



SMITH-EMERY GEOSERVICES

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PROTECTION

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**TIER-1 RISK BASED
CORRECTIVE ACTION ASSESSMENT**

**3925 ALAMEDA AVENUE
OAKLAND, CALIFORNIA**

5/15/97

Prepared for
Smooke & Sons Investment Co.

By
Smith-Emery GeoServices

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EXECUTIVE SUMMARY

The site is a commercial property in an industrial sector in west Oakland, adjacent to and downgradient of the former Ekotek refinery facility. The vicinity contains several LUST sites other than the Ekotek facility, including the former American National Can facility, the Shell Oil station, the City of Oakland property at 569 High Street, the Cobblestick-Kibbe site on High Street, and the Owens-Illinois and the Learner Company sites on Alameda Avenue. The landuse issues related to the Ekotek facility's history dominate the environmental conditions in the industrial corridor of the subject site.

The subject property had two on-site underground storage tanks, one 10,000-gallon diesel and one 1,000-gallon gasoline, removed in March of 1988. Analytical evidence of a gasoline and a diesel release was found under the tanks at that time. Additional soil and water analyses in March of 1994 confirmed gasoline, diesel, kerosene, and BTEX in the shallow subsurface in the immediate vicinity of the former tank pit. The groundwater monitoring program has been in place since three wells were installed in the third quarter of 1995.

The characterization of the hydrocarbon plume specific to the subject property was carried out by means of GeoProbes and installation of a fourth well in late 1996. The plume related to the former onsite tanks was defined is stable within an area enclosing and downgradient of the former onsite tank pit. The shallow groundwater in this area is not used as a source of drinking water, and does not have a known pathway to the surface.

This Tier 1 RBCA evaluation classifies the benzene in groundwater at the site as low risk. The site has been monitored for more than one complete hydrological cycle, and demonstrates stability with respect to plume parameters and hydrocarbon concentrations. The site has herein been determined not pose a threat to human health, the environment, or any sensitive nearby receptors. We find that existing database of site characterization and monitoring fully supports site categorization as a low-risk groundwater case in accordance with current regulatory guidance, as per Regional Board memorandum of January 5, 1996. Regulatory site closure is requested based on the site's low-risk Tier 1 RBCA status, and its confirmed remedial strategy of passive hydrocarbon attenuation under stable hydrological conditions.

INTRODUCTION

Smith-Emery GeoServices is pleased to present this report of a Tier-1 evaluation for the above referenced site using the ASTM E1739-95 (hereafter, ASTM) standard for Risk-Based Corrective Action (RBCA) assessments. The location of the site is shown on the Vicinity Map, Plate 1. The locations of the onsite monitoring wells and the latest estimated area of the onsite plume of hydrocarbons are presented on the Plot Plan, Plate 2. The subject property is owned and managed by Smooke & Sons Investment Co. (our client), and leased by Bobac Oakland C.F.S., a certified freight transport service.

The details of the original monitoring well installations were presented in Smith-Emery GeoServices Report No. 95-187, dated August 22, 1995. The installation of Monitoring Well MW4 was reported in SEG Report No. 96-621, dated December 16, 1996.

PURPOSE

The purpose of this report is to perform a Tier 1 RBCA qualitative evaluation for the potential risks posed to human health and the environment by the site's petroleum release, and to document the technical support for site closure determination requested herein. Regulatory oversight of the site is provided by the local agency, the Alameda County Department of Environmental Health (ACDEH).

SCOPE OF SERVICES

Smith-Emery GeoServices' scope of services for this project included:

- Review of database of site groundwater sampling and analytical testing;
- Application of the ASTM Tier 1 RBCA process;
- Presentation of this report of our findings.

GENERAL SETTING

The vicinity of the site is the predominantly industrial sector of Oakland that lies between Interstate-880 and the Tidal Canal of Alameda, stretching from the Oakland Airport to the Port of Oakland. The site is in the industrial corridor along Alameda Avenue from High Street to Fruitvale Avenue. This locality is part of the East Bay Plain of the Coast Range physiographic province of northern California. The site location is shown on the Vicinity Map, Plate 1, and on the Benzene Concentration Plate, Plate 2.

The land survey for this project referenced City of Oakland benchmark BM19NW24 at the corner of Alameda Avenue and Eighth Street, which has an elevation of 9.664 feet above mean sea level (MSL). The survey of the well casings indicates that the site's surface elevations range from approximately 9 feet above MSL along the Alameda Avenue frontage, to approximately 8 feet above MSL at the rear of the property. The surface in the general area slopes to the southwest toward the nearest body of open water, the Tidal Canal of the Alameda Harbor, which lies approximately 1,000 feet to the southwest.

The landuse of the adjacent sites is commercial/industrial. The nearest residential areas are located approximately 1,000 feet upgradient along East Eighth Street. No residential areas lie downgradient of the subject site, due to the proximity to the Tidal Canal and the adjoining commercial/industrial district.

The East Bay Plain consists of flat alluvial lowlands with bay and tidal marshes, much of which have been overlain with artificial fill. The geologic units beneath the site consist of unconsolidated,

permeable-to-impermeable interbeds of fine-to-coarse-grained sediments of Quaternary Age alluvial and estuarine deposits. These unconsolidated deposits are estimated to occur from the ground surface to a depth of approximately 1,000 feet, according to USGS Professional Paper 943. Smith-Emery GeoServices borings for the replacement Interstate-880 Cypress Structure, located in a similar setting along the Tidal Canal four miles northwest of the subject site, indicate shallow groundwater at six feet in depth within a 10-foot thick artificial fill of clayey silts. Deposits of the Merritt Sand underlie the fill, and extend to about 65 feet below ground surface, overlying the Yerba Buena Mud of the Quaternary San Antonio formation.

The major groundwater-bearing materials beneath the East Bay Plain occur at depths generally ranging from 50 feet to 1,000 feet below ground surface, with the depth to major aquifers increasing with distance from the foothills lying to the east. Groundwater from these aquifers is presently used for irrigation and industrial purposes only. The city of Oakland obtains its municipal water supplies from reservoirs in the East Bay Hills. The major aquifers below the subject site are anticipated to underlie the San Antonio formation, in strata that do not share significant hydrological connections with the shallow, or "first", aquifer.

Saturated, groundwater-bearing soil layers were encountered at a depth of below approximately 15 feet below ground surface (bgs) or greater. Occasional perched water within sandy fingers is found at shallower depths, and some borings to 20 feet bgs encountered no groundwater. The first groundwater at the site generally is contained within the permeable silts and sands, which are irregularly interrupted by fingers of low-permeability clayey silts found at a depth of 10 feet to 20 feet bgs. The groundwater at the site is under artesian conditions due to the overlying clays and silts that

act as a semi-confining layer. Due to these artesian conditions, the groundwater first encountered at 15 feet bgs in borings stabilized at approximately 9 to 10 feet bgs as measured later in the site's monitoring wells. The local groundwater gradient has been calculated to have a very shallow slope that flows predominantly to the south-southwest, as measured over the past five quarters.

ENVIRONMENTAL SETTING

The vicinity of the site is a predominantly industrial sector of Oakland that lies between Interstate-880 and the Tidal Canal of Alameda, stretching from the Oakland Airport to the Port of Oakland. This area has a significant history of heavy industrial use dating from the turn of the century, due to its favorable proximity to the nearby highways, docks, and shipyards along the Alameda Tidal Canal of the San Francisco Bay. Neighboring the subject site are a gasoline station, a former oil refining plant, a former can manufacturer, and facilities for trucking and manufacturing. Along with this industrial history have come several instances of environmental impact to the shallow groundwater, primarily in the form of fuel leaks from underground storage tanks (USTs). The subject property and each of its adjacent properties have case files on UST leaks. The adjacent and nearby sites with leaking UST cases define the subject site radius of impact as being at least 1,000 feet.

The most significant local impact is probably due to the former Ekotek used oil refinery located at 4200 Alameda Avenue across the street from the subject site. The Ekotek facility is being monitored for gasoline, kerosene, diesel, motor oil, PCB, BTEX, and other hydrocarbons in groundwater and soil, and is hydrologically upgradient from the subject site. Kerosene has been detected in the subject site's monitoring wells, strongly indicating that the Ekotek plume has extended into the subject property.

Plate 2 presents the benzene concentration contours for the site, derived from quarterly groundwater monitoring data from the four wells. The area in the vicinity of Monitoring Wells MW1 and MW2 has a benzene concentration of about 2,700 parts per billion (ppb). This is the area of the former underground storage tanks on the site. The grab sample of groundwater from Geoprobe G-6 found an isolated hot spot of benzene concentration, indicating the existence of preferential pathways and varying permeabilities of the lenses of the subsurface soil. The fact that the well recharge rate in Monitoring Well MW3 is significantly lower than the other three wells supports the observation that the water-bearing soil layers onsite have variable permeability and are somewhat discontinuous.

Plate 4 presents a plot of the gasoline concentration, benzene concentration, and piezometric elevation (water table elevation) from monitoring well data from the third quarter of 1995 through the last quarter of 1996. This graph shows that the benzene and gasoline levels at the site are relatively stable. It also shows that there is a direct correlation between the height of the water table and the concentrations of gasoline and benzene.

TIER 1 DISCUSSION

The steps to implement an ASTM Tier 1 Evaluation were applied to the subject property. The site assessment stage of the process was executed from 1994 to the present date, utilizing existing data and information generated by soil borings, well installations, and a groundwater monitoring program. According to the suggested site classifications described in the ASTM, the site may be classified as a Priority 4 scenario. Priority 4 scenarios are defined in the ASTM as having no demonstrable long-term threat to human health or safety or sensitive environmental receptors. Examples of Priority 4 scenarios in the ASTM guide include the following:

- Non-potable aquifer with no existing local use impacted;
- Groundwater is impacted, and non-potable wells are located down gradient outside the known extent of the chemicals of concern, and they produce from a nonimpacted zone.

The response actions for Priority 4 scenarios recommended by ASTM are to notify appropriate authorities, property owners, and potentially affected parties, and only evaluate the need to:

- Monitor ground water and evaluate the effect of natural attenuation on dissolved plume migration;
- Monitor ground water and evaluate effect of natural attenuation on leachate migration.

The implementation of the initial response actions appropriate to the site began in 1988 with the UST removals and soil overexcavations *not done* by Zaccor Construction. Further soil borings were performed by Engeo, Inc. in 1994. Three ground water monitoring wells were installed in 1995 by Smith-Emery GeoServices. A fourth groundwater monitoring well was installed, and perimeter soil probes were executed, by Smith-Emery in 1996. The monitoring wells at the site have been monitored quarterly since September 1995. This Tier 1 evaluation is based on benzene as the chemical of concern as per discussions with Mr. Barney Chan of the ACDEH.

Exposure Scenario Evaluation Flowchart

The ASTM flowchart for identifying categories of reasonable potential sources, transport pathways, and exposure pathways, is shown on Exposure Scenario Flowchart, Plate No. 3. In the flowchart, the primary sources are identified as the former product storage tanks and associated piping. The secondary sources are identified as impacted subsurface soils, and the dissolved groundwater plume. The potential transport mechanisms are identified as volatilization and atmospheric dispersion, and leaching and groundwater transport. The potential exposure pathways are identified as Inhalation and Potable Water Use. No potential receptors were identified. None of the potential sources, transport

pathways, exposure pathways, and potential receptors were determined to be applicable, as discussed in the following sections.

Tier 1 Look-Up Table of Risk-Based Screening Levels (RBSLs)

The ACDEH was consulted concerning the applicable RBSLs. Per the ACDEH guidance, the example levels for benzene listed in the ASTM Look-Up Table X2.1 are converted to lower, more stringent levels by a factor of 0.29 or 29%. The RBSL in the ASTM Look-Up Table X2.1 is used without the 29% modification for Toluene, Ethylbenzene, and Total Xylenes as per the ACDEH request. The RBSL values with the corresponding site levels are shown in Table 1. A summary of the monitoring well data for the site is presented in Table 2. The results of the soil sampling are presented in Appendix I.

TABLE 1
DERIVED TIER 1 LOOK-UP TABLE
Comparison of Site Concentrations of Chemicals of Concern (BTEX) with Tier 1 RBSL
(Adapted from Table X2.1, ASTM E1739-95)

Exposure Pathway	Average Site Benzene levels (see notes)	Benzene RBSL (CA value)	Average Site Toluene levels	Toluene RBSL	Comment
AIR					
Indoor Air Screening Levels, $\mu\text{g}/\text{m}^3$	NA	14.3 $\mu\text{g}/\text{m}^3$	NA	584 $\mu\text{g}/\text{m}^3$	Scenario not applicable
Outdoor Air Screening Levels, $\mu\text{g}/\text{m}^3$	NA	14.3 $\mu\text{g}/\text{m}^3$	NA	584 $\mu\text{g}/\text{m}^3$	Scenario not applicable
National indoor background concentration range, $\mu\text{g}/\text{m}^3$	NA	3.25 to 21.5 $\mu\text{g}/\text{m}^3$	NA	0.96 to 29.1 $\mu\text{g}/\text{m}^3$	Scenario not applicable
SOIL					
Soil Volatilization to Outdoor Air, mg/kg	0.24 mg/kg (1)	13.3 mg/kg	0.15 mg/kg	RES	See discussion
Soil-Vapor Intrusion from soil to Buildings, mg/kg	0.24 mg/kg (1)	0.32 mg/kg	0.15 mg/kg	54.5 mg/kg	See discussion
Surficial Soil Ingestion/Dermal/Inhalation mg/kg	0.24 mg/kg (1)	290 mg/kg	0.15 mg/kg	18,700 mg/kg	Scenario not applicable
Soil Leachate to Protect Ground Water Ingestion, mg/kg	0.24 mg/kg (1) <i>↑ ok</i>	1.58 mg/kg	0.15 mg/kg	361 mg/kg	See discussion
GROUNDWATER					
Groundwater Volatilization to Outdoor Air, mg/L	1.0 mg/L (2) ✓ <i>ok</i>	>S	0.013	>S	See discussion
Groundwater Ingestion, mg/L	1.0 mg/L (2)	0.29 mg/L	0.013	20.4 mg/L	See discussion
Groundwater Vapor Intrusion to Buildings, mg/L	1.0 mg/L (2)	2.14 mg/L	0.013	85.0 mg/L	See discussion

Receptor Scenario: Commercial/Industrial
Target Level Cancer Risk 1E-04 (0.0001)
Source: ASTM E1739-95

Notes: RBSL = Risk-Based Screening Level
 $\mu\text{g}/\text{m}^3$ = micrograms per cubic meter

>S = Should the calculated RBSL exceed the pure component solubility for any individual component, >S is entered in

the table to indicate that the selected risk level or hazard quotient cannot be reached or exceeded for that compound and

the specified exposure scenario.

NA = not applicable.

RES = Selected risk level is not exceeded for pure compound present at any concentration.

- 2 (1) Average of all measured concentrations, for the given constituent, as measured in all monitoring wells during 1996.
1 (2) Average of all SEG soil samples collected and analyzed for the given constituent.

if area is not zoned solely for commercial/ind. must use 10⁻⁵ or 10⁻⁶ risk

TABLE 1, continued
DERIVED TIER 1 LOOK-UP TABLE
Comparison of Site Concentrations of Chemicals of Concern (BTEX) with Tier 1 RBSL
(Adapted from Table X2.1, ASTM E1739-95)

Exposure Pathway	Average Site Ethylbenzene levels	Ethylbenzene RBSL	Average Site Total Xylenes	Total Xylenes RBSL	Comment
AIR					
Indoor Air Screening Levels, µg/m ³	NA	1460 µg/m ³	NA	10,200 µg/m ³	Scenario not applicable
Outdoor Air Screening Levels, µg/m ³	NA	1460 µg/m ³	NA	10,200 µg/m ³	Scenario not applicable
National indoor background concentration range, µg/m ³	NA	2.20 to 9.70 µg/m ³	NA	4.85 to 47.6 µg/m ³	Scenario not applicable
SOIL					
Soil Volatilization to Outdoor Air, mg/kg	0.90 mg/kg	RES	2.22 mg/kg	RES	See discussion
Soil-Vapor Intrusion from soil to Buildings, mg/kg	0.90 mg/kg	1,100 mg/kg	2.22 mg/kg	RES	See discussion
Surficial Soil Ingestion/Dermal/Inhalation mg/kg	0.90 mg/kg	11,500 mg/kg	2.22 mg/kg	208,000 mg/kg	Scenario not applicable
Soil Leachate to Protect Ground Water Ingestion, mg/kg	0.90 mg/kg	1,610 mg/kg	2.22 mg/kg	RES	See discussion
GROUNDWATER					
Groundwater Volatilization to Outdoor Air, mg/L	0.28	>S	0.57 mg/L	>S	See discussion
Groundwater Ingestion, mg/L	0.28	10.2 mg/L	0.57 mg/L	>S	See discussion
Groundwater Vapor Intrusion to Buildings, mg/L	0.28	>S	0.57 mg/L	>S	See discussion

Receptor Scenario: Commercial/Industrial
Target Level Cancer Risk 1E-04 (0.0001)

Source: ASTM E1739-95

Notes: RBSL = Risk-Based Screening Level
µg/m³ = micrograms per cubic meter

>S = Should the calculated RBSL exceed the pure component solubility for any individual component, >S is entered in the table to indicate that the selected risk level or hazard quotient cannot be reached or exceeded for that compound and

the specified exposure scenario.

NA = not applicable.

RES = Selected risk level is not exceeded for pure compound present at any concentration.

(1) Average of all measured concentrations, for the given constituent, as measured in all monitoring wells during 1996.

(2) Average of all SEG soil samples collected and analyzed for the given constituent.

TABLE 2 - WELL MONITORING HISTORY, 1995-1997

Well I.D.	Date of Meas.	Elevation (MSL)	Gradient	Flow Direction	TPH-G (mg/L)	Diesel (mg/L)	Kerosene (mg/L)	Mtr Oil (mg/L)	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (mg/L)	MTBE (mg/L)
Q4 96 ROUTINE QUARTERLY MONITORING													
MW-1	12-11-96	-0.63'	0.4%	S48°W	8.1	4.0	---	---	2.60	0.073	0.300	0.200	0.340
MW-2	12-11-96	-0.58'			5.2	3.0	---	---	2.1	0.340	0.400	1.500	0.170
MW-3	12-11-96	-0.40'			0.39	0.1	---	---	0.003	0.002	0.020	0.012	0.005
MW-4	12-11-96	-0.98'			2.4	2.0	---	---	0.390	0.070	0.540	0.840	0.160
Q3 96 ROUTINE QUARTERLY MONITORING													
MW-1	9-20-96	-0.95'	0.68%	S36°W	2.2	---	---	---	0.570	0.030	0.110	0.800	0.070
MW-2	9-20-96	-0.92'			11.0	---	---	---	2.7	0.600	0.500	1.500	0.370
MW-3	9-20-96	-0.67'			0.37	---	---	---	0.004	ND	0.026	0.013	0.006
MW-4	9-20-96	-1.34'			12.0	---	---	---	0.890	0.120	1.100	2.000	0.260
Q2 96 ROUTINE QUARTERLY MONITORING													
MW-1	6-26-96	-1.23'	1.3%	S46°W	7	ND	3	ND	2.3	0.062	0.230	0.160	0.093
MW-2	6-26-96	-1.15'			5	ND	1	ND	1.0	0.170	0.150	0.290	0.120
MW-3	6-26-96	-1.59'			0.4	ND	0.6	ND	0.004	0.004	0.025	0.012	0.009
Q1 96 ROUTINE QUARTERLY MONITORING													
MW-1	3-29-96	-0.85'	0.3%	S4°W	12	ND	4	ND	0.730	0.089	0.300	0.180	0.270
MW-2	3-29-96	-0.78'			6	ND	2	ND	0.640	0.300	0.190	0.490	0.078
MW-3	3-29-96	-0.69'			0.3	ND	0.2	ND	0.002	0.002	0.015	0.009	0.006
Q4 95 ROUTINE QUARTERLY MONITORING													
MW-1	12-7-95	-1.59'	0.6%	S37°E	6	ND	ND	ND	0.343	0.032	0.133	0.184	---
MW-2	12-7-95	-1.41'			8	ND	ND	ND	0.240	0.200	0.108	0.402	---
MW-3	12-7-95	-1.38'			ND	ND	ND	ND	ND	ND	0.013	0.013	---
Q3 95 ROUTINE QUARTERLY MONITORING													
MW-1	9-22-95	-1.78'	2.2%	S8°W	11.0	5	3	ND	2.3	0.081	0.390	0.560	---
MW-2	9-22-95	-1.27'			7.2	3.5	2	ND	1.2	0.560	0.250	1.0	---
MW-3	9-22-95	-0.62'			0.130	1.9	ND	ND	0.001	0.001	0.012	0.013	---
SOIL BORINGS, (Engeo, Inc.)													
B1-2	3/7/94	---	---	---	22	26	ND	---	0.034	ND	0.680	0.110	---
B2-3	3/7/94	---	---	---	150	19	ND	---	ND	ND	0.970	1.400	---
B3-1	3/7/94	---	---	---	ND	ND	ND	---	0.029	ND	ND	0.007	---
B4-2	3/7/94	---	---	---	370	150	150	---	0.180	ND	0.800	2.500	---
B2-W	3/7/94	---	---	---	52	2.30	0.410	---	2.30	2.1	0.710	3.00	---
B2-W	3/7/94	---	---	---	9.8	2.40	3.20	---	2.40	0.045	0.100	0.082	---
TANK REMOVAL, (Engeo, Inc.)													
1 Soil	3/18/88	---	---	---	---	210	---	---	0.42	0.33	---	0.840	---
2 Soil	3/18/88	---	---	---	---	450	---	---	ND	3.3	---	79	---
3 Soil	3/18/88	---	---	---	720	---	---	---	6.6	110	---	150	---
4 Soil	3/18/88	---	---	---	190	---	---	---	0.24	9.6	---	32	---
5 Water	3/18/88	---	---	---	---	150	---	---	---	---	---	---	---

---Notes:ND = not detected above the method detection limit.
--- = not applicable

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Potential Exposure Pathways

Our evaluation of the potential pathways for exposure of the site BTEX to reach the potential receptors is discussed in the order presented in the preceding Table 1. The applicable soil concentrations of BTEX compounds were selected from the soil sample analytical results. These soil samples were obtained from the well installations and geoprobe cores. ~~The soil concentrations were added together and divided by the total~~

~~of samples analyzed.~~ The average groundwater concentrations of BTEX compounds were calculated by adding together the concentration for the given analyte collected from the monitoring wells during 1996 and divided by the number of samples analyzed. The average site concentrations were then recorded in Table 1.

need to incorporate new data

Toluene, Ethylbenzene, and Total Xylenes were below the RBSLs for all potential exposure pathways for the site. The site is located within a commercial/industrial vicinity for at least a 1,000 foot radius. Our file reviews of cases at the ACDEH and the Alameda County Public Works Department affirm that no groundwater wells utilize the shallow aquifer affected by the site dissolved hydrocarbon plume. The groundwater of the aquifer is not considered a potential drinking water source due to its poor water quality parameters, primarily Total Dissolved Solids (TDS), and the proximity to impacts from the Ekotek used oil refinery formerly located at 4200 Alameda Avenue.

ever run?

Ekotek's release is not BTEX

not a well ut. Ave.

this is not a good method

Air Transport Mechanism

The characteristics of the site's plume, the subsurface, and the building's construction are site-specific conditions which do not support an air transport mechanism as a potential exposure pathway. Surficial soils

associated with the existing plume were excavated and removed during the tank removal by Zaccor Construction in 1988. This has minimized the potential of inhalation by wind erosion and atmospheric dispersion.

The site's hydrocarbon plume is localized to a subsurface zone that laterally pinches out to nondetectable levels upgradient and crossgradient of the former UST location. In addition, groundwater is located within a confined condition as discussed in the Setting section of this report, and in previous Smith-Emery reports for the well installations. The dissolved plume is located below surficial soils of clay and silt which confine the shallow groundwater aquifer. Because the surficial confining layers inhibit the upward migration of groundwater in the vicinity of the site, the volatilization of benzene would also be impeded or reduced to undetectable levels. In addition, the site average soil and groundwater benzene concentrations are below the RBSL for benzene.

Site-specific factors related to impediment of potential air transport mechanisms include the building's type of construction. The building was originally built as a trucking warehouse for a cold-storage facility, with the foundations set at ground level and the building's concrete floor slab elevated to approximately four feet above the ground level. The above-ground, sub-floor space is filled with concrete and compacted soil. Due to a combination of these building features, the low benzene levels, and the confining layers that impede volatilization, it is our opinion that the indoor/outdoor air screening levels would not be reached by the decreasing benzene concentrations observed onsite.

The site average soil and groundwater concentrations were applied to the RBSL look-up table, confirming that the site concentration of benzene is not sufficient to effectively exceed the RBSLs via the transport mechanisms of vapor intrusion to buildings.

Soil Exposure Pathway

As shown in Table 1, the average site concentration of benzene did not exceed the RBSLs for the four listed soil exposure pathways,

- Soil volatilization to outdoor air; - ~~2~~
- Soil-vapor intrusion ^{from} soil to buildings;
- Surficial soil ingestion/dermal/inhalation;
- Soil leachate to protect ground water ingestion.

Groundwater Exposure Pathway

Of the three exposure pathways for groundwater (volatilization to outdoor air, ingestion, and vapor intrusion to buildings) the site average benzene concentrations do not reach or exceed the RBSLs for volatilization to outdoor air or for vapor intrusion to buildings. The average site benzene concentration of 1.0 mg/L does exceed the groundwater ingestion RBSL of 0.29 mg/L. However, no transport mechanism for this exposure exists because no groundwater wells utilize the shallow aquifer affected by the site dissolved hydrocarbon plume and the groundwater of the aquifer is not considered a potential drinking water source due to its poor water quality parameters.

CONCLUSIONS

Based on the results of this Tier 1 Evaluation, the BTEX RBSLs for this site have not been exceeded with the exception of the Groundwater Ingestion pathway. Groundwater ingestion was eliminated as a viable exposure pathway by lack of drinking wells in the vicinity. It is our opinion that remediation of the benzene to RBSL levels is not warranted for this site due to the low risk posed by the benzene-in-groundwater concentrations observed, the poor original water quality parameters of the shallow groundwater, the site's location within a multiple-impact industrial corridor, the stability of the plume, and the absence of potential receptors of the shallow groundwater. Based on the results of this Tier 1 evaluation it is our opinion that continued groundwater monitoring for the site is a regulatory and financial encumbrance that will provide no significant new information, and is no longer necessary. We recommend based on the findings of this Tier 1 RBCA Evaluation that the site be granted regulatory closure in accordance with the facts and arguments presented herein.

LIMITS OF LIABILITY

The findings, conclusions and recommendations contained in this report are based on site conditions as they existed at the time of our investigation, and we further assume the explorations to be representative of the subsurface conditions throughout the site.

The factual data and interpretations pertain to the specific project described in this report and are solely for the use of **Smooke & Sons Investment Co.** and are not applicable to any other project or site. Any reliance on this document by any other person or entity shall be at that party's sole risk.

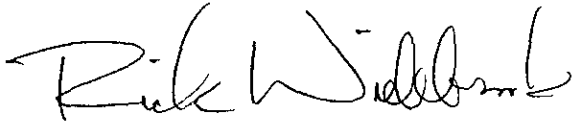
Our investigation was performed using the standard of care and level of skill ordinarily exercised under similar circumstances by reputable Environmental Assessors and Geologists currently practicing in these or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

The following plates and appendices complete this report.

References	
Plate No. 1	Vicinity Map
Plate No. 2	Plot Plan
Plate No. 3	Exposure Scenario Flowchart
Plate No. 4	
Appendix I	Summaries of Analytical Findings

Respectfully submitted,

SMITH-EMERY GEOSERVICES

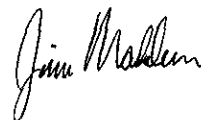


RICK WIDEBROOK
Project Geologist
R.E.A. No. 6603

Reviewed and approved by,



MILES GRANT
Registered Geologist
R.G. No. 5367



JIM MADDEN
Project Geologist

SMITH-EMERY GEOSERVICES

REFERENCES

SMITH-EMERY GEOSERVICES

REFERENCES

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Smith-Emery GeoServices Report No. 96-202. May 20, 1996. *Exploratory Borings, Interstate Highway 880 Construction, CalTrans Contract 04-192214.*

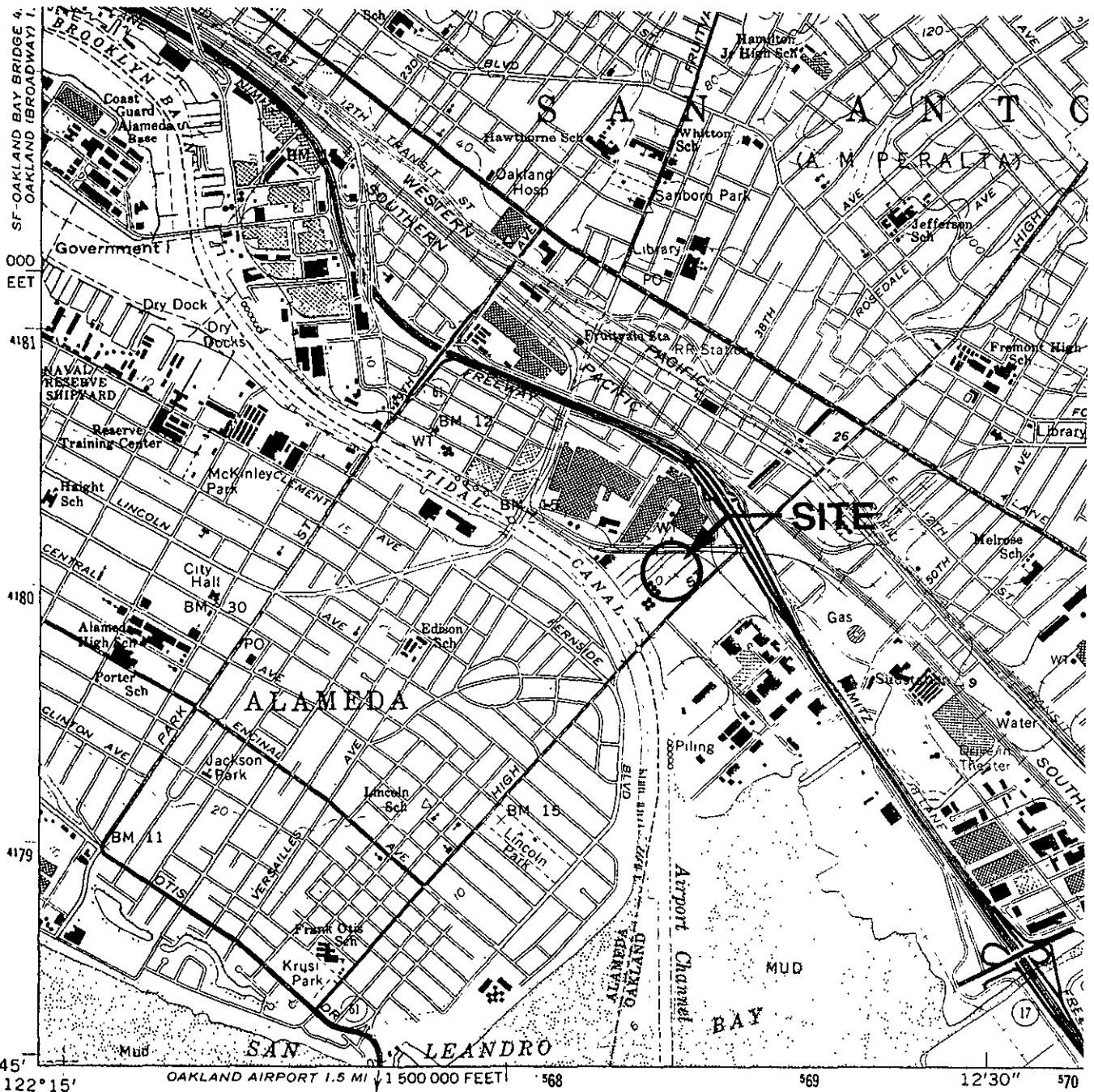
Smith-Emery GeoServices Report No. 96-621, December 16, 1996. *Monitoring Well MW4 Installation and GeoProbe Sampling, 3925 Alameda Avenue, Oakland, California.*

SMITH-EMERY GEOSERVICES

PLATES



SCALE: 1" = 2000'



REFERENCE:
 U.S.D.I. - GEOLOGICAL SURVEY
 OAKLAND EAST QUADRANGLE
 ALAMEDA COUNTY, CALIFORNIA

VICINITY MAP
 FILE NO. 90404

SMOOKE & SONS
 3925 ALAMEDA AVENUE
 OAKLAND, CALIFORNIA

SMITH-EMERY GEOSERVICES

TECHNICAL ILLUSTRATION BY P.M.

PLATE 1

EXPLANATION

INTERPRETATION OF BENZENE CONCENTRATION CONTOURS. UNITS IN MICROGRAMS PER LITER, OR PARTS PER BILLION.

250



MONITORING WELL LOCATION

ALAMEDA AVENUE

PROPERTY LINE

EXISTING BUILDING (SUBJECT SITE)

Q3-96 GROUNDWATER GRADIENT DIRECTION S38W

LOADING DOCK

RAILROAD TRACKS

MW-2 (2,700)

2000

1000

500

MW-4 (890)

100

MW-3 (4)

CITY PROPERTY

ADJACENT PROPERTY

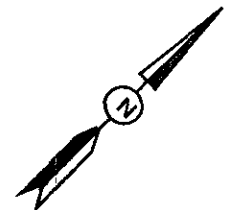
EASEMENT (CITY PROPERTY)

HOWARD STREET

WAREHOUSE

STORAGE LOT

NOTE:
NOT TO SCALE,
DISTANCES ARE
APPROXIMATE.
APPROXIMATE
SCALE: 1" = 37'



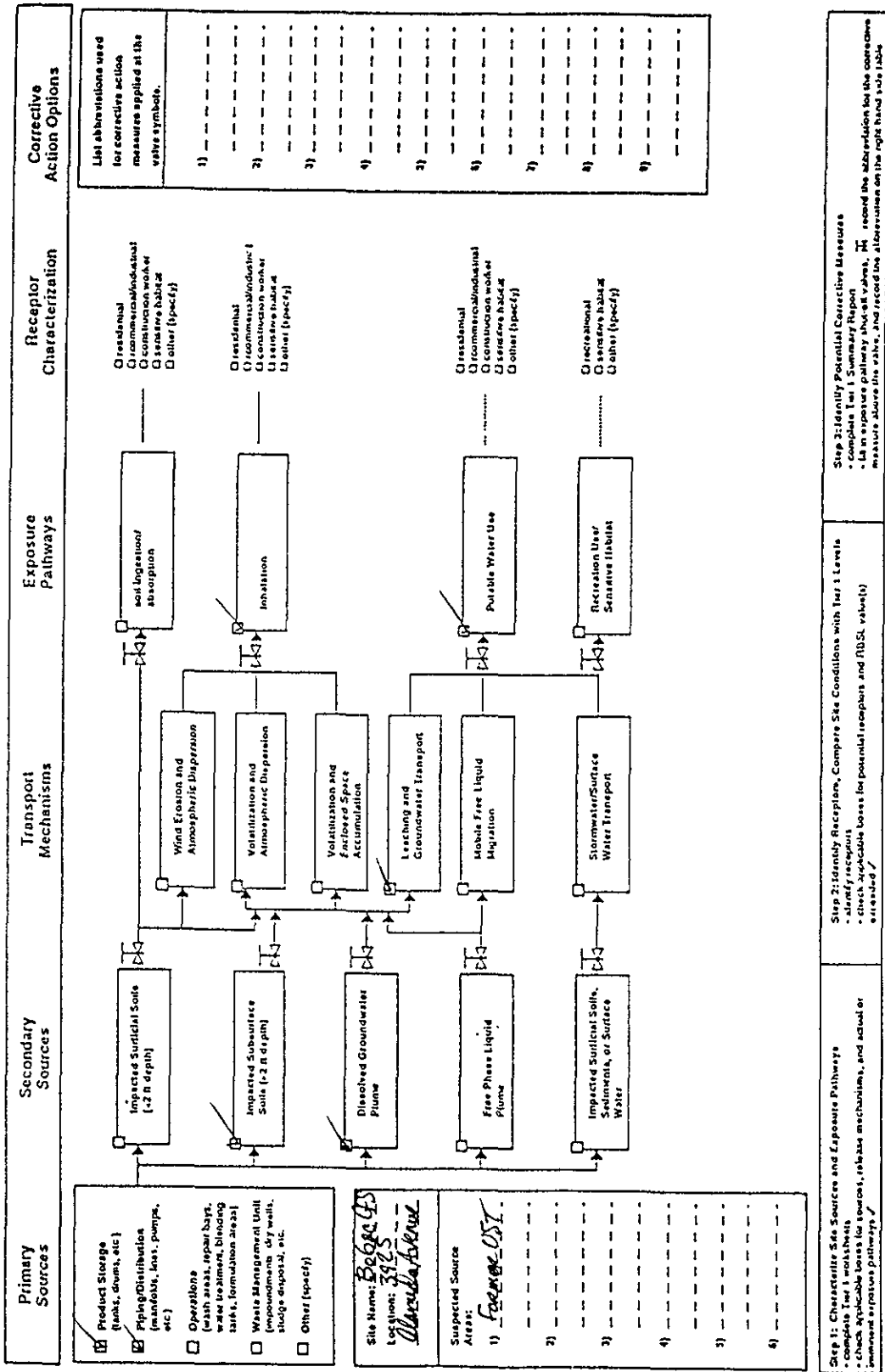
SMOOKE & SONS INVESTMENT CO.
3925 ALAMEDA AVENUE
OAKLAND, CALIFORNIA

BENZENE CONCENTRATION GRADIENT
UG/L IN WATER

SMITH-EMERY GEOSERVICES

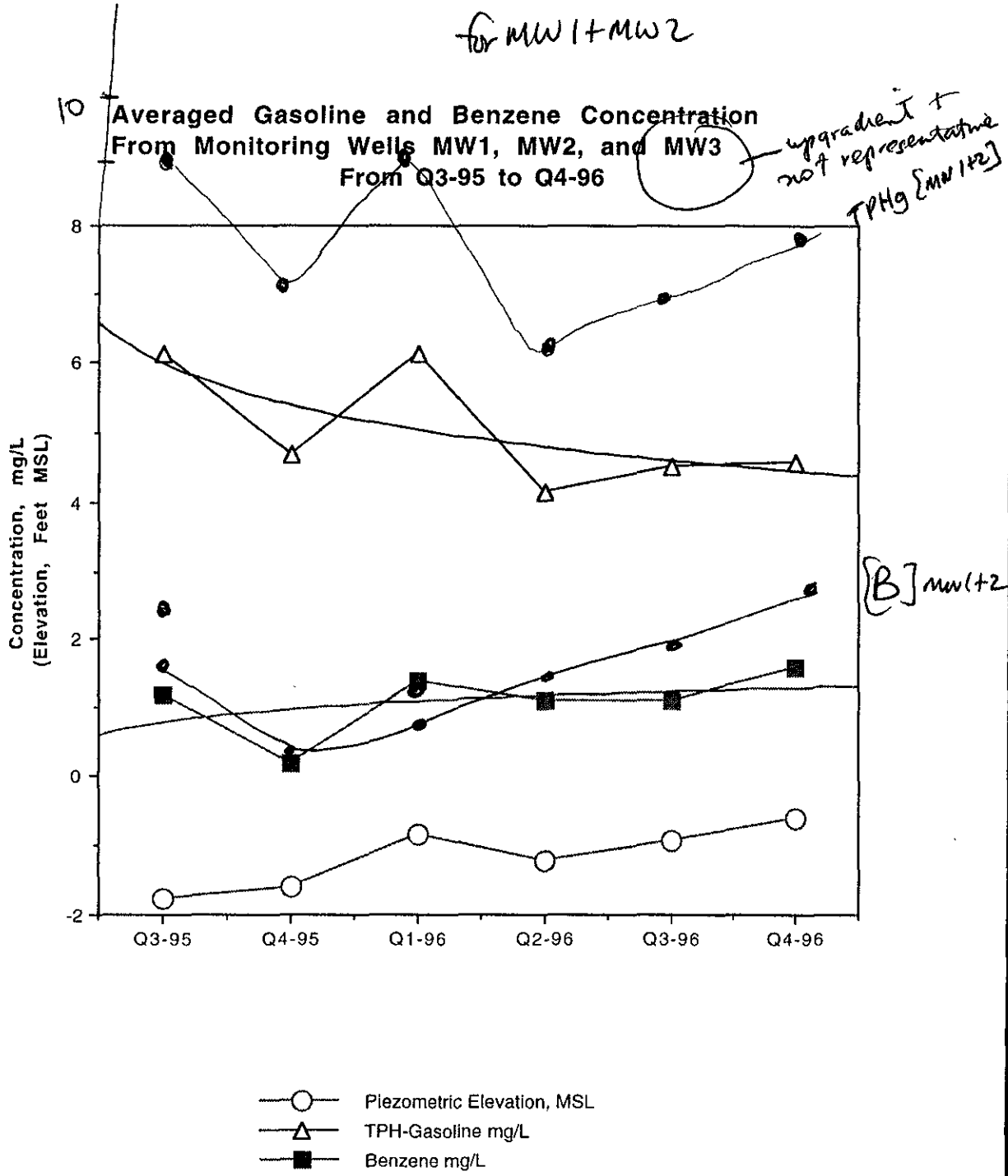
SEG JOB NO. 90404

PLATE 2



EXPOSURE SCENARIO FLOWCHART
 3925 ALAMEDA AVENUE
 OAKLAND, CALIFORNIA

TIER 1 EVALUATION
 SMITH-EMERY GEOSERVICES
 SEG JOB NO. 90404
 PLATE 3



SMOOKE & SONS INVESTMENT CO.
3925 ALAMEDA AVENUE
OAKLAND, CALIFORNIA

DATA GRAPH

SMITH-EMERY GEOSERVICES

SEG JOB NO. 90404

PLATE 4

SMITH-EMERY GEOSERVICES

APPENDIX I

SUMMARIES OF ANALYTICAL FINDINGS

SMITH-EMERY GEOSERVICES

ANALYTICAL FINDINGS FROM PRIOR SMITH-EMERY GEOSERVICES INVESTIGATIONS

MONITORING WELL BORINGS, SOIL SAMPLES

Date sampled 5/31/95; Date analyzed 6/07/95

Sample Name	TPH Gasoline ppm	TPH Diesel ppm	TPH Kerosene ppm	Benzene ppm	Toluene ppm	Ethylbenzene ppm	Xylene ppm
MW1-10.0	68	68	26	0.28	ND	0.31	0.50
MW1-13.5	200	310	130	1.3	0.52	2.50	6.4
MW2-11.0	880	73	35	1.0	2.2	14.0	36.0
MW2-14.0	4.1	26	ND	0.78	0.025	0.045	0.026
MW3-15.5	ND	130	ND	0.0012	0.0015	0.0022	0.006
MW3-18.0	ND	11	ND	ND	ND	0.0022	0.0066

ND = Not Detected

ppm = milligrams/Kg

ANALYTICAL RESULTS OF SOIL SAMPLES MONITORING WELL MW-4, 9/6/96

Sample Name	TPH-G (ppm)	TPH-D (ppm)	Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	Xylenes (ppm)	MBTE (ppm)
MW4-1-6'	0.950	ND	0.011	0.020	0.010	0.025	0.060
MW4-2-10'	0.66	ND	0.033	0.028	0.024	0.061	0.065
MW4-3-11'	1.1	ND	0.012	0.013	0.026	0.016	0.080
MW4-4-16'	0.560	ND	0.020	0.005	0.008	0.018	0.028
MW4-5-19'	18	ND	0.065	0.050	0.42	0.84	0.11

Note: ND - Not Detected

Date sampled 9/6/96, Date analyzed 9/12/96

SMITH-EMERY GEOSERVICES

ANALYTICAL RESULTS FOR SOIL SAMPLES GEOPROBE BORINGS, 8/14/96

Sample Name	TPH-G (ppm)	TPH-D (ppm)	Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	Xylenes (ppm)	MBTE (ppm)
G1-5-16	0.150	1	ND	ND	ND	0.020	0.024
G2-4-16	ND	ND	ND	ND	ND	ND	ND
G3-4-17	0.660	ND	ND	ND	ND	0.018	0.013
G4-4-17	ND	ND	ND	0.006	ND	0.041	0.021
G5-2-9	46.0	21.0	1.3	0.21	0.24	0.34	0.15
G5-4-16.5	0.59	ND	ND	ND	ND	0.015	ND
G6-3-15	ND	ND	ND	ND	ND	ND	ND
G7-3-14.5	ND	ND	ND	ND	ND	ND	ND
G8-2-14	ND	ND	ND	ND	ND	ND	ND

Note: ND - Not Detected

Date sampled 8/14/96, Date analyzed 8/19/96

SOIL

ANALYTICAL RESULTS OF GRAB GROUNDWATER SAMPLE INSTALLATION OF MONITORING WELL MW4

Sample Name	TPH-G (ppm)	TPH-D (ppm)	Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	Xylenes (ppm)	MBTE (ppm)
MW4-W-12'	11	330	0.31	0.053	0.47	1.1	0.170

Note: ND - Not Detected

Date sampled 9/6/96, Date analyzed 9/12/96

ANALYTICAL RESULTS OF GRAB GROUNDWATER SAMPLES GEOPROBE BORINGS

Sample Name	TPH-G (ppm)	TPH-D (ppm)	Benzene (ppm)	Toluene (ppm)	Ethylbenzene (ppm)	Xylenes (ppm)	MBTE (ppm)
G1 (no sample *)							
G2-WATER	0.15	ND	ND	0.002	ND	0.010	0.003
G3-WATER	0.670	5.0	0.017	0.015	0.020	0.035	0.013
G4-WATER	4.1	11.0	0.25	0.16	0.35	0.30	0.370
G5-WATER	1.5	6.0	0.12	0.023	0.10	0.25	0.11
G6-WATER	4.200	1.800	15	27	70	191	96
G7-WATER	3.0	3.0	0.29	0.032	0.094	0.085	0.070
G8-WATER	3.8	6.0	0.005	0.007	0.016	0.021	0.041

Note: ND - Not Detected

Date sampled 8/14/96, Date analyzed 8/19/96

* GeoProbe G1 did not yield groundwater.

SUMMARY OF MONITORING ANALYSES

Units: $\mu\text{g/L}$ (parts per billion)

<u>Well I.D.</u>	<u>Date of Meas.</u>	<u>Elevation (MSL)</u>	<u>Gradient</u>	<u>Flow Direction</u>	<u>Gasoline ($\mu\text{g/L}$)</u>	<u>Benzene ($\mu\text{g/L}$)</u>	<u>Toluene ($\mu\text{g/L}$)</u>	<u>Ethylbenzene ($\mu\text{g/L}$)</u>	<u>Xylenes ($\mu\text{g/L}$)</u>
Q4 96 ROUTINE QUARTERLY MONITORING									
MW-1	12-11-96	-0.63'	0.4%	S48°W	8,100	2,600	73.0	300	200
MW-2	12-11-96	-0.58'			5,200	2,100	340	400	1,500
MW-3	12-11-96	-0.40'			390	3.0	2.0	20	12
MW-4	12-11-96	-0.98'			2,400	390	70	540	840
Q3 96 ROUTINE QUARTERLY MONITORING									
MW-1	9-20-96	-0.95'	0.68%	S36°W	2,200	570	30	110	800
MW-2	9-20-96	-0.92'			11,000	2,700	600	500	1,500
MW-3	9-20-96	-0.67'			370	4.0	ND	026	13
MW-4	9-20-96	-1.34'			12,000	890	120	1,100	2,000
Q2 96 ROUTINE QUARTERLY MONITORING									
MW-1	6-26-96	-1.23'	1.3%	S46°W	7,000	2,300	62	230	160
MW-2	6-26-96	-1.15'			5,000	1,000	170	150	290
MW-3	6-26-96	-1.59'			400	4.0	4.0	25	12
Q1 96 ROUTINE QUARTERLY MONITORING									
MW-1	3-29-96	-0.85'	0.3%	S4°W	12,000	730	89	300	180
MW-2	3-29-96	-0.78'			6,000	640	300	190	490
MW-3	3-29-96	-0.69'			300	002	2.0	15	9.0
Q4 95 ROUTINE QUARTERLY MONITORING									
MW-1	12-7-95	-1.59'	0.6%	S37°E	6,000	343	32	133	184
MW-2	12-7-95	-1.41'			8,000	240	200	108	402
MW-3	12-7-95	-1.38'			ND	ND	ND	13	13
Q3 95 ROUTINE QUARTERLY MONITORING									
MW-1	9-22-95	-1.78'	2.2%	S8°W	11,000	2,300	81	390	560
MW-2	9-22-95	-1.27'			7,200	1,200	560	250	1,000
MW-3	9-22-95	-0.62'			130	1.0	1.0	12	13

---Notes: $\mu\text{g/L}$ = micrograms per liter

ND = not detected above the method detection limit.