



Texaco Refining  
and Marketing Inc

10 Universal City Plaza  
Universal City CA 91608

ALCO  
HAZMAT

94 MAY -4 PM 3:03

April 28, 1994

**ENV - SERVICE STATIONS**

Quarterly Groundwater Monitoring Report  
2225 Telegraph Avenue  
Oakland, California

Mr. Tom Peacock  
Alameda County Environmental  
Health Department  
80 Swan Way, Room 200  
Oakland, CA 94621

Dear Tom:

This letter will confirm our telephone conversation regarding your request for additional information to be submitted with our future quarterly monitoring and sampling reports. As we discussed, wells RW-1 and RW-2 are not monitored nor sampled as part of the quarterly monitoring program because they are part of an ongoing groundwater treatment system. However, the effluent from these wells are sampled and are reported to EBMUD on Texaco's groundwater self monitoring report.

Enclosed is a copy of the fourth quarter groundwater self monitoring report as submitted to EBMUD. Texaco recently received permission to reduce the reporting requirements from quarterly to biannually. By copy of this letter to Texaco's Richmond office I am instructing them to copy your office on all future groundwater self monitoring reports submitted. In addition, they are to include a statement, on the Quarterly Monitoring Report, which will inform your office on the operational status of the groundwater treatment system for that particular quarter.

Please call me at (818) 505-2476 if you have any questions or wish to discuss the report further.

Very truly yours,  
Texaco Refining and Marketing Inc.

Bob Robles  
Environmental Protection Coordinator

RR:rr

Enclosure  
RRZielinski

pr



Texaco Refining  
and Marketing Inc.

April 28, 1994

**ENV - SERVICE STATIONS**

Quarterly Groundwater Monitoring Report  
2225 Telegraph Avenue  
Oakland, California

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Alameda County Environmental  
Health Department  
80 Swan Way, Room 200  
Oakland, CA 94621

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pr\_\_

*Alameda*



3315 Almaden Expressway, Suite 34  
San Jose, CA 95118  
Phone: (408) 264-7723  
FAX: (408) 264-2435

# TRANSMITTAL

**TO:** Ms. Molly Ong  
East Bay Municipal Utility District  
Source Control Division, M.S. 702  
P.O. Box 24055, 375 11th Street,  
Mail Slot #702  
Oakland, California 94623

**DATE:** January 13, 1994  
**PROJECT NUMBER:** 62073.02  
**SUBJECT:** Final - Former Texaco Station  
2225 Telegraph Avenue, Oakland,  
California

**FROM:** Mr. Marc A. Briggs  
**TITLE:** Project Manager

**WE ARE SENDING YOU:**

| COPIES | DATED    | NO.      | DESCRIPTION   |
|--------|----------|----------|---|
| 1      | 01/13/94 | 62073.02 | Wastewater Discharge Permit #502-27801 Self Monitoring Report for Fourth Quarter 1993 for Groundwater Treatment System at the above subject site. |

**THESE ARE TRANSMITTED** as checked below:

- For review and comment     Approved as submitted     Resubmit \_\_\_ copies for approval
- As requested     Approved as noted     Submit \_\_\_ copies for distribution
- For approval     Return for corrections     Return \_\_\_ corrected prints
- For your files

**cc:** Mr. Robert Robles, Texaco Environmental Services (1 copy)  
Mr. Paul Priebe, Texaco Environmental Services (1 copy)

Copies: 1 to RESNA project file no. 62073.02

  
\_\_\_\_\_  
Project Manager Marc A. Briggs

3315 Almaden Expressway, Suite 34  
San Jose, CA 95118  
Phone: (408) 264-7723  
FAX: (408) 264-2435

January 13, 1994

Ms. Molly Ong  
East Bay Municipal Utility District  
Source Control Division, M.S. 702  
P.O. Box 24055, 375 11th Street, Mail Slot #702  
Oakland, California 94623

Subject: WASTEWATER DISCHARGE PERMIT #502-27801  
Self Monitoring Report for Fourth Quarter 1993 for Groundwater Treatment  
System  
Former Texaco Station,  
2225 Telegraph Avenue, Oakland, California.



Ms. Ong:

As requested by Texaco Environmental Services (TES), RESNA Industries, Inc. (RESNA) presents this letter regarding the operation and performance data collected for the groundwater treatment system at the above-subject site for Fourth Quarter 1993, in accordance with self monitoring requirements established by the East Bay Municipal Utility District (EBMUD) Wastewater Discharge Permit #502-27801.

The groundwater treatment system was installed at this site in 1990 by Harding Lawson Associates. The system was temporarily shutdown on June 4, 1992, and was reactivated on January 27, 1993. TES personnel are currently self-monitoring the operation and maintenance of the treatment system. RESNA personnel are currently the duly authorized representatives for reporting all operation and performance data collected on the groundwater treatment system (See Attachment A - Letter of Authorization). Exxon Company, U.S.A. is currently operating the site as an active service station facility.

The system was shut-down on November 15, 1993, to replace an inoperative pump and to perform preventive maintenance on the compressor. The system was restarted on January 12, 1994.

The treatment system extracts groundwater from two recovery wells RW-1 and RW-2 using air displacement pumps. Extracted groundwater is directed to a 1,000 gallon holding tank located in the treatment compound through subgrade remediation piping. The water is

contained in the tank until level sensors in the tank activate a transfer pump. The transfer pump discharges water from the tank for treatment through three carbon canisters in series prior to discharge to the sanitary sewer. A flow totalizer measures the total volume of water discharged to the sewer. Sample ports are located influent to the first carbon canister, effluent to the second carbon canister and the third carbon canister for monthly monitoring of system performance.

Water samples are collected monthly influent to the first carbon canister (CARB-INFL/INFL.), and effluent to the second carbon canister (CARB-BT2/BT2). Water samples are collected quarterly effluent to the third carbon canister (CARB-EFFL/EFFL). Collected samples are analyzed by a State Certified Laboratory (Mobile Chem Labs Inc.) for the presence of benzene, toluene, ethylbenzene, xylene (BTEX) and total petroleum hydrocarbons as gasoline (TPHg) using EPA Methods 5030/8020/8015. Analytical results are then reviewed to evaluate carbon breakthrough rates for the second carbon canister and to evaluate compliance with site specific wastewater discharge permit conditions.

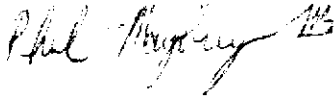
Operation and performance data for the groundwater treatment system including laboratory analyses results of water samples collected for the period of September 27, 1993 through November 15, 1993 are summarized in Table 1. Also enclosed with this letter are copies of the laboratory reports and Chain-Of-Custody forms (Attachment B), copies of the field data sheet (Attachment C), and carbon breakthrough calculations (Attachment D).

As indicated by Table 1, BTEX and TPHg concentrations in an effluent water sample (CARB-EFFL) collected on October 20, 1993 were below laboratory detection limits, and thus within EBMUD permit limits.

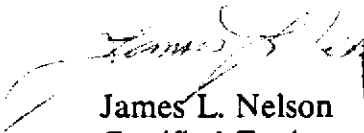
Based on the field data, it appears that a total of 28,428 gallons of water has been treated and discharged during the period of September 27 to November 15, 1993. A cumulative total of 583,679 gallons of water have been discharged to the sewer as of November 15, 1993 (see Table 1 and Attachment C).

Please call (408) 264-7723, if you have any questions or comments.

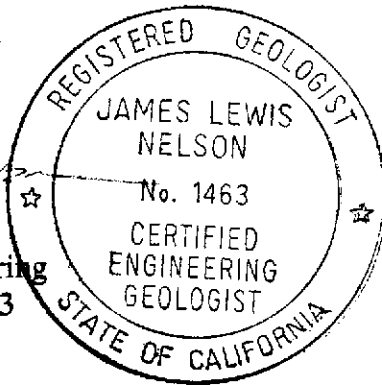
Sincerely,  
RESNA Industries Inc.



Philip J. Mayberry  
Project Geologist



James L. Nelson  
Certified Engineering  
Geologist No. 1463



cc: Mr. Robert Robles, Texaco Environmental Services  
Mr. Paul Priebe, Texaco Environmental Services

|              |               |   |
|--------------|---------------|---|
| Attachments: | Table 1:      | Operation & Performance Data for Groundwater Treatment System |
|              | Attachment A: | Letter of Authorization                                       |
|              | Attachment B: | Laboratory Reports and Chain-Of-Custody Documentation         |
|              | Attachment C: | Facility Inspection Logs                                      |
|              | Attachment D: | Carbon Breakthrough Calculations                              |

**TABLE 1: OPERATION & PERFORMANCE DATA FOR GROUNDWATER TREATMENT SYSTEM  
FOR 4th QUARTER 1993  
2255 TELEGRAPH AVENUE, OAKLAND, CALIFORNIA**

| SAMPLE DATE           | SAMPLE ID#           | CONCENTRATION IN PARTS PER BILLION (PPB) |         |         |               |               | VOL. OF WATER DISCHARGED (GALS.) |
|-----------------------|----------------------|--|---------|---------|---------------|---------------|----------------------------------|
|                       |                      | TPHg                                     | BENZENE | TOLUENE | ETHYL-BENZENE | TOTAL XYLENES |                                  |
| <b>PERMIT LIMITS*</b> |                      | NA                                       | 5       | 12      | 5             | 11            | -                                |
| 09/27/93              | CARB-INFL./INFL.     | 1,100                                    | 47      | 1.5     | <0.5          | 120           | 555,251                          |
|                       | CARB-BT2/BT2         | <50                                      | <0.5    | <0.5    | <0.5          | <0.5          |                                  |
| 10/20/93              | CARB-INFL./INFL.     | 6,100                                    | 270     | 72      | 11            | 400           | 567,610                          |
|                       | CARB-BT2/BT2         | <50                                      | <0.5    | <0.5    | <0.5          | <0.5          |                                  |
|                       | CARB-EFFL/EFFL.      | <50                                      | <0.5    | <0.5    | <0.5          | <0.5          |                                  |
| 11/15/93              | System was shut-down |  |         |         |               |               | 583,679                          |
| 01/12/94              | System was restarted |  |         |         |               |               |                                  |

**TABLE 1: OPERATION & PERFORMANCE DATA FOR GROUNDWATER TREATMENT SYSTEM  
FOR 4th QUARTER 1993  
2255 TELEGRAPH AVENUE, OAKLAND, CALIFORNIA**

| SAMPLE DATE | SAMPLE ID# | CONCENTRATION IN PARTS PER BILLION (PPB) |         |         |               |               | VOL. OF WATER DISCHARGED (GALS.) |
|-------------|------------|--|---------|---------|---------------|---------------|----------------------------------|
|             |            | TPHg                                     | BENZENE | TOLUENE | ETHYL-BENZENE | TOTAL XYLENES |                                  |

**NOTES:**

- \* EBMUD permit limits are the maximum discharge concentrations of BTEX and TPHg that can be present in treated water discharged to the sewer.
- \*\* Changed the first carbon canister out and added a new third carbon canister
- \*\*\* Despite detectable TPHg concentrations in effluent water (72 ppb), discharge permit limits were not exceeded due to non detectable levels of BTEX.
- \*\*\*\* System was shut down on 04/28/93 on realizing that detectable levels of TPHg were reported in the effluent sample from the third carbon canister on 04/15/93. A second sample was collected on 04/28/93 for verification prior to shutdown. As can be seen nondetectable levels of TPHg were reported confirming that the 04/15/93 effluent results were an anomaly.
- NA Not Applicable (Not specified)
- NS Not Sampled
- TPHg Total Petroleum Hydrocarbons as gasoline
- INF Influent to I Carbon Canister
- BT2 Effluent to II Carbon (breakthrough through No. 2 Canister)
- EFFL Effluent to III Carbon, discharged to sanitary sewer




**ATTACHMENT A**  
**LETTER OF AUTHORIZATION**

3315 Almaden Expressway, Suite 34  
San Jose, CA 95118  
Phone: (408) 264-7723  
FAX: (408) 264-2435

**LETTER OF AUTHORIZATION**

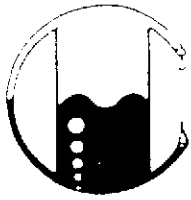
This letter authorizes the Geologic Technician (Ms. Mary Rysdale), the Project Engineer (Ms. Valli Voruganti) and/or the Project Manager (Mr. Phil Mayberry) of RESNA Industries, Inc. as the duly authorized representatives for having the responsibility of reporting all operational data collected on the groundwater remediation system at the Former Texaco station located at 2225 Telegraph Avenue, Oakland, California from which the wastewater originates. Texaco Environmental Services (TES) is currently self-monitoring the operation and maintenance of the groundwater remediation system.

  
Mr. Robert Robles  
Environmental Protection Coordinator  
Texaco Environmental Services

1/13/94  
Date of Authorization

**ATTACHMENT B**

**LABORATORY REPORTS AND CHAIN-OF-CUSTODY  
DOCUMENTATION**



# MOBILE CHEM LABS INC.

5011 Blum Road, Suite 1 • Martinez, CA 94553  
Phone (510) 372-3700 • Fax (510) 372-6955

624880195\1342\013078

Texaco Environmental Services  
108 Cutting Blvd.  
Richmond, CA 94804  
Attn: Paul Priebe  
Project Manager

Date Sampled: 10-20-93  
Date Received: 10-20-93  
Date Analyzed: 10-26-93

Sample Number  
-----  
103403

Sample Description  
-----  
Texaco - Oakland  
2225 Telgraph Ave.  
EFF WATER

## ANALYSIS

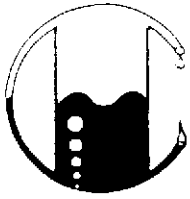
-----

|   | Detection<br>Limit<br>-----<br>ppb | Sample<br>Results<br>-----<br>ppb |
|---|------------------------------------|-----------------------------------|
| Total Petroleum Hydrocarbons<br>as Gasoline | 50                                 | <50                               |
| Benzene                                     | 0.5                                | <0.5                              |
| Toluene                                     | 0.5                                | <0.5                              |
| Xylenes                                     | 0.5                                | <0.5                              |
| Ethylbenzene                                | 0.5                                | <0.5                              |

Note: Analysis was performed using EPA methods 5030 and TPH  
LUFT with method 602 used for BTX distinction.  
(ppb) = (µg/L)

MOBILE CHEM LABS

Ronald G. Evans  
Lab Director



# MOBILE CHEM LABS INC.

5011 Blum Road, Suite 1 • Martinez, CA 94553  
Phone (510) 372-3700 • Fax (510) 372-6955

624880195\1342\013078

Texaco Environmental Services  
108 Cutting Blvd.  
Richmond, CA 94804  
Attn: Paul Priebe  
Project Manager

Date Sampled: 10-20-93  
Date Received: 10-20-93  
Date Analyzed: 10-26-93

Sample Number

103409

Sample Description

Texaco - Oakland  
2225 Telegraph Ave.  
BT-2 WATER

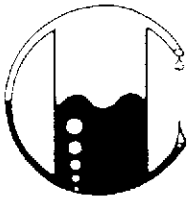
ANALYSIS

|   | <u>Detection<br/>Limit</u> | <u>Sample<br/>Results</u> |
|---|----------------------------|---------------------------|
|   | ppb                        | ppb                       |
| Total Petroleum Hydrocarbons<br>as Gasoline | 50                         | <50                       |
| Benzene                                     | 0.5                        | <0.5                      |
| Toluene                                     | 0.5                        | <0.5                      |
| Xylenes                                     | 0.5                        | <0.5                      |
| Ethylbenzene                                | 0.5                        | <0.5                      |

Note: Analysis was performed using EPA methods 5030 and TPH  
LUFT with method 602 used for BTX distinction.  
(ppb) = (µg/L)

MOBILE CHEM LABS

Ronald G. Evans  
Lab Director



# MOBILE CHEM LABS INC.

5011 Blum Road, Suite 1 • Martinez, CA 94553  
Phone (510) 372-3700 • Fax (510) 372-6955

624880195\1342\013078

Texaco Environmental Services  
108 Cutting Blvd.  
Richmond, CA 94804  
Attn: Paul Priebe  
Project Manager

Date Sampled: 10-20-93  
Date Received: 10-20-93  
Date Analyzed: 10-26-93

Sample Number  
-----  
103410

Sample Description  
-----  
Texaco - Oakland  
2225 Telgraph Ave.  
INF WATER

## ANALYSIS

-----

|   | Detection<br>Limit | Sample<br>Results |
|---|--------------------|-------------------|
|   | -----<br>ppb       | -----<br>ppb      |
| Total Petroleum Hydrocarbons<br>as Gasoline | 50                 | 6,100             |
| Benzene                                     | 0.5                | 270               |
| Toluene                                     | 0.5                | 72                |
| Xylenes                                     | 0.5                | 400               |
| Ethylbenzene                                | 0.5                | 11                |

Note: Analysis was performed using EPA methods 5030 and TPH  
LUFT with method 602 used for BTX distinction.  
(ppb) = ( $\mu\text{g/L}$ )

MOBILE CHEM LABS

Ronald G. Evans  
Lab Director



4080- Pike Lane  
Concord, CA 94520  
800-544-3422 (In CA)  
800-423-7143 (Outside CA)

**CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST** 72-13760

CUSTODY RECORD

**ANALYSIS REQUEST**

Project Manager: **Paul Priebe** Phone #: **510 2363541**  
 Address: **108 Cutting Blvd Richmond CA 94804** Site location: **2225 Telegraph Ave Oakland CA**  
 Project Number: **624880195** Project Name: **2225 Telegraph**  
 I attest that the proper field sampling procedures were used during the collection of these samples. Sampler Name (Print): **Paul Priebe**

|                               |                          |            |                          |            |                          |
|-------------------------------|--------------------------|------------|--------------------------|------------|--------------------------|
| BTEX 602                      | <input type="checkbox"/> | 8020       | <input type="checkbox"/> | with MTBE  | <input type="checkbox"/> |
| BTEX/TPH Gas                  | <input type="checkbox"/> | 602/8015   | <input type="checkbox"/> | 8020/8015  | <input type="checkbox"/> |
| TPH as Gas                    | <input type="checkbox"/> | Diesel     | <input type="checkbox"/> | Jet Fuel   | <input type="checkbox"/> |
| Product I.D. by GC (SIMDIS)   | <input type="checkbox"/> |            |                          |            |                          |
| Total Oil & Grease            | <input type="checkbox"/> | 413.1      | <input type="checkbox"/> | 413.2      | <input type="checkbox"/> |
| Total Petroleum Hydrocarbons  | <input type="checkbox"/> | 418.1      | <input type="checkbox"/> | 503E       | <input type="checkbox"/> |
| EPA 601                       | <input type="checkbox"/> | 8010       | <input type="checkbox"/> | DCA only   | <input type="checkbox"/> |
| EPA 602                       | <input type="checkbox"/> | 8020       | <input type="checkbox"/> |            | <input type="checkbox"/> |
| EPA 608                       | <input type="checkbox"/> | 8080       | <input type="checkbox"/> | PCBs only  | <input type="checkbox"/> |
| EPA 610                       | <input type="checkbox"/> | 8310       | <input type="checkbox"/> |            | <input type="checkbox"/> |
| EPA 624                       | <input type="checkbox"/> | 8240       | <input type="checkbox"/> | NBS +15    | <input type="checkbox"/> |
| EPA 625                       | <input type="checkbox"/> | 8270       | <input type="checkbox"/> | NBS +25    | <input type="checkbox"/> |
| EPTOX: Metals                 | <input type="checkbox"/> | Pesticides | <input type="checkbox"/> | Herbicides | <input type="checkbox"/> |
| TCLP Metals                   | <input type="checkbox"/> | VOA        | <input type="checkbox"/> | Semi-VOA   | <input type="checkbox"/> |
| EPA Priority Pollutant Metals | <input type="checkbox"/> | HSL        | <input type="checkbox"/> |            | <input type="checkbox"/> |
| LEAD 7420                     | <input type="checkbox"/> | 7421       | <input type="checkbox"/> | 239.2      | <input type="checkbox"/> |
| CAM Metals                    | <input type="checkbox"/> | STLC       | <input type="checkbox"/> | TTLc       | <input type="checkbox"/> |
| Corrosivity                   | <input type="checkbox"/> | Flashpoint | <input type="checkbox"/> | Reactivity | <input type="checkbox"/> |

| Field Sample ID | Source of Sample | GTEL Lab # (Lab use only) | # CONTAINERS | Matrix                              |      |     |       | Method Preserved |      |       |     | Sampling |       |      |          |      |
|-----------------|------------------|---------------------------|--------------|-------------------------------------|------|-----|-------|------------------|------|-------|-----|----------|-------|------|----------|------|
|                 |                  |                           |              | WATER                               | SOIL | AIR | OTHER | HCl              | HNO3 | H2SO4 | ICE | NONE     | OTHER | DATE | TIME     |      |
| EFF             | Carbon System    |                           | 2            | <input checked="" type="checkbox"/> |      |     |       |                  |      |       |     |          |       |      |          |      |
| BT-2            |                  |                           | 2            | <input checked="" type="checkbox"/> |      |     |       |                  |      |       |     |          |       |      |          |      |
| INF             |                  |                           | 2            | <input checked="" type="checkbox"/> |      |     |       |                  |      |       |     |          |       |      | 10-20-93 | 8:30 |

**SPECIAL HANDLING**  
 24 HOURS   
 EXPEDITED 48 Hours   
 SEVEN DAY   
 OTHER \_\_\_\_\_ (#) BUSINESS DAYS  
 QA/QC CLP Level  Blue Level   
 FAX

**SPECIAL DETECTION LIMITS (Specify)**  
  
**SPECIAL REPORTING REQUIREMENTS (Specify)**

**REMARKS:**  
 ON ICE NO head space

Lab Use Only \_\_\_\_\_ Storage Location \_\_\_\_\_  
 Lot #: \_\_\_\_\_ Work Order #: \_\_\_\_\_

|                          |          |       |
|--------------------------|----------|-------|
| Relinquished by Sampler: | Date:    | Time: |
| <i>Paul Priebe</i>       | 10-20-93 | 10:04 |
| Relinquished by:         | Date:    | Time: |
|                          | 10-20-93 | 10:04 |
| Relinquished by:         | Date:    | Time: |
|                          |          |       |

Received by Laboratory: **DAVE KEVINE** Way bill # \_\_\_\_\_

**ATTACHMENT C**  
**FACILITY INSPECTION LOGS**



FACILITY INSPECTION LOG  
Groundwater Treatment System  
2225 Telegraph Ave.  
Oakland, California

| Date                | Time  | Discharge Flow Totalizer | Activity/Observations   | Operator Initials | Company or Agency |
|---------------------|-------|--------------------------|---|-------------------|-------------------|
| 5-10-93             | 7:55  | 009511 $\frac{0}{8}$     | Jenifer Smith EB MUD<br>Took EFF H <sub>2</sub> O Sample                      | PGP               | TEXACO /<br>EBMUD |
| 5-14-93             | 10:00 | 009856 $\frac{0}{8}$     | Took BT-2 and INF Sample<br>Cleared Filter And Compond<br>RT 350355 R2-547530 | PGP               | TES.              |
| 6-1-93              | 8:00  | 010991 $\frac{0}{8}$     | Took BT-2 and INF Sample<br>Cleared Filter                                    | PGP               | TES               |
| 6-4-93              | 8:20  | 011882 $\frac{4}{8}$     | Took BT-2 and INF Sample<br>Cleared Filter Drained Air Comp                   | PGP               | TES               |
|                     |       |                          | R2-572440<br>R1-362212  | <del>PGP</del>    | <del>TES</del>    |
| 6-29-93             | 17:40 | 012634 $\frac{0}{9}$     | Sampled BT-2 and INF<br>Cleared Filter  | PGP               | TES               |
| 7-21-93             | 19:00 | 012682 $\frac{0}{8}$     | System Down Restart<br>Cleared Probs Sampled                                  | PGP               | TES               |
|                     |       |                          | EFF, BT-2 INF   |                   |                   |
| 8-9-93              | 7:00  | 013375 $\frac{0}{8}$     | Sampled BT-2 and Inf  | PGP               | TES.              |
| 8-27-93             | 8:30  | 013896 $\frac{6}{8}$     | Sampled BT-2 and INF<br>Oiled AC  | PGP               | TES.              |
|                     |       |                          | R1 367676 Fixed Probs<br>R2 610196 Cleared Probs                              |                   |                   |
| 9-27-93             | 16:25 | 015618 $\frac{0}{7}$     | Sampled BT-2 and Inf<br>RT 396080   | PGP               | TES               |
| <del>10-20-93</del> |       |                          | R2 619607   |                   |                   |
| 10-20-93            | 9:30  | 016854 $\frac{0}{8}$     | Sampled EFF, BT-2 and INF<br>From Between Tank and Carbon INF                 | PGP               | TES               |

Pumped out Containment Sump

FACILITY INSPECTION LOG  
Groundwater Treatment System  
2225 Telegraph Ave.  
Oakland, California

| Date     | Time | Discharge Flow Totalizer | Activity/Observations   | Operator Initials | Company or Agency |
|----------|------|--------------------------|---|-------------------|-------------------|
| 11-15-93 | 2:30 | 18461 $\frac{6}{5}$      | System Down. Air Compressor need oil change Possible Air Problem with Pumps | PGL               | TES               |
|          |      |                          |   |                   |                   |
|          |      |                          |   |                   |                   |
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|          |      |                          |   |                   |                   |
|          |      |                          |   |                   |                   |

**ATTACHMENT D**  
**CARBON BREAKTHROUGH CALCULATIONS**

**CARBON BREAKTHROUGH CALCULATIONS**

**Design Criteria**

Volume of wastewater treated = 28,428 gallons  
 Days of operation = 49 days (September 27, 1993, through November 15, 1993)  
 Avg. Influent TPHg Conc. = 3,600 (based on cumulative results of laboratory analyses of influent water samples (Table 1))  
 Carbon Canisters = Three, 200-pound activated liquid-phase carbon canisters

**Assumptions**

- 1) Based on manufacturer's specifications on liquid-phase carbon, carbon has an adsorption capacity of:

5 pounds (lbs) TPHg/100 lbs carbon = 10 lbs TPHg/200-lb carbon canister

- 2) Breakthrough is said to have occurred when the first reported detectable levels of hydrocarbons are detected at the sample port downstream of the second carbon (CARB-BT2/BT2).

**Breakthrough Calculations**

The average amount of TPHg in pounds per gallon, before activated carbon treatment, is calculated below:

$$\frac{3,600 \mu\text{grams TPHg}}{1 \ell \text{ H}_2\text{O}} \times \frac{1 \text{ gram}}{1,000,000 \mu\text{grams}} \times \frac{1 \text{ lb}}{454 \text{ grams}} \times \frac{3.785 \ell}{1 \text{ gallon}} = \frac{3.0 \times 10^{-5} \text{ lbs TPHg}}{1 \text{ gallon H}_2\text{O}}$$

The amount of TPHg in pounds to be treated during this 49 day period on a pound per day basis (lb/day), before activated carbon treatment is calculated below:

$$\frac{3.0 \times 10^{-5} \text{ lbs TPH}}{1 \text{ gallon } H_2O} \frac{28,428 \text{ gallons}}{49 \text{ days}} = \frac{0.017 \text{ lbs TPHg}}{1 \text{ day}}$$

Carbon breakthrough rate after flow through two carbon canisters is calculated as follows:

$$\frac{5 \text{ lb TPHg}}{100 \text{ lbs Carbon}} \frac{200 \text{ lb Carbon}}{\text{One Canisters}} \frac{1 \text{ day}}{0.017 \text{ lb TPHg}} = \frac{588 \text{ days}}{\text{One Canister}}$$

Thus at the design criteria detailed above, liquid-phase carbon changeout will be required approximately every nineteen (19) months.