STATE OF NEW YORK
DEPARTMENT OF HEALTH
Flanigan Square 547 River Street Troy, New York 12180-2216

Richard F. Daines, M.D.
Commissioner

Wendy E. Saunders
Chief of Staff

January 9, 2008

Dr. Richard March
Bethpage Union Free School District
Academic Building
10 Cherry Ave
Bethpage, NY 11714

Re: **Indoor Air Sampling Results**
Former Grumman Settling Ponds Site
Site # 130003A
Bethpage, Nassau County

Dear Dr. March:

On August 16th 2007, the New York State Department of Environmental Conservation (NYSDEC) and the New York State Departments of Health (NYSDOH) (collectively referred to as "the State") collected eight soil vapor samples at the Bethpage High School. This sampling is part of the State's on-going environmental investigation of tetrachloroethene (PCE), and trichloroethene (TCE) contamination associated with the Northrop-Grumman site. Five samples, (SV-01, SV-02, SV-03, SV-04 and SV-DUP01) were collected immediately adjacent to the school building with one of the five, (SV-DUP01) being a duplicate of sample SV-01. Three other samples, (SV-05, SV-06 and SV-07) were collected upgradient of the school building to determine what PCE or TCE contamination, if any, might be coming onto the school property. PCE and TCE were manufactured chemicals commonly used to remove grease from metals during the manufacturing processes at the Northrop-Grumman site. The goal of the soil vapor sampling is to determine whether actions are needed to address potential exposures to PCE and TCE. These compounds can move from contaminated groundwater into the indoor air of the high school through a process referred to as soil vapor intrusion (see enclosed fact sheet for additional information).

After reviewing the results of the soil vapor sampling (provided in Figure 1 and Table 3) near the school immediate actions are not needed to address the potential for exposures related to soil vapor intrusion into the high school. PCE and TCE were detected at low levels in soil vapor samples collected near the school and dichlorodifluoromethane (Freon 12) was detected in all of the soil vapor samples. The levels of Freon 12 detected around the school were lower in the shallow samples than in the deep sample. All of the upgradient samples had higher levels of Freon 12 and chlorodifluoromethane (Freon 22) than the downgradient samples. Freon 12 and Freon 22 are contaminants that have been detected on and off-site and investigations into the source of these contaminants are continuing.

Many other compounds were detected in the soil vapor samples. The majority of the additional contaminants were petroleum-based compounds such as trimethylbenzene, toluene, and xylene. Other non- petroleum-based compounds such as acetone, isopropanol, and propylene were also detected. Specific standards or guidance values have not been developed for soil vapor or subslab soil vapor data; however, the levels of contamination detected within the soil vapor are not likely to impact indoor air quality at the High School or pose a health concern.

I recommend additional sampling to confirm that soil vapor under the school is not a concern. Sampling should occur during the heating season, between December 15, 2007 and March 1, 2008. The NYSDEC has agreed to conduct this sampling and will be in contact to coordinate that sampling in the near future. This office would like to set up a conference call with you to discuss questions you may have concerning the upcoming sampling. As we discussed, the vapor intrusion testing is very sensitive and it is likely that some chemicals will be detected within the school's indoor air that may not be associated with the Northrop-Grumman site. Enclosed are copies of the Volatile Organic Compounds (VOCs) in Commonly Used Products and the Soil Vapor Intrusion fact sheets. These will explain in greater detail how commonly used products can contain chemicals that we are exposed to everyday and what the process of soil vapor intrusion is.

Northrop Grumman plans to implement an interim remedial measure, soil vapor extraction (SVE), to address the on-site soil and groundwater contamination. This system is expected to be in operation by December 2007. The results of these data will be evaluated to determine whether any further soil vapor sampling is needed.

If you have additional questions concerning this data, or if you have any site-related health questions, please contact me at 1-800-458-1158 (extension 27880). Thank you for allowing the State access to the school to evaluate the air quality. We appreciate your assistance in our environmental evaluation of the Northrop-Grumman site.

Sincerely,

Jacquelyn Nealon

Jacquelyn Nealon
Public Health Specialist III
Bureau of Environmental
Exposure Investigation

Enclosures

cc: G. Litwin/D. Miles/File
J. Swartwout – DEC Central Office
B. Weitzman – NCDOH
W. Parish – DEC Region 1
B. Devine – MARO
C. Thurnau - SED

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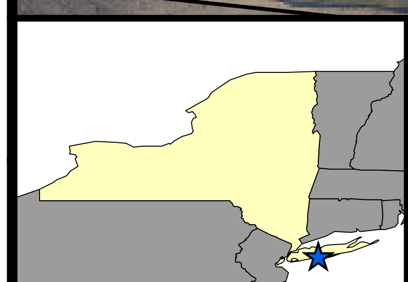

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Source: NYS GIS Clearing House

- Soil Vapor Sampling Point
- ug/m^3 Micrograms per cubic meter (ppbv)
- EJ Reported above the linear range and value is an estimate
- J Reported value is an estimate
- U Analyte detected below the method detection limit

FORMER GRUMMAN SETTLING PONDS (1-30-003A)
CONFIDENTIAL ISVI INVESTIGATION
SUMMARY REPORT
BETHPAGE, NEW YORK

FIGURE 3
Soil Vapor Sampling Locations

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
RSC	CJS	MS	RSC	AS SHOWN	DECEMBER 2007	14368.16	GIS/PROJECTS/ FIGURE3.MXD

1-30-003A-SV07	SV-07
	μg/m³
Acetone	22.5
Benzene	2.01
1,3-Butadiene	3.77 J
2-Butanone	3.96
Carbon disulfide	1.31
Chlorodifluoromethane	8,400 EJ
Chloroform	1.34 J
Chloromethane	0.355 J
3-Chloropropene	0.226 J
Dichlorodifluoromethane	320
Ethylbenzene	0.305 J
Freon-113	1.06 J
Freon-114	14.4
Heptane	1.98
n-Hexane	6.92 J
Isopropanol	1.95
Methylene chloride	2.23
Propylene	49.2 J
Tetrachloroethene	88.7
Toluene	5.66 J
1,1,1-Trichloroethane	3.75
Trichlorofluoromethane	19.7
1,2,4-Trimethylbenzene	0.436 J
2,2,4-Trimethylpentane	1.56 J
o-Xylene	0.907 J
p/m-Xylene	0.947 J

1-30-003A-SV05	SV-05
	μg/m³
Acetone	30.2
Benzene	2.78
1,3-Butadiene	4.76
2-Butanone	6.12
Carbon disulfide	1.14
Chlorodifluoromethane	13,900 EJ
Chloroform	1.8
Cyclohexane	0.419 J
Dichlorodifluoromethane	638
Ethylbenzene	0.453 J
4-Ethyltoluene	0.316 J
Freon-113	1.5 J
Freon-114	11.3
Heptane	3.05
n-Hexane	7.69
Isopropanol	0.769 J
Methylene chloride	1.91 J
Propylene	18.6
Tetrachloroethene	1.13 J
Toluene	2.85
1,1,1-Trichloroethane	0.702 J
Trichlorofluoromethane	10.8 J
1,3,5-Trimethybenzene	0.828 J
1,2,4-Trimethylbenzene	1.34 J
2,2,4-Trimethylpentane	0.739 J
o-Xylene	1.42 J
p/m-Xylene	1.8

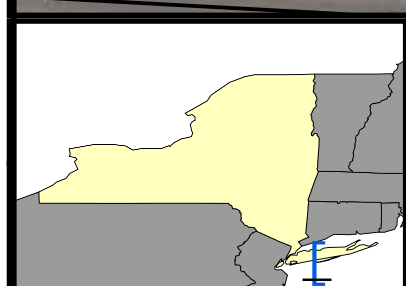
1-30-003A-SV04	SV-04
	μg/m³
Acetone	18.1
Benzene	2.09
1,3-Butadiene	1.8
2-Butanone	6.2
Carbon disulfide	0.947 J
Chlorodifluoromethane	814 EJ
Chloroform	0.857 J
Dichlorodifluoromethane	84.5
Ethylbenzene	0.754 J
n-Hexane	1.91
2-Hexanone	0.199 J
Isopropanol	1.65 J
Methylene chloride	2.58 J
Propylene	6.25
Tetrachloroethene	4.9
Toluene	5.93
1,1,1-Trichloroethane	2.43 J
Trichlorofluoromethane	8.63 J
p/m-Xylene	1.1 J

1-30-003A-SV02	SV-02
	μg/m³
Chloroform	1.61 J
Cyclohexane	2.61
Dichlorodifluoromethane	3.27
Ethylbenzene	18.6
4-Ethyltoluene	11.3
Heptane	17.1
n-Hexane	17.9
Isopropanol	2.87 J
Methyl tert butyl ether	9.66
Methylene chloride	2.55 J
Propylene	56.8
Tetrachloroethene	6.4
Toluene	116
Trichlorofluoromethane	7.55 J
1,3,5-Trimethybenzene	12.7
1,2,4-Trimethylbenzene	34.9
2,2,4-Trimethylpentane	24.8
o-Xylene	23.2
p/m-Xylene	67.9

1-30-003A-SV03	SV-03
	μg/m³
Chlorodifluoromethane	236
Chloroform	2.17
Cyclohexane	0.27 J
1,4-Dichlorobenzene	1.85 J
Dichlorodifluoromethane	526
Ethylbenzene	3.31
4-Ethyltoluene	3.81
Heptane	1.76
n-Hexane	3.79
2-Hexanone	0.224 J
Isopropanol	2.81 J
Methyl tert butyl ether	0.973 J
4-Methyl-2-pentanone	3.66
Methylene chloride	8.51 J
Propylene	21.7
Styrene	0.807 J
Tetrachloroethene	15.6
Tetrahydrofuran	3.59
Toluene	12.8
1,1,1-Trichloroethane	0.96 J
Trichloroethene	0.505 J
Trichlorofluoromethane	5.19 J
1,3,5-Trimethybenzene	2.86
1,2,4-Trimethylbenzene	17.4
2,2,4-Trimethylpentane	0.933 J
o-Xylene	5.48
p/m-Xylene	13.6

1-30-003A-SV06	SV-06
	μg/m³
Acetone	40.2
Benzene	1.59
1,3-Butadiene	1.32
2-Butanone	6.56
Carbon disulfide	2.56
Chlorodifluoromethane	98,100 EJ
Cyclohexane	0.718 J
1,4-Dichlorobenzene	1.86 J
Dichlorodifluoromethane	4160
Ethylbenzene	2.84
4-Ethyltoluene	2.26
Freon-113	8.48
Freon-114	80.6
Heptane	1.54
n-Hexane	2.13
2-Hexanone	0.256 J
Isopropanol	1.55 J
4-Methyl-2-pentanone	1.52
Methylene chloride	3.5 J
Styrene	0.851 J
Tetrachloroethene	3.22
Toluene	11.4
1,1,1-Trichloroethane	3.24 J
Trichloroethene	1.76 J
Trichlorofluoromethane	34.9 J
1,3,5-Trimethybenzene	2.02
1,2,4-Trimethylbenzene	10.3
2,2,4-Trimethylpentane	1.09 J
o-Xylene	3.63
p/m-Xylene	8.71

1-30-003A-SV01	SV-01	DUP-01
	μg/m³	μg/m³
Acetone	9.53	(<0.871 U)
Benzene	1.08 J	0.855 J
1,3-Butadiene	(<0.77 U)	0.681 J
2-Butanone	1.75	(<1.08 U)
Carbon disulfide	0.548 J	0.468 J
Chlorodifluoromethane	22.4	211
Chloroform	0.366 J	0.403 J
Chloromethane	0.658 J	(<0.757 U)
Dichlorodifluoromethane	3.44	5.28
Heptane	1.46	0.939 J
n-Hexane	1.38	0.737 J
Isopropanol	2.81 J	(<0.901 UJ)
Methylene chloride	12.1 J	2.23 J
Propylene	9.33	8.92
Tetrachloroethene	4	3.48
Toluene	2.21	(<2.24 U)
1,1,1-Trichloroethane	0.323 J	0.44 J
Trichloroethene	2.43	1.88 J
Trichlorofluoromethane	9.52 J	(<2.06 U)
2,2,4-Trimethylpentane	0.236 J	(<1.71 U)



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Source: NYS GIS Clearing House

- Soil Vapor Sampling Point
- ug/m³ — Micrograms per cubic meter (ppbv)
- EJ — Reported above the linear range and value is an estimate
- J — Reported value is an estimate
- U — Analyte detected below the method detection limit

FORMER GRUMMAN SETTLING PONDS (1-30-003A) CONFIDENTIAL ISVI INVESTIGATION SUMMARY REPORT BETHPAGE, NEW YORK

FIGURE 5
Summary of Detected Volatile Organic Compounds (VOCs) in Soil Vapor Samples

PROJECT MGR:	DESIGNED BY:	CREATED BY:	CHECKED BY:	SCALE:	DATE:	PROJECT NO:	FILE NO:
RSC	CJS	MS	RSC	AS SHOWN	DECEMBER 2007	14368.16	GIS/PROJECTS/ FIGURE3.MXD

Table 4
Summary of Volatile Organic Compounds (VOCs) in Soil Vapor Samples
Immediate Soil Vapor Investigation
Former Grumman Settling Ponds (NYSDEC Site No. 1-30-003A)
Bethpage, New York

Parameter List EPA Method TO-15	Sample ID	1-30-003A-SV01		1-30-003A-SV02		1-30-003A-SV03		1-30-003A-SV04	
	Lab ID	L0711999-01		L0711999-02		L0711999-03		L0711999-04	
	Sample Depth	7.5 - 8 ft.		7.5 - 8 ft.		39.5 - 40 ft.		7.5 - 8 ft.	
	Sample Type	Soil Vapor		Soil Vapor		Soil Vapor		Soil Vapor	
	Sample Date	8/16/2007		8/16/2007		8/16/2007		8/16/2007	
Acetone	(ug/m3)	**9.53**		**35.5**		0.811	U	**18.1**	
Benzene	(ug/m3)	**1.08**	**J**	**33.5**		**2.57**		**2.09**	
Benzyl chloride	(ug/m3)	1.8	U	1.81	U	1.77	U	1.8	U
Bromodichloromethane	(ug/m3)	2.33	U	2.35	U	2.29	U	2.33	U
Bromoform	(ug/m3)	3.6	U	3.62	U	3.53	U	3.59	U
Bromomethane	(ug/m3)	1.35	U	1.36	U	1.33	U	1.35	U
1,3- Butadiene	(ug/m3)	0.77	U	**4.87**		**2.12**		**1.8**	
2- Butanone	(ug/m3)	**1.75**		1.03	U	**15**		**6.2**	
Carbon disulfide	(ug/m3)	**0.548**	**J**	**7.34**		**2.11**		**0.947**	**J**
Carbon tetrachloride	(ug/m3)	2.19	U	2.2	U	**4.33**		2.19	U
Chlorobenzene	(ug/m3)	1.6	U	1.61	U	1.57	U	1.6	U
Chlorodifluoromethane	(ug/m3)	**22.4**		**7.04**		**236**		**814**	**EJ**
Chloroethane	(ug/m3)	0.919	U	0.925	U	0.901	U	0.917	U
Chloroform	(ug/m3)	**0.366**	**J**	**1.61**	**J**	**2.17**		**0.857**	**J**
Chloromethane	(ug/m3)	**0.658**	**J**	0.724	U	0.705	U	0.718	U
3- Chloropropene	(ug/m3)	1.09	U	1.1	U	1.07	U	1.09	U
Cyclohexane	(ug/m3)	1.2	U	**2.61**		**0.27**	**J**	1.2	U
Dibromochloromethane	(ug/m3)	2.97	U	2.99	U	2.91	U	2.96	U
1,2- Dibromoethane	(ug/m3)	2.68	U	2.69	U	2.62	U	2.67	U
1,2- Dichlorobenzene	(ug/m3)	2.09	U	2.11	U	2.05	U	2.09	U
1,3- Dichlorobenzene	(ug/m3)	2.09	U	2.11	U	2.05	U	2.09	U
1,4- Dichlorobenzene	(ug/m3)	2.09	U	2.11	U	**1.85**	**J**	2.09	U
Dichlorodifluoromethane	(ug/m3)	**3.44**		**3.27**		**526**		**84.5**	
1,1- Dichloroethane	(ug/m3)	1.41	U	1.42	U	1.38	U	1.41	U
1,2- Dichloroethane	(ug/m3)	1.41	U	1.42	U	1.38	U	1.41	U
1,1- Dichloroethene	(ug/m3)	1.38	U	1.39	U	1.35	U	1.38	U
cis-1,2- Dichloroethene	(ug/m3)	1.38	U	1.39	U	1.35	U	1.38	U
trans-1,2- Dichloroethene	(ug/m3)	1.38	U	1.39	U	1.35	U	1.38	U
1,2- Dichloropropane	(ug/m3)	1.61	U	1.62	U	1.58	U	1.61	U
cis-1,3- Dichloropropene	(ug/m3)	1.58	U	1.59	U	1.55	U	1.58	U
trans-1,3- Dichloropropene	(ug/m3)	1.58	U	1.59	U	1.55	U	1.58	U
1,4- Dioxane	(ug/m3)	1.26	U	1.26	U	1.23	U	1.25	U
Ethyl Acetate	(ug/m3)	1.26	U	1.26	U	1.23	U	1.25	U
Ethylbenzene	(ug/m3)	1.51	U	**18.6**		**3.31**		**0.754**	**J**
4- Ethyltoluene	(ug/m3)	1.71	U	**11.3**		**3.81**		1.71	U
Freon-113	(ug/m3)	2.67	U	2.69	U	2.62	U	2.66	U
Freon-114	(ug/m3)	2.43	U	2.45	U	2.39	U	2.43	U
Heptane	(ug/m3)	**1.46**		**17.1**		**1.76**		1.42	U
Hexachlorobutadiene	(ug/m3)	3.71	U	3.74	U	3.64	U	3.71	U
n- Hexane	(ug/m3)	**1.38**		**17.9**		**3.79**		**1.91**	
2- Hexanone	(ug/m3)	1.43	U	1.44	U	**0.224**	**J**	**0.199**	**J**
Isopropanol	(ug/m3)	**2.81**	**J**	**2.87**	**J**	**2.81**	**J**	**1.65**	**J**
Methyl tert butyl ether	(ug/m3)	1.26	U	**9.66**		**0.973**	**J**	1.25	U
4- Methyl-2-pentanone	(ug/m3)	1.43	U	1.44	U	**3.66**		1.42	U
Methylene chloride	(ug/m3)	**12.1**	**J**	**2.55**	**J**	**8.51**	**J**	**2.58**	**J**
Propylene	(ug/m3)	**9.33**		**56.8**		**21.7**		**6.25**	
Styrene	(ug/m3)	1.48	U	1.49	U	**0.807**	**J**	1.48	U
1,1,2,2- Tetrachloroethane	(ug/m3)	2.39	U	2.41	U	2.34	U	2.38	U
Tetrachloroethene	(ug/m3)	**4**		**6.4**		**15.6**		**4.9**	
Tetrahydrofuran	(ug/m3)	1.03	U	1.03	U	**3.59**		1.02	U
Toluene	(ug/m3)	**2.21**		**116**		**12.8**		**5.93**	
1,2,4- Trichlorobenzene	(ug/m3)	2.58	U	2.6	U	2.53	U	2.58	U
1,1,1- Trichloroethane	(ug/m3)	**0.323**	**J**	1.91	U	**0.96**	**J**	**2.43**	**J**
1,1,2- Trichloroethane	(ug/m3)	1.9	U	1.91	U	1.86	U	1.9	U
Trichloroethene	(ug/m3)	**2.43**		1.88	U	**0.505**	**J**	1.87	U
Trichlorofluoromethane	(ug/m3)	**9.52**	**J**	**7.55**	**J**	**5.19**	**J**	**8.63**	**J**
1,3,5- Trimethybenzene	(ug/m3)	1.71	U	**12.7**		**2.86**		1.71	U
1,2,4- Trimethylbenzene	(ug/m3)	1.71	U	**34.9**		**17.4**		1.71	U
2,2,4- Trimethylpentane	(ug/m3)	**0.236**	**J**	**24.8**		**0.933**	**J**	1.62	U
Vinyl acetate	(ug/m3)	1.23	U	1.24	U	1.2	U	1.22	U
Vinyl bromide	(ug/m3)	1.52	U	1.53	U	1.49	U	1.52	U
Vinyl chloride	(ug/m3)	0.89	U	0.896	U	0.873	U	0.888	U
o- Xylene	(ug/m3)	1.51	U	**23.2**		**5.48**		1.51	U
p/m- Xylene	(ug/m3)	1.51	U	**67.9**		**13.6**		**1.1**	**J**

Note:

EPA = Environmental Protection Agency
EJ = Reported above the linear range and value is an estimate
J = Reported value is an estimate
U = Analyte detected below the method detection limit.
ug/m3 = micrograms per cubic meter
Bold values indicate that the analyte was detected.

Table 4
Summary of Volatile Organic Compounds (VOCs) in Soil Vapor Samples
Immediate Soil Vapor Investigation
Former Grumman Settling Ponds (NYSDEC Site No. 1-30-003A)
Bethpage, New York

Parameter List EPA Method TO-15	Sample ID	1-30-003A-SV05		1-30-003A-SV06		1-30-003A-SV07		1-30-003A-SV-DUP01[a]	
	Lab ID	L0711999-05		L0711999-06		L0711999-07		L0711999-08	
	Sample Depth	7.5 - 8 ft.		39.5 - 40 ft.		7.5 - 8 ft.		7.5 - 8 ft.	
	Sample Type	Soil Vapor		Soil Vapor		Soil Vapor		Soil Vapor	
	Sample Date	8/16/2007		8/16/2007		8/16/2007		8/16/2007	
Acetone	(ug/m3)	**30.2**		**40.2**		**22.5**		0.871	U
Benzene	(ug/m3)	**2.78**		**1.59**		**2.01**		**0.855**	**J**
Benzyl chloride	(ug/m3)	1.8	U	1.8	U	1.91	U	1.9	U
Bromodichloromethane	(ug/m3)	2.33	U	2.33	U	2.48	U	2.46	U
Bromoform	(ug/m3)	3.59	U	3.59	U	3.82	U	3.79	U
Bromomethane	(ug/m3)	1.35	U	1.35	U	1.44	U	1.42	U
1,3- Butadiene	(ug/m3)	**4.76**		**1.32**		**3.77**	**J**	**0.681**	**J**
2- Butanone	(ug/m3)	**6.12**		**6.56**		**3.96**		1.08	U
Carbon disulfide	(ug/m3)	**1.14**		**2.56**		**1.31**		**0.468**	**J**
Carbon tetrachloride	(ug/m3)	2.19	U	2.19	U	2.32	U	2.31	U
Chlorobenzene	(ug/m3)	1.6	U	1.6	U	1.7	U	1.69	U
Chlorodifluoromethane	(ug/m3)	**13,900**	**EJ**	**98,100**	**EJ**	**8,400**	**EJ**	**211**	
Chloroethane	(ug/m3)	0.917	U	0.917	U	0.976	U	0.968	U
Chloroform	(ug/m3)	**1.8**		1.7	U	**1.34**	**J**	**0.403**	**J**
Chloromethane	(ug/m3)	0.718	U	0.718	U	**0.355**	**J**	0.757	U
3- Chloropropene	(ug/m3)	1.09	U	1.09	U	**0.226**	**J**	1.15	U
Cyclohexane	(ug/m3)	**0.419**	**J**	**0.718**	**J**	1.27	U	1.26	U
Dibromochloromethane	(ug/m3)	2.96	U	2.96	U	3.15	U	3.12	U
1,2- Dibromoethane	(ug/m3)	2.67	U	2.67	U	2.84	U	2.82	U
1,2- Dichlorobenzene	(ug/m3)	2.09	U	2.09	U	2.22	U	2.2	U
1,3- Dichlorobenzene	(ug/m3)	2.09	U	2.09	U	2.22	U	2.2	U
1,4- Dichlorobenzene	(ug/m3)	2.09	U	**1.86**	**J**	2.22	U	2.2	U
Dichlorodifluoromethane	(ug/m3)	**638**		**4,160**		**320**		**5.28**	
1,1- Dichloroethane	(ug/m3)	1.41	U	1.41	U	1.5	U	1.48	U
1,2- Dichloroethane	(ug/m3)	1.41	U	1.41	U	1.5	U	1.48	U
1,1- Dichloroethene	(ug/m3)	1.38	U	1.38	U	1.46	U	1.45	U
cis-1,2- Dichloroethene	(ug/m3)	1.38	U	1.38	U	1.46	U	1.45	U
trans-1,2- Dichloroethene	(ug/m3)	1.38	U	1.38	U	1.46	U	1.45	U
1,2- Dichloropropane	(ug/m3)	1.61	U	1.61	U	1.71	U	1.69	U
cis-1,3- Dichloropropene	(ug/m3)	1.58	U	1.58	U	1.68	U	1.66	U
trans-1,3- Dichloropropene	(ug/m3)	1.58	U	1.58	U	1.68	U	1.66	U
1,4- Dioxane	(ug/m3)	1.25	U	1.25	U	1.33	U	1.32	U
Ethyl Acetate	(ug/m3)	1.25	U	1.25	U	1.33	U	1.32	U
Ethylbenzene	(ug/m3)	**0.453**	**J**	**2.84**		**0.305**	**J**	1.59	U
4- Ethyltoluene	(ug/m3)	**0.316**	**J**	**2.26**		1.82	U	1.8	U
Freon-113	(ug/m3)	**1.5**	**J**	**8.48**		**1.06**	**J**	2.81	U
Freon-114	(ug/m3)	**11.3**		**80.6**		**14.4**		2.56	U
Heptane	(ug/m3)	**3.05**		**1.54**		**1.98**		**0.939**	**J**
Hexachlorobutadiene	(ug/m3)	3.71	U	3.71	U	3.94	U	3.91	U
n- Hexane	(ug/m3)	**7.69**		**2.13**		**6.92**	**J**	**0.737**	**J**
2- Hexanone	(ug/m3)	1.42	U	**0.256**	**J**	1.52	U	1.5	U
Isopropanol	(ug/m3)	**0.769**	**J**	**1.55**	**J**	**1.95**		0.901	UJ
Methyl tert butyl ether	(ug/m3)	1.25	U	1.25	U	1.33	U	1.32	U
4- Methyl-2-pentanone	(ug/m3)	1.42	U	**1.52**		1.51	U	1.5	U
Methylene chloride	(ug/m3)	**1.91**	**J**	**3.5**	**J**	**2.23**		**2.23**	**J**
Propylene	(ug/m3)	**18.6**		0.598	U	**49.2**	**J**	**8.92**	
Styrene	(ug/m3)	1.48	U	**0.851**	**J**	1.57	U	1.56	U
1,1,2,2- Tetrachloroethane	(ug/m3)	2.38	U	2.38	U	2.54	U	2.52	U
Tetrachloroethene	(ug/m3)	**1.13**	**J**	**3.22**		**88.7**		**3.48**	
Tetrahydrofuran	(ug/m3)	1.02	U	1.02	U	1.09	U	1.08	U
Toluene	(ug/m3)	**2.85**		**11.4**		**5.66**	**J**	2.24	U
1,2,4- Trichlorobenzene	(ug/m3)	2.58	U	2.58	U	2.74	U	2.72	U
1,1,1- Trichloroethane	(ug/m3)	**0.702**	**J**	**3.24**	**J**	**3.75**		**0.44**	**J**
1,1,2- Trichloroethane	(ug/m3)	1.9	U	1.9	U	2.02	U	2.0	U
Trichloroethene	(ug/m3)	1.87	U	**1.76**	**J**	1.99	U	**1.88**	**J**
Trichlorofluoromethane	(ug/m3)	**10.8**	**J**	**34.9**	**J**	**19.7**		2.06	U
1,3,5- Trimethybenzene	(ug/m3)	**0.828**	**J**	**2.02**		1.82	U	1.8	U
1,2,4- Trimethylbenzene	(ug/m3)	**1.34**	**J**	**10.3**		**0.436**	**J**	1.8	U
2,2,4- Trimethylpentane	(ug/m3)	**0.739**	**J**	**1.09**	**J**	**1.56**	**J**	1.71	U
Vinyl acetate	(ug/m3)	1.22	U	1.22	U	1.3	U	1.29	U
Vinyl bromide	(ug/m3)	1.52	U	1.52	U	1.62	U	1.6	U
Vinyl chloride	(ug/m3)	0.888	U	0.888	U	0.945	U	0.937	U
o- Xylene	(ug/m3)	**1.42**	**J**	**3.63**		**0.907**	**J**	1.59	U
p/m- Xylene	(ug/m3)	**1.8**		**8.71**		**0.947**	**J**	1.59	U

Note:

(a) 1-30-003A-SV-DUP01 collected at 1-30-003A-SV01
EPA = Environmental Protection Agency
EJ = Reported above the linear range and value is an estimate
J = Reported value is an estimate
U = Analyte detected below the method detection limit.
ug/m3 = micrograms per cubic meter
Bold values indicate that the analyte was detected.

NEW YORK STATE
DEPARTMENT OF HEALTH

SOIL VAPOR INTRUSION

Frequently Asked Questions

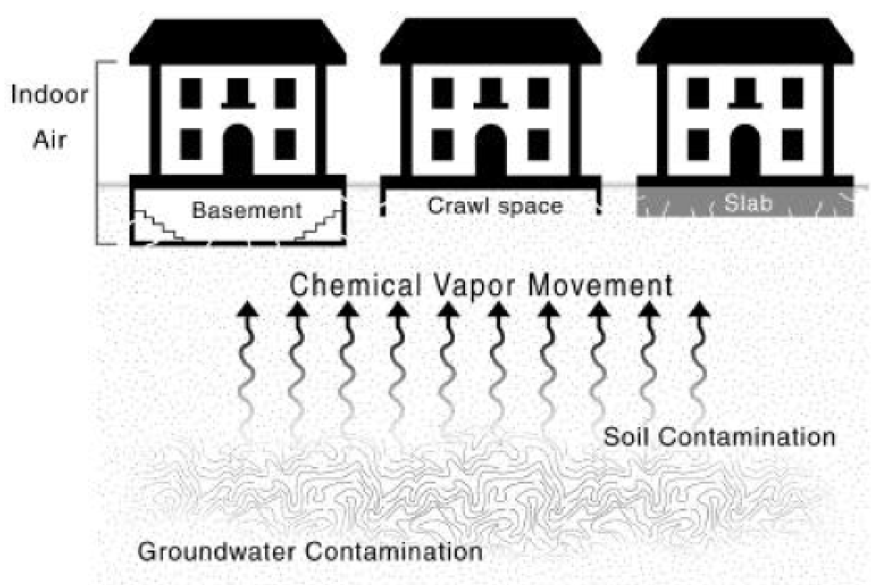
What is soil vapor intrusion?

The phrase "soil vapor intrusion" refers to the process by which volatile chemicals move from a subsurface source into the indoor air of overlying buildings.

Soil vapor, or soil gas, is the air found in the pore spaces between soil particles. Because of a difference in pressure, soil vapor enters buildings through cracks in slabs or basement floors and walls, and through openings around sump pumps or where pipes and electrical wires go through the foundation. Heating, ventilation or air-conditioning systems may create a negative pressure that can draw soil vapor into the building. This intrusion is similar to how radon gas seeps into buildings.

Soil vapor can become contaminated when chemicals evaporate from subsurface sources and enter the soil vapor. Chemicals that readily evaporate are called "volatile chemicals." Volatile chemicals include volatile organic compounds (VOCs). Subsurface sources of volatile chemicals may include contaminated soil and groundwater, or buried wastes. If soil vapor is contaminated, and enters a building as described above, indoor air quality may be affected.

When contaminated vapors are present in the zone directly next to or under the foundation of the building, vapor intrusion is possible. Soil vapor can enter a building whether it is old or new, or whether it has a basement, a crawl space, or is on a slab (as illustrated in the figure).



[Source: United States Environmental Protection Agency, Region 3]

How am I exposed to chemicals through soil vapor intrusion?

Humans can be exposed to soil vapor contaminated with volatile chemicals when vapors from beneath a building are drawn through cracks and openings in the foundation and mix with the indoor air. Inhalation is the route of exposure, or the manner in which the volatile chemicals actually enter the body, once in the indoor air.

Current exposures are when vapor intrusion is documented in an occupied building. *Potential* exposures are when volatile chemicals are present, or are accumulating, in the vapor phase beneath a building, but have not affected indoor air quality. Potential exposures also exist when there is a chance that contaminated soil vapors may move to existing buildings not currently affected or when there is a chance that new buildings can be built over existing subsurface vapor contamination. Both current and potential exposures are considered when evaluating soil vapor intrusion at a site that has documented subsurface sources of volatile chemicals.

In general, exposure to a volatile chemical does not necessarily mean that health effects will occur. Whether or not a person experiences health effects depends on several factors, including inhalation exposure, the length of exposure (short-term or acute versus long-term or chronic), the frequency of exposure, the toxicity of the volatile chemical, and the individual's sensitivity to the chemical.

What types of chemicals associated with environmental contamination may be entering my home via soil vapor intrusion?

Volatile organic compounds, or VOCs, are the most likely group of chemicals found in soil vapor, and which can move through the soil and enter buildings. Solvents used for dry cleaning, degreasing and other industrial purposes (e.g., tetrachloroethene, trichloroethene, 1,1,1-trichloroethane and Freon 113) are examples of VOCs. Examples of petroleum-related VOCs from petroleum spills are benzene, toluene, ethyl benzene, xylenes, styrene, hexane and trimethylbenzenes.

Is contaminated soil vapor the only source of volatile chemicals in my indoor air?

No. Volatile chemicals are also found in many household products. Paints, paint strippers and thinners, mineral spirits, glues, solvents, cigarette smoke, aerosol sprays, mothballs, air fresheners, new carpeting or furniture, hobby supplies, lubricants, stored fuels, refrigerants and recently dry-cleaned clothing all contain VOCs. Household products are often more of a source of VOCs in indoor air in homes than contaminated soil vapor.

Indoor air may also become affected when outdoor air containing volatile chemicals enters your home. Volatile chemicals are present in outdoor air due to their widespread use. Gasoline stations, dry cleaners, and other commercial/industrial facilities are important sources of VOCs to outdoor air.

What should I expect if soil vapor intrusion is a concern near my home?

If you live near a site that has documented soil, groundwater and/or soil vapor contaminated with volatile chemicals, you should expect that the potential for vapor intrusion is being, or has been, investigated. You may be contacted by the site owner or others working on the cleanup with information about the project. Your cooperation and consent would be requested before any testing/sampling would be done on your property. You may ask the person contacting you any questions about the work being done. You can also contact the NYSDOH's project manager for the site at 1-800-458-1158 (extension 2-7850) for additional information.

How is soil vapor intrusion investigated at sites contaminated with volatile chemicals?

The process of investigating soil vapor intrusion typically requires more than one set of samples to determine the extent of vapor contamination. Furthermore, four types of environmental samples are collected: soil vapor samples, sub-slab vapor samples, indoor air samples and outdoor air (sometimes referred to as "ambient air") samples.

Soil vapor samples are collected to characterize the nature and extent of vapor contamination in the soil in a given area. They are often collected before sub-slab vapor and/or indoor air samples to help identify buildings or groups of buildings that need to be sampled. Soil vapor samples are used to determine the *potential* for human exposures. *Soil vapor* samples are not the same as *soil* samples.

Sub-slab vapor samples are collected to characterize the nature and extent of vapor contamination in the soil immediately beneath a building with basement foundations or a slab. Sub-slab vapor results are used to determine the potential for *current* and *future* human exposures. For example, an exposure could occur in the future if cracks develop in the building's foundation or changes in the operation of the building's heating, ventilation or air-conditioning system are made that make the movement of contaminated soil vapor into the building possible.

Indoor air samples are collected to characterize the nature and extent of air contamination within a building. Indoor air sample results help to evaluate whether there are *current* human exposures. They are also compared to sub-slab vapor and outdoor air results to help determine where volatile chemicals may be coming from (indoor sources, outdoor sources, and/or beneath the building).

Outdoor air samples are collected to characterize site-specific background air conditions. Outdoor air results are used to evaluate the extent to which outdoor sources, such as automobiles, lawn mowers, oil storage tanks, gasoline stations, commercial/industrial facilities, and so forth, may be affecting indoor air quality.

What should I expect if indoor air samples are collected in my home?

You should expect the following:

- Indoor air samples are generally collected from the lowest-level space in a building, typically a basement, during the heating season. Indoor air samples may also be collected from the first floor of living space. Indoor air is believed to represent the greatest exposure potential with respect to soil vapor intrusion.
- Sub-slab vapor and outdoor air samples are usually collected at the same time as indoor air samples to help determine where volatile chemicals may be coming from (indoor sources, outdoor sources, and/or beneath the building).
- More limited sampling may be performed outside of the heating season. For example, sub-slab vapor samples without indoor air or outdoor air samples may be collected to identify buildings and areas where comprehensive sampling is needed during the heating season.
- An indoor air quality questionnaire and building inventory will be completed. The questionnaire includes a summary of the building's construction characteristics; the building's heating, ventilation and air-conditioning system operations; and potential indoor and outdoor sources of volatile chemicals. The building inventory describes products present in the building that might contain volatile chemicals. In addition, we take monitoring readings from a real-time organic vapor meter (also known as a photoionization detector or PID). The PID is an instrument that detects many VOCs in the air. When indoor air samples are collected, the PID is used to help determine whether

products containing VOCs might be contributing to levels that are detected in the indoor air.

What happens if soil vapor contamination or soil vapor intrusion is identified during investigation of a site?

Depending on the investigation results, additional sampling, monitoring or mitigation actions may be recommended. Additional sampling may be performed to determine the extent of soil vapor contamination and to verify questionable results. Monitoring (sampling on a recurring basis) is typically conducted if there is a significant potential for vapor intrusion to occur should building conditions change. Mitigation steps are taken to minimize exposures associated with soil vapor intrusion. Mitigation may include sealing cracks in the building's foundation, adjusting the building's heating, ventilation and air-conditioning system to maintain a positive pressure to prevent infiltration of subsurface vapors, or installing a sub-slab depressurization system beneath the building.

What is a sub-slab depressurization system?

A sub-slab depressurization system, much like a radon mitigation system, essentially prevents vapors beneath a slab from entering a building. A low amount of suction is applied below the foundation of the building and the vapors are vented to the outside (see illustration). The system uses minimal electricity and should not noticeably affect heating and cooling efficiency. This mitigation system also essentially prevents radon from entering a building, an added health benefit. The party responsible for cleaning up the source of the soil vapor contamination is usually responsible for paying for the installation of this system. If no responsible party is available, New York State will install the system. Once the contamination is cleaned up, the system should no longer be needed. In areas where radon is a problem, the NYSDOH recommends that these systems remain in place permanently.

What else can I do to improve my indoor air quality?

Household products and other factors, such as mold growth, carbon monoxide, and radon, can degrade the quality of air in your home. Consider the following tips to improve indoor air quality:

- Be aware of household products that contain VOCs. Do not buy more chemicals than you need at a time.
- Store unused chemicals in tightly-sealed containers in a well-ventilated location, preferably away from the living space in your home.
- Keep your home properly ventilated. Keeping it too air-tight may promote build up of chemicals in the air, as well as mold growth due to the build up of moisture.
- Fix all leaks promptly, as well as other moisture problems that encourage mold growth.
- Make sure your heating system, hot water, dryer and fireplaces are properly vented and in good condition. Have your furnace or boiler checked annually by a professional.
- Test your home for radon; take actions to reduce radon levels if needed.
- Install carbon monoxide detectors in your home; take immediate actions to reduce carbon monoxide levels if needed.

Where can I get more information?

For additional information about soil vapor intrusion, contact the NYSDOH's Bureau of Environmental Exposure Investigation at 1-800-458-1158 (extension 2-7850).

Volatile Organic Compounds (VOCs) in Commonly Used Products

People spend most of their time indoors – at home, school and work. This makes the quality of the indoor air you breathe important. This fact sheet focuses on certain kinds of chemicals called *volatile organic compounds* or *VOCs* that are found in many products that we commonly use. It is designed to help you think about what VOCs may be present in your indoor air and steps you can take to reduce them.

What are VOCs?

VOCs are chemicals that easily enter the air as gases from some solids or liquids. They are ingredients in many commonly used products and are in the air of just about every indoor setting. The table to the right shows some examples of products that contain VOCs.

How do VOCs get into indoor air?

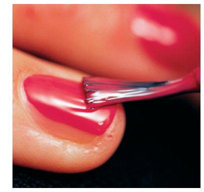
Products containing VOCs can release these chemicals when they are used and when they are stored. Many times you'll notice an odor when using these products. Product labels often list VOC ingredients and recommend that they should be used in well ventilated areas. *Ventilation* means bringing in fresh, outdoor air to mix with indoor air.

When you use a product containing VOCs indoors, the levels of these chemicals in the air increase, then decrease over time after you stop using them. The amount of time the chemical stays in the air depends on how quickly fresh air enters the room and the amount of the chemical used. Levels of VOCs will decrease faster if you open windows or doors, or use exhaust fans.

Building materials and furnishings, such as new carpets or furniture, slowly release VOCs over time. It may be necessary to ventilate areas with new carpeting or furniture for longer time periods because VOC levels can build up again after the windows are closed. If possible, unroll new carpets or store furniture outside your home (in a shed or detached garage) to minimize odors before bringing them in the home. If that's not possible, open windows, close doors and try to stay out of rooms until odors are reduced.

If VOC containing products are used outdoors near your home, you may want to close windows and nearby vents to prevent chemicals from coming inside.

Products used at home or work can release VOCs into the air when used and stored.



Examples of Household Products	Possible VOC Ingredients
Fuel containers or devices using gasoline, kerosene, fuel oil and products with petroleum distillates: paint thinner, oil-based stains and paint, aerosol or liquid insect pest products, mineral spirits, furniture polishes	BTEX (benzene, toluene, ethylbenzene, xylene), hexane, cyclohexane, 1,2,4-trimethylbenzene
Personal care products: nail polish, nail polish remover, colognes, perfumes, rubbing alcohol, hair spray	Acetone, ethyl alcohol, isopropyl alcohol, methacrylates (methyl or ethyl), ethyl acetate
Dry cleaned clothes, spot removers, fabric/leather cleaners	Tetrachloroethene (perchloroethene (PERC), trichloroethene (TCE))
Citrus (orange) oil or pine oil cleaners, solvents and some odor masking products	d-limonene (citrus odor), a-pinene (pine odor), isoprene
PVC cement and primer, various adhesives, contact cement, model cement	Tetrahydrofuran, cyclohexane, methyl ethyl ketone (MEK), toluene, acetone, hexane, 1,1,1-trichloroethane, methyl-iso-butyl ketone (MIBK)
Paint stripper, adhesive (glue) removers	Methylene chloride, toluene, older products may contain carbon tetrachloride
Degreasers, aerosol penetrating oils, brake cleaner, carburetor cleaner, commercial solvents, electronics cleaners, spray lubricants	Methylene chloride, PERC, TCE, toluene, xylenes, methyl ethyl ketone, 1,1,1-trichloroethane
Moth balls, moth flakes, deodorizers, air fresheners	1,4-dichlorobenzene, naphthalene
Refrigerant from air conditioners, freezers, refrigerators, dehumidifiers	Freons (trichlorofluoromethane, dichlorodifluoromethane)
Aerosol spray products for some paints, cosmetics, automotive products, leather treatments, pesticides	Heptane, butane, pentane
Upholstered furniture, carpets, plywood, pressed wood products	Formaldehyde

VOCs can also get into indoor air from contaminated soils and groundwater under buildings. The chemicals enter buildings through cracks and openings in basements or slabs. When nearby soil or groundwater is contaminated, you might be asked for permission to investigate indoor air at your property. More information can be found at *www.nyhealth.gov/environmental/indoors/vapor_intrusion/*.

Should I be surprised if VOCs are in the air I breathe?

No. Because they are commonly used, some VOCs are almost always found in indoor air. The New York State Department of Health (DOH) and other agencies have studied typical levels of VOCs that may be present in indoor and outdoor air. Sometimes these levels are called "*background levels*".

The term "background levels" can be confusing because they can vary depending on where an air sample was collected and whether VOCs were used or stored. For example, a study of VOCs in urban areas might find higher levels than another study in rural areas. Some studies look at office environments, others examine residences. Please keep in mind study findings may or may not make sense for your setting.

More information about levels of VOCs collected by DOH is available in Appendix C of the guidance for evaluating vapor intrusion at *www.nyhealth.gov/environmental/investigations/soil_gas/svi_guidance.*

How can VOCs affect human health?

Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure*. No matter how dangerous a substance or activity is, it cannot harm you without exposure.

Whether or not a person will have health effects after breathing in VOCs depends on:

1. The *toxicity* of the chemical (the amount of harm that can be caused by contact with the chemical).
2. How much of the chemical is in the air.
3. How long and how often the air is breathed.

Differences in age, health condition, gender and exposure to other chemicals also can affect whether or not a person will have health effects.

Short-term exposure to high levels of some VOCs can cause headaches, dizziness, light-headedness, drowsiness, nausea, and eye and respiratory irritation. These effects usually go away after the exposure stops. In laboratory animals, long-term exposure to high levels of some VOCs has caused cancer and affected the liver, kidney and nervous system. In general, we recommend minimizing exposure to chemicals, if possible.

How can I reduce the levels of VOCs indoors?

- Find out if products used or stored in your home contain VOCs. Information about the chemicals in many household products are listed on the front of this fact sheet and a larger list is on the National Institute of Health's website at *hpd.nlm.nih.gov/products.htm*.
- If you must store products containing VOCs, do so in tightly sealed, original containers in a secure and well-ventilated area. If possible store products in places where people do not spend much time, such as a garage or outdoor shed. Better yet, buy these products in amounts that are used quickly.
- Dispose of unneeded products containing VOCs. Many of these products are considered *household hazardous wastes* and should be disposed of at special facilities or during special household hazardous waste collection programs in your area. Contact your town or visit the New York State Department of Environmental Conservation's website at *www.dec.ny.gov/chemical/8485.html* for more information about disposing of these products.
- Use products containing VOCs in well-ventilated areas or outdoors. Open windows and doors or use an exhaust fan to increase ventilation. Repeated or prolonged ventilation may be necessary for reducing levels from building materials (new carpeting or furniture) that release VOCs slowly over time.
- Carefully read labels and follow directions for use.

Where can I find out more?

- **New York State Department of Health** (800) 458-1158 *www.nyhealth.gov/environmental/*
- **Indoor Air Quality and Your Home** from the New York State Energy Research and Development Authority *www.nyserda.org/publications/iaq.pdf*
- **The Inside Story: A Guide to Indoor Air Quality** *www.epa.gov/iaq/pubs/insidest.html*
- **New York State Department of Environmental Conservation** website for information about household hazardous waste disposal *www.dec.ny.gov/chemical/8485.html*
- **National Institute of Health's** website for information about chemicals found in many household products. *hpd.nlm.nih.gov/products.htm*

DOH

December 2007