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February 3, 2014

ECI Project Number: 0495-02

Mr. Mike Metcalf
82nd Street, LLC
10215 Portland Avenue E
Tacoma, Washington 98445-3919

Re: **Tier 1 Vapor Intrusion Letter Report**

Former Big Wheel Auto Parts Site (Ecology VCP#: SW1340)
8219 Pacific Avenue
Tacoma, Washington

Mr. Metcalf:

EcoCon, Inc. (ECI) is pleased to provide you with the following Vapor Intrusion Letter Report. This report provides a summary of site activities including collection of ambient air and sub-slab soil vapor samples, and provides findings and conclusions for the Former Big Wheel Auto Parts property (Site). This letter report is part of the ongoing remedial actions for the site. The goal of completing these remedial actions is to receive a determination of "No Further Action" by the Washington Department of Ecology (Ecology) under their Voluntary Cleanup Program (VCP). This letter report, along with all the other work conducted to date for the Site will be submitted to the Department of Ecology.

Vapor intrusion (VI) testing was conducted at the Site, located at 8219 Pacific Avenue, Tacoma, Washington (Figure 1) on January 15, 2014. The building on the Site is a single-story concrete and steel, slab on grade building divided into several separate operations. The VI testing was conducted in the location of where petroleum contaminated soil (PCS) was left in place, in the northern portion of the building currently occupied by rental facility.

The testing included the following:

- Collection of one (1) shallow/sub-slab sample was performed using a 1 liter Summa canister. The sample was collected adjacent to an interior load bearing wall (south side) in the northern portion of the building. This location is in the known location of PCS left in place under the building (former location of UST#3). The PCS was identified during previous remedial actions for the Site [Creative Environmental Technologies, Inc. (CETI), Underground Storage Tank Site Assessment / Site Characterization Report, Big Wheel Auto Parts Building, December 15, 1999], as indicated by Figure 3. and;

- Collection of two (2) ambient air samples using 6 liter Summa canisters, with one sample located in the interior adjacent to the collection site of the sub-slab vapor sample, and one located outside, northeast of the structure.

The air/vapor sample analyses were completed by Air Toxics, an Ecology accredited laboratory located in California. The samples were analyzed for select volatile organic compounds (VOCs) benzene, toluene, ethylbenzene, xylenes, and gasoline utilizing EPA Test Method TO-15. The analytical results were utilized by ECI to;

- Compare the indoor ambient and outdoor ambient air samples
- Compare the sub slab samples and ambient air samples to specific Model Toxics Control Act (MTCA) Method B cleanup levels for soil vapor and determine if VI is a concern. This was done utilizing Ecology's *Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action (Review DRAFT October 2009, Publication no. 09-09-047)*.
- Utilize the Johnson and Ettinger (J&E) Model (Johnson and Ettinger, 1991) to evaluate the vapor intrusion calculate a site-specific soil vapor screening level that is protective of pathway into buildings was utilized to calculate a site-specific attenuation factor and the site specific attenuation factor can be used to the MTCA Method B cleanup level for indoor air.

On the basis of the analytical data presented and site specific determinations, it appears that there is low risk for exposure from vapor intrusion in the area tested at the Site. Further inquiry is therefore not warranted at this time.

SAMPLE COLLECTION

Sample collection involved advancement of one boring through the concrete slab to collect sub-slab vapor samples at the above noted locations inside the building (PACVI-1). This location was based on previous soil sampling and remedial activities that were completed in 1999. Additionally two (2) ambient air samples were collected from a location inside the building (PAC Indoor) adjacent to (PACVI1) and from outside of the building (PAC Outdoor). The location outside the building was to determine ambient background levels.

Sub-Slab Vapor Sampling

Upon set up of the ambient air sample collection point, Environmental Services Northwest (ESN), a licensed drilling company, began borings in the concrete foundation for probe placement for the shallow/sub-slab soil gas sample beneath the concrete floor slab at the location noted above. The boring was made by advancing a one-inch diameter drill bit through the concrete floor and underlying soils to a depth of approximately three to four inches below the concrete floor slab. The boring exhibited an

approximate depth of 8 to 9 inches below the slab surface. The boring was advanced using an electric rotary impact drill equipped with a spline bit. Rigid 3/16-inch Spiral Flex Rilsan PA tubing was cut to length and inserted to the bottom of the boring. Sand was poured into the hole around the tubing. Hydrated granular bentonite chips were used to seal the top of the hole from the atmosphere. The sample location was then allowed to stabilize for approximately 15 to 30 minutes.

Upon completing the sampling point and allowing the allotted stabilization time to pass, the sub-slab sample was collected utilizing a 1-liter SUMMA "mini" canister fitted with a flow regulator (choke) calibrated to a flow rate of between 1.5 to 2.0-milliliters per minute (ml/min). The canister was attached to the probe tubing to collect the sub-slab soil gas sample.

Following completion of the above sampling, the probe tubing was removed and the boring was sealed/grouted flush with the floor using concrete. The laboratory analysis request forms were completed and the samples were shipped under proper chain of custody for analysis to the laboratory.

Table of Collection parameters for the Sub-Slab Vapor Samples

Sample ID / Collection Parameters	**VI-1**
Slab Thickness	6 inches
Depth of Borehole	8 inches
Screened Interval	2 - 3 inches
Depth to Filter Sand	4 inches
Seal Interval*	3.5 – 0.5
Collection Date	January 15, 2014
Start Time	NA
Finish Time	NA
Sample Vapor Probe Volume	1 Liter
Purge Volume	180 ml
Pre sample Canister Vacuum	27'' of Hg
Post sample Canister Vacuum	2" of Hg
Canisters Serial Numbers	33639

NA - not applicable
* Seal consists of bentonite powder and then hydrated bentonite chips

Ambient Air Samples

Two ambient air samples were collected for this project. One sample (indoor background) was collected from inside the building and the other ambient air sample was collected from a location northeast and downwind from the structure. These samples were collected utilizing 6 liter Summa canisters, supplied and certified clean by Air Toxics. The canisters were fitted with a flow regulator (choke) calibrated to a flow rate to allow collection of an ambient air sample over an approximate eight (8) hour period. The canisters were placed and the regulators opened per laboratory provided guidance at the start of the day (8:15 AM, January 15, 2014).

Following completion of the above sampling (4:15 PM, January 15, 2014), the regulators were closed and the laboratory analysis request forms were completed and the samples were shipped under proper chain of custody for analysis of gasoline and select volatile organic compounds benzene, toluene, ethylbenzene, and xylenes by EPA Method TO-15 (SUMMA canister samples). The table below summarizes the ambient and sub-slab sampling.

Table of Collection parameters for the Ambient Air Samples

Sample ID	PAC Indoor	PAC Outdoor
Collection Date	January 15, 2014	January 15, 2014
Start Time	8:15	8:15
Finish Time	4:15	4:15
Sample Vapor Probe Volume	N/A	N/A
Purge Volume	N/A	N/A
Pre sample Canister Vacuum	29 " of Hg	30 " of Hg
Post sample Canister Vacuum	5 " of Hg	5 " of Hg
Canisters Serial Numbers	21012	13665

NA - not applicable

RESULTS

Sub-Slab Samples

The sub slab sample collected from the interior of the building (PAC V1) showed concentrations of benzene (78 µg/m³), toluene (970 µg/m³), ethylbenzene (220 µg/m³), total xylenes (1,280 µg/m³) and gasoline-range organics (13,000 µg/m³) exceeding the laboratory minimum reporting limit. See figure 3 for sample location.

Table of Sub Slab Sample Results (Results in µg/m3)

Analyte/ Sample ID	Gasoline	Benzene	Toluene	Ethylbenzene	Total Xylenes
PAC V1	**13,000**	**78**	**970**	**220**	**1,280**
Labroatory MRL	160	2.4	2.9	3.3	3.3

BOLD: Analyte reported exceeding laboratory minimum reporting limits (MRL).

Ambient Air Samples

The ambient air samples collected from inside (PAC Indoor) and outside (PAC Outdoor) the building reflected concentrations target analytes above the laboratory minimum reporting limit for both samples. PAC Outdoor ambient sample reflected concentrations of toluene (5.8 µg/m³), total xylenes (4.5 µg/m³) and, gasoline-range organics (260 µg/m³) and the PAC Indoor sample reflected concentrations of benzene (4.2 µg/m³), toluene (14 µg/m³), total xylenes (14.9 µg/m³) and, gasoline-range organics (260 µg/m³). See figure 3 for sample locations.

Table of Ambient Air Sample Results (Results in µg/m3)

Analyte/ Sample ID	Gasoline	Benzene	Toluene	Ethylbenzene	Total Xylenes
Indoor Ambient	***230***	***4.2***	***14***	ND	***14.9***
Outdoor Ambient	***260***	ND	***5.8***	ND	***4.5***

BOLD: Analyte reported exceeding laboratory minimum reporting limits
ND: Indicates concentration of analyte is below laboratory minimum reporting limit.

Conclusions/ Recommendations

The soil vapor concentrations of benzene (78 µg/m3) and total xylenes (1,280 µg/m³) exceeds Ecology's Tier I default screening levels of 0.32 µg/m³ for benzene and 280 µg/m³ for xylenes. However, under Ecology's draft VI Guidance, the Johnson and Ettinger (J&E) Model (Johnson and Ettinger, 1991), used to evaluate the vapor intrusion pathway into buildings, can be utilized to calculate a site-specific attenuation factor and the site specific attenuation factor can be used to calculate a site-specific soil vapor screening level that is protective of the MTCA Method B cleanup level for indoor air. The J&E Model is a one-dimensional analytical solution, which incorporates both advection and diffusion transport mechanisms to produce a unit-less α. This α is a function of soil and building properties that limit the intrusion of VOCs into overlying buildings and is defined as the concentration of the compound in indoor air divided by the concentration of the compound in soil vapor.

Using the J&E Model, the calculated site-specific attenuation factor for the site for benzene is 0.003 and for total xylenes is 0.027 with the resulting site specific soil vapor screening level of 91.34 µg/m³ for benzene and 2,057 µg/m³ for xylenes which above noted concentrations from the sub-slab sample do not exceed. Utilizing the J&E Model site specific screening levels and the fact that the indoor ambient air sample reflected levels of benzene (4.2 µg/m³) and total xylenes (14.9 µg/m³) that were below the MTCA Method B Clean up levels for indoor air results for benzene (14 µg/m³) and xylenes (46 µg/m³) would indicate that vapor intrusion is not an issue at the site.

Additionally comparing the results of the ambient indoor and outdoor samples presented above reflect no discernable difference between the indoor and outdoor in the levels of toluene, total xylenes, and gasoline-range organics. Based on the sample results and Ecology's guidance it appears that VI is unlikely to be significant at the Site.

The Washington Department of Ecology's Guidance for Evaluating Soil Vapor Intrusion in Washington State: *Investigation and Remedial Action (Review DRAFT October 2009, Publication no. 09-09-047), Chapter 3, page 22 states:*

"Ecology therefore suggests that investigators use building-specific upwind ambient air measurement data as follows: When the measured building-specific upwind ambient air VOC level is the same or higher than the measured maximum indoor concentration for that VOC, assume that VI is unlikely to be significantly impacting indoor air quality. In this situation the ambient contribution to the indoor air concentration is probably close to 100%."

The table below summarizes the analytical results, the associated screening levels, and MTCA Method B Indoor Air CULs.

Analyte/ Sample ID	Benzene	Toluene	Ethylbenzene	Total Xylenes	Gasoline-range organics
Sub-Slab Vapor (PAC V1)	**78**	970	220	**1,280**	13,000
Ambient (PAC Indoor)	4.2	14	ND	14.9	230
Ambient (PAC Outdoor)	ND	5.8	ND	4.5	260
Tier I Sub-Slab Screening Level	0.32	22,000	4,600	460	N/A
EPA J&E Screening Level	91.34	117,500	681.9	2,057	N/A
MTCA Method B Indoor Air CUL	14	2300	460	46	N/A

Shaded and bolded area indicates results exceeded Ecology Tier I sub-slab Screening level
Results in µg/m³ / N/A denotes Not Applicable

QUALIFICATIONS OF THIS LETTER REPORT

Although this study has been a reasonably thorough attempt to determine if vapor intrusion is a potential source of contamination for the Site, there is always the possibility that other potential sources of contamination have escaped detection due to the limitations of this Study, the inaccuracy of governmental records, or the presence of undetected and unreported environmental incidents. ECI reserves the right to alter our findings based on our review of any information obtained and reviewed after the date of this report.

Our professional services have been performed using that degree of care and skill ordinarily exercised, under similar conditions, by reputable environmental consultants practicing in this or similar localities. No other warranty, expressed or implied, is made as to the professional information included in this report. Should you have any questions regarding this report, please contact our office at (253) 238-9270.

Sincerely,

Thomas W. Smith
Sr. Environmental Scientist
Direct: (253) 921-7059

Stephen M. Spencer
Principal Environmental Scientist
Direct: (253) 365-7647

List of Appendices/Enclosures

Appendix A: Project Figures

- Figure 1 - Site Map
- Figure 2 - Topographical Map
- Figure 3 - Sample Location Map

Appendix B: Project Analytical Results

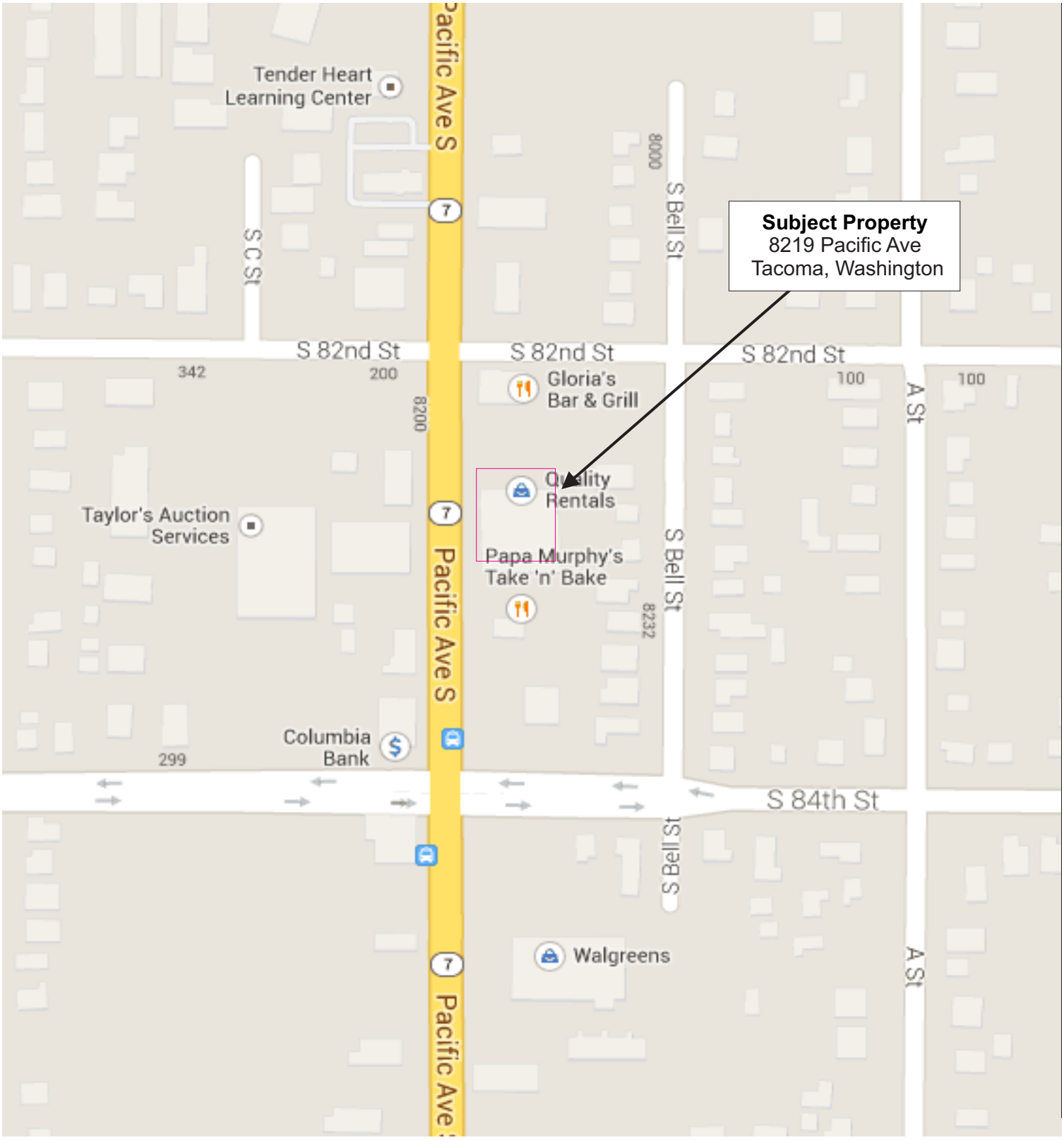
- Ambient Air Laboratory Results
- Sub-Slab Vapor Laboratory Result

Appendix C: Regulatory Agency Documents

- Table B-1: Indoor Air Cleanup Levels, Groundwater Screening Levels, & Soil Gas Screening Levels.
- EPA J&M Results

Appendix A

Project Figures



N
Not To Scale

Site Vicinity Map
Vapor Intrusion Assessment
8219 Pacific Ave
Tacoma, Washington 98408

Date:	February 3, 2014
Completed By:	K. Spencer
Reviewed By.:	M. Leone
Version:	ECI-001
Project No.:	0495-02

Figure No.: 01
Sheet 01 of 03

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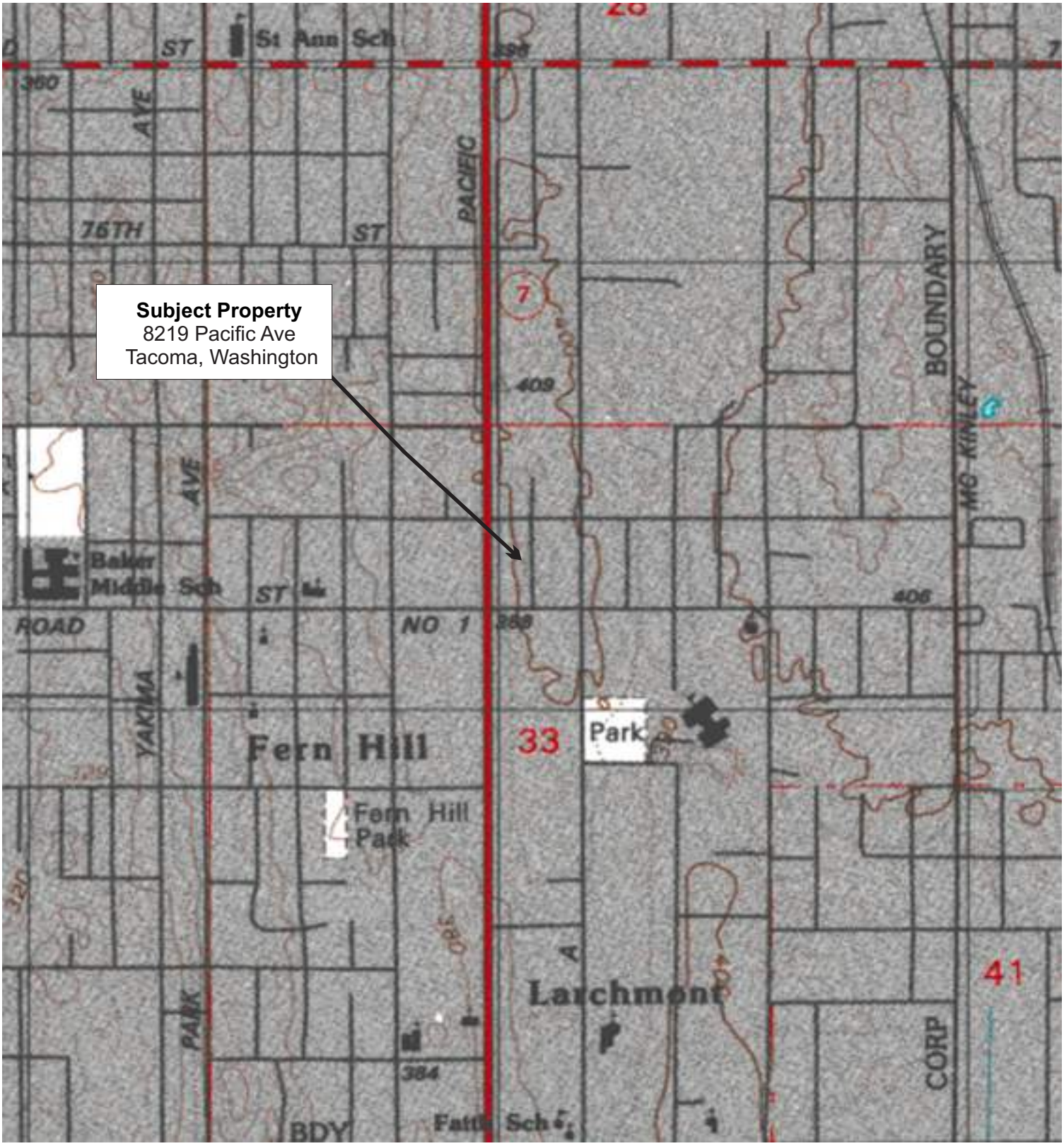

N

Site Topographic Map
Vapor Intrusion Assessment
8219 Pacific Ave
Tacoma, Washington 98408

Date:	February 3, 2014
Completed By:	K. Spencer
Reviewed By.:	M. Leone
Version:	ECI-001
Project No.:	0495-02

Figure No.: 02

Sheet 02 of 03

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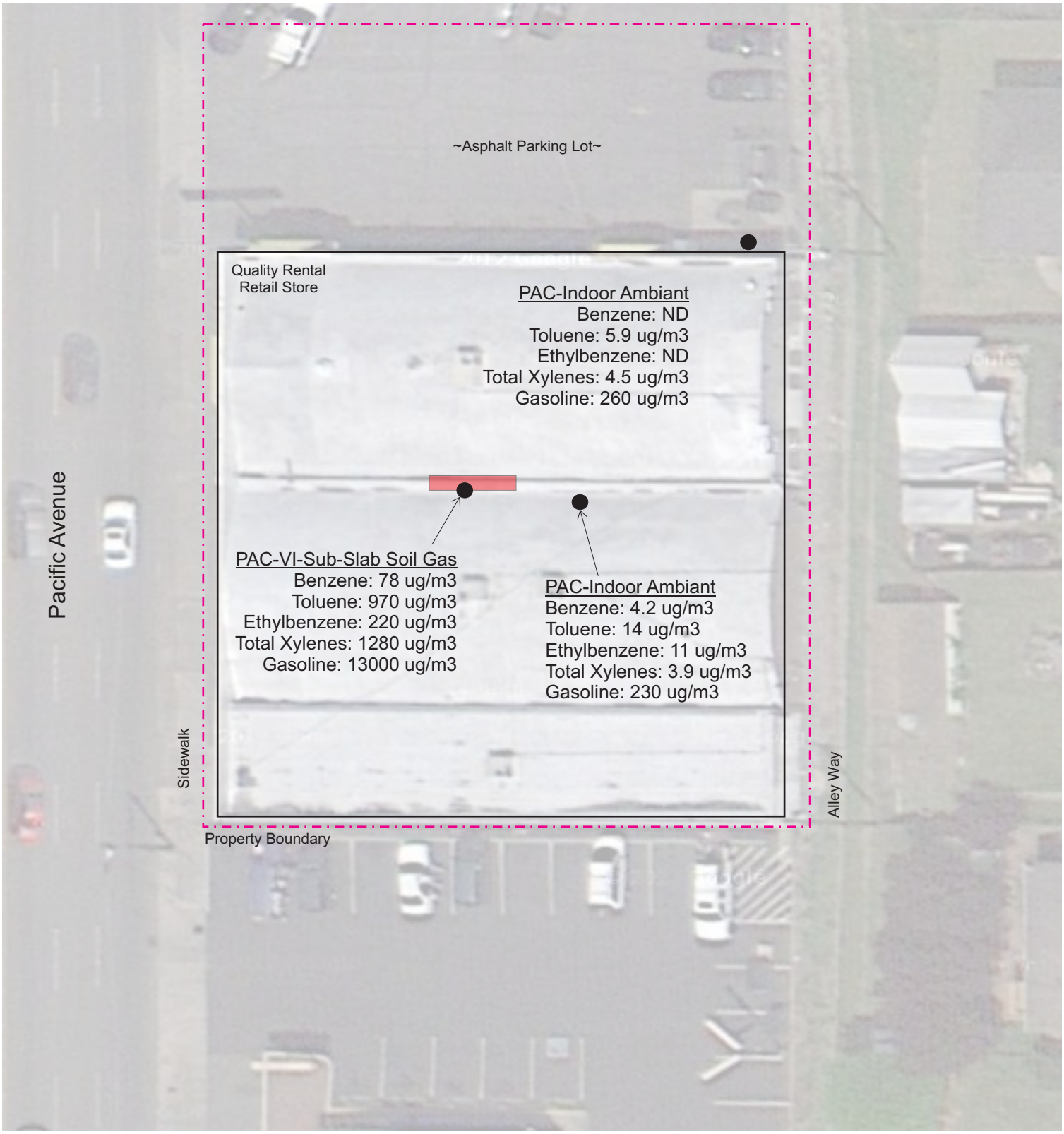

N

Not To Scale

Sample Lcoation Map
Vapor Intrusion Assessment
8219 Pacific Ave
Tacoma, Washington 98408

Date:	February 3, 2014
Completed By:	K. Spencer
Reviewed By.:	M. Leone
Version:	ECI-001
Project No.:	0495-02

Figure No.: 03

Sheet 03 of 03

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Appendix B

Project Analytical Results

Ambient Air Laboratory Results
Sub-Slab Vapor Laboratory Result
Table of Analytical Results

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2/1/2014
Mr. Tom Smith
ECI Environmental Services
PO Box 153

Fox Island WA 98333

Project Name: 8214 PAC AVE
Project #: 0495-02
Workorder #: 1401304

Dear Mr. Tom Smith

The following report includes the data for the above referenced project for sample(s) received on 1/22/2014 at Air Toxics Ltd.

The data and associated QC analyzed by TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Air Toxics Ltd. for your air analysis needs. Air Toxics Ltd. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

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WORK ORDER #: 1401304

Work Order Summary

CLIENT:	Mr. Tom Smith ECI Environmental Services PO Box 153 Fox Island, WA 98333	**BILL TO:**	Mr. Tom Smith ECI Environmental Services PO Box 153 Fox Island, WA 98333
PHONE:	253-365-7647	**P.O. #**	
FAX:	253-369-6228	**PROJECT #**	0495-02 8214 PAC AVE
DATE RECEIVED:	01/22/2014	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	02/01/2014		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	PAC UI-1	TO-15	6.5 "Hg	15 psi
02A	PAC Indoor	TO-15	3.5 "Hg	5 psi
03A	PAC Outdoor	TO-15	4.0 "Hg	5 psi
04A	Lab Blank	TO-15	NA	NA
05A	CCV	TO-15	NA	NA
06A	LCS	TO-15	NA	NA
06AA	LCSD	TO-15	NA	NA

CERTIFIED BY: Heidi Hayes DATE: 02/01/14

Technical Director

Certification numbers: AZ Licensure AZ0775, CA NELAP - 12282CA, NJ NELAP - CA016, NY NELAP - 11291, TX NELAP - T104704434-13-6, UT NELAP CA009332013-4, VA NELAP - 460197, WA NELAP - C935
Name of Accrediting Agency: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005, Effective date: 10/18/2013, Expiration date: 10/17/2014.
Eurofins Air Toxics Inc.. certifies that the test results contained in this report meet all requirements of the NELAC standards

180 BLUE RAVINE ROAD, SUITE B FOLSOM, CA - 9563
(916) 985-1000 . (800) 985-5955 . FAX (916) 985-1020

LABORATORY NARRATIVE
EPA Method TO-15
ECI Environmental Services
Workorder# 1401304

One 1 Liter Summa Canister and two 6 Liter Summa Canister samples were received on January 22, 2014. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Receiving Notes

The Chain of Custody (COC) was not relinquished properly. A date was not provided by the field sampler.

Analytical Notes

A single point calibration for TPH referenced to Gasoline was performed for each daily analytical batch. Recovery is reported as 100% in the associated results for each CCV.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit, LOD, or MDL value. See data page for project specific U-flag definition.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: PAC UI-1

Lab ID#: 1401304-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	1.3	24	4.1	78
Toluene	1.3	260	4.9	970
Ethyl Benzene	1.3	50	5.6	220
m,p-Xylene	1.3	240	5.6	1000
o-Xylene	1.3	64	5.6	280
TPH ref. to Gasoline (MW=100)	64	3200	260	13000

Client Sample ID: PAC Indoor

Lab ID#: 1401304-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	0.76	1.3	2.4	4.2
Toluene	0.76	3.7	2.9	14
m,p-Xylene	0.76	2.4	3.3	11
o-Xylene	0.76	0.90	3.3	3.9
TPH ref. to Gasoline (MW=100)	38	57	160	230

Client Sample ID: PAC Outdoor

Lab ID#: 1401304-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Toluene	0.78	1.5	2.9	5.8
m,p-Xylene	0.78	1.0	3.4	4.5
TPH ref. to Gasoline (MW=100)	39	64	160	260

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Client Sample ID: PAC UI-1

Lab ID#: 1401304-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2012708**	**Date of Collection: 1/15/14 9:05:00 AM**	
Dil. Factor:	**2.58**	**Date of Analysis: 1/27/14 01:45 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	1.3	24	4.1	78
Toluene	1.3	260	4.9	970
Ethyl Benzene	1.3	50	5.6	220
m,p-Xylene	1.3	240	5.6	1000
o-Xylene	1.3	64	5.6	280
TPH ref. to Gasoline (MW=100)	64	3200	260	13000

Container Type: 1 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	102	70-130
1,2-Dichloroethane-d4	107	70-130
4-Bromofluorobenzene	98	70-130

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Client Sample ID: PAC Indoor

Lab ID#: 1401304-02A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2012709**	**Date of Collection: 1/15/14 5:00:00 PM**	
Dil. Factor:	**1.52**	**Date of Analysis: 1/27/14 02:30 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	0.76	1.3	2.4	4.2
Toluene	0.76	3.7	2.9	14
Ethyl Benzene	0.76	Not Detected	3.3	Not Detected
m,p-Xylene	0.76	2.4	3.3	11
o-Xylene	0.76	0.90	3.3	3.9
TPH ref. to Gasoline (MW=100)	38	57	160	230

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130
1,2-Dichloroethane-d4	106	70-130
4-Bromofluorobenzene	90	70-130

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Client Sample ID: PAC Outdoor

Lab ID#: 1401304-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2012710**	**Date of Collection: 1/15/14 5:00:00 PM**	
Dil. Factor:	**1.55**	**Date of Analysis: 1/27/14 03:15 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	0.78	Not Detected	2.5	Not Detected
Toluene	0.78	1.5	2.9	5.8
Ethyl Benzene	0.78	Not Detected	3.4	Not Detected
m,p-Xylene	0.78	1.0	3.4	4.5
o-Xylene	0.78	Not Detected	3.4	Not Detected
TPH ref. to Gasoline (MW=100)	39	64	160	260

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
Toluene-d8	99	70-130
1,2-Dichloroethane-d4	105	70-130
4-Bromofluorobenzene	90	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1401304-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2012706**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 1/27/14 12:10 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	0.50	Not Detected	1.6	Not Detected
Toluene	0.50	Not Detected	1.9	Not Detected
Ethyl Benzene	0.50	Not Detected	2.2	Not Detected
m,p-Xylene	0.50	Not Detected	2.2	Not Detected
o-Xylene	0.50	Not Detected	2.2	Not Detected
TPH ref. to Gasoline (MW=100)	25	Not Detected	100	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130
1,2-Dichloroethane-d4	104	70-130
4-Bromofluorobenzene	96	70-130

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Client Sample ID: CCV

Lab ID#: 1401304-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2012702**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 1/27/14 09:08 AM**	

Compound	%Recovery
Benzene	85
Toluene	87
Ethyl Benzene	86
m,p-Xylene	86
o-Xylene	88
TPH ref. to Gasoline (MW=100)	100

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	102	70-130
1,2-Dichloroethane-d4	108	70-130
4-Bromofluorobenzene	98	70-130

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Client Sample ID: LCS

Lab ID#: 1401304-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2012703**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 1/27/14 09:48 AM**	

Compound	%Recovery	Method Limits
Benzene	88	70-130
Toluene	88	70-130
Ethyl Benzene	88	70-130
m,p-Xylene	89	70-130
o-Xylene	88	70-130
TPH ref. to Gasoline (MW=100)	Not Spiked	

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	102	70-130
1,2-Dichloroethane-d4	103	70-130
4-Bromofluorobenzene	100	70-130

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Client Sample ID: LCSD

Lab ID#: 1401304-06AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**2012704**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 1/27/14 10:32 AM**	

Compound	%Recovery	Method Limits
Benzene	87	70-130
Toluene	88	70-130
Ethyl Benzene	87	70-130
m,p-Xylene	88	70-130
o-Xylene	87	70-130
TPH ref. to Gasoline (MW=100)	Not Spiked	

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	100	70-130
1,2-Dichloroethane-d4	104	70-130
4-Bromofluorobenzene	98	70-130

eurofins | Air Toxics

Sample Transportation Notice
Relinquishing signature on this document indicates that sample is being shipped in compliance with all applicable local, State, Federal, national, and international laws, regulations and ordinances of any kind. Air Toxics Limited assumes no liability with respect to the collection, handling or shipping of these samples. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Air Toxics Limited against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples. D.O.T. Hotline (800) 467-4922

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX (916) 985-1020

Project Manager Tom Smith
Collected by: (Print and Sign) Thomas W. Smith
Company EcoCon Email
Address PO Box 153 City Fox Island State WA Zip 98333
Phone (253) 365-7647 Fax

Project Info:
P.O. # N/A
Project # 0495-02
Project Name 8214 Pac Ave

Turn Around Time:
☑ Normal
☐ Rush
specify

Lab Use Only
Pressurized by:
Date:
Pressurization Gas: N_2 He

Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested	Canister Pressure/Vacuum Initial	Final	Receipt	Final (psi)
01A	PACUE-1	33639	1/15/14	9:05AM	G/BTEX	27	2		
02A	PAC Indoor	21012	↓	8-5	↓	29	5		
03A	PAC Outdoor	13665	↓	8-5	↓	30	5		

Relinquished by: (signature) Date/Time	Received by: (signature) Date/Time
Thomas W. Smith	1-22-14 1230
Relinquished by: (signature) Date/Time	Received by: (signature) Date/Time 1-22-14
Relinquished by: (signature) Date/Time	Received by: (signature) Date/Time

Notes:

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals Intact?	Work Order #
	FedEx		NA	Good	Yes No None	1401304

Form 1293 rev.11

Appendix C

Regulatory Agency Documents

Table B-1: Indoor Air Cleanup Levels, Groundwater Screening Levels, & Soil Gas Screening Levels.

EPA J&M Results

Table B-1. ***Indoor Air Cleanup Levels, Groundwater Screening Levels, and Soil Gas Screening Levels***

Note: Numeric values are rounded and expressed with two significant numbers. The ***numerator*** *soil gas value is the screening level for* ***sub-slab*** *measurements; the* ***denominator*** *value is the screening level for* ***deep*** *soil gas measurements.*

		Method B							Method C						
		Risk Driver	Indoor Air CUL[79] ($\mu g/m^3$)		GW SL[80] ($\mu g/L$)		Soil Gas SL[81] ($\mu g/m^3$)		Risk Driver	Indoor Air CUL ($\mu g/m^3$)		GW SL ($\mu g/L$)		Soil Gas SL ($\mu g/m^3$)	
Name of Hazardous Substance	[82]CAS #		C[83]	NC	C	NC	C	NC		C	NC	C	NC	C	NC
2-chloro-1,3-butadiene (chloroprene)	126-99-8	NC		3.2		12		32/320	NC		7		25		70/700
acetaldehyde	75-07-0	C	1.1	4.1	530	1900	11/110	41/410	NC	11	9	5300	4200	110/1100	90/900
acetonitrile	75-05-8	NC		27		33000		270/2700	NC		60		72000		600/6000
acetophenone	98-86-2	NC		0.008		50		0.08/0.8	NC		0.018		110		0.18/1.8
acrolein (Propenal)	107-02-8	NC		0.0091		2.9		0.091/0.91	NC		0.02		6.4		0.2/2
acrylonitrile	107-13-1	C	0.037	0.91	16	390	0.37/3.7	9.1/91	C	0.37	2	160	850	3.7/37	20/200
aldrin	309-00-2	C	0.00051		0.32		0.0051/0.051		C	0.0051		3.2		0.051/0.51	
benzene	71-43-2	C	0.32	14	2.4	100	3.2/32	140/1400	C	3.2	30	24	230	32/320	300/3000
benzyl chloride	100-44-7	C	0.052		6.2		0.52/5.2		C	0.52		62		5.2/52	
bis(2-chloroethyl)ether	111-44-4	C	0.0076		26		0.076/0.76		C	0.076		260		0.76/7.6	
bromodichloromethane	75-27-4	C	0.0033		0.09		0.033/0.33		C	0.033		0.9		0.33/3.3	
bromoform	75-25-2	C	2.3		200		23/230		C	23		2000		230/2300	
bromomethane (bromomethane)	74-83-9	NC		2.3		13		23/230	NC		5		28		50/500
butadiene;1,3-	106-99-0	C	0.08	0.91	0.037	0.42	0.8/8	9.1/91	C	0.8	2	0.37	0.92	8/80	20/200
carbon disulfide	75-15-0	NC		320		400		3200/32000	NC		700		870		7000/70000
carbon tetrachloride	56-23-5	C	0.17		0.22		1.7/17		C	1.7		2.2		17/170	
chlorobenzene	108-90-7	NC		8		100		80/800	NC		18		220		180/1800
chlorodifluoromethane (Freon 22)	75-45-6	NC		23000		27000		230000/2300000	NC		50000		58000		500000/5000000
chloroform	67-66-3	C	0.11		1.2		1.1/11		C	1.1		12		11/110	
chloromethane	74-87-3	C	1.4		5.2		14/140		C	14		52		140/1400	
chloropropane;2-	75-29-6	NC		4.6		12		46/460	NC		10		26		100/1000
cumene (Isopropylbenzene)	98-82-8	NC		180		720		1800/18000	NC		400		1600		4000/40000
dibromochloromethane	124-48-1	C	0.0045		0.22		0.045/0.45		C	0.045		2.2		0.45/4.5	
dichlorobenzene;1,2-	95-50-1	NC		64		1800		640/6400	NC		140		4000		1400/14000
dichlorobenzene;1,4-	106-46-7	NC		370		7900		3700/37000	NC		800		17000		8000/80000
dichlorodifluoromethane (Freon 12)	75-71-8	NC		80		9.9		800/8000	NC		180		22		1800/18000
dichloroethane;1,1- (DCA)	75-34-3	NC		320		2300		3200/32000	NC		700		5000		7000/70000
dichloroethane;1,2- (DCA)	107-06-2	C	0.096	2.2	4.2	98	0.96/9.6	22/220	C	0.96	4.9	42	210	9.6/96	49/490
dichloroethylene;1,1- (DCE)	75-35-4	NC		91		130		910/9100	NC		200		280		2000/20000
dichloroethylene;1,2-,cis (DCE)	156-59-2	NC		16		160		160/1600	NC		35		350		350/3500
dichloroethylene;1,2-,trans (DCE)	156-60-5	NC		32		130		320/3200	NC		70		290		700/7000
dichloropropane;1,2-	78-87-5	NC		1.8		28		18/180	NC		4		62		40/400
dichloropropene;1,3-	542-75-6	C	0.63	9.1	1.6	23	6.3/63	91/910	C	6.3	20	16	51	63/630	200/2000
Diisopropyl Ether (isopropyl ether)	108-20-3	NC		180		2900		1800/18000	NC		400		6300		4000/40000
ethyl chloride	75-00-3	C	3	4600	12	18000	30/300	46000/460000	C	30	10000	120	40000	300/3000	100000/1000000

[79] Indoor Air Cleanup Level calculated using Equations 750-1 (for carcinogens) or 750-2 (for carcinogens) defined by MTCA.

[80] Ground Water Screening Level or that concentration in the groundwater expected to not result in exceedance of the air cleanup level in an overlying structure under most circumstances (See Chapter 3 for more information on the appropriate use of these screening levels). GW SL = [Indoor Air CUL]/[Hcc* α *1000], where α = 1.0E-3.

[81] Soil Gas Screening Level that concentration in the soil gas just beneath a building (first value) or at 15 foot depth or greater (second value) expected to not result in exceedance of the air cleanup level in an overlying structure under most circumstances (see Chapter 3 for more information on the appropriate use of these screening levels). Soil Gas SL = [Indoor Air CUL]/[α], where α = 0.1 or 0.01, depending on the depth of the soil gas sample to be compared to.

[82] Chemical Abstracts Number.

[83] "C" refers to the substance's toxicity as a carcinogen; "NC" refers its toxicity as a non-carcinogen.

Table B-1. *Indoor Air Cleanup Levels, Groundwater Screening Levels, and Soil Gas Screening Levels (Continued)*

		Method B							Method C						
		Risk Driver	Indoor Air CUL ($\mu g/m^3$)		GW SL ($\mu g/L$)		Soil Gas SL ($\mu g/m^3$)		Risk Driver	Indoor Air CUL ($\mu g/m^3$)		GW SL ($\mu g/L$)		Soil Gas SL ($\mu g/m^3$)	
Name of Hazardous Substance	CAS #		C	NC	C	NC	C	NC		C	NC	C	NC	C	NC
ethylbenzene	100-41-4	NC		460		2800		4600/46000	NC		1000		6100		10000/100000
ethylene dibromide (EDB)	106-93-4	C	0.011	0.16	0.74	10	0.11/1.1	1.6/16	C	0.11	0.35	7.4	23	1.1/11	3.5/35
ethylene oxide	75-21-8	C	0.025		1.6		0.25/2.5		C	0.25		16		2.5/25	
hexachlorobutadiene	87-68-3	C	0.11		0.81		1.1/11		C	1.1		8.1		11/110	
hexachloroethane	67-72-1	C	0.63		8.6		6.3/63		C	6.3		86		63/630	
hexane;n-	110-54-3	NC		320		7.8		3200/32000	NC		700		17		7000/70000
hydrogen cyanide	74-90-8	NC		1.4		390		14/140	NC		3		860		30/300
mercury (elemental)	7439-97-6	NC		0.14		0.89		1.4/14	NC		0.3		1.9		3/30
methacrylonitrile	126-98-7	NC		0.32		56		3.2/32	NC		0.7		120		7/70
methyl ethyl ketone	78-93-3	NC		460		350000		4600/46000	NC		1000		760000		10000/100000
methyl isobutyl ketone	108-10-1	NC		32		11000		320/3200	NC		70		24000		700/7000
methyl methacrylate	80-62-6	NC		320		46000		3200/32000	NC		700		100000		7000/70000
methyl tert-butyl ether (MTBE)	1634-04-4	C	9.6	1400	610	86000	96/960	14000/140000	C	96	3000	6100	190000	960/9600	30000/300000
methylcyclohexane	108-87-2	NC		1400		570		14000/140000	NC		3000		1300		30000/300000
methylene chloride	75-09-2	C	5.3	1400	94	24000	53/530	14000/140000	C	53	3000	940	53000	530/5300	30000/300000
naphthalene	91-20-3	NC		1.4		170		14/140	NC		3		360		30/300
nitrobenzene	98-95-3	NC		0.27		690		2.7/27	NC		0.6		1500		6/60
nitropropane;2-	79-46-9	C	0.00093	9.1	0.36	3500	0.0093/0.093	91/910	C	0.0093	20	3.6	7700	0.093/0.93	200/2000
styrene	100-42-5	C	4.4	460	78	8200	44/440	4600/46000	C	44	1000	780	18000	440/4400	10000/100000
tetrachloroethane;1,1,1,2-	630-20-6	C	0.34		7.4		3.4/34		C	3.4		74		34/340	
tetrachloroethane;1,1,2,2-	79-34-5	C	0.043		6.2		0.43/4.3		C	0.43		62		4.3/43	
tetrachloroethylene (PCE)	127-18-4	C	0.42	16	1	40	4.2/42	160/1600	C	4.2	35	10	88	42/420	350/3500
toluene	108-88-3	NC		2200		15000		22000/220000	NC		4900		33000		49000/490000
trichloro-1,2,2-trifluoroethane;1,1,2- (Freon 113)	76-13-1	NC		14000		1100		140000/1400000	NC		30000		2400		300000/3000000
trichlorobenzene;1,2,4-	120-82-1	NC		91		3900		910/9100	NC		200		8400		2000/20000
trichloroethane;1,1,1- (TCA)	71-55-6	NC		4800		11000		48000/480000	NC		11000		25000		110000/1100000
trichloroethane;1,1,2-	79-00-5	C	0.16		7.9		1.6/16		C	1.6		79		16/160	
trichloroethylene (TCE)	79-01-6	C	0.1	16	0.42	67	1/10	160/1600	C	1	35	4.2	150	10/100	350/3500
trichlorofluoromethane (Freon 11)	75-69-4	NC		320		120		3200/32000	NC		700		260		7000/70000
trimethylbenzene;1,2,4-	95-63-6	NC		2.7		24		27/270	NC		6		52		60/600
trimethylbenzene;1,3,5-	108-67-8	NC		2.7		25		27/270	NC		6		54		60/600
vinyl acetate	108-05-4	NC		91		7800		910/9100	NC		200		17000		2000/20000
vinyl chloride	75-01-4	C	0.28	46	0.35	57	2.8/28	460/4600	C	2.8	100	3.5	120	28/280	1000/10000
xylene;m-	108-38-3	NC		46		310		460/4600	NC		100		670		1000/10000
xylene;o-	95-47-6	NC		46		440		460/4600	NC		100		960		1000/10000
VPH [EC5-6 aliphatics + EC6-8 aliphatics] fraction	NE	NC				140			NC				310		
VPH [EC8-10 aliphatics + EC10-12 aliphatics] fraction	NE	NC				2.9			NC				6.4		
VPH [C8-10 aromatics + EC10-12 aromatics] fraction-[naphthalene]	NE	NC				1300			NC				2800		
APH [EC5-8 aliphatics] fraction	NE	NC		2700				27000/270000	NC		6000				60000/600000
APH [EC9-12 aliphatics] fraction	NE	NC		140				1400/14000	NC		300				3000/30000
APH [EC9-10 aromatics] fraction	NE	NC		180				1800/18000	NC		400				4000/40000

TARGET MEDIA CONCENTRATION RESULTS

Screening-Level Johnson and Ettinger Model

Site Name: Former Big Wheel Auto Parts Site
Report Date: Mon Feb 3 09:08:10 PST 2014
Report Generated From: http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite.htm
Depth to contamination from bottom of foundation: 1m +/- 0.1m
Average ground water temperature: 57F

CHEMICAL PROPERTIES
Chemical of Concern: Benzene CAS Number: 71432
Molecular Weight: 78.11[g/mole] Henrys Constant: 0.1386281[unitless]
Diffusivity in Air: 8.800e-2[cm^2/sec] Diffusivity in Water: 9.800e-6[cm^2/sec]
Unit Risk Factor: 0.0000078[$(\mu g/m^3)^{-1}$] Reference Concentration: 0[mg/m^3]

SOIL PROPERTIES
Soil Type: Loamy Sand Total Porosity: 0.39
Unsaturated Zone Moisture Content:
low= 0.049 best estimate= 0.076 high= 0.1
Capillary Zone Moisture Content: 0.303 Height of Capillary Rise: 0.188[m]
Soil-Gas Flow Rate into Building: 5 [L/min]

BUILDING PROPERTIES
Building Type: Slab-on-Grade Air Exchange Rate: 0.25[hr^{-1}]
Building Mixing Height: 2.44[m] Building Footprint Area: 100[m^2]
Subsurface Foundation Area: 106[m^2] Building Crack Ratio: 0.00038[unitless]
Foundation Slab Thickness: 0.1[m]

EXPOSURE PARAMETERS
Exposure Duration: carcinogens 30 [years] non-carcinogens: 30 [years]
Exposure Frequency: carcinogens 350 [days/year] non-carcinogens: 365 [days/year]
Averaging Time: carcinogens 70 [years] non-carcinogens: 30 [years]
Risk Factor for carcinogens: 1E-6 Target Hazard Quotient for non-carcinogens: 1

JOHNSON & ETTINGER SIMULATION RESULTS
Effective Diffusion Coefficients:
Unsaturated Zone(D_{eff}): 0.01222[cm^2/s]
Unsaturated Zone + Capillary Zone (D^T_{eff}): 0.0008951[cm^2/s]

Soil Gas Attenuation Factor (α_{SG}): 0.002993
Ground Water Attenuation Factor (α_{GW}): 0.0005027
Target Concentrations are based on CANCER risk.
Target Indoor Air Concentration: 0.312[$\mu g/m^3$] or 0.09771[ppbv]

[1]Less Protective Target Concentrations
Soil Gas: 121.9[$\mu g/m^3$] or 38.19[ppbv]; Ground Water: 4.587[µg/L]

Best Estimate Target Concentrations
Soil Gas: 104.2[$\mu g/m^3$] or 32.65[ppbv]; Ground Water: 4.477[µg/L]

[2]More Protective Target Concentrations
Soil Gas: 91.34[$\mu g/m^3$] or 28.61[ppbv]; Ground Water: 4.397[µg/L]

Based on parameter analysis: Advection is the dominant mechanism across foundation.

[1]"Less Protective" concentrations produced with HIGHEST moisture content and DEEPEST depth to contamination.
[2]"More Protective" concentrations produced with LOWEST moisture content and SHALLOWEST depth to contamination.

TARGET MEDIA CONCENTRATION RESULTS

Screening-Level Johnson and Ettinger Model

Site Name: Former Big Wheel Auto Parts Site
Report Date: Mon Feb 3 09:21:13 PST 2014
Report Generated From: http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite.htm
Depth to contamination from bottom of foundation: 1m +/- 0.1m
Average ground water temperature: 57F

CHEMICAL PROPERTIES
Chemical of Concern: Toluene CAS Number: 108883
Molecular Weight: 92.14[g/mole] Henrys Constant: 0.15506[unitless]
Diffusivity in Air: 8.700e-2[cm^2/sec] Diffusivity in Water: 8.600e-6[cm^2/sec]
Unit Risk Factor: 0[$(\mu g/m^3)^{-1}$] Reference Concentration: 0.4[mg/m^3]

SOIL PROPERTIES
Soil Type: Loamy Sand Total Porosity: 0.39
Unsaturated Zone Moisture Content:
low= 0.049 best estimate= 0.076 high= 0.1
Capillary Zone Moisture Content: 0.303 Height of Capillary Rise: 0.188[m]
Soil-Gas Flow Rate into Building: 5 [L/min]

BUILDING PROPERTIES
Building Type: Slab-on-Grade Air Exchange Rate: 0.25[hr^{-1}]
Building Mixing Height: 2.44[m] Building Footprint Area: 100[m^2]
Subsurface Foundation Area: 106[m^2] Building Crack Ratio: 0.00038[unitless]
Foundation Slab Thickness: 0.1[m]

EXPOSURE PARAMETERS
Exposure Duration: carcinogens 30 [years] non-carcinogens: 30 [years]
Exposure Frequency: carcinogens 350 [days/year] non-carcinogens: 365 [days/year]
Averaging Time: carcinogens 70 [years] non-carcinogens: 30 [years]
Risk Factor for carcinogens: 1E-6 Target Hazard Quotient for non-carcinogens: 1

JOHNSON & ETTINGER SIMULATION RESULTS
Effective Diffusion Coefficients:
Unsaturated Zone(D_{eff}): 0.01208[cm^2/s]
Unsaturated Zone + Capillary Zone (D^T_{eff}): 0.0008765[cm^2/s]

Soil Gas Attenuation Factor (α_{SG}): 0.002979
Ground Water Attenuation Factor (α_{GW}): 0.0004933
Target Concentrations are based on NON-CANCER risk.
Target Indoor Air Concentration: 400[$\mu g/m^3$] or 106.2[ppbv]

[1]Less Protective Target Concentrations
Soil Gas: 1.572e5[$\mu g/m^3$] or 4.174e4[ppbv]; Ground Water: 5357.[µg/L]

Best Estimate Target Concentrations
Soil Gas: 1.343e5[$\mu g/m^3$] or 3.565e4[ppbv]; Ground Water: 5229.[µg/L]

[2]More Protective Target Concentrations
Soil Gas: 1.175e5[$\mu g/m^3$] or 3.121e4[ppbv]; Ground Water: 5137.[µg/L]

Based on parameter analysis: Advection is the dominant mechanism across foundation.

[1]"Less Protective" concentrations produced with HIGHEST moisture content and DEEPEST depth to contamination.
[2]"More Protective" concentrations produced with LOWEST moisture content and SHALLOWEST depth to contamination.

TARGET MEDIA CONCENTRATION RESULTS

Screening-Level Johnson and Ettinger Model

Site Name: Former Big Wheel Auto Parts Site
Report Date: Mon Feb 3 09:37:14 PST 2014
Report Generated From: http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite.htm
Depth to contamination from bottom of foundation: 1m +/- 0.1m
Average ground water temperature: 57F

CHEMICAL PROPERTIES
Chemical of Concern: Ethylbenzene CAS Number: 100414
Molecular Weight: 106.17[g/mole] Henrys Constant: 0.1723961[unitless]
Diffusivity in Air: 7.500e-2[cm^2/sec] Diffusivity in Water: 7.800e-6[cm^2/sec]
Unit Risk Factor: 0.0000011[$(\mu g/m^3)^{-1}$] Reference Concentration: 1[mg/m^3]

SOIL PROPERTIES
Soil Type: Loamy Sand Total Porosity: 0.39
Unsaturated Zone Moisture Content:
low= 0.049 best estimate= 0.076 high= 0.1
Capillary Zone Moisture Content: 0.303 Height of Capillary Rise: 0.188[m]
Soil-Gas Flow Rate into Building: 5 [L/min]

BUILDING PROPERTIES
Building Type: Slab-on-Grade Air Exchange Rate: 0.25[hr^{-1}]
Building Mixing Height: 2.44[m] Building Footprint Area: 100[m^2]
Subsurface Foundation Area: 106[m^2] Building Crack Ratio: 0.00038[unitless]
Foundation Slab Thickness: 0.1[m]

EXPOSURE PARAMETERS
Exposure Duration: carcinogens 30 [years] non-carcinogens: 30 [years]
Exposure Frequency: carcinogens 350 [days/year] non-carcinogens: 365 [days/year]
Averaging Time: carcinogens 70 [years] non-carcinogens: 30 [years]
Risk Factor for carcinogens: 1E-6 Target Hazard Quotient for non-carcinogens: 1

JOHNSON & ETTINGER SIMULATION RESULTS
Effective Diffusion Coefficients:
Unsaturated Zone(D_{eff}): 0.01042[cm^2/s]
Unsaturated Zone + Capillary Zone (D^T_{eff}): 0.0007541[cm^2/s]

Soil Gas Attenuation Factor (α_{SG}): 0.002803
Ground Water Attenuation Factor (α_{GW}): 0.0004305
Target Concentrations are based on CANCER risk.
Target Indoor Air Concentration: 2.212[$\mu g/m^3$] or 0.5098[ppbv]

[1]Less Protective Target Concentrations
Soil Gas: 936.4[$\mu g/m^3$] or 215.8[ppbv]; Ground Water: 30.55[$\mu g/L$]

Best Estimate Target Concentrations
Soil Gas: 789.3[$\mu g/m^3$] or 181.9[ppbv]; Ground Water: 29.81[$\mu g/L$]

[2]More Protective Target Concentrations
Soil Gas: 681.9[$\mu g/m^3$] or 157.1[ppbv]; Ground Water: 29.27[$\mu g/L$]

Based on parameter analysis: Advection is the dominant mechanism across foundation. Diffusion through soil is the overall rate-limiting process for groundwater to indoor-air pathway.

[1]"Less Protective" concentrations produced with HIGHEST moisture content and DEEPEST depth to contamination.
[2]"More Protective" concentrations produced with LOWEST moisture content and SHALLOWEST depth to contamination.

TARGET MEDIA CONCENTRATION RESULTS

Screening-Level Johnson and Ettinger Model

Site Name: Former Big Wheel Auto Parts Site
Report Date: Mon Feb 3 09:39:46 PST 2014
Report Generated From: http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite.htm
Depth to contamination from bottom of foundation: 1m +/- 0.1m
Average ground water temperature: 57F

CHEMICAL PROPERTIES
Chemical of Concern: o-Xylene CAS Number: 95476
Molecular Weight: 106.17[g/mole] Henrys Constant: 0.1117104[unitless]
Diffusivity in Air: 8.700e-2[cm^2/sec] Diffusivity in Water: 1.000e-5[cm^2/sec]
Unit Risk Factor: 0[$(\mu g/m^3)^{-1}$] Reference Concentration: 7[mg/m^3]

SOIL PROPERTIES
Soil Type: Loamy Sand Total Porosity: 0.39
Unsaturated Zone Moisture Content:
low= 0.049 best estimate= 0.076 high= 0.1
Capillary Zone Moisture Content: 0.303 Height of Capillary Rise: 0.188[m]
Soil-Gas Flow Rate into Building: 5 [L/min]

BUILDING PROPERTIES
Building Type: Slab-on-Grade Air Exchange Rate: 0.25[hr^{-1}]
Building Mixing Height: 2.44[m] Building Footprint Area: 100[m^2]
Subsurface Foundation Area: 106[m^2] Building Crack Ratio: 0.00038[unitless]
Foundation Slab Thickness: 0.1[m]

EXPOSURE PARAMETERS
Exposure Duration: carcinogens 30 [years] non-carcinogens: 30 [years]
Exposure Frequency: carcinogens 350 [days/year] non-carcinogens: 365 [days/year]
Averaging Time: carcinogens 70 [years] non-carcinogens: 30 [years]
Risk Factor for carcinogens: 1E-6 Target Hazard Quotient for non-carcinogens: 1

JOHNSON & ETTINGER SIMULATION RESULTS
Effective Diffusion Coefficients:
Unsaturated Zone(D_{eff}): 0.01208[cm^2/s]
Unsaturated Zone + Capillary Zone (D^T_{eff}): 0.0008963[cm^2/s]

Soil Gas Attenuation Factor (α_{SG}): 0.002979
Ground Water Attenuation Factor (α_{GW}): 0.0005033
Target Concentrations are based on NON-CANCER risk.
Target Indoor Air Concentration: 7000[$\mu g/m^3$] or 1613[ppbv]

[1]Less Protective Target Concentrations
Soil Gas: 2.751e6[$\mu g/m^3$] or 6.339e5[ppbv]; Ground Water: 1.276e5[$\mu g/L$]

Best Estimate Target Concentrations
Soil Gas: 2.349e6[$\mu g/m^3$] or 5.414e5[ppbv]; Ground Water: 1.245e5[$\mu g/L$]

[2]More Protective Target Concentrations
Soil Gas: 2.057e6[$\mu g/m^3$] or 4.739e5[ppbv]; Ground Water: 1.223e5[$\mu g/L$]

Based on parameter analysis: Advection is the dominant mechanism across foundation.

[1]"Less Protective" concentrations produced with HIGHEST moisture content and DEEPEST depth to contamination.
[2]"More Protective" concentrations produced with LOWEST moisture content and SHALLOWEST depth to contamination.

TARGET MEDIA CONCENTRATION RESULTS

Screening-Level Johnson and Ettinger Model

Site Name: Former Big Wheel Auto Parts Site
Report Date: Mon Feb 3 09:42:23 PST 2014
Report Generated From: http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite.htm
Depth to contamination from bottom of foundation: 1m +/- 0.1m
Average ground water temperature: 57F

CHEMICAL PROPERTIES
Chemical of Concern: m-Xylene CAS Number: 108383
Molecular Weight: 106.17[g/mole] Henrys Constant: 0.1595469[unitless]
Diffusivity in Air: 7.000e-2[cm^2/sec] Diffusivity in Water: 7.800e-6[cm^2/sec]
Unit Risk Factor: 0[$(\mu g/m^3)^{-1}$] Reference Concentration: 7[mg/m^3]

SOIL PROPERTIES
Soil Type: Loamy Sand Total Porosity: 0.39
Unsaturated Zone Moisture Content:
low= 0.049 best estimate= 0.076 high= 0.1
Capillary Zone Moisture Content: 0.303 Height of Capillary Rise: 0.188[m]
Soil-Gas Flow Rate into Building: 5 [L/min]

BUILDING PROPERTIES
Building Type: Slab-on-Grade Air Exchange Rate: 0.25[hr^{-1}]
Building Mixing Height: 2.44[m] Building Footprint Area: 100[m^2]
Subsurface Foundation Area: 106[m^2] Building Crack Ratio: 0.00038[unitless]
Foundation Slab Thickness: 0.1[m]

EXPOSURE PARAMETERS
Exposure Duration: carcinogens 30 [years] non-carcinogens: 30 [years]
Exposure Frequency: carcinogens 350 [days/year] non-carcinogens: 365 [days/year]
Averaging Time: carcinogens 70 [years] non-carcinogens: 30 [years]
Risk Factor for carcinogens: 1E-6 Target Hazard Quotient for non-carcinogens: 1

JOHNSON & ETTINGER SIMULATION RESULTS
Effective Diffusion Coefficients:
Unsaturated Zone(D_{eff}): 0.009722[cm^2/s]
Unsaturated Zone + Capillary Zone (D^T_{eff}): 0.0007077[cm^2/s]

Soil Gas Attenuation Factor (α_{SG}): 0.002719
Ground Water Attenuation Factor (α_{GW}): 0.0004062
Target Concentrations are based on NON-CANCER risk.
Target Indoor Air Concentration: 7000[$\mu g/m^3$] or 1613[ppbv]

[1]Less Protective Target Concentrations
Soil Gas: 3.073e6[$\mu g/m^3$] or 7.082e5[ppbv]; Ground Water: 1.107e5[$\mu g/L$]

Best Estimate Target Concentrations
Soil Gas: 2.574e6[$\mu g/m^3$] or 5.932e5[ppbv]; Ground Water: 1.080e5[$\mu g/L$]

[2]More Protective Target Concentrations
Soil Gas: 2.210e6[$\mu g/m^3$] or 5.094e5[ppbv]; Ground Water: 1.061e5[$\mu g/L$]

Based on parameter analysis: Advection is the dominant mechanism across foundation. Diffusion through soil is the overall rate-limiting process for groundwater to indoor-air pathway.

[1]"Less Protective" concentrations produced with HIGHEST moisture content and DEEPEST depth to contamination.
[2]"More Protective" concentrations produced with LOWEST moisture content and SHALLOWEST depth to contamination.

TARGET MEDIA CONCENTRATION RESULTS

Screening-Level Johnson and Ettinger Model

Site Name: Former Big Wheel Auto Parts Site
Report Date: Mon Feb 3 09:54:47 PST 2014
Report Generated From: http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite.htm
Depth to contamination from bottom of foundation: 1m +/- 0.1m
Average ground water temperature: 57F

CHEMICAL PROPERTIES
Chemical of Concern: p-Xylene CAS Number: 106423
Molecular Weight: 106.17[g/mole] Henrys Constant: 0.166576[unitless]
Diffusivity in Air: 7.690e-2[cm^2/sec] Diffusivity in Water: 8.440e-6[cm^2/sec]
Unit Risk Factor: 0[$(\mu g/m^3)^{-1}$] Reference Concentration: 7[mg/m^3]

SOIL PROPERTIES
Soil Type: Loamy Sand Total Porosity: 0.39
Unsaturated Zone Moisture Content:
low= 0.049 best estimate= 0.076 high= 0.1
Capillary Zone Moisture Content: 0.303 Height of Capillary Rise: 0.188[m]
Soil-Gas Flow Rate into Building: 5 [L/min]

BUILDING PROPERTIES
Building Type: Slab-on-Grade Air Exchange Rate: 0.25[hr^{-1}]
Building Mixing Height: 2.44[m] Building Footprint Area: 100[m^2]
Subsurface Foundation Area: 106[m^2] Building Crack Ratio: 0.00038[unitless]
Foundation Slab Thickness: 0.1[m]

EXPOSURE PARAMETERS
Exposure Duration: carcinogens 30 [years] non-carcinogens: 30 [years]
Exposure Frequency: carcinogens 350 [days/year] non-carcinogens: 365 [days/year]
Averaging Time: carcinogens 70 [years] non-carcinogens: 30 [years]
Risk Factor for carcinogens: 1E-6 Target Hazard Quotient for non-carcinogens: 1

JOHNSON & ETTINGER SIMULATION RESULTS
Effective Diffusion Coefficients:
Unsaturated Zone(D_{eff}): 0.01068[cm^2/s]
Unsaturated Zone + Capillary Zone (D^T_{eff}): 0.0007757[cm^2/s]

Soil Gas Attenuation Factor (α_{SG}): 0.002833
Ground Water Attenuation Factor (α_{GW}): 0.0004417
Target Concentrations are based on NON-CANCER risk.
Target Indoor Air Concentration: 7000[$\mu g/m^3$] or 1613[ppbv]

[1]Less Protective Target Concentrations
Soil Gas: 2.925e6[$\mu g/m^3$] or 6.741e5[ppbv]; Ground Water: 9.751e4[$\mu g/L$]

Best Estimate Target Concentrations
Soil Gas: 2.471e6[$\mu g/m^3$] or 5.694e5[ppbv]; Ground Water: 9.514e4[$\mu g/L$]

[2]More Protective Target Concentrations
Soil Gas: 2.140e6[$\mu g/m^3$] or 4.931e5[ppbv]; Ground Water: 9.344e4[$\mu g/L$]

Based on parameter analysis: Advection is the dominant mechanism across foundation. Diffusion through soil is the overall rate-limiting process for groundwater to indoor-air pathway.

[1]"Less Protective" concentrations produced with HIGHEST moisture content and DEEPEST depth to contamination.
[2]"More Protective" concentrations produced with LOWEST moisture content and SHALLOWEST depth to contamination.