



Subsurface Consultants, Inc.

R. William Rudolph, P.E.
President

September 24, 1996
SCI 1039.002

Ms. Juliet Shin
Senior Hazardous Materials Specialist
Alameda County Environmental Health Services
1131 Harbor Bay Parkway, #250
Alameda, California 94502-6577

Risk Assessment
STID 1352
Albany Ford
718 San Pablo Avenue
Albany, California 94706

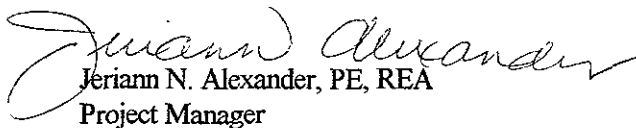
Dear Ms. Shin:

Pursuant to your letter dated July 24, 1996, the owner of the referenced property, Mr. Don Strough, has retained Subsurface Consultants, Inc. (SCI) to perform the requested risk assessment of the former Tank B area. SCI will perform a site specific Tier 2 risk assessment in accordance with the guidelines outlined in ASTM E 1739-95. The results of the assessment will be presented within 60 days of the date of this letter.

If you have any questions, please call.

Yours very truly,

Subsurface Consultants, Inc.


Jeriann N. Alexander, PE, REA
Project Manager

cc: Mr. Jonathan Redding, Esq.
Fitzgerald, Abbott & Beardsley

Mr. Don Strough
Concord Honda/Pontiac

ENVIRONMENTAL
PROTECTION

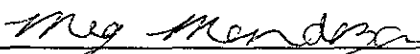
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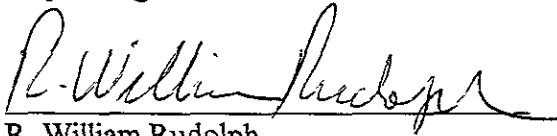
**RISK BASED CORRECTIVE
ACTION ASSESSMENT
TIER II ASTM E 1739-95
TANK AREA B
718 SAN PABLO AVENUE
ALBANY, CALIFORNIA
SCI 1039.002**

Prepared for:

Mr. Don Strough
Concord Honda/Pontiac
1300 Concord Avenue
Concord, California 94520

By:


Meg Mendoza
Project Engineer


R. William Rudolph
Geotechnical Engineer 741 (exp. 12/31/00)



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February 3, 1997

EXECUTIVE SUMMARY

This risk assessment was conducted for the Albany Ford and Subaru Dealership site located at 718 San Pablo Avenue, as required by the Alameda County Health Care Services Agency in their letter dated July 24, 1996. The purpose of the assessment was to evaluate risks to human health and the environment resulting from petroleum hydrocarbons in soil adjacent to the area of a former underground waste oil/gasoline storage tank. The primary objective of the assessment was to identify completed exposure pathways for the constituents of concern and evaluate their effects on potential receptors. The results of the assessment were used to develop conclusions regarding the need for future corrective actions at the site. The assessment was conducted for the site specific contaminant concentrations and current property uses, using the ASTM E 1739-95 "Standard Guide for Risk-Based Corrective Action at Petroleum Release Sites."

The property was formerly used as an auto repair facility. Impacts from the former use of the tank under investigation appear to be localized to the area of the former tank. The tank was removed in 1993. Areas impacted by releases from the former tank appear to exist in the driveway area and beneath adjacent buildings.

Based on the assessment, we conclude that the petroleum hydrocarbon impacted soils remaining at the site pose no significant human health or ecological risks for the given site use and that the site meets all six requirements of the Regional Water Quality Control Board Interim Guidance (1995) for classification as a low risk soils case. Impacts to groundwater beneath the former tank area are minimal and therefore evaluation of risks associated with these impacts was not warranted. We recommend that the former tank area be considered for site closure as a low risk soil case.

I INTRODUCTION

A. General

This report presents a preliminary evaluation of risks to human health and ecological receptors conducted by Subsurface Consultants, Inc. (SCI) for impacted soils in the former Tank B area located at the Albany Ford and Subaru Dealership, 718 San Pablo Avenue in Albany, California. This assessment was performed at the request of the Alameda County Health Care Services Agency (ACHCSA) as part of an evaluation of future corrective actions and/or site closure requirements, and was required by their letter dated July 24, 1996.

The assessment was conducted in accordance with the American Society for Testing Materials (ASTM) E 1739-95, "Standard Guide for Risk-Based Corrective Action (RBCA) at Petroleum Release Sites." This guide presents a tiered decision-making process for the assessment and response to a petroleum release, based on the protection of human health.

A Tier 1 evaluation compares representative site values with non-site specific values developed for constituents of concern. The ASTM document presents conservative risk-based screening levels for direct and indirect exposure pathways. The ACHCSA has conducted a Tier 1 evaluation and determined that some of the concentrations left in-place for Tank Area B exceed these Tier 1 values. Based on these results, the ACHCSA has requested that a Tier 2 evaluation be performed.

Through the Tier 2 RBCA process, Site Specific Target Levels (SSTLs) were established for soil and groundwater based on site specific hydrogeology (depth to groundwater, soil type, migration rates) and building environment parameters (use, ratio of building volume to area, air exchange rates, type of use). SSTLs were evaluated for completed volatilization exposure pathways.

B. Scope

The scope of services for this assessment included reviewing existing soil and groundwater data and conducting the assessment described herein. This report is limited to assessing impacts to human health and the environment for current site uses as a result of releases to soil associated with former Tank B. A review of the groundwater data collected from the monitoring well situated adjacent to the former Tank B area shows that groundwater has been minimally impacted by releases from the former tank. No petroleum hydrocarbon compounds have been detected in samples collected from this well. Volatile organic compounds have been detected at low concentrations below the maximum contaminant levels established for drinking water. Groundwater beneath the site is not used as a drinking water source. Hence, an evaluation of risks associated with groundwater is not warranted and has not been included in this assessment.

C. Background

In April 1993, five underground storage tanks and approximately 378 cubic yards of petroleum hydrocarbon impacted soil were removed from the site by others. Tank removal and overexcavation activities were overseen by Ms. Juliet Shin of the ACHCSA. Tank B is located in the north driveway as shown on the Site Plan, Plate 1. Based on sketches provided with the Tank Removal Report (Subsurface Environmental Corp., 1993). Tank B had a 550 gallon capacity and had previously contained waste oil or gasoline. It was not feasible to fully overexcavate Tank B area due to the proximity of building walls. Sidewall confirmation samples revealed the presence of gasoline range hydrocarbons and volatile constituents including benzene, toluene, ethylbenzene, and total xylenes (BTEX), as well as the volatile organic compounds tetrachloroethene (PCE) and 1,1,1-trichloroethane (TCA). Cambria Environmental Technology, Inc. drilled 3 soil borings adjacent to former Tank B

area in May 1994, with one soil boring being converted to a groundwater monitoring well (MW-3). Soil samples from the two borings drilled on the eastern side of the former tank area, near the sidewalk, did not detect the constituents of concern above their laboratory reporting limits. Soil samples collected from the test boring located on the western edge of the former tank, near the structural wall, detected the presence of petroleum hydrocarbons and BTEX compounds. Analytical test results for soil and groundwater for the Tank B area is presented on Tables 1 and 2, respectively.

II SITE CONDITIONS

A. Regional Setting

The site is located east of Albany Hill on a broad alluvial plain which extends from the Berkeley Hills to the San Francisco Bay. The hills are a major structural uplift in the Northern California Coast Ranges Geomorphic Province. The alluvial plain is generally characterized by nearly level topography which is incised by meandering stream channels. The alluvial deposits consist of poorly consolidated interbedded clays, silts, sands and gravels. The Hayward Fault is located approximately 2 miles northeast of the site.

B. Site Description

The project site is located on the western side of San Pablo Avenue between Washington Avenue and Castro Street. The site is a former automobile repair facility. A structure is situated on the site adjacent to San Pablo Avenue and an outside parking area exists at the rear of the facility. The site is currently occupied by a car dealership. Topography in the area slopes to the northeast, away from

Albany Hill. Middle Creek, which has been diverted to a subsurface culvert, exists approximately 1200 feet north of the site (Sowers, 1993).

C. Subsurface Conditions

A review of test boring logs indicate native materials beneath the site consist of stiff to very stiff clayey and sandy silts to the depths explored, approximately 20 feet below the ground surface. Based on measurements of the three on-site monitoring wells, the depth to groundwater at the site ranges from approximately 7 to 9 feet below grade.

Based on a review of groundwater elevation data, groundwater flows from the former Tank B area toward monitoring well MW-3 (east to northeast beneath the site), and appears to fluctuate approximately 2 feet seasonally.

III RISK ASSESSMENT

A. General

This human health risk assessment was performed in accordance with the procedures for a Tier 2 evaluation outlined in ASTM E 1739-95. Following the reasoning outlined in the ASTM guidelines, BTEX, PCE and TCA were the "indicator" compounds chosen to assess risks.

SSTLs were determined for BTEX, PCE and TCA by using the ASTM spreadsheet system developed by Groundwater System, Inc. (GSI), 1995. The SSTLs for benzene have been corrected to reflect CALEPA's more stringent toxicity value.

For this assessment, future use scenarios were evaluated for commercial/industrial uses. Based on site conditions, indoor and outdoor volatilization pathways appear to govern the risk

assessment as the soils impacted by petroleum hydrocarbons exist at depth. Therefore, ingestion, dermal contact and dust inhalation pathways were not evaluated.

B. Distribution of Contaminants

Soils impacted by the constituents of concern remain at the former Tank B location. Due to space constraints and the proximity of building walls, complete excavation of impacted soils was not feasible. For Tank B, the excavation extent was approximately 12 feet by 15 feet by 14 feet deep. Impacted soil remaining exists from a depth of approximately 5 feet below grade to 9.5 feet below grade, the maximum depth to groundwater. Based on studies by Dragun (1988), lateral migration of petroleum hydrocarbons in unsaturated soils appear to be limited to about 5 feet radially within a source area. Comparing the analytical data from the excavation sidewall samples with the outer-lying boring samples appears to confirm these studies. Thus, the maximum lateral extent of soil impact was conservatively modeled to be extend approximately 5 feet from the sides of the former tank excavation.

C. Characterization of Contaminants of Concern

For the Tank B area, analytical test results from the overexcavation sidewalls confirmation sampling, and from test borings SB-E, SB-F/MW-3 and SB-G were modeled as a lognormal distribution to obtain mean values of BTEX left in place. A lognormal distribution was used due to the asymmetry of the data set (Gilbert, 1987). The 90% upper confidence limits (UCLs) were calculated for these mean values and used as the representative site concentrations. Only one soil sample analyzed for PCE and TCA represents concentrations of in-place soils. These values were used as the representative site concentrations. Representative site concentrations are presented in Table 3.

Results of analytical testing of groundwater samples from monitoring well MW-3 indicate that for the three monitoring events conducted between June 1994 and April 1995 no petroleum

hydrocarbon compounds were detected. Volatile organic compounds were detected in the first two monitoring events at concentrations below 6 micrograms per liter (parts per billion), below their respective maximum contaminant levels.

D. Health Risk Assessment Results

Various scenarios were evaluated using the data outlined in the preceding section. The RBCA program and worksheets prepared by GSI were used to complete the analyses. RBCA worksheets and output results are presented in the Appendix. Output results are summarized in Table 3.

The results of the Tier 2 RBCA analyses indicate that the mean concentrations of BTEX, TCA and PCE in soil are below the respective SSTLs for a target risk level for commercial use, 1×10^{-5} . Additionally, impacted soil at the site is capped which effectively limits the utilization exposure pathways. Results of the analyses for soil are summarized in Table 3.

Levels of contaminants in groundwater are below regulatory threshold limits; therefore, volatilization from groundwater was not considered in the risk model.

IV CONCLUSIONS

A. Risk Based Analysis

The results of the RBCA Tier 2 site analyses indicate that for current site conditions impacted soil poses no significant risk to human health.

No formal evaluation of ecological risks has been performed for this assessment. Based on conditions at the site, the potential for off-site ecological impacts would be through movement of contaminants from groundwater to nearby surface waters. Impacts to groundwater are negligible in

monitoring well MW-3 located adjacent to the former Tank B area. In addition, there are no nearby downgradient receptors. Hence, we judge that the former Tank B area presents no significant risks to ecological habitats.

B. Request for Site Closure

The former Tank B area meets the criteria set forth by the California Regional Water Quality Control Board¹ (1995) to qualify as a low risk soils case. Specifically:

- The underground storage tank has been removed.
- The former tank area has been adequately characterized.
- Groundwater impacts do not exceed their maximum contaminant levels for drinking water standards.
- No water wells, surface waters or other sensitive receptors are likely to be impacted.
- The residual contaminants near the former tank present no significant risk to human health nor the environment.

Thus, based on a review of previous investigations conducted at the site, and the assessment presented herein, we request that the former Tank B area be considered for no further action status.

¹ California Regional Water Quality Control Board, San Francisco Bay Region, Memorandum "Regional Board Supplemental Instruction to State Water Board," December 8, 1995, "Interim Guidance on Required Cleanup at Low-Risk Fuel Site," January 5, 1996.

VIII LIMITATIONS

The assessment described herein was intended to provide a preliminary means of evaluating the risks to human health and ecological receptors resulting from petroleum hydrocarbon impacted soil beneath the subject site. The conclusions drawn from this assessment are an expression of our professional opinion, and do not constitute a warranty or guaranty, either expressed or implied. Additional investigative work may modify the conclusions presented herein, as additional information is generated.

SCI has performed this environmental assessment in accordance with generally accepted standards of care which exist in Northern California at the time of this study. The definition and evaluation of environmental conditions are difficult and inexact. Judgments leading to conclusions and recommendations are generally made with an incomplete knowledge of the subsurface and/or historic conditions applicable to the property. In addition, the conclusions expressed herein reflect property conditions at the time of the assessment. These conditions may change with time, and as such, our conclusions may also change.

This report has been prepared for the sole benefit of Mr. Don Strough and his assigns. The information contained in this report may not be used by any other party without the express written consent of SCI.

References

List of Tables

Table 1	Analytical Results for Soil
Table 2	Groundwater Elevation and Analytical Data
Table 3	Commercial RBCA Calculations

List of Illustrations

Plate 1	Site Plan
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Appendix

RBCA Output Tables and Worksheets

Distribution

- 1 copy: Ms. Juliet Shin
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Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, #250
Alameda, California 94502-6577
- 2 copies: Mr. Jonathan Redding
Fitzgerald, Abbott & Beardsley
1221 Broadway, 21st Floor
Oakland, California 94612-1837
- 1 copy: Mr. Don Strough
Concord Honda/Pontiac
1300 Concord Avenue
Concord, California 94520

REFERENCES

- American Society for Testing and Materials, "Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites, Designation E 1739-95", 1995.
- California Regional Water Quality Control Board, San Francisco Bay Region and Alameda County Flood Control and Water Conservation District, "Geohydrology and Groundwater-Quality Overview of the East Bay Plain Area, Alameda County, California," June 1988.
- California Regional Water Quality Control Board, San Francisco Bay Region, Memorandum "Regional Board Supplemental Instructions to State Water Board December 8, 1995, Interim Guidance on Required Clean-up at Low-Risk Fuel Sites", January 5, 1996.
- Cambria Environmental Technology, Inc., "First Quarter Monitoring Report, Albany Ford Dealership, 718 San Pablo Avenue, Albany, California," May 22, 1995.
- Cambria Environmental Technology, Inc., "Fourth Quarter Monitoring Report, Albany Ford Dealership, 718 San Pablo Avenue, Albany, California," March 16, 1995.
- Cambria Environmental Technology, Inc., "Subsurface Investigation Report for Albany Ford Dealership, 718 San Pablo Avenue, Albany, California," 1994.
- David Keith Todd Consulting Engineers, Inc., "Reconnaissance of Groundwater Resources for the EBMUD Service Area," March 1986.
- Dragun, James, The Soil Chemistry of Hazardous Materials, The Hazardous Materials Control Research Institute, Maryland, 1988.
- Gilbert, Richard O., Statistical Methods for Environmental Pollution Monitoring, Van Nostrand Reinhold, New York, 1987.
- ICF Kaiser Engineers, "Preliminary Site Assessment Plan for Albany Ford and Subaru Dealership, 718 San Pablo Avenue, Albany, California," August 10, 1993.
- Sowers, Janet M., "Watershed Map of the Oakland-Berkeley Area," 1993.
- Subsurface Environmental Corp., "Tank Closure Report, 718 San Pablo Avenue, Albany, California" 1993.

Table 1
 Tank B Area Analytical Results for Soil
 718 San Pablo Avenue
 Albany, California
 SCI 1039.002

Sample ID @ Depth (feet)	Date Sampled	<i>ppb</i>				<i>ppm</i>					
		Benzene (ug/kg)	Toluene (ug/kg)	Ethyl- benzene (ug/kg)	Total Xylenes (ug/kg)	TCA (ug/kg)	PCE (ug/kg)	TPHg (mg/kg)	TPHd (mg/kg)	O&G (mg/kg)	TPH mo (mg/kg)
Excavation Samples											
<i>sample was overexcavated</i> → TB004 @ 8.5'	April 6, 1993	<i>sample</i> 270	3300	2300	14,000	89	250	490	1400	4700	--
TB007 @ 14'	July 8, 1993	58	120	120	920	--	--	70	610	1100	--
TB008 @ 7' (west)	July 8, 1993	60	27	23	420	--	--	32	77	320	--
TB009 @ 8.5' (north)	July 8, 1993	1900	4200	5400	70,000	490	240	930	2000	4500	--
TB010 @ 9.5' (east)	July 8, 1993	2600	5100	3500	42,000	--	--	800	4400	8500	--
Test Boring Samples											
SB-E @ 5'	May 4, 1994	ND(2.5)	ND(2.5)	ND(2.5)	ND(2.5)	--	--	ND(1)	--	--	--
SB-E @ 10'	May 4, 1994	ND(2.5)	ND(2.5)	ND(2.5)	ND(2.5)	--	--	ND(1)	ND(1)	--	ND(10)
MW-3 (SB-F) @ 5'	May 4, 1994	ND(2.5)	ND(2.5)	ND(2.5)	ND(2.5)	--	--	ND(1)	--	--	--
MW-3 (SB-F) @ 10'	May 4, 1994	ND(2.5)	ND(2.5)	ND(2.5)	ND(2.5)	--	--	ND(1)	ND(1)	--	ND(10)
SB-G @ 5'	May 4, 1994	ND(2.5)	ND(2.5)	ND(2.5)	ND(2.5)	--	--	2.4	--	--	--
SB-G @ 10'	May 4, 1994	8.6	24	83	1200	--	--	88	500	--	160

Notes:
 TCA = 1,1,1-trichloroethane
 PCE = tetrachloroethene
 TPHg = total petroleum hydrocarbons as gasoline
 TPHd = total petroleum hydrocarbons as diesel
 O&G = oil and grease
 TPHmo = total petroleum hydrocarbons as motor oil
 ug/kg = micrograms per kilogram
 -- = test not requested
 ND(2.5) = analyte not detected above the reporting limit stated

Table 2
 Tank B Area Groundwater Elevation and Analytical Data
 718 San Pablo Avenue
 Albany, California
 SCI 1039.002

Well ID	Date Sampled	Groundwater		Elevation (ft)	TPHg (ug/l)	TPHd (ug/l)	TPHmo (ug/l)	Benzene (ug/l)	Toluene (ug/l)	Ethyl-benzene (ug/l)	Total Xylenes (ug/l)	1,1,1-TCA (ug/l)	1,1-DCA (ug/l)	PCE (ug/l)	Freon-11 (ug/l)	Other 8010 Compounds
		TOC (ft)	Depth (ft)													
MW-3	6/9/94	98.46	9.10	89.36	ND(50)	ND	ND	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	1.1	ND(0.4)	ND(0.4)	ND(0.4)	ND
	1/12/95		7.15	91.31	ND	ND	ND	ND	ND	ND	ND	2.6	1.8	0.51	5.6	ND
	4/10/95		6.85	91.61	ND(50)	ND	ND	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND	ND	ND	ND	ND

Notes:

TOC = Top of casing

ND = Analyte not detected above its laboratory reporting limit; reporting limit stated if available

ug/l = microgram per liter

TPHg = Total petroleum hydrocarbons as gasoline

TPHd = Total petroleum hydrocarbons as diesel

TPHmo = Total petroleum hydrocarbons as motor oil

1,1,1-TCA = 1,1,1-trichloroethane

Freon-11 = trichlorofluoromethane

1,1-DCA = 1,1-dichloroethane

PCE = tetrachloroethene

Table 3
718 San Pablo, Albany
Tank B Area
Subsurface Soil Exposure Pathways
Commercial RBCA Calculations, Risk Factor = 10⁻⁵
SCI 1039.002

Constituents of Concern	Site Specific Target Level for Constituents of Concern		Mean On-Site Concentration	UCL on Mean Concentration
	Volatilization to Indoor Air	Volatilization to Outdoor Air		
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
-- Benzene	0.348	>Res	0.018	0.072
Ethylbenzene	>Res	>Res	0.025	0.11
Toluene	140	>Res	0.022	0.098
total Xylenes	>Res	>Res	0.081	0.63
Tetrachloroethene	1600	15,000	--	0.24* ✓
1,1,1-Trichloroethane	340	>Res	--	0.49* ✓

Notes:

mg/kg = milligrams per kilogram

>Res = selected risk level cannot be reached or exceeded for that compound and the specified exposure scenario





Benzene has been corrected per CALEPA's more stringent requirements

Mean concentration represents a lognormal distribution

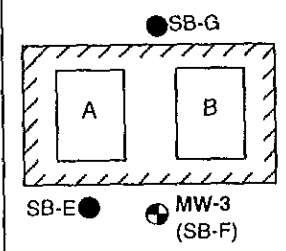
UCL = 90% Upper Confidence Limit

* = only one soil sample representing in-place concentrations was submitted for these analyses

-- =not enough data points to average

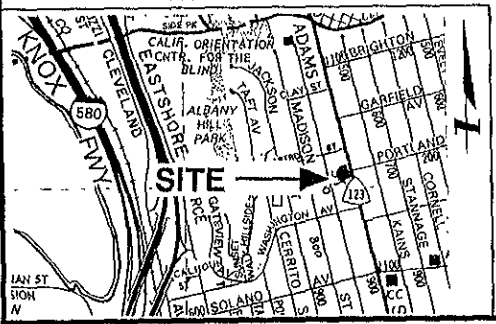
-  MONITORING WELL BY OTHERS
-  SOIL BORING BY OTHERS
-  APPROXIMATE LIMITS OF TANK EXCAVATION
-  FORMER UNDERGROUND STORAGE TANK LOCATION

ALBANY FORD DEALERSHIP



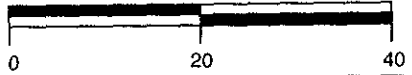
SIDEWALK

VICINITY MAP



SAN PABLO AVENUE

APPROXIMATE SCALE (feet)



SITE PLAN

718 SAN PABLO AVENUE
ALBANY, CALIFORNIA

PLATE

1



Subsurface Consultants, Inc.
Geotechnical & Environmental Engineers

JOB NUMBER
1039.002

DATE
12/10/96

APPROVED
[Signature]

APPENDIX
RBCA OUTPUT TABLES AND WORKSHEETS

RBCA SITE ASSESSMENT

Tier 2 Worksheet 9.2

Site Name: Val Strough Albany Ford
 Site Location: 718 San Pablo

Completed By: meg mendoza
 Date Completed: 12/27/1996

1 OF 1

Calculation Option: 1

**SUBSURFACE SOIL SSTL VALUES
 (> 3 FT BGS)**

Target Risk (Class A & B) 1.0E-5 MCL exposure limit?
 Target Risk (Class C) 1.0E-5 PEL exposure limit?
 Target Hazard Quotient 1.0E+0

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

CONSTITUENTS OF CONCERN		Representative Concentration (mg/kg)	Soil Leaching to Groundwater			Soil Volatilization to Indoor Air		Soil Volatilization to Outdoor Air		Applicable SSTL (mg/kg)	SSTL Exceeded ? * If yes	Required CRF Only if "yes" left
			Residential (on-site)	Commercial (on-site)	Regulatory (MCL) (on-site)	Residential (on-site)	Commercial (on-site)	Residential (on-site)	Commercial (on-site)			
71-43-2	Benzene	7.2E-2	NA	NA	NA	NA	1.2E+0	NA	>Res	1.2E+0	<input type="checkbox"/>	<1
100-41-4	Ethylbenzene	1.1E-1	NA	NA	NA	NA	>Res	NA	>Res	>Res	<input type="checkbox"/>	<1
127-18-4	Tetrachloroethene	#DIV/0! ?	NA	NA	NA	NA	1.6E+3	NA	1.5E+5	1.6E+3		#DIV/0! ?
108-88-3	Toluene	9.8E-2	NA	NA	NA	NA	1.4E+2	NA	>Res	1.4E+2	<input type="checkbox"/>	<1
71-55-6	Trichloroethane, 1,1,1-	#DIV/0! ?	NA	NA	NA	NA	3.4E+2	NA	>Res	3.4E+2		#DIV/0! ?
1330-20-7	Xylene (mixed isomers)	6.3E-1	NA	NA	NA	NA	>Res	NA	>Res	>Res	<input type="checkbox"/>	<1

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Software: GSI RBCA Spreadsheet
 Version: v 1.0

Serial: G-289-DJX-518

These values are the UCLs listed in Table 3.

$1.2 \times 0.29 = 0.348$

RBCA TIER 1/TIER 2 EVALUATION

Output Table 1

Site Name: Val Strough Albany Ford
 Site Location: 718 San Pablo
 Job Identification: 1039.002
 Date Completed: 12/27/96
 Completed By: meg mendoza

Software: GSI RBCA Spreadsheet
 Version: v 1.0

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

DEFAULT PARAMETERS

Exposure Parameter	Definition (Units)	Residential			Commercial/Industrial	
		Adult	(1-6yrs)	(1-16 yrs)	Chronic	Constrctn
ATc	Averaging time for carcinogens (yr)	70				
ATn	Averaging time for non-carcinogens (yr)	30	6	16	25	1
BW	Body Weight (kg)	70	15	35	70	
ED	Exposure Duration (yr)	30	6	16	25	1
EF	Exposure Frequency (days/yr)	350			250	180
EF_Derm	Exposure Frequency for dermal exposure	350			250	
IRgw	Ingestion Rate of Water (l/day)	2			1	
IRs	Ingestion Rate of Soil (mg/day)	100	200		50	100
IRadj	Adjusted soil ing. rate (mg*yr/kg*d)	1.1E+02			8.4E+01	
IRa.in	Inhalation rate indoor (m ³ /day)	15			20	
IRa.out	Inhalation rate outdoor (m ³ /day)	20			20	10
SA	Skin surface area (dermal) (cm ²)	5.8E+03		2.0E+03	5.8E+03	5.8E+03
SAadj	Adjusted dermal area (cm ² *yr/kg)	2.1E+03			1.7E+03	
M	Soil to Skin adherence factor	1				
AAFs	Age adjustment on soil ingestion	FALSE			FALSE	
AAFd	Age adjustment on skin surface area	FALSE			FALSE	
tox	Use EPA tox data for air (or PEL based)	TRUE				
gwMCL?	Use MCL as exposure limit in groundwater?	FALSE				

Matrix of Exposed Persons to Complete Exposure Pathways	Residential		Commercial/Industrial	
	Chronic	Constrctn	Chronic	Constrctn
Groundwater Pathways:				
GW i	Groundwater Ingestion	FALSE ✓	FALSE ✓	
GW.v	Volatilization to Outdoor Air	FALSE ✓	FALSE ✓	
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 ✓	FALSE ✓	TRUE ✓
SS.d	Direct Ingestion and Dermal Contact	FALSE ✓	FALSE ✓	TRUE ✓
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		Commercial/Industrial	
	Distance	On-Site	Distance	On-Site
GW	Groundwater receptor (cm)	TRUE		TRUE
S	Inhalation receptor (cm)	TRUE		TRUE

Matrix of Target Risks	Residential	
	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		
		Chronic	Construction	for adult
t	Exposure duration (yr)	30	25	1
A	Contaminated soil area (cm ²)	<u>2.3E+05</u>		<u>2.3E+05</u>
W	Length of affected soil parallel to wind (cm)	<u>6.1E+02</u>		<u>6.1E+02</u>
W.gw	Length of affected soil parallel to groundwater (cm)	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 Parameters	Definition (Units)	Value
delta.gw	Groundwater mixing zone depth (cm)	2.0E+02
I	Groundwater infiltration rate (cm/yr)	3.0E+01
Ugw	Groundwater Darcy velocity (cm/yr)	2.5E+03
Ugw.tr	Groundwater Transport velocity (cm/yr)	6.6E+03
Ks	Saturated Hydraulic Conductivity (cm/s)	
grad	Groundwater Gradient (cm/cm)	
Sw	Width of groundwater source zone (cm)	
Sd	Depth of groundwater source zone (cm)	
BC	Biodegradation Capacity (mg/L)	
BIO?	Is Bioattenuation Considered	FALSE
phi.eff	Effective Porosity in Water-Bearing Unit	3.8E-01
foe.sat	Fraction organic carbon in water-bearing unit	1.0E-03

Soil Parameters	Definition (Units)	Value
hc	Capillary zone thickness (cm)	5.0E+00
hv	Vadose zone thickness (cm)	3.0E+02
rho	Soil density (g/cm ³)	1.7
foe	Fraction of organic carbon in vadose zone	0.01
phi	Soil porosity in vadose zone	0.38
Lgw	Depth to groundwater (cm)	3.0E+02
Ls	Depth to top of affected soil (cm)	<u>1.5E+02</u> = 5'
Lsubs	Thickness of affected subsurface soils (cm)	<u>1.4E+02</u>
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 Parameters	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	1.5 x 10'
eta(N)	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)		

From Table X2.6 in RBCA