March 11, 1997

Madhulla,

Please review over the Risk Assessment and Risk Assessment addendum for the site at 2425 Encinal Ave. I have gone through and checked all the parameters they have used and have done the calculations to see whether they were done correctly, so you don't need to grind through them again. However, I do have some other questions:

3 months

- On Table 4-12 and 4-14, ACC has assumed an ED of 1 year and a EF of 12 days out of the year for a construction worker exposed to inhalation of outdoor air. Do these parameters seem too low? There are planter areas on site. Would it be fair to assess exposure to any potential gardener?

- Do you think that the determined excess cancer risk of 6.7E-05 is too high? (Refer to Table 6-5 in addendum)?

- It seems that ACC's overall approach was in conducting the risk assessment was acceptable. Can you skim the reports and see whether you agree?

Let me know whether you have any questions.

8 hr?

Thanks,
Juliet

6.5×10^{-3}

days / year

hours / day

A·C·C
ENVIRONMENTAL
CONSULTANTS

ENVIRONMENTAL
PROTECTION
97 FEB 14 PM 2:04

February 12, 1997

Ms. Juliet Shin
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

RE: Tier 1 Risk Assessment Addendum
2425 Encinal Avenue, Alameda, California
ACC Project No. 96-6039-2.5

Dear Ms. Shin:

ACC Environmental Consultants, Inc., (ACC) incorporated your comments into the Tier 1 Risk Assessment dated December 31, 1996, for the site at 2425 Encinal Avenue, Alameda, California. The revised Figure 5 and tables are attached, and should amend those in the report. ACC still believes that the risk to human health from constituents on site is minimal.

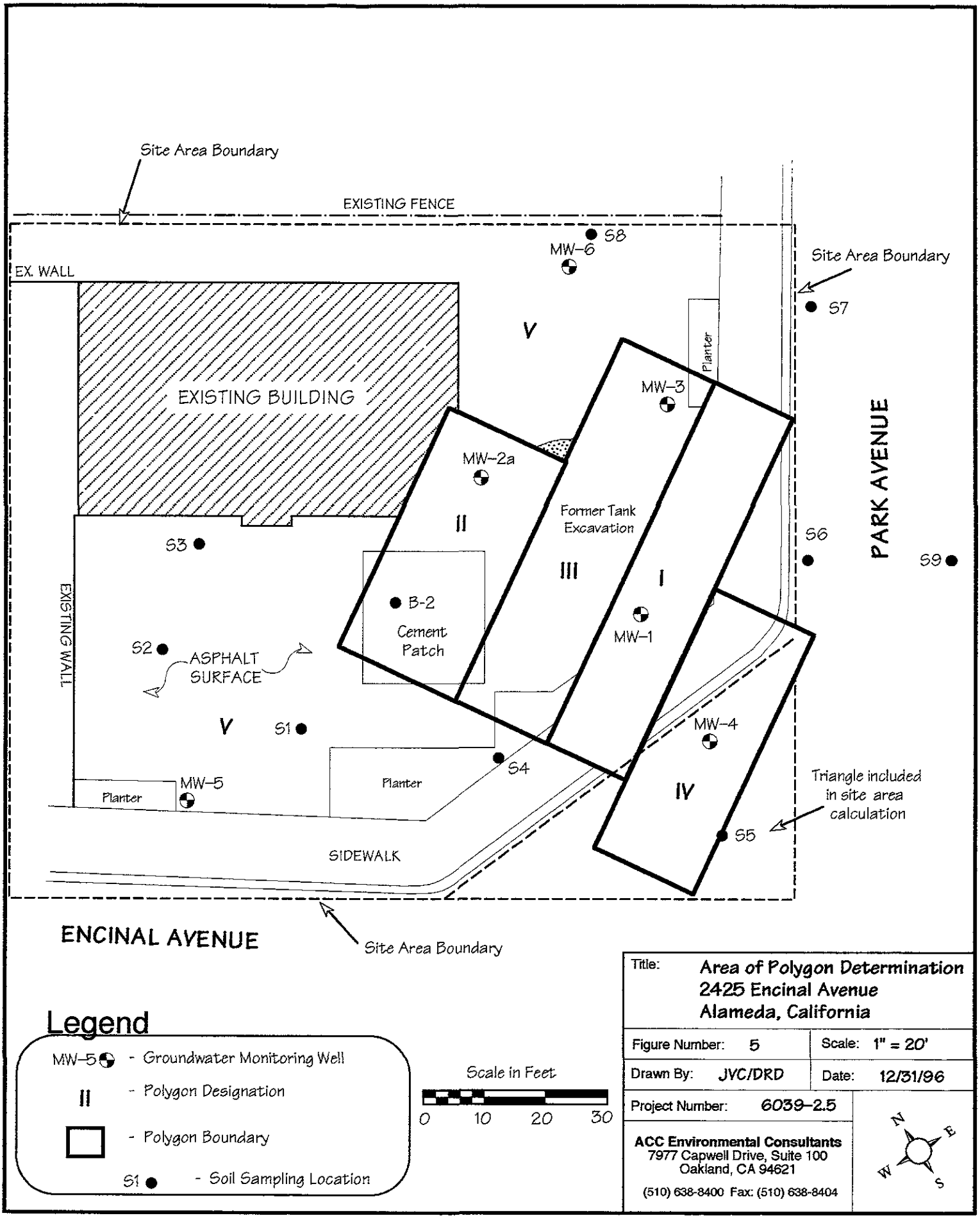
Please contact me if you have any questions regarding this addendum.

Sincerely,

Misty C. Kaltreider
Senior Project Geologist

/mcr:mck

cc: Mr. Steve Chrissanthos, Alameda Cellars



Legend

MW-5 - Groundwater Monitoring Well

II - Polygon Designation

- Polygon Boundary

S1 - Soil Sampling Location

Scale in Feet

0 10 20 30

Title:	**Area of Polygon Determination** **2425 Encinal Avenue** **Alameda, California**
Figure Number: 5	Scale: 1" = 20'
Drawn By: JVC/DRD	Date: 12/31/96
Project Number: 6039-2.5	

ACC Environmental Consultants
7977 Capwell Drive, Suite 100
Oakland, CA 94621
(510) 638-8400 Fax: (510) 638-8404

N E W S

should be 4.3! because soil concentrations from 16' bgs in MW-1 should not be used because below water table.

TABLE 3-1
THIESSEN POLYGON METHOD FOR SOIL
Alameda Cellars
2425 Encinal Avenue, Alameda, California

OK

Polygonal Element	Location of Corresponding Concentration in Boring/Well No.*	Mean Benzene Concentration in Soil - C (mg/kg)	Area of the Element A** (m^2)	A * C (m^2 - mg/kg)	Area Weighted Average Concentration (mg/kg)
I	MW-1	~~2.15~~ 4.3	81.9 ✓	~~176.1~~ 352.17	
II	MW-2a, B-2	9.85 ✓	81.27 ✓	800.5	
III	MW-3, S4	~~0.2~~ 0.3	93.6 ✓	~~18.72~~ 28.1	
IV	MW-4, S5	~~0.04~~ 2.98	74.52 ✓	~~2.98~~ 5.07	
V	MW-5, MW-6, S1, S2, S3, S8	0	906.21	0	
TOTALS			1,237.5	~~998.3~~	
Area-Weighted Average Concentration = $(\Sigma A * C)/A_{Total}$				1183.75	~~0.81~~ .96

* Benzene concentrations from borings S6, S7, and S9 were evaluated to be off the subject property and were not used in the Polygon calculation for the site.

**Areas were calculated by multiplying the area calculated in square feet by the conversion factor of 0.09.

TABLE 3-2
THIESSEN POLYGON METHOD FOR GROUNDWATER
Alameda Cellars
2425 Encinal Avenue, Alameda, California

Polygonal Element	Location of Corresponding Concentration Well No.	Mean Benzene Concentration in Water - C (µg/L)	Area of the Element A* (m^2)	A * C (m^2 - µg/L)	Area-Weighted Average Concentration µg/L
I	MW-1	395	81.9 ✓	32,350.5 ✓	
II	MW-2a	375	81.27 ✓	30,476.25 ✓	
III	MW-3	38	93.6 ✓	3,556.8 ✓	
IV	MW-4	127	74.52 ✓	9,464.04	
V	MW-5 and MW-6	0	906.21	0	
TOTALS			1,237.5	75,847.59 ✓	
Area-Weighted Average Concentration = $(\Sigma A * C)/A_{Total}$					61.3 ✓

*Areas were calculated by multiplying the area calculated in square feet by the conversion factor of 0.09.

Table 3-3
Benzene Concentrations in Soil Versus Tier 1 RBSLs

Route of Exposure	Subsurface Soil (mg/kg)					
	Maximum Detected Concentration	Area Weighted Average Concentration	ASTM RBCA Tier 1 RBSL [1]	USEPA Soil Screening Levels (SSLs)	Average Concentration Exceeds RBSL?	Average Concentration Exceeds SSL?[2]
Indoor Inhalation of Vapor	18.9 mg/kg 1.89E+01	~~0.81 mg/kg~~ .96 ~~8.1E-01~~ 9.6×10^{-1}	3.16E-02	N/A	YES	N/A
Outdoor Inhalation of Vapor	18.9 mg/kg 1.89E+01	~~0.81 mg/kg~~ .96 ~~8.1E-01~~ 9.6×10^{-1}	1.33E00	2.5E+01	no	no
Ingestion of Soil	18.9 mg/kg 1.89E+01	~~0.81 mg/kg~~ .96 ~~8.1E-01~~ 9.6×10^{-1}	1.68E-01	2.2E+02	YES	no

[1] CalEPA. January 5, 1996. *Interim Guidelines.*
[2] USEPA. March 1994. *Technical Background Document for Draft Soil Screening Level Guidance.*

"Soil leachate to protect g.w. ingestion target rate"

Table 3-4
Benzene Concentrations in Groundwater Versus Tier 1 RBSLs

Route of Exposure	Groundwater (mg/L)			
	Maximum Detected Concentration	Area Weighted Average Concentration	ASTM RBCA Tier 1 RBSL[1]	Average Concentration Exceeds RBSL?
Indoor Inhalation of Vapor	470 µg/L 4.7E+00 mg/L	61.3 µg/L 6.13E-02 mg/L	2.14E-01 214 ppb	no
Outdoor Inhalation of Vapor	470 µg/L 4.7E+00 mg/L	61.3 µg/L 6.13E-02 mg/L	5.34E+01 53,400 ppb	no
Ingestion of Groundwater	470 µg/L 4.7E+00 mg/L	61.3 µg/L 6.13E-02 mg/L	2.86E-02 29 ppb	YES

[1] CalEPA. January 5, 1996. *Interim Guidelines*

Table 4-1
Effective Diffusion Coefficient in Soil Based on Vapor-Phase Concentration
Alameda Cellars
2425 Encinal Avenue, Alameda, California

$$D_s^{eff}\left(cm^2/s\right)=\left[D_{air}\times\left(\frac{\theta_{as}^{3.33}}{\theta_T^2}\right)\right]+\left[\frac{D_{wat}}{H}\times\left(\frac{\theta_{ws}^{3.33}}{\theta_T^2}\right)\right]$$

Parameter	Value
D_{air}	0.093 cm^2/s
θ_{as}	0.26 cm^3-air/cm^3-soil
θ_T	0.38 cm^3/cm^3-soil
D_{wat}	1.1E-05 cm^2/s
H	0.22 cm^3 H_2O/cm^3-air
θ_{ws}	0.12 cm^3 H_2O/cm^3-soil

Therefore, D_s^{eff} = 7.26E-03 cm^2/s

Table 4-2
Effective Diffusion Coefficient Through Foundation
Alameda Cellars
2425 Encinal Avenue, Alameda, California

$$D_{crack}^{eff}\left(cm^2/s\right)=\left[D_{air}\times\left(\frac{\theta_{acrack}^{3.33}}{\theta_T^2}\right)\right]+\left[\frac{D_{wat}}{H}\times\left(\frac{\theta_{wcrack}^{3.33}}{\theta_T^2}\right)\right]$$

Parameter	Value
D_{air}	0.093 cm^2/s
θ_{acrack}	0.26 cm^3-air/cm^3-soil
θ_T	0.38 cm^3/cm^3-soil
D_{wat}	1.1E-05 cm^2/s
H	0.22 cm^3 H_2O/cm^3-air
θ_{wcrack}	0.12 cm^3 H_2O/cm^3-soil

Therefore, D_{cracks}^{eff} = 7.26E-03 cm^2/s

Table 4-3
Effective Diffusion Coefficient Through Capillary Fringe
Alameda Cellars
2425 Encinal Avenue, Alameda, California

$$D_{cap}^{eff}(cm^2/s) = \left[D_{air} \times \left(\frac{\theta_{acap}^{3.33}}{\theta_T^2}\right)\right] + \left[\frac{D_{wat}}{H} \times \left(\frac{\theta_{wcap}^{3.33}}{\theta_T^2}\right)\right]$$

Parameter	Value
D_{air}	0.093 cm^2/s
θ_{acap}	0.38 cm^3-air/cm^3-soil
θ_T	0.38 cm^3/cm^3-soil
D_{wat}	1.1E-05 cm^2/s
H	0.22 cm^3 H_2O/cm^3-air
θ_{wcap}	0.342 cm^3 H_2O/cm^3-soil

Therefore, D_{cap}^{eff} = 2.6E-02 cm^2/s ok

Table 4-4
Effective Diffusion Coefficient between Groundwater and Subsurface Soil
Alameda Cellars
2425 Encinal Avenue, Alameda, California

$$D_{ws}^{eff}(cm^2/s) = (h_{cap} + h_v) \times \left[\left(\frac{h_{cap}}{D_{cap}^{eff}}\right) + \left(\frac{h_v}{D_s^{eff}}\right)\right]^{-1}$$

Parameter	Value
h_{cap}	5 cm
h_v	100 cm
D_{cap}^{eff}	2.6E-02 cm^2/s
D_s^{eff}	7.26-03 cm^2/s

Therefore, D_{ws}^{eff} = 7.52E-03 cm^2/s ok

Table 4-5
Volatilization Factor: Groundwater to Enclosed Space Air
Alameda Cellars
2425 Encinal Avenue, Alameda, California

$$VF_{wesp}\left[\frac{(mg/m^3-air)}{mg/L-H_2O}\right]=\frac{H\times\left[\frac{D_{ws}^{eff}/L_{GW}}{ER\times L_B}\right]}{1+\left[\frac{D_{ws}^{eff}/L_{GW}}{ER\times L_B}\right]+\left[\frac{D_{ws}^{eff}/L_{GW}}{(D_{cracks}^{eff}/L_{crack})n}\right]}\times 10^3\frac{L}{m^3}$$

Parameter	Value
H	0.22 cm^3 H_2O/cm^3-air
D_{ws}^{eff}	7.52E-03 cm^2/s
L_{GW}	105 cm = 3.44'
ER	2.3E-04 s^{-1} (From ASTM)
L_B	300 cm (")
D_{cracks}^{eff}	7.26E-03 cm^2/s
L_{crack}	1.5E+01 cm (from ASTM)
n	1.0E-02 cm^2-cracks/cm^2 -total area

Therefore, VF_{wesp} = 1.45E-01 (mg/m^3-air)/(mg/L-H_2O) 1.45 x 10^{-2}

Table 4-6
Volatilization Factor: Groundwater to Ambient Air
Alameda Cellars
2425 Encinal Avenue, Alameda, California

$$VF_{wamb}\left[\frac{(mg/m^3-air)}{mg/L-H_2O}\right]=\frac{H}{1+\left[\frac{U_{air}\times\delta_{air}\times L_{GW}}{W\times D_{ws}^{eff}}\right]}\times 10^3\frac{L}{m^3}$$

Parameter	Value
H	0.22 cm^3 H_2O/cm^3-air
U_{air}	225 cm (From ASTM)
δ_{air}	200 cm (")
L_{GW}	105 cm
W	1,500 cm (From ASTM)
D_{ws}^{eff}	7.52E-03 cm^2/s

also, seems to fit site

Therefore, VF_{wamb} = 5.24E-03 (mg/m^3-air)/(mg/L-H_2O)
5.25 x 10^{-4}

Table 4-7
Volatilization Factor: Soil to Enclosed Space Air
Alameda Cellars
2425 Encinal Avenue, Alameda, California

$$VF_{sesp}\left[\frac{mg/m^3-air}{mg/kg-soil}\right]=\frac{\dfrac{H\rho_s}{\left[\theta_{ws}+k_s\rho_s+H\theta_{as}\right]}\left[\dfrac{D_s^{eff}/L_s}{ERL_B}\right]}{1+\left[\dfrac{D_s^{eff}/L_s}{ERL_B}\right]+\left[\dfrac{D_s^{eff}/L_s}{\left(D_{crack}^{eff}/L_{crack}\right)\eta}\right]}\times 10^3\frac{cm^3-kg}{m^3-g}$$

Parameter	Value
H	0.22 cm^3 H_2O/cm^3-air
ρ_s	1.7 g/cm^3
θ_{ws}	0.12 g/cm^3
k_s	0.38 cm^3-H_2O/g -soil
θ_{as}	0.26 cm^3-air/cm^3
D_s^{eff}	7.26-03 cm^2/s
ER	2.3E-04 s^{-1}
L_s	100 cm
L_B	300 cm
D_{cracks}^{eff}	7.26E-03 cm^2/s
L_{crack}	1.5E+01 cm
η	1.0E-02 cm^2-cracks/cm^2 -total area

log Koc = 1.58

Conservative for site

Therefore, VF_{sesp} = 3.3E-04 (mg/m^3-air)/(mg/kg-soil)

↑ 2.9×10^{-2}

Table 4-8
Volatilization Factor: Soil to Ambient Air
Alameda Cellars
2425 Encinal Avenue, Alameda, California

$$VF_{samb}\left[\frac{(mg/m^3-air)}{mg/kg-soil}\right]=\frac{H\rho_s}{\left[\theta_{ws}+k_s\rho_s+H\theta_{as}\right]\left(1+\frac{U_{air}\delta_{air}L_s}{D_s^{eff}W}\right)}\times 10^3\,\frac{cm^3-kg}{m^3-g}$$

Parameter	Value
H	0.22 cm^3 H_2O/cm^3-air
θ_{ws}	0.12 cm^3-air/cm^3-soil
k_s	0.38 cm^3 H_2O/g-soil
θ_{as}	0.26 cm^3-air/cm^3-soil
U_{air}	225 cm (From ASTM)
δ_{air}	200 cm "
L_s	100 cm "
W	1,500 cm "
D_s^{eff}	7.26E-03 cm^2/s

$\rho_s = 1.7$

Therefore, VF_{samb} = 1.1E-02 (mg/m^3-air)/(mg/kg-soil)

1.1 X 10^{-3}

Table 4-9
Exposure Point Concentrations for Groundwater COPCs
Alameda Cellars
2425 Encinal Avenue, Alameda, California

Chemical	Direct Groundwater Contact (mg/L)	VF_{wesp} (mg/m^3-air)/ (mg/L-H_2O)	Enclosed Air Concentration (mg/m^3) [1]	VF_{wamb} (mg/m^3-air)/ (mg/L-H_2O)	Ambient Air Concentration (mg/m^3) [2]
Benzene	6.13E-02	~~1.45E-01~~ 1.45×10^{-2}	~~8.9E-03~~ 8.9×10^{-4}	~~5.24E-03~~ 5.24×10^{-4}	~~3.2E-04~~ 3.2×10^{-5}

[1] Enclosed space air concentration calculated by multiplying groundwater concentration by appropriate volatilization factor (VF_{wesp}).

[2] Ambient air concentration calculated by multiplying groundwater concentration by appropriate volatilization factor (VF_{wamb}).

Table 4-10
Exposure Point Concentrations for Soil COPCs
Alameda Cellars
2425 Encinal Avenue, Alameda, California

Chemical	Direct Soil Contact (mg/kg)	VF_{sesp} (mg/m^3-air)/ (mg/kg-soil)	Enclosed Air Concentration (mg/m^3) [1]	VF_{samb} (mg/m^3-air)/ (mg/kg-soil)	Ambient Air Concentration (mg/m^3) [2]
Benzene	~~8.1E-01~~ 9.6×10^{-1}	~~3.3E-04~~ 2.9×10^{-2}	~~2.7E-04~~ 2.8×10^{-2}	~~1.1E-02~~ 1.1×10^{-3}	~~8.9E-03~~ 1.1×10^{-3}

[1] Enclosed space air concentration calculated by multiplying groundwater concentration by appropriate volatilization factor (VF_{sesp}).

[2] Ambient air concentration calculated by multiplying groundwater concentration by appropriate volatilization factor (VF_{samb}).

Table 4-11
Chemical Intake Exposure Assumptions Onsite Commercial Worker - Groundwater
Inhalation of Indoor Air
Alameda Cellars
2425 Encinal Avenue, Alameda, California

$$Intake(mg/kg-day) = \frac{C_A \times IR \times ET \times EF \times ED}{BW \times AT}$$

Parameter			Onsite Commercial Worker Value
CA	=	Chemical concentration in air (mg/m^3)	~~8.9E-03~~ (see Table 4-9)
IR	=	Inhalation rate (m^3/hour)	0.83
ET	=	Exposure time (hour/day)	~~8~~
EF	=	Exposure frequency (days/year)	250
ED	=	Exposure duration (years)	~~25~~
BW	=	Body weight (kg)	70
AT	=	Averaging time (days)	25,550

Therefore, Intake for the onsite commercial worker = 2.07E-04 mg/kg-day

Table 4-12
Chemical Intake Exposure Assumptions Onsite Construction Worker - Groundwater
Inhalation of Outdoor Air
Alameda Cellars
2425 Encinal Avenue, Alameda, California

$$Intake(mg/kg-day) = \frac{C_A \times IR \times ET \times EF \times ED}{BW \times AT}$$

Parameter			Onsite Construction Worker Value
CA	=	Chemical concentration in air (mg/m^3)	3.2E-04 (see Table 4-9)
IR	=	Inhalation rate (m^3/hour)	0.83
ET	=	Exposure time (hour/day)	8
EF	=	Exposure frequency (days/year)	12
ED	=	Exposure duration (years)	1
BW	=	Body weight (kg)	70
AT	=	Averaging time (days)	25,550

Therefore, Intake for the onsite construction worker = 1.4E-08 mg/kg-day

Table 4-13
Chemical Intake Exposure Assumptions Onsite Commercial Worker - Soil
Inhalation of Indoor Air
Alameda Cellars
2425 Encinal Avenue, Alameda, California

$$Intake(mg/kg-day) = \frac{C_A \times IR \times ET \times EF \times ED}{BW \times AT}$$

Parameter			Onsite Commercial Worker Value
CA	=	Chemical concentration in air (mg/m^3)	~~2.7E-04~~ (see Table 4-10)
IR	=	Inhalation rate (m^3/hour)	0.83
ET	=	Exposure time (hour/day)	8
EF	=	Exposure frequency (days/year)	250
ED	=	Exposure duration (years)	~~25~~
BW	=	Body weight (kg)	70
AT	=	Averaging time (days)	25,550

Therefore, Intake for the onsite commercial worker = ~~6.3E-06~~ mg/kg-day

Table 4-14
Chemical Intake Exposure Assumptions Onsite Construction Worker- Soil
Inhalation of Outdoor Air
Alameda Cellars
2425 Encinal Avenue, Alameda, California

$$Intake(mg/kg-day) = \frac{C_A \times IR \times ET \times EF \times ED}{BW \times AT}$$

Parameter			Onsite Construction Worker Value
CA	=	Chemical concentration in air (mg/m^3)	~~8.9E-03~~ (see Table 4-10)
IR	=	Inhalation rate (m^3/hour)	0.83
ET	=	Exposure time (hour/day)	~~8~~
EF	=	Exposure frequency (days/year)	~~12~~
ED	=	Exposure duration (years)	1
BW	=	Body weight (kg)	70
AT	=	Averaging time (days)	25,550

Therefore, Intake for the onsite construction worker = ~~3.97E-07~~ mg/kg-day

Table 5-1
Toxicity Values for Benzene
Alameda Cellars
2425 Encinal Avenue, Alameda, California

Chemical	Carcinogenic Weight of Evidence	Inhalation Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$	
		Value	Source
Benzene	A	1.0E-01	CalEPA

Table 6-1
Excess Cancer Risk Summary for Onsite Commercial Worker - Groundwater
Alameda Cellars
2425 Encinal Avenue, Alameda, California

R = SF x LDCI

Parameter			Onsite, Indoor Commercial Worker Value
R	=	Excess lifetime cancer risk (probability)	2.07E-05
SF	=	Slope factor $(mg/kg/day)^{-1}$ for benzene from linearized model	1.0E-01 (see Table 5-1)
LDCI	=	Lifetime daily chemical intake (mg/kg/day)	2.07E-~~04~~ x/0 -5 (see Table 4-11)

Therefore, the excess lifetime cancer risk for the onsite, indoor commercial worker = 2.07E-~~05~~ x/0 -6

Table 6-2
Excess Cancer Risk Summary for Onsite Construction Worker - Groundwater
Alameda Cellars
2425 Encinal Avenue, Alameda, California

R = SF x LDCI = 10 -11

Parameter			Onsite Construction Worker Value
R	=	Excess lifetime cancer risk (probability)	1.4E-09
SF	=	Slope factor $(mg/kg/day)^{-1}$ from linearized model	1.0E-01 (see Table 5-1)
LDCI	=	Lifetime daily chemical intake (mg/kg/day)	~~1.4E-08~~ 1.0 x/0 -9 (see Table 4-12)

Therefore, the excess lifetime cancer risk for the onsite, outdoor construction worker = ~~1.4E-09~~ 1.0 x/0 -10

Table 6-3
Excess Cancer Risk Summary for Onsite Commercial Worker - Soil
Alameda Cellars
2425 Encinal Avenue, Alameda, California

R = SF x LDCI = 1.6 X10^{-6}

Parameter			Onsite, Indoor Commercial Worker Value
R	=	Excess lifetime cancer risk (probability)	6.3E-07
SF	=	Slope factor (mg/kg/day)$^{-1}$ for benzene from linearized model	1.0E-01 (see Table 5-1)
LDCI	=	Lifetime daily chemical intake (mg/kg/day)	~~6.3E-06~~ 6.5 x10^{-4} (see Table 4-13) 1.6 X10^{-5}

Therefore, the excess lifetime cancer risk for the onsite, indoor commercial worker = ~~6.3E-07~~ 6.5 x10^{-5}

Table 6-4
Excess Cancer Risk Summary for Onsite Construction Worker - Soil
Alameda Cellars
2425 Encinal Avenue, Alameda, California

R = SF x LDCI = 10^{-10}

Parameter			Onsite Construction Worker Value
R	=	Excess lifetime cancer risk (probability)	3.97E-08
SF	=	Slope factor (mg/kg/day)$^{-1}$ from linearized model	1.0E-01 (see Table 5-1)
LDCI	=	Lifetime daily chemical intake (mg/kg/day)	~~3.97E-07~~ 4.8 x10^{-8} (see Table 4-14)

Therefore, the excess lifetime cancer risk for the onsite, outdoor construction worker = ~~3.97E-08~~ 4.8 x10^{-9}

10^{-10}

Table 6-5
Total Excess Cancer Risk Summary for Onsite Commercial Worker
Alameda Cellars
2425 Encinal Avenue, Alameda, California

Worker/Pathway	Excess Lifetime Cancer Risk
Onsite Commercial Worker/groundwater	~~2.07E-05~~ 2.07×10^{-6}
Onsite Commercial Worker/soil	~~6.3E-07~~ 6.5×10^{-5}
Total	~~2.13E-05~~ 6.7×10^{-5}

Table 6-6
Total Excess Cancer Risk Summary for Onsite Construction Worker
Alameda Cellars
2425 Encinal Avenue, Alameda, California

Worker/Pathway	Excess Lifetime Cancer Risk
Onsite Construction Worker/groundwater	1.~~4E-09~~ 1.0×10^{-9}
Onsite Construction Worker/soil	3.~~97E-08~~ 4.8×10^{-8}
Total	~~4.1E-08~~ 4.9×10^{-8}