Christopher M. Palmer, RG CEG HG, Consulting Hydrogeologist
1345 Kimberly Drive San Jose, CA 95118 ph 408/267-5238; fax 408/267-5238

August 22, 1997
File No. 152.00

Alameda County Health Care Services, Hazardous Materials Division
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94052

Final
Risk Assessment

Attn.: Ms. Madhulla Logan

Re: Addendum to Risk Assessment for Zima Center Corporation 2951 High Street, Oakland, CA (ASE Proj. No. 3011)

Dear Ms. Logan,

This addendum presents the results of the revisions to the Risk-Based Corrective Action (RBCA) for the above referenced site. As you know, a RBCA was prepared and presented to the Alameda County Health Care Services, Hazardous Materials Division (ACHCS) in a report dated May 19, 1997. The model revisions and simulations herein were discussed at your office on June 5, 1997, using soil and groundwater data collected by Aqua-Science Engineers, Inc. (ASE). This work is an addendum to the May 19, 1997 report and was discussed in our August 20, 1997 at your office.

Revisions to the Initial Model

The following changes or additions were requested by ACHCS: using the average of groundwater monitoring data and grab water samples for use in the model; using the average of the soil data in the model; adding a new scenario of a proposed building over existing well MW-5; the construction worker and proposed building scenarios were run for both 10-5 and 10-6 risk for dermal contact and inhalation. The following four scenarios were modeled;

Scenario 1.	Vapor entering the off-site residence neighboring the site.
Scenario 2.	Vapor entering the existing on-site commercial building.
Scenario 3.	Exposure to a construction worker from vapor, inhalation and dermal exposure in an excavation.
Scenario 4.	Vapor entering a proposed commercial building over MW-5.

Christopher M. Palmer, RG CEG HG, Consulting Hydrogeologist
1345 Kimberly Drive San Jose, CA 95118 ph 408/267-5238; fax 408/267-5238

The same Tier 2 RBCA computer model was used as in the previous submittal to ACHCS (model of Groundwater Services, Inc., 1995). This model uses the current ASTM E-1739 guidance for the RBCA calculations and predicts potential contaminant reduction for contaminant levels in each scenario. The contaminants modeled in each scenario were; Total Petroleum Hydrocarbons as Gasoline, Benzene, Toluene, Ethylbenzene, Xylene and Methyl-Tert-Butyl-Ether (MTBE).

Model Assumptions

The computer model calculates the potential risk and indicates cleanup for each scenario using the ASTM guidance as the guiding assumptions. The simulations were calculated for the output of Site Specific Threshold Levels (SSTLs) and contaminant reduction factors as indicated. Built-in model default assumptions were used either in the absence of on-site data or where they are reasonable given overall site conditions. In addition, the following assumptions were made for this set of model simulations (please refer to the model output for each scenario).

Scenario 1. The residence is 30 linear feet from the border of the site and groundwater would travel 30 feet to a point directly under the residence. Depth to groundwater is 20 feet, moves under a gradient of 0.014, and bioattenuation is factored into the transport of contaminants under the house using the Domenico one dimensional groundwater flow model embedded into the software. The contaminant concentrations are averages as previously stated. The vadose pathway of vapor is vertical through the vadose soil toward the structure. The foundation is assumed to have 5% cracks.

The soil chemical data are from ASE reports, specifically from Borings BH-A, BH-B, BH-C, BH-D, BH-E and MW-5. Groundwater chemical data are taken from monitoring wells MW-2, MW-4 and MW-5 and reconnaissance groundwater samples from Borings BH-A through BH-E. The soil data is averaged and the groundwater monitoring wells data are averaged from quarterly sampling results; the reconnaissance sample values are averaged.

Scenario 2. The commercial building is directly over the contaminated area. The groundwater is 20 feet deep, bioattenuation is factored into the model. The vadose pathway of vapor is vertical toward the structure. The foundation is assumed to have 5% cracks. If vapors entered the building they are assumed to disperse in the building according to the model defaults.

The soil chemical concentration data are taken from ASE reports, specifically from Borings BH-A, BH-B, BH-C, BH-D, BH-E and MW-1, MW-2, MW-3, MW-4, MW-5 and MW-6. Groundwater chemical data are taken from monitoring wells MW-1 through MW-6 and are averaged from quarterly sampling results.

Christopher M. Palmer, RG CEG HG, Consulting Hydrogeologist
1345 Kimberly Drive San Jose, CA 95118 ph 408/267-5238; fax 408/267-5238

Scenario 3. The construction worker is directly over the contaminated area and dermal contact and inhalation are selected in the model. The worker is placed in the middle of the contaminated area (hence direct exposure) by the model (selecting zero feet of vapor movement). Vapor transport is assumed to be vertical toward the surface and worker.

The soil chemical concentration data are taken from ASE reports, specifically from Borings BH-A at 6-feet and MW-5 at 5-feet. Groundwater chemical data are taken from monitoring wells MW-1, MW-2, MW-3, MW-4 and MW-5 using the highest dissolved concentrations observed to date. The soil data is averaged and the groundwater data are averaged from quarterly sampling results.

Scenario 4. The proposed commercial building is located directly above monitoring well MW-5, and uses the average of soil data. Groundwater is 20 feet deep, bioattenuation is factored into the model, and vapor movement is again vertical. The foundation is assumed to have 5% cracks. If vapors entered the building they are assumed to disperse in the building according to the model defaults.

The soil chemical concentration data are taken from ASE reports, specifically from Borings BH-A, BH-B, BH-C, BH-D, BH-E and MW-5. Groundwater chemical data are taken from monitoring wells MW-2, MW-4 and MW-5 and reconnaissance groundwater samples from Borings BH-A through BH-E. The soil data is averaged, and the groundwater monitoring wells data are averaged from quarterly sampling results; the reconnaissance sample values are averaged.

The bioattenuation factors used the following for contaminant half-lives assumptions; Benzene-720 days; Ethylbenzene-228 days; Toluene- 28 days; Xylene 360 days. A half life was not listed for MTBE in the model; MTBE is assumed to biodegrade more slowly than petroleum contaminants. The model default for capillary fringe thickness is on the order of inches which is reasonable for this site. The vadose soil thickness is assumed to be about 19.5 feet based upon site observations. When the Dominico transport model is used, it assumes one-dimensional transport directly to the receptor, using bioattenuation and contaminant decay as noted above.

Model Results

Scenario 1, off-site residence. The results show that the calculations were so low that an SSTL could not be calculated for soil or groundwater, and the air risk pathway was less than 10-6. In our opinion, this is due to biodegradation of dissolved contaminants and the relatively low concentrations present in clayey soils. This would tend to fit the observed hydrogeologic conditions since the groundwater transport would be the pathway of most concern to get contaminants under the residence. Since groundwater flow mapping to date shows a southerly groundwater flow away from the residence, there is relatively good agreement with the model and observed conditions, and vapor intrusion to the residence should not occur.

Christopher M. Palmer, RG CEG HG, Consulting Hydrogeologist
1345 Kimberly Drive San Jose, CA 95118 ph 408/267-5238; fax 408/267-5238

Scenario 2, commercial building on-site. The results show that SSTLs were not exceeded for soil, however they were exceeded in groundwater for Benzene. The risk pathway for air was calculated at less than 10-6. The SSTL was exceeded for Benzene in groundwater and this indicates that some groundwater cleanup is needed to decrease the Benzene concentration.

Scenario 3, construction worker. The results show that the SSTLs would not be exceeded for either soil or groundwater, and the air risk pathway was 9.0 x 10-7. This number is so low that the 10-5 risk level would not be exceeded. Thus, a the worker should not be exposed to contaminant vapors in a shallow excavation. Since soil concentrations were relatively low with the exception of the 5-foot sample at MW-5, the low air risk agrees with the observed data in our opinion.

Scenario 4, proposed building over MW-5. The results show that at both the 10-5 risk and 10-6 risk levels, some contaminant reduction to meet SSTLs is indicated in groundwater. An earlier draft simulation indicated that some vapor could enter the proposed building since one soil sample in MW-5 at 5 feet contained elevated concentrations of contaminants. However, a recheck of the data entry revealed a data entry error. A rerun of the model was done and the vapor calculation did not exceed an SSTL according to the model. Consequently, soil vapor would not exceed SSTLs at either 10-5 or 10-6 risk on the basis of the concentrations used (see above and attached output).

Conclusions

On the basis of RBCA computer model simulations using ASE subsurface data, there does not appear to be a threat to the off-site residence, existing or proposed buildings or construction workers from vapors arising from the on-site groundwater plume at this time. The model results show that some groundwater cleanup is indicated on-site since calculations exceeded SSTLs for the site in the commercial building scenarios. While some soil cleanup was potentially indicated in initial draft Scenario 4 results, this was due to a data entry error. A rerun of the model with corrected data shows that vapor SSTLs would not be exceeded under the proposed building.

In my opinion, the results show that vapor entry should not occur at levels above either the 10-5 or 10-6 risk level for a proposed building over MW-5. Since the groundwater exceeds Benzene SSTLs in some simulations, groundwater cleanup to lower SSTLs is indicated.

ASE has initiated a dissolved oxygen delivery to the groundwater to assist in degrading the dissolved contaminants through enhanced biodegradation. This approach should decrease the groundwater concentrations over time and would remove potential sources of vapor. ASE has begun groundwater cleanup and will report to ACHCS on the progress of the oxygen enhancement of contaminant biodegradation.

Christopher M. Palmer, RG CEG HG, Consulting Hydrogeologist
1345 Kimberly Drive San Jose, CA 95118 ph 408/267-5238; fax 408/267-5238

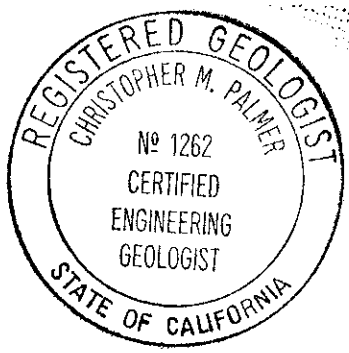
Limitations

This report has been prepared for the specifically for the 2951 High Street, Oakland, CA site and was done according to the State and local agency suggested guidance documents for these investigations. The interpretations, conclusions and recommendations made herein are based on the data collected on-site and should be reviewed in the context of the whole report and other consulting supporting documents. Christopher M. Palmer, Consulting Hydrogeologist is not responsible for errors in laboratory analysis and reporting, or information gathered by other consultants. The computer model results herein supersede and modify previous submittals.

If you have any questions, please call.

Sincerely,

Christopher M. Palmer, CEG 1262
Principal



Attachments: Model out put results for Scenarios 1 through 4.

References

Aqua Science Engineers, Inc. report dated March 17, 1997 entitled, "Remedial Action Plan for Remediation of Hydrocarbon Impacted Groundwater at Zima Center Corporation 2951 High Street, Oakland, CA (Draft)," 9 pages with attachments.

Aqua Science Engineers, Inc. report dated January 23, 1997 entitled, "Report of Soil and Groundwater Assessment ASE Job No. 3011 at Zima Center Corporation 2951 High Street Oakland, CA,"11 pages with attachments.

Groundwater Services©, Inc., 1995 Tier 2 RBCA for Risk-Based Corrective Action: computer models for soil, groundwater and vapor with accompanying texts.

RBCA TIER 1/TIER 2 EVALUATION

Output Table 1

Site Name: Zima Center Corp. (Scenario 1 Residence) Job Number: 3011
Site Location: 2951 High Street, Oakland, CA Date Completed: 7/25/97
Completed By: Chris Palmer

Software: GSI RBCA Spreadsheet
Version: v 1.0

DEFAULT PARAMETERS

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

Exposure Parameter	Definition (Units)	Residential Adult	Residential (1-6yrs)	Residential (1-16 yrs)	Commercial/Industrial Chronic	Commercial/Industrial Constrctn
ATc	Averaging time for carcinogens (yr)	70				
ATn	Averaging time for non-carcinogens (yr)	30	6	16		
BW	Body Weight (kg)	70	15	35		
ED	Exposure Duration (yr)	30	6	16		
EF	Exposure Frequency (days/yr)	350				
EF.Derm	Exposure Frequency for dermal exposure	350				
IRgw	Ingestion Rate of Water (l/day)					
IRs	Ingestion Rate of Soil (mg/day)					
IRadj	Adjusted soil ing. rate (mg-yr/kg-d)					
IRa.in	Inhalation rate indoor (m^3/day)	15			#DIV/0!	
IRa.out	Inhalation rate outdoor (m^3/day)	20				
SA	Skin surface area (dermal) (cm^2)	5.8E+03		***2.0E+03***		
SAadj	Adjusted dermal area (cm^2-yr/kg)	2.1E+03			#DIV/0!	
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				

Surface Parameters	Definition (Units)	Residential	Commercial/Industrial Chronic	Commercial/Industrial Construction
t	Exposure duration (yr)	30		
A	Contaminated soil area (cm^2)	2.2E+06		
W	Length of affected soil parallel to wind (cm)	***9.1E+02***		
W.gw	Length of affected soil parallel to groundwater (cr	***9.1E+02***		
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)	***1.3E+03***
Ugw.tr	Groundwater Transport velocity (cm/yr)	***5.0E+03***
Ks	Saturated Hydraulic Conductivity(cm/s)	1.0E-03
grad	Groundwater Gradient (cm/cm)	4.0E-02
Sw	Width of groundwater source zone (cm)	1.8E+03
Sd	Depth of groundwater source zone (cm)	3.0E+02
BC	Biodegradation Capacity (mg/L)	
BIO?	Is Bioattenuation Considered	TRUE
phi.eff	Effective Porosity in Water-Bearing Unit	2.5E-01
foc.sat	Fraction organic carbon in water-bearing unit	1.0E-03

Soil	Definition (Units)	Value	capillary	vadose	foundation
hc	Capillary zone thickness (cm)	5.0E+00			
hv	Vadose zone thickness (cm)	***6.0E+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)	***6.0E+02***			
Ls	Depth to top of affected soil (cm)	***1.5E+02***			
Lsubs	Thickness of affected subsurface soils (cm)	***4.6E+02***			
pH	Soil/groundwater pH	6.5			
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	
ER	Building air exchange rate (s^-1)	1.4E-04	
Lcrk	Foundation crack thickness (cm)	1.5E+01	
eta	Foundation crack fraction	***0.005***	

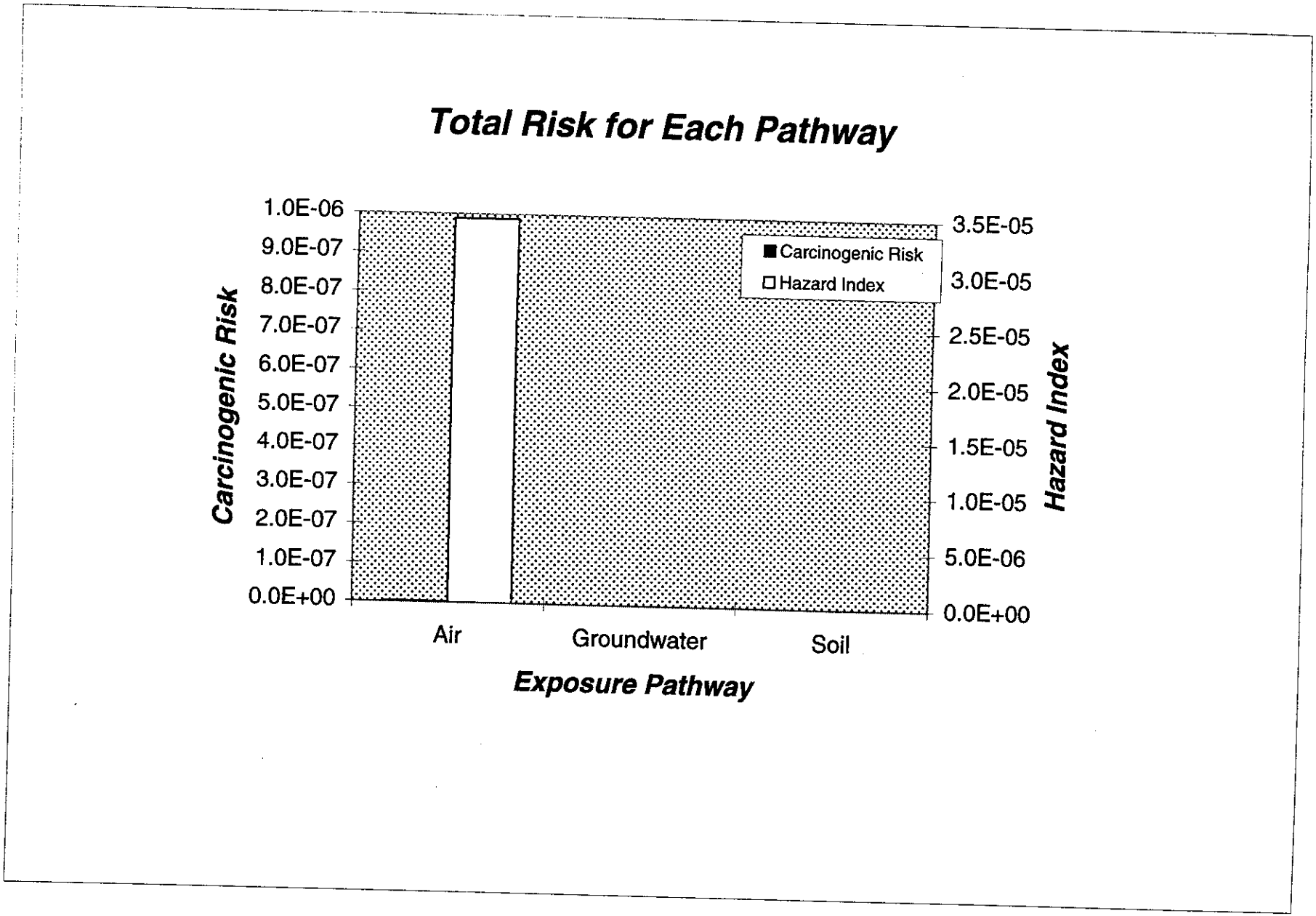
Matrix of Exposed Persons to Complete Exposure Pathways		Residential	Commercial/Industrial Chronic	Commercial/Industrial Constrctn
Groundwater Pathways:				
GW.i	Groundwater Ingestion	TRUE	FALSE	
GW.v	Volatilization to Outdoor Air	FALSE	FALSE	
GW.b	Vapor Intrusion to Buildings	TRUE	FALSE	
Soil Pathways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

Matrix of Receptor Distance and Location on- or off-site		Residential Distance	Residential On-Site	Commercial/Industrial Distance	Commercial/Industrial On-Site
GW	Groundwater receptor (cm)	9.1E+02	FALSE	9.1E+02	FALSE
S	Inhalation receptor (cm)	9.1E+02	FALSE	9.1E+02	FALSE

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

Dispersive Transport Parameters	Definition (Units)	Residential	Commercial
Groundwater			
ax	Longitudinal dispersion coefficient (cm)	9.1E+01	
ay	Transverse dispersion coefficient (cm)	3.0E+01	
az	Vertical dispersion coefficient (cm)	4.6E+00	
Vapor			
dcy	Transverse dispersion coefficient (cm)	1.1E+02	
dcz	Vertical dispersion coefficient (cm)	7.6E+01	

Scenario 1. Off-site Residence



Scenario 1. Off-site Residence

RBCA SITE ASSESSMENT

Site Name: Zima Center Corp. (Scenario 1 offsite res)
Site Location: 2951 High Street, Oakland, CA

Completed By: Chris Palmer
Date Completed: 7/25/1997

Tier 2 Worksheet 9.2

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

CONSTITUENTS OF CONCERN		Representative Concentration	SSTL Results For Complete Exposure Pathways ("x" if Complete)									
			X Soil Leaching to Groundwater			X Soil Volatilization to Indoor Air		X Soil Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/kg)	Residential: 30 feet	Commercial: (on-site)	Regulatory(MCL): 30 feet	Residential: (on-site)	Commercial: (on-site)	Residential: 30 feet	Commercial: (on-site)	(mg/kg)	■ If yes	Only if "yes" left
71-43-2	Benzene	2.6E-2	#VALUE!	NA	NA	1.3E-2	NA	1.8E+1	NA	#VALUE!	✂ ✂	#VALUE!
100-41-4	Ethylbenzene	1.9E-2	#VALUE!	NA	NA	6.9E+1	NA	>Res	NA	#VALUE!	✂ ✂	#VALUE!
#######	Methyl t-Butyl Ether	9.7E-2	#VALUE!	NA	NA	4.8E+2	NA	>Res	NA	#VALUE!	✂ ✂	#VALUE!
108-88-3	Toluene	1.6E-2	#VALUE!	NA	NA	4.2E+1	NA	>Res	NA	#VALUE!	✂ ✂	#VALUE!
#######	Xylene (mixed isomers)	2.8E-2	#VALUE!	NA	NA	>Res	NA	>Res	NA	#VALUE!	✂ ✂	#VALUE!

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: G-385-FVX-826

Data - Average of Soil results
BH-A, B, C, D, E; MW-2, 4, 5.

Scenario 1. Off-site Residence

RBCA SITE ASSESSMENT

Site Name: Zima Center Corp. (Scenario 1 offsite res)
Site Location: 2951 High Street, Oakland, CA

Completed By: Chris Palmer
Date Completed: 7/25/1997

Tier 2 Worksheet 9.3

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

CONSTITUENTS OF CONCERN		Representative Concentration	SSTL Results For Complete Exposure Pathways ("x" If Complete)									
			X Groundwater Ingestion			X Groundwater Volatilization to Indoor Air		Groundwater Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/L)	Residential: 30 feet	Commercial: (on-site)	Regulatory(MCL): 30 feet	Residential: (on-site)	Commercial: (on-site)	Residential (on-site)	Commercial: (on-site)	(mg/L	"■" If yes	Only if "yes" left
71-43-2	Benzene	6.7E-1	#VALUE!	NA	NA	3.4E-2	NA	NA	NA	#VALUE!	✂✂✂	#VALUE!
100-41-4	Ethylbenzene	2.0E-1	#VALUE!	NA	NA	1.1E+2	NA	NA	NA	#VALUE!	✂✂✂	#VALUE!
1634-04-4	Methyl t-Butyl Ether	9.5E+0	#VALUE!	NA	NA	2.6E+3	NA	NA	NA	#VALUE!	✂✂✂	#VALUE!
108-88-3	Toluene	3.1E-1	#VALUE!	NA	NA	4.6E+1	NA	NA	NA	#VALUE!	✂✂✂	#VALUE!
1330-20-7	Xylene (mixed isomers)	5.4E-1	#VALUE!	NA	NA	>Sol	NA	NA	NA	#VALUE!	✂✂✂	#VALUE!

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: G-385-FVX-826

Data - Average of groundwater quarterly results
Wells MW-1, 2, 3, 4, 5, 6; Reconnaissance
Boring groundwater results BH-A, B, C, D, E.

Scenario 1. Off-site Residence

Site Name: Zima Center Corp. (Scenario 1 Job Identification: 3011
Site Location: 2951 High Street, Oakland, Date Completed: 7/25/1997

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	Surface Soil	Subsurface Soil	Relevant SSTL Groundwater (mg/L)	Surface Soil (mg/kg)	Subsurface Soil (mg/kg)
71-43-2	Benzene	6.7E-1	0.0E+0	2.6E-2	n	o	o	2.0E-1	> 0.0E+0	> 2.6E+0
100-41-4	Ethylbenzene	2.0E-1	0.0E+0	1.9E-2	n	o	o	1.8E-1	> 0.0E+0	> 1.9E+0
1634-04-4	Methyl t-Butyl Ether	9.5E+0	0.0E+0	9.7E-2	n	o	o	8.4E+0	< 0.0E+0	> 9.7E+0
108-88-3	Toluene	3.1E-1	0.0E+0	1.6E-2	n	o	o	2.7E-1	> 0.0E+0	> 1.6E+0
1330-20-7	Xylene (mixed isomers)	5.4E-1	0.0E+0	2.8E-2	n	o	o	4.7E-1	> 0.0E+0	> 2.8E+0

Completed By: Chris Palmer

Cumulative Target Risk: 0.0E+0
Target Hazard Index: 0.0E+0

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: G-385-FVX-

Scenario 1. Off-Site Residence

RBCA TIER 1/TIER 2 EVALUATION

Output Table 1

Site Name: Zima Center Corp. (Zima 2) Job Identification: 3011
Site Location: 2951 High St., Oakland, CA Date Completed: 3/10/97
Completed By: Chris Palmer

Software: GSI RBCA Spreadsheet
Version: v 1.0

DEFAULT PARAMETERS

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

Exposure Parameter	Definition (Units)	Residential Adult	Residential (1-6yrs)	Residential (1-16 yrs)	Commercial/Industrial Chronic	Commercial/Industrial Constrctn
ATc	Averaging time for carcinogens (yr)	70			25	1
ATn	Averaging time for non-carcinogens (yr)				70	
BW	Body Weight (kg)				25	1
ED	Exposure Duration (yr)				250	180
EF	Exposure Frequency (days/yr)				250	
EF.Derm	Exposure Frequency for dermal exposure				1	
IRgw	Ingestion Rate of Water (l/day)				50	100
IRs	Ingestion Rate of Soil (mg/day)				#DIV/0!	
IRadj	Adjusted soil ing. rate (mg*yr/kg*d)	#DIV/0!			20	
IRa.in	Inhalation rate indoor (m^3/day)				20	10
IRa.out	Inhalation rate outdoor (m^3/day)				5.8E+03	5.8E+03
SA	Skin surface area (dermal) (cm^2)				#DIV/0!	
SAadj	Adjusted dermal area (cm^2*yr/kg)	#DIV/0!				
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	Commercial/Industrial Constrctn
Groundwater Pathways:				
GW.i	Groundwater Ingestion	FALSE	FALSE	
GW.v	Volatilization to Outdoor Air	FALSE	FALSE	
GW.b	Vapor Intrusion to Buildings	FALSE	TRUE	
Soil Pathways				
S.v	Volatiles from Subsurface Soils	FALSE	FALSE	
SS.v	Volatiles and Particulate Inhalation	FALSE	FALSE	FALSE
SS.d	Direct Ingestion and Dermal Contact	FALSE	TRUE	FALSE
S.l	Leaching to Groundwater from all Soils	FALSE	FALSE	
S.b	Intrusion to Buildings - Subsurface Soils	FALSE	TRUE	

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

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

Surface Parameters	Definition (Units)	Residential	Commercial/Industrial Chronic	Commercial/Industrial Construction
t	Exposure duration (yr)		25	1
A	Contaminated soil area (cm^2)	2.2E+06		1.0E+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 (cr	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)	***4.7E+05***
Ugw.tr	Groundwater Transport velocity (cm/yr)	***1.2E+06***
Ks	Saturated Hydraulic Conductivity(cm/s)	1.0E-01
grad	Groundwater Gradient (cm/cm)	1.5E-01
Sw	Width of groundwater source zone (cm)	
Sd	Depth of groundwater source zone (cm)	
BC	Biodegradation Capacity (mg/L)	
BIO?	Is Bioattenuation Considered	TRUE
phi.eff	Effective Porosity in Water-Bearing Unit	3.8E-01
foc.sat	Fraction organic carbon in water-bearing unit	1.0E-03

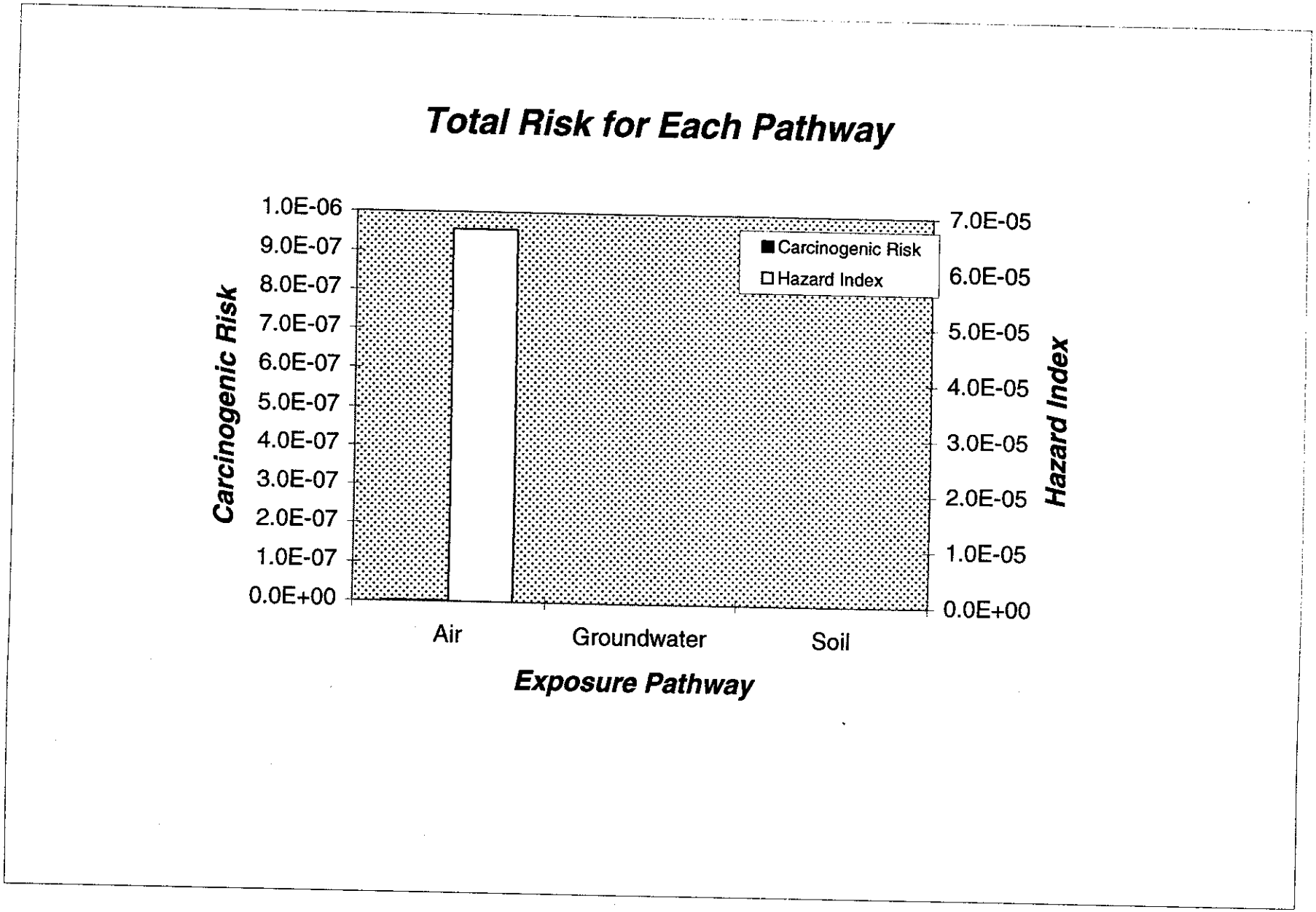
Soil	Definition (Units)	Value
hc	Capillary zone thickness (cm)	***9.8E+00***
hv	Vadose zone thickness (cm)	***2.3E+02***
rho	Soil density (g/cm^3)	1.7
foc	Fraction of organic carbon in vadose zone	0.01
phi	Soil porosity in vadose zone	0.38
Lgw	Depth to groundwater (cm)	***2.4E+02***
Ls	Depth to top of affected soil (cm)	***1.5E+02***
Lsubs	Thickness of affected subsurface soils (cm)	***3.0E+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)		3.0E+02
ER	Building air exchange rate (s^-1)		2.3E-04
Lcrk	Foundation crack thickness (cm)	1.5E+01	
eta	Foundation crack fraction	***0.005***	

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)		

Scenario 2. Commercial Building On-site



Scenario 2. Commercial Building On-site

RBCA SITE ASSESSMENT

Site Name: Zima Center Corp. Scen 2 comm bldg
Site Location: 2951 High St., Oakland, CA

Completed By: Chris Palmer
Date Completed: 7/25/1997

Tier 2 Worksheet 9.2

SUBSURFACE SOIL SSTL VALUES (> 3 FT BGS)

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

❑ MCL exposure limit?
❑ PEL exposure limit?

Calculation Option: 1

CONSTITUENTS OF CONCERN		Representative Concentration	SSTL Results For Complete Exposure Pathways ("x" if Complete)									
			Soil Leaching to Groundwater			X 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	2.6E-2	NA	NA	NA	NA	5.2E-1	NA	2.3E+2	5.2E-1	❑	<1
100-41-4	Ethylbenzene	1.9E-2	NA	NA	NA	NA	>Res	NA	>Res	>Res	❑	<1
#######	Methyl t-Butyl Ether	9.7E-2	NA	NA	NA	NA	1.2E+3	NA	>Res	1.2E+3	❑	<1
108-88-3	Toluene	2.1E-2	NA	NA	NA	NA	1.1E+2	NA	>Res	1.1E+2	❑	<1
#######	Xylene (mixed isomers)	2.8E-2	NA	NA	NA	NA	>Res	NA	>Res	>Res	❑	<1

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: G-385-FVX-826

Data: Soil data of BH-A, B, C, D, E and MW-2, 4, 5 averaged.

Scenario 2. Commercial Building On-site

RBCA SITE ASSESSMENT

Tier 2 Worksheet 9.3

Site Name: Zima Center Corp. Scen 2 comm bldg
Site Location: 2951 High St., Oakland, CA

Completed By: Chris Palmer
Date Completed: 7/25/1997

GROUNDWATER SSTL VALUES

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

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 1

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

CONSTITUENTS OF CONCERN		Representative Concentration		Groundwater Ingestion			X 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	1.2E+1	NA	NA	NA	NA	1.4E+0	NA	3.2E+2	1.4E+0	■	9.0E+00
100-41-4	Ethylbenzene	8.9E-1	NA	NA	NA	NA	>Sol	NA	>Sol	>Sol	☐	<1
1634-04-4	Methyl t-Butyl Ether	3.8E+1	NA	NA	NA	NA	6.7E+3	NA	>Sol	6.7E+3	☐	<1
108-88-3	Toluene	5.8E+0	NA	NA	NA	NA	1.6E+2	NA	>Sol	1.6E+2	☐	<1
1330-20-7	Xylene (mixed isomers)	5.8E+0	NA	NA	NA	NA	>Sol	NA	>Sol	>Sol	☐	<1

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: G-385-FVX-826

Data: Average of quarterly monitoring wells MW-1, 2, 3, 4, 5, 6

Scenario 2. Commercial Building On-site

RBCA TIER 1/TIER 2 EVALUATION

Output Table 1

Site Name: Zima Center Corp. Scen 3 conJobIdentification: 3011
Site Location: 2951 High Street, Oakland, CADate Completed: 7/25/97
Completed By: Chris Palmer

Software: GSI RBCA Spreadsheet
Version: v 1.0

DEFAULT PARAMETERS

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

Exposure Parameter	Definition (Units)	Residential Adult	Residential (1-6yrs)	Residential (1-16 yrs)	Commercial/Industrial Chronic	Commercial/Industrial Constrctn
ATc	Averaging time for carcinogens (yr)	70			25	1
ATn	Averaging time for non-carcinogens (yr)				70	
BW	Body Weight (kg)				25	1
ED	Exposure Duration (yr)				250	180
EF	Exposure Frequency (days/yr)				250	
EF.Derm	Exposure Frequency for dermal exposure				1	
IRgw	Ingestion Rate of Water (l/day)				50	100
IRs	Ingestion Rate of Soil (mg/day)	#DIV/0!			#DIV/0!	
IRadj	Adjusted soil ing. rate (mg*yr/kg*d)				20	
IRa.in	Inhalation rate indoor (m^3/day)				20	10
IRa.out	Inhalation rate outdoor (m^3/day)				5.8E+03	5.8E+03
SA	Skin surface area (dermal) (cm^2)	#DIV/0!			#DIV/0!	
SAadj	Adjusted dermal area (cm^2*yr/kg)	1				
M	Soil to Skin adherence factor	FALSE			FALSE	
AAFs	Age adjustment on soil ingestion	FALSE			***TRUE***	
AAFd	Age adjustment on skin surface area	TRUE				
tox	Use EPA tox data for air (or PEL based)	FALSE				
gwMCL?	Use MCL as exposure limit in groundwater?					

Matrix of Exposed Persons to Complete Exposure Pathways		Residential	Commercial/Industrial Chronic	Commercial/Industrial 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 Distance	Residential On-Site	Commercial/Industrial Distance	Commercial/Industrial On-Site
GW	Groundwater receptor (cm)		TRUE		TRUE
S	Inhalation receptor (cm)		TRUE		TRUE

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

Surface Parameters	Definition (Units)	Residential	Commercial/Industrial Chronic	Commercial/Industrial Construction
t	Exposure duration (yr)		25	1
A	Contaminated soil area (cm^2)	2.2E+06		1.0E+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 (cr	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)	
Ugw.tr	Groundwater Transport velocity (cm/yr)	
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

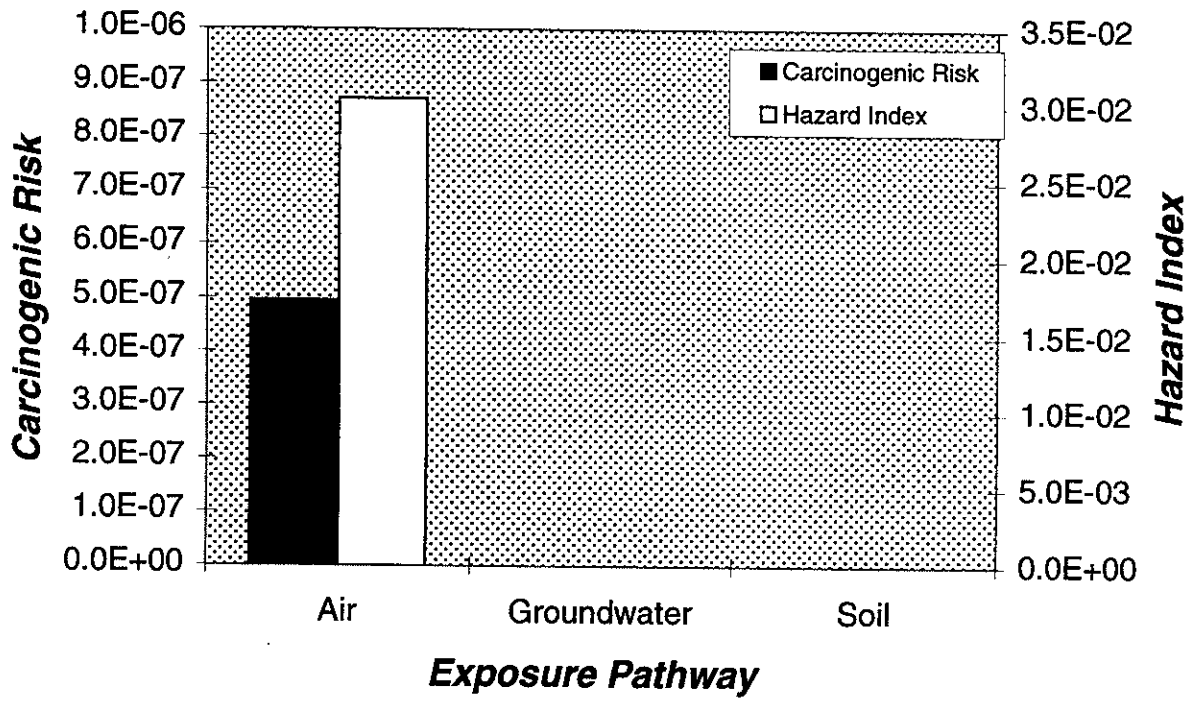
Soil	Definition (Units)	Value
hc	Capillary zone thickness (cm)	5.0E+00
hv	Vadose zone thickness (cm)	***6.0E+02***
rho	Soil density (g/cm^3)	1.7
foc	Fraction of organic carbon in vadose zone	0.01
phi	Soil porosity in vadose zone	0.38
Lgw	Depth to groundwater (cm)	***6.0E+02***
Ls	Depth to top of affected 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)		

Scenario 3. Construction Worker On-site



Scenario 3. Construction Worker On-Site

RBCA SITE ASSESSMENT

Tier 2 Worksheet 9.2

Site Name: Zima Center Corp. Scen 3 con worker
Site Location: 2951 High Street, Oakland, CA

Completed By: Chris Palmer
Date Completed: 7/25/1997

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: 1

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	1.7E+1	NA	NA	NA	NA	NA	NA	3.4E+1	3.4E+1	❑	<1
100-41-4	Ethylbenzene	3.9E+1	NA	NA	NA	NA	NA	NA	>Res	>Res	❑	<1
#######	Methyl t-Butyl Ether	7.6E+0	NA	NA	NA	NA	NA	NA	>Res	>Res	❑	<1
108-88-3	Toluene	6.9E+1	NA	NA	NA	NA	NA	NA	>Res	>Res	❑	<1
#######	Xylene (mixed isomers)	1.7E+2	NA	NA	NA	NA	NA	NA	>Res	>Res	❑	<1

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: G-385-FVX-826

Data: Average of soil samples
MW-5 @ 5'
BH-A @ 5'

Scenario 3. Construction worker on-site

RBCA SITE ASSESSMENT — Tier 2 Worksheet 9.3

Site Name: Zima Center Corp. Scen 3 con worker
Site Location: 2951 High Street, Oakland, CA

Completed By: Chris Palmer
Date Completed: 7/25/1997

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: 1

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	1.2E+1	NA	NA	NA	NA	NA	NA	2.1E+1	2.1E+1	☐	<1
100-41-4	Ethylbenzene	8.9E-1	NA	NA	NA	NA	NA	NA	>Sol	>Sol	☐	<1
1634-04-4	Methyl t-Butyl Ether	3.8E+1	NA	NA	NA	NA	NA	NA	>Sol	>Sol	☐	<1
108-88-3	Toluene	5.8E+0	NA	NA	NA	NA	NA	NA	>Sol	>Sol	☐	<1
1330-20-7	Xylene (mixed isomers)	5.8E+0	NA	NA	NA	NA	NA	NA	>Sol	>Sol	☐	<1

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: G-385-FVX-826

Data: Average of quarterly sampling results
wells MW-1, 2, 3, 4, 5

Scenario 3. Construction Worker on-site

RBCA TIER 1/TIER 2 EVALUATION

Output Table 1

Site Name: Zima Center Corp. Scen 4 con[illegible]ation: 3011
Site Location: 2951 High St., Oakland, CA Date Completed: 7/25/97
Completed By: Chris Palmer

Software: GSI RBCA Spreadsheet
Version: v 1.0

DEFAULT PARAMETERS

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

Exposure Parameter	Definition (Units)	Residential Adult	Residential (1-6yrs)	Residential (1-16 yrs)	Commercial/Industrial Chronic	Commercial/Industrial Constrctn
ATc	Averaging time for carcinogens (yr)	70			25	1
ATn	Averaging time for non-carcinogens (yr)				70	
BW	Body Weight (kg)				25	1
ED	Exposure Duration (yr)				250	180
EF	Exposure Frequency (days/yr)				250	
EF.Derm	Exposure Frequency for dermal exposure				1	
IRgw	Ingestion Rate of Water (l/day)				50	100
IRs	Ingestion Rate of Soil (mg/day)	#DIV/0!			#DIV/0!	
IRadj	Adjusted soil ing. rate (mg-yr/kg-d)				20	
IRa.in	Inhalation rate indoor (m^3/day)				20	10
IRa.out	Inhalation rate outdoor (m^3/day)				5.8E+03	5.8E+03
SA	Skin surface area (dermal) (cm^2)	#DIV/0!			#DIV/0!	
SAadj	Adjusted dermal area (cm^2-yr/kg)	1				
M	Soil to Skin adherence factor	FALSE			FALSE	
AAFs	Age adjustment on soil ingestion	FALSE			FALSE	
AAFd	Age adjustment on skin surface area	TRUE				
tox	Use EPA tox data for air (or PEL based)	FALSE				
gwMCL?	Use MCL as exposure limit in groundwater?					

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

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

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

Surface Parameters	Definition (Units)	Residential	Commercial/Industrial Chronic	Commercial/Industrial Construction
t	Exposure duration (yr)		25	1
A	Contaminated soil area (cm^2)	2.2E+06		1.0E+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 (cr	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)	***4.4E+03***
Ugw.tr	Groundwater Transport velocity (cm/yr)	***1.8E+04***
Ks	Saturated Hydraulic Conductivity(cm/s)	1.0E-02
grad	Groundwater Gradient (cm/cm)	1.4E-02
Sw	Width of groundwater source zone (cm)	
Sd	Depth of groundwater source zone (cm)	
BC	Biodegradation Capacity (mg/L)	
BIO?	Is Bioattenuation Considered	TRUE
phi.eff	Effective Porosity in Water-Bearing Unit	2.5E-01
foc.sat	Fraction organic carbon in water-bearing unit	1.0E-03

Soil	Definition (Units)	Value
hc	Capillary zone thickness (cm)	***9.8E+00***
hv	Vadose zone thickness (cm)	***5.4E+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)	***5.5E+02***
Ls	Depth to top of affected soil (cm)	***1.5E+02***
Lsubs	Thickness of affected subsurface soils (cm)	***3.0E+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)		3.0E+02
ER	Building air exchange rate (s^-1)		2.3E-04
Lcrk	Foundation crack thickness (cm)	1.5E+01	
eta	Foundation crack fraction	***0.005***	

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)		

Scenario 4. Proposed Commercial Building over MW-5 (at 10^{-5})

RBCA SITE ASSESSMENT

Site Name: Zima Center Corp. Scen 2 comm bldg
Site Location: 2951 High St., Oakland, CA

Completed By: Chris Palmer
Date Completed: 7/25/1997

Tier 2 Worksheet 9.2

SUBSURFACE SOIL SSTL VALUES (> 3 FT BGS)

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

❑ MCL exposure limit?
❑ PEL exposure limit?

Calculation Option: 1

CONSTITUENTS OF CONCERN		Representative Concentration	SSTL Results For Complete Exposure Pathways ("x" if Complete)										
				Soil Leaching to Groundwater			X	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	2.6E-2	NA	NA	NA		NA	5.2E-1		NA	2.3E+2	5.2E-1	❑	<1
100-41-4	Ethylbenzene	1.9E-2	NA	NA	NA		NA	>Res		NA	>Res	>Res	❑	<1
#######	Methyl t-Butyl Ether	9.7E-2	NA	NA	NA		NA	1.2E+3		NA	>Res	1.2E+3	❑	<1
108-88-3	Toluene	2.1E-2	NA	NA	NA		NA	1.1E+2		NA	>Res	1.1E+2	❑	<1
#######	Xylene (mixed isomers)	2.8E-2	NA	NA	NA		NA	>Res		NA	>Res	>Res	❑	<1

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: G-385-FVX-826

Data: Soil average of samples from BH-A, B, C, D, E and MW-5.

Scenario 4. Proposed Commercial Building over MW-5 (at 10^{-5}).

RBCA SITE ASSESSMENT

Site Name: Zima Center Corp. Scen 4 comm bldg over MW5
Site Location: 2951 High St., Oakland, CA

Completed By: Chris Palmer
Date Completed: 7/25/1997

Tier 2 Worksheet 9.3

GROUNDWATER SSTL VALUES

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

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 1

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

CONSTITUENTS OF CONCERN		Representative Concentration	Groundwater Ingestion			X Groundwater Volatilization to Indoor Air		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	1.2E+1	NA	NA	NA	NA	1.4E+0	NA	NA	1.4E+0	■	8.0E+00
100-41-4	Ethylbenzene	8.9E-1	NA	NA	NA	NA	>Sol	NA	NA	>Sol	☐	<1
1634-04-4	Methyl t-Butyl Ether	3.8E+1	NA	NA	NA	NA	7.3E+3	NA	NA	7.3E+3	☐	<1
108-88-3	Toluene	5.8E+0	NA	NA	NA	NA	1.7E+2	NA	NA	1.7E+2	☐	<1
1330-20-7	Xylene (mixed isomers)	5.8E+0	NA	NA	NA	NA	>Sol	NA	NA	>Sol	☐	<1

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: G-385-FVX-826

Data: Average of groundwater quarterly results wells MW-1, 2, 3, 4, 5, 6.

Scenario 4. Proposed Commercial Building over MW-5 (at 10-5)

RBCA TIER 1/TIER 2 EVALUATION

Output Table 1

Site Name: Zima Center Corp. Scen 4 con[illegible]ation: 3011
Site Location: 2951 High St., Oakland, CA Date Completed: 7/25/97
Completed By: Chris Palmer

Software: GSI RBCA Spreadsheet
Version: v 1.0

DEFAULT PARAMETERS

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

Exposure Parameter	Definition (Units)	Residential Adult	Residential (1-6yrs)	Residential (1-16 yrs)	Commercial/Industrial Chronic	Commercial/Industrial Constrctn
ATc	Averaging time for carcinogens (yr)	70			25	1
ATn	Averaging time for non-carcinogens (yr)				70	
BW	Body Weight (kg)				25	1
ED	Exposure Duration (yr)				250	180
EF	Exposure Frequency (days/yr)				250	
EF.Derm	Exposure Frequency for dermal exposure				1	
IRgw	Ingestion Rate of Water (l/day)				50	100
IRs	Ingestion Rate of Soil (mg/day)	#DIV/0!			#DIV/0!	
IRadj	Adjusted soil ing. rate (mg*yr/kg*d)				20	
IRa.in	Inhalation rate indoor (m^3/day)				20	10
IRa.out	Inhalation rate outdoor (m^3/day)				5.8E+03	5.8E+03
SA	Skin surface area (dermal) (cm^2)	#DIV/0!			#DIV/0!	
SAadj	Adjusted dermal area (cm^2*yr/kg)	1				
M	Soil to Skin adherence factor	FALSE			FALSE	
AAFs	Age adjustment on soil ingestion	FALSE			FALSE	
AAFd	Age adjustment on skin surface area	TRUE				
tox	Use EPA tox data for air (or PEL based)	FALSE				
gwMCL?	Use MCL as exposure limit in groundwater?					

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

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

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

Surface Parameters	Definition (Units)	Residential	Commercial/Industrial Chronic	Commercial/Industrial Construction
t	Exposure duration (yr)		25	1
A	Contaminated soil area (cm^2)	2.2E+06		1.0E+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 (cr	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)	***4.4E+03***
Ugw.tr	Groundwater Transport velocity (cm/yr)	***1.8E+04***
Ks	Saturated Hydraulic Conductivity(cm/s)	1.0E-02
grad	Groundwater Gradient (cm/cm)	1.4E-02
Sw	Width of groundwater source zone (cm)	
Sd	Depth of groundwater source zone (cm)	
BC	Biodegradation Capacity (mg/L)	
BIO?	Is Bioattenuation Considered	TRUE
phi.eff	Effective Porosity in Water-Bearing Unit	2.5E-01
foc.sat	Fraction organic carbon in water-bearing unit	1.0E-03

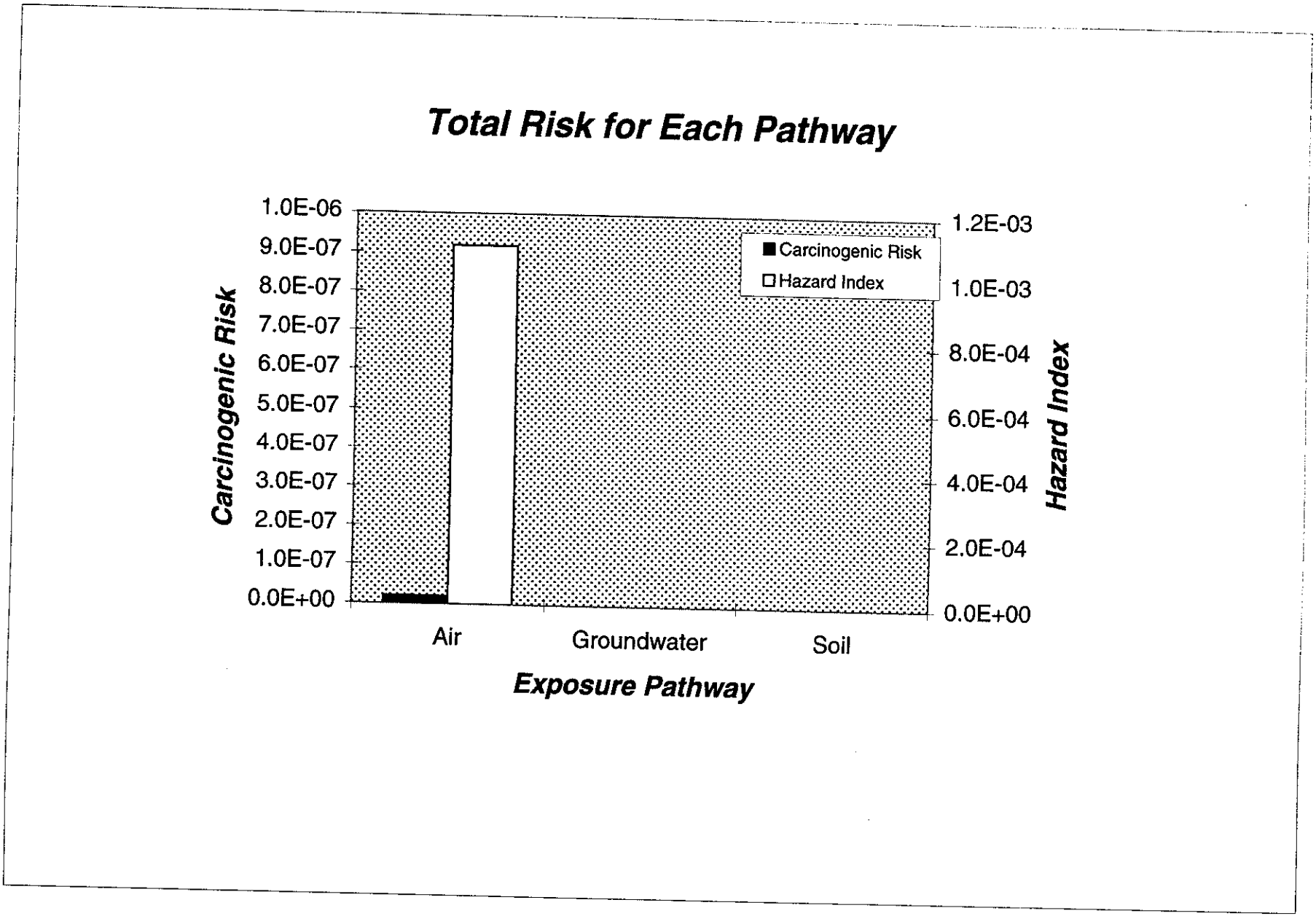
Soil	Definition (Units)	Value
hc	Capillary zone thickness (cm)	***9.8E+00***
hv	Vadose zone thickness (cm)	***5.4E+02***
rho	Soil density (g/cm^3)	1.7
foc	Fraction of organic carbon in vadose zone	0.01
phi	Soil porosity in vadose zone	0.38
Lgw	Depth to groundwater (cm)	***5.5E+02***
Ls	Depth to top of affected soil (cm)	***1.5E+02***
Lsubs	Thickness of affected subsurface soils (cm)	***3.0E+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)		3.0E+02
ER	Building air exchange rate (s^-1)		2.3E-04
Lcrk	Foundation crack thickness (cm)	1.5E+01	
eta	Foundation crack fraction	***0.005***	

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)		

Scenario 4. Proposed Commercial Building over MW-5 (at 10-6)



Scenario 4 Proposed Commercial Building over MW-5 (at 10^{-6})

RBCA SITE ASSESSMENT

Site Name: Zima Center Corp. Scen 4 comm bldg over MW5
Site Location: 2951 High St., Oakland, CA

Completed By: Chris Palmer
Date Completed: 7/25/1997

Tier 2 Worksheet 9.2

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: 1

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

CONSTITUENTS OF CONCERN		Representative Concentration	Soil Leaching to Groundwater			X 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	2.6E-2	NA	NA	NA	NA	5.2E-2	NA	2.3E+1	5.2E-2	❑	<1
100-41-4	Ethylbenzene	1.9E-2	NA	NA	NA	NA	>Res	NA	>Res	>Res	❑	<1
#######	Methyl t-Butyl Ether	9.7E-2	NA	NA	NA	NA	1.2E+3	NA	>Res	1.2E+3	❑	<1
108-88-3	Toluene	2.1E-2	NA	NA	NA	NA	1.1E+2	NA	>Res	1.1E+2	❑	<1
#######	Xylene (mixed isomers)	2.8E-2	NA	NA	NA	NA	>Res	NA	>Res	>Res	❑	<1

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: G-385-FVX-826

Data: Average of soil samples
BH-A, B, C, D, E and MW-5

Scenario 4. Proposed Commercial Building over MW-5 (at 10^{-6})

RBCA SITE ASSESSMENT

Tier 2 Worksheet 9.3

Site Name: Zima Center Corp. Scen 4 comm bldg over MW5
Site Location: 2951 High St., Oakland, CA

Completed By: Chris Palmer
Date Completed: 7/25/1997

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: 1

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

CONSTITUENTS OF CONCERN		Representative Concentration	Groundwater Ingestion			X Groundwater Volatilization to Indoor Air		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	1.2E+1	NA	NA	NA	NA	1.4E-1	NA	NA	1.4E-1	■	8.4E+01
100-41-4	Ethylbenzene	8.9E-1	NA	NA	NA	NA	>Sol	NA	NA	>Sol	☐	<1
1634-04-4	Methyl t-Butyl Ether	3.8E+1	NA	NA	NA	NA	7.3E+3	NA	NA	7.3E+3	☐	<1
108-88-3	Toluene	5.8E+0	NA	NA	NA	NA	1.7E+2	NA	NA	1.7E+2	☐	<1
1330-20-7	Xylene (mixed isomers)	5.8E+0	NA	NA	NA	NA	>Sol	NA	NA	>Sol	☐	<1

Software: GSI RBCA Spreadsheet
Version: v 1.0

Serial: G-385-FVX-826

Data: Average of groundwater quarterly results
MW-1, 2, 3, 4, 5, 6

Scenario 4. Proposed Commercial Building over MW-5
(at 10^{-6})