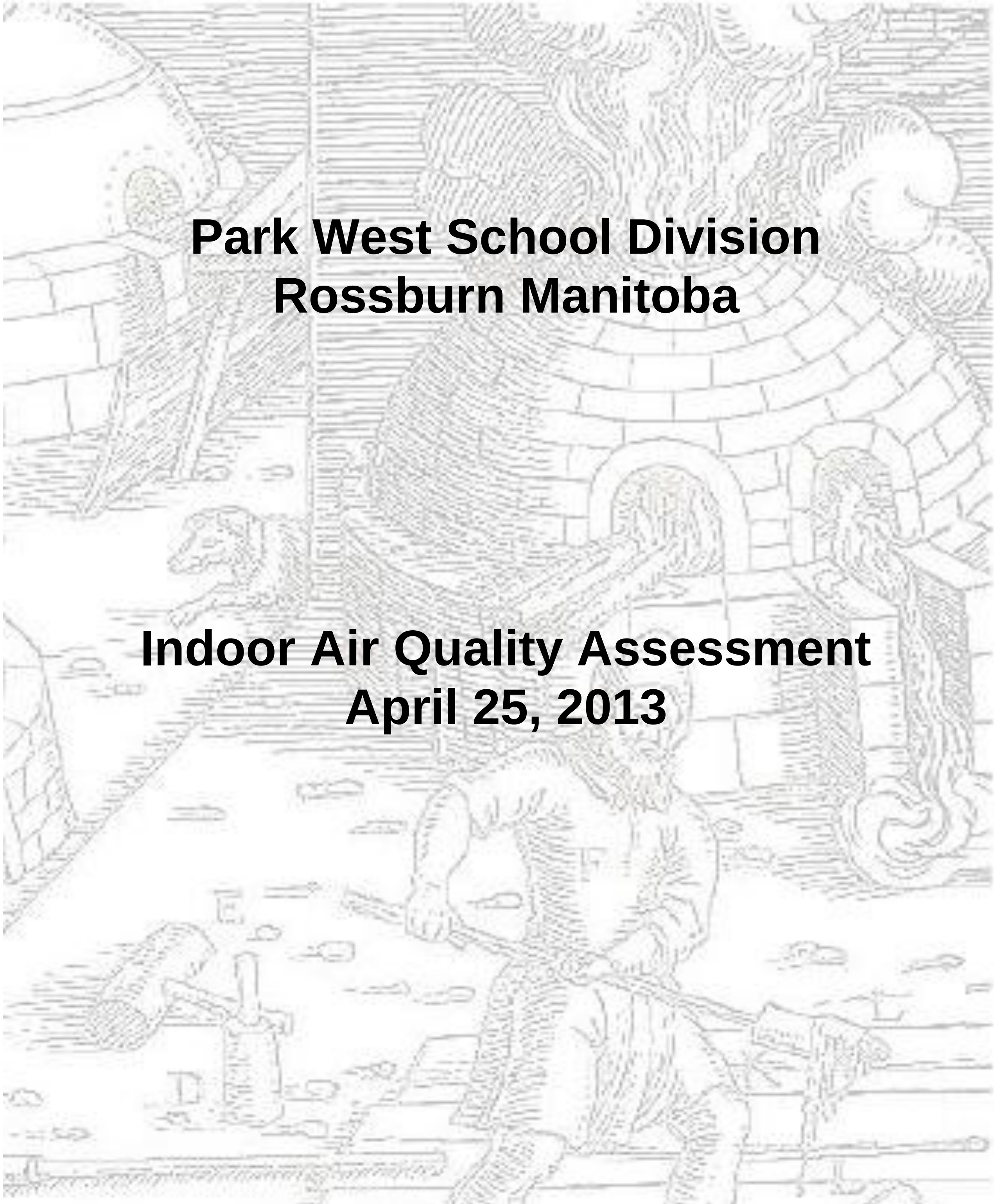
Park West School Division
Rossburn Manitoba



Indoor Air Quality Assessment
April 25, 2013

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Indoor Air Quality Assessment

Parkland West School Division
Rossburn Manitoba

Project Number 13-J-954

April 25, 2013

Assessment Performed by:

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April 25, 2013 **Project No.** 13-J-954

Rodney Snow
Maintenance Supervisor
Park West School Division
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Box 68
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Dear Mr. Snow

SUBJECT: Indoor Air Quality – Rossburn Elementary School

Elias Occupational Hygiene Consulting Inc. is pleased to submit our assessment of conditions at the Rossburn Elementary School. If you have any question please contact me at 1-204-261-1770.

Yours truly,
Elias Occupational Hygiene Consulting Inc.

John Elias, MPH, CIH, ROH, CRSP
Occupational Hygienist

Indoor Air Quality Assessment

Parkland West School Division
Rossburn Manitoba
Elementary School

SCOPE OF PROJECT

Some students in the Rossburn Elementary School started to show symptoms suggesting indoor air quality (IAQ) conditions. Reported symptoms included sore throat, headache, burning eyes, and dizziness. The symptoms occurred in the school and went away shortly after leaving the school. This assessment was carried out to determine if there were significant toxic materials present in the school.

BACKGROUND

Complaints started after spring break when students returned to school. During the break, the school was cleaned, and it was thought that residual cleaning agents could have caused the symptoms in sensitive students. The problem seemed to focus on the Home Ec. Room where there could have been more cleaning agents of some of the food ingredients that could trigger a reaction.

There are about 115 students in the school. To put this event into some context, an informal survey of regional schools suggested that on any given day 5 – 15 students will be absent from school. Some level of absenteeism, partly due to illness, is expected among a large number of people.

Since the event started, the ventilation system was inspected, modifications made, and the amount of fresh air being introduced into the school increased. The air in the school was being changed every 35 minutes. Increased ventilation is often the solution to IAQ conditions. It has been estimated that up to 80% of all IAQ problems are caused by poor ventilation. These changes may have resolved any ventilation related problems in the school.

On the day the samples were taken, the fans on the main floor were not working properly. Therefore the results shown below may be worst case conditions,

METHOD

Air samples were collected for the most common IAQ related causes. These included moulds, volatile organic compounds (VOCs), allergens in dusts, and carbon dioxide.

The school was operating under normal conditions. Students moved about the school in a normal fashion. Samples were taken in occupied areas.

OBSERVATIONS

Carbon dioxide

Carbon dioxide (CO_2) is a common odorless and colorless gas that exists in the outdoor environment. It is a byproduct of any combustion. Human respiration is a source of CO_2 (along with many other chemicals) in the indoor environment. It is not harmful to occupants until the levels rise beyond the tolerance limit. It is a useful indicator of the HVAC ventilation performance. As mentioned, CO_2 levels are an indicator of inadequate fresh air, and a predictor of IAQ sysmptoms among adults in the workplace. The concern is not the CO_2 but the other materials carried by the occupants such as perfumes, aftershave, and emissions from equipment being used, such as ozone from photocopiers. Different environments will have different acceptable concentrations of CO_2. For example long-term exposures to 3500 ppm in a home is considered acceptable.

When CO_2 levels exceed 600 ppm, some people in office settings express a concern. Once CO_2 levels reach 1000 ppm, concerns are wide spread. It should be noted that these levels are not toxic, they are only indicators of ventilation adequacy. The occupational exposure limit is 5,000 ppm, British submariners are allowed 10,000 ppm, and astronauts 20,000 ppm without significant adverse effects.

CO_2 levels were measured in occupied school rooms. The levels found are shown in Table 1 below. Levels are close to, but do not exceed the CO_2 concentrations that would cause widespread symptoms among adults in workplace settings. The highest levels were found in rooms with the oldest (largest) students.

TABLE 1: CO_2 Levels in occupied classrooms.

Room #	CO_2 Levels (ppm)
204	662
305	824
Library	790
303	762
Laboratory	730
302	981

Concentrations of CO_2 do not appear unacceptable in a non-workplace (classroom) setting.

Odours

At the time of the survey there were no unusual odours except for a corner classroom on the second floor. There was a bunt odour in the room. An electrician was called to inspect the heating system, and it was found to be a burnt out motor in the unit heater. As one would expect, this unusual odour caused some concern among staff and students.

The particulates and vapours from the burning may also affect the sampling results for the VOCs.

Moulds

Fungal spores are "ubiquitous" because they reside in the soil and in the general outdoor environment. The presence of microorganisms in the indoor environment in sufficient numbers or specific kinds of molds can cause health or comfort problems. Residences and commercial buildings can, under certain conditions, offer an environment for mold to flourish and allow mold concentrations to greatly exceed the normal ambient levels. These conditions typically include the following:

- the presence of stagnant water within a building;
- ventilation system filters packed with organic dusts; and
- moldy/dirty/wet gyp-rock, carpet or ceiling tiles

Although active fungal growth requires the presence of water or relatively high humidity, release of fungal spores into air can take place for months even after the water has disappeared. The sampling performed was designed to provide quantitative and qualitative information regarding the number and types of airborne molds present in the residence at the time of the survey.

The quantification of fungi has been assessed traditionally by the measure of colony-forming units (CFUs). In air, mold concentrations are expressed in terms of colony forming units per cubic meter of air (CFU/m^3). Air sampling collects or extracts molds from a known volume of air and retains the molds on a nutrient agar base. The agar is then incubated for a period of 7 days at 25 degrees Celsius.

As the type of fungi is as important as the number of fungi, the incubated samples were then evaluated by a mycologist with expertise in indoor air quality assessments.

It would be more accurate to say that the current methodology is semi-quantitative. This is because no one method can capture all spores of different shapes, sizes and masses with equal efficiency. In addition, the selection of agar favours certain types of fungi over others. Sampling in Canada normally uses a rose bengal agar because it accommodates the common fungi found in our environment but is resistant to the growth of bacteria cultures. This resistance to bacteria is advantageous because bacterium grows much faster than fungi and can cover the agar medium thus obscuring the fungi cultures from view

Bioaerosol exposure criteria

Bioaerosols include microorganisms and fragments, toxins, and particulate waste products. Bioaerosols are everywhere, and we are repeatedly exposed to them everyday. Biologically derived airborne contaminants include bioaerosols, gases and vapours, that living organism produce. These materials are natural components of indoor and outdoor environments. Under some conditions, the materials may be present in high enough concentrations to cause health effects.

At this time there is an absence of compliance criteria for biological agents. Data on the range of exposures to specific materials are limited, and the methods used by investigators to collect samples vary widely. Even if standards were set, they would be arbitrary standards because the available environmental and health data are few and of inconsistent quality.

At this time the only reliable method of assessing indoor environments rely on visually inspecting buildings, assessing occupant symptoms, evaluating building performance, testing potential environmental sources, and applying professional judgement. Outside or ambient bioaerosol levels are used as guidelines (not standards) in this assessment. Because of wide variations in sampling results, they cannot be used as an absolute standard. In general further investigation should be carried out when:

Health Canada in their 2004 revision of their document, *Fungal Contamination in Public Buildings: A guide to recognition and management*, finds that there is a correlation between wet buildings and illness. Once a building has been water-damaged there is a potential for adverse health effects from mold and other contaminants associated with dampness. Such health effects include irritative and non-specific respiratory symptoms, as well as the exacerbation and development of respiratory diseases such as asthma.

Bioaerosol sampling method

Air samples were taken with a Reuter centrifugal air sampler using a 4 minute sampling duration. This sampling device impacts any airborne molds present in the collected air onto an agar strip for subsequent incubation and evaluated by microscopic examination.

The building was allowed to operate under normal conditions before to ensure that the sampling would represent actual “in use” conditions.

Three air samples were taken for mold, one on each floor and one outdoor sample as a background.

Bioaerosol observations

Air samples were collected on April 10. One sample was collected from outside to be used as a background measurement. Table 2 shows the results of these samples.

As can be seen, the background mould levels as found outside the school are much higher than the mould levels inside the school. This is what one would expect where the building ventilation system is working and filtering the air entering the building. The types of mould on the main floor is similar, but with lower concentrations. This is not unexpected as moulds can be brought in when people go in and out of the building.

The most abundant molds indoors are *Alternaria* and *Cladosporium*. These are common molds, and are normally found in the environment. Eurotium species are the sexual states of Aspergillus, another common species and is found in soil, plants and house dust.

Table 2: Mould in air sampling results.

LOCATION	**CFU/m^3**	Yeast	*Alternaria*	*Cladosporium*	*Epicoccum*	*Eurotium*	*Phoma*	*Scopulariopsis*	*immature*
Samples taken April 10, 2013									
Background sample	150	19	6	13		94		13	6
Main Floor	38	17	6	17		33			
Second Floor	38	6		19	6		6		

Since the moulds are similar to those found in the outdoor air but at much lower levels, it is unlikely that moulds will cause any unusual effects.

Table 3 is a summary of outdoor levels found in Winnipeg. This information is offered to show the range of moulds normally found in the air without adverse effects. It is unlikely that moulds in the school were the cause of the symptoms reported.

TABLE 3: Examples of background mold levels found in Winnipeg Manitoba

LOCATION **Outside background levels in Winnipeg**	**CFU/ m^3**	Yeast	*Alternaria*	*Aspergillus*	*Chaetomium*	Chrysosporium	*Cladosporium*	*Epicoccum*	*Fusarium*	*Immature*	*Penicillium*	*Scopulariopsis*	*Stachybotrys*	*Trichothecium*	*unidentified*	*Ulocladium*
October 2011	960		170				750	19	6							
October 2010	888	6	63				769	19	6	25						
September 2010	406		100				238	38	13	6	13					
March 2006	50	13	6	19							6					
July 2005	113	6	63	6	6		13						6			
May 2004	200	38	13	38			50	13		31			19			
November 2004	1090	44	200				763	81	6							
November 2004	1290		488				794	6			6					
November 2004	900	81	88	6			694	19							13	
November 2003	770	6	19	638								106				
November 2003	130	6	31	75			6							6		
August 2003	660	6	638				6	13								
July 2003	470	13	363				69	19								
July 2002	540		302	490	16		81	54	16					11		
July 2002	920	28	351				119	49	9							
January 2000	38		7	25							7					
January 2000	12			12												
July 1999	1900	19	266				1520	19								
July 1999	2000	60	280				1580	20								
July 1999	1500		675				750	15								
July 1999	1300		143				936	52								13
July 1999	1200		468				588	72								
September 1999	470		249			5	174									5

Dusts

Dust samples were collected with a tape sampler for microscopic analysis. The goal was to determine if there were significant amounts of allergens such as pollens present. The sample analysis is shown below

Background (outside)
The tape lift sample was examined under a stereoscopic microscope at 40x and under a polarized light microscope at 100x and 400x. The dust on tape lift consisted mainly of common non-fibrous dust, a few pieces of plants, small amounts of lint fibres and skin flakes, a few pollen grains.

Home Ec. Room
The tape lift sample was examined under a stereoscopic microscope at 40x and under a polarized light microscope at 100x and 400x. The dust on

tape lift consisted mainly of lint fibres, common non-fibrous dust, large amounts of skin flakes and starch grains, many Myxomycete spores and plant pieces, as well as a few Epicoccum, Cladosporium, Bipolaris, rust spores and unidentified mould filaments

Myxomycetes, the most common molds found, occur all over the world and feed on microorganisms that live in any type of dead plant material. They contribute to the decomposition of dead vegetation, and feed on bacteria, yeasts, and fungi. For this reason, these organisms are usually found in soil, lawns, and on the forest floor, commonly on deciduous logs.

Second Floor

The tape lift sample was examined under a stereoscopic microscope at 40x and under a polarized light microscope at 100x and 400x. The dust on tape lift consisted mainly of common non-fibrous dust, lint fibres, skin flakes, a few starch grains, a few plant pieces and a few Alternaria spores.

The tape samples did not suggest that there were significant allergens inside that could cause the reported symptoms.

Volatile Organic Compounds

Some airborne chemicals can cause adverse health effects. Air samples were collected inside the school to determine if the symptoms could be caused by organic chemicals used in the school or brought into the school.

The school sample was collected in areas of concern, the Home Ec. Room, Gymnasium, Library, and a classroom. The sample was collected with an evacuated 6 L canister that was moved about the school for a composite sample.

Since the school had large volumes of air being drawn through it (35 min/air change), the air inside the school would contain many of the same materials found outside. Therefore a background sample was collected from outside for comparison.

The analysis is performed using procedures adapted from EPA Method TO-15. Air samples are collected into cleaned evacuated canisters. A volume of air sample is transferred from the canister to a preconcentrator system where the analytes are trapped & focused. The analytes are then thermally desorbed into a GC-MSD for analysis. Test results are not blank corrected unless indicated by a qualifier.

The method was developed by the USA Environmental Protection Agency for the detection of low levels of airborne samples. The selection of chemicals to be tested was selected for indoor environments.

Table 4 shows the levels of chemicals detected inside and outside the school. Table 5 shows all of the chemicals included in the analysis. Table 4 is a summary of the data for ease of reading.

- Column 1 is the material detected in the air.
- Column 2 is the concentration of material found outside the school.
- Column 3 is the concentration found inside the school. Half of the materials inside the school were found outside in about the same concentration.
- Column 4 shows the environmental exposure limits for the individual chemicals.
- Column 5 shows common uses for the materials

	Exposure levels (ppb)		**Exposure Limits ppb**	
Chemical	**Background**	**Inside**		**Use of material**
Acetone	4.9	5.7	4,925	Used as a solvent (finger nail polish) and found in blood and urine.
Benzene	0.32		2,500	Found in trace amounts in solvents and fuels.
Cloromethane	0.54	0.58	155,000	Used in the manufacture of plastics, rubber, and silicones.
Dichlorodifluoromethane	0.42	0.42	100,000	Feon 12 used as a refrigerent and aerosol propellant
Toluene	0.74		528	A common solvent such as paint thinners.
1,4-Dichlorobenzene		0.26	95	Used as a disinfectant, pesticide, and deodorant
Trichlorofluoromethane	0.22	0.22	6000	Freon 11 - Banned along with Freon 12
Isopropyl Alcohol		4.1	7300	Used as a disinfectant, cleaners, and pharmaceuticals.

TABLE 4: Summary of VOCs found in school and background air.

The exposure standards used for the VOCs are from environmental agencies, ONTARIO'S AMBIENT AIR QUALITY CRITERIA, and USA EPA Guidelines. These exposure limits were designed to protect the weakest members of the community for all day exposures. Exposures here were less than a 24 hours and thus there is an extra margin of safety in this application.

Exposure levels were about the same as found in ambient community air and less than 1/100th of the level that is expected to affect the weakest member of the community when continuously exposed.

Table 5 (See Appendix A) shows that the concentration of most materials were so low that they could not be detected as indicated by the symbol"<".

Since VOCs were either:

- not detected;
- same as in the rest of the community; or
- present at less that 1/100th the exposure limit;

it cannot be said that VOCs are a significant problem in the school.

CONCLUSIONS

Health symptoms reported in the school (sore throat, headache, burning eyes, and dizziness) were similar to those reported in indoor air quality (IAQ) events. In response to this, the school HVAC system was inspected, and the amount of fresh air entering the school was optimized. This was the usual step taken to resolve IAQ issues where an obvious source of the concern (such as visible mould growth) does not exist.

When the concerns continued, air tests were requested to determine if a problem still existed.

The main sources of IAQ complaints were assessed, molds, allergens in dust, VOCs, and CO_2 at an indicator of general ventilation levels.

All tests showed potential contaminant levels to be near, or below levels found outside the school in the general community. Exposure levels designed to protect the weakest members of the community were not exceeded.

Based on the sampling, it would appear that the changes made to the school ventilation system were successful in removing the main agents that could have triggered the effects reported. The increased air volume would dilute and remove contaminants in the school. The filters in the HVAC system would remove particulates such as moulds to render indoor air cleaner than outdoor air. However, the high rate of ventilation would result in vapour and gas levels in the school being similar to outdoor air. On the whole, this appears to have created a school environment without obvious contaminants, and should be acceptable to the majority of occupants.

APPENDIX A

VOC levels

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1288592-1 BACKGROUND 060000-0076 CA1200-0059							
Sampled By: CLIENT on 10-APR-13 @ 01:26							
Matrix: Air							
Canister EPA TO-15							
1,1,1-Trichloroethane	<1.1		1.1	ug/m3		17-APR-13	R2580629
1,1,1-Trichloroethane	<0.20		0.20	ppb(V)		17-APR-13	R2580629
1,1,2,2-Tetrachloroethane	<1.4		1.4	ug/m3		17-APR-13	R2580629
1,1,2,2-Tetrachloroethane	<0.20		0.20	ppb(V)		17-APR-13	R2580629
1,1,2-Trichloroethane	<1.1		1.1	ug/m3		17-APR-13	R2580629
1,1,2-Trichloroethane	<0.20		0.20	ppb(V)		17-APR-13	R2580629
1,1-Dichloroethane	<0.81		0.81	ug/m3		17-APR-13	R2580629
1,1-Dichloroethane	<0.20		0.20	ppb(V)		17-APR-13	R2580629
1,1-Dichloroethene	<0.79		0.79	ug/m3		17-APR-13	R2580629
1,1-Dichloroethene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
1,2,4-Trichlorobenzene	<1.5		1.5	ug/m3		17-APR-13	R2580629
1,2,4-Trichlorobenzene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
1,2,4-Trimethylbenzene	<0.98		0.98	ug/m3		17-APR-13	R2580629
1,2,4-Trimethylbenzene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
1,2-Dibromoethane	<1.5		1.5	ug/m3		17-APR-13	R2580629
1,2-Dibromoethane	<0.20		0.20	ppb(V)		17-APR-13	R2580629
1,2-Dichlorobenzene	<1.2		1.2	ug/m3		17-APR-13	R2580629
1,2-Dichlorobenzene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
1,2-Dichloroethane	<0.81		0.81	ug/m3		17-APR-13	R2580629
1,2-Dichloroethane	<0.20		0.20	ppb(V)		17-APR-13	R2580629
1,2-Dichloropropane	<0.92		0.92	ug/m3		17-APR-13	R2580629
1,2-Dichloropropane	<0.20		0.20	ppb(V)		17-APR-13	R2580629
1,3,5-Trimethylbenzene	<0.98		0.98	ug/m3		17-APR-13	R2580629
1,3,5-Trimethylbenzene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
1,3-Butadiene	<0.44		0.44	ug/m3		17-APR-13	R2580629
1,3-Butadiene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
1,3-Dichlorobenzene	<1.2		1.2	ug/m3		17-APR-13	R2580629
1,3-Dichlorobenzene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
1,4-Dichlorobenzene	<1.2		1.2	ug/m3		17-APR-13	R2580629
1,4-Dichlorobenzene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
1,4-Dioxane	<0.72		0.72	ug/m3		17-APR-13	R2580629
1,4-Dioxane	<0.20		0.20	ppb(V)		17-APR-13	R2580629
2-Hexanone	<4.1		4.1	ug/m3		17-APR-13	R2580629
2-Hexanone	<1.0		1.0	ppb(V)		17-APR-13	R2580629
4-Ethyltoluene	<0.98		0.98	ug/m3		17-APR-13	R2580629
4-Ethyltoluene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Acetone	11.5		5.9	ug/m3		18-APR-13	R2580629
Acetone	4.8		2.5	ppb(V)		18-APR-13	R2580629
Allyl chloride	<0.63		0.63	ug/m3		17-APR-13	R2580629
Allyl chloride	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Benzene	1.02		0.64	ug/m3		17-APR-13	R2580629
Benzene	0.32		0.20	ppb(V)		17-APR-13	R2580629
Benzyl chloride	<1.0		1.0	ug/m3		17-APR-13	R2580629
Benzyl chloride	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Bromodichloromethane	<1.3		1.3	ug/m3		17-APR-13	R2580629
Bromodichloromethane	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Bromoform	<2.1		2.1	ug/m3		17-APR-13	R2580629
Bromoform	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Bromomethane	<0.78		0.78	ug/m3		17-APR-13	R2580629
Bromomethane	<0.20		0.20	ppb(V)		17-APR-13	R2580629

[illegible]

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1288592-1 BACKGROUND 060000-0076 CA1200-0059							
Sampled By: CLIENT on 10-APR-13 @ 01:26							
Matrix: Air							
Canister EPA TO-15							
Carbon Disulfide	<0.62		0.62	ug/m3		17-APR-13	R2580629
Carbon Disulfide	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Carbon Tetrachloride	<1.3		1.3	ug/m3		17-APR-13	R2580629
Carbon Tetrachloride	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Chlorobenzene	<0.92		0.92	ug/m3		17-APR-13	R2580629
Chlorobenzene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Chloroethane	<0.53		0.53	ug/m3		17-APR-13	R2580629
Chloroethane	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Chloroform	<0.98		0.98	ug/m3		17-APR-13	R2580629
Chloroform	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Chloromethane	1.12		0.41	ug/m3		17-APR-13	R2580629
Chloromethane	0.54		0.20	ppb(V)		17-APR-13	R2580629
cis-1,2-Dichloroethene	<0.79		0.79	ug/m3		17-APR-13	R2580629
cis-1,2-Dichloroethene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
cis-1,3-Dichloropropene	<0.91		0.91	ug/m3		17-APR-13	R2580629
cis-1,3-Dichloropropene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Cyclohexane	<0.69		0.69	ug/m3		17-APR-13	R2580629
Cyclohexane	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Dibromochloromethane	<1.7		1.7	ug/m3		17-APR-13	R2580629
Dibromochloromethane	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Dichlorodifluoromethane	2.08		0.99	ug/m3		17-APR-13	R2580629
Dichlorodifluoromethane	0.42		0.20	ppb(V)		17-APR-13	R2580629
Ethyl acetate	<0.72		0.72	ug/m3		17-APR-13	R2580629
Ethyl acetate	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Ethyl benzene	<0.87		0.87	ug/m3		17-APR-13	R2580629
Ethyl benzene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Freon 113	<1.5		1.5	ug/m3		17-APR-13	R2580629
Freon 113	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Freon 114	<1.4		1.4	ug/m3		17-APR-13	R2580629
Freon 114	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Hexachlorobutadiene	<2.1		2.1	ug/m3		17-APR-13	R2580629
Hexachlorobutadiene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Isooctane	<0.93		0.93	ug/m3		17-APR-13	R2580629
Isooctane	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Isopropyl alcohol	<2.5		2.5	ug/m3		17-APR-13	R2580629
Isopropyl alcohol	<1.0		1.0	ppb(V)		17-APR-13	R2580629
m&p-Xylene	<1.7		1.7	ug/m3		17-APR-13	R2580629
m&p-Xylene	<0.40		0.40	ppb(V)		17-APR-13	R2580629
Methyl ethyl ketone	<0.59		0.59	ug/m3		17-APR-13	R2580629
Methyl ethyl ketone	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Methyl isobutyl ketone	<0.82		0.82	ug/m3		17-APR-13	R2580629
Methyl isobutyl ketone	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Methylene chloride	<0.69		0.69	ug/m3		22-APR-13	R2580629
Methylene chloride	<0.20		0.20	ppb(V)		22-APR-13	R2580629
MTBE	<0.72		0.72	ug/m3		17-APR-13	R2580629
MTBE	<0.20		0.20	ppb(V)		17-APR-13	R2580629
n-Heptane	<0.82		0.82	ug/m3		17-APR-13	R2580629
n-Heptane	<0.20		0.20	ppb(V)		17-APR-13	R2580629
n-Hexane	<0.70		0.70	ug/m3		17-APR-13	R2580629
n-Hexane	<0.20		0.20	ppb(V)		17-APR-13	R2580629
o-Xylene	<0.87		0.87	ug/m3		17-APR-13	R2580629

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1288592-1 BACKGROUND 060000-0076 CA1200-0059							
Sampled By: CLIENT on 10-APR-13 @ 01:26							
Matrix: Air							
Canister EPA TO-15							
o-Xylene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Propylene	<0.34		0.34	ug/m3		17-APR-13	R2580629
Propylene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Styrene	<0.85		0.85	ug/m3		17-APR-13	R2580629
Styrene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Tetrachloroethylene	<1.4		1.4	ug/m3		17-APR-13	R2580629
Tetrachloroethylene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Tetrahydrofuran	<0.59		0.59	ug/m3		17-APR-13	R2580629
Tetrahydrofuran	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Toluene	2.80		0.75	ug/m3		17-APR-13	R2580629
Toluene	0.74		0.20	ppb(V)		17-APR-13	R2580629
trans-1,2-Dichloroethene	<0.79		0.79	ug/m3		17-APR-13	R2580629
trans-1,2-Dichloroethene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
trans-1,3-Dichloropropene	<0.91		0.91	ug/m3		17-APR-13	R2580629
trans-1,3-Dichloropropene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Trichloroethylene	<1.1		1.1	ug/m3		17-APR-13	R2580629
Trichloroethylene	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Trichlorofluoromethane	1.2		1.1	ug/m3		17-APR-13	R2580629
Trichlorofluoromethane	0.22		0.20	ppb(V)		17-APR-13	R2580629
Vinyl acetate	<1.8		1.8	ug/m3		17-APR-13	R2580629
Vinyl acetate	<0.50		0.50	ppb(V)		17-APR-13	R2580629
Vinyl bromide	<0.87		0.87	ug/m3		17-APR-13	R2580629
Vinyl bromide	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Vinyl chloride	<0.51		0.51	ug/m3		17-APR-13	R2580629
Vinyl chloride	<0.20		0.20	ppb(V)		17-APR-13	R2580629
Surrogate: 4-Bromofluorobenzene	110.2		50-150	%		17-APR-13	R2580629
Canister Information							
Pressure on Receipt	-7.1		-30	in Hg	15-APR-13	15-APR-13	R2578530
Canister ID	06000-0076				15-APR-13	15-APR-13	R2578530
Regulator ID	CS1200-0059				15-APR-13	15-APR-13	R2578530
Batch Proof ID	B130211.104				15-APR-13	15-APR-13	R2578530
L1288592-2 INSIDE 060000-0086 CS1200-0061							
Sampled By: CLIENT on 10-APR-13 @ 01:26							
Matrix: Air							
Canister EPA TO-15							
1,1,1-Trichloroethane	<1.1		1.1	ug/m3		18-APR-13	R2580629
1,1,1-Trichloroethane	<0.20		0.20	ppb(V)		18-APR-13	R2580629
1,1,2,2-Tetrachloroethane	<1.4		1.4	ug/m3		18-APR-13	R2580629
1,1,2,2-Tetrachloroethane	<0.20		0.20	ppb(V)		18-APR-13	R2580629
1,1,2-Trichloroethane	<1.1		1.1	ug/m3		18-APR-13	R2580629
1,1,2-Trichloroethane	<0.20		0.20	ppb(V)		18-APR-13	R2580629
1,1-Dichloroethane	<0.81		0.81	ug/m3		18-APR-13	R2580629
1,1-Dichloroethane	<0.20		0.20	ppb(V)		18-APR-13	R2580629
1,1-Dichloroethene	<0.79		0.79	ug/m3		18-APR-13	R2580629
1,1-Dichloroethene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
1,2,4-Trichlorobenzene	<1.5		1.5	ug/m3		18-APR-13	R2580629
1,2,4-Trichlorobenzene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
1,2,4-Trimethylbenzene	<0.98		0.98	ug/m3		18-APR-13	R2580629
1,2,4-Trimethylbenzene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
1,2-Dibromoethane	<1.5		1.5	ug/m3		18-APR-13	R2580629

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1288592-2 INSIDE 060000-0086 CS1200-0061							
Sampled By: CLIENT on 10-APR-13 @ 01:26							
Matrix: Air							
Canister EPA TO-15							
1,2-Dibromoethane	<0.20		0.20	ppb(V)		18-APR-13	R2580629
1,2-Dichlorobenzene	<1.2		1.2	ug/m3		18-APR-13	R2580629
1,2-Dichlorobenzene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
1,2-Dichloroethane	<0.81		0.81	ug/m3		18-APR-13	R2580629
1,2-Dichloroethane	<0.20		0.20	ppb(V)		18-APR-13	R2580629
1,2-Dichloropropane	<0.92		0.92	ug/m3		18-APR-13	R2580629
1,2-Dichloropropane	<0.20		0.20	ppb(V)		18-APR-13	R2580629
1,3,5-Trimethylbenzene	<0.98		0.98	ug/m3		18-APR-13	R2580629
1,3,5-Trimethylbenzene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
1,3-Butadiene	<0.44		0.44	ug/m3		18-APR-13	R2580629
1,3-Butadiene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
1,3-Dichlorobenzene	<1.2		1.2	ug/m3		18-APR-13	R2580629
1,3-Dichlorobenzene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
1,4-Dichlorobenzene	1.6		1.2	ug/m3		18-APR-13	R2580629
1,4-Dichlorobenzene	0.26		0.20	ppb(V)		18-APR-13	R2580629
1,4-Dioxane	<0.72		0.72	ug/m3		18-APR-13	R2580629
1,4-Dioxane	<0.20		0.20	ppb(V)		18-APR-13	R2580629
2-Hexanone	<4.1		4.1	ug/m3		18-APR-13	R2580629
2-Hexanone	<1.0		1.0	ppb(V)		18-APR-13	R2580629
4-Ethyltoluene	<0.98		0.98	ug/m3		18-APR-13	R2580629
4-Ethyltoluene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Acetone	13.4		5.9	ug/m3		18-APR-13	R2580629
Acetone	5.7		2.5	ppb(V)		18-APR-13	R2580629
Allyl chloride	<0.63		0.63	ug/m3		18-APR-13	R2580629
Allyl chloride	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Benzene	<0.64		0.64	ug/m3		18-APR-13	R2580629
Benzene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Benzyl chloride	<1.0		1.0	ug/m3		18-APR-13	R2580629
Benzyl chloride	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Bromodichloromethane	<1.3		1.3	ug/m3		18-APR-13	R2580629
Bromodichloromethane	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Bromoform	<2.1		2.1	ug/m3		18-APR-13	R2580629
Bromoform	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Bromomethane	<0.78		0.78	ug/m3		18-APR-13	R2580629
Bromomethane	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Carbon Disulfide	<0.62		0.62	ug/m3		18-APR-13	R2580629
Carbon Disulfide	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Carbon Tetrachloride	<1.3		1.3	ug/m3		18-APR-13	R2580629
Carbon Tetrachloride	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Chlorobenzene	<0.92		0.92	ug/m3		18-APR-13	R2580629
Chlorobenzene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Chloroethane	<0.53		0.53	ug/m3		18-APR-13	R2580629
Chloroethane	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Chloroform	<0.98		0.98	ug/m3		18-APR-13	R2580629
Chloroform	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Chloromethane	1.20		0.41	ug/m3		18-APR-13	R2580629
Chloromethane	0.58		0.20	ppb(V)		18-APR-13	R2580629
cis-1,2-Dichloroethene	<0.79		0.79	ug/m3		18-APR-13	R2580629
cis-1,2-Dichloroethene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
cis-1,3-Dichloropropene	<0.91		0.91	ug/m3		18-APR-13	R2580629
cis-1,3-Dichloropropene	<0.20		0.20	ppb(V)		18-APR-13	R2580629

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1288592-2 INSIDE 060000-0086 CS1200-0061							
Sampled By: CLIENT on 10-APR-13 @ 01:26							
Matrix: Air							
Canister EPA TO-15							
Cyclohexane	<0.69		0.69	ug/m3		18-APR-13	R2580629
Cyclohexane	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Dibromochloromethane	<1.7		1.7	ug/m3		18-APR-13	R2580629
Dibromochloromethane	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Dichlorodifluoromethane	2.08		0.99	ug/m3		18-APR-13	R2580629
Dichlorodifluoromethane	0.42		0.20	ppb(V)		18-APR-13	R2580629
Ethyl acetate	<0.72		0.72	ug/m3		18-APR-13	R2580629
Ethyl acetate	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Ethyl benzene	<0.87		0.87	ug/m3		18-APR-13	R2580629
Ethyl benzene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Freon 113	<1.5		1.5	ug/m3		18-APR-13	R2580629
Freon 113	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Freon 114	<1.4		1.4	ug/m3		18-APR-13	R2580629
Freon 114	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Hexachlorobutadiene	<2.1		2.1	ug/m3		18-APR-13	R2580629
Hexachlorobutadiene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Isooctane	<0.93		0.93	ug/m3		18-APR-13	R2580629
Isooctane	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Isopropyl alcohol	10.1		2.5	ug/m3		18-APR-13	R2580629
Isopropyl alcohol	4.1		1.0	ppb(V)		18-APR-13	R2580629
m&p-Xylene	<1.7		1.7	ug/m3		18-APR-13	R2580629
m&p-Xylene	<0.40		0.40	ppb(V)		18-APR-13	R2580629
Methyl ethyl ketone	<0.59		0.59	ug/m3		18-APR-13	R2580629
Methyl ethyl ketone	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Methyl isobutyl ketone	<0.82		0.82	ug/m3		18-APR-13	R2580629
Methyl isobutyl ketone	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Methylene chloride	<0.69		0.69	ug/m3		22-APR-13	R2580629
Methylene chloride	<0.20		0.20	ppb(V)		22-APR-13	R2580629
MTBE	<0.72		0.72	ug/m3		18-APR-13	R2580629
MTBE	<0.20		0.20	ppb(V)		18-APR-13	R2580629
n-Heptane	<0.82		0.82	ug/m3		18-APR-13	R2580629
n-Heptane	<0.20		0.20	ppb(V)		18-APR-13	R2580629
n-Hexane	<0.70		0.70	ug/m3		18-APR-13	R2580629
n-Hexane	<0.20		0.20	ppb(V)		18-APR-13	R2580629
o-Xylene	<0.87		0.87	ug/m3		18-APR-13	R2580629
o-Xylene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Propylene	<0.34		0.34	ug/m3		18-APR-13	R2580629
Propylene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Styrene	<0.85		0.85	ug/m3		18-APR-13	R2580629
Styrene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Tetrachloroethylene	<1.4		1.4	ug/m3		18-APR-13	R2580629
Tetrachloroethylene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Tetrahydrofuran	<0.59		0.59	ug/m3		18-APR-13	R2580629
Tetrahydrofuran	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Toluene	<0.75		0.75	ug/m3		18-APR-13	R2580629
Toluene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
trans-1,2-Dichloroethene	<0.79		0.79	ug/m3		18-APR-13	R2580629
trans-1,2-Dichloroethene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
trans-1,3-Dichloropropene	<0.91		0.91	ug/m3		18-APR-13	R2580629
trans-1,3-Dichloropropene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Trichloroethylene	<1.1		1.1	ug/m3		18-APR-13	R2580629

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1288592-2 INSIDE 060000-0086 CS1200-0061							
Sampled By: CLIENT on 10-APR-13 @ 01:26							
Matrix: Air							
Canister EPA TO-15							
Trichloroethylene	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Trichlorofluoromethane	1.2		1.1	ug/m3		18-APR-13	R2580629
Trichlorofluoromethane	0.22		0.20	ppb(V)		18-APR-13	R2580629
Vinyl acetate	<1.8		1.8	ug/m3		18-APR-13	R2580629
Vinyl acetate	<0.50		0.50	ppb(V)		18-APR-13	R2580629
Vinyl bromide	<0.87		0.87	ug/m3		18-APR-13	R2580629
Vinyl bromide	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Vinyl chloride	<0.51		0.51	ug/m3		18-APR-13	R2580629
Vinyl chloride	<0.20		0.20	ppb(V)		18-APR-13	R2580629
Surrogate: 4-Bromofluorobenzene	108.5		50-150	%		18-APR-13	R2580629
Canister Information							
Pressure on Receipt	-7.1		-30	in Hg	15-APR-13	15-APR-13	R2578530
Canister ID	06000-0086				15-APR-13	15-APR-13	R2578530
Regulator ID	CS1200-0061				15-APR-13	15-APR-13	R2578530
Batch Proof ID	B130211.107				15-APR-13	15-APR-13	R2578530