November 19, 1997

11/21/97
- Sarkis will send table of [soil] and [GW] used in analysis
- Texaco does not want to evaluate GW volat. to building - it may not pass. So if we close, it would be under current use scenario, & no building to be constructed over soil/GW contam w/o evaluation for risk.

ENV - STUDIES, SURVEYS, & REPORTS
Former Texaco Service Station/Current 7-11 Store
930 Springtown Blvd., Livermore, California
RBCA Tier 2 Analysis Results and
Request for Risk-Based Case Closure

Ms. Eva Chu
Alameda County Department of Environmental Health
1131 Harbor Bay Parkway, Fl. 2
Alameda, CA 94502-6577

Dear Ms. Chu:

Enclosed is the *Risk-Based Corrective Action Analysis*, dated October 31, 1997 and completed by Kaprealian Engineering, Inc., for the subject site. As the report states, the site passed Tier 2 level analysis requirements under the most conservative assumptions, and, as Kaprealian recommends, Texaco is requesting risk-based case closure.

If you have any questions or comments regarding this site, please call me at (510) 236-9139.

Best Regards,
Texaco Refining and Marketing Inc.

Karen E. Petryna
Project Manager
Environment, Health & Safety

KEP:hs
U:\...\930\CLOS_REQ.DOC

Enclosure

cc: Mr. Bob DeNinno, The Southland Corporation (w/ enclosure)
Mr. Sarkis Soghomonian, Kaprealian Engineering, Inc. (w/o enclosure)

PR:

KAPREALIAN ENGINEERING
INCORPORATED

KEI-P95-0711.R2
October 31, 1997

Texaco Refining and Marketing, Inc.
108 Cutting Boulevard
Richmond, CA 94804

Attention: Ms. Karen E. Petryna

RE: Risk-Based Corrective Action (RBCA) Analysis
Former Texaco Service Station
930 Springtown Boulevard
Livermore, California

Dear Ms. Petryna

This report, prepared at your request, presents the results of Risk Based Corrective Action (RBCA) analysis performed by Kaprealian Engineering, Inc. (KEI) and was prepared in order to obtain Case Closure from the Alameda County Health Care Services Agency (ACHCSA). Per a telephone conversation on August 19, 1997 with Ms. Eva Chu of the ACHCSA, Case Closure will be granted if a Risk Based Corrective Action (RBCA) analysis is conducted and the results of the analysis indicate that no site-specific target levels are exceeded (passing result).

SITE DESCRIPTION AND BACKGROUND

The site formerly contained a Texaco service station facility and is currently occupied by a 7-11 convenience store. Subsurface investigation was initiated in September 1984 with the installation of two groundwater monitoring wells (MW-A and MW-B). Underground fuel storage tanks were removed in June 1985. Plume definition investigation continued through 1989. Monitoring wells MW-1 through MW-3 were installed in June 1985, MW-4 was installed in September 1985, and MW-5 and MW-6 were installed in November 1986. One soil boring was drilled and two additional monitoring wells (MW-7 and MW-8) were installed in December 1989 in order to fully define the extent of subsurface hydrocarbons. Monitoring wells MW-6 and MW-7 were destroyed in December 1995 and January 1996. A vapor extraction system operated at the site from September 1994 through October 1995. Results of the most recent and historical ground water samples collected from the monitoring wells at the subject site are presented in Texaco's report dated August 4, 1997.

RBCA ANALYSIS

KEI performed Risk-Based Corrective Action (RBCA) analysis for the subject site. The RBCA process is an analytical technique for assessment and determination of response to contamination associated with hydrocarbon releases. The technique integrates U.S. Environmental Protection Agency (EPA) risk assessment practices with traditional site investigation and remediation to determine

2401 Stanwell Drive, Suite 400
Concord, California 94520
Tel: 510.602.5100 Fax: 510.687.0602

cost-effective measures for protection of human health and environmental resources. The ASTM standard for this analysis is ASTM E-1739 "Standard for Risk-Based Corrective Action at Petroleum Release Sites."

Under RBCA, exposure to contaminants at petroleum release sites are characterized in terms of three steps: sources, transport mechanisms, and receptors. The analysis evaluates the need for corrective action(s) to prevent human or environmental exposure to harmful levels of contaminants. Based on the three-step exposure process model, corrective actions could involve removal or treatment of the source, interruption of transport mechanisms, or control of activities at potential receptors.

RBCA analysis can be performed at a Tier 1 or Tier 2 level. The more comprehensive Tier 2 level analysis using site specific data was performed in this study.

Within Tier 2 analysis, three options exist for evaluation. The most comprehensive option (Option 3) was used for these analyses. This option evaluates the constituents of concern on a cumulative basis as well as individually.

The RBCA analyses summarized in this report were performed using the RBCA Spreadsheet System of Groundwater Services, Inc. of Houston, Texas. The software consists of a series of linked worksheets in Microsoft Excel 5.0. Copies of the worksheets and output for these analyses are attached to this report as Appendix A.

RBCA analysis was performed to determine the impact of residual hydrocarbon contamination at the subject site.

A flow chart that illustrates the RBCA evaluation procedures is presented in Appendix A. All primary sources of contaminants (Column 1) have been removed from the site. Secondary sources and transport mechanism are shown in columns 2 and 3, respectively. It was assumed that no sensitive habitats were present on-site or potential ground water/potable water use on-site (Column 5). A detailed outline of exposure pathways and potential receptors are presented in Columns 4 through 6 of the flow chart in Appendix A. Potential receptors for the exposure pathway by dermal contact or soil ingestion on-site were evaluated for the case of a construction worker. The exposure pathway for inhalation - outdoor air was evaluated for the subject site.

For modelling of subsurface soils (>3 feet deep), all BTEX analytical results of soil samples collected from a depth of greater than 3 feet below grade were evaluated. All the results were input into the RBCA software which then calculated a representative concentration for each BTEX constituent with a 95% upper confidence level. Since no soil sample analytical results were available for a depth less than 3 feet below grade, a concentration of 0.005 mg/kg, the laboratory detection limit, was input for each BTEX constituent. However, the top 3 foot soil layer is not anticipated to be significantly impacted.

DISCUSSION

Based on the results of the RBCA analysis performed using the assumptions made during the modelling process, no on-site Site-Specific Target Levels (SSTLs) were exceeded (passing result) for any of the pathways modelled, either for cumulative or site specific levels (refer to Appendix A). Therefore, based upon the analytical results of all of the soil/ground water samples collected to date, results of the remediation system previously operated at the site, and the RBCA analysis previously described, it is KEI's technical opinion that no further remedial or investigative activities are warranted. Therefore, KEI recommends that Texaco formally request the ACHCSA to grant Case Closure. However, Ms. Chu stated during the August 19, 1997 conversation that since Texaco is not the property owner, a restriction will be included in any closure letter because the site will be closed using a "risk-based" approach and residual hydrocarbons remain at the site.

As with any soil and ground water fate and transport model, assumptions are made that significantly affect the risks associated with residual hydrocarbons present at a specific site or vicinity. We have attempted to evaluate the health risks associated with these residual hydrocarbons in a conservative manner. However, our interpretation is subject to the limitations of the software and/or analytical data utilized.

For [GW] avg 4 qtrs of MWs onsite

for soil > 3' bgs should use [soil] above GW elevation (avg dtw, take [soil] above that)

Should you have any questions regarding this report, please do not hesitate to call at (510) 602-5100.

Sincerely,

Kaprealian Engineering, Inc.

Hagop Kevork, P.E.
Senior Staff Engineer

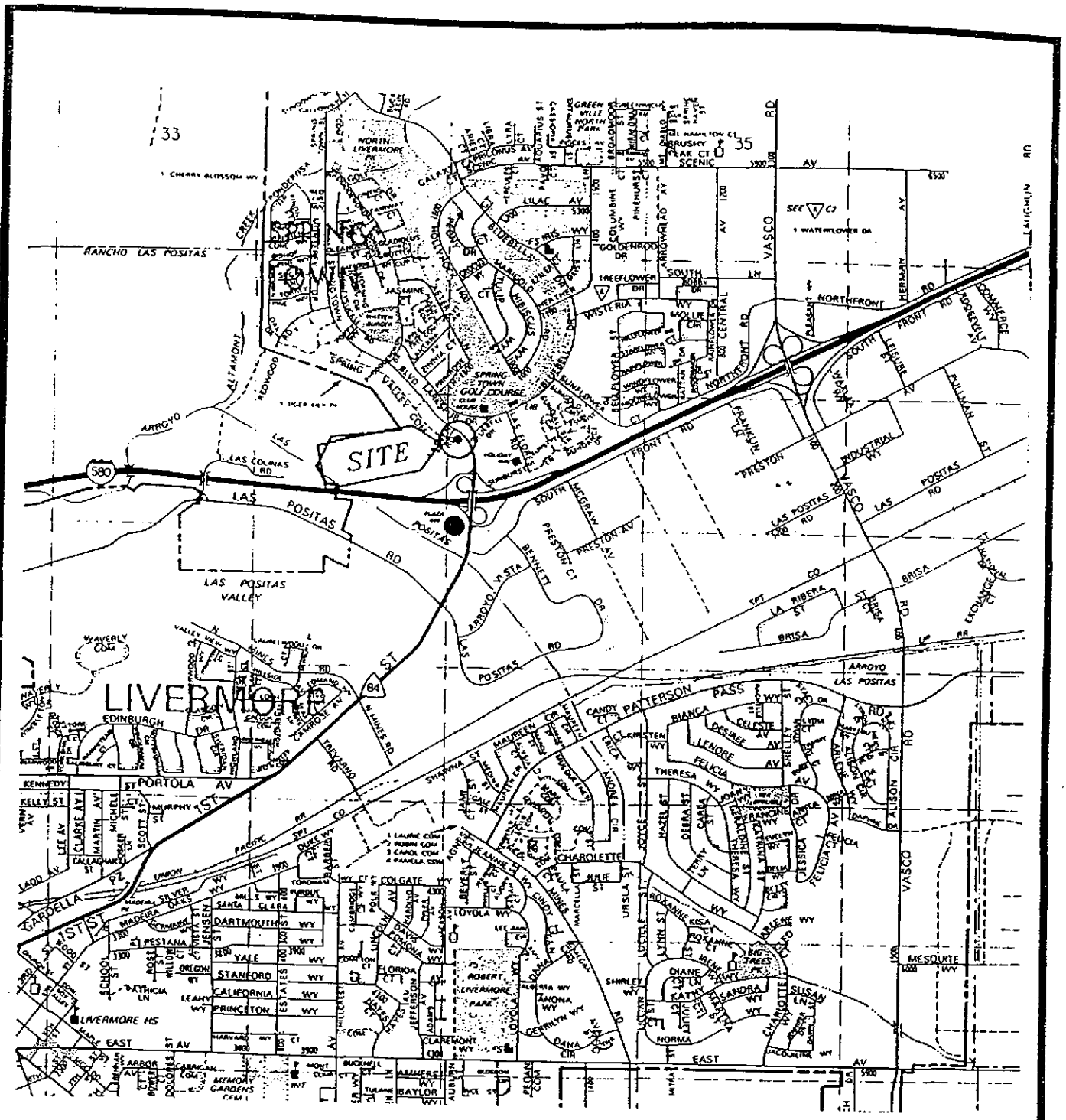
License No. C55734
Exp. Date: 12/31/00

REGISTERED PROFESSIONAL ENGINEER
HAGOP KEVORK
No. C 55734
Exp. 12/31/00
CIVIL
STATE OF CALIFORNIA

Sarkis A. Soghomonian
Project Engineer

SAS:jfc\5-0711.R2

Attachments: Location Map
Figure 1
Appendix A - RBCA Analysis



SOURCE:

1993 THE THOMAS GUIDE
ALAMEDA COUNTY, PAGE 51 (C3)

N

0 1/4 1/2 3/4 1

MILE

1" = 2200'

TEXACO

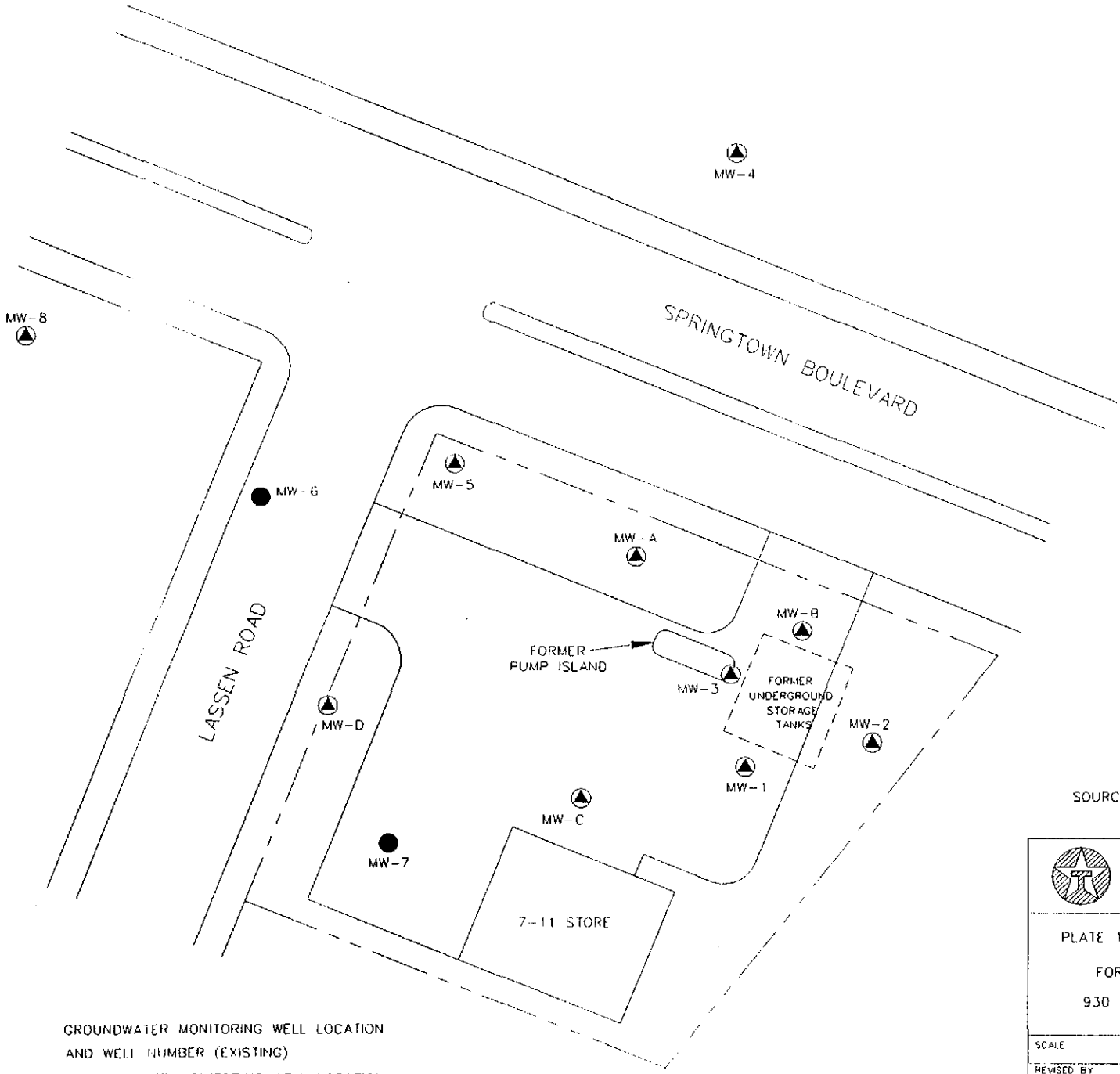
REFINING AND MARKETING, INC.
TEXACO ENVIRONMENTAL SERVICES

PLATE 1

SITE VICINITY MAP

FORMER TEXACO SERVICE STATION

930 SPRINGTOWN BLVD. / LASSEN RD.,
LIVERMORE, CALIFORNIA



LEGEND :

- MW-1 — GROUNDWATER MONITORING WELL LOCATION AND WELL NUMBER (EXISTING)
- MW-7 — GROUNDWATER MONITORING WELL LOCATION AND WELL NUMBER (DESTROYED)

SOURCE : MATTESON ENGINEERING CONDUCTED SURVEY ON 08/04/1994

TEXACO
REFINING AND MARKETING INC.
TEXACO ENVIRONMENTAL SERVICES

PLATE 1 : MONITORING WELL LOCATION MAP

FORMER TEXACO SERVICE STATION

930 SPRINGTOWN BLVD. / LASSEN RD.,
LIVERMORE, CALIFORNIA

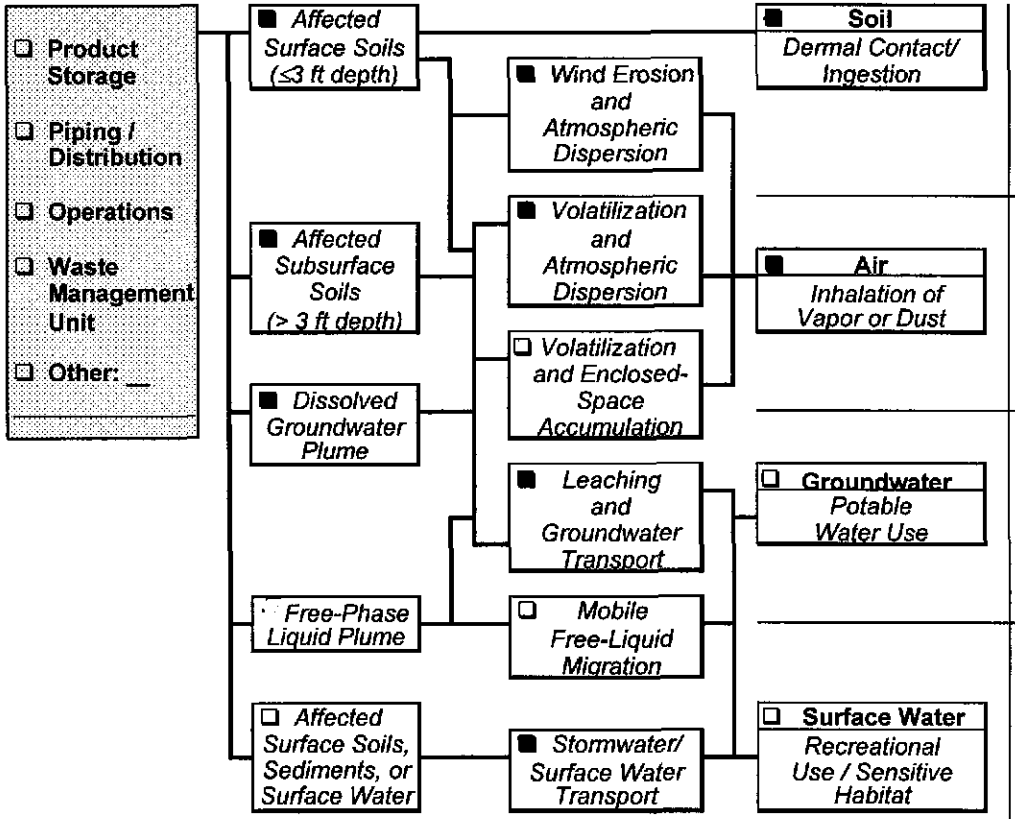
SCALE	1"=50'-0"	LOCATION #	61-857-1050
REVISED BY	AAB	DATE	12/5/95
CHECKED BY		DATE	
DRAWING NO.	FIGURE 1		

APPENDIX A

Site Name: Former Texaco Service Station
Site Location: 930 Springtown, Livermore, CA
Date Completed: 10/20/97
Completed by: Sarkis Soghomonian

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.***



POTENTIAL RECEPTORS		COMPLETE PATHWAY?
	Exposed Receptors	
	n-ite: ☐ Residential ■ Non-Resid. ☐ N/A ☐ Sensitive Habitat ☐ Recreation	☐ No ■ Yes ○ Current ● Potential
	ff-ite: ☐ Residential ☐ Non-Resid. ■ N/A ☐ Sensitive Habitat ☐ Recreation	☐ No ☐ Yes ○ Current ○ Potential
	Exposed Persons	
	n-ite: ☐ Residential ■ Non-Resid. ☐ N/A	☐ No ■ Yes ● Current ○ Potential
	ff-ite: ☐ Residential ☐ Non-Resid. ■ N/A	☐ No ☐ Yes ○ Current ○ Potential
	Groundwater Users	
	n-ite: ☐ Residential ☐ Non-Resid. ■ N/A	☐ No ☐ Yes ○ Current ○ Potential
	ff-ite: ☐ Residential ☐ Non-Resid. ■ N/A	☐ No ☐ Yes ○ Current ○ Potential
	Surface Water Users	
	n-ite: ☐ Residential ☐ Non-Resid. ■ N/A ☐ Sensitive Habitat ☐ Recreation	☐ No ☐ Yes ○ Current ○ Potential
	ff-ite: ☐ Residential ☐ Non-Resid. ■ N/A ☐ Sensitive Habitat ☐ Recreation	☐ No ☐ Yes ○ Current ○ Potential

(■ OR ● TO SELECT)

MAKE ZAPF NOT ITALICS

RBCA TIER 1/TIER 2 EVALUATION

Output Table 1

Site Name: Former Texaco S/S
Site Location: 930 Springtown Blvd

Job Identification: 930
Date Completed: 10/20/97
Completed By: Sarkis Soghomonian

Software: GSI RBCA Spreadsheet
Version: v 1.0

NOTE: values which differ from Tier 1 default values are shown in bold italics and underlined.

DEFAULT PARAMETERS

Exposure Parameter	Definition (Units)	Residential			Commercial/Industrial	
		Adult	(1-6yrs)	(1-16 yrs)	Chronic	Constrctn
ATc	Averaging time for carcinogens (yr)	70				
ATn	Averaging time for non-carcinogens (yr)	30	6	16	25	1
BW	Body Weight (kg)	70	15	35	70	
ED	Exposure Duration (yr)	30	6	16	25	1
EF	Exposure Frequency (days/yr)	350			250	180
EF.Derm	Exposure Frequency for dermal exposure	350			250	
IRgw	Ingestion Rate of Water (l/day)	2			1	
IRs	Ingestion Rate of Soil (mg/day)	100	200		50	100
IRadj	Adjusted soil ing. rate (mg-yr/kg-d)	1.1E+02			9.4E+01	
IRa.in	Inhalation rate indoor (m^3/day)	15			20	
IRa.out	Inhalation rate outdoor (m^3/day)	20			20	10
SA	Skin surface area (dermal) (cm^2)	5.8E+03		2.0E+03	5.8E+03	5.8E+03
SAadj	Adjusted dermal area (cm^2-yr/kg)	2.1E+03			1.7E+03	
M	Soil to Skin adherence factor	1				
AAFs	Age adjustment on soil ingestion	FALSE			FALSE	
AAFd	Age adjustment on skin surface area	FALSE			FALSE	
tox	Use EPA tox data for air (or PEL based)	TRUE				
gwMCL?	Use MCL as exposure limit in groundwater?	FALSE				

Matrix of Exposed Persons to Complete Exposure Pathways		Residential	Commercial/Industrial	
			Chronic	Constrctn
Groundwater Pathways:				
GW.i	Groundwater Ingestion	FALSE	FALSE	
GW.v	Volatilization to Outdoor Air	FALSE	TRUE	
GW.b	Vapor Intrusion to Buildings	FALSE	FALSE	
Soil Pathways				
S.v	Volatiles from Subsurface Soils	FALSE	TRUE	
SS.v	Volatiles and Particulate Inhalation	FALSE	TRUE	TRUE
SS.d	Direct Ingestion and Dermal Contact	FALSE	TRUE	TRUE
S.l	Leaching to Groundwater from all Soils	FALSE	FALSE	
S.b	Intrusion to Buildings - Subsurface Soils	FALSE	FALSE	

Matrix of Receptor Distance and Location on- or off-site		Residential		Commercial/Industrial	
		Distance	On-Site	Distance	On-Site
GW	Groundwater receptor (cm)		FALSE		FALSE
S	*Inhalation receptor (cm)*		FALSE		TRUE

Matrix of Target Risks		Individual	Cumulative
TRab	Target Risk (class A&B carcinogens)	1.0E-06	1.0E-04
TRc	Target Risk (class C carcinogens)	1.0E-05	
THQ	Target Hazard Quotient	1.0E+00	1.0E+00
Opt	Calculation Option (1, 2, or 3)	3	
Tier	RBCA Tier	2	

Surface Parameters	Definition (Units)	Residential	Commercial/Industrial Chronic	Commercial/Industrial Construction
t	Exposure duration (yr)	30	25	1
A	Contaminated soil area (cm^2)	***2.4E+06***		***2.4E+06***
W	Length of affected soil parallel to wind (cm)	1.5E+03		1.0E+03
W.gw	Length of affected soil parallel to groundwater (c	1.5E+03		
Uair	Ambient air velocity in mixing zone (cm/s)	2.3E+02		
delta	Air mixing zone height (cm)	2.0E+02		
Lss	Definition of surficial soils (cm)	1.0E+02		
Pe	Particulate areal emission rate (g/cm^2/s)	2.2E-10		

Groundwater	Definition (Units)	Value
delta.gw	Groundwater mixing zone depth (cm)	2.0E+02
I	Groundwater infiltration rate (cm/yr)	3.0E+01
Ugw	Groundwater Darcy velocity (cm/yr)	2.5E+03
Ugw.tr	Groundwater Transport velocity (cm/yr)	6.6E+03
Ks	Saturated Hydraulic Conductivity(cm/s)	
grad	Groundwater Gradient (cm/cm)	
Sw	Width of groundwater source zone (cm)	
Sd	Depth of groundwater source zone (cm)	
BC	Biodegradation Capacity (mg/L)	
BIO?	Is Bioattenuation Considered	FALSE
phi.eff	Effective Porosity in Water-Bearing Unit	3.8E-01
foc.sat	Fraction organic carbon in water-bearing unit	1.0E-03

Soil	Definition (Units)	Value		
hc	Capillary zone thickness (cm)	***6.1E+01***		
hv	Vadose zone thickness (cm)	***3.0E+02***		
rho	Soil density (g/cm^3)	1.7		
foc	Fraction of organic carbon in vadose zone	0.01		
phi	Soil porosity in vadose zone	0.38		
Lgw	Depth to groundwater (cm)	***3.7E+02***		
Ls	Depth to top of affected soil (cm)	1.0E+02		
Lsubs	Thickness of affected subsurface soils (cm)	2.0E+02		
pH	Soil/groundwater pH	6.5		
		capillary	vadose	foundation
phi.w	Volumetric water content	0.342	0.12	0.12
phi.a	Volumetric air content	0.038	0.26	0.26

Building	Definition (Units)	Residential	Commercial
Lb	Building volume/area ratio (cm)	2.0E+02	3.0E+02
ER	Building air exchange rate (s^-1)	1.4E-04	2.3E-04
Lcrk	Foundation crack thickness (cm)	1.5E+01	
eta	Foundation crack fraction	0.01	

Dispersive Transport Parameters	Definition (Units)	Residential	Commercial
Groundwater			
ax	Longitudinal dispersion coefficient (cm)		
ay	Transverse dispersion coefficient (cm)		
az	Vertical dispersion coefficient (cm)		
Vapor			
dcy	Transverse dispersion coefficient (cm)		
dcz	Vertical dispersion coefficient (cm)		

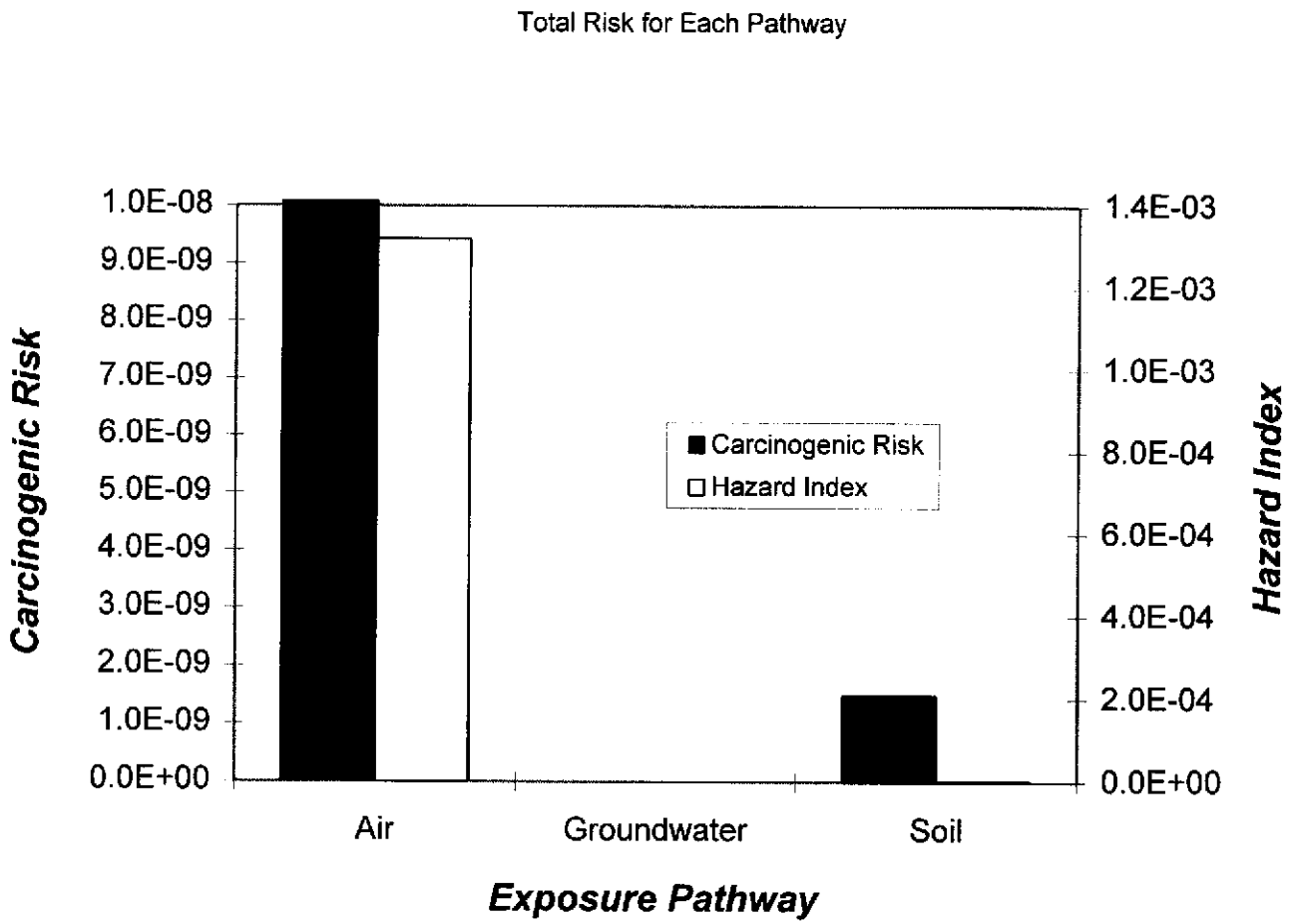
RBCA SITE ASSESSMENT	Tier 2 Worksheet 8.3

Site Name: Former Texaco S/S
Site Location: 930 Springtown Blvd

Completed By: Sarkis Soghomonian
Date Completed: 10/20/1997

TIER 2 BASELINE RISK SUMMARY TABLE

	BASELINE CARCINOGENIC RISK					BASELINE TOXIC EFFECTS				
	Individual COC Risk		Cumulative COC Risk		Risk Limit(s) Exceeded?	Hazard Quotient		Hazard Index		Toxicity Limit(s) Exceeded?
EXPOSURE PATHWAY	Maximum Value	Target Risk	Total Value	Target Risk		Maximum Value	Applicable Limit	Total Value	Applicable Limit	
AIR EXPOSURE PATHWAYS										
Complete:	2.2E-8	1.0E-6	2.2E-8	1.0E-4	☐	1.2E-3	1.0E+0	1.3E-3	1.0E+0	☐
GROUNDWATER EXPOSURE PATHWAYS										
Complete:	0.0E+0	1.0E-6	0.0E+0	1.0E-4	☐	0.0E+0	1.0E+0	0.0E+0	1.0E+0	☐
SOIL EXPOSURE PATHWAYS										
Complete:	1.5E-9	1.0E-6	1.5E-9	1.0E-4	☐	1.4E-6	1.0E+0	2.2E-6	1.0E+0	☐
CRITICAL EXPOSURE PATHWAY (Select Maximum Values From Complete Pathways)										
	2.2E-8	1.0E-6	2.2E-8	1.0E-4	☐	1.2E-3	1.0E+0	1.3E-3	1.0E+0	☐


Total Risk for Each Pathway
1.0E-08
9.0E-09
8.0E-09
7.0E-09
6.0E-09
5.0E-09
4.0E-09
3.0E-09
2.0E-09
1.0E-09
0.0E+00
Carcinogenic Risk
1.4E-03
1.2E-03
1.0E-03
8.0E-04
6.0E-04
4.0E-04
2.0E-04
0.0E+00
Hazard Index
Carcinogenic Risk
Hazard Index
Air
Groundwater
Soil
Exposure Pathway

Site Name: Former Texaco S/S
Site Location: 930 Springtown Blvd

Completed By: Sarkis Soghomonian
Date Completed: 10/20/1997

SURFACE SOIL SSTL VALUES (< 3 FT BGS)

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 3

SSTL Results For Complete Exposure Pathways ("x" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration		Soil Leaching to Groundwater			X	Ingestion, Inhalation and Dermal Contact	X	Construction Worker	Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/kg)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)	Residential: (on-site)		Commercial: (on-site)		Commercial: (on-site)	(mg/kg)	"■" If yes	Only if "yes" left
71-43-2	Benzene-CA	5.0E-3	NA	NA	NA	NA		3.2E+0		8.2E+1	3.2E+0	☐	<1
100-41-4	Ethylbenzene	5.0E-3	NA	NA	NA	NA		>Res		>Res	>Res	☐	<1
1634-04-4	Methyl t-Butyl Ether	0.0E+0	NA	NA	NA	NA		1.7E+2		2.4E+2	1.7E+2	☐	<1
108-88-3	Toluene	5.0E-3	NA	NA	NA	NA		>Res		>Res	>Res	☐	<1
1330-20-7	Xylene (mixed isomers)	5.0E-3	NA	NA	NA	NA		>Res		>Res	>Res	☐	<1

RBCA SITE ASSESSMENT | **Tier 2 Worksheet 9.2**

Site Name: Former Texaco S/S
Site Location: 930 Springtown Blvd

Completed By: Sarkis Soghomonian
Date Completed: 10/20/1997

SUBSURFACE SOIL SSTL VALUES (> 3 FT BGS)

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 3

SSTL Results For Complete Exposure Pathways ("x" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	Soil Leaching to Groundwater			Soil Volatilization to Indoor Air		X Soil Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/kg)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)	Residential: (on-site)	Commercial: (on-site)	Residential: (on-site)	Commercial: (on-site)	(mg/kg)	"■" If yes	Only if "yes" left
71-43-2	Benzene-CA	7.4E-1	NA	NA	NA	NA	NA	NA	3.4E+1	3.4E+1	☐	<1
100-41-4	Ethylbenzene	2.3E+0	NA	NA	NA	NA	NA	NA	>Res	>Res	☐	<1
1634-04-4	Methyl t-Butyl Ether	0.0E+0	NA	NA	NA	NA	NA	NA	>Res	>Res	☐	<1
108-88-3	Toluene	2.1E+0	NA	NA	NA	NA	NA	NA	>Res	>Res	☐	<1
1330-20-7	Xylene (mixed isomers)	1.2E+1	NA	NA	NA	NA	NA	NA	>Res	>Res	☐	<1

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: G-411-EHX-166

Site Name: Former Texaco S/S
Site Location: 930 Springtown Blvd
Completed By: Sarkis Soghomonian
Date Completed: 10/20/1997

GROUNDWATER SSTL VALUES

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 3

SSTL Results For Complete Exposure Pathways ("x" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration		Groundwater Ingestion				Groundwater Volatilization to Indoor Air		X	Groundwater Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/L)	Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)		Residential: (on-site)	Commercial: (on-site)		Residential (on-site)	Commercial: (on-site)	(mg/L	"■" If yes	Only if "yes" left
71-43-2	Benzene-CA	3.5E-2	NA	NA	NA		NA	NA		NA	1.9E+2	1.9E+2	☐	<1
100-41-4	Ethylbenzene	7.3E-2	NA	NA	NA		NA	NA		NA	>Sol	>Sol	☐	<1
1634-04-4	Methyl t-Butyl Ether	6.6E-2	NA	NA	NA		NA	NA		NA	>Sol	>Sol	☐	<1
108-88-3	Toluene	1.7E-1	NA	NA	NA		NA	NA		NA	>Sol	>Sol	☐	<1
1330-20-7	Xylene (mixed isomers)	2.7E-1	NA	NA	NA		NA	NA		NA	>Sol	>Sol	☐	<1

Site Name: Former Texaco S/S
Site Location: 930 Springtown Blvd

Job Identification: 930
Date Completed: 10/20/1997

SUMMARY CALCULATIONS - SSTL BY CUMULATIVE RISK

CAS No.	Constituent	Representative Concentration Groundwater (mg/L)	Representative Concentration Surface Soil (mg/kg)	Representative Concentration Subsurface Soil (mg/kg)	SSTL exceeded? Groundwater	SSTL exceeded? Surface Soil	SSTL exceeded? Subsurface Soil	Relevant SSTL Groundwater (mg/L)	Relevant SSTL Surface Soil (mg/kg)	Relevant SSTL Subsurface Soil (mg/kg)
71-43-2	Benzene-CA	3.5E-2	5.0E-3	7.4E-1	☐	☐	☐	NA	> 5.0E-1	> 7.4E+1
100-41-4	Ethylbenzene	7.3E-2	5.0E-3	2.3E+0	☐	☐	☐	NA	> 5.0E-1	> >Res
1634-04-4	Methyl t-Butyl Ether	6.6E-2	0.0E+0	0.0E+0	☐	☐	☐	NA	< 0.0E+0	< 0.0E+0
108-88-3	Toluene	1.7E-1	5.0E-3	2.1E+0	☐	☐	☐	NA	> 5.0E-1	> 2.1E+2
1330-20-7	Xylene (mixed isomers)	2.7E-1	5.0E-3	1.2E+1	☐	☐	☐	NA	> 5.0E-1	> >Res

Completed By: Sarkis Soghomonian

Cumulative Target Risk: 1.0E-4
Target Hazard Index: 1.0E+0

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: G-411-EHX-

RBCA CHEMICAL DATABASE

Physical Property Data

CAS Number	Constituent	type	Molecular Weight (g/mole) MW	ref	Diffusion Coefficients in air (cm2/s) Dair	re	Diffusion Coefficients in water (cm2/s) Dwat	re	log (Koc) or log(Kd) (@ 20 - 25 C) (l/kg) Koc	ref	Henry's Law Constant (@ 20 - 25 C) (atm-m3/mol)	(unitless)	re	Vapor Pressure (@ 20 - 25 C) (mm Hg) Pure Component	ref	Solubility (@ 20 - 25 C) (mg/l) Pure Component	ref	acid pKa	base pKb	ref
71-43-2	Benzene-CA	A	78.1		9.30E-02		1.10E-05		1.58		5.29E-03	2.20E-01		9.52E+01		1.75E+03				
100-41-4	Ethylbenzene	A	106.2	5	7.60E-02	A	8.50E-06	A	1.98	A	7.69E-03	3.20E-01	A	1.00E+01	4	1.52E+02	5			
1634-04-4	Methyl t-Butyl Ether	O	88.146	5	7.92E-02	6	9.41E-05	7	1.08	A	5.77E-04	2.40E-02		2.49E+02		4.80E+04	A			
108-88-3	Toluene	A	92.4	5	8.50E-02	A	9.40E-06	A	2.13	A	6.25E-03	2.60E-01	A	3.00E+01	4	5.15E+02	29			
1330-20-7	Xylene (mixed isomers)	A	106.2	5	7.20E-02	A	8.50E-06	A	2.38	A	6.97E-03	2.90E-01	A	7.00E+00	4	1.98E+02	5			

Site Name: Former Texaco S/S Site Location: 930 Springtown Blv Completed By: Sarkis Soghomonian Date Completed: 10/20/1997

Software version: v 1.0

RBCA CHEMICAL DATABASE

Toxicity Data

CAS Number	Constituent	Reference Dose (mg/kg/day) Oral RfD_oral	ref	Inhalation RfD_inhal	re	Slope Factors 1/(mg/kg/day) Oral SF_oral	ref	Inhalation SF_inhal	ref	EPA Weight of Evidence	Is Constituent Carcinogenic ?
71-43-2	Benzene-CA			1.70E-03		2.90E-02		2.90E-02		A	TRUE
100-41-4	Ethylbenzene	1.00E-01	A	2.86E-01	A	-	R	-	R	D	FALSE
1634-04-4	Methyl t-Butyl Ether	5.00E-03	R	8.57E-01	R	-	R	-	R		FALSE
108-88-3	Toluene	2.00E-01	A,R	1.14E-01	,	-	R	-	R	D	FALSE
1330-20-7	Xylene (mixed isomers)	2.00E+00	A,R	2.00E+00	A	-	R	-	R	D	FALSE

Site Name: Former Texac Site Location: 930 Springtown Blvd Completed By: Sarkis Soghomonian Date Completed: 10/20/1997

Software version: v 1.0

RBCA CHEMICAL DATABASE

Miscellaneous Chemical Data

CAS Number	Constituent	Maximum Contaminant Level MCL (mg/L)	reference	Permissible Exposure Limit PEL/TLV (mg/m3)	ref	Relative Absorption Factors Oral	Dermal	Detection Limits Groundwater (mg/L)	ref	Soil (mg/kg)	re	Half Life (First-Order Decay) (days) Saturated	Unsaturated	ref
71-43-2	Benzene-CA	1.00E-03		3.20E+00		1	0.5	0.0005		0.005				
100-41-4	Ethylbenzene	7.00E-01	6 FR 3526 (30 Jan 91	4.34E+02	ACGIH	1	0.5	0.002	C	0.005	S	228	228	H
1634-04-4	Methyl t-Butyl Ether			1.44E+02	ACGIH	1	0.5					360	360	H
108-88-3	Toluene	1.00E+00	6 FR 3526 (30 Jan 91	1.47E+02	ACGIH	1	0.5	0.002	C	0.005	S	28	28	H
1330-20-7	Xylene (mixed isomers)	1.00E+01	6 FR 3526 (30 Jan 91	4.34E+02	ACGIH	1	0.5	0.005	C	0.005	S	360	360	H

Site Name: Former Texac Site Location: 930 Springtown Blvd

Completed By: Sarkis Soghomo Date Completed: 10/20/1997

Software version: v 1.0

REPRESENTATIVE COC CONCENTRATIONS IN SOURCE MEDIA

(Complete the following table)

CONSTITUENT	Representative COC Concentration in Groundwater value (mg/L)	note	in Surface Soil value (mg/kg	note	in Subsurface Soil alue (mg/kg	note
Benzene-CA	3.5E-2	UCL	5.0E-3		7.4E-1	UCL
Ethylbenzene	7.3E-2	UCL	5.0E-3		2.3E+0	UCL
Methyl t-Butyl Ether	6.6E-2	UCL				
Toluene	1.7E-1	UCL	5.0E-3		2.1E+0	UCL
Xylene (mixed isomers)	2.7E-1	UCL	5.0E-3		1.2E+1	UCL

Site Name: Former Texaco S/S
Site Location: 930 Springtown Blvd

Completed By: Sarkis Soghomonian
Date Completed: 10/20/1997

RBCA SITE ASSESSMENT | Input Screen 9.4

GROUNDWATER DAF VALUES

(Enter DAF values in the grey area of the following table)

CONSTITUENT	Dilution Attenuation Factor (DAF) in Groundwater	
	Residential Receptor	Comm./Ind. Receptor
Benzene-CA	1.0E+0	1.0E+0
Ethylbenzene	1.0E+0	1.0E+0
Methyl t-Butyl Ether	1.0E+0	1.0E+0
Toluene	1.0E+0	1.0E+0
Xylene (mixed isomers)	1.0E+0	1.0E+0

Site Name: Former Texaco S/S
Site Location: 930 Springtown Blvd

Completed By: Sarkis Soghomonian
Date Completed: 10/20/1997

Site Name: Former Texaco S/S | Site Location: 930 Springtown Blvd | Completed By: Sarkis Soghomonian | Date Completed: 10/20/1997 | 1 OF 6

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

SURFACE SOILS: VAPOR AND DUST INHALATION

Constituents of Concern	Exposure Concentration 1) Source Medium: Surface Soil Conc. (mg/kg)	2) NAF Value (m^3/kg) Receptor: On-Site Commercial		3) Exposure Medium Air: POE Conc. (mg/m^3) (1) / (2): On-Site Commercial		4) Exposure Multiplier (IRxETxEFxED)/(BWxAT) (m^3/kg-day): On-Site Commercial		5) Average Daily Intake Rate (mg/kg-day) (3) X (4): On-Site Commercial	
Benzene-CA	5.0E-3	1.4E+5		3.6E-8		7.0E-2		2.5E-9	
Ethylbenzene	5.0E-3	1.4E+5		3.6E-8		2.0E-1		7.0E-9	
Methyl t-Butyl Ether	0.0E+0	1.4E+5		0.0E+0		2.0E-1		0.0E+0	
Toluene	5.0E-3	1.4E+5		3.6E-8		2.0E-1		7.0E-9	
Xylene (mixed isomers)	5.0E-3	1.4E+5		3.6E-8		2.0E-1		7.0E-9	

NOTE:
ABS = Dermal absorption factor (dim)
AF = Adherance factor
AT = Averaging time (days)
BW = Body Weight (kg)
CF = Units conversion factor
ED = Exp. duration (yrs)
EF = Exposure frequencey (days/yr)
ET = Exposure time (hrs/day)
IR = Intake rate (L/day or mg/day)
POE = Point of exposure
SA = Skin surface area (cm^2)

Site Name: Former Texaco S/S | Site Location: 930 Springtown Blvd | Completed By: Sarkis Soghomonian | Date Completed: 10/20/1997 | 2 OF 6

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

SUBSURFACE SOILS: VAPOR INHALATION Constituents of Concern	Exposure Concentration 1) Source Medium Subsurface Soil Conc. (mg/kg)	2) NAF Value (m^3/kg) Receptor On-Site Commercial		3) Exposure Medium Air: POE Conc. (mg/m^3) (1) / (2) On-Site Commercial		4) Exposure Multiplier (IRxETxEFxED)/(BWxAT) (m^3/kg-day) On-Site Commercial		5) Average Daily Intake Rate (mg/kg-day) (3) X (4) On-Site Commercial		TOTAL PATHWAY INTAKE (mg/kg-day) *(Sum intake values from surface & subsurface routes.)* On-Site Commercial	
Benzene-CA	7.4E-1	7.0E+4		1.1E-5		7.0E-2		7.4E-7		7.5E-7	
Ethylbenzene	2.3E+0	7.0E+4		3.3E-5		2.0E-1		6.5E-6		6.5E-6	
Methyl t-Butyl Ether	0.0E+0	7.0E+4		0.0E+0		2.0E-1		0.0E+0		0.0E+0	
Toluene	2.1E+0	7.0E+4		3.0E-5		2.0E-1		5.8E-6		5.8E-6	
Xylene (mixed isomers)	1.2E+1	7.0E+4		1.8E-4		2.0E-1		3.4E-5		3.4E-5	

NOTE:
ABS = Dermal absorption factor (dim)
AF = Adherance factor
AT = Averaging time (days)
BW = Body Weight (kg)
CF = Units conversion factor
ED = Exp. duration (yrs)
EF = Exposure frequencey (days/yr)
ET = Exposure time (hrs/day)
IR = Intake rate (L/day or mg/day)
POE = Point of exposure
SA = Skin surface area (cm^2)

Site Name: Former Texaco S/S | Site Location: 930 Springtown Blvd | Completed By: Sarkis Soghomonian | Date Completed: 10/20/1997 | 1 OF 3

TIER 2 PATHWAY RISK CALCULATION

AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAYS ARE ACTIVE)

Constituents of Concern	(1) EPA Carcinogenic Classification	CARCINOGENIC RISK: (2) Total Carcinogenic Intake Rate (mg/kg/day) On-Site Commercial		(3) Inhalation Slope Factor (mg/kg-day)^-1	(4) Individual COC Risk (2) x (3) On-Site Commercial		TOXIC EFFECTS: (5) Total Toxicant Intake Rate (mg/kg/day) On-Site Commercial		(6) Inhalation Reference Dose (mg/kg-day)	(7) Individual COC Hazard Quotient (5) / (6) On-Site Commercial	
Benzene-CA	A	7.5E-7		2.9E-2	2.2E-8		2.1E-6		1.7E-3	1.2E-3	
Ethylbenzene	D						6.5E-6		2.9E-1	2.3E-5	
Methyl t-Butyl Ether							0.0E+0		8.6E-1	0.0E+0	
Toluene	D						5.8E-6		1.1E-1	5.1E-5	
Xylene (mixed isomers)	D						3.4E-5		2.0E+0	1.7E-5	

Total Pathway Carcinogenic Risk = **2.2E-8** **0.0E+0**

Total Pathway Hazard Index = **1.3E-3** **0.0E+0**

Site Name: Former Texaco S/S | Site Location: 930 Springtown Blvd | Completed By: Sarkis Soghomonian | Date Completed: 10/20/1997 | 3 OF 6

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

SOIL EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

SURFACE SOILS OR SEDIMENTS:

DERMAL CONTACT

	Exposure Concentration	4) Exposure Multiplier (SAxAFxABSxCFxEFxED)/(BWxAT) (1/day)		5) Average Daily Intake Rate (mg/kg-day)	
Constituents of Concern	1) Source Medium: Surface Soil Conc. (mg/kg)	On-Site Residential	On-Site Commercial	On-Site Residential	On-Site Commercial
Benzene-CA	5.0E-3		1.0E-5		5.1E-8
Ethylbenzene	5.0E-3		2.8E-5		1.4E-7
Methyl t-Butyl Ether	0.0E+0		2.8E-5		0.0E+0
Toluene	5.0E-3		2.8E-5		1.4E-7
Xylene (mixed isomers)	5.0E-3		2.8E-5		1.4E-7

NOTE:
ABS = Dermal absorption factor (dim)
AF = Adherance factor
AT = Averaging time (days)
BW = Body Weight (kg)
CF = Units conversion factor
ED = Exp. duration (yrs)
EF = Exposure frequency (days/yr)
ET = Exposure time (hrs/day)
IR = Intake rate (L/day or mg/day)
POE = Point of exposure
SA = Skin surface area (cm^2)

Site Name: Former Texaco S/S Site Location: 930 Springtown Blvd Completed By: Sarkis Soghomoni Date Completed: 10/20/1997 *4 OF 6*

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

SOIL EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

SURFACE SOILS OR SEDIMENTS:

INGESTION

Exposure Concentration

Constituents of Concern	1) Source Medium: Surface Soil Conc. (mg/kg)	4) Exposure Multiplier (IRxCxEFxED)/(BWxAT) (1/day): On-Site Residential	4) Exposure Multiplier (IRxCxEFxED)/(BWxAT) (1/day): On-Site Commercial	5) Average Daily Intake Rate (mg/kg-day): On-Site Residential	5) Average Daily Intake Rate (mg/kg-day): On-Site Commercial	TOTAL PATHWAY INTAKE (mg/kg-day) *(Sum intake values from dermal & ingestion routes.)*: On-Site Residential	TOTAL PATHWAY INTAKE (mg/kg-day) *(Sum intake values from dermal & ingestion routes.)*: On-Site Commercial
Benzene-CA	5.0E-3		1.7E-7		8.7E-10		5.2E-8
Ethylbenzene	5.0E-3		4.9E-7		2.4E-9		1.4E-7
Methyl t-Butyl Ether	0.0E+0		4.9E-7		0.0E+0		0.0E+0
Toluene	5.0E-3		4.9E-7		2.4E-9		1.4E-7
Xylene (mixed isomers)	5.0E-3		4.9E-7		2.4E-9		1.4E-7

NOTE:

ABS = Dermal absorption factor (dim)
AF = Adherance factor
AT = Averaging time (days)
BW = Body Weight (kg)
CF = Units conversion factor
ED = Exp. duration (yrs)
EF = Exposure frequencey (days/yr)
ET = Exposure time (hrs/day)
IR = Intake rate (L/day or mg/day)
POE = Point of exposure
SA = Skin surface area (cm^2)

Site Name: Former Texaco S/S | Site Location: 930 Springtown Blvd | Completed By: Sarkis Soghomonian | Date Completed: 10/20/1997 | 2 OF 3

TIER 2 PATHWAY RISK CALCULATION

SOIL EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAYS ARE ACTIVE)

Constituents of Concern	(1) EPA Carcinogenic Classification	CARCINOGENIC RISK: (2) Total Carcinogenic Intake Rate (mg/kg/day) On-Site Residential	(2) Total Carcinogenic Intake Rate (mg/kg/day) On-Site Commercial	(3) Oral Slope Factor (mg/kg-day)^-1	(4) Individual COC Risk (2) x (3) On-Site Residential	(4) Individual COC Risk (2) x (3) On-Site Commercial	TOXIC EFFECTS: (5) Total Toxicant Intake Rate (mg/kg/day) On-Site Residential	(5) Total Toxicant Intake Rate (mg/kg/day) On-Site Commercial	(6) Oral Reference Dose (mg/kg-day)	(7) Individual COC Hazard Quotient (5) / (6) On-Site Residential	(7) Individual COC Hazard Quotient (5) / (6) On-Site Commercial
Benzene-CA	A		5.2E-8	2.9E-2		1.5E-9					
Ethylbenzene	D							1.4E-7	1.0E-1		1.4E-6
Methyl t-Butyl Ether								0.0E+0	5.0E-3		0.0E+0
Toluene	D							1.4E-7	2.0E-1		7.2E-7
Xylene (mixed isomers)	D							1.4E-7	2.0E+0		7.2E-8

Total Pathway Carcinogenic Risk = **0.0E+0** **1.5E-9**

Total Pathway Hazard Index = **0.0E+0** **2.2E-6**

Site Name: Former Texaco S/S | Site Location: 930 Springtown Blvd | Completed By: Sarkis Soghomonian | Date Completed: 10/20/1997 | 5 OF 6

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS ☐ (CHECKED IF PATHWAY IS ACTIVE)

SOIL: LEACHING TO GROUNDWATER/ INGESTION

Constituents of Concern	Exposure Concentration 1) Source Medium: Soil Concentration (mg/kg)	2) NAF Value (L/kg) Receptor		3) Exposure Medium: Groundwater POE Concentration (mg/L) (1)/(2)		4) Exposure Multiplier (IRxEFxED)/(BWxAT) (L/kg-day)		5) Average Daily Intake Rate (mg/kg-day)	
Benzene-CA	7.4E-1								
Ethylbenzene	2.3E+0								
Methyl t-Butyl Ether	0.0E+0								
Toluene	2.1E+0								
Xylene (mixed isomers)	1.2E+1								

NOTE: AT = Averaging time (days) | BW = Body Weight (kg) | CF = Units conversion factor | ED = Exp. duration (yrs) | EF = Exposure frequencey (days/yr) | IR = Intake rate (L/day) | POE = Point of exposure

Site Name: Former Texaco S/S | Site Location: 930 Springtown Blvd | Completed By: Sarkis Soghomonian | Date Completed: 10/20/1997 | 6 OF 6

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS ☐ (CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: INGESTION

Constituents of Concern	Exposure Concentration: 1) Source Medium — Groundwater Concentration (mg/L)	2) NAF Value (dim) — Receptor		3) Exposure Medium — Groundwater: POE Conc. (mg/L) (1)/(2)		4) Exposure Multiplier — (IRxEFxED)/(BWxAT) (L/kg-day)		5) Average Daily Intake Rate (mg/kg-day)		MAX. PATHWAY INTAKE (mg/kg-day) (Maximum intake of active pathways soil leaching & groundwater routes.)	
Benzene-CA	3.5E-2										
Ethylbenzene	7.3E-2										
Methyl t-Butyl Ether	6.6E-2										
Toluene	1.7E-1										
Xylene (mixed isomers)	2.7E-1										

NOTE: AT = Averaging time (days)
BW = Body Weight (kg)
CF = Units conversion factor
ED = Exp. duration (yrs)
EF = Exposure frequencey (days/yr)
IR = Intake rate (L/day or mg/day)
POE = Point of exposure

Site Name: Former Texaco S/S | Site Location: 930 Springtown Blvd | Completed By: Sarkis Soghomonian | Date Completed: 10/20/1997 | 3 OF 3

TIER 2 PATHWAY RISK CALCULATION

GROUNDWATER EXPOSURE PATHWAYS ☐ (CHECKED IF PATHWAYS ARE ACTIVE)

	CARCINOGENIC RISK						TOXIC EFFECTS			
Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Intake Rate (mg/kg/day)		(3) Oral Slope Factor (mg/kg-day)^-1	(4) Individual COC Risk (2) x (3)		(5) Total Toxicant Intake Rate (mg/kg/day)		(6) Oral Reference Dose (mg/kg-day)	(7) Individual COC Hazard Quotient (5) / (6)	
Benzene-CA	A			2.9E-2							
Ethylbenzene	*D*								1.0E-1		
Methyl t-Butyl Ether									5.0E-3		
Toluene	D								2.0E-1		
Xylene (mixed isomers)	D								2.0E+0		
Total Pathway Carcinogenic Risk =					**0.0E+0**	**0.0E+0**	***Total Pathway Hazard Index =***			**0.0E+0**	**0.0E+0**