PES Environmental, Inc.
Engineering & Environmental Services

May 8, 2018

1358.001.01

Mr. Christopher Maurer
VCP Site Manager – Toxics Cleanup Program
Washington Department of Ecology
P.O. Box 47600
Olympia, Washington 98501

REMEDIAL ACTION WORK PLAN AND STATUS REPORT SUBMITTALS
MANHATTAN VILLAGE SHOPPING CENTER AND HARRIS PROPERTIES
VCP NO. NW1873
NORMANDY PARK, WASHINGTON

Dear Mr. Maurer:

PES Environmental, Inc. (PES) is submitting the attached Remedial Action Work Plan and two semi-annual status report on behalf of Manhattan Tenants In Common (Manhattan TIC) and the Harris Family, LTD (Harris Family) regarding the following Site:

- **Ecology Site Name:** Normandy Park PCE
- **Site Address:** 17817-17825 & 17835 1st Avenue S, Normandy Park, Washington 98148
- **Facility/Site No.:** 4181060
- **Cleanup Site No.:** 3214
- **VCP Project No.:** NW1873

The following reports are attached for your review:

- PES Environmental, Inc. 2016. *Remedial Action Work Plan, Manhattan Village Shopping Center and Harris Properties, VCP NW1873, Normandy Park, Washington.* October.

- PES Environmental, Inc. 2017. Status Report – October 2016 through April 2017, *Manhattan Village Shopping Center and Harris Properties, Normandy Park, Washington.* July 19.

- PES Environmental, Inc. 2018. Status Report – May 2017 through October 2017, *Manhattan Village Shopping Center and Harris Properties, Normandy Park, Washington.* January 18.

REMEDIAL ACTION WORK PLAN

As you are aware, we had previously submitted the Remedial Action Work Plan to Ecology on October 17, 2016, and requested Ecology's opinion that the actions described in the report met the substantive requirements contained in MTCA and its implementing regulations for characterizing and addressing the contamination at the Site. You provided us with one comment in an e-mail dated May 8, 2017, and Mike Staton of SLR International Corporation and I met with you to discuss the report and comment on May 16, 2017 in Ecology's Lacey, Washington office. The following is a summary of the comment and our response:

Ecology Comment dated May 8,2017:

> *"Sections 3.3.3 and 4.3 – the sections are inconsistent with Appendix F. The sections state that a terrestrial ecological (TE) evaluation exclusion was applied for while Appendix F states that a simplified TE evaluation was performed. Please review the first three bulleted exclusions of step 3A(2) of the TEE form for applicability. If you have any questions, please contact me."*

Response:

We reviewed the bulleted exclusions on Step 3A(2) and confirmed that the Site does not qualify for a TEE exclusion, and we verified that the simplified TEE was appropriately applied. As shown on the TEE form in Appendix F, per Washington Administrative Code (WAC) 173-340-7492(2)(c), the simplified TEE process ended after determining in Step 3B(5) that none of the hazardous substance listed in Table 749-2 of WAC 173-340-900 are present in Site soils. Therefore, we have corrected the Remedial Action Work Plan in Section 3.3.3 (on page 22) and Section 4.3 (on page 25) to make the language consistent with the simplified TEE. We have also corrected the third page of the TEE form in Appendix F because we had inadvertently selected the seventh bullet under Step 3B(5) instead of the fourth bullet.

Because these edits are minor, we have elected to insert the three corrected pages into the 2016 Remedial Action Work Plan such that the original report title and date are maintained. The replacement pages include an updated footer (S13500101R_2231R1) to help identify corrected information. No other changes have been made to the report.

STATUS REPORTS

PES completed installation of the air sparging and soil vapor extraction (AS/SVE) systems and start-up in October 2016, and has been performing operation and maintenance (O&M) and performance groundwater monitoring as described in the October 2016 Remedial Action Work Plan. The attached status reports (PES, 2017 and 2018) document the work completed through October 2017.

We will be transmitting copies of all three reports and this cover letter in electronic PDF format separately. This cover letter will be attached to the front of the Remedial Action Work Plan.

If you have any questions regarding this letter, or need any additional information, please feel free to contact me at (206) 529-3980.

Sincerely,

PES ENVIRONMENTAL, INC.

Matthew V. Dahl, P.E.
Senior Engineer

Attachments: Remedial Action Work Plan – October 2016
Status Report – October 2016 through April 2017
Status Report – May 2017 through October 2017

cc: Mr. Harry Grant - Fox Rothschild L.L.P.
Mr. Kenneth Bloch – Keller Rohrback L.L.P

PES Environmental, Inc.
Engineering & Environmental Services

A Report Prepared for:

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REMEDIAL ACTION WORK PLAN
MANHATTAN VILLAGE SHOPPING CENTER AND HARRIS PROPERTIES, VCP NW1873
NORMANDY PARK, WASHINGTON

OCTOBER 2016

By:

Matthew Dahl, P.E.
Senior Engineer

for Deborah H. Gardner
Project Geologist

1358.001.01

TABLE OF CONTENTS

LIST OF TABLES iv
LIST OF ILLUSTRATIONS iv
ABBREVIATIONS v
1.0 INTRODUCTION 1
1.1 Property Description and History 1
1.2 Background 3
1.3 Current and Future Site Use 5
1.4 Report Purpose 5
1.5 Report Organization 6
2.0 SUMMARY OF INVESTIGATIONS AND INTERIM CLEANUP ACTIONS 8
2.1 Site Characterization Investigations 8
2.1.1 Pre-2009 Investigations 8
2.1.2 Investigations from 2009 through 2015 9
2.2 Interim Cleanup Actions 10
2.2.1 Pre-2009 Cleanup Actions 11
2.2.2 Cleanup Actions from 2009 through 2016 12
3.0 SUMMARY OF CURRENT ENVIRONMENTAL CONDITIONS 14
3.1 Geology and Hydrogeology 14
3.1.1 Geology and Soil Conditions 15
3.1.2 Hydrogeology 16
3.2 Nature and Extent of Contamination 17
3.2.1 Soil 18
3.2.2 Groundwater 19
3.2.3 Air 20
3.3 Human Health and Environmental Concerns 20
3.3.1 Contaminant Sources 20
3.3.2 Contaminant Transport Mechanisms 21
3.3.3 Exposure Pathways, Media, and Receptors 22
4.0 BASIS FOR DEVELOPMENT OF CLEANUP ACTION 23
4.1 Cleanup Standards 23
4.2 Areas Exceeding Cleanup Levels 24
4.2.1 Soil 24
4.2.2 Groundwater 24
4.2.3 Indoor Air 25
4.3 Remedial Action Objectives 25
4.4 Remedial Action Evaluation Criteria 25
4.5 Current Property Use Considerations 26
5.0 CLEANUP ACTION DEVELOPMENT 27
5.1 Revised Feasibility Study (2012) 27
5.2 Development of Current Cleanup Action 27
6.0 REMEDIAL ACTION PLAN 28
6.1 Overview of Remedial Action Approach 28
6.2 Description of the Air Sparging and SVE Systems 28

CONTENTS (Continued)

6.2.1 Air Sparging System Components....29
6.2.2 SVE System Components....30
6.2.3 Controls....32
6.2.4 Operation and Maintenance....32
6.3 Performance and Confirmation Sampling....33
6.3.1 Soil....33
6.3.2 Groundwater....34
6.4 Cleanup Action Consistency with MTCA Evaluation Criteria....35
6.4.1 Protectiveness....35
6.4.2 Compliance with Cleanup Standards....35
6.4.3 Compliance with Regulatory Requirements....35
6.4.4 Compliance Monitoring....36
6.4.5 Use of Permanent Solutions to Extent Practicable....36
6.4.6 Restoration Time Frame....37
7.0 SCHEDULE AND REPORTING....38
7.1 Remedial Action Implementation....38
7.2 Reporting....38

TABLES

FIGURES

APPENDIX A REFERENCE LIST

APPENDIX B BORING LOGS AND WELL COMPLETION DATA

APPENDIX C GEOLOGIC CROSS SECTIONS

APPENDIX D SOIL ANALYTICAL DATA

APPENDIX E GROUNDWATER ANALYTICAL DATA

APPENDIX F TERRESTRIAL ECOLOGICAL EVALUATION FORM

APPENDIX G FINAL AIR SPARGING AND SOIL VAPOR EXTRACTION DESIGN

APPENDIX H SAMPLING AND ANALYSIS PLAN

DISTRIBUTION

LIST OF TABLES

Table 1	Summary of Post-Interim Action Soil Sampling Results
Table 2	Summary of Current Groundwater Sampling Results
Table 3	Summary of Indoor Air Sampling Results
Table 4	Soil, Groundwater, and Indoor Air Cleanup Levels

LIST OF ILLUSTRATIONS

Figure 1	Subject Property Location Map
Figure 2	Site Plan
Figure 3	Soil Boring Exploration Locations
Figure 4	Groundwater Exploration Locations
Figure 5	Monitoring Well Locations
Figure 6	Soil Results Relative to Cleanup Levels
Figure 7	Groundwater Elevations and PCE Concentrations in December 2015
Figure 8	Indoor Air Sampling Locations
Figure 9	Conceptual Site Model
Figure 10	Remediation Well Locations

ABBREVIATIONS

Adapt	ADaPT Engineering, Inc.
AS	Air Sparging
Aspect	Aspect Consulting
ASTM	American Society of Testing and Materials
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CSM	Conceptual Site Model
CUL	MTCA Method A Cleanup Level
CVOC	Chlorinated Volatile Organic Compound
DAT	Diffused-Aeration Tank
DCE	Dichloroethene
DGI	Data Gap Investigation
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
ERM	ERM-West Group, Inc.
Farallon	Farallon Consulting, LLC
ft	Foot (or feet)
IHS	Indicator hazardous substances
ISCO	In situ chemical oxidation
Kane	Kane Environmental, Inc.
Manhattan Cleaners	Manhattan Cleaners and Coin-Op Laundry
µg/L	Micrograms per Liter (parts per billion)
mg/kg	Milligrams per Kilogram (parts per million)
MTCA	Model Toxics Control Act
MTIC	Manhattan Tenants In Common
MVSC	Manhattan Village Shopping Center
NAPL	Non-Aqueous Phase Liquid
NAVD 88	North American Vertical Datum, 1988
NC	Neighborhood Center
O&M	Operation & Maintenance
PES	PES Environmental, Inc.
PCE	Perchloroethylene/Tetrachloroethylene
PSCAA	Puget Sound Clean Air Agency
QAPP	Quality Assurance Project Plan
Qva	Vashon Advance Outwash
Qvi	Lawton Clay
Qvr	Vashon Recessional Outwash
Qvt	Vashon Till
Qpff	Fine-grained deposits of pre-Fraser glaciations age
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RW/WP&B	Riddell Williams and Wolfstone Panchot & Bloch

ABBREVIATIONS (CONT'D)

SAP	Sampling and Analysis Plan
SCS	SCS Engineers
SVE	Soil Vapor Extraction
TCE	Trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
USCS	Unified Soil Classification System
VCP	Voluntary Cleanup Program
VOC	Volatile Organic Compound
WAC	Washington Administrative Code
ZOI	Zone of Influence

1.0 INTRODUCTION

PES Environmental, Inc. (PES) has prepared this Remedial Action Work Plan (RAWP) on behalf of Manhattan Tenants In Common (MTIC) and the Harris Family, LTD to describe the final cleanup action to be implemented at the Manhattan Village Shopping Center (MVSC) property located at 17835 First Avenue South (the "MVSC property") and the Harris property located at 17817-17825 First Avenue South in Normandy Park, Washington (the "Harris property"), collectively referred to as the "Property." The term "Site," as used in this report, refers to the locations where contaminants originating from the Property have come to be located. Chlorinated volatile organic compounds (CVOC) have been detected in soil and groundwater at the Site. The location and current features of the Property are shown on Figures 1 and 2, respectively.

The Site has been the subject of numerous remedial investigations and interim remedial actions performed since 1998, the results of which are summarized in three previous submittals to Washington State Department of Ecology (Ecology) under the voluntary cleanup program (VCP). The primary objective of this RAWP is to compile the results of the remedial investigations and interim remedial actions completed to date at the Site, and to present a plan to complete the cleanup at the Site.

Specifically, this RAWP supplements following reports:

- ERM-West's (ERM) February 2009 report entitled *Final Data Gap Investigation Report, Manhattan Village Shopping Center and Harris Properties, 17817-17825 and 17835 1st Avenue South, Normandy Park, Washington* (DGI Report; ERM, 2009a);

- PES's August 2014 letter entitled *Site Status Summary, Manhattan Village Shopping Center and Harris Properties, VCP No. NW1873* (Site Status Summary; PES, 2014d); and

- PES's February 2016 report entitled *Groundwater Monitoring – October 2014 and December 2015, Manhattan Village Shopping Center and Harris Properties, Normandy Park, Washington* (Groundwater Report; PES, 2016).

ERM's 2009 report summarized the remedial investigations conducted through 2008. PES's 2014 letter included a brief summary of the remedial investigations and cleanup actions conducted between May 2009 and August 2014, summarized the status of the Site at that time, and described the planned future cleanup actions. PES's letter also included copies on compact disc of the referenced background documentation describing the post-2009 Site activities. PES's 2016 report summarized current groundwater conditions at the Site.

1.1 Property Description and History

The MVSC and Harris properties are adjacent to the west side of 1st Avenue South, as shown in Figure 2. The Property is situated below the crest of a glacial upland plateau overlooking Puget Sound to the west. Local topography slopes downhill to the north toward a former glacial outwash channel known as Walker Creek Basin. Surface elevations range from approximately

309 to 312 feet (ft) North American Vertical Datum 1988 (NAVD 88) on the MVSC property, and between 307 to 309 ft on the Harris property. The MVSC and Harris properties are separated by a four- to five-ft high retaining wall, and the Harris property surface slopes gently to the north following local topography.

According to King County Assessor records, the Property encompasses three tax parcels associated with multiple addresses and developments in Normandy Park, Washington:

- MVSC Property (Tax Parcel #312304-9091)
  - Vacant Building (Former Dairy Queen), 17827 First Avenue South
  - Four Star Cleaners and Other Retail, 17829-17851 First Avenue South
  - QFC and Four Star Cleaners, 17847 1st Avenue South

- MVSC Property (Tax Parcel #312304-9325)
  - Kids' Country Daycare, 17855 1st Avenue South

- Harris Property (Tax Parcel #312304-9229)
  - Former Manhattan Cleaners (Currently Retail Strip Mall), 17817-17825 1st Avenue South
  - Retail, 17801-17825 1st Avenue South
  - Private Residence, 137 SW 178th Street
  - Private Residence, 145 SW 178th Street

The two MVSC parcels encompass 5.07 acres in area and are developed with four buildings, surrounded by paved parking areas and scattered landscaping. The southernmost building in the shopping center is a single-story QFC grocery store. Kids' Country Daycare facility occupies the building west of the QFC. North of the QFC building is a retail strip mall that houses restaurants, retail shops, and a dry-cleaning facility (Four Star Cleaners). The building located east of the retail strip mall is currently vacant, and previously housed a Dairy Queen restaurant.

The Harris property is located north-adjacent to the MVSC property, and is developed with two residential structures, two single-story commercial buildings, and a storage shed. According to current King County Assessor records, the Harris property consisted of six contiguous tax parcels prior to 1993, when a Quit Claim Deed consolidated the land into one tax parcel encompassing a total area of 3.17 acres. The ground surface near the commercial buildings is a mix of gravel and pavement, the residences include lawns and landscaped areas, and the undeveloped areas include overgrown vegetation and gravel.

A summary of the historical land use of the Property is presented in ERM's 2009 *Final DGI Report* (ERM, 2009a). The following provides a brief summary of the key historical land uses and improvements that pertain to the development of investigation and cleanup actions for the Site:

- Four Star Cleaners facility operated at the MVSC property from approximately 1957 to the present [Riddell Williams and Wolfstone Panchot & Bloch (RW/WP&B), 2012]. Four Star Cleaners installed a closed-loop dry-cleaning machine in approximately 1990 (PES, 2014d), and reportedly discontinued the use of perchloroethylene (PCE) in 2013.

Four Star Cleaners originally discharged wastewater to a septic system located between the QFC and the daycare facility to the west (see Figure 2), and was connected to municipal sanitary sewer at a later, unknown date. Initial remedial investigations of the Property indicated that the side sewer drain upstream from the septic tank/sewer connection point was leaking CVOC-contaminated wastewater to subsurface soil and groundwater. In July 2000, approximately 300 linear ft of the original concrete bell-and-spigot drainpipe were replaced with PVC pipe (SCS, 2000c). The storm drain that parallels the side sewer was not replaced, and was not suspected of leaking, but has not been ruled out as subsurface source of water which has the potential to leach contaminants;

- The Manhattan Cleaners and Coin-Op Laundry (Manhattan Cleaners) facility operated at the Harris property between approximately 1965 and 1975 (RW/WP&B, 2012). Manhattan Cleaners originally discharged wastewater to a septic system located in the southeast quadrant of the Harris property (see Figure 2; ERM, 2009a). The facility reportedly was connected to sanitary sewer in 1967 and the septic system, which consisted of two 500-gallon tanks, was removed in 2006 (Kane 2006c and RW/WP&B, 2012); and

- A domestic well located near the middle of the Harris property served as a domestic and/ or irrigation water supply for the Harris property prior to 2005, when it was decommissioned (RW/WP&B, 2012).

The surrounding off-Property land uses are characterized by a mixture of commercial and multi-family residential developments. The tax parcel situated west-adjacent to the Harris property is developed with residential townhomes. The parcel situated across SW 178th Street to the north is occupied by a Dunn Lumber hardware and lumber store. The four tax parcels located across 1st Avenue South to the east are developed with the Normandy Fair Medical Offices and retail building, Key Bank, a retail strip mall, and a Shell-branded gasoline station and convenience store.

1.2 Background

The Property has been the subject of multiple phases of remedial investigation and interim remedial actions conducted since 1998. Remedial investigation locations are shown on Figures 3, 4 and 5, and remediation well locations are shown on Figure 10. Concentrations of PCE in soil are included in Table 1 and Appendix D – Table 1, and concentrations of PCE in groundwater are included in Table 2 and Appendix E – Table 1. The following is a brief and select chronology:

- Remedial investigation activities commenced in 1998 when SCS Engineers (SCS) confirmed a release of PCE to the subsurface (ERM, 2009). In October 1998, the maximum concentration of PCE in groundwater at the Site was 227 micrograms per liter (µg/L) in well DC-4, which was located near the sanitary side sewer line from the Four Star Cleaners. The maximum concentration of PCE in soil was 35 milligrams per kilogram (mg/kg) beneath the Four Star Cleaners. Other areas of elevated PCE concentrations in soil were observed behind the Four Star Cleaners, and

along the sanitary sewer alignment at locations north and west of the retail strip mall and behind the QFC building;

- Between October 1999 and July 2000, SCS installed and operated a 9-well soil vapor extraction (SVE) system at the Four Star Cleaners and along the side sewer line from the dry cleaner (SCS, 2000c). In November 2000, following SVE system shutdown, the PCE concentration in groundwater at well DC-4 was 64 µg/L, and the maximum concentration of PCE in downgradient wells DC-7 and DC-8 was 130 µg/L;

- In July 2000, approximately 300 linear ft of the leaking sanitary side sewer serving the Four Star Cleaners was replaced with PVC pipe;

- Between 1998 and 2008, multiple phases of remedial investigation were conducted at the Property by SCS, ADaPT Engineering, Inc. (Adapt), Kane Environmental, Inc. (Kane), Farallon Consulting, LLC (Farallon), and ERM;

- In 2006, Kane documented removal of the former septic system at the Harris property (Kane, 2006c);

- In May 2008, Kane and Farallon performed a limited investigation of shallow soil near the former septic system concrete drain lines at the Harris property (PES, 2015);

- In May 2008, ERM's sampling of indoor air at one of the residences at the Harris property ruled out soil vapor and indoor air as a complete exposure pathway at that area of the Site (ERM, 2009a);

- In August 2008, the maximum concentration of PCE in groundwater at the Site was 95.8 µg/L in on-Property well KMW-2, which is located at the southwestern part of the Harris property. The PCE concentration in downgradient well MW-7, at the Dunn Lumber facility, was 22.4 µg/L (ERM, 2009a);

- Between 2009 and 2014, ERM and PES installed and operated a 10-well SVE system at the Property (PES, 2014d);

- In 2011 and 2012, ERM performed performance/confirmatory soil sampling within the SVE influence area and found that soil cleanup in most areas was successful at reducing PCE concentrations to below the cleanup level (CUL);

- In 2011, ERM performed an in situ chemical oxidation (ISCO) pilot tests at the Site (ERM, 2012a);

- In 2012, ERM prepared a Feasibility Study for the Site (ERM, 2012b);

- In 2013, PES performed an air sparging (AS) pilot test at the Site (PES, 2013b);

- In December 2015, the maximum concentration of PCE in groundwater at the Site was 15.1 µg/L in on-Property wells KMW-2 and DC-17. The PCE concentration in

downgradient well MW-7, at the Dunn Lumber facility, was 7.42 µg/L (PES, 2016); and

- In 2016, an AS and expanded SVE system designed to treat residual source area contamination on the Property was installed and operation is expected to begin in October 2016.

1.3 Current and Future Site Use

The Property currently is developed with mixed commercial and single-family residential uses. At the time of this report, no plans for property redevelopment have been communicated to PES. The City of Normandy Park Future Land Use map indicates that the MVSC property and Harris property are zoned Neighborhood Center (NC) (Normandy Park, 2016).

Chapter 18.10 of the Normandy Park Municipal Code states that the purpose of the NC zone "is to combine shopping, business, and personal services activities into cohesive neighborhood focal points that promote pedestrian usage. As secondary uses, professional offices and multiple-family residential uses are encouraged to add vitality to the neighborhood centers…"

1.4 Report Purpose

The primary purpose of this RAWP is to describe the cleanup actions that will be implemented at the Site to remediate Site-related contamination as described in ERM's February 2009 *DGI Report* PES's August 2014 *Site Status Summary,* and PES's February 2016 groundwater monitoring report.

The RAWP has been developed consistent with the requirements of the Model Toxics Control Act (MTCA) under Chapter 70.105D RCW and its implementing regulations provided in Chapter 173-340 of the Washington Administrative Code (WAC). This RAWP includes the elements required in Ecology's Cleanup Action Plan Checklist (Ecology, 2016), and will be submitted to Ecology for review under the VCP together with a request for Ecology's opinion that the actions described herein meet the substantive requirements contained in MTCA and its implementing regulations for characterizing and addressing the contamination at the Site

Specific objectives of this RAWP are to:

- Compile the results of remedial investigations and remedial actions completed to date at the Site since 1998, including work performed and reports prepared since the date of the 2014 submittal;

- Update the Conceptual Site Model (CSM) to include the results of investigation, pilot testing, and remedial actions performed since 2009;

- Define the Remedial Action Objectives (RAOs) for the Site, and provide detailed descriptions of remediation system upgrades and monitoring procedures under implementation since 2014; and,

- Include a Sampling and Analysis Plan (SAP) and a Quality Assurance Project Plan (QAPP) that describe the final phases of performance and confirmation sampling and analysis.

1.5 Report Organization

The remainder of the RAWP is organized into the following six sections:

- **Section 2 – Summary of Investigations and Interim Cleanup Actions.** Section 2 summarizes site characterization investigations and interim cleanup actions completed from 1998 through 2015;

- **Section 3 – Summary of Current Environmental Conditions.** Section 3 summarizes the current environmental conditions at the Site, and is based on the information presented in Section 2. This section includes a summary of the results of the site characterization investigations conducted at the Site, including the geology and hydrogeology, the nature and extent of contamination in soil vapor, soil, and groundwater, contaminant sources, and a CSM including contaminant exposure pathways and receptors;

- **Section 4 – Basis for Development of Cleanup Action Elements.** Section 4 discusses the basis for developing the specific cleanup elements and includes a summary of the media cleanup standards, a description of the areas within each media that exceed CULs, and a description of the cleanup action objectives and the cleanup action evaluation criteria;

- **Section 5 – Cleanup Action Development.** Section 5 provides a conceptual description of the cleanup actions that will be implemented to meet the remedial action objectives;

- **Section 6 – Remedial Action Plan.** Section 6 includes a detailed description of the remedial action approach and a discussion demonstrating that the selected cleanup actions meet the MTCA evaluation criteria;

- **Section7 – Schedule and Reporting.** Section 7 provides a schedule for implementing the selected cleanup actions and describes the reports that will be submitted to Ecology during and after completion of the cleanup actions;

- **Appendix A – References.** Appendix A lists the references used in the development of the RAWP;

- **Appendix B – Boring Logs and Well Completion Data.** Appendix B provides the boring and well logs for subsurface explorations performed at the Site, and includes a well completion data table for monitoring and remediation wells;

- **Appendix C – Geologic Cross Sections.** Appendix C provides updated cross-sections through the Site, that reflect the results of subsurface investigations and well installations completed since 2013;

- **Appendix D –Soil Analytical Data.** Appendix D provides all analytical soil data from 1998 through 2012;

- **Appendix E –Groundwater Analytical Data.** Appendix E provides all analytical groundwater data from 1998 through 2015, and includes charts showing PCE concentrations over time for wells DC-3, DC-4, DC-7, and DC-8; and

- **Appendix F – Sampling and Analysis Plan.** Appendix F provides the SAP for this RAWP. The SAP includes a QAPP.

2.0 SUMMARY OF INVESTIGATIONS AND INTERIM CLEANUP ACTIONS

This section presents the results of previous investigations and interim cleanup actions at the Site between 1998 and 2015. This section is organized into in four subsections:

- Investigations performed prior to ERM's February 2009 *DGI Report* (ERM, 2009a);
- Investigations performed between February 2009 and the date of this RAWP;
- Cleanup actions performed prior to ERM's February 2009 *DGI Report*; and,
- Cleanup actions performed between February 2009 and the date of this RAWP.

Soil boring locations are shown on Figure 3. Groundwater sampling locations, including reconnaissance samples collected from temporary well-points, are shown on Figure 4. Figure 5 shows the locations of the monitoring wells.

2.1 Site Characterization Investigations

Investigations conducted between 1998 and 2015 progressively documented the subsurface geology and hydrogeology, characterized groundwater quality and flow direction, and related historical operations, septic systems, and sanitary and storm sewer lines to observed distributions of PCE and related compounds in soil and groundwater at the Site. The cumulative observations from these investigations were used to refine the CSM for the Site.

2.1.1 Pre-2009 Investigations

ERM's 2009 *DGI Report* provides a summary of subsurface investigations and remedial investigations conducted from 1998 through 2008 by Aspect Consulting (Aspect), Adapt, Farallon, Kane, and SCS. A list of available reports for the Site is included in Appendix A. The previous soil and groundwater data are included in Appendices D and E.

Subsurface investigations confirmed the presence of volatile organic compounds (VOCs) in vadose-zone soil and groundwater at the Site, documented the lateral and vertical extents, and documented indoor air sampling results. The results of subsurface investigations confirmed releases of VOCs to groundwater and vadose-zone soil, due to historical PCE use and dry-cleaning operations at the MVSC property and at the Harris property. Specifically, PCE was detected in vadose zone soils at both properties at concentrations greater than the MTCA Method A CUL for soil of 0.050 milligrams per kilogram (mg/kg). Soil impacts were located along and in the vicinity of the sanitary side sewer and storm sewer alignments on the MVSC property and near the former septic tanks on the Harris property. The primary mechanisms of release were wastewater discharge to the former septic tank system on the Harris property (removed in 2006), wastewater discharge to the suspected septic tank system on the MVSC property (converted to sanitary sewer at an unknown date), and associated suspected wastewater leakage from the drainpipes on the MVSC property.

The results of groundwater monitoring confirmed that dissolved PCE in groundwater extended north from the vicinity of the Four Star Cleaners facility and former sanitary sewer line, and north beneath the Harris property, to the Dunn Lumber property located across Southwest 178th Street. Between 1998 and spring 2007, concentrations of dissolved PCE in groundwater samples collected from Site monitoring wells ranged from non-detect up to 227 µg/L.

Air samples collected in 2008 both inside and adjacent to a residence at the southern edge of the Harris property did not contain detectable concentrations of PCE.

By the date of ERM's *DGI Report* in February 2009, the lateral and vertical extents of VOCs in soil had been defined, and the south (upgradient), east, and west extents of VOCs in groundwater had been defined; however, the north (downgradient) extent of PCE in groundwater had not been defined. Initial groundwater quality data for the Dunn Lumber facility indicated a concentration of 10 µg/L in a groundwater sample collected from a water supply well, which was later decommissioned. The MTCA Method A CUL for PCE in groundwater is 5 µg/L. The location of the former water supply well at the Dunn Lumber facility is shown on Figure 2.

2.1.2 Investigations from 2009 through 2015

Investigations conducted from 2009 to 2015 encountered subsurface conditions that generally were consistent with the established CSM, and also documented improvements to subsurface soil and groundwater quality as a result of the previous interim actions.

2010 Groundwater Sampling and 2011 Monitoring Well Installation and Sampling. ERM conducted groundwater sampling in March, April, and November 2010. ERM also installed and sampled monitoring wells MW-10 and MW-11 in February 2011 to serve as performance monitoring wells for a pending in-situ chemical oxidation (ISCO) pilot test (see Section 2.2.2). The March and April 2010 results were documented in a semiannual groundwater monitoring report (ERM, 2010), and the November 2010 and February 2011 results were documented in a groundwater sampling and well installation report (ERM, 2011b).

ERM also prepared a *Final Site Remediation Progress Summary* letter report (ERM, 2011a) that summarized the SVE system performance and included the most recent monthly O&M report, summarized the March 2010 groundwater monitoring activities and included the groundwater monitoring report, and presented the November 2010 groundwater monitoring data in a data table.

2011 and 2012 Soil Investigations to Document Interim SVE System Performance. ERM drilled nine soil borings (SB-1 through SB-9) in April 2011, March 2012, and April 2012 to document the performance of the SVE system in areas where PCE-impacted soil above the MTCA Method A CUL of 0.050 mg/kg had been observed prior to SVE system operation. Soil borings SB-1, SB-3 through SB-6, and SB-8 were installed along the side sewer alignment that wraps around the northwest corner of the building that houses the Four Star Cleaners; soil borings SB-2 and SB-7 were installed near the former septic tank on the Harris property; and soil boring SB-9 was installed inside the Four Star Cleaners building near the dry-cleaning machine (see Figure 3). Each of the borings were sampled at several depths in the vadose zone, and PCE was either not detected, or was detected at concentrations well below the PCE CUL indicating

successful soil remediation within a significant portion of the interim SVE operating area. The soil sample results are presented in Table D-1 in Appendix D.

2012 Monitoring Well Installation and Sampling. ERM installed groundwater monitoring wells MW-12 through MW-15 in March 2012. Wells MW-12 and MW-13 were installed on the MVSC property, and MW-14 and MW-15 were installed on the Harris property (see Figure 5). The wells were sampled in April 2012 as part of a full round of groundwater monitoring, and the analytical results are tabulated and summarized on an isoconcentration map in the *Revised Feasibility Study* report (Figure 4; ERM, 2012b).

May 2013 Well Installation and Sampling. PES installed monitoring well MW-16 and AS pilot test well AS-1 on May 16 and 17, 2013. MW-16 was installed to further delineate the extent of PCE impacted shallow groundwater northeast of MW-11 on the Harris property (see Figure 5). AS-1 was installed in the southwest portion of the Harris property (see Figure 3). Groundwater monitoring and sampling was conducted from May 28 through May 31, 2013. The results indicated similar and slightly lower PCE concentrations than the April 2012 data. The PCE concentration in newly installed well MW-16 was 2.5 µg/L, below the MTCA Method A CUL of 5 µg/L in groundwater. These activities were documented in PES's *Revised May 2013 Well Installation and Groundwater Monitoring Report* (PES, 2013c).

April 2014 Limited Groundwater Sampling. PES conducted a limited groundwater monitoring and sampling event in April 2014 to evaluate the effects on PCE concentrations in groundwater after temporarily shutting down SVE points SVE-5 through SVE-10 for a period of 8 weeks prior to the sampling event. Groundwater samples were collected from wells MW-2, MW-15, DC-11, DC-12, DC-13, DC-20, and KMW-9. Potential rebound of the PCE concentrations was not observed. The results are summarized in PES's *Groundwater Monitoring – April 2014* letter report (PES, 2014b).

October 2014 and December 2015 and Groundwater Sampling. PES shut down the entire SVE system in October 2014 due to planned SVE system upgrades and construction of the source area AS system. Groundwater samples were collected from 28 wells at and surrounding the Site, and included evaluation of potential rebound effects in wells MW-2, MW-15, DC-11, DC-12, DC-13, DC-20, and KMW-9. A comparison of groundwater analytical results from October 2014 and December 2015 indicated that effects of rebound were again not observed. Furthermore, PCE concentrations in the downgradient, off-Property well MW-7 decreased from 20 to 7.42 µg/L between October 2014 and December 2015. The results are summarized in PES's *Groundwater Monitoring – October 2014 and December 2015* letter report (PES, 2016).

2.2 Interim Cleanup Actions

Cleanup actions at the Site commenced in 1999 with the installation of a 9-well interim SVE system at the MVSC property. SVE technology has been the preferred remedial technology for the Site, supplemented with selective excavation in the vicinity of the septic tank at the Harris property and the side sewer plumbing at the MVSC property.

Engineering pilot tests were performed in 2011 and 2013, and a second, interim SVE system was operated from 2009 through 2014. Data collected from these pilot tests and remedial actions

were used to design upgrades to the SVE system, and to evaluate feasibility of alternative technologies, such as ISCO and AS.

2.2.1 Pre-2009 Cleanup Actions

1999 to 2000 Interim SVE System. SCS implemented limited soil remediation by installing and operation a SVE system at the MVSC property between October 1999 and July 2000. The SVE system operation was terminated and decommissioned (sometime between July and October 2000) prior to achieving the PCE CUL in soil (ERM, 2012b). Results of this initial phase of remediation indicate that the system recovered a significant mass of CVOCs from Site soils; however, due to errors in historical reporting, it is difficult to quantify the actual mass removal. The period of SVE system operation correlates with a significant drop in subsequent PCE concentrations in groundwater across much of the Site, but available soil quality data were insufficient to evaluate the overall effectiveness of the original SVE system. A site map showing a layout and construction details of the interim SVE system are included in Appendix D.

Sanitary Sewer Pipe Excavation and Replacement. In 2000, approximately 300 linear ft of concrete side sewer pipe was removed from the MVSC property and replaced with PVC sewer pipe. Site maps showing the excavation and location of bottom sample, and a summary table of sample results are included in Appendix D.

The former septic tank and drain field associated with the MVSC property was dismantled in the early 1970s (SCS, 1999b). The former septic tank reportedly consisted of a large concrete catchment that was demolished in place, and a 1998 geophysical survey conducted by SCS confirmed the presence of buried concrete (or rock) debris at the former septic tank location. The drain field is reportedly still in place west of the former catch basin location. PCE has been detected above the CUL in soil samples collected within the vicinity of the former septic tank and associated inlet piping at concentrations as high as 2.2 mg/kg. A soil sample collected within the drain field was non-detect for PCE. Site maps and data tables from sampling near the former septic tank and drain field test pit sampling are included in Appendix D. Current soil samples collected during the 2014 installation of the AS and SVE wells near the former septic tank indicate that PCE impacts persist in the vadose zone as high as 0.094 mg/kg (see Table 1).

Septic Tank Excavation and Removal. In 2006, the septic tanks located on the Harris property were removed (ERM, 2009a). PCE and related CVOCs were detected in the sludge inside the tanks, as well as in soils near the tanks. Approximately 37 tons of soil and concrete were removed from the vicinity of the septic tanks and disposed off-Site. After soil removal activities were complete, no CVOCs were detected above their respective CULs in the soil confirmation samples that were collected from the limits of the excavation. However, supplemental sampling documented up to 0.340 mg/kg PCE in test pit soil samples from the drain field of the former septic system at the Harris property (PES, 2015). Furthermore, soil investigation results at the time indicated that residual PCE impacts persisted in vadose zone soils in the vicinity of the former Manhattan Cleaners facility, at concentrations of up to 0.180 mg/kg. Site maps and data tables from the septic tank excavation and drain field test pit sampling are included in Appendix D.

2.2.2 Cleanup Actions from 2009 through 2016

Cleanup actions undertaken from 2009 through the date of this work plan focused on operation of a second interim SVE system and pilot testing activities in preparation for expansion and upgrades to the SVE system.

2009 through 2014 Interim SVE System Installation and Operation. In 2009, a second SVE system was installed to address residual PCE in soil that was discovered following decommissioning of the first SVE system. The 10-well SVE system was operated as an interim remedial action to address PCE in vadose zone soil along the sanitary sewer alignment and near the former septic system on the Harris property. Locations of the SVE wells SVE-1 through SVE-10 are shown on Figure 2. The SVE system started up in September 2009 and is described in ERM's *Final Soil Vapor Extraction Interim Remedial Action Design and Work Plan* (ERM, 2009b). PCE removal rates have ranged from 0.008 to 0.018 pounds per day and a total of approximately 95 pounds of PCE were removed from September 2009 through March 2014. Groundwater PCE concentrations continued to decline during this time period.

2011 ISCO Pilot Test. ERM conducted an ISCO pilot test in April 2011 in the northwestern corner of the MVSC property and the southwestern corner of the Harris property. The pilot test included injecting a total of 30,000 gallons of 2.5 percent potassium permanganate solution into the groundwater at 15 locations, and conducting three rounds of performance groundwater sampling over six months from May to October 2011. ERM reported that initial performance sampling indicated evidence of potassium permanganate in six of the 15 monitoring wells, and PCE concentrations initially decreased in these wells (DC-4, MW-4, KMW-2, DC-10B, DC-17, and MW-11).

Subsequent rounds of groundwater sampling indicated that PCE concentrations in three of the six wells rebounded to pre-pilot study concentrations (DC-4, KMW-2, and MW-4), and the rebound was assumed to be related to matrix diffusion. Results of the pilot test and groundwater sampling were included in ERM's *In Situ Chemical Oxidation Pilot Study Completion Report* (ERM, 2012a) and in ERM's *Revised Feasibility Study* report (ERM, 2012b).

September 2012 Revised Feasibility Study Report. ERM's *Revised Feasibility Study Report* (ERM, 2012b) summarized the site characterization and pilot testing activities and evaluated seven remedial alternatives. ERM selected source area air sparge/soil vapor extraction (AS/SVE) followed by Site-wide ISCO using potassium permanganate. ERM proposed to install six AS wells within the key source area located northwest of the Four Star Cleaners facility and utilize the existing SVE wells to collect the vapors. The alternative assumed that AS/SVE would be applied to the northwest source area until groundwater sampling demonstrated compliance with the cleanup objectives, or until no further decrease of PCE concentrations in groundwater was observed, and rebound did not occur after the AS/SVE system was shut down. ISCO was to be utilized, if necessary in the northwest source area and in the downgradient portion of the plume beneath the Harris property once the northwestern source area was addressed.

2013 Air-Sparging Pilot Test. PES conducted an AS pilot test on June 20, 2013 to determine the feasibility of air sparging to reduce concentrations of PCE in the saturated zone, and to collect information for design of a full-scale AS system. The AS pilot test consisted of baseline

monitoring of the injection test well AS-1 and four selected monitoring wells (DC-10A, MW-10, KMW-2, and MW-11), and a three-step AS test in AS-1 to assess the aquifer and vadose zone performance of the testing area under different flow rates and pressures.

Based on the results of the pilot test, AS appeared to be a feasible technology for the Site. PES estimated an effective radius of influence of 10 to 15 ft under the pilot test conditions. Observations of site conditions and review of historical data indicated that AS with SVE is likely to remove additional adsorbed and dissolved phase PCE at the Site. The pilot test activities and results were summarized in PES's *Air Sparging Pilot Test* report (PES, 2013b).

3.0 SUMMARY OF CURRENT ENVIRONMENTAL CONDITIONS

This section summarizes the current environmental conditions at the Site and is based on the results of the investigations and interim cleanup actions described in Section 2. This section describes the distributions of PCE in the subsurface, relates the identified PCE sources to the affected media, and identifies potential contaminant exposure migration pathways and receptors. The following summary provides sufficient detail to support the selection of the cleanup action elements described in Section 4.

3.1 Geology and Hydrogeology

The geologic conditions were best described in the SCS *Environmental Assessment Report* (SCS, 1999b) which included a description of local and regional geology. The following is the SCS description of regional geology:

> "The surficial and subsurface deposits in the area surrounding Normandy Park were primarily formed by fluvial, lacrustrine, and direct-ice contact processes attributed to the advance and recession of the Vashon Glacier. The near-surface lithostratigraphic units in Normandy Park – Des Moines area include the Vashon Drift series which consists of the following vertical sequence (top to bottom): Vashon Recessional Outwash (Qvr), Vashon Till (Qvt), Vashon Advance Outwash (Qva), and the Lawton Clay (Qvi). Several deeper regional aquifers and aquitards occur beneath the Vashon Drift Series (AGI, 1995 and Dames & Moore, 1992)."

USGS mapping of the Des Moines quadrangle indicates that the Qvt layer, which normally separates the Qvr from the Qva, is absent southeast of the Site, across 1st Avenue South, where the older Qva deposit is exposed (USGS, 2004). Surficial geology at the Site and throughout the majority of the Walker Creek Basin is mapped as Qvr. USGS indicates that "Deposits of Pre-Fraser glaciation age" underlie the Qva. As a result of alternating depositional and erosional forces in the vicinity of the Site, the oldest stratigraphy is exposed at higher elevations and the youngest deposits have accumulated on the lower surface elevations.

Aspect compiled subsurface geologic information throughout the glacial upland plateau and Des Moines-Normandy Park are and presented the results in the 2005 Seattle-Tacoma International Airport Phase 1 Groundwater Study Report (Aspect, 2005a). Aspect made the following observation of Transition Bed deposits, which include both the Qvi and Pre-Fraser fine-grained deposits:

> "The Lawton Clay is generally not present above about elevation 260 ft in the study area. The maximum deposit elevation was controlled by the height of a spillway that controlled the elevation of the glacial lake that the sediment was deposited into."

The occurrence of hard silt and clay soils at the Site below elevation 260 is consistent with Aspect's summary of the regional occurrence of the Transitional Bed deposits.

3.1.1 Geology and Soil Conditions

Between 1998 and 2009, subsurface soil conditions were investigated and characterized by five different consultant firms: SCS, Adapt, Kane, Farallon and ERM. Soil conditions were logged in general accordance with American Society of Testing and Materials (ASTM) Method D 2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) and assigned a Unified Soil Classification System (USCS) group symbol.

Some variability and discrepancies are apparent in the logging information, level of detail, and USCS group symbol assignments. PES noticed that, in some cases, variability exists even for adjacent borings. PES has attempted to take this into account and interpret the data to be as consistent as possible, Site-wide. In a representative example, a "GM" group symbol (well to poorly graded silty gravel or gravel with silt and sand) was assigned to one sample, while the lithology was described as a gravelly silty sand ("SM" group symbol). In these cases, PES elected to use the lithology description because the description identifies sand as the predominant particle size, which then classifies the soil as an SM. In addition, there were discrepancies on several of the historical boring logs that classified intervals within the deeper portion of the silty sand and sand unit as an "SW" group symbol (well-graded sand), while describing the lithology as a well-sorted (poorly graded) sand ("SP" group symbol). PES elected to use the lithology description in those cases because the interpretation corresponds better with the depositional environment and the other consultant's boring logs. However, in a few cases (i.e. MW-3), the soil descriptions were not detailed enough to modify the original classification, therefore no modifications were made.

PES prepared three geologic cross-sections that span the Property. The soil boring locations are shown on Figure 3, and the cross-section alignments and cross-sections are included in Appendix C as Figures C-1 through C-4. The cross-section interpretations are based on boring logs from the previous investigations by ERM, Farallon, Kane, and SCS, and have been updated to include stratigraphy encountered during the 2016 installation of the air-sparging wells. The cross-sections intersect the areas of historical maximum PCE impacts to soil and groundwater.

The cross sections generally depict the soil conditions that were previously described by SCS (SCS, 1999b; included in Appendix D), although the significant number of soil borings installed since 1999 have allowed a refined interpretation:

- Six to 12 ft of fill were encountered at the Site, primarily as a result of terracing the land for development on a sloping hillside.

- Subsurface investigations at the Site encountered undifferentiated outwash deposits consisting of medium dense to very dense, sand, silty sands, and silts, all with variable gravel. Discontinuous silt and silty, fine sand layers occur in the upper 10 to 20 ft, indicative of a recessional outwash environmental characterized by flowing and standing water. In general, the outwash deposits become very dense and coarser-grained with depth, with cobbly layers at depths over 40 ft below ground surface (bgs). The groundwater table at the Site occurs in these undifferentiated outwash deposits.

- Qvt has not been encountered at the Site, and appears to have been eroded, or never deposited at this location, between the Qva and Qvr.

- Hard silts and clays are encountered below approximate Elevation 260 ft beneath the southern half of the site, and function as a hydrogeologic confining layer beneath the water-bearing outwash deposits. This layer was encountered in many of the air-sparging wells, including wells DC-10A, DC-10B, and MW-8. These hard silts appear to correlate with the Transitional Beds (Aspect 2005a). USGS classifies these hard silts and clays as "fine-grained deposits of pre-Fraser glaciations age (Qpff).

The following clarifications should be considered when reviewing the three cross sections for the Site:

- Many of the previous historical soil borings were not surveyed, so PES interpreted horizontal locations from historical site maps, and estimate elevations based on recent survey of nearby monitoring wells, and or prior survey of the ERM soil borings;

- Final boring logs have not been prepared for soil borings SB-1 through SB-8 and monitoring wells MW-12 through MW-15, so PES interpreted lithology information from information provided on ERM's field logs; and

- Historical groundwater elevations (referenced in ft above NAVD 88) for select wells are shown on the cross sections. In a few cases, only one water elevation was available and depicted as a historical high.

3.1.2 Hydrogeology

Depth to groundwater across the site is variable due to seasonal variation and changes in surface elevations including the four to five ft high retaining wall between the MVSC and Harris properties and topographical changes. In general, depth to water on MVSC property is between 38 and 42 ft bgs, and between 33 and 35 ft bgs on western side of the Harris property and 37 to 40 ft bgs on the eastern side of the Harris property. Groundwater depth becomes more shallow downgradient of the Property due to northward sloping topography. Historical water level monitoring data is included in Appendix E, Table E-2.

The groundwater flow direction has historically been toward the north with localized vectors ranging from north-northeast to north-northwest. A former domestic/irrigation well located near the middle of the Harris property was decommissioned in 2005; prior to that time, localized vectors were attributed to the effects of pumping from the former well. Reported gradients on the Property have ranged from 0.004 to 0.006 ft/ft, with gradients increasing significantly north of the Property (0.028 ft/ft).

ERM reported that the increased gradient corresponds with a thinning of observed aquifer thickness from greater than 15 ft on the Property to between 2 to 3 ft in MW-8 and MW-9 in 2008 located downgradient of the Property. The observed changes between on-Property aquifer and off-Property aquifer thickness and gradients have remained consistent through December 2015.

SCS documented relatively equal groundwater elevations in nearby shallow and deeper well pairs MW-9A/-9B and MW-10A/-10B (both screened in the shallow perched water bearing zone) indicating a minimal vertical hydraulic gradient in the variable recessional outwash deposits.

SCS also conducted groundwater recovery tests in November 1998 in monitoring wells DC-1 and DC-4, and slug tests in April 1999 in monitoring wells DC-9B and DC-10B. Estimated hydraulic conductivities ranged from 1.3×10^{-3} to 5.5×10^{-2} centimeters per second (cm/s).

3.2 Nature and Extent of Contamination

This section describes the current nature and extent of contaminants detected in indoor air, soil, and groundwater media. The description is based on air samples collected in 2008 from the residence on the Harris property, confirmation soil samples collected in 2011 and 2012 from the zone of influence (ZOI) of the interim SVE systems, older (pre-2009) characterization soil samples collected in areas which have not yet been confirmed and/or are outside of the interim SVE ZOI, soil samples collected during AS/SVE system construction (2014), and the most recent round of groundwater sampling (PES, 2016). Summaries of laboratory analytical results for environmental samples collected at the Site are included with this report:

- Table 1 – Summary of Post-Interim Action Soil Sampling Results from AS wells AS-2 through AS-31 and SVE wells SVE-14 through SVE-19 (September and October 2014)
- Table 2 – Summary of Current Groundwater Sampling Results (December 2015)
- Table 3 – Volatile Organic Compounds In Air Samples (May 2008)
- Appendix D, Table 1 – Historical Summary of Soil Analytical Results (1998-2012)
- Appendix E, Table 1 – Historical Summary of Groundwater Analytical Results (1999-2015)

Based on the site investigations conducted to date, the primary contaminant of concern is PCE. PCE's common degradation products are trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-DCE, 1,1-DCE, and vinyl chloride. Although, trace concentrations of TCE, 1,1-DCE, and cis-1,2-DCE have been detected in subsurface media; the infrequency of detection and disproportionately low concentrations indicate that the subsurface environmental is well oxygenated and that significant reductive dechlorination is not occurring at the Site.

Trace concentrations of VOCs unrelated to PCE also have been detected in subsurface media; these include benzene, toluene, ethylbenzene, xylenes (BTEX) and other typical parking lot runoff related VOCs in soil; toluene, acetone, and chloroform in groundwater; and 1,1,1-trichloroethane, methylene chloride and trichlorofluoromethane in indoor air (ERM, 2009). None of these constituents were detected at concentrations exceeding potentially applicable CULs.

The 2009 *DGI Report* (ERM, 2009a) and 2012 *Revised Feasibility Study Report* (ERM, 2012b) identified PCE as the single indicator hazardous substance (IHS) and discussed using the MTCA Method A CUL as the applicable CUL for the Site. Since detections of other VOCs are infrequent and low concentration, and since reductive dechlorination processes are not actively generating degradation products, the following discussions regarding nature and extent of contamination are limited to PCE. Common degradation products are included in subsequent discussions regarding contaminant migration and exposure pathways. Soil and groundwater sampling locations are shown on Figures 3 and 4, respectively. Figure 6 features the approximate extents of individual areas where concentrations of PCE in soil exceed the CUL, Figure 7 illustrates the area where concentrations of PCE in groundwater exceeded the CUL during the most recent groundwater monitoring event in December 2015, and Figure 8 shows indoor air sampling locations.

3.2.1 Soil

PCE-contaminated soils were removed from the decommissioning and over-excavation of the former septic tanks on the Harris property, and from excavation and replacement of the former concrete drain line at the north end of the MVSC property from behind the Four Star Cleaners unit to the northwest corner of the strip mall building. Additional PCE has been removed through operation of the interim SVE systems, and currently concentrations of PCE in soil that exceed the MTCA Method A CUL are limited to five isolated residual source areas (Figure 6):

- **North and east of the former septic tank behind former Manhattan Cleaners on Harris property.** As described earlier, the former septic tank and surrounding soil above CULs was removed in 2006. However, in 2005, PCE impacted vadose zone soil was discovered in four borings located north and east of the former septic tank (KB-1, KB-2, KB-4, and KB-5). PCE impacted soils were encountered at between 15 and 31 ft bgs with a maximum PCE concentration of 0.180 mg/kg in KB-1 (35-36 ft bgs). This area is within the influence of the 2009-2014 interim SVE system and will be within the influence of the pending SVE system.

- **Adjacent to the drain field piping for the former septic tank behind former Manhattan Cleaners on Harris property.** In 2008, test pits were excavated and sampled near the former septic tank drain field to evaluate the limits of PCE impacted soil associated with the drain field. PCE impacted soils were encountered in two 2008 test pit samples (TP-2-4 and TP-5-2.5), with a maximum PCE concentration of 0.340 mg/kg (TP5-2.5). This area is within the influence of the 2009-2014 interim SVE system and will be within the influence of the pending SVE system.

- **Adjacent to monitoring well DC-17 on the Harris property.** In 2007 during drilling of monitoring well DC-17, soil sampling indicated a PCE concentration of 0.077 mg/kg in saturated soil (35-36 ft bgs). The impacted soil is likely due to the groundwater plume, and this area will likely be influenced by operation of the pending AS/SVE system.

- **Behind and east of the Four Star Cleaners on MVSC property and Harris property.** In 2007 PCE impacted vadose zone soil was discovered in two borings

(KGP-1, KGP-2 on MVSC property) and during drilling of monitoring well KMW-9 in both vadose and saturated soil (on Harris property). PCE impacted soils were encountered in the MVSC property soil boring samples from 4 to 38 ft bgs with a maximum PCE concentration of 59 mg/kg (KGP-1 at 8 ft bgs). PCE impacted soils were encountered in the Harris property KMW-9 soil samples from 14 and 40.5 ft bgs with a maximum PCE concentration of 1.8 mg/kg. A saturated soil sample collected at 39-40.5 ft bgs includes PCE at 0.053 mg/kg. This area was within the influence of the 2009-2014 interim SVE system and will be within the influence of the pending SVE system.

- **North and east of the former septic tank on the MVSC property.** This area includes PCE impacted vadose zone soil discovered in 1998 in two borings (BH-5, BH-7) and in 2014 during drilling of air sparging well AS-19. One sample each was collected at BH-5 (2.2 mg/kg) and BH-7 (0.1 mg/kg), and the maximum PCE concentration of PCE in AS-19 was detected at 8 ft bgs (0.094 mg/kg). This area will be within the influence of the pending AS/SVE system.

3.2.2 Groundwater

PCE occurs in the form of dissolved-phase groundwater contamination predominantly within the first 5 to 10 ft below the groundwater table. The results of groundwater monitoring indicate that non-aqueous-phase liquid (NAPL) conditions never formed at the Site. The majority of groundwater monitoring wells at the Site are screened across the upper 5 to 10 ft of the water-bearing zone. Wells DC-5, DC-9B, DC-10B, DC-16, and KMW-5D were installed just above the underlying confining layer, so that PCE concentrations could be documented at the top and bottom of the water-bearing zone. These wells include screens that begin at least 10 ft below water. Detected PCE in historical sampling of deeper screened wells has been below the MTCA Method A CUL of 5 µg/L with the exception of one result in DC-9B (6.4 µg/L in 2001).

The most recent groundwater monitoring events took place in October 2014 and December 2015. PCE concentrations exceeded the MTCA Method A CUL of 5 µg/L in 12 out of 28 wells sampled on October 2014, and in 9 out of 28 wells sampled during December 2015. Maximum concentrations of PCE detected in groundwater at the Site declined from 23 to 15.1 µg/L between the two sampling events. Downgradient concentrations of PCE in groundwater samples collected from downgradient well MW-7 declined from 20 µg/L in October 2014 to 7.4 µg/L in December 2015. In December 2015, PCE exceeded the MTCA Method A CUL in one off-Property monitoring well (downgradient well MW-7) located at the Dunn Lumber facility, and was detected below the CUL in two off-Property monitoring wells, KMW-7, KMW-8, both of which are situated downgradient from the Property.

Monitoring well locations at the Site are shown on Figure 5. Figure 7 depicts the current the lateral extent of PCE in groundwater. Historical groundwater sampling data is included in Appendix E.

3.2.3 Air

In May 2008, ERM performed direct indoor air sampling at the eastern residence on the Harris property (137 SW 178th Street), which is the residence centered over the groundwater PCE plume. ERM collected indoor air samples from the basement/crawlspace and from the living room on the main floor. One background (ambient) sample was collected outdoors. The air sampling locations are shown on Figure 8.

All three samples were collected using 1-liter stainless steel vacuum canisters with no moisture filter and analyzed for halogenated VOCs by EPA Method TO-15. Trace concentrations of several VOCs were detected in one or more samples including 1,1-DCE, methylene chloride, 1,1,1-trichloroethane, and trichlorofluoromethane. Of the four VOCs detected, only 1,1-DCE is potentially related to PCE. 1,1-DCE was detected in the basement sample at 0.48J micrograms per cubic meter ($\mu g/m^3$). The lab flagged the data as an estimated value. This concentration is well below the MTCA Method B CUL (9.62 $\mu g/m^3$).

The concentrations of the other VOCs detected were very low, not related to PCE, and are well below their applicable Method B CULs (Table 3).

3.3 Human Health and Environmental Concerns

This section summarizes the sources of contamination at the Site and the exposure pathways and receptors for contamination present in soil and groundwater. Figure 9 provides an illustration of the CSM with exposure pathways of potential concern.

3.3.1 Contaminant Sources

The results of investigations conducted at the Site have confirmed the presence one contaminant of concern in soil and groundwater: PCE. The following primary sources of PCE have been identified and eliminated from the Site:

- Historical dry-cleaning operations are known sources of PCE at the Site. Manhattan Cleaners operated at the Site between 1965 and 1975, and Four Star Cleaners operations used PCE between approximately 1957 and 2013;

- The former septic system at the Harris property released PCE to the subsurface between 1965 and 1967, which is when Manhattan Cleaners was connected to the municipal sanitary sewer service (RW/WP&B, 2012). The septic tanks and the surrounding PCE-contaminated soil were removed in 2006. Residual PCE impacted soil was discovered near the drain field in 2008;

- The original concrete side sewer piping for the Four Star Cleaners is a known source of PCE between approximately 1957 and July 2000, when the side sewer pipe was replaced;

- The former septic tank and associated inlet piping on the MVSC property is a suspected source of PCE between approximately 1957 and the early 1970s when the former septic system was dismantled and wastewater routed to sanitary sewer.

Secondary sources of PCE include residual PCE adsorbed to vadose zone and saturated soil. Common PCE degradation products such as TCE, 1,1,-DCE, and cis-1,2-DCE either are absent or trace concentrations are detected infrequently, indicating that reductive dechlorination processes are not active at the Site. Vinyl chloride has never been detected in indoor air, SVE effluent air, soil, or groundwater.

3.3.2 Contaminant Transport Mechanisms

The following summarizes the key transport mechanisms that may be active at the Site:

- **Leaching of Contaminants from Unsaturated Soil to Groundwater.** This process includes infiltration of natural precipitation through unsaturated soil, and transport of the contaminants to the saturated zone. This is currently an active transport mechanism primarily as a result of infiltration of precipitation infiltrating through PCE-contaminated soils in the unsaturated zone. The MVSC property is already capped, and in the event that the Harris property is redeveloped in a manner consistent with zoning, then the increased impervious area would render this mechanism inactive;

- **Volatilization from Unsaturated Soil and Groundwater to Indoor Air.** Volatilization of contaminants adsorbed to soil particles in the unsaturated zone transfer into the vapor phase in unsaturated soil. In addition, dissolved-phase contaminants in groundwater can volatize and transfer into the vapor phase in unsaturated soil. The contaminants in the soil vapor can migrate into buildings and occupied spaces above the soil vapor and impact the indoor air. This is an active transport mechanism at the Site; and

- **Advective Transport of Dissolved-Phase Contaminants.** PCE may be sorbed to soil particle surfaces and slowly dissolve into the groundwater at varying rates depending on concentration and changing groundwater elevations. Dissolved PCE then migrates by advection with groundwater flow. Advective transport of PCE is an active transport mechanism at the Site. However, based on the age of contaminant releases (likely 20 to 50 years ago), interim remedial actions undertaken, and groundwater monitoring results, the lateral and vertical extents of PCE in groundwater appear to be declining.

The soil and groundwater data generated during subsurface investigations at the Site indicate that leaching had been a significant migration mechanism before the residual sources were addressed by various interim remedial actions. The current soil and groundwater data suggest that advection in groundwater is the primary transport mechanism at the Site, and the extent of PCE contamination is diminishing.

Reductive dechlorination of PCE into other chlorinated VOCs including TCE, cis-1,2 DCE, and vinyl chloride is another common mechanism for generation of toxic contaminants. However, at this Site, the long-term soil and groundwater data indicate that while trace levels of TCE and cis-1,2-DCE have been detected in soil and groundwater well below their respective CULs, the oxygenated subsurface environment is not conducive to the generation of TCE, cis-1,2-DCE or vinyl chloride. Therefore, degradation of PCE by reductive dechlorination is not a significant fate and transport mechanism at the Site.

3.3.3 Exposure Pathways, Media, and Receptors

Current exposure pathways and receptors for contaminants detected at the Site are summarized below. The potential redevelopment of the Property does not alter the above conclusions regarding soil exposure pathways; in the event that the Property is redeveloped in a manner that is consistent with their current zoning, then impervious buildings or pavement will cover the majority of the land area.

Soil. Soil sampling results indicate that PCE is present in unsaturated soil to depths of approximately 38 ft bgs and in saturated soil observed in two locations. Exposure to occupants or workers through ingestion or direct contact with PCE-contaminated soil during construction or redevelopment activities is not currently a complete pathway because asphalt covers contaminated soil at the MVSC property and fencing controls access to contaminated soil at the Harris property. The ingestion or direct-contact pathway is a potential future pathway.

Groundwater. Groundwater contamination exists on the Property and downgradient in a monitoring well on Dunn Lumber property. Exposure to on-Property and off-Property residents and workers through ingestion of PCE-contaminated groundwater is not currently a complete pathway because there are currently no groundwater supply wells at the Site, and the Site and surrounding is served by municipal drinking water supply. Ingestion of groundwater is a potentially complete pathway if a water supply well were to be installed at some point in the future prior to completion of remediation.

Indoor Air. The indoor air sampling results do not indicate that PCE concentrations in soil and groundwater are affecting indoor air quality in buildings at the site. The results of indoor air sampling in one of the residential buildings at the Harris property (ERM, 2009a) did not show measurable concentrations of PCE in either of the indoor air samples analyzed. Site PCE concentrations in soil and groundwater have continued to decline since 2008, therefore, exposure to PCE in indoor air due to migration of PCE in soil vapors is not a complete exposure pathway.

A simplified terrestrial ecological evaluation was performed, and because no hazardous substance listed in Table 749-2 of WAC 173-340-900 is present in Site soils, it was determined that no further evaluation was required based on the provisions of WAC 173-340-7492(2)(c). A copy of Ecology's Terrestrial Ecological Evaluation Form is included in Appendix F.

4.0 BASIS FOR DEVELOPMENT OF CLEANUP ACTION

This section describes the basis for the development of the selected cleanup action. Specifically, this section summarizes the cleanup standards selected for soil and groundwater that were originally described in ERMs *DGI Report* (ERM, 2009a) and *Revised Feasibility Study* (ERM, 2012b); describes the areas exceeding soil and groundwater CULs; and describes the objectives of the selected cleanup action necessary to address the potential exposure pathways described in Section 3.3.3. Ecology's evaluation criteria and expectations for the selected cleanup action specified in MTCA are summarized in Section 4.4.

4.1 Cleanup Standards

The potential for PCE to breakdown into degradation products, such as TCE, DCE, and vinyl chloride, has been evaluated since remedial investigations began in 1998. Air, soil, and groundwater data indicate that the subsurface environment is adequately oxygenated to retard the generation of PCE degradation products, specifically:

- TCE has not been detected in indoor air or SVE effluent vapors;
- TCE was detected in 5 soil samples and only exceeded its CUL at one location;
- TCE has been detected in groundwater on 5 separate occasions, and the maximum detected concentration was 3.22 µg/L which is below the CUL of 5 µg/L;
- DCE has never been detected in soil or groundwater samples. 1,1-DCE was detected once, in the basement level indoor air sample, at a concentration of 0.48J µg/m^3 (well below the CUL); and
- Vinyl chloride has never been detected in air, soil, or groundwater samples collected at the Site.

Therefore, PCE is the only IHS at the Site. CULs for PCE in air, soil and groundwater are summarized in Table 4, and were developed as follows:

- **Air.** A MTCA Method A CUL has not been established for PCE in air; therefore, the indoor air CUL for the Site was established as the standard MTCA Method B Cancer air CUL. Based on the results of direct indoor air sampling performed in 2009, PCE was not detected in indoor air prior to implementation of the proposed remedial action, and complied with the MTCA Method B indoor air CUL (ERM, 2009a);
- **Soil.** The CUL for soil at the Site was established as the standard MTCA Method A CUL for unrestricted land use. The Method A CUL is also protective of indoor air; and
- **Groundwater.** The CUL for groundwater at the Site was established as the standard MTCA Method A CUL for unrestricted land use. The Method A CUL is also protective of indoor air.

The point of compliance for each medium is identified below:

- **Groundwater Point of Compliance.** The standard groundwater point of compliance is throughout the plume within the Site.

- **Soil Point of Compliance**. The soil point of compliance for protection of human health is throughout the Site to a depth of 15 ft bgs. The point of compliance for the protection of groundwater is throughout the Site down to the uppermost groundwater saturated zone; and

- **Air Point of Compliance**. The air point of compliance is ambient air throughout the Property. The location with the highest potential exposure to PCE in indoor air is in the basement/crawlspace of the residence located at 137 SW 178th Street.

  The current maximum PCE concentration in groundwater (15.1 µg/L, DC-17) is already below the Method B screening level for PCE protective of indoor air (22.9 µg/L). Therefore, Site groundwater is already protective of indoor air and will continue to be protective of indoor air when the MTCA Method A groundwater CUL (5 µg/L) is achieved.

4.2 Areas Exceeding Cleanup Levels

The following subsections summarize the areas where concentrations of IHSs exceed CULs in soil and groundwater.

4.2.1 Soil

Figure 6 graphically depicts the areas where PCE concentrations in soil exceed the CUL of 0.050 mg/kg, or have yet to be evaluated following operation of the SVE system.

4.2.2 Groundwater

Figure 7 graphically depicts the area where PCE concentrations in groundwater exceeded the CUL during the most recent groundwater monitoring event in December 2015. With the exception of well MW-7 at the Dunn Lumber facility, the PCE-contaminated groundwater is confined to the Property.

As described above in Section 3.2.2, there is no evidence that NAPL conditions ever formed at the Site; instead, dissolved concentrations of PCE appear to be confined to the upper 5 to 10 ft of the groundwater column. The vertical distribution of PCE in groundwater is consistent with the CSM, which attributes residual concentrations of PCE in groundwater to leaching mechanism from residual concentrations of PCE from the vadose zone.

4.2.3 Indoor Air

PCE has not been detected in indoor air at the Site and there are no locations at the Site where PCE exceeds its CUL in air.

4.3 Remedial Action Objectives

RAOs form the basis for developing the remedial action elements for the Site. RAOs are based on the data collected during previous investigations, the identified exposure pathways and receptors, and the established CULs. The focus of the RAOs is protection of human health. As described above, no further terrestrial ecological evaluation is required consistent with the requirements of WAC 173-340-749(2)(c) because no hazardous substance listed in Table 749-2 of WAC 173-340-900 is present in Site soils. Therefore, no terrestrial ecological-based RAOs are developed.

The following RAOs are identified for the Site:

- Prevent workers and occupants from direct contact with contaminated soil at concentrations exceeding CULs during construction, utility repairs, or redevelopment activities;
- Control leaching and migration of PCE in soil at concentrations that will cause groundwater to exceed its applicable CUL at the point of compliance; and
- Prevent consumption of groundwater containing PCE at concentrations exceeding CULs by on- and off-Property residents and workers

4.4 Remedial Action Evaluation Criteria

The cleanup action selected for the Site must meet the Ecology's criteria for evaluating and selecting a cleanup action identified in WAC 173-340-360(2), which include the following:

Threshold Requirements

- Protect human health and the environment;
- Comply with cleanup standards (WAC 173-340-700 through –760);
- Comply with applicable state and federal laws (WAC 173-340-710); and
- Provide for compliance monitoring.

Other Requirements

- Use permanent solutions to the maximum extent practicable;
- Provide for a reasonable restoration time frame; and

- Consider public concerns.

In addition to the above criteria, WAC 173-340-360(2) also includes the following specific requirements regarding certain types of cleanups:

- **Cleanup Actions at Residential Sites.** Soil containing contaminants above CULs must be treated, removed, or contained.

Ecology's expectations for cleanup actions are listed in WAC 173-340-370 and include: (1) a preference for use of treatment technologies to the extent practicable; (2) use of engineering controls at sites which contain large volumes of relatively low levels of hazardous substances where treatment is impracticable; (3) minimization of the potential for contaminant migration by preventing precipitation and runoff from contacting contaminated soil; (4) use of active measures to prevent the discharge of contaminants to surface waters; and (5) the use of natural attenuation may be appropriate for sites where certain conditions exist (e.g., source control/removal has been conducted, etc.).

4.5 Current Property Use Considerations

The Property is occupied by residents and tenants. Implementation of this RAWP will be coordinated in consideration with the safety of workers, occupants, and the public. Existing utilities must be protected from damage to prevent service interruptions. Access must be maintained for businesses and residences.

5.0 CLEANUP ACTION DEVELOPMENT

The results of performance monitoring documented the success and limitations of the interim, 2009-2014 SVE system. ERM evaluated supplemental technology alternatives in 2012, and PES further developed those alternatives to expand the ZOI, accelerate mass removal, and treat dissolved-phase PCE in groundwater. The results of supplemental pilot testing and interim SVE system performance monitoring informed the development of this final cleanup action.

5.1 Revised Feasibility Study (2012)

ERM's 2012 *Revised Feasibility Study* (ERM, 2012b) presented the results of technology evaluation screening for the following remedial alternatives (in addition to the "No Action" alternative – Alternative 1):

- Alternative 2 - Site-wide air sparging with SVE;
- Alternative 3 - Source Area SVE with Site-wide ISCO using potassium permanganate;
- Alternative 4 - Source Area AS/SVE with Site-wide ISCO using potassium permanganate;
- Alternative 5 -Source Area SVE and Source Area ISCO using ozone sparging, with downgradient ISCO using potassium permanganate; and
- Alternative 6 - Site-wide in-well air stripping, and
- Alternative 7 - Source Area SVE with Site-wide pump and treat.

The 2012 Revised Feasibility Study included a disproportionate cost analysis of the seven alternatives and based on the results of the April 2011 ISCO pilot test (ERM, 2012a), ERM concluded that Alternative 4 would be the most cost effective permanent solution.

5.2 Development of Current Cleanup Action

Due to observed rebound of PCE concentrations in groundwater in the years following the 2011 ISCO pilot study and the results of the 2013 air sparging pilot test, the ISCO treatments were discontinued in favor of AS technology. An expanded AS and SVE system will be implemented to treat groundwater and vadose zone soil in the southwest corner of the Harris property and west of the sanitary sewer alignment on the MVSC property. This system will include an AS well network in shallow groundwater and a dual-level SVE well network in the vadose zone. In addition, interim SVE wells will be operated at areas of remaining PCE-impacted soil on the Property. The overall remediation objectives of the AS and SVE systems is to reduce the mass of PCE in residual source areas to below the soil and groundwater CULs, while controlling subsurface vapors. The locations of the AS and SVE wells are shown on Figure 10.

6.0 REMEDIAL ACTION PLAN

This section describes the remedial action that will be implemented to address the areas identified at the Site where concentrations of PCE in soil and groundwater exceed their respective CULs (Section 4.1).

The RAWP has been designed to be consistent with the requirements of the MTCA Cleanup Regulation (Chapter 173-340 WAC) and to be substantially equivalent to an Ecology conducted or supervised cleanup. The remedial action will be performed as an independent action, and the results will be reported to Ecology under the VCP.

6.1 Overview of Remedial Action Approach

The cleanup action approach was developed based on the nature and extent of contamination, the results of pilot testing and previous remedial actions completed to date, exposure pathways and receptors, and previously described RAOs. In summary, the approach for cleanup actions at the Site includes the following actions:

- Operate the AS/SVE system to treat residual PCE in soil and groundwater within historical source areas on the Property. The AS component will: (1) aerate and volatilize contaminants that are dissolved in groundwater, and (2) transfer contaminants to the vadose zone for vapor-phase capture by the SVE system. The SVE component will intercept and control contaminants in the vadose zone. Extracted vapors can be discharged directly to the atmosphere at concentrations below regulated limits (see Section 6.2.2). The AS/SVE system will be operated until PCE concentrations in groundwater in the vicinity of the AS area wells are below the groundwater CUL of 5 µg/L for four consecutive quarters and PCE concentrations in SVE discharge vapors reach asymptotic levels.

- Monitor downgradient groundwater quality during and after the AS/SVE system operation to assess the effects of AS/SVE system on the water quality and to determine if groundwater concentrations throughout the Site meet the CULs.

- After the AS/SVE system is shut off, groundwater quality within the AS ZOI will be monitored for rebound and compliance with CULs.

- Once groundwater quality is in compliance with the CUL, then an additional four quarters of monitoring will be performed and soil samples will be collected to evaluate the removal of residual soil contamination to below the soil CUL of 0.050 mg/kg.

6.2 Description of the Air Sparging and SVE Systems

The existing 10-well SVE system is in the process of being expanded to 22 SVE wells, and upgraded with the addition of 31 AS wells. The AS wells are designed to target the sand and silty sand aquifer directly above the silt and clay layer that has been encountered at depths of 46.5 to 50 ft bgs on the Harris property and 55 to 56 ft bgs on the MVSC property. The SVE

wells are installed at two levels within the vadose zone. Shallow screened wells (5 to 20 ft bgs) target the upper vadose zone, and deeper screened wells (20 to 30 ft bgs on Harris property and 20 to 35 ft bgs on MVSC property) target the lower vadose zone. Both the vadose zone and the aquifer contain varying amounts of gravel, and the vadose zone contains scattered silt and clay lenses at various locations and depths from near surface to approximately 32 ft bgs.

The AS/SVE system has been constructed in accordance with the PES's *FINAL Air Sparging and Soil Vapor Extraction Design* memorandum dated July 7, 2014 (PES, 2014c) with minor exceptions noted in the following discussion of AS/SVE system components. A complete copy of the design memorandum, including design basis, detailed description, drawings, and calculations, is included in Appendix G. Locations of AS and SVE wells are shown on Figure 10, and well logs are included in Appendix B.

The AS/SVE system construction is expected to be complete and operational in September 2016, and will be operated until PCE concentrations in groundwater in the vicinity of the AS area wells are below the groundwater CUL of 5 μg/L for four consecutive quarters and PCE concentrations in SVE discharge vapors reach asymptotic levels.

6.2.1 Air Sparging System Components

The AS system consists of 31 AS wells, interconnecting piping, manifold, air compressor, and heat exchanger. Contingency AS header piping has been installed on the Harris property east of existing SVE-4 so that additional AS wells may be installed and operated if needed. The compressor is sized to operate all 31 wells simultaneously and includes extra capacity for additional AS wells along the contingency header. Based on the 2013 AS pilot test, the system is expected to operate at a flow rate of approximately 10 standard cubic ft per minute (scfm) per well at 8 pounds per square inch (psig) wellhead pressure, although the actual operational flow rate and pressure will be determined through startup testing.

6.2.1.1 Air Sparging Wells

One of the 31 AS wells (AS-1) was installed in May 2013 for the pilot test. The remaining 30 wells, AS-2 through AS-31, were subsequently installed in the southwestern corner of the Harris property and adjacent to the sanitary sewer alignment on the MVSC property. Minor location adjustments were required in the field due to locations of utilities and curbing.

Groundwater impacts appear to be limited to the upper 5 to 10 ft of the saturated zone, and therefore AS wells are screened at least 10 ft below groundwater level (see Appendix B, Table B-1). Injection air pressures, flow rates, and well spacing are based on the results of the 2013 AS pilot test. Well screen depths are limited by the presence of the underlying silt and clay layer.

AS-1 was installed with a 1-inch diameter Schedule 80 polyvinyl chloride (PVC) casing and a 2-ft long PVC screen (0.020-inch slot). The remaining 30 AS wells were constructed similarly except that 2-inch diameter PVC casing and screen were installed. The screened interval is backfilled with a 10-20 silica sand filter pack that extends 6 inches above the top of screen, a 2-ft

bentonite chip seal is constructed above the sand, and the remaining well annulus is filled with cement bentonite grout. Wellheads are completed in flush-with-grade traffic-rated monuments.

6.2.1.2 Piping and Manifolds

The AS manifold consists of a 3-inch diameter pipe from the compressor, reducing tees, 1-inch diameter AS well lateral pipes, and a 2-inch diameter spare AS pipe for contingency expansion. Lateral pipes in trenches are buried a minimum of 18 inches below grade, and the trench depth and width vary by location. The manifold location and lateral trench piping layout was modified slightly to accommodate field conditions encountered during construction.

6.2.1.3 Mechanical Equipment

Mechanical equipment for the AS system includes a 40 horsepower positive-displacement blower (i.e., low- pressure air compressor) and an air-to-air heat exchanger. The compressor is sized to operate all 31 wells simultaneously, and includes capacity for the diffused-aeration tank (DAT; also see SVE system discussion below) and for additional AS wells along the contingency header. The compressor is capable of delivering 360 scfm at approximately 12 psig in order to provide at least 10 psig at the manifold. Pressurized air exiting the compressor will be cooled using the heat exchanger to approximately 20 degrees above ambient temperatures. The compressor and heat exchanger are located at a remediation equipment enclosure located at the southwestern part of the Harris property (Figure 10).

The compressor motor includes a variable frequency drive so that the overall system flow rate may be adjusted to match system requirements. The compressor is fitted with an inlet filter, influent and effluent silencers, and housed in a weather-resistant sound enclosure rated to reduce the sound within 3 ft of the enclosure to approximately 65 decibels. The sound enclosure includes air cooling and sound-dampened air vents. The compressor discharge line will include a flow switch, which will notify the operator when adequate AS flow is not present. Automatic operation will require that the SVE blower be operating with at least 1.5 times the design flow rate of the AS system (465 scfm). During pre-startup field testing, it was determined that the heat exchanger also required noise abatement, and so an enclosure will be fabricated and installed prior to startup.

6.2.2 SVE System Components

The SVE system includes 22 SVE wells (10 interim SVE system wells, and 12 new wells) and interconnecting piping, piping manifold, moisture knockout, DAT, condensate storage, and blower. The SVE system has been designed to control off-gas from AS and to address residual PCE concentrations in soil that appear to be outside of the area of influence from the existing interim SVE system. The system is designed to operate at flow rate of 40 scfm per well at 10 inches of water column (in. w.c.) wellhead vacuum. Actual operational flow rate and vacuum will be determined during startup testing. Well spacing is based on providing an approximate 2:1 ratio of SVE to AS flow, and an anticipated ZOI of 40 ft. Historical ZOI has been observed at greater than 50 ft from the individual SVE wells.

Based on operation of the interim SVE system and expected mass transfer of PCE from soil and groundwater, the SVE system will be exempt from vapor treatment per Puget Sound Clean Air Agency (PSCAA) Regulation I, Article 6, Section 6.03(C)(94) and the Ecology toxic pollutant source control regulations WAC 173-460. Therefore, the SVE effluent will be discharged directly to atmosphere. If SVE effluent concentrations are higher than anticipated and result in mass discharge rates in excess of the PSCAA and Ecology limits (i.e., < 500 pounds per year and 32.4 pounds per year, respectively), the SVE effluent stack will be bypassed to allow vapor treatment with granular activated carbon prior to discharge.

6.2.2.1 SVE Wells

The new and existing SVE wells are screened in the vadose zone above the water table. Existing interim wells SVE-1 through SVE-10 are constructed of 2-inch diameter Schedule 40 PVC and include 20- to 25-ft long well screens (except for SVE-6 which includes a 5-ft screen). The existing SVE wells include a bypass valve that allows the wells to be operated under vacuum from the blower and to be open to atmosphere to induce fresh air into the subsurface.

The 12 new wells (SVE-11A through SVE-19) are constructed with 4-inch diameter Schedule 40 PVC and include a 0.020-inch slot PVC screen. Three of the new wells were screened in the upper vadose zone (5 to 20 ft bgs), and the other nine wells were screened in the lower vadose zone (20 to 35 ft bgs). The screened interval was backfilled with a 10-20 silica sand filter pack that extends 2 ft above the top of screen. A 1.5 to 2-ft bentonite chip seal was constructed above the sand and the remaining well annulus will be filled with cement bentonite grout. Wellheads are completed in flush-with-grade traffic rated monuments.

6.2.2.2 Piping and Manifolds

The SVE system header consists of a new 6-inch diameter pipe routed from the knockout to a 6-inch diameter manifold. The new 6-inch header is also connects to the existing 4-inch header for existing wells SVE-4 through SVE-10. The manifold includes tie-ins to the 2-inch diameter laterals from existing wells SVE-1 through SVE-3 and new wells SVE-11A through SVE-19.

Lateral pipes to new wells SVE-11A through SVE-19 were below grade in common trenches wherever possible. Laterals for SVE wells SVE-11A through SVE-16 extend south from the manifold and penetrate the retaining wall. Pipes in trenches are buried a minimum of 18 inches below grade, and the trench depth and width vary by location. The manifold location and lateral trench piping layout was modified slightly to accommodate field conditions encountered during construction.

6.2.2.3 Mechanical Equipment

Mechanical equipment for the SVE system was installed in the remediation equipment enclosure located at the southwestern part of the Harris property (with the AS mechanical equipment). Mechanical equipment includes a 15 horsepower positive-displacement SVE blower and two condensate transfer pumps. The blower is capable of delivering 880 scfm at approximately 60 in. w.c. vacuum in order to provide at least 25 in. w.c. vacuum at the upstream side of the inlet filter.

The blower motor includes a variable frequency drive so that the overall system flow rate may be adjusted to match system requirements. The blower is fitted with an inlet filter, influent and effluent silencers, and housed in a weather-resistant sound enclosure rated to reduce the sound within 3 ft of the enclosure to approximately 65 decibels. The sound enclosure includes air-cooling and sound-dampened air vents. The blower inlet line will include a flow meter and flow switch, which will notify the operator in the event of low SVE flow. A high-level alarm float switches in the condensate handling equipment will disable the blower. During pre-startup field testing, it was determined that the blower discharge stack also required noise abatement, and so an in-line silencer will be procured and installed prior to startup.

6.2.2.4 Condensate Management and Storage

Condensate accumulation is expected from mid-October through mid-April when ambient temperatures drop below the soil vapor temperature. The SVE system includes management and storage for SVE condensate that drops out of the soil vapor stream and into a moisture knockout tank. Knockout water will be processed through a DAT and sparged so that residual PCE, if present in the water, may be transferred back into the SVE vapor stream. The sparged water will then be transferred to a holding tank for sampling, waste profiling, and off-site disposal.

6.2.3 Controls

An outdoor-rated control panel including a programmable logic control system is located inside the remediation equipment enclosure. The panel provides automatic control of system components and operating parameters, includes an auto-dialer with inputs for all alarm conditions for the system, and the auto-dialer is equipped with battery backup. The auto-dialer will alert the operator to major mechanical issues such as power interruption, blower shut-off or low flow, compressor shut-off or low flow, and high-high liquid level in the condensate tanks. Each alarm, when triggered, will be configured to automatically shut down equipment operation.

6.2.4 Operation and Maintenance

A project specific operation and maintenance (O&M) plan will be developed to describe startup procedures, guidelines for overall system operation, and manufacturers' recommendations for equipment maintenance, preventative maintenance schedules, and forms. Initial operation will include baseline groundwater monitoring (completed in December 2015), SVE system startup and balancing, AS system startup and balancing, and relatively frequent O&M inspections and monitoring over the first several weeks of operation. After system operation is stabilized, O&M will be conducted on a monthly basis, and preventative maintenance performed in accordance with equipment manufacturers' guidelines.

Performance monitoring will be conducted periodically to assess whether changes in system performance are needed to optimize contaminant removal efficiency. Performance monitoring will include stack emissions monitoring, SVE well sampling, groundwater quality monitoring, and groundwater gradient evaluation. SVE stack and well samples will be analyzed for PCE by EPA Method TO-15 to verify compliance with PSCAA and Ecology toxic pollutant source discharge regulations. Groundwater quality monitoring is discussed below in Section 6.3.

6.3 Performance and Confirmation Sampling

A Sampling and Analysis Plan (SAP) is included in Appendix H and describes the proposed soil, and groundwater sampling methods, consistent with the requirements of WAC 173-340-410.

Soil and groundwater samples will be analyzed for PCE, TCE, cis-1,2-DCE, trans-1,2-DCE, 1,1,-DCE, and vinyl chloride using EPA Method 8260B.

6.3.1 Soil

After the AS/SVE system mass removal rates attenuate and source area groundwater concentrations have reached CULs, the AS/SVE system will be shut down. At that time, soil samples will be collected to verify that the remedial action has successfully reduced VOC concentrations in soil below their respective RAOs or further delineate areas that require additional treatment. Confirmation soil samples will be collected from 5 areas onsite to confirm remediation of PCE-impacted soil encountered during site characterization activities. These areas are shown on Figure 6 and are described as follows:

- **North and east of the former septic tank behind Manhattan Cleaners on Harris property.** Includes advancing three to four borings to confirm remediation of PCE impacted vadose zone soil in four 2005 borings (KB-1, KB-2, KB-4, and KB-5). Target sampling depths will in both the vadose zone and in saturated soil at approximately 15 to 40 ft bgs. This area is within the influence of the SVE system.

- **Adjacent to the drain field piping for the former septic tank behind Manhattan Cleaners on Harris property.** Includes advancing two borings to confirm remediation of shallow PCE impacted soil in two 2008 test pit samples (TP-2-4 and TP-5-2.5). Target sampling depths will be in the vadose zone at approximately 2 to 10 ft bgs. This area is within the influence of the SVE system.

- **Adjacent to monitoring well DC-17 on the Harris property.** Includes advancing one boring to confirm remediation of PCE impacted soil in a 2007 saturated soil sample collected during drilling of DC-17. Target sampling depth will be in saturated soil at approximately 35 to 37 ft bgs. This area is directly downgradient of the AS/SVE system remediation area.

- **Behind and east of the Four Star Cleaners on MVSC property and Harris property.** Includes advancing two to three borings to confirm remediation of PCE impacted vadose zone soil discovered in 2007 in two borings (KGP-1, KGP-2) and during drilling of monitoring well KMW-9 in both vadose and saturated soil. Target sampling depths on MVSC property will be in the vadose zone at approximately 4 to 38 ft. Target sampling depths on Harris property will be both in the vadose zone and in saturated soil at approximately 14 to 41 ft bgs. This area is within the influence of the SVE system.

- **North and east of the former septic tank on the MVSC property.** Includes advancing two or three borings to confirm remediation of PCE impacted vadose zone

soil discovered in 1998 in two borings (BH-5, BH-7) and in 2014 during drilling of air sparging well AS-19. Target sampling depths will be in the vadose zone at approximately 1 to 30 ft bgs. This area is within the influence of the AS/SVE system remediation area.

6.3.2 Groundwater

Groundwater monitoring will be conducted consistent with the requirements of WAC 173-340-410 to assess the performance of the remedial actions demonstrate that the groundwater extraction systems are adequately controlling off-Property contaminant migration and to assess water quality over time to demonstrate that CULs are being achieved at the point of compliance.

Monitoring will consist of collecting depth to water measurements and collecting groundwater samples for laboratory analysis. Groundwater samples will be collected using similar procedures as for the site characterization investigations.

Performance Monitoring. Performance monitoring will be conducted quarterly in source area wells during operation of the AS/SVE system to document remediation system performance, and semi-annually in non-source area wells to confirm plume geometry and non-source area concentrations. Performance monitoring includes the following tasks:

- Quarterly water level monitoring in all 40 shallow groundwater monitoring wells (Figure 3).
- Quarterly source area groundwater sampling in 11 monitoring wells within the air sparging ZOI to document performance of the AS/SVE system. Wells include MW-3, MW-4, MW-10, MW-11, MW-12, MW-13, MW-16, DC-3, DC-4, DC-10A, and KMW-2 (Figure 7).
- Semi-annual groundwater sampling in 19 monitoring wells to confirm plume geometry and document non-source area concentrations. Wells include MW-2, MW-7, MW-9, MW-14, MW-15, DC-7, DC-8, DC-11, DC-12, DC-13, DC-14, DC-15, DC-17, DC-18, DC-20, KMW-3, KMW-7, KMW-8, and KMW-9 (Figure 7).

Compliance Monitoring. Once the last round of groundwater performance monitoring has been completed, compliance groundwater monitoring will be conducted to demonstrate that groundwater within the Site meets the CUL at the point of compliance. Compliance monitoring will include an additional four quarters of monitoring to confirm compliance with groundwater CULs at the Site. Compliance monitoring will include the following tasks:

- Quarterly water level monitoring in all 40 shallow groundwater monitoring wells (Figure 3).

- Collection of groundwater samples from 22 monitoring wells on a quarterly basis to confirm compliance with groundwater CULs. Wells include MW-2, MW-3, MW-4, MW-7, MW-9, MW-10, MW-11, MW-12, MW-13, DC-3, DC-4, DC-7, DC-8, DC-10A, DC-13, DC-14, DC-17, DC-18, KMW-2, KMW-7, KMW-8, and KMW-9 (Figure 7).

6.4 Cleanup Action Consistency with MTCA Evaluation Criteria

The following sections describe how the cleanup actions described in this RAWP meet the MTCA criteria for selecting a cleanup action.

6.4.1 Protectiveness

The cleanup actions described above will achieve all of the RAOs (Section 4.3) and are protective of human health and the environment. The AS/SVE system will remove subsurface soil contaminants exceeding CULs, which will control leaching of contaminants to groundwater, and remove groundwater contaminants, reducing the area and contaminant concentrations of the contaminant plume. The SVE system will intercept soil vapors, protecting indoor air quality while the sparging system operates.

6.4.2 Compliance with Cleanup Standards

The remedial action has been designed to achieve soil cleanup standards on-Property through the operation of the SVE system. Groundwater standards will be achieved at the point of compliance initially through operation of the AS/SVE system, followed by monitoring of the already stable and attenuating downgradient groundwater plume.

6.4.3 Compliance with Regulatory Requirements

The cleanup action will comply with the applicable legal requirements including MTCA. Local requirements for on-going AS/SVE construction included obtaining grading and electric permits, and a pre-application review conference with the City of Normandy Park to review the overall site plan and discuss the project to determine the applicable requirements in the local code.

PCE-contaminated soil cuttings generated during shallow trenching and installation of new remediation wells have been disposed off-Site in accordance with the state solid waste and dangerous waste regulations. Specifically, a "contained-in policy" determination has been obtained to permit disposal of qualifying PCE-contaminated soil in a solid waste landfill.

Based on the expected mass transfer of PCE from soil and groundwater, the SVE system will be exempt from vapor treatment PSCAA Regulation I, Article 6, Section 6.03(C)(94) and the Ecology toxic pollutant source control regulations of WAC 173-460. Therefore, the SVE effluent may be discharged directly to atmosphere, and no air discharge permitting is required for the proposed system upgrades. If SVE effluent concentrations are higher than anticipated and result in mass discharge rates in excess of the PSCAA and Ecology limits (< 500 pounds per year

and 32.4 pounds per year, respectively), the SVE effluent stack will be bypassed to allow vapor treatment with granular activated carbon prior to discharge.

Other than condensate water collection and groundwater sampling purge water generation, no other liquid wastes will be generated that require neither an industrial waste discharge permit nor a stormwater discharge permit.

6.4.4 Compliance Monitoring

Performance and compliance monitoring are integral components of the RAWP. Performance monitoring will ensure that the ongoing cleanup actions are performing as intended and to allow adjustments to be implemented as necessary. Compliance monitoring will be performed to demonstrate that CULs are achieved (See SAP in Appendix H).

6.4.5 Use of Permanent Solutions to Extent Practicable

This criterion is typically used when evaluating multiple non-permanent cleanup action alternatives that meet the threshold requirements to differentiate between the alternatives and determine which of the alternatives uses permanent solutions to the maximum extent practicable. At this Site, in accordance with WAC 173-340-360, the selected cleanup action will be permanent solution because the cleanup standards of WAC 173-340-720 can be met without further action being required at the Site when the cleanup action has been completed.

The following sections describe how the selected cleanup action meets the technical and administrative criteria for using permanent solutions to the extent practicable. It is important to note the selected cleanup action meet the threshold requirements as described in Sections 4.4 and is permanent solution.

Protectiveness. The RAWP will be protective of human health and the environment both on- and off-Property. The remedial actions meet Ecology's requirements for conducting cleanup actions at residential sites in that the contaminated soil and groundwater media exceeding residential CULs on the Property will be treated in situ through the operation of the AS/SVE system to levels that are protective of human health and the environment.

Permanence. Primary sources of contaminants at the Site already have been addressed by removal of the former septic tank and leaking drainlines, and excavation and off-site disposal of readily accessible contaminated soils that were vulnerable to leaching. Secondary sources of contamination (residual concentrations of PCEs in groundwater and vadose zone soil) will be transferred from groundwater to the vadose zone by air-sparging, and removed from the vadose zone by the SVE extraction and treatment systems. The AS/SVE system will require on-going maintenance during the cleanup action, and groundwater performance monitoring, and soil and groundwater confirmation sampling to demonstrate the system's effectiveness. The selected remedial alternative will permanently remove soil and groundwater contamination above CULs when completed. In-situ treatment with AS/SVE will minimize the quantity and strength of waste by-products.

Effectiveness Over the Long Term. The effectiveness of the existing interim SVE system already has reduced concentrations of PCE in groundwater and reduced the footprint of the contaminant plume. The upgrades described in this RAWP will accelerate further reduction of contaminant mass in the subsurface. AS and SVE are well-proven technologies that are capable of achieving the RAOs throughout the Site. The long-term effectiveness of these systems can easily be monitored and documented, and maintenance activities can be implemented to ensure effectiveness throughout the active period of the cleanup action.

Manage Short Term Risks. There are limited short-term risks associated with the selected cleanup actions. The remedial construction activities will be conducted consistent with state and federal worker protection regulations and will use industry standard health and safety procedures to protect workers during construction activities. A health and safety plan will be developed outlining the specific requirements to protect remedial construction workers, including appropriate use of personal protective equipment and engineering controls. For the protection of Site occupants and workers, system controls logic will ensure that AS component does not operate unless the SVE system is fully operational.

Technical and Administrative Implementability. The selected cleanup action technology is commonly used and readily available, is already in the process of being implemented at the Site, and there are no significant technical implementability issues associated with the remaining work. System operation is expected to commence in September 2016.

Consideration of Public Concerns. Any public concerns that develop as result a result of RAWP implementation will be considered when and if they are received. The project team has already met with the adjacent townhome owners to notify them of the planned cleanup action, answer questions, and discuss and address their concerns.

6.4.6 Restoration Time Frame

Portions of the AS/SVE system infrastructure are already in place, and the technology is already proven at the Site. The AS/SVE system should be operational during October 2016. The anticipated timeframe for restoration is 1 to 2 years to reduce PCE concentrations below the MTCA Method A CUL in the AS treatment area groundwater followed by four quarters of compliance monitoring.

7.0 SCHEDULE AND REPORTING

7.1 Remedial Action Implementation

Installation of the AS system and expansion of the existing SVE is system is already underway, and system startup is planned in October 2016.

7.2 Reporting

The remedial action will be performed as an independent action under the VCP. Semi-annual progress reports will be prepared in a manner suitable for submission to Ecology. Progress reports will serve as updates on the progress of remedial actions at the Property and to document that the remedial actions are performing as designed. The progress reports will include a summary of the work performed over the reporting period and a summary of ongoing groundwater monitoring.

Upon completion of the groundwater performance monitoring period, a final cleanup action report will be prepared and submitted to Ecology. The purpose of the final cleanup action report will be to document the results of the remedial actions completed at the Site.

TABLES

Table 1

Summary of Post-Interim Action Soil Sampling Results
Manhattan Village Shopping Center and Harris Properties
Normandy Park, WA

Depth (ft) / Analytes	Cleanup Level (µg/L)	AS-2 5 9/29/2014		AS-3 10 10/1/2014		AS-4 5 9/30/2014		AS-5 15 9/30/2014		AS-6 5 9/26/2014		AS-7 5 9/24/2014		AS-8 3.5 9/30/2014		AS-8 25 10/17/2014	
Acetone	–	**0.082**		0.051	U	0.052	U	0.053	U	**0.063**		**0.29**		0.055	U	0.051	U
n-Butylbenzene	–	0.0011	U	0.0010	U	0.0010	U	0.0010	U	0.0011	U	0.0012	U	0.0011	U	**0.0036**	
Sec-Butylbenzene	–	0.0011	U	0.0010	U	0.0010	U	0.0010	U	0.0011	U	0.0012	U	0.0011	U	**0.002**	
2-Chlorotoluene	–	0.0011	U	0.0010	U	0.0010	U	0.0010	U	0.0011	U	0.0012	U	0.0011	U	0.0010	U
4-Chlorotoluene	–	0.0011	U	0.0010	U	0.0010	U	0.0010	U	0.0011	U	0.0012	U	0.0011	U	0.0010	U
Ethylbenzene	–	0.0011	U	0.0010	U	0.0010	U	0.0010	U	0.0011	U	0.0012	U	0.0011	U	0.0010	U
Cumene	–	0.0011	U	0.0010	U	0.0010	U	0.0010	U	0.0011	U	0.0012	U	0.0011	U	0.0010	U
p-Isopropyltoluene	–	0.0011	U	0.0010	U	0.0010	U	0.0010	U	0.0011	U	0.0012	U	0.0011	U	**0.0016**	
Methyl ethyl ketone	–	0.011	U	0.010	U	0.010	U	0.010	U	0.011	U	0.012	U	0.011	U	0.010	U
Naphthalene	–	0.0054	U	0.0051	U	0.0052	U	0.0053	U	0.0053	U	0.0060	U	0.0055	U	**0.0064**	
n-Propylbenzene	–	0.0011	U	0.0010	U	0.0010	U	0.0010	U	0.0011	U	0.0012	U	0.0011	U	**0.0041**	
Styrene	–	0.0011	U	0.0010	U	0.0010	U	0.0010	U	0.0011	U	0.0012	U	0.0011	U	0.0010	U
1,1,2,2-Tetrachloroethane	–	0.0011	U	0.0010	U	0.0010	U	0.0010	U	0.0011	U	0.0012	U	0.0011	U	0.0010	U
Tetrachloroethene	0.050	0.0011	U	**0.0010**		**0.0011**		**0.0040**		**0.0042**		0.0012	U	**0.0075**		**0.029**	
Toluene	–	0.0054	U	0.0051	U	0.0052	U	0.0053	U	0.0053	U	0.0060	U	0.0055	U	0.0051	U
1,2,3-Trichlorobenzene	–	0.0011	U	0.0010	U	0.0010	U	0.0010	U	0.0011	U	0.0012	U	0.0011	U	0.0010	U
1,1,2-Trichloroethane	–	0.0011	U	0.0010	U	0.0010	U	0.0010	U	0.0011	U	0.0012	U	0.0011	U	0.0010	U
1,2,4-Trimethylbenzene	–	0.0011	U	0.0010	U	0.0010	U	0.0010	U	0.0011	U	0.0012	U	0.0011	U	**0.047**	
Benzene, 1,2,3-Trimethyl-	–	0.0011	U	0.0010	U	0.0010	U	0.0010	U	0.0011	U	0.0012	U	0.0011	U	**0.014**	
1,3,5-Trimethylbenzene	–	0.0011	U	0.0010	U	0.0010	U	0.0010	U	0.0011	U	0.0012	U	0.0011	U	**0.013**	
Total Xylenes	–	0.0032	U	0.0031	U	0.0031	U	0.0032	U	0.0032	U	0.0036	U	0.0033	U	**0.011**	

Notes:

1. Summary of samples collected during 2014 remediation construction.
2. Refer to Appendix D for historical soil sample data summary.
3. All results in milligrams per kilogram (mg/kg) or parts per million
4. U = not detected at or above the practical quantitation limit (PQL)
5. Soil samples collected either prior to drilling with a hand auger or during drilling with a split spoon sampler.
6. Volatile Organic Compounds (VOC) by USEPA Method 8260B
7. Concentrations detected above the PQL shown in **bold**.
8. Concentrations exceeding the cleanup level are **shaded**.

Table 1

Summary of Post-Interim Action Soil Sampling Results
Manhattan Village Shopping Center and Harris Properties
Normandy Park, WA

Depth (ft) / Analytes	AS-9 3 9/30/2014		AS-9 25 10/16/2014		AS-10 3 10/1/2014		AS-10 8 10/14/2014		AS-11 3 10/1/2014		AS-11 10 10/13/2014		AS-12 3 10/1/2014		AS-12 8 10/10/2014	
Acetone	0.054	U	0.052	U	0.056	U	**0.069**		0.055	U	0.056	U	0.058	U	**0.10**	
n-Butylbenzene	0.0011	U	**0.0034**		0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0012	U	**0.0013**	
Sec-Butylbenzene	0.0011	U	**0.0014**		0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0012	U	0.0011	U
2-Chlorotoluene	0.0011	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0012	U	0.0011	U
4-Chlorotoluene	0.0011	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0012	U	0.0011	U
Ethylbenzene	0.0011	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0012	U	0.0011	U
Cumene	0.0011	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0012	U	0.0011	U
p-Isopropyltoluene	0.0011	U	**0.0012**		0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0012	U	0.0011	U
Methyl ethyl ketone	0.011	U	0.010	U	0.011	U	0.011	U	0.011	U	0.011	U	0.012	U	0.011	U
Naphthalene	0.0054	U	**0.0088**		0.0056	U	0.0053	U	0.0055	U	0.0056	U	0.0058	U	0.0056	U
n-Propylbenzene	0.0011	U	**0.0029**		0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0012	U	**0.0019**	
Styrene	0.0011	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0012	U	0.0011	U
1,1,2,2-Tetrachloroethane	0.0011	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0012	U	0.0011	U
Tetrachloroethene	**0.0039**		**0.012**		0.0011	U	**0.007**		**0.0011**		**0.0021**		**0.0017**		**0.017**	
Toluene	0.0054	U	0.0052	U	0.0056	U	0.0053	U	0.0055	U	0.0056	U	0.0058	U	0.0056	U
1,2,3-Trichlorobenzene	0.0011	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0012	U	0.0011	U
1,1,2-Trichloroethane	0.0011	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0012	U	0.0011	U
1,2,4-Trimethylbenzene	0.0011	U	**0.042**		0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0012	U	**0.02**	
Benzene, 1,2,3-Trimethyl-	0.0011	U	**0.016**		0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0012	U	**0.0053**	
1,3,5-Trimethylbenzene	0.0011	U	**0.01**		0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0012	U	**0.006**	
Total Xylenes	0.0032	U	**0.0078**		0.0034	U	0.0032	U	0.0033	U	0.0034	U	0.0034	U	**0.0084**	

Notes:

1. Summary of samples collected during 2014 remediation construction.
2. Refer to Appendix D for historical soil sample data summary.
3. All results in milligrams per kilogram (mg/kg) or parts per million
4. U = not detected at or above the practical quantitation limit (PQL)
5. Soil samples collected either prior to drilling with a hand auger or during drilling with a split spoon sampler.
6. Volatile Organic Compounds (VOC) by USEPA Method 8260B
7. Concentrations detected above the PQL shown in **bold**.
8. Concentrations exceeding the cleanup level are **shaded**.

Table 1

Summary of Post-Interim Action Soil Sampling Results
Manhattan Village Shopping Center and Harris Properties
Normandy Park, WA

Depth (ft) / Analytes	AS-13 3 10/1/2014	AS-13 8 10/1/2014	AS-14 3 9/29/2014	AS-14 8 10/8/2014	AS-15 3 9/29/2014	AS-15 8 10/6/2014	AS-16 3 9/29/2014	AS-16 15 10/7/2014
Acetone	0.055 U	0.052 U	0.054 U	0.053 U	0.055 U	**0.11**	0.053 U	0.056 U
n-Butylbenzene	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U
Sec-Butylbenzene	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U
2-Chlorotoluene	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U
4-Chlorotoluene	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U
Ethylbenzene	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U
Cumene	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U
p-Isopropyltoluene	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U
Methyl ethyl ketone	0.011 U	0.010 U	0.011 U	0.011 U	0.011 U	0.012 U	0.010 U	0.011 U
Naphthalene	0.0055 U	0.0052 U	0.0054 U	0.0054 U	0.0055 U	0.0060 U	0.0053 U	0.0055 U
n-Propylbenzene	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U
Styrene	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U
1,1,2,2-Tetrachloroethane	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U
Tetrachloroethene	**0.0028**	**0.0022**	**0.0038**	**0.0021**	**0.014**	**0.0031**	**0.018**	**0.0032**
Toluene	0.0055 U	0.0052 U	0.0054 U	0.0054 U	0.0055 U	0.0060 U	0.0053 U	0.0055 U
1,2,3-Trichlorobenzene	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U
1,1,2-Trichloroethane	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U
1,2,4-Trimethylbenzene	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U
Benzene, 1,2,3-Trimethyl-	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U
1,3,5-Trimethylbenzene	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U
Total Xylenes	0.0033 U	0.0032 U	0.0032 U	0.0032 U	0.0033 U	0.0036 U	0.0032 U	0.0033 U

Notes:

1. Summary of samples collected during 2014 remediation construction.
2. Refer to Appendix D for historical soil sample data summary.
3. All results in milligrams per kilogram (mg/kg) or parts per million
4. U = not detected at or above the practical quantitation limit (PQL)
5. Soil samples collected either prior to drilling with a hand auger or during drilling with a split spoon sampler.
6. Volatile Organic Compounds (VOC) by USEPA Method 8260B
7. Concentrations detected above the PQL shown in **bold**.
8. Concentrations exceeding the cleanup level are **shaded**.

Table 1

Summary of Post-Interim Action Soil Sampling Results
Manhattan Village Shopping Center and Harris Properties
Normandy Park, WA

Depth (ft) / Analytes	AS-17 3 9/29/2014	AS-17 8 10/3/2014	AS-17 30 10/3/2014	AS-18 3 9/29/2014	AS-18 8 10/2/2014	AS-19 3 9/29/2014	AS-19 8 10/2/2014	AS-20 30 9/29/2014	AS-20 10 10/6/2014
Acetone	**0.33**	0.051 U	0.053 U	**0.14**	0.052 U	**0.094**	1.2 U	**0.085**	0.052 U
n-Butylbenzene	0.0012 U	0.0010 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U	**1.4**	0.0011 U	0.0010 U
Sec-Butylbenzene	0.0012 U	0.0010 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U	**0.67**	0.0011 U	0.0010 U
2-Chlorotoluene	0.0012 U	0.0010 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U	**0.48**	0.0011 U	0.0010 U
4-Chlorotoluene	0.0012 U	0.0010 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U	**0.52**	0.0011 U	0.0010 U
Ethylbenzene	0.0012 U	0.0010 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U	**0.94**	0.0011 U	0.0010 U
Cumene	0.0012 U	0.0010 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U	**0.41**	0.0011 U	0.0010 U
p-Isopropyltoluene	0.0012 U	0.0010 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U	**0.41**	0.0011 U	0.0010 U
Methyl ethyl ketone	**0.011**	0.010 U	0.011 U	0.012 U	0.010 U	0.011 U	0.23 U	0.011 U	0.010 U
Naphthalene	0.0058 U	0.0051 U	0.0053 U	0.0058 U	0.0052 U	0.0055 U	**1.5**	0.0056 U	0.0052 U
n-Propylbenzene	0.0012 U	0.0010 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U	**1.8**	0.0011 U	0.0010 U
Styrene	0.0012 U	0.0010 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U	**0.089**	0.0011 U	0.0010 U
1,1,2,2-Tetrachloroethane	0.0012 U	0.0010 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U	**0.45**	0.0011 U	0.0010 U
Tetrachloroethene	**0.044**	**0.0071**	**0.0022**	**0.0049**	**0.0014**	**0.0091**	**0.094**	**0.012**	**0.0033**
Toluene	0.0058 U	0.0051 U	0.0053 U	0.0058 U	0.0052 U	0.0055 U	**0.13**	0.0056 U	0.0052 U
1,2,3-Trichlorobenzene	0.0012 U	0.0010 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U	**0.036**	0.0011 U	0.0010 U
1,1,2-Trichloroethane	0.0012 U	0.0010 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U	**0.34**	0.0011 U	0.0010 U
1,2,4-Trimethylbenzene	0.0012 U	**0.0028**	0.0011 U	0.0012 U	0.0010 U	0.0011 U	**18**	0.0011 U	**0.0029**
Benzene, 1,2,3-Trimethyl-	0.0012 U	**0.001**	0.0011 U	0.0012 U	0.0010 U	0.0011 U	**4.6**	0.0011 U	0.0010 U
1,3,5-Trimethylbenzene	0.0012 U	0.0010 U	0.0011 U	0.0012 U	0.0010 U	0.0011 U	**5.0**	0.0011 U	0.0010 U
Total Xylenes	0.0034 U	0.0031 U	0.0032 U	0.0035 U	0.0031 U	0.0033 U	**7.7**	0.0033 U	0.0031 U

Notes:

1. Summary of samples collected during 2014 remediation construction.
2. Refer to Appendix D for historical soil sample data summary.
3. All results in milligrams per kilogram (mg/kg) or parts per million
4. U = not detected at or above the practical quantitation limit (PQL)
5. Soil samples collected either prior to drilling with a hand auger or during drilling with a split spoon sampler.
6. Volatile Organic Compounds (VOC) by USEPA Method 8260B
7. Concentrations detected above the PQL shown in **bold**.
8. Concentrations exceeding the cleanup level are **shaded**.

Table 1

Summary of Post-Interim Action Soil Sampling Results
Manhattan Village Shopping Center and Harris Properties
Normandy Park, WA

Depth (ft) / Analytes	AS-21 3 10/1/2014	AS-21 8 10/7/2014	AS-22 3 10/1/2014	AS-22 8 10/1/2014	AS-22 10 10/8/2014	AS-23 3 9/30/2014	AS-23 8 9/30/2014	AS-23 10 10/10/2014
Acetone	0.054 U	0.052 U	**0.062**	0.053 U	**0.073**	0.054 U	0.052 U	0.052 U
n-Butylbenzene	0.0011 U	0.0010 U	0.0011 U	0.0010 U	**0.0097**	0.0011 U	0.0010 U	0.0010 U
Sec-Butylbenzene	0.0011 U	0.0010 U	0.0011 U	0.0010 U	**0.0059**	0.0011 U	0.0010 U	0.0010 U
2-Chlorotoluene	0.0011 U	0.0010 U	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0010 U	0.0010 U
4-Chlorotoluene	0.0011 U	0.0010 U	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0010 U	0.0010 U
Ethylbenzene	0.0011 U	0.0010 U	0.0011 U	0.0010 U	**0.0072**	0.0011 U	0.0010 U	0.0010 U
Cumene	0.0011 U	0.0010 U	0.0011 U	0.0010 U	**0.0041**	0.0011 U	0.0010 U	0.0010 U
p-Isopropyltoluene	0.0011 U	0.0010 U	0.0011 U	0.0010 U	**0.0036**	0.0011 U	0.0010 U	0.0010 U
Methyl ethyl ketone	0.011 U	0.010 U	0.011 U	0.010 U	0.013 U	0.011 U	0.010 U	0.010 U
Naphthalene	0.0054 U	0.0052 U	0.0055 U	0.0053 U	**0.022**	0.0054 U	0.0052 U	0.0052 U
n-Propylbenzene	0.0011 U	0.0010 U	0.0011 U	0.0010 U	**0.019**	0.0011 U	0.0010 U	0.0010 U
Styrene	0.0011 U	0.0010 U	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0010 U	0.0010 U
1,1,2,2-Tetrachloroethane	0.0011 U	0.0010 U	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0010 U	0.0010 U
Tetrachloroethene	**0.0034**	**0.0038**	**0.0066**	**0.0052**	**0.0027**	**0.0012**	**0.0022**	**0.0038**
Toluene	0.0054 U	0.0052 U	0.0055 U	0.0053 U	0.0056 U	0.0054 U	0.0052 U	0.0052 U
1,2,3-Trichlorobenzene	0.0011 U	0.0010 U	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0010 U	0.0010 U
1,1,2-Trichloroethane	0.0011 U	0.0010 U	0.0011 U	0.0010 U	0.0011 U	0.0011 U	0.0010 U	0.0010 U
1,2,4-Trimethylbenzene	0.0011 U	0.0010 U	0.0011 U	0.0010 U	**0.18**	0.0011 U	0.0010 U	0.0010 U
Benzene, 1,2,3-Trimethyl-	0.0011 U	0.0010 U	0.0011 U	0.0010 U	**0.052**	0.0011 U	0.0010 U	0.0010 U
1,3,5-Trimethylbenzene	0.0011 U	0.0010 U	0.0011 U	0.0010 U	**0.047**	0.0011 U	0.0010 U	0.0010 U
Total Xylenes	0.0032 U	0.0031 U	0.0033 U	0.0032 U	**0.076**	0.0032 U	0.0031 U	0.0031 U

Notes:

1. Summary of samples collected during 2014 remediation construction.
2. Refer to Appendix D for historical soil sample data summary.
3. All results in milligrams per kilogram (mg/kg) or parts per million
4. U = not detected at or above the practical quantitation limit (PQL)
5. Soil samples collected either prior to drilling with a hand auger or during drilling with a split spoon sampler.
6. Volatile Organic Compounds (VOC) by USEPA Method 8260B
7. Concentrations detected above the PQL shown in **bold**.
8. Concentrations exceeding the cleanup level are **shaded**.

Table 1

Summary of Post-Interim Action Soil Sampling Results
Manhattan Village Shopping Center and Harris Properties
Normandy Park, WA

Depth (ft) / Analytes	AS-24 3 9/30/2014	AS-24 8 9/30/2014	AS-24 10 10/14/2014	AS-25 3 10/1/2014	AS-25 10 10/15/2014	AS-26 3 9/30/2014	AS-26 8 9/30/2014	AS-26 10 10/16/2014
Acetone	**0.066**	0.053 U	0.053 U	0.054 U	0.053 U	**0.057**	**0.057**	0.055 U
n-Butylbenzene	0.0011 U	0.0010 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Sec-Butylbenzene	0.0011 U	0.0010 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U
2-Chlorotoluene	0.0011 U	0.0010 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U
4-Chlorotoluene	0.0011 U	0.0010 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Ethylbenzene	0.0011 U	0.0010 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Cumene	0.0011 U	0.0010 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U
p-Isopropyltoluene	0.0011 U	0.0010 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Methyl ethyl ketone	0.011 U	0.010 U	0.010 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U
Naphthalene	0.0054 U	0.0053 U	0.0053 U	0.0054 U	0.0053 U	0.0055 U	0.0055 U	0.0055 U
n-Propylbenzene	0.0011 U	0.0010 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Styrene	0.0011 U	0.0010 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U
1,1,2,2-Tetrachloroethane	0.0011 U	0.0010 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Tetrachloroethene	**0.0074**	**0.0013**	**0.0022**	**0.0017**	**0.002**	**0.0093**	**0.0089**	**0.0067**
Toluene	0.0054 U	0.0053 U	0.0053 U	0.0054 U	0.0053 U	0.0055 U	0.0055 U	0.0055 U
1,2,3-Trichlorobenzene	0.0011 U	0.0010 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U
1,1,2-Trichloroethane	0.0011 U	0.0010 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U
1,2,4-Trimethylbenzene	0.0011 U	0.0010 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Benzene, 1,2,3-Trimethyl-	0.0011 U	0.0010 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U
1,3,5-Trimethylbenzene	0.0011 U	0.0010 U	0.0010 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Total Xylenes	0.0033 U	0.0032 U	0.0032 U	0.0033 U	0.0032 U	0.0033 U	0.0033 U	0.0033 U

Notes:

1. Summary of samples collected during 2014 remediation construction.
2. Refer to Appendix D for historical soil sample data summary.
3. All results in milligrams per kilogram (mg/kg) or parts per million
4. U = not detected at or above the practical quantitation limit (PQL)
5. Soil samples collected either prior to drilling with a hand auger or during drilling with a split spoon sampler.
6. Volatile Organic Compounds (VOC) by USEPA Method 8260B
7. Concentrations detected above the PQL shown in **bold**.
8. Concentrations exceeding the cleanup level are **shaded**.

Table 1

Summary of Post-Interim Action Soil Sampling Results
Manhattan Village Shopping Center and Harris Properties
Normandy Park, WA

Depth (ft) / Analytes	AS-27 3 9/30/2014		AS-27 8 10/17/2014		AS-28 10 9/22/2014		AS-29 5 9/23/2014		AS-30 5 9/25/2014		AS-31 5 9/25/2014		SVE-14 3.5 9/30/2014		SVE-14 8.5 10/13/2014	
Acetone	0.054	U	0.054	U	0.051	U	**0.21**		0.055	U	**0.076**		0.054	U	0.053	U
n-Butylbenzene	0.0011	U	0.0011	U	0.0010	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0010	U
Sec-Butylbenzene	0.0011	U	0.0011	U	0.0010	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0010	U
2-Chlorotoluene	0.0011	U	0.0011	U	0.0010	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0010	U
4-Chlorotoluene	0.0011	U	0.0011	U	0.0010	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0010	U
Ethylbenzene	0.0011	U	0.0011	U	0.0010	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0010	U
Cumene	0.0011	U	0.0011	U	0.0010	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0010	U
p-Isopropyltoluene	0.0011	U	0.0011	U	0.0010	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0010	U
Methyl ethyl ketone	0.011	U	0.011	U	0.010	U	**0.018**		0.0011	U	0.0011	U	0.011	U	0.010	U
Naphthalene	0.0054	U	0.0054	U	0.0051	U	0.0052	U	0.0055	U	0.0057	U	0.0054	U	0.0053	U
n-Propylbenzene	0.0011	U	0.0011	U	0.0010	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0010	U
Styrene	0.0011	U	0.0011	U	0.0010	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0010	U
1,1,2,2-Tetrachloroethane	0.0011	U	0.0011	U	0.0010	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0010	U
Tetrachloroethene	**0.0051**		**0.015**		**0.0082**		**0.0034**		**0.0015**		0.0011	U	0.0011	U	**0.0012**	
Toluene	0.0054	U	0.0054	U	0.0051	U	0.0052	U	0.0055	U	0.0057	U	0.0054	U	0.0053	U
1,2,3-Trichlorobenzene	0.0011	U	0.0011	U	0.0010	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0010	U
1,1,2-Trichloroethane	0.0011	U	0.0011	U	0.0010	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	0.0010	U
1,2,4-Trimethylbenzene	0.0011	U	0.0011	U	0.0010	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	**0.0044**	
Benzene, 1,2,3-Trimethyl-	0.0011	U	0.0011	U	0.0010	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	**0.0019**	
1,3,5-Trimethylbenzene	0.0011	U	0.0011	U	0.0010	U	0.0010	U	0.0011	U	0.0011	U	0.0011	U	**0.0015**	
Total Xylenes	0.0032	U	0.0032	U	0.0031	U	0.0031	U	0.0033	U	0.0034	U	0.0033	U	0.0032	U

Notes:

1. Summary of samples collected during 2014 remediation construction.
2. Refer to Appendix D for historical soil sample data summary.
3. All results in milligrams per kilogram (mg/kg) or parts per million
4. U = not detected at or above the practical quantitation limit (PQL)
5. Soil samples collected either prior to drilling with a hand auger or during drilling with a split spoon sampler.
6. Volatile Organic Compounds (VOC) by USEPA Method 8260B
7. Concentrations detected above the PQL shown in **bold**.
8. Concentrations exceeding the cleanup level are **shaded**.

Table 1

Summary of Post-Interim Action Soil Sampling Results
Manhattan Village Shopping Center and Harris Properties
Normandy Park, WA

Depth (ft) / Analytes	SVE-15 3 11/1/2014		SVE-15 8 10/15/2014		SVE-16 3 9/30/2014		SVE-16 10 10/15/2014		SVE-17 5 9/24/2014		SVE-18 5 9/23/2014		SVE-19 5 9/29/2014	
Acetone	0.055	U	0.053	U	0.055	U	0.057	U	**0.15**		**0.11**		0.055	U
n-Butylbenzene	0.0011	U	0.0011	U	0.0011	U	**0.0048**		0.0015	U	0.0017	U	0.0011	U
Sec-Butylbenzene	0.0011	U	0.0011	U	0.0011	U	**0.0028**		0.0015	U	0.0017	U	0.0011	U
2-Chlorotoluene	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0015	U	0.0017	U	0.0011	U
4-Chlorotoluene	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0015	U	0.0017	U	0.0011	U
Ethylbenzene	0.0011	U	0.0011	U	0.0011	U	**0.0013**		0.0015	U	0.0017	U	0.0011	U
Cumene	0.0011	U	0.0011	U	0.0011	U	**0.0013**		0.0015	U	0.0017	U	0.0011	U
p-Isopropyltoluene	0.0011	U	0.0011	U	0.0011	U	**0.0023**		0.0015	U	0.0017	U	0.0011	U
Methyl ethyl ketone	0.011	U	0.011	U	0.011	U	0.011	U	0.015	U	0.017	U	0.011	U
Naphthalene	0.0055	U	0.0053	U	0.0055	U	**0.0075**		0.0075	U	0.0084	U	0.0055	U
n-Propylbenzene	0.0011	U	0.0011	U	0.0011	U	**0.0057**		0.0015	U	0.0017	U	0.0011	U
Styrene	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0015	U	0.0017	U	0.0011	U
1,1,2,2-Tetrachloroethane	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0015	U	0.0017	U	0.0011	U
Tetrachloroethene	**0.0018**		**0.0024**		**0.0037**		**0.008**		**0.026**		**0.0024**		0.0011	U
Toluene	0.0055	U	0.0053	U	0.0055	U	0.0057	U	0.0075	U	0.0084	U	0.0055	U
1,2,3-Trichlorobenzene	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0015	U	0.0017	U	0.0011	U
1,1,2-Trichloroethane	0.0011	U	0.0011	U	0.0011	U	0.0011	U	0.0015	U	0.0017	U	0.0011	U
1,2,4-Trimethylbenzene	0.0011	U	0.0011	U	0.0011	U	**0.074**		0.0015	U	0.0017	U	0.0011	U
Benzene, 1,2,3-Trimethyl-	0.0011	U	0.0011	U	0.0011	U	**0.023**		0.0015	U	0.0017	U	0.0011	U
1,3,5-Trimethylbenzene	0.0011	U	0.0011	U	0.0011	U	**0.021**		0.0015	U	0.0017	U	0.0011	U
Total Xylenes	0.0033	U	0.0032	U	0.0033	U	**0.02**		0.0045	U	0.0050	U	0.0033	U

Notes:

1. Summary of samples collected during 2014 remediation construction.
2. Refer to Appendix D for historical soil sample data summary.
3. All results in milligrams per kilogram (mg/kg) or parts per million
4. U = not detected at or above the practical quantitation limit (PQL)
5. Soil samples collected either prior to drilling with a hand auger or during drilling with a split spoon sampler.
6. Volatile Organic Compounds (VOC) by USEPA Method 8260B
7. Concentrations detected above the PQL shown in **bold**.
8. Concentrations exceeding the cleanup level are **shaded**.

Table 2

Summary of Current Groundwater Sampling Results
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Monitoring Well	Date	Sceened Interval Depth (feet TOC)	Depth to Water (feet TOC)	Pump Intake Depth (feet TOC)	PCE (µg/l)	
MTCA Method A Ground Water Cleanup Level					**5**	
Shallow Monitoring Wells						
MW-2	12/11/2015	32.22-42.22	36.89	39	1.00	U
MW-3	12/10/2015	35.67-45.67	39.41	42	**1.34**	
MW-4	12/14/2015	33.45-43.45	38.39	41	**4.89**	
MW-7	12/15/2015	34.47-44.47	38.58	41	**7.42**	
MW-9	12/10/2015	31.6-41.6	32.00	36	1.00	U
MW-10	12/11/2015	31.52-41.52	35.17	38	1.00	U
MW-11	12/14/2015	31.56-41.56	36.02	39.5	**11.9**	
MW-12	12/10/2015	35.7-45.7	40.49	42.5	1.00	U
MW-13	12/10/2015	34.58-44.58	36.97	40	1.00	U
MW-14	12/11/2015	27.6-37.6	32.65	35	1.00	U
MW-15	12/10/2015	37.14-47.14	40.75	43	1.00	U
MW-16	12/11/2015	29.45-44.65	38.89	42	**1.20**	
DC-3	12/11/2015	42.32-47.32	41.41	44.5	**1.49**	
DC-4	12/14/2015	43.36-48.36	40.51	45.5	**5.49**	
DC-7	12/16/2015	34.35-39.35	31.79	35	**13.3**	
DC-8	12/16/2015	36.64-41.64	35.41	38.5	**8.61**	
DC-11	12/11/2015	31.6-41.6	39.43	41.5	**1.48**	
DC-12	12/14/2015	31.7-41.7	39.59	41.5	**2.04**	
DC-13	12/14/2015	31.7-41.7	38.65	41	**2.78**	
DC-14	12/15/2015	34.4-44.4	38.11	41	**6.02**	
DC-15	12/16/2015	30.7-40.7	36.62	39	**5.93**	
DC-17	12/16/2015	29.81-39.81	33.58	36	**15.1**	
DC-18	12/14/2015	31.58-41.58	38.12	40.5	**3.19**	
DC-20	12/15/2015	33.8-43.8	39.44	41.5	**1.74**	
KMW-2	12/15/2015	29.91-39.91	35.30	37.5	**15.1**	
KMW-7	12/15/2015	28.78-43.78	31.03	34	**2.17**	
KMW-8	12/15/2015	28.69-43.69	37.61	40	**3.98**	
KMW-9	12/10/2015	33.5-43.5	38.70	41	**1.47**	

Table 2

Summary of Current Groundwater Sampling Results
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Monitoring Well	Date	Sceened Interval Depth (feet TOC)	Depth to Water (feet TOC)	Pump Intake Depth (feet TOC)	PCE (µg/l)

NOTES:

1. Tetrachloroethene (PCE) concentrations in migrograms per liter (µg/l).
2. Other detected analytes were below their respective cleanup levels: TCE (3.22 µg/L in MW-10) and 1,2-dichloropropane (1.82 µg/L in DC-20).
3. Groundwater samples analyzed using USEPA Method 8260B.
4. U = concentration not detected at or above the laboratory practical quantitation limit (PQL).
5. Detected concentrations are shown in **bold.**
6. Concentrations exceeding the cleanup level are **bold and shaded**.
7. Screened interval depth is estimated using from surveyed elevations (top of casing elevations, ground surface, and monument rim) and field measurements at the time of drilling.
8. Pump intake depth and depth to water is measured in feet below the top of casing (TOC).
9. Screened intervals completely submerged are shaded.

Table 3

Summary of Indoor Air Sampling Results
Manhattan Village Shopping Center and Harris Properties
Normandy Park, WA

Analytes	NP-Basement 5/20/2008				NP-Main Floor 5/20/2008				NP-Outdoor 5/20/2008			
	(ppbV)		(µg/m3)		(ppbV)		(µg/m3)		(ppbV)		(µg/m3)	
1,1-Dichloroethene	**0.12**	**J**	**0.48**	**J**	0.10	U	0.40	U	0.10	U	0.40	U
Methylene Chloride	0.15	U	0.52	U	**0.30**	**J**	**1.04**	**J**	0.15	U	0.52	U
1,1,1-Trichloroethane	0.15	U	0.82	U	**0.91**		**4.96**		**0.21**	**J**	**1.15**	**J**
Trichlorofluormethane	0.20	U	1.12	U	**0.62**		**3.48**		**0.46**		**2.58**	

Notes:

1. Summary of halogenated volatile organic compounds detected in air samples collected within and adjacent to residence on Harris Property.
2. Samples were collected using a 1-L stainless steel summa canister (no moisture filter).
3. Air samples analyzed using USEPA Method TO-15.
4. Results per February 2009 Final Data Gap Investigation Report (ERM).
5. Analytical laboratory results reported in parts per billion by volume (ppbV)
6. Lab results converted to from ppbV to micrograms per cubic meter (µg/m3) using molecular weight and temperature of 25 degrees C.
7. U = not detected at or above the practical quantitation limit (PQL)
8. J = concentrated reported as "estimated" by lab.
9. Concentrations detected above the PQL shown in **bold**.
10. Concentrations exceeding the cleanup level are **shaded**.

Table 4

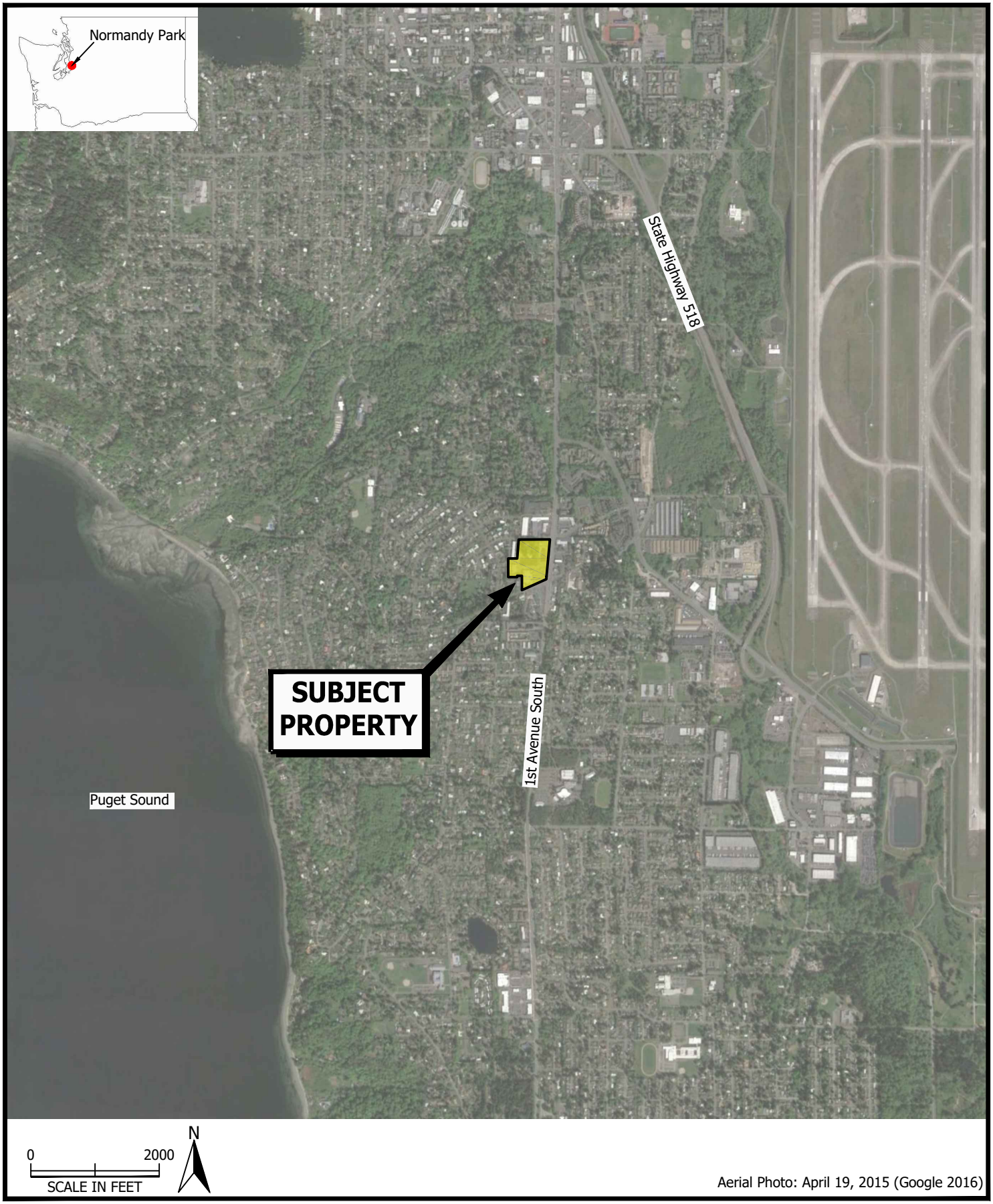
Soil, Groundwater, and Indoor Air Cleanup Levels
Manhattan Village Shopping Center and Harris Properties
Normandy Park, WA

Parameter	Soil (mg/kg) Method A	Groundwater (µg/L) Method A	Indoor Air (µg/m3) Method B
Tetrachloroethene	**0.05**	**5**	**9.62**

Notes:

1. Method A Cleanup Level for Unrestrictive Land Use (protective of groundwater)
2. mg/kg = milligrams per kilogram
3. µg/L = micrograms per liter
4. µg/m3 = micrograms per cubic meter

FIGURES

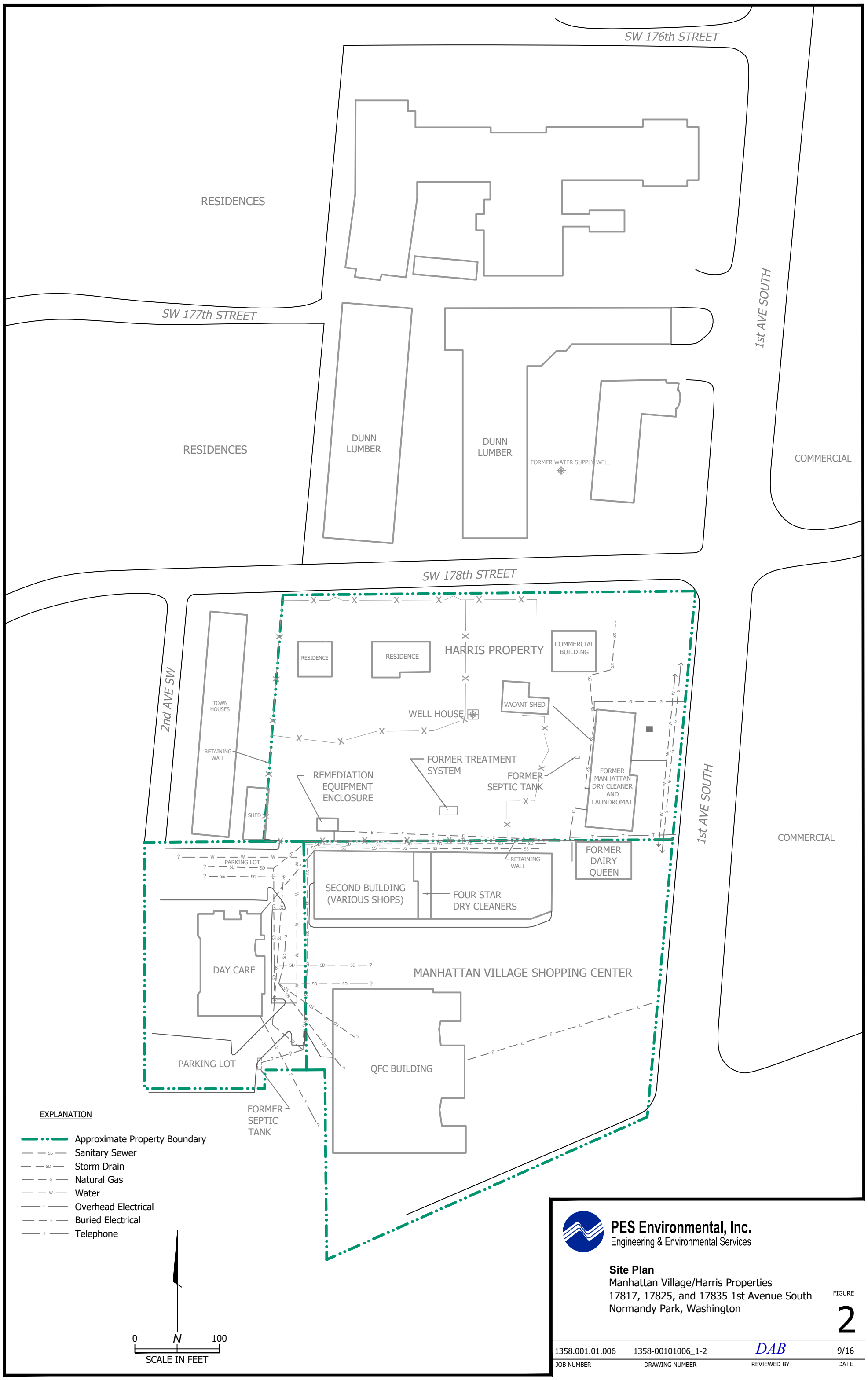


PES Environmental, Inc.
Engineering & Environmental Services

Subject Property Location Map
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE
1

1358.001.01.006	1358-00101006_1-2	*DAB*	9/16
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

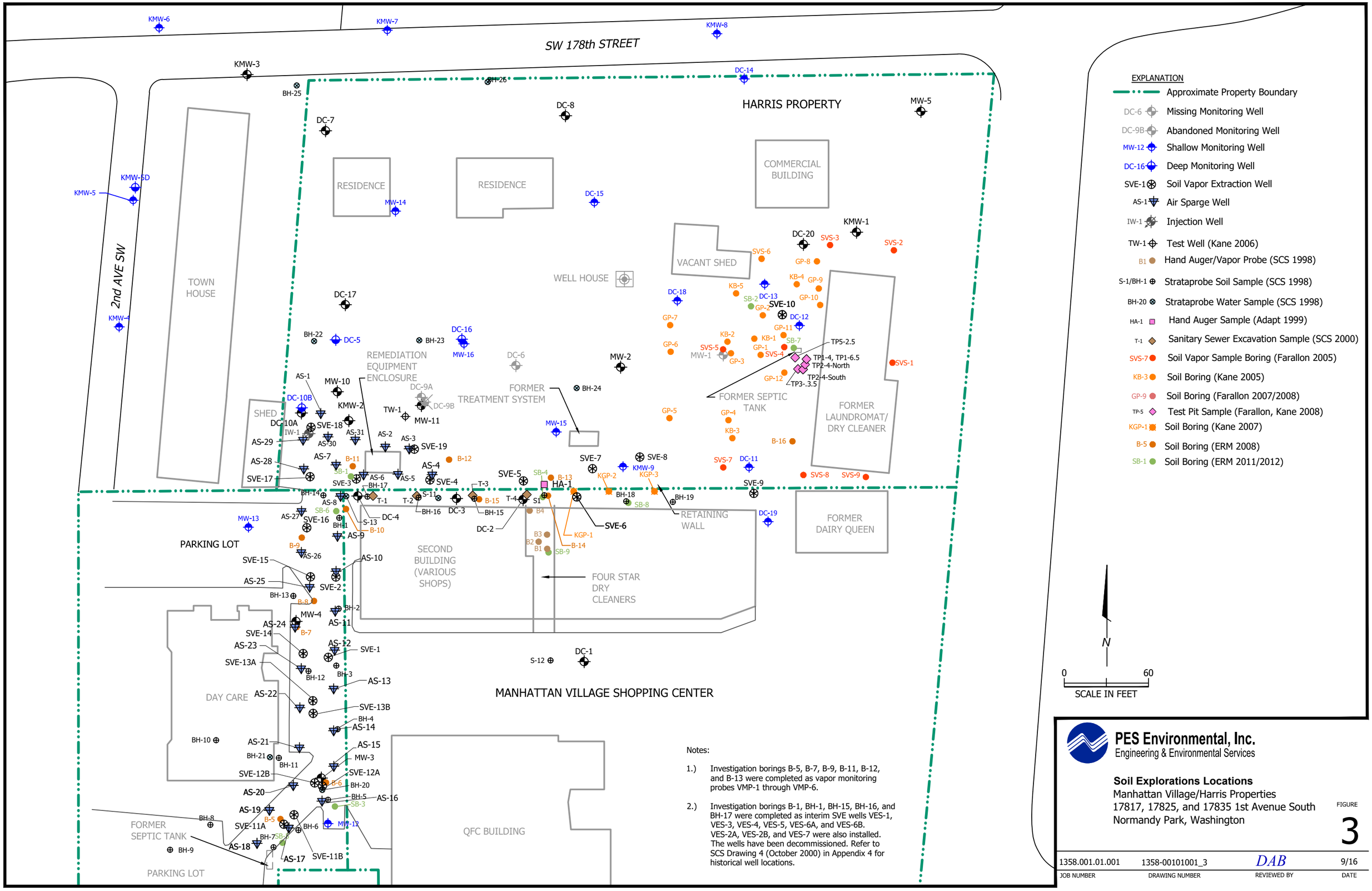


PES Environmental, Inc.
Engineering & Environmental Services

Site Plan
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE
2

1358.001.01.006	1358-00101006_1-2	DAB	9/16
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



Notes:

1.) Investigation borings B-5, B-7, B-9, B-11, B-12, and B-13 were completed as vapor monitoring probes VMP-1 through VMP-6.

2.) Investigation borings B-1, BH-1, BH-15, BH-16, and BH-17 were completed as interim SVE wells VES-1, VES-3, VES-4, VES-5, VES-6A, and VES-6B. VES-2A, VES-2B, and VES-7 were also installed. The wells have been decommissioned. Refer to SCS Drawing 4 (October 2000) in Appendix 4 for historical well locations.

PES Environmental, Inc.
Engineering & Environmental Services

Soil Explorations Locations
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE 3

1358.001.01.001	1358-00101001_3	DAB	9/16
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

MW-9
B-17
B-18
SW 176th STREET
RESIDENCES
1st AVE SOUTH
MW-8
SW 177th STREET
MW-7
MW-6
RESIDENCES
DUNN LUMBER
DUNN LUMBER
FORMER WATER SUPPLY WELL
COMMERCIAL
KMW-6
KMW-7
SW 178th STREET
KMW-8
KMW-3
BH-25
DC-14
DC-8
MW-5
DC-7
KMW-5D
KMW-5
RESIDENCE
RESIDENCE
HARRIS PROPERTY
COMMERCIAL BUILDING
MW-14
DC-15
KMW-1
DC-20
VACANT SHED
2nd AVE SW
TOWN HOUSES
WELL HOUSE
DC-13
DC-17
DC-18
KMW-4
DC-16
DC-12
DC-5
BH-22
BH-23
MW-16
MW-2
DC-10B
MW-10
FORMER TREATMENT SYSTEM
BH-24
FORMER MANHATTAN DRY CLEANER AND LAUNDROMAT
MW-11
KMW-2
FORMER SEPTIC TANK
DC-10A
REMEDIATION EQUIPMENT ENCLOSURE
MW-15
B-16
SHED
DC-11
S-13
S-11
KMW-9
1st AVE SOUTH
COMMERCIAL
MW-13
BH-14
DC-4
DC-3
DC-2
S-1
RETAINING WALL
FORMER DAIRY QUEEN
DC-19
PARKING LOT
SECOND BUILDING (VARIOUS SHOPS)
FOUR STAR DRY CLEANERS
B-8
MW-4
DC-1
DAY CARE
MANHATTAN VILLAGE SHOPPING CENTER
BH-21
MW-3
BH-20
MW-12
B-5
QFC BUILDING
FORMER SEPTIC TANK
N
0
100
SCALE IN FEET

EXPLANATION

- Approximate Property Boundary
- MW-12 Shallow Monitoring Well
- DC-16 Deep Monitoring Well
- BH-1 Strataprobe Soil Sample (SCS 1998)
- BH-20 Strataprobe Water Sample (SCS 1998)
- B-1 Soil Boring (ERM 2008)

PES Environmental, Inc.
Engineering & Environmental Services

Groundwater Exploration Locations
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE 4

1358.001.01.004	1358-00101006_4	DAB	9/16
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

MW-9
SW 176th STREET
RESIDENCES
1st AVE SOUTH
MW-8
SW 177th STREET
MW-7
MW-6
DUNN LUMBER
DUNN LUMBER
FORMER WATER SUPPLY WELL
COMMERCIAL
RESIDENCES
KMW-6
KMW-7
KMW-8
SW 178th STREET
KMW-3
DC-14
MW-5
DC-7
DC-8
RESIDENCE
HARRIS PROPERTY
COMMERCIAL BUILDING
KMW-5D
KMW-5
RESIDENCE
MW-14
DC-15
KMW-1
2nd AVE SW
TOWN HOUSE
DC-20
VACANT SHED
WELL HOUSE
DC-13
DC-17
DC-18
KMW-4
DC-16
DC-12
DC-5
MW-16
MW-2
FORMER MANHATTAN DRY CLEANER AND LAUNDROMAT
MW-10
DC-10B
MW-11
REMEDIATION EQUIPMENT ENCLOSURE
FORMER TREATMENT SYSTEM
FORMER SEPTIC TANK
DC-10A
KMW-2
MW-15
KMW-9
DC-11
DC-3
DC-2
DC-4
SHED
RETAINING WALL
MW-13
PARKING LOT
DC-19
FORMER DAIRY QUEEN
SECOND BUILDING (VARIOUS SHOPS)
FOUR STAR DRY CLEANERS
MW-4
DC-1
DAY CARE
MANHATTAN VILLAGE SHOPPING CENTER
MW-3
MW-12
PARKING LOT
FORMER SEPTIC TANK
QFC BUILDING

EXPLANATION

Approximate Property Boundary

MW-12 Shallow Monitoring Well

DC-16 Deep Monitoring Well

N

0 100

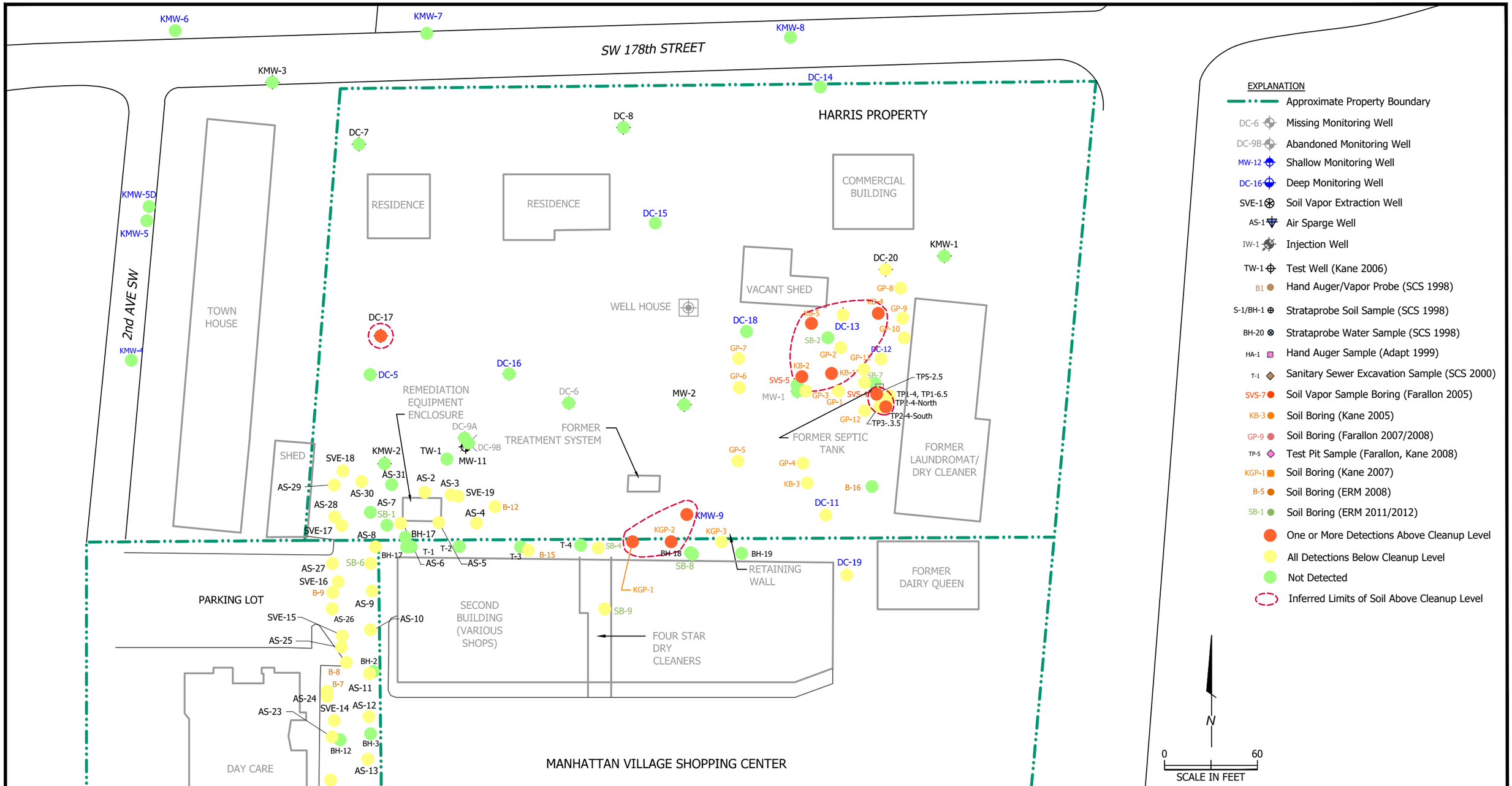
SCALE IN FEET

PES Environmental, Inc.
Engineering & Environmental Services

Monitoring Well Locations
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE 5

1358.001.01.006	1358-00101006_5	DAB	9/16
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



EXPLANATION

- Approximate Property Boundary
- DC-6 Missing Monitoring Well
- DC-9B Abandoned Monitoring Well
- MW-12 Shallow Monitoring Well
- DC-16 Deep Monitoring Well
- SVE-1 Soil Vapor Extraction Well
- AS-1 Air Sparge Well
- IW-1 Injection Well
- TW-1 Test Well (Kane 2006)
- B1 Hand Auger/Vapor Probe (SCS 1998)
- S-1/BH-1 Strataprobe Soil Sample (SCS 1998)
- BH-20 Strataprobe Water Sample (SCS 1998)
- HA-1 Hand Auger Sample (Adapt 1999)
- T-1 Sanitary Sewer Excavation Sample (SCS 2000)
- SVS-7 Soil Vapor Sample Boring (Farallon 2005)
- KB-3 Soil Boring (Kane 2005)
- GP-9 Soil Boring (Farallon 2007/2008)
- TP-5 Test Pit Sample (Farallon, Kane 2008)
- KGP-1 Soil Boring (Kane 2007)
- B-5 Soil Boring (ERM 2008)
- SB-1 Soil Boring (ERM 2011/2012)
- One or More Detections Above Cleanup Level
- All Detections Below Cleanup Level
- Not Detected
- Inferred Limits of Soil Above Cleanup Level

N

0 60

SCALE IN FEET

NOTE:

1. Soil PCE MTCA Method A CUL = 0.050 mg/kg
2. Former septic tank excavation samples (Kane, 2004) on Harris property are not shown. Following removal of the tank, all sidewall and bottom samples were below the MTCA Method A cleanup level for PCE.
3. Approximately 300 feet of sanitary sewer pipe behind the Manhattan Village Shopping Center was excavated and replaced in July 2000. Samples T-1 through T-4 were collected below the former concrete pipe.

PES Environmental, Inc.
Engineering & Environmental Services

Soil Results Relative to Cleanup Levels
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE 6

1358.001.01.001	1358-00101001_6	DAB	9/16
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

(252.91)
MW-9
<1.00
SW 176th STREET
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
RESIDENCES
(268.87)
MW-8
NS
SW 177th STREET
(263.89)
MW-7
7.42
MW-6
NS
(266.92)
1st AVE SOUTH
COMMERCIAL
RESIDENCES
DUNN LUMBER
DUNN LUMBER
FORMER WATER SUPPLY WELL
NS
(270.50)
KMW-6
2.17
(270.40)*
KMW-7
3.98
KMW-8
(270.39)
(NM)
KMW-3
NS
SW 178th STREET
(270.65)
DC-14
(270.71)
6.02
MW-5
(270.69)
NS
13.3
DC-7
(270.82)*
DC-8
8.61
KMW-5D
KMW-5
(270.92)
NS
RESIDENCE
RESIDENCE
MW-14
(271.17)*
<1.00
HARRIS PROPERTY
COMMERCIAL BUILDING
DC-15
(271.10)
5.93
KMW-1
(271.30)
NS
1.74
DC-20
(271.48)*
2nd AVE SW
TOWN HOUSES
15.1
DC-17
(271.58)*
WELL HOUSE
3.19
DC-18
(271.25)
VACANT SHED
DC-13
(271.41)
2.78
(271.55)
DC-12
2.04
1.20
(271.41)
MW-16
DC-16
DC-5
KMW-4
(271.49)
NS
<1.00
MW-2
(271.45)*
FORMER TREATMENT SYSTEM
FORMER SEPTIC TANK
FORMER MANHATTAN DRY CLEANER AND LAUNDROMAT
DC-10B
MW-10
<1.00
(271.49)
MW-11
(271.46)
MW-15
(271.67)
<1.00
KMW-2
(271.53)
11.9
15.1
DC-10A
(271.54)
SHED
NS
REMEDIATION EQUIPMENT ENCLOSURE
1.47
KMW-9
(271.62)
1.48
DC-11
(271.77)
MW-13
<1.00
PARKING LOT
(271.75)
DC-4
(271.66)
5.49
DC-3
(271.64)
1.49
DC-2
(271.70)
NS
RETAINING WALL
(271.96)
NS
DC-19
FORMER DAIRY QUEEN
SECOND BUILDING (VARIOUS SHOPS)
FOUR STAR DRY CLEANERS
MW-4
(271.87)
4.89
DC-1
(272.31)
NS
DAY CARE
MANHATTAN VILLAGE SHOPPING CENTER
1.34
MW-3
(272.13)
<1.00
MW-12
(272.21)
QFC BUILDING
FORMER SEPTIC TANK
N
0
100
SCALE IN FEET

EXPLANATION

- Approximate Property Boundary
- MW-12 — Shallow Monitoring Well
- DC-16 — Deep Monitoring Well
- (272.13) — Groundwater-Level Elevation in feet NAVD 88 on December 9, 2015
- 272 — Generalized Groundwater Elevation Contour
- * — Groundwater Elevation from groundwater sampling used for contouring
- NM — Elevation Not Measured
- Estimated Groundwater Flow Direction
- 13.3 — Tetrachloroethene (PCE) concentration in micrograms per liter (µg/L); results in red exceed the MTCA Method A cleanup level
- <1.00 — PCE not detected at or above the indicated method reporting limit (MRL)
- NS — Not Sampled
- Approximate Extent of PCE above MTCA Method A CUL = 5 µg/L

PES Environmental, Inc.
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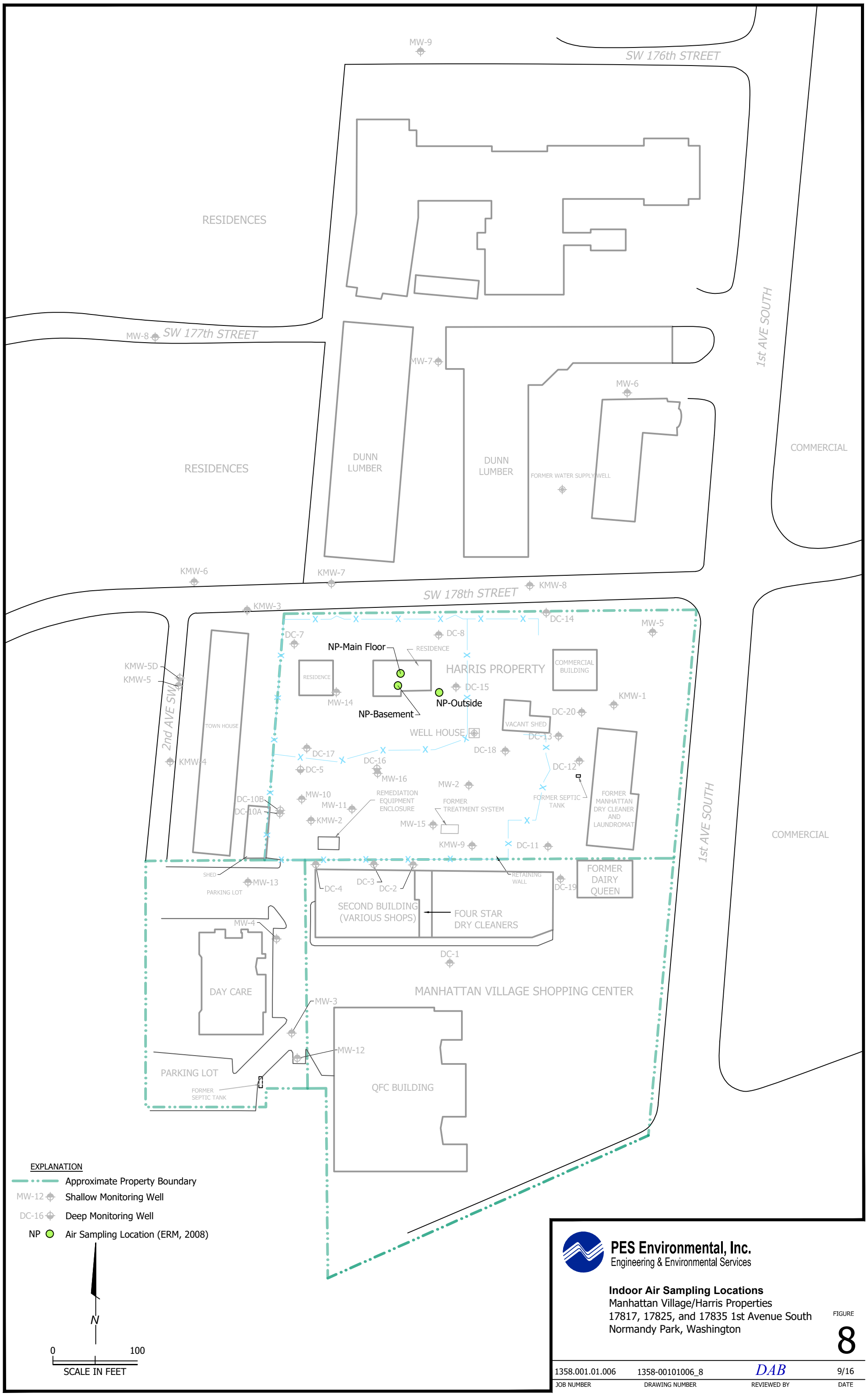
Groundwater Elevations and PCE Concentrations in December 2015
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE 7

1358.001.01.006	1358-00101006_7	DAB	9/16
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



PES Environmental, Inc.
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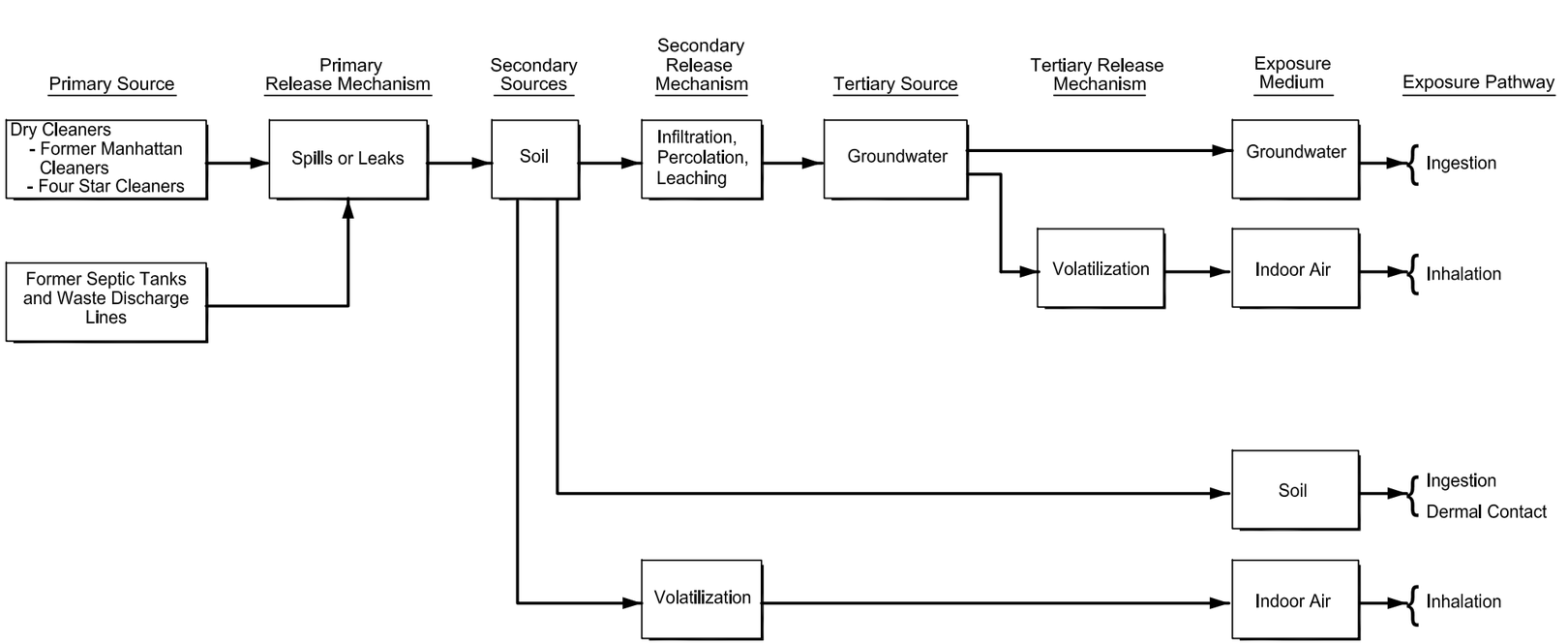
Indoor Air Sampling Locations
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE
8

1358.001.01.006	1358-00101006_8	DAB	9/16
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



HUMAN RECEPTORS			
On-Property		Off-Property	
Current	Future	Current	Future
X	O	X	O
X	X	X	X
X	O	NA	NA
X	O	NA	NA
X	X	NA	NA

LEGEND:
- ● Current Complete Pathway
- O Potential Future Pathway
- X Incomplete Pathway
- NA Not Applicable

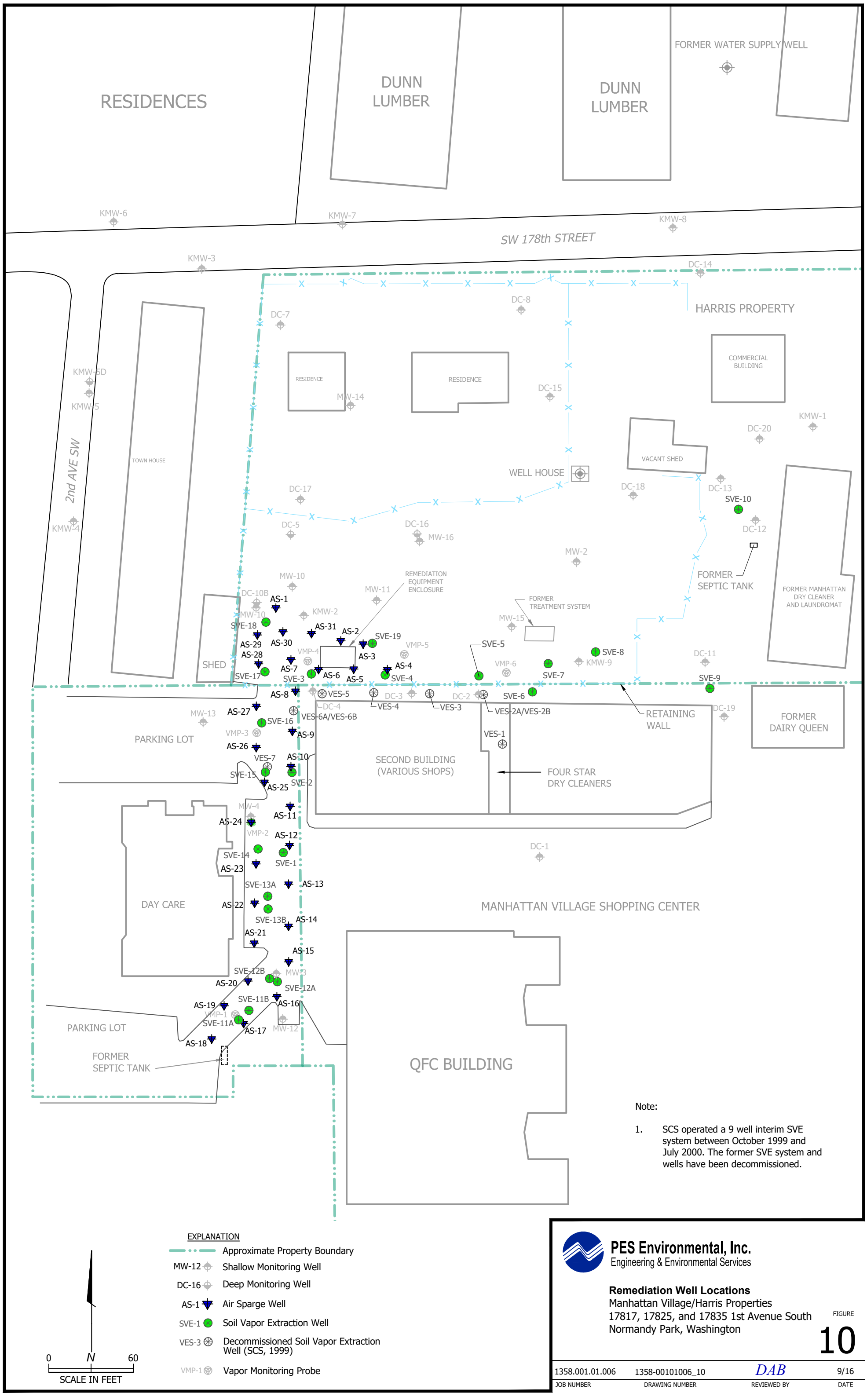
NOTE:
No terrestrial ecological evaluation is required for the Site based on the provisions of WAC 173-340-7492(2)(c), because no hazardous substance listed in Table 749-2 of WAC 173-340-900 is present in Site soils.

PES Environmental, Inc.
Engineering & Environmental Services

Conceptual Site Model
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE 9

1358.001.01.006	1358-00101006_9	DAB	9/16
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



Note:

1. SCS operated a 9 well interim SVE system between October 1999 and July 2000. The former SVE system and wells have been decommissioned.

PES Environmental, Inc.
Engineering & Environmental Services

Remediation Well Locations
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE
10

1358.001.01.006	1358-00101006_10	DAB	9/16
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

APPENDIX A

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APPENDIX B

BORING LOGS AND WELL COMPLETION DATA

Table B-1

Well Completion Details
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Well	Ecology Well Tag Number	Date Installed	Drilling Method	Location (feet NAD 83/91) Northing	Location (feet NAD 83/91) Easting	Elevation (feet NAVD 88) Monitoring Point	Elevation (feet NAVD 88) Surface Casing Rim	Elevation (feet NAVD 88) Ground Surface	Monument Type	Boring Depth (feet)	Well Diameter (inches)	Screen Depth (ft bgs) Below Ground	Screen Depth (ft bgs) Below Top of Casing	Slot Size (inch)	Filter Pack (ft bgs)	Seal (ft bgs)
Shallow Monitoring Wells																
MW-1		12/9/99	HSA	--	--	309.97	--	--	Flush	44	2	34-44	--	0.020	est. 32-44	0-est. 32
MW-2		12/9/99	HSA	165,149.8	1,268,724.6	308.34	309.13	309.12	Flush	43	2	33-43	32.22-42.22	0.020	est. 31-43	0-est. 31
MW-3		4/8/08	HSA	164,857.2	1,268,511.5	311.41	311.76	311.74	Flush	47	2	36-46	35.67-45.67	0.010	34-46	0-34
MW-4		4/8/08	HSA	164,968.5	1,268,493.6	310.47	311.03	311.02	Flush	44	2	34-44	33.45-43.45	0.010	32-44	0-32
MW-5		4/8/08	HSA	165,331.6	1,268,938.6	310.38	310.84	--	Flush	46	2	36-46	35.6-45.6	0.010	34-46	0-34
MW-6		4/9/08	HSA	165,615.5	1,268,908.5	304.14	304.71	304.68	Flush	45	2	35-45	34.46-44.46	0.010	33-45	0-35
MW-7		4/9/08	HSA	165,652.2	1,268,684.8	302.64	303.18	303.17	Flush	45	2	35-45	34.47-44.47	0.010	33-45	0-35
MW-8		8/18/08	HSA	165,681.2	1,268,349.8	280.68	281.05	280.97	Flush	26	2	13-23	12.71-22.71	0.010	11-23	0-11
MW-9		8/18/08	HSA	166,019.8	1,268,663.9	284.97	285.35	285.37	Flush	55	2	32-42	31.6-41.6	0.010	30-42	0-30
MW-10		2/3/11	HSA	165,132.3	1,268,522.8	306.71	307.20	307.19	Flush	42	2	32-42	31.52-41.52	0.010	30-42	0-30
MW-11		2/3/11	HSA	165,122.2	1,268,582.9	307.62	308.13	308.06	Flush	42	2	32-42	31.56-41.56	0.010	30-42	0-30
MW-12		3/28/12	HSA	164,825.0	1,268,516.1	312.80	313.12	313.10	Flush	46.5	2	36-46	35.7-45.7	0.010	34-46.5	0-34
MW-13		3/29/12	HSA	165,036.5	1,268,459.8	308.75	309.16	309.17	Flush	46.5	2	35-45	34.58-44.58	0.010	33-45	0-33
MW-14		3/27/12	HSA	165,261.1	1,268,564.6	303.82	304.24	--	Flush	38	2	28-38	27.6-37.6	0.010	26-38	0-26
MW-15		3/28/12	HSA	165,103.9	1,268,678.7	312.44	312.81	310.30	AG	46.5	2	35-45	37.14-47.14	0.010	33-45.5	0-33
MW-16	BHV646	5/16/13	HSA	165,164.5	1,268,613.3	310.37	311.21	307.92	AG	43	2	27.2-42.2	29.45-44.65	0.020	25-43	0-25
DC-1		10/12/98	HSA	164,940.2	1,268,698.6	312.82	313.34	--	Flush	47	2	40-45	39.5-44.5	0.020	37-47	0-37
DC-2		10/13/98	HSA	165,055.6	1,268,655.1	312.92	313.61	313.70	Flush	50	2	42-47	41.22-46.22	0.020	40-50	0-40
DC-3		10/13/98	HSA	165,056.4	1,268,607.7	313.11	313.68	313.79	Flush	48	2	43-48	42.32-47.32	0.020	41-48	0-41
DC-4		10/13/98	HSA	165,058.1	1,268,537.4	312.35	312.96	312.99	Flush	49	2	44-49	43.36-48.36	0.020	41-49	0-41
DC-6		1/22/99	HSA	--	--	308.46	--	--	Flush	45	2	40-45	--	0.020	37-45	0-37
DC-7		1/18/99	HSA	165,318.1	1,268,514.4	302.61	303.30	303.26	Flush	40	2	35-40	34.35-39.35	0.020	33-40	0-33
DC-8		1/18/99	HSA	165,328.8	1,268,685.4	306.23	306.70	306.59	Flush	42	2	37-42	36.64-41.64	0.020	34-42	0-34
DC-9A		4/6/99	HSA	165,124.7	1,268,587.3	308.02	--	--	Flush	38	2	33-38	32.6-37.6	0.020	31-38	0-31
DC-10A		4/5/99	HSA	165,117.2	1,268,497.2	307.73	307.83	307.72	Flush	37	2	32-37	32.01-37.01	0.020	30-37	0-30
DC-11		4/19/07	HSA	165,078.5	1,268,816.1	311.25	311.66	--	Flush	42	2	32-42	31.6-41.6	0.010	30-42	0-30
DC-12		4/18/07	HSA	165,179.4	1,268,851.9	311.25	311.58	--	Flush	42	2	32-42	31.7-41.7	0.010	30-42	0-30
DC-13		4/19/07	HSA	165,208.9	1,268,827.2	310.20	310.52	--	Flush	42	2	32-42	31.7-41.7	0.010	30-42	0-30
DC-14		4/17/07	HSA	165,355.0	1,268,812.6	308.94	309.49	--	Flush	45	2	35-45	34.4-44.4	0.010	33-45	0-33
DC-15		4/16/07	HSA	165,267.1	1,268,705.9	307.89	308.20	--	Flush	42	2	31-41	30.7-40.7	0.010	29-41	0-29
DC-17		4/16/07	HSA	165,194.2	1,268,528.6	305.16	305.58	305.35	Flush	40	2	30-40	29.81-39.81	0.010	28-40	0-28
DC-18		4/18/07	HSA	165,197.1	1,268,765.0	309.51	309.95	309.93	Flush	42	2	32-42	31.58-41.58	0.010	30-42	0-30
DC-19		6/1/07	HSA	165,039.3	1,268,829.6	313.62	313.82	--	Flush	47	2	37-47	36.8-46.8	0.010	35-47	0-35
DC-20		5/28/08	HSA	165,237.2	1,268,854.8	310.92	311.13	--	Flush	44	2	34-44	33.8-43.8	0.020	32-44	0-32
KMW-1		7/25/05	HSA	165,245.9	1,268,892.6	311.59	311.82	--	Flush	52	2	37-52	36.8-51.8	0.010	34-52	0-34
KMW-2		5/1/06	HSA	165,111.7	1,268,531.0	307.04	307.27	307.13	Flush	50	6	30-40	29.91-39.91	0.010	8-40	0-8
KMW-3		5/1/06	HSA	165,357.4	1,268,462.5	296.92	297.52	--	Flush	40	2	25-35	24.6-34.6	0.010	8-35	0-8
KMW-4		3/28/07	HSA	165,175.7	1,268,369.8	299.57	299.84	299.78	Flush	34	2	24-34	23.79-33.79	0.020	22-34	0-22
KMW-5		3/28/07	HSA	165,267.7	1,268,380.4	297.22	297.58	297.56	Flush	34	2	24-34	23.66-33.66	0.020	22-34	0-22
KMW-6		3/27/07	HSA	165,391.1	1,268,399.1	294.81	295.06	295.08	Flush	42.5	2	26-41	25.73-40.73	0.020	22-41	0-22
KMW-7		3/25/07	HSA	165,389.7	1,268,563.6	301.43	301.66	301.65	Flush	44	2	29-44	28.78-43.78	0.020	27-44	0-27
KMW-8		3/26/07	HSA	165,386.2	1,268,800.7	308.15	308.51	308.46	Flush	44	2	29-44	28.69-43.69	0.020	27-44	0-29
KMW-9		3/27/07	HSA	165,079.0	1,268,726.3	310.33	310.83	310.83	Flush	44	2	34-44	33.5-43.5	0.020	32-44	0-32

Table B-1

Well Completion Details
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Well	Ecology Well Tag Number	Date Installed	Drilling Method	Location (feet NAD 83/91)		Elevation (feet NAVD 88)			Monument Type	Boring Depth (feet)	Well Diameter (inches)	Screen Depth (ft bgs)		Slot Size (inch)	Filter Pack (ft bgs)	Seal (ft bgs)
				Northing	Easting	Monitoring Point	Surface Casing Rim	Ground Surface				Below Ground	Below Top of Casing			
Deep Monitoring Wells																
DC-5		1/22/99	HSA	165,166.5	1,268,526.9	306.03	306.28	306.24	Flush	58.5	2	41-46	40.79-45.79	0.020	39-47	0-39
DC-9B		4/5/99	HSA	165,122.8	1,268,589.4	308.16	--	--	Flush	60	2	53-58	--	0.020	50.5-58	0-50.5
DC-10B		4/6/99	HSA	165,120.4	1,268,497.5	307.80	308.29	307.89	Flush	56	2	45-50	44.91-49.91	0.020	43-50	0-43
DC-16		4/18/07	HSA	165,169.7	1,268,611.5	307.12	307.79	--	Flush	61.5	2	50-60	49.3-59.3	0.010	50-60	0-50
KMW-5D		3/28/07	HSA	165,276.5	1,268,382.0	297.04	297.35	297.32	Flush	46	2	41-46	40.72-45.72	0.020	41-46	0-41
Former SCS Soil Vapor Extraction Wells (1999)																
VES-1 (B1)		1999	--	--	--	--	--	--	Flush	11.5	2	3-11	--	0.020	2.5-11.5	1.5-2.5
VES-2A		1999	--	--	--	--	--	--	Flush	6.5	2	3-6	--	0.020	2.5-6.5	1.5-2.5
VES-2B		1999	--	--	--	--	--	--	Flush	36	2	11.5-35.5	--	0.020	7.5-36	1.5-2.5/6.5-7.5
VES-3 (BH-15)		1999	--	--	--	--	--	--	Flush	6.5	2	3-6	--	0.020	2.5-6.5	1.5-2.5
VES-4 (BH-16)		1999	--	--	--	--	--	--	Flush	6.5	2	3-6	--	0.020	2.5-6.5	1.5-2.5
VES-5 (BH-17)		1999	--	--	--	--	--	--	Flush	6.5	2	3-6	--	0.010	2.5-6.5	1.5-2.5
VES-6A (BH-1)		1999	--	--	--	--	--	--	Flush	6.5	2	3-6	--	0.020	2.5-6.5	1.5-2.5
VES-6B (BH-1)		1999	--	--	--	--	--	--	Flush	36	2	11.5-35.5	--	0.020	7.5-36	1.5-2.5/6.5-7.5
VES-7		1999	--	--	--	--	--	--	Flush	6.5	2	3-6	--	0.020	2.5-6.5	1.5-2.5
Soil Vapor Extraction Wells																
SVE-1		6/29/09	HSA	164,943.5	1,268,516.2	311.85	312.02	--	Flush	35.5	2	10-35	9.7-34.7	0.020	8-35.5	0-8
SVE-2		6/29/09	HSA	165,000.3	1,268,522.6	312.41	312.58	--	Flush	35.5	2	10-35	9.6-34.6	0.020	8-35.5	0-8
SVE-3		6/30/09	HSA	165,070.2	1,268,536.4	308.28	--	307.84	Flush	30.5	2	10-30	10.44-30.44	0.020	8-30.5	0-8
SVE-4		6/30/09	HSA	165,069.1	1,268,589.2	308.90	--	308.31	Flush	30.5	2	10-30	10.59-30.59	0.020	8-30.5	0-8
SVE-5		6/30/09	HSA	165,068.8	1,268,655.3	309.91	--	309.31	Flush	30.5	2	10-30	10.6-30.6	0.020	8-30.5	0-8
SVE-6		6/26/09	AKVAC	165,057.5	1,268,693.4	313.03	313.57	--	Flush	10	2	5-10	4.6-9.6	0.010	4-10	0-4
SVE-7		6/30/09	HSA	165,077.5	1,268,704.6	310.71	--	309.95	Flush	30.5	2	10-30	10.76-30.76	0.020	8-30.5	0-8
SVE-8		6/30/09	HSA	165,085.8	1,268,738.3	311.48	--	310.56	Flush	30.5	2	10-30	10.92-30.92	0.020	8-30.5	0-8
SVE-9		6/29/09	HSA	165,060.0	1,268,819.5	313.31	--	312.13	Flush	30.5	2	10-30	11.18-31.18	0.020	8-30.5	0-8
SVE-10		6/30/09	HSA	165,187.1	1,268,839.8	311.06	311.28	--	Flush	30.5	2	10-30	9.8-29.8	0.020	8-30.5	0-8
SVE-11A	BIE307	11/18/13	HSA	164,824.5	1,268,484.7	--	311.21	--	Flush	20	4	5-19.98	4.6-19.58	0.020	3-20	0-3
SVE-11B	BIE301	11/18/13	HSA	164,831.2	1,268,492.0	--	311.43	--	Flush	57	4	20-35	19.6-34.6	0.020	18-36	0-18
SVE-12A	BIE303	11/19/13	HSA	164,851.6	1,268,512.2	--	312.06	--	Flush	20	4	5-19.98	4.6-19.58	0.020	3-20	0-3
SVE-12B	BIE304	11/20/13	HSA	164,853.8	1,268,506.7	--	311.52	--	Flush	57	4	20-35	19.6-34.6	0.020	18-36	0-18
SVE-13A	BIE306	11/22/13	HSA	164,912.3	1,268,505.4	--	310.95	--	Flush	20	4	5-19.98	4.6-19.58	0.020	3-20	0-3
SVE-13B	BIE305	11/21/13	HSA	164,903.3	1,268,505.6	--	310.99	--	Flush	57.5	4	20-35	19.6-34.6	0.020	18-36	0-18
SVE-14	BID732	10/13/14	HSA	164,945.9	1,268,498.5	--	311.06	--	Flush	36	4	19.63-34.63	19.23-34.23	0.020	18.3-36	3-18.3
SVE-15	BID736	10/15/14	HSA	165,000.5	1,268,503.7	--	311.30	--	Flush	36	4	20.61-34.96	20.21-34.56	0.020	19.3-36	3.5-19.3
SVE-16	BID737	10/15/14	HSA	165,035.5	1,268,501.1	--	310.83	--	Flush	36	4	20.49-34.79	20.09-34.39	0.020	18-36	3.5-18
SVE-17	BID709	9/24/14	HSA	165,071.8	1,268,503.4	--	308.39	--	Flush	31	4	19.91-29.91	19.51-29.51	0.020	18-31	3.3-18
SVE-18	BID708	9/23/14	HSA	165,107.0	1,268,504.1	--	307.34	--	Flush	31	4	19.79-29.79	19.39-29.39	0.020	17.9-31	16-17.9
SVE-19	BID715	9/29/14	HSA	165,091.9	1,268,579.7	--	308.53	--	Flush	31	4	19.99-29.99	19.59-29.59	0.020	18-31	3.5-18

Table B-1

Well Completion Details
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Well	Ecology Well Tag Number	Date Installed	Drilling Method	Location (feet NAD 83/91)		Elevation (feet NAVD 88)			Monument Type	Boring Depth (feet)	Well Diameter (inches)	Screen Depth (ft bgs)		Slot Size (inch)	Filter Pack (ft bgs)	Seal (ft bgs)
				Northing	Easting	Monitoring Point	Surface Casing Rim	Ground Surface				Below Ground	Below Top of Casing			
Vapor Monitoring Probes																
VMP-1 (B-5)		3/26/08	DP	164,828.0	1,268,482.4	310.91	311.01	--	Flush	30	0.75	10-15	9.7-14.7	0.010	7-30	0-7
VMP-2 (B-7)		3/25/08	DP	164,964.6	1,268,493.8	310.97	311.04	--	Flush	30	0.75	10-15	9.8-14.8	0.010	7-30	0-7
VMP-3 (B-9)		3/25/08	DP	165,028.4	1,268,497.6	310.58	310.71	--	Flush	30	0.75	10-15	9.9-14.9	0.010	7-30	0-7
VMP-4 (B-11)		3/27/08	DP	165,079.0	1,268,533.8	307.67	308.00	--	Flush	30	0.75	10-15	9.7-14.7	0.010	7-30	0-7
VMP-5 (B-12)		3/27/08	DP	165,083.7	1,268,602.8	308.22	308.48	--	Flush	25	0.75	10-15	9.7-14.7	0.010	7-25	0-7
VMP-6 (B-13)		3/27/08	DP	165,071.2	1,268,674.9	308.95	309.18	--	Flush	26	0.75	10-15	9.8-14.8	0.010	7-26	0-7
Recirculation Well																
TW-1		5/2/06	HSA	165,114.8	1,268,571.3	--	--	--	AG	50	6	25-35/45-50	--	0.010	22-35/40-50	0-22/35-40
Pilot Test Injection Well																
IW-1		--	--	--	--	--	--	--	AG	38	--	--	--	--	--	--
Air Sparging Wells																
AS-1	BHV647	5/17/13	HSA	165,116.9	1,268,511.0	--	307.23	307.34	Flush	48	1	43.8-45.8	43.4-45.4	0.010	43.5-48	0-43.5
AS-2	BID714	9/29/14	HSA	165,093.2	1,268,557.0	--	308.30	--	Flush	53	2	48.08-51.13	47.68-50.73	0.020	48-53	3.0-48
AS-3	BID718	10/1/14	HSA	165,091.7	1,268,574.0	--	308.44	--	Flush	51	2	48.14-50.14	47.74-49.74	0.020	46-51	3.6-46
AS-4	BID717	9/30/14	HSA	165,073.3	1,268,590.4	--	308.25	--	Flush	51	2	48.82-50.80	48.42-50.4	0.020	47.3-51	3.3-47.3
AS-5	BID716	9/30/14	HSA	165,073.7	1,268,566.0	--	307.97	--	Flush	52	2	48.77-50.79	48.37-50.39	0.020	47.5-52	3.5-47.5
AS-6	BID713	9/26/14	HSA	165,073.2	1,268,541.5	--	307.89	--	Flush	52	2	48.91-50.92	48.51-50.52	0.020	47.6-52	3.5-47.6
AS-7	BID710	9/24/14	HSA	165,080.3	1,268,521.9	--	308.01	--	Flush	50.5	2	46.93-48.91	46.53-48.51	0.020	46-50.5	3.5-43
AS-8	BID740	10/17/14	HSA	165,058.0	1,268,525.1	--	312.52	--	Flush	54	2	52.10-54.14	51.7-53.74	0.020	51-54.31	3.5-51
AS-9	BID739	10/16/14	HSA	165,029.5	1,268,522.9	--	312.52	--	Flush	54	2	51.09-53.11	50.69-52.71	0.020	50-54	4-50
AS-10	BID733	10/14/14	HSA	165,004.5	1,268,521.9	--	312.52	--	Flush	56	2	52.78-54.80	52.38-54.4	0.020	52-56	3.9-52
AS-11	BID731	10/13/14	HSA	164,976.2	1,268,521.3	--	312.57	--	Flush	54.5	2	52.27-54.27	51.87-53.87	0.020	50.51-54.5	3-50.5
AS-12	BID729	10/10/14	HSA	164,948.4	1,268,520.9	--	312.34	--	Flush	54.24	2	52.06-54.07	51.66-53.67	0.020	50.7-54.24	3.5-50.7
AS-13	BID728	10/9/14	HSA	164,920.9	1,268,520.2	--	311.72	--	Flush	54	2	51.64-53.67	51.24-53.27	0.020	50.7-54	3.5-50.7
AS-14	BID726	10/8/14	HSA	164,891.0	1,268,520.2	--	311.93	--	Flush	54.09	2	51.88-53.92	51.48-53.52	0.020	50.9-54.09	3.3-50.09
AS-15	BID723	10/6/14	HSA	164,865.7	1,268,520.3	--	312.35	--	Flush	54	2	50.89-52.87	50.49-52.47	0.020	50-54	3.5-50
AS-16	BID724	10/7/14	HSA	164,841.0	1,268,511.9	--	312.37	--	Flush	54	2	51.89-53.97	51.49-53.57	0.020	51-54.04	3.3-51
AS-17	BID721	10/3/14	HSA	164,821.9	1,268,488.3	--	311.44	--	Flush	54.02	2	51.87-53.85	51.47-53.45	0.020	50.5-54.02	3.3-50.5
AS-18	BID719	10/2/14	HSA	164,810.9	1,268,465.6	--	310.51	--	Flush	54.5	2	50.37-52.35	49.97-51.95	0.020	49.5-54.5	3.6-49.5
AS-19	BID720	10/3/14	HSA	164,834.5	1,268,474.4	--	310.67	--	Flush	54.08	2	51.94-53.91	51.54-53.51	0.020	50.7-54.08	3.0-54.08
AS-20	BID722	10/6/14	HSA	164,852.1	1,268,491.4	--	311.00	--	Flush	54	2	50.96-52.94	50.56-52.54	0.020	49.6-54	3.5-49.6
AS-21	BID725	10/7/14	HSA	164,879.0	1,268,495.8	--	310.98	--	Flush	55	2	51.92-53.92	51.52-53.52	0.020	50.7-55	3.5-50.7
AS-22	BID727	10/8/14	HSA	164,907.4	1,268,496.1	--	310.72	--	Flush	55	2	52.38-54.40	51.98-54	0.020	51.5-55	3.5-51.5
AS-23	BID730	10/10/14	HSA	164,935.3	1,268,497.1	--	310.88	--	Flush	55	2	52.72-54.76	52.32-54.36	0.020	52-55	3.7-55
AS-24	BID734	10/14/14	HSA	164,963.7	1,268,494.9	--	311.08	--	Flush	55	2	52.68-54.74	52.28-54.34	0.020	52-55	3.5-52
AS-25	BID735	10/15/14	HSA	164,993.3	1,268,503.1	--	311.33	--	Flush	56	2	53.35-55.36	52.95-54.96	0.020	51.9-56	3.5-51.9
AS-26	BID738	10/16/14	HSA	165,018.0	1,268,497.2	--	310.75	--	Flush	55.5	2	53.10-54.14	52.7-53.74	0.020	52-55.5	4-52
AS-27	BID741	10/17/14	HSA	165,047.3	1,268,497.3	--	310.99	--	Flush	55.5	2	53.10-55.14	52.7-54.74	0.020	52-55.5	4-52
AS-28	BID706	9/22/14	HSA	165,077.4	1,268,498.9	--	308.11	--	Flush	50.5	2	47.94-49.88	47.54-49.48	0.020	47.5-50.5	3.5-47.5
AS-29	BID707	9/23/14	HSA	165,098.0	1,268,498.4	--	307.74	--	Flush	51	2	48.10-50.08	47.7-49.68	0.020	47-51	3.3-47
AS-30	BID711	9/25/14	HSA	165,100.2	1,268,516.2	--	307.36	--	Flush	52	2	48.24-50.24	47.84-49.84	0.020	46.8-52	3.8-46.8
AS-31	BID712	9/26/14	HSA	165,098.2	1,268,535.6	--	308.10	--	Flush	52.5	2	48.86-50.89	48.46-50.49	0.020	47.6-52.5	3.5-47.6

Table B-1

Well Completion Details
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Well	Ecology Well Tag Number	Date Installed	Drilling Method	Location (feet NAD 83/91)		Elevation (feet NAVD 88)			Monument Type	Boring Depth (feet)	Well Diameter (inches)	Screen Depth (ft bgs)		Slot Size (inch)	Filter Pack (ft bgs)	Seal (ft bgs)
				Northing	Easting	Monitoring Point	Surface Casing Rim	Ground Surface				Below Ground	Below Top of Casing			

Notes:

1. Northing and easting in feet relative to the Washington State Plane System North Zone (NAD 83/91)
2. Elevations in feet relative to the North American Vertical Datum (NAVD 88)
3. Monitoring point = top of the PVC well casing
4. All depths shown in feet below ground surface (ft bgs)
5. All wells completed with Schedule 40 PVC with the exception of AS-1 (Schdedule 80 PVC)
6. Drilling methods include hollow stem auger (HSA), direct push (DP), and vacuum truck with air knife (AKVAC)
7. '-- = not documented or unknown
8. Surface elevations for the direct push borings represents ground surface adjacent to the boring
9. Screened intervals are documented on boring logs and are typically based on a field measurements relative to ground surface at the time of drilling. Screened intervals relative to top of casing are estimated using well field construction measurements, surveyed top of casing elevations, surveyed ground surface elevations, and in some cases surveyed monument rim elevations. If ground or rim elevations are not surveyed, then top of casing is assumed to be 0.4 ft depth.
10. Monitoring wells MW-1, DC-6, DC-9A, DC-9B are missing or destroyed. The 1999 SCS VES wells have been decommissioned.

ERM
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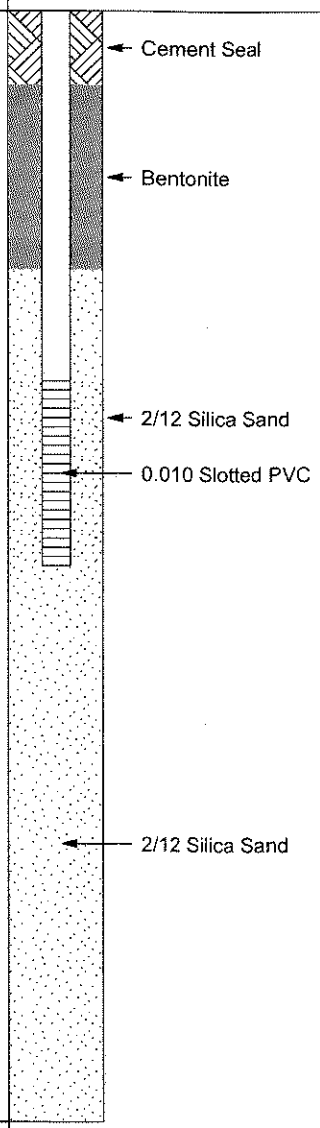
LOG OF BORING / VAPOR PROBE: B-5 / VMP-1

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Direct Push
Logged By: K. Knesek

Date Started: 3/26/2008
Date Completed: 3/26/2008
Total Depth: 30 feet
Borehole Diameter: 2.0"
Initial Water Level: feet bgs
Notes:

Depth (ft)	Graphic Log	USCS Code	Sample Interval	Field Screening (ppm)	Soil Description and Observations
					No Recovery
5		SM		PID = 0	SILTY SAND (SM): Reddish brown fine to medium silty sand with trace gravel, dry.
10		SP			SAND (SP): Light grayish brown fine to medium sand with trace silt, dry.
15		ML		PID = 0	SILT (ML): Light brown silt, damp.
20		SP		PID = 0.2	SAND (SP): Light grayish brown fine to medium silty sand with gravel, dry. Becomes damp at 28' below ground surface.
25				PID = 0.7	
30					Total Depth - 30 feet bgs



MW2 TO 40 FT BV - - 11/21/08 14:25 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY PARK.GPJ

ERM
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Bellevue, WA 98005
Phone: (425) 462-8591
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LOG OF BOREHOLE: B-6

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Direct Push
Logged By: K. Knesek

Date Started: 3/25/2008
Date Completed: 3/25/2008
Total Depth: 31 feet
Borehole Diameter: 2.0"
Initial Water Level:
Notes:

Depth (ft)	Graphic Log	USCS Code	Sample Interval	Field Screening (ppm)	Soil Description and Observations
					No recovery.
5		SM			SILTY SAND (SM): light brown, fine to medium sand, trace silt.
10		SP			GRAVELLY SAND (SP): light brown, fine to medium sand.
15		SM			SAND WITH SILT (SM): light brown, fine to medium sand, with 1.0-2.0" thick silt lenses.
20					SILTY SAND (SM): fine to medium sand, some silt.
25					SILTY SAND (SM): fine to medium sand, trace silt.
30					SAND WITH SILT (SM): fine to medium sand, with tan silt beds.
					Total Depth - 31 feet bgs
35					

BOREHOLE TO 40 FEET BV - - 05/08/08 13:48 - G:\GINT BORING LOGS\NORMANDY PARK - 0075720\GINT FILES\NORMANDY PARK.GPJ

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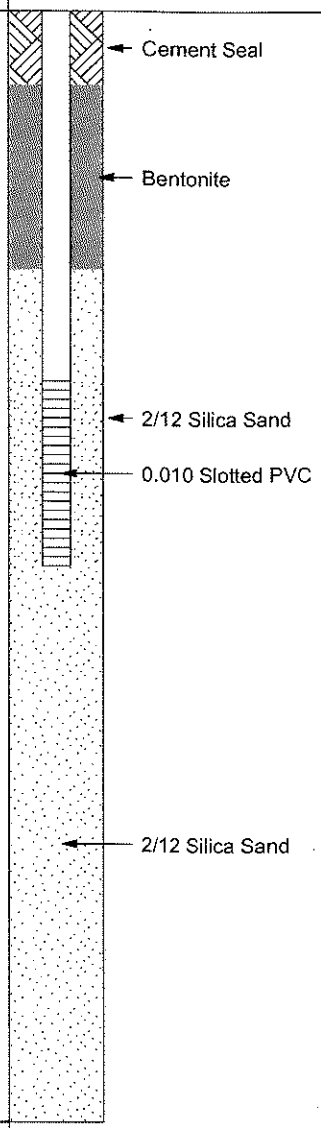
LOG OF BORING / VAPOR PROBE: B-7 / VMP-2

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Direct Push
Logged By: K. Knesek

Date Started: 3/25/2008
Date Completed: 3/25/2008
Total Depth: 30 feet
Borehole Diameter: 2.0"
Initial Water Level: feet bgs
Notes:

Depth (ft)	Graphic Log	USCS Code	Sample Interval	Field Screening (ppm)	Soil Description and Observations
					No recovery.
5		SP		PID = 0	SAND (SP): dark brown, fine to medium sand, trace gravel, moist.
10					SAND (SP): grayish brown, fine to medium sand.
					SAND (SP): grayish brown, fine to medium sand, some gravel.
15		SM			SAND WITH SILT (SM): grayish brown, fine to medium sand, with 1.0" silt lenses.
20				PID = 0.7	
25		SP			SAND (SP): grayish brown, fine to medium sand, some gravel.
					GRAVELLY SAND (SP): fine to medium sand, 1.0-2.0" silt lenses.
30					Total Depth - 30 feet bgs

WELL DIAGRAM



MW2 TO 40 FT BV - - 11/21/08 14:28 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY PARK.GPJ

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LOG OF BOREHOLE: B-8

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Direct Push
Logged By: K. Knesek

Date Started: 3/26/2008
Date Completed: 3/26/2008
Total Depth: 33 feet
Borehole Diameter: 2.0"
Initial Water Level: 41 feet bgs
Notes: Water level measured during second penetration with push rods.

Depth (ft)	Graphic Log	USCS Code	Sample Interval	Field Screening (ppm)	Soil Description and Observations
					No recovery.
5		SP		PID = 0	SAND (SP): reddish brown, fine to medium sand, some gravel.
10		ML			SILT (ML): light brown.
		SM		PID = 0.2	SILTY SAND (SM): brown, fine to medium sand, trace gravel.
15				PID = 0	SILTY SAND (SM): grayish brown, fine to medium sand, trace silt.
20		SP		PID = 0	SAND (SP): gray, fine to medium grained, trace gravel.
25				PID = 0.3	GRAVELLY SAND (SP): light gray, fine to medium sand, trace silt.
		SM			SILTY SAND (SM): light gray, fine to medium sand.
30		SP		PID = 2.6	GRAVELLY SAND (SP): medium to coarse grained.
35					Total Depth - 33 feet bgs

BOREHOLE TO 40 FEET BV - - 06/11/08 09:42 - G:\GINT BORING LOGS\NORMANDY PARK - 0075720\GINT FILES\NORMANDY PARK.GPJ

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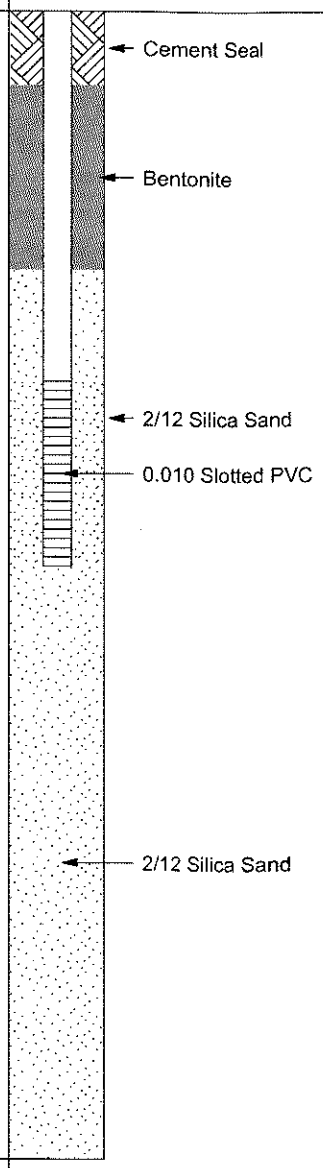
LOG OF BORING / VAPOR PROBE: B-9 / VMP-3

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Direct Push
Logged By: K. Knesek

Date Started: 3/25/2008
Date Completed: 3/25/2008
Total Depth: 31 feet
Borehole Diameter: 2.0"
Initial Water Level: feet bgs
Notes:

Depth (ft)	Graphic Log	USCS Code	Sample Interval	Field Screening (ppm)	Soil Description and Observations
					No recovery.
5					
		SP			SAND (SP): light brown, fine to medium sand.
10				PID = 0	
		ML			SILT (ML): light brown, wet.
15		SM			SAND WITH SILT (SM): light grayish brown, fine to medium sand, thin <0.5" silt lenses.
				PID = 0	
		SP			GRAVELLY SAND (SP): light gray, fine to medium sand.
20					
					SAND (SP): light grayish brown, fine to medium sand.
		ML		PID = 1.9	SILT (ML): light brown, very hard.
25					
		SM			SILTY SAND (SM): fine grained.
					SILTY SAND (SM): light brown, fine to medium sand.
30					
					Total Depth - 31 feet bgs

WELL DIAGRAM



MW2 TO 40 FT BV - - 11/21/08 14:31 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY PARK.GPJ

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LOG OF BOREHOLE: B-10

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Direct Push
Logged By: K. Knesek

Date Started: 3/24/2008
Date Completed: 3/24/2008
Total Depth: 30 feet
Borehole Diameter: 2.0"
Initial Water Level:
Notes: PID malfunctioned.

Depth (ft)	Graphic Log	USCS Code	Sample Interval	Field Screening (ppm)	Soil Description and Observations
					No recovery.
5		SM			SILTY SAND (SM): fine to medium grained, trace gravel.
10					SILTY SAND (SM): fine to medium sand, some silt.
		SP			SAND (SP): fine to medium sand, some silt.
15					
20					
		SM			SILTY SAND (SM): fine to medium sand, gravelly, trace silt.
25					
					SILTY SAND (SM): fine to medium sand, gravelly, trace silt.
30					Total Depth - 30 feet bgs
35					

BOREHOLE TO 40 FEET BV - - 05/08/08 13:50 - G:\GINT BORING LOGS\NORMANDY PARK - 0075720\GINT FILES\NORMANDY PARK.GPJ

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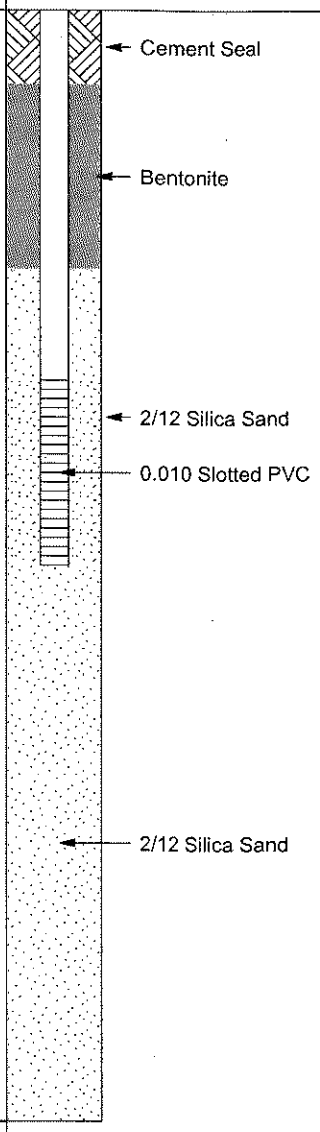
LOG OF BORING / VAPOR PROBE: B-11 / VMP-4

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Direct Push
Logged By: K. Knesek

Date Started: 3/27/2008
Date Completed: 3/27/2008
Total Depth: 30 feet
Borehole Diameter: 2.0"
Initial Water Level: feet bgs
Notes:

Depth (ft)	USCS Code	Field Screening (ppm)	Soil Description and Observations
			No Recovery
5	ML		SILT (ML): Light brown silt, damp.
	SM	PID = 0	SILTY SAND (SM): Brown fine to medium silty sand, damp.
10			
15		PID = 0	
	SP		SAND (SP): Grayish brown fine to medium silty sand with gravel, damp.
20			
	ML	PID = 0	SILT (ML): Light brown silt, moist.
25	SP		SAND (SP): Grayish brown fine to medium silty sand with gravel, damp.
		PID = 0	
30			Total Depth - 30 feet bgs

WELL DIAGRAM



MW2 TO 40 FT BV - - 11/21/08 14:35 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY PARK.GPJ

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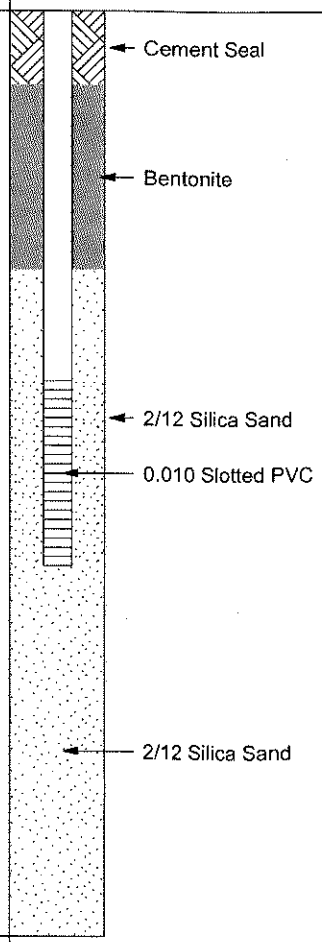
LOG OF BORING / VAPOR PROBE: B-12 / VMP-5

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Direct Push
Logged By: K. Knesek

Date Started: 3/27/2008
Date Completed: 3/27/2008
Total Depth: 25 feet
Borehole Diameter: 2.0"
Initial Water Level: feet bgs
Notes: PID Malfunctioned.

Depth (ft)	Graphic Log	USCS Code	Sample Interval	Field Screening (ppm)	Soil Description and Observations
					No Recovery
5		ML			SILT (ML): Dark brown silt, wet.
		SM			SILTY SAND (SM): Brown to grayish brown fine to medium silty sand, damp.
10					
15		ML			SILT (ML): Light brown silt, damp
		SM			SILTY SAND (SM): Light brown fine to medium silty sand, damp. Refusal encountered at 25' below ground surface.
20					
25					Total Depth - 25 feet bgs
30					

WELL DIAGRAM



MW2 TO 40 FT BV - - 11/21/08 14:37 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY PARK.GPJ

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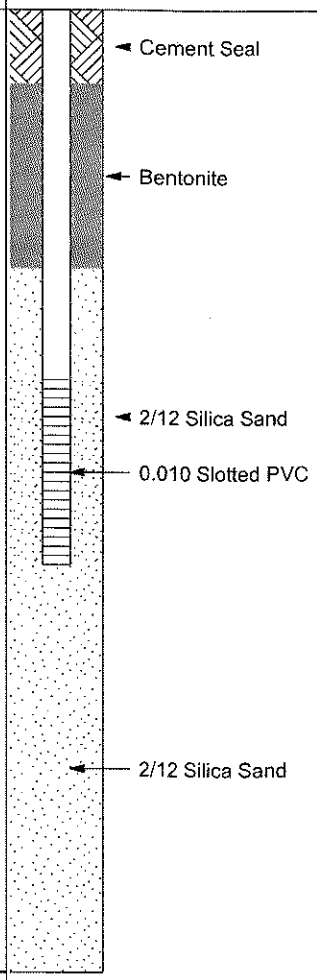
LOG OF BORING / VAPOR PROBE: B-13 / VMP-6

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Direct Push
Logged By: K. Knesek

Date Started: 3/27/2008
Date Completed: 3/27/2008
Total Depth: 26 feet
Borehole Diameter: 2.0"
Initial Water Level: feet bgs
Notes:

Depth (ft)	Graphic Log	USCS Code	Sample Interval	Field Screening (ppm)	Soil Description and Observations
					No Recovery
5		SM		PID = 0	SILTY SAND (SM): Light brown fine to medium silty sand, damp.
10				PID = 0	
15				PID = 0	
		ML			SILT (ML): Brown stiff silt, damp.
		SM			SILTY SAND (SM): Brown fine to medium silty sand, damp.
20		GP			SANDY GRAVEL (GP): Gray fine sandy gravel, damp.
		SM		PID = 0	SILTY SAND (SM): Grayish brown fine to medium silty sand, damp.
25					
					Total Depth - 26 feet bgs
30					

WELL DIAGRAM



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LOG OF BOREHOLE: B-14

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Direct Push
Logged By: K. Knesek

Date Started: 3/24/2008
Date Completed: 3/24/2008
Total Depth: 32 feet
Borehole Diameter: 2.0"
Initial Water Level:
Notes: PID malfunctioned.

Depth (ft)	Graphic Log	USCS Code	Sample Interval	Field Screening (ppm)	Soil Description and Observations
					No recovery.
5		SM			SILTY SAND (SM): fine sand, trace gravel, moist.
10					SILTY SAND (SM): gray, fine to medium sand, some silt.
		SP			SAND (SP): gray, fine to medium sand, trace gravel.
15					
20		SM			SAND WITH SILT (SM): very fine to fine sand, lenses of very fine silty sand (4.0" thick).
					No recovery.
25					
		SP			SAND (SP): fine to medium sand, trace silt and gravel.
30					
					Total Depth - 32 feet bgs
35					

BOREHOLE TO 40 FEET BV - - 05/08/08 13:50 - G:\GINT BORING LOGS\NORMANDY PARK - 0075720\GINT FILES\NORMANDY PARK.GPJ

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LOG OF BOREHOLE: B-15

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Direct Push
Logged By: K. Knesek

Date Started: 3/24/2008
Date Completed: 3/24/2008
Total Depth: 30 feet
Borehole Diameter: 2.0"
Initial Water Level:
Notes:

Depth (ft)	Graphic Log	USCS Code	Sample Interval	Field Screening (ppm)	Soil Description and Observations
					No recovery.
5		SP			SAND (SP): fine sand, trace silt and gravel.
10					SAND (SP): fine to medium sand, trace gravel.
15					SAND (SP): fine to medium sand, trace silt, some organics, damp.
20		SM ML SM			SANDY SILT (SM): fine sand. SILT (ML): light brown, damp. SAND WITH SILT (SM): gray, fine to medium sand, with sandy silt lenses.
25		SP			GRAVELLY SAND (SP): fine to medium sand.
30					Total Depth - 30 feet bgs
35					

BOREHOLE TO 40 FEET BV - - 05/08/08 13:50 - G:\GINT BORING LOGS\NORMANDY PARK - 0075720\GINT FILES\NORMANDY PARK.GPJ

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LOG OF BOREHOLE: B-16

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Direct Push
Logged By: K. Knesek

Date Started: 3/25/2008
Date Completed: 3/25/2008
Total Depth: 24 feet
Borehole Diameter: 2.0"
Initial Water Level:
Notes:

Depth (ft)	Graphic Log	USCS Code	Sample Interval	Field Screening (ppm)	Soil Description and Observations
					No recovery.
5		SM		PID = 0	SILTY SAND (SM): fine to medium sand, trace gravel.
10		SP		PID = 0	GRAVELLY SAND (SP): fine to medium sand, trace silt.
15		SM		PID = 0.5	SILTY SAND (SM): fine to medium sand.
20		SP		PID = 0.3	GRAVELLY SAND (SP): fine to medium sand.
25					Total Depth - 24 feet bgs
30					
35					

BOREHOLE TO 40 FEET BV - - 05/08/08 13:50 - G:\GINT BORING LOGS\NORMANDY PARK - 0075720\GINT FILES\NORMANDY PARK.GPJ

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LOG OF BOREHOLE: B-17

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Direct Push
Logged By: K. Knesek

Date Started: 3/26/2008
Date Completed: 3/26/2008
Total Depth: 36 feet
Borehole Diameter: 2.0"
Initial Water Level: 34 feet bgs
Notes:

Depth (ft)	USCS Code	Field Screening (ppm)	Soil Description and Observations
			No recovery.
5			
	ML		SILT (ML): light brown silt, stiff.
10		PID = 0	
15	SM		SAND WITH SILT (SM): fine to medium sand, with 1.0-2.0" silt lenses.
20	ML		SILT (ML): light brown silt.
	SM	PID = 0	SILTY SAND (SM): fine to medium sand, some silt, bands of orange oxidized sand.
25			SAND WITH SILT (SM): fine to medium sand, with 3.0-4.0" silt lenses.
		PID = 0	SAND WITH SILT (SM): as above.
30	SP		SAND (SP): light gray, fine to medium grained. Wet at 34' bgs.
35			Total Depth - 36 feet bgs

BOREHOLE TO 40 FEET BV - - 11/21/08 15:43 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY PARK.GPJ

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LOG OF BOREHOLE: B-18

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Direct Push
Logged By: K. Knesek

Date Started: 3/24/2008
Date Completed: 3/24/2008
Total Depth: 40 feet
Borehole Diameter: 2.0"
Initial Water Level: 31 feet bgs
Notes:

Depth (ft)	Graphic Log	USCS Code	Sample Interval	Field Screening (ppm)	Soil Description and Observations
					No recovery.
5		SM			SILTY SAND (SM): light brown, fine sand, trace silt.
10		ML			SILTY SAND (SM): very fine sand. Grades to SILT (ML): soft.
15		SP			SAND (SP): medium grained, trace gravel, dry.
20					
25					SAND (SP): fine to medium sand, trace gravel.
30					SAND (SP): fine to medium sand, trace gravel. Wet at 31' bgs.
35		SM			SILTY SAND (SM): fine sand, some silt. Wet SILTY SAND (SM): fine grained. Wet
40					Total Depth - 40 feet bgs

BOREHOLE TO 40 FEET BV - - 11/21/08 15:47 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY PARK.GPJ

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LOG OF BOREHOLE: B-18

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Direct Push
Logged By: K. Knesek

Date Started: 3/24/2008
Date Completed: 3/24/2008
Total Depth: 40 feet
Borehole Diameter: 2.0"
Initial Water Level: 31'
Notes:

Depth (ft)	Graphic Log	USCS Code	Sample Interval	Field Screening (ppm)	Soil Description and Observations
					No recovery.
5		SM			SILTY SAND (SM): light brown, fine sand, trace silt.
10		ML			SILTY SAND (SM): very fine sand, damp to moist. Grades to SILT (ML): soft, wet.
15		SP			SAND (SP): medium grained, trace gravel, dry.
20					
25					SAND (SP): fine to medium sand, trace gravel.
30	▽				SAND (SP): fine to medium sand, trace gravel, saturated.
35		SM			SILTY SAND (SM): fine sand, some silt. SILTY SAND (SM): fine grained, saturated.

BOREHOLE TO 40 FEET BV - - 05/08/08 13:47 - G:\GINT BORING LOGS\NORMANDY PARK - 0075720\GINT FILES\NORMANDY PARK.GPJ

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LOG OF BOREHOLE: B-18

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Direct Push
Logged By: K. Knesek

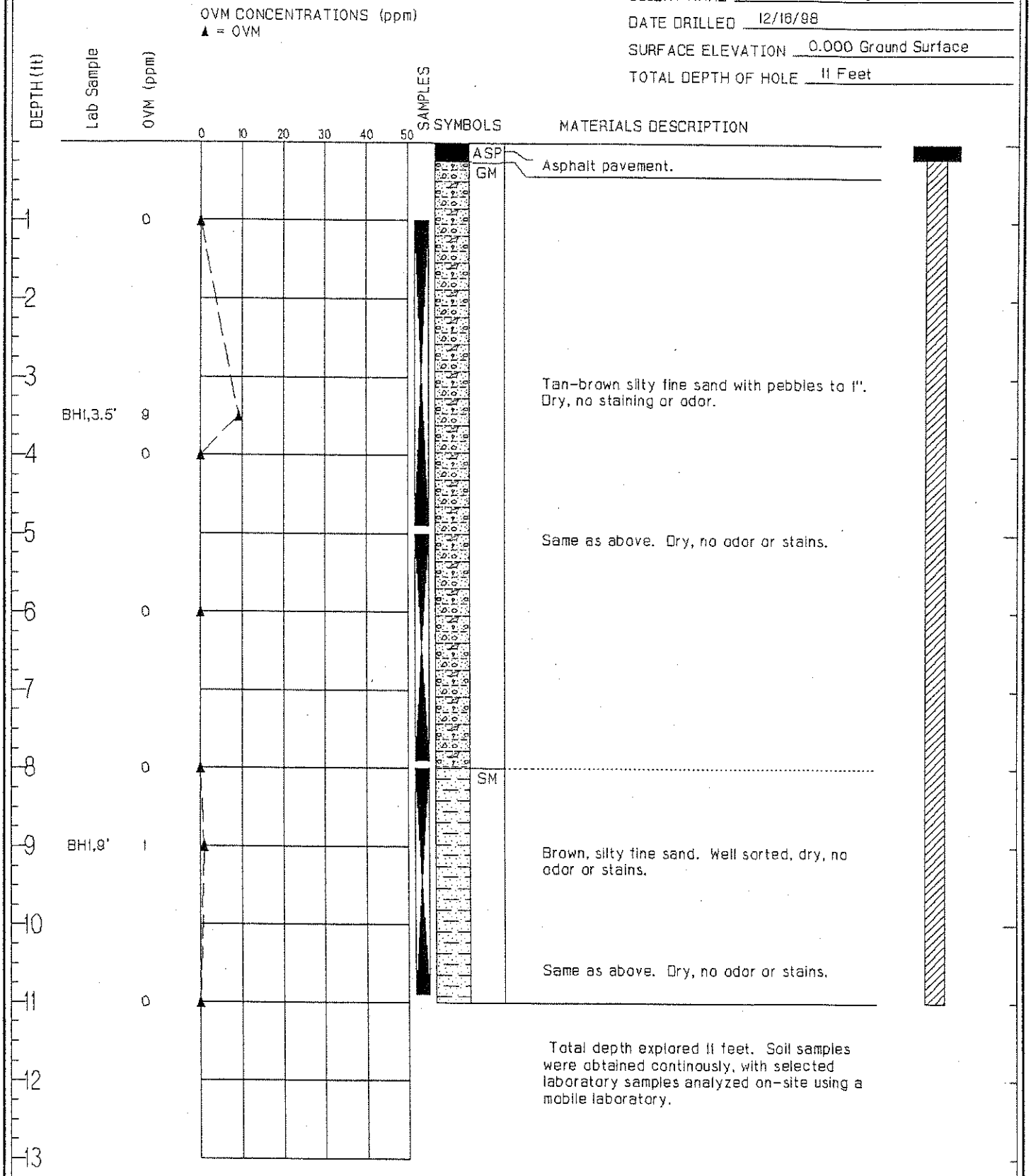
Date Started: 3/24/2008
Date Completed: 3/24/2008
Total Depth: 40 feet
Borehole Diameter: 2.0"
Initial Water Level: 31'
Notes:

Depth (ft)	Graphic Log	USCS Code	Sample Interval	Field Screening (ppm)	Soil Description and Observations
					Total Depth - 40 feet bgs
45					
50					
55					
60					
65					
70					
75					

BOREHOLE TO 40 FEET BV - - 05/08/08 13:47 - G:\GINT BORING LOGS\NORMANDY PARK - 0075720\GINT FILES\NORMANDY PARK.GPJ

BH-1 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner
DATE DRILLED 12/16/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 11 Feet



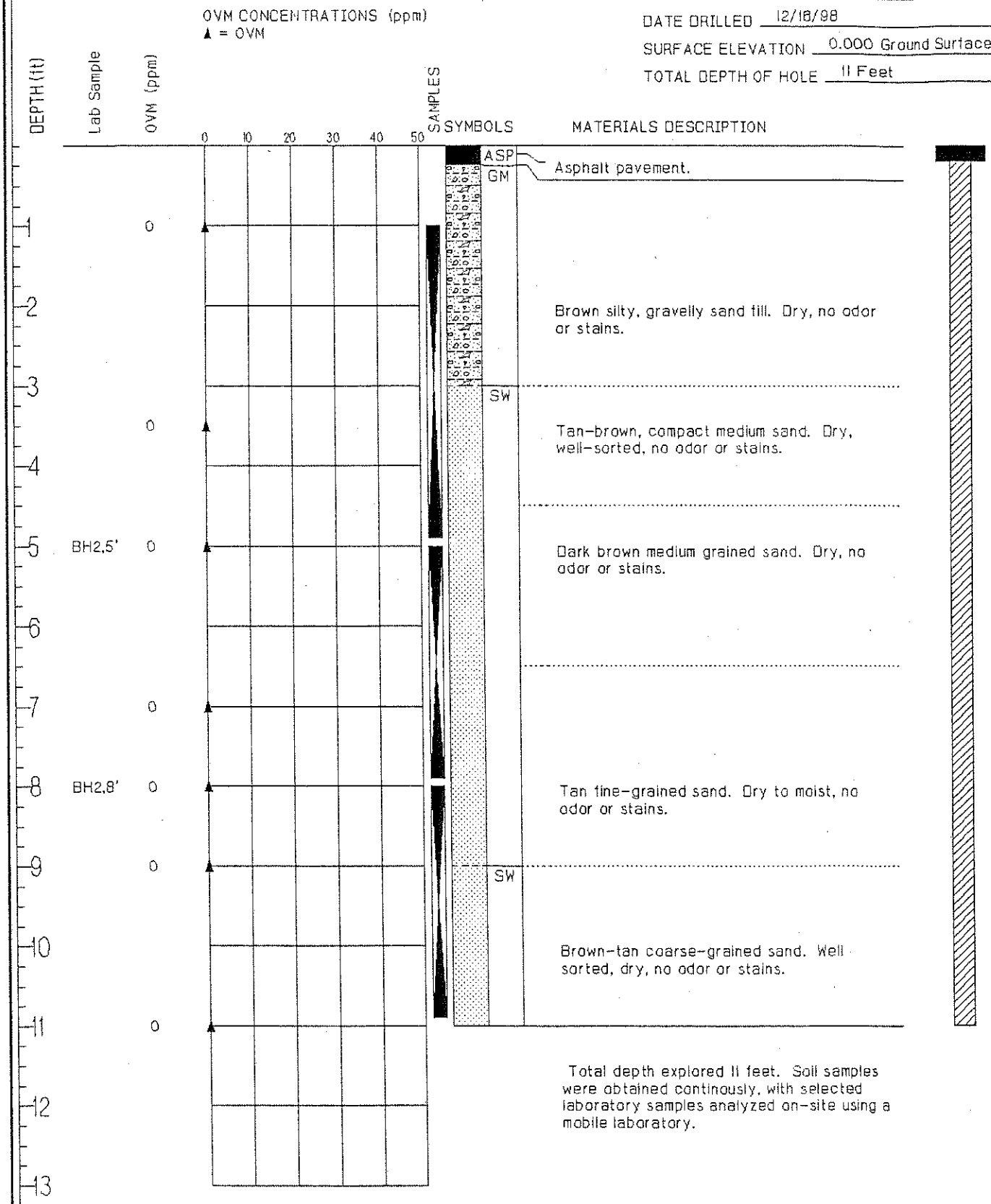
Total depth explored 11 feet. Soil samples were obtained continously, with selected laboratory samples analyzed on-site using a mobile laboratory.

JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

SCS ENGINEERS
Engineering and Environmental Consultants

BH-2 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner
DATE DRILLED 12/18/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 11 Feet



Total depth explored 11 feet. Soil samples were obtained continously, with selected laboratory samples analyzed on-site using a mobile laboratory.

JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

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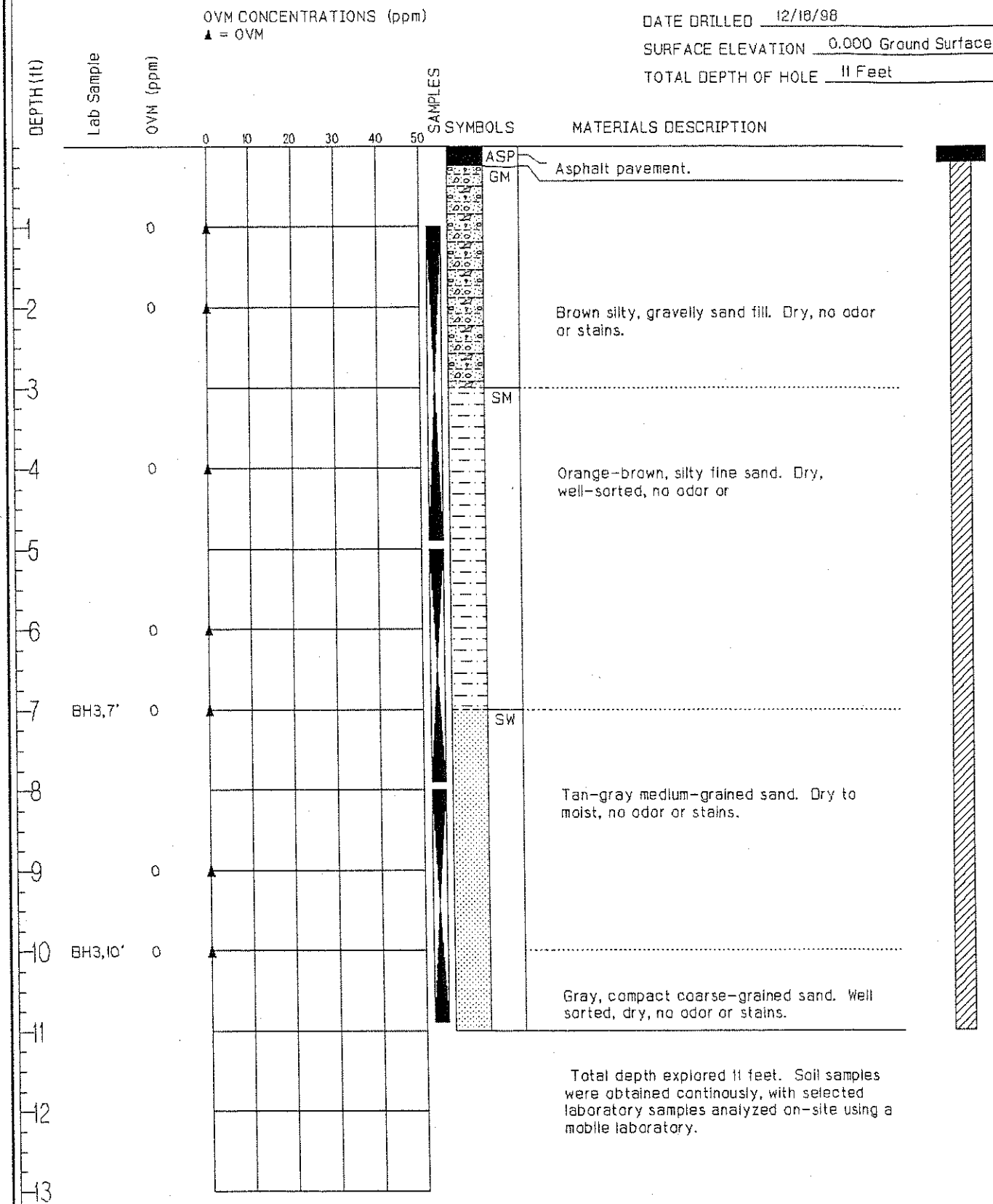
BH-3 *(Page 1 of 1)*

CLIENT NAME Manhattan Village – Dry Cleaner
DATE DRILLED 12/18/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 11 Feet



Total depth explored 11 feet. Soil samples were obtained continously, with selected laboratory samples analyzed on-site using a mobile laboratory.

JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

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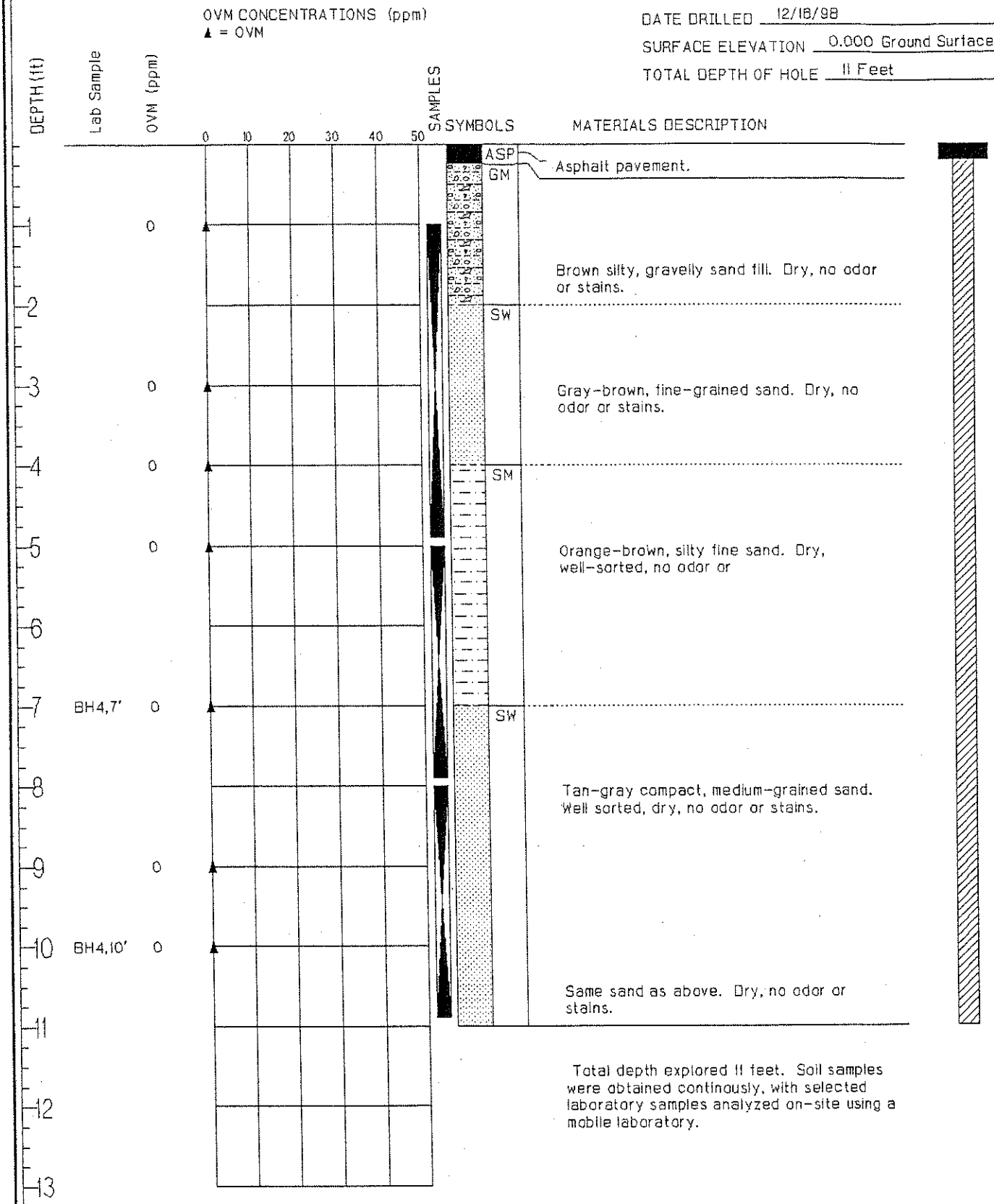
BH-4 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner
DATE DRILLED 12/18/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 11 Feet



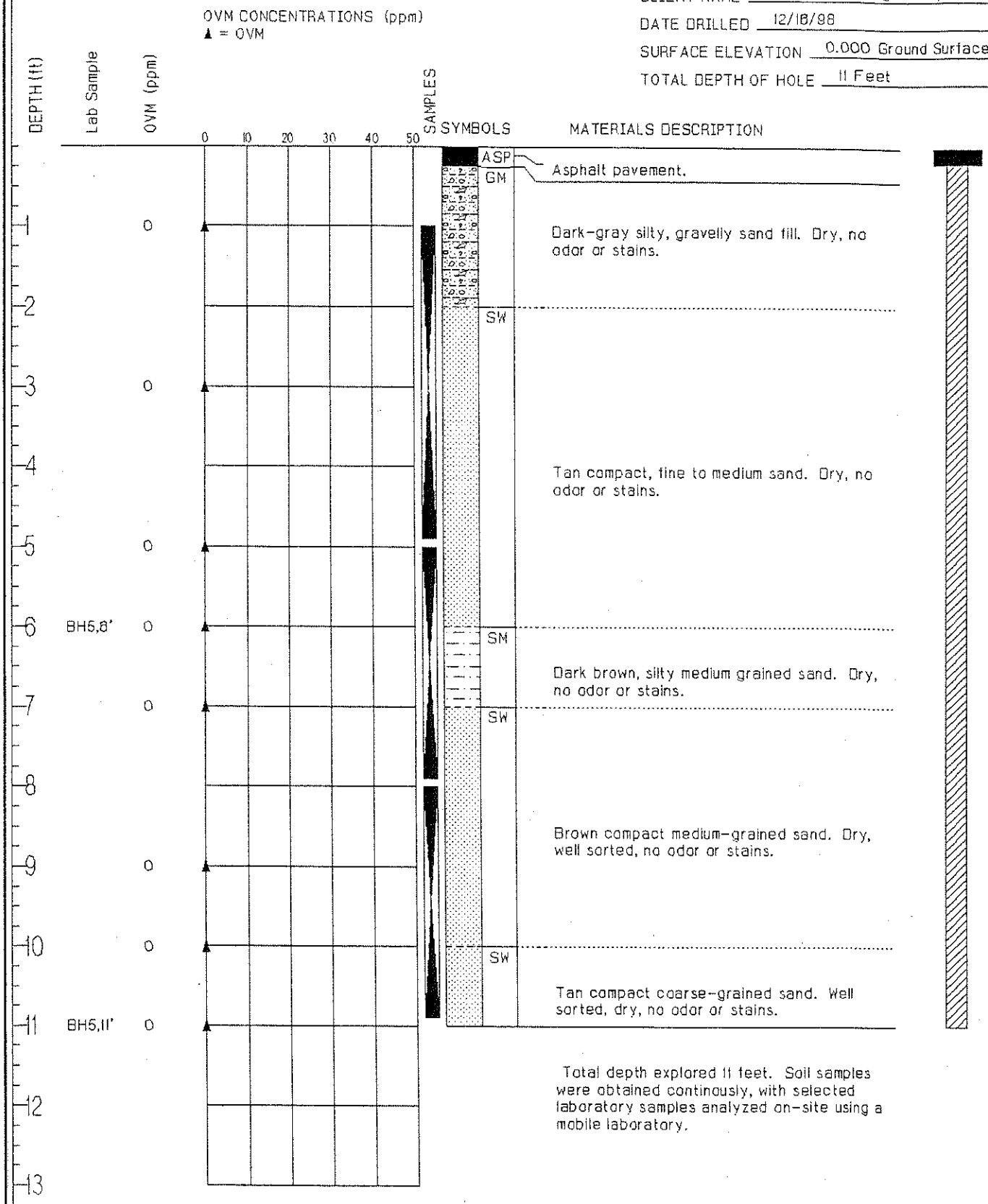
Total depth explored 11 feet. Soil samples were obtained continously, with selected laboratory samples analyzed on-site using a mobile laboratory.

JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

SCS ENGINEERS
Engineering and Environmental Consultants

BH-5 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner
DATE DRILLED 12/18/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 11 Feet



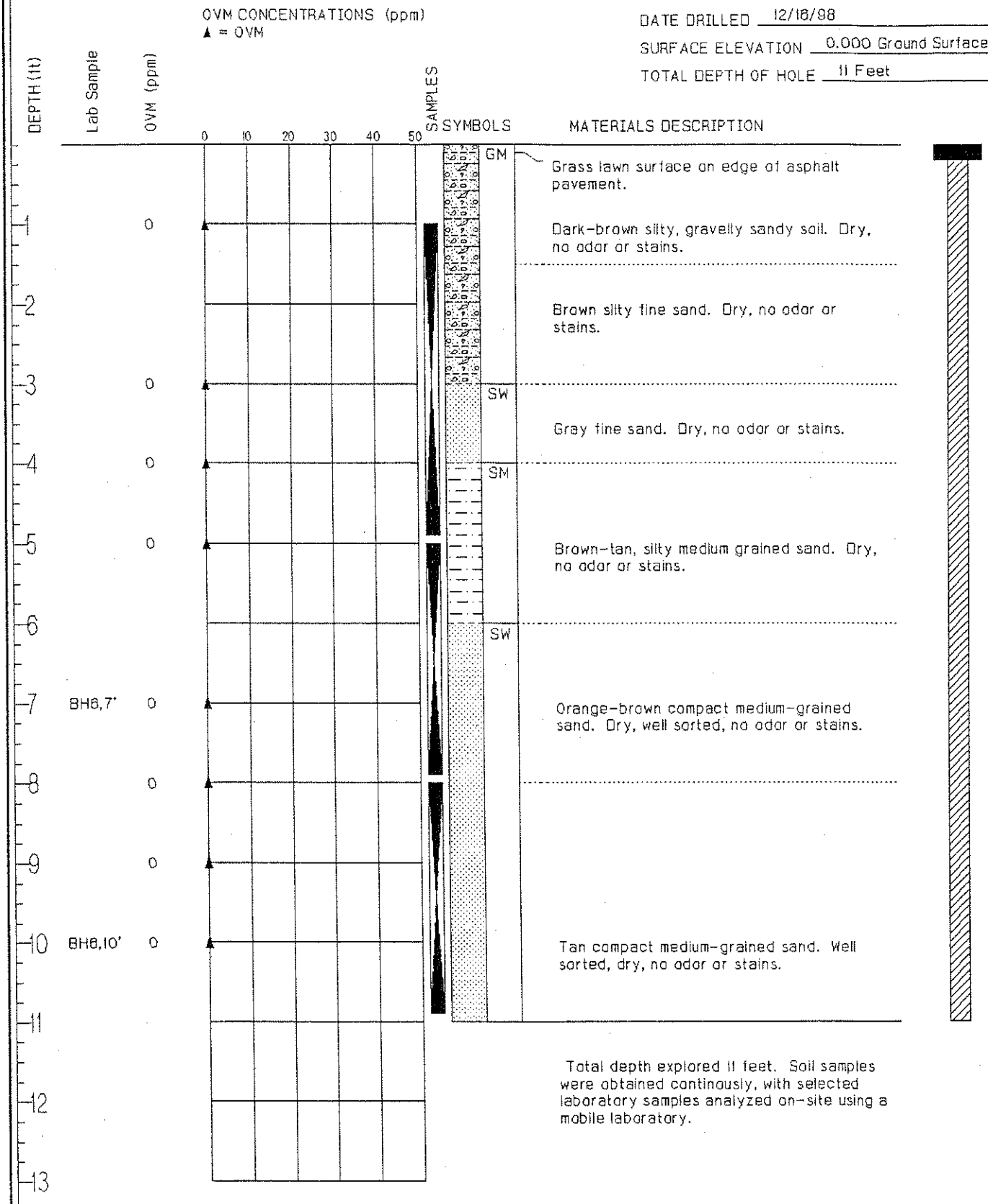
Total depth explored 11 feet. Soil samples were obtained continously, with selected laboratory samples analyzed on-site using a mobile laboratory.

JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

SCS ENGINEERS
Engineering and Environmental Consultants

BH-6 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner
DATE DRILLED 12/18/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 11 Feet



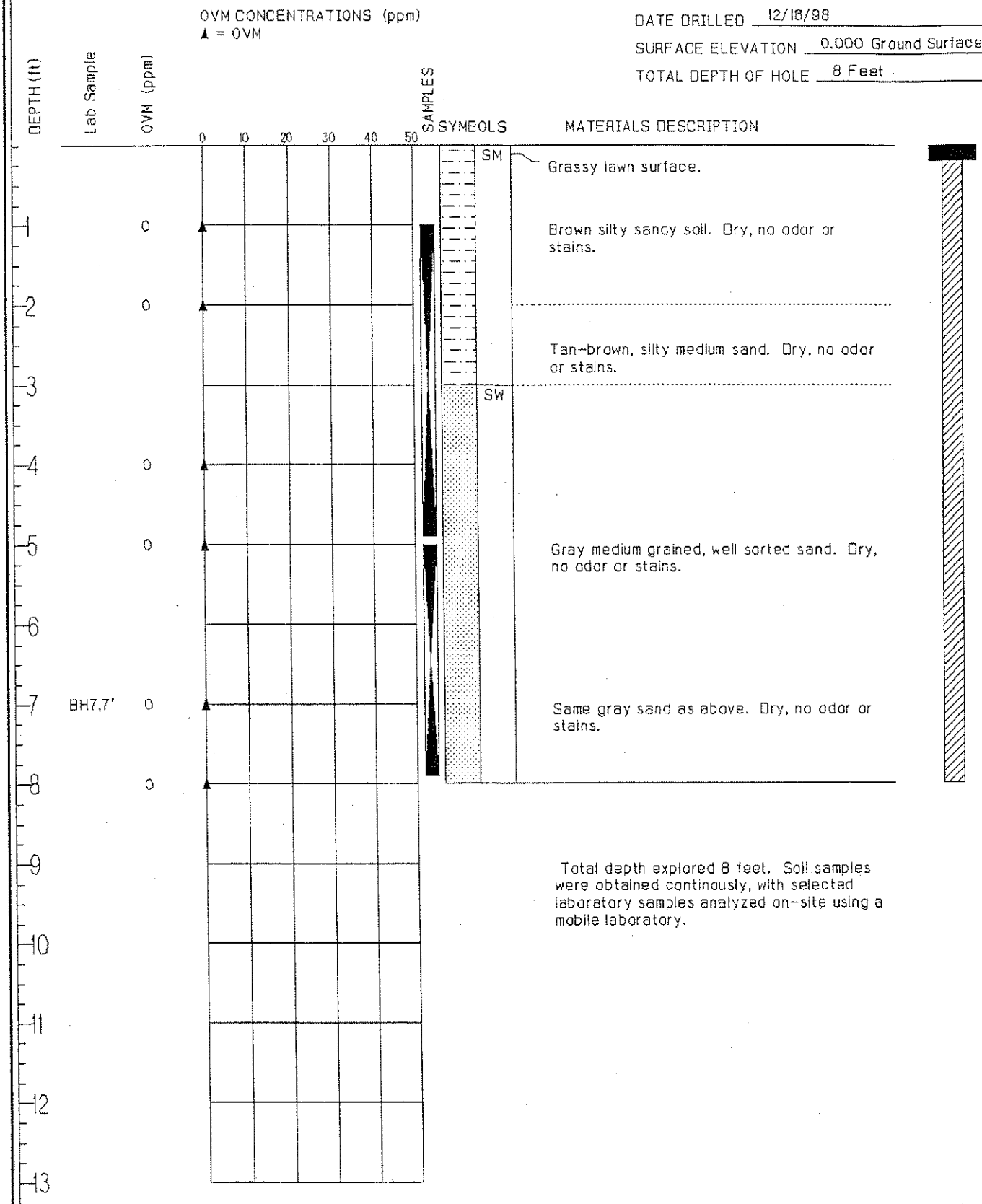
Total depth explored 11 feet. Soil samples were obtained continously, with selected laboratory samples analyzed on-site using a mobile laboratory.

JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

SCS ENGINEERS
Engineering and Environmental Consultants

BH-7 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner
DATE DRILLED 12/18/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 8 Feet



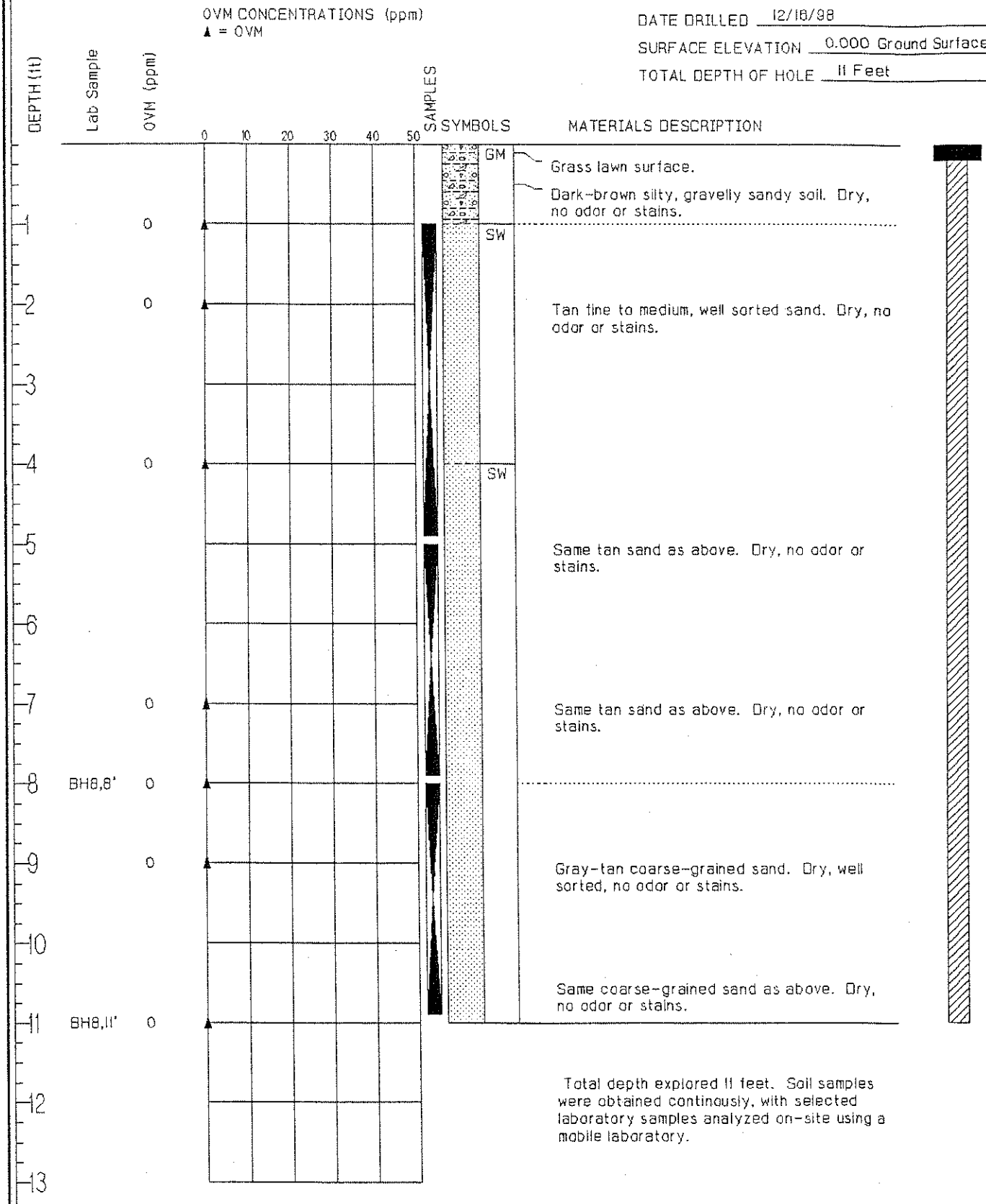
Total depth explored 8 feet. Soil samples were obtained continously, with selected laboratory samples analyzed on-site using a mobile laboratory.

JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

SCS ENGINEERS
Engineering and Environmental Consultants

BH-8 *(Page 1 of 1)*

CLIENT NAME Manhattan Village – Dry Cleaner
DATE DRILLED 12/18/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 11 Feet



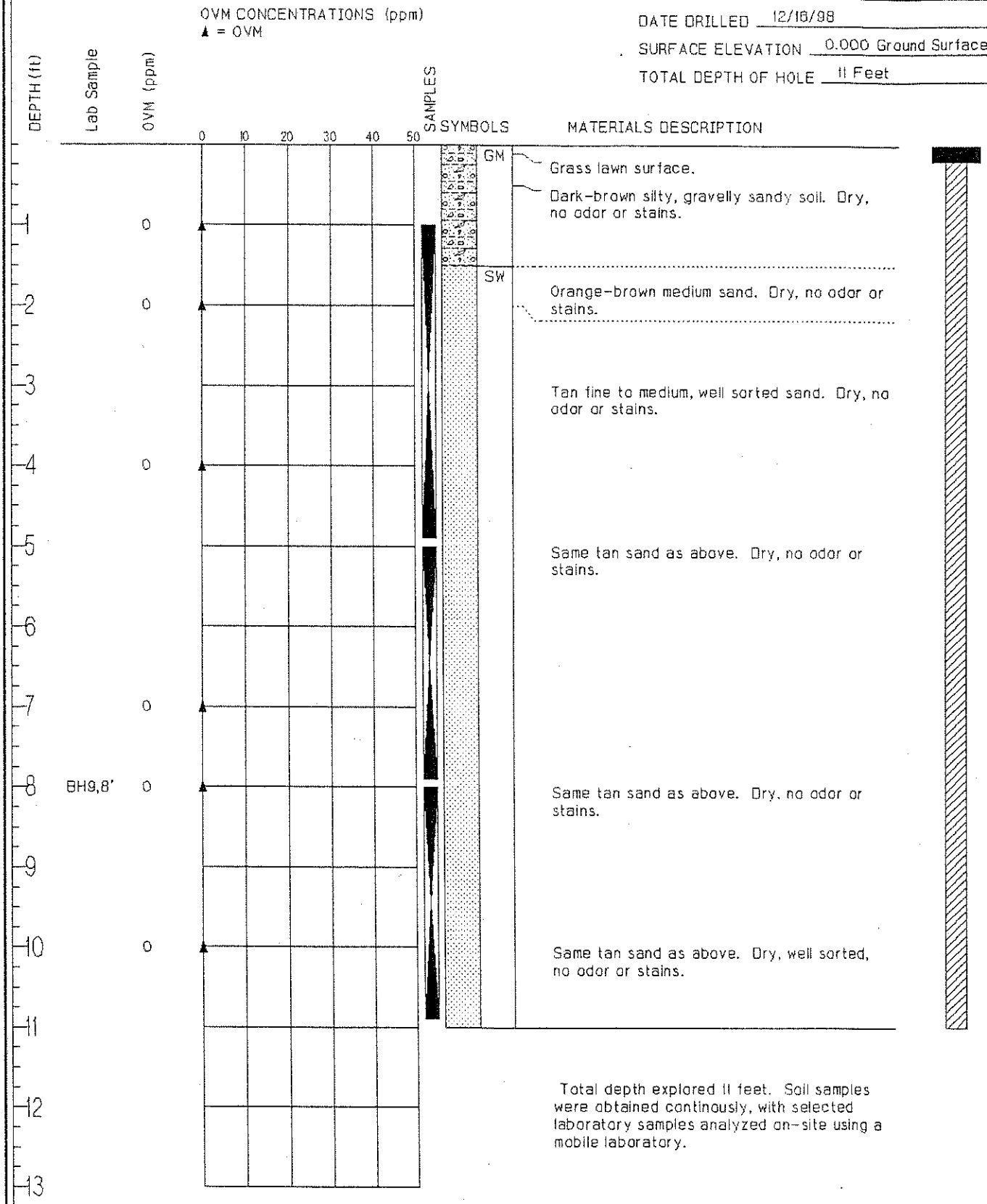
Total depth explored 11 feet. Soil samples were obtained continously, with selected laboratory samples analyzed on-site using a mobile laboratory.

JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

SCS ENGINEERS
Engineering and Environmental Consultants

BH-9 *(Page 1 of 1)*

CLIENT NAME Manhattan Village – Dry Cleaner
DATE DRILLED 12/16/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 11 Feet



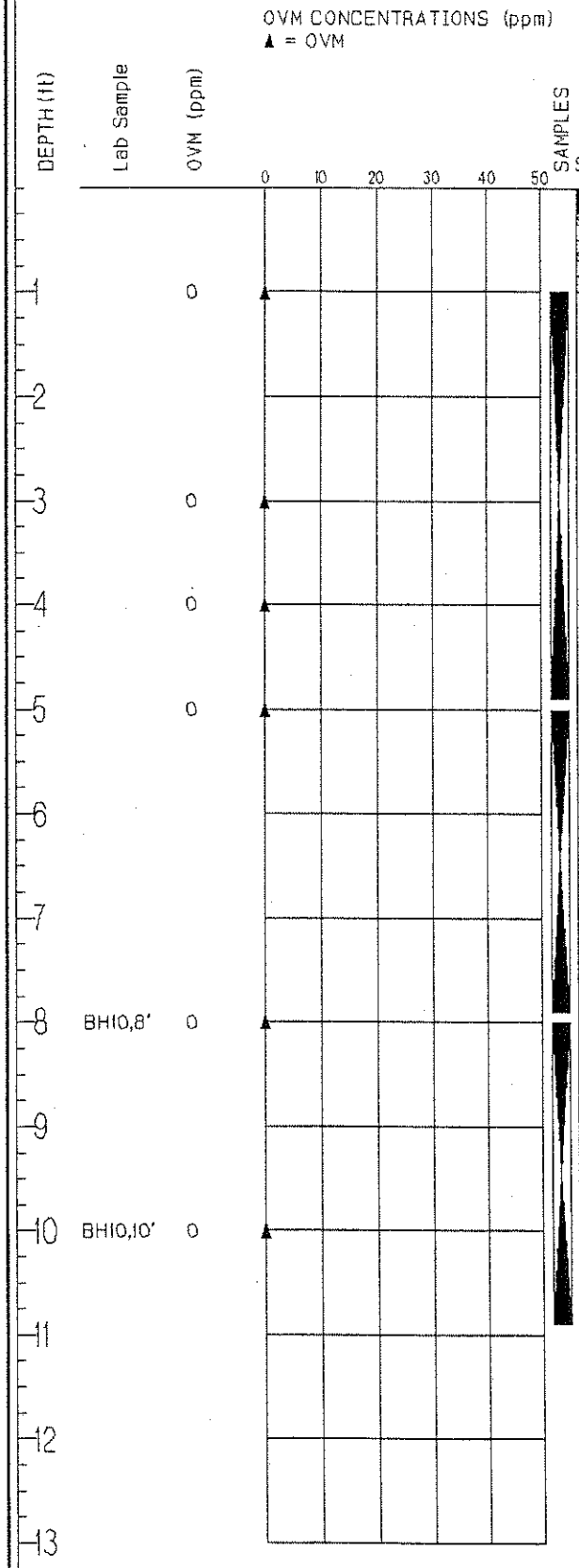
Total depth explored 11 feet. Soil samples were obtained continously, with selected laboratory samples analyzed on-site using a mobile laboratory.

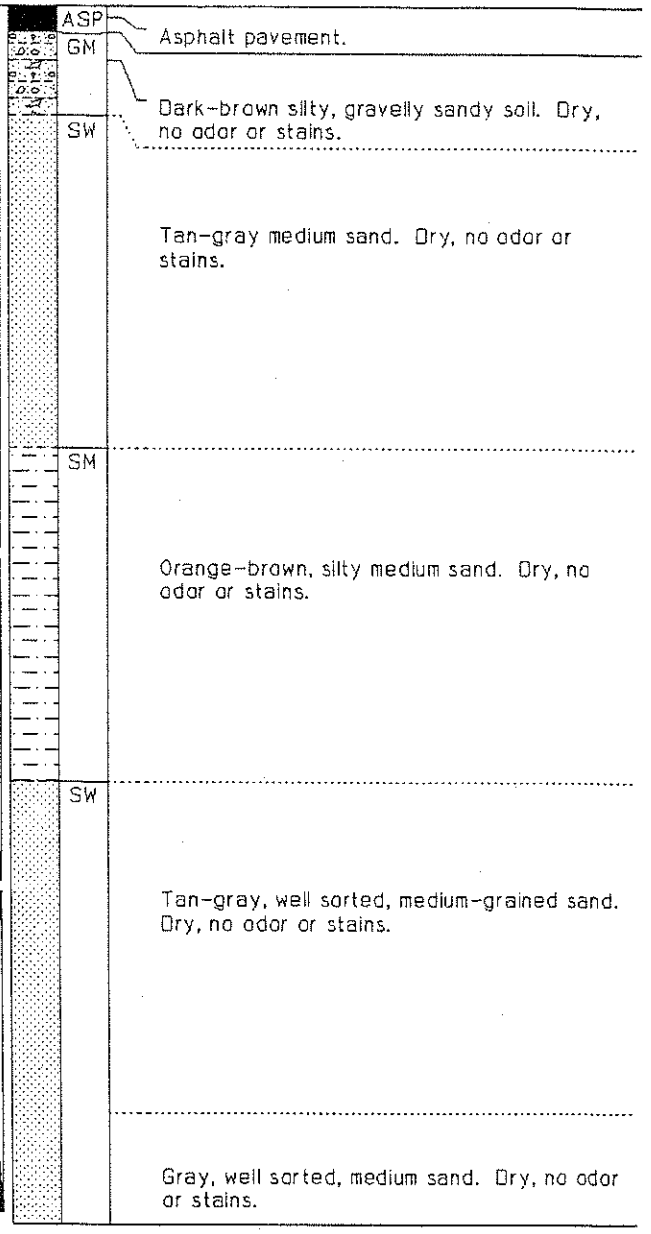
JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

SCS ENGINEERS
Engineering and Environmental Consultants

BH-10 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner
DATE DRILLED 12/16/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 11 Feet





MATERIALS DESCRIPTION

Asphalt pavement.

Dark-brown silty, gravelly sandy soil. Dry, no odor or stains.

Tan-gray medium sand. Dry, no odor or stains.

Orange-brown, silty medium sand. Dry, no odor or stains.

Tan-gray, well sorted, medium-grained sand. Dry, no odor or stains.

Gray, well sorted, medium sand. Dry, no odor or stains.

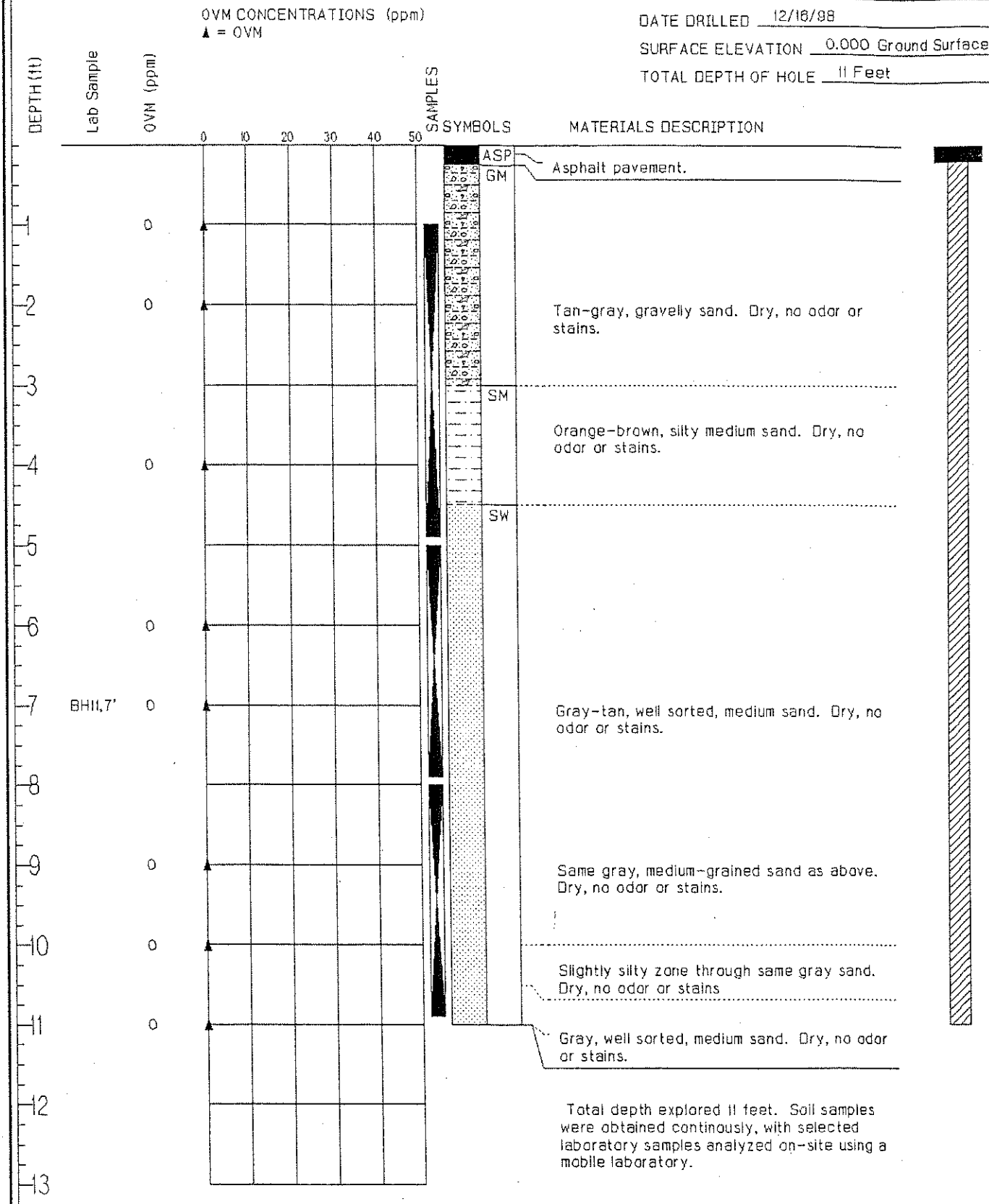
Total depth explored 11 feet. Soil samples were obtained continously, with selected laboratory samples analyzed on-site using a mobile laboratory.

JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

SCS ENGINEERS
Engineering and Environmental Consultants

BH-11 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner
DATE DRILLED 12/16/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 11 Feet



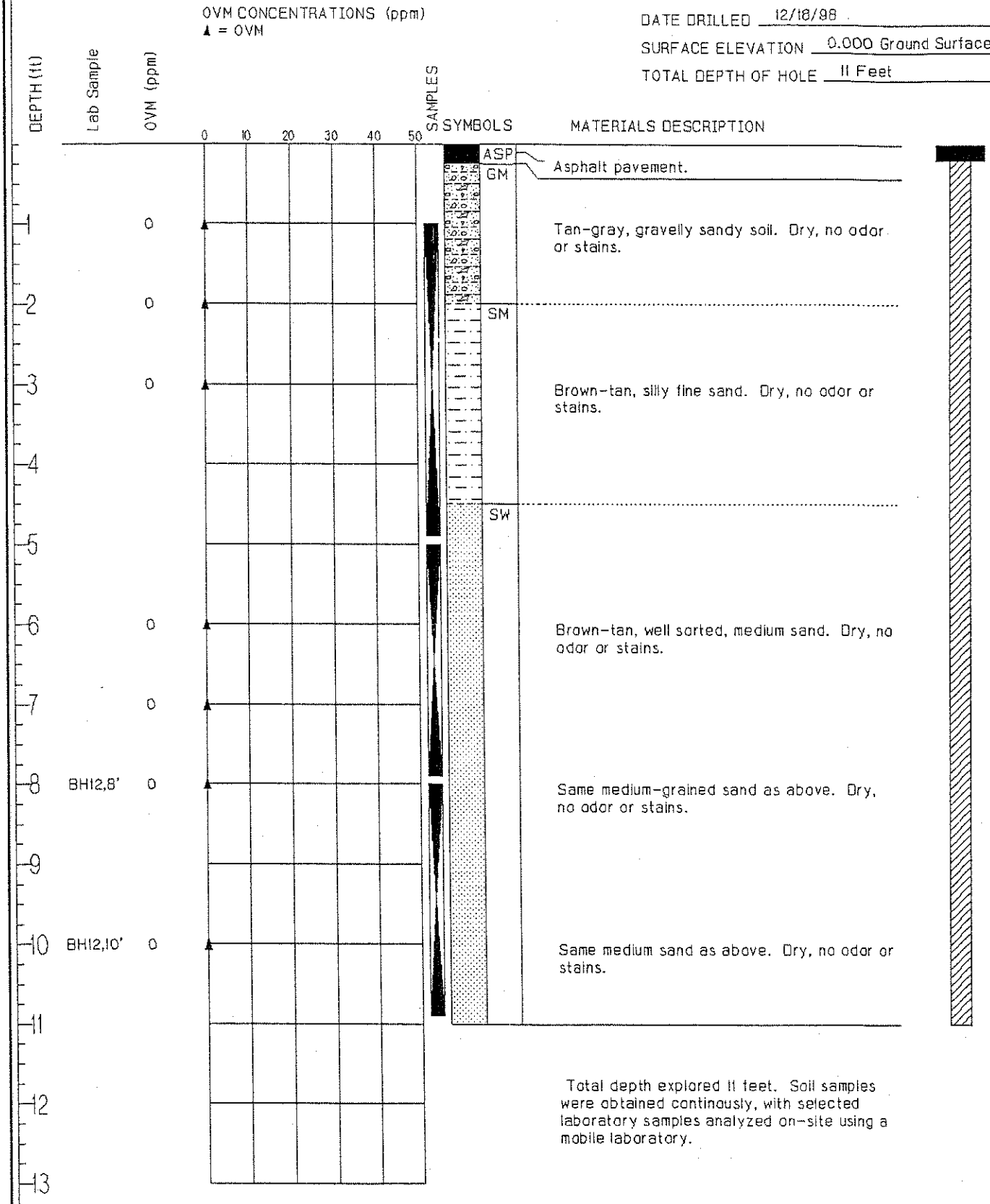
Total depth explored 11 feet. Soil samples were obtained continously, with selected laboratory samples analyzed on-site using a mobile laboratory.

JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

SCS ENGINEERS
Engineering and Environmental Consultants

BH-12 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner
DATE DRILLED 12/18/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 11 Feet



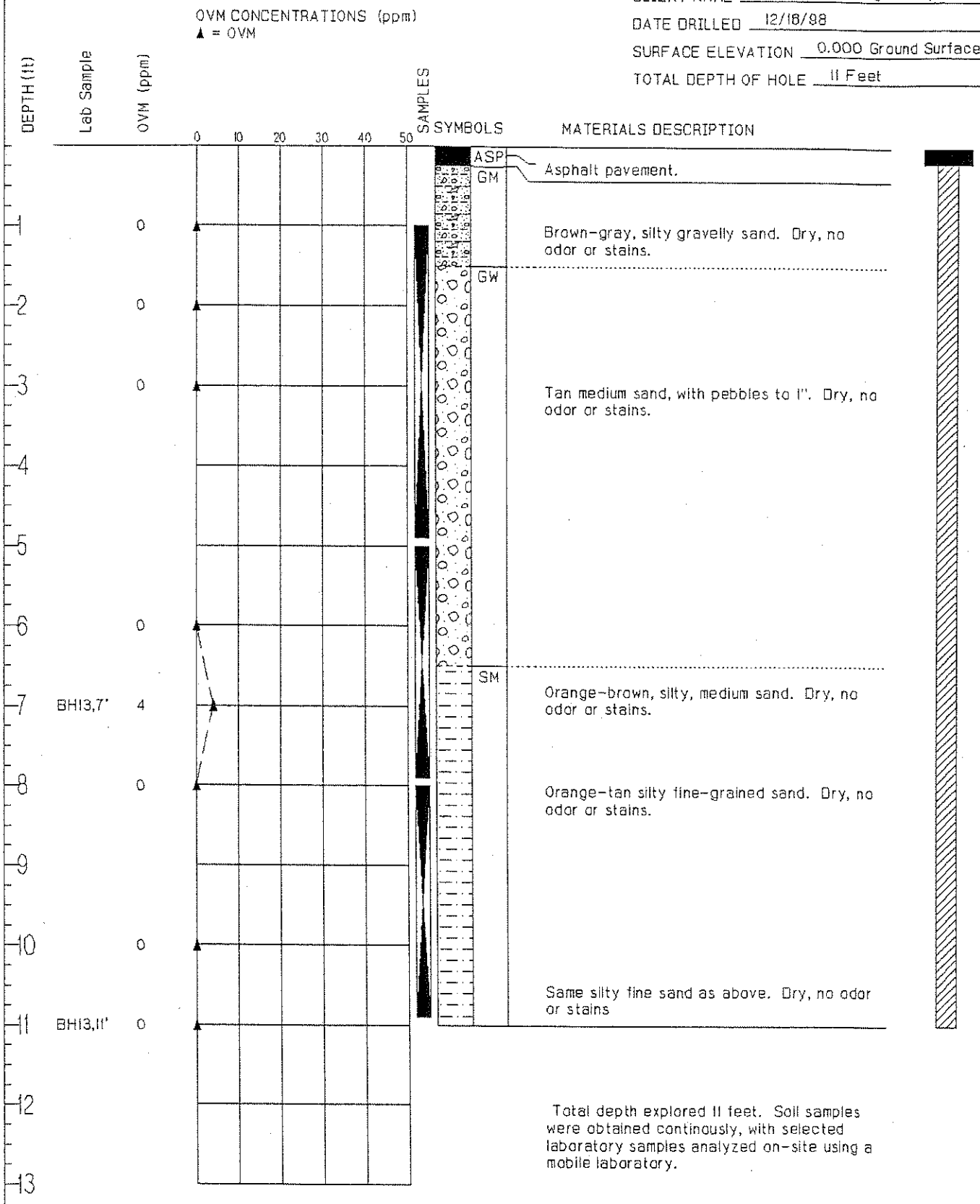
Total depth explored 11 feet. Soil samples were obtained continously, with selected laboratory samples analyzed on-site using a mobile laboratory.

JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

SCS ENGINEERS
Engineering and Environmental Consultants

BH-13 *(Page 1 of 1)*

CLIENT NAME Manhattan Village – Dry Cleaner
DATE DRILLED 12/16/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 11 Feet



Total depth explored 11 feet. Soil samples were obtained continously, with selected laboratory samples analyzed on-site using a mobile laboratory.

JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

SCS ENGINEERS
Engineering and Environmental Consultants

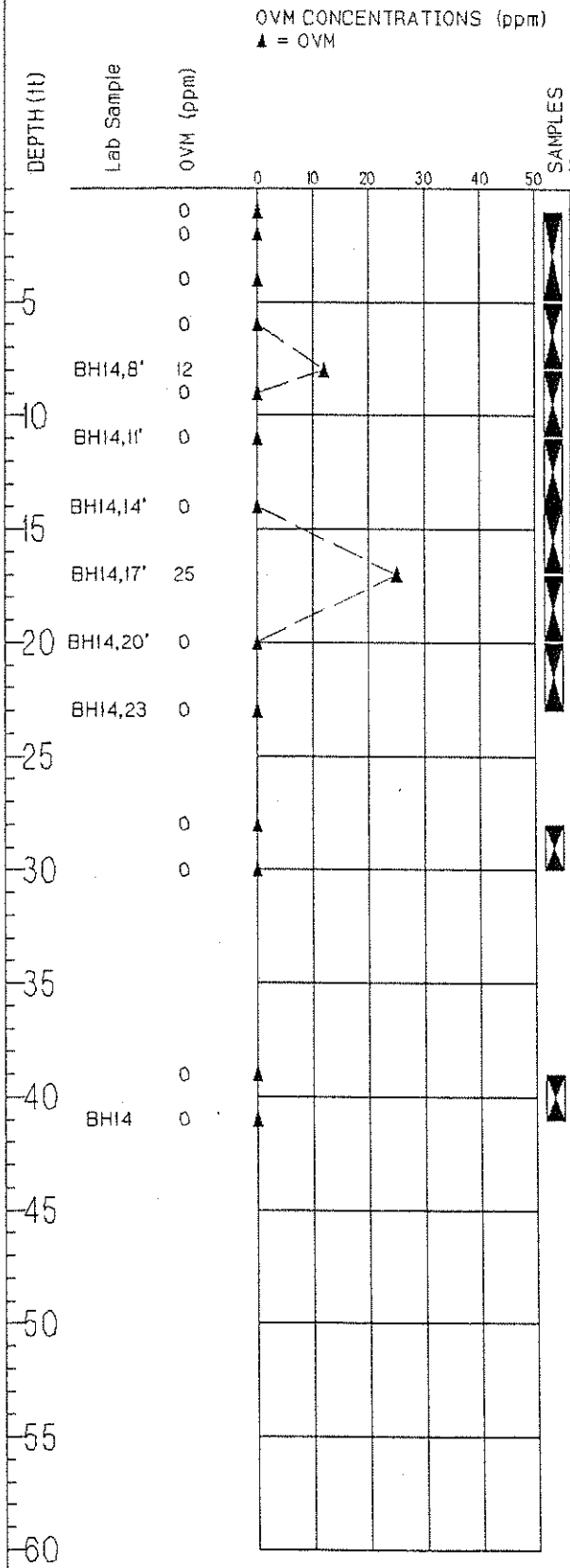
BH-14 *(Page 1 of 1)*

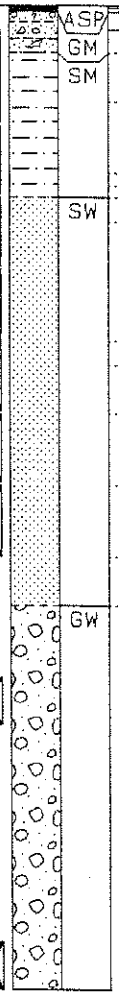
CLIENT NAME Manhattan Village - Dry Cleaner

DATE DRILLED 12/18/98

SURFACE ELEVATION 0.000 Ground Surface

TOTAL DEPTH OF HOLE 55 Feet





Asphalt pavement.

Brown-tan, gravelly sand. Dry, no odor or stains.

Tan, compact, silty fine sand. Dry, no odor or stains.

Orange-brown, silty, medium sand. Dry, compact, no odor, but may be stained (?).

Tan-brown, well sorted, medium-grained sand. Dry, no odor or stains.

Same medium sand as above. Dry, no odor or stains.

Gray-brown coarse sand. Well sorted, dry, no stains or odor.

Same coarse sand as above. Dry, no stains or odors.

Same coarse sand as above. Dry, no stains or odors.

Gray gravelly, coarse sand. Cobbles to 1". Dry, no odor or stains.

Same gray gravelly sand as above. Moist to wet, no odor or stains.

Groundwater sample B-14,45'

Groundwater sample B-14,50'

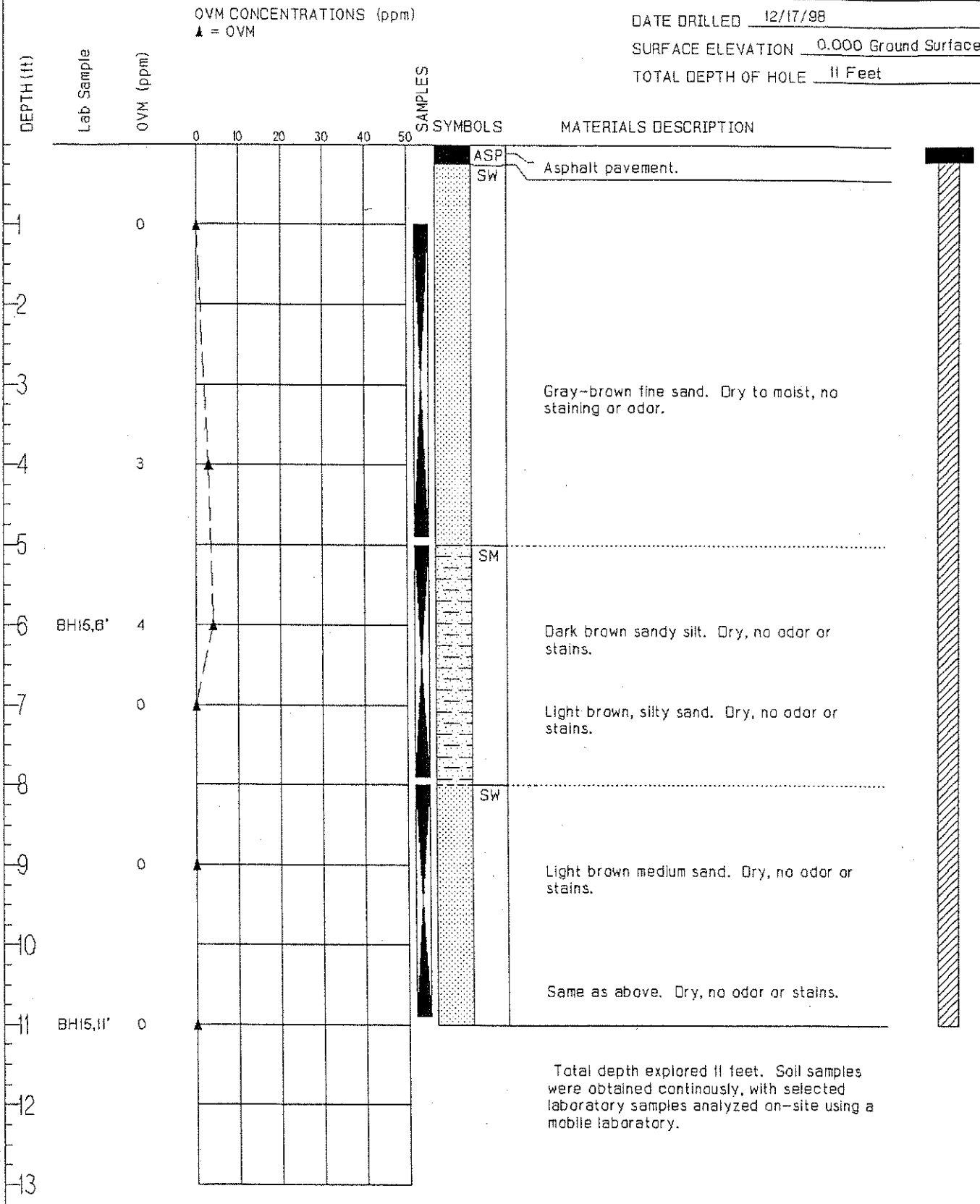
Total soil depth explored 41 feet. Soil samples were obtained continously, with selected laboratory samples analyzed on-site using a mobile laboratory. Groundwater samples were collected at BH14,45' and BH14,50'. An attempt to obtain groundwater from 55' could not produce sufficent water for a sample.

JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

SCS ENGINEERS
Engineering and Environmental Consultants

BH-15 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner
DATE DRILLED 12/17/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 11 Feet



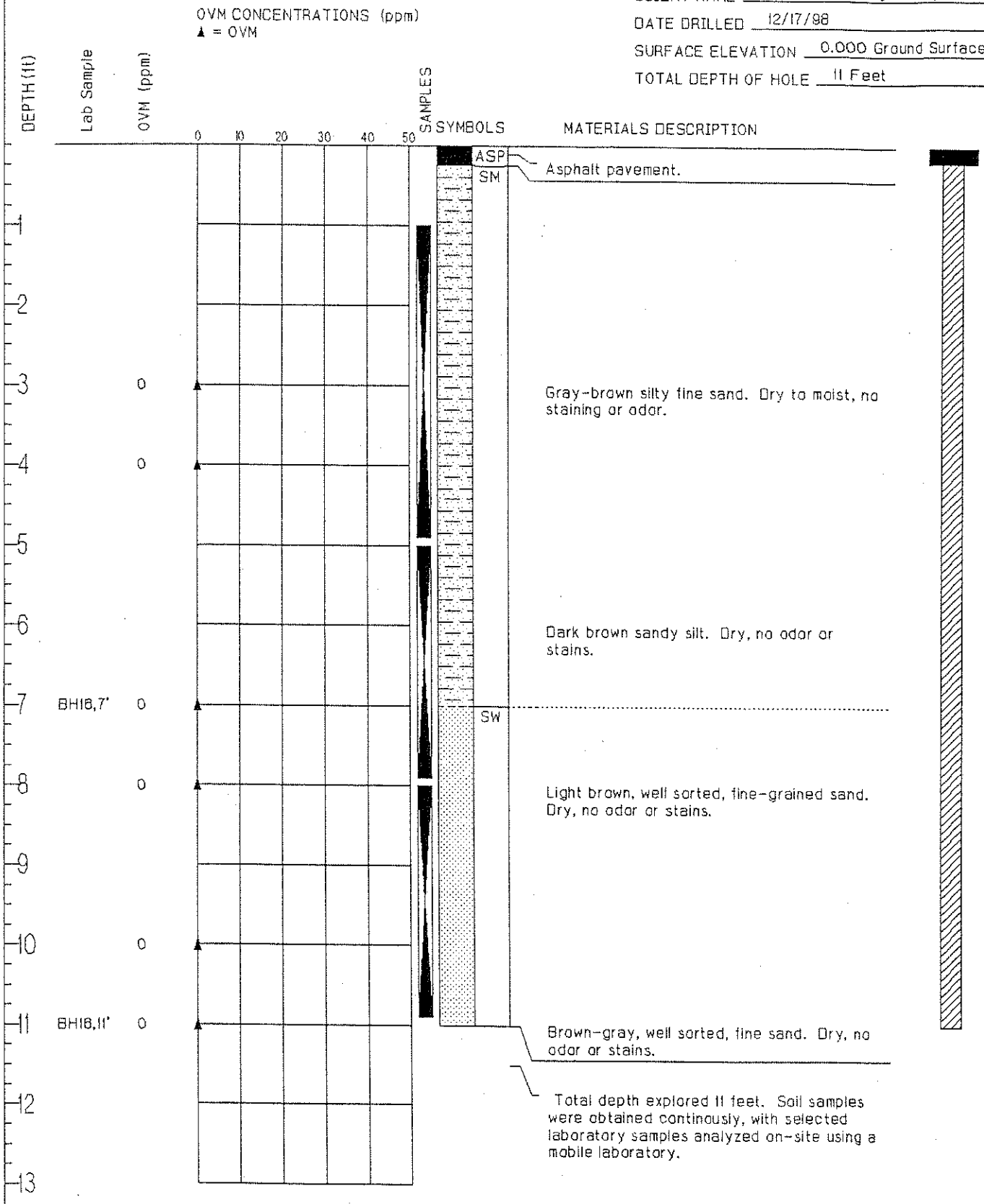
Total depth explored 11 feet. Soil samples were obtained continously, with selected laboratory samples analyzed on-site using a mobile laboratory.

JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

SCS ENGINEERS
Engineering and Environmental Consultants

BH-16 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner
DATE DRILLED 12/17/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 11 Feet

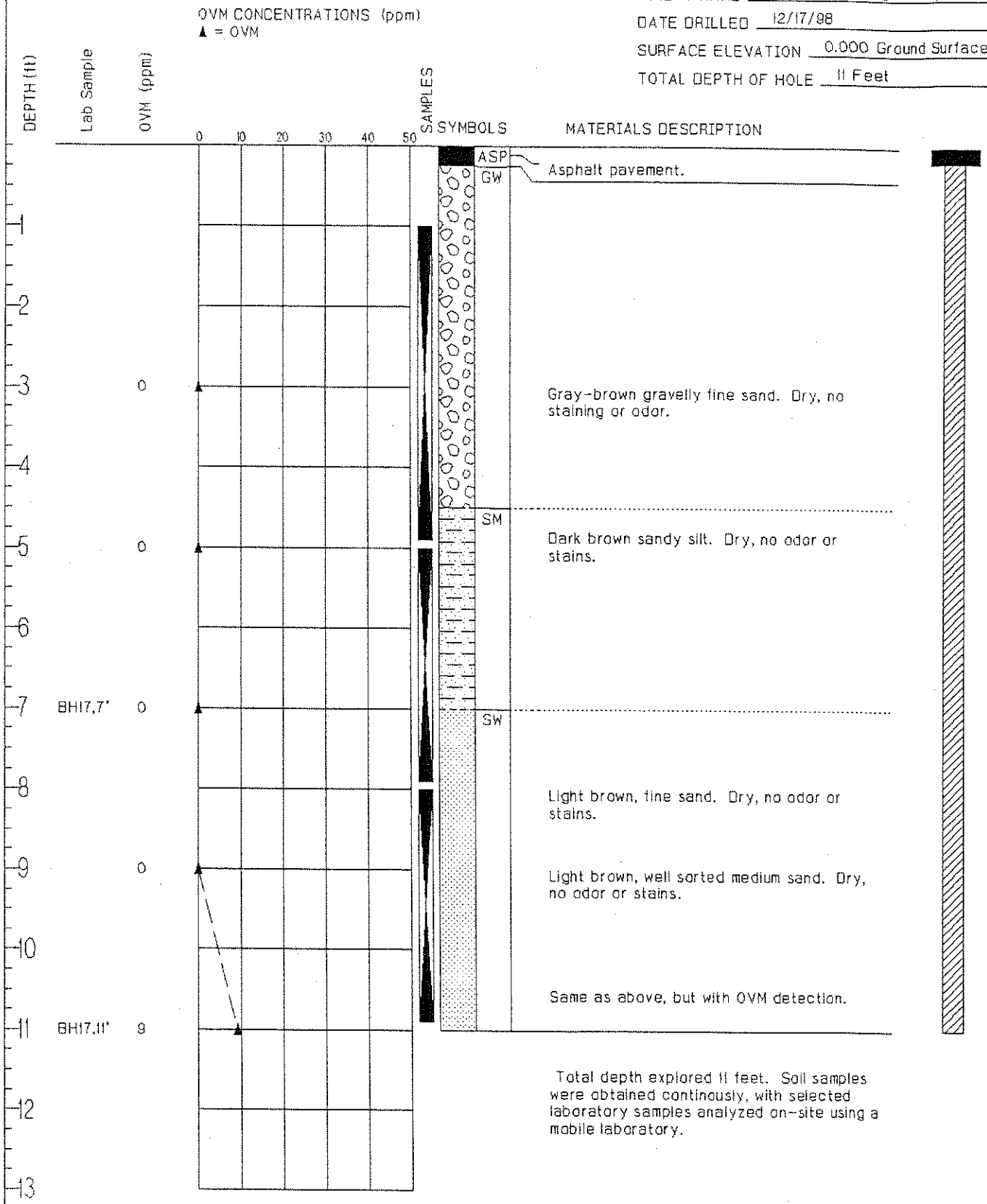


JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

SCS ENGINEERS
Engineering and Environmental Consultants

BH-17 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner
DATE DRILLED 12/17/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 11 Feet



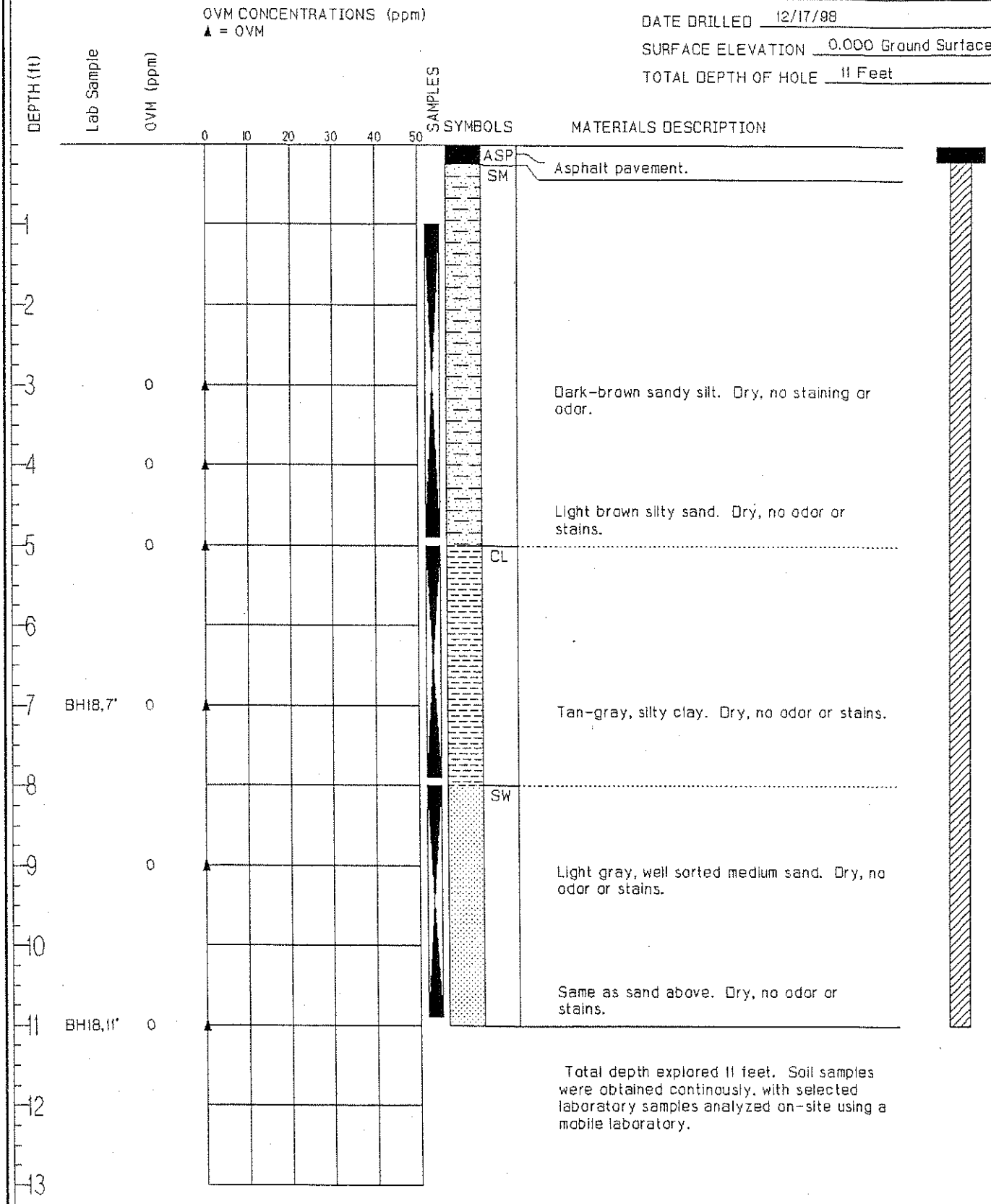
Total depth explored 11 feet. Soil samples were obtained continously, with selected laboratory samples analyzed on-site using a mobile laboratory.

JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

SCS ENGINEERS
Engineering and Environmental Consultants

BH-18 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner
DATE DRILLED 12/17/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 11 Feet



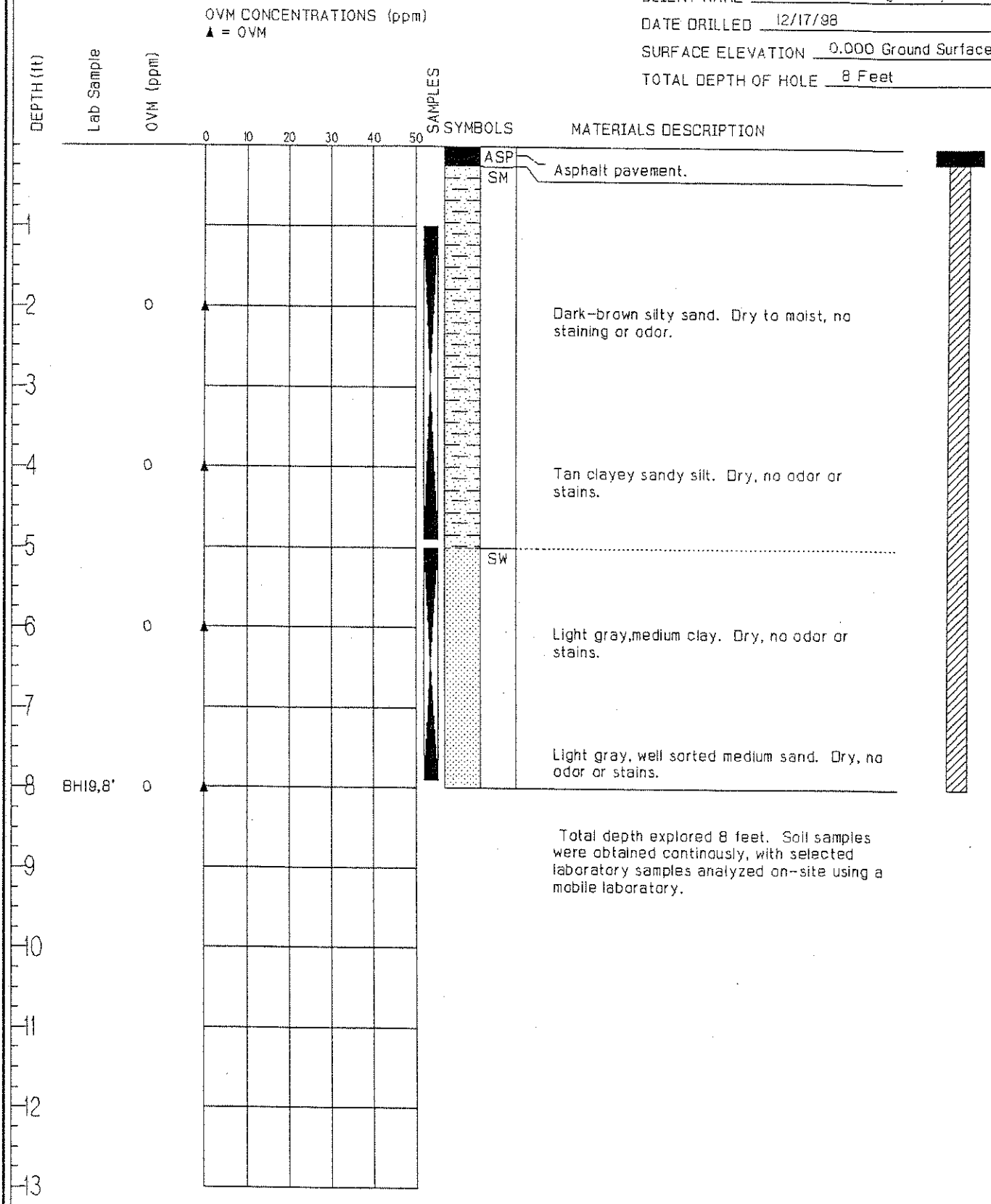
Total depth explored 11 feet. Soil samples were obtained continously, with selected laboratory samples analyzed on-site using a mobile laboratory.

JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

SCS ENGINEERS
Engineering and Environmental Consultants

BH-19 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner
DATE DRILLED 12/17/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 8 Feet



Total depth explored 8 feet. Soil samples were obtained continously, with selected laboratory samples analyzed on-site using a mobile laboratory.

JOB NUMBER: 0498007.05
LOCATION: Normandy Park, WA

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Engineering and Environmental Consultants

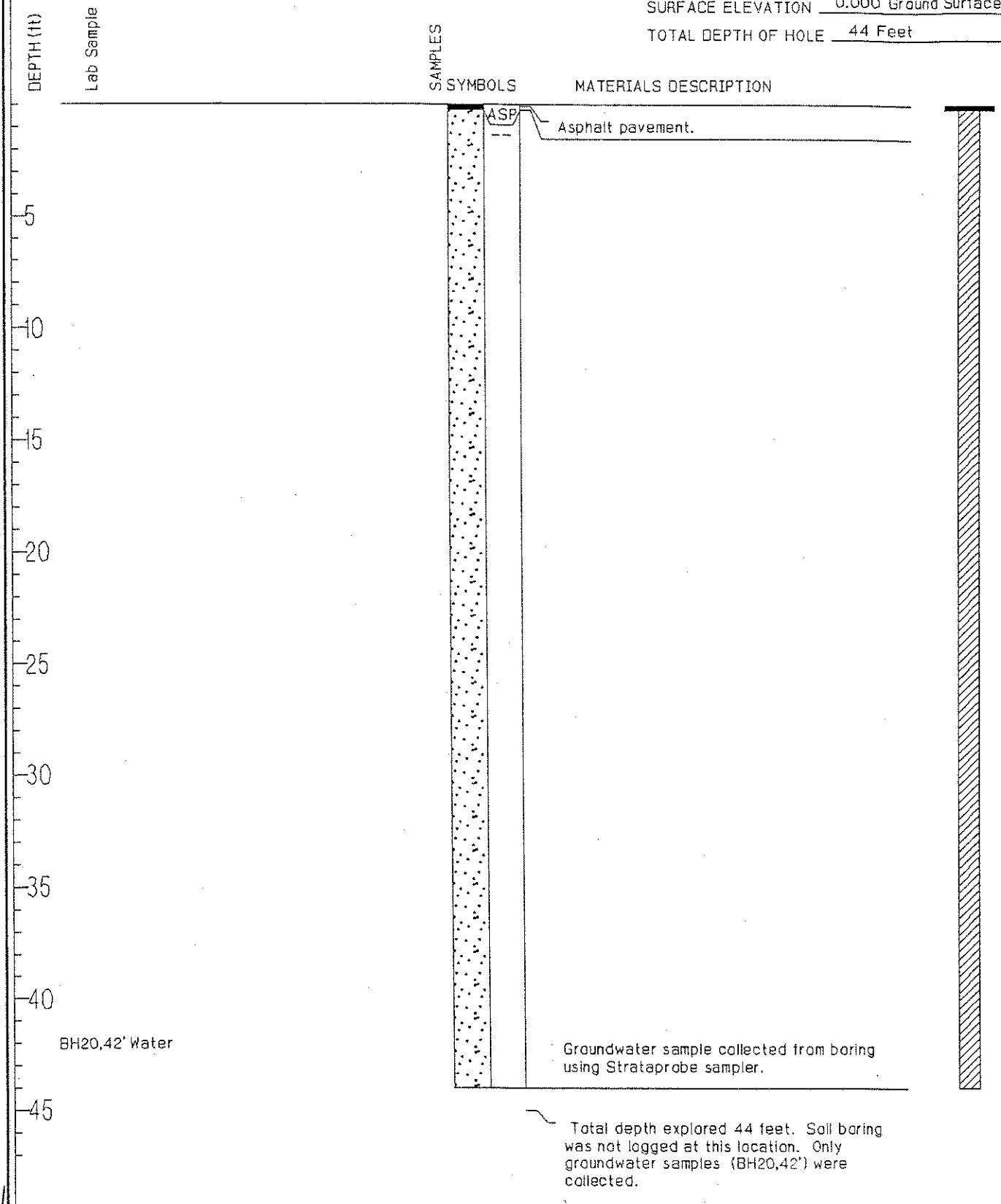
BH-20 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner

DATE DRILLED 12/17/98

SURFACE ELEVATION 0.000 Ground Surface

TOTAL DEPTH OF HOLE 44 Feet



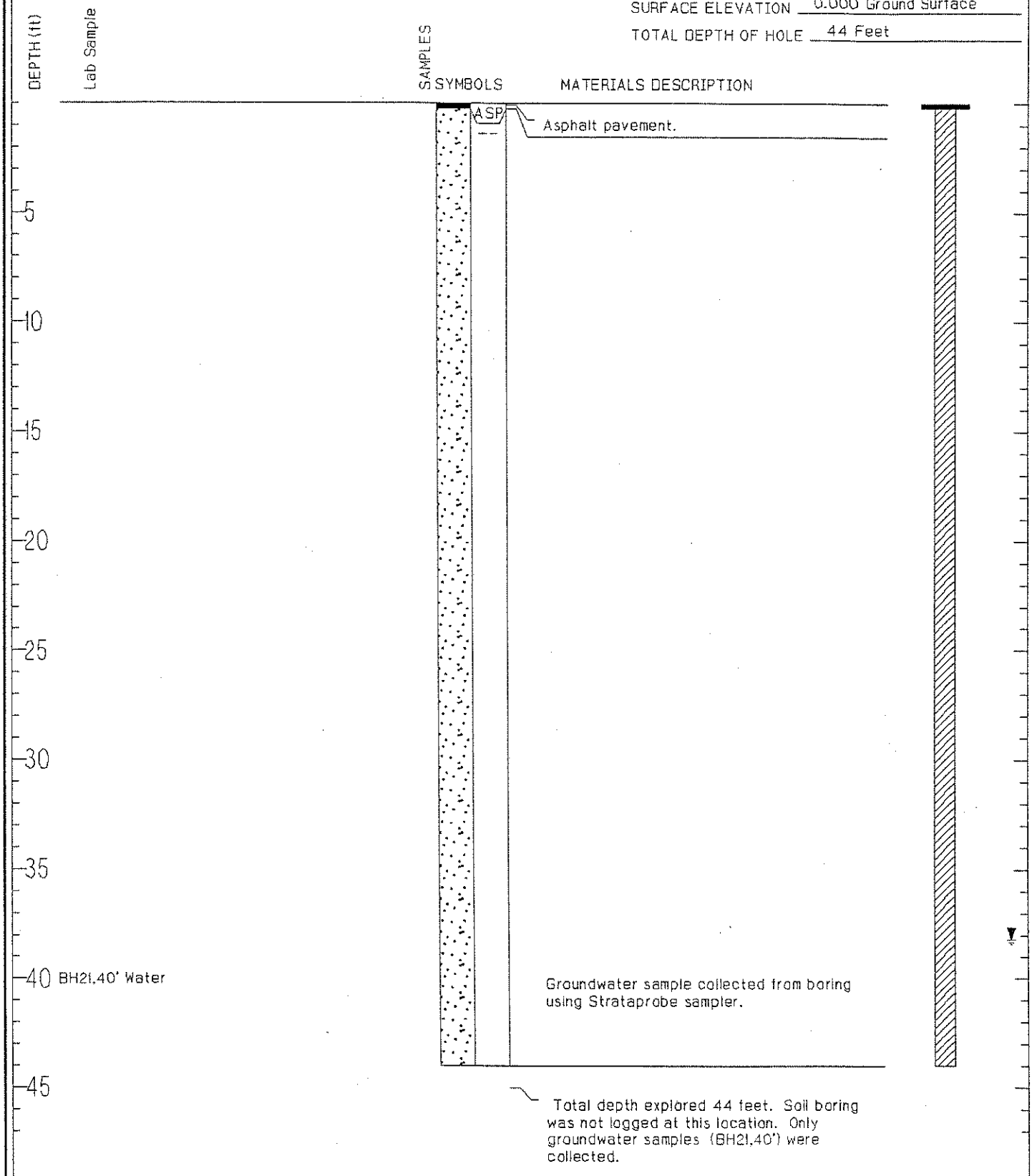
BH-21 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner

DATE DRILLED 12/18/98

SURFACE ELEVATION 0.000 Ground Surface

TOTAL DEPTH OF HOLE 44 Feet



BH-22 *(Page 1 of 1)*

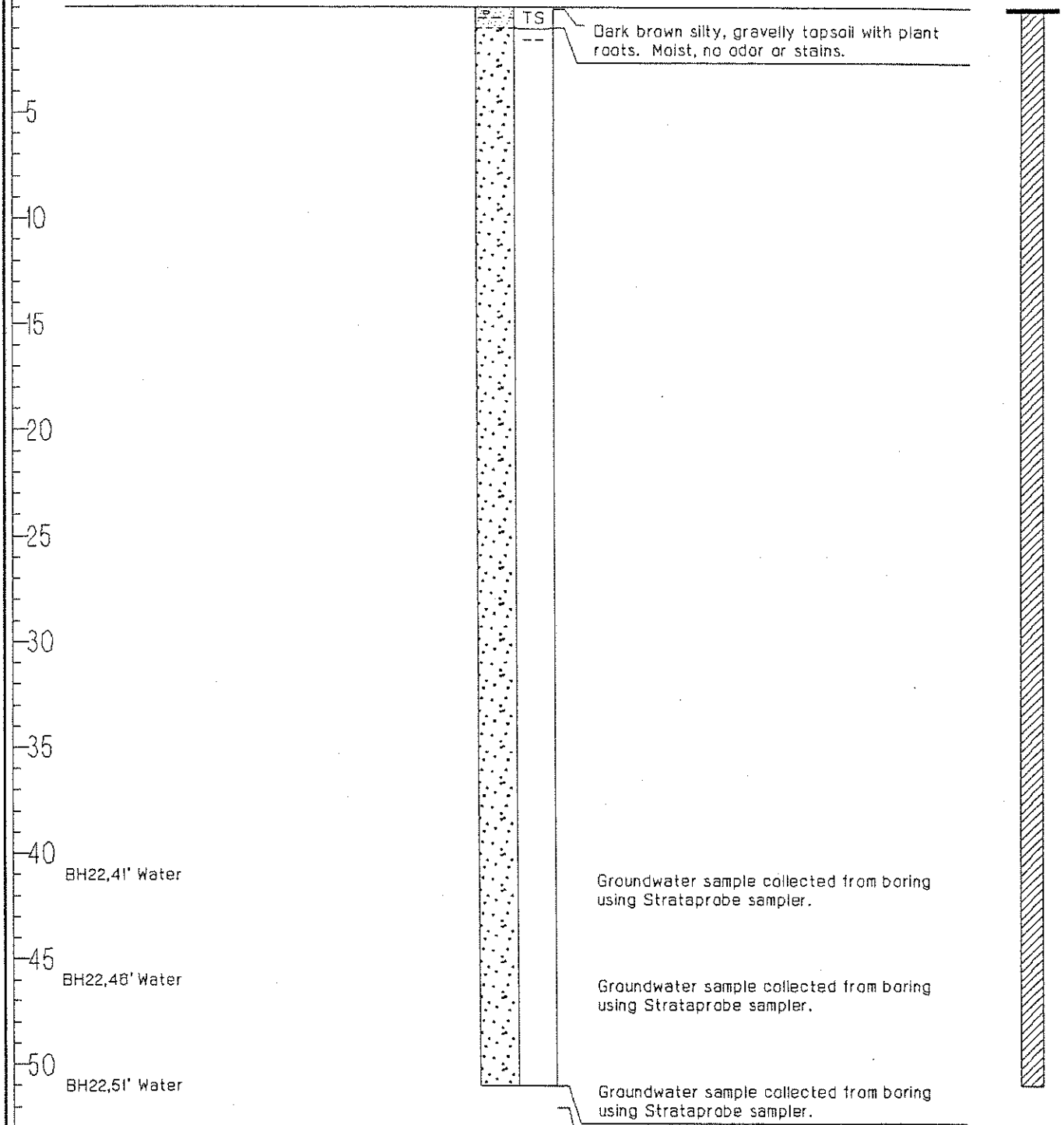
CLIENT NAME Manhattan Village - Dry Cleaner

DATE DRILLED 12/18/98

SURFACE ELEVATION 0.000 Ground Surface

TOTAL DEPTH OF HOLE 51 Feet

DEPTH (ft)	Lab Sample	SAMPLES	SYMBOLS	MATERIALS DESCRIPTION
0			TS	Dark brown silty, gravelly topsoil with plant roots. Moist, no odor or stains.
40	BH22,41' Water			Groundwater sample collected from boring using Strataprobe sampler.
45	BH22,46' Water			Groundwater sample collected from boring using Strataprobe sampler.
50	BH22,51' Water			Groundwater sample collected from boring using Strataprobe sampler.
				Total depth explored 51 feet. Soil boring was not logged at this location. Only groundwater samples (BH22 @ 41',46' and 51') were collected.



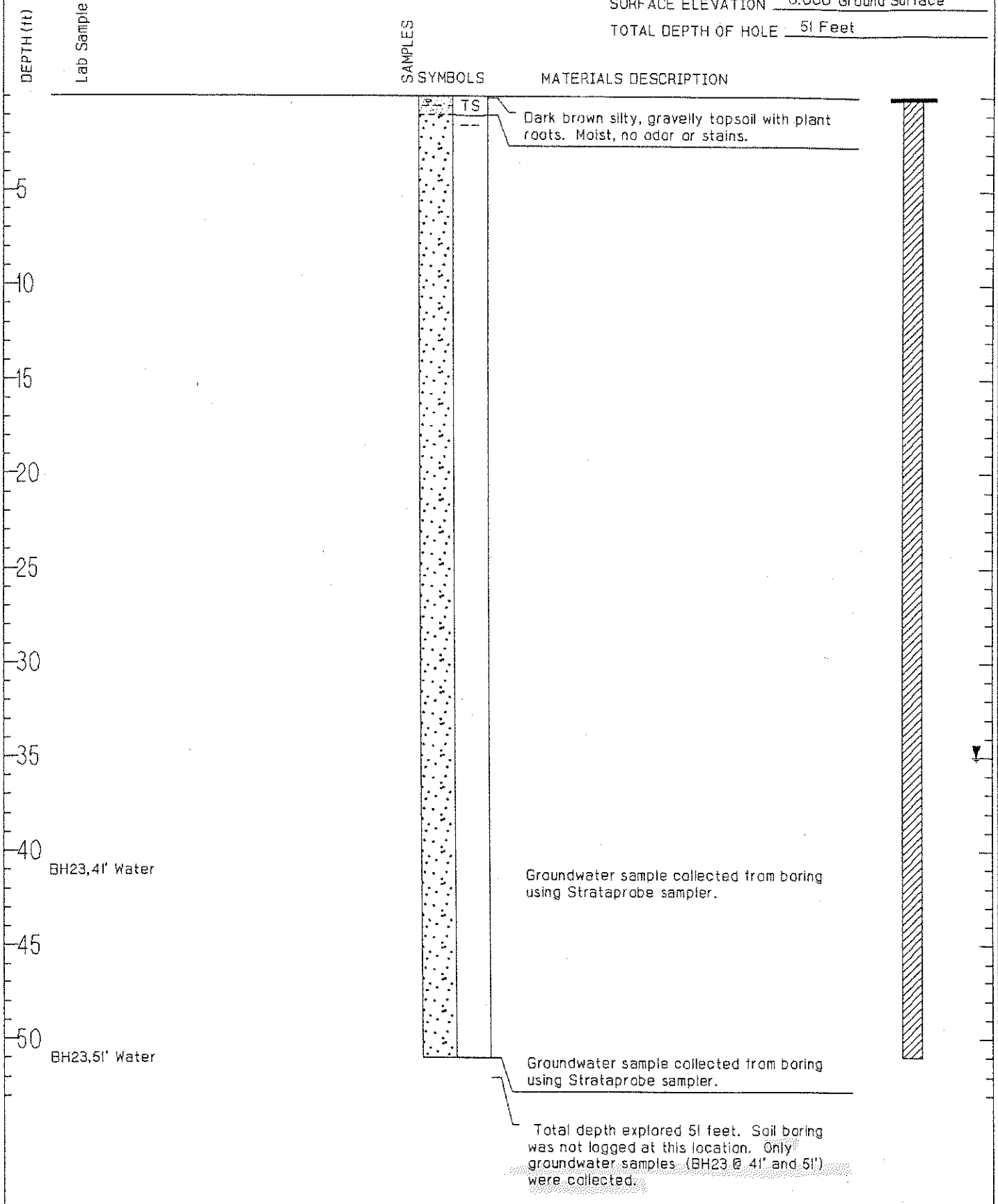
BH-23 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner

DATE DRILLED 12/18/98

SURFACE ELEVATION 0.000 Ground Surface

TOTAL DEPTH OF HOLE 51 Feet



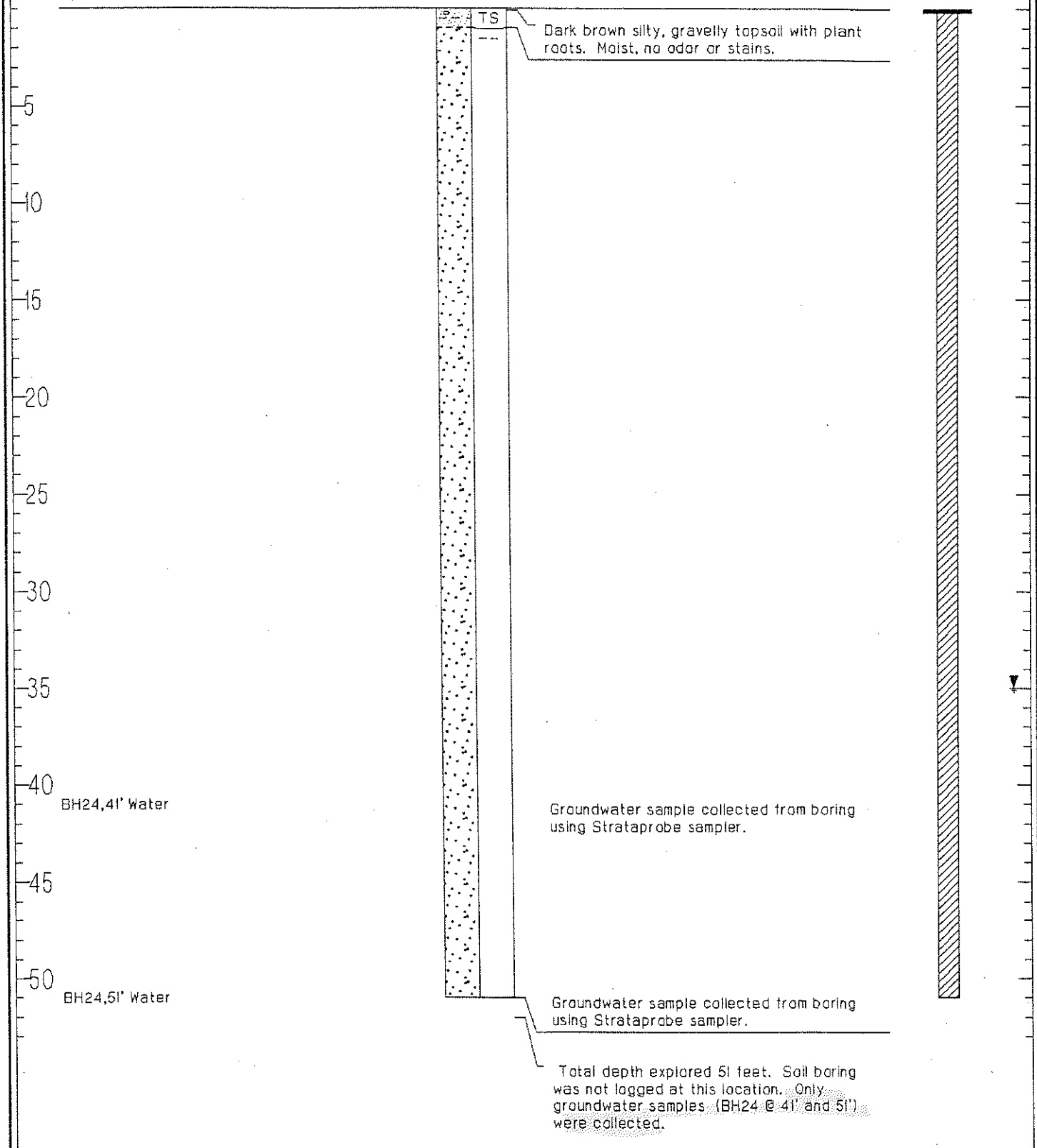
BH-24 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner

DATE DRILLED 12/21/98

SURFACE ELEVATION 0.000 Ground Surface

TOTAL DEPTH OF HOLE 51 Feet



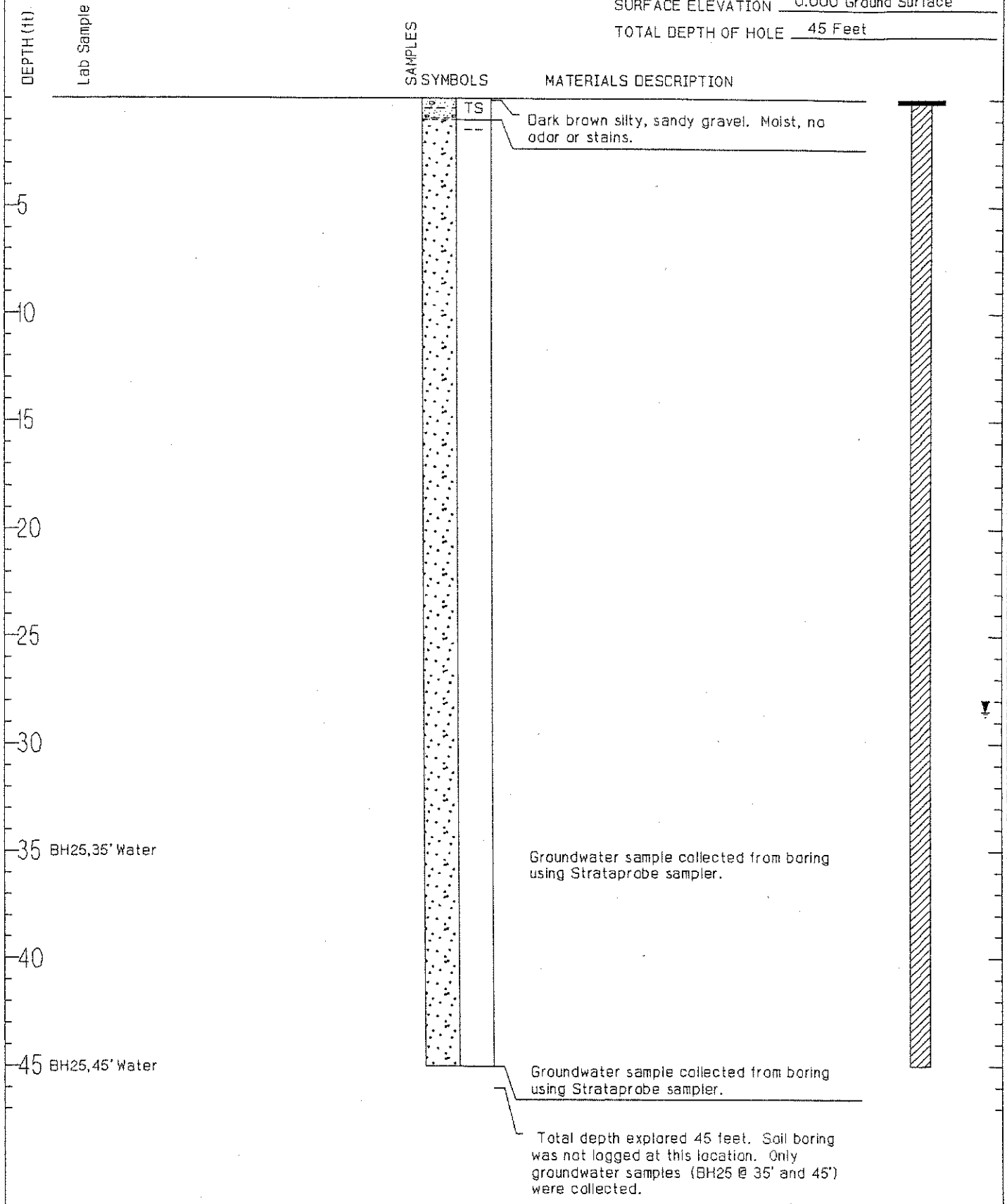
BH-25 *(Page 1 of 1)*

CLIENT NAME Manhattan Village - Dry Cleaner

DATE DRILLED 12/21/98

SURFACE ELEVATION 0.000 Ground Surface

TOTAL DEPTH OF HOLE 45 Feet



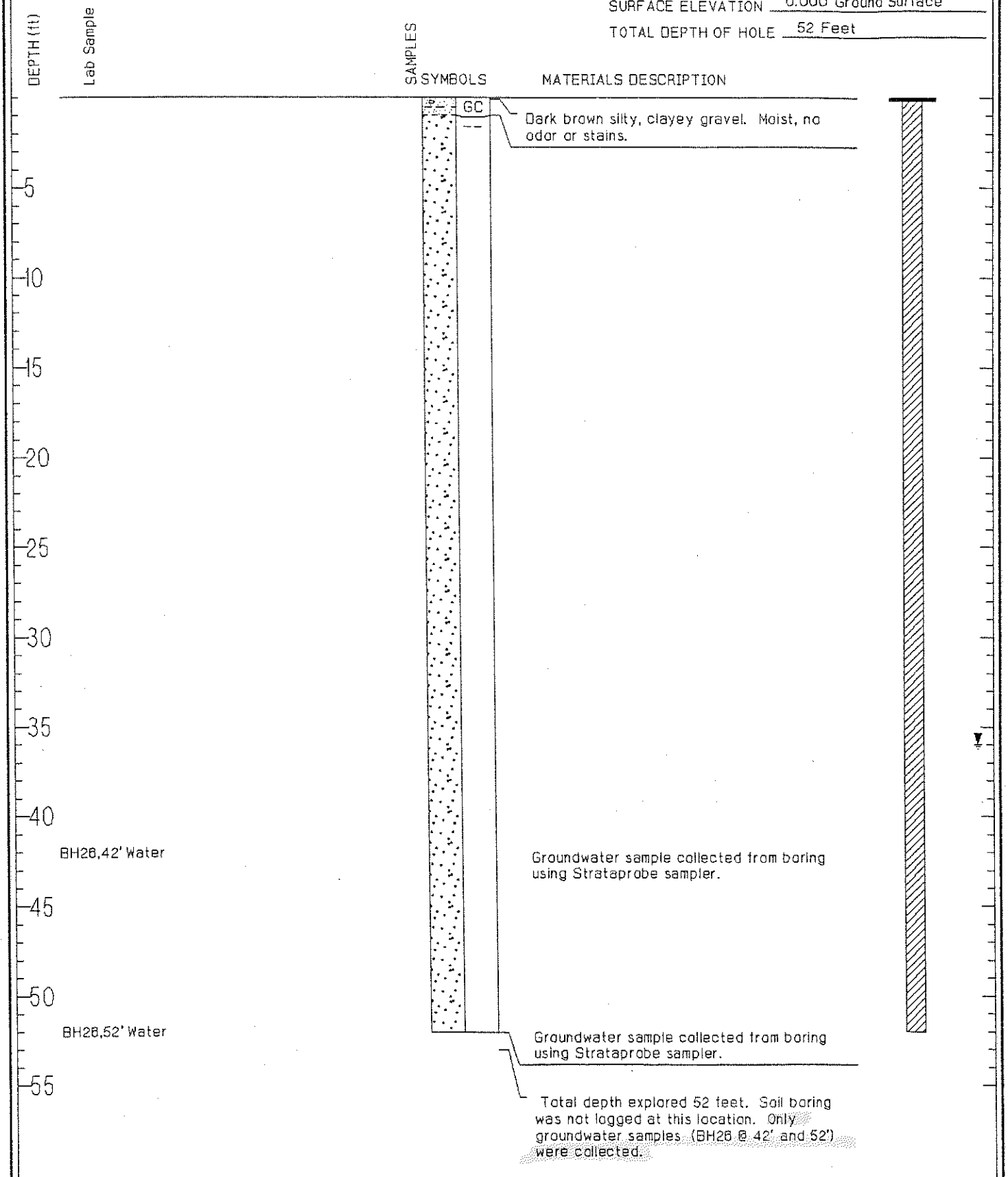
BH-26 *(Page 1 of 1)*

CLIENT NAME Manhattan Village – Dry Cleaner

DATE DRILLED 12/21/98

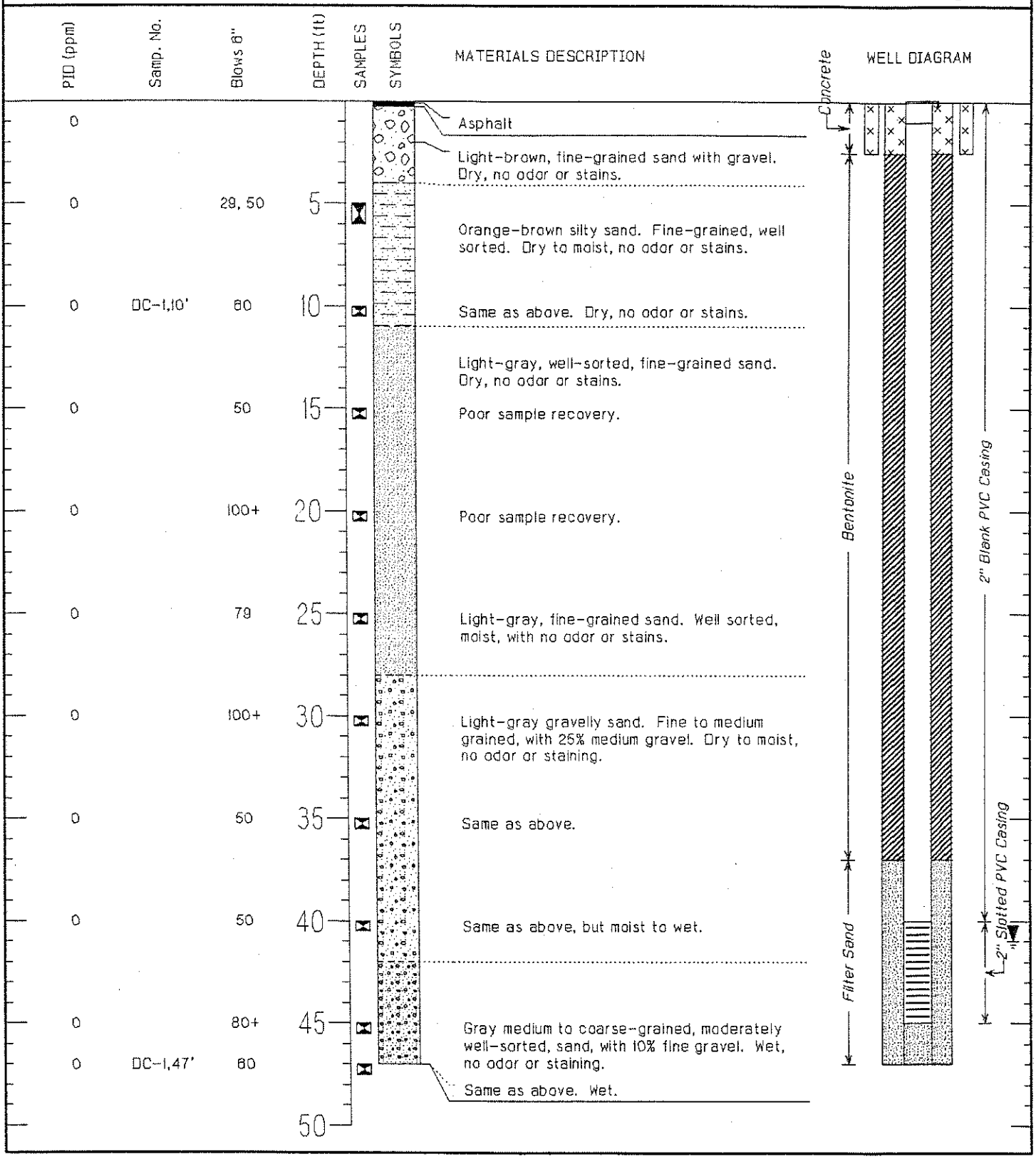
SURFACE ELEVATION 0.000 Ground Surface

TOTAL DEPTH OF HOLE 52 Feet



SCS Engineers
Environmental Consultants

LOG OF MONITORING WELL DC-1



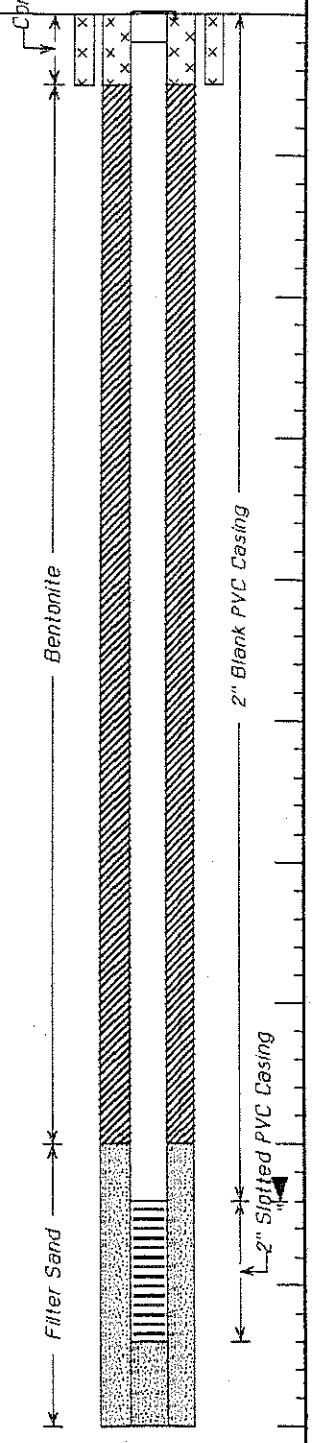
Project: Manhattan Village - Dry Cleaner	Drill Company: Cascade Drilling
Location: Normandy Park, WA	Date: 10-12-98
Project Number: 0498007.04	Surface Elevation: 308.945 feet above MSL
Logged by: Brian Doan	TOTAL DEPTH OF HOLE: 47 Feet
Drill Method: Hollow Stem Auger	Water Level: 41 Feet

SCS Engineers
Environmental Consultants

LOG OF MONITORING WELL DC-2

PID (ppm)	Samp. No.	Blows 8"	DEPTH (ft)	SAMPLES	SYMBOLS	MATERIALS DESCRIPTION
0						Asphalt
0		17, 25, 25	5			Orange-brown silty sand. Fine-grained, poorly-sorted, with 20% fine to medium grained gravel. Dry, no odor or stains.
0	DC-2,10'	50	10			Same as above. Dry, no odor or stains.
0		50	15			Gray-brown, well-sorted, fine-grained sand. Dry, no odor or stains.
0		50	20			Same as above.
0		50	25			Light-gray, fine to medium-grained sand. Well sorted, moist, with no odor or stains.
0		80	30			Same as above, but with 20% fine to medium-grained gravel.
0		100+	35			Gray-brown, fine-grained gravelly sand. Poorly sorted, with 30-50% fine to medium gravel. Dry, no odor or stains.
0		100+	40			Same as above, but with only 10% fine to medium gravel. Moist to wet.
0		70	45			Gray medium to coarse-grained, moderately well-sorted, sand. Wet, no odor or staining.
0	DC-2,50'	50+	50			Same as above. Wet.

WELL DIAGRAM



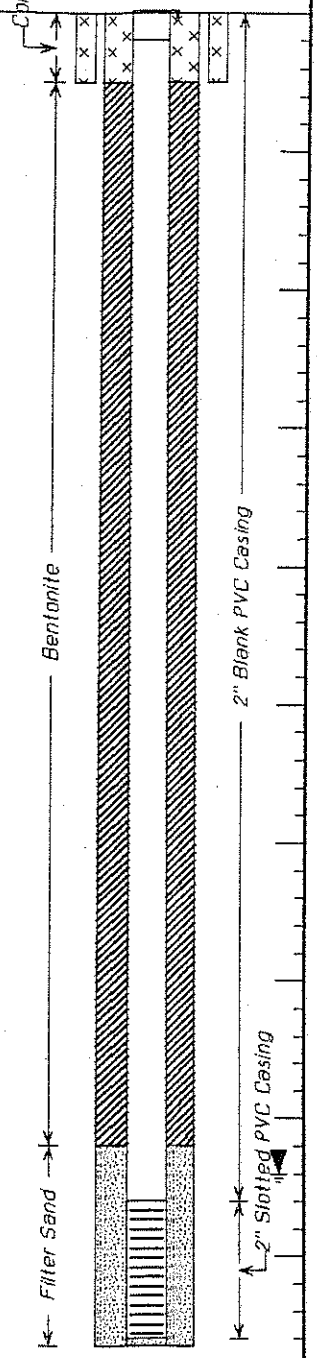
Project: Manhattan Village - Dry Cleaner	Drill Company: Cascade Drilling
Location: Normandy Park, WA	Date: 10-13-98
Project Number: 0498007.04	Surface Elevation: 309.285 feet above MSL
Logged by: Brian Doan	TOTAL DEPTH OF HOLE: 50 Feet
Drill Method: Hollow Stem Auger	Water Level: 42 Feet

SCS Engineers
Environmental Consultants

LOG OF MONITORING WELL DC-3

PID (ppm)	Samp. No.	Blows 6"	DEPTH (ft)	SAMPLES	SYMBOLS	MATERIALS DESCRIPTION
0						Asphalt
1.5		14, 12, 14	5			Light-brown, fine-grained silty sand with 20% fine gravel. Dry, no odor or stains.
8.5	DC-3,10'	50	10			Orange-brown sand. Fine-grained, well sorted. Dry to moist, no odor or stains.
10		50	15			Light-brown, fine grained sand. Dry, no odor or stains.
2.5		50	20			Same fine-grained sand as above, but with minor silt lenses. Dry, no odor or stains.
0		50	25			Light-gray, fine-grained sand, with minor gravel. Dry, no odor or stains.
0		50	30			Same as above.
0		--	35			
0		--	40			Same as above. Wet.
0		--	45			Gray medium to coarse-grained, moderately well-sorted, sand, with fine gravel. Wet, no odor or staining.
0	DC-3,48'	--				
			50			Bottom 15 feet of soil boring was logged from soil cuttings because the driller's soil sampler was disabled.

WELL DIAGRAM



Project: Manhattan Village – Dry Cleaner
Location: Normandy Park, WA
Project Number: 0498007.04
Logged by: Brian Doan
Drill Method: Hollow Stem Auger

Drill Company: Cascade Drilling
Date: 10-13-98
Surface Elevation: 309.47 feet above MSL
TOTAL DEPTH OF HOLE: 48 Feet
Water Level: 42 Feet

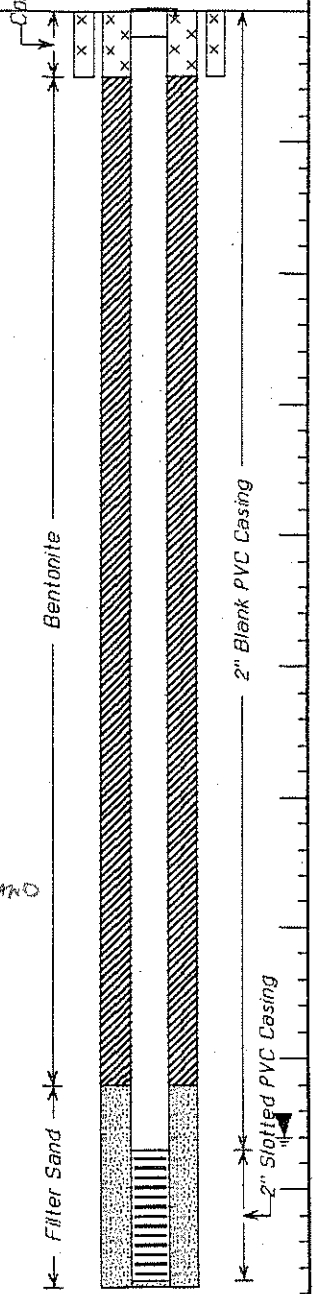
SCS Engineers
Environmental Consultants

LOG OF MONITORING WELL DC-4

PID (ppm)	Samp. No.	Blows 6"	DEPTH (ft)	SAMPLES	SYMBOLS	MATERIALS DESCRIPTION
0						Asphalt
0		--	5			Light-brown, fine-grained silty sand with gravel. Dry, no odor or stains.
						Orange-brown sand. Fine-grained, well sorted. Dry to moist, no odor or stains.
0		--	10			Same as above.
0		--	15			Same fine grained sand as above.
0		--	20			Same fine-grained sand as above.
0		--	25			Light-gray, fine-grained sand, with minor gravel. Dry, no odor or stains.
0		--	30			Same as above.
						0-4 SILTY SAND
						4-49 SAND GRAVELLY SAND
0		--	35			
0		--	40			Same as above. Wet.
0		--	45			Gray medium to coarse-grained, moderately well-sorted, sand, with 25% fine gravel. Wet, no odor or staining.
0	DC-4,49'	--	50			
			55			

Soil boring was logged using soil cuttings because the driller's soil sampler was disabled.

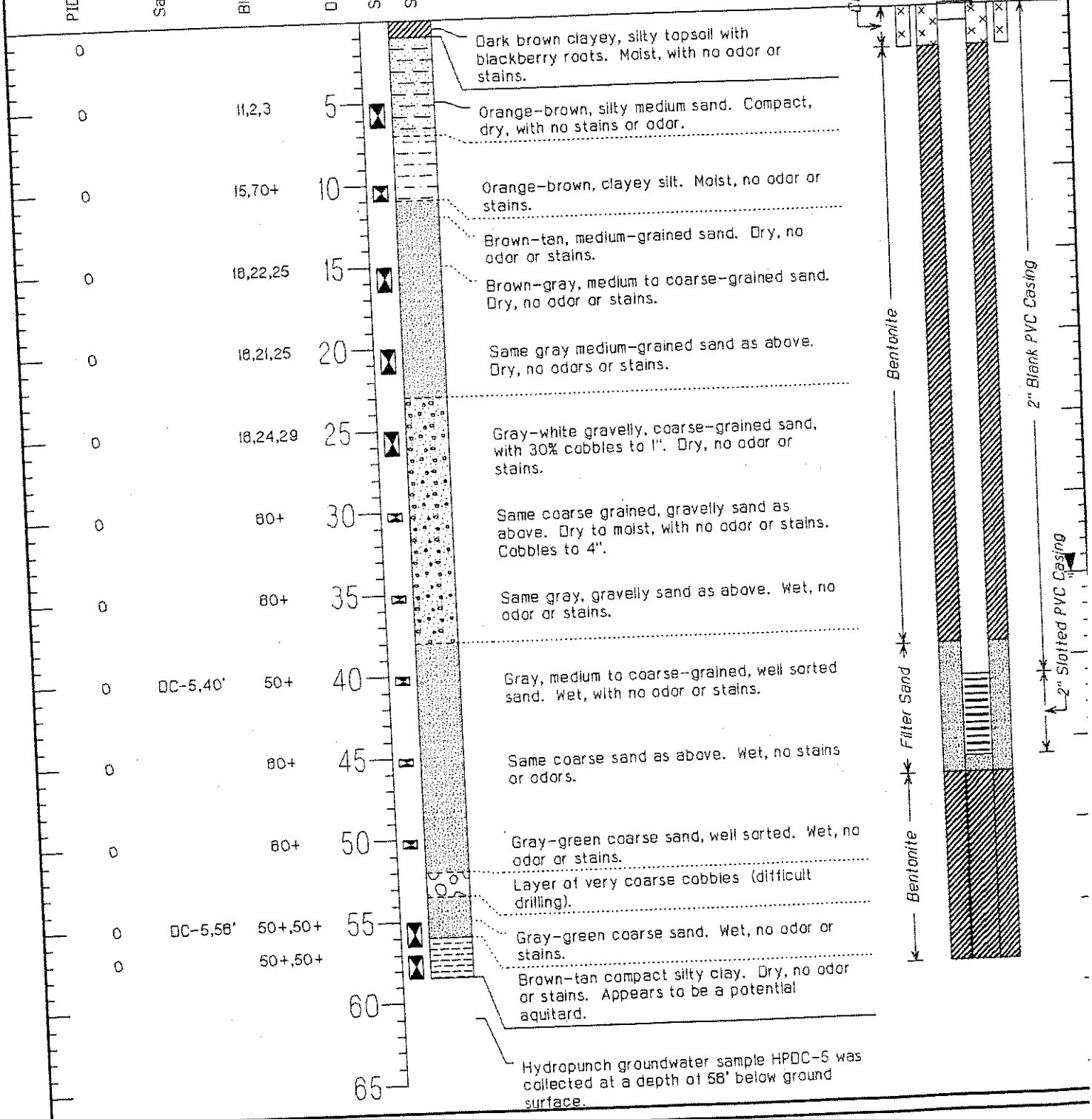
WELL DIAGRAM



Project: Manhattan Village - Dry Cleaner	Drill Company: Cascade Drilling
Location: Normandy Park, WA	Date: 10-13-98
Project Number: 0498007.04	Surface Elevation: 308.69 feet above MSL
Logged by: Brian Doan	TOTAL DEPTH OF HOLE: 49 Feet
Drill Method: Hollow Stem Auger	Water Level: 43 Feet

LOG OF MONITORING WELL DC-5

SCS Engineers
Environmental Consultants



Project Manhattan Village - Dry Cleaner
Location Normandy Park, WA
Project Number 0498007.08
Logged by Daniel Venchiarutti
Drill Method Hollow Stem Auger

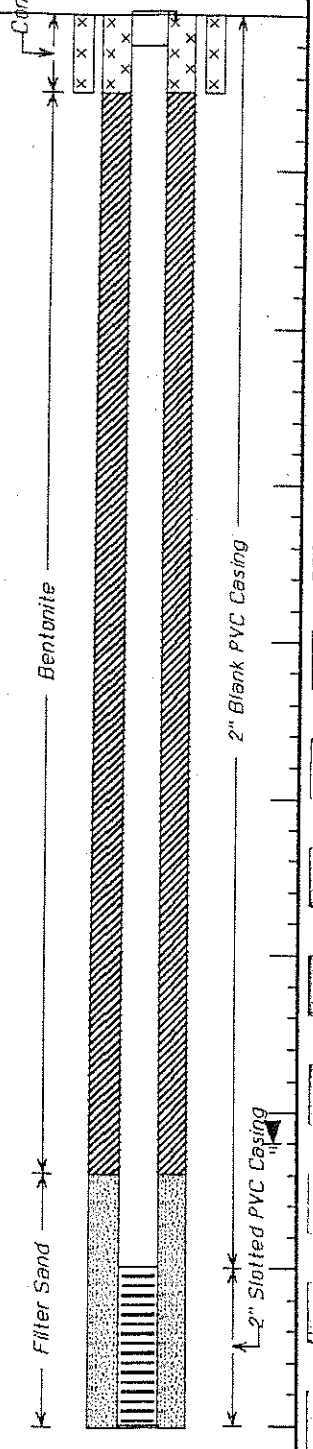
Drill Company Cascade Drilling
Date 01-22-98
Surface Elevation 302.59 feet above MSL
TOTAL DEPTH OF HOLE 58.5 Feet
Water Level 35 Feet

SCS Engineers
Environmental Consultants

LOG OF MONITORING WELL DC-6

PID (ppm)	Samp. No.	Blows 6"	DEPTH (ft)	SAMPLES	SYMBOLS	MATERIALS DESCRIPTION
0						Dark brown clayey, silty topsoil with blackberry roots. Moist, with no odor or stains.
0		8,10,11	5			Brown-tan, silty medium sand. Compact, dry, with no stains or odor.
0		5,13,18	10			Gray-brown, fine to medium-grained sand. Moderately well sorted. dry, no odor or stains.
0		15,22,28	15			Same fine to medium-grained sand as above. Dry, no odor or stains.
0		15,23,28	20			Same fine-medium sand as above, but with minor silt in matrix. Dry, no odors or stains.
0		22,48,50+	25			Gray-tan gravelly medium to coarse-grained sand, with cobbles to 2". Dry, no odor or stains.
0		50+	30			Tan-gray, coarse grained, gravelly sand. Dry to moist, with no odor or stains. Cobbles to 3".
0		50+	35			Same gray gravelly sand as above. Moist to wet, no odor or stains.
0	DC-6,40'	50+	40			Gray, coarse-grained, well sorted sand. Wet, with no odor or stains.
0		50+	45			Same coarse sand as above. No stains or odors.

WELL DIAGRAM

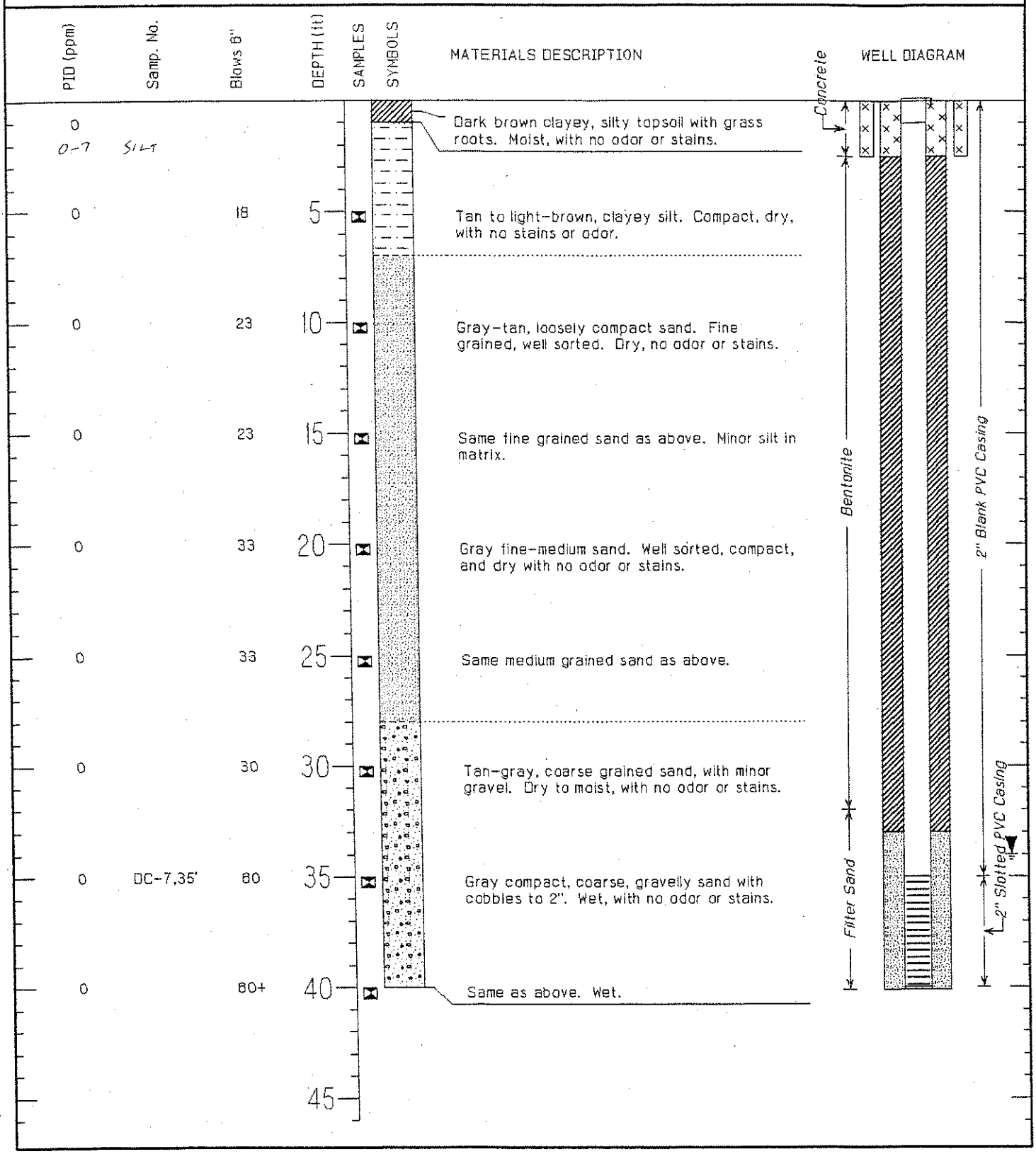


Project: Manhattan Village - Dry Cleaner
Location: Normandy Park, WA
Project Number: 0498007.08
Logged by: Daniel Venchiarutti
Drill Method: Hollow Stem Auger

Drill Company: Cascade Drilling
Date: 01-22-99
Surface Elevation: 305.23 feet above MSL
TOTAL DEPTH OF HOLE: 45 Feet
Water Level: 38 Feet

SCS Engineers
Environmental Consultants

LOG OF MONITORING WELL DC-7



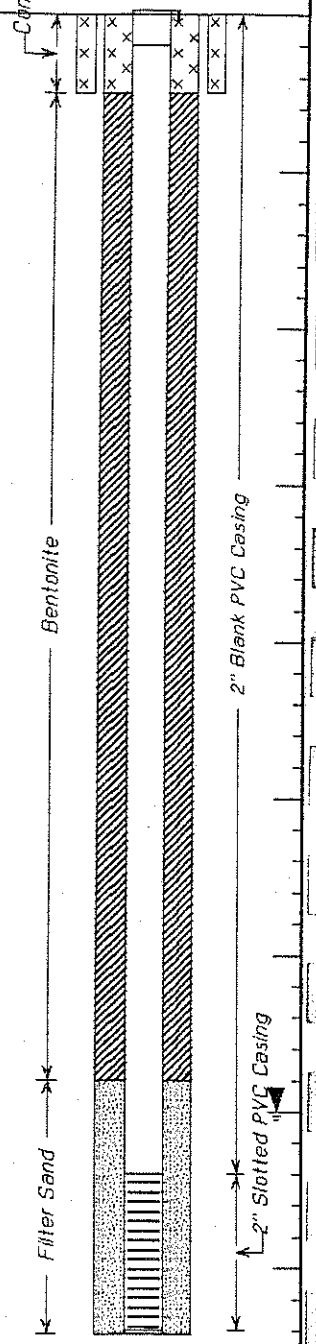
Project	Manhattan Village - Dry Cleaner	Drill Company	Cascade Drilling
Location	Normandy Park, WA	Date	01-18-99
Project Number	0488007.06	Surface Elevation	298.84 feet above MSL
Logged by	Daniel Venchiarutti	TOTAL DEPTH OF HOLE	40 Feet
Drill Method	Hollow Stem Auger	Water Level	34 Feet

SCS Engineers
Environmental Consultants

LOG OF MONITORING WELL DC-8

PID (ppm)	Samp. No.	Blows 6"	DEPTH (ft)	SAMPLES	SYMBOLS	MATERIALS DESCRIPTION
0						Dark brown clayey, silty topsoil with grass roots. Moist, with no odor or stains.
0		15	5			Tan to brown, clayey silt. Compact, dry, with no stains or odor.
0		28	10			Tan, fine grained, well sorted sand. Dry, no odor or stains.
0		33	15			Same fine grained sand as above.
0		34	20			Tan-gray medium sand. Well sorted, compact, and dry with no odor or stains.
0		28	25			Same medium grained sand as above.
0		30	30			Same medium grained sand as above.
0	DC-8,35'	55	35			Gray compact, coarse, gravelly sand with cobbles to 2". Wet, with no odor or stains.
0		55	40			Same as above. Wet.
			45			

WELL DIAGRAM



Project Manhattan Village - Dry Cleaner
Location Normandy Park, WA
Project Number 0498007.08
Logged by Daniel Venchiarutti
Drill Method Hollow Stem Auger

Drill Company Cascade Drilling
Date 01-18-99
Surface Elevation 303.08 feet above MSL
TOTAL DEPTH OF HOLE 42 Feet
Water Level 35 Feet

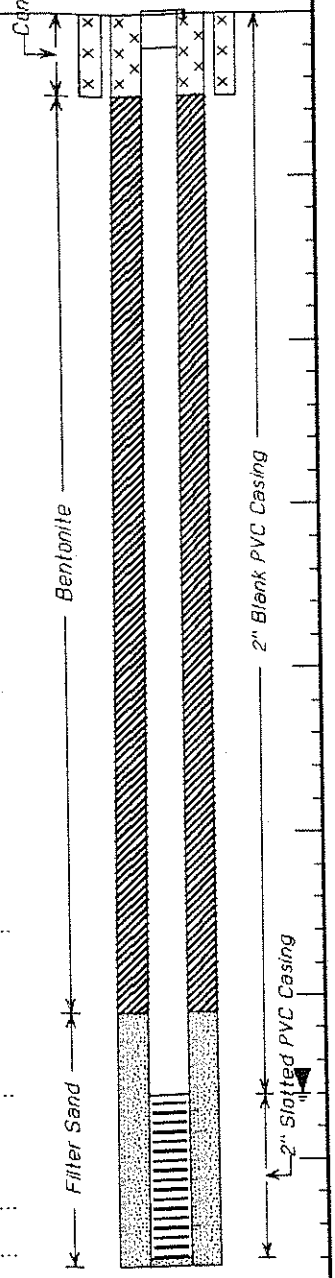
SCS Engineers
Environmental Consultants

LOG OF MONITORING WELL DC-9A

PID (ppm)	Samp. No.	Blows 6"	DEPTH (ft)	SAMPLES	SYMBOLS	MATERIALS DESCRIPTION
0						Dark brown sandy, silt topsoil with blackberry roots. Moist, with no odor or stains.
0		4,8,7	5			Brown-tan, fine silty sand. Compact, dry, with no stains or odor.
0		5,7,12	10			Brown-gray, well-sorted, medium sand. Dry, no odor or stains.
0		7,13,14	15			Brown-gray, medium-grained sand, with layers of fine sand and silty fine sand. Dry, no odor or stains.
0		14,20,21	20			Gray, well sorted, medium-grained sand. Dry, no odor or stains.
0		49,50+	25			Gray-brown fine to medium-grained sand. Dry, no odors or stains.
0		80+	30			Dark-gray gravelly, coarse-grained sand, with 30% cobbles to 1". Moist, no odor or stains.
0		38,80+	35			Gray well sorted medium-grained sand. Wet, with no odor or stains.
						Cobblely zone (difficult drilling).
			40			Gray, sandy gravel with 30% pea gravel and a matrix of medium-grained sand. Cobbles to 1". Wet, no odors or stains.

Soil lithology for the DC-9A boring is inferred to be identical to that described on the DC-9B boring log.

WELL DIAGRAM



Project Manhattan Village - Dry Cleaner
Location Normandy Park, WA
Project Number 0498007.07
Logged by Daniel Venchiarutti
Drill Method Hollow Stem Auger

Drill Company Cascade Drilling
Date 04-08-99
Surface Elevation 304.25 feet above MSL
TOTAL DEPTH OF HOLE 38 Feet
Water Level 33 Feet

SCS Engineers
Environmental Consultants

LOG OF MONITORING WELL DC-9B

PID (ppm)	Samp. No.	Blows 6"	DEPTH (ft)	MATERIALS DESCRIPTION
0				Dark brown sandy, silt topsoil with blackberry roots. Moist, with no odor or stains.
0		4,6,7	5	Brown-tan, fine silty sand. Compact, dry, with no stains or odor.
0		5,7,12	10	Brown-gray, well-sorted, medium sand. Dry, no odor or stains.
0		7,13,14	15	Brown-gray, medium-grained sand, with layers of fine sand and silty fine sand. Dry, no odor or stains.
0		14,20,21	20	Gray, well sorted, medium-grained sand. Dry, no odor or stains.
0		49,50+	25	Gray-brown fine to medium-grained sand. Dry, no odors or stains.
0		80+	30	Dark-gray gravelly, coarse-grained sand, with 30% cobbles to 1". Moist, no odor or stains.
0	DC-9B,35'	38,80+	35	Gray well sorted medium-grained sand. Wet, with no odor or stains.
				Cobblely zone (difficult drilling).
0	DC-9B,40'	80+	40	Gray, sandy gravel with 30% pea gravel and a matrix of medium-grained sand. Cobbles to 1". Wet, no odors or stains.
0	DC-9B,45'	80+	45	Dark-gray medium to coarse-grained sand. Wet, no stains or odors.
0		80+		Same sand as above. Wet, no odor or stains.
0	DC-9B,50'	48,50+	50	Dark-gray poorly sorted, gravelly, medium to coarse sand, with 10% pebbles. Wet, no odors or stains.
0		35,50+		Same gravelly sand as above, but with a 2" layer of pea gravel. Wet, no odor or stains.
0	DC-9B,55'	50+	55	Same gravelly sand as above. Wet, no odor or stains.
0	DC-9B,58'	30,50+		Brown-tan very compact silty clay. Dry, no odor or stains.
0		8,20,24	60	Brown-tan plastic clay. Dry, no odor or stains.

WELL DIAGRAM: Concrete; Bentonite; 2" Blank PVC Casing; Bentonite; Filter Sand; 2" Slotted PVC Casing

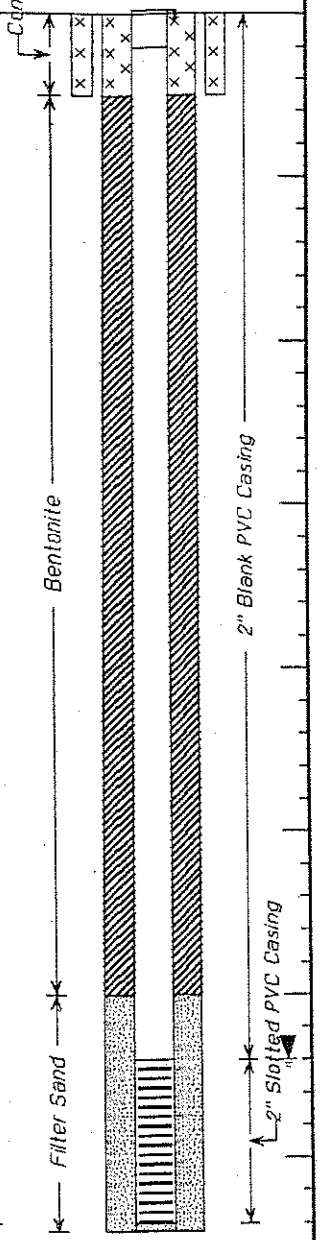
Project: Manhattan Village - Dry Cleaner	Drill Company: Cascade Drilling
Location: Normandy Park, WA	Date: 04-05-99
Project Number: 0498007.07	Surface Elevation: 304.40 feet above MSL
Logged by: Daniel Venchiarutti	TOTAL DEPTH OF HOLE: 60 Feet
Drill Method: Hollow Stem Auger	Water Level: 33 Feet

SCS Engineers
Environmental Consultants

LOG OF MONITORING WELL DC-10A

PID (ppm)	Samp. No.	Blows 6"	DEPTH (ft)	SAMPLES	SYMBOLS	MATERIALS DESCRIPTION
0						Dark brown sandy, silt topsoil with blackberry roots. Moist, with no odor or stains.
0		4,5,6	5			Brown-green, sandy silt. Compact, dry, with no stains or odor.
0		13,50+	10			Gray-Brown, well-sorted, medium sand. Dry, no odor or stains.
						Cobblely zone (zone of more difficult drilling).
0		31,48,37	15			Gray-Brown, well sorted, medium-grained sand. Dry, no odor or stains.
0		37,35	20			Same gray medium-grained sand as above. Dry, no odor or stains.
0		30,50+	25			Brown-gray fine to medium-grained sand, with minor layers of silty fine sand. Dry, no odor or stains.
0		21,40,50	30			Brown-gray, medium-grained sand, with minor gravel to 1". Moist, no odor or stains.
0		37,50+	35			Same gray gravelly medium-grained sand. Wet, with no odor or stains.
			40			Soil lithology for the DC-10A boring is inferred to be identical to that described on the DC-10B boring log.

WELL DIAGRAM



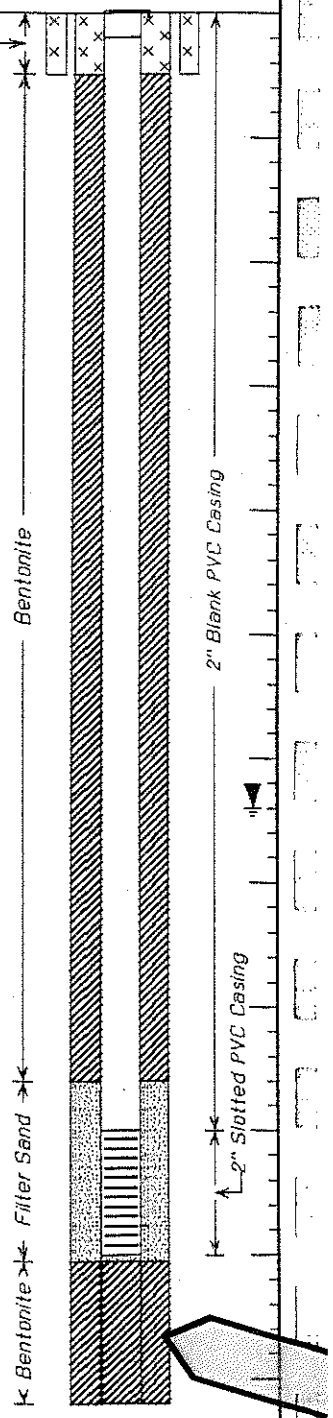
Project: Manhattan Village - Dry Cleaner	Drill Company: Cascade Drilling
Location: Normandy Park, WA	Date: 04-05-99
Project Number: 0498007.07	Surface Elevation: 304.08 feet above MSL
Logged by: Daniel Venchiarutti	TOTAL DEPTH OF HOLE: 37 Feet
Drill Method: Hollow Stem Auger	Water Level: 32 Feet

SCS Engineers
Environmental Consultants

LOG OF MONITORING WELL DC-10B

PID (ppm)	Samp. No.	Blows 6"	DEPTH (ft)	SAMPLES	SYMBOLS	MATERIALS DESCRIPTION
0						Dark brown sandy, silt topsoil with blackberry roots. Moist, with no odor or stains.
0		4,5,6	5			Brown-green, sandy silt. Compact, dry, with no stains or odor.
0		13,50+	10			Gray-Brown, well-sorted, medium sand. Dry, no odor or stains.
						Cobbley zone (zone of more difficult drilling).
0		31,48,37	15			Gray-Brown, well sorted, medium-grained sand. Dry, no odor or stains.
0		37,35	20			Same gray medium-grained sand as above. Dry, no odor or stains.
0		30,50+	25			Brown-gray fine to medium-grained sand, with minor layers of silty fine sand. Dry, no odor or stains.
0		21,40,50	30			Brown-gray, medium-grained sand, with minor gravel to 1". Moist, no odor or stains.
0	DC-10B,35'	37,50+	35			Same gray gravelly medium-grained sand. Wet, with no odor or stains.
0		27,48,50+	40			Brown-gray, well sorted coarse sand with minor gravel to 0.5". Wet, no odor or stains.
0		23,48,50+	45			Gray-brown coarse-grained gravelly sand with cobbles to 4". Wet, no odor or stains.
						Cobblely layer or rocky material (zone of more difficult drilling).
0	DC-10B,51'	27,44,42	50			Brown-tan, very compact silty clay. Dry, no odor or stains.
0		60+	55			Brown clayey gravel. Wet, no odor or stains.

WELL DIAGRAM



Project Manhattan Village - Dry Cleaner
Location Normandy Park, WA
Project Number 0498007.07
Logged by Daniel Venchiarutti
Drill Method Hollow Stem Auger

Drill Company Cascade Drilling
Date 04-05-99
Surface Elevation 304.15 feet above MSL
TOTAL DEPTH OF HOLE 58 Feet
Water Level 32 Feet

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-11

Client: Defendants of MVSC
Project: Manhattan Village SC
Location: Normandy Park, WA
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	04/19/07	**Sampler Type:**	D&M SS 18"x2"
Date/Time Completed:	04/19/07	**Drive Hammer (lbs.):**	300
Equipment:	CME 175	**Depth of Water ATD (ft bgs):**	36
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	42
Drilling Foreman:	James	**Total Well Depth (ft bgs):**	42
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0										Concrete
5		silty SAND, very fine, light brown, loose, moist, no odor, grading to SAND, very fine, loose, moist, no odor	SM		NA	5/7/8	0.2	DC-11-5-6.5		Bentonite
10		SAND, fine, light grey-brown, medium dense, moist, no odor	SP		NA	8/10/10	1.4	DC-11-10-11.5		Casing
5		SAND, fine grading to very fine with silt, medium dense	SP		NA	12/12/10	1.9	DC-11-15-16.5		
0		sandy GRAVEL, fine to coarse, brownish-grey, moist, no odor	GP		NA	20/21/20	5.0	DC-11-20-21.5		
5		SAND, fine to medium, trace gravel, grey, medium dense, moist, very slight odor	SP		NA	17/25/28	5.7	DC-11-25-26.5		
0										

onument Type: Flush Mount
asing Diameter (inches): 2
:reen Slot Size (inches): 0.010
:reened Interval (ft bgs): 32-42

Well Construction Information

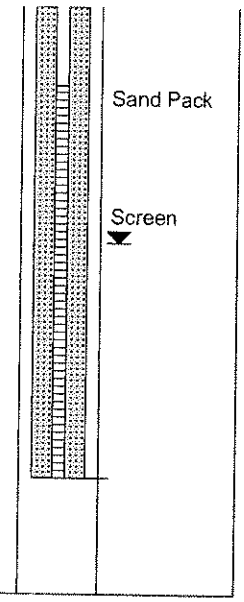
Filter Pack: Sand
Surface Seal: Cement
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-11

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
30		gravelly SAND, fine to coarse, brown, dense, moist, no odor	SP		30	50/6"	7.0	DC-11-30-31.5		
35		SAND, dense, very moist	SP		40	50/6"	7.4	DC-11-35-36.5		Sand Pack / Screen
40		SAND, medium to coarse, minor gravel, wet	SP		40	NA	8.7	DC-11-40-41.5		
45										



Well Construction Information

onument Type: Flush Mount
asing Diameter (inches): 2
creen Slot Size (inches): 0.010
creened Interval (ft bgs): 32-42

Filter Pack: Sand
Surface Seal: Cement
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-12

Client: Defendants of MVSC
Project: Manhattan Village SC
Location: Normandy Park, Washington
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	04/18/07	**Sampler Type:**	D&M SS 18"x2"
Date/Time Completed:	04/18/07	**Drive Hammer (lbs.):**	300
Equipment:	CME 175	**Depth of Water ATD (ft bgs):**	37
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	42
Drilling Foreman:	James	**Total Well Depth (ft bgs):**	42
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0										Concrete
5		SAND, very fine, light grey-brown, medium dense, moist, no odor	SP		NA	9/12/20	45	DC-12-5-6.5		Bentonite
10		SAND, fine, light grey, medium dense, moist, no odor	SP		NA	7/7/8	5.2	DC-12-10-11.5		Casing
5		SAND, fine to coarse, with gravel, light brown grey, medium dense	SP		NA	12/15/11	39.7	DC-12-15-16.5		
0					0	15/19/17	NA			
5		SAND, fine to medium			5	26/50 for 6"	NA			

Well Construction Information

onument Type: Flush-mount
asing Diameter (inches): 2
creen Slot Size (inches): 0.010
creened Interval (ft bgs): 32-42

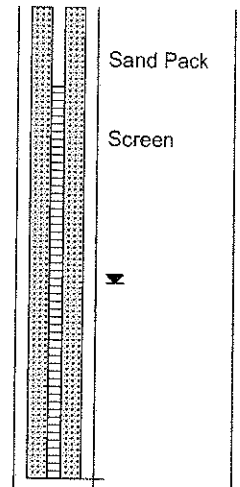
Filter Pack: Sand
Surface Seal: Concrete
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-12

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
30		Sand, medium, with gravel, fine to coarse, light brown grey, dense, moist, no odor	SP		50	50 for 6"	52.4	DC-12-30-31.5		Sand Pack
35		SAND, medium, light grey, dense	SP		NA	50 for 6"	51.7	DC-12-35-36.5		Screen
40		gravelly SAND, fine to coarse, grey, dense, wet, no odor	SP		NA	50 for 6"	56.9	DC-12-40-41.5		
45										



Well Construction Information

onument Type:	Flush-mount	**Filter Pack:**	Sand
asing Diameter (inches):	2	**Surface Seal:**	Concrete
creen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite
creened Interval (ft bgs):	32-42		

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-13

Client: Defendants of MVSC
Project: Manhattan Village SC
Location: Normandy Park, Washington
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	04/19/07 1040	**Sampler Type:**	D&M SS 18"x2"
Date/Time Completed:	04/19/07	**Drive Hammer (lbs.):**	300
Equipment:	CME 175	**Depth of Water ATD (ft bgs):**	35
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	42
Drilling Foreman:	James	**Total Well Depth (ft bgs):**	42
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
5		SILT, grading to SAND, very fine, with silt, light grey, orange mottling, medium dense, moist, no odor			NA	5/7/9	3.8	DC13-5-6.5		Cement / Bentonite
10		SAND, very fine grading to fine, light grey-brown, medium dense, moist, no odor			NA	11/8/12	8.0	DC13-10-11.5		Casing
15		SAND, fine, light grey, medium dense, moist, no odor			NA	18/19/22	13.7	DC13-15-16.5		
20		SAND, fine, minor fine gravel, medium dense, moist, no odor			NA	26/21/20	20.2	DC13-20-21.5		
35		SAND, fine to coarse, trace gravel, brown, dense, moist			40	50 for 6"	37.8	DC13-25-26.5		

Well Construction Information

Monument Type: Flush mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 32-42

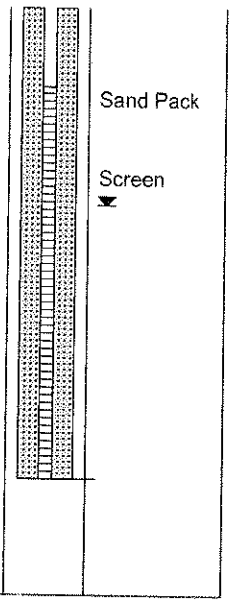
Filter Pack: Sand
Surface Seal: Concrete
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-13

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Detailse
30		SAND, fine to coarse, with gravel, grey, dense, moist, no odor			NA	50 for 6"	61.2	DC13-30-31.5		
35		SAND, dense, very moist to wet			NA	NA	60.7	DC13-35-36.5		
40		SAND, fine to coarse, trace silt, grey, wet, no odor			NA	NA	36.9	DC13-40-41.5		
45										



Well Construction Information

Monument Type:	Flush mount	Filter Pack:	Sand	Ground Surface Elevation (ft):	NA
Casing Diameter (inches):	2	Surface Seal:	Concrete	Top of Casing Elevation (ft):	NA
Screen Slot Size (inches):	0.010	Annular Seal:	Bentonite	Boring Abandonment:	NA
Screened Interval (ft bgs):	32-42			Surveyed Location: X: NA	Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-14

Client: Defendants of MVSC
Project: Manhattan Village SC
Location: Normandy Park, Washington
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	04/17/07 1020	**Sampler Type:**	D&M SS 18"x2"
Date/Time Completed:	04/17/07	**Drive Hammer (lbs.):**	300
Equipment:	CME 175	**Depth of Water ATD (ft bgs):**	NE
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	45
Drilling Foreman:	Steve	**Total Well Depth (ft bgs):**	45
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0										Concrete
5		5-6: SAND, very fine, brown, dense, very moist, no odor. 6-6.5 SAND, fine, light brown, dense, moist, no odor	SP		NA	10/27/38	1.7	DC14-5-6.5		Bentonite
10		SAND, fine to medium, trace gravel, light brown with dark brown inclusions, dense, moist, no odor	SP		60	50 for 6"	1.2	DC14-10-11.5		Casing
5		SAND	SP		60	50 for 6"	2.2	DC14-15-16.5		
0		SAND, fine, light grey-brown, dense, moist, no odor	SP		50	50 for 6"	2.8	DC14-20-21.5		
5		SAND, fine to medium, dense	SP		40	50 for 6"	3.0	DC14-25-26.5		
0										

Well Construction Information

onument Type: Flush mount
asing Diameter (inches): 2
creen Slot Size (inches): 0.010
creened Interval (ft bgs): 35-45

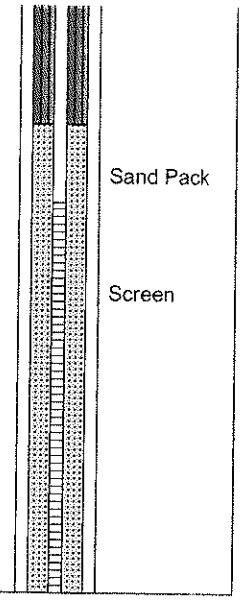
Filter Pack: Sand
Surface Seal: Concrete
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-14

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
30		sandy GRAVEL, fine to coarse, sand fine to coarse, light grey-brown, moist, no odor	GP		30	50 for 6"	3.4	DC14-30-31.5		
35		SAND, medium to coarse, minor gravel, light grey, dense, moist, no odor	SP		30	50 for 6"	3.5	DC14-35-36.5		Sand Pack
40		gravelly SAND, fine to coarse, grey, dense, wet, no odor	SP		50	50 for 6"	3.2	DC14-40-41.5		Screen
45										



Monument Type: Flush mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 35-45

Well Construction Information

Filter Pack: Sand
Surface Seal: Concrete
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

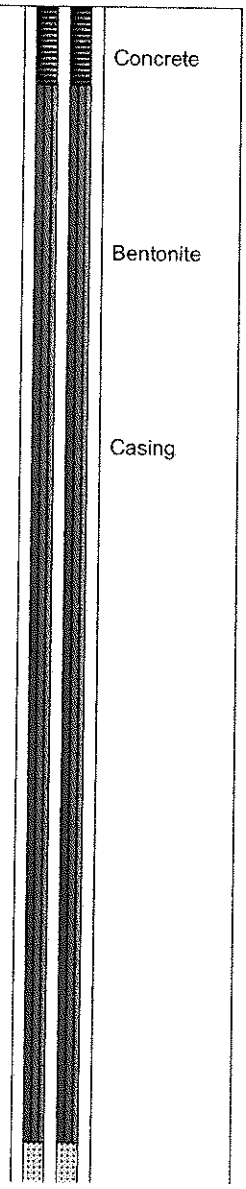
FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-15

Client: Defendants of MVSC
Project: Manhattan Village SC
Location: Normandy Park, Washington
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	04/16/07	**Sampler Type:**	D&M SS 18"x2"
Date/Time Completed:	04/16/07	**Drive Hammer (lbs.):**	300
Equipment:	CME 175	**Depth of Water ATD (ft bgs):**	35
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	42
Drilling Foreman:	Steve	**Total Well Depth (ft bgs):**	41
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
5		SILT, minor sand, sand very fine, grey brown, very stiff, very moist, no odor	ML		NA	17/20/26	0	DC15-5-6.5		
10		SAND, very fine, light brown, very dense, moist, no odor	SP		NA	27/37/52	0	DC15-10-11.5		
15		SAND, fine, grey brown, dense	SP		NA	50 for 6"	0	DC15-15-16.5		
20		SAND	SP		NA	45/50 for 6"	0	DC15-20-21.5		
25		SAND, fine to very fine, light brown-grey, dense, moist	SP		NA	35/50 for 6"	0	DC15-25-26.5		



Well Construction Information

Monument Type: Flush mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 31-41

Filter Pack: Sand
Surface Seal: Concrete
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-15

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
30		SAND, fine, with gravel, fine, dense, moist, no odor	SP		NA	30 for 6"	0	DC15-30-31.5		Sand Pack
35		sandy GRAVEL, fine, sand fine, grey, wet	GP		NA	39/50 for 6"	0	DC15-35-36.5		Screen
40		SAND, medium, grey, dense, wet, no odor	SP		NA	39/50 for 6"	0			Bentonite fill
45										

Well Construction Information

onument Type: Flush mount
asing Diameter (inches): 2
creen Slot Size (inches): 0.010
creened Interval (ft bgs): 31-41

Filter Pack: Sand
Surface Seal: Concrete
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-16

Client: Defendants of MVSC
Project: Manhattan Village SC
Location: Normandy Park, Washington
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	04/17/07 0820	**Sampler Type:**	D&M SS 18"x2"
Date/Time Completed:	04/18/07	**Drive Hammer (lbs.):**	300
Equipment:	CME 175	**Depth of Water ATD (ft bgs):**	35
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	61.5
Drilling Foreman:	Steve/James	**Total Well Depth (ft bgs):**	60
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
5		SAND, fine, light brown, medium dense, moist, no odor	SP		NA	10/17/17	0	DC16-5-6.5		
10		SAND, fine to medium, light brown-grey, dense, moist to very moist, no odor	SP		NA	19/20/26	0.2	DC16-10-11.5		
15		15-15.5 SAND, fine to coarse, white-grey very dense, moist, no odor. 15.5-16.5 SAND, fine, grading to SAND, very fine, light grey brown, very dense, moist, no odor	SP		NA	35/38/42	0.5	DC16-15-16.5		
20		SAND, fine, with gravel, fine, light brown-grey, dense, moist, no odor	SP		50	50 for 6"	0.9	DC16-20-21.5		
25		SAND, fine to medium, minor gravel, light brown, dense, moist, no odor	SP		50	50 for 6"	1.7	DC16-25-26.5		

Concrete
Bentonite
Casing

Well Construction Information

Monument Type: Flush mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 50-60
Filter Pack: Sand
Surface Seal: Concrete
Annular Seal: Bentonite
Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-16

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
30		SAND, fine to medium, minor gravel, dense, moist, no odor	SP		50	50 for 6"	1.8	DC16-30-31.5		
35		SAND, very fine to coarse, grey, dense, wet, no odor	SP		50	55 for 6"	1.8	DC16-35-36.5		
40		SAND, fine to medium, trace gravel, grey, dense, wet, no odor - mostly heave	SP		NA	55 for 5"	1.3			
45		SAND, fine, grey, dense, wet, no odor - mostly heave	SP		NA	20/50 for 2"	NA			
50		SAND, medium, grey, dense, wet - mostly heave	SP		NA	50 for 6"	NA			Sand Pack / Screen
55		SAND, minor gravel, dense - mostly heave	SP		NA	50 for 6"	NA			
60										

Well Construction Information

Monument Type:	Flush mount	Filter Pack:	Sand
Casing Diameter (inches):	2	Surface Seal:	Concrete
Screen Slot Size (inches):	0.010	Annular Seal:	Bentonite
Screened Interval (ft bgs):	50-60		

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-17

Client: Defendants of MVSC
Project: Manhattan Village SC
Location: Normandy Park, Washington
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	04/16/07	**Sampler Type:**	D&M SS 18"x2"
Date/Time Completed:	04/16/07	**Drive Hammer (lbs.):**	300
Equipment:	CME 175	**Depth of Water ATD (ft bgs):**	33
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	40
Drilling Foreman:	Steve	**Total Well Depth (ft bgs):**	40
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0										Concrete
5		sandy SILT, very dark brown, very stiff to hard, moist, organics	ML		NA	18/22/26	2.0	DC17-5-6.5		Bentonite
10		SAND, very fine, light grey brown, very dense, moist, no odor	SP		NA	26/31/39	2.1	DC17-10-11.5		Casing
15		SAND, very fine, with silt, light brown with orange mottling, dense, very moist to wet, no odor	SP-SM		NA	21/26/30	3.6	DC17-15-16.5		
		grading to SILT, light brown with orange mottling, very stiff to hard, very moist to wet, no odor	ML							
20		SAND, fine grading to very fine, light brown grey, dense, moist to very moist, no odor	SP		NA	31/50 for 6	4.3	DC17-20-21.5		
25		SAND, fine, light brown, dense, no odor	SP		NA	25/30/37	5.0	DC17-25-26.5		
		silty SAND, very fine, trace gravel, very dense, no odor	SM							
0										

Monument Type: Flush mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 30-40

Well Construction Information

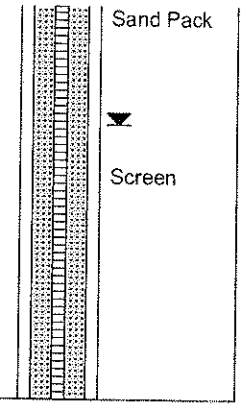
Filter Pack: Sand
Surface Seal: Concrete
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-17

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
30		silty SAND, very fine, moist, no odor	SM		NA	23/50 for 4	6.6	DC17-30-31.5		Sand Pack
		sandy GRAVEL, fine to coarse sand, moist, no odor	GP							
35		SAND, fine to medium, minor gravel, dense, very moist, no odor	SP		NA	20/23/33	5.9	DC17-35-36.5		Screen
40										



Well Construction Information

onument Type:	Flush mount	**Filter Pack:**	Sand
asing Diameter (inches):	2	**Surface Seal:**	Concrete
creen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite
creened Interval (ft bgs):	30-40		

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: **X:** NA **Y:** NA

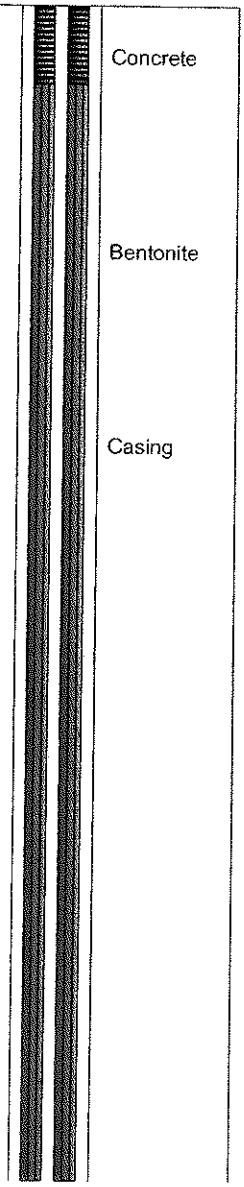
FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-18

Client: Defendants of MVSC
Project: Manhattan Village SC
Location: Normandy Park, Washington
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	04/18/07 1100	**Sampler Type:**	D&M SS 18"x2"
Date/Time Completed:	04/18/07	**Drive Hammer (lbs.):**	300
Equipment:	CME 175	**Depth of Water ATD (ft bgs):**	36
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	42
Drilling Foreman:	James	**Total Well Depth (ft bgs):**	42
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
5		SAND, fine, light brown, loose, moist, no odor			NA	7/7/8	0	DC18-5-6.5		
10		SAND, very fine grading to fine, light grey brown, medium dense			NA	10/11/15	1.6	DC18-10-11.5		
15		SAND, fine, grey, medium dense			NA	15/15/16	1.5	DC18-15-16.5		
20		silty SAND, very fine, light grey brown, medium dense, moist			NA	19/15/17	5.0	DC18-20-21.5		
25		SAND, fine to coarse, minor gravel, light grey-brown, dense, moist, no odor			NA	31/50 for 6	6.9	DC18-25-26.5		



Monument Type: Flush mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.010
Screened Interval (ft bgs): 32-42

Well Construction Information

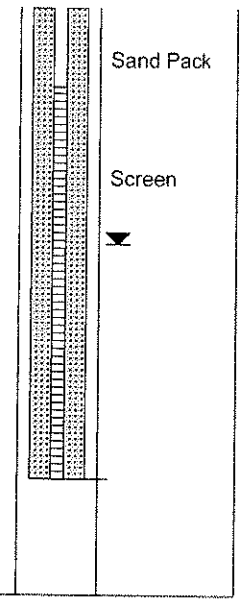
Filter Pack: Sand
Surface Seal: Concrete
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-18

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Detailse
30		SAND, fine to medium, trace gravel, dense			NA	36/50 for 6	9.2	DC18-30-31.5		Sand Pack
35		SAND, dense			NA	26/22/25	12.9	DC18-35-36.5		Screen
40		SAND, medium to coarse, minor gravel, grey, dense, wet, no odor			NA	26/50 for 6	13.4	DC18-40-41.5		
45										



Well Construction Information

Monument Type:	Flush mount	**Filter Pack:**	Sand
Casing Diameter (inches):	2	**Surface Seal:**	Concrete
Screen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite
Screened Interval (ft bgs):	32-42		

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-19

Client: Defendants of MVSC
Project: Manhattan Village SC
Location: Normandy Park, Washington
Farallon PN: 578-001
Logged By: J. Keller

Date/Time Started:	06/01/07 0820	**Sampler Type:**	D&M SS 18"x2"
Date/Time Completed:	06/01/07	**Drive Hammer (lbs.):**	300
Equipment:	CME 175	**Depth of Water ATD (ft bgs):**	40
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	47
Drilling Foreman:	Steve	**Total Well Depth (ft bgs):**	47
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		SAND, minor gravel, trace silt, fine to coarse, greyish-brown, moist, no odor	SP							Concrete
		SILT, minor fine sand, brown, stiff, moist, no odor	ML		100	5/8/9	2.6	DC19-4		
5										Bentonite
		SAND, fine to medium, trace silt and gravel, loose	SP		100	7/10/10	3.1	DC19-8		
10										Casing
5		SAND, medium to coarse, trace silt and gravel, dense	SP		100	31/50 for 6	0.2	NC		Bentonite
0		SAND, medium to coarse, minor coarse gravel, grey, dense, moist, no odor	SP		100	39/30/30	0.6	NC		Casing
										Casing
5		SAND, medium to coarse, grey, dense, moist, no odor	SW		100	29/25/30	0.9	NC		Bentonite
										Casing

Well Construction Information

onument Type:	NA	**Filter Pack:**	Sand	**Ground Surface Elevation (ft):**	NA
asing Diameter (inches):	2	**Surface Seal:**	Concrete	**Top of Casing Elevation (ft):**	NA
creen Slot Size (inches):	0.010	**Annular Seal:**	Bentonite	**Boring Abandonment:**	NA
creened Interval (ft bgs):	37-47			**Surveyed Location:** X: NA	Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-19

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details¥
30		SAND with gravel, grey, dense, moist, no odor	SP-GP		100	24/31/30	0.6	NC		Bentonite
35		GRAVEL with sand	GP-SP		100	50 for 6	0.7	NC		Casing
		GRAVEL with sand	GP-SP		100	50 for 6	0.3	DC19-38		Sand Pack
40		GRAVEL with sand	SP-GP		NA	50 for 6	0.2	NC		Screen
45										Sand Pack
50										Screen

Well Construction Information

onument Type: NA
asing Diameter (inches): 2
creen Slot Size (inches): 0.010
creened Interval (ft bgs): 37-47

Filter Pack: Sand
Surface Seal: Concrete
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: DC-20

Client: Defendants of MVSC
Project: Manhattan Village SC
Location: Normandy Park, Washington

Farallon PN: 578-001

Logged By: F. Reider

Date/Time Started:	5/28/08 0755	**Sampler Type:**	D&M SS 18"x2"
Date/Time Completed:	5/28/08 1045	**Drive Hammer (lbs.):**	300
Equipment:	CME 175	**Depth of Water ATD (ft bgs):**	39
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	44
Drilling Foreman:	Scotty	**Total Well Depth (ft bgs):**	44
Drilling Method:	Hollow Stem Auger		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
5		5-6.5' Poorly graded sand with silt (90, 10), fine sand, light brown, very moist, no odor, loose.	SP-SM		100	6/6/6	0.0	DC20-5-052808		Concrete
10		10-11.5' Poorly graded sand with silt (90, 10), very fine sand, light brown, very moist, no odor, medium dense.	SP-SM		100	6/9/10	0.0	DC20-10-052808	Y	Bentonite
15		15-16.5' Poorly graded sand (95, 5), fine to medium sand, trace silt, light grey-brown, moist, no odor, medium dense.	SP		100	10/12/15	0.0	DC20-15-052808		
20		20-21' Poorly graded sand with silt (90, 10), medium sand, very moist, no odor, dense.	SP-SM		100	18/20/23	0.0	DC20-20-052808		Casing
		21-21.2' Gravel with sand (90, 10), fine gravel, medium sand, very moist, dense.	GP							
25		21.2-21.5' Gravel with sand (70, 30), fine gravel, fine to coarse sand, medium brown, very moist, no odor, dense.	SP		100	32/50 for 6"	0.0	DC20-25-052808		
		25-26' Poorly graded sand (90, 5, 5), fine to medium sand, trace fine gravel, trace silt, grey, moist, no odor, very dense.								
30		30-31' poorly graded sand with gravel (60, 35, 5), fine to coarse sand, fine to coarse gravel, trace silt, light grey, very moist, no odor, very dense.	SP		100	36/50 for 6"	0.0	DC20-30-052808		Sand
35		35-36' Poorly graded sand with gravel and silt (60, 30, 10), fine to coarse sand, fine gravel, light brown, moist, no odor, very dense.	SP-SM		100	42/50 for 6"	0.0	DC20-35-052808	Y	Screen
40		40-41' Poorly graded sand with gravel (60, 35, 5), fine to coarse sand, fine gravel, trace silt, grey, wet, no odor, very dense.	SP		100	38/50 for 6"	0.0			
45										

Well Construction Information

Monument Type: Flush Mount
Casing Diameter (inches): 2
Screen Slot Size (inches): 0.020
Screened Interval (ft bgs): 34-44

Filter Pack: Sand
Surface Seal: Concrete
Annular Seal: Bentonite

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: NA
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: GP1

Client: MPSC
Project: Manhattan Plaza-Harris
Location: Normandy Park, WA
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	3/30/2007	**Sampler Type:**	Sleeve
Date/Time Completed:	3/30/2007	**Drive Hammer (lbs.):**	140
Equipment:	Geoprobe	**Depth of Water ATD (ft bgs):**	35
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	36
Drilling Foreman:	Jaymen	**Total Well Depth (ft bgs):**	NA
Drilling Method:	Geoprobe		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		SILT, trace gravel, brown to light brown, moist, no odor	ML				2.5	GP1-0-4		
5		GRAVEL, minor silt	GP							
		SAND, fine, light brown, moist, no odor	SP				0.4	GP1-4-8		
10		SAND, fine, light brown grades to grey, moist, no odor	SP				0.0	GP1-8-12	X	
15		SAND, fine, trace gravel, light brown grades to grey, moist, no odor	SP				1.2	GP1-12-16		
		SAND, fine, trace gravel, grey, moist, no odor	SP				0.3	GP1-16-20		
0										

Well Construction Information

Monument Type:	NA	**Filter Pack:**	NA	**Ground Surface Elevation (ft):**	NA
Casing Diameter (inches):	NA	**Surface Seal:**	NA	**Top of Casing Elevation (ft):**	NA
Screen Slot Size (inches):	NA	**Annular Seal:**	NA	**Boring Abandonment:**	Bentonite
Screened Interval (ft bgs):	NA			**Surveyed Location:** X: NA	Y: NA

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Issaquah, WA 98027

Log of Boring: GP1

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
20		SAND, fine, trace gravel, grey, moist, no odor	SP				0.8	GP1-20-24		Bentonite
		SAND, fine, trace gravel, grey, moist, no odor	SP							
25		SAND, fine, with gravel, brown, moist, no odor	SP				1.2	GP1-24-27		
		SAND, fine, trace gravel, brown, moist, no odor	SP				2.0	GP1-27-30		
30		Gravelly SAND, fine to medium, grey to black, moist, very slight odor	SP				2.5	GP1-30-34		
35		SAND, fine to medium, with gravel, grey to black, moist, very slight odor	SP				5.2	GP1-34-35	X	
40										

Well Construction Information

Monument Type: NA
Casing Diameter (inches): NA
Screen Slot Size (inches): NA
Screened Interval (ft bgs): NA

Filter Pack: NA
Surface Seal: NA
Annular Seal: NA

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: Bentonite
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: GP2

Client: MPSC
Project: Manhattan Plaza-Harris
Location: Normandy Park, WA
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	4/2/2007	**Sampler Type:**	Sleeve
Date/Time Completed:	4/2/2007	**Drive Hammer (lbs.):**	140
Equipment:	Geoprobe	**Depth of Water ATD (ft bgs):**	
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	36
Drilling Foreman:	Jaymen	**Total Well Depth (ft bgs):**	NA
Drilling Method:	Geoprobe		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Gravel cap, SILT, with fine sand. dark brown	ML							
		SILT, light brown to grey, trace organics	ML				4.2	GP2-0-4		
5		SILT, light brown to grey, trace organics	ML							
		SAND, very fine, light brown, moist to wet, no odor	SP				5.6	GP2-4-8	X	
0		Very fine grading, SAND, fine, very fine grading, grey to brown, moist, no odor	SP				7.6	GP2-8-12		
5		Very fine grading, SAND, fine, very fine grading, grey to brown, moist, no odor	SP				9.2	GP2-12-16		
		Very fine grading, SAND, fine, very fine grading, grey to brown, moist, no odor	SP							
		Sandy GRAVEL, light brown, moist, no odor	GP							
		SAND, fine, with gravel, grey to brown, no odor	SP				13.9	GP2-16-20		

Well Construction Information

onument Type: NA
asing Diameter (inches): NA
:reen Slot Size (inches): NA
:reened Interval (ft bgs): NA
Filter Pack: NA
Surface Seal: NA
Annular Seal: NA
Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: Bentonite
Surveyed Location: X: NA Y: NA

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Issaquah, WA 98027

Log of Boring: GP2

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
20		SAND, fine to medium, with trace gravel, grey, moist, no odor	SP				19.8	GP2-20-24		Bentonite
25		SAND, fine to medium, with gravel, grey, moist, no odor	SP				27.8	GP2-24-28		
30		SAND, fine to medium, with gravel, grey, moist, no odor	SP				30.9	GP2-28-32	X	
		GRAVEL, fine to course, with course sand, moist, no odor	GP							
35		SAND, medium, trace grave;, grey, moist to very moist, no odor	SP				37.1	GP2-32-36		
40										

Well Construction Information

Monument Type: NA
Casing Diameter (inches): NA
Screen Slot Size (inches): NA
Screened Interval (ft bgs): NA

Filter Pack: NA
Surface Seal: NA
Annular Seal: NA

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: Bentonite
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: GP3

Client: MPSC
Project: Manhattan Plaza-Harris
Location: Normandy Park, WA
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	3/30/2007	**Sampler Type:**	Sleeve
Date/Time Completed:	3/30/2007	**Drive Hammer (lbs.):**	140
Equipment:	Geoprobe	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	30
Drilling Foreman:	Jaymen	**Total Well Depth (ft bgs):**	NA
Drilling Method:	Geoprobe		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Gravel cap, SILT, dark to light brown, moist, no odor	ML				1.7	GP3-0-4		
5		Gravel cap, SILT, grades to very fine sand, dark to light brown, wet, no odor	ML				2.1	GP3-4-8		
10		SILT, trace very fine sand, light brown, wet, no odor	ML				2.0	GP3-8-12	X	
		SILT, grades to fine sand, brown to grey, moist, no odor	ML				2.2	GP3-12-16		
5		SILT, grades to fine sand, brown to grey, moist, no odor	ML				2.5	GP3-16-20		
0										

Well Construction Information

Monument Type:	NA	**Filter Pack:**	NA	**Ground Surface Elevation (ft):**	NA
Casing Diameter (inches):	NA	**Surface Seal:**	NA	**Top of Casing Elevation (ft):**	NA
Screen Slot Size (inches):	NA	**Annular Seal:**	NA	**Boring Abandonment:**	Bentonite
Screened Interval (ft bgs):	NA			**Surveyed Location:** X: NA	Y: NA

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Log of Boring: GP3

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
20		SILT, grades to fine sand, brown to grey, moist, no odor	ML							Bentonite
		SILT, grades to fine sand, trace gravel, brown to grey, moist, no odor	ML							
		SAND, fine to medium, minor gravel, brown to grey, moist, no odor	SP				2.4	GP3-20-24		
25		SAND, fine to medium, trace gravel, grey, moist, no odor	SP				1.6	GP3-24-28		
30		SAND, fine to medium, minor gravel, grey, moist, no odor	SP				1.4	GP3-28-30	X	

Well Construction Information

onument Type: NA
asing Diameter (inches): NA
creen Slot Size (inches): NA
creened Interval (ft bgs): NA

Filter Pack: NA
Surface Seal: NA
Annular Seal: NA

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: Bentonite
Surveyed Location: X: NA Y: NA

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Log of Boring: GP4

Client: MPSC
Project: Manhattan Plaza-Harris
Location: Normandy Park, WA
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	3/30/2007	**Sampler Type:**	Sleeve
Date/Time Completed:	3/30/2007	**Drive Hammer (lbs.):**	140
Equipment:	Geoprobe	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	30
Drilling Foreman:	Jaymen	**Total Well Depth (ft bgs):**	NA
Drilling Method:	Geoprobe		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Gravel cap, SILT, minor course sand, dark grading to brown, no odor	ML							
		SILT, light brown, moist, no odor	ML				0.5	GP4-0-4		
5		SILT, trace gravel, light brown, wet, no odor	ML				0.0	GP4-4-8		
		SILT, trace gravel, light brown, wet, no odor	ML							
		SAND, very fine, light brown, wet, no odor	SP							
0		SAND, fine, light brown to grey, moist, no odor	SP				0.1	GP4-8-12		
		SAND, fine to very fine, grey, moist, no odor	SP				10	GP4-12-16		
5		SAND, fine to very fine, grey, moist, no odor	SP							
		SAND, fine to medium, minor gravel, light brown, no odor	SP				0.5	GP4-16-20		
0		Sandy GRAVEL, fine, light brown to grey, no odor	GP							

Well Construction Information

Monument Type: NA
Casing Diameter (inches): NA
Screen Slot Size (inches): NA
Screened Interval (ft bgs): NA
Filter Pack: NA
Surface Seal: NA
Annular Seal: NA
Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: Bentonite
Surveyed Location: X: NA Y: NA

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Log of Boring: GP4

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Detailse
20		SAND, fine, minor gravel, grey to brown, moist, no odor	SP				1.8	GP4-20-24	X	Bentonite
25		SAND, fine, minor gravel, grey to brown, moist, no odor	SP				0.3	GP4-24-28		
30		SAND, fine, minor gravel, grey to brown, moist, no odor	SP				2.5	GP4-28-30		

Well Construction Information

Monument Type: NA
Casing Diameter (inches): NA
Screen Slot Size (inches): NA
Screened Interval (ft bgs): NA

Filter Pack: NA
Surface Seal: NA
Annular Seal: NA

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: Bentonite
Surveyed Location: X: NA Y: NA

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Issaquah, WA 98027

Log of Boring: GP5

Client: MPSC
Project: Manhattan Plaza-Harris
Location: Normandy Park, WA
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	4/3/2007	**Sampler Type:**	Sleeve
Date/Time Completed:	4/3/2007	**Drive Hammer (lbs.):**	140
Equipment:	Geoprobe	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	30
Drilling Foreman:	Jaymen	**Total Well Depth (ft bgs):**	NA
Drilling Method:	Geoprobe		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		SILT, traces of fine sand, dark to light brown, most to very moist, no odor	ML				0.4	GP5-0-4		
5		Silty SAND, very fine, light brown, moist to very moist	ML-SM				0.3	GP5-4-8	X	
0		SAND, fine, light grey brown, moist, no odor	SP				0.3	GP5-8-12		
		Silty SAND, fine, light grey brown, moist, no odor	ML-SM							
		Silty SAND, very fine, light grey brown, moist, no odor	ML-SM				0.4	GP5-12-16		
5		SAND, very fine, moist, no odor	SP							
		GRAVEL, minor fine sand	GP							
		SAND, fine to medium	SP							
		GRAVEL, minor fine to course sand	GP				2.4	GP5-16-20	X	
0		SAND, fine, moist, no odor	SP							

Well Construction Information

Monument Type: NA
Casing Diameter (inches): NA
Screen Slot Size (inches): NA
Screened Interval (ft bgs): NA
Filter Pack: NA
Surface Seal: NA
Annular Seal: NA
Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: Bentonite
Surveyed Location: X: NA Y: NA

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Log of Boring: GP5

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
20		SAND, fine, light brown, moist, no odor	SP							Bentonite
		GRAVEL, course, with fine to course sand	GP				0.6	GP5-20-24		
		SAND, fine to course, minor gravel	SP							
		GRAVEL, with fine to medium sand	GP							
25		SAND, fine to course, minor gravel	SP				0.6	GP5-24-26		
		Sandy GRAVEL, fine to course, light brown grey, moist, no odor	GP				1.9	GP5-26-28		
30										

Well Construction Information

Monument Type: NA
Casing Diameter (inches): NA
Screen Slot Size (inches): NA
Screened Interval (ft bgs): NA

Filter Pack: NA
Surface Seal: NA
Annular Seal: NA

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: Bentonite
Surveyed Location: X: NA Y: NA

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Issaquah, WA 98027

Log of Boring: GP6

Client: MPSC
Project: Manhattan Plaza-Harris
Location: Normandy Park, WA
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	4/2/2007	**Sampler Type:**	Sleeve
Date/Time Completed:	4/2/2007	**Drive Hammer (lbs.):**	140
Equipment:	Geoprobe	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	31
Drilling Foreman:	Jaymen	**Total Well Depth (ft bgs):**	NA
Drilling Method:	Geoprobe		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		SILT, with sand, dark brown	ML							
		SILT, light brown, wet, no odor	ML				1.2	GP6-0-4		
5		SILT, light brown to grey, wet, no odor	ML				2.1	GP6-4-8	X	
0		SILT, grading to very fine sand, grey, moist, no odor	ML				3.4	GP6-8-12		
5		SILT, grading to fine sand, grey, moist, no odor	ML				2.8	GP6-12-16		
0		SILT, grading to very fine sand, grey to light brown, no odor	ML				4.0	GP6-16-20		

Well Construction Information

onument Type: NA
asing Diameter (inches): NA
creen Slot Size (inches): NA
creened Interval (ft bgs): NA
Filter Pack: NA
Surface Seal: NA
Annular Seal: NA
Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: Bentonite
Surveyed Location: X: NA Y: NA

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Log of Boring: GP6

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
20		SAND, fine, trace gravel, light grey, moist, no odor	SP				3.3	GP6-20-24		Bentonite
25		SAND, fine, trace gravel	SP				3.2	GP6-24-27	X	
		Gravelly SAND, fine to course, light grey, moist, no odor	SP				2.9	GP6-27-30		
30		SAND, medium, minor gravel	SP				2.4	GP6-30-31		
35										

Well Construction Information

Monument Type: NA
Casing Diameter (inches): NA
Screen Slot Size (inches): NA
Screened Interval (ft bgs): NA

Filter Pack: NA
Surface Seal: NA
Annular Seal: NA

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: Bentonite
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
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Issaquah, WA 98027

Log of Boring: GP7

Client: MPSC
Project: Manhattan Plaza-Harris
Location: Normandy Park, WA
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	4/2/2007	**Sampler Type:**	Sleeve
Date/Time Completed:	4/2/2007	**Drive Hammer (lbs.):**	140
Equipment:	Geoprobe	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	38
Drilling Foreman:	Jaymen	**Total Well Depth (ft bgs):**	NA
Drilling Method:	Geoprobe		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		Silty SAND, very fine, moist to very moist, top 2" organics	SM				0.4	GP7-0-4		
5		SAND, very fine, light brown	SP							
		SAND, very fine, light brown to grey, very moist, no odor	SP				0.0	GP7-4-8	X	
		SAND, very fine, light grey, moist, no odor	SP				1.3	GP7-8-12		
10		SAND, fine, light grey, moist, no odor	SP				0.7	GP7-12-16		
5		SAND, fine, light grey, moist, no odor	SP							
		Silty SAND, very fine	SM							
		SAND, fine to course, trace gravel	SP				1.0	GP7-16-20		
0		SAND, fine, light grey, moist, no odor	SP							

Monument Type: NA
Casing Diameter (inches): NA
Screen Slot Size (inches): NA
Screened Interval (ft bgs): NA

Well Construction Information
Filter Pack: NA
Surface Seal: NA
Annular Seal: NA

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: Bentonite
Surveyed Location: X: NA Y: NA

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Issaquah, WA 98027

Log of Boring: GP7

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (ppm)	Sample ID	Sample Analyzed	Well Construction Details
20		SAND, fine to medium, trace gravel, light brown, moist	SP							Bentonite
		SAND, fine to medium, with gravel, light brown, moist	SP				0.9	GP7-20-24		
25		Gravelly SAND, fine to course, grey, moist, no odor	SP							
		Gravelly SAND, fine to course, grey, moist, no odor	SP				1.1	GP7-26-30		
30		Gravelly SAND, fine to course, grey, moist, no odor	SP							
		SAND, fine, with gravel, grey, moist	SP				1.5	GP7-30-34	X	
35		SAND, fine to medium, minor gravel, wet, slight odor	SP				1.0	GP7-34-38		
40										

Well Construction Information

Monument Type: NA
Casing Diameter (inches): NA
Screen Slot Size (inches): NA
Screened Interval (ft bgs): NA

Filter Pack: NA
Surface Seal: NA
Annular Seal: NA

Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: Bentonite
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
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Issaquah, WA 98027

Log of Boring: GP-8

Client: MPSC
Project: Manhattan Plaza-Harris
Location: Normandy Park, WA
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	5/27/08 0830	**Sampler Type:**	Macro Core
Date/Time Completed:	5/27/08 0935	**Drive Hammer (lbs.):**	NA
Equipment:	Geoprobe	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	10
Drilling Foreman:	Elijah Floyd	**Total Well Depth (ft bgs):**	10
Drilling Method:	Geoprobe		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		0-4' Hand cleared. At 2', silty sand (65, 30, 5), fine to coarse sand, trace fine gravel, light brown, moist, no odor.					0.0	GP8-2-052708		
		4-6' Silty sand (70, 30), fine to medium sand, light brown, very moist, no odor.	SP-SM				0.0	GP8-4-052708		
5						NA				Bentonite
		6-8' Poorly graded sand (95, 5), fine sand, trace silt, moist, no odor.	SP		100		0.0	GP8-6-052708	Y	
		8-10' Poorly graded sand (95, 5), fine to medium sand, trace silt, grey, moist, no odor.	SP		100		0.0	GP8-8-052708		
10							0.0	GP8-10-052708	Y	

Well Construction Information

Monument Type:	NA	**Filter Pack:**	NA	**Ground Surface Elevation (ft):**	NA
Casing Diameter (inches):	NA	**Surface Seal:**	NA	**Top of Casing Elevation (ft):**	NA
Screen Slot Size (inches):	NA	**Annular Seal:**	NA	**Boring Abandonment:**	Bentonite
Screened Interval (ft bgs):	NA			**Surveyed Location:** X: NA	Y: NA

FARALLON CONSULTING
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Log of Boring: GP-9

Client: MPSC
Project: Manhattan Plaza-Harris
Location: Normandy Park, WA
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	5/27/08 0940	**Sampler Type:**	Macro Core
Date/Time Completed:	5/27/08 1010	**Drive Hammer (lbs.):**	NA
Equipment:	Geoprobe	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	10
Drilling Foreman:	Elijah Floyd	**Total Well Depth (ft bgs):**	10
Drilling Method:	Geoprobe		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		0-4' Hand cleared. At 2', poorly graded sand (95, 5), fine to coarse sand, trace silt, medium grey, moist, no odor.					0.0	GP9-2-052708		
		4-5.5' Silty sand (75, 20, 5), very fine sand, trace coarse gravel, light brown, moist, no odor.	SM				0.0	GP9-4-052708	Y	
5						NA				Bentonite
		5.5-8' Poorly graded sand (95, 5), fine sand, trace silt, light brown, very moist, no odor.	SP		100		0.0	GP9-6-052708		
		8-10' Poorly graded sand (95, 5), medium sand, light brown-grey, moist, no odor.	SP		100		0.0	GP9-8-052708		
10							0.0	GP9-10-052708	Y	

Well Construction Information

Monument Type: NA
Casing Diameter (inches): NA
Screen Slot Size (inches): NA
Screened Interval (ft bgs): NA
Filter Pack: NA
Surface Seal: NA
Annular Seal: NA
Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: Bentonite
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: GP-10

Client: MPSC
Project: Manhattan Plaza-Harris
Location: Normandy Park, WA
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	5/27/08 1020	**Sampler Type:**	Macro Core
Date/Time Completed:	5/27/08 1100	**Drive Hammer (lbs.):**	NA
Equipment:	Geoprobe	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	10
Drilling Foreman:	Elijah Floyd	**Total Well Depth (ft bgs):**	10
Drilling Method:	Geoprobe		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		0-4' Hand cleared. At 2', pea gravel, fill.					0.0	GP10-2-052708		
		4-7.5' Silty sand (80, 20), fine sand, light brown, very moist, no odor.	SM				0.0	GP10-4-052708	Y	
5						NA				Bentonite
					100		0.0	GP10-6-052708		
		7.5-8' Poorly graded sand (95, 5), fine sand, trace silt, medium brown-grey, moist, no odor.	SP							
		8-10' Poorly graded sand (90, 5, 5), fine to medium sand, trace, fine gravel, trace silt, light grey, moist, no odor.	SP				0.0	GP10-8-052708		
					100					
10							0.0	GP10-10-052708	Y	

Well Construction Information

Monument Type: NA
Casing Diameter (inches): NA
Screen Slot Size (inches): NA
Screened Interval (ft bgs): NA
Filter Pack: NA
Surface Seal: NA
Annular Seal: NA
Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: Bentonite
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: GP-11

Client: MPSC
Project: Manhattan Plaza-Harris
Location: Normandy Park, WA
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	5/27/08 1130	**Sampler Type:**	Macro Core
Date/Time Completed:	5/27/08 1200	**Drive Hammer (lbs.):**	NA
Equipment:	Geoprobe	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	10
Drilling Foreman:	Elijah Floyd	**Total Well Depth (ft bgs):**	10
Drilling Method:	Geoprobe		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		0-1' Fine gravel fill.	FILL							
		1-2' Poorly graded sand with silt (85, 10, 5), fine sand, trace fine gravel, medium brown, moist, no odor.	SP-SM							
		2-4' Poorly graded sand with gravel and silt (80, 10, 10), fine sand, fine gravel, medium brown, moist, no odor.	SP-SM				0.0	GP11-2-052708		
		4-6' Poorly graded sand with silt (90, 10), light brown-grey, very moist, no odor.	SP-SM				0.0	GP11-4-052708		
5						NA				Bentonite
		6-8' Poorly graded sand (100), fine sand, light brown, moist, no odor.	SP		100		0.0	GP11-6-052708	Y	
		8-10' Poorly graded sand (100), medium sand, light brown, moist, no odor.	SP		100		0.0	GP11-8-052708		
10							0.0	GP11-10-052708	Y	

Well Construction Information

Monument Type: NA
Casing Diameter (inches): NA
Screen Slot Size (inches): NA
Screened Interval (ft bgs): NA
Filter Pack: NA
Surface Seal: NA
Annular Seal: NA
Ground Surface Elevation (ft): NA
Top of Casing Elevation (ft): NA
Boring Abandonment: Bentonite
Surveyed Location: X: NA Y: NA

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

Log of Boring: GP-12

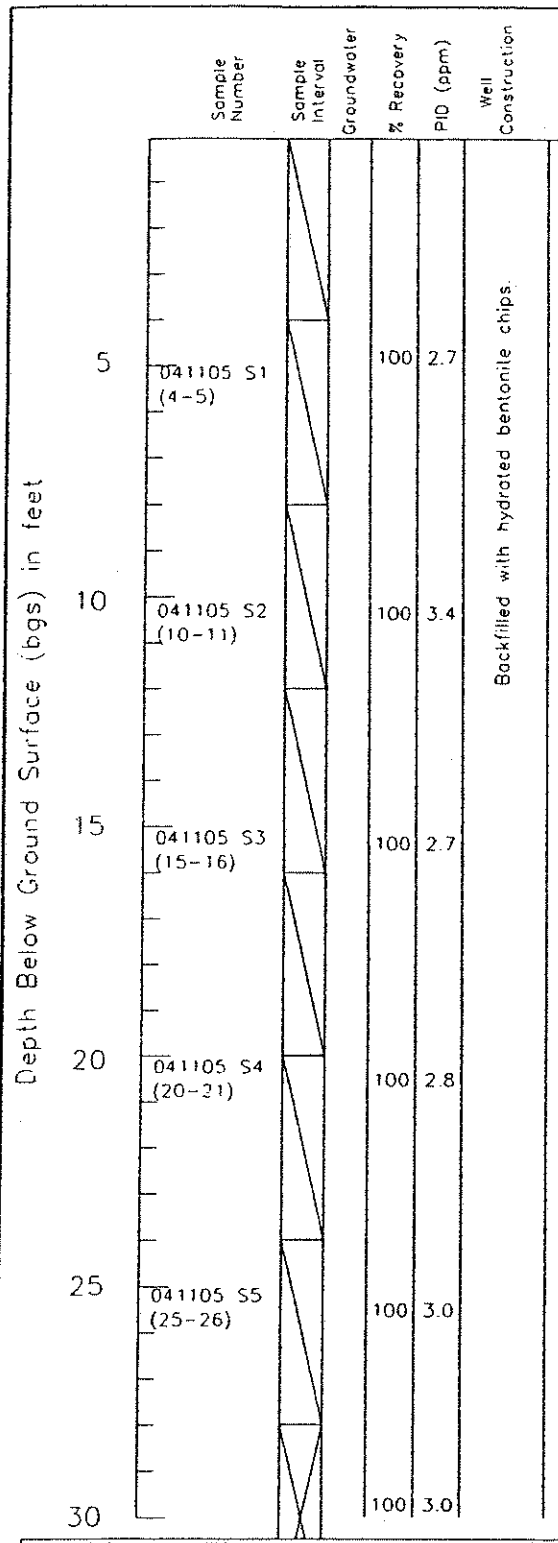
Client: MPSC
Project: Manhattan Plaza-Harris
Location: Normandy Park, WA
Farallon PN: 578-001
Logged By: F. Reider

Date/Time Started:	5/27/08 1205	**Sampler Type:**	Macro Core
Date/Time Completed:	5/27/08 1240	**Drive Hammer (lbs.):**	NA
Equipment:	Geoprobe	**Depth of Water ATD (ft bgs):**	NA
Drilling Company:	Cascade Drilling	**Total Boring Depth (ft bgs):**	10
Drilling Foreman:	Elijah Floyd	**Total Well Depth (ft bgs):**	10
Drilling Method:	Geoprobe		

Depth (feet bgs.)	Sample Interval	Lithologic Description	USCS	USGS Graphic	% Recovery	Blow Counts 8/8/8	PID (units)	Sample ID	Sample Analyzed	Boring/Well Construction Details
0		0-3' Hand cleared. At 2', Poorly graded sand with silt (85, 10, 5), fine to medium sand, trace fine gravel, dark brown, moist, no odor.					0.0	GP12-2-052708		
		3-10' Poorly graded sand (95, 5), fine to medium sand, trace silt, light grey, moist, no odor.	SP				0.0	GP12-4-052708		
5						NA				Bentonite
					100		0.0	GP12-6-052708	Y	
							0.0	GP12-8-052708		
					100					
10							0.0	GP12-10-052708	Y	

Well Construction Information

Monument Type:	NA	**Filter Pack:**	NA	**Ground Surface Elevation (ft):**	NA
Casing Diameter (inches):	NA	**Surface Seal:**	NA	**Top of Casing Elevation (ft):**	NA
Screen Slot Size (inches):	NA	**Annular Seal:**	NA	**Boring Abandonment:**	Bentonite
Screened Interval (ft bgs):	NA			**Surveyed Location:** X: NA	Y: NA



Logged by: M. Williams
Driller: ESN Northwest
Drilling Method: Power Probe
Sampling Method: Acetate Liner
Casing Type: Not Applicable (NA)
Annular Pack: NA
Slot Size: NA

Hammer Size: NA
Date Drilled: 4/11/2005
Hole Diameter: 2 inches
Hole Depth: 38 feet
Well Diameter: NA
Well Depth: NA
Screened Interval: NA

Depth to Water (First Encountered): 37 feet
Depth to Water (Static): NA

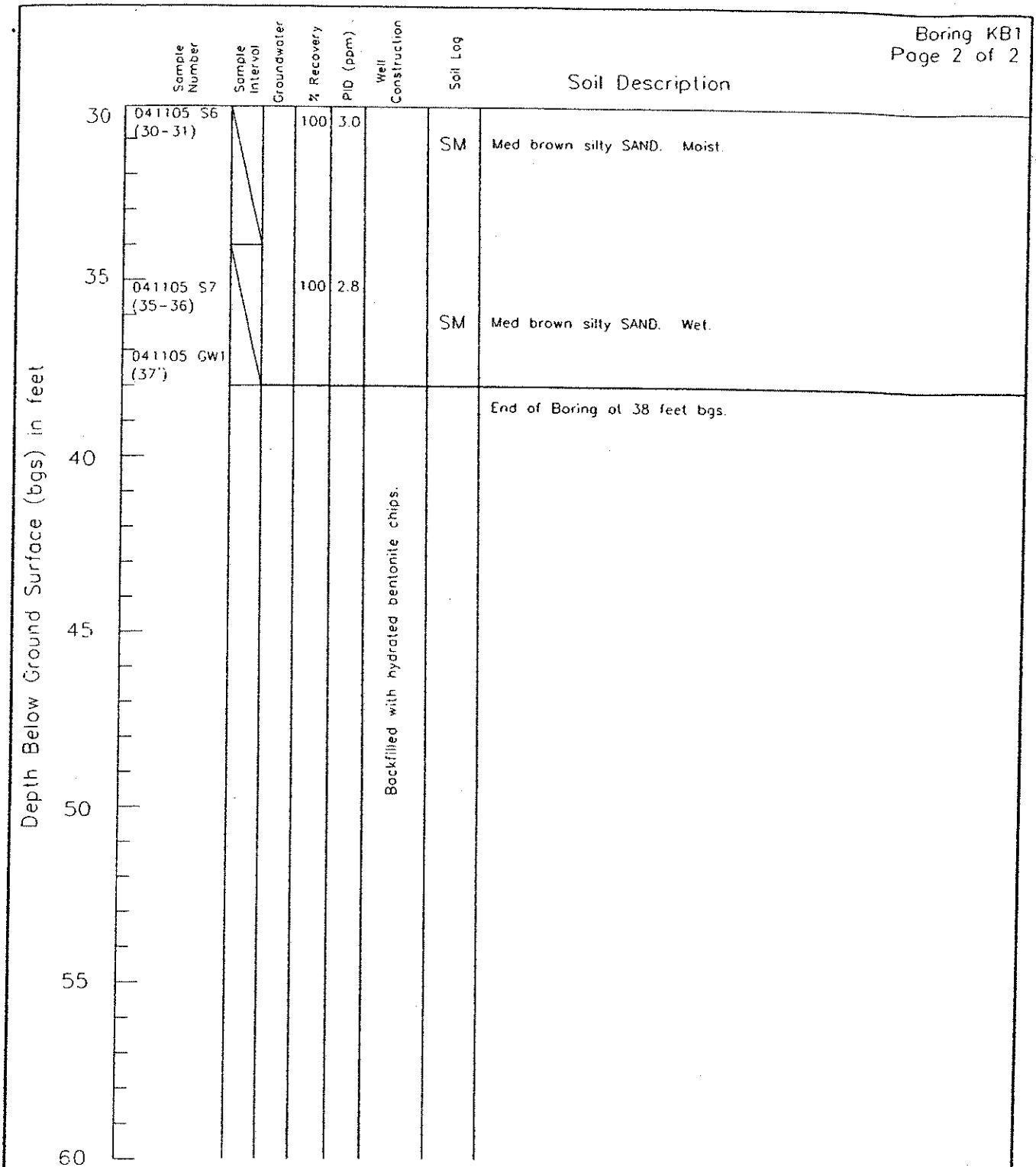
NR = Not Recorded

Soils classified visually using the Unified Soils Classification System

KANE
Environmental, Inc.
3831 Stone Way N, Seattle, WA - 206-691-6169
www.kane-environmental.com

Limited Phase II Site Assessment
Harris Property
17817-17825 1st Avenue South
Normandy Park, Washington

Soil Boring Log



Logged by: M. Williams	Hammer Size: NA	Depth to Water (First Encountered): 37 feet
Driller: ESN Northwest	Date Drilled: 4/11/2005	Depth to Water (Static): NA
Drilling Method: Power Probe	Hole Diameter: 2 inches	
Sampling Method: Acetate Liner	Hole Depth: 38 feet	
Casing Type: Not Applicable (NA)	Well Diameter: NA	
Annular Pack: NA	Well Depth: NA	NR = Not Recorded.
Slot Size: NA	Screened Interval: NA	

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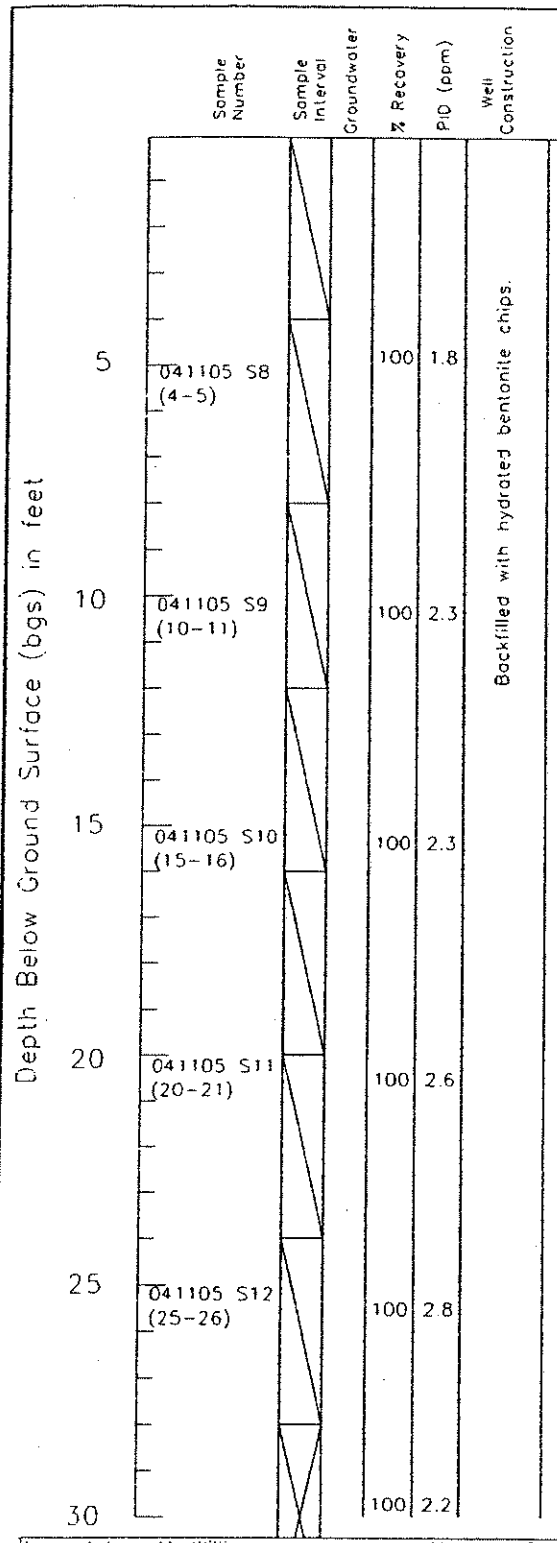
Soil Boring Log



Logged by: M. Williams
Driller: ESN Northwest
Drilling Method: Power Probe
Sampling Method: Acetate Liner
Casing Type: Not Applicable (NA)
Annular Pack: NA
Slot Size: NA

Hammer Size: NA
Date Drilled: 4/11/2005
Hole Diameter: 2 inches
Hole Depth: 38 feet
Well Diameter: NA
Well Depth: NA
Screened Interval: NA

Depth to Water (First Encountered): 37 feet
Depth to Water (Static): NA

NR = Not Recorded.

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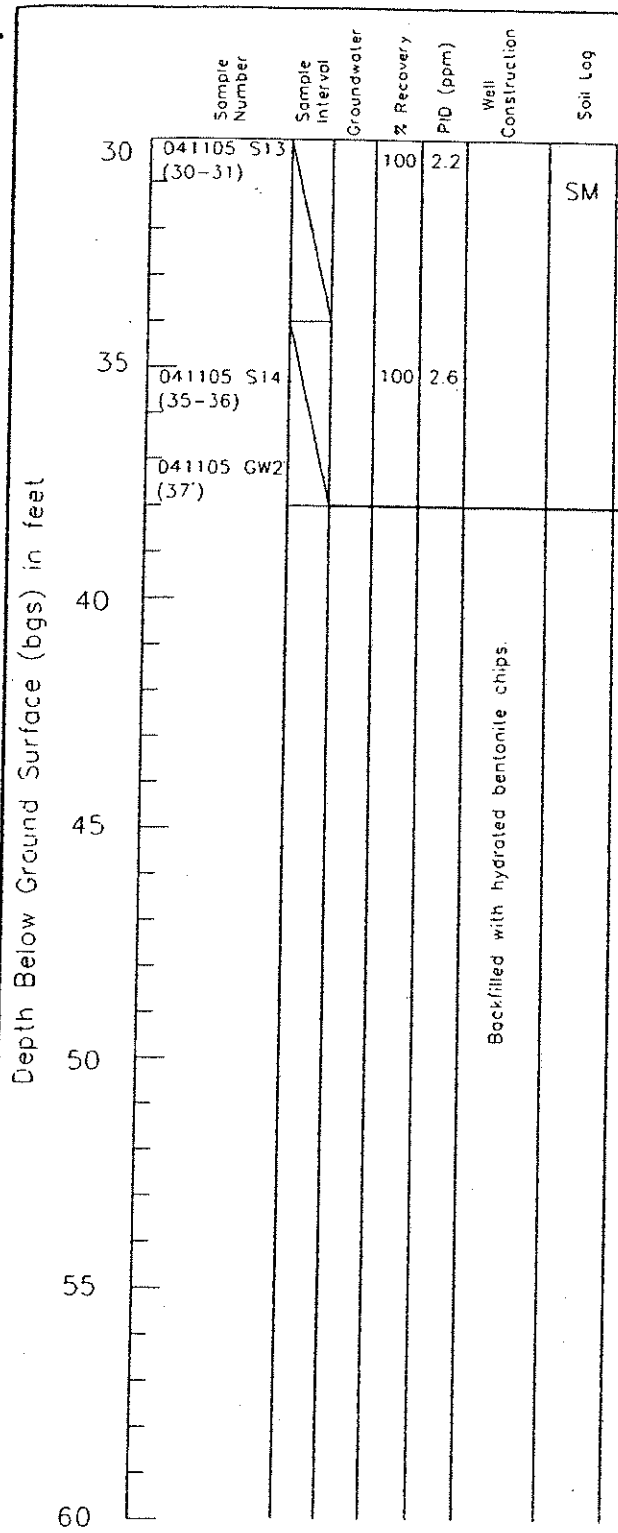

Logged by: M. Williams
Driller: ESN Northwest
Drilling Method: Power Probe
Sampling Method: Acetate Liner
Casing Type: Not Applicable (NA)
Annular Pack: NA
Slot Size: NA

Hammer Size: NA
Date Drilled: 4/11/2005
Hole Diameter: 2 inches
Hole Depth: 38 feet
Well Diameter: NA
Well Depth: NA
Screened Interval: NA

Depth to Water (First Encountered): 37 feet
Depth to Water (Static): NA

NR = Not Recorded

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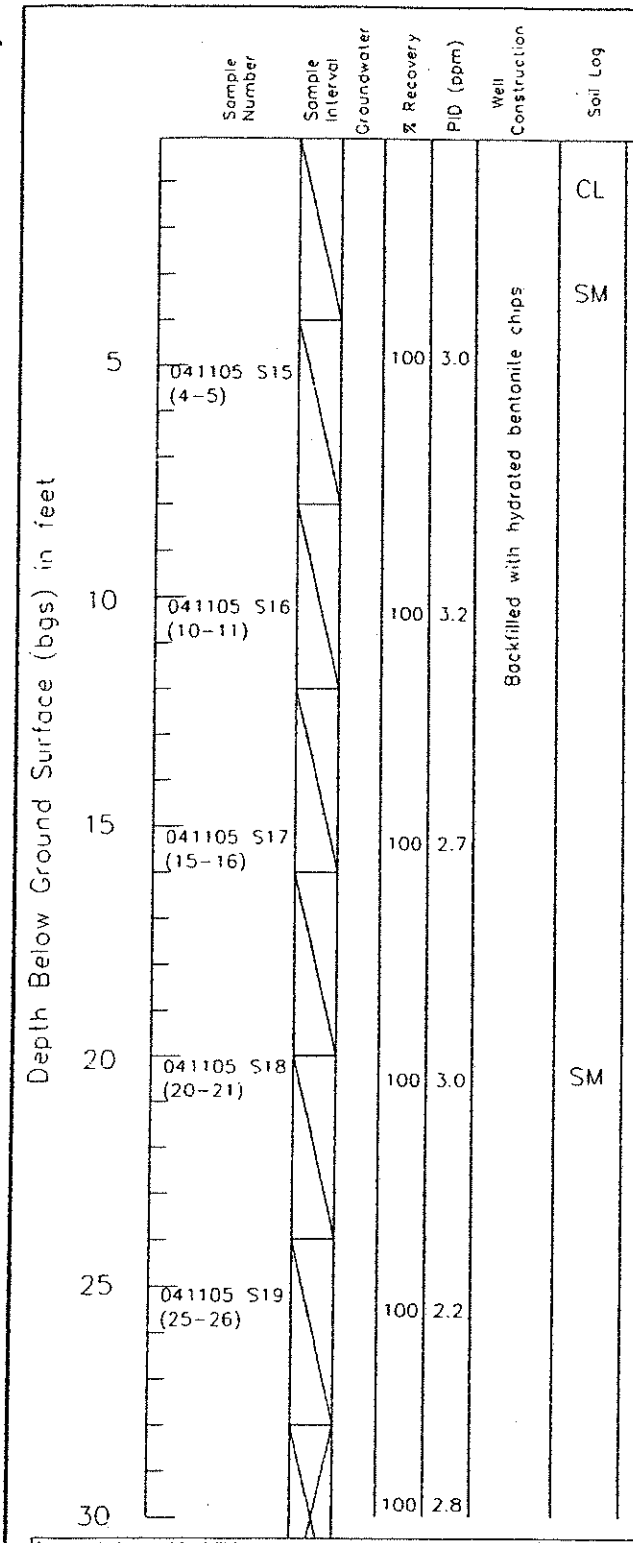
Soil Boring Log



Logged by: M. Williams
Driller: ESN Northwest
Drilling Method: Power Probe
Sampling Method: Acetate Liner
Casing Type: Not Applicable (NA)
Annular Pack: NA
Slot Size: NA

Hammer Size: NA
Date Drilled: 4/11/2005
Hole Diameter: 2 inches
Hole Depth: 38 feet
Well Diameter: NA
Well Depth: NA
Screened Interval: NA

Depth to Water (First Encountered): 37 feet
Depth to Water (Static): NA

NR = Not Recorded.

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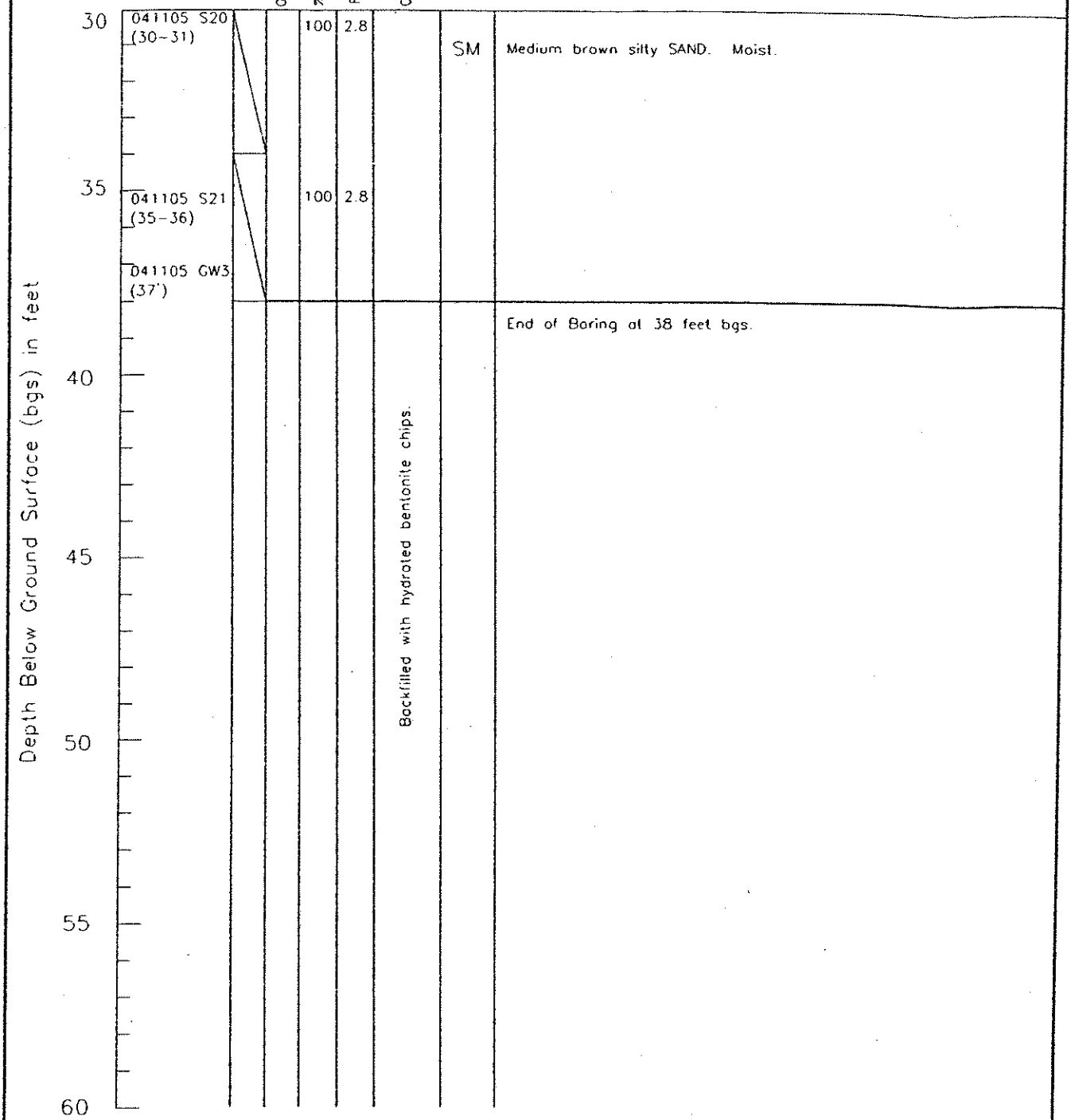
Soil Boring Log



Logged by: M. Williams	Hammer Size: NA	Depth to Water (First Encountered): 37 feet
Driller: ESN Northwest	Date Drilled: 4/11/2005	Depth to Water (Static): NA
Drilling Method: Power Probe	Hole Diameter: 2 inches	
Sampling Method: Acetate Liner	Hole Depth: 38 feet	
Casing Type: Not Applicable (NA)	Well Diameter: NA	
Annular Pack: NA	Well Depth: NA	NR = Not Recorded.
Slot Size: NA	Screened Interval: NA	

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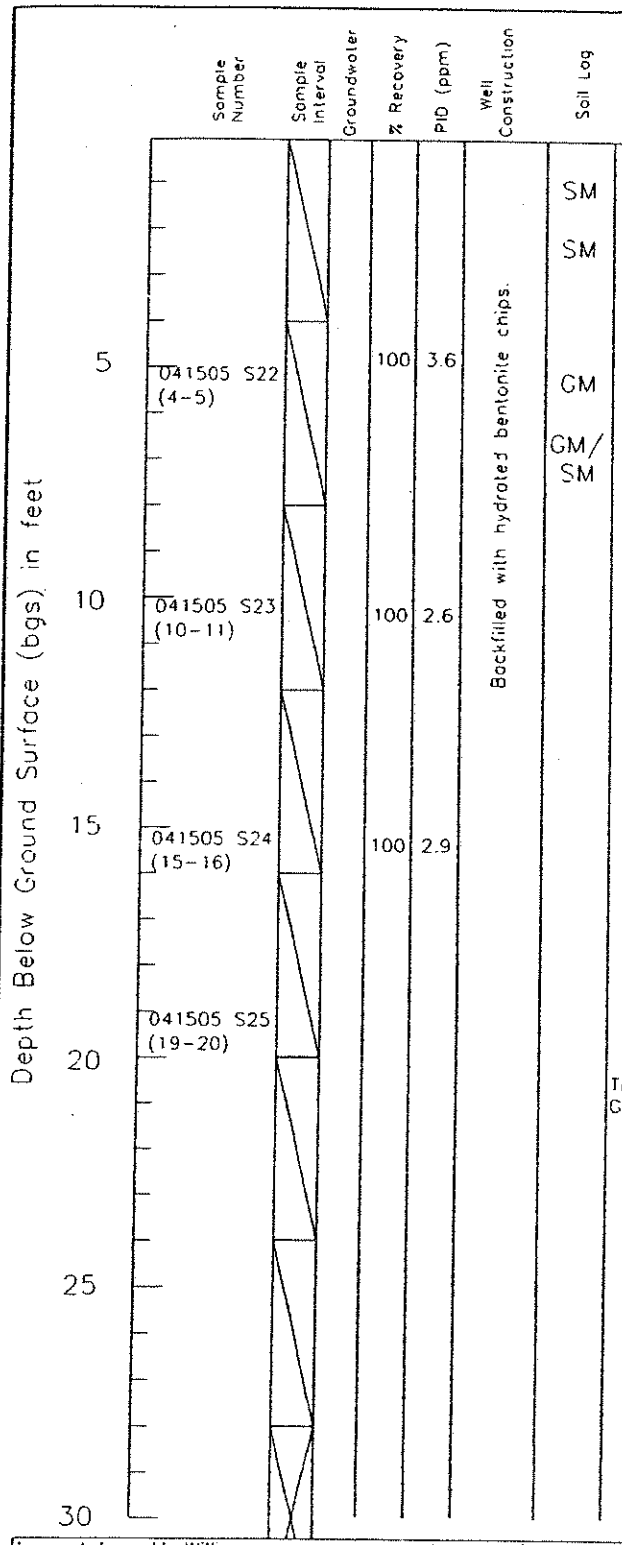
Normandy Park, Washington

Soil Boring Log



Logged by: M. Williams
Driller: ESN Northwest
Drilling Method: Power Probe
Sampling Method: Acetate Liner
Casing Type: Not Applicable (NA)
Annular Pack: NA
Slot Size: NA

Hammer Size: NA
Date Drilled: 4/15/2005
Hole Diameter: 2 inches
Hole Depth: 41 feet
Well Diameter: NA
Well Depth: NA
Screened Interval: NA

Depth to Water (First Encountered): 39 feet
Depth to Water (Static): NA

NR = Not Recorded.

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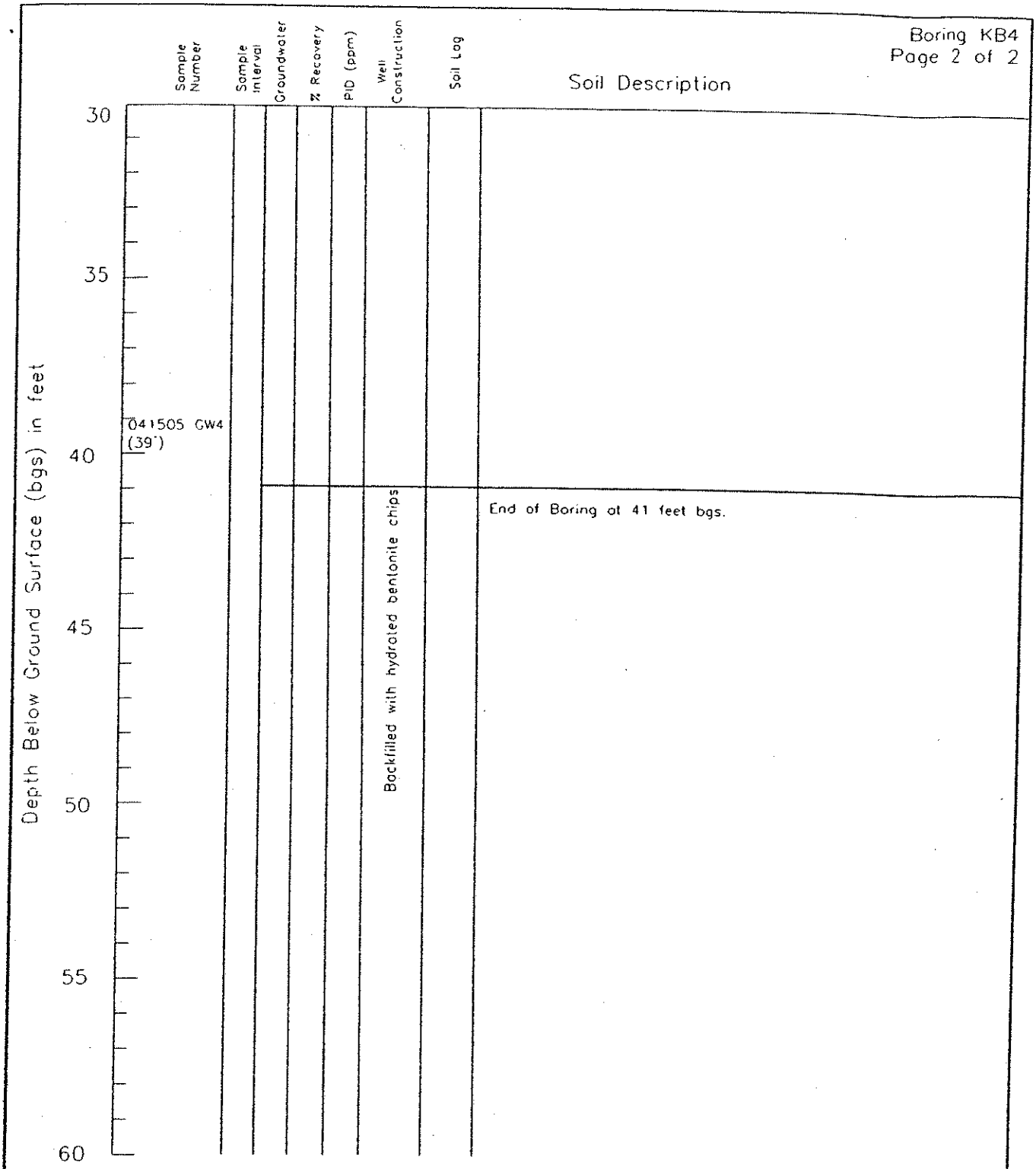

Logged by: M. Williams	Hammer Size: NA	Depth to Water (First Encountered): 39 feet
Driller: ESN Northwest	Date Drilled: 4/15/2005	Depth to Water (Static): NA
Drilling Method: Power Probe	Hole Diameter: 2 inches	
Sampling Method: Acetate Liner	Hole Depth: 41 feet	
Casing Type: Not Applicable (NA)	Well Diameter: NA	
Annular Pack: NA	Well Depth: NA	NR = Not Recorded.
Slot Size: NA	Screened Interval: NA	

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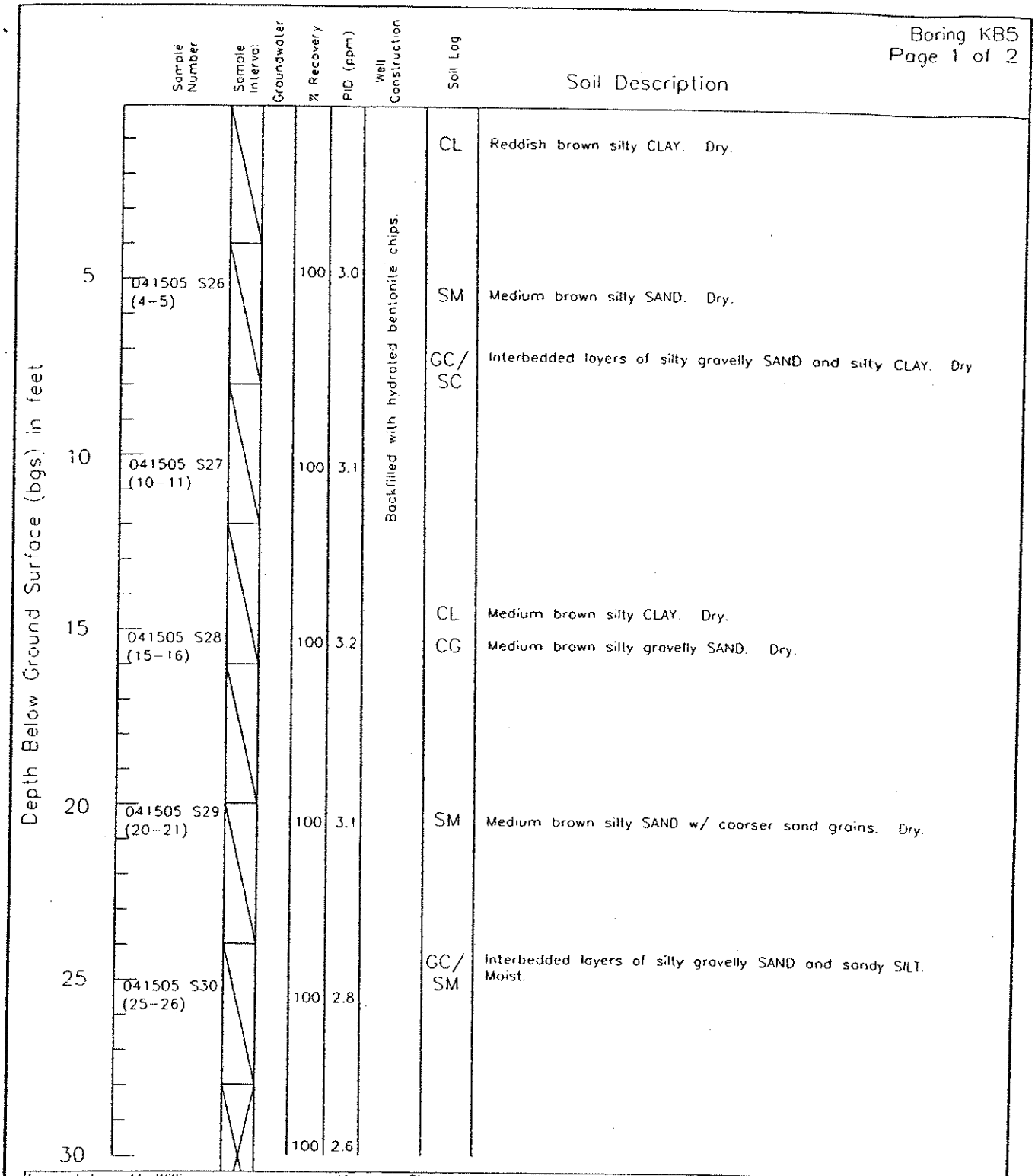
Normandy Park, Washington

Soil Boring Log



Logged by: M. Williams
Driller: ESN Northwest
Drilling Method: Power Probe
Sampling Method: Acetate Liner
Casing Type: Not Applicable (NA)
Annular Pack: NA
Slot Size: NA

Hammer Size: NA
Date Drilled: 4/15/2005
Hole Diameter: 2 inches
Hole Depth: 41 feet
Well Diameter: NA
Well Depth: NA
Screened Interval: NA

Depth to Water (First Encountered): 40 feet
Depth to Water (Static): NA

NR = Not Recorded

Soils classified visually using the Unified Soils Classification System

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Limited Phase II Site Assessment
Harris Property
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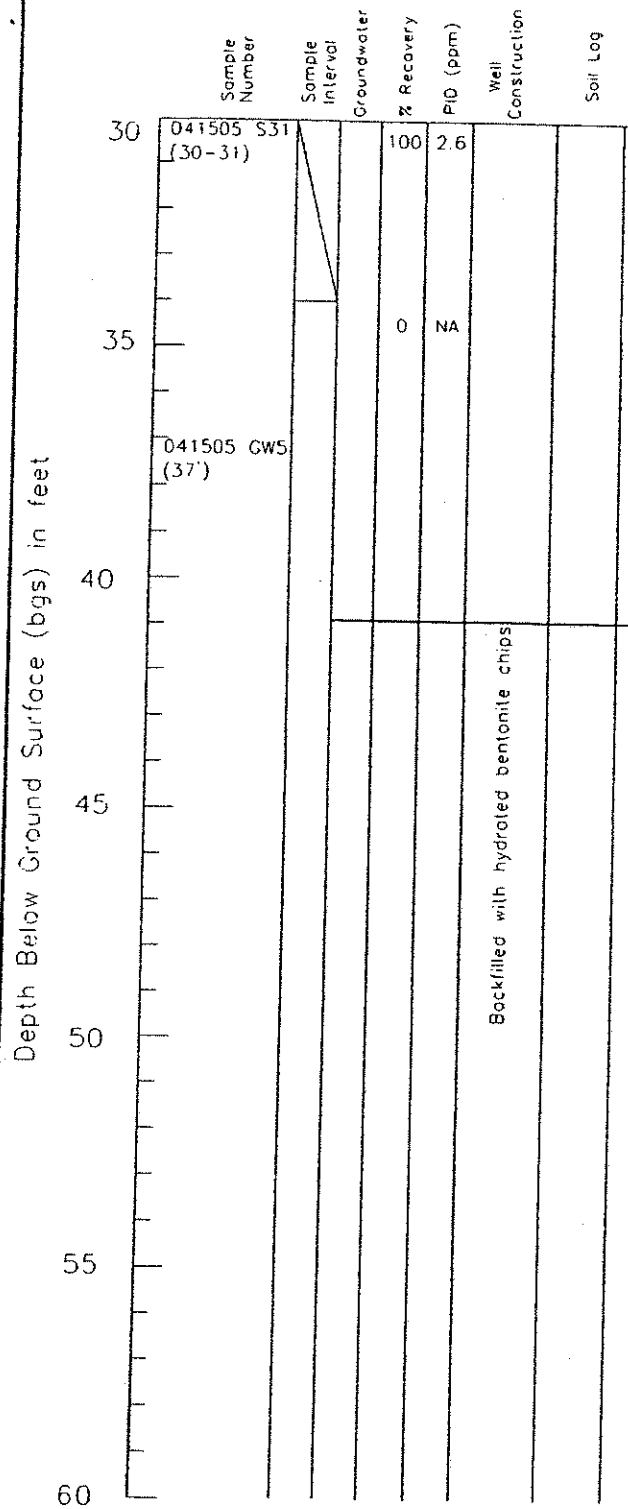
Normandy Park, Washington

Soil Boring Log



Soil Description

GC/ SM	Interbedded layers of silty gravelly SAND and sandy SILT. Moist.
	Tube refusal at 36 feet bgs. Switch to point to collect GW sample.
	End of Boring at 41 feet bgs.

Logged by: M. Williams
Driller: ESN Northwest
Drilling Method: Power Probe
Sampling Method: Acetate Liner
Casing Type: Not Applicable (NA)
Annular Pack: NA
Slot Size: NA

Hammer Size: NA
Date Drilled: 4/15/2005
Hole Diameter: 2 inches
Hole Depth: 41 feet
Well Diameter: NA
Well Depth: NA
Screened Interval: NA

Depth to Water (First Encountered): 40 feet
Depth to Water (Static): NA

NR = Not Recorded.

Soils classified visually using the Unified Soils Classification System

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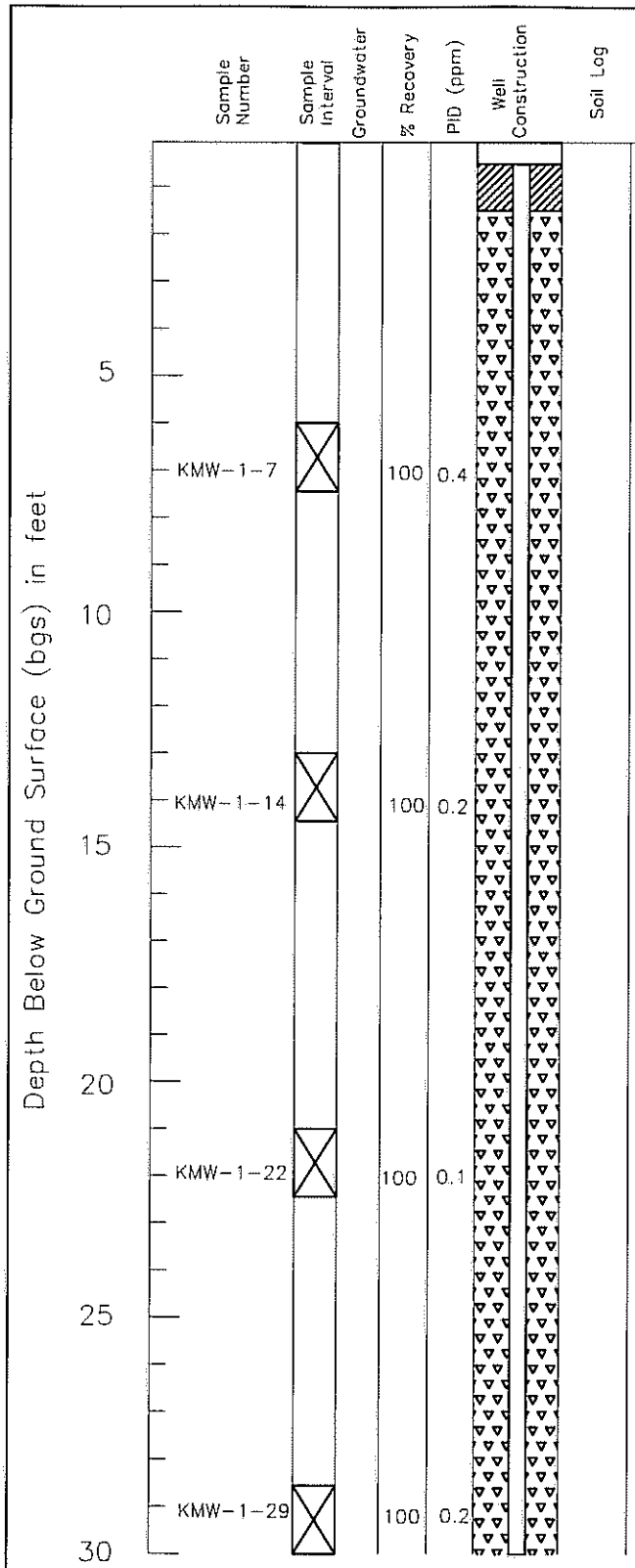
Limited Phase II Site Assessment
Harris Property
17817-17825 1st Avenue South
Normandy Park, Washington

Soil Boring Log

Soil Boring KMW-1



Logged by: Steve Worsley
Driller: ESN Northwest
Drilling Method: Auger
Sampling Method: Split Spoon
Casing Type: PVC
Annular Pack: NA
Slot Size: 10

Hammer Size: 140 lbs.
Date Drilled: 07/25/05
Hole Diameter: 8 inch
Hole Depth: 52 feet
Well Diameter: 2 inch
Well Depth: 52 feet
Screened Interval: 37 to 52ft

Depth to Water (First Encountered): 40.98 feet
Depth to Water (Static): NA

Key:
Concrete:
Bentonite
Silica sand
Screen

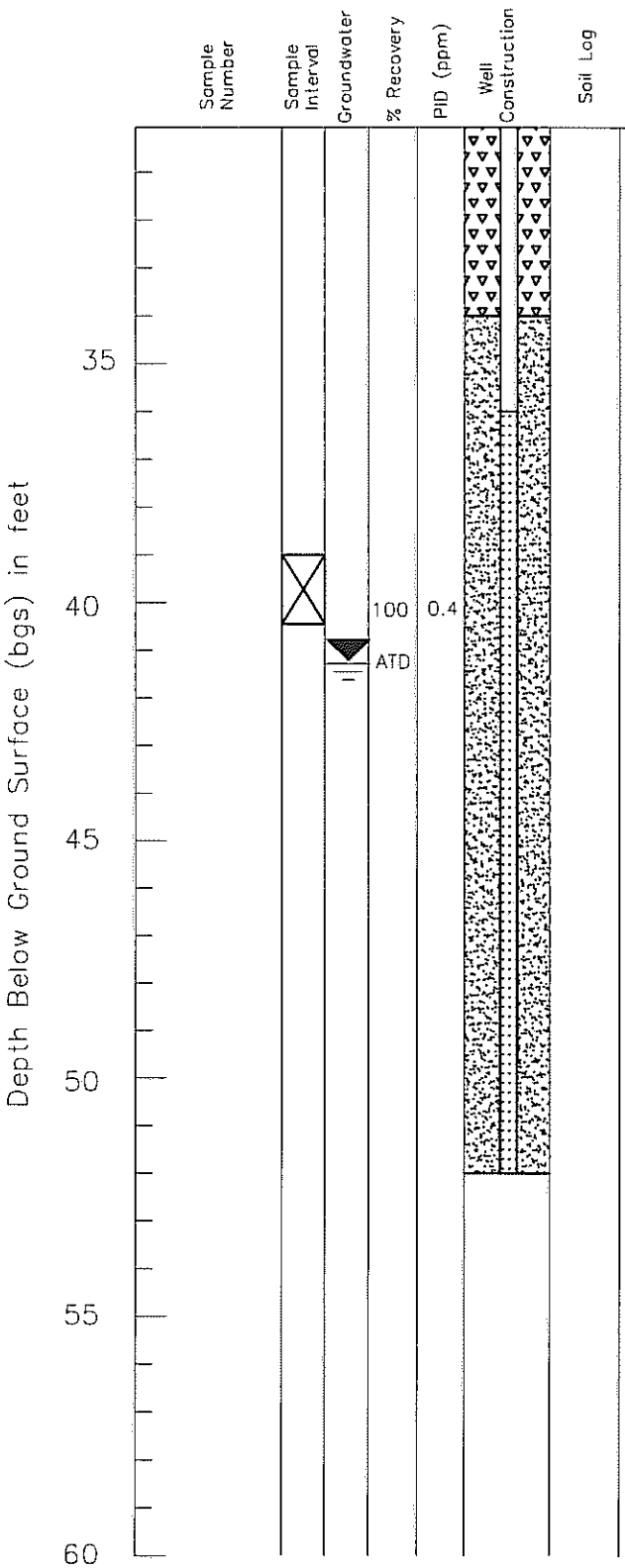
Soils classified visually using the Unified Soils Classification System

KANE ENVIRONMENTAL INC
3831 Stone Way N, Seattle, WA - 206-691-0476
www.kane-environmental.com

Harris Property
KWM-1 Well
Normandy Park, Washington

Soil Boring Log
KMW-1

Soil Boring KMW-1



Logged by: Steve Worsley
Driller: ESN Northwest
Drilling Method: Auger
Sampling Method: Split Spoon
Casing Type: PVC
Annular Pack: NA
Slot Size: 10

Hammer Size: 140 lbs.
Date Drilled: 07/25/05
Hole Diameter: 8 inch
Hole Depth: 52 feet
Well Diameter: 2 inch
Well Depth: 52 feet
Screened Interval: 37 to 52ft

Depth to Water (First Encountered): 40.98 feet
Depth to Water (Static): NA

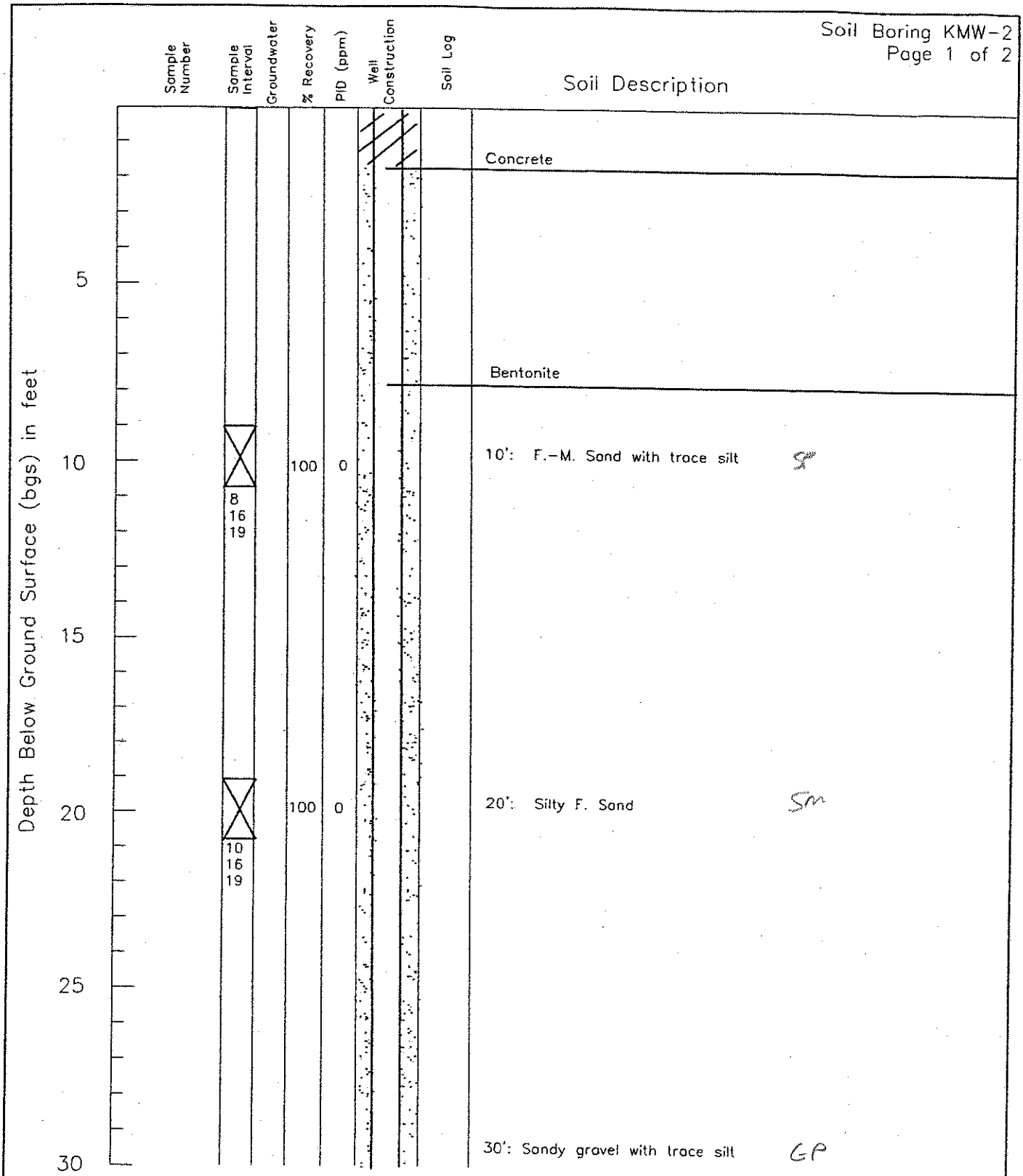
Key:
Concrete:
Bentonite
Silica sand
Screen

Soils classified visually using the Unified Soils Classification System

KANE ENVIRONMENTAL INC
3831 Stone Way N, Seattle, WA - 206-691-0476
www.kane-environmental.com

Harris Property
KWM-1 Well
Seattle, Washington

Soil Boring Log
KMW-1



Logged by: John Kane
Driller: Cascade Drilling
Drilling Method: Auger
Sampling Method: Split Spoon
Casing Type: PVC
Annular Pack: NA
Slot Size: 10

Hammer Size: 140 lbs.
Date Drilled: 05/01/06
Hole Diameter: 8 inch
Hole Depth: 40 feet
Well Diameter: 2 inch
Well Depth: 40 feet
Screened Interval: 30 to 40 feet

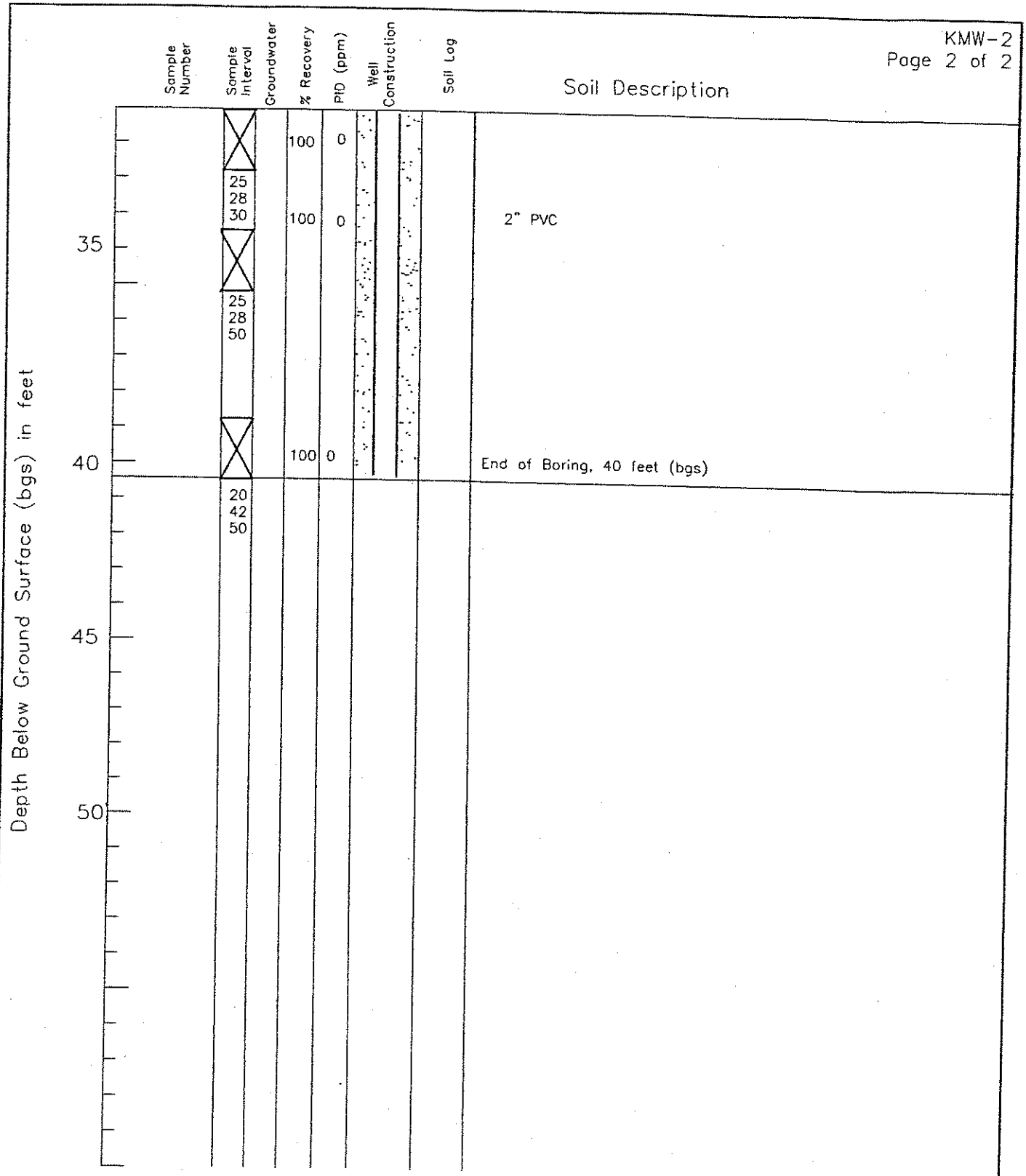
Depth to Water (First Encountered): ~35 feet ATD
Depth to Water (Static): ~36 feet

Soils classified visually using the Unified Soils Classification System

KANE ENVIRONMENTAL INC
3831 Stone Way N, Seattle, WA - 206-691-0476
www.kane-environmental.com

Harris Property
KWM-2 Well
Seattle, Washington

Soil Boring Log
KMW-2



Logged by: John Kane
Driller: Cascade Drilling
Drilling Method: Auger
Sampling Method: Split Spoon
Casing Type: PVC
Annular Pack: NA
Slot Size: 10

Hammer Size: 140 lbs.
Date Drilled: 05/01/06
Hole Diameter: 8 inch
Hole Depth: 50 feet
Well Diameter: 6 inch
Well Depth: 40 feet
Screened Interval: 30 to 40 feet

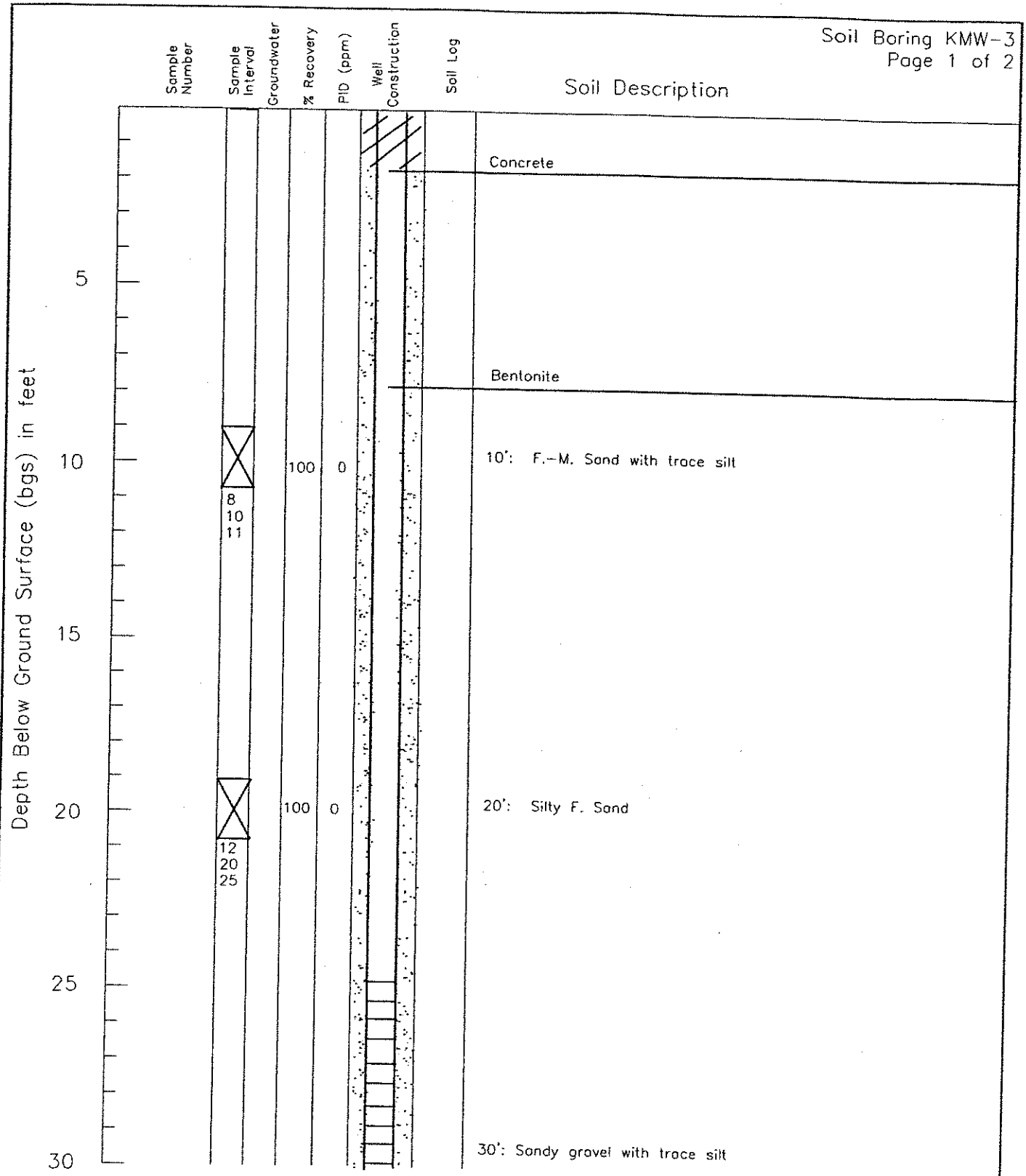
Depth to Water (First Encountered): ~35 feet ATD
Depth to Water (Static): ~36 feet

Soils classified visually using the Unified Soils Classification System

KANE ENVIRONMENTAL INC
3831 Stone Way N, Seattle, WA - 206-691-0476
www.kane-environmental.com

Harris Property
KMW-2 Well
Seattle, Washington

Soil Boring Log
KMW-2



Logged by: John Kane
Driller: Cascade Drilling
Drilling Method: Auger
Sampling Method: Split Spoon
Casing Type: PVC
Annular Pack: NA
Slot Size: 10

Hammer Size: 140 lbs.
Date Drilled: 05/01/06
Hole Diameter: 8 inch
Hole Depth: 40 feet
Well Diameter: 2 inch
Well Depth: 40 feet
Screened Interval: 25 to 35 feet

Depth to Water (First Encountered): ~25 feet ATD
Depth to Water (Static): ~27 feet

Soils classified visually using the Unified Soils Classification System

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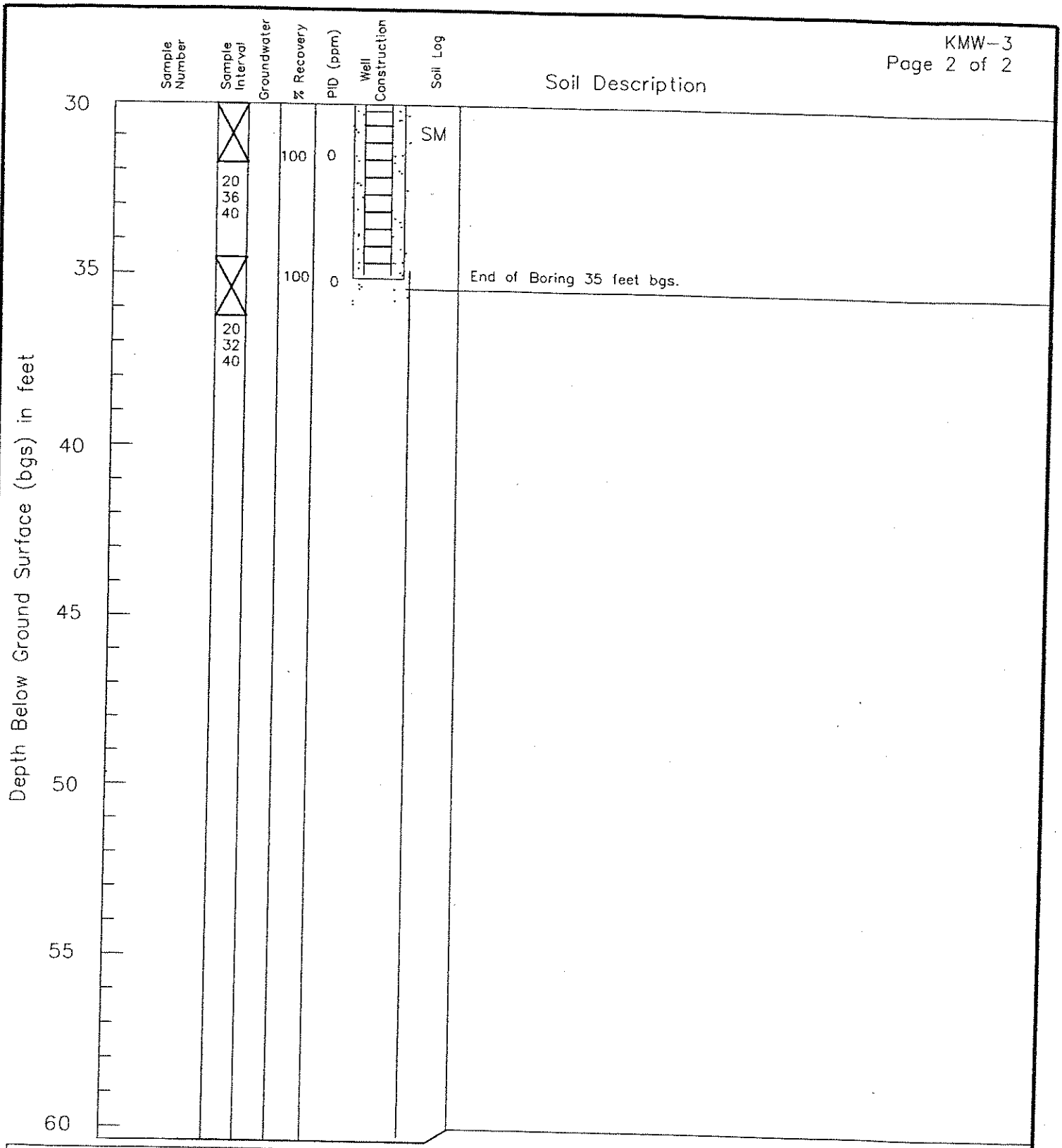
3831 Stone Way N, Seattle, WA - 206-691-0476
www.kane-environmental.com

Harris Property
KWM-2 Well
Seattle, Washington

Soil Boring Log
KMW-3



Logged by: John Kane
Driller: Cascade Drilling
Drilling Method: Hollow Stem Auger
Sampling Method: Split Spoon
Casing Type: PVC
Annular Pack: NA
Slot Size: 10

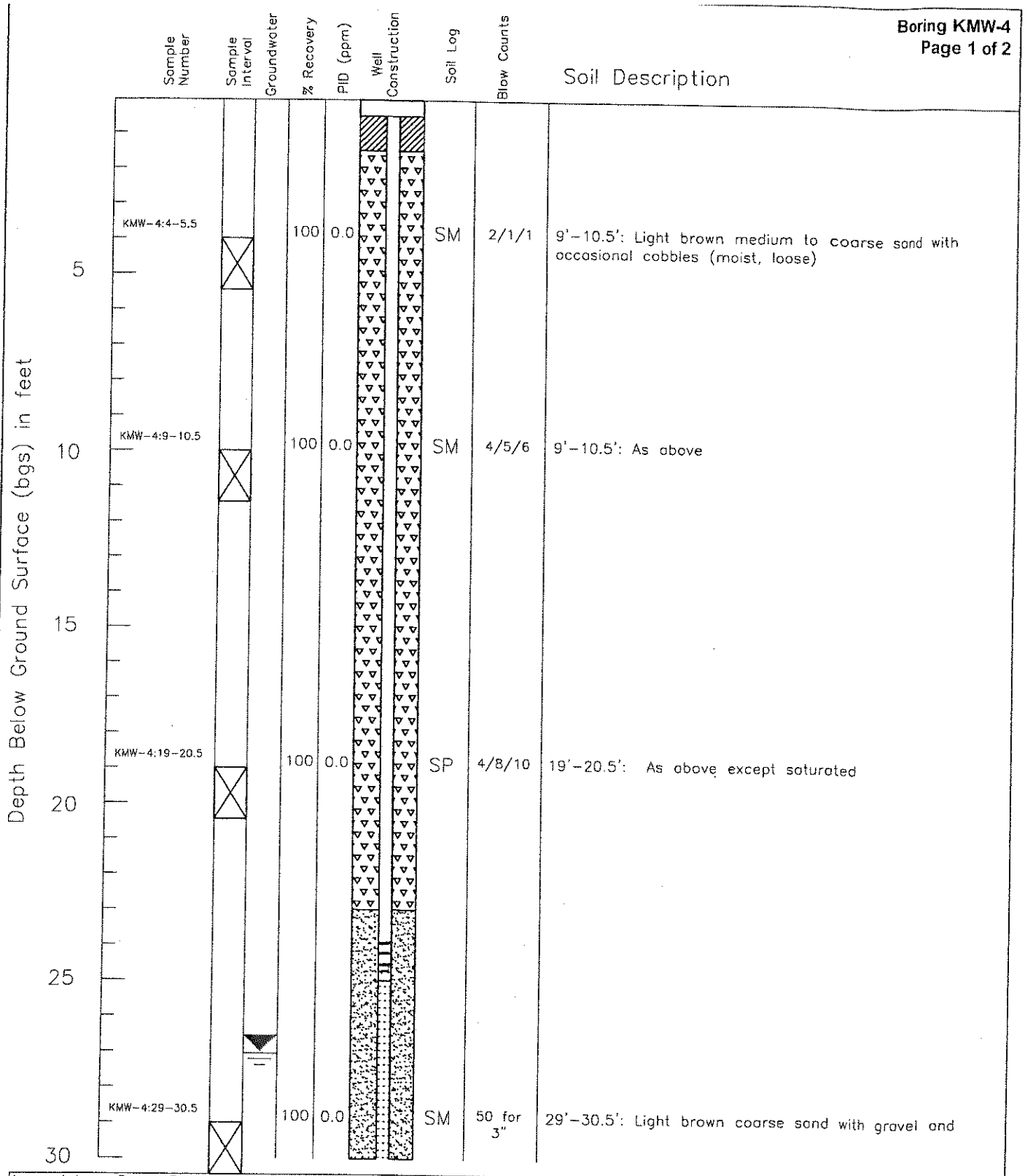
Hammer Size: 140 lbs.
Date Drilled: 05/01/06
Hole Diameter: 8 inches
Hole Depth: 40 feet
Well Diameter: 2 inch
Well Depth: 40 feet
Screened Interval: 25 to 35 feet

Depth to Water (First Encountered): 25 feet
Depth to Water (Static): 27 feet

KANE ENVIRONMENTAL INC
3831 Stone Way N, Seattle, WA - 206-691-0476
www.kane-environmental.com

Harris Property
KMW-3 Well
Seattle, Washington

Soil Boring Log
KMW-3



Logged by: Cyrus Gorman
Driller: Cascade Drilling
Drilling Method: Hollow-stem auger
Sampling Method: Split spoon
Casing Type: Not Applicable (NA)
Annular Pack: NA
Slot Size: NA

Hammer Size: 140 lb
Date Drilled: 03/28/07
Hole Diameter: 5/4 inch
Hole Depth: 34 feet
Well Diameter: 2 inches
Well Depth: 34 feet
Screened Interval: 24ft-34ft

Depth to Water (First Encountered): ~27 feet
Depth to Water (Static): NA

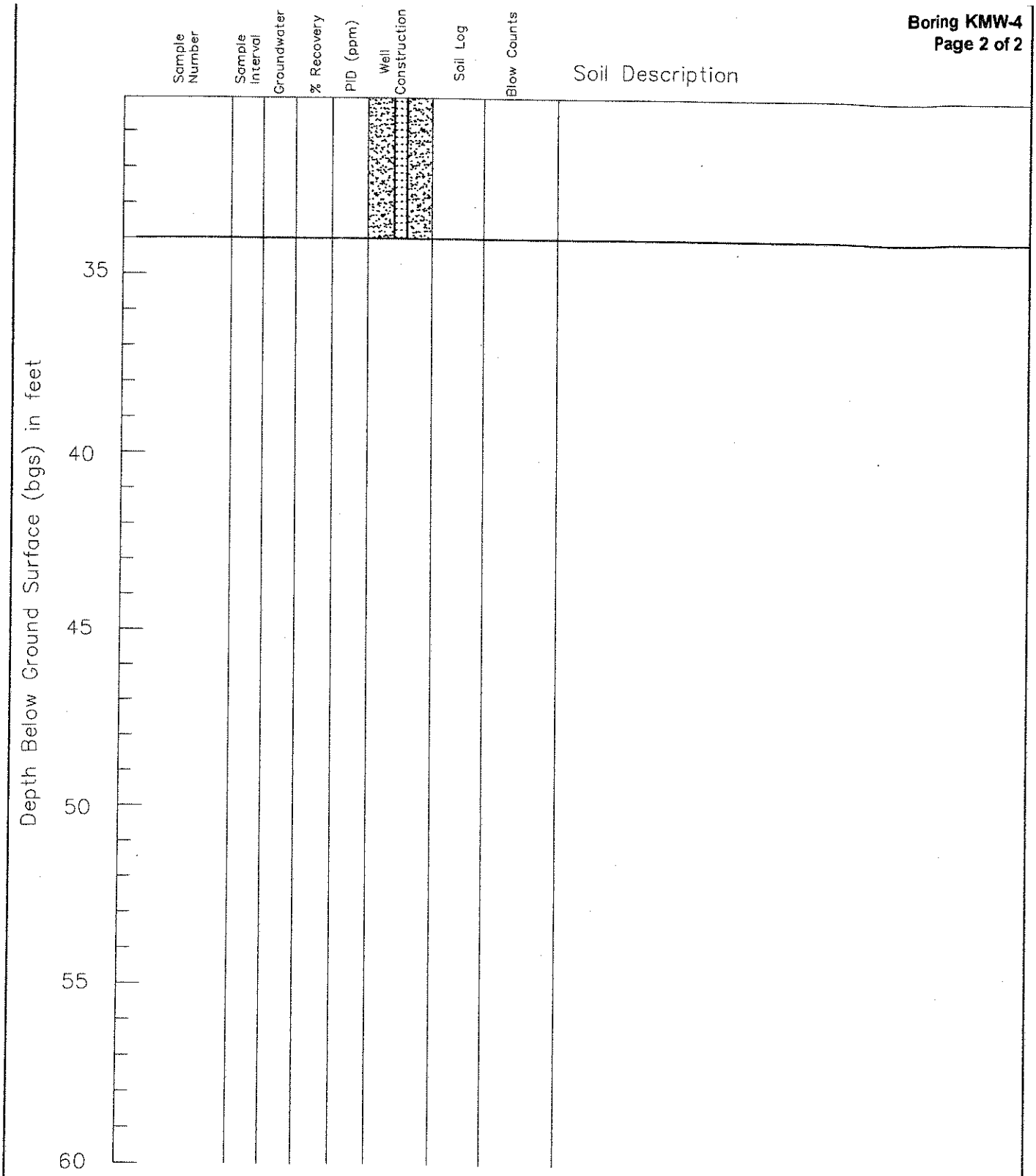
Key:
Concrete:
Bentonite
Silica sand
Screen

Soils classified visually using the Unified Soils Classification System

KANE ENVIRONMENTAL INC
3831 Stone Way N, Seattle, WA - 206-691-0476
www.kane-environmental.com

Harris Property
Off-site Well Instalation
Normandy Park, Washington

Soil Boring Log



Logged by: Cyrus Gorman
Driller: Cascade Drilling
Drilling Method: Hollow-stem auger
Sampling Method: Split spoon
Casing Type: Not Applicable (NA)
Annular Pack: NA
Slot Size: 0.1 inch

Hammer Size: 140 lb
Date Drilled: 03/28/07
Hole Diameter: 5/4 inch
Hole Depth: 34 feet
Well Diameter: 2 inches
Well Depth: 34 feet
Screened Interval: 24ft-34ft

Depth to Water (First Encountered): ~27 feet
Depth to Water (Static): NA

Key:
Concrete:
Bentonite
Silico sand
Screen

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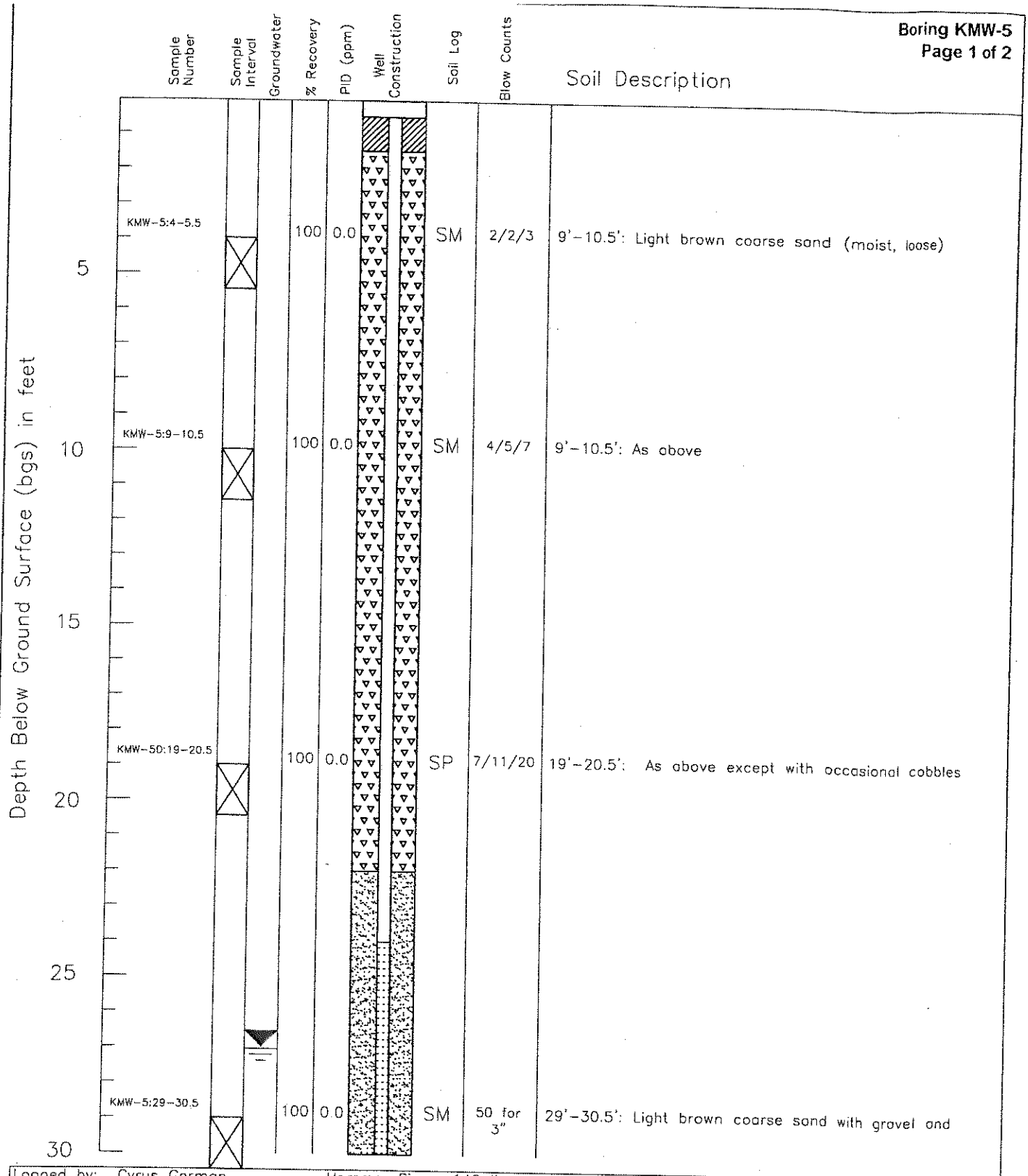

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Concrete:
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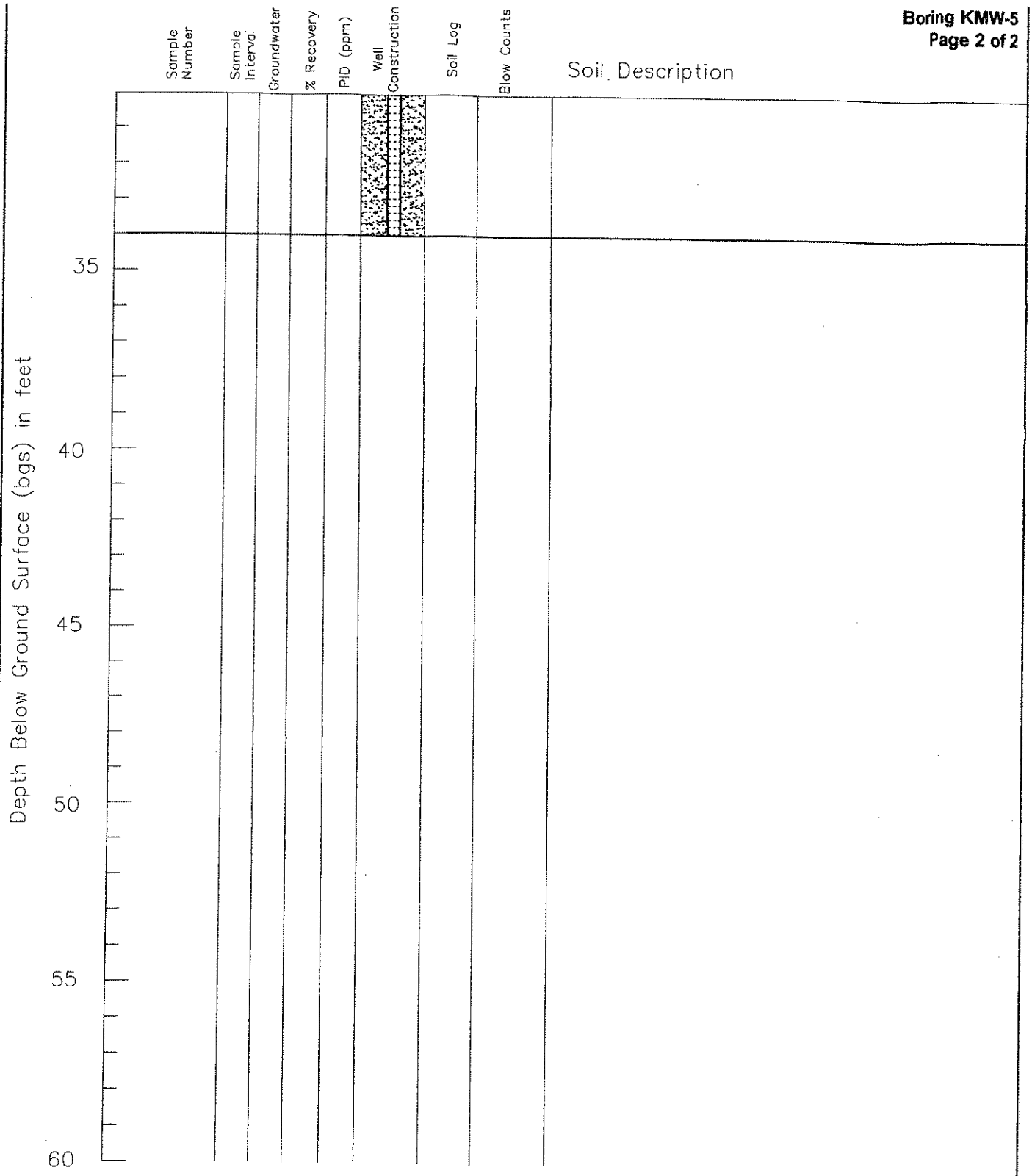
Soil Boring Log



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Annular Pack: NA
Slot Size: 0.1 inch

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Hole Depth: 34 feet
Well Diameter: 2 inches
Well Depth: 34 feet
Screened Interval: 24ft-34ft

Depth to Water (First Encountered): ~27 feet
Depth to Water (Static): NA

Key:
Concrete:
Bentonite
Silica sand
Screen

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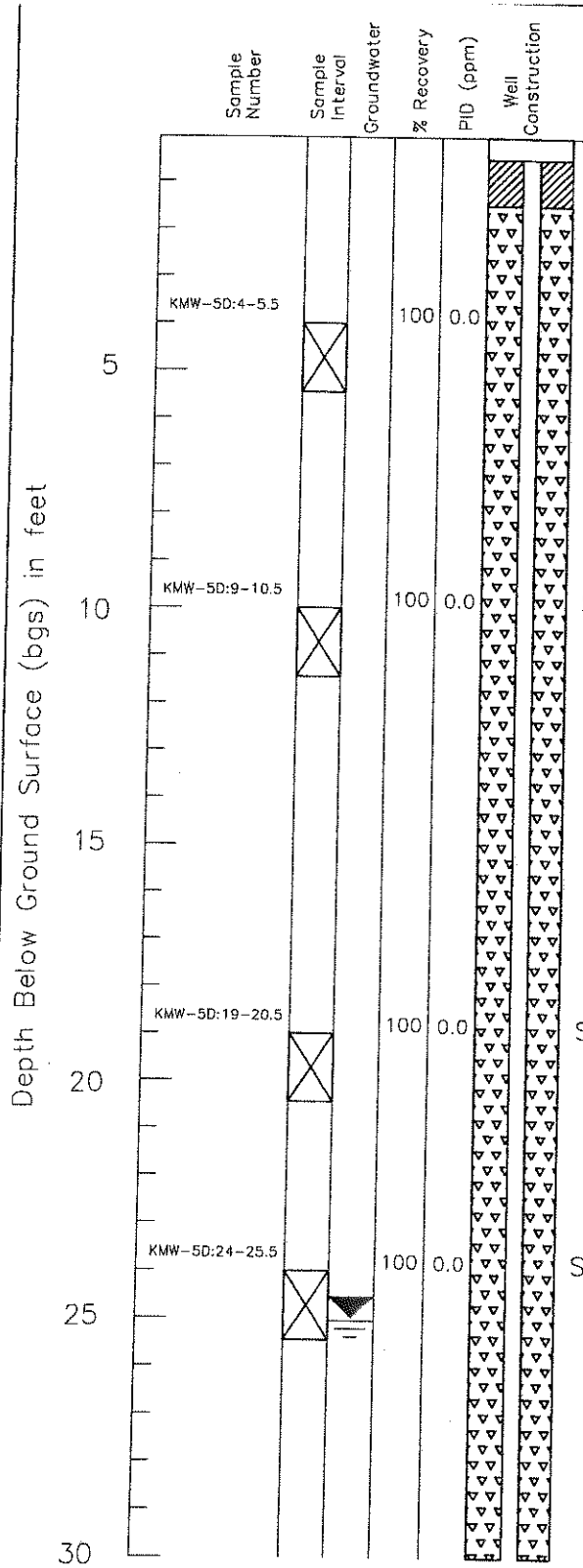
Soil Boring Log



Logged by: Cyrus Gorman
Driller: Cascade Drilling
Drilling Method: Hollow-stem auger
Sampling Method: Split spoon
Casing Type: Not Applicable (NA)
Annular Pack: NA
Slot Size: NA

Hammer Size: 140 lb
Date Drilled: 03/28/07
Hole Diameter: 5/4 inch
Hole Depth: 46 feet
Well Diameter: 2 inches
Well Depth: 46 feet
Screened Interval: 41ft-46ft

Depth to Water (First Encountered): ~25 feet
Depth to Water (Static): NA

Key:
Concrete:
Bentonite
Silica sand
Screen

Soils classified visually using the Unified Soils Classification System

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Harris Property
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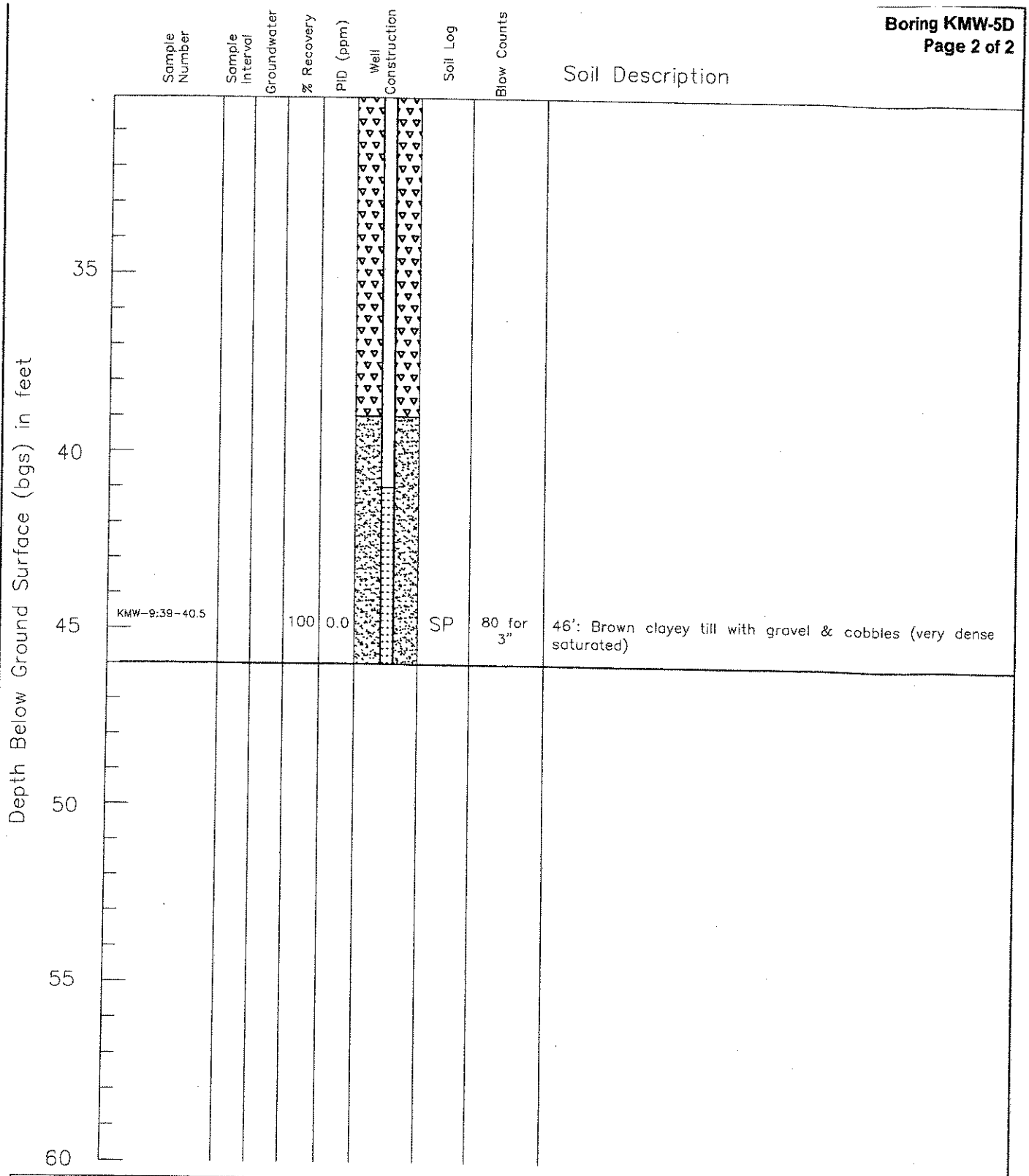
Normandy Park, Washington

Soil Boring Log



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Sampling Method: Split spoon
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Hammer Size: 140 lb
Date Drilled: 03/28/07
Hole Diameter: 5/4 inch
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Well Diameter: 2 inches
Well Depth: 46 feet
Screened Interval: 41ft-46ft

Depth to Water (First Encountered): ~25 feet
Depth to Water (Static): NA

Key:
Concrete:
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Silica sand
Screen

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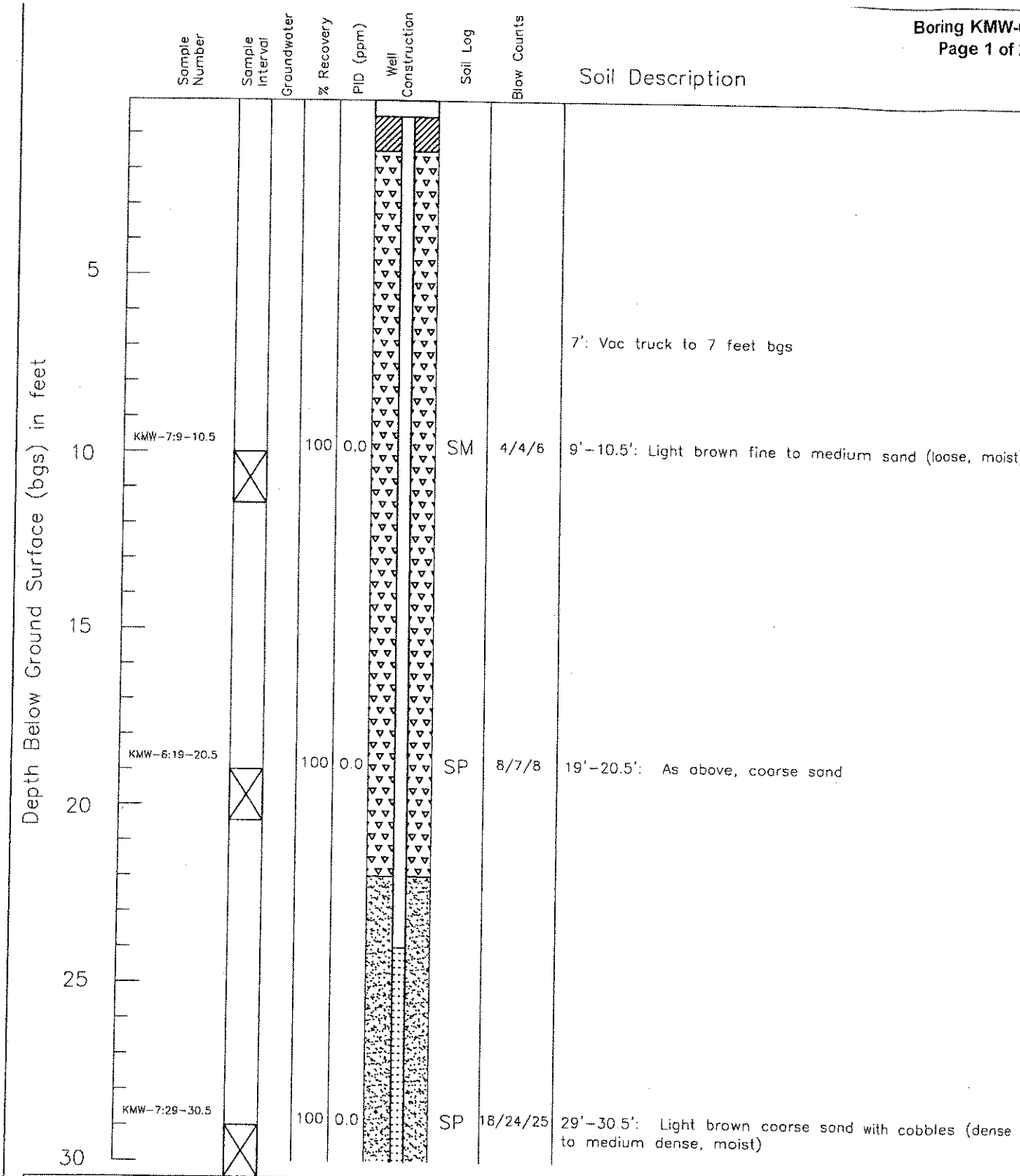
Normandy Park, Washington

Soil Boring Log



Logged by: Cyrus Gorman
Driller: Cascade Drilling
Drilling Method: Hollow-stem auger
Sampling Method: Split spoon
Casing Type: Not Applicable (NA)
Annular Pack: NA
Slot Size: NA

Hammer Size: 140 lb
Date Drilled: 03/27/07
Hole Diameter: 5/4 inch
Hole Depth: 42.5 feet
Well Diameter: 2 inches
Well Depth: 41 feet
Screened Interval: 29ft-44ft

Depth to Water (First Encountered): ~35 feet
Depth to Water (Static): NA

Key:
Concrete:
Bentonite
Silica sand
Screen

Soils classified visually using the Unified Soils Classification System

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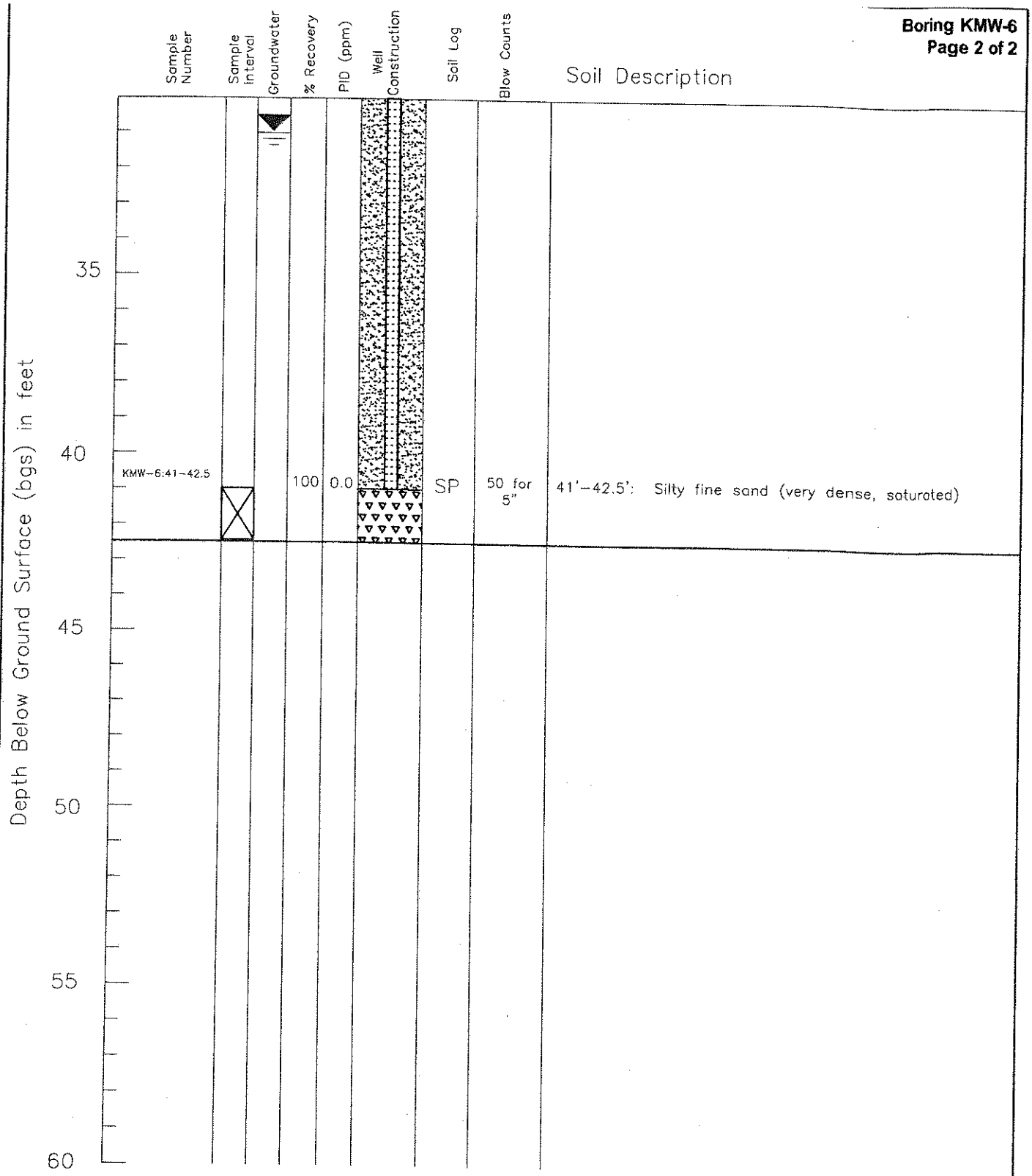
Harris Property
Off-site Well Instalation
Normandy Park, Washington

Soil Boring Log



Logged by: Cyrus Gorman
Driller: Cascade Drilling
Drilling Method: Hollow-stem auger
Sampling Method: Split spoon
Casing Type: Not Applicable (NA)
Annular Pack: NA
Slot Size: 0.1 inch

Hammer Size: 140 lb
Date Drilled: 03/26/07
Hole Diameter: 5/4 inch
Hole Depth: 44 feet
Well Diameter: 2 inches
Well Depth: 44 feet
Screened Interval: 29ft-44ft

Depth to Water (First Encountered): ~35 feet
Depth to Water (Static): NA

Key:
Concrete:
Bentonite
Silica sand
Screen

Soils classified visually using the Unified Soils Classification System

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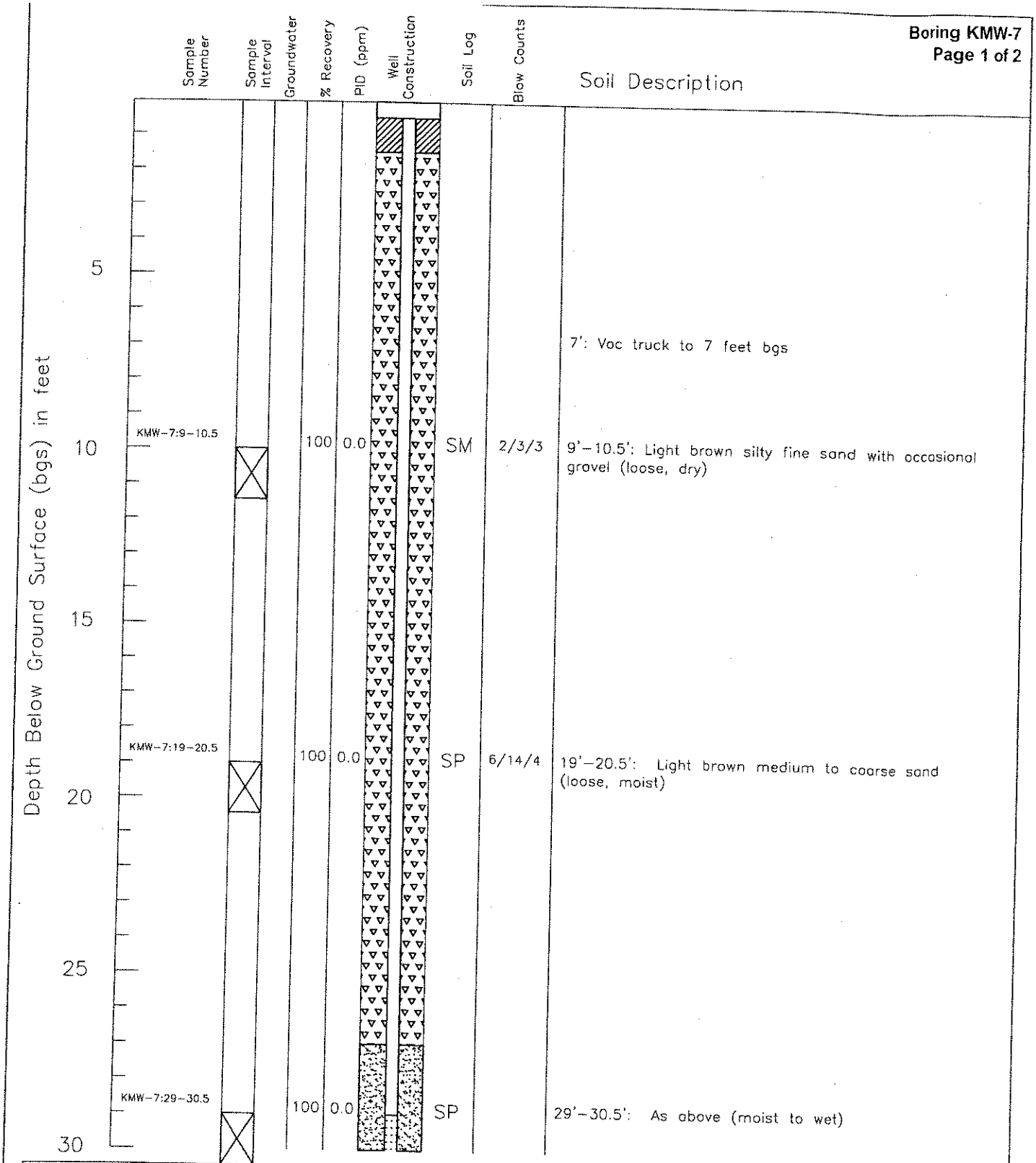
Soil Boring Log



Logged by: Cyrus Gorman
Driller: Cascade Drilling
Drilling Method: Hollow-stem auger
Sampling Method: Split spoon
Casing Type: Not Applicable (NA)
Annular Pack: NA
Slot Size: NA

Hammer Size: 140 lb
Date Drilled: 03/26/07
Hole Diameter: 5/4 inch
Hole Depth: 44 feet
Well Diameter: 2 inches
Well Depth: 44 feet
Screened Interval: 29ft-44ft

Depth to Water (First Encountered): ~35 feet
Depth to Water (Static): NA

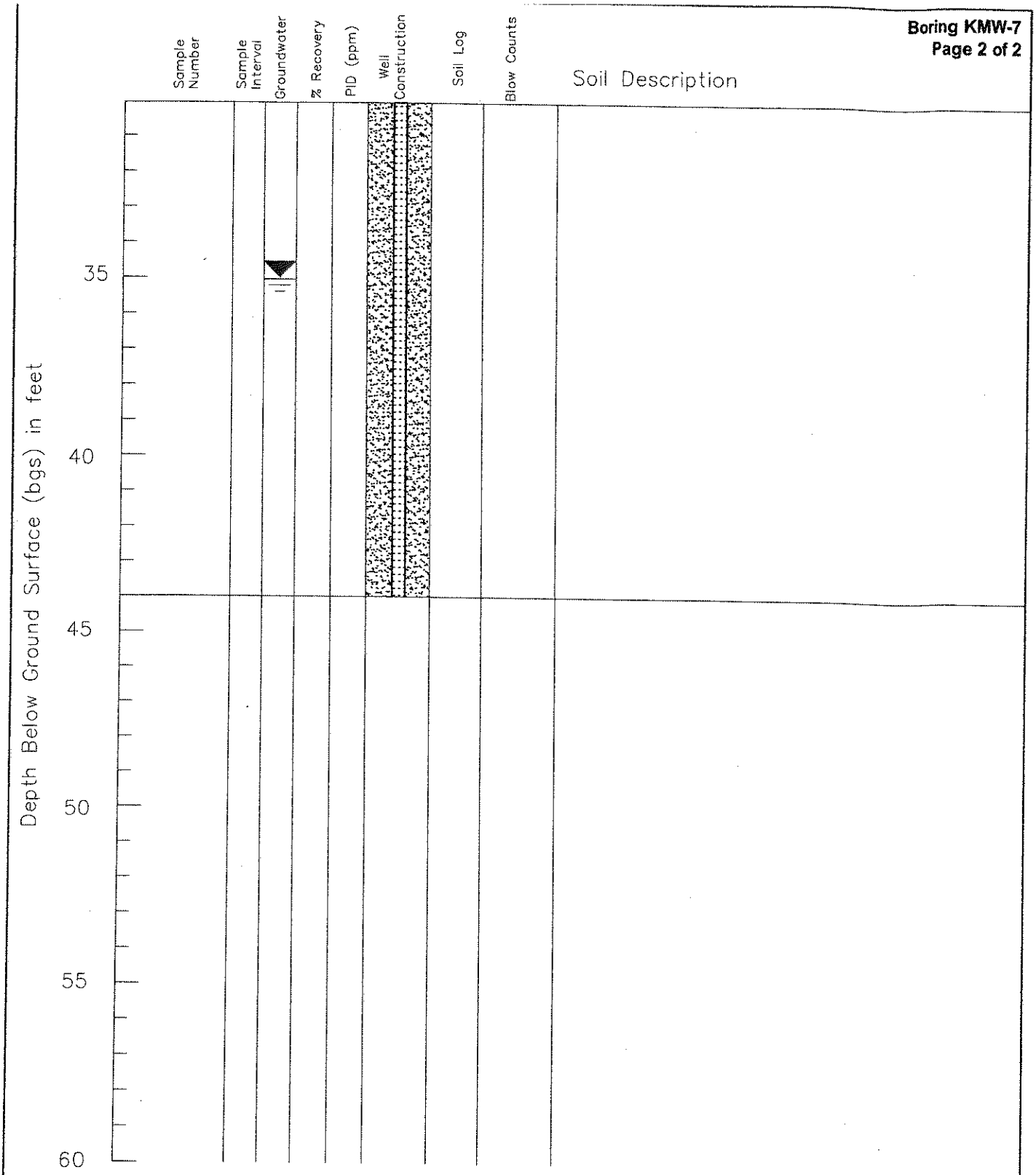
Key:
Concrete:
Bentonite
Silica sand
Screen

Soils classified visually using the Unified Soils Classification System

KANE ENVIRONMENTAL INC
3631 Stone Way N, Seattle, WA - 206-691-0476
www.kane-environmental.com

Harris Property
Off-site Well Instalation
Normandy Park, Washington

Soil Boring Log



Logged by: Cyrus Gormon
Driller: Cascade Drilling
Drilling Method: Hollow-stem auger
Sampling Method: Split spoon
Casing Type. Not Applicable (NA)
Annular Pack: NA
Slot Size: 0.1 inch

Hammer Size: 140 lb
Date Drilled: 03/26/07
Hole Diameter: 5/4 inch
Hole Depth: 44 feet
Well Diameter: 2 inches
Well Depth: 44 feet
Screened Interval: 29ft-44ft

Depth to Water (First Encountered): ~35 feet
Depth to Water (Static): NA

Key:
Concrete:
Bentonite
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Screen

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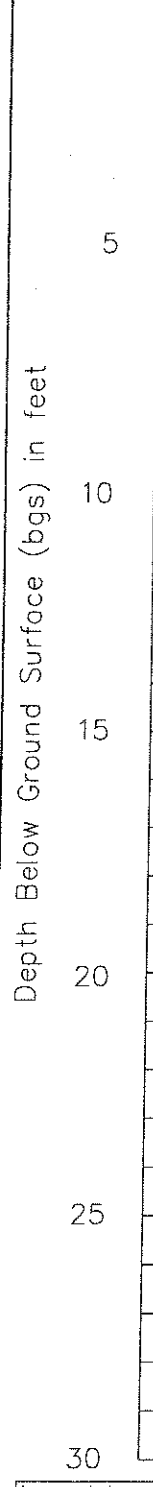

Sample Number	Sample Interval	Groundwater	% Recovery	PID (ppm)	Well Construction	Soil Log	Blow Counts	Soil Description
KMW-9:1-1.5			100	0.0		SM	3/4/6	9'-10.5': Light brown silty fine sand (loose, moist)
KMW-9:4-5.5			100	0.0		SM	1/2/3	9'-10.5': Light brown clay (stiff, moist)
KMW-7:9-10.5			100	0.0		SM	3/4/4	9'-10.5': Light brown fine sand (loose, moist)
KMW-9:14-15.5			100	0.0		SM	6/9/12	9'-10.5': As above
KMW-9:19-20.5			100	0.0		SP	6/8/18	19'-20.5': As above with except with gravel and cobbles (dense, moist)
KMW-9:24-25.5			100	0.0		SM	50 for 2"	24'-25.5': As above
KMW-9:29-30.5			100	0.0		SP	22/23/24	29'-30.5': As above

Logged by: Cyrus Gorman
Driller: Cascade Drilling
Drilling Method: Hollow-stem auger
Sampling Method: Split spoon
Casing Type: Not Applicable (NA)
Annular Pack: NA
Slot Size: NA
Soils classified visually using the Unified Soils Classification System

Hammer Size: 140 lb
Date Drilled: 03/27/07
Hole Diameter: 5/4 inch
Hole Depth: 44 feet
Well Diameter: 2 inches
Well Depth: 44 feet
Screened Interval: 34ft-44ft

Depth to Water (First Encountered): ~35 feet
Depth to Water (Static): NA

Key:
Concrete:
Bentonite
Silica sand
Screen

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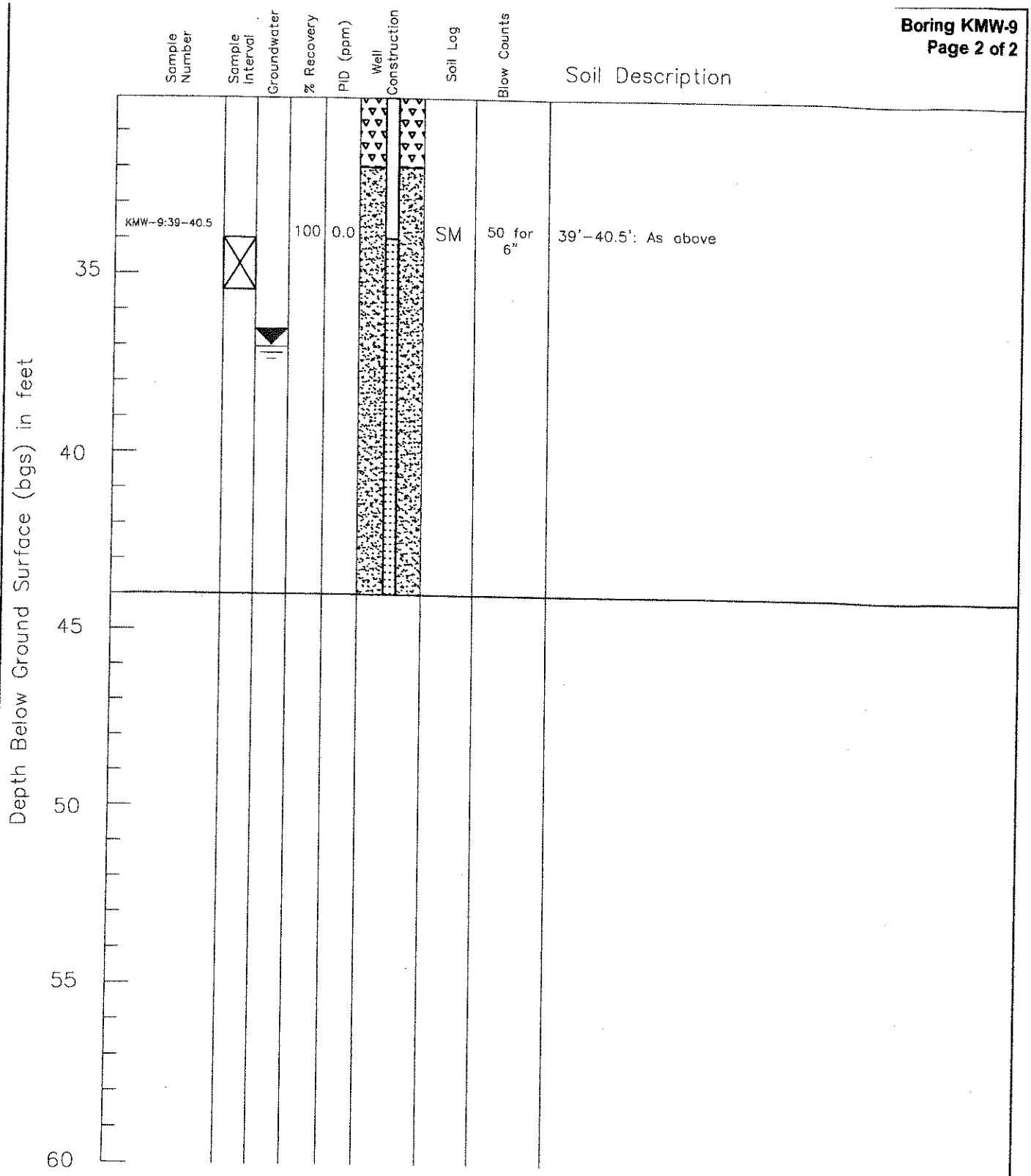
Harris Property
Off-site Well Instalation
Normandy Park, Washington

Soil Boring Log



Logged by: Cyrus Gorman
Driller: Cascade Drilling
Drilling Method: Hollow-stem auger
Sampling Method: Split spoon
Casing Type: Not Applicable (NA)
Annular Pack: NA
Slot Size: 0 1 inch

Hammer Size: 140 lb
Date Drilled: 03/27/07
Hole Diameter: 5/4 inch
Hole Depth: 44 feet
Well Diameter: 2 inches
Well Depth: 44 feet
Screened Interval: 34ft-44ft

Depth to Water (First Encountered): ~37 feet
Depth to Water (Static): NA

Key:
Concrete:
Bentonite
Silica sand
Screen

Soils classified visually using the Unified Soils Classification System

KANE ENVIRONMENTAL INC
3831 Stone Way N, Seattle, WA - 206-691-0476
www.kane-environmental.com

Harris Property
Off-site Well Installation
Normandy Park, Washington

Soil Boring Log

BORING/MONITORING WELL LOG

ADaPT Engineering, Inc.
800 Maynard Avenue South, Suite 403
SEATTLE, WASHINGTON 98134
TEL: 206.654.7045 FAX: 206.654.7048

PROJECT : Dr. Harris Property
17821 1st Avenue
Normandy Park, Washington

Job Number : WA99-2329-1

Boring No. : MW-1

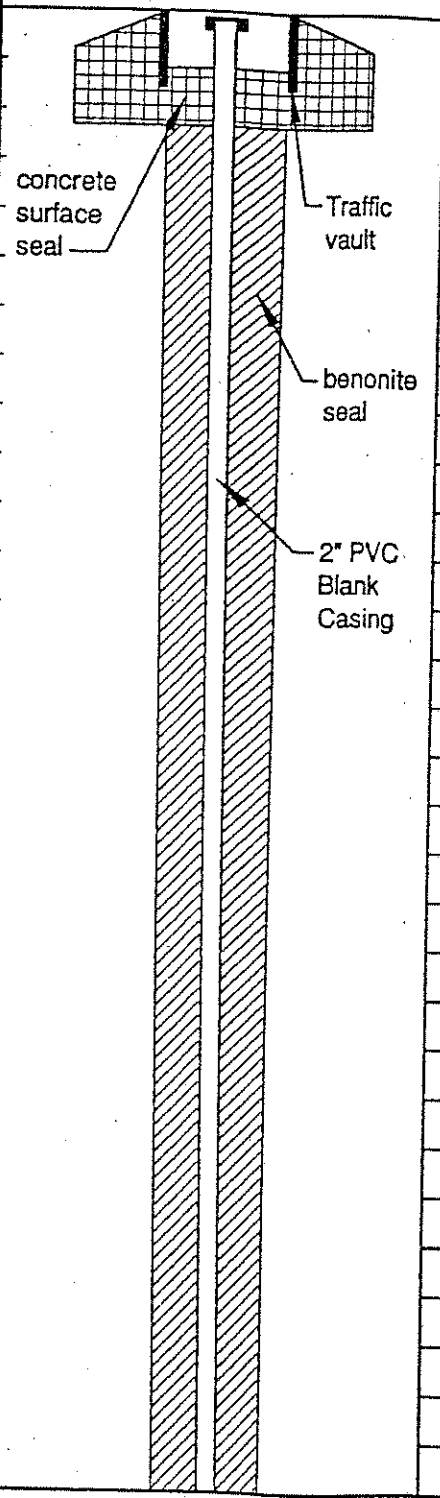
Monitoring Well No.: MW-1

Elevation Reference : N/A
Ground Surface Elevation : N/A

Well Completed : N/A
Casing Elevation : N/A

DEPTH (feet)		SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	OVM READING	GROUND WATER
0	Loose, moist to very moist, light brown, silty fine SAND					
			MW1 5	3 5 7	2.4	
5						
	Loose, moist, light brown, fine SAND with silt					
			MW1 10	6 7 11	3.6	
10						
	Medium dense, damp to moist, brown/gray fine coarse SAND					
			MW1 15	15 21 27	3.3	
15						
	As above					
			MW1 20	21 28 31	3.1	
20						
	Becomes dense gavelly SAND					
			MW1 25	15 28 44	3.1	
25						
	As above					
			MW1 30	19 26 41	3.5	
30						

AS-BUILT DESIGN



TESTING

LEGEND

- 2-inch O. D. Split-Spoon Sample
- 1" Geoprobe
- Sample not Recovered
- DATE — Static Water Level at Drilling
- DATE — Static Water Level
- Perched Groundwater
- Grab Sample
- WTPH-D ext. — Type of Analytical Testing Used
- NR — No Recovery

BORING/MONITORING WELL LOG

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Job Number : WA99-2329-1

Boring No. : MW-1

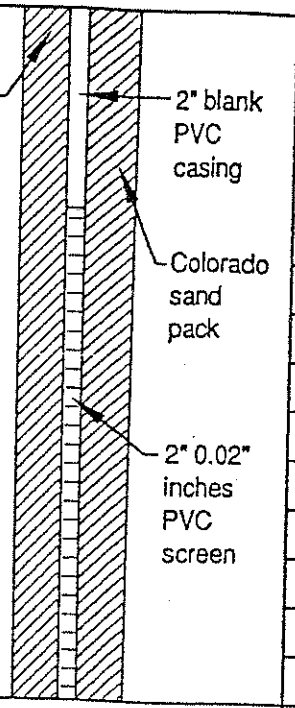
Monitoring Well No.: MW-1

Elevation Reference : N/A
Ground Surface Elevation : N/A

Well Completed : N/A
Casing Elevation : N/A

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	OVM READING	GROUND WATER	AS-BUILT DESIGN	TESTING
30							
No recovery cobble in shoe							
35							
As above		MW1 39		36	12/9 1999		
40							
As above							
		MW1 44		3.5			
45 End of boring at 44 feet							
Groundwater at ~37 feet							
50							
55							
60							

AS-BUILT DESIGN



LEGEND

- 2-inch O. D. Split-Spoon Sample
- 1" Geoprobe
- Sample not Recovered
- DATE — Static Water Level at Drilling
- DATE — Static Water Level
- Perched Groundwater
- Grab Sample
- WTPH-G Bx, 8010 — Type of Analytical Testing Used
- NR — No Recovery

BORING/MONITORING WELL LOG

ADaPT Engineering, Inc.
800 Maynard Avenue South, Suite 403
SEATTLE, WASHINGTON 98134
TEL: 206.654.7045 FAX: 206.654.7048

PROJECT : Dr. Harris Property
17821 1st Avenue
Normandy Park, Washington

Job Number : WA99-2329-1

Boring No. : MW-2

Monitoring Well No.: MW-2

Elevation Reference : N/A
Ground Surface Elevation : N/A

Well Completed : N/A
Casing Elevation : N/A

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	OVM READING	GROUND WATER	AS-BUILT DESIGN	TESTING
0							
		MW2 4		X			
5							
		MW2 9		X			
10							
		MW2 14		X			
15							
		MW2 19		X			
20							
		MW2 24		X			
25							
		MW2 29		X			
30							

Loose, moist, light brown, silty fine SAND

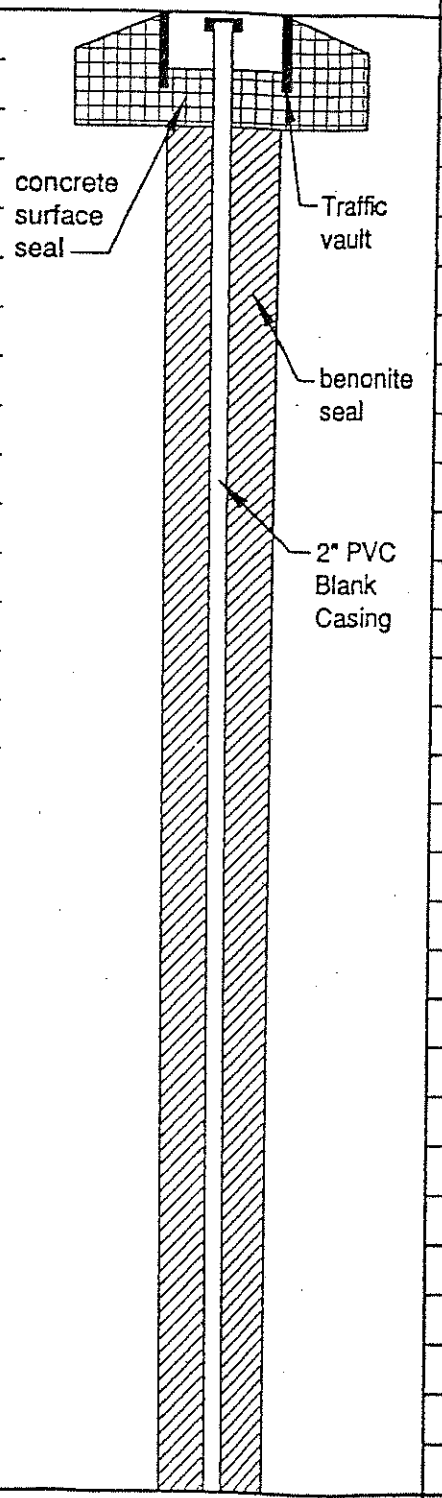
Loose, moist, light brown to brown, fine SAND with silt

As above increasing density, less moisture

Medium dense, damp, brown, fine coarse SAND with gravel

Medium dense, brown, sandy SILT

Medium dense, damp, brown, gravelly SAND



LEGEND

- 2-Inch O. D. Split-Spoon Sample
- 1" Geoprobe
- Sample not Recovered
- DATE — Static Water Level at Drilling
- DATE — Static Water Level
- Perched Groundwater
- Grab Sample
- WTPH-D Ext. 8015 — Type of Analytical Testing Used
- NR — No Recovery

BORING/MONITORING WELL LOG

ADaPT Engineering, Inc.
800 Maynard Avenue South, Suite 403
SEATTLE, WASHINGTON 98134
TEL: 206.654.7045 FAX: 206.654.7048

PROJECT : Dr. Harris Property
17821 1st Avenue
Normandy Park, Washington

Job Number : WA99-2329-1

Boring No. : MW-2

Monitoring Well No.: MW-2

Elevation Reference : N/A
Ground Surface Elevation : N/A

Well Completed : N/A
Casing Elevation : N/A

DEPTH (feet)		SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNT	OVM READING	GROUND WATER	AS-BUILT DESIGN	TESTING
30	becomes moist		MW2 34		3X		Bentonite seal; 2" blank PVC casing; Colorado sand pack; 2" 0.02" inches PVC screen	
35	As above		MW2 39		X			
40	As above		MW2 43		X			
45	End of boring at 43 feet Groundwater at ~35 feet *PID Technical mal function with readings							
50								
55								
60								

LEGEND

- 2-Inch O. D. Split-Spoon Sample
- 1" Geoprobe
- Sample not Recovered
- DATE — Static Water Level at Drilling
- DATE — Static Water Level
- Perched Groundwater
- Grab Sample
- WTPH-D Ext. 8015 — Type of Analytical Testing Used
- NR — No Recovery

A-A'

ERM
915 118th Avenue SE, Suite 130
Bellevue, WA 98005
Phone: (425) 462-8591
Fax: (425) 4553573

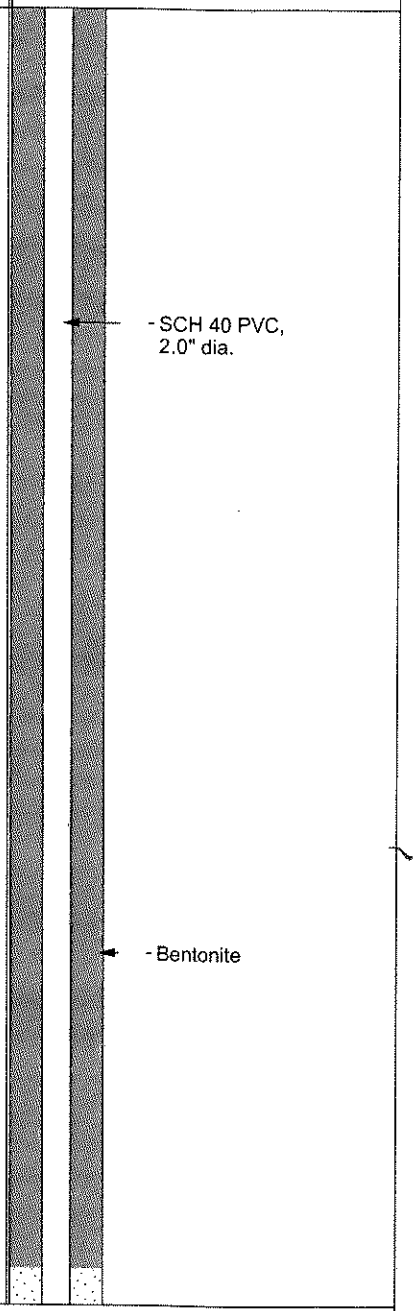
LOG OF MONITORING WELL: MW-3

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Hollow Stem Auger
Logged By: K. Knesek

Date Started: 4/8/2008
Date Completed: 4/8/2008
Total Depth: 47 feet
Borehole Diameter: 4.0"
Initial Water Level: 40 feet bgs
Notes:

Depth (ft)	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Description and Observations
				No recovery.
5	SM			SILTY SAND (SM): light brown, fine to medium sand, trace silt.
10				
	SP			GRAVELLY SAND (SP): light brown, fine to medium sand.
15	SM			SAND WITH SILT (SM): light brown, fine to medium sand, with 1.0-2.0" thick silt lenses.
20				
				SILTY SAND (SM): fine to medium sand, some silt.
25				SILTY SAND (SM): fine to medium sand, trace silt.
				SAND WITH SILT (SM): fine to medium sand, with tan silt beds.
30	SP		27-50	SAND (SP): light brown, fine to medium sand, some silt increasing with depth, damp
	SW		50	GRAVELLY SAND (SW): fine to medium sand, gravel decreasing with depth.

WELL DIAGRAM



MW2 TO 40 FT BV - - 11/21/08 16:23 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY PARK.GPJ

ERM
915 118th Avenue SE, Suite 130
Bellevue, WA 98005
Phone: (425) 462-8591
Fax: (425) 4553573

LOG OF MONITORING WELL: MW-3

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Hollow Stem Auger
Logged By: K. Knesek

Date Started: 4/8/2008
Date Completed: 4/8/2008
Total Depth: 47 feet
Borehole Diameter: 4.0"
Initial Water Level: 40 feet bgs
Notes:

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Description and Observations	WELL DIAGRAM
		SP		17-50	SAND (SP): fine to medium sand, some silt, some gravel, moist.	
				17-50	SAND (SP): brown, fine sand, trace gravel, very dense, moist.	
40		▽		27-50	SAND (SP): brown, fine sand, very dense, wet.	0.010" Slotted Screen, 2.0" dia.
		SW		50	GRAVELLY SAND (SW): brown, fine sand, very dense, wet.	Silica Sand
45		SP		50	SAND (SP): brown, fine to medium sand, very dense, wet.	
					SAND (SP): brown, fine to medium sand, trace gravel, very dense, wet.	
					Total Depth - 47 feet bgs	
50						
55						
60						
65						

MW2 TO 40 FT BV - - 11/21/08 16:23 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY PARK.GPJ

ERM
915 118th Avenue SE, Suite 130
Bellevue, WA 98005
Phone: (425) 462-8591
Fax: (425) 4553573

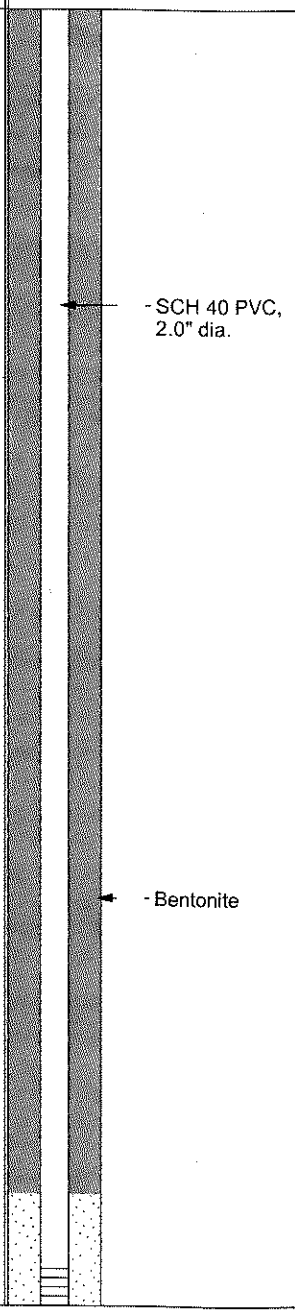
LOG OF MONITORING WELL: MW-4

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Hollow Stem Auger
Logged By: K. Knesek

Date Started: 4/8/2008
Date Completed: 4/8/2008
Total Depth: 44 feet
Borehole Diameter: 4.0"
Initial Water Level: 38 feet bgs
Notes:

Depth (ft)	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Description and Observations
				No recovery.
5	SP			SAND (SP): reddish brown, fine to medium sand, some gravel.
10	ML			SILT (ML): light brown.
	SM			SILTY SAND (SM): brown, fine to medium sand, trace gravel.
15				SILTY SAND (SM): grayish brown, fine to medium sand, trace silt.
20	SP			SAND (SP): gray, fine to medium grained, trace gravel.
25				GRAVELLY SAND (SP): light gray, fine to medium sand, trace silt.
	SM			SILTY SAND (SM): light gray, fine to medium sand.
30	SP		16-20-27 (47)	GRAVELLY SAND (SP): brown, fine to medium sand, hard, moist.
	SM		22-50	FINE SAND (SM): brown, fine sand, trace silt, increasing gravel with depth, very hard, moist.

WELL DIAGRAM



MW2 TO 40 FT BV - - 11/21/08 16:25 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY PARK.GPJ

ERM
915 118th Avenue SE, Suite 130
Bellevue, WA 98005
Phone: (425) 462-8591
Fax: (425) 4553573

LOG OF MONITORING WELL: MW-4

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Hollow Stem Auger
Logged By: K. Knesek

Date Started: 4/8/2008
Date Completed: 4/8/2008
Total Depth: 44 feet
Borehole Diameter: 4.0"
Initial Water Level: 38 feet bgs
Notes:

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Description and Observations	WELL DIAGRAM
40		SP			SAND (SP): brown, fine grained, very hard, damp.	
				50		
		SP ▽		22-50	SAND (SP): brown, fine to medium grained, some gravel, very hard, wet.	0.010" Slotted Screen, 2.0" dia.
				24-50	GRAVELLY SAND (SP): fine to medium sand, very hard, wet.	Silica Sand
45					Total Depth - 44 feet bgs	
50						
55						
60						
65						

MW2 TO 40 FT BV - - 11/21/08 16:25 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY PARK.GPJ

ERM
915 118th Avenue SE, Suite 130
Bellevue, WA 98005
Phone: (425) 462-8591
Fax: (425) 4553573

LOG OF MONITORING WELL: MW-5

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Hollow Stem Auger
Logged By: K. Knesek

Date Started: 4/8/2008
Date Completed: 4/8/2008
Total Depth: 46 feet
Borehole Diameter: 4.0"
Initial Water Level: 40 feet bgs
Notes:

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Description and Observations	WELL DIAGRAM
					Vacuum cleared.	
5		SP		10-16-19 (35)	SAND (SP): brown, fine to medium grained, hard, dry.	
				8-12-16 (28)	SAND (SP): brown, fine grained, increasing silt, hard, damp.	SCH 40 PVC, 2.0" dia.
10				12-16-22 (38)	SAND (SP): brown, fine grained, increasing gravel, moist.	
				24-50	SAND (SP): brown, fine to medium grained, very hard, moist.	
15				31-50	SAND (SP): brown, fine to medium grained, increasing gravel, very hard, moist.	
				32-50	SAND (SP): dark brown, fine to medium grained, trace gravel, very hard, moist.	
20				19-50	SAND (SP): dark brown, fine to medium grained, very hard, moist.	
				35-50	SAND (SP): dark brown, fine to medium grained, increasing gravel, very hard, damp.	
25				12-17-50 (67)	SAND (SP): dark brown, fine to medium grained, trace silt, very hard, damp.	Bentonite
				50	GRAVELLY SAND (SP): dark brown, fine to medium grained, damp.	
30				50	GRAVELLY SAND (SP): dark brown, fine to medium grained, very hard, moist.	
				12-50	GRAVELLY SAND (SP): dark brown, fine to medium grained, very hard, wet.	
				50	GRAVELLY SAND (SP): dark brown, fine to medium grained,	

MW2 TO 40 FT BV - - 11/21/08 16:21 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY PARK.GPJ

ERM
915 118th Avenue SE, Suite 130
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Phone: (425) 462-8591
Fax: (425) 4553573

LOG OF MONITORING WELL: MW-5

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Hollow Stem Auger
Logged By: K. Knesek

Date Started: 4/8/2008
Date Completed: 4/8/2008
Total Depth: 46 feet
Borehole Diameter: 4.0"
Initial Water Level: 40 feet bgs
Notes:

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Description and Observations	WELL DIAGRAM
					very hard, moist.	
				50	GRAVELLY SAND (SP): dark brown, fine to medium grained, very hard, moist.	
40		▽			GRAVELLY SAND (SP): dark brown, fine to medium grained, wet.	- 0.010" Slotted Screen, 2.0" dia.
				50	GRAVELLY SAND (SP): dark brown, fine to medium grained, very hard, wet.	- Silica Sand
45				50	GRAVELLY SAND (SP): dark brown, fine to medium grained, wet.	
					Total Depth - 46 feet bgs	
50						
55						
60						
65						

MW2 TO 40 FT BV - - 11/21/08 16:21 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY PARK.GPJ

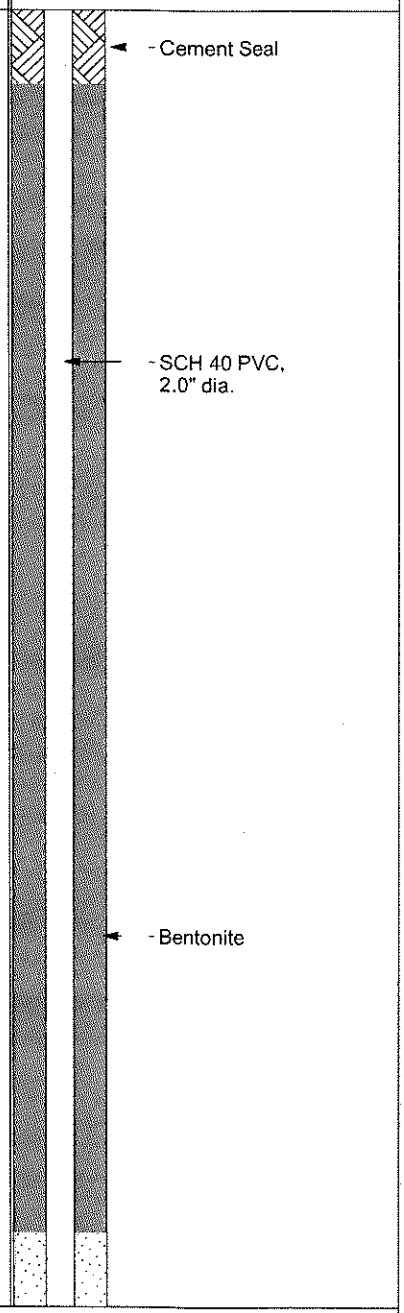
ERM
915 118th Avenue SE, Suite 130
Bellevue, WA 98005
Phone: (425) 462-8591
Fax: (425) 4553573

LOG OF MONITORING WELL: MW-6

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Hollow Stem Auger
Logged By: K. Knesek

Date Started: 4/9/2008
Date Completed: 4/9/2008
Total Depth: 45 feet
Borehole Diameter: 4.0"
Initial Water Level: 39 feet bgs
Notes:

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Description and Observations
					Vacuum cleared.
5		SM		6-8-9 (17)	FINE SAND (SM): light brownish red, very fine sand, some silt, dry.
				9-10-10 (20)	FINE SAND (SM): grayish brown, very fine to fine sand, some silt lenses, dry.
10				5-7-10 (17)	SILTY SAND (SM): brown, very fine sand, some organics, trace gravel, moist.
				50	SILTY SAND (SM): brown, very fine sand, trace gravel, moist.
15				12-15-19 (34)	SILTY SAND (SM): brown, very fine sand, moist.
				5-7-7 (14)	SILTY SAND (SM): grayish brown, very fine sand, some silt, moist.
20				8-14-12 (26)	SILTY SAND (SM): grayish brown, very fine sand, some silt, damp.
				50	FINE SAND (SM): gray, very fine sand, trace silt, moist.
25		SP		27-50	SAND (SP): gray, fine grained, very hard, moist.
				17-23-27 (50)	SAND (SP): grayish brown, fine grained, trace gavel and silt.
30				12-50	SAND (SP): grayish brown, fine grained, trace gravel.
				15-26-30 (56)	SAND (SP): brown, fine grained, silt lense (4.0" thick), trace gravel, damp.
				50	SAND (SP): gray, fine grained, trace gravel, moist.



WELL DIAGRAM

MW2 TO 40 FT BV - - 11/21/08 16:17 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY PARK.GPJ

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915 118th Avenue SE, Suite 130
Bellevue, WA 98005
Phone: (425) 462-8591
Fax: (425) 4553573

LOG OF MONITORING WELL: MW-6

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Hollow Stem Auger
Logged By: K. Knesek

Date Started: 4/9/2008
Date Completed: 4/9/2008
Total Depth: 45 feet
Borehole Diameter: 4.0"
Initial Water Level: 39 feet bgs
Notes:

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Description and Observations	WELL DIAGRAM
40				50	SAND (SP): gray, fine to medium sand, very hard, moist.	- 0.010" Slotted Screen, 2.0" dia.
		▽		50	GRAVELLY SAND (SP): grayish brown, fine to medum sand, very hard, wet.	
				50	GRAVELLY SAND (SP): grayish brown, fine to medium sand, very hard, wet.	- Silica Sand
45					Total Depth - 45 feet bgs	
50						
55						
60						
65						

MW2 TO 40 FT BV - - 11/21/08 16:17 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY PARK.GPJ

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Bellevue, WA 98005
Phone: (425) 462-8591
Fax: (425) 4553573

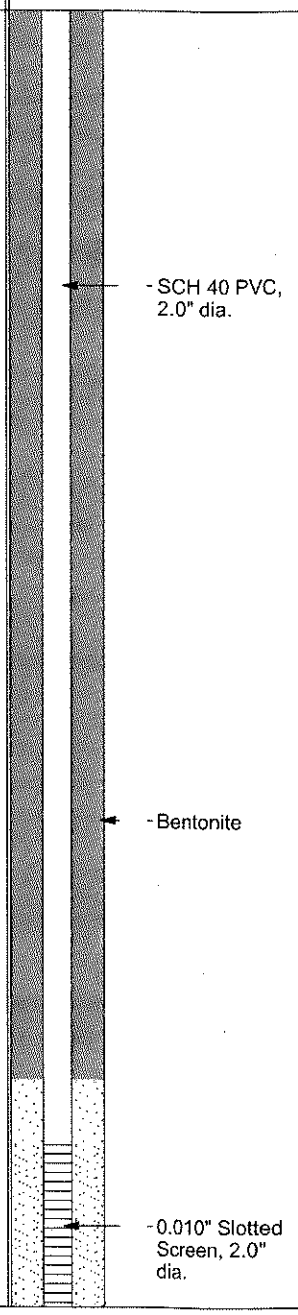
LOG OF MONITORING WELL: MW-7

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Hollow Stem Auger
Logged By: K. Knesek

Date Started: 4/9/2008
Date Completed: 4/9/2008
Total Depth: 45 feet
Borehole Diameter: 4.0"
Initial Water Level: 39 feet bgs
Notes:

Depth (ft)	USCS Code	BLOW COUNTS (N VALUE)	Soil Description and Observations
			Vacuum cleared.
5	SP	15-15-16 (31)	SAND (SP): brown, fine grained, some gravel, moist.
		8-9-7 (16)	SAND (SP): brown, fine grained, moist.
10		8-12-18 (30)	SAND (SP): brown, fine grained, grading to fine silty sand, some organics in silty sand, moist.
	SM		SILTY SAND (SM): brown, fine grained, grades to fine sand with trace gravel, moist.
		8-8-16 (24)	
15		7-8-12 (20)	SILTY SAND (SM): brown, fine sand, grades to brown silt, damp.
		8-8-13 (21)	SILTY SAND (SM): brown, fine sand, some silt lenses (0.5-1.0" thick), moist.
20	SP	10-11-12 (23)	SAND (SP): grayish brown, fine grained, grades to silty fine sand, moist.
	SM	8-9-13 (22)	SILTY SAND (SM): brown, fine grained, dry.
25		12-13-16 (29)	SILTY SAND (SM): light brown, fine grained, damp.
		10-15-13 (28)	SILTY SAND (SM): fine grained, grades to fine sand, trace silt, dry.
30	SP	17-50	SAND (SP): grayish brown, fine grained, very hard, dry.
		21-50	SAND (SP): grayish brown, fine grained, trace gravel, very hard, dry.
35		24-50	SAND (SP): grayish brown, fine grained, grades to fine gravelly brown sand, very hard, dry.
		19-50	SAND (SP): brown, fine to medium sand, very hard, moist.
		18-50	SAND (SP): brown, fine to medium grained, very hard, wet.

WELL DIAGRAM



MW2 TO 40 FT BV - - 11/21/08 16:30 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY PARK.GPJ

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Bellevue, WA 98005
Phone: (425) 462-8591
Fax: (425) 4553573

LOG OF MONITORING WELL: MW-7

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Hollow Stem Auger
Logged By: K. Knesek

Date Started: 4/9/2008
Date Completed: 4/9/2008
Total Depth: 45 feet
Borehole Diameter: 4.0"
Initial Water Level: 39 feet bgs
Notes:

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Description and Observations	WELL DIAGRAM
				50		- Silica Sand
45					Total Depth - 45 feet bgs	
50						
55						
60						
65						
70						
75						

MW2 TO 40 FT BV - - 11/21/08 16:30 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY PARK.GPJ

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Bellevue, WA 98005
Phone: (425) 462-8591
Fax: (425) 4553573

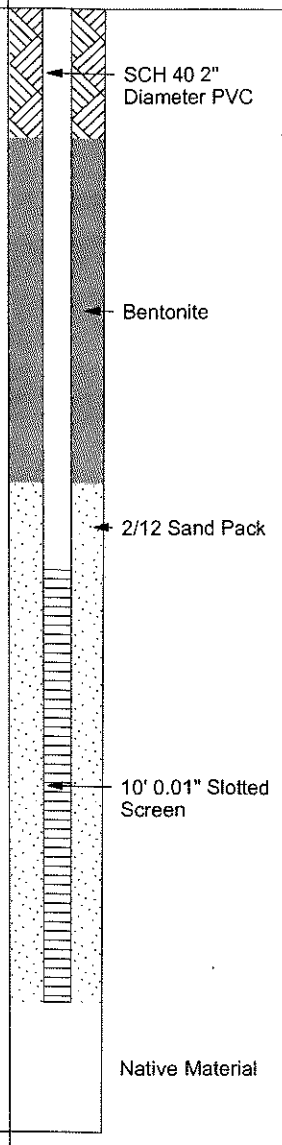
LOG OF MONITORING WELL: MW-8

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Hollow Stem Auger
Logged By: Olivia Williams

Date Started: 8/18/2008
Date Completed: 8/18/2008
Total Depth: 26 feet
Borehole Diameter: 4"
Initial Water Level: 12.78 feet bgs
Notes: Vacuum Cleared to 4' bgs.

Depth (ft)	USCS Code	Blow Counts	Soil Description and Observations
			VACUUM CLEARED. No Recovery.
5	SM	4 7 8	Brown fine silty SAND, damp.
10		7 7 11	
15	ML	7 15 17	Light brown SILT with very fine sand, trace gravel, dense, damp.
20	ML		Light grey SILT with some fine sand, dense, damp.
25	ML	8 15 17	Dark grey SILT, dense, moist.
			Total Depth - 26 feet bgs

WELL DIAGRAM



MW2 TO 40 FT BV - - 9/15/08 10:04 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY_OLW.GPJ

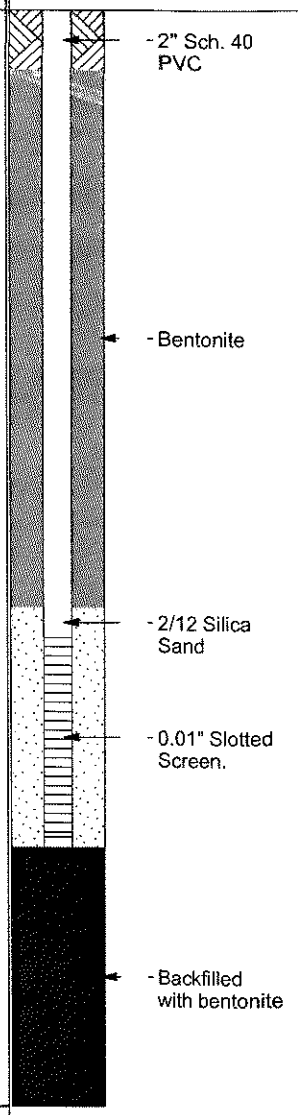
ERM
915 118th Avenue SE, Suite 130
Bellevue, WA 98005
Phone: (425) 462-8591
Fax: (425) 4553573

LOG OF MONITORING WELL: MW-9

Project Number: 0075720.00
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Hollow Stem Auger
Logged By: Olivia Williams

Date Started: 8/18/2008
Date Completed: 8/18/2008
Total Depth: 55 feet
Borehole Diameter: 4"
Initial Water Level: 32.24 feet bgs
Notes: Vacuum Cleared to 4' bgs.

Depth (ft)	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Description and Observations
				VACUUM CLEARED. NO RECOVERY.
5	SP		4-5-4 (9)	Stiff course SAND, some silt, wet.
10	SM		2-4-8 (12)	Brown very fine silty SAND, damp. Some clay from 19' bgs to 34' bgs. Wet at 32' bgs.
15			4-7-8 (15)	
20			6-7-12 (19)	
25			9-15-15 (30)	
30				
35	ML		15-16-18 (34)	Light brown dense SILT, some gravel, damp. Becomes grey and moist at 39' bgs.
40			13-15-15 (30)	
45			5-13-21 (34)	
50			9-19-21 (40)	
55			12-15-16 (31)	
60				Total Depth - 55 feet bgs



MW2 TO 40 FT BV - - 11/21/08 16:34 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY_OLW.GPJ

ERM
1218 3rd Avenue, Suite 1412
Seattle, Washington 98101
Phone: (425) 462-8591
www.erm.com

LOG OF MONITORING WELL: MW-10

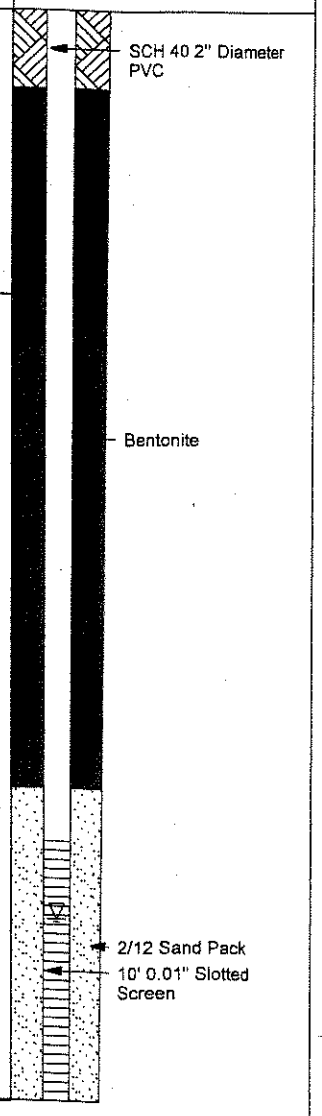
Project Number: 0123986
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Hollow Stem Auger
Logged By: Matt Crandell

Date Started: 2/3/2011
Date Completed: 2/3/2011
Total Depth: 42 feet
Borehole Diameter: 6.25"
Ground Surface Elevation: 303.21'
Initial Water Level: 35 feet bgs
Notes: Vacuum Cleared to 5' bgs.

Depth (ft)	Sample Interval	PID (ppm)	Blow Counts	USCS Code	GRAPHIC LOG	Soil Descriptions and Observations
0						Brown fine SAND with silt, moist, loose.
5			3 3 4	SM		Trace silt.
10			3 6 10			Silt, brown.
15			5 6 7	SP		Fine to medium SAND, trace gravel, light gray, loose.
20			6 7 7			Light brown, compacted fine sandy silt.
25			9 9 6			Trace gravel grading to clasts over 1". Grades to fine sand.
30			10 13 15			
35			10 15 16			
40			15 50 6			
42						Total Depth - 42 feet bgs
45						

0 - 10 SAND
10 - 11.5 SILT
11.5 - 21.5 SAND
21.5 - 25 SANDY SILT
25 - 42 SAND
32 - 42 SCREEN

WELL DIAGRAM



MW TO 50FT WHITTAKER - - 2/15/11 12:59 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY_OLW.GPJ

ERM
1218 3rd Avenue, Suite 1412
Seattle, Washington 98101
Phone: (425) 462-8591
www.erm.com

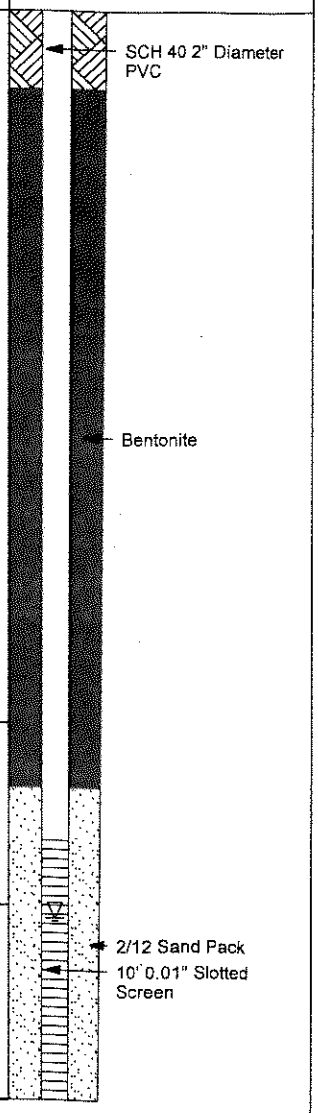
LOG OF MONITORING WELL: MW-11

Project Number: 0123986
Project Name: Normandy Park
Client Name: Normandy Park
Location: Normandy Park, Washington
Contractor: Cascade Drilling
Drilling Method: Hollow Stem Auger
Logged By: Matt Crandell

Date Started: 2/3/2011
Date Completed: 2/3/2011
Total Depth: 42 feet
Borehole Diameter: 6.25"
Ground Surface Elevation: 304.24'
Initial Water Level: 35 feet bgs
Notes: Vacuum Cleared to 5' bgs.

Depth (ft)	Sample Interval	PID (ppm)	Blow Counts	USCS Code	GRAPHIC LOG	Soil Descriptions and Observations
0				SM		Medium brown fine SAND with silt, moist, loose.
5	X		5 6 6			Trace organic matter with 24" silt layer. Sand changes to light brown/gray.
10	X		5 5 8			Medium gray.
15	X		5 5 5			Fine to medium sand, trace silt.
20	X		10 11 12			Trace fine gravel in ~6" layer.
25	X		7 10 11			Silty fine brown sand.
30	X		50 6	SP		Gravelly, medium to coarse SAND. Gravel is small, medium, semi-rounded.
35	X		22 50 6	SM		Medium to coarse gray SAND, trace silt.
40	X		22 36 50 6			Wet.
						Total Depth - 42 feet bgs
45						

WELL DIAGRAM



MW TO 50FT WHITTAKER - - 2/15/11 12:59 - C:\PROGRAM FILES\GINT\PROJECTS\NORMANDY_OLW.GPJ

ERM

Drilling Log

Project Normandy Park Owner Manhattan Village

Location N Park Project Number 159723

Boring Number MW-12 Total Depth of Auger 46.5 ft Auger Diameter 6 1/4

Surface Elevation / Water Level: Initial 36.5-40 between 24-hrs /

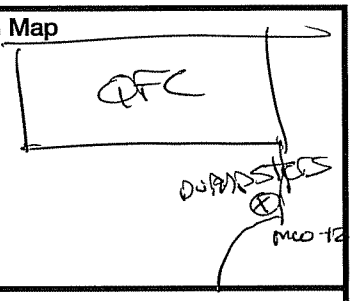
Total Depth of Soil Sampler 46.5 ft Total Depth of Ground Water Sampler / water at MW-3 38.5ft

Ground Water Sample Interval(s) /

Drilling Company CDI Drilling Method Air knife / HSA

Driller CDI Log By CF Date Drilled 3/27/12

Sketch Map



Notes

air knife to 6ft

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
0					Asphalt 0-3"
1	GP				4-7" Fill Gravel with brown fine sand, subangular moist
2					
3	SP				7" Brown fine sand with occasional gravel Ø-2", subrounded, moist.
4					
5					
6					~~Cobble at 4ft 2in~~ asphalt chunk fell in hole
7					Strike. that, actual asphalt chunk in
8					hole & piece at 5 ft, punched
9					through to 6 ft. to clear, OK.
10					

ERM

Drilling Log

Project N Park Owner Manhattan village

Location N Park Project Number 159723

Boring Number MW-12 Total Depth of Auger 46.5 ft Auger Diameter 6 1/4

Surface Elevation / Water Level: Initial page 1 24-hrs /

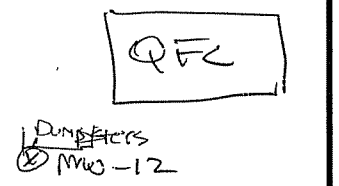
Total Depth of Soil Sampler 46.5 ft Total Depth of Ground Water Sampler /

Ground Water Sample Interval(s) N/A

Drilling Company CDI Drilling Method HSA

Driller David Log By CB Date Drilled 3/28/12

Sketch Map



Notes Air knife to 6 ft bgs

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
1					
2					
3					
4					
5					
6	SP/SM				5 - 7.5 ft (2/3/2) 25% rec
7					Brown fine sand w/ trace silt and occasional subrounded gravel 1-2". Moist
8					
9					
10					
11	SP				10 - 11.5 ft (5/5/5) 100% rec
12					Brown/ light brown fine sand w/ trace gravel. (subangular <1") Moist
13					
14					
15					
16	SP				15 - 16.5 ft (7/10/15) 100% rec
17					Brown fine to medium sand w/ lenses of brown silty fine sands 2 16 ft and occasional gravel 1-2", subrounded. moist
18					
19					
20					
21	SP				20 - 21.5 ft (11/24/25) 100% rec
22					Brown fine to medium sand w/ gravel 1-5", subrounded, dry
23					
24					
25					
26	SP				25 - 26.5 ft (13,50 for 6in) Brown fine to 100% rec
27					Medium sand, moist around 25-26 ft

ERM

Drilling Log

Project N Park Owner Manhattan College

Location N Park Project Number 159723

Boring Number MW-12 cont. Total Depth of Auger 46.5 Ft Auger Diameter 6 1/4

Surface Elevation ✓ Water Level: Initial page 1 24-hrs ✓

Total Depth of Soil Sampler 46.5 Total Depth of Ground Water Sampler ✓

Ground Water Sample Interval(s) ✓

Drilling Company CDE Drilling Method HSA

Driller David Log By CT Date Drilled 3/28/12

Sketch Map

Notes

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
28					
29					
30					
31	SP				30 - 31.5 ft (13/21/22) sampler wet 100% rec Brown fine to medium sand with trace gravel. <1", subangular wet.
32					checked hole w/ tape, no indication of H2O in hole
33					
34					
35					
36					35 - 36.5 ft (11/20/24) 100 % rec Brown fine to medium sand w/ occasional subrounded gravel 4-6" inch moist
37					
38					
39					
40					
41					40 - 41.5 ft (50 for 6") 100% rec As above, wet
42					
43					
44					
45					
46					45 - 46.5 ft (15, 50-for 6) 100% rec sampler wet Fine to medium sand, wet
47					

Screen 36 - 46 ft 0.010 2/12 sand

Sand 46.5 - 34 ft 6.5 bags

Chips 34 ft - 4 ft 11 bags (50 lbs)

Concrete 0 - 4 ft 4 bags (60 lbs)

Cement-all 1 bags + 1/4 bag Sand (60 lbs bags for

ERM

Drilling Log

Project N Park | Owner Manhattan Village

Location N Park | Project Number 159773

Boring Number MW-13 | Total Depth of Auger 46.5 ft | Auger Diameter 6 1/4

Surface Elevation ~ | Water Level: Initial ~~36.5 - 40 ft~~ between water 24-hrs 37.78 in mw-4

Total Depth of Soil Sampler 46.5 ft | Total Depth of Ground Water Sampler ~

Ground Water Sample Interval(s) ~

Drilling Company Cascade | Drilling Method Air knife / HSA

Driller David | Log By CB | Date Drilled air knife 3/27/12

Sketch Map

Notes: Air knife to ~~5~~ ft bgs

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
0					0-3 A/C
1					3-4 Gravel w/ fines, gravel Subangular 1-2" (fill) moist
2					4' Brown fine sand w/ occasional gravel, Sub-rounded
3					↓
4					5ft (clear / no utilities)
5					
6					
7					
8					

ERM

Drilling Log

Project N Park Owner Manhattan Village / Mark Properties

Location N Park Project Number 159723

Boring Number MW-13 Total Depth of Auger 46.5 ft Auger Diameter 6 1/4

Surface Elevation — Water Level: Initial — 24-hrs —

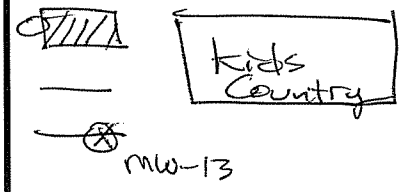
Total Depth of Soil Sampler 46.5 Ft Total Depth of Ground Water Sampler —

Ground Water Sample Interval(s) —

Drilling Company CDI Drilling Method HSA

Driller David Log By CB Date Drilled 3/29/12

Sketch Map



Notes Air knife to 5 ft bgs

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
1–5					Air knife to 5 ft bgs
6	SP				5-6.5 ft (2/2/3) 50 % rec Fine brown sand, moist.
10–11	SP				10-11.5 ft (6/9/10) % rec Fine brown sand, moist (w/ 1-2" subrounded gravel 10-10.5 ft)
15–16	SP				15-16.5 ft (6/7/12) 100 % rec fine brown Sand, dry
20–21	SP				20-21.5 ft (12/17/22) 100 % rec As above
25–26	SP				25-26.5 ft (13/18/22) 100 % rec Fine brown sand with subrounded gravel 1-3" moist.

ERM

Drilling Log

Project Normandy Park Owner Manhattan Village

Location N Park Project Number 159723

Boring Number MW-13 Total Depth of Auger 46.5 ft Auger Diameter 6 1/4

Surface Elevation ✓ Water Level: Initial 36.5 - 40 (between) 24-hrs ✓

Total Depth of Soil Sampler 46.5 ft Total Depth of Ground Water Sampler ✓

Ground Water Sample Interval(s) ✓

Drilling Company David Drilling Method HSA

Driller CDI Log By CF Date Drilled 3/29/12

Sketch Map

Notes

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
28					
29					
30					
31	SP				30-31.5 ft (50 for 6) 33 % rec
32					Fine - Medium brown sand w/
33					1-3" subrounded gravel, Moist.
34					
35					
36	SP				35-36.5 ft (21, 50 for 6) 100 % rec sampler wet
37					As above, slightly wet
38					at the bottom of sampler
39					
40					
41	SP				40-41.5 ft (50 for 5") 30 % rec
42					Sampler wet
43					Brown Coarse Sand and (50/50)
44					Gravel 1-5", wet.
45					
46	SP				45-46.5 ft (50 for 6") 33 % rec
					Saturated
					As above

screen 35-45 0.010 slot

sand 33-45 #2/12 6 bags

chips 33-34 1/2 50 lbs bags

Sand heaved back in 46.5-45 ft

Concrete mix 45 bags 4-0 Concrete

cement all

ERM

Drilling Log

Project N Park Owner Harris Property

Location N Park Project Number 159723

Boring Number MW-14 Total Depth of Auger 38 ft Auger Diameter 6 1/4

Surface Elevation — Water Level: Initial Between 25 - 35 24-hrs —

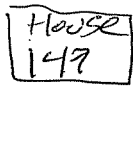
Total Depth of Soil Sampler 38 Ft Total Depth of Ground Water Sampler — (water level in DC-7 31.20)

Ground Water Sample Interval(s) —

Drilling Company CDI Drilling Method Air knife / HSA

Driller David Log By CF Date Drilled 3/27/12

Sketch Map



Notes

Air knife to 6 ft bgs

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
0					Grass 0-2"
1	SP				2" Red / brown fine sand w/ organics
2					
3					
4					
5					
6	SP				6ft Brown tan coarse sand

ERM

Drilling Log

Project N Park | Owner Harris Property

Location N Park | Project Number 159773

Boring Number MW-14 | Total Depth of Auger 38 ft | Auger Diameter 6 1/4

Surface Elevation ~~3~~ | Water Level: Initial page 1 | 24-hrs ~~✓~~

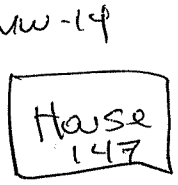
Total Depth of Soil Sampler 38 ft | Total Depth of Ground Water Sampler ~~✓~~

Ground Water Sample Interval(s) ~~✓~~

Drilling Company CDI | Drilling Method HSA

Driller David | Log By CB | Date Drilled 3/29/12

Sketch Map



Notes Air knife to 5 ft bgs

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
1					
2					
3					
4					
5					
6	~~SP~~				5-6.5 ft (8/7/6) 0 % rec
7					some 2/12 sand use to fill vac hole
8					
9					
10					
11	SP				10-11.5 (23/6/5) 10~~0~~ % rec
12					mostly 2/12 sand 3/4 in of
13					Brown fine sand, moist
14					
15					
16	SP				15-16.5 (6/11/11) 100 % rec
17					Brown fine-medium sand
18					w/ occasional gravel. Subrounded
19					1-2". moist.
20					
21	SP				20-21.5 (10/11/13) 100 % rec
22					As above
23					
24					
25					
26	SP				25-26.5 (13/18/18) 75 % rec
27					~~25~~-25.5-26 Large cobble 6" Fine-med
					sand w/ gravel as above
					~~26~~ 26-26.5 Fine brown sand, moist

ERM

Drilling Log

Project N Park Owner Harris Property

Location N Park Project Number 159723

Boring Number MW-14 Total Depth of Auger 38 Ft Auger Diameter 6 1/4

Surface Elevation — Water Level: Initial page 1 24-hrs —

Total Depth of Soil Sampler 38 Ft Total Depth of Ground Water Sampler —

Ground Water Sample Interval(s) —

Drilling Company CDI Drilling Method HSA

Driller David Log By CB Date Drilled 3/29/12

Sketch Map

Notes

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
28					
29					
30					30-31.5 ft (17, 5e for 6) 66 % rec
31	SP				Fine med sand w gravel
32					1-3" Subrounded, moist at the bottom
33					
34					
35					35-36.5 (5/7/12) sampler wet 100 % rec
36	SP				Brown med-coarse sand w/ gravel subrounded wet
37	|				36.5-38 (50 for 6) 2-4"
38	|				Sampler wet As above 100 95 rec
39					wet/sat
40					

Screen 28-38 ft 6 bags

Sand 26-38 ft 2/12 7 bags

Chips 26-4 13

Cement 4.5 bags 4-0

Concrete mix

ERM

Drilling Log

Project N Park Owner Harris Property

Location N Park Project Number 159723

Boring Number MW-15 Total Depth of Auger 46.5 Auger Diameter 6 1/4

Surface Elevation / Water Level: Initial between 36.5-40 ft 24-hrs / KMW-9 37.95.

Total Depth of Soil Sampler 46.5 Total Depth of Ground Water Sampler /

Ground Water Sample Interval(s) /

Drilling Company CDT Drilling Method HSA

Driller David Log By CF Date Drilled air knife 3/22/12

Sketch Map

Notes

Air knife to 5 ft bgs

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
1					Black silty sand, moist, w/ brick debris
2	SM				
3					
4					
5					5 ft

ERM

Drilling Log

Project N Park | Owner Harris Property

Location N Park | Project Number 159723

Boring Number MW-15 | Total Depth of Auger 46.5 | Auger Diameter 6¼

Surface Elevation — | Water Level: Initial page 1 | 24-hrs —

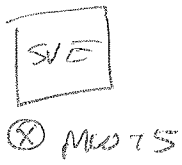
Total Depth of Soil Sampler 46.5 | Total Depth of Ground Water Sampler —

Ground Water Sample Interval(s) —

Drilling Company CDI | Drilling Method HSA

Driller David | Log By CB | Date Drilled 3/28/12

Sketch Map



Notes

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
1–4					
5	MV				5-6.5 ft (4/4/6) 25 % rec
6					Brown silt, moist
7					
8	SC				
9					
10	SP				10-11.5 ft (4/5/5) 80 % rec
11					Brown fine sand, moist
12					
13					
14					
15					15-16.5 ft (7/10/12) 100 % rec
16					As above brown fine sand, moist
17					
18					
19					
20					20-21.5 ft (10/10/10) 100 % rec
21					As above
22					
23					
24					
25					25-26.5 ft (7/10/14) 100 % rec
26					Brown fine-medium sand with
27					gravel 26-26.5 2-3", subrounded, moist

Drilling Log

ERM

Project N Park Owner Harris Property

Location N Park Project Number 159723

Boring Number MW-5 cont Total Depth of Auger 46.5 ft Auger Diameter

Surface Elevation / Water Level: Initial / 24-hrs /

Total Depth of Soil Sampler 46.5 ft Total Depth of Ground Water Sampler

Ground Water Sample Interval(s) /

Drilling Company CDI Drilling Method HSA

Driller David Log By CB Date Drilled 3/28/12

Sketch Map

Notes

Depth (Feet)	Graphic Log and USCS Designation	FID (ppm)	PID (ppm)	Sample Interval	Soil Description and Observations (Color, Texture, Structures, Odor, Foreign Matter)
28					
29					
30					
31	SP				30 - 31.5 ft (14/19/20) 100 % rec Brown Fine - med sand w/ occasional coarse grain, Gravel (with) 2-5", in Subangular, moist
32					
33					
34					
35					35 - 36.5 ft (50 for 6) ~~33~~ % rec
36					As above
37					
38					
39					
40					40 - 41.5 ft (14/17/19) 100 % rec
41					Sampler wet As above, more medium Sand with gravel & 2-5" inch subrounded
42					
43					
44					33 wet
45					43 - 46.5 FT (50 for 6) ~~100~~ % rec
46					wet As above Brown medium - coarse Sand with gravel 2-5" subrounded
					Screen - 35-45 wet
					Sand 33-46.5 8.5 bags
					chips 33-5 ft 18 bags (50 lbs
					concrete 13 bags 600 lbs
					Stick up well

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF MONITORING WELL: MW-16

Well Completion	Sample ID	PID (ppm)	Blow Count (/6 in.)	Sample Recovery	Sample Interval	Depth (feet)	Graphic Log	Lithologic Description
Concrete						0		BROWN SAND (SP), moist, loose, fine to medium, few fines, trace gravel, trace organics, no odor (boring logged based on auger cuttings to 25 feet bgs)
		0.0				2		
						4		
Bentonite								
		0.0				6		
						8		
						10		
		0.0				12		
PVC Blank Casing								
						14		
		0.0				16		
						18		
		0.0				20		
						22		
						24		@ 24.5 feet: drill rig chatter

Project: Manhattan Village
Project Number: 1358.001.001
Site Location: Normandy Park, Washington
Logged By: Karsten Springstead
Notes: Samples collected with nominal 2" Split Spoon Sampler

Total Drilled Depth: 43 feet
Diameter of Boring: 9 inches
Drill Date: 5/16/13
Drilled By: Holt Services, Inc.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF MONITORING WELL: MW-16

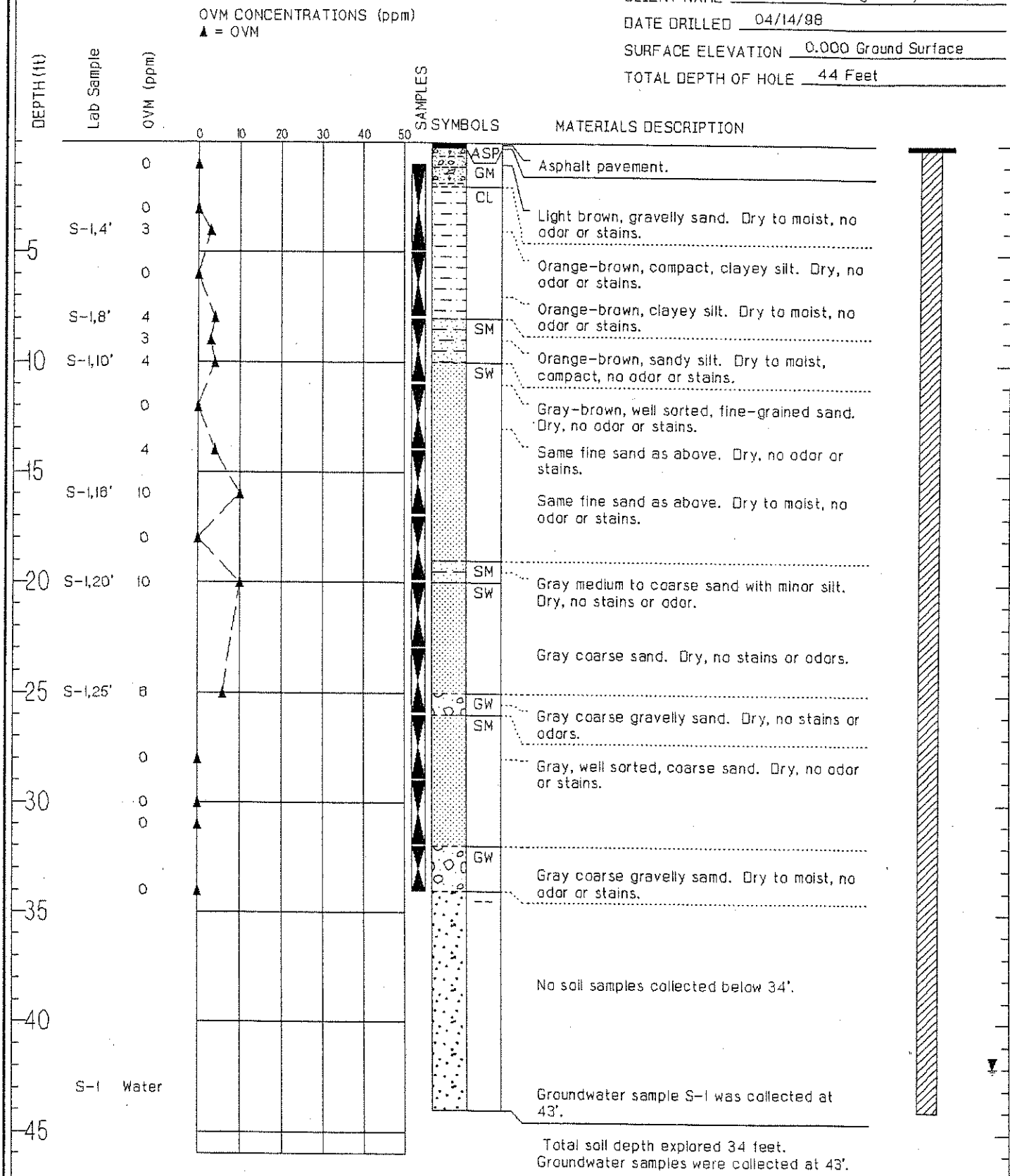
Well Completion	Sample ID	PID (ppm)	Blow Count (/6 in.)	Sample Recovery	Sample Interval	Depth (feet)	Graphic Log	Lithologic Description
PVC Blank Casing		0.1	11,28,32	12		26		BROWN GRAY SAND WITH GRAVEL (SP), moist, dense, medium to coarse, few fines, little subrounded gravel
						28		
10x20 Sand Filter Pack		0.1	50/6	6		30		
						32		
PVC Well Screen						34		GRAY SAND (SP), wet, dense, medium to coarse, trace fines (below 35 feet bgs, water visible on samples)
		0.1	12,23,30	18		36		
						38		
						40		(added ~35 gallons of water due to heaving sand)
		0.0	22,30,50	18		42		
End Cap		0.0	50/6	6		44		Bottom of boring @ 43 feet.
						46		MONITORING WELL COMPLETION DETAILS: Monitoring well MW-16 constructed with 2-inch Schedule 40 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 42.48 feet. Well Sump/Endcap: 42.23 to 42.48 feet. Well Screen: 27.20 to 42.23 feet. Well Blank:+2.5 to 27.20 feet. Completed 2.5 feet above ground. Filter Pack: 25 to 43 feet (#10-#20 Sand). Well Seal: 2.5 to 25 feet (hydrated bentonite chips). Surface Seal: 0 to 2.5 feet (concrete). Washington Department of Ecology Well Tag Number: BHV646.
						48		
						50		

Project: Manhattan Village
Project Number: 1358.001.001
Site Location: Normandy Park, Washington
Logged By: Karsten Springstead
Notes: Samples collected with nominal 2" Split Spoon Sampler

Total Drilled Depth: 43 feet
Diameter of Boring: 9 inches
Drill Date: 5/16/13
Drilled By: Holt Services, Inc.
Drill Method: Hollow Stem Auger

S-1 *(Page 1 of 1)*

CLIENT NAME Manhattan Village – Dry Cleaner
DATE DRILLED 04/14/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 44 Feet



JOB NUMBER: 0497048.01
LOCATION: Normandy Park, WA

SCS ENGINEERS
Engineering and Environmental Consultants

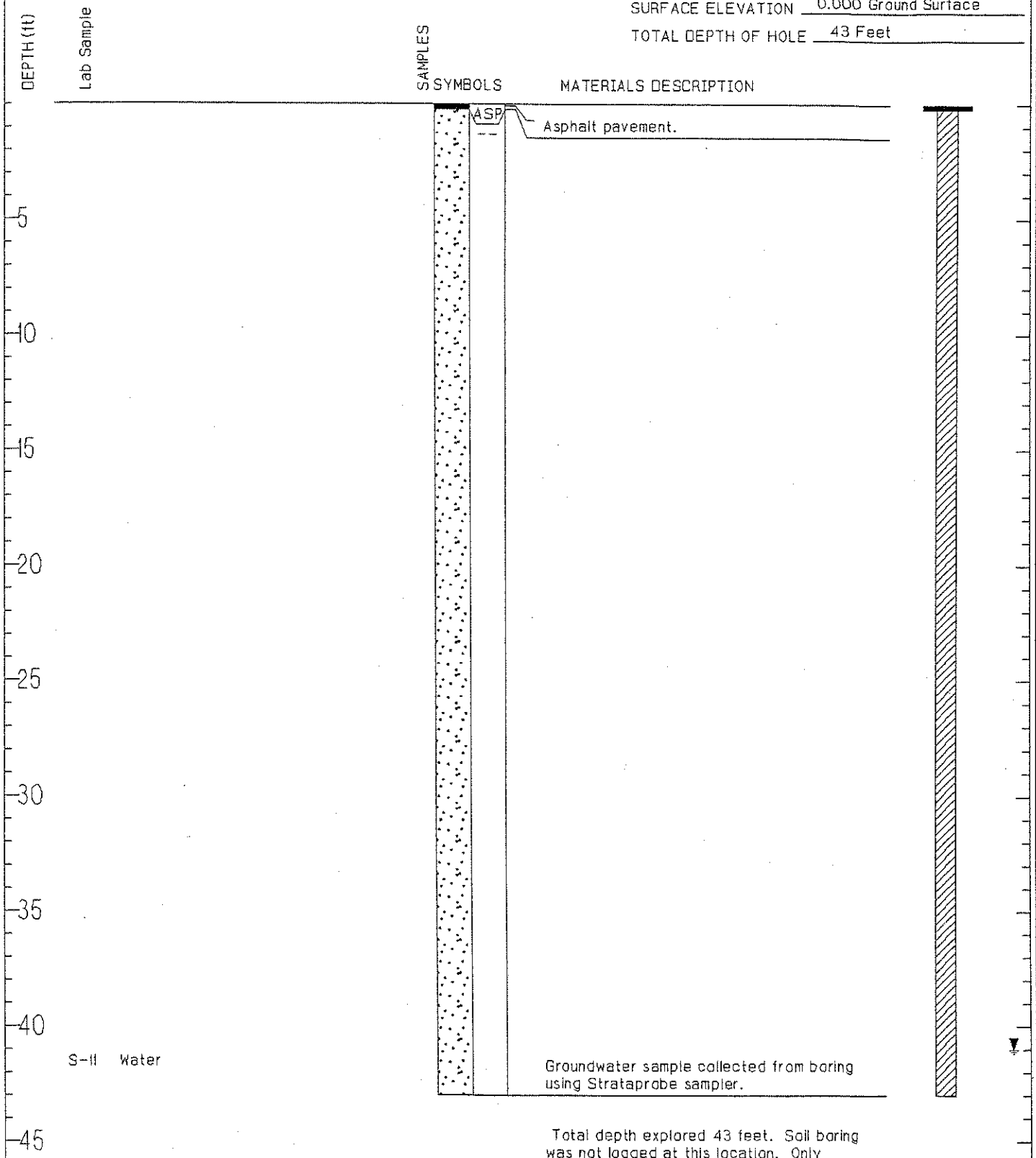
S-11 *(Page 1 of 1)*

CLIENT NAME Manhattan Village – Dry Cleaner

DATE DRILLED 04/15/98

SURFACE ELEVATION 0.000 Ground Surface

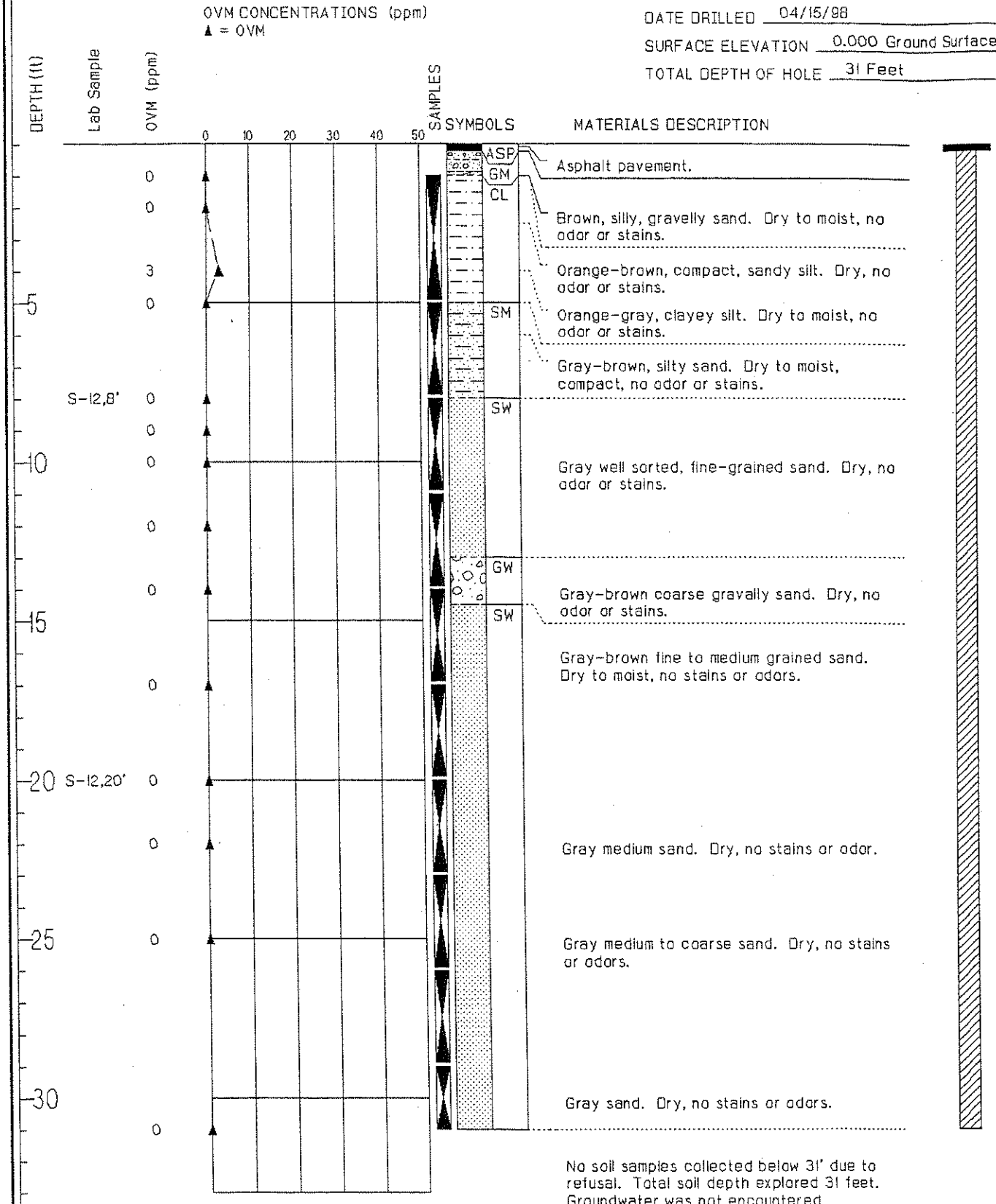
TOTAL DEPTH OF HOLE 43 Feet



Total depth explored 43 feet. Soil boring was not logged at this location. Only groundwater samples (S-11 @ 41.5') were collected.

S-12 *(Page 1 of 1)*

CLIENT NAME Manhattan Village – Dry Cleaner
DATE DRILLED 04/15/98
SURFACE ELEVATION 0.000 Ground Surface
TOTAL DEPTH OF HOLE 31 Feet



JOB NUMBER: 0497048.01
LOCATION: Normandy Park, WA

SCS ENGINEERS
Engineering and Environmental Consultants

S-13 *(Page 1 of 1)*

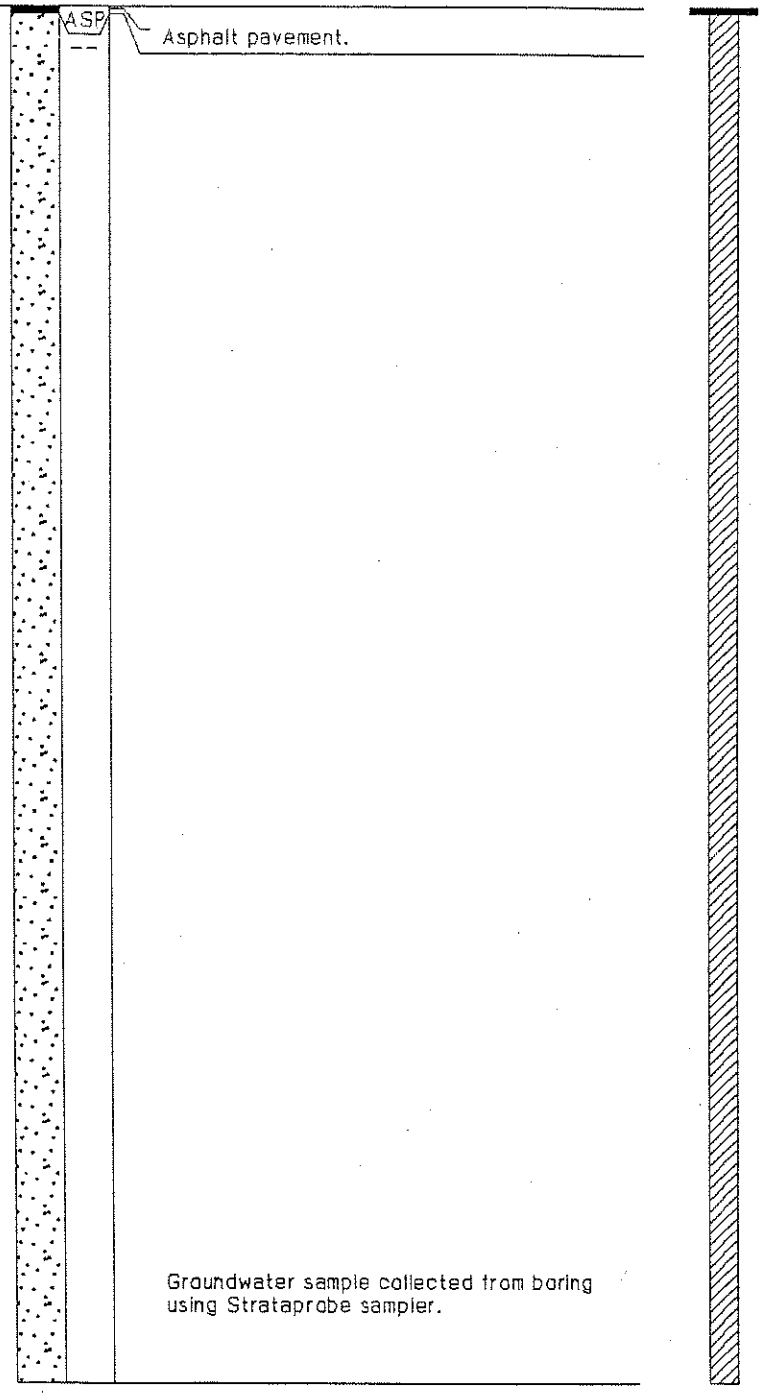
CLIENT NAME Manhattan Village - Dry Cleaner

DATE DRILLED 04/15/98

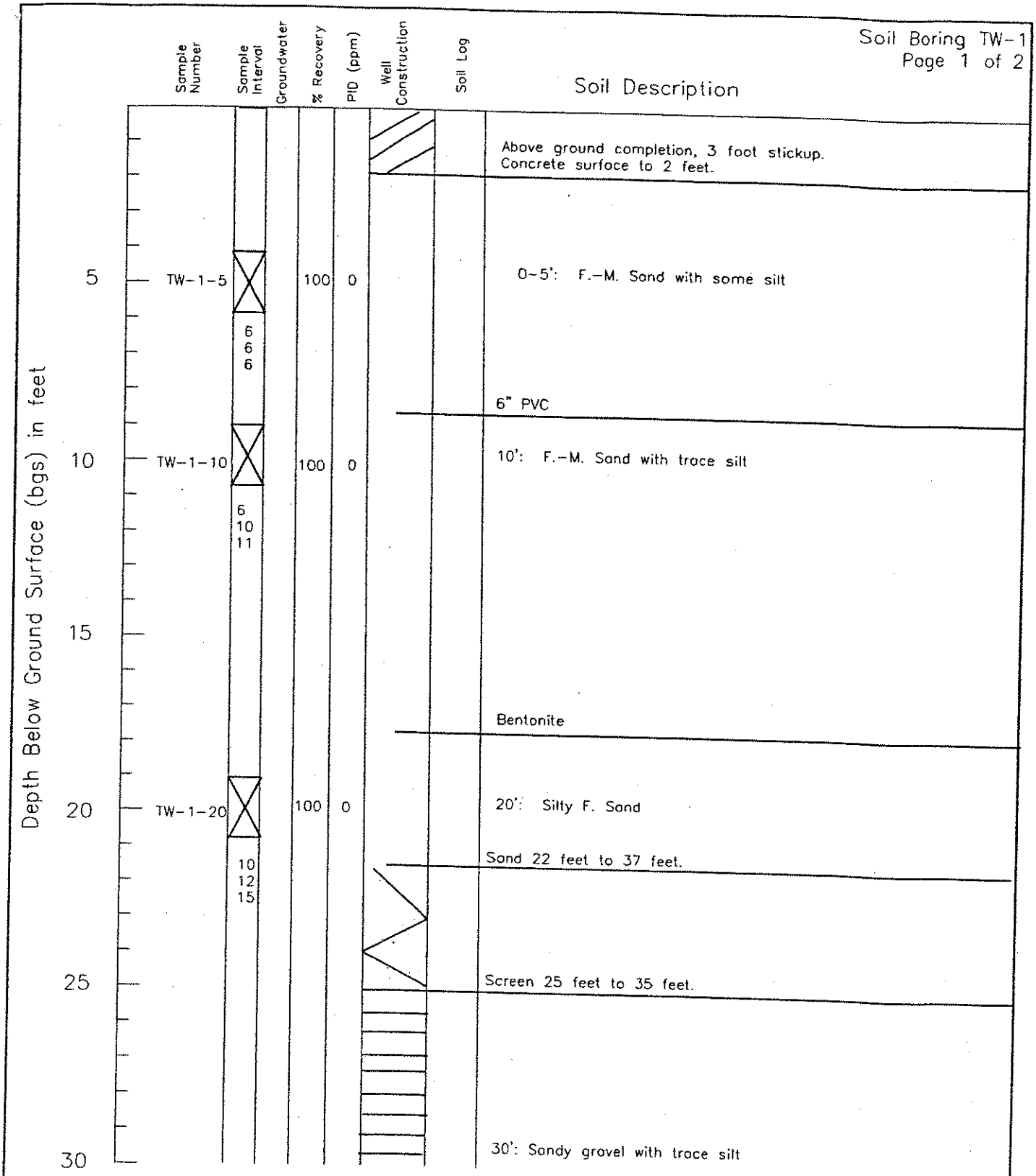
SURFACE ELEVATION 0.000 Ground Surface

TOTAL DEPTH OF HOLE 44 Feet

DEPTH (ft)	Lab Sample	SAMPLES	SYMBOLS	MATERIALS DESCRIPTION
0			ASP	Asphalt pavement.
40	S-13 Water			Groundwater sample collected from boring using Strataprobe sampler.



Total depth explored 44 feet. Soil boring was not logged at this location. Only groundwater samples (S-13 @ 40.5') were collected.



Logged by: John Kane
Driller: Cascade Drilling
Drilling Method: Auger
Sampling Method: Split Spoon
Casing Type: PVC
Annular Pack: NA
Slot Size: 10

Hammer Size: 140 lbs.
Date Drilled: 05/02/06
Hole Diameter: 12 inch
Hole Depth: 50 feet
Well Diameter: 6 inch
Well Depth: 50 feet
Screened Interval: 25 to 35 and 45 to 50 feet

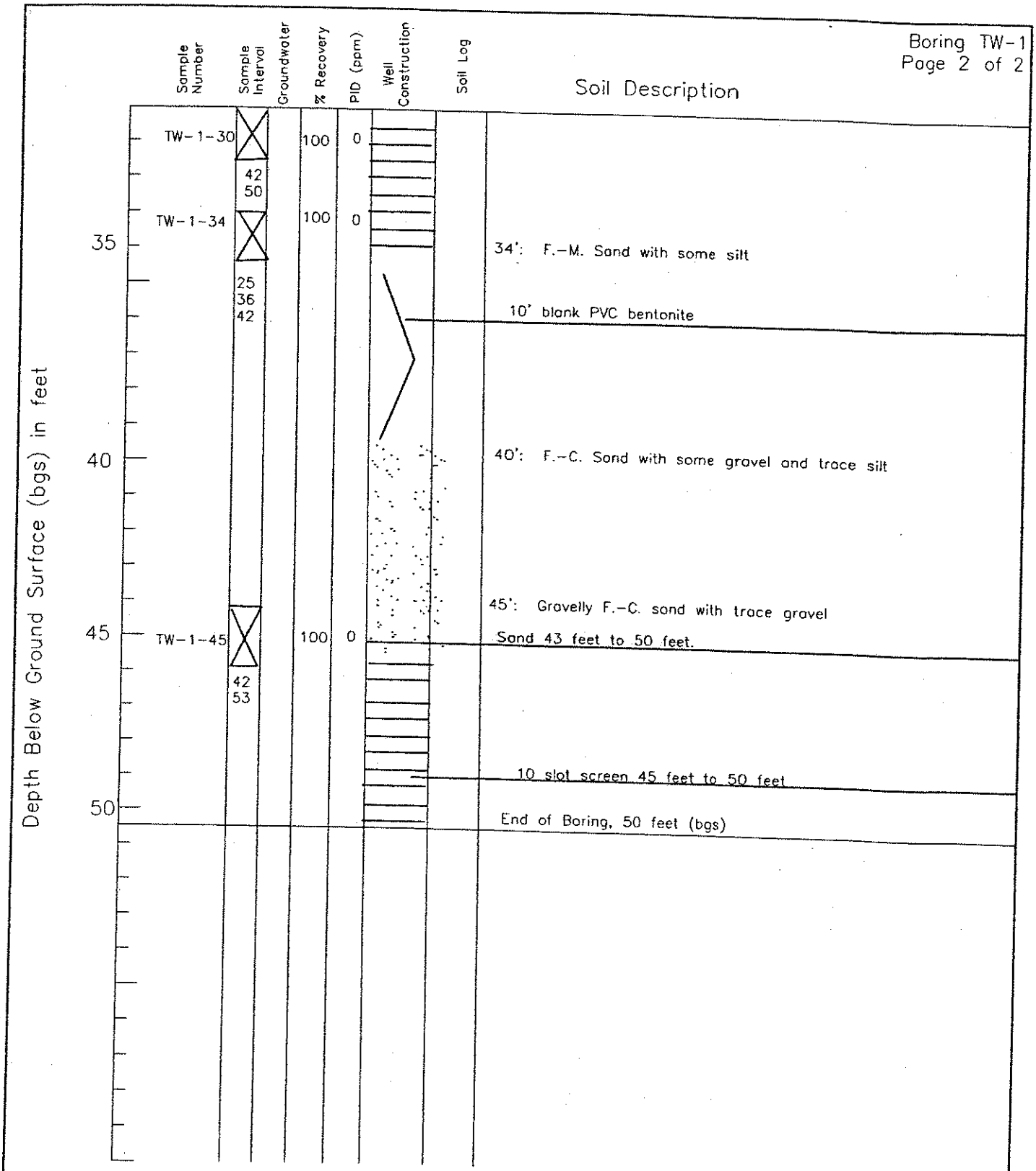
Depth to Water (First Encountered): ~35 feet ATD
Depth to Water (Static): NA

Soils classified visually using the Unified Soils Classification System

KANE ENVIRONMENTAL INC
3831 Stone Way N, Seattle, WA - 206-691-0476
www.kane-environmental.com

Harris Property
Pilot Test Well
Seattle, Washington

Soil Boring Log
TW-1



Logged by: John Kane
Driller: Cascade Drilling
Drilling Method: Auger
Sampling Method: Split Spoon
Casing Type: PVC
Annular Pack: NA
Slot Size: 10

Hammer Size: 140 lbs.
Date Drilled: 05/02/06
Hole Diameter: 12 inch
Hole Depth: 50 feet
Well Diameter: 6 inch
Well Depth: 50 feet
Screened Interval: 25 to 35 feet and 45 to 50 feet

Depth to Water (First Encountered): ~35 feet ATD
Depth to Water (Static): NA

Soils classified visually using the Unified Soils Classification System

KANE ENVIRONMENTAL INC
3831 Stone Way N, Seattle, WA - 206-691-0476
www.kane-environmental.com

Harris Property
Pilot Test Well
Seattle, Washington

Soil Boring Log
TW-1

ERM
915 118th Avenue SE, Suite 130
Bellevue, WA 98005
Phone: (425) 462-8591
Fax: (425) 455-3573

LOG OF MONITORING WELL: SVE-01

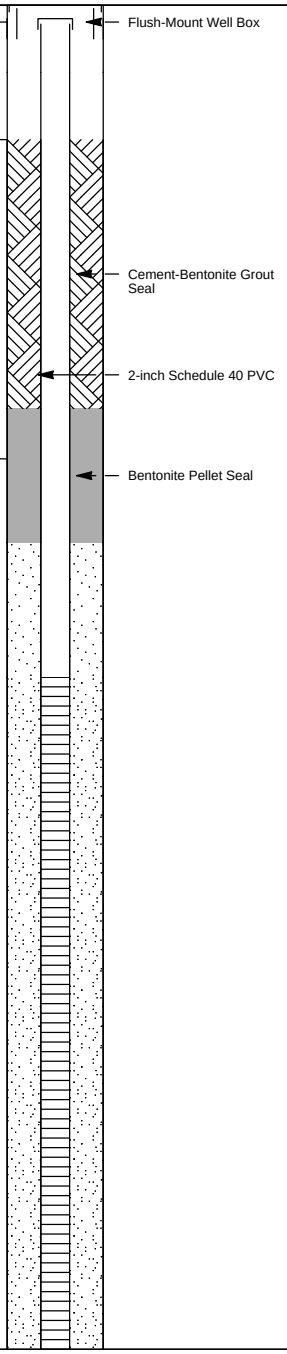
Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Hollow Stem Auger
Logged By: S. Terranova

Date Started: 6/29/2009
Date Completed: 6/29/2009
Total Depth: 35.5 feet
Borehole Diameter: 8 inches

Notes: Clearance to 5.5 feet by air knife

Depth (ft)	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations
				Asphalt
				Fill Material
	ML			SILT WITH SAND (ML): Brown, silt with fine sand.
5				Scattered gravel.
	SP			SAND (SP): Yellowish brown, medium to coarse, damp.
			7-10-13 (23)	
10				
			12-12-15 (27)	
15				Scattered fine gravel.
			20-21-24 (45)	

WELL DIAGRAM



MW TO 20 FEET BV2 - - 8/5/09 16:57 - F:\CAD\GINT BORING LOGS\NORMANDY PARK - 0099467.02\GINT FILES\99467 NORMANDY PARK SVE.GPJ

ERM
915 118th Avenue SE, Suite 130
Bellevue, WA 98005
Phone: (425) 462-8591
Fax: (425) 455-3573

LOG OF MONITORING WELL: SVE-01

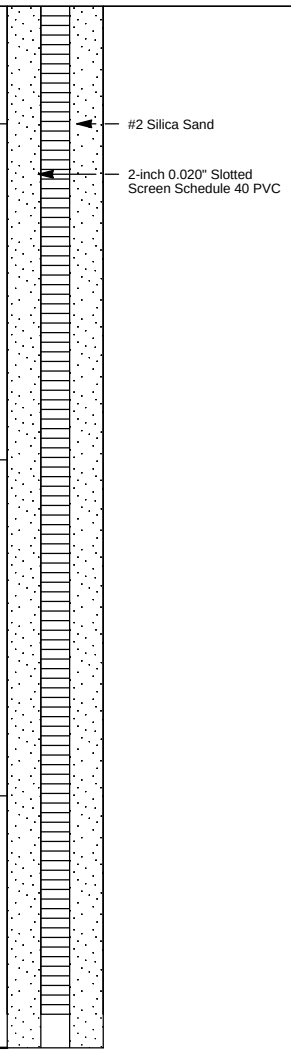
Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Hollow Stem Auger
Logged By: S. Terranova

Date Started: 6/29/2009
Date Completed: 6/29/2009
Total Depth: 35.5 feet
Borehole Diameter: 8 inches

Notes: Clearance to 5.5 feet by air knife

Depth (ft)	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations
				SAND (SP): Yellowish brown, medium to coarse, damp.
	SP			SAND (SP): Grayish brown, medium to coarse, scattered fine gravel, mica flakes, damp.
			15-21-23 (44)	
25				
	SP			SAND (SP): Yellowish brown, fine to medium, mica flakes, damp.
			16-19-22 (41)	
30				
				Particle size increases to medium to coarse sand.
			20-50-53 (103)	
35				Total Depth - 35.5 feet bgs

WELL DIAGRAM



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LOG OF MONITORING WELL: SVE-02

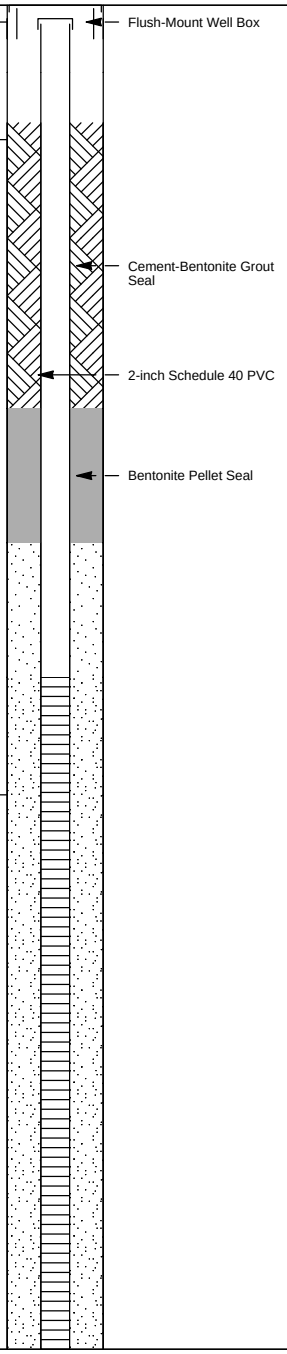
Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Hollow Stem Auger
Logged By: S. Terranova

Date Started: 6/29/2009
Date Completed: 6/29/2009
Total Depth: 35.5 feet
Borehole Diameter: 8 inches

Notes: Clearance to 5.5 feet by air knife

Depth (ft)	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations
				Asphalt
				Fill Material
	ML			SILT WITH SAND (ML): Yellowish brown, silt with fine sand.
5				
	ML			SILT WITH SAND (ML): Brown, damp.
			8-10-11 (21)	
10				
	SP			SAND (SP): Grayish brown, fine to medium, damp..
			9-12-18 (30)	
15				
	SP			SAND (SP): Grayish brown, fine, damp.
			12-15-20 (35)	

WELL DIAGRAM



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LOG OF MONITORING WELL: SVE-02

Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Hollow Stem Auger
Logged By: S. Terranova

Date Started: 6/29/2009
Date Completed: 6/29/2009
Total Depth: 35.5 feet
Borehole Diameter: 8 inches

Notes: Clearance to 5.5 feet by air knife

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations	WELL DIAGRAM
					SAND (SP): Grayish brown, fine to medium, damp..	#2 Silica Sand
		ML			SILT WITH SAND (ML): Gray, silt with fine to medium sand, damp.	2-inch 0.020" Slotted Screen Schedule 40 PVC
				15-15-19 (34)		
25						
				13-16-19 (35)		
30						
				16-50-55 (105)		
35					Total Depth - 35.5 feet bgs	

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LOG OF MONITORING WELL: SVE-03

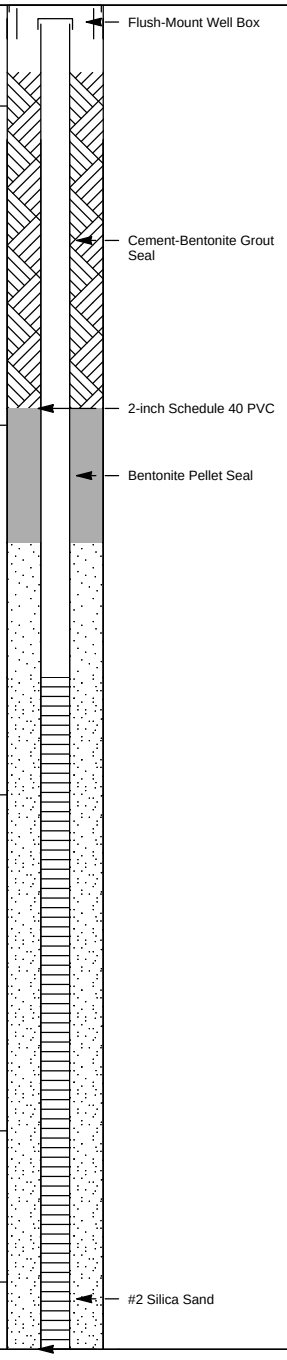
Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Hollow Stem Auger
Logged By: S. Terranova

Date Started: 6/30/2009
Date Completed: 6/30/2009
Total Depth: 30.5 feet
Borehole Diameter: 8 inches

Notes: Clearance to 4.0 feet by air knife

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations
		SM			SILTY SAND (SM): Brown, fine silty sand, scattered roots.
		SM			SILTY SAND (SM): Gray, very fine silty sand, scattered cobbles.
5		ML			SILT WITH SAND (ML): Reddish brown, silt with medium sand, moist.
				9-13-15 (28)	
10		SP			SAND (SP): Yellowish brown, fine to medium sand, damp.
				12-16-20 (36)	
15		ML			SILT (ML): Brown with veins of reddish brown, trace sand, damp.
		SP		12-15-17 (32)	SAND (SP): Yellowish brown, fine sand, damp.

WELL DIAGRAM



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LOG OF MONITORING WELL: SVE-03

Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Hollow Stem Auger
Logged By: S. Terranova

Date Started: 6/30/2009
Date Completed: 6/30/2009
Total Depth: 30.5 feet
Borehole Diameter: 8 inches

Notes: Clearance to 4.0 feet by air knife

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations	WELL DIAGRAM
					SAND (SP): Yellowish brown, fine sand, damp.	2-inch 0.020" Slotted Screen Schedule 40 PVC
		SP			SAND (SP): Grayish brown, fine to medium sand, scattered fine gravel, dry.	
				18-50-56 (106)		
25						
		SP			SAND (SP): Yellowish brown, medium sand, mica flakes, damp.	
				25-48-52 (100)		
30					Total Depth - 30.5 feet bgs	
35						

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LOG OF MONITORING WELL: SVE-04

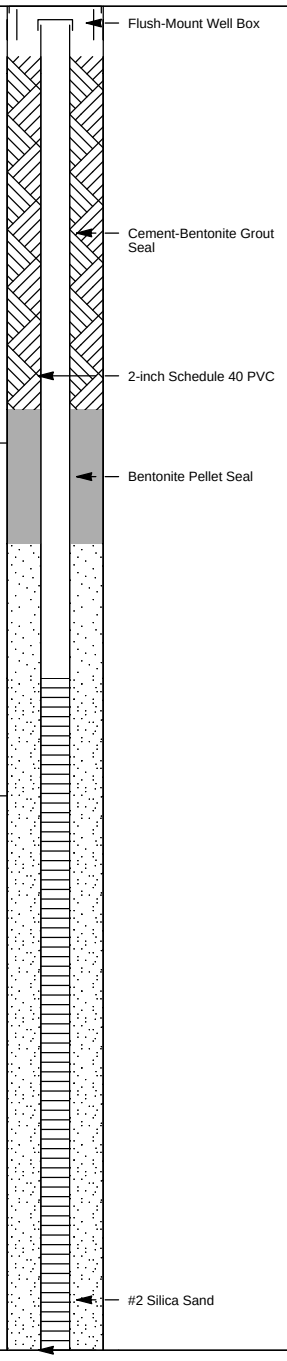
Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Hollow Stem Auger
Logged By: S. Terranova

Date Started: 6/30/2009
Date Completed: 6/30/2009
Total Depth: 30.5 feet
Borehole Diameter: 8 inches

Notes: Clearance to 4.5 feet by air knife

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations
		SM			SILTY SAND (SM): Brown, silty fine sand, scattered roots.
5		SP			SAND (SP): Yellowish brown, fine sand, damp.
				7-11-13 (24)	
10		SP			SAND (SP): Grayish brown, fine to medium sand, damp.
				12-15-19 (34)	
15					Scattered fine gravel and moisture content decreases to dry.
				17-17-20 (37)	

WELL DIAGRAM



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LOG OF MONITORING WELL: SVE-04

Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Hollow Stem Auger
Logged By: S. Terranova

Date Started: 6/30/2009
Date Completed: 6/30/2009
Total Depth: 30.5 feet
Borehole Diameter: 8 inches

Notes: Clearance to 4.5 feet by air knife

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations	WELL DIAGRAM
					SAND (SP): Grayish brown, fine to medium sand, damp.	2-inch 0.020" Slotted Screen Schedule 40 PVC
		SP			SAND (SP): Yellowish brown, fine to medium sand, mica flakes, damp.	
				14-19-22 (41)		
25						
		SP			SAND (SP): Yellowish brown, medium sand, scattered fine gravel, mica flakes, damp.	
				21-50-55 (105)		
30					Total Depth - 30.5 feet bgs	
35						

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LOG OF MONITORING WELL: SVE-05

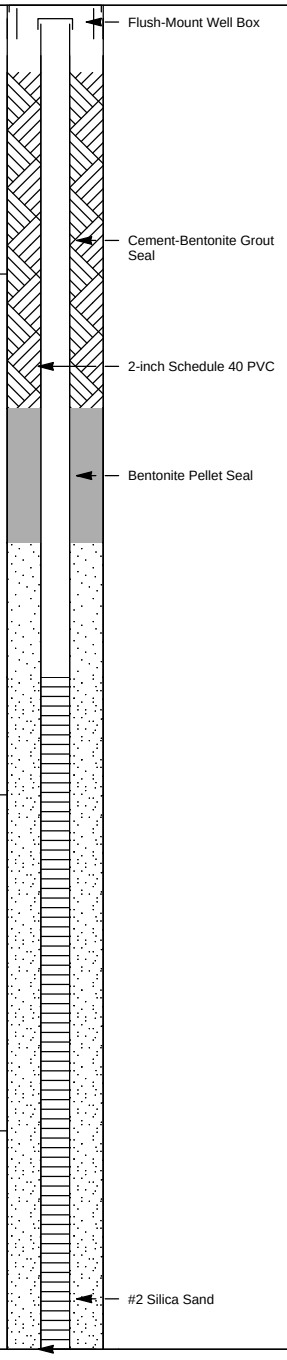
Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Hollow Stem Auger
Logged By: S. Terranova

Date Started: 6/30/2009
Date Completed: 6/30/2009
Total Depth: 30.5 feet
Borehole Diameter: 8 inches

Notes: Clearance to 4.0 feet by air knife

Depth (ft)	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations
	SM			SILTY SAND (SM): Brown, fine silty sand.
				Scattered roots.
5	SP			SAND (SP): Yellowish brown, fine to medium sand, mica flakes, damp.
			4-7-10 (17)	
10	ML			SILT (ML): Yellowish brown, trace fine sand, damp.
			13-15-16 (31)	
15	SP			SAND (SP): Yellowish brown, fine to medium sand, damp.
			14-18-19 (37)	

WELL DIAGRAM



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LOG OF MONITORING WELL: SVE-05

Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Hollow Stem Auger
Logged By: S. Terranova

Date Started: 6/30/2009
Date Completed: 6/30/2009
Total Depth: 30.5 feet
Borehole Diameter: 8 inches

Notes: Clearance to 4.0 feet by air knife

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations	WELL DIAGRAM
					SAND (SP): Yellowish brown, fine to medium sand, damp.	2-inch 0.020" Slotted Screen Schedule 40 PVC
		SP			SAND (SP): Yellowish brown, medium to coarse sand, scattered fine gravel, damp.	
				15-20-26 (46)		
25						
				30-50-56 (106)		
30					Total Depth - 30.5 feet bgs	
35						

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LOG OF MONITORING WELL: SVE-06

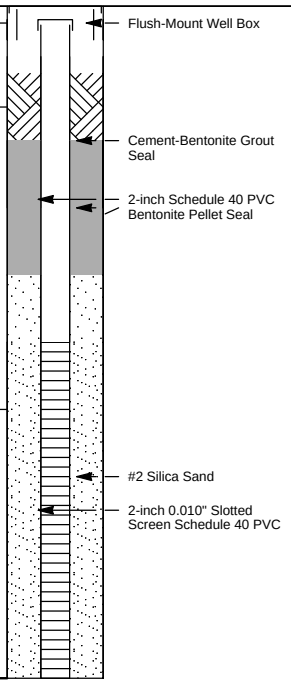
Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Air Knife/Vacuum
Logged By: O. Williams

Date Started: 6/26/2009
Date Completed: 6/26/2009
Total Depth: 10 feet
Borehole Diameter: 8 inches

Notes:

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations
					Asphalt
					Cobble Fill Material
		SM			SILTY SAND (SM): Gray, fine silty sand.
					Color change to brown.
5					
					Sample not logged.
10					Total Depth - 10 feet bgs
15					

WELL DIAGRAM



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LOG OF MONITORING WELL: SVE-07

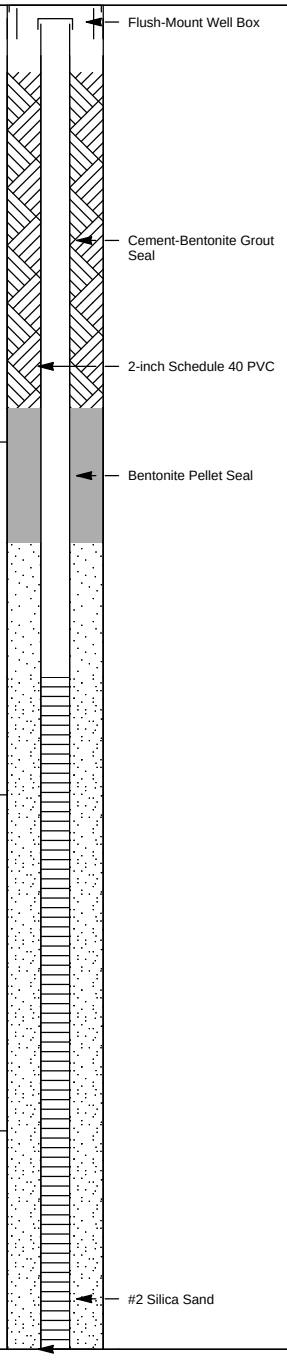
Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Hollow Stem Auger
Logged By: S. Terranova

Date Started: 6/30/2009
Date Completed: 6/30/2009
Total Depth: 30.5 feet
Borehole Diameter: 8 inches

Notes: Clearance to 4.25 feet by air knife

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations
		SM			SILTY SAND (SM): Brown, fine silty sand.
					Scattered roots.
5					
		SP			SAND (SP): Yellowish brown, fine to medium sand, mica flakes, damp.
				8-9-10 (19)	
10					
		ML			SILT WITH SAND (ML): Pale yellowish brown, silt with fine sand, mica flakes, damp.
				13-15-19 (34)	
15					
		SP			SAND (SP): Pale yellowish brown, medium sand, mica flakes, damp.
				14-15-15 (30)	

WELL DIAGRAM



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LOG OF MONITORING WELL: SVE-07

Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Hollow Stem Auger
Logged By: S. Terranova

Date Started: 6/30/2009
Date Completed: 6/30/2009
Total Depth: 30.5 feet
Borehole Diameter: 8 inches

Notes: Clearance to 4.25 feet by air knife

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations	WELL DIAGRAM
					SAND (SP): Pale yellowish brown, medium sand, mica flakes, damp.	2-inch 0.020" Slotted Screen Schedule 40 PVC
		SP			SAND (SP): Yellowish brown, medium to coarse sand, scattered cobbles, mica flakes, damp.	
				15-20-21 (41)		
25						
				18-19-23 (42)		
30					Total Depth - 30.5 feet bgs	
35						

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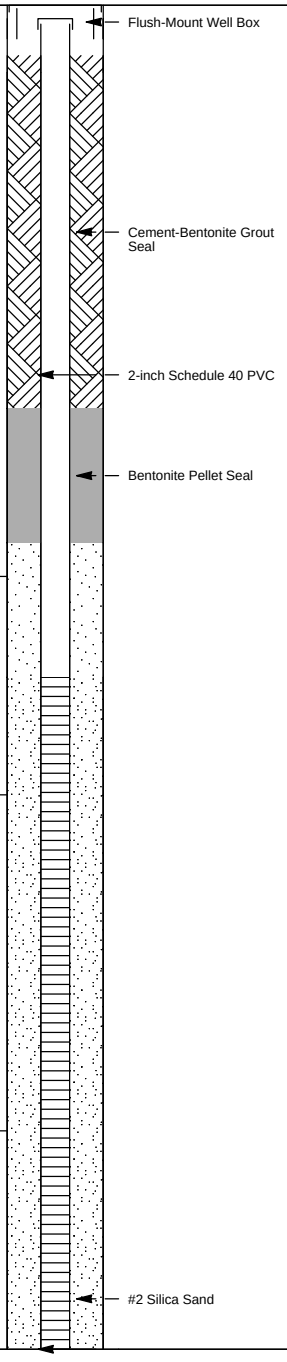
LOG OF MONITORING WELL: SVE-08

Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Hollow Stem Auger
Logged By: S. Terranova

Date Started: 6/30/2009
Date Completed: 6/30/2009
Total Depth: 30.5 feet
Borehole Diameter: 8 inches

Notes: Clearance to 5.0 feet by air knife

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations
					Sample not logged.
10		SP		12-20-24 (44)	SAND (SP): Yellowish brown, medium to coarse sand, mica flakes, damp.
		ML			SILT WITH SAND (ML): Yellowish brown, silt with fine to medium sand, mica flakes, damp.
15				11-18-24 (42)	
		SP			SAND (SP): Yellowish brown, medium sand, mica flakes, damp.
				24-50-56 (106)	



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LOG OF MONITORING WELL: SVE-08

Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Hollow Stem Auger
Logged By: S. Terranova

Date Started: 6/30/2009
Date Completed: 6/30/2009
Total Depth: 30.5 feet
Borehole Diameter: 8 inches

Notes: Clearance to 5.0 feet by air knife

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations	WELL DIAGRAM
		SP			SAND (SP): Yellowish brown, medium sand, mica flakes, damp.	2-inch 0.020" Slotted Screen Schedule 40 PVC
					Scattered gravel	
				19-50-56 (106)		
25						
		SW			SAND (SP): Yellowish brown, medium to coarse sand, scattered fine gravel, mica flakes, damp.	
				30-50-58 (108)		
30					Total Depth - 30.5 feet bgs	
35						

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LOG OF MONITORING WELL: SVE-09

Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Hollow Stem Auger
Logged By: S. Terranova

Date Started: 6/29/2009
Date Completed: 6/29/2009
Total Depth: 30.5 feet
Borehole Diameter: 8 inches

Notes: Clearance to 5.0 feet by air knife

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations
					Gravel road base
					Fill Material
		SM			SILTY SAND (SM): Brown, fine silty sand.
5					
		SP			SAND (SP): Light grayish brown, fine sand, damp.
				11-16-19 (35)	
10					
		SP			SAND (SP): Grayish brown, medium sand, scattered fine gravel, damp.
				15-19-19 (38)	
15					
				22-48-56 (104)	

WELL DIAGRAM

- Flush-Mount Well Box
- Cement-Bentonite Grout Seal
- 2-inch Schedule 40 PVC
- Bentonite Pellet Seal
- #2 Silica Sand

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LOG OF MONITORING WELL: SVE-09

Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Hollow Stem Auger
Logged By: S. Terranova

Date Started: 6/29/2009
Date Completed: 6/29/2009
Total Depth: 30.5 feet
Borehole Diameter: 8 inches

Notes: Clearance to 5.0 feet by air knife

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations	WELL DIAGRAM
					SAND (SP): Grayish brown, medium sand, scattered fine gravel, damp.	2-inch 0.020" Slotted Screen Schedule 40 PVC
		ML			SILTY SAND (SM): Light grayish brown, medium to coarse sand, damp.	
				29-50-56 (106)		
25						
		SP			SAND (SP): Grayish brown, medium to coarse sand, scattered fine gravel, damp.	
				50-55-56 (111)		
30					Total Depth - 30.5 feet bgs	
35						

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LOG OF MONITORING WELL: SVE-10

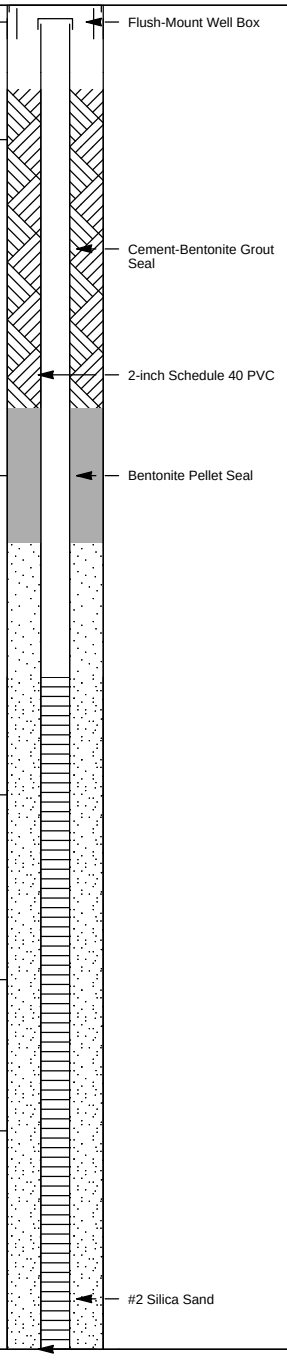
Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Hollow Stem Auger
Logged By: S. Terranova

Date Started: 6/30/2009
Date Completed: 6/30/2009
Total Depth: 30.5 feet
Borehole Diameter: 8 inches

Notes: Clearance to 5.5 feet by air knife

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations
					Gravel road base
					Cobble Fill Material
					Large cobble noted at 1.5 feet below ground surface.
		SM			SILTY SAND (SM): Brown, fine silty sand.
5					
		SP			SAND (SP): Yellowish brown, fine sand, mica flakes, damp.
				5-6-7 (13)	
10					
		SP			SAND (SP): Gray, fine to medium sand, damp.
				23-50-58 (108)	
15		ML			SILT (ML): Light brown, damp.
		SP			SAND (SP): Yellowish brown, medium sand, scattered fine gravel, damp.
				31-50-55 (105)	

WELL DIAGRAM



MW TO 20 FEET BV2 - - 8/5/09 16:58 - F:\CAD\GINT BORING LOGS\NORMANDY PARK - 0099467.02\GINT FILES\99467 NORMANDY PARK SVE.GPJ

ERM
915 118th Avenue SE, Suite 130
Bellevue, WA 98005
Phone: (425) 462-8591
Fax: (425) 455-3573

LOG OF MONITORING WELL: SVE-10

Project Number: 0099467.02
Project Name: Normandy Park
Client Name: Manhattan Village Shopping Center & Harris Properties
Location: Manhattan Village Shopping Center
Contractor: Cascade Drilling Inc. (Woodinville, WA)
Drilling Method: Hollow Stem Auger
Logged By: S. Terranova

Date Started: 6/30/2009
Date Completed: 6/30/2009
Total Depth: 30.5 feet
Borehole Diameter: 8 inches

Notes: Clearance to 5.5 feet by air knife

Depth (ft)	Graphic Log	USCS Code	Sample Interval	BLOW COUNTS (N VALUE)	Soil Descriptions and Observations	WELL DIAGRAM
					SAND (SP): Yellowish brown, medium sand, scattered fine gravel, damp.	2-inch 0.020" Slotted Screen Schedule 40 PVC
					Scattered gravel.	
25				23-52-56 (108)		
		SP			SAND (SP): Yellowish brown, coarse sand, scattered fine gravel, damp.	
30				21-51-57 (108)		
					Total Depth - 30.5 feet bgs	
35						

MW TO 20 FEET BV2 - - 8/5/09 16:58 - F:\CAD\GINT BORING LOGS\NORMANDY PARK - 0099467.02\GINT FILES\99467 NORMANDY PARK SVE.GPJ

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF EXTRACTION WELL: SVE-11A

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete Bentonite PVC Blank Casing 10x20 Sand Filter Pack PVC Well Screen End Cap	0.0 0.0 0.0 0.0					0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34		See SVE-11B for Lithology EXTRACTION WELL COMPLETION DETAILS: Extraction well SVE-11A constructed with 4-inch Schedule 40 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 20 feet. Well Sump/Endcap: 19.98 to 20 feet. Well Screen: 5 to 19.98 feet. Well Blank: 0 to 5 feet. Filter Pack: 3 to 20 feet (#10-#20 Sand). Well Seal: 1.5 to 3 feet (hydrated bentonite chips). Surface Seal: 0 to 1.5 feet (concrete). Washington Department of Ecology Well Tag Number: BIE307.

Project: Manhattan Village
Project Number: 1358.001.001
Site Location: Normandy Park, Washington
Logged By: Karsten Springstead
Notes: See SVE-11B for Lithology

Total Drilled Depth: 20 feet
Diameter of Boring: 12 inches
Drill Date: 11/18/13
Drilled By: Holt Services, Inc.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF MONITORING WELL: SVE-11B

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete						0		Asphalt, 3 inches thick
						2		BROWN SILTY SAND WITH GRAVEL (SM), fine to coarse, angular gravel (FILL)
								@ 2.5 feet: pieces of asphalt and rocks
Bentonite						4		BROWN SILTY SAND (SM), moist, fine to medium, trace gravel, trace organics (roots)
	0.0		2 4 8	12		6		
						8		
	0.0		5 8 9	12		10		GRAY SAND (SP), moist, medium dense, fine to medium, few silt
PVC Blank Casing						12		
	1.6		7 9 10	12		14 16		
						18		@ 18.5 feet: driller noted possible gravel
	0.0		9 50/6	6		20		GRAY GRAVEL (GP), moist, few sand and silt, ~ 0.5 inch diameter rounded gravel
						22		
						24		@ 23 feet: driller noted easy and difficult drilling that might indicate alternating layers of sand and gravel
	0.0		27 50/6	6		26		
10x20 Sand Filter Pack						28		
PVC Well Screen								GRAY SAND (SP), moist, very dense, fine to medium, orange mottling
	0.0		19 37 50	18		30 32		
						34		

Project: Manhattan Village
Project Number: 1358.001.001
Site Location: Normandy Park, Washington
Logged By: Karsten Springstead
Notes: Samples collected with nominal 2" Split Spoon Sampler

Total Drilled Depth: 57 feet
Diameter of Boring: 0' to 36':12 inches, 36' to 57': 8 inches
Drill Date: 11/18/13
Drilled By: Holt Services, Inc.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
End Cap	0.0	W-SVE-11 B-111813	17 50 50	12		36		GRAY SILTY GRAVEL WITH SAND (GM), moist, very dense, fine to coarse, some sand, little silt, subrounded gravel, orange mottling
	0.0		49 45 33	18		38		
	0.0		7 42 50/5	18		40		@ 39.5 feet: becomes wet
	0.0		21 45 50/5	12				@ 41 feet: 2 inch silty sand lens
	0.0		19 26 27	18		42		GRAY SAND (SP), wet, dense, fine to medium, few silt (note: temporary screen set from 40 to 45 feet used to collect a grab groundwater sample)
	0.0		9 12 16	24		44		@ 43 feet: becomes fine to coarse
			18 5 19	18				@ 43 feet: becomes fine to medium
Bentonite	0.0		17 18 50/5	12		46		
	0.0		50 18 46	0		48		
	0.0		33 32 25	24		50		GRAY SILTY SAND (SM), wet, very dense, fine to medium, little silt
	0.0		20 40 27	24		52		GRAY SILTY GRAVEL WITH SAND (GM), wet, very dense, some sand, little silt
	0.0		50 48 38	18				GRAY SILTY SAND (SM), wet, dense to very dense, fine to medium, little silt
	0.0		11 23 23	18		54		
	0.0		11 14 23	24		56		BROWN SILT (ML), moist, hard, few sand, medium plasticity
			36					GRAY CLAY (CL), damp, very hard, trace sand, medium to high plasticity
						58		Bottom of boring @ 57 feet
						60		EXTRACTION WELL COMPLETION DETAILS: Extraction well SVE-11B constructed with 4-inch Schedule 40 PVC pipe and 0.020-inch machine slotted screen with a flat end cap.
						62		Total Well Depth (bgs):35.20 feet. Well Sump/Endcap: 35 to 35.20 feet. Well Screen: 20 to 35 feet. Well Blank:0 to 20 feet. Filter Pack: 18 to 36 feet (#10-#20 Sand). Well Seal: 2.5 to 18 feet and 36 to 57 feet (hydrated bentonite chips). Surface Seal: 0 to 2.5 feet (concrete). Washington Department of Ecology Well Tag Number: BIE301.
						64		
						66		
						68		
						70		

Project: Manhattan Village
Project Number: 1358.001.001
Site Location: Normandy Park, Washington
Logged By: Karsten Springstead
Notes: Samples collected with nominal 2" Split Spoon Sampler

Total Drilled Depth: 57 feet
Diameter of Boring: 0' to 36':12 inches, 36' to 57': 8 inches
Drill Date: 11/18/13
Drilled By: Holt Services, Inc.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF EXTRACTION WELL: SVE-12A

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete Bentonite PVC Blank Casing 10x20 Sand Filter Pack PVC Well Screen End Cap	0.0 0.0 0.0 0.0					0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34		See SVE-12B for Lithology EXTRACTION WELL COMPLETION DETAILS: Extraction well SVE-12A constructed with 4-inch Schedule 40 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 20 feet. Well Sump/Endcap: 19.98 to 20 feet. Well Screen: 5 to 19.98 feet. Well Blank: 0 to 5 feet. Filter Pack: 3 to 20 feet (#10-#20 Sand). Well Seal: 2.0 to 3 feet (hydrated bentonite chips). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BIE303.

Project: Manhattan Village
Project Number: 1358.001.001
Site Location: Normandy Park, Washington
Logged By: Karsten Springstead
Notes: See SVE-12B for Lithology

Total Drilled Depth: 20 feet
Diameter of Boring: 12 inches
Drill Date: 11/19/13
Drilled By: Holt Services, Inc.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF EXTRACTION WELL: SVE-12B

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete						0		Asphalt, 3 inches thick
						2		BROWN SILTY SAND WITH GRAVEL (SM), fine to medium sand, little silt, subangular gravel (FILL)
Bentonite						4		BROWN SILTY SAND (SM), moist, loose, fine to medium, some silt, trace gravel
	0.0		7 3 2	18		6		
						8		
			6 4 6	18		10		BROWN SAND (SP), moist, loose, fine to medium, trace silt
PVC Blank Casing						12		
						14		@ 15 feet: dense
			10 19 20	0		16		
						18		BROWN SILTY SAND WITH GRAVEL (SM), moist, loose
	0.0		10 15 20	18		20		BROWN SAND (SP), moist, dense, fine to medium, few silt
						22		
						24		
	0.0		11 19 19	18		26		BROWN SILTY SAND (SM), moist, dense, fine to medium, little silt
10x20 Sand Filter Pack						28		
PVC Well Screen			11 24 25	12		30		
						32		
						34		

Project: Manhattan Village
Project Number: 1358.001.001
Site Location: Normandy Park, Washington
Logged By: Karsten Springstead
Notes: Samples collected with nominal 2" Split Spoon Sampler

Total Drilled Depth: 57 feet
Diameter of Boring: 0 to 35': 12 inches, 35 to 57': 8 inches
Drill Date: 11/20/13
Drilled By: Holt Services, Inc.
Drill Method: Hollow Stem Auger

LOG OF EXTRACTION WELL: SVE-12B

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
End Cap	0.0	W-SVE-12 B-112013	23 29 34	18		36		@ 35 to 36 feet: trace gravel
	0.0		14 20 19	24				
	0.0		28 16 31	18		38		@ 38 feet: orange mottling
	0.0		34 10 34			40		@ 39.5 feet: becomes wet
	0.0		50 35 14	24				BROWN SILTY SAND WITH GRAVEL (SM), wet, dense, fine to coarse, little silt, 0.5 inch gravel, subrounded
	0.0		25 50 5	18		42		GRAY SAND (SP), wet, medium dense, fine to medium, trace silt and gravel (note: temporary screen set from 39 to 44 feet to collect grab groundwater sample)
	0.0		8 4 4	18		44		
	0.0		5 12 5	18		46		GRAY SAND (SP), wet, medium dense to dense, fine to medium, trace silt, heaving
	0.0		13 18 24	24		48		
	0.0		15 20 23	18		50		
	0.0		5 12 26	24				GRAY SILTY SAND WITH GRAVEL (SM), wet, fine to coarse sand, little silt and gravel, subrounded gravel
	0.0		39 50 40	18		52		GRAY SAND (SP), wet, very dense, fine to medium, trace silt
	0.0		50 19 20	18		54		BLACK PEAT (PT), moist, loose
	0.0		23 5 12	24		56		GRAY GRAVEL WITH SILT AND SAND (GP), wet, dense, some fine to medium sand
	1.0		20 28					BROWN SANDY SILT (ML), moist, hard
						58		DARK GRAY SILT (ML), moit, very hard, medium plasticity
								Bottom of boring @ 57 feet
						60		MONITORING WELL COMPLETION DETAILS: Monitoring well SVE-12B constructed with 4-inch Schedule 40 PVC pipe and 0.020-inch machine slotted screen with a flat end cap.
						62		Total Well Depth (bgs): 35.20 feet. Well Sump/Endcap: 35 to 35.20 feet. Well Screen: 20 to 35 feet. Well Blank:0 to 35 feet. Filter Pack: 18 to 36 feet (#10-#20 Sand). Well Seal: 2.5 to 18 feet and 36 to 57 feet (hydrated bentonite chips). Surface Seal: 0 to 2.5 feet (concrete). Washington Department of Ecology Well Tag Number: BIE304.
						64		
						66		
						68		
						70		

Project: Manhattan Village
Project Number: 1358.001.001
Site Location: Normandy Park, Washington
Logged By: Karsten Springstead
Notes: Samples collected with nominal 2" Split Spoon Sampler

Total Drilled Depth: 57 feet
Diameter of Boring: 0 to 35': 12 inches, 35 to 57': 8 inches
Drill Date: 11/20/13
Drilled By: Holt Services, Inc.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF EXTRACTION WELL: SVE-13A

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete Bentonite PVC Blank Casing 10x20 Sand Filter Pack PVC Well Screen End Cap	0.0 0.0 0.0 0.0					0 2 4 6 8 10 12 14 16 18 20		See SVE-13B for Lithology
						22 24 26 28 30 32 34		EXTRACTION WELL COMPLETION DETAILS: Extraction well SVE-13A constructed with 4-inch Schedule 40 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 20 feet. Well Sump/Endcap: 19.98 to 20 feet. Well Screen: 5 to 19.98 feet. Well Blank: 0 to 5 feet. Filter Pack: 3 to 20 feet (#10-#20 Sand). Well Seal: 2.0 to 3 feet (hydrated bentonite chips). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BIE306.

Project: Manhattan Village
Project Number: 1358.001.001
Site Location: Normandy Park, Washington
Logged By: Karsten Springstead
Notes: See SVE-13B for Lithology

Total Drilled Depth: 20 feet
Diameter of Boring: 12 inches
Drill Date: 11/18/13
Drilled By: Holt Services, Inc.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
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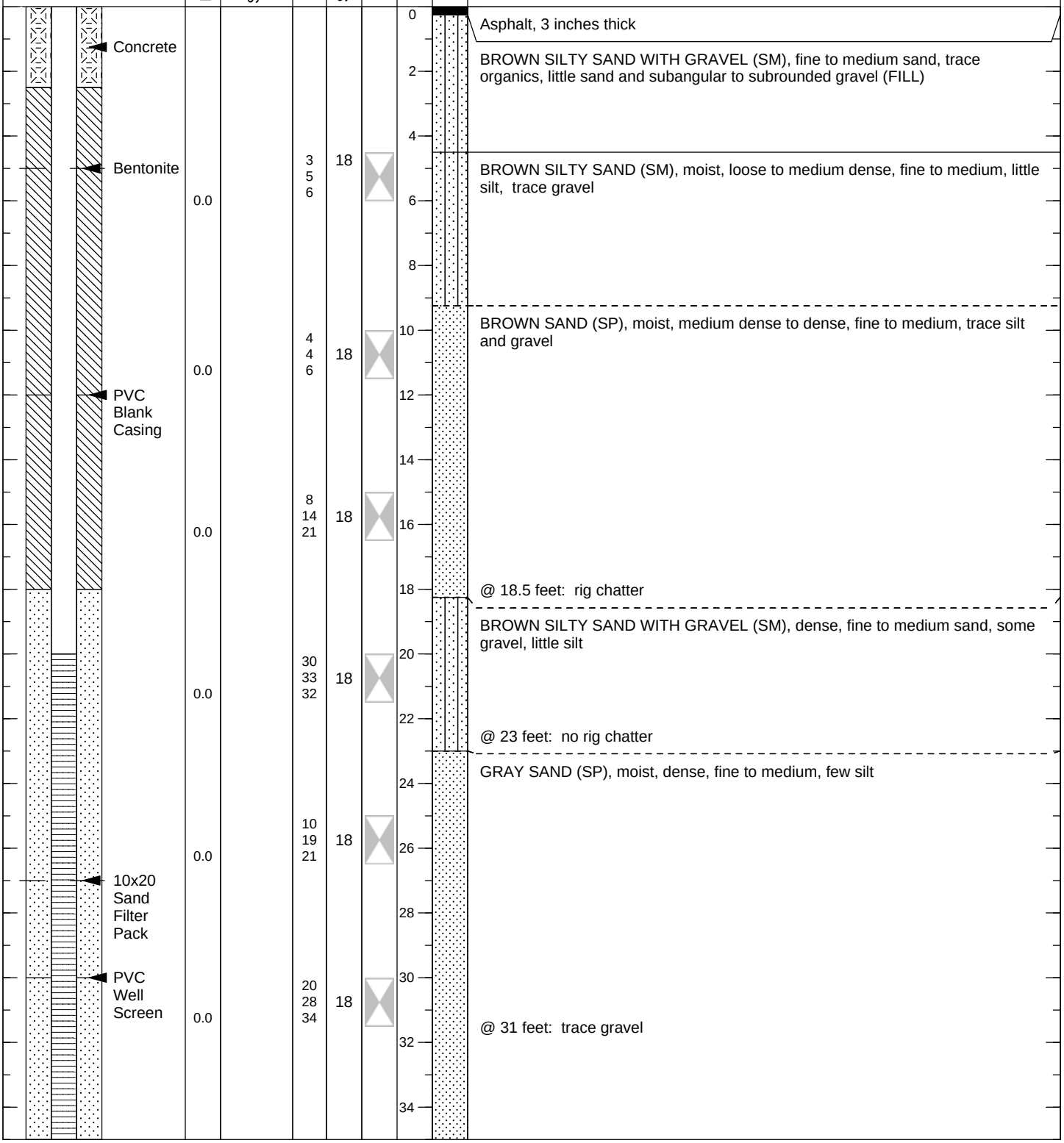
LOG OF EXTRACTION WELL: SVE-13B



Project: Manhattan Village
Project Number: 1358.001.001
Site Location: Normandy Park, Washington
Logged By: Karsten Springstead
Notes: Samples collected with nominal 2" Split Spoon Sampler

Total Drilled Depth: 57.5 feet
Diameter of Boring: 0 to 36': 12 inches, 36 to 57.5': 8 inches
Drill Date: 11/21/13
Drilled By: Holt Services, Inc.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
End Cap	0.0		33 50	24		36		BROWN SAND WITH GRAVEL(SP), moist, very dense, fine to medium, some gravel, trace silt
	0.0		39 36					
			14 28	18		38		BROWN SAND (SP), very dense, fine to medium, trace gravel and silt
	0.0		40 20					@ 38 feet: orange mottling
			22	18				@ 39 feet: wet
	0.0		35			40		@ 39.5 feet: trace gravel
		W-SVE-13 B-112113				42		
						44		(note: temporary screen set from 44 to 59 feet used to collect a grab gorundwater sample)
			18 34	18				
	0.0		38			46		@ 47 feet: heaving sand
						48		
			5 12	18		50		GRAY SAND (SP), wet, dense, fine to medium, trace silt
	0.0		21 9					
			9	18		52		
	0.0		16 12					
			17	18		54		
	0.0		27 11					
			21	18				
	0.0		13 18			56		DARK GRAY SILT (ML), moist, hard, trace fine sand, medium to high plasticity
		S-SVE-13 B-112113	12	18				
			13			58		Bottom of boring @ 57.5 feet
						60		EXTRACTION WELL COMPLETION DETAILS: Extraction well SVE-13B constructed with 4-inch Schedule 40 PVC pipe and 0.020-inch machine slotted screen with a flat end cap.
						62		Total Well Depth (bgs): 57.5 feet. Well Sump/Endcap: 35 to 35.2 feet. Well Screen: 20 to 35 feet. Well Blank: 0 to 20 feet. Filter Pack: 18 to 36 feet (#10-#20 Sand).
						64		Well Seal: 2.5 to 18 feet and 36 to 57.5 feet (hydrated bentonite chips). Surface Seal: 0 to 2.5 feet (concrete). Washington Department of Ecology Well Tag Number: BIE305.
						66		
						68		
						70		

Project: Manhattan Village
Project Number: 1358.001.001
Site Location: Normandy Park, Washington
Logged By: Karsten Springstead
Notes: Samples collected with nominal 2" Split Spoon Sampler

Total Drilled Depth: 57.5 feet
Diameter of Boring: 0 to 36': 12 inches, 36 to 57.5': 8 inches
Drill Date: 11/21/13
Drilled By: Holt Services, Inc.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: SVE-14

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete	0.0					0		Asphalt (3 inches)
	0.0							Asphalt base (4 inches)
	0.0	SVE-14-3.5				2		BROWN SAND (SP), fine to medium (soil cleared with air knife to 4 feet)
						4		YELLOW-BROWN SAND (SP), moist, medium dense, fine, few fines, faint chemical-like odor
	3.4		6 6 7	18		6		
						8		BROWN SAND (SP), moist, medium dense, medium, few fines
Bentonite -Portland Cement Grout	14.3	SVE-14-8.5	4 7 10	11		10		
	3.3		15 17 15	18				at 10 feet: dense
4" Sch. 40 PVC Casing						12		
						14		
	1.6		18 20 20	12		16		
Bentonite						18		
	12.9		16 14 19	12		20		at 20 feet: few fine to coarse gravel, chemical-like odor, higher moisture content than above
10x20 Sand Filter Pack						22		
						24		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 36 feet
Diameter of Boring: 9 inches
Drill Date: 10/13/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	6.4		20 30 30	12		26		at 25 feet: very dense
4" Sch. 40 PVC Screen 0.020-inch						28		
	3.2		21 20 20	12		30		at 30 feet: gray-brown, dense, no gravel
						32		
End Cap						34		
	1.3		29 50/6	12		36		at 35 feet: very dense, few fines, few fine to coarse gravel
								Bottom of boring at 36 feet. SOIL VAPOR EXTRACTION WELL COMPLETION DETAILS: soil vapor extraction well SVE-14 constructed with 4-inch Schedule 40 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 34.9 feet. Well Sump/Endcap: 34.6 to 34.9 feet. Well Screen: 19.6 to 34.6 feet. Well Blank: 0.8 to 19.6 feet. Filter Pack: 18.3 to 36 feet (10x20 Sand). Well Seal: 16.2 to 18.3 feet (hydrated bentonite chips). Annular Seal: 2.0 to 16.2 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 732
						38		
						40		
						42		
						44		
						46		
						48		
						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 36 feet
Diameter of Boring: 9 inches
Drill Date: 10/13/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

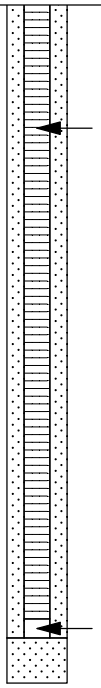
PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: SVE-15

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete	0.0					0		Asphalt (3 inches)
	0.0							Asphalt base (3 inches)
	0.0					2		BROWN SAND (SP), fine to medium, horizon of coarse gravel (soil cleared with airknife to 5 feet)
		SVE-15-3				4		
						6		BROWN SILTY SAND (SM), moist, fine, little fines, trace fine to coarse gravel (soil logged from cuttings to 8 feet)
	1.2					8		YELLOW-BROWN SAND (SP), moist, medium dense, medium, few fines
		SVE-15-8	8					
Bentonite-Portland Cement Grout	2.1		8	11				
			8					
			15			10		at 10 feet: dense, rare orange staining
	1.1		18	18				
			17					
4" Sch. 40 PVC Casing						12		
								BROWN SAND (SP), moist, dense, medium, few fines, frequent horizons up to 1/4 inches thick of orange staining
						14		
			16					
	1.9		23	18		16		
			19					
Bentonite						18		BROWN GRAVEL WITH SAND (GP), moist, very dense, fine, little fine to coarse sand, few fines
						20		
			32					
	1.5		20	11				
			39					
10x20 Sand Filter Pack						22		
								GRAY-BROWN SAND (SP), moist, dense, medium, few fines
						24		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 36 feet
Diameter of Boring: 9 inches
Drill Date: 10/15/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 4" Sch. 40 PVC Screen 0.020-inch	1.3		21 20 20	10		26		
						28		
	0.8		39 50/6	12		30		at 30 feet: very dense, few fine to coarse gravel, occasional cobbles
						32		
						34		
End Cap	0.5		31 50/6	12		36		at 35 feet: fine
						38		Bottom of boring at 36 feet. SOIL VAPOR EXTRACTION WELL COMPLETION DETAILS: soil vapor extraction well SVE-15 constructed with 4-inch Schedule 40 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 35.3 feet. Well Sump/Endcap: 34.9 to 35.2 feet. Well Screen: 20.6 to 34.9 feet. Well Blank: 0.6 to 20.6 feet. Filter Pack: 19.3 to 36 feet (10x20 Sand). Well Seal: 15.9 to 19.3 feet (hydrated bentonite chips). Annular Seal: 2.0 to 15.9 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete) Washington Department of Ecology Well Tag Number: BID 736
						40		
						42		
						44		
						46		
						48		
						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 36 feet
Diameter of Boring: 9 inches
Drill Date: 10/15/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: SVE-16

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
						0		Asphalt (3 inches)
Concrete	0.0							Asphalt base (3 inches)
	0.0					2		BROWN SAND (SP), fine, frequent cobbles (soil cleared with airknife to 5 feet)
	0.0	SVE-16-3						
						4		
								BROWN SILTY SAND (SM), moist, fine, little fines, trace fine gravel (soil logged from cuttings to 8 feet)
	4.2					6		
								BROWN SILT (ML), moist, soft, few fine sand, rapid dilatency, non-plastic, abundant orange staining
			3			8		
Bentonite-Portland Cement Grout	6.3		3	6				
			4					
			4			10		BROWN SILTY SAND (SM), moist, loose, fine, some fines, trace fine to coarse gravel
	23.5	SVE-16-10	4	10				
			5					
4" Sch. 40 PVC Casing						12		
								BROWN SAND (SP), moist, medium dense, medium, few fines
						14		
			10					
	1.0		16	18				
			12			16		
Bentonite								
						18		
						20		at 20 feet: gray, trace coarse gravel, chemical-like odor
			14					
	10.9		14	13				
			14					
						22		
10x20 Sand Filter Pack								
						24		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 35.5 feet
Diameter of Boring: 9 inches
Drill Date: 10/15/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.6		19 19 23	8		26		at 25 feet: dense, few fine gravel, no odor
4" Sch. 40 PVC Screen 0.020-inch						28		
	1.4		19 27 30	7		30		at 30 feet: brown, very dense, fine, few fines
						32		
						34		
End Cap	1.6		50/6	6		36		at 35 feet: medium Bottom of boring at 35.5 feet.
						38		
						40		
						42		
						44		
						46		
						48		
						50		

SOIL VAPOR EXTRACTION WELL COMPLETION DETAILS:
soil vapor extraction well SVE-16 constructed with 4-inch Schedule 40 PVC pipe and 0.020-inch machine slotted screen with a flat end cap.

Total Well Depth (bgs): 35.1 feet.
Well Sump/Endcap: 34.8 to 35.1 feet.
Well Screen: 20.5 to 34.8 feet.
Well Blank: 0.9 to 20.5 feet.
Filter Pack: 18 to 36 feet (10x20 Sand).
Well Seal: 16 to 18 feet (hydrated bentonite chips).
Annular Seal: 2.0 to 16 feet (bentonite-portland cement grout).
Surface Seal: 0 to 2.0 feet (concrete).
Washington Department of Ecology Well Tag Number: BID 737

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 35.5 feet
Diameter of Boring: 9 inches
Drill Date: 10/15/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: SVE-17

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete						0		BROWN SILTY SAND (SM), moist, medium dense, fine to medium, little fines (soil logged from cuttings to 5 feet)
						2		
						4		
		SVE-17-5	5 6 7	18		6		YELLOW-BROWN SILTY SAND (SM), moist, medium dense, fine to medium, little fines
						8		BROWN SILTY SAND (SM), dry, medium dense, fine to coarse, little fines, few fine subrounded gravel
Bentonite-Portland Cement Grout			8 9 9	18		10		
4" Sch. 40 PVC Casing						12		YELLOW-BROWN SAND (SP), moist, medium dense, fine to medium, few fines
						14		GRAY SILTY SAND (SM), moist, very dense, fine to coarse, little fines, trace fine to coarse gravel, pulverized rock in bottom of sampler
			37 50/6	12		16		
Bentonite						18		
			23 27 29	18		20		BROWN SAND (SP), moist, very dense, fine, few fines, trace fine subrounded gravel
10x20 Sand Filter Pack						22		
						24		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 31 feet
Diameter of Boring: 9 inches
Drill Date: 9/24/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
4" Sch. 40 PVC Screen 0.020-inch End Cap			36 50/6 33 50/6	12 12		26 28 30		
						32 34 36 38 40 42 44 46 48 50		Bottom of boring at 31 feet. SOIL VAPOR EXTRACTION WELL COMPLETION DETAILS: soil vapor extraction well SVE-17 constructed with 4-inch Schedule 40 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 30.2 feet. Well Sump/Endcap: 29.9 to 30.2 feet. Well Screen: 19.9 to 29.9 feet. Well Blank: 0.5 to 19.9 feet. Filter Pack: 18 to 31 feet (10x20 Sand). Well Seal: 16 to 18 feet (hydrated bentonite chips). Annular Seal: 2.0 to 16 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete) Washington Department of Ecology Well Tag Number: BID 709

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 31 feet
Diameter of Boring: 9 inches
Drill Date: 9/24/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: SVE-18

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete						0		BROWN SILTY SAND (SM), dry, medium dense, fine, little fines, trace fine gravel (soil logged from cuttings to 5 feet)
						2		
						4		
		SVE-18-5	7 7 8	15		6		YELLOW-BROWN SILTY SAND (SP), dry, medium dense, fine to medium, little fines
						8		GRAY SILTY SAND (SM), moist, very dense, fine to coarse, some fines, trace fine gravel, occasional cobbles
Bentonite-Portland Cement Grout			22 50/6	12		10		
4" Sch. 40 PVC Casing						12		
						14		
			36 50/6	12		16		GRAY SILTY SAND WITH GRAVEL (SM), moist, very dense, fine to coarse, some fines, little fine to coarse subrounded gravel
Bentonite						18		GRAY-BROWN SAND (SP), moist, very dense, fine, few fines, interbedded with GRAY-BROWN SILTY SAND (SM), moist, very dense, fine, little fines
			37 50/6	12		20		
10x20 Sand Filter Pack						22		
						24		BROWN SAND (SP), moist, very dense, fine to medium, few fines, trace coarse subrounded gravel

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 31 feet
Diameter of Boring: 9 inches
Drill Date: 9/23/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
			39 50/6	12		26		
4" Sch. 40 PVC Screen 0.020-inch						28		
End Cap			21 33 32	15		30		at 30 feet: no gravel
						32		Bottom of boring at 31 feet. SOIL VAPOR EXTRACTION WELL COMPLETION DETAILS: soil vapor extraction well SVE-18 constructed with 4-inch Schedule 40 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 30.1 feet. Well Sump/Endcap: 29.8 to 30.1 feet. Well Screen: 19.8 to 29.8 feet. Well Blank: 0.5 to 19.8 feet. Filter Pack: 17.9 to 31 feet (10x20 Sand). Well Seal: 16 to 17.9 feet (hydrated bentonite chips). Annular Seal: 2.0 to 16 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 708
						34		
						36		
						38		
						40		
						42		
						44		
						46		
						48		
						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 31 feet
Diameter of Boring: 9 inches
Drill Date: 9/23/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete						0		DARK BROWN SILTY SAND (SM), moist, medium dense, fine, little fines, few gravel, abundant wood debris (soil logged from cuttings to 5 feet)
						2		
						4		
	0.4	SVE-19-5	7 8 6	16		6		BROWN SAND (SP), moist, medium dense, fine, few fines
						8		
Bentonite-Portland Cement Grout								
	0.3		8 9 9	18		10		at to feet: brown-gray, medium
4" Sch. 40 PVC Casing						12		
						14		
	0.0		14 16 21	18		16		at 15 feet: dense, fine
Bentonite						18		BROWN SILTY SAND WITH GRAVEL (SM), moist, dense, medium, little fines, little fine gravel
						20		
	0.0		15 16 21	18				BROWN-GRAY SAND (SP), moist, dense, medium, few fines, rare horizons up to 2 inches thick of sand with gravel
10x20 Sand Filter Pack						22		
								BROWN SAND WITH GRAVEL (SP), moist, very dense, medium, few fines, some fine to coarse gravel
						24		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 31 feet
Diameter of Boring: 9 inches
Drill Date: 9/29/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
4" Sch. 40 PVC Screen 0.020-inch	0.0		50/6	6		26		
						28		BROWN SAND (SP), moist, very dense, medium, few fines, trace fine to coarse gravel
End Cap	0.0		41 50/6	12		30		
						32		Bottom of boring at 31 feet. SOIL VAPOR EXTRACTION WELL COMPLETION DETAILS: soil vapor extraction well SVE-19 constructed with 4-inch Schedule 40 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 30.3 feet. Well Sump/Endcap: 30.0 to 30.3 feet. Well Screen: 20.0 to 30.0 feet. Well Blank: 0.7 to 20.0 feet. Filter Pack: 18 to 31 feet (10x20 Sand). Well Seal: 16 to 18 feet (hydrated bentonite chips). Annular Seal: 2.0 to 16 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 715
						34		
						36		
						38		
						40		
						42		
						44		
						46		
						48		
						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 31 feet
Diameter of Boring: 9 inches
Drill Date: 9/29/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Conrete						0		BROWN SILTY SAND (SM), moist, loose, fine to coarse, trace subrounded gravel, trace roots (boring logged based on auger cuttings to 20 feet bgs)
						2		
						4		
						6		
Bentonite						8		
						10		
PVC Blank Casing 1" SCH 80						12		
						14		
						16		
						18		
						20		
	1.0		12,6,9	12				GRAY BROWN SILTY SAND (SM), little fines, few gravel
	0.8		5,6,9	12		22		GRAY SAND (SP), moist, fine to medium, trace fines
	0.9		10,24,22	12		24		@ 24.5 feet: few fines

Project: Manhattan Village
Project Number: 1358.001.001
Site Location: Normandy Park, Washington
Logged By: Karsten Springstead
Notes: Samples collected with nominal 2" Split Spoon Sampler

Total Drilled Depth: 48 feet
Diameter of Boring: 9 inches
Drill Date: 5/16/13 and 5/17/13
Drilled By: Holt Services, Inc.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.4		11,34,36	12		26		@ 26 feet: fine to coarse, little fines
	3.7		16,33,36	12				GRAY SILTY SAND (SM), moist, fine to medium, little fines, little subrounded gravel
	0.4		7,15,19	12		28		GRAY SAND (SP), moist, fine to medium, trace fines
	0.1	19	19,30/5	8		30		@ 30 feet: fine to coarse, little subrounded gravel
	0.1		15,45,48	12				
Bentonite						32		@ 31.5 feet: rust/orange mottling @ 32 feet: wet
	0.1		7,28,27	18				
	0.1		7,20,23	12		34		@ 34 feet: few gravel
PVC Blank Casing 1" SCH 80	0.1		14,27,26	18		36		@ 36 feet: little gravel @ 36.5 feet: dark brown silt lens (dry, hard)
	0.2		10,20,25	12				@ 37 feet: occasional 1" brown fine lenses
	0.2		9,26,38	18		38		
	0.4		28,41,43	12		40		Stopped Drilling on 5/16/13. Added ~75 gallons of water to prevent heaving. Continued drilling on 5/17/13 @ 41 to 42 feet: sample lost
	0.4		50/5	6		42		GRAY SILTY SAND (SM), wet, fine to coarse, little fines, few subrounded gravel (driller notes odor in auger.)
10x20 Sand Filter Pack	0.4		43,50/5	12		44		
PVC Well Screen	0.4		35,50/5	12		46		GRAY SILTY GRAVEL WITH SAND (GP), wet, fine to coarse, little fines, subrounded gravel, little to some sand
End Cap	0.0		11,12,18	18		48		BROWN SILT (ML), moist, dense, few fine sand, orange mottling, medium plasticity
						50		@ 48 feet: Bottom of Boring AIR SPARGE WELL COMPLETION DETAILS: Air sparge well constructed with 1-inch Schedule 80 PVC pipe and 0.020-inch

Project: Manhattan Village
Project Number: 1358.001.001
Site Location: Normandy Park, Washington
Logged By: Karsten Springstead
Notes: Samples collected with nominal 2" Split Spoon Sampler

Total Drilled Depth: 48 feet
Diameter of Boring: 9 inches
Drill Date: 5/16/13 and 5/17/13
Drilled By: Holt Services, Inc.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
						50		machine slotted screen with a flat end plug. AS-1 Total Well Depth: 45.80 feet. Well Sump/Endcap: 45.80 to 45.83feet. Well Screen: 43.80 to 45.80 feet. Well Blank:+3.0 to 43.80 feet. Completed 3.0 feet above ground. Filter Pack: 43.5 to 48 feet (#10-#20 Sand). Well Seal: 2.5 to 43.5 feet (hydrated bentonite chips). Surface Seal: 0 to 2.5 feet (concrete). Washington Department of Ecology Well Tag Number: BHV647.
						52		
						54		
						56		
						58		
						60		

Project: Manhattan Village
Project Number: 1358.001.001
Site Location: Normandy Park, Washington
Logged By: Karsten Springstead
Notes: Samples collected with nominal 2" Split Spoon Sampler

Total Drilled Depth: 48 feet
Diameter of Boring: 9 inches
Drill Date: 5/16/13 and 5/17/13
Drilled By: Holt Services, Inc.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete						0		DARK BROWN SILTY SAND (SM), dry, fine to coarse, little fines, little fine to coarse gravel (soil logged from cuttings to 5 feet)
						2		
						4		
		AS-2-5	12					
	0.8		10	18		6		LIGHT BROWN SANDY SILT (ML), moist, hard, some fine sand
			9					BROWN SILTY SAND (SM), moist, medium dense, medium, little fines
						8		
			10			10		at 10 feet: occasional horizons up to 1/2 inch thick of orange staining
	0.7		12	18				
2" Sch. 80 PVC Casing			10			12		
								BROWN SAND (SP), moist, medium dense, medium, few fines
						14		
			11					
	0.3		13	18		16		
			12					
						18		
Bentonite-Portland Cement Grout						20		at 20 feet: dense, trace fine gravel, horizons up to 6 inches thick of silty sand, abundant clumps up to 3/4 inch thick of silty sand
			17					
	0.0		15	18				
			20					
						22		
						24		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 53 feet
Diameter of Boring: 9 inches
Drill Date: 9/29/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.0		16 21 19	18		26		BROWN SILT (ML), moist, very hard, trace fine sand
						28		BROWN SILTY SAND WITH GRAVEL (SM), moist, dense, medium, little fines, little fine to coarse gravel, horizon 1/4 inch thick of coarse sand at base of overlying silt
	0.0		26 50/6	12		30		BROWN SILTY SAND (SM), moist, very dense, medium, little fines, few fine to coarse gravel, pulverized rock in sampler
						32		
						34		
	0.0		22 25 26	18		36		at 35 feet: no gravel
						38		
	0.0		27 50/6	12		40		at 40 feet: wet, trace fine gravel
	0.0		50/6	6		42		BROWN GRAVEL WITH SAND (GP), wet, very dense, fine to coarse, little medium to coarse sand, few fines
	0.0		50/6	6				BROWN SAND (SP), wet, very dense, medium, few fines
	0.0		50/6	6		44		
	0.0		50/6	6		46		
Bentonite	0.0		50/6	6		48		
10x20 Sand Filter Pack	0.0		50/6	6		50		at 49 feet: few fine to coarse gravel

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 53 feet
Diameter of Boring: 9 inches
Drill Date: 9/29/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
2" Sch. 80 PVC 0.020-inch Screen End Cap	0.0		50/6	6		50		
	0.0		50/6	6		52		
	0.0		50/6	6				SILTY GRAVEL (GM), wet, very dense, fine to coarse, some fines, few sand
	0.0		50/6	6				BROWN SILT (ML), moist, few sand, trace gravel
						54		Bottom of boring at 53 feet.
								Added 10 to 15 gallons of water to control heave.
						56		AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-2 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap.
						58		Total Well Depth (bgs): 51.3 feet. Well Sump/Endcap: 51.1 to 51.3 feet. Well Screen: 49.1 to 51.1 feet. Well Blank: 0.5 to 49.1 feet. Filter Pack: 48 to 53 feet (10x20 Sand). Well Seal: 46 to 48 feet (hydrated bentonite chips). Annular Seal: 2.0 to 46 feet (bentonite-portland cement grout). Surface Seat: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 714
						60		
						62		
						64		
						66		
						68		
						70		
						72		
						74		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 53 feet
Diameter of Boring: 9 inches
Drill Date: 9/29/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: AS-3

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete						0		BROWN SILTY SAND (SM), moist, fine to medium, some fines, few fine gravel (soil logged from cuttings to 5 feet)
						2		
						4		YELLOW-BROWN SAND (SP), moist, medium dense, fine, few fines
	0.0		5 5 6	12		6		
						8		BROWN SAND (SP), moist, medium dense, medium, few fines, rare horizons up to 1/3 inch thick of orange staining
	0.3	AS-3-10	9 9 9	13		10		
2" Sch. 80 PVC Casing						12		
						14		
	0.0		11 12 12	14		16		at 15 feet: gray-brown, fine
						18		
Bentonite-Portland Cement Grout	0.0		17 19 21	15		20		at 20 feet: gray, medium to coarse, few fines, sand coarsness varies in 2 to 3-inch thick layers
						22		
						24		

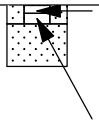
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 51 feet
Diameter of Boring: 9 inches
Drill Date: 10/01/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
			50/5	0		26		at 25 feet: no recovery
						28		BROWN SILTY GRAVEL WITH SAND (GM), moist, very dense, fine, some fine to coarse sand, little fines
	0.0		50/6	6		30		
						32		
						34		BROWN SAND (SP), wet, medium, few fines
	0.0		50/6	6		36		
						38		BROWN SILTY SAND WITH GRAVEL (SM), wet, dense, fine to coarse, some fine to coarse gravel, little fines (heaving)
	0.0		13 18 22	18		40		
						42		
						44		BROWN SILTY SAND (SM), wet, very dense, medium, little fines, few fine gravel
Bentonite	0.0		22 50/6	12		46		
	0.0		21 26 50/6	18		48		
10x20 Sand Filter Pack			20 26 50/6	12		50		BROWN SILTY SAND WITH GRAVEL (SM), wet, very dense, coarse, little fines, little fine to coarse gravel
			14					

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 51 feet
Diameter of Boring: 9 inches
Drill Date: 10/01/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 2" Sch. 80 PVC 0.020-inch Screen End Cap			15 50/6	18		50		
						52		Bottom of boring at 51 feet. Added 5 to 10 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-8 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 50.3 feet. Well Sump/Endcap: 50.1 to 50.3 feet. Well Screen: 48.1 to 50.1 feet. Well Blank: 0.5 to 48.1feet. Filter Pack: 46 to 51 feet (10x20 Sand). Well Seal: 44 to 46 feet (hydrated bentonite chips). Annular Seal: 2.0 to 44 feet (bentonite-portland cement grout). Surface Seatl: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 718
						54		
						56		
						58		
						60		
						62		
						64		
						66		
						68		
						70		
						72		
						74		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 51 feet
Diameter of Boring: 9 inches
Drill Date: 10/01/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete						0		DARK BROWN SILTY SAND (SM), dry, fine to medium, little fines, few fine to coarse gravel (soil logged from cuttings to 5 feet)
						2		at 1.25 feet: brown, moist, no gravel
						4		YELLOW-BROWN SILTY SAND (SM), moist, medium, few to little fines
	0.7	AS-4-5	7 8 8	18		6		YELLOW-BROWN SAND (SP), moist, medium dense, fine, few fines
						8		BROWN SAND (SP), moist, medium dense, medium, few fines
	0.0		8 8 8	18		10		
2" Sch. 80 PVC Casing						12		
						14		
	0.0		10 11 13	18		16		at 15 feet: gray-brown, fine
						18		BROWN SAND (SP), moist, dense, fine, few fines, few fine gravel, interbedded with BROWN-GRAY SAND (SP), moist, dense, medium, few fines, trace gravel
Bentonite-Portland Cement Grout	0.0		11 15 22	18		20		
						22		
						24		BROWN SAND (SP), moist, dense, fine, few fines

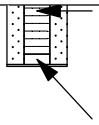
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 51 feet
Diameter of Boring: 9 inches
Drill Date: 9/30/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.0		15 21 24	18		26		
						28		
	0.0		27 31 30	18		30		at 30 feet: very dense, medium
						32		BROWN SILTY SAND (SM), moist, very dense, fine, little fines
	0.1		30 50/6	12		34 36		at 35 feet: wet (heaving)
						38		BROWN SILTY SAND WITH GRAVEL (SM), wet, very dense, medium, little fine to coarse gravel, little fines
	0.0		50/6	6		40		
						42		
						44		BROWN SAND (SP), wet, very dense, medium, few fines, trace fine gravel
	0.0		16 21 50/0	12		46		
Bentonite			19 20 50/0	12		48		
10x20 Sand Filter Pack			8 10 19	18		50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 51 feet
Diameter of Boring: 9 inches
Drill Date: 9/30/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 2" Sch. 80 PVC 0.020-inch Screen End Cap				12		50		
						52		Bottom of boring at 51 feet. Added approximately 70 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-4 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 51 feet. Well Sump/Endcap: 50.8 to 51.0 feet. Well Screen: 48.8 to 50.8 feet. Well Blank: 0.5 to 48.8 feet. Filter Pack: 47.3 to 51 feet (10x20 Sand). Well Seal: 45 to 47.3 feet (hydrated bentonite chips). Annular Seal: 2.0 to 45 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 717
						54		
						56		
						58		
						60		
						62		
						64		
						66		
						68		
						70		
						72		
						74		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 51 feet
Diameter of Boring: 9 inches
Drill Date: 9/30/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: AS-5

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete						0		BROWN SILTY SAND (SM), moist, medium, little fines, few fine to coarse gravel
						2		
						4		YELLOW-BROWN SILTY SAND (SM), moist, loose, fine, little fines
	0.4		5 5 5	18		6		
						8		BROWN SAND (SP), moist, medium dense, fine to medium, few fines
	0.3		5 8 9	18		10		
2" Sch. 80 PVC Casing						12		
						14		
	0.6	AS-5-15	8 9 10	18		16		at 15 feet: gray-brown, medium
						18		
Bentonite-Portland Cement Grout	0.2		18 21 30	12		20		at 20 feet: very dense, 1.5 inch thick horizon with medium sand, trace fine to coarse gravel
						22		
						24		

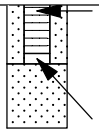
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 52 feet
Diameter of Boring: 9 inches
Drill Date: 9/30/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.2		33 25 29	18		26		at 25 feet: fine
						28		
			28			30		
	0.1		30 33	18				BROWN SILTY SAND (SM), moist, very dense, medium, little fines, trace fine gravel, higher moisture content than above
						32		
						34		
			37 50/6	12		36		at 35 feet: wet
						38		
						40		
	0.5		49 50/6	12				BROWN SAND (SP), wet, very dense, medium, few fine gravel, few fines (heaving)
						42		
						44		
	0.4		50/6	6		46		
Bentonite								
			24					
	0.1		26 37	18				at 47 feet: trace fine gravel
10x20 Sand Filter Pack						48		
	0.1		26 36 50	18				
			18			50		BROWN GRAVEL (GP), wet, very dense, fine to coarse subrounded gravel, few fine to coarse sand, few fines

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 52 feet
Diameter of Boring: 9 inches
Drill Date: 9/30/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 2" Sch. 80 PVC 0.020-inch Screen End Cap			29 50	18 12		50 52		BROWN SAND (SP), wet, very dense, medium, few fines, trace fine gravel (heaving)
								Bottom of boring at 52 feet. Added 50-75 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-5 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 51 feet. Well Sump/Endcap: 50.8 to 51.0 feet. Well Screen: 48.8 to 50.8 feet. Well Blank: 0.5 to 48.8 feet. Filter Pack: 47.5 to 52 feet (10x20 Sand). Well Seal: 44.8 to 47.5 feet (hydrated bentonite chips). Annular Seal: 2.0 to 44.8 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 716
						54		
						56		
						58		
						60		
						62		
						64		
						66		
						68		
						70		
						72		
						74		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 52 feet
Diameter of Boring: 9 inches
Drill Date: 9/30/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: AS-6

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete						0		BROWN SILTY SAND (SM), moist, fine to coarse, little fines, trace gravel
						2		
						4		YELLOW-BROWN SILTY SAND (SM), moist, medium dense, fine, little fines
	0.5	AS-6-5	6 6 6	18		6		
						8		BROWN SAND (SP), moist, medium dense, medium, few fines
	0.2		7 8 9	18		10		at 10.4 feet: fine, abundant orange mottling
2" Sch. 80 PVC Casing						12		
						14		
	0.4		10 12 12	18		16		
						18		
Bentonite-Portland Cement Grout	0.0		12 14 14	18		20		at 20 feet: medium
						22		YELLOW-BROWN SILTY SAND (SM), moist, medium dense, medium, some fines
						24		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 52 feet
Diameter of Boring: 9 inches
Drill Date: 9/26/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.0		14 17 19	18		26		at 25 feet: brown, dense, little fines
						28		BROWN SAND (SP), moist, dense, medium, few fines, horizons up to 1/4 inches thick of fine gravel, horizons up to 4 inches thick of orange staining
	0.0		21 21 20	18		30		
						32		
						34		
	0.0		24 50/6	12		36		at 35.5 feet: wet, very dense, no staining
						38		
	0.0		50/6	6		40		at 40 feet: heaving
	0.0		50/6	6		42		BROWN SAND WITH GRAVEL (SP), wet, very dense, fine to coarse, some fine gravel, few fines (heaving)
	0.0		50/6	6				at 43 feet: fine to coarse gravel
	0.0		50/6	6		44		at 44.5 feet: medium to coarse sand, fine gravel
Bentonite	0.0		50/6	6		46		BROWN SAND (SP), wet, very dense, medium, few fines (heaving)
10x20 Sand Filter Pack	0.0		50/6	6		48		at 47.5 feet: fine to coarse, few fine gravel
	0.0		50/6	6		50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 52 feet
Diameter of Boring: 9 inches
Drill Date: 9/26/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
2" Sch. 80 PVC 0.020-inch Screen End Cap	0.0 0.0		50/6 13 24	6 12		50 52 54 56 58 60 62 64 66 68 70 72 74		BROWN SILT (ML), moist Bottom of boring at 52 feet. Added 10 to 15 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-6 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 51.1 feet. Well Sump/Endcap: 50.9 to 51.1 feet. Well Screen: 48.9 to 50.9 feet. Well Blank: 0.5 to 48.9 feet. Filter Pack: 47.6 to 52 feet (10x20 Sand). Well Seal: 45.5 to 47.6 feet (hydrated bentonite chips). Annular Seal: 2.0 to 45.5 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 713

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 52 feet
Diameter of Boring: 9 inches
Drill Date: 9/26/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: AS-7

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete						0		DARK BROWN SILTY SAND (SM), moist, medium dense, fine to medium, some fines, trace coarse rounded gravel
						2		
						4		
	2.1	AS-7-5	4 5 7	18		6		YELLOW-BROWN SILTY SAND (SM), moist, medium dense, medium, little fines
						8		
	1.3		12 14 17	18		10		GRAY SAND (SP), moist, dense, fine to medium, few fines
2" Sch. 80 PVC Casing						12		
						14		
	0.2		13 19 2	18		16		at 15 feet: horizon 1/2 inch thick of orange staining
						18		
Bentonite-Portland Cement Grout	0.0		15 17 17	11		20		at 20 feet: medium, no staining
						22		
						24		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 50.5 feet
Diameter of Boring: 9 inches
Drill Date: 9/24/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.0		21 19 23	18		26		at 25 feet: trace rounded coarse gravel, horizon 1/8 inch thick of orange staining
	0.0		17 23 26	12		30		at 30 feet: no gravel, no staining
	0.0		20 50/6	12		34		BROWN SAND (SP), wet, very dense, medium, few fines (heaving)
	0.0		24 50/6	12		40		at 40 feet: trace fine subrounded gravel
	0.0		30 50/6	12		42		at 41.5 feet: no gravel
	0.0		26 50/6	12		44		BROWN GRAVEL WITH SAND (GP), wet, very dense, fine to coarse, some fine to medium sand, few fines
Bentonite	0.0		50/6	6				YELLOW-BROWN SAND (SP), wet, very dense, fine, few fines, yellow color varries, partings visible
	0.0			6		46		BROWN GRAVEL (GP), wet, very dense, fine to coarse, few sand, few fines
10x20 Sand Filter Pack	0.0		50/6	6		48		BROWN SAND WITH GRAVEL (SP), wet, very dense, coarse, little gravel, few fines
End Cap	0.0		26	12		50		BROWN SILT (ML), moist, very hard

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 50.5 feet
Diameter of Boring: 9 inches
Drill Date: 9/24/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
2" Sch. 80 PVC 0.020-inch Screen			50/6			50		Bottom of boring at 50.6 feet. Added 10 to 15 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-7 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 49.1 feet. Well Sump/Endcap: 48.9 to 49.1 feet. Well Screen: 46.9 to 48.9 feet. Well Blank: 0.5 to 46.9 feet. Filter Pack: 46 to 50 feet (10x20 Sand). Well Seal: 44 to 46 feet (hydrated bentonite chips). Annular Seal: 2.0 to 44 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 710
						52		
						54		
						56		
						58		
						60		
						62		
						64		
						66		
						68		
						70		
						72		
						74		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 50.5 feet
Diameter of Boring: 9 inches
Drill Date: 9/24/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete	0.0 0.0					0		Asphalt (3 inches) Asphalt base (3 inches)
	0.0	AS-8-3.5				2		BROWN SAND (SP), moist to wet, occasional cobbles (soil cleared with air knife to 5 feet)
	0.5					4		BROWN SILTY SAND (SM), moist, fine, little fines
	1.7		3 3 2	15		8		YELLOW-BROWN SILTY SAND (SM), moist, loose to medium dense, fine, little fines, orange staining at top of sampler
	4.7		5 6 5	18		10		at 10 feet: brown at 11 feet: orange staining
2" Sch 80 PVC Casing						12		
	4.1		11 14 13	18		14		GRAY-BROWN SAND (SP), moist, medium dense, fine, few fines, occasional orange staining, chemical-like odor
						16		
						18		
Bentonite-Portland Cement Grout	5.6		15 16 21	18		20		at 20 feet: dense, medium
						22		
						24		

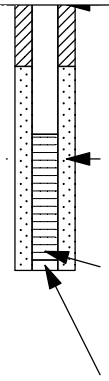
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54.3 feet
Diameter of Boring: 9 inches
Drill Date: 10/17/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
			20					
	6.5	AS-8-25	20	18		26		at 25.8 feet: fine to coarse, few fine to coarse gravel
			20					
						28		
	6.2		50/6	6		30		at 30 feet: brown, very dense, fine to coarse, little fine to coarse gravel
						32		
						34		
			23					
	4.4		31	18		36		at 35 feet: medium, no gravel
			30					
						38		
								BROWN SILTY SAND WITH GRAVEL (SM), wet, very dense, medium, little fine to coarse gravel, little fines (heaving)
	4.6		30	14		40		
			30					
			40					
						42		
						44		
	1.8		50/6	6				
						46		
						48		BROWN SAND WITH GRAVEL (SP), wet, very dense, medium, some fine to coarse gravel (heaving)
Bentonite						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54.3 feet
Diameter of Boring: 9 inches
Drill Date: 10/17/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 10x20 Sand Filter Pack; 2" Sch 80 PVC 0.020-inch Screen; End Cap	0.4		20 21 50/0	12		50		
	0.2		15 17 31	13		52		BROWN GRAVEL (GP), wet, dense, fine to coarse, few to little fine to coarse sand, few fines (heaving)
			50/6	6		54		at 53.5 feet: very dense
						56		Bottom of boring at 54.3 feet. Added 60 to 70 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-8 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 54.3 feet. Well Sump/Endcap: 54.1 to 54.3 feet. Well Screen: 52.1 to 54.1 feet. Well Blank: 0.3 to 52.1 feet. Filter Pack: 51 to 54.3 feet (10x20 Sand). Well Seal: 49 to 51 feet (hydrated bentonite chips). Annular Seal: 2.0 to 49 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete) Washington Department of Ecology Well Tag Number: BID 740
						58		
						60		
						62		
						64		
						66		
						68		
						70		
						72		
						74		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54.3 feet
Diameter of Boring: 9 inches
Drill Date: 10/17/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete	0.0					0		Asphalt (3 inches)
								Asphalt base (3 inches)
	0.0					2		GRAY-BROWN SAND (SP), dry to moist, few coarse gravel (soil cleared with air knife to 5 feet)
	0.0	AS-9-3						
						4		BROWN SILTY SAND (SM), moist, fine to medium, little fines
	8.3					6		
			6			8		YELLOW-BROWN SAND (SP), moist, loose, medium, few fines, strong chemical-like odor
	22.6		6	6				
			5					
			6			10		at 10 feet: medium dense, finer sand at top of sampler, orange stained silt clumps
	23.8		6	18				
2" Sch 80 PVC Casing			5			12		
						14		
			12					at 15 feet: brown
	22.3		16	18		16		
			15					
						18		
Bentonite-Portland Cement Grout						20		at 20 feet: trace fine gravel
			12					
	6.5		15	18				
			15					
						22		
						24		

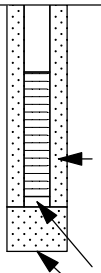
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/16/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	48.2	AS-9-25	12 13 14	18		26		at 25 feet: trace fine to coarse gravel BROWN SILT (ML), moist, very stiff, few fine sand
						28		BROWN SAND (SP), moist, dense, medium, few to little fine gravel, few fines
	37.4		21 17 23	18		30		
						32		
						34		
	14.3		25 22 26	18		36		at 35 feet: no gravel
						38		BROWN GRAVEL WITH SAND (GP), moist, dense, fine to coarse, little fine to coarse sand, few fines at 40 feet: wet (heaving)
	1.4		25 27 30	18		40		BROWN SAND (SP), wet, very dense, medium sand, few fines (heaving)
						42		
						44		
	1.0		32 30 30	18		46		
Bentonite						48		
						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/16/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 10x20 Sand Filter Pack; End Cap; 2" Sch 80 PVC 0.020-inch Screen	0.8 0.2 0.0		29 30 33 24 30 50/3 27 36	18 15 12		50 52 54 56 58 60 62 64 66 68 70 72 74		Bottom of boring at 54 feet. Added 60 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-8 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 53.3 feet. Well Sump/Endcap: 53.1 to 53.3 feet. Well Screen: 51.1 to 53.1 feet. Well Blank: 0.8 to 51.1 feet. Filter Pack: 50 to 54 feet (10x20 Sand). Well Seal: 48 to 50 feet (hydrated bentonite chips). Annular Seal: 2.0 to 48 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 739

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/16/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: AS-10

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
						0		Asphalt (3 inches)
Concrete	0.0							Asphalt base (3 inches)
	0.0					2		BROWN SAND, medium to coarse, few fine to coarse gravel, frequent cobbles (soil cleared with air knife to 5 feet)
	0.0	AS-10-3						
						4		
	2.7					6		BROWN SILTY SAND (SM), moist, fine, little fines, few fine gravel (soil logged from cuttings from 5 to 8 feet)
		AS-10-8	7			8		BROWN-YELLOW SAND (SP), moist, medium dense, fine, few fines
	4.7		8	11				
			8					
			8			10		
	0.9		10	18				at 10 feet: medium, trace fine gravel
2" Sch 40 PVC Casing			10			12		
								GRAY-BROWN SAND (SP), moist, medium dense, medium, few fines
						14		
			10					
	4.6		12	18		16		
			11					
						18		
Bentonite-Portland Cement Grout						20		
			14					at 20 feet: dense, faint chemical-like odor
	2.7		20	18				
			20			22		
								GRAY-BROWN SILTY SAND (SM), moist, dense, fine, little fines
						24		

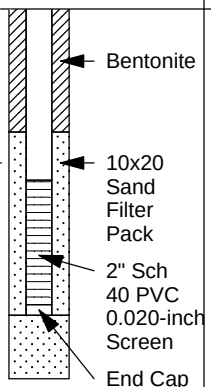
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 56 feet
Diameter of Boring: 9 inches
Drill Date: 10/14/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	1.1		22 20 20	15		26		
						28		GRAY-BROWN SAND (SP), moist, very dense, medium, few fine to coarse gravel, few fines, abundant clumps up to 1 inch thick of silt
	0.8		21 26 30	18		30		
						32		
						34		
	0.0		25 25 27	18		36		at 35 feet: brown, few to little fines, no gravel, no clumps of silt
						38		
	0.8		50/6	6		40		at 40 feet: fine to coarse, few fine to coarse gravel
						42		
						44		
	0.0		13 19 50/0	12		46		at 45 feet: wet, medium, few to little fines, trace fine gravel
						48		
						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 56 feet
Diameter of Boring: 9 inches
Drill Date: 10/14/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger



Depth (Feet)	PID (PPM)	Blow Count	Sample Recovery	Sample Interval	Graphic Log	Lithologic Description
50	0.0	23	12			
		50/6				
52	0.0	50/6	6			
	0.0	19	12			
		21				
54		50/0				
		21				
		27	18			
56		50/6				BROWN SILT (ML), moist, few to little sand, trace gravel

Bottom of boring at 56 feet.

Added 60 gallons of water to control heave.

AIR SPARGING WELL COMPLETION DETAILS:
Air sparging well AS-10 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap.

Total Well Depth (bgs): 55 feet.
Well Sump/Endcap: 54.8 to 55.0 feet.
Well Screen: 52.8 to 54.8 feet.
Well Blank: 0.7 to 52.8 feet.
Filter Pack: 52 to 56 feet (10x20 Sand).
Well Seal: 49.7 to 52 feet (hydrated bentonite chips).
Annular Seal: 2.0 to 49.7 feet (bentonite-portland cement grout).
Surface Seal: 0 to 2.0 feet (concrete).
Washington Department of Ecology Well Tag Number: BID 733

58
60
62
64
66
68
70

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 56 feet
Diameter of Boring: 9 inches
Drill Date: 10/14/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: AS-11

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete	0.0					0		Asphalt (3 inches)
	0.0							Asphalt base (3 inches)
	0.0	AS-11-3				2		LIGHT BROWN SAND (SP), fine to coarse, few coarse gravel (soil cleared with air knife to 5 feet)
						4		
	4.1		4 3 3	18		6		BROWN SILTY SAND (SM), moist, loose, fine, little fines
	2.7		7 7 7	18		8		YELLOW-BROWN SAND (SP), moist, medium dense, medium, few fines
	17.6	AS-11-10	10 12 10	16		10		BROWN SILTY SAND (SM), moist, medium dense, fine, some fines
2" Sch 80 PVC Casing						12		BROWN SAND (SP), moist, medium dense, medium, few fines, trace fine gravel
	4.4		11 16 20	16		14		GRAY-BROWN (SP), moist, dense, fine to coarse, few fines, separate layers of medium to coarse and fine sand
						16		
						18		BROWN SAND WITH GRAVEL (SP), moist, dense, meidume, some fine to coarse subrounded to rounded gravel, chemical-like odor
Bentonite-Portland Cement Grout	9.8		18 22 25	12		20		
						22		
						24		GRAY-BROWN SAND (SP), moist, dense, medium, few fines, faint chemical-like odor

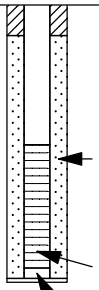
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54.5 feet
Diameter of Boring: 9 inches
Drill Date: 10/13/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	9.3		14 19 24	14		26		
						28		
	0.2		24 26 26	18		30		at 30 feet: very dense, fine to coarse gravel
						32		
						34		
	0.5		23 21 27	18		36		at 35 feet: dense, brown, fine, few fines, no gravel
						38		
	0.2		31 30 30	12		40		at 40 feet: wet, very dense, medium few fine to coarse gravel, occasional silt clumps (heaving)
						42		
						44		BROWN SILTY SAND (SM), wet, very dense, medium, little fines, few fine to coarse gravel (heaving)
	0.0		43 29 21	18		46		
						48		BROWN SAND(SP), wet, very dense, medium, few fines, few fine to coarse gravel (heaving)
← Bentonite						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54.5 feet
Diameter of Boring: 9 inches
Drill Date: 10/13/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 10x20 Sand Filter Pack; 2" Sch 80 PVC 0.020-inch Screen; End Cap	0.2 0.0 0.0		25 37 40 19 27 50/6 20 27 50/6	18 18 18		50 52 54		at 52 feet: trace fine gravel
						56 58 60 62 64 66 68 70 72 74		Bottom of boring at 54.5 feet. Added 60 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-11 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 54.4 feet. Well Sump/Endcap: 54.3 to 54.4 feet. Well Screen: 52.3 to 54.3 feet. Well Blank: 0.9 to 52.3 feet. Filter Pack: 50.5 to 54.5 feet (10x20 Sand). Well Seal: 48.7 to 50.5 feet (hydrated bentonite chips). Annular Seal: 2.0 to 48.7 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 731

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54.5 feet
Diameter of Boring: 9 inches
Drill Date: 10/13/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete	0.0					0		Asphalt (3 inches)
	0.0							Asphalt base (3 inches)
	0.0					2		BROWN SAND (SP), fine to medium, few coarse gravel, occasional cobbles (soil cleared with air knife to 5 feet)
	0.0	AS-12-3						
						4		
								DARK BROWN SILTY SAND (SM), moist, fine, little fines, trace gravel (soil logged from cuttings from 6 to 8 feet)
	3.9					6		
						8		YELLOW-BROWN SILTY SAND (SM), moist, medium dense, fine, little fines, abundant orange staining
		AS-12-8	6					
	4.3		6	8				YELLOW-BROWN SILTY SAND (SM), moist, medium, few fines
			7			10		
			7					BROWN SAND (SP), moist, medium dense, medium, few fines, trace coarse gravel
	1.2		10	15				
2" Sch 80 PVC Casing			9			12		
						14		
			15					
	0.3		20	18		16		at 15 feet: gray-brown, dense, trace fine gravel, horizons up to 2 inches thick of coarse sand
			20					
						18		
Bentonite-Portland Cement Grout						20		
			19					
	0.4		21	15				at 20 feet: brown, few fines, horizons up to 6 inches thick of brown gravel with sand
			25					
						22		
						24		

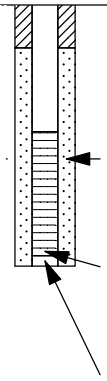
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54.2 feet
Diameter of Boring: 9 inches
Drill Date: 10/10/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.0		47 31 30	18		26		at 25 feet: gray-brown, very dense, few fine to coarse gravel
						28		
	0.0		22 19 22	18		30		at 30 feet: brown, dense, fine, no gravel
						32		
						34		
	0.0		29 50/6	12		36		
						38		BROWN SILTY SAND (SM), wet, very dense, medium, little fines, few fine to coarse gravel (heaving)
	0.2		33 50/6	12		40		
						42		BROWN GRAVEL (GP), wet, very dense, fine to coarse, few fine to coarse sand, few fines (heaving)
	0.1		50/6	6		44		
						46		
← Bentonite						48		BROWN SAND (SP), wet, very dense, medium, few fine to coarse gravel, few fines (heaving)
						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54.2 feet
Diameter of Boring: 9 inches
Drill Date: 10/10/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 10x20 Sand Filter Pack; 2" Sch 80 PVC 0.020-inch Screen; End Cap	0.0		30	12		50		
			50/6					
	0.0		13	12		52		
			19					
			50/0					
			12	12				
			24					
			50/0			54		BROWN SILTY SAND (SM), wet, very dense, medium, little fines, few fine to coarse gravel (heaving)
								Bottom of boring at 54.2 feet.
						56		Added 70 gallons of water to control heave.
								AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-12 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap.
						58		Total Well Depth (bgs): 54.2 feet. Well Sump/Endcap: 54.1 to 54.2 feet. Well Screen: 52.1 to 54.1 feet. Well Blank: 0.6 to 52.1 feet. Filter Pack: 50.7 to 54.2 feet (10x20 Sand). Well Seal: 47 to 50.7 feet (hydrated bentonite chips). Annular Seal: 2.0 to 47 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete) Washington Department of Ecology Well Tag Number: BID 729
						60		
						62		
						64		
						66		
						68		
						70		
						72		
						74		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54.2 feet
Diameter of Boring: 9 inches
Drill Date: 10/10/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
						0		Asphalt (3 inches)
Concrete	0.0							Asphalt base (3 inches)
	0.0					2		BROWN SAND (SP), fine to coarse, few coarse gravel (soil cleared with air knife to 8 feet)
	0.0	AS-11-3						
						4		
						6		
	0.0							
	1.9	AS-11-8	5			8		
			6	18				YELLOW-BROWN SAND (SP), moist, medium dense, medium, few fines, trace fine to coarse gravel, rare silt clumps and orange staining
			7					
						10		BROWN SAND (SP), moist, fine to medium, few fines
			8					
	0.3		9	18				YELLOW-BROWN SILTY SAND (SM), moist, medium dense, fine, little fines, abundant orange mottling
2" Sch 80 PVC Casing			9			12		at 11.2 feet: brown, no staining
								BROWN SAND (SP), moist, medium dense, medium, few fines
						14		
			12					
	0.3		14	18		16		
			15					
						18		
Bentonite-Portland Cement Grout						20		at 20 feet: dense, few fine gravel, few fines
			21					
	0.7		23	7				
			27					
						22		
						24		

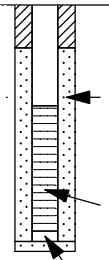
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/13/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.3		40 50/6	12		26		at 25 feet: very dense, no gravel
						28		
	0.1		16 34 30	18		30		at 30 feet: fine to medium, separate layers of fine and medium
						32		
	0.0		21 27 39	18		34 36		
						38		
	0.0		21 30 30	18		40 42		at 40 feet: wet, medium, few fine gravel, occasional clumps of silt (heaving)
						44		
	0.0		42 50/6	12		46		at 45 feet: no gravel, horizons up to 2 inches thick of medium to coarse sand
← Bentonite						48		BROWN SILTY SAND WITH GRAVEL (SM), wet, very dense, medium, little fine to coarse gravel, little fines, clumps of fine silty sand (heaving)
						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/13/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 10x20 Sand Filter Pack; 2" Sch 80 PVC 0.020-inch Screen; End Cap	0.0		31	12		50		
			50/6					
	0.0		41	12				
			37			52		at 51.5 feet: some gravel
			50/0					BROWN SAND (SP), wet, very dense, medium, few fine gravel, few fines
	0.0		33	12				
			50/6			54		Bottom of boring at 54 feet.
								Added 60-70 gallons of water to control heave.
						56		AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-13 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap.
						58		Total Well Depth (bgs): 53.8 feet. Well Sump/Endcap: 53.7 to 53.8 feet. Well Screen: 51.6 to 53.7 feet. Well Blank: 0.5 to 51.6 feet. Filter Pack: 50.7 to 54 feet (10x20 Sand). Well Seal: 47 to 50.7 feet (hydrated bentonite chips). Annular Seal: 2.0 to 47 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 728
						60		
						62		
						64		
						66		
						68		
						70		
						72		
						74		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/13/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: AS-14

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
						0		Asphalt (3 inches)
Concrete	0.0							Asphalt base, dark brown sand with 3/4 minus, (3 inches)
	0.0					2		Asphalt (3 inches)
	0.0	AS-14-3						LIGHT BROWN SAND (SP), medium (soil cleared with air knife to 5 feet)
						4		
								BROWN SILTY SAND (SM), moist, fine to medium, little fines
						6		
								YELLOW-BROWN SAND (SP), moist, medium dense, medium, few fines
		AS-14-8	4			8		
	5.1		8	10				
			10					
			10			10		
	4.8		10	11				at 10 feet: brown
			10					
2" Sch 80 PVC Casing						12		
						14		GRAY SAND (SP), moist, medium dense, fine to coarse, few fine gravel, few fines
			16					
	4.8		13	13		16		BROWN SAND (SP), moist, medium dense, fine, few fines
			15					
						18		
								GRAY-BROWN SAND (SP), moist, dense, medium, few fines
Bentonite-Portland Cement Grout						20		
			16					
	0.2		19	12				BROWN SILTY SAND (SM), moist, dense, fine, little fines
			22					
						22		
						24		BROWN SAND (SP), moist, very dense, mediume, few fines

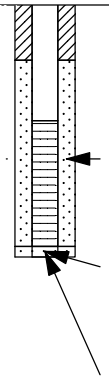
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54.1 feet
Diameter of Boring: 9 inches
Drill Date: 10/08/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.0		21 25 27	18		26		
						28		
	0.1		30 31 30	18		30		at 30 feet: trace fine gravel
						32		
						34		
	1.1		30 36 30	18		36		BROWN SILTY SAND (SM), moist, very dense, medium, little fines, few fine to coarse gravel
						38		
	0.0		41 50/6	12		40 ▼		at 40 feet: wet
						42		
						44		
			41 50/0	0		46		
						48		BROWN SAND WITH GRAVEL (SP), wet, very dense, fine to coarse, little gravel, few fines
← Bentonite						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54.1 feet
Diameter of Boring: 9 inches
Drill Date: 10/08/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 10x20 Sand Filter Pack; 2" Sch 80 PVC 0.020-inch Screen; End Cap	0.0 0.0 0.0		50/6 21 33 19 27 50/6	6 18 12		50 52 54		Bottom of boring at 54.1 feet. Added 50-70 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-14 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 54.1 feet. Well Sump/Endcap: 53.9 to 54.1 feet. Well Screen: 51.9 to 53.9 feet. Well Blank: 0.8 to 51.8 feet. Filter Pack: 50.9 to 54.1 feet (10x20 Sand). Well Seal: 47.6 to 50.9 feet (hydrated bentonite chips). Annular Seal: 2.0 to 47.6 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 726
						56 58 60 62 64 66 68 70 72 74		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54.1 feet
Diameter of Boring: 9 inches
Drill Date: 10/08/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: AS-15

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete						0		Asphalt (3 inches)
								Base (3 inches)
						2		sand with 3/4 minus (6 inches)
	0.0							Asphalt (3 inches)
	0.0	AS-15-3						tan sand (soil cleared with air knife to 5 feet)
						4		
								DARK BROWN SILTY SAND (SM), moist, fine to medium, little fines, few gravel
						6		
								BROWN SILTY SAND (SM), moist, loose, medium, little fines
		AS-15-8	5			8		
	4.0		4	15				
			2					BROWN SAND (SP), moist, medium dense, medium, few fines, sand size and fines percentage vary over 4-inch intervals
			5			10		
	1.3		6	18				
2" Sch 80 PVC Casing			8			12		
								BROWN SILTY SAND (SM), moist, dense, fine to coarse, little fines, few fine to coarse gravel
			14			14		
	0.8		15	18				
			16			16		
						18		
								BROWN SAND (SP), moist, very dense, fine, few fines
Bentonite-Portland Cement Grout			29			20		
	0.6		31	18				
			30			22		
						24		

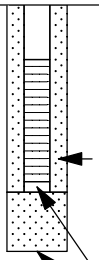
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/06/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.8		34 50/6	12		26		
						28		
	0.4		40 50/6	12		30		at 30 feet: finer sand
						32		
						34		
	0.5		27 50/6	12		36		
						38		
	0.3		50/6	6		40		at 40 feet: wet, sand heaving
						42		
						44		BROWN SILTY SAND (SM), wet, very dense, medium, few fines, trace fine to coase gravel
	0.0		50/6	6		46		
← Bentonite						48		BROWN SAND (SP), wet, very dense, fine to medium, few fines
						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/06/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 10x20 Sand Filter Pack; End Cap; 2" Sch 80 PVC 0.020-inch Screen	0.0 0.0		15 17 50/0 18 22 50/0 15 18 50/0	12 12 12		50 52 54 56 58 60 62 64 66 68 70 72 74		BROWN GRAVEL WITH SAND (GP), wet, very dense, fine, little fine to coarse sand, few fines BROWN SAND (SP), wet, fine to medium, few fines BROWN SILT (ML), moist, very hard, non-plastic, abundant orange staining along partings Bottom of boring at 54 feet. Added 50-60 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-15 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 53.0 feet. Well Sump/Endcap: 52.9 to 53.0 feet. Well Screen: 50.9 to 52.9 feet. Well Blank: 0.8 to 50.9 feet. Filter Pack: 50.9 to 54.1 feet (10x20 Sand). Well Seal: 48 to 50 feet (hydrated bentonite chips). Annular Seal: 2.0 to 48 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 723

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/06/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: AS-16

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete	0.0					0		Asphalt (2 inches)
	0.0							Asphalt base, brown sand, some fines, some 3/4 minus, (2 inches)
	0.0	AS-16-3				2		Asphalt (2 inches)
								Asphalt base, brown sand, 3/4 minus, few gravel up to 1 inch diameter (2 inches)
						4		
								DARK BROWN SILTY SAND (SM), moist, fine to medium, little fines, few gravel
						6		
								BROWN SAND (SP), moist, medium, few fines (soil logged from auger cuttings)
	1.8		4 8 10			8		
			10			10		BROWN SILTY SAND (SM), moist, medium dense, fine, little fines
	0.2		10 10	18				
2" Sch 80 PVC Casing						12		
						14		
	8.4	AS-16-15	16 13 15	12		16		BROWN SILTY GRAVEL WITH SAND (GM), moist, very dense, fine to coarse up to 2 inch diameter, little fine to coarse sand, little fines
								BROWN SAND (SP), moist, dense, medium, few fines, trace fine to coarse subrounded gravel
						18		
Bentonite-Portland Cement Grout						20		
	3.4		16 19 22	14				BROWN SILTY SAND (SM), moist, dense, fine, little fines
						22		
								BROWN SAND (SP), moist, dense, fine, few fines
						24		

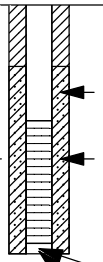
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/07/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.3		21 25 27	18		26		
						28		
	0.2		30 31 30	18		30		at 30 feet: medium, trace fine gravel
						32		
						34		
	0.0		30 36 30	18		36		at 35 feet: fine to medium, 4-inch variation of sand size, gravel percentage, and fines percentage
						38		
	0.0		41 50/6	12		40		at 40 feet: wet, very dense, medium
						42		
						44		
	0.0		41 50/0	12		46		
						48		
						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/07/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 Bentonite; 10x20 Sand Filter Pack; End Cap; 2" Sch 80 PVC 0.020-inch Screen	0.0		50/6	12		50		BROWN GRAVEL WITH SAND (GP), wet, very dense, fine to coarse, some fine to medium sand, few fines, (heaving)
	0.0		21 33 19	18		52		BROWN SAND (SP), wet, dense, medium, few fines, (heaving)
	0.0		27 50/6	14		54		BROWN SILTY SAND WITH GRAVEL (SM), wet, very dense, coarse, little fine to coarse gravel, little fines (heaving)
						56		Bottom of boring at 54 feet. Added 60-70 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-16 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 54.0 feet. Well Sump/Endcap: 53.9 to 54.0 feet. Well Screen: 51.9 to 53.9 feet. Well Blank: 0.8 to 51.9 feet. Filter Pack: 51 to 54.0 feet (10x20 Sand). Well Seal: 48.8 to 51 feet (hydrated bentonite chips). Annular Seal: 2.0 to 48.8 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 724
						58		
						60		
						62		
						64		
						66		
						68		
						70		
						72		
						74		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/07/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
						0		Asphalt (3 inches)
Concrete	0.0							Asphalt base, brown sand, some fines (2 inches)
	0.0							
	2.8					2		BROWN SAND (SP), fine (soil cleared with airknife to 5 feet)
		AS-17-3						
						4		
								YELLOW-BROWN SILTY SAND (SM), moist, fine, little fines
						6		
								YELLOW-BROWN SAND (SP), moist, medium dense, fine, few fines, chemical-like odor
		AS-17-8	10			8		
	50.5		12	18				
			12					
			8			10		
	30.1		12	18				
			16					
2" Sch 80 PVC Casing						12		
						14		
			18					
	1.5		21	18				at 15 feet: brown, dense
			20			16		
						18		
Bentonite-Portland Cement Grout						20		
			25					
	2.4		17	18				
			23					
						22		
						24		BROWN SILTY SAND (SM), moist, dense, fine to coarse, little fines, few fine gravel

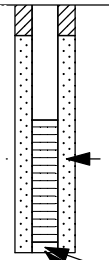
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/03/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	2.1		24 20 20	12		26		
						28		BROWN SAND (SP), moist, very dense, medium, few fines, trace fine gravel
	2.4		18 50/6	12		30		
						32		
						34		
	1.9		31 50/6	12		36		
						38		BROWN SILTY SAND WITH GRAVEL (SM), wet, very dense, medium, little fine gravel, little fines, (heaving)
	2.3		15 28 29	18		40		
						42		
						44		
	1.3		34 50/0	6		46		
						48		
Bentonite						50		BROWN GRAVEL (GP), wet, very dense, fine to coarse, few fine to coarse sand,

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/03/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 10x20 Sand Filter Pack; End Cap; 2" Sch 80 PVC 0.020-inch Screen	0.1 0.0 0.1		39 50/6 15 50/1 9 12 50/0	12 12 12		50 52 54 56 58 60 62 64 66 68 70 72 74		few fines BROWN SILTY SAND WITH GRAVEL (SM), wet, very dense, medium, little fine gravel, little fines, (heaving) BROWN SAND (SP), wet, fine, few fines

Bottom of boring at 54 feet.

Added 60-70 gallons of water to control heave.

AIR SPARGING WELL COMPLETION DETAILS:
Air sparging well AS-17 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap.

Total Well Depth (bgs): 54 feet.
Well Sump/Endcap: 53.8 to 54.0 feet.
Well Screen: 51.9 to 53.9 feet.
Well Blank: 1.0 to 51.9 feet.
Filter Pack: 51 to 54.0 feet (10x20 Sand).
Well Seal: 47.8 to 50.5 feet (hydrated bentonite chips).
Annular Seal: 2.0 to 47.8 feet (bentonite-portland cement grout).
Surface Seal: 0 to 2.0 feet (concrete).
Washington Department of Ecology Well Tag Number: BID 721

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/03/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
						0		Asphalt (3 inches)
Concrete	0.0							Asphalt base, brown sand, some fines (4 inches)
	0.0							
	0.0					2		BROWN SANDY SILT (SM), concrete debris up to 1-inch diameter, (soil cleared with airknife to 5 feet)
		AS-18a-3						BROWN SAND (SP)
						4		
								DARK BROWN SILTY SAND (SM), moist, fine to medium, little fine to coarse gravel, little fines, (soil logged from auger cuttings)
						6		
						8		
		AS-18-8	8					
	9.4		9	18				BROWN SAND (SP), moist, medium dense, medium, few fines, rare orange staining up to 1/2-inch thick
			12					
			10			10		
	2.7		12	18				at 10 feet: no staining
			12					
2" Sch 80 PVC Casing						12		
						14		
			19					
	0.4		16	18				at 15 feet: dense, 3-inch horizon with abundant orange mottling
			15			16		
						18		
Bentonite-Portland Cement Grout			20			20		
	0.4		21	18				at 20 feet: very dense, fine to coarse, few fines, few fine gravel, rare horizons up to 1/4-inch thick of silt
			26			22		
								BROWN SILTY SAND WITH GRAVEL (SM), wet, dense, fine, some fines, little fine to coarse gravel
						24		

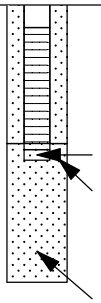
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54.5 feet
Diameter of Boring: 9 inches
Drill Date: 10/02/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.1		14 18 21	18		26		
						28		BROWN SILTY SAND (SM), moist, very dense, fine, little fines, few fine gravel
	0.0		27 50/6	12		30		
						32		
						34		BROWN SAND (SP), moist, very dense, fine, few fines, abundant horizons 2 to 3 inches thick of medium sand, few fine to coarse gravel
	0.0		29 50/6	12		36		
						38		BROWN SILTY SAND WITH GRAVEL (SM), wet, very dense, coarse, little fine gravel, little fines (heaving)
	0.1		50/6 50/6	6		40		
						42		BROWN SAND (SP), wet, very dense, medium, few fines, trace fine gravel (heaving)
						44		
	0.0		50/6	6		46		
← Bentonite						48		
						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54.5 feet
Diameter of Boring: 9 inches
Drill Date: 10/02/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 End Cap; 10x20 Sand Filter Pack; 2" Sch 80 PVC 0.020-inch Screen	0.0		50/6	6		50		at 50 feet: no gravel
			12					
			21	18		52		
			50/6					BROWN SILTY GRAVEL (GM), wet, very dense, fine to coarse, some fines, few fine to medium sand
			13					
			12	18		54		BROWN SAND (SP), wet, very dense, medium, few fine to coarse gravel, few fines
			50/6					BROWN SILT (ML), moist, very hard, slow dilitancy, low plasticity
						56		Bottom of boring at 54.5 feet.
								Added 60 gallons of water to control heave.
						58		AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-18 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap.
						60		Total Well Depth (bgs): 54.5 feet. Well Sump/Endcap: 52.3 to 52.5 feet. Well Screen: 50.4 to 52.3 feet. Well Blank: 0.7 to 50.4 feet. Filter Pack: 49.5 to 54.5 feet (10x20 Sand). Well Seal: 47.1 to 49.5 feet (hydrated bentonite chips). Annular Seal: 2.0 to 47.1 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 719
						62		
						64		
						66		
						68		
						70		
						72		
						74		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54.5 feet
Diameter of Boring: 9 inches
Drill Date: 10/02/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete	0.0					0		Asphalt (3 inches)
								Asphalt base, brown sand, some fines (5 inches)
	0.0					2		BROWN SAND (SP), medium to fine, (soil cleared with airknife to 5 feet)
	0.0	AS-19-3						at 2 feet: brown to tan
								at 3 feet: brown, some coarse gravel up to 3/4 inch diameter
						4		
						6		DARK BROWN SILTY SAND (SM), moist, medium dense, fine to medium, little fines, trace fine gravel, chemical odor
		AS-19-8	8			8		
	222		8	18				BROWN SAND (SP), moist, medium dense, medium, few fines, chemcial odor
			9					
			7			10		
	62.7		8	18				
2" Sch 80 PVC Casing			9			12		
								GRAY-BROWN SAND (SP), moist, dense, medium, few fines, chemical odor
			15			14		
	5.4		19	18				
			20			16		
						18		
								BROWN SILTY SAND WITH GRAVEL, moist, dense, medium, some fine to coarse gravel, little fines
Bentonite-Portland Cement Grout			22			20		
	0.7		21	18				
			30			22		
								BROWN SILTY SAND (SM), we very denset, fine, little fines, few gravel
						24		

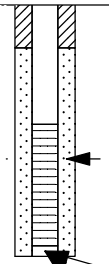
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/02/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.6		33 50/6	12		26		BROWN GRAVEL WITH SAND (GP), wet, very dense, fine to coarse, some fine to coarse sand, few fines
						28		
	1.7		27 50/6	12		30		
						32		
						34		BROWN SAND (SP), wet, very dense, medium, few fine to coarse gravel, few fines
	0.0		21 31 30	14		36		
						38		BROWN SILTY SAND WITH GRAVEL (SM), wet, dense, fine to coarse, little fines, few fine to coarse gravel
	0.2		14 21 15	18		40 ▼		
						42		
						44		BROWN SAND (SP), wet, very dense, medium, few fines, trace fine gravel
	0.4		36 50/6	12		46		
						48		
← Bentonite						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/02/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 10x20 Sand Filter Pack; End Cap; 2" Sch 80 PVC 0.020-inch Screen	0.1 0.3 0.1		30 50/6 12 21 50/6 21 30 50/0	12 18 12		50 52 54 56 58 60 62 64 66 68 70 72 74		BROWN GRAVEL WITH SAND (GP), wet, very dense, fine to coarse, little fine to medium sand, few fines Bottom of boring at 54 feet. Added 60-70 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-16 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 54.0 feet. Well Sump/Endcap: 53.9 to 54.0 feet. Well Screen: 51.9 to 53.9 feet. Well Blank: 0.8 to 51.9 feet. Filter Pack: 51 to 54.0 feet (10x20 Sand). Well Seal: 48.8 to 51 feet (hydrated bentonite chips). Annular Seal: 2.0 to 48.8 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 724

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/02/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: AS-20

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete	0.0					0		Asphalt (3 inches)
	0.0							Asphalt base, brown sand, some fines (3 inches)
	0.0	AS-20-3				2		
						4		
						6		DARK BROWN SILTY SAND (SM), moist, fine to medium, little fines
								BROWN SAND (SP), moist, medium dense, medium, few fines, odor
	32.7		5 12 6	18		8		
	42.6	AS-20-10	10 10 12	18		10		
2" Sch 80 PVC Casing						12		
						14		
	17.9		10 10 10	18		16		at 15 feet: grey-brown, fine
						18		BROWN SILTY SAND WITH GRAVEL (SM), moist, dense, fine, little fine to coarse gravel, little fines
Bentonite-Portland Cement Grout	8.6		14 18 20	13		20		BROWN SAND WITH GRAVEL (SP), moist, dense, medium, some fine to coarse gravel, few fines
						22		
						24		BROWN SILTY SAND (SM), moist, dense, fine, little fines

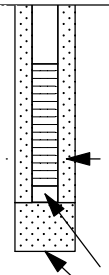
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/06/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.4		17 23 21	18		26		
						28		
	0.3		30 50/6	12		30		
						32		
						34		BROWN SAND (SP), moist, dense, medium, few fines
	0.3		18 21 30	18		36		BROWN SILTY SAND (SM), moist, very dense, medium, few fines
						38		BROWN SILTY SAND (SM), moist, very dense, fine, some fines, trace fine gravel
	0.3		36 50/6	12		40		BROWN SILTY GRAVEL WITH SAND (GM), wet, very dense, fine to coarse, little medium to coarse sand, little fines
						42		
						44		BROWN SILTY SAND (SM), wet, very dense, medium, little fines
	0.0		45 50/6	12		46		
← Bentonite						48		
						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/06/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 10x20 Sand Filter Pack; End Cap; 2" Sch 80 PVC 0.020-inch Screen	0.0 0.0		21 24 50/6 13 21 50/6 13 21	12 18 12		50 52 54 56 58 60 62 64 66 68 70 72 74		BROWN SAND WITH GRAVEL (SP), wet, very dense, medium, little fine gravel, few fines BROWN SILT (ML), moist, very stiff, few fine to medium sand, non-plastic Bottom of boring at 54 feet. Added 70 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-20 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 54 feet. Well Sump/Endcap: 52.9 to 53.2 feet. Well Screen: 51.0to 52.9 feet. Well Blank: 0.7 to 51.0feet. Filter Pack: 49.6 to 54 feet (10x20 Sand). Well Seal: 47.6 to 49.6 feet (hydrated bentonite chips). Annular Seal: 2.0 to 47.6 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 722

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 54 feet
Diameter of Boring: 9 inches
Drill Date: 10/06/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete	0.0					0		Asphalt (3 inches)
	0.0							Asphalt base, brown sand, some fines (3 inches)
	0.0	AS-21-3				2		BROWN SAND (SP), moist, medium dense, fine to medium, few fines (soil cleared with air knife to 5 feet)
						4		
						6		
	12.7	AS-21-8	7 8 8	18		8		
	8.4		6 7 7	18		10		YELLOW-BROWN SAND (SP), moist, medium dense, fine, few fines, horizons up to 1.5 inches thick of coarse sand, abundant orange staining
2" Sch 80 PVC Casing						12		BROWN SAND (SP), moist, medium dense, fine to medium, few fines
	2.1		10 12 10	18		14		
						16		
						18		BROWN SILTY SAND WITH GRAVEL (SM), moist, medium dense, medium, little fine to coarse subrounded gravel, little fines
Bentonite-Portland Cement Grout	1.5		17 19 21	12		20		
						22		
						24		BROWN SAND (SP), moist, very dense, fines, few fines

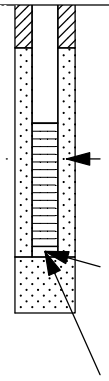
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 55 feet
Diameter of Boring: 9 inches
Drill Date: 10/07/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.5		46 50/6	12		26		
						28		
	0.2		29 50/6	12		30		at 30.7 feet: trace fine to coarse subrounded gravel
						32		
						34		
	0.3		50/6	6		36		
						38		BROWN SILTY GRAVEL WITH SAND (GM), wet, very dense, fine to coarse, little fine to coarse sand, little fines
	1.2		50/6	6		40		
						42		
								BROWN SAND (SP), wet, very dense, medium, few fines, trace fine gravel
	0.3		50/6	6		44		
						46		
						48		BROWN GRAVEL WITH SAND (GP), wet, very dense, fine to coarse, little fine to medium sand, few fines
← Bentonite						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 55 feet
Diameter of Boring: 9 inches
Drill Date: 10/07/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 10x20 Sand Filter Pack; 2" Sch 80 PVC 0.020-inch Screen; End Cap	0.0		50/6	6		50		
			20					BROWN SAND WITH GRAVEL (SP), wet, very dense, medium, little fine gravel, few fines
	0.0		50/6	12		52		
	0.0		11	12				
			50/6			54		
	2.4		21	12				
			50/6					Bottom of boring at 55 feet. Added 60 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-21 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 55 feet. Well Sump/Endcap: 53.9 to 54.1 feet. Well Screen: 51.2 to 53.9 feet. Well Blank: 1.1 to 51.2 feet. Filter Pack: 50.7 to 55 feet (10x20 Sand). Well Seal: 48 to 50.7 feet (hydrated bentonite chips). Annular Seal: 2.0 to 48 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 725
						56		
						58		
						60		
						62		
						64		
						66		
						68		
						70		
						72		
						74		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 55 feet
Diameter of Boring: 9 inches
Drill Date: 10/07/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
						0		Asphalt (3 inches)
Concrete	0.0							Asphalt base, dark brown sand, 3/4 minus gravel (3 inches)
	0.0					2		DARK BROWN SAND (SP), moist, loose, medium, some 3/4 minus gravel, (soil cleared with air knife to 8 feet)
	0.0	AS-22-3						at 3 feet: no gravel
						4		
						6		
		AS-22-8	9			8		
	1.6		3	18				
			7					
		AS-22-10	6			10		at 10 feet: few fines, trace fine to coarse gravel
	12.0		8	18				
			9					BROWN SILTY SAND (SM), moist, medium dense, medium, few fines, trace wood organics
2" Sch 80 PVC Casing						12		
								BROWN SAND (SP), moist, dense, medium, few fine to coarse gravel up to 2 inches diameter, few fines, horizons up to 2 inches thick of coarse sand, some fine gravel
			16			14		
	2.6		20	18				
			19			16		
						18		BROWN SAND WITH GRAVEL (SP), dry, very dense, fine, some fine to coarse gravel up to 2 inches diameter
Bentonite-Portland Cement Grout						20		
	10.6		31	12				
			50/6			22		
								BROWN SAND (SP), moist, dense, medium, few fines, trace fine gravel
						24		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 55 feet
Diameter of Boring: 9 inches
Drill Date: 10/08/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	2.0		16 26 32	18		26		
						28		
	0.6		24 27 32	18		30		at 30 feet: grey-brown
						32		
						34		
	0.1		50/6	6		36		at 35 feeet: gravel up to 2 inches diameter
						38		
	0.0		50/6	6		40		BROWN GRAVEL WITH SAND (GP), wet, very dense, fine to coarse, some fine to coarse sand, few fines
						42		
						44		BROWN SAND (SP), wet, very dense, medium, few gravel, few fines, (heaving)
	0.0		27 50/0	6		46		
						48		
						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 55 feet
Diameter of Boring: 9 inches
Drill Date: 10/08/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Bentonite	0.0		37	12		50		
			50/6					
	0.0			12				
			40			52		BROWN GRAVEL (GP), wet, very dense, fine to coarse, few fine to coarse sand, few fines
			50/6					
10x20 Sand Filter Pack								
			10					BROWN SAND (SP), wet, very dense, medium, few fine gravel, few fines
	0.0		10	18		54		
2" Sch 80 PVC 0.020-inch Screen			5					
	0.0		24	6				
End Cap								BROWN GRAVEL (GP), wet, very dense, fine to coarse, few fine to coarse sand, few fines
						56		Bottom of boring at 55 feet.
								Added 70 gallons of water to control heave.
						58		AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-22 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap.
						60		Total Well Depth (bgs): 55 feet. Well Sump/Endcap: 52.4 to 54.6 feet. Well Screen: 52.4 to 52.4 feet. Well Blank: 0.7 to 52.4 feet. Filter Pack: 51.5 to 55 feet (10x20 Sand). Well Seal: 49.5 to 51.5 feet (hydrated bentonite chips). Annular Seal: 2.0 to 49.5 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 727
						62		
						64		
						66		
						68		
						70		
						72		
						74		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 55 feet
Diameter of Boring: 9 inches
Drill Date: 10/08/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: AS-23

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
						0		Asphalt (3 inches)
Concrete	0.0							Asphalt base, brown sand, (4 inches)
	0.0					2		BROWN SAND (SP), moist, medium dense, fine to medium, (soil cleared with air knife to 8 feet)
	0.0	AS-23-3						
						4		
						6		
	0.0					8		
		AS-23-8	6					at 8 feet: medium, few fines
	9.7		5	18				
			9					
		AS-23-10	12			10		
	15.8		17	18				
			14					
2" Sch 80 PVC Casing						12		
						14		
			10					at 15 feet: trace coarse sand
	9.0		11	18				
			13			16		
						18		
Bentonite-Portland Cement Grout						20		at 20 feet: gray-brown, dense
	9.6		14	12				
			19					
			21			22		
						24		

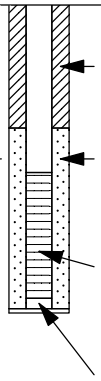
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 55 feet
Diameter of Boring: 9 inches
Drill Date: 10/10/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	6.3		33 29 25	18		26		at 25 feet: faint odor, very dense
						28		
	0.6		37 30 30	18		30		at 30 feet: no odor
						32		
						34		BROWN SILTY SAND (SM), moist, very dense, medium, little fines, few fine to coarse gravel, higher moisture content
			50/6	6		36		
						38		BROWN SILTY SAND WITH GRAVEL (SM), wet, dense, fine to coarse, little fine to coarse gravel, little fines, (heaving)
	0.4		29 30 31	6		40		
						42		
						44		BROWN GRAVEL WITH SAND (GP), wet, very dense, fine, little fine to coarse sand, few fines
	0.1		24 36 50/0	6		46		
						48		BROWN SAND WITH GRAVEL (SP), wet, very dense, medium, little fine to coarse gravel, few fines, (heaving)
						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 55 feet
Diameter of Boring: 9 inches
Drill Date: 10/10/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 Bentonite; 10x20 Sand Filter Pack; 2" Sch 80 PVC 0.020-inch Screen; End Cap	0.0 0.0 0.0 0.0		14 15 50/6 19 21 50/0 11 13 50/6 50/6	12 12 18 6		50 52 54 56 58 60 62 64 66 68 70 72 74		at 51.5 feet: few fine gravel BROWN GRAVEL (GP), wet, very dense, fine, few medium to coarse sand, few fines BROWN SAND WITH GRAVEL (SP), wet, very dense, medium, little fine to coarse gravel, few fines, (heaving) Bottom of boring at 55 feet. Added 60 to 70 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-23 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 55 feet. Well Sump/Endcap: 54.8 to 54.9 feet. Well Screen: 52.7 to 54.8 feet. Well Blank: 0.7 to 52.7 feet. Filter Pack: 52 to 55 feet (10x20 Sand). Well Seal: 50 to 52 feet (hydrated bentonite chips). Annular Seal: 2.0 to 50 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 730

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 55 feet
Diameter of Boring: 9 inches
Drill Date: 10/10/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: AS-24

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
						0		Asphalt (3 inches)
Concrete	0.0							Asphalt base, brown sand, 3/4 minus (4 inches)
	0.0					2		BROWN SAND (SP), fine to medium, 2 to 3 inch diameter cobbles, (soil cleared with air knife to 8 feet)
	0.0	AS-24-3				4		
						6		
		AS-24-8	4			8		
	1.3		4	11				YELLOW-BROWN SAND (SP), moist, loose, medium, few fines
			4					
		AS-24-10	4			10		
	1.5		4	16				at 10 feet: fine
			4					
2" Sch 80 PVC Casing						12		
								GRAY-BROWN SAND (SP), moist, medium dense, fine, few fines, trace fine gravel, faint chemical odor
						14		
			14					
	1.4		12	13		16		
			13					
						18		
Bentonite-Portland Cement Grout						20		
			21					at 20 feet: very dense, no odor
	0.6		24	18				
			30			22		
								BROWN SAND WITH GRAVEL (SP), moist, very dense, fine to coarse, some fine to coarse gravel, few fines
						24		

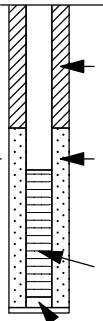
Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 55 feet
Diameter of Boring: 9 inches
Drill Date: 10/14/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.1		21 25 31	18		26		BROWN SILT (ML), moist, trace fine sand, non-plastic, rapid dilitancy
						28		BROWN GRAVEL WITH SAND (GP), moist, very dense, fine to coarse, little fine to medium sand, few fines
	0.8		24 27 32	18		30		BROWN SILTY SAND (SM), moist, very dense, fine, little fines, few fine gravel
						32		BROWN SAND (SP), moist, very dense, medium, few fines
	0.1		30 30 30	18		34 36		
						38		
	0.4		26 32 40	18		40		at 40 feet: wet
						42		BROWN SILTY GRAVEL WITH SAND (GM), wet, very dense, fine to coarse, little fine to medium sand, little fines, (heaving)
	0.1		21 29 50/6	12		44 46		
						48		BROWN SAND (SP), wet, very dense, fine to coarse, few fine to coarse gravel, few fines, (heaving)
						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 55 feet
Diameter of Boring: 9 inches
Drill Date: 10/14/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
 Bentonite; 10x20 Sand Filter Pack; 2" Sch 80 PVC 0.020-inch Screen; End Cap	0.0 0.0 0.0 0.0		50/6 17 21 50/0 9 8 12 17	6 12 18 6		50 52 54		
								Bottom of boring at 55 feet. Added 60 to 70 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-24 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 55 feet. Well Sump/Endcap: 54.7 to 54.9 feet. Well Screen: 52.7 to 54.7 feet. Well Blank: 0.9 to 52.7 feet. Filter Pack: 52 to 55 feet (10x20 Sand). Well Seal: 50 to 52 feet (hydrated bentonite chips). Annular Seal: 2.0 to 50 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 734
						56 58 60 62 64 66 68 70 72 74		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 55 feet
Diameter of Boring: 9 inches
Drill Date: 10/14/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: AS-25

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
						0		Asphalt (3 inches)
Concrete	0.0							Asphalt base(3 inches)
	0.0					2		BROWN SAND (SP), coarse, 3/4 minus gravel, cobbles up to 3 inch diameter, (boring cleared with airknife to 5 feet)
	0.0	AS-25-3						at 1.5 feet: light brown, fine, with gravel up to 2 inch diamter
						4		
	1.0					6		BROWN SILTY SAND (SM), moist, fine, little fines, trace fine to coarse gravel
			6			8		YELLOW-BROWN SAND (SP), moist, medium dense, medium, few fines
	1.2		7 8	10				
		AS-25-10	6			10		at 10 feet: rare orange staining
	1.5		7 8	11				
2" Sch 80 PVC Casing						12		
								BROWN SAND (SP), moist, medium dense, medium, few fines, abundant horizons of orange staining up to 1/4 inches thick
			12			14		
	0.3		12 10	14		16		
						18		GRAY-BROWN SAND (SP), moist, dense, medium, few fines, faint chemical odor
Bentonite-Portland Cement Grout			13			20		
	1.1		14 14	16				
						22		
						24		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 56 feet
Diameter of Boring: 9 inches
Drill Date: 10/15/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.4		13 14 50/6	18		26		at 25 feet: no odor
						28		
	0.2		18 21 20	12		30		BROWN GRAVEL WITH SAND (GP), moist, dense, fine to coarse, some fine to medium sand, few fines
						32		BROWN SILTY SAND WITH GRAVEL (SM), moist, dense, medium, little fine to coarse gravel, little fines
	0.1		20 21 20	14		34 36		
						38		BROWN SAND (SP), moist, very dense, medium to coarse, few fine to coarse gravel, few fines
	0.2		23 30 30	11		40 ▼ 42		at 40 feet: wet
						44		BROWN SILTY GRAVEL WITH SAND (GM), wet, dense, fine to coarse, some fine to coarse sand, little fines
	0.2		26 29 40	11		46		
						48		BROWN SAND (SP), wet, dense, medium, few fine to coarse gravel, few fines, (heaving)
						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 56 feet
Diameter of Boring: 9 inches
Drill Date: 10/15/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Bentonite 10x20 Sand Filter Pack 2" Sch 80 PVC 0.020-inch Screen End Cap	0.1 0.0 0.0		19 26 34 32 50/6 23 29 50/0 27 30 40	18 9 0 18		50 52 54 56 58 60 62 64 66 68 70 72 74		at 53 feet: no recovery Bottom of boring at 54 feet. Added 60-70 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-16 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 54.0 feet. Well Sump/Endcap: 53.9 to 54.0 feet. Well Screen: 51.9 to 53.9 feet. Well Blank: 0.8 to 51.9 feet. Filter Pack: 51 to 54.0 feet (10x20 Sand). Well Seal: 48.8 to 51 feet (hydrated bentonite chips). Annular Seal: 2.0 to 48.8 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 724 BROWN SILT (ML), moist, very stiff, few fine sand, non-plastic Bottom of boring at 56 feet. Added 70 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-25 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 56 feet. Well Sump/Endcap: 55.4 to 55.8 feet. Well Screen: 53.4 to 55.4 feet. Well Blank: 0.9 to 53.4 feet. Filter Pack: 51.9 to 56 feet (10x20 Sand). Well Seal: 49.7 to 51.9 feet (hydrated bentonite chips). Annular Seal: 2.0 to 49.7 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 735

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 56 feet
Diameter of Boring: 9 inches
Drill Date: 10/15/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

PES Environmental, Inc.
Engineering & Environmental Services

LOG OF BORING: AS-26

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete	0.0					0		Asphalt (3 inches)
	0.0							Asphalt base (3 inches)
						2		LIGHT BROWN SAND (SP) (soil cleared with air knife to 8 feet)
	0.0	AS-26-3						
						4		
						6		
		AS-26-8				8		
	0.0		8					YELLOW-BROWN SAND (SP), moist, medium dense, fine sand, few fines
	3.6		6	8				
			6					
			5			10		at 10 feet: brown
	13.5	AS-26-10	7	14				
2" Sch 40 PVC Casing			8			12		
								GRAY SAND (SP), moist, dense, medium, few fines, faint chemical-like odor
						14		
			15					
	2.6		19	18		16		
			22					
						18		
Bentonite-Portland Cement Grout						20		BROWN GRAVEL WITH SAND (GP), moist, very dense, fine to coarse, little fine to coarse sand, few fines
			26					
	2.2		24	8				BROWN SAND (SP), moist, very dense, medium, few fines, trace fine to coarse gravel
			31			22		
						24		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 55.5 feet
Diameter of Boring: 9 inches
Drill Date: 10/16/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
			31					at 25 feet: 6-inch layer of brown silt, trace fine sand
	4.0		30	18		26		
			30					at 26 feet: few fine gravel, finer sand
						28		
						30		
			29					
	1.3		31	18				at 30.7 feet: abundant orange staining
			30					BROWN SILTY SAND (SM), moist, very dense, medium, little fines, few fine to coarse gravel
						32		
								BROWN SAND (SP), moist, very dense, medium, few fines, few approximately 1/4-inch orange stained clumps of silt
						34		
			27					
	0.1		30	18		36		
			30					
						38		
								BROWN GRAVEL WITH SAND (GP), wet, very dense, fine to coarse, little fine to coarse sand, few fines (heaving)
	0.2		50/6	6		40		
						42		
								BROWN SAND (SP), wet, very dense, fine to coarse, few fines, trace fine to coarse gravel (heaving)
						44		
			21					
	0.3		23	18		46		
			30					BROWN SILTY SAND (SM), wet, very dense, medium, little fines (heaving)
						48		
						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 55.5 feet
Diameter of Boring: 9 inches
Drill Date: 10/16/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Bentonite	0.1		19 21 50/0	12		50		
10x20 Sand Filter Pack						52		BROWN SAND (SP), wet, very dense, medium, few fine to coarse gravel, few fines (heaving)
2" Sch 40 PVC 0.020-inch Screen	0.0		21 22 23 27 50/6	18 12		54		
End Cap						56		GRAY CLAY (CL), moist, very hard, trace fine to coarse gravel Bottom of boring at 55.5 feet. Added 40 to 50 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-26 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 55.3 feet. Well Sump/Endcap: 55.1 to 55.3 feet. Well Screen: 53.1 to 55.1 feet. Well Blank: 0.5 to 53.1 feet. Filter Pack: 52 to 55.5 feet (10x20 Sand). Well Seal: 50 to 52 feet (hydrated bentonite chips). Annular Seal: 2.0 to 50 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 738
						58		
						60		
						62		
						64		
						66		
						68		
						70		
						72		
						74		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 55.5 feet
Diameter of Boring: 9 inches
Drill Date: 10/16/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
						0		Asphalt (3 inches)
Concrete	0.0							Asphalt base (3 inches)
	0.0							
						2		BROWN SAND (SP), some coarse gravel, asphalt debris in upper 1 foot of soil (soil cleared with air knife to 4 feet)
	0.0	AS-27-3						
						4		BROWN SILTY SAND (SM), moist, fine to medium, little fines (soil logged from cuttings from 5 to 8 feet)
						6		
	10.7							
		AS-27-8	10			8		BROWN SAND (SP), moist, medium dense, fine to medium, few fines
	19.3		12	11				
			12					
			12			10		
	8.6		14	11				
			16					
2" Sch 40 PVC Casing						12		
						14		
			11					
	2.5		12	15				at 15 feet: gray-brown, 2 to 4-inch layers of varying sand size
			12			16		
						18		BROWN SILT (ML), moist, hard, trace fine sand, occasional orange staining and mottling
Bentonite-Portland Cement Grout						20		
			12					
	2.1		13	13				
			16					
						22		
								BROWN SAND (SP), moist, dense, medium, few fines, trace fine to coarse gravel
						24		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 55.5 feet
Diameter of Boring: 9 inches
Drill Date: 10/17/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	2.4		14 20 20	18		26		
						28		
	1.3		17 21 23	18		30		
						32		
						34		
	0.6		31 50/6	12		36		at 36 feet: 2 to 3-inch gravel in sampler
						38		BROWN SILTY GRAVEL (GM), wet, very dense, fine to coarse, little fines, few fine to coarse sand (heaving)
	0.8		50/6	6		40		
						42		
						44		BROWN SAND (SP), wet, very dense, medium, few fines, trace fine gravel (heaving)
	1.3		19 21 50	18		46		
						48		
						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 55.5 feet
Diameter of Boring: 9 inches
Drill Date: 10/17/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Bentonite	1.3		15 22 50	18		50		
10x20 Sand Filter Pack	0.8		15 16 50	18		52		BROWN GRAVEL (GP), wet, very dense, fine to coarse, few fine to coarse sand, few fines BROWN SAND (SP), wet, very dense, medium, few fines, trace fine gravel (heaving)
2" Sch 40 PVC 0.020-inch Screen	1.1		20 20 20	18		54		
End Cap	0.7		19 27	12		56		Bottom of boring at 55.5 feet. Added 70 to 80 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-27 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 55.3 feet. Well Sump/Endcap: 55.1 to 55.3 feet. Well Screen: 53.1 to 55.1 feet. Well Blank: 0.7 to 53.1 feet. Filter Pack: 52 to 55.5 feet (10x20 Sand). Well Seal: 50 to 52 feet (hydrated bentonite chips). Annular Seal: 2 to 50 feet (bentonite-portland cement grout). Surface Seal: 0 to 2 feet (concrete). Washington Department of Ecology Well Tag Number: BID 741
						58		
						60		
						62		
						64		
						66		
						68		
						70		
						72		
						74		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 55.5 feet
Diameter of Boring: 9 inches
Drill Date: 10/17/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete						0		BROWN SILTY SAND (SM), dry, loose, fine to medium, little fines, trace coarse gravel, concrete debris
						2		
						4		
	1.1		6 7 8	10		6		at 5 feet: wood organics BROWN SAND (SP), moist, medium dense to dense, fine to coarse, few fines
						8		
	1.5	AS-28-10	7 14 20	12		10		BROWN SILTY SAND (SM), moist, very dense, fine to medium, little fines
2" Sch. 80 PVC Casing						12		
						14		
	0.0		50/6	6		15		at 15 feet: some fines, trace coarse gravel, orange staining, 1-inch layer of brown silty sand
						16		
						18		BROWN SAND (SP), moist, very dense, fine to medium, few fines, higher moisture content
Bentonite-Portland Cement Grout	0.0		50/5	5		20		
						22		
						24		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 52 feet
Diameter of Boring: 9 inches
Drill Date: 9/22/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.0		50/4	4		26		
						28		
	0.0		50/4	4		30		at 30 feet: fine, trace coarse gravel, 1-inch layer of brown silty sand
						32		
						34		
	0.6		50/4	4		36		at 35 feet: wet, fine to coarse, little gravel (heaving)
						38		
	0.0		50/4 50/6	6		40		at 40 feet: fine to medium, trace fines, no gravel
	0.0		50/5	5		42		
	0.0		50/5	5		44		at 43.5 feet: some coarse gravel, few fines
	0.0		30 50 50/6	18		46		at 45 feet: no gravel
Bentonite								
10x20 Sand Filter Pack						48		
End Cap						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 52 feet
Diameter of Boring: 9 inches
Drill Date: 9/22/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
2" Sch. 80 PVC 0.020-inch Screen	0.0		50/6	6		50		BROWN SILT (ML), damp, very hard, trace fine sand, medium plasticity
								Bottom of boring at 50.5 feet.
						52		Added 5 to 10 gallons of water to control heave.
								AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-28 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap.
						54		Total Well Depth (bgs): 50.5 feet. Well Sump/Endcap: 49.9 to 50.5 feet. Well Screen: 47.9 to 49.9 feet. Well Blank: 0.5 to 47.9 feet. Filter Pack: 47.5 to 52 feet (10x20 Sand). Well Seal: 45.5 to 47.5 feet (hydrated bentonite chips). Annular Seal: 2 to 44.5 feet (bentonite-portland cement grout). Surface Seal: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 706
						56		
						58		
						60		
						62		
						64		
						66		
						68		
						70		
						72		
						74		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 52 feet
Diameter of Boring: 9 inches
Drill Date: 9/22/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete						0		BROWN SILTY SAND (SM), dry, medium dense, fine, little fines, trace fine gravel
						2		
						4		
	396	AS-29-5	9 9 9	18		6		at 5.3 feet: yellow-brown, fine to medium BROWN SAND (SP), dry, medium dense, fine to medium sand, few fines
						8		
	70.2		12 12 14	18		10		at 10 feet: moist
2" Sch. 80 PVC Casing						12		BROWN SILTY SAND (SM), moist, medium dense, fine to coarse, some fines, trace coarse gravel
						14		
	41.7		15 15 15	10		16		at 15 feet: gray, few fine to coarse gravel, 3-inch rock
						18		BROWN SAND (SP), moist, very dense, fine to medium, few fines
Bentonite-Portland Cement Grout	0.0		21 24 30	18		20		
						22		
						24		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 51 feet
Diameter of Boring: 9 inches
Drill Date: 9/23/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
	0.0		50/6	3		26		at 25 feet: very dense, finer sand
						28		BROWN SILTY SAND (SM), moist, very dense, fine to coarse, little fines
	41.0		50/6	6		30		
						32		
						34		BROWN SAND (SP), wet, very dense, fine to coarse, few fines, trace fine gravel (heaving)
	0.0		50/6	6		36		
						38		
	0.0		50/6	6		40		BROWN SAND WITH GRAVEL (SP), wet, very dense, fine to coarse, little fine to coarse gravel, few fines (heaving)
	0.0		50/6	6		42		
	0.0		14 50/6	12		44		
	0.0		50/6	6		46		
← Bentonite	0.0		50/6	6		48		
← 10x20 Sand Filter Pack						50		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 51 feet
Diameter of Boring: 9 inches
Drill Date: 9/23/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
2" Sch. 80 PVC 0.020-inch Screen End Cap			50/6			50		BROWN SILT (ML), moist, very hard, trace fine sand, medium plasticity
						52		Bottom of boring at 51 feet. Added 5 to 10 gallons of water to control heave. AIR SPARGING WELL COMPLETION DETAILS: Air sparging well AS-29 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap. Total Well Depth (bgs): 50.3 feet. Well Sump/Endcap: 50.1 to 50.3 feet. Well Screen: 48.1 to 50.1 feet. Well Blank: 0.6 to 48.1 feet. Filter Pack: 47 to 51 feet (10x20 Sand). Well Seal: 44.8 to 47 feet (hydrated bentonite chips). Annular Seal: 2.0 to 44.8 feet (bentonite-portland cement grout). Surface Seatl: 0 to 2.0 feet (concrete). Washington Department of Ecology Well Tag Number: BID 707
						54		
						56		
						58		
						60		
						62		
						64		
						66		
						68		
						70		
						72		
						74		

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 51 feet
Diameter of Boring: 9 inches
Drill Date: 9/23/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
Concrete						0		YELLOW-BROWN SILTY SAND (SM), moist, loose, fine some fines, orange staining (soil logged from cuttings to 5 feet)
						2		
						4		
	0.0	AS-31-5	6 5 5	18		6		
						8		GRAY-BROWN SAND (SP), moist, medium dense, medium, few fines, occasional horizons up to 1/4 inches thick of orange staining
	0.0		8 8 12	18		10		
2" Sch. 80 PVC Casing						12		
						14		
	0.0		12 13 18	18		16		at 15 feet: dense
						18		
Bentonite-Portland Cement Grout	0.0		16 21 20	18		20		at 20 feet: fine to coarse, trace fine subrounded gravel, no staining
						22		
						24		BROWN SAND WITH GRAVEL (SP), moist, dense, fine to coarse, little fine to coarse subrounded gravel, few fines

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 52.5 feet
Diameter of Boring: 9 inches
Drill Date: 9/25/14 and 9/26/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Depth (Feet)	Lithologic Description
	0.0		18 21 22	18	26	
					28	BROWN SAND (SP), moist, very dense, medium, few fines
			22 22 40	18	30 32	
			26 50/6	12	34 36	at 35 feet: wet
					38	BROWN SILTY SAND (SM), wet, very dense medium, little fines, (heaving)
	0.0		24 50/0	6	40	(Stopped Drilling on 5/25/14. Continued drilling on 5/26/14.)
	0.0		50/6	6	42	
	0.0		50/6	6		at 43 feet: trace fine gravel
					44	BROWN SAND (SP), wet, very dense, medium, few fines, few fine to coarse subrounded gravel (heaving)
	0.0		50/6	6		
Bentonite	0.0		50/6	6	46	at 46 feet: fine to coarse, no gravel
10x20 Sand Filter Pack	0.0		50/6	6	48	
			50/6	0	50	at 49 feet: no recovery, 3-inch rock in sampler

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 52.5 feet
Diameter of Boring: 9 inches
Drill Date: 9/25/14 and 9/26/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

Well Completion	PID (PPM)	Sample ID	Blow Count	Sample Recovery	Sample Interval	Depth (Feet)	Graphic Log	Lithologic Description
2" Sch. 80 PVC 0.020-inch Screen End Cap	0.0 0.0		50/6	6 18		50 52		BROWN GRAVEL WITH SAND (GP), wet, very dense, coarse gravel, little sand, few fines BROWN SILT (ML), moist

Bottom of boring at 52.5 feet.

Added 15 to 20 gallons of water to control heave.

AIR SPARGING WELL COMPLETION DETAILS:
Air sparging well AS-31 constructed with 2-inch Schedule 80 PVC pipe and 0.020-inch machine slotted screen with a flat end cap.

Total Well Depth (bgs): 52.5 feet.
Well Sump/Endcap: 50.9 to 51.1 feet.
Well Screen: 48.9 to 50.9 feet.
Well Blank: 0.5 to 48.9 feet.
Filter Pack: 47.6 to 52.5 feet (10x20 Sand).
Well Seal: 44.6 to 47.6 feet (hydrated bentonite chips).
Annular Seal: 2.0 to 44.6 feet (bentonite-portland cement grout).
Surface Seal: 0 to 2.0 feet (concrete).
Washington Department of Ecology Well Tag Number: BID 712

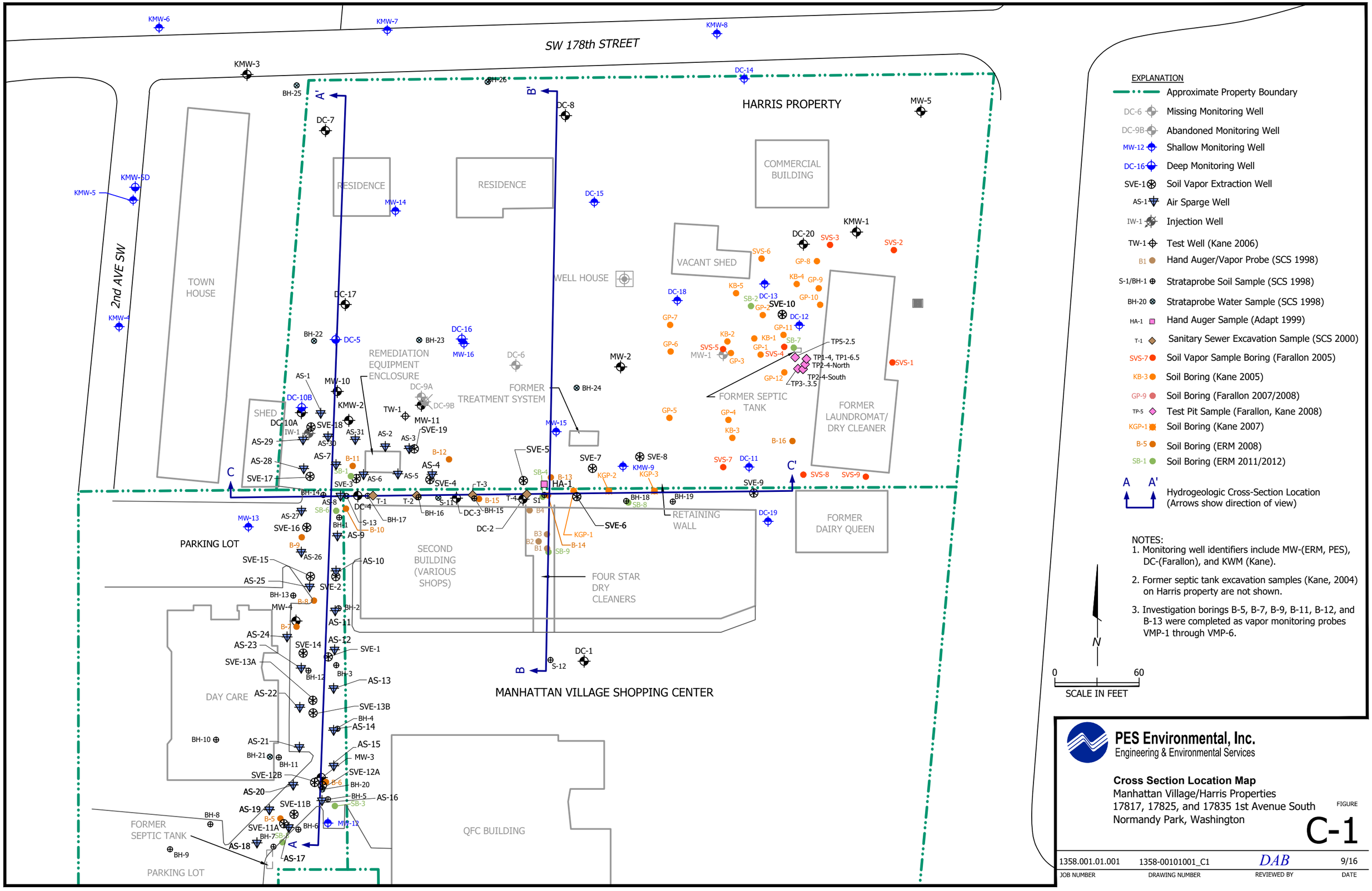
54 56 58 60 62 64 66 68 70 72 74

Project: Manhattan Village Shopping Center and Harris Tenants in Common
Project Number: 1358.001.01.009
Site Location: Normandy Park, Washington
Logged By: Chris DeBoer
Notes:

Total Drilled Depth: 52.5 feet
Diameter of Boring: 9 inches
Drill Date: 9/25/14 and 9/26/14
Drilled By: Cascade Drilling, L.P.
Drill Method: Hollow Stem Auger

APPENDIX C

GEOLOGIC CROSS SECTIONS



EXPLANATION

- Approximate Property Boundary
- DC-6 Missing Monitoring Well
- DC-9B Abandoned Monitoring Well
- MW-12 Shallow Monitoring Well
- DC-16 Deep Monitoring Well
- SVE-1 Soil Vapor Extraction Well
- AS-1 Air Sparge Well
- IW-1 Injection Well
- TW-1 Test Well (Kane 2006)
- B1 Hand Auger/Vapor Probe (SCS 1998)
- S-1/BH-1 Strataprobe Soil Sample (SCS 1998)
- BH-20 Strataprobe Water Sample (SCS 1998)
- HA-1 Hand Auger Sample (Adapt 1999)
- T-1 Sanitary Sewer Excavation Sample (SCS 2000)
- SVS-7 Soil Vapor Sample Boring (Farallon 2005)
- KB-3 Soil Boring (Kane 2005)
- GP-9 Soil Boring (Farallon 2007/2008)
- TP-5 Test Pit Sample (Farallon, Kane 2008)
- KGP-1 Soil Boring (Kane 2007)
- B-5 Soil Boring (ERM 2008)
- SB-1 Soil Boring (ERM 2011/2012)
- A A' Hydrogeologic Cross-Section Location (Arrows show direction of view)

NOTES:
1. Monitoring well identifiers include MW-(ERM, PES), DC-(Farallon), and KWM (Kane).
2. Former septic tank excavation samples (Kane, 2004) on Harris property are not shown.
3. Investigation borings B-5, B-7, B-9, B-11, B-12, and B-13 were completed as vapor monitoring probes VMP-1 through VMP-6.

N

0 60

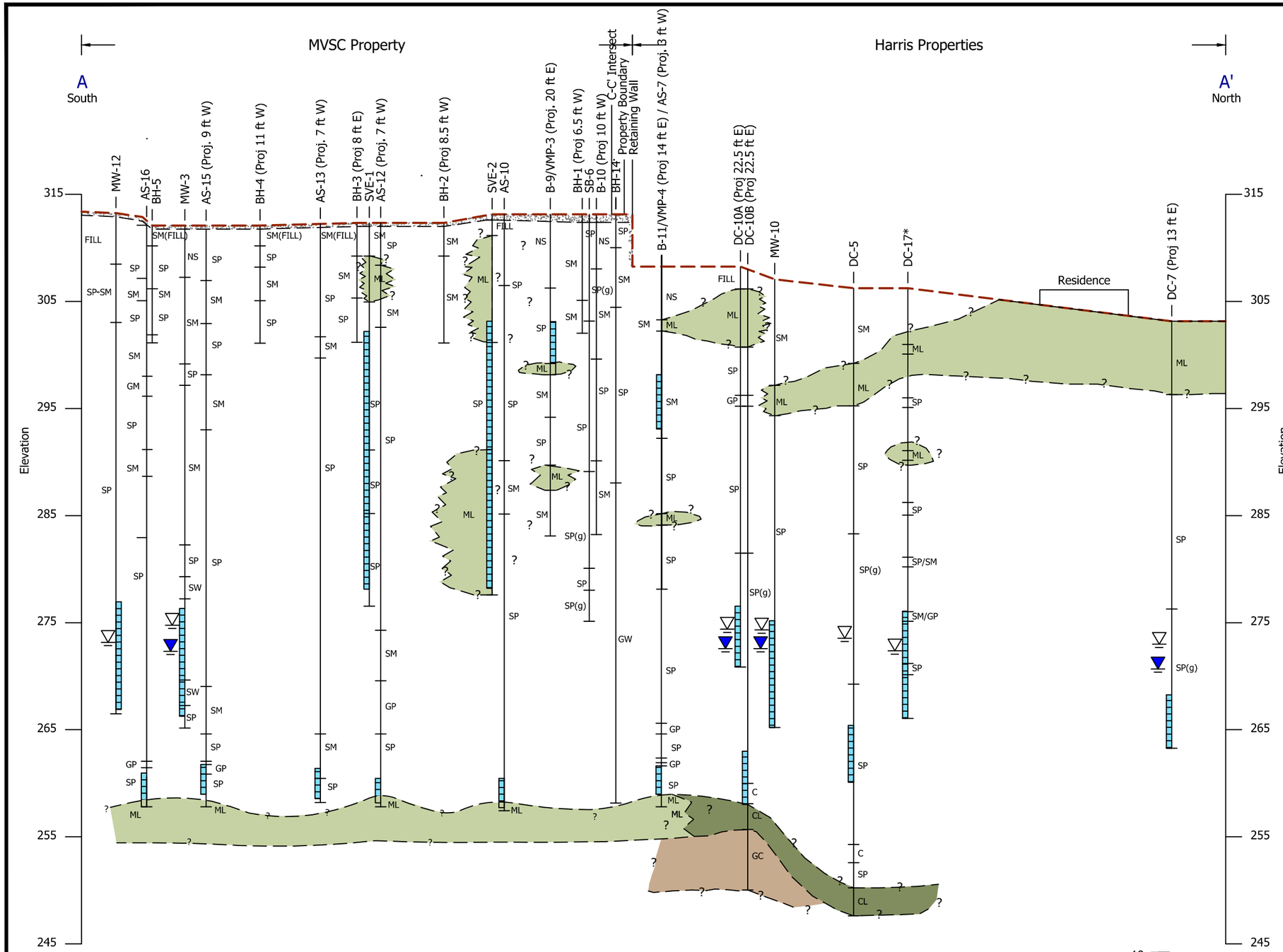
SCALE IN FEET

PES Environmental, Inc.
Engineering & Environmental Services

Cross Section Location Map
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE
C-1

1358.001.01.001	1358-00101001_C1	DAB	9/16
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



Explanation

- Approximate Surface Elevation (NAVD 88)
- DC-7 — Borehole or Monitoring Well with screen interval
- Approximate Lithologic Contact
- CL — Clay
- ML — Silt
- SM — Sandy Silt
- SP — Poorly Graded Sand
- SW — Well Graded Sand
- GP — Poorly Graded Gravel
- GC — Clayey Gravel
- SP(g) — Sand with Gravel
- C — Cobbles
- FILL — Fill
- NS — No Samples
- Measured historic high groundwater elevation (or only water elevation)
- Measured historic low groundwater elevation

Notes

Borings projected greater than 5 feet are noted above location.

* = Boring logs do not provide lithologic interpretation in between sample intervals.

MVSC = Manhattan Village Shopping Center

Lithologic Description based on ASTM D2488-06
Asphalt/Concrete
(GC) Clayey Gravel
(SM, SP, SW) Sand and Silty Sand
(ML) Silt with or without sand and gravel
(CL) Clay with or without sand and gravel

10 — 0 Vertical Scale in Feet

0 — 50 Horizontal Scale in Feet

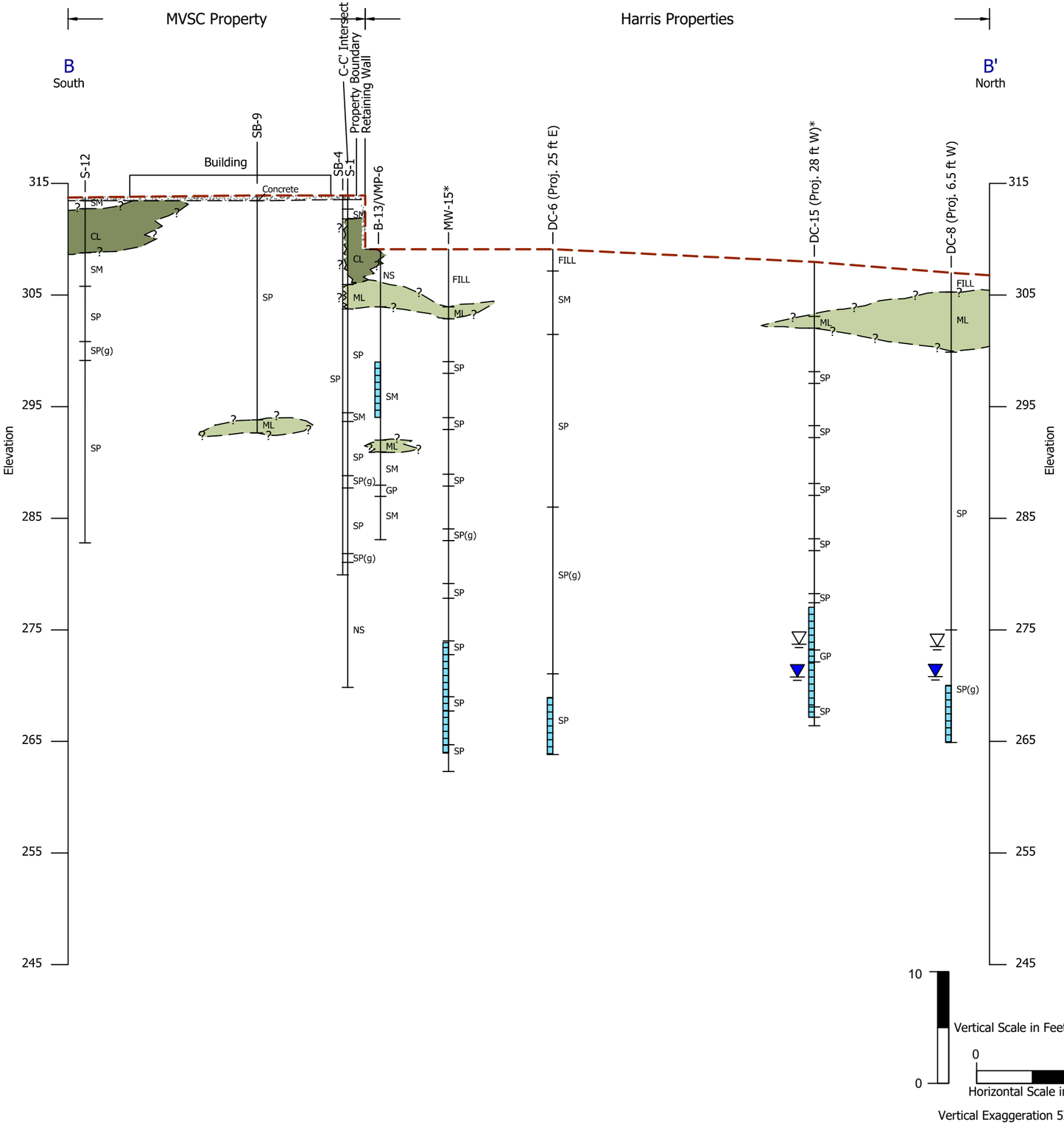
Vertical Exaggeration 5X

PES Environmental, Inc.
Engineering & Environmental Services

Cross Section A-A'
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE
C-2

1358.001.01.001	1358-00101001_xsecs	DAB	9/16
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



Explanation

- Surface Elevation (NAVD 88)
- DC-7 — Borehole or Monitoring Well with screen interval
- Approximate Lithologic Contact
- CL — Clay
- ML — Silt
- SM — Sandy Silt
- SP — Poorly Graded Sand
- SW — Well Graded Sand
- GP — Poorly Graded Gravel
- GC — Clayey Gravel
- SP(g) — Sand with Gravel
- C — Cobbles
- FILL — Fill
- NS — No Samples
- Measured historic high groundwater elevation (or only water elevation)
- Measured historic low groundwater elevation

Notes

Borings projected greater than 5 feet are noted above location.

* = Boring logs do not provide lithologic interpretation in between sample intervals.

MVSC = Manhattan Village Shopping Center

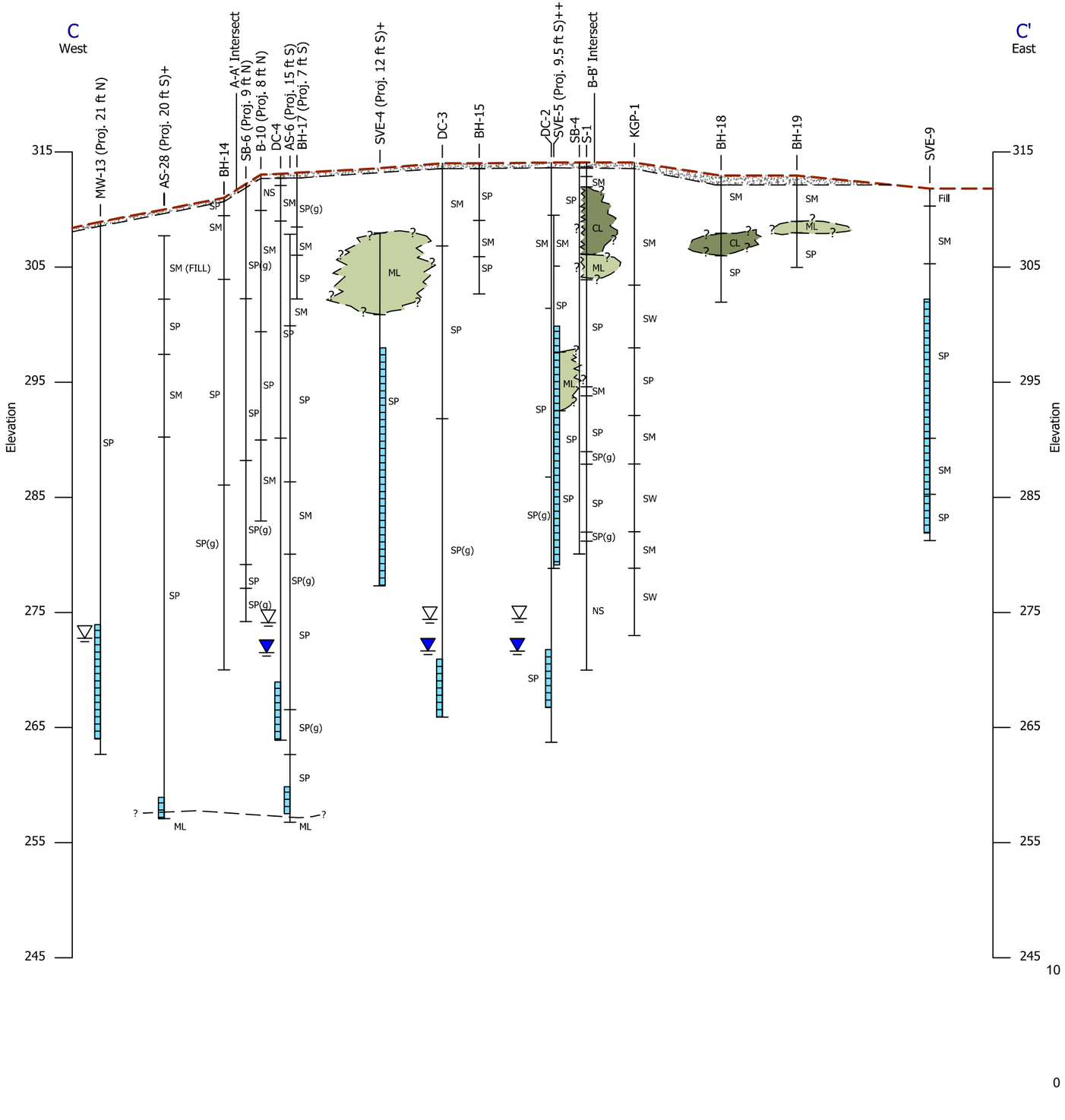
Lithologic Description based on ASTM D2488-06
Asphalt/Concrete
(GC) Clayey Gravel
(SM, SP, SW) Sand and Silty Sand
(ML) Silt with or without sand and gravel
(CL) Clay with or without sand and gravel

PES Environmental, Inc.
Engineering & Environmental Services

Cross Section B-B'
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE
C-3

1358.001.01.001	1358-00101001_xsecs	DAB	9/16
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



Explanation

- Surface Elevation (NAVD 88)
- DC-7 — Borehole or Monitoring Well with screen interval
- ? – – – ? Approximate Lithologic Contact
- CL — Clay
- ML — Silt
- SM — Sandy Silt
- SP — Poorly Graded Sand
- SW — Well Graded Sand
- GP — Poorly Graded Gravel
- GC — Clayey Gravel
- SP(g) — Sand with Gravel
- C — Cobbles
- FILL — Fill
- NS — No Samples
- Measured historic high groundwater elevation (or only water elevation)
- Measured historic low groundwater elevation

Notes

Borings projected greater than 5 feet are noted above location.

+ = SVE-4, AS-6, and AS-28 are projected 12 ft South, with an approximate elevation of 308 ft. which is shown below the surface elevation of the C-C' Line

++ = SVE-5 is projected 9.5 ft South, with an approximate elevation of 309 ft which is shown below the surface elevation of the C-C' Line

Lithologic Description based on ASTM D2488-06
Asphalt/Concrete
(GC) Clayey Gravel
(SM, SP, SW) Sand and Silty Sand
(ML) Silt with or without sand and gravel
(CL) Clay with or without sand and gravel

10 — Vertical Scale in Feet

0

0 — 50 Horizontal Scale in Feet

Vertical Exaggeration 5X

PES Environmental, Inc.
Engineering & Environmental Services

Cross Section C-C'
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE
C-4

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
1358.001.01.001	1358-00101001_xsecs	DAB	9/16

APPENDIX D

SOIL ANALYTICAL DATA

Table D-1

Historical Summary of Soil Analytical Results (1998 - 2012)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Sample ID	Depth	Date	PCE (mg/kg)	Other VOCs detected (mg/kg)	Comments
B-01-2	2	3/12/1998	**0.28**		
B-01-5	5	3/12/1998	**35**		
B-02-2	2	3/12/1998	**0.3**		
B-02-4	4	3/12/1998	**1.2**		
B-03-2	2	3/12/1998	**1.2**		
B-03-5	5	3/12/1998	**1.3**		
B-04-2	2	3/12/1998	**1.4**		
B-04-2	2	3/12/1998	**0.88**		Duplicate
B-04-5	5	3/12/1998	**0.99**		
S-01-11	11	4/14/1998	**0.8**		
S-01-20	20	4/14/1998	**0.6**		
S-01-30	30	4/14/1998	ND U		
S-01-34	34	4/14/1998	ND U		
DC-01	NA	12/17/1998	ND U		Composite
DC-02	NA	12/17/1998	**0.19**		Composite
DC-03	NA	12/17/1998	ND U		Composite
DC-04	NA	12/17/1998	**0.15**		Composite
DC-04	NA	12/17/1998	**0.16**		Duplicate
DC-03	NA	12/17/1998	**0.18**		Comp (sat)
DC-04	NA	12/17/1998	ND U		Comp (sat)
BH-01-3.5	3.5	12/16/1998	**0.88**	Benzene = 0.17	
BH-01-3.5	3.5	12/16/1998	**0.9**	Benzene = 0.15	Duplicate
BH-01-9	9	12/16/1998	**0.19**		
BH-02-8	8	12/16/1998	ND U		
BH-03-7	7	12/16/1998	ND U		
BH-04-7	7	12/16/1998	ND U		
BH-05-6	6	12/16/1998	**2.2**		
BH-05-6	6	12/16/1998	**2.2**		Duplicate
BH-05-11	11	12/16/1998	ND U		
BH-06-7	7	12/16/1998	ND U		
BH-06-10	10	12/16/1998	ND U		
BH-07-1	1	12/16/1998	**0.1**	Benzene = 0.31	
BH-08-8	8	12/16/1998	ND U		
BH-09-8	8	12/16/1998	ND U	Benzene = 0.86	
BH-10-8	8	12/16/1998	ND U		
BH-11-1	1	12/16/1998	ND U		
BH-12-8	8	12/16/1998	ND U		
BH-13-7	7	12/16/1998	**1.4**		
BH-13-11	11	12/16/1998	ND U		

Table D-1

Historical Summary of Soil Analytical Results (1998 - 2012)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Sample ID	Depth	Date	PCE (mg/kg)	Other VOCs detected (mg/kg)	Comments
BH-14-8	8	12/16/1998	**10**		
BH-14-11	11	12/16/1998	**0.22**		
BH-14-11	11	12/16/1998	**0.16**		Duplicate
BH-14-20	20	12/16/1998	ND U		
BH-15-6	6	12/17/1998	**1.1**		
BH-15-11	11	12/17/1998	ND U		
BH-16-7	7	12/17/1998	**0.3**		
BH-16-11	11	12/17/1998	ND U		
BH-17-11	11	12/17/1998	ND U		
BH-18-7	7	12/17/1998	ND U		
BH-18-11	11	12/17/1998	ND U		
BH-19-8	8	12/17/1998	ND U		
DC-05-56	56	1/22/1999	ND U		
DC-06-40	40	1/22/1999	ND U		
DC-07-35	35	1/22/1999	ND U		
DC-08-35	35	1/22/1999	ND U		
DC-9B-35	35	4/5/1999	ND U		
DC-10B-50	50	4/5/1999	ND U		
MW-01-5	2.5-4	12/9/1999	ND U		
MW-02-34	32.5-34	12/9/1999	ND U		
HA-01-5	4.5-5	12/22/1999	0.05 U		
HA-01-10	10.10.5	12/22/1999	**0.0685**		
HA-01-13	12.5-13	12/22/1999	0.05 U		
T-01	4	7/26/2000	ND U		S.Sewer Ex.
T-02	4	7/26/2000	ND U		S.Sewer Ex.
T-03	3	7/26/2000	ND U		S.Sewer Ex.
T-04	3	7/26/2000	ND U		S.Sewer Ex.
SVS-04	0-4	2/11/2005	**0.0058**		
SVS-05	0-4	2/11/2005	0.0011 U		
KB-01-4-5	4-5	4/15/2005	0.02 U		
KB-01-15-16	15-16	4/15/2005	**0.02**		
KB-01-25-26	25-26	4/15/2005	**0.084**		
KB-01-35-36	35-36	4/15/2005	**0.18**		
KB-02-4-5	4-5	4/15/2005	0.02 U		
KB-02-15-16	15-16	4/15/2005	0.02 U		
KB-02-25-26	25-26	4/15/2005	**0.098**		
KB-02-35-36	35-36	4/15/2005	**0.16**		
KB-03-4-5	4-5	4/15/2005	0.02 U		
KB-03-15-16	15-16	4/15/2005	0.02 U		
KB-03-25-26	25-26	4/15/2005	0.02 U		

Table D-1

Historical Summary of Soil Analytical Results (1998 - 2012)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Sample ID	Depth	Date	PCE (mg/kg)	Other VOCs detected (mg/kg)	Comments
KB-04-4-5	4-5	4/15/2005	0.02 U		
KB-04-15-16	15-16	4/15/2005	**0.049**		
KB-04-19-20	19-20	4/15/2005	**0.1**		
KB-05-4-5	4-5	4/15/2005	0.02 U		
KB-05-15-16	15-16	4/15/2005	0.02 U		
KB-05-25-26	25-26	4/15/2005	**0.035**		
KB-05-30-31	35-36	4/15/2005	**0.055**		
ST-01	6	3/29/2006	**0.07**		Overexcavated
North Septic Sidewall	9	4/5/2006	0.005 U		Sidewall
East Septic Sidewall	9	4/5/2006	**0.033**		Overexcavated
South Septic Sidewall	9	4/5/2006	0.005 U		Sidewall
West Septic Sidewall	9	4/5/2006	0.005 U		Sidewall
ST-02	6	4/5/2006	**0.006**		Overexcavated
ST-03	7	4/5/2006	**0.016**		Overexcavated
ST-04	7	4/5/2006	**0.073**		Overexcavated
ST5 Clearance	9	4/5/2006	0.005 U		Overexcavated
ST6 Clearance	9	4/5/2006	**0.007**		Bottom
East Septic Sidewall 2	11	4/6/2006	0.005 U		Sidewall
ST5 Clearance 2	12	4/5/2006	0.005 U		Bottom
KMW-01-7	7	7/25/2005	0.05 U		
KMW-01-22	22	7/25/2005	0.05 U		
KMW-01-40	40	7/25/2005	0.05 U		
KMW-02-10	10	5/1/2006	0.05 U		
KMW-02-20	20	5/1/2006	0.05 U		
KMW-02-30	30	5/1/2006	0.05 U		
KMW-03-10	10	5/1/2006	0.05 U		
KMW-03-20	20	5/1/2006	0.05 U		
TW-01-5	5	5/1/2006	0.05 U		
TW-01-10	10	5/1/2006	0.05 U		
TW-01-20	20	5/1/2006	0.05 U		
TW-01-30	30	5/1/2006	0.05 U		
KMW-04-4-5.5	4-5.5	3/28/2007	0.05 U		
KMW-04-9-10.5	9-10.5	3/28/2007	0.05 U		
KMW-04-19-20.5	19-20.5	3/28/2007	0.05 U		
KMW-04-29-30.5	29-30.5	3/28/2007	0.05 U		
KMW-05-4-5.5	4-5.5	3/28/2007	0.05 U		
KMW-05-9-10.5	9-10.5	3/28/2007	0.05 U		
KMW-05-19-20.5	19-20.5	3/28/2007	0.05 U		
KMW-05-29-30.5	29-30.5	3/28/2007	0.05 U		

Table D-1

Historical Summary of Soil Analytical Results (1998 - 2012)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Sample ID	Depth	Date	PCE (mg/kg)	Other VOCs detected (mg/kg)	Comments
KMW-5D-4-5.5	4-5.5	3/28/2007	0.05 U		
KMW-5D-9-10.5	9-10.5	3/28/2007	0.05 U		
KMW-5D-20-20.5	24-25.5	3/28/2007	0.05 U		
KMW-5D-46	46	3/28/2007	0.05 U		
KMW-06-9-10.5	9-10.5	3/27/2007	0.05 U		
KMW-06-19-20.5	19-20.5	3/27/2007	0.05 U		
KMW-06-29-30.5	29-30.5	3/27/2007	0.05 U		
KMW-06-41-42.5	41-42.5	3/27/2007	0.05 U		
KMW-07-9-10.5	9-10.5	3/27/2007	0.05 U		
KMW-07-19-20.5	19-20.5	3/27/2007	0.05 U		
KMW-07-29-30.5	29-30.5	3/27/2007	0.05 U		
KMW-08-9-10.5	9-10.5	3/27/2007	0.05 U		
KMW-08-20-21.5	20-21.5	3/27/2007	0.05 U		
KMW-08-29-30.5	29-30.5	3/27/2007	0.05 U		
KMW-09-5	5	3/27/2007	**0.0043**		
KMW-09-14-15.5	14-15.5	3/27/2007	**0.2**		
KMW-09-19-20.5	19-20.5	3/27/2007	**0.23**		
KMW-09-24-25.5	24-25.5	3/27/2007	**1.8**		
KMW-09-29-30.5	29-30.5	3/27/2007	**0.32**		
KMW-09-34-35.5	34-35.5	3/27/2007	**0.29**		Split
KMW-09-35	35	3/27/2007	**0.016**		Split
KMW-09-39-40.5	39-40.5	3/27/2007	**0.053**		
KGP-01-4	4	7/6/2007	**1.6**		Split
KGP-01-4	4	7/6/2007	**13**	TCE = 0.15	Split
KGP-01-8	8	7/6/2007	**59**		Split
KGP-01-8	8	7/6/2007	**14**		Split
KGP-01-10.5	10.5	7/6/2007	**2.1**		
KGP-01-16	16	7/6/2007	**0.28**		Split
KGP-01-16	16	7/6/2007	**0.08**		Split
KGP-01-20	20	7/6/2007	**0.23**		
KGP-01-23	23	7/6/2007	**0.15**		
KGP-01-32	32	7/6/2007	**0.17**		
KGP-01-38	38	7/6/2007	**0.051**		
KGP-02-4	4	7/6/2007	**0.16**		Split
KGP-02-4	4	7/6/2007	**0.087**		Split
KGP-02-8	8	7/6/2007	**0.013**		Split
KGP-02-8	8	7/6/2007	**0.0082**		Split
KGP-02- 10.5	10.5	7/6/2007	**0.064**		
KGP-02-16	16	7/6/2007	**0.02**		Split
KGP-02-16	16	7/6/2007	**0.022**		Split

Table D-1

Historical Summary of Soil Analytical Results (1998 - 2012)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Sample ID	Depth	Date	PCE (mg/kg)	Other VOCs detected (mg/kg)	Comments
KGP-02-20	20	7/6/2007	**0.088**		
KGP-02-23	23	7/6/2007	**0.033**		
KGP-02- 30-31	30-31	7/6/2007	**0.016**		
KGP-02-37	37	7/6/2007	**0.015**		
KGP-03-2-4	2-4	7/6/2007	**0.001**		Split
KGP-03-2-4	2-4	7/6/2007	**0.0017**		Split
KGP-03-8	8	7/6/2007	**0.005**		Split
KGP-03-8	8	7/6/2007	**0.0045**		Split
KGP-03-10.5	10.5	7/6/2007	**0.007**		
KGP-03-13-16	13-16	7/6/2007	**0.009**		Split
KGP-03-13-16	13-16	7/6/2007	**0.0089**		Split
KGP-03-20	20	7/6/2007	**0.009**		
KGP-03-23	23	7/6/2007	**0.012**		
KGP-03-29-32	29-32	7/6/2007	**0.011**		
KGP-03-38	38	7/6/2007	**0.01**		
GP-01-8-12	8-12	3/30/2007	0.0008 U		
GP-01-30-34	30-34	3/30/2007	**0.0067**		
GP-02-4-8	4-8	4/2/2007	0.0009 U		
GP-02-28-32	28-32	4/2/2007	**0.0055**		
GP-03-8-12	8-12	3/30/2007	0.00099 U		
GP-03-28-30	28-30	3/30/2007	**0.011**		
GP-04-20-24	20-24	3/30/2007	**0.0023**		
GP-05-4-8	4-8	4/3/2007	**0.0028**		
GP-05-16-20	16-20	4/3/2007	**0.024**		
GP-06-4-8	4-8	4/2/2007	0.0011 U		
GP-06-27-30	27-30	4/2/2007	**0.0033**		
GP-07-4-8	4-8	4/2/2007	0.00095 U		
GP-07-30-34	30-34	4/2/2007	**0.0016**		
GP-08-6-052708	6	5/27/2008	**0.0017**		
GP-08-10-052708	10	5/27/2008	**0.0026**		
GP-09-4-052708	4	5/27/2008	0.00086 U		
GP-09-10-052708	10	5/27/2008	**0.0019**		
GP-10-4-052708	4	5/27/2008	0.001 U		
GP-10-10-052708	10	5/27/2008	**0.0017**		
GP-11-6-052708	6	5/27/2008	**0.0014**		
GP-11-10-052708	10	5/27/2008	**0.0013**		
GP-12-6-052708	6	5/27/2008	**0.0011**		
GP-12-10-052708	10	5/27/2008	0.00092 U		
DC-11-15-16.5	15-16.5	4/19/2007	**0.0013**		
DC-11-30-31.5	30-31.5	4/19/2007	**0.0084**		

Table D-1

Historical Summary of Soil Analytical Results (1998 - 2012)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Sample ID	Depth	Date	PCE (mg/kg)	Other VOCs detected (mg/kg)	Comments
DC-12-15-16.5	15-16.5	4/18/2007	**0.0024**		
DC-13-15-16.5	15-16.5	4/19/2007	**0.00096**		
DC-13-35-36.5	35-36.5	4/19/2007	**0.0081**		
DC-14-15-16.5	15-16.5	4/17/2007	0.0011 U		
DC-15-15-16.5	15-16.5	4/16/2007	0.0011 U		
DC-16-15-16.5	15-16.5	4/17/2007	0.0011 U		
DC-17-15-16.5	15-16.5	4/16/2007	0.001 U		
DC-17-35	35-36.5	4/16/2007	**0.077**		
DC-18-15-16.5	15-16.5	4/18/2007	0.001 U		
DC-19-4	3.5-5	6/1/2007	0.00077 U		
DC-19-8	7.5-9	6/1/2007	0.00069 U		
DC-19-38	37.5-38	6/1/2007	**0.0047**		
DC-20-10-052808	10	5/28/2008	**0.0026**		
DC-20-35-052808	35	5/28/2008	**0.0018**		
TP-01-4-052108	4	5/12/2008	**0.001**		split
TP-01-4-052108	4	5/12/2008	0.02 U		split
TP-01-6.5-052108	6.5	5/12/2008	0.0012 U		split
TP-01-6.5-052108	6.5	5/12/2008	**0.02**		split
TP-02-4-052108-1 (south)	4	5/12/2008	**0.0068**		split
TP-02-4-052108-1 (south)	4	5/12/2008	**0.27**		split
TP-02-4-052108-2 (north)	4	5/12/2008	**0.05**		
TP-03-3.5-052108-2	3.5	5/12/2008	**0.014**		split
TP-03-3.5-052108-2	3.5	5/12/2008	**0.02**		split
TP-05-2.5-052108	2.5	5/12/2008	**0.34**		
B-05-10	10	3/26/2008	0.00287 U		
B-05-20	20	3/26/2008	**0.0034**		
B-05-30	30	3/26/2008	**0.00888**		
B-06 -10	10	3/25/2008	0.00302 U		
B-06 -20	20	3/25/2008	**0.00816**		
B-06 -30	30	3/25/2008	**0.00899**		
B-07-10	10	3/25/2008	0.000151 U		
B-07-20	20	3/25/2008	**0.00351**		
B-07-30	30	3/25/2008	**0.00884**		
B-08-10	10	3/26/2008	**0.00654**		
B-08-20	20	3/26/2008	**0.00554**		
B-08-30	30	3/26/2008	**0.00562**		
B-09-10	10	3/25/2008	**0.00616**		
B-09-20	20	3/25/2008	**0.0143**		
B-09-30	30	3/25/2008	**0.0116**		
B-10-10	10	3/24/2008	**0.671**		

Table D-1

Historical Summary of Soil Analytical Results (1998 - 2012)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Sample ID	Depth	Date	PCE (mg/kg)	Other VOCs detected (mg/kg)	Comments
B-10-20	20	3/24/2008	**0.0508**		
B-10-30	30	3/24/2008	**0.0154**		
B-11-10	10	3/27/2008	**0.0324**		
B-11-20	20	3/27/2008	**0.346**		
B-11-30	30	3/27/2008	**0.279**		
B-12-10	10	3/27/2008	0.00292 U		
B-12-20	20	3/27/2008	**0.00299**		
B-12-25	25	3/27/2008	**0.00848**		
B-13-10	10	3/27/2008	**0.0311**		
B-13-20	20	3/27/2008	**0.0314**		
B-13-30	30	3/27/2008	**0.0231**		
B-14-10	10	3/24/2008	**0.0118**		
B-14-20	20	3/24/2008	**0.0296**		
B-14-30	30	3/24/2008	**0.594**		
B-15-10	10	3/24/2008	**0.00532**		
B-15-20	20	3/24/2008	**0.0188**		
B-15-30	30	3/24/2008	**0.00785**		
B-16-10	10	3/25/2008	0.00324 U		
B-16-20	20	3/25/2008	0.00324 U		
B-16-24	24	3/25/2008	0.000139 U		
B-17-10	10	3/26/2008	0.00269 U		
B-17-20	20	3/26/2008	0.00251 U		
B-17-30	30	3/26/2008	0.00244 U		
SB-01-10	10	4/19/2011	0.01 U		
SB-01-20	20	4/19/2011	0.01 U		
SB-01-30	30	4/19/2011	0.01 U		
SB-02-10	10	4/19/2011	0.01 U		
SB-02-20	20	4/19/2011	0.01 U		
SB-02-30	30	4/19/2011	0.01 U		
SB-03-10	10	4/19/2011	0.01 U		
SB-03-20	20	4/19/2011	0.01 U		
SB-03-30	30	4/19/2011	0.01 U		
SB-04-5	5	3/1/2012	0.01 U		
SB-04-10	10	3/1/2012	0.01 U		
SB-04-20	20	3/1/2012	0.01 U		
SB-04-30	30	3/1/2012	0.01 U		
SB-04-34	34	3/1/2012	0.01 U		
SB-05-10	10	2/29/2012	0.01 U		
SB-05-20	20	2/29/2012	0.01 U		
SB-05-30	30	2/29/2012	0.01 U		

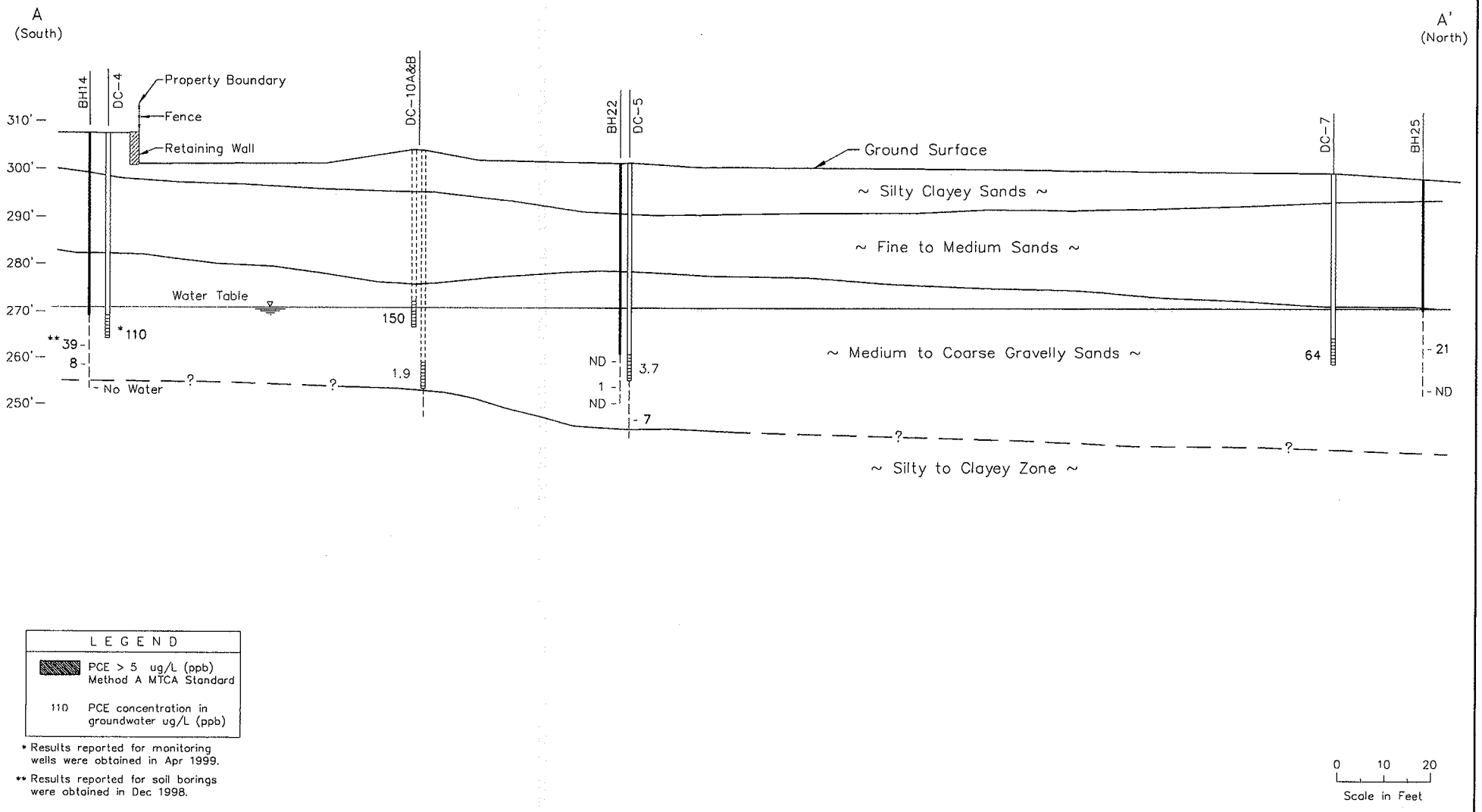
Table D-1

Historical Summary of Soil Analytical Results (1998 - 2012)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Sample ID	Depth	Date	PCE (mg/kg)	Other VOCs detected (mg/kg)	Comments
SB-06-5	5	2/29/2012	0.01 U		
SB-06-10	10	2/29/2012	**0.028**		
SB-06-20	20	2/29/2012	0.01 U		
SB-06-30	30	2/29/2012	0.01 U		
SB-06-38	38	2/29/2012	0.01 U		
SB-07-5	5	3/1/2012	0.01 U		
SB-07-20	20	3/1/2012	0.01 U		
SB-07-30	30	3/1/2012	0.01 U		
SB-07-38	38	3/1/2012	0.01 U		
SB-07-43	43	3/1/2012	0.01 U		
SB-08-10	10	2/29/2012	0.01 U		
SB-08-20	20	2/29/2012	0.01 U		
SB-08-30	30	2/29/2012	0.01 U		
SB-09-2	2	4/28/2012	ND U		
SB-09-8	8	4/28/2012	**0.013**		
SB-09-12	12	4/28/2012	ND U		
SB-09-20	20	4/28/2012	ND U		

NOTES:

1. Tetrachloroethene (PCE) concentrations in milligrams per kilogram (mg/kg).
2. Soil samples analyzed using USEPA Methods 8260B and 8021B (1998 through 2000 only).
3. ND and U = concentration not detected at or above the laboratory practical quantitation limit (PQL).
4. Detected concentrations are shown in **bold.**
5. Concentrations exceeding the PCE MTCA Method A cleanup level of 0.050 mg/kg are **bold and shaded**.
6. Other detected VOCs - only those which are above their respective cleanup level are listed.



LEGEND	
▨	PCE > 5 ug/L (ppb) Method A MTCA Standard
110	PCE concentration in groundwater ug/L (ppb)

* Results reported for monitoring wells were obtained in Apr 1999.

** Results reported for soil borings were obtained in Dec 1998.

0 10 20
Scale in Feet

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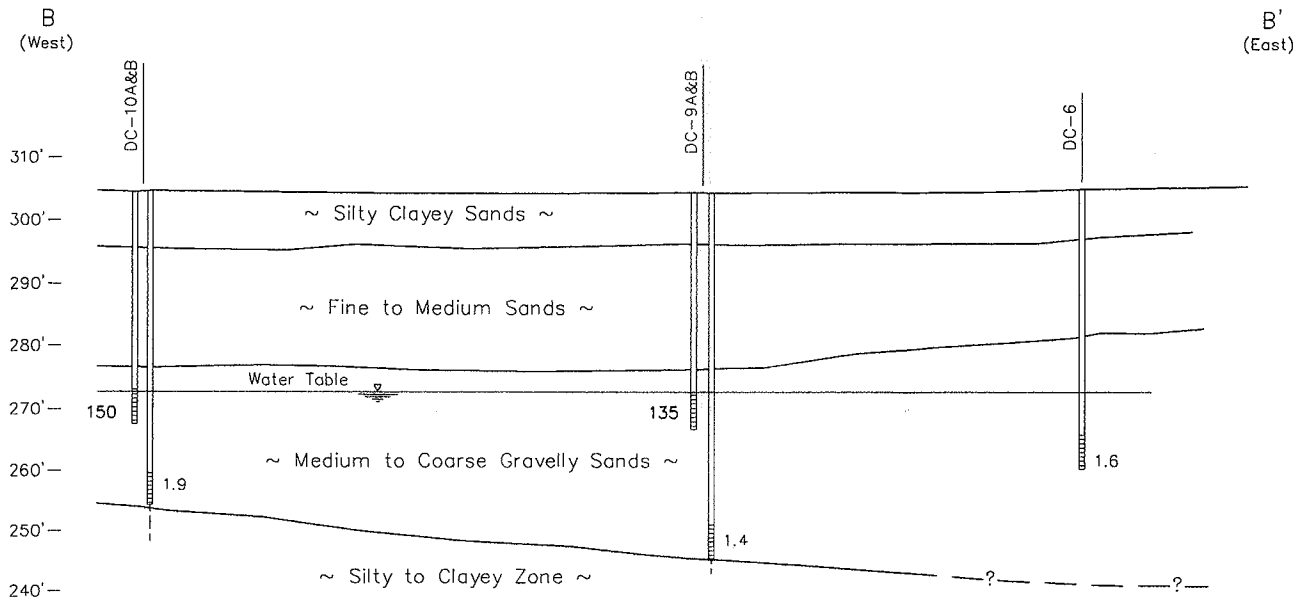
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS
2405 140TH AVE NE, SUITE 107, BELLEVUE, WA 98005 (425) 746-4600

PROJECT NO. 0498007.06	DES BY D.V.	GENERALIZED CROSS-SECTION A-A' FOUR STAR DRY CLEANERS MANHATTAN VILLAGE SHOPPING CENTER NORMANDY PARK, WASHINGTON	DATE MAY 1999
SCALE AS SHOWN	CHK BY D.V.		FIGURE 7
CAD FILE XAA01627	APP BY G.H.		



LEGEND	
	PCE > 5 ug/L (ppb) Method A MTCA Standard
110	PCE concentration in groundwater ug/L (ppb)

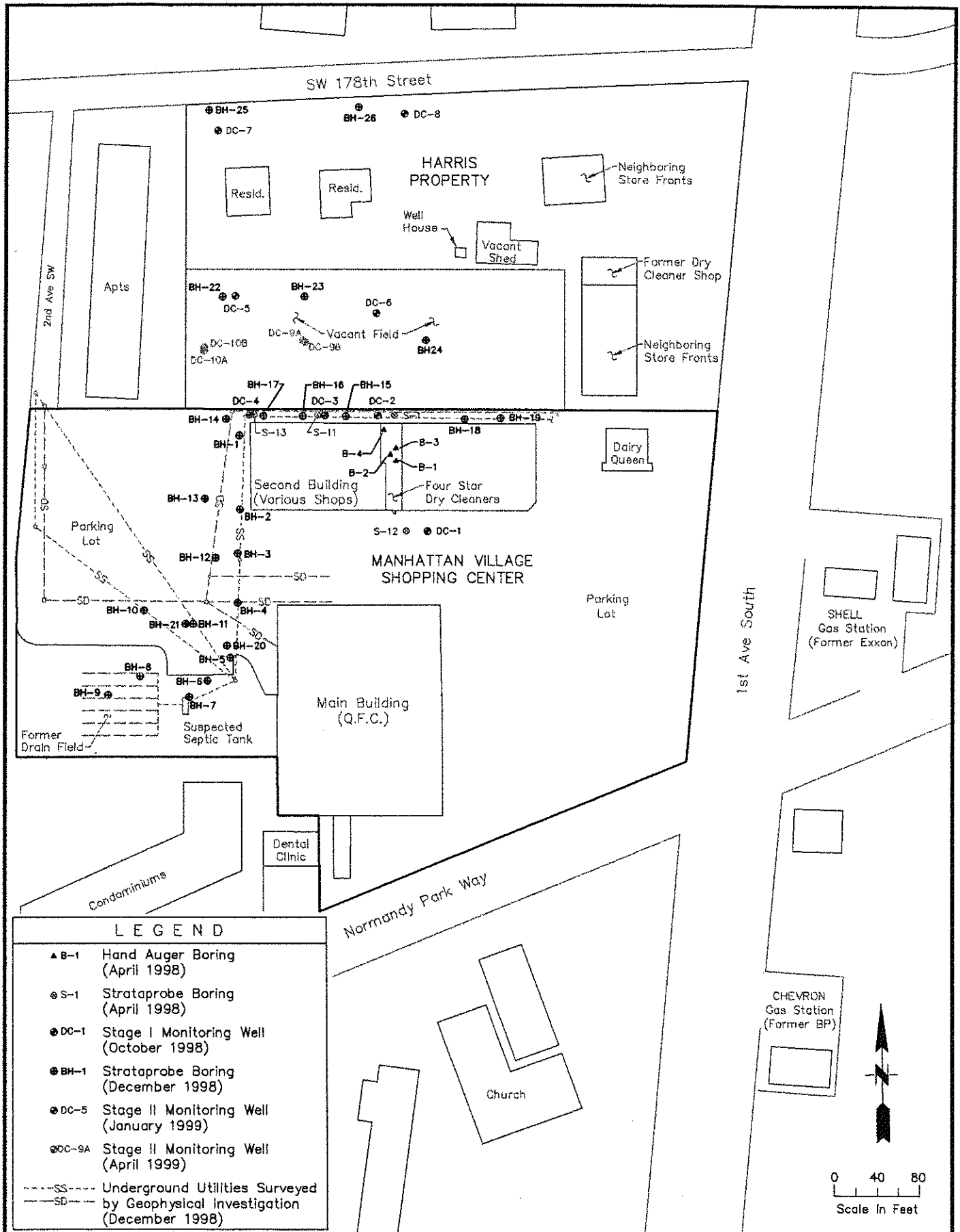
* Results reported for monitoring wells were obtained in Apr 1999.

** Results reported for soil borings were obtained in Dec 1998.

0 10 20

Scale in Feet

SCS ENGINEERS STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS 2405 140TH AVE NE, SUITE 107, BELLEVUE, WA 98005 (425) 746-4600			PROJECT NO. 0498007.06	DES BY D.V.	GENERALIZED CROSS-SECTION B-B' FOUR STAR DRY CLEANERS MANHATTAN VILLAGE SHOPPING CENTER NORMANDY PARK, WASHINGTON	DATE MAY 1999
			SCALE AS SHOWN	CHK BY D.V.		FIGURE 8
			CAD FILE XAA01628	APP BY G.H.		



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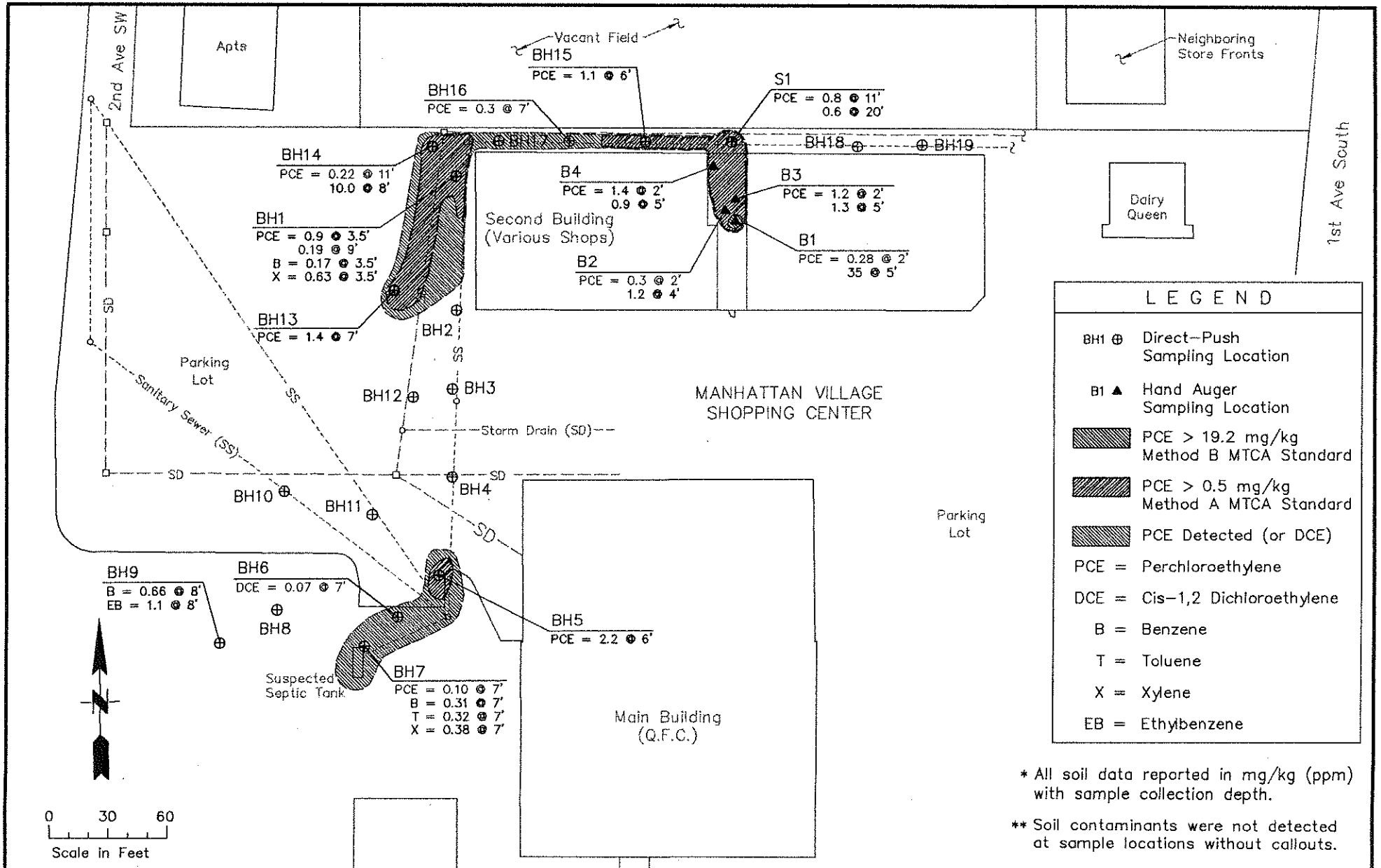
PROJECT NO. 0498007.06	DES BY D.V.
SCALE AS SHOWN	CHK BY D.V.
CAD FILE XAA01623	APP BY G.H.

AREAS OF INVESTIGATION
FOUR STAR DRY CLEANERS
MANHATTAN VILLAGE SHOPPING CENTER
NORMANDY PARK, WASHINGTON

DATE MAY 1999
FIGURE 3



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CONSULTING ENGINEERS
2405 140TH AVE NE, SUITE 107, BELLEVUE, WA 98005 (425) 746-4600

PROJECT NO. 0498007.06	DES BY D.V.	ESTIMATED EXTENT OF SOIL CONTAMINATION FOUR STAR DRY CLEANERS MANHATTAN VILLAGE SHOPPING CENTER NORMANDY PARK, WASHINGTON	DATE MAY 1999
SCALE AS SHOWN	CHK BY D.V.		FIGURE 5
CAD FILE XAA01625	APP BY G.H.		

TABLE 1

Summary of Analytical Data for Halogenated and Aromatic Volatile Organic Compounds in Soil; Four Star Dry Cleaners Site

SAMPLE LOCATION	SAMPLING DATE	EPA METHOD 8021 ANALYTES[1] (mg/kg)						
		PCE	cis-1,2 DCE	Chloroform	Benzene	Ethylbenzene	Toluene	Xylenes
Phase I/II Hand Augur Sampling (March 1998)								
B-1, 2'	03/12/98	0.28	ND	ND	--	--	--	--
B-1, 5'	03/12/98	35	ND	ND	--	--	--	--
B-2, 2'	03/12/98	0.3	ND	ND	--	--	--	--
B-2, 4'	03/12/98	1.2	ND	ND	--	--	--	--
B-3, 2'	03/12/98	1.2	ND	0.06	--	--	--	--
B-3, 5'	03/12/98	1.3	ND	ND	--	--	--	--
B-4, 2'	03/12/98	1.4	ND	ND	--	--	--	--
B-4, 2' (Dup)	03/12/98	0.88	ND	ND	--	--	--	--
B-4, 5'	03/12/98	0.99	ND	ND	--	--	--	--
Phase I/II Strataprobe Sampling (April 1998)								
S-1, 11'	04/14/98	0.8	ND	ND	ND	ND	ND	ND
S-1, 20'	04/14/98	0.6	ND	ND	ND	ND	ND	ND
S-1, 30'	04/14/98	ND	ND	ND	ND	ND	ND	ND
S-1, 34'	04/14/98	ND	ND	ND	ND	ND	ND	ND
Stage I Monitoring Well Soil Cuttings Sampling (December 1998) [2]								
DC-1, composite	12/17/98	ND	ND	ND	ND	ND	ND	ND
DC-2, composite	12/17/98	0.19	ND	ND	ND	ND	ND	ND
DC-3, composite	12/17/98	ND	ND	ND	ND	ND	ND	ND
DC-4, composite	12/17/98	0.15	ND	ND	ND	ND	ND	ND
DC-4, comp. (Dup)	12/17/98	0.16	ND	ND	ND	ND	ND	ND
DC-3, saturated	12/17/98	0.18	ND	ND	ND	ND	ND	ND
DC-4, saturated	12/17/98	ND	ND	ND	ND	ND	ND	ND
Additional Strataprobe Sampling (December 1998)								
BH-1, 3.5'	12/16/98	0.88	ND	ND	ND	0.17	ND	0.63
BH-1, 3.5' (Dup)	12/16/98	0.90	ND	ND	ND	0.15	ND	0.66
BH-1, 9'	12/16/98	0.19	ND	ND	ND	ND	ND	ND
BH-2, 8'	12/16/98	ND	ND	ND	ND	ND	ND	ND
BH-3, 7'	12/16/98	ND	ND	ND	ND	ND	ND	ND
BH-4, 7'	12/16/98	ND	ND	ND	ND	ND	ND	ND
BH-5, 6'	12/16/98	2.2	ND	ND	ND	ND	ND	ND
BH-5, 6' (Dup)	12/16/98	2.2	ND	ND	ND	ND	ND	ND
BH-5, 11'	12/16/98	ND	ND	ND	ND	ND	ND	ND
BH-6, 7'	12/16/98	ND	0.07	ND	ND	ND	ND	ND
BH-6, 10'	12/16/98	ND	ND	ND	ND	ND	ND	ND
BH-7, 7'	12/16/98	0.10	ND	ND	0.31	ND	0.32	0.38
BH-8, 8'	12/16/98	ND	ND	ND	ND	ND	ND	ND
BH-9, 8'	12/16/98	ND	ND	ND	0.66	1.1	ND	ND
BH-10, 8'	12/16/98	ND	ND	ND	ND	ND	ND	ND
BH-11, 7'	12/16/98	ND	ND	ND	ND	ND	ND	ND
BH-12, 8'	12/16/98	ND	ND	ND	ND	ND	ND	ND
BH-13, 7	12/16/98	1.4	ND	ND	ND	ND	ND	ND
BH-13, 11'	12/16/98	ND	ND	ND	ND	ND	ND	ND
MTCA Method A Soil Standard		**0.5**	**NA**	**NA**	**0.5**	**20**	**40**	**20**

Bold Analytical results exceed the Model Toxics Control Act Method A standard for this compound.

1 Equivalent analytical method (EPA 8260) used for Phase I/II hand auger analyses.

2 Composite and saturated soil samples collected from drummed soil cuttings.

-- Analyte not tested.

PCE Tetrachloroethylene.

DCE Dichloroethene.

ND Analyte not detected.

NA No MTCA standard has been established for this compound.

TABLE 1 (continued)

Summary of Analytical Data for Halogenated and Aromatic Volatile Organic Compounds in Soil; Four Star Dry Cleaners Site

SAMPLE LOCATION	SAMPLING DATE	EPA METHOD 8021 ANALYTES[1] (mg/kg)						
		PCE	cis-1,2 DCE	Chloroform	Benzene	Ethylbenzene	Toluene	Xylenes
Additional Strataprobe Sampling (December 1998)								
BH-14, 8'	12/16/98	10	ND	ND	ND	ND	ND	ND
BH-14, 11	12/16/98	0.22	ND	ND	ND	ND	ND	ND
BH-14, 11 (Dup)	12/16/98	0.16	ND	ND	ND	ND	ND	ND
BH-14, 20'	12/16/98	ND	ND	ND	ND	ND	ND	ND
BH-15, 6'	12/17/98	1.1	ND	ND	ND	ND	ND	ND
BH-15, 11'	12/17/98	ND	ND	ND	ND	ND	ND	ND
BH-16, 7'	12/17/98	0.30	ND	ND	ND	ND	ND	ND
BH-16, 11'	12/17/98	ND	ND	ND	ND	ND	ND	ND
BH-17, 11'	12/17/98	ND	ND	ND	ND	ND	ND	ND
BH-18, 7'	12/17/98	ND	ND	ND	ND	ND	ND	ND
BH-19,8'	12/17/98	ND	ND	ND	ND	ND	ND	ND
Stage II Monitoring Well Soil Sampling (January 1999)								
DC-5, 56'	01/22/99	ND	ND	ND	ND	ND	ND	ND
DC-6, 40'	01/22/99	ND	ND	ND	ND	ND	ND	ND
DC-7, 35'	01/22/99	ND	ND	ND	ND	ND	ND	ND
DC-8, 35'	01/22/99	ND	ND	ND	ND	ND	ND	ND
Additional **Stage II Well Nest Soil Sampling (April 1999)**								
DC-9B, 35'	04/05/99	ND	ND	ND	ND	ND	ND	ND
DC-10B, 50'	04/05/99	ND	ND	ND	ND	ND	ND	ND
MTCA Method A Soil Standard		**0.5**	**NA**	**NA**	**0.5**	**20**	**40**	**20**

Bold Analytical results exceed the Model Toxics Control Act Method A standard for this compound.
1 Equivalent analytical method (EPA 8260) used for Phase I/II hand augur analyses.
-- Analyte not tested.
PCE Tetrachloroethylene.
DCE Dichloroethene.
ND Analyte not detected.
NA No MTCA standard has been established for this compound.

3.3 GROUNDWATER CHEMISTRY

During the course of the field investigations a total of 45 primary groundwater samples, 6 duplicate samples, and 9 quality control samples were analyzed from Strataprobe and Hydropunch borings (S-, BH- and HPDC-prefixes), monitoring wells (DC-prefix), and the inactive domestic water well on the Harris property (WW-1 and DC-DWW). These samples were primarily collected during five main sampling events: April 14th, 1998 (S-1, S-11 and S-13); October 21st, 1998 (DC-1 through DC-4); December 18th through 22nd, 1998 (BH-14 and BH-20 through BH-26); February 3rd and 4th, 1999 (DC-1 through DC-8); and April 7th and 8th, 1999 (DC-1 through DC-10B). The analytical results for groundwater are summarized on Table 2.

Field parameters were recorded at each monitoring well location before the collection of groundwater samples. Groundwater parameters measured during the April 1999 sampling event ranged from 11.8 °C to 13.3 °C for temperature, 6.4 to 7.0 for pH, 183 µS to 352 µS for specific conductivity, and 4.6 mg/L O_2 to 7.7 mg/L O_2 for dissolved oxygen. These field measurements

Table 2: Summary of Soil Analytical Results			
Sample			EPA METHOD 8021B (mg/kg) (ppm)
ID	Depth (ft)	Date	HVOCs
MW1-5	2.5-4	12/9/99	ND*
MW-2-34	32.5-34	12/9/99	ND
Washington State Model Toxics Control Act (MTCA) Method "A" Residential Clean up Level			Various

Note: Methylene Chloride was detected at 0.674 mg/kg in MW1-5. The detection of Methylene chloride is considered a probable laboratory contaminate.

Based on the results summarized in Table 2, no chemicals of concern were detected above standard laboratory reporting limits. After discussion with laboratory personnel, the presence of methylene chloride in MW1-5 is considered a laboratory contaminate. Copies of laboratory results and chain-of-custody documents have been included in Appendix B. Specific sampling locations are depicted on Figure 2.

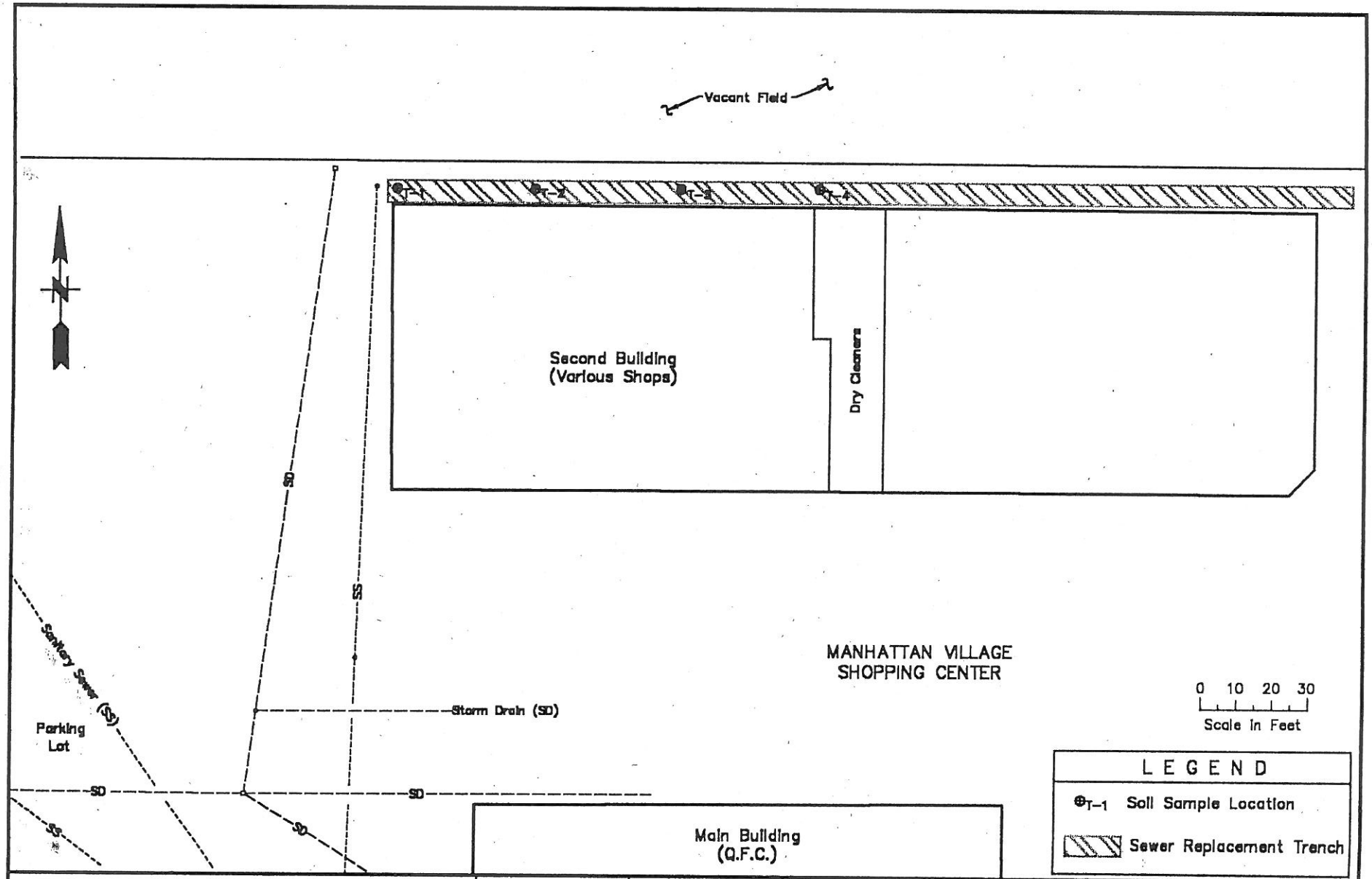
4.1.2 Hand Auger Boring

Three soil samples were submitted to North Creek for analytical testing for HVOCs using EPA Method 8021B. Analytical results of soil samples are summarized below in Table 3.

Table 3: Summary of Hand Auger Boring Analytical Results			
Sample			EPA METHOD 8021B (mg/kg) (ppm)
ID	Depth (ft)	Date	HVOCs
HA1-5	4.5-5	12/22/99	PCE- <0.05
HA1-10	10-10.5	12/22/99	PCE-0.0685
HA1-13	12.5-13	12/22/99	PCE-<0.05
MTCA Method "A" Residential Clean up Level			PCE-0.5

Note: Chloroform was detected in all three soil samples at concentrations ranging from 0.179 mg/kg to 0.235 mg/kg. The detection of chloroform is considered a probable laboratory contaminate.

Based on the results summarized in Table 3, PCE was detected above standard laboratory reporting limits but below MTCA Method A Cleanup levels in the soil sample HA1-10 at approximately 10 feet below ground surface. Chloroform was detected in all three soil samples at concentrations well below the MTCA Method A cleanup levels. After discussion with laboratory personnel, the presence of chloroform in the soil samples is considered a laboratory contaminate. Copies of laboratory results and chain-of-custody documents have been included in Appendix B. Specific sampling locations are depicted on Figure 2.



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PROJECT NO. 04199010.00	DES BY DV
SCALE –	CHK BY DV
CAD FILE Fig 8	APP BY GH

CONFIRMATIONAL SOIL SAMPLING LOCATIONS
SEWER REPLACEMENT TRENCH
NORMANDY PARK, WASHINGTON

DATE OCT 2000
FIGURE 8

5.3 CONFIRMATIONAL SOIL SAMPLING

On July 26th 2000, approximately 300 feet of old sanitary sewer pipeline (circa-1960) present behind the dry cleaner building was replaced with a new utility pipe as part of an overall upgrade to the Manhattan Village shopping center. The old concrete sewer pipe was completely removed from the excavation trench and the new PVC line was installed in its place. A visual examination of the old piping confirmed that the line was deteriorated in several places and was likely prone to significant leakage.

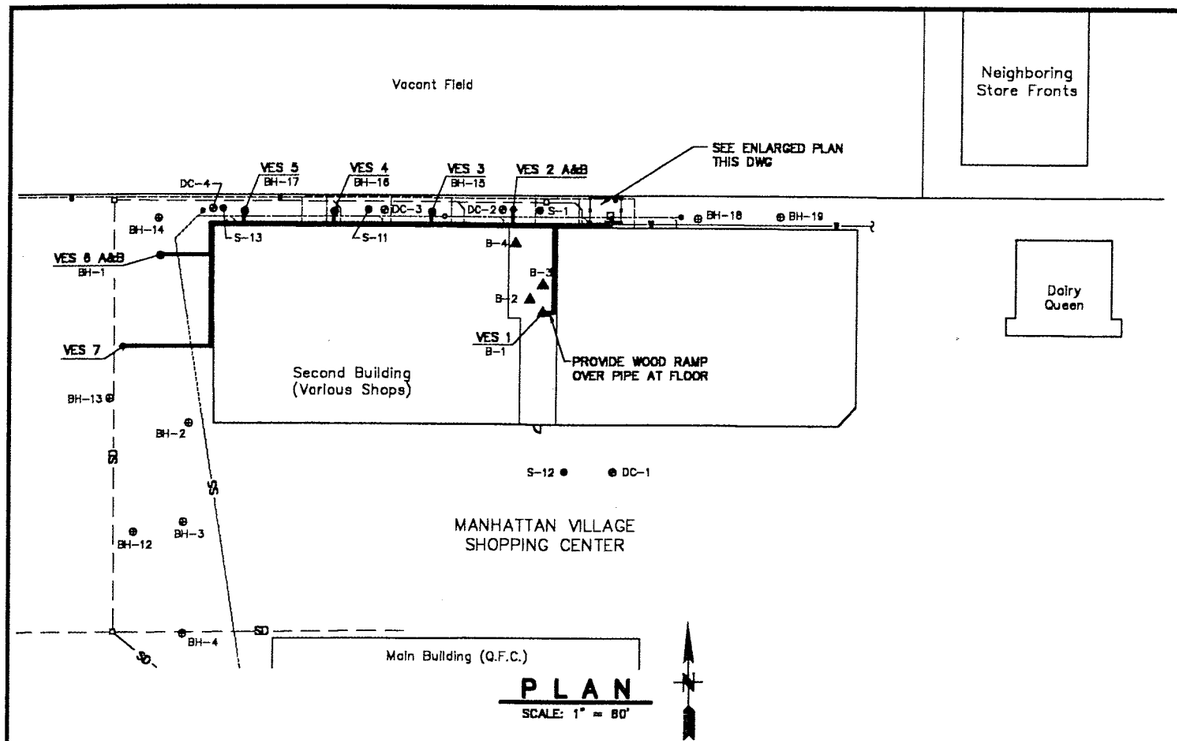
Immediately before the installation of the new sewer pipe, SCS Engineers collected a set of 4 confirmational soil samples from the construction trench to assess the effectiveness of the SVE remedial program. The samples were collected from the soil/fill horizon immediately beneath the old concrete pipeline at the locations illustrated on Figure 8. EPA Method 8021B analysis did not detect PCE or any other chlorinated solvents in these soil samples. The analytical testing data are presented below in Table 3. Laboratory data reports and chain-of-custody records for the confirmational soil samples are included in Appendix D.

TABLE 3

Summary of Analytical Data for Halogenated and Aromatic Volatile Organic Compounds in Soil, Sewer Replacement Trench

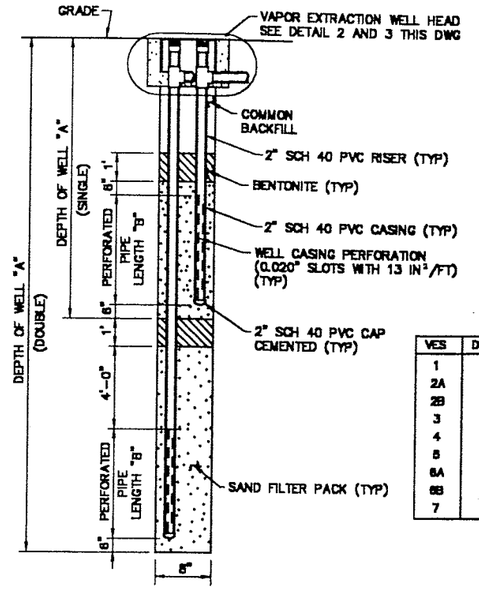
SAMPLE LOCATION	SAMPLE DEPTH (ft)	EPA METHOD 8021 ANALYTES[1] (µg/kg) (includes PCE)
T-1	4'	ND
T-2	4'	ND
T-3	3'	ND
T-4	3'	ND

ND Analytes not detected.



PLAN

SCALE: 1" = 80'



VAPOR EXTRACTION WELL

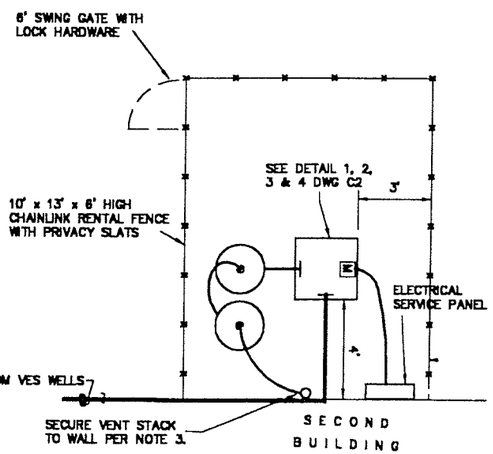
DETAIL 1

NO SCALE

VES	DEPTH "A"	LENGTH "B"
1	11.5'	5'
2A	6.5'	3'
2B	36'	24'
3	6.5'	3'
4	6.5'	3'
5	6.5'	3'
6A	6.5'	3'
6B	36'	24'
7	15.5'	12'

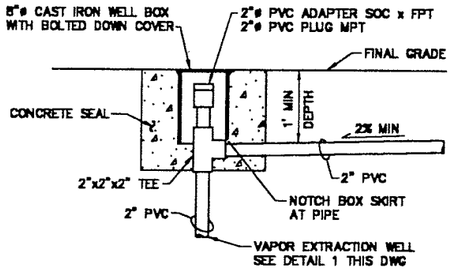
NOTES:

1. UNLESS NOTED OTHERWISE ALL PIPING TO BE SCHEDULE 40 PVC WITH SOLVENT WELDED JOINTS.
2. WELL PIPING TO BE SCHEDULE 40 PVC WITH FLUSH THREADED JOINTS.
3. ATTACH PIPING TO BUILDING WALL WITH 3/4" WIDE x 3/16 THICK GALVANIZED STEEL STRAP SECURED WITH 2 – 1/4" EXPANSION BOLTS. SPACE STRAPS AT 6' ON CENTER.
4. HOSE SHALL BE 2" ID PVC WITH 2" MPT FITTING EACH END (SWIVEL ONE END) (GRAINGER PAGE 2521).



ENLARGED PLAN

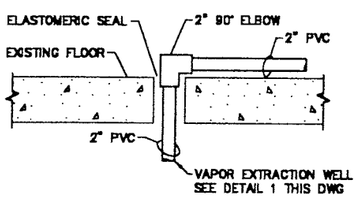
SCALE: 1" = 8'



VAPOR EXTRACTION WELL HEAD (EXCEPT VES 1)

DETAIL 2

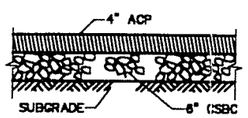
SCALE: 1" = 2'-0"



VES 1 WELL HEAD

DETAIL 3

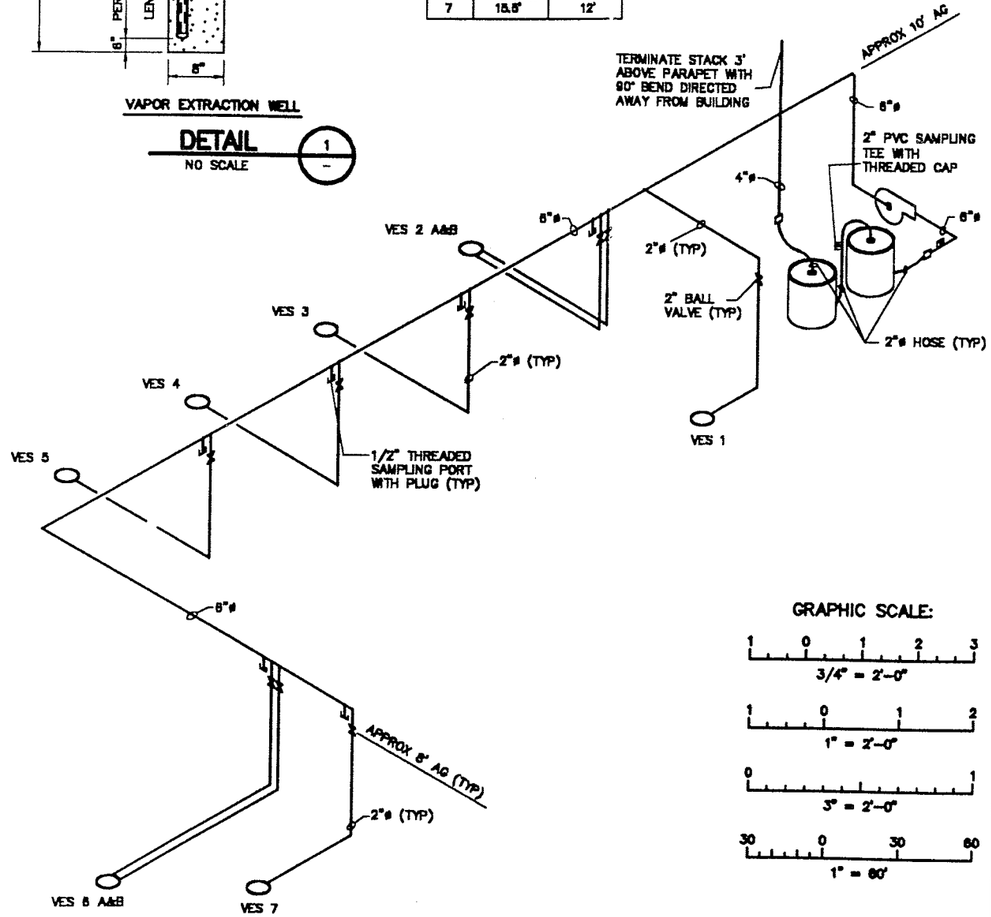
SCALE: 1" = 2'-0"



ASPHALT CONCRETE PAVEMENT SURFACE RESTORATION

DETAIL 4

SCALE: 3/4" = 2'-0"



VAPOR EXTRACTION SYSTEM ISOMETRIC

NO SCALE

GRAPHIC SCALE:

1 0 1 2 3
3/4" = 2'-0"

1 0 1 2
1" = 2'-0"

0 1
3" = 2'-0"

30 0 30 60
1" = 60'

NO.	REVISION	DATE

SHEET TITLE: VAPOR EXTRACTION SYSTEM PLAN AND DETAILS

PROJECT TITLE: FOUR STAR DRY CLEANERS
MANHATTAN VILLAGE SHOPPING CENTER
NORMANDY PARK, WASHINGTON

8C8 ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.

PROJ. NO. 041560010.00 | DWN. BY: LEL | ACAD FILE: Fig 4 | CHK. BY: EEC | APP. BY: | DSN. BY: EEC

DATE: OCT 2000

SCALE: AS SHOWN

DRAWING NO. 4

Table 3
Summary of Soil Analtyical Results
Harris Property
Normandy Park, Washington
Farallon PN: 839-002

Sample Location	Sample Identification	Date Collected	Depth (ft)[1]	Analytical Results (milligrams per kilogram)		
				Tetrachloroethene	Trichloroethene	Cis-1,2-dichloroethene
SVS-4	SVS-4	2/11/2005	0-4	0.0058	0.0015	0.0046
SVS-5	SVS-5	2/11/2005	0-4	<0.0011	<0.0011	<0.0011
MTCA Method A or B Cleanup Level				**0.05**	**0.03**	**80**

NOTES:

Analyzed by U.S. Environmental Protection Agency Method 8260B.

< Indicates compound not detected below the listed practical quantitation limit.

[1]Depth of soil sample collected in feet below ground surface.

G:\project\Clients\kane\seacor\temp1.jpg

G:\project\Clients\kane\seacor\temp2.jpg

DC-8	PCE (ppb)	TCE (ppb)
02/03/99	56	ND
04/08/99	48	ND
12/08/99	98	ND
04/26/00	87	ND
08/03/00	70	ND
11/14/00	130	ND
03/06/01	82	ND
6/20/01	80	ND
09/17/01	62	ND
12/20/01	50	ND
03/13/02	31	ND
06/13/02	26.6	ND
09/17/02	38.4	ND
03/31/03	33.5	ND
09/03/03	34.7	ND
07/25/05	26	ND

DC-7	PCE (ppb)	TCE (ppb)
02/03/99	74	ND
04/08/99	64	ND
12/08/99	107	ND
04/26/00	130	ND
08/03/00	50	ND
11/14/00	130	ND
03/06/01	140	ND
6/20/01	96	ND
09/17/01	81	ND
12/20/01	47	ND
03/13/02	31	ND
06/13/02	41.5	ND
09/17/02	77.7	ND
03/31/03	40.1	ND
09/03/03	57.4	ND
07/25/05	37	ND

DC-10A shallow well	PCE (ppb)	TCE (ppb)	DC-10B deep well	PCE (ppb)	TCE (ppb)
12/08/99	73	1.1	12/08/99	*	*
04/26/00	210	ND	04/26/00	*	*
08/03/00	IW	IW	08/03/00	*	*
11/14/00	IW	IW	11/14/00	*	*
03/06/01	*	*	03/06/01	3.3	1.7
6/20/01	*	*	6/20/01	2.4	ND
09/17/01	*	*	09/17/01	ND	ND
12/20/01	*	*	12/20/01	ND	ND
07/25/05	/	/	07/25/05	ND	ND

IW = insufficient water to sample
/ = unable to locate well
* = no data available

DC-9A shallow well	PCE (ppb)	TCE (ppb)	DC-9B deep well	PCE (ppb)	TCE (ppb)
12/08/99	73	1.2	12/08/99	*	*
04/26/00	240	ND	04/26/00	*	*
08/03/00	110	ND	08/03/00	*	*
11/14/00	IW	IW	11/14/00	*	*
03/06/01	*	*	03/06/01	20	1.3
6/20/01	*	*	6/20/01	ND	ND
09/17/01	*	*	09/17/01	ND	ND
12/20/01	*	*	12/20/01	6.4	ND
07/25/05	IW	IW	07/25/05	ND	ND

IW = insufficient water to sample
* = no data available

MW-2 / GW	PCE (ppb)	TCE (ppb)
12/09/99	16.7	ND
07/25/05	/	/
MW-2 / SOIL 32.5–34'	PCE (ppb)	TCE (ppb)
12/09/99	ND	ND

/ = unable to locate well

MW-1 / GW	PCE (ppb)	TCE (ppb)
12/09/99	21.6	ND
07/25/05	15	ND
MW-1 / SOIL 2.5–4'	PCE (ppb)	TCE (ppb)
12/09/99	ND	ND

KMW-1	PCE	TCE
7/26/05	ND	ND

KB2 SOIL					KB2 GW	
ppm	4–5'	15–16'	25–26'	35–36'	ppb	40'
TCE	<0.02	<0.02	<0.02	<0.02	TCE	<1.0
PCE	<0.02	<0.02	0.098	0.16	PCE	7.2

KB5 SOIL					KB5 GW	
ppm	4–5'	15–16'	25–26'	30–31'	ppb	40'
TCE	<0.02	<0.02	<0.02	<0.02	TCE	<1.0
PCE	<0.02	<0.02	0.035	0.055	PCE	<1.0

KB4 SOIL				KB4 GW	
ppm	4–5'	15–16'	19–20'	ppb	39'
TCE	<0.02	<0.02	<0.02	TCE	<1.0
PCE	<0.02	0.049	0.10	PCE	<1.0

KB1 SOIL					KB1 GW	
ppm	4–5'	15–16'	25–26'	35–36'	ppb	39'
TCE	<0.02	<0.02	<0.02	<0.02	TCE	<1.0
PCE	<0.02	0.02	0.084	0.18	PCE	<1.0

KB3 SOIL				KB3 GW	
ppm	4–5'	15–16'	25–26'	ppb	37'
TCE	<0.02	<0.02	<0.02	TCE	<1.0
PCE	<0.02	<0.02	<0.02	PCE	1

DC-5	PCE	TCE
02/04/99	2.4	ND
04/08/99	1.6	ND
07/25/05	37	ND

DC-6	PCE	TCE
02/04/99	5.1	ND
04/08/99	3.7	ND
07/25/05	/	/

/ = unable to locate well

SEPTIC TANK	PCE	TCE	trans-1,2-Dichloroethene	cis-1,2-Dichloroethene
04/01/05	19	88	1.6	500

DC-4	PCE (ppb)	TCE (ppb)
02/04/99	144	ND
04/08/99	110	ND
12/08/99	71	ND
04/26/00	120	ND
08/03/00	42	ND
11/14/00	64	ND
03/06/01	52	3
6/20/01	40	ND
09/17/01	23	ND
12/20/01	15	ND
03/13/02	55	ND
06/13/02	17.9	ND
09/17/02	28.8	ND
03/31/03	12.5	ND
09/03/03	14.1	ND

DC-3	PCE (ppb)	TCE (ppb)
02/04/99	25	ND
04/08/99	36	ND
12/08/99	45	ND
04/26/00	56	ND
08/03/00	25	ND
11/14/00	ND	ND
03/06/01	4.7	ND
6/20/01	2.8	ND
09/17/01	ND	ND
12/20/01	9.2	ND
03/13/02	40	ND
06/13/02	42.3	ND
09/17/02	33.4	ND
03/31/03	7.34	ND
09/03/03	2.08	ND

DC-2	PCE (ppb)	TCE (ppb)
02/03/99	0.7	ND
04/08/99	ND	ND
12/08/99	ND	ND
04/26/00	ND	ND
08/03/00	ND	ND
11/14/00	ND	ND
03/06/01	ND	ND
6/20/01	ND	ND
09/17/01	ND	ND
12/20/01	ND	ND
03/13/02	4	ND
06/13/02	ND	ND
09/17/02	ND	ND
03/31/03	3.37	ND
09/03/03	ND	ND

DC-1	PCE (ppb)	TCE (ppb)
02/03/99	ND	ND
04/08/99	ND	ND
12/08/99	ND	ND
04/26/00	ND	ND
08/03/00	ND	ND
11/14/00	ND	ND
03/06/01	ND	ND
6/20/01	ND	ND
09/17/01	ND	ND
12/20/01	ND	ND
03/13/02	ND	ND
06/13/02	–	–
09/17/02	ND	ND
03/31/03	ND	ND
09/03/03	ND	ND

– = insufficient water to sample

SW 178th Street

1st Avenue South

Apartments

Residence

Residence

Harris Property

Various Shops

Vacant Shed

Gasoline UST

Well House

Groundwater Flow Direction

Approximate location of septic tank

Various Shops

Various Shops (Second Building)

Four Star Cleaners

Dairy Queen

Manhattan Village Shopping Center

Q.F.C (Main Building)

DC-1 DC-2 DC-3 DC-4 DC-5 DC-6 DC-7 DC-8 DC-9 A/B DC-10 A/B

KB-1 KB-2 KB-3 KB-4 KB-5 MW-1 MW-2 KMW-1

Legend

- SCS Engineers installed monitoring well
- Adapt Engineering installed monitoring well
- Kane Environmental installed monitoring well
- Kane Environmental soil boring

N

0 110 220

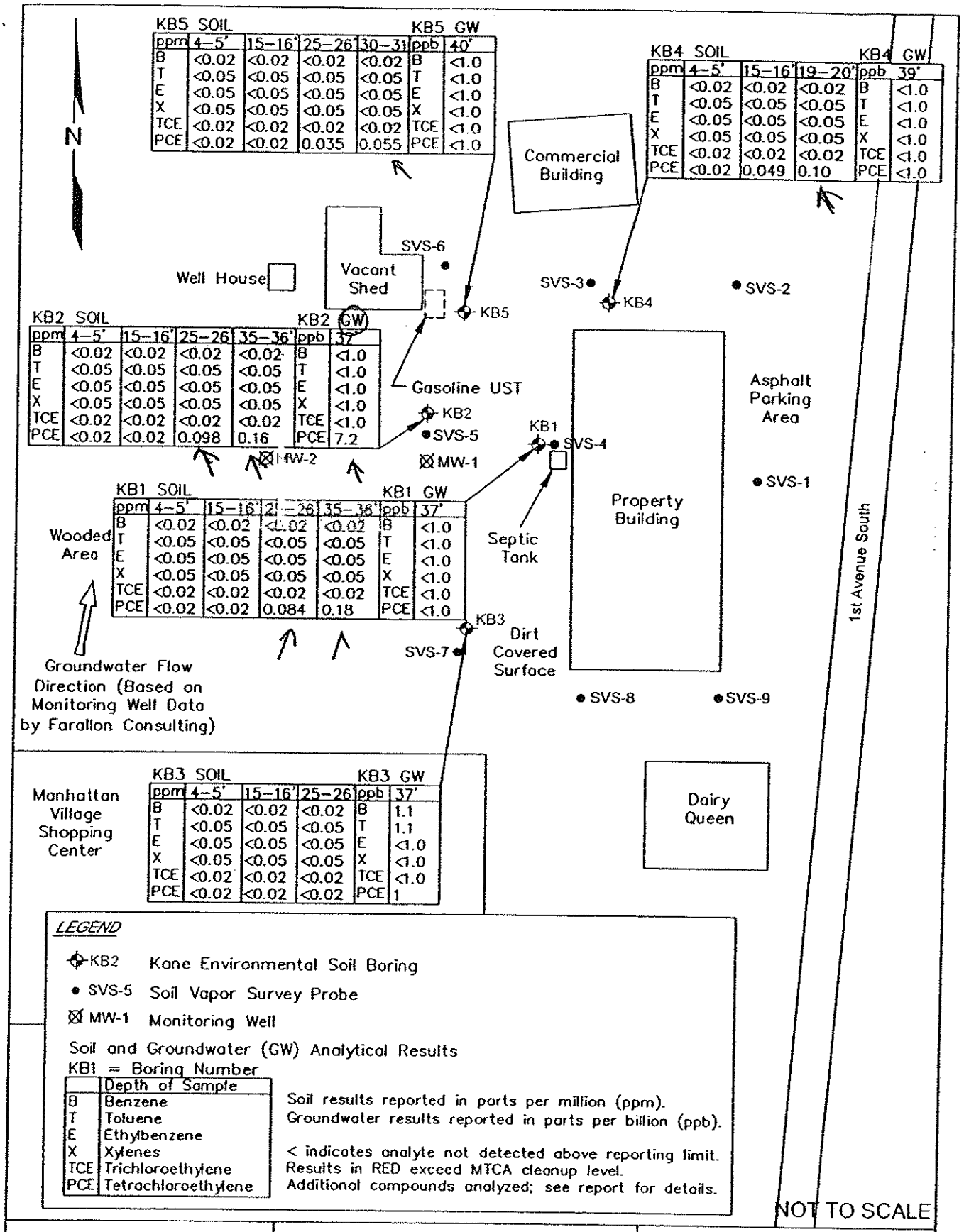
Approximate Scale in Feet

KANE ENVIRONMENTAL INC

Harris Property
17817-17825 1st Avenue South
Normandy Park, Washington

Figure 2
Generalized Site Plan with Summary PCE & TCE Concentrations

c:\my docs\AutoCAD figures\23rd & Broadway\Excavation figure.dwg



KANE ENVIRONMENTAL INC
3831 Stone Way N., Seattle - 206-691-0476
www.kane-environmental.com

Harris Property
17817-17825 1st Avenue South
Normandy Park, Washington

Figure 3
Selected Analytical Results
- April 2005

TABLE 2
Summary of Volatile Organic Compounds in Soil
Harris Property

Sample ID	041105 S1	041105 S3	041105 S5	041105 S7	041105 S8	041105 S10	041105 S12	041105 S14	041105 S15	041105 S17	041105 S19	041505 S22	041505 S24	041505 S25	041505 S26	041505 S28	041505 S30	041505 S31	Method Reporting Limit (mg/kg)	MTCA Method A or Method B Cleanup Level (mg/kg)
Sample Depth (in feet)	4-5	15-16	25-26	35-36	4-5	15-16	25-26	35-36	4-5	15-16	25-26	4-5	15-16	19-20	4-5	15-16	25-26	30-31		
Boring Number	KB1	KB1	KB1	KB1	KB2	KB2	KB2	KB2	KB3	KB3	KB3	KB4	KB4	KB4	KB5	KB5	KB5	KB5		
Sample Date	4/11/05	4/11/05	4/11/05	4/11/05	4/11/05	4/11/05	4/11/05	4/11/05	4/11/05	4/11/05	4/11/05	4/15/05	4/15/05	4/15/05	4/15/05	4/15/05	4/15/05	4/15/05		
Acetone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.5	8000
Benzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.02	0.03
Bromobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
Bromochloromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
Bromodichloromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	16.1
Bromoform	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	127
Bromomethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	112
2-Butanone (MEK)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.5	NV
n-Butylbenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
sec-Butylbenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
tert-Butylbenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
Carbon Tetrachloride	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	8
Chlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	1,600
Chloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
Chloroform	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	164
Chloromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	77
2-Chlorotoluene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	1,600
4-Chlorotoluene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	1,600
Dibromochloromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	12
1,2-Dibromo-3-chloropropane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	1
1,2-Dibromoethane (EDB)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.005	0.005
Dibromomethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
1,2-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	7,200
1,3-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
1,4-Dichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	42
Dichlorodifluoromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	16,000
1,1-Dichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	8,000
1,2-Dichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	11
1,1-Dichloroethene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	2
cis-1,2-Dichloroethene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	800
trans-1,2-Dichloroethene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	1,600
1,2-Dichloropropane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	15
1,3-Dichloropropane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
2,2-Dichloropropane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
1,1-Dichloropropene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
cis-1,3-Dichloropropene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	5.56
trans-1,3-Dichloropropene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	5.56
Ethylbenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	6

TABLE 2
Summary of Volatile Organic Compounds in Soil
Harris Property

Sample ID	041105 S1	041105 S3	041105 S5	041105 S7	041105 S8	041105 S10	041105 S12	041105 S14	041105 S15	041105 S17	041105 S19	041505 S22	041505 S24	041505 S25	041505 S26	041505 S28	041505 S30	041505 S31	Method Reporting Limit (mg/kg)	MTCA Method A or Method B Cleanup Level (mg/kg)
Sample Depth (in feet)	4-5	15-16	25-26	35-36	4-5	15-16	25-26	35-36	4-5	15-16	25-26	4-5	15-16	19-20	4-5	15-16	25-26	30-31		
Boring Number	KB1	KB1	KB1	KB1	KB2	KB2	KB2	KB2	KB3	KB3	KB3	KB4	KB4	KB4	KB5	KB5	KB5	KB5		
Sample Date	4/11/05	4/11/05	4/11/05	4/11/05	4/11/05	4/11/05	4/11/05	4/11/05	4/11/05	4/11/05	4/11/05	4/15/05	4/15/05	4/15/05	4/15/05	4/15/05	4/15/05	4/15/05		
Hexachlorobutadiene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	12.8
Hexane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
2-Hexanone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
Isopropylbenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
Isopropyltoluene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
Methylene Chloride	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	0.02
4-Methyl-2-Pentanone (MIBK)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
Methyl-t-butyl ether (MTBE)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	0.1
Naphthalene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	5 *
n-Propylbenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
Styrene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	33
1,1,1,2-Tetrachloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	38
1,1,2,2-Tetrachloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	5
Tetrachloroethylene (PCE)	nd	nd	**0.084**	**0.18**	nd	nd	**0.098**	**0.16**	nd	nd	nd	nd	0.049	**0.1**	nd	nd	0.035	**0.055**	0.02	0.05
Toluene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	7
1,2,3-Trichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
1,2,4-Trichlorobenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	800
1,1,1-Trichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	72,000
1,1,2-Trichloroethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	18
Trichloroethene (TCE)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.02	0.03
Trichlorofluoromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	24,000
1,2,3-Trichloropropane	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	0.14
1,2,4-Trimethylbenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
1,3,5-Trimethylbenzene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	NV
Vinyl Chloride	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.01	0.67
Xylenes	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.05	9

Notes:
All results reported in mg/kg (milligrams per kilogram)
nd = Not detected at method reporting limit.
NV = No cleanup value under this criteria.
NA = Not applicable
* Cleanup level is based on a total cleanup level for naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene.

TABLE 1
Summary of Halogenated Volatile Organic Compounds in Soil
Harrris Property--17821 1st Ave SW; Normandy Park, Washington

Sample ID	ST-1	NORTH SEPTIC SIDEWALL	EAST SEPTIC SIDEWALL	SOUTH SEPTIC SIDEWALL	WEST SPETIC SIDEWALL	ST-2	Method Reporting Limit (mg/kg)	MTCA Method A or Method B Cleanup Level (mg/kg)
Sample Depth (in feet)								
Sample Date	3.29.06	4.5.06	4.5.06	4.5.06	4.5.06	4.5.06		
Chloroethane	nd	nd	nd	nd	nd	nd	*0.05 / 0.005*	*NV*
1,1-Dichloroethane	nd	nd	nd	nd	nd	nd	*0.05 / 0.005*	*8,000*
1,2-Dichloroethane (EDC)	nd	nd	nd	nd	nd	nd	*0.05 / 0.005*	*11*
1,1-Dichloroethene	nd	nd	nd	nd	nd	nd	*0.05 / 0.005*	*2*
cis-1,2-Dichloroethene	nd	nd	0.012	nd	nd	0.007	*0.05 / 0.005*	*800*
trans-1,2-Dichloroethene	nd	nd	nd	nd	nd	nd	*0.05 / 0.005*	*1,600*
Methylene Chloride	nd	nd	nd	nd	nd	nd	*0.5*	*0.02*
Tetrachloroethylene (PCE)	**0.07**	nd	0.033	nd	nd	0.006	*0.05 / 0.005*	*0.05*
1,1,1-Trichloroethane	nd	nd	nd	nd	nd	nd	*0.05 / 0.005*	*72,000*
Trichloroethene (TCE)	nd	nd	0.019	nd	nd	0.005	*0.05 / 0.005*	*0.03*
Vinyl Chloride	nd	nd	na	nd	nd	nd	*0.05 / 0.005*	*0.67*

Notes:
All results reported in mg/kg (milligrams per kilogram)
NV = No cleanup value under this criteria.

TABLE 1 (continued 1)
Summary of Halogenated Volatile Organic Compounds in Soil
Harrris Property--17821 1st Ave SW; Normandy Park, Washington

Sample ID	ST-3	ST-4	ST5 clearance	ST6 clearance	Septic Stockpile	East Septic Sidewall 2	Method Reporting Limit (mg/kg)	MTCA Method A or Method B Cleanup Level (mg/kg)
Sample Depth (in feet)								
Sample Date	4.5.06	4.5.06	4.5.06	4.5.06	4.5.06	4.6.05		
Chloroethane	nd	nd	nd	nd	nd	nd	*0.03 / 0.05 / 0.005*	*NV*
1,1-Dichloroethane	nd	nd	nd	nd	nd	nd	*0.03 / 0.05 / 0.005*	*8,000*
1,2-Dichloroethane (EDC)	nd	nd	nd	nd	nd	nd	*0.03 / 0.05 / 0.005*	*11*
1,1-Dichloroethene	nd	nd	nd	nd	nd	nd	*0.03 / 0.05 / 0.005*	*2*
cis-1,2-Dichloroethene	nd	0.032	nd	nd	nd	nd	*0.03 / 0.05 / 0.005*	*800*
trans-1,2-Dichloroethene	nd	nd	nd	nd	nd	nd	*0.03 / 0.05 / 0.005*	*1,600*
Methylene Chloride	0.05lc	nd	nd	nd	nd	nd	*0.3 / 0.003 / 0.5*	*0.02*
Tetrachloroethylene (PCE)	0.016	**0.073**	nd	0.007	0.007	nd	*0.03 / 0.05 / 0.005*	*0.05*
1,1,1-Trichloroethane	nd	nd	nd	nd	nd	nd	*0.03 / 0.05 / 0.005*	*72,000*
Trichloroethene (TCE)	nd	0.026	nd	nd	nd	nd	*0.03 / 0.05 / 0.005*	*0.03*
Vinyl Chloride	nd	nd	nd	nd	nd	nd	*0.03 / 0.05 / 0.005*	*0.67*

Notes:
All results reported in mg/kg (milligrams per kilogram)
NV = No cleanup value under this criteria.
lc=the presence of the compound indicated is likely due to laboratory contamination

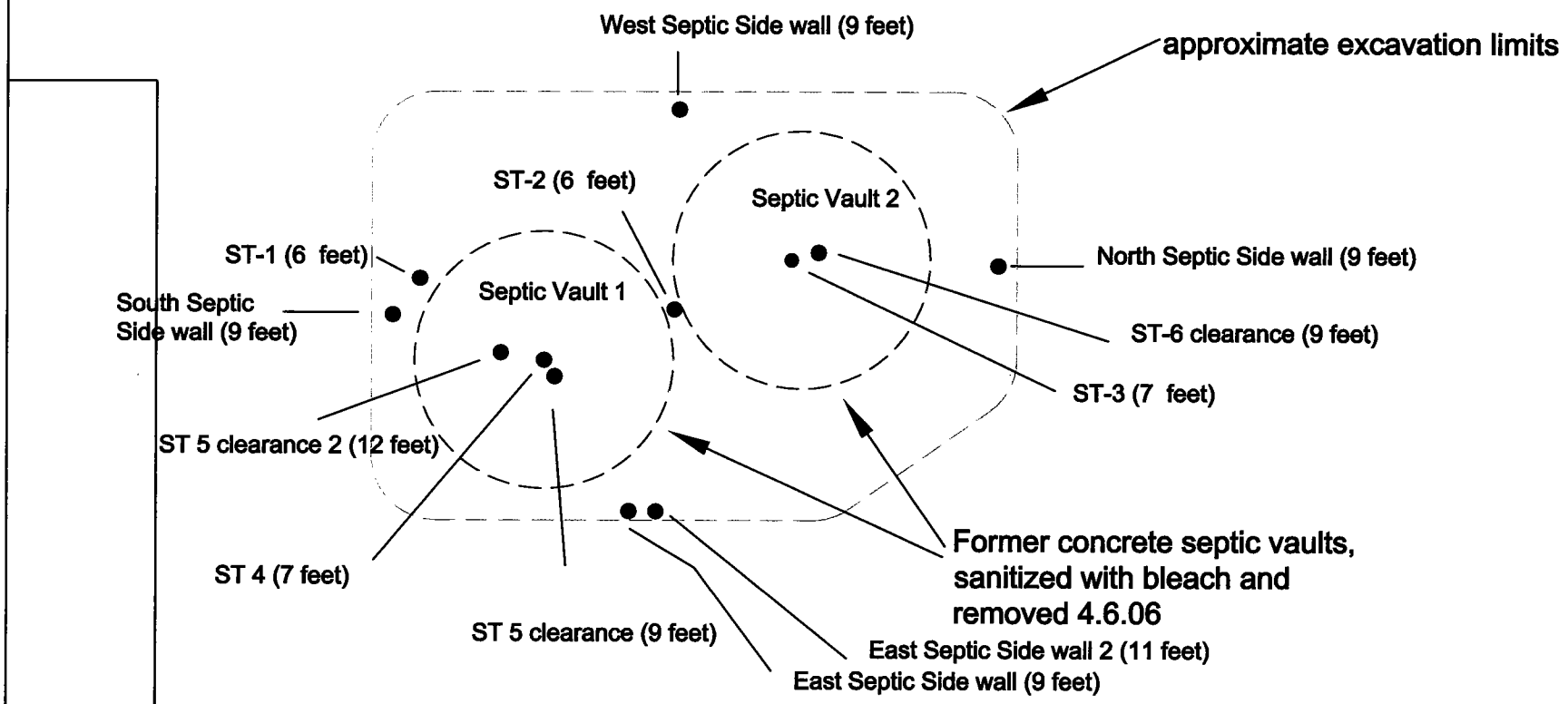
TABLE 1 (continued 2)
Summary of Halogenated Volatile Organic Compounds in Soil
Harrris Property--17821 1st Ave SW; Normandy Park, Washington

Sample ID	ST5 Clearance 2	Septic Concrete	Method Reporting Limit (mg/kg)	MTCA Method A or Method B Cleanup Level (mg/kg)
Sample Depth (in feet)	12			
Sample Date	4.6.06	4.7.06		
Chloroethane	nd	nd	0.05	NV
1,1-Dichloroethane	nd	nd	0.05	8,000
1,2-Dichloroethane (EDC)	nd	nd	0.05	11
1,1-Dichloroethene	nd	nd	0.05	2
cis-1,2-Dichloroethene	nd	nd	0.05	800
trans-1,2-Dichloroethene	nd	nd	0.05	1,600
Methylene Chloride	nd	nd	0.5	0.02
Tetrachloroethylene (PCE)	nd	nd	0.05	0.05
1,1,1-Trichloroethane	nd	nd	0.05	72,000
Trichloroethene (TCE)	nd	nd	0.03	0.03
Vinyl Chloride	nd	nd	0.05	0.67

Notes:
All results reported in mg/kg (milligrams per kilogram)
NV = No cleanup value under this criteria.

excavation is approximately 15 x 10 x 8-11/12 feet deep

- Soil sample containing halogenated VOC's below MTCA Method A Soil Cleanup Levels
- Soil sample containing halogenated VOCs above MTCA Method A Soil Cleanup Levels



0 4 8

Approximate Scale in Feet

KANE ENVIRONMENTAL INC

Harris Property
Pumpernickels Restaurant
17821 1st Ave S
Normandy Park, Washington

Figure 2
Soil Sample Locations

TABLE 3
Volatile Organic Compounds in Soil
Harris Property

Sample ID	KMW-2-10	KMW-2-20	KMW-2-30	KMW-3-10	KMW-3-20	TW-1-5	TW-1-10	TW-1-20	TW-1-30	MTCA Method A or Method B Cleanup Level (ppm)
Sample Date	5.1.06	5.1.06	5.1.06	5.1.06	5.1.06	5.1.06	5.1.06	5.1.06	5.1.06	
Acetone	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	8000
Benzene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03
Bromobenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
Bromochloromethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	16.1
Bromoform	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	127
2-Butanone (MEK)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
sec-Butylbenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
tert-Butylbenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
Carbon Tetrachloride	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	8
Chlorobenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	1,600
Chloroethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
Chloroform	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	77164
Chloromethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	77
2-Chlorotoluene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	1,600
4-Chlorotoluene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	1600
Dibromochloromethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	12
1,2-Dibromo-3-chloropropane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	1
1,2-Dibromoethane (EDB)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.005
Dibromomethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
1,2-Dichlorobenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	7200
1,3-Dichlorobenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
1,4-Dichlorobenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	42
Dichlorodifluoromethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	16,000
1,1-Dichloroethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	8,000
1,2-Dichloroethane (EDC)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	11
1,1-Dichloroethene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	2
cis-1,2-Dichloroethene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	800
trans-1,2-Dichloroethene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	1600
1,2-Dichloropropane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	15
1,3-Dichloropropane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
2,2-Dichloropropane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
1,1-Dichloropropene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
cis-1,3-Dichloropropene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	5.56
trans-1,3-Dichloropropene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	5.56
Ethylbenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	6
Hexachloro-1,3-butadiene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	12.80
Hexane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
2-Hexanone	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NV
Isopropylbenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
Isopropyltoluene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
Methylene Chloride	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.02
4-Methyl-2-Pentanone (MIBK	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NV
Methyl tert-butyl ether (MTBE	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.1
Naphthalene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	5
n-Propylbenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
Styrene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	33
1,1,1,2-Tetrachloroethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	38
1,1,2,2-Tetrachloroethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	5
Tetrachloroethene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05
Toluene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	7
1,2,3-Trichlorobenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
1,2,4-Trichlorobenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	800
1,1,1-Trichloroethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	38
1,1,2-Trichloroethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	18
Trichloroethene (TCE)	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03
Trichlorofluoromethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	24,000
1,2,3-Trichloropropane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
1,2,4-Trimethylbenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
1,3,5-Trimethylbenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
Vinyl Chloride	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.67
Xylenes	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	9

Notes:
All results reported in µg/g (micrograms per gram) = parts per million (ppm)

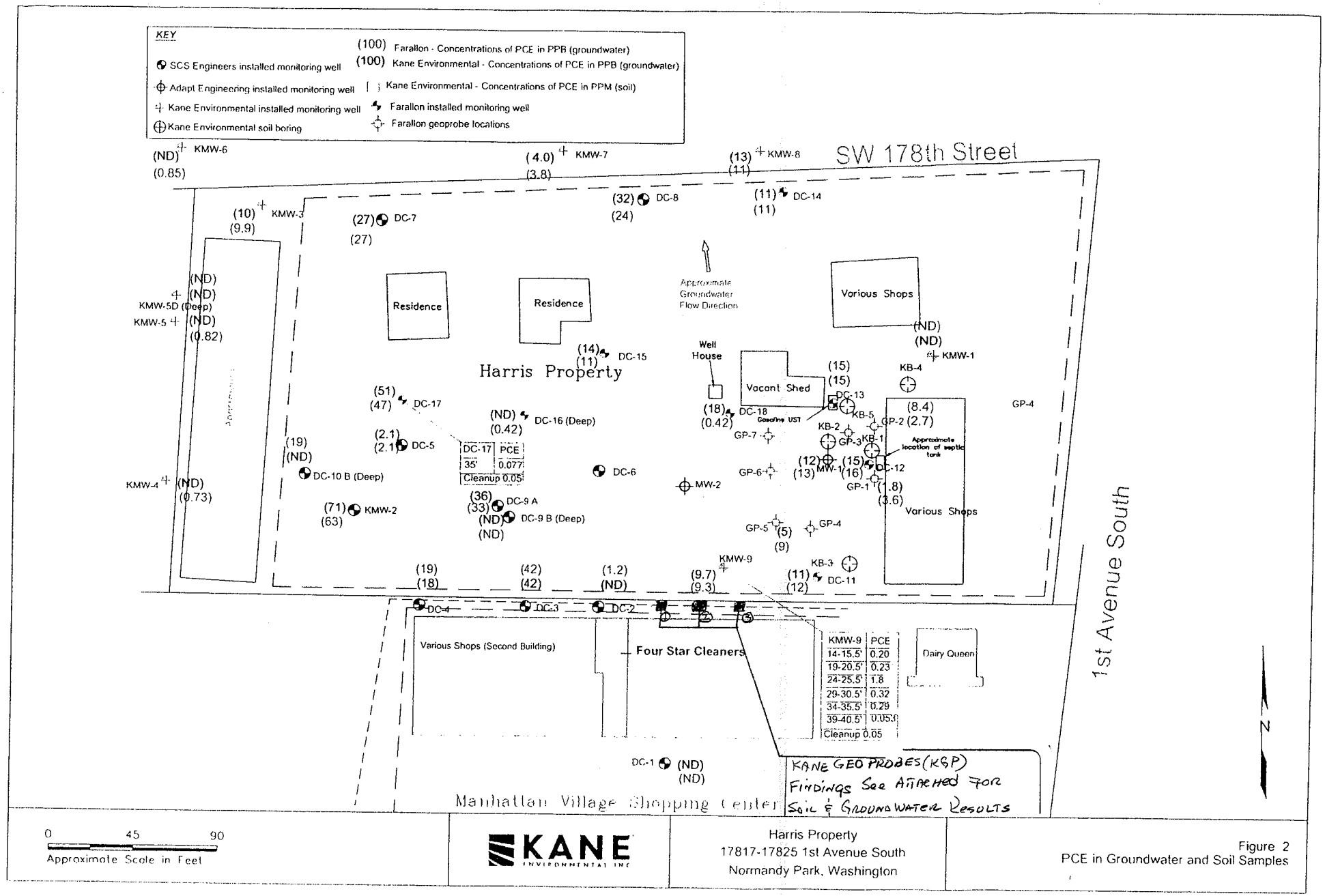
TABLE 4
Halogenated Volatile Organic Compounds in Soil
Harris Property

Sample ID	KMW-1-7	KMW-1-22	KMW-1-40	MTCA Method A or Method B Cleanup Level (ppm)
Sample Date	7.25.05	7.25.05	7.25.05	
Chloroethane	<0.05	<0.05	<0.05	NV
1,1-Dichloroethane	<0.05	<0.05	<0.05	8,000
1,2-Dichloroethane (EDC)	<0.05	<0.05	<0.05	11
1,1-Dichloroethene	<0.05	<0.05	<0.05	2
cis-1,2-Dichloroethene	<0.05	<0.05	<0.05	800
trans-1,2-Dichloroethene	<0.05	<0.05	<0.05	1600
Methylene Chloride	<0.5	<0.5	<0.5	0.02
Tetrachloroethene	<0.05	<0.05	<0.05	0.05
1,1,1-Trichloroethane	<0.05	<0.05	<0.05	38
Trichloroethene (TCE)	<0.03	<0.03	<0.03	0.03
Vinyl Chloride	<0.05	<0.05	<0.05	0.67

Notes:

All results reported in ug/g (micrograms per gram) = parts per million (ppm)

NV = No cleanup value under this criteria.


KEY
SCS Engineers installed monitoring well
Adapt Engineering installed monitoring well
Kane Environmental installed monitoring well
Kane Environmental soil boring
(100) Farallon - Concentrations of PCE in PPB (groundwater)
(100) Kane Environmental - Concentrations of PCE in PPB (groundwater)
[ ] Kane Environmental - Concentrations of PCE in PPM (soil)
Farallon installed monitoring well
Farallon geoprobe locations
SW 178th Street
1st Avenue South
Harris Property
Residence
Residence
Various Shops
Vacant Shed
Well House
Approximate Groundwater Flow Direction
Approximate location of septic tank
Gasoline UST
Various Shops
Various Shops (Second Building)
Four Star Cleaners
Dairy Queen
Manhattan Village Shopping Center
KMW-6 (ND) (0.85)
KMW-7 (4.0) (3.8)
KMW-8 (13) (11)
KMW-3 (10) (9.9)
DC-7 (27) (27)
DC-8 (32) (24)
DC-14 (11) (11)
KMW-5D (Deep) (ND) (ND)
KMW-5 (ND) (0.82)
KMW-1 (ND) (ND)
DC-15 (14) (11)
KB-4
DC-13 (15) (15)
DC-18 (18) (0.42)
KB-5
KB-2
GP-2 (8.4) (2.7)
GP-3
KB-1
GP-4
GP-7
GP-6
MW-1 (12) (13)
DC-12 (15) (16)
GP-1 (1.8) (3.6)
DC-17 (51) (47)
DC-16 (Deep) (ND) (0.42)
DC-5 (2.1) (2.1)
DC-17 | PCE
35' | 0.077
Cleanup 0.05
DC-10 B (Deep) (19) (ND)
KMW-4 (ND) (0.73)
DC-6
MW-2
DC-9 A (36) (33)
KMW-2 (71) (63)
DC-9 B (Deep) (ND) (ND)
GP-5 (5) (9)
GP-4
KMW-9
KB-3
DC-11 (11) (12)
DC-4 (19) (18)
DC-3 (42) (42)
DC-2 (1.2) (ND)
(9.7) (9.3)
KMW-9 | PCE
14-15.5' | 0.20
19-20.5' | 0.23
24-25.5' | 1.8
29-30.5' | 0.32
34-35.5' | 0.29
39-40.5' | 0.05.0
Cleanup 0.05
DC-1 (ND) (ND)
KANE GEO PROBES (KGP)
FINDINGS SEE ATTACHED FOR
SOIL & GROUNDWATER RESULTS
N
0 45 90
Approximate Scale in Feet
KANE ENVIRONMENTAL INC
Harris Property
17817-17825 1st Avenue South
Normandy Park, Washington
Figure 2
PCE in Groundwater and Soil Samples

Lederman, Ken

From: Lederman, Ken
Sent: Monday, July 23, 2007 4:59 PM
To: 'Robert Dijulio'
Cc: Grant, Harry Edward; Lederman, Ken
Subject: RE: Harris V. Manhattan.

Thanks Bob.

I don't have lab reports, but I do have preliminary data from Kane's soil and GW sampling results from the geoprobes along the eastern portion of the MVSC property. I don't have a map (yet) establishing the exact location of the 3 geoprobes, but Geoprobe #1 is (I believe) closest to Four Star and #2 and #3 are located further to the east along the sewer / stormwater lines.

Soil

KGP-1:4	**1.6**
KGP-1:8	**59.0**
KGP-1:10.5	**2.1**
KGP-1:16	**0.28**
KGP-1:20	**0.23**
KGP-1:23	**0.15**
KGP-1:32	**0.17**
KGP-1:38	**0.051**

KGP-2:4	**0.16**
KGP-2:8	0.013
KGP-2:10.5	**0.064**
KGP-2:16	0.02
KGP-2:20	**0.088**
KGP-2:23	0.033
KGP-2:30-31	0.016
KGP-2:37	0.015

KGP-3:2-4	0.001
KGP-3:8	0.005
KGP-3:10.5	0.007
KGP-3:13-16	0.009
KGP-3:20	0.009
KGP-3:23	0.012
KGP-3:29-32	0.011
KGP-3:38	0.010

Groundwater

KGP-1	**5.6**
KGP-2	**14.0**
KGP-3	4.8

See you tomorrow.

Table 2
Summary of Soil Analytical Results
Manhattan Plaza - Harris Property
Normandy Park, Washington
Farallon PN: 578-001

Sample Location	Sample ID	Sample Date	Depth (feet bgs)	Analytical Results (milligrams per kilogram)[1]				
				PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride
KMW-9	KMW9-5	3/27/2007	5	0.0043	<0.0011	<0.0011	<0.0011	<0.0011
KMW-9	KMW9-35	3/27/2007	35	0.016	<0.00098	<0.00098	<0.00098	<0.00098
GP1	GP1-8-12	3/30/2007	8-12	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080
GP1	GP1-30-34	3/30/2007	30-34	0.0067	<0.00081	<0.00081	<0.00081	<0.00081
GP2	GP2-4-8	4/2/2007	4-8	<0.00090	<0.00090	<0.00090	<0.00090	<0.00090
GP2	GP2-28-32	4/2/2007	28-32	0.0055	<0.00088	<0.00088	<0.00088	<0.00088
GP3	GP3-8-12	3/30/2007	8-12	<0.00099	<0.00099	<0.00099	<0.00099	<0.00099
GP3	GP3-28-30	3/30/2007	28-30	0.011	<0.00082	<0.00082	<0.00082	<0.00082
GP4	GP4-20-24	3/30/2007	20-24	0.0023	<0.00099	<0.00099	<0.00099	<0.00099
GP5	GP5-4-8	4/3/2007	4-8	0.0028	<0.00089	<0.00089	<0.00089	<0.00089
GP5	GP5-16-20	4/3/2007	16-20	0.024	<0.00094	<0.00094	<0.00094	<0.00094
GP6	GP6-4-8	4/2/2007	4-8	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011
GP6	GP6-27-30	4/2/2007	27-30	0.0033	<0.00088	<0.00088	<0.00088	<0.00088
GP7	GP7-4-8	4/2/2007	4-8	<0.00095	<0.00095	<0.00095	<0.00095	<0.00095
GP7	GP7-30-34	4/2/2007	30-34	0.0016	<0.00087	<0.00087	<0.00087	<0.00087
DC-11	DC11-15-16.5	4/19/2007	15-16.5	0.0013	<0.00095	<0.00095	<0.00095	<0.00095
DC-11	DC11-30-31.5	4/19/2007	30-31.5	0.0084	<0.00093	<0.00093	<0.00093	<0.00093
DC-12	DC12-15-16.5	4/18/2007	15-16.5	0.0024	<0.00094	<0.00094	<0.00094	<0.00094
DC-13	DC13-15-16.5	4/19/2007	15-16.5	0.00096	<0.00090	<0.00090	<0.00090	<0.00090
DC-13	DC13-35-36.5	4/19/2007	35-36.5	0.0081	<0.00095	<0.00095	<0.00095	<0.00095
DC-14	DC14-15-16.5	4/17/2007	15-16.5	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011
DC-15	DC15-15-16.5	4/16/2007	15-16.5	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011
DC-16	DC16-15-16.5	4/17/2007	15-16.5	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011
DC-17	DC17-15-16.5	4/16/2007	15-16.5	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
DC-18	DC18-15-16.5	4/18/2007	15-16.5	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
DC-19	DC19-4	6/1/2007	3.5-5	<0.00077	<0.00077	<0.00077	<0.00077	<0.00077
DC-19	DC19-8	6/1/2007	7.5-9	<0.00069	<0.00069	<0.00069	<0.00069	<0.00069
DC-19	DC19-38	6/1/2007	37.5-38	0.0047	<0.00076	<0.00076	<0.00076	<0.00076
KGP-1	KGP-1-4	7/6/2007	4	**13**	**0.15**	0.25	<0.039	<0.039
KGP-1	KGP-1-8	7/6/2007	8	**14**	<0.0009	0.0049	<0.0009	<0.0009
KGP-1	KGP-1-16	7/6/2007	16	**0.08**	<0.0009	0.001	<0.0009	<0.0009
KGP-2	KGP-2-4	7/6/2007	4	**0.087**	<0.00095	<0.00095	<0.00095	<0.00095
KGP-2	KGP-2-8	7/6/2007	8	0.0082	<0.00093	<0.00093	<0.00093	<0.00093
KGP-2	KGP-2-16	7/6/2007	16	0.022	<0.0011	<0.0011	<0.0011	<0.0011
KGP-3	KGP-3-2-4	7/6/2007	2-4	0.0017	<0.00092	<0.00092	<0.00092	<0.00092
KGP-3	KGP-3-8	7/6/2007	8	0.0045	<0.00082	<0.00082	<0.00082	<0.00082
KGP-3	KGP-3-13-16	7/6/2007	13-16	0.0089	<0.0011	<0.0011	<0.0011	<0.0011
MTCA Cleanup Levels for Soil				**0.05[2]**	**0.03[2]**	**800[3]**	**1,600[3]**	**0.667[3]**

NOTES:

< denotes concentrations not detected above the laboratory practical quantitation limit.

[1]Analyzed by U.S. Environmental Protection Agency Method 8260B.

[2]Washington State Department of Ecology (Ecology) Model Toxics Control Act Cleanup Regulation (MTCA) Method A Soil Cleanup Levels for Unrestricted Land Uses, Table 740-1 of Chapter 173-340-900 of the Washington Administrative Code.

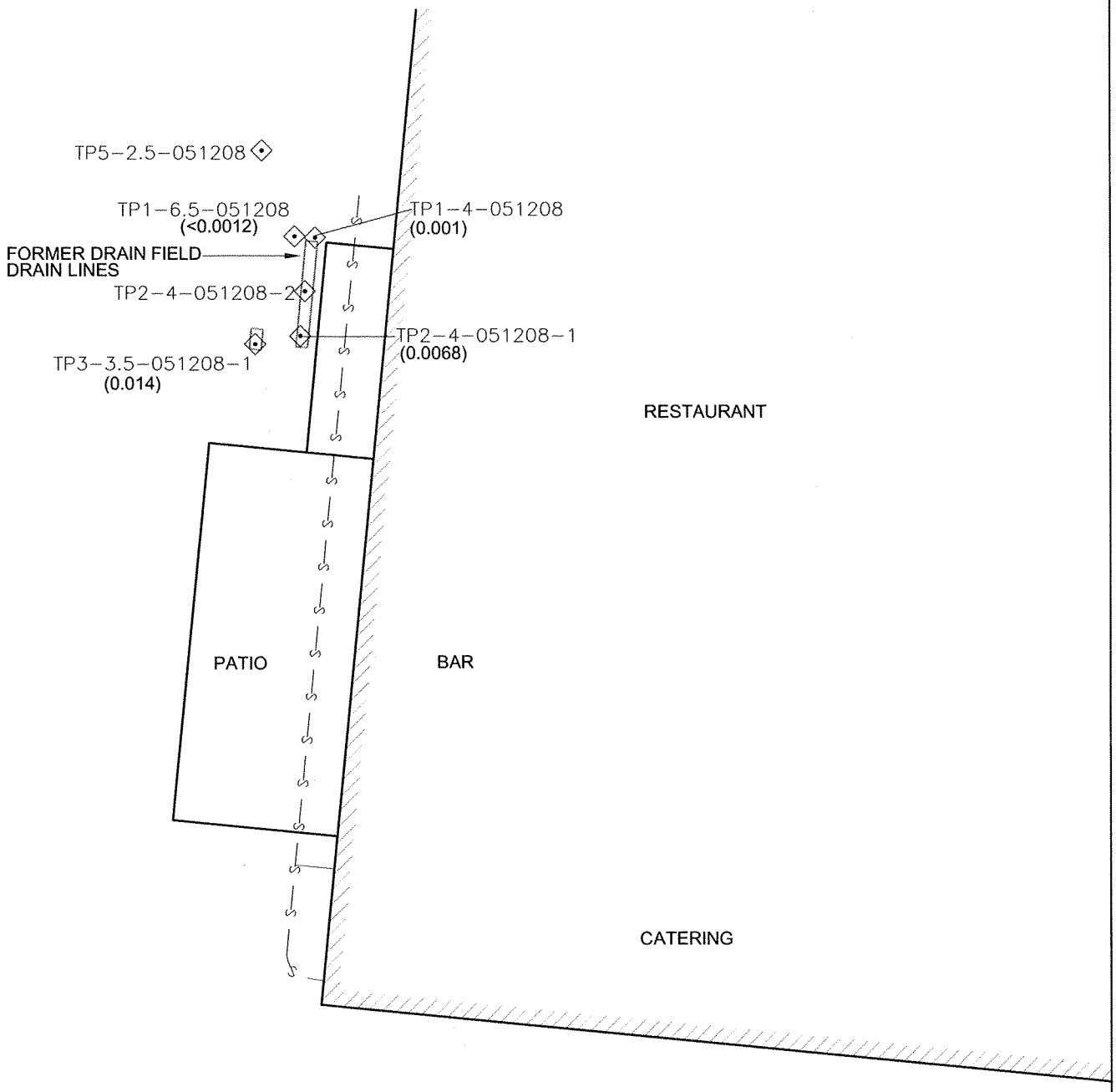
[3]Ecology Cleanup Levels and Risk Calculations under MTCA, Publication No. 94-145, Standard Method B Formula Values for Soil (Unrestricted Land Use) - Direct Contact Pathway (Ingestion Only), November 2001.

bgs = below ground surface
DCE = dichloroethene
PCE = tetrachloroethene
TCE = trichloroethene

TABLE 3
Volatile Organic Compounds in Soil
Harris Property

Sample Number	KMW-4:4-5.5	KMW-4:9-10.5	KMW-4:19-20.5	KMW-4:29-30.5	KMW-5:4-5.5	KMW-5:9-10.5	KMW-5:19-20.5	KMW-5:29-30.5	KMW-5D:4-5.5	KMW-5D:9-10.5	KMW-5D:19-20.5	KMW-5D:24-25.5	KMW-5D:46	KMW-6:9-10.5	KMW-6:19-20.5	KMW-6:29-30.5	KMW-6:41-42.5	KMW-7: 9-10.5	KMW-7:19-20.5	KMW-7: 29-30.5	KMW-8: 9-10.5	KMW-8: 20-21.5	KMW-8: 29-30.5	KMW-9:1-1.5	KMW-9:4-5.5	KMW-9:9-10.5	KMW-9:14-15.5	KMW-9:19-20.5	KMW-9:24-25.5	KMW-9:29-30.5	KMW-9:34-35.5	KMW-9:39-40.5	MTCA Method A or Method B Cleanup Level
Sample Date	3/28/07	3/28/07	3/28/07	3/28/07	3/28/07	3/28/07	3/28/07	3/28/07	3/28/07	3/28/07	3/28/07	3/28/07	3/28/07	3/27/07	3/27/07	3/27/07	3/27/07	3/27/07	3/27/07	3/27/07	3/27/07	3/27/07	3/27/07	3/27/07	3/27/07	3/27/07	3/27/07	3/27/07	3/27/07	3/27/07	3/27/07	3/27/07	3/27/07	(ppm)
Acetone	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	8000
Benzene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03
Bromobenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
Bromodichloromethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	16.1
Bromoform	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	127
Bromomethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	112
2-Butanone (MEK)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NV
sec-Butylbenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
tert-Butylbenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
Carbon Tetrachloride	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	8
Chlorobenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	1,600
Chloroethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
Chloroform	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	164
Chloromethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	77
2-Chlorotoluene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	1,600
4-Chlorotoluene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	1,600
Dibromochloromethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	12
1,2-Dibromo-3-chloropropane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	1
1,2-Dibromoethane (EDB)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.005
Dibromomethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
1,2-Dichlorobenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	7,200
1,3-Dichlorobenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
1,4-Dichlorobenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	42
Dichlorodifluoromethane	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	16,000
1,1-Dichloroethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	8,000
1,2-Dichloroethane (EDC)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	11
1,1-Dichloroethene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	2
cis-1,2-Dichloroethene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	800
trans-1,2-Dichloroethene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	1,600
1,2-Dichloropropane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	15
1,3-Dichloropropane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
2,2-Dichloropropane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
1,1-Dichloropropene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
cis-1,3-Dichloropropene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	5.56
trans-1,3-Dichloropropene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	5.56
Ethylbenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	6
Hexachlorobutadiene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	12.8
2-Hexanone	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NV
Isopropylbenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
p-Isopropyltoluene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
Methylene Chloride	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.02
4-Methyl-2-Pentanone (MIBK)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NV
Naphthalene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	5 [a]
n-Propylbenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
Styrene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	33
1,1,1,2-Tetrachloroethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	38
1,1,2,2-Tetrachloroethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	5
Tetrachloroethylene (PCE)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.2**	**0.23**	**1.8**	**0.32**	**0.29**	**0.053**	0.05
Toluene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	7
1,2,3-Trichlorobenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
1,2,4-Trichlorobenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	800
1,1,1-Trichloroethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	72,000
1,1,2-Trichloroethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	18
Trichloroethene (TCE)	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03
Trichlorofluoromethane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	24,000
1,2,3-Trichloropropane	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.14
1,2,4-Trimethylbenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
1,3,5-Trimethylbenzene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NV
Vinyl Chloride	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.67
m,p-Xylene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	160000
o-Xylene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	160000

Notes:
All results reported in parts per million (ppm)
Bold and shaded = above MTCA Method A or B Cleanup Level
NV = No cleanup value under this criteria.
Ic = The presence of the compound is likely due to laboratory contamination.
[a] Cleanup level is based on a total cleanup level for naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene.



LEGEND

TP3-3.5-051208-1 ◇ SOIL SAMPLE LOCATION

▯ OBSERVED CONCRETE PIPE

—S—S— SEWER LINE

(0.0068) = TETRACHLOROETHENE CONCENTRATION IN SOIL IN MILLIGRAMS PER KILOGRAM

<0.02 = INDICATES COMPOUND NOT DETECTED ABOVE LABORATORY PRACTICAL QUANTITATION LIMIT-SHOWN

0 10

APPROXIMATE SCALE IN FEET

N

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

DETAIL 1

SITE DETAIL
MANHATTAN PLAZA SHOPPING CENTER
SEATTLE, WASHINGTON

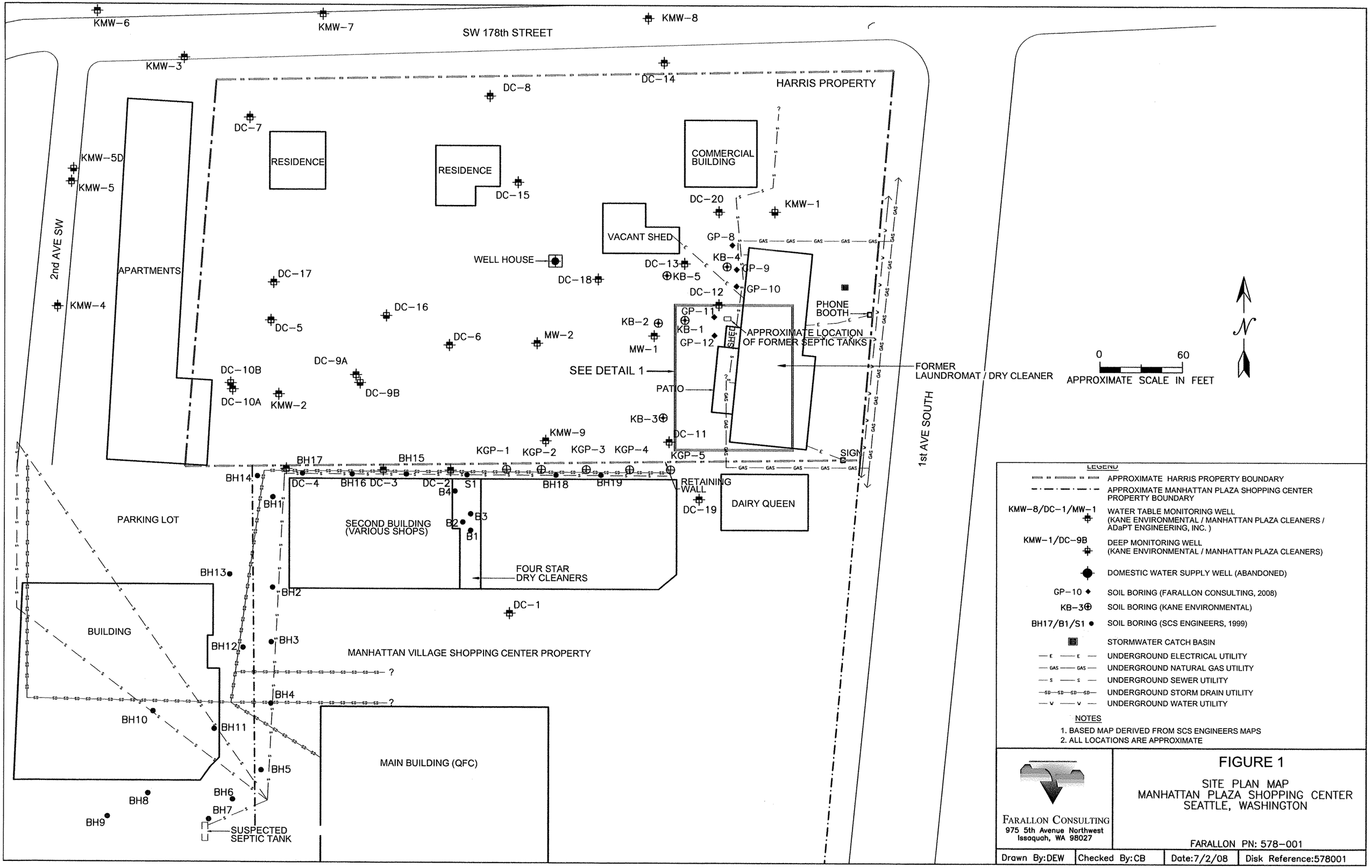
FARALLON PN: 578-001

Drawn By: DEW	Checked By: CB	Date: 7/2/08	Disk Reference: 578001DT

Kane Environmental Oversight of Farallon Consulting Trenching and Soil Sampling
May 12, 2008
Summary of Volatile Organic Compounds in Soil
Harris Property
17617-17825 1st Avenue South
Normandy Park, Washington

Sample ID	Trench-1-4	Trench-1-6.5	Trench-2-4 South	Trench-2-4 North	Trench-3-3.5	Trench-5-2.5	Method Reporting Limit (mg/kg)	MTCA Method A or Method B Cleanup Level (mg/kg)
Sample Depth (in feet)	4	6.5	4	4	3.5	2.5		
Sample Date (2008)	5/12/2008	5/12/2008	5/12/2008	5/12/2008	5/12/2008	5/12/2008		
Acetone	nd	nd	nd	nd	nd	nd	0.50	8000
Benzene	nd	nd	nd	nd	nd	nd	0.02	0.03
Bromobenzene	nd	nd	nd	nd	nd	nd	0.05	NV
Bromochloromethane	nd	nd	nd	nd	nd	nd	0.05	NV
Bromodichloromethane	nd	nd	nd	nd	nd	nd	0.05	16.1
Bromoform	nd	nd	nd	nd	nd	nd	0.05	127
Bromomethane	nd	nd	nd	nd	nd	nd	0.05	112
2-Butanone (MEK)	nd	nd	nd	nd	nd	nd	0.50	NV
n-Butylbenzene	nd	nd	nd	nd	nd	nd	0.05	NV
sec-Butylbenzene	nd	nd	nd	nd	nd	nd	0.05	NV
tert-Butylbenzene	nd	nd	nd	nd	nd	nd	0.05	NV
Carbon Tetrachloride	nd	nd	nd	nd	nd	nd	0.05	8
Chlorobenzene	nd	nd	nd	nd	nd	nd	0.05	1,600
Chloroethane	nd	nd	nd	nd	nd	nd	0.05	NV
Chloroform	nd	nd	nd	nd	nd	nd	0.05	164
Chloromethane	nd	nd	nd	nd	nd	nd	0.05	77
2-Chlorotoluene	nd	nd	nd	nd	nd	nd	0.05	1,600
4-Chlorotoluene	nd	nd	nd	nd	nd	nd	0.05	1,600
Dibromochloromethane	nd	nd	nd	nd	nd	nd	0.05	12
1,2-Dibromo-3-chloropropane	nd	nd	nd	nd	nd	nd	0.05	1
1,2-Dibromoethane (EDB)	nd	nd	nd	nd	nd	nd	0.01	0.005
Dibromomethane	nd	nd	nd	nd	nd	nd	0.05	NV
1,2-Dichlorobenzene	nd	nd	nd	nd	nd	nd	0.05	7,200
1,3-Dichlorobenzene	nd	nd	nd	nd	nd	nd	0.05	NV
1,4-Dichlorobenzene	nd	nd	nd	nd	nd	nd	0.05	42
Dichlorodifluoromethane	nd	nd	nd	nd	nd	nd	0.05	16,000
1,1-Dichloroethane	nd	nd	nd	nd	nd	nd	0.05	8,000
1,2-Dichloroethane	nd	nd	nd	nd	nd	nd	0.05	11
1,1-Dichloroethene	nd	nd	nd	nd	nd	nd	0.05	2
cis-1,2-Dichloroethene	nd	nd	nd	nd	nd	nd	0.05	800
trans-1,2-Dichloroethene	nd	nd	nd	nd	nd	nd	0.05	1,600
1,2-Dichloropropane	nd	nd	nd	nd	nd	nd	0.05	15
1,3-Dichloropropane	nd	nd	nd	nd	nd	nd	0.05	NV
2,2-Dichloropropane	nd	nd	nd	nd	nd	nd	0.05	NV
1,1-Dichloropropene	nd	nd	nd	nd	nd	nd	0.05	NV
cis-1,3-Dichloropropene	nd	nd	nd	nd	nd	nd	0.05	5.56
trans-1,3-Dichloropropene	nd	nd	nd	nd	nd	nd	0.05	5.56
Ethylbenzene	nd	nd	nd	nd	nd	nd	0.05	6
Hexachlorobutadiene	nd	nd	nd	nd	nd	nd	0.05	12.8
n-Hexane	nd	nd	nd	nd	nd	nd	0.05	4800
2-Hexanone	nd	nd	nd	nd	nd	nd	0.05	NV
Isopropylbenzene	nd	nd	nd	nd	nd	nd	0.05	NV
Isopropyltoluene	nd	nd	nd	nd	nd	nd	0.05	NV
Methylene Chloride	nd	nd	nd	nd	nd	nd	0.50	0.02
4-Methyl-2-Pentanone (MIBK)	nd	nd	nd	nd	nd	nd	0.05	NV
Methyl-t-butyl ether (MTBE)	nd	nd	nd	nd	nd	nd	0.05	0.1
Naphthalene	nd	nd	nd	nd	nd	nd	0.05	5 *
n-Propylbenzene	nd	nd	nd	nd	nd	nd	0.05	NV
Styrene	nd	nd	nd	nd	nd	nd	0.05	33
1,1,1,2-Tetrachloroethane	nd	nd	nd	nd	nd	nd	0.05	38
1,1,2,2-Tetrachloroethane	nd	nd	nd	nd	nd	nd	0.05	5
Tetrachloroethylene (PCE)	nd	0.02	0.27	0.05	0.02	0.34	0.02	0.05
Toluene	nd	nd	nd	nd	nd	nd	0.05	7
1,2,3-Trichlorobenzene	nd	nd	nd	nd	nd	nd	0.05	NV
1,2,4-Trichlorobenzene	nd	nd	nd	nd	nd	nd	0.05	800
1,1,1-Trichloroethane	nd	nd	nd	nd	nd	nd	0.05	72,000
1,1,2-Trichloroethane	nd	nd	nd	nd	nd	nd	0.05	18
Trichloroethene (TCE)	nd	nd	nd	nd	nd	nd	0.02	0.03
Trichlorofluoromethane	nd	nd	nd	nd	nd	nd	0.05	24,000
1,2,3-Trichloropropane	nd	nd	nd	nd	nd	nd	0.05	0.14
1,2,4-Trimethylbenzene	nd	nd	nd	nd	nd	nd	0.05	NV
1,3,5-Trimethylbenzene	nd	nd	nd	nd	nd	nd	0.05	NV
Vinyl Chloride	nd	nd	nd	nd	nd	nd	0.01	0.67
Xylenes	nd	nd	nd	nd	nd	nd	0.05	9

Notes:
All results reported in mg/kg (milligrams per kilogram)
nd = Not detected at method reporting limit.
NV = No cleanup value under this criteria.



LEGEND

- APPROXIMATE HARRIS PROPERTY BOUNDARY
- APPROXIMATE MANHATTAN PLAZA SHOPPING CENTER PROPERTY BOUNDARY
- KMW-8/DC-1/MW-1 — WATER TABLE MONITORING WELL (KANE ENVIRONMENTAL / MANHATTAN PLAZA CLEANERS / ADaPT ENGINEERING, INC.)
- KMW-1/DC-9B — DEEP MONITORING WELL (KANE ENVIRONMENTAL / MANHATTAN PLAZA CLEANERS)
- DOMESTIC WATER SUPPLY WELL (ABANDONED)
- GP-10 — SOIL BORING (FARALLON CONSULTING, 2008)
- KB-3 — SOIL BORING (KANE ENVIRONMENTAL)
- BH17/B1/S1 — SOIL BORING (SCS ENGINEERS, 1999)
- STORMWATER CATCH BASIN
- UNDERGROUND ELECTRICAL UTILITY
- UNDERGROUND NATURAL GAS UTILITY
- UNDERGROUND SEWER UTILITY
- UNDERGROUND STORM DRAIN UTILITY
- UNDERGROUND WATER UTILITY

NOTES

1. BASED MAP DERIVED FROM SCS ENGINEERS MAPS
2. ALL LOCATIONS ARE APPROXIMATE

FARALLON CONSULTING
975 5th Avenue Northwest
Issaquah, WA 98027

FIGURE 1

SITE PLAN MAP
MANHATTAN PLAZA SHOPPING CENTER
SEATTLE, WASHINGTON

FARALLON PN: 578-001

Drawn By:DEW	Checked By:CB	Date:7/2/08	Disk Reference:578001

Draft - Issued for Client Review

Table 2
Summary of Soil Analytical Results
Manhattan Plaza - Harris Property
Normandy Park, Washington
Farallon PN: 578-001

Sample Location	Sample ID	Sample Date	Sampled By	Depth (feet bgs)	Analytical Results (milligrams per kilogram)[1]				
					PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride
KMW-9	KMW9-5	3/27/2007	Farallon	5	0.0043	<0.0011	<0.0011	<0.0011	<0.0011
KMW-9	KMW9-35	3/27/2007	Farallon	35	0.016	<0.00098	<0.00098	<0.00098	<0.00098
GP1	GP1-8-12	3/30/2007	Farallon	8-12	<0.00080	<0.00080	<0.00080	<0.00080	<0.00080
GP1	GP1-30-34	3/30/2007	Farallon	30-34	0.0067	<0.00081	<0.00081	<0.00081	<0.00081
GP2	GP2-4-8	4/2/2007	Farallon	4-8	<0.00090	<0.00090	<0.00090	<0.00090	<0.00090
GP2	GP2-28-32	4/2/2007	Farallon	28-32	0.0055	<0.00088	<0.00088	<0.00088	<0.00088
GP3	GP3-8-12	3/30/2007	Farallon	8-12	<0.00099	<0.00099	<0.00099	<0.00099	<0.00099
GP3	GP3-28-30	3/30/2007	Farallon	28-30	0.011	<0.00082	<0.00082	<0.00082	<0.00082
GP4	GP4-20-24	3/30/2007	Farallon	20-24	0.0023	<0.00099	<0.00099	<0.00099	<0.00099
GP5	GP5-4-8	4/3/2007	Farallon	4-8	0.0028	<0.00089	<0.00089	<0.00089	<0.00089
GP5	GP5-16-20	4/3/2007	Farallon	16-20	0.024	<0.00094	<0.00094	<0.00094	<0.00094
GP6	GP6-4-8	4/2/2007	Farallon	4-8	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011
GP6	GP6-27-30	4/2/2007	Farallon	27-30	0.0033	<0.00088	<0.00088	<0.00088	<0.00088
GP7	GP7-4-8	4/2/2007	Farallon	4-8	<0.00095	<0.00095	<0.00095	<0.00095	<0.00095
GP7	GP7-30-34	4/2/2007	Farallon	30-34	0.0016	<0.00087	<0.00087	<0.00087	<0.00087
GP-8	GP8-6-052708	5/27/2008	Farallon	6	0.0017	<0.00093	<0.00093	<0.00093	<0.0047
GP-8	GP8-10-052708	5/27/2008	Farallon	10	0.0026	<0.0012	<0.0012	<0.0012	<0.0060
GP-9	GP9-4-052701	5/27/2008	Farallon	4	<0.00086	<0.00086	<0.00086	<0.00086	<0.0043
GP-9	GP9-10-052708	5/27/2008	Farallon	10	0.0019	<0.00094	<0.00094	<0.00094	<0.0047
GP-10	GP10-4-052708	5/27/2008	Farallon	4	<0.0010	<0.0010	<0.0010	<0.0010	<0.0051
GP-10	GP10-10-052708	5/27/2008	Farallon	10	0.0017	<0.00094	<0.00094	<0.00094	<0.0047
GP-11	GP11-6-052708	5/27/2008	Farallon	6	0.0014	<0.0086	<0.00086	<0.00086	<0.0043
GP-11	GP11-10-052708	5/27/2008	Farallon	10	0.0013	<0.0010	<0.0010	<0.0010	<0.0052
GP-12	GP12-6-052708	5/27/2008	Farallon	6	0.0011	<0.0010	<0.0010	<0.0010	<0.0052
GP-12	GP12-10-052708	5/27/2008	Farallon	10	<0.00092	<0.00092	<0.00092	<0.00092	<0.0046
DC-11	DC11-15-16.5	4/19/2007	Farallon	15-16.5	0.0013	<0.00095	<0.00095	<0.00095	<0.00095
DC-11	DC11-30-31.5	4/19/2007	Farallon	30-31.5	0.0084	<0.00093	<0.00093	<0.00093	<0.00093
DC-12	DC12-15-16.5	4/18/2007	Farallon	15-16.5	0.0024	<0.00094	<0.00094	<0.00094	<0.00094
DC-13	DC13-15-16.5	4/19/2007	Farallon	15-16.5	0.00096	<0.00090	<0.00090	<0.00090	<0.00090
DC-13	DC13-35-36.5	4/19/2007	Farallon	35-36.5	0.0081	<0.00095	<0.00095	<0.00095	<0.00095
DC-14	DC14-15-16.5	4/17/2007	Farallon	15-16.5	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011
DC-15	DC15-15-16.5	4/16/2007	Farallon	15-16.5	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011
DC-16	DC16-15-16.5	4/17/2007	Farallon	15-16.5	<0.0011	<0.0011	<0.0011	<0.0011	<0.0011
DC-17	DC17-15-16.5	4/16/2007	Farallon	15-16.5	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
DC-18	DC18-15-16.5	4/18/2007	Farallon	15-16.5	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
DC-19	DC19-4	6/1/2007	Farallon	3.5-5	<0.00077	<0.00077	<0.00077	<0.00077	<0.00077
DC-19	DC19-8	6/1/2007	Farallon	7.5-9	<0.00069	<0.00069	<0.00069	<0.00069	<0.00069
DC-19	DC19-38	6/1/2007	Farallon	37.5-38	0.0047	<0.00076	<0.00076	<0.00076	<0.00076
DC-20	DC20-10-052808	5/28/2008	Farallon	10	0.0026	<0.00096	<0.00096	<0.00096	<0.0048
DC-20	DC20-35-052808	5/28/2008	Farallon	35	0.0018	<0.00082	<0.00082	<0.00082	<0.0041
MTCA Cleanup Levels for Soil					**0.05**[2]	**0.03**[2]	**800**[3]	**1,600**[3]	**0.667**[3]

CAD File: S:\\0075720\00\007572000-19.dwg | Drawn By: C. Tallada/PR | Date: 11/20/08 | Project No. 075720.00

N

1" = 100'

0 50' 100' 200'

B-17

B-18

SW 176th STREET

RESIDENCES

B-2

B-1

1st AVE SOUTH

SW 177th STREET

DUNN LUMBER

DUNN LUMBER

RESIDENCES

WATER SUPPLY WELL

B-3

SW 178th STREET

2nd AVE SW

HARRIS PROPERTY

RESIDENCE

RESIDENCE

COMMERCIAL BUILDING

WELL HOUSE

VACANT SHED

SVS-6 SVS-3 SVS-2

KB-4 KB-5

GP-2 GP-7 KB-2 KB-1 SVS-4 SVS-5 GP-6 GP-3 GP-1

FORMER SEPTIC TANK

PHONE BOOTH

SVS-1

FORMER LAUNDROMAT/ DRY CLEANER

GP-5 GP-4 KB-3 B-16

SIGN

SVS-7 SVS-8 SVS-9

KGP-1 KGP-2 KGP-3

RETAINING WALL

FORMER DAIRY QUEEN

B-11 B-12 B-14 B-13 B-15 B-10 B-9 B-8 B-7 B-6 B-5

BH17 BH14 BH16 BH15 BH1 BH18 BH19

SECOND BUILDING (VARIOUS SHOPS)

B4 B3 B2 B1

FOUR STAR DRY CLEANERS

CONDOMINIUMS

PARKING LOT

BH13 BH2 BH12 BH3 BH4 BH10 BH11 BH8 BH9 BH6 BH5 BH7

BUILDING

SUSPECTED SEPTIC TANK

MANHATTAN VILLAGE SHOPPING CENTER

QFC BUILDING

B-12		
Date	Depth	VOCs
03/27/08	10'	ND
	20'	2.99
	30'	8.48

B-13		
Date	Depth	VOCs
03/27/08	10'	31.1
	20'	31.4
	30'	23.1

B-11		
Date	Depth	VOCs
03/27/08	10'	32.4
	20'	346
	30'	279

B-9		
Date	Depth	VOCs
03/25/08	10'	6.16
	20'	14.3
	30'	11.6

B-16		
Date	Depth	VOCs
03/25/08	10'	ND
	20'	ND
	30'	ND

B-8		
Date	Depth	VOCs
03/26/08	10'	6.54
	20'	5.54
	30'	5.62

B-14		
Date	Depth	VOCs
03/24/08	10'	11.8
	20'	29.6
	30'	594

B-7		
Date	Depth	VOCs
03/25/08	10'	ND
	20'	3.51
	30'	8.84

B-15		
Date	Depth	VOCs
03/24/08	10'	5.32
	20'	18.8
	30'	7.85

B-5		
Date	Depth	VOCs
03/26/08	10'	ND
	20'	3.4
	30'	8.88

B-10		
Date	Depth	VOCs
03/24/08	10'	671
	20'	50.8
	30'	15.4

B-6		
Date	Depth	VOCs
03/25/08	10'	ND
	20'	8.16
	30'	8.99

LEGEND

- Existing Soil Boring
- Soil Boring, Completed 2008
- 32.4 — PCE Concetration (µg/kg)
- 279 — PCE Concentration Above the Cleanup Standard (50 µg/kg)
- Inferred Impacted Soil Boundary, April 2008 Data
- Inferred Impacted Soil Boundary, April 2005 Data
- Approximate Harris Property Boundary
- Approximate Manhattan Village Shopping Center Property Boundary
- Underground Electrical Utility
- Underground Natural Gas Utility
- Underground Sewer Utility
- Underground Storm Drain Utility
- Underground Water Utility

Figure 4

Tetrachloroethene in Soil

MVSC/Harris Properties

Normandy Park, Washington

ERM 11/08

S:\Dwgs\0075720 Normandy Park\00\007572000-19.dwg, Layout1

Project No. 0159723.01
Date: 08/22/12
Drawn By: R. Olson
CAD File: G:\0159723\01\01597301-06.dwg

SW 178th STREET

2nd AVE SW

1st AVE SOUTH

HARRIS PROPERTY

MANHATTAN VILLAGE SHOPPING CENTER

CONDOMINIUMS

COMMERCIAL BUILDING

WELL HOUSE

VACANT SHED

FORMER SEPTIC TANK

FORMER LAUNDROMAT / DRY CLEANER

PHONE BOOTH

SIGN

RETAINING WALL

FORMER DAIRY QUEEN

SECOND BUILDING (VARIOUS SHOPS)

FOUR STAR DRY CLEANERS

PARKING LOT

BUILDING

QFC BUILDING

SUSPECTED SEPTIC TANK

B-1 SB-1 B-2 B-3 SB-4 B-4 B-5 SB-5 B-6 SB-6 B-7 B-8 SB-7 B-9 B-10 SB-8 B-11 B-12 B-13 SB-2 B-14 SB-9 B-15 B-16 SB-3

B-12		
Date	Depth	PCE
03/27/08	10'	ND
	20'	2.99
	30'	8.48

B-11		
Date	Depth	PCE
03/27/08	10'	32.4
	20'	346
	30'	279

SB-1		
Date	Depth	PCE
04/19/11	10'	ND
	20'	ND
	30'	ND

SB-6		
Date	Depth	PCE
02/29/12	5'	ND
	10'	28
	20'	ND
	30'	ND
	38'	ND

B-9		
Date	Depth	PCE
03/25/08	10'	6.16
	20'	14.3
	30'	11.6

B-8		
Date	Depth	PCE
03/26/08	10'	6.54
	20'	5.54
	30'	5.62

B-7		
Date	Depth	PCE
03/25/08	10'	ND
	20'	3.51
	30'	8.84

B-5		
Date	Depth	PCE
03/26/08	10'	ND
	20'	3.4
	30'	8.88

SB-5		
Date	Depth	PCE
02/29/12	10'	ND
	20'	ND
	30'	ND

SB-4		
Date	Depth	PCE
03/01/12	5'	ND
	10'	ND
	20'	ND
	30'	ND
	34'	ND

B-13		
Date	Depth	PCE
03/27/08	10'	31.1
	20'	31.4
	30'	23.1

SB-2		
Date	Depth	PCE
04/19/11	10'	ND
	20'	ND
	30'	ND

SB-8		
Date	Depth	PCE
02/29/12	10'	ND
	20'	ND
	30'	ND

B-16		
Date	Depth	PCE
03/25/08	10'	ND
	20'	ND
	30'	ND

SB-7		
Date	Depth	PCE
03/01/12	5'	ND
	20'	ND
	30'	ND
	38'	ND
	43'	ND

B-14		
Date	Depth	PCE
03/24/08	10'	11.8
	20'	29.6
	30'	594

B-15		
Date	Depth	PCE
03/24/08	10'	5.32
	20'	18.8
	30'	7.85

SB-9		
Date	Depth	PCE
04/28/12	2'	ND
	8'	13
	12'	ND
	20'	ND

B-10		
Date	Depth	PCE
03/24/08	10'	671
	20'	50.8
	30'	15.4

B-6		
Date	Depth	PCE
03/25/08	10'	ND
	20'	8.16
	30'	8.99

SB-3		
Date	Depth	PCE
04/19/11	10'	ND
	20'	ND
	30'	ND

LEGEND

- Soil Boring, Completed 2008
- Soil Boring, Completed 2011
- Soil Boring, Completed 2012
- 32.4 PCE Concentration (µg/kg)
- 279 PCE Concentration Greater Than Cleanup Standard (50 µg/kg)
- Inferred Impacted Soil Boundary, April 2008 Data
- Inferred Impacted Soil Boundary, April 2005 Data
- Approximate Harris Property Boundary
- Approximate Manhattan Village Shopping Center Property Boundary
- Underground Electrical Utility
- Underground Natural Gas Utility
- Underground Sewer Utility
- Underground Storm Drain Utility
- Underground Water Utility

N

1" = 100' 0 50' 100' 200'

Figure 3
Summary of PCE in Soil Samples
MVSC/Harris Properties
Normandy Park, Washington

ERM 08/12

TABLE 4

Volatile Organic Compounds in Soil Samples
MVSC/Harris Properties
Normandy Park, Washington

Boring Number	Date Sampled	Sampling Period	Sample Depth (feet bgs)	Volatile Organic Compounds[1] (µg/kg)
				Tetrachloroethene
SB-4	3/1/2012	After Pilot Study	5	ND
			10	ND
			20	ND
			30	ND
			34	ND
SB-5	2/29/2012	After Pilot Study	10	ND
			20	ND
			30	ND
SB-6	2/29/2012	After Pilot Study	5	ND
			10	**28**
			20	ND
			30	ND
			38	ND
SB-7	3/1/2012	After Pilot Study	5	ND
			20	ND
			30	ND
			38	ND
			43	ND
SB-8	2/29/2012	After Pilot Study	10	ND
			20	ND
			30	ND
SB-1	4/19/2011	Prior to Pilot Study	10	ND
			20	ND
			30	ND
SB-2	4/19/2011	Prior to Pilot Study	10	ND
			20	ND
			30	ND
SB-3	4/19/2011	Prior to Pilot Study	10	ND
			20	ND
			30	ND
B-5	3/26/2008	Prior to ERM SVE system	10	ND
			20	**3.40**
			30	**8.88**
B-6	3/25/2008	Prior to ERM SVE system	10	ND
			20	**8.16**
			30	**8.99**
B-7	3/25/2008	Prior to ERM SVE system	10	ND
			20	**3.51**
			30	**8.84**

TABLE 4

Volatile Organic Compounds in Soil Samples
MVSC/Harris Properties
Normandy Park, Washington

Boring Number	Date Sampled	Sampling Period	Sample Depth (feet bgs)	Volatile Organic Compounds[1] (µg/kg)
B-8	3/26/2008	Prior to ERM SVE system	10	**6.54**
			20	**5.54**
			30	**5.62**
B-9	3/25/2008	Prior to ERM SVE system	10	**6.16**
			20	**14.3**
			30	**11.6**
B-10	3/24/2008	Prior to ERM SVE system	10	**671**
			20	**50.8**
			30	**15.4**
B-11	3/27/2008	Prior to ERM SVE system	10	**32.4**
			20	**346**
			30	**279**
B-12	3/27/2008	Prior to ERM SVE system	10	ND
			20	**2.99**
			25	**8.48**
B-13	3/27/2008	Prior to ERM SVE system	10	**31.1**
			20	**31.4**
			30	**23.1**
B-14	3/24/2008	Prior to ERM SVE system	10	**11.8**
			20	**29.6**
			30	**594**
B-15	3/24/2008	Prior to ERM SVE system	10	**5.32**
			20	**18.8**
			30	**7.85**
B-16	3/25/2008	Prior to ERM SVE system	10	ND
			20	ND
			24	ND
B-17	3/26/2008	Prior to ERM SVE system	10	ND
			20	ND
			30	ND
Cleanup Goal[2]				50

Notes:

Data group by sampling event
Bold entries indicate positive analyte detections.
Shaded cells indicate concentrations greater than the cleanup goal
[1]Halogenated volatile organic compounds by USEPA Method 8260
[2]Model Toxics Control Act Method A Soil Cleanup Standard for Unrestricted Land Use
bgs = below ground surface
ND = Not detected at a concentration greater than the method detection limit
SVE = Soil vapor extraction
µg/kg = Micrograms per kilogram

APPENDIX E

GROUNDWATER ANALYTICAL DATA

Table E-1

Historical Summary of Groundwater Analytical Results (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Monitoring Well	Date	PCE (µg/l)	Other VOCs detected (µg/l)
Shallow Monitoring Wells			
MW-1	12/10/1999	**21.6**	
	7/25/2005	**15**	
	4/11/2006	**14**	
	10/26/2006	**11**	
	4/25/2007	**13**	
* Monitoring well cannot be located			
MW-2	12/10/1999	**16.7**	
	4/5/2012	**7.1**	
	5/30/2013	**2.4**	
	4/14/2014	**3.2**	
	10/24/2014	**1.4**	
	12/11/2015	1.00 U	
MW-3	4/14/2008	**2.31**	Chloroform (0.990)
	11/1/2010	**2.9**	
	5/31/2011	2.0 U	
	7/20/2011	2.0 U	
	10/18/2011	**6.1**	
	4/4/2012	**5.8**	
	5/29/2013	**4.0**	
	10/24/2014	**1.0**	
	12/10/2015	**1.34**	
MW-4	4/14/2008	**33**	Chloroform (0.780), cis-1,2-DCE (0.320), TCE (0.490)
	3/9/2010	**7.8**	
	11/1/2010	**16**	
	5/31/2011	**10**	
	7/21/2011	**25**	
	10/19/2011	**21**	
	4/4/2012	**11**	
	5/29/2013	**8.1**	
	10/29/2014	**7.3**	
	12/14/2015	**4.89**	
MW-5	4/11/2008	**0.470**	
	4/2/2012	2.0 U	
MW-6	4/15/2008	2.0 U	
	4/2/2012	2.0 U	
MW-7	4/16/2008	**22.4**	
	4/2/2012	**14**	
	10/29/2014	**20**	
	12/15/2015	**7.42**	

Table E-1

Historical Summary of Groundwater Analytical Results (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Monitoring Well	Date	PCE (µg/l)		Other VOCs detected (µg/l)
MW-8	8/21/2008	**0.20**	J	
	4/2/2012	2.0	U	
MW-9	8/21/2008	**0.10**	J	
	4/2/2012	2.0	U	
	10/24/2014	1.0	U	
	12/10/2015	1.00	U	
MW-10	2/8/2011	**10**		
	5/31/2011	2.0	U	
	7/20/2011	**4.1**		
	10/18/2011	**4.9**		
	4/6/2012	**6.7**		
	5/29/2013	**4.1**		
	10/24/2014	**1.7**		
	12/11/2015	1.00	U	TCE (3.22)
MW-11	2/8/2011	**47**		
	5/31/2011	2.0	U	Acetone (51)
	7/20/2011	2.0	U	Acetone (154)
	10/18/2011	2.0	U	Acetone (130)
	4/6/2012	**29**		
	5/31/2013	**22**		
	10/29/2014	**15**		
	12/14/2015	**11.9**		
MW-12	4/4/2012	2.0	U	
	5/28/2013	1.0	U	
	10/23/2014	1.0	U	
	12/10/2015	1.00	U	
MW-13	4/3/2012	2.0	U	
	5/30/2013	1.0	U	
	10/23/2014	1.0	U	
	12/10/2015	1.00	U	
MW-14	4/5/2012	2.0	U	
	5/29/2013	1.0	U	
	10/30/2014	1.0	U	
	12/11/2015	1.00	U	

Table E-1

Historical Summary of Groundwater Analytical Results (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Monitoring Well	Date	PCE (µg/l)		Other VOCs detected (µg/l)
MW-15	4/5/2012	2.0	U	
	5/28/2013	1.0	U	
	4/14/2014	1.0	U	
	10/23/2014	1.0	U	
	12/10/2015	1.00	U	
MW-16	5/31/2013	**2.5**		
	10/23/2014	**1.3**		
	12/11/2015	**1.20**		
DC-1	10/21/1998	**0.60**		Toluene (0.8)
	2/3/1999	0.5	U	
	4/7/1999	0.5	U	Toluene (8.7)
	12/8/1999	1.0	U	
	4/26/2000	1.0	U	
	8/3/2000	1.0	U	
	11/14/2000	1.0	U	
	3/6/2001	1.0	U	
	6/20/2001	1.0	U	
	9/17/2001	1.0	U	
	12/20/2001	1.0	U	
	3/13/2002	1.0	U	
	9/17/2002	1.0	U	
	12/10/2002	1.0	U	
	3/31/2003	1.0	U	
	9/3/2003	1.0	U	
	3/16/2004	1.0	U	
	9/7/2004	1.0	U	
	4/25/2007	0.2	U	
	4/4/2012	2.0	U	

Table E-1

Historical Summary of Groundwater Analytical Results (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Monitoring Well	Date	PCE (µg/l)		Other VOCs detected (µg/l)
DC-2	10/21/1998	**2.4**		Chloroform (1.8), Toluene (0.6)
	2/3/1999	**0.7**		
	4/7/1999	0.5	U	Chloroform (1.4), Toluene (14)
	12/8/1999	0.5	U	
	4/26/2000	1.0	U	
	8/3/2000	1.0	U	
	11/14/2000	1.0	U	
	3/6/2001	1.0	U	
	6/20/2001	1.0	U	
	9/17/2001	1.0	U	
	12/20/2001	1.0	U	
	3/13/2002	**4.0**		
	6/13/2002	1.0	U	
	9/17/2002	1.0	U	
	12/10/2002	**0.50**		
	3/31/2003	**3.37**		
	9/3/2003	1.0	U	
	3/16/2004	**0.74**		
	9/7/2004	1.0	U	
	4/26/2007	**1.2**		
	4/14/2008	**0.340**		Chloroform (1.60)
	11/3/2010	2.0	U	
	5/31/2011	2.0	U	
	7/21/2011	2.0	U	
	10/18/2011	2.0	U	
	4/4/2012	2.0	U	

Table E-1

Historical Summary of Groundwater Analytical Results (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Monitoring Well	Date	PCE (µg/l)		Other VOCs detected (µg/l)
DC-3	10/28/1998	**54**		Chloroform (1.9), Toluene (0.6)
	2/4/1999	**25**		
	4/8/1999	**36**		Chloroform (1.2), Toluene (15)
	12/8/1999	**45**		
	4/26/2000	**56**		
	8/3/2000	**25**		
	11/14/2000	1.0	U	
	3/6/2001	**4.7**		
	6/20/2001	**2.8**		
	9/17/2001	1.0	U	
	12/20/2001	**9.2**		
	3/13/2002	**40.0**		
	6/13/2002	**42.3**		
	9/17/2002	**33.4**		
	12/10/2002	**5.40**		
	3/31/2003	**7.34**		
	9/3/2003	**2.08**		
	3/16/2004	1.0	U	
	9/7/2004	**3.43**		
	4/26/2007	**42.0**		
	4/14/2008	**27.8**		Chloroform (1.50)
	3/9/2010	2.0	U	
	11/3/2010	2.0	U	
	5/30/2011	**3.9**		
	7/20/2011	**12**		
	10/18/2011	**6.7**		
	4/4/2012	**2.9**		
	10/27/2014	**1.4**		
	12/11/2015	**1.49**		

Table E-1

Historical Summary of Groundwater Analytical Results (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Monitoring Well	Date	PCE (µg/l)		Other VOCs detected (µg/l)
DC-4	10/28/1998	**227**		Chloroform (0.9), Toluene (0.7)
	2/4/1999	**144**		
	4/8/1999	**110**		Toluene (2.6)
	12/8/1999	**71**		
	4/26/2000	**120**		
	8/3/2000	**42**		
	11/14/2000	**64**		
	3/6/2001	**52**		TCE (3.0)
	6/20/2001	**40**		
	9/17/2001	**23**		
	12/20/2001	**15**		
	3/13/2002	**55**		
	6/13/2002	**17.9**		
	9/17/2002	**28.8**		
	12/10/2002	**22.4**		
	3/31/2003	**12.5**		
	9/3/2003	**14.1**		
	3/16/2004	**19.8**		
	9/7/2004	**18.5**		
	4/26/2007	**19.0**		
	4/11/2008	**30.2**		Chloroform (1.2)
	3/9/2010	**9.2**		
	11/3/2010	**13**		
	5/31/2011	2.0	U	Acetone (46)
	7/20/2011	2.0	U	Acetone (77)
	10/18/2011	**22**		
	4/4/2012	**22**		
	5/30/2013	**11**		
	10/29/2014	**13**		
	12/14/2015	**5.49**		
DC-6	2/4/1999	**5.1**		
	4/8/1999	**3.7**		Chloroform(1.3), Toluene (2.3)

* Monitoring well cannot be located

Table E-1

Historical Summary of Groundwater Analytical Results (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Monitoring Well	Date	PCE (µg/l)	Other VOCs detected (µg/l)
DC-7	2/4/1999	**74**	
	4/8/1999	**64**	Toluene (1.3)
	12/8/1999	**107**	
	4/26/2000	**130**	
	8/3/2000	**50**	
	11/14/2000	**130**	
	3/6/2001	**140**	
	6/20/2001	**96**	
	9/17/2001	**81**	
	12/20/2001	**47**	
	3/13/2002	**31**	
	6/13/2002	**41.5**	
	9/17/2002	**77.7**	
	12/10/2002	**91.8**	
	3/31/2003	**40.1**	
	9/3/2003	**57.4**	
	7/25/2005	**37.0**	
	4/11/2006	**23.0**	
	10/26/2006	**51.0**	
	4/24/2007	**27.0**	
	4/16/2008	**50.8**	
	11/3/2010	**34**	
	6/1/2011	**15**	
	7/21/2011	**38**	
	10/18/2011	**42**	
	4/5/2012	**18**	
	5/30/2013	**15**	
	10/30/2014	**23**	
	12/16/2015	**13.3**	

Table E-1

Historical Summary of Groundwater Analytical Results (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Monitoring Well	Date	PCE (µg/l)	Other VOCs detected (µg/l)
DC-8	2/4/1999	**56**	
	4/8/1999	**48**	Toluene (1.2)
	12/8/1999	**98**	
	4/26/2000	**87**	
	8/3/2000	**70**	
	11/14/2000	**130**	
	3/6/2001	**82**	
	6/20/2001	**80**	
	9/17/2001	**62**	
	12/20/2001	**50**	
	3/13/2002	**31**	
	6/13/2002	**26.6**	
	9/17/2002	**38.4**	
	12/10/2002	**53.1**	
	3/31/2003	**36.4**	
	9/3/2003	**34.7**	
	7/25/2005	**26.0**	
	4/11/2006	**14.0**	
	10/26/2006	**28.0**	
	4/24/2007	**24.0**	
	4/16/2008	**39.4**	
	11/3/2010	**25**	
	6/1/2011	**11**	
	7/21/2011	**25**	
	10/19/2011	**26**	
	4/5/2012	**18**	
	5/30/2013	**11**	
	10/30/2014	**18**	
	12/16/2015	**8.61**	
DC-9A	4/8/1999	**135**	Toluene (3.2)
	12/8/1999	**73**	
	4/26/2000	**240**	
	8/3/2000	**110**	
	4/11/2006	**78**	
	8/8/2006	**49**	
	11/2/2006	2.9	
	4/26/2007	**33**	
* Monitoring well cannot be located			
DC-10A	4/8/1999	**150**	Toluene (1.7)
	12/8/1999	**73**	TCE (1.1)
	4/26/2000	**210**	
	4/5/2012	**41**	
	5/31/2013	**19**	
	10/30/2014	**17**	

Table E-1

Historical Summary of Groundwater Analytical Results (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Monitoring Well	Date	PCE (µg/l)	Other VOCs detected (µg/l)
DC-11	4/26/2007	**12**	
	3/9/2010	**4.6**	
	11/1/2010	**4.8**	
	4/4/2012	**3.1**	
	4/15/2014	**1.2**	
	10/27/2014	**1.4**	
	12/11/2015	**1.48**	
DC -12	4/25/2007	**16**	
	4/4/2012	**3.7**	
	5/30/2013	**2.3**	
	4/15/2014	**1.4**	
	10/27/2014	**1.8**	
	12/14/2015	**2.04**	
DC-13	4/25/2007	**15**	
	4/16/2008	**23**	
	3/1/2010	**10**	
	11/2/2010	**9.2**	
	4/5/2012	**6.4**	
	5/30/2013	**1.7**	
	4/14/2014	**3.2**	
	10/27/2014	**2.7**	
	12/14/2015	**2.78**	
DC-14	4/25/2007	**11**	
	4/3/2012	**11**	
	5/30/2013	**6.0**	
	10/29/2014	**19**	
	12/15/2015	**6.02**	
DC-15	4/24/2007	**11**	
	4/5/2012	**20**	
	4/15/2014	**10**	
	10/30/2014	**5.8**	
	12/16/2015	**5.93**	
DC-17	4/25/2007	**47**	
	4/16/2008	**74.6**	
	5/31/2013	**21**	
	10/23/2014	**17**	
	12/16/2015	**15.1**	

Table E-1

Historical Summary of Groundwater Analytical Results (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Monitoring Well	Date	PCE (µg/l)		Other VOCs detected (µg/l)
DC-18	4/25/2007	**19**		
	4/5/2012	**7.2**		
	5/30/2013	**4.8**		
	10/28/2014	**3.0**		
	12/14/2015	**3.19**		
DC-19	6/4/2007	**0.79**		
	4/14/2008	**0.66**		
	4/4/2012	2.0	U	
DC-20	5/30/2013	**1.7**		
	4/14/2014	**1.4**		
	10/28/2014	1.0	U	
	12/15/2015	**1.74**		1,2-Dichlororpropane (1.82)
KMW-1	4/11/2006	1.0	U	
	10/26/2006	1.0	U	
	4/25/2007	0.2	U	
	4/14/2008	0.2	U	Chloroform (0.450)
	4/3/2012	2.0	U	
KMW-2	6/12/2006	**130**		
	8/8/2006	**130**		
	10/26/2006	**190**		
	4/24/2007	**63**		
	4/16/2008	**96**		
	3/8/2010	**81**		
	11/3/2010	**74**		
	6/1/2011	**12**		Acetone (140)
	7/20/2011	**44**		
	10/19/2011	**40**		
	4/6/2012	**25**		
	5/31/2013	**22**		
	10/29/2014	**18**		
	12/15/2015	**15**		
KMW-3	6/12/2006	**20**		
	10/26/2006	**13**		
	4/24/2007	**9.9**		
	11/2/2010	**11**		
	5/31/2011	**6.2**		
	7/20/2011	**12**		
	10/18/2011	**11**		
	4/3/2012	**6.8**		
	10/28/2014	1.0	U	

Table E-1

Historical Summary of Groundwater Analytical Results (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Monitoring Well	Date	PCE (µg/l)		Other VOCs detected (µg/l)
KMW-4	4/25/2007	**0.73**		
	4/3/2012	2.0	U	
KMW-5	4/25/2007	**0.82**		
	4/3/2012	2.0	U	
KMW-6	4/24/2007	**3.8**		
	4/3/2012	2.0	U	
KMW-7	4/24/2007	**3.8**		
	4/15/2008	**3.9**		
	11/3/2010	2.0	U	
	5/30/2011	**2.3**		
	7/20/2011	2.0	U	
	10/18/2011	2.0	U	
	4/3/2012	**3.3**		
	10/28/2014	**2.0**		p-isopropyltoluene (2.8)
	12/15/2015	**2.17**		
KMW-8	4/24/2007	**11**		
	4/15/2008	**17.4**		
	4/3/2012	**10**		
	10/28/2014	**5.9**		
	12/15/2015	**3.98**		
KMW-9	4/26/2007	**9.3**		
	3/8/2010	**4.4**		
	11/4/2010	**2.8**		
	4/5/2012	**4.0**		
	4/15/2014	**1.0**		
	10/27/2014	1.0	U	
	12/10/2015	**1.47**		

Table E-1

Historical Summary of Groundwater Analytical Results (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Monitoring Well	Date	PCE (µg/l)		Other VOCs detected (µg/l)
Deep Monitoring Wells				
DC-5	2/4/1999	**2.4**		
	4/8/1999	**1.6**		Chloroform (2.6), Toluene (1.0)
	7/25/2005	**37**		
	4/11/2006	**1.3**		
	4/26/2007	**2.1**		
	11/3/2010	**2.1**		
	5/30/2011	2.0	U	
	7/19/2011	2.0	U	
	10/18/2011	2.0	U	
	4/6/2012	2.0	U	
	5/29/2013	1.0	U	
DC-9B	4/8/1999	**1.4**		Chloroform (1.4), Toluene (2.9)
	3/6/2001	**2.0**		
	6/20/2001	1.0	U	
	9/17/2001	1.0	U	
	12/20/2001	**6.4**		
	7/25/2005	1.0	U	
	4/11/2006	1.0	U	
	8/8/2006	1.0	U	
	10/26/2006	1.0	U	
	4/26/2007	0.2	U	
	4/15/2008	**0.60**		
* Monitoring well has been decommissioned				
DC-10B	4/8/1999	**1.8**		Chloroform (1.2), Toluene (1.9)
	3/6/2001	**3.3**		TCE (1.7)
	6/20/2001	**2.4**		
	9/17/2001	1.0	U	
	12/20/2001	1.0	U	
	7/25/2005	1.0	U	
	4/11/2006	1.0	U	
	4/26/2007	**0.34**		
	11/3/2010	**2.6**		
	5/30/2011	2.0	U	Acetone (290)
	7/19/2011	2.0	U	Acetone (54)
	10/18/2011	2.0	U	Acetone (31)
	4/6/2012	2.0	U	

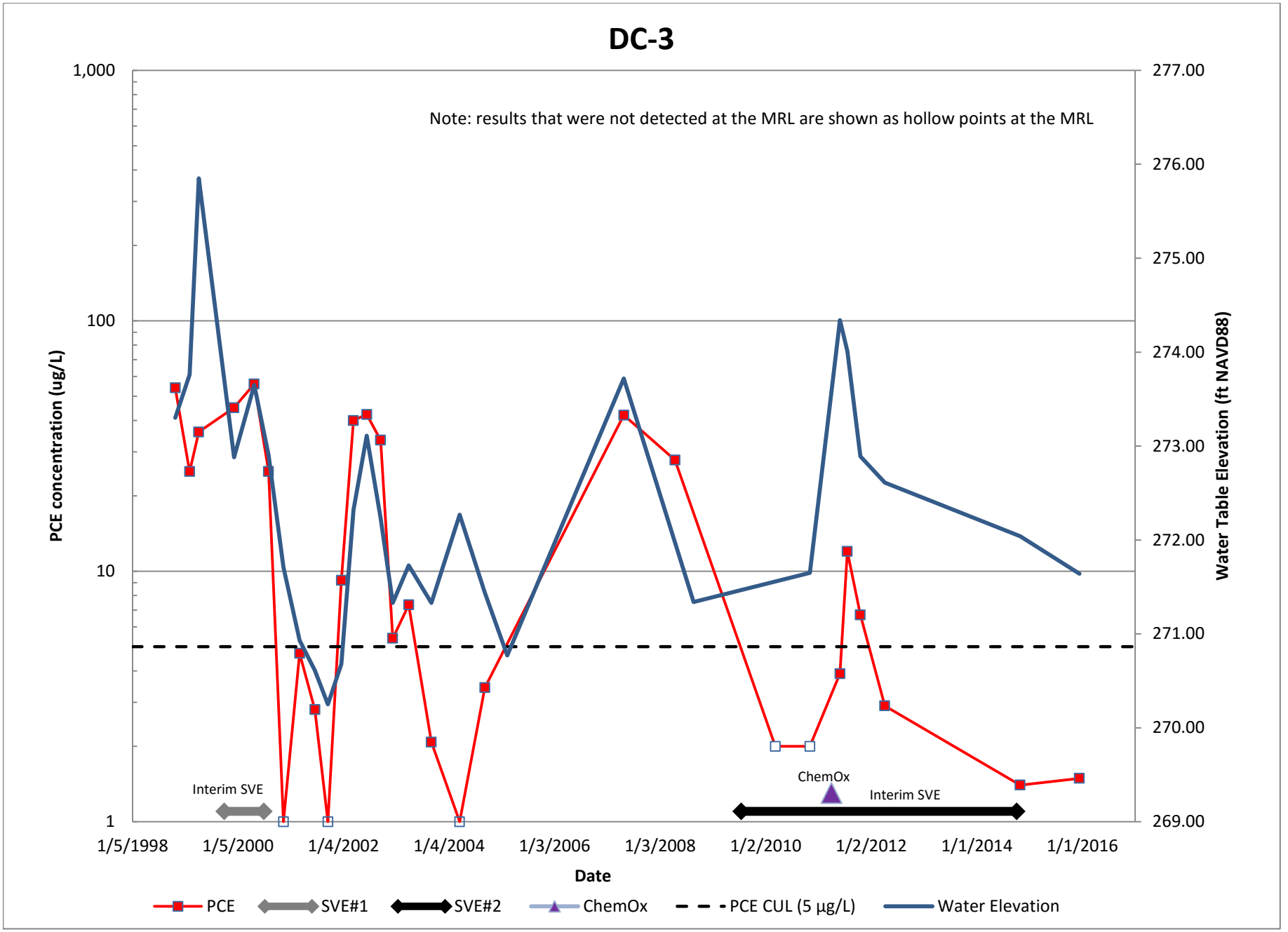
Table E-1

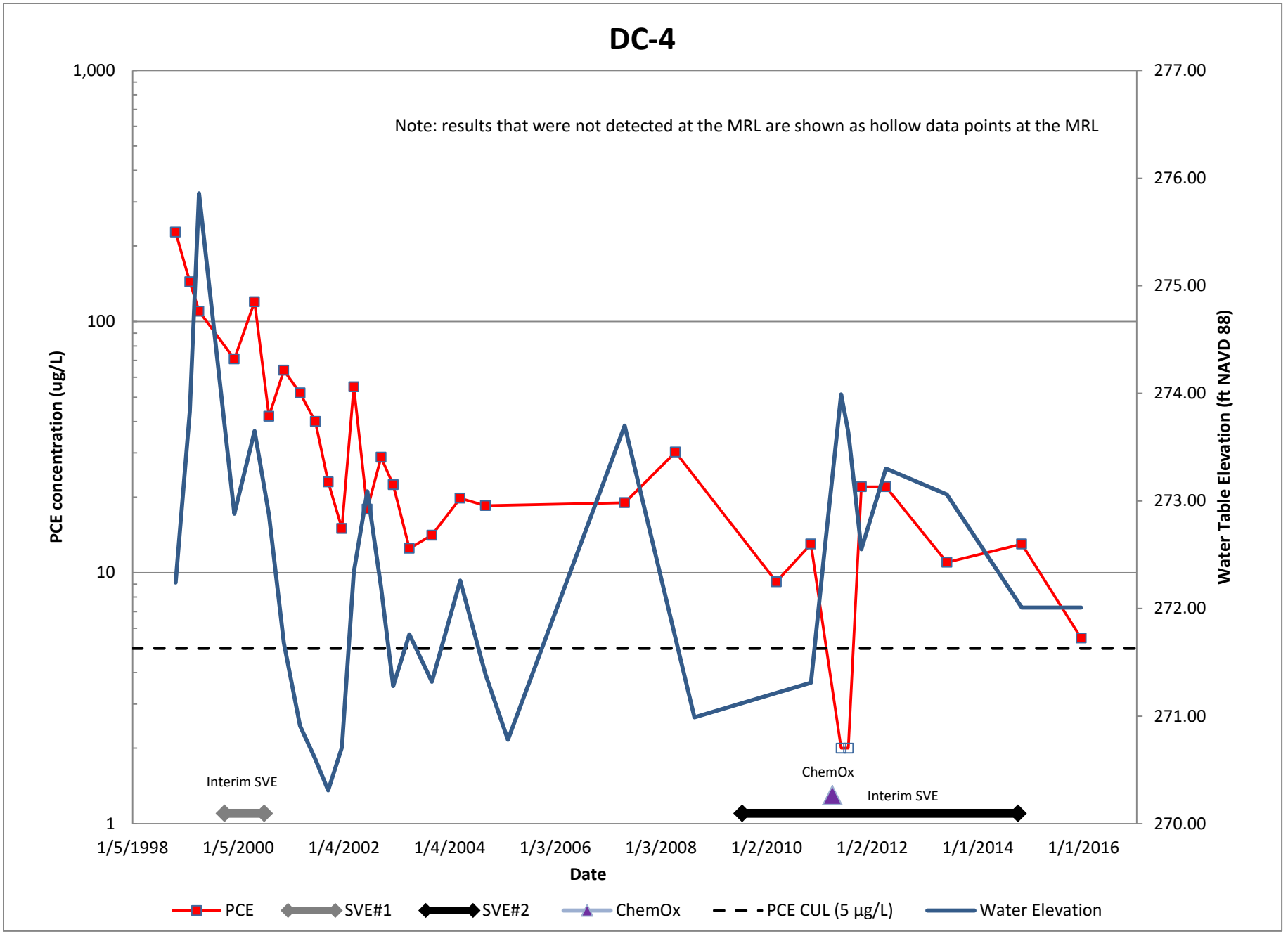
Historical Summary of Groundwater Analytical Results (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

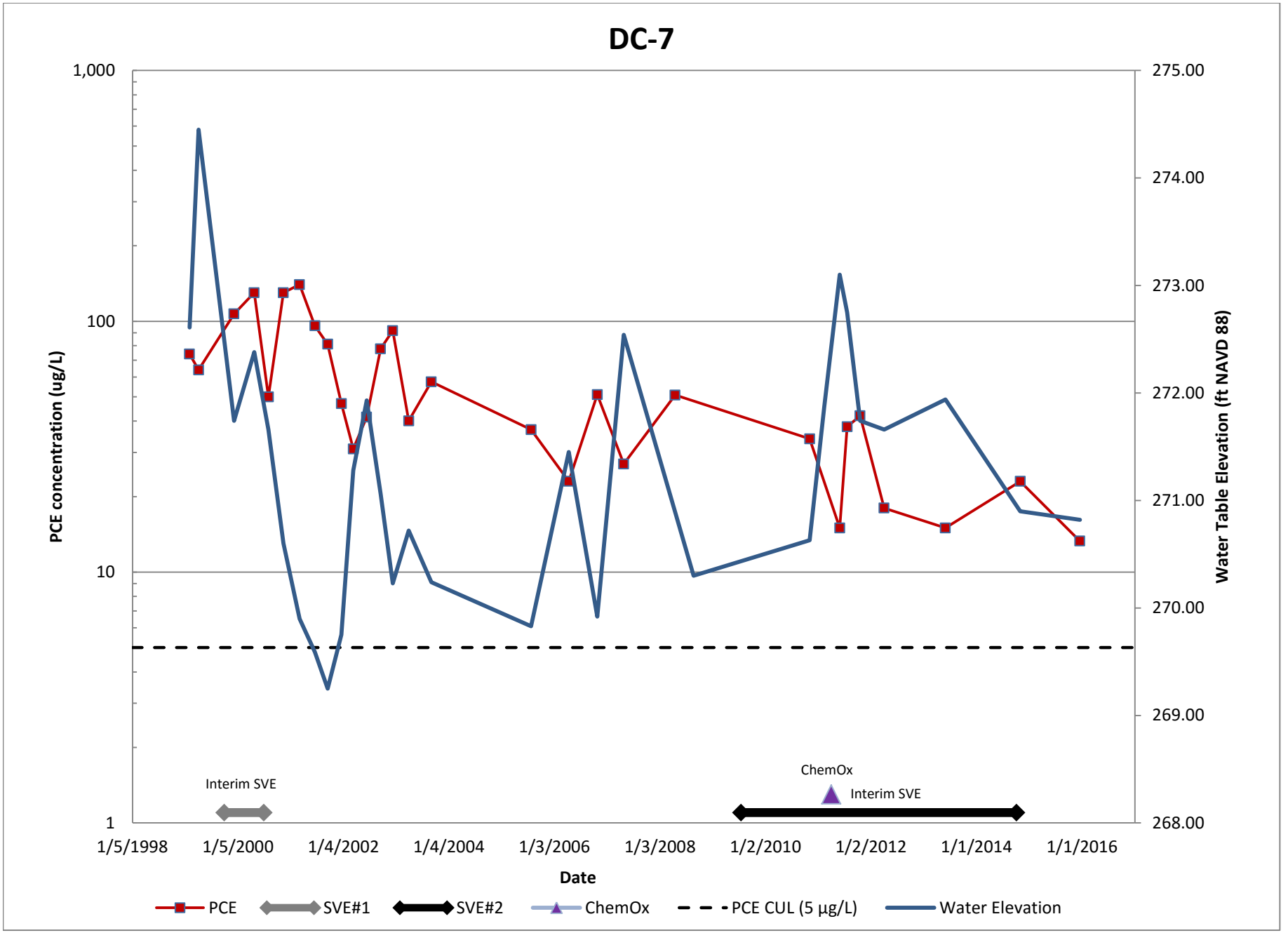
Monitoring Well	Date	PCE (µg/l)		Other VOCs detected (µg/l)
DC-16	4/25/2007	**0.42**		
	11/5/2010	2.0	U	
	5/31/2011	2.0	U	
	7/19/2011	2.0	U	
	10/18/2011	2.0	U	
	4/6/2012	2.0	U	
KMW-5D	4/25/2007	0.2	U	
	4/3/2012	2.0	U	

NOTES:

1. Tetrachloroethene (PCE) concentrations in migrograms per liter (µg/l).
2. Groundwater samples analyzed using USEPA Method 8260B.
3. U = concentration not detected at or above the laboratory practical quantitation limit (PQL).
4. Detected concentrations are shown in **bold.**
5. Concentrations exceeding the cleanup level are **bold and shaded**.
6. Other detected VOCs are below their respective cleanup level unless otherwise noted.
7. Shallow monitoring wells are screened at the top of the shallow aquifer, and deep monitoring wells are screened below and deeper within the shallow aquifer.
8. Review of historical results indicate that DC-17 was inadvertently sampled as DC-5 in 2010, 2011 and 2012. This table reports the 2010 - 2012 DC-17 data as DC-5.


DC-3
Note: results that were not detected at the MRL are shown as hollow points at the MRL
PCE concentration (ug/L)
1,000
100
10
1
Water Table Elevation (ft NAVD88)
277.00
276.00
275.00
274.00
273.00
272.00
271.00
270.00
269.00
1/5/1998
1/5/2000
1/4/2002
1/4/2004
1/3/2006
1/3/2008
1/2/2010
1/2/2012
1/1/2014
1/1/2016
Date
Interim SVE
ChemOx
Interim SVE
PCE
SVE#1
SVE#2
ChemOx
PCE CUL (5 µg/L)
Water Elevation


DC-4
Note: results that were not detected at the MRL are shown as hollow data points at the MRL
PCE concentration (ug/L)
1,000
100
10
1
Water Table Elevation (ft NAVD 88)
277.00
276.00
275.00
274.00
273.00
272.00
271.00
270.00
1/5/1998
1/5/2000
1/4/2002
1/4/2004
1/3/2006
1/3/2008
1/2/2010
1/2/2012
1/1/2014
1/1/2016
Date
Interim SVE
ChemOx
Interim SVE
PCE
SVE#1
SVE#2
ChemOx
PCE CUL (5 µg/L)
Water Elevation


DC-7
1,000
100
10
1
PCE concentration (ug/L)
275.00
274.00
273.00
272.00
271.00
270.00
269.00
268.00
Water Table Elevation (ft NAVD 88)
1/5/1998
1/5/2000
1/4/2002
1/4/2004
1/3/2006
1/3/2008
1/2/2010
1/2/2012
1/1/2014
1/1/2016
Date
Interim SVE
ChemOx
Interim SVE
PCE
SVE#1
SVE#2
ChemOx
PCE CUL (5 µg/L)
Water Elevation

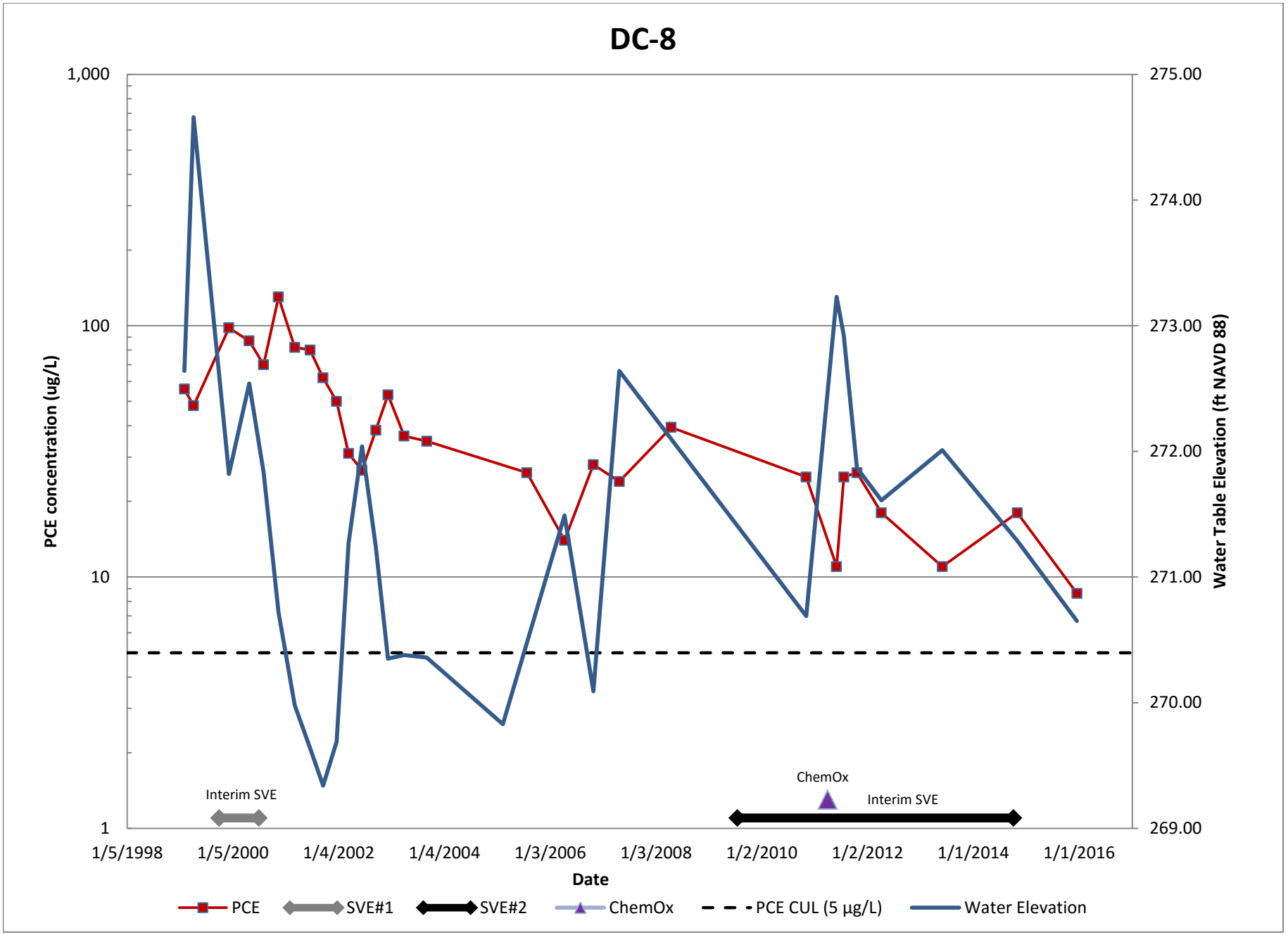

DC-8
1,000
100
10
1
PCE concentration (ug/L)
275.00
274.00
273.00
272.00
271.00
270.00
269.00
Water Table Elevation (ft NAVD 88)
1/5/1998
1/5/2000
1/4/2002
1/4/2004
1/3/2006
1/3/2008
1/2/2010
1/2/2012
1/1/2014
1/1/2016
Date
Interim SVE
ChemOx
Interim SVE
PCE
SVE#1
SVE#2
ChemOx
PCE CUL (5 µg/L)
Water Elevation

Table E-2

Historical Summary of Groundwater Elevations (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Location	Date	Well Casing Elevation (feet NAVD88)	Depth to Water (feet below well casing)	Water Level Elevation (feet NAVD88)
MW-01	12/10/1999	309.97	37.44	272.53
MW-01	2/9/2005	309.97	39.52	270.45
MW-01	4/11/2006	309.97	37.78	272.19
MW-01	10/26/2006	309.97	39.22	270.75
MW-01	4/24/2007	309.97	36.61	273.36
MW-01	8/21/2008	309.97	37.32	272.65
MW-02	12/10/1999	307.69	35.60	272.09
MW-02	11/5/2010	307.69	37.03	270.66
MW-02	2/11/2011	307.69	35.81	271.88
MW-02	5/30/2011	307.69	34.40	273.29
MW-02	7/19/2011	307.69	34.71	272.98
MW-02	10/17/2011	307.69	35.80	271.89
MW-02	4/2/2012	307.69	36.11	271.58
MW-02	5/28/2013	308.56	35.73	272.83
MW-02	4/14/2014	308.56	36.17	272.39
MW-02	10/21/2014	308.34	36.48	271.86
MW-02	12/11/2015	308.34	36.89	271.45
MW-03	8/21/2008	311.49	39.77	271.72
MW-03	11/5/2010	311.49	39.43	272.06
MW-03	2/11/2011	311.49	38.10	273.39
MW-03	5/30/2011	311.49	36.66	274.83
MW-03	7/19/2011	311.49	37.03	274.46
MW-03	10/17/2011	311.49	38.18	273.31
MW-03	4/2/2012	311.49	38.39	273.10
MW-03	5/28/2013	311.62	38.09	273.53
MW-03	10/21/2014	311.41	38.91	272.50
MW-03	12/9/2015	311.41	39.28	272.13
MW-04	11/5/2010	310.54	38.74	271.80
MW-04	2/11/2011	310.54	37.41	273.13
MW-04	5/30/2011	310.54	35.99	274.55
MW-04	7/19/2011	310.54	36.37	274.17
MW-04	10/17/2011	310.54	37.50	273.04
MW-04	4/2/2012	310.54	37.67	272.87
MW-04	5/28/2013	310.68	37.40	273.28
MW-04	10/21/2014	310.47	38.13	272.34
MW-04	12/9/2015	310.47	38.60	271.87

Table E-2

Historical Summary of Groundwater Elevations (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Location	Date	Well Casing Elevation (feet NAVD88)	Depth to Water (feet below well casing)	Water Level Elevation (feet NAVD88)
MW-05	8/21/2008	310.28	39.96	270.32
MW-05	11/5/2010	310.28	39.73	270.55
MW-05	2/11/2011	310.28	38.60	271.68
MW-05	5/30/2011	310.28	37.24	273.04
MW-05	7/19/2011	310.28	37.51	272.77
MW-05	10/17/2011	310.28	38.54	271.74
MW-05	4/2/2012	310.28	38.90	271.38
MW-05	10/21/2014	310.38	39.17	271.21
MW-05	12/9/2015	310.38	39.69	270.69
MW-06	8/21/2008	304.27	37.46	266.81
MW-06	11/5/2010	304.27	37.25	267.02
MW-06	2/11/2011	304.27	36.30	267.97
MW-06	5/30/2011	304.27	35.50	268.77
MW-06	7/19/2011	304.27	35.38	268.89
MW-06	10/17/2011	304.27	36.24	268.03
MW-06	4/2/2012	304.27	36.53	267.74
MW-06	10/21/2014	304.14	37.79	266.35
MW-06	12/9/2015	304.14	37.22	266.92
MW-07	8/21/2008	302.76	39.00	263.76
MW-07	11/5/2010	302.76	38.74	264.02
MW-07	2/11/2011	302.76	37.61	265.15
MW-07	5/30/2011	302.76	36.09	266.67
MW-07	7/19/2011	302.76	36.43	266.33
MW-07	10/17/2011	302.76	37.43	265.33
MW-07	4/2/2012	302.76	37.52	265.24
MW-07	5/28/2013	302.76	37.48	265.28
MW-07	10/30/2014	302.64	35.80	266.84
MW-07	12/9/2015	302.64	38.75	263.89
MW-08	8/21/2008	280.08	12.78	267.30
MW-08	2/11/2011	280.08	11.11	268.97
MW-08	5/30/2011	280.08	10.20	269.88
MW-08	7/19/2011	280.08	10.66	269.42
MW-08	10/17/2011	280.08	11.52	268.56
MW-08	4/2/2012	280.08	11.09	268.99
MW-08	10/21/2014	280.68	12.12	268.56
MW-08	12/9/2015	280.68	11.81	268.87

Table E-2

Historical Summary of Groundwater Elevations (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Location	Date	Well Casing Elevation (feet NAVD88)	Depth to Water (feet below well casing)	Water Level Elevation (feet NAVD88)
MW-09	8/21/2008	285.11	32.24	252.87
MW-09	11/5/2010	285.11	31.98	253.13
MW-09	2/11/2011	285.11	30.93	254.18
MW-09	5/30/2011	285.11	29.76	255.35
MW-09	7/19/2011	285.11	30.12	254.99
MW-09	10/17/2011	285.11	31.04	254.07
MW-09	4/2/2012	285.11	31.05	254.06
MW-09	10/21/2014	284.97	31.68	253.29
MW-09	12/9/2015	284.97	32.06	252.91
MW-10	2/11/2011	306.70	34.04	272.66
MW-10	5/30/2011	306.70	32.69	274.01
MW-10	7/19/2011	306.70	33.05	273.65
MW-10	10/17/2011	306.70	34.13	272.57
MW-10	4/2/2012	306.70	34.31	272.39
MW-10	5/28/2013	306.91	34.03	272.88
MW-10	10/21/2014	306.71	34.81	271.90
MW-10	12/9/2015	306.71	35.22	271.49
MW-11	2/11/2011	307.63	35.01	272.62
MW-11	5/30/2011	307.63	33.63	274.00
MW-11	7/19/2011	307.63	33.97	273.66
MW-11	10/17/2011	307.63	35.05	272.58
MW-11	4/2/2012	307.63	35.29	272.34
MW-11	5/28/2013	307.85	34.98	272.87
MW-11	10/21/2014	307.62	35.78	271.84
MW-11	12/9/2015	307.62	36.16	271.46
MW-12	4/2/2012	312.92	39.69	273.23
MW-12	5/28/2013	312.95	39.40	273.55
MW-12	10/21/2014	312.80	40.20	272.60
MW-12	12/9/2015	312.80	40.59	272.21
MW-13	4/2/2012	308.88	36.04	272.84
MW-13	5/28/2013	308.90	35.82	273.08
MW-13	10/21/2014	308.75	36.66	272.09
MW-13	12/9/2015	308.75	37.00	271.75

Table E-2

Historical Summary of Groundwater Elevations (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Location	Date	Well Casing Elevation (feet NAVD88)	Depth to Water (feet below well casing)	Water Level Elevation (feet NAVD88)
MW-14	4/2/2012	303.78	31.84	271.94
MW-14	5/28/2013	303.82	31.57	272.25
MW-14	10/21/2014	303.82	32.34	271.48
MW-14	12/11/2015	303.82	32.65	271.17
MW-15	4/2/2012	312.40	39.92	272.48
MW-15	5/28/2013	312.44	39.55	272.89
MW-15	4/14/2014	312.44	39.97	272.47
MW-15	10/21/2014	312.44	40.31	272.13
MW-15	12/9/2015	312.44	40.77	271.67
MW-16	5/28/2013	310.37	37.78	272.59
MW-16	10/21/2014	310.37	38.52	271.85
MW-16	12/9/2015	310.37	38.96	271.41

Table E-2

Historical Summary of Groundwater Elevations (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Location	Date	Well Casing Elevation (feet NAVD88)	Depth to Water (feet below well casing)	Water Level Elevation (feet NAVD88)
DC-01	2/3/1999	312.46	38.31	274.15
DC-01	4/16/1999	312.46	36.08	276.38
DC-01	12/8/1999	312.46	39.13	273.33
DC-01	4/26/2000	312.46	38.30	274.16
DC-01	8/3/2000	312.46	39.01	273.45
DC-01	11/14/2000	312.46	40.29	272.17
DC-01	3/6/2001	312.46	41.11	271.35
DC-01	6/20/2001	312.46	41.46	271.00
DC-01	9/17/2001	312.46	41.78	270.68
DC-01	12/20/2001	312.46	41.43	271.03
DC-01	3/13/2002	312.46	39.75	272.71
DC-01	9/17/2002	312.46	39.75	272.71
DC-01	12/10/2002	312.46	40.69	271.77
DC-01	3/31/2003	312.46	40.33	272.13
DC-01	9/3/2003	312.46	40.69	271.77
DC-01	3/16/2004	312.46	39.77	272.69
DC-01	9/7/2004	312.46	40.57	271.89
DC-01	2/9/2005	312.46	41.31	271.15
DC-01	4/24/2007	312.46	38.29	274.17
DC-01	8/21/2008	312.72	40.93	271.79
DC-01	11/5/2010	312.72	40.64	272.08
DC-01	2/11/2011	312.72	39.37	273.35
DC-01	5/30/2011	312.72	37.91	274.81
DC-01	7/19/2011	312.72	38.21	274.51
DC-01	10/17/2011	312.72	39.37	273.35
DC-01	4/2/2012	312.72	39.72	273.00
DC-01	5/28/2013	312.82	39.30	273.52
DC-01	10/21/2014	312.82	40.05	272.77
DC-01	12/9/2015	312.82	40.51	272.31

Table E-2

Historical Summary of Groundwater Elevations (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Location	Date	Well Casing Elevation (feet NAVD88)	Depth to Water (feet below well casing)	Water Level Elevation (feet NAVD88)
DC-02	2/3/1999	312.80	39.04	273.76
DC-02	4/16/1999	312.80	36.90	275.90
DC-02	12/8/1999	312.80	39.88	272.92
DC-02	4/26/2000	312.80	39.11	273.69
DC-02	8/3/2000	312.80	39.85	272.95
DC-02	11/14/2000	312.80	41.04	271.76
DC-02	3/6/2001	312.80	41.82	270.98
DC-02	6/20/2001	312.80	42.18	270.62
DC-02	9/17/2001	312.80	42.50	270.30
DC-02	12/20/2001	312.80	42.12	270.68
DC-02	3/13/2002	312.80	40.45	272.35
DC-02	6/13/2002	312.80	39.64	273.16
DC-02	9/17/2002	312.80	40.50	272.30
DC-02	12/10/2002	312.80	41.42	271.38
DC-02	3/31/2003	312.80	41.03	271.77
DC-02	9/3/2003	312.80	41.41	271.39
DC-02	3/16/2004	312.80	40.51	272.29
DC-02	9/7/2004	312.80	41.30	271.50
DC-02	2/9/2005	312.80	41.99	270.81
DC-02	4/24/2007	312.80	39.03	273.77
DC-02	8/21/2008	313.04	41.65	271.39
DC-02	11/5/2010	313.04	41.34	271.70
DC-02	2/11/2011	313.04	40.08	272.96
DC-02	5/30/2011	313.04	38.67	274.37
DC-02	7/19/2011	313.04	38.98	274.06
DC-02	10/17/2011	313.04	40.08	272.96
DC-02	4/2/2012	313.04	40.41	272.63
DC-02	10/21/2014	312.92	40.78	272.14
DC-02	12/9/2015	312.92	41.22	271.70

Table E-2

Historical Summary of Groundwater Elevations (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Location	Date	Well Casing Elevation (feet NAVD88)	Depth to Water (feet below well casing)	Water Level Elevation (feet NAVD88)
DC-03	10/21/1998	312.98	39.68	273.30
DC-03	2/3/1999	312.98	39.22	273.76
DC-03	4/16/1999	312.98	37.13	275.85
DC-03	12/8/1999	312.98	40.10	272.88
DC-03	4/26/2000	312.98	39.33	273.65
DC-03	8/3/2000	312.98	40.08	272.90
DC-03	11/14/2000	312.98	41.27	271.71
DC-03	3/6/2001	312.98	42.05	270.93
DC-03	6/20/2001	312.98	42.37	270.61
DC-03	9/17/2001	312.98	42.73	270.25
DC-03	12/20/2001	312.98	42.30	270.68
DC-03	3/13/2002	312.98	40.66	272.32
DC-03	6/13/2002	312.98	39.87	273.11
DC-03	9/17/2002	312.98	40.75	272.23
DC-03	12/10/2002	312.98	41.65	271.33
DC-03	3/31/2003	312.98	41.25	271.73
DC-03	9/3/2003	312.98	41.65	271.33
DC-03	3/16/2004	312.98	40.71	272.27
DC-03	9/7/2004	312.98	41.54	271.44
DC-03	2/9/2005	312.98	42.21	270.77
DC-03	4/24/2007	312.98	39.26	273.72
DC-03	8/21/2008	313.23	41.89	271.34
DC-03	11/5/2010	313.23	41.58	271.65
DC-03	2/11/2011	313.23	40.30	272.93
DC-03	5/30/2011	313.23	38.89	274.34
DC-03	7/19/2011	313.23	39.22	274.01
DC-03	10/17/2011	313.23	40.34	272.89
DC-03	4/2/2012	313.23	40.62	272.61
DC-03	10/21/2014	313.11	41.07	272.04
DC-03	12/9/2015	313.11	41.47	271.64

Table E-2

Historical Summary of Groundwater Elevations (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Location	Date	Well Casing Elevation (feet NAVD88)	Depth to Water (feet below well casing)	Water Level Elevation (feet NAVD88)
DC-04	10/21/1998	312.20	39.96	272.24
DC-04	2/3/1999	312.20	38.37	273.83
DC-04	4/16/1999	312.20	36.34	275.86
DC-04	12/8/1999	312.20	39.32	272.88
DC-04	4/26/2000	312.20	38.55	273.65
DC-04	8/3/2000	312.20	39.33	272.87
DC-04	11/14/2000	312.20	40.52	271.68
DC-04	3/6/2001	312.20	41.29	270.91
DC-04	6/20/2001	312.20	41.60	270.60
DC-04	9/17/2001	312.20	41.89	270.31
DC-04	12/20/2001	312.20	41.49	270.71
DC-04	3/13/2002	312.20	39.86	272.34
DC-04	6/13/2002	312.20	39.11	273.09
DC-04	9/17/2002	312.20	40.00	272.20
DC-04	12/10/2002	312.20	40.92	271.28
DC-04	3/31/2003	312.20	40.44	271.76
DC-04	9/3/2003	312.20	40.88	271.32
DC-04	3/16/2004	312.20	39.94	272.26
DC-04	9/7/2004	312.20	40.81	271.39
DC-04	2/9/2005	312.20	41.42	270.78
DC-04	4/24/2007	312.20	38.50	273.70
DC-04	8/21/2008	312.12	41.13	270.99
DC-04	11/5/2010	312.12	40.81	271.31
DC-04	2/11/2011	312.12	39.51	272.61
DC-04	5/30/2011	312.12	38.13	273.99
DC-04	7/19/2011	312.12	38.48	273.64
DC-04	10/17/2011	312.12	39.57	272.55
DC-04	4/2/2012	312.12	38.82	273.30
DC-04	5/28/2013	312.56	39.50	273.06
DC-04	10/21/2014	312.35	40.34	272.01
DC-04	12/9/2015	312.35	40.34	272.01

Table E-2

Historical Summary of Groundwater Elevations (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Location	Date	Well Casing Elevation (feet NAVD88)	Depth to Water (feet below well casing)	Water Level Elevation (feet NAVD88)
DC-05	2/3/1999	305.86	32.48	273.38
DC-05	4/16/1999	305.86	30.46	275.40
DC-05	4/11/2006	305.86	33.74	272.12
DC-05	4/24/2007	306.10	32.56	273.54
DC-05	8/21/2008	306.10	35.15	270.95
DC-05	11/5/2010	306.10	34.86	271.24
DC-05	2/11/2011	306.10	33.59	272.51
DC-05	5/30/2011	306.10	32.23	273.87
DC-05	7/19/2011	306.10	32.58	273.52
DC-05	10/17/2011	306.10	33.65	272.45
DC-05	4/2/2012	306.10	33.86	272.24
DC-05	5/28/2013	306.25	33.60	272.65
DC-06	2/3/1999	308.46	35.03	273.43
DC-06	4/16/1999	308.46	32.92	275.54

Table E-2

Historical Summary of Groundwater Elevations (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Location	Date	Well Casing Elevation (feet NAVD88)	Depth to Water (feet below well casing)	Water Level Elevation (feet NAVD88)
DC-07	2/3/1999	302.50	29.89	272.61
DC-07	4/16/1999	302.50	28.05	274.45
DC-07	12/8/1999	302.50	30.76	271.74
DC-07	4/26/2000	302.50	30.12	272.38
DC-07	8/3/2000	302.50	30.84	271.66
DC-07	11/14/2000	302.50	31.90	270.60
DC-07	3/6/2001	302.50	32.60	269.90
DC-07	6/20/2001	302.50	32.91	269.59
DC-07	9/17/2001	302.50	33.25	269.25
DC-07	12/20/2001	302.50	32.75	269.75
DC-07	3/13/2002	302.50	31.22	271.28
DC-07	6/13/2002	302.50	30.57	271.93
DC-07	9/17/2002	302.50	31.44	271.06
DC-07	12/10/2002	302.50	32.27	270.23
DC-07	3/31/2003	302.50	31.78	270.72
DC-07	9/3/2003	302.50	32.26	270.24
DC-07	2/9/2005	302.50	32.67	269.83
DC-07	4/11/2006	302.50	31.05	271.45
DC-07	10/26/2006	302.50	32.58	269.92
DC-07	4/24/2007	302.50	29.96	272.54
DC-07	8/21/2008	302.78	32.48	270.30
DC-07	11/5/2010	302.78	32.15	270.63
DC-07	2/11/2011	302.78	30.91	271.87
DC-07	5/30/2011	302.78	29.68	273.10
DC-07	7/19/2011	302.78	30.03	272.75
DC-07	10/17/2011	302.78	31.04	271.74
DC-07	4/2/2012	302.78	31.12	271.66
DC-07	5/28/2013	302.88	30.94	271.94
DC-07	10/21/2014	302.61	31.71	270.90
DC-07	12/16/2015	302.61	31.79	270.82

Table E-2

Historical Summary of Groundwater Elevations (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Location	Date	Well Casing Elevation (feet NAVD88)	Depth to Water (feet below well casing)	Water Level Elevation (feet NAVD88)
DC-08	2/3/1999	306.09	33.45	272.64
DC-08	4/16/1999	306.09	31.43	274.66
DC-08	12/8/1999	306.09	34.27	271.82
DC-08	4/26/2000	306.09	33.55	272.54
DC-08	8/3/2000	306.09	34.26	271.83
DC-08	11/14/2000	306.09	35.37	270.72
DC-08	3/6/2001	306.09	36.11	269.98
DC-08	6/20/2001	306.09	36.45	269.64
DC-08	9/17/2001	306.09	36.75	269.34
DC-08	12/20/2001	306.09	36.40	269.69
DC-08	3/13/2002	306.09	34.82	271.27
DC-08	6/13/2002	306.09	34.05	272.04
DC-08	9/17/2002	306.09	34.85	271.24
DC-08	12/10/2002	306.09	35.74	270.35
DC-08	3/31/2003	306.09	35.71	270.38
DC-08	9/3/2003	306.09	35.73	270.36
DC-08	2/9/2005	306.09	36.26	269.83
DC-08	4/11/2006	306.09	34.60	271.49
DC-08	10/26/2006	306.09	36.00	270.09
DC-08	4/24/2007	306.11	33.47	272.64
DC-08	11/5/2010	306.38	35.69	270.69
DC-08	2/11/2011	306.38	34.49	271.89
DC-08	5/30/2011	306.38	33.15	273.23
DC-08	7/19/2011	306.38	33.46	272.92
DC-08	10/17/2011	306.38	34.51	271.87
DC-08	4/2/2012	306.38	34.77	271.61
DC-08	5/28/2013	306.46	34.45	272.01
DC-08	10/21/2014	306.46	35.17	271.29
DC-08	12/9/2015	306.23	35.58	270.65
DC-09A	4/16/1999	307.76	32.19	275.57
DC-09A	12/8/1999	307.76	35.03	272.73
DC-09A	4/26/2000	307.76	34.35	273.41
DC-09A	8/3/2000	307.76	35.11	272.65
DC-09A	11/14/2000	307.76	36.30	271.46
DC-09A	4/11/2006	307.76	35.45	272.31
DC-09A	8/8/2006	307.76	36.25	271.51
DC-09A	11/2/2006	307.76	36.90	270.86
DC-09A	4/24/2007	307.75	34.30	273.45
DC-09A	8/21/2008	308.02	36.92	271.10

Table E-2

Historical Summary of Groundwater Elevations (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Location	Date	Well Casing Elevation (feet NAVD88)	Depth to Water (feet below well casing)	Water Level Elevation (feet NAVD88)
DC-09B	4/16/1999	307.91	32.34	275.57
DC-09B	3/6/2001	307.91	37.22	270.69
DC-09B	6/20/2001	307.91	37.52	270.39
DC-09B	9/17/2001	307.91	37.87	270.04
DC-09B	12/20/2001	307.91	37.45	270.46
DC-09B	4/11/2006	307.91	35.65	272.26
DC-09B	8/8/2006	307.91	36.40	271.51
DC-09B	10/26/2006	307.91	37.15	270.76
DC-09B	4/24/2007	307.94	34.45	273.49
DC-09B	8/21/2008	308.16	37.05	271.11
DC-10A	4/16/1999	307.59	31.85	275.74
DC-10A	12/8/1999	307.59	34.82	272.77
DC-10A	4/26/2000	307.59	34.05	273.54
DC-10A	8/3/2000	307.59	34.86	272.73
DC-10A	11/14/2000	307.59	36.05	271.54
DC-10A	2/11/2011	307.72	34.99	272.73
DC-10A	5/30/2011	307.72	33.65	274.07
DC-10A	7/19/2011	307.72	34.07	273.65
DC-10A	10/17/2011	307.72	35.12	272.60
DC-10A	4/2/2012	307.72	35.23	272.49
DC-10A	5/28/2013	307.93	35.04	272.89
DC-10A	10/21/2014	307.73	35.83	271.90
DC-10A	12/9/2015	307.73	36.19	271.54
DC-10B	4/16/1999	307.66	31.92	275.74
DC-10B	3/6/2001	307.66	36.89	270.77
DC-10B	6/20/2001	307.66	37.46	270.20
DC-10B	9/17/2001	307.66	37.55	270.11
DC-10B	12/20/2001	307.66	37.03	270.63
DC-10B	2/9/2005	307.66	36.98	270.68
DC-10B	4/11/2006	307.66	35.24	272.42
DC-10B	4/24/2007	307.66	34.08	273.58
DC-10B	8/21/2008	307.89	36.74	271.15
DC-10B	11/5/2010	307.89	36.40	271.49
DC-10B	2/11/2011	307.89	35.06	272.83
DC-10B	5/30/2011	307.89	33.72	274.17
DC-10B	7/19/2011	307.89	34.09	273.80
DC-10B	10/17/2011	307.89	35.15	272.74
DC-10B	4/2/2012	307.89	35.34	272.55

Table E-2

Historical Summary of Groundwater Elevations (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Location	Date	Well Casing Elevation (feet NAVD88)	Depth to Water (feet below well casing)	Water Level Elevation (feet NAVD88)
DC-11	4/24/2007	311.02	37.29	273.73
DC-11	11/5/2010	311.02	39.59	271.43
DC-11	2/11/2011	311.02	38.36	272.66
DC-11	5/30/2011	311.02	36.91	274.11
DC-11	4/2/2012	311.02	38.67	272.35
DC-11	4/14/2014	311.25	38.73	272.52
DC-11	10/21/2014	311.25	39.00	272.25
DC-11	12/9/2015	311.25	39.48	271.77
DC-12	4/24/2007	310.90	37.54	273.36
DC-12	8/21/2008	310.90	40.05	270.85
DC-12	11/5/2010	310.90	39.79	271.11
DC-12	2/11/2011	310.90	38.60	272.30
DC-12	5/30/2011	310.90	37.17	273.73
DC-12	7/19/2011	310.90	37.45	273.45
DC-12	10/17/2011	310.90	38.54	272.36
DC-12	4/2/2012	310.90	38.91	271.99
DC-12	5/28/2013	311.25	38.50	272.75
DC-12	4/14/2014	311.25	38.93	272.32
DC-12	10/27/2014	311.25	39.23	272.02
DC-12	12/9/2015	311.25	39.70	271.55
DC-13	4/24/2007	310.85	36.64	274.21
DC-13	8/21/2008	310.85	39.13	271.72
DC-13	11/5/2010	310.85	38.88	271.97
DC-13	2/11/2011	310.85	37.68	273.17
DC-13	5/30/2011	310.85	36.28	274.57
DC-13	7/19/2011	310.85	36.57	274.28
DC-13	10/17/2011	310.85	37.65	273.20
DC-13	4/2/2012	310.85	38.01	272.84
DC-13	5/28/2013	310.20	37.61	272.59
DC-13	4/14/2014	310.20	38.02	272.18
DC-13	10/27/2014	310.20	38.37	271.83
DC-13	12/9/2015	310.20	38.37	271.83

Table E-2

Historical Summary of Groundwater Elevations (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Location	Date	Well Casing Elevation (feet NAVD88)	Depth to Water (feet below well casing)	Water Level Elevation (feet NAVD88)
DC-14	4/24/2007	308.60	36.15	272.45
DC-14	8/21/2008	308.60	38.59	270.01
DC-14	11/5/2010	308.60	38.34	270.26
DC-14	2/11/2011	308.60	37.18	271.42
DC-14	5/30/2011	308.60	35.83	272.77
DC-14	7/19/2011	308.60	36.12	272.48
DC-14	10/17/2011	308.60	37.14	271.46
DC-14	4/2/2012	308.60	37.49	271.11
DC-14	5/28/2013	308.94	37.10	271.84
DC-14	10/21/2014	308.94	37.77	271.17
DC-14	12/9/2015	308.94	38.23	270.71
DC-15	4/24/2007	307.54	34.64	272.90
DC-15	11/5/2010	307.54	36.93	270.61
DC-15	2/11/2011	307.54	35.68	271.86
DC-15	5/30/2011	307.54	34.32	273.22
DC-15	7/19/2011	307.54	34.62	272.92
DC-15	10/17/2011	307.54	35.68	271.86
DC-15	4/2/2012	307.54	35.94	271.60
DC-15	5/28/2013	307.89	35.61	272.28
DC-15	4/14/2014	307.89	36.02	271.87
DC-15	10/21/2014	307.89	36.35	271.54
DC-15	12/9/2015	307.89	36.79	271.10
DC-16	4/24/2007	307.12	33.81	273.31
DC-16	8/21/2008	307.12	36.41	270.71
DC-16	11/5/2010	307.12	36.10	271.02
DC-16	2/11/2011	307.12	34.85	272.27
DC-16	5/30/2011	307.12	33.48	273.64
DC-16	7/19/2011	307.12	33.83	273.29
DC-16	10/17/2011	307.12	34.91	272.21
DC-16	4/2/2012	307.12	35.14	271.98
DC-17	4/24/2007	304.89	31.65	273.24
DC-17	5/28/2013	305.16	32.65	272.51
DC-17	10/21/2014	305.16	33.44	271.72
DC-17	12/16/2015	305.16	33.58	271.58
DC-18	4/24/2007	309.37	36.10	273.27
DC-18	5/28/2013	309.64	37.05	272.59
DC-18	10/21/2014	309.51	37.81	271.70
DC-18	12/9/2015	309.51	38.26	271.25

Table E-2

Historical Summary of Groundwater Elevations (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Location	Date	Well Casing Elevation (feet NAVD88)	Depth to Water (feet below well casing)	Water Level Elevation (feet NAVD88)
DC-19	8/21/2008	313.53	42.02	271.51
DC-19	11/5/2010	313.53	41.75	271.78
DC-19	2/11/2011	313.53	40.52	273.01
DC-19	5/30/2011	313.53	39.06	274.47
DC-19	7/19/2011	313.53	39.36	274.17
DC-19	10/17/2011	313.53	40.47	273.06
DC-19	4/2/2012	313.53	40.85	272.68
DC-19	5/28/2013	313.62	40.40	273.22
DC-19	12/9/2015	313.62	41.66	271.96
DC-20	5/28/2013	310.92	38.42	272.50
DC-20	4/14/2014	310.92	38.86	272.06
DC-20	10/21/2014	310.92	39.12	271.80
DC-20	12/15/2015	310.92	39.44	271.48
KMW-01	4/24/2007	311.21	38.15	273.06
KMW-01	8/21/2008	311.21	40.60	270.61
KMW-01	11/5/2010	311.21	40.37	270.84
KMW-01	2/11/2011	311.21	39.19	272.02
KMW-01	5/30/2011	311.21	37.79	273.42
KMW-01	7/19/2011	311.21	38.06	273.15
KMW-01	10/17/2011	311.21	39.13	272.08
KMW-01	4/2/2012	311.21	39.50	271.71
KMW-01	5/28/2013	311.59	39.08	272.51
KMW-01	10/21/2014	311.59	39.81	271.78
KMW-01	12/9/2015	311.59	40.29	271.30
KMW-02	4/24/2007	306.90	33.33	273.57
KMW-02	8/21/2008	306.90	35.96	270.94
KMW-02	11/5/2010	306.90	34.59	272.31
KMW-02	2/11/2011	306.90	34.32	272.58
KMW-02	5/30/2011	306.90	32.96	273.94
KMW-02	7/19/2011	306.90	33.30	273.60
KMW-02	10/17/2011	306.90	34.39	272.51
KMW-02	4/2/2012	306.90	34.59	272.31
KMW-02	5/28/2013	307.25	34.30	272.95
KMW-02	10/21/2014	307.04	35.14	271.90
KMW-02	12/9/2015	307.04	35.51	271.53

Table E-2

Historical Summary of Groundwater Elevations (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Location	Date	Well Casing Elevation (feet NAVD88)	Depth to Water (feet below well casing)	Water Level Elevation (feet NAVD88)
KMW-03	4/24/2007	296.92	24.51	272.41
KMW-03	8/21/2008	296.92	27.01	269.91
KMW-03	11/5/2010	296.92	26.37	270.55
KMW-03	5/30/2011	296.92	24.22	272.70
KMW-03	7/19/2011	296.92	24.61	272.31
KMW-03	10/17/2011	296.92	25.58	271.34
KMW-03	4/2/2012	296.92	25.59	271.33
KMW-03	10/21/2014	296.92	26.25	270.67
KMW-04	4/24/2007	299.45	25.95	273.50
KMW-04	8/21/2008	299.45	28.62	270.83
KMW-04	11/5/2010	299.45	28.22	271.23
KMW-04	2/11/2011	299.45	26.87	272.58
KMW-04	5/30/2011	299.45	25.59	273.86
KMW-04	7/19/2011	299.45	25.99	273.46
KMW-04	10/17/2011	299.45	27.07	272.38
KMW-04	4/2/2012	299.45	27.10	272.35
KMW-04	10/21/2014	299.57	27.80	271.77
KMW-04	12/9/2015	299.57	28.08	271.49
KMW-05	4/24/2007	297.10	24.32	272.78
KMW-05	8/21/2008	297.10	26.85	270.25
KMW-05	11/5/2010	297.10	26.49	270.61
KMW-05	2/11/2011	297.10	25.21	271.89
KMW-05	5/30/2011	297.10	24.00	273.10
KMW-05	7/19/2011	297.10	24.41	272.69
KMW-05	10/17/2011	297.10	25.41	271.69
KMW-05	4/2/2012	297.10	25.37	271.73
KMW-05	5/28/2013	297.10	25.30	271.80
KMW-05	10/21/2014	297.10	26.09	271.01
KMW-05	12/9/2015	297.10	26.30	270.80
KMW-05D	4/24/2007	296.94	24.19	272.75
KMW-05D	8/21/2008	296.94	26.72	270.22
KMW-05D	11/5/2010	296.94	26.35	270.59
KMW-05D	2/11/2011	296.94	25.10	271.84
KMW-05D	5/30/2011	296.94	23.89	273.05
KMW-05D	7/19/2011	296.94	24.28	272.66
KMW-05D	10/17/2011	296.94	25.28	271.66
KMW-05D	4/2/2012	296.94	25.19	271.75

Table E-2

Historical Summary of Groundwater Elevations (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Location	Date	Well Casing Elevation (feet NAVD88)	Depth to Water (feet below well casing)	Water Level Elevation (feet NAVD88)
KMW-06	4/24/2007	294.70	22.40	272.30
KMW-06	8/21/2008	294.70	24.90	269.80
KMW-06	11/5/2010	294.70	24.51	270.19
KMW-06	2/11/2011	294.70	23.26	271.44
KMW-06	5/30/2011	294.70	22.12	272.58
KMW-06	7/19/2011	294.70	22.52	272.18
KMW-06	10/17/2011	294.70	23.48	271.22
KMW-06	4/2/2012	294.70	23.39	271.31
KMW-06	10/21/2014	294.81	21.05	273.76
KMW-06	12/9/2015	294.81	24.31	270.50
KMW-07	4/24/2007	301.32	29.22	272.10
KMW-07	8/21/2008	301.32	31.65	269.67
KMW-07	11/5/2010	301.32	31.36	269.96
KMW-07	2/11/2011	301.32	30.14	271.18
KMW-07	5/30/2011	301.32	28.92	272.40
KMW-07	7/19/2011	301.32	29.27	272.05
KMW-07	10/17/2011	301.32	30.25	271.07
KMW-07	4/2/2012	301.32	30.35	270.97
KMW-07	10/21/2014	301.43	30.88	270.55
KMW-07	12/15/2015	301.43	31.03	270.40
KMW-08	4/24/2007	308.08	35.73	272.35
KMW-08	8/21/2008	308.08	38.14	269.94
KMW-08	11/5/2010	308.08	37.87	270.21
KMW-08	2/11/2011	308.08	36.72	271.36
KMW-08	5/30/2011	308.08	35.40	272.68
KMW-08	7/19/2011	308.08	35.68	272.40
KMW-08	10/17/2011	308.08	36.71	271.37
KMW-08	4/2/2012	308.08	37.02	271.06
KMW-08	10/21/2014	308.15	37.34	270.81
KMW-08	12/9/2015	308.15	37.76	270.39
KMW-09	4/24/2007	310.18	36.49	273.69
KMW-09	11/5/2010	310.18	38.78	271.40
KMW-09	2/11/2011	310.18	37.51	272.67
KMW-09	5/30/2011	310.18	36.11	274.07
KMW-09	7/19/2011	310.18	36.49	273.69
KMW-09	10/17/2011	310.18	37.51	272.67
KMW-09	4/2/2012	310.18	37.84	272.34
KMW-09	4/14/2014	310.53	37.91	272.62
KMW-09	10/21/2014	310.33	38.24	272.09
KMW-09	12/9/2015	310.33	38.71	271.62

Table E-2

Historical Summary of Groundwater Elevations (1999 - 2015)
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

Location	Date	Well Casing Elevation (feet NAVD88)	Depth to Water (feet below well casing)	Water Level Elevation (feet NAVD88)

NOTES:

1. '-- = not measured or not applicable.
2. Well monument types: flush grade monuments and above ground (AG) monuments.
3. Depth to water is measured from top of well casing.
4. Elevations are reported relative to North American Vertical Datum of 1988 (NAVD 88).
5. Top of casing (TOC) elevations were surveyed by D.R. Strong Consulting Engineers, Inc. in February and May 2013 and by Lanktree Land Surveying, Inc. in July 2015.

APPENDIX F

TERRESTRIAL ECOLOGICAL EVALUATION FORM

DEPARTMENT OF ECOLOGY
State of Washington

Voluntary Cleanup Program

Washington State Department of Ecology
Toxics Cleanup Program

TERRESTRIAL ECOLOGICAL EVALUATION FORM

Under the Model Toxics Control Act (MTCA), a terrestrial ecological evaluation is necessary if hazardous substances are released into the soils at a Site. In the event of such a release, you must take one of the following three actions as part of your investigation and cleanup of the Site:

1. Document an exclusion from further evaluation using the criteria in WAC 173-340-7491.
2. Conduct a simplified evaluation as set forth in WAC 173-340-7492.
3. Conduct a site-specific evaluation as set forth in WAC 173-340-7493.

When requesting a written opinion under the Voluntary Cleanup Program (VCP), you must complete this form and submit it to the Department of Ecology (Ecology). The form documents the type and results of your evaluation.

Completion of this form is not sufficient to document your evaluation. You still need to document your analysis and the basis for your conclusion in your cleanup plan or report.

If you have questions about how to conduct a terrestrial ecological evaluation, please contact the Ecology site manager assigned to your Site. For additional guidance, please refer to www.ecy.wa.gov/programs/tcp/policies/terrestrial/TEEHome.htm.

Step 1: IDENTIFY HAZARDOUS WASTE SITE

Please identify below the hazardous waste site for which you are documenting an evaluation.	
Facility/Site Name: Normandy Park PCE	
Facility/Site Address: 17817-17825 & 17835 1st Ave S	
Facility/Site No: 4181060	VCP Project No.: NW1873

Step 2: IDENTIFY EVALUATOR

Please identify below the person who conducted the evaluation and their contact information.		
Name: Matthew Dahl		Title: Senior Engineer
Organization: PES Environmental, Inc.		
Mailing address: 1215 Fourth Avenue, Suite 1350		
City: Seattle	State: WA	Zip code: 98161
Phone: (206)529-3980	Fax: (206)529-3985	E-mail: mdahl@pesenv.com

ECY 090-300 (07/2015) To request ADA accommodation including materials in a format for the visually impaired, call Ecology Toxic Cleanup Program 360-407-7170. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.

Step 3: DOCUMENT EVALUATION TYPE AND RESULTS

A. Exclusion from further evaluation.

1. Does the Site qualify for an exclusion from further evaluation?

☐ Yes *If you answered **"YES,"** then answer **Question 2**.*

☒ No or Unknown *If you answered **"NO" or "UKNOWN,"** then skip to **Step 3B** of this form.*

2. What is the basis for the exclusion? *Check all that apply. Then skip to **Step 4** of this form.*

Point of Compliance: WAC 173-340-7491(1)(a)

☐ All soil contamination is, or will be,* at least 15 feet below the surface.

☐ All soil contamination is, or will be,* at least 6 feet below the surface (or alternative depth if approved by Ecology), and institutional controls are used to manage remaining contamination.

Barriers to Exposure: WAC 173-340-7491(1)(b)

☐ All contaminated soil, is or will be,* covered by physical barriers (such as buildings or paved roads) that prevent exposure to plants and wildlife, and institutional controls are used to manage remaining contamination.

Undeveloped Land: WAC 173-340-7491(1)(c)

☐ There is less than 0.25 acres of contiguous# undeveloped± land on or within 500 feet of any area of the Site and any of the following chemicals is present: chlorinated dioxins or furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, heptachlor epoxide, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, or pentachlorobenzene.

☐ For sites not containing any of the chemicals mentioned above, there is less than 1.5 acres of contiguous# undeveloped± land on or within 500 feet of any area of the Site.

Background Concentrations: WAC 173-340-7491(1)(d)

☐ Concentrations of hazardous substances in soil do not exceed natural background levels as described in WAC 173-340-200 and 173-340-709.

* An exclusion based on future land use must have a completion date for future development that is acceptable to Ecology.

± "Undeveloped land" is land that is not covered by building, roads, paved areas, or other barriers that would prevent wildlife from feeding on plants, earthworms, insects, or other food in or on the soil.

"Contiguous" undeveloped land is an area of undeveloped land that is not divided into smaller areas of highways, extensive paving, or similar structures that are likely to reduce the potential use of the overall area by wildlife.

ECY 090-300 (07/2015) To request ADA accommodation including materials in a format for the visually impaired, call Ecology Toxic Cleanup Program 360-407-7170. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.

B. Simplified evaluation.

1. Does the Site qualify for a simplified evaluation?

- [x] Yes — *If you answered **"YES,"** then answer **Question 2** below.*
- [ ] No or Unknown — *If you answered **"NO"** or **"UNKNOWN,"** then skip to **Step 3C** of this form.*

2. Did you conduct a simplified evaluation?

- [x] Yes — *If you answered **"YES,"** then answer **Question 3** below.*
- [ ] No — *If you answered **"NO,"** then skip to **Step 3C** of this form.*

3. Was further evaluation necessary?

- [ ] Yes — *If you answered **"YES,"** then answer **Question 4** below.*
- [x] No — *If you answered **"NO,"** then answer **Question 5** below.*

4. If further evaluation was necessary, what did you do?

- [ ] Used the concentrations listed in Table 749-2 as cleanup levels. *If so, then skip to **Step 4** of this form.*
- [ ] Conducted a site-specific evaluation. *If so, then skip to **Step 3C** of this form.*

5. If no further evaluation was necessary, what was the reason? *Check all that apply. Then skip to **Step 4** of this form.*

Exposure Analysis: WAC 173-340-7492(2)(a)

- [ ] Area of soil contamination at the Site is not more than 350 square feet.
- [ ] Current or planned land use makes wildlife exposure unlikely. Used Table 749-1.

Pathway Analysis: WAC 173-340-7492(2)(b)

- [ ] No potential exposure pathways from soil contamination to ecological receptors.

Contaminant Analysis: WAC 173-340-7492(2)(c)

- [x] No contaminant listed in Table 749-2 is, or will be, present in the upper 15 feet at concentrations that exceed the values listed in Table 749-2.
- [ ] No contaminant listed in Table 749-2 is, or will be, present in the upper 6 feet (or alternative depth if approved by Ecology) at concentrations that exceed the values listed in Table 749-2, and institutional controls are used to manage remaining contamination.
- [ ] No contaminant listed in Table 749-2 is, or will be, present in the upper 15 feet at concentrations likely to be toxic or have the potential to bioaccumulate as determined using Ecology-approved bioassays.
- [ ] No contaminant listed in Table 749-2 is, or will be, present in the upper 6 feet (or alternative depth if approved by Ecology) at concentrations likely to be toxic or have the potential to bioaccumulate as determined using Ecology-approved bioassays, and institutional controls are used to manage remaining contamination.

C. Site-specific evaluation. A site-specific evaluation process consists of two parts: (1) formulating the problem, and (2) selecting the methods for addressing the identified problem. Both steps require consultation with and approval by Ecology. *See* WAC 173-340-7493(1)(c).

1. Was there a problem? *See* WAC 173-340-7493(2).

☐ Yes *If you answered **"YES,"** then answer **Question 2** below.*

☐ No *If you answered **"NO,"** then identify the reason here and then skip to **Question 5** below:*

- ☐ No issues were identified during the problem formulation step.
- ☐ While issues were identified, those issues were addressed by the cleanup actions for protecting human health.

2. What did you do to resolve the problem? *See* WAC 173-340-7493(3).

☐ Used the concentrations listed in Table 749-3 as cleanup levels. *If so, then skip to **Question 5** below.*

☐ Used one or more of the methods listed in WAC 173-340-7493(3) to evaluate and address the identified problem. *If so, then answer **Questions 3 and 4** below.*

3. If you conducted further site-specific evaluations, what methods did you use? *Check all that apply. See* WAC 173-340-7493(3).

- ☐ Literature surveys.
- ☐ Soil bioassays.
- ☐ Wildlife exposure model.
- ☐ Biomarkers.
- ☐ Site-specific field studies.
- ☐ Weight of evidence.
- ☐ Other methods approved by Ecology. If so, please specify:

4. What was the result of those evaluations?

- ☐ Confirmed there was no problem.
- ☐ Confirmed there was a problem and established site-specific cleanup levels.

5. Have you already obtained Ecology's approval of both your problem formulation and problem resolution steps?

☐ Yes If so, please identify the Ecology staff who approved those steps:

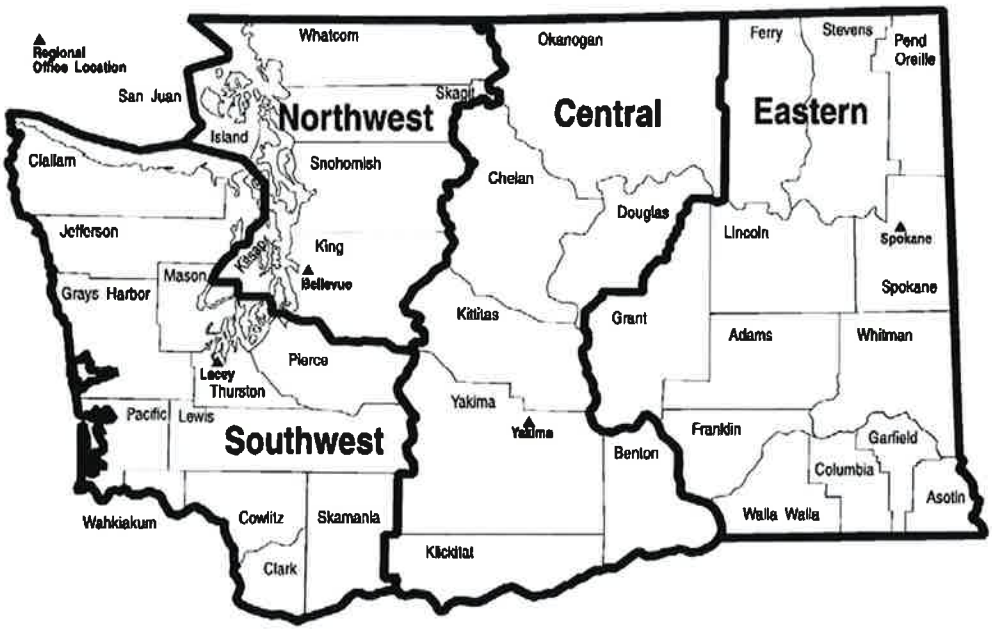
☐ No

ECY 090-300 (07/2015) To request ADA accommodation including materials in a format for the visually impaired, call Ecology Toxic Cleanup Program 360-407-7170. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.

Step 4: SUBMITTAL

Please mail your completed form to the Ecology site manager assigned to your Site. If a site manager has not yet been assigned, please mail your completed form to the Ecology regional office for the County in which your Site is located.

Northwest Region: Attn: VCP Coordinator 3190 160th Ave. SE Bellevue, WA 98008-5452	**Central Region:** Attn: VCP Coordinator 1250 West Alder St. Union Gap, WA 98903-0009
Southwest Region: Attn: VCP Coordinator P.O. Box 47775 Olympia, WA 98504-7775	**Eastern Region:** Attn: VCP Coordinator N. 4601 Monroe Spokane WA 99205-1295



ECY 090-300 (07/2015) To request ADA accommodation including materials in a format for the visually impaired, call Ecology Toxic Cleanup Program 360-407-7170. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.

Washington State Department of Ecology
Toxics Cleanup Program

Terrestrial Ecological Evaluation Process- Simplified Evaluation

Documentation Form

Criteria # (Concern)	Criteria	Response (Circle One)
1 (exposure)	Is the total area of soil contamination at the site less than or equal to 350 square feet	**Yes (End TEE) / No**
2 (exposure)	Does land use at the site and surrounding area make substantial wildlife exposure unlikely based on completion of Table 749-1?	**Yes (End TEE) / No**
3 (pathway)	Is there a potential exposure pathway from soil contamination to soil biota, plants, or wildlife?	**Yes / No (End TEE)**
4 (contaminant)	Are the hazardous substances at your site listed in Table 749-2 and is (or will) their location in the soil at your site be at a depth not exceeding the point of compliance, and at concentrations that do not exceed the values provided in Table 749-2.	**Yes (End TEE) / No** **Note: You must perform bioassays for contaminants at your site if no table value is provided.**
5 (contaminant)	Will hazardous substances listed in Table 749-2 be present in the soil at your site within 6 feet of the ground surface at concentrations likely to be toxic, or with the potential to bioaccumulate, based on bioassays using methods approved by the department.	**Yes / No (End TEE)**

[Exclusions Main] [TEE Definitions] [Simplified or Site-Specific?] [Simplified Ecological Evaluation] [Site-Specific Ecological Evaluation] [WAC 173-340-7493] [Index of Tables]

[TEE Home]

Terrestrial Ecological Evaluation Process- Simplified or Site-Specific Evaluation?

Documentation Form

	Terrestrial Concern	Response (Circle One)
*1	Is the site is located on or directly adjacent to an area where management or land use plans will maintain or restore native or semi-native vegetation?	Yes / (No)
*2a	Is the site used by a threatened or endangered species?	Yes / (No)
*2b	Is the site used by a wildlife species classified by the state department of fish and wildlife as a "priority species" or "species of concern" under Title 77 RCW?	Yes / (No)
*2c	Is the site used by a plant species classified by the Washington state department of Natural Resources natural heritage program as "endangered," "threatened," or "sensitive" under Title 79 RCW.	Yes / (No)
*3	Is the site (area where the contamination is located) located on a property that contains at least ten acres of native vegetation within 500 feet of the area where the contamination is located?	Yes / (No)
4	Has the department determined that the site may present a risk to significant wildlife populations?	Yes / (No)

*1 This includes for example, green-belts, protected wetlands, forestlands, locally designated environmentally sensitive areas, open space areas managed for wildlife, and some parks or outdoor recreation areas. This does not include park areas used for intensive sport activities such as baseball or football.

*2a What are the threatened or endangered species in Washington state?

*2b Which plant species are classified as threatened, endangered, or sensitive? Where can I find out more information about this topic?

*2c For plants, "used" means that a plant species grows at the site or has been found growing at the site. For animals, "used" means that individuals of a species have been observed to live, feed or breed at the site.

*3 For this analysis, do not include native vegetation beyond the property boundary.

The following sources shall be used in making this determination: Natural Vegetation of Oregon and Washington, J.F. Franklin and C.T. Dyrness, Oregon State University Press, 1988, and L.C. Hitchcock, C.L. Hitchcock, J.W. Thompson and A. Cronquist, 1955-1969, Vascular Plants of the Pacific Northwest(5 volumes). Areas planted with native species for ornamental or landscaping purposes shall not be considered to be native vegetation. [WAC 173-340-7491(2)(c)(i)]

(Here's a link to the Seattle Public Library and the Washington State Library to borrow a copy of Natural Vegetation of Oregon and Washington, J.F. Franklin and C.T. Dyrness, Oregon State University Press, 1988, or you may purchase it through your favorite bookseller. Here's an additional link to a useful online Field Guide to Selected Rare Plants of Washington developed by the Washington State Department of Natural Resources' Natural Heritage Program (WNHP) and the Spokane District of the U.S.D.I. Bureau of Land Management (BLM) which contains fact sheets for 139 vascular plant species and one lichen species. Here is an aid to calculating area and an aerial photo depicting a site, its 500 foot boundary and several labeled circles identifying various areas for reference in judging the area of native vegetation within the 500 foot radius.

[Exclusions Main] [TEE Definitions] [Simplified or Site-Specific?] [Simplified Ecological Evaluation] [Site-Specific Ecological Evaluation] [WAC 173-340-7493] [Index of Tables]

[TEE Home]

APPENDIX G

FINAL AIR SPARGING AND SOIL VAPOR EXTRACTION DESIGN

PES Environmental, Inc.
Engineering & Environmental Services

MEMORANDUM

TO: Courtney Seim – Riddell Williams P.S.
Robert DiJulio – Wolfstone, Panchot & Bloch, P.S.

FROM: Matt Dahl, P.E.

DATE: July 7, 2014

SUBJECT: FINAL Air Sparging and Soil Vapor Extraction Design
Manhattan Village Shopping Center and Harris Properties
Normandy Park, Washington

PROJECT NO.: 1358.001.01

PES Environmental, Inc. (PES) has prepared this technical memorandum to present the engineering design for the air sparging (AS) and soil vapor extraction system (SVE) at the Manhattan Village Shopping Center (MVSC) property located at 17835 First Avenue South (the "MVSC property") and the Harris property located at 17817 – 17825 First Avenue South in Normandy Park, Washington (the "Harris property"), collectively referred to as the "Property." The "Site" as used in this memorandum refers to the locations where contaminants originating from the Property have come to be located. This memorandum has been prepared in accordance with the Washington Department of Ecology (Ecology) Model Toxics Control Act (MTCA) to address the requirements of Washington Administrative Code (WAC) 173-340-400(4).

This design includes the basis and plans for expanding an existing SVE system that has been operating at the Property since 2009 and installing an AS system to treat residual sources of PCE in soil and groundwater. This design document includes the layouts and design details for well and wellhead construction, system manifolds, process piping, SVE system process equipment, AS system process equipment, and associated utilities. The drawings are schematics, and as such do not show all potential construction conditions. Modifications to this design can occur due to minor interferences and structural obstructions as a component of the construction work. The following information is attached to this memorandum:

- Attachment A includes site figures;
- Attachment B includes the construction drawings; and
- Attachment C includes key design calculations.

BACKGROUND

The MVSC and Harris properties are directly west of 1st Avenue South (Figure 1). MVSC is approximately four acres in area and consists of four buildings connected by a paved parking area and small areas of landscaping. The southern building is a single-story grocery store, the western building is a day care, the northern building is a strip mall which contains retail shops, restaurants, and the Four Star Dry Cleaners. The fourth building, located east of the strip mall, is currently unoccupied.

The Harris property includes six contiguous tax parcels with a total area of approximately 3.3 acres and is located adjacent and north of the MVSC property. The Harris property includes two residential structures, two single story commercial buildings, a storage shed, and two undeveloped tax parcels. The ground surface near the commercial buildings is a mix of gravel and pavement, the residences include lawns and landscaped areas, and the undeveloped parcels include vegetation and gravel. Records suggest that a dry cleaning facility (Manhattan Cleaners and Coin-Op Laundry) previously operated in the southern commercial building on the Harris property.

Surface Elevations. Surface elevations range from approximately 309 to 312 feet North American Vertical Datum 1988 (NAVD 88) on the MVSC property and between 307 to 309 feet on the Harris property. The properties are separated by a four to five foot high retaining wall, and the Harris property surface grade gently slopes to the north following local topography.

Geologic Conditions. Shallow soil across the Property generally consists of shallow silty sand from 0 to 10 feet below ground surface (bgs) and a well-sorted downward coarsening sand with varying amounts of silt and gravel to a depth of 46 to 56 feet bgs. Scattered silt and clay lenses are present at various depths from near surface to depths of approximately 32 feet bgs. A clay and silt unit has been encountered directly below the sand unit.

Hydrogeologic Conditions. Depth to groundwater on the Harris property is approximately 35 feet below ground surface (bgs) and 40 feet bgs on the MVSC property. The depth differences on the adjacent property are mainly due to differences in surface elevations. Groundwater flow direction has historically been toward the north with localized vectors ranging from north-northeast to north-northwest. Reported gradients on-Property have ranged from 0.004 to 0.006 feet/foot with gradients increasing significantly north of the Property (0.028 feet/foot). Reported hydraulic conductivities are between 1.3×10^{-3} to 5.5×10^{-2} centimeters per second (cm/s).

Historical Releases and Investigations. PCE has been detected in soil and groundwater at the Site, and available data indicate past releases of PCE from dry cleaning operations at the Four Star Dry Cleaners on MVSC property and from the former Manhattan Cleaners and Coin-Op Laundry on the Harris Property. Investigations indicated that PCE releases may have resulted in vadose zone soil impacts near the former septic systems at both properties, and the sanitary and possibly the storm sewer lines at the MVSC property. Groundwater impacts indicate that PCE in groundwater within the same areas as vadose zone impacts and extends north of the Property to the Dunn Lumber property.

Current Extent of Impacted Soil. Residual PCE likely remains in the vadose zone near the Four Star Cleaners, along the sanitary and storm sewer alignment near the MVSC strip mall, and near the former septic tank on the Harris property. In locations near the dry cleaner and sewer alignments, residual PCE is likely to remain in shallow soil within the upper silty sand to sand unit (e.g., upper 10 feet) and within the scattered silt and clay lenses (e.g., upper 32 feet). In locations near the former septic tank on the Harris property, residual PCE may remain in the lower vadose zone.

Current Extent of Impacted Groundwater. PCE in groundwater contamination is predominantly within the first 5 to 10 feet below the water table. The PCE plume appears to be primarily sourced from the northwestern corner of the MVSC property and southwestern corner of the Harris property, where the PCE in groundwater concentrations are the highest. However, there also appears to be remaining PCE in groundwater sourced along the sanitary sewer alignment (and possibly the storm sewer alignment) to the south to the suspected location of the former septic system on the MVSC property.

Previous Remedial Actions. The source of soil contamination was largely mitigated through operation of a seven-well SVE system in 1999 and 2000, replacement of 300 feet of sanitary sewer line behind the strip mall building on the MVSC property in July 2000, and excavation of PCE-impacted soil during removal of a septic tank on the Harris property in 2006. The SVE system operation and excavations resulted in significant reduction in PCE concentrations in groundwater.

Current Remedial Action. In 2009 a second SVE system was installed to address residual PCE in soil that was discovered following decommissioning of the first SVE system. The existing SVE system has been operated since 2009 and has removed an additional 95 pounds of residual PCE mass. Groundwater PCE concentrations continue to decline. The eastern half of the existing SVE system was temporarily shut down in February 2014 to evaluate for potential PCE rebound in nearby groundwater monitoring wells that have recently dropped below the MTCA Method A groundwater cleanup level (CUL) for PCE of 5 micrograms per liter (µg/L).

The existing SVE system consists of 10 SVE wells (SVE-1 through SVE-10), a 5 horse-power (HP) rotary lobe blower, moisture knockout, and condensate storage tank. As described in the April 2014 DRAFT operation and maintenance (O&M) status report[1], the SVE system has removed approximately 5 pounds of PCE over the last year. SVE well and discharge stack monitoring in November 2013 indicated that the SVE concentrations have declined significantly since 2010.

The existing SVE wells include a bypass valve that allows the wells to be operated under vacuum from the blower and to be open to atmosphere to induce fresh air into the subsurface. The SVE blower operates at approximately 240 to 280 standard cubic feet per minute (scfm), and when the entire well network is operating, each well is under approximately 3 to 7 inches of water column (in. w.c.) vacuum and generates between 18 to 26 scfm of vapor flow. Individual well vapor flow rates of more than 50 scfm have been observed when fewer SVE wells are

[1] PES, 2014. *Draft O&M Status Report - Manhattan Village and Harris Properties, September 2013 through March 2014.* April 2.

operated. Historical zone of influence (ZOI) has been observed at greater than 50 feet from the individual SVE wells.

Approximately 1,000 to 1,200 gallons of condensate is collected from the soil vapor stream when ambient air temperatures are cooler than the extracted soil vapors (mid-October and mid-April). Condensate drops out of the vapor stream in a moisture knockout vessel and is automatically transferred to a 200-gallon storage tank. The condensate is sampled and profiled prior to off-site disposal. Condensate generated in 2013 and early 2014 did not contain PCE above the laboratory method reporting limit (0.5 µg/L). This is likely a result of declining PCE concentrations in extracted soil vapors.

SUMMARY OF REMEDIAL APPROACH

An AS and SVE system will be implemented to treat shallow groundwater and vadose zone soil in the southwest corner of the Harris property and the west of the sanitary sewer alignment on the MVSC property. This system will include an AS well network in shallow groundwater and a dual level SVE well network in the vadose zone. The overall remediation objectives of the AS and SVE systems is to reduce the mass of PCE in residual source areas to below the soil and groundwater CULs.

The AS wells will be designed to target the sand and silty sand aquifer directly above a silt and clay layer which has been encountered at depths of 46.5 to 50 feet bgs on the Harris property and 55 to 56 feet bgs on the MVSC property. The SVE wells will be installed at two levels within the vadose zone. Shallow screened wells (5 to 20 feet bgs) will target the upper vadose zone, and deeper screened wells (20 to 30 feet bgs on Harris property and 20 to 35 feet bgs on MVSC property) will target the lower vadose zone. Both the vadose zone and the aquifer contain varying amounts of gravel, and the vadose zone contains scattered silt and clay lenses at various locations and depths from near surface to approximately 32 feet bgs.

Operation of the AS and expanded SVE system will continue until groundwater within the AS ZOI is at or below the MTCA Method A groundwater CUL (5 µg/L). Residual PCE concentrations in areas outside of the AS system influence will be allowed to naturally degrade. When the AS and SVE systems is shut down, groundwater will be monitored for potential rebound, and soil samples will be collected to evaluate the removal of residual soil contamination to below the MTCA Method A soil CUL for PCE of 50 micrograms per kilogram (µg /kg). After achieving four consecutive quarters of below CUL groundwater monitoring results on the Property and documentation of below CUL soils on the Property, Ecology will be petitioned with a request for no further action (NFA) at the Site. The AS and SVE system will be decommissioned following Ecology approval.

TECHNOLOGY JUSTIFICATION

AS and SVE has been selected to treat residual PCE in groundwater and soil source area groundwater plume. Application of these technologies is widely accepted for physically removing volatile organic compounds (VOC) from soil and groundwater.

Air Sparging. Critical design factors from the United States Army Corps of Engineers (USACE) engineering and design manual for AS include hydraulic conductivity of the saturated media, and the Henry's Law constant and vapor pressure of the VOC[2]. As listed below, the site criteria exceed the USACE minimum criteria:

Table 1 – Critical Factors for Air Sparging

Parameter	USACE Minimum Criteria	Site
Media Hydraulic Conductivity	> 1×10^{-4} cm/sec	1.3×10^{-3} to 5.5×10^{-2} (pump test)
Chemical Henry's Law Constant	> 2×10^{-3} atm-m3/mol	1.5×10^{-2} to 2.3×10^{-2}
Chemical Vapor Pressure	> 1 mm Hg	14 mm Hg

Other pertinent factors favorable to AS include relatively shallow contaminant depth below water table (5 to 10 feet), relatively low and decreasing (with time) dissolved phase PCE concentrations, and moderate plume size (Figure 2). In addition, an air sparging pilot test conducted in June 2013[3] indicated that relatively low compressed pressures (8 pounds per square inch gauge [psig]) and flow rates (9 to 10 scfm) resulted in a projected 13 foot ZOI around the pilot test well, which is roughly equivalent to the bottom depth of the injection well screen below the water table surface.

Soil Vapor Extraction. The technology justification for SVE is largely based on the favorable performance of the existing SVE system and includes the relatively low vacuum requirements (less than 10 in. w.c.) and relatively large ZOI (50 feet or greater). It should be noted that the presence of scattered silt and clay lenses in various locations and depths to approximately 32 feet bgs will likely result in preferential vapor flow patterns around finer zones. If finer zones are impacted with PCE above the CUL (50 µg/kg), it may result in longer timeframes for PCE removal in these localized areas.

GENERAL DESIGN CONSIDERATIONS

The following considerations were incorporated into the system design:

- Design capacity to operate the entire AS and SVE well fields at one time;
- Construct above ground AS and SVE manifolds on Harris property to decrease O&M costs, improve accessibility to monitor and control remediation wells, and minimize disruptions to MVSC property tenants and customers;
- Equipment noise limitations of 65 decibels for the blower and compressor;
- Automated condensate sparging and vapor recapture to lower O&M waste disposal fees;
- Freeze protection of the condensate piping for year-round operation; and

[2] USACE, 2008. *In-Situ Air Sparging, Manual No. 1110-1-4005*. Page 3-7. January.
[3] PES, 2014. *Air Sparging Pilot Test, Manhattan Village and Harris Properties, Normandy Park, Washington*. October 2.

- Automated systems and alarms to protect equipment and operator, and to decrease O&M costs.

AIR SPARGING SYSTEM DESIGN

The AS system includes 31 air sparging wells and interconnecting piping, manifold, air compressor, and heat exchanger. Groundwater impacts appear to be limited to the upper 5 to 10 feet of the saturated zone, and therefore AS wells will be screened at least 10 feet below groundwater. Injection air pressures, flow rates, and well spacing will be based on the results of the 2013 AS pilot test. Well screen depths will be limited by the presence of a silt and clay layer that has been observed at between 12 to 16 feet below groundwater. Contingency AS header piping will be installed on the Harris property east of existing SVE-4 so that additional AS wells may be installed and operated if needed.

The compressor will be sized to operate all 31 wells simultaneously and include extra capacity for the diffused aeration tank (see SVE system discussion below) and for additional AS wells along the contingency header. The system is expected to operate at a flow rate of 10 scfm per well at 8 psig wellhead pressure, although the actual operational flow rate and pressure will be determined through startup testing. Well spacing is based on the results of the 2013 AS pilot test which determined an approximate 1 to 1 ratio of screen depth below the water table and ZOI radius, and on the depth of a silt/clay layer that has been encountered during previous drilling and well installation activities. Based on these factors, spacing for the wells on the Harris property includes a 13 foot ZOI, and spacing for wells on the MVSC property includes a 15 foot ZOI. The actual screen depths will be determined in the field during drilling. Sheet C-2 includes representation of the ZOIs for the AS wells.

The following subsections describe the major components of the AS system, their function, and key process control equipment and parameters. Construction drawings including layout, details, and sections are included in Attachment B. A schematic of the entire AS system is included on Sheet P-3.

Air Sparging Wells. The AS system will consist of 31 AS wells. One well, AS-1, was installed in May 2013 for the pilot test. The remaining 30 wells, AS-2 through AS-31, will be installed in the southwestern corner of the Harris Property and adjacent to the sanitary sewer alignment on the MVSC property (Drawing C-3). AS-1 was installed with a 1-inch diameter Schedule 80 polyvinyl chloride (PVC) casing and a 2-foot long PVC screen (0.020-inch slot). The remaining 30 wells will be constructed similarly except that 2-inch diameter materials will be installed. All wellheads will be completed in flush-with-grade traffic rated monuments. As shown on Sheet C-5, a threaded end cap will be fitted to the bottom of each well screen, and the screened interval will be backfilled with a 10-20 silica sand filter pack which extends 6 inches above the top of screen. A 2-foot bentonite chip seal will be constructed above the sand and the remaining well annulus will be filled with cement bentonite grout.

Piping and Manifolds. Pressurized air will be conveyed from the air compressor, through a pipe manifold, and through 1-inch diameter lateral pipes to each AS well. Schedule 40 galvanized will be used for above ground pressurized piping and manifolds. Above ground

galvanized pipe may either be threaded or welded. Schedule 80 PVC will be used for below ground piping. Weather resistant EPDM hose will be used when needed to make above ground piping connections.

- Manifold. Consists of a 3-inch diameter pipe from the compressor, reducing tees, 1-inch diameter AS well lateral pipes, and a 2-inch diameter spare AS pipe. Laterals to each AS well include a 1-inch brass ball valve for shut-off and flow control, pressure gauge, rotameter, and 1-inch brass check valve. The lateral to the 2-inch diameter spare AS pipe includes a 2-inch brass ball valve. The manifold piping will be secured with supports and pipe clamps. The manifold is shown on Sheets C-7 and C-8.
- Lateral Piping: There are two main corridors for AS lateral piping. One corridor extends to wellheads for AS-2 through AS-6 and includes the 2-inch diameter contingency pipe, and the other corridor extends to the remaining wellheads. The second corridor includes the lateral pipes for AS-7 through AS-31. The laterals for AS-8 through AS-27 will penetrate the retaining wall through cored holes with the pipes secured on supports with pipe clamps. Lateral pipes in trenches will be buried a minimum of 18 inches below grade, and the trench depth and width will vary by location. Lateral pipes branch from the main trench to the AS wells. At a minimum, piping must be spaced 1 inch from the trench wall and 1 inch from other pipes. Piping layouts are shown on Sheets C-3 and C-4, wellhead connection details are shown on Sheet C-5, trench sections are shown on Sheet C-6, and retaining wall penetrations are shown on Sheet C-7.
- Spare AS Pipe: The 2-inch diameter galvanized pipe will be routed in a trench with lateral pipes for AS-2 through AS-6. The spare pipe will daylight at the retaining wall and be routed above ground along the retaining wall to near SVE-9. The above ground section will include 2-inch diameter galvanized tees and threaded end caps spaced every 30 feet. The entire above ground section will be secured with supports and pipe clamps. Pipe routing is shown on Sheet C-4, and trench sections are shown on Sheet C-6.
- Lateral to Diffused Aeration Tank: A 1-inch galvanized pipe will be extended from the 3-inch compressed air line to the diffused aeration tank. The lateral will include a 1-inch brass ball valve for shut-off and flow control, pressure gauge, rotameter, and 1-inch brass check valve.

Mechanical Equipment. Mechanical equipment will be installed in the remediation equipment enclosure located on Harris Property at the approximate location shown on Sheet C-3. Mechanical equipment includes positive displacement blower (i.e., low pressure air compressor) and a heat exchange. Equipment layout is shown on Sheet C-7, and a schematic of the entire AS system is shown on Sheet P-3.

- Compressor (AC-301): Pressurized air will be supplied by a single positive displacement blower capable of delivering 360 scfm at approximately 12 psig in order to provide at least 10 psig at the manifold. The actual compressor type (e.g., rotary lobe, etc.) and pressure rating will be determined by the remediation equipment vendor. The motor will include a variable frequency drive so that the overall system flow rate may be adjusted to match system requirements. The compressor will be fitted with an inlet filter, influent and effluent silencers, and housed in a weather resistant sound enclosure rated to reduce

the sound within 3 feet of the enclosure to approximately 65 decibels. The sound enclosure will include air cooling and sound dampened air vents. The compressor discharge line will include a flow switch, which will notify the operator when adequate AS flow is not present. Automatic operation will require that the SVE blower be operating at least 1.5 times the design flow rate of the AS system (465 scfm).

- Heat Exchanger (HEX-301): Pressurized air exiting the compressor will be cooled using an air to air heat exchanger to approximately 20 degrees above ambient temperatures.

SOIL VAPOR EXTRACTION SYSTEM DESIGN

The SVE system includes 22 SVE wells (10 existing and 12 new) and interconnecting piping, piping manifold, moisture knockout, condensate storage, and blower. The SVE system will be designed and operated to control off-gas from AS and to address residual PCE concentrations in soil that appear to be outside of the area of influence from the existing SVE system. The new and operating SVE wells will be screened in the vadose zone above the water table. Three of the new wells will be screened in the upper vadose zone (5 to 20 feet bgs), and the remaining nine wells will be screened in the lower vadose zone (20 to 35 feet bgs).

The system is designed to operate at flow rate of 40 scfm per well at 10 in. w.c. wellhead vacuum, although the actual operational flow rate and vacuum will be determined through startup testing. Well spacing is based on providing an approximate 2:1 ratio of SVE to AS flow, and an anticipated ZOI of 40 feet (see Sheet C-3).

The SVE system includes a management and storage for SVE condensate that drops out of the soil vapor stream and into the moisture knockout tank. Knockout water will be processed through a diffused aeration tank (DAT) and sparged so that residual PCE, if present in the water, may be transferred back into the SVE vapor stream. The sparged water will then be transferred to a holding tank for sampling, waste profiling, and off-site disposal.

Based on the expected mass transfer of PCE from soil and groundwater, the SVE system will be exempt from vapor treatment per Puget Sound Clean Air Agency (PSCAA) Regulation I, Article 6, Section 6.03(C)(94) and the Ecology toxic pollutant source control regulations WAC 173-460. Therefore, the SVE effluent will be discharged directly to atmosphere. If SVE effluent concentrations are higher than anticipated and result in mass discharge rates in excess of the PSCAA and Ecology limits (< 500 and 32.4 pounds per year, respectively), the SVE effluent stack can be bypassed to allow vapor treatment with granular activated carbon (GAC) prior to discharge.

The following subsections describe the major components of the SVE system, their function, and key process control equipment and parameters. Construction drawings including layout, details, and sections are included in Attachment B. A schematic of the entire SVE system is included on Sheet P-2.

Soil Vapor Extraction Wells. The SVE system will consist of 22 SVE wells and includes 10 existing wells which are currently operating as part of the existing SVE system (SVE-1 through SVE-10), 6 wells installed in November 2013 as part of a supplemental remedial investigation (SVE-11A through SVE-13B), and 6 new wells which will be installed prior to or during construction (SVE-14 through SVE-19). Existing wells SVE-1 through SVE-10 are constructed of 2-inch diameter Schedule 40 PVC and include 20- to 25-foot long well screens (except for SVE-6 which includes a 5-foot screen). The new wells will be constructed with 4-inch diameter Schedule 40 PVC and include a 0.020-inch slot PVC screen. All wellheads will be completed in flush-with-grade traffic rated monuments. As shown on Sheet C-5, a threaded end cap will be fitted to the bottom of each well screen, and the screened interval will be backfilled with a 10-20 silica sand filter pack which extends 2 feet above the top of screen. A 1.5 to 2-foot bentonite chip seal will be constructed above the sand and the remaining well annulus will be filled with cement bentonite grout.

Piping and Manifolds. Extracted soil vapors will be conveyed from the wells through lateral pipes, manifold and header pipes, moisture knockout, blower, and discharge stack. Schedule 40 PVC will be used for all laterals, manifolds, header to the moisture knockout, and discharge stack. Schedule 40 galvanized will be used on vapor piping between the knockout and the discharge stack, and on water piping between the condensate tanks.

- Manifold and Header Piping: The header consists of a new 6-inch diameter pipe that is routed from the knockout to the 6-inch diameter manifold. The new 6-inch header also connects to the existing 4-inch header for existing wells SVE-4 through SVE-10. The manifold includes tie-ins to the 2-inch diameter laterals from existing wells SVE-1 through SVE-3 and new wells SVE-11A through SVE-19. The lateral pipes within the manifold will include a 2-inch PVC ball valve for shut-off and flow control, and include a PVC labcock valve for sampling and monitoring vacuum at the individual SVE wells. The labcock may be removed, or a separate threaded plug may be installed for monitoring flow rate SVE well flow rate using a thermal anemometer. The manifold will be located adjacent to the retaining wall so that the individual laterals may tie directly into the manifold after passing through the wall. The manifold and header piping will be secured to the retaining wall with supports and pipe clamps. Above ground piping will slope towards SVE wells at a one percent slope. The manifold and header locations are shown on Sheet C-3, and manifold details are shown on Sheet C-9.
- Below Ground Piping and Trenching: Lateral pipes to new wells SVE-11A through SVE-19 will be routed below grade in common trenches wherever possible. Laterals for SVE wells SVE-11A through SVE-16 will extend south from the manifold and penetrate the retaining wall through cored holes with the pipes secured on supports with pipe clamps. Pipes in trenches will be buried a minimum of 18 inches below grade, and the trench depth and width will vary by location. At a minimum, piping must be spaced one-inch from the trench wall and one inch from other pipes. Below ground pipe locations are shown on Sheet C-3, well connection details are shown on Sheet C-5, trench sections are shown on Sheet C-6 and the manifold connections and retaining wall penetrations are shown on Sheet C-9.

- Discharge Pipe and Stack: The blower discharge includes several feet of a 6-inch diameter galvanized pipe to dissipate heat from the blower, and a 10 foot tall by 8-inch diameter Schedule 40 PVC stack pipe. The discharge stack will include a PVC labcock valve for monitoring and sampling.
- Water Piping: 1-inch diameter pipes will be installed between the condensate tanks and condensate transfer pumps. The pipes will include union fittings and ball valves at tanks and pumps, and will be heat traced, insulated, and wrapped with PVC sheets to prevent freezing.

Mechanical Equipment. Mechanical equipment will be installed in the remediation equipment enclosure located on Harris Property at the approximate location shown on Sheet C-3. Mechanical equipment includes an SVE blower and two condensate transfer pumps. Equipment layout is shown on Sheet C-6, and a schematic of the entire SVE system is shown on Sheet P-2.

- Blower (BL-101): SVE airflow and vacuum will be generated by a single positive displacement blower capable of delivering 880 scfm at approximately 60 in. w.c. vacuum in order to provide at least 25 in. w.c. vacuum at the upstream side of the inlet filter. The actual blower type (e.g., rotary lobe, etc.) and vacuum rating will be determined by the remediation equipment vendor. The blower motor will include a variable frequency drive so that the overall system flow rate may be adjusted to match system requirements. The blower will be fitted with an inlet filter, influent and effluent silencers, and housed in a weather resistant sound enclosure rated to reduce the sound within 3 feet of the enclosure to approximately 65 decibels. The sound enclosure will include air cooling and sound dampened air vents. The blower inlet line will include a flow meter and flow switch, which will notify the operator in the event of low SVE flow (e.g., 1.5 times the design AS flow rate, see above). A high level alarm float switch in the knockout tank (T-201) will disable the blower (and air compressor).
- Knockout Tank Transfer Pump (P-201): A centrifugal transfer pump will automatically transfer condensate water from the knockout tank to the DAT. Pumping will occur based on level control in tank knockout and can only be initiated when the diffused aeration tank level is low. High level alarm in any tank will disable the pump.
- Diffused Aeration Tank Transfer Pump (P-202): A centrifugal transfer pump will automatically transfer condensate water from the DAT to the holding tank. Pumping will initiate on high level in the knockout tank (P-201) and stop on low level in the DAT. This sequence is to ensure that the DAT level is low prior to transferring in fresh condensate from the knockout. High level alarm in either the DAT or the holding tank will disable the pump.

Condensate Management and Storage Tanks. Three tanks will be used to manage and store condensate. As referenced above, the tanks include a condensate knockout tank (T-201), DAT (T-202), and holding tank (T-203). Condensate accumulation is expected from mid-October through mid-April when ambient temperatures drop below the soil vapor temperature. Condensate accumulation in SVE systems is typically greatest in December and January when ambient temperatures are at their lowest, and the tank sizing is based on the following temperature related factors:

- An average daily cold weather condensate accumulation rate of 42 gallons per day is estimated based on average soil vapor temperature of 54°F and average ambient air temperature of 40°F;
- Process volumes in tanks T-201 and T-202 are rated at 75 gallons per day, which is equivalent to the single day condensate accumulation rate (above) with a 1.75 safety factor. This estimate allows for ambient temperatures below freezing; and
- Storage volume in T-203 is designed to hold at least 2 weeks of water at the below-freezing condensate accumulation rate, and at least 4 weeks of water at the average (cold weather) condensate accumulation rate.

Tanks T-201 and T-202 are sized to process condensate at a rate of one pump cycle per day, maximum, in order to optimize PCE transfer by maximizing the overall air to water ratio in the diffused aeration tank.

- Knockout Tank (T-201): The moisture knockout tank will remove moisture droplets from vapor stream and provide process capacity for 75 gallons of SVE condensate between the level switches for transfer pump P-201. The overall volume and configuration of this tank will be determined by the remediation equipment manufacturer.
- Diffused Aeration Tank (T-202): Consists of a 200-gallon polyethylene tank with a compressed air delivery pipe, a 5-way PVC pipe fitting, four sparger pipes installed inside and at the base of the tank, and a vent pipe connected to the 6-inch SVE inlet line. All pipes will be 1-inch diameter Schedule 40 PVC and the sparger pipes will include 1/8-inch diameter holes on 3 inch centers. The sparger pipes will be submerged with approximately 2 feet of water (below the low level shut-off switch) and with the 75-gallon process volume. Initially the compressed airflow rate will be set at 6 scfm to allow a single-day air to water ratio of approximately 450 to 1 (which is greater than the air to water ratio of a typical shallow tray air stripper).
- Holding Tank (T-203): Consists of a 1,500 gallons with approximately 1,200 gallons of storage below the high level float shut-off.

CONTROLS

A NEMA 4X rated control panel including a programmable logic control system will be located inside the remediation equipment enclosure. The panel will provide automatic control of system components and operating parameters. The control panel will be fabricated by a UL 508 shop and meet national and local electric codes. The control panel will include a blank exterior door with an internal swing door for operator access to controls. Each motor associated with the process equipment will have a motor starter (with thermal overloads as well as circuit breaker wiring protection), a Hand/Off/Auto (HOA) switch, and a green run-light. Alarm indicator lights with first-fault lockout will be provided. The internal swing door will also include a system power selector switch (On/Off) and hour meters for the blower and compressor. All lights, selector switches, push buttons, hour meters, and other panel face-mounted devices will be labeled with white letters engraved on black metal labels.

The control panel will house an auto-dialer with inputs for all alarm conditions for the system, and the auto-dialer will be equipped with battery backup. The auto-dialer will alert the operator to major mechanical issues such as power interruption, blower shut-off or low flow, compressor shut-off or low flow, and high-high liquid level in the condensate tanks. Each alarm, when triggered, will be configured to automatically shut down equipment operation.

POWER SUPPLY

The blower and compressor are expected to require 3-phase 460 voltage alternating current (VAC) at 60 hertz frequency. According to preliminary discussions with Puget Sound Energy, power is available nearby and may require transformer upgrade and an additional power pole. Sheets C-1 and C-4 show the locations of pole mounted transformers near the alley north of the MVSC strip mall building.

CONSTRUCTION

Construction tasks include permitting, site preparation, well installation, trenching and piping, and equipment installation.

Permitting. Anticipated permits include local grading and electric permits, and a pre-application review conference with the City of Normandy Park to review the overall site plan and discuss the project to determine the applicable requirements in the local code. Prior to the conference, the applicant is required to submit an application package including the application form, overall site plan showing both on-site and off-site features, a written narrative and $300 fee. According to the City Planner, pre-application review period of two to four weeks is typical, and the applicant should anticipate additional fees for outside consultant review.

Site Preparation. Underground utility locations will be cleared prior to any drilling or trenching activities. The proposed locations of the remediation wells and trenches will be marked with white spray paint. At least five days prior to any subsurface work, a One-Call ticket will be submitted to mark the locations of utilities in the public right-of-way. A private locating company will also be contracted to mark the locations of utilities outside of the right-of-way.

All remediation wells on MVSC property will be cleared with an air knife/ vacuum truck rig, and remediation wells on the undeveloped Harris property will be cleared with hand tools. Clearing will be performed to a minimum depth of 4 feet bgs. If planned drilling locations interfere with underground utilities, the well will be relocated a safe distance away, but as close to the original location as possible.

Due to the number and extent of underground utilities on the MVSC property, it is expected that the remediation trenches will intersect utility trenches in several locations. The contractor will be expected to field locate and pothole to verify the exact location of existing utilities, and will be expected to protect the utilities and repair if damaged.

Well Installation. The AS and SVE wells will be installed by a Washington-licensed driller. During drilling, samples will be collected for lithology and for waste disposal profiling at 5 foot intervals. Continuous samples will also be collected from the AS wells starting at the 40 foot

depth interval to find the silt/clay layer at the base of the aquifer. The drilling work will be observed by field geologist who will log samples, monitor drilling activities, record well construction information, and prepare boring logs and well construction diagrams for each well.

The wells will be completed below grade and temporarily covered with a metal plate so that the construction contractor may find the wells and construct the wellhead completions as shown in the plans. The wells on the MVSC property will also include an asphalt patch covering the metal plate so that the well locations can be driven on during the interim period between drilling and construction.

Trenching and Piping. Trenches will be constructed a minimum of 12-inches wide and excavated to a minimum depth of three inches deeper than the bottom of the lowest installed pipe. The AS and SVE pipes will be buried at least 18-inches deep, covered with a minimum of 8-inches of compacted sand overlain by compacted backfill. The trenches on MVSC property will be paved to match the existing ground surface. Trenches on Harris property will be graded covered with black weed barrier shields, and a thin layer of gravel. Utility pipes in unpaved areas will be buried a minimum of 36 inches below grade.

Above-ground piping will be secured to supports using pipe clamps. Manifold supports shall be mounted to the concrete retaining wall.

The SVE manifold and SVE and AS pipe penetrations will require additional evaluation and field verification by the contractor so that these features may be constructed efficiently and cleanly relative to the retaining wall construction, remediation pipe locations, pipe slopes, underground utilities, etc. Prior to construction the contractor shall develop shop drawings for a proposed configuration and submit to the engineer for review and approval.

Remediation Equipment Installation. The remediation equipment consists of the SVE blower assembly, SVE compressor assembly, heat exchanger, transfer pumps, moisture knockout, DAT, 1,500-gallon storage tank, and control panel. The blower and compressor assemblies will be skid mounted and installed inside weather resistant sound enclosures. The compressor skid will include the compressor assembly and heat exchanger, and the blower skid will include the blower assembly, transfer pumps, moisture knockout, and DAT. The skids may be separate or combined and include the control panel.

The skid mounted equipment will be installed on 6-inch thick gravel pad underlain with black weed barrier shield material, and inside a 6 foot high chain link fence. Prior to construction the contractor shall develop shop drawings for the chain link fence materials and configuration per Chain Link Fence Manufacturers Institute guidelines and submit to the engineer for review and approval.

The contractor will coordinate a power drop for the remediation equipment with Puget Sound Energy (PSE). According to discussion with the local field engineer, there is currently a three month backlog for installation of transformers and utility poles. PSE will install power from the transformer to be agreed upon electrical meter location, and the contractor will be responsible for field wiring to the remediation equipment as well as field interconnections between equipment as specified by the equipment manufacturer.

The contractor will coordinate a telephone cable with Century Link, who will drop the cable to be agreed upon location. The contractor will be responsible for additional field wiring to the control panel.

Shakedown and Testing. Equipment shakedown and testing will be performed to ensure all automation and safety controls are fully functional. The AS and SVE well fields will be isolated during equipment shakedown. System shakedown activities will include pressure testing process piping, leak-checking liquid transfer lines, checking motors for proper rotation, voltage, and amperages, verifying instrument signals, verifying analog and discrete signals to control system, testing system operation with clean water and ambient air, and setting valves to proper pre-start positions.

Survey. The new AS and SVE wells will be surveyed by a licensed surveyor. Horizontal coordinates will be surveyed to the Washington State Plane coordinate system, and elevations surveyed to NAVD 88.

OPERATION AND MAINTENANCE

A project specific O&M plan will be developed to describe to describe startup procedures, guidelines for overall system operation, manufacturers recommendations for equipment maintenance, preventative maintenance schedule, and forms. Initial operation will include baseline groundwater monitoring, SVE system startup and balancing, AS system startup and balancing, and relatively frequent O&M inspections and monitoring over the first several weeks of operation. After system operation is stabilized, O&M will be conducted on a monthly basis, and preventative maintenance performed in accordance with equipment manufacturer's guidelines.

Performance monitoring will be performed periodically to assess whether changes in system performance are needed to optimize contaminant removal efficiency. Performance monitoring will include stack emissions monitoring, groundwater quality monitoring, and groundwater gradient evaluation.

RESIDUALS

Drill cuttings, trench spoils, purge water, decontamination water, and SVE condensate water generated during system construction, monitoring, and O&M activities will be contained in segregated approved waste containers (55-gallon drums, roll-off containers, etc.). Waste containers will be clearly labeled with a description of contents and the accumulation date. The waste will be sampled, profiled, and properly disposed of at an approved facility.

REPORTING

The following reports are recommended as part of the remedial approach:

- Health and Safety Plan;
- O&M Manual;
- Construction and Startup Report; and

- Semi-annual Progress Reports.

LIMITATIONS

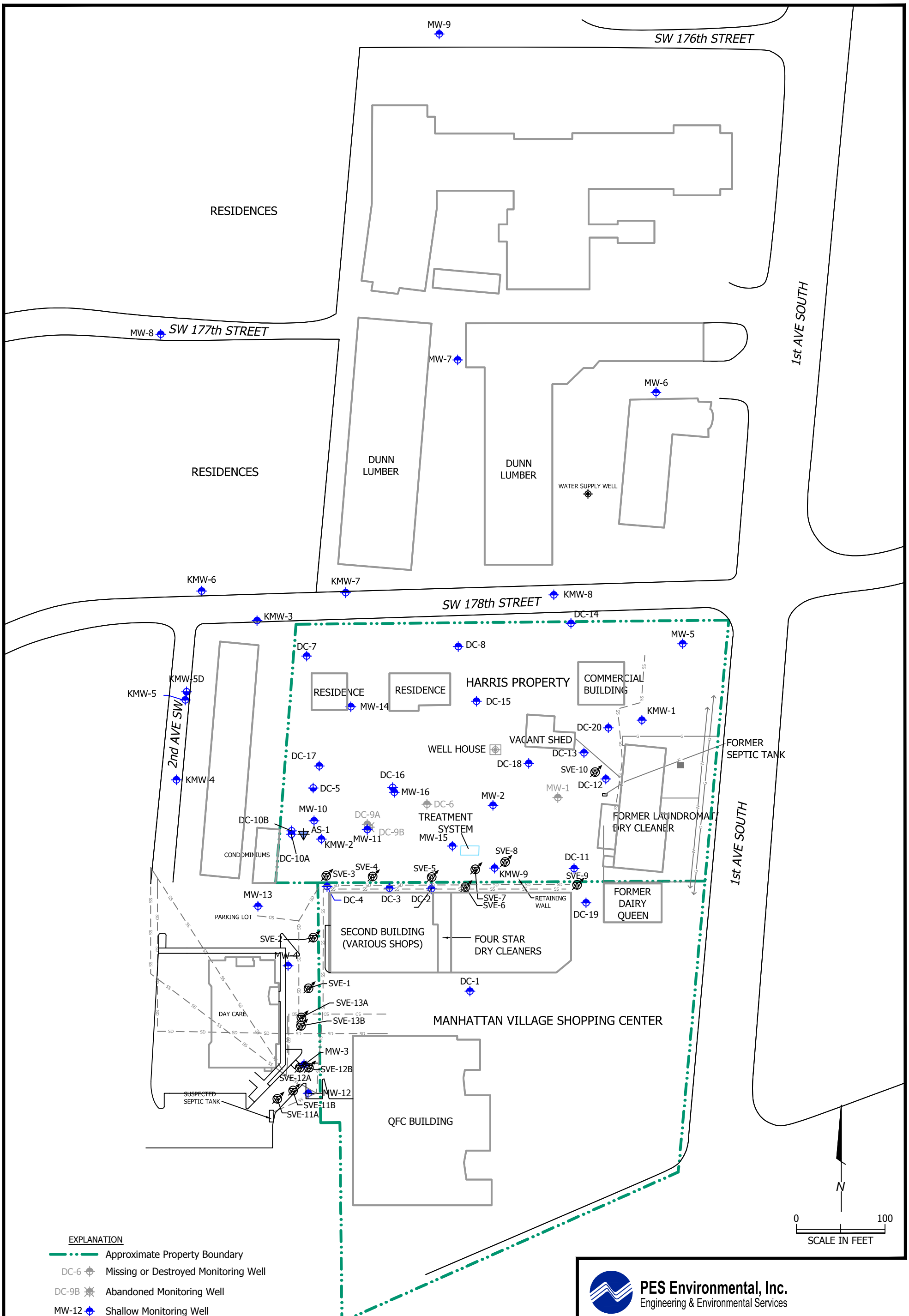
The services described in this technical memorandum were performed consistent with generally accepted professional consulting principles and practices. No other warranty, expressed or implied, is made. These services were performed consistent with our agreement with our client. This technical memorandum is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this technical memorandum apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report.

Enclosures: Attachment A – Site Figures
Attachment B –Construction Drawings
Attachment C – Calculations

ATTACHMENT A

SITE FIGURES



PES Environmental, Inc.
Engineering & Environmental Services

Site Map
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE
1

1358.001.01.003	1358-00101005_SVE_Fig1	DRAFT	3/14
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

MW-9
SW 176th STREET
RESIDENCES
MW-8
SW 177th STREET
MW-7
(265.28)
MW-6
1st AVE SOUTH
266
267
268
269
270
271
272
273
DUNN LUMBER
DUNN LUMBER
RESIDENCES
WATER SUPPLY WELL
KMW-6
KMW-7
KMW-8
KMW-3
SW 178th STREET
DC-14
(271.84)
6.0
MW-5
DC-7
(271.94)
15
DC-8
(272.01)
11
HARRIS PROPERTY
COMMERCIAL BUILDING
KMW-5D
KMW-5
(271.80)
2nd AVE SW
RESIDENCE
RESIDENCE
MW-14
(272.25)
<1.0
DC-15
(272.28)
KMW-1
(272.51)
DC-20
(272.50)
1.7
VACANT SHED
WELL HOUSE
FORMER SEPTIC TANK
DC-17
(272.51)
21
KMW-4
DC-5
(272.65)
<1.0
DC-16
MW-16
(272.59)
2.5
DC-6
DC-13
(272.59)
1.7
DC-18
(272.59)
4.8
MW-2
(272.83)
2.4
MW-1
DC-12
(272.75)
2.3
DC-10B
MW-10
(272.88)
4.1
DC-9A
DC-9B
AS-1
DC-10A
(272.89)
19
KMW-2
(272.95)
22
MW-11
(272.87)
22
TREATMENT SYSTEM
MW-15
(272.89)
<1.0
FORMER LAUNDROMAT/ DRY CLEANER
CONDOMINIUMS
KMW-9
DC-11
MW-13
(273.08)
<1.0
PARKING LOT
DC-4
(273.06)
11
DC-3
DC-2
RETAINING WALL
DC-19
(273.22)
FORMER DAIRY QUEEN
SECOND BUILDING (VARIOUS SHOPS)
FOUR STAR DRY CLEANERS
MW-4
(273.28)
8.1
DC-1
(273.52)
DAY CARE
MANHATTAN VILLAGE SHOPPING CENTER
MW-3
(273.53)
4.0
MW-12
(273.55)
<1.0
SUSPECTED SEPTIC TANK
QFC BUILDING
N
0
100
SCALE IN FEET

EXPLANATION

- Approximate Property Boundary
- DC-6 Missing or Destroyed Monitoring Well
- DC-9B Abandoned Monitoring Well
- MW-12 Shallow Monitoring Well
- DC-16 Deep Monitoring Well
- AS-1 Air Sparge Well
- (273.52) Groundwater-Level Elevation in feet NAVD 88 on May 28, 2013
- 273 Generalized Groundwater Elevation Contour (dashed where inferred)
- 22 Tetrachloroethene (PCE) concentration in micrograms per liter (ug/L); results in red exceed the MTCA Method A cleanup level
- <1.0 PCE not detected at or above the indicated method reporting limit (MRL)

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Engineering & Environmental Services

Groundwater Elevations, Contours, and PCE Concentrations – May 2013
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE 2

1358.001.01.003	1358-00101003_GW_1-2	MVD	8/13
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

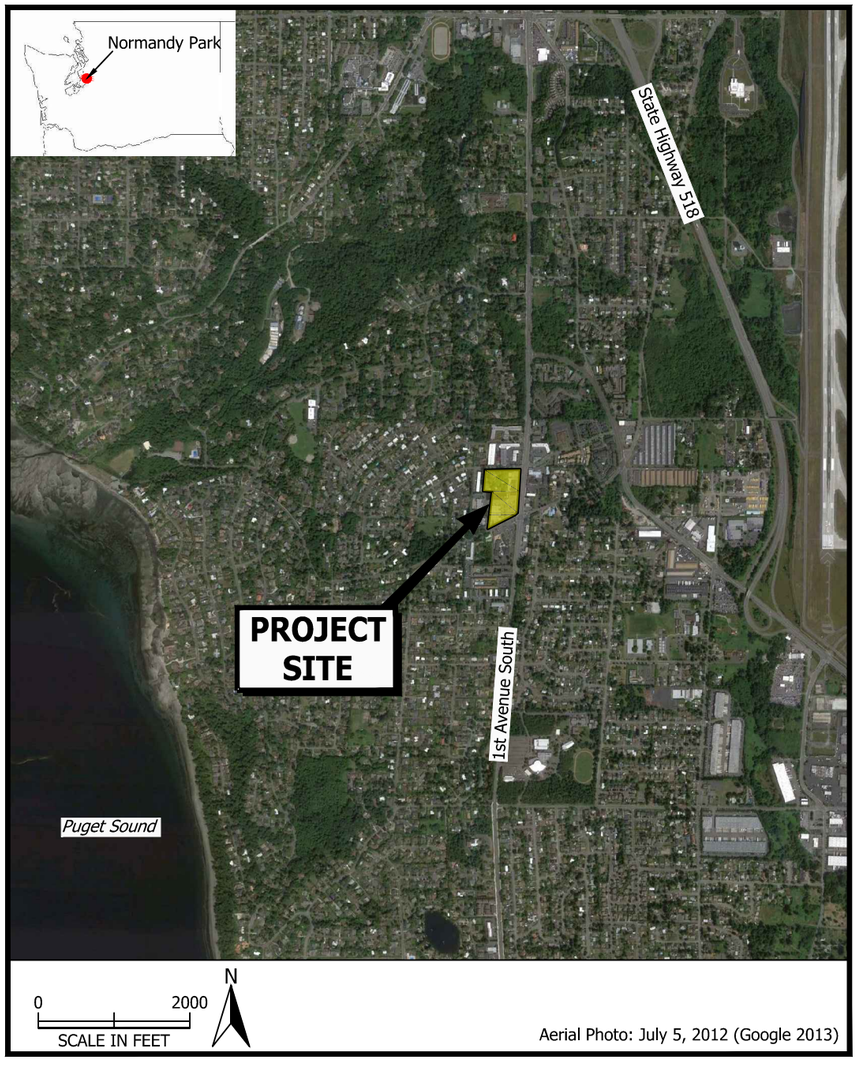
ATTACHMENT B

CONSTRUCTION DRAWINGS

AIR SPARGING AND SOIL VAPOR EXTRACTION SYSTEMS DESIGN
MANHATTAN VILLAGE SHOPPING CENTER / HARRIS PROPERTIES

17817, 17825, AND 17835 1ST AVENUE SOUTH
NORMANDY PARK, WASHINGTON

SITE LOCATION MAP



Aerial Photo: July 5, 2012 (Google 2013)

DRAWING INDEX

SHEET NUMBER	SHEET TITLE
T-1	COVER SHEET
G-1	GENERAL NOTES
C-1	EXISTING SITE PLAN
C-2	ZONE OF INFLUENCE LAYOUT
C-3	SITE LAYOUT - WEST
C-4	SITE LAYOUT - EAST
C-5	WELL CONSTRUCTION DETAILS
C-6	TRENCH SECTIONS
C-7	RETAINING WALL PENETRATION AND EQUIPMENT LAYOUT
C-8	AS MANIFOLD DETAILS
C-9	SVE MANIFOLD DETAILS
P-1	PROCESS AND INSTRUMENTATION NOTES
P-2	PROCESS AND INSTRUMENTATION DIAGRAM - SVE SYSTEM
P-3	PROCESS AND INSTRUMENTATION DIAGRAM - AS SYSTEM

No.	Date	Revisions	By
0	7/22/14	Issued for Bid	

Scale: AS NOTED
Designed by: MD
Drawn by: BP
Checked by: BO
Approved by: MD

MATTHEW V. DAHL
STATE OF WASHINGTON
50366
REGISTERED
PROFESSIONAL ENGINEER

PES Environmental, Inc.
Engineering & Environmental Services

Cover Sheet
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

Sheet T-1

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
1358.001.01.005	1358-00101005_SVE_r1_T1	BO	7/14

GENERAL NOTES:

1. LOCATIONS AND DESCRIPTIONS OF UTILITIES SHOWN ON THE DRAWINGS ARE APPROXIMATE AND ARE COMPILED FROM AVAILABLE RECORDS AND/OR LIMITED FIELD SURVEYS.
2. FIELD LOCATE AND POTHOLE TO VERIFY EXACT LOCATIONS OF EXISTING UTILITIES TO DETERMINE THE EXTENT OF PROTECTION REQUIRED AND/OR CHANGES THAT MAY BE REQUIRED PRIOR TO SUBSURFACE WORK. USE CARE WHEN EXCAVATING OR DRILLING NEAR UTILITIES, AND REPAIR ANY DAMAGED AT CONTRACTORS EXPENSE.
3. UTILITY LOCATES: CALL MINIMUM 5 DAYS AND MAXIMUM 10 DAYS BEFORE EXCAVATION AND DRILLING (1-800-424-5555).
4. COMPLY WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL REQUIREMENTS TO PERFORM WORK.
5. OBTAIN ALL PERMITS, INSURANCES, AND LICENSES TO PERFORM WORK.
6. CONSTRUCTION WORK AREA SHALL BE SECURED AGAINST UNAUTHORIZED ENTRY. MAINTAIN PEDESTRIAN ACCESS TO ALL BUILDING ENTRANCES AND EXITS, AND POST TEMPORARY SIGNAGE FOR DIRECTING PEDESTRIAN AND VEHICLE TRAFFIC AROUND THE CONSTRUCTION AREA.
7. ALL STREETS AND PARKING AREAS ADJACENT TO THE PROJECT SHALL BE KEPT CLEAN OF ALL MATERIAL DEPOSITS RESULTING FROM THE CONTRACTORS OPERATIONS.
8. PROTECT ALL EXISTING STRUCTURES, EXISTING WELLS, AND OTHER EXISTING SITE FEATURES, AND REPAIR ANY DAMAGED AS A RESULT OF THE WORK AT THE CONTRACTORS EXPENSE.
9. UPON COMPELETION OF WORK, RESTORE AREA TO ORIGINAL CONDITION.

CONSTRUCTION NOTES:

1. VERIFY ALL FIELD CONDITIONS AND DIMENSIONS PRIOR TO WORK.
2. CUT ASPHALT, CONCRETE, AND CURBS IN A STRAIGHT LINE PRIOR TO REMOVAL FOR TRENCHING OR DRILLING.
3. EXCAVATE TRENCHES MINIMUM OF 3 INCHES DEEPER THAN BOTTOM OF LOWEST PIPE. COVER ALL PIPES WITH AT LEAST 6 INCHES OF COMPACTED SAND. MINIMUM BURIAL DEPTHS: 36 INCHES FOR UTILITY PIPES, AND 18 INCHES FOR REMEDIATION PIPES. MULTIPLE PIPES: MAINTAIN 1-INCH MINIMUM OF SAND AROUND ALL PIPES.
4. BACKFILL TRENCHES WITH CLEAN SAND. MAXIMUM LOOSE LIFT OF 8 INCHES BEFORE COMPACTION. COMPACT ABOVE PIPE ZONE TO AT LEAST 95% OF MAXIMUM DENSITY AND WITHIN +/- 3% OF OPTIMUM MOISTURE (ASTM D-1557).
5. INSTALL TRACEABLE WARNING TAPE IN ALL TRENCHES AT LEAST 6-INCHES ABOVE HIGHEST PIPE.
6. MATCH SURFACING MATERIALS AND THICKNESS TO SURROUNDING UNLESS NOTED. PRIOR TO ASPHALTING, APPLY TACK COAT TO SURFACES. UPON COMPLETION, APPLY SEAL COAT AND RESTRIPE.
7. ALL PANELS AND METERS SHALL BE MOUNTED AT LEAST 36 INCHES ABOVE GRADE ON UNISTRUT ON 2 FT CENTERS.
8. SUPPORT ALL ABOVE GROUND PIPES WITH UNISTRUT AND SECURE WITH PIPE CLAMPS. 5 FT MAXIMUM SPACING BETWEEN SUPPORTS.
9. PRESSURE TEST ALL PIPING TO A MINIMUM OF 75 PSI PRIOR TO BACKFILLING AND/OR USE.

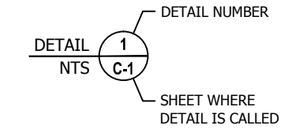
PLAN SYMBOLS:

- MW-12 — SHALLOW MONITORING WELL
- DC-16 — DEEP MONITORING WELL
- SVE-1 — OPERATING SVE WELL
- VMP-1 — VAPOR MONITORING WELL
- SVE-14 — NEW SVE WELL
- AS-2 — NEW AS WELL
- — X — CHAIN LINK FENCE
- EXISTING ABOVEGROUND SVE PIPE
- EXISTING UNDERGROUND SVE PIPE
- PROPOSED ABOVEGROUND SVE PIPE
- PROPOSED UNDERGROUND SVE PIPE
- PROPOSED ABOVEGROUND AS PIPE
- PROPOSED UNDERGROUND AS PIPE
- APPROXIMATE PROPERTY BOUNDARY
- — E — OVERHEAD ELECTRICAL LINE
- — — E — UNDERGROUND ELECTRICAL LINE
- — T — OVERHEAD TELEPHONE LINE
- — — T — UNDERGROUND TELEPHONE LINE
- — — G — NATURAL GAS LINE
- — — SD — STORM DRAIN
- — — SS — SANITARY SEWER LINE
- — — W — WATER LINE
- XXXXXXXXXX TO BE DEMOLISHED OR DECOMISSIONED

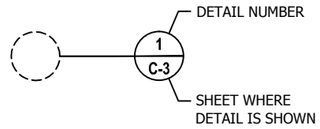
FILL PATTERNS:

- PAVEMENT
- SAND
- AGGREGATE
- SOIL
- CONCRETE
- BENTONITE CHIPS
- COMPACTED FILL
- CEMENT BENTONITE GROUT

SHEET WHERE DETAIL IS SHOWN:



SHEET WHERE DETAIL IS CALLED:



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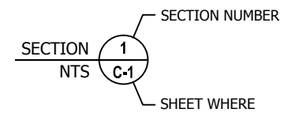
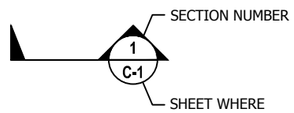


SHEET WHERE SECTION IS CALLED:



ABBREVIATIONS:

ø	DIAMETER	MVSC	MANHATTAN VILLAGE SHOPPING CENTER
'	FEET	MW	MONITORING WELL
"	INCHES	NTS	NOT TO SCALE
#	NUMBER	SDMH	STORM DRAIN MANHOLE
APPROX	APPROXIMATE	SSMH	SANITARY SEWER MANHOLE
AS	AIR SPARGING	SVE	SOIL VAPOR EXTRACTION
CB	CATCH BASIN	PCE	TERACHLOROETHENE
EL	ELEVATION	PSI	POUNDS PER SQUARE INCH
ES	ESTIMATED	PVC	POLYVINYL CHLORIDE
FH	FIRE HYDRANT	SCH	SCHEDULE
MAX	MAXIMUM	TYP	TYPICAL
MIN	MINIMUM	WC	WATER COLUMN
MPT	MALE PIPE THREAD	XFMR	TRANSFORMER

No.	Date	Revisions	By
0	7/22/14	Issued for Bid	

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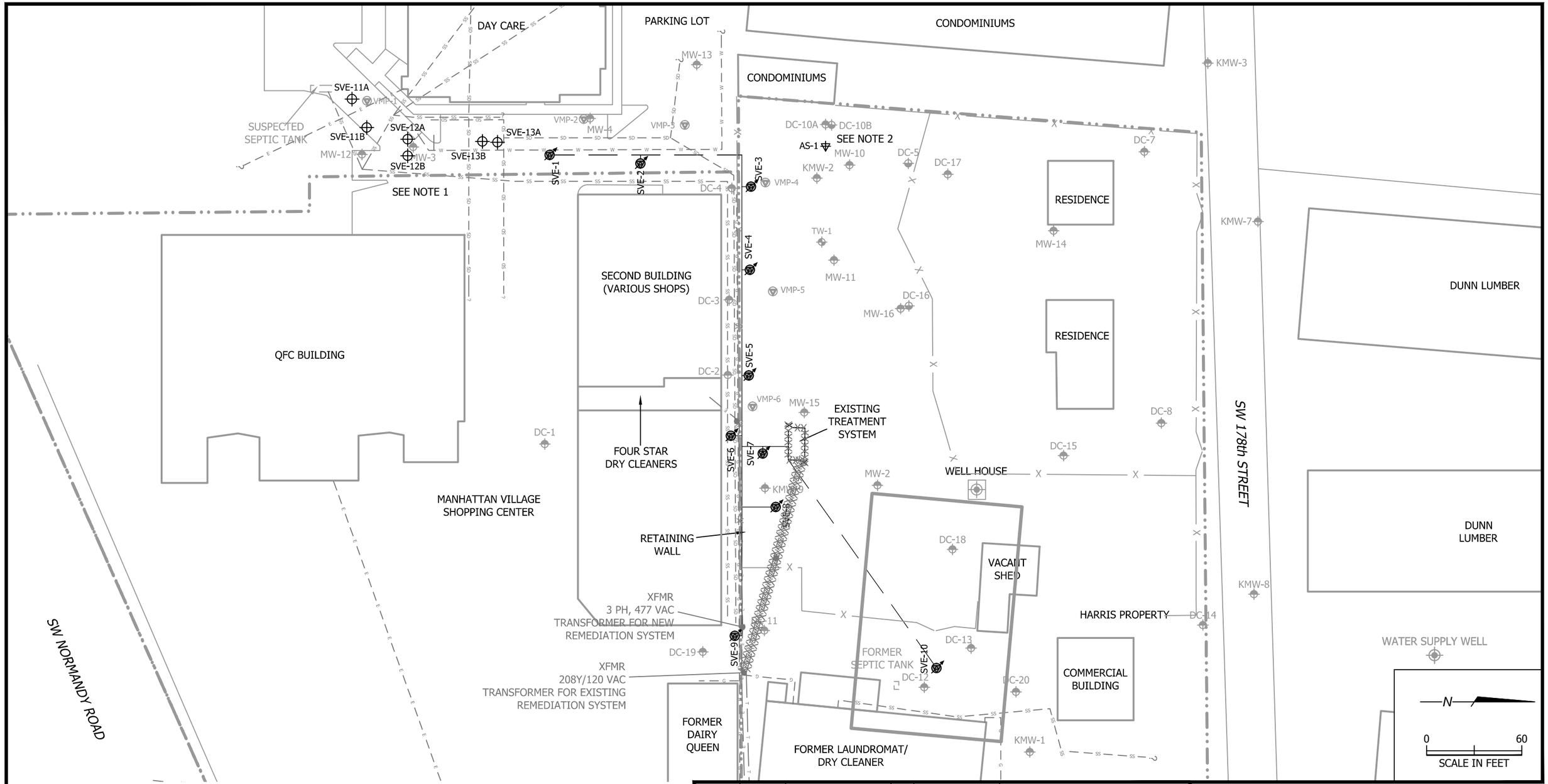
MATTHEW V. DAHL STATE OF WASHINGTON 50366 REGISTERED PROFESSIONAL ENGINEER

PES Environmental, Inc.
Engineering & Environmental Services

General Notes
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

Sheet G-1

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
1358.001.01.005	1358-00101005_SVE_r1_G1	BO	7/14



NOTES:

1. EXISTING WELLS SVE-11A, SVE-11B, SVE-12A, SVE-12B, SVE-13A,AND SVE-13B WERE INSTALLED IN NOVEMBER 2013. THESE WELLS ARE NOT CONNECTED TO THE EXISTING SVE SYSTEM AND ARE CLASSIFIED AS NEW WELLS IN THESE PLANS.

2. EXISTING WELL AS-1 WAS INSTALLED IN JUNE 2012. THIS WELL IS NOT CONNECTED TO THE EXISTING REMEDIATION SYSTEM AND IS CLASSIFIED AS A NEW WELL IN THESE PLANS.

No.	Date	Revisions	By
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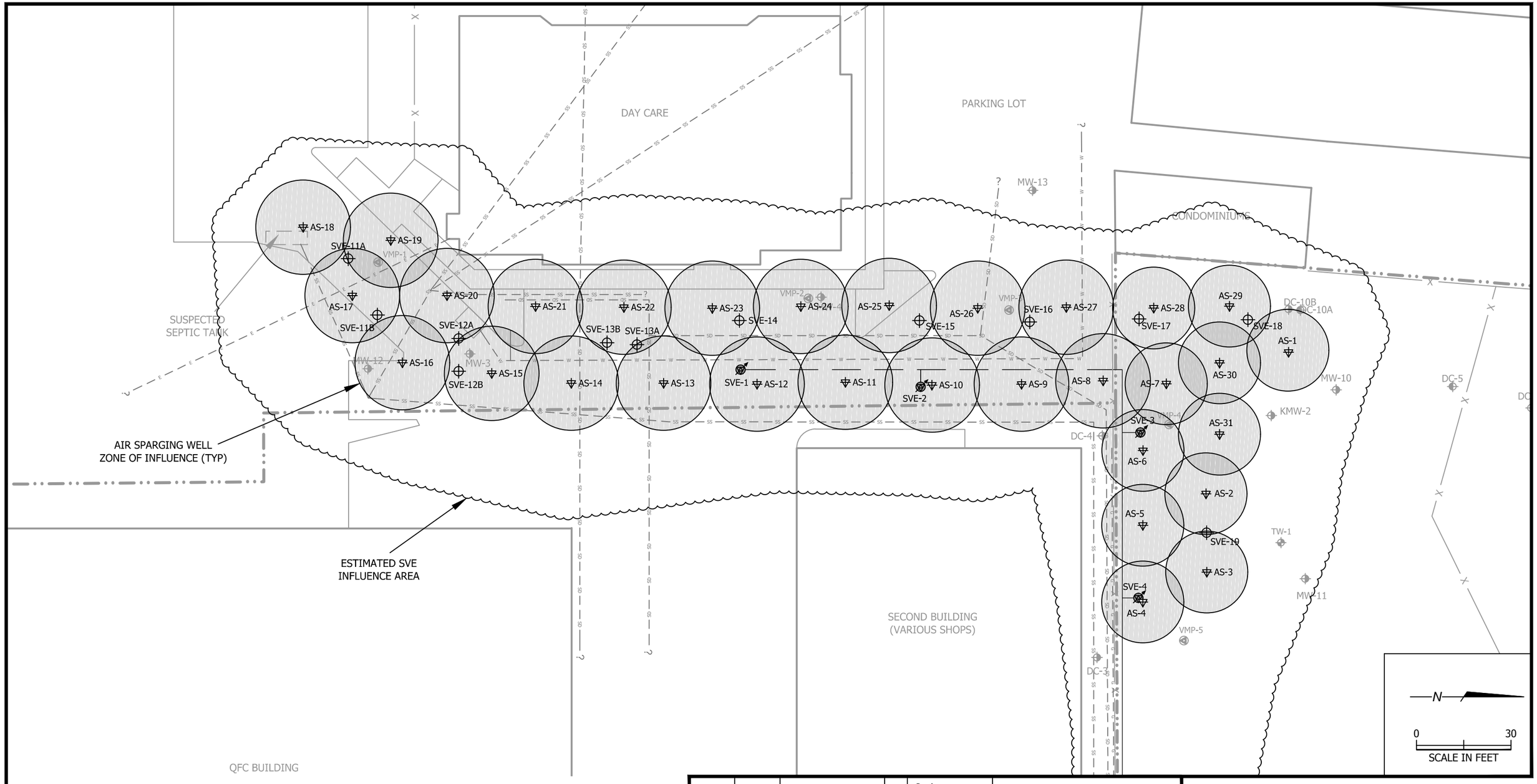
PES Environmental, Inc.
Engineering & Environmental Services

Existing Site Plan
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

Sheet C-1

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
1358.001.01.005	1358-00101005_SVE_r1_C1-C5	BO	7/14



NOTES:
1. AS WELLS ON HARRIS PROPERTY INCLUDE AN ESTIMATED 13 FT ZONE OF INFLUENCE.
2. AS WELLS ON MVSC PROPERTY INCLUDE AN ESTIMATED 15 FT ZONE OF INFLUENCE.
3. SVE WELLS INCLUDE AN ESTIMATED 40 FT RADIUS OF INFLUENCE. THE COMBINED SVE INFLUENCE AREA INCLUDES ALL 22 OF THE SVE WELLS (SVE-1 THROUGH SVE-19).

No.	Date	Revisions	By
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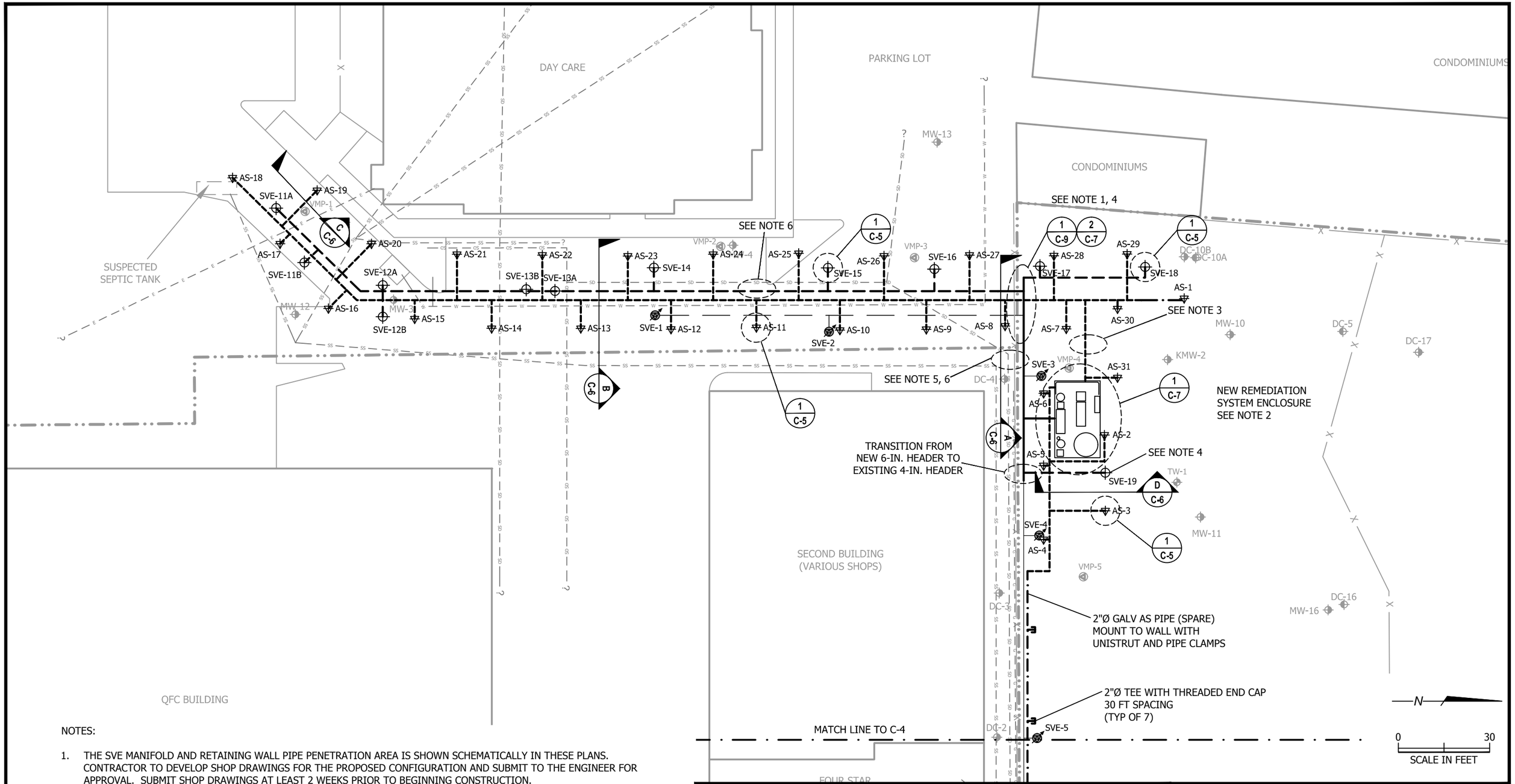
PES Environmental, Inc.
Engineering & Environmental Services

Zone of Influence Layout
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

Sheet C-2

1358.001.01.005	1358-00101005_SVE_r1_C1-C5	BO	7/14
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



NOTES:

1. THE SVE MANIFOLD AND RETAINING WALL PIPE PENETRATION AREA IS SHOWN SCHEMATICALLY IN THESE PLANS. CONTRACTOR TO DEVELOP SHOP DRAWINGS FOR THE PROPOSED CONFIGURATION AND SUBMIT TO THE ENGINEER FOR APPROVAL. SUBMIT SHOP DRAWINGS AT LEAST 2 WEEKS PRIOR TO BEGINNING CONSTRUCTION.
2. SUPPLY 3-PHASE 460 VAC POWER AND TELEPHONE UTILTIES TO THE NEW REMEDIATION SYSTEM ENCLOSURE. PROVIDE STEP DOWN TRANSFORMER FOR 120 VAC CONTROL LOADS AND GFCI OUTLETS.
3. INSTALL INDIVIDUAL LATERAL PIPES TO FLUSH GRADE WELLS IN COMMON TRENCHES WHEREVER POSSIBLE.
4. ROUTE LATERAL PIPES FROM SVE WELLS SVE-17, SVE-18, AND SVE-19 UNDERGROUND TO THE 6-INCH DIAMETER SVE HEADER AT THE RETAINING WALL. INSTALL MONITORING PORTS AND THROTTLING VALVES ON ABOVEGROUND SECTIONS OF LATERAL PIPES PRIOR TO HEADER TIE-IN.
5. SUPPORT ALL ABOVE GROUND PIPES AT 5 FT SPACING (MAX) TO PREVENT PIPE SAGS.
6. SLOPE SVE LATERALS AND HEADERS TO WELLS AT 1 PERCENT SLOPE.

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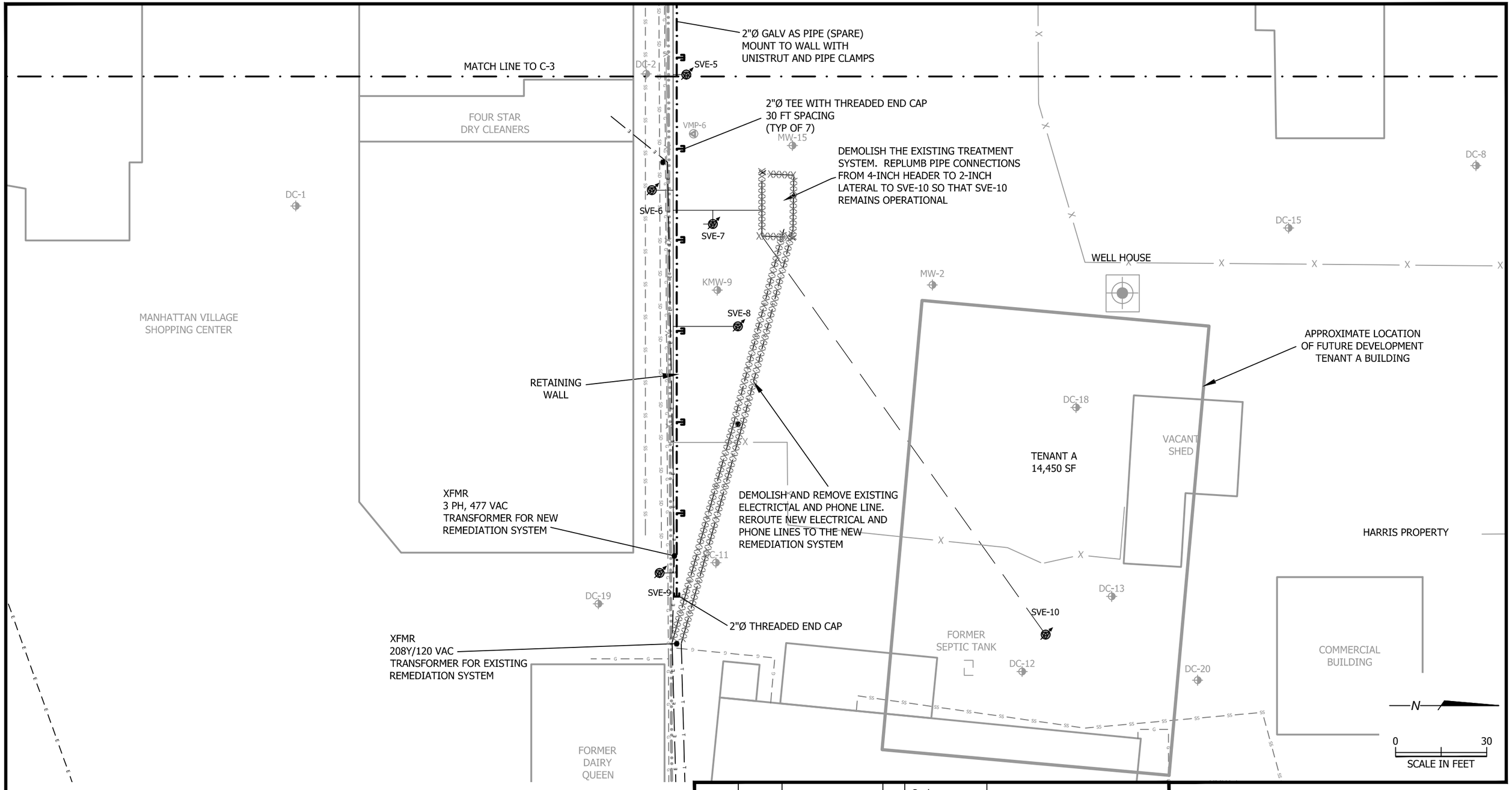
PES Environmental, Inc.
Engineering & Environmental Services

Site Layout - West
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

Sheet C-3

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
1358.001.01.005	1358-00101005_SVE_r1_C1-C5	BO	7/14



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				Designed by: MD
				Drawn by: BP
				Checked by: BO
0	7/22/14	Issued for Bid		Approved by: MD

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50366
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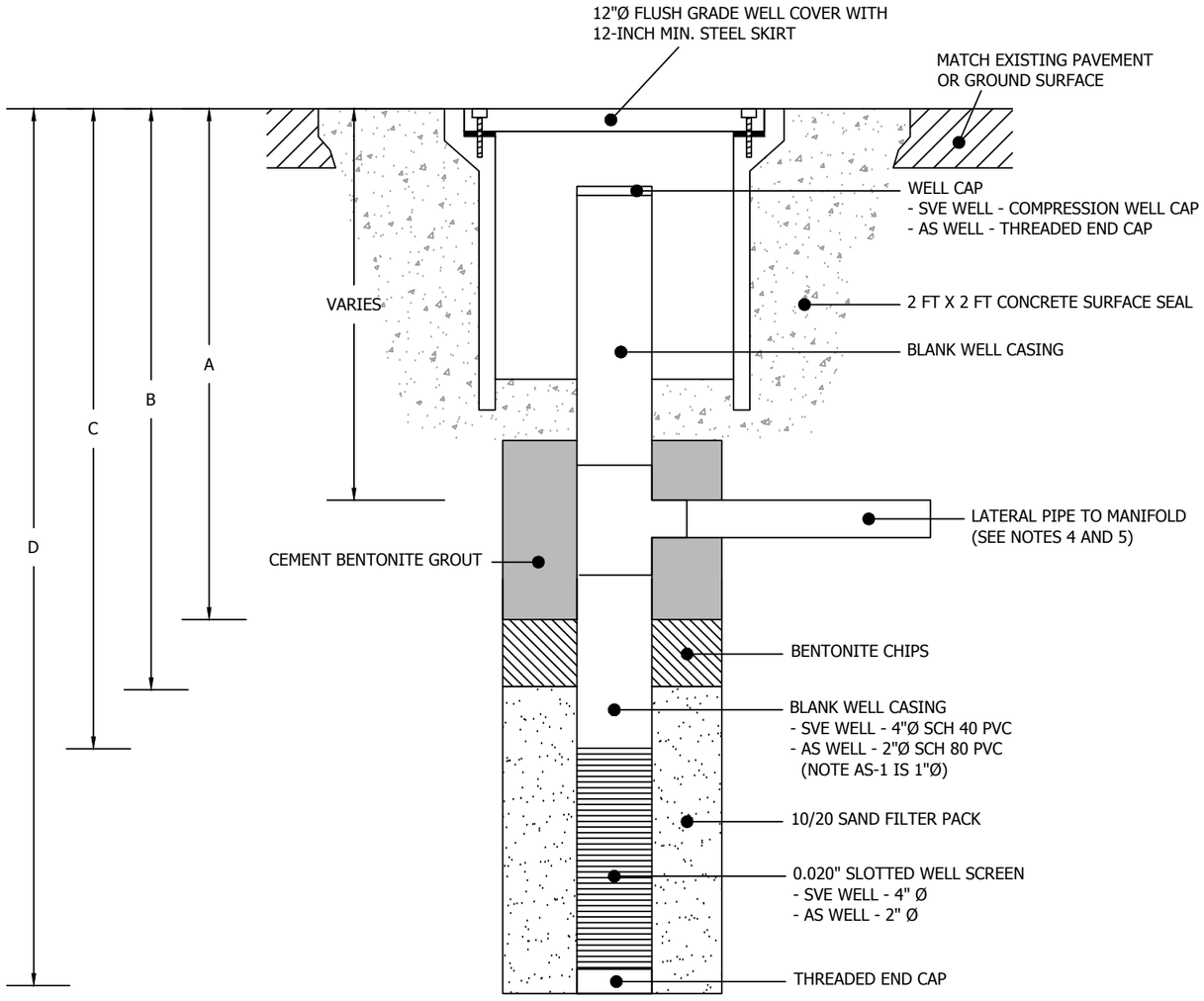
PROFESSIONAL ENGINEER

PES Environmental, Inc.
Engineering & Environmental Services

Site Layout - East
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

Sheet
C-4

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
1358.001.01.005	1358-00101005_SVE_r1_C1-C5	BO	7/14



SVE WELLS (FEET)				
WELL	A	B	C	D
SVE-11A	1.5	3	5	20
SVE-11B	2.5	18	20	35
SVE-12A	1.5	3	5	20
SVE-12B	2.5	18	20	35
SVE-13A	1.5	3	5	20
SVE-13B	2.5	18	20	35
SVE-14	16	18	20	35
SVE-15	16	18	20	35
SVE-16	16	18	20	35
SVE-17	16	18	20	30
SVE-18	16	18	20	30
SVE-19	16	18	20	30

AS WELLS (FEET)				
WELL	A	B	C	D
AS-1	2.5	43.5	43.8	45.8
AS-2	44.5	46.5	47	49
AS-3	44.5	46.5	47	49
AS-4	44.5	46.5	47	49
AS-5	44.5	46.5	47	49
AS-6	44.5	46.5	47	49
AS-7	44.5	46.5	47	49
AS-8	44.5	46.5	47	49
AS-9	44.5	46.5	47	49
AS-10	44.5	46.5	47	49
AS-11	44.5	51.5	52	54
AS-12	44.5	51.5	52	54
AS-13	44.5	51.5	52	54
AS-14	44.5	51.5	52	54
AS-15	44.5	51.5	52	54
AS-16	44.5	51.5	52	54
AS-17	44.5	51.5	52	54
AS-18	44.5	51.5	52	54
AS-19	44.5	51.5	52	54
AS-20	44.5	52.5	53	55
AS-21	44.5	52.5	53	55
AS-22	44.5	52.5	53	55
AS-23	44.5	52.5	53	55
AS-24	44.5	52.5	53	55
AS-25	44.5	52.5	53	55
AS-26	44.5	52.5	53	55
AS-27	44.5	52.5	53	55
AS-28	44.5	52.5	53	55
AS-29	44.5	52.5	53	55
AS-30	44.5	52.5	53	55
AS-31	44.5	52.5	53	55

TYPICAL SVE AND AS WELL CONSTRUCTION DETAIL (1 / C-3)
NTS

NOTES:
1. WELLS SVE-1 THROUGH SVE-13B (16 WELLS) AND AS-1 ARE EXISTING. SVE-1 THROUGH SVE-10 WERE INSTALLED IN 2009 AND MAKE UP THE EXISTING SVE SYSTEM. SVE-11A THROUGH SVE-13 AND AS-1 WERE INSTALLED IN 2013.
2. WELLS SVE-14 THROUGH SVE-19 AND AS-2 THROUGH AS-31 TO BE INSTALLED IN 2014.
3. SEE SVE AND AS WELL TABLES FOR WELL DIMENSIONS.
4. SVE LATERALS: 2"Ø SCH 4O PVC.
5. AS LATERALS: 1"Ø SCH 8O PVC BELOW GROUND, AND 1"Ø SCH 40 GALVANIZED ABOVE GROUND.

No.	Date	Revisions	By
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PES Environmental, Inc.
Engineering & Environmental Services

Well Construction Details
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

Sheet C-5

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
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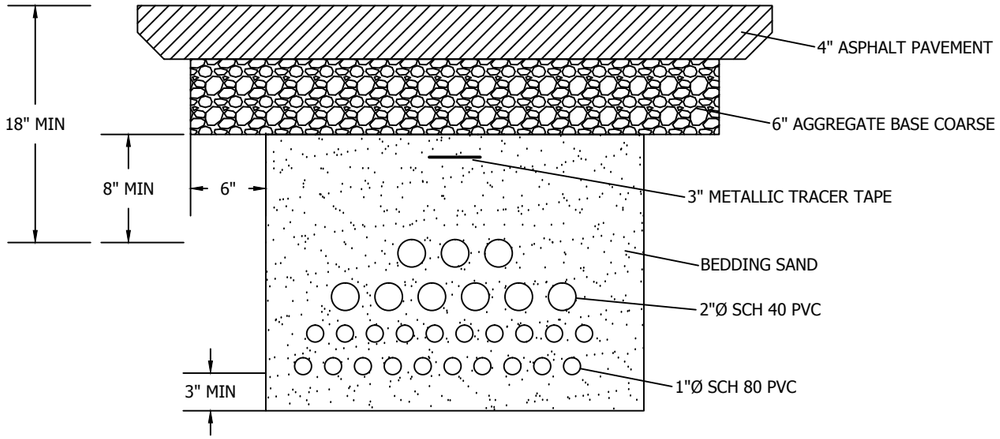
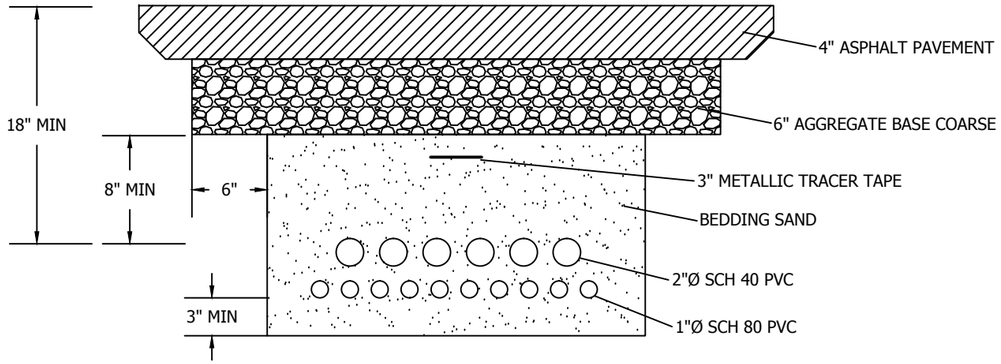


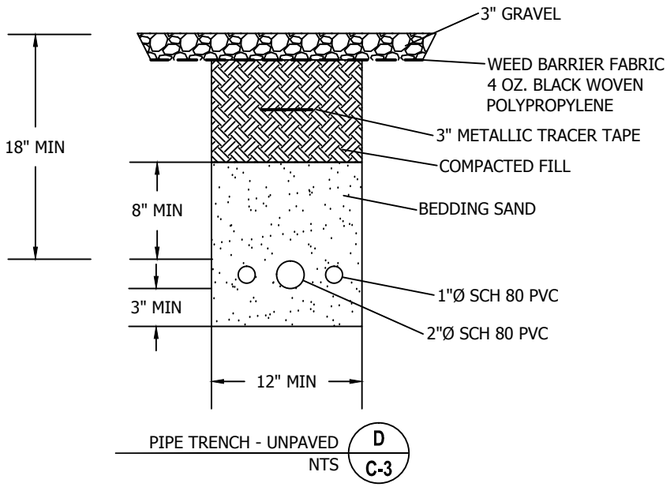
PIPE TRENCH - PAVED A / C-3
NTS



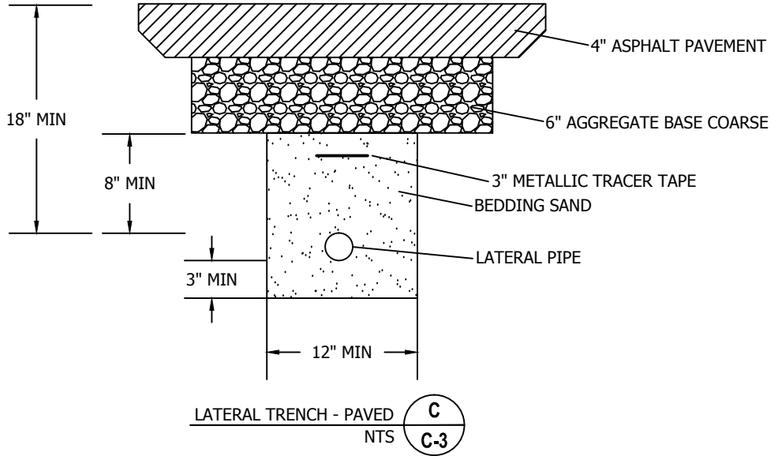
PIPE TRENCH - PAVED B / C-3
NTS

NOTES:

1. TRENCH DEPTH AND WIDTH WILL VARY BY LOCATION.
2. MULTIPLE PIPES: MAINTAIN 1" MIN. SAND AROUND ALL PIPES.
3. BACKFILL TRENCHES WITH CLEAN SAND WITH A MAXIMUM LOOSE LIFT OF 8-INCHES BEFORE COMPACTION.
4. COMPACT ABOVE THE PIPE ZONE TO AT LEAST 95% OF MAXIMUM DENSITY AND WITHIN +/- 3% OF OPTIMUM MOISTURE (ASTM D-1557).
5. AS LATERAL PIPE MATERIALS: SCH 80 PVC BELOW GROUND AND SCH 40 GALV ABOVE GROUND.



PIPE TRENCH - UNPAVED D / C-3
NTS



LATERAL TRENCH - PAVED C / C-3
NTS

No.	Date	Revisions	By
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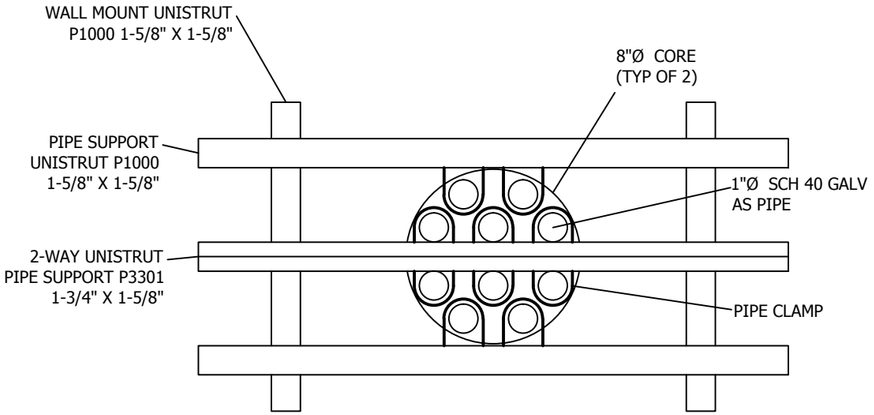
PES Environmental, Inc.
Engineering & Environmental Services

Trench Sections
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

Sheet C-6

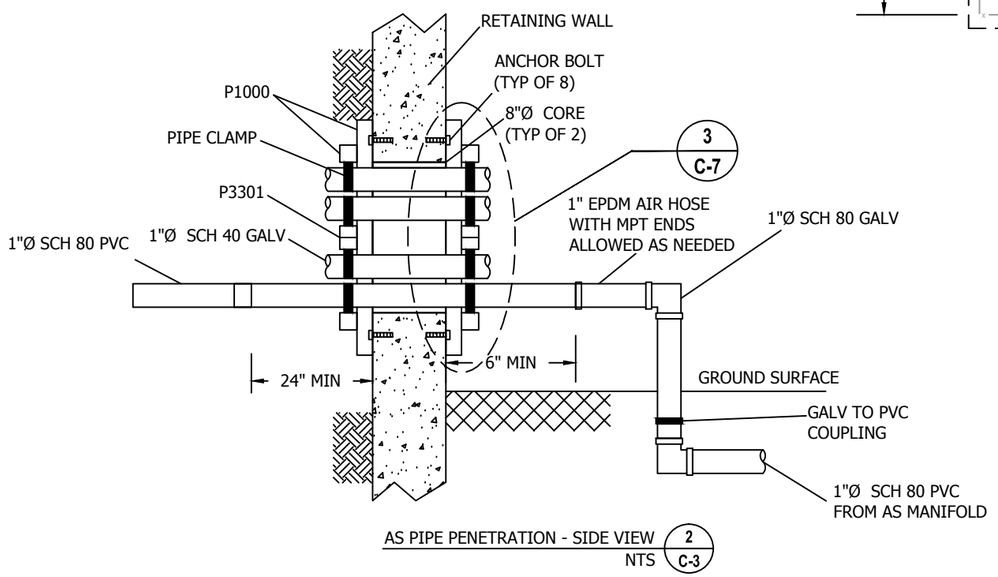
1358.001.01.005	1358-00101005_SVE_r1_C6	BO	7/14
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



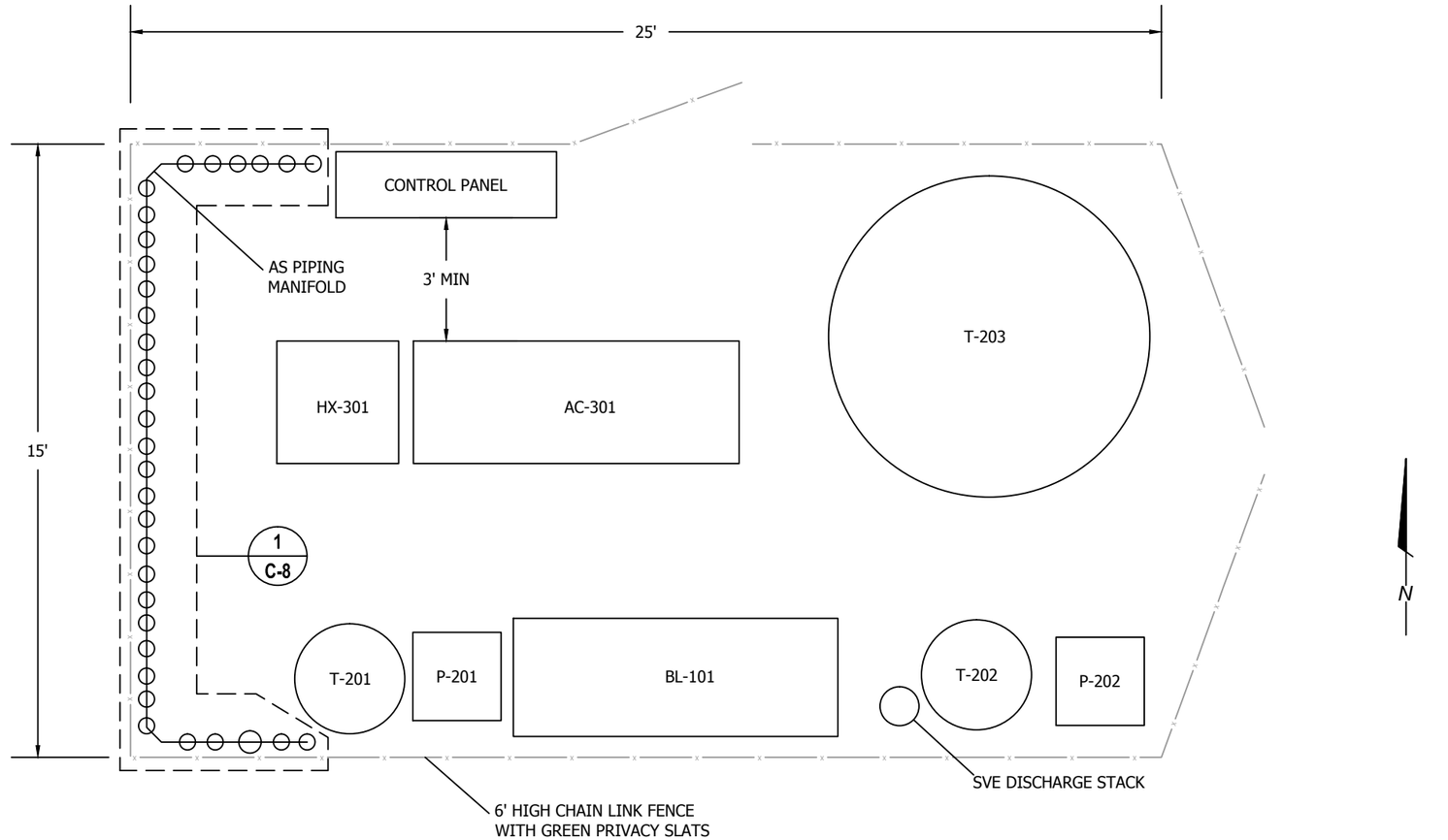
AS PIPE PENETRATION - FRONT VIEW 3/C-7
NTS

NOTES:

1. EXTEND 20 X 1"Φ SCH 40 GALV AS LATERAL PIPES THROUGH TWO 8"Φ CORES CUT INTO THE RETAINING WALL (18" SPACING MIN).
2. SECURE PIPES ON EITHER SIDE OF RETAINING WALL USING UNISTRUT AND PIPE CLAMPS.



AS PIPE PENETRATION - SIDE VIEW 2/C-3
NTS



EQUIPMENT LAYOUT 1/C-3
NTS

NOTE:
EQUIPMENT SIZES AND LAYOUT IS APPROXIMATE. CONTRACTOR TO SUBMIT FINAL EQUIPMENT LAYOUT TO ENGINEER FOR APPROVAL AT LEAST 2 WEEKS PRIOR TO CONSTRUCTION. FINAL LAYOUT TO BE BASED ON ACTUAL EQUIPMENT DIMENSIONS AND SETBACK REQUIREMENTS.

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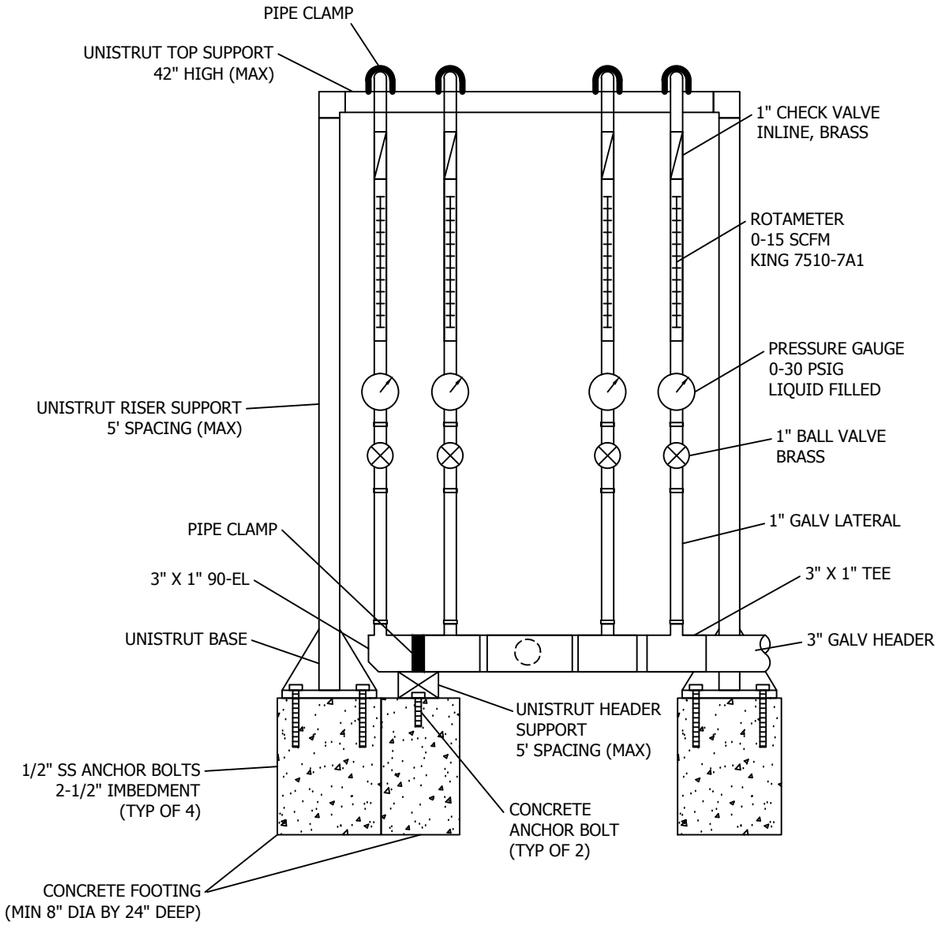
PES Environmental, Inc.
Engineering & Environmental Services

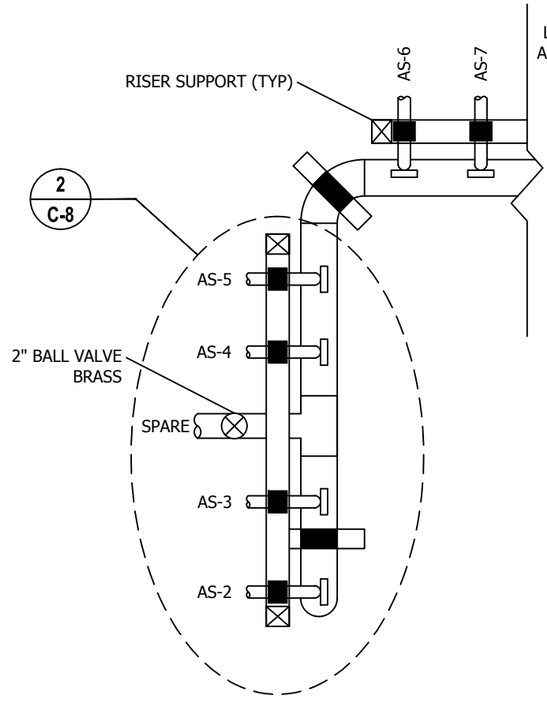
Retaining Wall Penetration and Equipment Layout
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

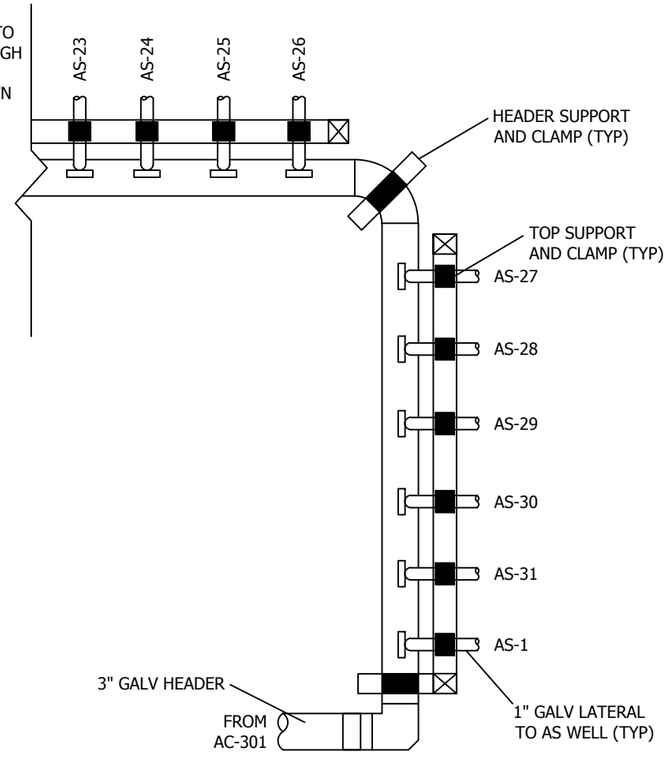
Sheet C-7

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
1358.001.01.005	1358-00101005_SVE_r1_C7-C9	BO	7/14



AS MANIFOLD FRONT VIEW 2 / C-8
NTS





NOTES:
1. EITHER THREADED OR WELDED GALVANIZED MANIFOLD IS ACCEPTABLE.
2. TRANSITION FROM GALVANIZED PIPE ABOVE GROUND TO SCH 80 PVC PIPE BELOW GROUND.

AS MANIFOLD TOP VIEW 1 / C-7
NTS

No.	Date	Revisions	By
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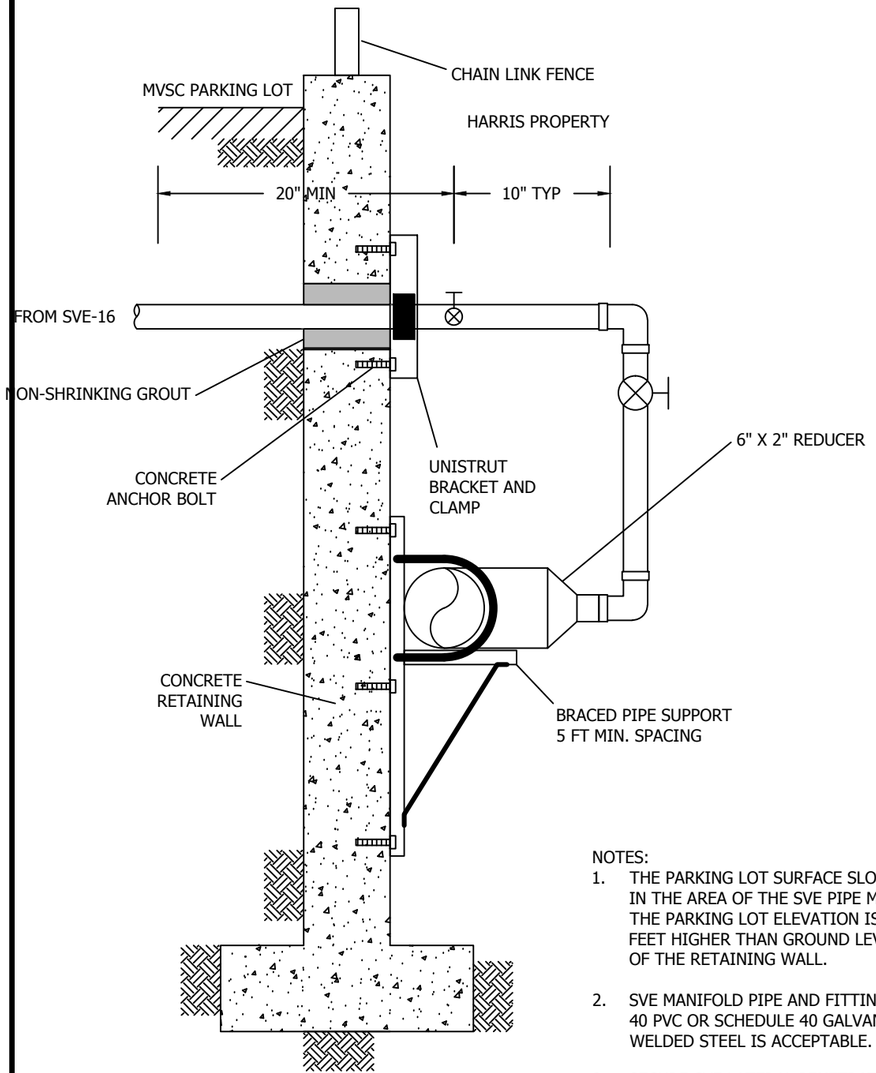
PES Environmental, Inc.
Engineering & Environmental Services

AS Manifold Details
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

Sheet C-8

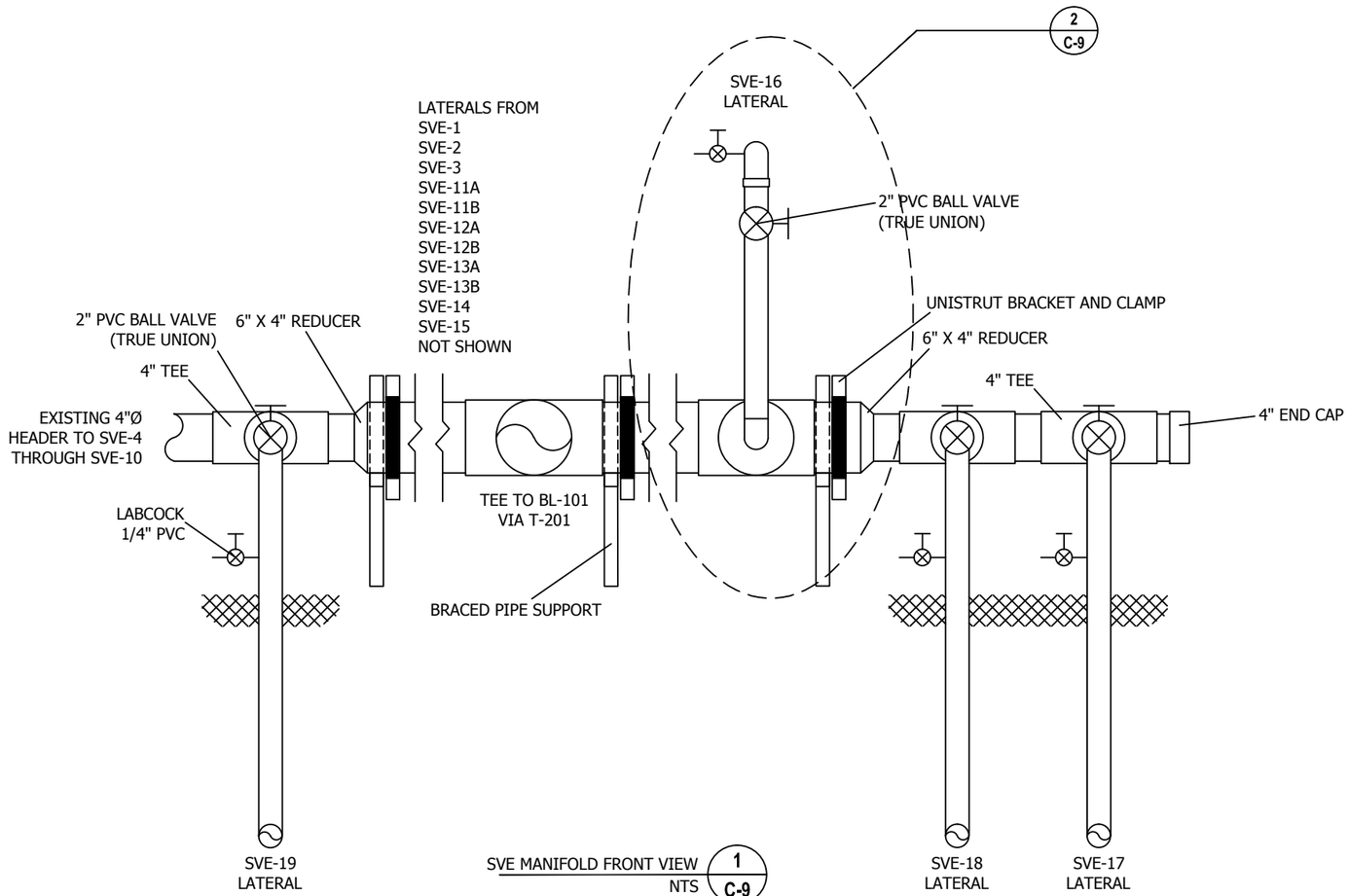
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
1358.001.01.003	1358-00101005_SVE_r1_C7-C9	BO	7/14



SVE MANIFOLD SIDE VIEW 2 / C-9
NTS

NOTES:

1. THE PARKING LOT SURFACE SLOPES DOWN TO THE WEST IN THE AREA OF THE SVE PIPE MANIFOLD. IN THIS AREA THE PARKING LOT ELEVATION IS APPROXIMATELY 3 TO 5 FEET HIGHER THAN GROUND LEVEL ON THE NORTH SIDE OF THE RETAINING WALL.
2. SVE MANIFOLD PIPE AND FITTING MATERIALS: SCHEDULE 40 PVC OR SCHEDULE 40 GALVANIZED STEEL PIPE. WELDED STEEL IS ACCEPTABLE.
3. SECURE SVE LATERAL PENETRATIONS AND SVE HEADER PIPES TO RETAINING WALL USING UNISTRUT BRACKETS AND CLAMPS.
4. SUPPORT SVE HEADER PIPE USING HORIZONTAL UNISTRUT SUPPORTS WITH DIAGONAL BRACES. 5 FT MIN. SPACING BETWEEN PIPE SUPPORTS.



SVE MANIFOLD FRONT VIEW 1 / C-9
NTS

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PES Environmental, Inc.
Engineering & Environmental Services

SVE Manifold Details
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

Sheet C-9

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
1358.001.01.003	1358-00101005_SVE_r1_C7-C9	BO	7/14

VALVE AND PIPING SYMBOLS

- GLOBE VALVE
- GATE VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- TRUE-UNION BALL VALVE
- RELIEF OR SAFETY VALVE
- SELF-CONTAINED PRESSURE REGULATING VALVE
- NEEDLE VALVE
- BALL VALVE
- 3-WAY VALVE
- SAMPLE PORT
- NO NORMALLY OPEN
- NC NORMALLY CLOSED
- LC LOCKED CLOSED
- DAMPER
- DIAPHRAGM VALVE
- ORIFICE VALVE

GENERAL SYMBOLS

- Y-TYPE STRAINER
- EQUIPMENT DRAIN
- REMOVABLE CAP
- FLANGE
- EXHAUST TO ATMOSPHERE
- REDUCER
- FILTER REDUCER
- UNION
- QUICK DISCONNECT COUPLING
- CAMLOCK COUPLING
- FLEXIBLE HOSE
- EXPANSION JOINT (FLANGED)
- GRAVITY FLOW
- FLOW ORIFICE
- DIAPHRAGM SEAL
- SIGHT GLASS
- VORTEX DAMPER
- CLEAN OUT
- FLEXIBLE COUPLING

VALVE OPERATOR SYMBOLS

- S SOLENOID
- M MOTOR, ELECTRIC
- DIAPHRAGM (GENERAL)
- P PNEUMATIC
- HAND

PRIMARY ELEMENT SYMBOLS

- ORIFICE PLATE
- AVERAGING PITOT TUBE
- PROPELLOR OR TURBINE
- VARIABLE AREA
- F FLOW
- FLOAT LEVEL
- P PRESSURE
- M MAGNETIC
- T TOTALIZER

EQUIPMENT SYMBOLS

- GROUNDWATER PUMP (ELECTRIC)
- CENTRIFUGAL PUMP
- AIR COMPRESSOR
- HEAT EXCHANGER (GAS/GAS)
- HEAT EXCHANGER (GAS/LIQUID)
- VFD VARIABLE FREQUENCY DRIVE
- REGENERATIVE BLOWER OR FAN
- PRODUCT PUMP (PNUEMATIC)
- 55 GALLON DRUM WITHIN 95 GALLON OVERPACK DRUM
- FILTER
- SUMP PUMP WITH LEVEL FLOAT
- METERING PUMP
- POSITIVE DISPLACEMENT BLOWER
- SILENCER
- TANK ADAPTER
- TANK FULL SHUTOFF (TFSO) UNIT
- CONDENSATE TRAP

GENERAL INSTRUMENT SYMBOLS

GENERAL INSTRUMENT OR FUNCTION SYMBOLS	FIELD MOUNTED	PRIMARY LOCATION ACCESSIBLE TO OPERATOR	AUXILLARY LOCATION ACCESSIBLE TO OPERATOR	NORMALLY INACCESSIBLE OR BEHIND THE PANEL
DISCRETE INSTRUMENTS	○	⊖	⊖	⊖
SHARED DISPLAY, SHARED CONTROL	□	▭	▭	▭
COMPUTER FUNCTION	⬡	⬡	⬡	⬡
PROGRAMMABLE LOGIC CONTROL	◇	◇	◇	◇

- IN-LINE DEVICE
- DIRECT CONNECTION TO PROCESS
- PILOT LAMP G = GREEN, R = RED
- 120 VAC ELECTRICAL SERVICE
- I# INTERLOCK - # INDICATES INTERLOCK NUMBER
- HOA HAND-OFF-AUTO
- HOR HAND-OFF-REMOTE
- I-O ON-OFF

PLC INPUT/OUTPUT SYMBOLS

- DISCRETE INPUT
- DISCRETE OUTPUT
- ANALOG INPUT
- ANALOG OUTPUT

LINE SYMBOLS

- PROCESS
- COMPRESSED AIR
- INTRINSICALLY SAFE SIGNAL
- ELECTRICAL SIGNAL
- FLEXIBLE TUBING
- SPARGER LINE
- SOFTWARE OR DATALINK

- FROM REFERENCED DRAWING OR EQUIPMENT
- TO REFERENCED DRAWING OR EQUIPMENT
- 1 / R-2 DETAIL LETTER OR NUMBER / DRAWING OF REFERENCE

PROCESS LINE ABBREVIATIONS

AIR	COMPRESSED AIR
CHEM	CHEMICAL ADDITION
COND	CONDENSATE
GW	GROUNDWATER
PROD	PRODUCT (LNAPL or DNAPL)
VAP	VAPOR
VENT	AIR VENT

PIPING MATERIAL IDENTIFICATION

CPVC	CHLORINATED POLYVINYL CHLORIDE
CSP	CARBON STEEL PIPE
GALV	GALVANIZED CARBON STEEL PIPE
HDPE	HIGH DENSITY POLYETHYLENE
HSE	HOSE
SSP	STAINLESS STEEL PIPE
SST	STAINLESS STEEL TUBING
PE	POLYETHYLENE
PVC	POLYVINYL CHLORIDE
T	TUBING

EQUIPMENT IDENTIFICATION

AD	AUTODIALER
AP	ANALYSIS/SAMPLE PORT
AC	AIR COMPRESSOR
BA	BOTTLED AIR
BL	BLOWER
CFP	CHEMICAL FEED PUMP
CP	CONTROL PANEL
FIL	FILTER
HEX	HEAT EXCHANGER
HMI	HUMAN MACHINE INTERFACE
HV	HAND VALVE
M	MOTOR
NPT	NATIONAL PIPE THREAD
P	PUMP
PLC	PROGRAMMABLE LOGIC CONTROLLER
RCP	REMOTE CONTROL PANEL
S	STRAINER OR VALVE
SG	VAPOR EXTRACTION WELL
SIL	SILENCER
SP	SAMPLE PORT
SVE	SOIL VAPOR EXTRACTION
T	TUBING
TFSO	TANK FULL SHUTOFF
VAC	VOLTAGE (ALTERNATING CURRENT)
VDC	VOLTAGE (DIRECT CURRENT)
VENT	PNEUMATIC PUMP AIR VENT
VFD	VARIABLE FREQUENCY DRIVE
XV	CHECK VALVE

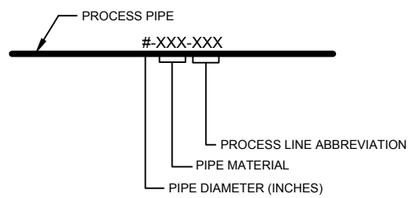
VALVE AND INSTRUMENT IDENTIFICATION SYMBOLS

	FIRST LETTER		SUCCEEDING LETTER		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER FLAME				
C	CONTROL			CONTROLLER	CLOSED
D	DENSITY (SP. GR.)	DIFFERENTIAL	DAMPER		
E	VOLTAGE		PRIMARY ELEMENT		
F	FLOW RATE	RATIO			
G	GAUGING (DIMENSIONAL)		GLASS		
H	HAND (MANUAL)				HIGH
I	CURRENT		INDICATOR		
J	POWER	SCAN			
K	TIME OR SCHEDULE			CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOISTURE OR HUMIDITY	MOMENTARY			MIDDLE
N					
O			ORIFICE		OPEN
P	PRESSURE OR VACUUM	RELIEF	POINT (TEST)		
Q	QUANT. OR EVENT	INTEGRATE			
R	RADIATION		RECORD OR PRINT		RELIEF
S	SPEED/FREQUENCY	SAFETY		SWITCH/SOLENOID	
T	TEMPERATURE			TRANSMITTER	TRANSDUCER
U	MULTIVARIABLE		MULTIFUNCTION		
V	VISCOSITY			VALVE	
W	WEIGHT		WELL		
X	POSITION		UNCLASSIFIED		
Y				RELAY OR COMPUTE	
Z	POSITION			DRIVE, ACTUATE	

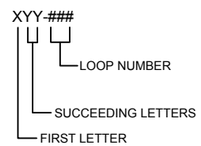
GENERAL NOTES:

1. DRAWINGS ARE DIAGRAMMATIC AND CANNOT SHOW ALL DETAILS. CONTRACTOR TO PROVIDE AND INSTALL ALL FITTINGS FOR A COMPLETE AND OPERABLE SYSTEM.
2. COMPONENTS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.
3. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, AND FEDERAL REQUIREMENTS.
4. REFER TO TECHNICAL SPECIFICATIONS FOR ADDTIONAL REQUIREMENTS. IN THE EVENT OF ANY DISCREPANCIES BETWEEN THE DRAWINGS AND THE SPECIFICATIONS, CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND MOST STRINGENT SHALL APPLY.
5. VALVES SHALL BE ORIENTED FOR OPTIMUM ACCESSIBILITY AND OPERABILITY. COMPONENTS SHALL BE INSTALLED WITH SUFFICIENT SPACE FOR MAINTENANCE AND REPAIRS.
6. FLOW METERS, GAUGES AND OHER INSTRUMENTATION SHALL NOT BE SUBJECT TO PRESSURE TESTING UNLESS SPECIFICALLY ALLOWED BY MANUFACTURER.
7. UNLESS OTHERWISE SPECIFIED BY MANUFACTURER, FLOW INSTRUMENTS SHALL BE INSTALLED A MINIMUM OF 10 PIPE DIAMETERS UPSTREAM AND 5 PIPE DIAMETERS DOWNSTREAM FROM ANY FITTING, VALVE, OR OTHER INSTRUMENT.
8. QUICK CONNECT HOSES SHALL BE COLOR-CODED AND EQUIPPED WITH BRASS NON-INTERCHANGEABLE, DOUBLE SHUTOFF QUICK CONNECTS.

PROCESS PIPING IDENTIFICATION



VALVE AND INSTRUMENT IDENTIFICATION



No.	Date	Revisions	By
0	7/22/14	Issued for Bid	

Scale: AS NOTED

Designed by: MD

Drawn by: BP

Checked by: BO

Approved by: MD

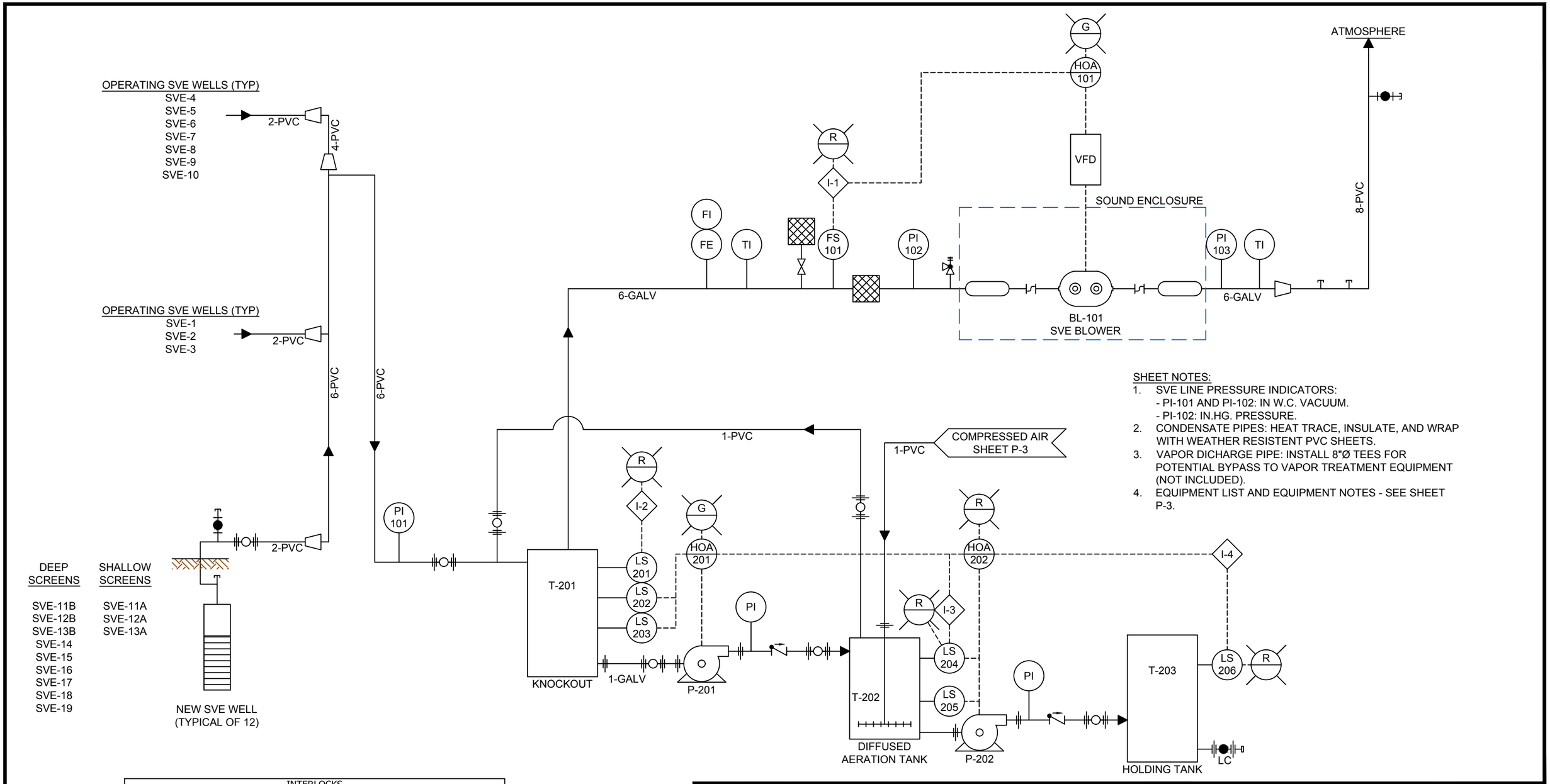
MATTHEW V. DAHL STATE OF WASHINGTON 50366 REGISTERED PROFESSIONAL ENGINEER

PES Environmental, Inc.
Engineering & Environmental Services

Process and Instrumentation Notes
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

Sheet P-1

1358.001.01.005	1358-00101005_SVE_r1_P1-P3	BO	7/14
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



SHEET NOTES:

1. SVE LINE PRESSURE INDICATORS:
   - PI-101 AND PI-102: IN W.C. VACUUM.
   - PI-102: IN.HG. PRESSURE.
2. CONDENSATE PIPES: HEAT TRACE, INSULATE, AND WRAP WITH WEATHER RESISTENT PVC SHEETS.
3. VAPOR DICHARGE PIPE: INSTALL 8"Ø TEES FOR POTENTIAL BYPASS TO VAPOR TREATMENT EQUIPMENT (NOT INCLUDED).
4. EQUIPMENT LIST AND EQUIPMENT NOTES - SEE SHEET P-3.

INTERLOCKS	
I-1	BL-101 (AUTO) AND FS-101: ENABLES AC-301 (AUTO)
I-2	LS-201 DISABLES P-201 & BL-101 (AUTO)
I-3	LS-204 DISABLES P-201 & P-202 (AUTO)
I-4	LS-206 DISABLES P-201 & P-202 (AUTO)

ALARMS	
A-1	LOW FLOW WHEN BL-101 IN AUTO
A-2	LOW FLOW WHEN AC-301 IN AUTO (ALERT ONLY)
A-3	HIGH LEVEL IN T-201
A-4	HIGH LEVEL IN T-202
A-5	HIGH LEVEL IN T-203

No.	Date	Revisions	By
0	7/22/14	Issued for Bid	

Scale: AS NOTED
Designed by: MD
Drawn by: BP
Checked by: BO
Approved by: MD

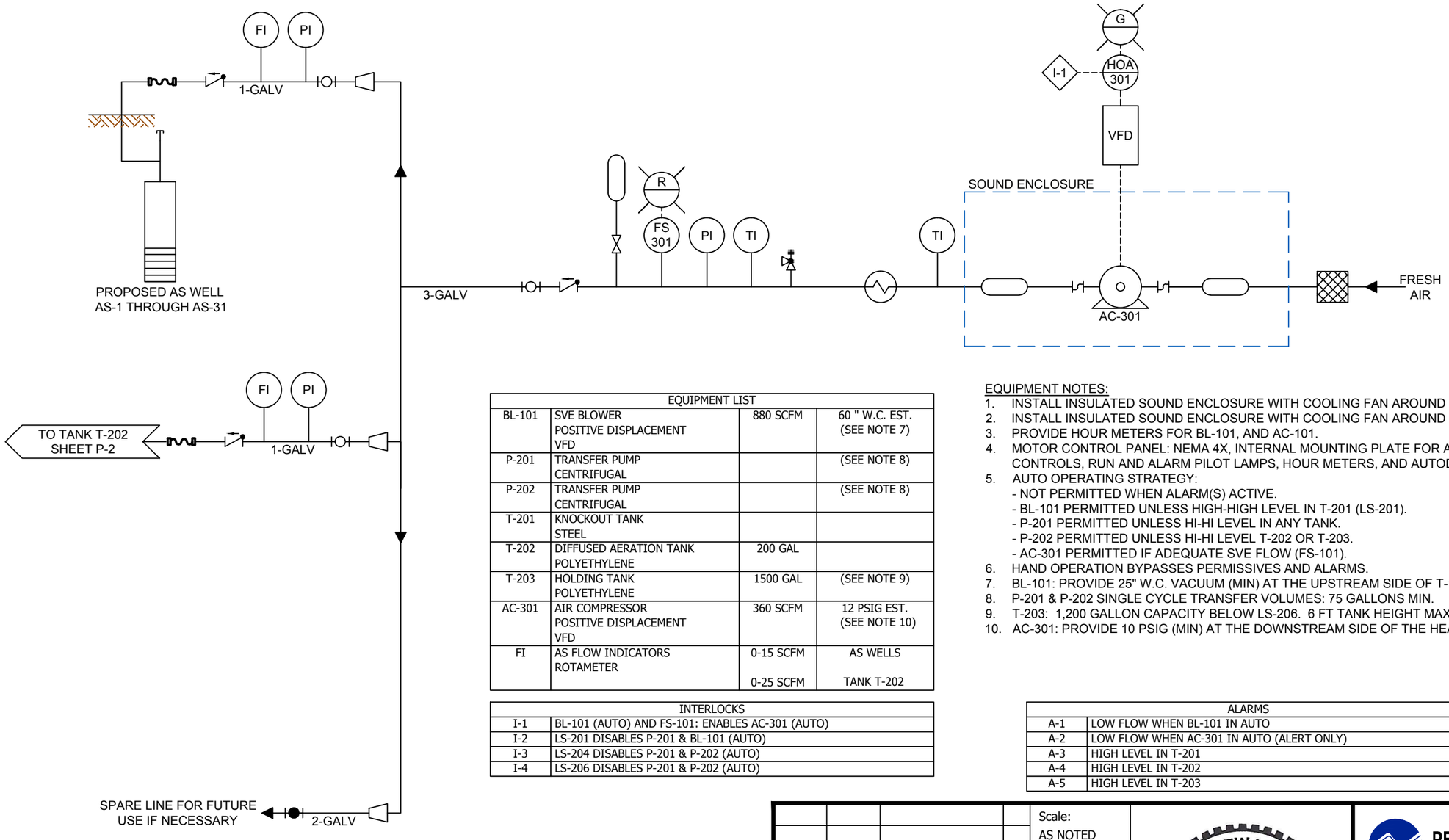
MATTHEW V. DAHL STATE OF WASHINGTON 50366 REGISTERED PROFESSIONAL ENGINEER

PES Environmental, Inc.
Engineering & Environmental Services

Process and Instrumentation Diagram
SVE System
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

Sheet P-2

1358.001.01.005	1358-00101005_SVE_r1_P1-P3	BO	7/14
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



EQUIPMENT LIST			
BL-101	SVE BLOWER POSITIVE DISPLACEMENT VFD	880 SCFM	60 " W.C. EST. (SEE NOTE 7)
P-201	TRANSFER PUMP CENTRIFUGAL		(SEE NOTE 8)
P-202	TRANSFER PUMP CENTRIFUGAL		(SEE NOTE 8)
T-201	KNOCKOUT TANK STEEL		
T-202	DIFFUSED AERATION TANK POLYETHYLENE	200 GAL	
T-203	HOLDING TANK POLYETHYLENE	1500 GAL	(SEE NOTE 9)
AC-301	AIR COMPRESSOR POSITIVE DISPLACEMENT VFD	360 SCFM	12 PSIG EST. (SEE NOTE 10)
FI	AS FLOW INDICATORS ROTAMETER	0-15 SCFM 0-25 SCFM	AS WELLS TANK T-202

INTERLOCKS	
I-1	BL-101 (AUTO) AND FS-101: ENABLES AC-301 (AUTO)
I-2	LS-201 DISABLES P-201 & BL-101 (AUTO)
I-3	LS-204 DISABLES P-201 & P-202 (AUTO)
I-4	LS-206 DISABLES P-201 & P-202 (AUTO)

EQUIPMENT NOTES:

1. INSTALL INSULATED SOUND ENCLOSURE WITH COOLING FAN AROUND BL-101. EXTERIOR 65 DB.
2. INSTALL INSULATED SOUND ENCLOSURE WITH COOLING FAN AROUND AC-101. EXTERIOR 65 DB.
3. PROVIDE HOUR METERS FOR BL-101, AND AC-101.
4. MOTOR CONTROL PANEL: NEMA 4X, INTERNAL MOUNTING PLATE FOR ACCESS TO MOTOR CONTROLS, RUN AND ALARM PILOT LAMPS, HOUR METERS, AND AUTODIALER (ALARMS).
5. AUTO OPERATING STRATEGY:
   - NOT PERMITTED WHEN ALARM(S) ACTIVE.
   - BL-101 PERMITTED UNLESS HIGH-HIGH LEVEL IN T-201 (LS-201).
   - P-201 PERMITTED UNLESS HI-HI LEVEL IN ANY TANK.
   - P-202 PERMITTED UNLESS HI-HI LEVEL T-202 OR T-203.
   - AC-301 PERMITTED IF ADEQUATE SVE FLOW (FS-101).
6. HAND OPERATION BYPASSES PERMISSIVES AND ALARMS.
7. BL-101: PROVIDE 25" W.C. VACUUM (MIN) AT THE UPSTREAM SIDE OF T-101.
8. P-201 & P-202 SINGLE CYCLE TRANSFER VOLUMES: 75 GALLONS MIN.
9. T-203: 1,200 GALLON CAPACITY BELOW LS-206. 6 FT TANK HEIGHT MAX.
10. AC-301: PROVIDE 10 PSIG (MIN) AT THE DOWNSTREAM SIDE OF THE HEAT EXCHANGER.

ALARMS	
A-1	LOW FLOW WHEN BL-101 IN AUTO
A-2	LOW FLOW WHEN AC-301 IN AUTO (ALERT ONLY)
A-3	HIGH LEVEL IN T-201
A-4	HIGH LEVEL IN T-202
A-5	HIGH LEVEL IN T-203

No.	Date	Revisions	By
0	7/22/14	Issued for Bid	

Scale: AS NOTED

Designed by: MD

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MATTHEW V. DAHL
STATE OF WASHINGTON
50366
REGISTERED
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PES Environmental, Inc.
Engineering & Environmental Services

Process and Instrumentation Diagram
AS System
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

Sheet
P-3

1358.001.01.005	1358-00101005_SVE_r1_P1-P3	BO	7/14
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

ATTACHMENT C

CALCULATIONS

PES Environmental, Inc.
Engineering & Environmental Services

SHEET	OF
JOB NO.	1358.001.01
FILE NAME	
PROJECT Muse/Harris AS/SVE Design	COMPUTED BY MWO DATE 4/2/2014
SUBJECT Condensate Generation	CHECKED BY DATE

Problem: Estimate SVE condensate accumulation in moisture knockout

Assumptions:
1) Temp. soil vapors = 54°F (field data)
2) Temp. Avg. Ambient Air = 40°F (JAN & DEC Avg. DAILY TEMP)
   SOURCE: NWS SEATAC 1948-2010
3) Water vapor content in soil vapor: Same as air @ same Temp. & pressure.
4) Soil vapors @ 100% RH.
5) SVE flow rate = 880 scfm

Calculation:

$$V_{COND} = \frac{(Hs_1)(\rho_{a_1}) - (Hs_2)(\rho_{a_2})}{\rho_{W_2}} \times Q_{SVE}$$

Where: Hs = Saturation Humidity
ρ_a = Density air
ρ_W = Density Water
Q_{SVE} = SVE Flow

Temp (°F)	Hs ($\frac{lb_W}{lb_A}$)	ρ_a (lb_a/ft^3)	ρ_W (lb_W/gal)
54°F	8.94×10^{-3}	0.0772	8.334
40°F	5.21×10^{-3}	0.0794	8.336

Source: Chemical Engineers Handbook 4th ed. Page 15-6 McGraw Hill.

V_1 (Initial Water Content @ 54°F) $= 8.94 \times 10^{-3}\ lb_W/lb_a \times 0.0772\ \frac{lb_a}{ft^3} = 6.9 \times 10^{-4}\ \frac{lb_W}{ft^3}$

V_2 (final water content @ 40°F) $= 5.21 \times 10^{-3} \times 0.0794 = 4.1 \times 10^{-4}$

$\Delta = 2.8 \times 10^{-4}\ lb_W/ft^3$

$$V_{COND} = \left(2.8 \times 10^{-4}\ \frac{lb_W}{ft^3_A}\right)\left(880\ \frac{ft^3_A}{min}\right)\left(\frac{1}{8.336\ lb_W/gal}\right) = 0.0295\ gpm$$

$$0.0295\ gpm \times \frac{1440\ min}{day} = \underline{\underline{42.5\ gal/day}}$$

PES Environmental, Inc.
Engineering & Environmental Services

SHEET	1 OF 4
JOB NO.	1358.001.01
FILE NAME	
PROJECT	MVSC/HARRIS
COMPUTED BY	MM DATE 4/2/2014
SUBJECT	PIPE HEAD LOSS - AS/SVE
CHECKED BY	DATE

Problem: Estimate head loss in AS piping — longest run

Assumptions: 1) $Q_{LATERAL}$ = 10 scfm

2) $Q_{MANIFOLD}$ = 350 scfm (max if add extra AS wells)

3) Temp = 100°F (compressed air after heat exchanger - summer)

4) LATERAL PIPE: 1"ϕ SCH 40 GALV (ID = 1.049") or 1"ϕ SCH80 PVC (ID = 0.957") * use for calculation

5) Header pipe 3"ϕ SCH 40 GALV (ID = 3.068")

6) Pipe Roughness factor (ϵ) $\epsilon_{plastic} = 0.000005$ ft

$\epsilon_{GALV} = 0.00015$ ft

7) Kinematic Viscosity (ν) = $Air_{100F} = 1.80 \times 10^{-4}$ ft²/s

Step ① Determine H_L per 100 ft pipe

$$H_L = \left(f\right)\left(\frac{L}{D}\right)\left(\frac{V^2}{2g}\right)$$

Where: $$f = \frac{1.325}{\left[\ln\left(\frac{\epsilon}{3.7D} + \frac{5.74}{Re^{0.9}}\right)\right]^2}$$

SOURCE: Fluid Mechanics, 8th ed. Page 220. 1985 Streeter, V.L & Wylie, E.B

NOTE: Approximates w/in 1% of Colebrook Eq. when $10^{-6} \leq \frac{\epsilon}{D} \leq 10^{-2}$ and $5000 \leq Re \leq 10^8$

L = pipe length (100 ft)

D = pipe dia

V = Fluid velocity (actual)

g = gravitational Constant = 32.17 ft/s²

Re = Reynolds Number = $\frac{VD}{\nu}$ where ν = kinematic viscosity

PES Environmental, Inc.
Engineering & Environmental Services

SHEET	2 OF 4
JOB NO.	1358.001.01
FILE NAME	
PROJECT	MVSC/HARRIS
SUBJECT	PIPE LOSS – AS/SVE
COMPUTED BY	MWD DATE 4/2/2014
CHECKED BY	DATE

A) Calculate actual flows: $Q_A = Q_{SCFM}\left(\frac{P_{STD}}{P_{ACT} - (P_{SAT})(\phi)}\right) \times \left(\frac{460^\circ + T_{ACT}}{520^\circ}\right)$

$P_{STD} = 14.7$ psia
$P_{ACT} = 14.7 + 10$ psia $= 24.7$ psia
$P_{SAT} = 0.946$ psi (steam tables)
$\phi = 70\%$ RH

- $Q_{LATERAL} = 10_{scfm} \times \left(14.7/24.7 - 0.946)(0.70\right)\left(\frac{460^\circ + 100^\circ}{520^\circ}\right) = 6.6$ acfm
- $Q_{A\ Header} = 350$ scfm $\times$ " $\times$ " $= 231$ acfm

B) VELOCITY

- $V_{ACTUAL\ LATERAL} = \frac{6.6 \text{ cfm}}{\frac{\pi\left(0.957'' \times \frac{1ft}{12''}\right)^2}{4}} = 1{,}202 \frac{ft}{min} = 21.0$ ft/s
- $V_{ACTUAL\ Header} = \frac{231 \text{ cfm}}{\frac{\pi(3.068)^2}{4}} = 4490$ ft/min $= 74.8$ ft/s

C) REYNOLDS #

- $Re_{LATERAL} = \frac{(21.0 \text{ ft/s})\left(0.957 \text{ in} \times \frac{1ft}{12in}\right)}{1.8 \times 10^{-4} \text{ ft}^2/\text{s}} = 9317$
- $Re_{Header} = \frac{(74.8 \text{ ft/s})(3.068 \text{ in})}{1.8 \times 10^{-4} \text{ ft}^2/\text{s}} = 106{,}290$

D) FRICTION FACTOR

- $f_{LATERAL} = \frac{1.325}{\left[\ln\left(\frac{0.000005 \text{ ft}}{(3.7)(0.957/12)\text{ft}} + \frac{5.74}{(9317)^{0.9}}\right)\right]^2} = 0.0317$
- $f_{Header} = \frac{1.325}{\left[\ln\left(\frac{0.00015 \text{ ft}}{(3.7)(3.068/12)\text{ft}} + \frac{5.74}{(106{,}290)^{0.9}}\right)\right]^2} = 0.0206$

E) Head Loss per 100 ft

- $H_{LATERAL} = \dfrac{(0.0317)(100\,ft)(21.9\,ft/s)^2}{\left(\frac{0.957}{12}\,ft\right)(2)(32.17\,ft/s^2)} = 273\ ft_{AIR} \times \rho_{AIR_{STD}}$ $(0.075\,lb/ft^3)$

$= 20.5\ lb/ft^2 / 144\ \frac{in^2}{ft^2}$

$= 0.14\ psi/100\,ft\ pipe$

- $H_{Header} = \dfrac{(0.0206)(100\,ft)(74.8)^2}{\left(3.068/12\right)(2)(32.17)} \times \dfrac{0.075}{144} = 0.37\ psi/100\,ft\ pipe$

Step (2) Calculate Equivalent Length of Pipe

$L_E = L_A + \left(\frac{L}{D}\right)_{eq\ fittings}$ where L_A = measured pipe length

$(L/D)_{ft\ fittings}$ = eq. length of fittings per pipe diameter

- Lateral L_A = 240 ft from Manifold to AS-20 Well Head

Fittings	#		$(L/D)_{eq}$			
Ball Valve	1	x	12	x	0.957 in / 12 in/ft	= 1.0
Flow Meter	1	x	30 est	x	"	= 2.4
Check Valve	1	x	100	x	"	= 8.0
Elbows (90°)	10	x	30	x	"	= 30
Expansion (1"x2")	1	x	36	x	"	= 2.9
Hose Coupling (ignore hose)	2	x	5	x	"	= 0.8
4" Tee (ignore)	—		—			+
4" Well (ignore)	—		—			
						= 45 ft

L_E = 240 ft + 45 ft = 285 ft for longest 1" ϕ pipe

PES Environmental, Inc.
Engineering & Environmental Services

SHEET 4 OF 4	
JOB NO. 1358.001.01	
FILE NAME	
PROJECT MWSC/HARRIS	COMPUTED BY MWD DATE 4/2/2014
SUBJECT PIPE LOSS – AS/SVE	CHECKED BY DATE

- HEADER ASSUME LA = 30 ft

	Fittings	#	(L/D)eq			
(L/Deq)	TEE	3	x 60	x 3.068"/12	=	46 ft
	BALLVALVE	1	x 12	x "	=	3.1 ft
	CHECK VALVE	1	x 100	x "	=	25.6 ft
	Reducer (3"x1")	1	x 16	x "	=	4.1 ft
						78.8 ft

L_E = 30 ft + 78.8 ft = 109 ft

Step (3) CALCULATE ~~TOTAL~~ H_L per ACTUAL LENGTH

(A) 1"ϕ LATERAL: 0.14 psi/100 ft x 285 ft = 0.4 psi

(B) 3"ϕ MANIFOLD: 0.37 psi/100 ft x 109 ft = 0.4 psi

0.8 psi ≈ 1 psi

∴ Longest pipe Run H_L = 1 psi

CHECK Pressure @ WELL HEAD 8 psig Required

Pressure @ Manifold 10 psig Supplied

Losses − 1 psi

9 psig > 8 psig Required OK

(WORST CASE SUMMER MONTHS)

AS PRESSURE 10 psig OK

PES Environmental, Inc.
Engineering & Environmental Services

SHEET	1 OF 4
JOB NO.	1358.001.01
FILE NAME	
PROJECT	MVSC/HARRIS
COMPUTED BY	MND DATE 4/2/2014
SUBJECT	PIPE HEAD LOSS - AS/SVE
CHECKED BY	DATE

Problem: Estimate head loss in SVE piping – longest run

Assumptions:
1) $Q_{LATERAL}$ = 40 scfm
2) Q_{Header} = 880 scfm
3) Temp = 54°F
4) Lateral pipe = 2" ϕ SCH 40 PVC (ID = 2.067")
5) Header pipe = 6" ϕ SCH 40 PVC (ID = 6.065")
6) Pipe Roughness factor (ϵ) $\epsilon_{plastic}$ = 0.000005 ft
7) Kinematic Viscosity (ν) = 1.58×10^{-4} ft²/s
8) Vacuum at Header = $-25"\text{w.c.} \times \frac{1\text{ psi}}{27.48"} = -0.91$ psi

Step ① Determine H_L per 100 ft pipe

$$H_L = \left(f\right)\left(\frac{L}{D}\right)\left(\frac{V^2}{2g}\right)$$

Where:
$$f = \frac{1.325}{\left[\ln\left(\frac{\epsilon}{3.7D} + \frac{5.74}{Re^{0.9}}\right)\right]^2}$$

SOURCE: Fluid Mechanics, 8th ed. Page 220. 1985 Streeter, V.L. & Wylie, E.B.

NOTE: Approximates w/in 1% of Colebrook Eq. when $10^{-6} \leq \frac{\epsilon}{D} \leq 10^{-2}$ and $5000 \leq Re \leq 10^8$

L = pipe length (100 ft)
D = pipe dia
V = Fluid velocity (actual)
g = gravitational Constant = 32.17 ft/s²
Re = Reynolds Number = $\frac{VD}{\nu}$ where ν = kinematic viscosity

PES Environmental, Inc.
Engineering & Environmental Services

SHEET 2 OF 4	
JOB NO. 1358.001.01	
FILE NAME	
PROJECT MVSC/HARRIS	COMPUTED BY MJD DATE 4/2/2014
SUBJECT PIPE LOSS – AS/SVE	CHECKED BY DATE

A) Calculate actual flows: $Q_A = Q_{SCFM}\left(\frac{P_{STD}}{P_{ACT} - (P_{SAT})(\phi)}\right) \times \left(\frac{460° + T_{ACT}}{520°}\right)$

$P_{STD} = 14.7$ psia

$P_{ACT} = 14.7 + -0.91$ psi $= 13.79$ psi

$P_{SAT} = 0.206$ (steam tables) @ 54°F

$\phi = 100\%$

- $Q_{A\,LATERAL} = 40_{scfm} \times \left(14.7/13.79 - (0.206)(1.0)\right)\left(\frac{460° + 60°}{520°}\right) = 43.3$ acfm
- $Q_{A\,Header} = 880$ scfm $\times$ " $\times$ " $= 952$ acfm

B) VELOCITY

- $V_{ACTUAL\ LATERAL} = \frac{43.3\ cfm}{\frac{\pi\left(2.067'' \times \frac{1ft}{12''}\right)^2}{4}} = 1858\ \frac{ft}{min} = 31.0\ ft/s$
- $V_{ACTUAL\ Header} = \frac{952\ cfm}{\frac{\pi(6.065^2)}{4}} = 4747\ ft/min = 79.1\ ft/s$

C) REYNOLDS #

- $Re_{LATERAL} = \frac{(31.0\ ft/s)\left(2.067\ in \times \frac{1ft}{12in}\right)}{1.58 \times 10^{-4}\ ft^2/s} = 33,761$
- $Re_{Header} = \frac{(79.1\ ft/s)(6.065\ in)/12}{1.58 \times 10^{-4}\ ft^2/s} = 253,061$

D) FRICTION FACTOR

- $f_{LATERAL} = \frac{1.325}{\left[\ln\left(\frac{0.000005\ ft}{(3.7)(2.067/12)ft} + \frac{5.74}{(33,761)^{0.9}}\right)\right]^2} = 0.0228$
- $f_{Header} = \frac{1.325}{\left[\ln\left(\frac{0.000005\ ft}{(3.7)(6.065/12)ft} + \frac{5.74}{(253,061)^{0.9}}\right)\right]^2} = 0.0156$

PES Environmental, Inc.
Engineering & Environmental Services

SHEET 3 OF 4			
JOB NO. 1358.001.01			
FILE NAME			
PROJECT MUSC / Harris	COMPUTED BY MWD	DATE 4/2/2014	
SUBJECT Pipe Loss – AS/SVE	CHECKED BY	DATE	

E) Head Loss per 100 ft

- $H_{Lateral} = \dfrac{(0.0228)(100\,ft)(31.0\,ft/s)^2}{\left(\frac{2.067}{12}\,ft\right)(2)(32.17\,ft/s^2)} = 1197\ ft_{AIR} \times \rho_{AIR_{STD}}$ $(0.075\,lb/ft^3)$

  $= 14.8\ lb/ft^2 / 144\ \frac{in^2}{ft^2}$

  $= 0.1\ psi / 100\,ft\ pipe$

  $= 2.8"\ w.c. / 100\,ft$

- $H_{Header} = \dfrac{(0.0156)(100\,ft)(79.1)^2}{\left(6.065/12\right)(2)(32.17)} \times \dfrac{0.075}{144} = 0.156\ psi/100\,ft\ pipe$

  $= 4.3"\ w.c./100\,ft$

Step (2) Calculate 'Equivalent Length of Pipe

$L_E = L_A + \left(\frac{L}{D}\right)_{eq\ fittings}$ where L_A = measured pipe length

$(L/D)_{ft\ fittings}$ = eq. length of fittings per pipe diameter

- Lateral L_A = 260 ft to SVE-11A

Fittings	#		$(L/D)_{eq}$			
Ball Valve	1	x	12	x	2.067 in/12 in/ft	= 2.1 ft
Elbows (90°)	3	x	30	x	"	= 15.5 ft
Expansion (2"x4")	1	x	36	x	"	= 6.2 ft
						24 ft

L_E = 260 ft + 24 ft = 284 ft for longest 2" ϕ pipe

PES Environmental, Inc.
Engineering & Environmental Services

SHEET	4 OF 4
JOB NO.	1358.001.01
FILE NAME	
COMPUTED BY	DATE 4/2/2014
CHECKED BY	DATE

PROJECT	MVSC/HARRIS
SUBJECT	PIPE LOSS - AS/SVE

- HEADER L_A =

(L/D_{eq}) Fittings	#		$(L/D)_{eq}$		
Ball Valve	1	x	12	x 6.065 /12 in/ft	= 6.1 ft
Elbow (90°)	4	x	30	x "	= 61 ft
Tee-Straight	1	x	20	x "	= 10.1 ft
					77 ft

$L_E = 75$ ft + 77 ft = 152 ft

Step (3) CALCULATE TOTAL H_L per ACTUAL LENGTH

(A) 2" ϕ LATERAL 2.8" wc /100 ft x 284 ft = 8.0" w.c.

(B) 6" ϕ MANIFOLD : 4.3" wc /100 ft x 152 ft = 6.5" w.c.

14.5" w.c.

∴ Longest pipe Run H_L = 15" w.c.

CHECK

VACCUM AT WELLHEAD REQ'D = 10" w/c (MAX)

VACUUM AT HEADER = 25" w.c.

LOSSES = -15" w.c.

10" w.c. Available OK ✓

* 6" Header losses are conservative because header loses 40% of its flow w/in first half of pipe (to SVE-4 through SVE-10 & SVE-19) such that the actual losses in the header would be closer to 4 to 4.5" w.c. leaving roughly 12" w.c. available at SVE-11A.

APPENDIX H

SAMPLING AND ANALYSIS PLAN

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SAMPLING AND ANALYSIS PLAN

MANHATTAN VILLAGE SHOPPING CENTER AND HARRIS PROPERTIES
NORMANDY PARK, WASHINGTON

OCTOBER 2016

By:

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1358.001.01

TABLE OF CONTENTS

LIST OF TABLES iii
LIST OF ILLUSTRATIONS iii
1.0 INTRODUCTION 4
1.1 Property Description 4
1.2 Project History 4
1.3 Remedial Action Purpose and Approach 5
1.4 Document Organization 5
2.0 SAMPLING AND ANALYSIS PLAN 7
2.1 Sampling Needs and Objectives 7
2.2 Health and Safety Plan Preparation 7
2.3 Confirmation Soil Sampling 7
2.3.1 Drilling and Soil Sample Collection 8
2.3.2 Location Records 9
2.4 Groundwater Performance and Compliance Monitoring 9
2.4.1 Performance Monitoring 9
2.4.2 Compliance Monitoring 10
2.4.3 Groundwater Monitoring Methods 10
2.5 Laboratory Analytical Procedures 12
2.6 Sample Labeling, Shipping, and Chain-of-Custody 12
2.6.1 Sample Labeling and Nomenclature 12
2.6.2 Sample Shipping 13
2.6.3 Chain-of-Custody 13
2.7 Decontamination 13
2.8 Drilling and Sampling Residuals 14
3.0 QUALITY ASSURANCE PROJECT PLAN 15
3.1 Quality Assurance Project Plan Objectives 15
3.2 Chemical Analyses 15
3.3 Laboratory Quality Control 15
3.4 Field Quality Assurance 16
3.4.1 Equipment Blanks 16
3.4.2 Trip Blanks 16
3.4.3 Field Duplicates 16
3.5 Data Reporting and Data Validation Review 16
4.0 DATA EVALUATION 18
4.1 Field Documentation 18
4.2 Nature and Extent of Contamination 18
4.3 Other Regulatory Requirements 18
5.0 REFERENCES 19

TABLES

FIGURES

APPENDIX A - FIELD FORMS

LIST OF TABLES

Table 1	Analytical Methods and Sample Handling Details
Table 2	Field and Laboratory Quality Control Sample Summary
Table 3	Laboratory Deliverables

LIST OF ILLUSTRATIONS

Figure 1	Subject Property Location Map
Figure 2	Soil Confirmation Sampling Locations
Figure 3	Performance and Compliance Sampling Monitoring Well Locations

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) was prepared as a reference appendix to the Remedial Action Work Plan (RAWP) for the Manhattan Village Shopping Center (MVSC) property located at 17835 First Avenue South (the "MVSC properties") and the Harris property located at 17817 – 17825 First Avenue South in Normandy Park, Washington (the "Harris property"), collectively referred to as the "Property" (Figure 1). The term "Site", as used in this SAP, refers to the locations where contaminants originating from the Property have come to be located. The Site is the location of historical dry-cleaning operations that released perchloroethene (PCE) to the subsurface, and has been the subject of on-going remedial investigations and remedial actions since 1998.

This SAP applies to the collection and analysis of soil and groundwater samples as a component of the RAWP, including the performance and confirmation sampling programs. This SAP includes a Quality Assurance Project Plan (QAPP), which is presented in Section 3.0.

1.1 Property Description

The Property encompasses three tax parcels associated with multiple addresses and developments in Normandy Park, Washington:

- MVSC Property (Tax Parcel #312304-9091)
  - Vacant Building (Former Dairy Queen), 17827 First Avenue South
  - Four Star Cleaners and Other Retail, 17829-17851 First Avenue South
  - QFC and Four Star Cleaners, 17847 1st Avenue South

- MVSC Property (Tax Parcel #312304-9325)
  - Kids' Country Daycare, 17855 1st Avenue South

- Harris Property (Tax Parcel #312304-9229)
  - Former Manhattan Cleaners (Currently Retail Strip Mall), 17817 – 17825 1st Avenue South
  - Retail, 17801 – 17825 1st Avenue South
  - Private Residence, 137 SW 178th Street
  - Private Residence, 145 SW 178th Street

The term "Site", whenever used in this SAP, refers to the locations where contaminants originating from the former dry-cleaning operations have come to be located, and includes the Dunn Lumber facility located across SW 178th Street to the north at 17635 1st Avenue South. The Dunn Lumber facility is hydrologically downgradient from the Property. Pertinent site features and the relative locations of the Dunn Lumber facility and the Property are shown on Figure 2.

1.2 Project History

Two historical dry-cleaning operations are associated with historical releases of PCE to the subsurface:

- Four Star Cleaners facility operated at 17835 1st Avenue S. from approximately 1957 to the present. Four Star Cleaners installed a closed-loop dry-cleaning machine in approximately 1990 (PES, 2014), and reportedly discontinued the use of PCE in 2013. Four Star Cleaners originally discharged wastewater to a septic system located between the QFC and the daycare facility, and was connected to municipal sanitary sewer at a later, unknown date (PES, 2016).

- The Manhattan Cleaners and Coin-Op Laundry (Manhattan Cleaners) facility operated at the Harris property between approximately 1965 and 1975 (PES, 2016). Manhattan Cleaners originally discharged wastewater to a septic system located in the southeast quadrant of the Harris property (PES, 2016). The facility reportedly was connected to sanitary sewer in 1967 and the septic system, which consisted of two 500-gallon tanks, was removed in 2006 (PES, 2016).

The MVSC and Harris Properties have been the subject of multiple phases of remedial investigation and interim remedial actions, alternately expanding, contracting, and revising the definition of the Site over time. PES's 2016 Remedial Action Work Plan provides additional details regarding previous investigations and remedial actions conducted at the Site.

1.3 Remedial Action Purpose and Approach

Currently, five areas of PCE-contaminated soil remain at the Property, and the plume of PCE-contaminated groundwater appears to have stabilized beneath the Site. Additional remedial actions are necessary to address the residual soil and groundwater contamination at the Site.

An air-sparging (AS) and expanded soil vapor extraction (SVE) system is being installed to treat residual PCE in soil and groundwater. The AS/SVE system is expected to be operational during the third quarter of 2016.

1.4 Document Organization

This SAP is organized into five sections. A brief description of each section is presented below.

- **Section 1 – Introduction.** Section 1 provides a description of the Site, briefly summarizes the project history, and describes the remedial action purpose and approach for remediating the subsurface soil and groundwater media, and documenting performance and compliance with the RAOs.

- **Section 2 – Sampling and Analysis Plan.** Section 2 details the performance and compliance monitoring procedures, laboratory methods, decontamination procedures, and the management of monitoring residuals.

- **Section 3 – Quality Assurance Project Plan.** Section 3 identifies quality assurance/quality control (QA/QC) procedures for monitoring and laboratory analysis.

- **Section 4 – Data Evaluation.** Section 4 provides the procedures for data evaluation, and interpretation.

- **Section 5 – References.** Section 5 provides the references cited in the work plan.
- **Appendix A – Field Forms**. Appendix A provides examples of field forms that will be used on this project.

2.0 SAMPLING AND ANALYSIS PLAN

This SAP has been developed as a project reference manual for the collection of high quality environmental data. This SAP includes collection of groundwater performance sampling data during AS/SVE system operation, and compliance soil and groundwater sampling after the AS/SVE system is shut-down. AS/SVE system operational monitoring and sampling will be described separately in an operations and maintenance plan.

2.1 Sampling Needs and Objectives

The sampling and analysis plan for the project has been developed to collect high quality environmental data. The overall goal of the field work is to generate data that are acceptable for use in evaluating performance of the remedial action, and documenting compliance with the remedial action objectives.

As demonstrated in the RAWP, PCE is the only contaminant of concern at the Site.

2.2 Health and Safety Plan Preparation

Prior to mobilization for field work, a site-specific health and safety plan (HASP) will be prepared. The HASP will be prepared consistent with the requirements of the Washington State Division of Occupational Safety and Health's Hazardous Waste Operations Regulation (WAC 296-843). The HASP will include a description of the project team, the scope of work, site control, a site hazard information, site hazard control, air monitoring, and emergency response. Information about the nearest hospital, including a map, will also be provided.

2.3 Confirmation Soil Sampling

Confirmation soil samples will be collected following implementation to document compliance with the RAOs in the vicinity of known source areas and potential data gaps that existed prior to implementation.

As part of the operations and maintenance program for the AS/SVE system, PCE concentrations in system effluent will be measured so that mass removal estimates can be updated. Once the PCE concentrations in the SVE discharge reach asymptotic levels and source area groundwater concentrations have reached cleanup levels for four consecutive quarters, the AS/SVE system will be shut down, and soil samples will be collected from additional borings and analyzed to document system performance and compliance with the RAOs (e.g., soil cleanup levels).

Confirmation soil samples will be collected from 5 areas on-site to confirm remediation of PCE impacted soil encountered during site characterization activities as shown on Figure 2:

- **North and east of the former septic tank behind Manhattan Cleaners on Harris property.** Includes advancing three to four borings to confirm remediation of PCE impacted vadose zone soil in four 2005 borings (KB-1, KB-2, KB-4, and KB-5). Target sampling depths will in both the vadose zone and in saturated soil at

approximately 15 to 40 feet below ground surface (bgs). This area is within the influence of the SVE system.

- **Adjacent to the drain field piping for the former septic tank behind Manhattan Cleaners on Harris property.** Includes advancing two borings to confirm remediation of shallow PCE impacted soil in two 2008 test pit samples (TP-2-4 and TP-5-2.5). Target sampling depths will be in the vadose zone at approximately 2 to 10 feet bgs. This area is within the influence of the SVE system.

- **Adjacent to monitoring well DC-17 on the Harris property.** Includes advancing one boring to confirm remediation of PCE impacted soil in a 2007 saturated soil sample collected during drilling of DC-17. Target sampling depth will be in saturated soil at approximately 35 to 37 feet bgs. This area is directly downgradient of the AS/SVE system remediation area.

- **Behind and east of the Four Star Cleaners on MVSC property and Harris property.** Includes advancing two or three borings to confirm remediation of PCE impacted vadose zone soil discovered in 2007 in two borings (KGP-1, KGP-2) and during drilling of monitoring well KMW-9 in both vadose and saturated soil. Target sampling depths on MVSC property will be in the vadose zone at approximately 4 to 38 feet. Target sampling depths on Harris property will be both in the vadose zone and in saturated soil at approximately 14 to 41 feet bgs. This area is within the influence of the SVE system.

- **North and east of the former septic tank on the MVSC property.** Includes advancing two or three borings to confirm remediation of PCE impacted vadose zone soil discovered in 1998 in two borings (BH-5, BH-7) and in 2014 during drilling of air sparging well AS-19. Target sampling depths will be in the vadose zone at approximately 1 to 30 feet bgs. This area is within the influence of the AS/SVE system remediation area.

2.3.1 Drilling and Soil Sample Collection

Soil borings will be advanced by a state-licensed well operator using a direct-push-probe drilling rig.

Soil samples will be collected continuously during drilling from the highest point possible to the bottom of the hole; samples will be extracted from the coring tube into new plastic sleeves. Soil samples will be monitored for odors and screened for volatile organic compounds with a photoionization detector (PID), and logged for lithologic characterization based on American Society of Testing and Materials (ASTM) Method D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Method). All observations and measurements will be recorded on a Field Lithologic Log Form (Appendix A).

Screening with a PID will be used to identify the apparent presence and absence of contamination. If field screening of soil samples in a boring indicates the potential for contamination, then the soil sample that appears to be the most contaminated will be submitted

for laboratory analysis of chlorinated volatile organic compounds (CVOCs). Soil samples will also be collected to document whether CVOCs are absent or below their respective RAOs for soil media.

Regardless of the apparent presence or absence of contamination, representative samples will be collected in accordance with EPA Method 5035 after the sample core is screened but before the sample core is logged. The samples will be placed in a laboratory-prepared containers, which will be placed in a chilled, insulated cooler. The samples will be handled and transported to the project laboratory as described in Section 2.6.

Each boring will be drilled until the target depth or lithologic unit is encountered. Upon drilling completion, each of the boreholes will be abandoned using bentonite in accordance with WAC 173-160, *Standard Construction and Maintenance of Wells*.

2.3.2 Location Records

The location of each boring will be surveyed after drilling and sampling to provide coordinates for entry into Ecology's Environmental Information Management (EIM) system. Per current Ecology guidelines, the horizontal coordinates will reference the Washington State Plane System North Zone (NAD 83), and the vertical coordinates will reference the North American Vertical Datum (NAVD 88).

2.4 Groundwater Performance and Compliance Monitoring

Groundwater monitoring will be conducted to assess the performance of the groundwater extraction systems at controlling off-Property contaminant migration and to assess water quality over time to demonstrate that cleanup levels are being achieved at the point of compliance. Monitoring will consist of collecting depth to water measurements and collecting groundwater samples for laboratory analysis. Groundwater samples will be collected using similar procedures as for the site characterization investigations. Monitoring well locations are shown on Figure 3.

2.4.1 Performance Monitoring

Performance monitoring will be conducted quarterly in source area wells during operation of the AS/SVE system to document remediation system performance, and semi-annually in non-source area wells to confirm plume geometry and non-source area concentrations. Performance monitoring includes the following tasks:

Quarterly water level monitoring in all 40 shallow groundwater monitoring wells (Figure 3).

- Quarterly source area groundwater sampling in 11 monitoring wells within the air sparging ZOI to document performance of the AS/SVE system. Wells include MW-3, MW-4, MW-10, MW-11, MW-12, MW-13, MW-16, DC-3, DC-4, DC-10A, and KMW-2.

- Semi-annual groundwater sampling in 19 monitoring wells on a semi-annual basis to confirm plume geometry and document non-source area concentrations. Wells include MW-2, MW-7, MW-9, MW-14, MW-15, DC-7, DC-8, DC-11, DC-12, DC-13, DC-14, DC-15, DC-17, DC-18, DC-20, KMW-3, KMW-7, KMW-8, and KMW-9.

2.4.2 Compliance Monitoring

Once the last round of groundwater performance monitoring has been completed, compliance groundwater monitoring will be conducted to demonstrate that groundwater within the Site meets the cleanup level at the point of compliance. Compliance monitoring will include an additional four quarters of monitoring to confirm compliance with groundwater cleanup levels at the Site. Compliance monitoring will include the following tasks:

- Quarterly water level monitoring in all 40 shallow groundwater monitoring wells (Figure 3).

- Collection of groundwater samples from 22 monitoring wells on a quarterly basis to confirm compliance with groundwater cleanup levels. Wells include MW-2, MW-3, MW-4, MW-7, MW-9, MW-10, MW-11, MW-12, MW-13, DC-3, DC-4, DC-7, DC-8, DC-10A, DC-13, DC-14, DC-17, DC-18, KMW-2, KMW-7, KMW-8, and KMW-9.

2.4.3 Groundwater Monitoring Methods

2.4.3.1 Groundwater Level Measurements

Groundwater elevations will be measured using the following procedures:

1. Open the well monument, remove any standing water and debris (i.e., sediment, vegetation, or refuse) prior to removing the well cap;
2. Open the well by carefully removing the cap. Allow the riser to vent if under pressure or vacuum. Record the time at which the well is initially vented to the atmosphere (i.e., time of well cap removal). Document initial conditions (i.e., well over-pressurized or under-pressurized relative to the atmosphere) on the Water Level Form (Appendix A);
3. After opening and venting the well, measure the initial water level to the nearest 0.01 foot, using an electronic water level probe;
4. Measure the water level at the surveyed measuring point (MP) on the north side of the top of the PVC casing;
5. Duplicate the water level measurement in each well in the field to ensure that the reading is accurate. Record all results (times, measured values, etc.) on the Water Level Form;
6. Rinse the probe tip with distilled water between each well to avoid cross contamination;
7. Replace the well cap upon completing the water level measurement;

8. Periodically, check the time needed for water level equilibration after cap removal by measuring the water level in a well, allowing the well to vent for a more extended period of time (at least 1 hour), and measuring the water level a second time. Record all results on the Water Level Form; and
9. Upon completion of the water level measurements, replace and tightly seal each of the surface monuments.

2.4.3.2 Groundwater Sampling

This section includes a description of groundwater sampling methods. Sample field forms are provided in Appendix A.

Preparation. Prior to the initiation of any sampling activities, all of the necessary field equipment and documentation materials (e.g. field notebook and sampling forms) will be prepared. Prior to the commencement of purging and sampling, each of the field instruments will be calibrated with standard solutions at a minimum of once per day. Laboratory supplied sample bottles will be inspected for proper preservative (Table 1). The depth to water will be measured prior to sampling using the procedures outlined above.

Low-Flow Purging. A submersible low-flow sampling pump will be used to sample each monitoring well. The submersible pump will be decontaminated prior use. The pump will be slowly lowered into the well until the pump intake is approximately two to three feet below the groundwater surface and within the screened interval, whichever is lower, and purged prior to sampling. The pump will be started and the start time will be recorded on a Groundwater Sampling Form. Pumping rates will be measured with a stopwatch and graduated cylinder, graduated cup, or volatile organic analysis (VOA) vial, depending on flow rate. Low flow purging will be conducted at a pumping rate between 80 and 500 mL/min.

During purging, the water level will be measured approximately every 3 to 5 minutes, until a steady water level is determined. If possible, a drawdown of 0.3 feet or less will be maintained in the well, with the pumping rate lowered to a minimum rate of 80 mL/min if necessary to maintain a drawdown of 0.3 feet or less. The water level in the well will be maintained above the pump at all times. If the well yield is sufficiently poor that the water level drops to the top of the pump, the pump will be stopped until the water level recovers to near the pre-pumping level. The process will then be repeated until the field parameters have stabilized. The final purge volume will be at least as great as the volume of water in the well casing above the pump intake. All measured water levels and pumping rate changes will be recorded on a Groundwater Sampling Form.

Field Parameter Measurements. Field indicator parameters will be measured approximately every 3 to 5 minutes during purging. Field parameters will include pH, specific conductance, temperature, dissolved oxygen (DO), and ORP. Measurements will be recorded to the following standards:

- pH to ±0.01 units;
- Specific conductance to ±1 micromho;
- Temperature to ±0.1^{o}C;

- DO to ±0.1 milligrams per liter (mg/L); and
- ORP to ±1 mV.

Samples will not be collected until these parameters have stabilized for three consecutive readings to the following criteria:

- pH to ±0.1 pH unit;
- Conductivity to ±3 percent;
- Temperature to ±3 percent; and
- DO to ±10 percent.

ORP measurements will not be used to determine stability. If field parameters do not stabilize after 1 hour of pumping, a sample will be collected. Well purging data will be recorded on a Groundwater Sampling Form. Field instruments will be calibrated using known, standard solutions, a minimum of once per day.

Sample Collection. Upon completion of purging, samples will be collected from the discharge end of the submersible pump tubing. The same pump rate used at the end of well purging will be used during sample collection. VOC samples will be collected by allowing the sample water to pour down the inside of the VOA vials without splashing onto the base. All sample containers will be prepared and provided by the analytical laboratory (Table 1).

After collection of the sample from each well, the submersible pump will be removed from the well, the well cap will be replaced, and the well cap or monument locked. The pump and tubing will be decontaminated prior to use in another well. Decontamination and purge water will be handled in accordance with Section 2.8 of this SAP.

2.5 Laboratory Analytical Procedures

All samples will be submitted to a Washington State-accredited laboratory. The laboratory methods shown in Table 1 will be used. Soil and groundwater samples will be analyzed for the following CVOCs by EPA Method 8260B: PCE, trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-dichloroethene (trans-1,2-DCE), 1,1-dichloroethene (1,1-DCE), and vinyl chloride.

2.6 Sample Labeling, Shipping, and Chain-of-Custody

Sample labeling, shipping, and chain-of-custody will be performed consistent with the procedures described below.

2.6.1 Sample Labeling and Nomenclature

Sample container labels will be completed immediately before or immediately following sample collection. Container labels will include the following information:

- Project name;

- Soil Sample Name: boring identification number followed by the depth interval. For example, sample name for a soil sample collected 8 feet below ground surface (ft bgs) in boring B19 would be "B19-08"; or
- Groundwater Sample Name: well identification number followed by the date sampled. For example, the sample name for a groundwater sample collected at monitoring well MW-4 on April 15, 2017, would be "MW-4-041517";
- Initials of collector;
- Date and time of collection; and
- Analysis requested.

2.6.2 Sample Shipping

Samples will be shipped to the analytical laboratory using the following procedures:

- Sample containers will be place in a sealed, iced cooler or other suitable shipping container after sample collection. This container will be used for transporting the samples to the analytical laboratory;
- In each shipping container, glass bottles will be separated by a shock absorbing material to prevent breakage and leakage;
- Ice sealed in separate plastic bags or "gel ice" packs, will be placed into each shipping container with the samples;
- All sample shipments will be accompanied by a chain-of-custody form (COC). The completed form will be sealed in a plastic bag, which will be taped to the inside lid of the shipping container;
- Signed and dated COC seals will be placed on all shipping containers; and
- The name and address of the analytical laboratory, along with sampler's name and office (return) address, will be placed on each shipping container prior to shipping.

2.6.3 Chain-of-Custody

Once a sample is collected, it will remain in the custody of the sampler or other PES personnel until shipment to the laboratory. Upon transfer of sample possession to subsequent custodians, a COC will be signed by the persons transferring custody of the sample container. A signed and dated COC seal will be placed on each shipping container prior to shipping. COC records will be included in the analytical report prepared by the laboratory.

2.7 Decontamination

Decontamination procedures will be performed consistent with the procedures described in this section. All non-disposable sampling equipment will be decontaminated prior to initial use, between sampling locations, and at the completion of the site-specific sampling.

The following decontamination procedure will be used for non-dedicated and non-disposable sampling equipment:

- Tap water rinse;
- Non-phosphatic detergent (e.g., Liquinox) and tap water wash;
- Tap water rinse; and
- Distilled water rinse.

Water level probes will be decontaminated by rinsing with distilled or de-ionized water. Decontamination of personnel involved in sampling activities will be accomplished as described in a site-specific health and safety plan.

2.8 Drilling and Sampling Residuals

The following procedures will be used for the drilling and sampling residuals, including soil, groundwater sampling purge water, and decontamination water:

- Soil generated during drilling will be placed in 55-gallon drums and securely stored on-site. Upon completion of drilling, a representative sample will be collected and analyzed for disposal characterization. Based on the results, the soil will be profiled and disposed of at an appropriate facility;
- Purge water and decontamination water generated during the investigation activities will be placed in 55-gallon drums and securely stored on site. A representative sample collected and analyzed for disposal characterization. Based on the results, the water will be profiled and disposed of at an appropriate facility; and
- Disposable clothing and equipment will be placed in plastic bags and disposed of as solid waste.

In addition to the CVOCs listed above, supplemental metals analysis may be necessary for disposal profiling purposes. If required, soil sample(s) would be analyzed for Toxicity Characteristic Leaching Procedure (TCLP) Resource Conservation and Recovery Act (RCRA) metals by EPA Method 6010/7000, and waste water sample(s) would be analyzed for Total RCRA metals by EPA Method 6010/7000.

3.0 QUALITY ASSURANCE PROJECT PLAN

This quality assurance project plan (QAPP) describes the measures undertaken so that the data collected during the project are acceptable for their intended use(s) and includes the elements from Ecology's QAPP guidance document (Ecology, 2004).

3.1 Quality Assurance Project Plan Objectives

The overall QAPP objective for measurement data is to provide data of known and acceptable quality. All measurements will be made to yield accurate and precise results representative of the media and conditions measured. Chemical analyses will be performed in accordance with the requirements of the analytical methods. All sample results will be calculated and reported in consistent units to allow comparison of the sample data with regulatory criteria and federal, state, and local databases. QAPP objectives for precision, accuracy, and completeness have been established for each measurement variable, where possible, and are discussed below.

3.2 Chemical Analyses

Analysis of environmental samples will be performed in accordance with the laboratory analytical methods summarized in Table 1. The laboratory will report the results to levels less than or equal to the cleanup levels, using method reporting limits (MRLs) or MDLs as necessary to meet the cleanup levels. Any special analytical methods or modifications to methods will be determined with laboratory concurrence prior to beginning sample analysis.

3.3 Laboratory Quality Control

This section presents quality control (QC) requirements for the analytical laboratory. The purpose of this QC program is to produce data of known quality meeting project objectives and the requirements of the standard methods of analysis. Laboratory QC samples will include laboratory control samples (LCSs), matrix spike/matrix spike duplicate (MS/MSD) samples, laboratory duplicates, and method blanks. Laboratory QC samples (e.g., blanks and LCSs) will be included in the preparation batch with the field samples. An analytical batch is a number of samples (not to exceed 20, including the associated laboratory QC samples, MSs and MSDs) that are from a similar matrix and extracted or digested at the same time, analyzed sequentially, and with the same lot of reagents.

The identity of each analytical batch will be reported with the analyses so that a reviewer can identify the QC samples and the associated environmental samples. Samples that do not need separate extraction or digestion (e.g., volatile analyses by purge and trap) are included in each analytical batch.

All sample preparation and analysis will be completed within the method-required holding times. The holding time begins at the time of sample collection. If holding times are exceeded and the analyses are performed, the data will be qualified during the data review, in accordance with USEPA Functional Guidelines (USEPA, 1999 and 2002).

3.4 Field Quality Assurance

Field QC samples will be collected during groundwater sampling and will include equipment blanks, trip blanks, and field duplicates. Field QC samples will be collected at the frequency specified in Table 2 and described below.

3.4.1 Equipment Blanks

An equipment blank (also known as a rinsate blank or field blank) is a sample of reagent grade or distilled water poured into or over or pumped through the groundwater sampling device, collected in a sample container, and transported to the laboratory for analysis. Equipment blanks will be used to assess the effectiveness of equipment decontamination procedures. One equipment blank will be collected for every 20 project samples being collected using non-dedicated equipment. Equipment blanks will be collected immediately after the equipment has been decontaminated. The blank will be analyzed for all laboratory analyses requested for the environmental samples collected. If an analyte is detected in an equipment blank sample, the affected results will be qualified during the data review per USEPA Functional Guidelines for Organics (USEPA, 1999) and Inorganics (USEPA, 2002).

3.4.2 Trip Blanks

A trip blank consists of a set of VOA vials filled in the laboratory with reagent-grade water, transported to the sampling site, handled under the same conditions as an environmental sample, and returned to the laboratory for analysis. Trip blanks are not opened in the field. Trip blanks are prepared only when volatile samples are collected and are analyzed only for volatile analytes. Trip blanks are used to assess the potential introduction of contaminants from sample containers or during the transportation and storage procedures. One trip blank per sampling day or per cooler will be included with the shipment of soil and water samples to the laboratory if VOC analyses are requested and will be analyzed for VOCs. If an analyte is detected in a trip blank, the data will be qualified during the data review per USEPA Functional Guidelines for Organics (USEPA, 1999).

3.4.3 Field Duplicates

A field duplicate sample is a second sample collected at the same location as the original sample. Duplicate samples are collected simultaneously or in immediate succession, using identical sampling techniques, and treated in an identical manner during storage, transportation, and analysis. The sample containers are assigned an identification number in the field so that they cannot be identified (blind duplicate) as duplicate samples by laboratory personnel performing the analysis. Duplicate sample results are used to assess precision of the sample collection process. One duplicate sample will be collected for approximately every 20 project samples.

3.5 Data Reporting and Data Validation Review

The laboratory performing sample analyses will be required to submit summary data and QA information to permit independent determination of data quality. The determination of data

quality will be performed using the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA, 1999) and USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (USEPA, 2002) as guidelines for data review.

Laboratory deliverable requirements are outlined below and included in Table 3:

- Narrative cover letters for each sample batch will include a summary of any QC, sample, shipment, or analytical problems, and will document all internal decisions. Problems will be outlined, and final solutions documented;
- A copy of the signed chain-of-custody form for each batch of samples will be included in the results packet;
- Sample concentrations will be reported on standard data sheets in proper units and to the appropriate number of significant figures. For undetected values, the lower limit of detection for each compound will be reported separately for each sample. Dates of sample extraction or preparation and analysis must be included;
- A method blank summary will be included;
- Surrogate percent recovery will be calculated and reported;
- LCS results will be included;
- MS/MSD percent recoveries, spike level, and relative percent difference will be included; and
- Laboratory duplicate results will be included.

All chemistry data will be validated per USEPA data review guidelines (USEPA, 1999 and 2002). Data validation will include a review of holding times, method blank results, surrogate recovery results, LCSs, MS/MSDs, field and laboratory duplicates, completeness, detection limits, and chain-of-custody forms. Data validation memos will be prepared summarizing the reviews and any assigned data qualifiers.

4.0 DATA EVALUATION

Data generated during the remedial action, including the performance and confirmation monitoring programs, will be reviewed, summarized, and evaluated.

4.1 Field Documentation

Field sampling documentation and procedures, and issues (if any) will be reviewed and summarized, and maps will be prepared showing updated sampling locations.

4.2 Nature and Extent of Contamination

Chemistry data collected in connection with performance and confirmation sampling programs will be validated, tabulated, and summarized on maps of the Property. Maps will be updated with groundwater elevation contours and validated groundwater analytical data. After site-specific remedial action objectives have been achieved, data will be compared to the remedial action objectives and points of compliance.

4.3 Other Regulatory Requirements

Consistent with WAC 173-340-700(3), applicable state and federal laws, cross-media contamination, risk assessment procedures, and natural background and analytical procedures will be taken into consideration. If applicable, the process described above may be modified to account for these other requirements.

5.0 REFERENCES

PES Environmental, Inc. (PES). 2014. *Request for Contained-In Policy Determination, Manhattan Village Shopping Center and Harris Properties "Normandy Park PCE", Normandy Park, Washington, Facility Site/ID No. 4181060 and VCP Project No NW1873, RCAR Site ID No. WAH000028116.* October 14.

PES Environmental, Inc. (PES). 2016. *Remedial Action Work Plan, Manhattan Village Shopping Center and Harris Properties, VCP NW1873, Normandy Park, Washington.* August.

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U.S. Environmental Protection Agency. 2002. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.* EPA 540/R-01/008. USEPA Office of Emergency and Remedial Response. July.

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Washington State Department of Ecology. 2004. *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies.* Publication No. 04-03-030. July.

TABLES

Table 1

Analytical Methods and Sample Handling Details
MVSC and Harris Properties, Normandy Park, Washington

Analyses	Analytical Method	Sample Container	Preservation	Maximum Holding Time
Soil Sample Laboratory Analyses				
Selected chlorinated volatile organic compounds	EPA 8260	3 x 40 mL VOA vial	Cool, 4°C, methanol or sodium bisulfate	14 days
Total TCLP metals (As, Ba, Cd, Cr, Pb, Se, Ag)	EPA 6020	4 to 8 oz glass jar	Cool, 4°C	6 months
Total TCLP metals (Hg)	EPA 200.8/7471	4 to 8 oz glass jar	Cool, 4°C	6 months
Groundwater Sample Laboratory Analyses				
Selected chlorinated volatile organic compounds	EPA 8260	3 x 40 mL VOA vial	Cool, 4°C, HCL (pH < 2), no headspace	14 days
Total metals, unfiltered (As, Ba, Cd, Cr, Pb, Se, Ag)	EPA 6020	250 to 500 mL P	Cool, 4°C, HNO_3 (pH < 2)	6 months
Total metals, unfiltered (Hg)	EPA 6020 mod/7470	250 to 500 mL P	Cool, 4°C, HNO_3 (pH < 2)	28 days
Groundwater Field Parameters				
pH	Probe/EPA 150.1	–	–	–
Specific conductance	Probe/EPA 120.1	–	–	–
Temperature	Probe/EPA 170.1	–	–	–
Dissolved oxygen (DO)	Probe/SM 4500	–	–	–
Oxidation/reduction potential (ORP)	Probe	–	–	–

NOTES:
EPA = US Environmental Protection Agency
SM = Standard Methods for the Examination of Water and Wastewater
P = polyethylene
G = glass
HCL = hydrochloric acid
HNO_3 = nitric acid

Table 2

Field and Laboratory Quality Control Sample Summary
MVSC and Harris Properties, Normandy Park, Washington

Matrix	QA/QC Analyses	Frequency
Field		
Soil/water	Trip blank	1 per sampling day or cooler when samples are analyzed for CVOCs
Soil/water	Field duplicate	1 per 20 project samples (approximately)
Water	Equipment blank	1 per 20 project samples (approximately)
Laboratory		
Soil/water	Laboratory control sample (LCS)	Every analytical batch
Soil/water	MS/MSD	1 per 20 project samples
Soil/water	Method blank	Every analytical batch

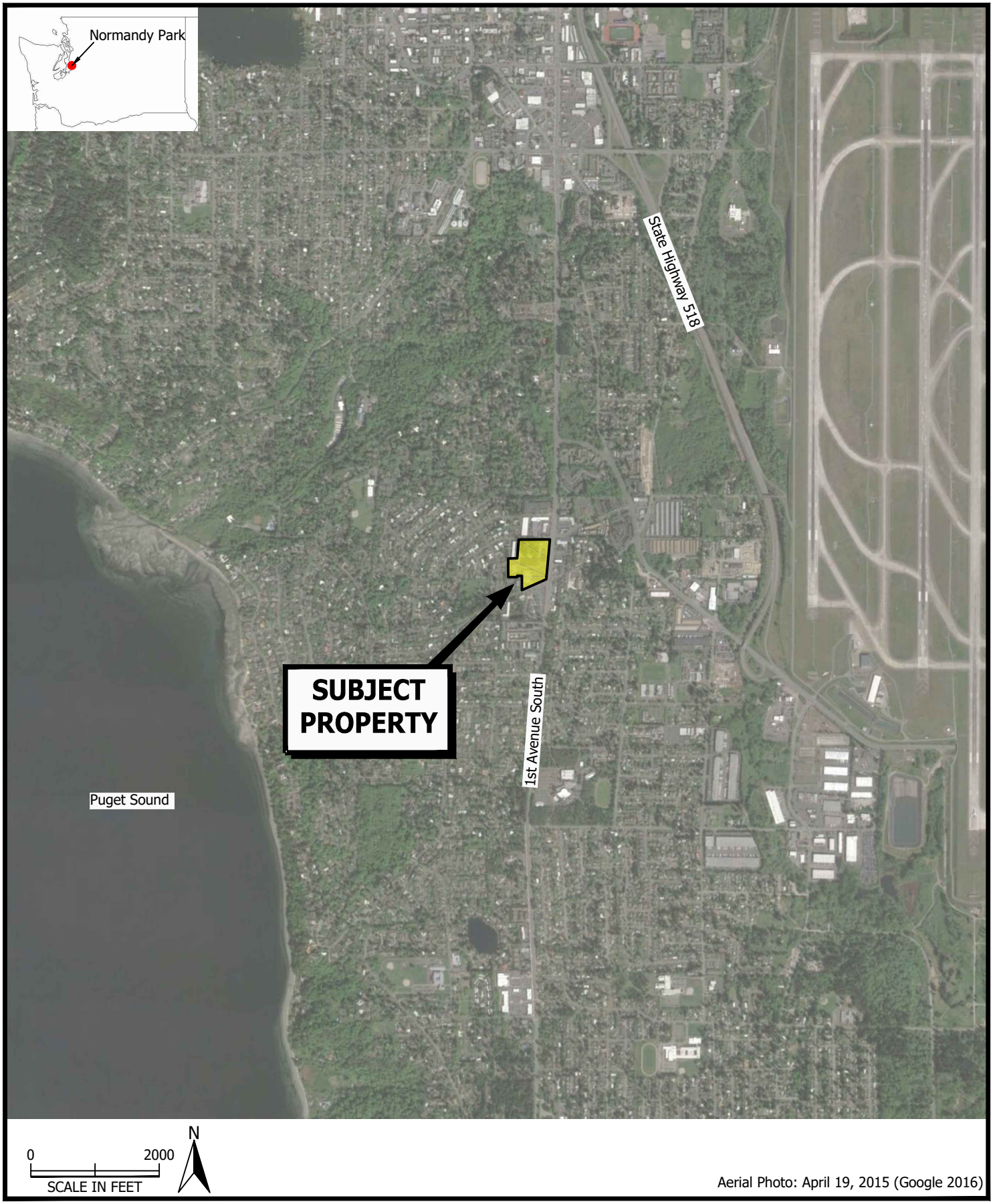
Table 3

Laboratory Deliverables
MVSC and Harris Properties, Normandy Park, Washington

The following deliverables will be required from the laboratory:

- A transmittal letter and case narrative which includes information about receipt of the samples, the analytical results, and any significant problems in any aspect of sample analysis (e.g., deviation from methodologies or quality control).
- Sample analytical results:
  - Soil results in mg/kg or µg/kg
  - Water results in mg/L or µg/L
  - Method detection limit (MDL) or Method Reporting limit (MRL) for undetected values reported for each analyte on a sample-by-sample basis
  - Date of sample receipt
  - Date of sample preparation/extraction
  - Date of sample analysis
  - Method blank results, including the samples associated with each blank
  - As applicable:
    - Surrogate recovery results, reported as percent recoveries, including actual spike levels
    - Duplicate results
    - Matrix Spike (MS)/ Matrix Spike Duplicate (MSD) results reported as percent recoveries, including actual spike levels
    - Laboratory control sample (LCS) results
- Copies of signed chain-of-custody forms

FIGURES



Aerial Photo: April 19, 2015 (Google 2016)

PES Environmental, Inc.
Engineering & Environmental Services

Subject Property Location Map
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE
1

1358.001.01.006	1358-00101006_SAP_1-2	*DAB*	9/16
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

SW 176th STREET

RESIDENCES

SW 177th STREET

1st AVE SOUTH

RESIDENCES

DUNN LUMBER

DUNN LUMBER

FORMER WATER SUPPLY WELL

COMMERCIAL

SW 178th STREET

2nd AVE SW

TOWN HOUSES

RESIDENCE

RESIDENCE

HARRIS PROPERTY

COMMERCIAL BUILDING

VACANT SHED

WELL HOUSE

RETAINING WALL

FORMER TREATMENT SYSTEM

REMEDIATION EQUIPMENT ENCLOSURE

FORMER SEPTIC TANK

FORMER MANHATTAN DRY CLEANER AND LAUNDROMAT

SHED

PARKING LOT

RETAINING WALL

SECOND BUILDING (VARIOUS SHOPS)

FOUR STAR DRY CLEANERS

FORMER DAIRY QUEEN

1st AVE SOUTH

COMMERCIAL

DAY CARE

MANHATTAN VILLAGE SHOPPING CENTER

PARKING LOT

QFC BUILDING

FORMER SEPTIC TANK

EXPLANATION

- Approximate Property Boundary
- SS Sanitary Sewer
- SD Storm Drain
- G Natural Gas
- W Water
- E Overhead Electrical
- E Buried Electrical
- T Telephone
- Inferred Limits of Soil Above Cleanup Levels

0 N 100

SCALE IN FEET

PES Environmental, Inc.
Engineering & Environmental Services

Soil Confirmation Sampling Locations
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE 2

1358.001.01.006	1358-00101006_SAP_1-2	DAB	9/16
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

MW-9
SW 176th STREET
RESIDENCES
1st AVE SOUTH
MW-8
SW 177th STREET
MW-7
MW-6
DUNN LUMBER
DUNN LUMBER
FORMER WATER SUPPLY WELL
COMMERCIAL
RESIDENCES
KMW-6
KMW-7
KMW-8
SW 178th STREET
KMW-3
DC-14
MW-5
DC-7
DC-8
RESIDENCE
KMW-5D
HARRIS PROPERTY
COMMERCIAL BUILDING
RESIDENCE
KMW-5
MW-14
DC-15
KMW-1
2nd AVE SW
TOWN HOUSE
DC-20
VACANT SHED
WELL HOUSE
DC-13
DC-17
DC-18
KMW-4
DC-16
DC-5
DC-12
MW-16
MW-2
FORMER MANHATTAN DRY CLEANER AND LAUNDROMAT
MW-10
DC-10B
MW-11
REMEDIATION EQUIPMENT ENCLOSURE
FORMER TREATMENT SYSTEM
FORMER SEPTIC TANK
DC-10A
KMW-2
MW-15
KMW-9
DC-11
DC-3
DC-2
DC-4
SHED
RETAINING WALL
MW-13
PARKING LOT
DC-19
FORMER DAIRY QUEEN
SECOND BUILDING (VARIOUS SHOPS)
FOUR STAR DRY CLEANERS
MW-4
DC-1
DAY CARE
MANHATTAN VILLAGE SHOPPING CENTER
MW-3
MW-12
PARKING LOT
FORMER SEPTIC TANK
QFC BUILDING

EXPLANATION
Approximate Property Boundary
MW-12 Shallow Monitoring Well
DC-16 Deep Monitoring Well

N
0 100
SCALE IN FEET

PES Environmental, Inc.
Engineering & Environmental Services

Performance and Compliance Sampling
Monitoring Well Locations
Manhattan Village/Harris Properties
17817, 17825, and 17835 1st Avenue South
Normandy Park, Washington

FIGURE 3

1358.001.01.006	1358-00101006_SAP_3	DAB	9/16
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE

APPENDIX A

FIELD FORMS

PES Environmental, Inc.
Engineering & Environmental Services

PAGE	OF
DATE:	
PROJECT:	
JOB No:	
PROJECT MANAGER:	
RECORDED BY:	

DAILY FIELD REPORT

TIME	DESCRIPTION, COMMENTS, NOTES, ETC.

PES ENVIRONMENTAL
DAILY SAFETY MEETING CHECKLIST

Project Name: _____ Date: _____

Project Number: _____ Presented by: _____

Check the Topics/Information Reviewed:

- ☐ Safety glasses, hard hat, safety boots
- ☐ Site safety plan review and location
- ☐ Equipment and machinery familiarization
- ☐ Employee right-to-know/MSDS location
- ☐ Open pits, excavations, and site hazards
- ☐ Vehicle safety and driving/road conditions
- ☐ Portable tool safety and awareness
- ☐ Overhead utility locations and clearance
- ☐ First aid, safety, and PPE location
- ☐ Sharp object, rebar, and scrap metal hazards
- ☐ Safety is everyone's responsibility
- ☐ Latex gloves inner/nitrile gloves outer
- ☐ Excavation/trenching inspections/documentation
- ☐ Full-face respirators with proper cartridges
- ☐ Upgrade to level ___ at: PID(___eV)>___ppm
- ☐ Work stoppage at: PID(___eV) >___ppm, %LEL>10%
- ☐ Slips, trips, and falls
- ☐ Directions to hospital
- ☐ Anticipated visitors
- ☐ Electrical ground fault
- ☐ Public safety and fences
- ☐ Excavator swing and loading
- ☐ Orderly site and housekeeping
- ☐ Smoking in designated areas
- ☐ Leather gloves for protection
- ☐ Effects of the night before
- ☐ Vibration related injuries
- ☐ Fire extinguisher locations
- ☐ Eye wash station locations
- ☐ Decontamination procedures
- ☐ Daily work scope
- ☐ Emergency protocol
- ☐ Parking and laydown
- ☐ Hot work permits
- ☐ Strains and sprains
- ☐ Noise hazards
- ☐ No horseplay
- ☐ Heat and cold stress
- ☐ Backing up hazards
- ☐ Accidents are costly
- ☐ Dust and vapor control
- ☐ Refueling procedures
- ☐ Confined space entry
- ☐ Flying debris hazards

Discussion/Comments/Follow-up Actions: _____

NAME	SIGNATURE	COMPANY

Instructions:

- Conduct a daily safety meeting prior to beginning each day's site activities.
- Complete form, obtain signatures, and file with the Daily Summary.
- Follow up on any noted items and document resolution of any action items.

PES Environmental, Inc.

FIELD LITHOLOGIC LOG

LOCATION SKETCH SCALE 1' =

Date: Page: of

BORING NO:

Job Number:

Project:

Project Manager:

Logged by:

Contractor:

Drilling Equipment:

Borehole Diameter:

Total Depth of Boring: / Backfill Method:

Sampling Method:

Surface Conditions:

Comments:

SAMPLE ID (Date/Time)	PID (PPM)	SOIL DRIVE INTERVAL	BLOWS /6INCHES	SAMPLE RECOVERED (Inches)	GW DEPTH	DEPTH (FEET)	GRAPHIC LOG	LITHOLOGIC DESCRIPTION
								COLOR, SOIL TYPE (SYMBOL) Munsell Number, Moisture, Consistency, Grain Size, Estimated Percentages (% gravel, % sand, % fines), Other (Angularity, Shape, Odor, Structure. Strength, Dilatancy, Toughness, Plasticity, etc.)
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

PES Environmental, Inc.

FIELD LITHOLOGIC LOG (CONT.)

Page: of	**BORING NO:**
Date:	
Job Number:	
Project:	
Logged by:	

SAMPLE ID (Date/Time)	PID (PPM)	SOIL DRIVE INTERVAL	BLOWS /6INCHES	SAMPLE RECOVERED (Inches)	GW DEPTH	DEPTH (FEET)	GRAPHIC LOG	**LITHOLOGIC DESCRIPTION** COLOR, SOIL TYPE (SYMBOL) Munsell Number, Moisture, Consistency, Grain Size, Estimated Percentages (% gravel, % sand, % fines), Other (Angularity, Shape, Odor, Structure. Strength, Dilatancy, Toughness, Plasticity, etc.)
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

LOGGED BY: _____ EDITED BY: _____

PES Environmental, Inc.
Engineering & Environmental Services

WATER LEVEL DATA FORM

PROJECT:
JOB No:
FIELD PERSONNEL:
RECORDED BY:
MEASURING POINT: TOP of PVC

MEASURING INSTRUMENT: ☐ ELECTRONIC SOUNDER ☐ OTHER-TYPE INSTRUMENT
TIME ON-SITE: TIME OFF-SITE:
WEATHER : Temperature: Precipitation:

Well I.D.	Total Well Depth (feet)	Time	Depth to Water (feet)	Time	Depth to Water (feet)	Time	Depth to Water (feet)	Comments

PES Environmental, Inc.

Engineering & Environmental Services

WELL DEVELOPMENT FORM

Page:	of
Date/Time:	
Project Name:	
Job No:	
Recorded By:	
Sampled By:	

Well Type: _____

Well Material: ☐ PVC ☐ Stainless Steel ☐ Other

Well ID:

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches)

☐ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other _____

Total Depth of Casing (ft. below TOC) (Pre-DV): _____

Total Depth of Casing (ft. below TOC) (Post-DV): _____

Water-Level Depth (feet below TOC): _____

PURGING METHOD

☐ Bailer - type: _____

☐ Submersible ☐ Centrifugal ☐ Bladder

☐ Other - Type: _____

PUMP INTAKE SETTING

☐ Near Bottom ☐ Near Top ☐ Other: _____

Depth in feet (BTOC): _____

Screen interval feet (BTOC) from _____ to _____

Est.Target Development Volume: 3x Borehole [sat.screen only] + water added during drilling

FIELD PARAMETERS MEASUREMENT

Time	Total Gallons Removed	Flow Rate (GPM)	Depth to Water (fbgs)	Pump Intake (fbgs)	Turbidity		Observations (color, well condition, odor, cloudiness, etc.)

---------- > STOP TIME: _____ ---------- > TOTAL GALLONS REMOVED _____

PES Environmental, Inc.

Engineering & Environmental Services

Page:	of
Date/Time:	
Project Name:	
Job No:	
Recorded By:	
Sampled By:	

GROUNDWATER SAMPLING FORM

Well Type:	☐ Monitoring	☐ Extraction	☐ Other		Well No:
Well Material:	☐ PVC	☐ Stainless Steel	☐ Other		

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches)

☐ 2-inch ☐ 4-inch ☐ 6-inch ☐ Other _____

Total Depth of Casing (TD in feet below top of casing): _____

Water-Level Depth (WL in feet below top of casing): _____

Pump rate: approximately _____ mL/minute

PURGING METHOD

☐ Bailer - type: _____

☐ Submersible ☐ Centrifugal ☐ Bladder

☐ Peristaltic - Type: _____

PUMP INTAKE SETTING

☐ Bottom ☐ Top ☐ Middle: _____

Depth in feet (BTOC): _____

Screen interval feet (BTOC) from _____ to _____

FIELD PARAMETER MEASUREMENTS

START TIME: _____ STOP TIME: _____ TOTAL GALLONS REMOVED: _____

Time	Gallons Removed	pH	Conductivity (µmhos/cm)	Temperature (ºC)	DTW (feet bgs)	ORP (mV)	DO (mg/L)	Observations (color, well condition, odor, cloudiness, etc.)

Notes:

WELL SAMPLING

☐ Bailer ☐ Peristalic

Sample No.	Time	Volume	Analyses	Bottle Type	Preservative

QUALITY CONTROL SAMPLES

Duplicate Sample No.	Time	Volume	Analyses	Bottle Type	Preservative
Field Blank Sample No.	**Time**	**Volume**	**Analyses**	**Bottle Type**	**Preservative**

Field Drum Inventory Form

PES PROJECT NUMBER:

JOB NAME:

ADDRESS:

PES FIELD REPRESENTATIVE:

Drum ID#	Generation Date	Waste Material (decon wtr, dv wtr, etc.)	Well ID(s)	Volume (gal)	Waste Description (decon water, development water, etc.)

DISTRIBUTION

REMEDIAL ACTION WORK PLAN
MANHATTAN VILLAGE SHOPPING CENTER AND
HARRIS PROPERTY, VCP NW1873
NORMANDY PARK, WASHINGTON

OCTOBER 2016

COPY NO.____

		Copy No.
e-Copy	Riddell Williams, P.S. 1001 Fourth Avenue, Suite 4500 Seattle, Washington 98154 Attention: Ms. Courtney Seim	NA
e-Copy	Keller Rohrback, L.L.P. 1201 Third Avenue, Suite 3200 Seattle, Washington 98101 Attention: Mr. Kenneth Bloch	NA
1 Copy	Washington State Department of Ecology, Northwest Region Voluntary Cleanup Program 3190 – 160th Avenue SE Bellevue, Washington 98008-5452 Attention: Mr. Dale Myers	1

Quality Assurance Review:

Daniel A. Balbiani, P.E.
Principal Engineer