

ENVIRONMENTAL SITE ASSESSMENT REPORT

**Sooper Dry Cleaners
Normandy Park Shopping Center
Normandy Park, Washington**

Prepared for:

**Griffin & Jensen DBA
Normandy Park, Washington**

Prepared by:

SCS ENGINEERS

Bellevue, Washington

October 2001

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SCS ENGINEERS

October 12, 2001
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Mr. Frank Jensen
Griffin & Jensen DBA- Normandy Park Shopping Center
22608 Marine View Drive South
Des Monies, Washington 98198

**Subject: Environmental Site Assessment Report, Sooper Dry Cleaners,
Normandy Park Shopping Center**

Dear Mr. Jensen:

Attached please find two copies of the Environmental Site Assessment (ESA) Report for the soil and groundwater investigations conducted at the former Sooper Dry Cleaners site at the Normandy Park Shopping Center, Normandy Park, Washington.

Thank you for the opportunity to provide our services. If you have any questions, please do not hesitate to call.

Sincerely,



Daniel A. Venchiarutti, P.G.
Project Manager
SCS ENGINEERS



Gregory D. Helland, P.G.
Project Director
SCS ENGINEERS

cc: Agnes Griffin

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ENVIRONMENTAL SITE ASSESSMENT REPORT

Sooper Dry Cleaners
Normandy Park Shopping Center
17835 First Avenue South
Normandy Park, Washington 98148

Prepared for:

Griffin & Jensen DBA
22608 Marine View Drive South
Des Moines, Washington
(206) 824 - 9100

Prepared by:

SCS ENGINEERS

2405 140th Avenue NE
Suite 107
Bellevue, Washington
(425) 746-4600

October 2001

04199025.03

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SECTION 1 INTRODUCTION

This Environmental Site Assessment Report was prepared by SCS Engineers for Griffin and Jensen DBA- Normandy Park Shopping Center to characterize the subsurface soils and groundwater in the vicinity of the Sooper Dry Cleaners, a business formerly located in the Normandy Park Shopping Center. The former dry cleaner tenant space is located at 19935 First Avenue South in Normandy Park, Washington.

1.1 PURPOSE AND SCOPE

The original purpose of the site investigation was to characterize the soil and groundwater conditions beneath the Sooper Cleaners and to provide a confirmation of several chlorinated solvent detections in the shallow soils and groundwater. The contaminants were detected during an initial Phase I/II Strataprobe assessment at the Normandy Park Shopping Center (SCS Engineers, April 2000). The detected compounds included tetrachloroethene (PCE), tetrachloroethane (PCA), and dichlorobenzene (DCB), with PCE exceeding the Model Toxics Control Act (MTCA) Method A standard for groundwater.

After the presence of these dry cleaning solvents was confirmed at the site, the scope of the field investigations was expanded to better characterize the subsurface conditions. Through this process, the investigative work reported in the current environmental site assessment was completed in three separate stages.

Initially, a Stage I site investigation, that included the installation and sampling of shallow soil borings inside the dry cleaner tenant space, a utility survey, follow-up Strataprobe sampling, and the installation of four groundwater monitoring wells, was completed. Based on the Stage I results, as well as historical site information, Stage II investigations were subsequently initiated at the site which included a geophysical survey of a former dry well adjacent to the cleaners and the installation of four additional downgradient groundwater monitoring wells. After evaluating these new data, a Stage III groundwater investigation was initiated.

The Stage III work included the installation and sampling of an additional five groundwater wells along the south and western borders of the shopping center to better delineate the horizontal and vertical extent of the groundwater contamination identified at the site. Aquifer hydraulic conductivity testing and water level elevation measurements were also completed to support development of a regional groundwater flow model. The regional model was then used to identify likely locations of contaminant transport, as well as groundwater discharge locations.

Based on these new data and the preliminary groundwater flow simulations, a deep offsite monitoring well was installed approximately 1,000 feet downgradient of the site. After a final round of groundwater sampling, a site-specific groundwater flow model was developed based on the regional flow model. This site-specific groundwater flow model was used as a platform for contaminant transport simulations. The purpose of the contaminant transport simulations were to estimate the expected configuration of the contaminant plume downgradient of the site (i.e. where monitoring wells were not located), and, based on the results of the transport simulations, evaluate expected



contaminant concentrations at the point of discharge under various levels of site clean-up, including a no-action alternative.

Detailed descriptions of each phase of the overall environmental assessment are provided in the following sections of the report.

Through this phased approach, the cumulative goals for the overall remedial investigation evolved to address the following site issues:

1. The nature and extent of PCE soil contamination directly beneath and in the immediate vicinity of the dry cleaner tenant space;
2. The identification of underground utilities (including dry wells and stormwater or sanitary sewer lines) that serviced the tenant space and could have provided potential migration routes for solvents released from the former dry cleaner operations;
3. The nature and extent of any groundwater contamination associated with the past releases of dry cleaning solvents from the site;
4. The extent to which the subsurface PCE contamination may be migrating off-site, the maximum possible concentrations that might be seen at the point of discharge, and the degree to which this contamination may present a potential threat to human health and the environment; and
5. The remedial or control measures that could be effectively implemented at the site to address the subsurface contamination present beneath the property.

Per Washington State requirements, the Department of Ecology (Ecology) was notified of the discovery of site contamination during September 2000. In May 2001, the Sooper Dry Cleaners site was formerly entered into Ecology's Voluntary Cleanup Program (VCP).

1.2 SITE BACKGROUND

The Normandy Park Shopping Center consists of approximately five acres of commercially zoned land situated along First Avenue South in Normandy Park, Washington (Figure 1). The property is fronted by 1st Avenue South, a major Normandy Park – Des Moines thoroughfare; the cross-street is 200th Street South. The main entrance into the shopping center is through the intersection of 1st Avenue South, and 199th Street South. Business address for the various tenants located in the shopping center range from 19901 to 19957 First Avenue South. A site plan for the shopping center that illustrates the location of the Sooper Dry Cleaners is provided as Figure 2.

1.2.1 Property Description

The Normandy Park Shopping Center is currently occupied by five, single-story commercial buildings. The main building (~ 20,000 square feet) is located on the southwest quarter of the property, the second-largest building (~10,000 sf.) is situated on the north end of the site, and a third building (~ 5,000 sf.) is located on the northeast corner of the site. The fourth building (~ 3,000 sf.) includes an



Exxon service station, and occupies the southeast corner of the shopping center. The fifth building (~400 sf.), consists of a small drive-through food stand situated immediately to the north of the service station. The balance of the property is paved or landscaped, with the majority of the area used for customer parking. An asphalt-paved access road runs along the north, west and southern borders of the shopping center. The property primarily slopes to the east, towards 1st Avenue South.

The tenant space that was formerly occupied by the Sooper Dry Cleaners is situated in the main building, along with a large shopping center and a video rental store (Figure 2). The main building faces east, across the main parking area, towards 1st Avenue South. Shipment receiving areas are present on the west and south sides of the building. The second building is currently occupied by several small businesses including a bicycle store, a Subway sandwich shop, a suntan clinic, a travel agency, a consignment store, and two beauty/barber shops. The third building is entirely occupied by a chiropractic clinic. Roxbury Auto Parts & Exxon service station occupies the fourth building. Two fuel dispenser islands covered by a single canopy are situated immediately in front (east) of this building. A Dandy Dog drive-through food stand occupies the fifth, and smallest, building.

The shopping center is bordered on the north by a residence and a small commercial building. Arrow Lake, a small private lake, is located approximately one-quarter mile further towards the north-northwest. Towards the east, across 1st Avenue South, is a large residential development. Single-family residences also lie to the south of the shopping center, across 200th Street South.

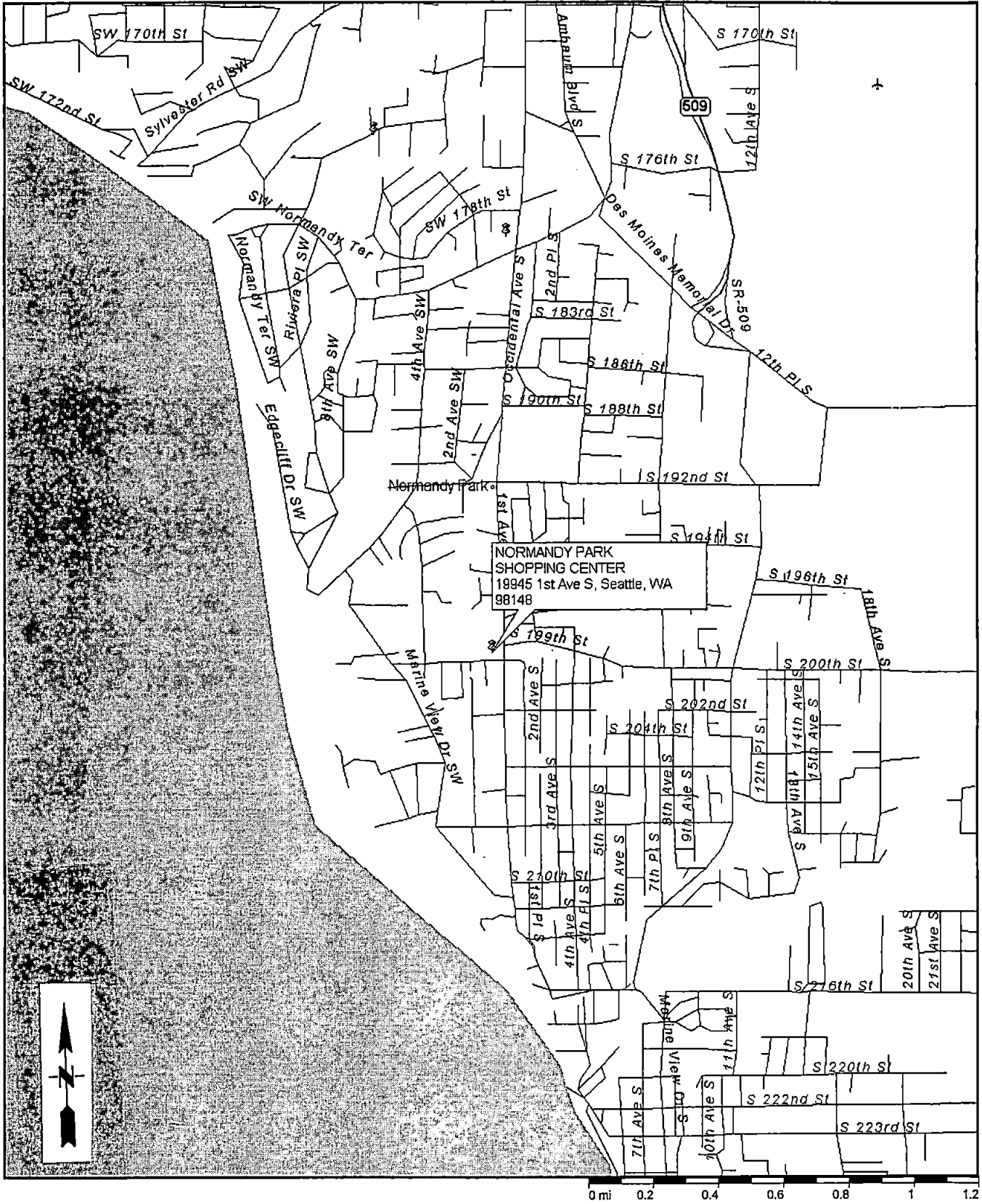
The western border of the shopping center is comprised of a steep hill that is reinforced behind the main building by a rock wall. Additional single-family residences as well a condominium complex are situated immediately west of the property. These properties are situated approximately 40 to 50 feet above the grade of the shopping center. City Hall Park (Marivista Park) lies further to the west, immediately beyond these adjacent residences. The western ridge behind the site forms a broad plateau before dropping off towards Puget Sound approximately a half mile to the west. Seattle-Tacoma International Airport is located approximately 1.5 miles northeast of the site.

1.2.2 Site History

Historical records indicate that the Normandy Park Shopping Center was initially developed by the current owners during the early 1960's. A service station, that included the existing Roxbury-Exxon building, was completed on the southeast corner of the property by 1960/61. Construction of the two primary commercial buildings (the 20,000 and 10,000 sf. structures) was completed in 1961. The two remaining buildings (the 5,000 sf. building and the portable stand) were subsequently constructed around 1970. Prior to their connection to the Normandy Park municipal sanitary sewer system in the late 1960's, these structures were serviced by three septic tanks and a drain field that were reportedly situated in the eastern half of the property.

Several dry cleaning businesses have reportedly occupied the dry cleaner tenant space on the north end of the main building for approximately the past 30 years. Throughout this period, the dry cleaning equipment used on the premises has reportedly been located along the northwest end of the tenant space. The most recent occupant, Sooper Cleaners, vacated the property on February 29, 2000. Although the Sooper Cleaners formerly operated a closed-loop cleaning machine, which recovers the spent solvent for re-use, regulatory records indicate that earlier tenants were small quantity generators





SCS ENGINEERS

STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.

2435 140TH AVE NE, SUITE 107, BELLEVUE, WA 98005 (425) 746-4800

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Figure 1

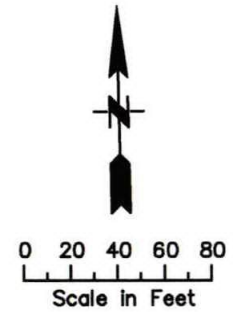
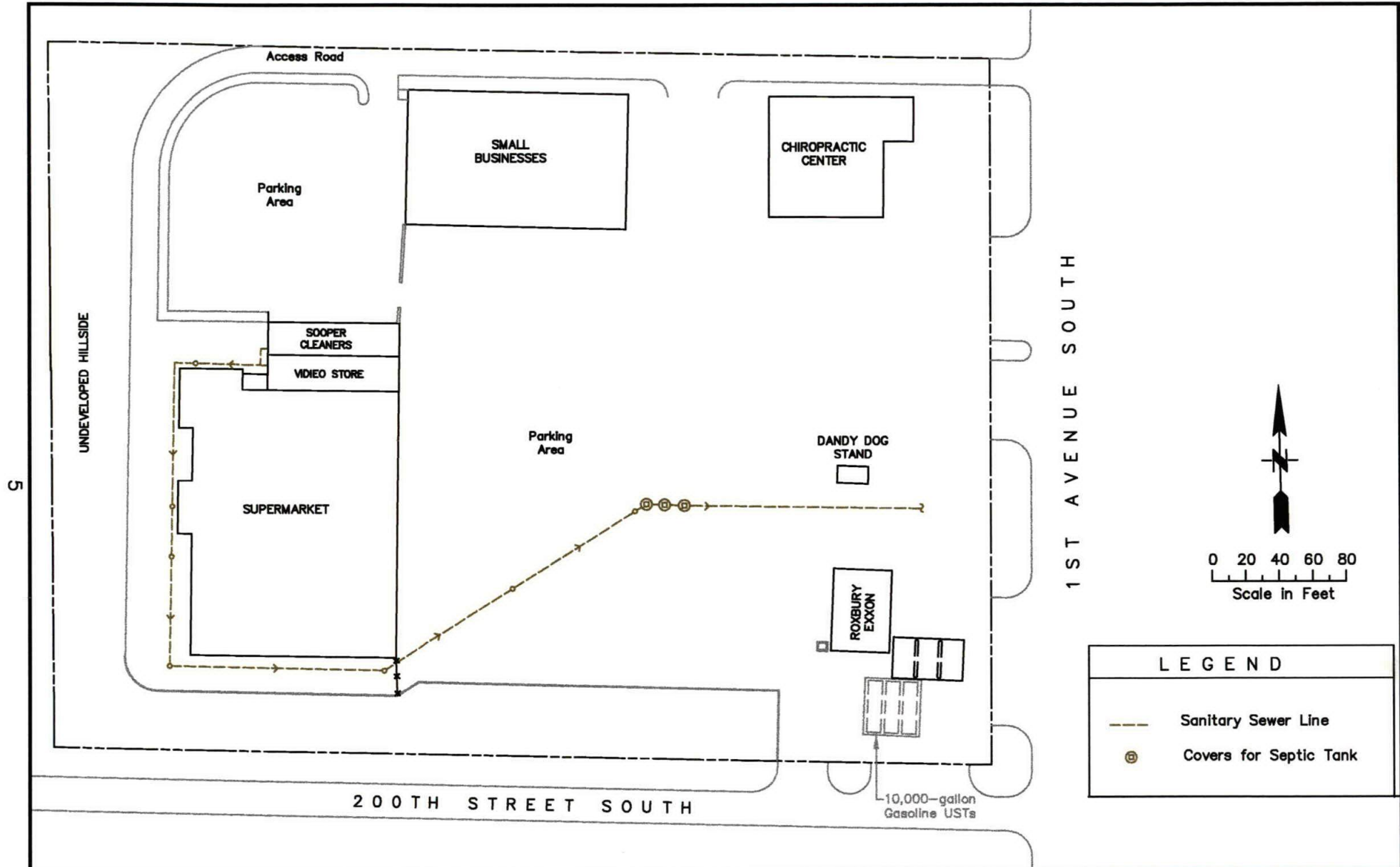
APP BY
G.H.

**SITE LOCATION MAP
NORMANDY PARK SHOPPING CENTER
ENVIRONMENTAL SITE ASSESSMENT**

DATE
AUG 2001

FIGURE

1



LEGEND	
	Sanitary Sewer Line
	Covers for Septic Tank

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SITE PLAN
 SOOPER DRY CLEANERS
 NORMANDY PARK SHOPPING CENTER

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FIGURE	2

of hazardous wastes. In addition, during an initial site inspection (SCS, February 2000), several 5-gallon containers of apparently new solvent and an area of stained carpeting were observed in the Sooper Cleaners next to the dry cleaning machine.

In addition, several gasoline stations have existed at the site of the Roxbury Auto Parts & Exxon service station during the past 40 years. The current owner/operator has occupied the site since the early 1980's. The Exxon station currently includes three underground gasoline storage tanks (USTs), two fuel islands and four computerized dispensers. The existing gasoline USTs were reportedly installed during 1989. Service station documents indicate that each fuel tank is double-walled, constructed of steel and has a storage capacity of 10,000 gallons.

1.2.3 Previous Investigations

SCS Engineers conducted a Phase I/II environmental assessment for the Normandy Park Shopping Center property during February-April 2000. Based on the property's history, the initial Phase II assessment consisted of a limited Strataprobe soil and groundwater investigation in the vicinity of the Sooper Dry Cleaners and the Roxbury Auto Parts – Exxon gasoline station. No significant petroleum hydrocarbon contamination was detected during the gasoline station investigation.

As illustrated on Figure 3, five Strataprobe borings (BH-7 through BH-11) were installed immediately outside the dry cleaners tenant space during the initial Phase II investigation. Boring BH-7 was located near the dry cleaner entrance, while borings BH-8 through BH-10 were placed along the outside wall of the tenant space, as close as possible to the former location of the dry cleaning machine. Due to the hardness of the subsurface soils beneath and adjacent to the dry cleaners, BH-7 through BH-10 could not be advanced beyond a depth of 12 feet below ground surface (bgs). However, after relocating approximately 25 feet northwest of the building, boring BH-11 was eventually advanced to the surface of the water table at a depth of approximately 37 feet bgs.

From ground surface to approximately 2.5 feet bgs, the soils in the vicinity of the dry cleaners generally consisted of tan-brown gravelly sand, which was immediately underlain by a compact tan silt. With the exception of BH-11, all of the Strataprobe borings experienced refusal within this formation. A tan, moist, fine-grained, silty sand, observed in BH-11 from 33 to 38 feet bgs, was the only water-bearing formation encountered in this area of the property. Field screening with an organic vapor meter (OVM) did not detect any organic vapors or soil staining in any of the soil cores obtained from the vicinity of the dry cleaners. The subsurface lithology and field screening results obtained during the initial assessment are detailed in the soil boring logs included in Appendix B.

Based on field observations, a total of nine soil samples and one groundwater sample collected from the dry cleaners investigative area were submitted for laboratory analysis for chlorinated solvents and related compounds using EPA method 8021B. Soil analysis reported detectable concentrations of dry cleaner-related contaminants in three of the soil borings (BH-9, BH-10 and BH-11) installed along the northwest corner of the Sooper Cleaners. The detected chemicals included: PCE, 1,1,2,2-PCA, 1,2-DCB, 1,3-DCB, 1,4-DCB, and xylene. Although, none of the soil detections exceeded MTCA standards, the 4,300 µg/kg of 1,1,2,2-PCA reported in BH-10, 2' did approach the 5,000 µg/kg Method B criterion for that compound. The most elevated solvent concentration was observed in



boring BH-10 at 2 feet bgs (4,300 µg/kg of 1,1,2,2-PCA). The deepest solvent occurrence (130 µg/kg of PCE) was observed at 37 feet bgs in boring BH-11.

EPA method 8021B analysis of the BH-11 groundwater sample detected 180 µg/L PCE, 13 µg/L 1,1,2,2-PCA, 2.8 µg/L 1,2-DCB, 1.0 µg/L 1,3-DCB and 1.5 µg/L 1,4-DCB, as well as 2.5 µg/L trichloroethene (TCE). The PCE and 1,1,2,2-PCA detections reported for this sample both exceeded their respective MTCA groundwater clean-up standards (the 5.0 µg/L Method A standard for PCE, and the 0.219 µg/L carcinogenic Method B standard for 1,1,2,2-PCA, respectively). None of the remaining compounds were detected at levels exceeding regulatory criteria.

Based on the results of the initial Phase II investigation, the installation of additional soil borings and groundwater wells around the dry cleaners was recommended to further evaluate the groundwater conditions beneath the site, and to assess the local groundwater flow regime.



SECTION 2 ENVIRONMENTAL ASSESSMENT

The environmental site assessment at the former Sooper Dry Cleaners was completed in three investigative stages: a Stage I subsurface investigation; an onsite Stage II groundwater investigation; and a Stage III onsite/offsite groundwater investigation. The cumulative assessment included: installation of 13 onsite groundwater monitoring wells (MW-1 through MW-12) and one offsite groundwater monitoring well (MW-13); drilling 11 Strataprobe borings (SP-1 through SP-11); drilling four shallow indoor soil borings (HA-1 through HA-4); the collection of soil and groundwater samples; a geophysical survey of underground utilities and a suspected dry well; and aquifer testing.

Data collected during the staged field program were compiled to characterize the nature and extent of the apparent PCE contamination and to determine the rate and direction of groundwater flow beneath the property. Groundwater flow and contaminant fate and transport modeling, as well as a detailed search for domestic water wells downgradient of the site, was completed to assess to potential for the subsurface contamination to impact human health or the environment. Detailed descriptions, along with the rationale for each of these investigative tasks, are provided below.

Site photographs taken during the course of the staged investigations are included in Appendix A. Subsurface lithology, well construction details, and the OVM field screening results are described in the soil boring logs included in Appendix B. Details from the geophysical survey completed at the site are included in Appendix C. Original analytical data reports and chain-of-custody forms are provided in Appendix D.

2.1 STAGE I SUBSURFACE INVESTIGATION

The purpose of the Stage I subsurface investigation was to confirm the PCE detections reported during the initial Phase I/II Strataprobe assessment and to assess the site hydrology. Stage I consisted of the following four investigative tasks:

- Installation and sampling of four shallow soil borings inside the dry cleaner tenant space;
- Completion of a utility survey to locate the sanitary sewer and stormwater lines (and an old septic tank and drain field) in the vicinity of the dry cleaner;
- Strataprobe sampling around subsurface utilities, including the old septic tanks and drain field that formerly served the property; and
- Installation and sampling of four groundwater monitoring wells.

2.1.1 Indoor Soil Borings

On May 26th, 2000, SCS Engineers installed four shallow borings (HA-1 through HA-4) in the subsurface soils beneath the dry cleaner tenant space. Concrete cores were cut at two locations in the reported vicinity of the former dry cleaning machine and at two locations adjacent to an existing floor drain. A hand augur was then used to advance each boring into the subsurface materials immediately



below the building foundation. Each boring was advanced to a depth of approximately five feet bgs. The locations of the indoor soil borings are illustrated on Figure 3.

Soil samples were continuously collected from each boring, lithologically logged by an SCS geologist, and field screened with an OVM for the presence of volatile organic compounds (VOCs). Based on field observations, two samples from each boring were collected directly from the auger barrel into pre-labeled laboratory supplied containers. Collected samples were immediately placed into a field cooler pending transfer to the Ecology-accredited analytical laboratory (ESN Northwest, formerly Transglobal Environmental Geosciences Northwest, Inc.). All the samples were analyzed for halogenated and aromatic compounds using EPA method 8021B.

All non-disposable sampling equipment, including the hand auger and sampling trowel, were carefully decontaminated using a non-phosphate detergent (TSP-substitute) wash and an initial clean tapwater rinse followed by a final distilled water rinse. After each boring was completed, the hole was sealed with soil cuttings and well-hydrated chip bentonite. The foundation was then concrete patched at each location to restore the slab.

2.1.2 Utility Locating

Because dry cleaning solvents releases are commonly associated with stormwater and sanitary sewer lines, these subsurface utilities were located to evaluate the potential for secondary contaminant release points and to determine the optimum locations for subsurface sampling. Anecdotal and historical information indicated that the sewer line servicing the dry cleaner had formerly been connected to a septic tank and drain field situated on the eastern end of the shopping center. The sewer line was reportedly rerouted to the city's sanitary system during the late 1960s.

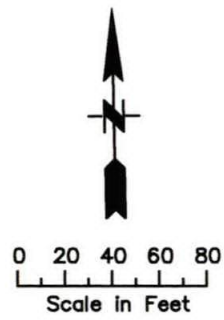
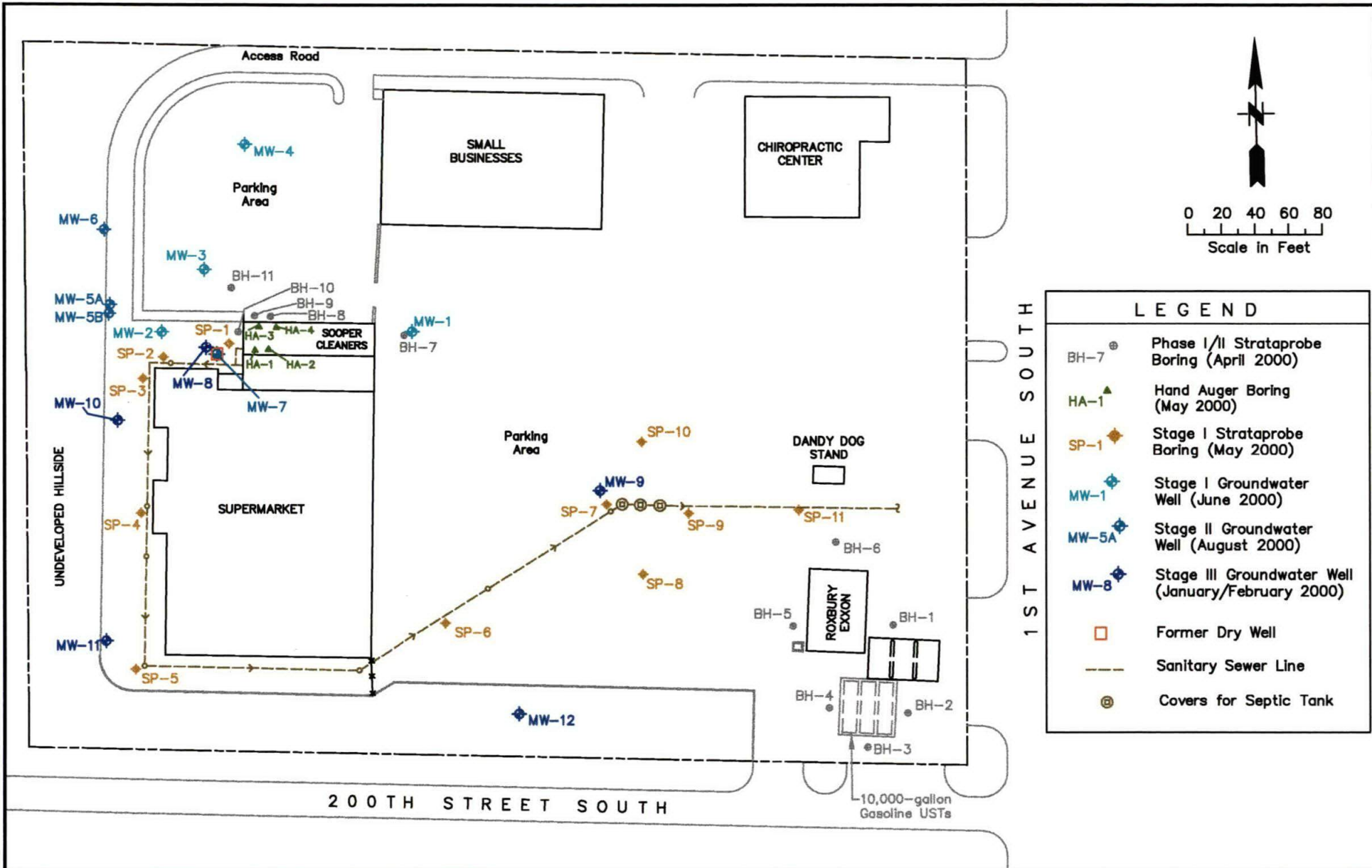
On May 26th, Applied Professional Services (APS), under the direction of SCS Engineers, conducted a limited utility survey of the shopping center property. A magnetometer, induction meter and a metal snake were used to mark out the all of subsurface utilities that currently or formerly connected to the dry cleaner tenant space. The survey included the delineation of the sanitary sewer, storm drain and several former septic tanks and a suspected drain field area. The locations of these underground features were marked in the field to direct the subsequent Strataprobe sampling effort.

The storm and sanitary sewer lines run in parallel north to south behind the dry cleaner building. These utilities subsequently turn east at the south end of the building and pass beneath the main parking area before leaving the property along 1st Avenue South. The subsurface sanitary sewer identified during the utility survey are illustrated on Figure 3.

2.1.3 Strataprobe Investigation

Once the indoor soil sampling and the utility locating tasks were completed, additional Strataprobe sampling was performed along subsurface utility lines to delineate additional potential solvent release points beyond the footprint of the dry cleaner tenant space. On May 31st, 2000, a Strataprobe drive-point sampling rig installed a total of 11 soil borings (SP-1 through SP-11) along the sanitary sewer lines that connect to the tenant space. The locations of the Strataprobe borings are illustrated on Figure 3.





LEGEND	
BH-7	Phase I/II Strataprobe Boring (April 2000)
HA-1	Hand Auger Boring (May 2000)
SP-1	Stage I Strataprobe Boring (May 2000)
MW-1	Stage I Groundwater Well (June 2000)
MW-5A	Stage II Groundwater Well (August 2000)
MW-8	Stage III Groundwater Well (January/February 2000)
□	Former Dry Well
---	Sanitary Sewer Line
⊕	Covers for Septic Tank

SCS ENGINEERS
 STEARNS, CONRAD AND SCHMIDT
 CONSULTING ENGINEERS
 2405 140TH AVE NE, SUITE 107, BELLEVUE, WA 98005 (425) 746-4600

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AREAS OF INVESTIGATION
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FIGURE	3

ESN Northwest operated the Strataprobe unit under the direction of a SCS field geologist. The Strataprobe soil sampling system uses a hydraulic ram, a percussion hammer, and the weight of the vehicle to advance a three-foot long split-spoon sampler into the undisturbed soil column. To collect groundwater samples, hollow probe rods were driven to the desired sampling depth with an expendable tip that was jettisoned within the saturated zone. Once groundwater flow through the stainless steel screen and into the probe rods was established, a length of teflon tubing connected to a peristaltic pump was used to purge several rod volumes of groundwater before drawing a sample.

As illustrated in Figure 3, six borings (SP-1 through SP-6) were installed in the fill zones that surround the sanitary sewer lines, and near suspected pipeline junctions or elbows (which can be prone to leaking). These borings were advanced to a depth of approximately 11 feet bgs. The remaining five borings (SP-7 through SP-11) were installed in the main parking area in the vicinity of a suspected former septic tank and drain field. These latter borings ranged from 11 to 19 feet in depth. Attempts to advance these soil borings into deeper soil horizons were refused. After each boring was completed it was sealed from the surface with well-hydrated chip bentonite.

Soil samples were continuously collected from each boring, lithologically logged, and field screened with an OVM for the presence of VOCs. A minimum of two samples were collected from each boring. Each sample was collected directly from the split-spoon sampler into pre-labeled, laboratory supplied containers. Collected samples were immediately placed into a field cooler pending transfer to the analytical laboratory. Based on field observations, a total of 15 soil samples were selected for laboratory analysis for halogenated and aromatic compounds using EPA method 8021B.

After the soil sampling equipment was advanced to the maximum depths allowed by the subsurface conditions, groundwater sampling was attempted at three Strataprobe boring locations (SP-7, SP-10 and SP-11). However, the smaller-diameter groundwater collection rods could only be driven into the saturated zone at SP-11. Groundwater sampling equipment was refused at 19 feet bgs in SP-7 and at 30 feet bgs in SP-10. The water table at SP-11 was encountered at approximately 22 feet bgs. One groundwater sample was collected from SP-11 and submitted to the laboratory for EPA method 8021B analysis.

2.1.4 Groundwater Monitoring Wells

Monitoring Well Installation

On June 6th, 2000, Cascade Drilling Inc. (Woodinville, WA) installed four groundwater monitoring wells (MW-1 through MW-4) under the direction of a SCS field geologist. As illustrated on Figure 3, MW-1 was installed at a location estimated to be immediately upgradient of the dry cleaner, while the remaining three wells were located at estimated downgradient positions behind the main building and in the adjacent parking lot where PCE had been previously detected. All drilling operations were completed using a truck-mounted, hollow-stem auger drill rig. Before the drilling rig was mobilized to the site, all boring locations were cleared for the presence of underground utilities.

A total of 36 subsurface soil samples were visually inspected, field screened and lithologically described during the borehole drilling. Samples were generally obtained from near the surface of each boring and at approximately five-foot intervals by driving a split-spoon sampler into the undisturbed



material beneath the lead auger. Field screening involved sealing about eight ounces of soil into an airtight ziplock bag, and testing the headspace with an organic vapor meter (OVM). The field screening results, a description of the soil lithology and other field observations were recorded on boring logs in Appendix B.

Representative soil samples were collected directly from the spilt spoon sampler into pre-labeled 4-ounce, glass containers, and immediately transferred to a field cooler. Based on field observations, 12 soil samples were submitted to ESN Northwest for laboratory analysis for halogenated and aromatic compounds using EPA method 8021B.

Once drilling operations were completed, groundwater monitoring wells were installed at each boring location. The wells were completed to depths ranging from 40 to 46 feet bgs. Each monitoring well was constructed of two-inch diameter, PVC casing with a 5-foot length of 0.020-inch factory-slotted screen positioned to intercept the water table and penetrate the uppermost horizons of the water-bearing formation. A clean, silica sand filter pack was placed in the annular space between the well and the formation, extending from the bottom of the well to about three feet above the top of the screen. The remainder of the annular space was filled with hydrated chip bentonite as a seal above the filter pack. The well casing terminated near the ground surface with an expandable locking pipe cap. The monitoring wells were finished at the ground surface with flush-mounted well monuments set in concrete. Wellhead elevations were then surveyed (Bush, Roed & Hitchings, Inc.) relative to mean sea level.

Following installation, each monitoring well was developed to provide a good hydraulic connection with the saturated zone. Well development procedures consisted of surging and pumping techniques to remove sediment that had accumulated inside the well, and to properly set the filter pack around the outside of the well screen. A minimum of 24 hours separated the well installation from the well development activities, and the well development from the actual groundwater sampling, allowing the hydrological conditions at each well location to re-equilibrate.

All drilling equipment, including auger flights, steel casing, and other drill fittings, were carefully decontaminated using an on-site steam cleaner to minimize the potential for cross-contamination. Non-disposable well development equipment was decontaminated using a non-phosphate detergent (TSP-substitute) wash and an initial clean tapwater rinse followed by a final distilled water rinse. All the waste materials generated during the field investigation, including soil cuttings, decontamination water and development water, were collected in 55-gallon drums and stored on-site.

Groundwater Sampling Methods

On June 9th, 2000, SCS Engineers collected an initial set of groundwater samples from MW-1 through MW-4. A stainless steel/teflon, Grundfos submersible sampling pump was used for well purging and the collection of all groundwater samples. Low-flow well purging and groundwater sampling methods were used to ensure the collection of undisturbed samples, and to minimize the generation and on-site storage of potentially contaminated groundwater.

Before sampling, the depth to water was measured in each well with an electric water level meter for subsequent calculation of the groundwater flow direction and gradient. The wells were then purged



under low flow conditions to allow for the collection of a fresh, representative sample. Field measurements for pH, specific conductance, and temperature were recorded at each location. All purging and sampling water was containerized in 55-gallon drums and stored on site.

Samples were collected directly from the sampling pump outlet into pre-labeled containers and preserved as required by the specific laboratory test methodology. Sample containers were immediately placed into field coolers for preservation and delivery to the analytical laboratory. All non-disposable sampling equipment (sampling pump and hose, water level probe, pH-conductivity meter, etc.) was thoroughly decontaminated with detergent and distilled water before each use. A new pair of disposable sampling gloves was used for the collection of each sample, and then discarded. Equipment rinse blanks and a blind duplicate sample were also collected and analyzed during the sampling event. Copies of the Well Sampling Records are provided in Appendix E.

All of the groundwater samples collected during the Stage I investigation were submitted under chain of custody control to ESN Northwest for halogenated and aromatic compound analysis using EPA method 8021B.

2.2 STAGE II GROUNDWATER INVESTIGATION

The Stage I investigation confirmed that PCE was present in the groundwater near the former location of the Sooper Dry Cleaners. The highest PCE concentrations were detected in the monitoring wells (MW-2 and MW-3) located behind the dry cleaner tenant space to the west and northwest of the main building. Following the completion of the Stage I investigation, a building plan dating from the early 1960's was discovered that indicated the presence of a dry well for roof drain runoff immediately behind the dry cleaner tenant space. If present, the old dry well could potentially represent a source for the groundwater contamination observed at the site.

The proximity of the western property border, combined with the groundwater flow direction calculated from the Stage I wells, indicated that PCE contaminated groundwater could be migrating west-northwest to the adjacent property. However, since the western border of the shopping center lies along a steep, wooded hill slope/cliff (~40 foot high), only 20 to 80 feet of level land was available downgradient of the Stage I wells. As a result, the Stage II groundwater wells were subsequently located at the furthest downgradient (i.e. west-northwest) positions that drilling equipment was able to access without leaving the confines of the property.

Based on these findings, additional site investigations focusing on the suspected dry well and the horizontal and vertical migration pathways of the PCE contaminated groundwater were initiated. Stage II investigative work included the following tasks:

- A geophysical survey to confirm the existence of the suspected dry well behind the dry cleaner tenant space;
- Installation of four additional groundwater monitoring wells downgradient of the dry cleaner. One well was located within the confirmed dry well. Also, a nested pair of wells was installed further downgradient to assess any vertical variations in the aquifer;



- Limited aquifer testing of the shallow aquifer; and
- Review of state and local water well records to identify any domestic or water production wells that were potentially situated downgradient of the site.

2.2.1 Geophysical Survey

On August 23rd, 2000, Apollo Geophysics (Seattle, Washington), under the direction of SCS Engineers, conducted a geophysical survey in the paved area immediately behind the dry cleaner tenant space. The geophysical investigation used ground-penetrating radar (GPR) to confirm the presence and approximate dimensions of a dry well that may have historically drained storm water from the building roof immediately above the former dry cleaners.

After the presence of the dry well was confirmed, the footprint of the dry well was marked in the field to better direct the subsequent groundwater investigation. The location of the former dry well is illustrated on Figure 3.

2.2.2 Stage II Groundwater Wells

Cascade Drilling installed the four Stage II groundwater monitoring wells (MW-5A through MW-7) on August 24th and 25th, 2000. As shown on Figure 3, a nested pair of monitoring wells (MW-5A/B) was located downgradient of the dry cleaner tenant space at foot of the hill that forms the western property border. The third Stage II monitoring well (MW-6) was located at the foot the same hill, but approximately 75 feet further to the north to provide lateral coverage downgradient of the building. The remaining well (MW-7) was installed through the center of the former dry well present immediately behind the tenant space.

The Stage II monitoring wells were installed with a hollow-stem auger drill rig using the same general construction methods previously described for the installation of the earlier Stage I wells (i.e. two-inch PVC casing, five-foot 0.020-slot screen, flush-mounted monument). The MW-5A/B well nest consisted of A and B wells completed within separate borings drilled within five feet of its complement. The MW-5A well was installed to a depth of 45 feet bgs and was screened through the upper five feet of the saturated zone. The complementary MW-5B well was installed to a depth of 60 bgs and was screened in a lower portion of the aquifer. Following installation, the new wellhead elevations were surveyed relative to mean sea level, and each well was developed to provide a good hydraulic connection with the saturated zone.

A total of 23 subsurface soil samples were visually inspected, field screened and lithologically described during the Stage II investigation. Soil samples were obtained at approximately five-foot intervals using a split-spoon sampler. Field screening results and soil lithology information were recorded on boring logs (Appendix B). Based on field observations, nine of these soil samples were submitted to ESN Northwest for laboratory analysis using EPA method 8021B.

A complete round of groundwater sampling, including all eight Stage I/II monitoring wells (MW-1 through MW-8), was conducted on August 29th, 2000. The same low-flow well purging and sampling methods previously described for Stage I were used during the second round of groundwater sampling.



Field measurements for pH, specific conductance, and temperature were recorded at each location. All Stage II groundwater samples were submitted to ESN Northwest for EPA method 8021B analysis. All excess purging and sampling water was containerized in 55-gallon drums and stored on site.

2.2.3 Aquifer Testing

On October 5th, 2000, limited aquifer testing was conducted at upgradient monitoring well MW-4 and downgradient monitoring well MW-5B to determine the hydrological characteristics of the shallow aquifer. The aquifer tests consist of a series of basic recovery tests that included short-duration recovery/pump tests at MW-4 and negative slug tests (using forced air injection) at MW-5B. These specific tests were selected based on the individual well configurations, as well as to minimize the generation of contaminated groundwater.

The rate of water level recovery measured through the testing period was recorded. These data were then used to calculate the physical properties of the aquifer and estimate the overall rate of groundwater movement beneath the site. Aquifer permeability calculations were made using computer program applications of the Bower and Rice test methods for unconfined aquifers.

2.2.4 Survey for Potential Downgradient Receptors

Upon completion of the Stage II field investigations, a records search and field survey were conducted to determine if any domestic or municipal water wells were present on properties downgradient of the Normandy Park Shopping Center. The principle goal of the survey, which included interviews with local residents and regulatory agencies, was to confirm that no potential receptors (i.e. domestic water or production wells) were receiving contaminated groundwater from the impacted aquifer.

The records search included a review of well logs, domestic well registrations and groundwater use permits within an approximately a one-mile radius of the site that were available from the archives at the Washington Department of Ecology, King County and state and local Health Departments. In addition, the Highline Water District (which serves the City of Normandy Park) provided municipal water supply and meter registration maps, which were examined to establish the water source for residences up to 3,000 feet west (downgradient) of the site.

To complement the records search, field surveys of the residential properties immediately downgradient of the shopping center were performed on October 9th, 2000, and later on April 16th, 2001. The survey included a visual confirmation of the water meters, interviews with available residents and curbside inspections for suspect structures (i.e. well houses, sheds) that could indicate the presence of a domestic well.

2.3 STAGE III GROUNDWATER INVESTIGATION

The Stage II groundwater investigation confirmed that PCE contaminated groundwater was present beneath much of the western half of the Normandy Park Shopping Center, and that PCE contamination was likely migrating offsite to the adjacent properties. The results of Stage I/II investigations also indicated that additional Stage III monitoring wells were necessary to adequately delineate the areal and vertical extent of the PCE contamination.



Of particular concern was the potential for dry cleaning chemicals released at the site to exist as a dense-phase non-aqueous liquid (DNAPL) that could possibly migrate downward towards the base of the aquifer. Although DNAPL was not observed during any of the field investigations, none of the Stage I/II borings had encountered the base of the aquifer. The installation of a deeper Stage III soil boring/monitoring well was needed to resolve this issue.

The presence of relatively elevated groundwater PCE concentrations beneath the western border of the shopping center strongly suggested that contaminated groundwater was leaving the site. However, because the surface topography of the areas immediately downgradient of the site rises abruptly towards the west prior to dropping down towards Puget Sound, and since virtually all of the neighborhood is residential, it was apparent that it would be extremely difficult to locate and install any offsite monitoring wells in this area to determine the downgradient extent of the PCE plume.

The Stage III groundwater investigation was initiated to address these site issues. Additional Stage III monitoring wells were installed on the shopping center property to fully characterize the onsite extent of the contaminant plume. In addition, a less invasive approach was devised for the offsite elements of the Stage III groundwater investigation. Quantitative groundwater flow modeling, combined with the installation of a single offsite monitoring well, was used to evaluate the downgradient extent of the contaminant plume. The overall goal of the Stage III investigation was to provide the necessary field and chemical data to allow the development of a credible hydrological model for the site that retains the capacity to predict the groundwater flow conditions downgradient of the property.

The Stage III investigative work included the following investigative tasks:

- Installation of five additional groundwater monitoring wells to fully delineate the onsite extent of the plume of PCE contaminated groundwater and to attempt to characterize the base of the aquifer;
- Additional aquifer testing to better define the hydrological characteristics of the aquifer and to provide input parameters for a site hydrological model;
- Construction of a quantitative groundwater flow model to simulate the present and future groundwater conditions beneath and downgradient of the site, and to establish the optimum placement for an off-site monitoring well;
- Installation of an offsite groundwater monitoring well to evaluate the downgradient extent of the plume of PCE contaminated groundwater; and
- Refinement of the quantitative groundwater flow model and preparation of a series of contaminant transport simulations to evaluate the current and future configuration of the PCE groundwater contamination and gauge its potential to impact human health and the environment.



2.3.1 Stage III Groundwater Wells

Cascade Drilling installed three Stage III groundwater monitoring wells (MW-8 through MW-10) on January 24th and 25th, 2001. These wells were installed with a hollow-stem auger drill rig using the same construction methods previously described for the installation of the earlier Stage I/II wells. The locations of the Stage III groundwater monitoring wells are illustrated on Figure 3.

Well MW-8 was located immediately downgradient of the dry well and was advanced to a depth of 90 feet bgs in an attempt to reach the lower confining layer of the aquifer. Well MW-9 was installed downgradient of several old septic tanks and a drain field that formerly serviced the shopping center. The remaining well (MW-10) was installed immediately behind the supermarket building to establish the southern edge of the PCE groundwater contamination. MW-9 and MW-10 were installed to a depth of 44 and 67.5 feet bgs, respectively. Following installation, the new wellhead elevations were surveyed relative to mean sea level, and each well was developed to provide a good hydraulic connection with the saturated zone.

A total of 56 soil samples were visually inspected, field screened and lithologically described during the drilling of the MW-8, MW-9 and MW-10 borings. Split-spoon soil samples were collected at five-foot intervals in the vadose zone and at 2.5-foot intervals in the saturated zone. Field screening results and soil lithology were recorded on boring logs (Appendix B). Based on field observations, six of the soil samples were submitted to ESN Northwest for EPA method 8021B analysis. In addition, five soil samples from various zones of the aquifer were submitted to Soil Technology (Bainbridge Island) for grain-size analysis. The grain size data were used to obtain estimates of hydraulic conductivity to complement data obtained during slug testing.

Groundwater samples were collected from the newly installed Stage III wells on February 1st, 2001. The same low-flow well purging and sampling methods previously described for the earlier monitoring events were used during this round of groundwater sampling. Field measurements for pH, specific conductance, temperature and dissolved oxygen were recorded at each location. Collected groundwater samples were submitted to ESN Northwest for EPA method 8021B analysis.

Upon review of the initial Stage III groundwater results, it became apparent that the southern extent of the PCE contaminated groundwater remained undefined. As a result, two additional Stage III groundwater monitoring wells (MW-11 and MW-12) were installed along the south and southwest borders of the shopping center on February 14th, 2001.

Wells MW-11 and MW-12 were installed to a depth of 60 and 50 feet bgs, respectively. Similar well construction, soil sampling and groundwater development and sampling methods were used as previously described. Two soil samples and one groundwater sample from each well were submitted to ESN Northwest for EPA method 8021B analysis. The locations of the final two Stage III groundwater monitoring wells are illustrated on Figure 3.

2.3.2 Additional Aquifer Testing

After the installation of the Stage III monitoring wells, additional aquifer testing was performed on selected wells to better define the hydrological characteristics of the aquifer and to provide input



parameters for the subsequent development of the site hydrological model. The additional aquifer testing consisted of a series of pressurized slug tests that were conducted on February 20th, 2001. Aquifer testing was conducted on MW-6, MW-8, MW-9 and MW-11.

The pressurized slug tests measured the rate of water level recovery after the static water table was initially depressed using compressed air to near the top of the well screen. Once the pressure inside the well stabilized, it was suddenly released to allow the interior water level to return to its static elevation. The recovery data were collected under ambient conditions using a submersed transducer and recorded in an automatic data-logger. Aquifer permeability calculations were made using a computer program application of the Bower and Rice slug test method for unconfined aquifers.

2.3.3 Regional Groundwater Flow Modeling

Hydrogeological information obtained from the on-site investigations, as well as from regional studies, were compiled and used to develop a quantitative regional groundwater flow model covering the former Sooper Dry Cleaners site and environs. Initially, site-specific field data and regional geologic information (including well logs, water table elevations, aquifer test data, etc.) were integrated to formulate a general conceptual hydrological model. The conceptual model was subsequently used to provide the framework for a numerically based, multi-layered numerical groundwater flow model.

The groundwater flow model consists of a three-dimensional steady-state simulation. That is, time varying effects of transient changes such as inconsistent precipitation or intermittent pumping are not accounted for. The model is intended to be representative of average conditions, rather than a particular "snapshot" in time. Over the time period that groundwater levels have been measured at the site, it appears that there is not much variability about the "average" conditions.

The groundwater flow model was constructed using MODFLOW (*McDonald and Harbaugh, 1988*). MODFLOW is a widely recognized, well-documented, thoroughly validated set of powerful modules that are selectively combined to simulate fully saturated three-dimensional groundwater flow. MODFLOW is based upon a finite-difference, numerical solution to the three-dimensional groundwater flow equations and is implemented through a rectangular grid structure that can accommodate variable spacing.

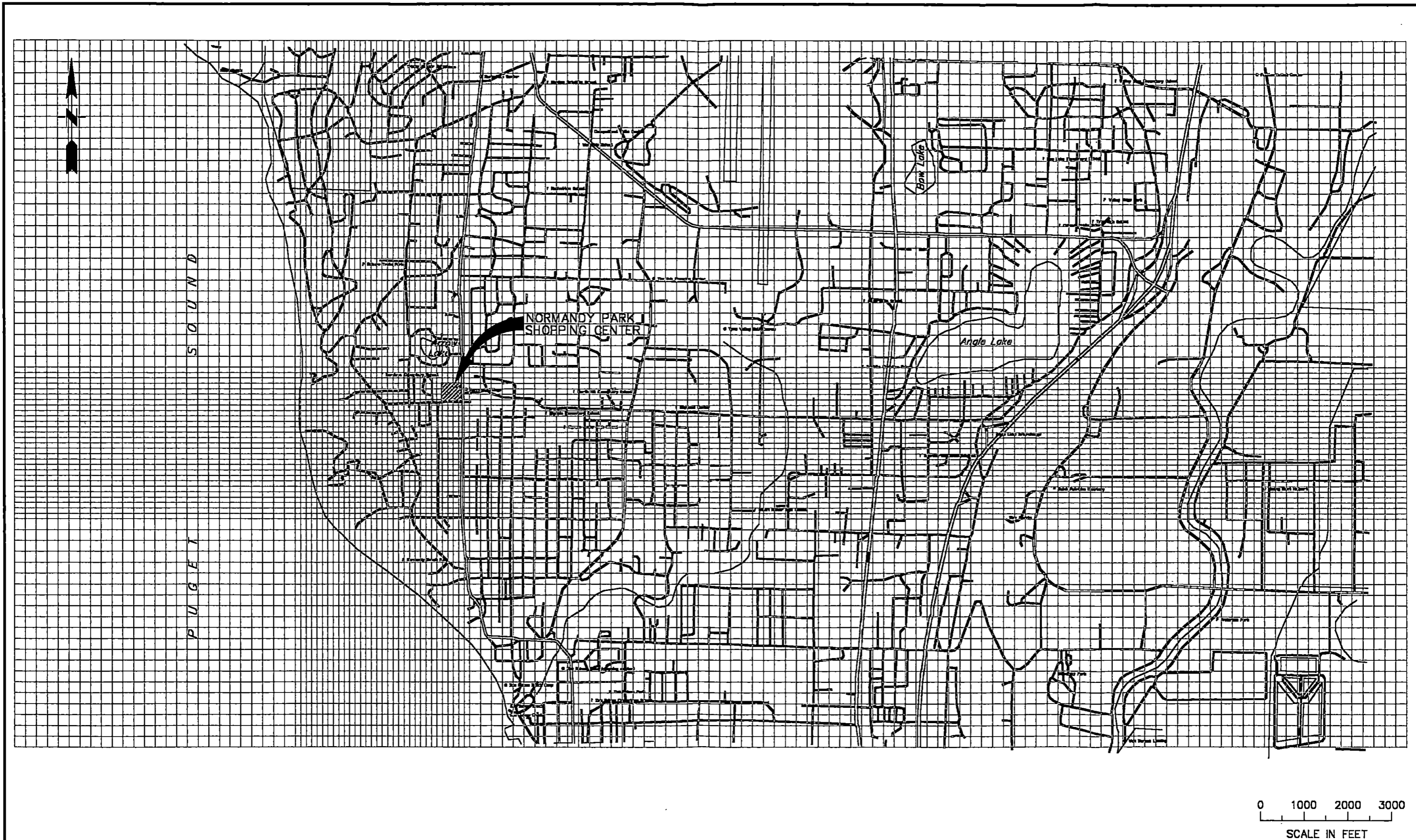
A "preprocessor" software package is a useful tool for establishing the model structure, populating the finite-difference grid with required parameters, and developing the input data files necessary for groundwater flow simulation. Processing MODFLOW for Windows® (*Chiang and Kinzelbach, 1996*) was used for all groundwater flow model development. This proprietary software fully implements all features of MODFLOW including third-party additions to the original MODFLOW code.

Model Configuration

Horizontal Grid

Figure 4 shows the groundwater flow model finite-difference grid overlaid on a regional map. The grid is 79 rows by 144 columns. The width of each cell varies.





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 STEARNS, CONRAD AND SCHMIDT
 CONSULTING ENGINEERS
 2405 140TH AVE NE, SUITE 107, BELLEVUE, WA 98005 (425) 746-4600

PROJECT NO.	04199025.03	DES BY	M.V.
SCALE	AS SHOWN	CHK BY	D.V.
CAD FILE	Figure 4	APP BY	G.H.

FINITE DIFFERENCE GRID
 FOR THE REGIONAL GROUNDWATER MODEL
 NORMANDY PARK SHOPPING CENTER

DATE	SEPT 2001
FIGURE	4

Layering

Six layers were established in the model. In general, the layers were specified to loosely represent the various hydrogeologic units recognized in the region, including (from land surface downward) recessional outwash, till (confining layer), advance outwash (principal aquifer), a middle confining layer (representing the Lawton Clay), a lower (sea level) aquifer (sometimes referred to as the third coarse grained unit or Qc(3)), and a lower confining unit. In some locations, such as at the site, the till is absent and the recessional outwash is in direct contact with the advance outwash. In some locations the till is the uppermost layer (i.e. the recessional outwash is absent).

Top and bottom layer elevations were established based on contact elevations recorded on well and boring logs and reported in the regional literature (Woodward et al, 1995). In general, limited data on contact elevations were available and the layering served to establish possible limits on vertical groundwater movement rather than an explicit representation of the groundwater system.

Boundary Conditions

The north and south edges of the regional groundwater flow model were established as no-flow boundaries which correspond to groundwater flowpaths that were estimated from regional information. River nodes with a fixed bottom elevation were specified at the west (Puget Sound) and east (Green River) edges of the model. Drain nodes (simulating groundwater seeps) were specified in the third model layer (corresponding to the advance outwash or principal aquifer) along the margins of Puget Sound. The model simulates the head variation between these boundaries as influenced by the aquifer geometry and spatially varying recharge. The lower boundary of the model is the deepest layer representing a lower confining unit (below sea level).

Hydrogeologic Parameters

Hydraulic Conductivity

In terms of hydraulic conductivity, the regional groundwater flow model is homogeneous and anisotropic. That is, the hydraulic conductivity is uniform across the model domain, but differs in the horizontal and vertical directions. Both the horizontal hydraulic conductivity and the anisotropy ratio ($k_h:k_v$) were used as calibration parameters. These parameters were initially assumed and then adjusted so that the model results reasonably matched observed conditions.

In the principal aquifer (3rd layer, corresponding to the advance outwash), model calibration resulted in a horizontal hydraulic conductivity of 15 ft/day and an anisotropy ratio of 10:1 ($k_h:k_v$). The calibrated hydraulic conductivity agrees reasonably well with the hydraulic conductivity values obtained from slug testing and grain size analyses. No site data are available to support the anisotropy ratio; however, this values is considered reasonable due to compaction and preferential particle orientation. A similar value was used for the lower aquifer and recessional outwash materials (where present). The hydraulic conductivity of each confining layer was assumed to be 0.1 ft/day or less.



Porosity

Based on material descriptions and grain size distribution data for the principal aquifer, an effective porosity between 20% and 30% is indicated. For baseline simulations, a porosity of 25% was assumed.

Recharge

Precipitation recharge was added to the top layer of the model at a uniform rate of 0.0032 ft./yr. A water balance approach was used to estimate the amount of precipitation recharge to groundwater. Inflow and outflow parameters used to develop the water balance are based on those used in previous investigations for the Des Moines upland (Hart Crowser, 1985; South King County Groundwater Advisory Committee, 1989; Seattle Water Department, 1990). Averages of these parameters are listed below:

- Precipitation: 39 in/year
- Evapotranspiration: 17 in/year
- Runoff: 8 in/year

Recharge is then calculated to be $39 \text{ in} - 17 \text{ in} - 8 \text{ in} = 14 \text{ in/year}$ (0.0032 ft/day).

Model Calibration

In order to establish that the groundwater model was capable of a credible representation of groundwater flow conditions, preliminary predictive simulations were matched against specific groundwater conditions observed at the site as well as general regional patterns of groundwater flow reported in various publications. The configuration of the flow model and the parameterization (i.e. hydraulic conductivity, recharge distribution, etc.) were adjusted within reasonable ranges until model predictions agreed with the observed conditions.

Once the groundwater flow model was calibrated, a series of particle tracking simulations were run to determine the expected groundwater flowpath from the suspected contaminant release area behind the former dry cleaner tenant space to the point of expected discharge at Puget Sound. Flowpaths were computed using PMPATH for Windows (Chiang and Kinzelbach, 1997). PMPATH is a particle-tracking program that directly uses the result files from MODFLOW. PMPATH uses the semi-analytical particle tracking scheme described by Pollock (1988) and used by the program MODPATH (Pollock, 1989) to calculate the groundwater paths and travel times.

The groundwater flow path estimates were used to identify candidate locations for an off-site downgradient monitoring well.



2.3.4 Offsite Groundwater Investigation

During June 26th through 30th, 2001, Environmental West Exploration Inc. (Spokane, Washington), under the direction of SCS Engineers, installed an offsite groundwater monitoring well (MW-13) approximately 1,000 feet downgradient of the shopping center. As illustrated on Figure 5, MW-13 was located on a city right of way along the east shoulder of 4th Avenue SW in Normandy Park, Washington. This location was selected because it lies downgradient of the site, is in a low traffic area (i.e. dead end street), and is relatively well screened from nearby residences. A construction permit was obtained from the City of Normandy Park before the well was installed.

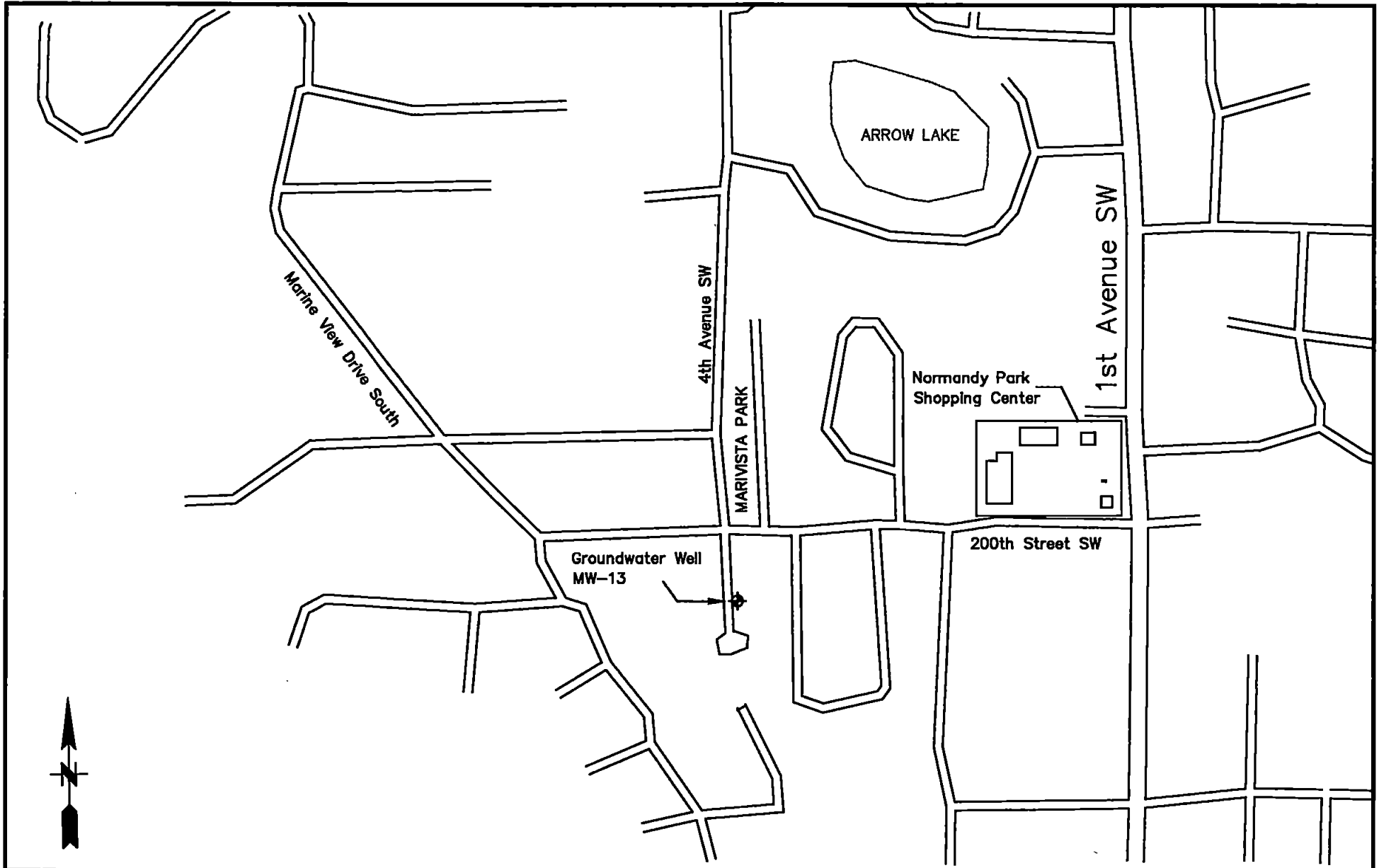
Because the aquifer immediately beneath the shopping center was projected to lie a minimum of 110 feet bgs at the MW-13 drilling location, an air-rotary drilling rig was used to install the monitoring well. From the ground surface to the top of the aquifer of interest, subsurface soils were field screened and lithologically described using the cuttings generated by the drilling equipment. Once the main aquifer was encountered (at approximately 112 feet bgs), the aquifer material was sampled at 20-foot intervals using a split spoon sampler. In addition, a Hydropunch[®] water sampler was used to collect in-place groundwater samples from the aquifer at 120, 160 and 180 feet bgs. The boring was terminated at 190 feet bgs.

Selected soil and groundwater samples from the MW-13 boring were rush analyzed for volatile organic compounds using EPA method 8260 to determine the optimum screen depth for the groundwater monitoring well. Based on the field and chemical data, MW-13 was screened from 185 to 190 feet bgs with a 5-foot long section of 0.020-inch factory slotted PVC screen. The well construction methods were similar to those previously described, and are detailed on the boring logs included in Appendix B.

Following installation, the wellhead elevation was surveyed, and well was developed to provide a good hydraulic connection with the saturated zone. All the soil cuttings and development water generated during the construction of MW-13 were placed in a plastic-lined container box and removed from the site for proper disposal.

Groundwater sampling was conducted at offsite well MW-13, as well as, shopping center wells MW-7, MW-8, MW-10 and MW-11 on July 11th, 2001. Low flow well purging and sampling methods were conducted using a portable QED bladder pump. Field measurements for pH, specific conductance, temperature and dissolved oxygen were recorded at each location. Groundwater samples were submitted to ESN Northwest for EPA method 8260 analysis for MW-13 and EPA method 8021B analysis for the remaining wells. All excess purging and sampling water was containerized in 55-gallon drums and stored on site. In addition, groundwater samples from MW-10, MW-11 and MW-13 were analyzed for a suite of groundwater quality parameters (including: chloride; sulfate; nitrate; total and dissolved iron; and total organic carbon) to assess whether the subsurface conditions were favorable for natural degradation of the site contaminants.





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	SCALE	-	CHK BY	DV		FIGURE	5
	CAD FILE	Figure 5	APP BY	GH			

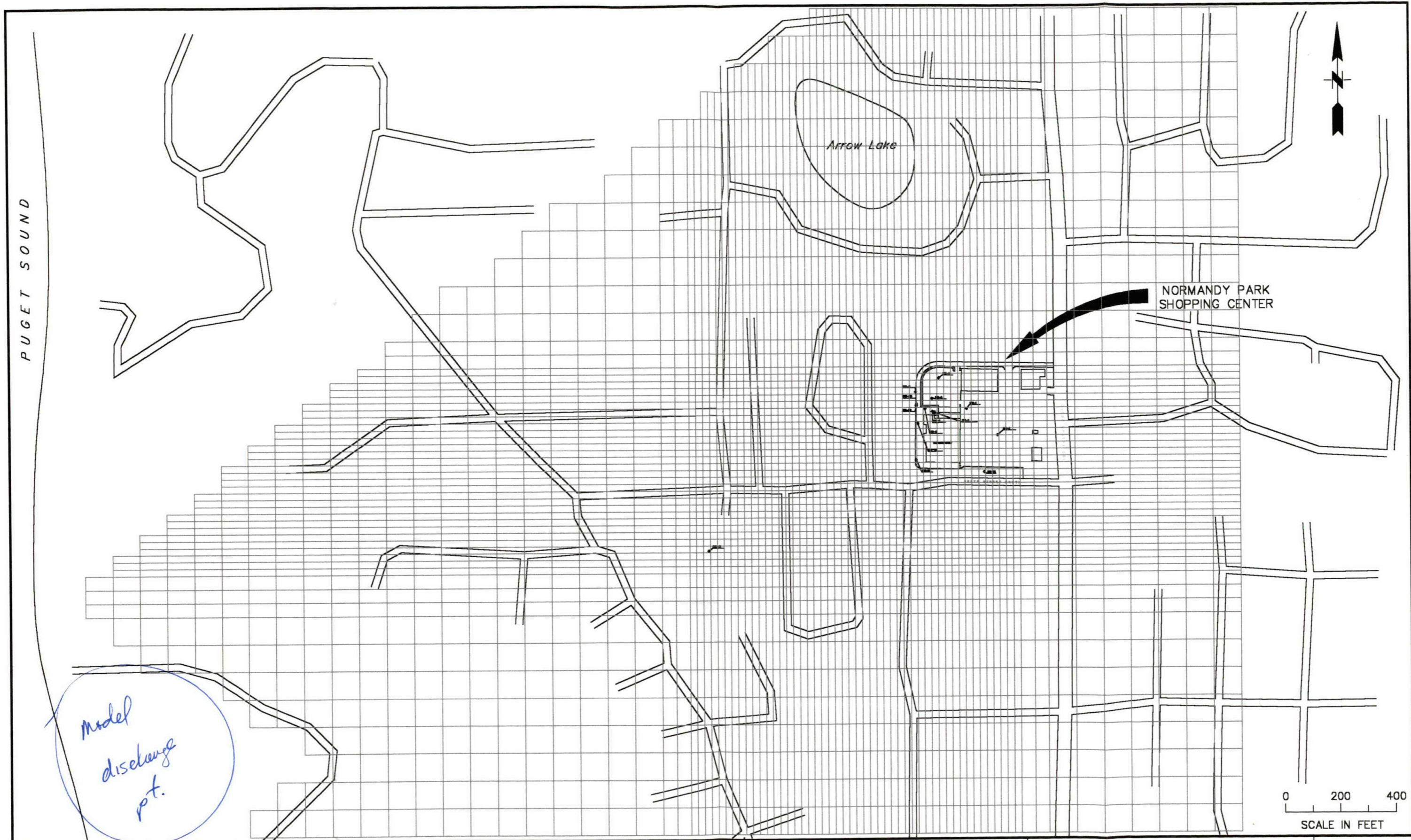
2.3.5 Site Groundwater Flow and Contaminant Transport Modeling

A site-specific groundwater flow model was developed using boundary conditions obtained from the regional flow modeling effort. As with the regional flow model, the site-specific flow model was implemented using the MODFLOW computer code. Identical parameters were specified; the only difference was the spacing of the grid and layering, which allowed for greater horizontal resolution than was provided by the regional flow model. The model finite difference grid for the site-specific model contains 55 rows and 83 columns and is irregularly spaced. Spacing in the vicinity of the site is set at a uniform 25 ft. Because the regional modeling effort did not indicate significant downward flow (and the site data do not confirm a strong downward gradient), only the primary aquifer was represented in the site groundwater flow model (equates to the third layer of the regional model). The horizontal grid of the site flow model is shown in Figure 6. As with the regional flow model, calibration was verified by comparing model results with site observations.

Using the site-specific groundwater flow model as a basis, contaminant transport simulations were then conducted using the code MT3D (Zheng, 1992). Unmeasured contaminant transport parameters (i.e. distribution coefficient, dispersivity) were adjusted within reasonable ranges until the model approximately reproduced observed conditions in the on- and offsite monitoring wells.

The results of the contaminant transport simulations were then subsequently used to predict contaminant breakthrough time and concentration at the point of discharge (Puget Sound), as well as investigate the effect (on the contaminant discharge) of various contaminant removal options.





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SCALE
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Figure 6

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M.V.

CHK BY
D.V.

APP BY
G.H.

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 FOR THE SITE GROUNDWATER MODEL
 NORMANDY PARK SHOPPING CENTER

DATE
SEPT 2001

FIGURE
6

SECTION 3 INVESTIGATIVE RESULTS

The geological and chemical data collected during the staged field investigations were compiled to characterize the subsurface conditions at the site and determine the extent of the PCE contamination resulting from releases from the former Sooper Dry Cleaners. The analytical test results, which are summarized on Tables 1 and 2, have been compared with MTCA Method A and Method B soil and groundwater standards for PCE and related compounds. Note that since the investigation activities and initial reporting were completed before August 15th, 2001, the MTCA criteria referenced in this document reflect the published values that existed prior to the August 15, 2001 update of MTCA.

Wellhead and water table elevation data, which are provided in Table 3, were used to estimate the direction and rate of groundwater flow. In addition, aquifer test results for several of the monitoring wells are provided in Appendix F. Our findings are discussed below.

3.1 SUBSURFACE CONDITIONS

During the course of the field investigations, approximately 240 subsurface soil samples were collected and field screened from a total of 40 hand auger, Strataprobe and monitoring well borings located on the Normandy Park Shopping Center and at the offsite monitoring well location. As illustrated on Figure 3, the majority of these soils data were obtained from beneath or downgradient (to the west) of the former dry cleaner and adjacent to the sanitary sewer utilities that serviced the tenant space.

With the exception of the undeveloped hill slope that forms the western property border and some perimeter landscaping, the shopping center is completely covered by buildings and concrete or asphalt pavement. Overall, the shopping center slopes gently towards the east, with the slope becoming more pronounced on the eastern half of the property. Historical records indicate that this parcel of land was excavated and regraded out of the broad ridge that is situated immediately behind the shopping center. As a result, the shopping center is currently situated approximately 40 feet lower than the neighboring properties to the west. Baring residential buildings and asphalt roadways, the majority of the area downgradient of the site remains unpaved.

The utility and geophysical surveys confirmed the locations of the underground utilities that service the main building. The majority of these subsurface utilities were situated approximately 4 to 6 feet bgs. The existing sanitary sewer line appears to run immediately south of three old septic tanks which were formerly connected to a drain field on the southeast end of the site. Anecdotal information indicates that the sanitary lines were rerouted to the municipal sewer main during the late 1960's. The drain field is reportedly still in place beneath the main parking area.

The geophysical survey also confirmed the presence of an old dry well beneath the asphalt pavement immediately behind the dry cleaner tenant space. The dry well consists of a gravel filled shaft, excavated into the surrounding silts, that is approximately five feet wide, five feet long and 13 feet deep. Although no surface drains or other conduits appear to currently connect to the dry well, an old building plan indicates that this structure was originally designed to receive stormwater from a pair of



roof drains above the dry cleaner tenant space. No other information was available concerning the design, use or disconnection date for this dry well.

3.1.1 Soil Lithology

The surficial and subsurface deposits in the area surrounding Normandy Park were primarily formed by fluvial, lacustrine, and direct-ice contact processes attributed to the advance and recession of the Vashon Glacier. The near-surface lithostratigraphic units in the Normandy Park-Des Monies 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 (Qvl). Several deeper regional aquifers and aquitards occur beneath the Vashon Drift series (U.S.G.S. Report, 1995).

Three units of the Vashon Drift series, including the Qvr recessional outwash, the Qvt till, and the Qva advance outwash, were encountered during the site investigations at the Normandy Park Shopping Center. Qvr was observed to immediately underlie the shopping center and appears to partially mantle the till unit on the ridge that lies immediately behind (west of) the property. The Qvr is characterized by stratified layers of clays, silts, sands and gravels that typically become increasingly coarse with depth. Qvr was also encountered in the upper section of the offsite boring at MW-13.

The recessional outwash appears to have filled valleys and other erosion features that were carved out of the underlying Qvt till formation. The till was observed at a depth of approximately 60 feet bgs at the offsite drilling location. Older Qva advance outwash sediments were encountered directly beneath the till. The clay, silt, sand and gravel layers that form the Qva typically become increasingly fine with depth. The Qvr recessional outwash is suspected to directly contact the older Qva advance outwash beneath the shopping center. A generalized cross-section through the majority of the investigative area is presented in Figure 7.

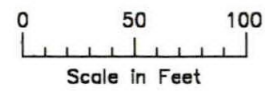
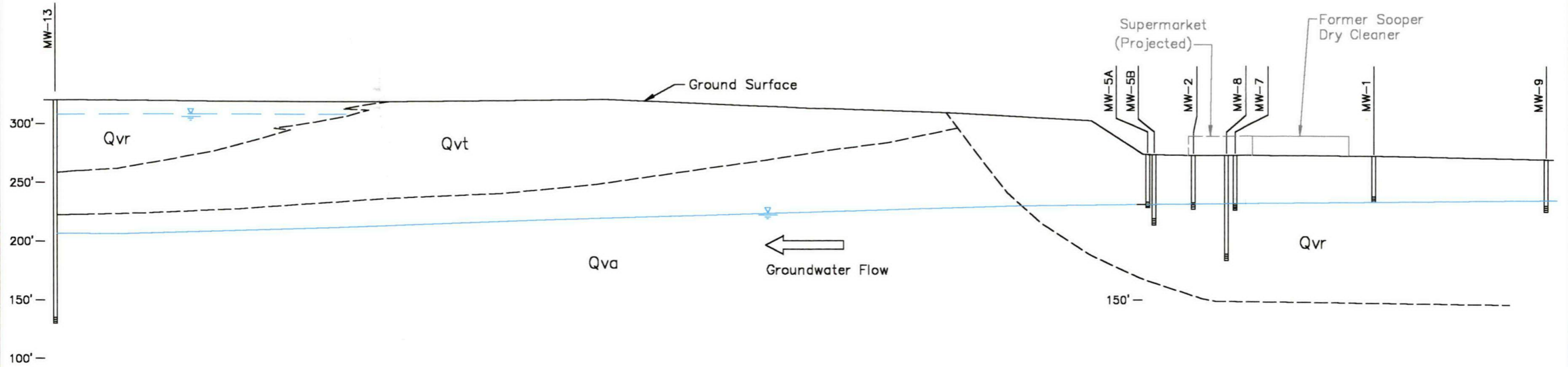
From the ground surface to 18 to 40 feet bgs, the soils beneath the shopping center property predominately consist of tan compact silt. A surficial layer of tan-brown to gray, silty to gravelly sand, containing minor amounts of concrete and fill debris, was observed to overlie the silty zone, especially towards the eastern end of the property. These silty formations were generally underlain by tan to gray, fine-grained, silty sands that typically graded into fine to medium sand with increasing depth. The water table was observed to lie within these sandy horizons at depths ranging from approximately 20 feet bgs (on the eastern end of the site) to approximately 40 feet (on the western half of the site).

A similar stratigraphic sequence was observed in the upper 60 feet of the subsurface at the offsite investigative area in the MW-13 boring. Fine to coarse sands and gravel (Qvr) became coarser with depth until the till was encountered at a depth of 62 feet bgs. The till (Qvt) provided a lower confining layer for approximately 45 feet of perched groundwater that resided in these upper sands. After drilling through approximately 35 feet of till formation, the sands and gravels of the Qva were encountered at a depth of 95 feet bgs. This lower unit tended to grade into gray sandy silts and clays with increasing depth. A second zone of groundwater was encountered in these Qva sediments at a depth of approximately 112 feet bgs. As shown on Figure 7, this deeper aquifer is hydrologically continuous with the aquifer encountered immediately beneath the shopping center.



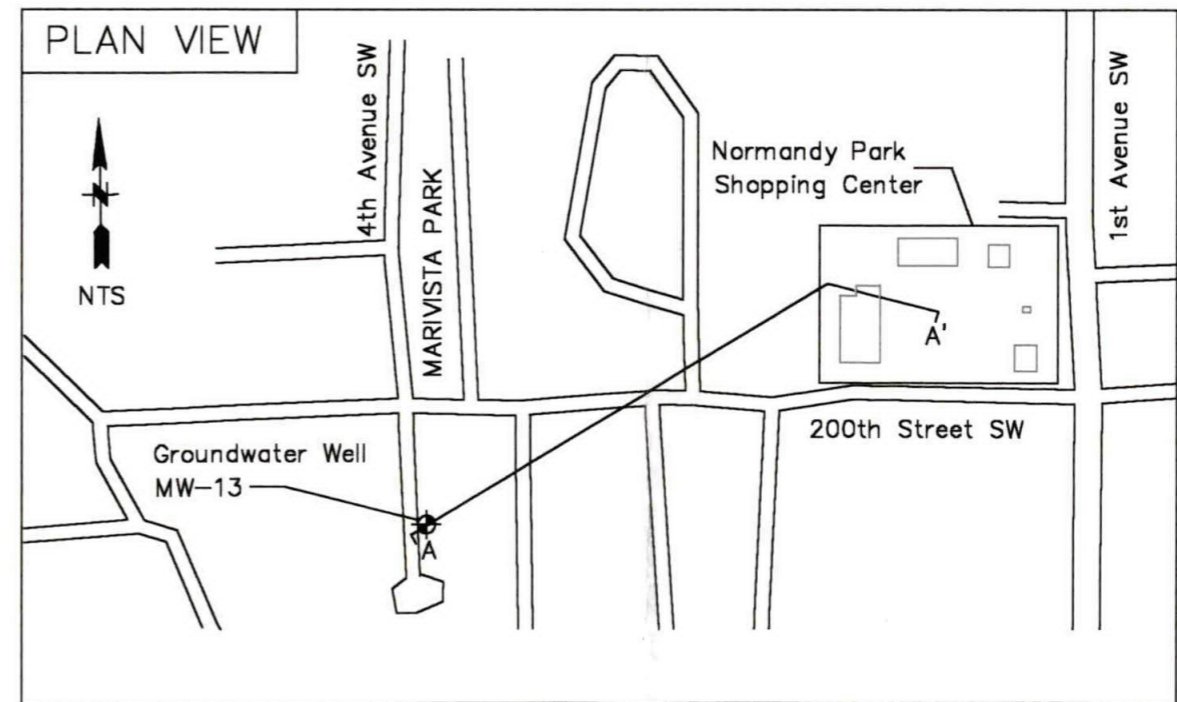
A
(West)

A'
(East)



LEGEND	
Qvr	Vashon Advance Outwash
Qvt	Vashon Till
Qva	Vashon Recessional Outwash
A—A'	Cross Section A-A'
	Water Table

* Results reported for monitoring wells were obtained in July 2001.



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STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS

2405 140TH AVE NE, SUITE 107, BELLEVUE, WA 98005 (425) 746-4600

PROJECT NO. 04199025.03	DES BY L.L.
SCALE AS SHOWN	CHK BY D.V.
CAD FILE Figure 7	APP BY G.H.

GENERALIZED CROSS-SECTION A-A'
SOOPER DRY CLEANERS
NORMANDY PARK SHOPPING CENTER
NORMANDY PARK, WASHINGTON

DATE
AUG 2001

FIGURE
7

Field screening detected organic vapors in soil samples collected from several areas of the Normandy Park property. OVM readings ranging from 1 to 20 parts per million (ppm) were intermittently recorded in subsurface soils in monitoring well borings MW-7, MW-8, MW-9 and MW-10. Readings recorded at MW-7 and MW-8 were noted in both the vadose and saturated zones, and appeared to be related to the proximity of the dry well. In MW-10, which lies about 60 feet downgradient of the dry well, the OVM detections (ranging to 10 ppm) were only observed in the saturated zone. Trace OVM readings (ranging to 2 ppm) were also detected in MW-9, in the vicinity of the old septic tanks and drain field. None of these soils exhibited staining or any other indicators of gross contamination.

Field screening did not detect any organic vapors or staining in any of the soil samples collected from immediately beneath the dry cleaner tenant space, near the sanitary sewer line behind the main building, or from the northern or southern ends of the shopping center property. In addition, no indication of organic vapors or soil staining were observed in MW-13 at the offsite investigative area.

3.2 SOIL CHEMISTRY

Based on field observations, a total of 64 soil samples were analyzed during the staged site investigations. Samples selected for laboratory analysis included soils collected from the initial Phase I/II Strataprobe borings (BH-series), the Stage I hand auger borings (HA-series), the additional Stage I Strataprobe borings (SP-series), and the Stage I/II/III monitoring well borings (MW-series). In general, these samples were obtained from soil horizons that either exhibited organic vapors, were situated near suspected PCE sources or sinks (i.e. the dry cleaner washer, floor drains, subsurface utility lines, vadose/saturated zone interface), or were located near the bottom of the boring.

As summarized on Table 1, EPA method 8021B analysis detected PCE in 15 of the soil samples collected during the field investigations. These PCE detections ranged from 0.057 to 5.1 mg/kg, with three samples exceeding Ecology's 0.5 mg/kg MTCA Method A soil clean-up level. None of the soils collected and analyzed during any of the field investigations completed at the Normandy Park Shopping Center contained PCE levels in excess of MTCA's risk-based, 19.6 mg/kg Method B soil clean-up level for PCE. In the past, Method B standards have been routinely applied by Ecology for sites with commercial and/or industrial land uses.

The highest PCE concentrations were directly associated with the former dry well (5.1 mg/kg at MW-7, 5' and 0.82 mg/kg at MW-7, 45'). Comparatively elevated PCE levels were also found in the upper horizons of the saturated zone in areas either immediately (0.85 mg/kg at MW-10, 65') or partially (0.14 mg/kg at MW-5B, 45') downgradient of the dry well. In addition, low, but detectable, levels of PCE were found immediately downgradient of the old septic tanks (0.082 to 0.24 mg/kg in SP-7). No evidence of DNAPL was observed during any of the field investigations.

Other chlorinated compounds were sporadically detected on the shopping center property, including: TCE (ranging from 0.082 to 0.14 mg/kg); 1,1,2,2-PCA (ranging from 0.54 to 4.6 mg/kg); chlorobenzene (ranging from 0.19 to 0.22 mg/kg); and m,p,o-dichlorobenzenes (total of 0.285 mg/kg at BH-9, 5'). None of these compounds were present at concentrations that exceeded their respective MTCA Method A or B soil standards. Similar to PCE, most of these detections were associated with either the dry well or the old septic tanks.



Table 1: Summary of Analytical Data for Halogenated and Aromatic Volatile Organic Compounds in Soil; Sooper Dry Cleaners Site

SAMPLE LOCATION	SAMPLING DATE	EPA METHOD 8021 ANALYTES ¹ (mg/kg)						
		PCE	TCE	1,1,2,2-PCA	Chlorobenzene	DCB	Toluene	Xylenes
Phase I/II Strataprobe Investigation (April 2000)								
BH-7,4'	04/05/00	ND	ND	ND	ND	ND	ND	ND
BH-8,2'	04/05/00	ND	ND	ND	ND	ND	ND	ND
BH-8,9'	04/05/00	ND	ND	ND	ND	ND	ND	ND
BH-9,2'	04/05/00	ND	ND	ND	ND	ND	ND	ND
BH-9,5'	04/05/00	ND	ND	ND	ND	0.285	ND	0.23
BH-10,2'	04/05/00	ND	ND	4.6	ND	ND	ND	0.22
BH-10,9'	04/05/00	ND	ND	0.54	ND	ND	ND	ND
BH-11,11'	04/05/00	ND	ND	ND	ND	ND	ND	ND
BH-11,37'	04/05/00	0.13	ND	ND	ND	ND	ND	ND
Stage I Hand Auger Investigation (May 2000)								
HA-1,2'	05/26/00	ND	ND	ND	ND	ND	ND	ND
HA-1,5'	05/26/00	ND	ND	ND	ND	ND	ND	ND
HA-2,2'	05/26/00	ND	ND	ND	ND	ND	ND	ND
HA-2,5'	05/26/00	ND	ND	ND	ND	ND	ND	ND
HA-3,2'	05/26/00	ND	ND	ND	ND	ND	ND	ND
HA-3,5'	05/26/00	ND	ND	ND	ND	ND	ND	ND
HA-4,2'	05/26/00	ND	ND	ND	ND	ND	ND	ND
HA-4,5'	05/26/00	ND	ND	ND	ND	ND	ND	ND
Stage I Additional Strataprobe Investigation (May 2000)								
SP-1, 3'	05/31/00	0.14	ND	ND	ND	ND	ND	ND
SP-1, 10'	05/31/00	ND	ND	ND	ND	ND	ND	ND
SP-2,6'	05/31/00	ND	ND	ND	ND	ND	ND	ND
SP-2,10'	05/31/00	ND	ND	ND	ND	ND	ND	ND
SP-3,11'	05/31/00	ND	ND	ND	ND	ND	ND	ND
SP-4,9'	05/31/00	ND	ND	ND	ND	ND	ND	ND
SP-5,11'	05/31/00	ND	ND	ND	ND	ND	ND	ND
SP-6,11'	05/31/00	ND	ND	ND	ND	ND	ND	ND
SP-7,8'	05/31/00	0.082	ND	ND	ND	ND	ND	ND
SP-7,13'	05/31/00	0.24	ND	ND	ND	ND	ND	ND
SP-7,18'	05/31/00	ND	ND	ND	ND	ND	ND	ND
SP-8,11'	05/31/00	ND	ND	ND	ND	ND	ND	ND
SP-9,11'	05/31/00	ND	ND	ND	ND	ND	ND	ND
SP-10,6'	05/31/00	ND	ND	ND	ND	ND	ND	ND
SP-11,11'	05/31/00	ND	ND	ND	ND	ND	ND	ND
MTCA Method A Soil Standard		0.5	0.5	200²	6,400²	41.7²	40	20

Bold Analytical results exceed the Model Toxics Control Act Method A or B standard for this compound.

1 Equivalent analytical method (EPA 8260) used for June 2001 analyses.

2 Only MTCA Method B soil standards exists for this compound.

-- Analyte not tested.

PCE Tetrachloroethylene.

TCE Trichloroethene.

PCA Tetrachloroethane.

DCB Total meta, para and ortho-Dichlorobenzene.

ND Analyte not detected.



Table 1 (continued) Summary of Analytical Data for Halogenated and Aromatic Volatile Organic Compounds in Soil; Sooper Dry Cleaners Site

SAMPLE LOCATION	SAMPLING DATE	EPA METHOD 8021 ANALYTES ¹ (mg/kg)						
		PCE	TCE	1,1,2,2-PCA	Chlorobenzene	DCB	Toluene	Xylenes
Stage I Groundwater Well Investigation (June 2000)								
MW-1,15'	06/06/00	ND	ND	ND	ND	ND	ND	ND
MW-1,35'	06/06/00	ND	ND	ND	ND	ND	ND	ND
MW-2,10'	06/06/00	0.14	ND	ND	ND	ND	ND	ND
MW-2,20'	06/06/00	ND	ND	ND	ND	ND	ND	ND
MW-2,30'	06/06/00	ND	ND	ND	ND	ND	ND	ND
MW-2,40'	06/06/00	0.34	ND	ND	ND	ND	ND	ND
MW-3,10'	06/06/00	0.057	ND	ND	ND	ND	ND	ND
MW-3,20'	06/06/00	ND	0.13	ND	ND	ND	0.13	ND
MW-3,30'	06/06/00	ND	ND	ND	ND	ND	ND	ND
MW-3,40'	06/06/00	0.12	ND	ND	ND	ND	ND	0.09
MW-4,15'	06/06/00	ND	ND	ND	ND	ND	ND	ND
MW-4,40'	06/06/00	ND	ND	ND	ND	ND	ND	ND
Stage II Groundwater Well Investigation (August 2000)								
MW-5A,35'	08/24/00	ND	ND	ND	ND	ND	ND	ND
MW-5B,45'	08/24/00	0.14	ND	ND	ND	ND	ND	ND
MW-5B,60'	08/24/00	0.11	ND	ND	ND	ND	ND	ND
MW-6,45'	08/24/00	ND	0.082	ND	ND	ND	ND	ND
MW-7,5'	08/24/00	5.1	0.14	ND	ND	ND	ND	ND
MW-7,13'	08/24/00	0.25	ND	ND	ND	ND	ND	ND
MW-7,20'	08/24/00	0.18	ND	ND	ND	ND	ND	ND
MW-7,35'	08/24/00	ND	ND	ND	ND	ND	ND	ND
MW-7,45'	08/24/00	0.850	ND	ND	ND	ND	ND	ND
Stage III Groundwater Well Investigation (January/February 2001)								
MW-8,55'	01/25/01	ND	ND	ND	ND	ND	ND	ND
MW-8,90'	01/25/01	ND	ND	ND	0.19	ND	ND	ND
MW-9,34'	01/25/01	ND	ND	ND	0.21	ND	ND	ND
MW-9,44'	01/25/01	ND	ND	ND	0.22	ND	ND	ND
MW-10,42.5'	01/25/01	ND	ND	ND	ND	ND	ND	ND
MW-10,65'	01/25/01	0.82	ND	ND	ND	ND	ND	ND
MW-11,25'	02/14/01	ND	ND	ND	ND	ND	ND	ND
MW-11,57.5'	02/14/01	ND	ND	ND	ND	ND	ND	ND
MW-12,25'	02/14/01	ND	ND	ND	ND	ND	ND	ND
MW-12,50'	02/14/01	ND	ND	ND	ND	ND	ND	ND
Stage III Offsite Groundwater Well Investigation (June 2001)								
MW-13,140'	06/27/01	ND	ND	ND	ND	--	ND	ND
MTCA Method A Soil Standard		0.5	0.5	200²	6,400²	41.7²	40	20

Bold Analytical results exceed the Model Toxics Control Act Method A or B standard for this compound.

1 Equivalent analytical method (EPA 8260) used for June 2001 analyses.

2 Only MTCA Method B soil standards exists for this compound.

-- Analyte not tested.

PCE Tetrachloroethylene.

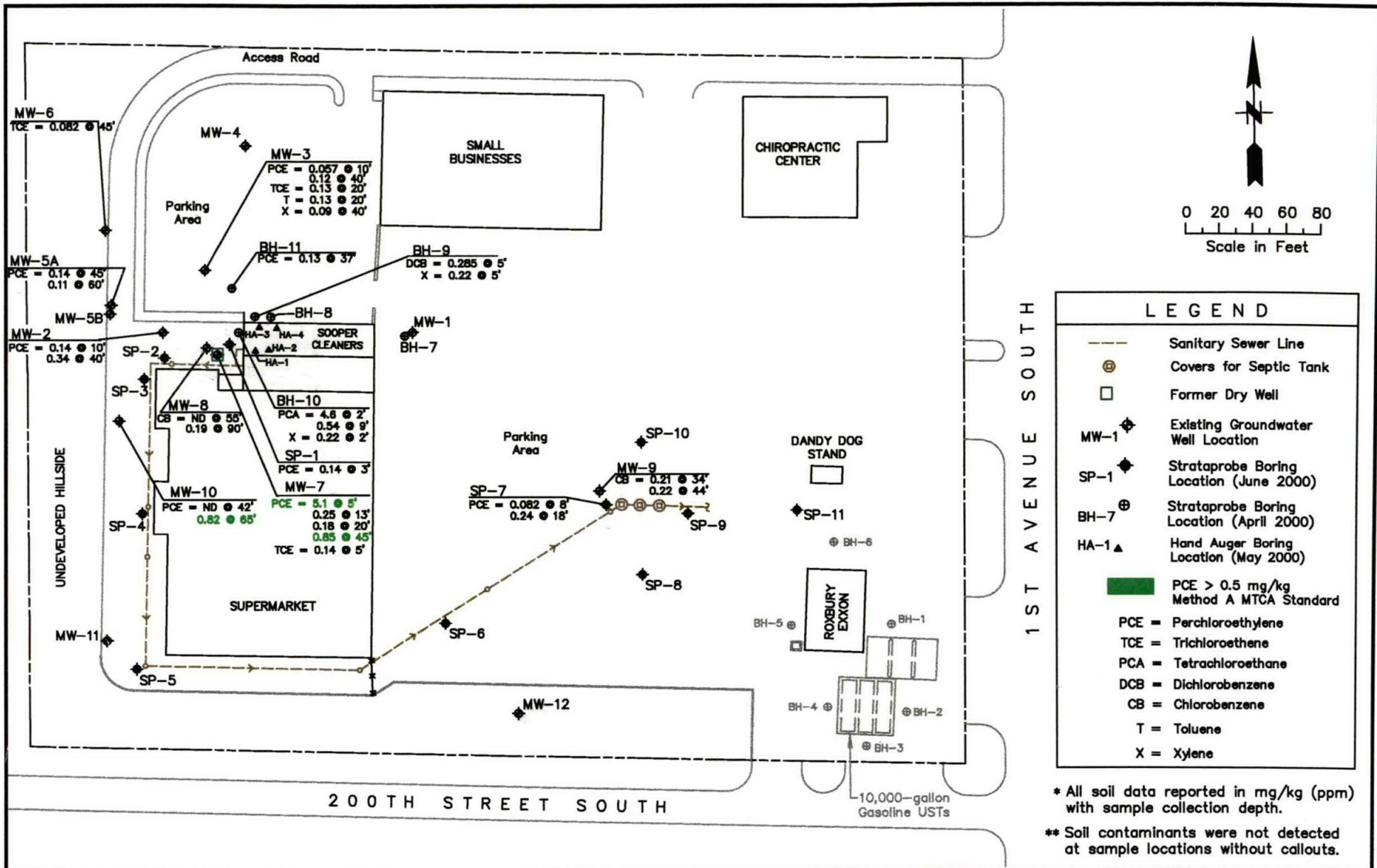
TCE Trichloroethene.

PCA Tetrachloroethane.

DCB Total meta, para and ortho-Dichlorobenzene.

ND Analyte not detected.





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	SCALE	AS SHOWN	CHK BY	D.V.		FIGURE	8
	CAD FILE	Figure 8	APP BY	G.H.			

Neither PCE, nor any related compounds, were detected in any of the soil samples collected from the hand auger borings (HA-1 through HA-4) installed inside the dry cleaner tenant space. With the exception of Strataprobe boring SP-7, which was located beside the former septic tanks, PCE was not detected in any of the soil samples collected from along the sanitary sewer line. In addition, PCE was not detected in any of the borings installed on the far north and southern ends of the shopping center. EPA method 8260 analysis did not detect any volatile organic compounds in the soil sample (MW-13, 140') that was collected from the lower saturated zone in the offsite monitoring well boring.

Several isolated toluene and xylene detections were reported during the course of the dry cleaner investigations. These petroleum hydrocarbon detections ranged from 0.09 to 0.23 mg/kg, and were scattered around the northwest corner of the main building. They do not appear to correlate well with the observed PCE contamination. However, all of these detections remained well below their respective MTCA Method A soil standards.

3.3 GROUNDWATER CHEMISTRY

During the course of the field investigations, 27 primary groundwater samples and 6 duplicate and quality control samples were analyzed from Strataprobe borings (BH- and SP- prefixes), Hydropunch borings (MW- prefixes with depth suffix), and monitoring wells (MW-prefix). These samples were collected during four main sampling events during 2000: April 5th (BH1-11); May 31st (SP1-11); June 9th (MW-1 through MW-4) and August 29th (MW-1 through MW-7), and three main sampling events during 2001: February 1st - 20th (MW-8 through MW-12); June 27th (MW-13, 120' through MW-13, 180') and July 11th (MW-7, MW-8, MW-10, MW-11 and MW-13). The analytical results for groundwater are summarized on Tables 2 and 3. In addition, the groundwater results for the onsite monitoring wells are also illustrated on Figure 9.

Field parameters were recorded at each monitoring well location before the collection of groundwater samples. Groundwater parameters measured during the staged investigations ranged from 12.4 °C to 18.2 °C for temperature, 6.3 to 7.5 for pH, 169 µS to 455 µS for specific conductivity, and 2.7 mg/L O₂ to 7.6 mg/L O₂ for dissolved oxygen. Generally, field measurements observed at each well remained consistent with those previously recorded at the same location. In addition, field parameters were generally consistent across the shopping center property. However, significantly lower dissolved oxygen levels were observed in offsite well MW-13. All the field parameter data collected during the staged investigations are recorded on the Well Sampling Logs provided in Appendix E.

As previously detailed in Section 1.2.3, groundwater collected from an initial Phase I/II Strataprobe boring (BH-11) was found to contain a PCE concentration (180 µg/L) that exceeded the 5 µg/L MTCA Method A PCE groundwater cleanup level. This boring was located near the northwest corner of the dry cleaner building. Similarly, only one groundwater sample could be obtained during the follow-up Stage I Strataprobe investigation. Sample SP-11 encountered groundwater approximately 22 feet bgs, near the suspected location of the former drain field on the eastern portion of the property. EPA method 8021B analysis of this sample detected 3.5 µg/L of PCE.

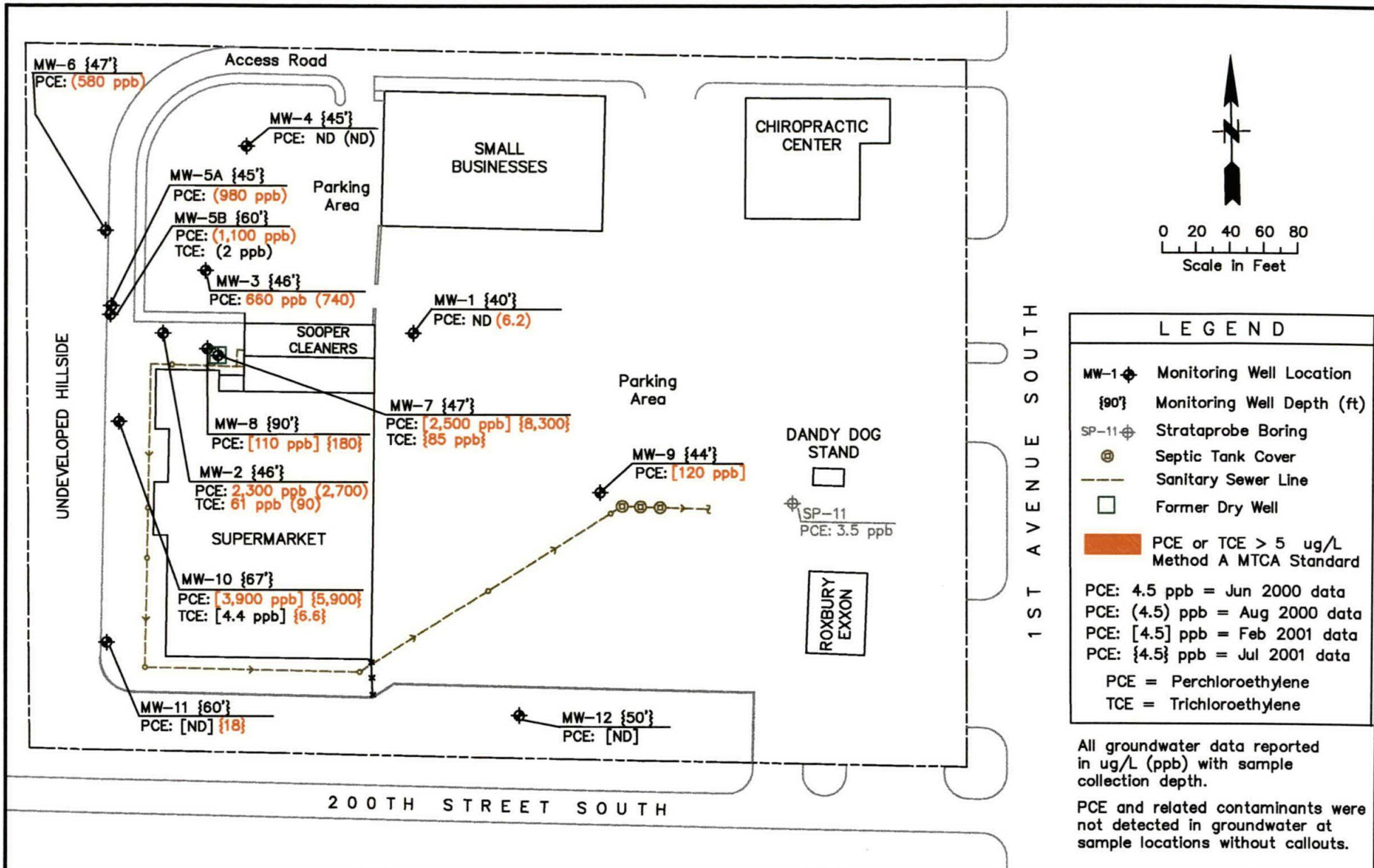


Table 2: Summary of Analytical Data for Halogenated and Aromatic Volatile Organic Compounds in Groundwater; Sooper Dry Cleaners Site

SAMPLE LOCATION	SAMPLING DATE	EPA METHOD 8021 ANALYTES ¹ (µg/L)							
		PCE	TCE	cis-1,2 DCE	Chloroform	Toluene	Methylene Chloride	DCB	1,1,2,2-PCA
Phase I/II Strataprobe Sampling (April 2000)									
BH-11	04/05/00	180	2.5	ND	ND	ND	ND	5.3	13
Stage I Additional Strataprobe Sampling (May 2000)									
SP-11	05/31/00	3.5	ND	ND	ND	ND	ND	ND	ND
Stage I Groundwater Sampling (June 2000)									
MW-1	06/09/00	ND	ND	ND	ND	ND	ND	ND	ND
MW-2	06/09/00	2,300	61	130	ND	ND	ND	ND	ND
MW-3	06/09/00	660	ND	ND	ND	ND	ND	ND	ND
DUP-A	06/09/00	690	ND	ND	ND	ND	ND	ND	ND
MW-4	06/09/00	ND	ND	ND	ND	ND	ND	ND	ND
RB-2	06/09/00	ND	ND	ND	ND	ND	ND	ND	ND
Stage II Groundwater Sampling (August 2000)									
MW-1	08/29/00	6.2	ND	ND	ND	ND	ND	ND	ND
MW-2	08/29/00	2,700	90	ND	ND	ND	ND	ND	ND
MW-3	08/29/00	740	ND	ND	ND	ND	ND	ND	ND
DUP-A	08/29/00	980	ND	ND	ND	ND	ND	ND	ND
MW-4	08/29/00	ND	ND	ND	ND	ND	ND	ND	ND
MW-5A	08/29/00	980	ND	ND	ND	ND	ND	ND	ND
MW-5B	08/29/00	1,100	2.0	ND	ND	ND	ND	ND	ND
MW-6	08/29/00	580	ND	ND	ND	ND	ND	ND	ND
MW-7	08/29/00	2,500	ND	ND	ND	ND	ND	ND	ND
RB-2	06/09/00	3.1	ND	ND	ND	ND	ND	ND	ND
Stage III Onsite Groundwater Sampling (February 2001)									
MW-8	02/01/01	110	ND	ND	ND	4.3	ND	ND	ND
MW-9	02/01/01	120	ND	ND	ND	2.7	ND	ND	ND
MW-10	02/01/01	3,900	4.4	ND	34	3.3	ND	ND	ND
MW-11	02/20/01	ND	ND	ND	ND	ND	ND	ND	ND
MW-12	02/20/01	ND	ND	ND	ND	ND	ND	ND	ND
RB-1	02/20/01	ND	ND	ND	ND	ND	ND	ND	ND
Stage III Offsite Hydropunch Groundwater Sampling (June 2001)									
MW-13,120'	06/27/01	ND	ND	ND	ND	ND	ND	--	ND
MW-13,160'	06/27/01	ND	ND	ND	ND	ND	ND	--	ND
MW-13,180'	06/28/01	ND	ND	ND	ND	ND	ND	--	ND
Stage III Onsite/Offsite Groundwater Sampling (July 2001)									
MW-7	07/11/01	8,300	85	65	40	ND	17	ND	ND
MW-8	07/11/01	180	ND	ND	ND	ND	ND	ND	ND
MW-10	07/11/01	5,900	6.6	ND	42	ND	ND	ND	ND
DUP-A	07/11/01	6,200	6.3	ND	40	ND	ND	ND	ND
MW-11	07/11/01	18	ND	ND	ND	ND	ND	ND	ND
MW-13	07/11/01	ND	ND	ND	ND	ND	ND	ND	ND
MTCA Method A GW Standard		5	5	720²	80²	40	5	720²	0.219²

- Bold** Analytical results exceed the Model Toxics Control Act Method A standard for this compound.
- 1 Equivalent analytical method (EPA 8260) used for June 2001 analyses.
- 2 Only MTCA Method B standards exists for the compound. The Method B PCA standard is for the carcinogenic component.
- Analyte not tested.
- PCE Tetrachloroethylene.
- TCE Trichloroethene.
- DCE cis-1,2-Dichloroethene.
- DCB Total meta, para and ortho-Dichlorobenzene.
- PCA Tetrachloroethane.
- ND Analyte not detected.





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	SCALE	AS SHOWN	CHK BY	D.V.		FIGURE	9
	CAD FILE	Figure 9	APP BY	G.H.			

Groundwater samples collected from the Stage I monitoring wells during the June 2000 sampling event confirmed the initial Strataprobe results. As shown on Table 2, PCE was detected at concentrations (2,300 µg/L in MW-2 and 660 µg/L in MW-3) that exceeded the 5 µg/L MTCA Method A standard in the two wells situated to the west (downgradient) of the tenant space. In addition, the well immediately behind the building (MW-2) contained 61 µg/L of TCE, which also exceeded the 5 µg/L MTCA Method A groundwater standard for TCE. Neither PCE, nor any related compounds, were detected in upgradient monitoring wells MW-1 and MW-4 during the June 2000 event.

With the exception of upgradient well MW-4, all the monitoring wells sampled during the Stage II monitoring event (August 2000) contained PCE concentrations in excess of the 5 µg/L MTCA standard. The PCE concentrations ranged from 6.2 µg/L (MW-1) to 2,700 µg/L (MW-7). TCE also was detected in MW-2 (90 µg/L) and MW-5B (2.0 µg/L), with MW-2 once again exceeding the MTCA TCE groundwater standard.

During Stage II, the highest PCE concentrations were reported in the groundwater wells installed directly within (2,700 µg/L in MW-7) and immediately downgradient (2,500 µg/L in MW-2) of the former dry well. Similar PCE concentrations were reported for nested well MW-5A/B in both the shallow A-well (980 µg/L) and the deep B-well (1,100 µg/L). Based on the detection of PCE in one of the equipment rinse blanks (3.1 µg/L in RB-2), the low level PCE exceedance (6.2 µg/L) reported in upgradient well MW-1 is suspected to be the result of residual contamination from the sampling equipment.

Groundwater collected from three of the five wells sampled during the Stage III sampling event (February 2001) contained PCE concentrations in excess of the 5 µg/L MTCA standard. The PCE detections ranged from 110 µg/L (MW-8) to 3,900 µg/L (MW-10). The highest PCE concentration (3,900 µg/L) was observed in downgradient well MW-10, along with 4.4 µg/L TCE. Lower level PCE exceedances were detected in the vicinity of the former septic tank (120 µg/L in MW-9) and in the deeper portions of the aquifer (110 µg/L in MW-8).

PCE concentrations were noted to have decreased significantly with depth between Stage II well MW-7 (2,500 µg/L at 47 feet bgs) and adjacent Stage III well MW-8 (110 µg/L at 90 feet bgs). These results strongly suggest that dry cleaning solvent product (DNAPL) is not present in the lower zones of the aquifer. Low concentrations of toluene and chloroform, ranging to 4.3 µg/L and 34µg/L, respectively, were also sporadically detected in MW-8, MW-9 and MW-10. Neither of these latter compounds was detected at levels exceeding regulatory criteria.

During the drilling of the offsite monitoring well (June 2001), three Hydropunch groundwater samples were collected from the MW-13 boring at depths of 120, 160 and 180 feet bgs. EPA method 8260 analysis did not detect PCE or any other volatile organic compounds in these samples. Although insufficient groundwater was collected at 140 feet bgs to provide a representative water sample, 8260 analysis of saturated soil from that depth failed to detect any VOCs. Based on these results, the MW-13 monitoring well was completed at a depth of 190 feet bgs.



During June 2001, a final round of groundwater sampling was completed that included newly installed offsite monitoring well MW-13, as well as four of the existing onsite monitoring wells. As shown on Table 2, PCE was detected in each of the onsite wells at concentrations ranging between 8,300 µg/L (MW-7) to 18 µg/L (MW-11). Once again, the most elevated PCE levels were reported in those wells either directly within (8,300 µg/L in MW-7) or downgradient (5,900 µg/L in MW-10) of the former dry well. These same wells also contained 85 µg/L and 6.6 µg/L TCE, respectively, exceeding the 5 µg/L MTCA groundwater standard. In addition, 65 µg/L cis-1,2 dichloroethene, 40 µg/L chloroform and 17 µg/L methylene chloride were detected in MW-7 and 42 µg/L chloroform was detected in MW-10. The 17 µg/L methylene chloride detection in MW-7 exceeded the 5 µg/L MTCA Method A groundwater standard for this compound.

Similar to the Stage II results, significantly lower PCE concentrations (180 µg/L) were observed in the deeper aquifer horizons (180 µg/L in MW-8). In addition, EPA method 8260 analysis did not detect PCE or any other volatile organic compounds in the groundwater sample collected from offsite well MW-13.

Groundwater quality parameters were analyzed from onsite monitoring wells near the center (MW-10) and the southern edge (MW-11) of the PCE plume, as well as from offsite well MW-13, to evaluate the geochemical conditions of the aquifer system. As illustrated below on Table 3, chloride, nitrate, sulfate, iron and TOC concentrations were all higher in offsite well MW-13 than beneath the shopping center property. These results suggest that subsurface conditions in the areas downgradient of the shopping center are significantly less oxidizing than those observed in the aquifer materials immediately beneath the shopping center. These observations are supported by the low dissolved oxygen readings (2.7 mg/L O₂) measured in MW-13 relative to the onsite wells (5.8 to 7.6 mg/L O₂). Reducing conditions are considered to be favorable for the natural attenuation of PCE and related contaminants.

Table 3: Summary of Analytical Data for Groundwater Quality Parameters in Groundwater; Sooper Dry Cleaners Site

SAMPLE LOCATION	SAMPLING DATE	WATER QUALITY PARAMETERS (mg/L)						PCE (µg/L)
		Chloride	Nitrate	Sulfate	TOC	Dissolved Iron	Total Iron	
MW-11 (edge of onsite PCE plume)	07/11/01	9.4	1.9	31	ND	ND	0.022	18
MW-10 (center of PCE onsite plume)	07/11/01	5.6	1.2	15	ND	ND	0.031	5,900
MW-13 (downgradient of site)	07/11/01	12	2.7	64	7.1	ND	0.086	ND
MTCA Method A GW Standard		NA	NA	NA	NA	NA	NA	5

Bold Analytical results exceed the Model Toxics Control Act Method A standard for this compound.

-- Analyte not tested.

PCE Tetrachloroethylene.

TOC Total organic carbon.

Fe Total organic carbon.

NA No MTCA standard has been established for this compound.



3.4 GROUNDWATER FLOW AND AQUIFER CHARACTERISTICS

Groundwater elevation data was measured at the existing monitoring wells at the Normandy Park Shopping Center during each of the staged groundwater sampling events between June 2000 through July 2001. These data, which are presented in Table 4, provided input parameters for the subsequent development of the groundwater flow model, and were used to determine the groundwater flow direction and gradient beneath the property.

Groundwater elevations (relative mean sea level) measured beneath the shopping center during the staged investigations ranged from 235.33 feet (MW-9 in February 2001) to 215.83 feet (MW-10 in July 2001). The water table elevation in MW-10, which ranged between 215.83 and 217.40, was noted to lie approximately 7 to 12 feet lower than that observed in nearby wells at both upgradient (MW-2) and downgradient (MW-11) locations. Although the zone of shallow silts at MW-10 was noted to extend to a greater depth than elsewhere on the site, the specific reason for the anomalously low water level elevation observed in this well remains uncertain.

During Stage I and Stage II, the horizontal groundwater flow direction and hydraulic gradient beneath the site were calculated using a standard three-point geometric model. For both the June 30th and August 29th, 2000 elevation data sets, the groundwater flow direction was estimated to be towards the west-northwest, with an estimated hydraulic gradient of 0.004 ft/ft.

Using the February 20th, 2001 elevation data, groundwater flow was calculated to be towards the west-southwest, with an estimated hydraulic gradient of 0.04 ft/ft. The hydraulic gradient was approximately an order of magnitude greater than those previously derived (0.004 ft/ft) solely from the northwest end of the shopping center. Figure 10 illustrates the onsite groundwater contours and flow direction generated for the site using SURFER contouring software with the February 2001 water table elevation data. It should be noted that the February 2001 results did not include water table elevation data from three monitoring wells (MW-1, MW-7 and MW-10). Wells MW-1 and MW-7 were inadvertently missed during the February 2001 round of measurements, while the MW-10 data was considered too anomalous to provide useful information. Figure 11 presents SURFER generated groundwater contours using elevation data (July, 11th, 2001) from both on- and offsite monitoring wells.

Examination of the groundwater elevation data measured from nested well MW-5A/B revealed that equal head values were recorded in both wells, which are vertically separated by 15 feet. The lack of a difference between the head values at the well nest indicates that the vertical hydraulic gradient at this location is minimal. However, the single set of elevation data (July 11th, 2001) measured between MW-7 and MW-8 (closely spaced horizontally; 45-ft vertical separation) indicates that a vertical gradient of ~0.01 ft/ft may exist at this location. Based on this conflicting information it is uncertain how important vertical groundwater flow may be at the site.

On October 6, 2000, two groundwater pressurized slug tests were performed at the MW-5B monitoring well. Analysis of the slug test data for this well indicated that the hydraulic conductivity of the upper aquifer beneath the western end of the shopping center ranges from 2.0×10^{-4} feet per second (ft/sec) to 7.5×10^{-4} ft/sec.



Table 4: Summary of Groundwater Elevations, Sooper Dry Cleaners Site

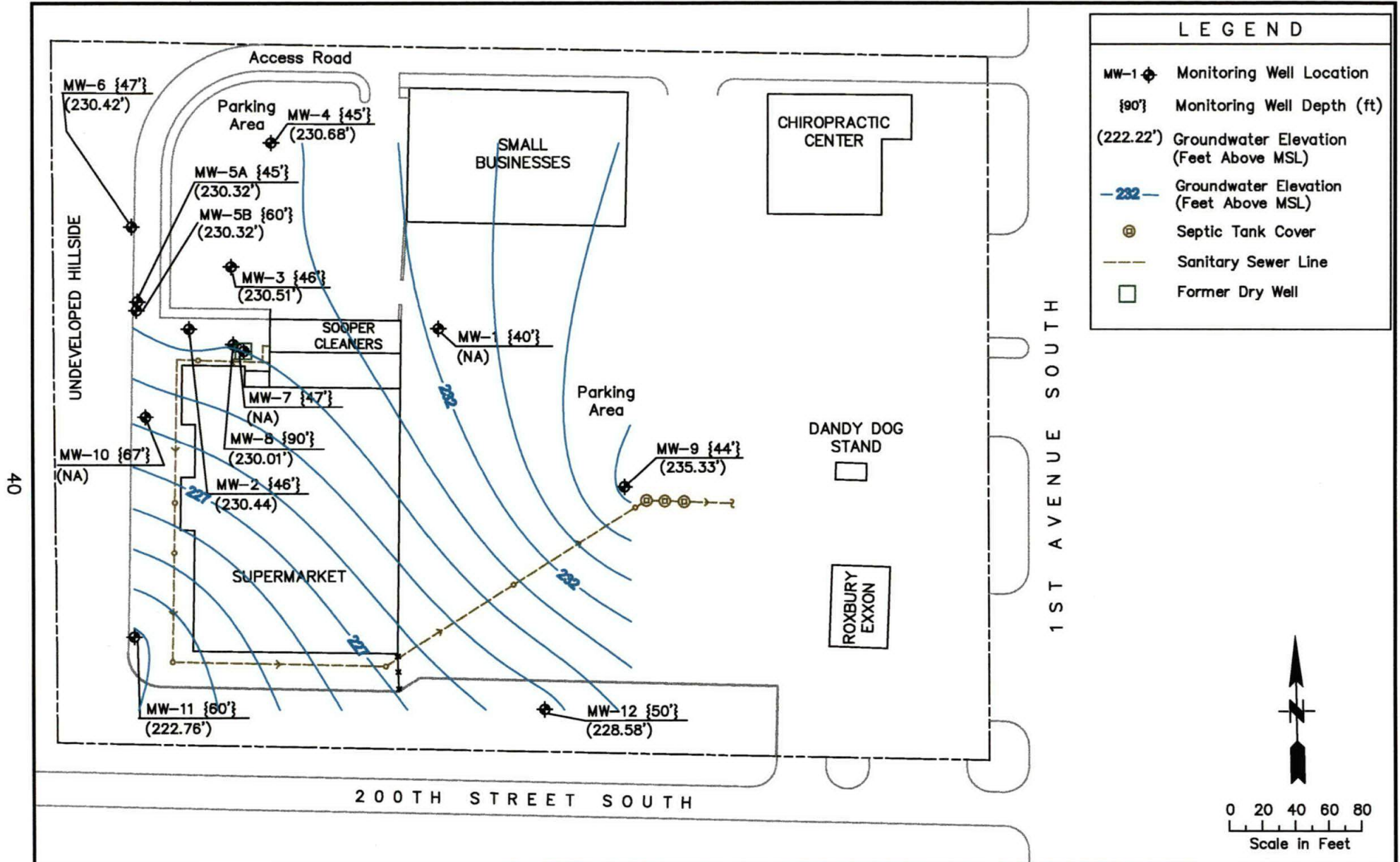
Well Location	Date	Wellhead Elevation ¹ (ft)	Depth to Groundwater ² (ft)	Water Table Elevation (ft)
MW-1	06/09/00	270.49	31.68	238.81
	06/30/00		31.83	238.66
	08/29/00		32.46	238.03
	10/05/00		33.08	237.41
	07/11/01		--	--
MW-2	06/09/00	270.78	36.78	234.00
	06/30/00		36.97	233.81
	08/29/00		37.67	233.11
	10/05/00		38.34	232.44
	02/20/01		40.34	230.44
MW-3	06/09/00	271.67	42.15	228.63
	06/30/00		37.62	234.05
	08/29/00		37.81	233.86
	10/05/00		38.51	233.16
	02/20/01		39.12	232.55
MW-4	07/11/01	272.01	41.16	230.51
	06/09/00		43.00	228.67
	06/30/00		37.78	234.23
	08/29/00		37.97	234.04
	10/05/00		38.67	233.34
MW-5A	02/20/01	271.29	39.35	232.66
	07/11/01		41.33	230.68
	08/29/00		--	--
	10/05/00		38.29	233.00
	02/20/01		38.97	232.32
MW-5B	07/11/01	271.10	40.97	230.32
	08/29/00		42.80	228.49
	10/05/00		38.11	232.99
	02/20/01		38.77	232.33
MW-6	07/11/01	272.27	40.78	230.32
	08/29/00		42.62	228.48
	10/05/00		39.17	233.10
	02/20/01		39.83	232.44
MW-7	07/11/01	271.24	41.85	230.42
	08/29/00		43.67	228.60
	10/05/00		38.11	233.13
MW-8	07/11/01	271.06	38.78	232.46
	02/20/01		42.61	228.63
MW-9	07/11/01	266.98	41.05	230.01
	02/20/01		42.85	228.21
MW-10	07/11/01	270.58	31.65	235.33
	02/20/01		34.24	232.74
MW-11	07/11/01	271.30	53.18	217.40
	02/20/01		54.75	215.83
MW-12	07/11/01	269.56	48.54	222.76
	02/20/01		50.15	221.15
MW-13	07/11/01	321.72	40.98	228.58
			43.05	226.51
			111.91	209.81

1 Elevation of the top of the well casing based on the USC&GS datum for geodetic mean sea level.

2 Referenced from the top of wellhead.

-- Measurement could not be obtained during this event.





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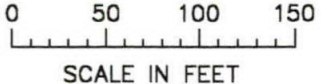
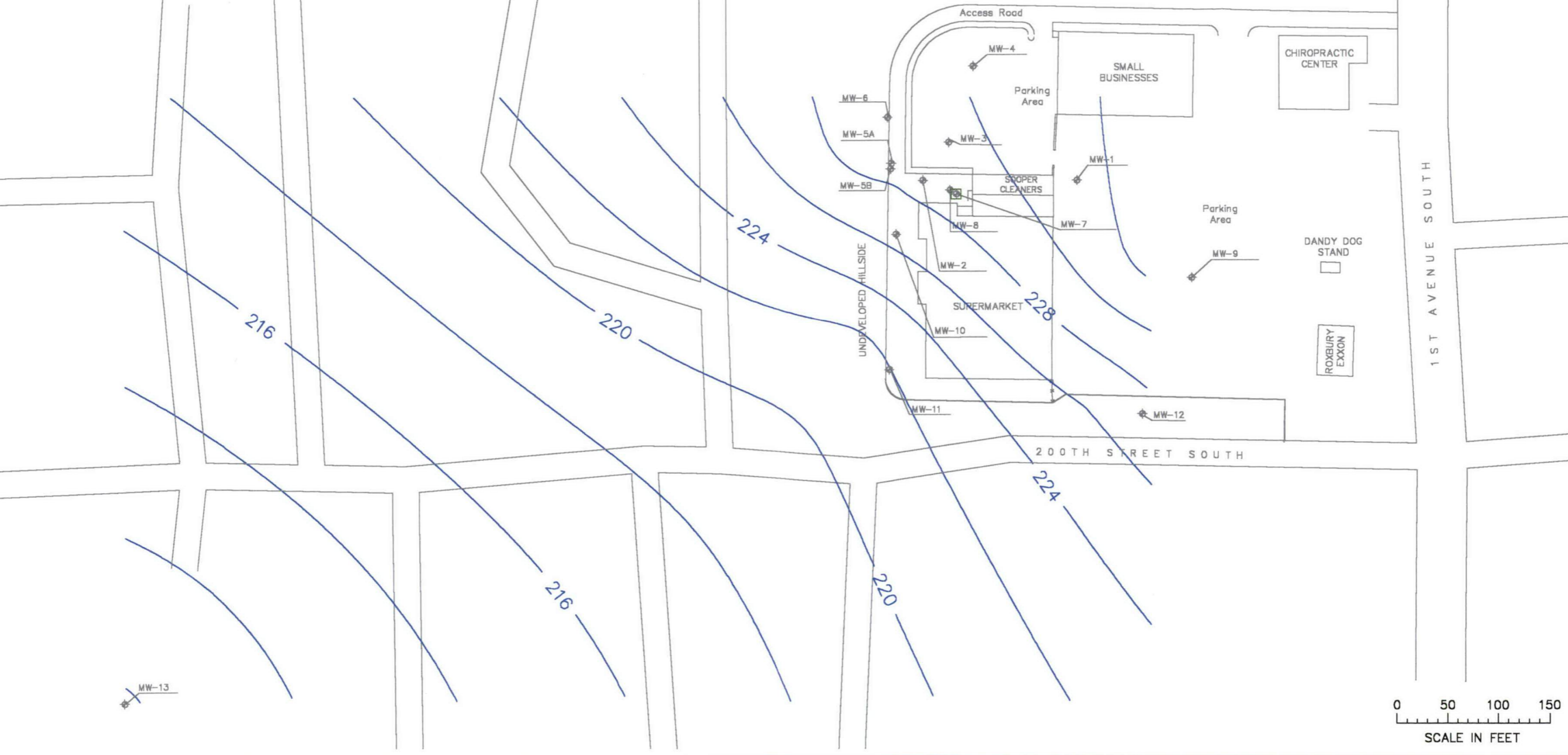
PROJECT NO.	04199025.03	DES BY	D.V.
SCALE	AS SHOWN	CHK BY	D.V.
CAD FILE	Figure 10	APP BY	G.H.

ONSITE GROUNDWATER ELEVATIONS
 FEBRUARY 20, 2001
 NORMANDY PARK SHOPPING CENTER

DATE MARCH 2001

FIGURE
 10

LEGEND	
MW-1	Monitoring Well Location
-224-	Groundwater Elevation (Feet Above MSL)
□	Former Dry Well



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PROJECT NO.	04199025.03	DES BY	M.V.
SCALE	AS SHOWN	CHK BY	D.V.
CAD FILE	Figure 11	APP BY	G.H.

OFFSITE GROUNDWATER ELEVATIONS	
JULY 11, 2001	
NORMANDY PARK SHOPPING CENTER	

DATE	SEPT 2001
FIGURE	11

On March 23rd, 2001, a more comprehensive series of pressurized slug tests were completed at five Stage II/III monitoring wells (MW-5B, MW-8, MW-9, MW-10 and MW-11) to better define the hydrological characteristics of the aquifer. Analysis of the slug test data collected from the monitoring wells screened within the upper 10 feet of the aquifer (MW-9, MW-10 and MW-11) derived hydraulic conductivity values ranging between 5.5×10^{-5} to 2.9×10^{-4} ft/sec. The lowest conductivity values (averaging 5.6×10^{-5} ft/sec) were observed in MW-11.

Similar conductivity values were calculated for the monitoring wells screened in deeper portions of the aquifer (MW-5B and MW-8). Hydraulic conductivity averaged 1.8×10^{-4} ft/sec in MW-5B (screened between 55 and 60 feet bgs) and 3.8×10^{-4} ft/sec in MW-8 (screened between 85 and 90 feet bgs). The graphical data and computer program output for the October 2000 and March 2001 pressurized slug tests are provided in Appendix F.

Table 5 presents a summary of the grain size distribution data and the hydraulic conductivity values calculated from these data using a variety of methods. Average hydraulic conductivity values calculated from the grain size data range between 5.83 ft/day (6.7×10^{-5} ft/sec) for MW-8 at 45' bgs to 16.59 ft/day (1.9×10^{-4} ft/sec for MW-8 at 87.5 ft bgs. These results compare favorably with the slug test results.

Table 5. Summary of Grain Size Data and Hydraulic Conductivity Estimates

Sample ID	Depth (feet)	Grain Size Data						Calculated Hydraulic Conductivity (ft/day)							Slug Testing (ft/day)
		% Gravel	% Sand	% Silt	% Clay	D10 (mm)	D50 (mm)	Hazen L	Hazen	Hazen H	Shepherd C	Shepherd Ch	Zhang & Brusseau	AVG	
MW-8-1	45	0	74.9	23	2.6	0.03	0.16	0.97	2.42	2.90	6.40	21.88	0.43	5.83	NT
MW-8-2	70	0	87.7	10	2.4	0.05	0.27	3.02	7.55	9.06	14.03	51.88	1.44	14.49	NT
MW-8-3	87.5	0.1	89.2	9	1.8	0.07	0.26	5.57	13.93	16.72	13.26	48.74	1.34	16.59	34.62
MW-9	41.5	0.2	89.5	9	1.7	0.07	0.22	5.89	14.74	17.68	10.32	37.00	1.26	14.48	10.36
MW-10	65	0.3	85.7	11	3.4	0.04	0.21	1.83	4.58	5.50	9.62	34.27	0.68	9.41	25.28

L Very compact sand or clayey sand.

H Uniform highly sorted sand.

C Consolidated.

Ch Channel.

NT Not tested.

AVG Average of calculated values.



3.5 ASSESSMENT OF DOWNGRAIENT RECEPTORS

The state and local regulatory agency records search did not find any evidence (well logs, water-use permits, registrations or database entries) of any domestic or water production wells within a one-mile radius of the Normandy Park Shopping Center. The closest public water system identified during the records search is located approximately one mile north (upgradient) of the site at the Rainer Village property (PWS # WA53700970). This domestic well is reportedly active, and serves treated water to less than 101 persons.

All the remaining water production systems identified during the records search were situated upgradient of the site and /or at least two-miles distant. In addition, a single groundwater well is located approximately one-half mile north of the site, immediately across Arrow Lake. This well is upgradient of the shopping center and is reportedly unused.

Highline Water District water line and meter box maps confirmed that all the residences up to 3,000 feet west and southwest (downgradient) of the site are serviced by the municipal water supply. During the October 9th, 2000 field survey, the presence of Highline Water District water meters was visually confirmed at all the residences immediately downgradient of the shopping center (as far west as 4th Avenue South).

After the Stage III wells and the groundwater flow model indicated a more southwesterly groundwater direction beneath the site, a second field survey was initiated on April 16th, 2001. The follow-up survey extended the search radius further towards the south-southwest. Once again, the field inspection and water district record search confirmed that these additional residences are all serviced by the municipal water system.

The records search and subsequent field surveys did not find any evidence of either municipal or domestic groundwater use within a 3,000-foot arc downgradient of the shopping center property. Based on these results and Highline Water District records (which confirmed that the downgradient residences are all utilizing municipal water), none of the residents within a reasonable distance downgradient of the site appear to be pumping or consuming water from the aquifer.

3.6 REGIONAL FLOW MODEL RESULTS

Following calibration to on-site water level data, the regional flow model was used to:

- Assess the groundwater flow direction and gradient off-site;
- Assess possible vertical movement of groundwater;
- Delineate the expected configuration of a groundwater flow path in the principal aquifer running through the area of highest observed groundwater contamination;
- Identify candidate locations for an off-site monitoring well that should lie on a flowpath leaving the contaminated part of the site; and



- Identify the possible point of discharge for contaminants leaving the site.

The regional flow model indicated groundwater flow off-site to the west-southwest toward Puget Sound. The modeled hydraulic gradient was approximately 0.02 ft/ft. The regional model indicated the majority of groundwater flow through the principal aquifer was horizontal, with discharge to Puget Sound via the seeps along the shoreline.

Using this information, together with an evaluation of the access issues for an off-site drilling program, the location for the off-site groundwater monitoring well (MW-13) was established. The subsequent water level measurements confirmed that the off-site groundwater monitoring well is situated downgradient of the former Sooper Cleaners site.

3.7 SITE GROUNDWATER FLOW MODEL AND CONTAMINANT TRANSPORT SIMULATION RESULTS

Initially, the contaminant transport code was used to predict baseline (existing) conditions with respect to the contaminant distribution in the groundwater off-site where monitoring wells could not be constructed due to site constraints (steep slopes, property access, etc.). Figure 12 shows the predicted contaminant distribution, based on the contaminant concentrations detected on the property, projected off site in the regional flow field. Assuming that the contamination was initially introduced into the subsurface approximately 30 years ago, contaminant retardation was adjusted such that the leading edge of the plume was located immediately upgradient of the off-site monitoring well (MW-13) where contaminants have not been detected. This provided a conservative estimate of the current conditions as it is assumed that the plume has spread all the way to MW-13, whereas the true leading edge could be anywhere between the site boundary and MW-13.

Using the conservative estimate of the plume as initial conditions, three forward-looking simulations were completed to evaluate potential remedial alternatives for the groundwater contamination:


1. No Action Alternative. This simulation assumes that there is a source of contamination in the subsurface near the former dry cleaner (such as highly contaminated soils) that continues to release contamination into the groundwater at a rate that will maintain on-site concentrations at their current level. The contamination continues to migrate consistent with the direction of groundwater flow, ultimately discharging into Puget Sound.

This simulation is considered to represent the most conservative set of assumptions. While the rate of introduction of dissolved contaminant into groundwater is unknown, it is expected that this rate will diminish over time because the dry cleaner is no longer in operation and no new contaminant is being discharged at the site.

2. Source Removal Alternative. This simulation assumes that all the source material on the property is completely removed. The result is that there is no longer any contribution of contamination from the subsurface sediments to the groundwater. The contamination that is present in the dissolved phase in the groundwater is not directly addressed through a

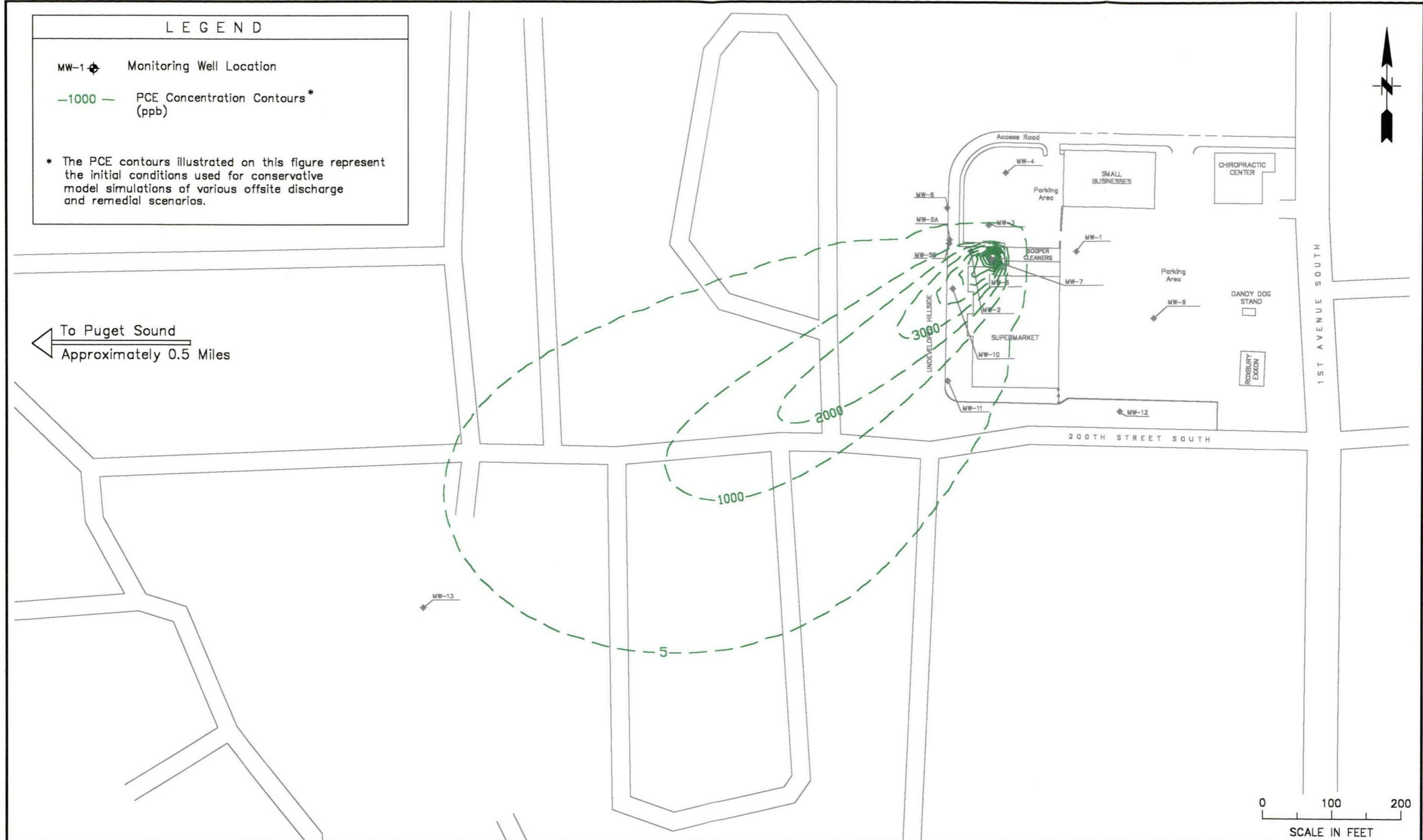


LEGEND

- MW-1  Monitoring Well Location
- 1000 - PCE Concentration Contours* (ppb)

* The PCE contours illustrated on this figure represent the initial conditions used for conservative model simulations of various offsite discharge and remedial scenarios.

← To Puget Sound
Approximately 0.5 Miles



SCS ENGINEERS STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS 2405 140TH AVE NE, SUITE 107, BELLEVUE, WA 98005 (425) 746-4600	PROJECT NO.	DES BY	PROJECTED CURRENT WORST-CASE CONDITIONS PCE CONTAMINANT TRANSPORT NORMANDY PARK SHOPPING CENTER	DATE
	SCALE	CHK BY		SEPT 2001
	CAD FILE	APP BY		FIGURE
	04199025.03	M.V.		
	AS SHOWN	D.V.		
	Figure 12	G.H.		12

remediation program, and continues to migrate consistent with the direction of groundwater flow.

3. Complete Removal Alternative. This simulation assumes that the entire mass of contamination on the property is completely removed and that there are no additional contaminant inputs to groundwater. The groundwater contamination assumed to be present off (west of) the property remains, and continues to migrate consistent with the groundwater flow direction.

The three simulations were used to conservatively predict the length of time before the contaminants were discharged into Puget Sound, the maximum contaminant concentration in the discharging groundwater, and the duration of the contaminant discharge. Figure 13 provides a graph that summarizes the results of the three simulations.

As shown in Figure 13, all three simulations predict that the contaminated groundwater will begin discharging to Puget Sound in approximately 40 years. Under the No Action Alternative, the maximum discharge concentration (approximately 300 ug/l) occurs between 90 to 110 years from now. The simulation predicts that the contaminated groundwater will continue to discharge beyond 125 years from now.

Under the Source Removal and the Complete Removal alternatives, the maximum concentrations (approximately 180 ug/l and 160 ug/l, respectively) discharge approximately 80 years from now. The discharge concentrations then decline, with a cessation of contaminant discharge in approximately 120 years under both scenarios.

As discussed above, the No Action Alternative prediction is considered conservative, as the simulation assumes that a constant source exists for on-going contribution to the groundwater, whereas the true source of dissolved contaminants to groundwater (such as contaminated subsurface soils) will decline over time.

3.8 LIMITATIONS

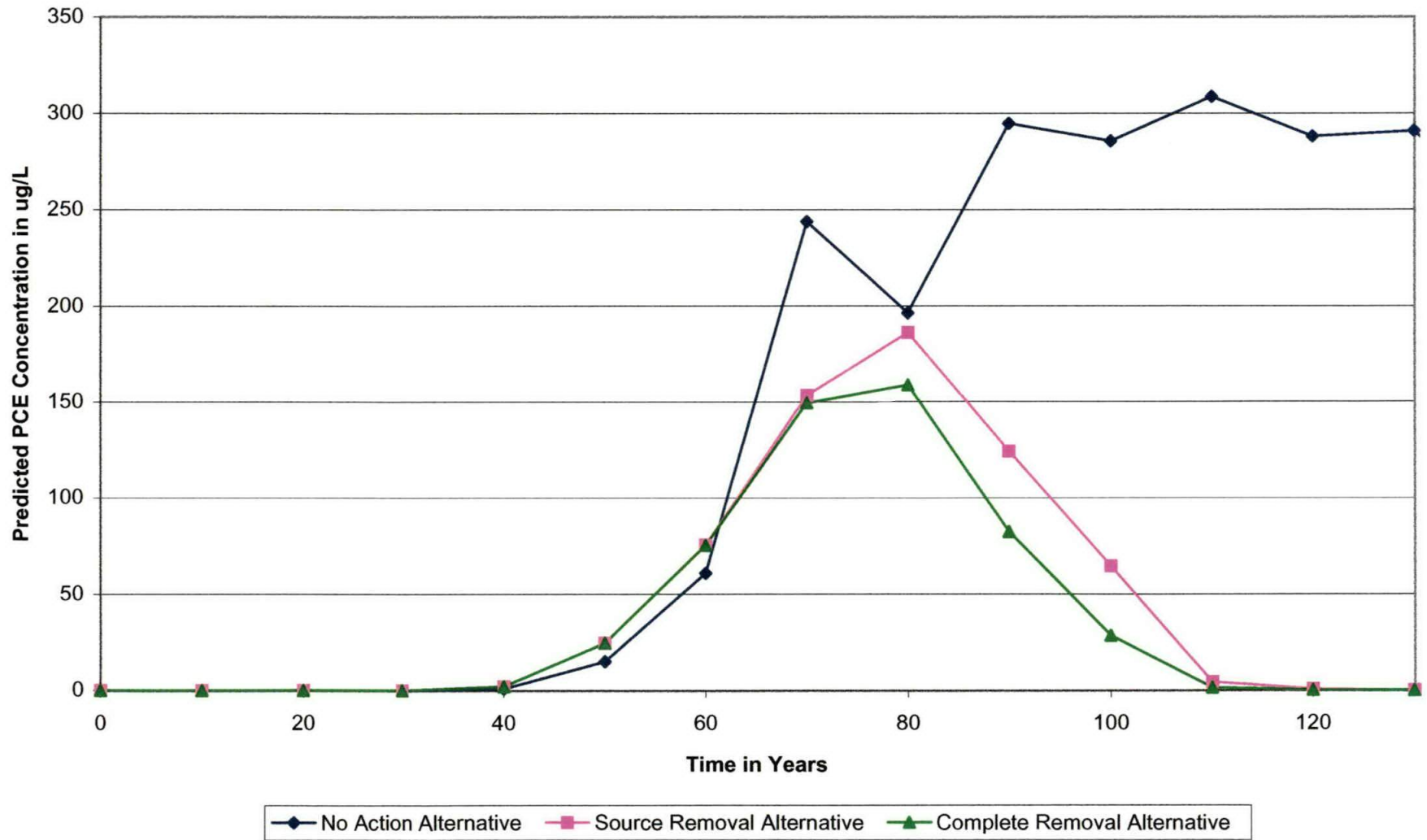
Several recognized areas of uncertainty exist in the investigation results. However our overall conclusions are not impacted by this uncertainty. These are discussed below.

Inherent in any subsurface investigation, the exact pattern of groundwater flow must be inferred from limited observation points. Assessment of the horizontal component of groundwater flow beneath the shopping center has been completed with reasonable resolution because there are many monitoring wells. However, some of the results (i.e. MW-10) indicate that the system is not fully understood. Also, as mentioned previously, measurements of vertical flow obtained from two locations on-site have provided differing results.

With the exception of offsite well MW-13, no monitoring points (or other wells where water level data could be obtained) are located between the site and the presumed point of groundwater discharge (Puget Sound). Groundwater conditions off-site had to be approximated using a modeling approach,



FIGURE 13: Predicted PCE Concentrations at Discharge Point Under Various Action Alternatives



which is subject to some degree of uncertainty largely due to the need to make assumptions regarding aquifer geometry and hydraulic properties. However, these assumptions were derived through a thoughtful consideration of the existing on- and offsite data.

Data regarding the vertical distribution of contaminants beneath the site are limited. The available information indicate that the contaminated zone is focused in the top 45 feet of the aquifer. However, this information was only available from one on-site location (MW-8), near the suspected release point where the vertical extent of the plume would be expected to be smaller if there were a downward flow gradient. In addition, all estimates of the horizontal and vertical distribution of contaminants off-site were obtained from model projections which contain inherent uncertainty due to the need to make assumptions regarding groundwater flow, aquifer hydraulic properties, and chemical transport properties. As previously mentioned, these assumptions were derived through a thoughtful consideration of the existing on- and offsite data.

There is also a degree of uncertainty associated with modeling the effectiveness of various remedial alternatives. Sensitivity to initial conditions is one of the most serious limitations in predictive modeling, and in this case the initial conditions (distribution of contaminant) was assumed. However, this assumption was based on the available site and regional information.

While these uncertainties must be acknowledged, it should be recognized that the information was used in such a way to look at very conservative scenarios. For example, when it was unknown how far the PCE plume extended off-site, it was assumed that the plume extended all the way up to just upgradient of the off-site monitoring well. The acknowledged uncertainties are typical of any similar subsurface investigation and must be interpreted with the context of the investigation objectives. It is SCS' opinion that investigation objectives were not compromised by these uncertainties.



SECTION 4 DISCUSSION AND REMEDIAL CONSIDERATIONS

4.1 EXTENT OF SUBSURFACE CONTAMINATION

The results of the field investigations at the former Sooper Dry Cleaners indicate that historical releases of dry cleaning solvents have contaminated the subsurface soils and groundwater beneath the Normandy Park Shopping Center with chlorinated solvents, primarily PCE. The PCE contaminated soils present at the site are relatively limited and appear to be primarily associated with the former dry well behind the dry cleaner tenant space. In turn, the former dry well also appears to be the focus for the plume of PCE contaminated groundwater observed beneath the western end of the shopping center. In addition, lower-level PCE groundwater contamination also appears to be associated with the old septic tanks located near the center of the parking area.

The nature and extent of the contaminants found in the soils and groundwater in the vicinity of the Sooper Dry Cleaners are discussed below.

4.1.1 Soil Contamination

The highest PCE concentration observed at the site (5.1 mg/kg at 5' in MW-7) was encountered in the gravelly fill materials that comprise the upper 13 feet of the former dry well. The next highest soil concentrations were found within the upper horizons of the saturated zone directly beneath (0.85 mg/kg at 45' in MW-7) and immediately downgradient (0.82 mg/kg at 65' in MW-10) of the dry well. The remaining contaminant detections in the soil ranged from 0.057 to 0.34 mg/kg. With few exceptions, the detectable contaminant concentrations were present in samples collected from depths of 10 feet or greater. None of the soils sampled during the site investigation exceeded the 19.6 mg/kg MTCA Method B (allowable for commercial land uses) soil standard.

Further evaluation of the soils data indicates that low, but detectable levels of PCE and several related compounds (TCE and PCA) are also present in the subsurface soils immediately to the west of the dry cleaner tenant space and the former septic tanks. These low level detections were sporadically observed throughout the vadose and saturated zones. No evidence of any non-aqueous phase liquids (NAPL) was observed in either the vadose or saturated zones during the site investigation.

The origins of the PCE contaminated soils observed in the former dry well are uncertain. The dry well was reportedly constructed to drain storm water that accumulated on the roof over the dry cleaner and adjacent tenant spaces. Possibly, PCE-containing vapors from the dry cleaning machine may have been vented to the roof and accumulated in the rainwater that ultimately discharged into the dry well. If this process continued over many years, it could explain the widespread, residual soil contamination that is observed beneath the site. Alternatively, if the dry well was formerly connected to a surface drain, dry cleaning solvent could have been historically spilled or otherwise released directly into the subsurface.



In addition, the presence of PCE around the old septic tanks suggests that PCE containing liquids (possibly wash water from the dry cleaning machine) were also historically discharged into the sanitary sewer. Although no information is available concerning the precise timing of these releases, it appears likely that some or all of these releases may have occurred before the main building was connected to the city's sanitary sewer system.

Several isolated detections of aromatic hydrocarbons, including toluene, xylene and chlorobenzene, were observed in the subsurface soil behind the tenant space and adjacent to the old septic tanks. None of these detections exceeded MTCA Method A soil standards. In addition, none of these scattered detections appear to be intimately correlated with the observed PCE contamination or suggest the presence of a significant release of petroleum hydrocarbons at the shopping center.

4.1.2 Groundwater Contamination

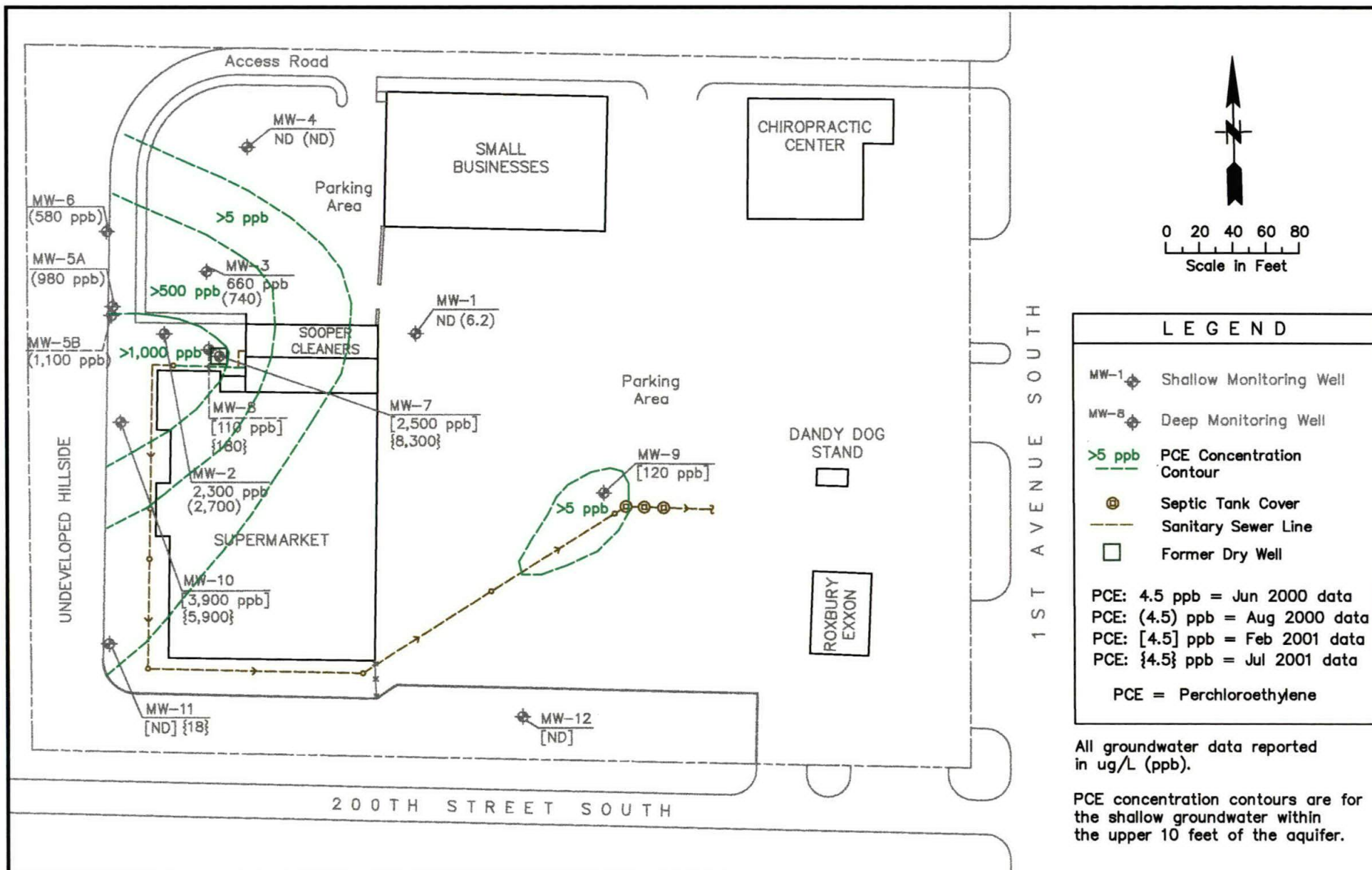
During the course of the field investigations, groundwater PCE concentrations exceeding the 5 µg/L MTCA Method A standard have been detected in 11 of the 13 monitoring wells installed on the shopping center property. Neither PCE nor any related contaminants were detected in any of the groundwater samples collected downgradient of the shopping center at offsite well MW-13.

As illustrated on Figure 14, the highest PCE concentrations (ranging between 2,300 to 8,300 µg/L) have been consistently observed in the wells directly within (MW-7) and immediately downgradient (MW-2 and MW-10) of the former dry well. The most elevated PCE concentrations appear to be restricted to the groundwater flowing through the upper 10 to 20 feet of the saturated zone. Although PCE contaminated soils are present in the vicinity of the dry well, the level of soil contamination observed was relatively minor. In addition, no evidence of DNAPL was observed beneath the property.

Slightly lower PCE concentrations (ranging between 580 to 980 µg/L) were detected in several monitoring wells (MW-3, MW-5A and MW-6) further west-northwest from the former dry cleaner tenant space. Even though these PCE detections did not occur immediately downgradient of the former dry well, it is believed that this contamination is originating from this structure. The relative flatness of the water table on the northern end of the shopping center, combined with seasonal fluctuations in the groundwater flow direction, could have spread the PCE contaminated groundwater further northwest towards these wells.

PCE groundwater contamination (ranging from 18 to 120 µg/L) was also observed in the vicinity of the old septic tanks and on the southwest corner of the property. The 18 µg/L detection in MW-11 appears to represent the southern edge of the main plume of PCE groundwater contamination. The 120 µg/L PCE detection in MW-9 may be part of a smaller plume of PCE contaminated groundwater that is originating from the old septic tanks and/or drain field. The lack of PCE or any related compounds in downgradient well MW-12 suggests that this latter potential PCE plume remains limited in extent. As previously discussed, the single PCE detection (6.2 µg/L) reported in upgradient well MW-1 is considered to be due to cross contamination from the sampling equipment.





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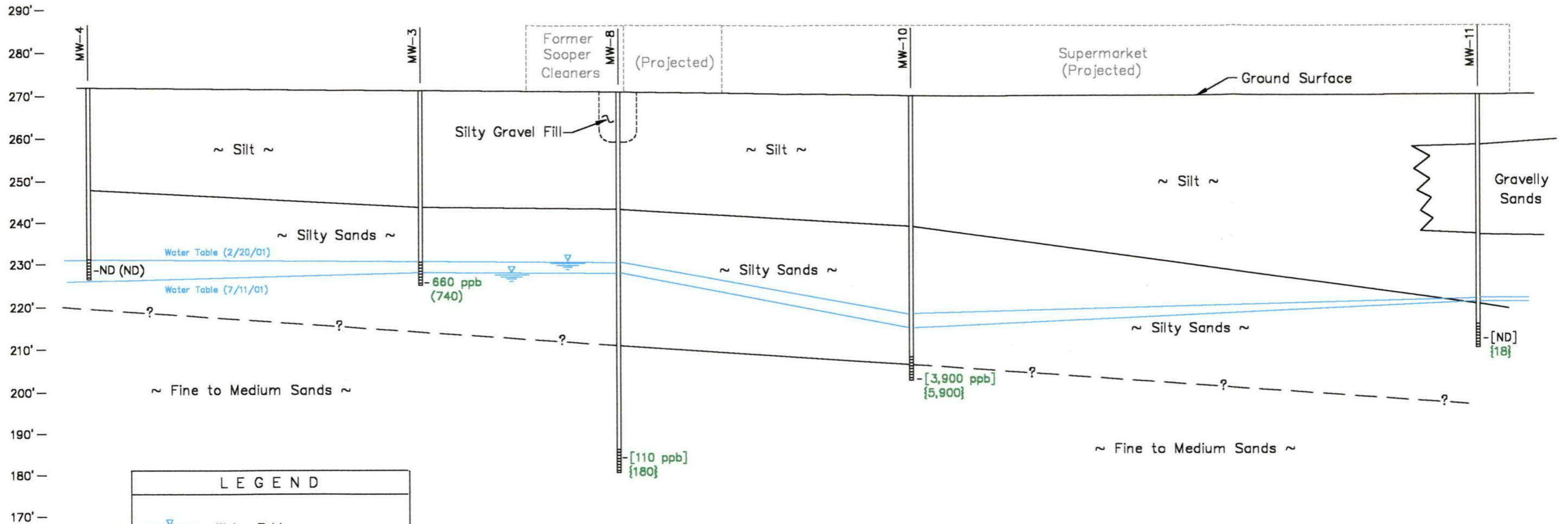
PROJECT NO.	04199025.03	DES BY	D.V.
SCALE	AS SHOWN	CHK BY	D.V.
CAD FILE	Figure 14	APP BY	G.H.

ESTIMATED EXTENT OF SHALLOW PCE
 GROUNDWATER CONTAMINATION
 SOOPER DRY CLEANERS SITE

DATE	AUG 2001
FIGURE	14

B
(North)

B'
(South)



LEGEND

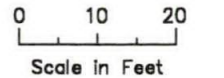
Water Table

PCE > 5 ug/L (ppb)
Method A MTCA Standard

110 PCE concentration in groundwater ug/L (ppb)

PCE: 4.5 ppb = Jun 2000 data
 PCE: (4.5) ppb = Aug 2000 data
 PCE: [4.5] ppb = Feb 2001 data
 PCE: {4.5} ppb = Jul 2001 data

PCE = Perchloroethylene



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PROJECT NO. 04199025.03	DES BY D.V.
SCALE AS SHOWN	CHK BY D.V.
CAD FILE Figure 15	APP BY G.H.

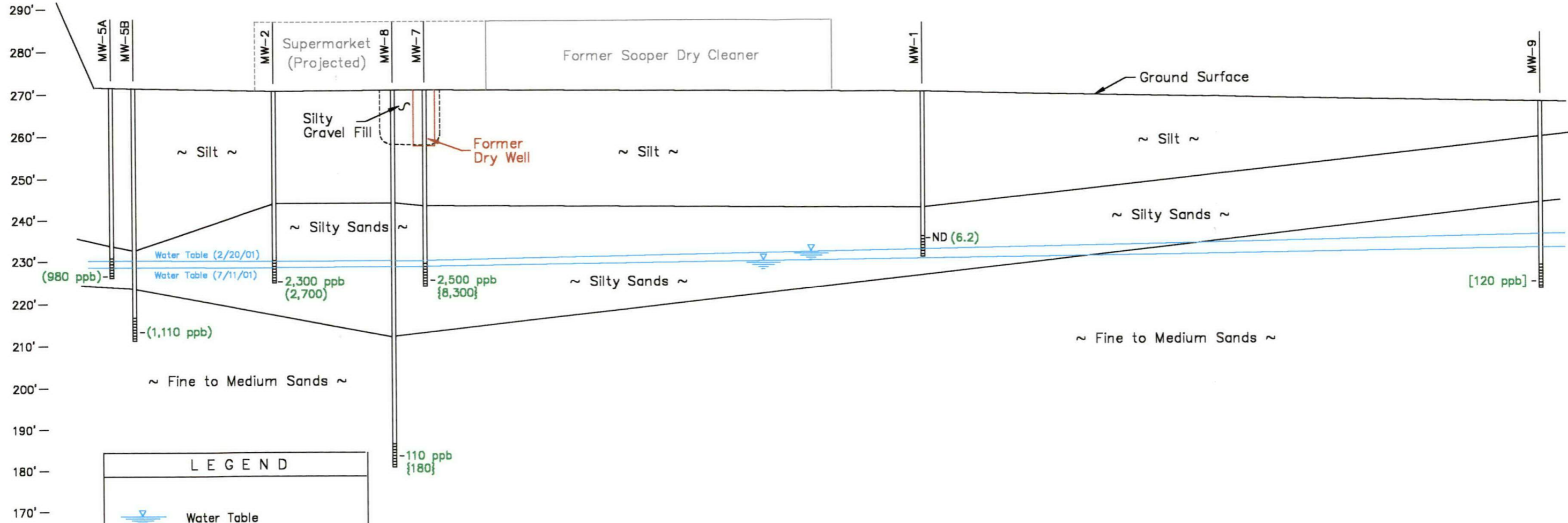
GENERALIZED ONSITE CROSS-SECTION B-B'
 SOOPER DRY CLEANERS
 NORMANDY PARK SHOPPING CENTER

DATE
AUG 2001

FIGURE
15

C
(West)

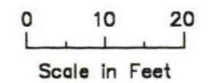
C'
(East)



LEGEND

- Water Table
- PCE > 5 ug/L (ppb)
Method A MTCA Standard
- 110 PCE concentration in groundwater ug/L (ppb)

PCE: 4.5 ppb = Jun 2000 data
PCE: (4.5) ppb = Aug 2000 data
PCE: [4.5] ppb = Feb 2001 data
PCE: {4.5} ppb = Jul 2001 data
PCE = Perchloroethylene



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PROJECT NO.
04199025.03

DES BY
D.V.

SCALE
AS SHOWN

CHK BY
D.V.

CAD FILE
Figure 16

APP BY
G.H.

GENERALIZED ONSITE CROSS-SECTION C-C'
SOOPER DRY CLEANERS
NORMANDY PARK SHOPPING CENTER

DATE
APRIL 2001

FIGURE
16

As illustrated on the site cross-sections (see Figures 15 and 16), the highest PCE concentrations appear to be confined to the upper portion of the aquifer. Although the PCE concentrations (110 to 180 µg/L) detected in the "deep" MW-8 monitoring well continue to exceed the 5 µg/L MTCA Method A standard, they remained below (up to an order of magnitude lower) the PCE levels (580 to 8,300 µg/L) observed in the shallower wells (MW-2, MW-3, MW-5A/B, MW-6, MW-7 and MW-10). In particular, the 110 to 180 µg/L concentrations in "deep" well MW-8 are significantly lower than the 2,500 to 8,300 µg/L concentrations in adjacent MW-7. Hydrological data (i.e. equal head values at MW-5A and MW-5B) also suggests that the vertical gradients within the aquifer are minimal at this location.

Also notable was the overall increase in PCE groundwater concentrations observed during lower water table conditions. Under higher water table conditions (i.e. August 2000 and February 2001), PCE concentrations in the main body of the contaminant plume ranged from 2,500 to 2,700 µg/L. However, during lower water table conditions (i.e. July 2001), PCE concentrations in this same area ranged as high as 8,300 µg/L. These observations suggest that the PCE contaminated groundwater at the site is predominantly situated near the interface between the vadose and the saturated zones.

In addition to PCE, related contaminants including TCE, dichloroethene and methylene chloride were occasionally detected in the onsite monitoring wells. TCE sporadically exceeded its 5 µg/L MTCA Method A groundwater standard in MW-2 (61 and 90 µg/L), MW-7 (85 µg/L) and MW-7 (6.3 µg/L). In addition, a single methylene chloride detection (17 µg/L) in excess of the 5 µg/L MTCA Method A standard was also observed in MW-7. All of these exceedance occurred within the main plume of PCE contaminated groundwater originating from the area of the dry well.

The overall direction of groundwater flow observed beneath the site has consistently remained towards the west-southwest. However, as previously discussed, groundwater flow under the northern end of the property is more westerly, with a significantly lower gradient. Assuming an average aquifer porosity of 25% and using the hydraulic conductivity (5.5×10^{-5} to 2.9×10^{-4} ft/sec) and hydraulic gradient (0.04 ft/ft) values derived from the March 2001 aquifer testing and water table elevation data, the groundwater flow velocity beneath the majority of the site is expected to range between approximately 277 and 1,463 feet/year.

The results of the onsite groundwater investigations indicate that PCE contaminated groundwater is likely migrating beyond the western border of the shopping center. However, neither PCE nor any related contaminants have been detected in offsite well MW-13, which is situated approximately 1,000 feet directly downgradient of the property. The lack of groundwater contamination in MW-13 indicates that the plume of PCE contaminated groundwater observed beneath the shopping center does not extend to 4th Avenue South. As previously noted, the subsurface conditions within the impacted aquifer apparently become increasingly reducing as the hydrological formation transitions from recessional to advance outwash in the areas immediately downgradient of the site. Natural attenuation of chlorinated compounds, including PCE, becomes increasingly favorable under reductive conditions.

A search of state and local regulatory records and followed by a curbside survey did not find any evidence of either municipal or domestic groundwater use within a 3,000-foot arc downgradient of the site. As a result, none of the local residents appear to currently be at risk from the consumption of PCE contaminated groundwater from the shallow aquifer.



4.2 REMEDIAL CONSIDERATIONS

The findings of this assessment do not support any active remediation of the low level soil contamination observed at the site. PCE was not detected at concentrations above the 19.6 mg/kg MTCA Method B soil standard. Because the property is zoned for commercial use, and the majority of the site is either covered by buildings or pavement, the somewhat scattered contaminant detections in the soil, generally located below a depth of 10 feet, are not considered to present a threat to human health. Furthermore, the groundwater modeling indicates that removal of the on-site contaminants would have a limited effect on long-term off-site discharges.

However, because elevated levels of PCE are present in the groundwater beneath the western end of the property, consideration was given to the use of onsite remediation methods to mitigate the groundwater contamination. Although observed soil concentrations were relatively low and unlikely to contribute significant amounts of PCE into the groundwater, the possibility exists that pockets of higher concentration contaminated soil exists in unsampled locations. The necessity of implementing any groundwater remedies at the site will likely depend on the degree to which the PCE present in the aquifer system represents an existing and long-term risk to human health or the environment. The practical ability to effect a meaningful improvement to the groundwater condition must also be considered.

The absence of groundwater contamination in downgradient well MW-13 indicates that PCE contaminated groundwater is not currently discharging to Puget Sound or other surface water bodies. As a result, the principle potential site risk is anticipated to be ingestion of PCE contaminated groundwater by downgradient residents. However, both the records search and field survey completed for local downgradient residences found no evidence of any current municipal or domestic groundwater use.

Since no downgradient receptors appear to be present in the areas west-southwest of the site, aggressive groundwater treatment to address a potential human health risk may not be warranted at this site. If the residents downgradient of the property are not extracting and using the groundwater, there is no exposure to the contaminants. Without an exposure, there is no potential human health risk. Institutional controls, deed restrictions and natural attenuation and/or dispersion of PCE contamination may be sufficient to address the groundwater issues from a human health risk perspective.

Although the historic releases from the site have negatively impacted a potential future source of drinking water, it remains unlikely that even an extremely aggressive remedial program would be able to restore this potential resource to a sufficiently pristine state to allow for its highest and best use. It also remains unclear whether sufficient benefit would be derived through a limited groundwater containment and/or PCE recovery program to warrant the treatment costs and disturbances to the site.

The contaminant transport simulations predict that the contaminated groundwater may discharge into Puget Sound in approximately 40 years. Under the No Action Alternative, the estimated maximum discharge concentration is conservatively estimated to be approximately 300 ug/l, which is below the 450 ug/l limit for chronic exposure per the EPA's Ambient Water Quality Criteria. Accordingly, the



conservative prediction from the contaminant transport simulation suggests that the migration and ultimate discharge of the contaminated groundwater would not result in an ecological risk.

Additional discussions with the Department of Ecology will be necessary in order to resolve these cleanup issues. Since the site has already been entered into Ecology's Voluntary Cleanup Program, any potential cleanup and long term management work should be completed through the VCP. In this manner, the owners can gauge Ecology's position with respect to their site and obtain some degree of assurance that the proposed clean-up program will be acceptable to the regulatory agency.

4.2.1 Soil

As previously discussed, soil treatment at the former Sooper Dry Cleaners site does not appear to represent an effective remedial alternative. Although the highest PCE soil concentrations (up to 5 mg/kg) were detected in the upper fill materials within the former dry well, the residual contamination remains below MTCA Method B standards. In addition, the dry well fill is currently covered by layer of surface soils and asphalt pavement.

The soil concentrations detected at the property do not exceed the MTCA Method B criterion for PCE. Application of the Method B criterion is appropriate for the existing and expected future use of the property. Consideration of various remediation technologies suggests that the soil conditions and the contaminant distribution are not amenable to direct remedial action. Therefore, as indicated above, soil remediation is not considered necessary or appropriate for this site. Furthermore, the groundwater modeling indicates that removal of the on-site contaminants would have a limited effect on long-term off-site discharges.

4.2.2 Groundwater

The results of the site assessment indicate that PCE contaminated groundwater is present beneath the western border of shopping center property and is likely migrating west-southwest to areas downgradient of the site. However, offsite field investigations demonstrate that the plume of PCE contaminated groundwater remains confined to an area less than 1,000 feet downgradient of the dry cleaner source area.

Before any defensible groundwater clean-up remedy can be selected for a site, all the potential downgradient receptors must be identified to determine whether the impacted groundwater presents any unacceptable risks. Based on the current land use and the most likely future development scenarios (i.e. shopping center or other commercial use), the PCE concentrations observed in the groundwater beneath the site are not anticipated to present an unacceptable risk to potential receptors on the Normandy Park property. Also, given the depth to groundwater beneath the site (40 feet bgs) and along downgradient properties (<100 feet bgs), exposure at the ground surface is unlikely, barring the presence of any domestic water wells.

The default MTCA Method A and B groundwater cleanup standards for PCE are 5 µg/L and 80 µg/L, respectively. However, each of these standards assumes that some degree of exposure of contaminated groundwater to humans is occurring at a site. As detailed earlier in this report, there is no evidence of any municipal or domestic groundwater use within a 3,000-foot arc downgradient of the site. Highline



Water District records confirmed that all the residences downgradient of the site obtain their domestic water from the municipal provider. As a result, it does not appear that the PCE contaminated groundwater originating from the former dry cleaners currently presents a threat to human health. Conversely, it is apparent that PCE contaminated groundwater from the site has negatively impacted a potential future drinking water source.

Contaminant transport simulations have predicted that PCE-contaminated groundwater containing concentrations up to 300 ug/L may ultimately discharge into Puget Sound under conservative assumptions. However, comparison of the predicted discharge concentration to the Ambient Water Criterion for PCE does not suggest that the discharge would result in a potential risk to the environment. Note that the predicted discharge concentration is considered conservative, and may over estimate the magnitude and duration of any contaminant discharge to Puget Sound.

The groundwater contamination associated with the former Sooper Dry Cleaners has been sufficiently characterized to allow for the evaluation of potential groundwater treatment options. Remedial goals for any groundwater cleanup at the site will have to take into account the lack of existing exposure routes and the technical difficulties associated with the treatment of chlorinated compounds. At best, the remediation goals achievable at this site would be limited to groundwater treatments that would attempt to partially contain and recover a portion of the PCE dissolved in the groundwater and adsorbed on to the upper saturated zone of the aquifer.

It is important to consider the predictions from the contaminant transport scenarios with respect to a potential groundwater remediation program. The simulations indicate that the existing conditions involve a considerable mass of contamination in the off-site groundwater. The simulations further show that complete removal of the entire mass of contamination in the soil and groundwater on the property does not result in a comparatively significant reduction in the contaminant concentration that could discharge to Puget Sound.

It is not technically feasible to effectively remove the entire mass of contamination at the property. The expected cost and duration of an on-site cleanup program that would likely result in a marginal improvement to the site conditions is not justified when considering the off-site contamination would remain largely unaffected. Incorporating an off-site groundwater treatment program adds the access and logistical issues associated with groundwater contamination beneath a residential area. In addition, the anticipated costs associated with an off-site remediation program, including obtaining space for off-site remediation equipment or installing subsurface piping to connect to a treatment system on the property, effectively outweigh the potential benefit from an off-site treatment program.

Ultimately, it is considered impractical to implement a direct groundwater remediation program at this site. While the PCE concentrations exceed the applicable cleanup levels, the lack of receptors prevents a potential human health risk associated with the contaminated groundwater. Conservative predictions of the magnitude and duration of contaminants that may discharge to Puget Sound do not suggest a potential ecological impact associated with the contaminated groundwater. Finally, the expected marginal utility resulting from a groundwater remediation program, coupled with the anticipated cost of the program, present practical impediments to an effective groundwater remediation program.



SECTION 5 CONCLUSIONS AND RECOMMENDATIONS

The results of the field investigations at the former Sooper Dry Cleaners indicate that the groundwater beneath the western half of the Normandy Park Shopping Center has been contaminated with perchloroethylene. Although PCE contaminated soils also were observed in and beneath an old dry well behind the former tenant space, none of these contaminant detections exceeded MTCA Method B soil standards. No evidence of any non-aqueous phase liquids (NAPLs) was observed in either the vadose or saturated zones.

Groundwater PCE concentrations exceeding the 5 µg/L MTCA Method A standard have been detected in 11 of the 13 monitoring wells installed on the shopping center property. The highest PCE concentrations, ranging between 2,300 to 8,300 µg/L, occur in the wells directly within (MW-7) and immediately downgradient (MW-2 and MW-10) of the former dry well. The most elevated PCE concentrations appear to be restricted to the groundwater flowing through the upper 10 to 20 feet of the saturated zone. The observed groundwater contamination appears to be primarily due to the leaching of residual PCE within the dry well fill and the underlying saturated soils.

Lower PCE concentrations, ranging between 18 to 580 µg/L, were detected along the northern and southern ends of the western property line, and in the vicinity of several former septic tanks near the center of the shopping center. The groundwater contamination originating near the old septic tanks appears to be confined to the property. Groundwater flow beneath the site is principally towards the west-southwest, with hydraulic conductivity values ranging between 5.5×10^{-5} to 2.9×10^{-4} ft/sec and an estimated gradient of 0.04 ft/ft. The groundwater flow velocity beneath the majority of the site is expected to range between approximately 277 and 1,463 feet/year.

Although the onsite investigations indicate that contaminated groundwater is migrating beyond the western border of the shopping center, neither PCE nor any related compounds were detected in offsite well MW-13 which is situated approximately 1,000 feet directly downgradient of the property. The offsite data suggest that the plume of PCE contaminated groundwater does not extend to 4th Avenue South. Changes in the lithological condition of the aquifer (i.e. an increasingly reducing environment and higher organic carbon levels) immediately downgradient of the property may be directly attenuating and/or limiting the migration of the PCE contamination.

A search of state and local regulatory records and followed by a curbside survey did not find any evidence of either municipal or domestic groundwater use within a 3,000-foot arc downgradient of the site. Information from the Highline Water District and local residents confirmed that the downgradient residences are all currently utilizing municipal water, and that there is no domestic use of groundwater in the area. As a result, none of the local residents appear to currently be at risk from the consumption of PCE contaminated groundwater from the shallow aquifer.

Remediation of the PCE contaminated soil at the property is not considered necessary. The concentrations detected during the investigation activities did not exceed the MTCA Method B standard. Further, the lack of a defined zone of obvious source material, the depth at which most of the soil contamination was detected, and the expected low permeability of the silty soil limit the practicality and the utility of a soil remediation program. Finally, the results of the modeling indicate



that the removal of any source material on the property provides minimal benefit to the groundwater conditions and the potential risks associated with the contaminated groundwater.

Similarly, a groundwater remediation program appears unnecessary. The available information indicates that the groundwater downgradient of the property is not being used. As a result, there is no current risk to human health associated with exposure to the contaminated groundwater. Also, the contaminant transport simulations suggest that a conservative estimate of the contaminant concentrations discharging into Puget Sound would not exceed the Ambient Water Criteria, and would therefore not represent an ecological risk.

Ultimately, however, a groundwater remediation program may also prove to be impractical. The contaminant transport simulations suggest only a marginal benefit would be realized even if the entire mass of contamination on the property were removed. Not only is removal of the entire mass of contamination technically infeasible, the expected cost to attempt this level of removal would be prohibitive. Efforts to address the off-site groundwater contamination would be similarly impractical, prohibitively expensive, and logistically challenging.



SECTION 6 REFERENCES

- 1) AGI. Hydrogeological Study. Draft Environmental Impact Statement for Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport, Port of Seattle. Volume 3, Appendix Q. April 1995.
- 2) Chiang, W-H, and W. Kinzelbach, 1996. Processing MODFLOW: A Simulation System for Modeling Groundwater Flow and Pollution.
- 3) Chiang, W-H, and W. Kinzelbach, 1997. PMPATH for Windows: A Computer Program for Particle Tracking.
- 4) Dames & Moore. Hydrogeological Study. Final Environmental Impact Statement: Seattle-Tacoma International Airport South Aviation Support Facility, Port of Seattle. Volume 2. September 1992.
- 5) McDonald, M.G., and A.W. Harbaugh, 1998. A Modular Three-Dimensional Finite-Difference Ground-Water Flow Model, USGS, Open File Report 83-875 (Chapter A1), Denver, CO.
- 6) Pollock, D. W. 1988. Semianalytical computation of path lines for finite difference models. Ground Water 26. no. 6, pp. 743-750.
- 7) Pollock, D. W. 1989. MODPATH (version 1.x), Documentation of computer programs to compute and display pathlines using results from the U. S. Geological Survey modular three-dimensional finite-difference ground-water model. U. S. Geological Survey Open-file report 89-381.
- 8) SCS Engineers. Phase I/II Environmental Site Assessment, Normandy Park Shopping Center, Normandy Park, Washington. April 2000.
- 9) SCS Engineers. Voluntary Cleanup Program Application for the Sooper Dry Cleaners Site, Normandy Park shopping Center, Normandy Park, Washington. February 2000.
- 10) United States Geological Survey. Occurrence and Quality of Groundwater in Southwest King County, Washington. U.S.G.S. Report 92-4098. 1995.
- 11) Washington State Department of Ecology - Toxics Cleanup Program. The Model Toxics Control Act Cleanup Regulation; Chapter 173-340 WAC. Publication 94-06. December 1993.



APPENDIX A

SITE PHOTOGRAPHS





Photo 1. View looking towards the northwest across the Normandy Park Shopping Center property. The two main commercial buildings are visible beyond the parking area. The former Sooper Dry Cleaners is visible on the far end of the main building.

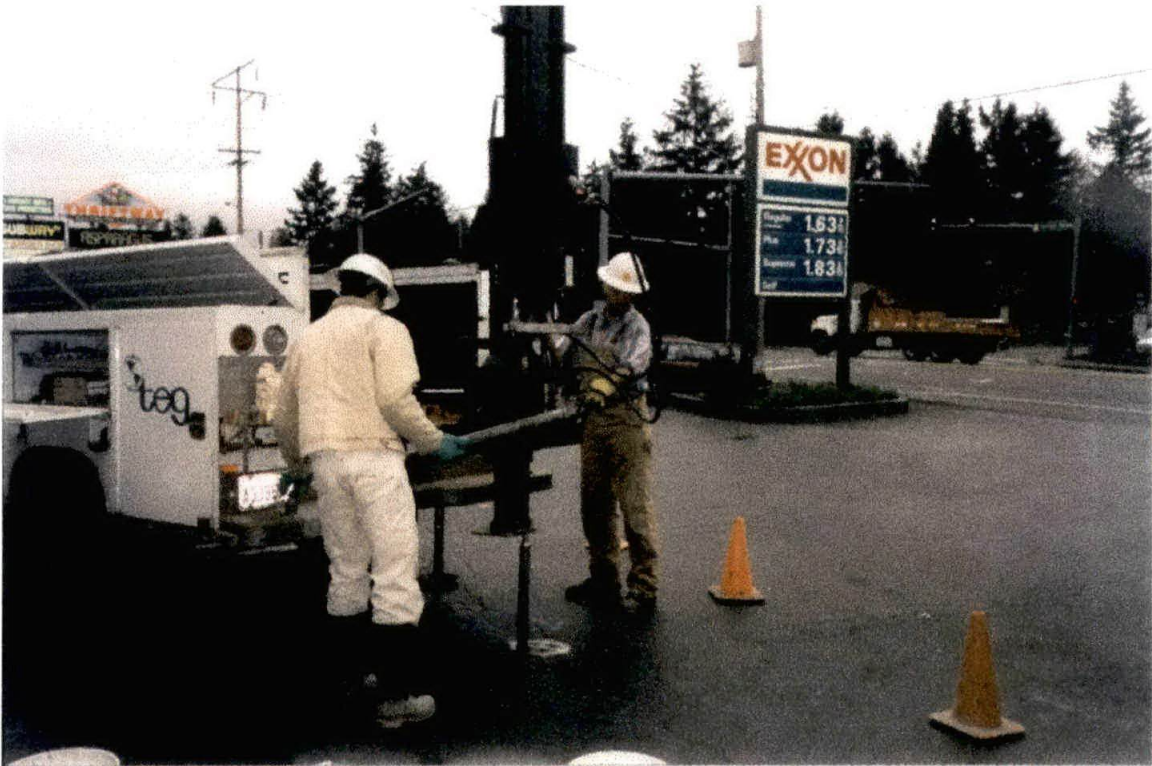


Photo 2. Collection of soil samples from the southeast corner of the shopping center during the initial Phase I/II Strataprobe investigation (April 2000).



Photo 3. View towards the west inside the tenant space formerly occupied by the Sooper Dry Cleaners. The locations of indoor soil borings HA-1 through HA-4 are visible along the base of the northern wall and beside the floor drain.



Photo 4. Close up view of the former dry cleaners floor drain and two of the indoor soil boring locations.



Photo 5. View towards the northwest during the installation of groundwater monitoring well MW-1 immediately upgradient of the former dry cleaner tenant space. Groundwater was encountered approximately 40 feet below ground surface.



Photo 6. View looking towards the south showing the rear of the main commercial building. The steeply sloping hill slope that parallels the western border of the shopping center property is visible along the right side of the photograph.



Photo 7. View to the east showing the rear entrance to the dry cleaner tenant space. The white painted rectangle immediately adjacent to the building marks the location of the inactive dry well that was reported to formerly drain storm water off the building roof.



Photo 8. Installation of Stage II groundwater monitoring well MW-6 along the far western edge of the property. The surface monuments for well nest MW-5A/B are visible in the foreground.



Photo 9. View to the northeast during the installation of off-site groundwater monitoring well MW-13. The well was located approximately 1,000 feet downgradient of the shopping center.



Photo 10. View of the Hydropunch sampler that was used during the drilling of the MW-13 boring to collect groundwater samples from the subsurface aquifer at depths of 120, 160 and 180 feet below ground surface.



Photo 11. Completion of off site groundwater well MW-13. A stainless steel Grunfos submersible groundwater pump was used during well development to establish a good hydrologic connection to the aquifer.



Photo 12. View looking towards the south showing the completed downgradient well MW-13. At this location the shopping center aquifer lies approximately 112 feet below ground surface.

APPENDIX B

**SOIL BORING LOGS AND
GROUNDWATER WELL CONSTRUCTION DETAILS**



WELL BH-7 (Page 1 of 1)

CLIENT NAME Sooper Cleaners - Dry Cleaner

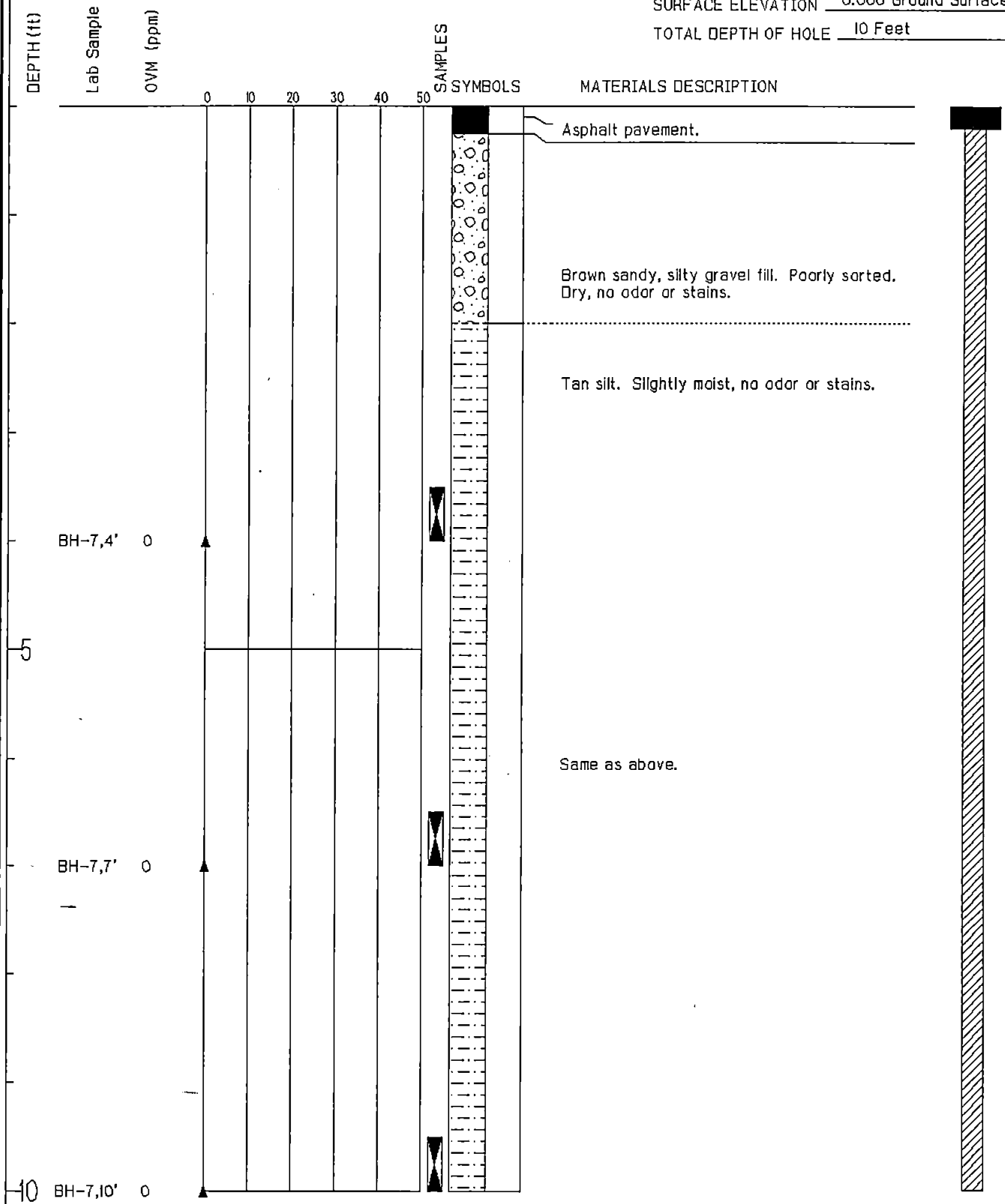
DATE DRILLED 04-05-00

SURFACE ELEVATION 0.000 Ground Surface

TOTAL DEPTH OF HOLE 10 Feet

OVM CONCENTRATIONS (ppm)

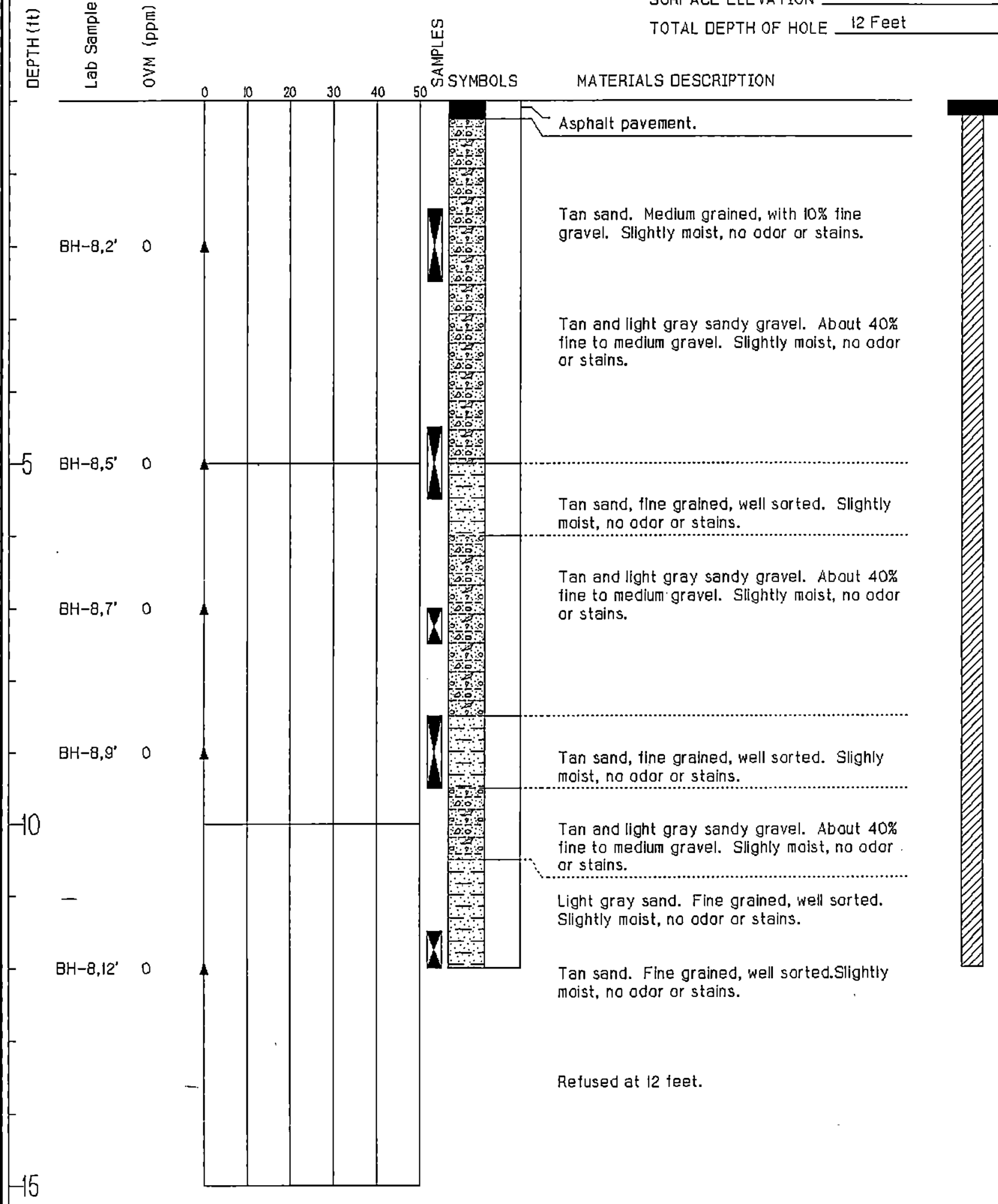
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WELL BH-8 (Page 1 of 1)

CLIENT NAME Sooper Cleaners - Dry Cleaner
 DATE DRILLED 04-05-00
 SURFACE ELEVATION 0.000 Ground Surface
 TOTAL DEPTH OF HOLE 12 Feet

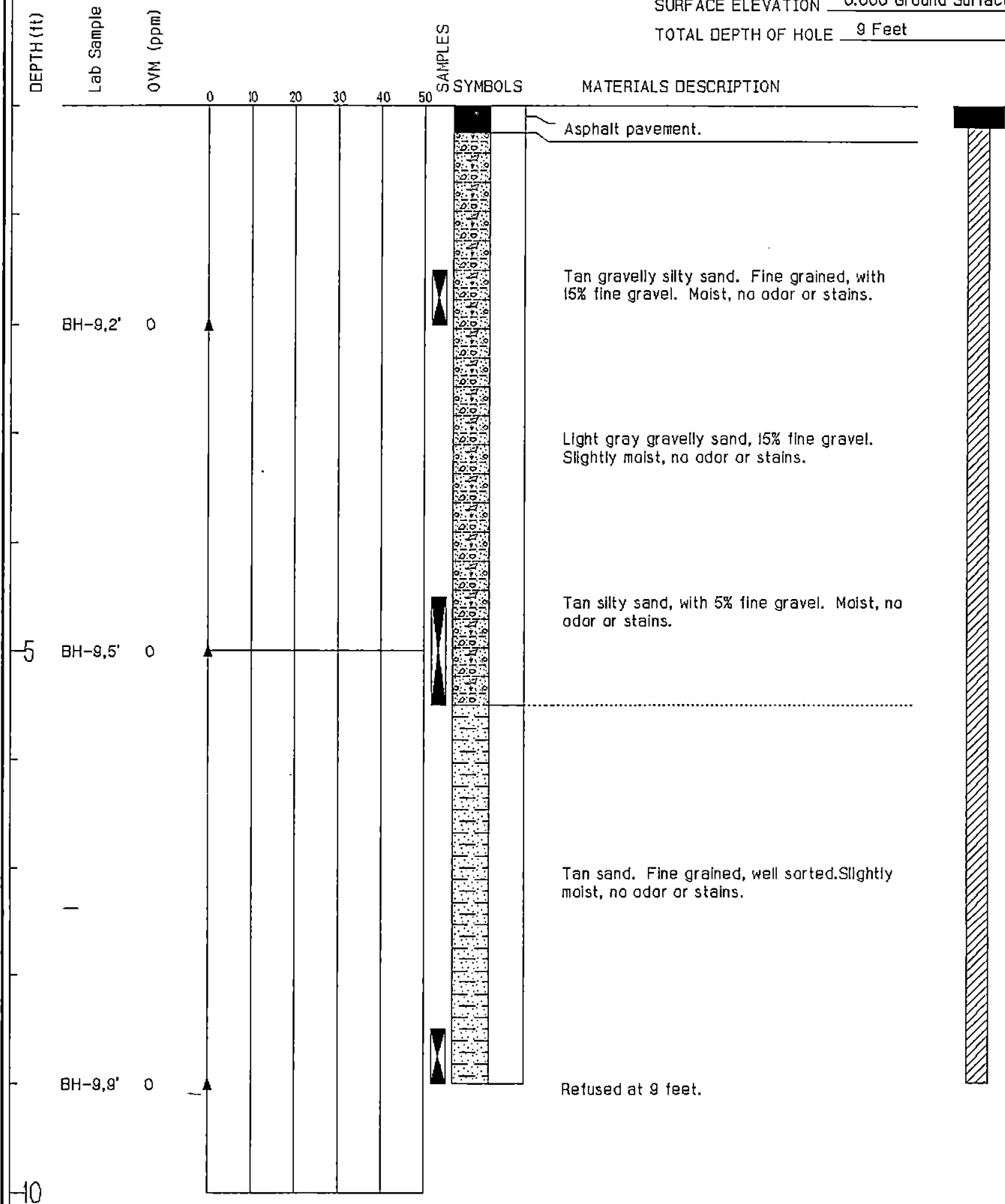
OVM CONCENTRATIONS (ppm)
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WELL BH-9 (Page 1 of 1)

CLIENT NAME Sooper Cleaners - Dry Cleaner
 DATE DRILLED 04-05-00
 SURFACE ELEVATION 0.000 Ground Surface
 TOTAL DEPTH OF HOLE 9 Feet

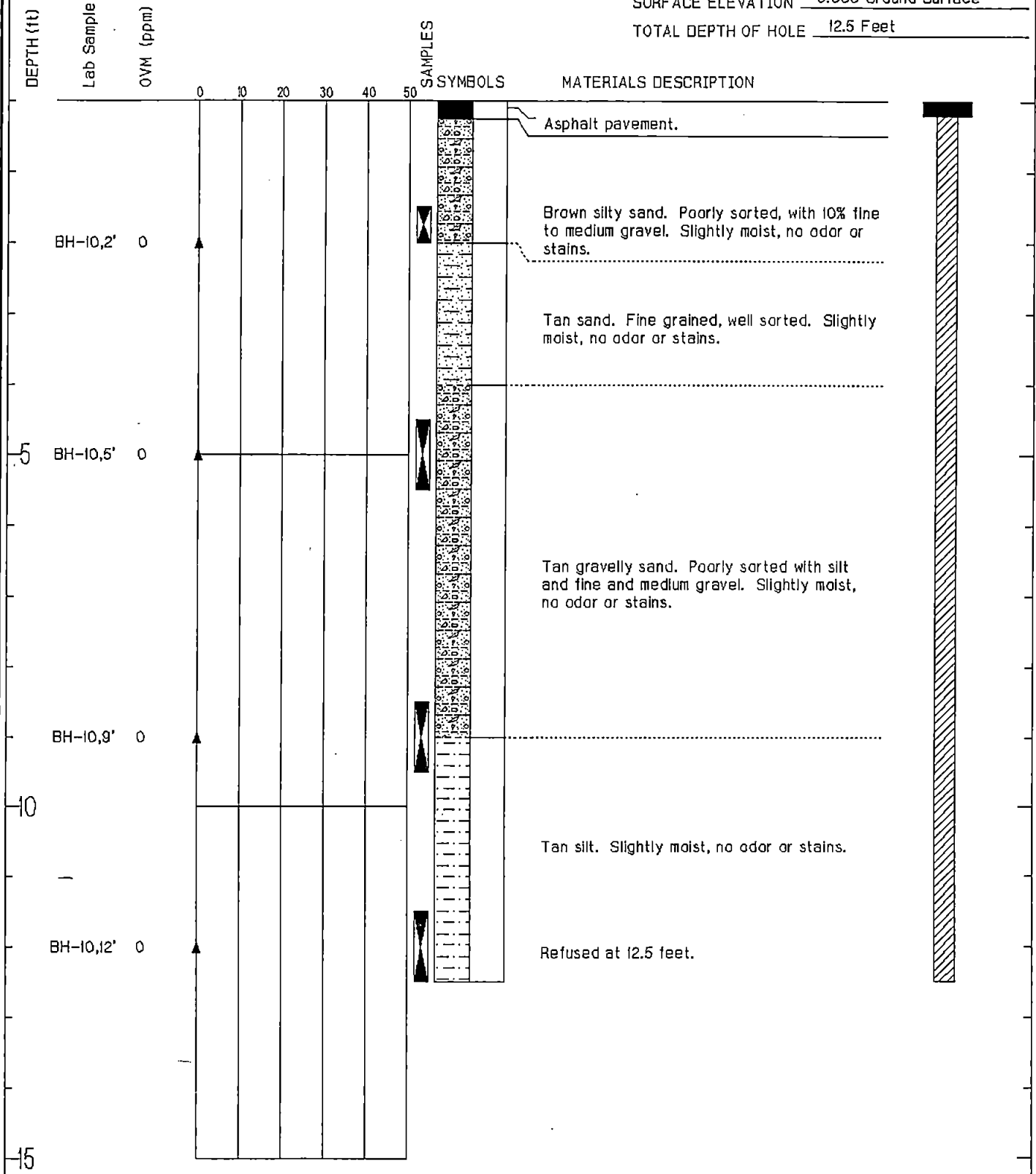
OVM CONCENTRATIONS (ppm)
 ▲ = OVM



WELL BH-10 (Page 1 of 1)

CLIENT NAME Scooper Cleaners - Dry Cleaner
 DATE DRILLED 04-06-00
 SURFACE ELEVATION 0.000 Ground Surface
 TOTAL DEPTH OF HOLE 12.5 Feet

OVM CONCENTRATIONS (ppm)
 ▲ = OVM



WELL BH-11 (Page 1 of 1)

CLIENT NAME Sooper Cleaners - Dry Cleaner

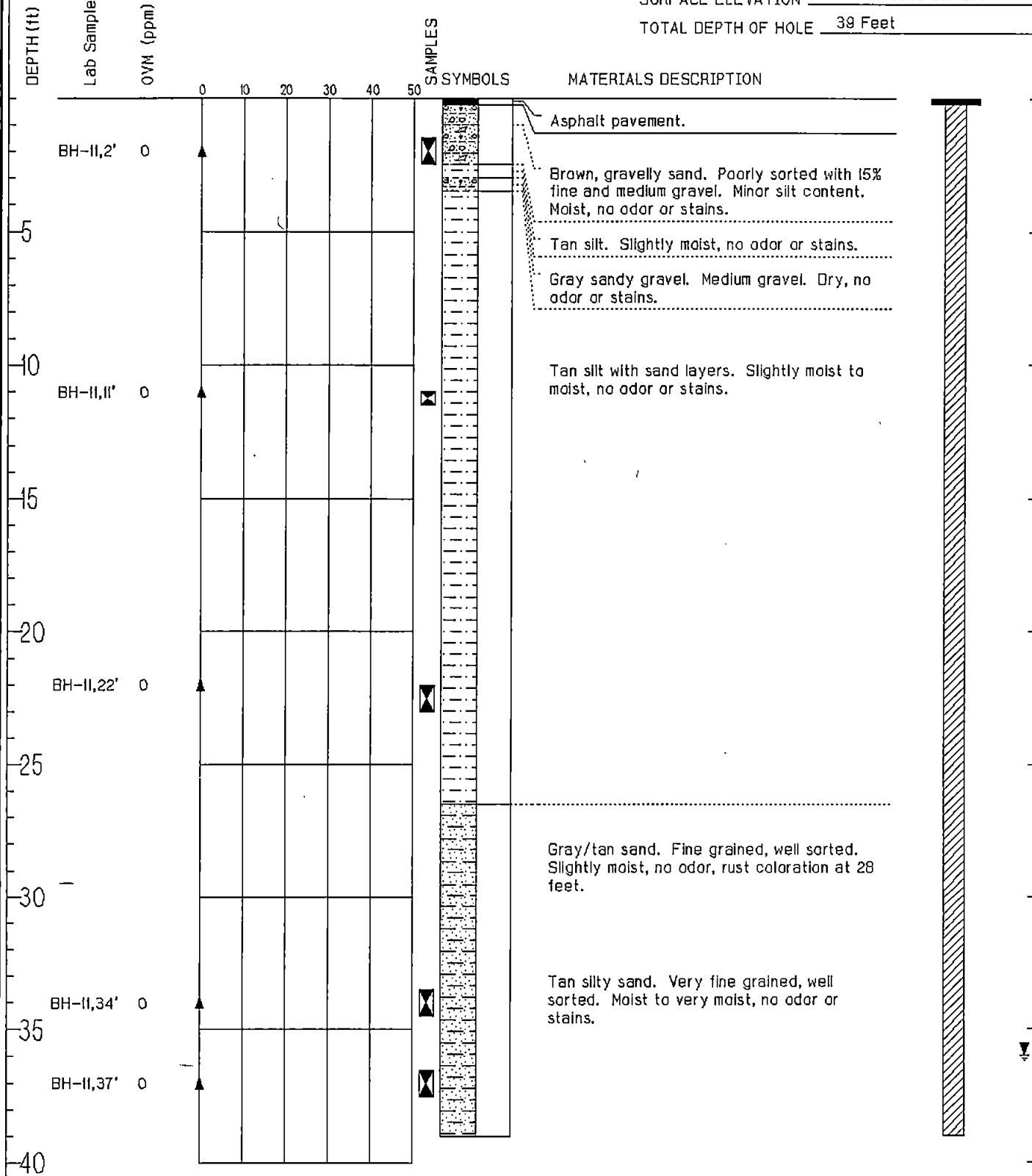
DATE DRILLED 04-05-00

SURFACE ELEVATION 0.000 Ground Surface

TOTAL DEPTH OF HOLE 39 Feet

OVM CONCENTRATIONS (ppm)

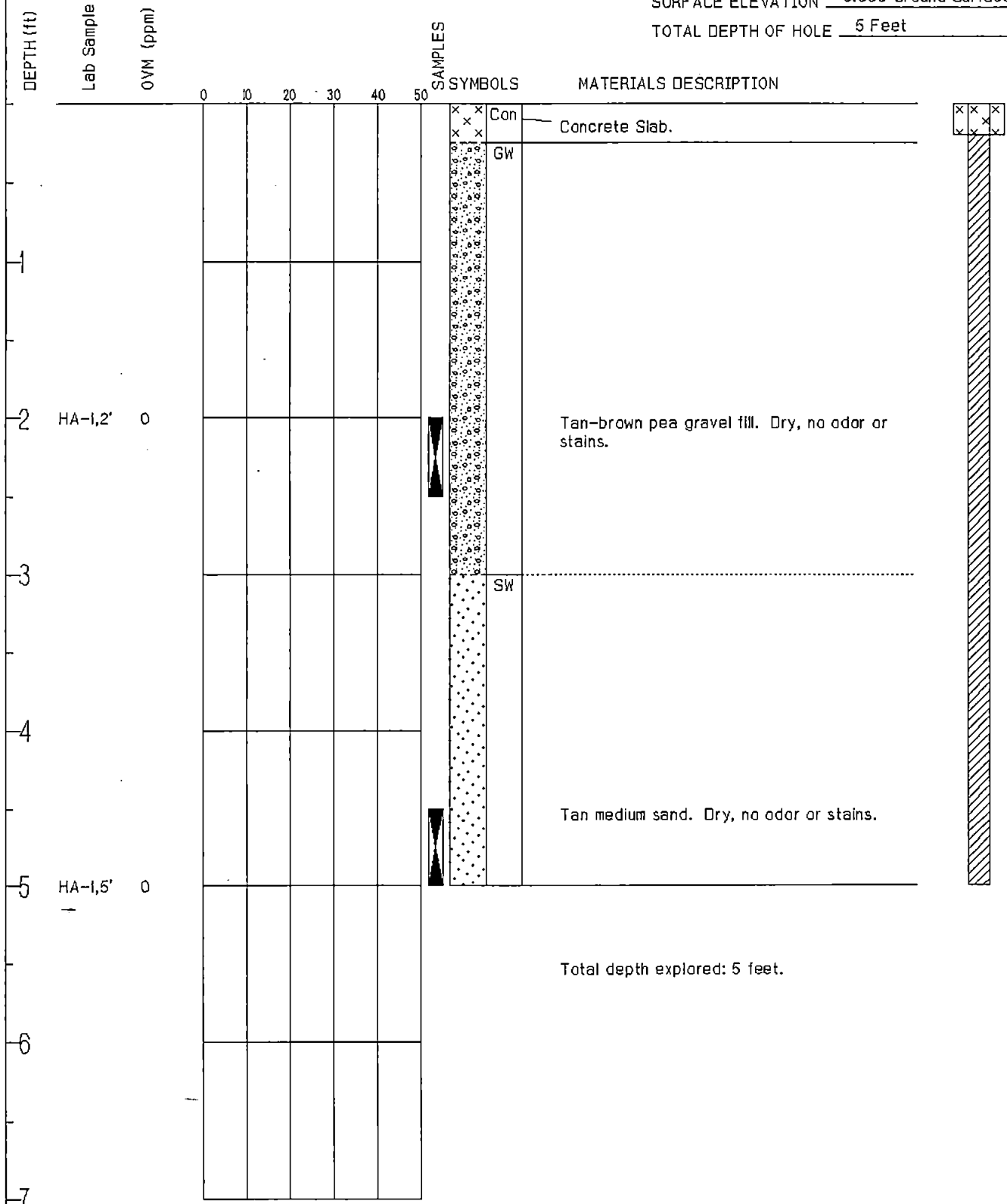
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WELL HA-1 (Page 1 of 1)

CLIENT NAME Sooper Cleaners - Dry Cleaner
 DATE DRILLED 05-28-00
 SURFACE ELEVATION 0.000 Ground Surface
 TOTAL DEPTH OF HOLE 5 Feet

OVM CONCENTRATIONS (ppm)
 ▲ = OVM



WELL HA-2 (Page 1 of 1)

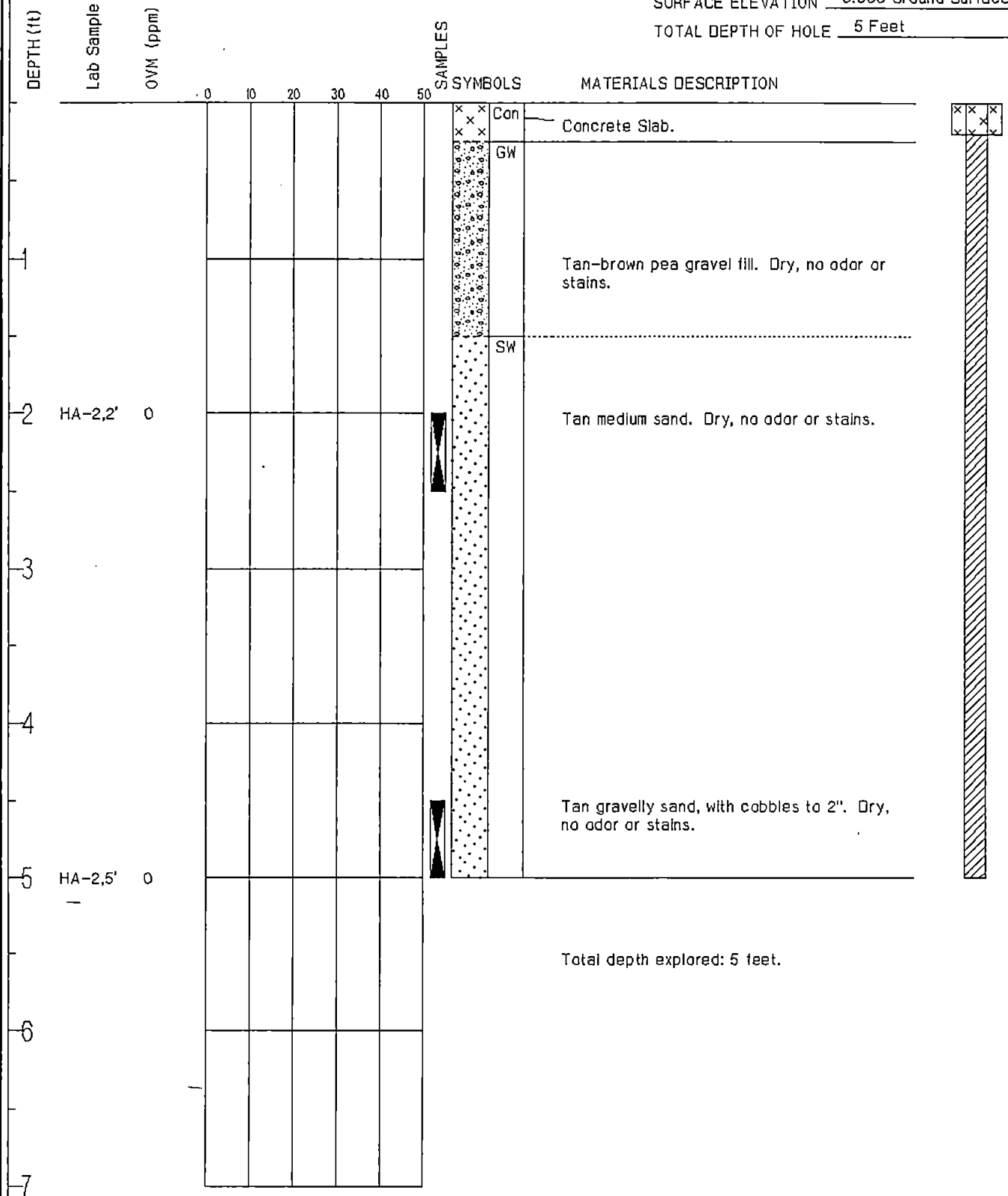
CLIENT NAME Sooper Cleaners - Dry Cleaner

DATE DRILLED 05-26-00

SURFACE ELEVATION 0.000 Ground Surface

TOTAL DEPTH OF HOLE 5 Feet

OVM CONCENTRATIONS (ppm)
▲ = OVM



WELL HA-3 (Page 1 of 1)

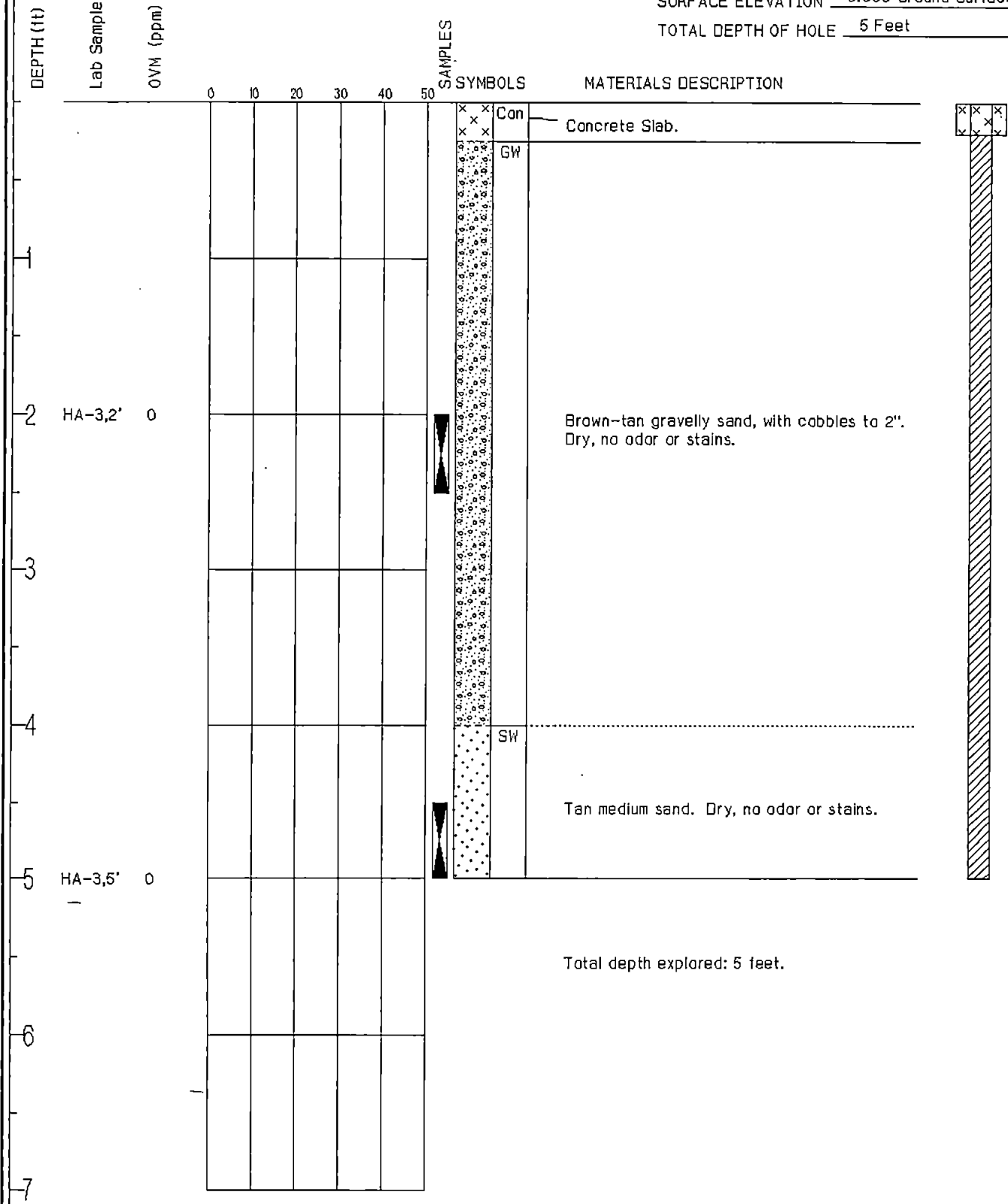
CLIENT NAME Scooper Cleaners - Dry Cleaner

DATE DRILLED 05-28-00

SURFACE ELEVATION 0.000 Ground Surface

TOTAL DEPTH OF HOLE 5 Feet

OVM CONCENTRATIONS (ppm)
▲ = OVM

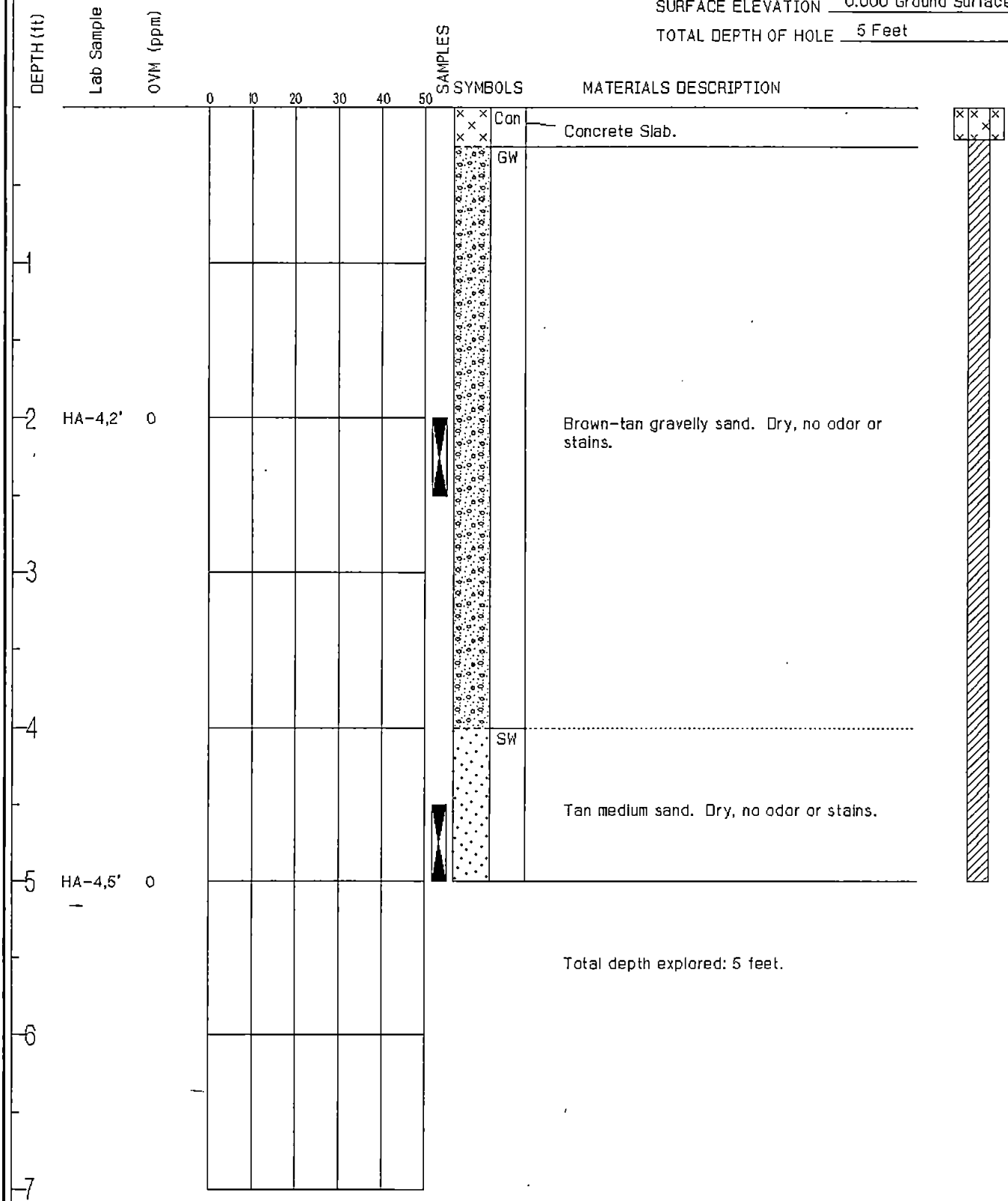


Total depth explored: 5 feet.

WELL HA-4 (Page 1 of 1)

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 DATE DRILLED 05-28-00
 SURFACE ELEVATION 0.000 Ground Surface
 TOTAL DEPTH OF HOLE 5 Feet

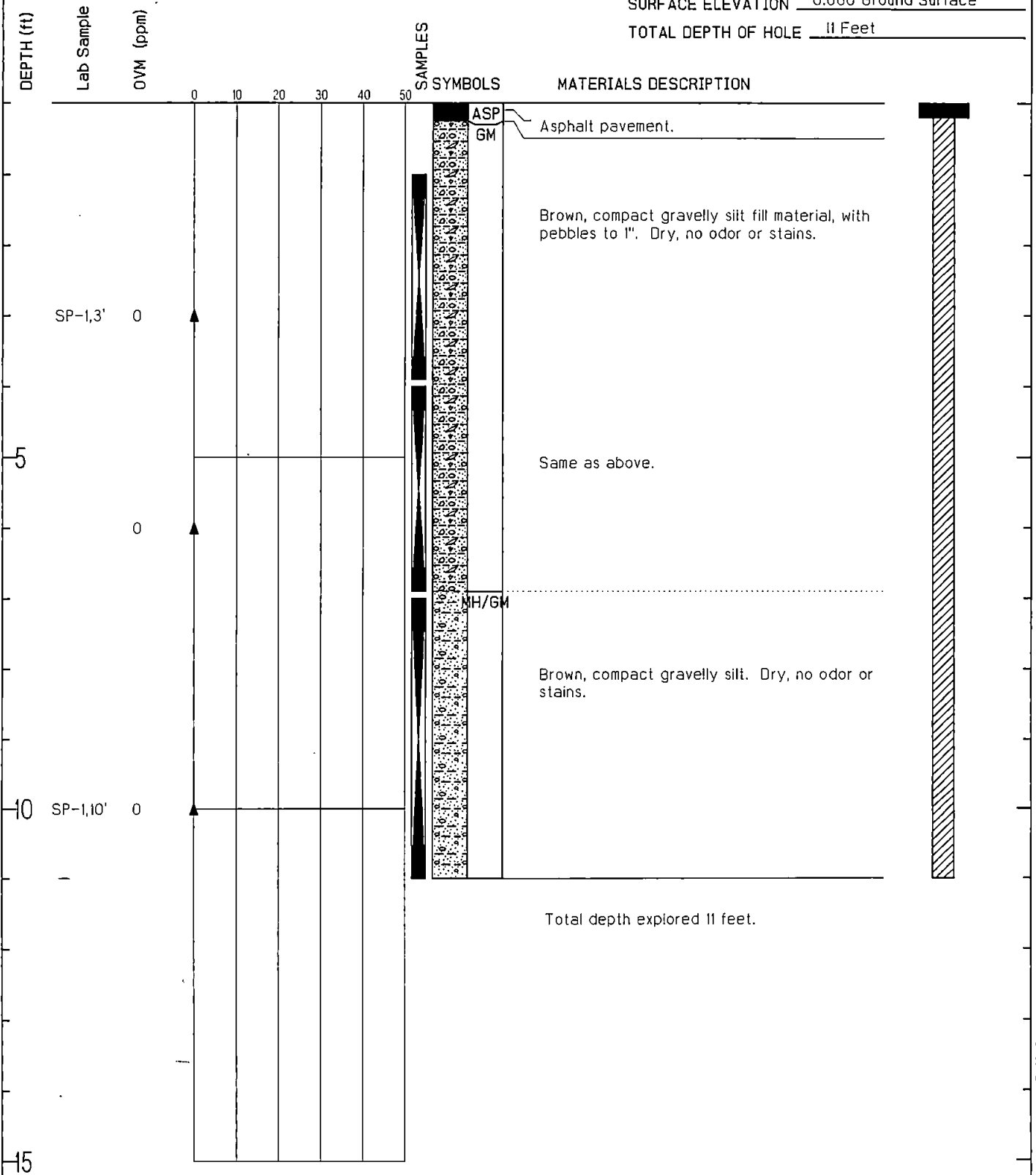
OVM CONCENTRATIONS (ppm)
 ▲ = OVM



WELL SP-1 *(Page 1 of 1)*

CLIENT NAME Soooper Cleaners - Dry Cleaner
 DATE DRILLED 05-31-00
 SURFACE ELEVATION 0.000 Ground Surface
 TOTAL DEPTH OF HOLE 11 Feet

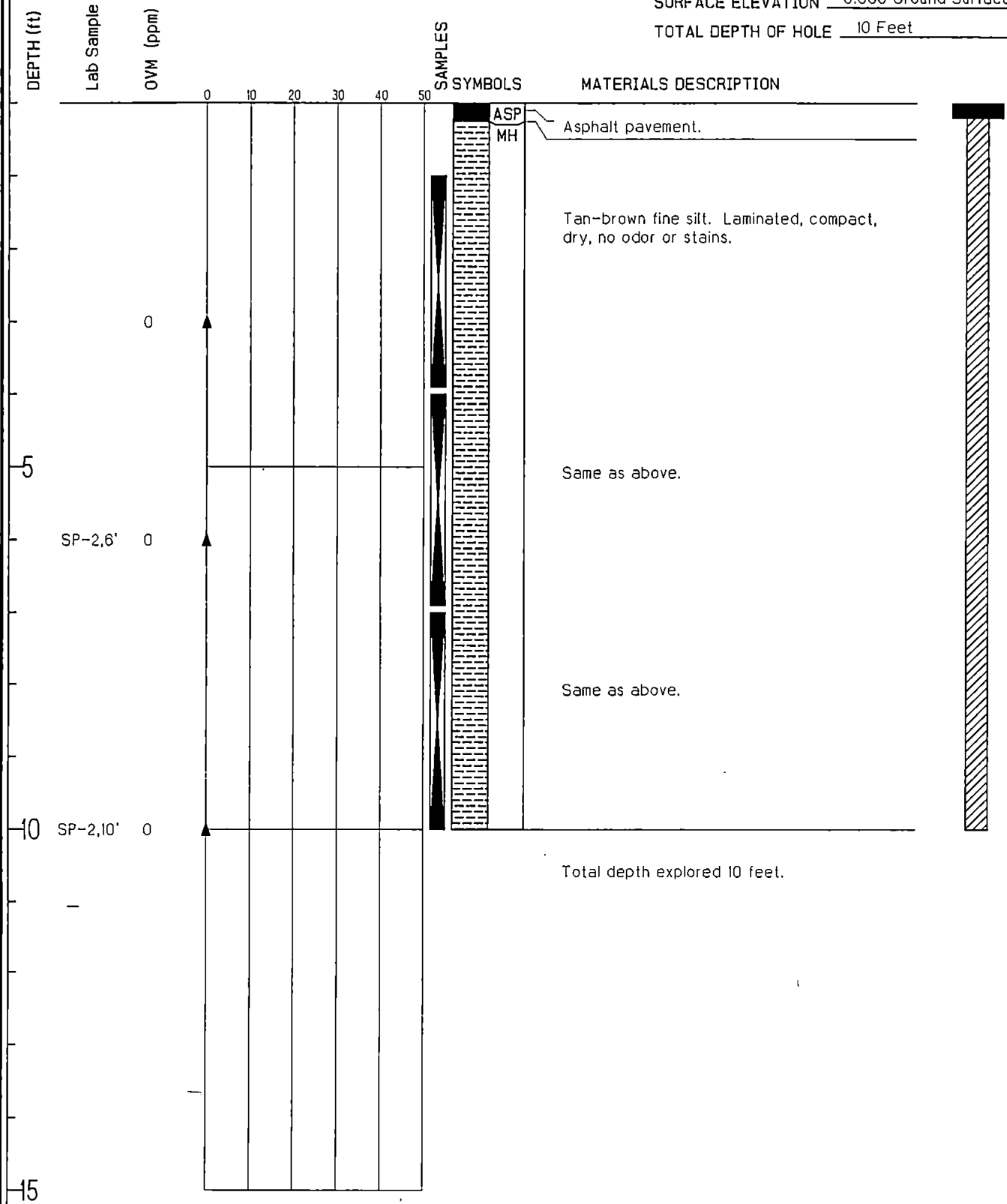
OVM CONCENTRATIONS (ppm)
 ▲ = OVM



WELL SP-2 *(Page 1 of 1)*

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 DATE DRILLED 05-31-00
 SURFACE ELEVATION 0.000 Ground Surface
 TOTAL DEPTH OF HOLE 10 Feet

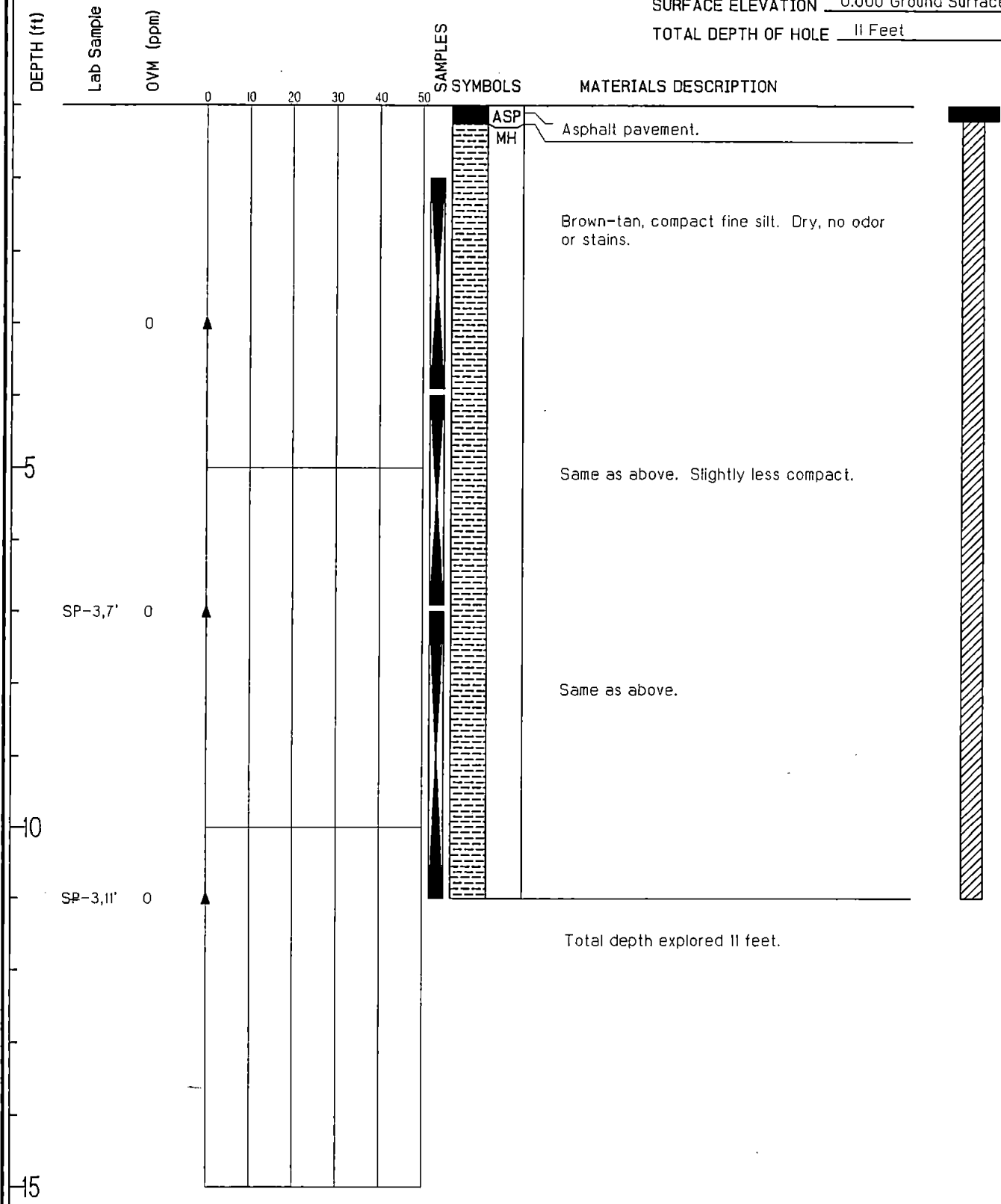
OVM CONCENTRATIONS (ppm)
 ▲ = OVM



WELL SP-3 *(Page 1 of 1)*

CLIENT NAME Soooper Cleaners - Dry Cleaner
 DATE DRILLED 05-31-00
 SURFACE ELEVATION 0.000 Ground Surface
 TOTAL DEPTH OF HOLE 11 Feet

OVM CONCENTRATIONS (ppm)
 ▲ = OVM



WELL SP-4 (Page 1 of 1)

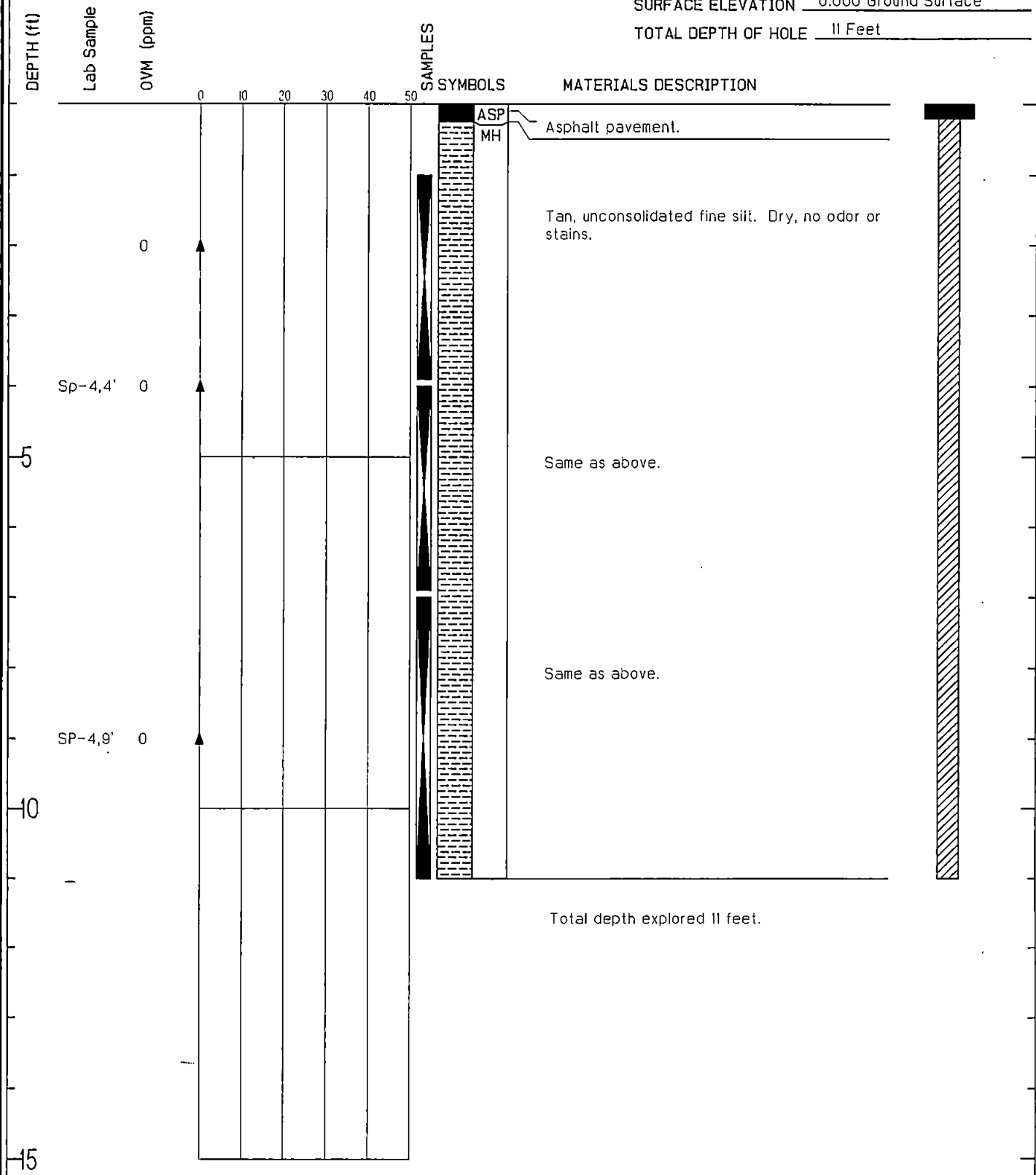
CLIENT NAME Sooper Cleaners - Dry Cleaner

DATE DRILLED 05-31-00

SURFACE ELEVATION 0.000 Ground Surface

TOTAL DEPTH OF HOLE 11 Feet

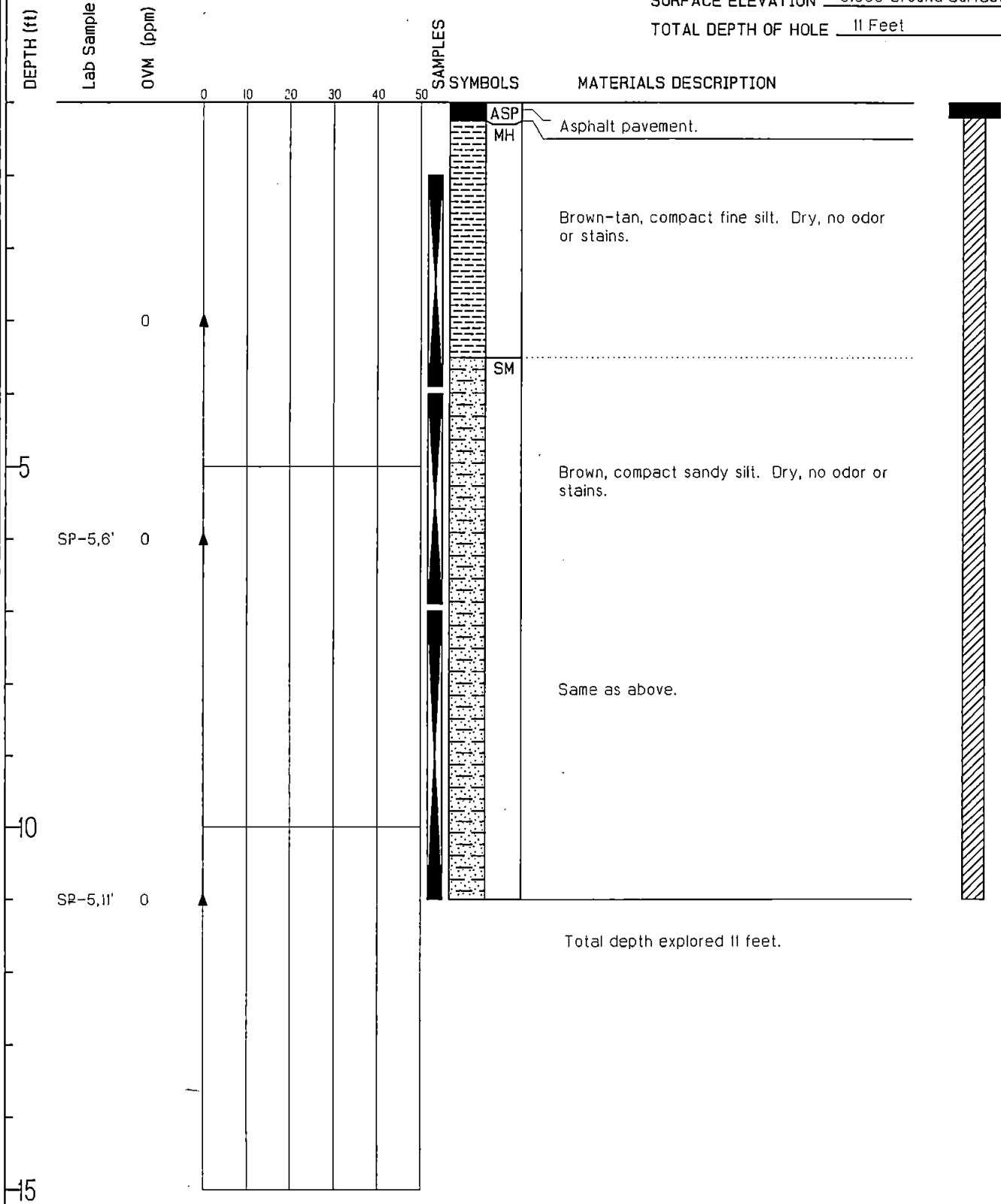
OVM CONCENTRATIONS (ppm)
▲ = OVM



WELL SP-5 *(Page 1 of 1)*

CLIENT NAME Soooper Cleaners - Dry Cleaner
 DATE DRILLED 05-31-00
 SURFACE ELEVATION 0.000 Ground Surface
 TOTAL DEPTH OF HOLE 11 Feet

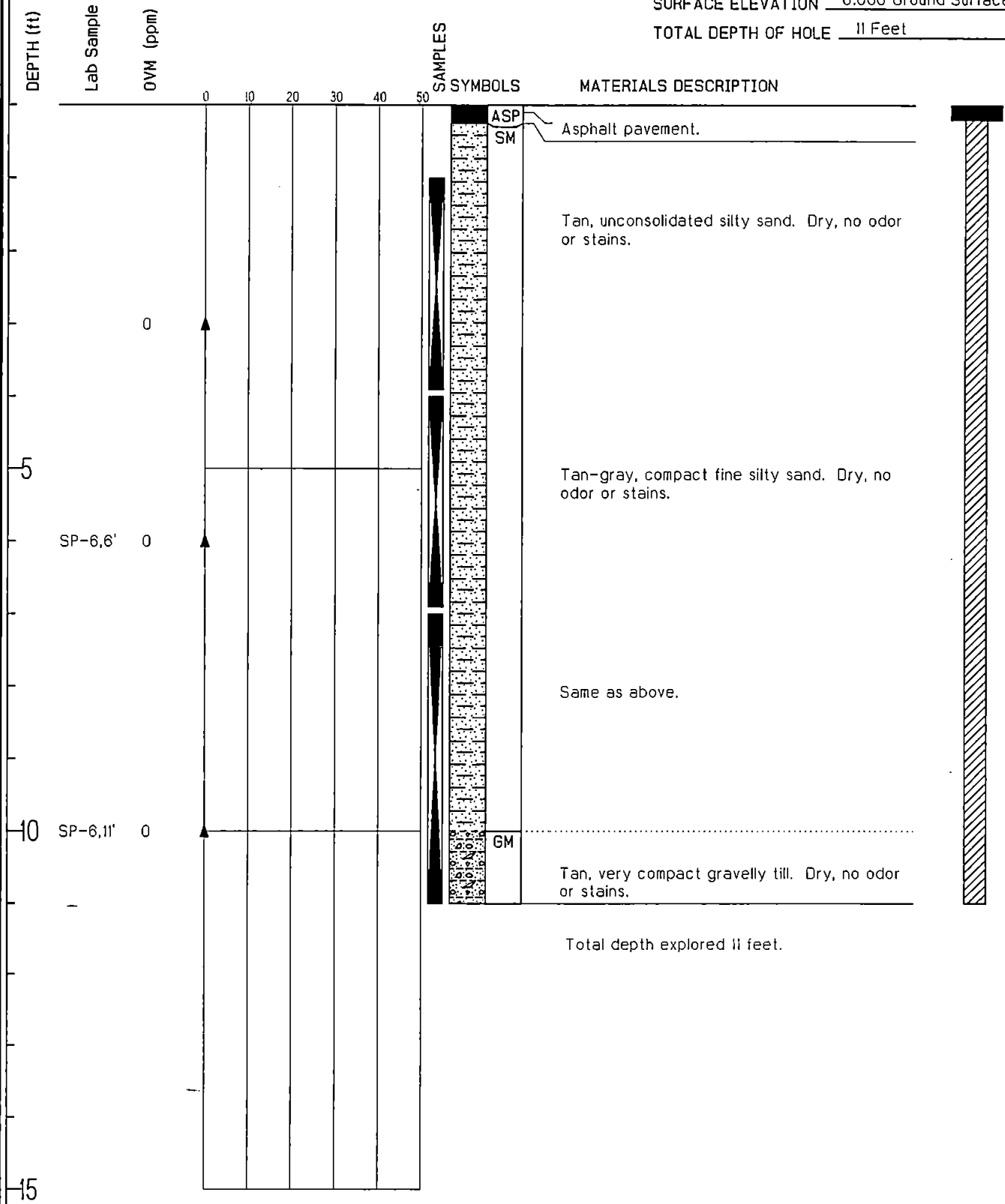
OVM CONCENTRATIONS (ppm)
 ▲ = OVM



WELL SP-6 (Page 1 of 1)

CLIENT NAME Sooper Cleaners - Dry Cleaner
 DATE DRILLED 05-31-00
 SURFACE ELEVATION 0.000 Ground Surface
 TOTAL DEPTH OF HOLE 11 Feet

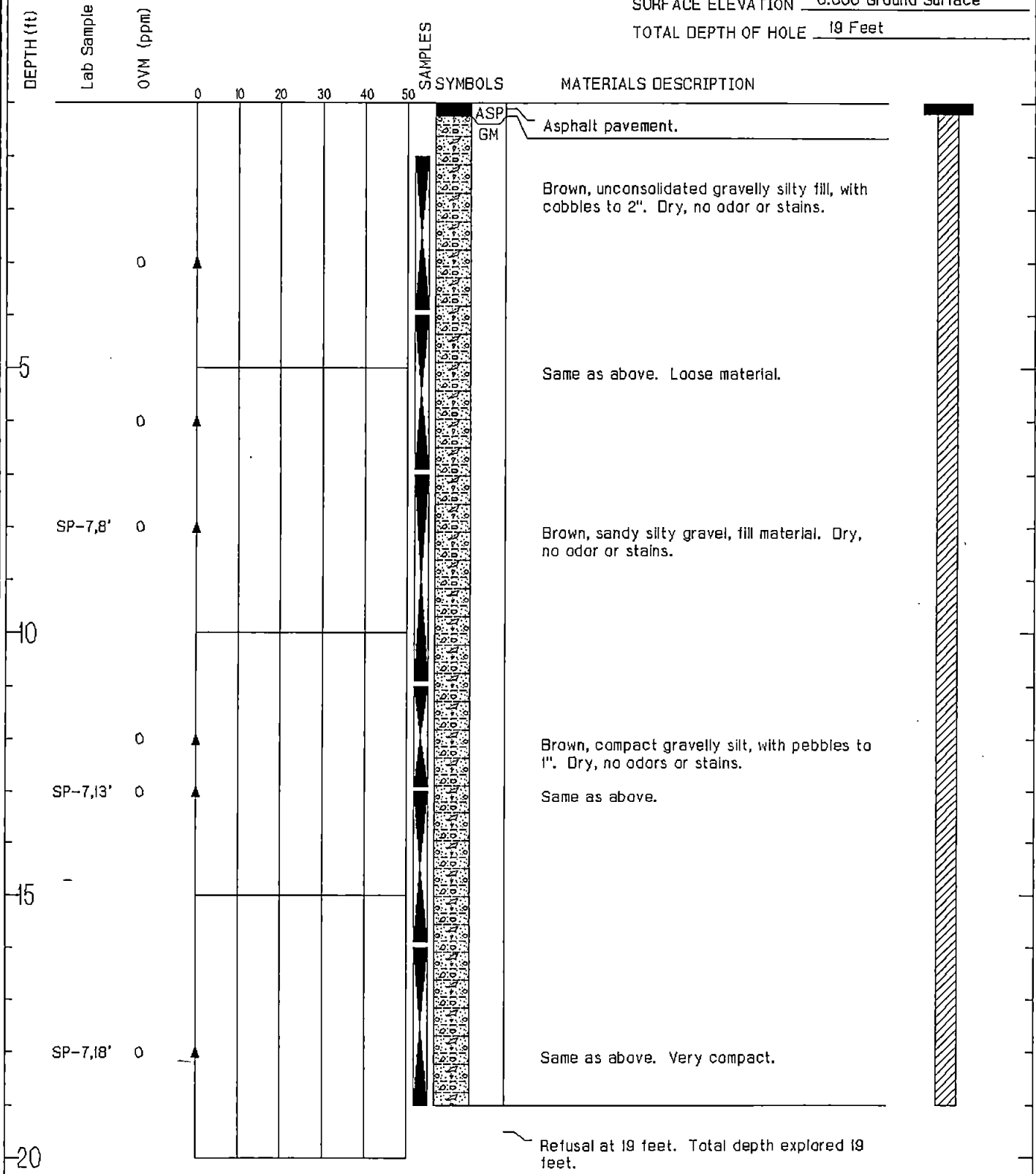
OVM CONCENTRATIONS (ppm)
 ▲ = OVM



WELL SP-7 (Page 1 of 1)

CLIENT NAME Scooper Cleaners - Dry Cleaner
 DATE DRILLED 05-31-00
 SURFACE ELEVATION 0.000 Ground Surface
 TOTAL DEPTH OF HOLE 19 Feet

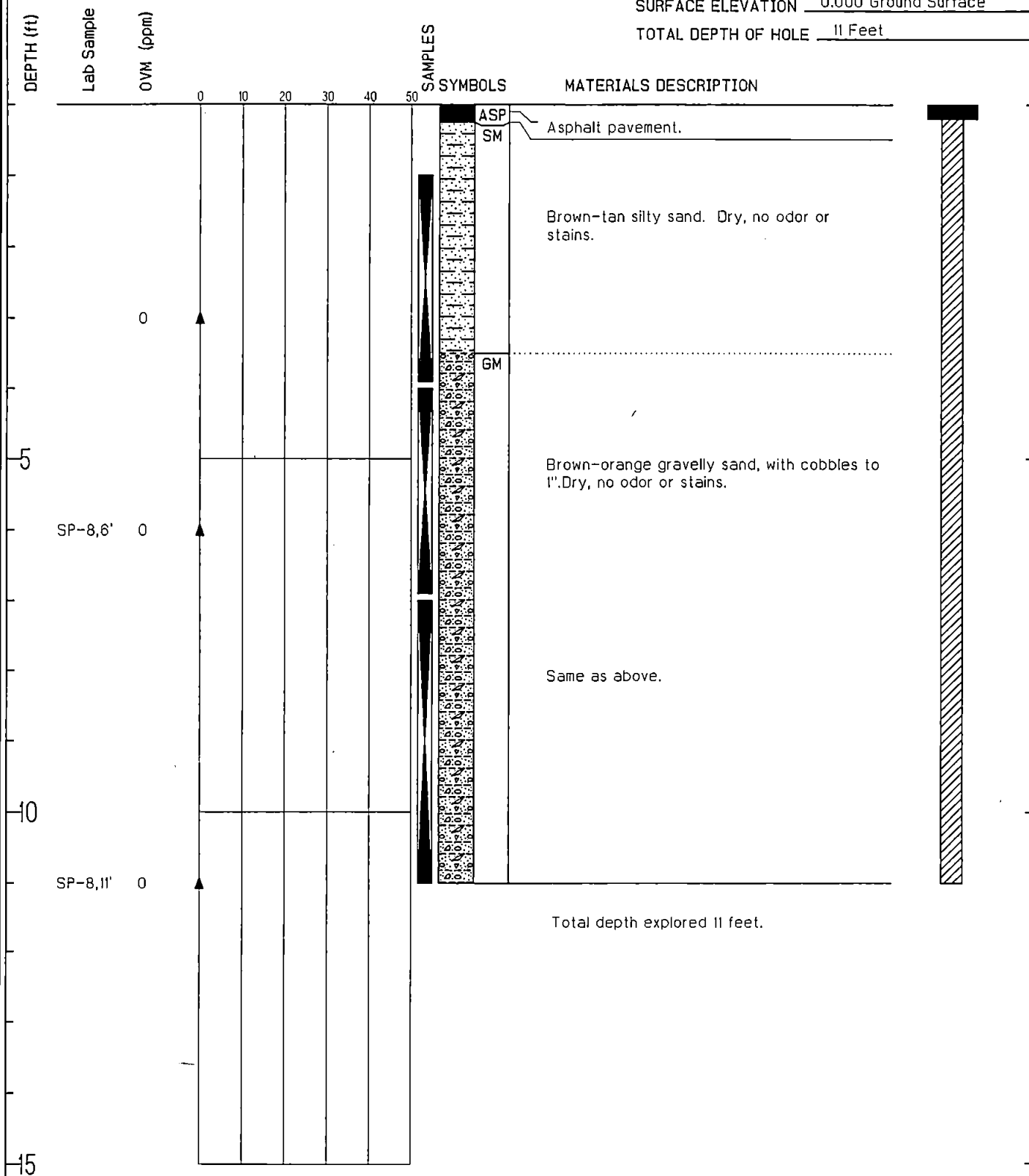
OVM CONCENTRATIONS (ppm)
 ▲ = OVM



WELL SP-8 *(Page 1 of 1)*

CLIENT NAME Sooper Cleaners - Dry Cleaner
 DATE DRILLED 05-31-00
 SURFACE ELEVATION 0.000 Ground Surface
 TOTAL DEPTH OF HOLE 11 Feet

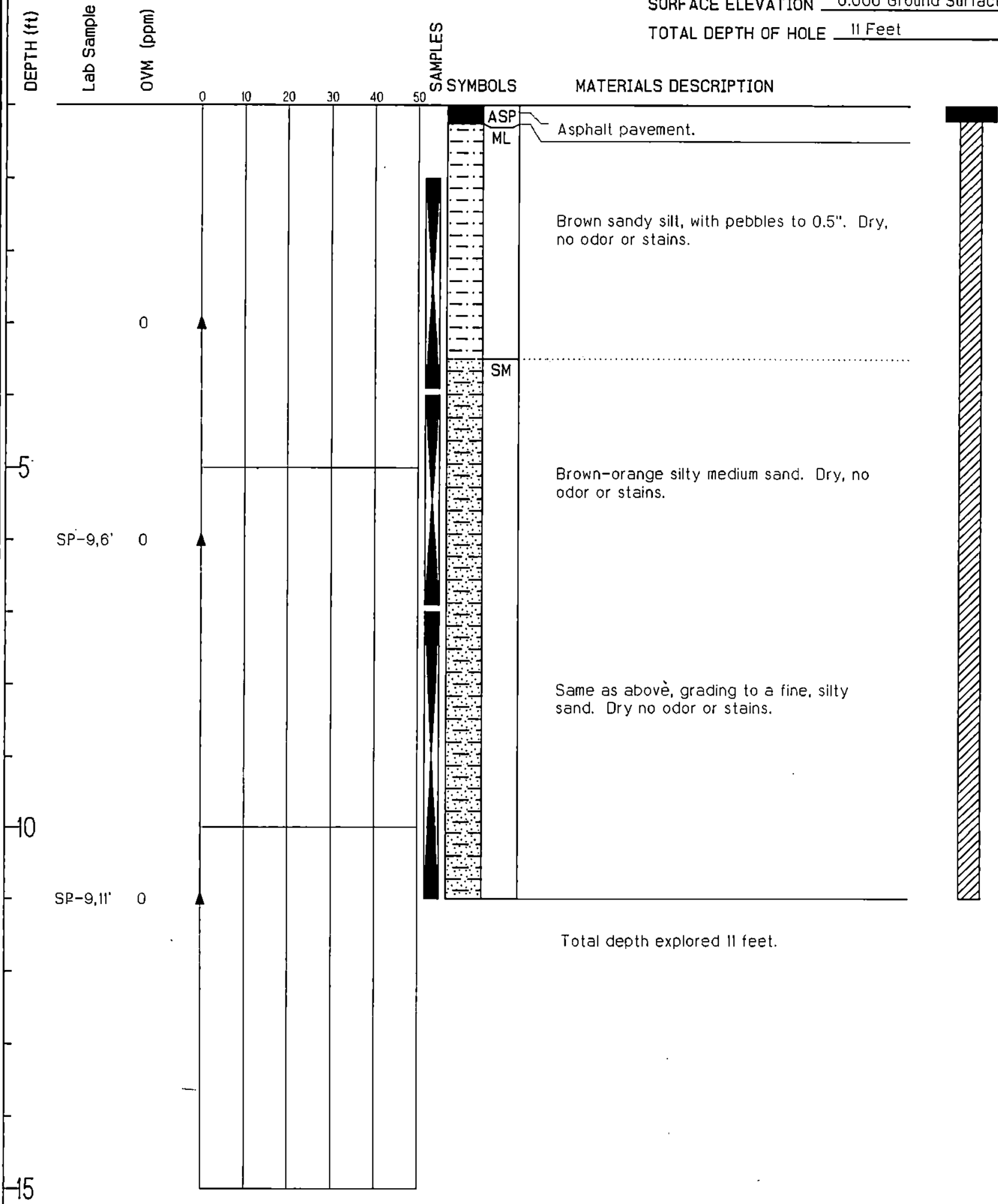
OVM CONCENTRATIONS (ppm)
 ▲ = OVM



WELL SP-9 *(Page 1 of 1)*

CLIENT NAME Sooper Cleaners - Dry Cleaner
 DATE DRILLED 05-31-00
 SURFACE ELEVATION 0.000 Ground Surface
 TOTAL DEPTH OF HOLE 11 Feet

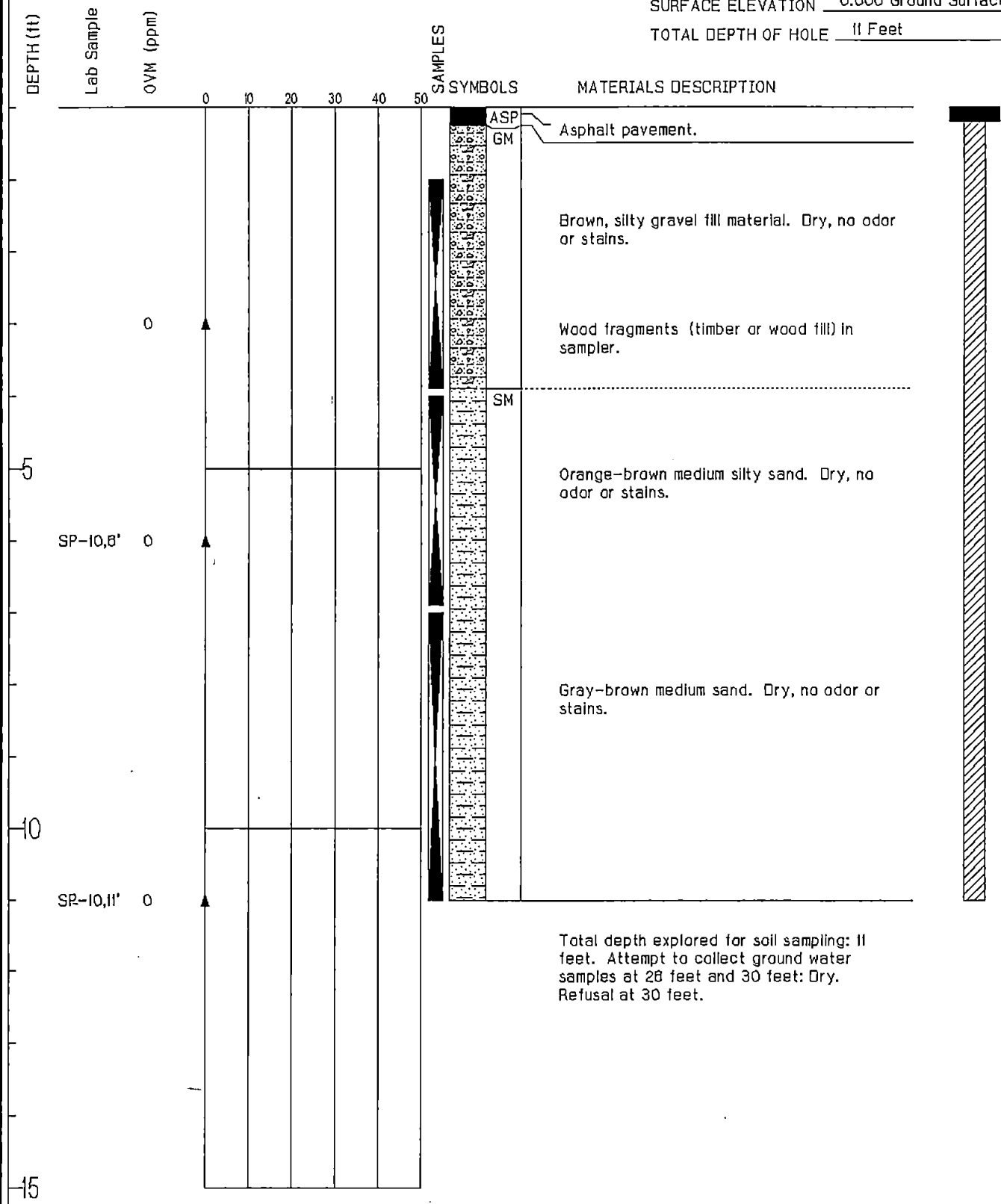
OVM CONCENTRATIONS (ppm)
 ▲ = OVM



WELL SP-10 (Page 1 of 1)

CLIENT NAME Sooper Cleaners - Dry Cleaner
 DATE DRILLED 05-31-00
 SURFACE ELEVATION 0.000 Ground Surface
 TOTAL DEPTH OF HOLE 11 Feet

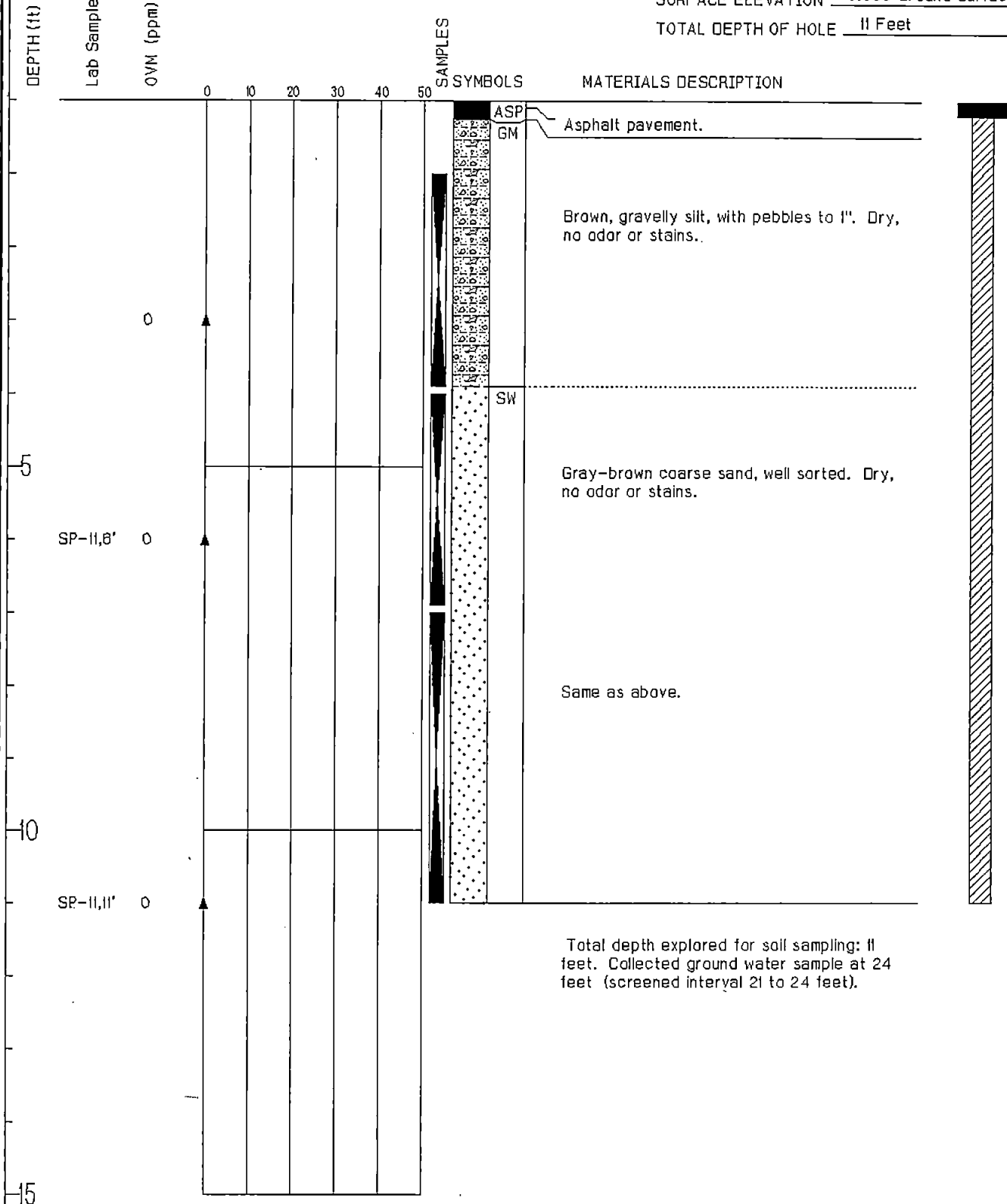
OVM CONCENTRATIONS (ppm)
 ▲ = OVM

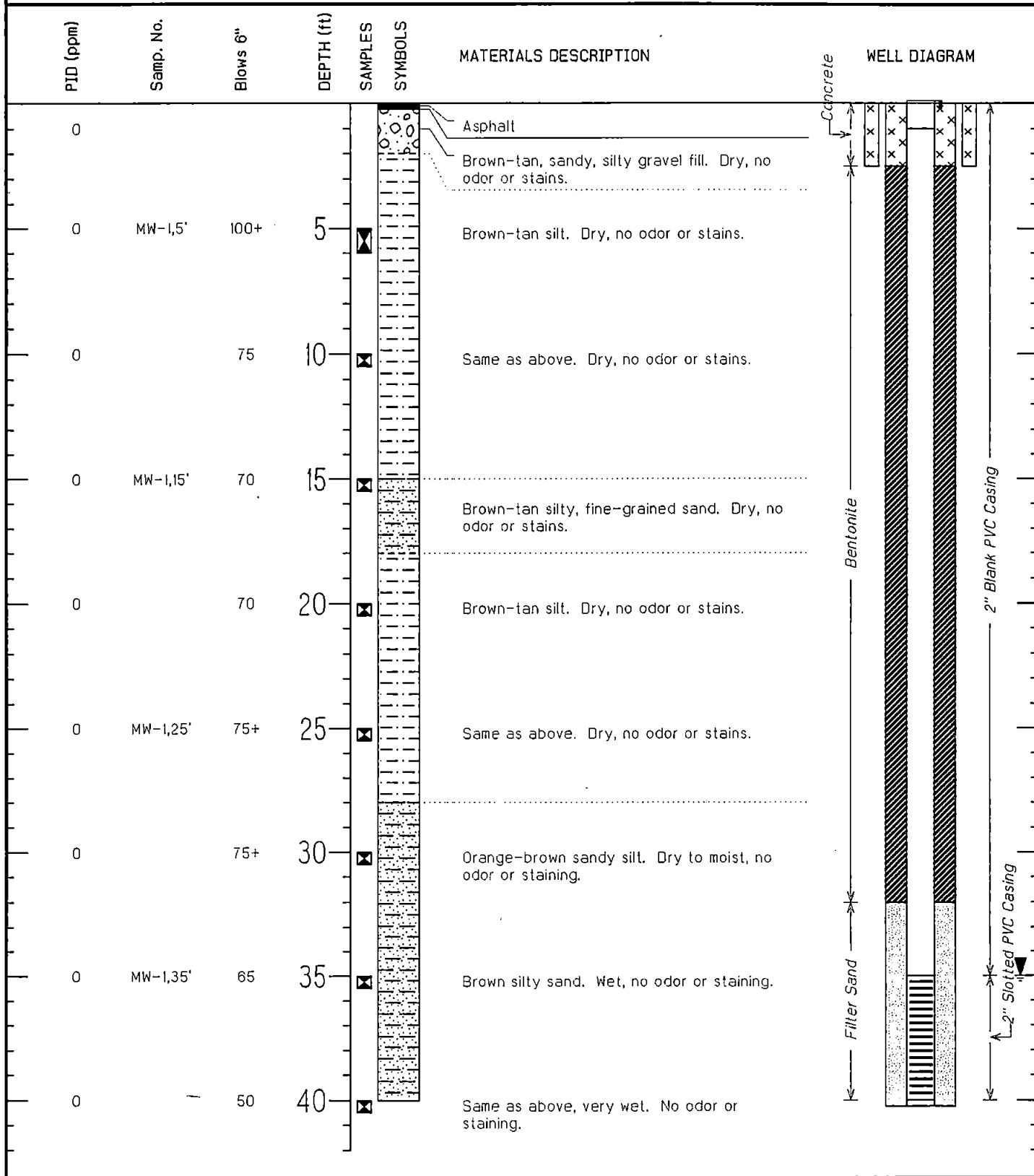


WELL SP-11 (Page 1 of 1)

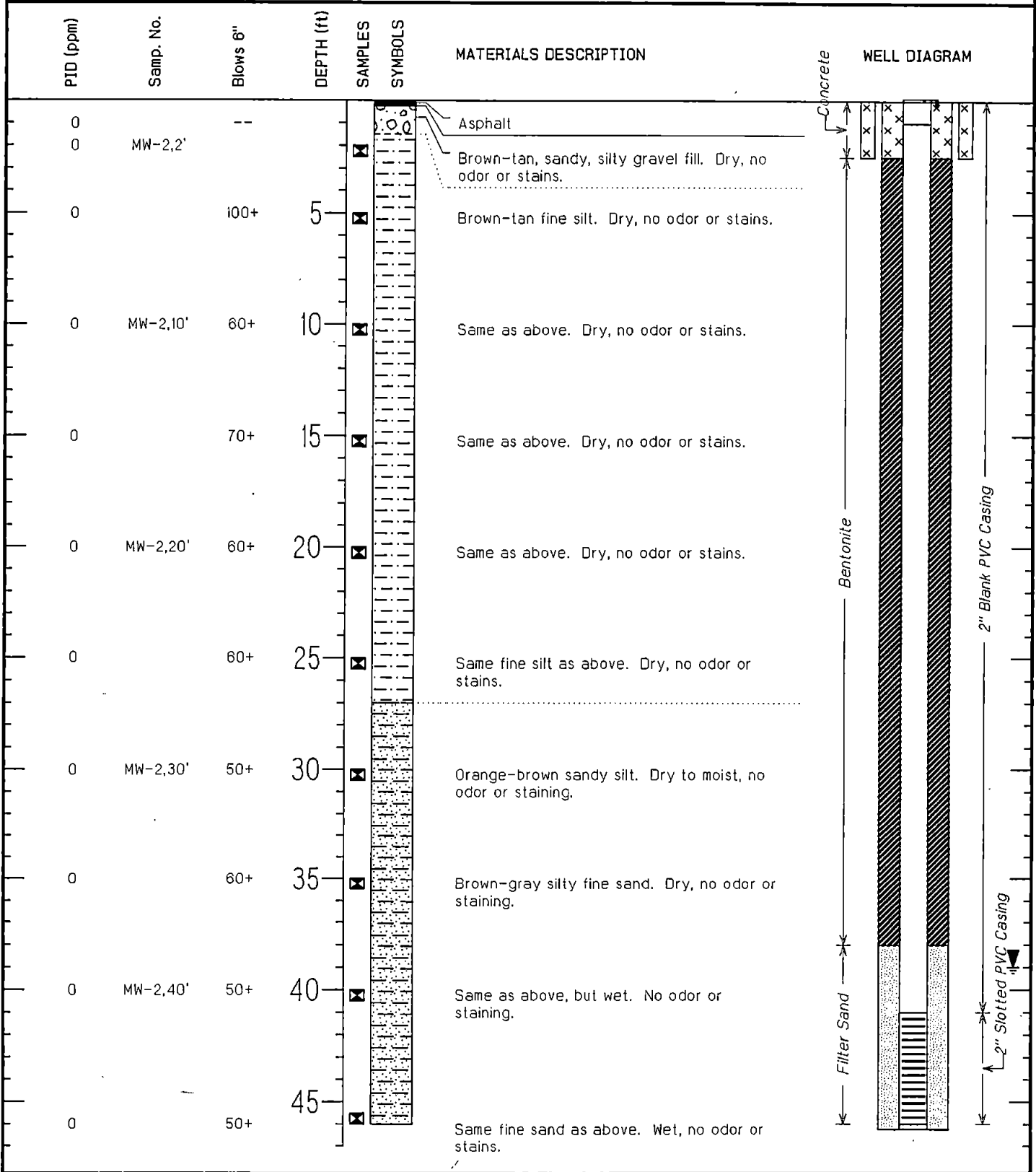
CLIENT NAME Sooper Cleaners - Dry Cleaner
 DATE DRILLED 05-31-00
 SURFACE ELEVATION 0.000 Ground Surface
 TOTAL DEPTH OF HOLE 11 Feet

OVM CONCENTRATIONS (ppm)
 ▲ = OVM

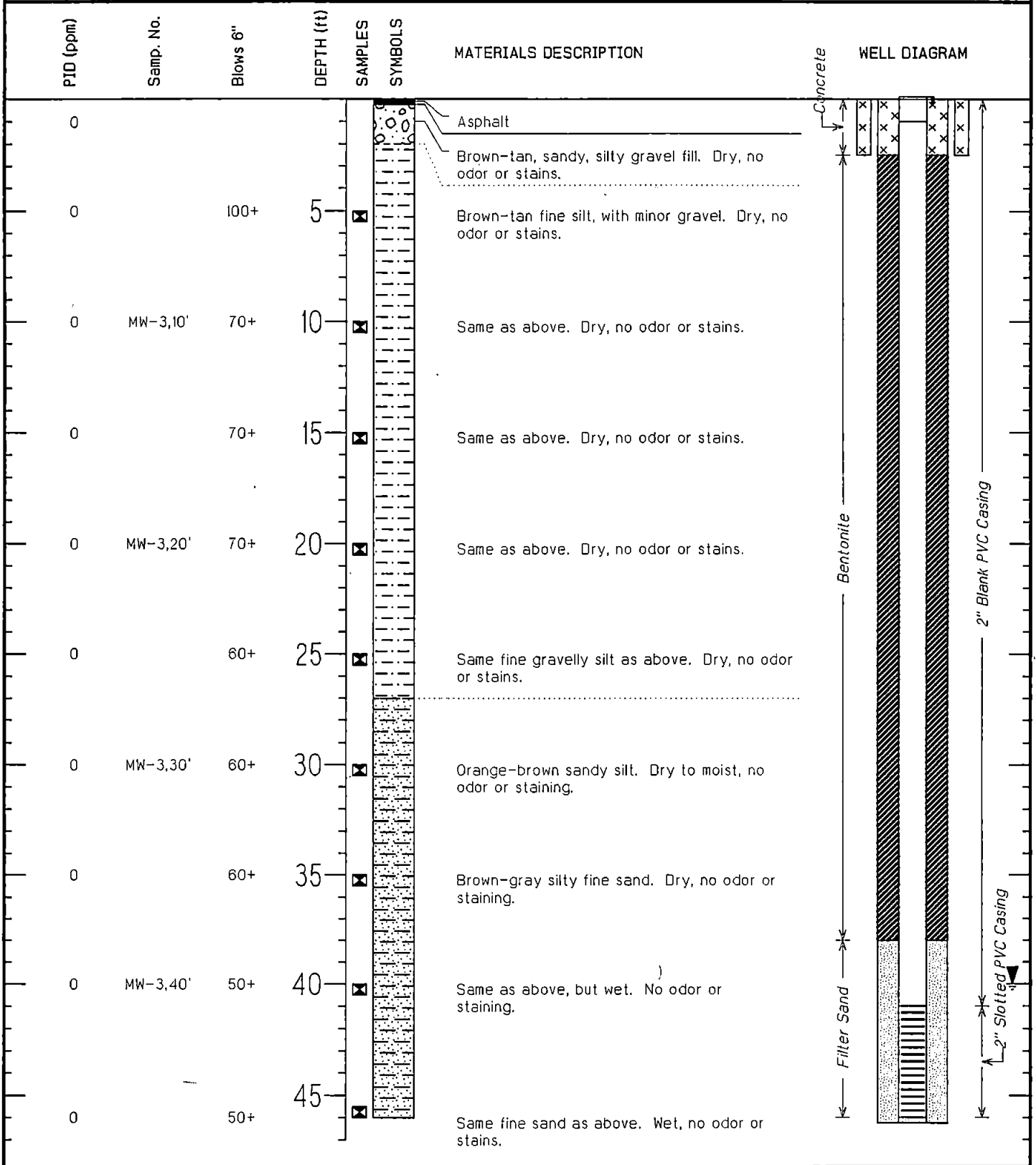




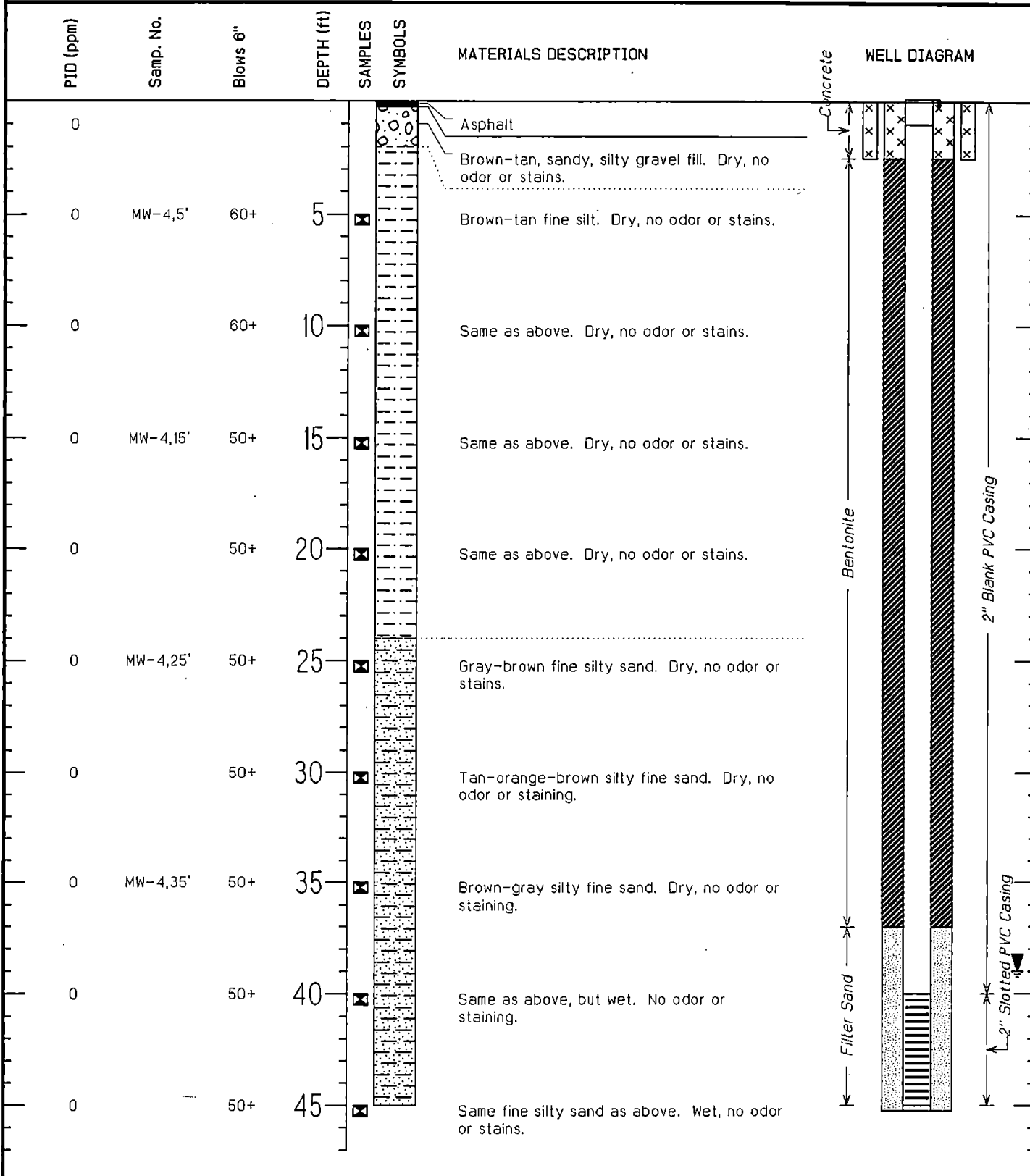
Project	<u>Normandy Park - Sooper Dry Cleaner</u>	Drill Company	<u>Cascade Drilling</u>
Location	<u>Normandy Park, WA</u>	Date	<u>06-06-00</u>
Project Number	<u>01499025.01</u>	Surface Elevation	<u>RP @ 270.49 feet above MSL</u>
Logged by	<u>Daniel Venchiarutti</u>	TOTAL DEPTH OF HOLE	<u>40 Feet</u>
Drill Method	<u>Hollow Stem Auger</u>	Water Level	<u>35 Feet</u>



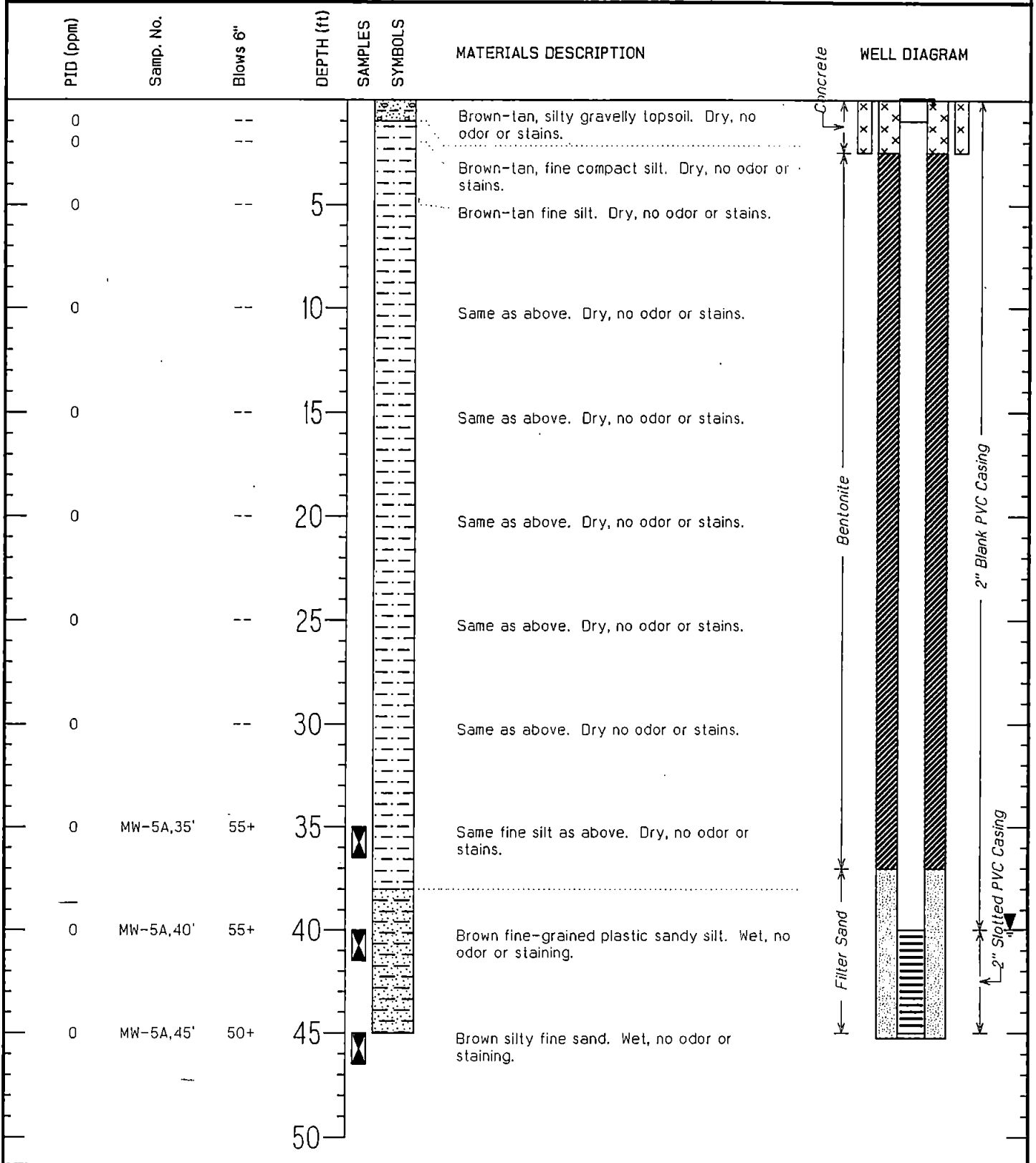
Project	Normandy Park - Sooper Dry Cleaner	Drill Company	Cascade Drilling
Location	Normandy Park, WA	Date	06-06-00
Project Number	01499025.01	Surface Elevation	RP @ 270.78 feet above MSL
Logged by	Daniel Venchiarutti	TOTAL DEPTH OF HOLE	46 Feet
Drill Method	Hollow Stem Auger	Water Level	39 Feet



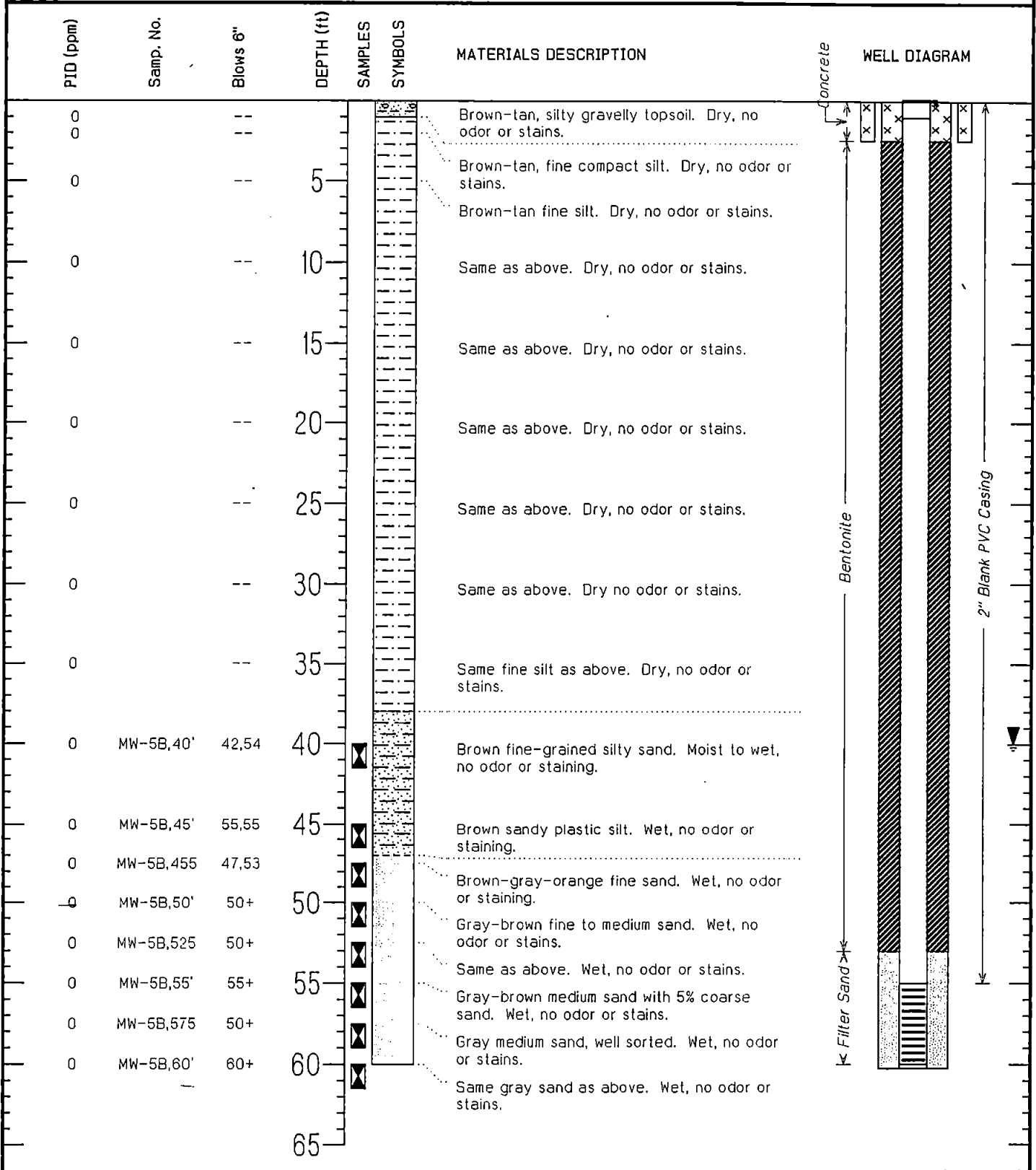
Project	Normandy Park - Sooper Dry Cleaner	Drill Company	Cascade Drilling
Location	Normandy Park, WA	Date	06-06-00
Project Number	01499025.01	Surface Elevation	RP @ 271.67 feet above MSL
Logged by	Daniel Venchiarutti	TOTAL DEPTH OF HOLE	46 Feet
Drill Method	Hollow Stem Auger	Water Level	40 Feet



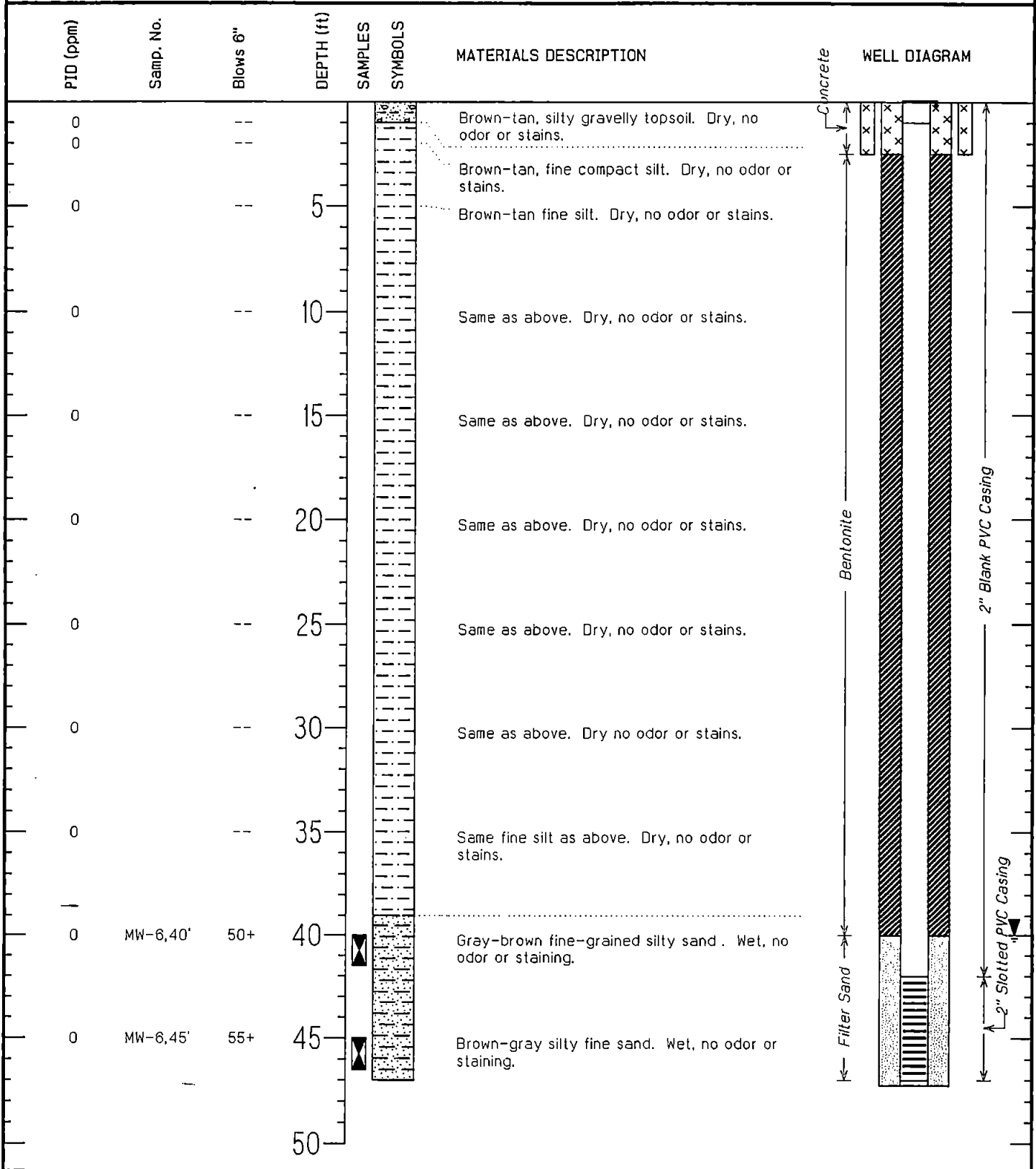
Project	Normandy Park - Sooper Dry Cleaner	Drill Company	Cascade Drilling
Location	Normandy Park, WA	Date	06-06-00
Project Number	01499025.01	Surface Elevation	RP @ 272.01 feet above MSL
Logged by	Daniel Venchiarutti	TOTAL DEPTH OF HOLE	45 Feet
Drill Method	Hollow Stem Auger	Water Level	39 Feet



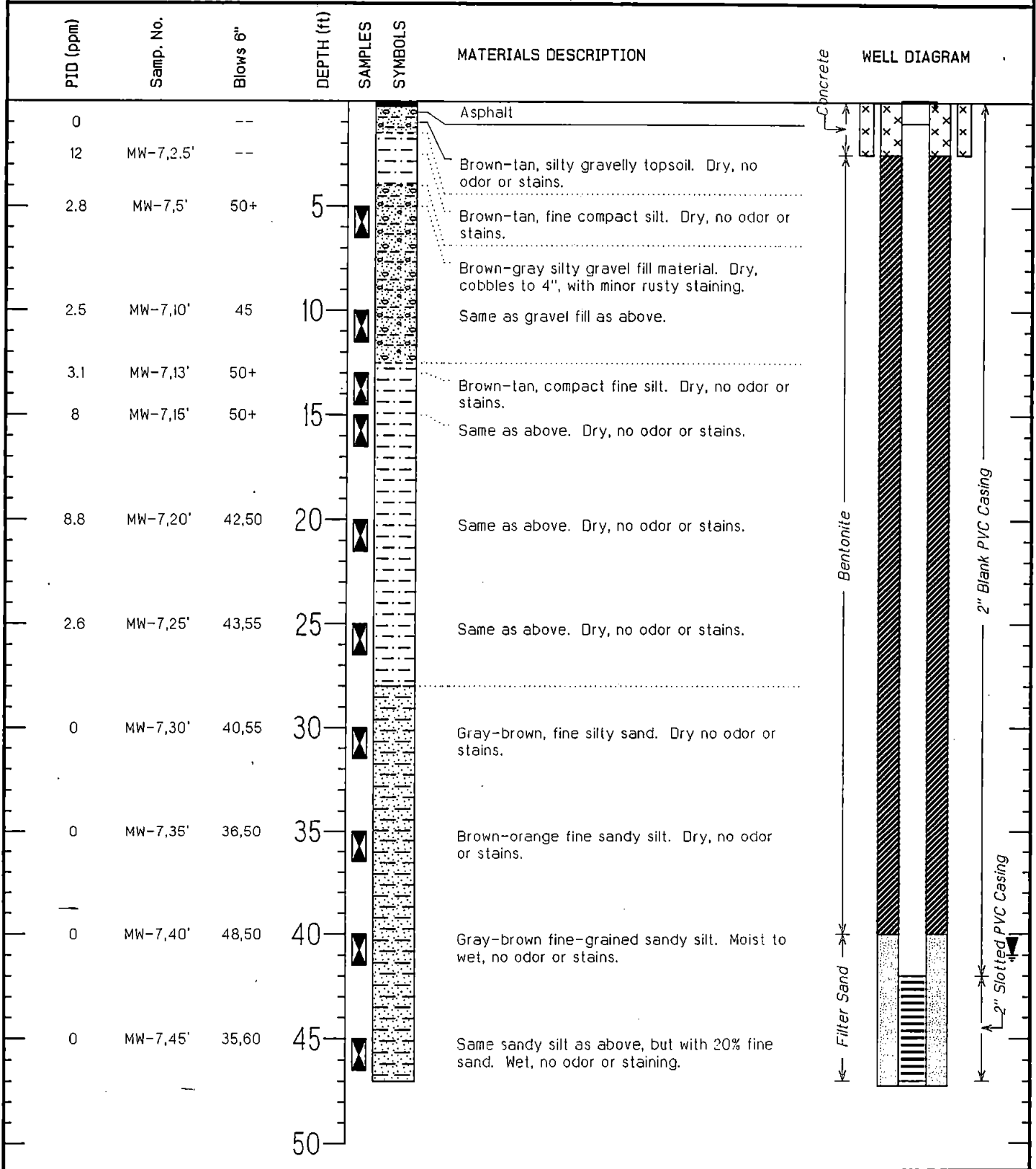
Project <u>Normandy Park - Sooper Dry Cleaner</u>	Drill Company <u>Cascade Drilling</u>
Location <u>Normandy Park, WA</u>	Date <u>08-24-00</u>
Project Number <u>01499025.02</u>	Surface Elevation <u>RP @ 271.29 feet above MSL</u>
Logged by <u>Daniel Venchiarutti</u>	TOTAL DEPTH OF HOLE <u>45 Feet</u>
Drill Method <u>Hollow Stem Auger</u>	Water Level <u>40 Feet</u>



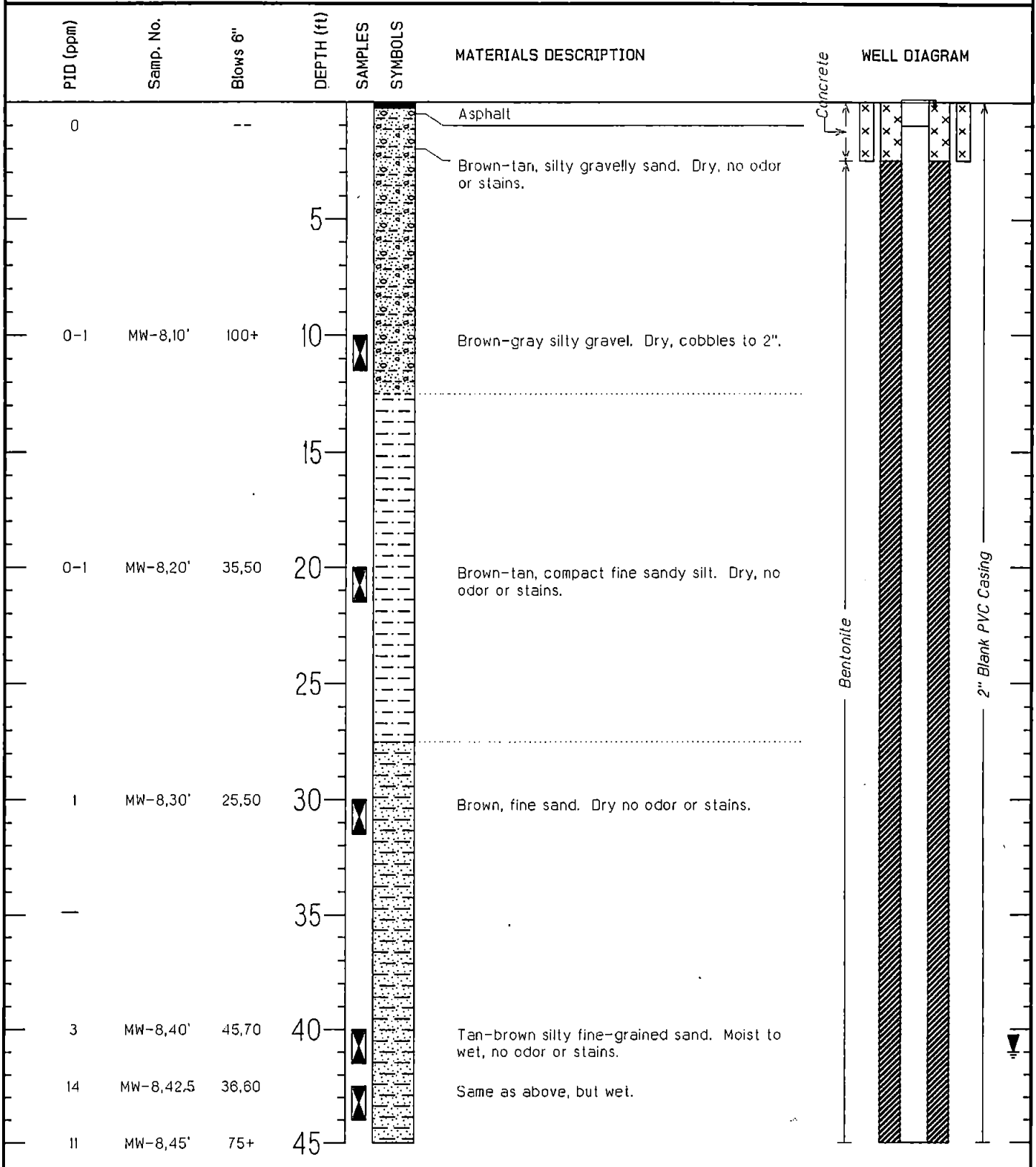
Project	Normandy Park - Sooper Dry Cleaner	Drill Company	Cascade Drilling
Location	Normandy Park, WA	Date	08-24-00
Project Number	01499025.02	Surface Elevation	RP @ 271.10 feet above MSL
Logged by	Daniel Venchiarutti	TOTAL DEPTH OF HOLE	60 Feet
Drill Method	Hollow Stem Auger	Water Level	40 Feet



Project	Normandy Park - Sooper Dry Cleaner	Drill Company	Cascade Drilling
Location	Normandy Park, WA	Date	08-24-00
Project Number	01499025.02	Surface Elevation	RP @ 272.27 feet above MSL
Logged by	Daniel Venchiarutti	TOTAL DEPTH OF HOLE	47 Feet
Drill Method	Hollow Stem Auger	Water Level	40 Feet



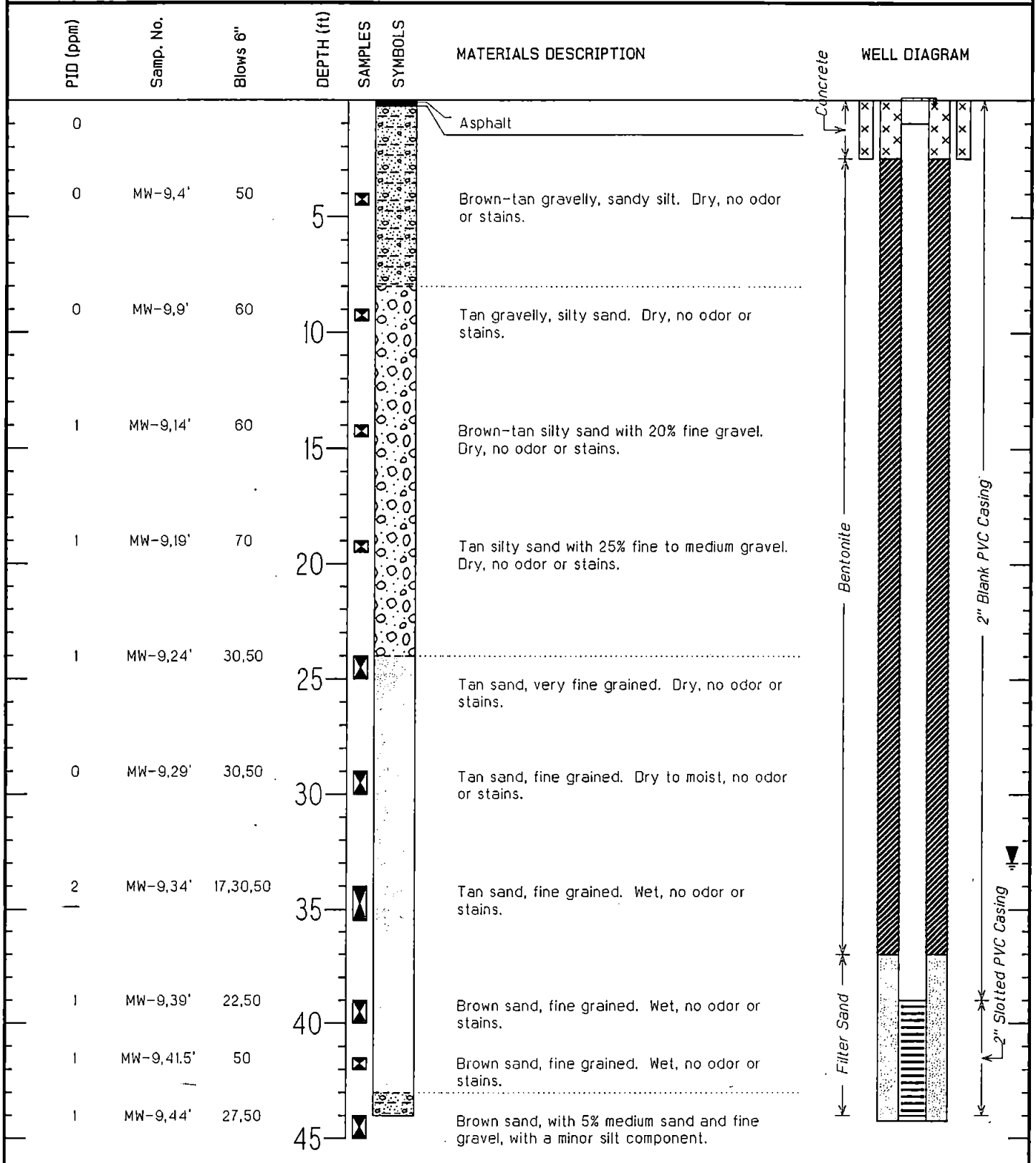
Project	Normandy Park - Sooper Dry Cleaner	Drill Company	Cascade Drilling
Location	Normandy Park, WA	Date	08-24-00
Project Number	01499025.02	Surface Elevation	RP @ 271.24 feet above MSL
Logged by	Daniel Venchiarutti	TOTAL DEPTH OF HOLE	47 Feet
Drill Method	Hollow Stem Auger	Water Level	41 Feet



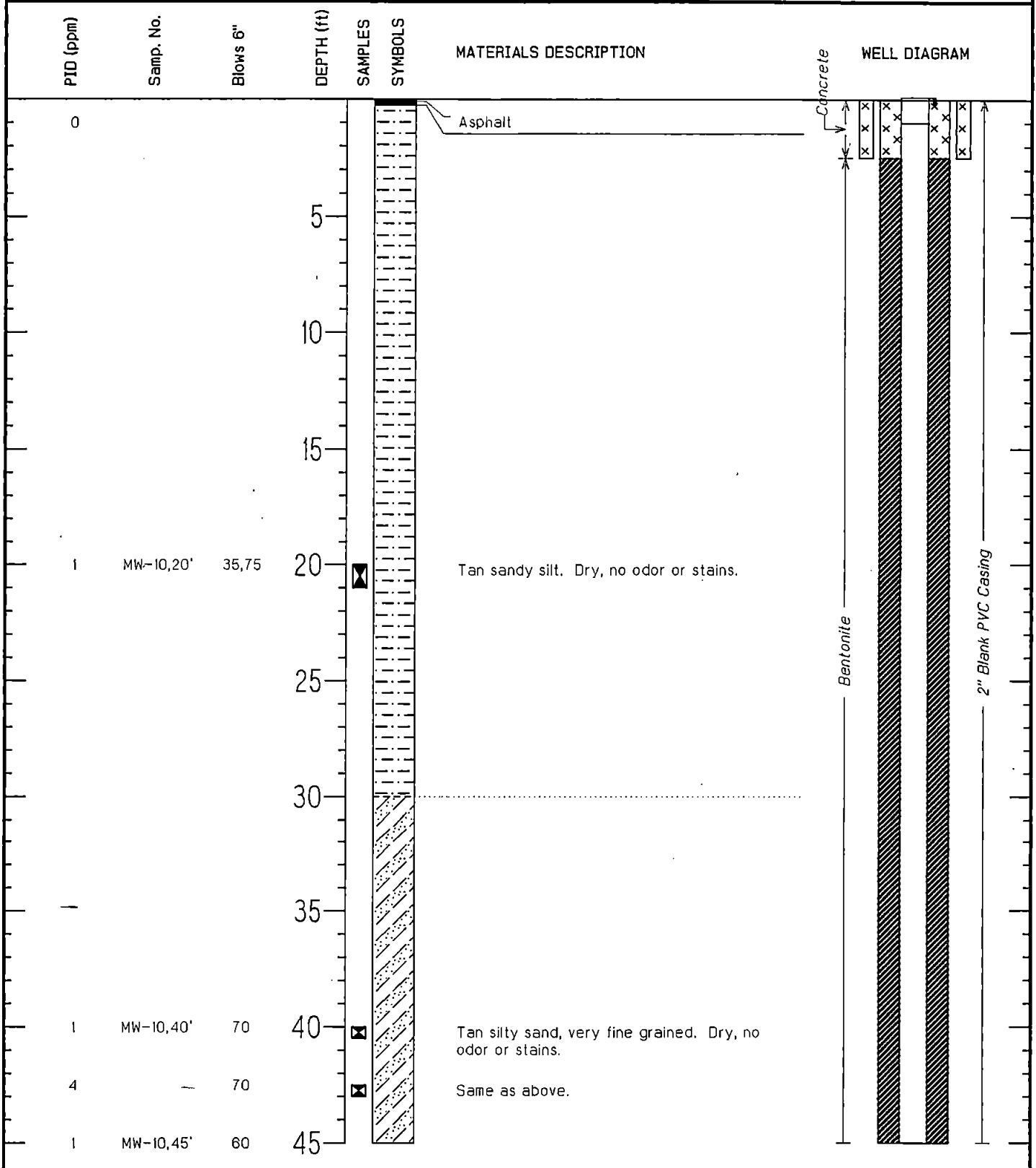
Project	Normandy Park - Sooper Dry Cleaner	Drill Company	Cascade Drilling
Location	Normandy Park, WA	Date	01-24-01
Project Number	01499025.03	Surface Elevation	RP @ 271.06 feet above MSL
Logged by	Daniel Venchiarutti	TOTAL DEPTH OF HOLE	90 Feet
Drill Method	Hollow Stem Auger	Water Level	41 Feet

PID (ppm)	Samp. No.	Blows 6"	DEPTH (ft)	SAMPLES	SYMBOLS	MATERIALS DESCRIPTION	WELL DIAGRAM
						Same as above.	<p>The well diagram shows a 2" Blank PVC Casing extending from the surface down to approximately 80 feet. Below this is a 2" Slotted PVC Casing. A section of Bentonite is shown between approximately 60 and 70 feet depth. Filter Sand is located at the bottom of the well, starting around 80 feet and extending to the bottom at 90 feet.</p>
8	MW-8,47.5	27,50				Same as above.	
10	MW-8,50'	50+	50			Same as above.	
15	MW-8,52.5	70+				Tan-gray fine sand, with 15% coarse sand. Wet, no odor or stains.	
20	MW-8,55'	50+	55			Tan-gray fine sand, with minor silt. Wet, no odor or stains.	
14	MW-8,57.5	17,50				Same as above, with thin interbedded layers of silt and black organic matter. Wet, no odor.	
15	MW-8,60'	29,50	60			Tan-gray fine sand, with 10% medium sand and silt. Wet, no odor or stains.	
6	MW-8,62.5	25,50				Same as above.	
9	MW-8,65'	37,100	65			Tan-gray fine-medium sand. Wet, no odor or stains.	
6	MW-8,67.5	28,50				Same as above.	
4	MW-8,70'	37,60	70			Tan-gray fine sand. Poorly sorted with minor silt and medium sand layering. Wet, no odor or stains.	
6	MW-8,72.5	17,21,50				Same as above.	
4	MW-8,75'	50+	75			Same as above.	
2	MW-8,77.5	14,30,50				Tan-gray fine to medium sand, with minor silt layering. Wet, no odor or stains.	
2	MW-8,80'	20,40,50	80			Same as above.	
0-1	MW-8,82.5	29,50+				Tan-gray fine to medium sand. Wet, no odor or staining.	
4	MW-8,85'	5,25,50	85			Same as above.	
3	MW-8,87.5	15,50+				Same tan-gray fine to medium sand as above.	
3	MW-8,90'	7,20,30	90				

Project	Normandy Park - Sooper Dry Cleaner	Drill Company	Cascade Drilling
Location	Normandy Park, WA	Date	01-24-01
Project Number	01499025.03	Surface Elevation	RP @ 271.06 feet above MSL
Logged by	Daniel Venchiarutti	TOTAL DEPTH OF HOLE	90 Feet
Drill Method	Hollow Stem Auger	Water Level	41 Feet



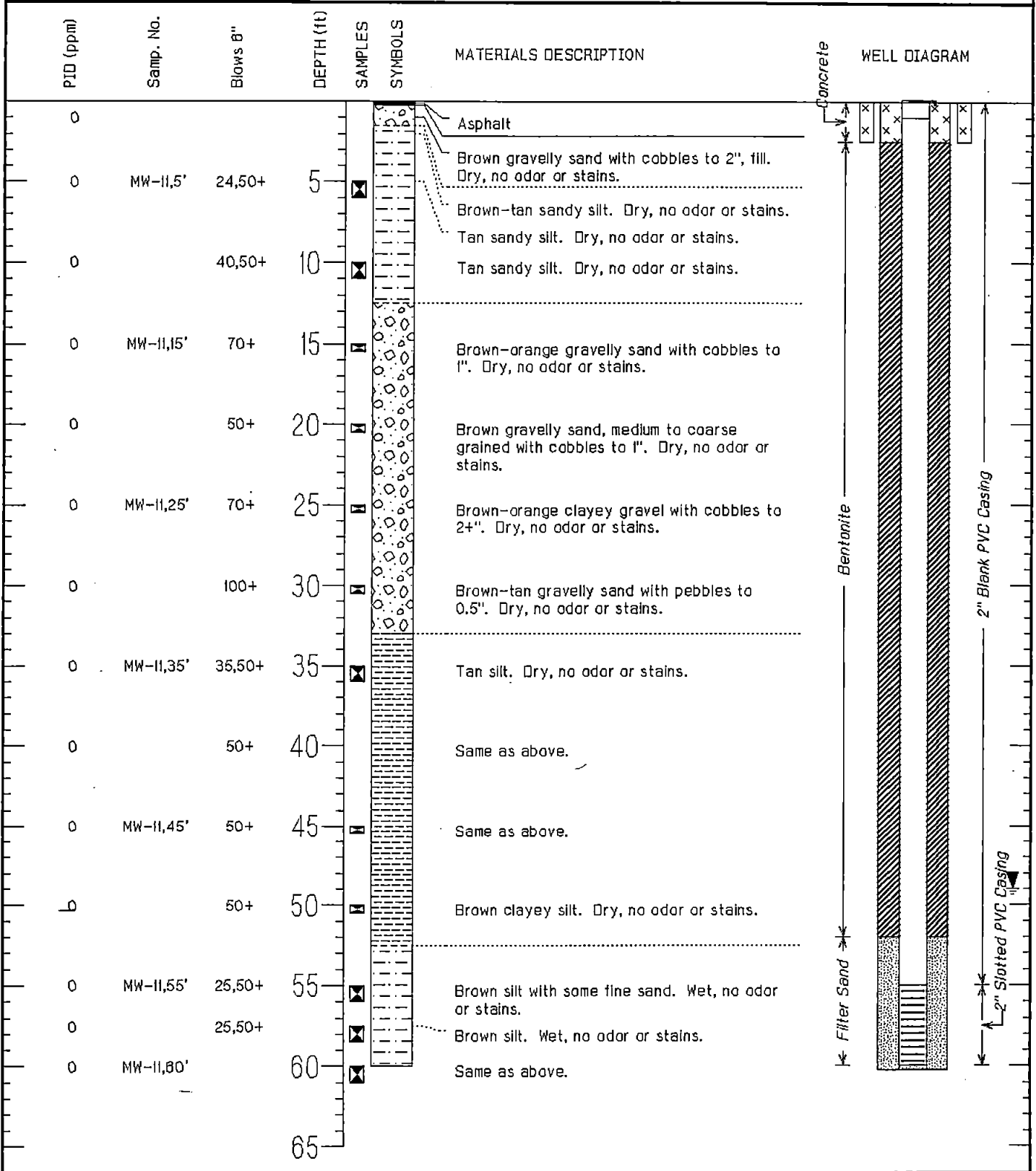
Project	Normandy Park - Sooper Dry Cleaner	Drill Company	Cascade Drilling
Location	Normandy Park, WA	Date	01-25-01
Project Number	01499025.03	Surface Elevation	RP @ 266.98 feet above MSL
Logged by	Daniel Venchiarutti	TOTAL DEPTH OF HOLE	44 Feet
Drill Method	Hollow Stem Auger	Water Level	33 Feet



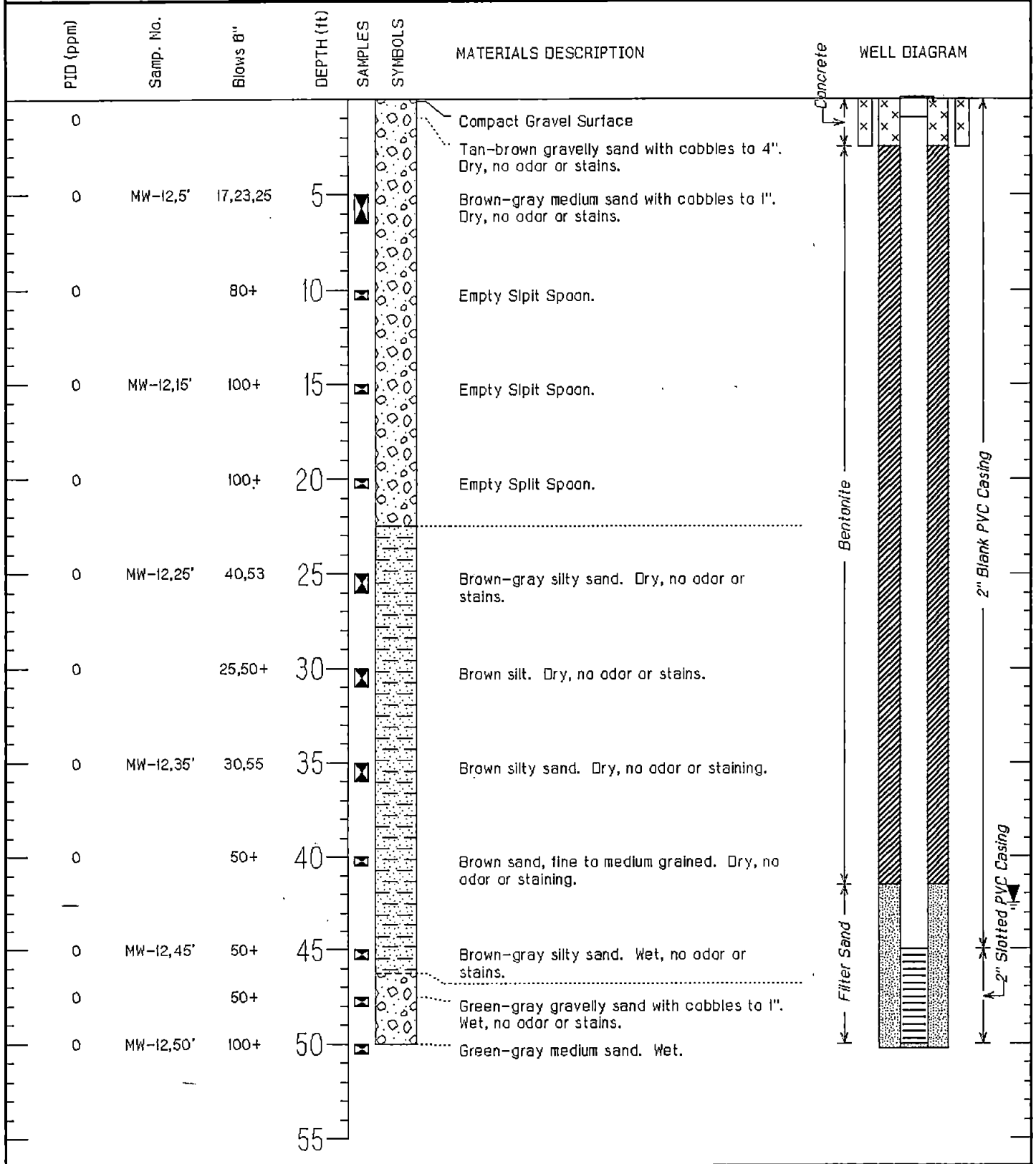
Project	Normandy Park - Sooper Dry Cleaner	Drill Company	Cascade Drilling
Location	Normandy Park, WA	Date	01-24-01
Project Number	01499025.03	Surface Elevation	RP @ 270.58 feet above MSL
Logged by	Daniel Venchiarutti	TOTAL DEPTH OF HOLE	67.5 Feet
Drill Method	Hollow Stem Auger	Water Level	52 Feet

PID (ppm)	Samp. No.	Blows 6"	DEPTH (ft)	SAMPLES	SYMBOLS	MATERIALS DESCRIPTION	WELL DIAGRAM
				☒	▨	Tan silty sand, fine grained. Dry, no odor or stains.	
1		70		☒	▨	Same as above.	
1	MW-10,50'	50	50	☒	▨	Tan-gray silty sand, very fine grained. Dry, no odor or stains.	
1		30,50		☒	▨	Tan-gray silty sand, fine grained, with both sandy and silty strata. Wet, no odor or stains.	
1	MW-10,55'	50	55	☒	▨	Tan-gray silty sand, fine to medium grained. Wet, no odor or stains.	
3		30,50		☒	▨	Tan-gray silty sand, fine grained, with silt strata. No odor or stains, wet.	
3	MW-10,60'	50	60	☒	▨	Tan-gray silty sand, fine to coarse grained, with thin coarse sand strata and silt strata. Wet, no odor or stains.	
2		30,50		☒	▨	Same as above.	
10	MW-10,65'	50	65	☒	▨	Tan sand, fine grained. Wet, no odor or stains.	
3		50		☒	▨	Tan sand, medium grained. Wet, no odor or stains.	

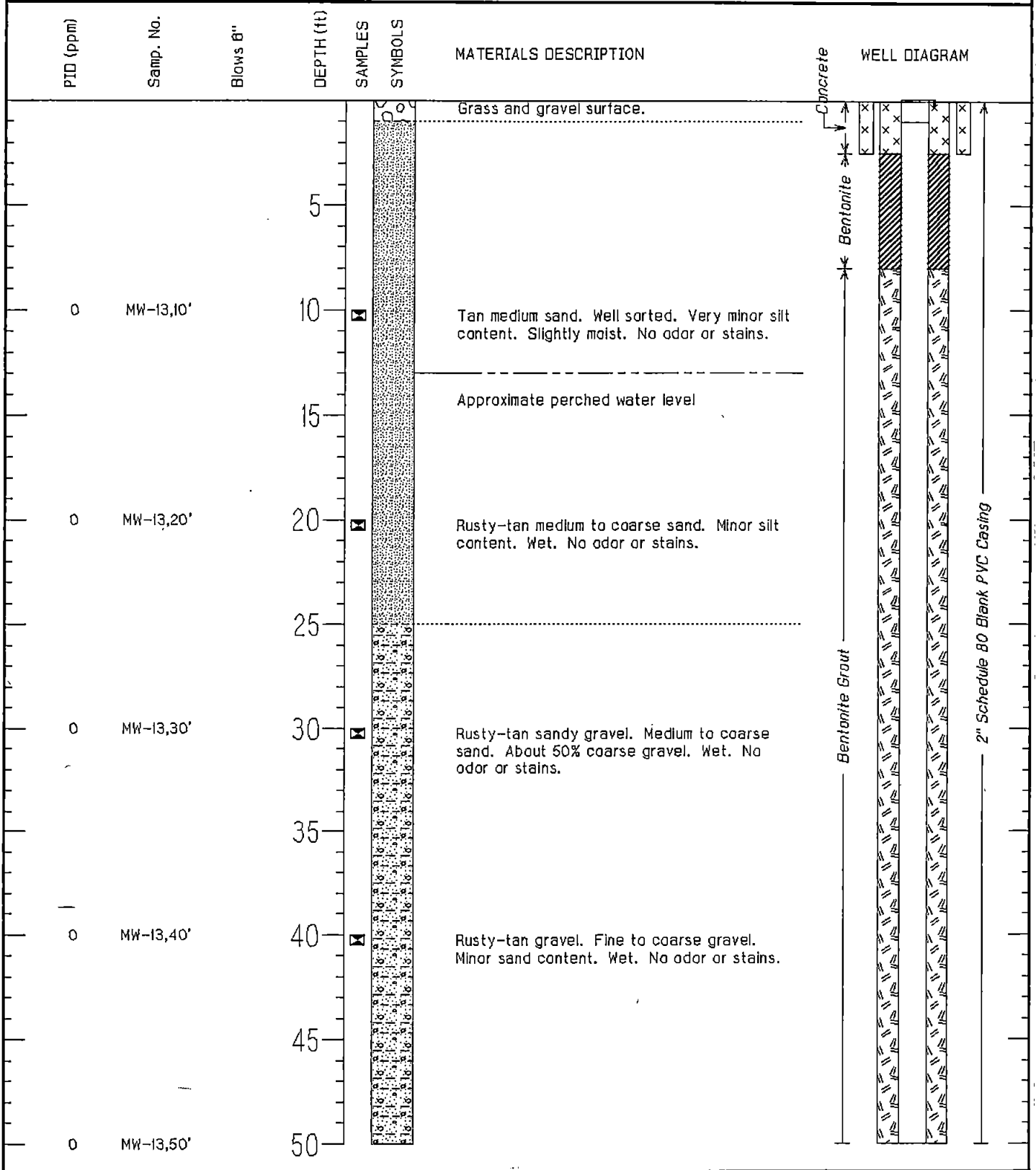
Project	Normandy Park - Sooper Dry Cleaner	Drill Company	Cascade Drilling
Location	Normandy Park, WA	Date	01-24-01
Project Number	01499025.03	Surface Elevation	RP @ 270.58 feet above MSL
Logged by	Daniel Venchiarutti	TOTAL DEPTH OF HOLE	67.5 Feet
Drill Method	Hollow Stem Auger	Water Level	52 Feet



Project	Normandy Park - Sooper Dry Cleaner	Drill Company	Cascade Drilling
Location	Normandy Park, WA	Date	02-14-01
Project Number	01499025.02	Surface Elevation	RP @ 271.30 feet above MSL
Logged by	Daniel Venchiarutti	TOTAL DEPTH OF HOLE	80 Feet
Drill Method	Hollow Stem Auger	Water Level	49 Feet



Project	Normandy Park - Sooper Dry Cleaner	Drill Company	Cascade Drilling
Location	Normandy Park, WA	Date	02-14-01
Project Number	01499025.02	Surface Elevation	RP @ 289.58 feet above MSL
Logged by	Daniel Venchiarutti	TOTAL DEPTH OF HOLE	50 Feet
Drill Method	Hollow Stem Auger	Water Level	42.5 Feet



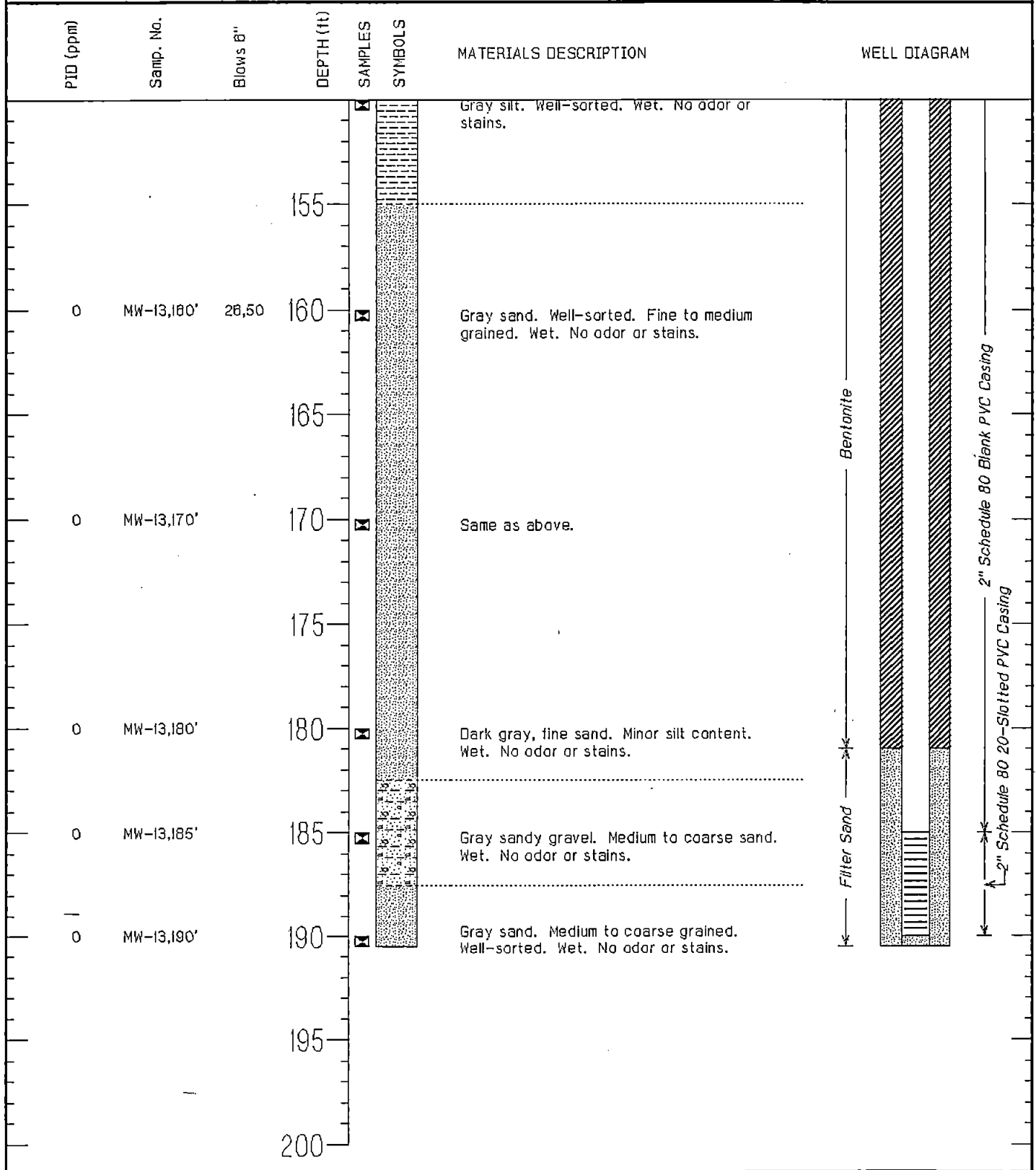
Project	Normandy Park - Sooper Dry Cleaner	Drill Company	Environmental West Exploration
Location	Normandy Park, WA	Date	08/28/01-08/30/01
Project Number	04199025.03	Surface Elevation	RP @ 321.72
Logged by	Daniel Venchiarutti and Elaine Dilley	TOTAL DEPTH OF HOLE	190 Feet
Drill Method	Air Rotary	Water Level	111 Feet

PID (ppm)	Samp. No.	Blows @"	DEPTH (ft)	SAMPLES	SYMBOLS	MATERIALS DESCRIPTION	WELL DIAGRAM
			55			Same as above.	
0	MW-13,80'		60			Rusty-tan sandy gravel. Coarse sand. Wet. No odor or stains.	
0	MW-13,85'		65			Approximate bottom of perched water Gray clay. Moist. No odor or stains.	
0	MW-13,70'		70			Gray sand. Fine to medium grained. Well-sorted. Slightly moist. No odor or stains.	
0	MW-13,80'		80			Gray gravelly sand. Fine to coarse sand. About 25% fine to medium gravel. Slightly moist. No odor or stains.	
0	MW-13,90'		90			Same as above.	
0	MW-13,100'		100				

Project	Normandy Park - Sooper Dry Cleaner	Drill Company	Environmental West Exploration
Location	Normandy Park, WA	Date	08/28/01-08/30/01
Project Number	04199025.03	Surface Elevation	RP @ 321.72
Logged by	Daniel Venchiarutti and Elaine Dilley	TOTAL DEPTH OF HOLE	190 Feet
Drill Method	Air Rotary	Water Level	111 Feet

PTD (ppm)	Samp. No.	Blows B"	DEPTH (ft)	SAMPLES	SYMBOLS	MATERIALS DESCRIPTION	WELL DIAGRAM
			105			Gray gravel. Minor coarse sand and silt content. Slightly moist. No odor or stains.	
0	MW-13,110'		110			Brown sandy gravel. Medium to coarse sand. Fine to medium gravel. Minor silt content. Slightly moist. No odor or stains.	
0	MW-13,112'	43,50				Gravel. Some coarse sand. Wet. No odor or stains.	
			115				
0	MW-13,120'		120			Gravel. Some coarse sand and silt. Wet. No odor or stains.	
			125				
0	MW-13,130'		130			Gray silty clay. Wet. No odor or stains.	
			135				
0	MW-13,140'	45,50	140			Same as above.	
			145				
0	MW-13,150		150				

Project	Normandy Park - Sooper Dry Cleaner	Drill Company	Environmental West Exploration
Location	Normandy Park, WA	Date	08/28/01-08/30/01
Project Number	04199025.03	Surface Elevation	RP @ 321.72
Logged by	Daniel Venchiarutti and Elaine Dilley	TOTAL DEPTH OF HOLE	190 Feet
Drill Method	Air Rotary	Water Level	111 Feet



Project <u>Normandy Park - Sooper Dry Cleaner</u>	Drill Company <u>Environmental West Exploration</u>
Location <u>Normandy Park, WA</u>	Date <u>06/28/01-08/30/01</u>
Project Number <u>04199025.03</u>	Surface Elevation <u>RP @ 321.72</u>
Logged by <u>Daniel Venchiarutti and Elaine Dilley</u>	TOTAL DEPTH OF HOLE <u>190 Feet</u>
Drill Method <u>Air Rotary</u>	Water Level <u>111 Feet</u>

APPENDIX C

GEOPHYSICAL SURVEY REPORT





APOLLO GEOPHYSICS CORPORATION

Engineering, Geology, Environmental, Construction & Mining

Monday, August 28, 2000

Dan Venchiarutti
SCS Engineers
2405 140th Avenue NE, Suite 107
Bellevue, Washington 98005-1877

AGC's File No.: **00.344**

Re: **GPR Exploration
Sooper Cleaners
Normandy Park, Washington**

Dear Mr. Venchiarutti,

This letter reports the results of geophysical exploration for a potential dry well at the above referenced site. The site is located in the Normandy Park Shopping Center at the intersection between First Avenue South and 200th Street South, in Normandy Park, Washington. A two-person field crew from **APOLLO GEOPHYSICS** completed the geophysical field program on Wednesday, August 23, 2000.

We investigated the site with a Ground Penetrating Radar (GPR) instrument on approximately 3-foot line spacings, which enabled us to identify anomalies as potential dry wells, underground utilities, or demolition debris. Ground Penetrating Radar establishes a relative depth, size and ground projection of the object (i.e. to determine if the object is indicative or is not indicative of a dry well). Small objects in the near surface, 1 to 2 feet, will respond the same as a larger object (dry well) at depth.

RESULTS OF THE GEOPHYSICAL SURVEY

An approximately 5-foot by 5-foot area traversed with the GPR instrument revealed images that might be associated with a dry well. The interpreted top of the dry well may be approximately 1 foot below the ground surface and the bottom of the dry well may be approximately 6 to 8 feet

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PO BOX 65169 • Seattle, Washington USA 98155-9169 • FAX (206) 365-3058 • Web Site www.apollogeophysics.com
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below the ground surface. We recommend this area to be further evaluated with direct exploration.

All recommended direct exploration locations were marked in the field with environmentally degradable paint. Suspected pipes, demolition debris, etc., were not marked in the field.

GROUND PENETRATING RADAR

APOLLO GEOPHYSICS uses a PE1000 with either a 450 or 110 MHz antenna for shallow explorations. The radar antenna transmits an electromagnetic step-pulse at a frequency of 450/110 MHz at a selected stack rate of 32/64. When the signal encounters a change in electrical properties/permittivity, a portion of the signal energy is reflected back to the surface. The character of the reflection is used to define the source of the reflection. The reflected signal is received by the antenna, processed by a DSP radar processor with signal gain control and the raw data is recorded by the outboard 80486 computer with 16 MB RAM & 300 MB Hard Drive. The radar data is displayed by the computer on a 16.5 cm Color Active Matrix LCD VGA screen in real-time. The radar displays the data in real-time, which enables us to review the data in the field for on the spot evaluation. The recorded raw data, as recorded by the computer, is then later processed to remove unwanted peripheral effects by proprietary GPR software.

WARRANTY OF SERVICES

Ground Penetrating Radar may define fiberglass or plastic objects or drums provided they fall within the exploration grid of the GPR.

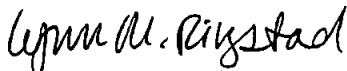
All geophysical information presented is based upon geophysical measurements made by generally accepted methods and field procedures and **APOLLO GEOPHYSICS'** interpretation of these data. The geophysical results are, therefore, interpretative in nature and are considered to be a reasonably accurate presentation of existing conditions within the limitations of the methods employed. Services performed by **APOLLO GEOPHYSICS** under this agreement are conducted in a manner consistent with, but no less than, that level of care skill ordinarily exercised by members of the profession currently practicing under similar conditions. We cannot guarantee the accuracy or correctness of any interpretation, and we shall not be liable or

responsible for any loss, cost, damages or expenses incurred or sustained by the Client resulting from any interpretation made by any of our officers, agents or employees. No other warranty, expressed or implied, is made. **APOLLO GEOPHYSICS** recognizes that subsurface conditions may vary from those encountered at the location where geophysical or other explorations are made. The data interpretations and recommendations made by **APOLLO GEOPHYSICS** are based solely on the information available to them at the time of performance; and **APOLLO GEOPHYSICS** shall not be responsible for the interpretation, by others, of the information developed.

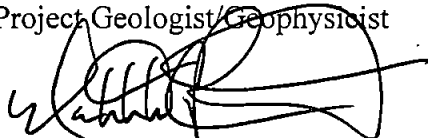
We trust this will complete your requirements for this project and look forward to working with you on future projects. If you have any further questions or need further assistance, please don't hesitate to call.

Sincerely,

APOLLO GEOPHYSICS CORPORATION



Lynn M. Ringstad
Project Geologist/Geophysicist



Matthew C. Ringstad
Project Geophysicist

APPENDIX D

ANALYTICAL LABORATORY REPORTS

AND

CHAIN OF CUSTODY DOCUMENTS



TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES NORTHWEST, INC.

**800 Sleater-Kinney SE, PMB #262
Lacey, Washington 98503-1127**

**Mobile Environmental Laboratories
Environmental Sampling Services**

**Telephone: (360) 459-4670
Fax: (360) 459-3432**

June 2, 2000

Dan Venchiarutti
SCS Engineers
2405 140th Ave. NE, #107
Bellevue, WA 98005

Dear Mr. Venchiarutti:

Please find enclosed the analytical data report for the Sooper Cleaners Project in Normanday Park, Washington. Soil samples were analyzed for Specific Halogenated Hydrocarbons and BTEX by Method 8021B on May 26, 2000.

The results of these analyses are summarized in the attached table. All soil values are reported on a dry weight basis. Applicable detection limits and QA/QC data are included. An invoice for this analytical work is also enclosed.

TEG Northwest appreciates the opportunity to have provided analytical services to SCS Engineers for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,



Michael A. Korosec
President

QA/QC FOR ANALYTICAL METHODS

GENERAL

The TEG Northwest Laboratory quality assurance and quality control (QA/QC) procedures are conducted following the guidelines and objectives which meet or exceed certification/-accreditation requirements of California DOHS, Washington DOE, and Oregon DEQ. The Quality Control Program is a consistent set of procedures which assures data quality through the use of appropriate blanks, replicate analyses, surrogate spikes, and matrix spikes, and with the use of reference standards that meet or exceed EPA standards.

When analyses are taking place on-site with the mobile lab, the need for Field Blanks or Travel/Trip Blanks is eliminated. If there is going to be a delay before sample preparation for analysis, the sample is stored at 4^o C.

ANALYTICAL METHODS

TEG Northwest Labs use analytical methodologies which are in conformity with U. S. Environmental Protection Agency (EPA), Washington DOE, and Oregon DEQ methodologies. When necessary and appropriate due to the nature or composition of the sample, TEG may use variations of the methods which are consistent with recognized standards or variations used by the industry and government laboratories.

Purgeable Volatile Halocarbons (Chlorinated Hydrocarbons, EPA 601/8021B)

A calibration standard is run at the beginning of the day. The standard must be within 15% of the continuing calibration curve value. The standard is rerun at the end of the day. All samples are prepared with a surrogate spike, and the recovery must be between 65% and 135%. At least 1 method blank is run per day.

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S00526-7
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS
 Client Job Number: 04199025.01

Analytical Results

MS

8021B, µg/kg	MTH BLK	LCS	HA1-2	HA1-5	HA2-2	HA2-5	HA2-5
Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Date extracted	Reporting	05/26/00	05/26/00	05/26/00	05/26/00	05/26/00	05/26/00
Date analyzed	Limits	05/26/00	05/26/00	05/26/00	05/26/00	05/26/00	05/26/00
Chloromethane	250	nd		nd	nd	nd	nd
Bromomethane	250	nd		nd	nd	nd	nd
Vinyl chloride	250	nd		nd	nd	nd	nd
Chloroethane	250	nd		nd	nd	nd	nd
cis-1,2-Dichloroethene	250	nd		nd	nd	nd	nd
1,1-Dichloroethene	250	nd	80%	nd	nd	nd	93%
Methylene Chloride	250	nd		nd	nd	nd	nd
trans-1,2-Dichloroethene	250	nd		nd	nd	nd	nd
1,1-Dichloroethane	250	nd		nd	nd	nd	nd
Chloroform	50	nd		nd	nd	nd	nd
1,1,1-Trichloroethane	50	nd		nd	nd	nd	nd
Carbontetrachloride	50	nd		nd	nd	nd	nd
1,2-Dichloroethane	250	nd		nd	nd	nd	nd
Trichloroethene	50	nd	87%	nd	nd	nd	90%
1,2-Dichloropropane	250	nd		nd	nd	nd	nd
Bromodichloromethane	250	nd		nd	nd	nd	nd
cis-1,3-Dichloropropene	250	nd		nd	nd	nd	nd
trans-1,3-Dichloropropene	250	nd		nd	nd	nd	nd
Chlorobenzene	250	nd	87%	nd	nd	nd	86%
1,1,2-Trichloroethane	50	nd		nd	nd	nd	nd
Tetrachloroethene	50	nd		nd	nd	nd	nd
Dibromochloromethane	250	nd		nd	nd	nd	nd
Bromoform	250	nd		nd	nd	nd	nd
1,1,2,2-Tetrachloroethane	250	nd		nd	nd	nd	nd
1,1,1,2-Tetrachloroethane	250	nd		nd	nd	nd	nd
Bromobenzene	250	nd		nd	nd	nd	nd
1,2,3-Trichloropropane	250	nd		nd	nd	nd	nd
Dibromomethane	250	nd		nd	nd	nd	nd
m-Dichlorobenzene	50	nd		nd	nd	nd	nd
p-Dichlorobenzene	50	nd		nd	nd	nd	nd
o-Dichlorobenzene	50	nd		nd	nd	nd	nd
Benzene	50	nd	94%	nd	nd	nd	96%
Toluene	50	nd	87%	nd	nd	nd	90%
Ethylbenzene	50	nd		nd	nd	nd	nd
Xylenes	50	nd		nd	nd	nd	nd

Surrogate recoveries:

Bromochloromethane	114%	105%	118%	102%	113%	119%	117%
1,4-Dichlorobutane	114%	101%	107%	110%	110%	116%	111%
Bromochloropropane	107%	96%	111%	113%	110%	115%	113%
Trifluorotoluene	84%	79%	89%	90%	85%	92%	88%
Bromofluorobenzene	87%	82%	89%	89%	87%	92%	89%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits

na - not analyzed

C - coelution with sample peaks

M - matrix interference

J - estimated value

Results reported on dry-weight basis

Acceptable Recovery limits: 65% TO 135%

Acceptable RPD limit: 35%

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S00526-7
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS
 Client Job Number: 04199025.01

Analytical Results		MSD		RPD			
8021B, µg/kg		HA2-5	HA2-5	HA3-2	HA3-5	HA4-2	HA4-5
Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Date extracted	Reporting	05/26/00	05/26/00	05/26/00	05/26/00	05/26/00	05/26/00
Date analyzed	Limits	05/26/00	05/26/00	05/26/00	05/26/00	05/26/00	05/26/00
Chloromethane	250			nd	nd	nd	nd
Bromomethane	250			nd	nd	nd	nd
Vinyl chloride	250			nd	nd	nd	nd
Chloroethane	250			nd	nd	nd	nd
cis-1,2-Dichloroethene	250			nd	nd	nd	nd
1,1-Dichloroethene	250	99%	6%	nd	nd	nd	nd
Methylene Chloride	250			nd	nd	nd	nd
trans-1,2-Dichloroethene	250			nd	nd	nd	nd
1,1-Dichloroethane	250			nd	nd	nd	nd
Chloroform	50			nd	nd	nd	nd
1,1,1-Trichloroethane	50			nd	nd	nd	nd
Carbontetrachloride	50			nd	nd	nd	nd
1,2-Dichloroethane	250			nd	nd	nd	nd
Trichloroethene	50	93%	3%	nd	nd	nd	nd
1,2-Dichloropropane	250			nd	nd	nd	nd
Bromodichloromethane	250			nd	nd	nd	nd
cis-1,3-Dichloropropene	250			nd	nd	nd	nd
trans-1,3-Dichloropropene	250			nd	nd	nd	nd
Chlorobenzene	250	91%	6%	nd	nd	nd	nd
1,1,2-Trichloroethane	50			nd	nd	nd	nd
Tetrachloroethene	50			nd	nd	nd	nd
Dibromochloromethane	250			nd	nd	nd	nd
Bromoform	250			nd	nd	nd	nd
1,1,2,2-Tetrachloroethane	250			nd	nd	nd	nd
1,1,1,2-Tetrachloroethane	250			nd	nd	nd	nd
Bromobenzene	250			nd	nd	nd	nd
1,2,3-Trichloropropane	250			nd	nd	nd	nd
Dibromomethane	250			nd	nd	nd	nd
m-Dichlorobenzene	50			nd	nd	nd	nd
p-Dichlorobenzene	50			nd	nd	nd	nd
o-Dichlorobenzene	50			nd	nd	nd	nd
Benzene	50	100%	4%	nd	nd	nd	nd
Toluene	50	94%	4%	nd	nd	nd	nd
Ethylbenzene	50			nd	nd	nd	nd
Xylenes	50			nd	nd	nd	nd

Surrogate recoveries:

Bromochloromethane	116%			117%	113%	111%	119%
1,4-Dichlorobutane	106%			107%	106%	110%	116%
Bromochloropropane	104%			110%	104%	113%	112%
Trifluorotoluene	92%			88%	84%	89%	92%
Bromofluorobenzene	84%			89%	86%	90%	94%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
 na - not analyzed
 C - coelution with sample peaks
 M - matrix interference
 J - estimated value
 Results reported on dry-weight basis
 Acceptable Recovery limits: 65% TO 135%
 Acceptable RPD limit: 35%

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES NORTHWEST, INC.

**800 Sleater-Kinney SE, PMB #262
Lacey, Washington 98503-1127**

**Mobile Environmental Laboratories
Environmental Sampling Services**

**Telephone: (360) 459-4670
Fax: (360) 459-3432**

June 14, 2000

Dan Venchiarutti
SCS Engineers
2405 140th Ave. NE, #107
Bellevue, WA 98005

Dear Mr. Venchiarutti:

Please find enclosed the analytical data report for the Sooper Cleaners Project in Normandy Park, Washington. Soil samples were analyzed for Specific Halogenated Hydrocarbons and BTEX by Method 8021B on June 1, 2000.

The results of these analyses are summarized in the attached table. All soil values are reported on a dry weight basis. Applicable detection limits and QA/QC data are included. An invoice for this analytical work is also enclosed.

TEG Northwest appreciates the opportunity to have provided analytical services to SCS Engineers for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,



Michael A. Korosec
President

QA/QC FOR ANALYTICAL METHODS

GENERAL

The TEG Northwest Laboratory quality assurance and quality control (QA/QC) procedures are conducted following the guidelines and objectives which meet or exceed certification/-accreditation requirements of California DOHS, Washington DOE, and Oregon DEQ. The Quality Control Program is a consistent set of procedures which assures data quality through the use of appropriate blanks, replicate analyses, surrogate spikes, and matrix spikes, and with the use of reference standards that meet or exceed EPA standards.

When analyses are taking place on-site with the mobile lab, the need for Field Blanks or Travel/Trip Blanks is eliminated. If there is going to be a delay before sample preparation for analysis, the sample is stored at 4^o C.

ANALYTICAL METHODS

TEG Northwest Labs use analytical methodologies which are in conformity with U. S. Environmental Protection Agency (EPA), Washington DOE, and Oregon DEQ methodologies. When necessary and appropriate due to the nature or composition of the sample, TEG may use variations of the methods which are consistent with recognized standards or variations used by the industry and government laboratories.

Purgeable Volatile Halocarbons

(Chlorinated Hydrocarbons, EPA 601/8021B)

A calibration standard is run at the beginning of the day. The standard must be within 15% of the continuing calibration curve value. The standard is rerun at the end of the day. All samples are prepared with a surrogate spike, and the recovery must be between 65% and 135%. At least 1 method blank is run per day.

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S00531-2
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS
 Client Job Number: 04199025.01

Analytical Results

8021B, µg/kg	MTH BLK		LCS	SP1-3	SP1-10	SP2-6	SP2-11	SP3-11
Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Date extracted	Reporting	06/01/00	06/01/00	06/01/00	06/01/00	06/01/00	06/01/00	06/01/00
Date analyzed	Limits	06/01/00	06/01/00	06/01/00	06/01/00	06/01/00	06/01/00	06/01/00
Moisture, %	15%							
Chloromethane	250	nd		nd	nd	nd	nd	nd
Bromomethane	250	nd		nd	nd	nd	nd	nd
Vinyl chloride	250	nd		nd	nd	nd	nd	nd
Chloroethane	250	nd		nd	nd	nd	nd	nd
cis-1,2-Dichloroethene	250	nd		nd	nd	nd	nd	nd
1,1-Dichloroethene	250	nd	85%	nd	nd	nd	nd	nd
Methylene Chloride	250	nd		nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	250	nd		nd	nd	nd	nd	nd
1,1-Dichloroethane	250	nd		nd	nd	nd	nd	nd
Chloroform	50	nd		nd	nd	nd	nd	nd
1,1,1-Trichloroethane	50	nd		nd	nd	nd	nd	nd
Carbontetrachloride	50	nd		nd	nd	nd	nd	nd
1,2-Dichloroethane	250	nd		nd	nd	nd	nd	nd
Trichloroethene	50	nd	103%	nd	nd	nd	nd	nd
1,2-Dichloropropane	250	nd		nd	nd	nd	nd	nd
Bromodichloromethane	250	nd		nd	nd	nd	nd	nd
cis-1,3-Dichloropropene	250	nd		nd	nd	nd	nd	nd
trans-1,3-Dichloropropene	250	nd		nd	nd	nd	nd	nd
Chlorobenzene	250	nd	107%	nd	nd	nd	nd	nd
1,1,2-Trichloroethane	50	nd		nd	nd	nd	nd	nd
Tetrachloroethene	50	nd		140	nd	nd	nd	nd
Dibromochloromethane	250	nd		nd	nd	nd	nd	nd
Bromoform	250	nd		nd	nd	nd	nd	nd
1,1,2,2-Tetrachloroethane	250	nd		nd	nd	nd	nd	nd
1,1,1,2-Tetrachloroethane	250	nd		nd	nd	nd	nd	nd
Bromobenzene	250	nd		nd	nd	nd	nd	nd
1,2,3-Trichloropropane	250	nd		nd	nd	nd	nd	nd
Dibromomethane	250	nd		nd	nd	nd	nd	nd
m-Dichlorobenzene	50	nd		nd	nd	nd	nd	nd
p-Dichlorobenzene	50	nd		nd	nd	nd	nd	nd
o-Dichlorobenzene	50	nd		nd	nd	nd	nd	nd
Benzene	50	nd	100%	nd	nd	nd	nd	nd
Toluene	50	nd	96%	nd	nd	nd	nd	nd
Ethylbenzene	50	nd		nd	nd	nd	nd	nd
Xylenes	50	nd		nd	nd	nd	nd	nd

Surrogate recoveries:

SURR 1	100%	100%	81%	83%	94%	101%	88%
SURR 2	84%	119%	87%	96%	105%	108%	102%
SURR 3	93%	113%	88%	105%	113%	121%	105%
SURR 4	72%	91%	69%	70%	80%	84%	86%
SURR 5	75%	95%	72%	77%	83%	87%	90%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits

na - not analyzed

C - coelution with sample peaks

M - matrix interference

J - estimated value

Results reported on dry-weight basis

Acceptable Recovery limits: 65% TO 135%

Acceptable RPD limit: 35%

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S00531-2
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS
 Client Job Number: 04199025.01

Analytical Results		MS		MSD		RPD		
8021B, µg/kg		SP4-9	SP4-9	SP4-9	SP4-9	SP5-11	SP6-11	SP7-8
Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Date extracted	Reporting	06/01/00	06/01/00	06/01/00	06/01/00	06/01/00	06/01/00	06/01/00
Date analyzed	Limits	06/01/00	06/01/00	06/01/00	06/01/00	06/01/00	06/01/00	06/01/00
Moisture, %								15%
Chloromethane	250	nd				nd	nd	nd
Bromomethane	250	nd				nd	nd	nd
Vinyl chloride	250	nd				nd	nd	nd
Chloroethane	250	nd				nd	nd	nd
cis-1,2-Dichloroethene	250	nd				nd	nd	nd
1,1-Dichloroethene	250	nd	80%	94%	16%	nd	nd	nd
Methylene Chloride	250	nd				nd	nd	nd
trans-1,2-Dichloroethene	250	nd				nd	nd	nd
1,1-Dichloroethane	250	nd				nd	nd	nd
Chloroform	50	nd				nd	nd	nd
1,1,1-Trichloroethane	50	nd				nd	nd	nd
Carbontetrachloride	50	nd				nd	nd	nd
1,2-Dichloroethane	250	nd				nd	nd	nd
Trichloroethene	50	nd	78%	91%	15%	nd	nd	nd
1,2-Dichloropropane	250	nd				nd	nd	nd
Bromodichloromethane	250	nd				nd	nd	nd
cis-1,3-Dichloropropene	250	nd				nd	nd	nd
trans-1,3-Dichloropropene	250	nd				nd	nd	nd
Chlorobenzene	250	nd	79%	88%	11%	nd	nd	nd
1,1,2-Trichloroethane	50	nd				nd	nd	nd
Tetrachloroethene	50	nd				nd	nd	82
Dibromochloromethane	250	nd				nd	nd	nd
Bromoform	250	nd				nd	nd	nd
1,1,1,2-Tetrachloroethane	250	nd				nd	nd	nd
1,1,1,2-Tetrachloroethane	250	nd				nd	nd	nd
Bromobenzene	250	nd				nd	nd	nd
1,2,3-Trichloropropane	250	nd				nd	nd	nd
Dibromomethane	250	nd				nd	nd	nd
m-Dichlorobenzene	50	nd				nd	nd	nd
p-Dichlorobenzene	50	nd				nd	nd	nd
o-Dichlorobenzene	50	nd				nd	nd	nd
Benzene	50	nd	81%	87%	7%	nd	nd	nd
Toluene	50	nd	76%	84%	10%	nd	nd	nd
Ethylbenzene	50	nd				nd	nd	nd
Xylenes	50	nd				nd	nd	nd

Surrogate recoveries:								
SURR 1		77%	77%	88%		77%	104%	85%
SURR 2		101%	101%	102%		101%	94%	94%
SURR 3		106%	106%	106%		106%	103%	99%
SURR 4		122%	122%	72%		122%	93%	93%
SURR 5		106%	106%	76%		106%	93%	96%

Data Qualifiers and Analytical Comments
 nd - not detected at listed reporting limits
 na - not analyzed
 C - coelution with sample peaks
 M - matrix interference
 J - estimated value
 Results reported on dry-weight basis
 Acceptable Recovery limits: 65% TO 135%
 Acceptable RPD limit: 35%

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S00531-2
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS
 Client Job Number: 04199025.01

Analytical Results

8021B, µg/kg		SP7-13	SP8-11	SP9-11	SP10-6	SP11-11	SP7-18
Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Date extracted	Reporting	06/01/00	06/01/00	06/01/00	06/01/00	06/01/00	06/05/00
Date analyzed	Limits	06/01/00	06/01/00	06/01/00	06/01/00	06/01/00	06/05/00
Moisture, %		15%					
Chloromethane	250	nd	nd	nd	nd	nd	nd
Bromomethane	250	nd	nd	nd	nd	nd	nd
Vinyl chloride	250	nd	nd	nd	nd	nd	nd
Chloroethane	250	nd	nd	nd	nd	nd	nd
cis-1,2-Dichloroethane	250	nd	nd	nd	nd	nd	nd
1,1-Dichloroethane	250	nd	nd	nd	nd	nd	nd
Methylene Chloride	250	nd	nd	nd	nd	nd	nd
trans-1,2-Dichloroethane	250	nd	nd	nd	nd	nd	nd
1,1-Dichloroethane	250	nd	nd	nd	nd	nd	nd
Chloroform	50	nd	nd	nd	nd	nd	nd
1,1,1-Trichloroethane	50	nd	nd	nd	nd	nd	nd
Carbon tetrachloride	50	nd	nd	nd	nd	nd	nd
1,2-Dichloroethane	250	nd	nd	nd	nd	nd	nd
Trichloroethene	50	nd	nd	nd	nd	nd	nd
1,2-Dichloropropane	250	nd	nd	nd	nd	nd	nd
Bromodichloromethane	250	nd	nd	nd	nd	nd	nd
cis-1,3-Dichloropropene	250	nd	nd	nd	nd	nd	nd
trans-1,3-Dichloropropene	250	nd	nd	nd	nd	nd	nd
Chlorobenzene	250	nd	nd	nd	nd	nd	nd
1,1,2-Trichloroethane	50	nd	nd	nd	nd	nd	nd
Tetrachloroethene	50	240	nd	nd	nd	nd	nd
Dibromochloromethane	250	nd	nd	nd	nd	nd	nd
Bromoform	250	nd	nd	nd	nd	nd	nd
1,1,2,2-Tetrachloroethane	250	nd	nd	nd	nd	nd	nd
1,1,1,2-Tetrachloroethane	250	nd	nd	nd	nd	nd	nd
Bromobenzene	250	nd	nd	nd	nd	nd	nd
1,2,3-Trichloropropane	250	nd	nd	nd	nd	nd	nd
Dibromomethane	250	nd	nd	nd	nd	nd	nd
m-Dichlorobenzene	50	nd	nd	nd	nd	nd	nd
p-Dichlorobenzene	50	nd	nd	nd	nd	nd	nd
o-Dichlorobenzene	50	nd	nd	nd	nd	nd	nd
Benzene	50	nd	nd	nd	nd	nd	nd
Toluene	50	nd	nd	nd	nd	nd	nd
Ethylbenzene	50	nd	nd	nd	nd	nd	nd
Xylenes	50	nd	nd	nd	nd	nd	nd

Surrogate recoveries:

SURR 1	82%	102%	109%	93%	88%	97%
SURR 2	105%	121%	127%	96%	102%	102%
SURR 3	122%	114%	119%	99%	105%	102%
SURR 4	87%	133%	141%	75%	86%	NA
SURR 5	73%	133%	139%	77%	90%	NA

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits

na - not analyzed

C - coelution with sample peaks

M - matrix interference

J - estimated value

Results reported on dry-weight basis

Acceptable Recovery limits: 65% TO 135%

Acceptable RPD limit: 35%

TEG NW SEATTLE CHEMISTRY LABORATORY
(425) 957-8872, fax (425) 957-9904

TEG Job Number: S00531-2
Client: SCS ENGINEERS
Client Job Name: SCOOPER CLEANERS
Client Job Number: 04199025.01
Printed: 6/5/00 10:38

Analytical Results

8021B, µg/l		MTH BLK	LCS	SP-11
Matrix	Water	Water	Water	Water
Date extracted	Reporting	08/01/00	08/01/00	08/01/00
Date analyzed	Limits	08/01/00	08/01/00	08/01/00
Chloromethane	5.0	nd		nd
Bromomethane	5.0	nd		nd
Vinyl chloride	5.0	nd		nd
Chloroethane	5.0	nd		nd
cis-1,2-Dichloroethane	5.0	nd		nd
1,1-Dichloroethane	5.0	nd	85%	nd
Methylene Chloride	5.0	nd		nd
trans-1,2-Dichloroethane	5.0	nd		nd
1,1-Dichloroethane	5.0	nd		nd
Chloroform	1.0	nd		nd
1,1,1-Trichloroethane	1.0	nd		nd
Carbon tetrachloride	1.0	nd		nd
1,2-Dichloroethane	5.0	nd		nd
Trichloroethane	1.0	nd	103%	nd
1,2-Dichloropropane	5.0	nd		nd
Bromochloromethane	5.0	nd		nd
cis-1,3-Dichloropropene	5.0	nd		nd
trans-1,3-Dichloropropene	5.0	nd		nd
Chlorobenzene	5.0	nd	107%	nd
1,1,2-Trichloroethane	1.0	nd		nd
Tetrachloroethane	1.0	nd		3.5
Dibromochloromethane	5.0	nd		nd
Bromoform	5.0	nd		nd
1,1,2,2-Tetrachloroethane	5.0	nd		nd
1,1,1,2-Tetrachloroethane	5.0	nd		nd
Bromobenzene	5.0	nd		nd
1,2,3-Trichloropropane	5.0	nd		nd
Dibromomethane	5.0	nd		nd
m-Dichlorobenzene	1.0	nd		nd
p-Dichlorobenzene	1.0	nd		nd
o-Dichlorobenzene	1.0	nd		nd
Benzene	1.0	nd	100%	nd
Toluene	1.0	nd	96%	nd
Ethylbenzene	1.0	nd		nd
Xylenes	1.0	nd		nd

Surrogate recoveries:

Bromochloromethane	100%	100%	82%
1,4-Dichlorobutane	84%	119%	95%
Bromochloropropane	93%	113%	100%
Trifluorobenzene	72%	91%	77%
Bromofluorobenzene	75%	95%	99%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
na - not analyzed
C - coelution with sample peaks
M - matrix interference
J - estimated value
Acceptable Recovery limits: 85% TO 135%
Acceptable RPD limit: 35%

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES NORTHWEST, INC.

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**Mobile Environmental Laboratories
Environmental Sampling Services**

**Telephone: (360) 459-4670
Fax: (360) 459-3432**

June 27, 2000

Dan Venchiarutti
SCS Engineers
2405 140th Ave. NE, #107
Bellevue, WA 98005

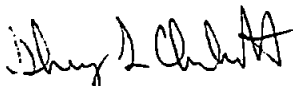
Dear Mr. Venchiarutti:

Please find enclosed the analytical data report for the Sooper Cleaners Wells Project in Normandy Park, Washington. Soil samples were analyzed for Specific Halogenated Hydrocarbons and BTEX by Method 8021B on June 7 & 14, 2000.

The results of these analyses are summarized in the attached table. All soil values are reported on a dry weight basis. Applicable detection limits and QA/QC data are included. An invoice for this analytical work is also enclosed.

TEG Northwest appreciates the opportunity to have provided analytical services to SCS Engineers for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,



Sherry L. Chilcutt
Vice President

QA/QC FOR ANALYTICAL METHODS

GENERAL

The TEG Northwest Laboratory quality assurance and quality control (QA/QC) procedures are conducted following the guidelines and objectives which meet or exceed certification/-accreditation requirements of California DOHS, Washington DOE, and Oregon DEQ. The Quality Control Program is a consistent set of procedures which assures data quality through the use of appropriate blanks, replicate analyses, surrogate spikes, and matrix spikes, and with the use of reference standards that meet or exceed EPA standards.

When analyses are taking place on-site with the mobile lab, the need for Field Blanks or Travel/Trip Blanks is eliminated. If there is going to be a delay before sample preparation for analysis, the sample is stored at 4^o C.

ANALYTICAL METHODS

TEG Northwest Labs use analytical methodologies which are in conformity with U. S. Environmental Protection Agency (EPA), Washington DOE, and Oregon DEQ methodologies. When necessary and appropriate due to the nature or composition of the sample, TEG may use variations of the methods which are consistent with recognized standards or variations used by the industry and government laboratories.

Purgeable Volatile Halocarbons

(Chlorinated Hydrocarbons, EPA 601/8021B)

A calibration standard is run at the beginning of the day. The standard must be within 15% of the continuing calibration curve value. The standard is rerun at the end of the day. All samples are prepared with a surrogate spike, and the recovery must be between 65% and 135%. At least 1 method blank is run per day.

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S00607-3
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS WELLS
 Client Job Number: 04199025

Analytical Results

8021B, µg/kg	MTH BLK		MW1-15'	MW1-35'	MW2-10'	MW2-40'	MW3-10'
Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Date extracted	06/07/00	06/07/00	06/07/00	06/07/00	06/07/00	06/07/00	06/07/00
Date analyzed	06/07/00	06/07/00	06/07/00	06/07/00	06/07/00	06/07/00	06/07/00
Moisture, %					13%	12%	12%

Chloromethane	250	nd	nd	nd	nd	nd	nd
Bromomethane	250	nd	nd	nd	nd	nd	nd
Vinyl chloride	250	nd	nd	nd	nd	nd	nd
Chloroethane	250	nd	nd	nd	nd	nd	nd
cis-1,2-Dichloroethane	250	nd	nd	nd	nd	nd	nd
1,1-Dichloroethane	250	nd	nd	nd	nd	nd	nd
Methylene Chloride	250	nd	nd	nd	nd	nd	nd
trans-1,2-Dichloroethane	250	nd	nd	nd	nd	nd	nd
1,1-Dichloroethane	250	nd	nd	nd	nd	nd	nd
Chloroform	50	nd	nd	nd	nd	nd	nd
1,1,1-Trichloroethane	50	nd	nd	nd	nd	nd	nd
Carbon tetrachloride	50	nd	nd	nd	nd	nd	nd
1,2-Dichloroethane	250	nd	nd	nd	nd	nd	nd
Trichloroethane	50	nd	nd	nd	nd	nd	nd
1,2-Dichloropropane	250	nd	nd	nd	nd	nd	nd
Bromodichloroethane	250	nd	nd	nd	nd	nd	nd
cis-1,3-Dichloropropane	250	nd	nd	nd	nd	nd	nd
trans-1,3-Dichloropropane	250	nd	nd	nd	nd	nd	nd
Chlorobenzene	250	nd	nd	nd	nd	nd	nd
1,1,2-Trichloroethane	50	nd	nd	nd	nd	nd	nd
Tetrachloroethane	250	nd	nd	nd	140	340	57
Dibromochloromethane	250	nd	nd	nd	nd	nd	nd
Bromoform	250	nd	nd	nd	nd	nd	nd
1,1,2,2-Tetrachloroethane	250	nd	nd	nd	nd	nd	nd
1,1,1,2-Tetrachloroethane	250	nd	nd	nd	nd	nd	nd
Bromobenzene	250	nd	nd	nd	nd	nd	nd
1,2,3-Trichloropropane	250	nd	nd	nd	nd	nd	nd
Dibromomethane	250	nd	nd	nd	nd	nd	nd
m-Dichlorobenzene	50	nd	nd	nd	nd	nd	nd
p-Dichlorobenzene	50	nd	nd	nd	nd	nd	nd
o-Dichlorobenzene	50	nd	nd	nd	nd	nd	nd
Benzene	50	nd	nd	nd	nd	nd	nd
Toluene	50	nd	nd	nd	nd	nd	nd
Ethylbenzene	50	nd	nd	nd	nd	nd	nd
Xylenes	50	nd	nd	nd	nd	nd	nd

Surrogate recoveries:

SURR 1	94%	113%	96%	81%	92%	91%
SURR 2	98%	108%	90%	86%	92%	106%
SURR 3	102%	84%	101%	68%	88%	76%

Data Qualifiers and Analytical Comments

- nd - not detected at listed reporting limits
 - na - not analyzed
 - C - co-elution with sample peaks
 - M - matrix interference
 - J - estimated value
- Results reported on dry-weight basis
 Acceptable Recovery limits: 65% TO 135%
 Acceptable RPD limit: 35%

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S00607-3
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS WELLS
 Client Job Number: 04199025

Analytical Results

8021B, µg/kg		MW3-40'	MW4-15'	MW4-40'	MTH BLK	LCS	MW2-20'
Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Date extracted	Reporting	06/07/00	06/07/00	06/07/00	06/14/00	06/14/00	06/14/00
Date analyzed	Limits	06/07/00	06/07/00	06/07/00	06/14/00	06/14/00	06/14/00
Moisture, %	11%						
Chloromethane	250	nd	nd	nd	nd		nd
Bromomethane	250	nd	nd	nd	nd		nd
Vinyl chloride	250	nd	nd	nd	nd		nd
Chloroethane	250	nd	nd	nd	nd		nd
cis-1,2-Dichloroethane	250	nd	nd	nd	nd		nd
1,1-Dichloroethane	250	nd	nd	nd	nd	124%	nd
Methylene Chloride	250	nd	nd	nd	nd		nd
trans-1,2-Dichloroethane	250	nd	nd	nd	nd		nd
1,1-Dichloroethane	250	nd	nd	nd	nd		nd
Chloroform	50	nd	nd	nd	nd		nd
1,1,1-Trichloroethane	50	nd	nd	nd	nd		nd
Carbontetrachloride	50	nd	nd	nd	nd		nd
1,2-Dichloroethane	250	nd	nd	nd	nd		nd
Trichloroethane	50	nd	nd	nd	nd	90%	nd
1,2-Dichloropropane	250	nd	nd	nd	nd		nd
Bromodichloromethane	250	nd	nd	nd	nd		nd
cis-1,3-Dichloropropene	250	nd	nd	nd	nd		nd
trans-1,3-Dichloropropene	250	nd	nd	nd	nd		nd
Chlorobenzene	250	nd	nd	nd	nd	82%	nd
1,1,2-Trichloroethane	50	nd	nd	nd	nd		nd
Tetrachloroethane	50	120	nd	nd	nd		nd
Dibromochloromethane	250	nd	nd	nd	nd		nd
Bromoform	250	nd	nd	nd	nd		nd
1,1,2,2-Tetrachloroethane	250	nd	nd	nd	nd		nd
1,1,1,2-Tetrachloroethane	250	nd	nd	nd	nd		nd
Bromobenzene	250	nd	nd	nd	nd		nd
1,2,3-Trichloropropane	250	nd	nd	nd	nd		nd
Dibromomethane	250	nd	nd	nd	nd		nd
m-Dichlorobenzene	50	nd	nd	nd	nd		nd
p-Dichlorobenzene	50	nd	nd	nd	nd		nd
o-Dichlorobenzene	50	nd	nd	nd	nd		nd
Benzene	50	nd	nd	nd	nd	98%	nd
Toluene	50	nd	nd	nd	nd	89%	nd
Ethylbenzene	50	nd	nd	nd	nd		nd
Xylenes	50	90	nd	nd	nd		nd

Surrogate recoveries:

SURR 1	65%	88%	89%	101%	123%	107%
SURR 2	82%	91%	92%	112%	116%	108%
SURR 3	69%	78%	95%	97%	112%	97%

Data Qualifiers and Analytical Comments

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(425) 957-9872, fax (425) 957-9904

TEG Job Number: S00607-3
Client: SCS ENGINEERS
Client Job Name: SOOPER CLEANERS WELLS
Client Job Number: 04199025

Analytical Results				MS	MSD	RPD
8021B, µg/kg	MW2-30'	MW3-20'	MW3-30'	MW2-20'	MW2-20'	MW2-20'
Matrix	Soil	Soil	Soil	Soil	Soil	Soil
Date extracted	Reporting	06/14/00	06/14/00	06/14/00	06/14/00	06/14/00
Date analyzed	Limits	06/14/00	06/14/00	06/14/00	06/14/00	06/14/00
Moisture, %			15%			

Chloromethane	250	nd	nd	nd			
Bromomethane	250	nd	nd	nd			
Vinyl chloride	250	nd	nd	nd			
Chloroethane	250	nd	nd	nd			
cis-1,2-Dichloroethene	250	nd	nd	nd			
1,1-Dichloroethene	250	nd	nd	nd	109%	109%	1%
Methylene Chloride	250	nd	nd	nd			
trans-1,2-Dichloroethene	250	nd	nd	nd			
1,1-Dichloroethane	250	nd	nd	nd			
Chloroform	50	nd	nd	nd			
1,1,1-Trichloroethane	50	nd	nd	nd			
Carbontetrachloride	50	nd	nd	nd			
1,2-Dichloroethane	250	nd	nd	nd			
Trichloroethene	50	nd	130	nd	79%	82%	4%
1,2-Dichloropropane	250	nd	nd	nd			
Bromodichloromethane	250	nd	nd	nd			
cis-1,3-Dichloropropene	250	nd	nd	nd			
trans-1,3-Dichloropropene	250	nd	nd	nd			
Chlorobenzene	250	nd	nd	nd	75%	77%	3%
1,1,2-Trichloroethane	50	nd	nd	nd			
Tetrachloroethene	50	nd	nd	nd			
Dibromochloromethane	250	nd	nd	nd			
Bromofom	250	nd	nd	nd			
1,1,2,2-Tetrachloroethane	250	nd	nd	nd			
1,1,1,2-Tetrachloroethane	250	nd	nd	nd			
Bromobenzene	250	nd	nd	nd			
1,2,3-Trichloropropane	250	nd	nd	nd			
Dibromomethane	250	nd	nd	nd			
m-Dichlorobenzene	50	nd	nd	nd			
p-Dichlorobenzene	50	nd	nd	nd			
o-Dichlorobenzene	50	nd	nd	nd			
Benzene	50	nd	nd	nd	88%	91%	3%
Toluene	50	nd	130	nd	79%	67%	16%
Ethylbenzene	50	nd	nd	nd			
Xylenes	50	nd	nd	nd			

Surrogate recoveries:

SURR 1	106%	120%	71%	124%	112%
SURR 2	101%	111%	90%	118%	112%
SURR 3	100%	105%	97%	113%	105%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits

na - not analyzed

C - coelution with sample peaks

M - matrix interference

J - estimated value

Results reported on dry-weight basis

Acceptable Recovery limits: 65% TO 135%

Acceptable RPD limit: 35%

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES NORTHWEST, INC.

**800 Sleater-Kinney SE, PMB #262
Lacey, Washington 98503-1127**

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Environmental Sampling Services**

**Telephone: (360) 459-4670
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June 16, 2000

Dan Venchiarutti
SCS Engineers
2405 140th Ave. NE, #107
Bellevue, WA 98005

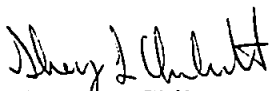
Dear Mr. Venchiarutti:

Please find enclosed the analytical data report for the Sooper Cleaners Project in Normandy Park, Washington. Water samples were analyzed for Specific Halogenated Hydrocarbons and BTEX by Method 8021B on June 9, 2000.

The results of these analyses are summarized in the attached table. Applicable detection limits and QA/QC data are included. An invoice for this analytical work is also enclosed.

TEG Northwest appreciates the opportunity to have provided analytical services to SCS Engineers for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,


Sherry L. Chilcutt
Vice President

QA/OC FOR ANALYTICAL METHODS

GENERAL

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When analyses are taking place on-site with the mobile lab, the need for Field Blanks or Travel/Trip Blanks is eliminated. If there is going to be a delay before sample preparation for analysis, the sample is stored at 4⁰ C.

ANALYTICAL METHODS

TEG Northwest Labs use analytical methodologies which are in conformity with U. S. Environmental Protection Agency (EPA), Washington DOE, and Oregon DEQ methodologies. When necessary and appropriate due to the nature or composition of the sample, TEG may use variations of the methods which are consistent with recognized standards or variations used by the industry and government laboratories.

Purgeable Volatile Aromatics (BTEX, EPA 8021B)

A check standard is run at the beginning of the day. The check standard is run at the end of the day. Both open and close standards must be within 15% of the continuing calibration curve value. All samples are prepared with a surrogate spike, and the recovery must be between 65% and 135% unless high sample concentrations interfere with the determination of the recovery percentage. At least 1 method blank is run per day.

Purgeable Volatile Halocarbons
(Chlorinated Hydrocarbons, EPA 601/8021B)

A calibration standard is run at the beginning of the day. The standard must be within 15% of the continuing calibration curve value. The standard is rerun at the end of the day. All samples are prepared with a surrogate spike, and the recovery must be between 65% and 135%. At least 1 method blank is run per day.

TEG NW SEATTLE CHEMISTRY LABORATORY
(425) 957-9872, fax (425) 957-9904

TEG Job Number: S00609-4
Client: SCS ENGINEERS
Client Job Name: SOOPER CLEANERS GW
Client Job Number: 04199025.01

Analytical Results

8021B, µg/l	MTH BLK	LCS	MW-1	MW-2	MW-3	MW-4
Matrix	Water	Water	Water	Water	Water	Water
Date extracted	Reporting	06/09/00	06/09/00	06/09/00	06/09/00	06/09/00
Date analyzed	Limits	06/09/00	06/09/00	06/09/00	06/09/00	06/09/00
Chloromethane	5.0	nd	nd	nd	nd	nd
Bromomethane	5.0	nd	nd	nd	nd	nd
Vinyl chloride	5.0	nd	nd	nd	nd	nd
Chloroethane	5.0	nd	nd	nd	nd	nd
cis-1,2-Dichloroethene	5.0	nd	nd	130	nd	nd
1,1-Dichloroethene	5.0	nd	76%	nd	nd	nd
Methylene Chloride	5.0	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	5.0	nd	nd	nd	nd	nd
1,1-Dichloroethane	5.0	nd	nd	nd	nd	nd
Chloroform	1.0	nd	nd	nd	nd	nd
1,1,1-Trichloroethane	1.0	nd	nd	nd	nd	nd
Carbontetrachloride	1.0	nd	nd	nd	nd	nd
1,2-Dichloroethane	5.0	nd	nd	nd	nd	nd
Trichloroethene	1.0	nd	84%	61	nd	nd
1,2-Dichloropropane	5.0	nd	nd	nd	nd	nd
Bromodichloromethane	5.0	nd	nd	nd	nd	nd
cis-1,3-Dichloropropene	5.0	nd	nd	nd	nd	nd
trans-1,3-Dichloropropene	5.0	nd	nd	nd	nd	nd
Chlorobenzene	5.0	nd	83%	nd	nd	nd
1,1,2-Trichloroethane	1.0	nd	nd	nd	nd	nd
Tetrachloroethene	1.0	nd	nd	2,300	660	nd
Dibromochloromethane	5.0	nd	nd	nd	nd	nd
Bromoform	5.0	nd	nd	nd	nd	nd
1,1,2,2-Tetrachloroethane	5.0	nd	nd	nd	nd	nd
1,1,1,2-Tetrachloroethane	5.0	nd	nd	nd	nd	nd
Bromobenzene	5.0	nd	nd	nd	nd	nd
1,2,3-Trichloropropane	5.0	nd	nd	nd	nd	nd
Dibromomethane	5.0	nd	nd	nd	nd	nd
m-Dichlorobenzene	1.0	nd	nd	nd	nd	nd
p-Dichlorobenzene	1.0	nd	nd	nd	nd	nd
o-Dichlorobenzene	1.0	nd	nd	nd	nd	nd
Benzene	1.0	nd	90%	nd	nd	nd
Toluene	1.0	nd	85%	nd	nd	nd
Ethylbenzene	1.0	nd	nd	nd	nd	nd
Xylenes	1.0	nd	nd	nd	nd	nd

Surrogate recoveries:

Bromochloromethane	113%	114%	86%	99%	94%	89%
1,4-Dichlorobutane	108%	102%	89%	108%	101%	94%
Bromochloropropane	103%	100%	75%	98%	91%	85%
Trifluorotoluene	106%	99%	106%	108%	106%	95%
Bromofluorobenzene	102%	95%	99%	112%	103%	95%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits

na - not analyzed

C - coelution with sample peaks

M - matrix interference

J - estimated value

Acceptable Recovery limits: 65% TO 135%

Acceptable RPD limit: 35%

TEG NW SEATTLE CHEMISTRY LABORATORY
(425) 957-9872, fax (425) 957-9904

TEG Job Number: S00609-4
Client: SCS ENGINEERS
Client Job Name: SOOPER CLEANERS GW
Client Job Number: 04199025.01

Analytical Results	DUPL				MS	MSD	RPD
	8021B, µg/l	MW-4	DUP-A	RB-2	MW-1	MW-1	MW-1
Matrix	Water	Water	Water	Water	Water	Water	Water
Date extracted	Reporting	06/09/00	06/09/00	06/09/00	06/09/00	06/09/00	06/09/00
Date analyzed	Limits	06/09/00	06/09/00	06/09/00	06/09/00	06/09/00	06/09/00
Chloromethane	5.0	nd	nd	nd			
Bromomethane	5.0	nd	nd	nd			
Vinyl chloride	5.0	nd	nd	nd			
Chloroethane	5.0	nd	nd	nd			
cis-1,2-Dichloroethene	5.0	nd	nd	nd			
1,1-Dichloroethene	5.0	nd	nd	nd	89%	83%	
Methylene Chloride	5.0	nd	nd	nd			
trans-1,2-Dichloroethene	5.0	nd	nd	nd			
1,1-Dichloroethane	5.0	nd	nd	nd			
Chloroform	1.0	nd	nd	nd			
1,1,1-Trichloroethane	1.0	nd	nd	nd			
Carbontetrachloride	1.0	nd	nd	nd			
1,2-Dichloroethane	5.0	nd	nd	nd			
Trichloroethene	1.0	nd	nd	nd	86%	88%	
1,2-Dichloropropane	5.0	nd	nd	nd			
Bromodichloromethane	5.0	nd	nd	nd			
cis-1,3-Dichloropropene	5.0	nd	nd	nd			
trans-1,3-Dichloropropene	5.0	nd	nd	nd			
Chlorobenzene	5.0	nd	nd	nd	88%	89%	
1,1,2-Trichloroethane	1.0	nd	nd	nd			
Tetrachloroethene	1.0	nd	690	nd			
Dibromochloromethane	5.0	nd	nd	nd			
Bromoform	5.0	nd	nd	nd			
1,1,2,2-Tetrachloroethane	5.0	nd	nd	nd			
1,1,1,2-Tetrachloroethane	5.0	nd	nd	nd			
Bromobenzene	5.0	nd	nd	nd			
1,2,3-Trichloropropane	5.0	nd	nd	nd			
Dibromomethane	5.0	nd	nd	nd			
m-Dichlorobenzene	1.0	nd	nd	nd			
p-Dichlorobenzene	1.0	nd	nd	nd			
o-Dichlorobenzene	1.0	nd	nd	nd			
Benzene	1.0	nd	nd	nd			
Toluene	1.0	nd	nd	nd	90%	91%	
Ethylbenzene	1.0	nd	nd	nd			
Xylenes	1.0	nd	nd	nd			

Surrogate recoveries:

Bromochloromethane	85%	107%	98%	118%	96%
1,4-Dichlorobutane	103%	115%	93%	100%	92%
Bromochloropropane	115%	102%	94%	61%	59%
Trifluorotoluene	111%	98%	129%	125%	111%
Bromofluorobenzene	106%	99%	112%	118%	113%

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Fax: (360) 459-3432**

September 7, 2000

Dan Venchiarutti
SCS Engineers
2405 140th Ave. NE, #107
Bellevue, WA 98005

Dear Mr. Venchiarutti:

Please find enclosed the analytical data report for the Sooper Cleaners GW II Project in Normandy Park, Washington. Soil samples were analyzed for Specific Halogenated Hydrocarbons and BTEX by Method 8021B on August 25, 2000.

The results of these analyses are summarized in the attached table. All soil values are reported on a dry weight basis. Applicable detection limits and QA/QC data are included. An invoice for this analytical work is also enclosed.

TEG Northwest appreciates the opportunity to have provided analytical services to SCS Engineers for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,



Michael A. Korosec
President

QA/QC FOR ANALYTICAL METHODS

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Purgeable Volatile Halocarbons

(Chlorinated Hydrocarbons, EPA 601/8021B)

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(425) 957-9872, fax (425) 957-9904

TEG Job Number: S00825-1
Client: SCS ENGINEERS
Client Job Name: SOOPER CLEANERS GW II
Client Job Number: 04199025.02

Analytical Results

8021B, µg/kg	MTH BLK		LCS	MW5A-35	MW5B-45	MW5B-60	MW6-45
Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Date extracted	Reporting	08/25/00	08/25/00	08/25/00	08/25/00	08/25/00	08/25/00
Date analyzed	Limits	08/25/00	08/25/00	08/25/00	08/25/00	08/25/00	08/25/00
Moisture, %				15%	15%	15%	15%
Chloromethane	250	nd		nd	nd	nd	nd
Bromomethane	250	nd		nd	nd	nd	nd
Vinyl chloride	250	nd		nd	nd	nd	nd
Chloroethane	250	nd		nd	nd	nd	nd
cis-1,2-Dichloroethene	250	nd		nd	nd	nd	nd
1,1-Dichloroethene	250	nd	71%	nd	nd	nd	nd
Methylene Chloride	250	nd		nd	nd	nd	nd
trans-1,2-Dichloroethene	250	nd		nd	nd	nd	nd
1,1-Dichloroethane	250	nd		nd	nd	nd	nd
Chloroform	50	nd		nd	nd	nd	nd
1,1,1-Trichloroethane	50	nd		nd	nd	nd	nd
Carbontetrachloride	50	nd		nd	nd	nd	nd
1,2-Dichloroethane	250	nd		nd	nd	nd	nd
Trichloroethene	50	nd	112%	nd	nd	nd	82
1,2-Dichloropropane	250	nd		nd	nd	nd	nd
Bromodichloromethane	250	nd		nd	nd	nd	nd
cis-1,3-Dichloropropene	250	nd		nd	nd	nd	nd
trans-1,3-Dichloropropene	250	nd		nd	nd	nd	nd
Chlorobenzene	250	nd	121%	nd	nd	nd	nd
1,1,2-Trichloroethane	50	nd		nd	nd	nd	nd
Tetrachloroethene	50	nd		nd	140	110	nd
Dibromochloromethane	250	nd		nd	nd	nd	nd
Bromoform	250	nd		nd	nd	nd	nd
1,1,2,2-Tetrachloroethane	250	nd		nd	nd	nd	nd
1,1,1,2-Tetrachloroethane	250	nd		nd	nd	nd	nd
Bromobenzene	250	nd		nd	nd	nd	nd
1,2,3-Trichloropropane	250	nd		nd	nd	nd	nd
Dibromomethane	250	nd		nd	nd	nd	nd
m-Dichlorobenzene	50	nd		nd	nd	nd	nd
p-Dichlorobenzene	50	nd		nd	nd	nd	nd
o-Dichlorobenzene	50	nd		nd	nd	nd	nd
Benzene	50	nd	110%	nd	nd	nd	nd
Toluene	50	nd	106%	nd	nd	nd	nd
Ethylbenzene	50	nd		nd	nd	nd	nd
Xylenes	50	nd		nd	nd	nd	nd

Surrogate recoveries:

Bromochloromethane	85%	100%	88%	92%	94%	102%
1,4-Dichlorobutane	89%	93%	94%	94%	96%	101%
Bromochloropropane	79%	90%	88%	92%	91%	89%
Trifluorotoluene	87%	88%	92%	86%	86%	92%
Bromofluorobenzene	86%	89%	88%	90%	89%	92%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits

na - not analyzed

C - coelution with sample peaks

M - matrix interference

J - estimated value

Results reported on dry-weight basis

Acceptable Recovery limits: 65% TO 135%

Acceptable RPD limit: 35%

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S00825-1
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS GW II
 Client Job Number: 04199025.02

Analytical Results	MS		MSD		RPD		
	8021B, µg/kg	MW6-45	MW6-45	MW6-45	MW7-5	MW7-13	MW7-20
Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Date extracted	Reporting	08/25/00	08/25/00	08/25/00	08/25/00	08/25/00	08/25/00
Date analyzed	Limits	08/25/00	08/25/00	08/25/00	08/25/00	08/25/00	08/25/00
Moisture, %					15%	15%	15%
Chloromethane	250				nd	nd	nd
Bromomethane	250				nd	nd	nd
Vinyl chloride	250				nd	nd	nd
Chloroethane	250				nd	nd	nd
cis-1,2-Dichloroethene	250				nd	nd	nd
1,1-Dichloroethene	250				nd	nd	nd
Methylene Chloride	250				nd	nd	nd
trans-1,2-Dichloroethene	250				nd	nd	nd
1,1-Dichloroethane	250				nd	nd	nd
Chloroform	50				nd	nd	nd
1,1,1-Trichloroethane	50				nd	nd	nd
Carbontetrachloride	50				nd	nd	nd
1,2-Dichloroethane	250				nd	nd	nd
Trichloroethene	50	106%	105%	1%	140	nd	nd
1,2-Dichloropropane	250				nd	nd	nd
Bromodichloromethane	250				nd	nd	nd
cis-1,3-Dichloropropene	250				nd	nd	nd
trans-1,3-Dichloropropene	250				nd	nd	nd
Chlorobenzene	250	111%	114%	3%	nd	nd	nd
1,1,2-Trichloroethane	50				nd	nd	nd
Tetrachloroethene	50				5,100	250	180
Dibromochloromethane	250				nd	nd	nd
Bromoform	250				nd	nd	nd
1,1,2,2-Tetrachloroethane	250				nd	nd	nd
1,1,1,2-Tetrachloroethane	250				nd	nd	nd
Bromobenzene	250				nd	nd	nd
1,2,3-Trichloropropane	250				nd	nd	nd
Dibromomethane	250				nd	nd	nd
m-Dichlorobenzene	50				nd	nd	nd
p-Dichlorobenzene	50				nd	nd	nd
o-Dichlorobenzene	50				nd	nd	nd
Benzene	50	107%	104%	3%	nd	nd	nd
Toluene	50	104%	101%	3%	nd	nd	nd
Ethylbenzene	50				nd	nd	nd
Xylenes	50				nd	nd	nd

Surrogate recoveries:

Bromochloromethane	92%	83%	103%	92%	92%
1,4-Dichlorobutane	101%	103%	103%	99%	99%
Bromochloropropane	86%	92%	88%	83%	90%
Trifluorotoluene	85%	89%	88%	92%	83%
Bromofluorobenzene	87%	91%	89%	88%	89%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
 na - not analyzed
 C - coelution with sample peaks
 M - matrix interference
 J - estimated value
 Results reported on dry-weight basis
 Acceptable Recovery limits: 65% TO 135%
 Acceptable RPD limit: 35%

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S00825-1
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS GW II
 Client Job Number: 04199025.02

Analytical Results

8021B, µg/kg		MW7-35	MW7-45
Matrix	Soil	Soil	Soil
Date extracted	Reporting	08/25/00	08/25/00
Date analyzed	Limits	08/25/00	08/25/00
Moisture, %		15%	15%

Chloromethane	250	nd	nd
Bromomethane	250	nd	nd
Vinyl chloride	250	nd	nd
Chloroethane	250	nd	nd
cis-1,2-Dichloroethene	250	nd	nd
1,1-Dichloroethene	250	nd	nd
Methylene Chloride	250	nd	nd
trans-1,2-Dichloroethene	250	nd	nd
1,1-Dichloroethane	250	nd	nd
Chloroform	50	nd	nd
1,1,1-Trichloroethane	50	nd	nd
Carbontetrachloride	50	nd	nd
1,2-Dichloroethane	250	nd	nd
Trichloroethene	50	nd	nd
1,2-Dichloropropane	250	nd	nd
Bromodichloromethane	250	nd	nd
cis-1,3-Dichloropropene	250	nd	nd
trans-1,3-Dichloropropene	250	nd	nd
Chlorobenzene	250	nd	nd
1,1,2-Trichloroethane	50	nd	nd
Tetrachloroethene	50	nd	850
Dibromochloromethane	250	nd	nd
Bromoform	250	nd	nd
1,1,2,2-Tetrachloroethane	250	nd	nd
1,1,1,2-Tetrachloroethane	250	nd	nd
Bromobenzene	250	nd	nd
1,2,3-Trichloropropane	250	nd	nd
Dibromomethane	250	nd	nd
m-Dichlorobenzene	50	nd	nd
p-Dichlorobenzene	50	nd	nd
o-Dichlorobenzene	50	nd	nd
Benzene	50	nd	nd
Toluene	50	nd	nd
Ethylbenzene	50	nd	nd
Xylenes	50	nd	nd

Surrogate recoveries:

Bromochloromethane	87%	102%
1,4-Dichlorobutane	96%	98%
Bromochloropropane	89%	91%
Trifluorotoluene	89%	87%
Bromofluorobenzene	88%	90%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits

na - not analyzed

C - coelution with sample peaks

M - matrix interference

J - estimated value

Results reported on dry-weight basis

Acceptable Recovery limits: 65% TO 135%

Acceptable RPD limit: 35%

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES NORTHWEST, INC.

800 Sleater-Kinney SE, PMB #262
Lacey, Washington 98503-1127

Mobile Environmental Laboratories
Environmental Sampling Services

Telephone: (360) 459-4670
Fax: (360) 459-3432

September 7, 2000

Dan Venchiarutti
SCS Engineers
2405 140th Ave. NE, #107
Bellevue, WA 98005

Dear Mr. Venchiarutti:

Please find enclosed the analytical data report for the Sooper Cleaners GW II Project in Normandy Park, Washington. Water samples were analyzed for Specific Halogenated Hydrocarbons and BTEX by Method 8021B on August 25, 2000.

The results of these analyses are summarized in the attached table. Applicable detection limits and QA/QC data are included. An invoice for this analytical work is also enclosed.

TEG Northwest appreciates the opportunity to have provided analytical services to SCS Engineers for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,



Michael A. Korosec
President

QA/QC FOR ANALYTICAL METHODS

GENERAL

The TEG Northwest Laboratory quality assurance and quality control (QA/QC) procedures are conducted following the guidelines and objectives which meet or exceed certification/-accreditation requirements of California DOHS, Washington DOE, and Oregon DEQ. The Quality Control Program is a consistent set of procedures which assures data quality through the use of appropriate blanks, replicate analyses, surrogate spikes, and matrix spikes, and with the use of reference standards that meet or exceed EPA standards.

When analyses are taking place on-site with the mobile lab, the need for Field Blanks or Travel/Trip Blanks is eliminated. If there is going to be a delay before sample preparation for analysis, the sample is stored at 4^o C.

ANALYTICAL METHODS

TEG Northwest Labs use analytical methodologies which are in conformity with U. S. Environmental Protection Agency (EPA), Washington DOE, and Oregon DEQ methodologies. When necessary and appropriate due to the nature or composition of the sample, TEG may use variations of the methods which are consistent with recognized standards or variations used by the industry and government laboratories.

Purgeable Volatile Halocarbons

(Chlorinated Hydrocarbons, EPA 601/8021B)

A calibration standard is run at the beginning of the day. The standard must be within 15% of the continuing calibration curve value. The standard is rerun at the end of the day. All samples are prepared with a surrogate spike, and the recovery must be between 65% and 135%. At least 1 method blank is run per day.

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S00829-10
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS GW II
 Client Job Number: 04199025.02

Analytical Results

8021B, µg/l		MTH BLK	LCS	RB-2	MW-1	MW-2	MW-3
Matrix	Water	Water	Water	Water	Water	Water	Water
Date extracted	Reporting	08/29/00	08/29/00	08/29/00	08/29/00	08/29/00	08/29/00
Date analyzed	Limits	08/29/00	08/29/00	08/29/00	08/29/00	08/29/00	08/29/00
Chloromethane	5.0	nd		nd	nd	nd	nd
Bromomethane	5.0	nd		nd	nd	nd	nd
Vinyl chloride	5.0	nd		nd	nd	nd	nd
Chloroethane	5.0	nd		nd	nd	nd	nd
cis-1,2-Dichloroethene	5.0	nd		nd	nd	nd	nd
1,1-Dichloroethene	5.0	nd		nd	nd	nd	nd
Methylene Chloride	5.0	nd		nd	nd	nd	nd
trans-1,2-Dichloroethene	5.0	nd		nd	nd	nd	nd
1,1-Dichloroethane	5.0	nd		nd	nd	nd	nd
Chloroform	1.0	nd		nd	nd	nd	nd
1,1,1-Trichloroethane	1.0	nd		nd	nd	nd	nd
Carbontetrachloride	1.0	nd		nd	nd	nd	nd
1,2-Dichloroethane	5.0	nd		nd	nd	nd	nd
Trichloroethene	1.0	nd	103%	nd	nd	90	nd
1,2-Dichloropropane	5.0	nd		nd	nd	nd	nd
Bromodichloromethane	5.0	nd		nd	nd	nd	nd
cis-1,3-Dichloropropene	5.0	nd		nd	nd	nd	nd
trans-1,3-Dichloropropene	5.0	nd		nd	nd	nd	nd
Chlorobenzene	5.0	nd	109%	nd	nd	nd	nd
1,1,2-Trichloroethane	1.0	nd		nd	nd	nd	nd
Tetrachloroethene	1.0	nd		3.1	6.2	2,700	740
Dibromochloromethane	5.0	nd		nd	nd	nd	nd
Bromoform	5.0	nd		nd	nd	nd	nd
1,1,2,2-Tetrachloroethane	5.0	nd		nd	nd	nd	nd
1,1,1,2-Tetrachloroethane	5.0	nd		nd	nd	nd	nd
Bromobenzene	5.0	nd		nd	nd	nd	nd
1,2,3-Trichloropropane	5.0	nd		nd	nd	nd	nd
Dibromomethane	5.0	nd		nd	nd	nd	nd
m-Dichlorobenzene	1.0	nd		nd	nd	nd	nd
p-Dichlorobenzene	1.0	nd		nd	nd	nd	nd
o-Dichlorobenzene	1.0	nd		nd	nd	nd	nd
Benzene	1.0	nd	102%	nd	nd	nd	nd
Toluene	1.0	nd	99%	nd	nd	nd	nd
Ethylbenzene	1.0	nd		nd	nd	nd	nd
Xylenes	1.0	nd		nd	nd	nd	nd

Surrogate recoveries:

Bromochloromethane	87%	94%	82%	100%	90%	86%
1,4-Dichlorobutane	86%	96%	96%	92%	97%	96%
Bromochloropropane	82%	91%	87%	95%	93%	94%
Trifluorotoluene	87%	94%	101%	92%	96%	92%
Bromofluorobenzene	83%	90%	91%	89%	95%	93%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits

na - not analyzed

C - coelution with sample peaks

M - matrix interference

J - estimated value

Acceptable Recovery limits: 65% TO 135%

Acceptable RPD limit: 35%

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S00829-10
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS GW II
 Client Job Number: 04199025.02

Analytical Results	MS				MSD			
	MW-4		MW-5A		MW-5B		MW-6	
	Water	Water	Water	Water	Water	Water	Water	
3021B, µg/l								
Matrix	Water	Water	Water	Water	Water	Water	Water	Water
Date extracted	08/29/00	08/29/00	08/29/00	08/29/00	08/29/00	08/29/00	08/29/00	08/29/00
Date analyzed	Limits	08/29/00	08/29/00	08/29/00	08/29/00	08/29/00	08/29/00	08/29/00
Chloromethane	5.0	nd	nd	nd	nd	nd	nd	
Bromomethane	5.0	nd	nd	nd	nd	nd	nd	
Vinyl chloride	5.0	nd	nd	nd	nd	nd	nd	
Chloroethane	5.0	nd	nd	nd	nd	nd	nd	
cis-1,2-Dichloroethene	5.0	nd	nd	nd	nd	nd	nd	
1,1-Dichloroethene	5.0	nd	nd	nd	nd	nd	nd	
Methylene Chloride	5.0	nd	nd	nd	nd	nd	nd	
trans-1,2-Dichloroethane	5.0	nd	nd	nd	nd	nd	nd	
1,1-Dichloroethane	5.0	nd	nd	nd	nd	nd	nd	
Chloroform	1.0	nd	nd	nd	nd	nd	nd	
1,1,1-Trichloroethane	1.0	nd	nd	nd	nd	nd	nd	
Carbontetrachloride	1.0	nd	nd	nd	nd	nd	nd	
1,2-Dichloroethane	5.0	nd	nd	nd	nd	nd	nd	
1,2-Dichloropropane	5.0	nd	nd	nd	nd	nd	nd	
Bromodichloromethane	5.0	nd	nd	nd	nd	nd	nd	
cis-1,3-Dichloropropene	5.0	nd	nd	nd	nd	nd	nd	
trans-1,3-Dichloropropene	5.0	nd	nd	nd	nd	nd	nd	
Chlorobenzene	5.0	nd	nd	nd	nd	nd	nd	
1,1,2-Trichloroethane	1.0	nd	nd	nd	nd	nd	nd	
Tetrachloroethene	1.0	nd	980	1,100	nd	nd	nd	
Dibromochloromethane	5.0	nd	nd	nd	nd	nd	nd	
Bromoform	5.0	nd	nd	nd	nd	nd	nd	
1,1,2,2-Tetrachloroethane	5.0	nd	nd	nd	nd	nd	nd	
1,1,1,2-Tetrachloroethane	5.0	nd	nd	nd	nd	nd	nd	
Bromobenzene	5.0	nd	nd	nd	nd	nd	nd	
1,2,3-Trichloropropane	5.0	nd	nd	nd	nd	nd	nd	
Dibromomethane	5.0	nd	nd	nd	nd	nd	nd	
m-Dichlorobenzene	1.0	nd	nd	nd	nd	nd	nd	
p-Dichlorobenzene	1.0	nd	nd	nd	nd	nd	nd	
o-Dichlorobenzene	1.0	nd	nd	nd	nd	nd	nd	
Benzene	1.0	nd	nd	nd	nd	nd	nd	
Toluene	1.0	nd	nd	nd	nd	nd	nd	
Ethylbenzene	1.0	nd	nd	nd	nd	nd	nd	
Xylenes	1.0	nd	nd	nd	nd	nd	nd	
Surrogate recoveries:								
Bromochloromethane		88%	71%	86%	86%	106%	72%	79%
1,4-Dichlorobutane		95%	86%	103%	103%	94%	86%	90%
Bromochloropropane		89%	79%	94%	94%	96%	94%	88%
Trifluorotoluene		87%	76%	93%	93%	92%	85%	86%
Bromofluorobenzene		91%	77%	91%	91%	95%	81%	84%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
 na - not analyzed
 C - co-elution with sample peaks
 M - matrix interference
 J - estimated value
 Acceptable Recovery limits: 65% TO 135%
 Acceptable RPD limit: 35%

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S00829-10
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS GW II
 Client Job Number: 04199025.02

Analytical Results	RPD			
	8021B, µg/l	MW-6	MW-7	DUP-A
Matrix	Water	Water	Water	Water
Date extracted	Reporting	08/29/00	08/29/00	08/29/00
Date analyzed	Limits	08/29/00	08/29/00	08/29/00
Chloromethane	5.0		nd	nd
Bromomethane	5.0		nd	nd
Vinyl chloride	5.0		nd	nd
Chloroethane	5.0		nd	nd
cis-1,2-Dichloroethene	5.0		nd	nd
1,1-Dichloroethene	5.0		nd	nd
Methylene Chloride	5.0		nd	nd
trans-1,2-Dichloroethene	5.0		nd	nd
1,1-Dichloroethane	5.0		nd	nd
Chloroform	1.0		nd	nd
1,1,1-Trichloroethane	1.0		nd	nd
Carbontetrachloride	1.0		nd	nd
1,2-Dichloroethane	5.0		nd	nd
Trichloroethene	1.0	12%	nd	3.6
1,2-Dichloropropane	5.0		nd	nd
Bromodichloromethane	5.0		nd	nd
cis-1,3-Dichloropropene	5.0		nd	nd
trans-1,3-Dichloropropene	5.0		nd	nd
Chlorobenzene	5.0	15%	nd	nd
1,1,2-Trichloroethane	1.0		nd	nd
Tetrachloroethene	1.0		2,500	980
Dibromochloromethane	5.0		nd	nd
Bromoform	5.0		nd	nd
1,1,2,2-Tetrachloroethane	5.0		nd	nd
1,1,1,2-Tetrachloroethane	5.0		nd	nd
Bromobenzene	5.0		nd	nd
1,2,3-Trichloropropane	5.0		nd	nd
Dibromomethane	5.0		nd	nd
m-Dichlorobenzene	1.0		nd	nd
p-Dichlorobenzene	1.0		nd	nd
o-Dichlorobenzene	1.0		nd	nd
Benzene	1.0	14%	nd	nd
Toluene	1.0	11%	nd	nd
Ethylbenzene	1.0		nd	nd
Xylenes	1.0		nd	nd

Surrogate recoveries:

Bromochloromethane	75%	83%
1,4-Dichlorobutane	93%	92%
Bromochloropropane	83%	89%
Trifluorotoluene	88%	84%
Bromofluorobenzene	87%	84%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits

na - not analyzed

C - coelution with sample peaks

M - matrix interference

J - estimated value

Acceptable Recovery limits: 65% TO 135%

Acceptable RPD limit: 35%

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES NORTHWEST, INC.

800 Sleater-Kinney SE, PMB #262
Lacey, Washington 98503-1127

Mobile Environmental Laboratories
Environmental Sampling Services

Telephone: (360) 459-4670
Fax: (360) 459-3432

February 5, 2001

Dan Venchiarutti
SCS Engineers
2405 140th Ave. NE, #107
Bellevue, WA 98005

Dear Mr. Venchiarutti:

Please find enclosed the analytical data report for the Normandy Park Project in Washington. Soil samples were analyzed for Specific Halogenated Hydrocarbons and BTEX by Method 8021B on January 26, 2001.

The results of these analyses are summarized in the attached table. All soil values are reported on a dry weight basis. Applicable detection limits and QA/QC data are included. An invoice for this analytical work is also enclosed.

TEG Northwest appreciates the opportunity to have provided analytical services to SCS Engineers for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,



Michael A. Korosec
President

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S10126-2
 Client: SCS ENGINEERS
 Client Job Name: NORMANDY PARK
 Client Job Number: 04199025.03

Analytical Results

8021B, µg/kg	MTH BLK		LCS		MW-8,55'		MW-8,90'		MW-9,34'		MW-9,44'		MW-10,42.5'	
Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Date extracted	Reporting	01/26/01	01/26/01	01/26/01	01/26/01	01/26/01	01/26/01	01/26/01	01/26/01	01/26/01	01/26/01	01/26/01	01/26/01	01/26/01
Date analyzed	Limits	01/26/01	01/26/01	01/26/01	01/26/01	01/26/01	01/26/01	01/26/01	01/26/01	01/26/01	01/26/01	01/26/01	01/26/01	01/26/01
Moisture, %							15%	15%	15%	15%	15%	15%	15%	15%
Chloromethane	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Bromomethane	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Vinyl chloride	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Chloroethane	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
cis-1,2-Dichloroethene	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,1-Dichloroethene	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Methylene Chloride	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,1-Dichloroethane	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Chloroform	50	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,1,1-Trichloroethane	50	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Carbontetrachloride	50	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,2-Dichloroethane	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Trichloroethene	50	nd	102%		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,2-Dichloropropane	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Bromodichloromethane	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
cis-1,3-Dichloropropene	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
trans-1,3-Dichloropropene	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Chlorobenzene	250	nd	95%		nd	nd	190	210	220	nd	nd	nd	nd	nd
1,1,2-Trichloroethane	50	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Tetrachloroethene	50	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Dibromochloromethane	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Bromoform	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,1,2,2-Tetrachloroethane	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,1,1,2-Tetrachloroethane	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Bromobenzene	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
1,2,3-Trichloropropane	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Dibromomethane	250	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
m-Dichlorobenzene	50	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
p-Dichlorobenzene	50	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
o-Dichlorobenzene	50	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Benzene	50	nd	81%		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Toluene	50	nd	84%		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Ethylbenzene	50	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Xylenes	50	nd			nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

Surrogate recoveries:

Bromochloromethane	81%	72%	71%	83%	86%	86%	84%
1,4-Dichlorobutane	110%	110%	102%	101%	102%	103%	102%
Bromochloropropane	107%	109%	108%	109%	110%	109%	110%
Trifluorotoluene	84%	83%	96%	94%	99%	95%	90%
Bromofluorobenzene	77%	73%	82%	82%	83%	83%	82%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
 na - not analyzed
 C - coelution with sample peaks
 M - matrix interference
 J - estimated value
 Results reported on dry-weight basis
 Acceptable Recovery limits: 65% TO 135%
 Acceptable RPD limit: 35%

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S10126-2
 Client: SCS ENGINEERS
 Client Job Name: NORMANDY PARK
 Client Job Number: 04199025.03

Analytical Results

8021B, µg/kg	MW-10,65'	
Matrix	Soil	Soil
Date extracted	Reporting	01/26/01
Date analyzed	Limits	01/26/01
Moisture, %		15%

Chloromethane	250	nd
Bromomethane	250	nd
Vinyl chloride	250	nd
Chloroethane	250	nd
cis-1,2-Dichloroethene	250	nd
1,1-Dichloroethene	250	nd
Methylene Chloride	250	nd
trans-1,2-Dichloroethene	250	nd
1,1-Dichloroethane	250	nd
Chloroform	50	nd
1,1,1-Trichloroethane	50	nd
Carbontetrachloride	50	nd
1,2-Dichloroethane	250	nd
Trichloroethene	50	nd
1,2-Dichloropropane	250	nd
Bromodichloromethane	250	nd
cis-1,3-Dichloropropene	250	nd
trans-1,3-Dichloropropene	250	nd
Chlorobenzene	250	nd
1,1,2-Trichloroethane	50	nd
Tetrachloroethene	50	820
Dibromochloromethane	250	nd
Bromoform	250	nd
1,1,1,2-Tetrachloroethane	250	nd
1,1,1,2-Tetrachloroethane	250	nd
Bromobenzene	250	nd
1,2,3-Trichloropropane	250	nd
Dibromomethane	250	nd
m-Dichlorobenzene	50	nd
p-Dichlorobenzene	50	nd
o-Dichlorobenzene	50	nd
Benzene	50	nd
Toluene	50	nd
Ethylbenzene	50	nd
Xylenes	50	nd

Surrogate recoveries:

Bromochloromethane	90%
1,4-Dichlorobutane	101%
Bromochloropropane	106%
Trifluorotoluene	93%
Bromofluorobenzene	82%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits

na - not analyzed

C - coelution with sample peaks

M - matrix interference

J - estimated value

Results reported on dry-weight basis

Acceptable Recovery limits: 65% TO 135%

Acceptable RPD limit: 35%

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES NORTHWEST, INC.

FEB 20 2001

SCS ENGINEERS-WA

800 Sleater-Kinney SE, PMB #262
Lacey, Washington 98503-1127

Mobile Environmental Laboratories
Environmental Sampling Services

Telephone: (360) 459-4670
Fax: (360) 459-3432

February 13, 2001

Dan Venchiarutti
SCS Engineers
2405 140th Ave. NE, #107
Bellevue, WA 98005

Dear Mr. Venchiarutti:

Please find enclosed the analytical data report for the Sooper Cleaners Phase III GW Project in Normandy Park, Washington. Water samples were analyzed for Specific Halogenated Hydrocarbons and BTEX by Method 8021B on February 1, 2001.

The results of these analyses are summarized in the attached table. Applicable detection limits and QA/QC data are included. An invoice for this analytical work is also enclosed.

TEG Northwest appreciates the opportunity to have provided analytical services to SCS Engineers for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,



Michael A. Korosec
President

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S10201-2
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS
 PHASE III
 Client Job Number: 04199025.03

Analytical Results 8021B, µg/l	MS MSD RPD							
	Water	Water	Water	Water	Water	Water	Water	Water
Date extracted	Reporting	02/01/01	02/01/01	02/01/01	02/01/01	02/01/01	02/01/01	02/01/01
Date analyzed	Limits	02/01/01	02/01/01	02/01/01	02/01/01	02/01/01	02/01/01	02/01/01
Chloromethane	5.0	nd		nd				nd
Bromomethane	5.0	nd		nd				nd
Vinyl chloride	5.0	nd		nd				nd
Chloroethane	5.0	nd		nd				nd
cis-1,2-Dichloroethene	5.0	nd		nd				nd
1,1-Dichloroethene	5.0	nd	91%	nd	106%	95%	11%	nd
Methylene Chloride	5.0	nd		nd				nd
trans-1,2-Dichloroethene	5.0	nd		nd				nd
1,1-Dichloroethane	5.0	nd		nd				nd
Chloroform	1.0	nd		nd				nd
1,1,1-Trichloroethane	1.0	nd		nd				nd
Carbontetrachloride	1.0	nd		nd				nd
1,2-Dichloroethane	5.0	nd		nd				nd
Trichloroethene	1.0	nd	98%	nd	98%	99%	1%	nd
1,2-Dichloropropane	5.0	nd		nd				nd
Bromodichloromethane	5.0	nd		nd				nd
cis-1,3-Dichloropropene	5.0	nd		nd				nd
trans-1,3-Dichloropropene	5.0	nd		nd				nd
Chlorobenzene	5.0	nd	108%	nd	107%	109%	2%	nd
1,1,2-Trichloroethane	1.0	nd		nd				nd
Tetrachloroethene	1.0	nd		nd				110
Dibromochloromethane	5.0	nd		nd				nd
Bromoform	5.0	nd		nd				nd
1,1,2,2-Tetrachloroethane	5.0	nd		nd				nd
1,1,1,2-Tetrachloroethane	5.0	nd		nd				nd
Bromobenzene	5.0	nd		nd				nd
1,2,3-Trichloropropane	5.0	nd		nd				nd
Dibromomethane	5.0	nd		nd				nd
m-Dichlorobenzene	1.0	nd		nd				nd
p-Dichlorobenzene	1.0	nd		nd				nd
o-Dichlorobenzene	1.0	nd		nd				nd
Benzene	1.0	nd	110%	nd	106%	106%	0%	nd
Toluene	1.0	nd	104%	1.4	103%	103%	0%	4.3
Ethylbenzene	1.0	nd		nd				nd
Xylenes	1.0	nd		nd				nd

Surrogate recoveries:

Bromochloromethane	107%	111%	90%	103%	84%	83%
1,4-Dichlorobutane	119%	120%	114%	118%	114%	118%
Bromochloropropane	110%	122%	97%	123%	117%	128%
Trifluorotoluene	102%	103%	98%	97%	93%	99%
Bromofluorobenzene	85%	91%	89%	87%	84%	91%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
 na - not analyzed
 C - coelution with sample peaks
 M - matrix interference
 J - estimated value
 Acceptable Recovery limits: 65% TO 135%
 Acceptable RPD limit: 35%

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S10201-2
 Client: SCS ENGINEERS
 Client Job Name: SCOOPER CLEANERS
 PHASE III
 Client Job Number: 04199025.03

Analytical Results

8021B, µg/l		MW-9	MW-10
Matrix	Water	Water	Water
Date extracted	Reporting	02/01/01	02/01/01
Date analyzed	Limits	02/01/01	02/01/01
Chloromethane	5.0	nd	nd
Bromomethane	5.0	nd	nd
Vinyl chloride	5.0	nd	nd
Chloroethane	5.0	nd	nd
cis-1,2-Dichloroethene	5.0	nd	nd
1,1-Dichloroethene	5.0	nd	nd
Methylene Chloride	5.0	nd	nd
trans-1,2-Dichloroethene	5.0	nd	nd
1,1-Dichloroethane	5.0	nd	nd
Chloroform	1.0	nd	34
1,1,1-Trichloroethane	1.0	nd	nd
Carbontetrachloride	1.0	nd	nd
1,2-Dichloroethane	5.0	nd	nd
Trichloroethene	1.0	nd	4.4
1,2-Dichloropropane	5.0	nd	nd
Bromodichloromethane	5.0	nd	nd
cis-1,3-Dichloropropene	5.0	nd	nd
trans-1,3-Dichloropropene	5.0	nd	nd
Chlorobenzene	5.0	nd	nd
1,1,2-Trichloroethane	1.0	nd	nd
Tetrachloroethene	1.0	120	3,900
Dibromochloromethane	5.0	nd	nd
Bromoform	5.0	nd	nd
1,1,2,2-Tetrachloroethane	5.0	nd	nd
1,1,1,2-Tetrachloroethane	5.0	nd	nd
Bromobenzene	5.0	nd	nd
1,2,3-Trichloropropane	5.0	nd	nd
Dibromomethane	5.0	nd	nd
m-Dichlorobenzene	1.0	nd	nd
p-Dichlorobenzene	1.0	nd	nd
o-Dichlorobenzene	1.0	nd	nd
Benzene	1.0	nd	nd
Toluene	1.0	2.7	3.3
Ethylbenzene	1.0	nd	nd
Xylenes	1.0	nd	nd

Surrogate recoveries:

Bromochloromethane	72%	114%
1,4-Dichlorobutane	113%	125%
Bromochloropropane	119%	127%
Trifluorotoluene	92%	93%
Bromofluorobenzene	87%	87%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits

na - not analyzed

C - coelution with sample peaks

M - matrix interference

J - estimated value

Acceptable Recovery limits: 65% TO 135%

Acceptable RPD limit: 35%

310201-2

CHAIN-OF-CUSTODY RECORD

CLIENT: SCS ENGINEERS
 ADDRESS: 2405 140th Ave NE Suite 107 Bellevue WA 98052
 PHONE: 425-746-4600 FAX: 425-746-6747
 CLIENT PROJECT #: 04179025.03 PROJECT MANAGER: Dr Venchiarutti

DATE: 02/01/01 PAGE 1 OF 1
 PROJECT NAME: Sooper Cleaners Phase III GW
 LOCATION: Norcrossing Park, WA
 COLLECTOR: DW/BD DATE OF COLLECTION 2/1

Sample Number	Depth	Time	Sample Type	Container Type	ANALYSES													NOTES	Total Number of Containers	Laboratory Note Number				
					VOA 8010/8021/B	VOA 8021/B BTEX/PCB	VOA 8280	SEMI VOL 8270	TPH - HC/D	TPH 8015 (gasoline)	TPH 8015 (diesel)	PAH 8015 (4 & 6)	PCBs 8082	Pesticides 8081	TOTAL LEAD	PB								
1. MW-8			WATER	2 JON.	X																			
2. MW-9			↓	↓	X																			
3. MW-10			↓	↓	X																			
4. RB-1					X																			
5.																								
6.																								
7.																								
8.																								
9.																								
10.																								
11.																								
12.																								
13.																								
14.																								
15.																								
16.																								
17.																								
18.																								

RELINQUISHED BY (Signature) [Signature] DATE/TIME 2/01/01 2pm RECEIVED BY (Signature) [Signature] DATE/TIME

RELINQUISHED BY (Signature) DATE/TIME RECEIVED BY (Signature) DATE/TIME

SAMPLE RECEIPT
 TOTAL NUMBER OF CONTAINERS
 CHAIN OF CUSTODY SEALS Y/N/NA
 SEALS INTACT? Y/N/NA
 RECEIVED GOOD COND./COLD

LABORATORY NOTES:

 Turn Around Time: Normal

SAMPLE DISPOSAL INSTRUCTIONS
 TEG DISPOSAL @ \$2.00 each Return Pickup

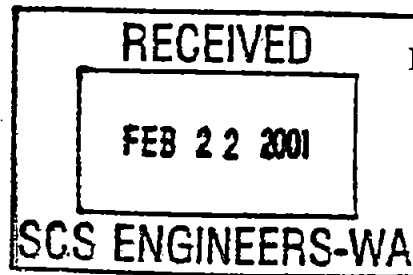
NOTES:

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES NORTHWEST, INC.

**800 Sleater-Kinney SE, PMB #262
Lacey, Washington 98503-1127**

**Mobile Environmental Laboratories
Environmental Sampling Services**

**Telephone: (360) 459-4670
Fax: (360) 459-3432**



February 19, 2001

Dan Venchiarutti
SCS Engineers
2405 140th Ave. NE, #107
Bellevue, WA 98005

Dear Mr. Venchiarutti:

Please find enclosed the analytical data report for the Sooper Cleaners Wells Project in Normandy Park, Washington. Soil samples were analyzed for Specific Halogenated Hydrocarbons and BTEX by Method 8021B on February 15, 2001.

The results of these analyses are summarized in the attached table. All soil values are reported on a dry weight basis. Applicable detection limits and QA/QC data are included. An invoice for this analytical work is also enclosed.

TEG Northwest appreciates the opportunity to have provided analytical services to SCS Engineers for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,

Michael A. Korosec
President

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S10214-4
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS WELLS
 Client Job Number: 04199025.02

Analytical Results	MTH BLK		LCS	MW11-25'	MS	MSD	RPD
	Soil	Soil	Soil	Soil	MW11-25'	MW11-25'	MW11-25'
8021 B, µg/kg							
Matrix	Reporting	02/15/01	02/15/01	02/15/01	02/15/01	02/15/01	02/15/01
Date extracted	Limits	02/15/01	02/15/01	02/15/01	02/15/01	02/15/01	02/15/01
Date analyzed							
Chloromethane	250	nd		nd			
Bromomethane	250	nd		nd			
Vinyl chloride	250	nd		nd			
Chloroethane	250	nd		nd			
cis-1,2-Dichloroethene	250	nd		nd			
1,1-Dichloroethene	250	nd		nd			
Methylene Chloride	250	nd		nd			
trans-1,2-Dichloroethene	250	nd		nd			
1,1-Dichloroethane	250	nd		nd			
Chloroform	50	nd		nd			
1,1,1-Trichloroethane	50	nd		nd			
Carbontetrachloride	50	nd		nd			
1,2-Dichloroethane	250	nd	68%	nd	66%	85%	25%
Trichloroethene	50	nd		nd			
1,2-Dichloropropane	250	nd		nd			
Bromodichloromethane	250	nd		nd			
cis-1,3-Dichloropropene	250	nd		nd			
trans-1,3-Dichloropropene	250	nd	87%	nd	68%	68%	0%
Chlorobenzene	250	nd		nd			
1,1,2-Trichloroethane	50	nd		nd			
Tetrachloroethene	50	nd		nd			
Dibromochloromethane	250	nd		nd			
Bromoform	250	nd		nd			
1,1,2,2-Tetrachloroethane	250	nd		nd			
1,1,1,2-Tetrachloroethane	250	nd		nd			
Bromobenzene	250	nd		nd			
1,2,3-Trichloropropane	250	nd		nd			
Dibromomethane	250	nd		nd			
m-Dichlorobenzene	50	nd		nd			
p-Dichlorobenzene	50	nd		nd			
o-Dichlorobenzene	50	nd		nd	67%	69%	3%
Benzene	50	nd	69%	nd	77%	80%	4%
Toluene	50	nd	79%	nd			
Ethylbenzene	50	nd		nd			
Xylenes	50	nd		nd			

Surrogate recoveries:

Bromochloromethane	129%	115%	97%	94%	131%
1,4-Dichlorobutane	123%	126%	122%	124%	125%
Bromochloropropane	120%	101%	110%	98%	128%
Trifluorotoluene	108%	109%	101%	106%	106%
Bromofluorobenzene	88%	85%	86%	84%	84%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits

na - not analyzed

C - coelution with sample peaks

M - matrix interference

J - estimated value

Results reported on dry-weight basis

Acceptable Recovery limits: 65% TO 135%

Acceptable RPD limit: 35%

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S10214-4
 Client: SCS ENGINEERS
 Client Job Name: SCOOPER CLEANERS WELLS
 Client Job Number: 04199025.02

Analytical Results

8021B, µg/kg	MW11-57.5'	MW12-25'	MW12-50'
Matrix	Soil	Soil	Soil
Date extracted	Reporting	02/15/01	02/15/01
Date analyzed	Limits	02/15/01	02/15/01
Chloromethane	250	nd	nd
Bromomethane	250	nd	nd
Vinyl chloride	250	nd	nd
Chloroethane	250	nd	nd
cis-1,2-Dichloroethene	250	nd	nd
1,1-Dichloroethene	250	nd	nd
Methylene Chloride	250	nd	nd
trans-1,2-Dichloroethene	250	nd	nd
1,1-Dichloroethane	250	nd	nd
Chloroform	50	nd	nd
1,1,1-Trichloroethane	50	nd	nd
Carbontetrachloride	250	nd	nd
1,2-Dichloroethane	50	nd	nd
Trichloroethene	250	nd	nd
1,2-Dichloropropane	250	nd	nd
Bromodichloromethane	250	nd	nd
cis-1,3-Dichloropropene	250	nd	nd
trans-1,3-Dichloropropene	250	nd	nd
Chlorobenzene	50	nd	nd
1,1,2-Trichloroethane	50	nd	nd
Tetrachloroethene	250	nd	nd
Dibromochloromethane	250	nd	nd
Bromoform	250	nd	nd
1,1,2,2-Tetrachloroethane	250	nd	nd
1,1,1,2-Tetrachloroethane	250	nd	nd
Bromobenzene	250	nd	nd
1,2,3-Trichloropropane	250	nd	nd
Dibromomethane	50	nd	nd
m-Dichlorobenzene	50	nd	nd
p-Dichlorobenzene	50	nd	nd
o-Dichlorobenzene	50	nd	nd
Benzene	50	nd	nd
Toluene	50	nd	nd
Ethylbenzene	50	nd	nd
Xylenes	50	nd	nd

Surrogate recoveries:

Bromochloromethane	100%	96%	95%
1,4-Dichlorobutane	123%	123%	123%
Bromochloropropane	109%	106%	115%
Trifluorotoluene	105%	101%	102%
Bromofluorobenzene	83%	87%	87%

Data Qualifiers and Analytical Comments

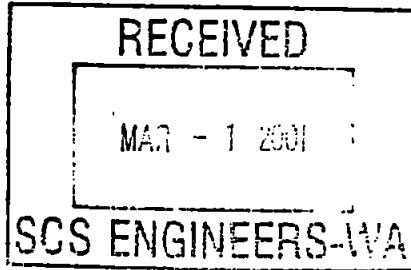
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 J - estimated value
 Results reported on dry-weight basis
 Acceptable Recovery limits: 65% TO 135%
 Acceptable RPD limit: 35%

TRANSGLOBAL ENVIRONMENTAL GEOSCIENCES NORTHWEST, INC.

**800 Sleater-Kinney SE, PMB #262
Lacey, Washington 98503-1127**

**Mobile Environmental Laboratories
Environmental Sampling Services**

**Telephone: (360) 459-4670
Fax: (360) 459-3432**



February 27, 2001

Dan Venchiarutti
SCS Engineers
2405 140th Ave. NE, #107
Bellevue, WA 98005

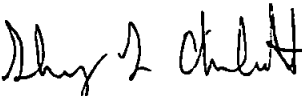
Dear Mr. Venchiarutti:

Please find enclosed the analytical data report for the Sooper Cleaners Phase III Project in Normandy Park, Washington. Soil samples were analyzed for Specific Halogenated Hydrocarbons and BTEX by Method 8021B on February 20, 2001.

The results of these analyses are summarized in the attached table. All soil values are reported on a dry weight basis. Applicable detection limits and QA/QC data are included. An invoice for this analytical work is also enclosed.

TEG Northwest appreciates the opportunity to have provided analytical services to SCS Engineers for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,


Sherry L. Chilcutt
Vice President

TEG NW SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

TEG Job Number: S10220-6
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS PHASE III
 Client Job Number: 04199025.02

Analytical Results

8021B, µg/l	MTH BLK		LCS	MW-11	MW-12
Matrix	Water	Water	Water	Water	Water
Date extracted	Reporting	02/20/01	02/20/01	02/20/01	02/20/01
Date analyzed	Limits	02/20/01	02/20/01	02/20/01	02/20/01
Chloromethane	5.0	nd		nd	nd
Bromomethane	5.0	nd		nd	nd
Vinyl chloride	5.0	nd		nd	nd
Chloroethane	5.0	nd		nd	nd
cis-1,2-Dichloroethene	5.0	nd		nd	nd
1,1-Dichloroethene	5.0	nd	104%	nd	nd
Methylene Chloride	5.0	nd		nd	nd
trans-1,2-Dichloroethene	5.0	nd		nd	nd
1,1-Dichloroethane	5.0	nd		nd	nd
Chloroform	1.0	nd		nd	nd
1,1,1-Trichloroethane	1.0	nd		nd	nd
Carbontetrachloride	1.0	nd		nd	nd
1,2-Dichloroethane	5.0	nd		nd	nd
Trichloroethene	1.0	nd	90%	nd	nd
1,2-Dichloropropane	5.0	nd		nd	nd
Bromodichloromethane	5.0	nd		nd	nd
cis-1,3-Dichloropropene	5.0	nd		nd	nd
trans-1,3-Dichloropropene	5.0	nd		nd	nd
Chlorobenzene	5.0	nd	94%	nd	nd
1,1,2-Trichloroethane	1.0	nd		nd	nd
Tetrachloroethene	1.0	nd		nd	nd
Dibromochloromethane	5.0	nd		nd	nd
Bromoform	5.0	nd		nd	nd
1,1,2,2-Tetrachloroethane	5.0	nd		nd	nd
1,1,1,2-Tetrachloroethane	5.0	nd		nd	nd
Bromobenzene	5.0	nd		nd	nd
1,2,3-Trichloropropane	5.0	nd		nd	nd
Dibromomethane	5.0	nd		nd	nd
m-Dichlorobenzene	1.0	nd		nd	nd
p-Dichlorobenzene	1.0	nd		nd	nd
o-Dichlorobenzene	1.0	nd		nd	nd
Benzene	1.0	nd	110%	nd	nd
Toluene	1.0	nd	108%	nd	nd
Ethylbenzene	1.0	nd		nd	nd
Xylenes	1.0	nd		nd	nd

Surrogate recoveries:

Bromochloromethane	123%	119%	92%	92%
1,4-Dichlorobutane	132%	122%	115%	107%
Bromochloropropane	122%	103%	114%	113%
Trifluorotoluene	101%	107%	90%	84%
Bromofluorobenzene	86%	90%	81%	74%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits

na - not analyzed

C - coelution with sample peaks

M - matrix interference

J - estimated value

Acceptable Recovery limits: 65% TO 135%

Acceptable RPD limit: 35%

July 9, 2001

Dan Venchiarutti
SCS Engineers
2405 140th Ave. NE, #107
Bellevue, WA 98005

Dear Mr. Venchiarutti:

Please find enclosed the analytical data report for the Sooper Cleaners Project in Normandy Park, Washington. Soil and water samples were analyzed for VOC's by Method 8260 on June 27, 2001.

The results of these analyses are summarized in the attached table. All soil values are reported on a dry weight basis. Applicable detection limits and QA/QC data are included. An invoice for this analytical work is also enclosed.

ESN Northwest appreciates the opportunity to have provided analytical services to SCS Engineers for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,



Michael A. Korosec
President

ESN SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

ESN Job Number: s10627-1
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS
 Client Job Number: 04199025.03

Analytical Results 8260, µg/L	MS MSD RPD							
	Water	Water	Water	Water	Water	Water	Water	Water
Date extracted	Reporting	06/27/01	06/27/01	06/27/01	06/27/01	06/27/01	06/27/01	06/27/01
Date analyzed	Limits	06/27/01	06/27/01	06/27/01	06/27/01	06/27/01	06/27/01	06/27/01
		MTH BLK	LCS	MW13-120	MW13-160	MW13-160	MW13-160	MW13-160
Dichlorodifluoromethane	1.0	nd		nd	nd			
Chloromethane	1.0	nd		nd	nd			
Vinyl chloride	1.0	nd		nd	nd			
Bromomethane	1.0	nd		nd	nd			
Chloroethane	1.0	nd		nd	nd			
Trichlorofluoromethane	1.0	nd		nd	nd			
1,1-Dichloroethene	1.0	nd		nd	nd			
Methylene chloride	1.0	nd		nd	nd			
trans-1,2-Dichloroethene	1.0	nd		nd	nd			
1,1-Dichloroethane	1.0	nd		nd	nd			
cis-1,2-Dichloroethene	1.0	nd		nd	nd			
2,2-Dichloropropane	1.0	nd		nd	nd			
Chloroform	1.0	nd		nd	nd			
Bromochloromethane	1.0	nd		nd	nd			
1,1,1-Trichloroethane	1.0	nd		nd	nd			
1,2-Dichloroethane	1.0	nd		nd	nd			
1,1-Dichloropropene	1.0	nd		nd	nd			
Carbon tetrachloride	1.0	nd		nd	nd			
Benzene	1.0	nd	125%	nd	nd	110%	110%	0%
Trichloroethene	1.0	nd	118%	nd	nd	102%	104%	2%
1,2-Dichloropropane	1.0	nd		nd	nd			
Dibromomethane	1.0	nd		nd	nd			
Bromodichloromethane	1.0	nd		nd	nd			
cis-1,3-Dichloropropene	1.0	nd		nd	nd			
Toluene	1.0	nd	110%	nd	nd	97%	96%	1%
trans-1,3-Dichloropropene	1.0	nd		nd	nd			
1,1,2-Trichloroethane	1.0	nd		nd	nd			
1,3-Dichloropropane	1.0	nd		nd	nd			
Dibromochloromethane	1.0	nd		nd	nd			
Tetrachloroethene	1.0	nd		nd	nd			
1,2-Dibromoethane (EDB)	1.0	nd		nd	nd			
Chlorobenzene	1.0	nd	108%	nd	nd	95%	96%	1%
1,1,1,2-Tetrachloroethane	1.0	nd		nd	nd			
Ethylbenzene	1.0	nd		nd	nd			
Xylenes	1.0	nd		nd	nd			
Styrene	1.0	nd		nd	nd			
Bromoform	1.0	nd		nd	nd			
1,1,2,2-Tetrachloroethane	1.0	nd		nd	nd			
Isopropylbenzene	1.0	nd		nd	nd			
1,2,3-Trichloropropane	1.0	nd		nd	nd			
Bromobenzene	1.0	nd		nd	nd			
n-Propylbenzene	1.0	nd		nd	nd			
2-Chlorotoluene	1.0	nd		nd	nd			
4-Chlorotoluene	1.0	nd		nd	nd			
1,3,5-Trimethylbenzene	1.0	nd		nd	nd			
tert-Butylbenzene	1.0	nd		nd	nd			
1,2,4-Trimethylbenzene	1.0	nd		nd	nd			
sec-Butylbenzene	1.0	nd		nd	nd			
1,3-Dichlorobenzene	1.0	nd		nd	nd			
1,4-Dichlorobenzene	1.0	nd		nd	nd			
Isopropyltoluene	1.0	nd		nd	nd			
1,2-Dichlorobenzene	1.0	nd		nd	nd			
n-Butylbenzene	1.0	nd		nd	nd			
1,2-Dibromo-3-Chloropropane	1.0	nd		nd	nd			
1,2,4-Trichlorobenzene	1.0	nd		nd	nd			
Naphthalene	1.0	nd		nd	nd			
Hexachloro-1,3-butadiene	1.0	nd		nd	nd			
1,2,3-Trichlorobenzene	1.0	nd		nd	nd			

ESN SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

ESN Job Number: s10627-1
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS
 Client Job Number: 04199025.03

Analytical Results		MS MSD RPD						
8260, µg/L		MTH BLK	LCS	MW13-120	MW13-160	MW13-160	MW13-160	MW13-160
Matrix	Water	Water	Water	Water	Water	Water	Water	Water
Date extracted	Reporting	06/27/01	06/27/01	06/27/01	06/27/01	06/27/01	06/27/01	06/27/01
Date analyzed	Limits	06/27/01	06/27/01	06/27/01	06/27/01	06/27/01	06/27/01	06/27/01

Surrogate recoveries

Dibromofluoromethane	128%	130%	129%	129%	130%	129%
Toluene-d8	104%	103%	103%	103%	103%	102%
4-Bromofluorobenzene	125%	126%	123%	124%	122%	125%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
 Acceptable Recovery limits: 65% TO 135%
 Acceptable RPD limit: 35%

ESN SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

ESN Job Number: s10627-1
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS
 Client Job Number: 04199025.03

Analytical Results

8260, µg/L	MTH BLK		LCS MW13-180	
	Water	Water	Water	Water
Date extracted	Reporting	06/29/01	06/29/01	06/29/01
Date analyzed	Limits	06/29/01	06/29/01	06/29/01
Dichlorodifluoromethane	1.0	nd		nd
Chloromethane	1.0	nd		nd
Vinyl chloride	1.0	nd		nd
Bromomethane	1.0	nd		nd
Chloroethane	1.0	nd		nd
Trichlorofluoromethane	1.0	nd		nd
1,1-Dichloroethene	1.0	nd		nd
Methylene chloride	1.0	nd		nd
trans-1,2-Dichloroethene	1.0	nd		nd
1,1-Dichloroethane	1.0	nd		nd
cis-1,2-Dichloroethene	1.0	nd		nd
2,2-Dichloropropane	1.0	nd		nd
Chloroform	1.0	nd		nd
Bromochloromethane	1.0	nd		nd
1,1,1-Trichloroethane	1.0	nd		nd
1,2-Dichloroethane	1.0	nd		nd
1,1-Dichloropropene	1.0	nd		nd
Carbon tetrachloride	1.0	nd		nd
Benzene	1.0	nd	130%	nd
Trichloroethene	1.0	nd	123%	nd
1,2-Dichloropropane	1.0	nd		nd
Dibromomethane	1.0	nd		nd
Bromodichloromethane	1.0	nd		nd
cis-1,3-Dichloropropene	1.0	nd		nd
Toluene	1.0	nd	110%	nd
trans-1,3-Dichloropropene	1.0	nd		nd
1,1,2-Trichloroethane	1.0	nd		nd
1,3-Dichloropropane	1.0	nd		nd
Dibromochloromethane	1.0	nd		nd
Tetrachloroethene	1.0	nd		nd
1,2-Dibromoethane (EDB)	1.0	nd		nd
Chlorobenzene	1.0	nd	109%	nd
1,1,1,2-Tetrachloroethane	1.0	nd		nd
Ethylbenzene	1.0	nd		nd
Xylenes	1.0	nd		nd
Styrene	1.0	nd		nd
Bromoform	1.0	nd		nd
1,1,2,2-Tetrachloroethane	1.0	nd		nd
Isopropylbenzene	1.0	nd		nd
1,2,3-Trichloropropane	1.0	nd		nd
Bromobenzene	1.0	nd		nd
n-Propylbenzene	1.0	nd		nd
2-Chlorotoluene	1.0	nd		nd
4-Chlorotoluene	1.0	nd		nd
1,3,5-Trimethylbenzene	1.0	nd		nd
tert-Butylbenzene	1.0	nd		nd
1,2,4-Trimethylbenzene	1.0	nd		nd
sec-Butylbenzene	1.0	nd		nd
1,3-Dichlorobenzene	1.0	nd		nd
1,4-Dichlorobenzene	1.0	nd		nd
Isopropyltoluene	1.0	nd		nd
1,2-Dichlorobenzene	1.0	nd		nd
n-Butylbenzene	1.0	nd		nd
1,2-Dibromo-3-Chloropropane	1.0	nd		nd
1,2,4-Trichlorobenzene	1.0	nd		nd
Naphthalene	1.0	nd		nd
Hexachloro-1,3-butadiene	1.0	nd		nd
1,2,3-Trichlorobenzene	1.0	nd		nd

ESN SEATTLE CHEMISTRY LABORATORY
(425) 957-9872, fax (425) 957-9904

ESN Job Number: s10627-1
Client: SCS ENGINEERS
Client Job Name: SOOPER CLEANERS
Client Job Number: 04199025.03

Analytical Results

8260, µg/L	MTH BLK		LCS MW13-180	
Matrix	Water	Water	Water	Water
Date extracted	Reporting	06/29/01	06/29/01	06/29/01
Date analyzed	Limits	06/29/01	06/29/01	06/29/01

Surrogate recoveries

Dibromofluoromethane	127%	120%	121%
Toluene-d8	99%	98%	94%
4-Bromofluorobenzene	127%	124%	125%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
Acceptable Recovery limits: 65% TO 135%
Acceptable RPD limit: 35%

ESN SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

ESN Job Number: s10627-1
 Client: SCS ENGINEERS
 Client Job Name: SCOOPER CLEANERS
 Client Job Number: 04199025.03

Analytical Results

Matrix	MTH BLK		LCS MW13-140	
	Soil	Soil	Soil	Soil
Date extracted	Reporting	06/27/01	06/27/01	06/27/01
Date analyzed	Limits	06/27/01	06/27/01	06/27/01
Dichlorodifluoromethane	50	nd		nd
Chloromethane	50	nd		nd
Vinyl chloride	50	nd		nd
Bromomethane	50	nd		nd
Chloroethane	50	nd		nd
Trichlorofluoromethane	50	nd		nd
1,1-Dichloroethane	50	nd		nd
Methylene chloride	50	nd		nd
trans-1,2-Dichloroethene	50	nd		nd
1,1-Dichloroethane	50	nd		nd
cis-1,2-Dichloroethene	50	nd		nd
2,2-Dichloropropane	50	nd		nd
Chloroform	50	nd		nd
Bromochloromethane	50	nd		nd
1,1,1-Trichloroethane	50	nd		nd
1,2-Dichloroethane	50	nd		nd
1,1-Dichloropropene	50	nd		nd
Carbon tetrachloride	50	nd		nd
Benzene	50	nd	125%	nd
Trichloroethene	50	nd	118%	nd
1,2-Dichloropropane	50	nd		nd
Dibromomethane	50	nd		nd
Bromodichloromethane	50	nd		nd
cis-1,3-Dichloropropene	50	nd		nd
Toluene	50	nd	110%	nd
trans-1,3-Dichloropropene	50	nd		nd
1,1,2-Trichloroethane	50	nd		nd
1,3-Dichloropropane	50	nd		nd
Dibromochloromethane	50	nd		nd
Tetrachloroethene	50	nd		nd
1,2-Dibromoethane (EDB)	50	nd		nd
Chlorobenzene	50	nd	108%	nd
1,1,1,2-Tetrachloroethane	50	nd		nd
Ethylbenzene	50	nd		nd
Xylenes	50	nd		nd
Styrene	50	nd		nd
Bromoform	50	nd		nd
1,1,2,2-Tetrachloroethane	50	nd		nd
Isopropylbenzene	50	nd		nd
1,2,3-Trichloropropane	50	nd		nd
Bromobenzene	50	nd		nd
n-Propylbenzene	50	nd		nd
2-Chlorotoluene	50	nd		nd
4-Chlorotoluene	50	nd		nd
1,3,5-Trimethylbenzene	50	nd		nd
tert-Butylbenzene	50	nd		nd
1,2,4-Trimethylbenzene	50	nd		nd
sec-Butylbenzene	50	nd		nd
1,3-Dichlorobenzene	50	nd		nd
1,4-Dichlorobenzene	50	nd		nd
Isopropyltoluene	50	nd		nd
1,2-Dichlorobenzene	50	nd		nd
n-Butylbenzene	50	nd		nd
1,2-Dibromo-3-Chloropropane	50	nd		nd
1,2,4-Trichlorobenzene	50	nd		nd
Naphthalene	50	nd		nd
Hexachloro-1,3-butadiene	50	nd		nd
1,2,3-Trichlorobenzene	50	nd		nd

ESN SEATTLE CHEMISTRY LABORATORY
(425) 957-9872, fax (425) 957-9904

ESN Job Number: s10627-1
Client: SCS ENGINEERS
Client Job Name: SCOOPER CLEANERS
Client Job Number: 04199025.03

Analytical Results

8260, µg/kg	MTH BLK		LCS MW13-140	
Matrix	Soil	Soil	Soil	Soil
Date extracted	Reporting	06/27/01	06/27/01	06/27/01
Date analyzed	Limits	06/27/01	06/27/01	06/27/01

Surrogate recoveries

Dibromofluoromethane	128%	130%	125%
Toluene-d8	104%	103%	104%
4-Bromofluorobenzene	125%	126%	123%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
Acceptable Recovery limits: 65% TO 135%
Acceptable RPD limit: 35%

510627-1

CHAIN-OF-CUSTODY RECORD

CLIENT: SCS Engineers
 ADDRESS: 2405 140th Ave NE, Suite 107, Bellevue, WA 98005
 PHONE: 425-746-4600 FAX: 425-746-6747
 CLIENT PROJECT #: 04199025.03 PROJECT MANAGER: Dan Kichinatti

DATE: 6/27/01 PAGE 1 OF 1
 PROJECT NAME: Sooper Creek GW
 LOCATION: Normandy Park, WA
 COLLECTOR: DJ/ED DATE OF COLLECTION 6/1/01

Sample Number	Depth	Time	Sample Type	Container Type	ANALYSES													NOTES	Total Number of Containers	Laboratory Note Number					
					VOA 8010/8021B	VOA 8021B BTX	VOA 8020	SEM VOL 8270	TPH - HCID	TPH 8015 (gasoline)	TPH 8015 (diesel)	PAH 8015 (d & o)	PCBs 8082	Pesticides 8081	TOTAL LEAD	PH									
1. MW-13, 120'			WATER	2 UOAs	X	X																			
2. MW-13, 160'			"	"	X	X																			
3. MW-13, 140'			SOIL	1 4oz.	X																				
4.																									
5.																									
6.																									
7.																									
8.																									
9.																									
10.																									
11.																									
12.																									
13.																									
14.																									
15.																									
16.																									
17.																									
18.																									

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
<i>[Signature]</i>	6/27/01	<i>[Signature]</i>	
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS Y/N/NA	
SEALS INTACT? Y/N/NA	
RECEIVED GOOD COND./COLD	
NOTES:	

LABORATORY NOTES:

Turn Around Time: Rush (Immediate)

SAMPLE DISPOSAL INSTRUCTIONS

TEG DISPOSAL @ \$2.00 each Return Pickup

July 24, 2001

Dan Venchiarutti
SCS Engineers
2405 140th Ave. NE, #107
Bellevue, WA 98005

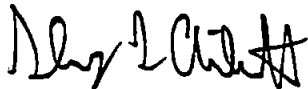
Dear Mr. Venchiarutti:

Please find enclosed the analytical data report for the Sooper Cleaners GW Project in Normandy Park, Washington. Water samples were analyzed for Specific Halogenated Hydrocarbons and BTEX by Method 8021B and VOC's by Method 8260 on July 12 & 13, 2001.

The results of these analyses are summarized in the attached table. Applicable detection limits and QA/QC data are included. An invoice for this analytical work is also enclosed.

ESN Northwest appreciates the opportunity to have provided analytical services to SCS Engineers for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,



Sherry L. Chilcutt
Vice President

ESN SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

ESN Job Number: S10712-1
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS GW
 Client Job Number: 04199025.03

Analytical Results

8260, µg/L	MTH BLK		LCS		MMW-13	
	Water	Water	Water	Water	Water	Water
Date extracted	Reporting	07/12/01	07/12/01	07/12/01	07/12/01	07/12/01
Date analyzed	Limits	07/12/01	07/12/01	07/12/01	07/12/01	07/12/01
Dichlorodifluoromethane	1.0	nd	nd	nd	nd	nd
Chloromethane	1.0	nd	nd	nd	nd	nd
Vinyl chloride	0.2	nd	nd	nd	nd	nd
Bromomethane	1.0	nd	nd	nd	nd	nd
Chloroethane	1.0	nd	nd	nd	nd	nd
Trichlorofluoromethane	1.0	nd	nd	nd	nd	nd
1,1-Dichloroethene	1.0	nd	nd	nd	nd	nd
Methylene chloride	1.0	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	1.0	nd	nd	nd	nd	nd
1,1-Dichloroethane	1.0	nd	nd	nd	nd	nd
cis-1,2-Dichloroethane	1.0	nd	nd	nd	nd	nd
2,2-Dichloropropane	1.0	nd	nd	nd	nd	nd
Chloroform	1.0	nd	nd	nd	nd	nd
Bromo-chloromethane	1.0	nd	nd	nd	nd	nd
1,1,1-Trichloroethane	1.0	nd	nd	nd	nd	nd
1,2-Dichloroethane	1.0	nd	nd	nd	nd	nd
1,1-Dichloropropene	1.0	nd	nd	nd	nd	nd
Carbon tetrachloride	1.0	nd	nd	102%	nd	nd
Benzene	1.0	nd	nd	96%	nd	nd
Trichloroethene	1.0	nd	nd	nd	nd	nd
1,2-Dichloropropane	1.0	nd	nd	nd	nd	nd
Dibromomethane	1.0	nd	nd	nd	nd	nd
Bromodichloromethane	1.0	nd	nd	nd	nd	nd
cis-1,3-Dichloropropene	1.0	nd	nd	100%	nd	nd
Toluene	1.0	nd	nd	nd	nd	nd
trans-1,3-Dichloropropene	1.0	nd	nd	nd	nd	nd
1,1,2-Trichloroethane	1.0	nd	nd	nd	nd	nd
1,3-Dichloropropane	1.0	nd	nd	nd	nd	nd
Dibromochloromethane	1.0	nd	nd	nd	nd	nd
Tetrachloroethene	1.0	nd	nd	nd	nd	nd
1,2-Dibromoethane (EDB)	1.0	nd	nd	97%	nd	nd
Chlorobenzene	1.0	nd	nd	nd	nd	nd
1,1,1,2-Tetrachloroethane	1.0	nd	nd	nd	nd	nd
Ethylbenzene	1.0	nd	nd	nd	nd	nd
Xylenes	1.0	nd	nd	nd	nd	nd
Styrene	1.0	nd	nd	nd	nd	nd
Bromodm	1.0	nd	nd	nd	nd	nd
1,1,2,2-Tetrachloroethane	1.0	nd	nd	nd	nd	nd
Isopropylbenzene	1.0	nd	nd	nd	nd	nd
1,2,3-Trichloropropane	1.0	nd	nd	nd	nd	nd
Bromobenzene	1.0	nd	nd	nd	nd	nd
n-Propylbenzene	1.0	nd	nd	nd	nd	nd
2-Chlorotoluene	1.0	nd	nd	nd	nd	nd
4-Chlorotoluene	1.0	nd	nd	nd	nd	nd
1,3,5-Trimethylbenzene	1.0	nd	nd	nd	nd	nd
tert-Butylbenzene	1.0	nd	nd	nd	nd	nd
1,2,4-Trimethylbenzene	1.0	nd	nd	nd	nd	nd
sec-Butylbenzene	1.0	nd	nd	nd	nd	nd
1,3-Dichlorobenzene	1.0	nd	nd	nd	nd	nd
1,4-Dichlorobenzene	1.0	nd	nd	nd	nd	nd
Isopropyltoluene	1.0	nd	nd	nd	nd	nd
1,2-Dichlorobenzene	1.0	nd	nd	nd	nd	nd
n-Butylbenzene	1.0	nd	nd	nd	nd	nd
1,2-Dibromo-3-Chloropropane	1.0	nd	nd	nd	nd	nd
1,2,4-Trichlorobenzene	1.0	nd	nd	nd	nd	nd
Naphthalene	1.0	nd	nd	nd	nd	nd
Hexachlor-1,3-butadiene	1.0	nd	nd	nd	nd	nd
1,2,3-Trichlorobenzene	1.0	nd	nd	nd	nd	nd

ESN SEATTLE CHEMISTRY LABORATORY
(425) 957-9872, fax (425) 957-9904

ESN Job Number: S10712-1
Client: SCS ENGINEERS
Client Job Name: SOOPER CLEANERS GW
Client Job Number: 04199025.03

Analytical Results

8260, µg/L		MTH BLK	LCS	MW-13
Matrx	Water	Water	Water	Water
Date extracted	Reporting	07/12/01	07/12/01	07/12/01
Date analyzed	Limits	07/12/01	07/12/01	07/12/01

Surrogate recoveries

Dibromofluoromethane	119%	117%	120%
Toluene-d8	117%	116%	118%
4-Bromofluorobenzene	120%	122%	121%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
Acceptable Recovery limits: 65% TO 135%
Acceptable RPD limit: 35%

ESN SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

ESN Job Number: S10712-1
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS GW
 Client Job Number: 04199025.03

Analytical Results

8021B, µg/l	MTH BLK	LCS	MW-7	MW-8	MW-10	MW-11	
Matrix	Water	Water	Water	Water	Water	Water	
Date extracted	Reporting	07/13/01	07/13/01	07/13/01	07/13/01	07/13/01	
Date analyzed	Limits	07/13/01	07/13/01	07/13/01	07/13/01	07/13/01	
Chloromethane	5.0	nd		nd	nd	nd	nd
Bromomethane	5.0	nd		nd	nd	nd	nd
Vinyl chloride	5.0	nd		nd	nd	nd	nd
Chloroethane	5.0	nd		nd	nd	nd	nd
cis-1,2-Dichloroethene	5.0	nd		65	nd	nd	nd
1,1-Dichloroethene	5.0	nd		nd	nd	nd	nd
Methylene Chloride	5.0	nd		17	nd	nd	nd
trans-1,2-Dichloroethene	5.0	nd		nd	nd	nd	nd
1,1-Dichloroethane	5.0	nd		nd	nd	nd	nd
Chloroform	1.0	nd		40	nd	42	nd
1,1,1-Trichloroethane	1.0	nd		nd	nd	nd	nd
Carbontetrachloride	1.0	nd		nd	nd	nd	nd
1,2-Dichloroethane	5.0	nd		nd	nd	nd	nd
Trichloroethene	1.0	nd	102%	85	nd	6.6	nd
1,2-Dichloropropane	5.0	nd		nd	nd	nd	nd
Bromodichloromethane	5.0	nd		nd	nd	nd	nd
cis-1,3-Dichloropropene	5.0	nd		nd	nd	nd	nd
trans-1,3-Dichloropropene	5.0	nd		nd	nd	nd	nd
Chlorobenzene	5.0	nd	106%	nd	nd	nd	nd
1,1,2-Trichloroethane	1.0	nd		nd	nd	nd	nd
Tetrachloroethene	1.0	nd		8,300	180	5,900	18
Dibromochloromethane	5.0	nd		nd	nd	nd	nd
Bromoform	5.0	nd		nd	nd	nd	nd
1,1,2,2-Tetrachloroethane	5.0	nd		nd	nd	nd	nd
1,1,1,2-Tetrachloroethane	5.0	nd		nd	nd	nd	nd
Bromobenzene	5.0	nd		nd	nd	nd	nd
1,2,3-Trichloropropane	5.0	nd		nd	nd	nd	nd
Dibromomethane	5.0	nd		nd	nd	nd	nd
m-Dichlorobenzene	1.0	nd		nd	nd	nd	nd
p-Dichlorobenzene	1.0	nd		nd	nd	nd	nd
o-Dichlorobenzene	1.0	nd		nd	nd	nd	nd
Benzene	1.0	nd	113%	nd	nd	nd	nd
Toluene	1.0	nd	108%	nd	nd	nd	nd
Ethylbenzene	1.0	nd		nd	nd	nd	nd
Xylenes	1.0	nd		nd	nd	nd	nd

Surrogate recoveries:

Bromochloromethane	124%	118%	113%	114%	114%	114%
1,4-Dichlorobutane	111%	108%	118%	104%	117%	110%
Bromochloropropane	106%	106%	84%	106%	107%	105%
Trifluorotoluene	96%	92%	100%	95%	94%	99%
Bromofluorobenzene	107%	106%	106%	106%	108%	108%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
 na - not analyzed
 C - coelution with sample peaks
 M - matrix interference
 J - estimated value
 Acceptable Recovery limits: 65% TO 135%
 Acceptable RPD limit: 35%

ESN SEATTLE CHEMISTRY LABORATORY
 (425) 957-9872, fax (425) 957-9904

ESN Job Number: S10712-1
 Client: SCS ENGINEERS
 Client Job Name: SOOPER CLEANERS GW
 Client Job Number: 04199025.03

Analytical Results

8021B, µg/l	DUP-A	
Matrix	Water	Water
Date extracted	Reporting	07/13/01
Date analyzed	Limits	07/13/01
Chloromethane	5.0	nd
Bromomethane	5.0	nd
Vinyl chloride	5.0	nd
Chloroethane	5.0	nd
cis-1,2-Dichloroethene	5.0	nd
1,1-Dichloroethene	5.0	nd
Methylene Chloride	5.0	nd
trans-1,2-Dichloroethene	5.0	nd
1,1-Dichloroethane	5.0	nd
Chloroform	1.0	40
1,1,1-Trichloroethane	1.0	nd
Carbontetrachloride	1.0	nd
1,2-Dichloroethane	5.0	nd
Trichloroethene	1.0	6.3
1,2-Dichloropropane	5.0	nd
Bromodichloromethane	5.0	nd
cis-1,3-Dichloropropene	5.0	nd
trans-1,3-Dichloropropene	5.0	nd
Chlorobenzene	5.0	nd
1,1,2-Trichloroethane	1.0	nd
Tetrachloroethene	1.0	6,200
Dibromochloromethane	5.0	nd
Bromoform	5.0	nd
1,1,2,2-Tetrachloroethane	5.0	nd
1,1,1,2-Tetrachloroethane	5.0	nd
Bromobenzene	5.0	nd
1,2,3-Trichloropropane	5.0	nd
Dibromomethane	5.0	nd
m-Dichlorobenzene	1.0	nd
p-Dichlorobenzene	1.0	nd
o-Dichlorobenzene	1.0	nd
Benzene	1.0	nd
Toluene	1.0	nd
Ethylbenzene	1.0	nd
Xylenes	1.0	nd

Surrogate recoveries:

Bromochloromethane	108%
1,4-Dichlorobutane	115%
Bromochloropropane	101%
Trifluorotoluene	91%
Bromofluorobenzene	108%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits

na - not analyzed

C - coelution with sample peaks

M - matrix interference

J - estimated value

Acceptable Recovery limits: 65% TO 135%

Acceptable RPD limit: 35%

APPENDIX E

GROUNDWATER SAMPLING DATA SHEETS



WELL SAMPLING RECORD

SCS ENGINEERS
Environmental Consultants
2405 140th Avenue, NE
Suite 107
Bellevue, WA 98005
206 746-4600
FAX 206 746-6747

PROJECT Sooper Cleaners GW
JOB NUMBER 04199025.01
PERSONNEL Dan Venchiarutti

DATE 6/9/00
WEATHER: cloudy

=====

WELL NO. MW-1 TIME 8 AM
DIAMETER OF WELL 2" STATIC WATER LEVEL 31.68' below RP
DEPTH OF WELL 40' VOLUME/FOOT _____
FEET OF WATER IN WELL ~8 WATER VOLUME IN WELL _____

PRODUCT PRESENT yes _____ no PRODUCT TYPE NA.
STATIC PRODUCT THICKNESS IN WELL NA.
TRUE PRODUCT THICKNESS NA.

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (E°)	DO.
<u>Grundfos Pump</u>	<u>5 gal</u>	<u>6.91</u>	<u>388 µS</u>	<u>17.8</u>	<u>-</u>
start Purge Time <u>8¹⁵ AM</u>					
End Purge Time _____					
Average Pumping Rate _____					
Volume Water Removed <u>7 gals</u>					

SAMPLING

Equipment Grundfos Pump Time 8³⁵
Sample Nos./Well Nos. MW-1 2 VOAs

Notes/Comments 1st well sampled (upgradient?)
Collected RB-1 before sampling MW-1

WELL SAMPLING RECORD

SCS ENGINEERS
 Environmental Consultants
 2405 140th Avenue, NE
 Suite 107
 Bellevue, WA 98005
 206 746-4600
 FAX 206 746-6747

PROJECT Scooper Cleaners GW

DATE 6/9/00

JOB NUMBER 04199025.01

WEATHER Cloudy

PERSONNEL Dan Venchiarutti

=====

WELL NO. MW-2

TIME 10⁴⁵ Am

DIAMETER OF WELL 2"

STATIC WATER LEVEL 36.78' below RP

DEPTH OF WELL _____

VOLUME/FOOT _____

FEET OF WATER IN WELL _____

WATER VOLUME IN WELL _____

PRODUCT PRESENT yes _____ no

PRODUCT TYPE NA.

STATIC PRODUCT THICKNESS IN WELL NA.

TRUE PRODUCT THICKNESS NA.

PURGING PRIOR TO SAMPLING

Equipment <u>Grundfos Pump</u>	Time/gal. _____	<u>pH</u>	<u>EC</u>	<u>Temp (E°)</u>	<u>DO.</u>
--------------------------------	-----------------	-----------	-----------	------------------	------------

Start Purge Time <u>11^{AM}</u>	<u>5 gal</u>	<u>7.19</u>	<u>223_{us}</u>	<u>16.3°C</u>	_____
---	--------------	-------------	-------------------------	---------------	-------

End Purge Time <u>11³⁵ Am</u>	_____	_____	_____	_____	_____
--	-------	-------	-------	-------	-------

Average Pumping Rate _____	_____	_____	_____	_____	_____
----------------------------	-------	-------	-------	-------	-------

Volume Water Removed <u>8</u> gals	_____	_____	_____	_____	_____
------------------------------------	-------	-------	-------	-------	-------

SAMPLING

Equipment <u>Grundfos Pump</u>	Time <u>11⁴⁵ Am</u>
--------------------------------	--------------------------------

Sample Nos./Well Nos. <u>MW-2</u>	<u>2 VOAs</u>
-----------------------------------	---------------

Notes/Comments Last well sampled

Collected RB-3 / After decon / After MW-2

WELL SAMPLING RECORD

SCS ENGINEERS
 Environmental Consultants
 2405 140th Avenue, NE
 Suite 107
 Bellevue, WA 98005
 206 746-4600
 FAX 206 746-6747

PROJECT Sooper Cleaners GW
 JOB NUMBER 04199025.01
 PERSONNEL Dan Venchiarutti

DATE 6/9/00
 WEATHER cloudy

=====

WELL NO. MW-3 TIME 10 AM
 DIAMETER OF WELL 2" STATIC WATER LEVEL 37.62' below RP
 DEPTH OF WELL _____ VOLUME/FOOT _____
 FEET OF WATER IN WELL _____ WATER VOLUME IN WELL _____

PRODUCT PRESENT yes _____ no PRODUCT TYPE N.A.
 STATIC PRODUCT THICKNESS IN WELL N.A.
 TRUE PRODUCT THICKNESS N.A.

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (°C)	DO
<u>Grundfos Pump</u>					
Start Purge Time <u>10 AM</u>	<u>5 gal</u>	<u>7.09</u>	<u>265 us</u>	<u>16.6°C</u>	
End Purge Time <u>10⁴⁵ AM</u>					
Average Pumping Rate _____					
Volume Water Removed <u>8 gals</u>					

SAMPLING

Equipment Grundfos Pump Time 1045
 Sample Nos./Well Nos. MW-3 2 VOAs
DUPA 2 UGAs

Notes/Comments 3rd well sampled.
Collected RB-2 (After decon/and/After collection of MW-4)
→ before collection of MW-3
→ Also DUPA collected with mw-3

WELL SAMPLING RECORD

SCS ENGINEERS
Environmental Consultants
2405 140th Avenue, NE
Suite 107
Bellevue, WA 98005
206 746-4600
FAX 206 746-6747

PROJECT Sooper Cleaners GW
JOB NUMBER 04199025.01
PERSONNEL Dan Venchiarutti

DATE 6/9/00
WEATHER ~~Clear~~ Cloudy

=====

WELL NO. MW-4 TIME 9 AM
DIAMETER OF WELL 2" STATIC WATER LEVEL 37.78' below RP
DEPTH OF WELL 46' VOLUME/FOOT _____
FEET OF WATER IN WELL _____ WATER VOLUME IN WELL _____

PRODUCT PRESENT yes _____ no PRODUCT TYPE NA.
STATIC PRODUCT THICKNESS IN WELL _____ NA.
TRUE PRODUCT THICKNESS _____ NA.

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (E°)	DO.
<u>Grundfos Pump</u>					
Start Purge Time <u>9:10</u>	<u>5 gal</u>	<u>7.17</u>	<u>303.5</u>	<u>16.9</u>	<u>-</u>
End Purge Time _____	_____	_____	_____	_____	_____
Average Pumping Rate _____	_____	_____	_____	_____	_____
Volume Water Removed <u>7 gals</u>	_____	_____	_____	_____	_____

SAMPLING

Equipment Grundfos Pump Time 9:30 AM
Sample Nos./Well Nos. MW-4 2 VOAs
Notes/Comments 2nd well sampled

WELL SAMPLING RECORD

SCS ENGINEERS
 Environmental Consultants
 2405 140th Avenue, NE
 Suite 107
 Bellevue, WA 98005
 206 746-4600
 FAX 206 746-6747

PROJECT Sooper Cleaners GW II
 JOB NUMBER 04199025.02
 PERSONNEL Dan Venchiatti

DATE 8/29/00
 WEATHER SUNNY

=====

WELL NO. MW-1 TIME 7¹⁵ AM
 DIAMETER OF WELL 2" STATIC WATER LEVEL 32.46" below RP
 DEPTH OF WELL _____ VOLUME/FOOT _____
 FEET OF WATER IN WELL _____ WATER VOLUME IN WELL _____

PRODUCT PRESENT yes _____ no PRODUCT TYPE N.A
 STATIC PRODUCT THICKNESS IN WELL N.A
 TRUE PRODUCT THICKNESS N.A

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (E°)	DO
<u>Grundfos Pump</u>					
Start Purge Time <u>7³⁵ AM</u>	<u>3</u>	<u>6.38</u>	<u>437_{us}</u>	<u>18.4</u>	<u>6.6 mg/l</u>
End Purge Time <u>8 AM</u>	<u>6</u>	<u>6.49</u>	<u>455_{us}</u>	<u>18.2</u>	<u>6.4 mg/l</u>
Average Pumping Rate _____	_____	_____	_____	_____	_____
Volume Water Removed <u>6 gals</u>	_____	_____	_____	_____	_____

SAMPLING

Equipment Grundfos Pump Time 8 AM
 Sample Nos./Well Nos. MW-1 2 VOAs

Notes/Comments _____
Water clear no odor or sheen.

WELL SAMPLING RECORD

SCS ENGINEERS
Environmental Consultants

2405 140th Avenue, NE
Suite 107
Bellevue, WA 98005

206 746-4600
FAX 206 746-6747

PROJECT Sooper Cleaners GW II

DATE 8/29/00

JOB NUMBER 04199025.02

WEATHER SUNNY

PERSONNEL Dan Venchiavitti

=====

WELL NO. MW-2

TIME 1:30 pm

DIAMETER OF WELL 2"

STATIC WATER LEVEL 37.61' below RP

DEPTH OF WELL _____

VOLUME/FOOT _____

FEET OF WATER IN WELL _____

WATER VOLUME IN WELL _____

PRODUCT PRESENT yes _____ no

PRODUCT TYPE N.A

STATIC PRODUCT THICKNESS IN WELL N.A

TRUE PRODUCT THICKNESS N.A

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (E°)	DO
<u>Grundfos Pump</u>					
Start Purge Time <u>1:30 pm</u>	<u>3</u>	<u>7.20</u>	<u>213 μS</u>	<u>18.2°C</u>	<u>6.6 mg/L</u>
End Purge Time <u>2 pm</u>	<u>5</u>	<u>7.19</u>	<u>214 μS</u>	<u>17.7°C</u>	<u>6.9 mg/L</u>
Average Pumping Rate _____	_____	_____	_____	_____	_____
Volume Water Removed <u>6 gals</u>	_____	_____	_____	_____	_____

SAMPLING

Equipment Grundfos Pump Time 2 pm

Sample Nos./Well Nos. MW-2 2 VOAs

Notes/Comments _____

Water clear, no odor or shear
Collect RB-4 after final decan.

WELL SAMPLING RECORD

SCS ENGINEERS
 Environmental Consultants
 2405 140th Avenue, NE
 Suite 107
 Bellevue, WA 98005
 206 746-4600
 FAX 206 746-6747

PROJECT Sooper Cleaners GW II
 JOB NUMBER 04199025.02
 PERSONNEL Dan Venchiatti

DATE 8/29/00
 WEATHER Sunny

=====

WELL NO. MW-3 TIME 11⁵⁰ AM
 DIAMETER OF WELL 2" STATIC WATER LEVEL 38[±] below RP
 DEPTH OF WELL _____ VOLUME/FOOT _____
 FEET OF WATER IN WELL _____ WATER VOLUME IN WELL _____

PRODUCT PRESENT yes _____ no PRODUCT TYPE N.A
 STATIC PRODUCT THICKNESS IN WELL N.A
 TRUE PRODUCT THICKNESS N.A

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (E°)	DO
<u>Grundfos Pump</u>					
Start Purge Time <u>11⁵⁵ AM</u>	<u>2-3</u>	<u>7.10</u>	<u>304_{µS}</u>	<u>18.0°C</u>	<u>6.9 mg/L</u>
End Purge Time _____	<u>5</u>	<u>6.99</u>	<u>305_{µS}</u>	<u>18.0°C</u>	<u>6.6 mg/L</u>
Average Pumping Rate _____					
Volume Water Removed <u>7</u> gals					

SAMPLING

Equipment Grundfos Pump Time 12¹⁵
 Sample Nos./Well Nos. MW-3 2 VOAs
DUP-A

Notes/Comments _____
Water clear - no odor or colour
Collected DUP-A
Collected BB-3 after Down MW-3.

WELL SAMPLING RECORD

SCS ENGINEERS
Environmental Consultants

2405 140th Avenue, NE
Suite 107
Bellevue, WA 98005

206 746-4600
FAX 206 746-6747

PROJECT Sooper Cleaners GW II

DATE 8/29/00

JOB NUMBER 04199025.02

WEATHER SUNNY

PERSONNEL Dan Venchiavitti

=====

WELL NO. MW-4

TIME 8³⁰ Am

DIAMETER OF WELL 2"

STATIC WATER LEVEL 38⁶⁷ below RP

DEPTH OF WELL _____

VOLUME/FOOT _____

FEET OF WATER IN WELL _____

WATER VOLUME IN WELL _____

PRODUCT PRESENT yes _____ no

PRODUCT TYPE N.A

STATIC PRODUCT THICKNESS IN WELL N.A

TRUE PRODUCT THICKNESS N.A

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (E°)	DO
<u>Grundfos Pump</u>					
Start Purge Time <u>8³⁰ Am</u>	<u>3</u>	<u>6.83</u>	<u>343 us</u>	<u>15.8°C</u>	<u>6.5</u> ms/L
End Purge Time _____	<u>5</u>	<u>6.92</u>	<u>300 us</u>	<u>15.8°C</u>	<u>6.3</u> ms/L
Average Pumping Rate _____	<u>7</u>	<u>6.90</u>	<u>292 us</u>	<u>15.4°C</u>	<u>6.4</u> ms/L
Volume Water Removed <u>7 gals</u>					

SAMPLING

Equipment Grundfos Pump Time 8⁵⁰

Sample Nos./Well Nos. MW-4 2 VOAs

Notes/Comments _____

Water clear, no odor or skew

Collected RB-1 after decom of MW-4 =>

WELL SAMPLING RECORD

SCS ENGINEERS
 Environmental Consultants
 2405 140th Avenue, NE
 Suite 107
 Bellevue, WA 98005
 206 746-4600
 FAX 206 746-6747

PROJECT Sooper Cleaners GW II
 JOB NUMBER 04199025.02
 PERSONNEL Dan Venchiavitti

DATE 8/29/00
 WEATHER Sunny

=====

WELL NO. MW-5A TIME 11⁰⁵ AM
 DIAMETER OF WELL 2" STATIC WATER LEVEL 38²⁴ below RP
 DEPTH OF WELL _____ VOLUME/FOOT _____
 FEET OF WATER IN WELL _____ WATER VOLUME IN WELL _____

PRODUCT PRESENT yes _____ no PRODUCT TYPE N.A
 STATIC PRODUCT THICKNESS IN WELL N.A
 TRUE PRODUCT THICKNESS N.A

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (E°)	DO
<u>Grundfos Pump</u>					
Start Purge Time <u>11⁰⁵</u>	<u>3</u>	<u>7.45</u>	<u>333.05</u>	<u>16.2</u>	<u>7.2</u>
End Purge Time _____	<u>5</u>	<u>7.40</u>	<u>328.05</u>	<u>16.3</u>	<u>6.8</u>
Average Pumping Rate _____	_____	_____	_____	_____	_____
Volume Water Removed <u>6</u> gals _____	_____	_____	_____	_____	_____

SAMPLING

Equipment Grundfos Pump Time _____
 Sample Nos./Well Nos. MW-5A 2 VOAs

Notes/Comments _____

Water clear, no odor or taste

WELL SAMPLING RECORD

SCS ENGINEERS
Environmental Consultants

2405 140th Avenue, NE
Suite 107
Bellevue, WA 98005

206 746-4600
FAX 206 746-6747

PROJECT Sooper Cleaners GW II

DATE 8/29/00

JOB NUMBER 04199025.02

WEATHER SUNNY

PERSONNEL Dan Venchiacchi

WELL NO. MW-5B

TIME 10¹⁵ Am

DIAMETER OF WELL 2"

STATIC WATER LEVEL 38" below RP

DEPTH OF WELL _____

VOLUME/FOOT _____

FEET OF WATER IN WELL _____

WATER VOLUME IN WELL _____

PRODUCT PRESENT yes _____ no

PRODUCT TYPE N.A

STATIC PRODUCT THICKNESS IN WELL N.A

TRUE PRODUCT THICKNESS N.A

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (E°)	DO
<u>Grundfos Pump</u>					
Start Purge Time <u>10¹⁵ Am</u>	<u>3</u>	<u>6.94</u>	<u>288μS</u>	<u>16.3°C</u>	<u>6.0 mg/L</u>
End Purge Time <u>10⁴⁵ Am</u>	<u>5</u>	<u>6.95</u>	<u>270μS</u>	<u>16.2°C</u>	<u>6.3 mg/L</u>
Average Pumping Rate _____	_____	_____	_____	_____	_____
Volume Water Removed <u>6</u> gals _____	_____	_____	_____	_____	_____

SAMPLING

Equipment Grundfos Pump Time 10⁴⁵ Am

Sample Nos./Well Nos. MW-5B 2 VOAs

Notes/Comments _____

Water clear, no odor or stains

Collected RB-2 after decontam MW-5B.

WELL SAMPLING RECORD

SCS ENGINEERS
 Environmental Consultants
 2405 140th Avenue, NE
 Suite 107
 Bellevue, WA 98005
 206 746-4600
 FAX 206 746-6747

PROJECT Scooper Cleaners GW II
 JOB NUMBER 04199025.02
 PERSONNEL Dan Venchiacutti

DATE 8/29/00
 WEATHER Sunny

=====

WELL NO. MW-6 TIME 9²⁵
 DIAMETER OF WELL 2" STATIC WATER LEVEL 39.17 below RP
 DEPTH OF WELL _____ VOLUME/FOOT _____
 FEET OF WATER IN WELL _____ WATER VOLUME IN WELL _____

PRODUCT PRESENT yes _____ no PRODUCT TYPE N.A
 STATIC PRODUCT THICKNESS IN WELL N.A
 TRUE PRODUCT THICKNESS N.A

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (°F)	DO
<u>Grundfos Pump</u>					
Start Purge Time <u>9²⁵ AM</u>	<u>3</u>	<u>6.83</u>	<u>382 µS</u>	<u>15.2</u>	<u>7.3 mg/L</u> O ₂
End Purge Time _____	<u>5</u>	<u>6.88</u>	<u>342 µS</u>	<u>15.7</u>	<u>6.7 mg/L</u> O ₂
Average Pumping Rate _____	<u>7</u>	<u>6.91</u>	<u>331 µS</u>	<u>15.8</u>	<u>6.7 mg/L</u> O ₂
Volume Water Removed <u>7.5</u> gals					

SAMPLING

Equipment Grundfos Pump Time 9⁵⁰ AM
 Sample Nos./Well Nos. MW-6 2 VOAs

Notes/Comments _____
water clear, no odor or show

WELL SAMPLING RECORD

SCS ENGINEERS
 Environmental Consultants
 2405 140th Avenue, NE
 Suite 107
 Bellevue, WA 98005
 206 746-4600
 FAX 206 746-6747

PROJECT Sooper Cleaners GW II
 JOB NUMBER 04199025.02
 PERSONNEL Dan Venchiacchi

DATE 8/29/00
 WEATHER Sunny

=====

WELL NO. MW-7 TIME 12⁴⁵ pm
 DIAMETER OF WELL 2" STATIC WATER LEVEL 38" below RP
 DEPTH OF WELL _____ VOLUME/FOOT _____
 FEET OF WATER IN WELL _____ WATER VOLUME IN WELL _____

PRODUCT PRESENT yes _____ no PRODUCT TYPE N.A
 STATIC PRODUCT THICKNESS IN WELL N.A
 TRUE PRODUCT THICKNESS N.A

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (°C)	DO
<u>Grundfos Pump</u>					
Start Purge Time <u>12⁴⁵ pm</u>	<u>3</u>	<u>7.49</u>	<u>177 µS</u>	<u>18.2 °C</u>	<u>5.8 mg/L</u>
End Purge Time <u>1¹⁰ pm</u>	<u>5</u>	<u>7.42</u>	<u>169 µS</u>	<u>18.2 °C</u>	
Average Pumping Rate _____	_____	_____	_____	_____	_____
Volume Water Removed _____ gals	_____	_____	_____	_____	_____

SAMPLING

Equipment Grundfos Pump Time 1¹⁵ pm
 Sample Nos./Well Nos. MW-7 2 VOAs

Notes/Comments _____
Water slightly silty... no odor or sheen.

WELL SAMPLING RECORD

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 Environmental Consultants
 2405 140th Avenue, NE
 Suite 107
 Bellevue, WA 98005
 206 746-4600
 FAX 206 746-6747

PROJECT Sooper Cleaners Phase III
 JOB NUMBER 04199025.03
 PERSONNEL Dan V / Brian D

DATE 2/1/01
 WEATHER Cloudy

=====

WELL NO. MW-8 TIME 1025
 DIAMETER OF WELL 2" STATIC WATER LEVEL _____
 DEPTH OF WELL ~90' VOLUME/FOOT _____
 FEET OF WATER IN WELL _____ WATER VOLUME IN WELL _____

PRODUCT PRESENT yes _____ no PRODUCT TYPE N.A.
 STATIC PRODUCT THICKNESS IN WELL N.A.
 TRUE PRODUCT THICKNESS N.A.

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (°C)	DO
<u>Grundfos Pump</u>					
Start Purge Time <u>1032</u>		<u>7.52</u>	<u>125</u>	<u>9.9</u>	<u>0.0</u>
End Purge Time <u>1112</u>		<u>7.53</u>	<u>285</u>	<u>15.1</u>	<u>0.0</u>
Average Pumping Rate <u>< 1L/minute</u>					
Volume Water Removed <u>~8 gals</u>					

meter not functioning

SAMPLING

Equipment Grundfos Pump Time 1112
 Sample Nos./Well Nos. MW-8 2 VOAs.

Notes/Comments water slightly turbid. Perc odor noted when well was opened.

↳ Meter not responding (not calibrating)

Time	Volume	DO $\mu\text{g/L}$	Cond μS	pH	Temp $^{\circ}\text{C}$
1032	0.25	0.0	125	7.52	9.9 $^{\circ}\text{C}$
1037	2	0.8	269	7.15	12.5 $^{\circ}$
1045	2.75	0.0	276	7.03	13.0
1050	3.5	0.1	280	7.05	14.2
1055	5	0.0	285	7.00	16.1
1104	6.5	0.0	285	7.07	14.8 15.7
1111	7.25	0.0	285	7.08	15.1
1112	Sample				

WELL SAMPLING RECORD

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 Suite 107
 Bellevue, WA 98005
 206 746-4600
 FAX 206 746-6747

PROJECT Sooper Cleaners Phase III

DATE 2/1/01

JOB NUMBER 04199025.03

WEATHER Cloudy

PERSONNEL Dan V / Brian D

WELL NO. MW-9

TIME 0910

DIAMETER OF WELL 2"

STATIC WATER LEVEL _____

DEPTH OF WELL ~44'

VOLUME/FOOT _____

FEET OF WATER IN WELL _____

WATER VOLUME IN WELL _____

PRODUCT PRESENT yes _____ no

PRODUCT TYPE N.A.

STATIC PRODUCT THICKNESS IN WELL N.A.

TRUE PRODUCT THICKNESS N.A.

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (°C)	DO
<u>Grundfos Pump</u>					
Start Purge Time <u>0914</u>		<u>7.27</u>	<u>243</u>	<u>9.5</u>	<u>5.2</u>
End Purge Time <u>0932</u>		<u>6.51</u>	<u>584</u>	<u>14.1</u>	<u>2.7</u>
Average Pumping Rate <u>2L/min</u>					
Volume Water Removed <u>7.5 gals</u>					

SAMPLING

Equipment Grundfos Pump Time 0932

Sample Nos./Well Nos. MW-9 2 VOAs.

Notes/Comments _____

Water Clear + no odor or sheen

~~Decomposition of ...~~

Time	Volume	DO	Cond.	pH	Temp °C
0910	0.25	5.2 mg/l	243 μS	7.27	9.5
0919	3	2.8	571 μS	6.82	13.4
0921	4	2.7	597 μS	no data	15.2
0923	5	no data	584	6.51	14.1
0932	5 7.5	sample			

↙ water stopped working properly

WELL SAMPLING RECORD

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 Environmental Consultants
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 Suite 107
 Bellevue, WA 98005
 206 746-4600
 FAX 206 746-6747

PROJECT Sooper Cleaners Phase III
 JOB NUMBER 04199025.03
 PERSONNEL Dan V / Brian D

DATE 2/1/01
 WEATHER Cloudy

=====

WELL NO. MW-10 TIME 12:00
 DIAMETER OF WELL 2" STATIC WATER LEVEL _____
 DEPTH OF WELL _____ VOLUME/FOOT _____
 FEET OF WATER IN WELL _____ WATER VOLUME IN WELL _____

PRODUCT PRESENT yes _____ no PRODUCT TYPE N.A.
 STATIC PRODUCT THICKNESS IN WELL N.A.
 TRUE PRODUCT THICKNESS N.A.

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (°F)	DO
<u>Grundfos Pump</u>					
Start Purge Time <u>1201</u>		<u>7.80</u>	<u>116</u>	<u>12.7</u>	<u>5.9</u>
End Purge Time <u>1227</u>		<u>7.52</u>	<u>169</u>	<u>15.2</u>	<u>2.5</u>
Average Pumping Rate <u>1L/minute</u>					
Volume Water Removed <u>6.5 gals</u>					

SAMPLING

Equipment Grundfos Pump Time 1227
 Sample Nos./Well Nos. MW-10 2 VOAs.

Notes/Comments No odor or sheen

<u>Time</u>	<u>Volume</u>	<u>DO_{mg/L}</u>	<u>condus</u>	<u>pH</u>	<u>Temp. °C</u>
1201	0.25	5.9	116	7.8	
1206	2.25	2.3	185	7.8 ^{7.59}	12.7
1209	2.75	2.6	180	7.44	12.9
1217	4	2.8	172	7.61	16.0
1221	5	2.2	172	7.43	15.5
1227	6.5	2.5	169	7.52	15.3

Sample

→ meter not responding or calibrating

WELL SAMPLING RECORD

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Environmental Consultants
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Suite 107
Bellevue, WA 98005
206 746-4600
FAX 206 746-6747

PROJECT Sooper Cleaners Phase III
JOB NUMBER 04199025.03
PERSONNEL DAN Venchiavutti / Elaine Dilley

DATE 2/20/01
WEATHER Sunny

=====

WELL NO. MW-11 TIME 10²⁰ Am
DIAMETER OF WELL 2" STATIC WATER LEVEL 48²⁴ below RP
DEPTH OF WELL 60' VOLUME/FOOT -
FEET OF WATER IN WELL _____ WATER VOLUME IN WELL -

PRODUCT PRESENT yes _____ no PRODUCT TYPE N.A
STATIC PRODUCT THICKNESS IN WELL N.A
TRUE PRODUCT THICKNESS N.A

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (E°)	DO (mg/L)
<u>Grundfos pump</u>					
Start Purge Time <u>10²⁰</u>	<u>Motor is not functional</u>				
End Purge Time <u>10⁴³ Am</u>					
Average Pumping Rate _____					
Volume Water Removed <u>6-7 gals</u>					

SAMPLING

Equipment Grundfos pump Time 10⁴⁵ Am
Sample Nos./Well Nos. MW-11 2 WAs

Notes/Comments _____
Water clear - no odor or ~~color~~ shows

WELL SAMPLING RECORD

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 Suite 107
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 FAX 206 746-6747

PROJECT Soaper Cleaners Phase III
 JOB NUMBER 04199025.03
 PERSONNEL Dan Venchiavitti / Elaine D. Hey

DATE 2/20/01
 WEATHER Sunny

=====

WELL NO. MW-12
 DIAMETER OF WELL 2"
 DEPTH OF WELL 50'
 FEET OF WATER IN WELL _____

TIME 11:20
 STATIC WATER LEVEL 40.98 below RP
 VOLUME/FOOT _____
 WATER VOLUME IN WELL _____

PRODUCT PRESENT : yes _____ no PRODUCT TYPE N.A
 STATIC PRODUCT THICKNESS IN WELL N.A
 TRUE PRODUCT THICKNESS N.A

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (E°)	DC (mg/L)
<u>Grundfos pump</u>					
Start Purge Time <u>11:20</u>	<u>field meter is not functional.</u>				
End Purge Time <u>12 PM</u>					
Average Pumping Rate _____					
Volume Water Removed <u>6-7</u> gals					

SAMPLING

Equipment Grundfos pump Time 12 PM
 Sample Nos./Well Nos. MW-12 2 Vials -
1 amber -

Notes/Comments _____
Water clear - no odor or sheen

WELL SAMPLING RECORD

SCS ENGINEERS
Environmental Consultants

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Suite 107
Bellevue, WA 98005

206 746-4600
FAX 206 746-6747

PROJECT Sooper Cleaners GW

DATE 7/14/01

JOB NUMBER 04199025.03

WEATHER Sunny

PERSONNEL DV/ED

=====

WELL NO. MW-7

TIME 755

DIAMETER OF WELL 2"

STATIC WATER LEVEL 42.6' below RP

DEPTH OF WELL 47'

VOLUME/FOOT -

FEET OF WATER IN WELL -

WATER VOLUME IN WELL -

PRODUCT PRESENT yes no PRODUCT TYPE N.A.

STATIC PRODUCT THICKNESS IN WELL N.A.

TRUE PRODUCT THICKNESS N.A.

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (°)
<u>QED bladder pump</u>				
Start Purge Time				
End Purge Time				
Average Pumping Rate				
Volume Water Removed	<u>gals</u>			

SAMPLING

Equipment QED bladder pump Time

Sample Nos./Well Nos. MW-7 2 VOAs

Notes/Comments

WELL SAMPLING RECORD

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Environmental Consultants
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Suite 107
Bellevue, WA 98005
206 746-4600
FAX 206 746-6747

PROJECT Sooper Cleaners GW
JOB NUMBER 04199025.03
PERSONNEL DV/ED

DATE 7/10/01
WEATHER Sunny

=====

WELL NO. MW-8
DIAMETER OF WELL 2"
DEPTH OF WELL 90'
FEET OF WATER IN WELL _____

TIME 1240
STATIC WATER LEVEL 42.85' below RP
VOLUME/FOOT _____
WATER VOLUME IN WELL _____

PRODUCT PRESENT yes _____ no PRODUCT TYPE N.A.
STATIC PRODUCT THICKNESS IN WELL N.A.
TRUE PRODUCT THICKNESS N.A.

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (E°)
<u>QED bladder pump</u>				
Start Purge Time _____	_____	_____	_____	_____
End Purge Time _____	_____	_____	_____	_____
Average Pumping Rate _____	_____	_____	_____	_____
Volume Water Removed _____ gals	_____	_____	_____	_____

SAMPLING

Equipment QED bladder pump Time _____
Sample Nos./Well Nos. MW-8 2VOAs

Notes/Comments _____

WELL SAMPLING RECORD

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Environmental Consultants

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Suite 107
Bellevue, WA 98005
206 746-4600
FAX 206 746-6747

PROJECT Sooper Cleaners GW

DATE 7/10/01

JOB NUMBER 04199025.03

WEATHER Sunny

PERSONNEL DJ/ED

=====

WELL NO. MW-10

TIME 3³⁰ PM

DIAMETER OF WELL 2"

STATIC WATER LEVEL 54.75' below RP

DEPTH OF WELL 67'

VOLUME/FOOT -

FEET OF WATER IN WELL -

WATER VOLUME IN WELL -

PRODUCT PRESENT yes no

PRODUCT TYPE N.A.

STATIC PRODUCT THICKNESS IN WELL N.A.

TRUE PRODUCT THICKNESS N.A.

PURGING PRIOR TO SAMPLING

Equipment QED bladder pump Time/gal. pH EC Temp (E°)

Start Purge Time _____

End Purge Time _____

Average Pumping Rate _____

Volume Water Removed gals _____

SAMPLING

Equipment QED bladder pump Time _____

Sample Nos./Well Nos. MW-10 2 VOAs

Notes/Comments _____

WELL SAMPLING RECORD

SCS ENGINEERS
Environmental Consultants
2405 140th Avenue, NE
Suite 107
Bellevue, WA 98005
206 746-4600
FAX 206 746-6747

PROJECT Sooper Cleaners GW
JOB NUMBER 04199025.03
PERSONNEL DV/ED

DATE 7/18/01
WEATHER Sunny

=====

WELL NO. MW-11
DIAMETER OF WELL 2"
DEPTH OF WELL 60'
FEET OF WATER IN WELL _____

TIME 11³⁰ Am
STATIC WATER LEVEL 50.15' below RP
VOLUME/FOOT _____
WATER VOLUME IN WELL _____

PRODUCT PRESENT yes _____ no PRODUCT TYPE N.A.

STATIC PRODUCT THICKNESS IN WELL N.A.

TRUE PRODUCT THICKNESS N.A.

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (E°)
<u>QED bladder pump</u>				
Start Purge Time _____	_____	_____	_____	_____
End Purge Time _____	_____	_____	_____	_____
Average Pumping Rate _____	_____	_____	_____	_____
Volume Water Removed _____ gals	_____	_____	_____	_____

SAMPLING

Equipment QED bladder pump Time _____

Sample Nos./Well Nos. MW-11 2VOAs

Notes/Comments _____

WELL SAMPLING RECORD

SCS ENGINEERS
 Environmental Consultants
 2405 140th Avenue, NE
 Suite 107
 Bellevue, WA 98005
 206 746-4600
 FAX 206 746-6747

PROJECT Soojer Cleanups GW
 JOB NUMBER 04199025.03
 PERSONNEL DV/ED

DATE 7/14/01
 WEATHER Sunny

=====

WELL NO. MW-13
 DIAMETER OF WELL 2"
 DEPTH OF WELL 190'
 FEET OF WATER IN WELL _____

TIME 9:45
 STATIC WATER LEVEL 111.99' below RP
 VOLUME/FOOT _____
 WATER VOLUME IN WELL _____

1 1/8"
 using LF
 water level
 indicator

PRODUCT PRESENT yes _____ no PRODUCT TYPE N.A.

STATIC PRODUCT THICKNESS IN WELL N.A.

TRUE PRODUCT THICKNESS N.A.

PURGING PRIOR TO SAMPLING

Equipment	Time/gal.	pH	EC	Temp (E°)
<u>QED bladder pump</u>				
Start Purge Time _____	_____	_____	_____	_____
End Purge Time _____	_____	_____	_____	_____
Average Pumping Rate _____	_____	_____	_____	_____
Volume Water Removed _____ gals	_____	_____	_____	_____

SAMPLING

Equipment QED bladder pump Time _____

Sample Nos./Well Nos. MW-13 2VOAs

Notes/Comments _____

APPENDIX F

AQUIFER TESTING RESULTS



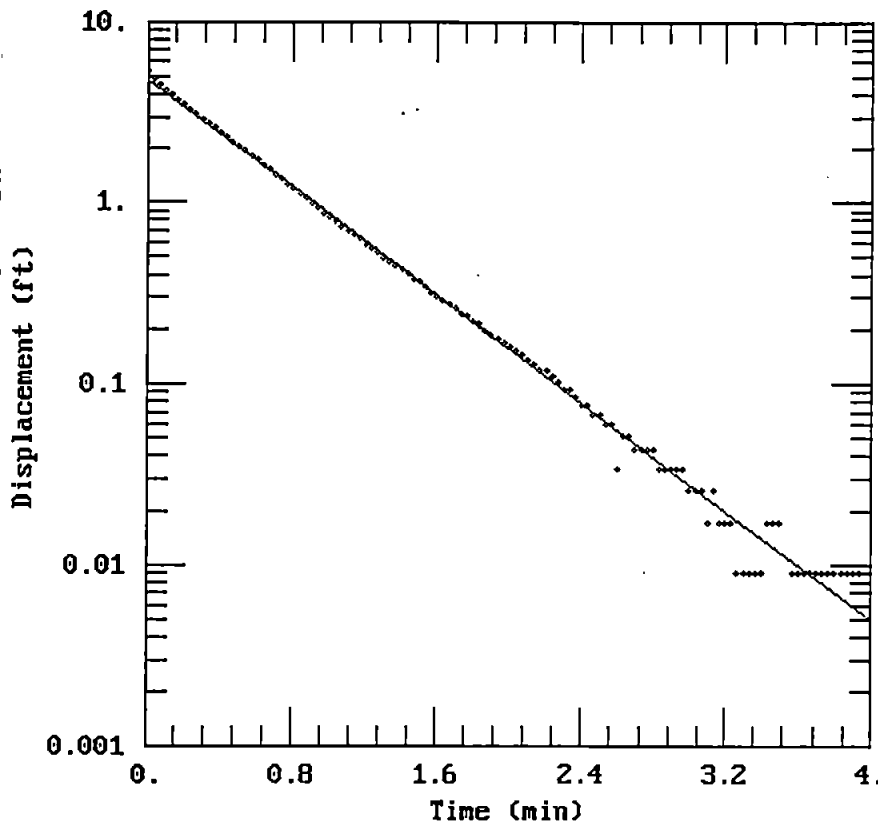
CLIENT: Griffin & Jensen DBA

COMPANY: SCS Engineers

LOCATION: Normandy Park, WA

PROJECT: 04199025.02

MW-5B Slug Test 2



DATA SET:
MWSBDAT1
10/06/00

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 10/4/00
test well: MW-5B
obs. well: MW-5B

TEST DATA:
 $H_0 = 5.38$ ft
 $r_c = 0.0833$ ft
 $r_w = 0.333$ ft
 $L = 5.$ ft
 $b = 30.$ ft
 $H = 20.56$ ft

PARAMETER ESTIMATES:
 $K = 0.01206$ ft/min
 $y_0 = 4.752$ ft

AQTESOLU

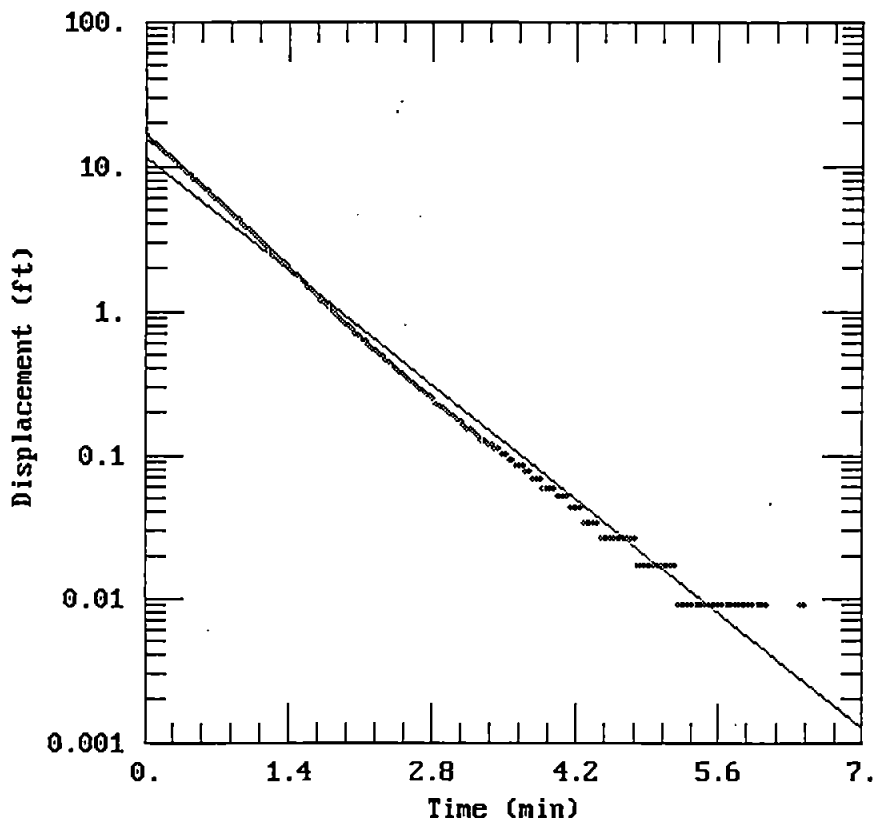
CLIENT: Griffin & Jensen DBA

COMPANY: SCS Engineers

LOCATION: Normandy Park, WA

PROJECT: 04199025.02

MW-5B Test 3



DATA SET:
MW5BDAT3
10/06/00

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 10/4/00
test well: MW-5B
obs. well: MW-5B

TEST DATA:
H₀ = 16.44 ft
r_c = 0.333 ft
r_w = 0.833 ft
L = 5. ft
b = 30. ft
H = 20.55 ft

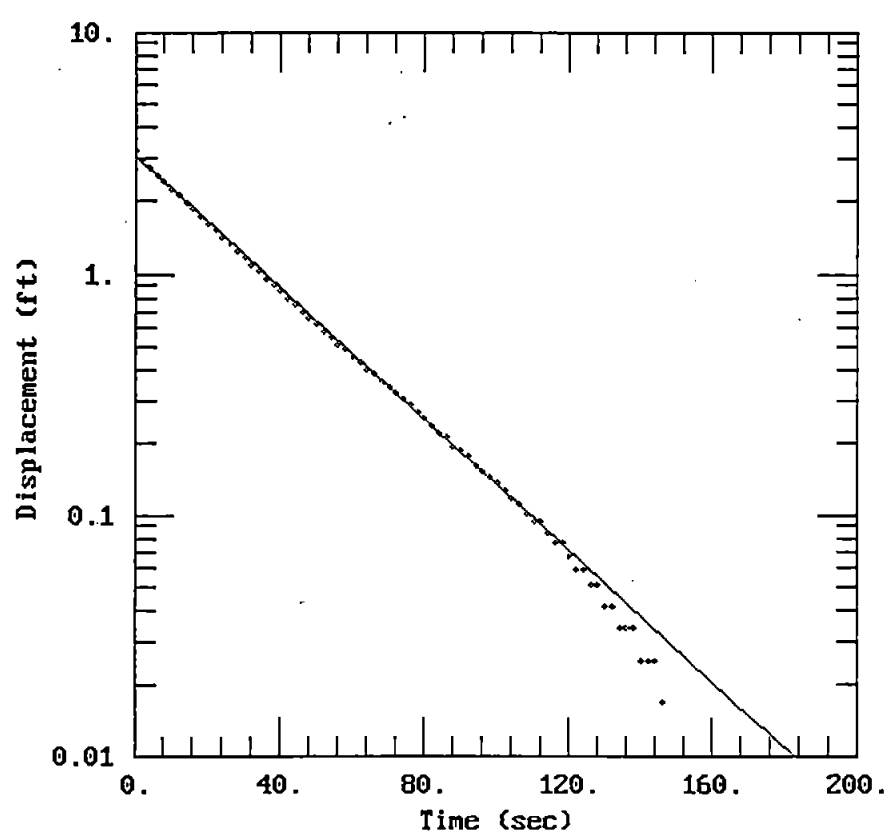
PARAMETER ESTIMATES:
K = 0.04544 ft/min
y₀ = 11.63 ft

AQTESOLV

CLIENT: Griffin & Jensen DBA COMPANY: SCS Engineers

LOCATION: Normandy Park, WA PROJECT: 04199025.02

MW-5B Slug Test 3



DATA SET:
MW5B3DAT
03/23/01

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 10/4/00
test well: MW-5B
obs. well: MW-5B

TEST DATA:
 $H_0 = 3.227$ ft
 $r_c = 0.0833$ ft
 $r_w = 0.333$ ft
 $L = 5.$ ft
 $b = 130.$ ft
 $H = 21.23$ ft

PARAMETER ESTIMATES:
 $K = 0.0002002$ ft/sec
 $y_0 = 3.063$ ft

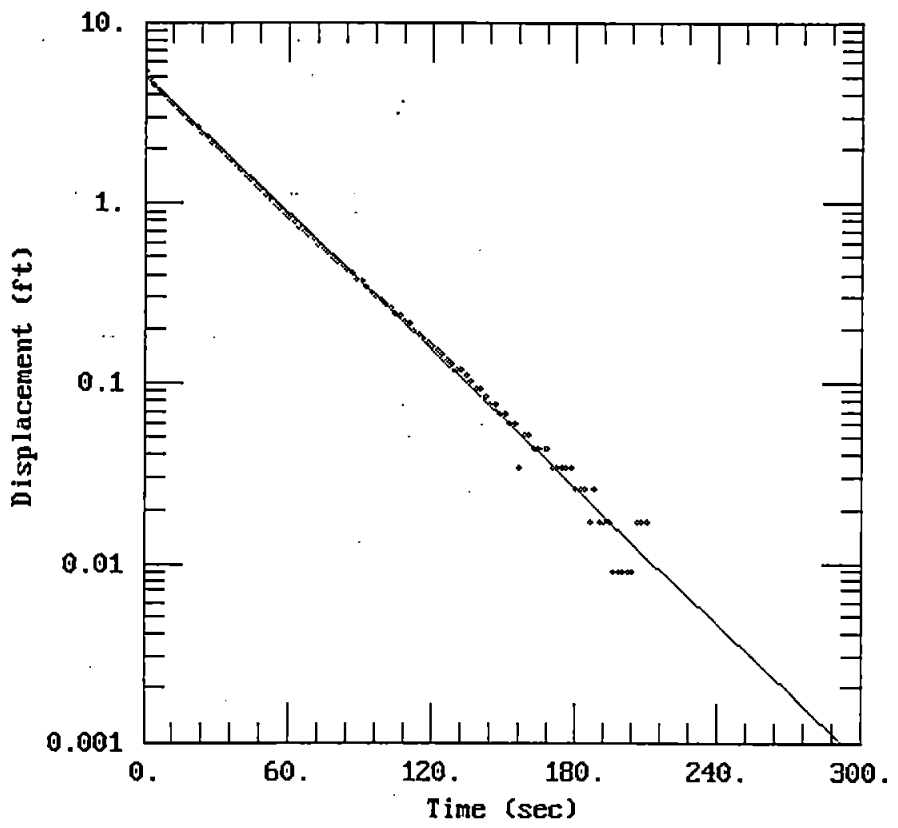
CLIENT: Griffin & Jensen DBA

COMPANY: SCS Engineers

LOCATION: Normandy Park, WA

PROJECT: 04199025.02

MW-5B Slug Test 5



DATA SET:
MW5B5DAT
03/23/01

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 10/4/00
test well: MW-5B
obs. well: MW-5B

TEST DATA:
 $H_0 = 5.357$ ft
 $r_c = 0.0833$ ft
 $r_w = 0.333$ ft
 $L = 5.$ ft
 $b = 130.$ ft
 $H = 21.23$ ft

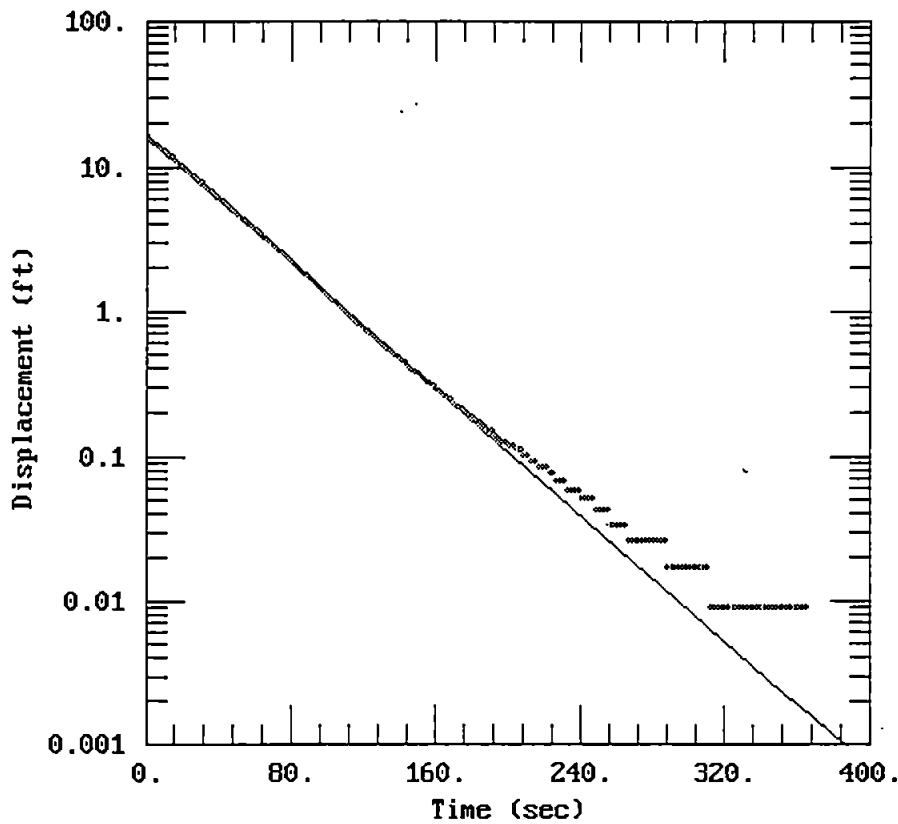
PARAMETER ESTIMATES:
 $K = 0.0001867$ ft/sec
 $y_0 = 5.003$ ft

AQTESOLU

CLIENT: Griffin & Jensen DBA COMPANY: SCS Engineers

LOCATION: Normandy Park, WA PROJECT: 04199025.02

MW-5B Slug Test 6



DATA SET:
MW5B6DAT
03/23/01

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bower-Rice

PROJECT DATA:
test date: 10/4/00
test well: MW-5B
obs. well: MW-5B

TEST DATA:
H0 = 16.44 ft
r_c = 0.0833 ft
r_w = 0.333 ft
L = 5. ft
b = 130. ft
H = 21.23 ft

PARAMETER ESTIMATES:
K = 0.0001601 ft/sec
y0 = 15.75 ft

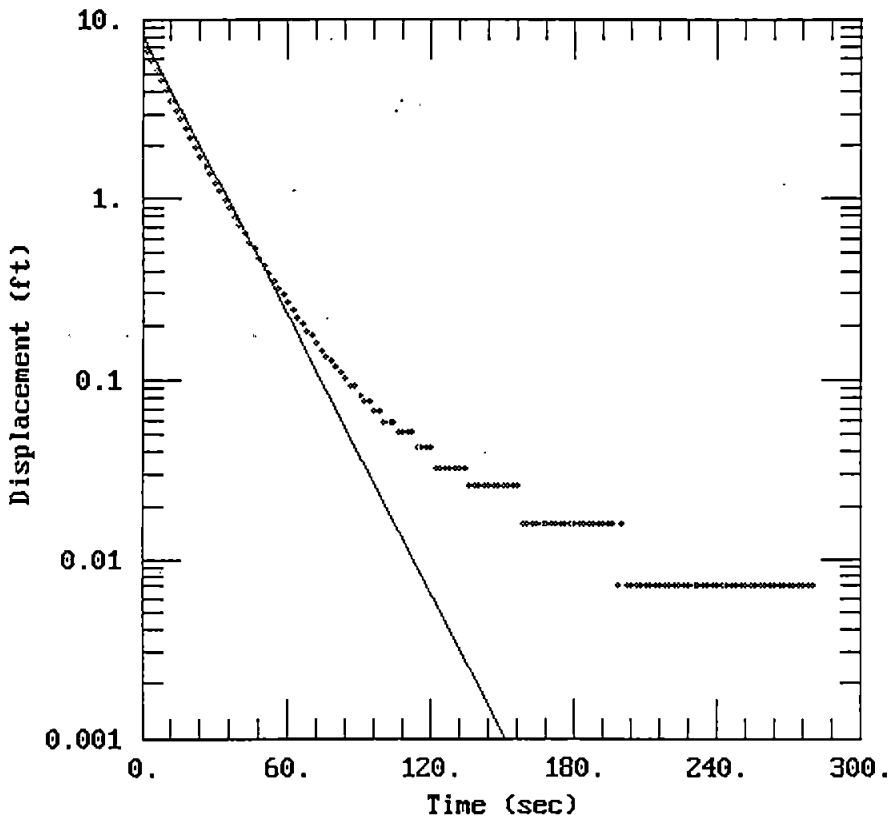
CLIENT: Griffin & Jensen DBA

COMPANY: SCS Engineers

LOCATION: Normandy Park, WA

PROJECT: 04199025.03

MW-8 Slug Test 1



DATA SET:
MW8-1DAT
03/23/01

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bower-Rice

PROJECT DATA:
test date: 02/20/01
test well: MW-8
obs. well: MW-8

TEST DATA:
 $H_0 = 7.683$ ft
 $r_c = 0.0833$ ft
 $r_w = 0.333$ ft
 $L = 5$ ft
 $b = 130$ ft
 $H = 49.8$ ft

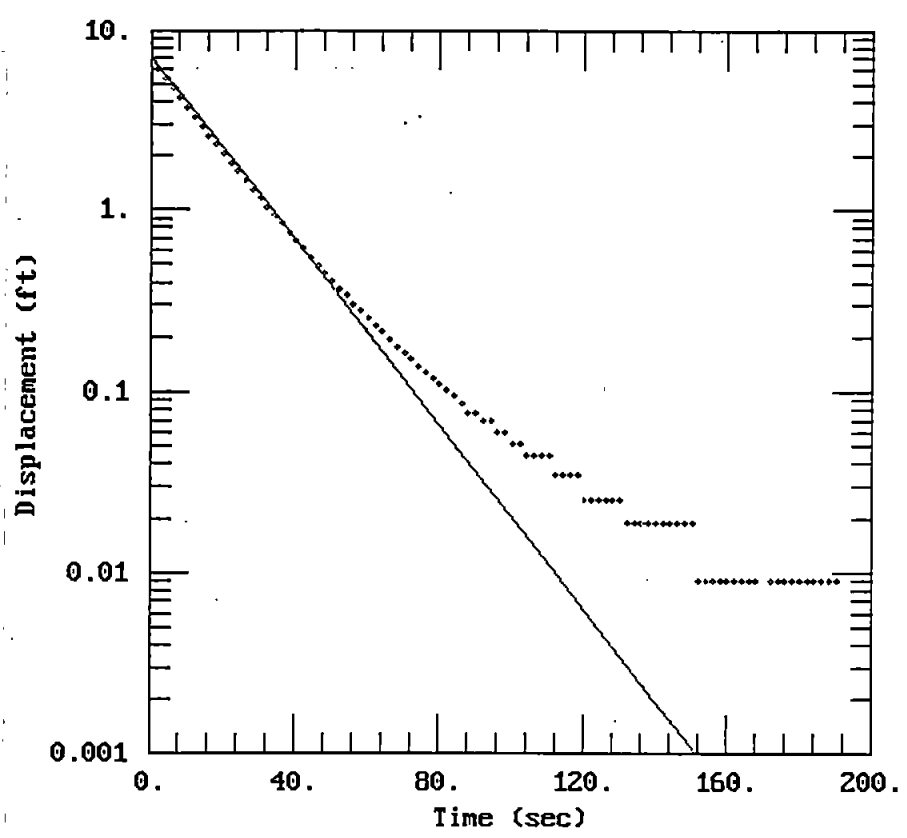
PARAMETER ESTIMATES:
 $K = 0.0004222$ ft/sec
 $y_0 = 7.83$ ft

AQTESOLV

CLIENT: Griffin & Jensen DBA COMPANY: SCS Engineers

LOCATION: Normandy Park, WA PROJECT: 04199025.03

MW-8 Slug Test 2



DATA SET:
MW8-2DAT
03/23/01

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bower-Rice

PROJECT DATA:
test date: 02/20/01
test well: MW-8
obs. well: MW-8

TEST DATA:
H0 = 6.905 ft
rc = 0.0833 ft
rw = 0.333 ft
L = 5. ft
b = 130. ft
H = 49.8 ft

PARAMETER ESTIMATES:
K = 0.0004159 ft/sec
y0 = 6.983 ft

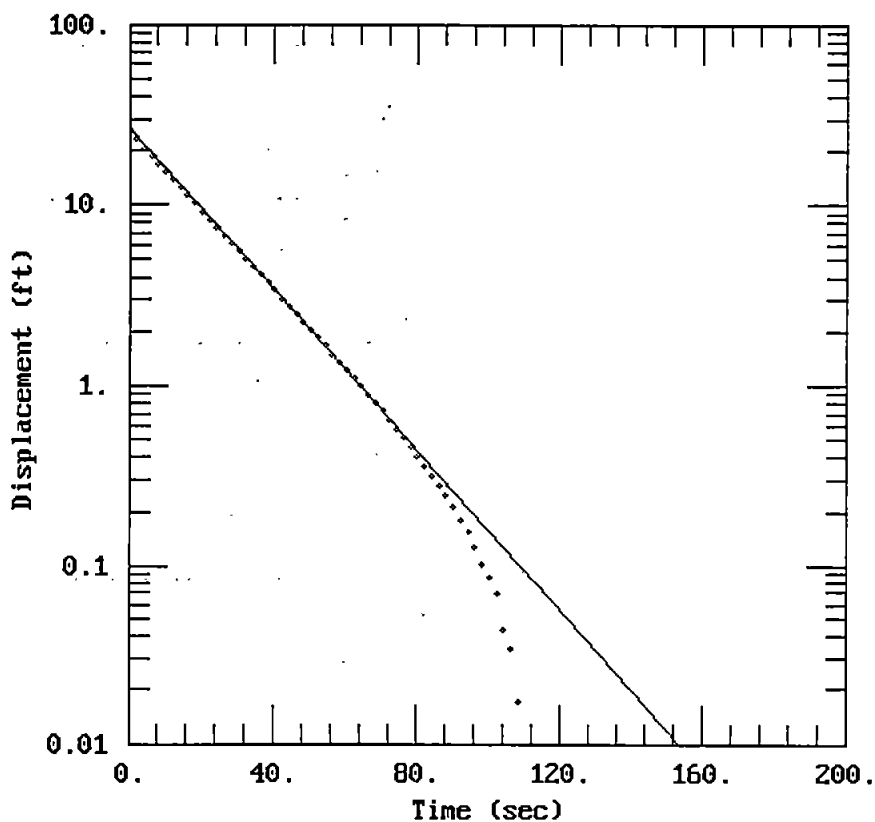
CLIENT: Griffin & Jensen DBA

COMPANY: SCS Engineers

LOCATION: Normandy Park, WA

PROJECT: 04199025.03

MW-8 Slug Test 3



DATA SET:
MW8-3DAT
03/23/01

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 02/20/01
test well: MW-8
obs. well: MW-8

TEST DATA:
 $H_0 = 26.1$ ft
 $r_c = 0.0833$ ft
 $r_w = 0.333$ ft
 $L = 5$ ft
 $b = 130$ ft
 $H = 49.8$ ft

PARAMETER ESTIMATES:
 $K = 0.0003644$ ft/sec
 $y_0 = 26.51$ ft

AQTESOLV

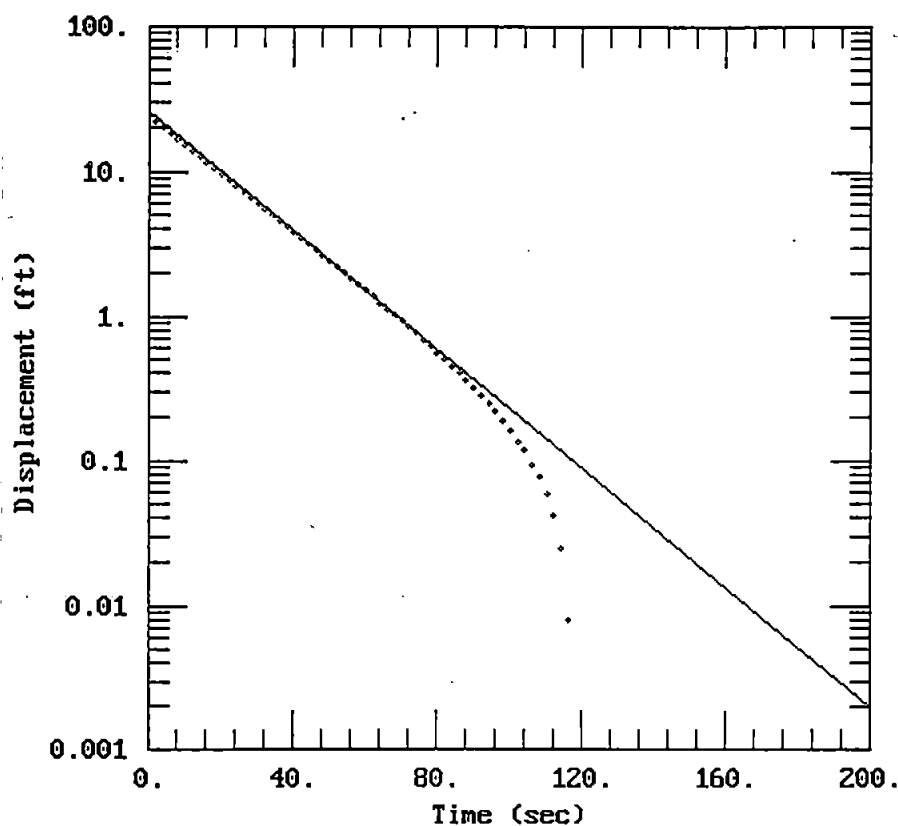
CLIENT: Griffin & Jensen DBA

COMPANY: SCS Engineers

LOCATION: Normandy Park, WA

PROJECT: 04199025.03

MW-8 Slug Test 4



DATA SET:
MW8-4DAT
03/23/01

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 02/20/01
test well: MW-8
obs. well: MW-8

TEST DATA:
H₀ = 24.15 ft
r_c = 0.0833 ft
r_w = 0.333 ft
L = 5. ft
b = 130. ft
H = 49.8 ft

PARAMETER ESTIMATES:
K = 0.0003347 ft/sec
y₀ = 25.2 ft

AQTESOLU

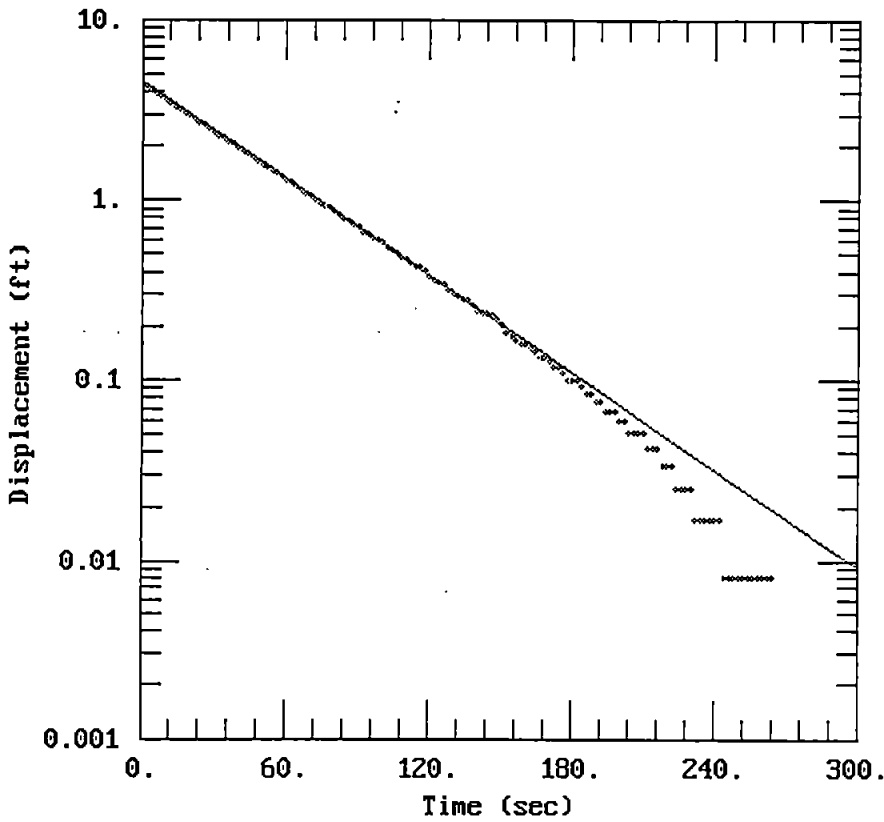
CLIENT: Griffin & Jensen DBA

COMPANY: SCS Engineers

LOCATION: Normandy Park, WA

PROJECT: 04199025.03

MW-9 Slug Test 1



DATA SET:
MW9-1DAT
03/23/01

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 02/20/01
test well: MW-9
obs. well: MW-9

TEST DATA:
 $H_0 = 4.41$ ft
 $r_c = 0.0833$ ft
 $r_w = 0.333$ ft
 $L = 5.$ ft
 $b = 130.$ ft
 $H = 12.$ ft

PARAMETER ESTIMATES:
 $K = 0.0001215$ ft/sec
 $y_0 = 4.473$ ft

AQTESOLU

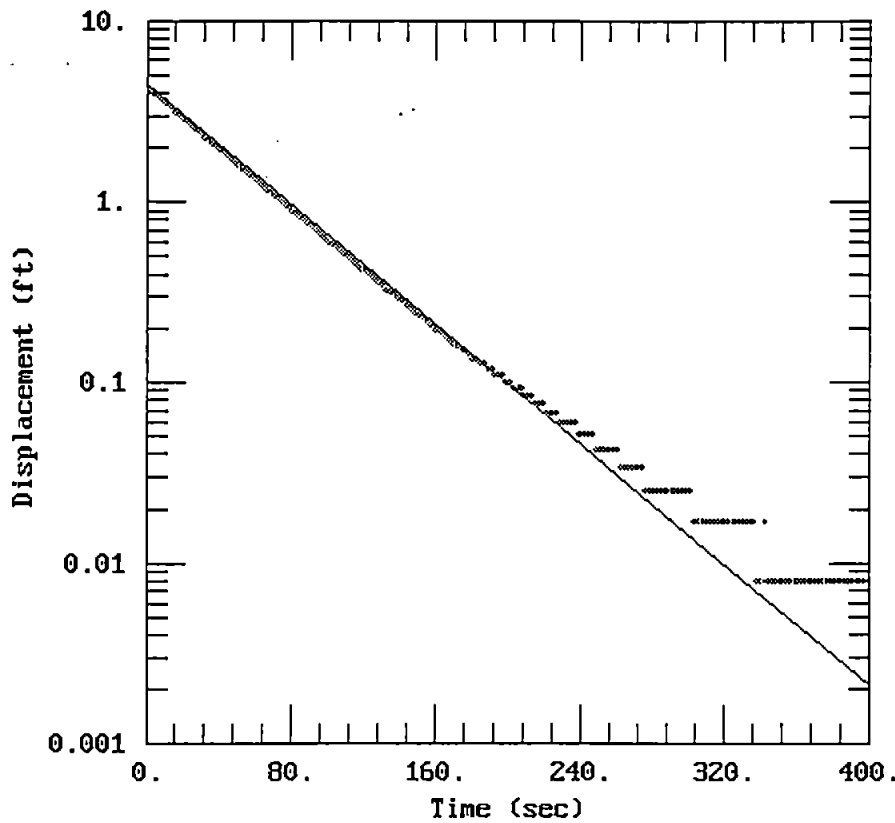
CLIENT: Griffin & Jensen DBA

COMPANY: SCS Engineers

LOCATION: Normandy Park, WA

PROJECT: 04199025.03

MW-9 Slug Test 2



DATA SET:
MW9-2DAT
03/23/01

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 02/20/01
test well: MW-9
obs. well: MW-9

TEST DATA:
H₀ = 4.089 ft
r_c = 0.0833 ft
r_w = 0.333 ft
L = 5. ft
b = 130. ft
H = 12. ft

PARAMETER ESTIMATES:
K = 0.0001126 ft/sec
y₀ = 4.382 ft

AQTESOLV

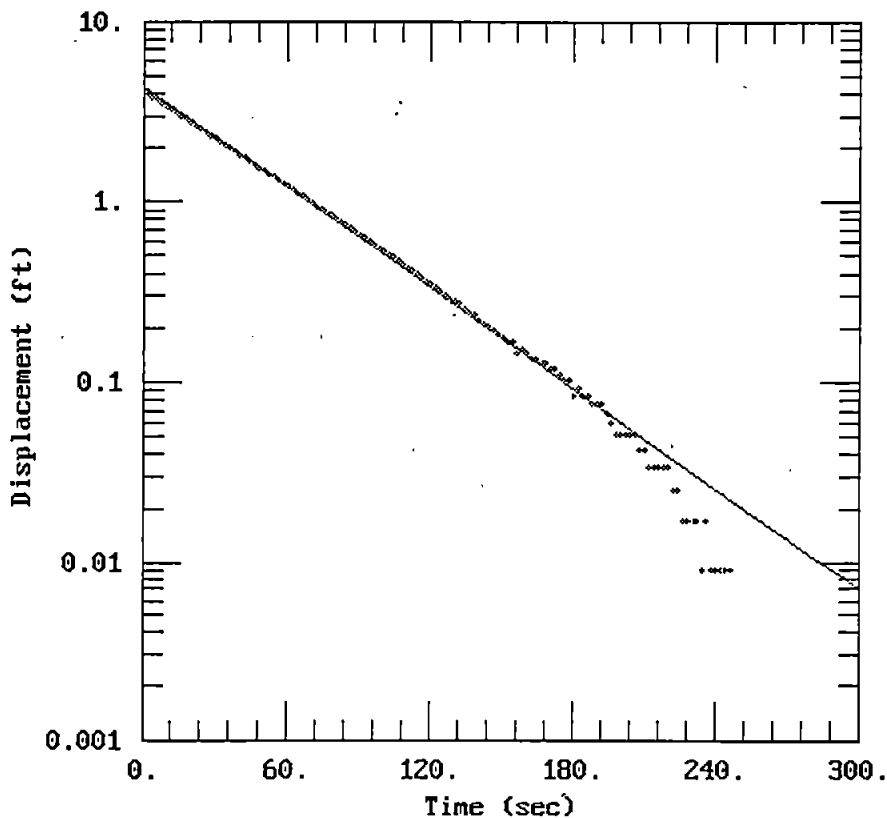
CLIENT: Griffin & Jensen DBA

COMPANY: SCS Engineers

LOCATION: Normandy Park, WA

PROJECT: 04199025.03

MW-9 Slug Test 3



DATA SET:
MW9-3DAT
03/23/01

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 02/20/01
test well: MW-9
obs. well: MW-9

TEST DATA:
 $H_0 = 4.131$ ft
 $r_c = 0.0833$ ft
 $r_w = 0.333$ ft
 $L = 5$ ft
 $b = 130$ ft
 $H = 12$ ft

PARAMETER ESTIMATES:
 $K = 0.0001259$ ft/sec
 $y_0 = 4.256$ ft

AQTESOLU

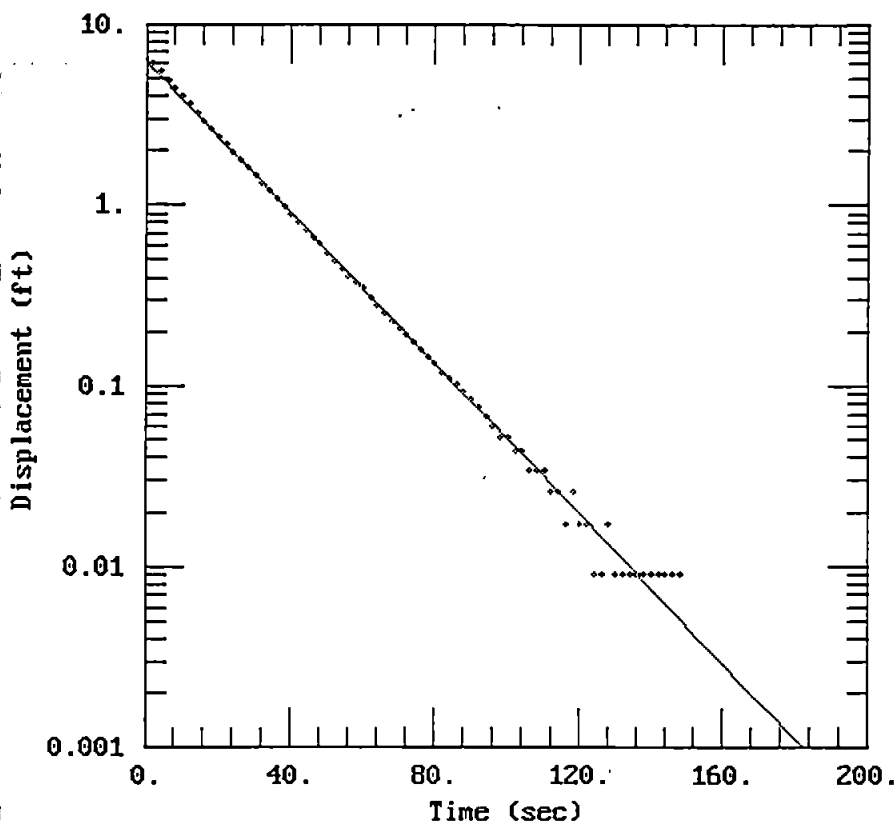
CLIENT: Griffin & Jensen DBA

COMPANY: SCS Engineers

LOCATION: Normandy Park, WA

PROJECT: 04199025.03

MW-10 Slug Test 1



DATA SET:
MW10-1DAT
03/23/01

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 02/20/01
test well: MW-10
obs. well: MW-10

TEST DATA:
H₀ = 6.109 ft
r_c = 0.0833 ft
r_w = 0.333 ft
L = 5. ft
b = 130. ft
H = 14.47 ft

PARAMETER ESTIMATES:
K = 0.0002895 ft/sec
y₀ = 6.093 ft

AQTESOLV

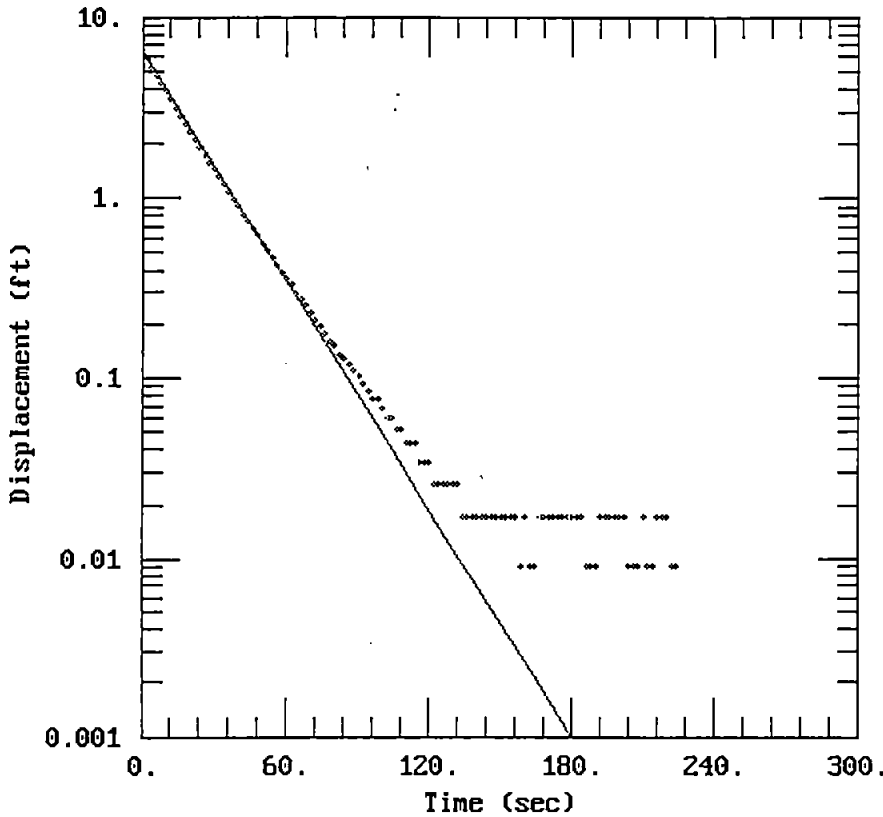
CLIENT: Griffin & Jensen DBA

COMPANY: SCS Engineers

LOCATION: Normandy Park, WA

PROJECT: 04199025.03

MW-10 Slug Test 2



DATA SET:
MW10-2DAT
03/23/01

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 02/20/01
test well: MW-10
obs. well: MW-10

TEST DATA:
H₀ = 5.897 ft
r_c = 0.0833 ft
r_w = 0.333 ft
L = 5. ft
b = 130. ft
H = 14.47 ft

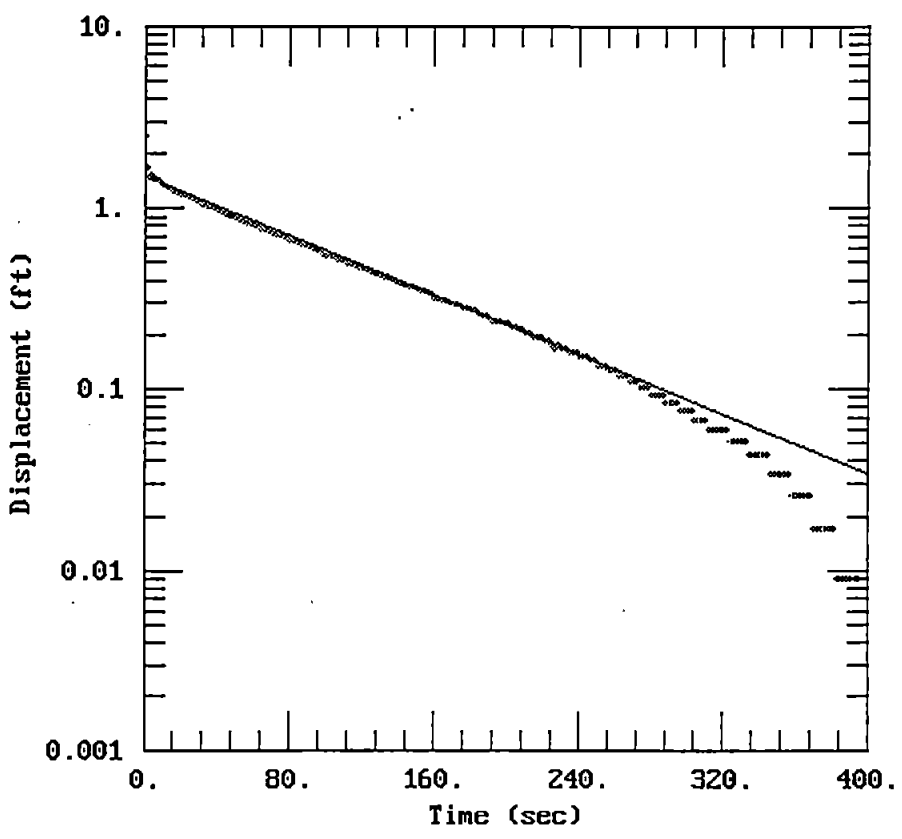
PARAMETER ESTIMATES:
K = 0.0002958 ft/sec
y₀ = 6.372 ft

AQTESOLV

CLIENT: Griffin & Jensen DBA COMPANY: SCS Engineers

LOCATION: Normandy Park, WA PROJECT: 04199025.03

MW-11 Slug Test 1



DATA SET:
MW11-1DAT
03/23/01

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 02/20/01
test well: MW-11
obs. well: MW-11

TEST DATA:
H₀ = 2.492 ft
r_c = 0.0833 ft
r_w = 0.333 ft
L = 5. ft
b = 130. ft
H = 11.46 ft

PARAMETER ESTIMATES:
K = 5.511E-05 ft/sec
y₀ = 1.483 ft

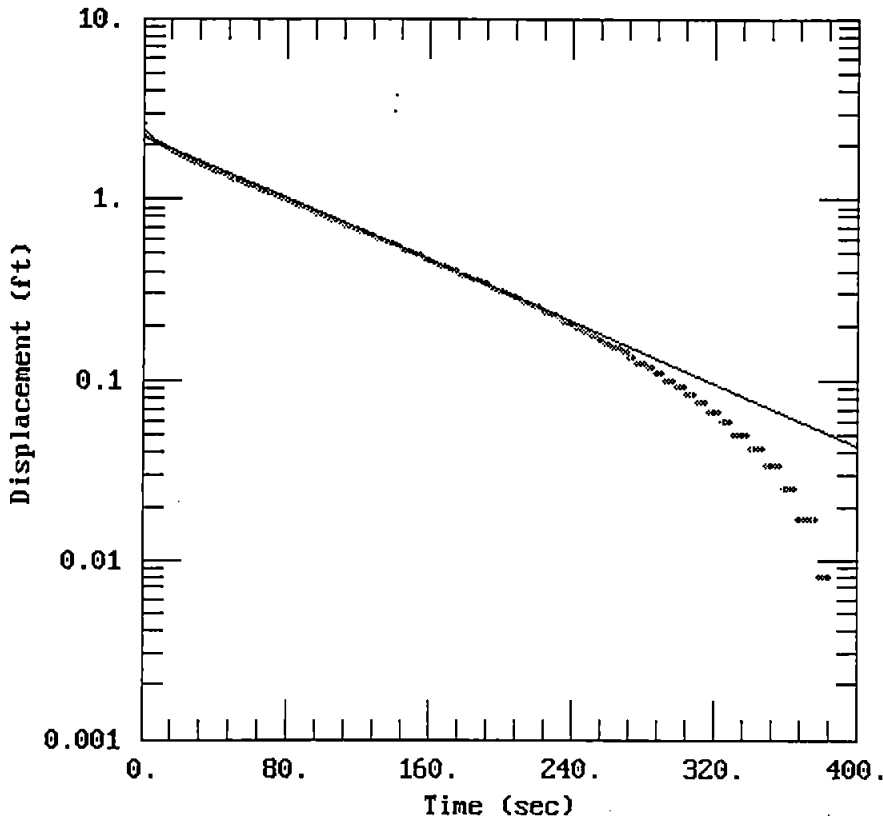
CLIENT: Griffin & Jensen DBA

COMPANY: SCS Engineers

LOCATION: Normandy Park, WA

PROJECT: 04199025.03

MW-11 Slug Test 2



DATA SET:
MW11-2DAT
03/23/01

AQUIFER MODEL:
Unconfined
SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 02/20/01
test well: MW-11
obs. well: MW-11

TEST DATA:
 $H_0 = 2.627$ ft
 $r_c = 0.0833$ ft
 $r_w = 0.333$ ft
 $L = 5.$ ft
 $b = 130.$ ft
 $H = 11.46$ ft

PARAMETER ESTIMATES:
 $K = 5.76E-05$ ft/sec
 $y_0 = 2.221$ ft

AQTESOLV