Letter Health Consultation

Evaluation of Exposures Related to Soil Vapor Intrusion Mitigation Verification — December 2009

SOUTHSIDE HIGH SCHOOL
ELMIRA, CHEMUNG COUNTY, NEW YORK

EPA FACILITY ID: NYD987025921

Prepared by
State of New York Department of Health

MARCH 4, 2010

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

You May Contact ATSDR TOLL FREE at
1-800-CDC-INFO
or
Visit our Home Page at: http://www.atsdr.cdc.gov

LETTER HEALTH CONSULTATION

Evaluation of Exposures Related to Soil Vapor Intrusion Mitigation Verification — December 2009

SOUTHSIDE HIGH SCHOOL

ELMIRA, CHEMUNG COUNTY, NEW YORK

EPA FACILITY ID: NYD987025921

Prepared By:

State of New York
Department of Health
Under a cooperative agreement with the
Agency for Toxic Substances and Disease Registry

STATE OF NEW YORK
INTERDEPARTMENTAL MEMORANDUM

DATE: March 3, 2010

TO: Mr. Carl Thurnau, Facilities Planning Coordinator
New York State Education Department

FROM: Ms. Krista M. Anders, Public Health Specialist Krista M. Anders
New York State Department of Health

RE: NYSDOH's Assessment of Air Results
Southside High School, Elmira, Chemung County, New York

Between January 28 and February 9, 2010, the New York State Department of Health's (NYS DOH's) Bureau of Environmental Exposure Investigation received a validated air data package from the Elmira City School District's consultant, Sterling Environmental Engineering, P.C. (Sterling), for the above-referenced property. The air samples were collected in December of 2009 to verify that mitigation actions currently being implemented at the school are continuing to be effective. These actions are intended to ensure that contaminants beneath the school are not being drawn into the building and affecting the indoor air quality. The NYS DOH, under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), has completed our evaluation of the data in the context of prior air sampling completed at the school. The NYS DOH and ATSDR's goal is to make sure the New York State Education Department (NYS ED) has the information the NYS ED, Elmira City School District and Southside High School community need to understand the health effects associated with the chemicals found in the indoor air of the high school and what additional actions, if any, we recommend to reduce human exposures. The following is a summary of our assessment.

BACKGROUND

Sterling collected the samples in accordance with the Elmira City School District's indoor air quality action plan, which the district developed in response to the NYS DOH's and ATSDR's recommendations presented in the *Health Consultation for Southside High School* (ATSDR 2003). In 1995, fuel oil contamination was discovered in nearby Miller Pond, which is east of Southside High School. Environmental investigations completed by the New York State Department of Environmental Conservation (NYS DEC) found that the petroleum contamination extends from beneath the school, at an approximate depth of 15 feet below ground, toward Miller Pond. During their investigations, the NYS DEC also discovered the presence of numerous contaminants, including chlorinated solvents, associated with prior industrial activities. As discussed in the health consultation, the NYS DEC and NYS DOH completed several indoor air investigations at the school in 1997 and 2000 to evaluate whether the subsurface environmental contaminants were affecting the indoor air quality due to soil vapor intrusion.

These previous air investigations identified several compounds in the indoor air at concentrations slightly higher than typical background—most likely due to indoor sources or activities, or due to their presence in the outdoor air that enters the school building. As discussed in the health consultation, their presence was not unusual and exposure at the reported levels was not expected to be a health concern. Relatively elevated concentrations of Freons and chlorinated solvents were found in the air beneath the building's slab (referred to as the sub-slab air). However, sampling demonstrated that human exposure to the contaminants was being minimized due to the operation of the building's heating, ventilating, and air-conditioning system. The system is operated in a manner intended to

minimize the potential for contaminants that are present beneath the building from being drawn into the building and affecting the indoor air quality (i.e., it is operated in a positive pressure mode).

The results of the NYS DEC and NYS DOH's sampling events in 1997 and 2000 did not show an indoor air contamination problem at the school. Overall, the results of Sterling's air sampling this past December are consistent with these previous findings.

STERLING's DECEMBER 2009 AIR SAMPLING

On December 17 and 18, 2009, Sterling collected 24 air samples at the school: 8 indoor air, 14 sub-slab air, and 2 outdoor air (duplicates from the same location). Samples were collected over a 24-hour time period. During this time period, the building's heating, ventilating, and air-conditioning system was operating in a positive pressure mode during times of occupancy (approximately 10 hours). Centek Laboratories, LLC, analyzed the air samples for a range of volatile organic compounds by using US EPA Method TO-15. The sampling locations, methods and analytical procedures are comparable to those implemented by the agencies during previous sampling events. Additional details regarding this sampling event can be found in the Elmira City School District's Indoor Air Quality Action Plan, which is included in the Environmental Management Plan for the school (Sterling 2009).

The results for all of the air samples are given in Tables 1 (indoor air), 2 (sub-slab air) and 3 (outdoor air). The sample locations and results for volatile organic compounds specifically identified in our exposure assessment are provided in Figure 1.

NYS DOH's EXPOSURE ASSESSMENT

Indoor Air

- As expected, volatile organic compounds were found in the air samples collected from inside the school. Based on a review of studies conducted to evaluate background levels of volatile chemicals in indoor air, most of the compounds present in the indoor air of the school are at concentrations consistent with levels usually found in the indoor air of buildings not affected by environmental contamination and do not represent a concern.
- Several compounds were detected at levels above those commonly found in indoor air (Table 4), but below applicable public health comparison values (Table 5):

  (a) Freon-12 and Freon-113, throughout the school: These compounds are typically used as refrigerants and as cleaning solvents. Their presence may be related to their use at the school, their presence in the outdoor air that enters the school, or due to soil vapor intrusion.

  (b) Chloroform, in the gym and the pool filter room: This compound is a known chlorination by-product and may be related to the swimming pool.

  (c) 1,1-Dichloroethene, throughout the school: This compound is most likely associated with its presence in the outdoor air that enters the school.

  (d) Trichloroethene, in Room-127: The concentration detected (2.4 micrograms per cubic meter) was higher than typical background levels, but lower than the NYS DOH's guideline of 5 micrograms per cubic meter. Its presence may be due to soil vapor intrusion.

  Overall, health effects from exposure to these compounds at the concentrations detected are unlikely (i.e., the health risks are minimal).

Sub-slab Air

- Similar to previous sampling events, chlorinated solvents and Freons were found at relatively elevated levels in the air beneath the school. In particular, elevated concentrations of one or more compounds were found beneath a portion of the gym, the pool filter room, and Room-127. No one is coming into direct contact with this air.

Outdoor Air

- Based on a review of studies conducted to evaluate background levels of volatile chemicals in outdoor air, the concentrations of most of the volatile organic compounds detected in the outdoor air sample are consistent with typical outdoor air background levels and do not represent a concern. Two compounds, 1,1-dichloroethene and Freon-12, were present at levels above those commonly found in outdoor air (Table 6), but below applicable public health comparison values (Table 5). Health effects from exposure to the concentrations detected are unlikely (i.e., the health risks are minimal).

NYS DOH's CONCLUSIONS AND RECOMMENDATIONS

Overall, the NYS DOH and ATSDR conclude that breathing volatile organic compounds at the levels found in the indoor air at the Southside High is not expected to harm people's health. Consistent with previous investigations, the recent indoor air testing results do not show a problem with chemical contamination in the school's air. However, given the concentrations of Freons and chlorinated solvents found beneath the building, we recommend that

- the school's heating, ventilating and air-conditioning system continue to be operated in a manner to prevent sub-slab air from being drawn into the building (particularly at times when the school is occupied);
- routine monitoring (e.g., of the pressure differentials between the sub-slab and building interior) be continued to verify that this mitigation measure continues to be effective;
- additional sampling be completed to evaluate the indoor air quality and the pressure differentials between the inside and outside of the building in the area of Room-127. The samples should be collected during periods when the school's heating, ventilating and air-conditioning system is operating in a positive pressure mode to obtain a more representative sample of the exposure scenario; and
- if necessary, adjustments be made to the school's heating, ventilating and air-conditioning system in the area of Room-127 to reduce the concentration of trichloroethene in the indoor air to within background ranges.

We also recommend that reasonable and practical actions be taken to reduce exposures to those compounds that are present in the indoor air at levels above background and are used or stored within the building.

We understand that the district is planning to do some work on the floor and/or concrete slab in the gym before the next school year begins. Given the levels of volatile organic compounds found beneath the slab, they may want to consider installing a sub-slab depressurization system in this portion of the building. If the building's slab is to be breached during these activities, then we recommend that an indoor air-monitoring program be implemented to address the potential for exposure to volatile organic compounds and, if possible, that the intrusive activities be completed when the building is unoccupied.

CONTACT INFORMATION

If you have any questions regarding this assessment or the recommendations contained herein, please feel free to contact me at 518-402-7860 or as follows:

via email: BEEI@health.state.ny.us [RE: Southside High School Air Results]

via mail: Krista M. Anders, Ph.D.
Public Health Specialist
Bureau of Environmental Exposure Investigation
New York State Department of Health
547 River Street, Troy, NY 12180

ADDITIONAL INFORMATION

- For information on what we mean when using the term "exposure," please see the NYS DOH's fact sheet titled *What is Exposure?* (enclosed). This fact sheet is also available on the NYS DOH's website at http://www.nyhealth.gov/environmental/about/exposure.htm.

- Please see the NYS DOH's fact sheet titled *Soil Vapor Intrusion: Frequently Asked Questions* (enclosed) for additional information on the process referred to as "soil vapor intrusion." This fact sheet is also available on the NYS DOH's website at http://www.nyhealth.gov/environmental/indoors/vapor_intrusion/fact_sheets/.

- Please see the NYS DOH's fact sheet titled *Trichloroethene (TCE) in Indoor and Outdoor Air* (enclosed) for additional information on trichloroethene and the NYS DOH's guideline of 5 micrograms per cubic meter for trichloroethene in air. This fact sheet is also available on the NYS DOH's website at http://www.nyhealth.gov/environmental/investigations/soil_gas/svi_guidance/fs_tce.htm.

REFERENCES

- ATSDR (Agency for Toxic Substance and Disease Registry). 2003. Health Consultation for Southside High School, Elmira, Chemung County, New York. U.S. September 30, 2003. Prepared by the New York State Department of Health under a cooperative agreement with the Agency for Toxic Substance and Disease Registry.

- Sterling Environmental Engineering, P.C. 2009. Elmira City School District, Southside High School, Elmira, New York: Environmental Management Plan. June 19, 2009. Prepared for the Elmira City School District.

Enclosures

ec: A. Salame-Alfie / G. Litwin / D. Miles / G. Laccetti / FILE
D. Luttinger / T. Johnson
B. Putzig / T. Schneider — NYSDEC, Region 8
L. Graziano — ATSDR, NY
G. Ulirsch — ATSDR, GA
T. Kump — Chemung County Health Department

Table 1. Indoor Air Results (micrograms per cubic meter, mcg/m^3)

Southside High School, Elmira, NY — December 16-17, 2009

Volatile Organic Compound	IA-GYM Gymnasium	IA-PF Pool Filter Room	IA-DUP [5] Duplicate of Pool Filter Room	IA-151A Room 151A	IA-127 Room 127	IA-138 Room 138	IA-CAF Cafeteria	IA-LIB Library
Chloroform	28	55	65	1.8	0.94	4.2	0.69 J	0.94
Freon 12 (Dichlorodifluoromethane)	4.2	27 JDV	3.3 JDV	25	12	6.0 J	25	9.6
Freon 113 (Trichlorotrifluoroethane)	16	97 JDV	66 JDV	9.0	4.8	6.6	7.2	7.3
1,1-Dichloroethene	< 0.60	1.1	< 0.60	1.0	0.69	0.60	0.97	1.0
1,1,1-Trichloroethane	2.4	< 0.83	< 0.83	< 0.83	< 0.83	< 0.83	< 0.83	< 0.83
Trichloroethene	0.22	1.4 JDV	1.0 JDV	0.44	2.4	0.27	0.33	0.49
1,1,2,2-Tetrachloroethane	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	< 0.83	< 0.83	< 0.83	< 0.83	< 0.83	< 0.83	< 0.83	< 0.83
1,1-Dichloroethane	< 0.62	0.49 J	< 0.62	0.49 J	< 0.62	< 0.62	0.49 J	0.41 J
1,2,4-Trichlorobenzene	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1
1,2,4-Trimethylbenzene	< 0.75	1.8 JDV	1.1 JDV	< 0.75	< 0.75	1.0	0.55 J	< 0.75
1,2-Dibromoethane	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
1,2-Dichlorobenzene	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92
1,2-Dichloroethane	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62	< 0.62
1,2-Dichloropropane	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70
1,3,5-Trimethylbenzene	< 0.75	< 0.75	< 0.75	< 0.75	< 0.75	< 0.75	< 0.75	< 0.75
1,3-Butadiene	< 0.34	< 0.34	< 0.34	< 0.34	< 0.34	< 0.34	< 0.34	< 0.34
1,3-Dichlorobenzene	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92
1,4-Dichlorobenzene	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92
1,4-Dioxane	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1
2,2,4-Trimethylpentane	< 0.71	< 0.71	< 0.71	< 0.71	< 0.71	< 0.71	< 0.71	< 0.71
4-Ethyltoluene	< 0.75	< 0.75	< 0.75	< 0.75	< 0.75	< 0.75	< 0.75	< 0.75
Acetone	17	37	37	18	14	23	17	16
Allyl Chloride	< 0.48	< 0.48	< 0.48	< 0.48	< 0.48	< 0.48	< 0.48	< 0.48
Benzene	0.42 J	0.58	0.45 J	0.52	0.42 J	0.65	0.49	0.42 J
Benzyl Chloride	< 0.88	< 0.88	< 0.88	< 0.88	< 0.88	< 0.88	< 0.88	< 0.88
Bromodichloromethane	< 1.0	1.0	0.9 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Bromomethane	< 0.59	< 0.59	< 0.59	< 0.59	< 0.59	< 0.59	< 0.59	< 0.59
Carbon Disulfide	< 0.47	0.32 J	< 0.47	< 0.47	< 0.47	0.95	< 0.47	< 0.47
Carbon Tetrachloride	0.32	0.45	0.38	0.38	0.32	0.38	0.38	0.38
Chlorobenzene	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70
Chloroethane	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40
Chloromethane	0.63	0.61	0.69	0.61	0.55	0.5	0.8	0.67
cis-1,2-Dichloroethene	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60
cis-1,3-Dichloropropene	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69
Cyclohexane	< 0.52	< 0.52	< 0.52	< 0.52	< 0.52	1.5	< 0.52	< 0.52
Dibromochloromethane	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3
Ethanol	3.5 JN	3.7 JN	3.2 JN	7.1 JN	7.9 JN	12 JN	6.5 JN	13 JN
Ethyl Acetate	< 0.92	< 0.92	0.77 J	< 0.92	2.1	< 0.92	3.0	< 0.92
Ethylbenzene	< 0.66	< 0.66	< 0.66	< 0.66	< 0.66	< 0.66	< 0.66	< 0.66
Freon 11 (Trichlorofluoromethane)	0.80 J	1.4	1.1	2.5	0.91	2.0	2.5	1.0
Freon 114 (1,2-Dichlorotetrafluoroethane)	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1
Heptane	< 0.62	< 0.62	< 0.62	0.67	6.4	0.79	< 0.62	0.87
Hexachloro-1,3-Butadiene	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Hexane	< 0.54	< 0.54	< 0.54	< 0.54	< 0.54	0.79	< 0.54	0.97
Isopropyl Alcohol	3.6	5.0	5.2	10	11	< 0.37	4.3	24
m&p-Xylene	< 1.3	0.88 J	0.66 J,JDV	0.79 J	< 1.3	1.0 J	< 1.3	< 1.3
Methyl Butyl Ketone	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Methyl Ethyl Ketone	1.0	1.4	1.4	0.57 J	0.51 J	0.84 J	0.36 J	0.78 J
Methyl Isobutyl Ketone	1.0 J	< 1.2	< 1.2	< 1.2	< 1.2	1.3	< 1.2	1.1 J
Methyl tert-Butyl Ether	< 0.55	< 0.55	< 0.55	< 0.55	< 0.55	< 0.55	< 0.55	< 0.55
Methylene Chloride	< 0.53	< 0.53	< 0.53	< 0.53	< 0.53	< 0.53	< 0.53	< 0.53
o-Xylene	< 0.66	< 0.66	< 0.66	< 0.66	< 0.66	< 0.66	< 0.66	< 0.66
Propylene	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26
Styrene	< 0.65	< 0.65	< 0.65	< 0.65	< 0.65	< 0.65	< 0.65	< 0.65
tert-Butyl Alcohol	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	< 1.0	0.69 J	< 1.0	0.76 J	< 1.0	< 1.0	< 1.0	< 1.0
Tetrahydrofuran	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45
Toluene	2.3	9.2 J	8.8	2.1	6.6	4.6	1.0	1.3
trans-1,2-Dichloroethene	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60
trans-1,3-Dichloropropene	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69
Vinyl Acetate	< 0.54	< 0.54	< 0.54	< 0.54	< 0.54	< 0.54	< 0.54	< 0.54
Vinyl Bromide	< 0.67	< 0.67	< 0.67	< 0.67	< 0.67	< 0.67	< 0.67	< 0.67
Vinyl Chloride	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

NOTES:

Indoor air sample locations are illustrated in Figure 1.

< The parameter is not detected at the laboratory detection limit shown.

ND Not detected in tentatively identified compounds.

LABORATORY/DATA VALIDATION QUALIFIERS:

J Analyte detected at or below quantitation limits.

JN Non-routine analyte. Quantitation estimated.

JDV Value is estimated as a result of Data Validation.

Table 2. Sub-slab Vapor Results (micrograms per cubic meter, mcg/m^3)

Southside High School, Elmira, NY — December 16-17, 2009

Volatile Organic Compound	SV-WM Room 159	SV-GYM EAST East Side of Gymnasium	SV-GYM WEST West Side of Gymnasium	SV-GS Gymnasium Storage Room	SV-PF Pool Filter Room	SV-WS Room 139C	SV-DUP [5] Duplicate of Room 139C	SV-GL Hallway Outside of Gymnasium	SV-NR Room 146	SV-151A Room 151A	SV-127 Room 127	SV-HALL 113 Hallway Behind Room 113B	SV-LIB Library	SV-BR Boiler Room
Chloroform	18	79	32	27	1,100	4	4.1	5.3	4.7	5	7.9	4.8	15	1.9
Freon 12 (Dichlorodifluoromethane)	65	3,600	4.7	4.5	110	420	460	48	270	360	1,800	87	980	33
Freon 113 (Trichlorotrifluoroethane)	4.8	1,100	39	36	660	3.5 JDV	6.2 JDV	6.6	17	33	< 1.2	3	1.6	3.1
1,1-Dichloroethene	< 0.6	240	< 0.6	< 0.6	1.2	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
1,1,1-Trichloroethane	0.83 JDV	23,000	1.7	1.2	16	< 0.83	< 0.83	< 0.83	5.7 JDV	1.7	1.6 JDV	3.4 JDV	1.7 JDV	5
Trichloroethene	3.1 JDV	28	0.6 J	< 0.82	460	< 0.82	< 0.82	0.71 J	1.2 JDV	4.2	2,100	< 0.82	< 0.82	97
1,1,2,2-Tetrachloroethane	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	< 0.83	< 0.83	< 0.83	< 0.83	< 0.83	< 0.83	< 0.83	< 0.83	< 0.83	< 0.83	< 0.83	< 0.83	< 0.83	< 0.83
1,1-Dichloroethane	3.9	85	< 0.62	< 0.62	1.7	0.62	0.70	< 0.62	1.1	1.7	1.3	2.1	< 0.62	< 0.62
1,2,4-Trichlorobenzene	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1
1,2,4-Trimethylbenzene	1.6 JDV	2.4 JDV	1.2	0.60 J	4.1 JDV	2.2 JDV	2.3 JDV	0.75	5.3 JDV	4.5 JDV	4.2 JDV	4.6 JDV	2.5 JDV	3.7 JDV
1,2-Dibromoethane	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
1,2-Dichlorobenzene	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92
1,2-Dichloroethane	0.53 J	< 0.62	< 0.62	< 0.62	0.62	< 0.62	< 0.62	< 0.62	< 0.62	0.62	0.45 J	0.95	< 0.62	< 0.62
1,2-Dichloropropane	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70
1,3,5-Trimethylbenzene	< 0.75	0.65 J,JDV	< 0.75	< 0.75	1.4 JDV	0.65 J,JDV	0.65 J,JDV	< 0.75	1.2 JDV	1.1 JDV	0.85 JDV	1.1 JDV	< 0.75	0.85 JDV
1,3-Butadiene	< 0.34	< 0.34	< 0.34	< 0.34	< 0.34	< 0.34	< 0.34	< 0.34	< 0.34	< 0.34	< 0.34	< 0.34	< 0.34	< 0.34
1,3-Dichlorobenzene	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92
1,4-Dichlorobenzene	< 0.92	1.2	< 0.92	< 0.92	0.67 J,JDV	< 0.92	< 0.92	< 0.92	1.1 JDV	< 0.92	< 0.92	< 0.92	< 0.92	0.67 J,JDV
1,4-Dioxane	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1
2,2,4-Trimethylpentane	0.66 J,JDV	0.95 JDV	< 0.71	< 0.71	< 0.71	< 0.71	< 0.71	< 0.71	< 0.71	1.0 JDV	0.57 J,JDV	1.6 JDV	0.90 JDV	< 0.71
4-Ethyltoluene	< 0.75	0.60 J,JDV	< 0.75	< 0.75	1.4 JDV	0.70 J,JDV	0.80	< 0.75	1.3 JDV	1.2 JDV	1.0 JDV	0.95 JDV	< 0.75	0.95 JDV
Acetone	77	190	11	22	51	190	190	25	47	49	130	110	120	27
Allyl Chloride	< 0.48	< 0.48	< 0.48	< 0.48	< 0.48	< 0.48	< 0.48	< 0.48	< 0.48	< 0.48	< 0.48	< 0.48	< 0.48	< 0.48
Benzene	1.9 JDV	17	0.36 J	0.42 J	1.4	0.58 JDV	0.75	1.8	1.2 JDV	1.7	1.4 JDV	30	1.8 JDV	0.81
Benzyl Chloride	< 0.88	< 0.88	< 0.88	< 0.88	< 0.88	< 0.88	< 0.88	< 0.88	< 0.88	< 0.88	< 0.88	< 0.88	< 0.88	< 0.88
Bromodichloromethane	2.7 JDV	11	< 1.0	< 1.0	12	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Bromomethane	< 0.59	< 0.59	< 0.59	< 0.59	< 0.59	< 0.59	< 0.59	< 0.59	< 0.59	< 0.59	< 0.59	< 0.59	< 0.59	< 0.59
Carbon Disulfide	13	15	0.76	< 0.47	3.5	2.7	2.3	1.2	3.6	3.4	1.2	2.3	3.9	0.92
Carbon Tetrachloride	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96	< 0.96
Chlorobenzene	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70	< 0.70
Chloroethane	9.7	3.0	< 0.40	< 0.40	2.2	0.86	0.91	< 0.40	2.1	2.5	2.4	2.8	< 0.40	< 0.40
Chloromethane	0.27 J	< 0.31	0.69	1.0	< 0.31	< 0.31	< 0.31	0.69	< 0.31	< 0.31	< 0.31	< 0.31	< 0.31	< 0.31
cis-1,2-Dichloroethene	< 0.60	< 0.60	< 0.60	< 0.60	3.2	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	300	< 0.60	< 0.60	< 0.60
cis-1,3-Dichloropropene	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69
Cyclohexane	< 0.52	< 0.52	< 0.52	< 0.52	2.6	< 0.52	< 0.52	< 0.52	< 0.52	2.9	< 0.52	< 0.52	< 0.52	< 0.52
Dibromochloromethane	< 1.3	2.0	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3	< 1.3
Ethanol	ND	ND	ND	3 JN	ND	8.3 JN	7.2 JN	2.7 JN	ND	ND	ND	ND	8.8 JN	ND
Ethyl Acetate	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	< 0.92	1.7	< 0.92	< 0.92	< 0.92	11	< 0.92	< 0.92
Ethylbenzene	1.5 JDV	3.4 JDV	< 0.66	0.53 J	0.97 JDV	1.6 JDV	1.9 JDV	1.7	2.8 JDV	2.9 JDV	2.6 JDV	3.3 JDV	1.3 JDV	2.0 JDV
Freon 11 (Trichlorofluoromethane)	0.69 J	21	0.86	1.5	3.8	1.3	1.3	0.86	34	1.9	0.86	1.3	1.0	4.2
Freon 114 (1,2-Dichlorotetrafluoroethane)	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1
Heptane	25	50	< 0.62	< 0.62	5.3	2.9	3.2	0.67	9.3	6.3	3.9	6.6	7.1	4.0
Hexachloro-1,3-Butadiene	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Hexane	54	65	< 0.54	< 0.54	6.8	< 0.54	< 0.54	< 0.54	8.1	7.1	< 0.54	< 0.54	22	< 0.54
Isopropyl Alcohol	< 0.37	< 0.37	2.8	2.2	3.2	< 0.37	9.5	3.1	< 0.37	< 0.37	< 0.37	< 0.37	< 0.37	2.9
m&p-Xylene	4.1 JDV	6.8 JDV	0.88 J	1.7	2.1 JDV	4 JDV	4.9 JDV	0.62 J	9.5 JDV	9.2 JDV	7.6 JDV	9.9 JDV	3.7 JDV	6.6 JDV
Methyl Butyl Ketone	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	3.0 JDV	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Methyl Ethyl Ketone	19	< 0.90	0.84 J	0.90	3.2	3.2	3.5	13	9.0	6.6 J	5.5	210	6.4	3.1
Methyl Isobutyl Ketone	7.2 JDV	7.0 JDV	0.92 J	2.2	< 1.2	0.54 J,JDV	0.58 J,JDV	< 1.2	< 1.2	1.3 JDV	1.8 JDV	1.4 JDV	2.0 JDV	0.71 J,JDV
Methyl tert-Butyl Ether	< 0.55	< 0.55	< 0.55	< 0.55	< 0.55	< 0.55	< 0.55	< 0.55	< 0.55	< 0.55	< 0.55	< 0.55	< 0.55	< 0.55
Methylene Chloride	0.88	< 0.53	< 0.53	< 0.53	3.4	< 0.53	< 0.53	1.5	< 0.53	0.42 J	0.46 J	1.9	0.42 J	< 0.53
o-Xylene	1.1 JDV	2.0 JDV	0.49 J	0.62 J	0.88 JDV	1.5 JDV	1.8 JDV	0.66	2.6 JDV	2.8 JDV	2.5 JDV	2.7 JDV	1.0 JDV	2.2 JDV
Propylene	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26	< 0.26
Styrene	< 0.65	2.3 JDV	< 0.65	< 0.65	1.0 JDV	< 0.65	< 0.65	16	1.9 JDV	1.2 JDV	1.3 JDV	0.87 JDV	0.43 J,JDV	1.1 JDV
tert-Butyl Alcohol	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	< 1.0	54 JDV	< 1.0	< 1.0	7.4 JDV	< 1.0	< 1.0	< 1.0	1.2 JDV	1.1 JDV	2.6 JDV	< 1.0	3.1 JDV	1.9 JDV
Tetrahydrofuran	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45	< 0.45
Toluene	16	39 JDV	1.7	5.8	7.1 JDV	37	31	2.9	21	31	29	45	14	19
trans-1,2-Dichloroethene	< 0.60	< 0.60	< 0.60	< 0.60	0.52 J	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	21 J	< 0.60	< 0.60	< 0.60
trans-1,3-Dichloropropene	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69	< 0.69
Vinyl Acetate	< 0.54	< 0.54	< 0.54	< 0.54	< 0.54	< 0.54	< 0.54	< 0.54	< 0.54	< 0.54	< 0.54	< 0.54	< 0.54	< 0.54
Vinyl Bromide	< 0.67	< 0.67	< 0.67	< 0.67	< 0.67	< 0.67	< 0.67	< 0.67	< 0.67	< 0.67	< 0.67	< 0.67	< 0.67	< 0.67
Vinyl Chloride	2.1	0.78	< 0.39	< 0.39	0.44	< 0.39	< 0.39	< 0.39	0.52	0.39	0.55	0.42	< 0.39	< 0.39

NOTES:

Indoor air sample locations are illustrated in Figure 1.

< The parameter is not detected at the laboratory detection limit shown.

ND Not detected in tentatively identified compounds.

LABORATORY/DATA VALIDATION QUALIFIERS:

J Analyte detected at or below quantitation limits.

JN Non-routine analyte. Quantitation estimated.

JDV Value is estimated as a result of Data Validation.

Table 3. Outoor Air Results (micrograms per cubic meter, mcg/m^3)

Southside High School, Elmira, NY — December 16-17, 2009

Volatile Organic Compound	OA-UR	OA-DUP [5]
	Roof, Upwind	Duplicate of Roof, Upwind
Chloroform	0.60 J	< 0.74
Freon 12 (Dichlorodifluoromethane)	5.5 J	9.0
Freon 113 (Trichlorotrifluoroethane)	6.3	5.5
1,1-Dichloroethene	0.81	0.73
1,1,1-Trichloroethane	< 0.83	< 0.83
Trichloroethene	< 0.22	< 0.22
1,1,2,2-Tetrachloroethane	< 1.0	< 1.0
1,1,2-Trichloroethane	< 0.83	< 0.83
1,1-Dichloroethane	< 0.62	< 0.62
1,2,4-Trichlorobenzene	< 1.1	< 1.1
1,2,4-Trimethylbenzene	< 0.75	< 0.75
1,2-Dibromoethane	< 1.2	< 1.2
1,2-Dichlorobenzene	< 0.92	< 0.92
1,2-Dichloroethane	< 0.62	< 0.62
1,2-Dichloropropane	< 0.70	< 0.70
1,3,5-Trimethylbenzene	< 0.75	< 0.75
1,3-Butadiene	< 0.34	< 0.34
1,3-Dichlorobenzene	< 0.92	< 0.92
1,4-Dichlorobenzene	< 0.92	< 0.92
1,4-Dioxane	< 1.1	< 1.1
2,2,4-Trimethylpentane	< 0.71	< 0.71
4-Ethyltoluene	< 0.75	< 0.75
Acetone	9.9	9.9
Allyl Chloride	< 0.48	< 0.48
Benzene	0.39 J	0.36 J
Benzyl Chloride	< 0.88	< 0.88
Bromodichloromethane	< 1.0	< 1.0
Bromoform	< 1.6	< 1.6
Bromomethane	< 0.59	< 0.59
Carbon Disulfide	< 0.47	< 0.47
Carbon Tetrachloride	< 0.26	< 0.26
Chlorobenzene	< 0.70	< 0.70
Chloroethane	< 0.40	< 0.40
Chloromethane	0.57	0.55
cis-1,2-Dichloroethene	< 0.60	< 0.60
cis-1,3-Dichloropropene	< 0.69	< 0.69
Cyclohexane	< 0.52	< 0.52
Dibromochloromethane	< 1.3	< 1.3
Ethanol	ND	ND
Ethyl Acetate	< 0.92	< 0.92
Ethylbenzene	< 0.66	< 0.66
Freon 11 (Trichlorofluoromethane)	1.7 JDV	0.91 JDV
Freon 114 (1,2-Dichlorotetrafluoroethane)	< 1.1	< 1.1
Heptane	< 0.62	< 0.62
Hexachloro-1,3-Butadiene	< 1.6	< 1.6
Hexane	< 0.54	< 0.54
Isopropyl Alcohol	< 0.37	< 0.37
m&p-Xylene	< 1.3	< 1.3
Methyl Butyl Ketone	< 1.2	< 1.2
Methyl Ethyl Ketone	< 0.90	< 0.90
Methyl Isobutyl Ketone	< 1.2	< 1.2
Methyl tert-Butyl Ether	< 0.55	< 0.55
Methylene Chloride	< 0.53	< 0.53
o-Xylene	< 0.66	< 0.66
Propylene	< 0.26	< 0.26
Styrene	< 0.65	< 0.65
tert-Butyl Alcohol	ND	ND
Tetrachloroethylene	< 1.0	< 1.0
Tetrahydrofuran	< 0.45	< 0.45
Toluene	0.50 J	< 0.57
trans-1,2-Dichloroethene	< 0.60	< 0.60
trans-1,3-Dichloropropene	< 0.69	< 0.69
Vinyl Acetate	< 0.54	< 0.54
Vinyl Bromide	< 0.67	< 0.67
Vinyl Chloride	< 0.10	< 0.10

NOTES:

Indoor air sample locations are illustrated in Figure 1.

< The parameter is not detected at the laboratory detection limit shown.

ND Not detected in tentatively identified compounds.

LABORATORY/DATA VALIDATION QUALIFIERS:

J Analyte detected at or below quantitation limits.

JN Non-routine analyte. Quantitation estimated.

JDV Value is estimated as a result of Data Validation.

Table 4. Summary of Indoor Air Results for Volatile Organic Compounds Found at Concentrations Above Typical Indoor Air Levels at the Southside High School

[All concentrations are reported in units of micrograms per cubic meter, mcg/m^3]

	LOCATION	Chloroform	Freon 12 (Dichlorodifluoromethane)	Freon 113 (Trichlorotrifluoroethane)	1,1-Dichloroethene	Trichloroethene
Southside High School	Gymnasium	28	4.2	16	< 0.60	0.2
	Pool Filter Room	55	27 JDV	97 JDV	1.1	1.4 JDV
	Duplicate of Pool Filter Room	65	3.3 JDV	66 JDV	< 0.60	1.0 JDV
	Room 151A	1.8	25	9.0	1.0	0.4
	Room 127	0.9	12	4.8	0.7	2.4
	Room 138	4.2	6.0 J	6.6	0.60	0.3
	Cafeteria	0.7 J	25	7.2	1.0	0.3
	Library	0.9	9.6	7.3	1.0	0.5
Typical Indoor Air Levels	NYS DOH Fuel Oil Study Database*					
	25th – 75th percentile	< 0.25 – 0.5	< 0.25 – 4.1	< 0.25 – 1.1	< 0.25 – < 0.25	< 0.25 - < 0.25
	95th percentile	4.6	26	3.4	0.7	0.8
	US EPA BASE Database**					
	25th – 75th percentile	< 0.4 - < 1.2	4.8 – 10.5	< 1.7 - < 3.0	< 0.9 - < 1.2	< 1.2 – 1.2
	95th percentile	1.4	32.9	9.4	< 1.4	6.5

*The New York State Department of Health (NYS DOH) database is a summary of indoor and outdoor air results from samples collected from control homes in New York State that heat with fuel oil. The NYS DOH conducted this study between 1997 and 2003.

**The United State Environmental Protection Agency (US EPA) database is a summary of indoor and outdoor air results from samples collected from 100 randomly selected public and commercial office buildings across the United States. The US EPA conducted this study from 1994 through 1996.

NOTES:

< = The parameter is not detected at the laboratory detection limit shown.

J = Analyte detected at or below quantitation limits.

JDV = Value is estimated as a result of Data Validation.

Additional information about the levels of volatile organic compounds that are often found in residential and non-residential buildings is available on the NYS DOH's website at http://www.nyhealth.gov/environmental/investigations/soil_gas/svi_guidance/ — in Section 3.2.4 of the first bulleted item titled "Guidance for Evaluating Soil Vapor Intrusion in New York State", as well as in the fourth bulleted item titled "Appendix C – Background VOCs."