STID 3520

Versar INC.

January 6, 2000

Mr. John A. Schovanec
Bank of America, N.A.
Environmental Services #305478
4000 MacArthur Boulevard, Suite 100
Newport Beach, California 92660

00 JAN 11 PM 2:04
ALAMEDA COUNTY
ENVIRONMENTAL
PROTECTION

Reference: Risk-Based Corrective Action (RBCA) Analysis
2585 Nicholson Street in San Leandro, California
ES# 305582
Versar Project No. 4422-002

Dear Mr. Schovanec:

In accordance with our proposal of November 1, 1999, and as authorized in Bank of America's engagement letter dated November 16, 1999, Versar, Inc. (Versar) has performed a Risk-Based Corrective Action (RBCA) analysis of residual petroleum hydrocarbons at the Site. The purpose for the RBCA analysis is to assess the magnitude of risk, if any, to human health associated with known Site groundwater contamination. The analysis was prepared using standard default parameters and existing Site data.

Site benzene concentrations at monitoring well MW-1 have fluctuated widely since June 1992, with the maximum concentration of 1,400 ppb detected in May 1999. Benzene concentrations have decreased significantly in subsequent monitoring events. A commercial building is located in the down-gradient direction of groundwater flow (April and July 1999). Since benzene could be migrating off Site to the southeast, and groundwater is shallow (less than 10 feet), the RBCA analysis was performed to quantify the risk to human health, if any, from potentially completed human receptor contact pathways within the area of benzene concentrations.

The RBCA Assessment

Versar has performed an American Society of Testing and Materials (ASTM) RBCA assessment of aromatic hydrocarbon concentrations in soil and groundwater to characterize potential risk to commercial workers in the area of maximum benzene concentrations at the Site. This assessment is considered a conservative indication of the risk to human health in the benzene plume area. While the Site and RBCA analysis include concentrations of other aromatic hydrocarbons, benzene is considered the chemical of concern, based on its concentrations and health risk to humans. The RBCA analysis includes an assessment of the cumulative risk of multiple chemicals of concern, as well as the potential impacts of individual chemicals. The RBCA assessment includes Versar's Site-specific data and assumptions regarding contaminant exposure pathways and Site receptors.

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The RBCA assessment is a decision-making process for assessment and response development to subsurface contamination by petroleum compounds. The process takes into account general physical and chemical characteristics of the Site in a tiered approach to tailor assessment and remediation activities to site-specific conditions. The RBCA process utilizes risk and exposure assessment practices promulgated by the U.S. Environmental Protection Agency (USEPA).

The RBCA assessment is performed in tiers. A Tier 1 assessment is initially performed to evaluate potential risks to on-site users using a broad, conservative approach. Contaminant exposure pathways via air, soil, and ground- and surface-water matrices to on-site users are identified; and cancer and toxicity risks are derived for chemicals of concern. In addition, risk-based screening levels (RBSLs) for each pathway matrix may be developed to focus further assessment activities on areas of greater risk.

If Tier 1 cancer/toxicity risks are exceeded, or there are off-site receptors, a Tier 2 assessment is performed. The Tier 2 analysis reassesses potential cancer/toxicity risks posed by Site chemicals of concern with more site-specific data, and also derives site-specific target levels (SSTL) for cleanup of each constituent of concern in air, water or soil matrices to levels protective of prospective receptors. The Tier 2 assessment incorporates site-specific parameters in performing conservative contaminant transport analyses for soil, groundwater and air to characterize risks from chemicals of concern to on- and off-site receptors. Models for contaminant transport and attenuation can be selected based on the amount of available data regarding site physical and chemical conditions, as well as contaminant concentration data over time.

The Site RBCA Analysis

Versar's RBCA analyses utilized a Microsoft® Excel spreadsheet-based program by Groundwater Services, Inc. (GSI) called the *RBCA Tool Kit, Chemical Releases, Version 1.0a* (RBCA Tool Kit). The GSI program utilizes the formulas and guidelines of the ASTM *Provisional Guide for Risk Based Corrective Action*, PS 104, in a PC-compatible, windows-based application. Printouts generated by the RBCA Toolkit presenting and supporting Versar's RBCA analyses are presented in Attachment I.

Risk Assessment Parameters

Site constituents of concern are the following: benzene, toluene, ethylbenzene, and total xylene isomers. Benzene represents the most significant potential risk since it is a carcinogen. Tier 1 and Tier 2 analyses characterize site usage as either residential or commercial, with adult or child receptors. The observed Site use is commercial. The identified receptor exposure pathway is inhalation from vapors emanating from contaminants in groundwater to indoor and outdoor air (see Figure 1, Attachment I). This pathway was selected because surface and subsurface concentrations

of hydrocarbons in soil have not been identified or have been removed, surface water is not present in the defined area of hydrocarbons, and no drinking, agricultural, or industrial water supply wells have been identified in the area of hydrocarbons.

Versar used the ASTM RBCA Tier 1 assessment methodology to characterize the risk to human health from residual hydrocarbons in groundwater at the Site. The exposure scenarios were based on commercial Site use. The exposure pathway was determined to be volatilization to indoor and outdoor air from residual hydrocarbon concentrations in shallow groundwater. The 95 percent upper confidence level of the mean concentration of each chemical of concern at the location of highest concentrations, monitoring well MW-1, was used in the model. Conservative model defaults were used where Site-specific parameters are not known. Site-specific information used in the model included the depth to saturated soil and groundwater, soil type, and soil pH (see Figure 2). The very conservative default receptor exposure duration of 25 years (the Reasonable Maximum Exposure - RME) was used in the model. RBCA chemical exposure pathways are presented in Figure 3.

Findings

The results of the Tier 1 RBCA analysis indicate that the selected cancer risk threshold of one-in-a-million ($1x10^{-6}$) is not exceeded for outdoor air (result is $3.4x10^{-10}$) and indoor air (result is $9.0x10^{-8}$) as a result of inhaling volatilized benzene at the location of maximum groundwater concentration s at the Site. The cumulative risk of toxic effects from inhaling volatilized chemicals of concern at the Site are less than the Hazard Index of 1.0. for outdoor air (result is $2.0x10^{-5}$) and indoor air (result is $5.2x10^{-3}$). The RBCA worksheets for the indoor and outdoor exposure scenarios are presented in Figures 4 and 5, and a summary of the risks is presented in Figure 6.

Conclusion

Versar finds that the residual concentrations of aromatic hydrocarbons in the subsurface at the location of maximum impact do not present an actionable risk to human health.

References

Groundwater Services, Inc. (GSI). *RBCA Tool Kit for Chemical Releases, Version 1.0a.* 1998.

U.S. Department of Agriculture, Soil Conservation Service. *Soil Survey of Alameda County, California, Western Part.* 1980. 273-058/6

Versar, Inc.. *Monitoring Well Installation and Groundwater Monitoring Report.* Prepared for Bank of America, N.T. & S.A.. Project No. 4422-001. June 30, 1999.

Statement of Limitations

The conclusions presented above are based on the agreed-upon scope of work outlined in the beginning of this report. Versar makes no warranties or guarantees as to the accuracy or completeness of information provided or compiled by others and used by Versar. It is possible that information exists beyond the scope of this investigation. Also, changes in Site use may have occurred sometime in the past due to variations in rainfall, temperature, water usage, economic, agricultural, or other factors. Additional information that was not found or available to Versar at the time of the writing of this report may result in a modification of the conclusions presented. This report is not a legal opinion.

The services performed by Versar have been conducted in a manner consistent with the level of care ordinarily exercised by members of our profession currently practicing under similar conditions. No other warranty expressed or implied is made.

This RBCA assessment was prepared by Versar on behalf of Bank of America. Mr. Tim Berger, Registered Geologist, prepared the report, and Mr. Scott Allin, Registered Environmental Assessor, reviewed the report.

Prepared by:

Tim Berger R.G. 5225
Supervising Geologist
Versar - Pacific Region

Reviewed by:

Scott Allin, R.E.A. 076223
Senior Program Manager
Versar - Pacific Region

Attachment I - RBCA Toolkit Printout

cc: Juliett Shin (Alameda County)
Mike Bakaldin (City of San Leandro)

ATTACHMENT I

RBCA Toolkit Printout

Exposure Pathway Flowchart

Site Name: Bank of America - San Leandro, California Job ID: 4422-001
Location: 2585 Nicholson Street Date: 1-Dec-99
Compl. By: Tim Berger

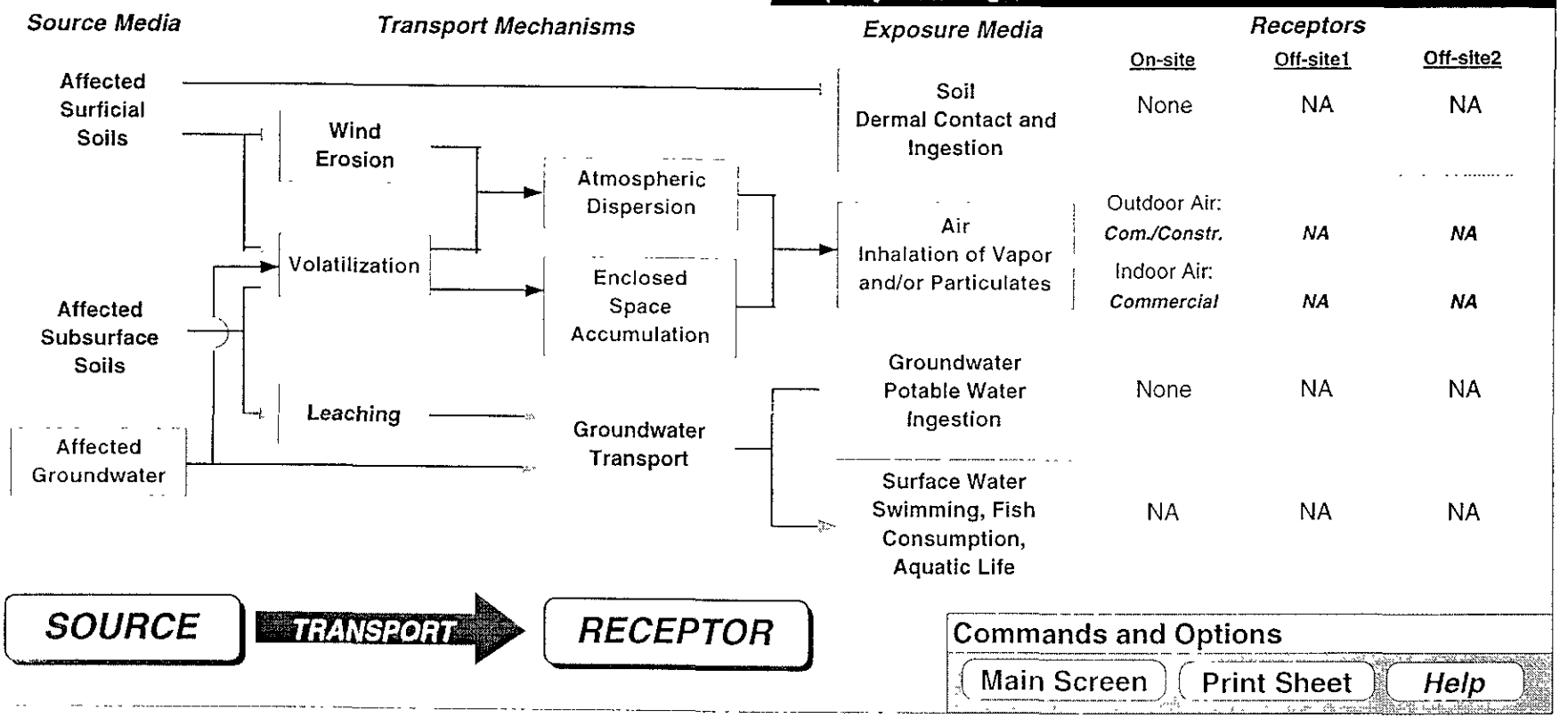


FIGURE 1

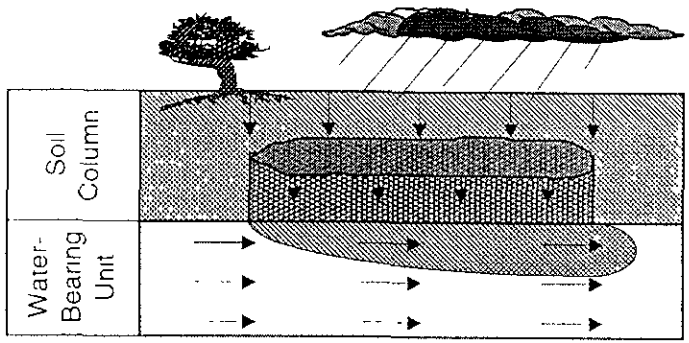
Site-Specific Soil Parameters

Site Name: Bank of America - San Leandro, California Job ID: 4422-001
Location: 2585 Nicholson Street Date: 1-Dec-99
Compl. By: Tim Berger

1. Soil Source Zone Characteristics

Hydrogeology

	General Case Construction	
Depth to water-bearing unit	5.544619423	(ft)
Capillary zone thickness	0.95144357	(ft)
Soil column thickness	4.593175853	(ft)
Affected Soil Zone		
Depth to top of affected soils		(ft)
Depth to base of affected soils		(ft)
Affected soil area		(ft^2)
Length of affected soil parallel to assumed wind direction		(ft)
Length of affected soil parallel to assumed GW flow direction		(ft)



2. Surface Soil Column

	Vadose Zone	Capillary Fringe	
Predominant USCS Soil Type	CL. Silty Clay		
or Enter Directly			
Total porosity	0.36		(-)
Volumetric water content	0.34	0.35	(-)
Volumetric air content	0.02	0.010	(-)
Dry bulk density	1.7		(kg/L)
Vertical hydraulic conductivity	8.6E-3		(cm/d)
Vapor permeability	1.1E-16		(ft^2)
Capillary zone thickness	9.5E-1		(ft)

Net Rainfall Infiltration

Net infiltration estimate		(cm/yr)
or NA	*or*	
Average annual precipitation		(cm/yr)

Partitioning Parameters

Fraction organic carbon	0.01	(-)
Soil/water pH	7.2	(-)

3. Commands and Options

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

FIGURE 2

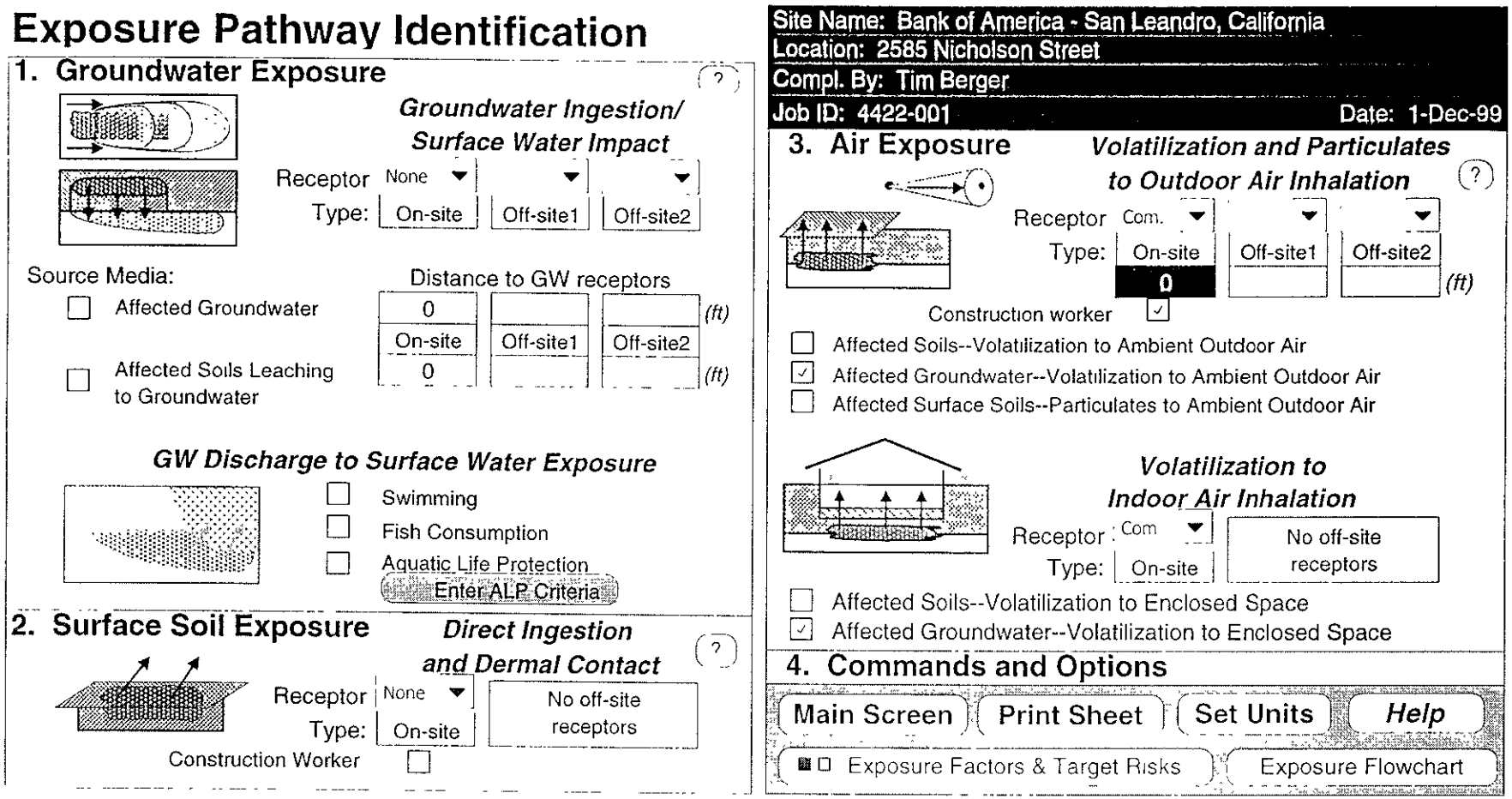

Exposure Pathway Identification
1. Groundwater Exposure
Groundwater Ingestion/
Surface Water Impact
Receptor None
Type: On-site Off-site1 Off-site2
Source Media:
Affected Groundwater
Affected Soils Leaching to Groundwater
Distance to GW receptors
0 On-site
0
(ft)
GW Discharge to Surface Water Exposure
Swimming
Fish Consumption
Aquatic Life Protection
Enter ALP Criteria
2. Surface Soil Exposure
Direct Ingestion
and Dermal Contact
Receptor None
Type: On-site
No off-site receptors
Construction Worker
Site Name: Bank of America - San Leandro, California
Location: 2585 Nicholson Street
Compl. By: Tim Berger
Job ID: 4422-001
Date: 1-Dec-99
3. Air Exposure
Volatilization and Particulates
to Outdoor Air Inhalation
Receptor Com.
Type: On-site Off-site1 Off-site2
0
(ft)
Construction worker
Affected Soils--Volatilization to Ambient Outdoor Air
Affected Groundwater--Volatilization to Ambient Outdoor Air
Affected Surface Soils--Particulates to Ambient Outdoor Air
Volatilization to
Indoor Air Inhalation
Receptor Com
Type: On-site
No off-site receptors
Affected Soils--Volatilization to Enclosed Space
Affected Groundwater--Volatilization to Enclosed Space
4. Commands and Options
Main Screen
Print Sheet
Set Units
Help
Exposure Factors & Target Risks
Exposure Flowchart

FIGURE 3

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

GROUNDWATER VAPOR INHALATION

Exposure Concentration

Constituents of Concern	1) Source Medium: Groundwater Conc (mg/L)	2) NAF Value (m^3/L) Receptor: On-site (0 ft) Commercial	Off-site 1 (0 ft) NA	Off site 2 (0 ft) NA	3) Exposure Medium Outdoor Air POE Conc (mg/m^3) (1) / (2): On site (0 ft) Commercial	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA
Benzene	2 2E-1	1 3E+6			1 7E-7		
Toluene	8 8E-2	1 3E+6			6 7E-8		
Ethylbenzene	8 4E-2	1 5E+6			5 5E-8		
Xylene (mixed isomers)	3 6E-1	1 5E+6			2 4E-7		

NOTE NAF = Natural attenuation factor POE = Point of exposure

Site Name Bank of America - San Leandro California
Site Location 2585 Nicholson Street
Completed By Tim Berger

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FIGURE 4

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

GROUNDWATER, VAPOR INHALATION (cont'd)

Constituents of Concern	4) Exposure Multiplier (EFxED)/(ATx365) (unitless)			5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4)		
	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)	On-site (0 ft)	Off-site 1 (0 ft)	Off-site 2 (0 ft)
	Commercial	NA	NA	Commercial	NA	NA
Benzene	2.4E-1			4.1E-8		
Toluene	6.8E-1			4.6E-8		
Ethylbenzene	6.8E-1			3.8E-8		
Xylene (mixed isomers)	6.8E-1			1.7E-7		

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

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FIGURE 4

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

OUTDOOR AIR EXPOSURE PATHWAYS

TOTAL PATHWAY EXPOSURE (mg/m^3)
(Sum average expsosure concentrations from soil and groundwater routes)

Constituents of Concern	On-site (0 ft) Commercial	On-site (0 ft) Construction Worker	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA
Benzene	4 1E-8			
Toluene	4 6E-8			
Ethylbenzene	3 8E-8			
Xylene (mixed isomers)	1 7E-7			

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FIGURE 4

RBCA SITE ASSESSMENT

TIER 1 PATHWAY RISK CALCULATION

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

CARCINOGENIC RISK

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m^3)				(3) Inhalation Unit Risk Factor (µg/m^3)^-1	(4) Individual COC Risk (2) x (3) x 1000			
		On site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)		On-site (0 ft)		Off-site 1 (0 ft)	Off-site 2 (0 ft)
		Commercial	Construction Worker	NA	NA		Commercial	Construction Worker	NA	NA
Benzene	A	4 1E-8				8 3E-6	3 4E-10			
Toluene	D									
Ethylbenzene	D									
Xylene (mixed isomers)	D									
Total Pathway Carcinogenic Risk =							3.4E-10			

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FIGURE 4

RBCA SITE ASSESSMENT

TIER 1 PATHWAY RISK CALCULATION

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

TOXIC EFFECTS

Constituents of Concern	(5) Total Toxicant Exposure (mg/m^3) On site (0 ft) Commercial	On site (0 ft) Construction Worker	Off site 1 (0 ft) NA	Off site 2 (0 ft) NA	(6) Inhalation Reference Conc (mg/m^3)	(7) Individual COC Hazard Quotient (5) / (6) On-site (0 ft) Commercial	On-site (0 ft) Construction Worker	Off-site 1 (0 ft) NA	Off-site 2 (0 ft) NA
Benzene	1.2E-7				6.0E-3	1.9E-5			
Toluene	4.6E-8				4.0E-1	1.1E-7			
Ethylbenzene	3.8E-8				1.0E+0	3.8E-8			
Xylene (mixed isomers)	1.7E-7				7.0E+0	2.4E-8			
Total Pathway Hazard Index =						2.0E-5			

Site Name Bank of America - San Leandro, California
Site Location 2585 Nicholson Street

Completed By Tim Berger
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FIGURE 4

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

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

GROUNDWATER VAPOR INTRUSION INTO ON-SITE BUILDINGS

Exposure Concentration

Constituents of Concern	1) Source Medium Groundwater Conc (mg/L)	2) NAF Value (unitless) Receptor Commercial	3) Exposure Medium Indoor Air POE Conc (mg/m3) Commercial	4) Exposure Multiplier EF x ED / (AT x 365) (unitless) Commercial	5) Average Inhalation Exposure Concentration (mg/m^3) (3) X (4) Commercial
Benzene	2 2E-1	4 9E+3	4 5E-5	2 4E-1	1 1E-5
Toluene	8 8E-2	5 0E+3	1 8E-5	6 8E-1	1 2E-5
Ethylbenzene	8 4E-2	5 8E+3	1 5E-5	6 8E-1	1 0E-5
Xylene (mixed isomers)	3 6E-1	5 5E+3	6 5E-5	6 8E-1	4 4E-5

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

Site Name Bank of America San Leandro California
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FIGURE 5

RBCA SITE ASSESSMENT

TIER 1 EXPOSURE CONCENTRATION AND INTAKE CALCULATION

INDOOR AIR EXPOSURE PATHWAYS

Constituents of Concern	TOTAL PATHWAY EXPOSURE (mg/m^3) *(Sum average exposure concentrations from soil and groundwater routes)* Commercial
Benzene	1 1E-5
Toluene	1 2E-5
Ethylbenzene	1 0E-5
Xylene (mixed isomers)	4 4E-5

Site Name Bank of America San Leandro Calif Date Completed 1-Dec-99
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Completed By Tim Berger

FIGURE 5

RBCA SITE ASSESSMENT

TIER 1 PATHWAY RISK CALCULATION

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

Constituents of Concern	(1) EPA Carcinogenic Classification	(2) Total Carcinogenic Exposure (mg/m^3)	(3) Inhalation Unit Risk Factor	(4) Individual COC Risk = (2) x (3) x 1000
		Commercial	(ug/m^3)^-1	Commercial
			CARCINOGENIC RISK	
Benzene	A	1.1E-5	8.3E-6	9.0E-8
Toluene	D			
Ethylbenzene	D			
Xylene (mixed isomers)	D			

Total Pathway Carcinogenic Risk = **9.0E-8**

Site Name: Bank of America - San Leandro, California
Site Location: 2585 Nicholson Street
Completed By: Tim Berger

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RBCA SITE ASSESSMENT

TIER 1 PATHWAY RISK CALCULATION

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

Constituents of Concern	(5) Total Toxicant Exposure mg/m³ Commercial	(6) Inhalation Reference Concentration mg/m³	TOXIC EFFECTS (7) Individual COC Hazard Quotient Commercial
Benzene	3.1E-5	6.0E-3	5.1E-3
Toluene	1.2E-5	4.0E-1	3.0E-5
Ethylbenzene	1.0E-5	1.0E+0	1.0E-5
Xylene (mixed isomers)	4.4E-5	7.0E+0	6.3E-6

Total Pathway Hazard Index = **5.2E-3**

Site Name: Bank of America - San Leandro, California
Site Location: 2585 Nicholson Street
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RBCA SITE ASSESSMENT

Baseline Risk Summary-All Pathways

Site Name: Bank of America - San Leandro, California
Site Location 2585 Nicholson Street

Completed By: Tim Berger
Date Completed 1-Dec-99

TIER 1 BASELINE RISK SUMMARY TABLE

EXPOSURE PATHWAY	BASELINE CARCINOGENIC RISK: Individual COC Risk – Maximum Value	Individual COC Risk – Target Risk	Cumulative COC Risk – Total Value	Cumulative COC Risk – Target Risk	Risk Limit(s) Exceeded?	BASELINE TOXIC EFFECTS: Hazard Quotient – Maximum Value	Hazard Quotient – Applicable Limit	Hazard Index – Total Value	Hazard Index – Applicable Limit	Toxicity Limit(s) Exceeded?
OUTDOOR AIR EXPOSURE PATHWAYS										
Complete:	3.4E-10	1.0E-6	3.4E-10	1.0E-5	☐	1.9E-5	1.0E+0	2.0E-5	1.0E+0	☐
INDOOR AIR EXPOSURE PATHWAYS										
Complete:	9.0E-8	1.0E-6	9.0E-8	1.0E-5	☐	5.1E-3	1.0E+0	5.2E-3	1.0E+0	☐
SOIL EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
GROUNDWATER EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
SURFACE WATER EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	☐	NA	NA	NA	NA	☐
CRITICAL EXPOSURE PATHWAY (Maximum Values From Complete Pathways)										
	9.0E-8	*1.0E-6*	*9.0E-8*	*1.0E-5*	☐	*5.1E-3*	*1.0E+0*	*5.2E-3*	*1.0E+0*	☐
	Indoor Air		*Indoor Air*			*Indoor Air*		*Indoor Air*		

FIGURE 6