



June 2, 2020

HWA Project No. 98165-675

City of Everett Public Works Department  
3200 Cedar Street  
Everett, WA 98201

Attention: Mark Sadler

**Subject: Gas Monitoring Probes and Compliance, North End of Landfill  
Everett Landfill/Tire Fire Site  
Everett, Washington**

Dear Mark,

This letter describes the rationale for locations of new or replacement landfill gas probes, and overall landfill gas compliance issues along the north edge of the landfill. Landfill gas probes are a component of long-term monitoring of the landfill Site to assess the potential for landfill gas to be migrating beyond the perimeter of the landfill Site.

Several probes along the north end of the landfill have been damaged or covered due to construction activities along 36<sup>th</sup> Street and on private properties adjoining the landfill that are outside the control of the City. Four new probes were installed in 2019 to replace the damaged probes. The current active probes provide a continuous line of monitoring along the landfill north boundary, as detailed below. The replacement probes are located within the 36<sup>th</sup> Street right-of-way (see Figure 1). The specific locations were selected to accommodate upcoming roadway construction associated with landfill redevelopment activities and avoid conflicts with numerous existing underground utilities along 36<sup>th</sup> Street. However, with these constraints, we believe the intent of the compliance monitoring program for the Site is achieved through monitoring of the upgraded compliance probe network, as described in the following sections.

### **Historical Gas Measurements / Gas Extraction Trenches**

Methane exceeding 5% by volume was historically detected in one or more of the probes installed at and north of the landfill northern perimeter. Due to these elevated gas readings, a gas extraction trench was constructed along the southern edge of 36<sup>th</sup> Street in 2004. A second gas extraction trench parallel and north of the first one was installed along the eastern portion of the northern edge of 36<sup>th</sup> Street in 2005 (see Figures 2 and 3). These extraction trenches were installed to ensure capture of landfill gas migrating from the landfill site. The gas extraction system was recently inspected by Herrera, under contract to the City for landfill gas system O&M support, and the system was found to be in good

working order, with sufficient vacuum and flows necessary to capture any gas emanating from the landfill (Herrera, 2019).

Soon after the northern gas extraction system was completed in 2005, methane concentrations in probes along 36<sup>th</sup> street decreased to near zero. The second trench was installed in response to elevated methane detections within the three probes on private property north of 36<sup>th</sup> Street (LG-44, LG-45, and LG-46) after installation of the first trench. However, there were no changes to methane concentrations in these probes after both gas extraction trenches were installed; methane concentrations on the property north of 36<sup>th</sup> Street remained elevated. Based on site boring and investigation information for the property north of 36<sup>th</sup> Street, the source of the methane was likely not the landfill, but the abundant buried peat, wood waste and debris present on the property north of 36<sup>th</sup> Street, as discussed in more detail below.

Figures 2 and 3 show a location map and cross section through the north end of the landfill, across 36<sup>th</sup> Street. The cross section illustrates how both gas extraction trenches extend to or near the ground water table, consistent with recommended practices for perimeter gas collection trenches, such that it is unlikely for any gas to migrate from the landfill to areas north of 36<sup>th</sup> Street.

### **Diversified Property Historical Use and Subsurface Conditions**

Gas probes with elevated methane concentrations (LG-44, LG-45, and LG-46) were located on the property north of 36<sup>th</sup> Street (former Port of Everett Property, former Diversified recycling facility) over 100 feet north of the landfill Site, north of the dual, parallel, perimeter landfill gas collection trenches, and north of multiple, closely spaced gas probes located along 36<sup>th</sup> Street (LG-59, LG-50, LG-12, LG-61, LG-62, LG-67, LG-11), where little to no methane has been detected for many years (boring logs are included in Attachment A). Before being buried during private property fill activities around 2008, these probes (LG-44, LG-45, and LG-46) displayed relatively constant ranges of methane concentrations (generally above 5% and up to 80%) before and after construction of the two northern gas extraction trenches in 2004 and 2005.

Methane concentrations measured north of the two gas extraction trenches are likely from off-site sources, as pocket or residual gas, if migrated from the landfill, would have dissipated in the years following installation and active operations of both perimeter extraction trenches. Monitoring of the compliance probes immediately north of the perimeter collection trenches also indicates that methane is not migrating north beyond the perimeter trenches. A pattern of decreasing methane concentrations was observed at the west edge of the landfill after the 2004 west gas extraction system was installed. Similarly, almost immediately after the northern gas extraction system was completed in 2005, methane in probes along the northern landfill boundary (LG-67, LG-68, LG-69, LG-70) which are located between the landfill and the Diversified property probes with elevated methane concentrations (LG-44, LG-45, and LG-46), decreased significantly (from up to 60% methane, to zero).

Soils on the Diversified property north of 36<sup>th</sup> Street contain abundant debris, wood waste, natural wood and peat deposits, which are all sources of methane during decomposition. Boring logs of probes installed throughout the Diversified Site (see Attachment A for boring logs, and a boring location figure) document the presence of multiple feet-thick layers of organics, peat, wood debris, and wood chips. Additionally, these logs consistently note the presence of concrete, asphalt, metal, glass and porcelain debris, typical of industrial fill. None of these logs note putrescible waste. Of the over 25 borings installed across the Diversified Site for which logs were available for review (and are included in Attachment A), only one location noted the presence of ‘refuse’. This location is along the property line adjacent to 36<sup>th</sup> Street. All other borings indicate that the fill present north of 36<sup>th</sup> includes demolition type debris and wood waste. This pattern is consistent with the historical use of these properties. Historical land use north of 36<sup>th</sup> Street included wood-related industries such as saw mills, and timber storage. Natural wood and peat deposits are also present beneath the fill unit, in some areas consisting of several feet of pure fibrous wood deposits (i.e., no soil material). The natural wood, residual wood waste, and debris in the subsurface are known sources of methane gas.

Prior studies (AESI, 2011) conducted at the former Diversified property (where LG-44, LG-45, and LG-46 were located), included historical research based on aerial photographs and tax assessor records. AESI (2011) indicated that past activities at the Diversified site included fill placement and grading as early as 1965, timber storage sometime around 1974 through the early 1980s, and later a materials recycling facility. The filling activities were not directly associated with the landfill south of 36<sup>th</sup> Street. *Subsurface explorations at the Diversified property did not encounter putrescible waste or large quantities of other household or demolition waste commonly associated with a municipal landfill.* Outside of minor amounts of debris (concrete, brick, glass) and charcoal mixed with soil, most of the fill encountered beneath the Diversified property consisted of soil and woody debris (bark, wood fiber, wood chips) likely associated with the timber storage activities.

### **Diversified Property Environmental Management**

The Diversified property is a separate Ecology-listed MTCA site, Facility Site ID #2055672, Cleanup Site ID: 11595), and was entered into the Voluntary Cleanup Program around 2011. The most current remedial investigation/feasibility study/cleanup action plan (RI/FS/CAP), dated October 2017 for the site recognized and described the methane in soil gas present on the property. The CAP for this property included gas mitigation measures very similar to those in place for the Everett Landfill, i.e., active gas control systems, gas monitoring, gas alarms in buildings, sealing to prevent soil gas intrusion, etc.

In addition to any methane assessment and mitigation planned for the Diversified property, the City also has in place a “methane hazard zone” permit requirement for all properties near a landfill or containing buried organic debris or other potential methane-producing sources, which requires methane hazard assessment and mitigation for all development (<https://everettwa.gov/DocumentCenter/View/24125/Construction-within-a->

[potential-methane-hazard-zone-PDF](#)). The properties north of 36<sup>th</sup> Street are in one of these methane hazard zones. Methane assessment and mitigation measures are modelled after the County of Los Angeles Mitigation Standards, which include detailed procedures and plans for assessment and mitigation.

### Landfill Boundary Compliance

Because some of the landfill gas probes along the landfill north boundary are located in between the two northern gas extraction trenches, Ecology has expressed concern that these are not ideal for use as compliance monitoring locations. To investigate if compliance (gas monitoring on the exterior of the gas collection system) could be demonstrated the City turned off the northern gas extraction trench on April 20, 2020 for a three day period, then turned the system back on. With this configuration, only the original, southern (of the northern landfill boundary) extraction trench was operational, such that all the gas probes along 36<sup>th</sup> Street were outside the landfill and outside the operating extraction trench. Gas readings collected prior to and following shutdown of the northern extraction trench in probes along 36<sup>th</sup> Street are summarized below. These readings show no methane detections before or after shutdown of the northern extraction trench, indicating that even with only a single gas collection trench operating, the southern extraction trench, within the landfill property, was and is still sufficient to control landfill gas migrating from the landfill. This further confirms for the City that gas detected north of 36<sup>th</sup> Street is not migrating from the landfill, but is from a separate source.

	Thurs 4/16/20			Thurs 4/23/20		
	CH4	CO2	O2	CH4	CO2	O2
LG-41	0	7.3	8.9	0	8.4	8.5
LG-59	0	4.2	12.6	0	3.2	15.1
LG-62	0	0	21.9	0	0.3	20.7
LG-91	0	2.4	17.2	0	3.0	17.1
LG-92	0	0.1	21.9	0	0.2	20.9
LG-93	0	0.1	22.5	0	0.4	20.5
LG-94	0	0.6	21.9	0	0.8	19.9

\* all concentrations in percent by volume

### Considerations for Landfill Gas Chemistry Analyses

Landfill gas is composed of a mixture of hundreds of different gases. By volume, landfill gas typically contains 45% to 60% methane and 40% to 60% carbon dioxide. In general (i.e., not only landfills) methane in soil can be from decomposition of organic waste, naturally occurring organic material, or petroleum. Gas generated from decomposition also includes small amounts of nitrogen, oxygen, ammonia, sulfides, hydrogen, carbon monoxide, and can contain non-methane organic compounds (NMOCs). NMOCs are organic compounds that can occur naturally but are typically formed in landfill gas by breakdown of fill, debris, and waste. The chemical composition of gas, and the NMOCs present, are based on the nature of the material and waste deposited, how it was

deposited, geochemical and ground water conditions, time since deposition, etc., and are highly localized, which is the case for a site as highly variable as the Everett Landfill.

Attempting to characterize, or “fingerprint” the chemical composition of landfill or non-landfill gas is likely not possible even if numerous samples, and statistical analysis of the results were done; including the approximately 70 NMOCs (in a typical TO-15 analysis). Attempting to establish statistical differences in data sets with 70 variables would be challenging at best, and very likely not conclusive, as the industrial activities on the north properties could have been such that result in similar gas composition. Using one or a few indicator compounds might also be ambiguous. Given the variability of filling on the landfill, and the similar variability of historical filling and operations at the Diversified property, and for the reasons listed above, we do not believe collection of samples for chemical analysis to compare the gas present on the Diversified property to gas at the landfill will be conclusive. There is a low likelihood that results would indicate a clear ‘fingerprint’ for the landfill compared to the Diversified property, and we recommend that without a clear, defensible work plan that the sampling not be done.

### **Probe Location Summary**

The gas probes north of the landfill and north of 36<sup>th</sup> ROW were on private property where building demolition and major site grading occurred. As a result, the following probes have been buried or damaged and can not be monitored: LG-12, LG-44, LG-45, LG-46, LG-47, LG-61, LG-67, and LG-68. LG-62 was covered for several years but was recently uncovered by construction excavation in the area. The probe was found to be functional, and will be fitted with a new monument and monitored in the future. Prior to installation of the four new probes (LG-91, LG-92, LG-93, and LG-94), five northern perimeter probes (LG-41, LG-55, LG-59, LG-62, and LG-70) were accessible for sampling, resulting in nine functional probes now operating at the north landfill boundary (not including an additional six probes used to monitor utility trenches (LG-85, LG-86, LG-87, LG-71, LG-72, and LG-73)).

### **Conclusions**

The City is not proposing installation of additional probes north of 36<sup>th</sup> Street, because we believe the existing network provides confirmation that the landfill gas collection system is functioning, and landfill gas is not migrating past the landfill site boundary. Probes along 36<sup>th</sup> Street which once had elevated methane were brought into compliance by the gas extraction trenches; and probes north of 36<sup>th</sup> Street on private property within the Diversified property, contained methane that is not related to migration of gas from the landfill past the perimeter collection system. The Diversified Site is a listed MTCA site, and from our review of available remedial reports for this Site, investigations identified known onsite methane sources, and the Site’s CAP has a remedy for management of the gas pathway. Because the presence of methane on this property is known, the City is requiring evaluation and mitigation of gas exposure through identification of the property within the City’s Methane Hazard Zone permit process, as discussed above.

The replacement probes in 36<sup>th</sup> Street were located where physically possible given the density of utilities, and where it made sense for them to be placed to fulfill their intended function of measuring landfill gas associated with the landfill Site (see Figure 1). Monitoring of the perimeter probes in 36<sup>th</sup> Street, along with the recent test done to confirm gas compliance while the northern trench of the perimeter system in 36<sup>th</sup> Street was shut off, confirm that the perimeter system is functioning to collect any gas associated with landfill waste potentially migrating to the landfill Site perimeter (see table above).

Probes located north of 36<sup>th</sup> Street do not fulfill the function of perimeter compliance monitoring probes because there are known debris, wood waste, and other naturally occurring sources of methane on the properties north of 36<sup>th</sup> Street, as described above that would make probes in this area not reflective of perimeter system performance. Investigation of soil gas in these areas north of 36<sup>th</sup> Street associated with historical operations and subsurface conditions on the Diversified property is outside the scope of the landfill site, and should instead be addressed through the MTCA process underway for that property. To address concern for methane gas on property within the City's jurisdiction, the City has implemented methane assessment and mitigation measures as part of its permitting process to make sure any future development on these private properties is protective, and that documentation of these evaluations and mitigation measures are provided to Ecology.

The City understands that the compliance monitoring program requirements developed prior to installation of the perimeter gas collection system and compliance probe network require confirmation monitoring via measurement of probes on the exterior of the gas collection system. Given the complexity of the site conditions on the north side of the property, the City believes the existing probe system confirms compliance with landfill gas collection requirements by monitoring the probe locations installed in 36<sup>th</sup> Street (Figure 1). Given the multiple lines of evidence above, the methane detected north of 36<sup>th</sup> street is not resulting from migration of gas from the landfill. The City is willing to discuss any remaining Ecology concerns, and other ways for the City to document perimeter system functionality.

## References

Associated Earth Sciences, Inc. (AESI), 2011, *Phase II Environmental Site Assessment: Soil and Ground Water Characterization*, 2915 36<sup>th</sup> Street South, Everett, Washington: June 16, 2011.

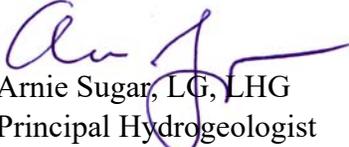
Herrera, 2019, Technical Memorandum, Everett Landfill –*Northeast Landfill Gas Collection System Inspection*, July 1, 2019.



June 2, 2020  
HWA Project No. 98165-670

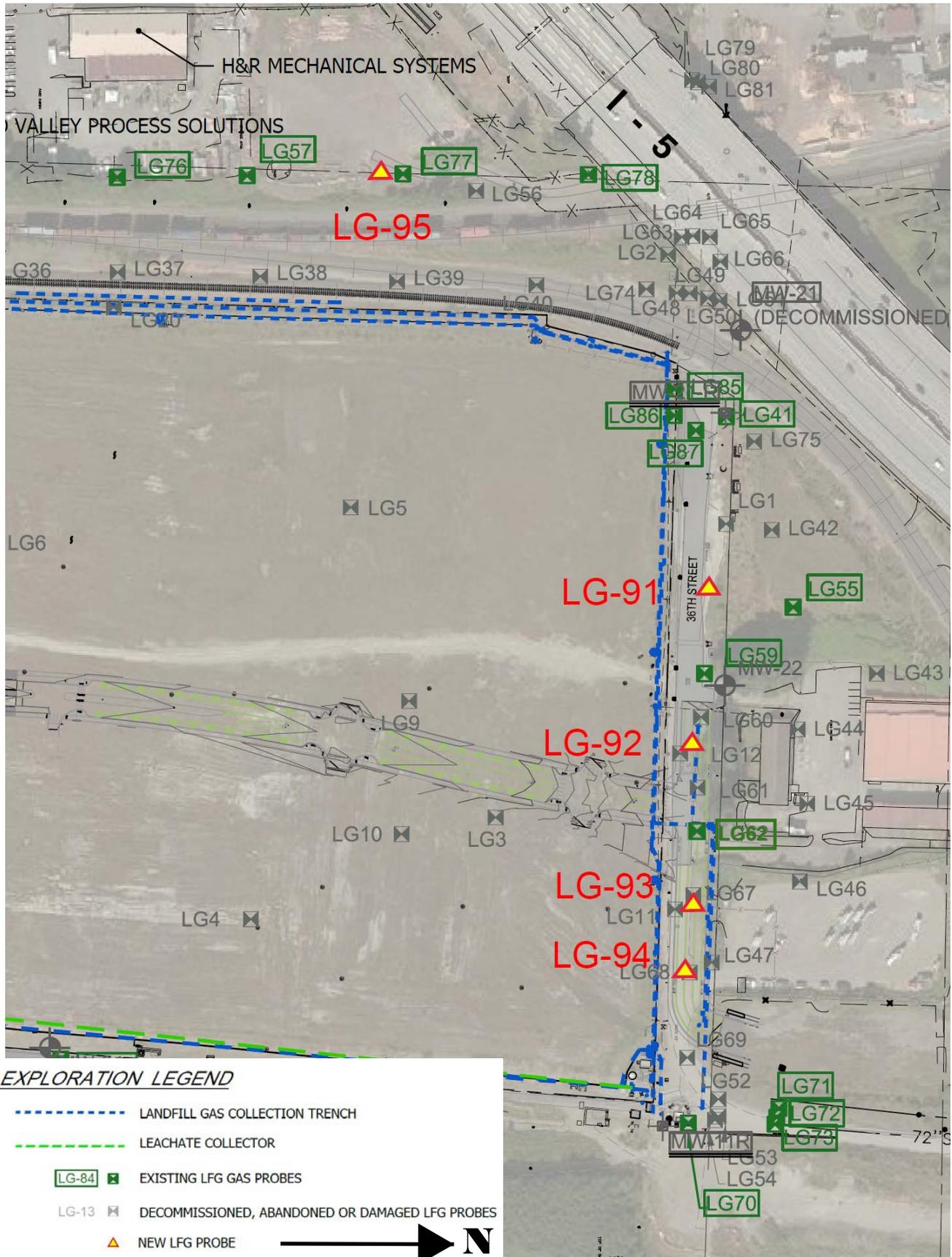
We appreciate the opportunity to provide our services. Please feel free to call if you have any questions or need more information.

Sincerely,  
HWA GEOSCIENCES INC.

  
Arnie Sugar, LG, LHG  
Principal Hydrogeologist

Attachments:

- Figure 1 New Gas Probe Locations
- Figure 2 Cross Section Location Map
- Figure 3 Cross Section A – A'
- Attachment A - Selected boring logs



NEW GAS PROBES, NORTH BOUNDARY

EVERETT LANDFILL  
EVERETT, WASHINGTON

FIGURE NO.

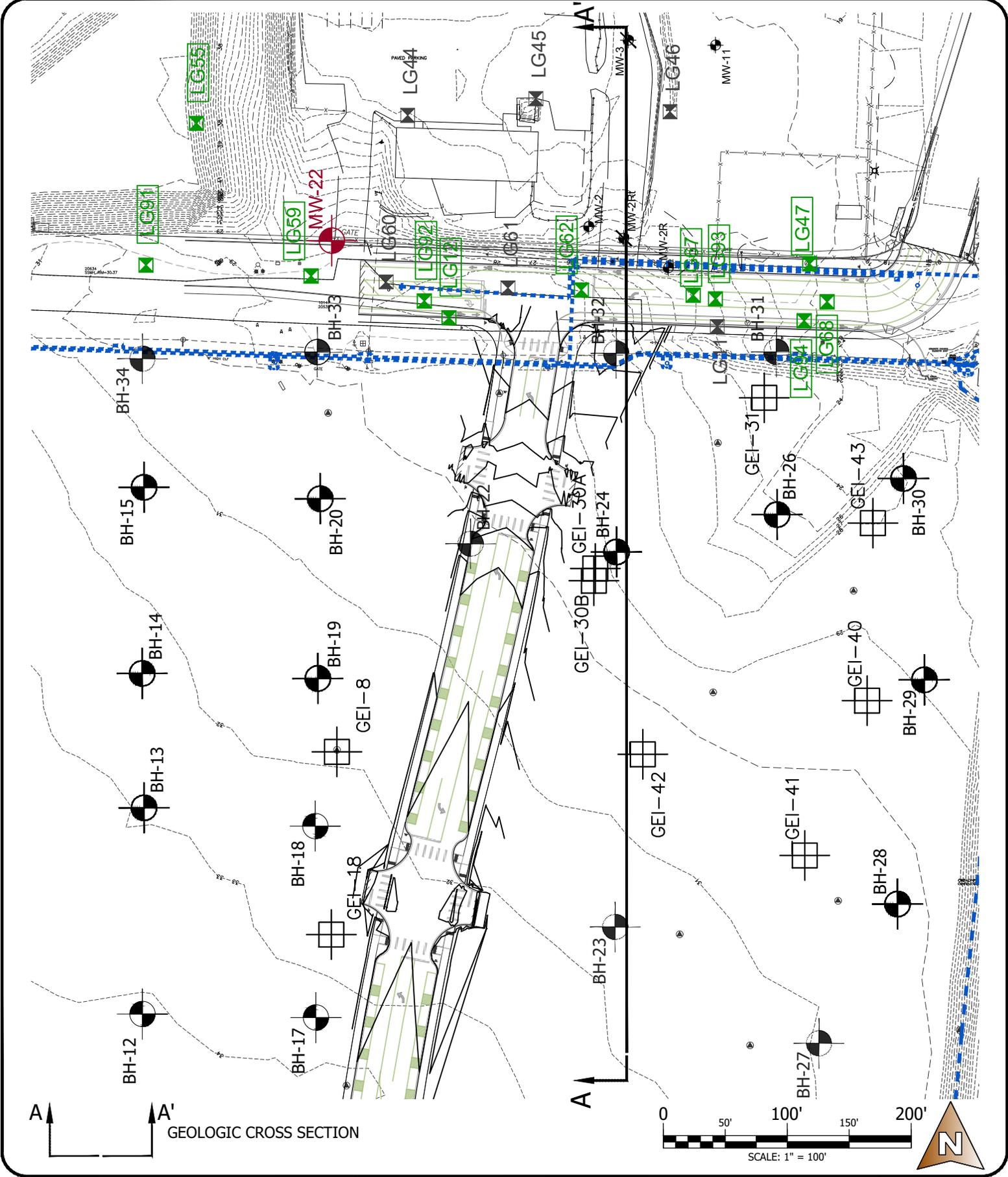
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PROJECT NO.

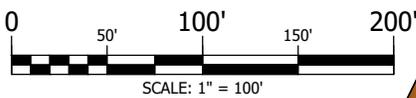
1998-165



HWA GEOSCIENCES INC.



A ↑ A' ↑  
GEOLOGIC CROSS SECTION



SITE AND EXPLORATION PLAN

EVERETT LANDFILL  
EVERETT, WASHINGTON

FIGURE NO.:

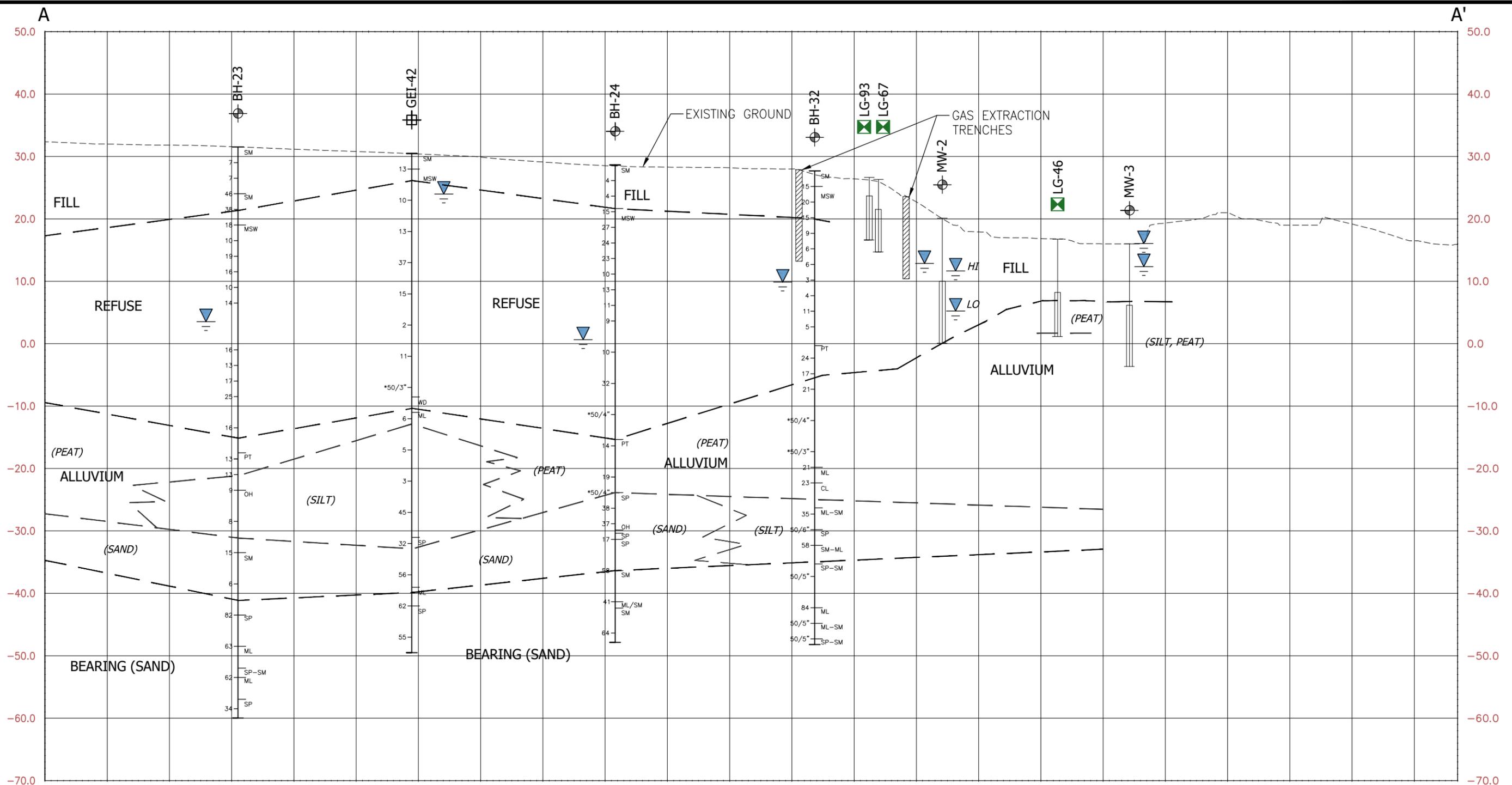
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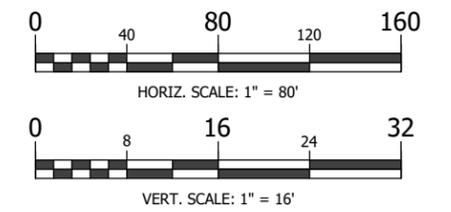
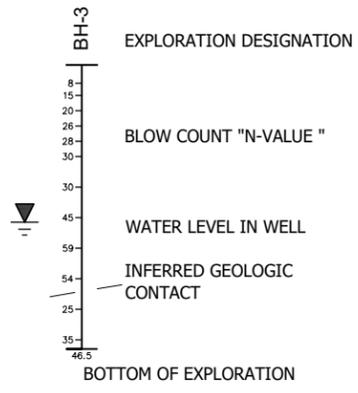
PROJECT #  
1998-165-675



**GEOSCIENCES INC.**  
DBE/MWBE



**BORE LEGEND**



**GEOSCIENCES INC.**  
DBE/MWBE

**EVERETT LANDFILL**  
EVERETT, WASHINGTON

**GEOLOGIC CROSS SECTION A-A'**

DRAWN BY:	FIGURE NO.:
CF	<b>3</b>
CHECK BY:	PROJECT NO.:
AS	1998-165-675

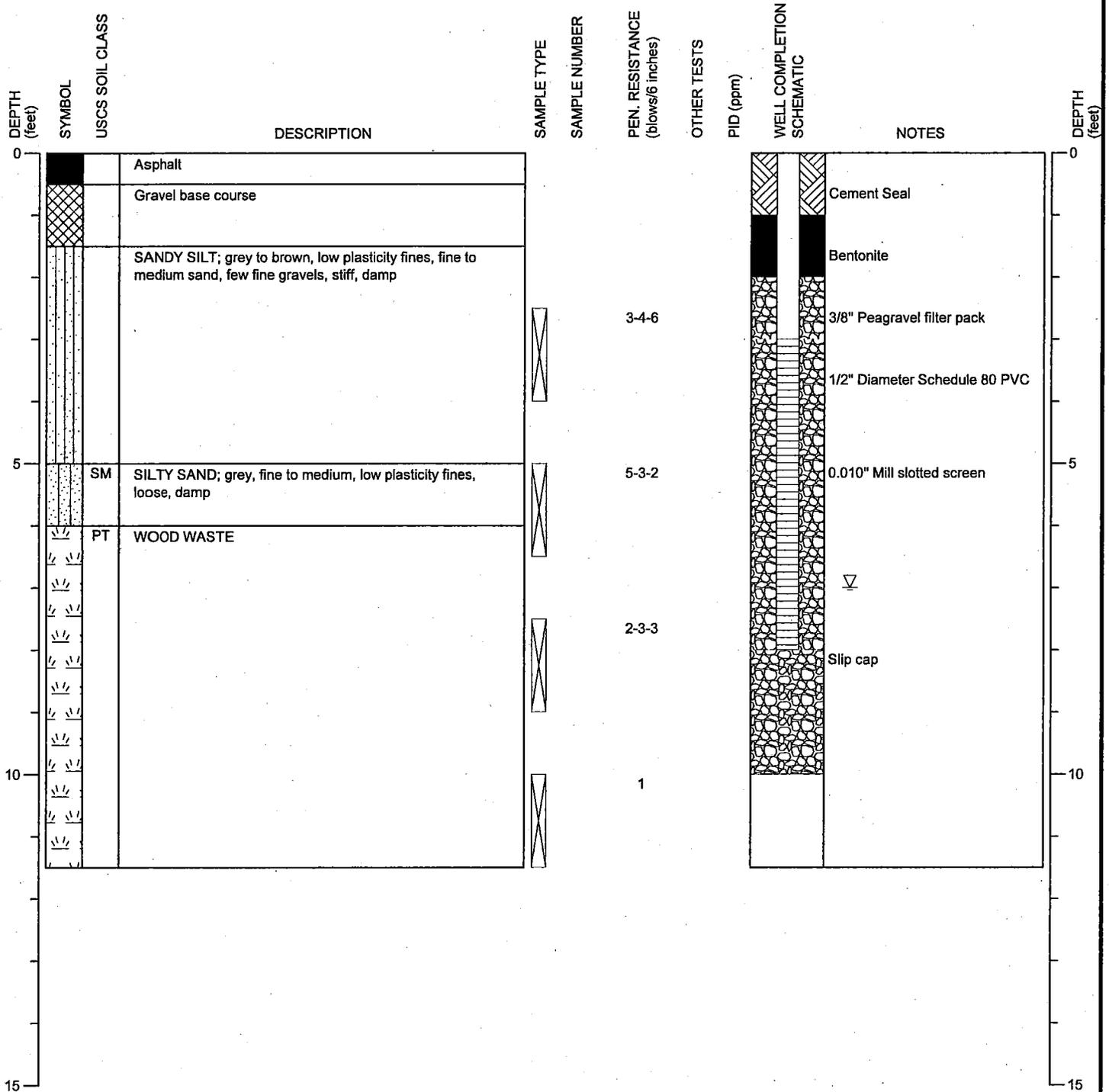
**ATTACHMENT A**

**SELECTED BORING LOGS**

DRILLING COMPANY: Cascade Drilling, Inc.  
 DRILLING METHOD: HSA, 8.25", O.D., Track rig  
 SAMPLING METHOD: SPT on winch line  
 LOCATION: Everett, Washington

SURFACE ELEVATION: ± feet

DATE STARTED: 4/30/2001  
 DATE COMPLETED: 4/30/2001  
 LOGGED BY: S. Zorn



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.



EVERETT LANDFILL  
 EVERETT, WASHINGTON

Landfill Gas Probe:  
 LFG-44

PAGE: 1 of 1

PROJECT NO.: 98165

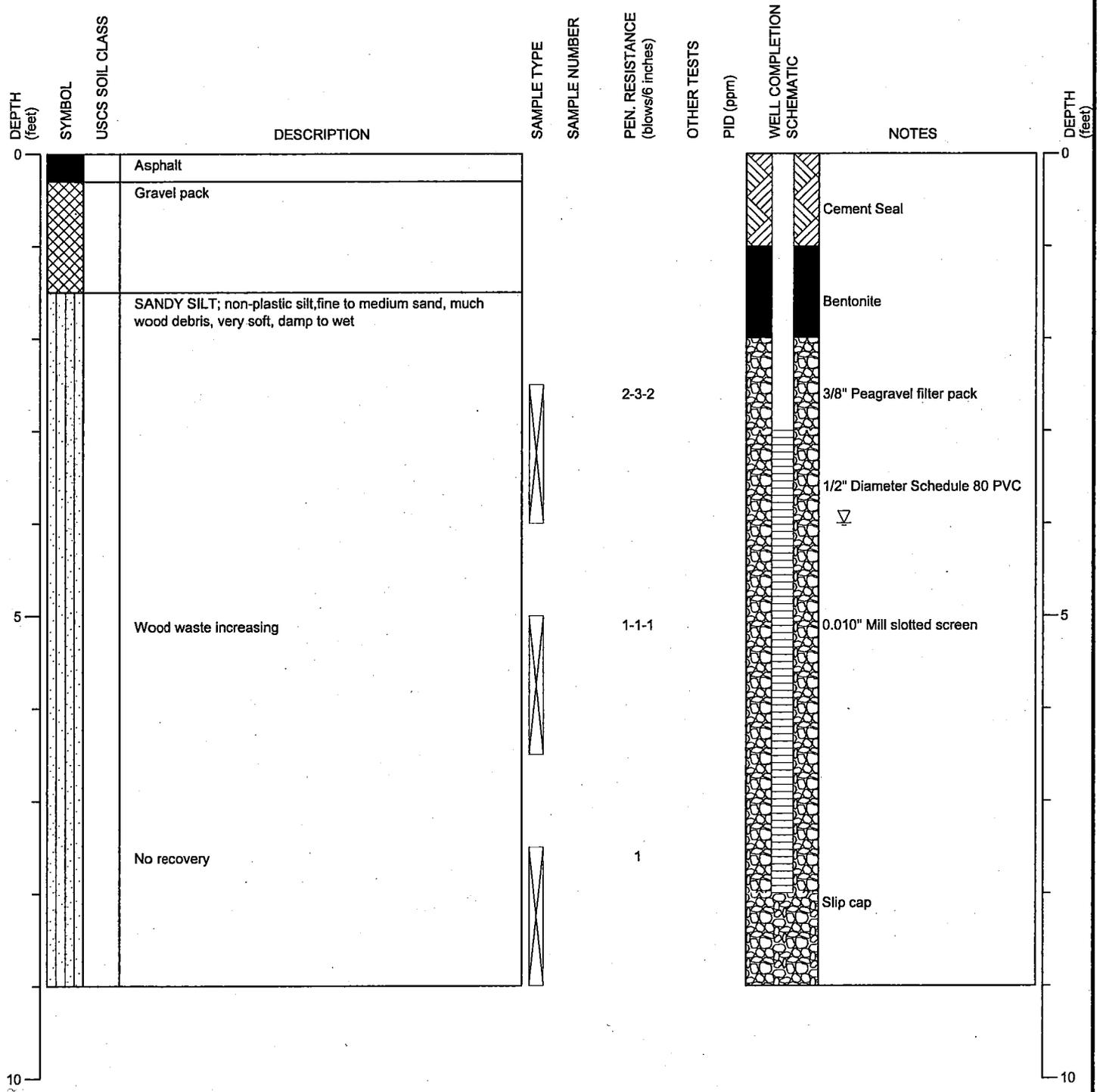
FIGURE:

B-33

DRILLING COMPANY: Cascade Drilling, Inc.  
 DRILLING METHOD: HSA, 8.25", O.D., Track rig  
 SAMPLING METHOD: SPT on winch line  
 LOCATION: Everett, Washington

SURFACE ELEVATION: ± feet

DATE STARTED: 4/30/2001  
 DATE COMPLETED: 4/30/2001  
 LOGGED BY: S. Zorn



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.



EVERETT LANDFILL  
 EVERETT, WASHINGTON

Landfill Gas Probe:  
 LFG-45

PAGE: 1 of 1

PROJECT NO.: 98165

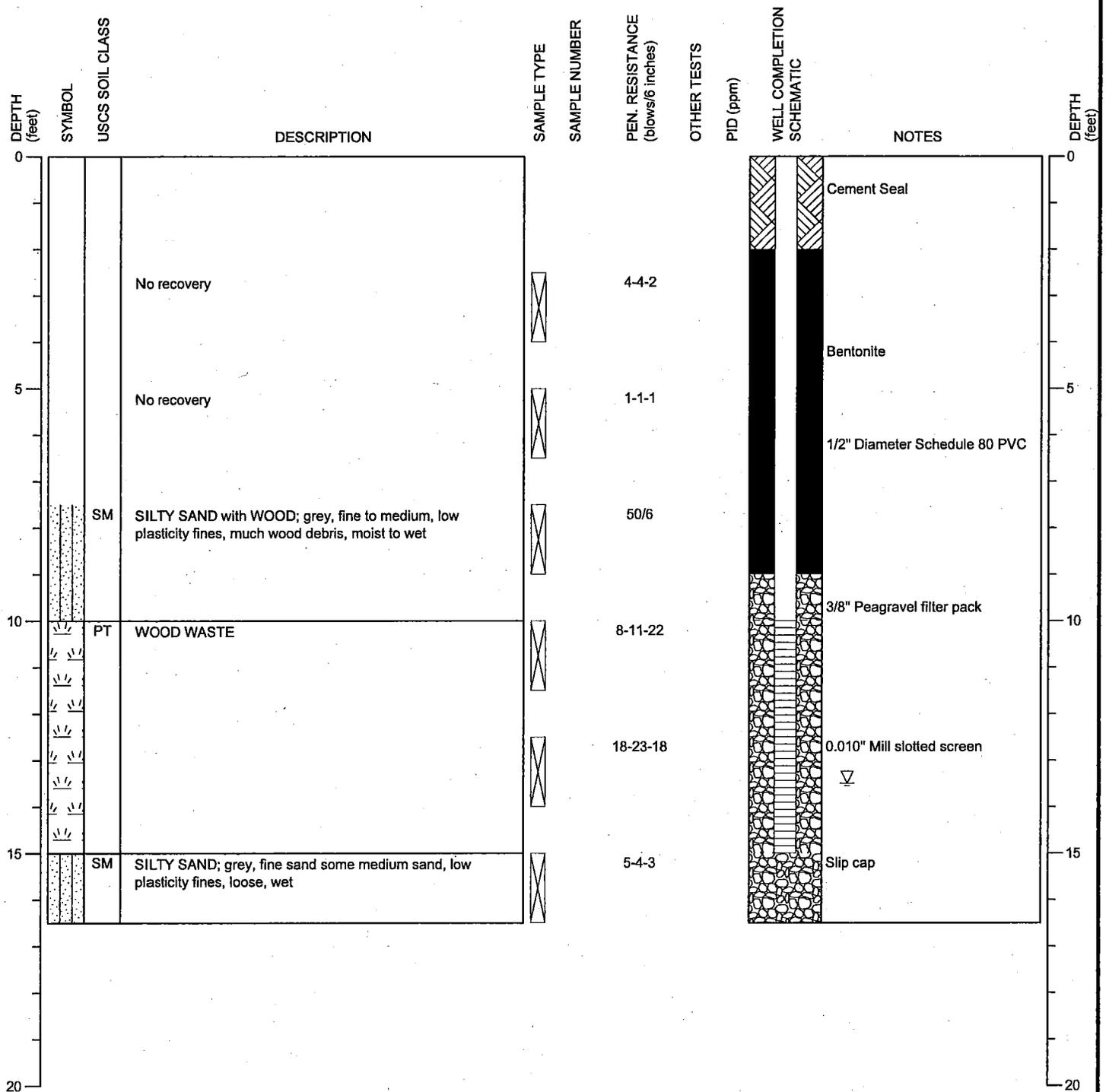
FIGURE:

B-34

DRILLING COMPANY: Cascade Drilling, Inc.  
 DRILLING METHOD: HSA, 8.25" O.D., Track rig  
 SAMPLING METHOD: SPT on winch line  
 LOCATION: Everett, Washington

SURFACE ELEVATION: ± feet

DATE STARTED: 4/27/2001  
 DATE COMPLETED: 4/27/2001  
 LOGGED BY: S. Zorn



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.

Landfill Gas Probe:  
 LFG-46

PAGE: 1 of 1



EVERETT LANDFILL  
 EVERETT, WASHINGTON

PROJECT NO.: 98165

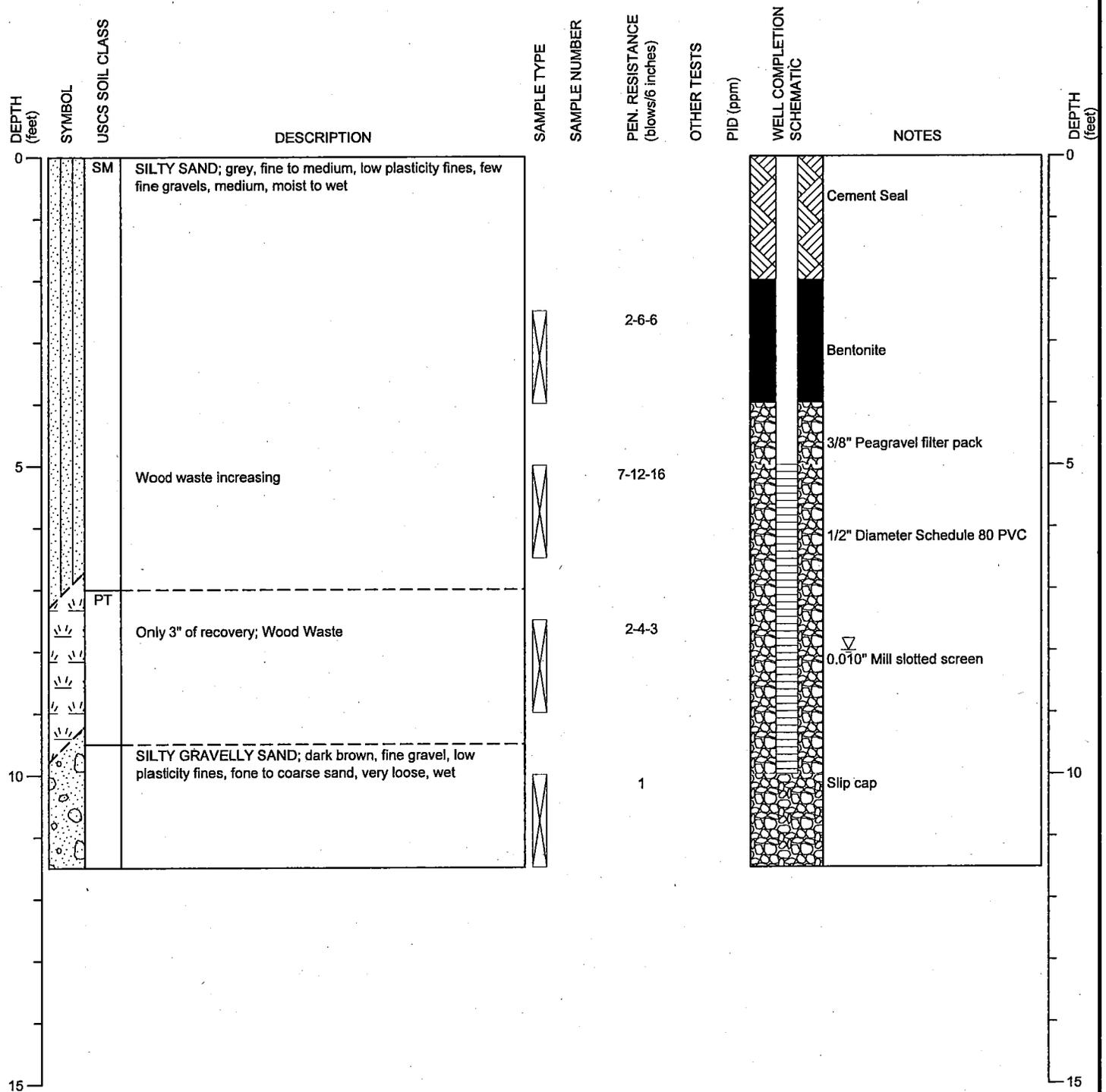
FIGURE:

B-35

DRILLING COMPANY: Cascade Drilling, Inc.  
 DRILLING METHOD: HSA, 8.25" O.D., Track rig  
 SAMPLING METHOD: SPT on winch line  
 LOCATION: Everett, Washington

SURFACE ELEVATION: ± feet

DATE STARTED: 4/27/2001  
 DATE COMPLETED: 4/27/2001  
 LOGGED BY: S. Zorn



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.



EVERETT LANDFILL  
 EVERETT, WASHINGTON

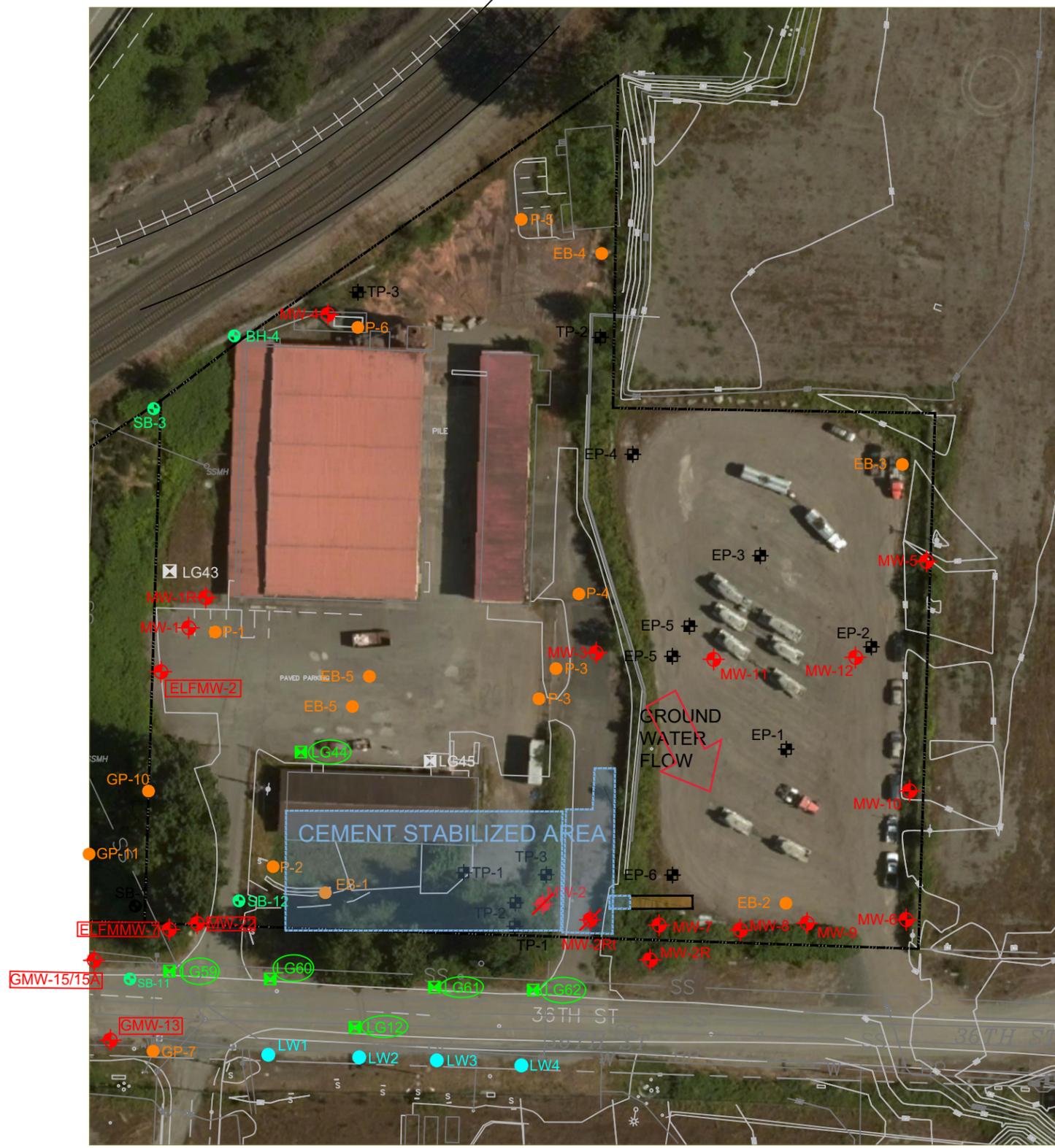
Landfill Gas Probe:  
 LFG-47

PAGE: 1 of 1

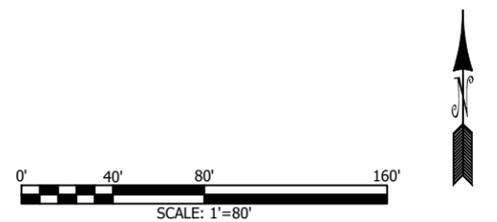
PROJECT NO.: 98165

FIGURE:

B-36



- LEGEND**
- Property Boundary
  - Direct push borings
  - Monitoring well
  - Test pit
  - Gas probe
  - Soil Boring
  - Decommissioned well
  - City of Everett well
  - CEMENT STABILIZED AREA
  - IN SITU FIXATION TRENCH



Diversified Industries  
Everett, Washington

**SITE AND  
EXPLORATION  
PLAN**

DRAWN BY <u>EFK</u>	FIGURE NO. <b>2</b>
CHECK BY <u>AS/NN</u>	PROJECT NO.
DATE 03.28.16	2013-052-22

## LOG OF EXPLORATION PIT NO. EP-1

Depth (ft)	<p>This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.</p>
	<b>DESCRIPTION</b>
1	<b>Fill</b>
2	Loose, wet, dark brown and gray, silty SAND, with gravel, frequent asphalt and wood debris.
3	
4	Loose, moist, dark brown, SAND, with silt, some gravel, organic debris, and glass scattered asphalt and concrete debris.
5	
6	Grades to few silt.
7	
8	
9	
10	
11	Bottom of exploration pit at 10 feet. Slight seepage at 6 feet. No caving.
12	
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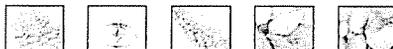
### Shadow Development Everett, WA

Associated Earth Sciences, Inc.

Project No. EV100334A

Logged by: EG

Approved by:



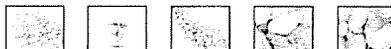
2/25/11

# LOG OF EXPLORATION PIT NO. EP-2

Depth (ft)	DESCRIPTION
1	<b>Till Fill</b> Medium dense, moist, gray, gravelly silty SAND.
2	----- <b>Fill</b>
3	Loose, moist, dark brown, medium SAND, with gravel, some silt, frequent organics, glass, and wood debris.
4	
5	
6	----- <b>Fill</b>
7	Loose, saturated, gray, medium SAND, some gravel, few silt.
8	
9	
10	
11	Bottom of exploration pit at 10 feet. Ground water at 6 feet. Massive caving below 6 feet.
12	
13	
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## Shadow Development Everett, WA

Associated Earth Sciences, Inc.



Logged by: EG

Approved by:

Project No. EV100334A

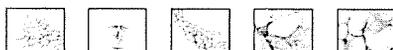
2/25/11

## LOG OF EXPLORATION PIT NO. EP-3

Depth (ft)	DESCRIPTION
	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.
	<b>Fill</b>
1	Loose, moist, gray, gravelly silty SAND, with 2-inch quarry spalls, organic debris, and scattered concrete.
2	
3	Grades to dark brown, medium SAND, with gravel, some silt, organic and wood debris, scattered concrete and brick fragments observed.
4	
5	
6	
7	
8	
9	
10	Bottom of exploration pit at 9 feet. Slight seepage at 3 feet.
11	
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### Shadow Development Everett, WA

Associated Earth Sciences, Inc.



Logged by: EG

Approved by:

Project No. EV100334A

2/25/11

## LOG OF EXPLORATION PIT NO. EP-4

Depth (ft)	DESCRIPTION
	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.
	<b>Fill</b>
1	Medium dense, moist, gray, gravelly SAND, few silt.
2	Slight odor noted. Sample obtained for testing.
3	
4	
5	
6	Grades to loose, moist, brown, medium SAND, some silt and gravel, with scattered wood and organic debris.
7	
8	
9	
10	Bottom of exploration pit at 9 feet. No seepage. No caving.
11	
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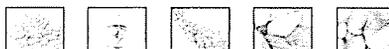
### Shadow Development Everett, WA

Associated Earth Sciences, Inc.

Project No. EV100334A

Logged by: EG

Approved by:



2/25/11

## LOG OF EXPLORATION PIT NO. EP-5

Depth (ft)	<p>This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.</p> <p><b>DESCRIPTION</b></p>
1	<b>Fill</b>
2	Medium dense, moist, gray, gravelly SAND, few silt (slight odor, sample obtained for lab testing).
3	
4	
5	Grades to dark brown, medium SAND, with silt, some gravel, organic debris, and construction debris (concrete, discarded wires).
6	
7	
8	
9	
10	
11	Bottom of exploration pit at 10 feet. Slight seepage at 4 feet. No caving.
12	
13	
14	
15	
16	
17	
18	
19	
20	

KCTP3 100334A.GPJ March 3, 2011

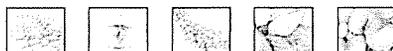
### Shadow Development Everett, WA

Associated Earth Sciences, Inc.

Project No. EV100334A

Logged by: EG

Approved by:



2/25/11

## LOG OF EXPLORATION PIT NO. EP-6

Depth (ft)	<p style="font-size: small;">This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.</p> <p style="margin: 0;"><b>DESCRIPTION</b></p>
1	<b>Fill</b>
2	<p>Loose, moist, brown, medium SAND, few gravel, trace to few silt, scattered organics.</p>
3	
4	
5	
6	
7	
8	<p>Grades to medium dense, moist, dark brown, gravelly SAND, with silt, glass, scattered organics, and woody debris.</p>
9	<p>Bottom of exploration pit at 10 feet. No water. Caving between 3 to 6 feet.</p>
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	

KCTP3 100334A.GPJ March 3, 2011

### Shadow Development Everett, WA

Associated Earth Sciences, Inc.

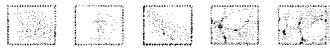


Logged by: EG

Approved by:

Project No. EV100334A

2/25/11



Project Number  
EV100334A

Exploration Number  
EB-1

Sheet  
1 of 1

Project Name Shadow Development Phase II  
 Location Everett, Washington  
 Driller/Equipment ESN  
 Hammer Weight/Drop 140# / 30"

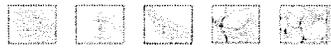
Ground Surface Elevation (ft) \_\_\_\_\_  
 Datum N/A  
 Date Start/Finish 2/24/11, 2/24/11  
 Hole Diameter (in) \_\_\_\_\_

Depth (ft)	S T	Samples	PID	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot				Other Tests
								10	20	30	40	
			0	Landfill Fill 2" crushed rock over, loose, damp, brown to black, silty fine SAND, trace gravel								
5			0									
10			0	Loose, wet to saturated dark brown to black, silty fine SAND and SANDY SILT, some glass, porcelain, and weathered brick pieces.		▼						
15			0	Loose, saturated, black, fine to coarse SAND, grades to SANDY SILT, trace gravel, wood, wire, porcelain debris								
20			0	Same as above, increased glass pieces.								
20				Bottom of exploration boring at 20 feet								
25												
30												
35												

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- ▼ Water Level ( )
- ▼ Water Level at time of drilling (ATD)

Logged by: MSA  
 Approved by: JNS



Project Number  
EV100334A

Exploration Number  
EB-2

Sheet  
1 of 1

Project Name Shadow Development Phase II  
 Location Everett, Washington  
 Driller/Equipment ESN  
 Hammer Weight/Drop 140# / 30"

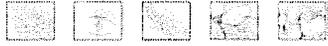
Ground Surface Elevation (ft) \_\_\_\_\_  
 Datum N/A  
 Date Start/Finish 2/24/11, 2/24/11  
 Hole Diameter (in) \_\_\_\_\_

Depth (ft)	S T	Samples	PID	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot				Other Tests
								10	20	30	40	
			0	Landfill Fill 2" crushed rock over loose, damp, dark grey, silty fine SAND, some gravel								
5			0	Driller noted obstruction at 5 feet, concrete? Soft, damp to moist, dark brown to black, fine SANDY SILT, some gravel grades to loose, light grey, fine to medium SAND		▼						
10			0	Same as above, grades to loose, moist dark grey to black, SANDY SILT, some gravel and wood debris, trace brick debris								
15			0	Loose, moist, salt/pepper, fine to medium SAND, grades to wood debris (large wood piece)								
20			0	Soft, wet, dark brown to black, organic SILT and SAND, with glass and porcelain debris, PEAT in last 6 inches								
				Bottom of exploration boring at 20 feet								
25												
30												
35												

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- ▼ Water Level ( )
- ▼ Water Level at time of drilling (ATD)

Logged by: MSA  
 Approved by: JNS



Project Number  
EV100334A

Exploration Number  
EB-3

Sheet  
1 of 1

Project Name Shadow Development Phase II  
 Location Everett, Washington  
 Driller/Equipment ESN  
 Hammer Weight/Drop 140# / 30"

Ground Surface Elevation (ft) \_\_\_\_\_  
 Datum N/A  
 Date Start/Finish 2/24/11, 2/24/11  
 Hole Diameter (in) \_\_\_\_\_

Depth (ft)	S T	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6'	Blows/Foot				Other Tests
								10	20	30	40	
5				<b>Landfill Fill</b> Medium dense, moist to wet, grey, silty fine to medium SAND, 2 inch organic bed and wet at 4 feet								
				8.1								
				6.3								
10				6.4								
				<b>Landfill Fill/Native?</b>								
				9.7								
15				1.0								
				6.3								
20				Bottom of exploration boring at 19 feet								
25												
30												
35												

**Sampler Type (ST):**

- 2" OD Split Spoon Sampler (SPT)       No Recovery      M - Moisture
- 3" OD Split Spoon Sampler (D & M)       Ring Sample      ▽ Water Level ( )
- Grab Sample       Shelby Tube Sample      ▽ Water Level at time of drilling (ATD)

Logged by: JNS  
 Approved by: JNS

# Exploration Log



Project Number  
EV100334A

Exploration Number  
EB-4

Sheet  
1 of 1

Project Name Shadow Development Phase II  
 Location Everett, Washington  
 Driller/Equipment ESN  
 Hammer Weight/Drop 140# / 30"

Ground Surface Elevation (ft) \_\_\_\_\_  
 Datum N/A  
 Date Start/Finish 2/24/11, 2/24/11  
 Hole Diameter (in) \_\_\_\_\_

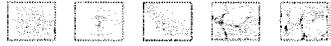
Depth (ft)	S T	Samples	PID	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot				Other Tests
								10	20	30	40	
				<b>Landfill Fill</b>								
			9.2	Crushed rock.								
				Medium dense, silty fine to medium SAND, with PEAT/organic interbeds								
5			5.4									
			7.3	Medium dense, saturated, grey, silty fine to medium SAND, with scattered organics and peat.								
			6.3									
10			7.2	Soft, saturated, dark brown, fine SAND, with organics and dark brown, organic SILT.								
				SILT, with wood chips.								
			7.2									
15				Medium dense, saturated, grey, silty, gravelly SAND, with scattered organics, mottled silty fine SAND.								
			7.4	Saturated, grey, silty fine SAND								
20				Bottom of exploration boring at 20 feet								
25												
30												
35												

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample
- M - Moisture
- ∇ Water Level ( )
- ∇ Water Level at time of drilling (ATD)

Logged by: JNS  
 Approved by: JNS

# Exploration Log



Project Number  
EV100334A

Exploration Number  
EB-5

Sheet  
1 of 1

Project Name	<u>Shadow Development Phase II</u>	Ground Surface Elevation (ft)	_____
Location	<u>Everett, Washington</u>	Datum	<u>N/A</u>
Driller/Equipment	<u>ESN</u>	Date Start/Finish	<u>2/24/11, 2/24/11</u>
Hammer Weight/Drop	<u>140# / 30"</u>	Hole Diameter (in)	_____

Depth (ft)	S T	Samples	PID	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot				Other Tests	
								10	20	30	40		
			5.5	Crushed rock. Loose to medium, grey, fine to medium SAND.									
5			8.5										
			3.3	Dark brown, organic rich SAND, with gravel, wood Grey, fine to medium SAND, some silt and dark brown, fine SAND and organic SILT, peat and wood pieces.									
10			4.5	Grey, fine to medium SAND, some porcelain fragments.									
			1.5	Dark brown, organic SILT, wood fragments.									
				Grey, fine to medium SAND, scattered gravel.									
15			10.1	Dark brown, organic SILT, wood fragments.									
			8.3	Same as above.									
			9.7										
20			10.8	Soft, olive green, SILTY SAND. Bottom of exploration boring at 20 feet									
25													
30													
35													

Sampler Type (ST):

- |  |  |  |
|--|--|--|
| <input type="checkbox"/> 2" OD Split Spoon Sampler (SPT)   | <input type="checkbox"/> No Recovery                   | M - Moisture   |
| <input type="checkbox"/> 3" OD Split Spoon Sampler (D & M) | <input type="checkbox"/> Ring Sample                   | <input type="checkbox"/> Water Level ( )                       |
| <input checked="" type="checkbox"/> Grab Sample            | <input checked="" type="checkbox"/> Shelby Tube Sample | <input type="checkbox"/> Water Level at time of drilling (ATD) |

Logged by: JNS  
Approved by: JNS



Project Number  
EV100334B

Well Number  
MW-1

Sheet  
1 of 1

Project Name Diversified industries  
 Elevation (Top of Well Casing) \_\_\_\_\_  
 Water Level Elevation \_\_\_\_\_  
 Drilling/Equipment EDI / HSA  
 Hammer Weight/Drop 140# / 30"

Location Everett, WA  
 Surface Elevation (ft) \_\_\_\_\_  
 Date Start/Finish 4/3/12, 4/3/12  
 Hole Diameter (in) \_\_\_\_\_

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Flush mount monument				
		Bentonite seal 1 to 13 feet		2 2 2		Loose, wet, gray, fine to medium SAND (SW). (VSS, 0 ppm)
5		2-inch I.D. PVC blank: 0 to 10 feet				
		10/20 sand 7 to 20 feet		0 1 1		Very loose, wet, gray, fine to medium SAND, with silt, peat (SW). (NS, 0 ppm)
10				7 9 16		Medium dense, wet, gray, silty SAND (SM). (NS, 0 ppm)
15		2-inch I.D. PVC well screen: 0.010-inch slot width, 10 to 20 feet		14 21 28		Dense, wet, gray, fine to coarse SAND, with gravel (SW). (NS, 0 ppm)
20						Boring terminated at 20 feet. Well completed at 20 feet on 4/3/12. Flowing artesian 0.20 ft above top of casing.
25						
30						
35						

NWELL-B 100334B.GPJ BORING.GDT 11/1/12

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

- M - Moisture
- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: DJB

Approved by:

# Geologic & Monitoring Well Construction Log



Project Number  
EV100334B

Well Number  
MW-2

Sheet  
1 of 1

Project Name Diversified industries  
 Elevation (Top of Well Casing) \_\_\_\_\_  
 Water Level Elevation \_\_\_\_\_  
 Drilling/Equipment EDI / HSA  
 Hammer Weight/Drop 140# / 30"

Location Everett, WA  
 Surface Elevation (ft) \_\_\_\_\_  
 Date Start/Finish 4/3/12, 4/3/12  
 Hole Diameter (in) \_\_\_\_\_

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Flush mount monument				
		Bentonite seal 1 to 13 feet		8 4 2		Loose, moist, gray, fine to coarse GRAVEL (GP). (VSS, 0 ppm)
5		2-inch I.D. PVC blank: 0 to 10 feet				
		10/20 sand 7 to 20 feet		1 2 4		Loose, moist, brown, fine SAND (SP). (NS, 0 ppm)
10						
				0 1 2		Loose, wet, black, SAND, with gravel, and silt (SW); contains refuse, porcelain pieces. (NS, 0 ppm)
15						
		2-inch I.D. PVC well screen: 0.010-inch slot width, 10 to 20 feet		2 1 2		Loose, wet, black, fine to coarse SAND, with silt (SW); contains refuse, wire, and porcelain pieces. (NS, 0 ppm)
20						Boring terminated at 20 feet. Well completed at 20 feet on 4/3/12. Ground water encountered at approximately 10 feet during drilling.
25						
30						
35						

NWELL-B-100334B.GPJ BORING.GDT 11/1/12

**Sampler Type (ST):**

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

- M - Moisture
- Water Level (9.05 on 4/12/12)
- Water Level at time of drilling (ATD)

**Logged by:** DJB  
**Approved by:**



Project Number  
EV100334B

Well Number  
MW-3

Sheet  
1 of 1

Project Name Diversified industries

Location Everett, WA

Elevation (Top of Well Casing) \_\_\_\_\_

Surface Elevation (ft) \_\_\_\_\_

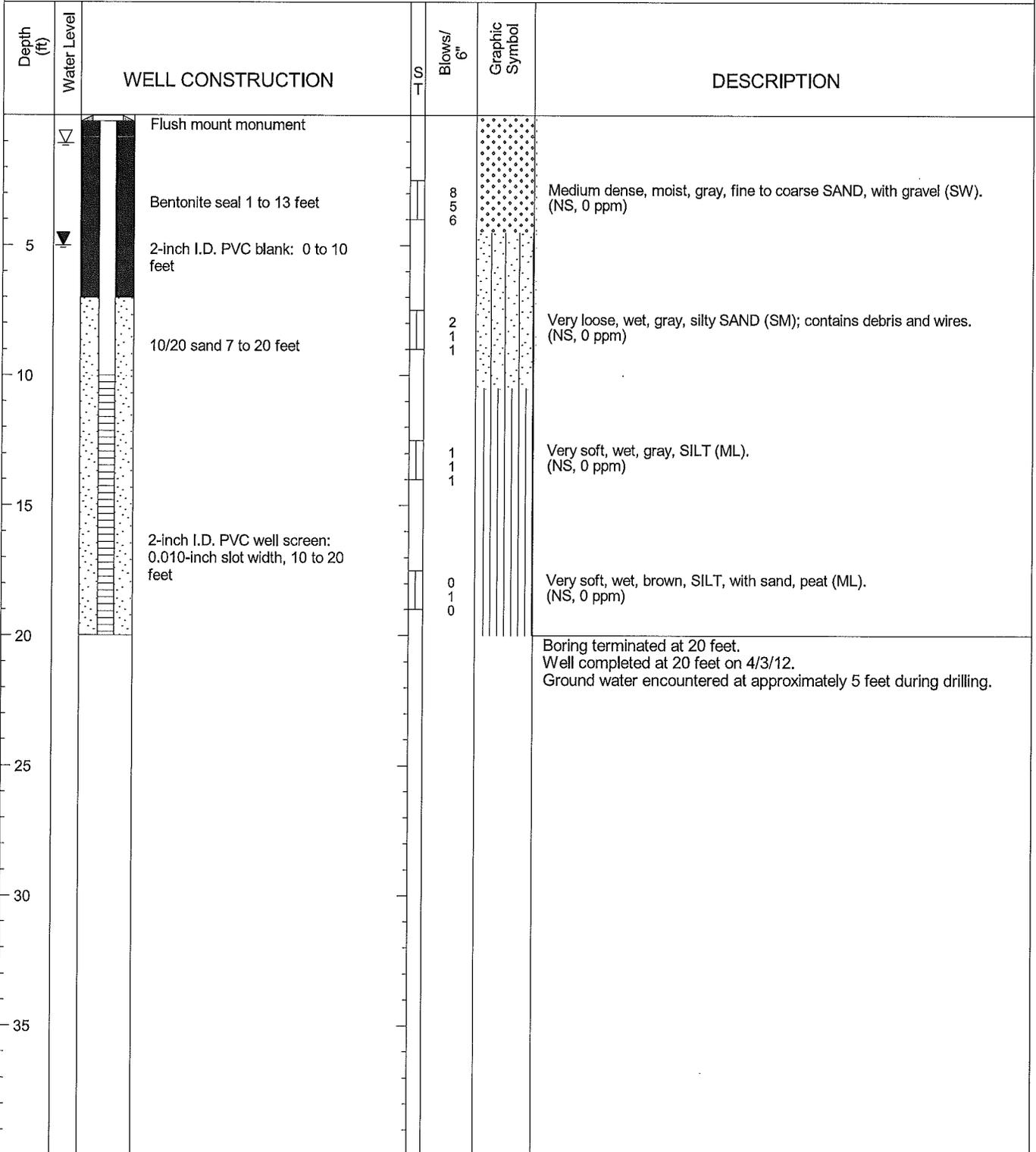
Water Level Elevation \_\_\_\_\_

Date Start/Finish 4/3/12, 4/3/12

Drilling/Equipment EDI / HSA

Hole Diameter (in) \_\_\_\_\_

Hammer Weight/Drop 140# / 30"



NWELL-B 100334B.GPJ BORING.GDT 11/1/12

Sampler Type (ST):



2" OD Split Spoon Sampler (SPT)



No Recovery

M - Moisture

Logged by: DJB



3" OD Split Spoon Sampler (D & M)



Ring Sample

▽ Water Level (1.07 on 4/12/12)

Approved by:



Grab Sample



Shelby Tube Sample

▼ Water Level at time of drilling (ATD)



Project Number  
EV100334B

Well Number  
MW-4

Sheet  
1 of 1

Project Name Diversified industries  
 Elevation (Top of Well Casing) \_\_\_\_\_  
 Water Level Elevation \_\_\_\_\_  
 Drilling/Equipment EDI / HSA  
 Hammer Weight/Drop 140# / 30"

Location Everett, WA  
 Surface Elevation (ft) \_\_\_\_\_  
 Date Start/Finish 4/2/12, 4/2/12  
 Hole Diameter (in) \_\_\_\_\_

Depth (ft)	Water Level	WELL CONSTRUCTION	S T	Blows/ 6"	Graphic Symbol	DESCRIPTION
		Flush mount monument				
		Bentonite seal 1 to 13 feet		3 3 4		Loose, moist, gray, SILT, with sand, and gravel, wood (ML). (NS, 0 ppm)
5		2-inch I.D. PVC blank: 0 to 10 feet				
		10/20 sand 7 to 20 feet		0 2 2		Very loose, wet, sawdust, WOOD. (NS, 0 ppm)
10						
		2-inch I.D. PVC well screen: 0.010-inch slot width, 10 to 20 feet		0 1 2		Soft, wet, brown, SILT, with wood, and gravel (ML). (NS, 0 ppm)
15						
				7 8 10		Very stiff, wet, brown, SILT / CLAY (ML). (NS, 0 ppm)
20						Boring terminated at 20 feet. Well completed at 20 feet on 4/2/12. Ground water encountered at approximately 7.5 feet during drilling.
25						
30						
35						

NWELL-B 100334B.GPJ BORING.GDT 11/1/12

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

- M - Moisture
- Water Level (2.11 on 4/12/12)
- Water Level at time of drilling (ATD)

Logged by: DJB

Approved by:

# Geologic & Monitoring Well Construction Log



Project Number  
EV100334B

Well Number  
MW-5

Sheet  
1 of 1

Project Name Diversified industries

Location Everett, WA

Elevation (Top of Well Casing) \_\_\_\_\_

Surface Elevation (ft) \_\_\_\_\_

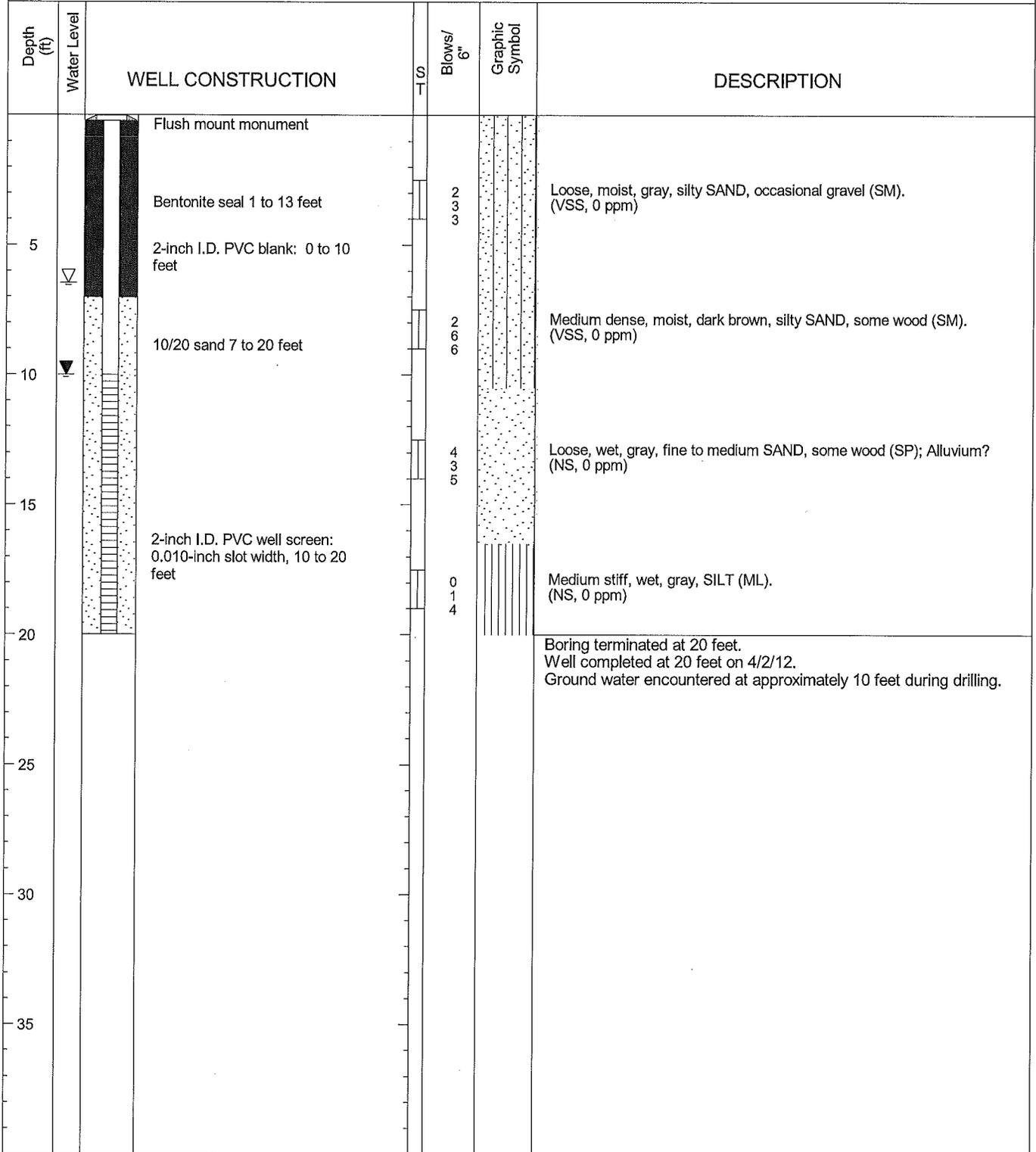
Water Level Elevation \_\_\_\_\_

Date Start/Finish 4/2/12, 4/2/12

Drilling/Equipment EDI / HSA

Hole Diameter (in) \_\_\_\_\_

Hammer Weight/Drop 140# / 30"



NWWell-B\_100334B.GPJ BORING.GDT 11/1/12

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture

Water Level (6.46 on 4/12/12)

Water Level at time of drilling (ATD)

Logged by: DJB

Approved by:



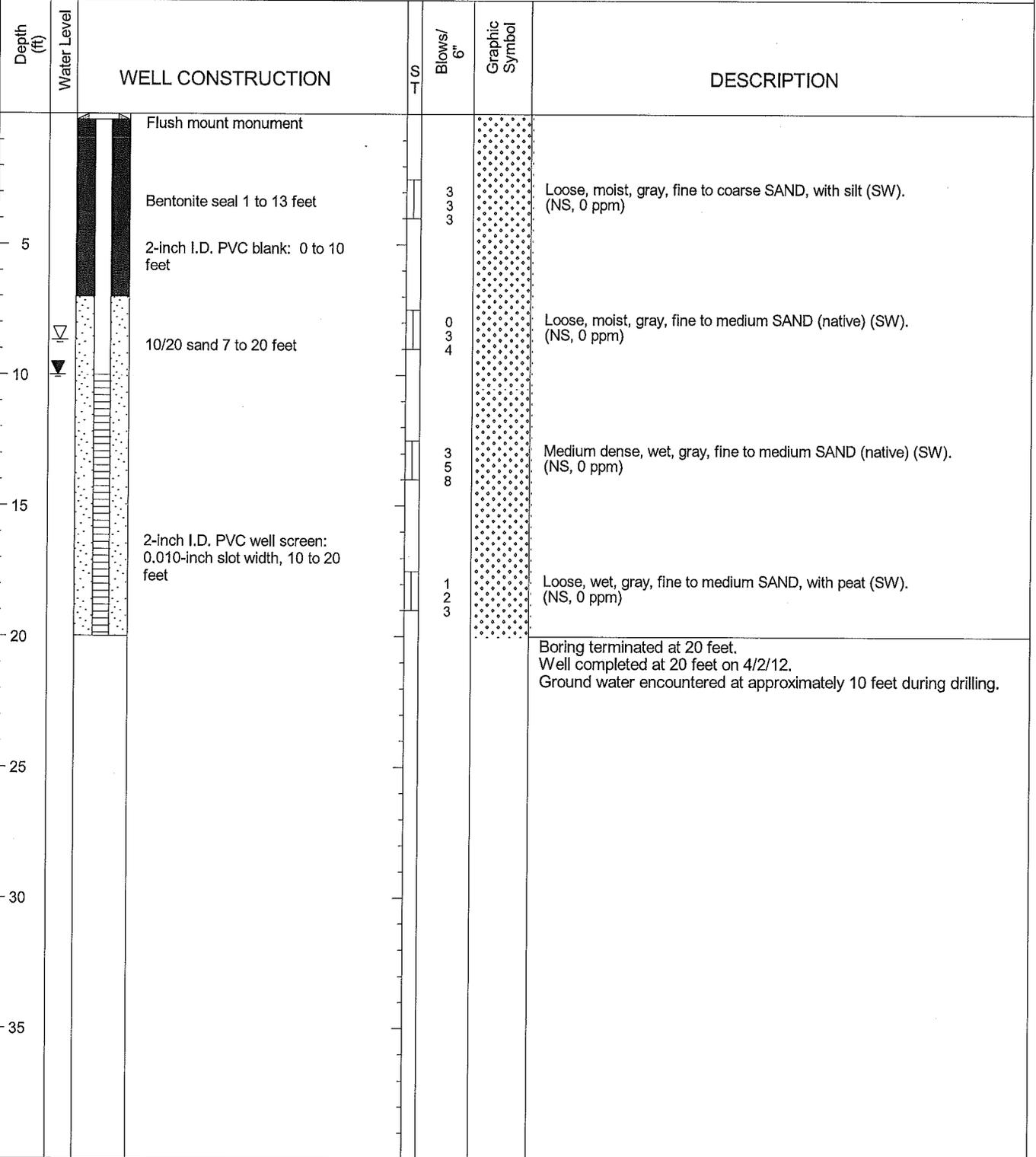
Project Number  
EV100334B

Well Number  
MW-6

Sheet  
1 of 1

Project Name Diversified industries  
 Elevation (Top of Well Casing) \_\_\_\_\_  
 Water Level Elevation \_\_\_\_\_  
 Drilling/Equipment EDI / HSA  
 Hammer Weight/Drop 140# / 30"

Location Everett, WA  
 Surface Elevation (ft) \_\_\_\_\_  
 Date Start/Finish 4/2/12, 4/2/12  
 Hole Diameter (in) \_\_\_\_\_



NWELL-B 100334B.GPJ BORING.GDT 11/1/12

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

- M - Moisture
- Water Level (8.67 on 4/12/12)
- Water Level at time of drilling (ATD)

Logged by: DJB

Approved by:

## RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N-VALUE

COHESIONLESS SOILS			COHESIVE SOILS		
Density	N (blows/ft)	Approximate Relative Density(%)	Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)
Very Loose	0 to 4	0 - 15	Very Soft	0 to 2	<250
Loose	4 to 10	15 - 35	Soft	2 to 4	250 - 500
Medium Dense	10 to 30	35 - 65	Medium Stiff	4 to 8	500 - 1000
Dense	30 to 50	65 - 85	Stiff	8 to 15	1000 - 2000
Very Dense	over 50	85 - 100	Very Stiff Hard	15 to 30 over 30	2000 - 4000 >4000

## TEST SYMBOLS

%F	Percent Fines
AL	Atterberg Limits: PL = Plastic Limit LL = Liquid Limit
CBR	California Bearing Ratio
CN	Consolidation
DD	Dry Density (pcf)
DS	Direct Shear
GS	Grain Size Distribution
K	Permeability
MD	Moisture/Density Relationship (Proctor)
MR	Resilient Modulus
PID	Photoionization Device Reading
PP	Pocket Penetrometer Approx. Compressive Strength (tsf)
SG	Specific Gravity
TC	Triaxial Compression
TV	Torvane Approx. Shear Strength (tsf)
UC	Unconfined Compression

## USCS SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP DESCRIPTIONS		
Coarse Grained Soils	Gravel and Gravelly Soils	Clean Gravel (little or no fines)		GW Well-graded GRAVEL	
		Gravel with Fines (appreciable amount of fines)		GP Poorly-graded GRAVEL	
	More than 50% Retained on No. 4 Sieve	Sand and Sandy Soils	Clean Sand (little or no fines)		SW Well-graded SAND
			Sand with Fines (appreciable amount of fines)		SP Poorly-graded SAND
Fine Grained Soils	Silt and Clay	Liquid Limit Less than 50%		ML SILT	
		Liquid Limit 50% or More		CL Lean CLAY	
		Liquid Limit 50% or More		OH Organic SILT/Organic CLAY	
	50% or More Passing No. 200 Sieve Size	Silt and Clay	Liquid Limit Less than 50%		MH Elastic SILT
			Liquid Limit 50% or More		CH Fat CLAY
			Liquid Limit 50% or More		PT PEAT
Highly Organic Soils				PT PEAT	

## SAMPLE TYPE SYMBOLS

	2.0" OD Split Spoon (SPT) (140 lb. hammer with 30 in. drop)
	Shelby Tube
	3-1/4" OD Split Spoon with Brass Rings
	Small Bag Sample
	Large Bag (Bulk) Sample
	Core Run
	Non-standard Penetration Test (3.0" OD split spoon)

## GROUNDWATER SYMBOLS

	Groundwater Level (measured at time of drilling)
	Groundwater Level (measured in well or open hole after water level stabilized)

## COMPONENT DEFINITIONS

COMPONENT	SIZE RANGE
Boulders	Larger than 12 in
Cobbles	3 in to 12 in
Gravel	3 in to No 4 (4.5mm)
Coarse gravel	3 in to 3/4 in
Fine gravel	3/4 in to No 4 (4.5mm)
Sand	No. 4 (4.5 mm) to No. 200 (0.074 mm)
Coarse sand	No. 4 (4.5 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074mm)

## COMPONENT PROPORTIONS

PROPORTION RANGE	DESCRIPTIVE TERMS
< 5%	Clean
5 - 12%	Slightly (Clayey, Silty, Sandy)
12 - 30%	Clayey, Silty, Sandy, Gravelly
30 - 50%	Very (Clayey, Silty, Sandy, Gravelly)
Components are arranged in order of increasing quantities.	

NOTES: Soil classifications presented on exploration logs are based on visual and laboratory observation. Soil descriptions are presented in the following general order:

*Density/consistency, color, modifier (if any) GROUP NAME, additions to group name (if any), moisture content. Proportion, gradation, and angularity of constituents, additional comments.*  
(GEOLOGIC INTERPRETATION)

Please refer to the discussion in the report text as well as the exploration logs for a more complete description of subsurface conditions.

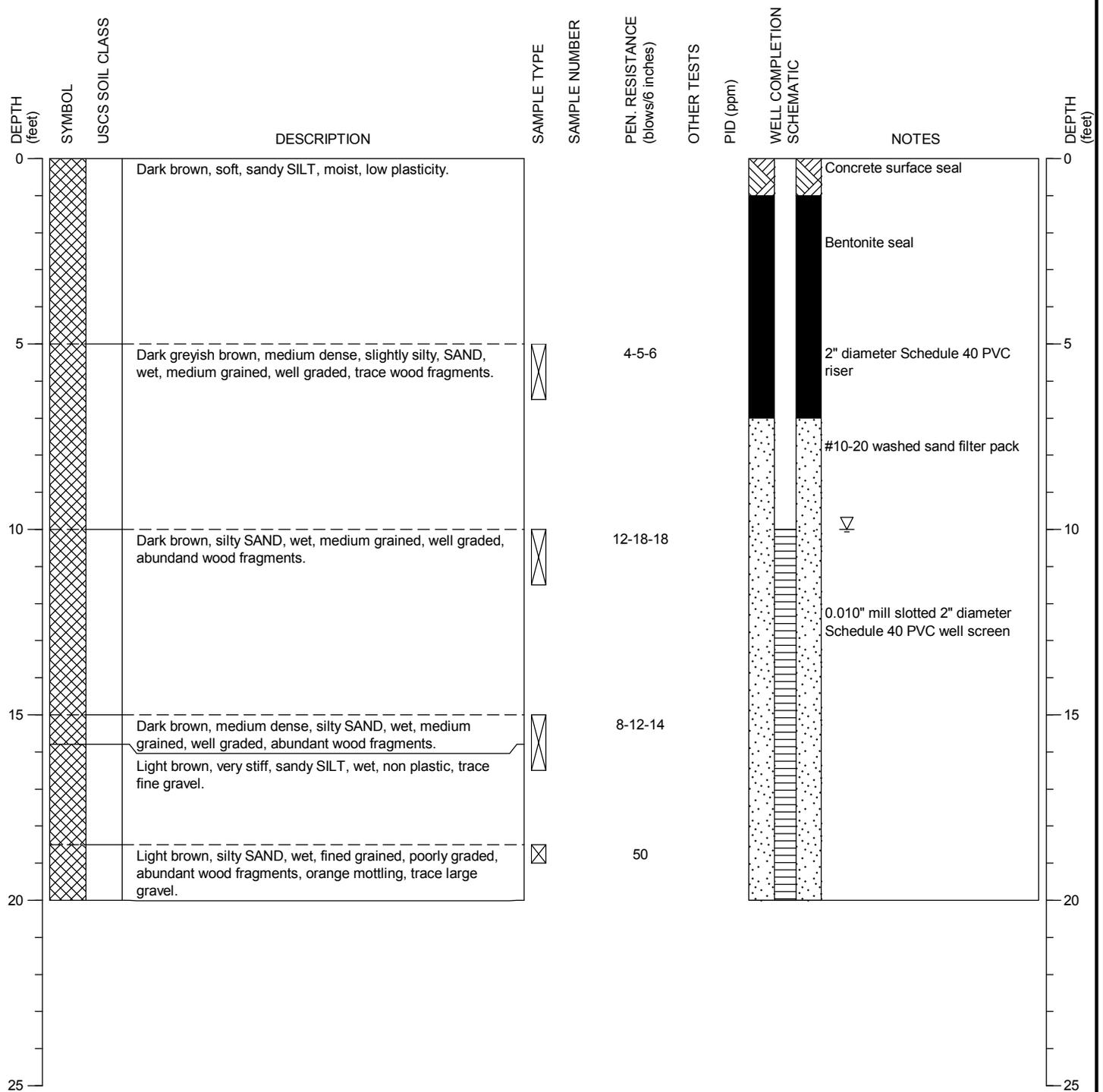
## MOISTURE CONTENT

DRY	Absence of moisture, dusty, dry to the touch.
MOIST	Damp but no visible water.
WET	Visible free water, usually soil is below water table.

DRILLING COMPANY: Environmental Drilling Inc.  
 DRILLING METHOD: HSA  
 SAMPLING METHOD: SPT - 18 Inches  
 LOCATION: See Figure 2

SURFACE ELEVATION: ± feet  
 CASING ELEVATION: ± feet

DATE STARTED: 2/10/2016  
 DATE COMPLETED: 2/10/2016  
 LOGGED BY: A. York



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.



Diversified Industries  
 Everett, Washington

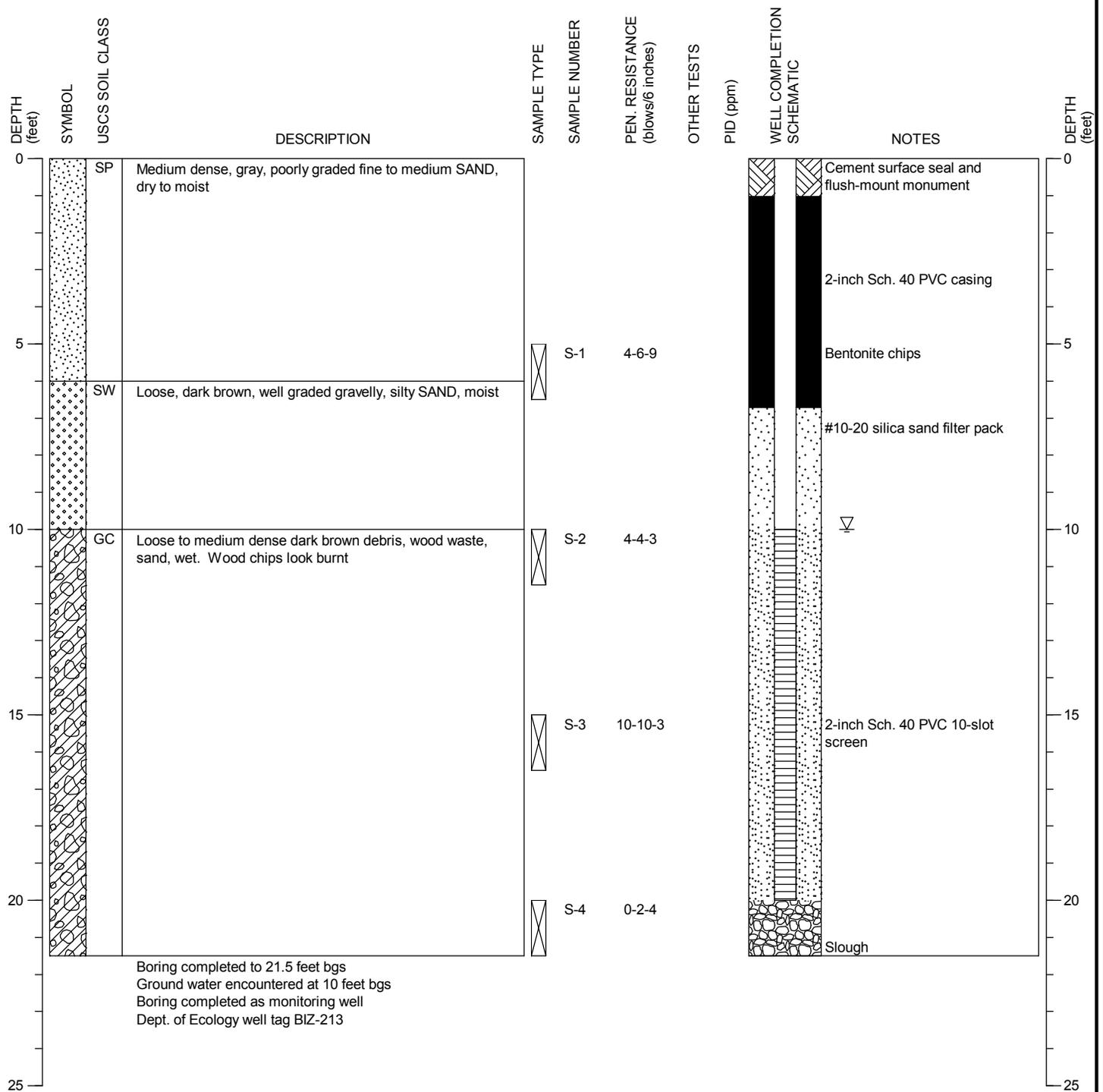
MONITORING WELL:  
 MW-1R

PAGE: 1 of 1

DRILLING COMPANY: Environmental Drilling Inc.  
 DRILLING METHOD: HSA  
 SAMPLING METHOD: SPT - 18 Inches  
 LOCATION: See Figure 2

SURFACE ELEVATION: ± feet  
 CASING ELEVATION: ± feet

DATE STARTED: 9/1/2015  
 DATE COMPLETED: 9/1/2015  
 LOGGED BY: A. Sugar



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.



Diversified Industries  
 Everett, Washington

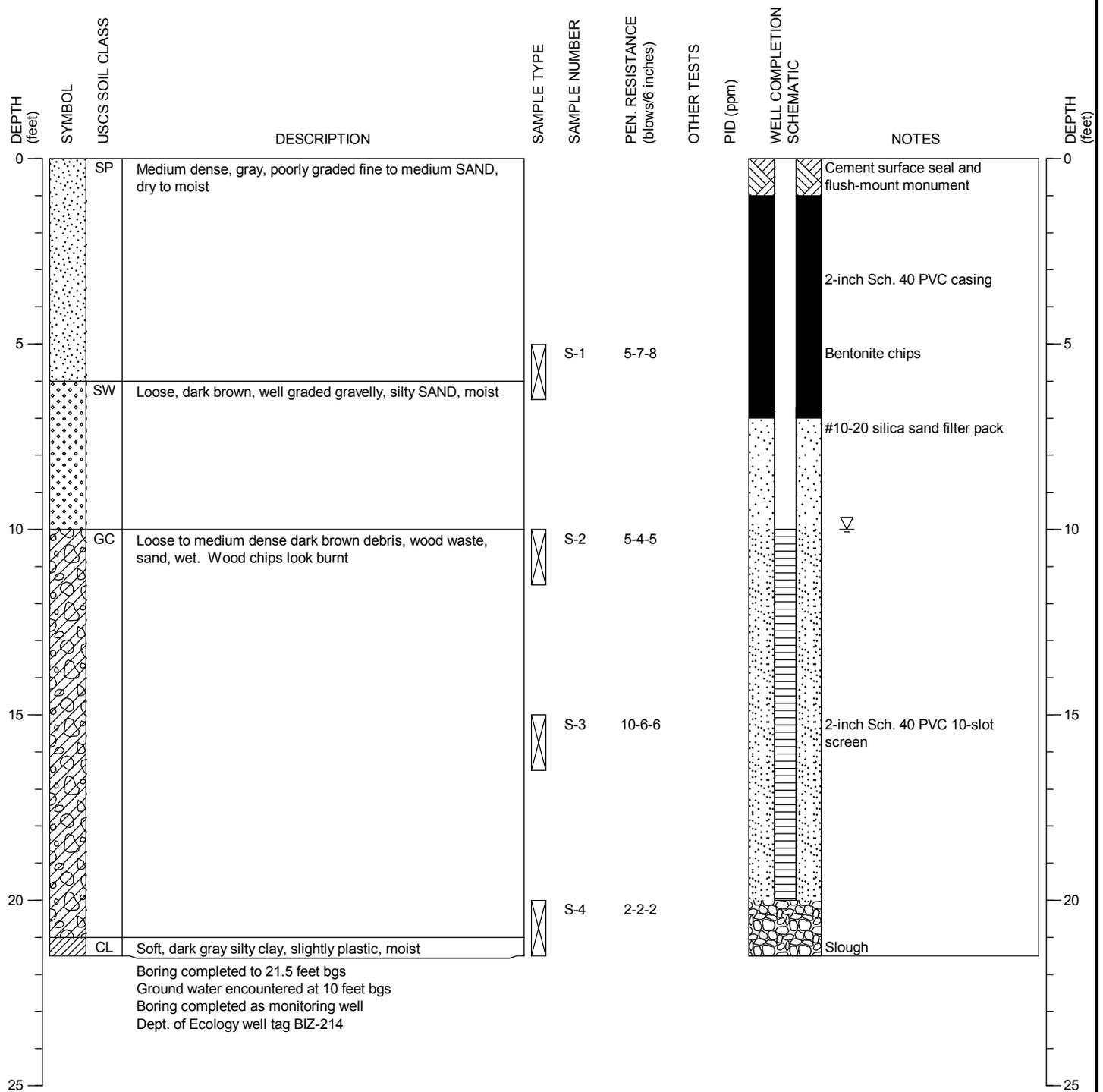
MONITORING WELL:  
 MW-7

PAGE: 1 of 1

DRILLING COMPANY: Environmental Drilling Inc.  
 DRILLING METHOD: HSA  
 SAMPLING METHOD: SPT - 18 Inches  
 LOCATION: See Figure 2

SURFACE ELEVATION: ± feet  
 CASING ELEVATION: ± feet

DATE STARTED: 9/1/2015  
 DATE COMPLETED: 9/1/2015  
 LOGGED BY: N. Nielsen



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.



Diversified Industries  
 Everett, Washington

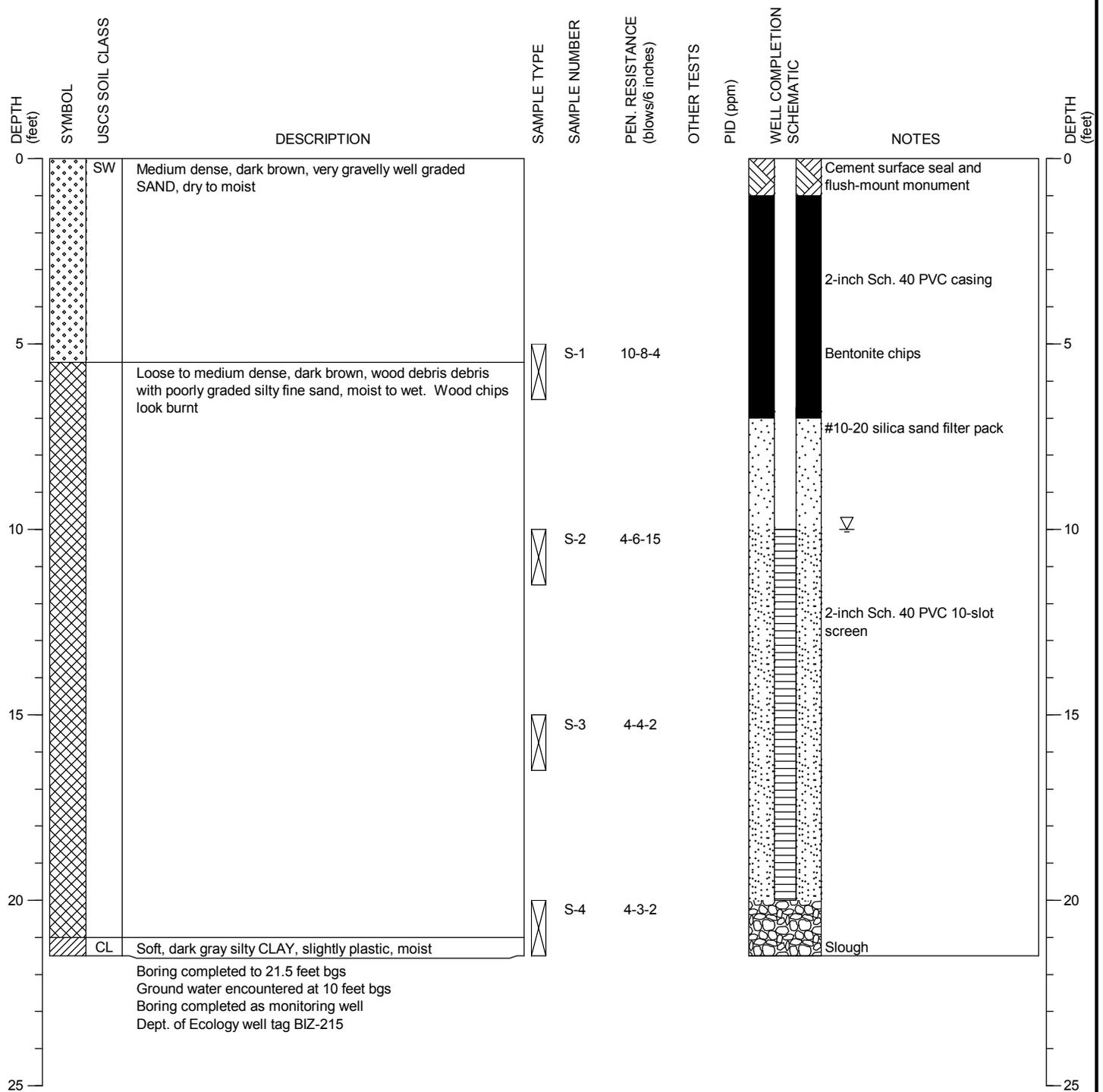
MONITORING WELL:  
 MW-8

PAGE: 1 of 1

DRILLING COMPANY: Environmental Drilling Inc.  
 DRILLING METHOD: HSA  
 SAMPLING METHOD: SPT - 18 Inches  
 LOCATION: See Figure 2

SURFACE ELEVATION: ± feet  
 CASING ELEVATION: ± feet

DATE STARTED: 9/1/2015  
 DATE COMPLETED: 9/1/2015  
 LOGGED BY: N. Nielsen



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.



Diversified Industries  
 Everett, Washington

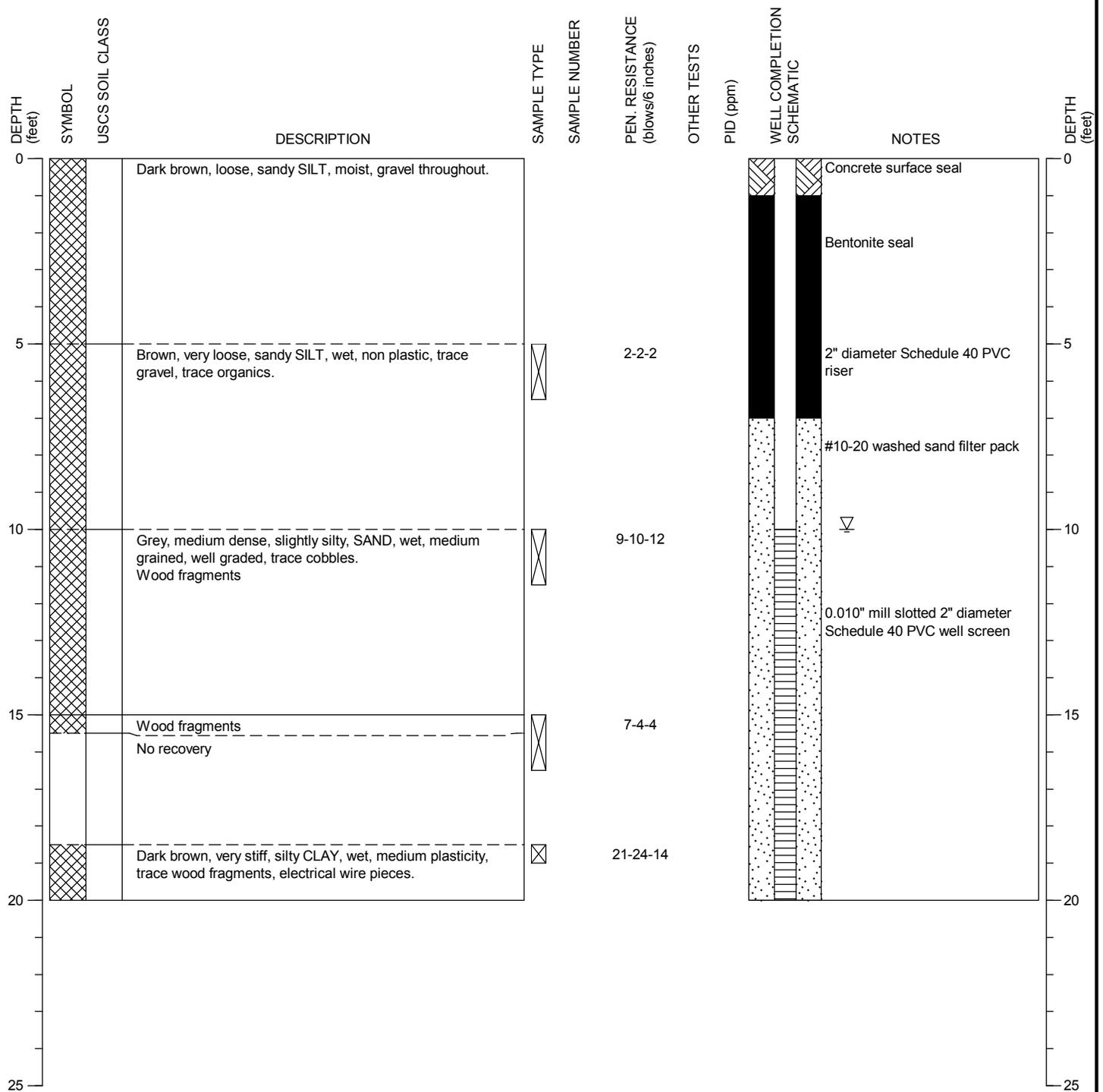
MONITORING WELL:  
 MW-9

PAGE: 1 of 1

DRILLING COMPANY: Environmental Drilling Inc.  
 DRILLING METHOD: HSA  
 SAMPLING METHOD: SPT - 18 Inches  
 LOCATION: See Figure 2

SURFACE ELEVATION: ± feet  
 CASING ELEVATION: ± feet

DATE STARTED: 2/9/2016  
 DATE COMPLETED: 2/9/2016  
 LOGGED BY: A. York



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.



Diversified Industries  
 Everett, Washington

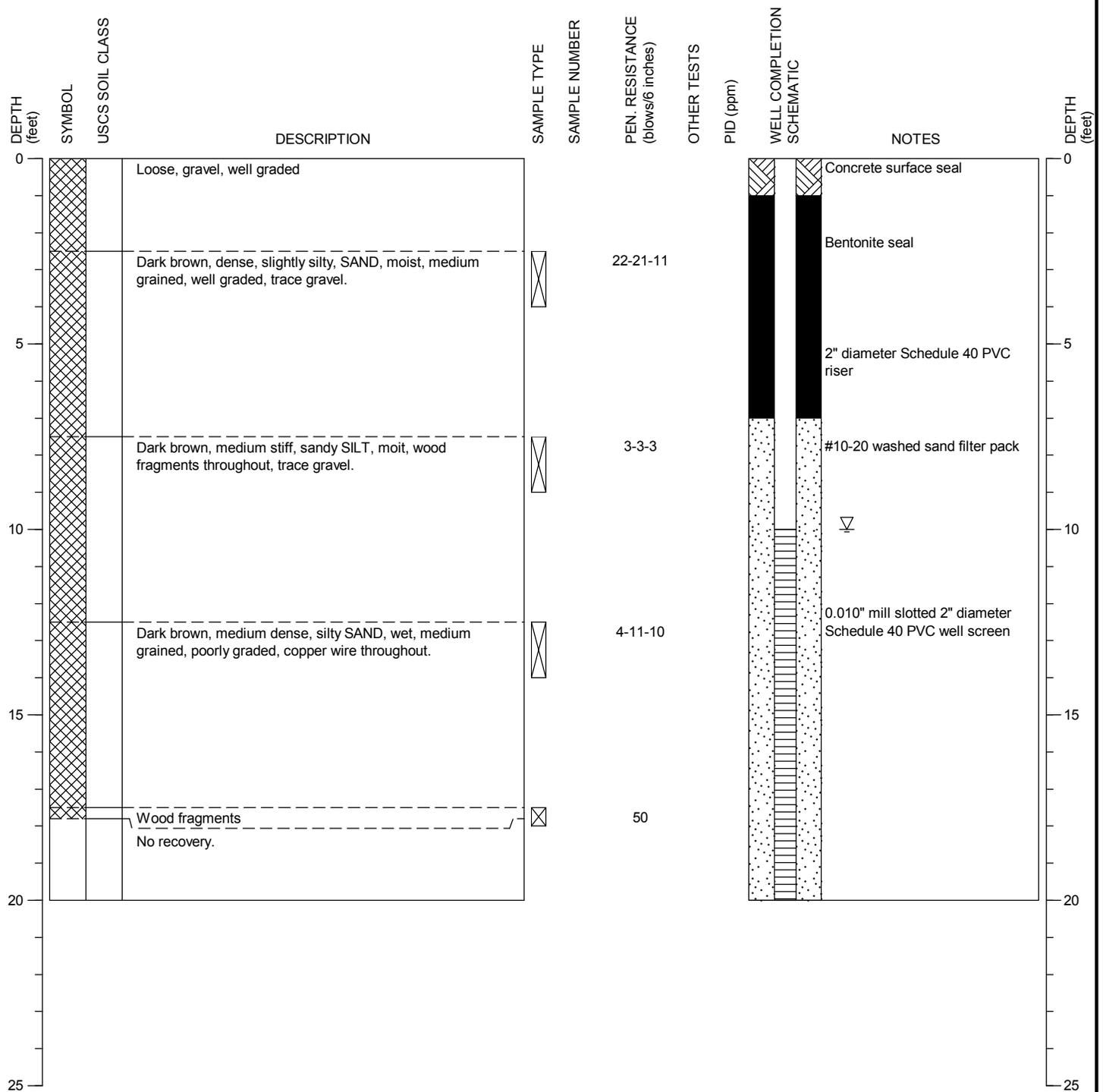
MONITORING WELL:  
 MW-10

PAGE: 1 of 1

DRILLING COMPANY: Environmental Drilling Inc.  
 DRILLING METHOD: HSA  
 SAMPLING METHOD: SPT - 18 Inches  
 LOCATION: See Figure 2

SURFACE ELEVATION: ± feet  
 CASING ELEVATION: ± feet

DATE STARTED: 2/9/2016  
 DATE COMPLETED: 2/9/2016  
 LOGGED BY: A. York



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.



Diversified Industries  
 Everett, Washington

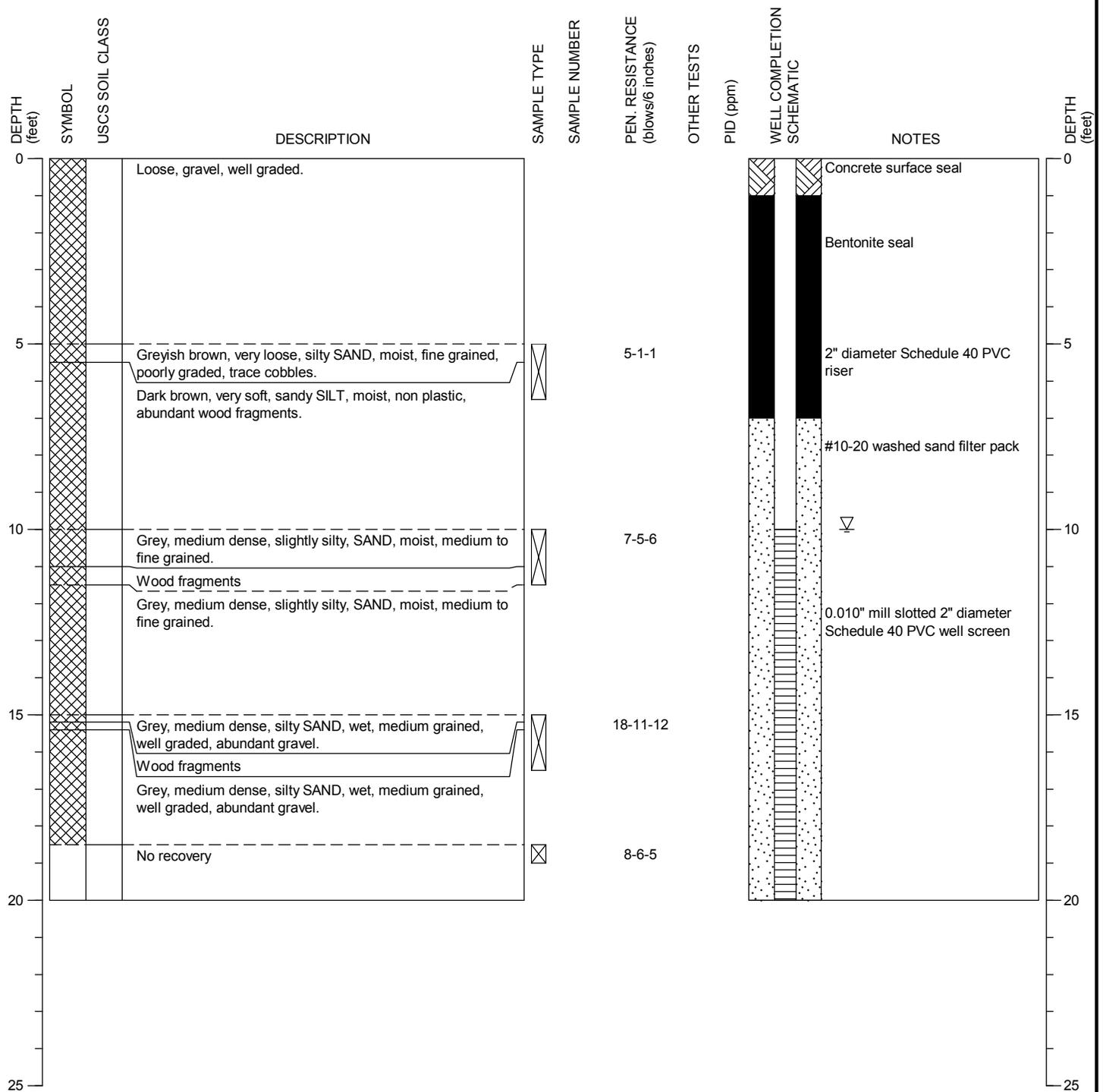
MONITORING WELL:  
 MW-11

PAGE: 1 of 1

DRILLING COMPANY: Environmental Drilling Inc.  
 DRILLING METHOD: HSA  
 SAMPLING METHOD: SPT - 18 Inches  
 LOCATION: See Figure 2

SURFACE ELEVATION: ± feet  
 CASING ELEVATION: ± feet

DATE STARTED: 2/9/2016  
 DATE COMPLETED: 2/9/2016  
 LOGGED BY: A. York



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Diversified Industries  
 Everett, Washington

MONITORING WELL:  
 MW-12

PAGE: 1 of 1

PROJECT NO.: 2013-052-100

FIGURE:

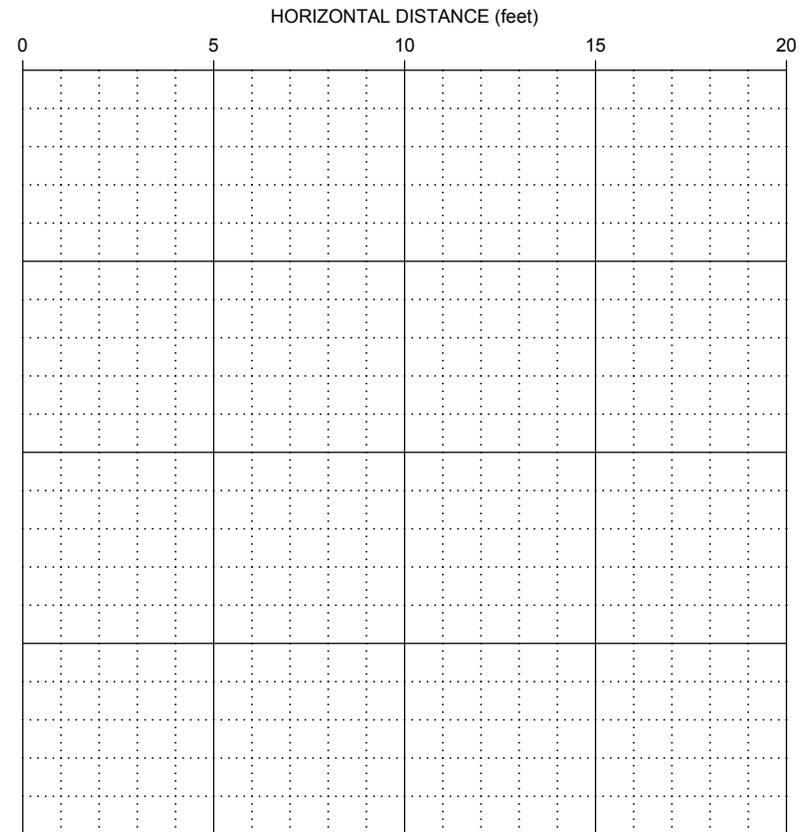
A-7

EXCAVATION COMPANY: KLB  
 EXCAVATING EQUIPMENT: Track Mounted Excavator

LOCATION: 15' SW of MW-2  
 DATE COMPLETED: 2/14/14  
 LOGGED BY: V. Atkins

DEPTH (feet)	SYMBOL	USCS SOIL CLASS	DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	MOISTUE CONTENT (%)	OTHER TESTS
0		GP	Gray angular coarse Gravel (FILL).				
		SM	Medium dense gray-brown silty SAND with trace debris and roots, moist.				
		SM	Medium dense brown to dark brown silty SAND with trace roots, moist.				
4					4		
6.5			Medium dense gray-orange silty FILL with glass and metal debris, moist.		6.5		
12			Grading wet. Grading gray to dark gray.		12		
15			Test pit completed to 15 feet bgs. Ground water encountered at 12 feet bgs. Test pit backfilled and bucket-compacted.		15		

SKETCH OF SIDE OF PIT



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.



**HWAGEOSCIENCES INC.**

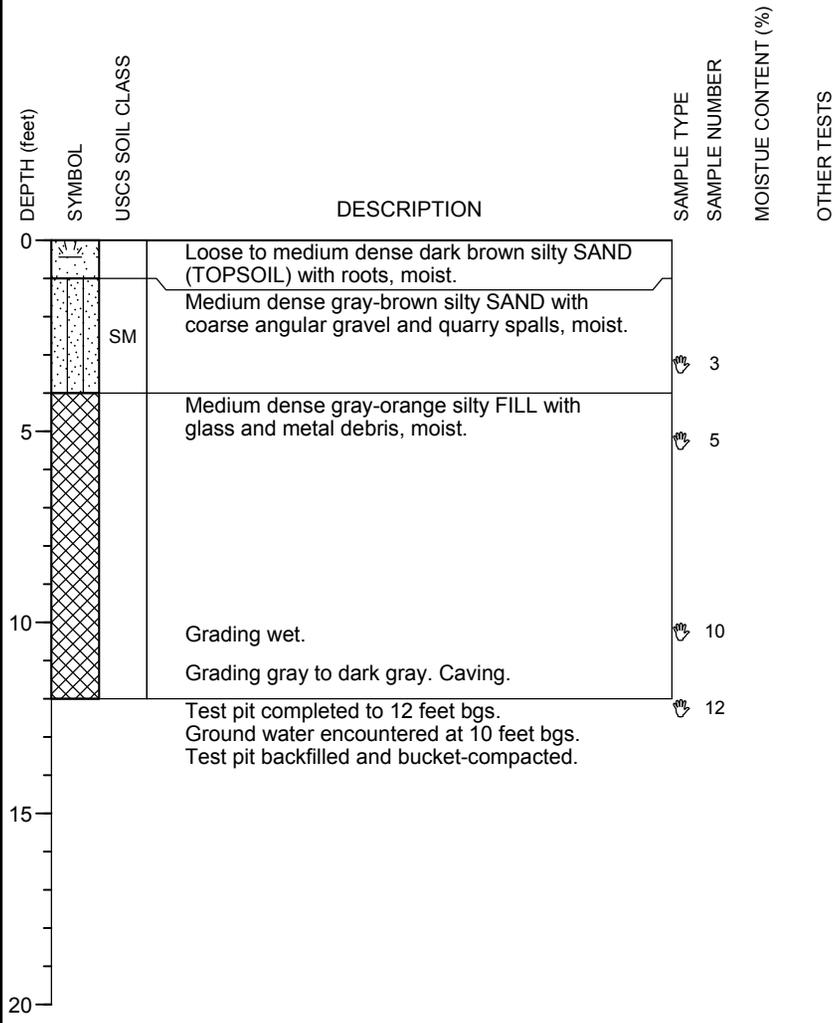
Harbor Mountain Development  
 Diversified Industries Site

**LOG OF TEST PIT  
 TP-1**

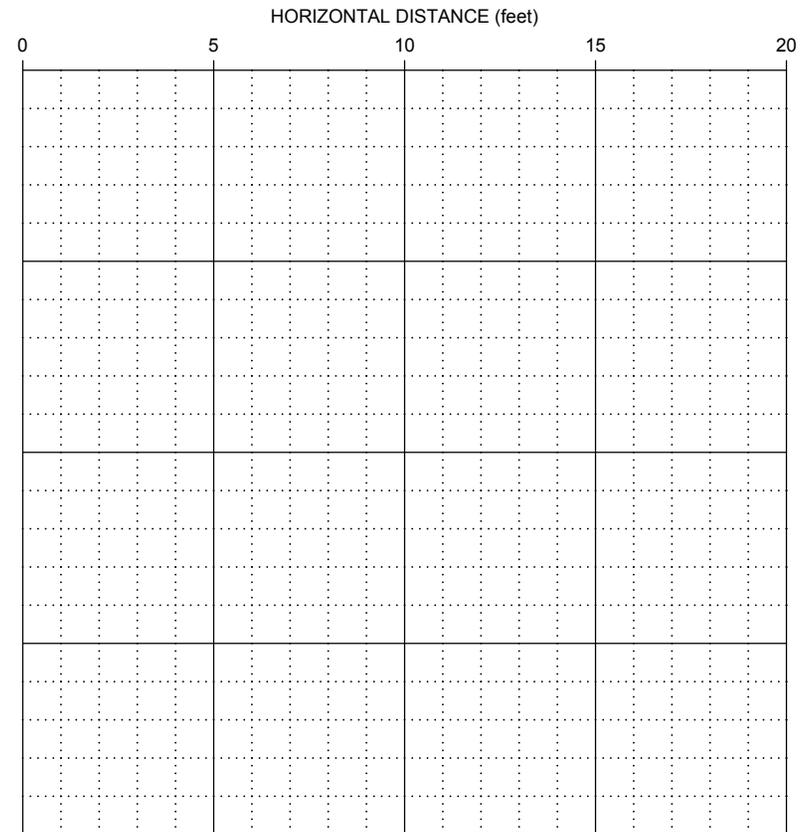
PAGE: 1 of 1

EXCAVATION COMPANY: KLB  
 EXCAVATING EQUIPMENT: Track Mounted Excavator

LOCATION: 10' W of MW-2  
 DATE COMPLETED: 2/14/14  
 LOGGED BY: V. Atkins



SKETCH OF SIDE OF PIT



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.



**HWAGEOSCIENCES INC.**

Harbor Mountain Development  
 Diversified Industries Site

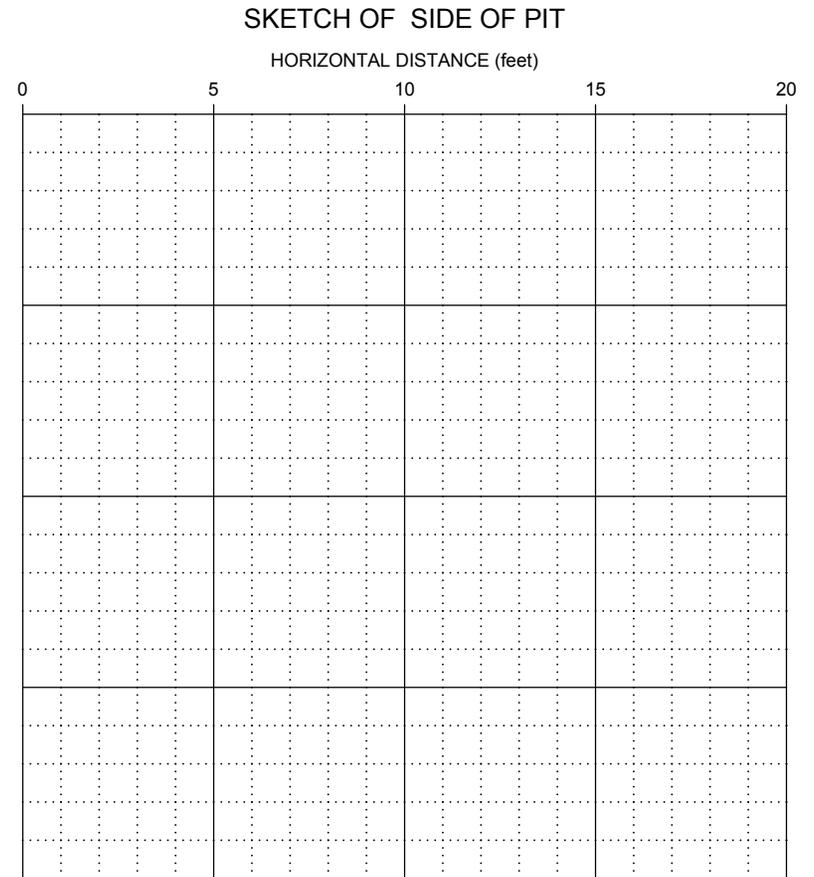
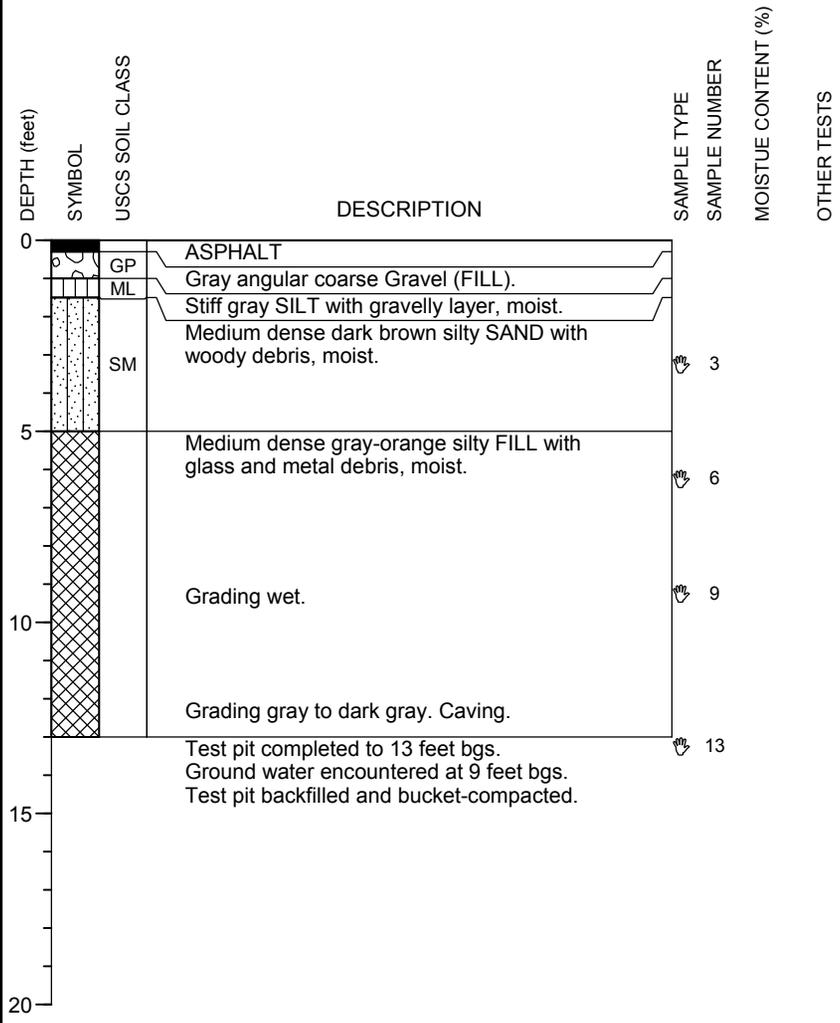
**LOG OF TEST PIT  
 TP-2**

PAGE: 1 of 1

PROJECT NO.: 2013-052-22 FIGURE: A-3

EXCAVATION COMPANY: KLB  
 EXCAVATING EQUIPMENT: Track Mounted Excavator

LOCATION: 10' N of MW-2  
 DATE COMPLETED: 2/14/14  
 LOGGED BY: V. Atkins



NOTE: This log of subsurface conditions applies only at the specified location and on the date indicated and therefore may not necessarily be indicative of other times and/or locations.



Harbor Mountain Development  
 Diversified Industries Site

LOG OF TEST PIT  
 TP-3

PAGE: 1 of 1

PROJECT NO.: 2013-052-22 FIGURE: A-4