

June 5, 2017

**XCG File No. 4-2352-04-03**

Ms. Janet Whitesell  
Solid Waste Superintendent  
Environmental Services Department  
City of Red Deer  
Box 5008 – 7721 40 Avenue  
Red Deer, Alberta T4N 3T4

**Re: Indoor Air Quality Sampling and Assessment at Select Residences in the Vicinity of the Former Montfort Landfill, Red Deer, Alberta**

Dear Ms. Whitesell:

## **1. INTRODUCTION, PURPOSE, AND USE**

XCG Consulting Limited (XCG) was retained by the City of Red Deer (City) to implement a vapour intrusion assessment and environmental monitoring program at the Montfort Landfill (Site), as per XCG's proposals dated August 23, 2016 and November 7, 2016.

The objective of the indoor air quality (IAQ) assessment was to determine whether the volatile organic compounds (VOCs) detected in groundwater and soil vapour on, and immediately adjacent to, the Site are migrating to indoor air and adversely affecting the adjacent off-site residential indoor air quality.

This report has been prepared for the exclusive use of The City of Red Deer and may not be relied upon by any other person or entity without written authorization of XCG.

## **2. BACKGROUND**

The Montfort Landfill is reported to have been in operation in 1968 and 1969, accepting municipal solid waste from the City. After the Site was closed, and prior to the changes in regulation prohibiting residential encroachment to closed landfill sites, numerous residences/buildings were developed adjacent to the Site. In 2015, the City undertook a Phase I Environmental Site Assessment (ESA), a Phase II ESA, and an Environmental Risk Management Plan (ERMP) for the Site. These studies indicated that additional environmental monitoring and investigations were required to determine the potential for landfill gases to impact the homes and residents neighbouring the Site. The locations of the monitoring wells and soil vapour probes are shown on Figure 1.

XCG understands that the City of Red Deer offered indoor air quality monitoring to all residents living within a 100-metre radius of the subject property, of which, 22 residents requested the monitoring.



- Implementing a phased approach, XCG recommended assessing indoor air quality at 11 of the above-noted 22 properties that are located immediately adjacent to the Site, (Residence A through Residence K).
- Although included in the 11 proposed testing locations, indoor air quality testing was not conducted at Residence K because the resident was away for an extended period of time. Therefore, the first phase of monitoring was designed to establish whether there is evidence of Site-related impacts at the above-mentioned 10 adjacent properties, the results of which are documented in this letter report. Based on the results of this first phase of indoor air monitoring, additional recommendations will be made regarding additional indoor air monitoring for properties located further away from the Site.

The following sections describe the sampling activities and the analytical results for indoor air samples collected by XCG personnel in select residential buildings located on properties adjacent to the Site on March 13 through March 14, 2017. The indoor air sampling and quality assessment described below were completed in general accordance with the work plan presented in a document entitled “Proposed Investigation Program, Montfort Landfill, Red Deer, Alberta,” dated April 11, 2017 (Revised Work Plan).

### **3. IDENTIFICATION OF CONTAMINANTS OF CONCERN**

The indoor air quality assessment program was designed to measure the concentrations of select VOCs, collectively referred to hereafter as the contaminants of concern (COCs), in indoor air samples collected in the basements of residential dwellings located adjacent to the Site. The potential COCs in indoor air were determined based on groundwater and soil vapour testing conducted in conjunction with the indoor air sampling.

The groundwater and soil vapour sampling was completed to provide a baseline characterization of leachate derived VOCs which could be present in the soil vapour on and immediately adjacent to the Site. The parameters detected in soil vapour were screened (using a deminimus approach) to determine which parameters had the potential to impact indoor air based on concentrations present in the soil vapour. Parameters detected in soil vapour that exceeded the deminimus soil vapour criteria were identified as potential COCs in indoor air. Both soil vapour and indoor air sampling activities were conducted while the ground was frozen (i.e. while natural venting from the ground is limited), to assess worst case scenario concentrations of VOCs.

The following sections discuss the findings of the soil vapour deminimus screening and indoor air sampling undertaken in March 2017. Detailed results of the complete soil vapour and groundwater quality assessment will be provided under separate cover following completion of the three additional quarterly monitoring events.

#### **3.1 Assessment Criteria**

##### **3.1.1 Indoor Air Quality Criteria**

Indoor Air Quality Criteria were derived for each COC based on toxicity reference values as published in Table A-7 Human Toxicity Reference Values (TRVs) of the Alberta Environment publication entitled “Alberta Tier 2 Soil and Groundwater Remediation Guidelines,” dated February 2, 2016 (Alberta Tier 2 Guidelines). For COCs that did not have TRVs published in



the Alberta Tier 2 Guidelines and for contaminants with more recent toxicological data, conservative TRVs were selected from Canadian Council of Ministers of the Environment (CCME) or the United States Environmental Protection Agency (USEPA) Integrated Risk Information System (IRIS). The selected TRVs are summarized in Attachment A (Table A1) and were discussed with Alberta Environment and Parks (AEP) and Alberta Health Services (AHS) personnel prior to finalizing the list.

The allowable health based indoor air concentration was calculated for each COC using the selected TRV for that contaminant. In order to be conservative, and as directed by AEP, exposure pro-rating was not utilized to adjust the allowable limits. Candidate indoor air concentrations were calculated for both threshold and non-threshold effects and the lowest risk level was selected as the allowable health based indoor air concentration (see Attachment A, Table A2).

Methane in indoor air was assessed based on the “Draft Soil and Building Methane Gas Management Guide,” dated October 2013 and prepared by Alberta Health Services (AHS, 2013). A trigger value of between 2,500 and <5,000 parts per million by volume (ppmv) [5.0 to <10.0 % lower explosive limit (LEL)] was selected for indoor air. As recommended in Table 7 of the AHS 2013 document, indoor methane concentrations detected in this range (2,500 and <5,000 ppmv) require a detailed indoor air monitoring program be completed throughout the building, and methane mitigation strategies be implemented (sealing cracks, service entry points, etc.). Concentrations >5,000 ppmv (>10 % LEL) will require building evacuation and ventilation to remove explosion hazard.

### **3.1.2 Soil Vapour Deminimus Screening**

Soil vapour results were screened using a deminimus approach. A default soil vapour attenuation coefficient of 0.01 was applied in order to conservatively screen soil vapour concentrations as follows:

$$C_{svDeminimus} = \frac{C_{air}}{\alpha}$$

where

$C_{svDeminimus}$  = Deminimus Concentration of Soil Vapour

$C_{air}$  = Health Based Indoor Air Criteria (as discussed in 3.1.2 above)

$\alpha$  = deminimus vapour attenuation coefficient 0.01 (as directed by AEP).

The deminimus soil vapour criteria calculations are shown in Attachment A (Table A3). As discussed above, if a parameter was detected in soil vapour at a concentration exceeding the deminimus soil vapour screening criteria, analyses in indoor air was required for the parameter. If the deminimus modelling did not exceed the deminimus soil vapour criteria, then analyses for the parameter was not analyzed for in indoor air even if it was detected in soil vapour.

Methane in soil vapour will also be assessed in accordance with the AHS 2013 document. Based on this guidance document a soil vapour screening level for soil methane adjacent to a building is between 1,000 and 5,000 ppm at soil gas pressures between 0.10 to <0.50 psi. As



recommended in Table 6 of the AHS 2013 document, further investigation and site characterization is recommended when methane is detected in these ranges.

Screening values for soil vapour for propane, ethane and ethylene were derived based on National Institute for Occupational Safety and Health (NIOSH) recommended exposure limits (REL) as listed in Attachment A3. The soil vapour screening values for these parameters were derived assuming that no vapour attenuation occurs.

Soil vapour results for fixed gases and petroleum hydrocarbons, VOCs, and siloxanes are tabulated in Attachment A (Tables A4, A5, and A6, respectively). Worst case concentrations of each parameter detected in the soil vapour were tabulated to compare to the calculated deminimus soil vapour screening criteria as illustrated in Attachment A (Table A7). Based on the comparison, only methane, vinyl chloride and cis-1,2-dichloroethylene (cis-1,2-DCE) were requested for analyses in the indoor and ambient air samples.

### **3.1.3 Additional Considerations Based on Groundwater Data**

It should be noted that in addition to the consideration of the deminimus soil vapour calculations, 1,3,5-trichlorobenzene was detected in groundwater at monitoring well location MW-06 at a concentration of 0.73 µg/L. This compound is not part of the standard laboratory VOC analyses package for vapour as it exists as a solid at standard temperature and pressure. 1,3,5-trichlorobenzene was not detected at this location during previous sampling events, and was not detected anywhere else on the Site. Borehole logs for MW-06 are not available, but given the groundwater quality and both the odour and colour of the groundwater at this location, it is assumed that this monitoring well is situated within the limit of waste. Calculations using Henry's Law to determine what the maximum soil vapour concentration would be based on the known groundwater concentration partitioning into soil vapour resulted in a calculated concentration of 56.7 µg/m<sup>3</sup>. The calculated soil vapour screening value for 1,3,5-trichlorobenzene is 72 µg/m<sup>3</sup>. As a result of the fact that this monitoring well is likely within the limit of waste as well as the fact that the soil vapour value immediately above the groundwater-vapour interface is less than the soil vapour screening value, XCG elected not to request 1,3,5-trichlorobenzene data for indoor air. The Henry's Law calculations are provided at the bottom of Table A7 in Attachment A.

## **4. INDOOR AIR QUALITY ASSESSMENT**

The indoor air quality assessment program was designed to measure the concentrations of select VOCs, in samples of whole air collected in the basements of residential dwellings located adjacent to the Site. The XCG SOP for Indoor Air Sampling is included in Attachment B.

The design of the investigation was developed, in part, using information contained within the following guidance manuals:

- Alberta Environment and Parks (AEP), "Alberta Tier 2 Soil and Groundwater Remediation Guidelines," dated 2016.
- CH2M Gore & Storrie Limited, "Guidance Document on the Management of Methane Gas Adjacent to Landfills," dated December 1999.



- Canadian Council of Ministers of the Environment (CCME), “A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures via Inhalation of Vapours,” dated 2014
- Alberta Health Services, “Draft Soil and Building Methane Gas Management Guide,” dated October 2013; and
- Health Canada, “Federal Contaminated Site Risk Assessment in Canada, Part VII – Guidance for Soil Vapour Intrusion Assessment at Contaminated Sites,” dated 2010.

#### 4.1 Preliminary Inspections

Prior to commencing indoor air sampling on March 13, 2017, XCG personnel completed preliminary inspections in all of the residential dwellings. During the preliminary inspections, XCG personnel were accompanied by the residential property owners. The building surveys were completed to identify potential background sources of chemicals and to assess building conditions that may influence indoor air quality. The building surveys were conducted a minimum of 48 hours prior to the start of the indoor air sampling. This allowed XCG personnel to identify any potential sources of indoor air contamination which could potentially bias the indoor air sampling results, and to make recommendations regarding the elimination of the source (to the extent practical).

The pre-sampling surveys also allowed XCG personnel to confirm the sample locations with the occupants ahead of the scheduled sampling day.

Pertinent key observations made in the basements of the on-site dwellings and recommendations made during the preliminary inspections are summarized in Table 1, below.

**Table 1 Observations documented during Preliminary Site Inspections**

Date of Initial Inspection	Finishes	Preferential Pathways	Observations & Actions
<b>Residence A</b>			
06/12/16	Basement has finished floors (tile, carpet) and walls. Layout encompasses a larger living room area, washroom, bedrooms, and a utility room.	Sanitary stack runs through floor outside of utility room. Floor drain outside of utility room.	No recommended actions.
<b>Residence B</b>			
05/12/16	Basement has finished floors (carpet) and walls except for the utility room. Layout encompasses a larger living room area, washroom, bedrooms, laundry room, and a utility room off the laundry room.	Sanitary stack runs through floor in utility room. Floor drain in utility room.	Paints and thinners in a cupboard in another room in basement. Recommended to not open paints in basement until after sampling. Cans of insecticides, window cleaners, etc. in laundry room. These were moved to the garage prior to the sampling event.



Date of Initial Inspection	Finishes	Preferential Pathways	Observations & Actions
<b>Residence C</b>			
06/12/16	Basement has finished floors (tile, carpet) and walls except for utility room. Layout is completely open other than wall/hall dividing stairwell from rest of basement.  New carpeting on main level installed November 2016.	Sanitary stack runs through floor near furnace.  Floor drain near furnace.	Tubes of acrylic paint present (hobby sized). Not opened for long time. Recommended to keep closed until after sampling.
<b>Residence D</b>			
05/12/16	Basement has finished floors (linoleum) and walls except for crawlspace. Layout is open other than half of basement is a crawlspace which has a door separating it from the rest of the basement.	Sanitary stack runs through floor near furnace.  No visible floor drain-possibly present under furniture or utilities.	No recommended actions.
<b>Residence E</b>			
06/12/16	Basement has finished floors (carpet) and walls in approximately two-thirds of area. Layout encompasses a living room area, a bedroom, a storage area/crawlspace, and a utility room situated off the bedroom.	Sanitary stack runs through floor in utility room.  Floor drain in utility room.  Several cracks visible in slab in storage area.  Movement of air between storage area and the utility room is possible even with the doors closed to both areas.	At least one member of the household smokes cigarettes in the house. Basement bedroom is occupied full time, therefore personal hygiene products (deodorant, etc.) present.  Ductwork in crawl space formerly directly connected to garage above. Homeowner sealed off.  No recommended actions.
<b>Residence F</b>			
06/12/16	Basement has finished floors (tile, carpet) and walls except for utility room. Layout encompasses a larger living room area, washroom, small storage room, and utility room.  New flooring, carpeting on main level installed November 2016.  Renovations within the week prior to sampling included new woodwork and the use of low VOC paint in the basement (Minwax water-based Wood Stain).	Sanitary stack runs through floor in utility room.  Floor drain in utility room.  0.6m x 0.6m piece of plywood covering hole through slab in craft room in basement. Appears to be native clay below.	Household cleaners in basement moved to garage before sampling event
<b>Residence G</b>			
06/12/16	Basement has finished floors (carpet) and walls except for utility room. Layout encompasses a larger living room area, washroom, small storage room, and utility room.	Sanitary stack runs through floor in utility room.  Floor drain in utility room.	Bleach powder under sink in basement washroom. No recommended actions.



Date of Initial Inspection	Finishes	Preferential Pathways	Observations & Actions
<b>Residence H</b>			
06/12/16	Basement unfinished - Concrete floor slab and studs visible. Basement completely open - no dividing walls.	Sanitary stack and floor drain near furnace. Minor crack in slab.	No recommended actions.
<b>Residence I</b>			
09/03/17	Basement has finished floors (carpet) and walls except for the utility area. Layout encompasses a larger living room area, washroom, laundry room, and a utility room off the laundry room.	Sanitary stack and floor drain near furnace. Minor crack in slab.	No recommended actions.
<b>Residence J</b>			
09/03/17	Basement has finished floors (carpet) and walls except for the utility area. Layout encompasses a larger living room area, washroom, and a laundry/utility room.	Sanitary stack and floor drain near furnace. Minor cracks in slab.	Removed household cleaning products from the laundry/utility room prior to sampling.

*General notes:*

- All residential windows were closed prior to and during the sampling events. Minimal traffic occurred through the doors. Sample locations were not directly connected to exterior access points.
- All residences are connected to a garage.
- All residences have fireplaces, either gas or wood-burning.
- The floor slabs were not completely visible in any of the basements due to obstructions or flooring materials.

#### **4.2 Sampling Activities**

The indoor and outdoor (ambient) air sample collection was completed over a period of 24 hours commencing on March 13, 2017. The sampling was completed in general accordance with the Proposed Investigation Program following XCG's Standard Operating Procedure (SOP) for Indoor Air Quality Sampling using Summa® Canisters. During the commencement of sampling activities on March 13, 2017, XCG was accompanied on-site by the property owners or their appointed representatives.

The sampling locations are shown on Figure 1. The field observations pertinent to the sampling activities are summarized in Attachment C.

The following summarizes the sampling activities conducted between March 13 and March 14, 2017:

- It was ensured that any recommended actions outlined in Table 1, above, had been completed.



- The indoor air sampling was conducted using Summa® Canisters. One Summa® Canisters was deployed in the basement of each of the residences, with the exception of Residence C. Two Summa® Canisters (a primary sample and a duplicate sample) were deployed in the basement of Residence C. In addition to the indoor air samples, XCG also collected a sample of outdoor (ambient) air by deploying one Summa® Canisters on the back porch of Residence I. All samples were collected using laboratory supplied Summa® Canisters with pre-calibrated 24-hour flow regulators.
- The indoor air Summa® Canisters were placed at heights ranging between approximately 1.0 to 1.5 metres above the basement floors.
- The ambient air Summa® Canisters was placed at a height of approximately 2.0 metres above the ground surface.
- The air samples were collected over a period of approximately 24 hours.
- The heating systems were running as normal at all of the locations with the exception of Residence G because the homeowners were away and had turned the thermostat down a few degrees.
- The concentrations of total organic vapours (TOVs) in the basements were measured using a handheld Photoionization Detector (PID) RKI Eagle 2, and ranged between 0 and 3 parts per million (ppm).
- The concentrations of methane, oxygen and carbon dioxide in the basements were measured using a Landtech GEM-2000 Gas Analyzer. Methane concentrations ranged between 0 and 0.1 % (v/v), oxygen concentrations ranged between 20.8 and 21.6 % (v/v) and carbon dioxide concentrations consistently measured 0.1% (v/v).
- Attachment C contains the field notes for the sample collection, which provide details related to additional observations, meteorological conditions, sampling time, and canister vacuums at the commencement and upon completion of the sampling activities.
- The trip blank canister was also the trip blank sample used for the soil vapour sampling, as all of the canisters were shipped together and kept together for the duration of the sampling and while in transit.
- The canisters containing the indoor and outdoor air samples were submitted under Chain of Custody protocol on March 15, 2017 to Maxxam Analytics Inc. (Maxxam). Maxxam is accredited by the Standards Council of Canada (SCC). Samples were placed on hold until the analytical results for both the groundwater and soil vapour samples were reviewed to determine the list of parameters which would be investigated in the indoor air and ambient air samples.
- Once the preliminary sampling results for groundwater and soil vapour were received, the list of parameters for analyses in the indoor air samples was updated based on the results from soil vapour probes and groundwater monitoring wells.

## **5. MONITORING RESULTS**

The analytical results for the indoor and outdoor air samples are summarized in Table 2 (end of text). Copies of the Laboratory Certificates of Analysis are provided in Attachment D. The following sections provide the summary and the assessment of the sampling results.



### **5.1 Background (Ambient) Air Quality**

Concentrations of methane, vinyl chloride, and cis-1,2-DCE were not detected in ambient air above the laboratory reportable detection limits (RDLs), which were set below the Health Based Indoor Air Criteria.

### **5.2 Indoor Air Quality**

Concentrations of methane, vinyl chloride, and cis-1,2-DCE were not detected in indoor air above the laboratory RDLs in any of the indoor air samples collected from any of the 10 basements. The laboratory RDLs were set below the Health Based Indoor Air Criteria.

Given this information, it is highly unlikely that soil vapour impacted by the landfill is migrating into the indoor air of the residences adjacent to the Site.

### **5.3 Recommendations**

No further monitoring is recommended at this time, either in the residential units where monitoring has already been conducted or in the residences originally proposed for the provisional phase of monitoring. Additional indoor air monitoring recommendations may be included as part of the 2017 Annual Report for the Site once a full year of water levels and soil vapour monitoring data have been collected.

### **5.4 Quality Assurance/Quality Control (QA/QC) Results**

XCG reviewed the laboratory sample results and quality assurance and quality control (QA/QC) samples to evaluate whether data quality objectives were met. The analytical data are considered to be representative, reliable, and complete, and have a documented accuracy and precision. The laboratory sample spikes and QC standard samples analyzed by the laboratory did not reveal any anomalous results.

For the fieldwork program, XCG followed standard QA/QC field protocols, which included cleaning and calibration of sampling equipment, dedicated sampling equipment, unique sample identification and completing chains of custody, recording observations in field notes, and shipping samples to the laboratory as soon as possible after collection, noting the recommended maximum holding times. The soil vapour duplicate field sample had a calculated relative percent difference (RPD) of 92 percent for toluene. No other RPD were calculated for either soil vapour or indoor air as the concentration in the sample or the duplicate was too low to permit a reliable RPD (one or both samples were less than five times the laboratory RDL).

## **6. CONCLUSIONS**

Concentrations of methane, vinyl chloride, and cis-1,2-DCE were not detected in ambient air or in any of the basements of the 10 residences above the laboratory RDLs. The laboratory RDLs were set below the Health Based Indoor Air Criteria. It can be concluded that it is unlikely that soil vapour impacted by the landfill is migrating into the indoor air of the residences adjacent to the Site. No additional recommendations are being made at this time.



## **7. LIMITATIONS**

This report has been prepared for the exclusive use of by the City of Red Deer, and may not be relied upon by any other person or entity without written authorization of XCG. The scope of services performed in the execution of this scope of work may not be appropriate to satisfy the needs of other users, and any use or reuse of this document or the findings, conclusions, or recommendations represented herein is at the sole risk of said users.

Conditions which could not be detected or anticipated at the time of this investigation could influence the findings of this assessment. As such, XCG cannot be held responsible for environmental conditions that were not apparent from the available information.

## **8. CLOSURE**

If you have any questions, comments, or require further assistance, please do not hesitate to contact the undersigned.

Respectfully submitted,

XCG CONSULTING LIMITED

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Mary-Catherine Lanning, B.Sc., M.Sc., P.Geo.  
Project Specialist

A handwritten signature in black ink, appearing to read 'Pamela Cameron'.

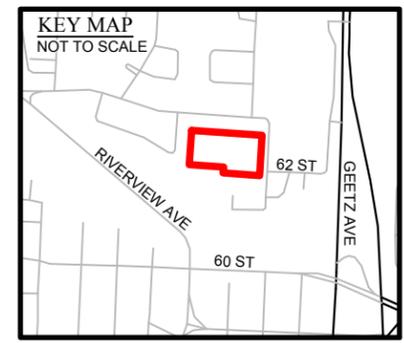
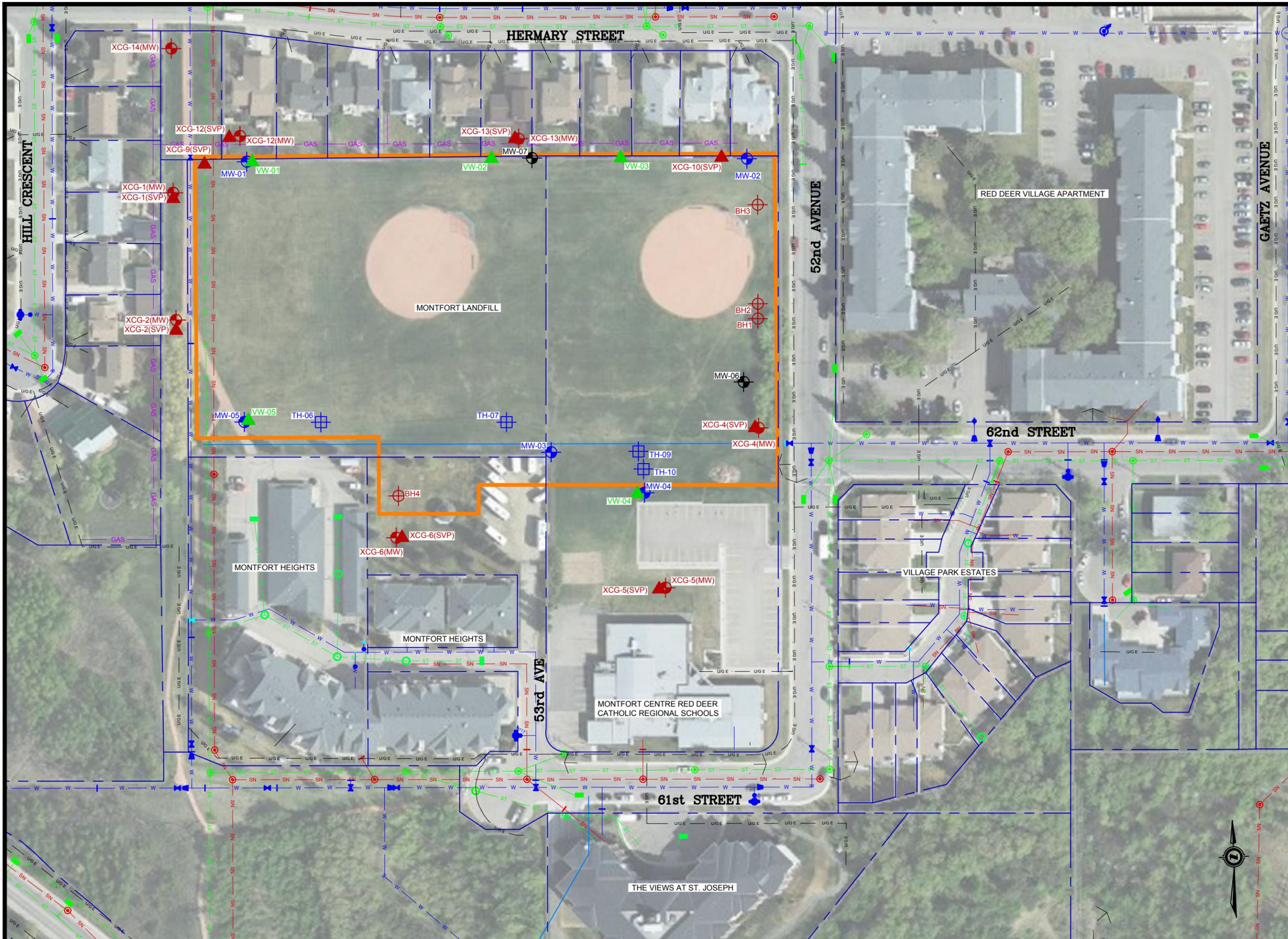
Pamela Cameron, B.A.Sc., P.Eng., EP(CEA)  
Senior Project Manager

Attachments: References  
Figure 1  
Table 2 – Summary of Analytical Results for VOCs in Indoor Air  
Attachment A – Soil Vapour Guidelines and Screening  
Attachment B - XCG SOP for Indoor Air Sampling  
Attachment C - Field Notes  
Attachment D - Laboratory Certificates of Analysis

**REFERENCES**

1. Alberta Environment and Parks (AEP), “Alberta Tier 2 Soil and Groundwater Remediation Guidelines,” dated 2016.
2. Alberta Health Services, “Draft Soil and Building Methane Gas Management Guide,” dated October 2013.
3. Atlantic PIRI, RBCA (Risk-Based Corrective Action) Version 2.0 for Petroleum Impacted Sites in Atlantic Canada, “Guidance for Soil Vapour and Indoor Air Monitoring Assessments,” dated 2006.
4. Canadian Council of Ministers of the Environment (CCME), “Final Scoping Assessment of Soil Vapour Monitoring Protocols for Evaluating Subsurface Vapour Intrusion into Indoor Air,” dated July 8, 2008.
5. Canadian Council of Ministers of the Environment (CCME), “A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures via Inhalation of Vapours,” dated 2014.
6. CH2M Gore & Storrie Limited, “Guidance Document on the Management of Methane Gas Adjacent to Landfills,” dated December 1999.
7. Health Canada, “Federal Contaminated Site Risk Assessment in Canada, Part VII: Guidance for Soil Vapour Intrusion Assessment at Contaminated Sites,” dated 2010.
8. Ontario Ministry of the Environment, “Draft Technical Guidance: Soil Vapour Intrusion Assessment,” dated September 2013.
9. Science Advisory Board for Contaminated Sites in British Columbia (SABCS), “Guidance on Site Characterization for Evaluation of Soil Vapour Intrusion into Buildings,” report prepared by Golder Associates, dated May 2011.
10. Tiamat Environmental Consultants Ltd., “Phase I Environmental Site Assessment Historic Waste Disposal Site Montfort Landfill Site The City of Red Deer,” dated September 24, 2013.
11. Tiamat Environmental Consultants Ltd., “Phase II Environmental Site Assessment Historic Waste Disposal Site Montfort Landfill Site The City of Red Deer,” dated February 26, 2014.
12. Tiamat Environmental Consultants Ltd., “Environmental Risk Management Plan Historic Waste Disposal Site Montfort Landfill Site The City of Red Deer,” dated November 21, 2014.

***FIGURE***



**LEGEND:**

- APPROXIMATE PROPERTY BOUNDARIES
- SN SANITARY LINE
- ST STORM LINE
- GAS GAS LINE
- UGE UNDERGROUND ELECTRICAL TRENCH
- APPROXIMATE LIMIT OF WASTE
- GROUNDWATER MONITORING WELL LOCATION (TIAMAT, 2014)
- GROUNDWATER MONITORING WELL LOCATION (OTHERS)
- TEST HOLE
- SOIL VAPOUR MONITORING WELL
- MONITORING WELL LOCATION (XCG, JAN. 2017)
- SOIL VAPOUR MONITORING LOCATION (XCG, JAN. 2017)
- BOREHOLE LOCATION (XCG, JAN. 2017)



MONITORING WELL AND SOIL VAPOUR PROBE LOCATIONS  
 INDOOR AIR INVESTIGATION PROGRAM  
 FORMER MONTFORT LANDFILL SITE  
 CITY OF RED DEER, ALBERTA



DRAWING REFERENCE: Figure based on Phase II ESA (Tiamat Environmental Consultants Ltd., April 2014), City of Red Deer online mapping and XCG field notes.  
 NOTE: Location of building, underground utilities, etc. are for reference only and should not be relied upon for detailed design, renovation, or construction purposes. Property boundary and building locations shown may not represent actual surveyed boundaries.

SHEET: R423520403001FIG01.pdf  
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DATE	JOB NO.	FIGURE NO.
MAR. 2017	4-2352-04-03	1

***TABLE***

Table 2 Summary of Analytical Results for VOCs in Indoor Air

Sample ID	UNITS	Reportable Detection Limit	Health Based Indoor Air Criteria	Indoor Air Samples										Ambient	
				Residence A/2758	Residence B/T21636	Residence C/14258		Residence D/18232	Residence E/129	Residence F/14918	Residence G/14531	Residence H/18260	Residence I/14530	Residence J/2813	OAQ/2595
Laboratory				Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	Maxxam	
Laboratory ID				EBG197	EBG194	EBG196	EBG205	EBG201	EBG200	EBG199	EBG198	EBG195	EBG202	EBG203	
Date Sampled				14/03/2017	14/03/2017	14/03/2017	14/03/2017	14/03/2017	14/03/2017	14/03/2017	14/03/2017	14/03/2017	14/03/2017	14/03/2017	
Summa Canister Pressure on Receipt	psig	NV	NV	(-3.9)	(-5.0)	(-4.5)	(-4.5)	(-4.6)	(-4.5)	(-4.0)	(-4.0)	(-3.6)	(-4.5)	(-4.3)	(-2.2)
Vinyl Chloride	$\mu\text{g}/\text{m}^3$	0.0511	1.136	<0.051	<0.051	<0.051	<0.051	<0.051	<0.051	<0.051	<0.051	<0.051	<0.051	<0.051	<0.051
cis-1,2-Dichloroethylene	$\mu\text{g}/\text{m}^3$	0.200	1.790	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Methane	% v/v	0.1-0.2	0.25-0.5	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Notes: Note 1 Health Based Indoor Air Criteria is derived from Risk Assessment modelling, which takes a number of conservative assumptions into consideration. The Criteria are not regulated, rather are indicators of possible sources. <b>Bold and underline</b> Parameter concentration exceeds Health Based Indoor Air Criteria for Commercial Use NA Not Analyzed < Below Laboratory RDL															

**ATTACHMENT A**  
**SOIL VAPOUR GUIDELINES AND SCREENING**

**Table A1 Toxicity Reference Values**

(List of chemicals is based on parameters with detectable levels in groundwater and soil vapour from Tiamat Environmental Consultants Ltd., Environmental Risk Management Plan (ERMP) and Phase II ESA- Montfort Landfill Site, City of Red Deer)

Chemical	Carcinogen		Toxicity Reference Value (TRV)				Source Allocation Factor
			Tolerable Concentration (TC) (mg/m <sup>3</sup> )	Reference	Inhalation Unit Risk (UR) (mg/m <sup>3</sup> ) <sup>-1</sup>	Reference	
trans-1,2-dichloroethylene	N/E		0.009	IRIS 2010 adopted from Oral TRV 0.002 mg/kg/d	-		0.2
1,2-dibromoethane	Likely Carcinogen		0.009	IRIS 2004	0.0006	IRIS 2004	0.2
1,2-dichlorobenzene	N/E		1.92411	Alberta Env [ HC (2004) estimated from Oral]	-		0.2
styrene	N/E		0.092	Alberta Env [ HC (2004)]	-		0.5
1,3,5-trichlorobenzene	N/E		0.0036	Alberta Env [ HC (2004)]	-		0.2
1,1,2-trichloroethane	Possible Carcinogen		0.018	USEPA 1995 adopted from Oral TRV of 0.004 mg/kg/day	0.000016	USEPA 1995	0.2
Ethane	N/E		813	Occupational Exposure Limit (1000 ppm)	-		
Ethylene	Non-Carcinogen		174	Occupational Exposure Limit (200 ppm)	-		
Methane	Non-Carcinogen		-		-		
Propane	Non-Carcinogen		1800	Occupational Exposure Limit (1000 ppm)	-		1
Dichlorodifluoromethane (Freon 12)	Non-Carcinogen		0.89	IRIS 1987 adopted from Oral TRV 0.2 mg/kg/d	-		0.2
1,2-dichlorotetrafluoroethane (R114)	N/E		7000	Alberta ENV - Occupational Exposure Limit	-		1
Chloromethane	Non-Carcinogen		0.09	IRIS 2001	-		0.2
Vinyl Chloride	Carcinogen		0.1	Alberta Env [USEPA (2006)]	0.0088	Alberta Env [USEPA (2006)]	0.2
Chloroethane	N/E		10	IRIS 1991	-		0.2
Trichlorofluoromethane (Freon 11)	Non-Carcinogen		1	(Subchronic) [PPRTV Provisional Peer Review]	-		0.2
Ethanol (Ethyl Alcohol)	Carcinogen		1900	ACGIH exposure Limit (1000 ppm)	-		1
2-Propanol (isopropyl alcohol)	N/E		491	ACGIH exposure Limit (400 ppm)	-		1
2-Propanone (acetone)	N/E		3.09E+01	ATSDR	-		0.2
Methyl Ethyl Ketone (2-Butanone)	N/E	Developmental Effects	5	IRIS 2003	-		0.2
1,4-dichlorobenzene	Possible Carcinogen		0.095	Alberta Env [Health Canada 2004]	-		0.2
1,1-dichloroethylene	Possible Carcinogen		0.2	Alberta Env [USEPA (2006)]	-		0.2
cis-1,2-dichloroethylene	N/E		0.009	IRIS 2010 adopted from Oral TRV 0.002 mg/kg/d	-		0.2
methylene chloride (dichloromethane)	Possible Carcinogen		3	Alberta Env [ORNL (2006)]	0.000023	Alberta Env [HC (2004b)]	0.2
chloroform	Possible Carcinogen		0.028	(modified from HC 2006 oral TDI)	-		0.2
1,1,1-trichloroethane	N/E		1	MOECC (Cal EPA chREL 2000)	-		0.2
trichloroethylene (updated)	Carcinogen	Developmental Effects	0.04	Alberta Env [CCME 2006]	0.00061	Alberta Env [CCME 2006]	0.2
tetrachloroethylene	Carcinogen		0.04	USEPA IRIS 2012	0.00026	USEPA IRIS 2012	0.2
benzene	Carcinogen		0.03	MOECC (IRIS 2003)	0.0033	Alberta Env [HC (2004b)]	0.2
toluene	Non-Carcinogen		3.8	Alberta Env [HC (2004b)]	-		0.5
PHC F1							
Aliphatic C6-C8	Non-Carcinogen		18.4	CCME 2008	-		0.5
Aliphatic C8-C10	Non-Carcinogen		1	CCME 2008	-		0.5
Aromatic C8-C10	Non-Carcinogen		0.2	CCME 2008	-		0.5
PHC F2							
Aliphatic C10-C12	Non-Carcinogen		1	CCME 2008	-		0.5
Aliphatic C12-C16	Non-Carcinogen		1	CCME 2008	-		0.5
Aromatic C10-C12	Non-Carcinogen		0.2	CCME 2008	-		0.5
Aromatic C12-C16	Non-Carcinogen		0.2	CCME 2008	-		0.5
ethylbenzene	Possible Carcinogen	Developmental Effects	1	Alberta Env [USEPA (2006)]	-		0.5
total xylenes	Non-carcinogen		0.18	Alberta Env [HC (2004b)]	-		0.5
1,3,5-trimethylbenzene	Non-carcinogen		0.02	IRIS 2012b DRAFT	-		0.2
1,2,4-trimethylbenzene	Non-carcinogen		0.02	IRIS 2012b DRAFT	-		0.2
hexane	Non-carcinogen		0.7	CCME 2011	-		0.2
heptane	N/E		0.4	PPRTV [PPRTV Provisional Peer Review]	-		0.2
cyclohexane	N/E		6	IRIS 2003	-		0.2
tetrahydrofuran	Possible Carcinogen		2	IRIS 2012	-		0.2
propene	N/E		3	CalEPA	-		0.2
2,2,4-trimethylpentane	N/E		64.2	ACGIH exposure Limit (300 ppm)	-		1
carbon disulfide	Non-carcinogen		0.1	Health Canada	-		0.2
trimethylsilyl fluoride	N/E						
trimethylsilanol	N/E						
hexamethyl cyclotrisiloxane - D3	N/E						
octamethyl cyclotetrasiloxane -D4	N/E						
decamethyl cyclopentasiloxane - D5	N/E						
dodecamethyl cyclohexasiloxane - D6	N/E						

Notes  
N/E Not Evaluated

**Table A2 Indoor Air Quality Criteria**

**Non Cancer**

$$\text{Indoor Air Concentration} = \frac{\text{TC} \times \text{SAF} \times \text{C}}{\text{Non Cancer Pro-rating Factor}}$$

**Cancer**

$$\text{Indoor Air Concentration} = \frac{\text{CRL} \times \text{C}}{\text{Cancer Pro-rating Factor} \times \text{IUR}}$$

where:

Indoor Air Concentration	µg/m <sup>3</sup>	Allowable Indoor Air Concentration
TC	mg/m <sup>3</sup>	Tolerable Concentration
IUR	(mg/m <sup>3</sup> ) <sup>-1</sup>	Inhalation Unit Risk
SAF		Source Allocation Factor
CRL		Cancer Risk Level (assume 1 x 10 <sup>-5</sup> )
C		1,000 µg/mg conversion factor
Pro-rating Factor		Assume no pro-rating for screening level criteria = 1

**Developmental Effects**

Parameters with inhalation chronic non-cancer toxicity reference values based on reproductive or developmental effects are not pro-rated for exposure. Default exposure is set as 1.

Chemical	Tolerable Concentration (TC) (mg/m <sup>3</sup> )	Inhalation Unit Risk (UR) (mg/m <sup>3</sup> ) <sup>-1</sup>	Notes	Indoor Air Criteria (ug/m3)		
				threshold	non-threshold	Lowest Risk Level
trans-1,2-dichloroethylene	0.009	-		1.79E+00		1.79E+00
1,2-dibromoethane	0.009	0.0006		1.80E+00	1.67E+01	1.80E+00
1,2-dichlorobenzene	1.924	-		3.85E+02		3.85E+02
styrene	0.092	-		4.60E+01		4.60E+01
1,3,5-trichlorobenzene	0.004	-		7.20E-01		7.20E-01
1,1,2-trichloroethane	0.018	0.000016		3.58E+00	6.25E+02	3.58E+00
Ethane	813	-				1000 ppm (8.13E+5 ug/m3)
Ethylene	174	-				200 ppm (1.74 E+05 ug/m3)
Methane	-	-				2500 to 5000 ppmv ( 5 to <10 % LEL)
Propane	1800	-		1.80E+06		1000 ppm (1.8 E+6 ug/m3)
Dichlorodifluoromethane (Freon 12)	0.89	-		1.78E+02		1.78E+02
1,2-dichlorotetrafluorethane (R114)	7000	-		7.00E+06		1000 ppm (7.0E+6 ug/m3)
Chloromethane	0.09	-		1.80E+01		1.80E+01
Vinyl Chloride	0.1	0.0088		2.00E+01	1.14E+00	1.14E+00
Chloroethane	10	-		2.00E+03		2.00E+03
Trichlorofluoromethane (Freon 11)	1	-		2.00E+02		2.00E+02
Ethanol (Ethyl Alcohol)	1900	-		1.90E+06		1.90E+06
2-Propanol (isopropyl alcohol)	491	-		4.91E+05		4.91E+05
2-Propanone (acetone)	30.9	-		6.18E+03		6.18E+03
Methyl Ethyl Ketone (2-Butanone)	5	-	Developmental Effects	1.00E+03		1.00E+03
1,4-dichlorobenzene	0.095	-		1.90E+01		1.90E+01
1,1,-dichlorethylene	0.2	-		4.00E+01		4.00E+01
cis-1,2-dichloroethylene	0.008949367	-		1.79E+00		1.79E+00
methylene chloride (dichloromethane)	3	0.000023		6.00E+02	4.35E+02	4.35E+02
chloroform	0.028	-		5.60E+00		5.60E+00
1,1,1-trichloroethane	1	-		2.00E+02		2.00E+02
trichloroethylene (updated)	0.04	0.00061		8.00E+00	1.64E+01	8.00E+00
tetrachloroethylene	0.04	0.00026	Developmental Effects	8.00E+00	3.85E+01	8.00E+00
benzene	0.03	0.0033		6.00E+00	3.03E+00	3.03E+00
toluene	3.8	-		1.90E+03		1.90E+03
PHC F1			CCME Soil Subfractions (Tier 1 Table C-10) used to derive F1 criteria			5.95E+02
Aliphatic C6-C8	18.4	-		9.20E+03		9.20E+03
Aliphatic C8-C10	1	-		5.00E+02		5.00E+02
Aromatic C8-C10	0.2	-		1.00E+02		1.00E+02
PHC F2			CCME Soil Subfractions (Tier 1 Table C-10) used to derive F1 criteria			2.78E+02
Aliphatic C10-C12	1	-		5.00E+02		5.00E+02
Aliphatic C12-C16	1	-		5.00E+02		5.00E+02
Aromatic C10-C12	0.2	-		1.00E+02		1.00E+02
Aromatic C12-C16	0.2	-		1.00E+02		1.00E+02
ethylbenzene	1	-		5.00E+02		5.00E+02
total xylenes	0.18	-		9.00E+01		9.00E+01
1,3,5-trimethylbenzene	0.02	-		4.00E+00		4.00E+00
1,2,4-trimethylbenzene	0.02	-		4.00E+00		4.00E+00
hexane	0.7	-		1.40E+02		1.40E+02
heptane	0.4	-		8.00E+01		8.00E+01
cyclohexane	6	-		1.20E+03		1.20E+03
tetrahydrofuran	2	-		4.00E+02		4.00E+02
propene	3	-		6.00E+02		6.00E+02
2,2,4-trimethylpentane	64.2	-		6.42E+04		6.42E+04
carbon disulfide	0.1	-		2.00E+01		2.00E+01
trimethylsilyl fluoride						
trimethylsilanol						
hexamethyl cyclotrisiloxane - D3						
octamethyl cyclotetrasiloxane -D4						
decamethyl cyclopentasiloxane - D5						
dodecamethyl cyclohexasiloxane - D6						

1. Methane screening will be completed in accordance with Table 7, Draft Soil and Building Methane Gas Management Guide, Oct 2013, (Alberta Health Services)  
 2. Ethane, Ethylene, Ethanol, 2-Propanol, Propane, 1,2-dichlorotetrafluorethane (R114), and 2,2,4-trimethylpentane criteria adopted from Occupational Exposure Limits (PEL), assume no dilution/attenuation

**Table A3 Derive Acceptable Soil Vapour Concentrations (Soil Vapour Screening Levels)**

Deminimus Soil Vapour Criteria were calculated as follows:

$$C_{sv_{Deminimus}} = \frac{C_{air}}{\alpha}$$

where

$C_{sv_{Deminimus}}$  = Deminimus Concentration of Soil Vapour

$C_{air}$  = Health Based Indoor Air Criteria (based on toxicity reference values)

Deminimus Alpha = 0.01 (default, as per Alberta Environment)

Chemical	Deminimus Screening	Deminimus Screening
	Soil Vapour Screening ( $\mu\text{g}/\text{m}^3$ )	Soil Vapour Screening ( $\mu\text{g}/\text{m}^3$ )
trans-1,2-dichloroethylene	1.79E+02	179
1,2-dibromoethane	1.80E+02	180
1,2-dichlorobenzene	3.85E+04	38482
styrene	4.60E+03	4600
1,3,5-trichlorobenzene	7.20E+01	72
1,1,2-trichloroethane	3.58E+02	358
Ethane	8.13E+05	813000
Ethylene	1.74E+05	174000
Methane	1.5E+6 to <7.6E+6 $\mu\text{g}/\text{m}^3$	1,500,000 to <7,600,000 $\mu\text{g}/\text{m}^3$
Propane	1.80E+06	1800000
Dichlorodifluoromethane (Freon 12)	1.78E+04	17800
1,2-dichlorotetrafluoroethane (R114)	7.00E+06	7000000
Chloromethane	1.80E+08	1800
Vinyl Chloride	1.14E+02	114
Chloroethane	2.00E+05	200000
Trichlorofluoromethane (Freon 11)	2.00E+04	20000
Ethanol (Ethyl Alcohol)	1.90E+06	618000
2-Propanol (isopropyl alcohol)	4.91E+05	491000
2-Propanone (acetone)	6.18E+05	618000
Methyl Ethyl Ketone (2-Butanone)	1.00E+05	100000
1,4-dichlorobenzene	1.90E+03	1900
1,1,-dichloroethylene	4.00E+03	4000
cis-1,2-dichloroethylene	1.79E+02	179
methylene chloride (dichloromethane)	4.35E+04	43478
chloroform	5.60E+02	560
1,1,1-trichloroethane	2.00E+04	20000
trichloroethylene (updated)	8.00E+02	800
tetrachloroethylene	8.00E+02	800
benzene	3.03E+02	303
toluene	1.90E+05	190000
PHC F1	5.95E+04	59532
Aliphatic C6-C8	9.20E+05	920000
Aliphatic C8-C10	5.00E+04	50000
Aromatic C8-C10	1.00E+04	10000
PHC F2	2.78E+04	27778
Aliphatic C10-C12	5.00E+04	50000
Aliphatic C12-C16	5.00E+04	50000
Aromatic C10-C12	1.00E+04	10000
Aromatic C12-C16	1.00E+04	10000
ethylbenzene	5.00E+04	50000
total xylenes	9.00E+03	9000
1,3,5-trimethylbenzene	4.00E+02	400
1,2,4-trimethylbenzene	4.00E+02	400
hexane	1.40E+04	14000
heptane	8.00E+03	8000
cyclohexane	1.20E+05	120000
tetrahydrofuran	4.00E+04	40000
propene	6.00E+04	60000
2,2,4-trimethylpentane	6.42E+04	64173
carbon disulfide	2.00E+03	2000
<b>Notes</b>		
1. Methane screening will be completed in accordance with Table 6, Draft Soil and Building Methane Gas Management Guide, Oct 2013, (Alberta Health Services)		
2. Ethane, Ethylene, Ethanol, 2-Propanol, Propane, 1,2-dichlorotetrafluoroethane (R114), and 2,2,4-trimethylpentane criteria adopted from Occupational Exposure Limits (PEL), assume no dilution/attenuation		

**Table A4 Summary of Analytical Results for Fixed Gases and Petroleum Hydrocarbons in Soil Vapour**

Sample ID	Units	Reportable Detection Limit	Soil Vapour Probes													
			VW-01	VW-03	VW-05		XCG-1(SVP)	XCG-2(SVP)	XCG-4(SVP)	XCG-5(SVP)	XCG-6(SVP)	XCG-9(SVP)	XCG-10(SVP)	XCG-12(SVP)	XCG-13(SVP)	Trip Blank
Laboratory			Maxxam	Maxxam	Maxxam		Maxxam	Maxxam	Maxxam							
Canister number			332	1280	1800	3017	1470	243	1281	1380	238	333	354	262	354	215
Laboratory ID			EBG095	EBG097	EBG090	EBG091	EBG092	EBG089	EBG086	EBG085	EBG088	EBG096	EBG094	EBG087	EBG093	EBG098
Date Sampled			12-Mar-17	12-Mar-17	11-Mar-17	11-Mar-17	11-Mar-17	11-Mar-17	14-Mar-17	14-Mar-17	13-Mar-17	11-Mar-17	12-Mar-17	14-Mar-17	12-Mar-17	N/A
Summa Canister Pressure on Receipt (psig)		NV	(-2.9)	(-3.1)	(-1.9)	(-2.0)	(-1.7)	(-3.6)	(-3.4)	(-3.4)	(-3.0)	(-2.7)	(-1.1)	(-3.0)	(-1.7)	(-14.3)
Oxygen	(% v/v)	0.2-0.3	23.0	12.5	8.6	9.6	20.4	20.3	2.0	20.3	1.9	21.3	15.8	18.7	4.3	--
Nitrogen	(% v/v)	0.2-0.3	77.0	80.7	79.0	78.9	78.1	78.4	82.8	77.4	81.5	78.2	81.7	79.0	84.8	--
Carbon Monoxide	(% v/v)	0.2-0.3	<0.2	<0.2	<0.2	<0.2	<0.2	<0.3	<0.2	<0.3	<0.2	<0.2	<0.2	<0.2	<0.2	--
Methane	(% v/v)	0.2-0.3	<0.2	<0.2	0.3	0.3	<0.2	<0.3	5.7	<0.3	1.2	<0.2	<0.2	<0.2	1.1	--
Carbon Dioxide	(% v/v)	0.2-0.3	<0.2	6.8	12.1	11.3	1.5	1.3	9.5	2.3	15.4	0.6	2.5	2.3	9.8	--
Ethane	ppm	0.17-0.27	<0.21	<0.19	2.3	2.1	<0.2	<0.27	0.24	<0.26	<0.22	<0.21	<0.17	<0.23	<0.19	--
Ethylene	ppm	0.17-0.27	<0.21	<0.19	6.8	6.3	<0.2	<0.27	6.2	<0.26	0.57	<0.21	<0.17	<0.23	0.25	--
Propane	ppm	0.17-0.27	<0.21	<0.19	<0.21	<0.2	<0.2	<0.27	<0.23	<0.26	<0.22	<0.21	<0.17	<0.23	<0.19	--
Propene	ppm	0.17-0.27	<0.21	<0.19	<0.21	<0.2	<0.2	<0.27	<0.23	<0.26	<0.22	<0.21	<0.17	<0.23	<0.19	--
F1-BTEX, C6-C10 (as Toluene)	µg/m <sup>3</sup>	5.0	7.9	31.8	486	530	36.1	<5.0	39.7	18.4	668	6.0	43.0	8.8	5830	<5.0
F2, C10-C16 (as Decane)	µg/m <sup>3</sup>	5.0	12.7	<5.0	62.8	68.9	<5.0	<5.0	<5.0	6.2	<5.0	<5.0	<5.0	<5.0	972	<5.0
Notes:																
--	Not Analyzed															
<	Below Laboratory MDL															



**Table A6 Summary of Analytical Results for Siloxanes in Soil Vapour**

Sample ID	Units	Reportable Detection Limit	Soil Vapour Probes									
			VW-01	VW-03	VW-05		XCG-1(SVP)	XCG-2(SVP)	XCG-4(SVP)	XCG-6(SVP)	XCG-10(SVP)	XCG-13(SVP)
Laboratory			ALS	ALS	ALS		ALS	ALS	ALS	ALS	ALS	ALS
Tube ID			G0150695SVI	G0150687SVI	G0150642SVI	G0150640SVI	G0150699SVI	G0150637SVI	G0150637SVI	G0150069SVI	G0150698SVI	G0150688SVI
Laboratory ID			L1901643-2	L1901643-1	L1901643-3	L1901643-4	L1901643-5	L1901643-8	L1901643-8	L1901643-7	L1901643-9	L1901643-6
Date Sampled			12-Mar-17	12-Mar-17	11-Mar-17	11-Mar-17	11-Mar-17	11-Mar-17	11-Mar-17	14-Mar-17	13-Mar-17	12-Mar-17
hexamethyl cyclotrisiloxane	µg/m <sup>3</sup>	170	<170	<170	<170	<170	<170	<170	<170	<170	<170	<170
octamethyl cyclotetrasiloxane	µg/m <sup>3</sup>	170	<170	<170	<170	<170	<170	<170	<170	<170	<170	<170
decamethyl cyclopentasiloxane	µg/m <sup>3</sup>	170	<170	<170	<170	<170	<170	<170	<170	<170	<170	<170
dodecamethyl cyclohexasiloxane	µg/m <sup>3</sup>	170	<170	<170	<170	<170	<170	<170	<170	<170	<170	<170
hexamethyldisiloxane	µg/m <sup>3</sup>	170	<170	<170	<170	<170	<170	<170	<170	<170	<170	<170
octamethyltrisiloxane	µg/m <sup>3</sup>	170	<170	<170	<170	<170	<170	<170	<170	<170	<170	<170
decamethyltetrasiloxane	µg/m <sup>3</sup>	170	<170	<170	<170	<170	<170	<170	<170	<170	<170	<170
dodecamethylpentasiloxane	µg/m <sup>3</sup>	170	<170	<170	<170	<170	<170	<170	<170	<170	<170	<170

**Notes:**  
 < Below Laboratory RDL

**Table A7 Summary of Deminimus Screening of Detected Soil Vapour Concentrations**

All detected soil vapour concentrations were compared to a deminimums soil vapour criteria (calculated as per below). Parameters with concentrations detected which exceeded the deminimus soil vapour criteria were considered potential contaminants of concern for indoor air and were included in the indoor air testing program.

$$C_{sv\text{Deminimus}} = \frac{C_{air}}{\alpha}$$

where

$C_{sv\text{Deminimus}}$  = Deminimus Concentration of Soil Vapour

$C_{air}$  = Health Based Indoor Air Criteria (based on toxicity reference values)

$\alpha$  = vapour attenuation factor      Deminimus Alpha = 0.01 (default, as per Alberta Environment)

Chemical	Deminimus Screening				
	Soil Vapour Screening ( $\mu\text{g}/\text{m}^3$ )	Soil Vapour Screening ( $\mu\text{g}/\text{m}^3$ )	Worst case concentration in soil vapour probes (including probes within the limit of waste)	Location	Include in Indoor Air Testing? (Y/N)
trans-1,2-dichloroethylene	1.79E+02	179	5.49	XCG-13(SVP)	N
1,2-dibromoethane	1.80E+02	180	0.768	RDL in all	N
1,2-dichlorobenzene	3.85E+04	38,482	0.601	RDL in all	N
styrene	4.60E+03	4,600	2.41	XCG-4(SVP)	N
1,3,5-trichlorobenzene	7.20E+01	72	*not measured in SV. See note below.		N
1,1,2-trichloroethane	3.58E+02	358	0.546	RDL in all	N
Ethane	8.13E+05	813,000	318	XCG-4(SVP)	N
Ethylene	1.74E+05	174,000	8400	VW-05	N
Methane	1.5E+6 to <7.6E+6 ug/m3	1,500,000 to <7,600,000 ug/m3	37,393,865.03 (5.7%)	XCG-4(SVP)	Y
Propane	1.80E+06	1,800,000	524	Non-detect in all, XCG-2 (SVP) was potential highest	N
Dichlorodifluoromethane (Freon 12)	1.78E+04	17,800	2950	XCG-13(SVP)	N
1,2-dichlorotetrafluorethane (R114)	7.00E+06	7,000,000	1790	VW-03	N
Chloromethane	1.80E+08	1,800	4.39	VW-01	N
Vinyl Chloride	1.14E+02	114	1250	VW-05 (duplicate)	Y
Chloroethane	2.00E+05	200,000	23.2	VW-05	N
Trichlorofluoromethane (Freon 11)	2.00E+04	20,000	5.92	VW-05	N
Ethanol (Ethyl Alcohol)	1.90E+06	618,000	180	XCG-4(SVP)	N
2-Propanol (isopropyl alcohol)	4.91E+05	491,000	2.46	RDL in all	N
2-Propanone (acetone)	6.18E+05	618,000	47.5	XCG-13(SVP)-elevated RDL bc of matrix interference	N
Methyl Ethyl Ketone (2-Butanone)	1.00E+05	100,000	6.19	XCG-6(SVP)-elevated RDL bc of matrix interference	N
1,4-dichlorobenzene	1.90E+03	1,900	0.601	RDL in all	N
1,1,-dichloroethylene	4.00E+03	4,000	5.72	XCG-13(SVP)	N
cis-1,2-dichloroethylene	1.79E+02	179	223	XCG-13(SVP)	Y
methylene chloride (dichloromethane)	4.35E+04	43,478	2.78	RDL in all	N
chloroform	5.60E+02	560	21.2	VW-03	N
1,1,1-trichloroethane	2.00E+04	20,000	0.937	VW-05 (duplicate)	N
trichloroethylene (updated)	8.00E+02	800	11.7	XCG-13 (SVP)	N
tetrachloroethylene	8.00E+02	800	12.6	XCG-10(SVP)	N
benzene	3.03E+02	303	1.35	VW-05	N
toluene	1.90E+05	190,000	6.61	VW-05	N
PHC F1	5.95E+04	59,532	5830	XCG-13(SVP)	N
PHC F2	2.78E+04	27,778	972	XCG-13(SVP)	N
ethylbenzene	5.00E+04	50,000	0.434	RDL in all	N
total xylenes	9.00E+03	9,000	1.74	XCG-13(SVP)-elevated RDL bc of matrix interference	N
1,3,5-trimethylbenzene	4.00E+02	400	2.46	RDL in all	N
1,2,4-trimethylbenzene	4.00E+02	400	2.46	RDL in all	N
hexane	1.40E+04	14,000	7.14	XCG-6(SVP)	N
heptane	8.00E+03	8,000	1.92	XCG-6(SVP)	N
cyclohexane	1.20E+05	120,000	92.6	XCG-13(SVP)	N
tetrahydrofuran	4.00E+04	40,000	1.18	RDL in all	N
propene	6.00E+04	60,000	89.2	XCG-4(SVP)	N
2,2,4-trimethylpentane	6.42E+04	64,173	8.17	XCG-13(SVP)	N
carbon disulfide	2.00E+03	2,000	25.7	XCG-12(SVP)	N

**Notes**

1. Methane screening will be completed in accordance with Table 6, Draft Soil and Building Methane Gas Management Guide, Oct 2013, (Alberta Health Services)

\*1,3,5-trichlorobenzene was detected in MW-06 but not measured in soil vapour because of the following:

(note that MW-06 is assumed to be within the limit of waste, and therefore 1,3,5-trichlorobenzene was not under consideration for indoor air testing )

Henry's Law Constant (HCL)       $1.9 \times 10^{-3} \text{ atm m}^3/\text{mol}$

Convert to HLC (unitless)      0.077661031

Concentration of 1,3,5-trichlorobenzene detected in Groundwater      0.73  $\mu\text{g}/\text{L}$

Using Henry's Law to convert to soil vapour concentration =

$C_{sv} = C_{gw} (\mu\text{g}/\text{L}) \times \text{HCL}(\text{unitless}) \times 1,000 \text{ L}/\text{m}^3$

Concentration in Soil Vapour =  $C_{sv} = 0.73 \mu\text{g}/\text{L} * 0.077661 * 1,000 \text{ L}/\text{m}^3 =$       56.69  $\mu\text{g}/\text{m}^3$

This concentration is less than the soil vapour screening value of 72  $\mu\text{g}/\text{m}^3$ . Therefore, even with very conservative assumptions, groundwater at concentrations detected would not cause a soil vapour concentration to exceed the deminimus screening concentrations.

***ATTACHMENT B***  
***XCG SOP FOR INDOOR AIR SAMPLING***

## **INDOOR AIR QUALITY SAMPLING USING SUMMA® CANISTERS**

### **1. BACKGROUND**

Indoor air quality is often evaluated at contaminated sites where existing buildings may be impacted by volatile or semi-volatile chemicals. Assessment of contaminant concentrations in the indoor air of the building may be an important exposure pathway to consider when evaluating potential human health risks at a site.

### **2. PURPOSE**

The collection of indoor air quality samples using a Summa® canister allows for multiple VOCs to be analyzed using one sample. Samples can be reanalyzed because of the stability of the sample in the canister, and the small amount of sample which is required for analyses. Summa® canister sampling is ideal for time-weighted average (TWA) sampling (e.g. 8 hours, 24 hours). In addition, it is not required that the range of concentrations be known prior to sampling, although if high concentrations are expected, it is best to inform the laboratory ahead of time. In cases where concentrations are potentially high, they may recommend the use of borosilicate glass canisters.

### **3. SCOPE**

This document describes the procedure for sampling indoor air quality using a Summa® canister.

### **4. SITE CHARACTERIZATION**

Indoor air quality sampling should be conducted after all potential vapour sources (e.g. non-aqueous phase liquids, contaminated soil, and groundwater) have been characterized. In addition, the physical setting of the site should be known, including (if applicable):

- Geology (soil textures, stratigraphy);
- Hydrogeology (depth to groundwater, groundwater flow direction, vertical and lateral gradients, hydraulic conductivity);
- Vadose zone characteristics including water content, porosity, fraction of organic carbon, bulk density, and soil-air permeability;
- Preferential pathways, such as subsurface utilities;
- Building construction [location, use, size, height, foundation type, foundation characteristics, heating, ventilation, and air conditioning (HVAC)]; and
- Vertical and lateral distance from soil vapour sources to buildings.

### **5. SITE CONDITIONS**

The MOECC may require that indoor air quality samples are collected at a time when the surrounding ground is frozen, as well as at another time when it is not frozen. On the day of sampling, weather conditions including outdoor and indoor air temperatures will be recorded. Information on barometric pressure and relative humidity during the sample

## **INDOOR AIR QUALITY SAMPLING USING SUMMA® CANISTERS**

collection period will be obtained from the nearest Environment Canada (or other) weather station, if the data is publicly available.

### **6. LENGTH OF TIME**

Eight hour flow regulators should be used for commercial, institutional and industrial indoor air quality sampling. Residential applications require a 24 hour flow regulator.

### **7. EQUIPMENT**

Laboratories need several days notice to deliver SUMMA® canisters. The usual size for indoor air quality is 6 litres. If you are sampling at a different altitude, let the project manager know so that the flow controller can be adjusted to reflect this difference.

#### **Required from the Laboratory:**

- One travel blank SUMMA® canister filled with purified air that is taken to the field, but not opened;
- One Summa® canister for each sample required, as well as an additional field duplicate for every 10 samples; and
- One flow regulator for each Summa® canister (see section 6 for the required length of time).

#### **Additional Equipment:**

- 2 x 9/16" wrenches;
- Barometer, Thermometer, and Hygrometer;
- PID or FID; and
- Nitrile Gloves.

#### **Important Notes:**

- Instruct the clients not to use glues, adhesives, paints, floor wax, or strong cleaners, etc, in the vicinity of the sampling for several days prior to sampling.
- Do not smoke, pump gas, use hand sanitizer, or handle any solvents prior to handling the Summa® canisters or any of the equipment. Avoid these activities on the day of sampling.

### **8. SAMPLING:**

1. To attach the regulator on to the SUMMA® canister, remove the brass nut on the top and then hand-tighten the Swagelok® regulator nut on to the SUMMA® canister. Use a 9/16" wrench to make a quarter turn to tighten the regulator.
2. Label the paper tag affixed to the SUMMA® with the sample number, as well as which regulator will be associated with it.

## **INDOOR AIR QUALITY SAMPLING USING SUMMA® CANISTERS**

3. Label the field notes with the SUMMA® identification number and the regulator number, as well as the initial SUMMA® vacuum and the final SUMMA® vacuum.
4. Record indoor and outdoor meteorological data for that time and date using the portable barometer, thermometer, and hygrometer, as well as Environment Canada ([https://weather.gc.ca/canada\\_e.html](https://weather.gc.ca/canada_e.html)).
5. Place the SUMMA® canister at a height of one to two metres above the ground, in an area that is away from doorways, HVAC outlets/inlets, and loading dock areas where idling vehicles might be present over the course of the day.
6. Open the SUMMA® canister by turning the Swagelok® valve counter-clockwise a quarter turn. Record the time and vacuum in the field notes.
7. Using the appropriate detector, record five ambient air readings taken over the course of a minute from either the PID or FID. Non-detect concentrations should be observed. This information may help to identify background conditions and evaluate potential biases.
8. Let the sampling continue for the appropriate length of time based on the regulator. Ideally, allow the sampling to continue for the full pre-determined period until the regulator reads between -8 inches Hg and -3 inches Hg. **Do not allow the regulator to reach a value of 0 inches Hg.** If sampling is progressing more quickly than expected, you may need to close the Swagelok® valve sooner than expected.
9. Prior to closing the Summa® canister, record five ambient air readings taken over the course of a minute from either the PID or FID.
10. Record the final vacuum reading and time. Close the Summa® canister by turning the Swagelok® valve clockwise. Remove the vacuum gauge. Using your fingers, replace the brass nut. Use the wrench to turn it a 1/4 turn.
11. If the sampling period was more than 1 hour, record indoor and outdoor meteorological data for that time and date using the portable barometer, thermometer, and hygrometer, as well as the Environment Canada website ([https://weather.gc.ca/canada\\_e.html](https://weather.gc.ca/canada_e.html)).
12. Summa® canisters do not need to be kept cold and can be shipped via airplanes and couriers. Hold time is 30 days (NB: some jurisdictions say 14 days depending on the compound in question).

### **9. PERFORMING A DUPLICATE SAMPLE:**

1. A duplicate sample is taken by placing a secondary Summa® canister immediately adjacent to the primary Summa® canister. The outlets for both regulators should be as close together as possible. The sampling period does not change.



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## **INDOOR AIR QUALITY SAMPLING USING SUMMA® CANISTERS**

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### **10. CHECKING YOUR DATA:**

Data reported in:

- ppbv (independent of P & T);
- $\mu\text{g}/\text{m}^3$  (at 1 atm, 25 degrees C);
- 1 atm and 25 degrees C may not be representative of conditions at your site > results can be altered using the Gas Law Constant; and
- NB these do NOT correspond directly to water concentration units.

Ambient Air is composed of the following gases commonly known as "matrix gases" that do NOT need to be analyzed for indoor air quality sampling:

- Nitrogen 78%;
- Oxygen 21%; and
- 1% CO<sub>2</sub>, argon, helium.

### **11. ATTACHMENT**

- Indoor Air Quality Field Sheet.



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## **INDOOR AIR QUALITY SAMPLING USING SUMMA® CANISTERS**

### **INDOOR AIR QUALITY- SUMMA CANISTER SAMPLING**

Date:			
Technician:			
Project Number:			
Site Address:			
Lab Identifier:			
Canister Number(s):		Regulator Number:	

#### **Starting Parameters:**

Outdoor Barometric Pressure:		Indoor Barometric Pressure:	
Outdoor Temperature:		Indoor Temperature:	
Relative Humidity of Sampling Environment:		Wind Direction & Speed:	
PID readings - 5 in one minute:			
Start Time:		Starting Canister Vacuum:	

Sample Height:	
Description of Sample Location (i.e. room, position within a building, exit number, building number, etc):	
Additional notes about condition of the floor and/or foundation (i.e. cracks, spills, stains, sumps, drains, utility conduits):	
HVAC conditions during sampling:	
Fireplace, furnace, fans present?	



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## INDOOR AIR QUALITY SAMPLING USING SUMMA® CANISTERS

Indoor sources of VOCs noted during sampling:	
Description of doors and windows and their usage (open, closed, high traffic through the doors, i.e. how many times opened and closed in an hour)	

**End Parameters:**

Outdoor Barometric Pressure:		Indoor Barometric Pressure:	
Outdoor Temperature:		Indoor Temperature:	
Relative Humidity of Sampling Environment:		Wind Direction & Speed:	
PID readings - 5 in one minute:			
End Time:		End Canister Vacuum:	

***ATTACHMENT C***  
***FIELD NOTES***

~~Outdoor~~

### Indoor Air Quality- Summa Canister Sampling

Date:	Mar 13/17 - Mar 14/17
Technician:	MCL
Project Number:	4-2352-04-03
Site Address:	Residence I

#### Starting Meteorological Parameters:

Outdoor Barometric Pressure:	101.8	Indoor Barometric Pressure:	N/A
Outdoor Temperature:	-13°C (-21 WC)	Indoor Temperature:	N/A
Relative Humidity of Sampling Environment:	73%	Wind Direction & Speed:	18 km/hr South

#### Ending Meteorological Parameters:

Outdoor Barometric Pressure:	100.7	Indoor Barometric Pressure:	N/A
Outdoor Temperature:	1°C	Indoor Temperature:	N/A
Relative Humidity of Sampling Environment:	76%	Wind Direction & Speed:	0 km/hr SSE

Trip Blank Canister Number:	—		
Location of Duplicate Sample:	—		
Canister Number(s):	—	Regulator Number:	—

# Ambient Sample

Lab Identifier:	OAQ				
Canister Number(s):	2595		Regulator Number:	955	
Starting PID readings- 5 in 1 minute:	0	1	1	0	1
Start Time:	11:00		Starting Canister Vacuum:	-26.5	
Ending PID readings- 5 in 1 minute:	0	1	0	1	2
End Time:	11:15		Ending Canister Vacuum:	-4.5	

Sample Height:	~2.3m above GS
Description of Sample Location (ie. room, position within a building, exit number, building number, etc):	on back patio @ Residence I on patio table.
HVAC conditions during sampling:	Type: <u>N/A</u>  ___(On)___(Off)
Description of doors and windows and their usage (open, closed, high traffic through the doors, ie. how many times opened and closed in an hour)	N/A.

CH<sub>4</sub> 0.0  
 CO<sub>2</sub> 0.0  
 O<sub>2</sub> 20.9

Residence J

**Preliminary Assessment:**

Potential Sources	Location(s)	Removed before Sampling? (Yes/No/NA)
Gasoline storage cans	no	
Gas-powered equipment	no.	
Kerosene storage cans	no.	
Paints / thinners / strippers	yes - in garage	
Cleaning solvents	no.	
Oven cleaners	Yes - in kitchen.	
Carpet / upholstery cleaners	Resolve - not used in past few weeks.	
Other house cleaning products	Tide, toilet bowl cleaner, etc. yes.	
Moth balls	maybe in garage	
Polishes / waxes	pledge	
Insecticides	in garage.	
Furniture / floor polish		
Nail polish / polish remover	in ensuite bathroom	
Hairspray	no	
Cologne / perfume	no	

laundry machine area.

## Residence J

Air fresheners	no.	
Fuel tank (inside building)	no.	
Wood stove or fireplace	gas fireplace	
New furniture / upholstery	no	
New carpeting / flooring	no.	
Hobbies - glues, paints, etc.	no.	

<p>Additional notes about material and condition of the floor and/or foundation and/or walls (ie. cracks, spills, stains, utility conduits):</p>	<p>Wall material: <u>drywall</u></p> <p>Floor material: <u>concrete</u></p> <p>Cracks? Epoxy or waterproof paint sealants?  <u>fine cracks where slab visible</u></p> <p>Spills or stains?  <u>not visible.</u></p> <p>Utility Conduits?  <u>yes through slab.</u></p>
--	--

## Residence J

Sumps	Sump: <input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no) Sump Pump: <input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no) Water in sump: <input type="checkbox"/> (yes) <input type="checkbox"/> (no)
Floor Drains	<input checked="" type="checkbox"/> (yes) <input type="checkbox"/> (no)  <i>near furnace room/ laundry.</i>
Fireplace, furnace or fans present?	
Is the room attached to a garage?	<input checked="" type="checkbox"/> (yes) <input type="checkbox"/> (no) <i>upstairs.</i> <input type="checkbox"/> (car) <input type="checkbox"/> (gas powered equipment or fuel stored in garage)
Number of floors above grade:	<i>1</i>
Are basements or crawlspaces present?	<input type="checkbox"/> (No) <input checked="" type="checkbox"/> YES. Approx. Depth: <i>2</i> (m)
Maintenance and repairs- has any painting or staining been done in the past 6 months?	<i>no.</i>
Does anyone smoke in the facility or just outside any of the doors or windows?	<i>no.</i>
Has there ever been a fire in the facility?	<input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no)
Ground cover surrounding building:	<i>grass, asphalt.</i>
Is there a septic system on site?	<input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no)

# Residence J

Commercial or Industrial Facility- where are the uniforms laundered? Type of cleaner?	N/A
Commercial or Industrial Facility- do any of the tools or equipment require sterilization? What process or chemical is used?	N/A
Other:	—

**Indoor Air Sampling - Preliminary Assessment:**

<b>Address:</b>	Residence A
<b>Time/Date:</b>	5:30 pm
<b>Name of Person:</b>	

man. night.

Potential Sources	Location(s)	Removed before Sampling? (Yes/ No/ N/A)
Gasoline storage cans	no	
Gas-powered equipment	"	
Kerosene storage cans	"	
Paints / thinners / strippers	"	
Cleaning solvents	"	
Oven cleaners	"	
Carpet / upholstery cleaners	"	
Other house cleaning products	maybe bathroom	
Moth balls	no.	
Polishes / waxes	no	
Insecticides	no	
Furniture / floor polish	no	
Nail polish / polish remover	no.	
Hairspray	no	
Cologne / perfume	no	
Air fresheners	no	

Fuel tank (inside building)	no	
Wood stove or fireplace	no.	
New furniture / upholstery	no.	
New carpeting / flooring	no.	
Hobbies - glues, paints, etc.	no.	

<p>Additional notes about material and condition of the floor and/or foundation and/or walls (ie. cracks, spills, stains, utility conduits):</p>	<p>Wall material: <u>drywall.</u></p>
	<p>Floor material: <u>carpet, tile.</u></p>
	<p>Cracks? Epoxy or waterproof paint sealants? <u>unable to tell.</u></p>
	<p>Spills or stains? <u>no.</u></p>
	<p>Utility Conduits? <u>sanitary stack.</u></p>
<p>Sumps</p>	<p>Sump: <u>__</u>(yes) <u>✓</u>(no) Sump Pump: <u>__</u>(yes) <u>✓</u>(no) Water in sump: <u>__</u>(yes) <u>__</u>(no) <u>N/A</u></p>

Floor Drains	<input checked="" type="checkbox"/> (yes) <input type="checkbox"/> (no) basement, off furnace room.
Fireplace, furnace or fans present?	furnace.
Is the room attached to a garage?	<input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no) <input type="checkbox"/> (car) <input type="checkbox"/> (gas powered equipment or fuel stored in garage)
Number of floors above grade:	1
Are basements or crawlspaces present?	<input type="checkbox"/> (No) <input checked="" type="checkbox"/> YES. Approx. Depth: _____ (m) 8'
Maintenance and repairs- has any painting or staining been done in the past 6 months?	no.
Does anyone smoke in the facility or just outside any of the doors or windows?	no.
Has there ever been a fire in the facility?	<input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no)
Ground cover surrounding building:	grass, driveway, landscaping.
Is there a septic system on site?	<input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no)

**Indoor Air Sampling - Preliminary Assessment:**

<b>Address:</b>	Residence B
<b>Time/Date:</b>	Dec 5 2016. <sup>0</sup>
<b>Name of Person:</b>	

Potential Sources	Location(s)	Removed before Sampling? (Yes/ No/ N/A)
Gasoline storage cans	no	
Gas-powered equipment	no	
Kerosene storage cans	no	
Paints / thinners / strippers	yes - cupboards in a different room.	
Cleaning solvents		
Oven cleaners	no.	
Carpet / upholstery cleaners		
Other house cleaning products	laundry detergent.	
Moth balls	yes.	
Polishes / waxes		
Insecticides	yes - Raid.	
Furniture / floor polish	no.	
Nail polish / polish remover	no	
Hairspray	no	
Cologne / perfume	n	
Air fresheners	fabric softener.	

Various cans of Raid, Windex, etc. in laundry room.

Fuel tank (inside building)	no.	
Wood stove or fireplace	yes.	
New furniture / upholstery	no.	
New carpeting / flooring	no.	
Hobbies - glues, paints, etc.	no.	

<p>Additional notes about material and condition of the floor and/or foundation and/or walls (ie. cracks, spills, stains, utility conduits):</p>	<p>Wall material: <u>drywall.</u> <u>good condition.</u></p> <p>Floor material: <u>carpeted. everywhere</u> <u>except utility room.</u> <u>good condition</u></p> <p>Cracks? Epoxy or waterproof paint sealants? <u>none visible.</u></p> <p>Spills or stains? <u>none visible</u></p> <p>Utility Conduits? <u>yes - some pipes through</u> <u>slab in utility room.</u></p>
<p>Sumps</p>	<p>Sump: <u>  </u>(yes) <u>  </u>(no)</p> <p>Sump Pump: <u>  </u>(yes) <u>  </u>(no)</p> <p>Water in sump: <u>  </u>(yes) <u>  </u>(no) <u>N/A.</u></p>

Residence B



Floor Drains	<input checked="" type="checkbox"/> (yes) <input type="checkbox"/> (no) utility room .
Fireplace, furnace or fans present?	furnace .
Is the room attached to a garage?	<input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no) <input type="checkbox"/> (car) <input type="checkbox"/> (gas powered equipment or fuel stored in garage)
Number of floors above grade:	1
Are basements or crawlspaces present?	<input type="checkbox"/> (No) <input type="checkbox"/> YES. Approx. Depth: _____ (m) yes - 8' . all full height.
Maintenance and repairs- has any painting or staining been done in the past 6 months?	single board on Dec 4th. no more.
Does anyone smoke in the facility or just outside any of the doors or windows?	no .
Has there ever been a fire in the facility?	<input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no)
Ground cover surrounding building:	hardscaping, grass/garden, driveway .
Is there a septic system on site?	<input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no)



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**Indoor Air Sampling - Preliminary Assessment:**

<b>Address:</b>	Residence C
<b>Time/Date:</b>	4 <sup>30</sup> Dec 6/16
<b>Name of Person:</b>	

Potential Sources	Location(s)	Removed before Sampling? (Yes/ No/ N/A)
Gasoline storage cans	no	
Gas-powered equipment	"	
Kerosene storage cans	"	
Paints / thinners / strippers	old paint can (1). acrylic paints	no odour closed long time.
Cleaning solvents	no. (save bathroom cleaners)	
Oven cleaners	upstairs	
Carpet / upholstery cleaners	no.	
Other house cleaning products	see above.	
Moth balls	no.	
Polishes / waxes	no.	
Insecticides	few weeks - indoor <del>pest</del> VOC-free	
Furniture / floor polish	no.	
Nail polish / polish remover	no	
Hairspray	no	
Cologne / perfume	no.	
Air fresheners	no.	

Fuel tank (inside building)	no	
Wood stove or fireplace	yes - hasn't been on since Jan 2016	
New furniture / upholstery	no	
New carpeting / flooring	upstairs - new carpet 1 mth ago.	
Hobbies - glues, paints, etc.	acrylic paints,	

<p>Additional notes about material and condition of the floor and/or foundation and/or walls (ie. cracks, spills, stains, utility conduits):</p>	<p>Wall material: <u>drywall</u> - good condition.</p> <p>Floor material: <u>carpet/painted slab</u> - good condition.</p> <p>Cracks? Epoxy or waterproof paint sealants? no.</p> <p>Spills or stains? no.</p> <p>Utility Conduits? <u>yes.</u></p>
<p>Sumps</p>	<p>Sump: <u>  </u>(yes) <input checked="" type="checkbox"/> (no)</p> <p>Sump Pump: <u>  </u>(yes) <input checked="" type="checkbox"/> (no)</p> <p>Water in sump: <u>  </u>(yes) <u>  </u>(no) <u>N/A.</u></p>

Floor Drains	<input checked="" type="checkbox"/> (yes) ___ (no)
Fireplace, furnace or fans present?	
Is the room attached to a garage?	<input checked="" type="checkbox"/> (yes) ___ (no) ___ (car) <i>upstairs</i> ___ (gas powered equipment or fuel stored in garage)
Number of floors above grade:	<i>2</i>
Are basements or crawlspaces present?	___ (No) ___ YES. Approx. Depth: ___ (m) <i>yes 8'</i>
Maintenance and repairs- has any painting or staining been done in the past 6 months?	<i>no.</i>
Does anyone smoke in the facility or just outside any of the doors or windows?	<i>no</i>
Has there ever been a fire in the facility?	___ (yes) <input checked="" type="checkbox"/> (no)
Ground cover surrounding building:	<i>grass, driveway</i>
Is there a septic system on site?	___ (yes) <input checked="" type="checkbox"/> (no)



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Indoor Air Sampling - Preliminary Assessment:

Address:	Residence D
Time/Date:	Mon Dec 5/16 4:15
Name of Person:	

Basement

Potential Sources	Location(s)	Removed before Sampling? (Yes/ No/ N/A)
Gasoline storage cans	NO	
Gas-powered equipment	✓ //	
Kerosene storage cans	✓ //	
Paints / thinners / strippers	//	
Cleaning solvents	//	
Oven cleaners	//	
Carpet / upholstery cleaners	//	
Other house cleaning products	//	
Moth balls	//	
Polishes / waxes	//	
Insecticides	//	
Furniture / floor polish	//	
Nail polish / polish remover	//	
Hairspray	//	
Cologne / perfume	//	
Air fresheners	//	



Residence D

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Fuel tank (inside building)	no,	
Wood stove or fireplace	no.	
New furniture / upholstery	no.	
New carpeting / flooring	no.	
Hobbies - glues, paints, etc.	no. = decades ago same paint/glue on floor. no odour.	

Additional notes about material and condition of the floor and/or foundation and/or walls (ie. cracks, spills, stains, utility conduits):	Wall material: <u>drywall</u> . good condition
	Floor material: <u>tile on slab</u> . visible slab in good condition.
	Cracks? Epoxy or waterproof paint sealants? not visible.
	Spills or stains? <del>no</del> yes - see "hobbies"
	Utility Conduits?
Sumps	Sump: __ (yes) <input checked="" type="checkbox"/> (no) Sump Pump: __ (yes) <input checked="" type="checkbox"/> (no) Water in sump: __ (yes) __ (no) N/A.

sanitary stack runs down through basement flr.

Floor Drains	<input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no)
Fireplace, furnace or fans present?	Gas Furnace.
Is the room attached to a garage?	<input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no) <input type="checkbox"/> (car) <input type="checkbox"/> (gas powered equipment or fuel stored in garage)
Number of floors above grade:	2
Are basements or crawlspaces present?	<input type="checkbox"/> (No) <input checked="" type="checkbox"/> YES. Approx. Depth: _____ (m) 8' reg. 5' crawl space.
Maintenance and repairs- has any painting or staining been done in the past 6 months?	no.
Does anyone smoke in the facility or just outside any of the doors or windows?	no.
Has there ever been a fire in the facility?	<input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no)
Ground cover surrounding building:	grass, asphalt driveway, garden.
Is there a septic system on site?	<input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no)

1/2 crawl space, 1/2 reg. height.

**Indoor Air Sampling - Preliminary Assessment:**

<b>Address:</b>	Residence E
<b>Time/Date:</b>	6 Dec 16 5 <sup>30</sup> .
<b>Name of Person:</b>	

Potential Sources	Location(s)	Removed before Sampling? (Yes/ No/ N/A)
Gasoline storage cans	no	
Gas-powered equipment	"	
Kerosene storage cans	"	
Paints / thinners / strippers	"	
Cleaning solvents	"	
Oven cleaners	"	
Carpet / upholstery cleaners	"	
Other house cleaning products	"	
Moth balls	"	
Polishes / waxes	"	
Insecticides	"	
Furniture / floor polish	"	
Nail polish / polish remover	"	
Hairspray	"	
Cologne / perfume	bedroom	
Air fresheners	no	

ductwork runs to garage from  
crawl space => flaps in garage.



XCG Consultants Ltd.

Fuel tank (inside building)	no.	
Wood stove or fireplace	no.	
New furniture / upholstery	no.	
New carpeting / flooring	no.	
Hobbies - glues, paints, etc.	soldering iron, photomounting (dry mount) photo solutions	} not used recently

Additional notes about material and condition of the floor and/or foundation and/or walls (ie. cracks, spills, stains, utility conduits):	<p>Wall material: <u>drywall</u>.</p> <p>Floor material: <u>carpet + bare slab</u>.</p> <p>Cracks? Epoxy or waterproof paint sealants? <u>yes. no sealant.</u></p> <p>Spills or stains? <u>no.</u></p> <p>Utility Conduits? <u>yes.</u></p>
Sumps	<p>Sump: <u>  </u>(yes) <u>  </u>(no) <input checked="" type="checkbox"/></p> <p>Sump Pump: <u>  </u>(yes) <u>  </u>(no) <input checked="" type="checkbox"/></p> <p>Water in sump: <u>  </u>(yes) <u>  </u>(no) <u>N/A.</u></p>

fresh air returns  
↳ 4 upstairs or  
main level.

Residence E



Floor Drains	<input checked="" type="checkbox"/> (yes) ___ (no) furnace room
Fireplace, furnace or fans present?	furnace.
Is the room attached to a garage?	___ <input checked="" type="checkbox"/> (yes) ___ (no) ___ (car) ___ (gas powered equipment or fuel stored in garage)
Number of floors above grade:	2 storey split.
Are basements or crawlspaces present?	___ (No) <input checked="" type="checkbox"/> YES. Approx. Depth: ___ (m) 6' cs, 9'
Maintenance and repairs- has any painting or staining been done in the past 6 months?	no.
Does anyone smoke in the facility or just outside any of the doors or windows?	indoor smoking.
Has there ever been a fire in the facility?	___ (yes) <input checked="" type="checkbox"/> (no)
Ground cover surrounding building:	grass, garden, driveway
Is there a septic system on site?	___ (yes) <input checked="" type="checkbox"/> (no)

**Indoor Air Sampling - Preliminary Assessment:**

<b>Address:</b>	Residence F
<b>Time/Date:</b>	6 <sup>15</sup> Dec 6/16.
<b>Name of Person:</b>	

Potential Sources	Location(s)	Removed before Sampling? (Yes/ No/ N/A)
Gasoline storage cans	no	
Gas-powered equipment	"	
Kerosene storage cans	"	
Paints / thinners / strippers	"	
Cleaning solvents	"	
Oven cleaners	"	
Carpet / upholstery cleaners	"	
Other house cleaning products	yes => will move to garage.	
Moth balls	"	
Polishes / waxes	"	
Insecticides	"	
Furniture / floor polish	vinyl cleaner upstairs - Rinse-free Cleaner - Mannington	ten.
Nail polish / polish remover	"	
Hairspray	"	
Cologne / perfume	"	
Air fresheners	"	

Glycol Ether  
Alkyl Phenol, EDTA  
Sodium Salt

Fuel tank (inside building)	no	
Wood stove or fireplace	yes - upstairs	
New furniture / upholstery	no	
New carpeting / flooring	not in basement ↳ upstairs - 1 mth old.	
Hobbies - glues, paints, etc.	spray starch, adhesive	⇒ Quilting.

<p>Additional notes about material and condition of the floor and/or foundation and/or walls (ie. cracks, spills, stains, utility conduits):</p>	<p>Wall material: <u>drywall</u>, good condition.</p> <p>Floor material: <u>tile, carpet,</u> slab good condition other than below.</p> <p>Cracks? Epoxy or waterproof paint sealants? craft room in basement ↳ plywood covering area 2x2 ⇒ other opened, clay underneath.</p> <p>Spills or stains? no,</p> <p>Utility Conduits? sanitary stack</p>
<p>Sumps</p>	<p>Sump: __ (yes) <input checked="" type="checkbox"/> (no)</p> <p>Sump Pump: __ (yes) <input checked="" type="checkbox"/> (no)</p> <p>Water in sump: __ (yes) __ (no) N/A</p>

Residence F



Floor Drains	<input checked="" type="checkbox"/> (yes) <input type="checkbox"/> (no) furnace room.
Fireplace, furnace or fans present?	furnace.
Is the room attached to a garage?	<input checked="" type="checkbox"/> (yes) <input type="checkbox"/> (no) <input type="checkbox"/> (car) chemicals, lawnmower <input type="checkbox"/> (gas powered equipment or fuel stored in garage)
Number of floors above grade:	1
Are basements or crawlspaces present?	<input type="checkbox"/> (No) <input checked="" type="checkbox"/> YES. Approx. Depth: _____ (m) 8'
Maintenance and repairs- has any painting or staining been done in the past 6 months?	painting upstairs.
Does anyone smoke in the facility or just outside any of the doors or windows?	previous owners
Has there ever been a fire in the facility?	<input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no)
Ground cover surrounding building:	driveway, concrete, grass, hardscaping.
Is there a septic system on site?	<input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no)

**Indoor Air Sampling - Preliminary Assessment:**

<b>Address:</b>	Residence G
<b>Time/Date:</b>	6:15 pm Dec 6/16
<b>Name of Person:</b>	

Potential Sources	Location(s)	Removed before Sampling? (Yes/ No/ N/A)
Gasoline storage cans	no	
Gas-powered equipment	"	
Kerosene storage cans	"	
Paints / thinners / strippers	low VOC acrylic	
Cleaning solvents	no.	
Oven cleaners	upstairs	
Carpet / upholstery cleaners	no.	
Other house cleaning products	basics under sink in bathroom - bleach powder	
Moth balls	no.	
Polishes / waxes	no.	
Insecticides	no.	
Furniture / floor polish	no. polished floors dx/upstairs * mfn!	
Nail polish / polish remover	no.	
Hairspray	occasionally	
Cologne / perfume	not much basement	
Air fresheners	"	

"Damp Tramp" in washroom

\* Bona, Stone, tile, & laminate floor cleaner.

Fuel tank (inside building)	no	
Wood stove or fireplace	not hooked up	
New furniture / upholstery	no	
New carpeting / flooring	no	
Hobbies - glues, paints, etc.	Spray starch, adhesive (quilting).	

<p>Additional notes about material and condition of the floor and/or foundation and/or walls (ie. cracks, spills, stains, utility conduits):</p>	<p>Wall material: <u>drywall</u>. good condition</p> <p>Floor material: <u>carpet, slab (concrete)</u> good condition.</p> <p>Cracks? Epoxy or waterproof paint sealants? none visible</p> <p>Spills or stains? no</p> <p>Utility Conduits? <u>yes - sanitary</u></p>
<p>Sumps</p>	<p>Sump: <input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no)</p> <p>Sump Pump: <input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no)</p> <p>Water in sump: <input type="checkbox"/> (yes) <input type="checkbox"/> (no) N/A.</p>

Residence G



Floor Drains	<input checked="" type="checkbox"/> (yes) <input type="checkbox"/> (no) furnace room.
Fireplace, furnace or fans present?	fireplace.
Is the room attached to a garage?	<input type="checkbox"/> (yes) <input type="checkbox"/> (no) <input type="checkbox"/> (car) <input type="checkbox"/> (gas powered equipment or fuel stored in garage)
Number of floors above grade:	1
Are basements or crawlspaces present?	<input type="checkbox"/> (No) <input checked="" type="checkbox"/> YES. Approx. Depth: 8' (m)
Maintenance and repairs- has any painting or staining been done in the past 6 months?	Painted upstairs both ↳ 2 yrs ago.
Does anyone smoke in the facility or just outside any of the doors or windows?	no.
Has there ever been a fire in the facility?	<input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no)
Ground cover surrounding building:	garden, grass, hardscaping, driveway
Is there a septic system on site?	<input type="checkbox"/> (yes) <input checked="" type="checkbox"/> (no)

**Indoor Air Sampling - Preliminary Assessment:**

<b>Address:</b>	Dec 6 6 <sup>30</sup>
<b>Time/Date:</b>	↙
<b>Name of Person:</b>	

~~Monday~~ Mon/Tues  
2:30pm.

Potential Sources	Location(s)	Removed before Sampling? (Yes/ No/ N/A)
Gasoline storage cans	no	
Gas-powered equipment	no.	
Kerosene storage cans	no	
Paints / thinners / strippers	no.	
Cleaning solvents	no.	
Oven cleaners	no.	
Carpet / upholstery cleaners	no.	
Other house cleaning products	no.	
Moth balls	no.	
Polishes / waxes	"	
Insecticides	"	
Furniture / floor polish	"	
Nail polish / polish remover	no.	
Hairspray	"	
Cologne / perfume	"	
Air fresheners	"	

Fuel tank (inside building)	no.	
Wood stove or fireplace	yes - gas	
New furniture / upholstery	no.	
New carpeting / flooring	no. (laminette - 3 yrs old)	
Hobbies - glues, paints, etc.	no.	

<p>Additional notes about material and condition of the floor and/or foundation and/or walls (ie. cracks, spills, stains, utility conduits):</p>	<p>Wall material: <u>concrete, insulation/studs.</u></p> <p>Floor material: <u>concrete</u> <u>good condition.</u></p> <p>Cracks? Epoxy or waterproof paint sealants? <u>minor crack one area.</u></p> <p>Spills or stains? <u>no.</u></p> <p>Utility Conduits? <u>sanitary.</u></p>
<p>Sumps</p>	<p>Sump: <u>  </u>(yes) <input checked="" type="checkbox"/> (no)</p> <p>Sump Pump: <u>  </u>(yes) <input checked="" type="checkbox"/> (no)</p> <p>Water in sump: <u>  </u>(yes) <u>  </u>(no) <u>N/A.</u></p>

Floor Drains	<input checked="" type="checkbox"/> (yes) ___ (no)
Fireplace, furnace or fans present?	Furnace.
Is the <u>room</u> attached to a garage? ↳ not room. but attached garage.	<input checked="" type="checkbox"/> (yes) ___ (no) ___ (car) ___ (gas powered equipment or fuel stored in garage)
Number of floors above grade:	1
Are basements or crawlspaces present?	___ (No) <input checked="" type="checkbox"/> YES. Approx. Depth: ___ (m) 8'
Maintenance and repairs- has any painting or staining been done in the past 6 months?	no.
Does anyone smoke in the facility or just outside any of the doors or windows?	no.
Has there ever been a fire in the facility?	___ (yes) <input checked="" type="checkbox"/> (no)
Ground cover surrounding building:	grass, hardscaping, paving
Is there a septic system on site?	___ (yes) <input checked="" type="checkbox"/> (no)

# Residence I

## Preliminary Assessment:

Potential Sources	Location(s)	Removed before Sampling? (Yes/No/NA)
Gasoline storage cans	no.	
Gas-powered equipment	no.	
Kerosene storage cans	no.	
Paints / thinners / strippers	under basement stairs ↳ not opened in 4 yrs. latex/acrylic	not removed. water based.
Cleaning solvents	no.	
Oven cleaners	no.	
Carpet / upholstery cleaners	no.	
Other house cleaning products	yes - bathroom in basement	
Moth balls	no.	
Polishes / waxes	pledge Go Gone	no - under kitchen sink.
Insecticides	no.	
Furniture / floor polish	see above.	
Nail polish / polish remover	no.	
Hairspray	no	
Cologne / perfume	no.	

# Residence I

Air fresheners	Febreze sometimes.	
Fuel tank (inside building)	no.	
Wood stove or fireplace	gas fireplaces	
New furniture / upholstery	no.	
New carpeting / flooring	no.	
Hobbies - glues, paints, etc.	no.	

<p>Additional notes about material and condition of the floor and/or foundation and/or walls (ie. cracks, spills, stains, utility conduits):</p>	<p>Wall material: <u>drywall</u>.</p> <p>Floor material: <u>concrete</u> <u>but carpet</u></p> <p>Cracks? Epoxy or waterproof paint sealants?  1 minor crack in furnace room. remainder covered.</p> <p>Spills or stains?  none visible.</p> <p>Utility Conduits?  in furnace room, through slab.</p>
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# Residence I

Sumps	Sump: __ (yes) <input checked="" type="checkbox"/> (no) Sump Pump: __ (yes) <input checked="" type="checkbox"/> (no) Water in sump: __ (yes) __ (no)
Floor Drains	<input checked="" type="checkbox"/> (yes) __ (no)  in furnace, laundry area.
Fireplace, furnace or fans present?	yes - gas.
Is the room attached to a garage?	<input checked="" type="checkbox"/> (yes) __ (no) => not directly => upstairs. <input checked="" type="checkbox"/> (car) __ (gas powered equipment or fuel stored in garage)
Number of floors above grade:	1
Are basements or crawlspaces present?	__ (No) <input checked="" type="checkbox"/> YES. Approx. Depth: <u>2</u> (m)
Maintenance and repairs- has any painting or staining been done in the past 6 months?	no.
Does anyone smoke in the facility or just outside any of the doors or windows?	no.
Has there ever been a fire in the facility?	__ (yes) <input checked="" type="checkbox"/> (no)
Ground cover surrounding building:	grass, asphalt.
Is there a septic system on site?	__ (yes) <input checked="" type="checkbox"/> (no)

# Residence I

Commercial or Industrial Facility- where are the uniforms laundered? Type of cleaner?	N/A
Commercial or Industrial Facility- do any of the tools or equipment require sterilization? What process or chemical is used?	N/A.
Other:	—

**Indoor Air Quality- Summa Canister Sampling**

Date:	Mar 13/17 - Mar 14/17
Technician:	MCL
Project Number:	4-2352-04-03
Site Address:	Residence A

**Starting Meteorological Parameters:**

Outdoor Barometric Pressure:	101.6	Indoor Barometric Pressure:	105.4
Outdoor Temperature:	7°C (-12°C WC)	Indoor Temperature:	16°C
Relative Humidity of Sampling Environment:	35%	Wind Direction & Speed:	511 km/hr

**Ending Meteorological Parameters:**

Outdoor Barometric Pressure:	100.2	Indoor Barometric Pressure:	105.3
Outdoor Temperature:	2°C (no WC)	Indoor Temperature:	17°C
Relative Humidity of Sampling Environment:	39%	Wind Direction & Speed:	22 km/hr SE

Trip Blank Canister Number:	—		
Location of Duplicate Sample:	—		
Canister Number(s):	—	Regulator Number:	—

no changes to PSI (Dec/16)

Lab Identifier:	Residence A				
Canister Number(s):	2758		Regulator Number:	861	
Starting PID readings- 5 in 1 minute:	2	1	2	2	1
Start Time:	15:52		Starting Canister Vacuum:	-26.0	
Ending PID readings- 5 in 1 minute:	1	1	1	2	1
End Time:	15:45		Ending Canister Vacuum:	-6.0	

Sample Height:	~1.1m
Description of Sample Location (ie. room, position within a building, exit number, building number, etc):	in room w/ FD off main room, adjacent to furnace room
HVAC conditions during sampling:	Type: <u>forced air</u> <input checked="" type="checkbox"/> (On) <input type="checkbox"/> (Off)
Description of doors and windows and their usage (open, closed, high traffic through the doors, ie. how many times opened and closed in an hour)	doors all open in basement. Minimal in/out to exterior of house.

CH<sub>4</sub> 0.0  
 O<sub>2</sub> 21.0  
 CO<sub>2</sub> 0.1  
 %LEL 0.

**Indoor Air Quality- Summa Canister Sampling**

Date:	Mar 13/17 - Mar 14/17
Technician:	MCL
Project Number:	4-2352-04-03
Site Address:	Residence B

**Starting Meteorological Parameters:**

Outdoor Barometric Pressure:	101.6	Indoor Barometric Pressure:	105.5
Outdoor Temperature:	-5°C (-8 WC)	Indoor Temperature:	16°C.
Relative Humidity of Sampling Environment:	45%	Wind Direction & Speed:	ESE 7 km/hr.

**Ending Meteorological Parameters:**

Outdoor Barometric Pressure:	100.0	Indoor Barometric Pressure:	105.3
Outdoor Temperature:	2°C (nowc)	Indoor Temperature:	17°C
Relative Humidity of Sampling Environment:	45%.	Wind Direction & Speed:	SE 26 km/hr

Trip Blank Canister Number:	—		
Location of Duplicate Sample:	—		
Canister Number(s):	—	Regulator Number:	—

CH4 0.0  
 CO2 0.1  
 O2 21.5  
 % LEL 0

Lab Identifier:	Residence B				
Canister Number(s):	T21634			Regulator Number:	1309
Starting PID readings- 5 in 1 minute:	1	1	1	1	0
Start Time:	17:27		Starting Canister Vacuum:	-25.0	
Ending PID readings- 5 in 1 minute:	1	1	1	0	1
End Time:	17:30		Ending Canister Vacuum:	-6.5	

Sample Height:	~1.2m
Description of Sample Location (ie. room, position within a building, exit number, building number, etc):	furnace room, off laundry room.
HVAC conditions during sampling:	Type: <u>forced air</u> <input checked="" type="checkbox"/> (On) <input type="checkbox"/> (Off)
Description of doors and windows and their usage (open, closed, high traffic through the doors, ie. how many times opened and closed in an hour)	pretty isolated from any direct exterior air influences.

Washing machine / dryer going @ sample drop-off.

Cleaning products removed to another area in basement, door closed.

↳ no other changes to PSI conducted Dec 16.

**Indoor Air Quality- Summa Canister Sampling**

Date:	Mar 13/17 → Mar 14/17
Technician:	MCL
Project Number:	4-2352-04-03
Site Address:	Residence C

**Starting Meteorological Parameters:**

Outdoor Barometric Pressure:	101.6	Indoor Barometric Pressure:	105.7
Outdoor Temperature:	7°C (-12°CWC)	Indoor Temperature:	18°C
Relative Humidity of Sampling Environment:	38%	Wind Direction & Speed:	S11 Km/hr

**Ending Meteorological Parameters:**

Outdoor Barometric Pressure:	100.2	Indoor Barometric Pressure:	105.4
Outdoor Temperature:	2°C (nowc)	Indoor Temperature:	18°C
Relative Humidity of Sampling Environment:	42%	Wind Direction & Speed:	22 km/hr SE

Trip Blank Canister Number: *	—		
Location of Duplicate Sample:	immediately beside other		
Canister Number(s):	2580	Regulator Number:	1407.

no changes since PSI Dec/16.

\* Trip Blank: some canister used for both SV + IA canisters. All kept together during shipping and when not in use.

Lab Identifier:	Residence C					"XCG-300"				
Canister Number(s):	14258			Regulator Number:		1368				
Starting PID readings- 5 in 1 minute:	1	1	1	0	1					
Start Time:	15:32			Starting Canister Vacuum:		-26.0 / -27.0				
Ending PID readings- 5 in 1 minute:	1	1	1	1	1					
End Time:	3:29			Ending Canister Vacuum:		-6.0 / -9.0				

Sample Height:	1.2m
Description of Sample Location (ie. room, position within a building, exit number, building number, etc):	basement, under stairs near FD.
HVAC conditions during sampling:	Type: <u>forced</u> air <input checked="" type="checkbox"/> (On) <input type="checkbox"/> (Off)
Description of doors and windows and their usage (open, closed, high traffic through the doors, ie. how many times opened and closed in an hour)	no door to 1st flr. minimal traffic in + out front door.

basement all open, incl. furnace, hot water heater, etc.

CH<sub>4</sub> 0.0  
O<sub>2</sub> 21.3  
CO<sub>2</sub> 0.1  
%LEL 0

**Indoor Air Quality- Summa Canister Sampling**

Date:	Mar 13/17 - Mar 14/17.
Technician:	MCL
Project Number:	4-2352-04-03
Site Address:	Residence D

**Starting Meteorological Parameters:**

Outdoor Barometric Pressure:	102.1	Indoor Barometric Pressure:	105.7 kPa
Outdoor Temperature:	-15°C (-23°C WWC)	Indoor Temperature:	20°C
Relative Humidity of Sampling Environment:	42%	Wind Direction & Speed:	S 16 km/hr.

**Ending Meteorological Parameters:**

Outdoor Barometric Pressure:	101.8	Indoor Barometric Pressure:	105.6
Outdoor Temperature:	-8 (-10 WWC)	Indoor Temperature:	19°C
Relative Humidity of Sampling Environment:	45%	Wind Direction & Speed:	N 3 km/hr

Trip Blank Canister Number:	—		
Location of Duplicate Sample:	—		
Canister Number(s):	—	Regulator Number:	—

no changes since PSI Dec/16.

on stool in basement, ~1.2m off floor near furnace, utility conduits through floor.

Lab Identifier:	Residence D				
Canister Number(s):	18232		Regulator Number:	766.	
Starting PID readings- 5 in 1 minute:	2	1	1	2	1
Start Time:	9:50		Starting Canister Vacuum:	-32.0	
Ending PID readings- 5 in 1 minute:	1	1	2	2	2
End Time:	9:55		Ending Canister Vacuum:	-11	

Sample Height:	~1.2m.
Description of Sample Location (ie. room, position within a building, exit number, building number, etc):	on stool in basement
HVAC conditions during sampling:	Type: <u>forced air</u> <input checked="" type="checkbox"/> (On) <input type="checkbox"/> (Off)
Description of doors and windows and their usage (open, closed, high traffic through the doors, ie. how many times opened and closed in an hour)	minimal. Door to basement closed from rest of house to keep cat upstairs.

CO<sub>2</sub> 0.1%.  
 CH<sub>4</sub> 0.0%.  
 O<sub>2</sub> 20.9%.  
 %LEL 0

**Indoor Air Quality - Summa Canister Sampling**

Date:	Mar 13/17 - Mar 14/17.
Technician:	MCL
Project Number:	<del>4-2382-04-03</del>
Site Address:	Residence E

**Starting Meteorological Parameters:**

Outdoor Barometric Pressure:	102.1	Indoor Barometric Pressure:	105.6
Outdoor Temperature:	-15°C (-23°C)	Indoor Temperature:	18°C
Relative Humidity of Sampling Environment:	45%	Wind Direction & Speed:	S 16km/hr

**Ending Meteorological Parameters:**

Outdoor Barometric Pressure:	101.8	Indoor Barometric Pressure:	105.4
Outdoor Temperature:	-8 (-10WC)	Indoor Temperature:	16°C
Relative Humidity of Sampling Environment:	40%	Wind Direction & Speed:	N 3km/hr

Trip Blank Canister Number:	—		
Location of Duplicate Sample:	—		
Canister Number(s):	—	Regulator Number:	—

9:32 -29.0.

in furnace room, which is also connected to crawl space. 1.5m off floor on step-ladder.

no changes since PSI Dec/16.

Lab Identifier:	Residence E				
Canister Number(s):	129		Regulator Number:	757	
Starting PID readings- 5 in 1 minute:	2	3	2	2	2
Start Time:	9:32		Starting Canister Vacuum:	-29.0	
Ending PID readings- 5 in 1 minute:	3	2	2	3	2
End Time:	9:40		Ending Canister Vacuum:	-9.0	

Sample Height:	~ 1.5m
Description of Sample Location (ie. room, position within a building, exit number, building number, etc):	In furnace room. Connected to crawl space.
HVAC conditions during sampling:	Type: <u>forced air</u> <input checked="" type="checkbox"/> (On) <input type="checkbox"/> (Off)
Description of doors and windows and their usage (open, closed, high traffic through the doors, ie. how many times opened and closed in an hour)	no direct pathway to exterior. 3 people living in house - moderate door traffic.

CH<sub>4</sub> 0.0  
 CO<sub>2</sub> 0.1  
 O<sub>2</sub> 20.8

1 person lives in basement, bedroom connected to furnace room. Crawl space used to store Xmas decorations, etc.

**Indoor Air Quality- Summa Canister Sampling**

Date:	Mar 13 / 17 - Mar 14 / 17
Technician:	MCL
Project Number:	4-2352-04-03
Site Address:	Residence F

**Starting Meteorological Parameters:**

Outdoor Barometric Pressure:	101.9	Indoor Barometric Pressure:	106.0.
Outdoor Temperature:	-12°C (-17°C windchill)	Indoor Temperature:	15°C
Relative Humidity of Sampling Environment:	48%	Wind Direction & Speed:	SSE 10 km/hr

**Ending Meteorological Parameters:**

Outdoor Barometric Pressure:	100.5	Indoor Barometric Pressure:	105.8
Outdoor Temperature:	2°C (no wc)	Indoor Temperature:	18°C
Relative Humidity of Sampling Environment:	45%	Wind Direction & Speed:	SE 17 km/hr

Trip Blank Canister Number:	_____		
Location of Duplicate Sample:	_____		
Canister Number(s):	_____	Regulator Number:	_____

low VOC paint, new door / door frame in past few weeks before sampling. Photograph of paint can included w/ site photos. No detectable odour noted. No other changes since RSI (Dec/16)

Lab Identifier:	Residence F				
Canister Number(s):	14918		Regulator Number:	458	
Starting PID readings- 5 in 1 minute:	1	0	0	1	1
Start Time:	12:38		Starting Canister Vacuum:	-26.0	
Ending PID readings- 5 in 1 minute:	1	1	1	0	0
End Time:	12:30		Ending Canister Vacuum:	-7.0	

Sample Height:	1.2m on step ladder
Description of Sample Location (ie. room, position within a building, exit number, building number, etc):	in furnace room A FD w/ door open.
HVAC conditions during sampling:	Type: <u>Forced Air</u> <input checked="" type="checkbox"/> (On) <input type="checkbox"/> (Off)
Description of doors and windows and their usage (open, closed, high traffic through the doors, ie. how many times opened and closed in an hour)	windows closed. Door to furnace room open to rest of house. Door to exterior opened a few times only during sample.

new door, painting in past few weeks.  
↳ Minwax photos on camera.

O<sub>2</sub> 21.2%  
CH<sub>4</sub> 0.0%  
CO<sub>2</sub> 0.1%  
% LEL 0

### Indoor Air Quality- Summa Canister Sampling

Date:	Mar 13/17 - Mar 14/17
Technician:	MCL
Project Number:	4-2350-04-03
Site Address:	Residence G

#### Starting Meteorological Parameters:

Outdoor Barometric Pressure:	101.9	Indoor Barometric Pressure:	105.9
Outdoor Temperature:	-12°C (-17 WC)	Indoor Temperature:	16°C
Relative Humidity of Sampling Environment:	34%	Wind Direction & Speed:	SSE 10 km/hr

#### Ending Meteorological Parameters:

Outdoor Barometric Pressure:	100.5	Indoor Barometric Pressure:	105.7
Outdoor Temperature:	2°C (no WC)	Indoor Temperature:	17°C
Relative Humidity of Sampling Environment:	36%	Wind Direction & Speed:	SE 17 km/hr

Trip Blank Canister Number:	—		
Location of Duplicate Sample:	—		
Canister Number(s):	—	Regulator Number:	—

no changes to preliminary site inspection (Dec 2016)

Lab Identifier:	Residence G				
Canister Number(s):	14531		Regulator Number:	1376	
Starting PID readings- 5 in 1 minute:	1	0	0	1	0
Start Time:	12:52		Starting Canister Vacuum:	-260	
Ending PID readings- 5 in 1 minute:	0	0	1	2	1
End Time:	12:50.		Ending Canister Vacuum:	-5.5	

Sample Height:	~1m off floor
Description of Sample Location (ie. room, position within a building, exit number, building number, etc):	in furnace room, doors open, on step stool
HVAC conditions during sampling:	Type: <u>forced air</u> <input checked="" type="checkbox"/> (On) <input type="checkbox"/> (Off) ↳ set to lower temp than normal b/c residents away.
Description of doors and windows and their usage (open, closed, high traffic through the doors, ie. how many times opened and closed in an hour)	minimal. Residents are away, therefore gave access to XCB. All windows closed.

GEM readings @ pick-up:

O<sub>2</sub> 20.9 %  
PID 2ppm  
CO<sub>2</sub> 0.1 %  
CH<sub>4</sub> 0.1 %  
% LEL = 0

**Indoor Air Quality- Summa Canister Sampling**

Date:	Mar 13/17 - Mar 14/17
Technician:	MCL
Project Number:	4-2352-04-03
Site Address:	Residence H

**Starting Meteorological Parameters:**

Outdoor Barometric Pressure:	101.6	Indoor Barometric Pressure:	105.7
Outdoor Temperature:	-5°C (-23°C) <sub>WCL</sub>	Indoor Temperature:	16°C.
Relative Humidity of Sampling Environment:	<del>50</del> 40%	Wind Direction & Speed:	ESE 7 km/hr

**Ending Meteorological Parameters:**

Outdoor Barometric Pressure:	100.0	Indoor Barometric Pressure:	105.5
Outdoor Temperature:	2°C (no WCL)	Indoor Temperature:	16°C
Relative Humidity of Sampling Environment:	40%	Wind Direction & Speed:	SE 26 km/hr

Trip Blank Canister Number:	—		
Location of Duplicate Sample:	—		
Canister Number(s):	—	Regulator Number:	—

no changes since PSI Dec/16.

Lab Identifier:	Residence H				
Canister Number(s):	18260		Regulator Number:	1354	
Starting PID readings- 5 in 1 minute:	1	1	0	0	1
Start Time:	18:03 pm		Starting Canister Vacuum:	-26.0	
Ending PID readings- 5 in 1 minute:	0	0	1	0	1
End Time:	18:15		Ending Canister Vacuum:	-5.5	

Sample Height:	~1.1m
Description of Sample Location (ie. room, position within a building, exit number, building number, etc):	middle of basement on stepladder
HVAC conditions during sampling:	Type: <u>forced air</u> <input checked="" type="checkbox"/> (On) <input type="checkbox"/> (Off)
Description of doors and windows and their usage (open, closed, high traffic through the doors, ie. how many times opened and closed in an hour)	minimal. windows closed.

Basement completely open ->  
no barriers/walls.

CH4 0.0  
CO2 0.1  
O2 21.6  
%LEL 0

**Indoor Air Quality- Summa Canister Sampling**

Date:	Mar 13/17 - Mar 14/17
Technician:	MCL
Project Number:	4-2352-04-03
Site Address:	Residence I

**Starting Meteorological Parameters:**

Outdoor Barometric Pressure:	101.8	Indoor Barometric Pressure:	105.5
Outdoor Temperature:	-13°C (-21°F)	Indoor Temperature:	20°C
Relative Humidity of Sampling Environment:	40%	Wind Direction & Speed:	18 km/hr South

**Ending Meteorological Parameters:**

Outdoor Barometric Pressure:	100.7	Indoor Barometric Pressure:	105.4
Outdoor Temperature:	1°C	Indoor Temperature:	21°C
Relative Humidity of Sampling Environment:	45%	Wind Direction & Speed:	12 km/hr SSE

Trip Blank Canister Number:	—		
Location of Duplicate Sample:	—		
Canister Number(s):	—	Regulator Number:	—

PST conducted Mar 9/17 - no changes.

1 m off ground in middle of laundry, furnace room. Door to rest of basement/house open.

Lab Identifier:	Residence I				
Canister Number(s):	14530		Regulator Number:	972	
Starting PID readings- 5 in 1 minute:	2	1	1	2	1
Start Time:	10:34		Starting Canister Vacuum:	-29.0	
Ending PID readings- 5 in 1 minute:	1	1	1	2	1
End Time:	10:50		Ending Canister Vacuum:	-8.0	

Sample Height:	~1m on chair
Description of Sample Location (ie. room, position within a building, exit number, building number, etc):	in middle of laundry / furnace room
HVAC conditions during sampling:	Type: <u>forced air</u> <input checked="" type="checkbox"/> (On) <input type="checkbox"/> (Off)
Description of doors and windows and their usage (open, closed, high traffic through the doors, ie. how many times opened and closed in an hour)	minimal. Residents away overnight.

CH<sub>4</sub> 0.0  
 CO<sub>2</sub> 0.1  
 O<sub>2</sub> 20.5  
 %LEL 0.

**Indoor Air Quality- Summa Canister Sampling**

Date:	Mar 13/17 - Mar 14/17
Technician:	MCL
Project Number:	4-2352-04-03
Site Address:	Residence J

**Starting Meteorological Parameters:**

Outdoor Barometric Pressure:	101.8	Indoor Barometric Pressure:	105.4
Outdoor Temperature:	-13°C (-21° WC)	Indoor Temperature:	22°C
Relative Humidity of Sampling Environment:	40%	Wind Direction & Speed:	South 18 km/hr

**Ending Meteorological Parameters:**

Outdoor Barometric Pressure:	100.7	Indoor Barometric Pressure:	105.4
Outdoor Temperature:	1°C	Indoor Temperature:	21°C
Relative Humidity of Sampling Environment:	42%	Wind Direction & Speed:	SSE 12 km/hr

Trip Blank Canister Number:	/		
Location of Duplicate Sample:	/		
Canister Number(s):	/	Regulator Number:	/

on ironing board in middle of room,  
~1.5m above floor in furnace/laundry  
room.

Ambient sample 2595 reg 955

11em north of

#4

Lab Identifier:	Residence J				
Canister Number(s):	2813		Regulator Number:	166.	
Starting PID readings- 5 in 1 minute:	1	1	2	1	0
Start Time:	10:49		Starting Canister Vacuum:	-28.0	
Ending PID readings- 5 in 1 minute:	1	1	2	2	2
End Time:	11:00		Ending Canister Vacuum:	-9.0	

Sample Height:	on ironing board ~ 1.5m
Description of Sample Location (ie. room, position within a building, exit number, building number, etc):	middle of laundry / furnace room (basement)
HVAC conditions during sampling:	Type: <u>forced air</u> <input checked="" type="checkbox"/> (On) <input type="checkbox"/> (Off)
Description of doors and windows and their usage (open, closed, high traffic through the doors, ie. how many times opened and closed in an hour)	minimal.

CH<sub>4</sub> 0.0  
 O<sub>2</sub> 20.9  
 CO<sub>2</sub> 0.1  
 % LEL 0

no change since  
 PSI conducted  
 March 9/17.

***ATTACHMENT D***  
***LABORATORY CERTIFICATE OF ANALYSIS***

Your Project #: 4-2352-04-03  
Your C.O.C. #: 30583

**Attention: Mary-Catherine Lanning**

XCG Consulting Limited  
820 Trillium Dr  
Kitchener, ON  
N2R 1K4

**Report Date: 2017/04/10**  
Report #: R4420991  
Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

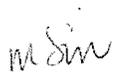
**MAXXAM JOB #: B752696**  
**Received: 2017/03/16, 10:00**

Sample Matrix: AIR  
# Samples Received: 12

Analyses	Date		Laboratory Method	Reference
	Quantity	Extracted		
Canister Pressure (TO-15)	12	N/A	2017/03/30 BRL SOP-00304	EPA TO-15 m
Matrix Gases (1)	12	N/A	2017/04/06 CAM SOP-00225	
VOCs in Air (TO-15)	12	N/A	2017/03/30 BRL SOP-00304	EPA TO-15 m

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.  
(1) Argon interferes with  in the reported Oxygen concentration. The atmosphere contains about 0.9% Argon.

Encryption Key



Marinela Sim  
Project Manager  
10 Apr 2017 16:47:51

Please direct all question  ate of Analysis to your Project Manager.  
Marinela Sim, Project Manager  
Email: MSim@maxxam.ca  
Phone# (905) 817-5700

=====  
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

**RESULTS OF ANALYSES OF AIR**

<b>Maxxam ID</b>		EBG194	EBG195	EBG196	EBG197	
<b>Sampling Date</b>		2017/03/14	2017/03/14	2017/03/14	2017/03/14	
<b>COC Number</b>		30583	30583	30583	30583	
	<b>UNITS</b>	Residence B/T21636	Residence H /18260	Residence C/14258	Residence A/2758	<b>QC Batch</b>

<b>Volatile Organics</b>						
Pressure on Receipt	psig	(-5.0)	(-3.6)	(-4.5)	(-3.9)	4920443
QC Batch = Quality Control Batch						

<b>Maxxam ID</b>		EBG198	EBG199	EBG200	EBG201	
<b>Sampling Date</b>		2017/03/14	2017/03/14	2017/03/14	2017/03/14	
<b>COC Number</b>		30583	30583	30583	30583	
	<b>UNITS</b>	Residence G /14531	Residence F /14918	Residence E/129	Residence D/18232	<b>QC Batch</b>

<b>Volatile Organics</b>						
Pressure on Receipt	psig	(-4.0)	(-4.0)	(-4.5)	(-4.6)	4920443
QC Batch = Quality Control Batch						

<b>Maxxam ID</b>		EBG202	EBG203	EBG204	EBG205	
<b>Sampling Date</b>		2017/03/14	2017/03/14	2017/03/14	2017/03/14	
<b>COC Number</b>		30583	30583	30583	30583	
	<b>UNITS</b>	Residence I/14530	Residence J /2813	OAQ/2595	XCG-300/2580	<b>QC Batch</b>

<b>Volatile Organics</b>						
Pressure on Receipt	psig	(-4.5)	(-4.3)	(-2.2)	(-4.5)	4920443
QC Batch = Quality Control Batch						

**COMPRESSED GAS PARAMETERS (AIR)**

<b>Maxxam ID</b>		EBG194	EBG195	EBG196		
<b>Sampling Date</b>		2017/03/14	2017/03/14	2017/03/14		
<b>COC Number</b>		30583	30583	30583		
	<b>UNITS</b>	Residence B/T21636	Residence H /18260	Residence C/14258	<b>RDL</b>	<b>QC Batch</b>
<b>Fixed Gases</b>						
Methane	% v/v	<0.2	<0.2	<0.2	0.2	4930064
RDL = Reportable Detection Limit QC Batch = Quality Control Batch						

<b>Maxxam ID</b>		EBG197	EBG198	EBG199		
<b>Sampling Date</b>		2017/03/14	2017/03/14	2017/03/14		
<b>COC Number</b>		30583	30583	30583		
	<b>UNITS</b>	Residence A/2758	RDL Residence G /14531	Residence F /14918	<b>RDL</b>	<b>QC Batch</b>
<b>Fixed Gases</b>						
Methane	% v/v	<0.1	0.1	<0.2	<0.2	0.2 4930064
RDL = Reportable Detection Limit QC Batch = Quality Control Batch						

<b>Maxxam ID</b>		EBG200	EBG201	EBG202	EBG203		
<b>Sampling Date</b>		2017/03/14	2017/03/14	2017/03/14	2017/03/14		
<b>COC Number</b>		30583	30583	30583	30583		
	<b>UNITS</b>	Residence E/129	Residence D/18232	Residence I/14530	Residence J/2813	<b>RDL</b>	<b>QC Batch</b>
<b>Fixed Gases</b>							
Methane	% v/v	<0.2	<0.2	<0.2	<0.2	0.2	4930064
RDL = Reportable Detection Limit QC Batch = Quality Control Batch							

<b>Maxxam ID</b>		EBG204	EBG205	EBG205		
<b>Sampling Date</b>		2017/03/14	2017/03/14	2017/03/14		
<b>COC Number</b>		30583	30583	30583		
	<b>UNITS</b>	OAQ/2595	XCG-300/2580	XCG-300/2580 Lab-Dup	<b>RDL</b>	<b>QC Batch</b>
<b>Fixed Gases</b>						
Methane	% v/v	<0.2	<0.2	<0.2	0.2	4930064
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate						

**VOLATILE ORGANICS BY GC/MS (AIR)**

<b>Maxxam ID</b>		EBG194			EBG195				
<b>Sampling Date</b>		2017/03/14			2017/03/14				
<b>COC Number</b>		30583			30583				
	<b>UNITS</b>	Residence B/T21636	<b>ug/m3</b>	<b>DL (ug/m3)</b>	Residence H /18260	<b>RDL</b>	<b>ug/m3</b>	<b>DL (ug/m3)</b>	<b>QC Batch</b>

<b>Volatile Organics</b>									
Vinyl Chloride	ppbv	<0.02	<0.051	0.051	<0.02	0.02	<0.051	0.051	4920442
cis-1,2-Dichloroethylene	ppbv	<0.05	<0.20	0.20	<0.05	0.05	<0.20	0.20	4920442

<b>Surrogate Recovery (%)</b>									
Bromochloromethane	%	89	N/A	N/A	90		N/A	N/A	4920442
D5-Chlorobenzene	%	91	N/A	N/A	85		N/A	N/A	4920442
Difluorobenzene	%	86	N/A	N/A	83		N/A	N/A	4920442

RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch  
N/A = Not Applicable

<b>Maxxam ID</b>		EBG195			EBG196				
<b>Sampling Date</b>		2017/03/14			2017/03/14				
<b>COC Number</b>		30583			30583				
	<b>UNITS</b>	Residence H /18260 Lab-Dup	<b>ug/m3</b>	<b>DL (ug/m3)</b>	Residence C/14258	<b>RDL</b>	<b>ug/m3</b>	<b>DL (ug/m3)</b>	<b>QC Batch</b>

<b>Volatile Organics</b>									
Vinyl Chloride	ppbv	<0.02	<0.051	0.051	<0.02	0.02	<0.051	0.051	4920442
cis-1,2-Dichloroethylene	ppbv	<0.05	<0.20	0.20	<0.05	0.05	<0.20	0.20	4920442

<b>Surrogate Recovery (%)</b>									
Bromochloromethane	%	86	N/A	N/A	83		N/A	N/A	4920442
D5-Chlorobenzene	%	81	N/A	N/A	80		N/A	N/A	4920442
Difluorobenzene	%	79	N/A	N/A	78		N/A	N/A	4920442

RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch  
Lab-Dup = Laboratory Initiated Duplicate  
N/A = Not Applicable

**VOLATILE ORGANICS BY GC/MS (AIR)**

<b>Maxxam ID</b>		EBG197			EBG198				
<b>Sampling Date</b>		2017/03/14			2017/03/14				
<b>COC Number</b>		30583			30583				
	<b>UNITS</b>	Residence A/2758	ug/m3	DL (ug/m3)	Residence G /14531	RDL	ug/m3	DL (ug/m3)	QC Batch

<b>Volatile Organics</b>									
Vinyl Chloride	ppbv	<0.02	<0.051	0.051	<0.02	0.02	<0.051	0.051	4920442
cis-1,2-Dichloroethylene	ppbv	<0.05	<0.20	0.20	<0.05	0.05	<0.20	0.20	4920442
<b>Surrogate Recovery (%)</b>									
Bromochloromethane	%	85	N/A	N/A	83		N/A	N/A	4920442
D5-Chlorobenzene	%	82	N/A	N/A	78		N/A	N/A	4920442
Difluorobenzene	%	79	N/A	N/A	78		N/A	N/A	4920442
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable									

<b>Maxxam ID</b>		EBG199			EBG200				
<b>Sampling Date</b>		2017/03/14			2017/03/14				
<b>COC Number</b>		30583			30583				
	<b>UNITS</b>	Residence F /14918	ug/m3	DL (ug/m3)	Residence E/129	RDL	ug/m3	DL (ug/m3)	QC Batch

<b>Volatile Organics</b>									
Vinyl Chloride	ppbv	<0.02	<0.051	0.051	<0.02	0.02	<0.051	0.051	4920442
cis-1,2-Dichloroethylene	ppbv	<0.05	<0.20	0.20	<0.05	0.05	<0.20	0.20	4920442
<b>Surrogate Recovery (%)</b>									
Bromochloromethane	%	84	N/A	N/A	82		N/A	N/A	4920442
D5-Chlorobenzene	%	81	N/A	N/A	80		N/A	N/A	4920442
Difluorobenzene	%	78	N/A	N/A	76		N/A	N/A	4920442
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable									

**VOLATILE ORGANICS BY GC/MS (AIR)**

<b>Maxxam ID</b>		EBG201			EBG202				
<b>Sampling Date</b>		2017/03/14			2017/03/14				
<b>COC Number</b>		30583			30583				
	<b>UNITS</b>	Residence D/18232	ug/m3	DL (ug/m3)	Residence I/14530	RDL	ug/m3	DL (ug/m3)	QC Batch

<b>Volatile Organics</b>									
Vinyl Chloride	ppbv	<0.02	<0.051	0.051	<0.02	0.02	<0.051	0.051	4920442
cis-1,2-Dichloroethylene	ppbv	<0.05	<0.20	0.20	<0.05	0.05	<0.20	0.20	4920442

<b>Surrogate Recovery (%)</b>									
Bromochloromethane	%	82	N/A	N/A	81		N/A	N/A	4920442
D5-Chlorobenzene	%	77	N/A	N/A	76		N/A	N/A	4920442
Difluorobenzene	%	76	N/A	N/A	75		N/A	N/A	4920442

RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch  
N/A = Not Applicable

<b>Maxxam ID</b>		EBG203			EBG204				
<b>Sampling Date</b>		2017/03/14			2017/03/14				
<b>COC Number</b>		30583			30583				
	<b>UNITS</b>	Residence J/2813	ug/m3	DL (ug/m3)	OAQ/2595	RDL	ug/m3	DL (ug/m3)	QC Batch

<b>Volatile Organics</b>									
Vinyl Chloride	ppbv	<0.02	<0.051	0.051	<0.02	0.02	<0.051	0.051	4920442
cis-1,2-Dichloroethylene	ppbv	<0.05	<0.20	0.20	<0.05	0.05	<0.20	0.20	4920442

<b>Surrogate Recovery (%)</b>									
Bromochloromethane	%	83	N/A	N/A	81		N/A	N/A	4920442
D5-Chlorobenzene	%	80	N/A	N/A	74		N/A	N/A	4920442
Difluorobenzene	%	79	N/A	N/A	74		N/A	N/A	4920442

RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch  
N/A = Not Applicable

**VOLATILE ORGANICS BY GC/MS (AIR)**

<b>Maxxam ID</b>		EBG205				
<b>Sampling Date</b>		2017/03/14				
<b>COC Number</b>		30583				
	<b>UNITS</b>	<b>XCG-300/2580</b>	<b>RDL</b>	<b>ug/m3</b>	<b>DL (ug/m3)</b>	<b>QC Batch</b>
<b>Volatile Organics</b>						
Vinyl Chloride	ppbv	<0.02	0.02	<0.051	0.051	4920442
cis-1,2-Dichloroethylene	ppbv	<0.05	0.05	<0.20	0.20	4920442
<b>Surrogate Recovery (%)</b>						
Bromochloromethane	%	80		N/A	N/A	4920442
D5-Chlorobenzene	%	75		N/A	N/A	4920442
Difluorobenzene	%	74		N/A	N/A	4920442
RDL = Reportable Detection Limit QC Batch = Quality Control Batch N/A = Not Applicable						

**GENERAL COMMENTS**

Matrix Gas Analysis: Canisters were pressurized with Helium to enable sampling. Results and DLs adjusted accordingly.

Matrix Gas Analysis: Results normalized to 100% dry volume.

**Results relate only to the items tested.**

**QUALITY ASSURANCE REPORT**

QA/QC	Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
4920442	MM2		Spiked Blank	Bromochloromethane	2017/03/30		99	%	60 - 140
				D5-Chlorobenzene	2017/03/30		95	%	60 - 140
				Difluorobenzene	2017/03/30		95	%	60 - 140
				Vinyl Chloride	2017/03/30		94	%	70 - 130
				cis-1,2-Dichloroethylene	2017/03/30		93	%	70 - 130
4920442	MM2		Method Blank	Bromochloromethane	2017/03/30		99	%	60 - 140
				D5-Chlorobenzene	2017/03/30		86	%	60 - 140
				Difluorobenzene	2017/03/30		91	%	60 - 140
				Vinyl Chloride	2017/03/30	<0.02		ppbv	
				cis-1,2-Dichloroethylene	2017/03/30	<0.05		ppbv	
4920442	MM2		RPD [EBG195-01]	Vinyl Chloride	2017/03/30	NC		%	25
				cis-1,2-Dichloroethylene	2017/03/30	NC		%	25
4930064	VTH		Method Blank	Methane	2017/04/07	<0.1		% v/v	
4930064	VTH		RPD [EBG205-01]	Methane	2017/04/06	NC		%	20

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

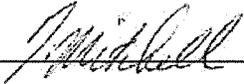
NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

**VALIDATION SIGNATURE PAGE**

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



\_\_\_\_\_  
Angel Guerrero, Team Leader, VOC Air



\_\_\_\_\_  
Tom Mitchell, B.Sc, Supervisor, Compressed Gases

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.