**Woodward-Clyde**

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Recommended Monitoring

January 8, 1997
92C0414A

Mr. Barney Chan
Alameda County Department of Environmental Health
Hazardous Materials Division
1131 Harbor Bay Parkway, Suite 200
Alameda, CA 94502

**Re: City of Oakland - Municipal Service Center, 7101 Edgewater Drive, Oakland, California**

**Subject: August 1996 Groundwater Monitoring Report**

Dear Mr. Cotton:

Enclosed is a copy of Baseline Environmental Consulting's August 1996 Groundwater Monitoring Report, dated October 10, 1996. The report includes the analytical results from the August 1996 and past sampling events as well as a groundwater flow direction and gradient map using August 27, 1996 water level data.

After evaluation of groundwater monitoring data through August 1996, Woodward-Clyde Consultants (WCC) recommend the following modifications to future groundwater monitoring events:

**Groundwater Monitoring Frequency Modification**

WCC recommends decreasing groundwater monitoring frequency from quarterly to semi-annual for wells MW-1, MW-2, MW-5 and MW-6. Annual monitoring is recommended for MW-7. Future semi-annual groundwater monitoring would be conducted in February and August and summarized in corresponding semi-annual groundwater monitoring reports. Annual monitoring of MW-7 is recommended in February because the water table is expected to be highest during the winter (rainy season) months, maximizing the potential for mobilizing TPH and TPH-related constituents (if present) in soil within the zone of seasonal water table fluctuation.

Through August 1996 eight water quality monitoring rounds have been conducted on wells MW-1, MW-2, MW-5, MW-6 and MW-7. This includes completion of six successive quarterly groundwater monitoring events in April, July and November 1995 and February, May and August 1996.

Review of historic groundwater sample data, summarized on Tables 1 and 2 (attached), indicates that Total Petroleum Hydrocarbon (TPH), benzene, toluene, ethylbenzene, total xylene (BTEX) and metal concentrations have been fairly stable, to the point where continued quarterly



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monitoring is not expected to enhance the current understanding of groundwater quality. As such semi-annual sampling is considered sufficient to achieve monitoring goals.

In order to compare Oakland MSC groundwater quality to available regulatory criteria, Tables 1 and 2 include Tier 1 Cleanup Standards for the saltwater ecological protection zone that have been established for San Francisco International Airport (SFO) (California Regional Water Quality Control Board, San Francisco Bay Region Order No. 95-136). The SFO Tier 1 Cleanup Standards are shown because the cultural (industrial) and environmental settings for SFO and the Oakland MSC are similar. Shallow groundwater at the Oakland MSC is brackish and is not considered useable as drinking water under natural conditions. As such, an appropriate evaluation of risk for Oakland MSC site groundwater would be applied to protection of saltwater ecological receptors (i.e., San Leandro Bay), similar to that of SFO.

**Sample Analyses Modifications**

WCCs recommended modifications for future groundwater sample analyses are summarized on Table 3 (attached). Analyses performed on the August 1996 groundwater samples are designated with the letter P. Recommended analyses are designated by the letter R. Consistent with previous sample analyses modifications, discontinuation of specific analysis is recommended after non-detection in four successive sampling events. The rationale for these modifications is outlined below for each well:

MW-1 TPH as gasoline (TPHg) and BTEX analyses will continue because of continued detections. WCC also recommends the addition of TPH as diesel (TPHd) analysis. Although MW-1 groundwater samples have never been analyzed for TPHd, it is recommended because it has been detected in groundwater samples from nearby temporary wells installed as part of the Additional Groundwater Characterization Investigation. (The results of the Additional Groundwater Characterization Investigation will be included in a summary report, due in January 1997).

TPHg, BTEX & TPHd

MW-2 Addition of TPHd is recommended as rationalized for MW-1. BTEX analyses will continue because benzene was detected. While lead has not been detected in the three quarterly sample events prior to August 1996, analysis in February 1997 is recommended because of inconclusive August 1996 sample results (sample filtered after preservation). Discontinuation of lead analyses will be recommended if it is not detected in the February 1997 sample.

TPHg BTEX & TPHd

MW-5 TPHg, TPHd, TPH as kerosene (TPHk) and BTEX analyses will continue. Discontinuing analyses for TPH as motor oil (TPHmo) and zinc is recommended because of non-detection in at least the last four quarterly samples. Discontinuation of TPHk will be recommended if it is not detected in the February 1997 semi-annual groundwater sample.

MW-6 Analyses for TPHg, TPHd and BTEX will continue because of continued detections. Elimination of cadmium, chromium and lead is recommended because of non detection in at least the last four quarterly sampling rounds. Discontinuation of zinc analyses is also recommended because concentrations, when detected, have been low (0.01 and 0.015 mg/L). Discontinuation of nickel analysis is recommended because detections in the last four monitoring events (0.02 mg/L maximum) have been low.

MW-7 One more round of BTEX analyses is recommended. Although benzene, toluene and ethylbenzene have never been detected in previous samples, xylene was detected (at 1.5 mg/L) in November 1995. While xylene has not been detected in the last three quarters, one more sample should be analyzed to clearly establish non-detection. Discontinuation of BTEX analyses will be recommended if these compounds are not detected in the February 1997 semi-annual groundwater sample. WCC recommends discontinuing lead, cadmium and chromium analyses because those metals have not been detected in at least the last four monitoring events. WCC also recommends discontinuing zinc analysis because it has only been quantified at low concentrations (0.11 mg/L maximum). WCC recommends continuing nickel analyses because it continues to be detected at or above 0.1 mg/L.

**Continued Silica Gel Cleanup**

WCC recommends continuing the silica gel cleanup (EPA Method 3630M) of future samples being analyzed for total extractable hydrocarbons (TPHd and TPHk) to minimize potential interference by biogenic materials.

**Continued Water Level Monitoring**

WCC recommends continued water level monitoring of all Oakland MSC monitoring wells (including MW-3 and MW-4) during future groundwater monitoring events. The water levels should be measured within a one hour time frame to ensure evaluation of same time/tide water levels. The round of water level measurements for any monitoring event should be completed at

either high, slack or low tide and the local tidal cycle for the day of measurement should be included in the monitoring event report.

Please call Al Ridley (510)874-3125 or George Muehleck (510)874-3080 if you have any questions on this letter or the August 1996 Groundwater Monitoring Report.

Sincerely,

Albert P Ridley, C.E.G..
Project Manager

George Muehleck, R.G.
Senior Project Hydrogeologist

Attachments:

Table 1 Summary of Groundwater Sample Analytical Results - TPH and BTEX
Table 2 Summary of Groundwater Sample Analytical Results - Metals
Table 3 Recommended Analyses for Future Groundwater Samples

Enclosures: August 1996 Groundwater Monitoring Report - City of Oakland Municipal Service Center, Baseline Environmental Consulting, dated October 10, 1996

cc: Joseph Cotton, City of Oakland
Andrew Clark-Clough, City of Oakland
Rhodora Del Rosario, Baseline Environmental Consulting
Dan Schoenholz, Port of Oakland, Environmental Department
California Regional Water Quality Control Board, San Francisco Bay Region
File

# TABLE 1

## SUMMARY OF GROUNDWATER SAMPLE ANALYTICAL RESULTS
## TPH and BTEX
### CITY OF OAKLAND
### MUNICIPAL SERVICE CENTER

| | | TPH-gasoline 5030/8015M mg/L | TPH-kerosene 3510/8015M mg/L | TPH-diesel 3510/8015M mg/L | TPH-motor oil 3510/8015M mg/L | TRPH 418.1 mg/L | Benzene 8020 and/or 8240 ug/L | Toluene 8020 and/or 8240 ug/L | Ethylbenzene 8020 and/or 8240 ug/L | Xylenes 8020 and/or 8240 ug/L |
|---|---|---|---|---|---|---|---|---|---|---|
| SFO Saltwater Tier 1 | | 0.1 | NE | 0.1 | NE | NE | 71 | 5,000 | 43 | 2,200 |
| MW-1 | 10/4/89 | 0.54 | -- | -- | -- | -- | 120 | 46 | 43 | 78 |
| | 10/4/89 | -- | -- | -- | -- | -- | 65 | 26 | 14 | 22 |
| | 4/27/93 | < 1 | -- | -- | -- | < 1 | < 1 | < 1 | < 1 | < 1 |
| | 4/19/95 | 3.2 | -- | -- | -- | -- | 880 | 15 | 23 | 21 |
| | 7/27/95 | 0.98 | -- | -- | -- | -- | 130 | 3.6 | 1.4 | 5.6 |
| | 11/20/95 | 0.4 | -- | -- | -- | -- | 99 | 2.8 | 1.1 | 4.6 |
| | 2/21/96 | 1.7 | -- | -- | -- | -- | 340 | 8.4 | 5.3 | 16 |
| | 5/13/96 | 7.3 | -- | -- | -- | -- | 2000 | 30 | 42 | 38 |
| | 8/27/96 | 0.38 | -- | -- | -- | -- | 61 | 2.4 | < 0.5 | 4.2 |
| MW-2 | 10/4/89 | < 0.03 | -- | -- | -- | -- | 2 | < 2 | < 2 | < 2 |
| | 10/4/89 | -- | -- | -- | -- | -- | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| | 4/27/93 | < 1 | -- | -- | -- | < 1 | < 1 | < 1 | < 1 | < 1 |
| | 4/19/95 | < 0.05 | -- | -- | -- | -- | 1.8 | < 0.5 | < 0.5 | < 0.5 |
| | 7/27/95 | < 0.05 | -- | -- | -- | -- | 2.3 | < 0.5 | < 0.5 | < 0.5 |
| | 11/20/95 | < 0.05 | -- | -- | -- | -- | 2.2 | < 0.5 | < 0.5 | < 0.5 |
| | 2/21/96 | < 0.05 | -- | -- | -- | -- | 1.7 | < 0.5 | < 0.5 | < 0.5 |
| | 5/13/96 | -- | -- | -- | -- | -- | 2 | < 0.5 | < 0.5 | < 0.5 |
| | 8/27/96 | -- | -- | -- | -- | -- | 2.4 | < 0.5 | < 0.5 | < 0.5 |
| MW-5 | 12/31/91 | 16 | -- | 1.9 | -- | -- | 1800 | < 250 | 1000 | 3800 |
| | 12/31/91 | 13 | -- | -- | -- | -- | 1500 | 190 | 970 | 2500 |
| | 4/27/93 | 35 | -- | 12 | -- | 9 | 2100 | < 1.0 | 1800 | 2700 |
| | 4/19/95 | 14 | -- | 0.88 | -- | 4.7 | 490 | 51 | 610 | 1200 |
| | 7/27/95 | 22 | -- | 0.59 | -- | 5 | 1300 | 54 | 1500 | 2400 |
| | 11/20/95 | 8.9 | 1.9 | < 0.05 | < 0.5 | -- | 430 | 31 | 610 | 880 |

# TABLE 1

## SUMMARY OF GROUNDWATER SAMPLE ANALYTICAL RESULTS
## TPH and BTEX
### CITY OF OAKLAND
### MUNICIPAL SERVICE CENTER

| | | TPH-gasoline 5030/8015M mg/L | TPH-kerosene 3510/8015M mg/L | TPH-diesel 3510/8015M mg/L | TPH-motor oil 3510/8015M mg/L | TRPH 418.1 mg/L | Benzene 8020 and/or 8240 ug/L | Toluene ug/L | Ethylbenzene ug/L | Xylenes ug/L |
|---|---|---|---|---|---|---|---|---|---|---|
| SFO Saltwater Tier 1 | | 0.1 | NE | 0.1 | NE | NE | 71 | 5,000 | 43 | 2,200 |
| MW-5 | 2/21/96 | 10 | < 0.05 | 0.48 | < 0.5 | -- | 540 | 65 | 700 | 970 |
| (con't) | 5/13/96 | 5.9 | < 0.05 | < 0.05 | < 0.5 | -- | 430 | 26 | 580 | 760 |
| | 5/13/96 | 7.3 | < 0.05 | < 0.05 | < 0.5 | -- | 360 | 22 | 490 | 640 |
| | 8/27/96 | 6.6 | < 0.051 | 2 | < 0.51 | -- | 430 | 27 | 600 | 650 |
| | 8/27/96 | 6.3 | < 0.051 | 0.66 | < 0.51 | -- | 410 | 25 | 580 | 620 |
| MW-6 | 12/31/91 | 0.78 | -- | 0.52 | -- | -- | 110 | 2.7 | < 2.5 | 5.5 |
| | 12/31/91 | -- | -- | -- | -- | -- | 95 | 5 | < 5 | < 5 |
| | 4/27/93 | < 1 | -- | < 1 | -- | < 1 | 430 | 4 | 5 | 10 |
| | 4/27/93 | -- | -- | -- | -- | -- | 300 | < 5 | < 5 | < 5 |
| | 4/19/95 | 5.7 | -- | 6.7 | -- | -- | 40 | < 0.5 | 3.9 | 29 |
| | 4/19/95 | 3 | -- | 3.7 | -- | -- | 310 | 3.1 | 2.7 | 100 |
| | 7/27/95 | 6.1 | -- | 3.9 | -- | -- | 430 | 15 | 200 | 600 |
| | 7/27/95 | 6.3 | -- | 2.6 | -- | -- | 420 | -- | -- | -- |
| | 11/20/95 | 6.8 | -- | 0.85 | -- | -- | 160 | 4.6 | 8 | 240 |
| | 11/20/95 | 3.6 | -- | 0.83 | -- | -- | 130 | 11 | 4.4 | 200 |
| | 2/21/96 | 2.8 | -- | 1.7 | -- | -- | 230 | 2.8 | 3.8 | 44 |
| | 2/21/96 | 2.2 | -- | 2.5 | -- | -- | 280 | 3 | 4 | 46 |
| | 5/13/96 | 3.1 | < 0.05 | 0.4 | < 0.5 | -- | 430 | 12 | 5.2 | 67 |
| | 8/27/96 | 4.2 | -- | 3.1 | -- | -- | 300 | 9.3 | 110 | 110 |
| MW-7 | 12/31/91 | < 0.05 | -- | < 0.05 | -- | -- | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| | 12/31/91 | -- | -- | -- | -- | -- | < 5 | < 5 | < 5 | < 5 |
| | 4/27/93 | < 1 | -- | < 1 | -- | < 1 | < 1 | < 1 | < 1 | < 1 |
| | 4/19/95 | < 0.05 | -- | < 0.05 | -- | < 1 | < 2 | < 2 | < 2 | < 2 |
| | 7/27/95 | < 0.05 | -- | < 0.05 | -- | < 1 | < 2 | < 2 | < 2 | < 2 |

# TABLE 1

## SUMMARY OF GROUNDWATER SAMPLE ANALYTICAL RESULTS
## TPH and BTEX
### CITY OF OAKLAND
### MUNICIPAL SERVICE CENTER

| | | TPH-gasoline 5030/8015M mg/L | TPH-kerosene 3510/8015M mg/L | TPH-diesel 3510/8015M mg/L | TPH-motor oil 3510/8015M mg/L | TRPH 418.1 mg/L | Benzene 8020 and/or 8240 ug/L | Toluene ug/L | Ethylbenzene ug/L | Xylenes ug/L |
|---|---|---|---|---|---|---|---|---|---|---|
| SFO Saltwater Tier 1 | | 0.1 | NE | 0.1 | NE | NE | 71 | 5,000 | 43 | 2,200 |
| MW-7 | 11/20/95 | < 0.05 | -- | < 0.05 | -- | -- | < 0.5 | < 0.5 | < 0.5 | 1.5 |
| (con't) | 2/21/96 | < 0.05 | -- | < 0.05 | -- | -- | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| | 5/13/96 | -- | -- | -- | -- | -- | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| | 8/27/96 | -- | -- | -- | -- | -- | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| MW-500 | 4/19/95 | < 0.05 | -- | -- | -- | -- | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| | 7/27/95 | < 0.05 | -- | -- | -- | -- | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| | 11/20/95 | < 0.05 | -- | -- | -- | -- | < 0.5 | < 0.5 | 0.5 | < 0.5 |
| | 2/21/96 | < 0.05 | -- | -- | -- | -- | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| | 5/13/96 | < 0.05 | -- | -- | -- | -- | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| | 8/27/96 | < 0.05 | -- | -- | -- | -- | < 0.5 | < 0.5 | < 0.5 | < 0.5 |

Notes:
TPH - Total Petroleum Hydrocarbons
TRPH - Total Recoverable Petroleum Hydrocarbons
MW-500 - trip blank sample
-- indicates that the sample was not analyzed for specific analysis listed.
NE - Not Established
SFO Saltwater Tier 1 - San Francisco International Airport Tier 1 water quality criteria for saltwater ecological protection zone (RWQCB Order No. 95-136) included for comparison only.

# TABLE 2

## SUMMARY OF GROUNDWATER SAMPLE ANALYTICAL RESULTS
## METALS
### CITY OF OAKLAND
### MUNICIPAL SERVICE CENTER
(results in mg/L)

| | | Lead | Cadmium | Chromium | Nickel | Zinc |
|---|---|---|---|---|---|---|
| SFO Saltwater Tier 1 | | 0.0056 | 0.0093 | 0.05 | 0.0071 | 0.058 |
| MW-1 | 10/4/89 | -- | -- | -- | -- | -- |
| | 4/27/93 | < 0.003 | -- | -- | -- | -- |
| | 4/19/95 | < 0.01 | -- | -- | -- | -- |
| | 7/27/95 | < 0.01 | -- | -- | -- | -- |
| | 11/20/95 | < 0.01 | -- | -- | -- | -- |
| | 2/21/96 | < 0.01 | -- | -- | -- | -- |
| MW-2 | 10/4/89 | -- | -- | -- | -- | -- |
| | 4/27/93 | 0.083 | -- | -- | -- | -- |
| | 4/19/95 | 0.1 | -- | -- | -- | -- |
| | 7/27/95 | 0.07 | -- | -- | -- | -- |
| | 11/20/95 | < 0.01 | -- | -- | -- | -- |
| | 2/21/96 | < 0.01 | -- | -- | -- | -- |
| | 5/13/96 | < 0.005 | -- | -- | -- | -- |
| | 8/27/96 | 0.47 | sample filtered after preservation | | -- | -- |
| MW-5 | 12/31/91 | 0.173 | -- | 0.0226 | < 0.04 | 0.201 |
| | 4/27/93 | < 0.003 | < 0.005 | 0.03 | < 0.02 | < 0.02 |
| | 4/19/95 | < 0.01 | < 0.005 | < 0.01 | < 0.01 | 0.02 |
| | 7/27/95 | < 0.01 | < 0.005 | < 0.01 | < 0.01 | < 0.01 |
| | 11/20/95 | < 0.01 | < 0.005 | < 0.01 | < 0.01 | < 0.01 |
| | 2/21/96 | < 0.01 | < 0.005 | < 0.01 | < 0.01 | < 0.01 |
| | 5/13/96 | -- | -- | -- | -- | < 0.01 |
| | 5/13/96 | -- | -- | -- | -- | < 0.01 |
| | 8/27/96 | -- | -- | -- | -- | < 0.01 |
| | 8/27/96 | -- | -- | -- | -- | 0.01 |
| MW-6 | 12/31/91 | 1.04 | -- | 0.0422 | 0.126 | 0.837 |
| | 4/27/93 | < 0.003 | -- | -- | -- | -- |
| | 4/19/95 | 0.41 | -- | -- | -- | -- |
| | 4/19/95 | 0.39 | -- | -- | -- | -- |
| | 7/27/95 | < 0.001 | -- | -- | -- | -- |
| | 7/27/95 | < 0.01 | -- | -- | -- | -- |
| | 11/20/95 | < 0.01 | < 0.005 | < 0.01 | 0.01 | 0.01 |
| | 11/20/95 | < 0.01 | < 0.005 | < 0.01 | 0.02 | < 0.01 |
| | 2/21/96 | < 0.01 | < 0.005 | < 0.01 | 0.02 | < 0.01 |
| | 2/21/96 | < 0.01 | < 0.005 | < 0.01 | 0.02 | < 0.01 |
| | 5/13/96 | < 0.005 | < 0.002 | < 0.005 | 0.016 | < 0.01 |
| | 8/27/96 | < 0.005 | < 0.002 | < 0.005 | 0.017 | 0.015 |

# TABLE 2

## SUMMARY OF GROUNDWATER SAMPLE ANALYTICAL RESULTS
## METALS
### CITY OF OAKLAND
### MUNICIPAL SERVICE CENTER
(results in mg/L)

| | | Lead | Cadmium | Chromium | Nickel | Zinc |
|---|---|---|---|---|---|---|
| SFO Saltwater Tier 1 | | 0.0056 | 0.0093 | 0.05 | 0.0071 | 0.058 |
| MW-7 | 12/31/91 | 0.0114 | -- | 0.0106 | 0.27 | 0.101 |
| | 4/27/93 | < 0.003 | 0.009 | 0.19 | 0.3 | 0.05 |
| | 4/19/95 | < 0.01 | 0.069 | 0.07 | 0.08 | 0.04 |
| | 7/27/95 | < 0.01 | < 0.005 | < 0.01 | 0.08 | 0.11 |
| | 11/20/95 | < 0.01 | < 0.005 | < 0.01 | 0.14 | 0.02 |
| | 2/21/96 | < 0.01 | < 0.005 | < 0.01 | 0.24 | 0.06 |
| | 5/13/96 | -- | < 0.002 | < 0.005 | 0.12 | 0.015 |
| | 8/27/96 | -- | < 0.002 | < 0.005 | 0.092 | 0.03 |

Notes:
Samples analyzed by EPA Method 3010A M/6010
-- indicates that the sample was not analyzed for specific analysis listed.
NE - Not Established
SFO Saltwater Tier 1 - San Francisco International Airport Tier 1 Water Quality Criteria for saltwater ecological protection zone (RWQCB Order No. 95-136) included for comparison only.

# TABLE 3

## RECOMMENDED ANALYSES FOR FUTURE GROUNDWATER SAMPLES
### CITY OF OAKLAND
### MUNICIPAL SERVICE CENTER

| Location | Monitoring Frequency | TOTAL PETROLEUM HYDROCARBONS | | | | BTEX[2] | METALS[3] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Gasoline (5030/8015) | Diesel[1] (3510/8015) | Kerosene[1] (3510/8015) | Motor Oil[1] (3510/8015) | (8020) | Cadmium (6010) | Chromium (6010) | Lead (6010) | Nickel (6010) | Zinc (6010) |
| MW-1 | SA | PR | R | -- | -- | PR | -- | -- | -- | -- | -- |
| MW-2 | SA | -- | R | -- | -- | PR | -- | -- | PR | -- | -- |
| MW-5 | SA | PR | PR | PR | PR | PR | -- | -- | -- | -- | P |
| MW-6 | SA | PR | PR | -- | -- | PR | P | P | P | P | P |
| MW-7 | A | -- | -- | -- | -- | PR | P | P | -- | PR | P |
| Trip Blank[4] | | PR | -- | -- | -- | PR | -- | -- | -- | -- | -- |

Notes:
-- = not analyzed
Number shown in parentheses indicates the EPA method used for analysis.
Recommended modifications based on evaluation of data through August 1996
SA - Semi Annual Monitoring (February and August)
A - Annual Monitoring (February)
P - Analyses Performed in August 1996
R - Recommended Analyses
[1] EPA Method 3630M Silica Gel Cleanup
[2] BTEX - Benzene, toluene, ethylbenzene, and xylenes
[3] All samples for metals analyses are to be filtered in the laboratory
[4] Labeled MW-500 on chain-of-custody form