



May 23, 2022

LTR-PR 3105

Michael R. Warfel
Site Manager, Voluntary Cleanup Program
Department of Ecology Northwest Regional Office (NWRO)
P.O. Box 330316
Shoreline, WA 98133-9716

**RE: VCP NW 3242 – Montlake Gas Station – Monitoring well installation
information**

Dear Mr. Warfel:

In response to Washington State Department of Ecology's (Ecology) email dated March 31, 2022, WSDOT is submitting monitoring well installation information, including well construction diagrams, geologic logs, and well development documentation.

Four new groundwater monitoring wells were installed at the former Montlake Gas Station (site) located in Seattle, Washington as part of the post remediation Compliance Groundwater Monitoring Plan (Shannon & Wilson, 2021). The four new monitoring wells are designated MW-6-22, MW-7-22, MW-8-22, and MW-9-22, and are approximately located as depicted on Exhibit 1. The wells were installed using rotary-sonic drilling methods on April 19 and 20, 2022 and subsequently developed on April 27, 2022. Because of remedial action completed at the site during the summer of 2021 (PBS, 2021), soil types encountered during drilling were predominately sand and gravel backfill.

Following Ecology's review of the Compliance Monitoring Plan, the well installation approach was amended from that proposed in the plan. Following Ecology's recommendation (Ecology, 2022), the new monitoring wells were installed with the top of the screen interval above the seasonal high-water level and the bottom of the screen interval set to accommodate sampling during the seasonal low-water level with much of the well screen interval within the newly emplaced backfill.

The soil conditions encountered and well construction details for each of the new wells are provided as Boring and Well Construction Logs (Exhibit 2). The well development detail for each of the new wells is provided in the Well Development Forms (Exhibit 3).

PR: 3105
May 23, 2022

References:

PBS Engineering and Environmental, 2021, Remedial Action Completion Report, Montlake Gas Station, Seattle, December 20.

Shannon & Wilson, Inc, 2021, Compliance Groundwater Monitoring Plan, Montlake Gas Station (Appendix G of PBS 2021), December 7.

Washington State Department of Ecology, 2022, email dated March 21, 2022 with comments on the Shannon & Wilson 2021 Compliance Groundwater Monitoring Plan.

We appreciate Ecology's continued coordination on this matter. Should you have any questions, please contact me at kucharm@wsdot.wa.gov or 206-498-0508.

Sincerely,

Margaret Kucharski

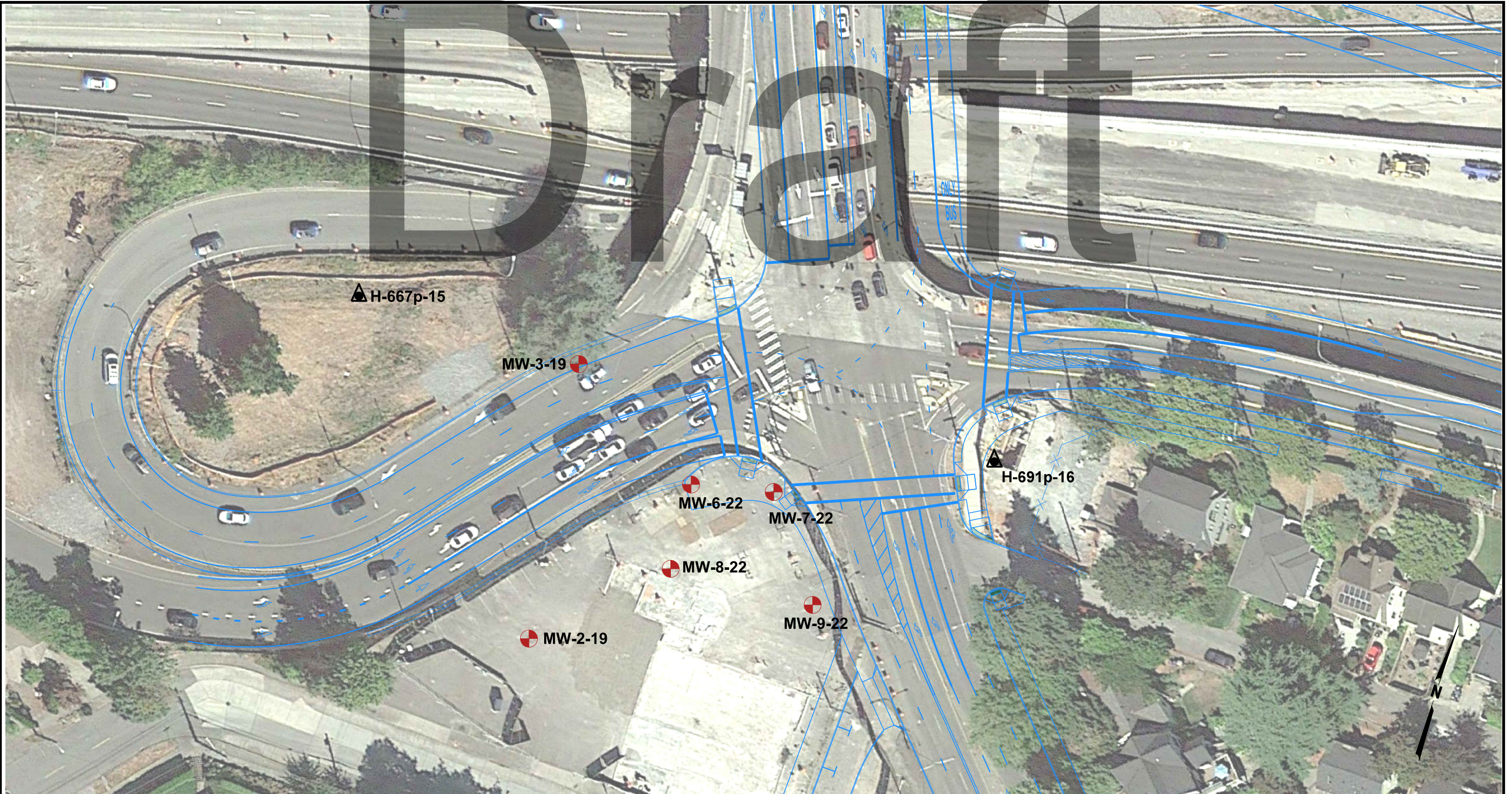
Margaret Kucharski
WSDOT Megaprograms Environmental Manager

Enclosure: Exhibits

cc:
Robyn Boyd
Dave Becher
Meg Strong

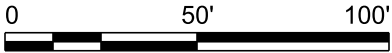
Filename: C:\Users\jpmits\CAD Group Dropbox\Drive\21122242\104\comments\211-22242-104-FIG.dgn
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4/11/2022

Model: FIG 1



NOTES:
1. HORIZONTAL DATUM:
WSDOT PROJECT DATUM
SR520 BRIDGE REPLACEMENT
MODIFIED NAD 83/91 4601 WA NORTH

PLAN
SCALE: 1" = 50'



PROPOSED BORING	NORTHING	EASTING
MW-6-22	566360.36	1605944.50
MW-7-22	566370.50	1605987.50
MW-8-22	566314.38	1605948.42
MW-9-22	566320.10	1606026.17

LEGEND:
 H-667p-15 DECOMMISSIONED WELL LOCATION AND DESIGNATION

2. POST CONSTRUCTION CONFIGURATION SHOWN AS: 

Washington State DOT
SR 520 Bridge and HOV Replacement

**GROUNDWATER MONITORING
WELL NETWORK (Revised)**

April 2022 21-1-22242-112

 **SHANNON & WILSON, INC.**
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Exhibit 1

Shannon & Wilson, Inc. (S&W), uses a soil classification system modified from the Unified Soil Classification System (USCS). Elements of the USCS and other definitions are provided on this and the following page. Soil descriptions are based on visual-manual procedures (ASTM D 2488-93) unless otherwise noted.

S&W CLASSIFICATION OF SOIL CONSTITUENTS

- MAJOR constituents compose more than 50 percent, by weight, of the soil. Major constituents are capitalized (i.e., SAND).
- Minor constituents compose 12 to 50 percent of the soil and precede the major constituents (i.e., silty SAND). Minor constituents preceded by "slightly" compose 5 to 12 percent of the soil (i.e., slightly silty SAND).
- Trace constituents compose 0 to 5 percent of the soil (i.e., slightly silty SAND, trace of gravel).

MOISTURE CONTENT DEFINITIONS

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, from below water table

ABBREVIATIONS

ATD	At Time of Drilling
Elev.	Elevation
ft	feet
FeO	Iron Oxide
MgO	Magnesium Oxide
HSA	Hollow Stem Auger
ID	Inside Diameter
in	inches
lbs	pounds
Mon.	Monument cover
N	Blows for last two 6-inch increments
NA	Not applicable or not available
NP	Non plastic
OD	Outside diameter
OVA	Organic vapor analyzer
PID	Photo-ionization detector
ppm	parts per million
PVC	Polyvinyl Chloride
SS	Split spoon sampler
SPT	Standard penetration test
USC	Unified soil classification
WOH	Weight of hammer
WOR	Weight of drill rods
WLI	Water level indicator

GRAIN SIZE DEFINITION











DESCRIPTION	SIEVE NUMBER AND/OR SIZE
FINES	< #200 (0.08 mm)
SAND* - Fine - Medium - Coarse	#200 to #40 (0.08 to 0.4 mm) #40 to #10 (0.4 to 2 mm) #10 to #4 (2 to 5 mm)
GRAVEL* - Fine - Coarse	#4 to 3/4 inch (5 to 19 mm) 3/4 to 3 inches (19 to 76 mm)
COBBLES	3 to 12 inches (76 to 305 mm)
BOULDERS	> 12 inches (305 mm)

* Unless otherwise noted, sand and gravel, when present, range from fine to coarse in grain size.

RELATIVE DENSITY / CONSISTENCY

COARSE-GRAINED SOILS		FINE-GRAINED SOILS	
N, SPT, BLOWS/FT.	RELATIVE DENSITY	N, SPT, BLOWS/FT.	RELATIVE CONSISTENCY
0 - 4	Very loose	Under 2	Very soft
4 - 10	Loose	2 - 4	Soft
10 - 30	Medium dense	4 - 8	Medium stiff
30 - 50	Dense	8 - 15	Stiff
Over 50	Very dense	15 - 30	Very stiff
		Over 30	Hard

WELL AND OTHER SYMBOLS

	Bent. Cement Grout		Surface Cement Seal
	Bentonite Grout		Asphalt or Cap
	Bentonite Chips		Slough
	Silica Sand		Bedrock
	PVC Screen		
	Vibrating Wire		

Montlake Gas Station VCP
Compliance Groundwater Monitoring
2625 East Montlake Place East, Seattle, WA

SOIL CLASSIFICATION AND LOG KEY

May 2022

21-1-22242-104

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Exhibit 2
Sheet 1 of 2

**UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)
(From USACE Tech Memo 3-357)**

MAJOR DIVISIONS			GROUP/GRAPHIC SYMBOL	TYPICAL DESCRIPTION
COARSE-GRAINED SOILS (more than 50% retained on No. 200 sieve)	Gravels (more than 50% of coarse fraction retained on No. 4 sieve)	Clean Gravels (less than 5% fines)	GW	Well-graded gravels, gravels, gravel/sand mixtures, little or no fines.
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
		Gravels with Fines (more than 12% fines)	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sands (50% or more of coarse fraction passes the No. 4 sieve)	Clean Sands (less than 5% fines)	SW	Well-graded sands, gravelly sands, little or no fines
			SP	Poorly graded sand, gravelly sands, little or no fines
		Sands with Fines (more than 12% fines)	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more passes the No. 200 sieve)	Sils and Clays (liquid limit less than 50)	Inorganic	ML	Inorganic silts of low to medium plasticity, rock flour, sandy silts, gravelly silts, or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		Organic	OL	Organic silts and organic silty clays of low plasticity
	Sils and Clays (liquid limit 50 or more)	Inorganic	MH	Inorganic silts, micaceous or diatomaceous fine sands or silty soils, elastic silt
			CH	Inorganic clays or medium to high plasticity, sandy fat clay, or gravelly fat clay
		Organic	OH	Organic clays of medium to high plasticity, organic silts
HIGHLY-ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor		PT	Peat, humus, swamp soils with high organic content (see ASTM D 4427)

NOTE: No. 4 size = 5 mm; No. 200 size = 0.075 mm

NOTES

- Dual symbols (*symbols separated by a hyphen, i.e., SP-SM, slightly silty fine SAND*) are used for soils with between 5% and 12% fines or when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart.
- Borderline symbols (*symbols separated by a slash, i.e., CL/ML, silty CLAY/clayey SILT; GW/SW, sandy GRAVEL/gravelly SAND*) indicate that the soil may fall into one of two possible basic groups.

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**SOIL CLASSIFICATION
AND LOG KEY**

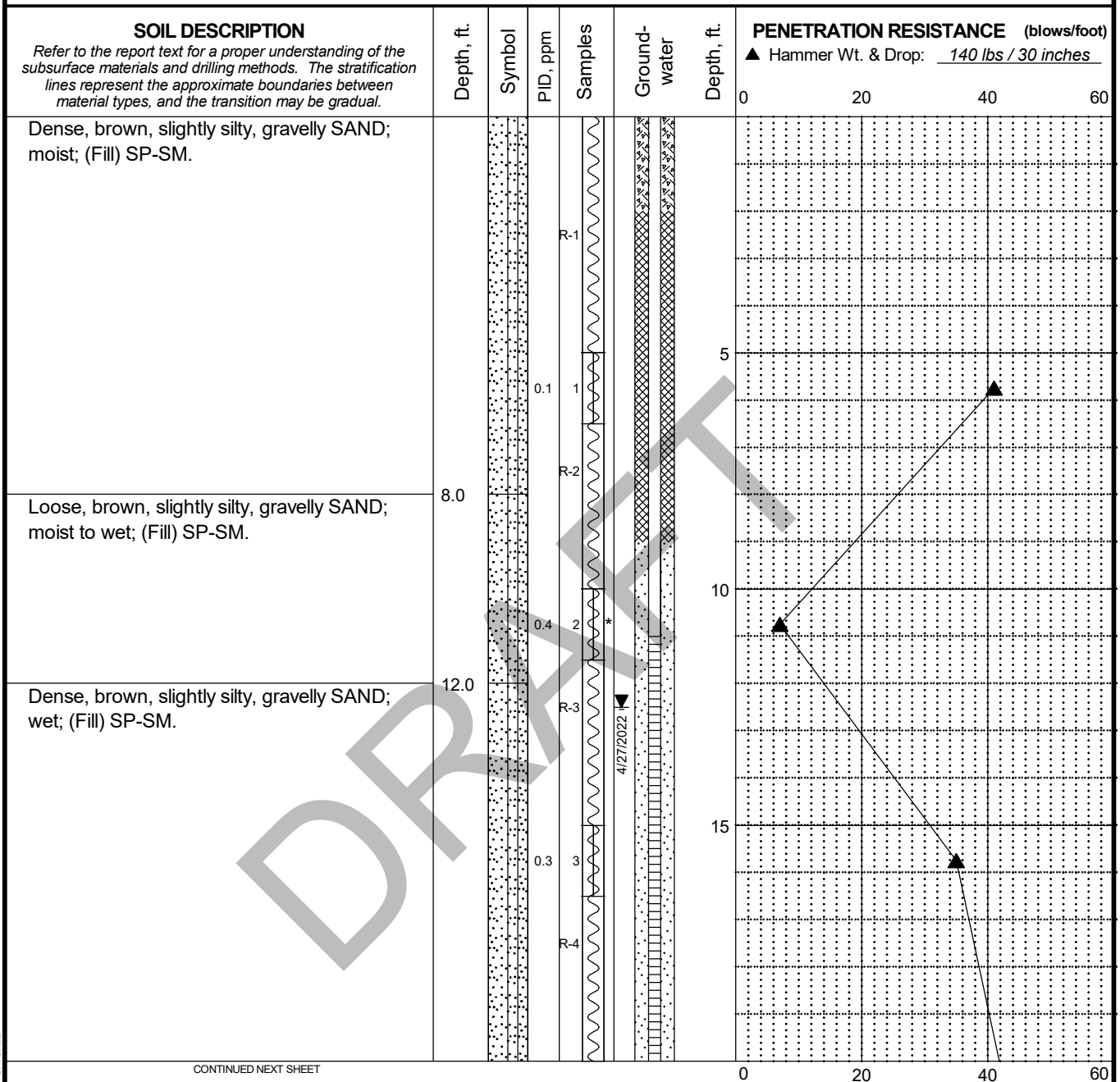
May 2022

21-1-22242-104

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Geotechnical and Environmental Consultants

Exhibit 2
Sheet 2 of 2

Total Depth: 25 ft.	Northing: 238,268 ft.	Drilling Method: Sonic Core	Hole Diam.: 6 in.
Top Elevation: 59.7 ft.	Easting: 1,277,835 ft.	Drilling Company: Cascade Drilling	Rod Diam.: 4-inch
Vert. Datum: NAVD 88	Station:	Drill Rig Equipment: LS 250 MiniSonic	Hammer Type: Automatic
Horiz. Datum: NAD 83	Offset:	Other Comments: Well Tag BNV 407	Hammer ER:



NOTES

1. Refer to SOIL CLASSIFICATION AND LOG KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary. Groundwater level is the highest available measurement to date.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. Hammer ER = hammer energy ratio (efficiency) as a percentage.

Montlake Gas Station VCP
Compliance Groundwater Monitoring
2625 East Montlake Place East, Seattle, WA

LOG OF BORING MW-6-22

May 2022

21-1-22242-104

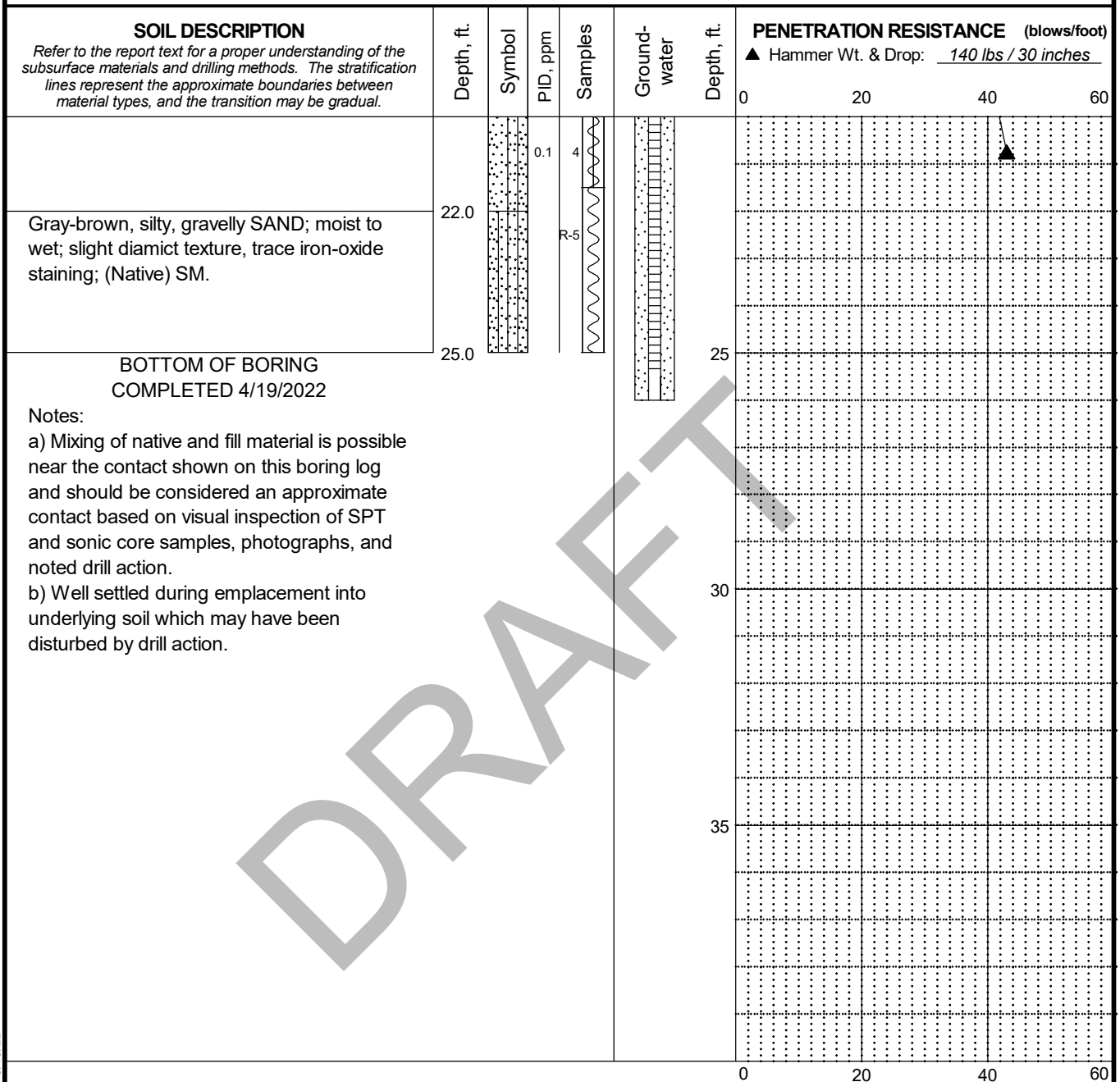
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Sheet 1 of 2

VERSION 1
FINAL

SR520 MASTER LOG E 2019 21-22242.GPJ SHAN WIL GDT 5/13/22 Log: MRH Rev: SAW Typ: LKN

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LOG OF BORING MW-6-22

May 2022

21-1-22242-104

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Sheet 2 of 2

VERSION 1
FINAL

Total Depth:	<u>25 ft.</u>	Northing:	<u>238,273 ft.</u>	Drilling Method:	<u>Sonic Core</u>	Hole Diam.:	<u>6 in.</u>
Top Elevation:	<u>59.7 ft.</u>	Easting:	<u>1,277,874 ft.</u>	Drilling Company:	<u>Cascade Drilling</u>	Rod Diam.:	<u>4-inch</u>
Vert. Datum:	<u>NAVD 88</u>	Station:	<u></u>	Drill Rig Equipment:	<u>LS 250 MiniSonic</u>	Hammer Type:	<u>Automatic</u>
Horiz. Datum:	<u>NAD 83</u>	Offset:	<u></u>	Other Comments:	<u>Well Tag BNV 409</u>	Hammer ER:	<u></u>

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LOG OF BORING MW-7-22

May 2022

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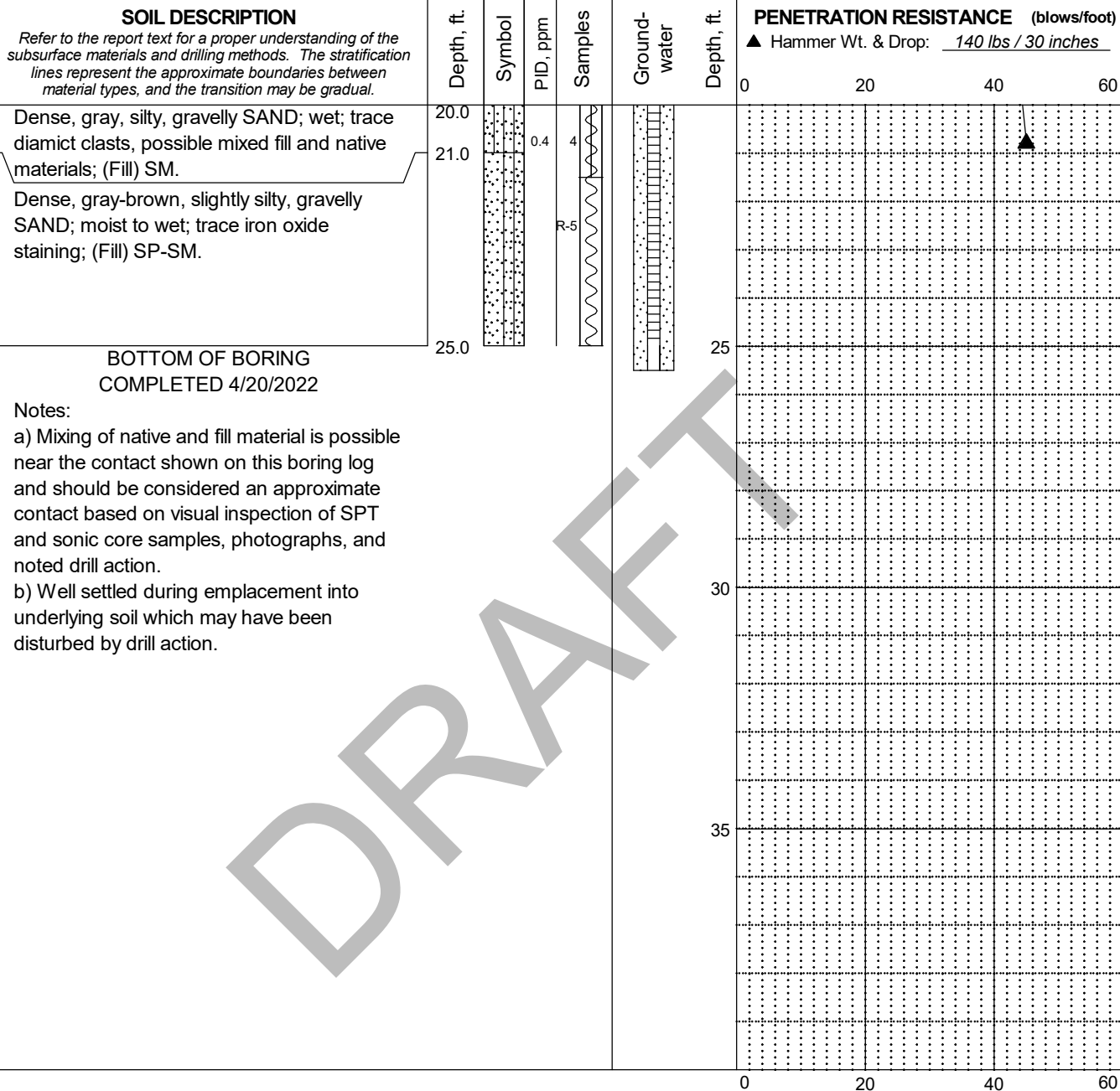
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SR520 MASTER LOG E 2019 21-22242.GPJ SHAN WIL.GDT 5/13/22 Log: MRH Rev: SAW Typ: LKN

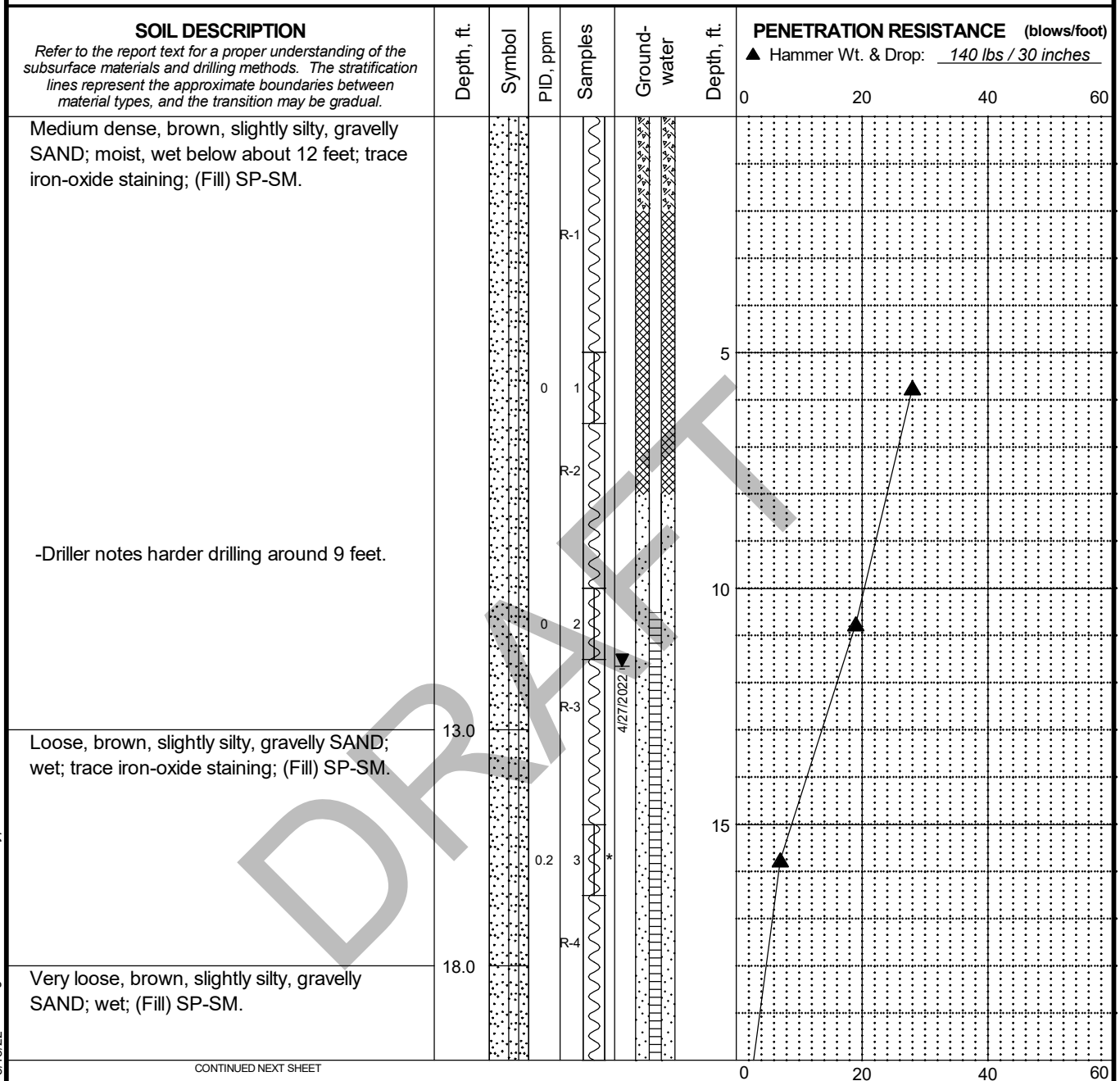
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Montlake Gas Station VCP Compliance Groundwater Monitoring 2625 East Montlake Place East, Seattle, WA	
LOG OF BORING MW-7-22	
May 2022	21-1-22242-104
SHANNON & WILSON, INC. Geotechnical and Environmental Consultants	Sheet 2 of 2

Total Depth:	<u>25 ft.</u>	Northing:	<u>238,226 ft.</u>	Drilling Method:	<u>Sonic Core</u>	Hole Diam.:	<u>6 in.</u>
Top Elevation:	<u>58.9 ft.</u>	Easting:	<u>1,277,828 ft.</u>	Drilling Company:	<u>Cascade Drilling</u>	Rod Diam.:	<u>4-inch</u>
Vert. Datum:	<u>NAVD 88</u>	Station:	<u></u>	Drill Rig Equipment:	<u>LS 250 Minisonic</u>	Hammer Type:	<u>Automatic</u>
Horiz. Datum:	<u>NAD 83</u>	Offset:	<u></u>	Other Comments:	<u>Well Tag BNV 406</u>	Hammer ER:	<u></u>



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Compliance Groundwater Monitoring
2625 East Montlake Place East, Seattle, WA

LOG OF BORING MW-8-22

May 2022

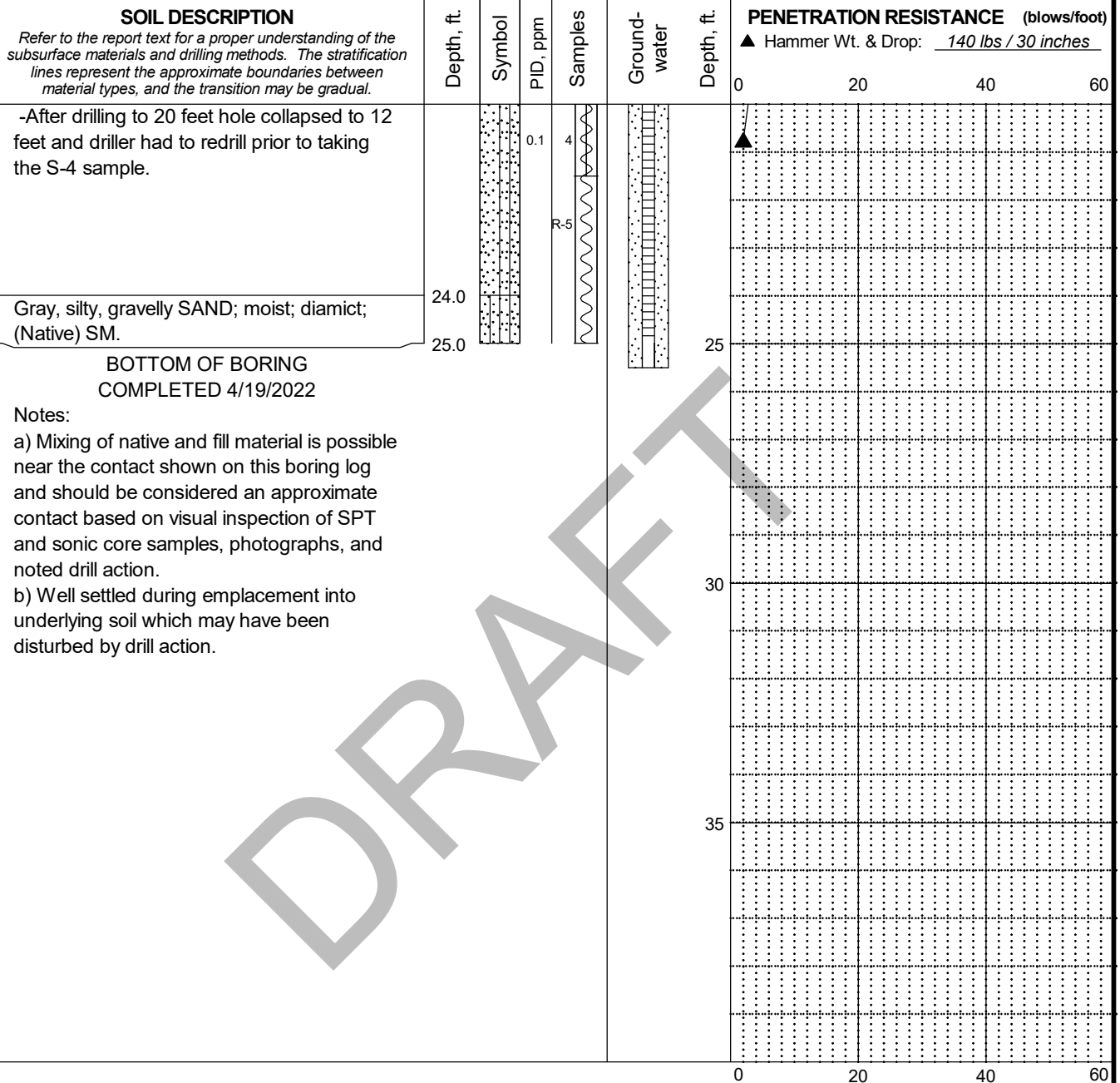
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Sheet 1 of 2

SR520 MASTER LOG E 2019 21-22242.GPJ SHAN WIL.GDT 5/13/22 Log: MRH Rev: SAW Typ: LKN

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LOG OF BORING MW-8-22

May 2022

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VERSION 1
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SR520 MASTER LOG E 2019 21-22242.GPJ SHAN WIL GDT 5/13/22 Log: MRH Rev: SAW Typ: LKN

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Horiz. Datum:	<u>NAD 83</u>	Offset:	<u></u>	Other Comments:	<u>Well Tag BNV 408</u>	Hammer ER:	<u></u>

SOIL DESCRIPTION						PENETRATION RESISTANCE (blows/foot)	
<i>Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.</i>						▲ Hammer Wt. & Drop: <u>140 lbs / 30 inches</u>	
Depth, ft.	Symbol	PID, ppm	Samples	Ground-water	Depth, ft.		
0					0	20	40 60
Medium dense, brown, slightly silty, gravelly SAND; moist; trace iron-oxide staining; (Fill) SP-SM.			R-1 0.4 1		5		
8.0			R-2 0.5 2		10		
Loose, brown, slightly silty, gravelly SAND; moist, wet at about 12 feet; (Fill) SP-SM.			R-3 0.3 3		15		
13.0			R-4				
Dense, brown, slightly silty, gravelly SAND; moist; trace iron-oxide staining; (Fill) SP-SM.							
						0	20 40 60

CONTINUED NEXT SHEET

◇ % Fines (<0.075mm)
● Natural Water Content

NOTES

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Montlake Gas Station VCP
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2625 East Montlake Place East, Seattle, WA

LOG OF BORING MW-9-22

May 2022

21-1-22242-104

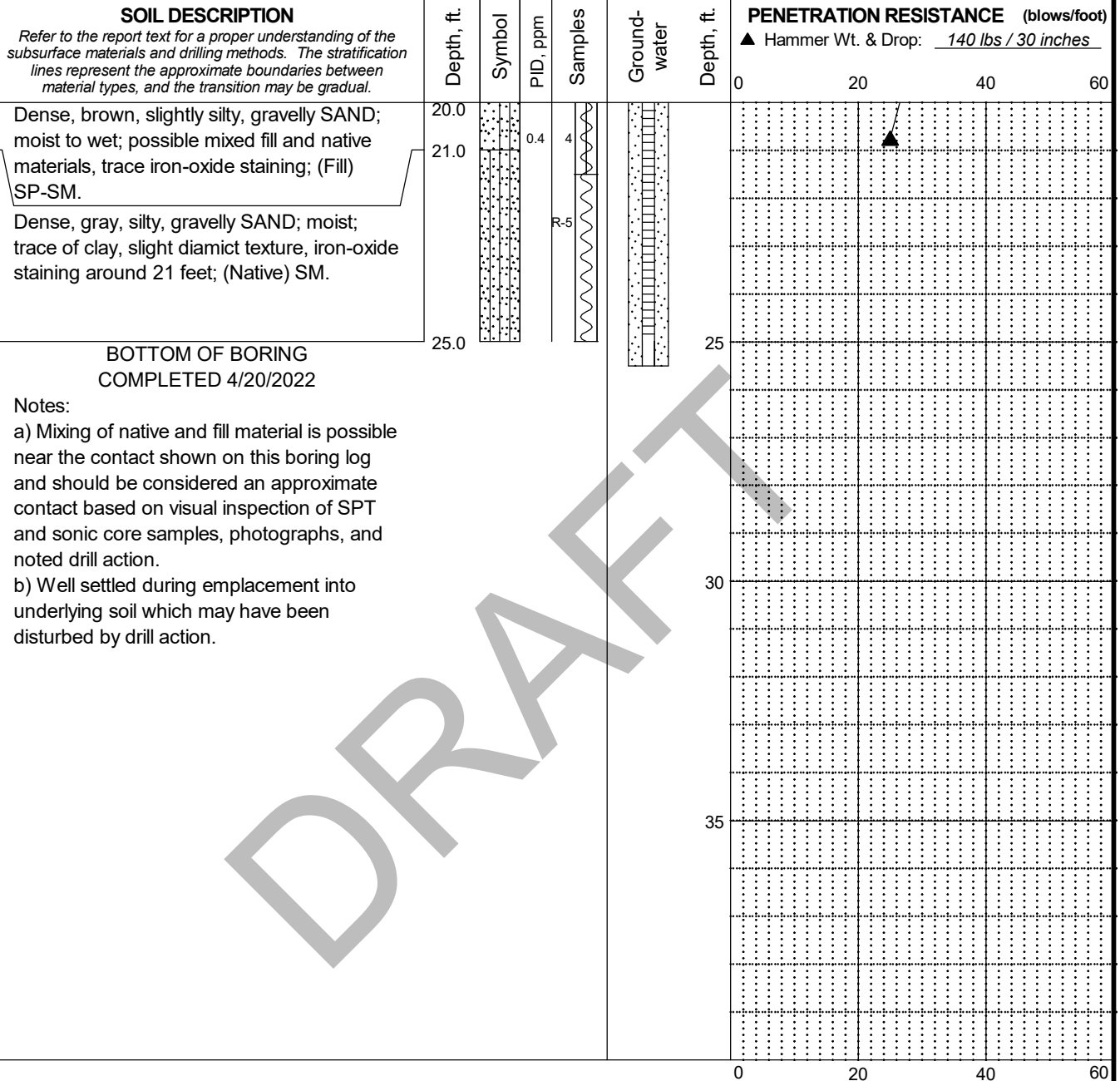
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Sheet 1 of 2

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Montlake Gas Station VCP
Compliance Groundwater Monitoring
2625 East Montlake Place East, Seattle, WA

LOG OF BORING MW-9-22

May 2022

21-1-22242-104

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Geotechnical and Environmental Consultants

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VERSION 1
FINAL

OWNER / LOCATION: WSPOT / Mountlake Gas Station DATE: 4/27/2022

WELL NO: MW-6-22 WEATHER: Cloudy, Low 50s PERSONNEL: MRH

ECOLOGY TAG NO: BNV 407 MEASURING POINT (MP): NTDL

LOCK NO. OR COMBINATION: — CASING DIA: 2 in. CASING: 0.16 gal / ft. TIME / PID HEADSPACE: Ø ppm

CASING STICKDOWN < OPEN MON. RIM: 0.35 ft. MON. HEIGHT: Ø ft. MONUMENT TYPE & DIA: 8 in.

SURGE BLOCK TYPE: PVC PRODUCT THICKNESS: Ø ft. PRODUCT MEASUREMENT METHOD: Interface probe

TIME / STATIC WL < MP: 12.15 ft. DEVELOPMENT METHOD: (Bailer-SS, Teflon, HDPE) (Hand Water) (Powered Water) (Other _____)

TIME / VWP READING: _____ (Digits, Temp.) VWP READOUT BOX ID: _____ DECON. METHOD: _____

WELL DEPTH < MP: 25.98 ft. (Hard or Soft?) WATER COLUMN HEIGHT: 13.83 ft. VOLUME IN WELL: 2.21 gal.

WATER VOLUME ADDED? None (Tap or Distilled?) VOLUME PURGED: 13.25 gal. REPAIRS NEEDED? None

MEANS OF SEDIMENT MEASUREMENT IN PURGE WATER: Bucket checking SCREEN LENGTH: 15 ft.

FIELD PARAMETERS

[illegible]

*TD = Total Depth of Well

PURGE WATER DISPOSITION: cloudy Brown DRUM NUMBERS / LOCATION: stayed on site
RELATIVE RECOVERY RATE: _____ (Rapid - Moderate - Slow) FINAL WELL DEPTH < MP: 25.98 ft. SHEEN / ODOR? None
COMMENTS: No sheen observed
CASING CAP LEFT LOOSE OR TIGHT? Tight WAS ALL SEDIMENT REMOVED? Yes

OWNER / LOCATION: WSPOT / Montlake Gas Station DATE: 4/27/22

WELL NO: MW-9-22 WEATHER: Mostly Sunny, Low 50s PERSONNEL: MRH

ECOLOGY TAG NO: BNV 409 MEASURING POINT (MP): NTOC

LOCK NO. OR COMBINATION: — CASING DIA: 2 in. CASING: 0.16 gal / ft. TIME / PID HEADSPACE: Ø ppm

CASING STICKDOWN < OPEN MON. RIM: 0.35 ft. MON. HEIGHT: Ø ft. MONUMENT TYPE & DIA: Ø in.

SURGE BLOCK TYPE: PVC PRODUCT THICKNESS: Ø ft. PRODUCT MEASUREMENT METHOD: Interface probe

TIME / STATIC WL < MP: 12.32 ft. DEVELOPMENT METHOD: (Bailer-SS, Teflon, HDPE) (Hand Waterra) (Powered Waterra) (Other —)

TIME / VWP READING: — (Digits, Temp.) VWP READOUT BOX ID: — DECON. METHOD: —

WELL DEPTH < MP: 25.15 ft. (Hard or Soft?) WATER COLUMN HEIGHT: 12.83 ft. VOLUME IN WELL: 2.05 gal.

WATER VOLUME ADDED? — (Tap or Distilled?) VOLUME PURGED: 15 gal. REPAIRS NEEDED? None

MEANS OF SEDIMENT MEASUREMENT IN PURGE WATER: Bucket check SCREEN LENGTH: 15 ft.

FIELD PARAMETERS

[illegible]

*TD = Total Depth of Well

PURGE WATER DISPOSITION: Cloudy Brown

DRUM NUMBERS / LOCATION: Staged on site

RELATIVE RECOVERY RATE: Rap to Mod (Rapid - Moderate - Slow)

FINAL WELL DEPTH < MP: 25.15 ft. SHEEN / ODOR? None

COMMENTS:

CASING CAP LEFT LOOSE OR TIGHT ? TIGHT

WAS ALL SEDIMENT REMOVED? yes

OWNER / LOCATION: WSDOT / Former Montlake Gas Station DATE: 4/27/2022

WELL NO: MW-8-22 WEATHER: Cloudy, Mid 40s PERSONNEL: MET/NAE

ECOLOGY TAG NO: BNV 406 MEASURING POINT (MP): NTOL

LOCK NO. OR COMBINATION: — CASING DIA: 2 in. CASING: 0.16 gal / ft. TIME / PID HEADSPACE: 0.0 ppm

CASING STICKDOWN < OPEN MON. RIM: 0.35 ft. MON. HEIGHT: 0 ft. MONUMENT TYPE & DIA: 2 in.

SURGE BLOCK TYPE: PVE PRODUCT THICKNESS: 0 ft. PRODUCT MEASUREMENT METHOD: Interface Probe

TIME / STATIC WL < MP: 11.30 ft. DEVELOPMENT METHOD: (Bailer-SS, Teflon, HDPE) (Hand Water) (Powered Water) (Other)

TIME / VWP READING: (Digits, Temp.) VWP READOUT BOX ID: DECON. METHOD:

WELL DEPTH < MP: 26.05 ft. (Hard or Soft?) WATER COLUMN HEIGHT: 14.75 ft. VOLUME IN WELL: 1.88 ^{2.36} gal.

WATER VOLUME ADDED? (Tap or Distilled?) VOLUME PURGED: 16 gal. REPAIRS NEEDED? None

MEANS OF SEDIMENT MEASUREMENT IN PURGE WATER: Bucket checking SCREEN LENGTH: 15 ft.

FIELD PARAMETERS

[illegible]

*TD = Total Depth of Well

PURGE WATER DISPOSITION: Brown DRUM NUMBERS / LOCATION: Staged on site

RELATIVE RECOVERY RATE: Moderate (Rapid - Moderate - Slow) FINAL WELL DEPTH < MP: 26.05 ft. SHEEN / ODOR? No

COMMENTS: PA15 Sand locked - trying to get it to pump - can't produce water. Used metal surge block to remove sand from bottom

CASING CAP LEFT LOOSE OR TIGHT? Tight WAS ALL SEDIMENT REMOVED? Yes

OWNER / LOCATION: NSDOT / Mountain Gas Station DATE: 4/27/22

WELL NO: MW-7-22 WEATHER: Sunny, Low 50s PERSONNEL: MRH

ECOLOGY TAG NO: BNV 409 MEASURING POINT (MP): NTOL

LOCK NO. OR COMBINATION: — CASING DIA: 2 in. CASING: 0.16 gal / ft. TIME / PID HEADSPACE: Ø ppm

CASING STICKDOWN < OPEN MON. RIM: 0.5 ft. MON. HEIGHT: Ø ft. MONUMENT TYPE & DIA: 8-inch in.

SURGE BLOCK TYPE: PVC PRODUCT THICKNESS: Ø ft. PRODUCT MEASUREMENT METHOD: interface probe

TIME / STATIC WL < MP: 12.05 ft. DEVELOPMENT METHOD: (Bailer-SS, Teflon, HDPE) (Hand Waterra) (Powered Waterra) (Other —)

TIME / VWP READING: — (Digits, Temp.) VWP READOUT BOX ID: — DECON. METHOD: —

WELL DEPTH < MP: 15.37 ft. (Hard or Soft?) WATER COLUMN HEIGHT: 13.32 ft. VOLUME IN WELL: 2.13 gal.

WATER VOLUME ADDED? — (Tap or Distilled?) VOLUME PURGED: 13.5 gal. REPAIRS NEEDED? None

MEANS OF SEDIMENT MEASUREMENT IN PURGE WATER: Chocking Bucket SCREEN LENGTH: 15 ft.

FIELD PARAMETERS

[illegible]

*TD = Total Depth of Well

PURGE WATER DISPOSITION: cloudy brown DRUM NUMBERS / LOCATION: staged on site
RELATIVE RECOVERY RATE: _____ (Rapid Moderate Slow) FINAL WELL DEPTH < MP: 25.37 ft. SHEEN / ODOR? None
COMMENTS: _____
CASING CAP LEFT LOOSE OR TIGHT? Tight WAS ALL SEDIMENT REMOVED? Yes