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FARALLON CONSULTING
Quality Service for Environmental Solutions

July 19, 2000

Mr. Brian Sato P.E.
Northwest Regional Office
Washington State Department of Ecology
3190 160th Avenue SE
Bellevue, WA 98008-5452

RE: PILOT TEST SUMMARY REPORT
QUEEN ANN TEXACO
SEATTLE, WASHINGTON
FARALLON PN: 619-010

Dear Mr. Sato:

Farallon Consulting, L.L.C. (Farallon) has prepared this Pilot Test Summary report on behalf of Texaco to provide the results of the pilot test conducted at the above referenced site (Figure 1) on the existing soil vapor extraction (SVE) system that was installed by the Washington State Department of Ecology (Ecology). The purpose of the pilot test was to initiate remediation at the site after a long period of inactivity and to collect sufficient data to evaluate the technical feasibility of the existing SVE system for site cleanup.

Farallon conducted a 48-hour trial of the existing SVE system in mid-February 2000 to evaluate if treatment of the vapor emissions would be necessary to meet the permit requirements of the Puget Sound Clean Air Agency's (PSCAA) Order of Approval for the system. The results of the 48-hour trial indicated that the concentrations of total petroleum hydrocarbons as gasoline and benzene in the emissions would not require treatment to meet the discharge limits for the three-month pilot test.

Based on the results of the 48-hour trial and the configuration of the existing SVE system, Farallon prepared a Monitoring Plan and an Optimization Plan (Appendix A) and reactivated the soil vapor extraction system for a three-month continuous pilot test in mid March 2000. This report summarizes the results of the three-month pilot test.

PILOT TEST RESULTS

Prior to reactivating the existing SVE system at the site for the three-month pilot test, Farallon conducted a 48-hour trial to determine how the soil vapor extraction portion of the system was functioning, determine if any repairs were needed, measure vacuum and pumping rates, conduct initial air monitoring, and clean up the compound. The groundwater pump and treat portion of the system was not engaged during the trial, nor was it engaged during the three-month pilot test.

PSCAA Notification

Prior to reactivating the existing SVE system, Farallon contacted Mr. Jay Willenberg and Mr. Kwame Agyei of PSCAA to discuss the preliminary requirements for the 48-hour trial. Mr. Willenberg stated that the Order of Approval previously issued for the SVE system was still in effect and that the SVE system could be reactivated under that existing Order of Approval. The condition of the catalytic oxidizer was unknown prior the reactivation; therefore, Farallon sought approval by PSCAA to reactivate the system without treatment. Mr. Willenberg stated that the SVE system could be reactivated for 48 hours without treatment of the emissions. In Mr. Willenberg's absence, communications were continued with Mr. Agyei and Farallon submitted a letter to Mr. Agyei dated February 1, 2000 confirming the 48-hour trial of the on-site SVE system, as requested by PSCAA. A copy of the letter submitted to PSCAA is included in Appendix B.

After completion of the 48-hour trial and review of the monitoring results, Farallon submitted a letter to PSCAA dated March 6, 2000 (Appendix B) confirming that the three-month pilot test would involve continuous operation of the SVE system. Farallon estimated the total pounds per year of total petroleum hydrocarbons as gasoline and benzene that would be discharged from full time operation of the existing SVE system. The results of the discharge calculation estimates confirmed that treatment of the emissions would not be necessary to meet the requirements of the PSCAA Order of Approval for full time operation. A copy of the letter submitted to PSCAA and the calculations are included in Appendix B of this report.

48-Hour Trial

Farallon reactivated the SVE system on February 16, 2000 at approximately 12:45 pm. Farallon notified the tenants along the east facing side of the Del Roy Apartment building that the SVE system would be reactivated and recommended that they keep their windows closed during the 48-hour trial to avoid potential noxious odors. Farallon adjusted the ball valve to reduce the overall system vacuum in order to reduce the discharge concentration. Farallon cut back vegetation, swept out the compound, and removed dislodged insulation to eliminate potential fire hazard while the SVE system was operating.

During the 48-hour trial, Farallon conducted soil vapor monitoring at each of the vapor extraction ports, VP-1 through VP-9 (vapor wells) and H1 through H4 (horizontal vapor extraction lines beneath the Manhattan Express parking lot). Gastech colorimetric tubes were used to measure gasoline (Gastech #101L) and benzene (Gastech #121SL) concentrations at each of the vapor extraction ports and at the blower manifold discharge port before the vapor entered the catalytic oxidizer. The results of the soil vapor monitoring are presented in Table 1. The soil vapor was monitored once during the 48-hour trial.

Prior to reactivation, the intake valve was adjusted from the automatic operation setting (closed) to open and the blower intake valve was adjusted from the automatic operation setting (open) to closed. After these adjustments were made to allow manual operation, the SVE system was reactivated. It was a windy day and a strong petroleum odor was noted a few minutes after reactivation.

The SVE system was in operation for approximately three hours allowing the system to warm-up before the emissions were monitored. The vacuum from the individual wells measured 14 inches water gage (W.G.). The Stealth remediation system electronic readout indicated that the catalytic oxidizer was operating within the parameters of PSCAA's Order of Approval for the remediation system. The monitoring results are summarized on Table 1.

On February 17th, Farallon monitored the discharge and recorded readings from the individual vapor extraction ports with an organic vapor meter (OVM). The OVM readings at the blower discharge were 56 ppm at 9:30 am and 48 ppm at 10:35. After the first few initial OVM readings collected from the individual vapor extraction ports, the OVM meter's accuracy was tested and found to be impaired. Therefore, the measurements collected from the individual vapor extraction ports using the OVM have not been included in this report.

On the morning of February 18th, Farallon measured the gasoline vapor concentrations in each of the vapor extraction ports with Gastech colorimetric tubes and hand pump as summarized on Table 1. Farallon reduced the vacuum of the wells with gasoline concentrations below 60 ppm (lines 2, 3, 5, 6, 7, and H3) to one-inch of water column to increase the vacuum on the wells with higher gasoline concentrations. The increased vacuum on the remaining wells caused an inflow of groundwater into the system. Farallon adjusted the ball valve to reduce the overall vacuum of the system in order to preclude the water from entering the system. The gasoline and benzene concentrations at the blower discharge were measured with Gastech colorimetric tubes and hand pump. The gasoline concentration was 110 ppm and the benzene concentration was 1 ppm. The system was shutdown at 1:00 pm. After the system was shutdown, Farallon installed a sample port in the header to provide a location for a total vacuum measurement.

48-hour Trial Results

Farallon determined that the catalytic oxidizer was functioning within the PSCAA Order of Approval parameters. The benzene concentration at the blower discharge, collected prior to entering the catalytic oxidizer, was measured at 1 ppm at the end of the 48-hour trial. The benzene concentration is within PSCAA's policy limits as defined in PSCAA's *Permitting Policy for Soil & Groundwater Remediation* and therefore did not require treatment prior to discharge. The gasoline concentrations at the blower discharge collected prior to entering the catalytic oxidizer, also indicated that the SVE system could be operated without the catalytic oxidizer and would not exceed the total hydrocarbon emissions of 1,000 pounds over the project lifetime as established in PSCAA's policy limits. Based on Farallon's observations during the 48-hour trial, it appeared that the SVE system was in adequate condition to be operated for the three-month pilot test.

Three-Month Pilot Test

The Operating Plan for the three-month pilot test consists of a Maintenance Plan, Monitoring Plan, and Optimization Plan and is provided as Appendix A. The Operating Plan is designed to evaluate the technical feasibility of using the current SVE system for long-term cleanup of the site.

SVE System Equipment Evaluation

On March 13, 2000, Farallon reactivated the SVE system for the three-month pilot test. Farallon adjusted the individual vapor extraction ports to apply the maximum vacuum on each individual vapor extraction well. Farallon also measured the initial blower manifold discharge port for gasoline and benzene concentrations utilizing a Gastec pump and colorimetric tubes.

Farallon monitored the SVE system approximately one week after reactivation and on an approximate monthly schedule thereafter. Farallon measured the gasoline and benzene concentrations from the blower manifold discharge port and individual vapor extraction ports VP-1 through VP-9 and H-1 through H-4

using the Gastec colormetric tools. The gasoline and benzene concentration results are presented in Table 1. After each field-screening event, Farallon readjusted individual vapor extraction ports that indicated an increase or decrease in gasoline concentrations to apply the maximum vacuum on the wells that contained the highest concentrations of gasoline. Farallon noted that vapor extraction wells VP-1, VP-2, VP-4, and VP-8 contained the highest concentrations of gasoline throughout the pilot test. The remaining vapor extraction ports were adjusted accordingly to apply the maximum vacuum on vapor extraction wells VP-1, VP-2, VP-4, and VP-8.

Farallon's operation and maintenance program during the pilot test consisted of visual observations of the vapor extraction system, measuring vacuum and flow of the overall system and at the individual vapor extraction ports, bailing LNAPL or placement of absorbent socks in wells containing LNAPL, and general mechanical maintenance. Farallon conducted the following maintenance during the three-month pilot test:

- Changed the oil in the blower and lubricated drive end bearings within the blower housing,
- Observed the air filter on the dilution air inlet,
- Checked the belt tension on blower motor,
- Checked the system connections in the Stealth system panel,
- Checked the water float switch and heating element connections, and
- Replaced chart paper in the panel.

The catalytic oxidizer was operating within the PSCAA Order of Approval parameters during the pilot test. The system shut down on March 29 and April 2, 2000. Based on Farallon's communications with Stealth Industries, it appears that the system may have shut down due to power outages. Farallon restarted the system each time within 48-hours of the shut down. Farallon made several visits to the site during this time period to ensure that the system continued to operate.

Soil Vapor Monitoring Results

The initial gasoline vapor concentrations collected on February 18, 2000 when the system was reactivated for the 48-hour trial, were the highest concentrations measured during the operation of the soil vapor extraction system. Gasoline vapor concentrations were significantly reduced at the time of the March 21, 2000 soil vapor monitoring event, which was one week after reactivation for the three-month pilot test. Benzene measurements of the soil vapor were only conducted at the two ports that previously had the highest gasoline measurements in the soil vapor (VP-8 and VP-1) on March 21, 2000. Benzene concentrations remained low throughout the three-month period. Only four of the vapor extraction wells (VP-1, VP-2, VP-4, and VP-8) had gasoline vapor concentrations above 4 parts per million (ppm) on March 21, 2000. Therefore, Farallon increased the vacuum at the four vapor extraction wells with the highest gasoline vapor concentrations and reduced the vacuum on the remaining vapor extraction wells and horizontal lines.

A reduction in gasoline vapor concentrations was noted in VP-1 and VP-2 with initial measurements of 60 and 20 ppm on March 21, 2000 and final measurements of 30 and 5 ppm on June 12, 2000, respectively. Gasoline vapor concentrations in VP-4 and VP-8 fluctuated and showed no trend of overall reduction from March 21, 2000. The system was operating at approximately 220 CFM during the pilot test. Based on the measured concentrations of gasoline and benzene in the emissions, the volume of emissions, and the duration of active vapor extraction, Farallon has estimated that 200 pounds of gasoline and 2.2 pounds of benzene were recovered during the three-month pilot test. The calculations for the volume of emissions are shown on Table 2.

CONCLUSIONS

The SVE system is operational and can perform as designed. No additional repair or upgrades are necessary.

An overall decrease in gasoline vapor concentrations was observed in the soil vapor measurements collected from most of the vapor extraction ports during the three-month pilot test. The SVE system is functioning within the PSCAA Order of Approval limits.

The concentrations of gasoline and benzene in the soil vapor extracted from the existing wells were below the allowable PSCAA discharge limits based on an annualized estimate. The use of the catalytic oxidizer for treatment of the emissions is not necessary to operate the SVE system in the current configuration. Direct discharge of the emission would be allowable under the PSCAA discharge limits based on the results of the pilot test.

Farallon trusts that this report provides sufficient information to meet your present needs. Feel free to contact either of the undersigned at (425) 427-0061 if you have any questions.

Sincerely,

Farallon Consulting, L.L.C.

Kim Saganski
Project Geologist

Peter Jewett
Principal

Attachments
Table 1- Gastech Colorimetric Measurements
Table 2 – Discharge Calculations
Figure1 – Site Location Map
Figure 2 – Site Map
Appendix A – O and M Plans
Appendix B – PSCAA Permit Documentation

cc: Jeff Goold, Equiva Services, L.L.C
Mike Nesteroff, Lane Powell Spears Lubersky
Mark Myers, William Kastner & Gibbs
Bert Hyde, Equipose Corp.
Patti Thompson, Davis Wright Themaine

KS/PJ:th

TABLE 1
GASTECH COLORIMETRIC MEASUREMENTS
QUEEN ANNE TEXACO
REMEDIATION SYSTEM
SEATTLE, WASHINGTON
FARALLON PN: 619-010

Measured Compound	Vapor Extraction Port (ppm)[1]													Mainfold Discharge (Gasoline/Benzene)	Date
	VP1	VP2	VP3	VP4	VP5	VP6	VP7	VP8	VP9	H1	H2	H3	H4		
Gasoline[2]	220	20	7.5	450	15	2	0	1200	40	75	230	60	25	110/1	2/18/00[4]
Gasoline[2]	60	25	0	2.5	0	2.5	0	60	4	0	0.2	2	1	17/0.5	3/21/00[5]
Benzene[3]	0.25	NM[7]	NM	NM	NM	NM	NM	0.25	NM	NM	NM	NM	NM		
Gasoline[2]	75	50	0	25	0	2.5	0	60	4	0	5	4	1	25/0	4/17/00
Benzene[3]	1	1	0	0	0	0	0	1	0	0	0	0	0		
Gasoline[2]	31	7.5	15	30	0	5	0	250	1	1	7.5	0	0	28/0.75	5/16/00
Benzene[3]	0.5	1.25	1	0.5	NM	NM	NM	1	0	0	0.1	0	0		
Gasoline[2]	30	5	17.5	13	0	0	0	80	0	0	7.5	0	0	15/0	6/12/2000[6]
Benzene[3]	0	0	0	0	0	0	0	0	0	0	0	0	0		

Notes:
1- ppm = parts per million
2- Gastech colorimetric tube #101L gasoline measuring range 30-2,000 ppm
3- Gastech colorimetric tube #121SL benzene in aromatics measuring range 1-100ppm
4- 48-hour trial began February 16, 2000
5- SVE system reactivated March 13, 2000 (beginning of 3-month pilot test)
6- SVE system deactiactivated June 13, 2000 (end of 3-month pilot test)
7- NM - not measured

TABLE 2
DISCHARGE CALCULATIONS FOR TPH-G AND BENZENE
SOIL VAPOR EXTRACTION SYSTEM
QUEEN ANN TEXACO
SEATTLE, WA
FARALLON PN: 619-010

CALCULATION OF TOTAL PETROLEUM HYDROCARBON AS GASOLINE DISCHARGE

Source[1]	Colori-metric Tube (ppm vol)[2]	Accuracy Factor	Flow (cfm)[3]	Air Density (lb/cf)[4]	min/day	Gasoline Molecular Weight	Air Molecular Weight	**lb/day[5]**	**lb/90 days**	**lb/yr[6]**
Blower Di	21.25	1.25	220	0.0748	1440	102	28.96	**2.2170**	**199.53**	**809.19**

CALCULATION OF BENZENE DISCHARGE

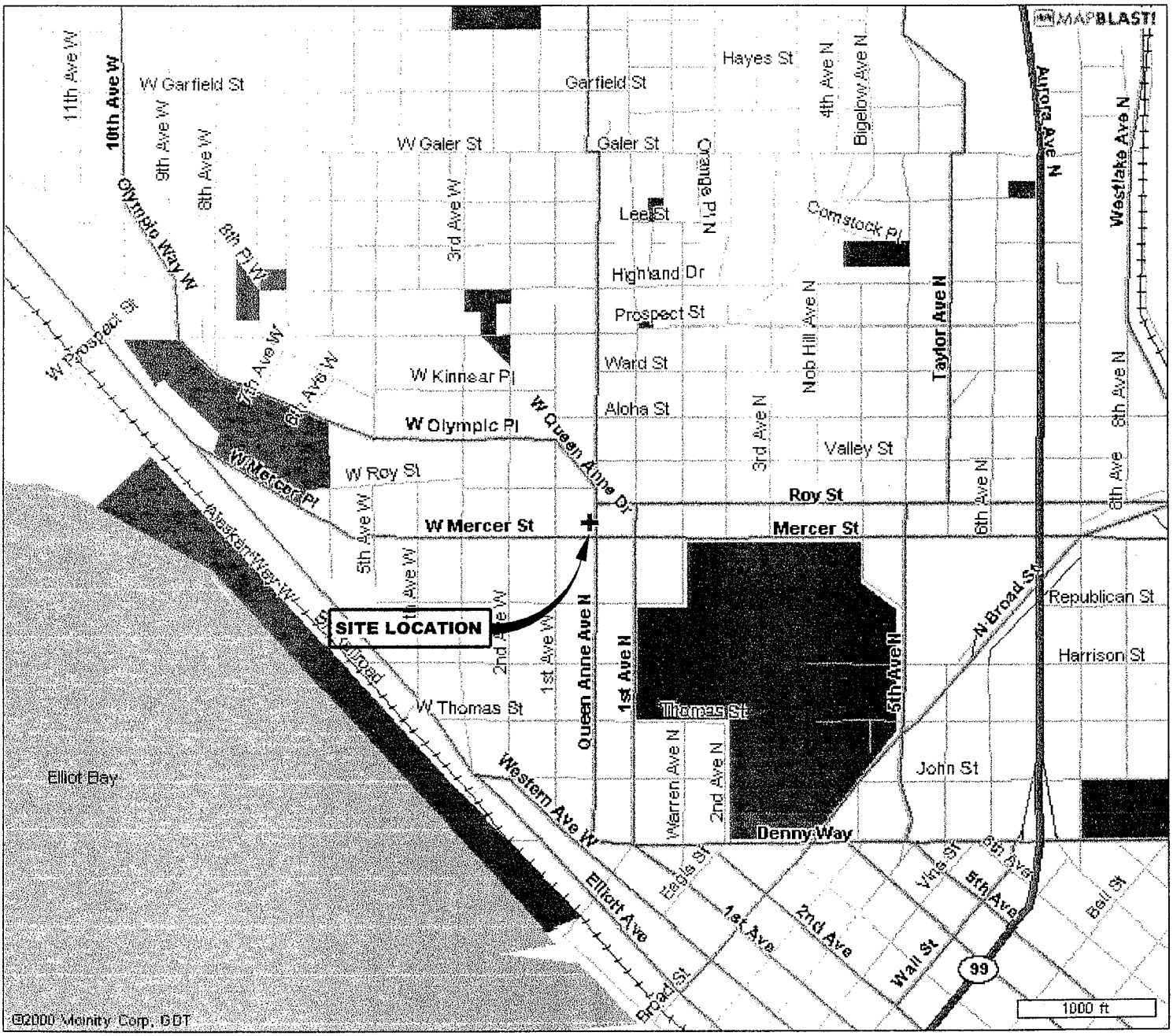
Source	Colori-metric Tube (ppm vol)	Accuracy Factor	Flow (cfm)	Air Density (lb/cf)	min/day	Benzene Molecular Weight	Air Molecular Weight	**lb/day**	**lb/90 days**	**lb/yr**
Blower Di	0.31	1.25	220	0.0748	1440	78.114	28.96	**0.0247679**	**2.22910901**	**9.0403**

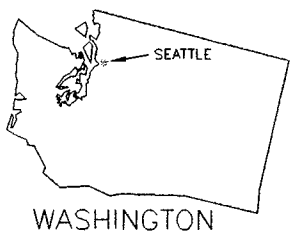
CALCULATION FORMULA:

$$\frac{\text{ppm-vol} \times \text{accuracy factor} \times \text{flow (cfm)} \times \text{air density (lb/cf)} \times 1440 \text{ (min/day)} \times \text{Hydrocarbon molecula}}{28.96 \text{ (air molecular weight)} \times 1{,}000{,}000} = \text{discharge (lb/day)}$$

discharge (lb/day) x 90 (days) = discharge (lb/90 days)
discharge (lb/day) x 365 (days/year) = discharge (lb/year)

Source located a discharge from blower upstream of catalytic oxidizing unit.
ppm vol = parts per million by volume based on colorimetric tubes
cfm = cubic feet per minute
lb/cf = pounds per cubic foot
lb/day = pounds per day
lb/yr = pounds per year





FARALLON CONSULTING
320 3rd Ave. NE, Suite 200
Issaquah, WA 98027

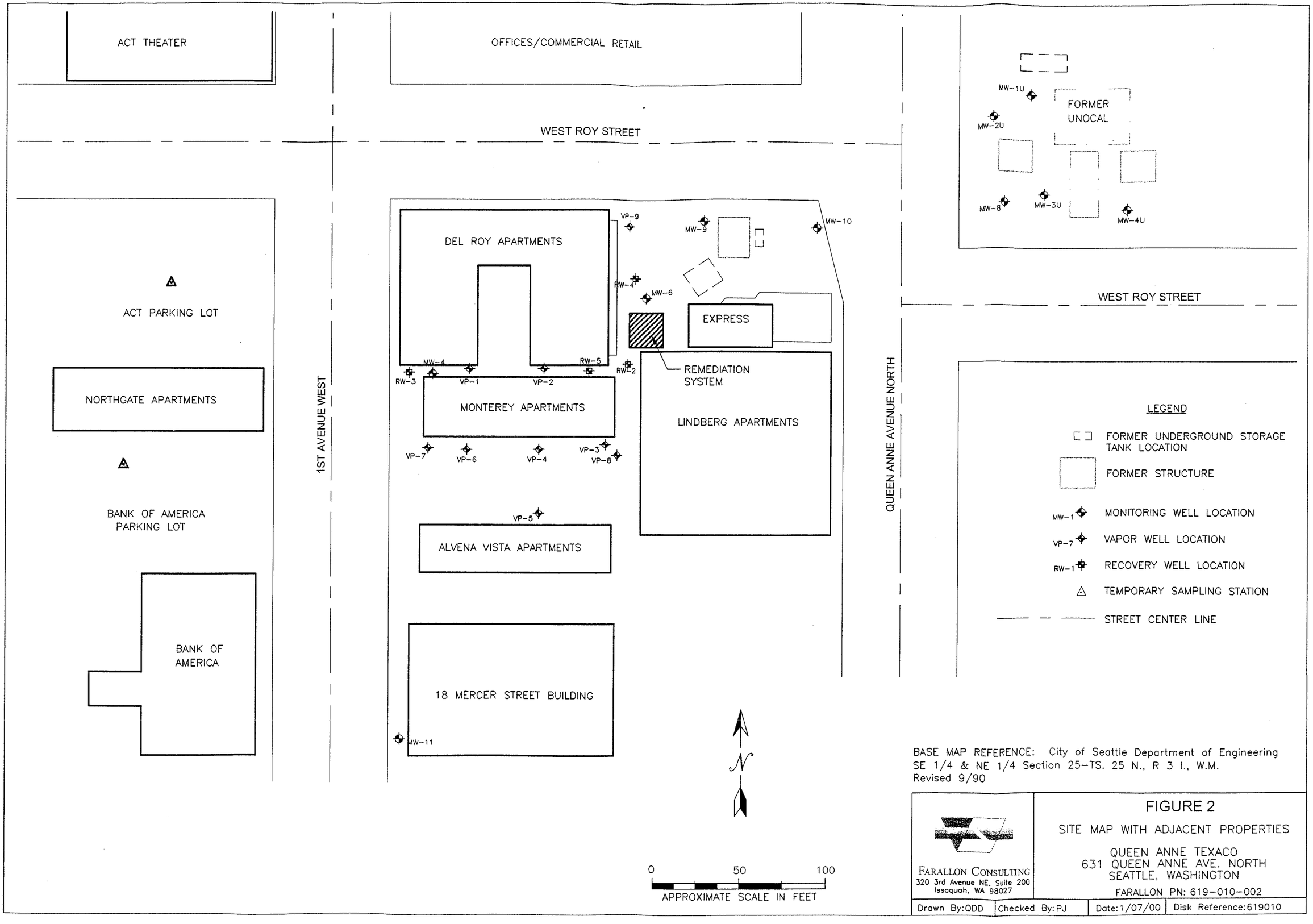
FIGURE 1

SITE VICINITY MAP

QUEEN ANNE TEXACO
631 QUEEN ANNE AVE. NORTH
SEATTLE, WA.

FARALLON PN: 619-010

Drawn By: QDD	Checked By: CS	Date: 6/26/00	Disk Reference: 619-001



BASE MAP REFERENCE: City of Seattle Department of Engineering
SE 1/4 & NE 1/4 Section 25-TS. 25 N., R 3 I., W.M.
Revised 9/90

FARALLON CONSULTING
320 3rd Avenue NE, Suite 200
Issaquah, WA 98027

FIGURE 2

SITE MAP WITH ADJACENT PROPERTIES

QUEEN ANNE TEXACO
631 QUEEN ANNE AVE. NORTH
SEATTLE, WASHINGTON

FARALLON PN: 619-010-002

Drawn By: QDD	Checked By: PJ	Date: 1/07/00	Disk Reference: 619010

TABLE 3
DISCHARGE CALCULATION FOR TPH-G AND BENZENE
SOIL VAPOR EXTRACTION SYSTEM
QUEEN ANNE TEXACO
SEATTLE, WASHINGTON
FARALLON PN: 619-010

CALCULATION OF TOTAL PETROLEUM HYDROCARBON AS GASOLINE DISCHARGE

Source[1]	Colori-metric Tube (ppm vol)[2]	Accuracy Factor	Flow (cfm)[3]	Air Density (lb/cf)[4]	min/day	Gasoline Molecular Weight	Air Molecular Weight	**lb/day[5]**	**lb/yr[6]**	
Blower Discharge	110	1.25	4	0.0748	1440	102	28.96	**0.2087**	**76.16**	

CALCULATION OF BENZENE DISCHARGE

Source	Colori-metric Tube (ppm vol)	Accuracy Factor	Flow (cfm)	Air Density (lb/cf)	min/day	Gasoline Molecular Weight	Air Molecular Weight	**lb/day**	**lb/yr**	
Blower Discharge	1	1.25	4	0.0748	1440	78.114	28.96	**0.0014527**	**0.5302**	

CALCULATION FORMULA:

$$\frac{\text{ppm-vol} \times \text{accuracy factor} \times \text{flow (cfm)} \times \text{air density (lb/cf)} \times 1440 \text{ (min/day)} \times \text{Hydrocarbon molecular weight}}{28.96 \text{ (air molecular weight)} \times 1{,}000{,}000} = \text{discharge (lb/day)}$$

discharge (lb/day) x 365 (days/year) = discharge (lb/year)

1- Source located a discharge from blower upstream of catalytic oxidizing unit.
2- ppm vol = parts per million by volume based on colorimetric tubes
3- cfm = cubic feet per minute
4- lb/cf = pounds per cubic foot
5- lb/day = pounds per day
6- lb/yr = pounds per year

Puget Sound Air Pollution Control Agency

HEREBY ISSUES AN ORDER OF APPROVAL TO CONSTRUCT, INSTALL, OR ESTABLISH

Registration No. 10767

Notice of Construction No. 5018

Date JUN 30 1993

Soil and Groundwater Extraction System at 80 cfm controlled by an Internal Combustion Engine and Catalytic Converter at 80 cfm.

RECEIVED
JUL 02 1993
DEPT. OF ECOLOGY

MATTHEW HAYES

APPLICANT
SCIENCE APPLICATIONS INTL CORP (SAIC)
606 COLUMBIA ST NW STE 300
OLYMPIA WA 98501

OWNER
WASHINGTON STATE DEPT OF ECOLOGY (BRIAN SATO)
3190 160TH AVE SE
BELLEVUE WA 98008

INSTALLATION ADDRESS

MONTEREY APARTMENTS, 622 1ST AVE W, SEATTLE, WA, 98119

THIS ORDER IS ISSUED SUBJECT TO THE FOLLOWING RESTRICTIONS AND CONDITIONS

1. Approval is hereby granted as provided in Article 6 of Regulation I of the Puget Sound Air Pollution Control Agency to the applicant to install or establish the equipment, device or process described hereon at the INSTALLATION ADDRESS in accordance with the plans and specifications on file in the Engineering Division of PSAPCA.
2. Compliance with this ORDER and its conditions does not relieve the owner or operator from the responsibility of compliance with Regulations I, II or III, RCW 70.94 or any other emission control requirements, nor from the resulting liabilities and/or legal remedies for failure to comply. Section 5.05(e) of Regulation I requires that the owner or operator must develop and implement an operation and maintenance (O&M) plan to assure continuous compliance with Regulations I, II, and III.
3. This approval does not relieve the applicant or owner of any requirement of any other governmental agency.
4. SAIC shall not cause or allow the operation of the soil and groundwater extraction system unless the temperature at the inlet of the catalytic converter exceeds 600 degrees F and the temperature at the outlet does not exceed 750 degrees F.
5. SAIC shall not cause or allow the operation of the soil and groundwater extraction system if emissions from the exhaust stack exceed 10% opacity for more than an aggregate of 3 minutes in any hour.

MARGARET L. CORBIN
Reviewing Engineer

JAY M. WILLENBERG
Reviewing Engineer

for ANITA J. FRANKEL
Air Pollution Control Officer

MEJ

Appendix A

Operations and Maintenance Plan

MONITORING PLAN
VAPOR EXTRACTION SYSTEM
QUEEN ANN TEXACO SITE
FARALLON PN: 619-010

- **BASIC SYSTEM MONITORING: will be conducted weekly for the first four weeks, then monthly, except repeated within a week after optimization adjustments and follow-up monitoring have been completed.**

  - Calibrate the flow transmitter following the instructions on page 18 of the Stealth Industries VES System Operation and Maintenance Manual.

  - Record the Stealth Industries VES System readout information:

    1. Temperature before CAT-Ox (degree F);

    2. TPH (%LEL);

    3. Flow (scfm);

    4. Temperature after CAT-Ox (degree F);

    5. Temperature pre-heat (degree F);

  - Using colorimetric monitoring tubes and the appropriate calibrated pump, measure and record the TPH-G and Benzene concentrations in the 3-inch PVC header through the ½-inch threaded monitoring port inside the plywood enclosure.

  - Using a pitot tube and a 0 - 0.5-inch water gage (W.G.) Magnehelix vacuum gage, measure and record the velocity in the 3-inch PVC header through the ½-inch threaded monitoring port inside the plywood enclosure.

  - Using a 0 to 150-inch W.G. Magnehelix vacuum gage, measure and record the vacuum in the 3-inch PVC header through the ½-inch threaded monitoring port inside the plywood enclosure (note: doing all measurements in this monitoring port sequentially requires removing and replacing the threaded plug only once, and is a time saver. It also saves wear on the threads in the PVC pipe).

- Using the field instruments listed in the above three bullet items, measure and record the TPH-G and Benzene concentrations, the velocity, and the vacuum in each of the pipes from the individual vapor extraction wells (no. 1 - 9) and horizontal vapor extraction pipes (no. H1 – H4). The measurements will be made through the monitoring port located below the regulating ball valves in each of the 4-inch PVC pipes. A smaller-range vacuum gage, such as 0 – 3 inches W.G., will be appropriate for measuring the vacuum in extraction wells or horizontal extraction pipes that have reduced flow and vacuum. Note that the velocity measurement requires unscrewing each quick-connect adaptor and then replacing.

- Absorbent socks will be placed inside wells VP-6, VP-4, VP-1, RW-2 and MW-6 to soak up product. The used socks will be placed in a sealed and labeled container and stored inside the compound.

- **ALERT FARALLON PROJECT MANAGER OF ANY UNUSUAL CONDITIONS**

OPERATION AND MAINTENANCE PLAN
VAPOR EXTRACTION SYSTEM
QUEEN ANN TEXACO SITE
FARALLON PN: 619-010

- **UTILIZATION OF THE STEALTH INDUSTRIES INSTRUCTION MANUAL:**
  - General overall understanding: this three-month operation will utilize the soil vapor extraction system only. No groundwater will be pumped, and no air-sparging of groundwater will occur. All personnel involved in the operation of the system will become familiar with the VES sections of the Stealth Industries Instruction Manual, and the various manufacturer's manuals for system components in the Stealth Manual Appendix. All safety cautions will be observed. A check-list will be developed from the following sections of the manual:
  - VES start-up instructions, Section 6, page 9
  - VES operation procedures, Section 7, page 11
  - VES maintenance schedule, Section 10, page 16 – 18
  - Roots Blower instructions for lubrication and operation, pages 7 – 10. These supercede the blower lubrication instructions in the Stealth Manual.

- **ALERT FARALLON PROJECT MANAGER OF ANY UNUSUAL CONDITIONS**

OPTIMIZATION PLAN
VAPOR EXTRACTION SYSTEM
QUEEN ANN TEXACO SITE
FARALLON PN: 619-010

OBJECTIVE OF SYSTEM OPTIMIZATION: to maximize the rate of remediation of soil and groundwater as evidenced by the maximum rate of removal of petroleum hydrocarbons through the Vapor Extraction System (VES).

DISCUSSION: Based on the VES 48-hour trial performed by Farallon, February 16 through 18, 2000, the Stealth VES mechanical components have considerable flow capacity and vacuum available to apply to the in-soil extraction wells and horizontal vapor extraction pipes. The monitoring conducted during the pilot test indicated that the probable maximum rate of removal of petroleum hydrocarbons from the wells and pipes will not exceed Puget Sound Clean Air Agency policy limitations for the Seattle area.

The flow rates of air in the soil, withdrawn from the individual wells and pipes, are closely proportional to the vacuum induced in each of them. Near the end of the pilot test the vacuum was increased to over 50 inches water gage (W.G.) in well ports 1, 4, 8 and 9, and horizontal pipes H1, H2 and H4 (the extraction points with the highest concentrations of hydrocarbons). Shortly thereafter, groundwater surges began out of the underground system. There was not enough time during the pilot test to determine which part(s) of the underground system were producing the water.

The vacuum applied in an extraction well or pipe extends into the surrounding soil with decreasing strength with respect to the distance. The vacuum above the groundwater surface at any given point raises the groundwater surface the exact height of the vacuum when measured in inches W.G. The 50 inches W.G. applied late in the pilot test raised the groundwater surface above the pipe perforations in one or more of the extraction wells or horizontal pipes. The water was then drawn into the system by the in-rushing air and vacuum. The optimization process will include determining which extraction wells and/or horizontal pipes will pull in water at stronger vacuums.

OPTIMIZATION PROCESS:

Start up the VES and adjust the vacuum in the header from the extraction wells and horizontal pipes to about 30 inches W.G. vacuum. This adjustment will be made by manually opening the filtered air bypass valve. Leave all well control valves at their present settings. Run the system at this vacuum for at least 8 hours and determine if any significant water is being pulled into the system. If water is being pulled into the system, reduce the vacuum at the header by 3-inch W.G. increments until no significant water is produced for 8 hours.

Select one of the higher hydrocarbon wells (concentration greater than 40 ppm) and increase the vacuum in 2-inch W.G. increments, allowing at least 30 minutes between increases, and observe at what vacuum the well starts producing water through the VES. A comparison of groundwater surface elevations and extraction well/pipe perforation elevations will be made to determine which lines are most likely to produce water, and those lines will be tested first. The single well vacuum will be increased by a two-step process: first, reducing the vacuum to 15 inches W.G. vacuum in the other higher hydrocarbon wells by partially closing each ball-valve; second, increase the system vacuum by partially closing the filtered air bypass valve to increase by 2-inch W.G. vacuum increments in the well being tested. Record the vacuum at which the extraction well or horizontal pipe produces water, to be called the vacuum limit.

Repeat this process for all wells with higher hydrocarbon concentrations. It should be noted that this vacuum is accurate for the groundwater surface elevation at the date the test is performed. Seasonal changes in the groundwater surface will change the vacuum at which extraction wells produce water.

Readjust the vacuums in each extraction well and horizontal pipe with TPH-G over 40 ppm to 60% of the vacuum limit and run the system for at least 48 hours. Conduct follow-up monitoring by measuring TPH-G and benzene concentrations, vacuum, and velocity in the pipes from each extraction well and horizontal pipe as described in the Monitoring Plan.

Compare the extraction well and horizontal pipe TPH-G and benzene concentrations with the December 1999 groundwater TPH-G and benzene data on a location by location basis. Determine which extraction wells and horizontal pipes are likely to accomplish removal of gasoline and benzene from the soil and groundwater.

Increase the vacuum in these extraction wells and horizontal pipes to 80% of the vacuum limit and run for at least 48 hours. Measure TPH-G and benzene concentrations, vacuum and velocity in the pipes from each extraction well and horizontal pipe.

Do a mass flow calculation (ppm x velocity x pipe diameter) for each extraction well and horizontal pipe at the 60% vacuum and 80% vacuum. Determine if the increased vacuum results in increased mass flow.

Increase the vacuum to 90% of the extraction limit in each extraction well and horizontal pipe that shows an increased mass flow. Re-measure TPH-G and benzene concentrations, vacuum, and velocity in the pipes from each extraction well and horizontal pipe after at least 48 hours operation.

Complete a mass flow calculation (ppm x velocity x pipe diameter) for each extraction well and horizontal pipe at the 90% vacuum. Determine if the increased vacuum results in increased mass flow. Further vacuum increases may risk water surges.

Appendix B

PSCAA Permit Documentation

Williams, Kastner & Gibbs PLLC

LAW FIRM

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May 17, 2000

68750.110

Brian S. Sato, P.E.
Project Manager
Toxics Cleanup Program
Washington Department of Ecology
3190 – 160th Ave S.E.
Bellevue, WA 98008-5452

Andrew A. Fitz
Assistant Attorney General
Attorney General of Washington
P. O. Box 40117
Olympia, WA 98504-0117

Re: In Re the Estate of Erma R. Arnold
King County Superior Court No. 96-4-04704-7 SEA

Dear Brian and Andy:

As you probably recall, the Arnolds' Mini Mart/Manhattan Express property was owned for many years by William and Erma Arnold. On July 19, 1996, Mrs. Arnold suffered a heart attack and died. At the time of her death and for many years prior to her death, Mrs. Arnold had suffered from extreme stress. This stress arose largely from the Department of Ecology's demands that the Arnolds were solely responsible for contamination of the property. For those many years, Ecology ignored the fact that Texaco, the long-time owner and operator of the gas station, was the most likely source of site contamination. The stress on Mrs. Arnold was magnified even more after Ecology in 1995 issued an Enforcement Order from which the Arnolds had no ability to comply. Most upsetting is the fact that Ecology had credible evidence of Texaco's PLP status in 1991 when it removed tanks from the property. Despite this, Ecology continued to pursue the Arnolds only. The Arnold Family is convinced that Ecology's decision to focus its enforcement strategy solely on the Arnolds, an elderly couple with limited means, shortened Mrs. Arnold's life and certainly lessened the enjoyment of her later years.

On March 3, 1997, Ecology filed a Creditor's Claim against the Estate of Erma R. Arnold. The claim consisted of Ecology's past costs relating to the site. The Estate has been lying in limbo while we, on behalf of the Arnolds, have pursued Ecology to name Texaco as a "potentially liable person" and to further the investigation into site conditions to support cost-effective remedial measures. The Estate has been unable to close probate because of the Ecology claim.

We have worked diligently with Ecology to move this site forward. Through our efforts, we have finally convinced Ecology that Texaco, the site owner and operator from the early 1950s to

1977, is a PLP. Texaco has now become fully involved in the site. For the past year, Texaco has taken responsibility for evaluating (1) the effectiveness of in-place remediation equipment and (2) remedial options for the site. It is now almost four years after Mrs. Arnold's death. Estate assets have dwindled because of the Estate's inability to close probate and sell certain assets. I understand the probate must move forward and cannot continue waiting indefinitely.

The only significant assets in Mrs. Arnold's estate are the former family home in Woodinville, Washington. The Estate has had to pay taxes on this property and has almost completely exhausted any cash remaining in the Estate bank account. Mr. Arnold is very ill and requires full time live-in care. The Estate needs to sell to avoid further depleting assets and to pay for Mr. Arnold's care—rather than making him a ward of the State. For these reasons, we seek to have Ecology withdraw its claim against the Estate or the Estate will have to pursue relief through the probate court.

Ecology is no longer at risk that insufficient assets will be available to fund further site remediation work. The Arnolds' Mini-Mart/Manhattan Express property remains subject to potential liens by Ecology to secure payment of past costs and contribute to any future remediation. The property has value and may become quite valuable should it be remediated. More importantly, Texaco is now involved as a PLP and is jointly and severally liable for all remedial tasks, including past and future costs.

For these reasons, the Arnolds request that Ecology withdraw its Creditor's Claim against the Estate of Erma R. Arnold. The Arnolds will provide Ecology with any information and backup documentation it requires to assess this situation. Let's stop holding the Arnold family hostage over this site. Let them close Mrs. Arnold's Estate and pay for the care of their ill father.

Very truly yours,

WILLIAMS, KASTNER & GIBBS PLLC

Mark M. Myers

MMM:bjh

cc: Ms. Debra R. Tadlock
Patricia E. Thompson, Esq.
Michael A. Nesteroff, Esq.

FARALLON CONSULTING LLC

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MEMORANDUM

TO: Brian Sato
Washington State Department of Ecology

FROM: Peter Jewett
Principal

DATE: July 19, 2000

RE: Meeting Notes
Queen Ann Texaco
Seattle, Washington
Farallon PN: 619-010

Farallon Consulting, L.L.C. (Farallon) has prepared this Memorandum to summarize the discussions at the meeting on July 6, 2000 regarding the Queen Ann Texaco site located in Seattle, Washington. The following attended the meeting:

Ms. Patti Thompson, Davis Wright Tremaine: on behalf of the Arnolds.
Mr. Mark Myers, Williams, Kastner & Gibbs: on behalf of the Arnolds.
Mr. Bert Hyde, Equipose NW: on behalf of the Arnolds.
Mr. Mike Nesteroff, Lane Powel Spears Lubersky: on behalf of Texaco.
Mr. Jeff Goold; Equiva Services LLC: on behalf of Texaco.
Mr. Peter Jewett, Farallon: on behalf of Texaco.
Ms. Kim Saganski, Farallon: on behalf of Texaco.
Mr. Brian Sato, Ecology
Mr. Andrew Fitz, Attorney Generals Office

Mr. Sato provided an agenda for the meeting which is used for the summary presented below. The following was discussed:

Pilot Test Results

Farallon presented the results of the three month pilot test of the existing soil vapor extraction system at the site. Farallon noted the following:

- The vapor extraction (VE) system is operational as designed;
- There are insufficient concentrations of total petroleum hydrocarbons (TPH) as gasoline and benzene in the vapor emissions to provide enough fuel for the catalytic oxidizer (cat-ox) treatment system to operate at full capacity. Additionally, the emission concentrations are low enough that a cat-ox treatment system is not necessary and emission treatment can be completed cost effectively using activated carbon.
- Approximately 200 pounds of TPH as gasoline and 5 pounds of benzene were removed from the soil vapor during the pilot test.
- The groundwater extraction system (in-well pumps) is not operational.
- The VE system is operated under an existing air emission permit.
- The VE system will be reactivated, operated continuously, and monitored.
- Analytical results of the emission samples were provided in table format.
- Analytical results of groundwater samples were provided with historical groundwater analytical results in table format.
- The analytical results show that the concentrations of TPH as gasoline and benzene, toluene, ethyl benzene and xylenes (BTEX) have not decreased significantly since the release was first discovered in 1989-1990.
- There is a large TPH as diesel component to the dissolved phase and free product phase TPH detected in and on groundwater.

Based on the information provided, the following future work was agreed to:

- Reports will be provided of the pilot test results and of groundwater monitoring results.
- Mr. Sato requested that a plume map be created for the site. Farallon indicated that the site conditions are complex and a plume map would not be representative of the site conditions. Tables and figures with the analytical results of groundwater samples will be provided in the groundwater monitoring report.

Proposed Remedial Alternatives

Mr. Goold indicated that the preliminary results of a background investigation currently underway by Texaco indicates that there may be additional sources of TPH as gasoline and diesel at the site the have not been addressed in previous work. Texaco will identify potential off-site sources of what appears to be regional contamination in the vicinity of the site. Texaco will conduct the following interim remedial actions:

- A background investigation of the site will be completed.
- Free product will be manually recovered from the wells at the site on a weekly basis.
- Quarterly sampling and analysis of groundwater will be conducted, with the next sampling round scheduled for September 2000.
- A groundwater well will be installed west of, and across 1st Avenue, to evaluate off-site migration of TPH and BTEX in groundwater.
- Quarterly reports will be provided to summarize the analytical results of the quarterly groundwater sampling, the results of the off-site groundwater well, and the operation and monitoring results of the VE system.

Project Schedule

The following schedule for deliverables was agreed to:

- The Pilot Summary Report – July 20, 2000.
- Quarterly Report – September 2000.
- Background Report –September 2000.
- Cost Recovery Backup (see discussion below) –August.

The next meeting is scheduled for September 25, 2000 at 9:30 am at the NW office of Ecology.

Cost Recovery

Farallon provided a summary table of cost to date incurred by Ecology. Farallon completed an evaluation of the expenditures by Ecology and developed a cost estimate based on a similar scope of work. The cost estimate developed by Farallon assumed the same or similar scope of work completed by Ecology using 2000 costs. It was noted that Farallon had the advantage of hind-sight and a more mature and developed technical standard. Farallon noted the following:

- Ecology had incurred $320,949 in Category 1 – Site Investigation costs between 1986 and 1993 ($273,948 in consultant costs and $47,000 in Ecology oversight costs).
- Ecology had incurred $601,743 in Category 2 – Site Remediation costs between 1993 and 1997 ($495,947 in consultants costs and $105,796 in Ecology oversight).
- A total of $769,894 was spent on consultants by Ecology with $152,797 in oversight costs for a grand total of $922,692.
- Farallon estimated a total of $349,643 ($317,039 for consultants and $32,604 for Ecology oversight) for the same scope of work.

Mr. Nesteroff noted that the $349,643 was not the amount being offered by Texaco. Mr. Myers noted that using other cost allocation methods, that included developing our own

scope of work, independent of the work completed by Ecology, or using an evaluation of the amount of cleanup completed, would results in a much lower cost. Ecology received the cost summary and estimate tables and requested that Farallon provide backup for the cost estimates.

Closing

As of July 7, 2000 Ecology has agreed to allow Texaco the use of the cat-ox system pending cost recovery discussions. The system was reactivated July 11, 2000 and is currently operating. Farallon trusts that this correctly represents a summary of the discussion held at the July 6, 2000 meeting regarding the Queen Ann Texaco site. Feel free to contact Mr. Peter Jewett or Ms. Kim Saganski at (425) 427-0061 if you have any questions or comments.

CC: Ms. Patti Thompson, Davis Wright Tremaine.
Mr. Mark Myers, Williams, Kastner & Gibbs
Mr. Bert Hyde, Equipose NW
Mr. Mike Nesteroff, Lane Powel Spears Lubersky
Mr. Jeff Goold; Equiva Services LLC
Mr. Andrew Fitz, Attorney Generals Office