RO-2437

Delta
Environmental
Consultants, Inc.

3164 Gold Camp Drive
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916/638-2085
FAX: 916/638-8385

June 24, 2002

Ms. Eva Chu
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502

Subject: *Revised Risk-Based Corrective Action Evaluation*
Former Chevron Service Station No. 21-0208
6006 International Boulevard
Oakland, California
DG20208H.3C01

Ms. Chu:

At the request of Chevron Products Company (Chevron), Delta Environmental Consultants, Inc. (Delta) network associate Gettler-Ryan Inc. (GR) is submitting this report to document the results of the implementation of the Risk-Based Corrective Action (RBCA) planning process, as described in ASTM E2081-00 "Standard Guide for Risk-Based Corrective Action". This revised version of the RBCA was prepared in response and in accordance with Ms. Eva Chu's (Alameda County Health Care Services Agency) electronic mail to Delta, dated June 14, 2002 (Appendix A). This Tier 2 RBCA was conducted with site-specific data from the former Chevron service station located at 6006 International Boulevard in Oakland, California. This RBCA was prepared to evaluate a residential use scenario. The site is currently developed and utilized for residential housing. The purpose of this work was to evaluate whether the residual hydrocarbons in the site soil and groundwater pose a risk to human health. This report describes site conditions and the RBCA model results for the site (Groundwater Services, Inc. RBCA Toolkit for Chemical Releases, version 1.3a).

Risk-Based Corrective Action (RBCA)

Tier 1 of the RBCA process involves comparison of the site constituent concentrations to generic Risk-Based Screening Levels (RBSL) to evaluate whether further evaluation and/or active remediation is warranted. RBSL values are derived from standard exposure equations and reasonable maximum exposure (RME) estimates per U.S. EPA guidelines. RBSL concentrations are designed to be protective of human health even if exposure occurs directly within the onsite area of impacted soil or groundwater, and inherently provides conservative estimates of potential threats to human health and the environment. According to the RBCA process, if Tier 1 limits are not exceeded, the user may proceed directly to compliance monitoring and/or no further action. However, if these defined screening levels are exceeded, the affected media may be addressed by: 1) remediating to the generic Tier 1 limits, if practicable; 2) conducting Tier 2 evaluation to develop site-specific remediation goals; or 3) implement an interim remedial action to abate risk "hot spots". Tier 2 analysis evaluates baseline risks both on and offsite, utilizing site specific soil, groundwater and air parameters. Additionally, Tier 2 analyses allow the use of transport models in calculating risks and cleanup standards related to offsite receptors, and utilizes Site Specific Target Levels (SSTL). The SSTL is a chemical of concern (COC) concentration limit (clean-up level) in the source medium derived by multiplying the risk-based exposure limit at the point of exposure by the natural attenuation factor for the exposure pathway.

Site Parameters

Complete exposure pathways are those that could pose a reasonable potential for contaminant contact with human or environmental receptors. Under Tier 2 RBCA, both onsite and offsite receptors apply. For the purpose of this Tier 2 evaluation, a residential exposure pathway with a risk factor of 1.0E-6 was evaluated for the site. Groundwater beneath and in the site vicinity is not used for drinking water purposes, therefore the groundwater ingestion pathway is considered incomplete. However, an industrial well is located approximately 1,700 feet southwest of the site and GR evaluated the groundwater exposure pathway related to the presence of a sensitive receptor. The following complete risk pathways were evaluated: subsurface soil and groundwater volatilization to indoor and outdoor air inhalation; and, ingestion and dermal contact from groundwater.

Where available, site specific physical data were used in this RBCA evaluation. Site specific parameters included maximum concentrations of TPHg, TPHd, BTEX and MtBE in both soil and groundwater, depth of affected soil (6.55 ft), pH (6.8), total porosity (0.405), dry bulk density (7.7787 kg/l), hydraulic conductivity (0.0019 cm/d), volumetric water content (0.231/0.2493), average groundwater gradient (0.0016 ft/ft), and thickness of affected subsurface soils (6.55 ft). Also utilized were the actual physical parameters of the building located in the southeastern portion of the site (source area) as provided by the building general contractor (JH Fitzmaurice), including foundation area (2822 ft^2), foundation perimeter (270 ft), building volume/area ratio (28 ft), and building air exchange rate (4.67/hr or 0.000654/s) (H&M Mechanical Group). Due to the presence of a 10-mil vapor barrier below the concrete slab, and the fact that the concrete slab is new, GR reduced the foundation crack fraction number in the RBCA by one order of magnitude. The depth to groundwater value utilized (6.55 ft) was calculated as an average of the depth to water measurements collected by Delta from the temporary wells on February 27 and March 27, 2002. Where appropriate and consistent with site conditions, default values were used. The Chemicals of Concern (COC) were evaluated at the maximum reported concentrations as well as the California adjusted oral slope factor for benzene (0.1) for this RBCA analysis. TPHg was evaluated by inputting the reported TPHg values from soil and groundwater into the aromatic fraction C08-C10. TPHd (weathered) was evaluated by dividing the total amount of TPHd into the following fractions for input: 20% C12-16 aliphatic; 55% C16-21 aliphatic; 15% C16-21 aromatic; and 10% C21-35 aromatic (Total Petroleum Hydrocarbon Criteria Working Group Series, Volume 5, June 1999).

Results of RBCA Analysis

Based on information from previous site investigations and groundwater monitoring and sampling data, the Tier 2 RBCA program evaluated the complete exposure pathways identified at the site. The RBCA program findings for the identified pathways are: 1) outdoor and indoor air exposures with cumulative risk factors of 6.0E-8 and 6.3E-8; and 2) groundwater (exposure) with a cumulative risk factor of 3.8E-14 (Appendix B, Tier 2 Baseline Risk Summary Table). Using the residential risk factor of 1.0E-6 and site conditions, the SSTLs for BTEX, MtBE, TPHg and TPHd were determined to be below established Tier 2 SSTLs (Appendix B, SSTL Values) for all pathways evaluated. Pertinent input and output data including site specific parameters used in the analysis are presented in Appendix B.

Conclusions And Recommendations

GR performed the RBCA evaluation for the assessment and response to petroleum hydrocarbons in the subsurface soil and groundwater beneath the subject site. A Tier 2 evaluation was performed utilizing available site specific data. The results of these analyses confirm that current site conditions do not exceed the calculated Tier 2 SSTLs specific to the site (Appendix B). Since a service station is no longer present at the site, it is anticipated that dissolved concentrations of petroleum hydrocarbons will continue to attenuate over time, thereby also lowering the associated risk over time.

According to the RBCA decision making process, no further work is warranted to protect against human exposure via the exposure pathways evaluated. Since the groundwater beneath the site is neither currently utilized nor is expected to be utilized in the future for drinking water purposes, and the fact that the site is currently developed for residential use, GR is of the opinion that no further work is warranted at the site. Based on the RBCA program and findings presented in this report, and that the groundwater beneath and in the vicinity of the site is not used for drinking water purposes, it is GR's opinion that the site should be considered for case closure.

If you have any questions or comments on the enclosed materials, please contact our Rancho Cordova office at (916) 631-1300.

DELTA ENVIRONMENTAL CONSULTANTS, INC.
Network Associate **GETTLER-RYAN INC.**

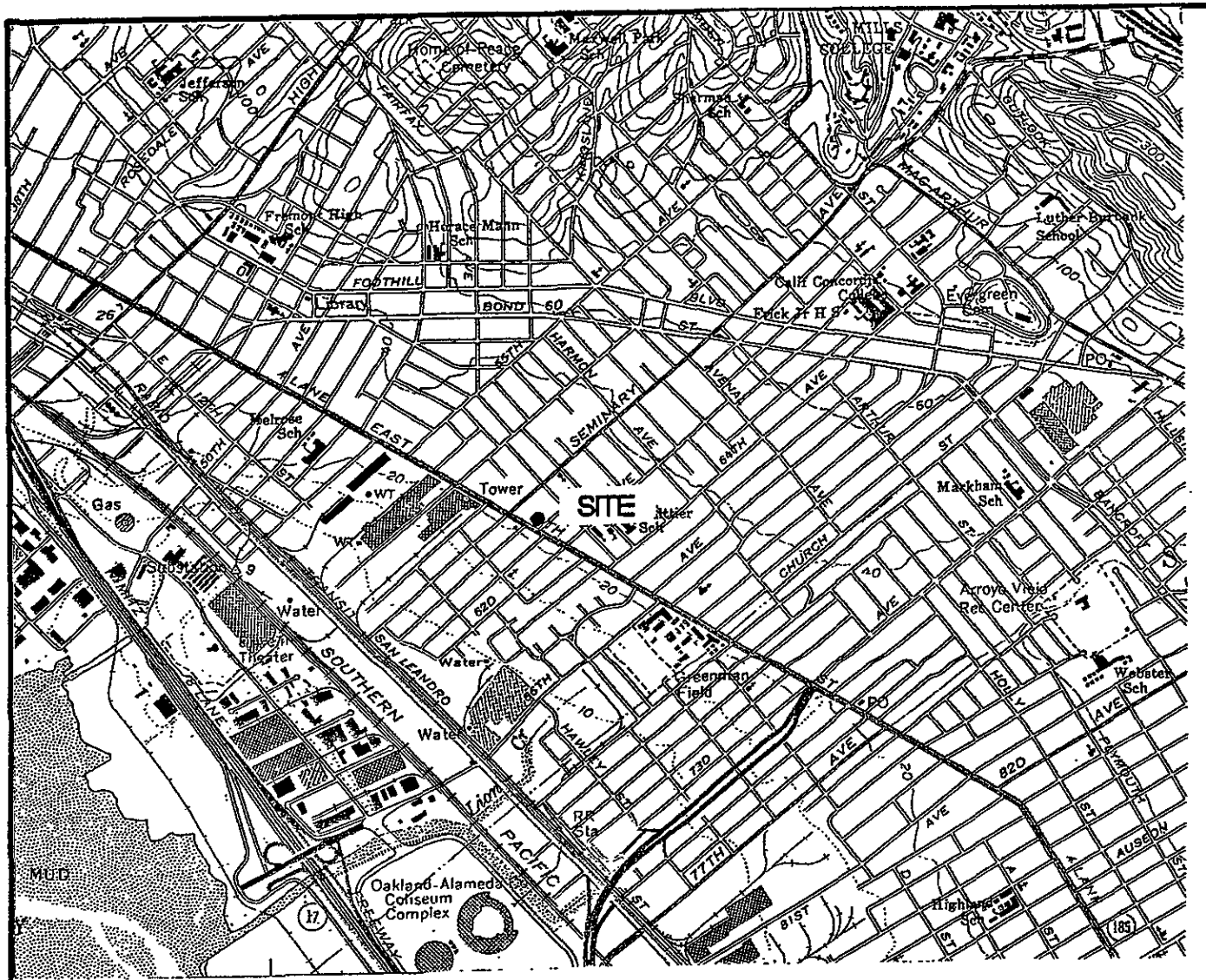
Jed A. Douglas (707) 789-3256 x 13
Senior Geologist

David W. Herzog
Senior Geologist, R.G. 7211

REGISTERED GEOLOGIST
DAVID W. HERZOG
No. 7211
STATE OF CALIFORNIA

Attachments: Figure 1. Site Location Map
Figure 2. Site Plan
Appendix A. Eva Chu email request, dated June 14, 2002
Appendix B. Tier 2 RBCA Input/Output Data

Cc: Ms. Karen Streich, Chevron Products Company, P. O. Box 6004, San Ramon, CA 94583
Mr. Mike Berrington, Delta Environmental Consultants, Inc. (916) 536-2616



Source: USGS Quad Map

FIGURE 1

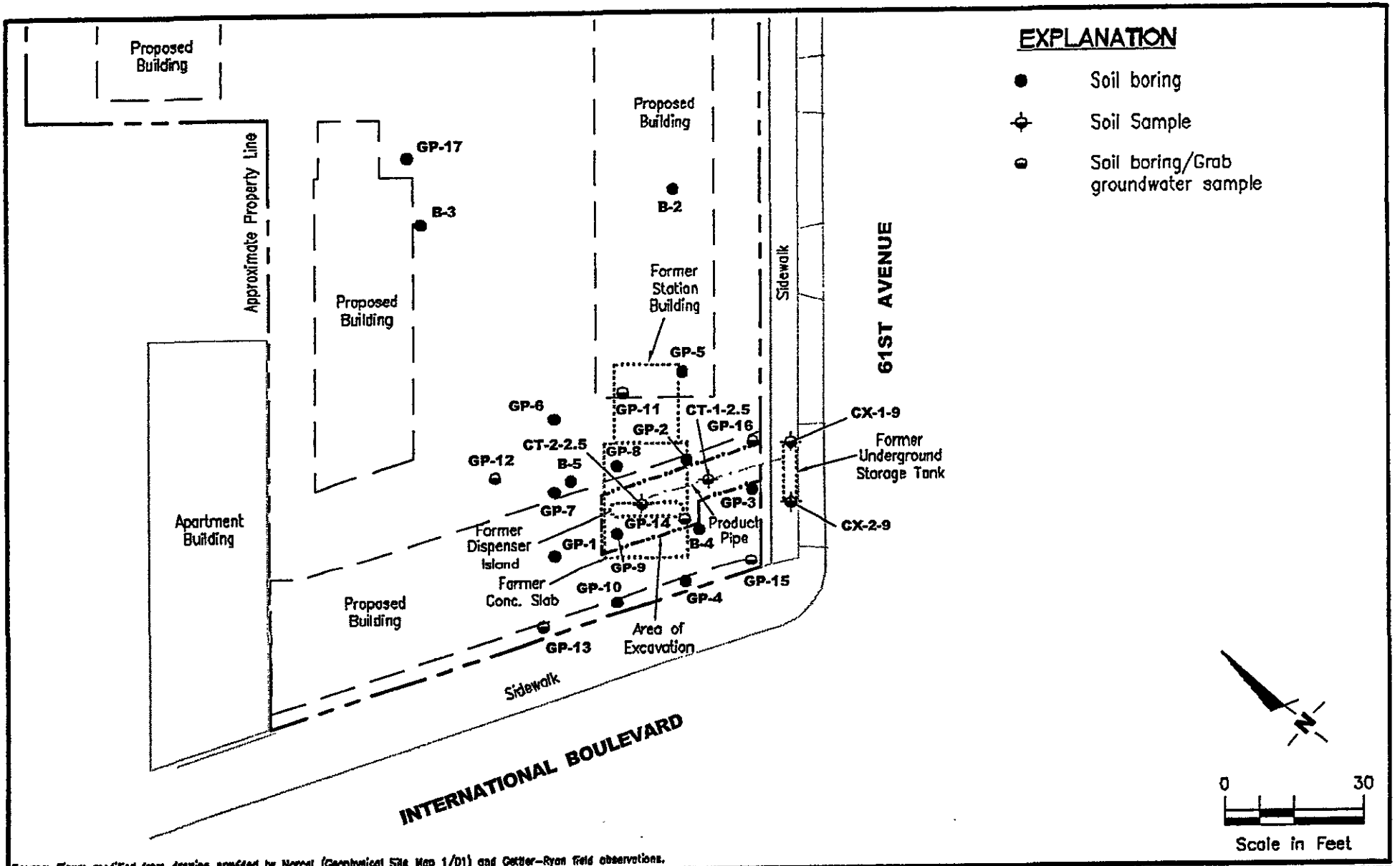
Gettler - Ryan Inc.

1364 North McDowell Boulevard, Suite B2
Petaluma, CA 94954 (707) 789-3255

VICINITY MAP
Former Chevron Service Station #21-0208
6006 International Blvd.
Oakland, California

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
DG20208C.4C01		6/01	

FILE NAME: E:\Enviro\Chevron\A01-210208.dwg | Layout Tab: Vic Map



Source: Figure modified from drawing provided by Norcal (Geophysical Site Map 1/01) and Gettler-Ryan field observations.

FIGURE 2

SOIL BORING LOCATION MAP
Former Chevron Service Station No. 21-0208
6006 International Boulevard
Oakland, California

GETTLER - RYAN INC.
6747 Sierra Ct., Suite J
Dublin, CA 94568
(925) 551-7555

PROJECT NUMBER
DG20208G.4C01

REVIEWED BY

DATE
8/01

REVISED DATE

FILE NAME: P:\ENVIRO\CHEVRON\210208\A01-21-0208.DWG | Layout Tab: Boring Plot 8-01

APPENDIX A

From: Chu, Eva, Env. Health [mailto:EChu@co.alameda.ca.us]
Sent: Friday, June 14, 2002 11:46 AM
To: Berrington Mike (E-mail); Karen Streich (E-mail)
Subject: 6006 International Blvd. Oakland, CA

Hi Mike, Karen,

I finally had a chance to go over the case with Donna Drogos, my supervisor. She felt that soil data should have been collected from greater depths (especially after overexcavation of the dispenser area - my fault), since some of the borings (B4 and B5) had contamination at 10 feet bgs. So, instead of collecting more data, she would like to see a revised RBCA that assumes two scenario: one, when groundwater is at it's current level, and two, when it's at 10 or so feet. The RBCA should include:

* use 10 E-06 risk for all evaluation
* benzene slope factor should be 0.1
* use highest soil contaminant data, regardless of depth soil was collected.
* use hightest groundwater concentration data
* provide calculated site specific target levels, so we can see if site concentrations exceed SSTLs
* use ASTM default values, unless you have site specific values.

provide a list of all site specific values you use. (the seepage velocity you previously used doesn't look right, eg)

Please call me Monday if you have any questions regarding this message. I'm feeling a bit under the weather and will take off the rest of the day.

eva chu
Hazardous Materials Specialist
1131 Harbor Bay Parkway
(510) 567-6762
(510) 337-9335 (fax)

APPENDIX B

Main Screen

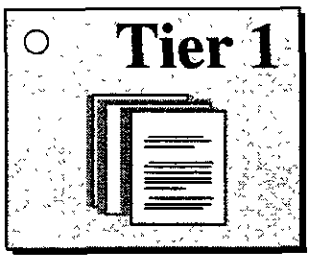
RBCA Tool Kit for Chemical Releases
Version 1.3a © 2000

1. Project Information

Site Name:	Former Chevron Service Station No. 21-0208		
Location:	6006 International Blvd., Oakland, CA		
Compl. By:	J. Douglas		
Date:	21-Jun-02	Job ID:	DG20208H.3C01

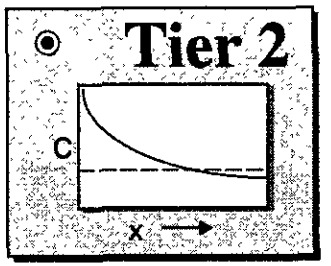
2. Which Type of RBCA Analysis? (?)

○ **Tier 1**



Generic Values
On-Site
Exposure

◉ **Tier 2**



Site-Specific Values
On- or Off-Site Exposure

3. Calculation Options (?)

Affects which input data are required

☑ ***Baseline Risks (Forward mode)***

☑ ***RBCA Cleanup Standards (Backward mode)***

4. RBCA Evaluation Process

Prepare Input Data

Data Complete? (■= yes, ■= no)

- ■□ **Exposure Pathways**
- ■□ **Constituents of Concern (COCs)**
- ■□ **Transport Models**
- ■□ **Soil Parameters**
- ■□ **GW Parameters**
- ■□ **Air Parameters**

Review Output

- **Exposure Flowchart**
- **COC Chem. Parameters**
- **Input Data Summary**
- **User-Spec. COC Data...**
- **Transient Domenico Analysis...**
- **Baseline Risks...**
- **Cleanup Standards...**

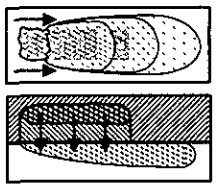
5. Commands and Options

New Site	**Load Data...**	**Save Data As...**	**Quit**
Print Sheet	**Set Units**	Custom Chem. Data...	***Help***

Exposure Pathway Identification

Site Name: Former Chevron Service Station No. 21-0208
Location: 6006 International Blvd., Oakland, CA
Compl. By: J. Douglas
Job ID: DG20208H.3C01 Date: 21-Jun-02

1. Groundwater Exposure



Groundwater Ingestion/ Surface Water Impact

Receptor Type:	None / On-site	Com. / Off-site1	None / Off-site2

Source Media:

- [x] Affected Groundwater
- [ ] Affected Soils Leaching to Groundwater

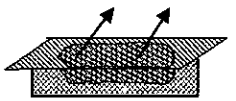
Distance to GW receptors

On-site	Off-site1	Off-site2
	1700	(ft)
		(ft)

[illegible]
Enter ALP Criteria

2. Surface Soil Exposure

Direct Ingestion and Dermal Contact



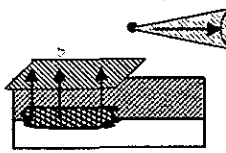
Receptor Type: None / On-site

No off-site receptors

[illegible]

3. Air Exposure

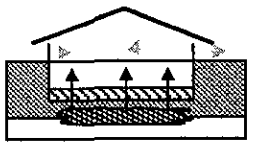
Volatilization and Particulates to Outdoor Air Inhalation



Receptor Type:	Res. / On-site	None / Off-site1	None / Off-site2
	0		(ft)

Construction worker

- [x] Affected Soils--Volatilization to Ambient Outdoor Air
- [x] Affected Groundwater--Volatilization to Ambient Outdoor Air
- [ ] Affected Surface Soils--Particulates to Ambient Outdoor Air



Volatilization to Indoor Air Inhalation

Receptor Type: Res. / On-site

No off-site receptors

- [x] Affected Soils--Volatilization to Enclosed Space
- [x] Affected Groundwater--Volatilization to Enclosed Space

4. Commands and Options

Main Screen | Print Sheet | Set Units | *Help*

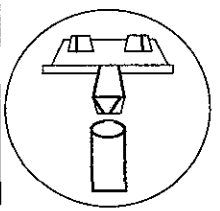
Exposure Factors & Target Risks | Exposure Flowchart

Exposure Factors and Target Risk Limits

Site Name: Former Chevron Service Station No. 21-0208
Location: 6006 International Blvd., Oakland. CA
Compl. By: J. Douglas
Job ID: DG20208H.3C01 Date: 21-Jun-02

1. Exposure Parameters

		Residential			Commercial	
Age Adjustment?		Adult	(Age 0-6)	(Age 0-16)	Chronic	Construc.
Averaging time, carcinogens (yr)		70				
Averaging time, non-carcinogens (yr)		30			25	1
Body weight (kg)		70	15	35	70	
Exposure duration (yr)		30	6	16	25	1
Exposure frequency (days/yr)		350			250	180
Dermal exposure frequency (days/yr)		350			250	
Skin surface area, soil contact (cm^2)	☐	5800		2023	5800	5800
Soil dermal adherence factor ($mg/cm^2/day$)		1				
Water ingestion rate (L/day)		2			1	
Soil ingestion rate (mg/day)	☐	100	200		50	100
Swimming exposure time (hr/event)		3				
Swimming event frequency (events/yr)		12	12	12		
Swimming water ingestion rate (L/hr)	☐	0.05	0.5			
Skin surface area, swimming (cm^2)	☐	23000		8100		
Fish consumption rate (kg/day)		0.025				
Contaminated fish fraction (unitless)		1				



2. Risk Goal Calculation Options

- ○ Individual Constituent Risk Goals Only
- ◉ Individual and Cumulative Risk Goals

3. Target Health Risk Limits

	Individual	Cumulative
Target Risk (Class A/B carcins.)	1.0E-6	1.0E-5
Target Risk (Class C carcinogens)	1.0E-5	
Target Hazard Quotient	1.0E+0	
Target Hazard Index		1.0E+0

4. Commands and Options

Return to Exposure Pathways

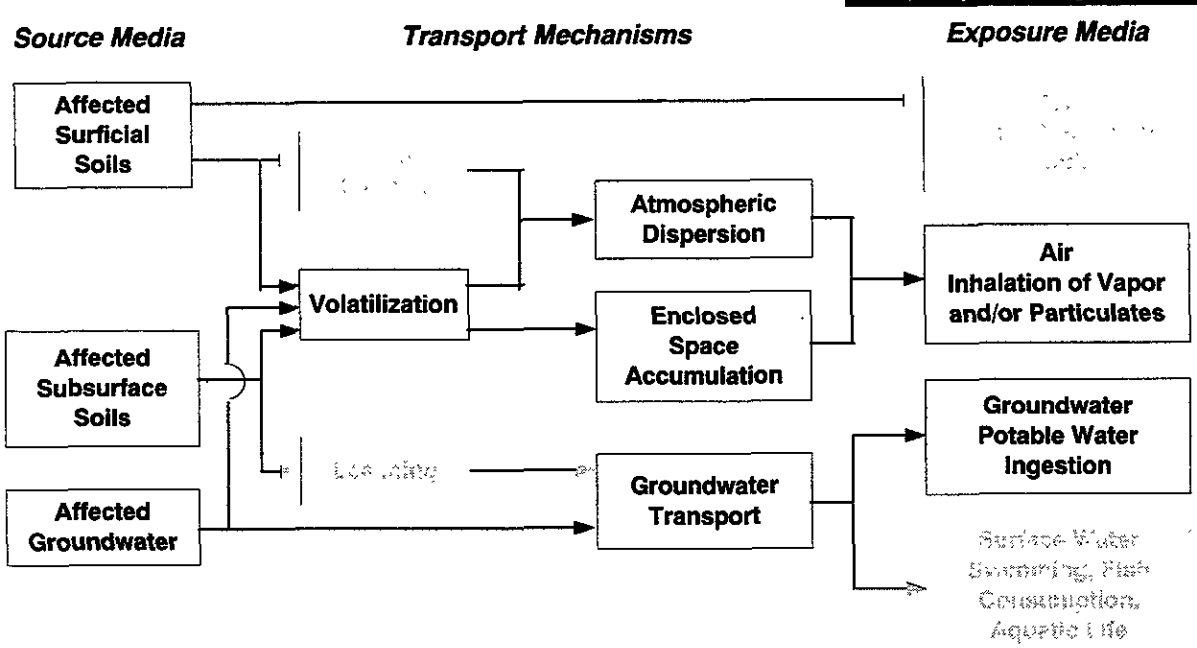
Use Default Values

Print Sheet

Help

Exposure Pathway Flowchart

Site Name: Former Chevron Service Station No[illegible]G20208H.3C01
Location: 6006 International Blvd., Oakland, CA Date: 21-Jun-02
Compl. By: J. Douglas



Receptors	On-site	Off-site1	Off-site2
	None	NA	NA
Outdoor Air:			
Residential	*None*	*None*	*None*
Indoor Air:			
Residential	*NA*	*NA*	*NA*
	None	*Commercial*	*None*
	NA	NA	NA

SOURCE → TRANSPORT → RECEPTOR

Commands and Options

Return | Print Sheet | Help

RBCA Tool Kit for Chemical Releases, Version 1.3a

Site Name: Former Chevron Service Station No. 21-0: Job ID: DG20208H.3C01
Location: 6006 International Blvd., Oakland, CA Date: 21-Jun-02
Compl. By: J. Douglas

Commands and Options

Main Screen | Print Sheet | *Help*

Source Media Constituents of Concern (COCs)

☐ Apply Raoult's Law (?)

Selected COCs

COC Select: ***Sort List:*** (?)

Add/Insert | Top | MoveUp
Delete | Bottom | MoveDown

Representative COC Concentration (?)

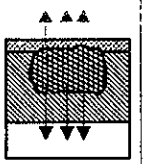
Selected COCs	Groundwater Source Zone		Soil Source Zone		
	Calculate / Enter Site Data		Calculate / Enter Site Data		
	(mg/L)	note	*(mg/kg)*	note	
Benzene*	1.0E-1		2.5E-3		
Toluene	1.3E-2		2.5E-3		
Ethylbenzene	1.8E-1		2.5E-3		
Xylene (mixed isomers)	5.7E-2		4.0E-1		
Methyl t-Butyl ether	1.4E-1		4.3E-1		
TPH - Arom >C08-C10	1.3E+1		1.1E+2		
TPH - Aliph >C12-C16	1.7E+0		1.0E-1		
TPH - Aliph >C16-C21	4.6E+0		2.8E-1		
TPH - Arom >C16-C21	1.3E+0		7.5E-2		
TPH - Arom >C21-C35	8.4E-1		5.0E-2		

* = Chemical with user-specified data

Transport Modeling Options

Site Name: Former Chevron Service Station No. 20208 G20208H.3C01
Location: 6006 International Blvd., Oakland, CA Date: 21-Jun-02
Compl. By: J. Douglas

1. Vertical Transport, Surface Soil Column



Outdoor Air Volatilization Factors

(?)

- ○ Surface soil volatilization model only
- ◉ Combination surface soil/Johnson & Ettinger models
  Thickness of surface soil zone [3.28084] *(ft)*
- ○ User-specified VF from other model [Enter VF Values]

Indoor Air Volatilization Factors

(?)

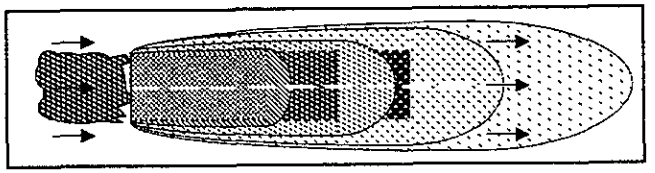
- ◉ Johnson & Ettinger model
- ○ User-specified VF from other model [Enter VF Values]

○ [illegible] (?)
□ [illegible]
□ [illegible]
[Enter Decay Rates]
○ [illegible] [Enter LF Values]

[illegible] (?)

	Off-site 1	Off-site 2	
○ [illegible]			
○ [illegible]	1.00E+0	1.00E+0	(-)

3. Groundwater Dilution Attenuation Factor



Calculate DAF using Domenico Model

(?)

- ○ Domenico equation with dispersion only (no biodegradation)
- ◉ Domenico equation first-order decay [■□ Enter Decay Rates]
- ○ Modified Domenico equation using electron acceptor superposition [Enter Site Data]

[Enter Directly] [illegible]

— or —

User-Specified DAF Values

- ○ DAF values from other model or site data [Enter DAF Values]

4. Commands and Options

Main Screen **Print Sheet** ***Help***

RBCA Tool Kit for Chemical Releases, Version 1.3a

Site Name: Former Chevron Service Station No. 2[illegible]0208DG20208H.3C01
Location: 6006 International Blvd., Oakland, CA Date: 21-Jun-02
Compl. By: J. Douglas

Commands and Options

Return | Print Sheet | Paste Default Values | *Help*

Constituent Half-Life Values

Constituent	Saturated Zone Half-Life *(day)*	Saturated Zone First-Order Decay Coeffecient *(1/day)*	Unsaturated Zone Half-Life *(day)*	Unsaturated Zone First-Order Decay Coeffecient *(1/day)*
Benzene*	7.2E+2	9.6E-4	7.2E+2	9.6E-4
Toluene	2.8E+1	2.5E-2	2.8E+1	2.5E-2
Ethylbenzene	2.3E+2	3.0E-3	2.3E+2	3.0E-3
Xylene (mixed isomers)	3.6E+2	1.9E-3	3.6E+2	1.9E-3
Methyl t-Butyl ether	3.6E+2	1.9E-3	1.8E+2	3.9E-3
TPH - Arom >C08-C10	3.6E+2	1.9E-3	1.8E+2	3.9E-3
TPH - Aliph >C12-C16	3.6E+2	1.9E-3	1.8E+2	3.9E-3
TPH - Aliph >C16-C21	3.6E+2	1.9E-3	1.8E+2	3.9E-3
TPH - Arom >C16-C21	3.6E+2	1.9E-3	1.8E+2	3.9E-3
TPH - Arom >C21-C35	3.6E+2	1.9E-3	1.8E+2	3.9E-3

Site-Specific Soil Parameters

Site Name: Former Chevron Service Station No. 21-0208 ID: DG20208H.3C01
Location: 6006 International Blvd., Oakland, CA Date: 21-Jun-02
Compl. By: J. Douglas

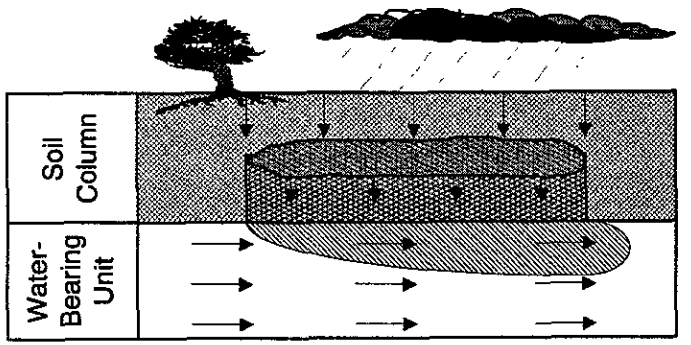
1. Soil Source Zone Characteristics

Hydrogeology

	General Case Construction	
Depth to water-bearing unit	6.55	(ft)
Capillary zone thickness	0.2	(ft)
Soil column thickness	6.35	(ft)

Affected Soil Zone

Depth to top of affected soils	0		(ft)
Depth to base of affected soils	6.55		(ft)
Affected soil area	100	100	(ft^2)
Length of affected soil parallel to assumed wind direction	10	10	(ft)



2. Surface Soil Column

	Vadose Zone	Capillary Fringe	
	or		or
Total porosity	0.405		(-)
Volumetric water content	0.2321	0.2493	(-)
Volumetric air content	0.1729	0.1557	(-)
Dry bulk density	7.7787		(kg/L)
Vertical hydraulic conductivity	1.9E-3		(cm/d)
Vapor permeability	1.1E-11		(ft^2)
Capillary zone thickness	2.0E-1		(ft)

Calculate

NA

or

Partitioning Parameters

Fraction organic carbon	0.01	(-)
Soil/water pH	6.8	(-)

3. Commands and Options

Main Screen | Use Default Values | Print Sheet
Set Units | | Help

Site-Specific Groundwater Parameters

Site Name: Former Chevron Service Station No. 20208 DG20208H.3C01
Location: 6006 International Blvd., Oakland, CA Date: 21-Jun-02
Compl. By: J. Douglas

1. Water-Bearing Unit

Hydrogeology

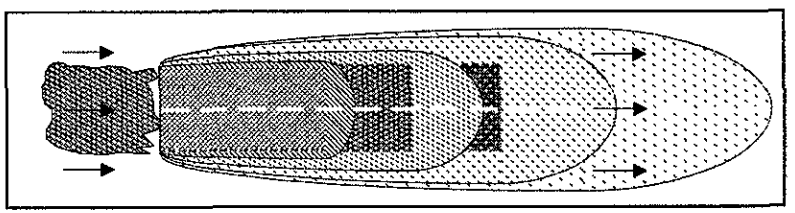
Groundwater Darcy velocity	1.1E+0	*(cm/d)*
Groundwater seepage velocity	2.9E+0	*(cm/d)*
or Enter Directly	*or*	
Hydraulic conductivity	6.9E+2	*(cm/d)*
Hydraulic gradient	1.6E-3	*(-)*
Effective porosity	0.38	*(-)*

Sorption

Fraction organic carbon--saturated zone	0.001	*(-)*
Groundwater pH	6.20	*(-)*

2. Groundwater Source Zone

Groundwater plume width at source	147.6377953	*(ft)*
Plume (mixing zone) thickness at source	6.56167979	*(ft)*
or Calculate	*or*	



3. Groundwater Dispersion

Model: ASTM Default

	GW Ingestion	Soil Leaching to GW		
	Off-site 1			
Distance to GW receptors	1700			*(ft)*
or Enter Directly	*or*		*or*	
Longitudinal dispersivity	170			*(ft)*
Transverse dispersivity	56.1			*(ft)*
Vertical dispersivity	8.5			*(ft)*

5. Commands and Options

Main Screen | Use Default Values | Print Sheet
Set Units | | *Help*

Site-Specific Air Parameters

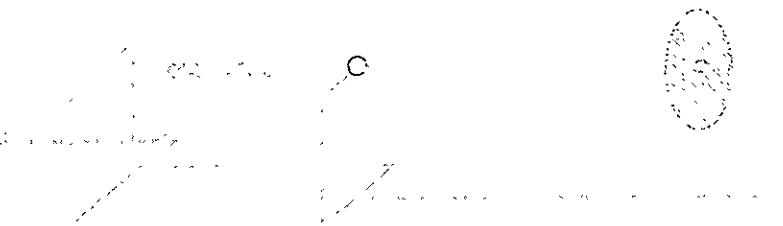
Site Name: Former Chevron Service Station No 20-0208H.3C01
Location: 6006 International Blvd., Oakland, CA Date: 21-Jun-02
Compl. By: J. Douglas

1. Outdoor Air Pathway

NA or

Air Source Zone

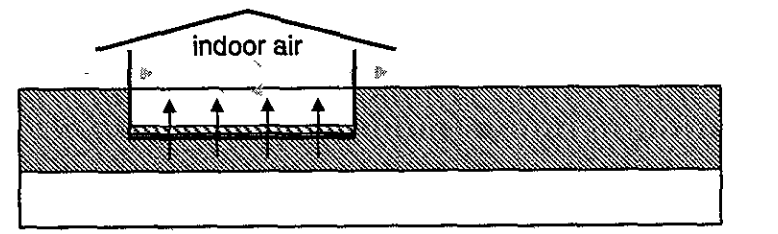
Air mixing zone height	6.56167979	(ft)
Ambient air velocity in mixing zone	7.381889764	(ft/s)



2. Indoor Air Pathway

Building Parameters

	Residential	
Building volume/area ratio	28	(ft)
Foundation area	2822	(ft^2)
Foundation perimeter	270	(ft)
Building air exchange rate	6.5E-4	(1/s)
Depth to bottom of foundation slab	0.49213	(ft)
Convective air flow through cracks	0.0E+0	(ft^3/s)
Foundation thickness	0.492125984	(ft)
Foundation crack fraction	0.001	(-)
Volumetric water content of cracks	0.12	(-)
Volumetric air content of cracks	0.26	(-)
Indoor/Outdoor differential pressure	0	(g/cm/s^2)



3. Commands and Options

Main Screen | Use Default Values | Print Sheet
Set Units | | Help

RBCA SITE ASSESSMENT | **Baseline Risk Summary-All Pathways**

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA

Completed By: J. Douglas
Date Completed: 21-Jun-02

TIER 2 BASELINE RISK SUMMARY TABLE

EXPOSURE PATHWAY	BASELINE CARCINOGENIC RISK					BASELINE TOXIC EFFECTS				
	Individual COC Risk		Cumulative COC Risk		Risk Limit(s) Exceeded?	Hazard Quotient		Hazard Index		Toxicity Limit(s) Exceeded?
	Maximum Value	Target Risk	Total Value	Target Risk		Maximum Value	Applicable Limit	Total Value	Applicable Limit	
OUTDOOR AIR EXPOSURE PATHWAYS										
Complete:	6.0E-8	1.0E-6	6.0E-8	1.0E-5	☐	7.3E-1	1.0E+0	7.7E-1	1.0E+0	☐
INDOOR AIR EXPOSURE PATHWAYS										
Complete:	6.3E-8	1.0E-6	6.3E-8	1.0E-5	☐	7.4E-1	1.0E+0	7.8E-1	1.0E+0	☐
SOIL EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
GROUNDWATER EXPOSURE PATHWAYS										
Complete:	3.8E-14	1.0E-6	3.8E-14	1.0E-5	☐	3.5E-10	1.0E+0	4.0E-10	1.0E+0	☐
SURFACE WATER EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
CRITICAL EXPOSURE PATHWAY (Maximum Values From Complete Pathways)										
	6.3E-8	***1.0E-6***	***6.3E-8***	***1.0E-5***	☐	***7.4E-1***	***1.0E+0***	***7.8E-1***	***1.0E+0***	☐
	Indoor Air		***Indoor Air***			***Indoor Air***		***Indoor Air***		

CHEMICAL DATA FOR SELECTED COCs

Physical Property Data

Constituent	CAS Number	type	Molecular Weight (g/mole) MW	ref	Diffusion Coefficients in air (cm2/s) Dair	ref	in water (cm2/s) Dwat	ref	log (Koc) or log(Kd) (@ 20 - 25 C) log(L/kg) partition		ref	Henry's Law Constant (@ 20 - 25 C) (atm-m3) mol	(unitless)	ref	Vapor Pressure (@ 20 - 25 C) (mm Hg)	ref	Solubility (@ 20 - 25 C) (mg/L)	ref	acid pKa	base pKb	ref
Benzene*	71-43-2	A	78.1	PS	8.80E-02	PS	9.80E-06	PS	1.77	Koc	PS	5.55E-03	2.29E-01	PS	9.52E+01	PS	1.75E+03	PS	-	-	-
Toluene	108-88-3	A	92.4	5	8.50E-02	A	9.40E-06	A	2.13	Koc	A	6.30E-03	2.60E-01	A	3.00E+01	4	5.15E+02	29	-	-	-
Ethylbenzene	100-41-4	A	106.2	PS	7.50E-02	PS	7.80E-06	PS	2.56	Koc	PS	7.88E-03	3.25E-01	PS	1.00E+01	PS	1.69E+02	PS	-	-	-
Xylene (mixed isomers)	1330-20-7	A	106.2	5	7.20E-02	A	8.50E-06	A	2.38	Koc	A	7.03E-03	2.90E-01	A	7.00E+00	4	1.98E+02	5	-	-	-
Methyl t-Butyl ether	1634-04-4	O	88.146	5	7.92E-02	6	9.41E-05	7	1.08	Koc	A	5.77E-04	2.38E-02	-	2.49E+02	-	4.80E+04	A	-	-	-
TPH - Arom >C08-C10	0-00-0	T	120	T	1.00E-01	T	1.00E-05	T	3.20	Koc	T	1.16E-02	4.80E-01	T	4.79E+00	-	6.50E+01	T	-	-	-
TPH - Aliph >C12-C16	0-00-0	T	200	T	1.00E-01	T	1.00E-05	T	6.70	Koc	T	1.26E+01	5.21E+02	T	3.65E-02	-	7.60E-04	T	-	-	-
TPH - Aliph >C16-C21	0-00-0	T	270	T	1.00E-01	T	1.00E-05	T	8.80	Koc	T	1.19E+02	4.90E+03	T	8.36E-04	-	2.50E-06	T	-	-	-
TPH - Arom >C16-C21	0-00-0	T	190	T	1.00E-01	T	1.00E-05	T	4.20	Koc	T	3.22E-04	1.33E-02	T	9.36E-04	-	6.50E-01	T	-	-	-
TPH - Arom >C21-C35	0-00-0	T	240	T	1.00E-01	T	1.00E-05	T	5.10	Koc	T	1.60E-05	6.60E-04	T	3.34E-07	-	6.60E-03	T	-	-	-

* = Chemical with user-specified data

Site Name: Former Chevron Service Station No. 21-0208

Site Location: 6006 International Blvd., Oakland, CA

Completed By: J. Douglas

Date Completed: 21-Jun-02

Job ID: DG20208H.3C01

CHEMICAL DATA FOR SELECTED COCs

Toxicity Data

Constituent	Reference Dose (mg/kg/day) Oral RfD_oral	ref	Reference Dose (mg/kg/day) Dermal RfD_dermal	ref	Reference Conc. (mg/m3) Inhalation RfC_inhal	ref	Slope Factors 1/(mg/kg/day) Oral SF_oral	ref	Slope Factors 1/(mg/kg/day) Dermal SF_dermal	ref	Unit Risk Factor 1/(µg/m3) Inhalation URF_inhal	ref	EPA Weight of Evidence	Is Constituent Carcinogenic ?
Benzene*	3.00E-03	R	-	-	5.95E-03	R	1.00E-01	PS	2.99E-02	TX	8.29E-06	PS	A	TRUE
Toluene	2.00E-01	A,R	1.60E-01	TX	4.00E-01	A,R	-	-	-	-	-	-	D	FALSE
Ethylbenzene	1.00E-01	PS	9.70E-02	TX	1.00E+00	PS	-	-	-	-	-	-	D	FALSE
Xylene (mixed isomers)	2.00E+00	A,R	1.84E+00	TX	7.00E+00	A	-	-	-	-	-	-	D	FALSE
Methyl t-Butyl ether	1.00E-02	31	8.00E-03	TX	3.00E+00	R	-	-	-	-	-	-	-	FALSE
TPH - Arom >C08-C10	4.00E-02	T	-	-	2.00E-01	T	-	-	-	-	-	-	D	FALSE
TPH - Aliph >C12-C16	1.00E-01	T	-	-	1.00E+00	T	-	-	-	-	-	-	D	FALSE
TPH - Aliph >C16-C21	2.00E+00	T	-	-	-	T	-	-	-	-	-	-	D	FALSE
TPH - Arom >C16-C21	3.00E-02	T	-	-	-	T	-	-	-	-	-	-	D	FALSE
TPH - Arom >C21-C35	3.00E-02	T	-	-	-	T	-	-	-	-	-	-	D	FALSE

* = Chemical with user-specifiec

Site Name: Former Chevron Se

Site Location: 6006 Internatio

Miscellaneous Chemical Data

Constituent	Maximum Contaminant Level MCL (mg/L)	ref	Time-Weighted Average Workplace Criteria TWA (mg/m3)	ref	Aquatic Life Prot. Criteria AQL (mg/L)	ref	Bioconcentration Factor (L-wat/kg-fish)
Benzene*	5.00E-04	-	3.25E+00	-	-	-	12.6
Toluene	1.00E+00	56 FR 3526 (30 Jan 91)	1.47E+02	ACGIH	-	-	70
Ethylbenzene	7.00E-01	56 FR 3526 (30 Jan 91)	4.35E+02	PS	-	-	1
Xylene (mixed isomers)	1.00E+01	56 FR 3526 (30 Jan 91)	4.34E+02	ACGIH	-	-	1
Methyl t-Butyl ether	-	-	6.00E+01	NIOSH	-	-	1
TPH - Arom >C08-C10	-	-	-	-	-	-	1
TPH - Aliph >C12-C16	-	-	-	-	-	-	1
TPH - Aliph >C16-C21	-	-	-	-	-	-	1
TPH - Arom >C16-C21	-	-	-	-	-	-	1
TPH - Arom >C21-C35	-	-	-	-	-	-	1

* = Chemical with user-specifiec

Site Name: Former Chevron Se

Site Location: 6006 Internatio

CHEMICAL DATA FOR SELECTED COCs

Miscellaneous Chemical Data

Constituent	Dermal Relative Absorp. Factor (unitless)	Water Dermal Permeability Data: Dermal Permeability Coeff. (cm/hr)	Lag time for Dermal Exposure (hr)	Critical Exposure Time (hr)	Relative Contr of Derm Perm Coeff (unitless)	Water/Skin Derm Adsorp Factor (cm/event)	ref	Detection Limits: Groundwater (mg/L)	ref	Soil (mg/kg)	ref	Half Life (First-Order Decay) (days): Saturated	Unsaturated	ref
Benzene*	0.5	0.021	0.26	0.63	0.013	7.3E-2	D	0.002	S	0.005	S	720	720	H
Toluene	0.5	0.045	0.32	0.77	0.054	1.6E-1	D	0.002	S	0.005	S	28	28	H
Ethylbenzene	0.5	0.074	0.39	1.3	0.14	2.7E-1	D	0.002	S	0.005	S	228	228	H
Xylene (mixed isomers)	0.5	0 08	0.39	1.4	0.16	2.9E-1	D	0.005	S	0.005	S	360	360	H
Methyl t-Butyl ether	0.5	-	-	-	-	-	-	-	-	-	-	360	180	H
TPH - Arom >C08-C10	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH - Aliph >C12-C16	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH - Aliph >C16-C21	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH - Arom >C16-C21	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-
TPH - Arom >C21-C35	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-

* = Chemical with user-specifiec

Site Name: Former Chevron Se

Site Location: 6006 Internatio

RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd , Oakland, CA

Completed By: J. Douglas
Date Completed: 21-Jun-02

Job ID: DG20208H.3C01

Exposure Parameters		Residential			Commercial/Industrial	
		Adult	(1-6yrs)	(1-16 yrs)	Chronic	Construc.
AT_c	Averaging time for carcinogens (yr)	70				
AT_n	Averaging time for non-carcinogens (yr)	30			25	1
BW	Body weight (kg)	70	15	35	70	
ED	Exposure duration (yr)	30	6	16	25	1
τ	Averaging time for vapor flux (yr)	30			25	1
EF	Exposure frequency (days/yr)	350			250	180
EF_D	Exposure frequency for dermal exposure	350			250	
IR_w	Ingestion rate of water (L/day)	2			1	
IR_s	Ingestion rate of soil (mg/day)	100	200		50	100
SA	Skin surface area (dermal) (cm^2)	5800		2023	5800	5800
M	Soil to skin adherence factor	1				
ET_{swim}	Swimming exposure time (hr/event)	3				
EV_{swim}	Swimming event frequency (events/yr)	12	12	12		
IR_{swim}	Water ingestion while swimming (L/hr)	0.05	0.5			
SA_{swim}	Skin surface area for swimming (cm^2)	23000		8100		
IR_{fish}	Ingestion rate of fish (kg/yr)	0.025				
H_{fish}	Contaminated fish fraction (unitless)	1				

Complete Exposure Pathways and Receptors	On-site	Off-site 1	Off-site 2
Groundwater:			
Groundwater Ingestion	None	Commercial	None
Soil Leaching to Groundwater Ingestion	None	None	None
Applicable Surface Water Exposure Routes:			
Swimming			NA
Fish Consumption			NA
Aquatic Life Protection			NA
Soil:			
Direct Ingestion and Dermal Contact	None		
Outdoor Air:			
Particulates from Surface Soils	None	None	None
Volatilization from Soils	Residential	None	None
Volatilization from Groundwater	Residential	None	None
Indoor Air:			
Volatilization from Subsurface Soils	Residential	NA	NA
Volatilization from Groundwater	Residential	NA	NA

Receptor Distance from Source Media	On-site	Off-site 1	Off-site 2	(Units)
Groundwater receptor	NA	1700	NA	(ft)
Soil leaching to groundwater receptor	NA	NA	NA	(ft)
Outdoor air inhalation receptor	0	NA	NA	(ft)

Target Health Risk Values		Individual	Cumulative
TR_{ab}	Target Risk (class A&B carcinogens)	1.0E-6	1.0E-5
TR_c	Target Risk (class C carcinogens)	1.0E-5	
THQ	Target Hazard Quotient (non-carcinogenic risk)	1.0E+0	1.0E+0

Modeling Options	
RBCA tier	Tier 2
Outdoor air volatilization model	Surface & subsurface models
Indoor air volatilization model	Johnson & Ettinger model
Soil leaching model	NA
Use soil attenuation model (SAM) for leachate?	NA
Air dilution factor	NA
Groundwater dilution-attenuation factor	Domenico model w/ biodeg.

NOTE. NA = Not applicable

Surface Parameters		General	Construction	(Units)
A	Source zone area	1.0E+2	NA	(ft^2)
W	Length of source-zone area parallel to wind	1.0E+1	NA	(ft)
W_{gw}	Length of source-zone area parallel to GW flow	NA		(ft)
U_{air}	Ambient air velocity in mixing zone	7.4E+0		(ft/s)
δ_{air}	Air mixing zone height	6.6E+0		(ft)
P_a	Areal particulate emission rate	NA		(g/cm^2/s)
L_{ss}	Thickness of affected surface soils	3.3E+0		(ft)

Surface Soil Column Parameters		Value			(Units)
h_{cap}	Capillary zone thickness	2.0E-1			(ft)
h_v	Vadose zone thickness	6.4E+0			(ft)
ρ_s	Soil bulk density	7.8E+0			(g/cm^3)
f_{oc}	Fraction organic carbon	1.0E-2			(-)
θ_T	Soil total porosity	4 1E-1			(-)
K_{vs}	Vertical hydraulic conductivity	1 9E-3			(cm/d)
k_v	Vapor permeability	1.1E-11			(ft^2)
L_{gw}	Depth to groundwater	6.6E+0			(ft)
L_s	Depth to top of affected soils	0.0E+0			(ft)
L_{base}	Depth to base of affected soils	6.6E+0			(ft)
L_{subs}	Thickness of affected soils	6.6E+0			(ft)
pH	Soil/groundwater pH	6.8E+0			(-)
		capillary	vadose	foundation	
θ_w	Volumetric water content	0.2493	0.2321	0.12	(-)
θ_a	Volumetric air content	0 1557	0.1729	0.26	(-)

Building Parameters		Residential	Commercial	(Units)
L_b	Building volume/area ratio	2.80E+1	NA	(ft)
A_b	Foundation area	2.82E+3	NA	(ft^2)
X_{crk}	Foundation perimeter	2.70E+2	NA	(ft)
ER	Building air exchange rate	6.54E-4	NA	(1/s)
L_{crk}	Foundation thickness	4 92E-1	NA	(ft)
Z_{crk}	Depth to bottom of foundation slab	4.92E-1	NA	(ft)
η	Foundation crack fraction	1.00E-3	NA	(-)
dP	Indoor/outdoor differential pressure	0.00E+0	NA	(g/cm/s^2)
Q_s	Convective air flow through slab	0 00E+0	NA	(ft^3/s)

Groundwater Parameters		Value	(Units)
δ_{gw}	Groundwater mixing zone depth	NA	(ft)
I_f	Net groundwater infiltration rate	NA	(in/yr)
U_{gw}	Groundwater Darcy velocity	1.1E+0	(cm/d)
V_{gw}	Groundwater seepage velocity	2.9E+0	(cm/d)
K_s	Saturated hydraulic conductivity	6 9E+2	(cm/d)
I	Groundwater gradient	1.6E-3	(-)
S_w	Width of groundwater source zone	1.5E+2	(ft)
S_d	Depth of groundwater source zone	6.6E+0	(ft)
θ_{eff}	Effective porosity in water-bearing unit	3.8E-1	(-)
$f_{oc\text{-}sat}$	Fraction organic carbon in water-bearing unit	1.0E-3	(-)
pH_{sat}	Groundwater pH	6.2E+0	(-)
	Biodegradation considered?	1st Order	

Transport Parameters		Off-site 1	Off-site 2	Off-site 1	Off-site 2	(Units)
Lateral Groundwater Transport		Groundwater Ingestion		Soil Leaching to GW		
α_x	Longitudinal dispersivity	1.7E+2	NA	NA	NA	(ft)
α_y	Transverse dispersivity	5.6E+1	NA	NA	NA	(ft)
α_z	Vertical dispersivity	8.5E+0	NA	NA	NA	(ft)
Lateral Outdoor Air Transport		Soil to Outdoor Air Inhal.		GW to Outdoor Air Inhal.		
σ_y	Transverse dispersion coefficient	NA	NA	NA	NA	(ft)
σ_z	Vertical dispersion coefficient	NA	NA	NA	NA	(ft)
ADF	Air dispersion factor	NA	NA	NA	NA	(-)

Surface Water Parameters		Off-site 2	(Units)
Q_{sw}	Surface water flowrate	NA	(ft^3/s)
W_{pl}	Width of GW plume at SW discharge	NA	(ft)
δ_{pl}	Thickness of GW plume at SW discharge	NA	(ft)
DF_{sw}	Groundwater-to-surface water dilution factor	NA	(-)

RBCA SITE ASSESSMENT

Site Name: Former Chevron Service Station No. 21-0208 | Completed By: J. Douglas | Job ID: DG20208H.3C01

Site Location: 6006 International Blvd , Oakland, CA | Date Completed: 21-Jun-02

SOIL (0 - 6.6 ft) SSTL VALUES

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

Groundwater DAF Option: Domenico - First Order (One-directional vert. dispersion)

SSTL Results For Complete Exposure Pathways ("X" If Complete)

				Soil Leaching to Groundwater Ingestion / Discharge to Surface Water			X Soil Vol. to Indoor Air	X Soil Volatilization to Outdoor Air				Surface Soil Inhalation, Ingestion,Dermal Contact		Applicable SSTL	SSTL Exceeded ?	Required CRF
CONSTITUENTS OF CONCERN		Representative Concentration		On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)				Only if "yes" left
CAS No.	Name	(mg/kg)		None	None	None	Residential	Residential	Construction Worker	None	None	None	Construction Worker	(mg/kg)	"■" if yes	
71-43-2	Benzene*	2.5E-3		NA	NA	NA	9.8E-1	2.6E+1	NA	NA	NA	NA	NA	9.8E-1	☐	<1
108-88-3	Toluene	2.5E-3		NA	NA	NA	>7.1E+2	>7.1E+2	NA	NA	NA	NA	NA	>7.1E+2	☐	NA
100-41-4	Ethylbenzene	2.5E-3		NA	NA	NA	>6.2E+2	>6.2E+2	NA	NA	NA	NA	NA	>6.2E+2	☐	NA
1330-20-7	Xylene (mixed isomers)	4.0E-1		NA	NA	NA	>4.8E+2	>4.8E+2	NA	NA	NA	NA	NA	>4.8E+2	☐	NA
1634-04-4	Methyl t-Butyl ether	4.3E-1		NA	NA	NA	>7.2E+3	>7.2E+3	NA	NA	NA	NA	NA	>7.2E+3	☐	NA
0-00-0	TPH - Arom >C08-C10	1.1E+2		NA	NA	NA	>1.0E+3	>1.0E+3	NA	NA	NA	NA	NA	>1.0E+3	☐	NA
0-00-0	TPH - Aliph >C12-C16	1.0E-1		NA	NA	NA	>3.8E+1	>3.8E+1	NA	NA	NA	NA	NA	>3.8E+1	☐	NA
0-00-0	TPH - Aliph >C16-C21	2.8E-1		NA	NA	NA	NC	NC	NA	NA	NA	NA	NA	NC	☐	NA
0-00-0	TPH - Arom >C16-C21	7.5E-2		NA	NA	NA	NC	NC	NA	NA	NA	NA	NA	NC	☐	NA
0-00-0	TPH - Arom >C21-C35	5.0E-2		NA	NA	NA	NC	NC	NA	NA	NA	NA	NA	NC	☐	NA

* = Chemical with user-specified data

">" indicates risk-based target concentration greater than constituent residual saturation value. NA = Not applicable. NC = Not calculated.

RBCA SITE ASSESSMENT

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA

Completed By: J. Douglas
Date Completed: 21-Jun-02

Job ID: DG20208H.3C01

GROUNDWATER SSTL VALUES

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

Groundwater DAF Option: Domenico - First Order (One-directional vert. dispersion)

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

CONSTITUENTS OF CONCERN		Representative Concentration	X	Groundwater Ingestion			X	GW Vol. to Indoor Air	X	Groundwater Volatilization to Outdoor Air			Applicable SSTL	SSTL Exceeded ?	Required CRF
				On-site (0 ft)	Off-site 1 (1700 ft)	Off-site 2 (0 ft)		On-site (0 ft)		On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)			Only if "yes" left
CAS No.	Name	(mg/L)		None	Commercial	None		Residential		Residential	None	None	(mg/L)	"■" if yes	
71-43-2	Benzene*	1.0E-1		NA	>1.8E+3	NA		1.7E+0		1.7E+0	NA	NA	1.7E+0	☐	<1
108-88-3	Toluene	1.3E-2		NA	>5.2E+2	NA		>5.2E+2		>5.2E+2	NA	NA	>5.2E+2	☐	NA
100-41-4	Ethylbenzene	1.8E-1		NA	>1.7E+2	NA		>1.7E+2		>1.7E+2	NA	NA	>1.7E+2	☐	NA
1330-20-7	Xylene (mixed isomers)	5.7E-2		NA	>2.0E+2	NA		>2.0E+2		>2.0E+2	NA	NA	>2.0E+2	☐	NA
1634-04-4	Methyl t-Butyl ether	1.4E-1		NA	>4.8E+4	NA		>4.8E+4		>4.8E+4	NA	NA	>4.8E+4	☐	NA
0-00-0	TPH - Arom >C08-C10	1.3E+1		NA	>6.5E+1	NA		>6.5E+1		>6.5E+1	NA	NA	>6.5E+1	☐	NA
0-00-0	TPH - Aliph >C12-C16	1.7E+0		NA	>7.6E-4	NA		>7.6E-4		>7.6E-4	NA	NA	>7.6E-4	☐	NA
0-00-0	TPH - Aliph >C16-C21	4.6E+0		NA	>2.5E-6	NA		NC		NC	NA	NA	>2.5E-6	☐	NA
0-00-0	TPH - Arom >C16-C21	1.3E+0		NA	>6.5E-1	NA		NC		NC	NA	NA	>6.5E-1	☐	NA
0-00-0	TPH - Arom >C21-C35	8.4E-1		NA	>6.6E-3	NA		NC		NC	NA	NA	>6.6E-3	☐	NA

* = Chemical with user-specified data

">" indicates risk-based target concentration greater than constituent solubility value. NA = Not applicable. NC = Not calculated.

RBCA SITE ASSESSMENT | **TPH Criteria SSTL Worksheet**

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA

Completed By: J. Douglas
Date Completed: 21-Jun-02

Job ID: DG20208H.3C01

CALCULATION OF SSTL VALUES FOR TPH

CONSTITUENTS OF CONCERN		Mass Fractions		Representative Concentrations		Calculated Concentration Limits		Appilcable SSTL Values	
		Soil	Groundwater	Soil	Groundwater	Residual Soil Concentration	Solubility	Soils (0 - 6.6 ft)	Groundwater
CAS No.	Name	(-)	(-)	(mg/kg)	(mg/L)	(mg/kg)	(mg/L)	(mg/kg)	(mg/L)
0-00-0	TPH - Arom >C08-C10	1.0E+0	6.1E-1	1.1E+2	1.3E+1	1.0E+3	6.5E+1	>1.0E+3	>6.5E+1
0-00-0	TPH - Aliph >C12-C16	9.0E-4	7.8E-2	1.0E-1	1.7E+0	3.8E+1	7.6E-4	>3.8E+1	>7.6E-4
0-00-0	TPH - Aliph >C16-C21	2.5E-3	2.1E-1	2.8E-1	4.6E+0	1.6E+1	2.5E-6	NC	>2.5E-6
0-00-0	TPH - Arom >C16-C21	6.8E-4	5.9E-2	7.5E-2	1.3E+0	1.0E+2	6.5E-1	NC	>6.5E-1
0-00-0	TPH - Arom >C21-C35	4.5E-4	3.9E-2	5.0E-2	8.4E-1	8.3E+0	6.6E-3	NC	>6.6E-3
* = Chemical with user-specified data									
	Total	1.0E+0	1.0E+0	1.1E+2	2.1E+1				

Total TPH SSTL value >Res >Sol

">" indicates risk-based target concentration greater than constituent residual saturation value. NC = Not calculated.

RBCA SITE ASSESSMENT | **Cumulative Risk Worksheet**

Site Name: Former Chevron Service Station No. 21-0208 | Completed By: J. Douglas | Job ID: DG20208H.3C01

Site Location: 6006 International Blvd., Oakland, CA | Date Completed: 21-Jun-02 | *1 OF 3*

CUMULATIVE RISK WORKSHEET

CONSTITUENTS OF CONCERN		Representative Concentration		Proposed CRF		Resultant Target Concentration	
CAS No.	Name	Soil (mg/kg)	Groundwater (mg/L)	Soil	GW	Soil (mg/kg)	Groundwater (mg/L)
71-43-2	Benzene*	2.5E-3	1.0E-1			2.5E-3	1.0E-1
108-88-3	Toluene	2.5E-3	1.3E-2			2.5E-3	1.3E-2
100-41-4	Ethylbenzene	2.5E-3	1.8E-1			2.5E-3	1.8E-1
1330-20-7	Xylene (mixed isomers)	4.0E-1	5.7E-2			4.0E-1	5.7E-2
1634-04-4	Methyl t-Butyl ether	4.3E-1	1.4E-1			4.3E-1	1.4E-1
0-00-0	TPH - Arom >C08-C10	1.1E+2	1.3E+1			1.1E+2	1.3E+1
0-00-0	TPH - Aliph >C12-C16	1.0E-1	1.7E+0			1.0E-1	1.7E+0
0-00-0	TPH - Aliph >C16-C21	2.8E-1	4.6E+0			2.8E-1	4.6E+0
0-00-0	TPH - Arom >C16-C21	7.5E-2	1.3E+0			7.5E-2	1.3E+0
0-00-0	TPH - Arom >C21-C35	5.0E-2	8.4E-1			5.0E-2	8.4E-1

Cumulative Values:

RBCA SITE ASSESSMENT | **Cumulative Risk Worksheet**

Site Name: Former Chevron Service Station No. 21Site Name: Former Chevron Service Station No. 21-(Completed By: J. Douglas Job ID: DG20208H.3C01

Site Location: 6006 International Blvd., Oakland, CASite Location: 6006 International Blvd., Oakland, CA Date Completed: 21-Jun-02 *2 OF 3*

CUMULATIVE RISK WORKSHEET

Cumulative Target Risk: 1.0E-5 Target Hazard Index: 1.0E+0

ON-SITE RECEPTORS

CONSTITUENTS OF CONCERN		Outdoor Air Exposure: Residential		Indoor Air Exposure: Residential		Soil Exposure: None		Groundwater Exposure: None	
		Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0	Target Risk: 1.0E-6 / 1.0E-5	Target HQ: 1.0E+0
CAS No.	Name	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene*	6.0E-8	2.8E-3	6.3E-8	3.0E-3				
108-88-3	Toluene		6.1E-6		6.9E-6				
100-41-4	Ethylbenzene		3.7E-5		3.7E-5				
1330-20-7	Xylene (mixed isomers)		2.3E-6		5.8E-6				
1634-04-4	Methyl t-Butyl ether		3.1E-6		1.7E-5				
0-00-0	TPH - Arom >C08-C10		3.5E-2		4.1E-2				
0-00-0	TPH - Aliph >C12-C16		7.3E-1		7.4E-1				
0-00-0	TPH - Aliph >C16-C21								
0-00-0	TPH - Arom >C16-C21								
0-00-0	TPH - Arom >C21-C35								
Cumulative Values:		**6.0E-8**	**7.7E-1**	**6.3E-8**	**7.8E-1**	**0.0E+0**	**0.0E+0**	**0.0E+0**	**0.0E+0**

■ indicates risk level exceeding target risk

RBCA SITE ASSESSMENT | **Cumulative Risk Worksheet**

Site Name: Former Chevron Service Station No. 21Site Name: Former Chevron Service Station No. 21-0 Completed By: J. Douglas Job ID: DG20208H.3C01

Site Location: 6006 International Blvd., Oakland, CASite Location: 6006 International Blvd., Oakland, CA Date Completed: 21-Jun-02

CUMULATIVE RISK WORKSHEET

Cumulative Target Risk: 1.0E-5 Target Hazard Index: 1.0E+0

Groundwater DAF Option: Domenico - First Order

OFF-SITE RECEPTORS

CONSTITUENTS OF CONCERN		Outdoor Air Exposure: None Target Risk: 1.0E-6 / 1.0E-5		Outdoor Air Exposure: None Target HQ: 1.0E+0		Groundwater Exposure: Commercial (1700 ft) Target Risk: 1.0E-6 / 1.0E-5		Groundwater Exposure: None Target Risk: 1.0E-6 / 1.0E-5	
CAS No.	Name	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient	Carcinogenic Risk	Hazard Quotient
71-43-2	Benzene*					3.8E-14	3.5E-10		
108-88-3	Toluene						2.4E-60		
100-41-4	Ethylbenzene						3.0E-32		
1330-20-7	Xylene (mixed isomers)						3.0E-24		
1634-04-4	Methyl t-Butyl ether						4.5E-11		
0-00-0	TPH - Arom >C08-C10						3.4E-47		
0-00-0	TPH - Aliph >C12-C16						1.6E-101		
0-00-0	TPH - Aliph >C16-C21						2.3E-102		
0-00-0	TPH - Arom >C16-C21						4.1E-101		
0-00-0	TPH - Arom >C21-C35						2.7E-101		
Cumulative Values:		**0.0E+0**	**0.0E+0**	**0.0E+0**	**0.0E+0**	**3.8E-14**	**4.0E-10**	**0.0E+0**	**0.0E+0**

■ indicates risk level exceeding target risk

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

SURFACE SOILS (0 - 3.3 ft):
VAPOR INHALATION

Constituents of Concern	1) Source Medium	2) NAF Value (m^3/kg) Receptor				3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)			
	Soil Conc. (mg/kg)	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
		Residential	Construction Worker	None	None	Residential	Construction Worker	None	None
Benzene*	2.5E-3	1.8E+5				1.4E-8			
Toluene	2.5E-3	1.8E+5				1.4E-8			
Ethylbenzene	2.5E-3	1.8E+5				1.4E-8			
Xylene (mixed isomers)	4.0E-1	1.8E+5				2.2E-6			
Methyl t-Butyl ether	4.3E-1	1.8E+5				2.4E-6			
TPH - Arom >C08-C10	1.1E+2	2.0E+5				5.6E-4			
TPH - Aliph >C12-C16	1.0E-1	3.4E+5				3.0E-7			
TPH - Aliph >C16-C21	2.8E-1	1.2E+6				2.2E-7			
TPH - Arom >C16-C21	7.5E-2	3.7E+6				2.0E-8			
TPH - Arom >C21-C35	5.0E-2	4.0E+7				1.2E-9			

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA
Completed By: J. Douglas

Date Completed: 21-Jun-02
Job ID: DG20208H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SURFACE SOILS (0 - 3.3 ft):
VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)				5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)			
	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
	Residential	Construction Worker	None	None	Residential	Construction Worker	None	None
Benzene*	4.1E-1				5.7E-9			
Toluene	9.6E-1				1.3E-8			
Ethylbenzene	9.6E-1				1.3E-8			
Xylene (mixed isomers)	9.6E-1				2.1E-6			
Methyl t-Butyl ether	9.6E-1				2.3E-6			
TPH - Arom >C08-C10	9.6E-1				5.3E-4			
TPH - Aliph >C12-C16	9.6E-1				2.8E-7			
TPH - Aliph >C16-C21	9.6E-1				2.1E-7			
TPH - Arom >C16-C21	9.6E-1				1.9E-8			
TPH - Arom >C21-C35	9.6E-1				1.2E-9			

* = Chemical with user-specified data

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA
Completed By: J. Douglas

Date Completed: 21-Jun-02
Job ID: DG20208H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ **(CHECKED IF PATHWAY IS ACTIVE)**

SUBSURFACE SOILS (3.3 - 6.6 ft):

VAPOR INHALATION

Constituents of Concern	1) Source Medium	2) NAF Value (m^3/kg) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		
	Soil Conc. (mg/kg)	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene*	2.5E-3	9.0E+4			2.8E-8		
Toluene	2.5E-3	9.0E+4			2.8E-8		
Ethylbenzene	2.5E-3	9.0E+4			2.8E-8		
Xylene (mixed isomers)	4.0E-1	9.0E+4			4.4E-6		
Methyl t-Butyl ether	4.3E-1	9.0E+4			4.8E-6		
TPH - Arom >C08-C10	1.1E+2	9.0E+4			1.2E-3		
TPH - Aliph >C12-C16	1.0E-1	9.0E+4			1.1E-6		
TPH - Aliph >C16-C21	2.8E-1	9.0E+4			3.1E-6		
TPH - Arom >C16-C21	7.5E-2	9.0E+4			8.3E-7		
TPH - Arom >C21-C35	5.0E-2	9.0E+4			5.6E-7		

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA
Completed By: J. Douglas

Date Completed: 21-Jun-02
Job ID: DG20208H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

SUBSURFACE SOILS (3.3 - 6.6 ft):

VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene*	4.1E-1			1.1E-8		
Toluene	9.6E-1			2.7E-8		
Ethylbenzene	9.6E-1			2.7E-8		
Xylene (mixed isomers)	9.6E-1			4.3E-6		
Methyl t-Butyl ether	9.6E-1			4.6E-6		
TPH - Arom >C08-C10	9.6E-1			1.2E-3		
TPH - Aliph >C12-C16	9.6E-1			1.1E-6		
TPH - Aliph >C16-C21	9.6E-1			2.9E-6		
TPH - Arom >C16-C21	9.6E-1			8.0E-7		
TPH - Arom >C21-C35	9.6E-1			5.3E-7		

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA
Completed By: J. Douglas

Date Completed: 21-Jun-02
Job ID: DG20208H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: VAPOR INHALATION

Exposure Concentration

Constituents of Concern	1) Source Medium	2) NAF Value (m^3/L) Receptor			3) Exposure Medium Outdoor Air: POE Conc. (mg/m^3) (1) / (2)		
	Groundwater Conc. (mg/L)	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene*	1.0E-1	5.7E+3			1.8E-5		
Toluene	1.3E-2	5.2E+3			2.5E-6		
Ethylbenzene	1.8E-1	4.7E+3			3.8E-5		
Xylene (mixed isomers)	5.7E-2	5.5E+3			1.0E-5		
Methyl t-Butyl ether	1.4E-1	5.3E+4			2.6E-6		
TPH - Arom >C08-C10	1.3E+1	2.4E+3			5.4E-3		
TPH - Aliph >C12-C16	1.7E+0	2.2E+0			7.6E-1		
TPH - Aliph >C16-C21	4.6E+0	2.3E-1			2.0E+1		
TPH - Arom >C16-C21	1.3E+0	8.5E+4			1.5E-5		
TPH - Arom >C21-C35	8.4E-1	1.2E+6			6.9E-7		

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA
Completed By: J. Douglas

Date Completed: 21-Jun-02
Job ID: DG20208H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

GROUNDWATER: VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) Residential	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene*	4.1E-1			7.2E-6		
Toluene	9.6E-1			2.4E-6		
Ethylbenzene	9.6E-1			3.7E-5		
Xylene (mixed isomers)	9.6E-1			1.0E-5		
Methyl t-Butyl ether	9.6E-1			2.5E-6		
TPH - Arom >C08-C10	9.6E-1			5.2E-3		
TPH - Aliph >C12-C16	9.6E-1			7.3E-1		
TPH - Aliph >C16-C21	9.6E-1			1.9E+1		
TPH - Arom >C16-C21	9.6E-1			1.4E-5		
TPH - Arom >C21-C35	9.6E-1			6.6E-7		

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr)

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA
Completed By: J. Douglas

Date Completed: 21-Jun-02
Job ID: DG20208H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

TOTAL PATHWAY EXPOSURE (mg/m^3)

(Sum average exposure concentrations from soil and groundwater routes.)

Constituents of Concern	On-site (0 ft) Residential	On-site (0 ft) Construction Worker	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene*	7.3E-6			
Toluene	2.4E-6			
Ethylbenzene	3.7E-5			
Xylene (mixed isomers)	1.6E-5			
Methyl t-Butyl ether	9.4E-6			
TPH - Arom >C08-C10	6.9E-3			
TPH - Aliph >C12-C16	7.3E-1			
TPH - Aliph >C16-C21	1.9E+1			
TPH - Arom >C16-C21	1.5E-5			
TPH - Arom >C21-C35	1.2E-6			

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA
Completed By: J. Douglas

Date Completed: 21-Jun-02
Job ID: DG20208H.3C01

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ **(CHECKED IF PATHWAYS ARE ACTIVE)**

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m^3)				(3) Inhalation Unit Risk Factor (ug/m^3)^-1	(4) Individual COC Risk (2) x (3) x 1000			
		On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)		On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
		Residential	Construction Worker	None	None		Residential	Construction Worker	None	None
Benzene*	A	7.3E-6				8.3E-6	6.0E-8			
Toluene	D									
Ethylbenzene	D									
Xylene (mixed isomers)	D									
Methyl t-Butyl ether	-									
TPH - Arom >C08-C10	D									
TPH - Aliph >C12-C16	D									
TPH - Aliph >C16-C21	D									
TPH - Arom >C16-C21	D									
TPH - Arom >C21-C35	D									
Total Pathway Carcinogenic Risk =							**6.0E-8**			

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA

Completed By: J. Douglas
Date Completed: 21-Jun-02

Job ID: DG20208H.3C01

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS ■ **(CHECKED IF PATHWAYS ARE ACTIVE)**

TOXIC EFFECTS

Constituents of Concern	(5) Total Toxicant Exposure (mg/m^3)				(6) Inhalation Reference Conc. (mg/m^3)	(7) Individual COC Hazard Quotient (5) / (6)			
	On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)		On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
	Residential	Construction Worker	None	None		Residential	Construction Worker	None	None
Benzene*	1.7E-5				6.0E-3	2.8E-3			
Toluene	2.4E-6				4.0E-1	6.1E-6			
Ethylbenzene	3.7E-5				1.0E+0	3.7E-5			
Xylene (mixed isomers)	1.6E-5				7.0E+0	2.3E-6			
Methyl t-Butyl ether	9.4E-6				3.0E+0	3.1E-6			
TPH - Arom >C08-C10	6.9E-3				2.0E-1	3.5E-2			
TPH - Aliph >C12-C16	7.3E-1				1.0E+0	7.3E-1			
TPH - Aliph >C16-C21									
TPH - Arom >C16-C21									
TPH - Arom >C21-C35									

Total Pathway Hazard Index = **7.7E-1**

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA

Completed By: J. Douglas
Date Completed: 21-Jun-02

Job ID: DG20208H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

SOILS (0 - 6.6 ft): VAPOR INTRUSION INTO ON-SITE BUILDINGS

Constituents of Concern	1) Source Medium Soil Conc. (mg/kg)	2) NAF Value (m^3/kg) Receptor Residential	3) Exposure Medium Indoor Air POE Conc (mg/m^3) (1) / (2) Residential	4) Exposure Multiplier (EFxED)/(ATx365) (unitless) Residential	5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4) Residential
Benzene*	2.5E-3	3.3E+3	7.5E-7	4.1E-1	3.1E-7
Toluene	2.5E-3	6.8E+3	3.7E-7	9.6E-1	3.6E-7
Ethylbenzene	2.5E-3	1.6E+4	1.5E-7	9.6E-1	1.5E-7
Xylene (mixed isomers)	4.0E-1	1.3E+4	3.2E-5	9.6E-1	3.1E-5
Methyl t-Butyl ether	4.3E-1	8.6E+3	5.0E-5	9.6E-1	4.8E-5
TPH - Arom >C08-C10	1.1E+2	3.6E+4	3.1E-3	9.6E-1	3.0E-3
TPH - Aliph >C12-C16	1.0E-1	1.0E+5	9.6E-7	9.6E-1	9.2E-7
TPH - Aliph >C16-C21	2.8E-1	1.4E+6	2.0E-7	9.6E-1	1.9E-7
TPH - Arom >C16-C21	7.5E-2	1.3E+7	5.8E-9	9.6E-1	5.6E-9
TPH - Arom >C21-C35	5.0E-2	2.0E+9	2.5E-11	9.6E-1	2.4E-11

* = Chemical with user-specified data

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA
Completed By: J. Douglas

Date Completed: 21-Jun-02
Job ID: DG20208H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: VAPOR INTRUSION INTO ON-SITE BUILDINGS

Exposure Concentration

Constituents of Concern	1) Source Medium Groundwater Conc. (mg/L)	2) NAF Value (m^3/L) Receptor Residential	3) Exposure Medium Indoor Air: POE Conc. (mg/m^3) (1) / (2) Residential	4) Exposure Multiplier (EFxED)/(ATx365) (unitless) Residential	5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4) Residential
Benzene*	1.0E-1	5.6E+3	1.8E-5	4.1E-1	7.3E-6
Toluene	1.3E-2	5.1E+3	2.5E-6	9.6E-1	2.4E-6
Ethylbenzene	1.8E-1	4.7E+3	3.9E-5	9.6E-1	3.7E-5
Xylene (mixed isomers)	5.7E-2	5.4E+3	1.0E-5	9.6E-1	1.0E-5
Methyl t-Butyl ether	1.4E-1	6.0E+4	2.3E-6	9.6E-1	2.2E-6
TPH - Arom >C08-C10	1.3E+1	2.4E+3	5.5E-3	9.6E-1	5.3E-3
TPH - Aliph >C12-C16	1.7E+0	2.2E+0	7.7E-1	9.6E-1	7.4E-1
TPH - Aliph >C16-C21	4.6E+0	2.3E-1	2.0E+1	9.6E-1	1.9E+1
TPH - Arom >C16-C21	1.3E+0	8.6E+4	1.5E-5	9.6E-1	1.4E-5
TPH - Arom >C21-C35	8.4E-1	1.7E+6	5.0E-7	9.6E-1	4.8E-7

NOTE: AT = Averaging time (days) EF = Exposure frequency (days/yr) ED = Exposure duration (yr) NAF = Natural attenuation factor POE = Point of exposure

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA
Completed By: J. Douglas

Date Completed: 21-Jun-02
Job ID: DG20208H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

Constituents of Concern	TOTAL PATHWAY EXPOSURE (mg/m^3) *(Sum average exposure concentrations from soil and groundwater routes.)* Residential
Benzene*	7.6E-6
Toluene	2.8E-6
Ethylbenzene	3.7E-5
Xylene (mixed isomers)	4.1E-5
Methyl t-Butyl ether	5.0E-5
TPH - Arom >C08-C10	8.2E-3
TPH - Aliph >C12-C16	7.4E-1
TPH - Aliph >C16-C21	1.9E+1
TPH - Arom >C16-C21	1.4E-5
TPH - Arom >C21-C35	4.8E-7

Site Name: Former Chevron Service Station No. 2 Date Completed: 21-Jun-02
Site Location: 6006 International Blvd., Oakland, C Job ID: DG20208H.3C01
Completed By: J. Douglas

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ **(CHECKED IF PATHWAYS ARE ACTIVE)**

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m^3) Residential	(3) Inhalation Unit Risk Factor (µg/m^3)^-1	CARCINOGENIC RISK (4) Individual COC Risk (2) x (3) x 1000 Residential
Benzene*	A	7.6E-6	8.3E-6	6.3E-8
Toluene	D			
Ethylbenzene	D			
Xylene (mixed isomers)	D			
Methyl t-Butyl ether	-			
TPH - Arom >C08-C10	D			
TPH - Aliph >C12-C16	D			
TPH - Aliph >C16-C21	D			
TPH - Arom >C16-C21	D			
TPH - Arom >C21-C35	D			

Total Pathway Carcinogenic Risk = **6.3E-8**

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA
Completed By: J. Douglas

Date Completed: 21-Jun-02
Job ID: DG20208H.3C01

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

INDOOR AIR EXPOSURE PATHWAYS ■ **(CHECKED IF PATHWAYS ARE ACTIVE)**

Constituents of Concern	(5) Total Toxicant Exposure (mg/m^3) Residential	(6) Inhalation Reference Concentration (mg/m^3)	(7) Individual COC Hazard Quotient (5) / (6) Residential
	TOXIC EFFECTS		
Benzene*	1.8E-5	6.0E-3	3.0E-3
Toluene	2.8E-6	4.0E-1	6.9E-6
Ethylbenzene	3.7E-5	1.0E+0	3.7E-5
Xylene (mixed isomers)	4.1E-5	7.0E+0	5.8E-6
Methyl t-Butyl ether	5.0E-5	3.0E+0	1.7E-5
TPH - Arom >C08-C10	8.2E-3	2.0E-1	4.1E-2
TPH - Aliph >C12-C16	7.4E-1	1.0E+0	7.4E-1
TPH - Aliph >C16-C21			
TPH - Arom >C16-C21			
TPH - Arom >C21-C35			

Total Pathway Hazard Index = **7.8E-1**

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA
Completed By: J. Douglas

Date Completed: 21-Jun-02
Job ID: DG20208H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS ☐ (CHECKED IF PATHWAY IS ACTIVE)

SOILS : LEACHING TO GROUNDWATER INGESTION

Constituents of Concern	1) Source Medium: Soil Conc. (mg/kg)	2) NAF Value (L/kg) Receptor: On-site (0 ft) None	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	3) Exposure Medium Groundwater: POE Conc. (mg/L) (1)/(2): On-site (0 ft) None	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene*	2.5E-3						
Toluene	2.5E-3						
Ethylbenzene	2.5E-3						
Xylene (mixed isomers)	4.0E-1						
Methyl t-Butyl ether	4.3E-1						
TPH - Arom >C08-C10	1.1E+2						
TPH - Aliph >C12-C16	1.0E-1						
TPH - Aliph >C16-C21	2.8E-1						
TPH - Arom >C16-C21	7.5E-2						
TPH - Arom >C21-C35	5.0E-2						

* = Chemical with user-specified data

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA
Completed By: J. Douglas

Date Completed: 21-Jun-02
Job ID: DG20208H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

SOILS : LEACHING TO GROUNDWATER INGESTION (cont'd)

Constituents of Concern	4) Exposure Multiplier (IRxEFxED)/(BWxAT) (L/kg-day)			5) Average Daily Intake Rate (mg/kg/day) (3) x (4)		
	On-site (0 ft) None	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None	On-site (0 ft) None	Off-site 1 (0 ft) None	Off-site 2 (0 ft) None
Benzene*						
Toluene						
Ethylbenzene						
Xylene (mixed isomers)						
Methyl t-Butyl ether						
TPH - Arom >C08-C10						
TPH - Aliph >C12-C16						
TPH - Aliph >C16-C21						
TPH - Arom >C16-C21						
TPH - Arom >C21-C35						

* = Chemical with user-specified data

NOTE: AT = Averaging time (days) ED = Exposure duration (yr) IR = Ingestion rate (mg/day)
BW = Body weight (kg) EF = Exposure frequency (days/yr)

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA

Completed By: J. Douglas
Date Completed: 21-Jun-02

Job ID: DG20208H.3(

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS ■ (CHECKED IF PATHWAY IS ACTIVE)

GROUNDWATER: INGESTION

	1) Source Medium	2) NAF Value (unitless) Receptor			3) Exposure Medium Groundwater: POE Conc. (mg/L) (1)/(2)		
Constituents of Concern	Groundwater Conc. (mg/L)	On-site (0 ft) None	Off-site 1 (1700 ft) Commercial	Off-site 2 (0 ft) None	On-site (0 ft) None	Off-site 1 (1700 ft) Commercial	Off-site 2 (0 ft) None
Benzene*	1.0E-1		9.3E+8			1.1E-10	
Toluene	1.3E-2		2.7E+56			4.9E-59	
Ethylbenzene	1.8E-1		5.8E+29			3.1E-31	
Xylene (mixed isomers)	5.7E-2		9.3E+19			6.1E-22	
Methyl t-Butyl ether	1.4E-1		3.1E+9			4.6E-11	
TPH - Arom >C08-C10	1.3E+1		9.4E+46			1.4E-46	
TPH - Aliph >C12-C16	1.7E+0		1.0E+100			1.7E-100	
TPH - Aliph >C16-C21	4.6E+0		1.0E+100			4.6E-100	
TPH - Arom >C16-C21	1.3E+0		1.0E+100			1.3E-100	
TPH - Arom >C21-C35	8.4E-1		1.0E+100			8.4E-101	

NOTE: NAF = Natural attenuation factor POE = Point of exposure

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA
Completed By: J. Douglas

Date Completed: 21-Jun-02
Job ID: DG20208H.3C01

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

GROUNDWATER INGESTION (cont'd)

Constituents of Concern	4) Exposure Multiplier (IRxEFxED)/(BWxAT) (L/kg/day)			5) Average Daily Intake Rate (mg/kg/day) (3) x (4)		
	On-site (0 ft) None	Off-site 1 (1700 ft) Commercial	Off-site 2 (0 ft) None	On-site (0 ft) None	Off-site 1 (1700 ft) Commercial	Off-site 2 (0 ft) None
Benzene*		3.5E-3			3.8E-13	
Toluene		9.8E-3			4.8E-61	
Ethylbenzene		9.8E-3			3.0E-33	
Xylene (mixed isomers)		9.8E-3			6.0E-24	
Methyl t-Butyl ether		9.8E-3			4.5E-13	
TPH - Arom >C08-C10		9.8E-3			1.4E-48	
TPH - Aliph >C12-C16		9.8E-3			1.6E-102	
TPH - Aliph >C16-C21		9.8E-3			4.5E-102	
TPH - Arom >C16-C21		9.8E-3			1.2E-102	
TPH - Arom >C21-C35		9.8E-3			8.2E-103	

* = Chemical with user-specified data

NOTE: AT = Averaging time (days) ED = Exposure duration (yr) IR = Ingestion rate (mg/day)
BW = Body weight (kg) EF = Exposure frequency (days/yr)

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA

Completed By: J. Douglas
Date Completed: 21-Jun-02

Job ID: DG20208H.3

RBCA SITE ASSESSMENT

TIER 2 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

GROUNDWATER EXPOSURE PATHWAYS

MAXIMUM PATHWAY INTAKE (mg/kg/day)

(Maximum intake of active pathways soil leaching & groundwater routes.)

Constituents of Concern	On-site (0 ft) None	Off-site 1 Commercial	Off-site 2 None
Benzene*		3.8E-13	
Toluene		4.8E-61	
Ethylbenzene		3.0E-33	
Xylene (mixed isomers)		6.0E-24	
Methyl t-Butyl ether		4.5E-13	
TPH - Arom >C08-C10		1.4E-48	
TPH - Aliph >C12-C16		1.6E-102	
TPH - Aliph >C16-C21		4.5E-102	
TPH - Arom >C16-C21		1.2E-102	
TPH - Arom >C21-C35		8.2E-103	

* = Chemical with user-specified data

Site Name: Former Chevron Service Station No. 21-0208
3C Site Location: 6006 International Blvd., Oakland, CA
Completed By: J. Douglas

Date Completed: 21-Jun-02
Job ID: DG20208H.3C01

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

GROUNDWATER EXPOSURE PATHWAYS ■ **(CHECKED IF PATHWAYS ARE ACTIVE)**

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Maximum Carcinogenic Intake Rate (mg/kg/day)			(3) Oral Slope Factor (mg/kg-day)^-1	(4) Individual COC Risk (2) x (3)		
		On-site (0 ft) None	Off-site 1 Commercial	Off-site 2 None		On-site (0 ft) None	Off-site 1 Commercial	Off-site 2 None
Benzene*	A		3.8E-13		1.0E-1		3.8E-14	
Toluene	D							
Ethylbenzene	D							
Xylene (mixed isomers)	D							
Methyl t-Butyl ether	-							
TPH - Arom >C08-C10	D							
TPH - Aliph >C12-C16	D							
TPH - Aliph >C16-C21	D							
TPH - Arom >C16-C21	D							
TPH - Arom >C21-C35	D							
Total Pathway Carcinogenic Risk =							**3.8E-14**	

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA
Completed By: J. Douglas

Date Completed: 21-Jun-02
Job ID: DG20208H.3C01

RBCA SITE ASSESSMENT

TIER 2 PATHWAY RISK CALCULATION

GROUNDWATER EXPOSURE PATHWAYS ■ **(CHECKED IF PATHWAYS ARE ACTIVE)**

TOXIC EFFECTS

Constituents of Concern	(5) Maximum Toxicant Intake Rate (mg/kg/day)			(6) Oral Reference Dose (mg/kg/day)	(7) Individual COC Hazard Quotient (5) / (6)		
	On-site (0 ft) None	*Off-site 1* Commercial	*Off-site 2* None		On-site (0 ft) None	Off-site 1 Commercial	Off-site 2 None
Benzene*		1.1E-12		3.0E-3		3.5E-10	
Toluene		4.8E-61		2.0E-1		2.4E-60	
Ethylbenzene		3.0E-33		1.0E-1		3.0E-32	
Xylene (mixed isomers)		6.0E-24		2.0E+0		3.0E-24	
Methyl t-Butyl ether		4.5E-13		1.0E-2		4.5E-11	
TPH - Arom >C08-C10		1.4E-48		4.0E-2		3.4E-47	
TPH - Aliph >C12-C16		1.6E-102		1.0E-1		1.6E-101	
TPH - Aliph >C16-C21		4.5E-102		2.0E+0		2.3E-102	
TPH - Arom >C16-C21		1.2E-102		3.0E-2		4.1E-101	
TPH - Arom >C21-C35		8.2E-103		3.0E-2		2.7E-101	
Total Pathway Hazard Index =						**4.0E-10**	

Site Name: Former Chevron Service Station No. 21-0208
Site Location: 6006 International Blvd., Oakland, CA
Completed By: J. Douglas

Date Completed: 21-Jun-02
Job ID: DG20208H.3C01