

February 9, 2007

Northshore School District
22105 – 23rd Avenue SE
Bothell, Washington 98021

Attention: Dan Vaught, Executive Director of Support Services
c/o: Laura Brent, Shockey/Brent, Inc.

Subject: Environmental Review, BP Oil Station Cleanup Plan
18725 Bothell Way NE
Bothell, Washington
File No. 12666-001-04

INTRODUCTION

This letter summarizes GeoEngineers' review of the cleanup action proposed by the Washington State Department of Ecology (Ecology) for the BP Oil Station #11352 property located at 18725 Bothell Way NE in Bothell, Washington. We understand that Ecology is responsible for the cleanup at the BP site, and that a portion of the gasoline-related contaminant plume originating on the BP property is migrating onto Northshore School District property, beneath the Northshore Pool Building. Further, we understand that Ecology has asked Northshore School District to comment on the cleanup action plan prior to the start of the upcoming cleanup action that we understand is planned to start in 2007. We reviewed the following documents prepared by Ecology's consultant:

- Investigation Report for Washington State Department of Ecology, Mixed Funding LUST Sites (all information but for BP Oil Station #11352 deleted), June 2005, prepared for Ecology by EA Engineering, Science, and Technology, Inc.
- Draft Cleanup Action Plan, BP Oil Station #11352, November 2006, prepared for Ecology by EA Engineering, Science, and Technology, Inc.
- Remedial Alternative Evaluation, BP Oil Station #11352, November 27, 2006, prepared for Ecology by EA Engineering, Science, and Technology, Inc.
- Specification for Remedial Action at the Bothell BP Station, November 2006, prepared by Ecology.

Based on our review of the documents, the remedial action approach is intended to (a) remove gasoline-contaminated soil source material on the BP property and a portion of the Northshore School District property (north of the Northshore Pool Building), (b) reduce residual hydrocarbon concentrations in groundwater, and (c) prevent suspected gasoline vapors resulting from the contaminant plume from migrating into the airspace of the pool building. Remedial action goals are intended to be attained using a chemical oxidation and remedial excavation approach.

PURPOSE

The purpose of GeoEngineers services was to review the proposed cleanup action to be completed for the BP site, then to provide our opinion related to the adequacy of the cleanup action relative to the contaminant plume that has migrated onto the Northshore School District property.

REVIEW OF CLEANUP ACTION PLAN

SUMMARY OF SUBSURFACE CONDITIONS

According to the EA report, the gasoline station property was developed with fueling facilities in 1958. The property is built on approximately 9 to 12 feet of fill material overlying glacial till composed of very dense silty sand with gravel. Depths to groundwater range between 6 and 11 feet below ground surface (bgs). The shallow groundwater flow direction has been observed to the southwest or south-southwest.

Documented releases of gasoline occurred at the gasoline station property in the early 1980s and again in 2003. Undocumented releases of petroleum were discovered during tank removal in 1990, a remedial investigation in 1993, and supplemental subsurface investigation in 1993 and 2005. Diesel- and heavy oil-range hydrocarbon contamination is present in groundwater, and likely soil, near the heating oil and waste oil underground storage tanks (USTs) near the gasoline station building. Elevated concentrations of gasoline remain in soil and groundwater, around and downgradient of, the service islands and former USTs, which are immediately upgradient of the Northshore Pool Building. MTBE (a gasoline additive) was not detected in groundwater samples. Lead (another gasoline additive) either was not detected or was detected at concentrations below the MTCA Method A cleanup level in groundwater samples from the gasoline station property. Contaminated soil is expected to be present at depths of approximately 5 to 12 feet bgs.

The surface grade of the pool building is several feet below the grade of the gasoline station property. According to EA, the deep end of the pool (western end) foundation extends below the water table, which is as high as 3 feet bgs at this location. During pool construction, coarse gravel subgrade was placed surrounding the pool. The gravel serves to collect water beneath the pool foundation; the water is collected in a sump near the west end of the pool building. Contaminated water and fuel in the sump and gasoline vapors in the pool building have been reported on a periodic basis in the past. Borings between the gasoline station property and the Northshore Pool Building have been completed during the assessments lead by Ecology. Gasoline-range hydrocarbons, and/or benzene and xylenes were detected at concentrations exceeding the MTCA Method A cleanup levels in soil and/or groundwater from one or more of these borings, at depths at least 7.5 feet bgs. Lead slightly exceeded the MTCA Method A cleanup level in one grab groundwater sample obtained from one boring located north of the pool building.

SUMMARY OF PROPOSED CLEANUP ACTION

Ecology's selected remedial alternative for the gasoline station property and downgradient impacted soil and groundwater is summarized below. Selected figures from EA's Draft Cleanup Action Plan are presented in Attachment A.

- Excavate contaminated soil along the base of the slope between the gasoline station property and the Northshore property, north of the pool building, to the top of the glacial till.

- Backfill the excavation with a low-permeability material, such as clay, to limit the migration of residual contaminated groundwater beneath the pool building.
- Apply a chemical oxidizer (Regenox[®]) in a 20 by 20 foot area of highest groundwater contamination, by injecting the oxidizer into saturated soil via direct push borings, in two separate events. This action is intended to chemically degrade petroleum concentrations. The plan indicates injection points will be on seven-foot centers.
- Apply an oxygen source and nutrients (ORC Advanced[®]) into saturated soil at the location of the former waste oil/heating oil USTs and former gasoline USTs via direct push borings, during the second event to inject the chemical oxidizer. This application is intended to enhance biological remediation (natural biodegradation), as the oxygen is reported to be released over a period of one year following application. The plan indicates injection points will be on 10-foot centers.

Ecology intends to monitor air and water in the pool sump for gasoline and gasoline vapors during and following the injection of the chemical oxidizer. Two monitoring wells (MW-9 and MW-10) are proposed as performance monitoring wells, which will be installed between the gasoline station property and Northshore Pool Building upon completion of remedial activities. Quarterly monitoring of groundwater in these wells for gasoline-range hydrocarbons is proposed following remediation. If contaminants in these samples are not less than MTCA Method A cleanup levels after one year, Ecology proposes to apply a second dose of ORC Advanced[®] to the areas surround the non-compliant wells. They will then follow-up with an additional year of groundwater monitoring.

CONCERNS RELATED TO PROPOSED CLEANUP

This section addresses our concerns relative to the proposed remedial alternative and subsequent compliance (performance) monitoring.

- 1. Remedial Excavation. Excavate contaminated soil north of the pool building to remove the source of contamination immediately upgradient of the pool building.**
 - a. Comment 1:** The extent of soil contamination that was encountered north of the building is not known. Contaminated soil likely extends beneath the pool building. If there is a groundwater contaminant plume beneath the pool building, it likely will remain as long as contaminated soil remains as an ongoing source of contamination to groundwater. We are assuming that compliance soil samples will be obtained from the south wall and base of the remedial excavation to document what contaminant concentrations, if any remain in unexcavated soil.
 - b. Comment 2:** Contaminated, untreated groundwater that migrates onto the Northshore property will be deflected around the backfilled remedial excavation that will contain lower permeability fill. Appropriate siting of compliance monitoring well locations is warranted (see discussion below on compliance monitoring wells).
- 2. Chemical Injection. Chemical injection of a short-duration chemical oxidation compound (Regenox[®]) is proposed for treating the most heavily contaminated area. Less contaminated areas will be injected with a slow-release, long-duration compound (ORC Advanced[®]) that releases oxygen to groundwater.**
 - a. Comment 1:** The chemical oxidizer is new in the environmental marketplace (limited track record) and it is questionable if it will be effective in reducing contaminant concentrations in soil and groundwater. The ability of ORC, in general, to significantly reduce the concentration of petroleum contaminants in saturated soil is limited based on

our experience. The Regenox and ORC injection points would need to be on a tight spacing. In order to assess the optimum spacing and application frequency, a pilot test should be completed.

- b. **Comment 2:** Monitoring points (i.e., monitoring wells) should be installed prior to application of the chemical amendment to establish baseline groundwater and in-situ vapor conditions. As discussed previously, Ecology has proposed installation of two compliance (performance) monitoring wells, MW-9 and MW-10, to be installed on Northshore property to track effectiveness of the remedial alternative. GeoEngineers has proposed a minimum of four monitoring well locations, two of which are close to proposed monitoring wells MW-9 and MW-10 and wells east and south of the pool building. Although vapor monitoring in the pool sump during and after injection of the chemical oxidizer is proposed by Ecology, we recommend that a vapor monitoring plan be developed. This plan should include baseline monitoring, as well as expand vapor monitoring to several locations within the pool building and vapor monitoring points between the injection points and the pool building during and after each injection event.
3. **Compliance Monitoring Well Network. Groundwater monitoring will be completed on a quarterly basis to confirm that the cleanup action has attained cleanup standards. Ecology proposes to install two monitoring wells, MW-9 and MW-10, on the Northshore property.**

 - a. **Comment:** As discussed above, contaminated groundwater may migrate around the lower permeability backfill of the completed remedial excavation. We propose four compliance monitoring wells on the Northshore property: Ecology 1 through Ecology 4 (Figure 1). Ecology 1 and Ecology 4 are placed to assess groundwater that migrates around the excavation backfill. Ecology 2 and Ecology 3 are placed to assess areas that have previously been unexplored, thereby giving further assessment as to whether a contaminant plume that likely is under the pool building has possibly migrated out the downgradient side.

In summary, the cleanup action plan may be effective in remediating the soil and groundwater contaminants that currently affect the Northshore property. However, additional groundwater monitoring is necessary prior to conducting chemical injections to evaluate groundwater flow direction and groundwater quality. Pilot testing to evaluate and scope the appropriate chemical injection concentration and frequency should be completed. Performance monitoring and a secondary action plan is needed should contaminated soil, which will act as an ongoing source of contamination, remain beneath the pool building foundation. A more comprehensive vapor testing program is necessary prior to injection. The vapor testing program should include vapor monitoring within an expanded well network between the injection points and the pool building as well as within the pool building itself.

LIMITATIONS

This environmental review has been prepared for use by the Northshore School District and their representatives, and may be provided to Ecology. GeoEngineers has performed our services for the proposed cleanup action at the BP Oil Station #11352 property located at 18725 Bothell Way NE, relative to the perceived impacts to the adjacent Northshore School District property to the south in Bothell, Washington in general accordance with the scope and limitations of our proposal dated February 6, 2007.

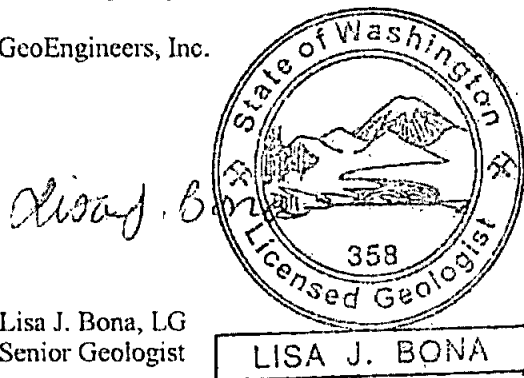
Within the limitations of scope, schedule and budget, our services have been executed in accordance with the generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

Thank you for the opportunity to assist you on this project. If you have any questions, please call.

Yours very truly,

GeoEngineers, Inc.



Lisa J. Bona, LG
Senior Geologist

A handwritten signature in cursive that reads "David A. Cook".

David A. Cook, LG, LBP
Principal

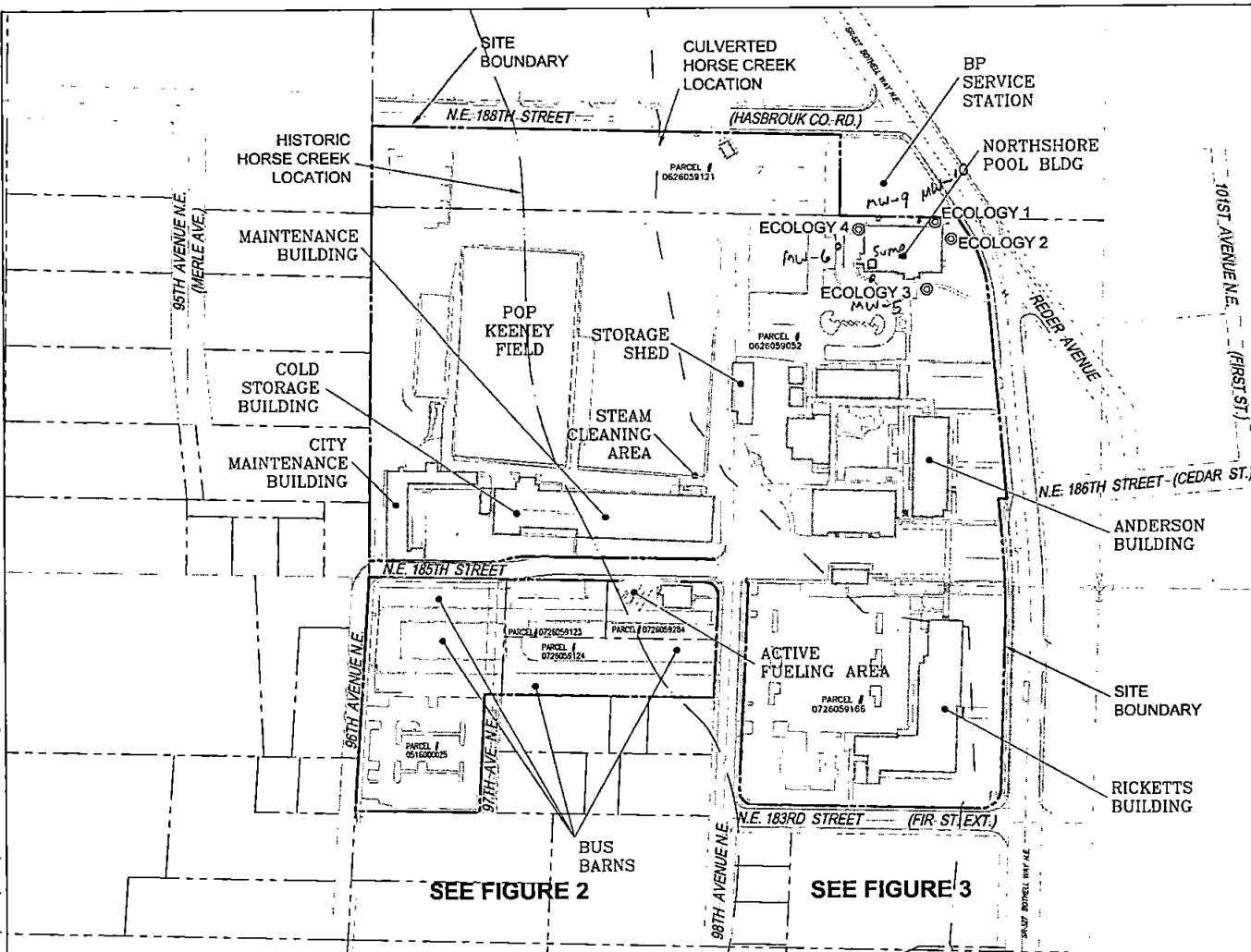
LJB:DAC:ta
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Enclosures: Attachment A-Selected EA Figure

cc: William Joyce
Salter Joyce Ziker, PLLC

Disclaimer: Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

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LJBSSES 02/09/07 Xref: N/A Image: N/A

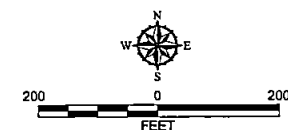


Legend:

ECOLOGY 1 Well recommended that Ecology install

Historic Horse Creek location
(from 1895 topographic map location
from MrSID web site
<http://content.wsulibs.wsu.edu/sid/bin/show.plx>)

Culverted Horse Creek location
(provided from City of Bothell GIS)



Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: CAD files provided by Pace Engineers, 12/28/05 and COUGHLIN-PORTER-LUNDEEN, 12/05-06.
Site details developed from aerial photo obtained from King County GIS Center iMAP
(<http://www.metrokc.gov/gis/mapportal/IMAP/>), 1/11/06.

Site Plan

Northshore Downtown Bothell Properties
Bothell, Washington

GEOENGINEERS

Figure 1



ATTACHMENT A
SELECTED EA FIGURES

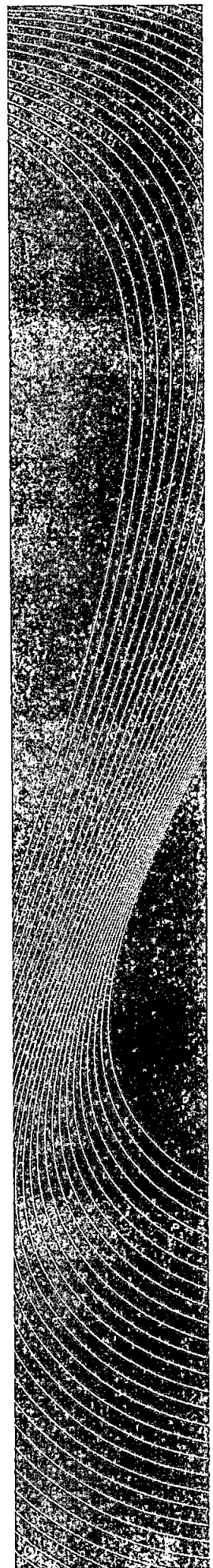
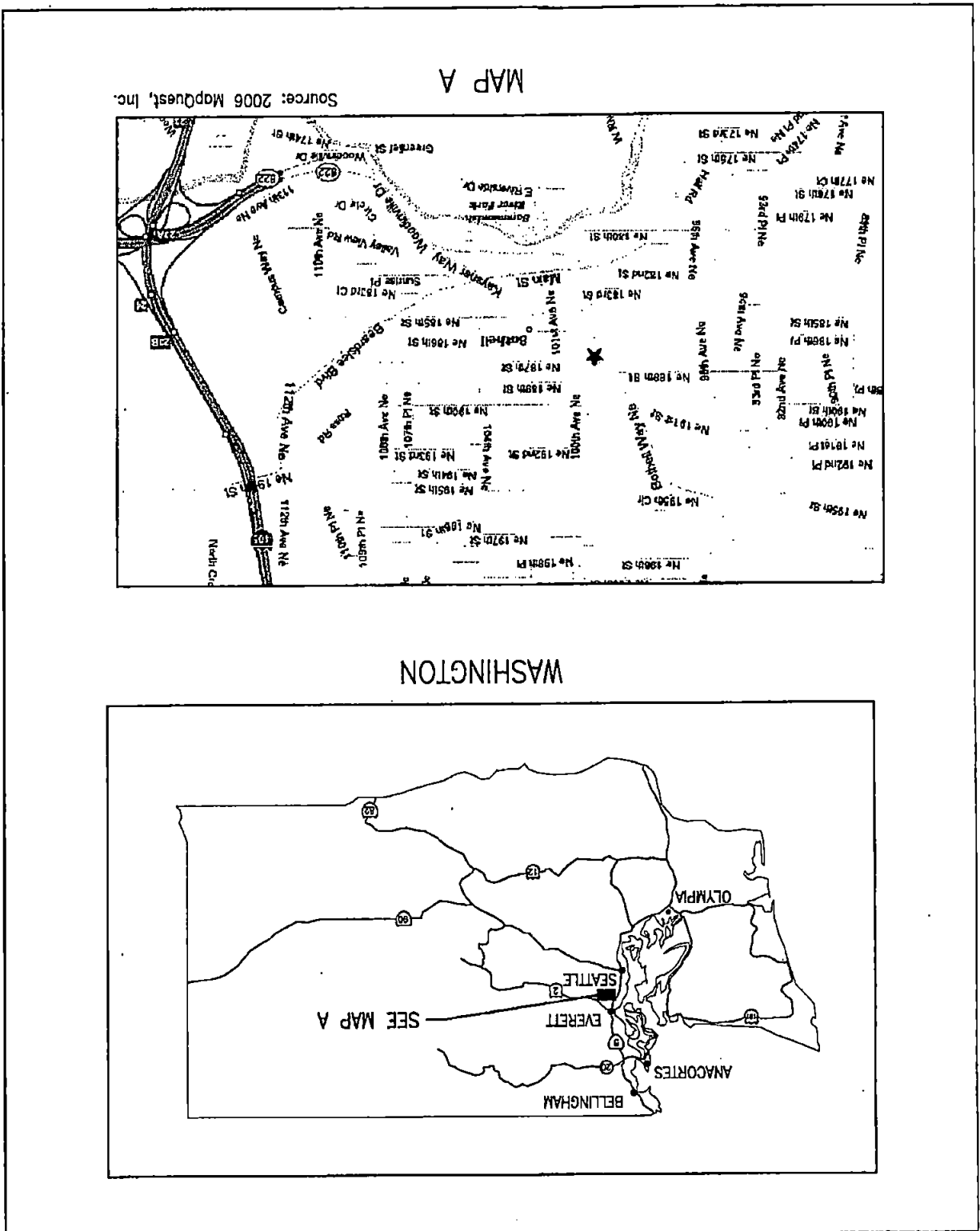




Figure 1. BP Oil Station #11352 Location Map.



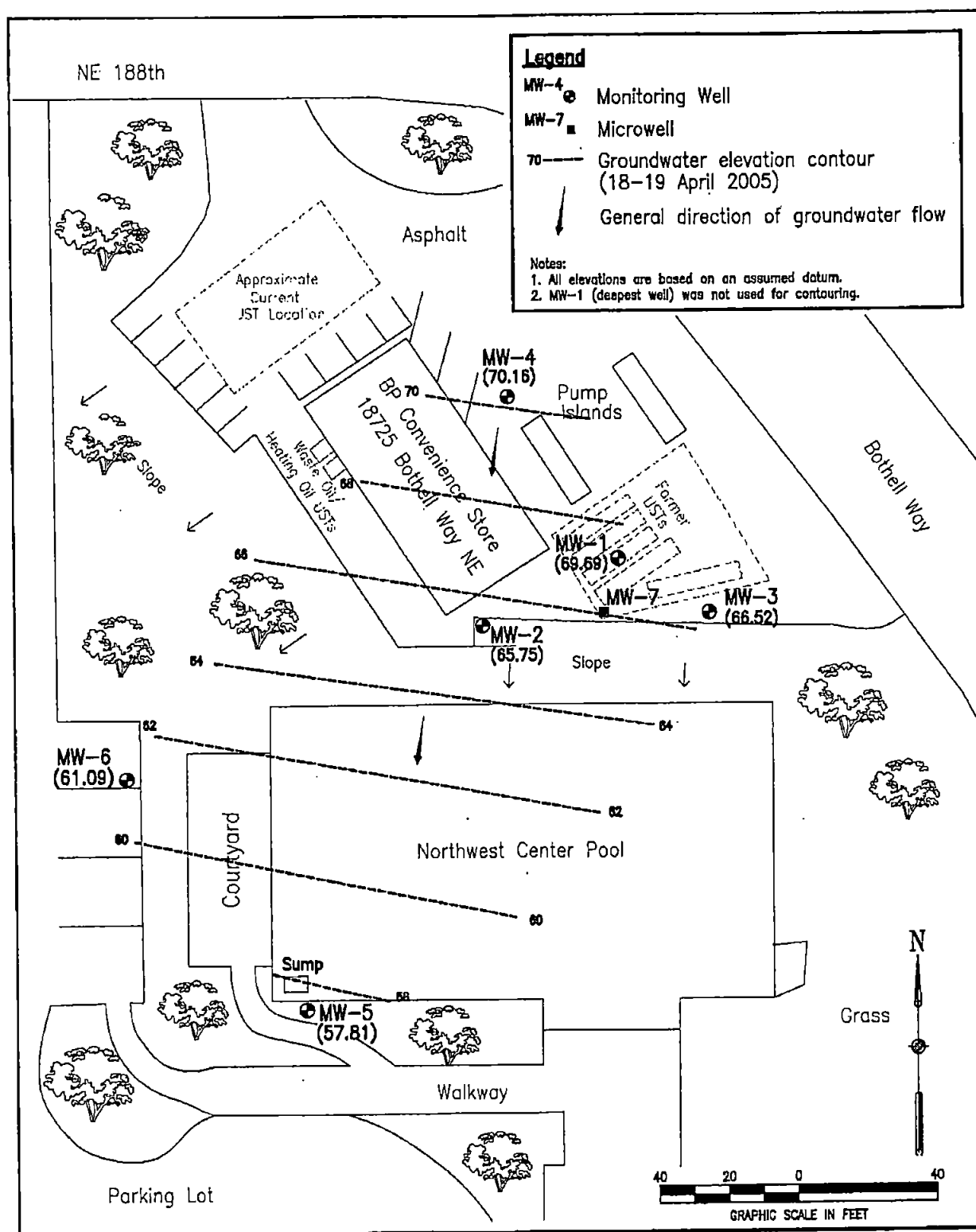


Figure 2. Site Map, BP Oil Station #11352



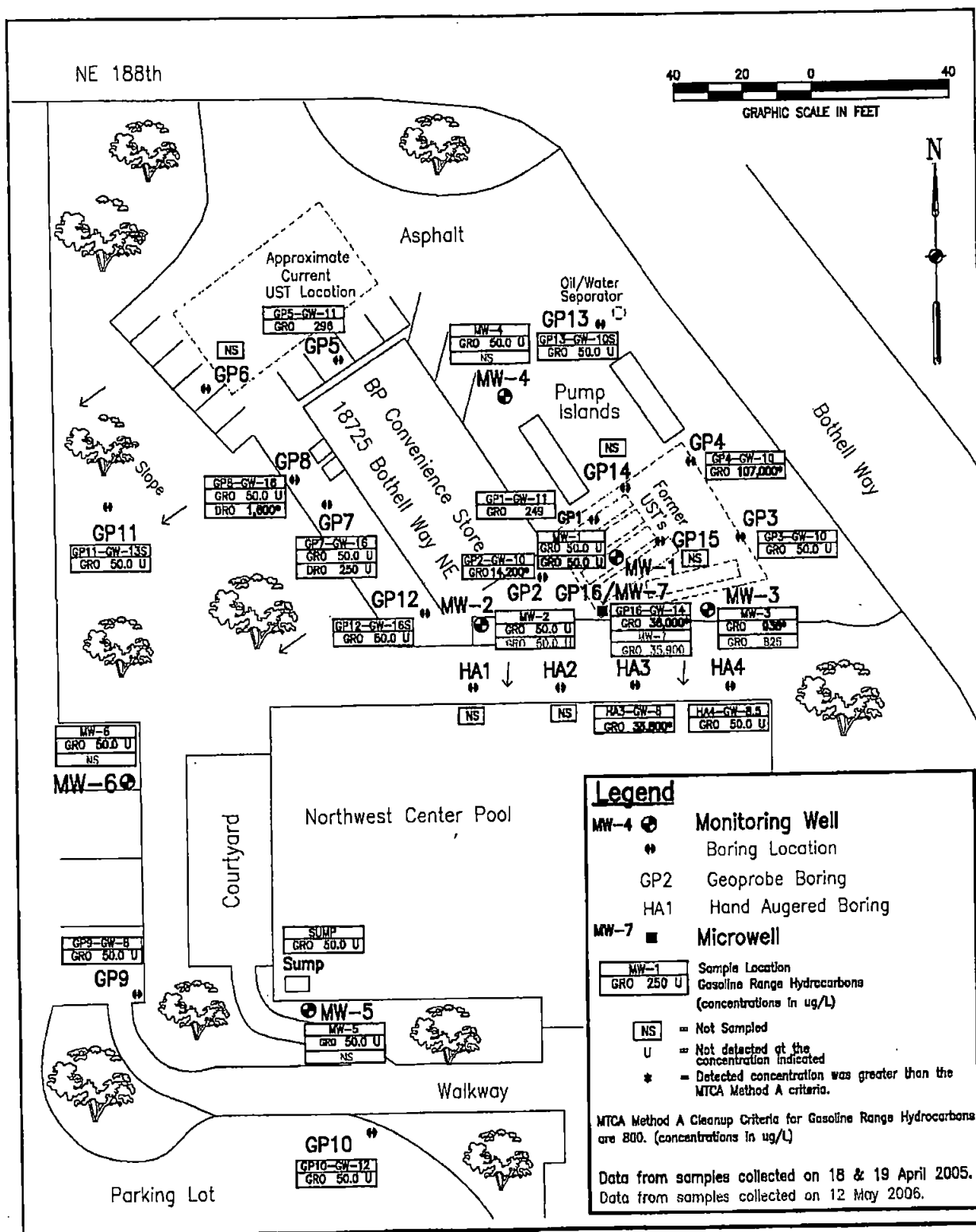


Figure 3. Groundwater Analytical Data, April 2005 and May 2006, BP Oil Station #11352



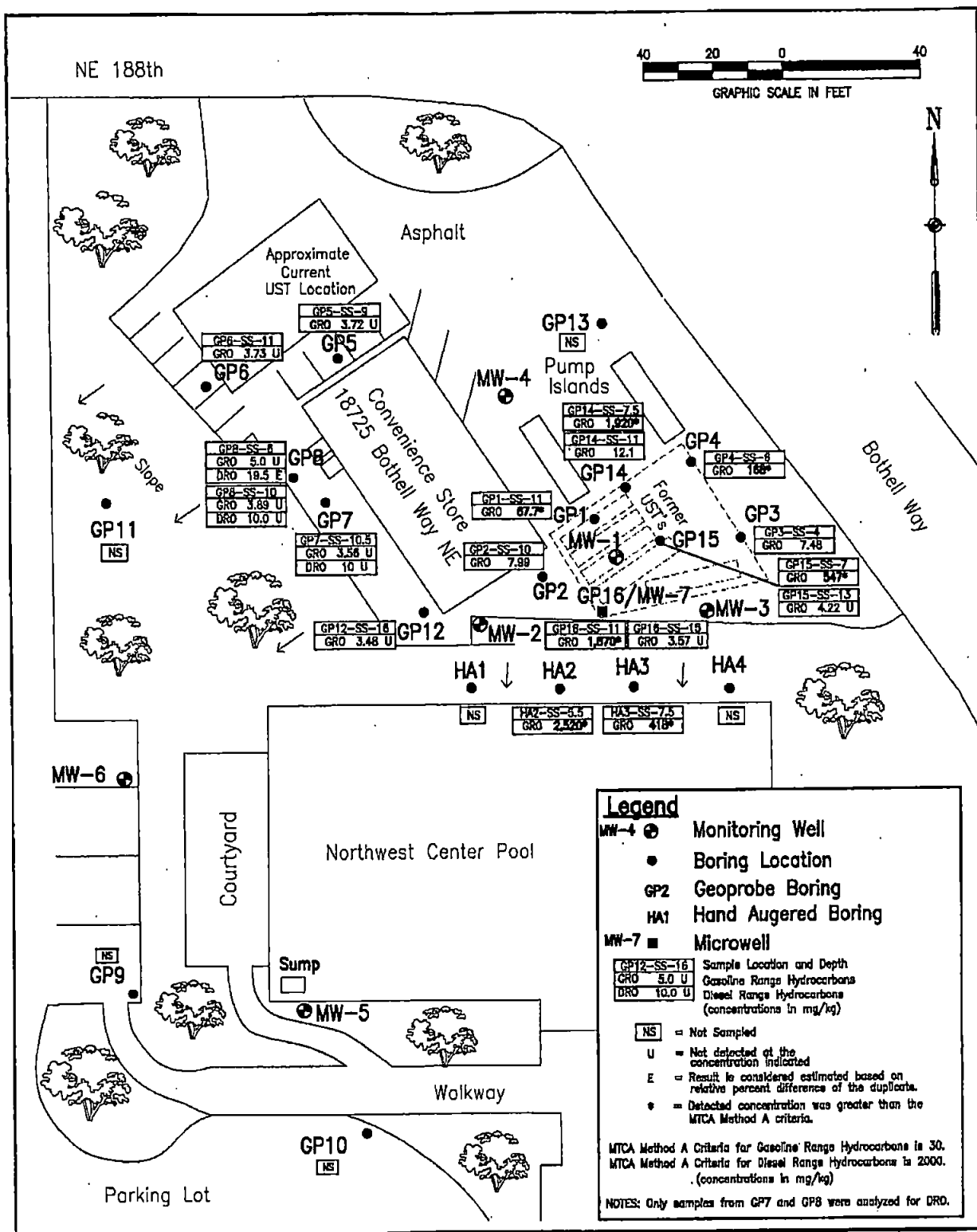


Figure 4. Soil Analytical Data, April 2005, BP Oil Station #11352



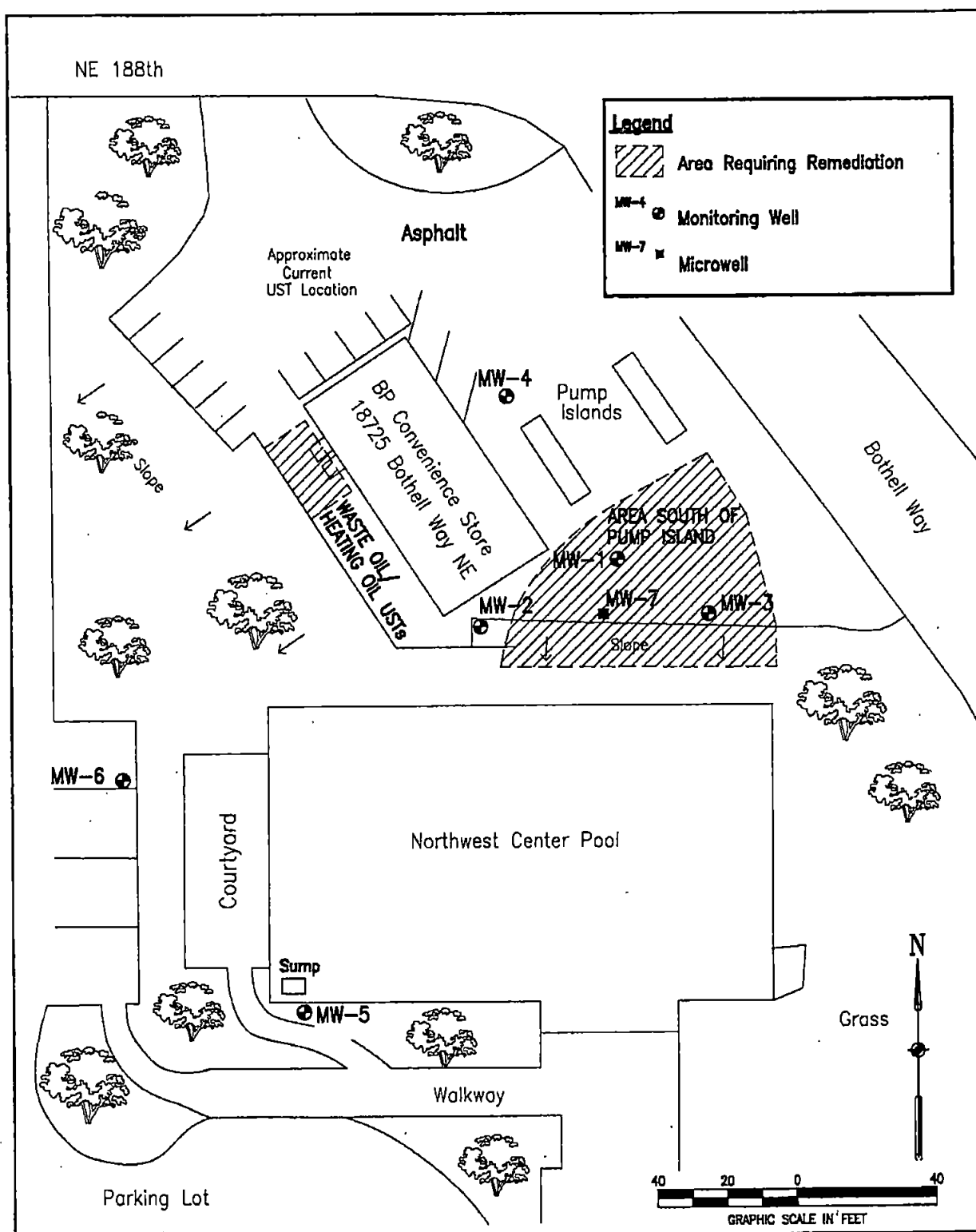


Figure 5. Approximate Extent of Contamination



I:\1994.01 2006_2007 Ecology LUST Sites\Bothell BP\CAP - Final\Figs Edent.dwg, 10/24/2008 4:43:18 PM, emantoler

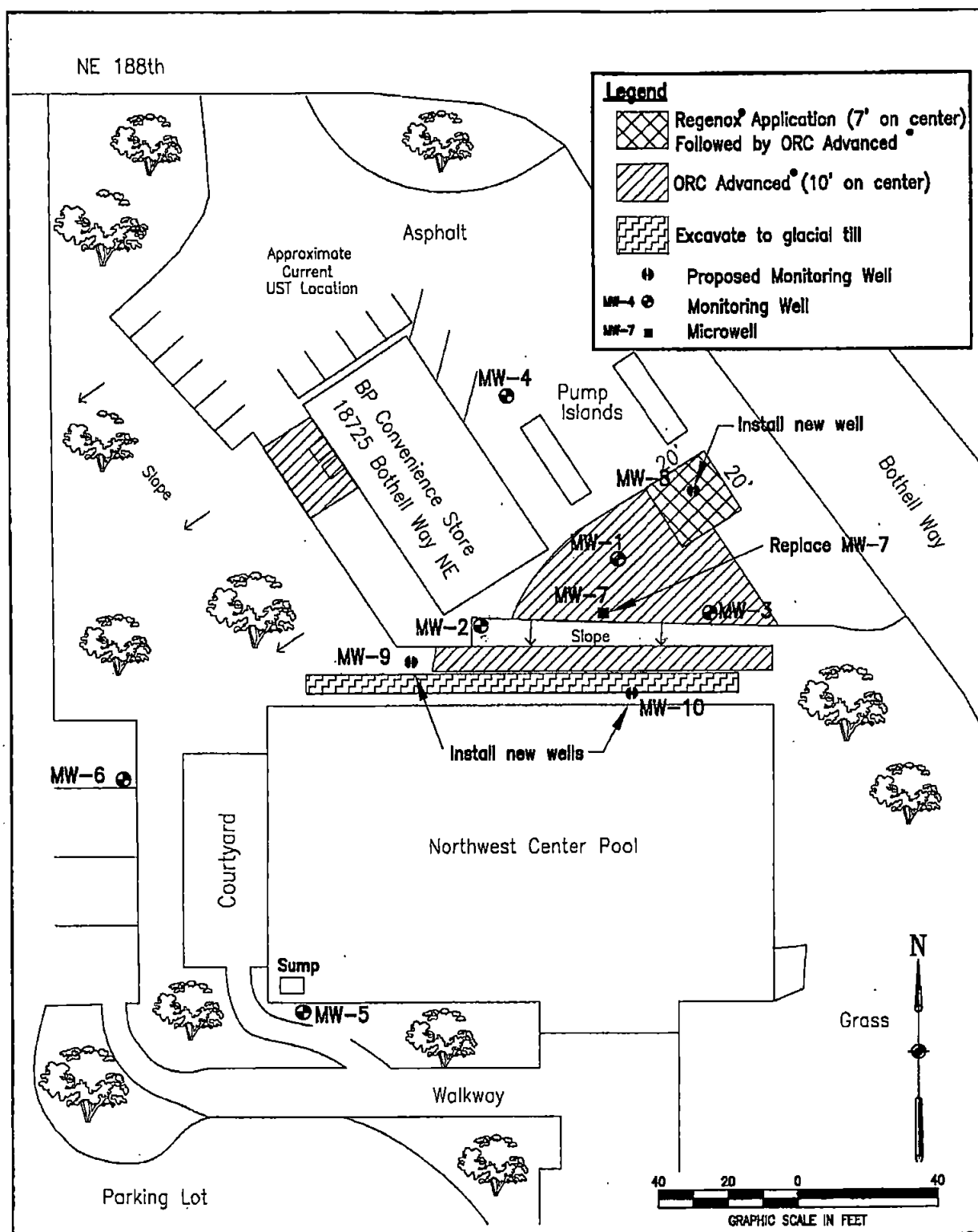


Figure 6. Selected Cleanup Alternative: Excavation with Chemical Oxidation/
Enhanced Bioremediation



G:\projects\61994.01 2006_2007 Ecology\LUIS\Sites\Bothell\BP\CAP - Final\Fig6 Excavation & chemical oxidation.dwg, Layout1, 11/7/2006 1:57:02 PM

Date Excavated: 05/02/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 58.12

Elevation feet	Depth feet	Sample	Sample Number	Analytical Testing	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	OTHER TESTS AND NOTES
0						AC	8 inches asphalt concrete			
			1			SM	Gray silty fine to coarse sand with gravel (loose, dry) (fill)	NS	<0.1	
			2							
			3	CA		SM	Mottled orange and brown silty fine sand with roots and occasional gravel (loose, wet) (fill)	NS	<0.1	
			4					SS	<0.1	
								NS	<0.1	
						SM	Orange/brown silty fine to coarse sand with gravel (loose, wet) (fill)			
			5			SM	Gray silty fine to coarse sand with gravel (loose, wet) (fill)	NS	<0.1	
						SM	Gray silty fine sand with occasional gravel (dense, moist) (till)			

Note: See Figure B-1 for explanation of symbols.

LOG OF DIRECT-PUSH BORING DP-02

GEOENGINEERS

Project: Northshore School District
 Project Location: Bothell, Washington
 Project Number: 12666-001-03

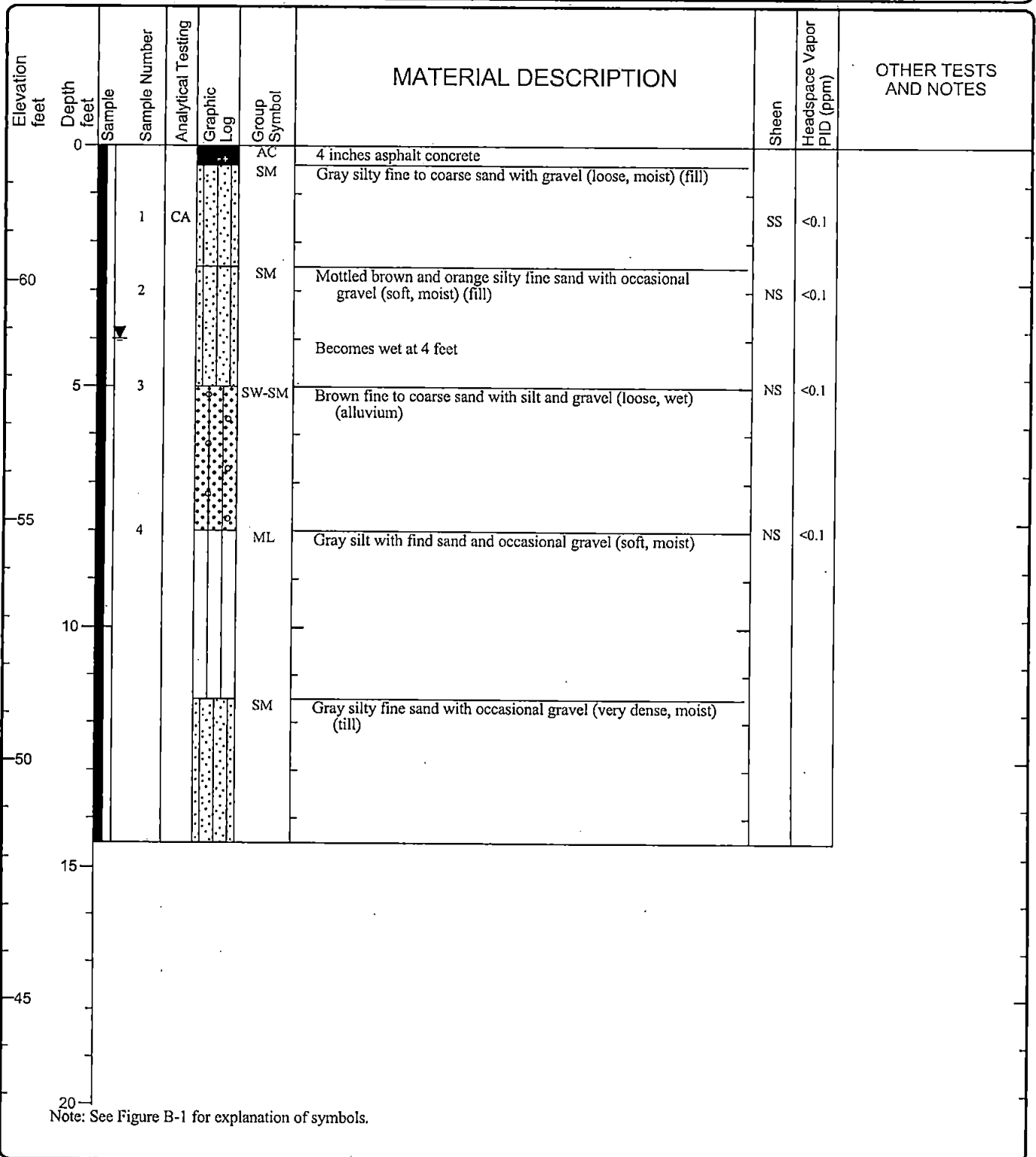
Figure B-2
 Sheet 1 of 1

Date Excavated: 05/02/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 62.80



LOG OF DIRECT-PUSH BORING DP-03

GEOENGINEERS



Project: Northshore School District
 Project Location: Bothell, Washington
 Project Number: 12666-001-03

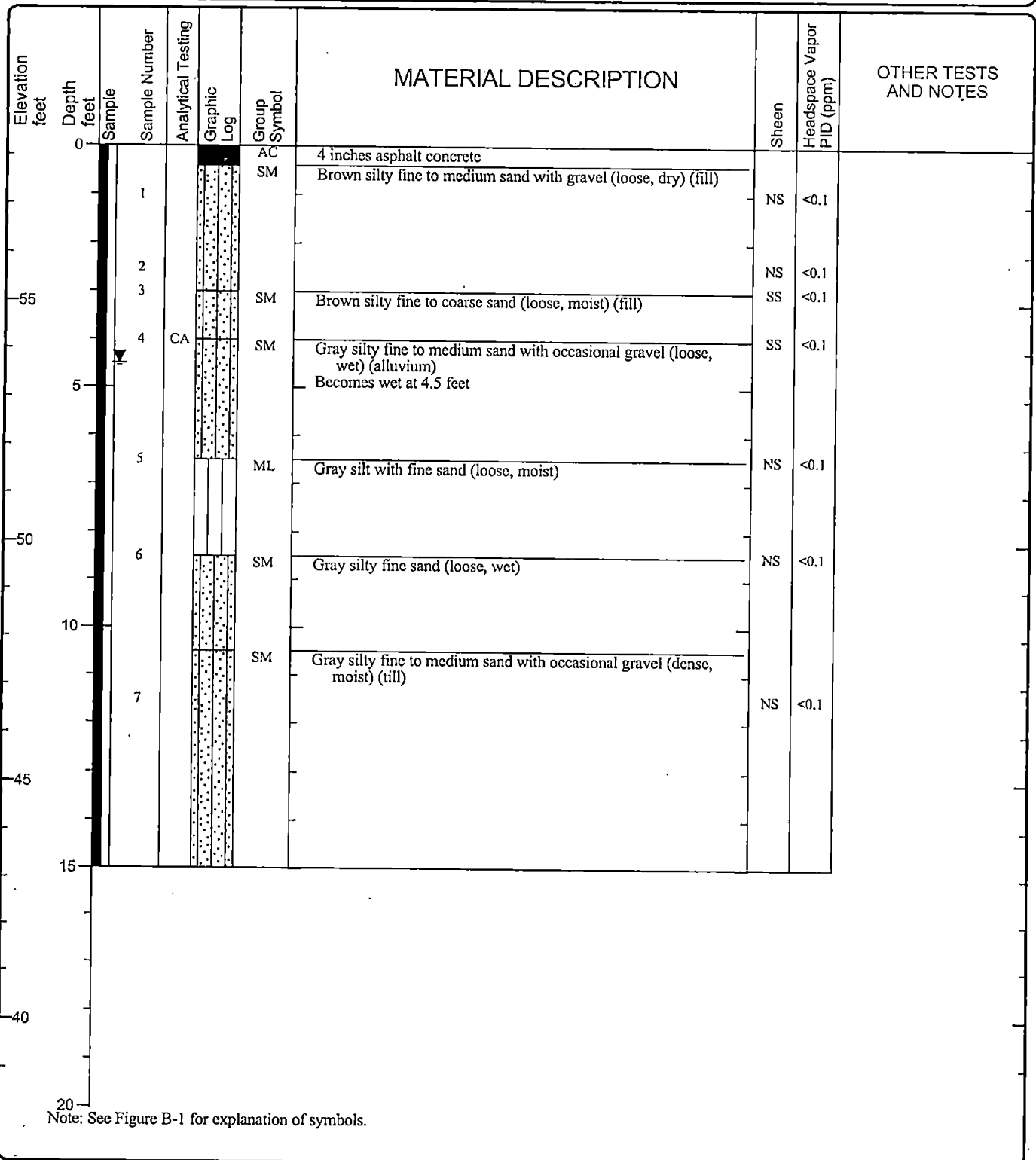
Figure B-3
 Sheet 1 of 1

Date Excavated: 05/02/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 58.20



LOG OF DIRECT-PUSH BORING DP-04

GEOENGINEERS



Project: Northshore School District
 Project Location: Bothell, Washington
 Project Number: 12666-001-03

Figure B-4
 Sheet 1 of 1

Date Excavated: 05/02/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 63.30

Elevation feet	Depth feet	Sample Number	Analytical Testing	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	OTHER TESTS AND NOTES
0					AC	6 inches asphalt concrete			
		1			SM	Gray silty fine to coarse sand with gravel (loose, dry) (fill)	NS	<0.1	
		2	CA		SM	Mottled gray and orange silty fine sand (loose, moist) (fill)	SS	<0.1	
-60		3			ML	Dark brown silt with organics (soft, moist)	NS	<0.1	
		4			SM	Mottled gray and orange silty fine sand (loose, moist)			
-5		5			SW-SM	Brown medium sand with silt (loose, wet) (alluvium)	NS	<0.1	
		6					NS	<0.1	
		7			ML	Brown silt with fine sand (medium stiff, moist)	NS	<0.1	
					SW-SM	Gray medium to coarse sand with silt and fine gravel (loose, wet) (alluvium)	NS	<0.1	
-55									
		8			SM	Gray silty fine sand with occasional gravel (dense, moist) (till)	NS	<0.1	
-10									
-50									
-15									
-45									
-20									

Note: See Figure B-1 for explanation of symbols.

LOG OF DIRECT-PUSH BORING DP-05

GEOENGINEERS

Project: Northshore School District
Project Location: Bothell, Washington
Project Number: 12666-001-03

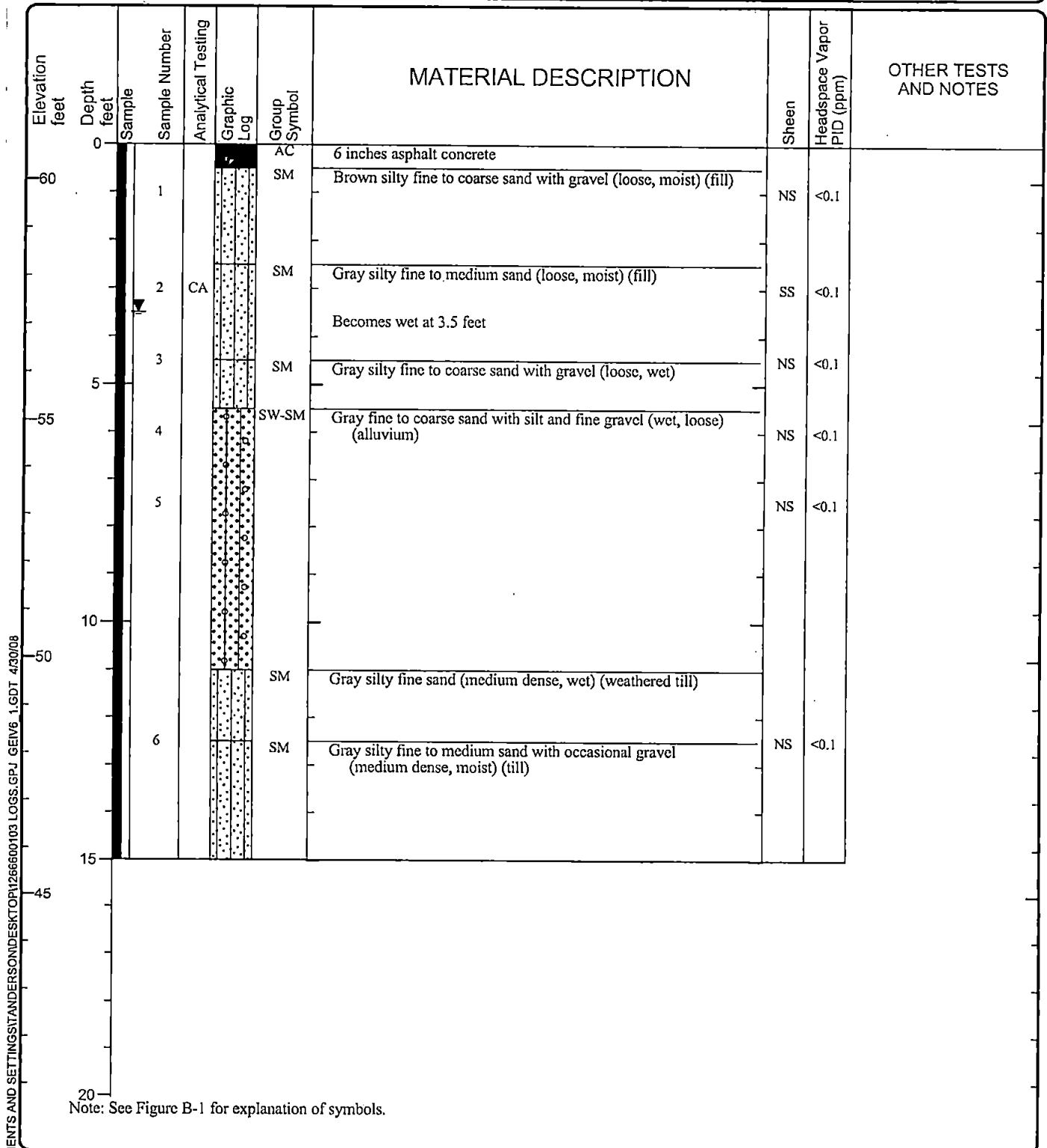
Figure B-5
Sheet 1 of 1

Date Excavated: 05/07/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 60.75



LOG OF DIRECT-PUSH BORING DP-06

GEOENGINEERS

Project: Northshore School District
 Project Location: Bothell, Washington
 Project Number: 12666-001-03

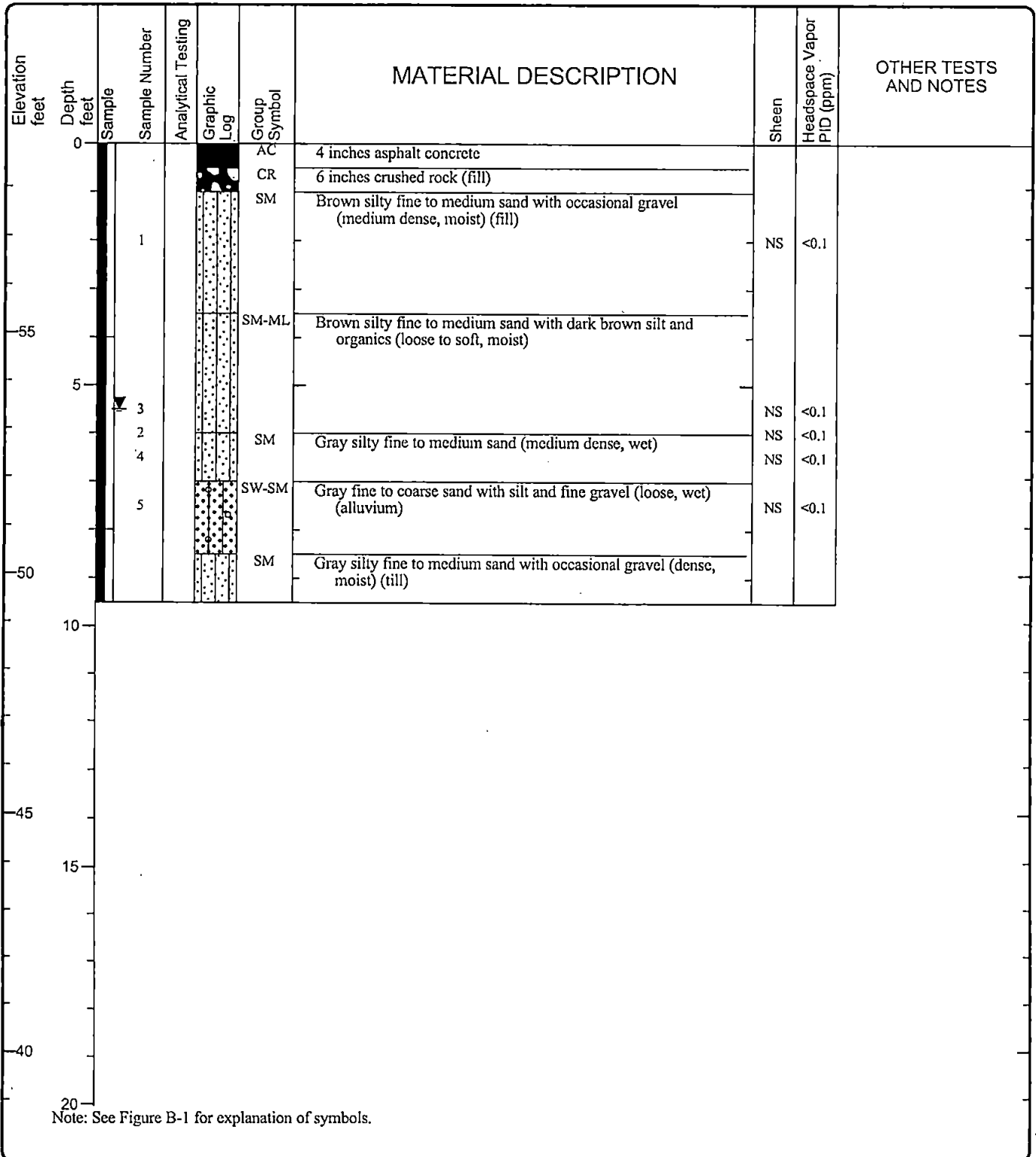
Figure B-6
 Sheet 1 of 1

Date Excavated: 08/22/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 58.90



LOG OF DIRECT-PUSH BORING DP-07



Project: Northshore School District
 Project Location: Bothell, Washington
 Project Number: 12666-001-03

Figure B-7
 Sheet 1 of 1

Surface Elevation (ft): 58.82

Elevation feet	Depth feet	Sample	Analytical Testing	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	OTHER TESTS AND NOTES
	0				AC	4 inches asphalt concrete			
					CR	6 inches crushed rock (fill)			
					SM	Brown silty fine to medium sand (medium dense, moist) (fill)			
		1					NS	<0.1	
					SM	Mottled brown and orange silty fine to medium sand (medium dense, moist) (fill)			
-55									
	5	3			ML	Dark brown silt with fine sand and occasional organics (stiff, wet)	NS	<0.1	
		2					NS	<0.1	
					SM	Brown silty fine to medium sand with occasional gravel (medium dense, wet)			
					SW-SM	Gray fine to coarse sand with silt and fine gravel (loose, wet) (alluvium)			
-50		4					NS	<0.1	
		5			SM	Gray silty fine to medium sand with occasional gravel (dense, moist) (till)	NS	<0.1	
-45									
	15								
-40									
	20								

Note: See Figure B-1 for explanation of symbols.

LOG OF DIRECT-PUSH BORING DP-08



Project: Northshore School District
Project Location: Bothell, Washington
Project Number: 12666-001-03

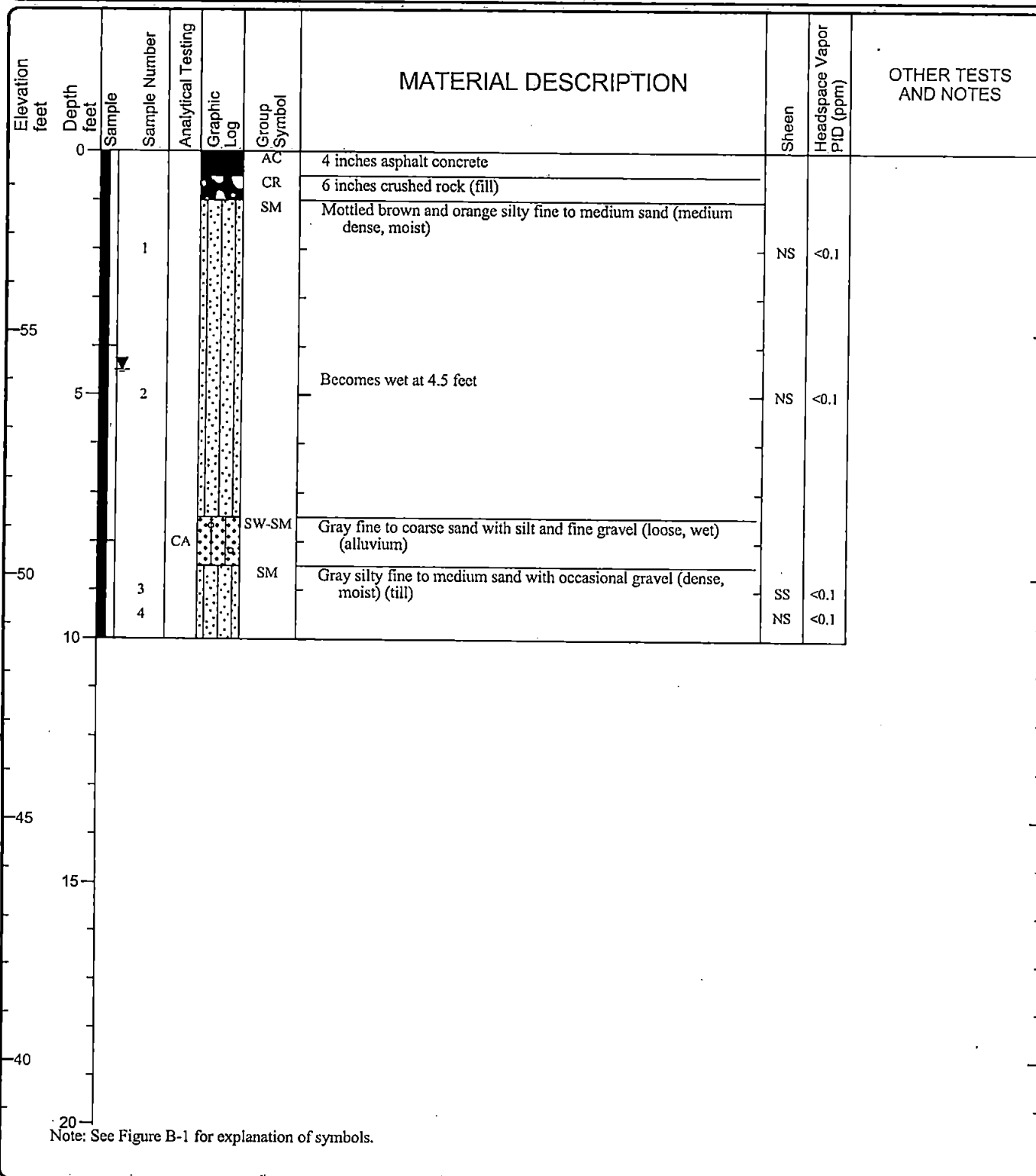
Figure B-8
Sheet 1 of 1

Date Excavated: 08/22/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 58.70



LOG OF DIRECT-PUSH BORING DP-09

GEOENGINEERS

Project: Northshore School District
Project Location: Bothell, Washington
Project Number: 12666-001-03

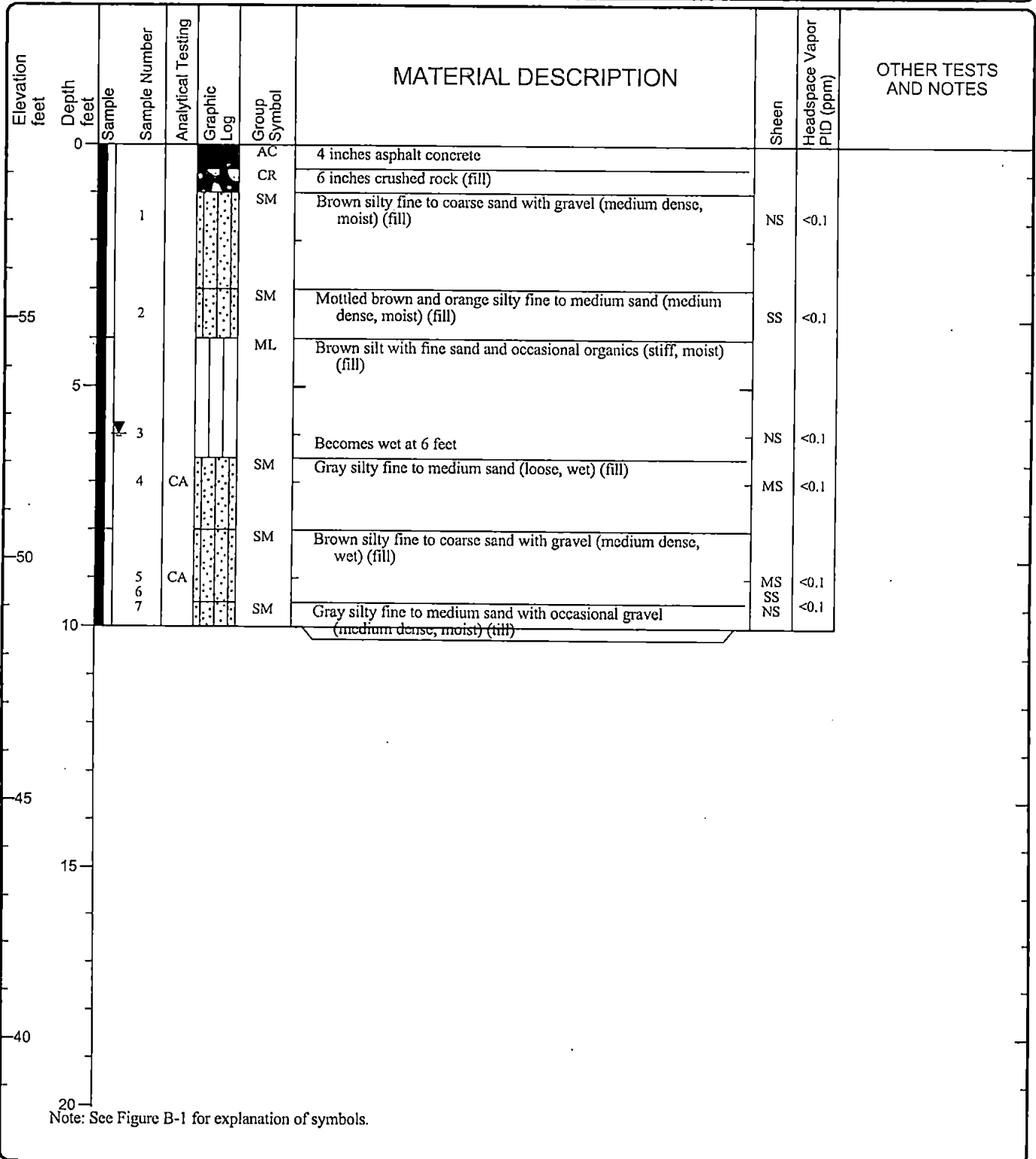
Figure B-9
Sheet 1 of 1

Date Excavated: 08/22/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 58.60



LOG OF DIRECT-PUSH BORING DP-10



Project: Northshore School District
 Project Location: Bothell, Washington
 Project Number: 12666-001-03

Figure B-10
 Sheet 1 of 1

Date Excavated: 08/22/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 58.55

Elevation feet	Depth feet	Sample	Sample Number	Analytical Testing	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	OTHER TESTS AND NOTES
0						AC	4 inches asphalt concrete			
						CR	6 inches crushed rock (fill)			
			1			SM	Red-brown silty fine sand (medium dense, moist) (fill)			
						SM	Brown silty fine to coarse sand with gravel (medium dense, moist) (fill)	NS	<0.1	
			2			SM	Gray silty fine to coarse sand with fine gravel (medium dense, moist) (fill)	NS	<0.1	
-55						ML	Dark brown silt with fine sand, occasional gravel and roots (medium stiff, moist) (fill)	SS	<0.1	
	5		3			SM	Grayish brown silty fine to medium sand (medium dense, moist) (fill)			
			4			SM	Brown silty fine to coarse sand with gravel (medium dense, wet) (fill)	MS	<0.1	
			5	CA		SM	Gray silty fine to medium sand with occasional gravel (dense, moist) (fill)	NS	<0.1	
			6	CA		SM				

Note: See Figure B-1 for explanation of symbols.

LOG OF DIRECT-PUSH BORING DP-11

GEOENGINEERS

Project: Northshore School District

Project Location: Bothell, Washington

Project Number: 12666-001-03

Figure B-11
Sheet 1 of 1

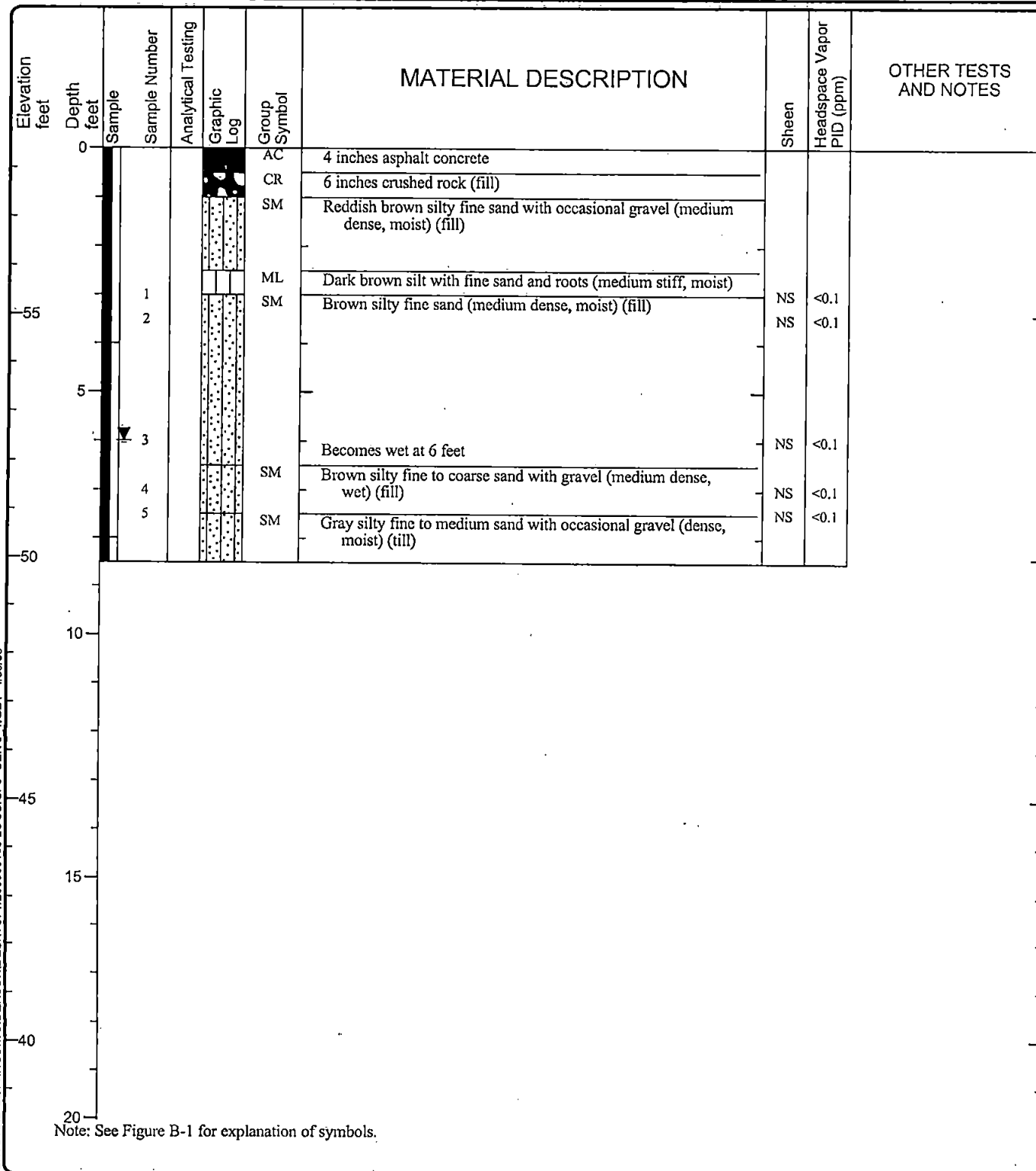
Surface Elevation (ft): 58.48

Date Excavated: 08/22/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 58.40



LOG OF DIRECT-PUSH BORING DP-13

GEOENGINEERS 

Project: Northshore School District

Project Location: Bothell, Washington

Project Number: 12666-001-03

Figure B-13
Sheet 1 of 1

Date Excavated: 08/22/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 58.30

Elevation feet	Depth feet	Sample	Sample Number	Analytical Testing	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	OTHER TESTS AND NOTES
0						AC	4 inches asphalt concrete			
						CR	6 inches crushed Rock (fill)			
						SM	Reddish brown silty fine sand (medium dense, moist) (fill)			
55			1					NS	<0.1	
						SM	Brown silty fine to coarse sand with gravel (medium dense, wet) (fill)			
5			2					NS	<0.1	
			3			SM	Gray silty fine to medium sand with occasional gravel (dense, moist) (till)	NS	<0.1	
50			4					NS	<0.1	
10										
45										
15										
40										
20										

Note: See Figure B-1 for explanation of symbols.

LOG OF DIRECT-PUSH BORING DP-14



Project: Northshore School District

Project Location: Bothell, Washington

Project Number: 12666-001-03

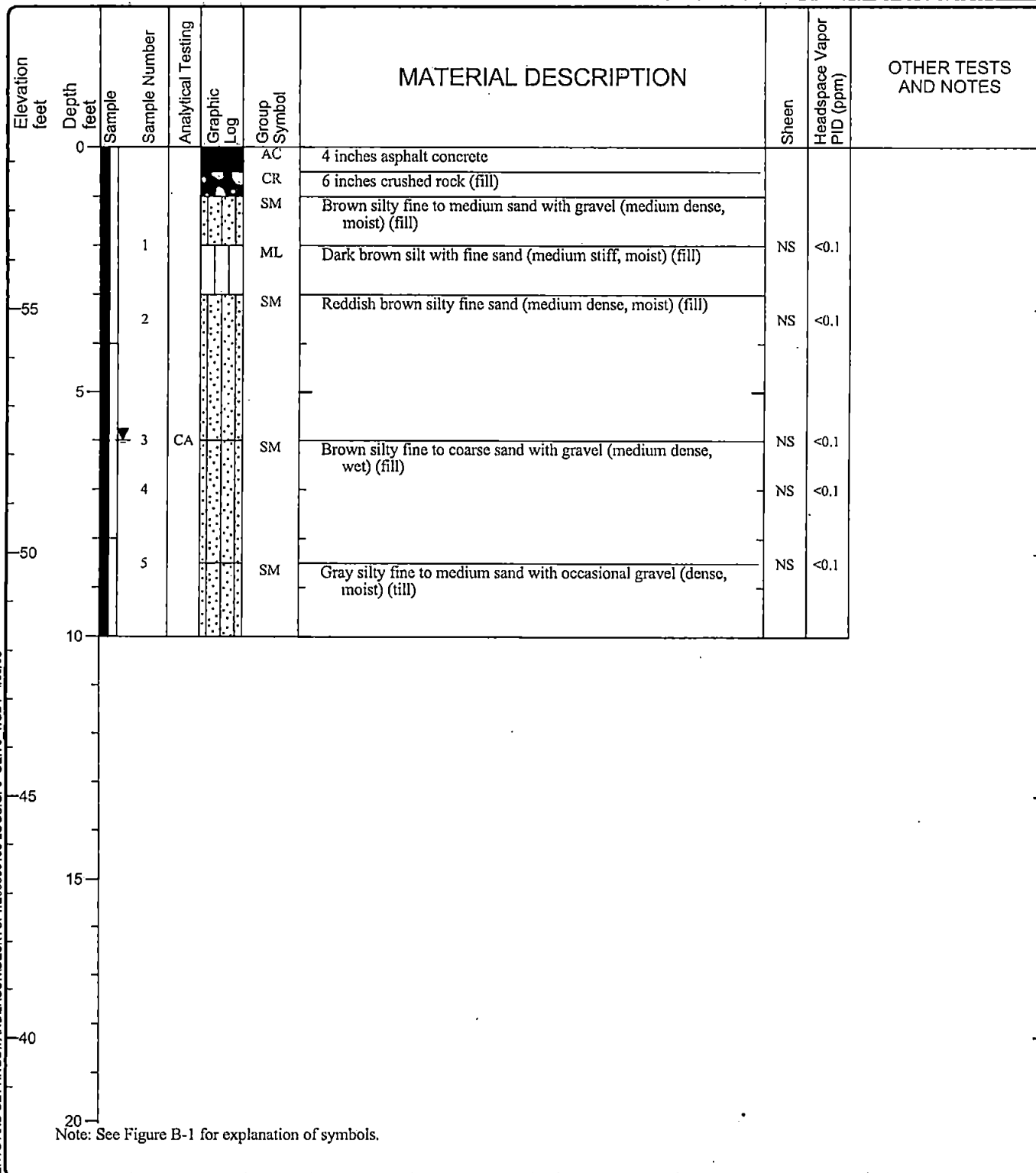
Figure B-14
Sheet 1 of 1

Date Excavated: 08/22/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 58.30



LOG OF DIRECT-PUSH BORING DP-15

GEOENGINEERS

Project: Northshore School District
Project Location: Bothell, Washington
Project Number: 12666-001-03

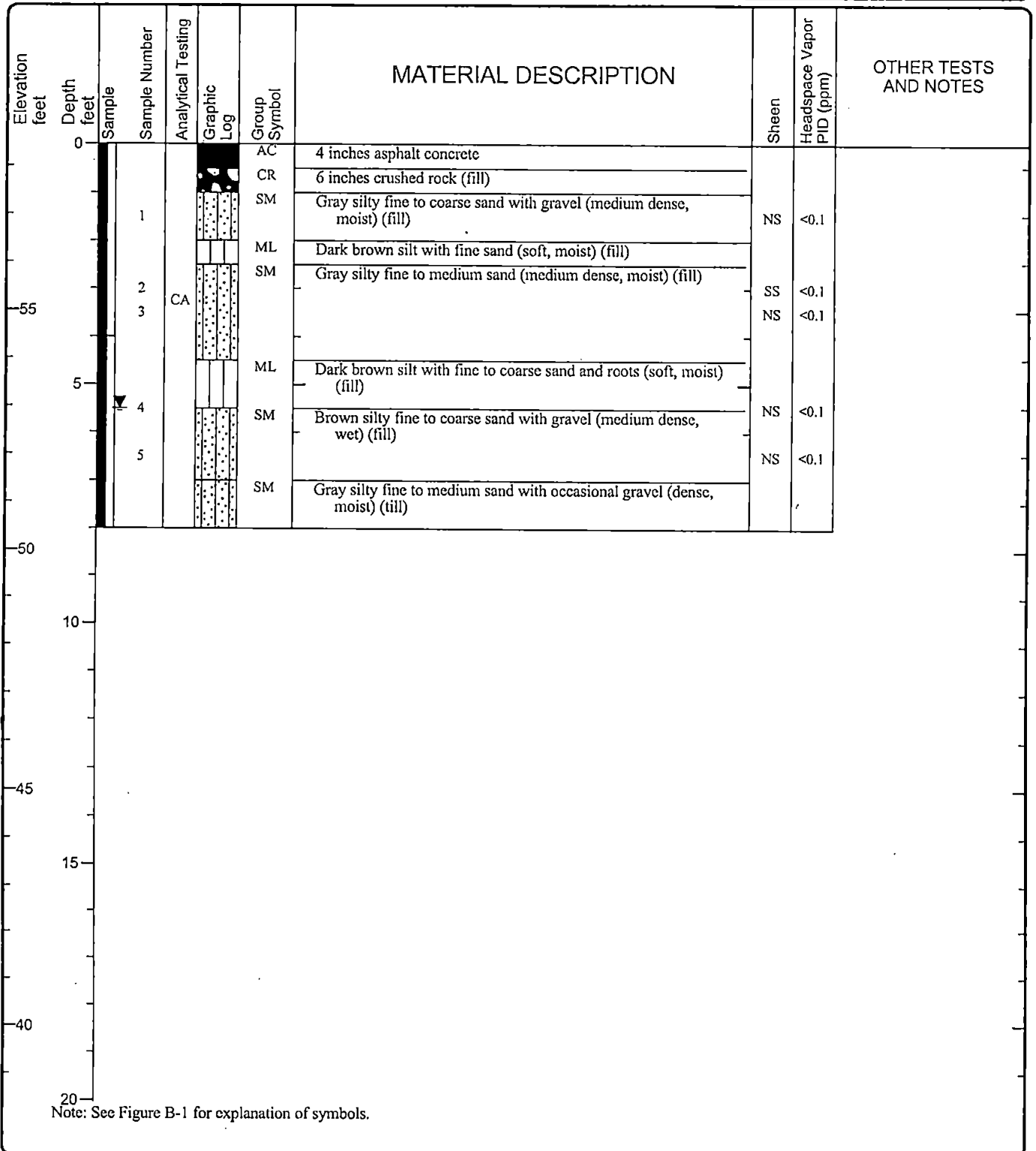
Figure B-15
Sheet 1 of 1

Date Excavated: 08/22/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 58.45



LOG OF DIRECT-PUSH BORING DP-16

GEOENGINEERS

Project: Northshore School District
 Project Location: Bothell, Washington
 Project Number: 12666-001-03

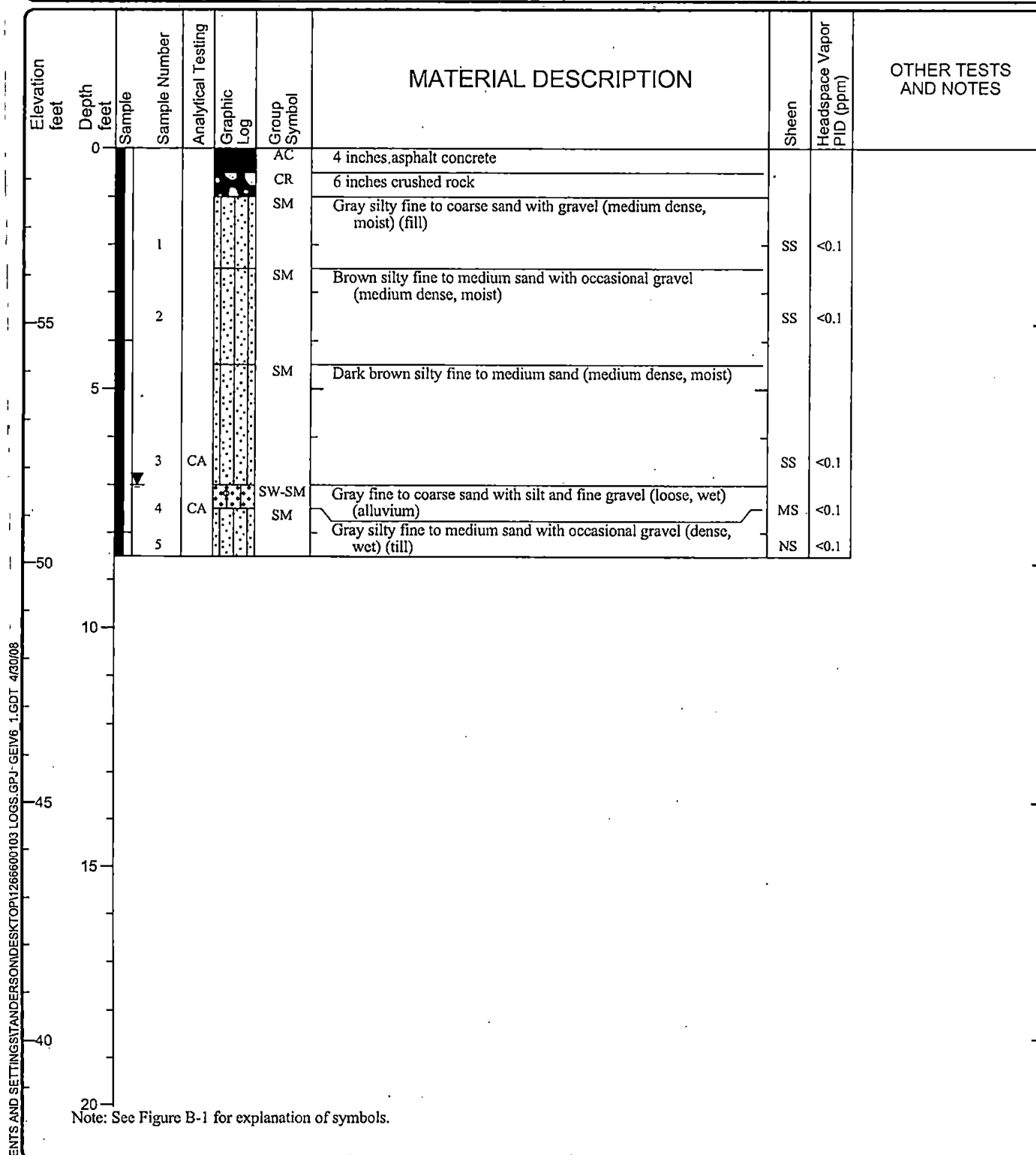
Figure B-16
 Sheet 1 of 1

Date Excavated: 08/22/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 58.65



LOG OF DIRECT-PUSH BORING DP-17

GEOENGINEERS

Project: Northshore School District
Project Location: Bothell, Washington
Project Number: 12666-001-03

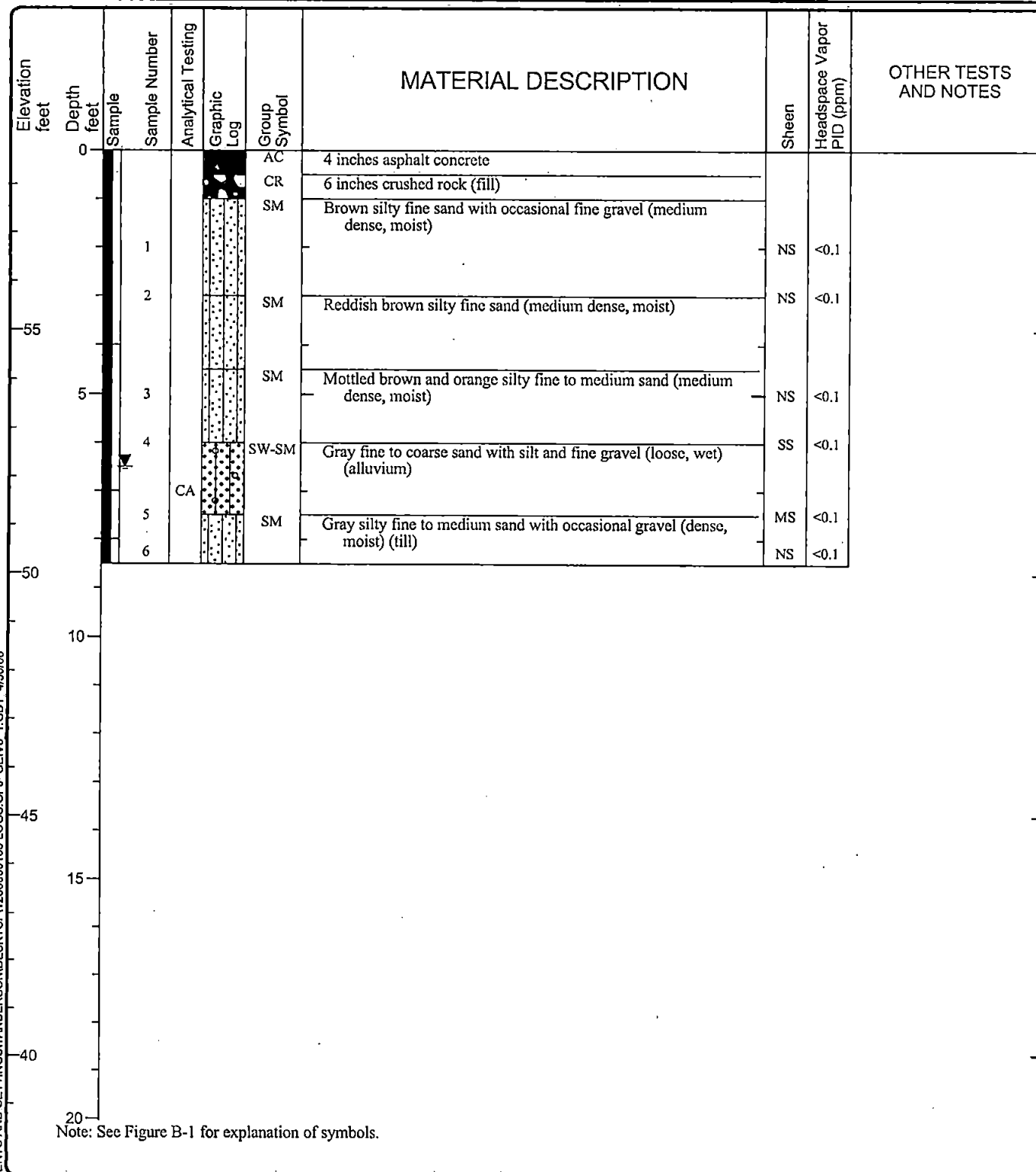
Figure B-17
Sheet 1 of 1

Date Excavated: 08/22/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 58.70



LOG OF DIRECT-PUSH BORING DP-18

GEOENGINEERS

Project: Northshore School District
Project Location: Bothell, Washington
Project Number: 12666-001-03

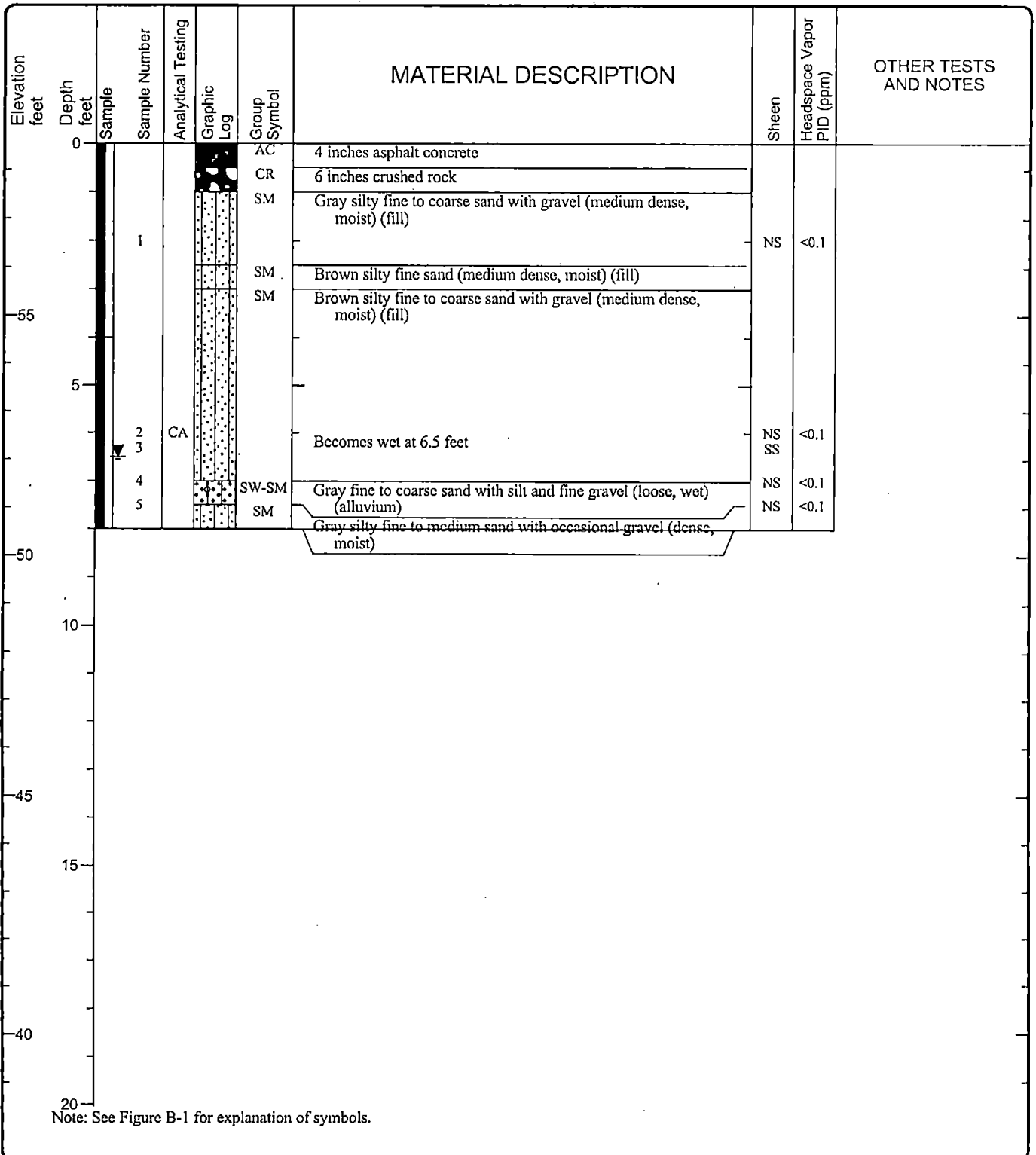
Figure B-18
Sheet 1 of 1

Date Excavated: 08/23/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 58.55



LOG OF DIRECT-PUSH BORING DP-19

GEOENGINEERS

Project: Northshore School District
 Project Location: Bothell, Washington
 Project Number: 12666-001-03

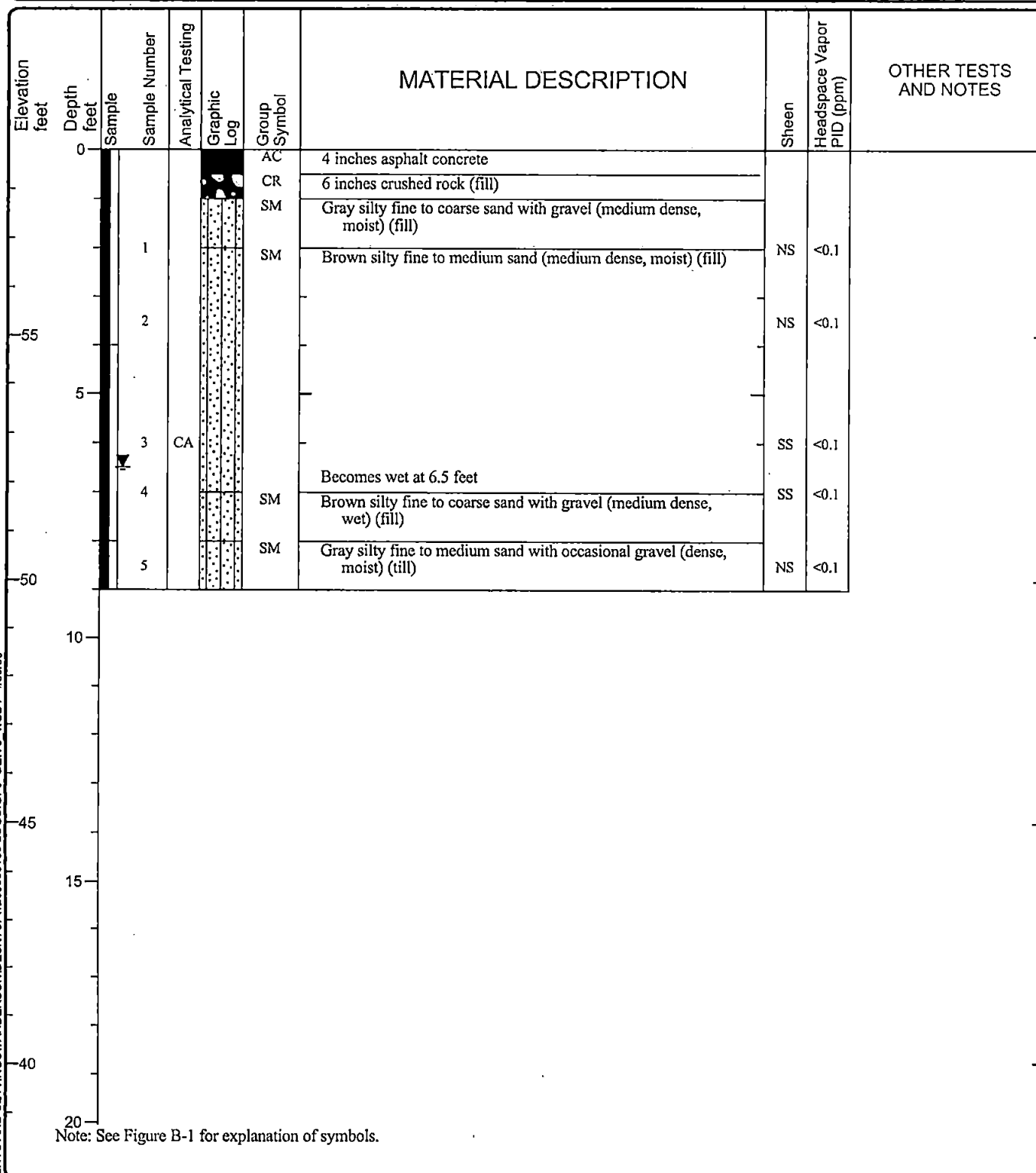
Figure B-19
 Sheet 1 of 1

Date Excavated: 08/23/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 58.80



LOG OF DIRECT-PUSH BORING DP-20

GEOENGINEERS 

Project: Northshore School District

Project Location: Bothell, Washington

Project Number: 12666-001-03

Figure B-20
Sheet 1 of 1

Date Excavated: 08/23/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 58.60

Elevation feet	Depth feet	Sample Number	Analytical Testing	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	OTHER TESTS AND NOTES
0					AC	4 inches asphalt concrete			
					CR	6 inches crushed rock (fill)			
		1			SM	Gray silty fine to coarse sand with gravel (medium dense, moist) (fill)			
					SM	Brown silty fine to medium sand (medium dense, moist) (fill)	NS	<0.1	
55									
	5	2					NS	<0.1	
		3			SM	Brown silty fine to coarse sand with gravel (medium dense, wet) (fill)	NS	<0.1	
					SW-SM	Gray fine to coarse sand with fine gravel (loose, wet) (alluvium)			
50		4					NS	<0.1	
		5			SM	Gray silty fine to medium sand with occasional gravel (dense, moist) (till)	NS	<0.1	
10									
45									
	15								
40									
20									

Note: See Figure B-1 for explanation of symbols.

LOG OF DIRECT-PUSH BORING DP-21

GEOENGINEERS



Project: Northshore School District
 Project Location: Bothell, Washington
 Project Number: 12666-001-03

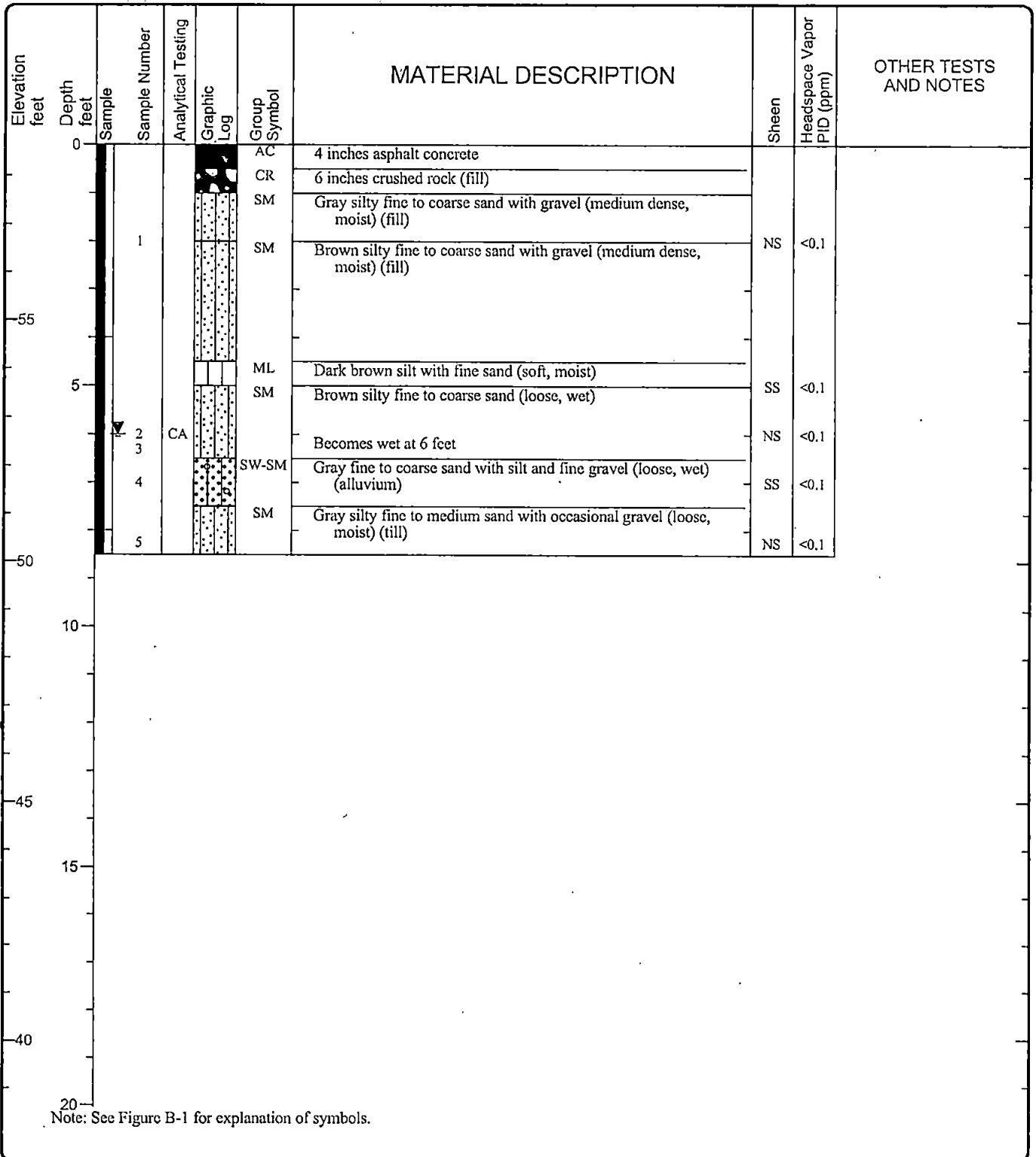
Figure B-21
 Sheet 1 of 1

Date Excavated: 08/23/07

Logged by: MCL

Equipment: _____

Surface Elevation (ft): 58.65



LOG OF DIRECT-PUSH BORING DP-22



Project: Northshore School District
 Project Location: Bothell, Washington
 Project Number: 12666-001-03

Figure B-22
 Sheet 1 of 1

Date Excavated: 08/23/07

Logged by: MCL

Equipment: _____

Surface Elevation (ft): 58.82

Elevation feet	Depth feet	Sample	Sample Number	Analytical Testing	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Sheen	Headspace Vapor PID (ppm)	OTHER TESTS AND NOTES
0						AC	4 inches asphalt concrete			
						CR	6 inches crushed rock (fill)			
			1			SM	Gray silty fine to coarse sand with gravel (medium dense, moist) (fill)	NS	<0.1	
			2			SM	Brown silty fine to coarse sand with gravel (medium dense, moist)	NS	<0.1	
55										
	5									
			3			SW-SM	Gray fine to coarse sand with silt and fine gravel (loose, wet) (alluvium)	NS	<0.1	
						SM	Gray silty fine to medium sand with occasional gravel (dense, moist) (till)			
50										
	10									
45										
	15									
40										
20										

Note: See Figure B-1 for explanation of symbols.

LOG OF DIRECT-PUSH BORING DP-23



Project: Northshore School District
 Project Location: Bothell, Washington
 Project Number: 12666-001-03

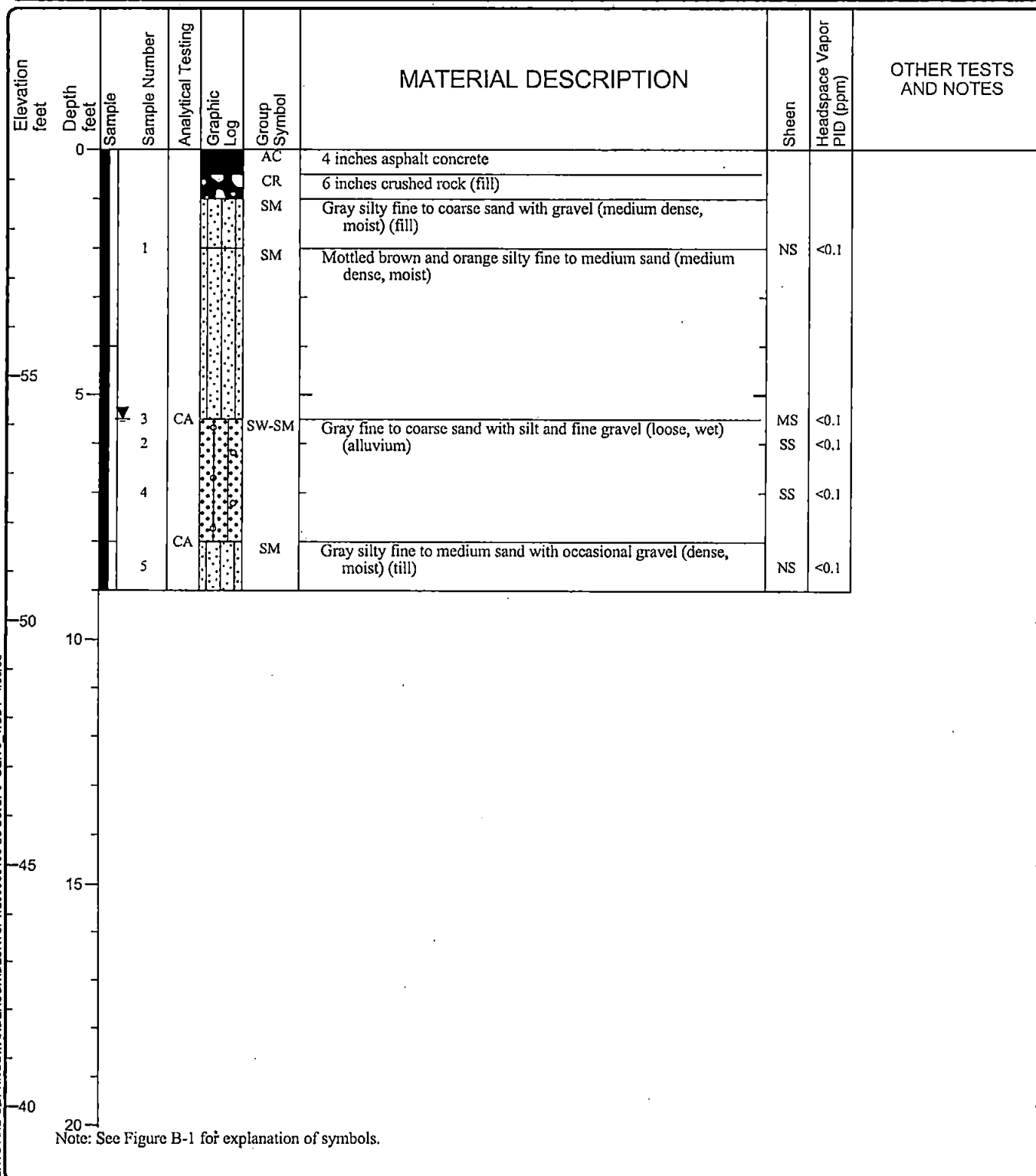
Figure B-23
 Sheet 1 of 1

Date Excavated: 08/23/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 59.62



LOG OF DIRECT-PUSH BORING DP-24



Project: Northshore School District
Project Location: Bothell, Washington
Project Number: 12666-001-03

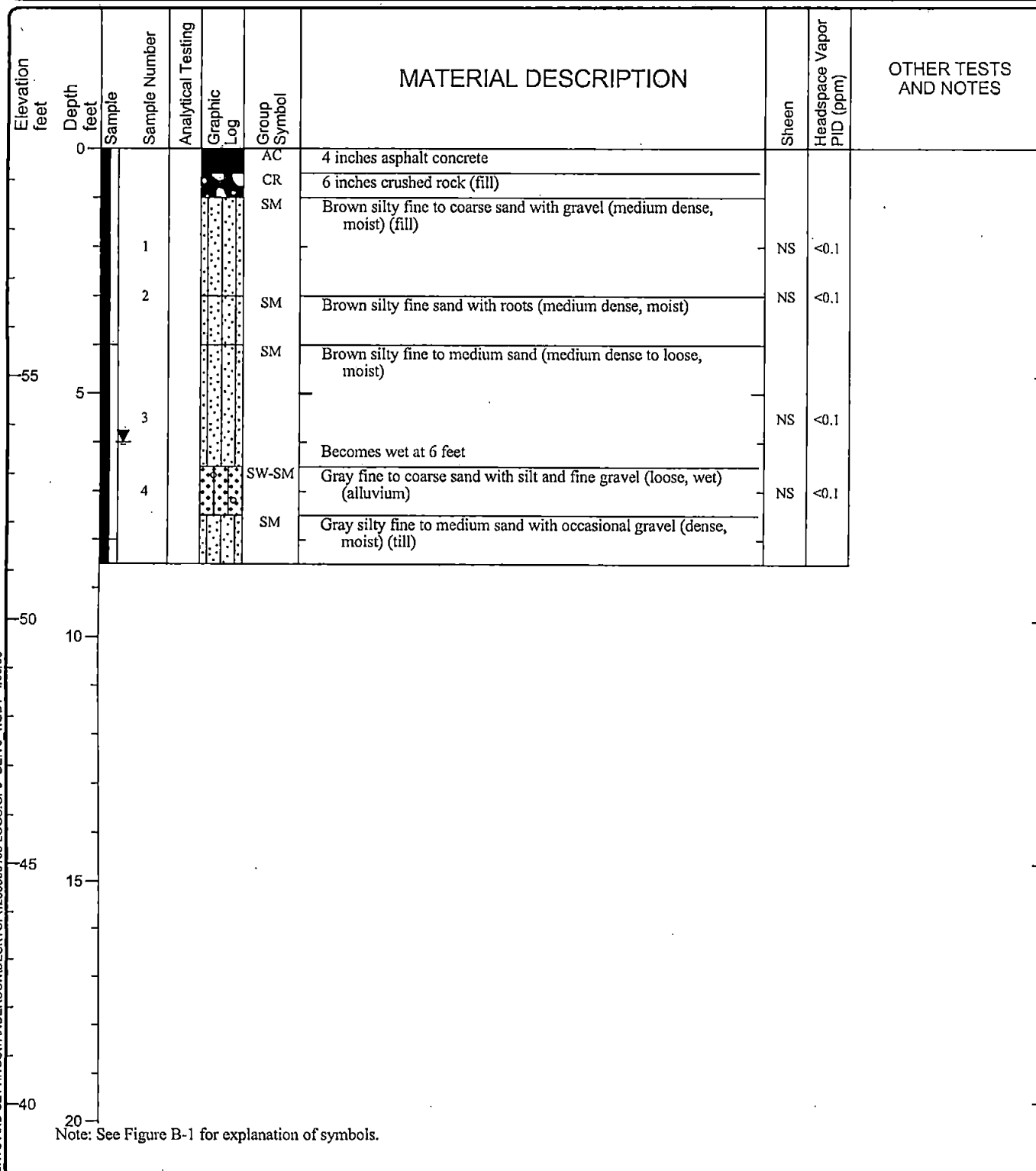
Figure B-24
Sheet 1 of 1

Date Excavated: 08/23/07

Logged by: MCL

Equipment:

Surface Elevation (ft): 59.65



LOG OF DIRECT-PUSH BORING DP-25



Project: Northshore School District

Project Location: Bothell, Washington

Project Number: 12666-001-03

Figure B-25
Sheet 1 of 1