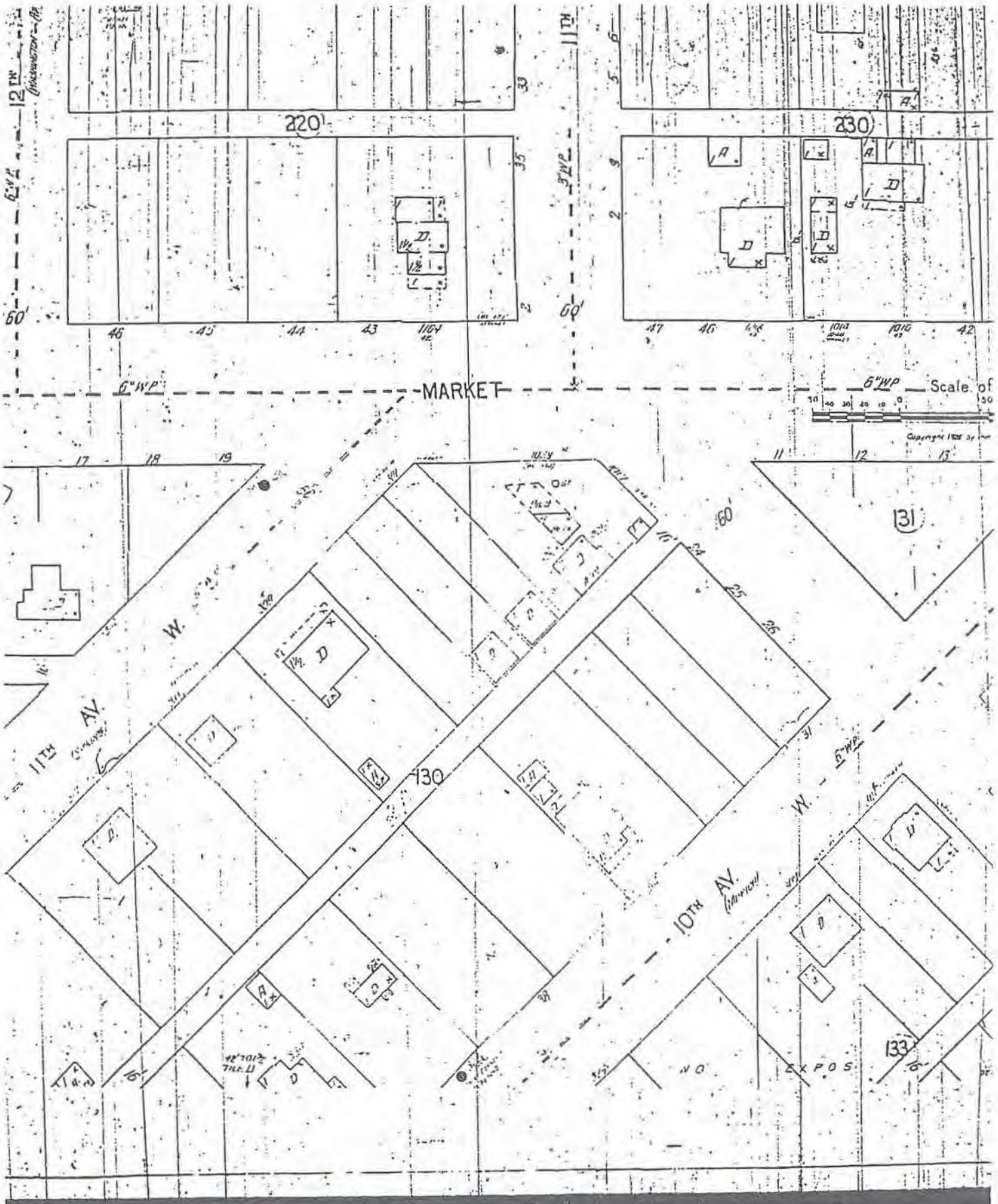
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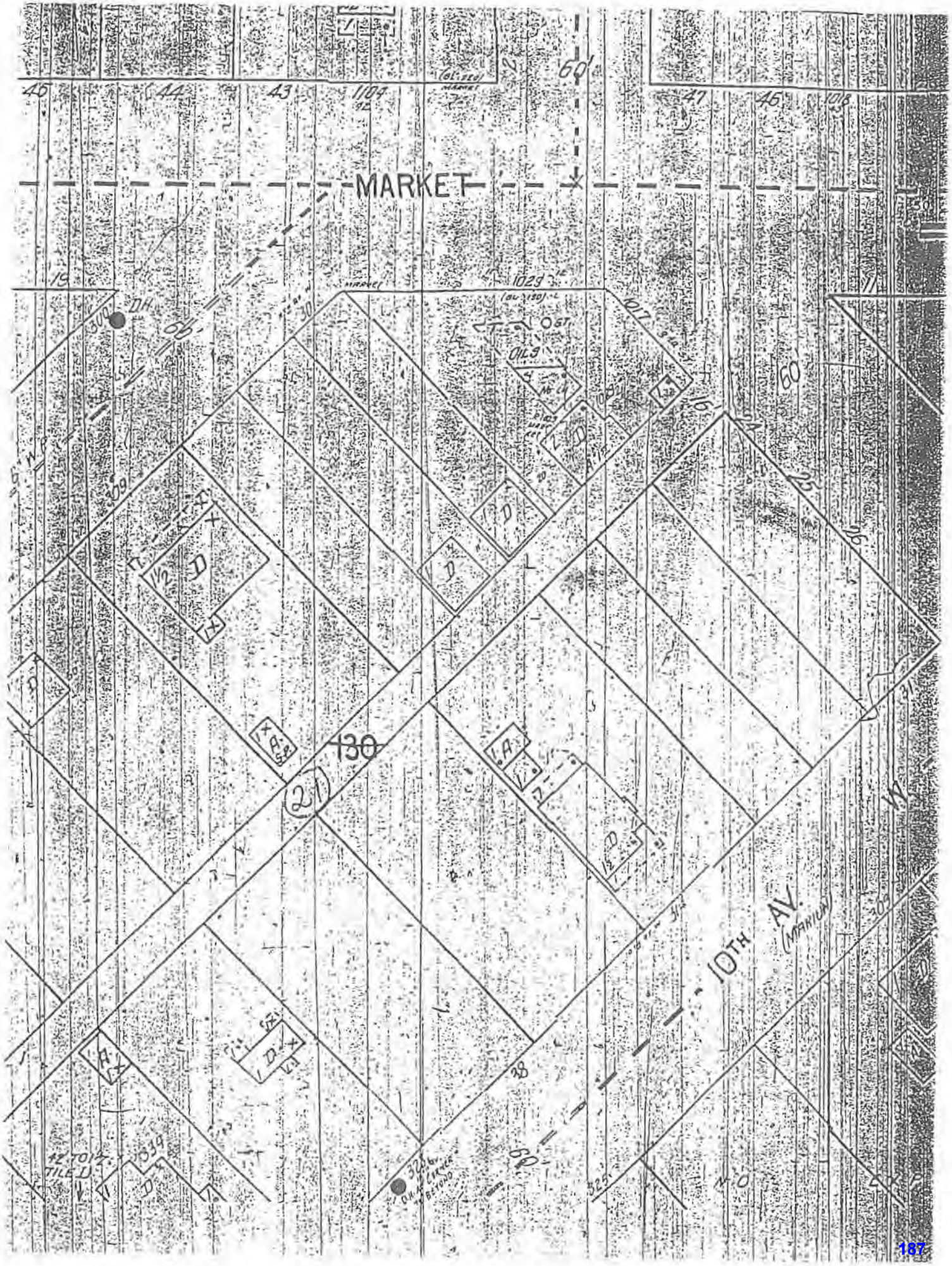
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APPENDIX A
SUBSURFACE EXPLORATION PROCEDURES AND BORING LOGS

APPENDIX A
12-01232-00

Subsurface Exploration

The field exploration program conducted for this study consisted of advancing 6 hollow-stem auger borings to depths of 20 to 41.5 feet below the existing site grade. Four of the borings were accomplished to install monitoring wells. The approximate locations of the explorations are illustrated on Figure 2. These locations and elevations were approximated using the City of Kirkland datum by Horton Dennis and Associates, Inc. of Kirkland, Washington.

The borings were drilled on 28 and 29 November 1994 by Cascade Drilling, Inc. of Woodinville, Washington under subcontract to AGRA. Soils were contained in 55-gallon drums and stored on site. The borings were continuously observed and logged by an experienced geologist from our firm.

Characterization of Soils

Soil samples were obtained using the Standard Penetration Test Procedure as described in ASTM:D-1586. The testing and sampling consisted of driving a standard 3-inch outside diameter split barrel sampler a distance of 18 inches into the soil below the auger bit with a 140-pound hammer free falling a distance of 30 inches. The number of blows for each 6-inch interval is recorded and the number of blows required to drive the sampler the final 12 inches is considered the Standard Penetration Resistance ("N") or the blow count which is represented on the boring logs in this appendix. If a total of 50 blows is recorded within a 6-inch interval, the blow count is recorded as 50 blows for the actual number of inches of penetration and is considered refusal. The blow count, or "N" value, provides a measure of the relative density of granular soils or the relative consistency of cohesive soils. The high gravel, cobble and boulder content of some fluvial and glacial soils often yields unrepresentatively high blow counts due to oversized material. The soil samples retrieved from the split-spoon sampler were classified in the field and a representative portion placed in laboratory prepared glass containers.

Soil Sampling Procedures

The soil samples were recovered at each interval using procedures designed to minimize the risk of cross contamination. Prior to the drilling of the boring, the drilling equipment and sample tools were cleaned using a steam cleaner. Between each sampling attempt, the sampling tools were scrubbed with a stiff brush and a detergent solution consisting of Liquinox and warm water, and then rinsed with potable water and liberal quantities of distilled water. The samples were classified in the field and immediately transferred to laboratory treated glass jars, and tightly sealed with a teflon-lined threaded cap. Samples were screened in the field with an organic vapor meter (OVM). Samples were stored and transported in a chilled ice chest throughout the field investigation. Selected soil samples were subsequently transferred to North Creek Analytical of Spokane, Washington in accordance with AGRA chain-of-custody procedures.

The boring logs presented in this appendix are based on the drilling action and visual inspection of the samples. The various types of soils are indicated, as well as the depths where soils or characteristics of the soils changed. It should be noted that these changes may have been gradual, and if the changes occurred between sample intervals, the soil contacts are interpreted.

Subsurface groundwater conditions are evaluated by observing the moisture condition of the samples, the free water on the sample rods, and in well measurements. Groundwater was encountered at depths of 16 to 16.5 feet beneath the ground surface at time of drilling. Groundwater elevations in installed monitoring wells occurred at depths of 3.64 to 6.43 feet beneath the top of casing.

Field Headspace Measurements

Each soil sample was screened for the presence of volatile organic compounds to facilitate selecting an appropriate soil sample to submit for chemical analysis. This involved placing approximately 6 ounces of sampled soil directly into a resealable baggie. The sample was then shaken vigorously for approximately 15 seconds and a head space reading was taken after plunging the probe of the OVM detector through the baggie. Field head space analysis was performed on each sample utilizing a Model 580B OVM. The highest digital readout value displayed by the instrument was recorded for each sample. This value indicates the total vapor concentration of volatilized organic compounds. These compounds include those typically associated with petroleum hydrocarbons. However, the OVM is neither capable of determining the species of these compounds nor quantifying concentrations of specific compounds in the soil samples. Consequently, this technique should be considered a qualitative screening tool that aides in detecting the presence of volatile soil contaminants.

Monitoring Well Installation

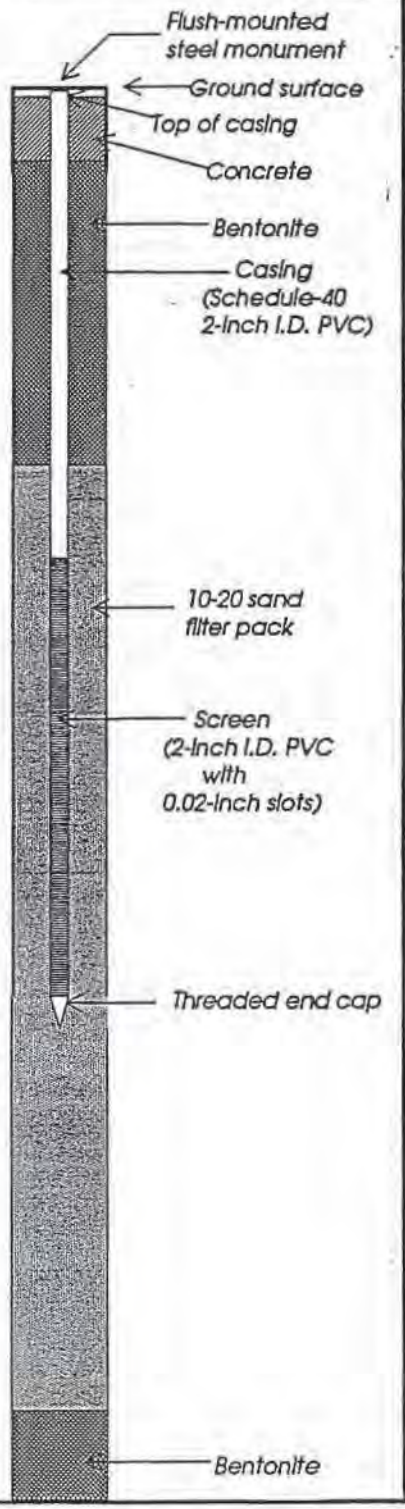
Three borings were completed for the purpose of installing 2-inch groundwater monitoring wells, the fourth was a 4-inch monitoring well and the fifth and sixth were soil borings only (abandoned after installation). The wells were screened with 0.020 slot well screen with 10 to 20 feet of screened interval. All wells were attached to blank Schedule 40 PVC pipe. The pipe sections were installed inside the hollow stem augers. The augers were then filled periodically with a select sand filter pack and slowly withdrawn to allow the sand to surround the well screen and fill the annulus of the boring to approximately one to two feet above the top of the well screen. A 2-foot seal consisting of bentonite was then placed above the sand filter pack. Above the bentonite seal, a grout mixture was then placed into the bore hole from the bottom to top to a depth of approximately 1½ feet below the ground surface. Each well was completed by installing a locking cap in the top of the blank PVC pipe and cementing in a flush-mounted steel well monument.

PROJECT: *1029 Market Street* W.O. *12-01232-00* WELL NO. *MW-1*

Elevation reference: *City of Kirkland* Well completed: *28 November 1994*
Ground surface elevation: *168.66 feet* Casing elevation: *168.30 feet*

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	2" Asphalt over moist, brown, silty SAND with some gravel (Fill)						
	Hard, moist, brown to gray with some mottling, SILT with some sand and trace to some gravel						
5			MW-1/ 5.0	80	0.0	12/7/94	WTPH-G BTEX
10	Very dense, moist to slightly wet, gray, sandy SILT with trace to some gravel		MW-1/ 10.0	50/ 6"	0.0		WTPH-G BTEX
15			MW-1/ 15.0	50/ 6"	0.0		WTPH-G BTEX
	Very dense, saturated, gray, SILT with sand and trace to some gravel					ATD	
20	Very dense, damp to moist, gray, sandy SILT with trace to some gravel		MW-1/ 20.0	50/ 6"	0.0		
25			MW-1/ 25.0	100/ 6"	0.0		
30	(continued)						



LEGEND

- 3-inch O.D. split-spoon sample
- WTPH-G BTEX — Analytical testing
- ATD — Observed groundwater level, ATD = at time of drilling
- 0/00/00 — Observed groundwater level, 0/00/00 = date observed

AGRA Earth & Environmental
11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: *28 November 1994* Drilling completed: *28 November 1994* Logged by: *JK*

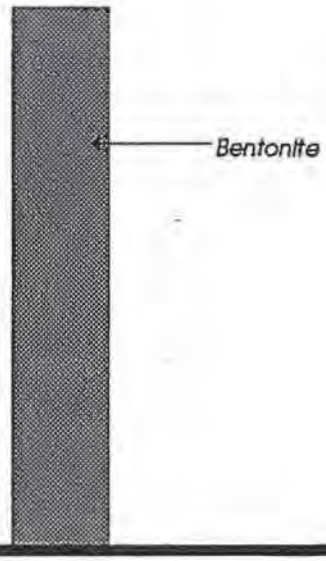
AGRA Earth and Environmental, Inc.

PROJECT: *1029 Market Street* W.O. *12-01232-00* WELL NO. *MW-1*

Elevation reference: *City of Kirkland* Well completed: *28 November 1994*
Ground surface elevation: *168.66 feet* Casing elevation: *168.30 feet*

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
30			MW-1/ 30.0	95/ 6"	0.0		
35	*Hard, damp to moist, gray, SILT with some sand and trace to some gravel*		MW-1/ 35.0	100/ 6"	0.0		
40			MW-1/ 40.0	100/ 6"	0.0		
	Bottom of boring at 41 feet.						
45							
50							
55							
60							



LEGEND

3-inch O.D. split-spoon sample

ATD Observed groundwater level ATD = at time of drilling

WTPH-G BTEX Analytical testing

AGRA Earth & Environmental
11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: *28 November 1994* Drilling completed: *28 November 1994* Logged by: *JK*

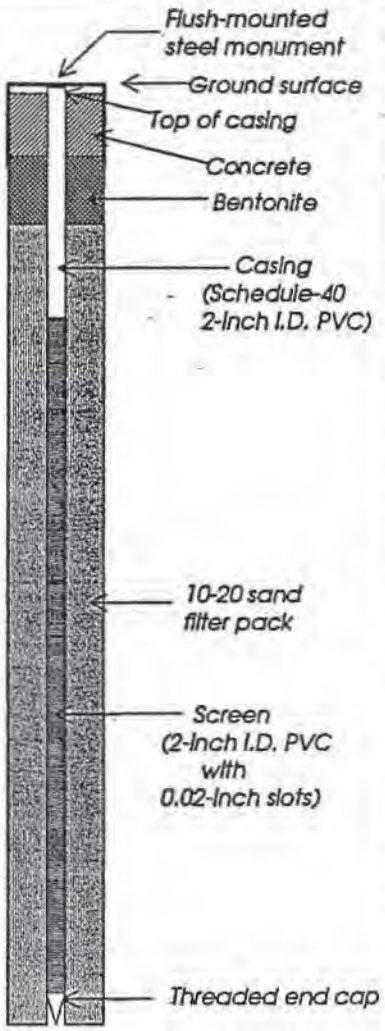
AGRA Earth and Environmental, Inc.

PROJECT: *1029 Market Street* W.O. *12-01232-00* WELL NO. *MW-2*

Elevation reference: *City of Kirkland* Well completed: *28 November 1994*
Ground surface elevation: *169.62 feet* Casing elevation: *169.30 feet*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	2" Asphalt over moist, brown to gray, silty SAND with some gravel (Fill)				115		
5	Dense to very dense, damp to moist, gray, sandy SILT with trace to some gravel		MW-2/ 5.0	48	116	12/7/94	WTPH-G BTEX
10	Becomes slightly wet		MW-2/ 10.0	60/ 4"	NT		WTPH-HCID WTPH-G BTEX Total Pb
15			MW-2/ 15.0	50/ 6"	NT	ATD	WTPH-G BTEX
	Hard, wet(saturated), gray, SILT with sand and trace to some gravel		MW-2/ 16.0	50/ 4"	NT		
			MW-2/ 17.0	100/ 4"	NT		
			MW-2/ 18.0	100/ 6"	NT		
	Hard, damp to moist, gray, SILT with some sand and trace to some gravel						
20			MW-2/ 20.0	100/ 6"	0.0		
	Bottom of boring at 21 feet.						
25							
30							

AS-BUILT DESIGN



LEGEND

- 3-Inch O.D. split-spoon sample
- ATD — Observed groundwater level, ATD = at time of drilling
- NT = Insufficent sample for OVM Reading
- WTPH-G BTEX — Analytical testing
- 0/00/00 — Observed groundwater level, 0/00/00 = date observed

AGRA Earth & Environmental
11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: *28 November 1994* Drilling completed: *28 November 1994* Logged by: *JK*

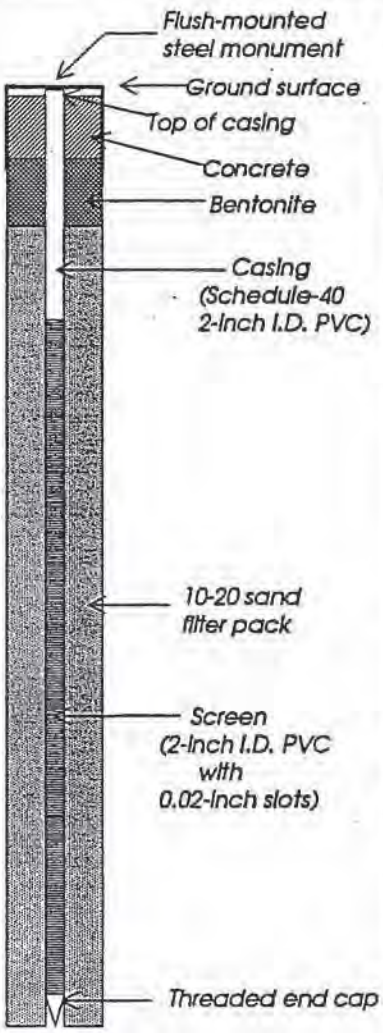
AGRA Earth and Environmental, Inc.

PROJECT: *1029 Market Street* W.O. *12-01232-00* WELL NO. *MW-3*

Elevation reference: *City of Kirkland* Well completed: *29 November 1994*
Ground surface elevation: *168.61 feet* Casing elevation: *168.10 feet*

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*Moist, brown, silty SAND with gravel (Fill)*						
	Wet, greenish/gray, SILT with sand and gravel (Fill)					12/1/94	
5	*Very dense, moist to slightly wet, gray with some mottling, sandy SILT with trace to some gravel*		MW-3/ 5.0	75/ 6"	0.0		WTPH-G BTEX
10	*Hard, moist, gray, SILT with some sand and trace to some gravel*		MW-3/ 5.0	50/ 5"	0.0		WTPH-G BTEX
15	*Very dense, moist, gray, sandy SILT with trace to some gravel*		MW-3/ 15.0	50/ 4"	0.0		WTPH-G BTEX
20			MW-3/ 20.0	84/ 6"	0.0		
	Bottom of boring at 21 feet.						
25							
30							



LEGEND

3-inch O.D. split-spoon sample

Observed groundwater level 0/00/00 = date observed

WTPH-G BTEX — Analytical testing

AGRA Earth & Environmental
11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: *29 November 1994* Drilling completed: *29 November 1994* Logged by: *JK*

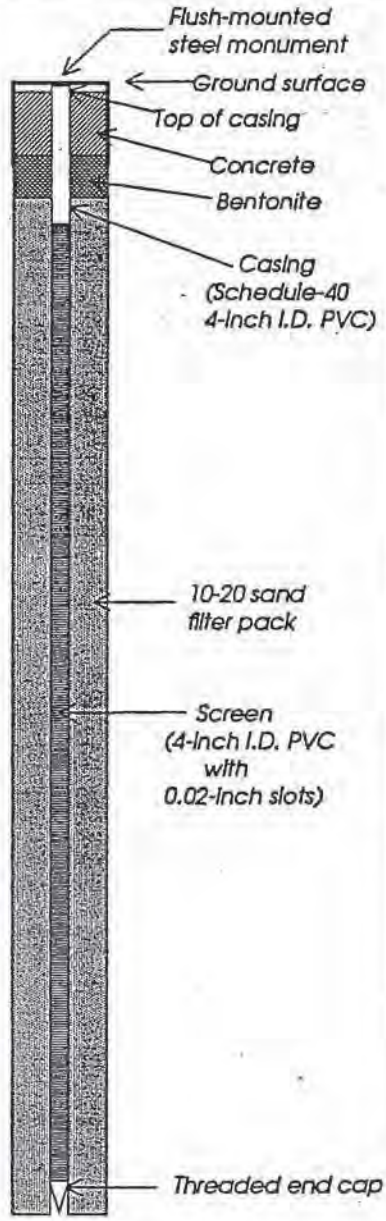
AGRA Earth and Environmental, Inc.

PROJECT: *1029 Market Street* W.O. *12-01232-00* WELL NO. *MW-4*

Elevation reference: *City of Kirkland* Well completed: *29 November 1994*
Ground surface elevation: *167.23 feet* Casing elevation: *166.70 feet*

AS-BUILT DESIGN

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	OVM READING	GROUND WATER	TESTING
0	*Moist, brown, silty SAND with gravel (Fill)*				3	ATD 12/7/94	
	Becomes gray, water seeps into borehole						
	Very dense, wet, gray, sandy SILT with some gravel						
5			MW-4/ 5.0	67	347		WTPH-HCID WTPH-G BTEX
10			MW-4/ 5.0	90/ 6"	217	ATD	WTPH-G BTEX
	Hard, saturated, gray, SILT with sand and trace to some gravel						
15	*Hard, moist, gray, SILT with some sand and trace to some gravel*		MW-4/ 15.0	100/ 6"	6.0		WTPH-G BTEX Total Pb
20			MW-4/ 20.0	70/ 6"	12		
25			MW-4/ 25.0	100/ 6"	6.0		
30	*Bottom of boring at 24 feet.*						



LEGEND

- 3-inch O.D. split-spoon sample
- WTPH-G BTEX — Analytical testing
- ATD — Observed groundwater level ATD = at time of drilling
- 0/00/00 — Observed groundwater level 0/00/00 = date observed

AGRA Earth & Environmental
11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: *29 November 1994* Drilling completed: *29 November 1994* Logged by: *JK*

AGRA Earth and Environmental, Inc.

PROJECT: *1029 Market Street* W.O. *12-01232-00* BORING NO. *B-1*

DEPTH (feet)	SOIL DESCRIPTION Approximate ground surface elevation: *169 feet*	SAMPLE TYPE	SAMPLE NUMBER	OVM READING	GROUND WATER	STANDARD PENETRATION RESISTANCE (Blows per foot)	TESTING
0	*Medium dense, moist to wet, gray, sandy SILT with some gravel (TP-2 Backfill)*			368			
5	*Very dense, damp to moist, gray, sandy SILT with trace to some gravel*		B-1/ 5.0	679			WTPH-HCID WTPH-G BTEX Total Pb
10			B-1/ 10.0	164		50/4"	WTPH-G BTEX
15			B-1/ 15.0	30		50/5"	WTPH-G BTEX
	Very dense, saturated, gray, SILT with sand and trace to some gravel				ATD		
	Very dense, damp to moist, gray, sandy SILT with trace to some gravel		B-1/ 17.0	2.6		75/6"	
20			B-1/ 19.0	0.0		90/6"	
	Boring terminated at approximately 20 feet						
25							
30							

MOISTURE CONTENT: Plastic limit — Natural — Liquid limit

LEGEND

3-inch OD split-spoon sample

WTPH-G BTEX — Analytical testing

ATD — Groundwater level at time of drilling

AGRA Earth & Environmental
11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling started: *28 November 1994* Drilling completed: *28 November 1994* Logged by: *JK*

AGRA Earth and Environmental, Inc.

PROJECT: *1029 Market Street* W.O. *12-01232-00* BORING NO. *B-2*

DEPTH (feet)	SOIL DESCRIPTION Approximate ground surface elevation: *167.3 feet*	SAMPLE TYPE	SAMPLE NUMBER	OVM READING	GROUND WATER	STANDARD PENETRATION RESISTANCE (Blows per foot)	TESTING
0	*Moist, brown, silty SAND with gravel (Fill)*						
	Hard, moist, brown to gray with some mottling, SILT with some sand and trace to some gravel						
5			B-2/ 5.0	2.0		50/4"	WTPH-G BTEX
10	*Becomes slightly wet*		B-2/ 10.0	0.0		50/6"	WTPH-G BTEX
15	*Very dense, moist, gray, sandy SILT with trace to some gravel*		B-2/ 15.0	0.0		75/6"	WTPH-G BTEX
			B-2/ 17.5	0.0		50/6"	
20	*Becomes damp*		B-2/ 20.0	0.0		100/6"	
25			B-2/ 25.0	0.0		100/6"	
			B-2/ 30.0 (Interval from 30.0-31.0 ft)	0.0		100/6"	
30	*Boring terminated at approximately 31 feet*						

MOISTURE CONTENT: Plastic limit — Natural — Liquid limit

LEGEND

3-inch OD split-spoon sample

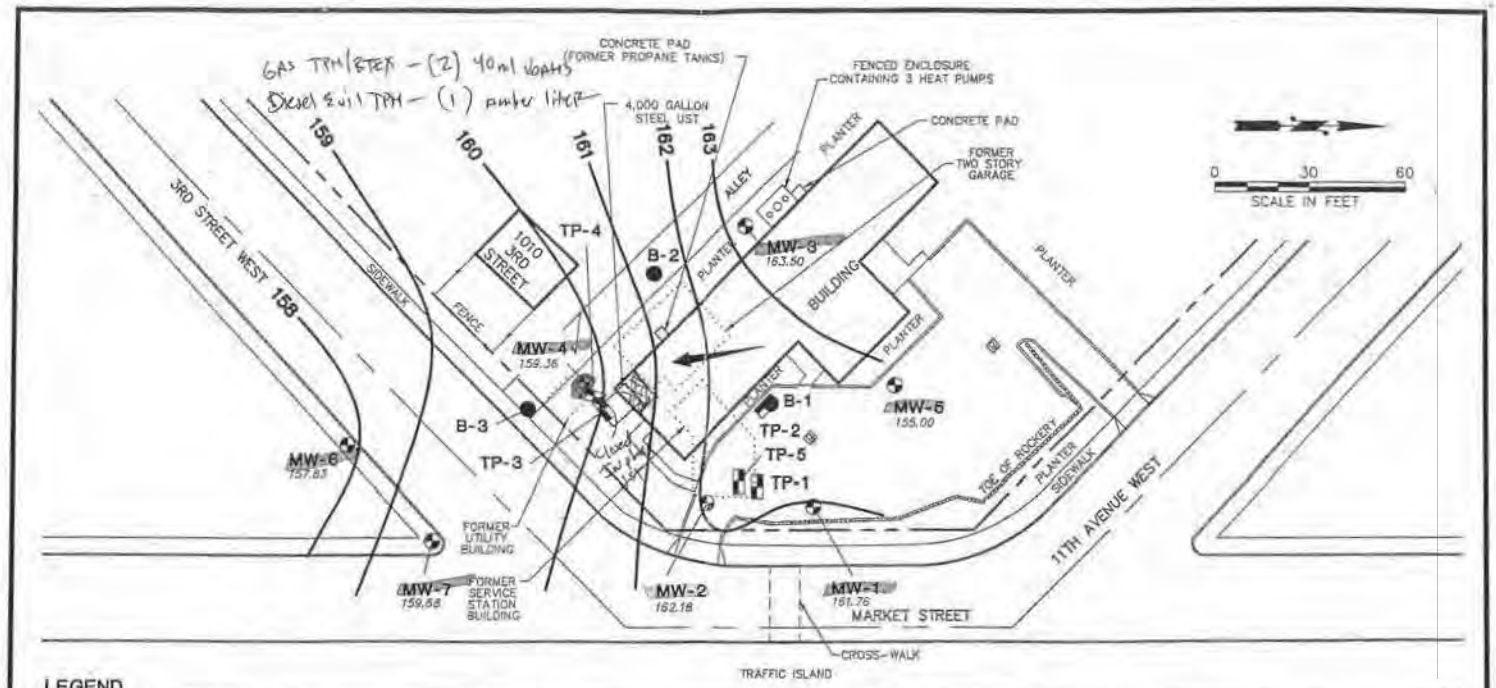
WTPH-G BTEX — Analytical testing

AID — Groundwater level at time of drilling

AGRA Earth & Environmental
11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

AGRA Earth and Environmental, Inc.

Drilling started: *28 November 1994* Drilling completed: *28 November 1994* Logged by: *JK*



LEGEND

- B-2 — BORING NUMBER AND LOCATION
- MW-1 — 2" MONITORING WELL NUMBER AND LOCATION
- MW-4 — 4" MONITORING WELL NUMBER AND LOCATION
- TP-5 — TEST PIT NUMBER AND LOCATION (PERFORMED BY OTHERS)
- CATCH BASIN
- —163— INFERRED GROUNDWATER SURFACE ELEVATION CONTOUR IN FEET
- 163.50 SPOT GROUNDWATER SURFACE ELEVATION IN FEET
- INFERRED DIRECTION OF GROUNDWATER MIGRATION

NOTE: VERTICAL DATUM BASED ON CITY OF KIRKLAND BENCHMARK, E. BOLT ON FIRE HYDRANT LEVEL NET POINT #129 AT MARKET STREET AND 7TH AVENUE.

FIGURE 3

AGRA Earth & Environmental
E. 520 North Foothills Drive
Suite 800
Spokane, WA, U.S.A. 99207

W.O.	12-01232-00
DESIGN	JK
DRAWN	JMR
DATE	SEP 1995
SCALE	1"=30'

1029 MARKET STREET
KIRKLAND, WASHINGTON

GROUNDWATER CONTOUR MAP
FOR 08 SEPTEMBER 1995

AGRA EARTH & ENVIRONMENTAL, INC. DRAWING NO. \12\01232\TASK04\GW-09NOLDWG

UNDERGROUND STORAGE TANK CLOSURE ASSESSMENT AND REMEDIATION 1029 MARKET STREET KIRKLAND, WASHINGTON

Submitted To:

The 1029 Market Street Participant Group

Submitted By:

AGRA Earth & Environmental, Inc.
11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

September 1995

File #12-01232-01

ATTACHMENT E

6 September 1995
12-01232-01

The 1029 Market Street Participant Group

Subject: Underground Storage Tank Closure and Remediation Report
1029 Market Street
Kirkland, Washington

Dear 1029 Market Street Participant Group:

AGRA Earth & Environmental, Inc. (AEE) is pleased to present this "Underground Storage Tank Closure Report" for the above referenced site. The scope of this portion of the project consisted of: in-place-closure of the 4,000-gallon underground storage tank (UST), located at the southwest corner of the existing building; excavation of petroleum impacted soils in the vicinity of the UST; excavation of petroleum impacted soils in the front parking area; backfilling both excavations; and re-asphalting and re-landscaping the site.

Based on AEE's field observations and analytical testing data collected during this investigation, petroleum hydrocarbon impacted soils were more extensive than originally anticipated. Approximately 383 tons of petroleum impacted soils were removed from the UST area while approximately 538 tons of petroleum impacted soils were removed from the front parking area. All petroleum impacted soils were removed to TPS Technologies, Inc. of Tacoma, Washington for treatment.

Based upon the analytical data obtained from closure samples collected from the lateral and vertical extent of the UST excavation, petroleum hydrocarbon concentrations exceeding the Washington Model Toxics Control Act (MTCA) Method A criteria for soils persist beneath the building in the vicinity of the UST itself and along the west sidewall between the sanitary sewer and storm sewer lines. In the parking area, petroleum hydrocarbon concentrations exceeding MTCA Method A criteria for soils exist along the western sidewall of the excavation, near the building itself, and immediately east of the catch basin. In both cases (UST and parking areas), further excavation could not be completed without damaging existing utilities or the building. Following excavation activities all excavations were backfilled and the site was returned to a condition approximating that which existed prior to site remedial activities.

In our opinion, remedial activities at the site have removed accessible petroleum impacted soils and further excavation activities are not warranted. However, if the building is removed or

replaced, petroleum impacted soils beneath the building could be exposed and pose a potential risk to human health and the environment.

All work was performed within the scope of the 6 April 1995 Environmental Services Contract and subsequent Change Orders. If there are any questions regarding the contents of this report, please do not hesitate to contact our office at your convenience.

Respectfully submitted,
AGRA Earth & Environmental, Inc.

Jeffrey Kaspar
Project Environmental Geologist

Bruce D. Williams
Senior Project Scientist

cc: Mr. Steven Cobb
Mr. Russell Cofano
Mr. Dennis Dunphy
Mr. Richard Lowell

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12-01232-01

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Figure 2 Site and Exploration Plan
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Appendix A Ecology's UST Site Check/Site Assessment Checklist
Appendix B Analytical Laboratory Test Certificates: UST Excavation
Appendix C Analytical Laboratory Test Certificates: Parking Area Excavation

1.0 SUMMARY

On 17 July 1995, AGRA Earth & Environmental, Inc. (AEE) initiated an Underground Storage Tank (UST) Closure Assessment at the above referenced site. The complete contents of this report should be consulted for specific details regarding this assessment; however, a brief summary of the investigation results is presented below:

- On 17 July 1995, the 4,000-gallon UST was closed-in-place. Approximately 4,000 gallons of water and 10 to 20 gallons of sludge were removed from the UST. The tank was pumped and rinsed prior to abandonment-in-place, accomplished by filling it with a grout mix;

- No apparent evidence of holes or punctures were noted during the UST closure. The visible surfaces of the UST appeared to exhibit minor surface corrosion only. Holes were placed in the base and north wall of the UST for sampling purposes. The hole in the base of the UST was plugged due to groundwater continuously flowing into the UST, therefore no soil sample was collected in this location. Soil sample UST4K-NSW-5.5 was obtained from an approximate depth of 5.5 feet below the top of the UST (7.5 to 8 feet below grade) and beneath the building;

- All product and vent lines appeared to have been removed prior to construction of the building. Two pipes had been cut off and placed inside the UST. The ports had apparently been plugged prior to pouring the building foundation and footings;

- Following closure of the UST, overexcavation of petroleum impacted soils around the tank was initiated. The final excavation limits were approximately 25 feet by 32 feet and approximately 10 feet in depth;

- Excavation was also performed in the front parking area. Petroleum hydrocarbon impacted soils were more extensive than predicted by the former site investigations. The final excavation dimensions were approximately 30 feet by 40 feet and approximately 10 to 12 feet in depth;

- Soils encountered consisted of 2 to 4 feet of fill underlain by a 6-inch layer of organics and topsoil, interpreted to be a former ground surface, underlain by dense glacial till;

- Groundwater was observed in both excavations at an approximate depth of 10 to 11 feet below grade. The groundwater was observed seeping slowly into the excavations through a more permeable sandy horizon of till at this depth;

- Laboratory analytical results from the closure samples obtained from the UST excavation indicated that soil containing petroleum hydrocarbon concentrations

exceeding MTCA Method A criteria still exists in two isolated areas: beneath the building in the area of the UST, and along the west sidewall beneath a large maple tree located between the storm sewer and sanitary sewer lines;

- Laboratory analytical results from the closure samples obtained from the front parking area indicated that soil containing petroleum hydrocarbon concentrations exceeding MTCA Method A cleanup criteria still exists in two locations: along the western wall of the excavation adjacent to the building and on the east end of the catch basin;

- All petroleum hydrocarbon impacted soils removed from the excavations were transported to TPS Technologies, Inc. of Tacoma, Washington for incineration and recycling. Approximately 920 tons were removed to TPS Technologies, Inc.; and

- All excavations were backfilled with compacted, imported fill consisting of a crushed and/or washed rock base overlain by sand and gravel fill.

2.0 PROJECT DESCRIPTION

The purpose of this assessment was to perform a permanent in-place closure of the existing 4,000-gallon UST and to overexcavate, to the extent practical, petroleum impacted soils associated with both the UST area and the front parking area.

AEE was present on site to: document and observe all site activities; continuously screen all soils to determine the lateral and vertical extent of petroleum impact; obtain discrete soil samples from the excavation limits; and document the restoration of the site, including backfill and compaction testing.

All excavation and soil removal activities were performed by Custom Backhoe and Dumptruck Services of Bellevue, Washington. The UST was decommissioned by Sound Testing, Inc. of Seattle, Washington. All water present in the UST was transported to Burlington Environmental, a licensed treatment and disposal facility located in Renton, Washington, by Basin Oil, Inc. of Seattle, Washington. Closure of the UST was performed by Tank Services Northwest, Inc. of Woodinville, Washington. All petroleum impacted soils were removed to TPS Technologies, Inc. of Tacoma, Washington.

All work performed during this assessment was accomplished within the basic framework of the Environmental Services Contract of April 1995 issued to AEE by the 1029 Market Street Participant Group.

3.0 SITE DESCRIPTION

The site is located at 1029 Market Street in Kirkland, Washington (Figure 1). The site

presently consists of a one-story office building, under the ownership of the Kelly Trust. Surrounding properties consist of residential housing. Figure 2 depicts the general site features.

This facility operated as an automobile service station with retail gasoline sales from at least 1946 through 1977. In 1946, Time Oil Co. purchased the property from Chas. R. & Mary Winstead. An equipment and furnishings list associated with the purchase documents indicates that the site was developed as a fuel service station at the time of Time Oil Co.'s purchase of the property, during the time the property was owned by the Winsteads. A photograph within Time Oil Co.'s property file portrays the site as Chuck's Texaco service station. Several USTs were operated at the facility including one 285-gallon capacity UST, one 550-gallon capacity UST, one 1,000-gallon capacity UST, three 3,000-gallon capacity USTs, one 4,000-gallon capacity UST, and at least one fuel dispenser island.

In 1977, the property was sold by the Time Oil Company to Karl Cunningham. Demolition of the site was completed by the City of Kirkland under contract to Time Oil Co. in March 1977. The demolition project was approved by the City of Kirkland Department of Fire Services on 17 June 1977. During 1977 and 1978, the property was rezoned and the existing building was constructed. In January 1984, the property was sold by Mr. Cunningham to Mr. John DiLoreto and repossessed by Mr. Cunningham approximately 4 1/2 years later in lieu of foreclosure. The building was resold in December 1988 by Mr. Cunningham to Dr. Thorpe M. Kelly and the Kelly Trust, current owners of the property. To the best of our knowledge, no environmental assessment work was performed for the property transactions which occurred prior to 1994.

An environmental site assessment was conducted by 3rd Party Site Assessments in 1994 (Phase I Environmental Site Assessment and Limited Phase II Environmental Site Assessment, June 1994). Results of these assessments indicated a soil sample collected from a test pit near the southeast corner of the building (TP-3) contained levels of benzene, xylenes, and GRPH above the cleanup criteria. Additionally, a steel UST was encountered (approximately 4,000-gallon capacity) in the vicinity of the southeast corner of the building. Portions of the UST were beneath the building and the wooden form used to place the building footing had been cut to fit around the tank surface.

On 20 November 1994, AEE initiated its involvement at the site by performing a subsurface petroleum hydrocarbon assessment on behalf of the 1029 Market Street Participant Group. Details of this investigation may be referenced in the 18 January 1995 report entitled "Subsurface Petroleum Hydrocarbon Assessment." During this assessment, 4 groundwater monitoring wells and 2 soil borings were installed. Soil exceeding the MTCA Method A cleanup criteria for soil was found only in boring B-1, located in the front parking area (Figure

2). Groundwater exceeding MTCA Method A criteria was present only in MW-4, located west of the existing UST.

AEE has also performed a Supplemental Phase I Assessment (report dated 7 July 1995) and a Soil Vapor Survey (16 August 1995) at the subject site. The Supplement Phase I Assessment was performed to fill potential gaps in the data noted during the review of the Phase I Investigation conducted by 3rd Party Site Assessments. Results of this investigation provided additional site background data but no additional significant findings in regards to historical evidence of other environmentally suspect land use activities. The Soil Vapor Survey was performed to assess for the presence or absence of petroleum hydrocarbons (vapor phase) along the known utility corridors and to establish an approximation of the lateral extent of petroleum impact. The results of this investigation indicated that the utility corridors (electric, phone, and storm sewer) were not apparently acting as significant conduits for petroleum migration.

4.0 EXCAVATION AND TANK CLOSURE OBSERVATIONS

4.1 4,000-Gallon UST Closure and Excavation

Tank closure operations were initiated on 17 July 1995 by Tank Services Northwest, Inc. of Woodinville, Washington. Three ports for the support piping (fill, vent and product) were located on the north end of the UST. Upon opening the plug in one of the accessible ports, the UST was found to be completely filled with water. This water was pumped from the UST by Basin Oil, Inc. of Seattle, Washington. A total of 4,000 gallons of water, with no apparent indications of petroleum hydrocarbons, was removed to Burlington Environmental of Renton, Washington for disposal.

Following removal of the water from the tank, the UST was pumped, rinsed, and then inerted using carbon dioxide gas. Sound Testing, Inc. of Seattle, Washington certified the decommissioning of the UST. The interior of the tank was cleaned prior to closure. Approximately 20 to 30 gallons of sludge was removed during the cleaning process. The sludge was placed in a barrel and disposed of by Tank Services Northwest. During the cleaning of the interior of the UST, two of the three pipes for the system were noted to have been cut off and placed inside the tank. No apparent holes or punctures were noted, based upon the absence of groundwater seepage into the UST following the cleaning process. The dimensions of the UST were approximately 7.5 feet in diameter by 12 feet in length. Minor corrosion was apparent covering over 90 percent of the visible portions of the UST's surface area. A copy of Ecology's UST Site Check/Site Assessment Checklist is included in Appendix A.

Approximately 2 feet of fill, consisting of sand and gravel with some silt was overlying the UST. The fill depth varied around the UST area from 3 to 4 feet in depth. Underlying the fill

was what appeared to be a soil horizon representative of a former ground surface. This soil horizon consisted of approximately 6-inches of organic materials with what appeared to be topsoil. Underlying the topsoil horizon was what appeared to be native soils interpreted to be representative of glacial till. The till consisted predominantly of silt with some fine sand and some gravel from approximately 4.5 feet to 9 to 10 feet below grade. Lenses and small horizons of fine to medium sand were also observed to be present. The apparent density of the till increased significantly at a depth of approximately 10 to 11 feet below grade. Groundwater was observed entering the excavation at the interface of the less dense overlying till horizon(s) and the more dense till horizon(s) at the base of the excavation. This groundwater occurrence is interpreted to be perched.

A hole was drilled into the base of the UST in order to obtain a sample of the underlying soils. Groundwater was observed to enter the pilot hole, streaming into the UST under pressure. The water was allowed to flow for approximately 15 minutes to ascertain whether the flow would drop off or stop following the release of the confining pressure of the overlying UST. The water flow did not decrease significantly therefore the hole was plugged. A second sampling hole was placed in the north wall of the UST at an approximate depth of 5.5 feet below the top of the UST (7.5 feet below grade). The location of this sample was based upon several small pilot holes which were placed in the north side of the UST. The sample was obtained immediately above the location where groundwater was observed entering a pilot hole in the UST. Soil sample UST4K-NSW-5.5 was obtained from beneath the building, through the north sidewall of the UST.

Following soil sampling, the UST was closed-in-place. The UST was completely filled with a grout mix on 17 July 1995. The grout mix was allowed to set prior to initiating excavation activities around the UST.

On 18 July 1995, excavation of petroleum impacted soils surrounding the UST was initiated. Soils were screened for volatile components of petroleum hydrocarbons periodically during the excavation process using an Organic Vapor Meter (OVM). The OVM is a type of photoionization detector (PID) capable of providing semi-quantitative data in respect to the presence or absence of volatile organic compounds such as those typically associated with petroleum hydrocarbons. The OVM cannot identify specific chemical species or detect organic compounds which are not volatile (i.e. heavy oils, PCBs, or metals). The OVM measurements, in combination with physical observations of soil conditions for indications of petroleum hydrocarbons, were used to determine the approximate limits of overexcavation.

All soils exhibiting indications of petroleum concentrations potentially in excess of MTCA Method A soil cleanup criteria were removed directly to TPS Technologies, Inc. of Tacoma, Washington. A total of 383 tons (approximately 286 cubic yards) of petroleum impacted soil

was excavated from the area surrounding the UST. The excavation extended: up to the city sidewalk to the south; to the sanitary sewer line and MW-4 to the west; within 1.5 to 2 feet of the building to the north; approximately 5 feet of the southeast corner of the building; and up to 10 to 11 feet below grade in depth. The final dimensions of the excavation were approximately 32 feet (east to west) by 23 feet (north to south) and 10.5 feet in depth. The primary zone of apparent petroleum impact, based upon physical observations and OVM readings, was between 5 feet and 10 feet in depth.

During excavation operations, several of the utility lines were uncovered, including the sanitary sewer line (6-inch PVC), the phone line (3-inch PVC) and the storm sewer line (6-inch PVC). The storm sewer line trended northeast to southwest, approximately 4 feet south of the UST and at an approximate depth of 4.5 feet below grade. The line itself apparently was set less than 6-inches from the petroleum impacted soils.

The portion of the sanitary sewer line that was exposed extended north from the concrete cleanout, approximately 6 feet west of the southwest corner of the building. The top of the pipe was approximately 3 feet below grade and was entrenched with a pea gravel base overlain by what appeared to be reworked till. A section of 2-inch steel pipe and section of 4-inch clay pipe were present in the fill above the sanitary sewer piping. A 2-foot thick concrete block with a 4-inch diameter coated steel pipe extending parallel to the west sidewall was present in the northwest corner of the excavation, immediately adjacent to the sanitary sewer line. The two small sections of pipe were removed during overexcavation. The concrete block was not removed in order to prevent further disturbance of the sanitary sewer line.

The phone line was uncovered when the surrounding fill, consisting of medium grained sand, collapsed into the excavation. The phone line consisted of a 3-inch PVC conduit trending parallel to the sidewalk along 3rd Street West and the southern wall of the excavation. The phone line was approximately 4 feet below grade while the trench extended to approximately 4.5 feet below grade. No apparent petroleum impacted soils were present within the trench fill.

In all three cases, the trenches extended beneath the organic-rich soil horizon interpreted to be representative of a former ground surface. This soil horizon was absent in the vicinity of all piping trenches as well as along the west sidewall of the excavation. Figure 3 depicts the approximate locations of the utilities, based upon excavation observations and the utility locating services data.

Soils samples were obtained during the excavation process to determine whether the lateral and vertical limits of the excavation had been reached. These samples were utilized as closure

samples if all analytical parameters were below Washington Model Toxics Control Act (MTCA) Method A cleanup criteria for soil or if further excavation in that direction could not be accomplished. Fifteen soil samples were collected from the UST excavation, of which fourteen samples were used for closure purposes. Discrete soil samples obtained from the lateral and vertical extents of the excavation included:

- UST4K-NSW-5.5 - obtained from approximately 2.5 feet beneath the building, from the north sidewall of the existing UST, at an approximate depth of 7.5 feet below grade;

- UST4K-WSW-9 - obtained from the west sidewall, approximately 3 to 4 feet west of the UST, at an approximate depth of 8 to 9 feet. This sample was obtained prior to completion of overexcavation and was not utilized for closure purposes;

- UST4K-BTS-10 - obtained from the base of the excavation, approximately 3 to 4 feet south of the UST, at an approximate depth of 10 feet below grade. This sample was utilized to estimate the vertical extent of contamination and as a UST closure sample;

- UST4K-SESW-9 - obtained from the eastern end of the south sidewall at an approximate depth of 8 to 9 feet;

- UST4K-ESW-9.5 - obtained from the northern end of the east sidewall at an approximate depth of 9 to 9.5 feet;

- UST4K-BTSA-11 - obtained from the base of the excavation, at the southeast end, and at an approximate depth of 11 feet;

- UST4K-BTW-11 - obtained from the base of the excavation, at the west end, and at an approximate depth of 11 feet;

- UST4K-SSWA-9 - obtained from the center of the south sidewall, at an approximate depth of 8 to 9 feet;

- UST4K-SSWB-9 - obtained from the western end of the south sidewall, at an approximate depth of 8 to 9 feet;

- UST4K-WSWA-9 - obtained from the north end of the west sidewall, at an approximate depth of 8 to 9 feet;

- UST4K-WSWB-8 - obtained from the south end of the west sidewall, at an approximate

depth of 7 to 8 feet;

- UST4K-NSWA-9 - obtained from the east end of the north sidewall, at an approximate depth of 8 to 9 feet;
- UST4K-NSWB-9 - obtained from approximately 4 to 5 feet east of the UST along the north sidewall, at an approximate depth of 8 to 9 feet;
- UST4K-ESWA-8 - obtained from the south end of the east sidewall, at an approximate depth of 7 to 8 feet; and
- UST4K-BTE-11 - obtained from the base of the excavation, on the northeast end, and at an approximate depth of 11 feet.

These sample locations are also depicted on Figure 4.

Following sampling of the excavation, the hole was backfilled. Approximately 1.5 to 2 feet of 1 to 3-inch washed rock was placed in the bottom of the excavation to provide a stable base layer above the groundwater level. Fill material consisting of sand and gravel with some silt was then utilized to complete backfilling operations. All soils were compacted as they were placed using a backhoe-mounted hoepack.

4.2 Parking Area Excavation

Excavation of petroleum impacted soils associated with the parking area of the subject site was initiated on 19 July 1995. Soil conditions beneath the asphalt and subbase consisted of reworked fill soils which exhibited indications of petroleum impact. The fill consisted of a combination of gray and brown sand, silt and some gravel with construction debris. The debris included sections of steel piping, concrete, rebar, and bricks. Field screening of the upper 2 to 3 feet of this fill yielded OVM readings up to 202 parts per million (ppm) indicating the presence of volatile organic compounds.

The storm sewer line and trench were readily distinguishable from the surrounding soils. The soils within the trench consisted of a slightly darker gray, silty fine sand with some gravel which was homogeneous throughout the trench. The soil within the trench was also impacted with petroleum hydrocarbons from below the asphalt and base fill layer through the extent of the trench. The trench appeared to be approximately 3 to 3.5 feet in width and 4 to 5 feet below grade in depth. Figure 3 depicts the location of the storm sewer line.

In general, subsurface conditions in the front parking area appeared dissimilar to those encountered in the UST excavation area for the upper fill soils and construction areas only.

As previously noted, the soils comprising the fill within the upper 2 to 4 feet below grade appeared to consist of predominantly reworked soils inferred to have been originally associated with the former site features. This is supported by the heterogeneous coloration and composition as well as the presence of man-made debris. The soil horizon interpreted to have been representative of a former ground surface, consisting of 4 to 6 inches of organic material and topsoil, was present approximately 2 feet below grade along the west and south sidewalls; however, it was absent east of the storm sewer line and along the north sidewall. This is inferred to be due to the demolition and construction activities in these areas. Where the organic layer of soil was absent, fill consisting of sand and gravel with some silt was present. The fill appeared similar to the surrounding soils and is not readily distinguishable except for a slight variation in color and a lower apparent soil density than the underlying glacial till. Soil conditions beneath the fill were similar to those encountered in the UST excavation.

Groundwater was also encountered between 10 and 11 feet below grade in the vicinity of the parking lot excavation. The groundwater was observed to slowly seep into the excavation through a sandier layer of fill, and is interpreted to be perched upon the denser, less permeable, underlying till unit(s).

Petroleum impacted soils were encountered from within 6 inches of the ground surface extending to 10 to 11 feet below grade. The zone of the most severe petroleum impact ranged from approximately 4 to 8 feet below grade, as indicated by elevated OVM readings. Field screening and observations also indicated that petroleum impact was more concentrated in the northwestern portion of the excavation and generally decreased to the east.

The excavation extended: south to within several feet of MW-2; approximately 25 feet east of the building; within 3 feet of the building itself in the western direction; and up to the main entrance as well as the catch basin to the north. Petroleum impacted soils to the west and northwest in the vicinity of the entrance were not removed due to the risk of compromising the structural integrity of the building. Some petroleum impacted soils were also left on the east side of the catch basin to avoid undermining and collapse of the entire storm system.

Soil samples were obtained from the lateral and vertical extent of excavation prior to completion of the excavation as well as following completion of the remedial overexcavation. The intermediate samples were used to determine whether the lateral and vertical limits of petroleum impact were reached. The final closure samples were obtained from 16 August to 18 August 1995 and represent the final limits of excavation. Intermediate samples which contained concentrations of petroleum hydrocarbons below MTCA Method A cleanup criteria for soil were also utilized as closure samples. Eighteen soil samples were collected from this excavation of which fourteen samples were utilized for closure purposes. Discrete soil

samples obtained from the parking area excavation included:

- TP1-12 - obtained from an initial test pit used to estimate the vertical extent of petroleum impact. The sample was obtained from an approximate depth of 11 to 12 feet below grade;

- PKX-SWSW-4 - an intermediate sample obtained from the south end of the west sidewall at its limit on 21 July 1995. The sample was obtained from an approximate depth of 4 feet below grade. This sample was obtained prior to completion of overexcavation, and was not utilized for closure purposes;

- PKX-NWSW-5 - an intermediate sample obtained from the north end of the west sidewall at its limit on 21 July 1995. The sample was collected from an approximate depth of 5 feet below grade. This sample was obtained prior to completion of overexcavation, and was not utilized for closure purposes;

- PKX-SSW-6 - an intermediate sample obtained from the west end of the south sidewall at its limit on 21 July 1995. The sample was collected from an approximate depth of 6 feet below grade. This sample was obtained prior to completion of overexcavation, and was not utilized for closure purposes;

- PKX-ESW-8 - an intermediate sample obtained from the center of the east sidewall at its limits on 21 July 1995. The sample was collected from an approximate depth of 8 feet below grade. This sample was obtained prior to completion of overexcavation, and was not utilized for closure purposes;

- PKX-SSW-8W - obtained from the west end of the south sidewall at an approximate depth of 7 to 8 feet below grade;

- PKX-WSW-7S - obtained from the south end of the west sidewall at an approximate depth of 6 to 7 feet below grade;

- PKX-SSW-8E - obtained from the east end of the south sidewall, at an approximate depth of 7 to 8 feet below grade;

- PKX-ESW-9.5S - obtained from the south end of the east sidewall, at an approximate depth of 9 to 9.5 feet below grade;

- PKX-BTSE-10 - obtained from the southeast end of the base of the excavation, at an approximate depth of 10 to 10.5 feet below grade;

- PKX-NSW-8W - obtained from the west end of the north sidewall, at an approximate depth of 7 to 8 feet below grade;

- PKX-BTNW-10 - obtained from the northwest end of the base of the excavation, at an approximate depth of 10 to 10.5 feet below grade;

- PKX-BTNE-10 - obtained from the northeast end of the base of the excavation, at an approximate depth of 10 to 10.5 feet below grade;

- PKX-NSW-7E - obtained from the east side of the north sidewall, at an approximate depth of 6 to 7 feet below grade;

- PKX-ESW-8C - obtained from the center of the east sidewall, at an approximate depth of 7 to 8 feet below grade;

- PKX-NSW-7WCR - obtained from the west corner of the north sidewall, near the building entrance, at an approximate depth of 6 to 7 feet below grade;

- PKX-WSW-8C - obtained from the center of the west sidewall, at an approximate depth of 7 to 8 feet below grade; and

- PKX-WSW-7N - obtained from the north side of the west sidewall, at an approximate depth of 7 to 8 feet below grade.

The locations of these samples (final closure only) are depicted on Figure 4. A total of approximately 537 tons (approximately 358 cubic yards) of petroleum impacted soils were removed to TPS Technologies, Inc.

Upon completion of soil sampling, the excavation was backfilled. Approximately 2 to 3 feet of 2 to 4-inch crushed rock was placed in the base of the excavation to provide a stable base layer for compaction. Imported fill consisting of sand and gravel with some silt was used to fill the remainder of the excavation. AEE was present on site to test compaction of the placed fill. A nuclear densometer was utilized to test compaction. Compaction results ranged from 97% to 100.5% of the maximum dry density for the fill material being utilized.

5.0 SUBSURFACE CONDITIONS

Soil conditions encountered generally consisted of up to 4 feet of fill soils. The fill soils included both imported sand and gravel fill as well as fill that appeared to consist of native soils that had been reworked, possibly during demolition and construction activities. This was evident by the incomplete sections of piping, concrete debris, and bricks scattered throughout

the fill.

Underlying the fill, in areas which had not been affected by construction or demolition, an organic rich layer consisting of what appears to be grass and small plant remains mixed with a topsoil layer. This soil horizon was encountered between approximately 2 to 4 feet in depth and was generally 4 to 6 inches in thickness. This soil horizon could represent: a previous ground surface prior to development of the site; areas of the site which were not developed; or areas which were developed/landscaped around previous structures at the site.

The native soils underlying the fill and/or organic soil horizons consisted predominantly of silt with variable sand content and some gravel to boulder size materials. These materials were relatively dense, increasing generally in the degree of compaction with depth. The soils comprising this third horizon are interpreted to be representative of glacial till of the Quaternary age.

Quaternary age sediments which mantle most of the Puget Lowlands, a complex topographic and structural basin formed approximately 2 to 3 million years ago, are the result of repeated glacial ice advances and intermittent nonglacial periods. These deposits consist of both unstratified and stratified deposits of clay, silt, sand, gravel and cobbles. Ice from the most recent glacial advance, known as the Fraser Glaciation, occupied the Puget Lowland approximately 11,000 to 13,000 years ago. The ice sheets at this time were believed to have reached thicknesses of 3,500 to 4,500 feet. Consequently, the sediments deposited are highly compacted by the weight of the glacial ice, and are described as "overconsolidated glacial sediments."

The glacial deposits at the site were observed to have layers of sand of variable thickness scattered throughout the 6 to 7 foot section exposed during excavation activities. Groundwater was encountered at approximately 10 feet below grade in both excavations, seeping into the excavations through a sand layer in the till. The seepage rate was very slow and accumulation of groundwater in the open excavation was minimal. This soil horizon was not saturated but did yield water interpreted to be perched upon the more dense, underlying silt layer. Based upon the results of AEE's former subsurface petroleum hydrocarbon assessment, in combination with the excavation observations of this phase of the project, it appears that a non-homogenous groundwater system with differing hydrogeological characteristics exists at the site. Groundwater occurrence was first observed during excavation activities at an approximate depth of 10 feet. A saturated zone encountered between 13 and 17 feet during installation of the monitoring wells was also observed. This system is likely to be under semi-confining pressure resulting from the overlying, relatively, impermeable till layer(s). This is supported by the groundwater elevations in the monitoring wells which has been observed to rise up to 3 feet of the ground surface. Excavation

observations have confirmed that no indications of groundwater seepage has been evident above 10 feet in depth.

Groundwater contour maps depicting the inferred groundwater flow directions based upon water level data collected in May, June, and August have been included as Figures 5, 6, and 7. In general, the apparent groundwater flow throughout the summer season has been to the southwest.

6.0 QUANTITATIVE LABORATORY ANALYSIS

All soil samples collected were placed in laboratory prepared glass jars, labeled and immediately placed in cold storage until they could be submitted to the laboratory for analysis. AEE chain-of-custody procedures were maintained to document sample integrity. All laboratory analyses were subcontracted to North Creek Analytical, Inc. of Bothell, Washington.

The analytical testing scope performed for this phase of the project was based on Ecology's guidance documents for UST site checks and site assessments, and upon the results of AEE's former subsurface site assessment. Soil samples collected were analyzed by the following methods;

- Gasoline range petroleum hydrocarbons (GRPH) by Ecology Method WTPH-G;
- Volatile aromatic hydrocarbons (benzene, toluene, ethylbenzene and xylenes (BTEX)) by EPA Method 8020;
- Diesel range petroleum hydrocarbons by EPA Method WTPH-D (selected samples only); and
- Total lead by EPA Method 6010 (selected samples only).

Soil analytical results are summarized in Tables 1 and 2. Laboratory analytical test certificates are presented in Appendices B and C.

Analytical results of the final closure samples from the UST excavation indicated concentrations of petroleum hydrocarbons exceeding MTCA Method A criteria for soils in two samples. Sample UST4K-NSW-5.5, obtained from the north sidewall, behind the UST and beneath the building, contained concentrations of 4,700 ppm, 5.0 ppm, and 46 ppm for GRPH, benzene and total xylenes, respectively. Sample UST4K-WSWB-8, obtained just south of the storm drain line, on the west sidewall, contained concentrations of 850 ppm and 0.62 ppm for GRPH and benzene, respectively. Ecology's MTCA Method A cleanup criteria for soil for GRPH, benzene and xylenes are 100 ppm, 0.5 ppm and 20 ppm, respectively. Concentrations of petroleum compounds in all other closure samples were below MTCA criteria.

Analytical results of the final closure samples obtained from the parking area excavation indicated multiple samples with concentrations of petroleum compounds exceeding MTCA Method A soil cleanup criteria. Sample PKX-SSW-8W, obtained from the west corner of the south sidewall, contained 370 ppm of GRPH. Sample PKX-WSW-7S, obtained from the south end of the west sidewall, contained 560 ppm GRPH and 0.67 ppm benzene. Sample PKX-NSW-7E, obtained from the east side of the north sidewall, adjacent to the catch basin, contained a GRPH concentration of 350 ppm. Sample PKX-NSW-7WCR, obtained from the west corner of the north sidewall, adjacent to the building's entrance, contained a GRPH concentration of 410 ppm. Sample PKX-WSW-8C, obtained from the center of the west sidewall contained a GRPH concentration of 130 ppm. Sample PKX-WSW-7N, obtained from the north end of the west sidewall, contained a GRPH concentration of 520 ppm. All other samples contained analyte concentrations below MTCA criteria.

One sample per excavation which contained the highest concentrations of petroleum compounds was chosen for supplemental analysis by WTPH-D and EPA Method 6010. These samples included UST4K-NSW-5.5 from the UST excavation and PKX-WSW-7S from the parking area excavation. Neither sample contained concentrations of either diesel range petroleum hydrocarbons or total lead in excess of the MTCA Method A cleanup criteria for soil.

7.0 CONCLUSIONS

Approximately 920 tons of petroleum impacted soils were removed from the site between 18 July and 18 August 1995: approximately 383 tons were removed from the UST excavation and approximately 538 tons were removed from the parking lot excavation. A total of 28 soil samples (14 from each excavation) were collected for closure purposes. Twenty of the soil samples contained concentrations of GRPH and the BTEX compounds either below MTCA Method A cleanup criteria or below method detection limits.

Eight soil samples, two from the UST excavation and six from the parking lot excavation contained levels of GRPH above the MTCA Method A cleanup criteria. Three of these eight samples contained concentrations of benzene above the MTCA Method A cleanup criteria (including both samples from the UST excavation), and only one sample (also from the UST excavation) contained a total xylenes concentration above the Method A cleanup criteria. In each case, further excavation in these areas was deemed impractical due to risk of undermining the building's foundation, risk of damage to existing utilities, or losing several of the larger existing trees at the site.

Six of the eight samples with elevated GRPH concentrations were collected either beneath the existing building or as close to the building as possible, without compromising its structural integrity. Five of these six samples were located in the excavation in the front parking lot, and the remaining sample was collected from the UST excavation. The other sample collected

from the UST excavation with elevated GRPH concentrations was obtained adjacent to a storm sewer line and beneath a large maple tree. Further excavation could not continue without removing the tree and disconnecting the storm sewer line, and potentially damaging the sidewalk and underlying utilities on Third Street. The other sample collected from the parking lot excavation was obtained as close to a catch basin as possible without posing a hazard to the storm drainage system.

Based upon the data available, the existing UST does not appear to exhibit any apparent signs of a structural compromise. This is based upon the condition of both the inside and outside of the UST. The petroleum impacted soils could therefore have been a result of: leakage from another UST(s) that had been removed; repeated overflow of the UST(s) during filling; or a failure in the piping system for the UST(s).

With respect to vertical distribution, in the vicinity of the UST, petroleum impacted soils were not observed to be present until an approximate depth of 5 feet. This was below both the fill and organic layers. The area surrounding the UST and over the fill pipes were disturbed prior to AEE's involvement with the site therefore it is unknown as to whether petroleum impact was present in the vicinity of the fill pipe area or near the surface of the UST prior to disturbance. Based upon the stockpiled soils and observations around the sanitary sewer trench as well as the building itself, if petroleum contaminants had been present, it is likely they had been removed during construction activities. The UST would also have been within 6 inches of the former ground surface given the location of the topsoil horizon nearby corresponding with the top of the UST. This data tends to indicate the topsoil area is representative of a former ground surface elevation which existed before the area was developed. Furthermore, if this holds true, the overlying soil may represent native soils in some areas of the site and at least a second placement of fill in the developed ares of the site.

Excavation observations indicated petroleum impacted soils extended to the initial groundwater occurrence at 10 feet of depth. A substantial decrease in apparent petroleum impact was noted within the underlying very dense till horizon on which the groundwater was perched.

The vertical extent of petroleum impact in the vicinity of the front parking area extended from immediately below the ground surface up to the perched groundwater occurrence at approximately 10 feet below grade. The area of most severe petroleum impact appeared to be between 4 and 8 feet in depth, based upon field screening readings using the OVM. Due to the apparent mixing of materials in the upper 3 to 4 feet, conclusions regarding an origin of the impacted soil is difficult to interpret.

Overall, the majority of the petroleum impacted soils have now been removed from the subsurface. The remaining soils beneath the building are unlikely to pose a potential threat

to human health or the environment since they are capped with a structure which prevents exposure to humans and to potential agents of transport and erosion. Furthermore, excavation observations indicate the soils with the highest apparent residual petroleum impact are within the zone of dense native till. This till body was not observed to be severely fractured or to have any apparent groundwater occurrence above 10 to 11 feet in depth, indicating a low migration potential for residual contaminants. Existing utility conduits are above the zone of residual contamination and therefore, in our opinion, do not represent preferential conduits for contaminant migration. Finally, benzene concentrations were generally low and exceeded the cleanup criteria of 0.5 parts per million (ppm) in only three of the 28 soil samples submitted for closure, with all three results at or below 5.0 ppm. Benzene concentrations are considered most critical when assigning a risk value to a petroleum impacted site since they are the one of the most volatile, mobile, and toxic of the petroleum constituents.

AEE has conducted a secondary drilling assessment at the site in September 1995 (results are not available yet). This assessment included the installation of several additional monitoring wells in the vicinity of both excavations to ascertain whether groundwater has been affected in areas which were not encompassed by the monitoring well network established during the November 1994 assessment. Based upon previous groundwater data from the existing monitoring wells, groundwater in the vicinity of both excavations did not appear to be severely impacted. Based upon the low petroleum concentrations in groundwater in the immediate vicinity of the excavations, it is inferred that existing groundwater conditions and future groundwater conditions would improve now that the source areas have been removed. This will be documented during the upcoming site investigation.

In our opinion, remedial activities conducted at the site have removed the accessible petroleum impacted soils. No additional excavation activities or remedial actions appear warranted at this time. However, residual petroleum impacted soils remain beneath the building. If this building is removed in the future, remedial actions may be necessary to minimize the risk associated with potentially exposing these soils.

8.0 CLOSURE

The conclusions presented in this report are based upon the specific analyses, and explorations performed for this investigation. These conclusions should be considered as being representative of subsurface conditions in the vicinity of the excavated areas only. The scope of work performed was based upon both the Environmental Services Contract dated 6 April 1995 and change orders approved by the Participant Group during the completion of this phase of the project.

AGRA Earth & Environmental, Inc. appreciates the opportunity to be of service to the 1029 Market Street Participant Group. If there are any questions regarding either the contents of

this report, or any other aspects of this assessment, please feel free to contact our office at your earliest convenience.

Respectfully submitted,
AGRA Earth & Environmental, Inc.

Jeffrey Kaspar
Project Environmental Geologist

Bruce D. Williams
Senior Project Scientist

Jon N. Sondergaard, P.G., R.E.A.
Associate

JK/

TABLE 1: SUMMARY OF SOIL ANALYTICAL RESULTS: UST EXCAVATION
1029 MARKET STREET
KIRKLAND, WASHINGTON

SAMPLE NUMBER	DATE COLLECTED	OVM ppm	GRPH mg/kg	BENZENE mg/kg	TOLUENE mg/kg	ETHYL-BENZENE mg/kg	TOTAL XYLENES mg/kg
UST4K-NSW-5.5	7/19/95	407	**4700**	**5.0**	18	9.8	46
UST4K-WSW-9 (1)	7/19/95	389	**1700**	**4.0**	<0.20	7.1	11
UST4K-BTS-10	7/19/95	68	4.8	<0.050	<0.050	0.15	0.23
UST4K-SESW-9	8/9/95	29	9.5	<0.050	<0.050	0.34	0.46
UST4K-ESW-9.5	8/9/95	252	3.0	<0.050	<0.050	0.068	<0.10
UST4K-BSTA-11	8/10/95	59	2.4	0.16	0.052	0.23	0.38
UST4K-BTW-11	8/10/95	28	4.6	<0.050	<0.050	0.11	0.20
UST4K-SSWA-9	8/11/95	5	2.4	<0.050	<0.050	0.051	<0.10
UST4K-SSWB-9	8/11/95	38	4.9	<0.050	<0.050	0.096	0.23
UST4K-WSWA-9	8/11/95	94	22	<0.050	<0.050	0.21	0.52
UST4K-WSWB-8	8/11/95	234	**850**	**0.62**	<0.080	3.4	5.8
UST4K-NSWA-9	8/11/95	37	3.7	<0.050	<0.050	0.11	<0.10
UST4K-NSWB-9	8/11/95	164	9.0	<0.050	<0.050	0.10	<0.10
UST4K-ESWA-8	8/11/95	388	36	<0.080	<0.080	0.39	0.56
UST4K-BTE-11	8/11/95	82	7.9	0.086	<0.050	<0.05	<0.10
MTCA Method A Cleanup Levels			100	0.5	40	20	20
UST4K-WSWB-8 : DRPH = 13 mg/kg, Total Lead = 12 mg/kg							

Notes:

(1) Sample UST4K-WSW-9 was not utilized as a closure sample.
GRPH - Gasoline range petroleum hydrocarbons (C7-C12), analyzed by Ecology Method WTPH-G.
DRPH - Diesel range petroleum hydrocarbons (C13-C24), analyzed by Ecology Method WTPH-D.
BTEX - Benzene, toluene, ethylbenzene, and total xylenes, analyzed by EPA Method 8020.
Total Lead by EPA Method 7421.
OVM - Organic vapor meter.
All concentrations are listed in milligrams per kilograms (mg/kg), also referred to as parts per million (ppm).
Bolded areas indicate results exceed MTCA Method A cleanup criteria.

TABLE 2: SUMMARY OF SOIL ANALYTICAL RESULTS: PARKING AREA EXCAVATION
1029 MARKET STREET
KIRKLAND, WASHINGTON

SAMPLE NUMBER	DATE COLLECTE	OVM ppm	GRPH mg/kg	BENZENE mg/kg	TOLUENE mg/kg	ETHYL-BENZENE mg/kg	TOTAL XYLENES mg/kg
TP1-12	7/19/95	NA	<1.0	<0.050	<0.050	<0.050	<1.0
PKS-SWSW-4 (1)	7/21/95	364	**610**	<0.080	<0.080	1.5	2.2
PKS-NWSW-5 (2)	7/21/95	489	**720**	0.34	<0.080	3.0	4.8
PKS-SSW-6 (3)	7/21/95	268	**1300**	**0.73**	<0.020	4.6	6.0
PKS-ESW-8 (4)	7/21/95	312	**470**	0.42	0.94	2.1	3.4
PKS-SSW-8W	8/16/95	482	**370**	<0.20	0.58	1.0	<0.10
PKS-WSW-7S	8/16/95	255	**560**	**0.67**	0.98	1.4	1.3
PKS-SSW-8E	8/16/95	17	2.1	<0.050	<0.050	<0.050	<0.10
PKS-ESW-9.5S	8/16/95	13	1.2	<0.050	<0.050	<0.050	<0.10
PKS-BTSE-10	8/16/95	9	2.4	0.066	<0.050	<0.050	<0.10
PKS-NWS-8W	8/17/95	11	1.7	<0.050	<0.050	<0.050	<0.10
PKS-BTNW-10	8/17/95	3	2.4	<0.050	<0.050	<0.050	<0.10
PKS-BTNE-10	8/17/95	9	<1.0	<0.050	<0.050	<0.050	<0.10
PKS-NSW-7E	8/17/95	36	**350**	<0.050	0.15	0.49	<0.10
PKS-ESW-8C	8/17/95	414	<1.0	<0.050	<0.050	<0.050	<0.10
PKS-NSW-7WCR	8/17/95	8	**410**	<0.20	0.27	0.91	2.2
PKS-WSW-8C	8/18/95	224	**130**	0.059	0.17	0.31	0.50
PKS-WSW-7N	8/18/95	222	**520**	0.14	0.45	1.6	2.2
MTCA Method A Cleanup Levels			100	0.5	40	20	20
PKS-WSW-7S : DRPH = 43 mg/kg, Total Lead = <10 mg/kg							

Notes:

(1) Sample PKS-SWSW-4 was not utilized as a closure sample.
(2) Sample PKS-NWSW-5 was not utilized as a closure sample.
(3) Sample PKS-SSW-6 was not utilized as a closure sample.
(4) Sample PKS-ESW-8 was not utilized as a closure sample.
GRPH - Gasoline range petroleum hydrocarbons (C7-C12), analyzed by Ecology Method WTPH-G.
DRPH - Diesel range petroleum hydrocarbons (C13-C24), analyzed by Ecology Method WTPH-D.
BTEX - Benzene, toluene, ethylbenzene, and total xylenes, analyzed by EPA Method 8020.
Total Lead by EPA Method 7421.
OVM - Organic vapor meter.
All concentrations are listed in milligrams per kilograms (mg/kg), also referred to as parts per million (ppm).
Bolded areas indicate results exceed MTCA Method A cleanup criteria.
NA-not available

Table 3: **Summary of Fluid Level Measurements**
1029 Market Street
Kirkland, Washington
AGRA Earth & Environmental, Inc. Project No. 12-01232-00

Well Number/ Top of Casing Elevation (ft)	Date Collected	Depth to Water (ft)	Groundwater Elevation (ft)
MW-1/ 168.30	07-Dec-94	5.29	163.01
	11-Jan-95	5.14	163.16
	24-May-95	6.30	162.00
	23-Jun-95	5.44	162.86
	24-Aug-95	7.54	160.76
MW-2/ 169.30	07-Dec-94	6.43	162.87
	11-Jan-95	6.04	163.26
	24-May-95	6.54	162.76
	23-Jun-95	6.69	162.61
	24-Aug-95	7.65	161.65
MW-3/ 168.10	07-Dec-94	4.19	163.91
	11-Jan-95	3.93	164.17
	24-May-95	4.03	164.07
	23-Jun-95	4.19	163.91
	24-Aug-95	4.43	163.67
MW-4/ 166.70	07-Dec-94	3.64	163.06
	11-Jan-95	2.91	163.79
	24-May-95	6.85	159.85
	23-Jun-95	7.29	159.41
	24-Aug-95	7.33	159.37

FIGURE 1

AGRA
Earth & Environmental
E. 520 North Foothills Drive
Suite 600
Spokane, WA, U.S.A. 99207

W.O.	12-01232-00
DESIGN	JK
DRAWN	JMR
DATE	SEP 1995
SCALE	N.T.S.

1029 MARKET STREET
KRIKLAND, WASHINGTON

LOCATION MAP

AGRA EARTH & ENVIRONMENTAL, INC. DRAWING NO. \12\01232\TASK03\LOCATION.DWG

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East 11115 Montgomery, Suite B • Spokane, WA 99206-4776 (509) 924-9200 • FAX 924-9290
9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

AGRA Earth & Environmental	Client Project ID:	1029 Market Street	
E. 520 North Foothills, #600	Sample Matrix:	Soil	
Spokane, WA 99207			Received: Jul 19, 1995
Attention: Bruce Williams	First Sample #:	B507332-01	Reported: Jul 20, 1995

TOTAL SOLIDS & MOISTURE CONTENT REPORT

Sample Number	Sample Description	Total Solids %	Moisture Content %
B507332-01	UST4K-NSW-5.5	83	17
B507332-02	UST4K-WSW-9	88	12
B507332-03	UST4K-BTS-10	86	14
B507332-04	TP1-12	83	17

The enclosed analytical results for soils, sediments and sludges have been converted to a DRY WEIGHT reporting basis.
To attain the wet weight "as received" equivalent, multiply the dry weight result by the decimal fraction of percent Total Solids.

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Shannon Stowell
Project Manager

507332.AGS <2>

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AGRA Earth & Environmental	Client Project ID:	1029 Market Street		Sampled:	Jul 19, 1995
E. 520 North Foothills, #600	Sample Matrix:	Soil		Received:	Jul 19, 1995
Spokane, WA 99207	Analysis Method:	WTPH-G		Analyzed:	Jul 20, 1995
Attention: Bruce Williams	First Sample #:	B507332-01		Reported:	Jul 20, 1995

TOTAL PETROLEUM HYDROCARBONS-GASOLINE RANGE

Sample Number	Sample Description	Sample Result mg/kg (ppm)	Surrogate Recovery %
B507332-01	UST4K-NSW-5.5	4,700	S-2
B507332-02	UST4K-WSW-9	1,700	S-2
B507332-03	UST4K-BTS-10	4.8	113
B507332-04	TP1-12	N.D.	104
BLK072095	Method Blank	N.D.	114

Reporting Limits	**1.0**

4-Bromofluorobenzene surrogate recovery control limits are 50 - 150 %.
Volatile Total Petroleum Hydrocarbons are quantitated as Gasoline Range Organics (toluene - dodecane).
Analytes reported as N.D. were not detected above the stated Reporting Limit. The results reported above are on a dry weight basis.

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Please Note:
S-2 = The Surrogate Recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present in the sample.

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AGRA Earth & Environmental E. 520 North Foothills, #600 Spokane, WA 99207 Attention: Bruce Williams	Client Project ID: 1029 Market Street Sample Matrix: Soil Analysis Method: WTPH-G Units: mg/kg (ppm)	Analyst: B. Christlieb F. Shino Analyzed: Jul 20, 1995 Reported: Jul 24, 1995

HYDROCARBON QUALITY CONTROL DATA REPORT

ACCURACY ASSESSMENT
Laboratory Control Sample

Gasoline	
Spike Conc. Added:	5.0
Spike Result:	3.1
% Recovery:	62
Upper Control Limit %:	115
Lower Control Limit %:	33

PRECISION ASSESSMENT
Sample Duplicate

Gasoline Range Hydrocarbons	
Sample Number:	B507332-01
Original Result:	4700
Duplicate Result:	6100
Relative % Difference:	26
Maximum RPD:	67

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Project Manager

% Recovery: $\frac{\text{Spike Result}}{\text{Spike Concentration Added}} \times 100$

Relative % Difference: $\frac{\text{Original Result} - \text{Duplicate Result}}{(\text{Original Result} + \text{Duplicate Result}) / 2} \times 100$

507332.AGS <4>

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AGRA Earth & Environmental	Client Project ID:	1029 Market Street	Sampled:	Jul 19, 1995
E. 520 North Foothills, #600	Sample Matrix:	Soil	Received:	Jul 19, 1995
Spokane, WA 99207	Analysis Method:	EPA 8020	Analyzed:	Jul 20, 1995
Attention: Bruce Williams	First Sample #:	B507332-01	Reported:	Jul 24, 1995

BTEX DISTINCTION

Sample Number	Sample Description	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)	Surrogate Recovery %
B507332-01	UST4K-NSW-5.5	5.0	18	9.8	46	95
B507332-02	UST4K-WSW-9	4.0	N.D. (R.L. = 0.20)	7.1	11	151
B507332-03	UST4K-BTS-10	N.D.	N.D.	0.15	0.23	90
B507332-04	TP1-12	N.D.	N.D.	N.D.	N.D.	87
BLK072095	Method Blank	N.D.	N.D.	N.D.	N.D.	91
Reporting Limits:		0.050	0.050	0.050	0.10	

4-Bromofluorobenzene surrogate recovery control limits are 34 - 166 %.
Analytes reported as N.D. were not detected above the stated Reporting Limit.
The results reported above are on a dry weight basis.

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AGRA Earth & Environmental	Client Project ID: 1029 Market Street	Analyst: B. Christlieb
E. 520 North Foothills, #600	Sample Matrix: Soil	F. Shino
Spokane, WA 99207	Analysis Method: EPA 8020	
Attention: Bruce Williams	Units: mg/kg (ppm)	Analyzed: Jul 20, 1995
	QC Sample #: B507332-04	Reported: Jul 24, 1995

MATRIX SPIKE QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Sample Result:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	0.60	0.60	0.60	1.80
Spike Result:	0.43	0.43	0.44	1.24
Spike % Recovery:	72%	72%	73%	69%
Spike Dup. Result:	0.47	0.48	0.50	1.42
Spike Duplicate % Recovery:	78%	80%	83%	79%
Upper Control Limit %:	111	118	120	128
Lower Control Limit %:	59	55	61	55
Relative % Difference:	8.9%	11%	13%	14%
Maximum RPD:	17	16	17	17

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% Recovery: $\frac{\text{Spike Result - Sample Result}}{\text{Spike Conc. Added}} \times 100$

Relative % Difference: $\frac{\text{Spike Result - Spike Dup. Result}}{(\text{Spike Result + Spike Dup. Result}) / 2} \times 100$

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AGRA Earth & Environmental	Project Name:	1029 Market Street	
11335 NE 122nd Way, #100	Client Project :	#12-1232-01	
Kirkland, WA 98034			Received: Aug 9, 1995
Attention: Bruce Williams	NCA Project #:	B508169	Reported: Aug 10, 1995

PROJECT SUMMARY PAGE

Laboratory Sample Number	Sample Description	Sample Matrix	Date Sampled
B508169-01	UST4K-SESW-9	Soil	8/9/95
B508169-02	UST4K-ESW-9.5	Soil	8/9/95

The results in this report apply to the samples analyzed in accordance with the chain of custody document.
This analytical report must be reproduced in its entirety.

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Project Manager

508169.AGR <1>

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AGRA Earth & Environmental	Client Project ID:	1029 Market Street	
11335 NE 122nd Way, #100	Sample Matrix:	Soil	
Kirkland, WA 98034			Received: Aug 9, 1995
Attention: Bruce Williams	First Sample #:	B508169-01	Reported: Aug 10, 1995

TOTAL SOLIDS & MOISTURE CONTENT REPORT

Sample Number	Sample Description	Total Solids %	Moisture Content %
B508169-01	UST4K-SESW-9	84	16
B508169-02	UST4K-ESW-9.5	83	17

The enclosed analytical results for soils, sediments and sludges have been converted to a DRY WEIGHT reporting basis.
To attain the wet weight "as received" equivalent, multiply the dry weight result by the decimal fraction of percent Total Solids.

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Project Manager

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AGRA Earth & Environmental	Client Project ID:	1029 Market Street	Sampled:	Aug 9, 1995
11335 NE 122nd Way, #100	Sample Matrix:	Soil	Received:	Aug 9, 1995
Kirkland, WA 98034	Analysis Method:	WTPH-G	Analyzed:	Aug 10, 1995
Attention: Bruce Williams	First Sample #:	B508169-01	Reported:	Aug 10, 1995

TOTAL PETROLEUM HYDROCARBONS-GASOLINE RANGE

Sample Number	Sample Description	Sample Result mg/kg (ppm)	Surrogate Recovery %
B508169-01	UST4K-SESW-9	9.5	101
B508169-02	UST4K-ESW-9.5	3.0	94
BLK081095	Method Blank	N.D.	100

Reporting Limits	**1.0**

4-Bromofluorobenzene surrogate recovery control limits are 50 - 150 %.
Volatile Total Petroleum Hydrocarbons are quantitated as Gasoline Range Organics (toluene - dodecane).
Analytes reported as N.D. were not detected above the stated Reporting Limit. The results reported above are on a dry weight basis.

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AGRA Earth & Environmental	Client Project ID: 1029 Market Street	Analyst: B. Christlieb
11335 NE 122nd Way, #100	Sample Matrix: Soil	F. Shino
Kirkland, WA 98034	Analysis Method: WTPH-G	
Attention: Bruce Williams	Units: mg/kg (ppm)	Analyzed: Aug 10, 1995
		Reported: Aug 10, 1995

HYDROCARBON QUALITY CONTROL DATA REPORT

ACCURACY ASSESSMENT
Laboratory Control Sample

Gasoline	
Spike Conc. Added:	5.0
Spike Result:	3.0
% Recovery:	60
Upper Control Limit %:	115
Lower Control Limit %:	33

PRECISION ASSESSMENT
Sample Duplicate

Gasoline Range Hydrocarbons	
Sample Number:	B508169-01
Original Result:	9.5
Duplicate Result:	11
Relative % Difference:	Relative Percent Difference values are not reported at sample concentration levels less than 10 times the Detection Limit.
Maximum RPD:	67

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Project Manager

% Recovery: $\frac{\text{Spike Result}}{\text{Spike Concentration Added}} \times 100$

Relative % Difference: $\frac{\text{Original Result - Duplicate Result}}{(\text{Original Result + Duplicate Result}) / 2} \times 100$

508169.AGR <4>

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9405 S.W. Nimbus Avenue • Beaverton, OR 97008-7132 (503) 643-9200 • FAX 644-2202

AGRA Earth & Environmental	Client Project ID:	1029 Market Street	Sampled:	Aug 9, 1995
11335 NE 122nd Way, #100	Sample Matrix:	Soil	Received:	Aug 9, 1995
Kirkland, WA 98034	Analysis Method:	EPA 8020	Analyzed:	Aug 10, 1995
Attention: Bruce Williams	First Sample #:	B508169-01	Reported:	Aug 10, 1995

BTEX DISTINCTION

Sample Number	Sample Description	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)	Surrogate Recovery %
B508169-01	UST4K-SESW-9	N.D.	N.D.	0.34	0.46	81
B508169-02	UST4K-ESW-9.5	N.D.	N.D.	0.068	N.D.	74
BLK081095	Method Blank	N.D.	N.D.	N.D.	N.D.	81
Reporting Limits:		**0.050**	**0.050**	**0.050**	**0.10**	

4-Bromofluorobenzene surrogate recovery control limits are 34 - 166 %.
Analytes reported as N.D. were not detected above the stated Reporting Limit.
The results reported above are on a dry weight basis.

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Project Manager

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AGRA Earth & Environmental	Client Project ID: 1029 Market Street	Analyst: B. Christlieb
11335 NE 122nd Way, #100	Sample Matrix: Soil	F. Shino
Kirkland, WA 98034	Analysis Method: EPA 8020	
Attention: Bruce Williams	Units: mg/kg (ppm)	Analyzed: Aug 10, 1995
	QC Sample #: B508157-03	Reported: Aug 10, 1995

MATRIX SPIKE QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Sample Result:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	0.64	0.64	0.64	1.91
Spike Result:	0.41	0.44	0.42	1.30
Spike % Recovery:	64%	69%	66%	68%
Spike Dup. Result:	0.43	0.43	0.43	1.32
Spike Duplicate % Recovery:	67%	67%	67%	69%
Upper Control Limit %:	111	118	120	128
Lower Control Limit %:	59	55	61	55
Relative % Difference:	4.8%	2.3%	2.4%	1.5%
Maximum RPD:	17	16	17	17

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Project Manager

% Recovery: $\frac{\text{Spike Result - Sample Result}}{\text{Spike Conc. Added}} \times 100$

Relative % Difference: $\frac{\text{Spike Result - Spike Dup. Result}}{\text{(Spike Result + Spike Dup. Result) / 2}} \times 100$

508169.AGR <6>

AGRA
Earth & Environmental
11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918
Tel (206) 820-4669 Fax (206) 821-3914

01234

CHAIN OF CUSTODY

PROJECT: 1029 Market Street
PROJECT No.: 12-1232-01
CLIENT: AEF
PHONE No.: (509) 482-0104
PROJECT MANAGER: Bruce Williams
PHONE No.: (509) 482-0104
SAMPLER'S NAME (please print): Jeff Kasper
PHONE No.: (206) 820-4669
SAMPLER'S SIGNATURE:

ANALYSIS REQUESTED (circle, check box or write preferred method in box)

SAMPLE I.D.	DATE	TIME	MATRIX	PRESERVATIVE	CONTAINERS No.	CONTAINERS VOL.	BTEX by EPA 602 / 8020	WTPH-G	BTEX / WTPH-G	WTPH-HCID	WTPH-D / WTPH-D EXTENDED	TPH by EPA 8015 MODIFIED	WTPH-418.1 MODIFIED	TPH by EPA 418.1	GC / MS EPA 624 / 8240 or EPA 8260 Volatiles	GC / MS EPA 625 / 8270 Semi-volatiles	VOCs EPA 601 / 8010 or EPA 602 / 8020	PCBs EPA 608 / 8080	LEAD EPA 6010 / EPA 7421 Total / Dissolved	TOTAL METALS	TCLP				
1 UST4L-SESW-9	8/9/95	2:30	S	Chill	1				X													B508169-01			
2 UST4L-ESW-9.5	8/9/95	2:40	S	Chill	1				X																02
3.																									
4.																									
5.																									
6.																									
7.																									
8.																									
9.																									
10.																									

SAMPLE RECEIPT	LABORATORY North Creek	TURNAROUND TIME	SPECIAL INSTRUCTIONS / ADDITIONAL COMMENTS
TOTAL # CONTAINERS	SHIPPING I.D. / AIRBILL #	☐ 8 HOUR	
CONDITION OF CONTAINERS	CARRIER	☒ 24 HOUR	
CONDITION OF SEALS	DOT DESIGNATION	☐ 1 WEEK	
		☐ 2 WEEK (standard)	
		☐ OTHER _____	

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
1. (Jeff Kasper) AEF	8/9/95	4:10	1. NCL	8/9/95	1610
2.			2.		
3.			3.		

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AGRA Earth & Environmental, Inc. (7/94)

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AGRA Earth & Environmental	Project Name:	1029 Market Street	
11335 NE 122nd Way, #100	Client Project :	#12-1232-01	
Kirkland, WA 98034			Received: Aug 11, 1995
Attention: Bruce Williams	NCA Project #:	B508227	Reported: Aug 17, 1995

PROJECT SUMMARY PAGE

Laboratory Sample Number	Sample Description	Sample Matrix	Date Sampled
B508227-01	UST4K-BTSA-11	Soil	8/10/95
B508227-02	UST4K-BTW-11	Soil	8/10/95
B508227-03	UST4K-SSWA-9	Soil	8/11/95
B508227-04	UST4K-SSWB-9	Soil	8/11/95
B508227-05	UST4K-WSWA-9	Soil	8/11/95
B508227-06	UST4K-WSWB-8	Soil	8/11/95
B508227-07	UST4K-NSWA-9	Soil	8/11/95
B508227-08	UST4K-NSWB-9	Soil	8/11/95
B508227-09	UST4K-ESWA-8	Soil	8/11/95
B508227-10	UST4K-BTW-11	Soil	8/11/95

The results in this report apply to the samples analyzed in accordance with the chain of custody document.
This analytical report must be reproduced in its entirety.

NORTH CREEK ANALYTICAL Inc.

Shannon Stowell
Project Manager

508227.AGR <1>

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AGRA Earth & Environmental
11335 NE 122nd Way, #100
Kirkland, WA 98034
Attention: Bruce Williams

Client Project ID: 1029 Market Street
Sample Matrix: Soil
First Sample #: B508227-01

Received: Aug 11, 1995
Reported: Aug 17, 1995

TOTAL SOLIDS & MOISTURE CONTENT REPORT

Sample Number	Sample Description	Total Solids %	Moisture Content %
B508227-01	UST4K-BTSA-11	85	15
B508227-02	UST4K-BTW-11	84	16
B508227-03	UST4K-SSWA-9	80	20
B508227-04	UST4K-SSWB-9	89	11
B508227-05	UST4K-WSWA-9	86	14
B508227-06	UST4K-WSWB-8	86	14
B508227-07	UST4K-NSWA-9	91	9.0
B508227-08	UST4K-NSWB-9	90	10
B508227-09	UST4K-ESWA-8	87	13
B508227-10	UST4K-BTW-11	83	17

The enclosed analytical results for soils, sediments and sludges have been converted to a DRY WEIGHT reporting basis.
To attain the wet weight "as received" equivalent, multiply the dry weight result by the decimal fraction of percent Total Solids.

NORTH CREEK ANALYTICAL Inc.

Shannon Stowell
Project Manager

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AGRA Earth & Environmental	Client Project ID:	1029 Market Street	Sampled: Aug 11, 1995
11335 NE 122nd Way, #100	Sample Matrix:	Soil	Received: Aug 11, 1995
Kirkland, WA 98034	Analysis Method:	WTPH-G	Analyzed: Aug 15-16, 1995
Attention: Bruce Williams	First Sample #:	B508227-01	Reported: Aug 17, 1995

TOTAL PETROLEUM HYDROCARBONS-GASOLINE RANGE

Sample Number	Sample Description	Sample Result mg/kg (ppm)	Surrogate Recovery %
B508227-01	UST4K-BTSA-11 8/10/95	2.4	95
B508227-02	UST4K-BTW-11 8/10/95	4.6	93
B508227-03	UST4K-SSWA-9	2.4	88
B508227-04	UST4K-SSWB-9	4.9	99
B508227-05	UST4K-WSWA-9	22	85
B508227-06	UST4K-WSWB-8	850	S-2
B508227-07	UST4K-NSWA-9	3.7	95
B508227-08	UST4K-NSWB-9	9.0	92
B508227-09	UST4K-ESWA-8	36	86
B508227-10	UST4K-BTE-11	7.9	81
Reporting Limits		**1.0**	

4-Bromofluorobenzene surrogate recovery control limits are 50 - 150 %.
Volatile Total Petroleum Hydrocarbons are quantitated as Gasoline Range Organics (toluene - dodecane).
Analytes reported as N.D. were not detected above the stated Reporting Limit. The results reported above are on a dry weight basis.

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Please Note:
S-2 = The Surrogate Recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present in the sample.

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AGRA Earth & Environmental	Client Project ID:	1029 Market Street		
11335 NE 122nd Way, #100	Sample Matrix:	Method Blank		
Kirkland, WA 98034	Analysis Method:	WTPH-G	Analyzed:	Aug 15, 1995
Attention: Bruce Williams	First Sample #:	BLK081595	Reported:	Aug 17, 1995

TOTAL PETROLEUM HYDROCARBONS-GASOLINE RANGE

Sample Number	Sample Description	Sample Result mg/kg (ppm)	Surrogate Recovery %
BLK081595	Method Blank	N.D.	99

Reporting Limits	1.0

4-Bromofluorobenzene surrogate recovery control limits are 50 - 150 %.
Volatile Total Petroleum Hydrocarbons are quantitated as Gasoline Range Organics (toluene - dodecane).
Analytes reported as N.D. were not detected above the stated Reporting Limit. The results reported above are on a dry weight basis.

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Shannon Stowell
Project Manager

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AGRA Earth & Environmental	Client Project ID:	1029 Market Street	Sampled: Aug 11, 1995
11335 NE 122nd Way, #100	Sample Matrix:	Soil	Received: Aug 11, 1995
Kirkland, WA 98034	Analysis Method:	EPA 8020	Analyzed: Aug 15-16, 1995
Attention: Bruce Williams	First Sample #:	B508227-01	Reported: Aug 17, 1995

BTEX DISTINCTION

Sample Number	Sample Description	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)	Surrogate Recovery %
B508227-01	UST4K-BTSA-11 8/10/95	0.16	0.052	0.23	0.38	94
B508227-02	UST4K-BTW-11 8/10/95	N.D.	N.D.	0.11	0.20	94
B508227-03	UST4K-SSWA-9	N.D.	N.D.	0.051	N.D.	90
B508227-04	UST4K-SSWB-9	N.D.	N.D.	0.096	0.23	98
B508227-05	UST4K-WSWA-9	N.D.	N.D.	0.21	0.52	84
B508227-06	UST4K-WSWB-8	0.62	N.D. (R.L. = 0.080)	3.4	5.8	116
B508227-07	UST4K-NSWA-9	N.D.	N.D.	0.11	N.D.	94
B508227-08	UST4K-NSWB-9	N.D.	N.D.	0.10	N.D.	95
B508227-09	UST4K-ESWA-8	N.D. (R.L. = 0.080)	N.D. (R.L. = 0.080)	0.39	0.56	82
B508227-10	UST4K-BTE-11	0.086	N.D.	N.D.	N.D.	83
Reporting Limits:		**0.050**	**0.050**	**0.050**	**0.10**	

4-Bromofluorobenzene surrogate recovery control limits are 34 - 166 %.
Analytes reported as N.D. were not detected above the stated Reporting Limit.
The results reported above are on a dry weight basis.

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Shannon Stowell
Project Manager

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AGRA Earth & Environmental	Client Project ID: 1029 Market Street	Analyst: B. Christlieb
11335 NE 122nd Way, #100	Sample Matrix: Soil	F. Shino
Kirkland, WA 98034	Analysis Method: WTPH-G	
Attention: Bruce Williams	Units: mg/kg (ppm)	Analyzed: Aug 15, 1995
		Reported: Aug 17, 1995

HYDROCARBON QUALITY CONTROL DATA REPORT

ACCURACY ASSESSMENT
Laboratory Control Sample

Gasoline

Spike Conc. Added:	5.0
Spike Result:	3.3
% Recovery:	66
Upper Control Limit %:	115
Lower Control Limit %:	33

PRECISION ASSESSMENT
Sample Duplicate

Gasoline Range Hydrocarbons

Sample Number:	B508227-10
Original Result:	7.9
Duplicate Result:	10
Relative % Difference:	Relative Percent Difference values are not reported at sample concentration levels less than 10 times the Detection Limit.
Maximum RPD:	67

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Project Manager

% Recovery: $\frac{\text{Spike Result}}{\text{Spike Concentration Added}} \times 100$

Relative % Difference: $\frac{\text{Original Result - Duplicate Result}}{(\text{Original Result + Duplicate Result}) / 2} \times 100$

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