PHASE 1 REPORT

REMEDIAL INVESTIGATION

of the
SOUTH TACOMA SWAMP
SUPERFUND SITE

C86027-290

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Prepared For

BURLINGTON NORTHERN RAILROAD
SEATTLE, WASHINGTON

By

REMEDIATION TECHNOLOGIES, INC
KENT, WASHINGTON

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2.5

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1.0 INTRODUCTION

1.1 Background

In 1981, the South Tacoma Channel was designated a high priority area under CERCLA (Superfund). Contamination of Tacoma City water wells with chlorinated solvents was the motivating basis for this determination. The South Tacoma Swamp area (approximately 300 acres) was included in this designation as a suspected source of contamination to the groundwaters, and because the area was considered to be a major recharge area for the aquafir supplying the city wells.

Burlington Northern Railroad (BN) owns roughly 220 of the 300 acres in the South Tacoma Swamp area. As a potentially responsible party (PRP) under CERCLA, BN is conducting an RI/FS which was authorized in an Administrative Order on Consent from the U.S. Environmental Protection Agency (EPA), effective on January 22, 1987. This document is a report of Phase 1 of the RI/FS, which is being conducted by Remediation Technologies, Inc. (ReTeC), under contract to BN.

1.2 Objectives

This Phase 1 Report is a summary of the work which was performed in the pursuit of the objectives outlined in the "Work Plan for a Remedial Investigation and Feasibility Study of the Burlington Northern Railroad, South Tacoma Site", which was submitted to the EPA in November 1986.

Phase 1 of this RI/FS is the preliminary site investigation, which included the following objectives:

- History of the site
- Characterization of the hydrogeology
- Land survey of the site and development of detailed map
- Development of a Health and Safety Plan
- Development of a Quality Assurance/Quality Control Plan
- Development of a Sampling Plan
- Description of the surface debris
- Sampling of the surface debris and soils
- Submittal to EPA of a Phase 1 Report

Phase 2 of this RI/FS is the development of methods for the removal of wastes that constitute an immediate threat to health. Phase 3 is the additional remedial investigation required to support the Feasibility Study. Also included in this report are recommendations for the investigations to be conducted during Phase 3.

1.3 Report Organization

This Phase 1 Report is organized into eight chapters. (All drawings larger than 11 x 17 inches are are enclosed in pockets in the rear of the report.)

The eight chapters are as follows:

- Chapter 1 is the report introduction. It summarizes the background, the scope of work conducted and the organizational structure of this document.

- Chapter 2 summarizes the site history, both from land use and from land structure perspectives. It contains information on the areas of concern, history of the railroad shops, information on the geography, surface water, geology and hydrogeology.

- Chapter 3 discusses the site land survey and presents the associated site map drawn on a scale of one inch equals 200 feet.

- Chapter 4 briefly mentions the site operating plans which have been developed, but are not included herein. These include the Health and Safety Plan, and the Quality Assurance/Quality Control Plan.

- Chapter 5 discusses the Waste Sampling Plan and analysis, and includes the analytical results obtained.

- Chapter 6 discusses the different waste materials that have been found on the site, to date.

- Chapter 7 presents those conclusions which have been made at this point in the RI/FS, and recommendations associated therewith.

- Chapter 8 is a list of references used to prepare this report.

2.0 SITE HISTORY AND PHYSICAL ENVIRONMENT

2.1 Location

The South Tacoma Channel Superfund Site includes an industrial, commercial and residential area in the City of Tacoma, Washington.

The South Tacoma Swamp portion of the site encompasses approximately 300 acres in the NE 1/4 of Section 24 and the E 1/2 of Section 13 of Township 20 North, Range 2 East, Pierce County, Washington. The general location of the site is within the City of Tacoma, near its southwest corner. The site is bounded by Tyler Street and Manitou Way to the west, BN railroad tracks to the east, South 56th Street to the south, and South 36th Street to the north. Figure 2-1 presents the site location. BN owns approximately 220 acres within this site. Some of the other owners include General Plastics, Anderson Enterprises, Pacific Container Corporation, and the Lige & William B. Dickson Co.

2.2 History

The land encompassed by Burlington Northern's South Tacoma site was historically utilized for three different purposes. The larger of the three tracts of land was used by the Northern Pacific Railroad for their South Tacoma Car Shops from the 1890's until closure in 1974. About 70 acres was used as an airport for 26 years from 1936 to 1973 and was known as the South Tacoma Airport. A third tract (actually part of the airport property) was originally wetlands, but has been utilized as a dumpsite for industrial and construction materials, and has been filled to the extent that little wetland now exists.

The closure of Northern Pacific's Car Shops, which closely followed Northern Pacific's merger into the new Burlington Northern Railroad, was followed by the dismantling of all facilities, and sub-dividing of the property into the Burlington Northern Tacoma Industrial Center.

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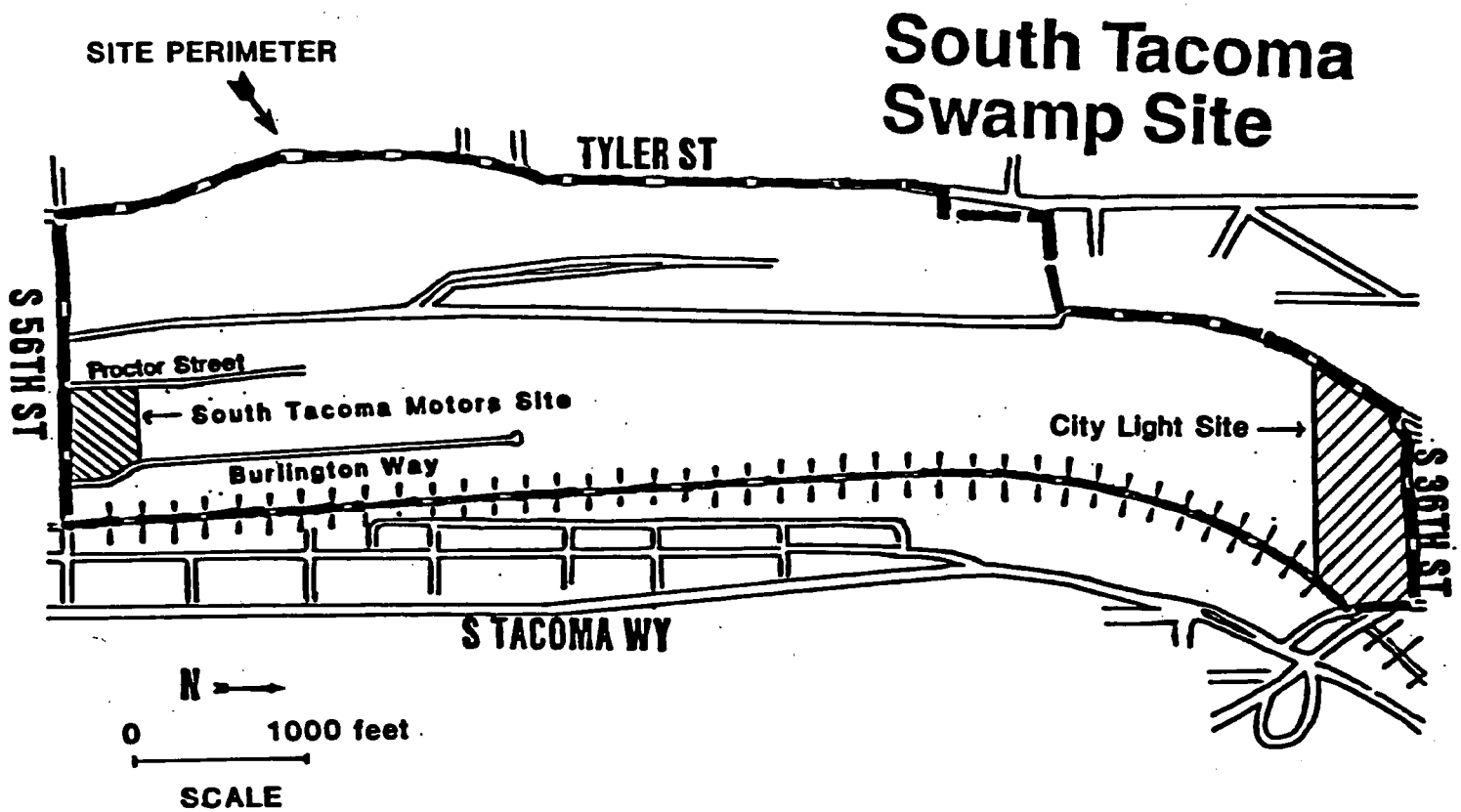


SITE LOCATION

FIGURE
2-1

An investigation into the historical use of the entire BN site was conducted by Dr. Jack Berryman, a consulting environmental historian, for ReTeC. A report on this subject was prepared by ReTeC in April 1987. The reader is directed to this document for further information on the the history of the South Tacoma site. Drawings 86027-1 and 86027-2 show details of Northern Pacific Railroad's historical site usage.

2.3 Geographic Settings

2.3.1 Landforms

The South Tacoma site is situated in a topographically low area, compared to the surrounding terrain. This area is an expression of a channel incised by a large stream near the end of the Fraser glaciation period which was approximately 10,000 years ago. The channel is referred as the South Tacoma Channel by local glacial geologists.

2.3.2 Surface Water Drainage

The South Tacoma site is located in the headwaters of Flett Creek, a small ephemeral stream. The Flett Creek basin is about 15.5 square miles in size. The basin drains to the south-southwest via Flett Creek into Chambers Creek and then into Puget Sound. The portion of the creek occupying the South Tacoma site is actually a drainage ditch which was excavated to drain the South Tacoma Swamp. A lake was located on the site at one time just south of the South Tacoma Airport, but has been entirely filled with man-made refuse or fill dirt hauled in from offsite.

2.3.3 Climate

The climate in this area is typical of maritime regions with relatively mild summers and cool, wet winters. The weather is controlled by the westerly air currents over the Pacific Ocean and the Olympic and Cascade Mountains. The average annual precipitation is 37 to 38 inches (U.S. Department of Commerce, 1982) with the majority of the precipitation occurring in the winter months.

2.4 Regional and Local Geology

2.4.1 Geological Literature

There are numerous publications on the geology and hydrogeology in the vicinity of the South Tacoma site. The publications include reports by the U.S. Geological Survey, the Washington Department of Natural Resources, the Washington Department of Ecology, scientific journals, and engineering consulting firms. A majority of this geologic literture will be listed in the reference section included at the end of this report.

2.4.2 Geologic Description

The South Tacoma site lies within an area known as the South Tacoma Channel. This channel was carved through the existing glacial debris deposited by glaciers associated with the Vashon Stade (phase) of the Fraser glaciation period by a large meltwater river. The river which cut the South Tacoma channel originated from a proglacial lake formed by an ice dam in the Puyallup River valley. Course gravels and sands known as the Steilacoom Gravels were deposited by the glacial river in the channel and in a broad plain south of the channel.

On a regional scale the surficial geology of the Tacoma area represents the glaciation of the Pleistocene Epoch. Several glaciers advanced and receded in the Puget Sound region depositing sand, gravel, silt and clay. These sediments were

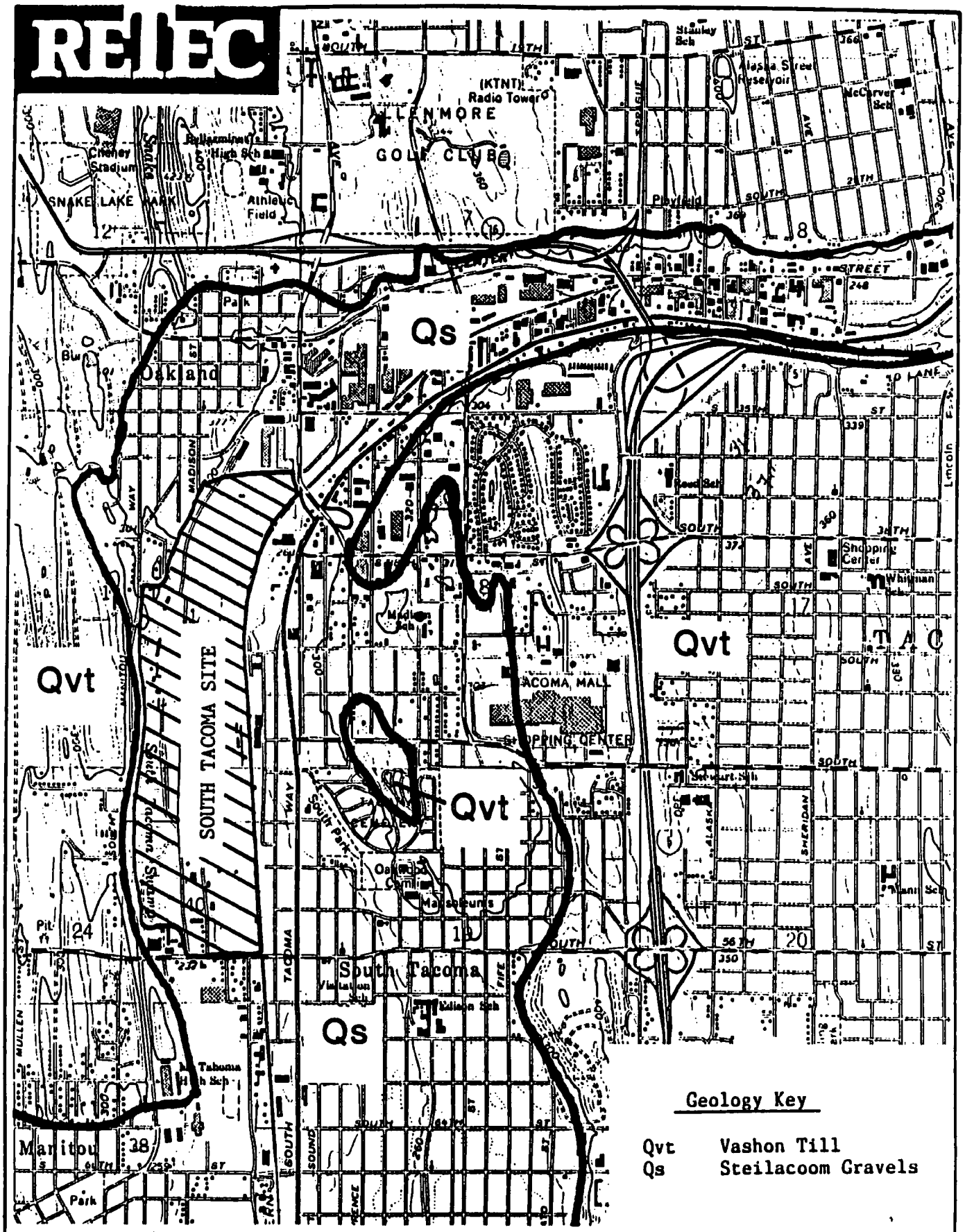
deposited either by the glaciers, known as till, or from the meltwaters during the advance and retreat of the glaciers. The meltwater or glaciofluvial deposits are better sorted and contain less silts and clays thus making them better water transmitting units than the poorly sorted tills which generally contain more silts and clays in the matrix. Brown and Caldwell (1985) described the surficial geology in terms of hydrostratigraphic units and those of importance to the hydrogeology of the South Tacoma site will be described in this report. Figure 2-2 shows the regional surficial hydrogeology, Figure 2-3 is a hypothetical cross-section of the regional stratigraphy, which is also represented in Table 2-1.

Brown and Caldwell (1985) desribe Layer A as consisting of all units stratigraphically above the Kitsap Formation. The Kitsap Formation is composed of the nonglacial deposits associated with the period in between the most recent Vashon Glacial Stade and the older Salmon Springs glaciation. Layer A consists of the following units: the Vashon Advance Outwash, the Vashon Till, the Steilacoom Gravels, and the Colvos Sand which is an advance outwash of the Vashon Glacial Stade.

The South Tacoma channel and associated Steilacoom Gravels is bounded to the east and the west by the Vashon Till and the Vashon Advance Outwash (Black and Veatch, 1987). The Vashon Till is not saturated in this area.

Layer B is associated with the Kitsap Formation and is considered an aquitard and consists primarily of silts and clays deposited in a low energy fluvial environment during the nonglacial interlude. This is an important regional aquitard or confining layer which limits the downward flow of groundwater.

Layer C is considered an aquifer by Brown and Caldwell (1985) and is most likely correlated with the Salmon Springs Drift. This unit is composed of sands and gravels deposited in a glaciofluvial environment.



REGIONAL SURFICIAL GEOLOGY

FIGURE 2-2

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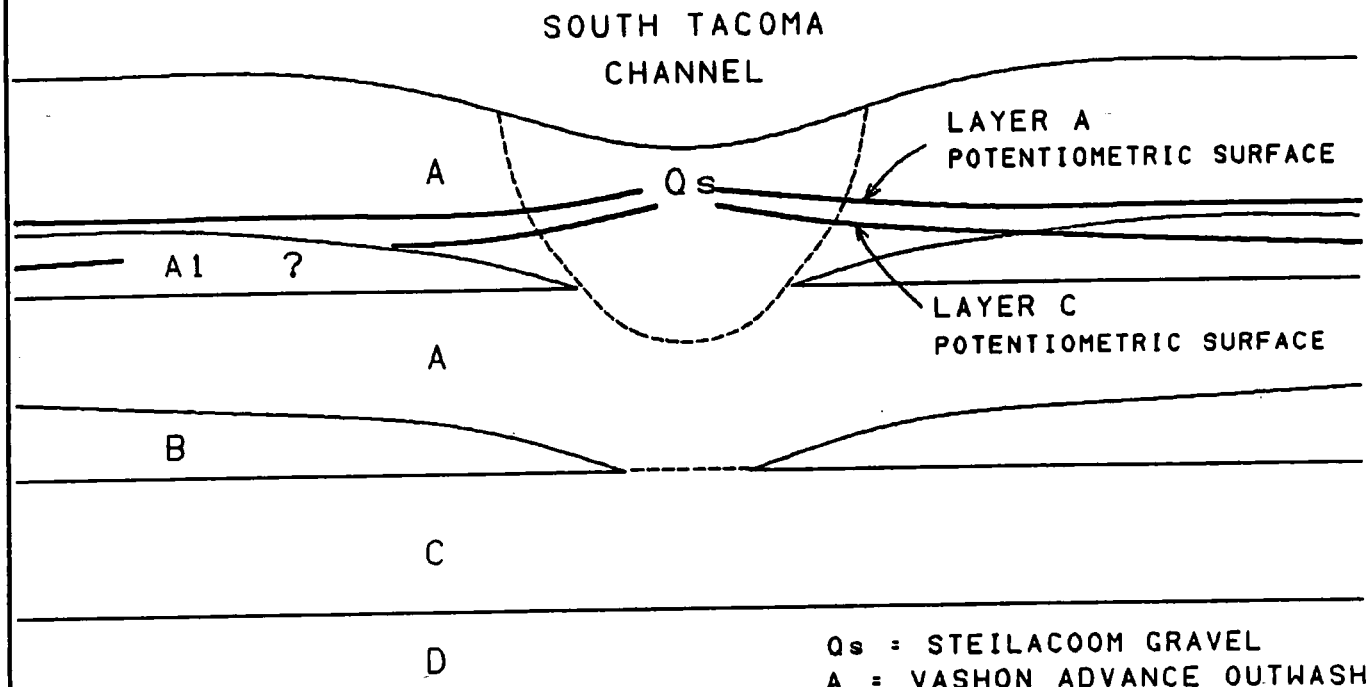
HYPOTHETICAL CROSS-SECTION



Qs = STEILACOOM GRAVEL
A = VASHON ADVANCE OUTWASH
A1 = NONGLACIAL AQUITARD?
B = KITSAP FORMATION
C = SALMON SPRINGS DRIFT
D = PUYALLUP FORMATION

NDA 5-26-87 NOT TO SCALE

HYPOTHETICAL GEOLOGIC CROSS SECTION (west to east)

FIGURE 2-3

Layer D lies stratigraphically below Layer C and is considered an aquitard as it consists of sand, clays and silts and was deposited in a low energy fluvial environment during an intergalcial period. Layer D is probably equivalent to the Puyallup Formation (Brown and Caldwell, 1985).

Brown and Caldwell (1985) also describe a layer which is located stratigraphically between Layer A and Layer B as Layer A1 and is composed of sands, silts and clay deposited in an nonglacial fluvial environment. Layer A1 is considered an aquitard. Black and Veatch (1987) report a group of glacial sediments consisting of gravels, tills, and outwash gravel older than the Vashon glacial sediments. This new information is based on the monitoring well logs associated with the City of Tacoma landfill located just west of the South Tacoma site. Both reports describe a sequence of sediments which were not previously mentioned in the geologic literature.

The thickness of the Steilacoom Gravel is not clearly defined but extends to a depth of 99 feet in the vicinity of monitor Well CBS-13 located within the South Tacoma channel. The thickness of the Steilacoom Gravel is probably not greater than 150 feet. The transmissivity of these gravels has been reported as high as 2,900,000 gallons per day per foot from a City of Tacoma well (Griffin et al., 1962). Assuming the saturated thickness of the gravels is 120 feet, then the permeability would be 24,000 gpd/ft^2 or 1.1 centimeters per second (cm/sec).

Layer B has an estimated thickness of 50 to 100 feet and a permeability of 10 to 100 gpd/ft^2 or a maximum of $5x10^{-03}$ cm/sec (Brown amd Caldwell, 1985).

Layer C has an estimated thickness of 50 to 100 feet and a permeability of 30 to 300 gpd/ft^2 (0.01 cm/sec). Layer D has an estimated thickness of 50 to 200 feet and a permeability of 3 to 30 gpd/ft^2 ($1x10^{-03}$ cm/sec).

The importance of this discussion is that the aquifer associated with the South Tacoma site is regional in extent and includes a wide area in the Tacoma vicinity. The aquifer described as the saturated portion of Layer A is the same aquifer underlying the Tacoma Landfill and being utilized by the City of Tacoma for a municipal water supply. It is speculated by Brown and Caldwell (1985) that the Layer A1 and Layer B aquitards are not present under the entire South Tacoma channel area. This hypothesis is based on evidence from well logs in the vicinity and the groundwater potentiometric contours constructed for the Layer A and Layer C aquifers.

The groundwater potentiometric map of Layer C (Brown and Caldwell, 1985) shows a groundwater recharge zone near the center of the South Tacoma site and the groundwater potentiometric maps (Black and Veatch, 1983) of the Steilacoom Gravels (Layer A) indicate a less pronounced recharge zone in the same area. If this is the case then the uppermost aquifer (Layer A) is hydraulically connected to the Layer C aquifer and groundwater from the Steilacoom Gravels is recharging the Layer C aquifer.

Thirteen groundwater monitoring wells, shown as "CBS-" on Sheet 1, were constructed at the South Tacoma Swamp site by Black & Veatch for EPA in 1983. Four additional wells were installed by ReteC at the South Tacoma Motors site in August 1986, and are shown as "STM-" on Sheet 1. The well logs and construction information are included in Appendix A of this report. Four cross-sections of the stratigraphy of the site were constructed from the well log information. These are presented in Figures 2-4 through 2-7, and Figure 2-8 shows the location of the cross-sections.

Continued monitoring of groundwater levels is necessary, since a better understanding of local hydrology is important to the Tacoma Landfill investigation. Appendix B presents level data taken as part of this investigation.

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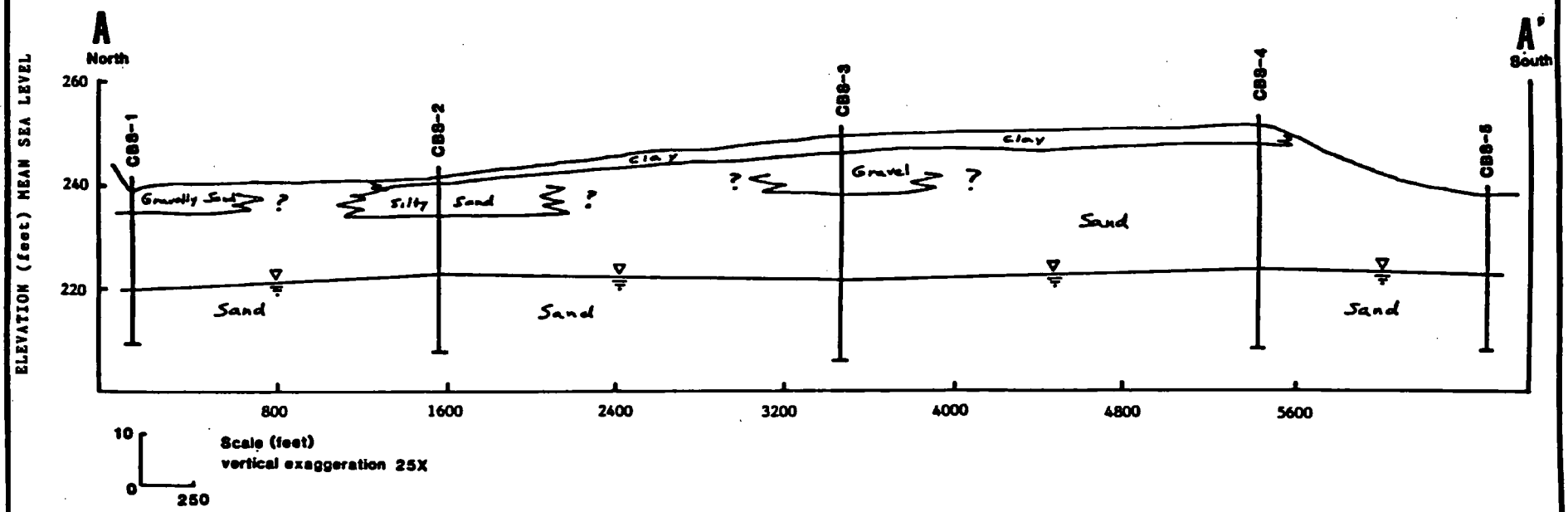

GEOLOGIC CROSS SECTION A to A'

FIGURE 2-4

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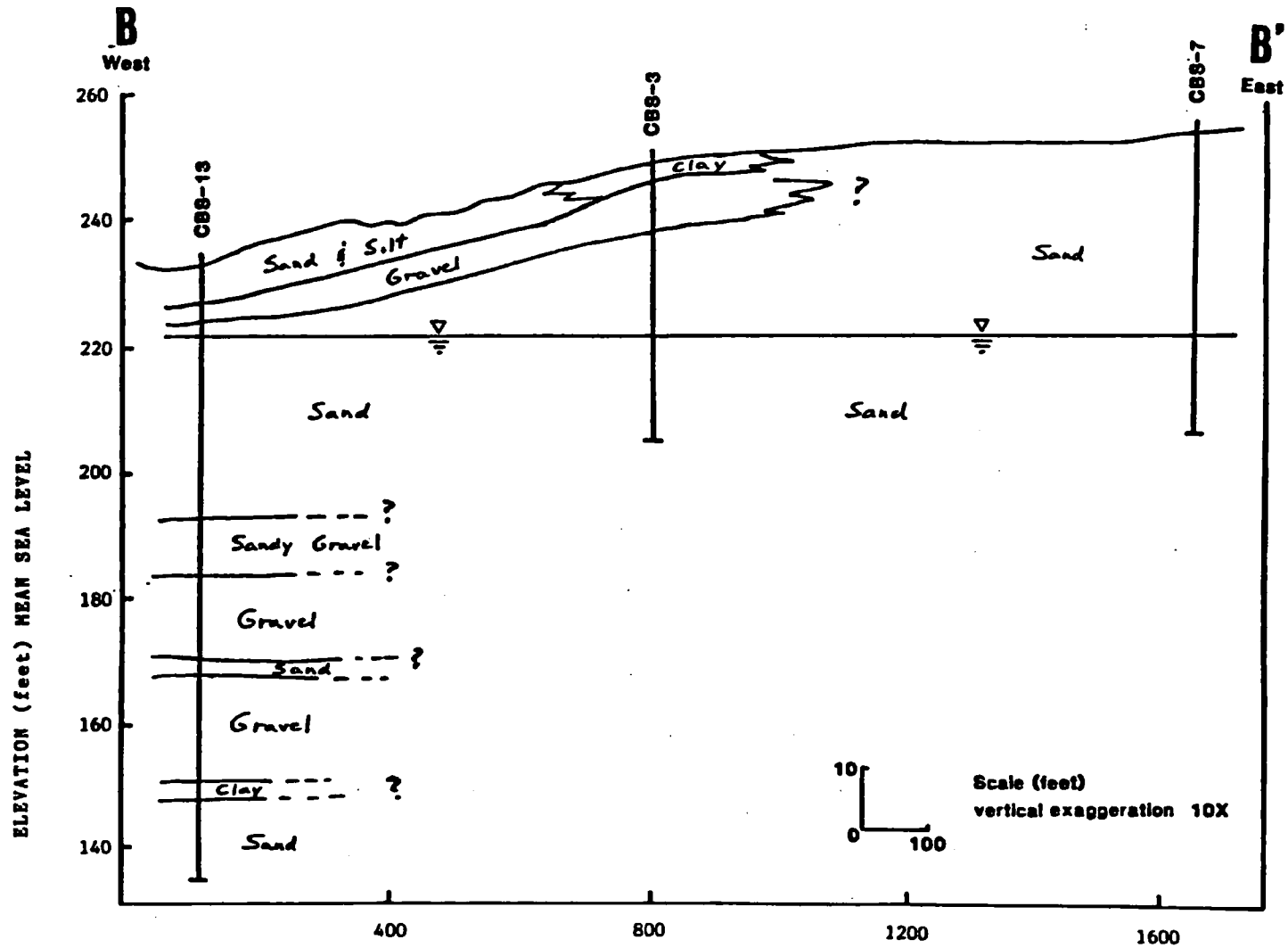

GEOLOGIC CROSS SECTION B to B'

FIGURE 2-5

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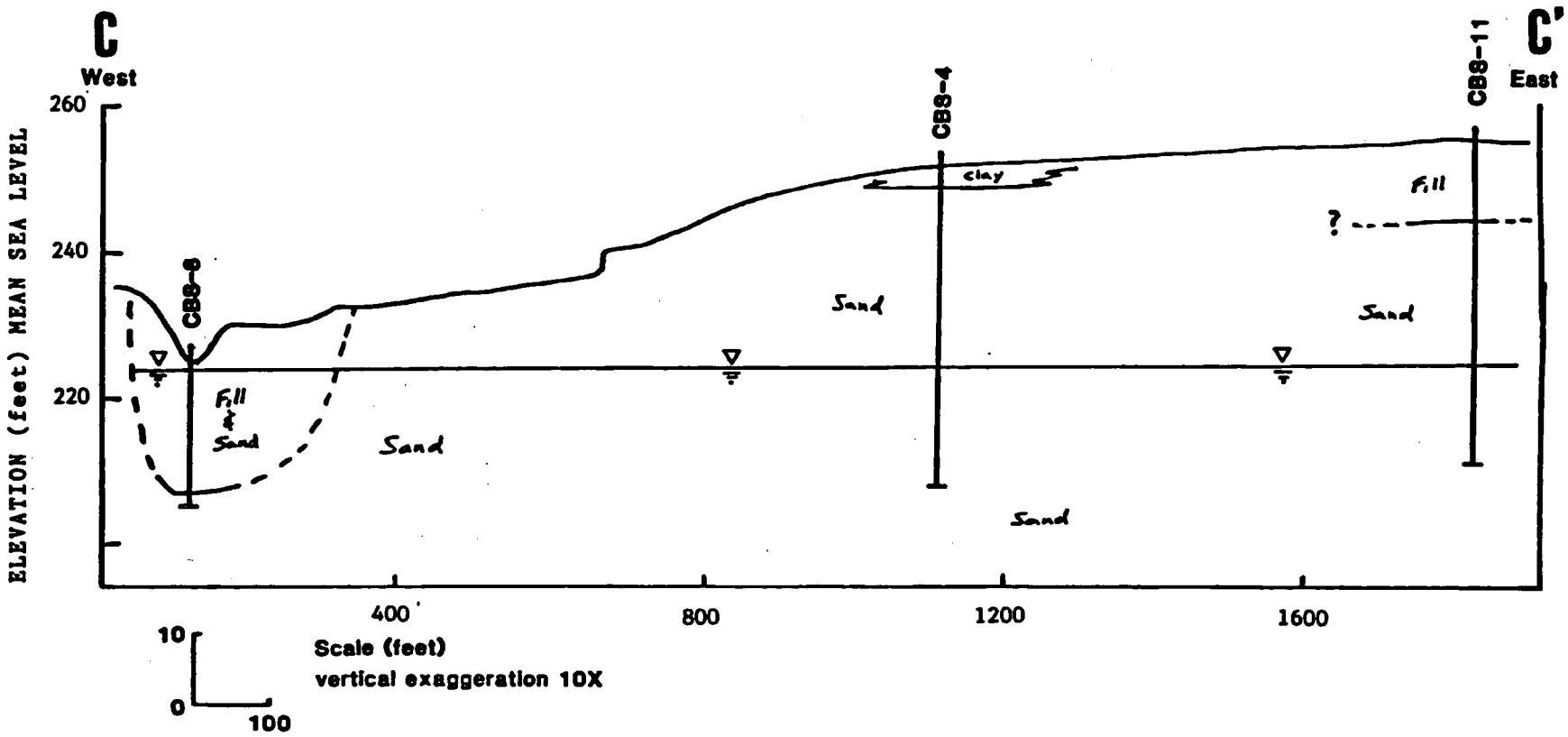

GEOLOGIC CROSS SECTION C to C'

FIGURE 2-6

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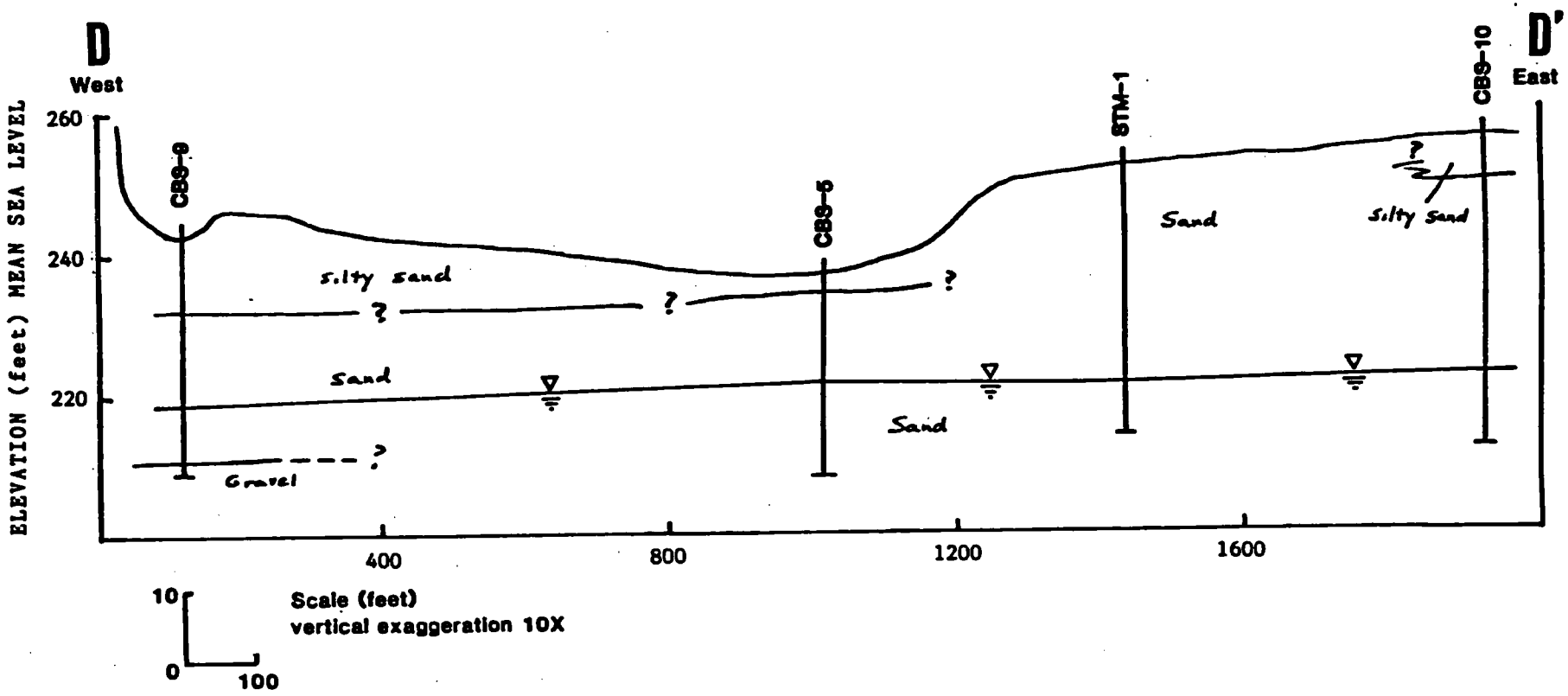

GEOLOGIC CROSS SECTION D to D'

FIGURE 2-7

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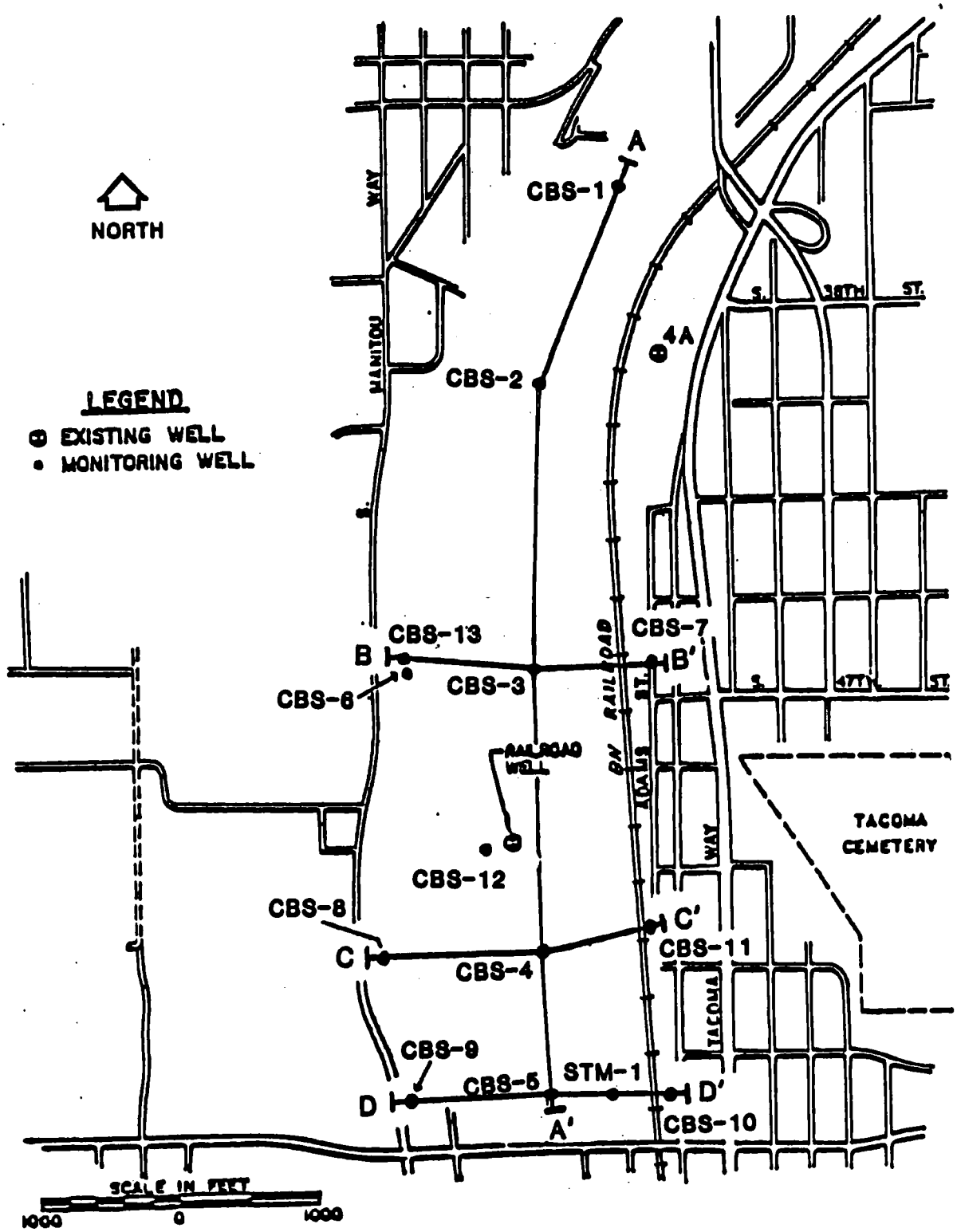


LOCATION OF GEOLOGIC CROSS SECTIONS A to D

FIGURE 2-8

TABLE 2-1
GEOLOGIC STRATIGRAPHY
OF THE SOUTH TACOMA CHANNEL VICINITY

	Geologic Unit		Thickness
Layer A	Qvt	Vashon Till	0-50 feet
	Qvs	Steilacoom Gravel	150 feet
	Qva	Vashon advance Outwash	20-60 feet
	Qvr	Vashon Recessional Gravel	
	Qcs	Colvos Sand	70 feet
Layer A1	Qo	Nonglacial sediments (Brown and Caldwell, 1985) Older glacial deposits (Black and Veatch, 1987)	5-20 feet
Layer B	Qk	Kitsap Fornmation	50-100 feet
Layer C	Qss	Salmon Springs Drift	50-180 feet
Layer D	Qp	Puyallup Formation	50-200 feet

2.5 History of Regulatory & Investigative Activity

2.5.1 Superfund Status

In mid-1981, the South Tacoma Channel was designated one of the top 100 priority areas under CERCLA (Comprehensive Environmental Response, Compensation and Liability Act), better known as Superfund. This status was motivated by the discovery of chlorinated solvent contamination in two City of Tacoma water wells, and the knowledge that the South Tacoma Channel is a major recharge area for the aquifer supplying the City wells.

Since the original designation of Superfund priority status, the source(s) of solvent contamination north of the South Tacoma Swamp area have been investigated by EPA, Pierce County Health Dept. and CH2M/Hill, and have now been eliminated. However, to the west, near the Tacoma Landfill, complaints of private water well contamination date back to 1968. Although many of these complaints were attributed to the Landfill by qualified investigators, and were corrected by the City of Tacoma, some complaints of well contamination have continued (Black & Veatch, 1987). As a result of an EPA investigation of the Tacoma Landfill area in 1983, it was added to the South Tacoma Channel Superfund Site. Groundwater elevation studies of the entire site, which are incomplete at this writing, indicate that much of the groundwater flowing past the Tacoma Landfill area may have originated in the South Tacoma Swamp/South Tacoma Channel depression. Thus, this investigation of Burlington Northern's South Tacoma Swamp property is essential to a complete resolution of the water well contamination problems (perhaps just to provide good background data for the Landfill study).

2.5.2 Previous Investigations

Past investigations have been performed as follows:

1. Black and Veatch (1982-83). A preliminary site investigation was done for the EPA, as a direct result of the site being declared a high priority CERCLA site. Results of the soil and water sampling are attached as Appendix C.

2. Mr. Grover Way, consulting soils engineer (1984). This investigation was contracted by South Tacoma Motors, who were intending to purchase a parcel of the site for the expansion of their automobile dealership.

3. GeoEngineers, Inc. (1985). This firm was retained by BN to investigate and characterize deposits of lime found by Mr. Grover Way (above), and to determine its effect on local groundwater. Their report is attached as Appendix D.

4. Tacoma-Pierce County Health Department (1985-86). This investigation was part of an environmental assessment of a parcel of the site, which the Tacoma City Light Division was contemplating the purchase of, for expanding their existing facilities. Results of soil sampling are attached as Appendix E.

2.5.3 Previous ReTeC Investigations

In 1986, prior to the Consent Order authorizing the RI/FS for the entire South Tacoma Channel Site (of which this study is Phase 1), ReTeC had been contracted by BN to do an RI/FS on the South Tacoma Motors parcel of the site (see 2., above). Four groundwater monitoring wells were installed in August 1986. Results of groundwater sampling are included in Appendix F.

Also, prior to the execution of the consent order, ReTeC sampled surface debris in several areas on the site (see Sheet 1-B). Results of sample analyses are included in Appendix F.

3.0 SITE SURVEY

A land survey of the South Tacoma site was completed by a registered land surveyor. Sheet 1 is a 24 inch by 36 inch drawing at a scale of 1:2400 (1 inch = 200 feet). The ground-water monitoring wells and the vertical and horizontal controls for the wells are included on Sheet 1.

4.0 SITE OPERATING PLANS

The following plans were written and published in November, 1986, by ReTeC and are not included in this report.

4.1 Quality Assurance/Quality Control Plan

The Quality Assurance/Quality Control Plan for the South Tacoma Swamp RI/FS was written by ReTeC and published in November, 1986. The plan includes information on the training of investigative personnel, document control, sample control and chain of custody, sample collection, preservation, and shipment, field instrumentation, and peer review.

4.2 Health and Safety Plan

The Health and Safety Plan was written by ReTeC and published in November, 1986, bound in the same cover as the QA/QC Plan. The plan includes information on personal protection, training, decontamination procedures, and emergency procedures.

5.0 WASTE SAMPLING AND ANALYSIS

5.1 Sampling Plan

A waste sampling plan titled "Waste Sampling Plan for Surface Debris Mapping at the Burlington Northern Railroad Site in South Tacoma, Washington" was written by ReTeC and published in January, 1987. The purpose of this plan was to provide sampling locations, parameters and procedures for analyzing the surface debris and soils to determine if an immediate health hazard was present at the site.

In January, a total of 49 surface debris samples were taken at 38 different locations, and were analyzed in a field laboratory for volatile organics only, as a preliminary screening step, using hand tools for excavation. Most of the sample sites were located in the southwestern portion of the site. These sample locations are shown on Sheet 1-B. Results from this preliminary screening revealed that little or no concentration of volatiles existed in the samples.

Of those 38 original locations, 11 locations were chosen for complete laboratory analysis, based on indications of contamination from the preliminary screening or from previous investigations by Black and Veatch (1983) and Tacoma City Light (1986). Sheet 1-A shows the location of these 11 sample points. The samples were collected on February 12, 1987.

On March 3, 1987, Revision 1 to the "Waste Sampling Plan for Surface Debris Mapping" was published. This plan included an additional 38 locations for surface debris sampling and complete analysis, to give a statistical representation of the surface debris over the entire Burlington Northern site in South Tacoma.

Each previously unsampled square in a 500 foot grid was sampled. The 38 samples were composited in 19 adjacent pairs as shown on Figure 1-A and the composite samples were submitted for analysis. These samples were collected on March 10 and 12, 1987.

5.2 Sampling Results

Results of sample analyses and Quality Assurance data for samples taken by ReTeC, as part of this investigation, are presented in Appendix G.

Table 5-1 is a summary of surface debris (soil) sample analyses, including only those results that have metals concentrations (EP toxicity) above the lower limit for designation as dangerous waste (DW), under Washington law (WAC 173-303-090). This data was extracted from all preliminary investigations, as well as from this investigation.

Table 5-2 is a similar summary, but includes only those results that have metals concentrations (EP toxicity) above the lower limit for designation as extremely hazardous waste (EHW), under Washington law (WAC 173-303-090).

Table 5-3 is a summary of all surface debris (soil) sample analyses taken by ReTeC during this investigation.

TABLE 5-1

SOIL SAMPLES
WHICH MEET RCRA EP TOXICITY CRITERIA
TO BE DESIGNATED
DANGEROUS WASTE (DW)

SAMPLE LOCATION	SAMPLE TYPE	SAMPLED BY	DATE	CONTAMINANT	mg/Liter in Extract CONCENTRATION	CRITERIA
S2	SURFACE	PCHD	1985	LEAD	160	5
S3	"	PCHD	1985	LEAD	10.4	5
S5	"	PCHD	1985	LEAD	4850	5
S6	"	PCHD	1985	LEAD	16.1	5

TABLE 5-2

SOIL SAMPLES
WHICH MEET RCRA EP TOXICITY CRITERIA
TO BE DESIGNATED
EXTREMELY HAZARDOUS WASTE (EHW)

SAMPLE LOCATION	SAMPLE TYPE	SAMPLED BY	DATE	CONTAMINANT	mg/Liter in Extract CONCENTRATION	CRITERIA
S5	SURFACE	PCHD	1985	LEAD	4850	500

Table 5-3 Summary of Surface Debris Sampling Results

Field ID:	27-3	27-9	27-10	27-11	27-31	27-32	27-33	27-34	27-36	27-36a	27-37	27-38	27-39/40
Sample Date:	2/12/87	2/12/87	2/12/87	2/12/87	2/12/87	2/12/87	2/12/87	2/12/87	2/12/87	2/12/87	2/12/87	2/12/87	3/12/87
Parameter Lab ID:	2344-9	2344-10	2344-11	2344-12	2344-1	2344-2	2344-3	2344-4	2344-5	2344-6	2344-7	2344-8	2877-3
Inorganics, mg/kg or ppm													
Antimony	--	29	90	180	--	3.3	--	--	--	--	--	--	3.2
Arsenic	11	31	23	41	8.2	3.5	2.8	2.8	1.0	0.8	5.8	7.0	13.0
Beryllium	0.5	0.8	0.4	0.6	--	--	--	--	--	--	0.8	0.2	0.4
Cadmium	--	--	2.7	2.7	--	--	--	--	--	--	--	--	1.8
Chromium	22	14	19	26	460	90	120	130	26	23	150	390	52
Copper	32	6,100	2,700	730	320	54	150	98	39	20	95	290	160
Lead	42	1,700	1,900	1,700	50	300	85	34	--	--	14	87	200
Mercury	--	--	0.2	12	--	--	--	--	--	--	--	--	--
Nickel	22	37	38	57	740	41	74	59	17	15	79	280	36
Selenium	--	--	--	--	--	0.8	3.5	0.7	--	--	--	--	--
Silver	--	1.3	--	--	--	--	--	--	--	--	--	1.6	--
Zinc	64	320	720	810	340	86	63	33	26	27	62	130	270
Total Solids, %	84.7	78.4	80.3	80.1	80.5	85.8	79.1	83.8	83.5	81.4	70.8	78.7	79.0
Volatile Organics, ug/kg or ppb													
Methylene Chloride	--	Trace	Trace	--	Trace	41	Trace	Trace	Trace	Trace	Trace	--	Trace
Acetone	--	Trace	--	--	--	17	--	--	--	--	66	--	Trace
Trichloroethylene	--	--	Trace	--	--	--	--	--	Trace	--	--	--	--
Tetrachloroethylene	--	--	--	--	--	Trace	--	--	--	--	--	--	Trace
Extractable Organics, ug/kg or ppb													
Phenol	--	--	--	--	1,200	420	--	--	610	730	4,200	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	990	--
Naphthalene	97	220	130	710	780	220	--	150	310	290	1,700	380	--
Acenaphthylene	300	--	72	--	--	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	830	440	--	210	--	--	--	--	--
Fluorene	--	--	--	--	650	86	--	--	--	--	130	--	--
Phenanthrene	180	310	380	1,600	2,100	670	140	270	63	74	460	120	--
Anthracene	170	--	120	--	230	240	--	--	--	--	230	60	--
Dibutylphthalate	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	400	250	530	1,400	4,300	2400	280	830	--	--	130	--	--
Pyrene	400	320	470	1,200	2,700	2,000	210	680	--	--	86	--	--
Benzo(a)anthracene	260	--	260	1,100	3,400	2,900	280	1,100	--	--	--	--	--
Chrysene	560	220	330	1,300	3,500	2,900	350	1,200	--	--	--	--	--
Bis(2-ethylhexyl) phthalate	98	160	88	--	98	150	93	120	470	200	290	67	7,300
Di-n-octyl phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(b)fluoranthene	740	350	710	1,900	6,500	7,400	680	2,500	--	--	--	--	--
Benzo(k)fluoranthene	380	210	*	*	1,800	2,500	360	1,300	--	--	--	--	--
Benzo(a)pyrene	200	86	270	610	3,400	8,300	660	2,600	--	--	--	--	--
Indeno(123-cd)pyrene	220	97	120	--	1,400	3,100	330	1,300	--	--	--	--	--
Dibenzo(ah)anthracene	--	--	--	--	110	230	57	89	--	--	--	--	--
Benzo(ghi)perylene	210	94	100	--	1,100	2,800	270	1,100	--	--	--	--	--
Benzoic Acid	860	800	1,500	--	390	--	330	--	690	610	300	660	--
Dibenzofuran	--	140	67	--	690	68	--	--	--	--	190	--	--
2-Methylnaphthalene	--	1,000	150	660	1,700	150	--	76	330	340	1,600	340	--
PCBs	NA	--	--	0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
-- indicates value less than detectable limit
* compound co-eluted with benzo(b)fluoranthene

Trace - indicates an unquantifiable amount less than 10 ppb
NA - indicates sample not analyzed for this parameter

Table 5-3 Summary of Surface Debris Sampling Results

Field ID:	27-41/42	27-41/42	27-43/44	27-45/46	27-47/48	27-49/50	27-51/52	27-53/54	27-55/56	27-57/58	27-59/60	27-59/60
Sample Date:	3/12/87	3/12/87	3/12/87	3/10/87	3/10/87	3/10/87	3/12/87	3/12/87	3/12/87	3/10/87	3/10/87	3/10/87
Parameter Lab ID:	2877-4	2877-5	2877-6	2807-1	2807-2	2807-3	2877-1	2877-7	2877-2	2807-11	2807-4	2807-5
Inorganics, mg/kg or ppm												
Antimony	--	--	--	14	8.5	19	--	--	--	3.1	21	13
Arsenic	9.0	9.6	11	9.6	16	13	18	13	9.6	14	38	36
Beryllium	0.4	0.4	0.5	0.4	0.6	0.7	0.4	0.5	0.4	0.6	0.7	0.6
Cadmium	--	--	0.5	0.6	1.1	1.0	1.2	0.7	0.6	0.8	3.8	3.8
Chromium	22	26	27	28	32	26	15	23	17.0	19	35	43
Copper	16	15	29	260	280	120	28	28	17.0	36	420	300
Lead	--	--	63	2,300	910	1,300	45	28	17	50	2,000	2,100
Mercury	--	--	--	--	0.1	--	--	--	--	--	--	--
Nickel	28	30	30	34	32	22	21	31	22	22	23	23
Selenium	--	--	--	--	--	--	--	--	--	--	0.8	--
Silver	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	44	42	68	130	350	120	60	61	39	65	1,700	1,400
Total Solids, %	80.3	80.9	78.8	89.7	81.4	78.5	73.4	83.0	76.2	68.7	75.8	76.9
Volatile Organics, ug/kg or ppb												
Methylene Chloride	Trace	Trace	Trace	Trace	Trace	Trace	Trace	Trace	--	--	Trace	Trace
Acetone	Trace	18	Trace	--	22	56	--	--	--	--	76	61
Trichloroethylene	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene	--	--	--	--	--	--	17	11	12	--	--	--
Extractable Organics, ug/kg or ppb												
Phenol	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	110	--	--	--	--	--	180	220
Acenaphthylene	--	--	270	--	260	2,900	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	--	--	90	--	76	--	--	--	--	--	--	--
Phenanthrene	--	--	1,500	110	790	440	--	--	--	--	480	460
Anthracene	--	--	180	74	600	430	--	--	--	--	66	57
Dibutylphthalate	--	--	--	--	180	--	--	--	--	140	--	180
Fluoranthene	--	--	1,900	130	1,100	1,000	--	--	--	--	190	190
Pyrene	--	--	2,000	180	1,600	1,400	--	--	--	--	220	250
Benzo(a)anthracene	--	--	910	--	610	2,100	--	--	--	--	--	--
Chrysene	--	--	950	160	1,100	4,200	--	--	--	--	240	300
Bis(2-ethylhexyl) phthalate	87	--	66	--	170	--	--	200	68	--	140	110
Di-n-octyl phthalate	--	410	--	--	--	--	110	240	--	1,100	--	--
Benzo(b)fluoranthene	--	--	1,700	350	2,500	4,800	--	--	--	--	220	250
Benzo(k)fluoranthene	--	--	*	*	*	*	--	--	--	--	*	*
Benzo(a)pyrene	--	--	1,000	220	1,200	2,500	--	--	--	--	130	140
Indeno(123-cd)pyrene	--	--	520	--	740	2,900	--	--	--	--	--	--
Dibenzo(ah)anthracene	--	--	100	--	300	660	--	--	--	--	--	--
Benzo(ghi)perylene	--	--	480	180	730	2,600	--	--	--	--	--	--
Benzoic Acid	2,100	1,200	2,100	430	600	--	870	1,900	920	--	540	110
Dibenzofuran	--	--	--	--	82	--	--	--	--	--	89	250
2-Methylnaphthalene	--	--	--	--	88	--	--	--	--	--	270	--
PCBs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
-- indicates value less than detectable limit
* compound co-eluted with benzo(b)fluoranthene

Trace - indicates an unquantifiable amount less than 10 ppb
NA - indicates sample not analyzed for this parameter

Table 5-3 Summary of Surface Debris Sampling Results

Field ID:	27-61/62	27-64/63	27-65/66	27-67/68	27-69/70	27-71/72	27-73/74	27-75/8
Sample Date:	3/12/87	3/10/87	3/10/87	3/10/87	3/10/87	3/10/87	3/10/87	3/10/87
Parameter Lab ID:	2877-8	2807-12	2807-6	2807-13	2807-10	2807-7	2807-9	2807-8
Inorganics, mg/kg or ppm								
Antimony	--	2.6	6.4	--	11	11	230	6.0
Arsenic	8.7	4.4	14.0	5.7	14	33	11	21
Beryllium	0.4	0.5	0.9	0.4	0.7	0.8	0.5	0.6
Cadmium	0.8	--	0.8	2.9	3.2	2.6	3.0	1.4
Chromium	21	24	24	32	26	36	82	19
Copper	19	23	120	32	260	280	39,000	180
Lead	42	34	210	67	780	1,100	9,900	570
Mercury	--	--	--	--	--	--	1.7	--
Nickel	28	25	23	28	33	39	210	29
Selenium	--	--	--	--	--	--	--	--
Silver	--	--	--	--	--	--	--	--
Zinc	46	53	130	74	780	930	1,800	260
Total Solids, %	87.7	87.3	79.5	70.3	71.4	70.6	83.6	67.7
Volatile Organics, ug/kg or ppb								
Methylene Chloride	--	Trace	Trace	Trace	Trace	18	Trace	Trace
Acetone	--	--	68	88	--	Trace	Trace	Trace
Trichloroethylene	--	--	--	--	--	--	--	--
Tetrachloroethylene	Trace	Trace	--	--	--	Trace	--	--
Extractable Organics, ug/kg or ppb								
Phenol	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	--	--	--	--	350	--	--	--
Naphthalene	--	--	130	--	--	--	--	--
Acenaphthylene	--	--	--	--	--	--	--	--
Acenaphthene	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--
Phenanthrene	--	--	300	--	420	840	--	280
Anthracene	--	--	78	--	200	150	--	--
Dibutylphthalate	--	--	--	--	--	--	--	200
Fluoranthene	--	69	320	--	420	1,000	56	200
Pyrene	--	57	310	--	360	900	--	190
Benzo(a)anthracene	--	--	--	--	--	--	--	--
Chrysene	--	81	170	--	510	--	--	230
Bis(2-ethylhexyl) phthalate	120	--	120	120	--	130	--	--
Di-n-octyl phthalate	56	61	--	--	210	270	250	--
Benzo(b)fluoranthene	--	150	280	--	1,000	510	85	370
Benzo(k)fluoranthene	--	*	*	--	*	*	*	*
Benzo(a)pyrene	--	69	160	--	370	490	--	150
Indeno(123-cd)pyrene	--	--	--	--	150	190	--	--
Dibenzo(ah)anthracene	--	--	--	--	--	230	--	--
Benzo(ghi)perylene	--	--	--	--	190	--	--	--
Benzoic Acid	1,600	310	510	890	--	920	350	--
Dibenzofuran	--	--	84	--	140	--	--	--
2-Methylnaphthalene	--	--	170	--	360	260	--	220
PCBs	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
-- indicates value less than detectable limit
* compound co-eluted with benzo(b)fluoranthene

Trace - indicates an unquantifiable amount less than 10 ppb
NA - indicates sample not analyzed for this parameter

6.0 NATURE OF SURFACE DEBRIS

6.1 General

The surface debris on the BN site, described in this chapter, includes a variety of material which has been discovered during the several investigations since 1981. The history of discovery and a description of each type of waste is discussed in this chapter. Remediation methods for these wastes are discussed in section 7.2 of this report.

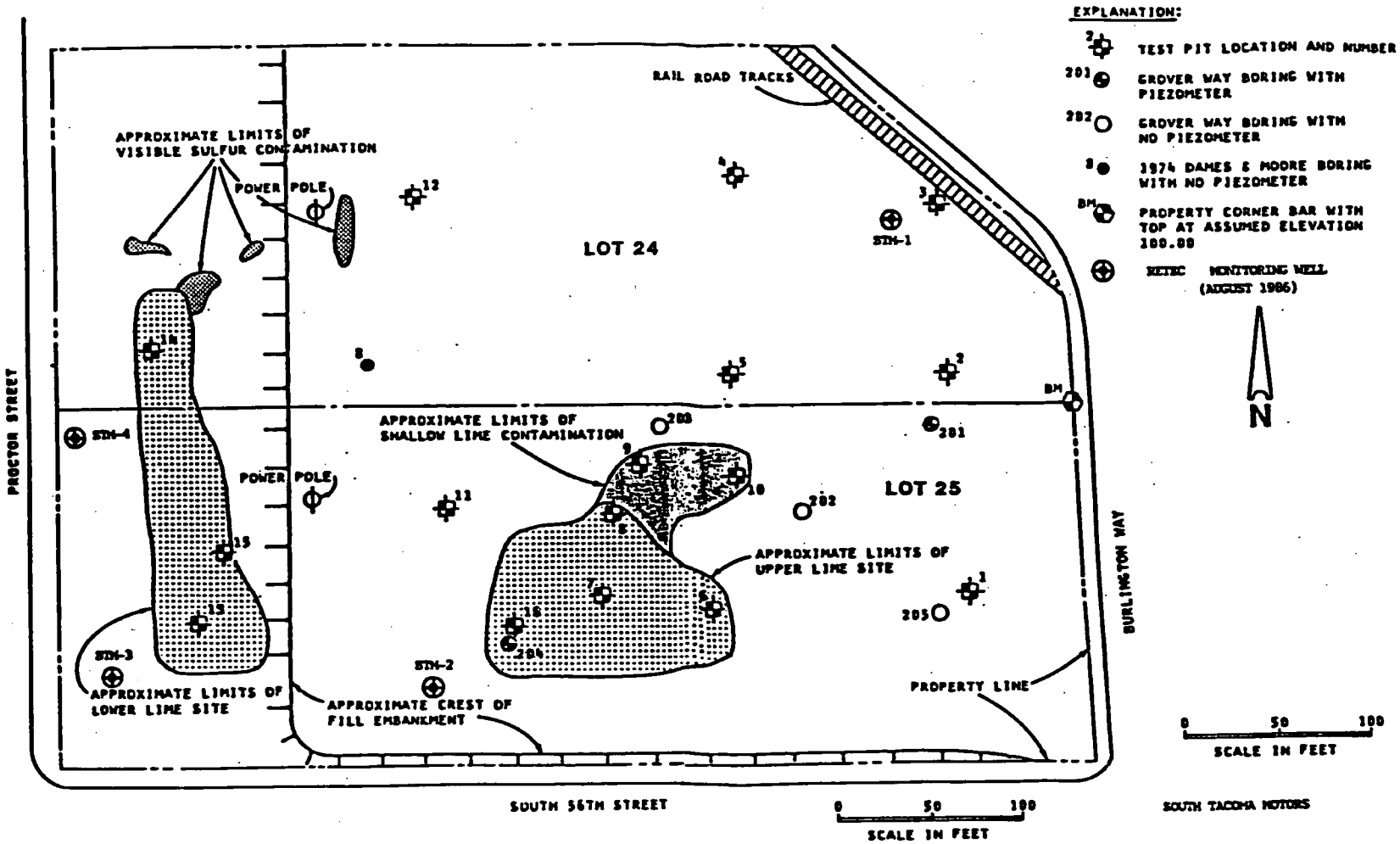
6.2 Lime and Sulfur Waste

Sulfur and lime-like wastes were originally discovered in 1984 by Mr. Grover Way, a consulting soils engineer retained by South Tacoma Motors. He determined that the lime waste had a pH of 11.8. These wastes are located in the southeastern portion of the South Tacoma site, specifically in Lots 24 and 25 of the BN Tacoma Industrial Center which border South 56th Street, Proctor Street, and Burlington Way (see Figure 2-1).

GeoEngineers, Inc., were then retained by BN who subsequently repurchased the property from South Tacoma Motors. GeoEngineers conducted an investigation of the area in 1985 and produced a report titled "Phase 1 Subsurface Investigation, Burlington Northern Tacoma Industrial Center, South 56th Street and Burlington Way, Tacoma, Washington". By digging test pits, they discovered cinder, lime, and sulfur wastes.

The lime waste was located in two areas within the South Tacoma Motors site (see Figure 6-1). The combined volume of lime waste from the two areas is estimated at 3300 cubic yards. The sulfur waste is located in several areas at this site and its total volume is estimated at 30 to 40 cubic yards.

RETEC



LIME AND SULFUR CONTAMINATION WITHIN THE SOUTH TACOMA MOTORS SITE

FIGURE 6-1

6.3 Barreled Waste

During the ReTeC investigation of the South Tacoma Motors site in 1986, some barreled waste was discovered. Approximately 100 barrels were uncovered and 90 percent of these barrels contain an emulsified asphalt. Four samples were collected from these barrels, with two samples pulled from the emulsified asphalt barrels and two samples from barrels containing unknown waste. Laboratory results reported no PCB or sulfide in any of the samples. One barrel contained a whitish solid material with a cyanide content of 1.4 ppm. Halogenated hydrocarbons were reported in samples pulled from the emulsified asphalt barrels at values of 28 and 41 ppm. These levels are below the DOE dangerous waste level of 100 ppm. Analyses are shown on Figure 6-2.

All the barrels at the site were relocated to an area within the secured South Tacoma Motors site near the corner of South 56th Street and Proctor Street. The barrels were covered with a waterproof tarpaulin with the edges of the tarpaulin bermed with sand to hold the tarpaulin in place. The security of the South Tacoma Motors site is provided with a 10 foot high chain link with two locked gates constructed around the perimeter of the site (Lots 24 and 25).

Another barrel, approximately one-third full, containing liquid and sludge was discovered by ReTeC in the preliminary inspection of surface debris of the entire South Tacoma site. This barrel was placed in an oversized salvage drum and is currently stored inside the secured area next to the other barrels. A sample of this barrel's contents was pulled on May 5, 1987, and the results are pending.

REIEC

FIGURE 6-2

LABORATORY RESULTS
BARRELED WASTES

BARREL COUNT --->	94		1	1
	ASPHALT EMULSION			
PARAMETER	BLACK PHASE	BROWN PHASE	OIL	WHITE MATERIAL
PCB, mg/kg	<1	<1	<1	<1
CYANIDE, mg/kg	<0.5	<0.5	1.4	<0.5
SULFIDES, mg/kg	<20	<20	<20	<20
HALOGENATED HYDROCARBONS, mg/kg	41	28	<35	<10
4,5 & 6 RING PAH's, wt %	18.9	9.2	16.9	<1
pH	7.8	8.4	6	12.5
IGNITION TEMPERATURE, F	N/I	N/I	101+	N/I
REACTIVITY, EPA Method SW-846	N/R	N/R	N/R	N/R
METALS, EP TOX, mg/l				
ARSENIC	<0.2	<0.2	<0.2	<0.2
BARIUM	0.2	0.4	0.2	0.2
CADMIUM	<0.01	<0.01	<0.01	<0.01
CHROMIUM	<0.1	<0.1	<0.1	<0.1
LEAD	<0.1	<0.1	<0.1	<0.1
MERCURY	0.015	<0.005	<0.005	0.04
SELENIUM	<0.2	<0.2	<0.2	<0.2
SILVER	<0.1	<0.1	<0.1	<0.1

NOTES:

N/I = Not ignitable in Setaflash Tester below 200 F
N/R = Not Reactive When Tested According to SW-846, USEPA,

ANALYSES OF WASTES FOUND IN BARRELS

FIGURE 6-2

6.4 Asbestos Waste

Asbestos was discovered in the southwestern portion of the site (in the old South Tacoma Motors site) by ReTeC in 1986. This material was found at and near the surface, and appeared to be residue from the dismantling of industrial facilities (possibly from previous buildings on the BN site, itself). No additional asbestos is visible at the surface of the site, although history indicates that more may be found near the car dismantling area in the northern portion of the site.

6.5 Tires

During the ReTeC investigation of surface debris in 1986, about 25 tons of tires were discovered throughout the South Tacoma site. Insofar as possible all of the tires have been consolidated into large piles for easy removal.

6.6 Common Trash

Large quantities of common trash were found scattered throughout the South Tacoma site, evidently placed there by unscrupulous "midnight dumpers". Most of this trash is of domestic origin, but some has been identified as being of commercial origin, both waste paper and landscaping residues.

6.7 Construction/Demolition Waste

The buildings associated with the Northern Pacific Car Shops were demolished in 1975 and 1976, after closure of the facility in 1974. Much of the demolition material was salvaged and transported off site. Some of the rubble (bricks, concrete, etc.) was used for fill for pits and basements of buildings.

Lumber from the buildings and scrap wood was buried in an area near monitoring well CBS-08, south of the former airport.

The demolition contractor left many of the concrete building foundations, floors, platforms and roadways in place throughout the Car Shop site. Some of the floors and platforms were broken up, but were left in place.

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

1. That the Burlington Northern portion of the South Tacoma Swamp contained no serious immediate health hazards at the time this investigation was commenced.

2. That several less-serious immediate health hazards did exist. These included the asbestos (which was mostly buried) and some material in 55 gallon drums, most of which was nonflammable and nontoxic.

3. That several conditions exist which can be designated as long term health risks. These are mentioned in following conclusions and recommendations, and will be the subject of additional investigation in Phase 3.

4. That some areas of surface soil in the former car dismantling site near Tacoma City Light's facility at the north end of the BN property contain high concentrations of lead. Several samples taken by the Pierce County Health Dept. show lead at dangerous levels, and one sample shows it at a hazardous level. (Using RCRA EP toxicity criteria).

5. That petroleum products and, to a lesser degree, chemicals were used in many parts of the Car Shops site, but in small quantities. In only a few areas were these products present in quantities comparable to a modern automobile service station.

6. That there are a number of areas of environmental concern in the Car Shops site, because of past usage.

7. That the portion of the South Tacoma Airport site which was actually utilized as an airport, contains no known or suspected hazards to the environment or to public health, insofar as past history and recent investigation has determined.

8. That the 40 acres of the site south of the airport have been filled with a variety of unknown industrial waste. Investigations conducted to date have not adequately identified and inventoried any hazardous materials that may be present, nor have the effects of these materials on groundwater quality been determined.

7.2 Recommendations

The following recommendations are made:

1. That all asbestos wastes found be considered an immediate hazard to health, and be removed and appropriately disposed of as part of Phase 2 (This has been accomplished between the dates of March 1 and April 8, 1987, with the permission of EPA. Fifty cubic yards of asbestos/soil mixture was double-bagged and placed in a designated asbestos area at the Tacoma land-fill.) Phase 3 investigations will include the exploration of at least one old displosal pit area that may contain more asbestos.

2. That organic material found in 55 gallon drums be considered an immediate health hazard, and be removed as part of Phase 2 (A commercial TSD facility has studied the asphalt emulsion found in most of the drums, and has agreed to process it for removal of water and subsequent blending into fuel oil. Other drums will be shipped to Chem Security in Arlington, Oregon, as soon as the laboratory work is complete on the last drum.)

3. That, although the tires and common trash do not constitute an immediate health hazard, they are very visible; and their presence encourages the dumping of other materials which could include hazardous materials. Therefore, they also should be removed as part of Phase 2 (With EPA's permission, all of the common trash was removed between the dates of May 11 and May 15, 1987, and was hauled to the Tacoma land-fill. About 50% of the tires were removed between the dates of April 2 and April 8, 1987, and were hauled to Pacific Aqua-Tech in Toppenish. The remainder of the tires will also be hauled to Toppenish when Pacific Aqua-Tech can take them. Pacific Aqua-Tech will manufacture activated carbon from the tires.)

4. That the Phase 3 Work Plan include an exploration of the Car Shops area with a backhoe and TIP analyzer, to cover the areas of concern, based on historic usage. The exact methodology and actions to be taken when hazardous materials are found will be covered in the Work Plan.

5. That the Phase 3 Work Plan include an exploration of the southwest 40 acres of the BN property by core drilling (this is the area filled with industrial wastes). Cores will be analyzed for volatile organics, PAH's and metals. Initial samples will be taken from each square in a grid covering the area. Additional samples will be taken to define the extent of any hazardous wastes found.

6. That the Phase 3 Work Plan include sampling grounwater from the existing wells on the site. Additional wells will be installed only in locations down-gradient from any significant concentrations of hazardous wastes found in the explorations, above.

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APPENDIX A

Project C86027 **Site** South Tacoma Motor **BORING** STM-2 **Sh 1 of** 2

Date Started 8-14-86 **Completed** 8-14-86 **Ground Elevation** _____

Total Depth 42.50' **Location** approx. center S. side **Logged by** J. Reese

Casing I.D. 6" hollow stem/well 2" ID **Contractor** Kring Drilling Company, Inc.

Remarks see map for location: Driller - [illegible] whisper [illegible] recorded; split spoon samples visually inspected but not retained due to fragmentation occurring during penetration

Elev. Feet	Depth Feet	Sample Type & Number	Blows per 6 In.	Depth Range	Rec.	Graphic Log	Sample Description	Equipment Installed
		① grab		grab: 2-4'			SAND, fine, dark brown, and GRAVEL, with a little coarse sand and silt and a trace of clay and roots (SM-SW-GM)	60# readymix; 2.81'; 198# portland; 5 gal H_2O
	5	② grab	26	Spoon & grab: 6-8'	50%		SAND, fine, dark brown, with some gravel and a little coarse sand and silt and a trace of clay and roots (SM-SW-GM)	
	10	③ grab	27	Spoon & grab: 12-14'	30%		SAND, fine, dark brown, and GRAVEL with a little coarse sand and silt and a trace of clay and roots (SM-SW-GM)	200# bentonite crumbles; galvanized steel pipe 2" ID
	15	④ grab	30	Spoon & grab: 17-19'	20%		SAND, medium to fine, brown, with a little gravel and a trace of silt and clay (SP)	
	20	⑤ grab	31	Spoon & grab: 21-23'	10%		SAND, medium, light brown, with some gravel and a trace of silt and clay (SP-GM)	
	25	⑥ grab		grab: 26-28				25# bent.; pel.
	30	⑦ grab	33	Spoon & grab: 32-34	10%	▽	GRAVEL, fine, with some coarse to fine sand with a trace of silt and clay (SP-GM)	200# 10-20 sand; .010 2" ID screen

12"

REMEDIATION TECHNOLOGIES INC

note: monument pad 24" diam

Project C86027 **Site** South Tacoma Motor **BORING** STM-1 **Sh 1 of** 2
Date Started 8-12-86 **Completed** 8-13-86 **Ground Elevation**
Total Depth 38.28' **Location** NE corner of site **Logged by** J. Reese
Casing I.D. 6" hollow stem/well 2" ID **Contractor** Kring Drilling Company, Inc.
Remarks see map for location; Driller Charles Whisnant; blow counts recorded; split spoon samples visually inspected but not retained due to fragmentation occurring during penetration

Elev. Feet	Depth Feet	Sample: Type & Number	Sample: Blows per 6 In.	Sample: Depth Range	Sample: Rec.	Graphic Log	Sample Description	Equipment Installed
		① grab		grab: 1-3'			SAND, fine, brown, some gravel, trace of silt and roots (SP-SM)	300# readymix; 2.48'; +5 gal H_2O
	5	② grab	35	Spoon + grab: 3-6	40%			
		③ grab		grab: 7-9'			SAND, medium, brown and grey with a trace of silt and fine gravel (SP)	
	10	④ grab	37	Spoon + grab: 10-12'	30%			450# bent. crumbles; galvanized steel pipe 2" ID
	15	⑤ grab	37	Spoon + grab: 14-16'	25%		SAND, medium, brown and grey, a little gravel and a trace of silt (SP)	
	20	⑥ grab	41	Spoon + grab: 18-20'	10%		SAND, brown and grey with some gravel and a trace of silt (SP)	
	25	⑦ grab	40	Spoon + grab: 25-27'	10%		mud / bentonite slurry mix (376# portland II cement, 50 gal. water, and 50# super gel)	bent pel; 25#
	30	⑧ grab	36	Spoon + grab: 29-31'	25%		SAND, medium to coarse, brown and grey with a little fine gravel and a trace of silt and clay (SW)	200# 10-20 sand; .010" screen 2" ID

12"

REMEDIATION TECHNOLOGIES INC

note: monument pad 24" diam

Project C86027 Site South Tacoma Motor **BORING** STM-1 Sh 2 of 2

Date Started 8-12-86 Completed 8-12-86 Ground Elevation

Total Depth 38.28' Location NE corner of site Logged by J. Ficcke

Casing I.D. 6" hollow stem / well 2" ID Contractor Kring Drilling Company, Inc.

Remarks See map for location: Driller - Charles Whisnant

Elev. Feet	Depth Feet	Sample Type & Number	Sample Blows per 6 in.	Sample Depth Range	Sample Rec.	Graphic Log	Sample Description	Equipment Installed		
		(10) grab	36	Spoon & grab: 35-37'	25%		SAND, medium to coarse, brown, trace of gravel and silt (SW)	10-20 Sand	.010" Screen	
	40							Total Depth 38.28'		

REMEDIATION TECHNOLOGIES INC

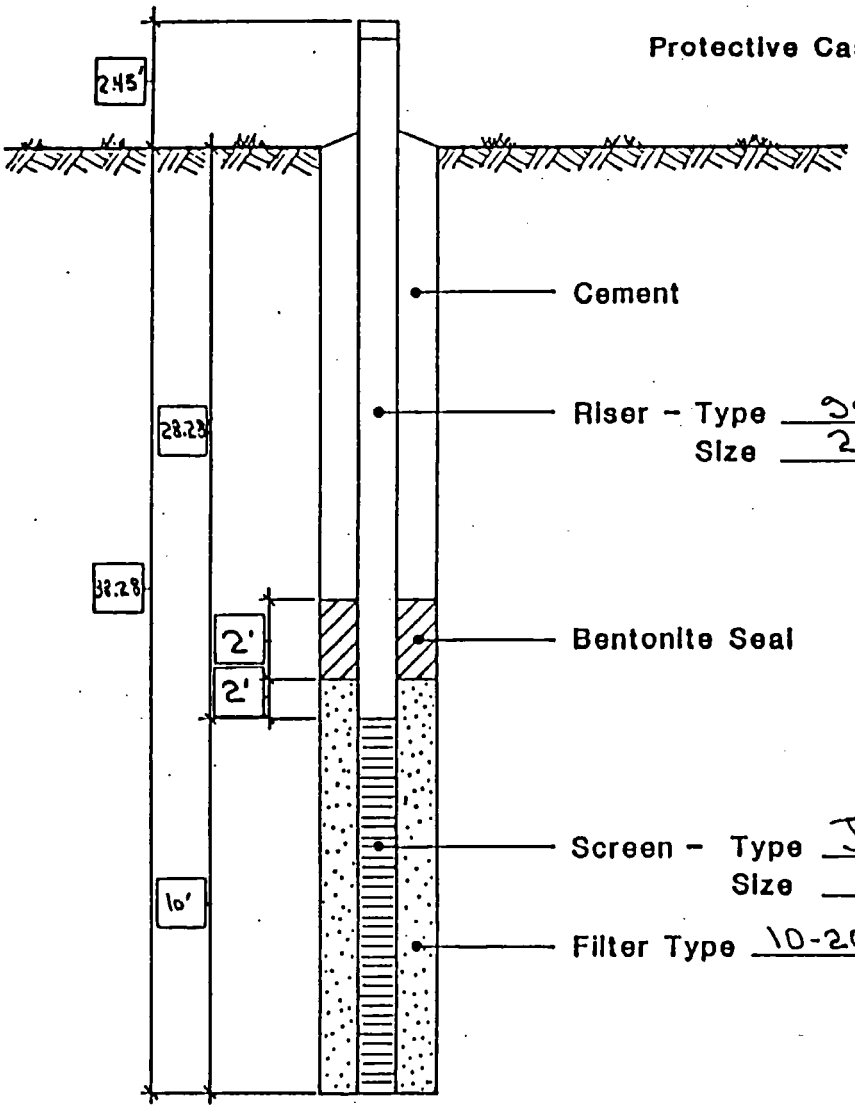
WELL COMPLETION LOG

PROJECT: South Tacoma Motors

CLIENT: Burlington Northern DATE: 8-13-86

WELL NUMBER: STM-1 LOCATION: NE corner of site

INSTALLED BY: Kring Drilling Co., Inc.



Protective Casing – Yes ✓
No
Type metal, locking

Cement

Riser – Type galvanized steel
Size 2" ID

Bentonite Seal

Screen – Type Johnson slotted - stainless steel
Size .010"

Filter Type 10-20 silica sand

Comments:

WELL DEVELOPMENT LOG

PROJECT: South Tacoma Motors

CLIENT: Burlington Northern DATE: 8-22-86

LOCATION: NE corner of site

WELL NUMBER: STM-1 DEPTH: 38.28'

SCREEN INTERVAL: 28.28' - 38.28' STICK-UP: 2.45'
(depth below ground surface)

METHOD OF DEVELOPMENT: compressor air lift

WELL CONDITION: intact

START DEVELOPMENT

Time: 0943 Static Water Level: 34.55'

Water Appearance: cloudy, brown with silt and sand

Comments:

END DEVELOPMENT

Time: 1153 Water Level: 34.58'

Water Appearance: clear, trace of silt and sand

TOTAL TIME: 2hrs 10min TOTAL QUANTITY: 8.8 gallons

Project C810027 Site South Tacoma Motor **BORING** STM-2 Sh 2 of 2

Date Started 8-14-86 Completed 8-14-86 Ground Elevation

Total Depth 42.50' Location approx center S side Logged by J. Reese

Casing I.D. 6" hollow stem / well 2" ID Contractor Kring Drilling Company, Inc.

Remarks See map for location: driller - Charles Whisenant

Elev. Feet	Depth Feet	Sample Type & Number	Blows per 6 In.	Depth Range	Rec.	Graphic Log	Sample Description	Equipment Installed
		⑧ grab	35	Spoon + grab 36-38'	20%		GRAVEL, fine, with some coarse to fine sand with a trace of silt and clay (SP-GM)	10-20 Sand; .010" 2" ID Screen
	40	⑨ grab		grab: 39-41				
	45							Total Depth 42.50'

REMEDIATION TECHNOLOGIES INC

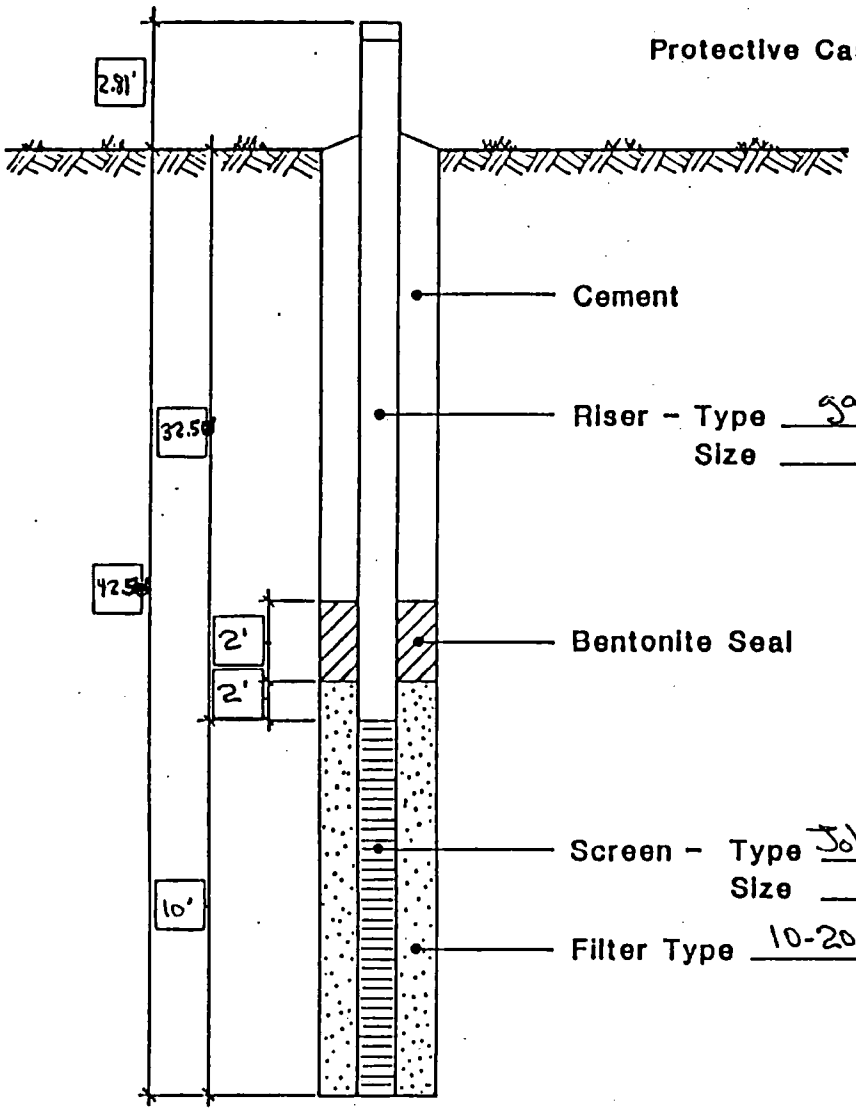
WELL COMPLETION LOG

PROJECT: South Tacoma Motors

CLIENT: Burlington Northern DATE: 8-14-86

WELL NUMBER: STM-2 LOCATION: approx. center of south side

INSTALLED BY: Kring Drilling Co. Inc.



Protective Casing – Yes ✓
No
Type metal, locking

Cement

Riser – Type galvanized steel
Size 2"

Bentonite Seal

Screen – Type Johnson slotted - stainless steel
Size .010"

Filter Type 10-20 silica sand

Comments:

WELL DEVELOPMENT LOG

PROJECT: South Tacoma Motors

CLIENT: Burlington Northern DATE: 8-22-86

LOCATION: approx. center of south side of site

WELL NUMBER: STM-2 DEPTH: 42.50'

SCREEN INTERVAL: 32.50'- 42.50 STICK-UP: 2.81'

note: all depths measured from ground surface

METHOD OF DEVELOPMENT: compressor air lift

WELL CONDITION: intact

START DEVELOPMENT

Time: 1343 Static Water Level: 33.51'

Water Appearance: cloudy, brown with silt and sand

Comments:

END DEVELOPMENT

Time: 1523 Water Level: 33.50'

Water Appearance: clear, trace of silt and sand

TOTAL TIME: 1hr. 40 min TOTAL QUANTITY: 9.4 gallons

Project C86027 **Site** South Tacoma Water Co **BORING** STM-3 **Sh 1 of** 1

Date Started 2-14-86 **Completed** 2-14-86 **Ground Elevation** _____

Total Depth 23.27 **Location** SW corner of site **Logged by** J. Reeves

Casing I.D. 6" hollow stem / well 2" ID **Contractor** Kring Drilling Consultants, Inc.

Remarks See [illegible] for location. Driller - Charles Whisnant; blow counts recorded; split spoon samples visually inspected but not [illegible] due to fragmentation occurring during penetration

Elev. Feet	Depth Feet	Sample Type & Number	Blows per 6 In.	Depth Range	Rec.	Graphic Log	Sample Description	Equipment Installed
							Lime fill	3.56'
	5	① grab		3-5'			SAND, grey to light grey, with some fine gravel and a trace of silt (SW-GW)	120# ready-mix; 300# bentonite crumbles; 2" ID galvanized steel; +5 gal H2O
		② grab	27	spoon + grab: 7-9'	15%			
	10	③ grab	33	spoon + grab: 11'-13'	10%		SAND, medium to coarse, grey to light grey and GRAVEL, with a trace of silt (SW-GW)	25# bent.; pellets
	15	④ grab	37	spoon + grab: 16-18'	5%	▽	GRAVEL with some grey to light grey medium to coarse sand and a trace of silt (GM-GW)	100# 10-20 Sand; .010" 2" ID Screen
	20	⑤ grab		grab: 19-21'				
	25							← 12" → Total Depth 23.27'

REMEDIATION TECHNOLOGIES INC

note: monument pad 24" diam.

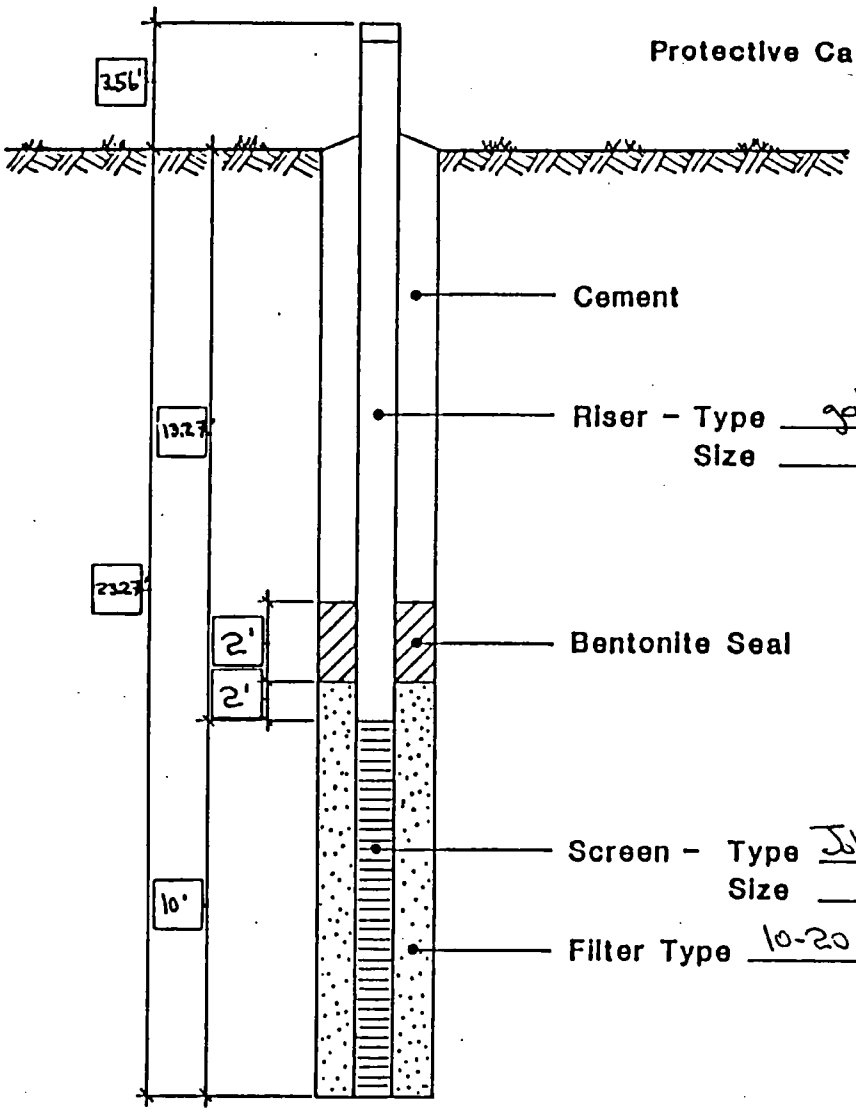
WELL COMPLETION LOG

PROJECT: South Tacoma Motors

CLIENT: Burlington Northern DATE: 8-14-86

WELL NUMBER: STM-3 LOCATION: SW corner of site

INSTALLED BY: Kring Drilling Co., Inc.



Protective Casing – Yes ✓
No
Type metal, locking

Cement

Riser – Type galvanized steel
Size 2"

Bentonite Seal

Screen – Type Johnson slotted-stainless steel
Size .010"

Filter Type 10-20 silica sand

Comments:

WELL DEVELOPMENT LOG

PROJECT: South Tacoma Motors

CLIENT: Burlington Northern DATE: 8-21-86

LOCATION: SW corner of site

WELL NUMBER: STM-3 DEPTH: 23.27'

SCREEN INTERVAL: 13.27'- 23.27' STICK-UP: 3.56'

note: all depths measured from ground surface

METHOD OF DEVELOPMENT: compressor air lift

WELL CONDITION: intact

START DEVELOPMENT

Time: 1445 Static Water Level: 15.43'

Water Appearance: cloudy, brown with silt and sand

Comments:

END DEVELOPMENT

Time: 1812 Water Level: 16.47'

Water Appearance: clear, trace of silt and sand

TOTAL TIME: 3 hrs. 27 min TOTAL QUANTITY: 27.1 gallons

Project C86027 **Site** South Tacoma Motor Co **BORING** STM-4 **Sh 1 of** 1

Date Started 8-15-86 **Completed** 8-15-86 **Ground Elevation** _____

Total Depth 26.60' **Location** approx. center E side **Logged by** J. Reese

Casing I.D. 6" hollow stem / well 2" ID **Contractor** Kring Drilling Company, Inc.

Remarks See map for [illegible] Driller - Charles Whisnant; blow counts recorded; split spoon samples visually inspected but not retained due to fragmentation occurring during penetration

Elev. Feet	Depth Feet	Sample Type & Number	Blows per 6 In.	Depth Range	Rec.	Graphic Log	Sample Description	Equipment Installed
							Lime fill	183# mod. mix; 2.84'; 5 gal H_2O
	5'	① grab	27	Spoon & grab: 3-5'	30%		SAND, fine to medium, brown, with a trace of fine gravel, coarse sand and silt (SW)	400# bentonite crumbles; 2" ID galvanized steel
		② grab	30	Spoon & grab 7-9'	25%		SAND, medium to coarse, brown, with a little fine gravel and a trace of silt	
	10'	③ grab	31	Spoon & grab: 12-14'	10%		SAND, medium to coarse, brown and fine gravel with a trace of silt (SW-GW)	25# bent; pellets
	15'	④ grab	35	Spoon & grab: 16-18'	5%	▽	GRAVEL, some brown medium to coarse sand with a trace of silt (GW)	100# 10-20 sand; .010 - 2" ID screen
	20'	⑤ grab		grab: 19-21'				
	25'	⑥ grab		grab: 23-25'				
	30'							← 12" → Total Depth 26.60'

REMEDIATION TECHNOLOGIES INC

note: monument pad 24" diam

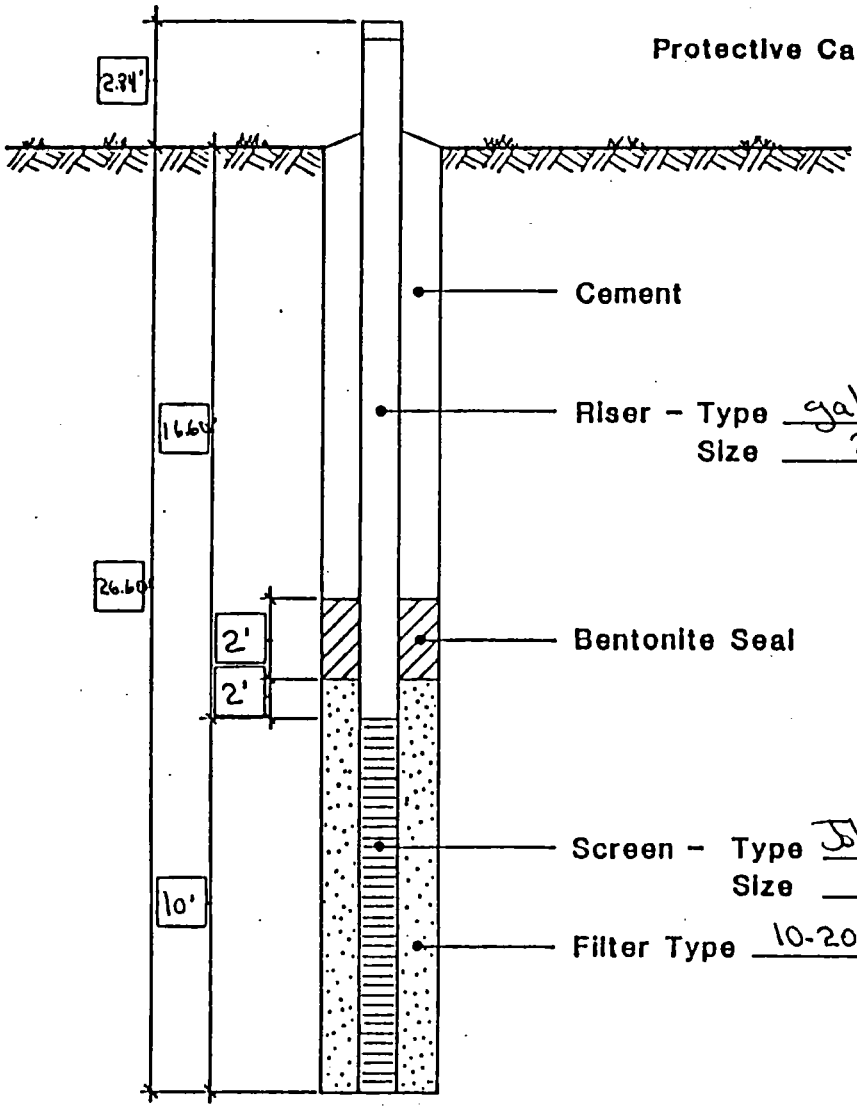
WELL COMPLETION LOG

PROJECT: South Tacoma Motors

CLIENT: Burlington Northern **DATE:** 8-15-86

WELL NUMBER: STM-4 **LOCATION:** approx. center of E side of site

INSTALLED BY: Kring Drilling Co., Inc.



Protective Casing – Yes ✓
No
Type metal, locking

Cement

Riser – Type galvanized steel
Size 2"

Bentonite Seal

Screen – Type Johnson slotted - stainless steel
Size .010"

Filter Type 10-20 silica sand

Comments:

WELL DEVELOPMENT LOG

PROJECT: South Tacoma Motors

CLIENT: Burlington Northern DATE: 8-21-86

LOCATION: approx. center of E. side of site

WELL NUMBER: STM-4 DEPTH: 26.60'

SCREEN INTERVAL: 16.60' - 26.60' STICK-UP: 2.84'

note: all depths measured from ground surface

METHOD OF DEVELOPMENT: compressor air lift

WELL CONDITION: intact

START DEVELOPMENT

Time: 1234 Static Water Level: 18.52

Water Appearance: cloudy, brown with silt and sand

Comments:

END DEVELOPMENT

Time: 1429 Water Level: 18.51

Water Appearance: clear, trace of silt and sand

TOTAL TIME: 1hr. 54min. TOTAL QUANTITY: 22.2 gallons

BORING LOG

SHEET 1 OF 2

PROJECT NAME COMMENCEMENT BAY

PROJECT NO. K81-4521

DATE 10-11-82

CBS-01

PROJECT LOCATION Tacoma, Washington

RIG Mobile B-61

LOGGED BY M. Genoud DRILLED BY R. Kring

WATER ENTERS El. 215 ATD

SURFACE ELEVATION 239 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
0				Loose, dark brown, poorly graded, Gravelly SAND with trace of silt	SP GP	Boring advanced with 10" diameter hollow stem augers with 11" diameter bit Sampler driven with 325 lbs. cable tool jars Slightly moist OVA-0.3ppm
	DM	12/18	3 7 8	Loose, gray, poorly graded, coarse grained GRAVELLY SAND with trace of silt		
5				Medium dense, red-yellow, poorly graded, fine to medium grained SAND with trace of silt	SP	Moist
	DM	15/18	7 11 18			OVA-Background
10						
	DM	15/18	11 20 26	Dense, gray, poorly graded, fine to medium grained SAND with some gravel and trace of silt		Moist to wet OVA-0.2ppm
15						
	DM	18/18	11 16 23			OVA-0.1ppm
20						
	DM	18/18	10 16 17	Becoming gray-yellow and medium grained		OVA-0.8ppm ← Water detected ATD
25						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-1

BORING LOG

SHEET 2 OF 2

PROJECT NAME COMMENCEMENT BAY

PROJECT NO. K81-4521

DATE 10-11-82

CBS-01

PROJECT LOCATION Tacoma, Washington

RIG Mobile B-61

LOGGED BY M. Genoud DRILLED BY R. Kring

WATER ENTERS El. 215 ATD

SURFACE ELEVATION 239 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
25				SAME: Dense, gray-yellow, poorly graded, medium grained SAND with some gravel and some silty clay	SP	Saturated
						OVA-5.4ppm
	DM	18/18	6 12 20			
						Bottom of boring 29.5'
30						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-2

BORING LOG

SHEET 1 OF 2

PROJECT NAME COMMENCEMENT BAY

PROJECT NO. K81-4521

DATE 10-13-82

CBS-02

PROJECT LOCATION Tacoma, Washington

RIG Mobile B-61

LOGGED BY G. Hess DRILLED BY S. Sterling

WATER ENTERS El. 214 ATD

SURFACE ELEVATION 240 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
0				Medium dense, dark brown, low plastic Clayey SILT to Silty CLAY with some fine to coarse gravel	CL ML	Boring advanced with 10" diameter hollow stem augers with 11" diameter bit Sampler driven with 325 lbs. cable tool jars
				Medium dense, light brown-tan, fine grained, poorly graded, Silty SAND with some fine to medium gravel with trace of clay	SM	
	DM	10/12	7 16			OVA-0.2ppm
5						
				Medium dense, light brown, fine to medium grained, poorly graded SAND	SP	
	DM	12/12	4 15			OVA-0.4ppm
10						
	DM	12/12	12 12			OVA-0.6ppm
15						
	DM	12/12	8 10			OVA-Background
20						
	DM	12/12	13 17	Becoming dense, medium grained and gray		OVA-0.8ppm
25						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-3

BORING LOG

SHEET 2 OF 2

PROJECT NAME COMMENCEMENT BAY

PROJECT NO. K81-4521

DATE 10-13-82

RIG Mobile B-61

WATER ENTERS El. 214 ATD

CBS-02

PROJECT LOCATION Tacoma, Washington

LOGGED BY G. Hess

DRILLED BY S. Sterling

SURFACE ELEVATION 240

ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
25				SAME: Dense, gray, medium grained, poorly graded SAND	SP	← Water detected ATD
						OVA-4.2ppm
	DM	12/12	10 10			
30						OVA-0.6ppm
	DM	12/12	5 15			Bottom of boring 33.0'
35						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-4

BORING LOG

SHEET 1 OF 2

PROJECT NO. K81-4521

DATE 10-9-82

RIG Mobile B-61

WATER ENTERS El. 212 ATD

PROJECT NAME COMMENCEMENT BAY

CBS-03

PROJECT LOCATION Tacoma, Washington

LOGGED BY G. Hess DRILLED BY S. Sterling

SURFACE ELEVATION 249 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
0				Firm, light brown, low plastic Silty CLAY with some gravel and trace of sand	CL	Boring advanced with 10" diameter hollow-stem augers with 11" diameter bit Sampler driven with 325 lbs. cable tool jars
	DM	0/10	17 10	Medium dense, light brown, fine to medium grained, poorly graded GRAVEL with sand and silt	GP	
5						
	DM	0/12	6 12			
10				Dense, light brown-gray, medium to coarse grained, poorly graded SAND with some fine to medium gravel	SP	OVA-Background
	DM	18/18	12 18 18			
15						
	DM	2/12	10 18			OVA-0.2ppm
20				Dense, light brown, medium grained, poorly graded SAND		
	DM	18/18	10 18 22			OVA-0.4ppm
25						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-5

BORING LOG

SHEET 2 OF 2

PROJECT NO. K81-4521

DATE 10-4-82

RIG Mobile B-61

WATER ENTERS El. 212 ATD

PROJECT NAME COMMENCEMENT BAY

CBS-03

PROJECT LOCATION Tacoma, Washington

LOGGED BY G. Hess DRILLED BY S. Sterling

SURFACE ELEVATION 249 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
25				Medium dense, light brown, medium to fine grained, poorly graded SAND	SP	
	DM	12/12	7 11			OVA-0.5ppm
30						
	DM	12/12	7 8			OVA-0.3ppm
35						Water detected ATD
	DM	12/12	8 10			OVA-0.3ppm
40				Becoming dense		
	DM	10/12	12 20			OVA-Background
45						Bottom of boring 44.0'

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-6

BORING LOG

SHEET 1 OF 2
PROJECT NO. K81-4521
DATE 10-11-82
RIG Mobile B-61
WATER ENTERS El. 213
ATD

PROJECT NAME COMMENCEMENT BAY

CBS-04

PROJECT LOCATION Tacoma, Washington
LOGGED BY G. Hess DRILLED BY S. Sterling
SURFACE ELEVATION 251 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
0				Firm, dark brown-olive, low plastic Silty CLAY with some fine sand to Silty Sand	CL | .SM	Boring advanced with 10" diameter hollow stem augers with 11" diameter bit Sampler driven with 325 lbs. cable tool jars
	DM	12/12	4 9	Medium dense, brown, fine to medium grained, poorly graded SAND with trace of silt and fine to medium gravel	SP	OVA-0.4ppm
5						
	DM	12/12	5 7			OVA-0.4ppm
10				With less silt and gravel		
	DM	12/12	5 8			OVA-Background
15				Increasing fine gravel content		
	DM	12/12	7 16	With some fine gravel		OVA-1.0ppm
20				Gravel content decreasing		
	DM	12/12	15 35	Becoming dense		OVA-0.8ppm
25						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. 8-7

BORING LOG

SHEET 2 OF 2
PROJECT NO. K81-4521
DATE 10-11-82
RIG Mobile B-61
WATER ENTERS El. 213
ATD

PROJECT NAME COMMENCEMENT BAY

CBS-04

PROJECT LOCATION Tacoma, Washington
LOGGED BY G. Hess DRILLED BY S. Sterling
SURFACE ELEVATION 251 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
25				SAME: Dense, brown, fine to medium grained, poorly graded SAND with trace of silt and gravel	SP	
						OVA-0.6ppm
	DM	12/12	13 25			
30						
						OVA-0.85ppm
	DM	12/12	12 27			
35						
						Water detected ATD
	DM	12/12	10 10			
						OVA-2.2ppm
40						
						OVA-0.2ppm
	DM	6/6	30			Bottom of boring 43.5'
45						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-8

BORING LOG

SHEET 1 OF 2

PROJECT NAME COMMENCEMENT BAY

PROJECT NO. K81-4521

DATE 10-11-82

CBS-05

PROJECT LOCATION Tacoma, Washington

RIG Mobile B-61

LOGGED BY G. Hess DRILLED BY S. Sterling

WATER ENTERS El. 216 ATD

SURFACE ELEVATION 237 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
0				Medium dense, brown, fine grained, poorly grained SAND with clay and silt	SP	Boring advanced with 10" diameter hollow stem augers with 11" diameter bit Sampler driven with 325 lbs. cable tool jars
	DM	12/12	8 12	Medium dense, light brown, fine to medium grained, poorly graded SAND		OVA-0.6ppm
5				With trace of medium gravel		
	DM	6/12	12 12			OVA-0.8ppm
10				With trace of clay and silt		
	DM	6/12	15 21			OVA-1.2ppm
15						
	DM	10/12	5 12			OVA-0.9ppm
20						← Water detected ATD
	DM	12/12	16 24			OVA-2.4ppm
25						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-9

BORING LOG

SHEET 2 OF 2

PROJECT NAME COMMENCEMENT BAY

PROJECT NO. K81-4521

DATE 10-11-82

CBS-05

PROJECT LOCATION Tacoma, Washington

RIG Mobile B-61

LOGGED BY G. Hess DRILLED BY S. Sterling

WATER ENTERS El. 216 ATD

SURFACE ELEVATION 237 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
25				SAME: Medium dense, light brown, fine to medium grained, poorly graded SAND	SP	
				Becoming loose		OVA-0.8ppm
	DM	12/12	2 2			
						Bottom of boring 29.0'
30						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-10

BORING LOG

SHEET 1 OF 2
PROJECT NO. K81-4521
DATE 10-12-82
RIG Mobile B-61
WATER ENTERS El. 213 ATD

PROJECT NAME COMMENCEMENT BAY

CBS-06

PROJECT LOCATION Tacoma, Washington
LOGGED BY G. Hess DRILLED BY S. Sterling
SURFACE ELEVATION 233 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
0				Medium dense, gray-brown, fine grained, poorly graded Silty SAND with some clay	SM	Boring advanced with 10" diameter hollow stem augers with 11" diameter bit
						← Water detected ATD
	DM	12/12	2 1			OVA-2.0ppm
						Sampler driven with 325 lbs. cable tool jars
5				Stiff, light brown, medium plastic, PEAT with silt	PT	
	DM	12/12	2 1			OVA-100 to 240ppm
10						
	DM	6/6	16	Medium dense, gray-brown, fine to medium grained, poorly graded GRAVEL with some sand and trace of coarse gravel	GP	OVA-180ppm
15				Medium dense, gray, medium grained, poorly graded SAND	SP	
	DM	12/12	6 10			OVA-38ppm
						← Water detected ATD
20						
	DM	12/12	8 15			OVA 38ppm
25						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-11

BORING LOG

SHEET 2 OF 2

PROJECT NO. K81-4521

DATE 10-12-82

RIG Mobile B-61

WATER ENTERS El. 213 ATD

PROJECT NAME COMMENCEMENT BAY

CBS-06

PROJECT LOCATION Tacoma, Washington

LOGGED BY G. Hess DRILLED BY S. Sterling

SURFACE ELEVATION 233 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
25				SAME: Medium dense, gray, medium grained, poorly graded SAND	SP	
						OVA-0.8ppm
	DM	12/12	7 27	Becoming dense		
						Bottom of boring 28.0'
30						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-12

BORING LOG

SHEET 1 OF 2

PROJECT NO. K81-4521

DATE 10-12-82

RIG Mobile B-61

WATER ENTERS El. 211 ATD

PROJECT NAME COMMENCEMENT BAY

CBS-07

PROJECT LOCATION Tacoma, Washington

LOGGED BY M. Genoud DRILLED BY R. Kring

SURFACE ELEVATION 254 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
0				Loose, dark brown, poorly graded Organic Silt with gravel	OL	Boring advanced with 10" diameter hollow-stem augers with 11" diameter bit
	DM	16/18	6 7 9	Loose, gray-brown, poorly graded, medium to coarse grained Gravelly SAND with trace of silt	SP	Sampler driven with 325 lbs. cable tool jars Slightly moist OVA-Background
5				Becoming medium dense		OVA-1.7ppm
	DM	18/18	8 12 16			
10				Dense, light gray-brown, poorly graded, fine to medium grained SAND with some silt and thin (1/8") layers of silt interbedded	W/ ML	Slightly moist OVA-Background
	DM	18/18	11 22 27			
15						
	DM	18/18	5 17 19			OVA-2.0ppm
20				Dense, light brown-yellow, poorly graded, fine grained SAND with some silt		Moist
	DM	12/12	9 16			OVA-Background
25						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-13

BORING LOG

SHEET 2 OF 2
PROJECT NO. K81-4521
DATE 10-12-82
RIG Mobile B-61
WATER ENTERS El. 211 ATD

PROJECT NAME COMMENCEMENT BAY

CBS-07

PROJECT LOCATION Tacoma, Washington
LOGGED BY M. Genoud DRILLED BY R. Kring
SURFACE ELEVATION 254 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
25				SAME: Dense, light brown-yellow, poorly graded, fine grained SAND with some silt	SP	Moist
	DM	12/12	6 17	Dense, gray-brown, poorly graded, medium grained SAND with trace of silt		OVA-0.2ppm Moist
30						
	DM	12/12	11 29			OVA-0.2ppm
35				Becoming medium dense		
	DM	10/12	7 12			OVA-0.5ppm
40						OVA-0.6ppm Water detected ATD
	DM	8/12	9 21	Dense, dark gray, poorly graded, coarse grained SAND with trace of gravel and trace of silt		Saturated
45						OVA-1.2ppm
	DM	10/12	13 26			Bottom of boring 48.0'
50						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-14

BORING LOG

SHEET 1 OF 1

PROJECT NAME COMMENCEMENT BAY

PROJECT NO. K81-4521

DATE 10-13-82

RIG Mobile B-61

WATER ENTERS El. 213 ATD

CBS-08

PROJECT LOCATION Tacoma, Washington

LOGGED BY G. Hess DRILLED BY S. Sterling

SURFACE ELEVATION 224 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
0				Loose, medium brown, fine grained, poorly graded Silty Sand FILL with trace of some gravel	F I L L	Boring advanced with 10" diameter hollow stem augers with 11" diameter bit Sampler driven with 325 lbs. cable tool jars
				Loose, light brown, fine to medium grained, poorly graded Sand and Wood FILL		OVA-0.6ppm
	DM	4/4	20/4"			
5	DM	2/12	2 5			
	DM	5/12	5 12			OVA-60ppm
10				Loose, dark gray, low plastic Silty SAND with wood	SM	← Water detected ATD
	DM	5/12	3 2			OVA-500ppm
15				Medium dense, gray, medium grained, poorly graded SAND	SP	
	DM	12/12	7 11			OVA >1000ppm
20						Bottom of boring 19.0'

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-15

BORING LOG

SHEET 1 OF 2

PROJECT NO. K81-4521

DATE 10-11-82

RIG Mobile B-61

WATER ENTERS El. 215

ATD

PROJECT NAME COMMENCEMENT BAY

CBS-09

PROJECT LOCATION Tacoma, Washington

LOGGED BY G. Hess DRILLED BY S. Sterling

SURFACE ELEVATION 242 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
0				Medium dense, gray-brown, fine to medium grained, Silty SAND with some clay and trace of fine to medium gravel	SM	Boring advanced with 10" diameter hollow stem augers with 11" diameter bit
						OVA-2.0ppm Possibly FILL
	DM	12/12	16 11			Sampler driven with 325 lbs. cable tool jars
5						
	DM	12/12	14 17			OVA-1.2ppm
10						
				Medium dense, light gray-yellow brown, fine grained, poorly graded SAND with thin silt and low plastic clay layers	SP W/ ML & CL	
	DM	12/12	8 8			OVA-0.5ppm
15						
	DM	12/12	12 19	Becoming dense		OVA-0.8ppm
20						
				Dense, gray, medium grained, poorly graded SAND		
	DM	12/12	12 17			OVA-0.4ppm
25						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-16

BORING LOG

SHEET 2 OF 2
PROJECT NO. K81-4521
DATE 10-11-82
RIG Mobile B-61
WATER ENTERS El. 215 ATD

PROJECT NAME COMMENCEMENT BAY

CBS-09

PROJECT LOCATION Tacoma, Washington
LOGGED BY G. Hess DRILLED BY S. Sterling
SURFACE ELEVATION 242 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
25				SAME: Dense, Gray, medium grained, poorly graded SAND	SP	Water detected ATD
	DM	12/12	8 15			OVA-0.2 to 8ppm
30						OVA-0.8 to 2.0ppm
	DM	12/12	23 25	Very dense, gray, fine grained, poorly graded GRAVEL	GP	Bottom of boring 34.0'
35						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-17

BORING LOG

SHEET 1 OF 2

PROJECT NO. K81-4521

DATE 10-12-82

RIG Mobile B-61

WATER ENTERS El. 219 ATD

PROJECT NAME COMMENCEMENT BAY

CBS-10

PROJECT LOCATION Tacoma, Washington

LOGGED BY G. Hess DRILLED BY S. Sterling

SURFACE ELEVATION 255 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
0				Medium dense, dark brown, fine grained, poorly graded Silty SAND with some fine gravel and organics	SM	Boring advanced with 10" diameter hollow-stem augers with 11" diameter bit Sampler driven with 325 lbs. cable tool jars
	DM	9/12	3 11			OVA-1.0ppm
5						
				Dense, brown, medium grained, poorly graded SAND with some fine to medium gravel	SP	
	DM	6/6	28			OVA-1.6ppm
10				With trace of coarse gravel		
	DM	12/12	20 15			OVA-0.2ppm
15						
				Medium dense, light brown, fine grained, poorly graded SAND with trace of silt and clay		
	DM	12/12	9 12			OVA-0.2ppm
20						
	DM	12/12	6 14			OVA-2.2ppm
25						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-18

BORING LOG

SHEET 2 OF 2

PROJECT NAME COMMENCEMENT BAY

PROJECT NO. K81-4521

DATE 10-12-82

CBS-10

PROJECT LOCATION Tacoma, Washington

RIG Mobile B-61

LOGGED BY G. Hess DRILLED BY S. Sterling

WATER ENTERS El. 219 ATD

SURFACE ELEVATION 255 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
25				SAME: Medium dense, light brown, fine grained, poorly graded SAND with trace of silt and clay	SP	
	DM	12/12	9 16			OVA-0.6ppm
30				Becoming dense		
	DM	12/12	7 22			OVA-0.4ppm
35						← Water detected ATD
	DM	12/12	8 23			OVA-7.8ppm
40				Becoming medium dense		
	DM	12/12	4 11			OVA-3.4ppm
45						Bottom of boring 44.0'

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-19

BORING LOG

SHEET 1 OF 2

PROJECT NAME COMMENCEMENT BAY

PROJECT NO. K81-4521

DATE 10-14-82

RIG Mobile B-61

WATER ENTERS El. 217 ATD

CBS-11

PROJECT LOCATION Tacoma, Washington

LOGGED BY G. Hess DRILLED BY S. Sterling

SURFACE ELEVATION 254 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
0				Loose, dark brown-black, fine grained, poorly graded Silty SAND FILL with trace of fine to medium gravel	FILL	Boring advanced with 10" diameter hollow stem augers with 11" diameter bit Sampler driven with 325 lbs. cable tool jars
	DM	4/12	3 2			OVA-0.8ppm
5						
	DM	6/18	1 2 1			OVA-0.5ppm
10				Medium dense, light brown, medium grained, poorly graded SAND with trace of fine to medium gravel	SP	
	DM	10/12	6 9			OVA-3.1ppm
15						
	DM	10/12	6 9			OVA-7.5ppm
20				Gravel content decreasing Becoming dense		
	DM	6/12	12 25			OVA-5.1ppm
25						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-20

BORING LOG

SHEET 2 OF 2

PROJECT NAME COMMENCEMENT BAY

PROJECT NO. K81-4521

DATE 10-14-82

RIG Mobile B-61

WATER ENTERS El. 217 ATD

CBS-11

PROJECT LOCATION Tacoma, Washington

LOGGED BY G. Hess DRILLED BY S. Sterling

SURFACE ELEVATION 254 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
25				SAME: Medium dense, light brown, medium grained, poorly graded SAND with trace of fine to medium gravel	SP	
				Medium dense, light brown, fine grained, poorly graded SAND		
	DM	10/12	14 14			OVA-0.8ppm
30				Becoming light brown		
						OVA-1.9ppm
	DM	10/12	19 23			
35				Medium dense, gray-brown, medium grained, poorly graded SAND		Water detected ATD
						OVA-2.8ppm
	DM	12/12	21 25			
40						
						OVA-1.8ppm
	DM	12/12	4 8			
						Bottom of boring 44.0'
45						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-21

BORING LOG

SHEET 1 OF 2

PROJECT NO. K81-4521

DATE 10-13-82

RIG Mobile B-61

WATER ENTERS El. 212

ATD

PROJECT NAME COMMENCEMENT BAY

CBS-12

PROJECT LOCATION Tacoma, Washington

LOGGED BY G. Hess DRILLED BY S. Sterling

SURFACE ELEVATION 238 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
0				Medium dense, dark brown, fine grained, poorly graded SAND and silt, with some clay and trace of gravel	SP SM	Boring advanced with 10" diameter hollow stem augers with 11" diameter bit Sampler driven with 325 lbs. cable tool jars
				Loose, light brown, fine to medium grained, poorly graded SAND with some fine to medium gravel	SP	
	DM	6/12	3 2			OVA-1.2ppm
5						
	DM	10/12	4 4			OVA-Background
10				Becoming medium grained		
	DM	8/12	2 2			OVA-0.6ppm
15				Becoming fine to medium grained		
	DM	12/12	6 10			OVA-0.2ppm
20				Becoming medium dense with trace of coarse sand and gravel		
	DM	12/12	8 15			OVA-0.6ppm
25						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-22

BORING LOG

SHEET 2 OF 2
PROJECT NO. K81-4521
DATE 10-13-82
RIG Mobile B-61
WATER ENTERS El. 212 ATD

PROJECT NAME COMMENCEMENT BAY

CBS-12

PROJECT LOCATION Tacoma, Washington
LOGGED BY G. Hess DRILLED BY S. Sterling
SURFACE ELEVATION 238 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
25				SAME: Medium dense, light brown, fine to medium grained, poorly graded SAND with some gravel	SP	Water detected ATD
						OVA-4.0ppm
	DM	10/12	8 30			
30						OVA-Background
	DM	6/12	7 15			Bottom of boring 34.0'
35						

FIGURE NO. B-23

WOODWARD-CLYDE CONSULTANTS

BORING LOG

SHEET 1 OF 4
PROJECT NO. K81-4521
DATE 11-4-82
RIG Speedstar SS15
WATER ENTERS El. 224 ATD

PROJECT NAME COMMENCEMENT BAY

CBS-13

PROJECT LOCATION Tacoma, Washington
LOGGED BY M. Doolan DRILLED BY R. Ostgoodby
SURFACE ELEVATION 233 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
0				Dense, brown, poorly graded, medium grained Gravelly SAND with some silt and trace of clay	SP	Boring advanced with air rotary rig, using 7 7/8" tricone roller bit Sampler driven with 350 lbs. cable tool jars
5				Dense, brown, poorly graded, medium Sandy GRAVEL with some silt and trace of clay	GP	
				Loose to medium dense, brown-gray, poorly graded, medium to coarse grained Gravelly SAND with some silt and trace of clay	SP	Water detected ATD
10	DM	12/12	9			OVA-2.0ppm Boring continued with 5 7/8" tricone roller bit with air and 6" diameter welded steel casing with top drive casing hammer
15				Becoming dense		
				With occasional layers of dense, gray, Sandy SILT with trace of clay and gravel	W/ ML	
	DM	12/12	50	Gravel content decreasing		OVA 5.0ppm
20						
25						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-24

BORING LOG

SHEET 2 OF 4
PROJECT NO. K81-4521
DATE 11-4-82
RIG Speedstar SS15
WATER ENTERS El. 224
ATD

PROJECT NAME COMMENCEMENT BAY

CBS-13

PROJECT LOCATION Tacoma, Washington
LOGGED BY M. Doolan DRILLED BY R. Ostgoodby
SURFACE ELEVATION 233 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
25				SAME: Dense, gray, poorly graded, medium grained SAND with some medium to coarse gravel and trace of silt and clay	SP	
	DM	12/12	37			OVA-0.6ppm
30				Becoming more gravelly with fine to medium gravel		
35						
	DM	0/12	75			
40				With layers of dense, brown-gray, poorly graded, Sandy GRAVEL	W/ GP	
45						
				Very dense, brown-gray, poorly graded, medium to coarse grained GRAVEL with some sand and trace of silt	GP	
	DM	8/12	120			OVA-4.0ppm
50						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-25

BORING LOG

SHEET 3 OF 4

PROJECT NAME COMMENCEMENT BAY

PROJECT NO. K81-4521

DATE 11-5-82

CBS-13

PROJECT LOCATION Tacoma, Washington

RIG Speedstar SS15

LOGGED BY M. Doolan DRILLED BY R. Ostgoodby

WATER ENTERS El. 224 ATD

SURFACE ELEVATION 233 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
50				SAME: Very dense, brown-gray, poorly graded, medium to coarse grained GRAVEL with some sand and trace of silt With dense, gray, medium sand lenses	GP W/ SP	
55				Increasing coarse sand content		OVA-4.4ppm
	DM	12/12	120			
60				Very dense, gray-brown, medium grained SAND with some medium gravel and trace of silt	SP	
65				Very dense, gray-brown, fine to medium grained Sandy GRAVEL with some silt	GP	
	DM	4/12	50	Becoming coarse		OVA-0.6ppm
70						
75						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-26

BORING LOG

SHEET 4 OF 4

PROJECT NAME COMMENCEMENT BAY

PROJECT NO. K81-4521

DATE 11-5-82

CBS-13

PROJECT LOCATION Tacoma, Washington

RIG Speedstar SS15

LOGGED BY M. Doolan DRILLED BY R. Ostgoodby

WATER ENTERS El. 224 ATD

SURFACE ELEVATION 233 ELEVATION DATUM USC & GS

DEPTH	SAMPLE TYPE	SAMPLE REC	SAMPLE RESIST	DESCRIPTION	U.S.C.	SPECIAL NOTES AND FIELD OBSERVATIONS
75				SAME: Very dense, gray-brown, fine to medium grained Sandy GRAVEL with some silt Silt content increasing	GP GP I GM	
	DM	8/12	30			OVA-4.6ppm
80						
				Dense, gray-brown, highly plastic Clayey with sand and trace of gravel	MH	
				Dense, brown-gray, poorly graded, Silty SAND with some gravel	SM	
85						
	DM	12/12	67			OVA-2.0ppm
90						
95						
						OVA-0.8ppm
	DM	12/12	72			Bottom of boring 99.0'
100						

WOODWARD-CLYDE CONSULTANTS

FIGURE NO. B-27

PIEZOMETER INSTALLATION REPORT

Piezometer No. CBS-01

Project COMMENCEMENT BAY

Location Tacoma, Wa.

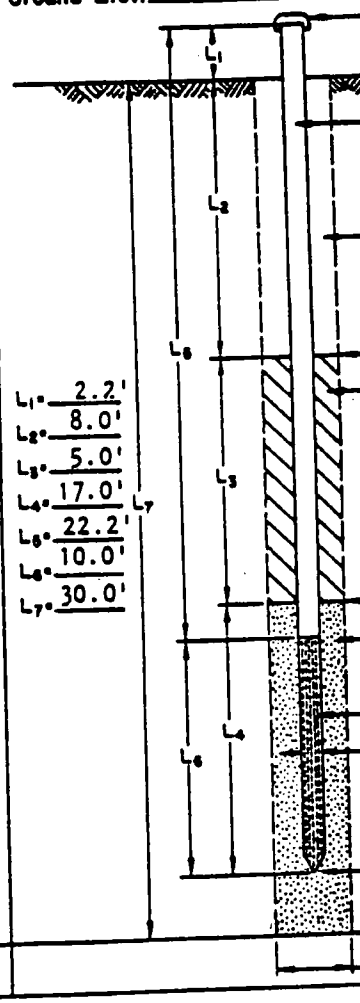
Project No. K81-4521 Installed By M. Geroud

Date 10-11-82 Time 1550

Method of Installation See Boring Log CBS-01 for details.

LOG OF BORING AND PIEZOMETER

BORING			PIEZOMETER
Depth in ft.	Description	Symbol	Type of Piezometer Monitoring Well
	See Boring Log CBS-01 for detailed description		Ground Elev. 238.6



Top of Steel Riser Elev. 240.81

Vented Cap

I.D. of Riser Pipe 2 in.

Type of Pipe PVC Sched. 40

Type of Backfill Around Riser Cement-Bentonite Grout

Top of Seal Elev. 230.6

Type of Seal Material Bentonite Slurry

L_1 = 2.2'
L_2 = 8.0'
L_3 = 5.0'
L_4 = 17.0'
L_5 = 22.2'
L_6 = 10.0'
L_7 = 30.0'

Top of Filter Elev. 225.6

Type of Filter Material Traction Sand

Size of Openings 0.010 in.

Diameter of Piezometer Tip 2 in. I.D.

Bottom of Piez. Elev. 208.6

Bottom of Boring Elev. 208.6

Diameter of Boring 11 in.

Remarks Protective casing stick-up 2.2'

C-1 Inspected By M. Geroud

WOODWARD-CLYDE CONSULTANTS

PIEZOMETER INSTALLATION REPORT

Piezometer No. CBS-02
Location Tacoma, Wa.
Date 10-13-82 Time 1120

Project COMMENCEMENT BAY
Project No. K81-4521 Installed By G. Hess

Method of Installation See Boring Log CBS-02 for details.

LOG OF BORING AND PIEZOMETER

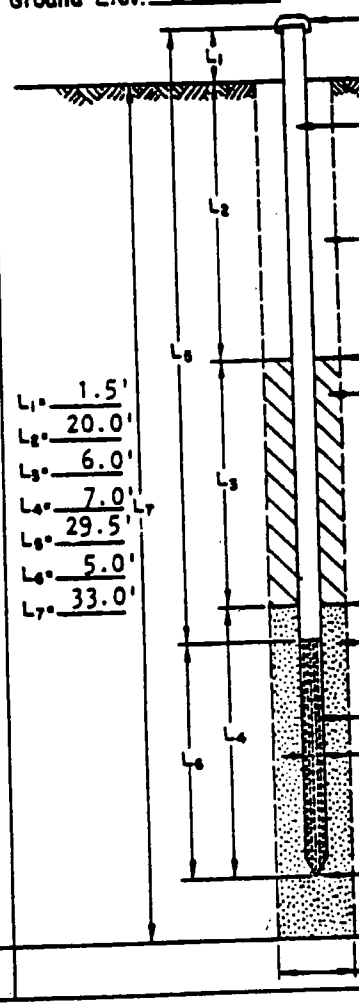
BORING		
Depth in ft.	Description	Symbol
	See Boring Log CBS-02 for detailed description	

PIEZOMETER

Type of Piezometer Monitoring Well

Ground Elev. 240.3

Top of Steel Riser Elev. 241.78



L_1= 1.5'
L_2= 20.0'
L_3= 6.0'
L_4= 7.0'
L_5= 29.5'
L_6= 5.0'
L_7= 33.0'

I.D. of Riser Pipe 2 in.
Type of Pipe PVC Sched. 40
Type of Backfill Around Riser Cement-Bentonite Grout
Top of Seal Elev. 220.3
Type of Seal Material Bentonite Slurry
Top of Filter Elev. 214.3
Type of Filter Material Traction Sand
Size of Openings 0.010 in.
Diameter of Piezometer Tip 2 in. I.D.
Bottom of Piez. Elev. 207.3
Bottom of Boring Elev. 207.3
Diameter of Boring 11 in.

Remarks Protective casing stick-up 1.5'.

C-2 Inspected By G. Hess

WOODWARD-CLYDE CONSULTANTS

PIEZOMETER INSTALLATION REPORT

Piezometer No. CBS-03

Project COMMENCEMENT BAY

Location Tacoma, Wa.

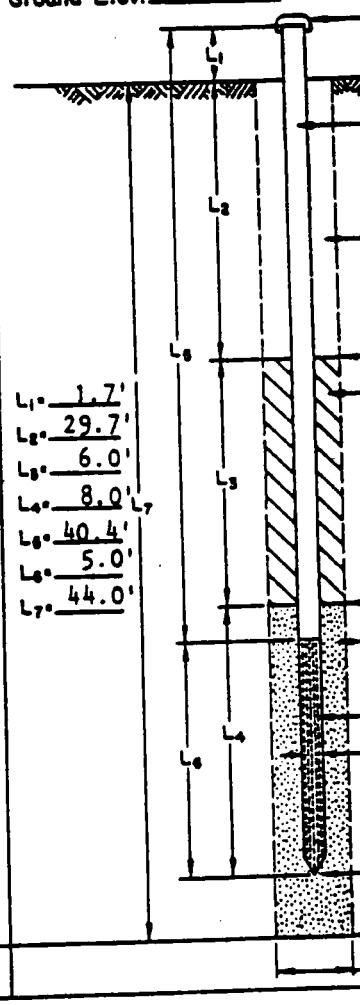
Project No. K81-4521 Installed By G. Hess

Date 10-10-82 Time 1130

Method of Installation See Boring Log CBS-03 for details.

LOG OF BORING AND PIEZOMETER

BORING			PIEZOMETER
Depth in ft.	Description	Symbol	Type of Piezometer Monitoring Well
	See Boring Log CBS-03 for detailed description		Ground Elev. 249.4



Top of Steel Riser Elev. 251.14

Vented Cap

I.D. of Riser Pipe 2 in.

Type of Pipe PVC Sched. 40

Type of Backfill Around Riser Cement-Bentonite Grout

Top of Seal Elev. 219.7

Type of Seal Material Bentonite Slurry

L_1= 1.7'
L_2= 29.7'
L_3= 6.0'
L_4= 8.0'
L_5= 40.4'
L_6= 5.0'
L_7= 44.0'

Top of Filter Elev. 213.7

Type of Filter Material Traction Sand

Size of Openings 0.010 in.

Diameter of Piezometer Tip 2 in. I.D.

Bottom of Piez. Elev. 205.7

Bottom of Boring Elev. 205.4

Diameter of Boring 11 in.

Remarks Protective casing stick-up 1.75'.

Inspected By G. Hess

WOODWARD-CLYDE CONSULTANTS

PIEZOMETER INSTALLATION REPORT

Piezometer No. CBS-04
Location Tacoma, Wa.
Date 10-11-82 Time 1330

Project COMMENCEMENT BAY
Project No. K81-4521 Installed By G. Hess

Method of Installation See Boring Log CBS-04 for details.

LOG OF BORING AND PIEZOMETER

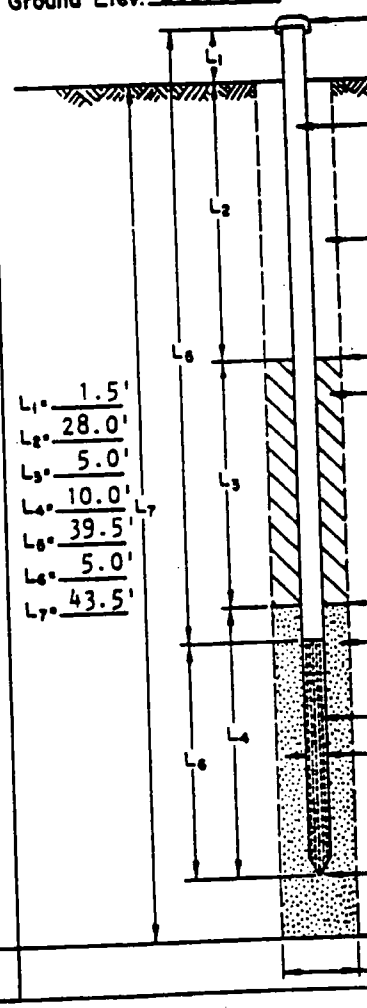
BORING		
Depth in ft.	Description	Symbol
	See Boring Log CBS-04 for detailed description	

PIEZOMETER

Type of Piezometer Monitoring Well

Ground Elev. 250.8

Top of Steel Riser Elev. 252.30



Vented Cap

I.D. of Riser Pipe 2 in.

Type of Pipe PVC Sched. 40

Type of Backfill Around Riser Cement-Bentonite Grout

Top of Seal Elev. 222.8

Type of Seal Material Bentonite Slurry

L_1 = 1.5'
L_2 = 28.0'
L_3 = 5.0'
L_4 = 10.0'
L_5 = 39.5'
L_6 = 5.0'
L_7 = 43.5'

Top of Filter Elev. 217.8

Type of Filter Material Traction Sand

Size of Openings 0.010 in.

Diameter of Piezometer Tip 2 in. I.D.

Bottom of Piez. Elev. 207.8

Bottom of Boring Elev. 207.3

Diameter of Boring 11 in.

Remarks Protective casing stick-up 1.5'.

C-4 Inspected By G. Hess

WOODWARD-CLYDE CONSULTANTS

PIEZOMETER INSTALLATION REPORT

Project COMMENCEMENT BAY
Project No. K81-4521 Installed By G. Hess
Method of Installation See Boring Log CBS-05 for details.

Piezometer No. CBS-05
Location Tacoma, Wa.
Date 10-11-82 Time 1300

LOG OF BORING AND PIEZOMETER

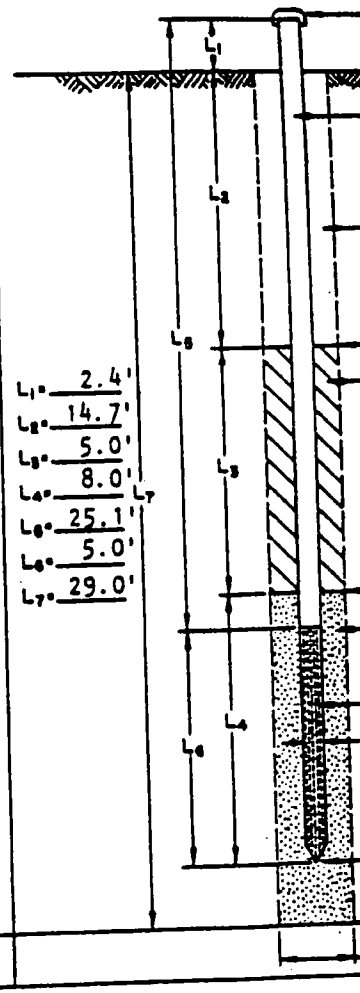
BORING		
Depth in ft.	Description	Symbol
	See Boring Log CBS-05 for detailed description	

PIEZOMETER

Type of Piezometer Monitoring Well

Ground Elev. 236.9

Top of Steel Riser Elev. 239.28



L_1 = 2.4'
L_2 = 14.7'
L_3 = 5.0'
L_4 = 8.0'
L_5 = 25.1'
L_6 = 5.0'
L_7 = 29.0'

Vented Cap
I.D. of Riser Pipe 2 in.
Type of Pipe PVC Sched. 40
Type of Backfill Around Riser Cement-Bentonite Grout
Top of Seal Elev. 222.2
Type of Seal Material Bentonite Slurry
Top of Filter Elev. 217.2
Type of Filter Material Traction Sand
Size of Openings 0.010 in.
Diameter of Piezometer Tip 2 in. I.D.
Bottom of Piez. Elev. 209.2
Bottom of Boring Elev. 207.9
Diameter of Boring 11 in.

Remarks Protective casing stick-up 2.4'.

Inspected By G. Hess

WOODWARD-CLYDE CONSULTANTS

PIEZOMETER INSTALLATION REPORT

Project COMMENCEMENT BAY
Project No. K81-4521 Installed By G. Hess
Method of Installation See Boring Log CBS-06 for details.

Piezometer No. CBS-06
Location Tacoma, Wa.
Date 10-12-82 Time 1600

LOG OF BORING AND PIEZOMETER

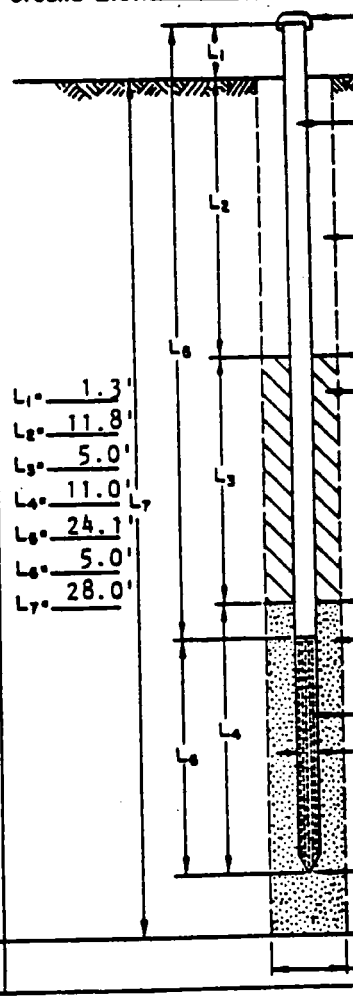
BORING		
Depth in ft.	Description	Symbol
	See Boring Log CBS-06 for detailed description	

PIEZOMETER

Type of Piezometer Monitoring Well

Ground Elev. 233.1

Top of Steel Riser Elev. 234.37



Vented Cap

I.D. of Riser Pipe 2 in.
Type of Pipe PVC Sched. 40
Type of Backfill Around Riser Cement-Bentonite Grout
Top of Seal Elev. 221.3
Type of Seal Material Bentonite Slurry
Top of Filter Elev. 216.3
Type of Filter Material Traction Sand
Size of Openings 0.010 in.
Diameter of Piezometer Tip 2 in. I.D.
Bottom of Piez. Elev. 205.3
Bottom of Boring Elev. 205.1
Diameter of Boring 11 in.

L_1 = 1.3'
L_2 = 11.8'
L_3 = 5.0'
L_4 = 11.0'
L_5 = 24.1'
L_6 = 5.0'
L_7 = 28.0'

Remarks Protective casing stick-up 1.3'.

C-6 Inspected By G. Hess

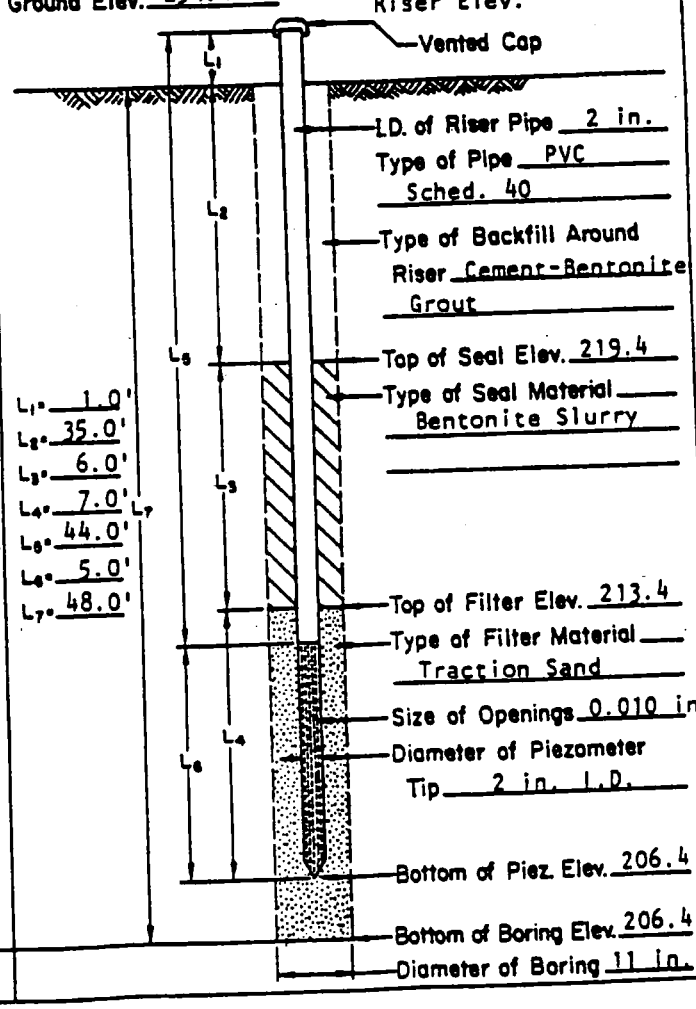
WOODWARD-CLYDE CONSULTANTS

PIEZOMETER INSTALLATION REPORT

Piezometer No. CBS-07
Location Tacoma, Wa.
Project COMMENCEMENT BAY
Project No. K81-4521 Installed By M. Geroud Date 10-12-82 Time 1400
Method of Installation See Boring Log CBS-07 for details.

LOG OF BORING AND PIEZOMETER

BORING			PIEZOMETER
Depth in ft.	Description	Symbol	Type of Piezometer Monitoring Well
	See Boring Log CBS-07 for detailed description		Ground Elev. 254.4



Remarks Protective casing stick-up .95'

C-7 Inspected By M. Geroud

WOODWARD-CLYDE CONSULTANTS

PIEZOMETER INSTALLATION REPORT

Piezometer No. CBS-08

Project COMMENCEMENT BAY

Location Tacoma, Wa.

Project No. K81-4521 Installed By M. Geroud

Date 10-13-82 Time 1630

Method of Installation See Boring Log CBS-08 for details.

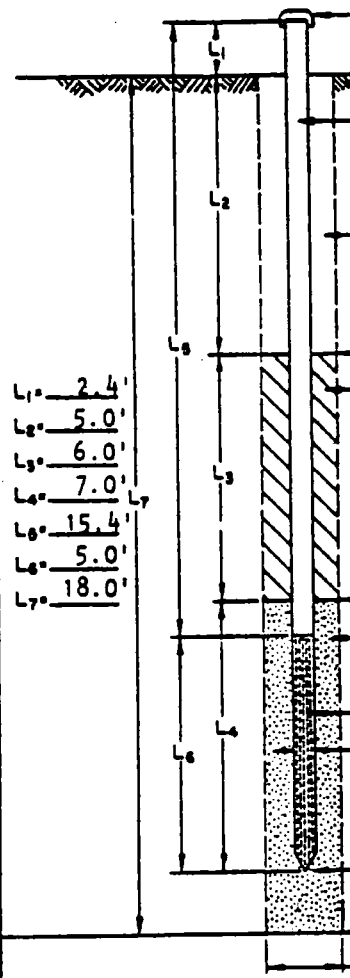
LOG OF BORING AND PIEZOMETER

BORING			PIEZOMETER
Depth in ft.	Description	Symbol	Type of Piezometer Monitoring Well

Ground Elev. 224.0

Top of Steel Riser Elev. 226.44

See Boring Log CBS-08 for detailed description



L_1 = 2.4'
L_2 = 5.0'
L_3 = 6.0'
L_4 = 7.0'
L_5 = 15.4'
L_6 = 5.0'
L_7 = 18.0'

Vented Cap

I.D. of Riser Pipe 2 in.

Type of Pipe PVC Sched. 40

Type of Backfill Around Riser Cement-Bentonite Grout

Top of Seal Elev. 219.0

Type of Seal Material Bentonite Slurry

Top of Filter Elev. 213.0

Type of Filter Material Traction Sand

Size of Openings 0.010 in.

Diameter of Piezometer Tip 2 in. I.D.

Bottom of Piez. Elev. 206.0

Bottom of Boring Elev. 206.0

Diameter of Boring 11 in.

Remarks Protective casing stick-up 2.4'.

C-8 Inspected By M. Geroud

WOODWARD-CLYDE CONSULTANTS

PIEZOMETER INSTALLATION REPORT

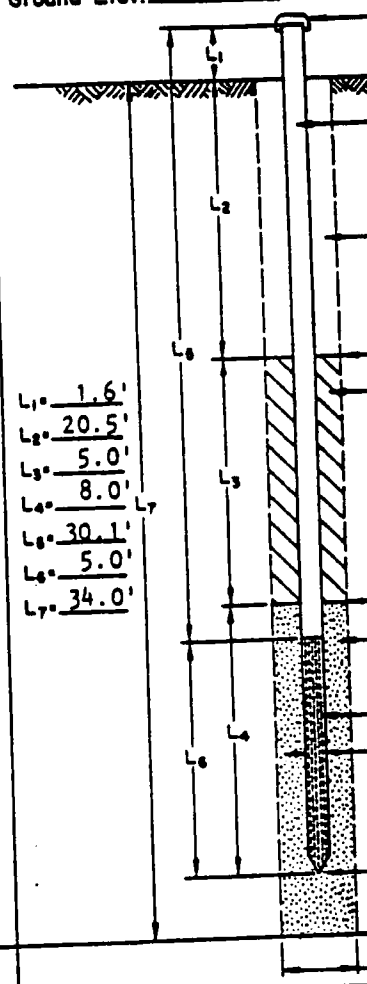
Piezometer No. CBS-09
Location Tacoma, Wa.
Date 10-11-82 Time 1600

Project COMMENCEMENT BAY
Project No. K81-4521 Installed By G. Hess

Method of Installation See Boring Log CBS-09 for details.

LOG OF BORING AND PIEZOMETER

BORING			PIEZOMETER
Depth in ft.	Description	Symbol	Type of Piezometer Monitoring Well
	See Boring Log CBS-09 for detailed description		Ground Elev. 242.3



L_1 = 1.6'
L_2 = 20.5'
L_3 = 5.0'
L_4 = 8.0'
L_5 = 30.1'
L_6 = 5.0'
L_7 = 34.0'

Top of Steel Riser Elev. 243.88
Vented Cap
I.D. of Riser Pipe 2 in.
Type of Pipe PVC Sched. 40
Type of Backfill Around Riser Cement-Bentonite Grout
Top of Seal Elev. 221.8
Type of Seal Material Bentonite Slurry
Top of Filter Elev. 216.8
Type of Filter Material Traction Sand
Size of Openings 0.010 in
Diameter of Piezometer Tip 2 in. I.D.
Bottom of Piez. Elev. 208.8
Bottom of Boring Elev. 208.3
Diameter of Boring 11 in.

Remarks Protective casing stick-up 1.6'.

Inspected By G. Hess

WOODWARD-CLYDE CONSULTANTS

PIEZOMETER INSTALLATION REPORT

Piezometer No. CBS-10

Project COMMENCEMENT BAY

Location Tacoma, Wa.

Project No. K81-4521 Installed By G. Hess

Date 10-12-82 Time 1045

Method of Installation See Boring Log CBS-10 for details.

LOG OF BORING AND PIEZOMETER

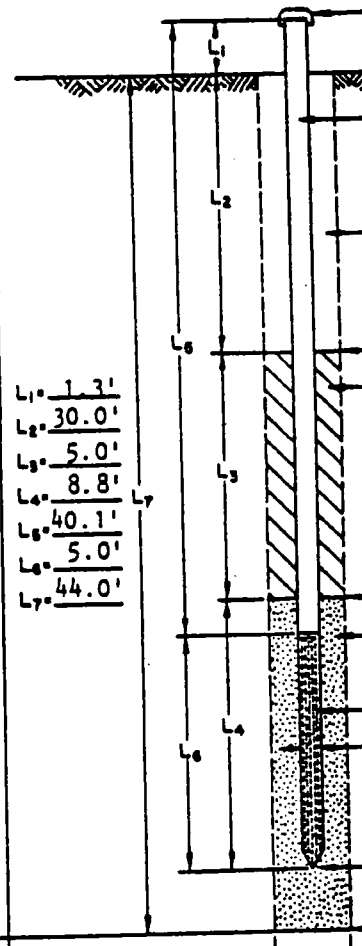
BORING		
Depth in ft.	Description	Symbol
	See Boring Log CBS-10 for detailed description	

PIEZOMETER

Type of Piezometer Monitoring Well

Ground Elev. 255.2

Top of Steel Riser Elev. 256.45



Vented Cap

I.D. of Riser Pipe 2 in.

Type of Pipe PVC Sched. 40

Type of Backfill Around Riser Cement-Bentonite Grout

Top of Seal Elev. 225.2

Type of Seal Material Bentonite Slurry

L_1 = 1.3'
L_2 = 30.0'
L_3 = 5.0'
L_4 = 8.8'
L_5 = 40.1'
L_6 = 5.0'
L_7 = 44.0'

Top of Filter Elev. 220.2

Type of Filter Material Traction Sand

Size of Openings 0.010 in.

Diameter of Piezometer Tip 2 in. I.D.

Bottom of Piez. Elev. 211.4

Bottom of Boring Elev. 211.2

Diameter of Boring 11 in.

Remarks Protective casing stick-up 1.3'.

C-10 Inspected By G. Hess

WOODWARD-CLYDE CONSULTANTS

PIEZOMETER INSTALLATION REPORT

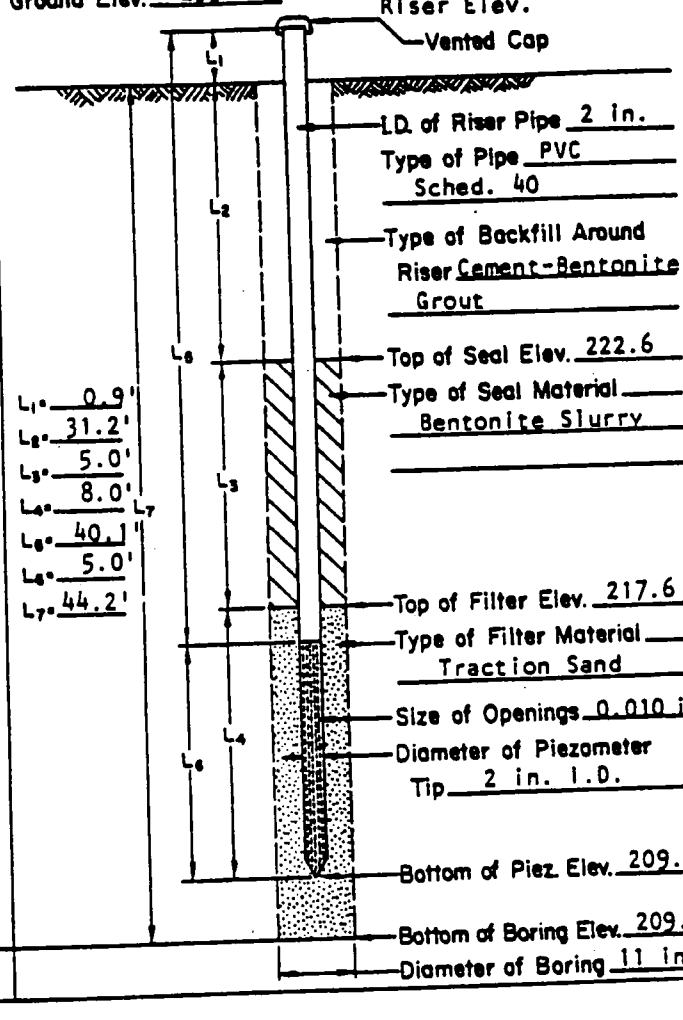
Piezometer No. CBS-11
Location Tacoma, Wa.
Date 10-14-82 Time 1000

Project COMMENCEMENT BAY
Project No. K81-4521 Installed By G. Hess

Method of Installation See Boring Log CBS-11 for details.

LOG OF BORING AND PIEZOMETER

BORING			PIEZOMETER
Depth in ft.	Description	Symbol	Type of Piezometer Monitoring Well
	See Boring Log CBS-11 for detailed description		Ground Elev. 253.8



Remarks Protective casing stick-up 0.9'.

C-11 Inspected By G. Hess

WOODWARD-CLYDE CONSULTANTS

PIEZOMETER INSTALLATION REPORT

Piezometer No. CBS-12

Project COMMENCEMENT BAY

Location Tacoma, Wa.

Project No. K81-4521 Installed By G. Hess

Date 10-13-82 Time 1315

Method of Installation See Boring Log CBS-12 for details.

LOG OF BORING AND PIEZOMETER

BORING

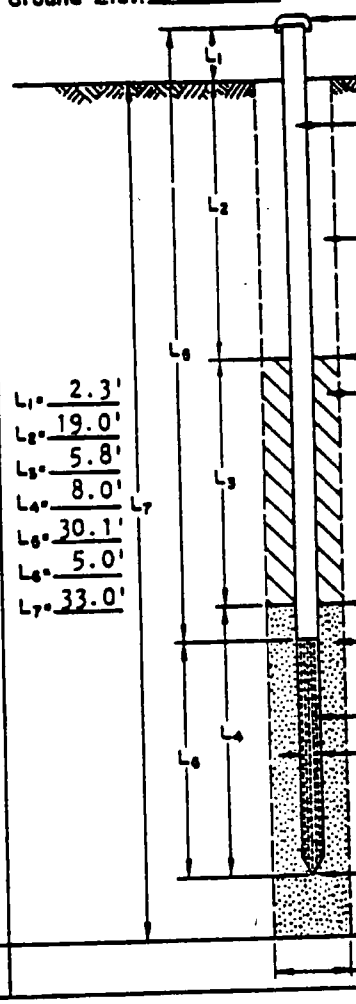
Depth in ft.	Description	Symbol
	See Boring Log CBS-12 for detailed description	

PIEZOMETER

Type of Piezometer Monitoring Well

Ground Elev. 238.5

Top of Steel Riser Elev. 240.79



Vented Cap

I.D. of Riser Pipe 2 in.

Type of Pipe PVC Sched. 40

Type of Backfill Around Riser Cement-Bentonite Grout

Top of Seal Elev. 219.5

Type of Seal Material Bentonite Slurry

L_1 = 2.3'
L_2 = 19.0'
L_3 = 5.8'
L_4 = 8.0'
L_5 = 30.1'
L_6 = 5.0'
L_7 = 33.0'

Top of Filter Elev. 213.7

Type of Filter Material Traction Sand

Size of Openings 0.010 in

Diameter of Piezometer Tip 2 in. I.D.

Bottom of Piez. Elev. 205.7

Bottom of Boring Elev. 205.5

Diameter of Boring 11 in.

Remarks Protective casing stick-up 2.3'.

C-12 Inspected By G. Hess

WOODWARD-CLYDE CONSULTANTS

PIEZOMETER INSTALLATION REPORT

Piezometer No. CBS-13

Project COMMENCEMENT BAY

Location Tacoma, Wa.

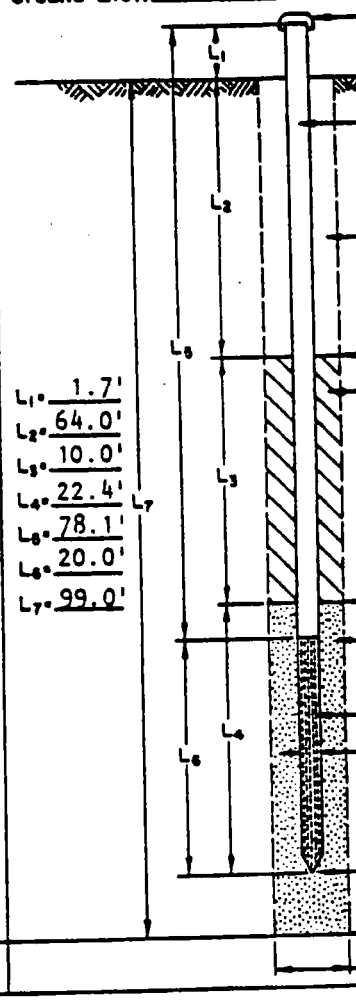
Project No. K81-4521 Installed By M. Doolan

Date 11-8-82 Time 1500

Method of Installation See Boring Log CBS-13 for details.

LOG OF BORING AND PIEZOMETER

BORING			PIEZOMETER
Depth in ft.	Description	Symbol	Type of Piezometer Monitoring Well
	See Boring Log CBS-13 for detailed description		Ground Elev. 233.2



Top of Steel Riser Elev. 234.90

Vented Cap

I.D. of Riser Pipe 4 in.

Type of Pipe PVC Sched. 40

Type of Backfill Around Riser Cement-Bentonite Grout

Top of Seal Elev. 169.2

Type of Seal Material Bentonite Slurry

L_1 = 1.7'
L_2 = 64.0'
L_3 = 10.0'
L_4 = 22.4'
L_5 = 78.1'
L_6 = 20.0'
L_7 = 99.0'

Top of Filter Elev. 159.2

Type of Filter Material Natural cave in

Size of Openings 0.010 in

Diameter of Piezometer Tip 4 in. I.D.

Bottom of Piez. Elev. 136.8

Bottom of Boring Elev. 134.2

Diameter of Boring 6 in.

Remarks Protective casing stick-up 1.65'.

C-13 Inspected By M. Doolan

WOODWARD-CLYDE CONSULTANTS

APPENDIX B

APPENDIX B

South Tacoma Project
Static Water Level Elevations

May 13, 1987
Time: 1315 to 1710
Temperature: 70 F; partly cloudy

Measurements taken by: Paul Lemire (ReTeC)
Larry McGill (Olympus Contracting)

Well No.	Depth to Water (feet)
CBS-01	18.50
CBS-02	18.24
CBS-03	27.60
CBS-04	28.42
CBS-05	15.82
CBS-06	11.04
CBS-07	32.68
CBS-08	3.65
CBS-09	23.93
CBS-10	32.50
CBS-11	31.27
CBS-12	16.98
CBS-13	11.59
STM-01	30.44
STM-02	31.76
STM-03	15.43
STM-04	16.86

All wells measured from the top of the outer steel casing using a Solinst™ electric water level probe

South Tacoma Project
Static Water Level Elevations

April 13, 1987
Time: 1045 to 1255
Temperature: 62 F; partly cloudy

Measurements taken by: Paul Lemire (ReTeC)

Well No.	Depth to Water (feet)
CBS-01	19.40
CBS-02	19.66
CBS-03	28.80
CBS-04	29.36
CBS-05	16.66
CBS-06	12.16
CBS-07	33.85
CBS-08	4.60
CBS-09	23.94
CBS-10	33.52
CBS-11	32.23
CBS-12	18.12
CBS-13	12.72
STM-01	31.37
STM-02	32.65
STM-03	16.30
STM-04	17.74

All wells measured from the top of the outer steel casing using a Solinst™ electric water level probe

South Tacoma Project
Static Water Level Elevations

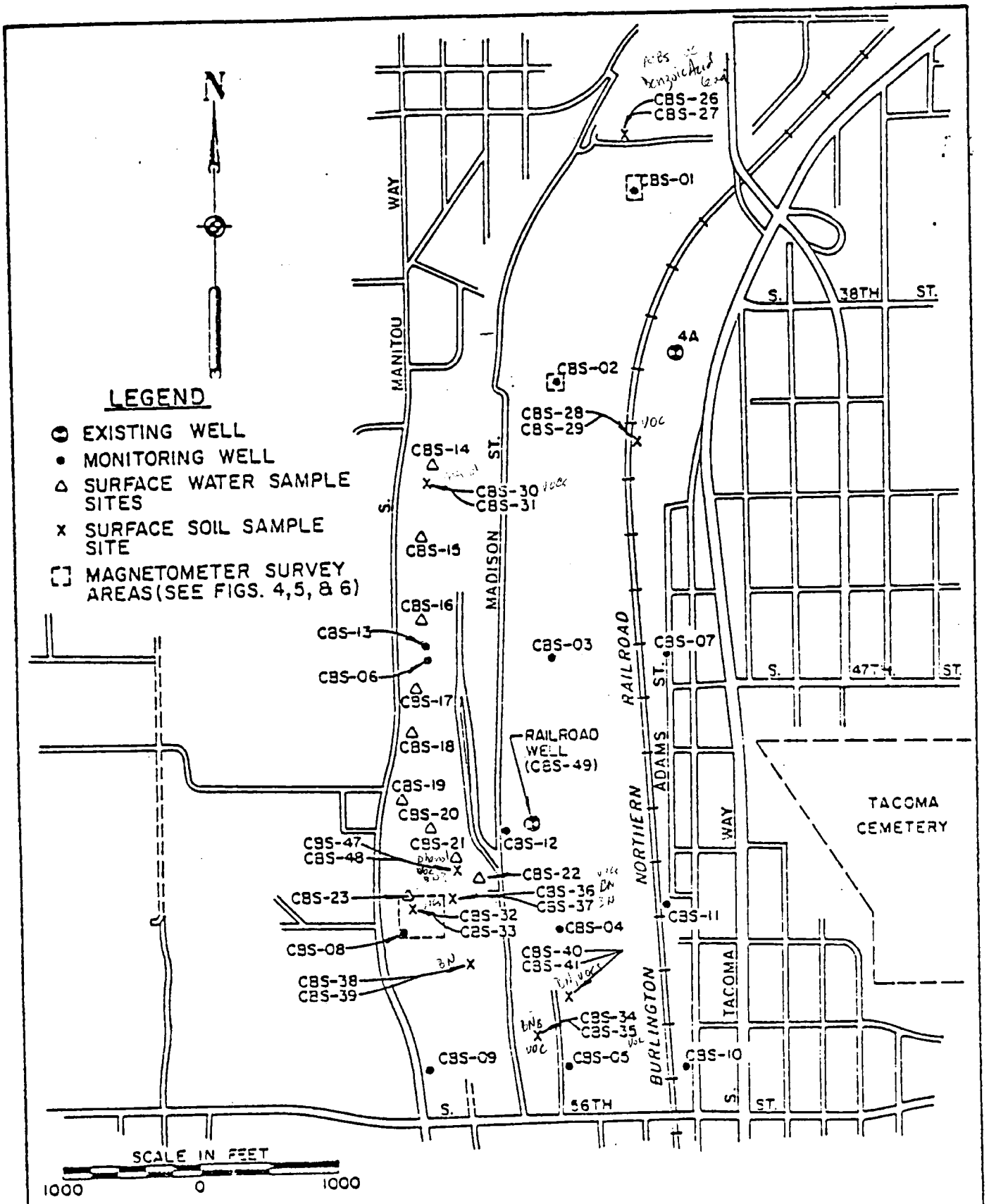
March 13, 1987
Time: 0945 to 1255

Measurements taken by: Larry McGill (Olympus Contracting)
Greg Wagner (Tetratech)

Well No.	Depth to Water (feet)
CBS-01	18.48
CBS-02	17.65
CBS-03	27.46
CBS-04	27.30
CBS-05	14.25
CBS-06	11.25
CBS-07	32.83
CBS-08	missing data
CBS-09	24.42
CBS-10	32.22
CBS-11	31.28
CBS-12	16.28
CBS-13	11.32
STM-01	29.38
STM-02	30.63
STM-03	14.20
STM-04	15.41

All wells measured from the top of the outer steel casing using a Solinst™ electric water level probe

APPENDIX C



SAMPLE LOCATION AND VICINITY MAP

PRELIMINARY FIELD INVESTIGATION
SOUTH TACOMA SWAMP
TACOMA, WASHINGTON

FIGURE 1

U.S. ENVIRONMENTAL PROTECTION AGENCY
EPA CONTRACT NO. 68-03-1614
WORK ASSIGNMENT NO. 2-3-6

TABLE A-4
SOUTH TACOMA SWAMP
PRELIMINARY SITE INVESTIGATION
SURFACE SOIL ANALYSES

BLACK & VEATCH
KANSAS CITY, MO

SMO TRAFFIC NO.	T1322/ MT8911	T1323/ MT8912	T1324/ MT8913	T1325/ MT8914	T1326/ MT8915	T1327/ MT8916	T1328/ MT8917	T1329/ MT8918	T1330/ MT8919	T1331/ MT8921	T1332/ MT8922	T1333/ MT8923
B&V SAMPLE NO.	CBS-26-SL-01	CBS-27-SL-01	CBS-28-SL-01	CBS-29-SL-01	CBS-30-SL-01	CBS-31-SL-01	CBS-32-SL-01	CBS-33-SL-01	CBS-34-SL-01	CBS-35-SL-01	CBS-36-SL-01	CBS-37-SL-01
DATE SAMPLED	10-18-82	10-18-82	10-82-82	10-18-82	10-18-82	10-18-82	10-18-82	10-18-82	10-18-82	10-18-82	10-18-82	10-18-82
DETECTION LIMIT REFERENCE NO.	(3)	(2)	(2)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
							(ug/Kg)					
Acid Compounds												
phenol	nd	nd	nd	nd	nd	400K	nd	nd	nd	nd	nd	nd
(Non-priority pollutants)												
benzoic acid	100000K	nd	nd	nd	11000	nd	nd	nd	nd	nd	nd	nd
Base/Neutral Compounds												
fluoranthene	nd	nd	nd	nd	nd	nd	nd	nd	2700	880	560	880
naphthalene	nd	nd	nd	7600	nd	nd	nd	nd	nd	nd	nd	nd
bis (2-ethylhexyl) phthalate	29000	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
di-n-butyl phthalate	nd	nd	nd	nd	520	nd	nd	nd	nd	nd	nd	nd
benzo(a) anthracene	nd	nd	nd	nd	nd	nd	nd	nd	1300	520	640	960
benzo(a) pyrene	nd	nd	nd	nd	nd	nd	nd	nd	1100	800K	2000	1800
3,4-benzofluoranthene	nd	nd	nd	nd	nd	nd	nd	nd	1200	800	2100	1500
benzo(k)fluoranthene	nd	nd	nd	nd	nd	nd	nd	nd	1200	800K	1000	1500
chrysene	10000K	nd	nd	nd	nd	nd	nd	nd	3000	560	1000	1200
benzo(ghi)perylene	nd	nd	nd	nd	nd	nd	nd	nd	800K	nd	1300	1600
phenanthrene	10000K	nd	nd	nd	nd	nd	nd	nd	1300	800	400K	400K
dibenzo(a,h)anthracene	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	1000	nd
indeno(1,2,3-cd)pyrene	nd	nd	nd	nd	nd	nd	nd	nd	800K	nd	1100	1800
pyrene	nd	nd	nd	nd	nd	nd	nd	nd	2900	1100	880	1100
(Non-priority pollutants)												
2-methylnapthalene	nd	nd	nd	800K	nd	nd	nd	nd	nd	nd	nd	nd

Footnotes on page 3 of 5

U.S. ENVIRONMENTAL PROTECTION AGENCY
EPA CONTRACT NO. 68-03-1614
WORK ASSIGNMENT NO. 2-3-6

TABLE A-4
SOUTH TACOMA SWAMP
PRELIMINARY SITE INVESTIGATION
SURFACE SOIL ANALYSES
(Continued)

SMO TRAFFIC NO.	T1322/ MT8911	T1323/ MT8912	T1324/ MT8913	T1325/ MT8914	T1326/ MT8915	T1327/ MT8916	T1328/ MT8917	T1329/ MT8918	T1330/ MT8919	T1331/ MT8921	T1332/ MT8922	T1333/ MT8923
B&V SAMPLE NO.	CBS-26-SL-01	CBS-27-SL-01	CBS-28-SL-01	CBS-29-SL-01	CBS-30-SL-01	CBS-31-SL-01	CBS-32-SL-01	CBS-33-SL-01	CBS-34-SL-01	CBS-35-SL-01	CBS-36-SL-01	CBS-37-SL-01
DATE SAMPLED	10-18-82	10-18-82	10-82-82	10-18-82	10-18-82	10-18-82	10-18-82	10-18-82	10-18-82	10-18-82	10-18-82	10-18-82
DETECTION LIMIT REFERENCE NO.	(3)	(2)	(2)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Volatiles												
1,2-dichloroethane	nd	nd	nd	nd	nd	nd	nd	1.4*	nd	nd	nd	nd
methylene chloride[1]	25	4.8	23	2.0	5.0	6.5	7.0	2.0*	nd	8.0	53	19
trichlorofluoromethane	10	3.3	5.6	2.1	2.5	2.5K	nd	2.0*	nd	4.0	4.0	nd
(Non-priority pollutants)												
acetone	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	33
Pesticides												
PCB-1248	57900	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
PCB-1254	nd	1444[2]	nd	nd	nd	nd	nd	nd	0.54	nd	nd	nd
DETECTION LIMIT REFERENCE NO.	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)
							(mg/Kg)					
Inorganics												
Aluminum (Al)	1100	1900	1000	3500	2200	2300	540	360	1200	3400	1200	510
Boron (B)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	22	nd
Barium (Ba)	34	22	nd	18	nd	23	17	nd	46	18	62	48
Chromium (Cr)	2.8	nd	nd	nd	nd	nd	nd	nd	nd	nd	54	2.8
Copper (Cu)	31	nd	nd	6.9	6.8	nd	nd	nd	330	52	21	nd
Iron (Fe)	470	680	250	440	310	260	690	410	1040	2800	3000	920
Manganese (Mn)	35	60	41	83	10	32	25	21	430	1800	230	46
Nickel (Ni)	nd	nd	nd	nd	nd	nd	nd	nd	35	5.7	15	nd
Zinc (Zn)	91	10	19	47	6.8	2.1	5.8	2.7	120	15	21	3.8

Footnotes on page 3 of 5

U.S. ENVIRONMENTAL PROTECTION AGENCY
EPA CONTRACT NO. 68-03-1614
WORK ASSIGNMENT NO. Z-3-6

TABLE A-4
SOUTH TACOMA SWAMP
PRELIMINARY SITE INVESTIGATION
SURFACE SOIL ANALYSES
(Continued)

SMO TRAFFIC NO.	T1322/ MT8911	T1323/ MT8912	T1324/ MT8913	T1325/ MT8914	T1326/ MT8915	T1327/ MT8916	T1328/ MT8917	T1329/ MT8918	T1330/ MT8919	T1331/ MT8921	T1332/ MT8922	T1333/ MT8923
B&V SAMPLE NO.	CBS-26-SL-01	CBS-27-SL-01	CBS-28-SL-01	CBS-29-SL-01	CBS-30-SL-01	CBS-31-SL-01	CBS-32-SL-01	CBS-33-SL-01	CBS-34-SL-01	CBS-35-SL-01	CBS-36-SL-01	CBS-37-SL-01
DATE SAMPLED	10-18-82	10-18-82	10-82-82	10-18-82	10-18-82	10-18-82	10-18-82	10-18-82	10-18-82	10-18-82	10-18-82	10-18-82
DETECTION LIMIT REFERENCE NO.	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)
Inorganics												
Arsenic (As)	4.6	2.2	1.3	5.4	4.3	1.4	nd	nd	110	6.0	2.0	nd
Cadmium (Cd)	0.2	0.2	0.3	0.2	0.4	0.5	nd	0.7	0.2	0.4	nd	3.4
Lead (Pb)	72	6.5	8.8	14	86	12	2.8	1.4	200	31	35	17
Antimony (Sb)	nd	nd	nd	nd	nd	nd	nd	nd	13	3.6	nd	nd
Tin (Sn)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

*-Below quantitation limit
1-Detected in laboratory blank
2-PCB cannot be confirmed by GC/MS

K-Detected below but more than one half of specified detection limti
All other priority pollutants not detected

U.S. ENVIRONMENTAL PROTECTION AGENCY
EPA CONTRACT NO. 68-03-1614
WORK ASSIGNMENT NO. Z-3-6

TABLE A-4
SOUTH TACOMA SWAMP
PRELIMINARY SITE INVESTIGATION
SURFACE SOIL ANALYSES
(Continued)

SMO TRAFFIC NO.	T1334/ MT8924	T1335/ MT8925	T1336/ MT8926	T1337/ MT8927	T1320/ MT9424	T1321/ MT9425
B&V SAMPLE NO.	CBS-38-SL-01	CBS-39-SL-01	CBS-40-SL-01	CBS-41-SL-01	CBS-47-SL-01	CBS-48-SL-01
DATE SAMPLED	10-18-82	10-18-82	10-82-82	10-18-82	10-18-82	10-18-82
DETECTION LIMIT REFERENCE NO.	(1)	(1)	(1)	(1)	(1)	(1)
			(ug/Kg)			
Acid Compounds						
phenol	nd	nd	nd	nd	3600	1900
Base/Neutral Compounds						
acenaphthene	400K	nd	nd	nd	nd	nd
fluoranthene	1000	nd	nd	400K	nd	400K
naphthalene	nd	nd	nd	nd	nd	400K
benzo(a)anthracene	1600	nd	nd	nd	nd	nd
benzo(a)pyrene	1800	nd	nd	nd	nd	nd
3,4-benzofluoranthene	1600	nd	nd	nd	nd	nd
benzo(k)fluoranthene	1600	nd	nd	nd	nd	nd
chrysene	1500	nd	nd	400K	nd	nd
benzo(ghi)perylene	1200	nd	nd	nd	nd	nd
phenanthrene	400	nd	nd	400K	nd	400K
dibenzo(a,h)anthracene	1300	nd	nd	nd	nd	nd
indeno(1,2,3-cd)pyrene	2100	nd	nd	nd	nd	nd
pyrene	1400	nd	400K	400K	nd	400K
				(ug/Kg)		
Volatiles						
methylene chloride[1]	15	27	14	14	3.6	3.7
trichlorofluormethane	nd	14	nd	nd	2.7	4.3
trichloroethylene	nd	nd	32	nd	nd	nd

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EPA CONTRACT NO. 68-03-1614
WORK ASSIGNMENT NO. Z-3-6

TABLE A-5
SOUTH TACOMA SWAMP
PRELIMINARY SITE INVESTIGATION
SUBSURFACE SOIL ANALYSES

BLACK & VEATCH
KANSAS CITY, MO

SMO TRAFFIC NOS.	T1294/ MT8998	T1295/ MT8999	T1296/ MT9000	T1297/ MT9401	T1298/ MT9402	T1299/ MT9403	T1300/ MT9404	T1301/ MT9405	T1302/ MT9406	T1303/ MT9407	T1304/ MT9408	T1305/ MT9409	T1306/ MT9410
B&V SAMPLE NO.	CBS-01-SS-01	CBS-01-SS-02	CBS-02-SS-01	CBS-02-SS-02	CBS-03-SS-01	CBS-03-SS-02	CBS-04-SS-01	CBS-04-SS-02	CBS-05-SS-01	CBS-05-SS-02	CBS-06-SS-01	CBS-06-SS-02	CBS-07-SS-01
ELEVATION (FEET)**	216	211	227	212	221	211	233	213	224	214	220	210	236
DATE SAMPLED	10-11-82	10-11-82	10-13-82	10-13-82	10-9-82	10-9-82	10-11-82	10-11-82	10-11-82	10-11-82	10-12-82	10-12-82	10-12-82
DETECTION LIMIT REFERENCE NO.	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Base/Neutral Compounds							(ug/Kg)						
di-n-butyl phthalate	nd	nd	nd	nd	nd	nd	nd	nd	400K	nd	nd	nd	nd
Volatiles													
methylene chloride[1]	24	10	5.0	31	9.4	11	6.2	32	24	29	74	22	8.7
trichlorofluoromethane	nd	nd	nd	nd	nd	nd	nd	nd	nd	2.5K	nd	nd	nd
(Non-Priority pollutants)													
acetone[2]	26*	nd	nd	nd	nd	nd	nd	2.7*	nd	nd	nd	nd	nd
DETECTION LIMIT REFERENCE NO.	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)
Inorganics							(mg/Kg)						
Aluminum (Al)	940	950	1000	580	990	80	780	820	1100	720	1400	480	830
Barium (B)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Chromium (Cr)	nd	1.8	nd	nd	1.2	nd	1.3	2.2	2.2	1.5	1.2	nd	nd
Copper (Cu)	nd	nd	nd	nd	7.2	nd	nd	nd	nd	nd	nd	nd	nd
Iron (Fe)	790	860	1370	480	990	760	460	830	1350	790	930	840	730
Manganese (Mn)	59	64	30	18	89	46	33	41	191	108	23	13	78
Nickel (Ni)	nd	nd	nd	nd	nd	nd	nd	4.6	nd	nd	5.1	4.1	4.9

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EPA CONTRACT NO. 68-03-1614
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TABLE A-5
SOUTH TACOMA SWAMP
PRELIMINARY SITE INVESTIGATION
SUBSURFACE SOIL ANALYSES
(Continued)

SMO TRAFFIC NOS.	T1294/ MT8998	T1295/ MT8999	T1296/ MT9000	T1297/ MT9401	T1298/ MT9402	T1299/ MT9403	T1300/ MT9404	T1301/ MT9405	T1302/ MT9406	T1303/ MT9407	T1304/ MT9408	T1305/ MT9409	T1306/ MT9410
B&V SAMPLE NO.	CBS-01-SS-01	CBS-01-SS-02	CBS-02-SS-01	CBS-02-SS-02	CBS-03-SS-01	CBS-03-SS-02	CBS-04-SS-01	CBS-04-SS-02	CBS-05-SS-01	CBS-05-SS-02	CBS-06-SS-01	CBS-06-SS-02	CBS-07-SS-01
ELEVATION (FEET)**	216	211	227	212	221	211	233	213	224	214	220	210	236
DATE SAMPLED	10-11-82	10-11-82	10-13-82	10-13-82	10-9-82	10-9-82	10-11-82	10-11-82	10-11-82	10-11-82	10-12-82	10-12-82	10-12-82
DETECTION LIMIT REFERENCE NO.	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Vanadium (V)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Zinc (Zn)	4.2	4.9	5.7	2.9	6.2	5.1	1.9	5.0	6.2	5.1	6.1	4.2	4.8
Arsenic (As)	nd	nd	nd	nd	nd	nd	nd	nd	1.4	nd	2.2	nd	nd
Cadmium (Cd)	nd	nd	nd	nd	nd	nd	0.2	0.2	nd	nd	nd	nd	nd
Lead (Pb)	1.5	1.2	1.5	0.6	2.3	3.6	1.0	1.3	2.3	1.1	5.0	1.0	1.3

nd-Not detected
All other priority pollutants not detected
K-Detected below but greater than one half of specified limit
na-Not analyzed

1-Detected in laboratory blanks in a range from 1.4 to 22 ppb
2-Compound used in rinsing laboratory glassware
*-Below quantitation limit
**-USGS Datum

U.S. ENVIRONMENTAL PROTECTION AGENCY
EPA CONTRACT NO. 68-03-1614
WORK ASSIGNMENT NO. Z-3-6

TABLE A-5
SOUTH TACOMA SWAMP
PRELIMINARY SITE INVESTIGATION
SUBSURFACE SOIL ANALYSES

BLACK & VEATCH
KANSAS CITY, MO

SMO TRAFFIC NOS.	T1307/ MT9411	T1308/ MT9412	T1309/ MT9413	T1310/ MT9414	T1311/ MT9415	T1312/ MT9416	T1313/ MT9417	T1314/ MT9418	T1315/ MT9419	T1316/ MT9420	T1317/ MT9421	T1318/ MT9422	T1319/ MT9423
B&V SAMPLE NO.	CBS-07-SS-02	CBS-08-SS-01	CBS-08-SS-02	CBS-09-SS-01	CBS-09-SS-02	CBS-10-SS-01	CBS-10-SS-02	CBS-11-SS-01	CBS-11-SS-02	CBS-12-SS-01	CBS-12-SS-02	CBS-13 SS-01	CBS-13-SS-02
ELEVATION (FEET)*	207	211	206	214	209	232	217	236	216	225	210	185	155
DATE SAMPLED	10-12-82	10-13-82	10-13-82	10-11-82	10-11-82	10-11-82	10-11-82	10-14-82	10-14-82	10-13-82	10-13-82	11-16-82	11-16-82
DETECTION LIMIT REFERENCE NO.	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Volatiles						(ug/Kg)							
methylene chloride[1]	7.7	na[2]	110	62	28	34	44	9.9	31	8.1	62	3.8	6.7
trichlorofluoromethane	nd	na[2]	nd	3.6	6.0	4.6	4.2	4.7	2.7	6.0	nd	nd	nd
Pesticides													
beta-endosulfan	nd	nd	nd	nd	nd	nd	nd	6.8[3]	nd	nd	nd	nd	nd
DETECTION LIMIT REFERENCE NO.	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)
Inorganics						(mg/Kg)							
Aluminum (Al)	570	1300	520	620	490	850	590	550	580	610	620	1168	1321
Barium (Ba)	nd	45	nd	nd	nd	nd	nd	nd	nd	nd	nd	11	11
Chromium (Cr)	nd	4.4	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.4	2.3
Copper	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	5.4	nd
Iron (Fe)	620	2900	1300	1460	1310	720	560	330	420	580	530	1944	1831
Manganese (Mn)	31	42	25	21	17	63	33	36	23	20	36	28	38
Nickel (Ni)	nd	6.4	6.3	5.6	4.2	nd	nd	nd	nd	nd	nd	nd	9.3
Vanadium (V)	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	5.0	4.2
Zinc (Zn)	3.9	4.0	12	5.3	5.2	4.8	3.9	5.7	2.9	6.2	2.9	5.4	7.6
Arsenic (As)	nd	6	1.5	nd	nd	nd	1.2	1.8	1.3	1.3	1.1	1.1	1.1
Cadmium (Cd)	nd	0.2	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.2	0.6
Lead (Pb)	0.8	15.9	7.3	1.4	6.1	2.0	2.1	2.8	2.2	3.9	1.3	0.9	0.7
Tin (Sn)	nd	nd	nd	nd	nd	nd	nd	nd	nd	2.8	nd	nd	nd

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U.S. ENVIRONMENTAL PROTECTION AGENCY
EPA CONTRACT NO. 68-03-1614
WORK ASSIGNMENT NO. Z-3-6

TABLE A-5
SOUTH TACOMA SWAMP
PRELIMINARY SITE INVESTIGATION
SUBSURFACE SOIL ANALYSES

BLACK & VEATCH
KANSAS CITY, MO

SHO TRAFFIC NOS.	T1307/ MT9411	T1308/ MT9412	T1309/ MT9413	T1310/ MT9414	T1311/ MT9415	T1312/ MT9416	T1313/ MT9417	T1314/ MT9418	T1315/ MT9419	T1316/ MT9420	T1317/ MT9421	T1318/ MT9422	T1319/ MT9423
B&V SAMPLE NO.	CBS-07-SS-02	CBS-08-SS-01	CBS-08-SS-02	CBS-09-SS-01	CBS-09-SS-02	CBS-10-SS-01	CBS-10-SS-02	CBS-11-SS-01	CBS-11-SS-02	CBS-12-SS-01	CBS-12-SS-02	CBS-13 SS-01	CBS-13-SS-02
ELEVATION (FEET)*	207	211	206	214	209	232	217	236	216	225	210	185	155
DATE SAMPLED	10-12-82	10-13-82	10-13-82	10-11-82	10-11-82	10-11-82	10-11-82	10-14-82	10-14-82	10-13-82	10-13-82	11-16-82	11-16-82
DETECTION LIMIT REFERENCE NO.	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(12)	(12)
							(mg/Kg)						
Other Pollutants													
Calcium	na	na	na	na	na	na	na	na	na	na	na	1072	1234
Magnesium	na	na	na	na	na	na	na	na	na	na	na	431	900
Sodium	na	na	na	na	na	na	na	na	na	na	na	141	nd

na-Not Analyzed
All other priority pollutants not detected
*USGS Datum

nd-Not detected
1-Detected in laboratory blank
2-No volatile analyses included due to laboratory accident
3-Pesticide cannot be confirmed by GC/MS

APPENDIX D

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PHASE 1 SUBSURFACE INVESTIGATION
BURLINGTON NORTHERN TACOMA INDUSTRIAL CENTER
SOUTH 56TH STREET AND BURLINGTON WAY
TACOMA, WASHINGTON

INTRODUCTION

The results of our Phase 1 investigation of subsurface lime contamination on two commercial lots in Tacoma are presented in this report. The study site is bordered by South 56th Street to the south and by Burlington Way and Proctor Street to the east and west, respectively. The project location relative to surrounding topography and streets is shown on the Location Map, Figure 1. The specific study area consists of Lots 24 and 25 of the Burlington Northern Tacoma Industrial Center. These lots are shown on the Site Plan, Figure 2.

We understand that Lot 25 is currently owned by the South Tacoma Motor Company (South Tacoma Motors). A new automobile dealership is planned for construction on Lot 25 by South Tacoma Motors. Mr. Grover C. Way, consulting soils engineer, was contracted by South Tacoma Motors to provide a soils investigation of the parcel for use in design of the proposed automobile dealership. Mr. Way's report of September 7, 1984 indicated the presence of variable fill materials, as well as lime fill in one portion of the site. Mr. Way recommended that all fill and organic native soil be excavated and removed from the immediate building area. Mr. Way further recommended that all lime fill (even that located outside the building area) be completely removed from the site.

Testing conducted for Mr. Way by Benlab indicated that the lime had a pH of 11.8. We understand that concerns regarding the presence of the lime and its high alkalinity led South Tacoma Motors to contact Burlington Northern regarding the presence of "deleterious substances" on their property. The communications to Burlington Northern have been made through Victor L. Lyon, Inc., the realtor for South Tacoma Motors. We understand that one option being explored by South Tacoma Motors is acquiring Lot 24 at a reduced price in consideration of unforeseen difficulties in developing Lot 25. If this is done, we understand that South Tacoma Motors would develop both Lots 24 and 25 for their automobile dealership.

The purpose of our Phase 1 investigation is to develop additional information regarding the surface and subsurface extent and the toxicity of the lime. Specifically, our services include:

1. Excavating, logging and sampling 16 backhoe test pits in the study area.
2. Preparing a site map showing the exploration locations and the approximate limits of lime waste.
3. Measuring relative ground water elevations in two piezometers previously installed by Mr. Grover Way.
4. Making field determinations of pH, conductivity, salinity and temperature for water samples obtained from the two piezometers.
5. Submitting soil and lime samples obtained at the site to ERT for bioassay-toxicity testing.
6. Estimating the volume of lime waste present at the site.
7. Providing preliminary comments regarding relative environmental hazards and remedial options.

SITE CONDITIONS

SURFACE DESCRIPTION

The study area is generally relatively level and is vegetated with tall grass, weeds and local concentrations of blackberry bushes. The eastern three-quarters of Lots 24 and 25 are at the approximate grade of Burlington Way. The western one-quarter of the study area is at the approximate grade of Proctor Street. A fill embankment separates the upper (eastern) portion of the site from the western portion. The fill embankment is generally 15 to 18 feet high.

Lime waste is exposed at the surface in two portions of the site. The areas of surface lime are bare of vegetation and are gray-white in color. The lime waste area in the western portion of the study area is located within both Lots 24 and 25. The lime disposal area in the central portion of Lot 25 has been subdivided based on the depth and character of lime in that area.

Small areas of sulfur at the ground surface were observed in the western portion of Lot 24. The sulfur appears to have been placed in a molten condition and is locally mixed with solidified tar.

SUBSURFACE SOIL CONDITIONS

Subsurface conditions were explored by excavating 16 test pits with a rubber-tired backhoe owned and operated by Joe Hall Construction Company. The test pit sites were selected by an engineering geologist from our staff. Our representative observed each test pit excavation, obtained representative bulk samples of the materials encountered and prepared a detailed log of each excavation. Soils were classified in accordance with the Unified Soil Classification System, which is explained on Figure 3. The test pit logs are included on Figures 4 through 11. The locations of the test pits are shown on Figure 2.

The test pit excavations and previous borehole data for the site indicate that essentially all of the site is covered by fill. The fill beneath the relatively level eastern three-quarters of the site increases in thickness from east to west. The fill appears to be less than one foot thick along the eastern property lines for Lots 24 and 25, and it gradually increases to a thickness of at least 15 feet along the western crest of the fill embankment. The western one-quarter of the study area appears to be blanketed by one to three feet of fill.

The fill is highly variable in its composition. The three major categories of fill are described below, followed by a description of the underlying native soils.

Cinder Fill: Most of the fill at the site is grouped within this category. The cinder fill apparently includes several sources of material, since the fill varies considerably in color and texture. The cinder fill often includes brick, slag, glass, sand and metal. Large pieces of metal were found in TP-5. The cinder fill is generally loose to medium dense in consistency and overlies native soils. The age of the cinder fill is not known, but we believe it is at least 25 years old and it may be more than 50 years old.

Lime Waste Fill: The lime fill is concentrated in two portions of the site, as indicated on Figure 2. The lime is soft to stiff in texture

and is generally moist. The two major areas of lime disposal are shown with a stippled pattern on Figure 2 and are designated as the upper and lower lime sites. It appears that waste lime in slurry form was pumped into excavated pits at each of these two lime sites.

Lime in the lower lime site was found to be one to two feet thick in our test pit excavations. We estimate that the volume of lime in the lower lime site is approximately 500 cubic yards. Each of our test pits in the lower lime site encountered native sand and gravel soils directly below the lime waste.

The lime in the upper lime site was found to be 7 to 8-1/2 feet thick in our test pits. We estimate that the volume of lime in the upper lime site is approximately 2650 cubic yards. The lime at this location was found to overlie native soils (TP-6, TP-7, and TP-8) as well as cinder fill (TP-16). The presence of cinder fill beneath the lime in TP-16 suggests that much of the cinder fill may have been placed before a pit was excavated for disposal of lime slurry.

The area of shallow lime contamination indicated north of the upper lime site has surficial lime contamination which is one to two feet thick at our test pit locations. Evidence at TP-8 (see log on Figure 7) suggests that this shallow lime may have been deposited after placement of the lime slurry in the upper lime site. It is possible that this shallow lime was derived from the upper lime site and spread northward by earth-moving equipment. We estimate that the volume of lime in the area designated as having shallow lime contamination is approximately 150 cubic yards.

Sulfur/tar Fill: The areas of visible sulfur shown on Figure 2 appear to be the most recent deposits of fill at the site, with the possible exception of localized piles of construction debris. The sulfur appears to have been dumped in a molten condition along with tar. The solidified sulfur/tar waste is estimated to be less than one foot thick in most areas. However, specific explorations were not made to confirm the thickness of this waste. Assuming an average sulfur/tar thickness of one foot, we estimate that the volume of the sulfur/tar waste is approximately 30 to 40 cubic yards.

Native Soils: The original topsoil at the site underlies fill at some of the exploration sites (TP-1, TP-2, TP-3, TP-5 and each of the Grover

Way borings). The original topsoil was not reached in some of the test pits, and the topsoil was absent in others. In general, the topsoil consists of dark brown to black sand with silt and disseminated organic matter.

The native soils which underlie the original topsoil (or the fill where the topsoil is missing) include clean fine to medium sand and clean well-graded sand with gravel. Existing borings and test pits at the site did not reach the base of this relatively permeable native soil unit.

The upper few feet of the native sand and gravel beneath the lime in TP-13 and TP-14 was cemented with calcium carbonate. In our opinion, this cementation was probably derived from the overlying lime.

GROUND WATER

Regional Ground Water Conditions: The study area is located within a valley which was occupied by a major glacial meltwater stream during the last glaciation (See Figure 1). This valley extends north and east of the site to the vicinity of the intersection of South Tacoma Way and Yakima Avenue. The northern part of this glacial channel is commonly referred to as the "South Tacoma Channel". South of the study area, the glacial channel widens and opens into a broad glacial outwash plain which is underlain by highly permeable gravel. The headwater area of Flett Creek is located approximately one mile south of the study area. Flett Creek drains into Chambers Creek, which discharges into Puget Sound.

The study site is located along the southern boundary of the Commencement Bay Superfund Site. Many productive water wells are located within and south of this Superfund site. Well 12A, which is used for municipal supply by the City of Tacoma, is located approximately 1.9 miles north-northeast of the study site. Millions of dollars have been spent recently to remove low levels of organic contamination from Well 12A. Existing preliminary data suggest that the ground water which occurs beneath the lime disposal sites in the study area may be in hydraulic connection with the aquifer(s) which are tapped by production wells in the area.

Site Ground Water Conditions: None of the test pits excavated by GeoEngineers encountered ground water. Piezometers were installed by Grover Way in Borings 201 and 204. Water level measurements in these piezometers by GeoEngineers indicates that the water table is approximately 29 feet

below general site grades in the eastern three-quarters of the study area. The water table occurs within native sand and gravel deposits which we interpret to be moderately to highly permeable. The base of the lime waste in each of our explorations was found to be located above the water table.

We determined the water surface elevations in each of the Grover Way piezometers on two dates. A datum benchmark elevation of 100.00 feet was used for the eastern property corner between Lots 24 and 25. The piezometric data are presented below.

PIEZOMETRIC WATER SURFACE ELEVATIONS
(Assumed Datum)

Boring No.	3/15/85	3/29/85
201	71.95	72.02
204	71.74	71.81

The elevation of the piezometric surface in Boring 204 was lower than that in Boring 201 for each measurement date. This indicates that the direction of ground water flow at the study site has a northeast-to-southwest directional component. At least one other ground water data point is needed to determine the actual direction of ground water flow at the site. The existing data indicate that Boring 201 is located upgradient from areas of known lime disposal at the site. The piezometric elevations also suggest that ground water flow within the South Tacoma Channel in the immediate study area is southward toward the headwaters of Flett Creek.

We constructed a small-diameter bailer to allow ground water sampling from the Grover Way piezometers. Field determinations of temperature, conductivity, salinity and pH were made on the water samples on March 29. The temperature measurements may not accurately reflect in-situ ground water temperatures since only small volumes of water could be obtained with the sampler and several minutes passed before a sufficient volume of water was collected to allow measurement. The field data are summarized below.

FIELD GROUND WATER QUALITY DATA

Boring No.	Temperature (Centigrade)	Conductivity (mmho/cm)	Salinity (ppt)	pH
201	13	328	2	7.10
204	13	178	1	7.62

The pH of the water sample from Boring 204 is higher than that measured for Boring 201. This suggests a potential impact to the pH of the shallow ground water due to leaching of lime from the upper lime site.

Local ground water quality data are published in the State of Washington Water Supply Bulletin No. 22. The published data indicate that the pH of water from wells within two miles of the study site typically ranges between 7.1 and 7.8. These data indicate that the pH of the ground water samples from Borings 201 and 204 falls within the range of typical ground water in the area.

LABORATORY ANALYTICAL RESULTS

Samples of lime and native soil collected from the test pits were shipped to ERT for laboratory analysis. All testing was instructed to be done in accordance with State of Washington hazardous/dangerous waste statutes and regulations. The analytical schedule is as follows:

Sample No.	Test Pit No.	Sample Depth (ft)	Fish Bioassay	LC-50	EP Toxicity (metals)	pH-Corrosivity
7A	7	5	X	X	X	X
13A	13	1	X	X	X	X
13B	13	3			X	X
13C	13	8			X	X

The analytical results from ERT will be submitted as an addendum to this report. A summary of the analytical results are presented below.

pH-CORROSIVITY

The lime from the upper and lower lime sites is highly alkaline. Earlier testing of a lime sample by Grover Way resulted in a pH of 11.8. Both lime samples tested for this study by ERT had a pH of 12.3.

A solid waste in Washington State is classified as a "dangerous waste" due to its corrosivity if it has a slurry pH of 12.5 or higher (WAC 173-303-090). Although none of the samples tested resulted in pH values of 12.5 or higher, the test results are borderline with regard to this test standard.

FISH BIOASSAYS AND LC-50

Static acute fish toxicity tests were conducted on lime samples from the upper and lower lime sites. The fish toxicity testing resulted in classification of the lime as an "Extremely Hazardous Waste". The toxicity of the lime to the test organisms is a result of the high pH of the lime when mixed in water. At a 100ppm mixture, the pH of the test water for the two bioassays ranged between 10.85 and 10.95. ERT reports that the test organism, rainbow trout (Salmo gairdneri), cannot survive in water with a pH higher than 9.5.

The medium lethal concentration (LC-50) of the lime-water mixture was determined for the lime samples after completing the fish toxicity tests. The resulting LC-50 for the samples from the upper and lower lime sites were 62.4 and 62.5 ppm, respectively. This places the lime in Toxic Category C (WAC 173-303-101). Using State of Washington procedures, this results in an "Equivalent concentration" of 0.1 percent. For a batch waste quantity of approximately 4000 tons, the waste at the site is designated as an "Extremely Hazardous Waste" according to Washington State standards for waste analysis by LC-50 criteria.

EP TOXICITY

Testing for EP Toxicity (metals) on two lime samples and two native soil samples indicated no specific contaminants in the "Dangerous Waste" or "Extremely Hazardous Waste" classifications (WAC 173-303-090). This provides further support to indicate that the toxicity of the lime to fish is a result of the high pH of the lime-water mixture and is not a result of toxic reactions to specific heavy metal contaminants.

CONCLUSIONS

Approximately 3300 cubic yards of lime waste at the study site are classified as an "Extremely Hazardous Waste" due to the apparent toxicity

of the material. This classification results in regulation of the waste by the State of Washington Department of Ecology. How the site will be regulated depends, in part, on the remedial actions which may be taken at the site.

The toxicity of the lime waste appears to be a result of its high alkalinity. Limited testing by our firm indicates that the pH of ground water beneath the upper lime site may be somewhat higher than that from the immediate upgradient direction. Nevertheless, the pH and conductivity of the ground water from beneath the upper lime site are within the normal range reported for water wells in the region. The base of the lime waste is located above the water table and no surface water sources are known to drain onto the study area. Consequently, leaching of lime into the ground water would occur only in response to precipitation which infiltrates the ground.

In our opinion, the lime waste exposed at the surface represents a potential public hazard. We recommend that public access to the lime areas be restricted by fencing and/or burial of the waste. Once direct access to the lime waste is precluded, it is questionable (in our opinion) whether the lime waste represents "a threat to public health or the environment". This is the basic premise used to justify regulation of hazardous/dangerous wastes by the State of Washington.

Considering the available information, there seems to be at least seven remedial options for consideration at the study area. The available options are complicated by the fact that Lot 25 is currently owned by South Tacoma Motors, and development of the site is planned. Each of the identified options is described briefly below.

1. **Limited Response** – Leave the lime and sulfur in place and prevent direct public contact by fencing and/or burial. This may preclude site development.
2. **Capping** – Minimize future leachate potential by capping the lime areas with an impermeable surface. It may be possible to incorporate this option with modified site development plans.
3. **Excavation and Local Disposal** – Remove the lime and sulfur and dispose of the waste in a local landfill.

4. **Excavation and Disposal in Arlington, Oregon** – Due to the classification of lime as an "Extremely Hazardous Waste," it may become necessary to dispose of the lime in strict compliance with prevailing regulations. We estimate that disposal of the lime and sulfur in Arlington, Oregon would cost $600-$700 thousand, including excavation, hauling, permitting and landfill disposal.
5. **Excavation and Treatment** – Remove the lime and neutralize it on-site or locally through an acidification process.
6. **In-Situ Treatment** – Neutralize the lime in-situ through a controlled program of acid treatment. (This option is probably infeasible due to the difficulty of containing the acid and preventing its escape into the shallow ground water).
7. **Excavation and Recycling** – Remove the lime and give (or sell) it to an appropriate industry.

The final alternative, recycling, is our preferred response option. Current federal and state regulations are stressing the importance of recycling hazardous wastes to reduce waste volumes. The lime at the study site may be suitable for use in the manufacture of Portland cement, as a soil stabilizer, or in various industrial processes.

Additional feasibility studies are necessary to evaluate the costs and regulatory climate regarding the listed response options. More detailed information regarding ground water conditions and the chemical characteristics of the lime will be necessary to evaluate remedial options at this site.

JAMES A. MILLER
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL ENGINEER

Respectfully submitted,

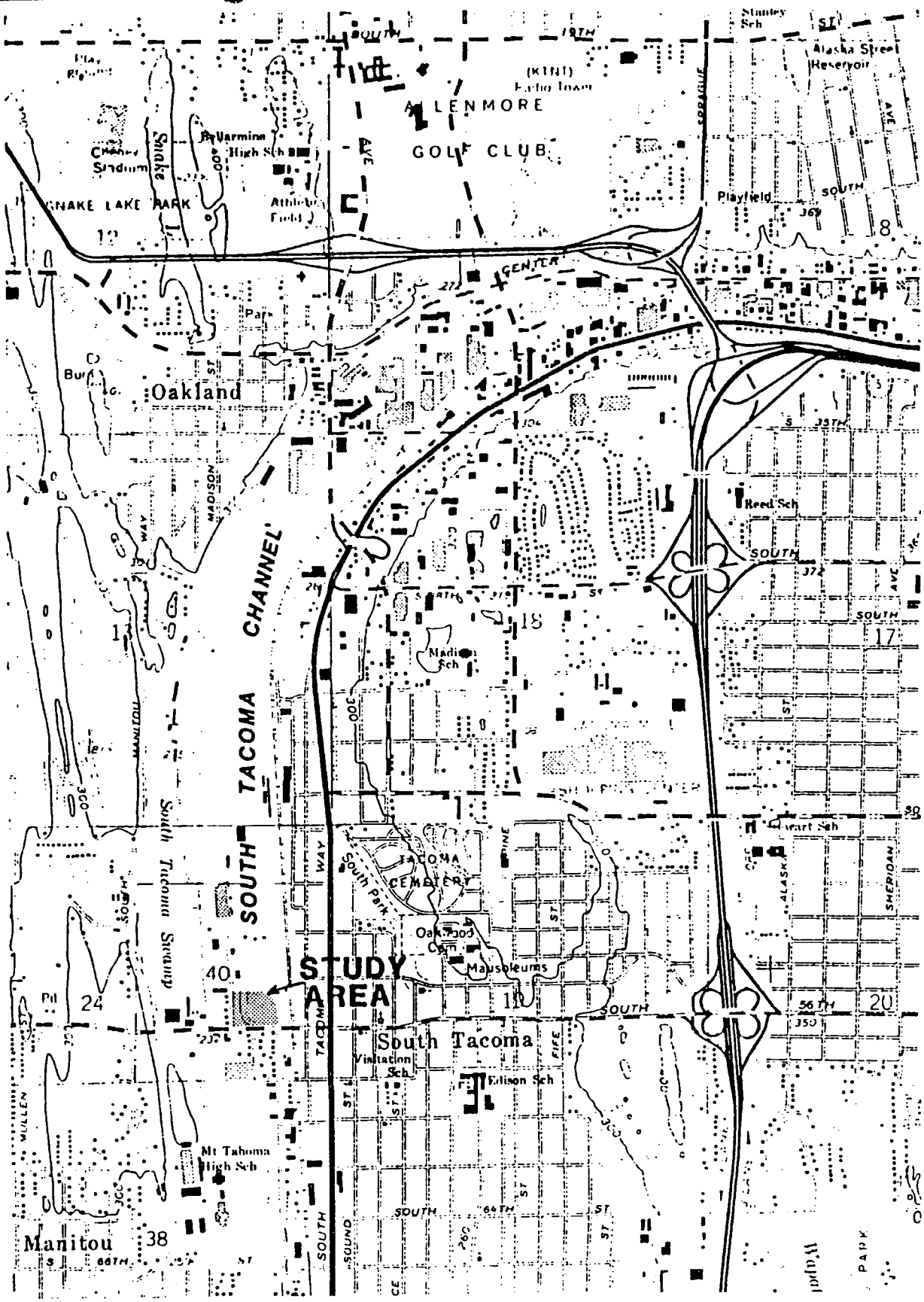
GeoEngineers, Inc.

James A. Miller

James A. Miller
Associate

JAM:da

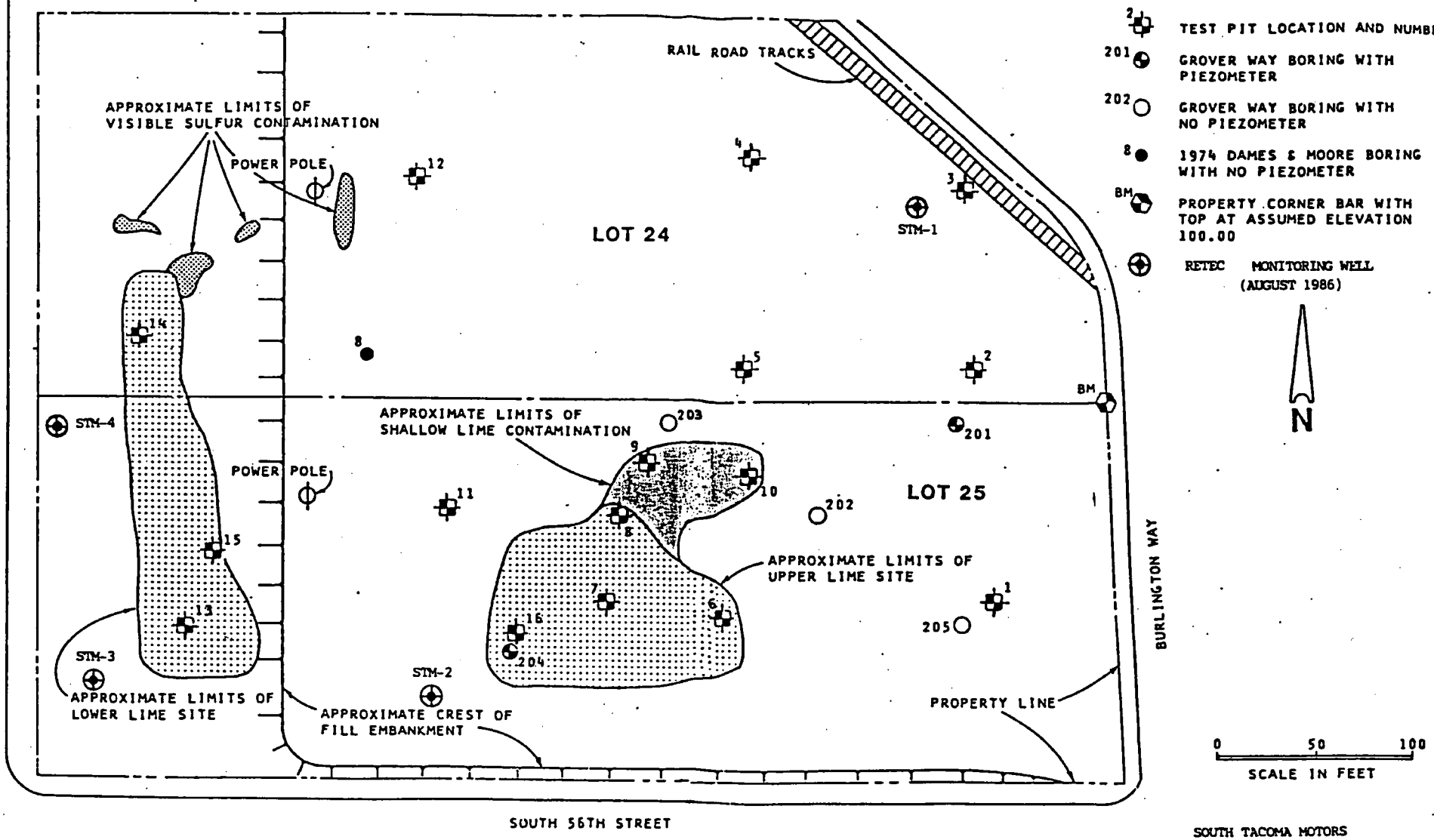
FIGURE 1



REFERENCE: U.S.G.S. "TACOMA SOUTH"
7.5' QUADRANGLE MAP.

GeoEngineers Inc.

LOCATION MAP



NOTE: LOCATIONS OF PROPERTY LINES AND SITE FEATURES ARE APPROXIMATE.

GeoEngineers Inc.	SITE PLAN

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			LETTER SYMBOL	DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	ML	INORGANIC SILTS, AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS INDICATE BORDERLINE SOIL CLASSIFICATION

GeoEngineers Inc. | UNIFIED SOIL CLASSIFICATION SYSTEM

DEPTH BELOW GROUND SURFACE (FEET)	UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOL	DESCRIPTION
		TEST PIT ONE
0 - 3	SM	BLACK SILTY FINE SAND WITH CINDERS AND OCCASIONAL PIECES OF BRICK AND SLAG (MEDIUM DENSE, MOIST) (FILL)
3 - 3½	SP	BLACK FINE SAND WITH SOME SILT (MEDIUM DENSE, MOIST) (TOPSOIL)
3½ - 5½	SP	BROWN FINE SAND WITH A TRACE OF SILT (MEDIUM DENSE, MOIST)
5½ - 8½	SP	BROWN FINE TO MEDIUM SAND (MEDIUM DENSE, MOIST)
		TEST PIT COMPLETED AT 8½ FEET ON 3/18/85
		NO SEEPAGE OBSERVED
		DISTURBED SAMPLES OBTAINED AT 2 AND 4 FEET
		TEST PIT TWO
0 - 1½	SM	BLACK SILTY SAND WITH CINDERS AND OCCASIONAL PIECES OF BRICK, SLAG AND IRON (MEDIUM DENSE, MOIST) (FILL)
1½ - 3	SP	BLACK FINE SAND WITH A TRACE OF SILT (MEDIUM DENSE, MOIST) (TOPSOIL)
3 - 8	SP	BROWN FINE TO MEDIUM SAND (MEDIUM DENSE, MOIST)
		TEST PIT COMPLETED AT 8½ FEET ON 3/18/85
		NO SEEPAGE OBSERVED
		DISTURBED SAMPLES OBTAINED AT 1 AND 4 FEET

DEPTH BELOW GROUND SURFACE (FEET)	UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOL	DESCRIPTION
		TEST PIT THREE
0 - 1	SM	BROWN SILTY CINDERS WITH SOME PIECES OF BRICK AND CLAY MIXED WITH BROWN FINE TO MEDIUM SAND (MEDIUM DENSE, MOIST) (FILL)
1 - 2½	SP	BLACK FINE SAND WITH SOME SILT (MEDIUM DENSE, MOIST) (TOPSOIL)
2½ - 4	SP	BROWN FINE SAND WITH A TRACE OF SILT (MEDIUM DENSE, MOIST)
4 - 7	SP	BROWN FINE TO MEDIUM SAND (MEDIUM DENSE, MOIST)
		TEST PIT COMPLETED AT 7 FEET ON 3/18/85
		NO SEEPAGE OBSERVED
		DISTURBED SAMPLE OBTAINED AT ½ FOOT
		TEST PIT FOUR
0 - 1½	SM	BLACK AND BROWN SILTY CINDERS WITH OCCASIONAL PIECES OF BRICK AND SLAG MIXED WITH BROWN FINE TO MEDIUM SAND (MEDIUM DENSE, MOIST) (FILL)
1½ - 3	SP	BLACK CINDERS AND BLACK FINE SAND WITH OCCASIONAL PIECES OF BRICK AND SLAG (MEDIUM DENSE, MOIST) (FILL)
3 - 6	SP	BROWN FINE SAND WITH A TRACE OF SILT (MEDIUM DENSE, MOIST)
6 - 7½	SP	BROWN FINE TO MEDIUM SAND (MEDIUM DENSE, MOIST)
		TEST PIT COMPLETED AT 7½ FEET ON 3/18/85
		NO SEEPAGE OBSERVED

DEPTH BELOW GROUND SURFACE (FEET)	UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOL	DESCRIPTION
		TEST PIT FIVE
0 - 1	SP	BLACK CINDERS AND BLACK FINE SAND WITH OCCASIONAL PIECES OF BRICK AND SLAG (MEDIUM DENSE, MOIST) (FILL)
1 - 1½	LIME	WHITE LIME (HARD, DRY) (FILL)
1½ - 3½	SP	BLACK CINDERS AND BLACK FINE SAND WITH PIECES OF BRICK, SLAG, LARGE PIECES OF METAL, AND VISIBLE LIME CONTAMINATION (MEDIUM DENSE, MOIST) (FILL)
3½ - 6½	SW/SM	REDDISH-BROWN SILTY CINDERS AND REDDISH-BROWN SILTY FINE TO MEDIUM SAND WITH VISIBLE LIME CONTAMINATION (MEDIUM DENSE, MOIST) (FILL)
6½ - 8	SP	DARK BROWN FINE SAND WITH SOME SILT (MEDIUM DENSE, MOIST) (TOPSOIL)
		TEST PIT COMPLETED AT 8 FEET ON 3/18/85
		NO SEEPAGE OBSERVED
		DISTURBED SAMPLES OBTAINED AT 2, 5 AND 7 FEET
		TEST PIT SIX
0 - 8½	LIME	WHITE LIME WITH A LAMINATED STRUCTURE (SOFT, MOIST) (FILL)
8½ - 11	SP	BROWN FINE SAND WITH A TRACE OF SILT (MEDIUM DENSE, MOIST)
		TEST PIT COMPLETED AT 11 FEET ON 3/18/85
		NO SEEPAGE OBSERVED
		DISTURBED SAMPLE OBTAINED AT 3½ FEET

DEPTH BELOW GROUND SURFACE (FEET)	UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOL	DESCRIPTION
		TEST PIT SEVEN
0 - 7½	LIME	WHITE LIME WITH A LAMINATED STRUCTURE (SOFT, MOIST TO WET) (FILL)
7½ - 9	SP	BLACK CINDERS AND BLACK FINE SAND WITH PIECES OF BRICK, METAL AND SLAG (MEDIUM DENSE, MOIST) (FILL)
		TEST PIT COMPLETED AT 9 FEET ON 3/18/85
		NO SEEPAGE OBSERVED
		DISTURBED SAMPLE OBTAINED AT 5 FEET
		TEST PIT EIGHT
0 - 1	LIME	WHITE LIME (MEDIUM STIFF, MOIST) (FILL)
1 - 3	SM	BLACK SILTY CINDERS AND BLACK SILTY FINE SAND WITH PIECES OF BRICK, GLASS, METAL AND SLAG (MEDIUM DENSE, MOIST) (FILL)
3 - 10½	LIME	WHITE LIME WITH A LAMINATED STRUCTURE (MEDIUM STIFF, MOIST) (FILL)
10½ - 11	SP	BROWN FINE SAND WITH SOME SILT (MEDIUM DENSE, MOIST)
		TEST PIT COMPLETED AT 11 FEET ON 3/18/85
		NO SEEPAGE OBSERVED
		DISTURBED SAMPLES OBTAINED AT 2 AND 5 FEET

DEPTH BELOW GROUND SURFACE (FEET)	UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOL	DESCRIPTION
		TEST PIT NINE
0 - 2	LIME	WHITE LIME (MEDIUM STIFF, MOIST) (FILL)
2 - 5½	SM	BLACK SILTY CINDERS AND BLACK SILTY FINE SAND WITH OCCASIONAL PIECES OF WOOD, BRICK AND SLAG (MEDIUM DENSE, MOIST) (FILL)
5½ - 9	SM	BLACK SILTY DEBRIS WITH LARGE PIECES OF METAL, CINDERS AND VISIBLE LIME CONTAMINATION (MEDIUM DENSE, MOIST) (FILL)
9 - 10½	SP	BROWN FINE TO MEDIUM SAND (MEDIUM DENSE, MOIST)
		TEST PIT COMPLETED AT 10½ FEET ON 3/18/85
		NO SEEPAGE OBSERVED
		DISTURBED SAMPLES OBTAINED AT 2½ AND 9½ FEET
		TEST PIT TEN
0 - 1½	LIME	WHITE LIME (MEDIUM STIFF, MOIST) (FILL)
1½ - 4	SM	BLACK SILTY CINDERS AND BLACK SILTY FINE SAND WITH OCCASIONAL PIECES OF BRICK, WOOD AND SLAG (MEDIUM DENSE, MOIST) (FILL)
4 - 6	SM	REDDISH-BROWN SILTY CINDERS AND REDDISH-BROWN SILTY FINE TO MEDIUM SAND (MEDIUM DENSE, MOIST) (FILL)
6 - 9	SM	DARK BROWN SILTY FINE SAND WITH OCCASIONAL PIECES OF BRICK (MEDIUM DENSE, MOIST) (FILL)
		TEST PIT COMPLETED AT 9 FEET ON 3/18/85
		NO SEEPAGE OBSERVED
		DISTURBED SAMPLES OBTAINED AT 1, 2 AND 9 FEET

DEPTH BELOW GROUND SURFACE (FEET)	UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOL	DESCRIPTION
		TEST PIT ELEVEN
0 - 1½	SM	DARK GRAY SILTY CINDERS WITH BLACK SILTY FINE SAND AND LARGE PIECES OF BRICK (MEDIUM DENSE, MOIST) (FILL)
1½ - 3	SP	BLACK CINDERS AND BLACK FINE SAND WITH LARGE PIECES OF BRICK (MEDIUM DENSE, DAMP) (FILL)
3 - 11	SM	REDDISH-BROWN SILTY CINDERS AND REDDISH-BROWN SILTY FINE TO MEDIUM SAND (MEDIUM DENSE, MOIST) (FILL)
		TEST PIT COMPLETED AT 11 FEET ON 3/18/85
		NO SEEPAGE OBSERVED
		DISTURBED SAMPLES OBTAINED AT 1 AND 10 FEET
		TEST PIT TWELVE
0 - 8½	SP	BLACK CINDERS AND BLACK FINE SAND WITH OCCASIONAL PIECES OF BRICK AND SLAG (MEDIUM DESNE, MOIST) (FILL)
8½ - 10	SM	REDDISH-BROWN SILTY CINDERS WITH SOME SILTY SAND (MEDIUM DENSE, MOIST) (FILL)
10 - 11	SP	REDDISH-BROWN FINE TO MEDIUM SAND (MEDIUM DENSE, MOIST) (FILL?)
		TEST PIT COMPLETED AT 11 FEET ON 3/18/85
		NO SEEPAGE OBSERVED
		DISTURBED SAMPLES OBTAINED AT 1½, 9 AND 10½ FEET

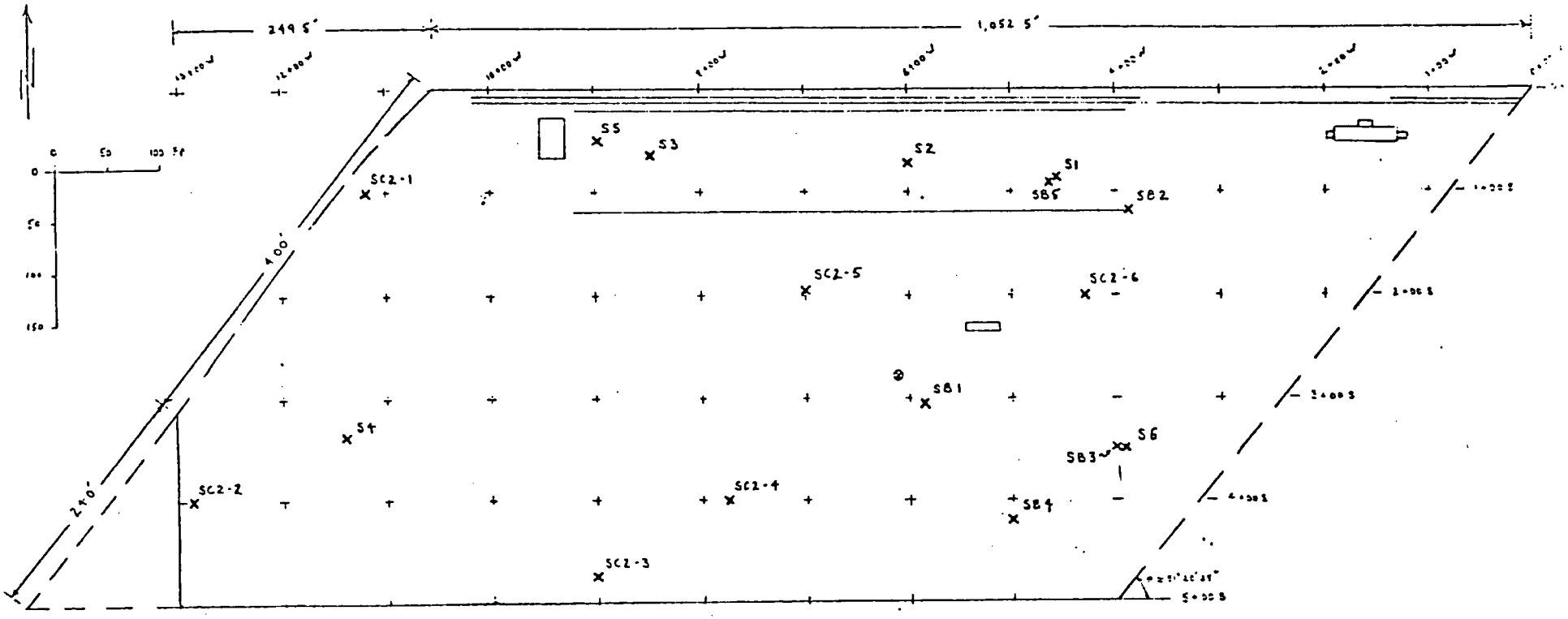
FIGURE 10

DEPTH BELOW GROUND SURFACE (FEET)	UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOL	DESCRIPTION
		TEST PIT THIRTEEN
0 - 1½	LIME	WHITE LIME (MEDIUM STIFF, MOIST) (FILL)
1½ - 5	SP	BROWN FINE TO MEDIUM SAND (MEDIUM DENSE BUT LOCALLY CEMENTED TO HARD, MOIST)
5 - 11	SW	BROWN FINE TO COARSE SAND WITH GRAVEL (MEDIUM DENSE, MOIST)
		TEST PIT COMPLETED AT 11 FEET ON 3/18/85
		NO SEEPAGE OBSERVED
		DISTURBED SAMPLES OBTAINED AT 1, 3 AND 8 FEET
		TEST PIT FOURTEEN
0 - 2	LIME	WHITE LIME (MEDIUM STIFF, MOIST) (FILL)
2 - 3½	SP	BROWN FINE TO MEDIUM SAND (MEDIUM DENSE BUT LOCALLY CEMENTED TO HARD, MOIST)
		TEST PIT COMPLETED AT 3½ FEET ON 3/18/85
		NO SEEPAGE OBSERVED
		TEST PIT FIFTEEN
0 - 1	LIME	WHITE LIME (MEDIUM STIFF, MOIST)
1 - 4½	SP	BROWN FINE TO MEDIUM SAND (MEDIUM DENSE, MOIST)
		TEST PIT COMPLETED AT 4½ FEET ON 3/18/85
		NO SEEPAGE OBSERVED

3/27/85 JAM:HM 500-07

DEPTH BELOW GROUND SURFACE (FEET)	UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOL	DESCRIPTION
		TEST PIT SIXTEEN
0 - 7	LIME	WHITE LIME WITH A LAMINATED STRUCTURE (MEDIUM STIFF TO SOFT, MOIST TO WET) (FILL)
7 - 8½	SM	BLACK SILTY CINDERS WITH SOME BLACK FINE SAND AND OCCASIONAL PIECES OF BRICK AND METAL (CEMENTED HARD, MOIST) (FILL)
		TEST PIT COMPLETED AT 8½ FEET ON 3/18/85
		NO SEEPAGE OBSERVED
		DISTURBED SAMPLES OBTAINED AT 3½ AND 8½ FEET

APPENDIX E



S - surface soil sample, from soils initially suspected as contaminated.

SB - subsurface soil sample.

SC - composite soil sample.

Samples SB1, SB2 and SB3 were archived at TPCHD. Please refer to appendices 3,4 and 5 for results of laboratory analyses.

⊗ - E.P.A. Monitor Well CBS-01

Tac. Lab. Report
by TPCHD

FIRST REPORT

WEYERHAEUSER TECHNOLOGY CENTER
ANALYTICAL LABORATORY
TACOMA, WASHINGTON

REPORT

PIERCE COUNTY HEALTH DEPT SLUDGE
POLYAROMATIC HYDROCARBONS
ug/L

The soil samples were dark and appeared to contain a significant amount of asphalt, some samples including chunks. Samples were soxhlet extracted overnight with acetone/hexane as in EPA Method 3250. The very dark extracts were Kuderna-Danish evaporated and the solvent exchanged into methylene chloride. These extracts fluoresced highly when viewed with a uv light. A portion of the extract was "cleaned-up" by gel permeation chromatography to remove large molecular weight material. An attempt was made to analyze it by high performance liquid chromatography with fluorescence detection, however, the sample extracts were too complex to be analyzed in this manner. There were too many highly fluorescent compounds all in the same portion of the chromatogram to adequately resolve the PAH compounds. An attempt to clean-up the samples further with silica gel chromatography did not improve the hplc analysis situation, although the silica gel did apparently remove much colored material from the extract.

It was decided that the only way we could get meaningful data from the samples was to analyze the extracts by gc/ms after the addition of stable isotope labelled compounds to a portion of the gpc cleaned extract. It should be noted that compounds not listed were not looked for. From observing the sample we would expect higher molecular weight PAHs. The results are summarized below.

compound	SB4 ug/g	SB5 ug/g
naphthalene	2.2	12
acenaphthylene	<0.2	<1
acenaphthene	2.2	4.4
fluorene	6.1	6.9
phenanthrene	24	30
anthracene	3.9	7.1
fluoranthene	3.0	2.8
pyrene	12	13
benzo(a)anthracene	2.6	<1
chrysene	9.8	<1
benzo(b)fluoranthene	2.2	<1

Approved _____ Date 17 Feb 86 Notebook _____

Page Number _____

benzo(k)fluoranthene	<0.2	<1
benzo(a)pyrene	1.6	<1
indeno(1,2,3-cd)pyrene	<0.2	<1
dibenzo(a,h)anthracene	<0.2	<1
benzo(ghi)perylene	<0.2	<1

	SC-1 ug/g	SC-2 ug/g	S-1 ug/g	S-2 ug/g	S-3 ug/g	S-4 ug/g	S-5 ug/g	S-6 ug/g
naphthalene	2.2	0.10	0.46	0.49	5.5	1.0	ND	0.35
acenaphthalene	ND	ND	ND	ND	ND	ND	ND	0.092
acenaphthene	0.87	ND	0.30	ND	ND	ND	ND	ND
fluorene	1.3	ND	0.43	ND	ND	ND	ND	0.076
phenanthrene	7.2	0.15	2.2	1.3	2.6	1.5	0.73	1.9
anthracene	1.4	ND	0.51	0.15	ND	ND	0.16	0.15
fluoranthene	1.6	0.078	0.86	1.2	1.1	0.79	1.3	1.8
pyrene	5.9	0.078	3.0	1.2	3.4	1.2	1.4	1.4
benz(a)anthracene	2.8	0.078	0.83	0.41	0.48	15	0.33	0.54
chrysene	3.5	0.078	1.6	0.88	1.4	11	ND	0.99
benzo(b)fluoranthene	0.39	0.12	ND	1.0	ND	ND	ND	1.5
benzo(k)fluoranthene	ND	0.063	ND	ND	ND	ND	ND	ND
benzo(a)pyene	ND	0.086	ND	0.36	0.99	ND	ND	0.70
indenopyrene	ND	0.071	ND	0.14	0.51	ND	ND	0.53
dibenzo(a,h)anthracene	ND	0.031	ND	ND	0.28	ND	ND	ND
benzoperylene	ND	0.094	0.59	ND	0.63	ND	ND	ND

ND - not detected, usually less than 0.2 ug/g

Approved Margaret M Kugel Date 12 Feb 86 Notebook _____

Page Number _____

WEYERHAEUSER TECHNOLOGY CENTER
Analytical Laboratories
Tacoma, Washington

Tacoma/Pierce County

Service Request 13216/13245

Soil/Sludge Samples, mg/kg as-received unless otherwise noted

REPORT

Page _____ of _____

SAMPLE DESCRIPTION	ANALYTICAL LAB CODE	Ag	Ba	Cd	Cr	Pb	As	Se	Hg	EOX	TOC %	pH un
SC1												
SC2	77655	<5	150	<2	28	487	11	<2	0.07	<5	3.30	6.3
S1	77656	<5	230	<2	72	864	14	<2	0.08	<5	3.90	6.2
S2	77657	<5	320	5	51	7480	16	<2	0.50	<5	3.63	6.7
S3	77658	<5	1940	2	642	5750	20	<2	0.05	<5	15.7	8.2
S4	77659	<5	430	<2	28	2050	36	<2	0.22	<5	7.76	3.6
S5	77660	<5	860	7	45	146500	25	<2	0.05	<5	9.27	6.3
S6	77661	<5	290	2	29	1990	26	<2	0.23	<5	5.01	6.4
SB4	77912	<5	81	<2	23	465	13	<3	<.05	<25	34.6	6.8
SB5	78340	<5	110	2	162	964	12	<3	<.05	<10	12.5	5.8

Notebook

WEYERHAEUSER TECHNOLOGY CENTER
ANALYTICAL LABORATORY
TACOMA, WASHINGTON

REPORT

PIERCE COUNTY HEALTH DEPT SLUDGE
POLYCHLORINATED BIPHENYLS

Sample	Arochlor	ug/L
SB4	not detected	
SB5	1260	0.33

Approved [illegible] Date 15 Jul 86 Notebook _____

Page Number _____

WEYERHAEUSER TECHNOLOGY CENTER
ANALYTICAL LABORATORY
TACOMA, WASHINGTON

REPORT

PIERCE COUNTY HEALTH DEPT SLUDGE
POLYCHLORINATED BIPHENYLS

Sample	Arochlor	ug/L
SC1	1260	0.15
SC2	1260	0.30

Approved [illegible] Date 15 Jul 86 Notebook _____

Page Number _____

WEYERHAEUSER TECHNOLOGY CENTER
Analytical Laboratories
Tacoma, Washington

Report

TACOMA/PIERCE COUNTY HEALTH DEPARTMENT
EP TOXICITY RESULTS

Sample Name	Sample Number	mg/L in Extract		
		Ba	Cr	Pb
SC2	77655	<0.05	<0.02	<0.1
S1	77656	0.28	0.06	<0.1
S2	77657	2.1	0.08	160
S3	77658	4.1	0.08	10.4
S4	77659	<0.05	0.06	0.3
S5	77660	4.7	<0.04	4850
S6	77661	2.3	<0.02	16.1
SB4	77912	1.1	<0.02	0.3
SB5	78340	1.3	0.06	0.6

Methods Used: EP Extraction Procedure EPA 1310
Metals Analysis by ICP EPA 6010

Approved: [signature] Date 2/3/88 Notebook _____
Page No. _____

WEYERHAEUSER TECHNOLOGY CENTER
Analytical Laboratories
Tacoma, Washington

REPORT

Service Request 13476

TACOMA/PIERCE COUNTY HEALTH DEPARTMENT
HALOGENATED HYDROCARBON RESULTS

Samples SB4 and SB5 were analyzed for halogenated hydrocarbons using WDOE 83-13 extraction and combustion procedures followed by ion chromatography and coulometric titration. The following results were found:

	SB4	SB5
Bromide	< 0.01%	< 0.01%
Chloride	< 0.01%	< 0.01%
Fluoride	< 0.01%	< 0.01%
Iodide	< 0.01%	< 0.01%

These results are based on the percent of as-received sample.

Approved _____ Date 2/1/88 Notebook _____

WEYERHAEUSER TECHNOLOGY CENTER
Analytical Laboratories
Tacoma, Washington

Service Request 13476

REPORT

DOE PAH CONTENT OF SB4 AND SB5 SAMPLES

DOE fraction #6 from the SB4 and SB5 samples were 9.6 and 3.2 percent respectively. Therefore they were submitted for analysis by HPLC. The HPLC chromatograms consisted of broad envelopes formed by the overlapping of many individual peaks. Only a small amount of peak structure was in evidence along the tops of the envelopes. It was not possible to definitely identify any of the priority pollutant PAH compounds in these chromatograms. The best we could do was to calculate the maximum amount of each PAH that could be present if it extended from the baseline to the top of the envelope at its normal elution time. This procedure probably exaggerates the actual amount of PAH present by 10 to 100 times. Only the much more sophisticated method, GC/MS, could resolve these identification and quantitation problems.

When we do the maximum PAH computation on the HPLC envelopes the following result is obtained:

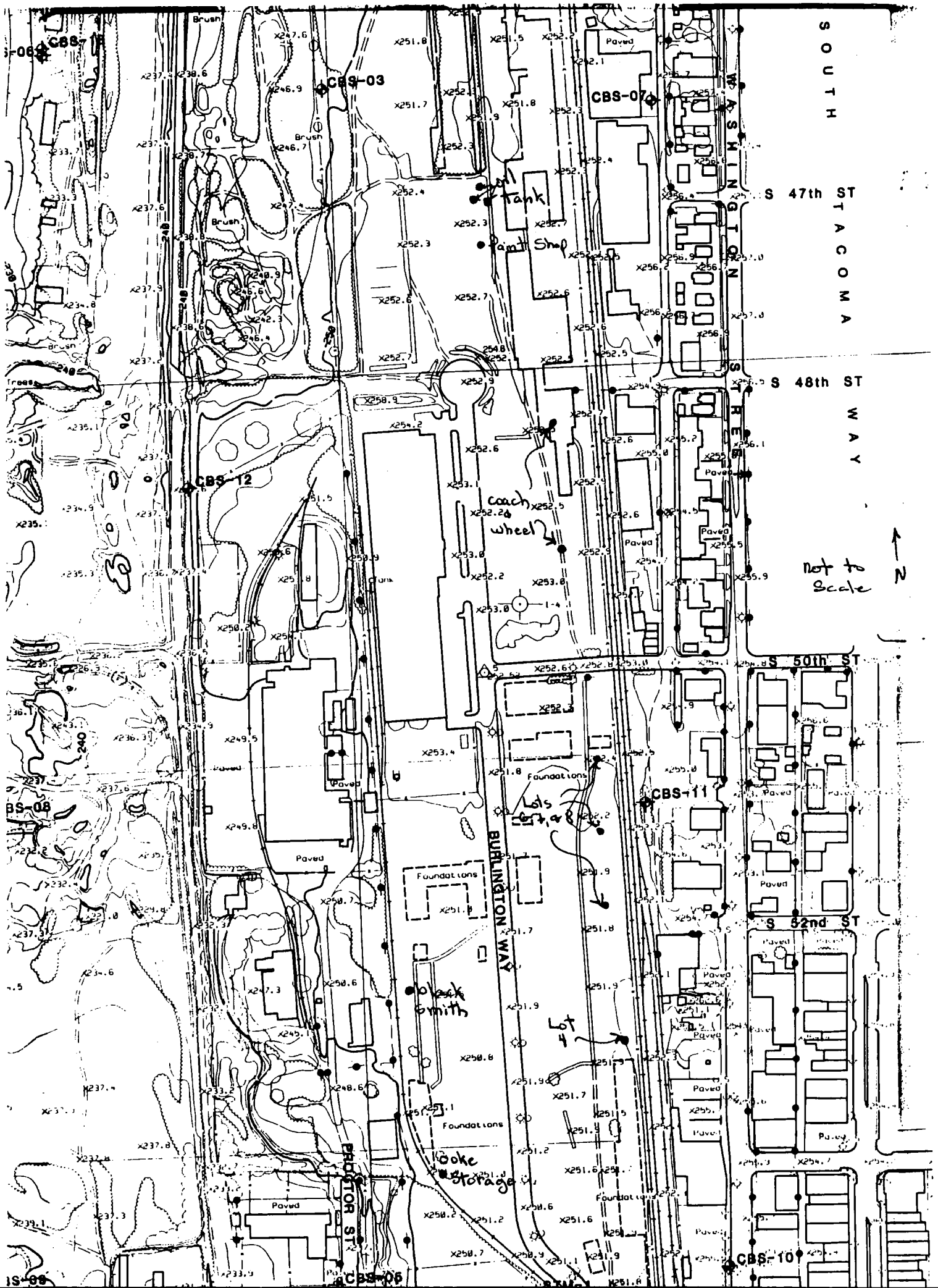
SB4 1.4 %
SB5 1.9 %

Approved E. E. Barnes Date 28FEB86 Notebook

E. E. Barnes

Page Number

APPENDIX F



SOUTH TACOMA WAY
WASHINGTON STREET
S 47th ST
S 48th ST
S 50th ST
S 52nd ST
BURLINGTON WAY
PROCTOR ST
CBS-03
CBS-07
CBS-12
CBS-11
CBS-10
CBS-05
CBS-08
Brush
Paved
Foundations
Tank
Paint Shop
coach wheel
Lots 6, 7, & 8
black smith
Lot 4
Cooke Storage
Not to Scale
N

TABLE 1
SOUTH TACOMA SOIL SAMPLES
** PRELIMINARY DATA **

PARAMETER	LOTS 6,7 & 8 TOTAL, MG/KG	LOT 4 TOT, MG/KG	LOT 4 EP TOX, MG/L	RCRA EP TOX LIMIT MG/L
ARSENIC	NA	NA	<0.2	5
BARIUM	120	140	0.3	100
CADMIUM	2.2	<0.5	<0.01	1
CHROMIUM	20	19	<0.1	5
LEAD	180	300	<0.1	5
MERCURY	0.4	0.3	<0.005	0.2
SELENIUM	NA	NA	<0.2	1
SILVER	<2	<2	<0.1	5

NA - ANALYSIS NOT YET COMPLETE

APPENDIX G

Laucks
Testing Laboratories, Inc.
940 South Harney St., Seattle, Washington 98108 (206)767-5060

Certificate

Chemistry, Microbiology, and Technical Services

CLIENT: Remediation Technology Inc.
19219 West Valley Hwy., Suite M103
Kent, WA 98032
ATTN: Lena Blais

LABORATORY NO. 2807

DATE: May 15, 1987

REPORT ON: SOIL/OIL

SAMPLE IDENTIFICATION: Submitted 03/10/87 and identified on the containers as shown below:

1) 27-45/27-46 03/10/87 0930
2) 27-48/27-47 03/10/87 0940
3) 27-50/27-49 03/10/87 1000
4) 27-60/27-59 03/10/87 1015
5) 27-60/27-59 03/10/87 1015
6) 27-66/27-65 03/10/87 1035
7) 27-72/27-71 03/10/87 1051
8) 27-75/27- 8 03/10/87 1110
9) 27-74/27-73 03/10/87 1125
10) 27-70/27-69 03/10/87 1145
11) 27-58/27-57 03/10/87 1255
12) 27-64/27-63 03/10/87 1300
13) 27-68/27-67 03/10/87 1310
14) SEP-60 30' N of 27-60 03/10/87 1010

TESTS PERFORMED AND RESULTS:

Samples were passed through a No. 10 sieve, with percent retained and description of retained matter shown below. Only material passing the sieve was analyzed, with exception that an aliquot for volatile organics was split off prior to sieving.

Sample No.	% Retained	Major Description	Minor Description
1	46.	Rock	----
2	45.	Rock	----
3	48.	Rock	----
4	34.	Rock	Wood
5	30.	Rock	----
6	69.	Rock	----
7	56.	Rock	Grass
8	49.	Rock	Bolt
9	78.	Rock	----
10	41.	Rock	----

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Sample No.	% Retained	Major Description	Minor Description
11	47.	Rock	Grass
12	45.	Rock	----
13	33.	Rock	----

	parts per million (mg/kg)
	14
PCB	<5.*

* Analysis was performed on the oil phase.

Samples were analyzed for priority pollutants in accordance with Test Methods for Evaluating Solid Waste (SW-846) U.S.E.P.A. 1982 Method 8240 (volatile organics), 8270 (semi-volatile extractables), and the 7000 series and/or 6010 (metals analysis).

	1	2	3	4	5
Total Solids, %	89.7	81.4	78.5	75.8	76.9
	parts per million (mg/kg), dry basis				
Antimony	14.	8.5	19.	21.	13.
Arsenic	9.6	16.	13.	38.	36.
Beryllium	0.4	0.6	0.7	0.7	0.6
Cadmium	0.6	1.1	1.0	3.8	3.8
Chromium	28.	32.	26.	35.	43.
Copper	260.	280.	120.	420.	300.
Lead	2300.	910.	1300.	2000.	2100.
Mercury	<0.1	0.1	<0.1	<0.1	<0.1
Nickel	34.	32.	22.	23.	23.
Selenium	<0.5	<0.5	<0.5	0.8	<0.5
Silver	<0.5	<0.5	<0.5	<0.5	<0.5
Thallium	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	130.	350.	120.	1700.	1400.

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	6	7	8	9	10
Total Solids, %	79.5	70.6	67.7	83.6	71.4
	parts per million (mg/kg), dry basis				
Antimony	6.4	11.	6.0	230.	11.
Arsenic	14.	33.	21.	11.	14.
Beryllium	0.9	0.8	0.6	0.5	0.7
Cadmium	0.8	2.6	1.4	3.0	3.2
Chromium	24.	36.	19.	82.	26.
Copper	120.	280.	180.	39000.	260.
Lead	210.	1100.	570.	9900.	780.
Mercury	<0.1	<0.1	<0.1	1.7	<0.1
Nickel	23.	39.	29.	210.	33.
Selenium	<0.5	<0.5	<0.5	<0.5	<0.5
Silver	<0.5	<0.5	<0.5	<0.5	<0.5
Thallium	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	130.	930.	260.	1800.	780.

	11	12	13	Lab Blank
Total Solids, %	68.7	87.3	70.3	---
	parts per million (mg/kg), dry basis			
Antimony	3.1	2.6	<2.5	<2.5
Arsenic	14.	4.4	5.7	<0.5
Beryllium	0.6	0.5	0.4	<0.1
Cadmium	0.8	<0.5	2.9	<0.5
Chromium	19.	24.	32.	<1.
Copper	36.	23.	32.	<1.
Lead	50.	34.	67.	<10.
Mercury	<0.1	<0.1	<0.1	<0.1
Nickel	22.	25.	28.	<2.
Selenium	0.8	<0.5	<0.5	<0.5
Silver	<0.5	<0.5	<0.5	<0.5
Thallium	<0.5	<0.5	<0.5	<0.5
Zinc	65.	53.	74.	3.

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parts per million (mg/kg), as received

	14
Antimony	3.5
Arsenic	<0.5
Beryllium	<0.1
Cadmium	<0.5
Chromium	<1.
Copper	1.
Lead	44.
Mercury	<0.1
Nickel	<2.
Selenium	<0.5
Silver	<0.5
Thallium	<0.5
Zinc	<1.

Volatile Organics (by GC/MS)

parts per billion (ug/kg), dry basis

	1	2	3	4	5	6
Chloromethane	<3.	<3.	<3.	<3.	<3.	<3.
Bromomethane	<3.	<3.	<3.	<3.	<3.	<3.
Vinyl Chloride	<3.	<3.	<3.	<3.	<3.	<3.
Chloroethane	<3.	<3.	<3.	<3.	<3.	<3.
Methylene Chloride	Trace1	Trace1	Trace1	24.	Trace1	Trace1
Acrolein	<15.	<15.	<15.	<15.	<15.	<15.
*Acetone	<3.	22.	56.	76.	61.	68.
Acrylonitrile	<15.	<15.	<15.	<15.	<15.	<15.
*Carbon Disulfide	<3.	<3.	<3.	<3.	<3.	<3.
1,1-Dichloroethylene	<3.	<3.	<3.	<3.	<3.	<3.
1,1-Dichloroethane	<3.	<3.	<3.	<3.	<3.	<3.
trans-1,2-Dichloroethylene	<3.	<3.	<3.	<3.	<3.	<3.
Chloroform	<3.	<3.	<3.	<3.	<3.	<3.
*2-Butanone	<3.	<3.	<3.	<3.	<3.	<3.
1,2-Dichloroethane	<3.	<3.	<3.	<3.	<3.	<3.
1,1,1-Trichloroethane	<3.	<3.	<3.	<3.	<3.	<3.
*Vinyl Acetate	<3.	<3.	<3.	<3.	<3.	<3.

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parts per billion (ug/kg), dry basis

	1	2	3	4	5	6
Bromodichloromethane	<3.	<3.	<3.	<3.	<3.	<3.
Carbon Tetrachloride	<3.	<3.	<3.	<3.	<3.	<3.
1,2-Dichloropropane	<3.	<3.	<3.	<3.	<3.	<3.
Trichloroethylene	<3.	<3.	<3.	<3.	<3.	<3.
Benzene	<3.	<3.	<3.	<3.	<3.	<3.
Chlorodibromomethane	<3.	<3.	<3.	<3.	<3.	<3.
1,1,2-Trichloroethane	<3.	<3.	<3.	<3.	<3.	<3.
2-Chloroethyl vinyl ether	<3.	<3.	<3.	<3.	<3.	<3.
Bromoform	<3.	<3.	<3.	<3.	<3.	<3.
*4-Methyl-2-pentanone	<3.	<3.	<3.	<3.	<3.	<3.
*2-Hexanone	<3.	<3.	<3.	<3.	<3.	<3.
1,1,2,2-Tetrachloroethane	<3.	<3.	<3.	<3.	<3.	<3.
Tetrachloroethylene	<3.	<3.	<3.	<3.	<3.	<3.
Toluene	<3.	<3.	<3.	<3.	<3.	<3.
Chlorobenzene	<3.	<3.	<3.	<3.	<3.	<3.
trans-1,3-Dichloropropene	<3.	<3.	<3.	<3.	<3.	<3.
Ethylbenzene	<3.	<3.	<3.	<3.	<3.	<3.
cis-1,3-Dichloropropene	<3.	<3.	<3.	<3.	<3.	<3.
*Styrene	<3.	<3.	<3.	<3.	<3.	<3.
*o-Xylene	<3.	<3.	<3.	<3.	<3.	<3.

	7	8	9	10	11
Chloromethane	<3.	<3.	<3.	<3.	<3.
Bromomethane	<3.	<3.	<3.	<3.	<3.
Vinyl Chloride	<3.	<3.	<3.	<3.	<3.
Chloroethane	<3.	<3.	<3.	<3.	<3.
Methylene Chloride	18.	Trace1	Trace1	Trace1	<3.
Acrolein	<15.	<15.	<15.	<15.	<15.
*Acetone	Trace1	Trace1	Trace1	<3.	<3.
Acrylonitrile	<15.	<15.	<15.	<15.	<15.
*Carbon Disulfide	<3.	<3.	<3.	<3.	<3.
1,1-Dichloroethylene	<3.	<3.	<3.	<3.	<3.
1,1-Dichloroethane	<3.	<3.	<3.	<3.	<3.
trans-1,2-Dichloroethylene	<3.	<3.	<3.	<3.	<3.
Chloroform	<3.	<3.	<3.	<3.	<3.

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Retec

LABORATORY NO. 2807

parts per billion (ug/kg), dry basis

	7	8	9	10	11
*2-Butanone	<3.	<3.	<3.	<3.	<3.
1,2-Dichloroethane	<3.	<3.	<3.	<3.	<3.
1,1,1-Trichloroethane	<3.	<3.	<3.	<3.	<3.
*Vinyl Acetate	<3.	<3.	<3.	<3.	<3.
Bromodichloromethane	<3.	<3.	<3.	<3.	<3.
Carbon Tetrachloride	<3.	<3.	<3.	<3.	<3.
1,2-Dichloropropane	<3.	<3.	<3.	<3.	<3.
Trichloroethylene	<3.	<3.	<3.	<3.	<3.
Benzene	<3.	<3.	<3.	<3.	<3.
Chlorodibromomethane	<3.	<3.	<3.	<3.	<3.
1,1,2-Trichloroethane	<3.	<3.	<3.	<3.	<3.
2-Chloroethyl vinyl ether	<3.	<3.	<3.	<3.	<3.
Bromoform	<3.	<3.	<3.	<3.	<3.
*4-Methyl-2-pentanone	<3.	<3.	<3.	<3.	<3.
*2-Hexanone	<3.	<3.	<3.	<3.	<3.
1,1,2,2-Tetrachloroethane	<3.	<3.	<3.	<3.	<3.
Tetrachloroethylene	Trace1	<3.	<3.	<3.	<3.
Toluene	<3.	<3.	<3.	<3.	<3.
Chlorobenzene	<3.	<3.	<3.	<3.	<3.
trans-1,3-Dichloropropene	<3.	<3.	<3.	<3.	<3.
Ethylbenzene	<3.	<3.	<3.	<3.	<3.
cis-1,3-Dichloropropene	<3.	<3.	<3.	<3.	<3.
*Styrene	<3.	<3.	<3.	<3.	<3.
*o-Xylene	<3.	<3.	<3.	<3.	<3.

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parts per billion (ug/kg), dry basis

	12	13	Lab Blank
Chloromethane	<3.	<3.	<1.
Bromomethane	<3.	<3.	<1.
Vinyl Chloride	<3.	<3.	<1.
Chloroethane	<3.	<3.	<1.
Methylene Chloride	Trace1	Trace1	<1.
Acrolein	<15.	<15.	<5.
*Acetone	<3.	88.	<1.
Acrylonitrile	<15.	<15.	<5.
*Carbon Disulfide	<3.	<3.	<1.
1,1-Dichloroethylene	<3.	<3.	<1.
1,1-Dichloroethane	<3.	<3.	<1.
trans-1,2-Dichloroethylene	<3.	<3.	<1.
Chloroform	<3.	<3.	<1.
*2-Butanone	<3.	<3.	<1.
1,2-Dichloroethane	<3.	<3.	<1.
1,1,1-Trichloroethane	<3.	<3.	<1.
*Vinyl Acetate	<3.	<3.	<1.
Bromodichloromethane	<3.	<3.	<1.
Carbon Tetrachloride	<3.	<3.	<1.
1,2-Dichloropropane	<3.	<3.	<1.
Trichloroethylene	<3.	<3.	<1.
Benzene	<3.	<3.	<1.
Chlorodibromomethane	<3.	<3.	<1.
1,1,2-Trichloroethane	<3.	<3.	<1.
2-Chloroethyl vinyl ether	<3.	<3.	<1.
Bromoform	<3.	<3.	<1.
*4-Methyl-2-pentanone	<3.	<3.	<1.
*2-Hexanone	<3.	<3.	<1.
1,1,2,2-Tetrachloroethane	<3.	<3.	<1.
Tetrachloroethylene	Trace1	<3.	<1.
Toluene	<3.	<3.	<1.
Chlorobenzene	<3.	<3.	<1.
trans-1,3-Dichloropropene	<3.	<3.	<1.
Ethylbenzene	<3.	<3.	<1.
cis-1,3-Dichloropropene	<3.	<3.	<1.
*Styrene	<3.	<3.	<1.
*o-Xylene	<3.	<3.	<1.

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Retec

LABORATORY NO. 2807

	parts per billion (ug/L)	parts per billion (ug/kg), as received
	14a	14b
Chloromethane	<5.	<1000.
Bromomethane	<5.	<1000.
Vinyl Chloride	<5.	<1000.
Chloroethane	<5.	<1000.
Methylene Chloride	Trace2	<1000.
Acrolein	<25.	<5000.
*Acetone	130.	<1000.
Acrylonitrile	<25.	<5000.
*Carbon Disulfide	<5.	<1000.
1,1-Dichloroethylene	<5.	<1000.
1,1-Dichloroethane	<5.	<1000.
trans-1,2-Dichloroethylene	<5.	<1000.
Chloroform	<5.	<1000.
*2-Butanone	Trace2	<1000.
1,2-Dichloroethane	<5.	<1000.
1,1,1-Trichloroethane	<5.	<1000.
*Vinyl Acetate	<5.	<1000.
Bromodichloromethane	<5.	<1000.
Carbon Tetrachloride	<5.	<1000.
1,2-Dichloropropane	<5.	<1000.
Trichloroethylene	<5.	<1000.
Benzene	<5.	<1000.
Chlorodibromomethane	<5.	<1000.
1,1,2-Trichloroethane	<5.	<1000.
2-Chloroethyl vinyl ether	<5.	<1000.
Bromoform	<5.	<1000.
*4-Methyl-2-pentanone	<5.	<1000.
*2-Hexanone	<5.	<1000.
1,1,2,2-Tetrachloroethane	<5.	<1000.
Tetrachloroethylene	<5.	<1000.
Toluene	<5.	<1000.
Chlorobenzene	<5.	<1000.
trans-1,3-Dichloropropene	<5.	<1000.
Ethylbenzene	<5.	<1000.
cis-1,3-Dichloropropene	<5.	<1000.
*Styrene	<5.	<1000.
*o-Xylene	<5.	<1000.

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Chemistry, Microbiology, and Technical Services

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LABORATORY NO. 2807

Extractables (by GC/MS)

parts per billion (ug/kg), dry basis

	1	2	3	4	5	6	7
N-nitrosodimethylamine	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Bis(2-chloroethyl)ether	<50.	<50.	<260.	<54.	<53.	<52.	<120.
2-Chlorophenol	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Phenol	<50.	<50.	<260.	<54.	<53.	<52.	<120.
1,3-Dichlorobenzene	<50.	<50.	<260.	<54.	<53.	<52.	<120.
1,4-Dichlorobenzene	<50.	<50.	<260.	<54.	<53.	<52.	<120.
1,2-Dichlorobenzene	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Bis(2-chloroisopropyl)ether	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Hexachloroethane	<50.	<50.	<260.	<54.	<53.	<52.	<120.
N-nitroso-di-n-propylamine	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Nitrobenzene	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Isophorone	<50.	<50.	<260.	<54.	<53.	<52.	<120.
2-Nitrophenol	<50.	<50.	<260.	<54.	<53.	<52.	<120.
2,4-Dimethylphenol	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Bis(2-chloroethoxy)methane	<50.	<50.	<260.	<54.	<53.	<52.	<120.
2,4-Dichlorophenol	<50.	<50.	<260.	<54.	<53.	<52.	<120.
1,2,4-Trichlorobenzene	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Naphthalene	<50.	110.	<260.	180.	220.	130.	220.
Hexachlorobutadiene	<50.	<50.	<260.	<54.	<53.	<52.	<120.
4-Chloro-m-cresol	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Hexachlorocyclopentadiene	<50.	<50.	<260.	<54.	<53.	<52.	<120.
2,4,6-Trichlorophenol	<50.	<50.	<260.	<54.	<53.	<52.	<120.
2-Chloronaphthalene	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Acenaphthylene	<50.	260.	2900.	<54.	<53.	<52.	<120.
Dimethylphthalate	<50.	<50.	<260.	<54.	<53.	<52.	<120.
2,6-Dinitrotoluene	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Acenaphthene	<50.	<50.	<260.	<54.	<53.	<52.	<120.
2,4-Dinitrophenol	<50.	<50.	<260.	<54.	<53.	<52.	<120.
2,4-Dinitrotoluene	<50.	<50.	<260.	<54.	<53.	<52.	<120.
4-Nitrophenol	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Fluorene	<50.	76.	<260.	<54.	<53.	<52.	<120.
4-Chlorophenyl phenyl ether	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Diethylphthalate	<50.	<50.	<260.	<54.	<53.	<52.	<120.
4,6-Dinitro-o-cresol	<50.	<50.	<260.	<54.	<53.	<52.	<120.
1,2-Diphenylhydrazine	<50.	<50.	<260.	<54.	<53.	<52.	<120.

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	1	2	3	4	5	6	7
4-Bromophenyl phenyl ether	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Hexachlorobenzene	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Pentachlorophenol	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Phenanthrene	110.	790.	440.	480.	460.	300.	840.
Anthracene	74.	600.	430.	66.	57.	78.	150.
Dibutylphthalate	<50.	180.	<260.	<54.	180.	<52.	<120.
Fluoranthene	130.	1100.	1000.	190.	190.	320.	1000.
Pyrene	180.	1600.	1400.	220.	250.	310.	900.
Benzidine	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Butyl benzyl phthalate	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Benzo(a)anthracene	<50.	610.	2100.	<54.	<53.	<52.	<120.
Chrysene	160.	1100.	4200.	240.	300.	170.	<120.
3,3'-Dichlorobenzidine	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Bis(2-ethylhexyl)phthalate	<50.	170.	<260.	140.	110.	120.	130.
N-nitrosodiphenylamine	<50.	<50.	<260.	<54.	<53.	<52.	<120.
Di-n-octyl phthalate	<50.	<50.	<260.	<54.	<53.	<52.	270.
Benzo(b)fluoranthene	350.	2500.	4800.	220.	250.	280.	510.
Benzo(k)fluoranthene	****	****	****	****	****	****	****
Benzo(a)pyrene	220.	1200.	2500.	130.	140.	160.	490.
Indeno(1,2,3-cd)pyrene	<50.	740.	2900.	<54.	<53.	<52.	190.
Dibenzo(ah)anthracene	<50.	300.	660.	<54.	<53.	<52.	<120.
Benzo(ghi)perylene	180.	730.	2600.	<54.	<53.	<52.	230.
*Aniline	<50.	<50.	<260.	<54.	<53.	<52.	<120.
*Benzoic Acid	430.	600.	<260.	540.	<53.	510.	920.
*Benzyl Alcohol	<50.	<50.	<260.	<54.	<53.	<52.	<120.
*4-Chloroaniline	<50.	<50.	<260.	<54.	<53.	<52.	<120.
*Dibenzofuran	<50.	82.	<260.	89.	110.	84.	<120.
*2-Methylnaphthalene	<50.	88.	<260.	270.	250.	170.	260.
*2-Methylphenol	<50.	<50.	<260.	<54.	<53.	<52.	<120.
*4-Methylphenol	<50.	<50.	<260.	<54.	<53.	<52.	<120.
*2-Nitroaniline	<50.	<50.	<260.	<54.	<53.	<52.	<120.
*3-Nitroaniline	<50.	<50.	<260.	<54.	<53.	<52.	<120.
*4-Nitroaniline	<50.	<50.	<260.	<54.	<53.	<52.	<120.
*2,4,5-Trichlorophenol	<50.	<50.	<260.	<54.	<53.	<52.	<120.

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	8	9	10	11	12	13	Lab Blank
N-nitrosodimethylamine	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Bis(2-chloroethyl)ether	<120.	<50.	<120.	<60.	<50.	<60.	<50.
2-Chlorophenol	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Phenol	<120.	<50.	<120.	<60.	<50.	<60.	<50.
1,3-Dichlorobenzene	<120.	<50.	<120.	<60.	<50.	<60.	<50.
1,4-Dichlorobenzene	<120.	<50.	<120.	<60.	<50.	<60.	<50.
1,2-Dichlorobenzene	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Bis(2-chloroisopropyl)ether	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Hexachloroethane	<120.	<50.	<120.	<60.	<50.	<60.	<50.
N-nitroso-di-n-propylamine	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Nitrobenzene	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Isophorone	<120.	<50.	<120.	<60.	<50.	<60.	<50.
2-Nitrophenol	<120.	<50.	<120.	<60.	<50.	<60.	<50.
2,4-Dimethylphenol	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Bis(2-chloroethoxy)methane	<120.	<50.	<120.	<60.	<50.	<60.	<50.
2,4-Dichlorophenol	<120.	<50.	<120.	<60.	<50.	<60.	<50.
1,2,4-Trichlorobenzene	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Naphthalene	<120.	<50.	350.	<60.	<50.	<60.	<50.
Hexachlorobutadiene	<120.	<50.	<120.	<60.	<50.	<60.	<50.
4-Chloro-m-cresol	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Hexachlorocyclopentadiene	<120.	<50.	<120.	<60.	<50.	<60.	<50.
2,4,6-Trichlorophenol	<120.	<50.	<120.	<60.	<50.	<60.	<50.
2-Chloronaphthalene	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Acenaphthylene	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Dimethylphthalate	<120.	<50.	<120.	<60.	<50.	<60.	<50.
2,6-Dinitrotoluene	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Acenaphthene	<120.	<50.	<120.	<60.	<50.	<60.	<50.
2,4-Dinitrophenol	<120.	<50.	<120.	<60.	<50.	<60.	<50.
2,4-Dinitrotoluene	<120.	<50.	<120.	<60.	<50.	<60.	<50.
4-Nitrophenol	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Fluorene	<120.	<50.	<120.	<60.	<50.	<60.	<50.
4-Chlorophenyl phenyl ether	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Diethylphthalate	<120.	<50.	<120.	<60.	<50.	<60.	<50.
4,6-Dinitro-o-cresol	<120.	<50.	<120.	<60.	<50.	<60.	<50.
1,2-Diphenylhydrazine	<120.	<50.	<120.	<60.	<50.	<60.	<50.
4-Bromophenyl phenyl ether	<120.	<50.	<120.	<60.	<50.	<60.	<50.

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	8	9	10	11	12	13	Lab Blank
Hexachlorobenzene	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Pentachlorophenol	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Phenanthrene	280.	<50.	420.	<60.	<50.	<60.	<50.
Anthracene	<120.	<50.	200.	<60.	<50.	<60.	<50.
Dibutylphthalate	200.	<50.	<120.	140.	<50.	<60.	165.
Fluoranthene	200.	56.	420.	<60.	69.	<60.	<50.
Pyrene	190.	<50.	360.	<60.	57.	<60.	<50.
Benzidine	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Butyl benzyl phthalate	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Benzo(a)anthracene	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Chrysene	230.	<50.	510.	<60.	81.	<60.	<50.
3,3'-Dichlorobenzidine	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Bis(2-ethylhexyl)phthalate	<120.	<50.	<120.	<60.	<50.	120.	<50.
N-nitrosodiphenylamine	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Di-n-octyl phthalate	<120.	250.	210.	1100.	61.	<60.	<50.
Benzo(b)fluoranthene	370.	85.	1000.	<60.	150.	<60.	<50.
Benzo(k)fluoranthene	****	****	****	****	****	****	<50.
Benzo(a)pyrene	150.	<50.	370.	<60.	69.	<60.	<50.
Indeno(1,2,3-cd)pyrene	<120.	<50.	150.	<60.	<50.	<60.	<50.
Dibenzo(ah)anthracene	<120.	<50.	<120.	<60.	<50.	<60.	<50.
Benzo(ghi)perylene	<120.	<50.	190.	<60.	<50.	<60.	<50.
*Aniline	<120.	<50.	<120.	<60.	<50.	<60.	<50.
*Benzoic Acid	<120.	350.	<120.	<60.	310.	890.	<50.
*Benzyl Alcohol	<120.	<50.	<120.	<60.	<50.	<60.	<50.
*4-Chloroaniline	<120.	<50.	<120.	<60.	<50.	<60.	<50.
*Dibenzofuran	<120.	<50.	140.	<60.	<50.	<60.	<50.
*2-Methylnaphthalene	220.	<50.	360.	<60.	<50.	<60.	<50.
*2-Methylphenol	<120.	<50.	<120.	<60.	<50.	<60.	<50.
*4-Methylphenol	<120.	<50.	<120.	<60.	<50.	<60.	<50.
*2-Nitroaniline	<120.	<50.	<120.	<60.	<50.	<60.	<50.
*3-Nitroaniline	<120.	<50.	<120.	<60.	<50.	<60.	<50.
*4-Nitroaniline	<120.	<50.	<120.	<60.	<50.	<60.	<50.
*2,4,5-Trichlorophenol	<120.	<50.	<120.	<60.	<50.	<60.	<50.

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	14	Lab Blank
N-nitrosodimethylamine	<2000.	<200.
Bis(2-chloroethyl)ether	<2000.	<200.
2-Chlorophenol	<2000.	<200.
Phenol	<2000.	<200.
1,3-Dichlorobenzene	<2000.	<200.
1,4-Dichlorobenzene	<2000.	<200.
1,2-Dichlorobenzene	<2000.	<200.
Bis(2-chloroisopropyl)ether	<2000.	<200.
Hexachloroethane	<2000.	<200.
N-nitroso-di-n-propylamine	<2000.	<200.
Nitrobenzene	<2000.	<200.
Isophorone	<2000.	<200.
2-Nitrophenol	<2000.	<200.
2,4-Dimethylphenol	<2000.	<200.
Bis(2-chloroethoxy)methane	<2000.	<200.
2,4-Dichlorophenol	<2000.	<200.
1,2,4-Trichlorobenzene	<2000.	<200.
Naphthalene	<2000.	<200.
Hexachlorobutadiene	<2000.	<200.
4-Chloro-m-cresol	<2000.	<200.
Hexachlorocyclopentadiene	<2000.	<200.
2,4,6-Trichlorophenol	<2000.	<200.
2-Chloronaphthalene	<2000.	<200.
Acenaphthylene	<2000.	<200.
Dimethylphthalate	<2000.	<200.
2,6-Dinitrotoluene	<2000.	<200.
Acenaphthene	<2000.	<200.
2,4-Dinitrophenol	<2000.	<200.
2,4-Dinitrotoluene	<2000.	<200.
4-Nitrophenol	<2000.	<200.
Fluorene	3800.	<200.
4-Chlorophenyl phenyl ether	<2000.	<200.
Diethylphthalate	<2000.	<200.
4,6-Dinitro-o-cresol	<2000.	<200.
1,2-Diphenylhydrazine	<2000.	<200.
4-Bromophenyl phenyl ether	<2000.	<200.
Hexachlorobenzene	<2000.	<200.

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parts per billion (ug/L), as received basis

	14	Lab Blank
Pentachlorophenol	<2000.	<200.
Phenanthrene	18000.	<200.
Anthracene	<2000.	<200.
Dibutylphthalate	<2000.	200.
Fluoranthene	<2000.	<200.
Pyrene	<2000.	<200.
Benzidine	<2000.	<200.
Butyl benzyl phthalate	<2000.	<200.
Benzo(a)anthracene	<2000.	<200.
Chrysene	5200.	<200.
3,3'-Dichlorobenzidine	<2000.	<200.
Bis(2-ethylhexyl)phthalate	<2000.	<200.
N-nitrosodiphenylamine	<2000.	<200.
Di-n-octyl phthalate	<2000.	<200.
Benzo(b)fluoranthene	<2000.	<200.
Benzo(k)fluoranthene	<2000.	<200.
Benzo(a)pyrene	<2000.	<200.
Indeno(1,2,3-cd)pyrene	<2000.	<200.
Dibenzo(ah)anthracene	<2000.	<200.
Benzo(ghi)perylene	<2000.	<200.
*Aniline	<2000.	<200.
*Benzoic Acid	<2000.	<200.
*Benzyl Alcohol	<2000.	<200.
*4-Chloroaniline	<2000.	<200.
*Dibenzofuran	<2000.	<200.
*2-Methylnaphthalene	<2000.	<200.
*2-Methylphenol	<2000.	<200.
*4-Methylphenol	<2000.	<200.
*2-Nitroaniline	<2000.	<200.
*3-Nitroaniline	<2000.	<200.
*4-Nitroaniline	<2000.	<200.
*2,4,5-Trichlorophenol	<2000.	<200.

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Key

* = additional compounds from the EPA's Hazardous Substances List
**** = Benzo (b) fluoranthene and Benzo (k) fluoranthene reported as one compound
< = "less than"
trace1 = an unquantifiable amount between 3-15 parts per billion (ug/kg).
trace2 = an unquantifiable amount between 5-25 parts per billion (ug/L).
14a = analysis on water phase
14b = analysis on oil phase

Note:

Benzoic acid "hits" reported may be due to contaminated sample collection jars supplied to Laucks by an outside vendor. Analyses are currently in progress to verify this.

Attachments:

Appendix A: Surrogate Recovery
Appendix B: Matrix Spike Inorganics/Organics
Appendix C: Tentatively Identified Compounds
Appendix D: Chain of Custody

Respectfully submitted,

Laucks Testing Laboratories, Inc.

J.M. Owens

J.M. Owens

JMO:jm

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APPENDIX A

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction and analysis to monitor for matrix effects, purging efficiency, and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types.

Sample No.	Surrogate Compound	Spike Level	Spike Found	% Recovery	Control Limit
		parts per billion (ug/kg), dry basis			
Method Blank	d4-1,2-Dichloroethane	50.	46.6	93.2	50-160
	d8-Toluene	50.	49.2	98.4	50-160
	p-Bromofluorobenzene	50.	47.2	94.4	50-160
1	d4-1,2-Dichloroethane	78.4	73.8	94.1	50-160
	d8-Toluene	78.4	75.3	96.0	50-160
	p-Bromofluorobenzene	78.4	63.7	81.3	50-160
2	d4-1,2-Dichloroethane	93.1	87.1	93.6	50-160
	d8-Toluene	93.1	86.8	93.2	50-160
	p-Bromofluorobenzene	93.1	77.5	83.2	50-160
3	d4-1,2-Dichloroethane	95.4	93.2	97.7	50-160
	d8-Toluene	95.4	87.4	91.6	50-160
	p-Bromofluorobenzene	95.4	67.1	70.3	50-160
4	d4-1,2-Dichloroethane	92.1	101.	110.	50-160
	d8-Toluene	92.1	82.0	89.0	50-160
	p-Bromofluorobenzene	92.1	63.0	68.4	50-160
5	d4-1,2-Dichloroethane	98.2	106.	108.	50-160
	d8-Toluene	98.2	89.9	91.5	50-160
	p-Bromofluorobenzene	98.2	63.2	64.4	50-160

This report is submitted for the exclusive use of the person, partnership, or corporation to whom it is addressed. Subsequent use of the name of this company or any member of its staff in connection with the advertising or sale of any product or process will be granted only on contract. This company accepts no responsibility except for the due performance of inspection and/or analysis in good faith and according to the rules of the trade and of science.

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Chemistry, Microbiology, and Technical Services

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Retec

LABORATORY NO. 2807

Sample No.	Surrogate Compound	Spike Level	Spike Found	% Recovery	Control Limit
		parts per billion (ug/kg), dry basis			
Method Blank	d4-1,2-Dichloroethane	50.	51.0	102.	50-160
	d8-Toluene	50.	49.9	99.8	50-160
	p-Bromofluorobenzene	50.	47.3	94.6	50-160
6	d4-1,2-Dichloroethane	95.6	97.5	102.	50-160
	d8-Toluene	95.6	90.3	94.5	50-160
	p-Bromofluorobenzene	95.6	75.3	78.8	50-160
7	d4-1,2-Dichloroethane	107.	106.	99.1	50-160
	d8-Toluene	107.	101.	94.4	50-160
	p-Bromofluorobenzene	107.	70.5	65.9	50-160
8	d4-1,2-Dichloroethane	113.	110.	97.3	50-160
	d8-Toluene	113.	105.	92.9	50-160
	p-Bromofluorobenzene	113.	84.6	74.9	50-160
9	d4-1,2-Dichloroethane	64.2	65.4	102.	50-160
	d8-Toluene	64.2	61.2	95.3	50-160
	p-Bromofluorobenzene	64.2	52.7	82.1	50-160
10	d4-1,2-Dichloroethane	98.4	100.	102.	50-160
	d8-Toluene	98.4	94.8	96.3	50-160
	p-Bromofluorobenzene	98.4	70.5	71.6	50-160
11	d4-1,2-Dichloroethane	121.	123.	102.	50-160
	d8-Toluene	121.	112.	92.6	50-160
	p-Bromofluorobenzene	121.	85.7	70.8	50-160
12	d4-1,2-Dichloroethane	87.8	89.1	101.	50-160
	d8-Toluene	87.8	84.5	96.2	50-160
	p-Bromofluorobenzene	87.8	65.0	74.0	50-160
13	d4-1,2-Dichloroethane	87.8	87.5	99.7	50-160
	d8-Toluene	87.8	82.4	93.8	50-160
	p-Bromofluorobenzene	87.8	72.3	82.3	50-160

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LABORATORY NO. 2807

Sample No.	Surrogate Compound	Spike Level	Spike Found	% Recovery	Control Limit
		parts per billion (ug/kg), dry basis			
Method Blank	d4-1,2-Dichloroethane	50.	50.2	100.	50-160
	d8-Toluene	50.	47.4	94.8	50-160
	p-Bromofluorobenzene	50.	46.0	92.0	50-160
14 water phase	d4-1,2-Dichloroethane	50.	53.4	107.	50-160
	d8-Toluene	50.	48.6	97.2	50-160
	p-Bromofluorobenzene	50.	46.8	93.6	50-160
Method Blank	d4-1,2-Dichloroethane	50.	51.7	103.	50-160
	d8-Toluene	50.	48.5	97.0	50-160
	p-Bromofluorobenzene	50.	45.6	91.2	50-160
14 oil phase	d4-1,2-Dichloroethane	49000.	48400.	98.8	50-160
	d8-Toluene	49000.	48800.	99.6	50-160
	p-Bromofluorobenzene	49000.	45400.	92.7	50-160
2MS	d4-1,2-Dichloroethane	93.1	96.6	104.	50-160
	d8-Toluene	93.1	88.6	103.	50-160
	p-Bromofluorobenzene	93.1	73.3	78.8	50-160
2MSD	d4-1,2-Dichloroethane	93.1	90.5	97.2	50-160
	d8-Toluene	93.1	86.2	92.6	50-160
	p-Bromofluorobenzene	93.1	76.1	81.8	50-160

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LABORATORY NO. 2807

APPENDIX B

Matrix Spike/Matrix Spike Duplicate Report

Inorganics/Metals Analyses

parts per million (mg/kg), dry basis — mg/kg

Sample	Analyte	Spike Added	Sample Result	MS Result	% Rec	MSD Result	% Rec	RPD
5	Mercury	0.50	<0.1	0.4	78.	0.4	7.2	8.
7	Thallium	2.5	<0.5	2.3	92.	2.2	86.	6.7
8	Antimony	25.	6.0	14.	32.	20.	58.	58.
8	Beryllium	2.5	0.6	2.7	82.	2.6	82.	0.
8	Cadmium	2.5	1.4	4.2	111.	3.8	97.	13.
8	Chromium	25.	19.	41.	87.	41.	87.	0.
8	Copper	170.	250.	350.	73.*	370.	80.	9.
8	Lead	610.	1000.	1400.	79.	1400.	81.	2.
8	Nickel	25.	29.	55.	101.	51.	86.	16.
8	Silver	<0.5	10.	5.1	51.	5.2	52.	2.
8	Zinc	260.	250.	420.	65.*	440.	75.	14.
13	Selenium	2.5	<0.5	2.6	104.	2.5	100.	4.

parts per million (mg/kg), as received — mg/kg

14	Arsenic	5.0	<0.5	4.6	92.	4.0	80.	14.	none established

MS = Matrix Spike
MSD = Matrix Spike Duplicate
Rec = Recovery
RPD = Relative Percent Difference

* Samples are spiked prior to preparation and analysis at a level deemed to be generally appropriate to the average sample processed in the laboratory. In this case, the level of analyte already present in the sample was large enough to make an accurate determination of spike recovery impossible.

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Lake Testing Laboratories, Inc.

Sample Type: Low Soil
Lab No: 2507
Client: Retec
CC Logged:

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction to monitor for matrix effects and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types. In certain cases, we will have accumulated insufficient data to have established control limits.

Sample Number: 1RI Reported Values in Units of: ug/kg

Sample DWE: 27.6 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	3623	3370	93.0	25-121
d5-Phenol	3623	2431	67.1	24-113
2-Bromophenol	3623	2264	62.5	44-112
2,4,6-Tribromophenol	3623	3649	100.7	19-122
d5-Nitrobenzene	1812	1953	107.8	23-120
2-Fluorobiphenyl	1812	1650	91.1	30-115
d10-Azobenzene	1812	1363	75.3	60-126
d14-p-Terphenyl	1812	1839	101.5	18-137

Sample Number: 4RI Reported Values in Units of: ug/kg

Sample DWE: 23.2 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4710	3974	84.3	25-121
d5-Phenol	4710	3475	73.7	24-113
2-Bromophenol	4710	3541	75.2	44-112
2,4,6-Tribromophenol	4710	5668	121.5 *	19-122
d5-Nitrobenzene	2355	1994	92.5	23-120
2-Fluorobiphenyl	2355	2066	93.1	30-115
d10-Azobenzene	2355	2773	117.6	60-126
d14-p-Terphenyl	2355	2744	127.7	18-137

Sample Number: 2RI Reported Values in Units of: ug/kg

Sample DWE: 24.5 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4082	3522	86.3	25-121
d5-Phenol	4082	2580	67.7	24-113
2-Bromophenol	4082	3367	82.5	44-112
2,4,6-Tribromophenol	4082	4763	116.7	19-122
d5-Nitrobenzene	2041	1969	96.5	23-120
2-Fluorobiphenyl	2041	1912	93.7	30-115
d10-Azobenzene	2041	2131	104.4	60-126
d14-p-Terphenyl	2041	2414	118.3	18-137

Sample Number: 5RI Reported Values in Units of: ug/kg

Sample DWE: 23.7 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4219	2852	68.0	25-121
d5-Phenol	4219	2627	62.5	24-113
2-Bromophenol	4219	2641	62.6	44-112
2,4,6-Tribromophenol	4219	4495	106.4	19-122
d5-Nitrobenzene	2110	1730	82.0	23-120
2-Fluorobiphenyl	2110	1658	78.6	30-115
d10-Azobenzene	2110	1957	92.8	60-126
d14-p-Terphenyl	2110	2259	107.1	18-137

[illegible] Testing Laboratories, Inc.

Sample Type: Low Soil
Lab No: 2267
Client: Reter
GC Logged:

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction to monitor for matrix effects and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types. In certain cases, we will have accumulated insufficient data to have established control limits.

03165061

Sample Number: MB Reported Values in Units of: ug/kg

Sample DWB: 30.0 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	3333	2853	85.6	25-121
d5-Phenol	3333	3060	91.8	24-113
2-Bromophenol	3333	2610	78.3	44-112
2,4,6-Tribromophenol	3333	2927	87.8	19-122
d5-Nitrobenzene	1667	1390	83.4	23-120
2-Fluorobiphenyl	1667	1222	73.4	30-115
d10-Azobenzene	1667	1553	93.2	60-126
d14-p-Terphenyl	1667	2080	124.8	18-137

Sample Number: 10MB Reported Values in Units of: ug/kg

Sample DWB: 10.6 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	9434	8642	91.6	25-121
d5-Phenol	9434	8434	89.4	24-113
2-Bromophenol	9434	8226	87.2	44-112
2,4,6-Tribromophenol	9434	10245	108.6	19-122
d5-Nitrobenzene	4717	4349	92.2	23-120
2-Fluorobiphenyl	4717	3877	82.2	30-115
d10-Azobenzene	4717	4292	91.0	60-126
d14-p-Terphenyl	4717	5066	107.4	18-137

Sample Number: 13 Reported Values in Units of: ug/kg

Sample DWB: 21.2 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4717	4099	86.9	25-121
d5-Phenol	4717	4099	86.9	24-113
2-Bromophenol	4717	4120	87.4	44-112
2,4,6-Tribromophenol	4717	5410	114.7	19-122
d5-Nitrobenzene	2358	2142	90.8	23-120
2-Fluorobiphenyl	2358	2061	87.4	30-115
d10-Azobenzene	2358	2189	92.8	60-126
d14-p-Terphenyl	2358	2533	107.4	18-137

Sample Number: 13MS Reported Values in Units of: ug/kg

Sample DWB: 10.6 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	9259	7731	83.5	25-121
d5-Phenol	9259	7972	86.1	24-113
2-Bromophenol	9259	7963	86.0	44-112
2,4,6-Tribromophenol	9259	10324	111.5	19-122
d5-Nitrobenzene	4630	4046	87.4	23-120
2-Fluorobiphenyl	4630	3991	86.2	30-115
d10-Azobenzene	4630	4120	89.0	60-126
d14-p-Terphenyl	4630	4835	104.4	18-137

Laucks Testing Laboratories, Inc.

Sample Type: Low Soil
Lab No: 2807
Client: Retec
QC Logged:

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction to monitor for matrix effects and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types. In certain cases, we will have accumulated insufficient data to have established control limits.

1:5 dilu

Sample # 3RI Reported Values in Units of: ug/kg

Sample DWE: 23.6 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4237	4674	110.3	25-121
d5-Phenol	4237	4436	104.7	24-113
2-Bromophenol	4237	4093	96.6	44-112
2,4,6-Tribomophenol	4237	5229	123.4*	19-122
d5-Nitrobenzene	2119	2449	115.6	23-120
2-Fluorobiphenyl	2119	2487	117.4*	30-115
d10-Azobenzene	2119	1008	47.6	60-126
d14-p-Terphenyl	2119	1814	85.6	18-137

1:2 dilu

Sample Number: 8 Reported Values in Units of: ug/kg

Sample DWE: 20.5 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4878	3380	69.3	25-121
d5-Phenol	4878	2995	61.4	24-113
2-Bromophenol	4878	2834	58.1	44-112
2,4,6-Tribromophenol	4878	4546	93.2	19-122
d5-Nitrobenzene	2439	2032	83.3	23-120
2-Fluorobiphenyl	2439	2009	82.4	30-115
d10-Azobenzene	2439	2215	90.8	60-126
d14-p-Terphenyl	2439	1902	78.0	18-137

1:2 dilu

Sample Number: 7 Reported Values in Units of: ug/kg

Sample DWE: 21.2 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4717	2915	61.8	25-121
-Phenol	4717	3080	65.3	24-113
2-Bromophenol	4717	3094	65.6	44-112
2,4,6-Tribromophenol	4717	4142	87.8	19-122
d5-Nitrobenzene	2358	1941	82.3	23-120
2-Fluorobiphenyl	2358	1868	79.2	30-115
d10-Azobenzene	2358	2038	86.4	60-126
d14-p-Terphenyl	2358	1769	75.0	18-137

Sample Number: 12RI Reported Values in Units of: ug/kg

Sample DWE: 26.4 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	3788	3420	90.3	25-121
d5-Phenol	3788	2970	78.4	24-113
2-Bromophenol	3788	2701	71.3	44-112
2,4,6-Tribromophenol	3788	4280	113.0	19-122
d5-Nitrobenzene	1894	2017	106.5	23-120
2-Fluorobiphenyl	1894	1722	90.9	30-115
d10-Azobenzene	1894	1930	101.9	60-126
d14-p-Terphenyl	1894	1684	88.9	18-137

Laboratory Testing Laboratories, Inc.

Sample Type: Water/Oil
Lab No: 2207
Client: Retec
QC Logged:

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction to monitor for matrix effects and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types. In certain cases, we will have accumulated insufficient data to have established control limits.

Sample Number: MB/14;Reported Values in Units of: ug/l

Sample Volume: 0.005 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	40000	26360	65.9	21-100
d5-Phenol	40000	24414	61.0	10-94
2-Bromophenol	40000	26320	65.8	---
2,4,6-Tribromophenol	40000	33026	82.6	10-123
d5-Nitrobenzene	20000	15544	77.7	35-114
2-Fluorobiphenyl	20000	14072	70.4	43-116
d10-Azobenzene	20000	14062	70.3	---
d14-p-Terphenyl	20000	16820	84.1	33-141

Sample Number: 14(x10Reported Values in Units of: ug/l

Sample Volume: 0.005 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	40000	18680	46.7	21-100
d5-Phenol	40000	25720	64.3	10-94
2-Bromophenol	40000	31960	79.9	---
2,4,6-Tribromophenol	40000	32060	80.2	10-123
d5-Nitrobenzene	20000	17780	88.9	35-114
2-Fluorobiphenyl	20000	21540	107.7	43-116
d10-Azobenzene	20000	14240	71.2	---
d14-p-Terphenyl	20000	17280	86.4	33-141

Laboratory Testing Laboratories, Inc.

Sample Type: Low Soil
Lab No: 2847
Client: Reter
GC Logged:

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction to monitor for matrix effects and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types. In certain cases, we will have accumulated insufficient data to have established control limits.

Sample Number: 6 Reported Values in Units of: ug/kg

Sample DWE: 24.1 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4150	3222	77.6	25-121
d5-Phenol	4150	3063	73.8	24-113
2-Bromophenol	4150	3026	72.9	44-112
2,4,6-Tribromophenol	4150	4569	110.1	19-122
d5-Nitrobenzene	2075	1797	86.6	23-120
2-Fluorobiphenyl	2075	1814	87.4	30-115
d10-Azobenzene	2075	2013	97.0	60-125
d14-p-Terphenyl	2075	2251	108.5	18-137

Sample Number: 11 Reported Values in Units of: ug/kg

Sample DWE: 26.7 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4828	2689	55.7	25-121
d5-Phenol	4828	2327	48.2	24-113
2-Bromophenol	4828	2018	41.8	44-112
2,4,6-Tribromophenol	4828	4977	103.1	19-122
d5-Nitrobenzene	2414	1686	69.9	23-120
2-Fluorobiphenyl	2414	1724	71.4	30-115
d10-Azobenzene	2414	2168	89.8	60-125
d14-p-Terphenyl	2414	2446	101.3	18-137

Lattice Testing Laboratories, Inc.

Sample Type: Low Soil
Lab No: 2807
Client: Retec
QC Logged:

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction to monitor for matrix effects and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types. In certain cases, we will have accumulated insufficient data to have established control limits.

Sample Number: 9 Reported Values in Units of: ug/kg

Sample DWE: 25.4 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	3944	3143	79.7	25-121
d5-Phenol	3944	3208	81.3	24-113
2-Bromophenol	3944	3025	76.8	44-112
2,4,6-Tribromophenol	3944	3435	87.1	19-122
d5-Nitrobenzene	1972	1954	99.1	23-120
2-Fluorobiphenyl	1972	2000	101.9	30-115
d10-Azobenzene	1972	1876	95.2	60-126
d14-p-Terphenyl	1972	1830	92.8	18-137

Sample Number: 10(x2)Reported Values in Units of: ug/kg

Sample DWE: 21.4 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4665	4138	88.7	25-121
d5-Phenol	4665	4081	87.5	24-113
2-Bromophenol	4665	4313	92.4	44-112
2,4,6-Tribromophenol	4665	5070	108.7	19-122
d5-Nitrobenzene	2333	2416	103.6	23-120
2-Fluorobiphenyl	2333	2465	105.7	30-115
d10-Azobenzene	2333	2395	102.7	60-126
d14-p-Terphenyl	2333	2316	99.3	18-137

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Retec

LABORATORY NO. 2807

APPENDIX B

Matrix Spike/Duplicate Spike Quality Control

Reported below are the results of additional QC compounds utilized in the analysis of organic compounds. Compounds of interest are spiked into two additional sample aliquots prior to extraction and/or analysis to monitor for matrix effects, sample processing errors, and to calculate percent recoveries of compunds of interest and relative error in the analysis. The control limits represent the 95% confidence interval established in the laboratory through repetitive analysis of these sample types.

Sample # 2

	ug/kg, dry basis				ug/kg				
Compound	Conc Spike	Conc Samp	Conc MS	% REC	Conc MSD	% REC	RPD	RPD Limit	REC Limit
1,1-Dichloroethene	92.9	0.	92.5	99.6	90.8	97.7	1.9	22	59-172
Trichloroethene	92.9	0.	87.2	93.9	84.7	91.2	2.9	24	62-137
Chlorobenzene	92.9	0.	89.3	96.1	89.6	96.4	-0.3	21	60-133
Toluene	92.9	0.	81.7	87.9	79.4	85.5	2.8	21	59-139
Benzene	92.9	0.	90.7	97.6	82.6	88.9	9.3	21	66-142

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.MDS REPORT

MATRIX SPIKE/MATRIX SPIKE DUPLICATE REPORT

LABORATORY NO.2807 – 13
CLIENT:RETEC
MATRIX:SOIL

UNITS REPORTED IN:UG ADDED (µg)

SMP NO.	ANALYTE	SPIKE ADDED	SAMPLE RESULT	FOR CALC.	MS RESULT	% REC	MSD RESULT	% REC	RPD	QC LIMITS RPD	QC LIMITS % REC
13	1,2,4-TRICHLOROBENZENE	100.0	<1.25	0	97.6	97.6	89.1	89.1	9.1	0-23	38-107
	ACENAPHTHENE	100.0	<1.25	0	104.5	104.5	110.1	110.1	5.2	0-19	31-137
	2,4-DINITROTOLUENE	100.0	<1.25	0	132.4	132.4 *	126.5	126.5 *	4.6	0-47	28-89
	PYRENE	100.0	<1.25	0	110.9	110.9	117.4	117.4	5.7	0-36	35-142
	N-NITROSO-DI-N-PROPYLAMINE	100.0	<1.25	0	105.2	105.2	98.7	98.7	6.4	0-38	41-126
___B/N___	1,4-DICHLOROBENZENE	100.0	<1.25	0	87.1	87.1	91.7	91.7	5.1	0-27	28-104
	PENTACHLOROPHENOL	200.0	<1.25	0	188.1	94.1	174.0	87.0	7.8	0-47	17-109
	PHENOL	200.0	<1.25	0	198.3	99.2 *	180.3	90.2 *	9.5	0-35	26-90
	2-CHLOROPHENOL	200.0	<1.25	0	185.1	92.6	171.7	85.9	7.5	0-50	25-102
	4-CHLORO-3-METHYLPHENOL	200.0	<1.25	0	217.4	108.7 *	197.8	98.9	9.4	0-33	26-103
__ACIDS__	4-NITROPHENOL	200.0	<1.25	0	225.4	112.7	220.7	110.4	2.1	0-50	11-114

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Testing Laboratories, Inc.
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Chemistry, Microbiology, and Technical Services

Certificate

Retec

LABORATORY NO. 2807

Appendix C

Attached are copies of Tentatively Identified Compounds

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(206)-767-5060

LAB # 2807
SMPL# 6

CLIENT -

LISTED BELOW ARE TENATIVELY IDENTIFIED COMPOUNDS REPORTED IN ESTIMATED AMOUNTS USING TOTAL PEAK AREA RELATIVE TO INTERNAL STANDARD AREAS. THESE COMPOUNDS WERE MAJOR COMPONENTS IN THE SAMPLE THAT WERE NOT IDENTIFIED AS PRIORITY POLLUTANTS. MASS SPECTRA WERE MATCHED AGAINST NBS LIBRARY SPECTRA FOR BEST FIT. IF NO MATCH IS FOUND, THE PEAK IS REPORTED AS "UNKNOWN" ALONG WITH ANY INFORMATION (I.E. 'PHTHALATE' OR 'HYDROCARBON') THAT CAN BE ASSIGNED BY MASS SPECTRAL ANALYSIS.

VOLATILE ORGANICS
ANALYSIS DATA SHEET
TENATATIVELY IDENTIFIED COMPOUNDS

NO	NAME	SCAN	EST CONC UG/KG
1	PENTANE	70	13
2	ETHANE,1,1'-OXYBIS-	80	11
3		0	0
4		0	0
5		0	0
6		0	0
7		0	0
8		0	0
9		0	0
10		0	0
11		0	0
12		0	0
13		0	0
14		0	0
15		0	0

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(206)-767-5060

LAB # 2807
SMPL# 7

CLIENT -

LISTED BELOW ARE TENATIVELY IDENTIFIED COMPOUNDS REPORTED IN ESTIMATED AMOUNTS USING TOTAL PEAK AREA RELATIVE TO INTERNAL STANDARD AREAS. THESE COMPOUNDS WERE MAJOR COMPONENTS IN THE SAMPLE THAT WERE NOT IDENTIFIED AS PRIORITY POLLUTANTS. MASS SPECTRA WERE MATCHED AGAINST NBS LIBRARY SPECTRA FOR BEST FIT. IF NO MATCH IS FOUND, THE PEAK IS REPORTED AS "UNKNOWN" ALONG WITH ANY INFORMATION (I.E. 'PHTHALATE' OR 'HYDROCARBON') THAT CAN BE ASSIGNED BY MASS SPECTRAL ANALYSIS.

VOLATILE ORGANICS
ANALYSIS DATA SHEET
TENATATIVELY IDENTIFIED COMPOUNDS

NO	NAME	SCAN	EST CONC UG/KG
1	ETHANE,1,1'-OXYBIS-	90	13
2		0	0
3		0	0
4		0	0
5		0	0
6		0	0
7		0	0
8		0	0
9		0	0
10		0	0
11		0	0
12		0	0
13		0	0
14		0	0
15		0	0

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(206)-767-5060

LAB # 2807
SMPL# 5

CLIENT -

LISTED BELOW ARE TENATIVELY IDENTIFIED COMPOUNDS REPORTED IN ESTIMATED AMOUNTS USING TOTAL PEAK AREA RELATIVE TO INTERNAL STANDARD AREAS. THESE COMPOUNDS WERE MAJOR COMPONENTS IN THE SAMPLE THAT WERE NOT IDENTIFIED AS PRIORITY POLLUTANTS. MASS SPECTRA WERE MATCHED AGAINST NBS LIBRARY SPECTRA FOR BEST FIT. IF NO MATCH IS FOUND, THE PEAK IS REPORTED AS "UNKNOWN" ALONG WITH ANY INFORMATION (I.E. 'PHTHALATE' OR 'HYDROCARBON') THAT CAN BE ASSIGNED BY MASS SPECTRAL ANALYSIS.

VOLATILE ORGANICS
ANALYSIS DATA SHEET
TENATATIVELY IDENTIFIED COMPOUNDS

NO	NAME	SCAN	EST CONC UG/KG
1	PENTANE	80	28 J
2	ETHANE,1,'-OXYBIS-	91	24 J
3		0	0
4		0	0
5		0	0
6		0	0
7		0	0
8		0	0
9		0	0
10		0	0
11		0	0
12		0	0
13		0	0
14		0	0
15		0	0

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SAMPLE NUMBER
(2807-MB)
0316SSB1

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	27	150J
2.		Unknown	ABN	49	890J
3.	2216300	Heptane, 2,5-dimethyl-	ABN	59	200J
4.		Unknown	ABN	96	5000J
5.	922281	Heptane, 3,4-dimethyl-	ABN	99	310J
6.	110123	2-Hexanone, 5-methyl-	ABN	103	260J
7.	2216344	Octane, 4-methyl-	ABN	110	710J
8.	2216333	Octane, 3-methyl-	ABN	122	1200J
9.		Unknown	ABN	187	620J
10.	10544500	Sulfur, mol.	ABN	1160	160J
11.	143282	9-Octaden-1-ol	ABN	1180	450J
12.		Unknown	ABN	1544	190J

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SAMPLE NUMBER
< 2807-MB >
0318SSB1

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.	Unknown	ABN	16	780J
2.	Unknown	ABN	54	5100J
3.	Unknown	ABN	62	5508J
4. 921471	Hexane,2,3,4-trimethyl-	ABN	70	710J
5.	Unknown	ABN	82	1200J
6.	Unknown	ABN	151	440J

Form I, Part B mn/11-85

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SAMPLE NUMBER
< 2807-1RI >

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	48	6800J
2.		Unknown	ABN	54	8400J
3.		Unknown	ABN	57	430J
4.		Unknown	ABN	63	300J
5.	2213232	Heptane,2,4-dimethyl-	ABN	69	900J
6.	2216333	Octane,3-methyl-	ABN	82	1600J
7.		Unknown	ABN	105	290J
8.		Unknown	ABN	801	220J
9.		Unknown	ABN	875	360J
10.		Unknown	ABN	903	300J
		Unknown	ABN	943	200J
12.		Unknown	ABN	1047	370J
13.		Unknown	ABN	1065	230J
14.		Unknown	ABN	1075	350J
15.		Unknown	ABN	1125	240J
16.		Unknown	ABN	1160	240J
17.		Unknown	ABN	1197	270J
18.		Unknown	ABN	1212	270J
19.		Unknown	ABN	1225	400J
20.		Unknown	ABN	1267	280J
21.		Unknown	ABN	1320	350J
22.		Unknown	ABN	1418	280J
23.		Unknown	ABN	1465	510J
24.		Unknown	ABN	1524	330J
25.		Unknown	ABN	1726	420J

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SAMPLE NUMBER
(2807-2RI)

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.	Unknown	ABN	40	4500J
2.	Unknown	ABN	51	6600J
3.	Unknown	ABN	872	1800J
4.	Unknown	ABN	1316	900J
5.	Unknown	ABN	1367	1000J
6.	Unknown	ABN	1415	1000J
7.	Unknown	ABN	1444	900J
8.	Unknown	ABN	1462	1400J
9.	Unknown	ABN	1469	830J
	Unknown	ABN	1485	910J
1..	Unknown	ABN	1487	900J
12.	Unknown	ABN	1496	880J
13.	Unknown	ABN	1518	1000J
14.	Unknown	ABN	1521	1200J
15.	Unknown	ABN	1526	900J
16.	Unknown	ABN	1532	930J
17.	Unknown	ABN	1539	1300J
18.	Unknown	ABN	1557	1000J
19.	Unknown	ABN	1560	940J
20.	Unknown	ABN	1569	930J
21.	Unknown	ABN	1577	890J
22.	Unknown	ABN	1592	800J
23.	Unknown	ABN	1595	840J

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SAMPLE NUMBER
< 2807-3RI >

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	37	16000J
2.	629209	1,3,5,7-Cyclooctatetraene	ABN	105	11000J
3.	100801	Benzene,1-ethenyl-3-methyl-	ABN	256	8600J
4.		Unknown	ABN	260	9500J
5.	673325	Benzene,1-propynyl	ABN	314	6600J
6.		Unknown	ABN	408	19000J
7.	15677153	Cycloprop[a]indene,1,1a,6,6a-tetrahydro-	ABN	431	4100J
8.	65051834	Benzene,(1-methyl-2-cyclopropen-1yl)-	ABN	439	6700J
9.		Unknown	ABN	510	17000J
10.		Unknown	ABN	514	11000J
		Unknown	ABN	518	9600J
12.		Unknown	ABN	574	6400J
13.		Unknown	ABN	598	4200J
14.		Unknown	ABN	627	3000J
15.	7214611	Benzene,(1-nitroethyl)-	ABN	651	11000J
16.		Unknown	ABN	733	2200J
17.		Unknown	ABN	740	2000J
18.		Unknown	ABN	769	2000J
19.		Unknown	ABN	875	2700J
20.		Unknown	ABN	886	2700J
21.		Unknown	ABN	1207	3200J
22.	203123	Benzo[ghi]fluoranthene	ABN	1319	2200J
23.		Unknown	ABN	1414	2300J
24.	192972	Benzo[e]pyrene	ABN	1538	4800J
25.		Unknown	ABN	1726	2900J

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SAMPLE NUMBER
(2807-4RI)

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc ( )
1.		Unknown	ABN	49	8500J
2.	2216333	Octane,3-methyl-	ABN	77	1400J
3.		Unknown	ABN	820	730J
4.		Unknown	ABN	870	1000J
5.	593453	Octadecane	ABN	892	680J
6.		Unknown	ABN	897	1800J
7.	112958	Eicosane	ABN	961	950J
8.		Unknown	ABN	1027	1100J
9.		Unknown	ABN	1042	2100J
10.		Unknown	ABN	1060	940J
11.		Unknown	ABN	1064	810J
12.		Unknown	ABN	1089	1100J
13.		Unknown	ABN	1091	1100J
14.	3674666	Phenanthrene,2,5-dimethyl-	ABN	1121	1200J
15.		Unknown	ABN	1149	1700J
16.		Unknown	ABN	1184	1000J
17.	629970	Docosane	ABN	1206	1500J
18.		Unknown	ABN	1221	1700J
19.	630024	Octacosane	ABN	1261	1400J
20.		Unknown	ABN	1313	1600J
21.		Unknown	ABN	1363	1700J
22.		Unknown	ABN	1412	1200J
23.	629970	Docosane	ABN	1458	1600J

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SAMPLE NUMBER
< 2807-5RI >

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	53	7900J
2.	629629	Pentadecane	ABN	748	740J
3.		Unknown	ABN	874	1300J
4.	544763	Eicosane	ABN	897	910J
5.	74645980	Dodecane,2,7,10-trimethyl-	ABN	902	2200J
6.		Unknown	ABN	966	940J
7.		Unknown	ABN	1031	1000J
8.		Unknown	ABN	1046	1800J
9.		Unknown	ABN	1064	1100J
10.		Unknown	ABN	1069	970J
11.		Unknown	ABN	1087	780J
[illegible]		Unknown	ABN	1094	1200J
[illegible]		Unknown	ABN	1096	1300J
14.	3674666	Phenanthrene,2,5-dimethyl-	ABN	1126	1300J
15.		Unknown	ABN	1153	2200J
16.		Unknown	ABN	1156	890J
17.		Unknown	ABN	1160	800J
18.		Unknown	ABN	1189	1400J
19.	630024	Octacosane	ABN	1211	1700J
20.	483658	Phenanthrene,1-methyl-7-(methylethyl)-	ABN	1226	2200J
21.	630079	Pentatriacontane	ABN	1265	1900J
22.	630024	Octacosane	ABN	1318	1700J
23.	630079	Pentatriacontane	ABN	1368	2100J
24.	630079	Pentatriacontane	ABN	1416	1800J
25.	630068	Hexatriacontane	ABN	1463	1900J

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SAMPLE NUMBER
(2807-6)

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	49	6800J
2.		Unknown	ABN	54	7700J
3.	2216333	Octane,3-methyl-	ABN	81	980J
4.		Unknown	ABN	685	350J
5.	593453	Octadecane	ABN	718	280J
6.		Unknown	ABN	874	1400J
7.	74764117	Iron,tricarbonyl[N-(phenyl-2-pyridinyl	ABN	897	450J
8.	74645980	Dodecane,2,7,10-trimethyl-	ABN	902	1700J
9.	630024	Octacosane	ABN	966	570J
10.		Unknown	ABN	1031	640J
[illegible]1.		Unknown	ABN	1046	820J
[illegible]		Unknown	ABN	1064	540J
[illegible]	630068	Hexatriacontane	ABN	1094	700J
14.	3674666	Phenanthrene,2,5-dimethyl-	ABN	1126	530J
15.	630024	Octacosane	ABN	1154	880J
16.		Unknown	ABN	1189	470J
17.	630079	Pentatriacontane	ABN	1211	1100J
18.	483658	Phenanthrene,1-methyl-7-(1-methylethyl)-	ABN	1226	1100J
19.		Unknown	ABN	1266	1200J
20.		Unknown	ABN	1318	1200J
21.		Unknown	ABN	1369	1500J
22.		Unknown	ABN	1417	1100J
23.		Unknown	ABN	1464	3800J
24.		Unknown	ABN	1552	2500J
25.		Unknown	ABN	1634	990J

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SAMPLE NUMBER
< 2807-7 >

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	43	23000J
2.	2216333	Octane,3-methyl-	ABN	80	3600J
3.		Unknown	ABN	874	1700J
4.	74645980	Dodecane,2,7,10-trimethyl-	ABN	901	3800J
5.		Unknown	ABN	1031	2000J
6.		Unknown	ABN	1045	4900J
7.		Unknown	ABN	1063	3200J
8.		Unknown	ABN	1068	1500J
9.		Unknown	ABN	1071	1200J
		Unknown	ABN	1095	5400J
11.		Unknown	ABN	1105	1900J
12.		Unknown	ABN	1113	1500J
13.	3674666	Phenanthrene,2,5-dimethyl-	ABN	1123	1700J
14.	630079	Pentatriacontane	ABN	1153	1900J
15.		Unknown	ABN	1210	2100J
16.	483658	Phenanthrene,1-methyl-7-(1-methylethyl)-	ABN	1223	4500J
17.		Unknown	ABN	1265	2200J
18.		Unknown	ABN	1317	2900J
19.		Unknown	ABN	1368	2900J
20.		Unknown	ABN	1416	2600J
21.		Unknown	ABN	1463	3800J
22.		Unknown	ABN	1626	2200J
23.		Unknown	ABN	1634	2500J
24.		Unknown	ABN	1663	1800J

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SAMPLE NUMBER
< 2807-8 >

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	41	27000J
2.	2213232	Heptane,2,4-dimethyl-	ABN	67	2000J
3.	2216333	Octane,3-methyl-	ABN	79	3100J
4.		Unknown	ABN	675	1600J
5.	26537713	9,12,15-Ocadecatriaenal	ABN	875	2700J
6.	1921706	Pentadecane	ABN	903	5700J
7.		Unknown	ABN	1033	1500J
8.		Unknown	ABN	1046	2700J
9.		Unknown	ABN	1065	1700J
10.		Unknown	ABN	1097	2400J
[illegible]	21964498	1,13-Tetradecadiene	ABN	1140	2300J
[illegible]	630079	Pentatriacontane	ABN	1155	1800J
13.	7225641	Heptadecane,9-octyl-	ABN	1212	2200J
14.	483658	Phenanthrene,1-methyl-7-(1-methylethyl)-	ABN	1225	2700J
15.	630024	Octacosane	ABN	1267	2500J
16.	629970	Docosane	ABN	1319	2300J
17.	630079	Pentatriacontane	ABN	1370	3900J
18.		Unknown	ABN	1386	1300J
19.		Unknown	ABN	1410	1900J
20.	629970	Docosane	ABN	1418	2200J
21.	629970	Docosane	ABN	1465	4700J
22.	630079	Pentatriacontane	ABN	1511	2000J
23.		Unknown	ABN	1596	1400J
24.	630079	Pentatriacontane	ABN	1637	3600J
25.		Unknown	ABN	1646	1100J

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SAMPLE NUMBER
(2807-9)

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	11	480J
2.		Unknown	ABN	52	7300J
3.		Unknown	ABN	58	7900J
4.	2213232	Heptane,2,4-dimethyl	ABN	68	630J
5.		Unknown	ABN	81	1100J
6.		Unknown	ABN	200	900J
7.		Unknown	ABN	213	530J
8.		Unknown	ABN	663	1300J
9.		Unknown	ABN	874	940J
10.		Unknown	ABN	1224	170J
11.		Unknown	ABN	1370	160J
[illegible]	3648213	1,2-Benzenedicarboxylic acid,diheptyl	ABN	1389	280J
13.		Unknown	ABN	1447	270J
14.		Unknown	ABN	1466	150J
15.		Unknown	ABN	1525	190J
16.		Unknown	ABN	1536	230J
17.		Unknown	ABN	1569	290J
18.		Unknown	ABN	1571	480J
19.		Unknown	ABN	1635	180J
20.		Unknown	ABN	1638	180J
21.		Unknown	ABN	1652	320J
22.		Unknown	ABN	1665	160J
23.		Unknown	ABN	1747	280J
24.		Unknown	ABN	1772	220J
25.		Unknown	ABN	1823	170J

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SAMPLE NUMBER
(2807-10)

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	46	13000J
2.		Unknown	ABN	79	1700J
3.	74645980	Dodecane,2,7,10-trimethyl-	ABN	899	2700J
4.		Unknown	ABN	1029	1100J
5.		Unknown	ABN	1043	1200J
6.		Unknown	ABN	1061	850J
7.	630079	Pentatriacontane	ABN	1091	1000J
8.	630035	Nonacosane	ABN	1151	1000J
9.	630079	Pentatriacontane	ABN	1208	1200J
10.	483658	Phenanthrene,1-methyl-7-(1methylethyl)-	ABN	1222	2100J
11.	630079	Pentatriacontane	ABN	1263	1400J
		Unknown	ABN	1316	1400J
13.		Unknown	ABN	1366	1800J
14.		Unknown	ABN	1414	1300J
15.		Unknown	ABN	1444	660J
16.		Unknown	ABN	1461	1800J
17.		Unknown	ABN	1490	8100J
18.		Unknown	ABN	1506	1200J
19.		Unknown	ABN	1520	1000J
20.		Unknown	ABN	1523	710J
21.		Unknown	ABN	1531	710J
22.	192972	Benzo[e]pyrene	ABN	1536	970J
23.		Unknown	ABN	1560	680J
24.		Unknown	ABN	1567	1000J
25.		Unknown	ABN	1592	680J

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SAMPLE NUMBER
(2807-11)

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	49	10000J
2.		Unknown	ABN	54	870J
3.		Unknown	ABN	58	410J
4.	2213232	Heptane,2,4-dimethyl-	ABN	69	910J
5.	2216333	Octane,3-methyl-	ABN	82	1433J
6.		Unknown	ABN	201	430J
7.		Unknown	ABN	1047	230J
8.		Unknown	ABN	1181	370J
9.		Unknown	ABN	1190	200J
10.	629970	Docosane	ABN	1371	420J
11.	3648213	1,2-Benzenedicarboxylic acid,diheptyl	ABN	1392	490J
[illegible]	3648213	1,2-Benzenedicarboxylic acid,diheptyl	ABN	1449	340J
1[illegible].		Unknown	ABN	1454	220J
14.	630035	Nonacosane	ABN	1468	840J
15.		Unknown	ABN	1513	400J
16.		Unknown	ABN	1573	300J
17.	55429840	Tetracosane,11-decyl-	ABN	1640	700J
18.		Unknown	ABN	1732	1200J
19.		Unknown	ABN	1845	210J

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SAMPLE NUMBER
(2807-13)

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	48	1200J
2.	2216300	Heptane, 2,5-dimethyl-	ABN	62	350J
3.		Unknown	ABN	97	8400J
4.	922281	Heptane,3,4-dimethyl-	ABN	101	500J
5.	110123	2-Hexanone,5-dimethyl-	ABN	105	460J
6.	2216344	Octane,4-methyl-	ABN	112	1200J
7.		Unknown	ABN	124	2100J
8.		Unknown	ABN	189	510J
9.		Unknown	ABN	249	480J
10.	87445	Bicyclo[7.2.0]undec-4-ene	ABN	723	570J
11.		Unknown	ABN	912	1500J
12.		Unknown	ABN	1562	340J
13.	7683649	2,6,10,14,18,22-Tetracosahexaene	ABN	1567	440J
14.		Unknown	ABN	1569	400J
15.		Unknown	ABN	1574	380J
16.		Unknown	ABN	1578	410J
17.		Unknown	ABN	1583	460J
18.		Unknown	ABN	1589	480J
19.		Unknown	ABN	1605	450J
20.		Unknown	ABN	1609	490J
21.		Unknown	ABN	1614	490J
22.		Unknown	ABN	1618	530J
23.		Unknown	ABN	1622	540J
24.		Unknown	ABN	1626	500J
25.		Unknown	ABN	1642	440J
26.		Unknown	ABN	1645	430J
27.		Unknown	ABN	1652	460J

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SAMPLE NUMBER
(2807-12RI)

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	10	1000J
2.		Unknown	ABN	56	13000J
3.		Unknown	ABN	59	14000J
4.	110123	2-Hexanone,5-methyl-	ABN	65	660J
5.	921471	Hexane,2,3,4-trimethyl-	ABN	71	1500J
6.		Unknown	ABN	84	2600J
7.		Unknown	ABN	153	690J
8.		Unknown	ABN	216	680J
9.	87445	Bicyclo[7.2.0]undec-4-ene	ABN	687	480J
10.		Unknown	ABN	877	2200J
11.	55045119	Tridecane,5-propyl-	ABN	904	620J
[illegible]		Unknown	ABN	1066	350J
13.		Unknown	ABN	1074	460J
14.		Unknown	ABN	1227	460J
15.	55429840	Tetracosane,11-decyl-	ABN	1269	420J
16.		Unknown	ABN	1315	350J
17.		Unknown	ABN	1322	590J
18.	55429840	Tetracosane,11-decyl-	ABN	1373	530J
19.		Unknown	ABN	1422	370J
20.	7225641	Heptadecane,9-octyl-	ABN	1469	900J
21.	630068	Hexatriacontane	ABN	1514	450J
22.	630079	Pentatriacontane	ABN	1641	730J
23.		Unknown	ABN	1751	630J
24.		Unknown	ABN	1828	540J

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SAMPLE NUMBER
(2807-14MB)
0316SWB1

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

CAS Number	Compound Name	Frac	Scan	Conc (ug/l)
1.	Unknown	ABN	1161	1050J

Form I, Part B

mn/11-85

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SAMPLE NUMBER
(2807-14)
1:10 diln

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.	Unknown	ABN	829	85000J
2.	Unknown	ABN	866	64000J
3.	Unknown	ABN	904	120000J
4.	Unknown	ABN	909	110000J
5.	Unknown	ABN	928	55000J
6.	Unknown	ABN	935	54000J
7.	Unknown	ABN	941	58000J
8.	Unknown	ABN	945	60000J
9.	Unknown	ABN	949	60000J
10.	Unknown	ABN	961	50000J
11.	Unknown	ABN	971	69000J
.	Unknown	ABN	975	110000J
13.	Unknown	ABN	981	100000J
14.	Unknown	ABN	988	49000J
15.	Unknown	ABN	990	48000J
16.	Unknown	ABN	998	49000J
17.	Unknown	ABN	1004	58000J
18.	Unknown	ABN	1009	49000J
19.	Unknown	ABN	1013	49000J
20.	Unknown	ABN	1017	54000J
21.	Unknown	ABN	1022	51000J
22.	Unknown	ABN	1032	49000J
23.	Unknown	ABN	1041	88000J
24.	Unknown	ABN	1104	50000J
25.	Unknown	ABN	1164	50000J

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Appendix D

Attached are copies of the Chain of Custody Original are retained in our file.

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Ketec
Kent, WA

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
South Tacoma Swamp	S. Tacoma, WA

Project No.	Field Logbook No.
0027	001

Sampler: (Signature)	Chain of Custody Tape No.
SEMc Gill	—

ANALYSES

	Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	VOLS Method 624	Semi-VOLS Method 625	Priority pollutant metal Method 207	PCB's			REMARKS
1	27-46/45	3-10-87	0922		soil	✓	✓	✓				
2	27-48/47		0935			✓	✓	✓				
3	27-50/49		0952			✓	✓	✓				
4	27-60/59		1005			✓	✓	✓				
5	27-60/59		1005			✓	✓	✓				
4	27-60		1009			✓	✓	✓	✓			
6	27-66/65		1035			✓	✓	✓				
7	27-72/71		1048			✓	✓	✓				

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
SEMc Gill	3-10-87	1610			
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
			Judy Ecklund	3/10/87	1610
Sample Disposal Method:			Disposed of by: (Signature)	Date	Time

Sample Receipt acknowledged pending verification of sample count. You will be notified within one working day of any discrepancies found.

SAMPLE COLLECTOR Signed SE Date 3/10 Time 1610

ANALYTICAL LABORATORY

R

Retec
Kent, WA

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
South Tacoma Swamp	S. Tacoma, WA

Project No.	Field Logbook No.
0027	001

Sampler: (Signature)	Chain of Custody Tape No.
SEMc Gill	—

ANALYSES

	Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	VOLS method 624	Semi-VOLS method 625	Priority pollutant metal method 207				REMARKS
8	27-75/8	3-10-87	1110		soil	✓	✓	✓				
9	27-74/73		1124			✓	✓	✓				
10	27-70/69		1138			✓	✓	✓				
11	27-58/57		1249			✓	✓	✓				
12	27-64/63		1258			✓	✓	✓				
	27-68/67		1312			✓	✓	✓				

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
SEMc Gill	3-10-87	1610			
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
			Judy Ecklund	3/10/87	1610
Sample Disposal Method:			Disposed of by: (Signature)	Date	Time

Sample Receipt acknowledged pending verification of sample count. You will be notified within one working day of any discrepancies found.
Signed [illegible] Date 3/10 Time 1610

SAMPLE COLLECTOR | ANALYTICAL LABORATORY

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Chemistry, Microbiology, and Technical Services

CLIENT: Remediation Technologies, Inc.
19219 West Valley Hwy., Suite M103
Kent, WA 98032
ATTN: Lena Blais

LABORATORY NO. 2877

DATE: May 13,1987

REPORT ON: SOIL

SAMPLE IDENTIFICATION: Submitted 03/12/87 and identified on the containers as shown below:

1)	27-52/27-51	03/12/87	0940
2)	27-56/55	03/12/87	0955
3)	27-39/40	03/12/87	1105
4)	27-41/42	03/12/87	1105
5)	27-41/42	03/12/87	1105
6)	27-44/43	03/12/87	1215
7)	27-53/54	03/12/87	1235
8)	27-61/62	03/12/87	1245

TESTS PERFORMED AND RESULTS:

Sample was passed through a No. 10 sieve, with percent retained and description of retained matter shown below. Only material passing the sieve was analyzed.

Sample No.	% Retained	Major Description	Minor Description
1	56.	Rock	Wood
2	33.	Rock	Roots
3	29.	Rock	---
4	37.	Rock	Grass
5	47.	Rock	---
6	49.	Rock	---
7	56.	Rock	---
8	76.	Rock	---

Samples were analyzed for priority pollutants in accordance with Test Methods for Evaluating Solid Waste (SW-846) U.S.E.P.A. 1982 Method 8240 (volatile organics), 8270 (semi-volatile extractables), and the 7000 series (metals analysis).

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	1	2	3	4	5	6
Total Solids, %	73.4	76.2	79.0	80.3	80.9	78.8
	parts per million (mg/kg), dry basis					
Antimony	<2.5	<2.5	3.2	<2.5	<2.5	<2.5
Arsenic	18.	9.6	13.	9.0	9.6	11.
Beryllium	0.4	0.4	0.4	0.4	0.4	0.5
Cadmium	1.2	0.6	1.8	<0.5	<0.5	0.5
Chromium	15.	17.	52.	22.	26.	27.
Copper	28.	17.	160.	16.	15.	29.
Lead	45.	17.	200.	<10.	<10.	63.
Mercury	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	21.	22.	36.	28.	30.	30.
Selenium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Thallium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	60.	39.	270.	44.	42.	68.

	7	8	Lab Blank
Total Solids, %	83.0	87.7	---
	parts per million (mg/kg), dry basis		
Antimony	<2.5	<2.5	<2.5
Arsenic	13.	8.7	<0.5
Beryllium	0.5	0.4	<0.1
Cadmium	0.7	0.8	<0.5
Chromium	23.	21.	<1.
Copper	28.	19.	<1.
Lead	28.	42.	<10.
Mercury	<0.1	<0.1	<0.1
Nickel	31.	28.	<2.
Selenium	0.6	<0.5	<0.5
Silver	<0.5	<0.5	<0.5
Thallium	<0.5	<0.5	<0.5
Zinc	61.	46.	2.

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LABORATORY NO. 2877

Retec

Volatile Organics (by GC/MS)

parts per billion (ug/kg), dry basis

	1	2	3	4	5	6
Chloromethane	<2.	<2.	<2.	<2.	<2.	<2.
Bromomethane	<2.	<2.	<2.	<2.	<2.	<2.
Vinyl Chloride	<2.	<2.	<2.	<2.	<2.	<2.
Chloroethane	<2.	<2.	<2.	<2.	<2.	<2.
Methylene Chloride	Trace 1	<2.	Trace 1	Trace 1	Trace 1	Trace 1
Acrolein	<10.	<10.	<10.	<10.	<10.	<10.
*Acetone	<2.	<2.	Trace 1	Trace 1	18.	Trace 1
Acrylonitrile	<10.	<10.	<10.	<10.	<10.	<10.
*Carbon Disulfide	<2.	<2.	<2.	<2.	<2.	<2.
1,1-Dichloroethylene	<2.	<2.	<2.	<2.	<2.	<2.
1,1-Dichloroethane	<2.	<2.	<2.	<2.	<2.	<2.
trans-1,2-Dichloroethylene	<2.	<2.	<2.	<2.	<2.	<2.
Chloroform	<2.	<2.	<2.	<2.	<2.	<2.
*2-Butanone	<2.	<2.	<2.	<2.	<2.	<2.
1,2-Dichloroethane	<2.	<2.	<2.	<2.	<2.	<2.
1,1,1-Trichloroethane	<2.	<2.	<2.	<2.	<2.	<2.
*Vinyl Acetate	<2.	<2.	<2.	<2.	<2.	<2.
Bromodichloromethane	<2.	<2.	<2.	<2.	<2.	<2.
Carbon Tetrachloride	<2.	<2.	<2.	<2.	<2.	<2.
1,2-Dichloropropane	<2.	<2.	<2.	<2.	<2.	<2.
Trichloroethylene	<2.	<2.	<2.	<2.	<2.	<2.
Benzene	<2.	<2.	<2.	<2.	<2.	<2.
Chlorodibromomethane	<2.	<2.	<2.	<2.	<2.	<2.
1,1,2-Trichloroethane	<2.	<2.	<2.	<2.	<2.	<2.
2-Chloroethyl vinyl ether	<2.	<2.	<2.	<2.	<2.	<2.
Bromoform	<2.	<2.	<2.	<2.	<2.	<2.
*4-Methyl-2-pentanone	<2.	<2.	<2.	<2.	<2.	<2.
*2-Hexanone	<2.	<2.	<2.	<2.	<2.	<2.
1,1,2,2-Tetrachloroethane	<2.	<2.	<2.	<2.	<2.	<2.

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LABORATORY NO. 2877

parts per billion (ug/kg), dry basis

	1	2	3	4	5	6
Tetrachloroethylene	17.	12.	Trace 1	<2.	<2.	<2.
Toluene	<2.	<2.	<2.	<2.	<2.	<2.
Chlorobenzene	<2.	<2.	<2.	<2.	<2.	<2.
trans-1,3-Dichloropropene	<2.	<2.	<2.	<2.	<2.	<2.
Ethylbenzene	<2.	<2.	<2.	<2.	<2.	<2.
cis-1,3-Dichloropropene	<2.	<2.	<2.	<2.	<2.	<2.
*Styrene	<2.	<2.	<2.	<2.	<2.	<2.
*o-Xylene	<2.	<2.	<2.	<2.	<2.	<2.

	7	8	Lab Blank
Chloromethane	<2.	<2.	<1.
Bromomethane	<2.	<2.	<1.
Vinyl Chloride	<2.	<2.	<1.
Chloroethane	<2.	<2.	<1.
Methylene Chloride	Trace 1	<2.	<1.
Acrolein	<10.	<10.	<5.
*Acetone	<2.	<2.	Trace 2
Acrylonitrile	<10.	<10.	<5.
*Carbon Disulfide	<2.	<2.	<1.
1,1-Dichloroethylene	<2.	<2.	<1.
1,1-Dichloroethane	<2.	<2.	<1.
trans-1,2-Dichloroethylene	<2.	<2.	<1.
Chloroform	<2.	<2.	<1.
*2-Butanone	<2.	<2.	<1.
1,2-Dichloroethane	<2.	<2.	<1.
1,1,1-Trichloroethane	<2.	<2.	<1.
*Vinyl Acetate	<2.	<2.	<1.
Bromodichloromethane	<2.	<2.	<1.
Carbon Tetrachloride	<2.	<2.	<1.
1,2-Dichloropropane	<2.	<2.	<1.
Trichloroethylene	<2.	<2.	<1.
Benzene	<2.	<2.	<1.
Chlorodibromomethane	<2.	<2.	<1.
1,1,2-Trichloroethane	<2.	<2.	<1.
2-Chloroethyl vinyl ether	<2.	<2.	<1.

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parts per billion (ug/kg), dry basis

	7	8	Lab Blank
Bromoform	<2.	<2.	<1.
*4-Methyl-2-pentanone	<2.	<2.	<1.
*2-Hexanone	<2.	<2.	<1.
1,1,2,2-Tetrachloroethane	<2.	<2.	<1.
Tetrachloroethylene	11.	Trace 1	<1.
Toluene	<2.	<2.	<1.
Chlorobenzene	<2.	<2.	<1.
trans-1,3-Dichloropropene	<2.	<2.	<1.
Ethylbenzene	<2.	<2.	<1.
cis-1,3-Dichloropropene	<2.	<2.	<1.
*Styrene	<2.	<2.	<1.
*o-Xylene	<2.	<2.	<1.

Extractables (by GC/MS)

parts per billion (ug/kg), dry basis

	1	2	3	4	5	6
N-nitrosodimethylamine	<57.	<55.	<3200.	<52.	<52.	<53.
Bis(2-chloroethyl)ether	<57.	<55.	<3200.	<52.	<52.	<53.
2-Chlorophenol	<57.	<55.	<3200.	<52.	<52.	<53.
Phenol	<57.	<55.	<3200.	<52.	<52.	<53.
1,3-Dichlorobenzene	<57.	<55.	<3200.	<52.	<52.	<53.
1,4-Dichlorobenzene	<57.	<55.	<3200.	<52.	<52.	<53.
1,2-Dichlorobenzene	<57.	<55.	<3200.	<52.	<52.	<53.
Bis(2-chloroisopropyl)ether	<57.	<55.	<3200.	<52.	<52.	<53.
Hexachloroethane	<57.	<55.	<3200.	<52.	<52.	<53.
N-nitroso-di-n-propylamine	<57.	<55.	<3200.	<52.	<52.	<53.
Nitrobenzene	<57.	<55.	<3200.	<52.	<52.	<53.
Isophorone	<57.	<55.	<3200.	<52.	<52.	<53.
2-Nitrophenol	<57.	<55.	<3200.	<52.	<52.	<53.

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LABORATORY NO. 2877

parts per billion (ug/kg), dry basis

	1	2	3	4	5	6
2,4-Dimethylphenol	<57.	<55.	<3200.	<52.	<52.	<53.
Bis(2-chloroethoxy)methane	<57.	<55.	<3200.	<52.	<52.	<53.
2,4-Dichlorophenol	<57.	<55.	<3200.	<52.	<52.	<53.
1,2,4-Trichlorobenzene	<57.	<55.	<3200.	<52.	<52.	<53.
Naphthalene	<57.	<55.	<3200.	<52.	<52.	<53.
Hexachlorobutadiene	<57.	<55.	<3200.	<52.	<52.	<53.
4-Chloro-m-cresol	<57.	<55.	<3200.	<52.	<52.	<53.
Hexachlorocyclopentadiene	<57.	<55.	<3200.	<52.	<52.	<53.
2,4,6-Trichlorophenol	<57.	<55.	<3200.	<52.	<52.	<53.
2-Chloronaphthalene	<57.	<55.	<3200.	<52.	<52.	<53.
Acenaphthylene	<57.	<55.	<3200.	<52.	<52.	270.
Dimethylphthalate	<57.	<55.	<3200.	<52.	<52.	<53.
2,6-Dinitrotoluene	<57.	<55.	<3200.	<52.	<52.	<53.
Acenaphthene	<57.	<55.	<3200.	<52.	<52.	<53.
2,4-Dinitrophenol	<57.	<55.	<3200.	<52.	<52.	<53.
2,4-Dinitrotoluene	<57.	<55.	<3200.	<52.	<52.	<53.
4-Nitrophenol	<57.	<55.	<3200.	<52.	<52.	<53.
Fluorene	<57.	<55.	<3200.	<52.	<52.	90.
4-Chlorophenyl phenyl ether	<57.	<55.	<3200.	<52.	<52.	<53.
Diethylphthalate	<57.	<55.	<3200.	<52.	<52.	<53.
4,6-Dinitro-o-cresol	<57.	<55.	<3200.	<52.	<52.	<53.
1,2-Diphenylhydrazine	<57.	<55.	<3200.	<52.	<52.	<53.
4-Bromophenyl phenyl ether	<57.	<55.	<3200.	<52.	<52.	<53.
Hexachlorobenzene	<57.	<55.	<3200.	<52.	<52.	<53.
Pentachlorophenol	<57.	<55.	<3200.	<52.	<52.	<53.
Phenanthrene	<57.	<55.	<3200.	<52.	<52.	1500.
Anthracene	<57.	<55.	<3200.	<52.	<52.	180.
Dibutylphthalate	<57.	<55.	<3200.	<52.	<52.	<53.
Fluoranthene	<57.	<55.	<3200.	<52.	<52.	1900.
Pyrene	<57.	<55.	<3200.	<52.	<52.	2000.
Benzidine	<57.	<55.	<3200.	<52.	<52.	<53.
Butyl benzyl phthalate	<57.	<55.	<3200.	<52.	<52.	<53.
Benzo(a)anthracene	<57.	<55.	<3200.	<52.	<52.	910.
Chrysene	<57.	<55.	<3200.	<52.	<52.	950.
3,3'-Dichlorobenzidine	<57.	<55.	<3200.	<52.	<52.	<53.
Bis(2-ethylhexyl)phthalate	<57.	68.	7300.	87.	<52.	66.
N-nitrosodiphenylamine	<57.	<55.	<3200.	<52.	<52.	<53.
Di-n-octyl phthalate	110.	<55.	<3200.	<52.	410.	<53.

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Chemistry, Microbiology and Technical Services

Retec

LABORATORY NO. 2877

parts per billion (ug/kg), dry basis

	1	2	3	4	5	6
Benzo(b)fluoranthene	<57.	<55.	<3200.	<52.	<52.	1700.
Benzo(k)fluoranthene	<57.	<55.	<3200.	<52.	<52.	****
Benzo(a)pyrene	<57.	<55.	<3200.	<52.	<52.	1000.
Indeno(1,2,3-cd)pyrene	<57.	<55.	<3200.	<52.	<52.	520.
Dibenzo(ah)anthracene	<57.	<55.	<3200.	<52.	<52.	100.
Benzo(ghi)perylene	<57.	<55.	<3200.	<52.	<52.	480.
*Aniline	<57.	<55.	<3200.	<52.	<52.	<53.
*Benzoic Acid	870.	920.	<3200.	2100.	1200.	2100.
*Benzyl Alcohol	<57.	<55.	<3200.	<52.	<52.	<53.
*4-Chloroaniline	<57.	<55.	<3200.	<52.	<52.	<53.
*Dibenzofuran	<57.	<55.	<3200.	<52.	<52.	<53.
*2-Methylnaphthalene	<57.	<55.	<3200.	<52.	<52.	<53.
*2-Methylphenol	<57.	<55.	<3200.	<52.	<52.	<53.
*4-Methylphenol	<57.	<55.	<3200.	<52.	<52.	<53.
*2-Nitroaniline	<57.	<55.	<3200.	<52.	<52.	<53.
*3-Nitroaniline	<57.	<55.	<3200.	<52.	<52.	<53.
*4-Nitroaniline	<57.	<55.	<3200.	<52.	<52.	<53.
*2,4,5-Trichlorophenol	<57.	<55.	<3200.	<52.	<52.	<53.

parts per billion (ug/kg), dry basis

	7	8	Lab Blank 1	Lab Blank 2
N-nitrosodimethylamine	<50.	<50.	<50.	<2500.
Bis(2-chloroethyl)ether	<50.	<50.	<50.	<2500.
2-Chlorophenol	<50.	<50.	<50.	<2500.
Phenol	<50.	<50.	<50.	<2500.
1,3-Dichlorobenzene	<50.	<50.	<50.	<2500.
1,4-Dichlorobenzene	<50.	<50.	<50.	<2500.
1,2-Dichlorobenzene	<50.	<50.	<50.	<2500.
Bis(2-chloroisopropyl)ether	<50.	<50.	<50.	<2500.
Hexachloroethane	<50.	<50.	<50.	<2500.
N-nitroso-di-n-propylamine	<50.	<50.	<50.	<2500.
Nitrobenzene	<50.	<50.	<50.	<2500.
Isophorone	<50.	<50.	<50.	<2500.

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parts per billion (ug/kg), dry basis

	7	8	Lab Blank 1	Lab Blank 2
2-Nitrophenol	<50.	<50.	<50.	<2500.
2,4-Dimethylphenol	<50.	<50.	<50.	<2500.
Bis(2-chloroethoxy)methane	<50.	<50.	<50.	<2500.
2,4-Dichlorophenol	<50.	<50.	<50.	<2500.
1,2,4-Trichlorobenzene	<50.	<50.	<50.	<2500.
Naphthalene	<50.	<50.	<50.	<2500.
Hexachlorobutadiene	<50.	<50.	<50.	<2500.
4-Chloro-m-cresol	<50.	<50.	<50.	<2500.
Hexachlorocyclopentadiene	<50.	<50.	<50.	<2500.
2,4,6-Trichlorophenol	<50.	<50.	<50.	<2500.
2-Chloronaphthalene	<50.	<50.	<50.	<2500.
Acenaphthylene	<50.	<50.	<50.	<2500.
Dimethylphthalate	<50.	<50.	<50.	<2500.
2,6-Dinitrotoluene	<50.	<50.	<50.	<2500.
Acenaphthene	<50.	<50.	<50.	<2500.
2,4-Dinitrophenol	<50.	<50.	<50.	<2500.
2,4-Dinitrotoluene	<50.	<50.	<50.	<2500.
4-Nitrophenol	<50.	<50.	<50.	<2500.
Fluorene	<50.	<50.	<50.	<2500.
4-Chlorophenyl phenyl ether	<50.	<50.	<50.	<2500.
Diethylphthalate	<50.	<50.	<50.	<2500.
4,6-Dinitro-o-cresol	<50.	<50.	<50.	<2500.
1,2-Diphenylhydrazine	<50.	<50.	<50.	<2500.
4-Bromophenyl phenyl ether	<50.	<50.	<50.	<2500.
Hexachlorobenzene	<50.	<50.	<50.	<2500.
Pentachlorophenol	<50.	<50.	<50.	<2500.
Phenanthrene	<50.	<50.	<50.	<2500.
Anthracene	<50.	<50.	<50.	<2500.
Dibutylphthalate	<50.	<50.	<50.	<2500.
Fluoranthene	<50.	<50.	<50.	<2500.
Pyrene	<50.	<50.	<50.	<2500.
Benzidine	<50.	<50.	<50.	<2500.
Butyl benzyl phthalate	<50.	<50.	<50.	<2500.
Benzo(a)anthracene	<50.	<50.	<50.	<2500.
Chrysene	<50.	<50.	<50.	<2500.
3,3'-Dichlorobenzidine	<50.	<50.	<50.	<2500.
Bis(2-ethylhexyl)phthalate	200.	120.	<50.	<2500.

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parts per billion (ug/kg), dry basis

	7	8	Lab Blank 1	Lab Blank 2
N-nitrosodiphenylamine	<50.	<50.	<50.	<2500.
Di-n-octyl phthalate	240.	56.	<50.	<2500.
Benzo(b)fluoranthene	<50.	<50.	<50.	<2500.
Benzo(k)fluoranthene	<50.	<50.	<50.	<2500.
Benzo(a)pyrene	<50.	<50.	<50.	<2500.
Indeno(1,2,3-cd)pyrene	<50.	<50.	<50.	<2500.
Dibenzo(ah)anthracene	<50.	<50.	<50.	<2500.
Benzo(ghi)perylene	<50.	<50.	<50.	<2500.
*Aniline	<50.	<50.	<50.	<2500.
*Benzoic Acid	1900.	1600.	<50.	<2500.
*Benzyl Alcohol	<50.	<50.	<50.	<2500.
*4-Chloroaniline	<50.	<50.	<50.	<2500.
*Dibenzofuran	<50.	<50.	<50.	<2500.
*2-Methylnaphthalene	<50.	<50.	<50.	<2500.
*2-Methylphenol	<50.	<50.	<50.	<2500.
*4-Methylphenol	<50.	<50.	<50.	<2500.
*2-Nitroaniline	<50.	<50.	<50.	<2500.
*3-Nitroaniline	<50.	<50.	<50.	<2500.
*4-Nitroaniline	<50.	<50.	<50.	<2500.
*2,4,5-Trichlorophenol	<50.	<50.	<50.	<2500.

Key

* = additional compounds from the EPA's Hazardous Substances List
**** = Benzo (b) and benzo (k) fluoranthene reported as total.
< = "less than"
trace 1 = an unquantifiable amount between 2-10 parts per billion (ug/kg).
trace 2 = an unquantifiable amount between 1-5 parts per billion (ug/kg).
Lab Blank 1 is for samples 1,2 & 4-8
Lab Blank 2 if for sample #3

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Note:

Benzoic acid "hits" reported may be due to contaminated sample collection jars supplied to Laucks by an outside vendor. Analyses are currently in progress to verify this.

Attachments

Appendix A: Surrogate Recovery Report
Appendix B: Matrix Spike Inorganics/Organics
Appendix C: Tentatively Identified Compounds
Appendix D: Chain of Custody

Respectfully submitted,

Laucks Testing Laboratories, Inc.

J. M. Owens

JMO:jm

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APPENDIX A

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction and analysis to monitor for matrix effects, purging efficiency, and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types.

Sample No.	Surrogate Compound	Spike Level	Spike Found	% Recovery	Control Limit
		parts per billion (ug/kg), dry basis			
Method Blank	d4-1,2-Dichloroethane	50.0	46.2	92.4	50-160
	d8-Toluene	50.0	47.6	95.2	50-160
	p-Bromofluorobenzene	50.0	48.7	97.4	50-160
1	d4-1,2-Dichloroethane	112.	109.	97.3	50-160
	d8-Toluene	112.	106.	94.6	50-160
	p-Bromofluorobenzene	112.	89.3	79.7	50-160
2	d4-1,2-Dichloroethane	103.	101.	98.1	50-160
	d8-Toluene	103.	99.4	96.5	50-160
	p-Bromofluorobenzene	103.	86.4	83.9	50-160
3	d4-1,2-Dichloroethane	83.7	80.4	96.1	50-160
	d8-Toluene	83.7	69.2	82.7	50-160
	p-Bromofluorobenzene	83.7	65.5	78.3	50-160
4	d4-1,2-Dichloroethane	75.0	74.0	98.7	50-160
	d8-Toluene	75.0	72.8	96.9	50-160
	p-Bromofluorobenzene	75.0	73.2	97.6	50-160
5	d4-1,2-Dichloroethane	85.6	87.3	102.	50-160
	d8-Toluene	85.6	86.8	101.	50-160
	p-Bromofluorobenzene	85.6	77.4	90.4	50-160

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Sample No.	Surrogate Compound	Spike Level	Spike Found	% Recovery	Control Limit
		parts per billion (ug/kg), dry basis			
	d4-1,2-Dichloroethane	99.8	102.	102.	50-160
6	d8-Toluene	99.8	96.6	96.8	50-160
	p-Bromofluorobenzene	99.8	85.2	85.4	50-160
	d4-1,2-Dichloroethane	86.1	80.7	93.7	50-160
7	d8-Toluene	86.1	79.7	92.6	50-160
	p-Bromofluorobenzene	86.1	68.2	79.2	50-160
	d4-1,2-Dichloroethane	77.3	72.6	93.9	50-160
8	d8-Toluene	77.3	69.7	90.2	50-160
	p-Bromofluorobenzene	77.3	66.6	86.2	50-160
	d4-1,2-Dichloroethane	75.0	68.4	91.2	50-160
4MS	d8-Toluene	75.0	71.7	95.6	50-160
	p-Bromofluorobenzene	75.0	69.3	92.4	50-160
	d4-1,2-Dichloroethane	75.0	73.2	97.6	50-160
4MSD	d8-Toluene	75.0	70.5	94.0	50-160
	p-Bromofluorobenzene	75.0	68.1	90.8	50-160

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Laucks Testing Laboratories, Inc.

Sample Type: Low Soil
Lab No: 2877
Client: Retec
QC Logged:

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction to monitor for matrix effects and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types. In certain cases, we will have accumulated insufficient data to have established control limits.

03175587

Sample Number: MB-LOW Reported Values in Units of: ug/kg

Sample DWE: 30.0 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	3333	2176	65.3	25-121
d5-Phenol	3333	2228	66.9	24-113
2-Bromophenol	3333	1944	58.3	44-112
2,4,6-Tribromophenol	3333	1919	57.6	19-122
d5-Nitrobenzene	1667	1388	83.3	23-120
2-Fluorobiphenyl	1667	1020	61.2	30-115
d10-Azobenzene	1667	1060	63.6	60-126
d14-p-Terphenyl	1667	1630	97.8	18-137

Sample Number: 1 Reported Values in Units of: ug/kg

Sample DWE: 22.0 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4541	2733	60.2	25-121
d5-Phenol	4541	2959	65.2	24-113
2-Bromophenol	4541	2963	65.2	44-112
2,4,6-Tribromophenol	4541	3792	83.5	19-122
d5-Nitrobenzene	2271	1421	62.6	23-120
2-Fluorobiphenyl	2271	1594	70.2	30-115
d10-Azobenzene	2271	1696	74.7	60-126
d14-p-Terphenyl	2271	1618	71.2	18-137

Sample Number: 2 Reported Values in Units of: ug/kg

Sample DWE: 22.9 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4374	2622	59.9	25-121
d5-Phenol	4374	2750	62.9	24-113
2-Bromophenol	4374	2881	65.9	44-112
2,4,6-Tribromophenol	4374	3765	86.1	19-122
d5-Nitrobenzene	2187	1436	65.7	23-120
2-Fluorobiphenyl	2187	1404	64.2	30-115
d10-Azobenzene	2187	1807	82.6	60-126
d14-p-Terphenyl	2187	1683	77.0	18-137

Testing Laboratories, Inc.

Sample Type: Medium Soil
Lab No: 2344
Client: Retec
QC Logged:

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction to monitor for matrix effects and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types. In certain cases, we will have accumulated insufficient data to have established control limits.

03225SBZ

Sample Number: MB-MEDReported Values in Units of: ug/kg

Sample DWE: 0.50

Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	400000	170040	42.5	25-121
d5-Phenol	400000	187880	47.0	24-113
2-Bromophenol	400000	180520	45.1	44-112
2,4,6-Tribromophenol	400000	240920	60.2	19-122
d5-Nitrobenzene	200000	115440	57.7	23-120
2-Fluorobiphenyl	200000	91360	45.7	30-115
d10-Azobenzene	200000	101960	51.0	60-126
d14-p-Terphenyl	200000	148040	74.0	18-137

Sample Number: 3 Reported Values in Units of: ug/kg

Sample DWE: 0.40

Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	506329	290532	57.4	25-121
d5-Phenol	506329	320658	63.3	24-113
2-Bromophenol	506329	343241	67.8	44-112
2,4,6-Tribromophenol	506329	494380	97.6	19-122
d5-Nitrobenzene	253165	212152	83.8	23-120
2-Fluorobiphenyl	253165	153418	60.6	30-115
d10-Azobenzene	253165	218025	86.1	60-126
d14-p-Terphenyl	253165	202278	79.9	18-137

Laucks Testing Laboratories, Inc.

Sample Type: Low Soil
Lab No: 2877
Client: Retec
QC Logged:

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction to monitor for matrix effects and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types. In certain cases, we will have accumulated insufficient data to have established control limits.

Sample Number: 4 Reported Values in Units of: ug/kg

Sample DWE: 24.1 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4149	3535	85.2	25-121
d5-Phenol	4149	3469	83.6	24-113
2-Bromophenol	4149	3328	80.2	44-112
2,4,6-Tribromophenol	4149	4606	111.0	19-122
d5-Nitrobenzene	2075	1701	82.0	23-120
2-Fluorobiphenyl	2075	1730	83.4	30-115
d10-Azobenzene	2075	2137	103.0	60-126
d14-p-Terphenyl	2075	1851	89.2	18-137

Sample Number: 5 Reported Values in Units of: ug/kg

Sample DWE: 24.3 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4115	2556	62.1	25-121
d5-Phenol	4115	2947	71.6	24-113
2-Bromophenol	4115	2778	67.5	44-112
2,4,6-Tribromophenol	4115	3942	95.8	19-122
d5-Nitrobenzene	2058	1617	78.6	23-120
2-Fluorobiphenyl	2058	1449	70.4	30-115
d10-Azobenzene	2058	1798	87.4	60-126
d14-p-Terphenyl	2058	1551	75.4	18-137

Sample Number: 5MS Reported Values in Units of: ug/kg

Sample DWE: 24.3 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4115	2638	64.1	25-121
d5-Phenol	4115	2926	71.1	24-113
2-Bromophenol	4115	2947	71.6	44-112
2,4,6-Tribromophenol	4115	5226	127.0 *	19-122
d5-Nitrobenzene	2058	1247	60.6	23-120
2-Fluorobiphenyl	2058	1494	72.6	30-115
d10-Azobenzene	2058	2313	112.4	60-126
d14-p-Terphenyl	2058	1914	93.0	18-137

Sample Number: 5MSD Reported Values in Units of: ug/kg

Sample DWE: 24.3 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4115	2605	63.3	25-121
d5-Phenol	4115	3045	74.0	24-113
2-Bromophenol	4115	3239	78.7	44-112
2,4,6-Tribromophenol	4115	5309	129.0 *	19-122
d5-Nitrobenzene	2058	1333	64.8	23-120
2-Fluorobiphenyl	2058	1531	74.4	30-115
d10-Azobenzene	2058	2272	110.4	60-126
d14-p-Terphenyl	2058	1831	89.0	18-137

Laucks Testing Laboratories, Inc.

Sample Type: Low Soil
Lab No: 2877
Client: Retec
QC Logged:

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction to monitor for matrix effects and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types. In certain cases, we will have accumulated insufficient data to have established control limits.

Sample Number: 6 Reported Values in Units of: ug/kg

Sample DWE: 23.6 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4237	2415	57.0	25-121
d5-Phenol	4237	3008	71.0	24-113
2-Bromophenol	4237	2962	69.9	44-112
2,4,6-Tribromophenol	4237	5339	126.0 *	19-122
d5-Nitrobenzene	2119	1089	51.4	23-120
2-Fluorobiphenyl	2119	1250	59.0	30-115
d10-Azobenzene	2119	2356	111.2	60-126
d14-p-Terphenyl	2119	2097	99.0	18-137

Sample Number: 7 Reported Values in Units of: ug/kg

Sample DWE: 24.9 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4016	2558	63.7	25-121
d5-Phenol	4016	3189	79.4	24-113
2-Bromophenol	4016	3060	76.2	44-112
2,4,6-Tribromophenol	4016	6024	150.0 *	19-122
d5-Nitrobenzene	2008	1157	57.6	23-120
2-Fluorobiphenyl	2008	1325	66.0	30-115
d10-Azobenzene	2008	2337	116.4	60-126
d14-p-Terphenyl	2008	2036	101.4	18-137

Sample Number: 8 Reported Values in Units of: ug/kg

Sample DWE: 26.3 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	3802	2224	58.5	25-121
d5-Phenol	3802	2768	72.8	24-113
2-Bromophenol	3802	2726	71.7	44-112
2,4,6-Tribromophenol	3802	6350	167.0 *	19-122
d5-Nitrobenzene	1901	1065	56.0	23-120
2-Fluorobiphenyl	1901	1133	59.6	30-115
d10-Azobenzene	1901	2308	121.4	60-126
d14-p-Terphenyl	1901	2076	109.2	18-137

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LABORATORY NO. 2877

APPENDIX B

Matrix Spike/Matrix Spike Duplicate Report

Inorganics/Metals Analyses

	parts per million (mg/kg), dry basis					mg/kg			QC Limits	
Sample	Analyte	Spike Added	Sample Result	MS Result	% Rec	MSD Result	% Rec	RPD	RPD	REC
5	Silver	10.	<0.5	5.9	59.	5.6	56.	5.	none	established
5	Beryllium	2.5	0.4	2.4	80.	2.4	81.	1.	8	61-113
5	Cadmium	2.5	<0.5	2.	80.	2.	80.	0.	26	65-124
5	Chromium	25.	26.	44.	75.*	49.	93.	21.*	10	76-123
5	Copper	50.	18.	64.	92.	63.	90.	2.	11	80-118
5	Lead	50.	<10.	52.	86.	54.	90.	5.	40	66-135
5	Nickel	25.	30.	49.	77.	54.	97.	23.	21	75-128
5	Zinc	100.	42.	130.	85.	130.	91.	7.	24	67-121
5	Antimony	25.	<2.5	11.	45.	15.	60.	29.	none	established
7	Mercury	0.50	<0.1	0.4	82.	0.5	92.	12.	--	-----
8	Thallium	2.5	<0.5	1.9	77.	1.8	73.	5.3	none	established
8	Arsenic	25.	8.7	32.	94.	32.	94.	0.	none	established
8	Selenium	2.5	<0.5	2.3	92.	2.3	92.	0.	none	established

MS = Matrix Spike
MSD = Matrix Spike Duplicate
Rec = Recovery
RPD = Relative Percent Difference
* Values with asterisk are outside of QC limits

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LABORATORY NO. 2877

APPENDIX B

Matrix Spike/Duplicate Spike Quality Control

Reported below are the results of additional QC compounds utilized in the analysis of organic compounds. Compounds of interest are spiked into two additional sample aliquots prior to extraction and/or analysis to monitor for matrix effects, sample processing errors, and to calculate percent recoveries of compunds of interest and relative error in the analysis. The control limits represent the 95% confidence interval established in the laboratory through repetitive analysis of these sample types.

Sample # 4

	ug/kg, dry basis				ug/kg				
Compound	Conc Spike	Conc Samp	Conc MS	% REC	Conc MSD	% REC	RPD	RPD Limit	REC Limit
1,1-Dichloroethene	75.1	0.	67.0	89.2	76.0	101.	-12.4	22	59-172
Trichloroethene	75.1	0.	72.4	96.4	78.0	104.	-7.6	24	62-137
Chlorobenzene	75.1	0.	69.3	92.3	75.5	101.	-9.0	21	60-133
Toluene	75.1	0.	65.3	87.0	68.8	91.6	-5.2	21	59-139
Benzene	75.1	0.	70.8	94.3	77.4	103.	-8.8	21	66-142

Key

Conc = Concentration
Samp = Sample
MS = Matrix Spike
MSD = Matrix Spike Duplicate
REC = Recovery
RPD = Relative Percent Difference

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MDS REPORT

MATRIX SPIKE/MATRIX SPIKE DUPLICATE REPORT

LABORATORY NO.2877
CLIENT:RETEC
MATRIX:SOIL

UNITS REPORTED IN:UG ADDED

SMP NO.	ANALYTE	SPIKE ADDED	SAMPLE RESULT	FOR CALC.	MS RESULT	% REC	MSD RESULT	% REC	RPD	QC LIMITS RPD	QC LIMITS % REC
5	1,2,4-TRICHLOROBENZENE	100.0	<1.25	0	82.8	82.8	68.4	68.4	19.1	0-23	38-107
	ACENAPHTHENE	100.0	<1.25	0	82.8	82.8	85.8	85.8	3.6	0-19	31-137
	2,4-DINITROTOLUENE	100.0	<1.25	0	125.9	125.9 *	138.1	138.1 *	9.3	0-47	28-89
	PYRENE	100.0	<1.25	0	81.4	81.4	85.2	85.2	4.6	0-36	35-142
	N-NITROSO-DI-N-PROPYLAMINE	100.0	<1.25	0	87.5	87.5	89.1	89.1	1.8	0-38	41-126
___B/N___	1,4-DICHLOROBENZENE	100.0	<1.25	0	56.9	56.9	57.7	57.7	1.4	0-27	28-104
	PENTACHLOROPHENOL	200.0	<1.25	0	192.5	96.2	177.2	88.6	8.2	0-47	17-109
	PHENOL	200.0	<1.25	0	125.9	63.0	139.3	69.6	10.1	0-35	26-90
	2-CHLOROPHENOL	200.0	<1.25	0	121.3	60.6	130.9	65.5	7.7	0-50	25-102
	4-CHLORO-3-METHYLPHENOL	200.0	<1.25	0	244.5	122.3 *	248.5	124.3 *	1.6	0-33	26-103
__ACIDS__	4-NITROPHENOL	200.0	<1.25	0	313.5	156.8 *	301.2	150.6 *	4.0	0-50	11-114

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Appendix C

Attached are the Tentatively Identified Compounds

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LAUCKS TESTING LABORATORIES, INC
[illegible]0 S. Harney, Seattle, WA 98108
[illegible]06) 767-5060

SAMPLE NUMBER
(2877-MB)
0317SSB1

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1		Unknown	ABN	79	170J
2.		Unknown	ABN	94	610J
3.		Unknown	ABN	139	4200J
4.		Unknown	ABN	142	4300J
5.	3074713	Heptane,2,3-dimethyl-	ABN	146	310J
6.	922281	Heptane,3,4-dimethyl-	ABN	149	140J
7.	110123	2-Hexanone,5-methyl-	ABN	152	150J
8.	2216344	Octane,4-methyl-	ABN	159	350J
9.	2216333	Octane,3-methyl-	ABN	171	530J
10.		Unknown	ABN	233	460J
		Unknown	ABN	278	140J
[illegible].		Unknown	ABN	336	140J

Form I, Part B

mn/11-85

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SAMPLE NUMBER
(2877-1)

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	88	820J
2.		Unknown	ABN	138	7400J
3.	2216344	Octane,4-methyl-	ABN	160	470J
4.		Unknown	ABN	176	720J
5.		Unknown	ABN	879	600J
6.		Unknown	ABN	882	530J
7.		Unknown	ABN	1160	460J
8.		Unknown	ABN	1255	810J
9.	1235741	1-Phenanthrenecarboxylic acid	ABN	1291	540J
10.	27519024	9-Tricosene,(Z)-	ABN	1459	1400J
11.	55429840	Tetracosane,11-decyl-	ABN	1462	640J
12.		Unknown	ABN	1529	1400J
13.	74764117	Iron,tricarbonyl[N-(phenyl-2-pyridinyl	ABN	1560	4100J
14.	638664	Octadecanal	ABN	1623	1700J
15.	630068	Hexatriacontane	ABN	1651	4600J
16.	56554939	15-Octadecenal	ABN	1721	1100J
17.	629970	Docosane	ABN	1752	790J
18.		Unknown	ABN	1757	1700J
19.		Unknown	ABN	1766	530J
20.		Unknown	ABN	1784	660J
21.		Unknown	ABN	1848	360J
22.		Unknown	ABN	1859	590J
23.	83476	Stigmast-5-en-3-ol,(3.beta.,24S)-	ABN	1936	3500J
24.		Unknown	ABN	1942	350J
25.		Unknown	ABN	1969	1000J

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SAMPLE NUMBER
(8977-2)

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	91	720J
2.		Unknown	ABN	140	5600J
3.	3074713	Heptane,2,3-dimethyl-	ABN	148	620J
4.	922281	Heptane,3,4-dimethyl-	ABN	152	410J
5.	2216344	Octane,4-methyl-	ABN	161	650J
6	2216332	Octane,3-methyl-	ABN	173	1000J
7.		Unknown	ABN	234	450J
8		Unknown	ABN	280	540J
9.		Unknown	ABN	882	510J
10.	2091294	9-Hexadecenoic acid	ABN	1147	230J
[illegible]		Unknown	ABN	1160	530J
12.		Unknown	ABN	1255	240J
13.		Unknown	ABN	1270	470J
14.	27519024	9-Tricosene,(Z)-	ABN	1459	780J
15.	40710701	Octatetracontane	ABN	1559	890J
16.		Unknown	ABN	1605	240J
17.		Unknown	ABN	1622	470J
18.		Unknown	ABN	1650	1400J
19.		Unknown	ABN	1720	330J
20.	14167590	Tetratraicontane	ABN	1752	430J
21.		Unknown	ABN	1756	570J
22.		Unknown	ABN	1785	250J
23.	4651518	Ergost-5-en-3-ol,(3.beta.)-	ABN	1859	250J
24.		Unknown	ABN	1933	1800J
25.		Unknown	ABN	1953	280J

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SAMPLE NUMBER
8877-4RE

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1		Unknown	ABN	84	910J
2.	926829	Heptane,3,5-dimethyl-	ABN	110	460J
3.		Unknown	ABN	131	5100J
4.	3074713	Heptane,2,3-dimethyl-	ABN	144	1000J
5.		Unknown	ABN	147	970J
6.		Unknown	ABN	157	1200J
7.	2216300	Heptane,3,5-dimethyl-	ABN	169	3300J
8.		Unknown	ABN	250	350J
9.		Unknown	ABN	276	960J
10.		Unknown	ABN	334	300J
	87445	Bicyclo[7.2.0]undec-4-ene,	ABN	770	310J
12.		Unknown	ABN	958	1300J
13.	2091294	9-Hexadecenoic acid	ABN	1148	170J
14.	57114	Octadecanoic acid	ABN	1155	840J
15.		Unknown	ABN	1251	380J
16.	36237668	6,10,14-Hexadecatrien-1-ol,	ABN	1618	230J
17.	630079	Pentatriacontane	ABN	1646	330J
18.		Unknown	ABN	1746	240J
19.		Unknown	ABN	1918	280J

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SAMPLE NUMBER
(2877-3)

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.	Unknown	ABN	1368	40000J
2.	Unknown	ABN	1528	36000J
3.	Unknown	ABN	1540	52000J
4.	Unknown	ABN	1549	66000J
5.	Unknown	ABN	1552	38000J
6.	Unknown	ABN	1579	42000J
7.	Unknown	ABN	1620	55000J
8.	Unknown	ABN	1627	120000J
9.	Unknown	ABN	1632	72000J
10.	Unknown	ABN	1637	71000J
11.	Unknown	ABN	1646	110000J
[illegible]	Unknown	ABN	1657	72000J
13.	Unknown	ABN	1672	52000J
14.	Unknown	ABN	1677	50000J
15.	Unknown	ABN	1680	69000J
16.	Unknown	ABN	1685	74000J
17.	Unknown	ABN	1697	45000J
18.	Unknown	ABN	1701	36000J
19.	Unknown	ABN	1710	50000J
20.	Unknown	ABN	1720	70000J
21.	Unknown	ABN	1728	48000J
22.	Unknown	ABN	1745	54000J
23.	Unknown	ABN	1807	77000J
24.	Unknown	ABN	1876	53000J
25.	Unknown	ABN	1968	37000J

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SAMPLE NUMBER
(2877-B)

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	77	230J
2.		Unknown	ABN	86	720J
3		Unknown	ABN	136	5200J
4.	16789461	Hexane,3-ethyl-2-methyl-	ABN	143	470J
5.	922281	Heptane,3,4-dimethyl-	ABN	147	240J
6.	921471	Hexane,2,3,4-trimethyl-	ABN	156	510J
7.	2216333	Octane,3-methyl-	ABN	168	880J
8.		Unknown	ABN	230	510J
9		Unknown	ABN	276	560J
10	143077	Dodecanoic acid	ABN	877	220J
11.	26537713	Octadecatrienal	ABN	958	920J
12.	3648213	1,2-Benzenedicarboxylic acid,diheptyl	ABN	1448	250J
[illegible]	3648213	1,2-Benzenedicarboxylic acid,diheptyl	ABN	1481	480J
14.	3648213	1,2-Benzenedicarboxylic acid,diheptyl	ABN	1539	290J
15.		Unknown	ABN	1545	240J
16.	2004399	1-Heptacosanol	ABN	1555	270J
17.		Unknown	ABN	1629	400J
18.		Unknown	ABN	1636	270J
19.		Unknown	ABN	1647	370J
20.	3648213	1,2-Benzenedicarboxylic acid,diheptyl	ABN	1666	720J
21.		Unknown	ABN	1747	220J
22.		Unknown	ABN	1770	490J
23.		Unknown	ABN	1880	200J
24.		Unknown	ABN	1922	300J
25.		Unknown	ABN	1927	260J

[illegible]KS TESTING LABORATORIES, INC.
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[illegible]) 767-5060

SAMPLE NUMBER
(2677-6)

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	80	590J
2.		Unknown	ABN	131	6300J
3.	3074713	Heptane,2,3-dimethyl-	ABN	141	470J
4.		Unknown	ABN	145	400J
5.	2216344	Octane,4-methyl-	ABN	154	520J
6.	2216333	Octane,3-methyl-	ABN	166	830J
7.		Unknown	ABN	274	460J
8.		Unknown	ABN	1154	500J
9.		Unknown	ABN	1169	430J
10.	238846	11H-Benzo[a]fluorene	ABN	1317	310J
11.		Unknown	ABN	1416	320J
12.		Unknown	ABN	1552	370J
13.		Unknown	ABN	1616	370J
14.		Unknown	ABN	1640	820J
15.		Unknown	ABN	1642	1100J
16.		Unknown	ABN	1672	440J
17.		Unknown	ABN	1674	390J
18.		Unknown	ABN	1689	370J
19.		Unknown	ABN	1711	360J
20.	7098217	Tritetracontane	ABN	1742	860J

TESTING LABORATORIES, INC
S. Harney, Seattle WA 98108
767-5060

SAMPLE NUMBER
(2877-7)

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	83	770J
2.		Unknown	ABN	130	5400J
3.	3074713	Heptane,2,3-dimethyl-	ABN	138	650J
4.	2216344	Octane,4-methyl	ABN	151	680J
5.		Unknown	ABN	163	1200J
6.		Unknown	ABN	272	600J
7.		Unknown	ABN	331	420J
8.	143077	Dodecanoic acid	ABN	875	460J
9.		Unknown	ABN	1152	500J
10.	4764721	15-Octadecenoic acid,methyl ester	ABN	1262	720J
11.	3648213	1,2-Benzenedicarboxylic acid,diheptyl	ABN	1476	340J
12.	630079	Pentatriacontane	ABN	1550	420J
13.		Unknown	ABN	1612	150J
14.	7098228	Tetratetracontane	ABN	1640	930J
15.		Unknown	ABN	1658	320J
16.	3648213	1,2-Benzenedicarboxylic acid,diheptyl	ABN	1660	490J
17.	629970	Docosane	ABN	1740	620J
18.		Unknown	ABN	1762	320J
19.	74764117	Iron,tricarbonyl[N-(phenyl-2-	ABN	1872	430J
20.		Unknown	ABN	1881	480J
21.	83476	Stigmast-5-en-3-ol,(3.beta.,24S)-	ABN	1934	520J

TESTING LABORATORIES, INC
Harney, Seattle, WA 98108
767-5060

SAMPLE NUMBER
2877-8

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	80	690J
2.		Unknown	ABN	129	5600J
3.	1069530	Hexane,2,3,5-trimethyl-	ABN	137	580J
4.	2216344	Octane,4-methyl-	ABN	150	610J
5.		Unknown	ABN	162	970J
6.		Unknown	ABN	1547	750J
7.		Unknown	ABN	1562	480J
8.		Unknown	ABN	1564	470J
9.		Unknown	ABN	1581	740J
10.		Unknown	ABN	1593	530J
11.		Unknown	ABN	1605	430J
12.		Unknown	ABN	1609	660J
13.		Unknown	ABN	1614	530J
14.		Unknown	ABN	1619	540J
15.		Unknown	ABN	1625	560J
16.	630079	Pentatriacontane	ABN	1637	1500J
17.		Unknown	ABN	1654	620J
18.		Unknown	ABN	1683	440J
19.		Unknown	ABN	1706	480J
20.		Unknown	ABN	1736	800J

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Certificate

Chemistry, Microbiology, and Technical Services

Retec

LABORATORY NO. 2877

Appendix D

Attached are the chain of custody records

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Retec
Kent WA

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
South Tacoma Swamp	S. Tacoma, WA
Project No.	**Field Logbook No.**
0027	001
Sampler: (Signature)	**Chain of Custody Tape No.**
SEMcGill	—

ANALYSES

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	VOLS method 624	semi-vols method method 625	pinnate pollutants metals method 207				REMARKS
27-52/51	3-12-87	0920	–	soil	✓	✓	✓				
27-55/56		1006			✓	✓	✓				
27-40/34		1105			✓	✓	✓				
27-41/42		1119			✓	✓	✓				
27-41/42		1127			✓	✓	✓				
27-44/43		1214			✓	✓	✓				
27-54/53		1233			✓	✓	✓				
27-62/61		1241			✓	✓	✓				

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
SEMcGill	3-12-87	1520			
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature)	Date	Time
			R Bronson	3/12/87	3:20pm
Sample Disposal Method:	Disposed of by: (Signature)			Date	Time

SAMPLE COLLECTOR | ANALYTICAL LABORATORY

Sample Receipt acknowledged pending verification of sample count. You will be notified within one working day of any discrepancies found.
Signed [illegible] Date 3/12 Time 3:20pm

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Chemistry, Microbiology, and Technical Services

CLIENT: Remediation Technologies, Inc.
19219 West Valley Hwy., Suite M103
Kent, WA 98032
ATTN: Norm Allworth

LABORATORY NO. 2344

DATE: April 6, 1987

JOB: 0027 South Tacoma

REPORT ON: SOIL

SAMPLE IDENTIFICATION: Submitted 02/12/87 and identified as shown below:

1)	27-31	02/12/87	L.M.	10:40
2)	27-32	02/12/87	L.M.	10:46
3)	27-33	02/12/87	L.M.	10:50
4)	27-34	02/12/87	L.M.	10:54
5)	27-36	02/12/87	L.M.	10:18
6)	27-36a	02/12/87	L.M.	10:18
7)	27-37	02/12/87	L.M.	10:23
8)	27-38	02/12/87	L.M.	10:28
9)	27-3	02/12/87	McGill	09:19
10)	27-9	02/12/87	L.M.	09:32
11)	27-10	02/12/87	L.M.	09:40
12)	27-11	02/12/87	L.M.	09:45

TESTS PERFORMED AND RESULTS:

Splits for volatile organics analysis were taken prior to sieving. Samples were then passed through a No. 8 sieve, and Only material passing the sieve was utilized for all other analyses.

	1	2	3	4	5	6
% Retained	15.	16.	19.	31.	L/2.	5.
Major Description	Rocks	Rocks	Rocks	Rocks	—	Rocks
Minor Description	Roots/ Grass	Roots	Roots/ Grass	—	—	—

	7	8	9	10	11	12
% Retained	3.	8.	61.	36.	58.	46.
Major Description	Rocks	Rocks	Rocks	Rocks	Rocks	Rocks

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Selected samples were analyzed with results as shown below:

	parts per billion (ug/kg), dry basis		
	10	11	12
PCB	L/50.	L/50.	200. C

Samples were analyzed for priority pollutants in accordance with Test Methods for Evaluating Solid Waste (SW-846) U.S.E.P.A. 1982 Method 8240 (volatile organics), 8270 (semi-volatile extractables), 8080 (pesticides and PCB's),and the 7000 series (metals analysis).

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Inorganics	1	2	3	4	5
Total Solids, %	80.5	85.8	79.1	83.8	83.5
	parts per million (mg/kg), dry basis				
Antimony	L/2.5	3.3	L/2.5	L/2.5	L/2.5
Arsenic	8.2	3.5	2.8	2.8	1.0
Beryllium	L/0.1	L/0.1	L/0.1	L/0.1	L/0.1
Cadmium	L/0.5	L/0.5	L/0.5	L/0.5	L/0.5
Chromium	460.	90.	120.	130.	26.
Copper	320.	54.	150.	98.	39.
Lead	50.	300.	85.	34.	L/10.
Mercury	L/0.1	L/0.1	L/0.1	L/0.1	L/0.1
Nickel	740.	41.	74.	59.	17.
Selenium	L/0.5	0.8	3.5	0.7	L/0.5
Silver	L/0.5	L/0.5	L/0.5	L/0.5	L/0.5
Thallium	L/0.5	L/0.5	L/0.5	L/0.5	L/0.5
Zinc	340.	86.	63.	33.	26.

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Inorganics	6	7	8	9	10
Total Solids, %	81.4	70.8	78.7	84.7	78.4
	parts per million (mg/kg), dry basis				
Antimony	L/2.5	L/2.5	L/2.5	L/2.5	29.
Arsenic	0.8	5.8	7.0	11.	31.
Beryllium	L/0.1	0.8	0.2	0.5	0.8
Cadmium	L/0.5	L/0.5	L/0.5	L/0.5	L/0.5
Chromium	23.	150.	390.	22.	14.
Copper	20.	95.	290.	32.	6100.
Lead	L/10.	14.	87.	42.	1700.
Mercury	L/0.1	L/0.1	L/0.1	L/0.1	L/0.1
Nickel	15.	79.	280.	22.	37.
Selenium	L/0.5	L/0.5	L/0.5	L/0.5	L/0.5
Silver	L/0.5	L/0.5	1.6	L/0.5	1.3
Thallium	L/0.5	L/0.5	L/0.5	L/0.5	L/0.5
Zinc	27.	62.	130.	64.	320.

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Inorganics	11	12	Method Blank
Total Solids, %	80.3	80.1	—
	parts per million (mg/kg), dry basis		
Antimony	90.	180.	L/2.5
Arsenic	23.	41.	L/0.5
Beryllium	0.4	0.6	L/0.1
Cadmium	2.7	2.7	L/0.5
Chromium	19.	26.	L/1.
Copper	2700.	730.	L/1.
Lead	1900.	1700.	L/10.
Mercury	0.2	12.	L/0.1
Nickel	38.	57.	2.
Selenium	L/0.5	L/0.5	L/0.5
Silver	L/0.5	L/0.5	2.5
Thallium	L/0.5	L/0.5	L/0.5
Zinc	720.	810.	2.

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Remediation Technologies, Inc.

LABORATORY NO. 2344

Volatile Organics (GC/MS)	parts per billion (ug/kg), dry basis				
	1	2	3	4	5
Chloromethane	L/3.	L/3.	L/3.	L/3.	L/3.
Bromomethane	L/3.	L/3.	L/3.	L/3.	L/3.
Vinyl Chloride	L/3.	L/3.	L/3.	L/3.	L/3.
Chloroethane	L/3.	L/3.	L/3.	L/3.	L/3.
Methylene Chloride	tracel	41.	tracel	tracel	tracel
Acrolein	L/15.	L/15.	L/15.	L/15.	L/15.
*Acetone	L/3.	17.	L/3.	L/3	L/3.
Acrylonitrile	L/15.	L/15.	L/15.	L/15.	L/15.
*Carbon Disulfide	L/3.	L/3.	L/3.	L/3.	L/3.
1,1-Dichloroethylene	L/3.	L/3.	L/3.	L/3.	L/3.
1,1-Dichloroethane	L/3.	L/3.	L/3.	L/3.	L/3.
trans-1,2-Dichloroethylene	L/3.	L/3.	L/3.	L/3.	L/3.
Chloroform	L/3.	L/3.	L/3.	L/3.	L/3.
*2-Butanone	L/3.	L/3.	L/3.	L/3.	L/3.
1,2-Dichloroethane	L/3.	L/3.	L/3.	L/3.	L/3.
1,1,1-Trichloroethane	L/3.	L/3.	L/3.	L/3.	L/3.
*Vinyl Acetate	L/3.	L/3.	L/3.	L/3.	L/3.
Bromodichloromethane	L/3.	L/3.	L/3.	L/3.	L/3.
Carbon Tetrachloride	L/3.	L/3.	L/3.	L/3.	L/3.
1,2-Dichloropropane	L/3.	L/3.	L/3.	L/3.	L/3.
Trichloroethylene	L/3.	L/3.	L/3.	L/3.	tracel
Benzene	L/3.	L/3.	L/3.	L/3.	L/3.

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Volatile Organics (GC/MS)	parts per billion (ug/kg), dry basis				
	1	2	3	4	5
Chlorodibromomethane	L/3.	L/3.	L/3.	L/3.	L/3.
1,1,2-Trichloroethane	L/3.	L/3.	L/3.	L/3.	L/3.
2-Chloroethyl vinyl ether	L/3.	L/3.	L/3.	L/3.	L/3.
Bromoform	L/3.	L/3.	L/3.	L/3.	L/3.
*4-Methyl-2-pentanone	L/3.	L/3.	L/3.	L/3.	L/3.
*2-Hexanone	L/3.	L/3.	L/3.	L/3.	L/3.
1,1,2,2-Tetrachloroethane	L/3.	L/3.	L/3.	L/3.	L/3.
Tetrachloroethylene	L/3.	tracel	L/3.	L/3.	L/3.
Toluene	L/3.	L/3.	L/3.	L/3.	L/3.
Chlorobenzene	L/3.	L/3.	L/3.	L/3.	L/3.
trans-1,3-Dichloropropene	L/3.	L/3.	L/3.	L/3.	L/3.
Ethylbenzene	L/3.	L/3.	L/3.	L/3.	L/3.
cis-1,3-Dichloropropene	L/3.	L/3.	L/3.	L/3.	L/3.
*Styrene	L/3.	L/3.	L/3.	L/3.	L/3.
*o-Xylene	L/3.	L/3.	L/3.	L/3.	L/3.

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Volatile Organics (GC/MS)	parts per billion (ug/kg), dry basis				
	6	7	8	9	10
Chloromethane	L/3.	L/3.	L/3.	L/3.	L/3.
Bromomethane	L/3.	L/3.	L/3.	L/3.	L/3.
Vinyl Chloride	L/3.	L/3.	L/3.	L/3.	L/3.
Chloroethane	L/3.	L/3.	L/3.	L/3.	L/3.
Methylene Chloride	tracel	tracel	L/3.	L/3.	tracel
Acrolein	L/15.	L/15.	L/15.	L/15.	L/15.
*Acetone	L/3.	66.	L/3.	L/3.	tracel
Acrylonitrile	L/15.	L/15.	L/15.	L/15.	L/15.
*Carbon Disulfide	L/3.	L/3.	L/3.	L/3.	L/3.
1,1-Dichloroethylene	L/3.	L/3.	L/3.	L/3.	L/3.
1,1-Dichloroethane	L/3.	L/3.	L/3.	L/3.	L/3.
trans-1,2-Dichloroethylene	L/3.	L/3.	L/3.	L/3.	L/3.
Chloroform	L/3.	L/3.	L/3.	L/3.	L/3.
*2-Butanone	L/3.	L/3.	L/3.	L/3.	L/3.
1,2-Dichloroethane	L/3.	L/3.	L/3.	L/3.	L/3.
1,1,1-Trichloroethane	L/3.	L/3.	L/3.	L/3.	L/3.
*Vinyl Acetate	L/3.	L/3.	L/3.	L/3.	L/3.
Bromodichloromethane	L/3.	L/3.	L/3.	L/3.	L/3.
Carbon Tetrachloride	L/3.	L/3.	L/3.	L/3.	L/3.
1,2-Dichloropropane	L/3.	L/3.	L/3.	L/3.	L/3.
Trichloroethylene	L/3.	L/3.	L/3.	L/3.	L/3.
Benzene	L/3.	L/3.	L/3.	L/3.	L/3.

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Volatile Organics (GC/MS)	parts per billion (ug/kg), dry basis				
	6	7	8	9	10
Chlorodibromomethane	L/3.	L/3.	L/3.	L/3.	L/3.
1,1,2-Trichloroethane	L/3.	L/3.	L/3.	L/3.	L/3.
2-Chloroethyl vinyl ether	L/3.	L/3.	L/3.	L/3.	L/3.
Bromoform	L/3.	L/3.	L/3.	L/3.	L/3.
*4-Methyl-2-pentanone	L/3.	L/3.	L/3.	L/3.	L/3.
*2-Hexanone	L/3.	L/3.	L/3.	L/3.	L/3.
1,1,2,2-Tetrachloroethane	L/3.	L/3.	L/3.	L/3.	L/3.
Tetrachloroethylene	L/3.	L/3.	L/3.	L/3.	L/3.
Toluene	L/3.	L/3.	L/3.	L/3.	L/3.
Chlorobenzene	L/3.	L/3.	L/3.	L/3.	L/3.
trans-1,3-Dichloropropene	L/3.	L/3.	L/3.	L/3.	L/3.
Ethylbenzene	L/3.	L/3.	L/3.	L/3.	L/3.
cis-1,3-Dichloropropene	L/3.	L/3.	L/3.	L/3.	L/3.
*Styrene	L/3.	L/3.	L/3.	L/3.	L/3.
*o-Xylene	L/3.	L/3.	L/3.	L/3.	L/3.

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Volatile Organics (GC/MS)	parts per billion (ug/kg), dry basis		
	11	12	Method Blank
Chloromethane	L/3.	L/3.	L/3.
Bromomethane	L/3.	L/3.	L/3.
Vinyl Chloride	L/3.	L/3.	L/3.
Chloroethane	L/3.	L/3.	L/3.
Methylene Chloride	tracel	L/3.	L/3.
Acrolein	L/15.	L/15.	L/15.
*Acetone	L/3.	L/3.	L/3.
Acrylonitrile	L/15.	L/15.	L/15.
*Carbon Disulfide	L/3.	L/3.	L/3.
1,1-Dichloroethylene	L/3.	L/3.	L/3.
1,1-Dichloroethane	L/3.	L/3.	L/3.
trans-1,2-Dichloroethylene	L/3.	L/3.	L/3.
Chloroform	L/3.	L/3.	L/3.
*2-Butanone	L/3.	L/3.	L/3.
1,2-Dichloroethane	L/3.	L/3.	L/3.
1,1,1-Trichloroethane	L/3.	L/3.	L/3.
*Vinyl Acetate	L/3.	L/3.	L/3.
Bromodichloromethane	L/3.	L/3.	L/3.
Carbon Tetrachloride	L/3.	L/3.	L/3.
1,2-Dichloropropane	L/3.	L/3.	L/3.
Trichloroethylene	tracel	L/3.	L/3.
Benzene	L/3.	L/3.	L/3.

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parts per billion (ug/kg), dry basis

Volatile Organics (GC/MS)	11	12	Method Blank
Chlorodibromomethane	L/3.	L/3.	L/3.
1,1,2-Trichloroethane	L/3.	L/3.	L/3.
2-Chloroethyl vinyl ether	L/3.	L/3.	L/3.
Bromoform	L/3.	L/3.	L/3.
*4-Methyl-2-pentanone	L/3.	L/3.	L/3.
*2-Hexanone	L/3.	L/3.	L/3.
1,1,2,2-Tetrachloroethane	L/3.	L/3.	L/3.
Tetrachloroethylene	L/3.	L/3.	L/3.
Toluene	L/3.	L/3.	L/3.
Chlorobenzene	L/3.	L/3.	L/3.
trans-1,3-Dichloropropene	L/3.	L/3.	L/3.
Ethylbenzene	L/3.	L/3.	L/3.
cis-1,3-Dichloropropene	L/3.	L/3.	L/3.
*Styrene	L/3.	L/3.	L/3.
*o-Xylene	L/3.	L/3.	L/3.

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Extractables (by GC/MS)	parts per billion (ug/kg) 1	2	3	4	5
N-nitrosodimethylamine	L/50.	L/50.	L/50.	L/50.	L/50.
Bis(2-chloroethyl)ether	L/50.	L/50.	L/50.	L/50.	L/50.
2-Chlorophenol	L/50.	L/50.	L/50.	L/50.	L/50.
Phenol	1200.	420.	L/50.	L/50.	610.
1,3-Dichlorobenzene	L/50.	L/50.	L/50.	L/50.	L/50.
1,4-Dichlorobenzene	L/50.	L/50.	L/50.	L/50.	L/50.
1,2-Dichlorobenzene	L/50.	L/50.	L/50.	L/50.	L/50.
Bis(2-chloroisopropyl)ether	L/50.	L/50.	L/50.	L/50.	L/50.
Hexachloroethane	L/50.	L/50.	L/50.	L/50.	L/50.
N-nitroso-di-n-propylamine	L/50.	L/50.	L/50.	L/50.	L/50.
Nitrobenzene	L/50.	L/50.	L/50.	L/50.	L/50.
Isophorone	L/50.	L/50.	L/50.	L/50.	L/50.
2-Nitrophenol	L/50.	L/50.	L/50.	L/50.	L/50.
2,4-Dimethylphenol	L/50.	L/50.	L/50.	L/50.	L/50.
Bis(2-chloroethoxy)methane	L/50.	L/50.	L/50.	L/50.	L/50.
2,4-Dichlorophenol	L/50.	L/50.	L/50.	L/50.	L/50.
1,2,4-Trichlorobenzene	L/50.	L/50.	L/50.	L/50.	L/50.
Naphthalene	780.	220.	L/50.	150.	310.
Hexachlorobutadiene	L/50.	L/50.	L/50.	L/50.	L/50.
4-Chloro-m-cresol	L/50.	L/50.	L/50.	L/50.	L/50.
Hexachlorocyclopentadiene	L/50.	L/50.	L/50.	L/50.	L/50.
2,4,6-Trichlorophenol	L/50.	L/50.	L/50.	L/50.	L/50.
2-Chloronaphthalene	L/50.	L/50.	L/50.	L/50.	L/50.
Acenaphthylene	L/50.	L/50.	L/50.	L/50.	L/50.
Dimethylphthalate	L/50.	L/50.	L/50.	L/50.	L/50.
2,6-Dinitrotoluene	L/50.	L/50.	L/50.	L/50.	L/50.
Acenaphthene	830.	440.	L/50.	210.	L/50.
2,4-Dinitrophenol	L/50.	L/50.	L/50.	L/50.	L/50.
2,4-Dinitrotoluene	L/50.	L/50.	L/50.	L/50.	L/50.
4-Nitrophenol	L/50.	L/50.	L/50.	L/50.	L/50.

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Remediation Technologies, Inc.

LABORATORY NO. 2344

Extractables (by GC/MS)	parts per billion (ug/kg) 1	2	3	4	5
Fluorene	650.	86.	L/50.	L/50.	L/50.
4-Chlorophenyl phenyl ether	L/50.	L/50.	L/50.	L/50.	L/50.
Diethylphthalate	L/50.	L/50.	L/50.	L/50.	L/50.
4,6-Dinitro-o-cresol	L/50.	L/50.	L/50.	L/50.	L/50.
1,2-Diphenylhydrazine	L/50.	L/50.	L/50.	L/50.	L/50.
4-Bromophenyl phenyl ether	L/50.	L/50.	L/50.	L/50.	L/50.
Hexachlorobenzene	L/50.	L/50.	L/50.	L/50.	L/50.
Pentachlorophenol	L/50.	L/50.	L/50.	L/50.	L/50.
Phenanthrene	2100.	670.	140.	270.	63.
Anthracene	230.	240.	L/50.	L/50.	L/50.
Dibutylphthalate	L/50.	L/50.	L/50.	L/50.	L/50.
Fluoranthene	4300.	2400.	280.	830.	L/50.
Pyrene	2700.	2000.	210.	680.	L/50.
Benzidine	L/50.	L/50.	L/50.	L/50.	L/50.
Butyl benzyl phthalate	L/50.	L/50.	L/50.	L/50.	L/50.
Benzo(a)anthracene	3400.	2900.	280.	1100.	L/50.
Chrysene	3500.	2900.	350.	1200.	L/50.
3,3'-Dichlorobenzidine	L/50.	L/50.	L/50.	L/50.	L/50.
Bis(2-ethylhexyl)phthalate	98.	150.	93.	120.	470.
N-nitrosodiphenylamine	L/50.	L/50.	L/50.	L/50.	L/50.
Di-n-octyl phthalate	L/50.	L/50.	L/50.	L/50.	L/50.
Benzo(b)fluoranthene	6500.	7400.	680.	2500.	L/50.
Benzo(k)fluoranthene	1800.	2500.	360.	1300.	L/50.
Benzo(a)pyrene	3400.	8300.	660.	2600.	L/50.
Indeno(1,2,3-cd)pyrene	1400.	3100.	330.	1300.	L/50.
Dibenzo(ah)anthracene	110.	230.	57.	89.	L/50.
Benzo(ghi)perylene	1100.	2800.	270.	1100.	L/50.
*Aniline	L/50.	L/50.	L/50.	L/50.	L/50.

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*Benzoic Acid	390.	1/50.	330.	L/50.	690.
*Benzyl Alcohol	L/50.	L/50.	L/50.	L/50.	L/50.
*4-Chloroaniline	L/50.	L/50.	L/50.	L/50.	L/50.
*Dibenzofuran	690.	68.	L/50.	L/50.	L/50.
*2-Methylnaphthalene	1700.	150.	L/50.	76.	330.
*2-Methylphenol	L/50.	L/50.	L/50.	L/50.	L/50.
*4-Methylphenol	L/50.	L/50.	L/50.	L/50.	L/50.
*2-Nitroaniline	L/50.	L/50.	L/50.	L/50.	L/50.
*3-Nitroaniline	L/50.	L/50.	L/50.	L/50.	L/50.
*4-Nitroaniline	L/50.	L/50.	L/50.	L/50.	L/50.
*2,4,5-Trichlorophenol	L/50.	L/50.	L/50.	L/50.	L/50.

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Extractables (by GC/MS)	parts per billion (ug/kg) 6	7	8	9	10
N-nitrosodimethylamine	L/50.	L/60.	L/50.	L/50.	L/50.
Bis(2-chloroethyl)ether	L/50.	L/60.	L/50.	L/50.	L/50.
2-Chlorophenol	L/50.	L/60.	L/50.	L/50.	L/50.
Phenol	730.	4200.	L/50.	L/50.	L/50.
1,3-Dichlorobenzene	L/50.	L/60.	990.	L/50.	L/50.
1,4-Dichlorobenzene	L/50.	L/60.	L/50.	L/50.	L/50.
1,2-Dichlorobenzene	L/50.	L/60.	L/50.	L/50.	L/50.
Bis(2-chloroisopropyl)ether	L/50.	L/60.	L/50.	L/50.	L/50.
Hexachloroethane	L/50.	L/60.	L/50.	L/50.	L/50.
N-nitroso-di-n-propylamine	L/50.	L/60.	L/50.	L/50.	L/50.
Nitrobenzene	L/50.	L/60.	L/50.	L/50.	L/50.
Isophorone	L/50.	L/60.	L/50.	L/50.	L/50.
2-Nitrophenol	L/50.	L/60.	L/50.	L/50.	L/50.
2,4-Dimethylphenol	L/50.	L/60.	L/50.	L/50.	L/50.
Bis(2-chloroethoxy)methane	L/50.	L/60.	L/50.	L/50.	L/50.
2,4-Dichlorophenol	L/50.	L/60.	L/50.	L/50.	L/50.
1,2,4-Trichlorobenzene	L/50.	L/60.	L/50.	L/50.	L/50.
Naphthalene	290.	1700.	380.	97.	220.
Hexachlorobutadiene	L/50.	L/60.	L/50.	L/50.	L/50.
4-Chloro-m-cresol	L/50.	L/60.	L/50.	L/50.	L/50.
Hexachlorocyclopentadiene	L/50.	L/60.	L/50.	L/50.	L/50.
2,4,6-Trichlorophenol	L/50.	L/60.	L/50.	L/50.	L/50.
2-Chloronaphthalene	L/50.	L/60.	L/50.	L/50.	L/50.
Acenaphthylene	L/50.	L/60.	L/50.	300.	L/50.
Dimethylphthalate	L/50.	L/60.	L/50.	L/50.	L/50.
2,6-Dinitrotoluene	L/50.	L/60.	L/50.	L/50.	L/50.
Acenaphthene	L/50.	L/60.	L/50.	L/50.	L/50.
2,4-Dinitrophenol	L/50.	L/60.	L/50.	L/50.	L/50.
2,4-Dinitrotoluene	L/50.	L/60.	L/50.	L/50.	L/50.
4-Nitrophenol	L/50.	L/60.	L/50.	L/50.	L/50.

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Extractables (by GC/MS)	parts per billion (ug/kg) 6	7	8	9	10
Fluorene	L/50.	130.	L/50.	L/50.	L/50.
4-Chlorophenyl phenyl ether	L/50.	L/60.	L/50.	L/50.	L/50.
Diethylphthalate	L/50.	L/60.	L/50.	L/50.	L/50.
4,6-Dinitro-o-cresol	L/50.	L/60.	L/50.	L/50.	L/50.
1,2-Diphenylhydrazine	L/50.	L/60.	L/50.	L/50.	L/50.
4-Bromophenyl phenyl ether	L/50.	L/60.	L/50.	L/50.	L/50.
Hexachlorobenzene	L/50.	L/60.	L/50.	L/50.	L/50.
Pentachlorophenol	L/50.	L/60.	L/50.	L/50.	L/50.
Phenanthrene	74.	460.	120.	180.	310.
Anthracene	L/50.	230.	60.	170.	L/50.
Dibutylphthalate	L/50.	L/60.	L/50.	L/50.	L/50.
Fluoranthene	L/50.	130.	L/50.	400.	250.
Pyrene	L/50.	86.	L/50.	400.	320.
Benzidine	L/50.	L/60.	L/50.	L/50.	L/50.
Butyl benzyl phthalate	L/50.	L/60.	L/50.	L/50.	L/50.
Benzo(a)anthracene	L/50.	L/60.	L/50.	260.	L/50.
Chrysene	L/50.	L/60.	L/50.	560.	220.
3,3'-Dichlorobenzidine	L/50.	L/60.	L/50.	L/50.	L/50.
Bis(2-ethylhexyl)phthalate	200.	290.	67.	98.	160.
N-nitrosodiphenylamine	L/50.	L/60.	L/50.	L/50.	L/50.
Di-n-octyl phthalate	L/50.	L/60.	L/50.	L/50.	L/50.
Benzo(b)fluoranthene	L/50.	L/60.	L/50.	740.	350.
Benzo(k)fluoranthene	L/50.	L/60.	L/50.	380.	210.
Benzo(a)pyrene	L/50.	L/60.	L/50.	200.	86.
Indeno(1,2,3-cd)pyrene	L/50.	L/60.	L/50.	220.	97.
Dibenzo(ah)anthracene	L/50.	L/60.	L/50.	L/50.	L/50.
Benzo(ghi)perylene	L/50.	L/60.	L/50.	210.	94.
*Aniline	L/50.	L/60.	L/50.	L/50.	L/50.

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Extractables (by GC/MS)	parts per billion (ug/kg) 6	7	8	9	10
*Benzoic Acid	610.	300.	660.	860.	800.
*Benzyl Alcohol	L/50.	L/60.	L/50.	L/50.	L/50.
*4-Chloroaniline	L/50.	L/60.	L/50.	L/50.	L/50.
*Dibenzofuran	L/50.	190.	L/50.	L/50.	140.
*2-Methylnaphthalene	340.	1600.	340.	L/50.	1000.
*2-Methylphenol	L/50.	730.	L/50.	L/50.	L/50.
*4-Methylphenol	L/50.	L/60.	L/50.	L/50.	L/50.
*2-Nitroaniline	L/50.	L/60.	L/50.	L/50.	L/50.
*3-Nitroaniline	L/50.	L/60.	L/50.	L/50.	L/50.
*4-Nitroaniline	L/50.	L/60.	L/50.	L/50.	L/50.
*2,4,5-Trichlorophenol	L/50.	L/60.	L/50.	L/50.	L/50.

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Extractables (by GC/MS)	parts per billion (ug/kg) 11	12	Method Blank
N-nitrosodimethylamine	L/50.	L/500.	L/50.
Bis(2-chloroethyl)ether	L/50.	L/500.	L/50.
2-Chlorophenol	L/50.	L/500.	L/50.
Phenol	L/50.	L/500.	L/50.
1,3-Dichlorobenzene	L/50.	L/500.	L/50.
1,4-Dichlorobenzene	L/50.	L/500.	L/50.
1,2-Dichlorobenzene	L/50.	L/500.	L/50.
Bis(2-chloroisopropyl)ether	L/50.	L/500.	L/50.
Hexachloroethane	L/50.	L/500.	L/50.
N-nitroso-di-n-propylamine	L/50.	L/500.	L/50.
Nitrobenzene	L/50.	L/500.	L/50.
Isophorone	L/50.	L/500.	L/50.
2-Nitrophenol	L/50.	L/500.	L/50.
2,4-Dimethylphenol	L/50.	L/500.	L/50.
Bis(2-chloroethoxy)methane	L/50.	L/500.	L/50.
2,4-Dichlorophenol	L/50.	L/500.	L/50.
1,2,4-Trichlorobenzene	L/50.	L/500.	L/50.
Naphthalene	130.	710.	L/50.
Hexachlorobutadiene	L/50.	L/500.	L/50.
4-Chloro-m-cresol	L/50.	L/500.	L/50.
Hexachlorocyclopentadiene	L/50.	L/500.	L/50.
2,4,6-Trichlorophenol	L/50.	L/500.	L/50.
2-Chloronaphthalene	L/50.	L/500.	L/50.
Acenaphthylene	72.	L/500.	L/50.
Dimethylphthalate	L/50.	L/500.	L/50.
2,6-Dinitrotoluene	L/50.	L/500.	L/50.
Acenaphthene	L/50.	L/500.	L/50.
2,4-Dinitrophenol	L/50.	L/500.	L/50.
2,4-Dinitrotoluene	L/50.	L/500.	L/50.
4-Nitrophenol	L/50.	L/500.	L/50.

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Extractables (by GC/MS)	parts per billion (ug/kg) 11	12	Method Blank
Fluorene	L/50.	L/500.	L/50.
4-Chlorophenyl phenyl ether	L/50.	L/500.	L/50.
Diethylphthalate	L/50.	L/500.	L/50.
4,6-Dinitro-o-cresol	L/50.	L/500.	L/50.
1,2-Diphenylhydrazine	L/50.	L/500.	L/50.
4-Bromophenyl phenyl ether	L/50.	L/500.	L/50.
Hexachlorobenzene	L/50.	L/500.	L/50.
Pentachlorophenol	L/50.	L/500.	L/50.
Phenanthrene	380.	1600.	L/50.
Anthracene	120.	L/500.	L/50.
Dibutylphthalate	L/50.	L/500.	L/50.
Fluoranthene	530.	1400.	L/50.
Pyrene	470.	1200.	L/50.
Benzidine	L/50.	L/500.	L/50.
Butyl benzyl phthalate	L/50.	L/500.	L/50.
Benzo(a)anthracene	260.	1100.	L/50.
Chrysene	330.	1300.	L/50.
3,3'-Dichlorobenzidine	L/50.	L/500.	L/50.
Bis(2-ethylhexyl)phthalate	88.	L/500.	L/50.
N-nitrosodiphenylamine	L/50.	L/500.	L/50.
Di-n-octyl phthalate	L/50.	L/500.	L/50.
Benzo(b)fluoranthene	710.	1900.	L/50.
Benzo(k)fluoranthene	***	***	L/50.
Benzo(a)pyrene	270.	610.	L/50.
Indeno(1,2,3-cd)pyrene	120.	L/500.	L/50.
Dibenzo(ah)anthracene	L/50.	L/500.	L/50.
Benzo(ghi)perylene	100.	L/500.	L/50.
*Aniline	L/50.	L/500.	L/50.

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*Benzoic Acid	1500.	L/500.	L/50.
*Benzyl Alcohol	L/50.	L/500.	L/50.
*4-Chloroaniline	L/50.	L/500.	L/50.
*Dibenzofuran	67.	L/500.	L/50.
*2-Methylnaphthalene	150.	660.	L/50.
*2-Methylphenol	L/50.	L/500.	L/50.
*4-Methylphenol	L/50.	L/500.	L/50.
*2-Nitroaniline	L/50.	L/500.	L/50.
*3-Nitroaniline	L/50.	L/500.	L/50.
*4-Nitroaniline	L/50.	L/500.	L/50.
*2,4,5-Trichlorophenol	L/50.	L/500.	L/50.

Key

L/ indicates less than
* indicates additional compounds from the EPA's Hazardous Substances List.
** Other compounds of interest identified, in estimated amounts
***Reported as Total Benzo(b)Fluoranthene/Benzo(k)Fluoranthene. No resolution of peaks.
tracel indicates an unquantifiable amount between 3-5 parts per billion.

Respectfully submitted,

Laucks Testing Laboratories, Inc.

J. M. Owens

J. M. Owens

JMO:laj

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APPENDIX A

Matrix Spike/Matrix Spike Duplicate Report

		parts per million (mg/kg)*				mg/kg*		
Sample	Analyte	Spike Added	Sample Result	MS Result	% Rec	MSD Result	% Rec	RPD
10	Mercury	0.50	L/0.1	0.46	92.	0.68	136.	-39.
3	Beryllium	2.5	L/0.1	2.0	80.	2.1	84.	5.
3	Chromium	25.	120.	**	**	**	**	**
3	Copper	50.	150.	**	**	**	**	**
3	Lead	50.	85.	140.	109.	130.	100.	9.
3	Nickel	25.	74.	**	**	**	**	**
3	Zinc	100.	63.	150.	91.	160.	96.	5.
4	Thallium	2.5	L/0.5	1.7	68.	2.0	82.	19.
3	Silver	10.	L/0.5	8.0	80.	9.3	93.	14.
3	Cadmium	2.5	L/0.5	2.7	93.	2.6	92.	1.
3	Antimony	25.	L/2.5	14.	58.	13.	52.	11.
5	Selenium	2.5	L/0.5	2.3	92.	2.2	86.	7.
5	Arsenic	25.	1.0	20.	77.	23.	90.	16.
		parts per billion (ug/kg) *				ug/kg*		
10	PCB	520.	L/50.	359.	69.0	343.	66.0	4.4

MS = Matrix Spike
MSD = Matrix Spike Duplicate
* Reported on the dry basis

Rec = Recovery
RPD = Relative Percent Difference

**Samples are spiked prior to preparation and analysis at a level deemed to be generally appropriate to the average sample processed in the laboratory. In this case, the level of analyte already present in the sample was large enough to make an accurate determination of spike recovery impossible.

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APPENDIX B -

Matrix Spike/Duplicate Spike Quality Control

Organics

Reported below are the results of additional QC compounds utilized in the analysis of organic compounds. Compounds of interest are spiked into two additional sample aliquots prior to extraction and/or analysis to monitor for matrix effects, sample processing errors, and to calculate percent recoveries of compunds of interest and relative error in the analysis. The control limits represent the 95% confidence interval established in the laboratory through repetitive analysis of these sample types.

Sample 2

	ug/kg			ug/kg					
Compound	Conc Spike	Conc Samp	Conc MS	% REC	Conc MSD	% REC	RPD	RPD Limit	REC Limi
1,2,4-Trichlorobenzene	3890.	0.	2505.	64.4	3058.	78.6	-19.9	23	38-107
Acenaphthene	3890.	97.9	3310.	74.1	3871.	88.4	-17.6	19.	31-137
2,4-Dinitrotoluene	3890.	0.	4240.	109.	4551.	117.	-7.1	47.	28-89
Pyrene	3890.	21.9	3672.	44.2	4357.	62.3	-34.0	36	35-147
N-Nitrosodipropylamine	3890.	0.	2875	73.9	3727.	95.8	-25.8	38.	41-12
1,4-Dichlorobenzene	3890.	0.	3096.	79.6	3295.	84.7	-6.2	27.	28-10

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Chemistry Microbiology and Technical Services

Certificate

LABORATORY NO. 2344

Remediation Technologies, Inc.

Sample 2

Compound	ug/kg Conc Spike	ug/kg Conc Samp	ug/kg Conc MS	% REC	ug/kg Conc MSD	% REC	RPD	RPD Limit	REC Limit
Pentachlorophenol	7782.	0.	2685.	34.5	3712.	47.7	-32.1	47.	17-109
Phenol	7782.	42.4	5883.	70.1	6903.	83.3	-17.2	35.	26-90
2-Chlorophenol	7782.	0.	5128.	65.9	5868.	75.4	-13.4	50.	25-102
P-Chloro-m-cresol	7782.	0.	6630.	85.2	7471.	96.0	-11.9	33.	26-103
4-Nitrophenol	7782.	0.	7128.	91.6	8638.	111.	-19.2	50.	11-114
1,1,-Dichloroethene	99.6	0.	111.	111.	115.	115.	-3.5	22.	59-172
Trichloroethene	99.6	0.	108.	108.	112.	112.	-3.6	24.	62-137
Chlorobenzene	99.6	0.	105.	105.	106.	106.	-0.9	21.	60-133
Toluene	99.6	0.	98.1	98.5	100.	100.	-1.5	21.	59-139
Benzene	99.6	0.	102.	102.	105.	105.	-2.9	21.	66-142

Key

Conc = Concentration
Samp = Sample
MS = Matrix Spike
MSD = Matrix Spike Duplicate
REC = Recovery
RPD = Relative Percent Difference

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Remediation Technologies, Inc.

LABORATORY NO. 2344

APPENDIX C

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction and analysis to monitor for matrix effects, purging efficiency, and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types.

Sample No.	Surrogate Compound	% Recovery	Control Limits
MB	d4-1,2-Dichloroethane	101.	50-160
MB	d8-Toluene	97.0	50-160
MB	Bromofluorobenzene	101.	50-160
1	d4-1,2-Dichloroethane	102.	50-160
1	d8-Toluene	99.2	50-160
1	Bromofluorobenzene	102.	50-160
1 MS	d4-1,2-Dichloroethane	104.	50-160
1 MS	d8-Toluene	97.1	50-160
1 MS	Bromofluorobenzene	100.	50-160
1 MSD	d4-1,2-Dichloroethane	104.	50-160
1 MSD	d8-Toluene	96.3	50-160
1 MSD	Bromofluorobenzene	98.6	50-160
2	d4-1,2-Dichloroethane	100.	50-160
2	d8-Toluene	96.6	50-160
2	Bromofluorobenzene	96.6	50-160

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LABORATORY NO. 2344

Remediation Technologies, Inc.

Sample No.	Surrogate Compound	% Recovery	Control Limits
3	d4-1,2-Dichloroethane	103.	50-160
3	d8-Toluene	94.9	50-160
3	Bromofluorobenzene	96.6	50-160
4	d4-1,2-Dichloroethane	102.	50-160
4	d8-Toluene	96.1	50-160
4	Bromofluorobenzene	99.2	50-160
5	d4-1,2-Dichloroethane	105.	50-160
5	d8-Toluene	100.0	50-160
5	Bromofluorobenzene	96.2	50-160
6	d4-1,2-Dichloroethane	104.	50-160
6	d8-Toluene	98.5	50-160
6	Bromofluorobenzene	95.5	50-160
7	d4-1,2-Dichloroethane	110.	50-160
7	d8-Toluene	96.8	50-160
7	Bromofluorobenzene	100.	50-160
8	d4-1,2-Dichloroethane	107.	50-160
8	d8-Toluene	96.8	50-160
8	Bromofluorobenzene	97.6	50-160
9	d4-1,2-Dichloroethane	101.	50-160
9	d8-Toluene	94.1	50-160
9	Bromofluorobenzene	88.8	50-160

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Chemistry, Microbiology, and Technical Services

LABORATORY NO. 2344

Remediation Technologies, Inc.

Sample No.	Surrogate Compound	% Recovery	Control Limits
10	d4-1,2-Dichloroethane	102.	50-160
10	d8-Toluene	91.4	50-160
10	Bromofluorobenzene	75.3	50-160
11	d4-1,2-Dichloroethane	103.	50-160
11	d8-Toluene	95.6	50-160
11	Bromofluorobenzene	86.8	50-160
12	d4-1,2-Dichloroethane	104.	50-160
12	d8-Toluene	85.4	50-160
12	Bromofluorobenzene	78.2	50-160
10	Dibutylchlorendate	40.5	18-123
11	Dibutylchlorendate	54.8	18-123
12	Dibutylchlorendate	36.8	18-123
10 MS	Dibutylchlorendate	47.6	18-123
10 MSD	Dibutylchlorendate	53.6	18-123
Blank	Dibutylchlorendate	39.5	18-123
10	Isodrin	41.4	10-114
11	Isodrin	58.9	10-114
12	Isodrin	33.0	10-114
10 MS	Isodrin	43.8	10-114
10 MSD	Isodrin	45.5	10-114
Blank	Isodrin	48.5	10-114

MB = Method Blank
MS = Matrix Spike
MSD = Matrix Spike Duplicate

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Laucks Testing Laboratories, Inc.

Sample Type: Low Soil
Lab No: 2344
Client: Retec
QC Logged:

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction to monitor for matrix effects and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types. In certain cases, we will have accumulated insufficient data to have established control limits.

Sample Number: Blank Reported Values in Units of: ug/kg

Sample DWE: 30.0 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	3333	1823	54.7	25-121
d5-Phenol	3333	2273	68.2	24-113
2-Bromophenol	3333	2043	61.3	44-112
2,4,6-Tribromophenol	3333	1013	30.4	19-122
d5-Nitrobenzene	1667	1430	85.8	23-120
2-Fluorobiphenyl	1667	1252	75.1	30-115
d10-Azobenzene	1667	1473	88.4	60-126
d14-p-Terphenyl	1667	972	58.3	18-137

Sample Number: 1 Reported Values in Units of: ug/kg

Sample DWE: 24.2 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4132	3165	76.6	25-121
d5-Phenol	4132	3298	79.8	24-113
2-Bromophenol	4132	3421	82.8	44-112
2,4,6-Tribromophenol	4132	4215	102.0	19-122
d5-Nitrobenzene	2066	1800	87.1	23-120
2-Fluorobiphenyl	2066	1645	79.6	30-115
d10-Azobenzene	2066	2060	99.7	60-126
d14-p-Terphenyl	2066	1459	70.6	18-137

Sample Number: 2 Reported Values in Units of: ug/kg

Sample DWE: 25.7 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	3891	3054	78.5	25-121
d5-Phenol	3891	3482	89.5	24-113
2-Bromophenol	3891	3241	83.3	44-112
2,4,6-Tribromophenol	3891	4756	122.0	19-122
d5-Nitrobenzene	1946	1749	89.9	23-120
2-Fluorobiphenyl	1946	1471	75.6	30-115
d10-Azobenzene	1946	1946	100.0	60-126
d14-p-Terphenyl	1946	1354	69.6	18-137

Sample Number: 3 Reported Values in Units of: ug/kg

Sample DWE: 23.7 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4219	3034	71.9	25-121
2-Fluoroanaline	4219	3506	83.1	24-113
d5-Phenol	4219	3156	74.8	44-112
2-Bromophenol	4219	4810	114.0	19-122
d5-Nitrobenzene	2110	1772	84.0	23-120
2-Fluorobiphenyl	2110	1527	72.4	30-115
2,4,6-Tribromophenol	2110	1926	91.3	60-126
d14-p-Terphenyl	2110	1390	65.9	18-137

Laucks Testing Laboratories, Inc.

Sample Type: Low Soil
Lab No: 2344
Client: Retec
QC Logged:

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction to monitor for matrix effects and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types. In certain cases, we will have accumulated insufficient data to have established control limits.

Sample Number: 8 Reported Values in Units of: ug/kg

Sample DWE: 23.6 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4237	3123	73.7	25-121
d5-Phenol	4237	3801	89.7	24-113
2-Bromophenol	4237	3216	75.9	44-112
2,4,6-Tribromophenol	4237	3746	88.4	19-122
d5-Nitrobenzene	2119	1926	90.9	23-120
2-Fluorobiphenyl	2119	1822	86.0	30-115
d10-Azobenzene	2119	2085	98.4	60-126
d14-p-Terphenyl	2119	1964	92.7	18-137

Sample Number: 9 Reported Values in Units of: ug/kg

Sample DWE: 25.4 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	3937	3528	89.6	25-121
d5-Phenol	3937	3917	99.5	24-113
2-Bromophenol	3937	3701	94.0	44-112
2,4,6-Tribromophenol	3937	6063	154.0 *	19-122
d5-Nitrobenzene	1969	1866	94.8	23-120
2-Fluorobiphenyl	1969	1539	78.2	30-115
d10-Azobenzene	1969	1742	88.5	60-126
d14-p-Terphenyl	1969	2047	104.0	18-137

Sample Number: 10 Reported Values in Units of: ug/kg

Sample DWE: 23.5 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4255	2353	55.3	25-121
d5-Phenol	4255	3481	81.8	24-113
2-Bromophenol	4255	2796	65.7	44-112
2,4,6-Tribromophenol	4255	2391	56.2	19-122
d5-Nitrobenzene	2128	2013	94.6	23-120
2-Fluorobiphenyl	2128	1732	81.4	30-115
d10-Azobenzene	2128	2255	106.0	60-126
d14-p-Terphenyl	2128	2255	106.0	18-137

Sample Number: 11 Reported Values in Units of: ug/kg

Sample DWE: 24.1 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4149	3340	80.5	25-121
2-Fluoroaniline	4149	3784	91.2	24-113
d5-Phenol	4149	3582	91.5	44-112
2-Bromophenol	4149	5436	131.0 *	19-122
d5-Nitrobenzene	2075	1724	83.1	23-120
2-Fluorobiphenyl	2075	1583	76.3	30-115
2,4,6-Tribromophenol	2075	2116	102.0	60-126
d14-p-Terphenyl	2075	2021	97.4	18-137

Laucks Testing Laboratories, Inc.

Sample Type: Low Soil
Lab No: 2344
Client: Retec
QC Logged:

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction to monitor for matrix effects and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types. In certain cases, we will have accumulated insufficient data to have established control limits.

Sample Number: 4 Reported Values in Units of: ug/kg

Sample DWE: 25.1 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	3984	2876	72.2	25-121
d5-Phenol	3984	3347	84.0	24-113
2-Bromophenol	3984	3064	76.9	44-112
2,4,6-Tribromophenol	3984	4661	117.0	19-122
d5-Nitrobenzene	1992	1564	78.5	23-120
2-Fluorobiphenyl	1992	1416	71.1	30-115
d10-Azobenzene	1992	1843	92.5	60-126
d14-p-Terphenyl	1992	2464	124.7	18-137

Sample Number: 5 Reported Values in Units of: ug/kg

Sample DWE: 25.0 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4000	3136	78.4	25-121
d5-Phenol	4000	3756	93.9	24-113
2-Bromophenol	4000	3212	80.3	44-112
2,4,6-Tribromophenol	4000	3048	76.2	19-122
d5-Nitrobenzene	2000	2180	109.0	23-120
2-Fluorobiphenyl	2000	1816	90.8	30-115
d10-Azobenzene	2000	2100	105.0	60-126
d14-p-Terphenyl	2000	1982	99.1	18-137

Sample Number: 6 Reported Values in Units of: ug/kg

Sample DWE: 24.4 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4098	3119	76.1	25-121
d5-Phenol	4098	3488	85.1	24-113
2-Bromophenol	4098	3139	76.6	44-112
2,4,6-Tribromophenol	4098	3439	83.9	19-122
d5-Nitrobenzene	2049	1957	95.5	23-120
2-Fluorobiphenyl	2049	1602	78.2	30-115
d10-Azobenzene	2049	1895	92.5	60-126
d14-p-Terphenyl	2049	1936	94.5	18-137

Sample Number: 7 Reported Values in Units of: ug/kg

Sample DWE: 21.2 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4717	4217	89.4	25-121
2-Fluoroaniline	4717	4495	95.3	24-113
d5-Phenol	4717	4113	87.2	44-112
2-Bromophenol	4717	5546	118.0	19-122
d5-Nitrobenzene	2358	2335	99.0	23-120
2-Fluorobiphenyl	2358	2002	84.9	30-115
2,4,6-Tribromophenol	2358	2406	102.0	60-126
d14-p-Terphenyl	2358	1998	84.7	18-137

Laucks Testing Laboratories, Inc.

Sample Type: Low Soil
Lab No: 2344
Client: Retec
QC Logged:

Surrogate Recovery Quality Control Report

Listed below are surrogate (chemically similar) compounds utilized in the analysis of organic compounds. The surrogates are added to every sample prior to extraction to monitor for matrix effects and sample processing errors. The control limits represent the 95% confidence interval established in our laboratory through repetitive analysis of these sample types. In certain cases, we will have accumulated insufficient data to have established control limits.

Sample Number: 12 [redacted] Reported Values in Units of: ug/kg

Sample DWE: 24.0 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	4167	2263	54.3	25-121
d5-Phenol	4167	2833	68.1	24-113
2-Bromophenol	4167	3150	75.6	44-112
2,4,6-Tribromophenol	4167	4833	116.0	19-122
d5-Nitrobenzene	2083	1529	73.4	23-120
2-Fluorobiphenyl	2083	1925	92.4	30-115
d10-Azobenzene	2083	2025	97.2	60-126
d14-p-Terphenyl	2083	1900	91.2	18-137

Sample Number: 2as Reported Values in Units of: ug/kg

Sample DWE: 25.7 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	3891	2696	69.3	25-121
d5-Phenol	3891	2708	69.6	24-113
2-Bromophenol	3891	2700	69.4	44-112
2,4,6-Tribromophenol	3891	4202	108.0	19-122
d5-Nitrobenzene	1946	1395	71.7	23-120
2-Fluorobiphenyl	1946	1251	64.3	30-115
d10-Azobenzene	1946	1735	89.2	60-126
d14-p-Terphenyl	1946	1196	61.5	18-137

Sample Number: 2asd Reported Values in Units of: ug/kg

Sample DWE: 25.7 Surrogate Compound	Spike Level	Spike Detected	Percent Recovery	Control Limits
2-Fluorophenol	3891	3424	88.0	25-121
d5-Phenol	3891	3389	87.1	24-113
2-Bromophenol	3891	3407	87.6	44-112
2,4,6-Tribromophenol	3891	4717	122.0	19-122
d5-Nitrobenzene	1946	1357	97.3	23-120
2-Fluorobiphenyl	1946	1861	95.4	30-115
d10-Azobenzene	1946	2023	104.0	60-126
d14-p-Terphenyl	1946	1490	76.6	18-137

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(206) 767-5060

SAMPLE NUMBER
2344-MB2

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	50	730J
2.	2216300	Heptane, 2,5-dimethyl-	ABN	62	210J
3.		Unknown	ABN	95	4700J
4.	3074713	Heptane, 2,3-dimethyl-	ABN	98	610J
5.	922281	Heptane, 3,4-dimethyl-	ABN	102	260J
6.	110123	2-Hexanone, 5-methyl-	ABN	105	270J
7.	2213232	Heptane, 2,4-dimethyl-	ABN	112	570J
8.	2216333	Octane, 3-methyl-	ABN	124	920J
9.		Unknown	ABN	188	350J
10.		Unknown	ABN	236	550J
11.		Unknown	ABN	1204	150J

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40 S. Harney, Seattle, WA 98108
06) 767-5060

SAMPLE NUMBER
2344-1

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	102	7200J
2.		Unknown	ABN	105	7400J
3.	238846	11H-Benzo[a]fluorene	ABN	1271	970J
4.	82053	7H-Benz[de]anthracen-7-one	ABN	1350	840J
5.	205436	Benzo[b]naphtho[1,2-d]thiophene	ABN	1364	1200J
6.		Unknown	ABN	1370	1100J
7.		Unknown	ABN	1376	670J
.	82053	7H-Benz[de]anthracen-7-one	ABN	1383	590J
9.		Unknown	ABN	1420	1000J
10.		Unknown	ABN	1435	1100J
11.		Unknown	ABN	1442	910J
12.		Unknown	ABN	1466	960J
13.		Unknown	ABN	1471	710J
14.		Unknown	ABN	1482	720J
15.		Unknown	ABN	1485	670J
16.		Unknown	ABN	1537	600J
17.		Unknown	ABN	1571	1100J
18.		Unknown	ABN	1585	660J
19.	192972	Benzo[e]pyrene	ABN	1594	2200J
20.	205992	Benz[e]acephenanthrylene	ABN	1610	1300J

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SAMPLE NUMBER
2344-2

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	92	4400J
2.	243174	11H-Benzo[b]fluorene	ABN	1270	770J
3.		Unknown	ABN	1369	1300J
4.		Unknown	ABN	1419	1200J
5.		Unknown	ABN	1434	1400J
6.		Unknown	ABN	1441	670J
7.	3697243	Chrysene, 5-methyl-	ABN	1465	1100J
.	1705846	Triphenylene, 2-methyl-	ABN	1470	780J
9.		Unknown	ABN	1477	740J
10.		Unknown	ABN	1482	740J
11.		Unknown	ABN	1485	1100J
12.	205992	Benz[e]acephenanthrylene	ABN	1554	1100J
13.	192972	Benzo[e]pyrene	ABN	1571	1400J
14.	192972	Benzo[e]pyrene	ABN	1594	2400J
15.	205992	Benz[e]acephenanthrylene	ABN	1611	1700J
16.		Unknown	ABN	1616	1100J
17.		Unknown	ABN	1629	690J
18.		Unknown	ABN	1633	680J
19.		Unknown	ABN	1663	680J
20.	53703	Dibenz[a,h]anthracene	ABN	1779	1400J

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340 S. Harney, Seattle, WA 98108
(206) 767-5060

SAMPLE NUMBER
2344-3

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	47	750J
2.	2216300	Heptane, 2,5-dimethyl-	ABN	63	190J
3.		Unknown	ABN	95	5300J
4.	3074713	Heptane, 2,3-dimethyl-	ABN	99	530J
5.	922281	Heptane, 3,4-dimehtyl-	ABN	103	240J
6.	110123	2-Hexanone, 5-methyl-	ABN	105	270J
7.	2216344	Octane, 4-methyl-	ABN	113	560J
8.	2216333	Octane, 3-methyl-	ABN	125	890J
9.		Unknown	ABN	190	180J
10.	4436753	3-Hexene-2,5-dione	ABN	239	680J
11.		Unknown	ABN	739	190J
12.		Unknown	ABN	1207	220J
13.		Unknown	ABN	1508	240J
14.		Unknown	ABN	1568	260J
15.	192972	Benzo[e]pyrene	ABN	1589	500J
16.		Unknown	ABN	1685	230J
17.	135488	Pentacene	ABN	1771	220J

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SAMPLE NUMBER
2344-4

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	44	670J
2.		Unknown	ABN	92	4900J
3.	3074713	Heptane, 2,3-dimethyl-	ABN	98	500J
4.	2216344	Octane, 4-methyl-	ABN	112	540J
5.	2216333	Octane, 3-methyl-	ABN	124	900J
6.		Unknown	ABN	237	660J
7.	1921706	Pentadecane, 2,6,10,14-tetramethyl-	ABN	941	350J
8.	7098217	Tritetracontane	ABN	1012	370J
9.		Unknown	ABN	1194	370J
10.		Unknown	ABN	1214	390J
11.		Unknown	ABN	1268	560J
12.	203123	Benzo[ghi]fluoranthene	ABN	1365	360J
13.		Unknown	ABN	1414	330J
14.	2498773	Benz[a]anthracene, 1-methyl-	ABN	1461	260J
15.	192972	Benzo[e]pyrene	ABN	1565	690J
16.	192972	Benzo[e]pyrene	ABN	1586	1300J
17.	192972	Benzo[e]pyrene	ABN	1603	810J
18.		Unknown	ABN	1609	540J
19.		Unknown	ABN	1611	420J
20.	53703	Dibenz[a,h]anthracene	ABN	1769	700J

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SAMPLE NUMBER
2344-5

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	45	680J
2.	2216300	Heptane, 2,5-dimethyl-	ABN	59	170J
3.		Unknown	ABN	93	6100J
4.	3074713	Heptane, 2,3-dimethyl-	ABN	95	650J
5.	922281	Heptane, 3,4-dimethyl-	ABN	98	280J
6.	110123	2-Hexanone, 5-methyl-	ABN	102	360J
7.	2216344	Octane, 4-methyl-	ABN	109	630J
8.	2216333	Octane, 3-methyl-	ABN	121	1100J
9.		Unknown	ABN	186	430J
10.		Unknown	ABN	235	770J
11.		Unknown	ABN	287	240J
12.	535773	Benzene, 1-methyl-3-(1-methylethyl)-	ABN	398	180J
13.	527537	Benzene, 1,2,3,5-tetramethyl-	ABN	431	180J
14.	488233	Benzene, 1,2,3,4-tetramethyl-	ABN	435	230J
15.	1119400	Pentanedioic acid, dimethyl ester	ABN	455	440J
16.	91576	Naphthalene, 2-methyl-	ABN	622	220J
17.	101688	Benzene, 1,1'-methylenebis[4-isocyanato-	ABN	1195	180J
18.		Unknown	ABN	1358	700J

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SAMPLE NUMBER
2344-6

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	47	690J
2.	2216300	Heptane, 2,5-dimethyl-	ABN	61	190J
3.		Unknown	ABN	94	5300J
4.	3074713	Heptane, 2,3-dimethyl-	ABN	97	570J
5.	922281	Heptane, 3,4-dimethyl-	ABN	101	250J
6.	110123	2-Hexanone, 5-methyl-	ABN	104	310J
7.	2216344	Octane, 4-methyl-	ABN	111	560J
8.	2216333	Octane, 3-methyl-	ABN	123	940J
9.		Unknown	ABN	237	650J
10.		Unknown	ABN	290	210J
11.		Unknown	ABN	400	190J
12.	488233	Benzene, 1,2,3,4-tetramethyl-	ABN	433	170J
13.	527537	Benzene, 1,2,3,5-tetramethyl-	ABN	437	210J
14.		Unknown	ABN	457	450J
15.	2471832	1H-Indene, 1-ethylidene-	ABN	625	220J
16.	2057490	Pyridine, 4-(3-phenylpropyl)-	ABN	986	220J
17.	101688	Benzene, 1,1'-methylenebis[4-isocyanato	ABN	1197	190J
18.		Unknown	ABN	1204	180J
19.		Unknown	ABN	1360	760J

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SAMPLE NUMBER
2344-7

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	44	890J
2.		Unknown	ABN	92	7800J
3.	3-74713	Heptane, 2,3-dimethyl-	ABN	95	760J
4.	921471	Hexane, 2,3,4-trimethyl-	ABN	109	690J
5.	2216333	Octane, 3-methyl-	ABN	121	1200J
6.		Unknown	ABN	234	810J
7.	535773	Benzene, 1-methyl-3-(1-methylethyl)-	ABN	397	710J
8.	488233	Benzene, 1,2,3,4-tetramethyl-	ABN	431	700J
9.	488233	Benzene, 1,2,3,4-tetramethyl-	ABN	435	1000J
10.		Unknown	ABN	455	1200J
11.	91576	Naphthalene, 2-methyl-	ABN	622	930J
12.	575371	Naphthalene, 1,7-dimethyl-	ABN	717	800J
13.	2057490	Pyridine, 4-(3-phenylpropyl)-	ABN	983	3500J
14.	230273	Benzo[h]quinoline	ABN	1007	1000J
15.	611643	Acridine, 9-methyl-	ABN	1088	720J
16.		Unknown	ABN	1130	630J
17.		Unknown	ABN	1190	770J
18.		Unknown	ABN	1268	470J
19.		Unknown	ABN	1311	490J
20.		Unknown	ABN	1486	400J

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SAMPLE NUMBER
2344-8

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	44	680J
2.	926829	Heptane, 3,5-dimethyl-	ABN	58	240J
3.		Unknown	ABN	92	6000J
4.	3074713	Heptane, 2,3-dimethyl-	ABN	94	630J
5.	922281	Heptane, 3,4-dimethyl-	ABN	98	310J
6.	110123	2-Hexanone, 5-methyl-	ABN	101	260J
7.	2216344	Octane, 4-methyl-	ABN	108	580J
8.	2216333	Octane, 3-methyl-	ABN	120	850J
9.		Unknown	ABN	235	800J
10.		Unknown	ABN	288	310J
11.	90028	Benzaldehyde, 2-hydroxy-	ABN	347	180J
12.	527844	Benzene, 1-methyl-2-(1-methylethyl)-	ABN	398	240J
13.	488233	Benzene, 1,2,3,4-tetramethyl-	ABN	431	180J
14.	527537	Benzene, 1,2,3,5-tetramethyl-	ABN	436	300J
15.		Unknown	ABN	455	350J
16.	4453901	1,4-Methanonaphthalene, 1,4-dihydro-	ABN	623	200J
17.	2057490	Pyridine, 4-(3-phenylpropyl)_	ABN	983	470J
18.		Unknown	ABN	1195	200J
19.		Unknown	ABN	1202	340J
20.	123795	Hexanedioic acid, dioctyl ester	ABN	1358	440J

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SAMPLE NUMBER
2344-9

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	90	6200J
2.	2216333	Octane, 3-methyl-	ABN	120	950J
3.	694871	Bicyclo[4.2.0]octa-1,3,5-triene	ABN	144	1700J
4.	61141977	Benzene, 1,1'-(1-ethenyl-1,3-propanediyl) bis-	ABN	289	1000J
5.	873494	Benzene, cyclopropyl-	ABN	294	840J
6.	673325	Benzene, 1-propynyl-	ABN	348	680J
7.		Unknown	ABN	441	2000J
		Unknown	ABN	542	1300J
9.		Unknown	ABN	547	990J
10.	140761	Pyridine, 5-ethenyl-2-methyl-	ABN	551	700J
11.	7214611	Benzene, (1-nitroethyl)-	ABN	685	1400J
12.		Unknown	ABN	1108	570J
13.	2091294	9-Hexadecenoic acid	ABN	1215	460J
14.		Unknown	ABN	1234	530J
15.	630079	Pentatriacontane	ABN	1502	840J
16.	192972	Benzo[e]pyrene	ABN	1582	700J
17.	630079	Pentatriacontane	ABN	1591	1900J
18.		Unknown	ABN	1677	780J
19.		Unknown	ABN	1789	1700J
20.		Unknown	ABN	1959	880J

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SAMPLE NUMBER
2344-10

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	84	6100J
2.		Unknown	ABN	891	1300J
3.		Unknown	ABN	910	1000J
4.		Unknown	ABN	928	1400J
5.		Unknown	ABN	933	2400J
6.		Unknown	ABN	937	860J
7.		Unknown	ABN	953	1100J
8.		Unknown	ABN	957	1100J
9.		Unknown	ABN	965	870J
10.	56771778	4-Hexenoic aicd, 3-methyl-2,6-dioxo-	ABN	997	1100J
11.		Unknown	ABN	1004	1600J
12.		Unknown	ABN	1111	1300J
13.		Unknown	ABN	1228	1500J
14.	483658	Phenanthrene, 1-methyl-7-(1-methylethyl)-	ABN	1260	1400J
15.	630068	Hexatriacontane	ABN	1295	1100J
16.	630079	Pentatriacontane	ABN	1347	1100J
17.	7098228	Tetratetracontane	ABN	1398	1400J
18.	7098228	Tetratetracontane	ABN	1446	1300J
19.	630079	Pentatriacontane	ABN	1493	1900J
20.	7098217	Tritetracontane	ABN	1581	1300J

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SAMPLE NUMBER
2344-11

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	44	770J
2.		Unknown	ABN	91	6600J
3.		Unknown	ABN	122	890J
4.		Unknown	ABN	236	1100J
5.		Unknown	ABN	911	430J
6.	1921706	Pentadecane, 2,6,10,14-tetramethyl-	ABN	938	1000J
7.		Unknown	ABN	1087	490J
8.		Unknown	ABN	1105	370J
9.	54833486	Heptadecane, 2,6,10,15-tetramethyl-	ABN	1191	400J
10.		Unknown	ABN	1202	310J
11.	629787	Heptadecane	ABN	1249	490J
12.	483658	Phenanthrene, 1-methyl-7-(1-methylethyl)-	ABN	1267	950J
13.	630079	Pentatriacontane	ABN	1304	590J
14.	630079	Pentatriacontane	ABN	1357	690J
15.	630068	Hexatriacontane	ABN	1407	740J
16.	630079	Pentatriacontane	ABN	1456	610J
17.	7098228	Tetratetracontane	ABN	1503	1400J
18.	192972	Benzo[e]pyrene	ABN	1582	440J
19.	630079	Pentatriacontane	ABN	1592	1200J
20.		Unknown	ABN	1678	430J

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SAMPLE NUMBER
2344-12

Organics Analysis Data Sheet
(Page 4)
Tentatively Identified Compounds

	CAS Number	Compound Name	Frac	Scan	Conc (ug/kg)
1.		Unknown	ABN	65	20000J
2.	1921706	Pentadecane, 2,6,10,14-tetramethyl-	ABN	935	8000J
3.		Unknown	ABN	1083	2600J
4.		Unknown	ABN	1128	2100J
5.		Unknown	ABN	1134	1900J
6.	22599968	Cholestan-3-ol, 2-methylene-, (3.beta., 5.alpha.)-	ABN	1188	2200J
7.	22599968	Cholestan-3-ol, 2-methylene-, (3.beta., 5.alpha.)-	ABN	1246	3200J
8.		Unknown	ABN	1263	5400J
9.		Unknown	ABN	1301	3700J
10.		Unknown	ABN	1354	4400J
11.	22599968	Cholestan-3-ol, 2-methylene-, (3.beta., 5.alpha.)-	ABN	1405	5200J
12.		Unknown	ABN	1421	1700J
13.		Unknown	ABN	1430	1800J
14.		Unknown	ABN	1434	2100J
15.		Unknown	ABN	1436	2100J
16.	22599968	Cholestan-3-ol, 2-methylene-, (3.beta., 5.alpha.)-	ABN	1453	5100J
17.		Unknown	ABN	1500	9300J
18.		Unknown	ABN	1545	5100J
19.		Unknown	ABN	1589	8600J
20.		Unknown	ABN	1674	3000J

Retec

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
South Tacoma Swamp	S. Tacoma, WA
Project No.	**Field Logbook No.**
0027	001
Sampler: (Signature)	**Chain of Custody Tape No.**
[illegible]	—

ANALYSES

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	VOLS Method 624	Semi-VOLS Method 625	Metals priority pollutants Method 200.7				REMARKS
27-31	2-12-87	1040		Soil	✓	✓	✓				
27-32		1046			✓	✓	✓				
27-33		1050			✓	✓	✓				
27-34		1054			✓	✓	✓				
27-36		1018			✓	✓	✓				
27-36A		1018			✓	✓	✓				
27-37		1023			✓	✓	✓				
27-38		1028			✓	✓	✓				

	Date	Time		Date	Time
Relinquished by: (Signature)	2/12/87	1614	Received by: (Signature)		
Relinquished by: (Signature)			Received by: (Signature)		
Relinquished by: (Signature)			Received for Laboratory: (Signature) Robin Bronson	2/12/87	4:17pm
Sample Disposal Method:			Disposed of by: (Signature)		

SAMPLE COLLECTOR: Retec

ANALYTICAL LABORATORY

Sample Receipt acknowledged pending verification of sample count. You will be notified within one working day of any discrepancies found.
Signed [illegible] Date 2-12 Time 4:17p

Retec

CHAIN OF CUSTODY RECORD

Client/Project Name	Project Location
South Tacoma Swamp	S Tacoma, WA

Project No.	Field Logbook No.
0027	001

Sampler: (Signature)	Chain of Custody Tape No.
SEMcGee	—

ANALYSES

Sample No./ Identification	Date	Time	Lab Sample Number	Type of Sample	VOCs method 624	semi-vols method 625	priority pollutant metals method 2007	PCB's			REMARKS
27-3	2-12-87	0919		soil	✓	✓	✓				
27-9		0932			✓	✓	✓	✓			
27-10		0940			✓	✓	✓	✓			
27-11		0945			✓	✓	✓	✓			

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
SEMcGee	2/12/87	1614			
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received for Laboratory: (Signature) Robin Branson	Date 2/12/87	Time 4:17 ~~4:16~~
Sample Disposal Method:	Disposed of by: (Signature)			Date	Time

SAMPLE COLLECTOR
Retec

ANALYTICAL LABORATORY

Sample Receipt acknowledged pending verification of sample count. You will be notified within one working day of any discrepancies found.
Signed RB Date 2-12 Time 4:17p

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Chemistry, Microbiology, and Technical Services

CLIENT: Remediation Technologies, Inc.
19219 W. Valley Hwy., Suite M-103
Kent, Wa 98032
ATTN: Lean Blais

LABORATORY NO: 97625

DATE: September 3, 1986

REPORT ON: OIL/TAR/WHITE MATERIAL

SAMPLE IDENTIFICATION: Submitted 7/9/86 and identified as shown below:

1)	STM 1	BN S. Tacoma Motors	Black Tar	7/2/86
2)	STM 2	BN S. Tacoma Motors	Brown Tar	7/2/86
3)	STM 3	BN S. Tacoma Motors	Oil	7/2/86
4)	STM 4	BN S. Tacoma Motors	White Material	7/2/86

TESTS PERFORMED AND RESULTS:

	parts per million (mg/kg)			
	1	2	3	4
PCB	L/1.	L/1.	L/1.	L/1.
Cyanide	L/0.5	L/0.5	1.4	L/0.5
Sulfides	L/20.	L/20.	L/20.	L/20.

Samples were analyzed for Halogenated Hydrocarbons in accordance with Washington State Department of Ecology WAC 173-303 with results as follow:

	1	2	3	4
Halogenated Hydrocarbons* parts per million (mg/kg), as received basis	41.	28.	L/35.	L/10.

* reported as the sum of the halogens bromide, chloride, fluoride and iodide. A value of less than 100 mg/kg is classified as undesignated waste.

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Remediation Technologies, Inc.

LABORATORY NO: 97625

Samples were analyzed also for Gravimetric Polycyclic Aromatic Hydrocarbons in accordance with Washington State Department of Ecology WAC 173-303. The method requires analysis of the sample through successive stages until the result obtained is less than 1% by weight (as received basis) or until the fourth stage has been completed. Results are as shown below:

	1	2	3	4	2 dup
Stage:	% by weight, as received basis*				
1. Soxhlet Extraction	49.5	28.4	41.8	L/1.	24.4
2. Acid-base clean up	44.7	22.2	24.1	---	20.5
3. Silica gel chromatography	18.9	9.20	22.2	---	8.43
4. High Performance Liquid Chromatography (HPLC) Analysis	18.9	9.20	16.9	---	8.43

* for 4,5,6 membered rings

	1	2	3	4
Corrosivity (pH)* -	7.8	8.4	6.0	12.5
Ignitability	Note 1	Note 1	Note 2	Note 1
Reactivity	Note 3	Note 3	Note 3	Note 3

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Remediation Technologies, Inc.

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Samples were analyzed for E.P. Toxicity in accordance with Test Methods for Evaluating Solid Wastes, (SW 846), U.S.E.P.A., July, 1982. Extraction was performed using Method 1310. Mercury was determined using a 7000 series method; other metals performed by ICAP, Method 6010.

	parts per million (mg/L)		
	1	2	3
Arsenic	L/0.2	L/0.2	L/0.2
Barium	0.2	0.4	0.2
Cadmium	L/0.01	L/0.01	L/0.01
Chromium	L/0.1	L/0.1	L/0.1
Lead	L/0.1	L/0.1	L/0.1
Mercury	0.015	L/0.005	L/0.005
Selenium	L/0.2	L/0.2	L/0.2
Silver	L/0.1	L/0.1	L/0.1

	4	4 dup	MCL
Arsenic	L/0.2	L/0.2	5.0
Barium	0.2	0.2	100.
Cadmium	L/0.01	L/0.01	1.0
Chromium	L/0.1	L/0.1	5.0
Lead	L/0.1	L/0.1	5.0
Mercury	0.040	0.028	0.2
Selenium	L/0.2	L/0.2	1.0
Silver	L/0.1	L/0.1	5.0

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LABORATORY NO: 97625

Comments:

The reported results for the 4-, 5-, and 6-ring PNAs for samples 1 and 2 are based on a correction of the results of the silica gel fractionation for the concentrations of the 2- and 3-ring PNAs in the residue from the silica gel fractionation. The concentrations of the 2- and 3-ring PNAs were determined by HPLC. This calculation is performed in accordance with the method as written.

A qualitative review of the elution region for the 4-, 5- and 6-ring PNAs in the HPLC chromatogram indicates that the correction factor derived as previously described does not accurately quantitfy the 4-, 5- and 6-ring PNAs in these samples. Further confirmatory work, such as GC/MS, may be required to more accurately quantify these compounds in this sample.

The value reported for sample #3 appears to indicate the presence of some PNAs.

Key

MCL = Maximum Contamination Level allowed per regulation.
* = must fall between 2.0 and 12.5 to pass test.
L/ = Less than
Note 1 = Does not flash at, or less than 200 degrees F when test is a setaflash tester
Note 2 = Flashes between 101-139 degrees F
Note 3 = Is not reactive when tested in accordance with Test Methods for Evaluating Solids Waste (SW 846), U.S.E.P.A., July, 1982.

Respectfully submitted,

Laucks Testing Laboratories, Inc.

J. M. Owens

JMO:dr

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Chemistry, Microbiology, and Technical Services

Remediation Technologies, Inc.

LABORATORY NO: 97625

APPENDIX

Replicate Quality Control Report

Sample	Analyte	parts per million Replicate 1	Replicate 2	% Relative Error
3	PCB	L/1.	L/1.	(0)

Parentheses () indicate the error expressed is in absolute terms, not as relative percent. This is done when test results are at or near the limit of quantitation and is regarded as a more accurate measure of error in low level analyses.

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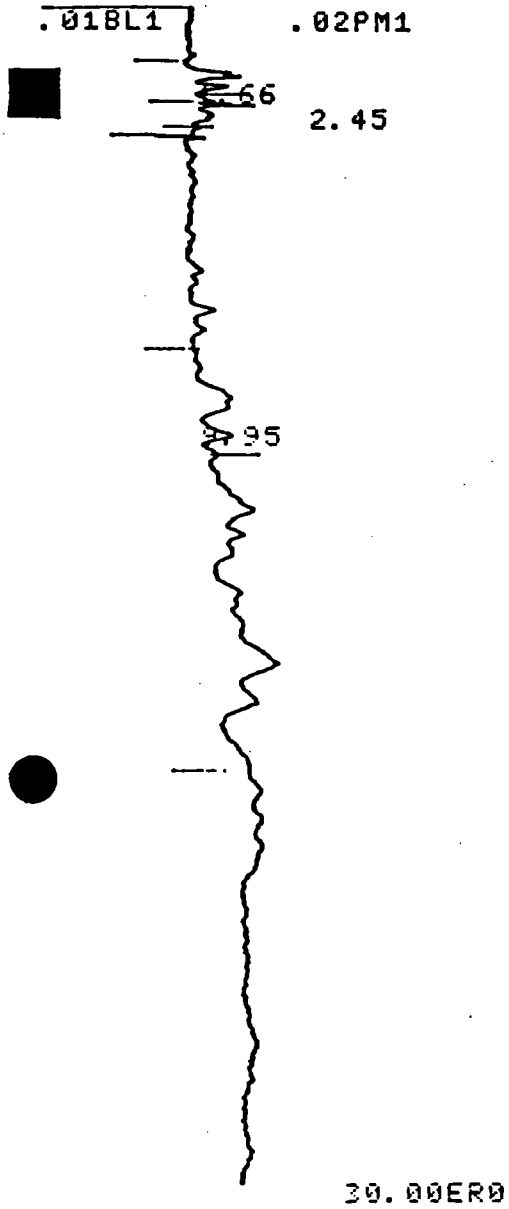
x 1

JECT TIME 08 10:28:30



97625-1

PNA'S 08 10:28:30

FILE 4 METHOD 5. RUN 33 INDEX 33

ANALYST: DON M

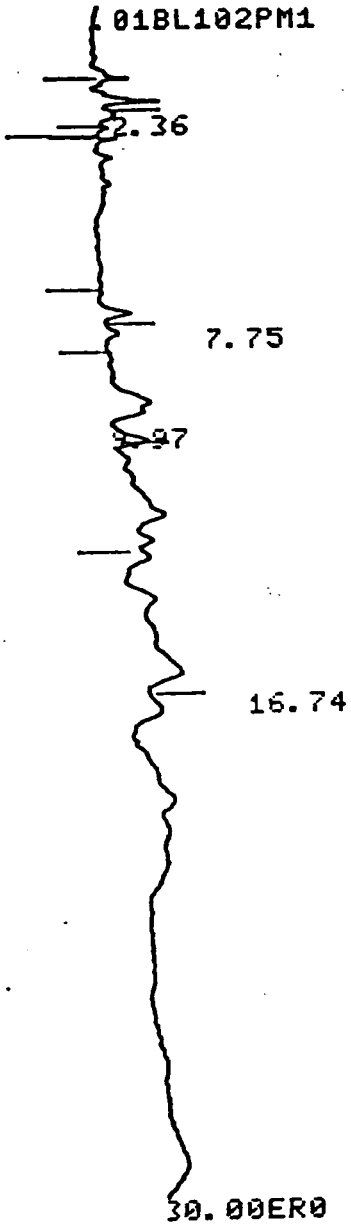
NAME	CONC	RT	AREA	BC	RF
1	0.	1.66	13788	61	
2	0.	2.45	1260	61	
3	0.	9.95	25235	61	

x 193

97625-2 dupl

INJECT TIME 11 19:09:01

01BL102PM1



PNA'S 11 19:09:01

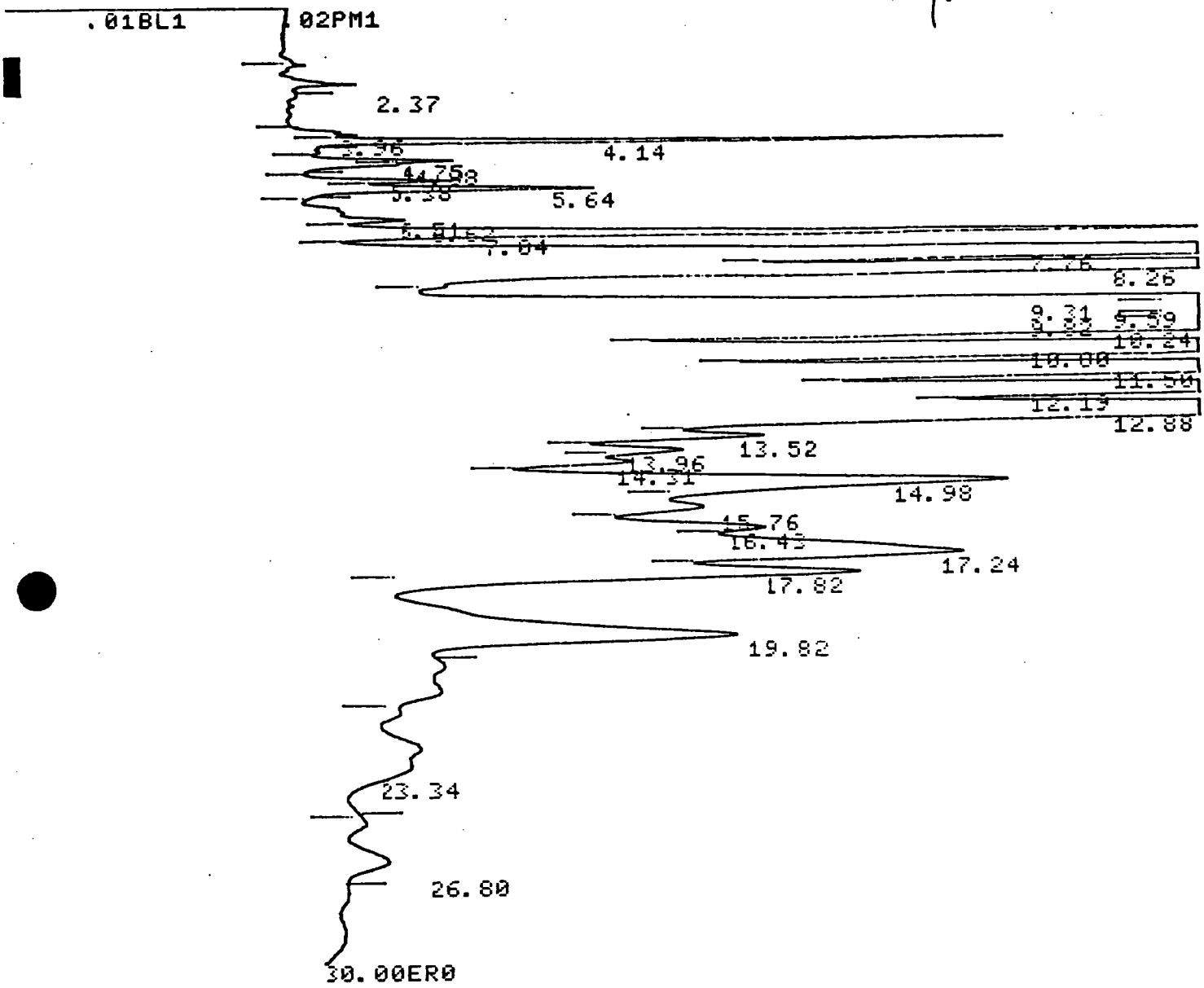
FILE 4 METHOD 5. RUN 75 INDEX 75

ANALYST: DON M

NAME	CONC	RT	AREA	BC	RF
1	0.	2.36	7520	61	
2	0.	7.75	5782	61	
3	0.	9.97	26294	61	

97625-3
1/50 dilution of Residue

INJECT TIME 11 19:50:16



PNA'S 11 19:50:16

FILE 4 METHOD 5. RUN 76 INDEX 76

A[illegible] YST: DON M

NAME	CONC	RT	AREA	BC	RF
1	0.	2.37	14269	61	
2	0.	3.96	7442	62	
3	0.	4.14	108306	63	

001
SEATTLE DISTRICT
7400 THIRD AVENUE S.
SEATTLE, WASHINGTON 98108
TEL: 206-762-4664
FAX: 206-763-2936

PTL - INSPECTORATE INC.

REPORT

Lab No. 3380
ORDER NO. SEA 4665
DATE 9/3/86

PO #C86027

#1 - Final

REPORT OF: Soils Analysis

CLIENT: REMEDIATION TECHNOLOGIES INC.
19219 West Valley Highway
Suite M103
Kent, WA 98032

SUBMITTED BY: Client

DATE RECEIVED: 8/28/86

DATE TESTED: 8/29/86

REPORTED TO: (1) Client

SAMPLE DESCRIPTION

Four (4) soil samples identified as STM-1, 2, 3 & 4 respectively.

TEST RESULTS

Gradation

Sieve Size	Percentage Passing STM-1	STM-2	STM-3	STM-4
2"	100	100	100	100
1-1/2"	100	100	100	76
1"	100	100	55	56
3/4"	100	87	42	49
3/8"	100	59	25	31
#4	98	43	20	24
#10	96	36	16	21
#40	45	25	5	9
#100	7	8	2	3
#200 (wash)	2.7	4.9	1.5	2.0
Sample #	10	847	5	546

Note: Size of sample submitted was smaller than that required in ASTM C-136.

Respectfully submitted,

David S. Haley, P. E.
Seattle District Manager

DY/lc

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 SIXTH AVENUE
SEATTLE, WA 98101

TARGET SHEET

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Document ID #: PART OF 4205

File #:

Site Name:

MAP 1.-HISTORIC USE OF SOUTH TACOMA CAR SHOPS. NORTHERN PACIFIC RAILROAD COMPANY. SHEET 1 OF 2.
MAP 2.-SURFACE DEBRIS SAMPLING PLAN FEBRUARY 1987.
MAP 3.- WELL ELEVATIONS.
MAP 4.- HISTORIC USE OF SOUTH TACOMA CAR SHOPS. NORTHERN PACIFIC RAILROAD COMPANY. SHEET 2 OF 2.