UST # 7972

Applied Geotechnology Inc.

A Work Plan prepared for:

Mr. Roger Jensen
Wilkins Distributing Company
Post Office Box 147
Port Orchard, Washington 98366

WORK PLAN
VAPOR EXTRACTION SYSTEM
NEWMAN TEXACO
2021 6TH STREET
BREMERTON, WASHINGTON

AGI Project No. 15,526.001

AGI
PROJECT
REPORT

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DEPT. OF ECOLOGY

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October 17, 1990

1.0 INTRODUCTION

This Work Plan describes actions to be performed by Applied Geotechnology Inc. (AGI) on behalf of Wilkins Distributing Company to remediate soil contaminated with petroleum hydrocarbons at Newman Texaco service station, located at 2021 6th Street in Bremerton, Washington. Remediation will consist of installation and operation of a vapor extraction system (VES) to reduce hydrocarbon contamination in the soil. Contaminated soil removed from the tank cavity was disposed at Kitsap County Landfill.

Underground storage tanks (UST) were removed in August 1990. The tank and soil removal activities are summarized in Section 1.0 of this report. Recommendations for remediation, including installation of subsurface VES piping, were described in a letter from AGI to Wilkins Distributing dated August 27, 1990.

1.1 Description of Facility

The Newman Texaco service station is situated southeast of the intersection of 6th and Naval Streets. The site is bounded on the west by Naval Street, on the north by 6th Street, and by commercial businesses and residences to the east and south. The lot is generally level, but surrounding topography slopes gently down to the west and south. There is a 3- to 4-foot-high retaining wall along the southern property line with a 10- to 12-foot drop on the other side. A Site Plan is presented in Figure 1.

Six USTs have been removed from two cavities in the northeast corner of the site. The waste oil tank was in one cavity, and the other five tanks were in another large cavity. Four 4,000-gallon tanks were oriented with their long axes north to south. The 550-gallon waste oil tank and 6,000-gallon gasoline tank were oriented with their long axes east to west. The five large tanks previously contained gasoline. Two service islands were located north of the building and west of the tanks. Two test pits were excavated southeast of the tank cavity to delineate lateral extent of contamination.

1.2 Site Background

1.2.1 Geology

Beneath the asphalt subgrade, native soil was medium dense sandy silt to the greatest depth penetrated. A layer of medium dense sand at 10 to 12 feet below ground surface (bgs) was observed along the north, west and south walls of the excavation. This seam was not observed in two test pits excavated to 13 feet bgs at the southeast corner of the main tank cavity. Sandy silt was present again beneath the sand seam, and extended to 14 feet bgs, the greatest depth excavated.

Tank backfill consisted of sandy gravel. Most of the backfill was removed from the site during tank removal.

1.2.2 Hydrogeology

No groundwater was encountered, nor were any groundwater seeps observed during excavation of the USTs. Groundwater likely occurs in a thick sand unit (Glacial Advance Outwash), at a depth of 70 to 75 feet below ground surface.

1.3 Assessment Activity

AGI was present during tank removal operations on August 7 to 9, 1990. All six tanks were constructed of steel. Five of the tanks (one 6,000-gallon and four 4,000-gallon tanks) were apparently sandblasted and lined in 1988. Field evidence (presence of fine black sand around fill pipes) confirmed the sandblasting. The lined tanks were in good condition with little exterior corrosion. A slight dent was made in the 6,000-gallon tank during removal operations. No holes were visible in any of the lined tanks. A large dent, running along the long axes on the south side of the 550-gallon waste oil tank, was observed prior to removal. Several holes (1/4 inch to 1 inch in diameter) and a leaking seam were observed in the sides of the waste oil tank.

Pacific Environmental Services (Pacific) reported the presence of a leak in tank piping in the southeast corner of the main tank cavity, and AGI personnel observed gasoline being drained from an electrical conduit running across the middle of the main tank cavity. Gasoline and approximately 7 gallons of oil, possibly diesel fuel, were drained from product lines running across the northwest corner of the main cavity. Diesel fuel has not been sold at the site in the 26 years Wilkins Distributing has been associated with it.

An organic vapor meter equipped with a photoionization detector (OVM), along with visual observations, were used to check for hydrocarbon contamination during tank removal and subsequent soil excavation. Soil screening tests were performed by placing a fixed amount of soil into a resealable plastic bag, agitating it, allowing it to equilibrate with air in the bag, then placing the OVM probe into the headspace above the sample. The peak OVM reading provides a relative measure of the soil's volatile organic compound content.

Headspace readings provided the basis to select soil samples for laboratory analysis from each of the sides and base of the tank cavities. Selected soil samples were submitted to Sound Analytical Services (Sound) in Tacoma, Washington for chemical analysis of total petroleum hydrocarbons (TPH) using Modified EPA Method 8015, organochlorine pesticides and PCBs by EPA Method 8080, halogenated volatiles by EPA Method 8010, and metals by EPA Method 6010.

1.4 Analytical Results and Conclusions

Modified EPA Method 8015 provides both a concentration value and a description of the predominant petroleum product based upon the detected carbon range. The analytical results for soil samples collected from the main tank cavity and the base of the waste oil tank cavity are presented in Table 1. Reports of the analytical testing results from the laboratory are attached.

TABLE 1
Soil Analytical Results

Sample ID	Sample Locations	Sample Depth (ft)	TPH (ppm)	Product
A	South 1/2 of pit, east wall	10.5	10,230	Gas
B	South 1/2 of pit, south wall	10.5	4,875	Gas
C	South 1/2 of pit, west wall	10.0	245	Aged Gas
N	North 1/2 of pit, north wall	10 - 11.0	346	Gas
W	North 1/2 of pit, west wall	10 - 11.0	1,550	Aged Gas, Mineral Spirits, Diesel
E	North 1/2 of pit, east wall	10 - 11.0	<10	
1	Under Tank No. 4, north 1/2 of pit	13.5	<10	
2	Under Tank No. 2, north 1/2 of pit	13.5	57	Gas
3	Under Tank No. 5, north 1/2 of pit	14.0	<10	
5	Base of Waste Oil Pit	10.0	<10	
6	Composite of Walls of Waste Oil Pit	7 to 7.5	40.4	
Pit 1	Test Pit No. 1 (south)	13.8	634	Gas
Pit 2	Test Pit No. 2 (east)	13.0	4	Gas
Ecology Cleanup Guideline			200	Waste Oil and Diesel
			100	Gas

Testing results indicate hydrocarbon levels in subsurface soil exceed Washington State Department of Ecology (Ecology) cleanup guidelines along the west and north walls, and in the southeast corner of the main tank cavity. This soil contamination likely originated from overfill spillage and/or small tank or line leaks over an extended period of time.

All the analyses presented in Table 1 are representative of soil remaining in-place. This Work Plan outlines procedures to remediate the remaining contamination around the gasoline tank cavity.

A single composite soil sample of the four sides of the waste oil tank cavity was analyzed for pesticides, PCBs, and halogenated volatiles and heavy metals; copies of the analytical laboratory reports are attached. Analytical results indicate no detectable PCBs or halogenated volatiles, but show the presence of chromium, copper, lead, and pesticides. The metals and pesticides detected were below their respective cleanup guidelines or accepted tolerance levels as shown in Table 2 below, and, in our opinion, do not pose a risk to human health or the environment. We believe no further action is necessary with regard to the soil around the waste oil tank cavity.

TABLE 2
Metals and Pesticides in Soil

Contaminant	Concentration (ppm)	Cleanup Guideline (ppm)
Total Chromium	16.3	100
Total Copper	25.1	500
Total Lead	69.8	250
Aldrin	0.03	0.1 (tolerance level)
g-BHC (isomer of Lindane)	0.15	1.0
4,4'-DDD	1.16	Insecticidally inert
4,4'-DDE	0.37	Insecticidally inert
4,4'-DDT	0.06	1.0
Endosulfan I	0.13	2.0 (tolerance level)

Notes: Tolerance levels were taken from Pesticide Manufacturing and Toxic Materials Control Encyclopedia, edited by Marshall Sittig, Noyes Data Corporation, Park Ridge, New Jersey, 1989, 810 pp.

Cleanup guidelines derived from interim draft Method A Cleanup Levels for Soil, Washington Department of Ecology.

1.5 Recommendations

Hydrocarbon contamination levels in the vicinity of the tank cavity are above Ecology action guidelines. We believe the most cost effective way to remediate this remaining contamination is by installation of a VES. Sections 2 and 3 of this Work Plan describe installation, operation, and demobilization of the proposed VES.

Because contamination was above Ecology guidelines at the greatest depth penetrated in the test pits, AGI recommends drilling a well in the vicinity of test pit TP1, as discussed between you and AGI in a telephone conversation on September 14, 1990. This well would evaluate the maximum depth of contamination, and would be available if remediation at greater depths than the tank cavity were necessary.

2.0 VAPOR EXTRACTION SYSTEM (VES)

Subsurface remediation will consist of vapor extraction to volatilize and remove hydrocarbons from contaminated soil surrounding the main tank cavity.

2.1 Vapor Extraction Process

The VES uses in-situ volatilization of hydrocarbons to decontaminate soil in-place. The process consists of applying a vacuum to a well, series of wells, or perforated pipes in the zone of contamination to induce air flow through the subsurface soil.

As air passes through the contaminated soil, the clean air displaces soil gas laden with volatilized hydrocarbons and the volatile vapors are extracted through the central well. The clean air drawn into the contaminated soil volatilizes more hydrocarbons present within the soil and these vapors are, in turn, removed. Exhaust vapor is discharged to the atmosphere in compliance with governmental requirements. In addition to vapor removal, the introduction of air into the contaminated soil will enhance the biodegradation of hydrocarbons by increasing the amount of oxygen available for bacterial degradation.

2.2 VES Design

A schematic of the VES is presented in Figure 2. AGI will apply to the Puget Sound Air Pollution Control Agency (PSAPCA) for a permit to allow discharge of air emissions from the VES to the atmosphere. The application will be submitted upon authorization from Wilkins Distributing. Processing by PSAPCA normally requires four to six weeks. Construction normally requires four weeks lead time for equipment and two days on-site installation.

The VES contains the following four basic components:

1. Underground vapor extraction piping consists of 4-inch-diameter vapor extraction well piping leading to the equipment area. The subsurface piping has been installed at this site. The extraction piping is slotted in the area of contamination and hard piped to the equipment. Installation of piping is shown on the Piping Diagram, Figure 3.

2. The blower assembly will consist of a blower fan with explosion-proof motor, explosion-proof circuit breaker and starter box. The system will generate a vacuum of up to 6 inches of water at VES intake.

3. Emissions control will be maintained by dilution with fresh air if necessary. An air vent installed upstream from the blower provides this capability. The airstream will be discharged to the atmosphere through a 20-foot-high, 6-inch-diameter PVC vent pipe.

4. Piping manifolds and valves connecting the extraction piping, blower, and emissions control system allow control of hydrocarbon vapor concentration exiting the VES.

2.3 VES Operation and Monitoring

When the VES is placed in operation, maintenance requirements will be minimal. Monitoring will constitute the primary activity, with frequent measurements at startup. Once the system has stabilized, frequency of monitoring will quickly diminish. Vapor concentrations and air flow volume will be measure several times per day for the first two days, decreasing to twice weekly for the balance of the first two weeks, then weekly to the end of the first month. Thereafter, measurements will be taken only biweekly to monthly. The system will probably remain in operation for six months to a year.

Monitoring will consist of calculating the volume of air passing through the system and measuring the concentration of volatile hydrocarbons exiting from the system. During the first two days of operation, volatile gas concentrations will also be monitored at ground surface to detect and control any accumulation of vapors.

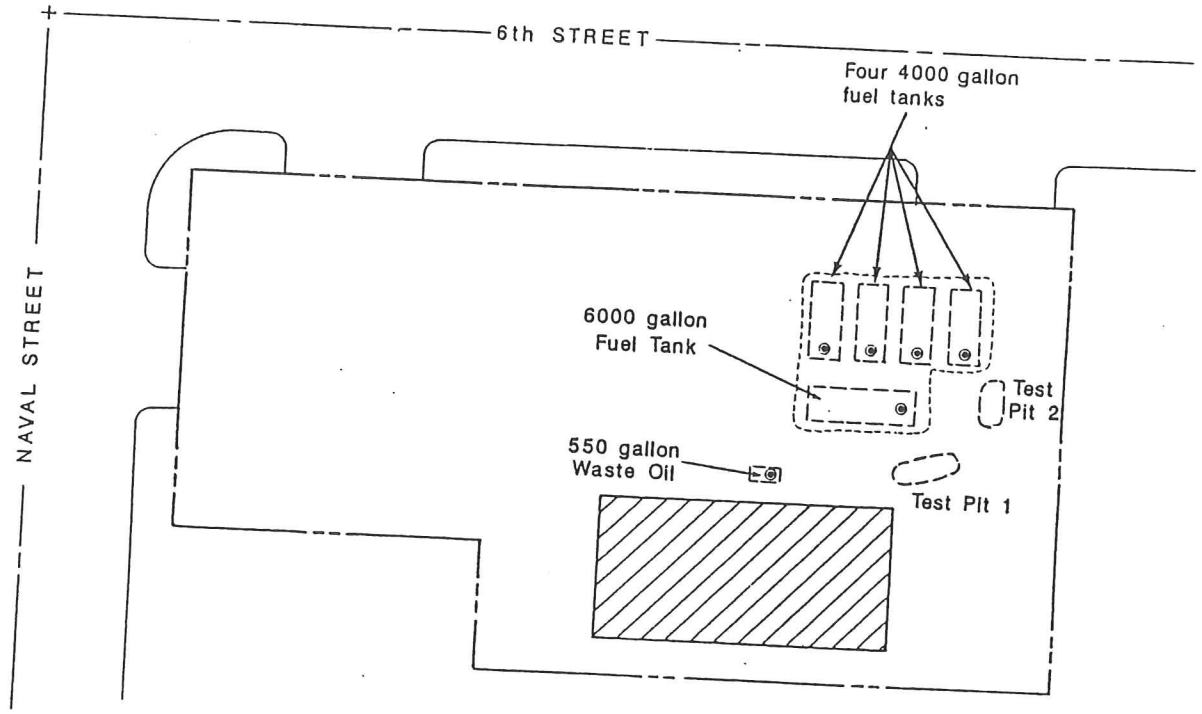
One monitoring point is located on the vacuum side of the blower and the other on the vent stack. The vacuum side monitor point will allow measuring the vacuum in inches of water (inches H_2O) developed by the extraction system.

The downstream monitoring point is located on the vent stack. At this location, discharge velocity (flow rate), temperature, pressure, and vapor concentration are measured. The exhaust contains air and aromatic hydrocarbons, and the vapor concentration is used to estimate the total mass of hydrocarbon removed from the soil. The permissible hydrocarbon concentration allowed at this point will be indicated by the permitting agency (PSAPCA).

3.0 SITE RESTORATION

Vapor concentration will diminish with time. The criteria for turning off the system will be when vapor concentrations are below the limit of detection.

Upon termination of vapor extraction, the blower and stack will be disassembled and removed from the site. AGI will prepare a final report summarizing the remediation.



LEGEND

- Property Boundary
- Building
- Underground Storage Tank
- Limits of excavation

N

0 40 80

Scale in Feet

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Geotechnical Engineering
Geology & Hydrogeology

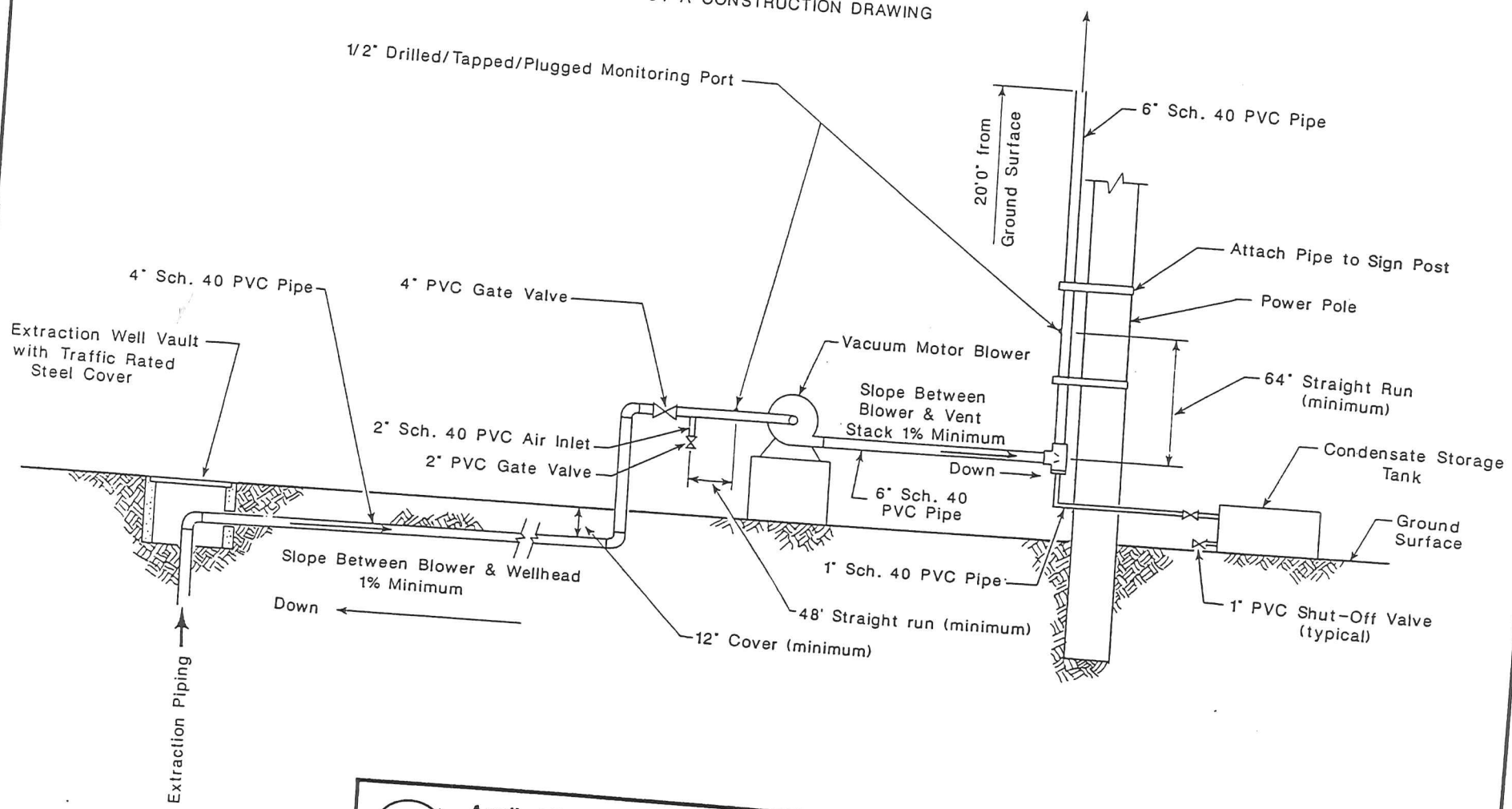
Site Plan

Wilkins Distributing/Newman Texaco
Bremerton, Washington

FIGURE 1

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15,526.001	DFF	CHS	19 Sep. 90		

SCHEMATIC ONLY–NOT TO SCALE
NOT A CONSTRUCTION DRAWING



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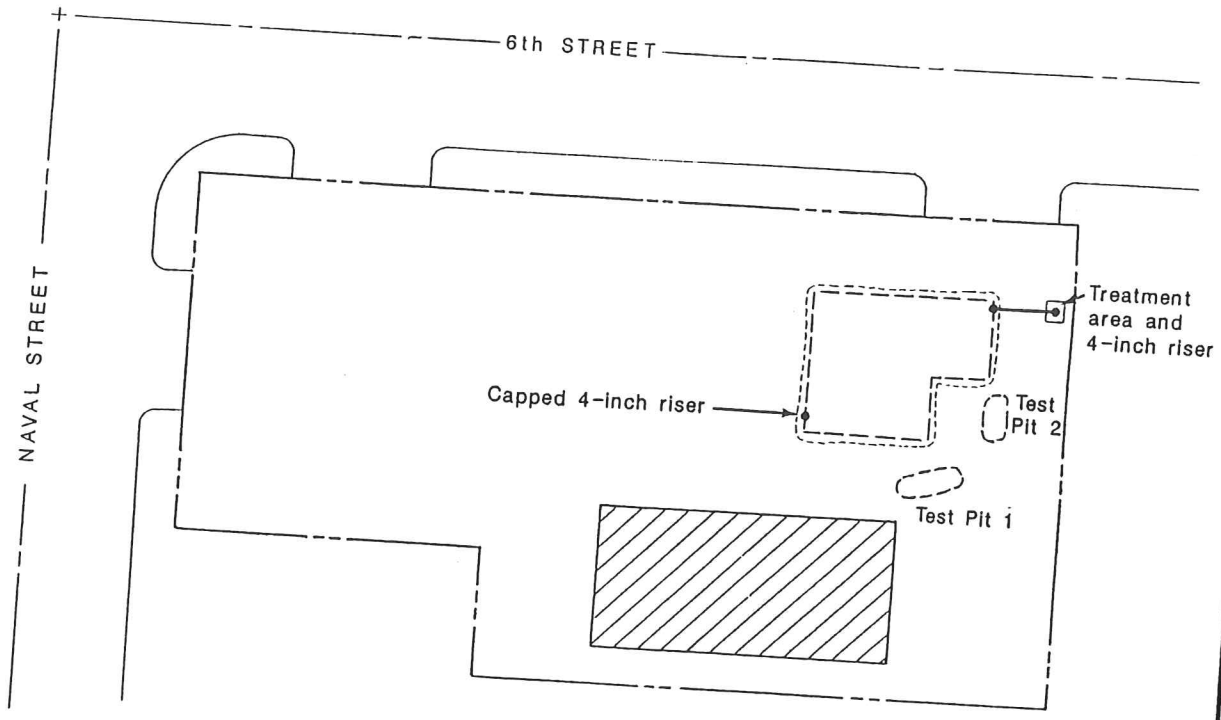
Vapor Extraction System Schematic Design

Wilkins Distributing/Newman Texaco
Bremerton, Washington

FIGURE **2**

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15,526.001	DFF	CHS	19 Sep. 90		



LEGEND

- Property Boundary
- Building
- 4-inch PVC extraction piping, .050 slots, bedded in pea gravel
- Limits of excavation
- Solid 4-inch PVC piping

N

0 40 80

Scale in Feet

Applied Geotechnology Inc.
Geotechnical Engineering
Geology & Hydrogeology

Piping Diagram

Wilkins Distributing/Newman Texaco
Bremerton, Washington

FIGURE 3

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15,526.001	DFF	CHS	19 Sep. 90		

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS
4630 PACIFIC HIGHWAY EAST, SUITE B-14, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922- 5047

Report To: Applied Geotechnology Date: August 10, 1990

Report On: Analysis of Soil Lab No.: 12688

IDENTIFICATION:
Samples Received on 08-09-90
Project: 15518.001 Pac. Environ. Ser/Newman Texaco

ANALYSIS:

Lab Sample No.	RUSH 1	RUSH 2	RUSH 3
Client Identification	#1	#2	#3
Matrix/Units	Soil ppm	Soil ppm	Soil ppm
Total Petroleum Fuel Hydrocarbons by EPA SW-846 Modified Method 8015 TPH as	< 10	57 Gasoline	< 10

SOUND ANALYTICAL SERVICES

C. LARRY ZURAW

SOUND ANALYTICAL SERVICES, INC.

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QUALITY CONTROL REPORT

DUPLICATES

Lab No: 12688
Date: August 10, 1990
Client: Applied Geotechnology

Client ID: #3
Matrix: Soil
Units: ppm

Compound	Sample(S)	Duplicate(D)	RPD*	
Total Petroleum Fuel Hydrocarbons	< 10	< 10	---	

*RPD = relative percent difference
= [(S - D) / ((S + D) / 2)] x 100

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Report To: Applied Geotechnology

Report On: Analysis of Soil

Date: August 14, 1990

Lab No.: 12719

IDENTIFICATION:

Samples Received on 08-10-90

Project: 15578.001 Pacific Environ. Serv./Newman Texaco

ANALYSIS:

Lab Sample No.	Client ID	Total Petroleum Fuel Hydrocarbons, ppm*
1	A	10,230 as Gas
2	B	4,875 as Gas
3	C	245 as Aged Gas
4	5	< 10

*TPH by EPA SW-846 Modified Method 8015

Continued . . . .

SOUND ANALYTICAL SERVICES, INC.

Applied Geotechnology
Project: 15578.001

Lab No. 12719
August 14, 1990

Lab Sample No. 5

Client ID: #6

Halogenated Volatiles Per EPA SW-846 Method 8010.

Contaminant	Concentration (mg/kg) (ppm)
Methylene chloride	< 0.05
1,1-dichloroethylene	< 0.05
1,1-dichloroethane	< 0.05
1,2-transdichloroethylene	< 0.05
1,2-dichloroethane	< 0.05
1,1,1-trichloroethane	< 0.05
Carbon Tetrachloride	< 0.05
1,2-dichloropropane	< 0.05
Trans-1,3-dichloropropene	< 0.05
Trichloroethylene	< 0.05
Cis-1,3-dichloropropene	< 0.05
1,1,2-trichloroethane	< 0.05
Tetrachloroethylene	< 0.05
1,1,2,2-tetrachloroethane	< 0.05
Chlorobenzene	< 0.05
1,2 Dichlorobenzene	< 0.05
1,3 Dichlorobenzene	< 0.05
1,4 Dichlorobenzene	< 0.05

Total Petroleum Hydrocarbons, ppm by EPA Method 418.1	40.4
Total Chromium, ppm	16.3
Total Copper, ppm	25.1
Total Lead, ppm	69.8

Continued. . . . .

SOUND ANALYTICAL SERVICES, INC.

Applied Geotechnology
Project: 15578.001

Lab No. 12719
August 14, 1990

Lab Sample No. 5

Client ID: #6

ORGANOCHLORINE PESTICIDES AND PCB - Method 8080

Compound	Conc., mg/kg	Detection Limit
Aldrin	0.03	
a-BHC	ND	0.01
b-BHC	ND	0.01
g-BHC	0.15	0.01
Y-BHC (Lindane)	ND	0.01
Chlordane (technical)	ND	0.01
4,4'-DDD	1.16	0.1
4,4'-DDE	0.37	0.01
4,4'-DDT	0.06	0.01
Dieldrin	ND	0.01
Endosulfan I	0.13	0.01
Endosulfan II	ND	0.01
Endosulfan sulfate	ND	0.01
Endrin	ND	0.01
Endrin aldehyde	ND	0.01
Heptachlor	ND	0.01
Heptachlor epoxide	ND	0.01
Methoxychlor	ND	0.01
Toxaphene	ND	0.02
PCB - Type	ND	0.1
PCB	ND	0.1

ND = Not Detectable.

PESTICIDE SURROGATE RECOVERY	
2,4,5,6-Tetrachloro-m-xylene	101
Decachlorobiphenyl	103

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4630 PACIFIC HIGHWAY EAST, SUITE B-14, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922- 5047

Report To: Applied Geotechnology Date: August 20, 1990

Report On: Analysis of Soil Lab No.: 12754

IDENTIFICATION:
Samples Received on 08-13-90
Project: 15,518.001 PAL Env/Newman Texaco

ANALYSIS:

Lab Sample No.	Client ID	*Total Petroleum Fuel Hydrocarbons, ppm
1	N	346 as Gasoline
2	W	1,550 as Aged Gas, Mineral Spirits, & Diesel
3	E	< 10

*TPH by EPA SW-846 Modified Method 8015

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QUALITY CONTROL REPORT

DUPLICATES

Lab No: 12754
Date: August 20, 1990
Client: Applied Geotechnology

Client ID: N
Matrix: Soil
Units: ppm

Compound	Sample(S)	Duplicate(D)	RPD*	
Total Petroleum Fuel Hydrocarbons	346	287	18.6	

*RPD = relative percent difference
= [(S - D) / ((S + D) / 2)] x 100

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4630 PACIFIC HIGHWAY EAST, SUITE B-14, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Applied Geotechnology Date: August 30, 1990

Report On: Analysis of Soil Lab No.: 13069

IDENTIFICATION:
Samples Received on 08-29-90
Project: 15518.001 PES/Newman Texaco

ANALYSIS:

Lab Sample No.	Client ID	Total Petroleum Fuel Hydrocarbons, ppm
RUSH 1	Pit-1-13.8	634 as, Gas
RUSH 2	Pit-2-13.0	41 as, Gas

*TPH by EPA SW-846 Modified Method 8015

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4630 PACIFIC HIGHWAY EAST, SUITE B-14, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922- 5047

QUALITY CONTROL REPORT

DUPLICATES

Lab No: 13069
Date: August 30, 1990
Client: Applied Geotechnology

Client ID: Pit-2-13.0
Matrix: Soil
Units: ppm

Compound	Sample(S)	Duplicate(D)	RPD*	
Total Petroleum Fuel Hydrocarbons	41	41	----	

*RPD = relative percent difference
= [(S - D) / ((S + D) / 2)] x 100

DISTRIBUTION

3 Copies

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Port Orchard, Washington 98366

Quality Assurance/Technical Review by:

Gary L. Laakso
Remediation Services Manager

CHS/JEN/cgl