

SCA

Environmental, Inc.

SCA Environmental, Inc.
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TO/ COMPANY	Amy Leach Alameda County fx: 510-337-9335
cc:	Shawn Munger, Engeo
FROM:	Andy Hilliard
DATE:	Wed, Jul 2, 1997
RE:	Revised ASTM RBCA calcs Parker's Shell facility
SCA Proj #	F-2082

Time-sensitive Information

Please deliver ASAP to Amy Leach

97 JUL -3 AM 9:21

<input checked="" type="checkbox"/> FAX
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<input type="checkbox"/> FEDEX
<input type="checkbox"/> UPS GROUND

SCA

Environmental, Inc.

Engineering and Environmental Consultants

3 AM 9:21

July 2, 1997

Mr. Shawn Munger
Engeo Incorporated
2401 Crow Canyon Road
Suite 200
San Ramon, CA 94583

FAX: (510) 838-7425

Re: Revised Summary of Risk-Based Corrective Action Assessment
Former Parker's Shell Facility - 5293 Crow Canyon Road
Castro Valley, CA
SCA Project No. F-2082

Dear Mr. Munger:

This letter report summarizes the risk assessment performed of the subject property. The assessment was performed by SCA Environmental, Inc. (SCA) under contract to Engeo, Inc.

Background

Underground storage tanks were removed from the site in February 1989, according to Alameda County Health Services Agency files. Subsequent soil sampling (conducted in 1990) at the site revealed the presence of benzene in soil in concentrations ranging from Non-Detect to 4.3 mg/kg.

Proposed uses for the property include residential development. The Lead Agency, Alameda County Health Care Services, requested a site-specific evaluation of risk to human health and the environment from exposure to the subsurface soil contamination left in place, specifically to the benzene in soil.

Methodology

The assessment calculations were performed by SCA using Groundwater Services, Inc. (GSI) Tier II® software.

The assessment focused on a *Soil Volatilization to Indoor Air* pathway, for a residential scenario. Other pathways were not considered in this assessment. Since groundwater at the site was not impacted, based upon extensive sampling conducted in 1990 and before, the *Soil Leaching to Groundwater* pathway was not considered.

Surface soils were expected to have minimal concentrations of the analytes of concern, given the 8 year lag time since the USTs were removed and any surface impact from product may have occurred. The surface soils are expected to be dramatically altered by the planned residential renovation, including excavated for foundations, landscaped, paved, terraced, etc. Based on SCA's experience at similar sites, this pathway would not pose a significant exposure to workers or residents, under this scenario. The net effect was that *Soil Volatilization to Outdoor Air* was not anticipated to be a significant exposure pathway and was not evaluated.

Note that California toxicity slope factors for benzene were used.

Results

1. An initial Tier 2 assessment was performed of soil sampling data from 1990 and before.
 - a. The Tier 2 assessment established a site-specific target level (SSTL) for benzene of 5.8×10^{-3} mg/kg,
 - b. The mean benzene level at the site was 5.2×10^{-3} mg/kg, or below the SSTL. This level is based upon the 1990 soil sampling data; a degradation rate for benzene of 0.009, which is the slowest degradation reported in Table X3.2 of ASTM Standard E1739; and a 95% upper confidence limit calculation.
2. A decision was made to conduct soil sampling of the areas which were identified as having the highest levels of benzene in the 1990 sampling data. These locations were identified as SB-1 and SB-8 in the 1990 sampling reports. Engeo staff conducted sampling at these locations, with analysis by Chromalab, Inc. See Engeo's documents, provided under separate cover, which detail this sampling activity. Note that Engeo's staff designated the locations SB-1A and SB-8A, respectively.
3. SCA used the 1997 soil sampling results from SB-1A and SB-8A, and deleted the 1990 soil sampling data for SB-1 and SB-8. Using these results, a Tier 2 assessment was performed of the new data set.
 - a. Using the 1997 data, the mean benzene concentration at the site, based upon a 95% upper confidence limit calculation, was 3.4×10^{-3} mg/kg (see Appendix A, Tier 2 Worksheet 9.2).
 - b. This concentration was based upon the most conservative first order decay constants listed in Table X3.2 of ASTM Standard E1739; and upon standard Method Detection Limits (MDLs) for analytical methods used. (see Appendix B, RBCA Chemical Database).
 - c. The Tier 2 assessment established a Site-specific Threshold Level (SSTL) for benzene of 5.8×10^{-3} mg/kg, using the California toxicity slope factor of 0.1 for benzene (see Appendix A, Tier 2 Worksheet 9.2).
 - d. The mean benzene level at the site was 3.4×10^{-3} mg/kg, or below the SSTL, for the *Soil Volatilization to Indoor Air* pathway with a residential scenario.
4. At the request of Ms. Amy Leach of Alameda County, SCA performed the identical calculation as listed above, but without the use of decay constants for benzene. This "Scenario #2" is shown in Appendix B.

The sampling results obtained in 1990 were used, with an assumption that 0% decay had occurred in the 7 years period. For locations SB-1 and SB-8, the 1997 soil sampling results were used for the 5' depth only. For deeper samples (at 10, 15, and 20' depths) the 1990 soil sampling results were used.

The mean benzene level at the site was 6.8×10^{-3} mg/kg, or 17% above the SSTL, for the *Soil Volatilization to Indoor Air* pathway with a residential scenario.

5. An analysis of the 1990 and 1997 sampling results indicates that intrinsic degradation and/or volatilization is taking place, at a rate at least as rapid as the 0.009 value used in the initial calculation.

Sample Location	1990 Results for Benzene	Expected Results in 1997 based upon 730 days ⁻¹ decay constant	Actual Results in 1997
SB-1 (5' depth)	2.5 mg/kg	0.25 mg/kg	0.0076 mg/kg
SB-8 (5' depth)	4.3 mg/kg	0.43 mg/kg	None Detected (<0.005 mg/kg)

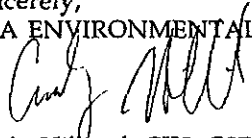
Conclusions

In our professional opinion, the site appears acceptable to develop for residential use, based upon the data supplied to us and the conservative assessment detailed in "Scenario #1".

For "Scenario #2", the "no decay" assumption causes the mean upper 95% confidence level to exceed the site's SSTL.

Please feel free to contact me at (415) 397-9936 with any questions or clarifications.

Sincerely,
SCA ENVIRONMENTAL, INC.



Andy Hilliard, CIH, CSP, CHMM
Regional Manager

- Appendix:
- A. Tier 2 Worksheet 9.2 for "Scenario #1" (assumes conservative decay constant for benzene)
 - B. Tier 2 Worksheet 9.2 for "Scenario #2" (assumes no decay constant for benzene)
 - C. Supplementary Data



Appendix A
Tier 2 Worksheet 9.2 for "Scenario #1"
(assumes conservative decay constant for benzene)

Site Name: Parker's Shell Station
 Site Location: Castro Valley

Completed By: Andy Hilliard

Date Completed: 5/2/1997

**SUBSURFACE SOIL SSTL VALUES
 (> 3.3 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 (mg/kg)	Soil Leaching to Groundwater			Soil Volatilization to Indoor Air		Soil Volatilization to Outdoor Air		Applicable SSTL (mg/kg)	SSTL Exceeded?	Required CRF
		Residential: (on-site)	Commercial: (on-site)	Regulatory(MCL): (on-site)	Residential: (on-site)	Commercial: (on-site)	Residential: (on-site)	Commercial: (on-site)			
CAS No. Name											
71-43-2 Benzene	3.4E-3	NA	NA	NA	2.0E-2	NA	NA	NA	2.0E-2*	<input type="checkbox"/>	<1
100-41-4 Ethylbenzene	4.4E-3	NA	NA	NA	7.1E+1	NA	NA	NA	7.1E+1	<input type="checkbox"/>	<1
108-88-3 Toluene	4.8E-3	NA	NA	NA	2.8E+1	NA	NA	NA	2.8E+1	<input type="checkbox"/>	<1
1330-20-7 Xylene (mixed isomers)	6.9E-3	NA	NA	NA	>Res	NA	NA	NA	>Res	<input type="checkbox"/>	<1

>Res indicates risk-based target concentration greater than constituent residual saturation value

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Software: GSI RBCA Spreadsheet
 Version: 1.0.1

Serial: G-421-DSX-400

RBCA SITE ASSESSMENT

- Version #1
 with decay constant
 of 730 days⁻¹

* Using PA benzene level:
 $(2.0 \times 10^{-2})(0.29) = 5.8 \times 10^{-3}$

Appendix B
Tier 2 Worksheet 9.2 for "Scenario #2"
(assumes no decay constant for benzene)

Site Name: Parker's Shell Station (no decay)
 Site Location: Castro Valley

Completed By: Andy Hilliard
 Date Completed: 7/2/1997

Calculation Option: 1

**SUBSURFACE SOIL SSTL VALUES
 (> 3.3 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?

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?	Required CRF
CAS No.	Name		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	6.8E-3	NA	NA	NA	2.0E-2	NA	NA	NA	2.0E-2	<input type="checkbox"/>	<1
100-41-4	Ethylbenzene	7.6E-3	NA	NA	NA	7.1E+1	NA	NA	NA	7.1E+1	<input type="checkbox"/>	<1
108-88-3	Toluene	5.5E-3	NA	NA	NA	2.8E+1	NA	NA	NA	2.8E+1	<input type="checkbox"/>	<1
1330-20-7	Xylene (mixed isomers)	7.9E-3	NA	NA	NA	>Res	NA	NA	NA	>Res	<input type="checkbox"/>	<1

>Res Indicates risk-based target concentration greater than constituent residual saturation value

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Software: GSI RBCA Spreadsheet
 Version: 1.0.1

Serial: G-421-DSX-400

RBCA SITE ASSESSMENT

*Version #2
 without decay constant
 (values assumed identical
 to 1990 values measured)*

** using CA level, 5.8×10^{-3}*

Appendix C
Supplementary Data

Output Table 1

Site Name: Parker's Shell Station
 Site Location: Castro Valley

Job Identification: 1428-01
 Date Completed: 5/2/97
 Completed By: Andy Hilliard

Software: GSI RBCA Spreadsheet
 Version: 1.0.1

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

Exposure Parameter	Definition (Units)	Residential		Commercial/Industrial		Surface Parameters		Residential	Commercial
		Adult	(1-6yrs)	(1-16 yrs)	Chronic	Constructn	Definition (Units)		
ATc	Averaging time for carcinogens (yr)	70						2.2E+06	1.0E+06
ATn	Averaging time for non-carcinogens (yr)	30	6	16	25	1		1.5E+03	1.0E+03
BW	Body Weight (kg)	70	15	35	70			1.5E+03	
ED	Exposure Duration (yr)	30	6	16	25	1		2.3E+02	
t	Averaging time for vapor flux (yr)	30			25	1		2.0E+02	
EF	Exposure Frequency (days/yr)	350			250	180		1.0E+02	
EF.Derm	Exposure Frequency for dermal exposure	350			250			6.8E-14	
IRgw	Ingestion Rate of Water (L/day)	2			1				
IRs	Ingestion Rate of Soil (mg/day)	100	200		50	100			
IRadj	Adjusted soil ing. rate (mg-yr/kg-d)	1.1E+02			9.4E+01				
IRa.in	Inhalation rate indoor (m ³ /day)	15			20				
IRa.out	Inhalation rate outdoor (m ³ /day)	20			20	10			
SA	Skin surface area (dermal) (cm ²)	5.8E+03		2.0E+03	5.8E+03	5.8E+03			
SAadj	Adjusted dermal area (cm ² -yr/kg)	2.1E+03			1.7E+03				
M	Soil to Skin adherence factor	1							
AAFs	Age adjustment on soil ingestion	FALSE			FALSE				
AAFd	Age adjustment on skin surface area	FALSE			FALSE				
tox	Use EPA tox data for air (or PEL based)?	TRUE							
gwMCL?	Use MCL as exposure limit in groundwater?	FALSE							
Matrix of Exposed Persons to Complete Exposure Pathways:		Residential		Commercial/Industrial					
Outdoor Air Pathways:									
SS.v	Volatiles and Particulates from Surface Soils	FALSE			FALSE	FALSE			
S.v	Volatilization from Subsurface Soils	FALSE			FALSE				
GW.v	Volatilization from Groundwater	FALSE			FALSE				
Indoor Air Pathways:									
S.b	Vapors from Subsurface Soils	TRUE			FALSE				
GW.b	Vapors from Groundwater	FALSE			FALSE				
Soil Pathways:									
SS.d	Direct Ingestion and Dermal Contact	FALSE			FALSE	TRUE			
Groundwater Pathways:									
GW.i	Groundwater Ingestion	FALSE			FALSE				
S.I	Leaching to Groundwater from all Soils	FALSE			FALSE				
Matrix of Receptor Distance and Location On- or Off-Site:		Residential		Commercial/Industrial					
		Distance	On-Site	Distance	On-Site				
GW	Groundwater receptor (cm)		TRUE		TRUE				
S	Inhalation receptor (cm)		TRUE		TRUE				
Matrix of Target Risks:									
TRab	Target Risk (class A&B carcinogens)	Individual	Cumulative						
TRc	Target Risk (class C carcinogens)	1.0E-06	1.0E-05						
THQ	Target Hazard Quotient	1.0E+00							
Opt	Calculation Option (1, 2, or 3)	1							
Tier	RBCA Tier	2							
Surface Parameters:									
A	Contaminated soil area (cm ²)								
W	Length of affect. soil parallel to wind (cm)								
W.gw	Length of affect. soil parallel to groundwater (cm)								
Uair	Ambient air velocity in mixing zone (cm/s)								
delta	Air mixing zone height (cm)								
Lss	Thickness of affected surface soils (cm)								
Pe	Particulate areal emission rate (g/cm ² /s)								
Groundwater Parameters:									
delta.gw	Groundwater mixing zone depth (cm)						Value		
I	Groundwater infiltration rate (cm/yr)						2.0E+02		
Ugw	Groundwater Darcy velocity (cm/yr)						3.0E+01		
Ugw.tr	Groundwater seepage velocity (cm/yr)						2.5E+03		
Ks	Saturated hydraulic conductivity (cm/s)						6.6E+03		
grad	Groundwater gradient (cm/cm)								
Sw	Width of groundwater source zone (cm)								
Sd	Depth of groundwater source zone (cm)								
phi.eff	Effective porosity in water-bearing unit						3.8E-01		
foc.sat	Fraction organic carbon in water-bearing unit						1.0E-03		
BIO?	Is biodegradation considered?						FALSE		
BC	Biodegradation Capacity (mg/L)								
Soil Parameters:									
hc	Capillary zone thickness (cm)						Value		
hv	Vadose zone thickness (cm)						5.0E+00		
rho	Soil density (g/cm ³)						3.0E+02		
foc	Fraction of organic carbon in vadose zone						1.7		
phi	Soil porosity in vadose zone						0.01		
Lgw	Depth to groundwater (cm)						0.38		
Ls	Depth to top of affected subsurface soil (cm)						3.0E+02		
Lsubs	Thickness of affected subsurface soils (cm)						1.5E+02		
pH	Soil/groundwater pH						3.0E+02		
							6.5		
phi.w	Volumetric water content						capillary	vadose	foundation
phi.a	Volumetric air content						0.342	0.12	0.12
							0.038	0.28	0.26
Building Parameters:									
Lb	Building volume/area ratio (cm)						Residential	Commercial	
ER	Building air exchange rate (s ⁻¹)						2.0E+02	3.0E+02	
Lcrk	Foundation crack thickness (cm)						1.4E-04	2.3E-04	
eta	Foundation crack fraction						1.5E+01		
							0.01		
Transport Parameters:									
ax	Longitudinal dispersivity (cm)						Residential	Commercial	
ay	Transverse dispersivity (cm)								
az	Vertical dispersivity (cm)								
dcy	Transverse dispersion coefficient (cm)								
dcz	Vertical dispersion coefficient (cm)								

RBCA TIER 1/TIER 2 EVALUATION

Physical Property Data

CAS Number	Constituent	type	Molecular Weight (g/mole)	MW ref	Diffusion Coefficients			log (Koc) or log(Kd) (@ 20 - 25 C)		Henry's Law Constant (@ 20 - 25 C)			Vapor Pressure (@ 20 - 25 C)		Solubility (@ 20 - 25 C)		acid pKa	base pKb	ref
					in air (cm2/s)	Dair ref	in water (cm2/s)	Dwat ref	log(l/kg)	ref	mol (atm-m3)	(unitless)	ref	ref	ref	(mg/L)			
71-43-2	Benzene	A	78.1	5	9.30E-02	A	1.10E-05	A	1.58	A	5.29E-03	2.20E-01	A	9.52E+01	4	1.75E+03	A		
100-41-4	Ethylbenzene	A	106.2	5	7.60E-02	A	8.50E-06	A	1.98	A	7.69E-03	3.20E-01	A	1.00E+01	4	1.52E+02	5		
108-88-3	Toluene	A	92.4	5	8.50E-02	A	9.40E-06	A	2.13	A	6.25E-03	2.60E-01	A	3.00E+01	4	5.15E+02	29		
1330-20-7	Xylene (mixed isomers)	A	106.2	5	7.20E-02	A	8.50E-06	A	2.38	A	6.97E-03	2.90E-01	A	7.00E+00	4	1.98E+02	5		

Site Name: Parker's Shell Station

Site Location: Castro Valley

Completed By: Andy Hilliard

Date Completed: 5/2/1997

Software version: 1.0.1

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Toxicity Data

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

Site Name: Parker's Shell Station

Site Location: Castro Valley

Completed By: Andy Hilliard

Date Completed: 5/2/1997

Software version: 1.0.1

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RBGA CHEMICAL DATABASE

Miscellaneous Chemical Data

CAS Number	Constituent	Maximum Contaminant Level		Permissible Exposure Limit PEL/TLV		Relative Absorption Factors		Detection Limits			Half Life (First-Order Decay) (days)			
		MCL (mg/L)	reference	(mg/m3)	ref	Oral	Dermal	Groundwater (mg/L)	ref	Soil (mg/kg)	ref	Saturated	Unsaturated	ref
71-43-2	Benzene	5.00E-03	52 FR 25690	3.20E+00	OSHA	1	0.5	0.002	C	0.005	S	720	720	H
100-41-4	Ethylbenzene	7.00E-01	56 FR 3526 (30 Jan 91)	4.34E+02	ACGIH	1	0.5	0.002	C	0.005	S	228	228	H
108-88-3	Toluene	1.00E+00	56 FR 3526 (30 Jan 91)	1.47E+02	ACGIH	1	0.5	0.002	C	0.005	S	28	28	H
1330-20-7	Xylene (mixed isomers)	1.00E+01	56 FR 3526 (30 Jan 91)	4.34E+02	ACGIH	1	0.5	0.005	C	0.005	S	360	360	H

Site Name: Parker's Shell Station

Site Location: Castro Valley

Completed By: Andy Hilliard

Date Completed: 5/2/1997

Software version: 1.0.1

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*Version #1:
Conservative
Decay Constants*

Tier 2 Worksheet 5.5

Site Name: Parker's Shell Station (no decay)
 Site Location: Castro Valley

Completed By: Andy Hilliard
 Date Completed: 7/2/1997

TIER 2 SUBSURFACE SOIL CONCENTRATION DATA SUMMARY

CONSTITUENTS DETECTED		Analytical Method		Detected Concentrations			
CAS No.	Name	Typical Detection Limit (mg/kg)	No. of Samples	No. of Detects	Maximum Conc. (mg/kg)	Mean Conc. (mg/kg)	UCL on Mean Conc. (mg/kg)
71-43-2	Benzene	5.0E-03	44	9	7.6E-01	4.7E-03	6.8E-03
100-41-4	Ethylbenzene	5.0E-03	44	8	3.3E+00	5.0E-03	7.6E-03
108-88-3	Toluene	5.0E-03	44	7	1.6E-01	4.1E-03	5.5E-03
1330-20-7	Xylene (mixed isomers)	5.0E-03	44	10	3.2E-01	5.3E-03	7.9E-03

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Serial: G-421-DSX-40

Software: GSI RBCA Spreadsheet
 Version: 1.0.1

RBCA SITE ASSESSMENT

006