



December 8, 1999

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

**RE: GROUNDWATER SAMPLING AND ANALYSIS
QUEEN ANN TEXACO
SEATTLE, WASHINGTON
FARALLON PN: 619-010**

Dear Mr. Sato:

Farallon Consulting LLC (Farallon) has prepared this letter on behalf of Texaco to provide you with a summary of the groundwater sampling and analysis to be conducted at the above site. As we discussed, collection of the groundwater samples is scheduled for December 14-15, 1999. Farallon will be on site at 8:00 am on December 14 to begin sampling.

The scope of work to be conducted at the site for the groundwater sampling and analysis includes collection of baseline data from existing groundwater monitoring and recovery wells MW-2, MW-4, MW-6, MW-9, MW-10, RW-2, RW-3, RW-4, RW-5 and vapor recovery wells VP-1, VP-3, VP-4, VP-5, VP-6, VP-7, VP-8, and VP-9 (see attached map). The baseline data will include:

- Measuring volatile organic compound (VOC) vapor concentrations at each well head;
- Measuring depth to groundwater;
- Measuring product thickness, if present;
- Collection of groundwater samples, and;
- Collection of product samples.

The fieldwork will be done in accordance with a site-specific health and safety plan (HASP). Access to the site and adjacent properties has been confirmed by an Access Agreement with Texaco. The procedures for collection of the baseline data include:

- Wells located in parking areas will be coned off with notes placed on parked cars requesting that the cars be moved for access to the wells;

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- Wells located in parking areas will be coned off with notes placed on parked cars requesting that the cars be moved for access to the wells;
- Temporary traffic control will be necessary for access to wells located in high traffic areas;
- Each well head will be opened and the VOC vapors measured with a photoionization detector (PID) and recorded on the field notes;
- The depth to groundwater will be measured from the top of casing in feet using an electronic water level meter. If product is encountered in the well, the depth and thickness of product will be measured and recorded on the field notes;
- VOC vapors and depth to groundwater and/or product thickness will be measured at all of the existing well on and off-site prior to collection of groundwater and/or product samples in any of the wells;
- Groundwater wells with no product will be purged and developed by removal of at least three casing volumes using a disposable bailer dedicated to each well. If turbid water is observed after removal of three saturated casing volumes, additional casing volumes, up to a maximum of five, will be removed from the well. Purge water will be temporarily stored on-site pending disposal in the above ground storage tank located in the treatment compound;
- Groundwater and/or vapor wells which have measurable floating product will not be developed. Product samples will be collected from these wells with a disposable bailer. Groundwater samples will not be collected from the wells with floating product.
- Groundwater and/or product samples will be decanted into laboratory prepared glass jars, sealed, labeled and placed on-ice pending delivery to North Creek Analytical for laboratory analysis;
- Groundwater samples will be analyzed for:
 - ◆ Total petroleum hydrocarbons (TPH) as gasoline by WTPH-g;
 - ◆ TPH as diesel and motor oil by WTPH -dx;
 - ◆ Benzene, toluene, ethyl benzene and xylenes (BTEX) by EPA Method 8021B;
 - ◆ Total and dissolved lead by EPA Method Series 6000, and;
 - ◆ Dissolved oxygen, pH, temperature, conductivity, dissolved manganese and ferrous iron, and selected nutrients such as nitrate and sulfate.
- The PVC well caps will be repaired or replaced, as necessary. The locks on the well heads will be replaced with Texaco locks.
- All field observations and measurements will be recorded on field notes and records.



As noted above, the purge water from each sampled monitoring wells will be temporarily stored in the above ground storage tank located in the remediation system compound. The tank is connected to an air stripper and the sewer. The tank, air stripper and piping are owned by Ecology. Ecology has agreed to allow Texaco to use the equipment during this phase of work. The tank is currently approximately 1/3 full with water and floating product. Texaco has agreed to manage the disposal of the waste water/product currently in the tank with the wastewater generated by the groundwater sampling. Management of the wastewater disposal will include:

- Removal of any floating product in the above ground storage tank to a 55-gallon drum for off-site disposal;
- Storage of purge water generated during this sampling event in the tank pending analytical results;
- Collection of a wastewater sample from the tank for analysis after completion of the groundwater sampling;
- Repair of the existing discharge piping from air stripper system;
- Obtaining a one-time Discharge Authorization with King County Industrial Waste for disposal of the wastewater stored in the tank to the sewer, and;
- Disposal of the wastewater to the sewer system.

Farallon will prepare a scope of work and schedule to complete the Pilot Test/Feasibility Study after the analytical results have been reviewed and evaluated. It is likely that the pilot test will occur in January or February 2000.

Farallon trusts that this provides sufficient information for your needs. Should you have any questions or require additional information, feel free to contact the undersigned at (425) 427-0061.

Sincerely,

Farallon Consulting LLC

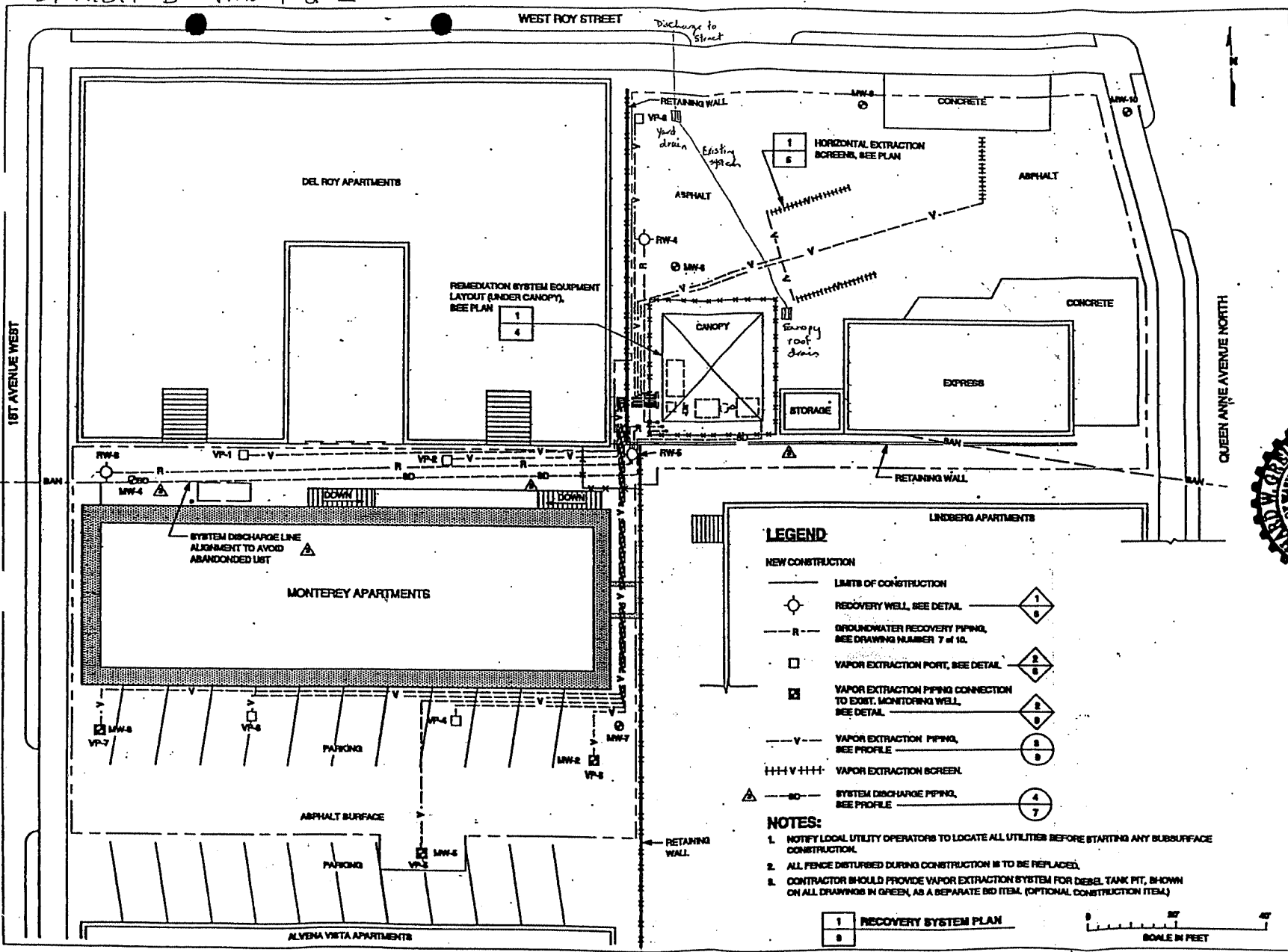
Peter Jewett
Principal

Attachment

- Site Map

CC: Jeff Goold, Equiva Services LLC
Mike Nesteroff, Lane Powell Spears Lubersky
Tom Vaughan, Equipoise
Mark Myers, Williams Kastner and Gibbs

1871011 D - PLAN 1 of 2



NO.	DESCRIPTION	DATE
1	ORIGINAL DRAWING	
2	REVISION	
3	REVISION	
4	REVISION	
5	REVISION	
6	REVISION	
7	REVISION	
8	REVISION	
9	REVISION	
10	REVISION	

LEGEND

- NEW CONSTRUCTION**
- LIMITS OF CONSTRUCTION
 - RECOVERY WELL, SEE DETAIL
 - R --- GROUNDWATER RECOVERY PIPING, SEE DRAWING NUMBER 7 of 10.
 - VAPOR EXTRACTION PORT, SEE DETAIL
 - ▣ VAPOR EXTRACTION PIPING CONNECTION TO EXIST. MONITORING WELL, SEE DETAIL.
 - V --- VAPOR EXTRACTION PIPING, SEE PROFILE
 - +++ V +++ VAPOR EXTRACTION SCREEN
 - SD --- SYSTEM DISCHARGE PIPING, SEE PROFILE

NOTES:

1. NOTIFY LOCAL UTILITY OPERATORS TO LOCATE ALL UTILITIES BEFORE STARTING ANY SUBSURFACE CONSTRUCTION.
2. ALL FENCE DISTURBED DURING CONSTRUCTION IS TO BE REPLACED.
3. CONTRACTOR SHOULD PROVIDE VAPOR EXTRACTION SYSTEM FOR DIESEL TANK PIT, SHOWN ON ALL DRAWINGS IN GREEN, AS A SEPARATE BID ITEM. (OPTIONAL CONSTRUCTION ITEM.)

1 RECOVERY SYSTEM PLAN
2



RECOVERY SYSTEM
CONSTRUCTION PLAN

MONTEREY APARTMENTS
SEATTLE, WASHINGTON

DATE: MARCH 8, 1988

DRAWING NUMBER: 8 of 92



PROJECT NUMBER: 8701.013



BY B. SATO DATE 10/01/97

SHEET 1 OF 3

CHKD. BY _____ DATE _____

PROGRAM/SECTION _____ COUNTY _____

PROJECT Monterey Apt

SUBJECT Plume Migration

CALCULATION PAD

Determine time required for release at Tarsaco to migrate to the Monterey Apartment.

$$V = \frac{ki}{n_e} \quad \text{where } V = \text{velocity (ft/day)}$$

k = hydraulic conductivity (ft/day)

i = hydraulic gradient ^{dy}/_{dx} (unitless)

n_e = effective porosity (specific yield S_y) (unitless)

Site soil: silty sand / sandy silt

$$K = 10^{-5} - 10^{-6} \text{ ft/sec} \quad \text{E&E Aug 1991 Phase I RI pg 3-9}$$

$$= 8.64 \times 10^{-1} - 8.64 \times 10^{-2} \text{ ft/day} \quad \text{convert to ft/day: ft/sec (60 sec/min)(60 min/hr)(24 hr/day)}$$

$$i = i_{\text{average}} = 0.050 \quad \text{E&E Aug 1991 Phase I RI pg 2-3 / Fig 4-1}$$

$$i_{\text{max}} = 0.047$$

$$S_y = \frac{0.08 - 0.23}{n_e} = n_e \quad \text{Groundwater Hydrology, 2nd Ed David Keith Todd Table 2.5 pg 38}$$

for silt - fine sand

BY B. Sato DATE 10/10/97SHEET 2 OF 3

CHKD. BY _____ DATE _____

PROGRAM/SECTION _____ COUNTY _____

PROJECT Montana Apt

SUBJECT _____

CALCULATION PADCalculate range of \bar{v} $\bar{v} = \frac{ki}{n_e}$ * for sandier soils - let $k = 8.64 \times 10^{-1} \text{ ft/day}$
 $n_e = 0.23$

$$\bar{v} = \frac{ki}{n_e} = \frac{8.64 \times 10^{-1} (i)}{0.23} = 3.757(i) \quad \text{let } i = 0.047 - 0.050$$

$$\bar{v} = 3.757(0.047) - 3.757(0.050) \\ = 0.177 - 0.188 \text{ ft/day}$$

* for siltier soils - let $k = 8.64 \times 10^{-2} \text{ ft/day}$
 $n_e = 0.08$

$$\bar{v} = \frac{8.64 \times 10^{-2} (i)}{0.08} = 1.080(i) \quad \text{let } i = 0.047 - 0.050$$

$$\bar{v} = 1.080(0.047) - 1.080(0.050) \\ = 0.051 - 0.054 \text{ ft/day}$$

BY B. Sato DATE 10/1/07SHEET 3 OF 3

CHKD. BY _____ DATE _____

PROGRAM/SECTION _____ COUNTY _____

PROJECT Monterey Apt

SUBJECT _____

CALCULATION PADDistance from Monterey Apt. to Leaking tanks $L = 70 - 130$ ft

Time for plume to travel

$$T = \frac{L}{\bar{v}}$$

where $T =$ time (days)
 $L =$ distance (ft)
 $\bar{v} =$ Velocity (ft/day)

* For fastest time use highest velocity, and shortest distance

$$T = \frac{70 \text{ ft}}{0.188 \text{ ft/day}} = \underline{\underline{372 \text{ days} \approx 1 \text{ yr}}}$$

* for longest time use slowest velocity, and longest distance

$$T = \frac{130 \text{ ft}}{0.051 \text{ ft/day}} = \underline{\underline{2,549 \text{ days} \approx 7 \text{ yrs}}}$$

 \therefore Plume would take 1.7 yrs to travel from Texas to Monterey Apt.* Note: site soils are quite variable. order of magnitude change in k is possible at site (reasonable)
Using $k = 8.64$ ft/day, $T = 3$ months.