EMCON
1921 Ringwood Avenue • San Jose, California 95131-1721 • (408) 453-7300 • Fax (408) 437-9526

June 10, 1997
Project 20805-127.004

Addendum to RA. #744 BO

Ms. Medula Logan
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway
Alameda California 94502

Re: Response to comments on Tier 1, Tier 2 Risk-Based Corrective Action Evaluation for ARCO Service Station No. 2111

Dear Ms. Logan:

This letter documents EMCON's response to comments you raised during our June 9, 1997 telephone conversation regarding the *Tier 1, Tier 2 Risk-Based Corrective Action Evaluation for ARCO Service Station No. 2111, 1156 Davis Street, San Leandro, California* (RBCA report) dated September 27, 1996.

The first comment was a request to verify the duration of potential exposure at the First Christian Church and Community Center located to the west of the ARCO Service Station 2111 (the Site). I spoke by phone with the assistant to the pastor of the church on June 10, 1997. She informed me that she and the pastor are generally at the church from 8 AM until 4 PM on weekdays, and that the pastor sometimes stays later the 4 PM. The church is also available for 2 to 3 hours in the evenings on weekdays for special classes, and on Sunday for morning and afternoon services. Day-care services are no longer offered at this location. This information substantiates the assumption used in the RBCA report that the potential exposure of the occupants of the church and community center is conservatively represented by the 40-hour per week commercial/industrial worker exposure scenario.

The second comment was a request to clarify the difference between the site-specific threshold level (SSTL) for the on-site and off-site receptors presented in Table 2 of the RBCA report. Although the commercial/industrial exposure scenario was used to represent both groups of potential receptors, a target risk level of 1×10^{-5} (consistent with worker exposure limits contained in Proposition 65) was used for the on-site workers, while a risk level of 1×10^{-6} was used for the off-site receptors to reflect the fact the latter group was not composed of workers, as detailed above. These differences are noted in the footnotes in Table 2.

The third comment pertained to why the potential risk from impacted soils was not quantitatively evaluated. As discussed on page 3 of the RBCA report, the maximum concentration of benzene in soil remaining at the site was very low (0.3 milligrams per kilogram). More importantly, these levels were detected within the water table fluctuation zone, and thus do not represent unsaturated zone soil as modeled in the RBCA chemical transport equations. The impact to residual soil at the Site appears to be from contact with impacted groundwater, and thus the evaluation evaluated groundwater as the potential source to both indoor and ambient air.

Hopefully the information presented above addresses your concerns regarding our RBCA evaluation of ARCO Station 2111. If you have any additional questions or concerns, please do not hesitate to call.

Sincerely,

EMCON

Dr. Ray Kaminsky

Environmental Chemist

cc: Paul Supple, ARCO

Valli Vouriganti, EMCON

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1921 Ringwood Avenue • San Jose, California 95131-1721 • (408) 453-7300 • Fax (408) 437-9526

September 27, 1996
Project 20805-127.004

Mr. Paul Supple
ARCO Products Company
PO Box 6549
Moraga, California 94570

Re: Tier 1, Tier 2 Risk-Based Corrective Action Evaluation for ARCO Service Station 2111, 1156 Davis Street, San Leandro, California

Dear Mr. Supple:

This report presents the results of the Tier 1, Tier 2 risk-based corrective action (RBCA) evaluation prepared for ARCO Products Company (ARCO) Service Station 2111, 1156 Davis Street, San Leandro, California (Figures 1 and 2). This report addresses potential exposures to current and future workers on the commercial property and to visitors to the First Christian Church/Community Center. The RBCA evaluation results indicate that no acceptable levels of risk are exceeded at this site.

Based on the results of investigations performed to date, the site qualifies as a "low risk" site as defined in the Regional Water Quality Control Board's (RWQCB) January 1996 Supplemental Instructions. The RWQCB's requirements are bulleted as follows:

- Source must be removed

The waste oil tank and petroleum impacted soils to the north of the service station building were removed in August 1994, and no petroleum hydrocarbons have been detected in the two monitoring wells downgradient of the former tank. Although source removal has not been performed to address the impacted groundwater associated with the fuel tanks, the declining levels of petroleum hydrocarbons in groundwater monitoring wells downgradient of the tanks suggests the presence of a temporary or diminishing source which is, in effect, equivalent to source removal.

- Site is adequately characterized

Soil and groundwater investigations have been performed at the site and have investigated the lateral and vertical extent of gasoline hydrocarbons in soil and groundwater (*Soil and Groundwater Assessment Report, Arco Service Station 2111, San Leandro, California,* EMCON, September 1996).

- Plume is stable or receding

Concentrations of gasoline and its constituents (i.e., benzene, toluene, ethylbenzene, and xylenes [BTEX]) dissolved in groundwater have been decreasing in groundwater monitoring wells since the monitoring program was initiated in the third quarter of 1995 (Table 1).

- No threat to surface water or deep aquifers

Groundwater investigations have defined the vertical extent of the dissolved gasoline plume to be contained within the shallow water bearing zone (EMCON, September 1996). No deep aquifers or surface waters are impacted or threatened.

- No threat to human health

Based on the results of this evaluation, no threat to human health exists.

- No threat to the environment

No ecological receptors have been identified as threatened.

This RBCA evaluation was prepared in accordance with the guidelines contained in *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (American Society of Testing Materials [ASTM] E-1739-95, November, 1995). In general, the tiered approach recommended in the ASTM guidelines is designed as a step-wise process to evaluate the potential risk posed by a chemical release, determine what corrective action, if any, is needed, and tailor that action to those risks.

The steps that make up the tiered RBCA approach are summarized in Figure 3. This report will follow these steps, and refer to information summarized in tables, figures, and *Tier 2 RBCA Tool Kit* worksheets contained in Attachment A. This report should be read in conjunction with reviewing these worksheets.

INITIAL SITE ASSESSMENT AND SITE CLASSIFICATION

Steps 1 and 2 of RBCA are designed to screen for the possibility that the site presents an imminent threat to public health and the environment. This refers, for example, to sites where an unconfined release to the surface has taken place in which direct contact to product is a possibility, or where a release presents a potential for an explosion to occur. Chemical impact to soil and groundwater at this site has been characterized (EMCON, September 1996) and summarized in Worksheet 4.2. No surface releases have taken place at this site which have not been immediately contained and cleaned. Although gasoline has been detected in the subsurface, these hydrocarbons do not present a potential risk of direct contact. A comparison of site-measured soil and groundwater data

The emission and air dispersion models, and the default modeling values used in the ASTM guidelines to generate the RBSLs are suitable to generate conservative RBSLs for the following reasons:

- Losses due to biodegradation and adsorption onto soil during volatilization from the unsaturated zone are not accounted for by the models.

- Volatilization of BTEX to ambient air was considered a complete pathway for the purposes of this assessment. This assumption is extremely conservative because the site is covered by concrete and asphalt, which although not completely impermeable, limits vapor diffusion to a much greater degree than accounted for by the vapor emission model.

- The RBSLs for volatilization from soil and groundwater to ambient air are based on the assumption that volatilization takes place through a sandy material. In fact, the soils at this site are clays with gravelly lenses. The RBSLs, therefore, are based on significantly higher rates of volatilization than are expected at this site.

The assumptions used to develop RBSLs for the pertinent potential exposure pathways are judged to be appropriate for the purposes of screening. The only modification necessary to the RBSLs presented in Table X2.1 of the ASTM guidelines is to adjust the RBSLs for benzene by multiplying them by 0.29 (California Regional Water Quality Control Board, San Francisco Bay Region, memorandum, January 5, 1996). For example, the adjusted RBSL from Table X2.1 for exposure to benzene through volatilization from groundwater to ambient air is presented below.

<u>For Commercial/Industrial Receptor Scenario:</u>

Vapor intrusion from groundwater into indoor air

Target Levels from Lookup Table X2.1 for Benzene (mg/l)

- 10^{-6} risk - (i.e., 1E-06) = 7.39E-02

Selected a RBSL corresponding to a on-site 10^{-5} risk

- 1E-05 risk = 7.39E-01 or 0.074 mg/l

RWQCB benzene correction

- 0.074 mg/l x 0.29 = 0.021 mg/l

RBSL = 0.021 mg/l

As shown in Worksheet 4.4, comparing the appropriate groundwater concentrations of benzene, toluene, ethylbenzene and xylenes to the RBSLs for each respective pathway, the RBSLs for groundwater-to-ambient air pathway was not exceeded. In accordance with ASTM guidelines, no further evaluation is necessary for the ambient air pathway, or for toluene, ethylbenzene or xylenes via the groundwater-to-indoor air pathway.

The results in Worksheet 4.4, however, show that the RBSLs for benzene in the groundwater-to-indoor air scenario for both the service station and the church were exceeded. Although these results do not necessarily indicate a risk to public health (because they are only screening levels), they indicate that further evaluation is needed to determine if a risk to public health is present at this site. The next step (Step 5) in the RBCA procedure is a Tier 2 evaluation of benzene for the indoor pathways from groundwater to the service station and the church.

TIER 2 EVALUATION

In accordance with the ASTM guidelines, the same conservative volatilization models used in the Tier 1 evaluation were used to evaluate the presence of benzene in the groundwater-to-indoor air potential exposure pathway to the service station and the church. The Tier 2 evaluation, however, incorporates greater site-specificity in the values used for the model parameters. Greater site-specificity was achieved in two main areas.

- Accounting for the type of soil present at the site, and the thickness of the unsaturated zone.

- Accounting for the fact that the BTEX concentrations used in the Tier 1 assessment were from a well that is about 40 feet upgradient from the center of the church, and thus the concentrations were probably significantly greater than those beneath the church.

Soil parameter values for soil water content, bulk density and total organic carbon were not measured at this site. Conservative values for some of these parameters were estimated by using values measured at another site. The second site is located on clayey sand; therefore, the water content and bulk density of the unsaturated zone soil from the second site would tend to be less than that expected for a site, such as ARCO 2111, located on clay with gravelly lenses (EMCON, September 1996). Soil porosity was also

reduced from the default value of 0.38 (representing a clean sand) to 0.30 to reflect the presence of the heavier soil at this site. Similarly, capillary thickness was increased from 5 to 30.5 centimeters to account for the heavier soils. The default for bulk density (1.7 grams per cubic centimeter) and total organic carbon (1 percent) were used for this evaluation. The foundation at the site was found to be competent, based on an observation made by EMCON, during a site inspection in September 1996. As a result, the fraction of the foundation areas for the service station and church assumed to be cracked were reduced from 1 to 0.5 percent, to represent a more accurate but still conservative estimate of this parameter. Additional information (e.g., minimum depth to water) used for the site-specific Tier 2 evaluation is presented in Worksheets 5.1 and 5.3, and in Figure 4.

The parameters described above were used to calculate risk-based, site-specific threshold levels (SSTLs) for the service station and church groundwater-to-indoor air pathway. The results of this evaluation are summarized in Table 2. These results show that the concentration of benzene representing the source of the groundwater impact (i.e., the average concentration detected in wells MW-7 and MW-2; 0.34 mg/l) is about 4-times less than the SSTL (1.54 mg/l).

In the Tier 1 evaluation of the potential risk to occupants of the church, the data for the nearest upgradient well (MW-2) was used to estimate the strength of the source. This estimate, however, probably over-estimates the concentration beneath the church because benzene was not detected in monitoring well MW-5 less than 20 feet downgradient of the church. To better estimate the sources strength for the Tier 2 evaluation, we used a feature in the ASTM RBCA software that uses site-specific groundwater results to interpolate between two measured points. The calculation of a dilution attenuation factor (DAF) can be used if data are available from wells that are positioned roughly along the center of the axis of migration of the groundwater plume. Wells MW-7, MW-2, and MW-5 are reasonably well-positioned for this purpose. The saturated zone transport model recommended in the ASTM guidelines was essentially calibrated to this site using actual site data to estimate the benzene concentration beneath the center of the church. The concentration determined in this manner (0.0049 mg/l) was compared to the SSTL (0.15 mg/l) calculated for the groundwater-to-indoor air pathway. The estimated groundwater benzene concentration is about 31-times less than the SSTL.

While more representative of actual site conditions than the Tier 1 results, the Tier 2 results are still conservative for several reasons, the most important of which are:

- As previously discussed for the Tier 1 evaluation, the source of the petroleum to the groundwater is diminishing. Because the models used to estimate emission rates of BTEX from groundwater and transport within the groundwater assume a

constant source of chemicals, and no losses due to biodegradation, the resulting cleanup levels (i.e. SSTLs) will be significantly over-estimated.

- The model used to estimate the benzene concentration in indoor air is likely to overestimate these values because it assumes air exchange rates more appropriate for a modern business building with a controlled rate of makeup air rather than a service station with rollup doors or a church with windows that open. In both cases, the indoor air is likely to be exchanged with outdoor air at a much higher rate than a modern business building.

SUMMARY AND CONCLUSION

At ARCO Station 2111, the former waste oil tank and impacted soil were removed from the site. The BTEX in the soil and groundwater associated with the current underground fuel storage tanks was evaluated to determine what risk, if any, it might present to current and future on-site and off-site receptors. This evaluation was conducted using the ASTM RBCA guidelines. The results show concentrations of BTEX detected at this site do not exceed levels that correspond to an acceptable level of risk. These results indicate that no additional remedial measures are necessary to protect the health of current or future on-site and off-site receptors.

Based on the results of this evaluation, and the designation of this property as a "low risk" site, we propose that future work at this site consist of groundwater monitoring to verify that BTEX levels continue to decrease.

Sincerely,

EMCON

Dr. Ray Kaminsky
Environmental Chemist

John C. Young, R.G. 6407
Senior Project Geologist

REGISTERED GEOLOGIST
JOHN CHARLES YOUNG
NO. 6407
STATE OF CALIFORNIA

Attachments: Table 1 - Historical Groundwater Elevation and Analytical Data
Table 2 - Tier 2 Results, Groundwater to Indoor Air Pathway
Figure 1 - Site Location
Figure 2 - Site Plan
Figure 3 - Risk-Based Corrective Action Process Flowchart
Figure 4 - Groundwater Data, Third Quarter of 1996
Attachment A - ASTM RBCA Worksheets

cc: Mr. Dale Klettke, ACHCSA
Mr. Kevin Graves, RWQCB

Table 1
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents

ARCO Service Station 2111
1156 Davis Street, San Leandro, California

Date: 09-17-96

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-1	08-01-95	39.60	17.45	22.15	ND	NR	NR	08-01-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
MW-1	12-14-95	39.60	17.09	22.51	ND	W	0.002	12-14-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-1	03-21-96	39.60	14.72	24.88	ND	WSW	0.005	03-21-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-1	05-24-96	39.60	15.94	23.66	ND	W	0.003	05-24-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-1	08-09-96	39.60	17.89	21.71	ND	WNW	0.01	08-09-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-2	08-01-95	37.99	15.67	22.32	ND	NR	NR	08-01-95	23000	1300	310	500	3500	--	--	--
MW-2	12-14-95	37.99	15.36	22.63	ND	W	0.002	12-14-95	7300	900	25	180	1000	<200*	--	--
MW-2	03-21-96	37.99	12.84	25.15	ND	WSW	0.005	03-21-96	9600	850	30	280	1400	250	--	--
MW-2	05-24-96	37.99	14.03	23.96	ND	W	0.003	05-24-96	2300	300	<5*	73	310	<25*	--	--
MW-2	08-09-96	37.99	16.10	21.89	ND	WNW	0.01	08-09-96	2800	290	6	75	320	50	--	--
MW-3	08-01-95	39.32	17.00	22.32	ND	NR	NR	08-01-95	<50	<0.5	<0.5	<0.5	<0.5	--	600	76^
MW-3	12-14-95	39.32	16.70	22.62	ND	W	0.002	12-14-95	<50	<0.5	<0.5	<0.5	<0.5	<3	<500	<50
MW-3	03-21-96	39.32	14.17	25.15	ND	WSW	0.005	03-21-96	<50	<0.5	<0.5	<0.5	<0.5	<3	<500	<50
MW-3	05-24-96	39.32	15.30	24.02	ND	W	0.003	05-24-96	<50	<0.5	<0.5	<0.5	<0.5	<3	<500	<50
MW-3	08-09-96	39.32	17.58	21.74	ND	WNW	0.01	08-09-96	<50	<0.5	<0.5	<0.5	<0.5	<3	<0.5	--
MW-4	08-01-95	38.10	15.65	22.45	ND	NR	NR	08-01-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
MW-4	12-14-95	38.10	15.35	22.75	ND	W	0.002	12-14-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-4	03-21-96	38.10	12.74	25.36	ND	WSW	0.005	03-21-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-4	05-24-96	38.10	14.03	24.07	ND	W	0.003	05-24-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-4	08-09-96	38.10	16.10	22.00	ND	WNW	0.01	08-09-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
MW-5	03-21-96	37.21	12.60	24.61	ND	WSW	0.005	03-22-96	<50	<0.5	<0.5	<0.5	<0.5	82	--	--
MW-5	05-24-96	37.21	13.71	23.50	ND	W	0.003	05-24-96	<50	<0.5	<0.5	<0.5	<0.5	7	--	--
MW-5	08-09-96	37.21	15.60	21.61	ND	WNW	0.01	08-09-96	<50	<0.5	<0.5	<0.5	<0.5	8	--	--

Table 1
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents

ARCO Service Station 2111
1156 Davis Street, San Leandro, California

Date: 09-17-96

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-6	03-21-96	37.11	11.55	25.56	ND	WSW	0.005	03-22-96	<50	<0.5	1.9	<0.5	<0.5	<3	--	--
MW-6	05-24-96	37.11	12.80	24.31	ND	W	0.003	05-24-96	<50	<0.5	<0.5	<0.5	<0.5	6	--	--
MW-6	08-09-96	37.11	Not surveyed: Car parked on well					08-09-96	Not sampled: Car parked on well							
MW-7	03-21-96	38.68	13.32	25.36	ND	WSW	0.005	03-22-96	32000	870	450	970	4900	280	--	--
MW-7	05-24-96	38.68	14.58	24.10	ND	W	0.003	05-24-96	22000	570	40	42	1900	<200*	--	--
MW-7	08-09-96	38.68	15.33	23.35	ND	WNW	0.01	08-09-96	14000	390	<10*	180	470	<200*	--	--

ft-MSL: elevation in feet, relative to mean sea level
MWN: ground-water flow direction and gradient apply to the entire monitoring well network
ft/ft: foot per foot
TPHG: total petroleum hydrocarbons as gasoline, California DHS LUFT Method
µg/L: micrograms per liter
EPA: United States Environmental Protection Agency
MTBE: Methyl-tert-butyl ether
TRPH: total recoverable petroleum hydrocarbons
TPHD: total petroleum hydrocarbons as diesel, California DHS LUFT Method
NR: not reported; data not available or not measurable
ND: none detected
W: west
WSW: west-southwest
NW: northwest
^: chromatogram fingerprint is not characteristic of diesel
*: method reporting limit was raised due to: (1) high analyte concentration requiring sample dilution, or (2) matrix interference
- -: not available

Table 2

Tier 2 Results
Groundwater to Indoor Air Pathway
ARCO Service Station 2111

	Compound	Concentration at Point of Exposure (mg/L)	Site-Specific Threshold Level (mg/L)
Onsite			
	Benzene	0.34	1.54 [1]
Offsite			
	Benzene	0.0049	0.15 [2]

1 Based on 1.00E-05 risk

2 Based on 1.00E-06 risk

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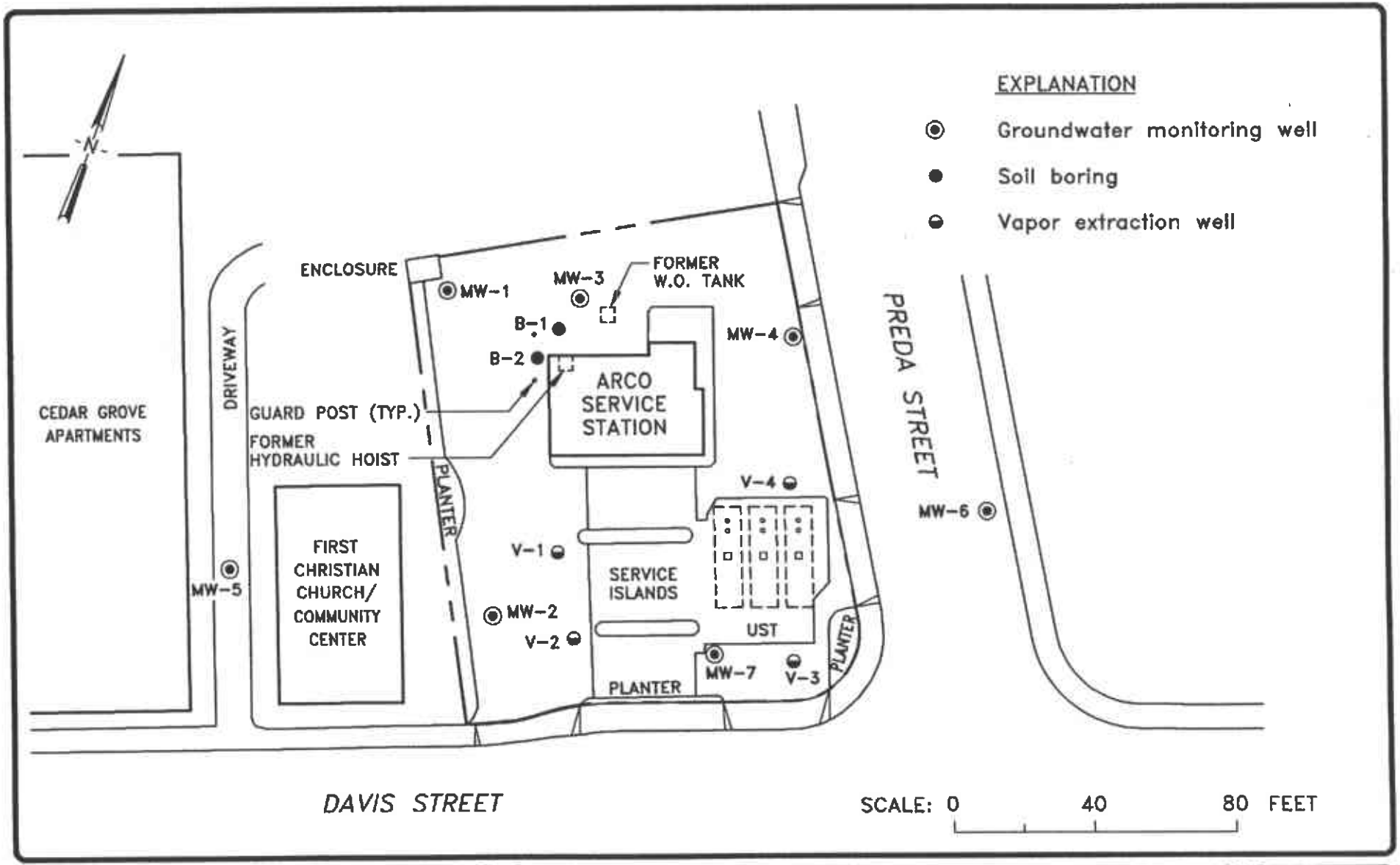
ARCO PRODUCTS COMPANY
SERVICE STATION 2111, 1156 DAVIS STREET
SAN LEANDRO, CALIFORNIA

SITE LOCATION

FIGURE
1
PROJECT NO.
805-127.04



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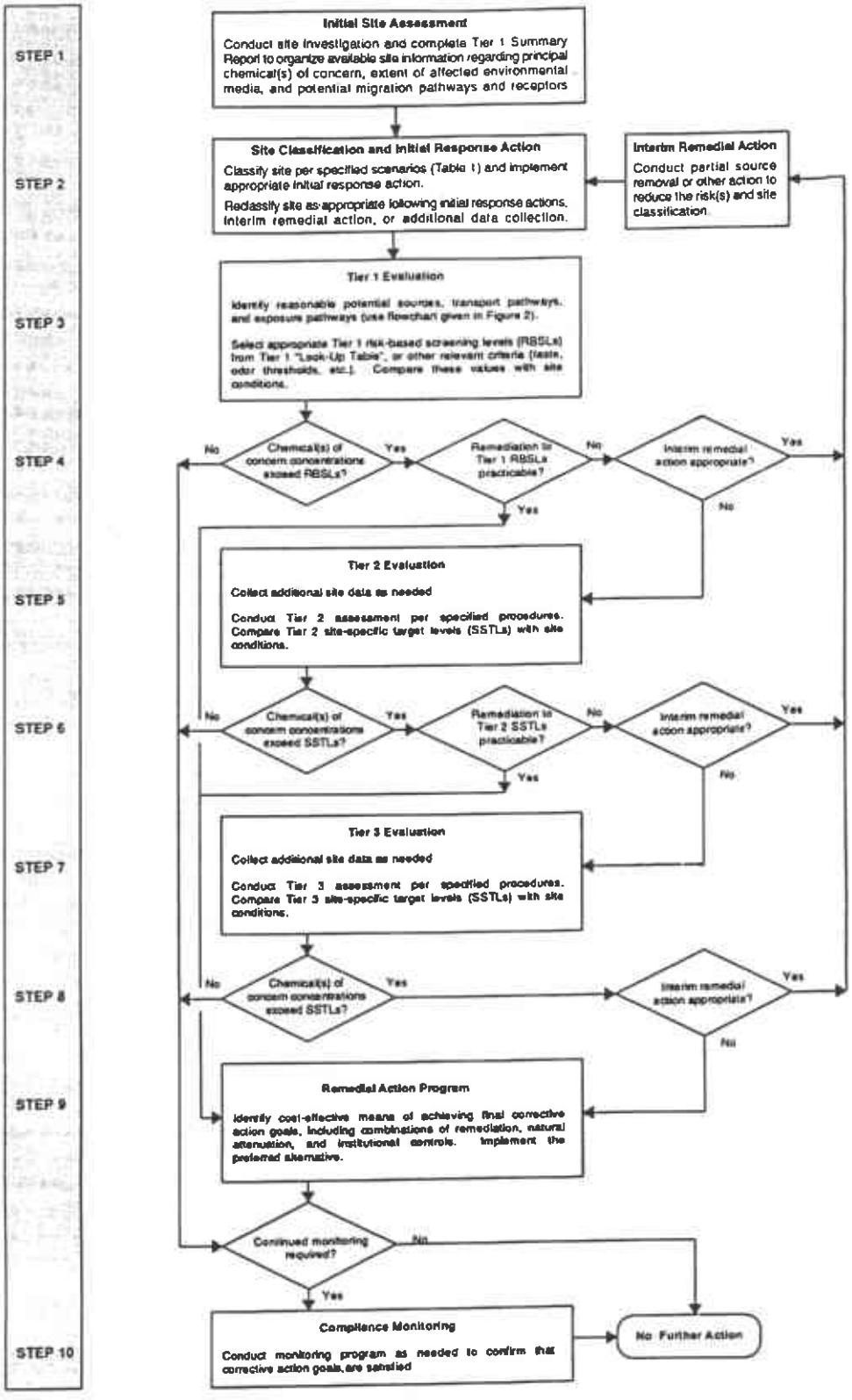
SERVICE STATION 2111, 1156 DAVIS STREET
SAN LEANDRO, CALIFORNIA

SITE PLAN

FIGURE
2
PROJECT NO.
805-127.04

155812



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SAN LEANDRO, CALIFORNIA

RISK-BASED CORRECTIVE ACTION PLAN
PROCESS FLOWCHART

FIGURE
3

PROJECT NO.
805-127.04

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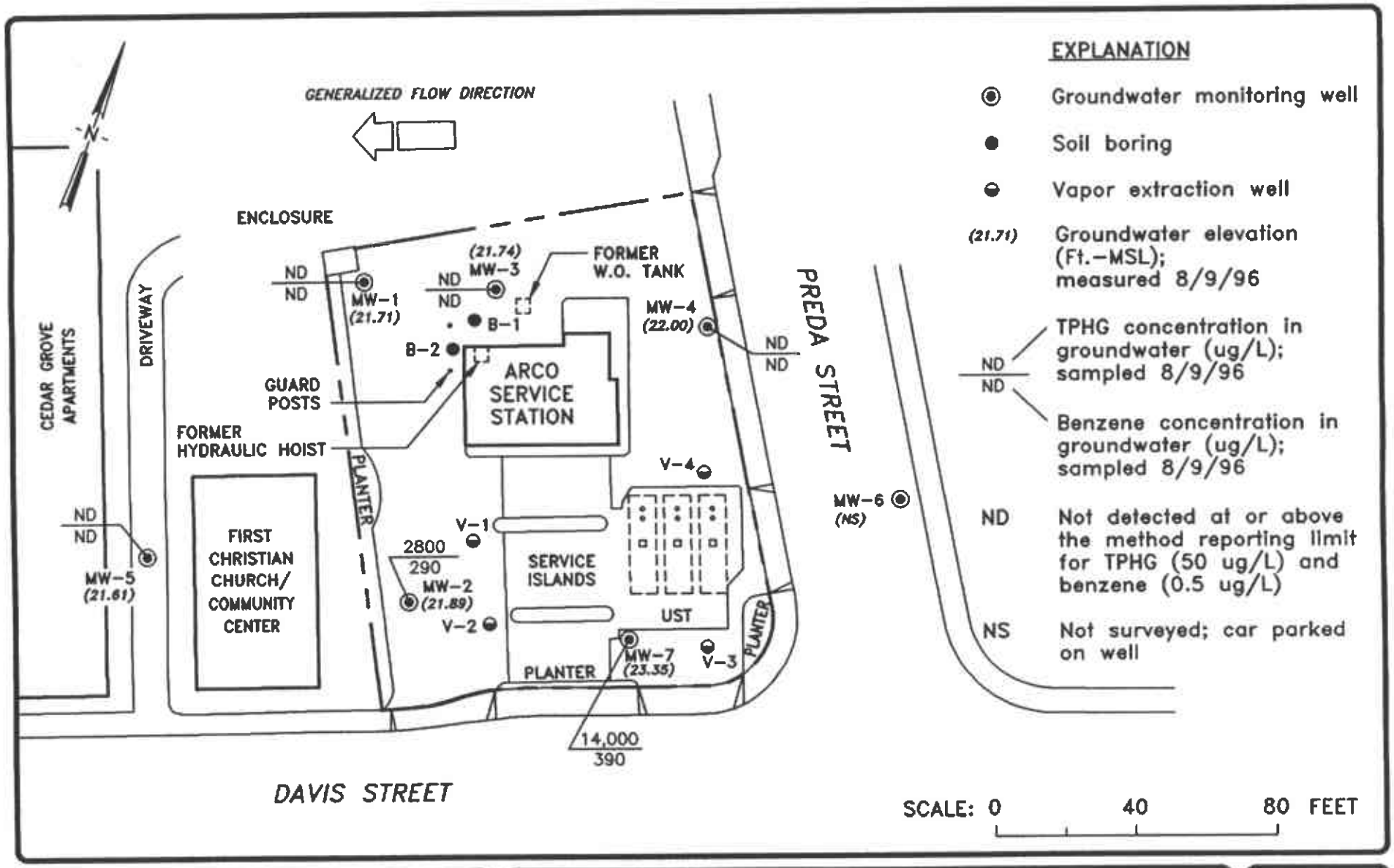

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SERVICE STATION 2111, 1156 DAVIS STREET
SAN LEANDRO, CALIFORNIA

GROUNDWATER DATA
THIRD QUARTER 1996

FIGURE
4
PROJECT NO.
805-127.04

ATTACHMENT A

ASTM RBCA WORKSHEETS

Site Name: ARCO 2111 Date Completed: 9-11-96

Site Location: 1156 Davis Street, San Leandro, CA Completed By: EMCON

TIER 1 EXECUTIVE SUMMARY CHECKLIST

VISUAL/HISTORICAL ASSESSMENT	(■ TO SELECT)		
Site size (acres)	■ <1	❑ <10	❑ >10
Site setting	❑ undeveloped	■ industrial	❑ residential
Site access	■ capped	❑ fenced-in	❑ open
Visual evidence of environmental impact	■ none	❑ limited	❑ extensive
Current site land use	❑ undeveloped	■ indust./comm.	❑ residential
Contaminant sources	■ tanks/spills	❑ trench/drums	❑ ponds/pits
Affected environmental media	❑ soil (>3 ft BGS)	■ groundwater	❑ surficial soil (≤3 ft BGS)
Types of compounds likely to be present	■ petroleum hydrocarbons	❑ metals	
	❑ inorganic (nitrates)	❑ other:(pesticides)	

BASELINE RECEPTOR IDENTIFICATION			
Reasonable potential receptors (greatest concern)	❑ none	❑ ecological	■ human
Distance from fenceline to nearest off-site receptor (ft)	❑ >500	❑ 100 - 500	■ <100
Travel time to closest groundwater receptor (yr)	❑ >10	❑ 2 - 10	■ <2
Depth to first encountered groundwater (ft)	❑ >150	❑ 50 - 150	■ <50
Complete exposure pathways	❑ none	❑ ingestion	■ inhalation
	❑ ecological	❑ dermal	❑ absorption

TIER 1 TASKS COMPLETED

- ■ Visual / historical assessment
- ■ Initial (screening) site assessment
- ■ Site prioritization / classification
- ■ Detailed site characterization
- ■ RBSL comparison
- ❑ Initial ecological assessment
- ■ Corrective action planned or implemented

TIER 1 CLASSIFICATION EVALUATION

Classification No.	Scenario Description	Prescribed Interim Action	Date Implemented
3	Dissolved BTEX in groundwater. Potential exposure via volatilization from groundwater to indoor and ambient air.	Tier 2 evaluation	9-6-96

TIER 1 CORRECTIVE ACTION CRITERIA

	Screening Level Criteria Exceeded? (■ if yes)						
Affected Medium	Risk-Based	Other (MCL)	Others: (specify)	_____	_____	_____	None Exceeded
• Surface Soil (< 3ft BGS)	❑	❑	❑	❑	❑	❑	■
• Subsurface Soil (> 3ft BGS)	❑	❑	❑	❑	❑	❑	■
• Groundwater (potable/nonpotable)	■	❑	❑	❑	❑	❑	❑
• Surface waters	❑	❑	❑	❑	❑	❑	■

NOTES: (List and discuss chemicals for which a Tier 1 exceedance is found.)

PROPOSED TIER 1 ACTION

- ❑ ***No Action:*** Site does not exceed Tier 1 criteria. - Apply for closure.
- ❑ ***Interim Corrective Action:*** Site exceeds some Tier 1 criteria. - Propose interim corrective action and reprioritize site.
- ❑ ***Final Corrective Action:*** Site exceeds some Tier 1 criteria. - Propose corrective action to achieve Tier 1 criteria.
- ■ ***Tier 2 Evaluation:*** Site exceeds some Tier 1 criteria. - Re-evaluate corrective action goals per Tier 2 risk assessment.

NOTE:
Rationale for proposed action documented on Worksheets 1.3 and 10.1-10.3.

ALL WORKSHEETS ENCLOSED IN THIS REPORT ARE IDENTIFIED ON THE TABLE OF CONTENTS FORM.

Site Name: ARCO 2111 Date Completed: 9-11-96

Site Location: 1156 Davis Street, San Leandro, CA Completed By: EMCON

TIER 2 EXECUTIVE SUMMARY CHECKLIST

TIER 2 SSTL CALCULATION METHOD (■ OR ● TO SELECT)

SSTL Calculation Option

- ■ Option 1: Site-Specific Screening Levels
- ☐ Option 2: Individual Constituent SSTL Values
- ☐ Option 3: Cumulative Constituent SSTL Values

NAF Calculation Method

- ■ Fate and Transport Modeling:
  - ● RBCA Spreadsheet System
  - ○ Other Model(s)
- ☐ Empirical NAF Calculation

SITE DATA INVENTORY

Source Zone Investigation Complete:

- ☐ Surface Soil (e.g., ≤ 3 ft BGS)
- ■ Subsurface Soil (e.g., > 3 ft BGS)
- ■ Groundwater

Exposure Pathway Information Compiled:

- ☐ Air Pathway
- ■ Groundwater Pathway
- ■ Soil Pathway
- ☐ Surface Water Pathway
- ■ Land Use Classification (on-site and off-site)

TIER 1 WORKSHEETS 1.3 - 4.2 AND 5.2 - 5.6 HAVE BEEN UPDATED TO INCLUDE NEW TIER 2 INFORMATION.

TASKS COMPLETED

- ■ Tier 1 Evaluation
- ☐ Tier 1 Interim Corrective Action
- ■ Tier 2 Evaluation
- ☐ Tier 2 Interim Corrective Action
- ☐ Tier 2 Final Corrective Action
- ☐ Tier 3 Evaluation

CURRENT SITE CLASSIFICATION

Classification No.	Scenario Description	Prescribed Interim Action	Date Implemented
4	No long-term threat to human health or safety or sensitive environmental receptors.	Continue monitoring	

TIER 2 CORRECTIVE ACTION CRITERIA

Affected Medium	Tier 2 SSTL Exceeded ?		Applicable Excess Risk Limits (specify value)				Other Applicable Exposure Limit
	Yes	No	Indiv. Risk	Total Risk	Hazard Index	Hazard Quotient	*(specify, if any)*
• Surface Soil (≤ 3ft BGS)	☐	☐					
• Subsurface Soil (> 3ft BGS	☐	☐					
• Groundwater	☐	■	1.0E-05			1	

PROPOSED ACTION

- ■ ***No Action:*** Tier 2 SSTLs not exceeded. Apply for closure.
- ☐ ***Interim Corrective Action:*** Address principal, near-term risks sources.
- ☐ ***Final Corrective Action:*** Remediate/control site to meet Tier 2 criteria.
- ☐ ***Tier 3 Evaluation:*** Improve baseline risk and SSTL estimates.

NOTE:

Rationale for proposed action documented on Worksheets 1.3 and 10.1-10.3.

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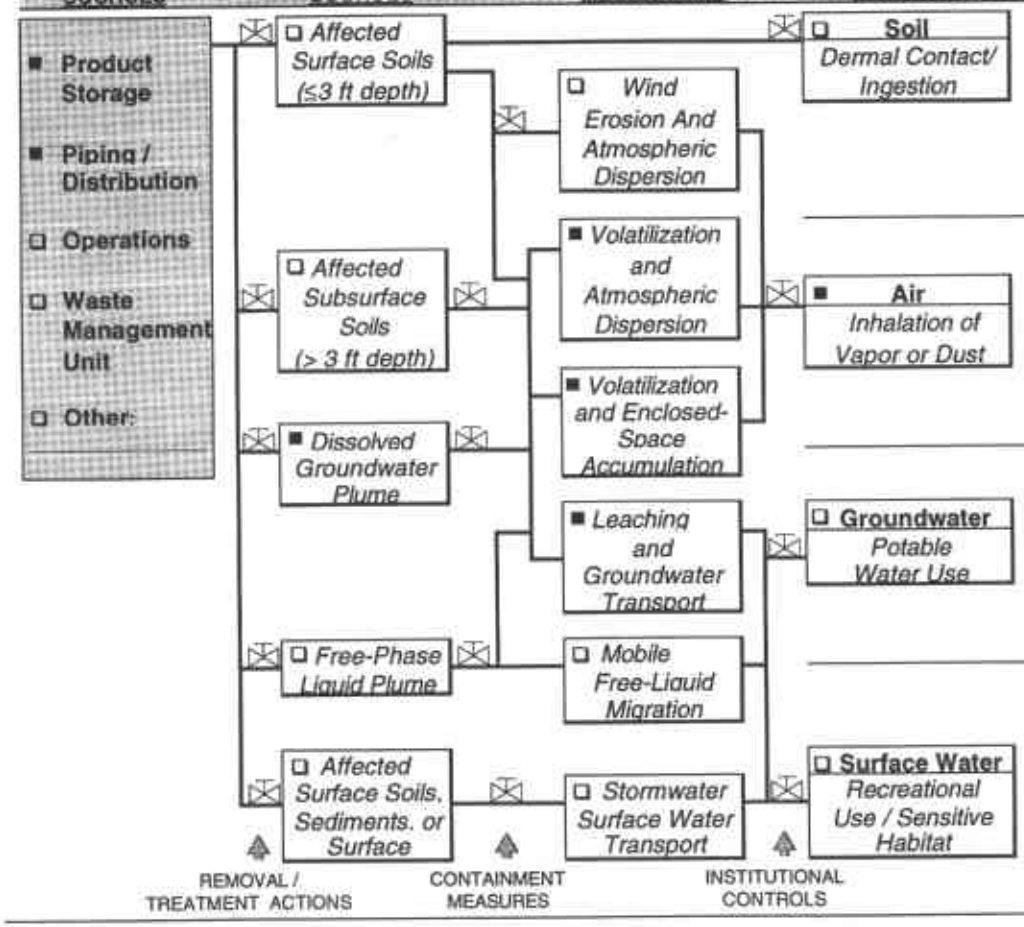
EXPOSURE CONTROL FLOWCHART

Instructions: *Identify remedial measures to be implemented to prevent exposure, as follows:* • Step 1 – *Baseline Exposure: Identify applicable sources, transport mechanisms, and receptors as shown on Worksheet 4.2 (■ = applicable to site).* • Step 2 – *Remedial Measures: Fill in shut-off valves (⋈) to indicate removal / treatment action, containment measure, or institutional controls to be used to "shut off" exposure pathway.* • Step 3 – *Remedial Technology Options: For each complete pathway, identify category of corrective measure to be applied and list possible technology options in space provided (see options list in RBCA Guidance Manual).*



POTENTIAL RECEPTORS

Exposed Receptors

On-Site: □ Residential □ Non-Resid. ■ N/A; □ Sensitive Habitat □ Recreation
Off-Site: □ Residential □ Non-Resid. ■ N/A; □ Sensitive Habitat □ Recreation

Exposed Persons

On-Site: □Residential ■ Non-Resid. □ N/A
Off-Site: □Residential ■ Non-Resid. □ N/A

Groundwater Users

On-Site: □Residential □ Non-Resid. ■ N/A
Off-Site: □Residential □ Non-Resid. ■ N/A

Surface Water Users

On-Site: □ Residential □ Non-Resid. ■ N/A; □ Sensitive Habitat □ Recreation
Off-Site: □ Residential □ Non-Resid. ■ N/A; □ Sensitive Habitat □ Recreation

REMEDIAL ACTION TECHNOLOGY OPTIONS

□ Complete Pathway: ○ Current ○ Potential
⋈ Action Required: □Yes ■ No
If yes, list technology options for ⋈:

■ Complete Pathway: ● Current ○ Potential
⋈ Action Required: □Yes ■ No
If yes, list technology options for ⋈:

□ Complete Pathway: ○ Current ○ Potential
⋈ Action Required: □Yes ■ No
If yes, list technology options for ⋈:

□ Complete Pathway: ○ Current ○ Potential
⋈ Action Required: □Yes ■ No
If yes, list technology options for ⋈:

(■ OR ● OR ⋈ TO SELECT)

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SITE DESCRIPTION

Location Description (see Figure 1)

Address: 1156 Davis Street

Cross-Street: Preda Street

City: San Leandro

County: Alameda

State: California

Notes:

Regulatory Agencies

Identify regulatory authorities and regulatory / legal status of site.

1) Agency: Alameda County Health Care Services Agency

Contact: Dale Klettke

Agency: Regioual Water Quality Control Board, San Francisco Bay Region

Contact: Kevin Graves

3) Other Involved Parties:

(■ *TO SELECT*) ❑ Consent order ❑ Lawsuit

Discussion:

Local Land Use (See Figure 2)

(■ *TO SELECT*)

On-Site Use	Current	Potential	Prior
Commercial	■	❑	❑
Residential	❑	❑	❑
Industrial	❑	❑	❑
Sensitive Habitat	❑	❑	❑
Other: (below)	❑	❑	❑

Other Comments:

Discuss options for listed items (including anticipated future use)

Topography (See Figures 1 and 3)

Other Comments:

Terrain ■ Flat ❑ Steep ❑ Variable

Site Elevation Interval (ft-MSL)

High Pt. 25.36 Low Pt. 21.71

Average Ground Surface Slope

Direction west Grade (ft/ft) 0.003

Local Climate

Other Comments:

Average Annual Rainfall (in): 20

Annual Average Evapotranspiration (in):

Within 100 Year Floodplain?: ❑ yes / ■ no

Summer Temperature Range (°F): 71-74

Winter Temperature Range (°F): 56-64

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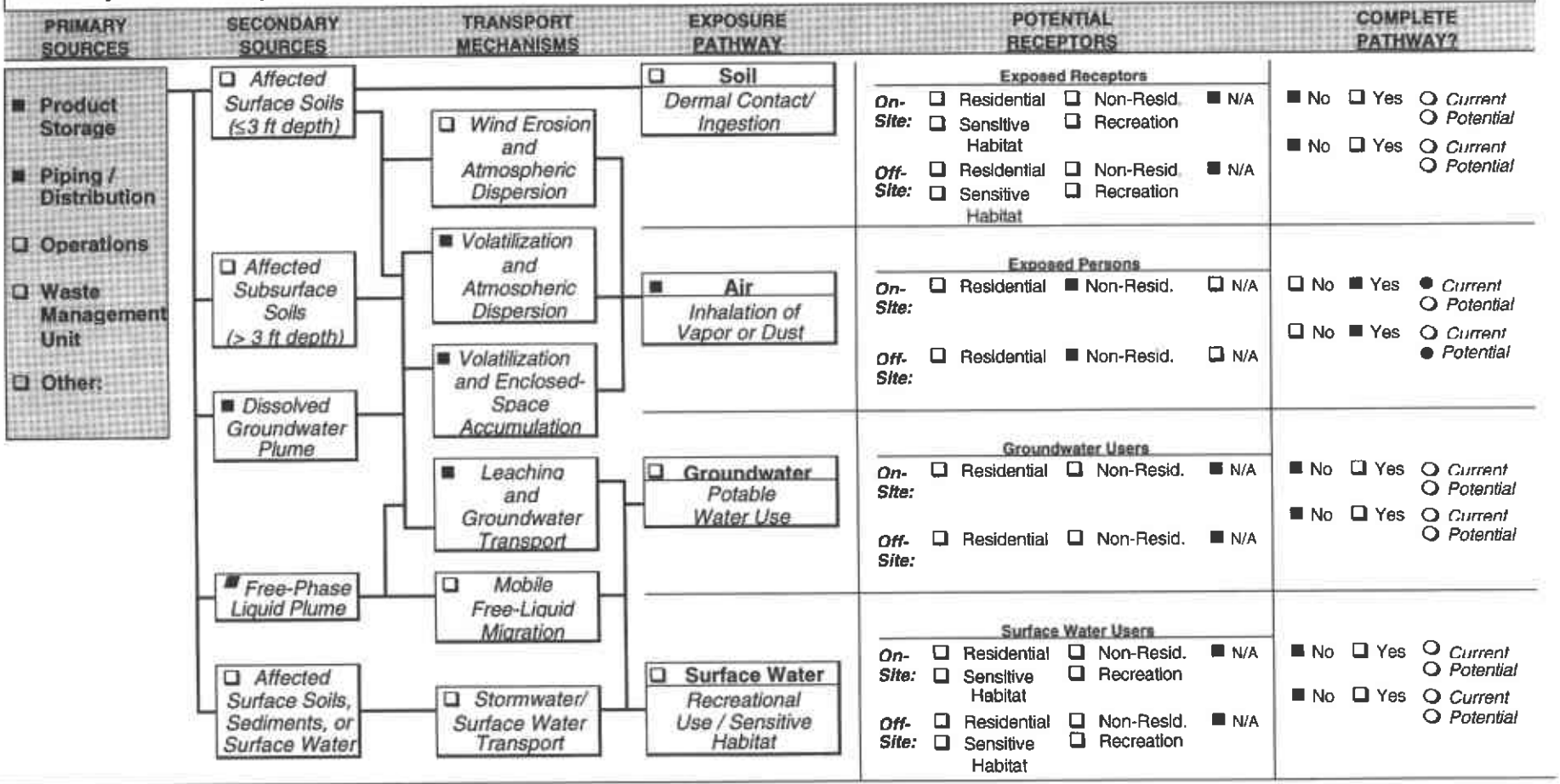
BASELINE EXPOSURE FLOWCHART

Instructions: *To characterize baseline exposure conditions, check boxes to identify applicable primary sources, secondary sources (affected media), potential transport mechanisms, and current or potential exposure pathways and receptors (■ = applicable to site). Identify types(s) of both on-site and off-site receptors, if applicable. Provide detailed information on complete pathways, exposure factors, and risk goals on Worksheets 4.3 - 4.5.*



(■ OR ● TO SELECT)

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EXPOSURE FACTOR CHECKLIST

Instructions: • ***Tier 1 Evaluation:*** *Indicate use of either residential or commercial / industrial Reasonable Maximum Exposure (RME) factors at on-site points of exposure (POEs) for complete exposure pathways.* • ***Tier 2 Evaluation:*** *Indicate use of either a Reasonable Maximum Exposure (RME) factor or a site-specific exposure factor for both residential and commercial / industrial points of exposure (POEs), as appropriate for each exposure pathway. For Tier 2, data is required for Global Factors and for complete pathways only (see Worksheet 4.4).*

		RESIDENTIAL POE		COMMERCIAL/ INDUSTRIAL POE	
		RME	Site-Specific	RME	Site-Specific
GLOBAL FACTORS		(■ TO SELECT)			
AT_C	Averaging time for carcinogens	☐ 70 yrs	☐	■ 70 yrs	☐
AT_n	Averaging time for non-carcinogens	☐ = ED	☐	■ = ED	☐
BW	Body weight -Adult	☐ 70 kg	☐	■ 70 kg	☐
	-Child (1-6 yrs)	☐ 15 kg	☐	☐ NA	☐
ED	Exposure duration	☐ 30 yrs	☐	■ 25 yrs	☐
AIR EXPOSURE FACTORS		■ COMPLETE (provide data)		☐ NOT COMPLETE (skip)	
EF	Exposure frequency (inhalation)	☐ 350 dy/yr	☐	■ 250 dy/yr	☐
IR_{ai}	Daily indoor inhalation rate	☐ 15 m^3/dy (24-hr/dy)	☐	■ 20 m^3/dy (8-hr/dy)	☐
IR_{ao}	Daily outdoor inhalation rate	☐ 20 m^3/dy (24-hr/dy)	☐	■ 20 m^3/dy (8-hr/dy)	☐
POTABLE WATER USE EXPOSURE FACTORS		☐ COMPLETE (provide data)		■ NOT COMPLETE (skip)	
EF	Exposure frequency (ingestion/showering)	☐ 350 dy/yr	☐	☐ 250 dy/yr	☐
IR_W	Daily water ingestion rate	☐ 2 L/dy (24-hr/dy)	☐	☐ 1 L/dy (8-hr/dy)	☐
EP_{sh}	Exposure period (showering)	☐ 12 min/dy	☐	☐ 12 min/day	☐
SA_W	Skin surface area (showering) -Adult (70 kg)	☐ 0.86 m^2	☐	☐ 0.86 m^2	☐
SOIL EXPOSURE FACTORS		☐ COMPLETE (provide data)		■ NOT COMPLETE (skip)	
EF	Exposure Frequency -Dermal Contact	☐ 350 dy/yr	☐	☐ 40 dy/yr	☐
	-Soil ingestion	☐ 350 dy/yr	☐	☐ 250 dy/yr	☐
SA_S	Skin surface area (soil contact) -Adult (18 to 31 yrs, 70 kg)	☐ 0.58 m^2	☐	☐ 0.58 m^2	☐
	-Child (1 - 17 yrs, 35 kg)	☐ 0.20 m^2	☐	☐ NA	☐
M	Soil to skin adherance factor	☐ 1.0 mg/cm^2	☐	☐ 1.0 mg/cm^2	☐
IR_S	Soil ingestion rate - Age-adjusted average	☐ 114 mg-yr /kg-dy	☐	o NA	☐
	-Adult (7 to 31 yrs, 70 kg)	☐ 100 mg/dy (24-hr/dy)	☐	☐ 50 mg/dy (8-hr/dy)	☐
	-Child (1 - 6 yrs, 15 kg)	☐ 200 mg/dy (24-hr/dy)	☐	☐ NA	☐
SURFACE WATER EXPOSURE FACTORS		☐ COMPLETE (provide data)		■ NOT COMPLETE (skip)	
EF	Exposure Frequency -Fish consumption	☐ 350 dy/yr	☐	☐ NA	☐
	-Swimming	☐ 7 dy/yr	☐	☐ NA	☐
IR_f	Daily fish intake rate -Freshwater	☐ 10 g/dy	☐	☐ NA	☐
	-Saltwater	☐ 15 g/dy	☐	☐ NA	☐
SA_W	Skin surface area (swimming) -Adult (70 kg)	☐ 0.86 m^2	☐	☐ NA	☐
EP_{sw}	Exposure period (swimming)	☐ 2.6 hrs/dy	☐	☐ NA	☐

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TIER 2 EXPOSURE PATHWAY SCREENING

Instructions: *Exposure pathways screening involves the following steps:*

1) *Source Medium: Compare maximum constituent concentration in relevant source medium to applicable Tier 1 RBSL value for designated pathway.*

2) *Transport Mechanism: Transport is active at site if: a) relevant source medium is affected, b) exposure medium or receptor exists, and c) constituent transport from source to receptor could occur under current or anticipated future use.*

3) *Exposure Medium: For pathways under steady-state transport conditions (e.g., air), compare measured COC concentration at POE to applicable Tier 1 exposure limit for air, groundwater, or soil. Surface water concentrations should be compared to applicable state or federal water quality criteria.*

4) *Complete Pathway: For screening, pathway considered complete if "Yes" reported in Column A and either Column B or C.*

Notes:
RBSL = Risk-Based Screening Level
POE = Point of Exposure
COC = Constituent of Concern
NM = Not Measured

PATHWAY	A) SOURCE MEDIUM: Type	A) SOURCE MEDIUM: Pathway Tier 1 RBSL Exceeded? (■ TO SELECT)	B) TRANSPORT MECHANISM: Type	B) TRANSPORT MECHANISM: Active at Site? (■ TO SELECT)	C) EXPOSURE MEDIUM: Type	C) EXPOSURE MEDIUM: Exposure Limit Exceeded at POE? (■ TO SELECT)	COMPLETE PATHWAY? (Check if yes & specify status)
AIR EXPOSURE PATHWAYS							
1) *Surface Soils:* Vapor Inhalation and Dust Ingestion	Surface Soil	☐ Yes ■ No	Volatilization /Dust Transport	■ No ☐ Yes - Current ☐ Yes - Future	Ambient Air	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
2) *Subsurface Soils:* Volatilization to Ambient Air	Subsurface Soil	☐ Yes ■ No	Volatilization	■ No ☐ Yes - Current ☐ Yes - Future	Ambient Air	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
3) *Subsurface Soils:* Volatilization to Enclosed Space	Subsurface Soil	☐ Yes ■ No	Volatilization	■ No ☐ Yes - Current ☐ Yes - Future	Indoor Air	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
4) *Groundwater:* Volatilization to Ambient Air	Groundwater	☐ Yes ■ No	Volatilization	☐ No ■ Yes - Current ■ Yes - Future	Ambient Air	■ NM ☐ No ☐ Yes	■ Current ☐ Potential
5) *Groundwater:* Volatilization to Enclosed Space	Groundwater	■ Yes* ☐ No	Volatilization	☐ No ■ Yes - Current ■ Yes - Future	Indoor Air	■ NM ☐ No ☐ Yes	■ Current ☐ Potential
GROUNDWATER EXPOSURE PATHWAYS							
6) *Soil:* Leaching to Groundwater: Ingestion	Surface or Subsurface Soils	☐ Yes ■ No	Leaching /Groundwater Flow	■ No ☐ Yes - Current ☐ Yes - Future	Groundwater	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
7) *Dissolved or Free-Phase Groundwater Plume:* Ingestion	Groundwater	☐ Yes ■ No	Groundwater Flow	■ No ☐ Yes - Current ☐ Yes - Future	Groundwater	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
SOIL EXPOSURE PATHWAY							
8) *Surface Soils:* Dermal Contact /Ingestion	Surface Soil	☐ Yes ■ No	Direct Contact	■ No ☐ Yes - Current ☐ Yes - Future	Soil	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential

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TIER 2 EXPOSURE PATHWAY SCREENING *CONTINUED*

PATHWAY	A) SOURCE MEDIUM: Type	A) SOURCE MEDIUM: Pathway Tier 1 RBSL Exceeded?	B) TRANSPORT MECHANISM: Type	B) TRANSPORT MECHANISM: Active at Site?	C) EXPOSURE MEDIUM: Type	C) EXPOSURE MEDIUM: Exposure Limit Exceeded at POE?	COMPLETE PATHWAY? (Check if yes & specify status)
SURFACE WATER PATHWAYS							
9) *Soil:* Leaching to Groundwater /Discharge to Surface Water: Recreation or Fish	Surface or Subsurface Soils	☐ Yes ■ No	Leaching /Groundwater Flow	■ No ☐ Yes - Current ☐ Yes - Future	Surface Water	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
10) *Groundwater Plume:* Discharge to Surface Water: Recreation or Fish	Groundwater	☐ Yes ■ No	Groundwater Flow	■ No ☐ Yes - Current ☐ Yes - Future	Surface Water	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
11) *Soil :* Leaching to Stormwater / Discharge to Surface Water: Recreation or Fish	Surface Soils	☐ Yes ■ No	Overland Flow	■ No ☐ Yes - Current ☐ Yes - Future	Surface Water	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential

Additional Information: ***Provide necessary background discussion for data provided above. Also, if ecological exposure pathway identified on Worksheet 3.5, identify relevant source medium, transport mechanism, exposure medium, and receptor type below.***

Tier 1 Results:

	RBSL Groundwater to -Indoor Air (mg/L)	Site Concentration (Well MW-2) (mg/L)
Benzene	2.14E-01	2.9E-01
Toluene	8.50E+01	6.0E-03
Ethyl benzene	>1.61E+02	7.5E-02
Xylenes	>2.00E+02	3.2E-01

	RBSL Groundwater to -Ambient Air (mg/L)	Site Concentration (Average of wells MW-2 and MW-7) (mg/L)
Benzene	5.34E+01	3.4E-01
Toluene	>5.35E+02	6.0E-03
Ethyl benzene	>1.61E+02	1.3E-01
Xylenes	>2.00E+02	4.0E-01

Notes:

1. RBSLs for benzene are for $1x10^{-5}$ risk level, and have been multiplied by 0.29 to account for California slope factor for benzene.
2. Concentrations from well MW-2 were used to represent the source of BTEX from groundwater to indoor air.
3. Concentrations from wells MW-2 and MW-7 were averaged to represent the source of BTEX from groundwater to ambient air.

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TIER 2 EXPOSURE SCENARIOS AND RISK GOALS

Instructions: ***For each exposure pathway, indicate i) Point of Exposure (POE) location (on-site, off-site, or both), ii) applicable exposure scenario at each POE (residential or commercial / industrial), and iii) applicable risk goals. Distance from source corresponds to shortest lateral distance to applicable POE from point of maximum COC concentration in source medium along possible migration pathway. Provide exposure limit information if applicable (e.g., OSHA Limits, MCLs, etc.).*** *(■ TO SELECT)*

EXPOSURE PATHWAY	DISTANCE FROM SOURCE	EXPOSURE SCENARIO AT POE	TARGET RKSKS AT POE: Individual Constituent Effects — Indiv. Risk	Individual Constituent Effects — HQ	Cumulative Constituent Effects — Additive Risk	Cumulative Constituent Effects — HI	Other Exposure Limit (specify if applicable)
AIR EXPOSURE PATHWAYS	■ COMPLETE (provide data)	☐ NOT COMPLETE (skip to next pathway)					
■ On-Site POE:	0 ft	☐ Residential ■ Commercial /Industrial	1.0E-05	1			☐ PEL/TLV
■ Off-Site POE:	15 ft	☐ Residential ■ Commercial /Industrial	1.0E-05	1			☐ PEL/TLV
GROUNDWATER EXPOSURE PATHWAYS	☐ COMPLETE (provide data)	■ NOT COMPLETE (skip to next pathway)					
☐ On-Site POE:	_____ ft	☐ Residential ☐ Commercial /Industrial					☐ MCL
☐ Off-Site POE	_____ ft	☐ Residential ☐ Commercial /Industrial					☐ MCL
SOIL EXPOSURE PATHWAY	☐ COMPLETE (provide data)	■ NOT COMPLETE (skip to next pathway)					
☐ On-Site POE: (at source)		☐ Residential ☐ Commercial /Industrial					☐ _____
☐ Off-Site POE (at source)		☐ Residential ☐ Commercial /Industrial					☐ _____
SURFACE WATER EXPOSURE PATHWAYS	☐ COMPLETE (provide data)	☐ NOT COMPLETE (skip to next pathway)					
☐ On-Site POE:	_____ ft	☐ Recreational ☐ Ecological *(specify exp. limit only)*					☐ _____
☐ Off-Site POE	_____ ft	☐ Recreational ☐ Ecological *(specify exp. limit only)*					☐ _____

ADDITIONAL INFORMATION:

If exposure limit is specified, provide reference for concentration limits to be applied to each COC (e.g., OSHA limits, water quality criteria, etc.):

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SITE PARAMETER CHECKLIST FOR RISK-BASED SCREENING LEVELS

Instructions: *For Tier 1 evaluation (generic screening levels), review specified default parameters (*) to ensure values are conservative for site. For Tier 2 Option 1 SSTL calculation (site-specific screening levels), provide site-specific values for sensitive parameters (§). Indicate parameter value used in evaluation by completing check box (■).*

Note: * **Confirm conservatism of these values for Tier 1 evaluation.**

§ **Provide site-specific measurement or estimate for Tier 2 evaluation.**

		Default Value Used		Site-Specific Value Used		
Soil Parameters						
	soil type	❑	sandy soil	■	clayey sand	*§
Θ_T	Soil porosity	❑	0.38 (dim)	■	0.30	§
Θ_{ws}	water content - vadose zone	❑	0.12 (dim)	■	0.17	§
Θ_{as}	air content - vadose zone (= Θ_T - Θ_{ws})	❑	0.26 (dim)	■	0.13	
Θ_{wcap}	water content - capillary fringe	❑	0.342 (dim)	■	0.25	
Θ_{acap}	air content - capillary fringe (= Θ_T - Θ_{wcap})	❑	0.038 (dim)	■	0.05	
ρ_s	Soil density	■	1.7 g/cm^3	❑		§
foc	mass fraction of organic carbon in soil	■	0.01 (dim)	❑		§
Ls	Depth to contaminated soil	❑	100 cm	❑		§
Lgw	Depth to groundwater	❑	300 cm	■	366	§
h_{cap}	capillary zone thickness	❑	5 cm	■	30.5	
hv	vadose zone thickness (= Lgw - hc)	❑	295 cm	■	335	
pH	Soil/water pH	■	6.5	❑		
Groundwater Parameters						
I	Water infiltration rate	❑	30 cm/yr	❑		§
V_{gw}	groundwater velocity	❑	82.0 ft/yr	❑		*§
δ_{gw}	groundwater mixing zone depth	❑	200 cm	❑		*§
DF	aquifer dilution factor (= 1 + V_{gw} δ_{gw}/(IW))	❑	12.1	❑		
Surface Parameters						
U_{air}	Amb. air velocity in mixing zone	❑	225 cm/s	❑		*§
δ_{air}	Mixing zone height	❑	200 cm	❑		*§
A	Contaminated Area	❑	2250000 cm^2	❑		
W	Width of Contaminated Area	❑	1500 cm	❑		§
d	Thickness of Surficial Soils	❑	100 cm	❑		§
Pe	Particulate areal emission rate	❑	2.17E-10 g/cm^2-s	❑		§
Building Parameters						
L_{crack}	Foundation crack thickness	■	15 cm	❑		
η	Foundation crack fraction	❑	0.01 (dim)	■	0.005	
Lb_r	Building Volume/Foundation Area Ratio (res.)	❑	200 cm	❑		
Lb_c	Building Volume/Foundation Area Ratio (com./ind.)	■	300 cm	❑		
ER_r	Building vapor volume exchange rate (res.)	❑	12 dy^{-1}	❑		
ER_c	Building vapor volume exchange rate (com./ind.)	■	20 dy^{-1}	❑		

Discussion: *Provide rationale for default parameter revision; discuss additional site-specific features of note; etc.*

(continue on next page if needed)

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SUMMARY OF MEDIA INVESTIGATION & CHEMICAL ANALYSES

		Site Media Analyzed (■ *TO SELECT*)					
		Ground-water	Surface Soil	Subsurf. Soil	Soil Vapor	Ambient Vapor	Surface Water
	Applicable?	■	☐	☐	☐	☐	☐
	Sampled?	■	☐	☐	☐	☐	☐
Chemical Analysis	**EPA Analysis Method**	•ana. = chemical analyzed; •det. = chemical detected					
Organic Chemicals		ana./det.	ana./det.	ana./det.	ana./det.	ana./det.	ana./det.
Volatile Organics	*8240 / 624*	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
Semi-Volatile Organics	*8270 / 625*	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
Polynuclear Aromatic Hydrocarbons	*8310 / 8270*	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
Purgeable Aromatics	*5030/8020*	■ ■	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
Total Petroleum Hydrocarbons (GC)	*5030/8020*	■ ■	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
Halogenated Organic Chemicals		ana./det.	ana./det.	ana./det.	ana./det.	ana./det.	ana./det.
Halogenated Volatile Organics	*8010 / 601*	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
Organochlorine & PCBs	*8080*	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
Inorganic Chemicals		ana./det.	ana./det.	ana./det.	ana./det.	ana./det.	ana./det.
Metals	*6010 / 7xxx series*	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
Others		ana./det.	ana./det.	ana./det.	ana./det.	ana./det.	ana./det.
• _____		☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
• _____		☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
• _____		☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
• _____		☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐

DISCUSSION OF MEDIA INVESTIGATION & CHEMICAL ANALYSES

Items for discussion include: •Selection of sampled media •Selected analysis methods •Planned additional sampling

Items	

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Site Location: 1156 Davis Street, San Leandro, CA Completed By: EMCON

SUMMARY OF SOURCE ZONE CHARACTERISTICS

Instructions: ***Provide information regarding presence and dimensions of affected soil and groundwater zones. For each affected medium, list constituents of concern (COCs) and representative concentration data on Worksheets 5.4 - 5.6. Describe source area histories on Worksheets 2.2 and 2.3 and show locations on Figures 3 through 7. (Under RBCA, the affected soil or groundwater zone is defined as the area or volume containing COC concentrations in excess of Tier 1 screening levels.)***

AFFECTED SURFACE SOILS (≤ 3 ft BGS) (■ TO SELECT)

- ☐ Present
- ■ Not Present
- ☐ Not Measured

If present, complete the following:

- Maximum areal extent (ft^2): _____
- Width of affected zone (ft): _____
- Length of affected zone (ft) : _____
- Depth interval (ft,BGS): _____

(Provide COC data on Worksheet 5.4)

AFFECTED SUBSURFACE SOILS (> 3 ft BGS)

- ☐ Present
- ■ Not Present
- ☐ Not Measured

If present, complete the following:

- Depth to top of affected soil (ft) (min. 3 ft, BGS): _____
- Depth to base of affected soil (ft, BGS): _____
- Maximum areal extent (ft^2): _____

(Provide COC data on Worksheet 5.5)

AFFECTED GROUNDWATER

- ■ Present
- ☐ Not Present
- ☐ Not Measured

If present, complete the following:

- Maximum areal extent (ft^2): 15,080
- Length of plume (ft): 160 (maximum)
- Width of plume (ft): 120 (estimate)
- Depth to top of affected water-bearing unit (ft, BGS): 12
- Depth to base of plume (ft, BGS): _____

(Provide COC data on Worksheet 5.6)

OTHER SOURCE MEDIUM

- ☐ Present
- ■ Not Present

If present, describe nature of material and dimensions:

_____

_____

_____

_____

(Provide COC data on separate table)

Site Name: ARCO 2111 | Date Completed: 9-11-96

Site Location: 1156 Davis Street, San Leandro, CA | Completed By: EMCON

GROUNDWATER CONCENTRATION DATA SUMMARY

Instructions: *Indicate type and concentrations of hazardous constituents detected in groundwater. Provide statistical data (maximum value, mean value, upper 90% confidence limit on mean) on detectable concentrations only. Do not include non-detects from outside of source zone. Select "representative concentration" value for comparison to cleanup standard (SSTL or RBSL) and calculation of baseline risk. Provide detailed lab data table(s) as Appendix A to this report.*

CONSTITUENTS DETECTED		ANALYTICAL METHOD		SAMPLE POPULATION		DETECTED CONCENTRATIONS			SELECTED REPRESENTATIVE CONC. (mg/L)
CAS No.	Name	Method No.	Typical Detection Limit (mg/L)	No. of Samples	No. of Detects	Max Conc. (mg/L)	Mean Conc. (mg/L)	Upper 90%CL Conc. (mg/L)	
	Volatilization from Groundwater to Indoor Air								
	Benzene	5030/8020	0.0005	28	8	1.30	0.196		0.290
	Toluene	5030/8020	0.0005	28	7	0.450	0.031		0.006
	Ethyl benzene	5030/8020	0.0005	28	8	0.970	0.082		0.075
	Xylenes	5030/8020	0.0005	28	8	4.90	0.493		0.032
	Volatilization from Groundwater to Ambient Air								
	Benzene	5030/8020	0.0005	28	8	1.30	0.196		0.340
	Toluene	5030/8020	0.0005	28	7	0.450	0.031		0.006
	Ethyl benzene	5030/8020	0.0005	28	8	0.970	0.082		0.128
	Xylenes	5030/8020	0.0005	28	8	4.90	0.493		0.395

Site Name: ARCO 2111 | Date Completed: 9-11-96

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TIER 2 EXPOSURE PATHWAY TRANSPORT PARAMETERS

Instructions: ***For complete exposure pathways, provide site-specific values for transport parameters. In absence of direct measurements, default values may be selected for some parameters, as shown below. If no default value shown, site-specific value must be provided.***

	TRANSPORT PARAMETER	SITE-SPECIFIC VALUE (INPUT VALUE BELOW)	DEFAULT VALUE (■ TO SELECT)
AIR PARAMETERS			
δ_{air}	Air mixing zone height (cm)		■ 200
U_{air}	Ambient air velocity in mixing zone (cm/sec)		■ 225
Pe	Soil particulate areal emission rate (g/cm^2-sec)		❑ 2.17E-10
σ_y	Transverse air dispersion coeff. (m)		■ 100
σ_z	Vertical air dispersion coeff. (m)		■ 10
GROUNDWATER PARAMETERS			
δ_{gw}	Groundwater mixing zone depth (cm)		❑ 200
I	Water infiltration rate (cm/yr)		❑ 30
V_{gw}	Groundwater Darcy velocity (ft/yr)		
K	Saturated hydraulic conductivity (cm/sec)		
i_{grad}	Lateral groundwater flow gradient (dim)		
$(BC)_i$	Available biodegradation capacity of electron acceptors for constituent *i*		
x	Distance to POE from point of maximum COC concentration in groundwater (ft)		
α_x	Longitudinal groundwater dispersion coeff. (cm)		❑ 10% of x
α_y	Transverse groundwater dispersion coeff. (cm)		❑ 33% of α_x
α_z	Vertical groundwater dispersion coeff. (cm)		❑ 5% of α_z
SOIL PARAMETERS			
h_{cap}	Capillary zone thickness (cm)		❑ 5
h_v	Vadose zone thickness (cm)		
ρ_s	Soil bulk density (g/cm^3)		❑ 1.7
foc_s	Fraction organic carbon in soil leaching zone (dim)		❑ 0.01
foc_{gw}	Fraction organic carbon in water-bearing unit (dim)		❑ 0.001
Lgw	Depth to groundwater (cm)		
Θ_T	Soil porosity (dim)		❑ 0.38
	Soil volumetric watecr content (dim)		
Θ_{wcap}	• Capillary zone		❑ 0.342
Θ_{ws}	• Vadose zone		❑ 0.12
Θ_{wcrack}	• Foundation crack		❑ 0.12

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TIER 2 EXPOSURE PATHWAY TRANSPORT PARAMETERS *CONTINUED*

TRANSPORT PARAMETER		SITE-SPECIFIC VALUE (INPUT VALUE BELOW)	DEFAULT VALUE (■ TO SELECT)	
SOIL PARAMETERS (Continued)				
	Soil volumetric air content (dim)			
Θ_{acap}	•Capillary zone		❑ 0.038	
Θ_{as}	•Vadose zone		❑ 0.26	
Θ_{acrack}	•Foundation crack		❑ 0.26	
d	Thickness of surficial soil zone (cm)		❑ 100 cm	
BUILDING PARAMETERS				
			Resid.	Comm/ Ind.
L_b	Building volume/area ratio (cm)		❑ 200	■ 300
ER	Building air exchange rate (dy-1)		❑ 12	■ 20
L_{crack}	Foundation crack thickness (cm)		■ 15	
η	Foundation crack fraction		■ 0.005	

Additional Information: