/PL 0 60 80			USCS	MATERIAL D	ESCRIPTI	ON	REMARKS AND TESTS	BACKFILL/INSTALL.
668	SPT_ 8 SPT_ 9	100	6-12-8 (N=20) 3-4-8 (N=12)		• 0 0			MH	Very stiff, wet, gray-bro ELASTIC SILT (MH); higl coarse sand, relict text Sensitive Saprolite o Formation At 32.5 feet, becomes to coarse gravel.	n plasticity, ure, sensiti f the Sprin	fine to ve. gwater	29.5 feet.	
35	SPT_ 10	100	5-16-12 (N=28)	Þ				ML	Very stiff, wet, light bro SILT (ML); low plasticity gravel, fine to coarse sa Less Weathered Spri	y, few fine and.	to coarse	SPT_10: Oven Dried PI=3.3 (PL, LL = 22.4, 25.7).	
663 40	SPT_ 11	100	21-24-28 (N=52)	0			· · ·	SM	Very dense, moist, ligh SAND with gravel (SM) fine to coarse sand, low Less Weathered Spri	t brown an : fine to co v plasticity	d gray, Silty arse gravel, fines.		
	SPT_ 12	100	14-29-31 (N=60)	O				SM	Very dense, moist, ligh SAND (SM); fine to coa overconsolidated fines Less Weathered Sprin	t brown an rse sand, le	d gray, Silty w plasticity		
	SPT_ 13	100	0-2-2 (N=4)	•) 			CL	Soft, moist to wet, gray plasticity. Less Weathered Spri			Soft at 45 feet.	
653 50	SPT_	100	2-3-5		0								
648	14		(N=8)					ML	Medium stiff to hard, r brown, Sandy SILT (ML coarse sand, relict text Sensitive Saprolite w Springwater Formation); low plast ure, sensiti r ithin Less '	icity, fine to		
55	SPT_ 15	100	9-17-40 (N=57)	Ē	H				Very dense, wet, gray a			SPT_15: Oven Dried PI=4.5 (PL, LL = 33.9, 38.4).	
643								SM	with gravel (SM); fine t coarse sand, low plasti fines, weakly cementer Less Weathered Spri	city overco d.	nsolidated		
DEL					rce: PWB Survey	5-13-2	202	1		B	oring	FF-B-206	
underg			Vertical Datum Coordinate Sys		ertical 983 StatePlane C	regon	No	rth FIPS	5 3601 Feet		Sheet	t 2 of 3	

Log of Boring

Project Nu	umber	: 608	34.0							ГГ-]	D-200	
Date(s) Drilled C	4/15/2	021 -	04/16/2021		Client	Portla	nd W	Vater Bureau	Final Depth	80.3 ft b	gs	
Coordinates 7	04/15/2021 - 04/16/2021 Portland Water Bureau 80.3 ft bgs ates 7740484.3 E, 660667.1 N Geotechnical Consultant Lacamas Consulting Method/ Rig Type Mud Rotary/CME 800 Track 702.3 ft. Drilling Contractor Western States Soil Conservation, Inc. Hole Diameter Carpenter Lane Nursery Logged by/ Checked by Susan Bednarz / Susan Bednarz Hammer Type 140 lb / 30 in / Automatic											
Surface Elevation 7	′02.3 ft	•				Western	States	Soil Conservation, Inc.				
Location (Carpen	ter L	ane Nurse	ry		Susan	Bedn	arz / Susan Bednarz		140 lb / 3	30 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%)		RES BLC 10 2 O WATE (MC)	SISTANCE DWS/FT 0 30 40 H H H ER CONTENT RBERG LL/PL	USCS GRAPHIC	USCS	MATERIAL D	ESCRIPTI	ON	AND	BACKFILL/INSTALL.
638	16	146	-	0			SM	with gravel (SM); fine t coarse sand, low plasti fines, weakly cemented	o coarse gr city overco d.	avel, fine to nsolidated		
		100		0				SAND with silt and cob coarse sand, low plasti sensitivity.	bles (SW-SI city fines, n	VI); fine to hinor		
633 70 -		120	-	0							71.5 feet on gravel	
623	19		(Refusal)	0			SM	Silty SAND (SM): fine to plasticity fines, minor s Less Weathered Sprin Trace gravel, weakly	o coarse san sensitivity. ngwater Fo	nd, low rmation	drilling from about	
	-	168	/ -	0		···					at 80.3 feet below ground surface	
618 85												
613												
DEL			Location and El Vertical Datum	: Portland V	ertical			5 3601 Feet	В	U		

Log of Boring

Project Nu	mber:	6084.0									FF-I	B-20 7	
Date(s) Drilled 0	4/07/202	21			Client	Po	rtlar	nd W	ater Bureau	Final Depth	80.5 ft bş	gs	
^{Coordinates} 7	740742.	1 E, 6607	786.2 N	1	Geotechnical Consultant	La	cam	as Co	onsulting	Method/ Rig Type	Mud Ro	tary/CME 75	
Surface Elevation 7	07.0 ft.				Drilling Contractor	Wes	tern S	States S	Soil Conservation, Inc.	Hole Diameter	5.00 in		
Location C	Carpente	er Lane I	Nurse	ry	Logged by/ Checked by	Su	san I	Bedn	arz / Susan Bednarz	Hammer Type	140 lb / 3	30 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%) BLOW	COUNTS	RES BLC 10 2 O WATE (MC)	IETRATIC SISTANCE DWS/FT 0 30 40 H H H ER CONTE RBERG LL 0 60 80	D ENT /PL	USCS GRAPHIC	USCS	MATERIAL D			REMARKS AND TESTS	BACKFILL/INSTALL.
702 5 697 10 692 15	1 SPT_ 1 2	(N 100 3- (N 100 3-	-0-2 J=2) -4-5 J=9) -5-6 =11)	■ .c				MH	Soft, moist, orange-bro (MH); high plasticity. Residual Soil of the S <i>Becomes stiff at 10 fe</i>	pringwate		Dirt road at ground surface.	
687 20 682 25	4 SH_5	(N 75	8-12 =20)		•			СН	Very stiff, moist, gray a (CH); high plasticity. Residual Soil of the S <i>Becomes gray, orang</i> Soft, wet, brown, gray, SILT with sand (MH): h	e, and red. and black, igh plasticit	r Formation	SH_5 advanced at 400 to 600 psi from 22.5 to 24.5 feet.	
682 25	SPT_ 1 6		-2-2 √=4)		0				sand, relict texture, ser Sensitive Saprolite o Formation		gwater		
	SH_7	66						MH SM	Loose, wet, gray-brown to coarse sand, high pl texture, sensitive. Sensitive Saprolite o Formation	asticity fine	es, relict	SH_7 advanced at 500 to 650 psi from 27.5 to 29.5 feet.	
		🚽 Vertic	on and El al Datum:	Portland Ve	rce: GPS (no ertical 983 StatePlar			rth FIPS	5 3601 Feet	В	0	FF-B-207 t 1 of 3	

Log of Boring

FF-B-207

Projec	t Nu	ımber	: 608	34.0		-				rr-	B-20 7	
Date(s) Drilled	0	4/07/2)21			Client	Portl	and V	Vater Bureau	Final Depth 80.5 ft b	gs	
Coordinates	7	740742	2.1 E,	660786.2 N	J	Geotechnical Consultant	Laca	mas C	Consulting	Method/ Rig Type Mud Ro	otary/CME 75	
Surface Elevation	7	07.0 ft	•			Drilling Contractor	Wester	n States	Soil Conservation, Inc.	Hole 5.00 in		
Location	C	Carpen	ter L	ane Nurse	ry	Logged by/ Checked by	Susar	n Bedr	narz / Susan Bednarz	Hammer Type 140 lb /	30 in / Automatic	
ELEV. (FT) WATER LEVEL	DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	NETRATION BISTANCE DWS/FT 0 30 40 H H H ER CONTEN RBERG LL/P 0 60 80		USCS	MATERIAL D	DESCRIPTION	REMARKS AND TESTS	BACKFILL/INSTALL.
-		SPT_ 8 SH_9	100 75	1-1-5 (N=6)		0		SM	to coarse sand, high pl texture, sensitive.		SH_9 advanced at 300 to 900 psi from 32.5 to 34.5 feet.	
672 35	5	SPT_ 10	100	3-3-12 (N=15)	•	-þ		ML	Stiff, wet, gray, brown, SILT (ML); low plasticit relict texture, sensitive Sensitive Saprolite o Formation	y, fine to coarse sand,	SPT_10: Oven Dried PI=10.8 (PL, LL = 28.8, 39.6). Drilling action indicates gravel at	
667 4(SPT_ 11 SPT_ 12	17 0	12-29-39 (N=68) 50/2" (Refusal)				GP	Very dense, wet, gray-	barse gravel, trace fine bw plasticity fines.	36.5 feet.	
662 45	5	SPT_ 13	100	50/4" (Refusal)	0			2	Very dense, moist, tan GRAVEL with silt, sand GM); fine to coarse gra sand, low plasticity fin Less Weathered Spri	, and cobbles (GP- avel, fine to coarse es, minor sensitivity.	Drilling action indicates cobbles at 43 feet.	
- - -657 5(SPT_ 14	100	10-15-20 (N=35)	юı			CL	Hard, moist, gray and o (CL); low plasticity, ove Less Weathered Spri	erconsolidated.	Soft drilling zone at 47.5 feet. No gravel from 50 to 55 feet. SPT_14: Oven Dried PI=16.4	
- 652 55 - -	5	SPT_ 15	100	5-10-15 (N=25)				MH	Sensitive Saprolite w Springwater Formatio Hard, moist, gray and I (ML); low plasticity, fin gravel, overconsolidate	h plasticity, fine to rithin Less Weathered n prown, Sandy SILT e to coarse sand, trace ed.	(PL, LL = 20.4, 36.8). Drilling action indicates gravel at 57 feet.	
		rour		NOTES: Location and El Vertical Datum Coordinate Syst	: Portland Ve	ertical		 North FIP	S 3601 Feet	Boring	FF-B-207 et 2 of 3	<u>////</u>

Log of Boring

Project Nu	mber: 60	84.0						B-207	
Date(s) Drilled 04	4/07/2021		Client	Portla	nd W	Vater Bureau	Final Depth 80.5 ft b	gs	
Coordinates 77	7 40742.1 E,	, 660786.2 N	Geotechnical Consultant	Lacan	nas C	onsulting	Method/ Rig Type Mud Ro	tary/CME 75	
Surface 7 0 Elevation	07.0 ft.		Drilling Contractor	Western	States	Soil Conservation, Inc.	Hole 5.00 in		
Location C	arpenter I	ane Nursery	Logged by/ Checked by	Susan	Bedn	arz / Susan Bednarz	Hammer Type 140 lb / 3	30 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER RECOVERY (%)	BL 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	NETRATION SISTANCE OWS/FT 20 30 40 H H H ER CONTEN RBERG LL/PI 40 60 80	U U	USCS	MATERIAL D	ESCRIPTION	REMARKS AND TESTS	BACKFILL/INSTALL.
642 65	SPT_ 106 16 SPT_ 100 17	/5" (Refusal)			GM	Hard, moist, gray and b (ML); low plasticity, fin gravel, overconsolidate Less Weathered Spri Becomes very hard, g trace gravel. Very dense, moist, gray with cobbles (GM); find fine to coarse sand, low Less Weathered Spri	e to coarse sand, trace ed. ngwater Formation gray and brown, with y-brown, Silty GRAVEL e to coarse gravel, few w plasticity fines.	Cobbles below 62	
637 70	SPT_ 146 18	50/5" O (Refusal)			SM	Very dense, moist, gray with gravel and cobble gravel, fine to coarse so overconsolidated fines Less Weathered Spri	s (SM); fine to coarse and, low plasticity	SPT_18: 23.9% fines by ASTM D1140	
	SPT_ 181 19	(Refusal)			ML	Hard, moist, gray-brow gravel and cobbles (MI gravel, fine to coarse s overconsolidated fines	.); fine to coarse and, low plasticity		
627 80	<u>SPT_ 109</u> 20	50/5" O (Refusal)				Less Weathered Spri	ngwater Formation	Borehole completed at 80.5 feet below ground surface (bgs).	
622 85-				····					
DEL		NOTES: Location and Elevation So Vertical Datum: Portland V Coordinate System: NAD 1	/ertical		I orth FIP:	1 5 3601 Feet	0	FF-B-207 tt 3 of 3	

Log of Boring

Project Nu	ımber	: 608	4.0								FF-I	B-208	
Date(s) Drilled 0	4/06/20)21			Client	Р	ortla	nd W	later Bureau	Final Depth	81.5 ft bg	gs	
Coordinates 7	741007	7.7 E, (660783.7 N	J	Geotechnical Consultant	L	acam	nas C	onsulting	Method/ Rig Type	Mud Ro	tary/CME 75	٦
Surface Elevation 7	11.4 ft	•			Drilling Contractor	W	/estern	States	Soil Conservation, Inc.	Hole Diameter	6.00 in		٦
Location C	Carpen	ter La	ne Nurse	ry	Logged by/ Checked by	S	usan	Bedn	arz / Susan Bednarz	Hammer Type	140 lb / 3	30 in / Automatic	Τ
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	IETRATIC SISTANCE DWS/FT 0 30 4 H H ER CONTE RBERG LL 0 60 8	E 0 ENT ./PL	USCS GRAPHIC	USCS	MATERIAL D	ESCRIPTI	ON	REMARKS AND TESTS	BACKFILL/INSIALL
707 5 702 10 697 15	SPT_ 1 SPT_ 2	100	2-3-4 (N=7) 2-2-3 (N=5)	. .				МН	Medium stiff, moist, or SILT (MH); high plastici Residual Soil of the S <i>Becomes stiff at 15 fe</i>	ty. pringwate		Borehole instrumented with a 2" ID standpipe piezometer with 010 slot and 10/20 sand; flush-mount monument at surface. Well ID #: L14170 Start Card #:1051383 Grass at ground surface.	
692	SPT_ 3	100	3-5-7 (N=12)	• •					Very stiff, moist, orang	e. black. ar	d grav. FAT		
20	SPT_ 4	100	6-9-13 (N=22)						CLAY (CH); high plastici Residual Soil of the S	ty.			
687 25	SPT_ 5 SPT_	100	5-8-11 (N=19) 3-5-7		D O			СН	Becomes stiff, gray, o	-			
682	6 SPT_ 7	100	(N=12) 2-2-3 (N=5)		 0			мн	Medium stiff, wet, gray yellow, and brown, ELA (MH); high plasticity, fi relict texture, sensitive Sensitive Saprolite of Formation	STIC SILT v ne to medi	vith sand um sand,	SPT_7: Oven Dried PI=39.6 (PL, LL = 36.9, 76.5).	
			NOTES: Location and El Vertical Datum Coordinate Syst	: Portland Ve	ertical				5 3601 Feet	В	•	FF-B-208 t 1 of 3	

Log of Boring

Project N	umber	: 608	4.0								FF-I	B-208	
Date(s) Drilled ()4/06/2	021			Client	Pe	ortla	nd W	later Bureau	Final Depth	81.5 ft bg	gs	
Coordinates	7741002	7.7 E,	660783.7 N	J	Geotechnical Consultant	Lá	acam	as C	onsulting	Method/ Rig Type	Mud Ro	tary/CME 75	
Surface Elevation	711.4 ft	•			Drilling Contractor	We	estern	States	Soil Conservation, Inc.	Hole Diameter	6.00 in		
Location	Carpen	ter La	ane Nurse	ry	Logged by/ Checked by	Sı	usan	Bedn	arz / Susan Bednarz	Hammer Type	140 lb / 3	80 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLF TYPF	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	IETRATIO SISTANCE DWS/FT 0 30 40 H H RECONTE RBERG LL/ 0 60 80) ENT /PL	USCS GRAPHIC	USCS	MATERIAL D	escripti	ON	REMARKS AND TESTS	BACKFILL/INSTALL.
	SPT_ 8	100	0-1-3 (N=4)		O			SM	Very loose, wet, browr black, Silty SAND (SM); high plasticity fines, re Sensitive Saprolite of Formation	fine to coal	arse sand, , sensitive.		
677 35	SPT_ 9	83	1-5-7 (N=12)		0			MH	Stiff, wet, gray-brown, (MH); high plasticity, fi relict texture, sensitive	ne to medi	um sand,	SPT_10: Oven Dried	
	SPT_ 10	100	2-3-6 (N=9)		Ho				Sensitive Saprolite of Formation Trace fine to coarse g Very stiff, wet, gray-bro	ıravel at 35	feet.	PI=3.6 (PL, LL = 37.6, 41.2).	
672 40	SPT_ 11	50	7-11-14 (N=25)	0				ML	sand (ML); low plasticit gravel, fine to coarse sa Less Weathered Spri	and. ngwater Fo	ormation	Hard, "cobbly"	
	SPT_ 12	100	3-26-19 (N=45)	0				SM	Dense, moist, gray and SAND with cobbles (SM low plasticity fines, min Less Weathered Spri	1); fine to c nor sensitiv ngwater Fo	oarse sand, rity. rmation _ /	drilling from 40 to 50 feet. Cobbles of 4-5" diameter.	
667 45 -	SPT_ 13	50	50/3" (Refusal)					SP	Very dense, wet, gray, with cobbles (SP); fine decomposed cobble. Less Weathered Spri	to coarse s	and,		
662 50 -	= SPT_ 14	100	50/1" (Refusal)					GP	Very dense, Poorly Gra cobbles (GP). Less Weathered Spri				
657 55	SPT	100	7-10-17	()			CL	Very stiff, moist, gray a (CL); low plasticity. Less Weathered Sprin	_		Soft drilling from 52 to 55 feet.	
652	15	100	(N=27)					SM	Very dense, moist becc brown, Silty SAND with coarse sand, trace fine plasticity fines, oxidized Less Weathered Spri	n cobbles (S to coarse g d.	SM); fine to gravel, low	"Gravelly" drilling below 58 feet; hard and soft layered.	
			NOTES: Location and El Vertical Datum Coordinate Syst	Portland Ve	ertical						oring	FF-B-208 t 2 of 3	1

Log of Boring

Project Number: 6084.0					B-208	
Date(s) Drilled 04/06/2021	Client	Portland V	Vater Bureau	Final Depth 81.5 ft b	gs	
^{Coordinates} 7741007.7 E, 660783	3.7 N Geotechnical Consultant	Lacamas (Consulting	Method/ Rig Type Mud Ro	tary/CME 75	
Surface 711.4 ft.	Drilling Contractor	Western State	Soil Conservation, Inc.	Hole 6.00 in		
Location Carpenter Lane Nu	Logged by/ Checked by	Susan Bed	narz / Susan Bednarz	Hammer Type 140 lb / 3	30 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE SAMPLE NUMBER RECOVERY (%) BLOW	ATTERBERG LL/F 20 40 60 80	SCS GRAPHIC USCS		ESCRIPTION	REMARKS AND TESTS	BACKFILL/INSTALL.
647 65 X SPT_ 144 18-50, (Refus 57 163 29-50, (Refus	sal) /5" 0	SM	Very dense, moist beco brown, Silty SAND with coarse sand, trace fine plasticity fines, oxidize Less Weathered Spri <i>Becomes red-gray an</i> <i>overconsolidated at b</i>	n cobbles (SM); fine to to coarse gravel, low d. ngwater Formation d orange,	Cobbles are larger below 65 feet.	
642 70 8 9 18 120 24-39 /3" (Refus 637 75 75 8 505 132 1050	sal)	ML	overconsolidated. Less Weathered Spri Very dense, moist to w SAND with gravel and	plasticity, fine to o coarse gravel, ngwater Formation ret, gray-brown, Silty	Easier drilling below	
632 80 SPT_ 133 19-50, (Refus 80 SPT_ 100 20-24- (N= 1	sal) -20 0	ML	plasticity, few fine to c gravel.	ngwater Formation with cobbles (ML); low parse sand, trace fine	75 feet; cobbles and gravel still present.	
627 85 622	4)				Borehole completed at 81.5 feet below ground surface (bgs).	
Vertical D	and Elevation Source: PWB Surv latum: Portland Vertical te System: NAD 1983 StatePlane		1 25 3601 Feet	e	FF-B-208 t 3 of 3	

Log of Boring

Project Number	: 6084	.0							FF-]	B-209	
Date(s) 04/04/20	021			Client	Port	land V	Vater Bureau	Final Depth 8	0.3 ft bg	zs	
Coordinates 7741215	5.4 E, 66	50653.9 N	1	Geotechnical Consultant	Laca	amas (Consulting	Method/ Rig Type	Mud Ro	tary/CME 75	
Surface 713.2 ft	•			Drilling Contractor	Weste	ern States	Soil Conservation, Inc.	Hole Diameter 5	5.00 in		
Carpen	ter Lan	e Nurse	ry	Logged by/ Checked by	Susa	an Bedi	narz / Susan Bednarz	Hammer Type 1	.40 lb / 3	80 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 0 WATE (MC) ATTER	IETRATION SISTANCE WS/FT D 30 40 H H R CONTEN BERG LL/F D 60 80		USCS	MATERIAL D	ESCRIPTION	J	REMARKS AND TESTS	BACKFILL/INSTALL.
709 5 8 9 1		2-2-4 (N=6))	·····		Medium stiff, moist, or SILT (MH); high plastici Residual Soil of the S	ty.		Flush-mount monument installed. VWP installed at 31 feet and grouted into borehole. S/N: 2113125 Plowed field at ground surface.	
704 10 X SPT_ 2	100	3-3-4 (N=7)		D.		МН					
699 15 SPT_ 3		5-8-10 (N=18)					Becomes very stiff, or black at 15.0 feet.	ange-brown a	ınd		
694 20 8PT_ 4		5-7-9 (N=16))		СН	Very stiff, moist, gray a (CH); high plasticity. Residual Soil of the S	•			
689 25 SPT_5		3-7-9 (N=16)		D			Bacomos stiff at 25.0	faat			
SPT_ 6		3-5-7 (N=12)		0			Becomes stiff at 25.0 Medium stiff, wet, oran gray, Sandy ELASTIC SII fine to medium sand, r	nge, dark brow T (MH); high p	olasticity,		
684 SPT_ 7		2-3-3 (N=6)	•			III MH	Sensitive Saprolite of Formation			(PL, LL = 34.9, 63.7).	
DELVI	Loo Ver	rtical Datum:	Portland Ve	rce: PWB Surv ertical 83 StatePlane			S 3601 Feet	Bo	-	FF-B-209 t 1 of 3	

Log of Boring

FF-B-209

Project Nu	mber:	608	4.0								FF-I	B-209	
Date(s) Drilled 04	4/04/202	21			Client	Portl	land	l W	ater Bureau	Final Depth	80.3 ft bş	<u>g</u> s	
Coordinates 72	741215.	4 E,	660653.9 N	J	Geotechnical Consultant	Laca	mas	6 Co	onsulting	Method/ Rig Type	Mud Ro	tary/CME 75	
Surface Elevation 72	13.2 ft.				Drilling Contractor	Wester	n Sta	ites S	Soil Conservation, Inc.	Hole Diameter	5.00 in		
Location C	arpent	er La	ane Nurse	ry	Logged by/ Checked by	Susa	n Be	edn	arz / Susan Bednarz	Hammer Type	140 lb / 3	0 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	NETRATION SISTANCE DWS/FT 0 30 40 H H H ER CONTEN RBERG LL/PL 0 60 80	U U		NSCS	MATERIAL D	ESCRIPTI	ON	REMARKS AND TESTS	BACKFILL/INSTALL.
	8	100	2-2-3 (N=5)		0		M		Medium stiff, wet, orar gray, Sandy ELASTIC SIL fine to medium sand, r Sensitive Saprolite of Formation	T (MH); hig elict textur	gh plasticity, e, sensitive.	SPT_9: Oven Dried	
679 35	SPT_ 2 9	100	4-7-4 (N=11)		þ		N	/IL	<u>Trace gravel at 30.0 f</u> Stiff, wet, gray with min with cobbles (ML); low	nor orange plasticity,	fine to	PI=2.1 (PL, LL = 34.0, 36.1). "Cobbly" drilling from 33 to 49.5	
	SPT_ 2 10	100	6-8-11 (N=19)	0			N	۱L	coarse sand, trace fine texture, sensitive. Sensitive Saprolite of Formation			feet.	
674 40	11		15-20-38 (N=58) 13-15-30 (N=45)	0			SI	М	Very stiff, gray-brown a with gravel and cobble fine to coarse gravel, fi relict texture. Less Weathered Spri Very dense, moist, gray with cobbles (SM); fine	s (ML); low ne to coars ngwater Fc /-brown, Si	plasticity, se sand, prmation Ity SAND		
669 45	SPT_ 13	100	39-50/3" (Refusal)	Q			SI	м	fine to coarse gravel, lo plastic fines. Less Weathered Sprin Becomes dense, grav trace at 40.0 feet. Very dense, moist, gray with gravel and cobble gravel, fine to coarse sa overconsolidated fines Less Weathered Sprin	w plasticit ngwater Fc el content p 	y to non- prmation grades to lty SAND e to coarse asticity	Slightly softer drilling at 43 feet.	
664 50	SPT_ 2 14	100	4-11-9 (N=20)	0			c	Ľ	Very stiff, moist, gray, c LEAN CLAY (CL); low pla Less Weathered Sprin Large cobble from 49	orange, and asticity. ngwater Fo	l brown,	Soft drilling at 49.5 feet.	
659 55 654	SPT_ 2 15	100	12-8-8 (N=16)		0		M	1H	Very stiff, wet, light bro ELASTIC SILT with sand fine to coarse sand, tra sensitive. Sensitive Saprolite w Springwater Formation	(MH); low ce fine gra ithin Less '	plasticity, vel,	"Soft" from 54 to 64 feet; lower sensitive soil zone.	
			Vertical Datum:	Portland Ve	rce: PWB Survey ertical 983 StatePlane C			FIPS	3601 Feet	В	U	FF-B-209 t 2 of 3	

Log of Boring

Proje	ct Nu	mber	: 608	34.0		-						FF-	B-209	
Date(s) Drilled	0	4/04/2	021			Client	Po	rtla	nd W	ater Bureau	Final Depth	80.3 ft bg	gs	
Coordinate	²⁵ 7	741215	5.4 E,	660653.9 N	1	Geotechnical Consultant	La	cam	as C	onsulting	Method/ Rig Type	Mud Ro	tary/CME 75	
Surface Elevation	7	13.2 ft	•			Drilling Contractor	Wes	stern	States	Soil Conservation, Inc.	Hole Diameter	5.00 in		
Location	0	arpen	ter L	ane Nurse	ry	Logged by/ Checked by	Su	san	Bedn	arz / Susan Bednarz	Hammer Type	140 lb / 3	30 in / Automatic	
ELEV. (FT) WATER LEVEL	DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 WATE (MC)	NETRATION SISTANCE DWS/FT 0 30 40 H H H ER CONTEN RBERG LL/P 0 60 80	T	USCS GRAPHIC	USCS	MATERIAL D	escripti	ON	REMARKS AND TESTS	BACKFILL/INSTALL.
- - - 649 -	65	SPT_ 16 SPT_ 17	100	(N=49) 22-36-50 /2"	0	>			MH	Hard, moist, gray-brow ELASTIC SILT (MH); hig coarse sand, trace fine sensitivity. Sensitive Saprolite w Springwater Formation Very dense, moist, gray with cobbles (SM); fine fine to coarse gravel, lo overconsolidated fines Less Weathered Spri	h plasticity, gravel, mir rithin Less V n y-brown, Si e to coarse bw plasticit	fine to nor Weathered Ity SAND sand, few y	"Cobbly" drilling from 64 to 70 feet.	
644	70	SPT_ 18	64	(Refusal) 36-39-50 /0" (Refusal)	0				ML	6" diameter cobble a Hard, moist, light brow with gravel and cobble fine to coarse gravel, fi overconsolidated. Less Weathered Spri Cobble at 69.0 feet.	t 66.0 feet. m-gray, Sar s (ML); low ne to coars	ndy SILT plasticity, e sand,	Hard, slow drilling from 70 to 75; no cobbles.	
639 - - - 634	75	SPT_ 19	232	50/3" (Refusal)	0				SM	Very dense, moist, ligh SAND (SM); fine to coa overconsolidated fines Less Weathered Spri <i>Large cobble/small b</i> <i>78.0 feet.</i>	rse sand, lo ngwater Fo	ow plasticity ormation	No cobbles below 78.	
	80 🔽	SPT	227	50/4"	0					Few fine to coarse gr	avel below	80.0 feet.		
629	85 -	20		(Refusal)			····						Borehole completed at 80.3 feet below ground surface (bgs).	
624	-													
D		rour		NOTES: Location and El Vertical Datum Coordinate Syst	Portland V	ertical				5 3601 Feet	B	U	FF-B-209 t 3 of 3	

Log of Boring

face 774 face 711 ration Ca		- 04/21/2021 E, 660449.2 I		Geotechnical			Vater Bureau		80.2 ft bş	J
race 712 ration Ca		_,		Consultant	Lacan	nas C	onsulting	Method/	Mud Rotar	y/CME 55 Track Mount
Ca	1.0 10.			Consultant Drilling			Soil Conservation, Inc.	Rig Type Hole	5.00 in	y/eme of mack mount
	rnenter	Lane Nurse	rv	Contractor Logged by/			· · · · · · · · · · · · · · · · · · ·	Diameter Hammer		30 in / Automatic
VEL VEL			1	Checked by				Туре		
DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER RFCOVERY (%)	BLOW	RES BLC 10 2 O WATE (MC)	SISTANCE DWS/FT 0 30 40 H H ER CONTEN RBERG LL/P 0 60 80	Э. SCS GRAPHIC	USCS	MATERIAL D			REMARKS AND TESTS
07 5 5 8 8	SPT_ 95 1	5 2-3-5 (N=8)					Medium stiff, moist, or SILT (MH); high plastici Residual Soil of the S	ty.		Flush-mount monument installed. VWP installed at 28.5 feet and grouted into borehole. S/N: 2113122 Plowed field at ground surface.
02 10 10 87	SPT_ 10 2	0 3-4-6 (N=10)	, C	5		МН	Becomes stiff at 10.0	feet.		
15	SPT_ 10 3	0 15-7-11 (N=18)					Very stiff, moist, red-br high plasticity. Residual Soil of the S			
92 20 1 S	5H_4 11	4				СН				SH_4 advanced at 600 psi from 20 to 21 feet and at 800 psi to refusal at 21 to 21.3 feet.
87 25	SH_5 54	ł					Becomes orange-brow Becomes stiff at 25.0		feet.	SH_5 advanced at 500 psi from 22.5 to 23.5 feet and at 700
	SPT_ 10 6	0 4-5-6 (N=11)	• •				Medium stiff, wet, orar black, Sandy ELASTIC S plasticity, fine to coarse sensitive.	nge-brown, ILT (MH); h	igh	psi from 23.5 to 24.5 feet.
32 S	SPT_ 10 7	0 2-2-3 (N=5)		I →I		МН	Sensitive Sensitive Saprolite of Formation Becomes orange and		-	

Log of Boring

	Project Number: 6084.0													
Date(s) Drilled 04	/20/2021 - (04/21/2021	Client	Portla	nd W	Vater Bureau	Final Depth 80.2 ft bgs							
Coordinates 77	40516.2 E,	660449.2 N	Geotechnical Consultant	Lacam	as C	onsulting	Method/ Rig Type Mud Rotary/CME 55 Track Mounted							
Surface 71	1.3 ft.		Drilling Contractor	ntractor Western States Soil Conservation, Inc. Diameter 5.00 In										
Location Ca	arpenter L	ane Nursery	Logged by/ Checked by											
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER RECOVERY (%)	BLOW BLOW COUNTS M	ATER CONTEN C) ERBERG LL/PI	0 0	nscs	MATERIAL D		REMARKS AND TESTS						
	SH_8 100 SPT_ 100 9	2-2-3 (N=5)	I 1 0		МН	Medium stiff, wet, orar black, Sandy ELASTIC S plasticity, fine to coarse sensitive. Sensitive Saprolite of Formation Grades to ELASTIC SIL 32.0 feet, becomes gr	LT (MH); high e sand, relict textur the Springwater T with sand (MH) a	400 psi from 30 to 31 feet and at 500 psi from 31 to 32 feet. SPT_9: Oven Dried						
672	SH_1 100 0 SPT_ 100 11	2-5-11 (N=16)	• 0			yellow. Grades to Sandy ELAS 35.0 feet, becomes gr Becomes very stiff, gr green, and black, with gravel at 36.75 feet.	TIC SILT (MH) at ay-brown. ay-brown, red,							
	SPT_ 100 12	5-8-18 (N=26)	CH =	···	ML	Very stiff, moist, gray-b (ML); low plasticity, fin Less Weathered Sprin Becomes hard, moist,	e to coarse sand. ngwater Formation							
667	SPT_ 100 13 SPT_ 149 14	5-37-50/ 4" (Refusal) 31-50/2" (Refusal)			SM	42.5 feet. Cobble at 44.0 feet. Very dense, moist to w SAND (SM); fine to coa coarse gravel, low plast Less Weathered Sprin	rse sand, trace fine icity fines.	feet.						
662 50 4 657	SPT_ 100 15	11-4-4 (N=8)	0		MH	Becomes gray, orang feet. Medium stiff, moist, lig ELASTIC SILT (MH); high Sensitive Saprolite w Springwater Formation	ht brown and oran n plasticity, sensitiv ithin Less Weather	/ ge, e.						
55	SPT_ 100 16	3-3-10 (N=13)	I HO	··· · · · · · · · · · · · · · · · · ·	MH	Stiff, moist to wet, gray ELASTIC SILT (MH); higl coarse sand, relict clast Sensitive Saprolite w Springwater Formation	n plasticity, fine to ic texture, sensitive ithin Less Weather	PI=5.3 (PL, LL = 43.2, 48.5).						
DEL		NOTES: Location and Elevation Vertical Datum: Portlar Coordinate System: NA	d Vertical			5 3601 Feet		g FF-B-212 heet 2 of 3						

Log of Boring

Project N	lumbei	r: 608	34.0							FF-	B-212	
Date(s) Drilled	04/20/2	021 -	04/21/2021		Client	Portla	nd W	later Bureau	80.2 ft bgs			
Coordinates	774051	6.2 E,	660449.2 N	Ν	Geotechnical Consultant	Lacam	nas C	onsulting	Method/ Rig Type	Mud Rota	ry/CME 55 Track Moun	ted
Surface Elevation	711.3 ft	•			Drilling Contractor	Western	States	Soil Conservation, Inc.	Hole Diameter			
Location	Carper	ter L	ane Nurse	ery	Logged by/ Checked by	Susan	Bedn	arz / Susan Bednarz	Hammer Type			
ELEV. (FT) WATER LEVEL DEPTH (FT)	SAMPLE ITPE	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 • • • • • • • • • • • • • • • • • • •	NETRATION SISTANCE DWS/FT 0 30 40 H H H ER CONTENT RBERG LL/PL 0 60 80	U C	USCS	MATERIAL D	escripti	ON	REMARKS AND TESTS	BACKFILL/INSTALL.
647	SPT_ 17	17	15-20-17 (N=37)				GM	Dense, wet, gray-brow sand (GM); fine to coa coarse sand, low plasti Less Weathered Spri	rse gravel, city fines.	fine to		
	SPT_ 18	123	38-50/3" (Refusal)	0			•	Very dense, moist to w (SM); fine to medium s fines, relict texture. Less Weathered Spri	and, low p	lasticity		
642 70	SPT_ 19	100	50/4" (Refusal)				SM	Becomes moist, no re 70.0 feet.	lict texture	e below	Stiff drilling with some gravel from 70 to 75 feet.	
637 75 632	SPT_ 20	100	50/3" (Refusal)								"Concrete"-like drilling at approximately 78 feet; likely mudflow deposit.	
	SPT	47	50/2"					Non-plastic fines belo	ow 80.0 fee	t.		
627 85	21		(Refusal)			· · · · · · · · · · · · · · · · · · ·					Borehole completed at 80.2 feet below ground surface (bgs).	
622	10 100 serve		NOTES:							•		
DE			Location and E Vertical Datum	: Portland V	rce: PWB Survey ertical 983 StatePlane C			5 3601 Feet	В	U	FF-B-212 t 3 of 3	

Log of Boring

ate(s)		: 608	4.0		Client					Final Depth		B-214	
rilled U	5/07/2				Portland Water Bureau						80.1 ft bgs		
7			660494.8 I	N	Consultant Drilling	La	icama	as C	onsulting	Rig Type Hole	Mud Rotary/CME 55 Track I		untec
evation 7	14.4 ft				Contractor				Soil Conservation, Inc.	Diameter	5.00 in		
ocation C	-	ter La	ne Nurse		Logged by/ Checked by		isan H	Bedn	arz / Susan Bednarz	Hammer Type	140 lb / 3	80 in / Automatic	2
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 WATE (MC)	NETRATIO SISTANCI DWS/FT 0 30 4 H H ER CONT RBERG LI 0 60 8	E 0 	USCS GRAPHIC	USCS	MATERIAL D	DESCRIPT	ION	REMARKS AND TESTS	
710 5	SPT_ 1	100	2-1-3 (N=4)		2				Soft, moist, orange-bro (MH); high plasticity. Residual Soil of the S			Plowed field at ground surface.	
05	SPT_ 2	100	2-3-4 (N=7)	■ Fe	≻-1	· · · · · · · · · · · · · · · · · · ·		МН	Becomes medium stij	ff at 10.0 j	feet.		
700	SPT_ 3	100	4-6-7 (N=13)	•0					Becomes stiff at 15.0	feet.			
95 20 X	SPT_ 4	100	5-8-9 (N=17)) 				Very stiff, moist, gray-b CLAY (CH); high plastic Residual Soil of the S	ity.	-		
90	SPT_ 5	100	4-6-10 (N=16)		0			СН	Becomes gray, orang feet.	e, and rea	l at 22.5		
25	SPT_ 6	100	4-6-8 (N=14)						Becomes stiff, gray a feet. Soft, wet, brown and c	_			
85	SPT_ 7	100	3-2-2 (N=4)		0			MH	SILT (MH); high plastici sand, relict texture, se Sensitive Saprolite o	ty, fine to nsitive.	medium		

Log of Boring

Project Nu	mber: 60	84.0							FF-I	B-214	
Date(s) Drilled 0	5/07/2021			Client	Portla	nd W	Vater Bureau	Final Depth	80.1 ft bgs		
^{Coordinates} 7	741171.8 E	, 660494.8 N	V	Geotechnical Consultant	Lacam	as C	onsulting	Method/ Rig Type	Mud Rotar	y/CME 55 Track Moun	ted
Surface Elevation 7	14.4 ft.			Drilling Contractor	Western	States	Soil Conservation, Inc.	Hole Diameter	5.00 in		
Location C	Carpenter	Lane Nurse	ry	Logged by/ Checked by	Susan	usan Bednarz / Susan Bednarz			140 lb / 3	80 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	NETRATION SISTANCE DWS/FT 10 30 40 H H H ER CONTENT RBERG LL/PL 0 60 80	U U	USCS	MATERIAL D	ESCRIPTI	ON	REMARKS AND TESTS	BACKFILL/INSTALL.
680 35	SPT_ 100 8 100 SPT_ 100 9 100 SPT 100 10 100	(N=7) 2-3-5 (N=8)	•	• • • • • • • • • • • • • • • • • • •		SM	Loose, wet, orange-bro Silty SAND (SM); fine to plasticity fines, relict cl sensitive. Sensitive Saprolite of Formation Becomes gray-orange gravel (SM) at 32.0 fe Dense, moist, gray-bro gravel (SM); fine to coa	o coarse sai astic textur f the Spring <i>e, Silty SAN</i> <i>ret.</i> wn, Silty SA urse gravel,	nd, high e, gwater D with ND with fine to	SPT_8: Oven Dried PI=15.2 (PL, LL = 36.5, 51.7). SPT_9: 42.1% fines by ASTM D1140 Gravelly drilling at 32.5 feet. SPT_10: Oven Dried PI=1.1 (PL, LL = 24.6, 25.7).	
675 40 X	SPT_ 100 11 SPT_ 144	0 17-17-31 (N=48) 4 15-50/3"	0	1		SM	coarse sand, low plastic cemented. Less Weathered Sprin Very dense, moist, gray with boulders (SM); fin	ngwater Fo	rmation	SPT_11: 27.1% fines by ASTM D1140 Bouncing on	
670 45 665	12 SPT_ 120 13	(Refusal) 0 6-19-50/ 3" (Refusal)	С			SM	fine gravel, low plastici Less Weathered Sprin Boulder from 41.0 to 4 Less Weathered Sprin Very dense, moist to w orange, and dark brow fine to coarse sand, fev plasticity fines. Less Weathered Sprin	ty fines. ngwater Fo 3.0 feet. ngwater Fo et, gray-bro n, Silty SAN v fine grave	rmation _ / pwn, ID (SM); el, low	boulder from 41 to 43 feet. Softer drilling at 43 feet.	
50 660	SPT_ 100 14) 3-3-11 (N=14)		0			Medium dense, wet, bi fine to medium sand, h sensitive. Sensitive Saprolite w Springwater Formation	igh plastici ithin Less V	ty fines,		
655	SPT_ 22 15	7-7-7 (N=14)				SM					
DEL	VE	NOTES: Location and El	levation Sou	rce: PWB Survey	(5-13-207	1	I	В	oring	FF-B-214	
underg		Vertical Datum	: Portland Ve	,			S 3601 Feet		U	t 2 of 3	
[

Log of Boring

Proje	ct Nu	ımbeı	r: 608	34.0								FF-I	B-214	
Date(s) Drilled	0	5/07/2	021			Client	P	Portla	nd W	Vater Bureau	Final Depth 80.1 ft bgs			
Coordinate	^s 7	74117	1.8 E,	660494.8 N	N	Geotechnical Consultant Lacamas Consulting					Method/ Rig Type Mud Rotary/CME 55 Track Mounted			
Surface Elevation	7	'14.4 ft	•			Drilling Contractor Western States Soil Conservation, Inc. Hole Diameter 5					5.00 in			
Location	(Carpen	ter L	ane Nurse	ry	Logged by/ Checked by							30 in / Automatic	
ELEV. (FT) WATER LEVEL	DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 WATE (MC)	NETRATION SISTANCE DWS/FT 20 30 40 H H H ER CONTEN RBERG LL/PI		USCS GRAPHIC	USCS	MATERIAL D	escripti	ON	REMARKS AND TESTS	BACKFILL/INSTALL.
650		SPT_ 16	100	(N=27)		-10			SM	Medium dense, wet, b fine to medium sand, l Less Weathered Spri Becomes gray-brown trace fine gravel at 6	ow plasticit ngwater Fo and orang	y fines. rmation	PI=NP (PL, LL = 29.7, NP).	
645	55 —	SPT_ 17	0	50/0" (Refusal)						Very dense, wet, dark g GRAVEL (GP). Less Weathered Spri			Hard drilling from 65 to 70 feet.	
- 7	70	SPT_ 18	100	50/1" (Refusal)			•		GP				Chattering on gravel at 70 feet.	
640 - 7	75 🗶	SPT_ 19	68	50/3" (Refusal)					GP- GM	Very dense, wet, gray, with silt and sand (GP- coarse sand, low plasti Less Weathered Spri	GC); fine gr city fines.	avel, fine to		
635	-							h°°C						
{	30	SPT_ 20	212	50/1" (Refusal)				<u>F. 001</u>	SM	Very dense, moist, red fine to coarse sand, lov Less Weathered Spri	v plasticity	fines.	Borehole completed at 80.1 feet below ground surface (bgs).	
630 . E	35 -													
625	-													
D		Irour		NOTES: Location and El Vertical Datum Coordinate Sys	: Portland Ve	ertical				5 3601 Feet	В	U	FF-B-214 t 3 of 3	

Log of Boring

Market Control 04/29/2021 - 04/30/2021 Pert Note Portland Water Bureau Notes S0.3 ff bgs Control 717.1 ft. Control Contro Control Control	Projec	t Nu	ımber	: 608	84.0								FF-	B-215	
Image: Construct Product Lackmas Consuming Lackmas Consuming Lackmas Consuming Made Construction frame Made Construction frame Carpenter Lane Nursery Lase for Construction frame Susan Bednarz / Su		0	4/29/2	021 - (04/30/2021		Client	ŀ	Portla	nd W	later Bureau	Final Depth	80.3 ft bg	gs	
Later 717.1 H. produce Wetter States Saft Cancervation, Inc. Juncture 5.00 IT WHOP Cancervation Swam Bednarz / Sw	Coordinates	7	741377	7.9 E,	660488.4 I	N		I I	Lacam	nas C	onsulting				
Carpender Late Vulsery Lease to susan bednar? Justan Pednar2 just Tell to / so in / Automate International distribution Image: Strange distribution Matternation Remain distribution Remain distribution International distribution Internation Internation Internation Remain distribution Remain distribution Remain distribution Remain distribution Remain distribution International distribution Internation Internation Internation Internation Remain distribution Remain distribution International distribution Internation Internation Internation Internation Internation Internation Remain distribution Internation Internation Internation Internation Internation Internation Internation Internation Internation Internation Internation Internation Internation Internation Internation Internation Internation Internation Internation Internation Internation Internation Internation Internation <		7	'17.1 ft	•				ntractor Western States Soil Conservation, Inc. Diameter 5.00 11							
Set Set <th>Location</th> <th>0</th> <th>Carpen</th> <th>ter La</th> <th>ane Nurse</th> <th>ery</th> <th></th> <th>5</th> <th>Susan</th> <th>Bedn</th> <th>arz / Susan Bednarz</th> <th></th> <th>140 lb / 3</th> <th>30 in / Automati</th> <th>c</th>	Location	0	Carpen	ter La	ane Nurse	ery		5	Susan	Bedn	arz / Susan Bednarz		140 lb / 3	30 in / Automati	c
713 5 SPT_1 100 1-2-1 • • Residual Soil of the Springwater Formation ground surface. 708 10 SPT_1 100 1-2-1 • • • Residual Soil of the Springwater Formation ground surface. 708 10 SPT_1 100 2-2-2 •	ELEV. (FT) WATER LEVEL	DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	SISTANC OWS/FT 0 30 4 ER CONT	E 40 	USCS GRAPHIC	USCS	MATERIAL D	ESCRIPTI	ON	AND	BACKFILL/INSTALL.
10 SPT_2 100 2-2-2 703 15 SPT_3 100 2-3-7 698 20 SPT_4 100 4-5-5 Becomes stiff at 15.0 feet. 698 20 SPT_4 100 4-5-5 Stiff, moist, gray and orange, FAT CLAY (CH); high plasticity. 693 25 SPT_4 100 4-6-7 CH 693 25 SPT_5 100 4-6-7 CH 693 25 SPT_100 4-6-7 CH 688 SPT_7 100 5-4-4 688 SPT_7 100 5-4-4 Sensitive Saprolite of the Springwater 688 SPT_7 100 5-4-4 Sensitive Saprolite of the Springwater 688 SPT_7 100 5-4-4 Sensitive Saprolite of the Springwater 70 WHEI Superitre Mediare Verial Salvery 5-13-2021		5	_	100		• 0					(MH); high plasticity.				
15 SPT_100 2-3-7 • • • • • • Becomes stiff at 15.0 feet. 698 20 SPT_100 4-5-5 • • • • • • Stiff, moist, gray and orange, FAT CLAY (CH); high plasticity. 698 20 SPT_100 4-5-5 • • • • • • • • 693 25 SPT_100 4-6-7 • • • • • • 693 25 SPT_100 4-6-7 • • • • • • 693 25 SPT_100 4-6-7 • • • • • • 688 SPT_1 100 5-4-4 • • • • • • 688 SPT_1 100 5-4-4 • • • • • • 688 7 100 5-4-4 • • • • • • 0 SPT_1 100 5-4-4 • • • • • • 688 7 100 5-4-4 • • • • • • 0 Stiff • • • • • • • • • • 688 7 100 5-4-4 <td< td=""><td></td><td></td><td>_</td><td>100</td><td></td><td></td><td>5</td><td></td><td></td><td>МН</td><td>Becomes soft at 10.0</td><td>feet.</td><td></td><td></td><td></td></td<>			_	100			5			МН	Becomes soft at 10.0	feet.			
698 20 X SPT_4 100 4-5-5 Image: high plasticity. 693 25 X SPT_5 100 4-6-7 Image: high plasticity. 693 25 X SPT_5 100 4-6-8 Image: high plasticity. 693 25 X SPT_6 100 4-6-8 Image: high plasticity. 693 25 X SPT_7 100 5-4-4 Image: high plasticity. 688 X SPT_7 100 5-4-4 Image: high plasticity. Image: high plasticity. 688 X SPT_7 100 5-4-4 Image: high plasticity. Sensitive Saprolite of the Springwater 688 X Y 100 5-4-4. Image: high plasticity. Sensitive Saprolite of the Springwater 688 X Y 100 5-4-4. Image: high plasticity. Sensitive Saprolite of the Springwater 688 X Y Y Y Y Y Y 688 X Y Y Y Y Y Y 688 Y<		5	_	100		• •					Becomes stiff at 15.0	feet.			
693 5 (N=13) CH 25 SPT_ 100 4-6-8 (N=14) 6 (N=14) Very loose, wet, orange-brown, Silty SAND 688 SPT_ 100 5-4-4 O Construct SM Sensitive Saprolite of the Springwater Formation Formation NOTES: Location and Elevation Source: PWB Survey 5-13-2021 Vertical Datum: Portland Vertical Vertical Datum: Portland Vertical				100			>1				high plasticity.	-			
SPT_ 100 4-6-8 Image: Construction of the synthesis of the synthes			_	100		∎0				СН					
688 SPT_7 100 5-4-4 SPT_7 SPT			_	100							Very loose, wet, orange	e-brown.	ilty SAND		
Location and Elevation Source: PWB Survey 5-13-2021 Vertical Datum: Portland Vertical	688				(N=8)		>			SM	(SM); fine to coarse sau fines, relict clastic textu Sensitive Saprolite o	nd, high pla ure, sensiti	asticity ve.		
					Location and E			Survey	5-13-202	21		B	•		
	und	erg	rour	nd				lane Or	regon No	orth FIPS	5 3601 Feet		Shee	t 1 of 3	

Log of Boring

	Project Number: 6084.0 FF-B-215											
Date(s) Drilled 04/29	/2021 -	04/30/2021		Client	Portla	nd W	later Bureau	Final Depth 80.3 ft bgs				
Coordinates 77413	577.9 E,	660488.4 N		Geotechnical Consultant	Lacan	nas C	onsulting	Method/ Rig Type Mud Rotary/CME 55 Track Mounted			nted	
Surface 717.1	ft.			Drilling Contractor	Western	States	Soil Conservation, Inc.	Hole Diameter 5.	5.00 in			
Location Carp	enter L	ane Nurser	y	Logged by/ Checked by						30 in / Automatic		
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 WATE (MC) ATTER	NETRATION SISTANCE DWS/FT 0 30 40 H H ER CONTEN RBERG LL/PL 0 60 80	U U	USCS	MATERIAL D	ESCRIPTION		REMARKS AND TESTS	BACKFILL/INSTALL.	
SPT 8 SPT		(N=4) 1-2-4	•	⊢ ∎ 0 0		SM	Very loose, wet, orange (SM); fine to coarse sat fines, relict clastic texter Sensitive Saprolite of Formation Becomes loose, gray-	nd, high plastici ure, sensitive. f the Springwa t	ity ter	SPT_8: 48.3% fines by ASTM D1140 SPT_8: Oven Dried PI=16.8 (PL, LL = 34.8, 51.6).		
683 9 35 SPT 10	-	(N=6) 3-4-12 (N=16)		0			gravel at 32.5 feet. Becomes medium der	nse at 35.0 feet		Chatter on gravel		
678 40 SPT	-	8-7-17 (N=24)	¢			SM	Medium dense, moist, SAND (SM); fine to coa fines, relict clastic texto Less Weathered Spri	rse sand, low p ure.	lasticity	Chatter on gravel below 37.5 feet. Gravel from 40 to		
SPT 12	-	12-12-50 /2" (Refusal)	₽		••	ML	Hard, wet when worke SILT (ML); low plasticity trace fine to coarse gra texture. Less Weathered Spri	y, fine to coarse wel, relict clasti	e sand, ic	42.5 feet. SPT_12: Oven Dried PI=3.6 (PL, LL = 29.0, 32.6). Gravel from 43.5 to		
673 45 — SPT 13	-	50/0" (Refusal)					Boulder from 45.0 to 4 Less Weathered Spri		ntion	45 feet. Boulder from 45 to 47 feet.		
668 50 \$PT 14	_	7-8-16 (N=24)	0			GP CL	Gravel from 47.0 to 48 Less Weathered Spri Very stiff, moist, orango (CL); low plasticity. Less Weathered Spri	ngwater Forma e-brown, LEAN	CLAY	Soft drilling at 48 feet.		
663 55 SPT 15	-	2-6-10 (N=16)		0		SM	Medium dense, wet, o brown, Silty SAND (SM trace gravel, low plastic texture, sensitive. Sensitive Saprolite w Springwater Formation Very stiff, wet when we and red, Sandy SILT (M to coarse sand, relict of sensitive.); fine to coarse city fines, relict ithin Less Wea n prked, brown, g L); low plasticit lastic texture,	e sand, clastic thered gray, y, fine			
658						ML	Sensitive Saprolite w Springwater Formation		thered			
		NOTES: Location and Elev Vertical Datum: F Coordinate Syste	Portland Ve	ertical		21			U	FF-B-215 t 2 of 3		
Log of Boring

FF-B-215 inal Depth Date(s) Client 04/29/2021 - 04/30/2021 **Portland Water Bureau** 80.3 ft bgs Drilled Coordinates Geotechnical /lethod/ 7741377.9 E, 660488.4 N Lacamas Consulting Mud Rotary/CME 55 Track Mounted onsultant Rig Type Drilling Surface Hole 717.1 ft. 5.00 in Western States Soil Conservation, Inc. levatior Diameter ontracto ocation _ogged by/ Hammer 140 lb / 30 in / Automatic **Carpenter Lane Nursery** Susan Bednarz / Susan Bednarz SAMPLE NUMBER PENETRATION BACKFILL/INSTALL. GRAPHIC (%) SAMPLE TYPE RESISTANCE WATER LEVEI DEPTH (FT) BLOW COUNTS BLOWS/FT <u>el</u>ev. (Ft RECOVERY REMARKS USCS 10 20 30 40 MATERIAL DESCRIPTION AND O WATER CONTENT USCS (TESTS (MC) ATTERBERG LL/PL 20 40 60 80 Very stiff, moist to wet, brown, gray, and red, SPT 16: Oven Dried SPT 100 6-8-18 ELASTIC SILT (MH); high plasticity, fine to PI=4.8 16 (N=26) MH coarse sand, relict clastic texture, sensitive. (PL, LL = 35.2, 40.0). Sensitive Saprolite within Less Weathered Springwater Formation Gravel at 63 feet. Very dense, moist, gray-red, Silty SAND with 653 gravel (SM); fine to coarse gravel, fine to 65 📩 SPT coarse sand, low plasticity overconsolidated 132 50/3" fines, moderately cemented. 17 (Refusal) Less Weathered Springwater Formation 648 70 SPT_ Layered hard and 50/5" 201 Becomes gray-brown at 70.0 feet. less hard drilling 18 (Refusal) from 70 to 75 feet. SM 643 75 SPT_ Very dense, gravelly 50/5" 198 Becomes Silty SAND (SM) at 75.0 feet. drilling from 75 to 19 (Refusal) 80 feet. 638 Becomes red-brown, SIIty SAND with 80 x SPT gravel (SM) at 80.0 feet. 50/3" 168 20 (Refusal) Borehole completed at 80.3 feet below ground surface (bgs). 633 85 628 NOTES: Boring FF-B-215 DE Location and Elevation Source: PWB Survey 5-13-2021

Vertical Datum: Portland Vertical Coordinate System: NAD 1983 StatePlane Oregon North FIPS 3601 Feet

underground

Sheet 3 of 3

Log of Boring

Project N	umber	: 608	4.0							FF-I	B-216	
Date(s) Drilled	04/21/2	021			Client	Portl	and V	Vater Bureau	Final Depth	80.3 ft bş	gs	
Coordinates	7740768	8.6 E,	660320.0 N	V	Geotechnical Consultant	Laca	mas C	onsulting	Method/ Rig Type	Mud Rotar	y/CME 55 Track Mou	nted
Surface Elevation	715.5 ft	•			Drilling Contractor	Contractor Western States Soil Conservation, Inc. Diameter 5.00 in						
Location	Carpen	ter La	ne Nurse	ry	Type						0 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPI F TYPF	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	NETRATION SISTANCE DWS/FT 0 30 40 H H H ER CONTEI RBERG LL/I 0 60 80	면 적 USCS GRAPHIC	USCS	MATERIAL E			REMARKS AND TESTS	BACKFILL/INSTALL.
-711 5	SPT_ 1	100	2-3-4 (N=7)					Medium stiff, moist, re (MH); high plasticity. Residual Soil of the S			Dirt road at ground surface.	
706	SPT_ 2	100	3-3-5 (N=8)	• 0		·····	мн	Becomes medium sti 10.0 feet.	ff, orange-	brown at		
701	SPT_ 3	100	4-5-7 (N=12)	• •		·····		Becomes stiff at 15.0) feet.			
696 20	SPT_ 4	100	4-5-8 (N=13)	•0				Very stiff, moist, gray, plasticity, interlayered brown, LEAN CLAY (CL	with orang	ge and dark		
691 25	SPT_ 5	100	6-8-10 (N=18)	•				Residual Soil of the				
	SPT_ 6	100	5-7-10 (N=17)				СН					
686	SPT_ 7	100	4-6-10 (N=16)	Þ	I			Not interlayered with 27.5 feet.	h lean clay	below		
			NOTES: Location and E Vertical Datum Coordinate Sys	: Portland Ve	ertical			5 3601 Feet	E	•	FF-B-216 t 1 of 3	

Log of Boring

Project N	lumbei	r: 608	34.0						FF ²	-B-216	
Date(s) Drilled	04/21/2	021			Client	Port	land	Water Bureau	Final Depth 80.3 ft	bgs	
Coordinates	7740768	8.6 E,	660320.0 N	J	Geotechnical Consultant	Laca	amas (Consulting	Method/ Rig Type Mud Ro	tary/CME 55 Track Mour	nted
Surface Elevation	715.5 ft	•			Drilling Contractor	Weste	rn State	s Soil Conservation, Inc.	Hole 5.00 in		
Location	Carper	ter L	ane Nurse	ry	Logged by/ Checked by	Susa	ın Bed	narz / Susan Bednarz	Hammer Type 140 lb	/ 30 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT)	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	NETRATION BISTANCE DWS/FT 0 30 40 H H H ER CONTEN RBERG LL/F 0 60 80	SCS GRAPHIC	USCS	MATERIAL E	DESCRIPTION	REMARKS AND TESTS	BACKFILL/INSTALL.
	SPT_ 8 SPT_ 9	100 100	3-1-3 (N=4) 2-2-2 (N=4)		0 		CH MI	plasticity Residual Soil of the S Soft, wet, orange and SILT (MH); high plastic relict clastic texture as	Springwater Formatic gray, Sandy ELASTIC ity, fine to coarse sand ensitive.	SPT 9: Oven Dried	
681 35	SPT_ 10	100	1-2-3 (N=5)		0			Formation	y-dark brown at 32.5		
676 ₄₀	SPT_ 11 SPT_ 12	100 0	2-3-8 (N=11) 8-11-13 (N=24)		•		SN	Medium dense, wet, g (SM); fine to coarse sa high plasticity fines, re	nd, trace fine gravel, lict clastic texture,	Gravelly drilling at 39 feet.	
671 45	SPT_ 13 SPT_ 14	100 120	7-18-49 (N=67) 26-33-50 /3" (Refusal)	0			SN	Very dense, moist to v SAND with cobbles (SN trace fine to coarse gra fines. Less Weathered Spri	٨); fine to coarse sand avel, low plasticity	Cobbles and gravel from 45 to 50 feet.	
666 50	SPT_ 15	100	25-39-36 (N=75)	0			SN	Very dense, moist, gra with cobbles (SM); fing gravel, low plasticity o Less Weathered Spri	e to coarse sand, trace verconsolidated fines		
661 55	SPT_ 16	114	50/3" (Refusal)					Becomes moderately feet.		Softer drilling from	
656							CL	Very stiff, moist, gray, plasticity. Less Weathered Spri		57 to 65 feet.	
DE			NOTES: Location and El Vertical Datum Coordinate Sys	Portland Ve	ertical			PS 3601 Feet	C	FF-B-216	

Log of Boring

Project Nu	umber	: 608	34.0						FI	г -В-216	
Date(s) Drilled 0	4/21/20	021			Client ·	Portla	nd V	Vater Bureau	Final Depth 80.3 f	t bgs	
Coordinates 7	740768	8.6 E,	660320.0 N	V	Geotechnical · Consultant	Lacan	nas C	onsulting	Method/ Rig Type Mud R	Rotary/CME 55 Track Mounte	ed
Surface Elevation 7	'15.5 ft	•			Drilling Contractor	Western	States	Soil Conservation, Inc.	Hole 5.00 i	n	
Location C	Carpen	ter L	ane Nurse	ry	Logged by/ Checked by	Susan	Bedr	arz / Susan Bednarz	Hammer Type 140 ll	b / 30 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	NETRATION SISTANCE DWS/FT 0 30 40 H H H ER CONTENT RBERG LL/PL 0 60 80		USCS	MATERIAL D			BACKFILL/INSTALL.
	SPT_ 17	100	8-10-19 (N=29)	0			CL	Very stiff, moist, gray, L plasticity. Less Weathered Sprin			
651 65	SPT_ 18	100	8-16-17 (N=33)		0		SM	Dense, wet, gray, yellow Silty SAND (SM); fine to plasticity fines, relict cl sensitive. Sensitive Saprolite w Springwater Formation Dense, moist, gray, yell Silty SAND (SM); fine to	o coarse sand, high astic texture, ithin Less Weather n ow, red, and brown	/	
646 70	SPT_ 19	160	50/5" (Refusal)	0			SM	plasticity fines. Less Weathered Spri Very dense, moist, gray with gravel (SM); fine t coarse sand, low plastic Less Weathered Sprin	 brown, Silty SAND o coarse gravel, fine city fines. 	e to	
641 75	SPT_ 20	186	47-50/1" (Refusal)	0			SM	Very dense, moist, gray (SM); fine to coarse sau fines, moderately ceme Less Weathered Sprin	nd, overconsolidate ented.	ed	
636	COT		50 (0)								
	21	114	50/3" (Refusal)			• • • • • • • • • • • • • • • • • • •				Borehole completed at 80.3 feet below ground surface (bgs).	
631 85											
626											
			Vertical Datum	: Portland Ve	rce: PWB Survey ertical 983 StatePlane O			1 S 3601 Feet		g FF-B-216 heet 3 of 3	

Log of Boring

Project N	lumber	: 608	4.0							FF-	B-217	
Date(s) Drilled	04/22/20)21 - (04/23/2021		Client	Portla	nd W	Vater Bureau	Final Depth 80.0 ft bgs			
Coordinates	7740994	I.O E,	660223.3 N	J	Geotechnical Consultant	Lacan	nas C	onsulting	Method/ Rig Type Mud Rotary/CME 800 Track			
Surface Elevation	719.5 ft	•			Drilling Contractor	Western	States	Soil Conservation, Inc.	Hole Diameter	5.00 in		
Location	Carpen	ter La	ne Nurse	ry	Logged by/ Checked by	Susan	Bedn	arz / Susan Bednarz	Hammer . Type	140 lb / 3	30 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT)	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	NETRATION SISTANCE DWS/FT 0 30 40 H H ER CONTEN RBERG LL/P 0 60 80	U U	USCS	MATERIAL D	ESCRIPTIO	N	REMARKS AND TESTS	BACKFILL/INSTALL.
715 5	SPT_ 1	100	2-2-4 (N=6)	• 0				Medium stiff, moist, re (MH); high plasticity. Residual Soil of the S			Flush-mount monument installed. VWP installed at 38 feet and grouted into borehole. S/N: 2113124 Plowed field at ground surface.	
710 10	SPT_ 2	100	3-5-6 (N=11)		D		МН	Becomes stiff at 10.0	feet.			
	SPT_ 3	100	3-4-8 (N=12)	. 0								
700 20	SPT_ 4	100	4-4-8 (N=12)	■ 0								
695 25	SPT_ 5 SH_6	100 128	4-6-9 (N=15)	Đ	I		СН	Stiff, moist, orange and high plasticity. Residual Soil of the S Becomes gray, orang trace fine to coarse so	pringwater F	ormation with	450 psi from 25 to 26 feet and at 800 psi from 26 to 26.5	
690	SPT_ 7	100	6-8-10 (N=18))			Becomes very stiff at	27.5 feet.		feet.	
DE			NOTES: Location and El Vertical Datum: Coordinate Syst	Portland Ve	ertical			5 3601 Feet	Bo	U	FF-B-217 t 1 of 3	

Log of Boring

Project Nu	umber	: 608	34.0			FF-B-217					
Date(s) Drilled C	4/22/20)21 - (04/23/2021		Client	Portla	nd V	later Bureau	Final Depth 80.0 ft bgs		
Coordinates 7	740994	4.0 E,	660223.3 N	J	Geotechnical Consultant	Lacan	nas C	onsulting	Method/ Rig Type Mud Ro	tary/CME 800 Tra	ck
Surface Elevation 7	'19.5 ft	•			Drilling Contractor	Western	States	Soil Conservation, Inc.	Hole 5.00 in		
Location (Carpen	ter La	ane Nurse	ry	Logged by/ Checked by	Susan	Bedr	arz / Susan Bednarz	Type 140 lb / 3	30 in / Automatic	
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	NETRATION SISTANCE DWS/FT 0 30 40 H H ER CONTENT RBERG LL/PL 0 60 80		USCS		ESCRIPTION	REMARKS AND TESTS	BACKFILL/INSTALL.
685 35	SH_8 SPT_ 9	84 100	2-4-6 (N=10)	•	0		сн мн	Stiff, moist, orange and high plasticity. Residual Soil of the S <u>Becomes gray and re</u> Stiff, wet, gray, red, and SILT (MH); high plastici Sensitive Saprolite of Formation	pringwater Formation <i>d at 30.0 feet.</i> J light brown, ELASTIC ty, sensitive.	SH_8 advanced at 500 psi from 30 to 31 feet and at 750 psi from 21 to 32 feet. SH_10 advanced at	
680	SH_1 0 SPT_ 11	100	2-3-6 (N=9)		H o		МН	Stiff, wet, orange-brow ELASTIC SILT (MH); high coarse sand, sensitive. Sensitive Saprolite of Formation	n plasticity, fine to	350 psi from 35 to 36 feet and at 600 psi from 36 to 37 feet. SPT_11: Oven Dried PI=4.7 (PL, LL = 41.5, 46.2).	
40	SH_1 2 SPT_ 13	212 100	8-10-13 (N=23)	¢	1		ML	Very stiff, moist, gray-b SILT (ML); low plasticity Less Weathered Spri Medium dense, wet, g	y, fine to coarse sand. ngwater Formation	SH_12 advanced at 800 psi for 1". SPT_13: Oven Dried PI=3.7	
675 45	SPT_ 14	55	13-17-12 (N=29)	0			SM	(SM); fine to medium s low plasticity fines, reli sensitive.	and, trace fine gravel, ct clastic texture,	(PL, LL = 34.2, 37.9). Gravelly drilling at 42.5 feet. Cobbles	
670	SPT_ 15	123	25-50/3" (Refusal)	0				Less Weathered Spri Very dense, wet, gray-l gravel and cobbles (SN to medium sand, low p texture. Less Weathered Spri No cobbles below 48.	orown, Silty SAND with I); coarse gravel, fine Ilasticity fines, relict ngwater Formation	feet.	
50	SPT_ 16	159	27-50/1" (Refusal)	O			SM			Gravelly drilling from 50 to 57 feet.	
665 55 -	SPT_ 17	200	50/3" (Refusal)	0			CL	Becomes Silty SAND (55.0 feet; overconsol moderately cemented Hard, moist, light gray, plasticity, overconsolid Less Weathered Spri	idated fines, d LEAN CLAY (CL); low ated.	⁻ Clayey drilling at 57 feet.	
660											
			Vertical Datum	: Portland Ve	rce: PWB Survey ertical 983 StatePlane C			5 3601 Feet	U	FF-B-217 t 2 of 3	

Log of Boring

Proje	ct Nu	ımber	: 608	34.0							F-B-217		
Date(s) Drilled	0	4/22/2	021 -	04/23/2021		Client]	Portla	nd V	Vater Bureau	Final Depth 80.0 ft bgs			
Coordinate	^s 7	740994	4.0 E,	660223.3 N	N	Geotechnical Consultant	Lacan	nas C	onsulting	Method/ Rig Type Muc	d Rotary/CME 800 Tr	ack	
Surface Elevation	7	19.5 ft	•			Drilling Contractor	Western	States	Soil Conservation, Inc.	Hole 5.00	5.00 in		
Location	(Carpen	ter L	ane Nurse	ery	Logged by/ Checked by	Susan	Bedr	arz / Susan Bednarz	Hammer Type 140	lb / 30 in / Automatic		
ELEV. (FT) WATER LEVEL	DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 • • • • • • • • • • • • • • • • • • •	NETRATION SISTANCE DWS/FT 0 30 40 H H ER CONTENT RBERG LL/PL 0 60 80	U C	USCS		DESCRIPTION	REMARKS AND TESTS	BACKFILL/INSTALL.	
- - - - -		SPT_ 18	100	7-14-21 (N=35)	0			CL	Hard, moist, light gray, plasticity, overconsolic Less Weathered Spri	ated.			
	65 X	SPT_ 19	156	9-50/3" (Refusal)		0		SM	Very dense, moist and Cobbles (SM); fine to r high plasticity and low clastic texture, sensitiv Sensitive Saprolite w Springwater Formatio Two cobbles at 67.0 j	nedium sand, layer plasticity fines, rel re. rithin Less Weathe n	red lict		
650 - -	70 X	SPT_ 20	128	21-41-50 /2" (Refusal)	Ō				Very dense, moist, gra with Gravel (SM); fine to coarse sand, low pla overconsolidated fines Less Weathered Spri	to coarse gravel, fi asticity , weakly cemented	ne 75 feet.		
645 <u>7</u>	/5	SPT_ 21	227	50/4" (Refusal)	0			SM			Hard gravels from 75 to 80 feet.		
640	-												
635	30	SPT_ 22	0	50/0" (Refusal)			· · · · · · · · · · · · · · · · · · ·				Borehole completed at 80 feet below ground surface (bgs).	t	
635	35 -												
D		V		NOTES: Location and E Vertical Datum		rce: PWB Survey ertical	5-13-202	21	1		ng FF-B-217		
unc	lerg	Sheet 3 of 3											

Log of Boring

Project Nu	imber:	608	4.0								ГГ-Э	C-203	
Date(s) Drilled 0	5/03/20	21			Client	Р	ortla	nd W	ater Bureau	Final Depth	80.0 ft bş	gs	
Coordinates 7	740510	.5 E, 6	561024.3 N	J	Geotechnical Consultant	L	acam	as C	onsulting	Method/ Rig Type	Sonic Drilling/	Track Mounted Geoprobe 8150	LS
Surface Elevation 7	'06.8 ft.				Drilling Contractor	и	Vestern	States	Soil Conservation, Inc.	Hole Diameter	6.00 in		
Location C	Carpent	ter La	ne Nurse	ry	Logged by/ Checked by	S	usan	Bedn	arz / Susan Bednarz	Hammer Type	N/A		
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	NETRATIO BISTANCI DWS/FT 0 30 4 H H ER CONT RBERG LI 0 60 8	E ł0 	USCS GRAPHIC	NSCS	MATERIAL D			REMARKS AND TESTS	BACKFILL/INSTALL.
702 5		100 100		0					Moist, orange-brown, l high plasticity. Residual Soil of the S			Borehole instrumented with a 2" ID standpipe piezometer with 010 slot and 10/20 sand; flush-mount monument at surface. Well ID #: L142278 Start Card	
697 ₁₀	C_2 GS_2	100 87		0				МН				#:1051771 Driller used water to reduce friction on drill casing during installation.	
692 ₁₅	C_3 GS_3	87 100		C	þ								
	C_4	97											
687 ₂₀	GS_4	100		0					Becomes orange-bro feet. Moist, gray and brown		/	Fat clay swelling; sample recovery	
		100 103		O				СН	plasticity. Residual Soil of the S			over 100% from 20	
682 ₂₅									Becomes gray, red, a 25.0 feet.	nd orange	below		
		127						МН	Moist, orange-brown, ELASTIC SILT (MH); higi medium sand, relict ter Sensitive Saprolite or	n plasticity xture, sens	, fine to sitive.	GS_6: Oven Dried	
- 184	GS_6		NOTES					14111	Formation			PI=21.4	
DEL			NOTES: Location and El /ertical Datum: Coordinate Syst	Portland Ve	ertical				5 3601 Feet	B	•	F-SC-203 t 1 of 3	

Log of Boring

FF-SC-203

Project Number: 6084.0		FF-SC-203
Date(s) Drilled 05/03/2021	Portland Water Bureau	Final Depth 80.0 ft bgs
^{Coordinates} 7740510.5 E, 661024.3 N	consultant Lacamas Consulting	Method/ Rig Type Sonic Drilling/Track Mounted Geoprobe 8150 LS
Surface 706.8 ft.	brilling Contractor Western States Soil Conservation, Inc.	Hole 6.00 in
Location Carpenter Lane Nursery	ogged by/ hecked by Susan Bednarz / Susan Bednarz	Hammer N/A
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE AMPLE NUMBE RECOVERY (%) BLOW COUNTS COUNTS	ETRATION ISTANCE WS/FT 0 30 40 1 + + + S R CONTENT BERG LL/PL 0 60 80	DESCRIPTION AND TESTS
GS_7 200 C_7 100	CH Moist, gray and orange plasticity. Sensitive Saprolite or Formation Wet, brown, gray, and SILT (MH), high plastici relict clastic texture, se Sensitive Saprolite or	f the Springwater yellow, Sandy ELASTIC ty, fine to coarse sand, ensitive.
C_8 100	Formation Wet, brown, gray, and	yellow, Silty SAND to coarse gravel, fine to ricity fines, sensitive. f the Springwater f the springwater to to coarse gravel, fine to sonic drilling disturbs relict clastic
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Coarse sand, few fine t plasticity fines, sensitiv Sensitive Saprolite or Formation Wet, gray-brown, Silty	o coarse gravel, high /e. f the Springwater (PL, LL = 26.4, 28.6).
662 45	SM Less Weathered Spri Two 4-5" diameter cob 43 feet. (Broken by dril Less Weathered Spri Moist, gray-brown, Silt	ngwater Formation
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	SM SM, fille to coarse sat gravel, low plasticity fin Less Weathered Spri 6" diameter cobble a Moist, gray-brown, Silt (SM); fine to coarse gra sand, low plasticity fine moderately cemented. Less Weathered Spri	nes. issues drilling in ngwater Formation Less Weathered t 44.5 feet. Springwater ry SAND with gravel Formation. avel, fine to coarse Hard drilling at 50 es, weakly to feet; very difficult to advance casing to
652 55 ₩2 GS_1 100	At 50.0 feet becomes orange-brown. Moist to wet, gray and (CL); low plasticity, ove Less Weathered Spri	orange, LEAN CLAY erconsolidated.
	Moist to wet, gray and (ML); low plasticity, fin (ML) Less Weathered Spri	e to medium sand.
DELVE Underground	ce: PWB Survey 5-13-2021	Boring FF-SC-203

underground Vertical Datum: Portland Vertical Coordinate System: NAD 1983 StatePlane Oregon North FIPS 3601 Feet

Sheet 2 of 3

Log of Boring

Project Number: 6084.0		FF-SC-203			
Date(s) Drilled 05/03/2021	Client Portland Water Bureau	Final Depth 80.0 ft bgs			
^{Coordinates} 7740510.5 E, 661024.3 N	Geotechnical Consultant Lacamas Consulting	Method/ Rig Type Sonic Drilling/Track Mounted Geoprobe 8150 LS			
Surface 706.8 ft.	Drilling Contractor Western States Soil Conservation, Inc.	Hole Diameter 6.00 in			
Location Carpenter Lane Nursery	Logged by/ Checked by Susan Bednarz / Susan Bednarz	Hammer N/A			
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE SAMPLE NUMBE AMPLE NUMBE RECOVERY (%) BLOW COUNTS COUNTS	ETRATION ISTANCE WS/FT D 30 40 H 4 VS/ST R CONTENT BERG LL/PL D 60 80 H 4 VS/ST NATERIAL D	REMARKS AND TESTS BACKFILL/INSTALLAL AND TESTS			
C_13 100	SM SM SM SM SM SM SM SM SM SM SM SM SM S	nd, few fine to coarse ines, relict clastic rithin Less Weathered n orange, Silty SAND s (SM); fine to coarse and, low plasticity rately cemented,			
637 70 GS_1 100 C_15 70	6" diameter andesite 6" diameter andesite SAND (SM); fine to coa coarse gravel, low plast moderately cemented, zones. Less Weathered Sprin	cobble at 65.0 feet. becoming gray, Silty rse sand, few fine to ticity fines, weakly to oxidized/weathered			
632 75 GS_1 100 C_16 100 627	SM SM SM SM SM SM SM SM SM SM SM SM SM S	brown and orange, (SM); fine to coarse and, low plasticity rately cemented. ngwater Formation b 80.0 feet;			
		Borehole completed at 80 feet below ground surface (bgs).			
DELVE underground NOTES: Location and Elevation Sour Vertical Datum: Portland Ver Coordinate System: NAD 19		Boring FF-SC-203 Sheet 3 of 3			

Log of Boring

Project Numbe	r: 6084.0	-				C-215	
Date(s) Drilled 05/04/2	2021	Client	Portland W	later Bureau	Final Depth 80.0 ft bg	gs	
Coordinates 774091	.8.7 E, 660489.4 N	Geotechnical Consultant	Lacamas C	onsulting	Method/ Rig Type Sonic Drilling/	Track Mounted Geoprobe 8150 I	LS
Surface 713.9 f	t.	Drilling Contractor	Western States	Soil Conservation, Inc.	Hole 6.00 in		
Location Carper	nter Lane Nursery	Logged by/ Checked by	Susan Bedn	arz / Susan Bednarz	Hammer N/A		
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE SAMPLE NUMBER	RECOVERY (%) BLOW COUNTS COUNTS COUNTS	NETRATION SISTANCE DWS/FT 20 30 40 H H H ER CONTEN RBERG LL/PI 40 60 80		MATERIAL D		REMARKS AND TESTS	BACKFILL/INSTALL.
709 5	. 100 . 100	-1		Moist, orange-brown, plasticity. Residual Soil of the S	FAT CLAY (CH); high	Installed drill casing to 20 feet.	
C_2	80						
704 10 GS_2	2 100						
	100 100 · · ·		СН				
699 15 C_4 GS_4 694 20	100 100 0			Becomes gray and br	own at 20.0 faat	Driller requires water to drill due to squeezing clay and high friction. 20 - 21 feet: soil is	
	100 C				ut 2010 jeet.	wet from drilling water.	
C_6	5 100	0	SM	Wet, orange-brown, gr SAND (SM); fine to coa plasticity fines, relict te Sensitive Saprolite o Formation	rse sand, high exture, sensitive.		
DELV		/ertical		5 3601 Feet		F-SC-213 t 1 of 3	

Log of Boring

FF-SC-213

					34.0				-,
80.0 ft bgs	Final Depth 80.0 ft b	/ater Bureau	and W	Client Portl)21	5/04/20	0	e(s) ed
Sonic Drilling/Track Mounted Geoprobe 8150 LS	Method/ Rig Type Sonic Drilling	00011111100	nas C	Geotechnical Consultant Lacai	660489.4 N	8.7 E,	740918	7	rdinates
6.00 in	Hole 6.00 in	Soil Conservation, Inc.	States	Drilling Contractor Wester			13.9 ft	7	ace ation
N/A	Hammer N/A		Bedn	Logged by/ Checked by Susar	ane Nursery	ter La	arpen	C	ation
TESTS	ESCRIPTION	MATERIAL D	USCS	UETRATION SISTANCE WS/FT 0 30 40 ER CONTENT CBERG LL/PL 0 60 80	SLN 10 2 SLN 10 2 O O O WATE (MC) I ATTEF	RECOVERY (%)	SAMPLE NUMBER	SAMPLE TYPE	WATER LEVEL
highdisturbed by augersitive.bit used to retaingwatersoil in sonic corebarrel.barrel.e-brown,GS_7: Oven DriedPI=19.3PI=19.3t(PL, LL = 36.9, 56.2).a gravel and35 to 36 feet; soil is	rse sand, high xture, sensitive. the Springwater mes orange-brown, w 32.5 feet. SAND with gravel and	Wet, orange-brown, gra SAND (SM); fine to coal plasticity fines, relict te Sensitive Saprolite of Formation Below 30.0 feet becor red, gray, and yellow. Scattered gravel below Wet, gray-brown, Silty	SM	► 10		100 100	C_7 GS_7		793
relict Hard drilling from 36 to 37 feet. gwater	city fines, relict the Springwater	coarse sand, high plasti texture, sensitive. Sensitive Saprolite of Formation Weathered boulder fro	SM		0	107 100	C_8 GS_8		74 4
th gravel gravel, fine is, relict	/ SAND with gravel to coarse gravel, fine sticity fines, relict	Less Weathered Sprin Moist, gray-brown, Silty and boulders (SM); fine to coarse sand, low plat texture. Less Weathered Sprin	SM		0	100 100	C_9 GS_9		
o coarse itely ormation	vel, fine to coarse is, moderately tion. gwater Formation / SAND with gravel to coarse gravel fine	Moist, gray-brown, Silty (SM); fine to coarse gra sand, low plasticity fine cemented, minor oxida Less Weathered Sprin Moist, gray-brown, Silty and cobbles (SM); fine to coarse sand, low pla moderately cemented.	SM			100	C_10		39 4 34 5
feet.	le at 45.5 feet. feet. le at 52.0 feet.	Less Weathered Sprin One 4" diameter cobb Trace cobbles at 50.0 One 5" diameter cobb				100	C_11		
plasticity, prmation th gravel cocoarse e.	(ML); low plasticity, lidated. gwater Formation / SAND with gravel vel, fine to coarse s, sensitive. ithin Less Weathered	One 3.5" diameter co. Moist, gray-brown, SILT trace gravel, overconso Less Weathered Sprin Moist, gray-brown, Silty (SM): fine to coarse gra sand, low plasticity fine Sensitive Saprolite w Springwater Formatior	ML SM	- 1	P -	100 100	GS_1 0 C_12		59 5
gwatersoil in sonic core barrel.e-brown,GS_7: Oven Dried PI=19.3torgavel and vel, fine to relict(PL, LL = 36.9, 56.2). 35 to 36 feet; soil is wet from drilling. Hard drilling from 36 to 37 feet.gwater37.0 feet;ormation th gravel e gravel, fine th gravel pocoarse itelyormation feetormation feetormation feetormation feetormation feetormation feetormation feetormation feetormation feetormation feetormation feetormation feetormation feetormation feetormation feetormation feetormation feetormation coarse e	the Springwater mes orange-brown, w 32.5 feet. SAND with gravel and coarse gravel, fine to city fines, relict the Springwater m 36.0 to 37.0 feet; mgwater Formation / SAND with gravel to coarse gravel, fine sticity fines, relict mgwater Formation / SAND with gravel vel, fine to coarse s, moderately tion. mgwater Formation / SAND with gravel to coarse gravel fine sticity fines, mgwater Formation / SAND with gravel wel, fine to coarse (ML); low plasticity, lidated. mgwater Formation / SAND with gravel vel, fine to coarse is, sensitive. ithin Less Weathered	Sensitive Saprolite of Formation Below 30.0 feet becom red, gray, and yellow. Scattered gravel below Wet, gray-brown, Silty boulders (SM); fine to co coarse sand, high plastit texture, sensitive. Sensitive Saprolite of Formation Weathered boulder fro broken by drilling. Less Weathered Sprin Moist, gray-brown, Silty and boulders (SM); fine to coarse sand, low plasticity fine cemented, minor oxida Less Weathered Sprin Moist, gray-brown, Silty and low plasticity fine cemented, minor oxida Less Weathered Sprin Moist, gray-brown, Silty and cobbles (SM); fine to coarse sand, low plasticity fine cemented, minor oxida Less Weathered Sprin Moist, gray-brown, Silty and cobbles (SM); fine to coarse sand, low plas moderately cemented. Less Weathered Sprin One 4" diameter cobb Trace cobbles at 50.0 One 5" diameter cobb Silty, fine to coarse gra sand, low plasticity fine (SM); fine to coarse gra sand, low plasticity fine	SM SM SM SM SM	тсе: USGS Торо Мар	O	100 107 100 100 100 100	GS_7 C_8 GS_8 C_9 GS_9 C_10 C_11 GS_1 0		74 4 69 4 64 5 59 5

Vertical Datum: Portland Vertical Coordinate System: NAD 1983 StatePlane Oregon North FIPS 3601 Feet

underground

Sheet 2 of 3

Log of Boring

FF-SC-213 ^{Final Depth} 80.0 ft bgs

Date(s) Drilled		5/04/20				Client	Portla	nd W	Vater Bureau	Final Depth 80.0 ft b	- 95		
Drilled Coordinates				660489.4 N	N	Geotechnical			onsulting	Method/			
Surface		13.9 ft			•	Drilling			Soil Conservation, Inc.	Hole 6.00 in	7 1 rack Mounted Geoprobe 8150	15	
Elevation Location				ane Nurse	erv	Loggod by/			arz / Susan Bednarz	Diameter 8.00 III Hammer N/A Type N/A			
ELEV. (FT) WATER LEVEL DEPTH (FT)	SAMPLE TYPE	SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	NETRATION SISTANCE DWS/FT 0 30 40 H H H ER CONTENT RBERG LL/PL 0 60 80		USCS	MATERIAL D	DESCRIPTION	REMARKS AND TESTS	RACKFILL/INSTALL	
649 65		C_13	100						Moist, brown, Silty SAN cobbles (SM); fine to co coarse sand, low plasti fines, weakly cementer Less Weathered Spri One 4" diameter cobb At 65.0 feet, becomes	oarse gravel, fine to city overconsolidated d. ngwater Formation ble at 63.6 feet. s weakly to			
644 70		C_14 GS_1 1			O			SM	moderately cemented One 6" diameter brok feet. One 3.5" cobble at 67 One 3.5" diameter co	ken cobble at 65.0 7.0 feet.			
	-	C_15	100						At 70.0 feet becomes gray, uncemented to One large broken cob	gray-brown and weakly cemented.			
639 75	-	C_16 GS-1 2			0			SM	12" diameter broken, from 75.0 to 76.0 fee Moist, gray-brown and with gravel, cobbles, ai to coarse sand, low pla moderately cemented. Less Weathered Spri One 4" diameter cobb	weathered boulder t red-gray, Silty SAND nd boulders (SM); fine isticity fines, weakly to ngwater Formation			
	-										Borehole completed at 80 feet below ground surface (bgs).		
629 85	-												
DE		V				rce: USGS Topo I	Map	<u> </u>	1	Boring l	FF-SC-213	<u> </u>	
unde	rg	rour	nd	Vertical Datum Coordinate Sys		ertical 983 StatePlane C	regon No	orth FIP:	S 3601 Feet	Shee	et 3 of 3		

Log of Boring

Project Number: 6084.0 ۲۲-5C-21۵										
Date(s) Drilled 05		Client	Portla	and W	Vater Bureau	Final Depth 80.0 ft b	it bgs			
Coordinates 77	741208.6 l	V	Geotechnical Consultant	Lacamas Consulting			Method/ Rig Type Sonic Drilling/Track Mounted Geoprobe 8150 LS			
Surface 71 Elevation					Western	Western States Soil Conservation, Inc. Hole Diameter 6.00 in				
Location C	arpenter	Lane Nurse	ry	Logged by/ Checked by	Susar	n Bedn	arz / Susan Bednarz	Hammer N/A		
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE	SAMPLE NUMBER RECOVERY (%)	BLOW COUNTS	RES BLC 10 2 O WATE (MC)	NETRATION SISTANCE DWS/FT 0 30 40 H H H ER CONTE RBERG LL/ 0 60 80	USCS GRAPHIC	USCS		DESCRIPTION	REMARKS AND TESTS	BACKFILL/INSTALL.
715 5	C_1 10 GS_1 87 C_2 72	,	0				Moist, orange-brown, high plasticity. Residual Soil of the S <i>Becomes brown to of</i> <i>feet.</i>	Springwater Formation		
	GS_2 10 C_3 10	0	0			мн				
705 15	GS_3 10	0	1	-1						
700 20	C_4 10 GS_4 10		0		·····		Becomes orange-bro	wn and black at 20.0	Driller used water	
	C_5 11 GS_5 10		0		·····		feet.		below 20 feet. Swelling clay from 20 to 30 feet; driller removed extra 9" before core box photo was taken.	
695 25	C_6 10		0			СН	Moist, gray, orange, ar high plasticity. Residual Soil of the S	nd red, FAT CLAY (CH);		
	GS_6 12	0								
690										
DEL	VE	NOTES: Location and E Vertical Datum Coordinate Sys	: Portland Ve	ertical			5 3601 Feet	U	FF-SC-218 ht 1 of 3	

Log of Boring

Project Number: 6084.0 FF-SC-218							
Date(s) Drilled 05/05/2021	Client]	Portland W	later Bureau	Final Depth 80.0 ft bgs			
Coordinates 7741208.6 E, 660246.6 N	Geotechnical Consultant	Lacamas C	onsulting	Method/ Rig Type Sonic Drilling/Track Mounted Geoprobe 8150 LS			
Surface 719.6 ft.	Drilling	Western States Soil Conservation, Inc. Diameter 6.0					
Location Carpenter Lane Nursery	La marcal la col	Susan Bedn	arz / Susan Bednarz	Hammer N/A			
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE AMPLE NUMBE RECOVERY (%) BLOW COUNTS COUNTS	NETRATION SISTANCE DWS/FT 0 30 40 H H ER CONTENT RBERG LL/PL 0 60 80		MATERIAL D		REMARKS AND TESTS	BACKFILL/INSTALL.	
$\begin{array}{c c} & C_7 & 100 \\ \hline & & & \\ & & & & \\ & & & \\ & & &$	⊢ ∎0	СН		Springwater Formation brown, Sandy ELASTIC ty, fine to coarse sand, el, sensitive. f the Springwater			
C_8 80 GS_8 100 680 40	Ō	SM	cobbles (SM); fine to co coarse sand, low plasti Sensitive Saprolite or Formation One 3.5" diameter co Wet, gray-brown, Sand high plasticity, fine to r	barse gravel, fine to city fines, sensitive. f the Springwater <u>bble at 39.5 feet.</u> y ELASTIC SILT (MH);	added water. GS_7: Oven Dried PI=13.8 (PL, LL = 38.1, 51.9).		
C_9 103		SM	sensitive. Sensitive Saprolite of Formation Moist to wet, gray-brow	f the Springwater wn and orange, Silty			
675 45 GS_9 100 O		SM	plasticity fines, modera Less Weathered Spri	ticity fines. ngwater Formation y SAND with gravel to coarse sand, low ately cemented. ngwater Formation			
670 50 C_11 100			One cobble at 44.0 fe At 45.0 feet becomes orange, no cementat cemented, oxidized. One 3.5" diameter cob Two 4" diameter cob and 51.0 feet. Moist, gray-brown and with sand and cobbles gravel, fine to coarse sa	gray-brown and ion to moderately bble at 46.0 feet. bles between 50.0 orange, Silty GRAVEL (GM); fine to coarse			
C_12 100		CL	fines, weakly to moder minor oxidation. Less Weathered Spri One 6" diameter cobl Moist, gray and orange plasticity. Less Weathered Spri	ngwater Formation ble at 53.0 feet			
DELVE NOTES: Location and Elevation Sou	rce: PWB Survey	5-13-2021		Boring F	F-SC-218		
underground Coordinate System: NAD 15	ertical		5 3601 Feet	0	t 2 of 3		

Log of Boring

Project Number: 6084.0 FF-5C-218													
Date(s) Drilled 05/05/2						Client Portland Water Bureau				Final Depth 80.0 ft bgs			
Coordinates 774120	^{nates} 7741208.6 E, 660246.6 N				Geotechnical Consultant Lacamas Consulting			Method/ Rig Type Sonic Drilling/Track Mounted Geoprobe 8150 LS					
Surface 719.6 d								6.00 in					
Location Carpe	y	Logged by/ Checked by	Susan	Bedr	narz / Susan Bednarz	Hammer Type	N/A						
ELEV. (FT) WATER LEVEL DEPTH (FT) SAMPLE TYPE SAMPLE NUMBER	RECOVERY (%)	BLOW COUNTS	RES BLO 10 20 	IETRATION SISTANCE WS/FT 0 30 40 		USCS	MATERIAL D	DESCRIPTI	ON	REMARKS AND TESTS	BACKFILL/INSTALL.		
GS_1 GS_1 GS_1 C_13 GS_1 C_13 GS_2 GS_2 GS_2 C_13 GS_2 C_13 GS_2 C_13 C_14 C_14 GS_2 C_13 C_14 C	3 107 1 100 4		0			SM SM SM	Moist, orange-brown a with gravel and cobble gravel, fine to coarse s fines, sensitive. Sensitive Saprolite w Springwater Formation One 4" diameter cob Minor sensitivity from Moist, orange, brown, with gravel and cobble gravel, fine to coarse s fines, weakly to moder Less Weathered Spri One 5+" diameter con Moist, gray-brown, Silt (SM); fine to coarse gra sand, low plasticity fine moderately cemented. Less Weathered Spri	s (SM); fine and, low pl vithin Less n ble at 60.0 n 62.0 to 6 and gray, S s (SM); fine and, low pl rately ceme ngwater Fo bble at 67.3 y SAND wi avel, fine to es, weakly	e to coarse asticity Weathered feet. 5.0 feet. 5.0 feet. e to coarse asticity ented. 5 feet. 5 feet. th gravel o coarse to	GS_10: Oven Dried PI=2.0 (PL, LL = 34.0, 36.0).			
640	1 100 5		0			SM	Moist, gray-brown, Silt and boulders (SM); fin- to coarse sand, low pla moderately cemented. Less Weathered Spri 1.5' diameter andesit to 79.0 feet; broken c	y SAND wir e to coarse asticity fine ngwater Fo te boulder j	th gravel gravel, fine s, weakly to prmation from 77.5	1.5' diameter andesite boulder from 77.5 to 79 feet; broken during coring.			
635 85 - 630 630										Borehole completed at 80 feet below ground surface (bgs).			
		OTES:				<u> </u>	<u> </u>	R	oring I	F_SC_218			
DELV	nd Ve	ertical Datum:	Portland Ve	rce: PWB Survey ertical 183 StatePlane C			S 3601 Feet	D	•	F-SC-218 t 3 of 3			