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Mr. George Jacob, Remedial Project Manager
United Stated Environmental Protection Agency – Region 2
290 Broadway, 20th Floor
New York, New York 10007-1866

ENVIRONMENT

Subject:
Soil Vapor Screening Evaluation Report
Colesville Landfill Site (Site No. 704010)
Broome County, New York

Date:
January 28, 2009

Dear Mr. Jacob:

On behalf of the Broome County Division of Solid Waste Management, ARCADIS is submitting to the U. S. Environmental Protection Agency (EPA) the Soil Vapor Screening Evaluation Report.

If there are any questions, please do not hesitate to contact me at 631-391-5244.

Sincerely,

ARCADIS

Steven M. Feldman
Project Manager

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Steven M. Feldman

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(631) 391-5244

Email:
Steven.Feldman@arcadis-us.com

Our ref:
NY000949.0021.00005

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Joseph Yavonditte, NYSDEC
Payson Long, NYSDEC
Julia Kenney, NYSDOH
Laurie Haskell, Broome County
File

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Broome County Division of
Solid Waste Management

Soil Vapor Screening Evaluation Report

Colesville Landfill

Broome County, New York

NYSDEC Site 704010

January 28, 2009

ARCADIS

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Project Manager/Associate Vice President

Soil Vapor Screening Evaluation Report

Colesville Landfill
Broome County, New York
NYSDEC Site 704010

Prepared for:
Broome County Division of Solid Waste Management

Prepared by:
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Our Ref.:
NY000949.0021.00004

Date:
January 28, 2009

1. Introduction

On behalf of the Broome County Division of Solid Waste Management, ARCADIS conducted a soil vapor screening evaluation to assess the potential for indoor air vapor intrusion at residences in the vicinity of the Colesville Landfill (Site). The Site is located in Broome County, New York. This Soil Vapor Screening Evaluation Report (Report) documents the work and findings of the soil vapor screening evaluation.

The soil vapor screening evaluation scope of work was presented in a final Soil Vapor Screening Evaluation Work Plan (Work Plan) that was submitted to the U.S. Environmental Protection Agency (EPA), the New York State Department of Environmental Conservation (NYSDEC), and the New York State Department of Health (NYSDOH) on October 3, 2008 (ARCADIS, 2008). The EPA pre-approved the final Work Plan in an e-mail dated September 9, 2008, which indicated that a final Work Plan should be submitted that incorporated the agency comments on the August 16, 2006 Work Plan and ARCADIS' response to comments. The work was performed in accordance with the methods outlined in the final Work Plan.

1.1 Background

The scope of work presented in the final Work Plan was developed in response to EPA's recommendation in the EPA Second Five-Year Review Report for the Site dated April 2005. The EPA suggested that sub-slab soil vapor samples be collected beneath homes located hydraulically downgradient of the Site to evaluate the potential for vapor intrusion. Based on follow up discussions with EPA, it was mutually agreed that soil vapor samples would be collected from the interval immediately above the water table to evaluate the potential for vapor intrusion. Consequently, the scope of work presented in the final Work Plan was developed to evaluate volatile organic compounds (VOCs) in soil vapor in the vicinity of the residences.

Consistent with Section 2.2.2 of the October 2006 NYSDOH Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, sub-slab soil vapor samples may only be necessary after soil vapor characterization and/or other environmental sampling (e.g., soil and groundwater characterization) indicate they are warranted. Therefore, consistent with the approved Work Plan, the soil vapor samples were collected as an initial step to determine if VOCs are present in soil vapor on parcels with existing structures.

Based on a number of discussions and correspondences with the EPA, the NYSDEC, and the NYSDOH between 2006 and 2008, the key aspects of the work scope were as follows:

- Soil borings were advanced in the vicinity of the residences and along East Windsor Road.
- It is believed that the North Stream intercepts VOC-impacted groundwater. At the request of the EPA, one of the soil borings (SV-1) was advanced on the west of the North Stream to evaluate the potential for vapor intrusion at the residences on this side of the stream.
- Soil vapor samples were collected at the interval approximately one foot above the water table.
- The soil vapor sample results were evaluated in accordance with the Office of Solid Waste and Emergency Response (OSWER) document entitled, "Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)" (EPA, 2002).
- The soil vapor sample data was compared to Target Shallow Soil Gas Concentrations and evaluated using attenuation factors.

2. Environmental Setting

The following subsections describe the soil type in the vicinity of the soil borings and groundwater flow conditions.

2.1 Soil Type

The soil type in the vicinity of the soil borings is glacial till. The surficial till is generally brown in color, consisting of sand and gravel, with some clay and silt. The density of the material, as determined during remedial investigation drilling activities, is quite low with blow counts generally less than 20 per six inches.

Soil from the two-foot interval above the soil vapor sample depth (e.g., 6 to 8 foot soil core if the soil vapor sample was collected at 8 feet below land surface [ft bls] and the

depth to water is 9 ft bls) was submitted to a laboratory for particle size analysis by ASTM D422 Standard Test Method for Particle-Size Analysis of Soils (see Section 4.1 of this Report).

2.2 Groundwater Flow Conditions

The depth to water in the vicinity of the residences ranges from approximately 7 to 10 ft bls. The groundwater flow direction in the project area (i.e., adjacent to the landfill western perimeter) is toward the southwest from the western perimeter of the landfill. The groundwater flow direction in areas further to the east of the project area is toward the south/southwest (see Figure 1).

3. Soil Vapor Screening Evaluation

The scope of work described in Section 1 of this Report focused on determining if there is a potential for the vapor intrusion pathway to be complete in the vicinity of the residences located hydraulically downgradient of the Site. To meet this objective, a screening evaluation was conducted through the collection of soil vapor samples in the vicinity of the residences and on the west side of the North Stream.

3.1 EPA Second Five-Year Review

During its Second Five-Year Review, EPA reviewed the potential for vapor intrusion into downgradient residences using a conservative screening level analysis. This analysis was conducted by using the worst-case assumption that concentrations in the groundwater under the residences are the same as the maximum chemical concentration that was detected in downgradient off-site monitoring wells. Appropriately, only the off-site wells were used by the EPA in this screening level evaluation because the on-site wells exhibit concentrations that are not representative of groundwater quality beneath the residences downgradient of the Site.

EPA compared the maximum concentrations of VOCs measured between 2002 and 2004 in the downgradient off-site monitoring wells with risk-based screening criteria provided in the "Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)" (EPA, 2002). This guidance provides chemical-specific groundwater concentrations protective of indoor air quality based on a cancer risk ranging from one in one million to one in ten thousand ($1x10^{-6}$ to $1x10^{-4}$) and/or a noncancer hazard quotient (HQ) of 1.0.

The primary constituent of potential concern (COPC) detected downgradient of the Site relative to the soil vapor intrusion pathway is trichloroethene (TCE). For TCE, EPA compared the maximum groundwater concentration detected in a downgradient off-site monitoring well (19 micrograms per liter [µg/l] at well W-18) to the EPA Target Groundwater Concentration (5.3 µg/L), which is based on a cancer risk of one in ten thousand (10^{-4}). The comparison showed that the measured concentration in well W-18 exceeded the Target Groundwater Concentration. While monitoring well W-18 is located on a property where there is currently an abandoned house and, therefore, no current potential for exposure, these results did suggest that vapor intrusion could potentially be a route of future exposure if a residential dwelling were to be constructed there.

It is unlikely that groundwater VOC concentrations in well W-18 are representative of the groundwater VOC concentrations near occupied residences. This is due to the fact that the residences are located either sidegradient of the locations where the highest VOC concentrations have been measured in groundwater, or are located on the other side of the North Stream.

3.2 Sampling Approach and Methodology

To evaluate VOCs in soil vapor, six (6) soil borings (SV-1 through SV-6) were advanced for the collection of soil cores and soil vapor samples along East Windsor Road and in the vicinity of well W-18. The approximate soil boring locations are shown on Figure 1. As outlined in the Work Plan, the soil boring locations were positioned to meet the objectives of the screening evaluation. Specifically, the soil borings were located to provide areal coverage and were situated along a transect that is generally transverse to the direction of groundwater flow. Soil borings SV-2, SV-4, and SV-6 were advanced at least 10 feet away from the residential structures.

A soil vapor sample could not be collected at proposed soil boring SV-3 due to an insufficient air flow rate (i.e., less than 20 milliliters per minute [mL/min]) that was observed during purging. Soil vapor sampling was attempted in multiple soil borings at the SV-3 location before concluding that a soil vapor sample could not be collected at this location due to the soil permeability (see Section 4.1 of this Report for particle size analysis results).

SV-2 was initially located along East Windsor Road. SV-2 was relocated approximately 185 feet southwest of its original location due to an insufficient air flow rate (i.e., less than 20 mL/min) that was observed during purging at the initial location.

This relocated sample collection point was approximately 18 feet northeast (i.e., upgradient and toward East Windsor Road) of well W-18. Soil vapor sampling was attempted in multiple soil borings at the initial SV-2 location before relocating.

A soil boring was advanced at each location to a depth of 8 to 12 ft bls for the collection of continuous soil cores. The soil cores were used to characterize the soil lithology and to determine the depth of the water table in the vicinity of each soil vapor sample location. After the soil cores were collected, a separate boring was advanced approximately five feet from the soil boring for the collection of the soil vapor sample. The soil cores and soil vapor samples were collected using the methodologies outlined in Sections 3.2.1 and 3.2.2 of the final Work Plan.

Groundwater was encountered at approximately 9 to 10 ft bls and soil vapor samples were collected at a depth of 8 to 9 ft bls in soil borings SV-1, SV-2, SV-4, and SV-5 (see Table 1 for specific sample depths). Groundwater was encountered at approximately 5 ft bls and the soil vapor sample was collected at a depth of 4 ft bls in soil boring SV-6.

As outlined in the Work Plan, tracer gas (i.e., helium) testing was conducted at all of the soil boring locations to check the seal established around the temporary soil vapor sampling point. The tracer gas testing indicated that there was a sufficient seal established around the temporary soil vapor sampling points and that there was no ambient air infiltration.

A duplicate soil vapor sample was collected at the SV-2 location. The duplicate sample was collected at the same time as the SV-2 sample using a stainless steel "T" fitting, a second SUMMA® canister, and the methodologies outlined in the final Work Plan. The replicated data were acceptable.

The particle size analyses were performed by TestAmerica Laboratories, Inc. using ASTM D422 Standard Test Method for Particle-Size Analysis of Soils. The soil vapor samples were collected in individually (100%) certified, pre-cleaned 6-liter SUMMA® canisters provided by Air Toxics, Ltd. (ATL), a NYSDOH approved laboratory, located in Folsom, California. All samples were analyzed by ATL for the ATL TO-15 low-level compound list by EPA Method TO-15.

4. Data Evaluation

The soil vapor sample analytical results were evaluated in accordance with the OSWER document entitled, *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)* (EPA, 2002). Consistent with EPA (2002), the soil vapor results were evaluated in a step-wise manner. First, the soil vapor analytical results were compared to target concentrations presented in Tables 2a and 2c, which represent target soil vapor concentrations based on cancer risks of $1x10^{-4}$ and $1x10^{-6}$, respectively, as a means to bracket the potential risk associated with the soil gas results. This information aided in determining all available options ranging from no further action to additional sampling. Second, COPCs with soil vapor results greater than target concentrations presented in Tables 2a and 2c were evaluated further using site-specific attenuation factors selected from Tables 3a and 3c of the guidance. The site-specific Target Shallow Soil Gas Concentrations in Tables 3a and 3c represent target soil vapor concentrations based on cancer risks of $1x10^{-4}$ and $1x10^{-6}$ (see Table 1), considering site-specific information on soil type and sample depth as presented in Figure 3a.

Table 1 provides the concentrations of VOCs in the soil vapor samples that were collected from the temporary soil vapor points and compares those concentrations with relevant generic and site-specific Target Shallow Soil Gas Concentrations. The soil vapor samples analytical data are provided in Appendix A. Relevant information that provides the rationale for selecting the representative site-specific attenuation factors is provided in Appendix B.

4.1 Particle Size Analysis Data

As discussed previously, soil from the two-foot interval above the soil vapor sample depth (e.g., 6 to 8 foot soil core if the soil vapor sample was collected at 8 ft bls and the depth to water is 9 ft bls) was submitted to a laboratory for particle size analysis by ASTM D422 Standard Test Method for Particle-Size Analysis of Soils. The particle size analyses laboratory data are provided in Appendix C.

The particle size analyses indicated that the predominant soil type was loamy sand (i.e., soil cores from soil borings SV-1, SV-2, SV-4, and SV-5). The particle size analyses indicated that the soil type for the soil cores collected from soil borings SV-3 and SV-6 were silt loam and loam, respectively. The silt loam at soil boring SV-3 is consistent with the insufficient air flow rate that was observed during purging activities

(i.e., low permeability soil). These soil types are consistent with a glacial depositional environment. The soil types were determined using the laboratory particle size analyses data and soil texture descriptions in the United States Department of Agriculture Soil Survey Manual (USDA, 1993).

The soil particle size analyses data indicate that movement of soil vapor will be limited due to the presence of lower permeability soil types. For example, at SV-3 and the initial location of SV-2, a soil vapor sample could not be obtained due to the lack of sufficient air flow.

4.2 Soil Vapor Sample Data

As discussed previously, if the soil vapor sample concentration data exceeded the relevant target concentrations provided in Tables 2a and 2c, the data were then compared to site-specific Target Shallow Soil Gas Concentrations provided in Tables 3a and 3c of the EPA guidance (see Table 1). A comparison of the soil vapor sample concentration data to the site-specific Target Shallow Soil Gas Concentrations indicates that 1,3-butadiene (SV-1, SV-4, and SV-5 soil vapor samples) and TCE (SV-2 soil vapor sample) exceeded their respective site-specific Target Shallow Soil Gas Concentrations for the $1x10^{-6}$ risk level in a limited number of samples. No constituents exceeded the site-specific soil gas concentrations at the $1x10^{-4}$ risk level.

The TCE exceedance at soil boring SV-2 is consistent with the fact that TCE is the primary COPC detected downgradient of the Site relative to the soil vapor intrusion pathway. As discussed previously, SV-2 was located approximately 18 feet from well W-18, which historically had the highest detected TCE concentrations off-site. TCE concentrations at SV-2 are below the site-specific target concentrations at the $1x10^{-4}$ risk level. The site-specific values are most appropriate for use at the Site because they take into consideration both soil type and depth of sampling.

1,3-butadiene is a chemical made from the processing of petroleum (ATSDR, 1995). About 75% of the manufactured 1,3-butadiene is used to make synthetic rubber, including tires on cars and trucks. 1,3-butadiene is also used to make plastics including acrylics. Small amounts are found in gasoline. 1,3-butadiene was detected at soil borings SV-1, SV-4, SV-5, and SV-6, which were located along East Windsor Road, but was not detected at soil boring SV-2, which was located approximately 190 feet from East Windsor Road. The presence of 1,3-butadiene in the soil vapor samples collected adjacent to East Windsor Road suggests that this compound is related to vehicle use on the road (i.e., impacts from roadway runoff).

Similar to 1,3-butadiene, aromatic hydrocarbons (e.g., benzene, toluene, ethylbenzene, and xylene [BTEX]) were detected at low levels at soil vapor points SV-1, SV-4, SV-5, and SV-6. BTEX compounds were not detected at soil boring SV-2. The presence of BTEX compounds in the soil vapor samples collected adjacent to East Windsor Road also suggests that these compounds are related to vehicle use on the road.

Site-related chlorinated VOCs (CVOCs) (e.g., TCE, 1,1,1-trichloroethane [1,1,1-TCA], 1,1-dichloroethane [1,1-DCA], cis-1,2-dichloroethene [cis-1,2-DCE]) were not detected in the soil vapor sample collected at soil boring SV-1. The absence of these CVOCs at soil boring SV-1 supports the conceptual site model (CSM) that the North Stream intercepts VOC-impacted groundwater. These CVOCs were detected in the soil vapor sample collected at soil boring SV-2, which is located on the east side of the North Stream.

Collectively, the data indicate that there is no current potential for exposure at residences downgradient of the landfill. However, vapor intrusion could potentially be a route of future exposure if a residential dwelling were to be constructed in the general area of soil boring SV-2.

5. Conclusions

Based on the data that was collected during the soil vapor screening evaluation, ARCADIS concludes the following:

- The particle size analyses indicate that the predominant soil type is loamy sand. Lower permeability soil types (i.e., silt loam and loam) are also present. These soil types are consistent with a glacial depositional environment and are expected to significantly limit the potential movement of VOCs in soil vapor.

- Groundwater was generally encountered at depths approximately 9 to 10 ft bls in the soil borings.

- A comparison of the soil vapor sample concentration data to the site-specific Target Shallow Soil Gas Concentrations indicates that 1,3-butadiene (SV-1, SV-4, and SV-5 soil vapor samples) and TCE (SV-2 soil vapor sample) exceed their respective site-specific Target Shallow Soil Gas Concentrations for the $1x10^{-6}$ risk level, but not at the$1x10^{-4}$

risk level. These exceedances do not pose a current potential for exposure at residences downgradient of the landfill.

- TCE was detected at concentrations above the $1x10^{-6}$ risk level only at SV-2, which was near the off-site groundwater well (W-18) that exhibited the highest concentration of TCE in off-site groundwater.

- The presence of 1,3-butadiene in the soil vapor samples collected adjacent to East Windsor Road and not near the groundwater plume suggests that this compound is related to vehicle use on the road.

- BTEX compounds in the soil vapor samples collected adjacent to East Windsor Road are also likely related to vehicle use on the road.

- The absence of Site-related CVOCs at soil boring SV-1 supports the CSM that the North Stream intercepts VOC-impacted groundwater.

- While monitoring well W-18 is located on a property where there is currently an abandoned house and, therefore, no current potential for exposure, the soil vapor sample data collected from soil boring SV-2 suggests that vapor intrusion could potentially be a route of future exposure if a residential dwelling were to be constructed there.

- The collective soil vapor sample data support the CSM that groundwater VOC concentrations in well W-18 are not representative of the groundwater VOC concentrations near other residences (e.g., Scott and Smith residences). This is due to the fact that the residences are located either sidegradient of the locations where the highest VOC concentrations have been measured in groundwater, or are located on the other side of the North Stream.

6. References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. ToxFAQs for 1,3-Butadiene. September 1995.

ARCADIS. 2008. Soil Vapor Screening Evaluation Work Plan. October 2008.

U.S. Department of Agriculture (USDA). 1993. Soil Survey Manual. October 1993.

U.S. Environmental Protection Agency (USEPA). 2002. OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance). November 2002.

Table 1. Concentrations of Volatile Organic Compounds in Soil Vapor Samples Collected from Temporary Soil Vapor Points, Soil Vapor Screening Evaluation, Colesville Landfill, Broome County, New York.

Sample ID Compound [5]	Soil Vapor Concentration (ug/m^3)	Target Shallow Soil Gas Concentration [1] (ug/m^3) Risk = 1 x 10^{-4}	Soil Vapor Concentration Exceeds Target Shallow Soil Gas Concentration [1] Risk = 1 x 10^{-4}	Target Shallow Soil Gas Concentration [1] (ug/m^3) Risk = 1 x 10^{-6}	Soil Vapor Concentration Exceeds Target Shallow Soil Gas Concentration [1] Risk = 1 x 10^{-6}	Soil Type [2]	Representative Scenario-Specific Attenuation Factor [3]	Target Shallow Soil Gas Concentration [4] (ug/m^3) Risk = 1 x 10^{-4}	Target Shallow Soil Gas Concentration [4] (ug/m^3) Risk = 1 x 10^{-6}
SV-1 (8')									
Freon 12	1.5	2,000	No	2,000	No	**Loamy Sand**	$2x10^{-3}$	NR	NR
Chloromethane	0.86	900	No	24	No			NR	NR
1,3-Butadiene	**54**	8.7	**Yes**	0.087	**Yes**	**SV-1 (6-8)**		430	4.3
Bromomethane	2.8	50	No	50	No	Gravel - 7.5%		NR	NR
Freon 11	1.3	7,000	No	7,000	No	Sand - 70%		NR	NR
Ethanol	3.6	NA	--	NA	--	Coarse Sand - 5.1%		--	--
Acetone	130	3,500	No	3,500	No	Medium Sand - 10.9%		NR	NR
Carbon Disulfide	9.8	7,000	No	7,000	No	Fine Sand - 54.0%		NR	NR
Hexane	36	2,000	No	2,000	No	Silt - 14.7%		NR	NR
2-Butanone (Methyl Ethyl Ketone)	25	10,000	No	10,000	No	Clay - 7.7%		NR	NR
Chloroform	2.5	110	No	1.1	**Yes**			5,300	53
Cyclohexane	10	NA	--	NA	--			--	--
Benzene	26	310	No	3.1	**Yes**			16,000	160
Heptane	28	NA	--	NA	--			--	--
Toluene	14	4,000	No	4,000	No			NR	NR
Ethyl Benzene	0.90	2,200	No	22	No			NR	NR
m,p-Xylene	1.7	70,000	No	70,000	No			NR	NR
o-Xylene	0.84	70,000	No	70,000	No			NR	NR
SV-2 (8')									
Freon 12	31	2,000	No	2,000	No	**Loamy Sand**	$2x10^{-3}$	NR	NR
Chloroethane	10	100,000	No	100,000	No			NR	NR
Freon 11	7.6	7,000	No	7,000	No	**SV-2 (6-8)**		NR	NR
Ethanol	10	NA	--	NA	--	Gravel - 47.7%		--	--
Freon 113	74	300,000	No	300,000	No	Sand - 39.1%		NR	NR
1,1-Dichloroethene	8.2	2,000	No	2,000	No	Coarse Sand - 4.9%		NR	NR
Acetone	34	3,500	No	3,500	No	Medium Sand - 17.1%		NR	NR
trans-1,2-Dichloroethene	3.2	700	No	700	No	Fine Sand - 17.1%		NR	NR
1,1-Dichloroethane	230	5,000	No	5,000	No	Silt - 7.0%		NR	NR
2-Butanone (Methyl Ethyl Ketone)	12	10,000	No	10,000	No	Clay - 6.1%		NR	NR
cis-1,2-Dichloroethene	130	350	No	350	No			NR	NR
Chloroform	17	110	No	1.1	**Yes**			5,300	53
1,1,1-Trichloroethane	710	22,000	No	22,000	No			NR	NR
Trichloroethene	**550**	22	**Yes**	0.22	**Yes**			1,100	11

See footnotes on last page.

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Sample ID Compound [5]	Soil Vapor Concentration (ug/m^3)	Target Shallow Soil Gas Concentration [1] (ug/m^3) Risk = 1 x 10^{-4}	Soil Vapor Concentration Exceeds Target Shallow Soil Gas Concentration [1] Risk = 1 x 10^{-4}	Target Shallow Soil Gas Concentration [1] (ug/m^3) Risk = 1 x 10^{-6}	Soil Vapor Concentration Exceeds Target Shallow Soil Gas Concentration [1] Risk = 1 x 10^{-6}	Soil Type [2]	Representative Scenario-Specific Attenuation Factor [3]	Target Shallow Soil Gas Concentration [4] (ug/m^3) Risk = 1 x 10^{-4}	Target Shallow Soil Gas Concentration [4] (ug/m^3) Risk = 1 x 10^{-6}
SV-4 (9')									
Freon 12	1.8	2,000	No	2,000	No	**Loamy Sand**	$2x10^{-3}$	NR	NR
Chloromethane	0.94	900	No	24	No			NR	NR
1,3-Butadiene	**9.2**	8.7	**Yes**	0.087	**Yes**	**SV-4 (7-9)**		430	4.3
Freon 11	2.0	7,000	No	7,000	No	Gravel - 47.9%		NR	NR
Ethanol	5.4	NA	--	NA	--	Sand - 39.4%		--	--
Freon 113	6.9	300,000	No	300,000	No	Coarse Sand - 14.5%		NR	NR
Acetone	35	3,500	No	3,500	No	Medium Sand - 14.6%		NR	NR
Carbon Disulfide	3.4	7,000	No	7,000	No	Fine Sand - 10.2%		NR	NR
Hexane	57	2,000	No	2,000	No	Silt - 7.7%		NR	NR
1,1-Dichloroethane	2.3	5,000	No	5,000	No	Clay - 5.1%		NR	NR
2-Butanone (Methyl Ethyl Ketone)	7.2	10,000	No	10,000	No			NR	NR
Chloroform	3.0	110	No	1.1	**Yes**			5,300	53
1,1,1-Trichloroethane	15	22,000	No	22,000	No			NR	NR
Cyclohexane	18	NA	--	NA	--			--	--
Benzene	11	310	No	3.1	**Yes**			16,000	160
Heptane	34	NA	--	NA	--			--	--
Trichloroethene	2.3	22	No	0.22	**Yes**			1,100	11
Toluene	6.8	4,000	No	4,000	No			NR	NR
Ethyl Benzene	0.79	2,200	No	22	No			NR	NR
m,p-Xylene	1.3	70,000	No	70,000	No			NR	NR
o-Xylene	0.64	70,000	No	70,000	No			NR	NR
SV-5 (8.5')									
Freon 12	2.6	2,000	No	2,000	No	**Loamy Sand**	$2x10^{-3}$	NR	NR
1,3-Butadiene	**7.7**	8.7	No	0.087	**Yes**			430	4.3
Bromomethane	0.64	50	No	50	No	**SV-5 (6.5-8.5)**		NR	NR
Freon 11	1.6	7,000	No	7,000	No	Gravel - 46.8%		NR	NR
Ethanol	2.0	NA	--	NA	--	Sand - 40.2%		--	--
Freon 113	7.4	300,000	No	300,000	No	Coarse Sand - 11.8%		NR	NR
Acetone	45	3,500	No	3,500	No	Medium Sand - 19.8%		NR	NR
Carbon Disulfide	2.8	7,000	No	7,000	No	Fine Sand - 8.6%		NR	NR
Hexane	23	2,000	No	2,000	No	Silt - 7.9%		NR	NR
1,1-Dichloroethane	2.5	5,000	No	5,000	No	Clay - 5.2%		NR	NR
2-Butanone (Methyl Ethyl Ketone)	8.0	10,000	No	10,000	No			NR	NR
Chloroform	3.2	110	No	1.1	**Yes**			5,300	53
1,1,1-Trichloroethane	26	22,000	No	22,000	No			NR	NR
Cyclohexane	6.4	NA	--	NA	--			--	--
Benzene	7.7	310	No	3.1	**Yes**			16,000	160
Heptane	16	NA	--	NA	--			--	--
Trichloroethene	4.2	22	No	0.22	**Yes**			1,100	11
Toluene	6.9	4,000	No	4,000	No			NR	NR
Tetrachloroethene	1.4	810	No	8.1	No			NR	NR
m,p-Xylene	1.5	70,000	No	70,000	No			NR	NR

See footnotes on last page.

Table 1. Concentrations of Volatile Organic Compounds in Soil Vapor Samples Collected from Temporary Soil Vapor Points, Soil Vapor Screening Evaluation, Colesville Landfill, Broome County, New York.

Sample ID Compound [5]	Soil Vapor Concentration (ug/m^3)	Target Shallow Soil Gas Concentration [1] (ug/m^3) Risk = 1 x 10^{-4}	Soil Vapor Concentration Exceeds Target Shallow Soil Gas Concentration [1] Risk = 1 x 10^{-4}	Target Shallow Soil Gas Concentration [1] (ug/m^3) Risk = 1 x 10^{-6}	Soil Vapor Concentration Exceeds Target Shallow Soil Gas Concentration [1] Risk = 1 x 10^{-6}	Soil Type [2]	Representative Scenario-Specific Attenuation Factor [3]	Target Shallow Soil Gas Concentration [4] (ug/m^3) Risk = 1 x 10^{-4}	Target Shallow Soil Gas Concentration [4] (ug/m^3) Risk = 1 x 10^{-6}
SV-6 (4')									
Freon 12	0.67 J	2,000	No	2,000	No	**Loam**	$1x10^{-3}$	NR	NR
Chloromethane	0.85 J	900	No	24	No			NR	NR
1,3-Butadiene	1.8 J	8.7	No	0.087	**Yes**	**SV-6 (2-4)**		870	8.7
Bromomethane	1.8 J	50	No	50	No	Gravel - 0.3%		NR	NR
Ethanol	3.4 J	NA	--	NA	--	Sand - 49.0%		--	--
Freon 113	1.3 J	300,000	No	300,000	No	Coarse Sand - 0.5%		NR	NR
Acetone	120 J	3,500	No	3,500	No	Medium Sand - 1.7%		NR	NR
2-Propanol	1.7 J	NA	--	NA	--	Fine Sand - 46.8%		--	--
Hexane	1.9 J	2,000	No	2,000	No	Silt - 32.4%		NR	NR
2-Butanone (Methyl Ethyl Ketone)	19 J	10,000	No	10,000	No	Clay - 18.4%		NR	NR
Chloroform	1.0 J	110	No	1.1	No			NR	NR
1,1,1-Trichloroethane	2.2 J	22,000	No	22,000	No			NR	NR
Benzene	1.9 J	310	No	3.1	No			NR	NR
Heptane	1.0 J	NA	--	NA	--			--	--
Toluene	2.3 J	4,000	No	4,000	No			NR	NR
Ethyl Benzene	0.86 J	2,200	No	22	No			NR	NR
m,p-Xylene	0.77 J	70,000	No	70,000	No			NR	NR
Styrene	3.1 J	10,000	No	10,000	No			NR	NR
4-Ethyltoluene	0.81 J	NA	--	NA	--			--	--
1,2,4-Trimethylbenzene	0.95 J	60	No	60	No			NR	NR

1	Generic Attenuation Factor = 0.1.
2	Soil types were determined using laboratory particle size analyses and soil texture descriptions in the United States Department of Agriculture Soil Survey Manual, October 1993.
3	The representative Scenario-Specific Attenuation Factor was selected using Figure 3a from EPA OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), November 2002.
4	Representative Scenario-Specific Attenuation Factor.
5	Only compounds detected above the laboratory reporting limit are presented.
ug/m^3	Micrograms per cubic meter.
J	Estimated value.
NA	Not available.
NR	Analysis not required based on comparison to Target Shallow Soil Gas Concentrations (Generic Attenuation Factor).
	Soil Vapor Concentration Equals or Exceeds Target Shallow Soil Gas Concentration, Risk = 1 x 10^{-6} (Representative Scenario-Specific Attenuation Factor).

PROJECT AREA

LANDFILL

EAST WINDSOR ROAD

NORTH STREAM

SOUTH STREAM

Susquehanna River

DEFREITA

RILEY

HILL

KITCHEN

SCOTT JR

SCOTT

SMITH

LEE

LAVARE

1010 1000 990 980 970 960 950

0 200' 400'
SCALE IN FEET

NOTE: ALL LOCATIONS ARE APPROXIMATE

EXPLANATION

- SV-1 — LOCATION AND DESIGNATION OF SOIL BORING AND SOIL VAPOR SAMPLE POINT
- W-24 — LOCATION AND DESIGNATION OF RI MONITORING WELL
- SCOTT — LOCATION AND DESIGNATION OF EXISTING HOMEOWNER WELL
- HILL — LOCATION AND DESIGNATION OF FORMER HOMEOWNER WELL
- IW-2 — LOCATION AND DESIGNATION OF INJECTION WELL
- GMPW-2 — LOCATION AND DESIGNATION OF PRODUCTION WELL
- 950 — WATER LEVEL CONTOUR IN FT. MSL; CONTOUR INTERVAL IS FIVE (5) FT (DASHED WHERE INFERRED)
- HORIZONTAL COMPONENT OF FLOW

LONG-TERM MONITORING PLAN DESIGNATIONS

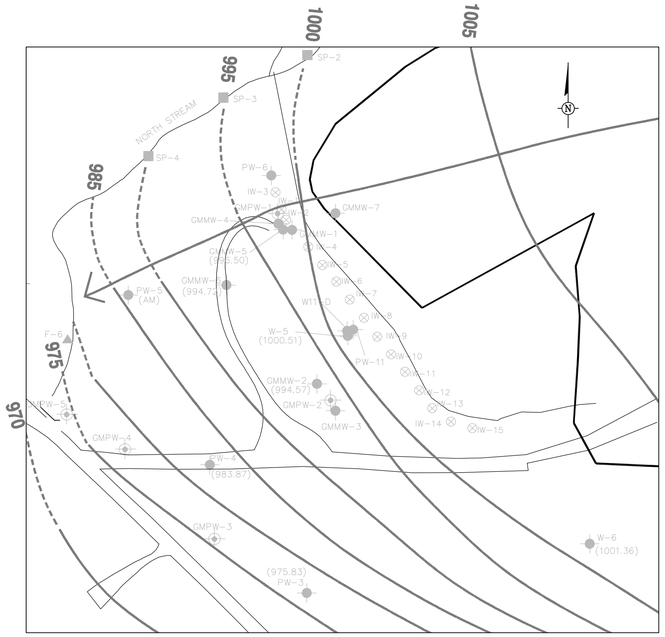
- W-5 — LOCATION AND DESIGNATION OF QUARTERLY MONITORING WELL
- W-6 — LOCATION AND DESIGNATION OF SEMI-ANNUAL MONITORING WELL
- W-16S — LOCATION AND DESIGNATION OF ANNUAL MONITORING WELL
- F-6 — LOCATION AND DESIGNATION OF SURFACE WATER SAMPLE LOCATION
- SP-2 — LOCATION AND DESIGNATION OF SPRING SAMPLE LOCATION
- W-13 (1007.00) — LOCATION AND DESIGNATION OF WELLS INCLUDED IN HYDRAULIC MEASUREMENT PROGRAM AND WATER-LEVEL ELEVATION IN FT MSL (WELL SYMBOL AND OTHER LTM COMPONENTS NOT SHOWN)

NOTES:

WATER-LEVEL ELEVATIONS AND GROUNDWATER FLOW DIRECTION BASED ON SEPTEMBER 13, 2005 WATER-LEVEL ROUND

FT MSL FEET RELATIVE TO MEAN SEA LEVEL

AM ANOMALOUS MEASUREMENT



SITE PLAN SHOWING PROJECT AREA

0 100' 200'
SCALE IN FEET

COLESVILLE LANDFILL
BROOME COUNTY, NEW YORK

SOIL BORING AND SOIL VAPOR SAMPLE LOCATIONS

ARCADIS

FIGURE
1

ARCADIS

Appendix A

Soil Vapor Samples Analytical Data

Air Toxics Ltd.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: SV-5 (8.5')

Lab ID#: 0811050-01A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**g111415**	**Date of Collection:**	**10/30/08**
Dil. Factor:	**1.52**	**Date of Analysis:**	**11/14/08 07:39 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Freon 12	0.15	0.54	0.75	2.6
Freon 114	0.15	Not Detected	1.1	Not Detected
Chloromethane	0.15	Not Detected	0.31	Not Detected
Vinyl Chloride	0.15	Not Detected	0.39	Not Detected
1,3-Butadiene	0.15	3.5	0.34	7.7
Bromomethane	0.15	0.16	0.59	0.64
Chloroethane	0.15	Not Detected	0.40	Not Detected
Freon 11	0.15	0.29	0.85	1.6
Ethanol	0.76	1.1	1.4	2.0
Freon 113	0.15	0.97	1.2	7.4
1,1-Dichloroethene	0.15	Not Detected	0.60	Not Detected
Acetone	0.76	19	1.8	45
2-Propanol	0.76	Not Detected	1.9	Not Detected
Carbon Disulfide	0.76	0.90	2.4	2.8
Methylene Chloride	0.30	Not Detected UJ	1.0	Not Detected UJ
Methyl tert-butyl ether	0.15	Not Detected	0.55	Not Detected
trans-1,2-Dichloroethene	0.15	Not Detected	0.60	Not Detected
Hexane	0.15	6.6	0.54	23
1,1-Dichloroethane	0.15	0.61	0.62	2.5
2-Butanone (Methyl Ethyl Ketone)	0.15	2.7	0.45	8.0
cis-1,2-Dichloroethene	0.15	Not Detected	0.60	Not Detected
Tetrahydrofuran	0.76	Not Detected	2.2	Not Detected
Chloroform	0.15	0.65	0.74	3.2
1,1,1-Trichloroethane	0.15	4.8	0.83	26
Cyclohexane	0.15	1.9	0.52	6.4
Carbon Tetrachloride	0.15	Not Detected	0.96	Not Detected
Benzene	0.15	2.4	0.48	7.7
1,2-Dichloroethane	0.15	Not Detected	0.62	Not Detected
Heptane	0.15	3.9	0.62	16
Trichloroethene	0.15	0.78	0.82	4.2
1,2-Dichloropropane	0.15	Not Detected	0.70	Not Detected
1,4-Dioxane	0.15	Not Detected	0.55	Not Detected
Bromodichloromethane	0.15	Not Detected	1.0	Not Detected
cis-1,3-Dichloropropene	0.15	Not Detected	0.69	Not Detected
4-Methyl-2-pentanone	0.15	Not Detected	0.62	Not Detected
Toluene	0.15	1.8	0.57	6.9
trans-1,3-Dichloropropene	0.15	Not Detected	0.69	Not Detected
1,1,2-Trichloroethane	0.15	Not Detected	0.83	Not Detected
Tetrachloroethene	0.15	0.21	1.0	1.4

0007

Air Toxics LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: SV-5 (8.5')

Lab ID#: 0811050-01A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**g111415**	**Date of Collection: 10/30/08**	
Dil. Factor:	**1.52**	**Date of Analysis: 11/14/08 07:39 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Hexanone	0.76	Not Detected	3.1	Not Detected
Dibromochloromethane	0.15	Not Detected	1.3	Not Detected
1,2-Dibromoethane (EDB)	0.15	Not Detected	1.2	Not Detected
Chlorobenzene	0.15	Not Detected	0.70	Not Detected
Ethyl Benzene	0.15	Not Detected	0.66	Not Detected
m,p-Xylene	0.15	0.34	0.66	1.5
o-Xylene	0.15	Not Detected	0.66	Not Detected
Styrene	0.15	Not Detected	0.65	Not Detected
Bromoform	0.15	Not Detected	1.6	Not Detected
Cumene	0.15	Not Detected	0.75	Not Detected
1,1,2,2-Tetrachloroethane	0.15	Not Detected	1.0	Not Detected
Propylbenzene	0.15	Not Detected	0.75	Not Detected
4-Ethyltoluene	0.15	Not Detected	0.75	Not Detected
1,3,5-Trimethylbenzene	0.15	Not Detected	0.75	Not Detected
1,2,4-Trimethylbenzene	0.15	Not Detected	0.75	Not Detected
1,3-Dichlorobenzene	0.15	Not Detected	0.91	Not Detected
1,4-Dichlorobenzene	0.15	Not Detected	0.91	Not Detected
alpha-Chlorotoluene	0.15	Not Detected UJ	0.79	Not Detected UJ
1,2-Dichlorobenzene	0.15	Not Detected	0.91	Not Detected
1,2,4-Trichlorobenzene	0.76	Not Detected	5.6	Not Detected
Hexachlorobutadiene	0.76	Not Detected	8.1	Not Detected

Container Type: 6 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	110	70-130
Toluene-d8	107	70-130
4-Bromofluorobenzene	98	70-130

0008

Air Toxics LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: SV-6 (4')

Lab ID#: 0811050-02A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	g111416	**Date of Collection:**	10/30/08
Dil. Factor:	1.34	**Date of Analysis:**	11/14/08 08:19 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Freon 12	0.13	0.14 J	0.66	0.67 J
Freon 114	0.13	Not Detected	0.94	Not Detected
Chloromethane	0.13	0.41	0.28	0.85
Vinyl Chloride	0.13	Not Detected	0.34	Not Detected
1,3-Butadiene	0.13	0.80	0.30	1.8
Bromomethane	0.13	0.48	0.52	1.8
Chloroethane	0.13	Not Detected	0.35	Not Detected
Freon 11	0.13	Not Detected	0.75	Not Detected
Ethanol	0.67	1.8	1.3	3.4
Freon 113	0.13	0.16	1.0	1.3
1,1-Dichloroethene	0.13	Not Detected	0.53	Not Detected
Acetone	0.67	49	1.6	120
2-Propanol	0.67	0.68	1.6	1.7
Carbon Disulfide	0.67	Not Detected J	2.1	Not Detected J
Methylene Chloride	0.27	Not Detected UJ	0.93	Not Detected UJ
Methyl tert-butyl ether	0.13	Not Detected J	0.48	Not Detected J
trans-1,2-Dichloroethene	0.13	Not Detected	0.53	Not Detected
Hexane	0.13	0.54	0.47	1.9
1,1-Dichloroethane	0.13	Not Detected	0.54	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.13	6.6	0.40	19
cis-1,2-Dichloroethene	0.13	Not Detected	0.53	Not Detected
Tetrahydrofuran	0.67	Not Detected	2.0	Not Detected
Chloroform	0.13	0.21	0.65	1.0
1,1,1-Trichloroethane	0.13	0.40	0.73	2.2
Cyclohexane	0.13	Not Detected	0.46	Not Detected
Carbon Tetrachloride	0.13	Not Detected	0.84	Not Detected
Benzene	0.13	0.59	0.43	1.9
1,2-Dichloroethane	0.13	Not Detected	0.54	Not Detected
Heptane	0.13	0.24	0.55	1.0
Trichloroethene	0.13	Not Detected	0.72	Not Detected
1,2-Dichloropropane	0.13	Not Detected	0.62	Not Detected
1,4-Dioxane	0.13	Not Detected	0.48	Not Detected
Bromodichloromethane	0.13	Not Detected	0.90	Not Detected
cis-1,3-Dichloropropene	0.13	Not Detected	0.61	Not Detected
4-Methyl-2-pentanone	0.13	Not Detected	0.55	Not Detected
Toluene	0.13	0.61	0.50	2.3
trans-1,3-Dichloropropene	0.13	Not Detected	0.61	Not Detected
1,1,2-Trichloroethane	0.13	Not Detected	0.73	Not Detected
Tetrachloroethene	0.13	Not Detected J	0.91	Not Detected J

0037

Air Toxics Ltd.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: SV-6 (4')

Lab ID#: 0811050-02A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**g111416**	**Date of Collection:**	**10/30/08**
Dil. Factor:	**1.34**	**Date of Analysis:**	**11/14/08 08:19 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Hexanone	0.67	Not Detected J	2.7	Not Detected J
Dibromochloromethane	0.13	Not Detected	1.1	Not Detected
1,2-Dibromoethane (EDB)	0.13	Not Detected	1.0	Not Detected
Chlorobenzene	0.13	Not Detected	0.62	Not Detected
Ethyl Benzene	0.13	0.20	0.58	0.86
m,p-Xylene	0.13	0.18	0.58	0.77
o-Xylene	0.13	Not Detected	0.58	Not Detected
Styrene	0.13	0.73	0.57	3.1
Bromoform	0.13	Not Detected	1.4	Not Detected
Cumene	0.13	Not Detected	0.66	Not Detected
1,1,2,2-Tetrachloroethane	0.13	Not Detected	0.92	Not Detected
Propylbenzene	0.13	Not Detected	0.66	Not Detected
4-Ethyltoluene	0.13	0.16	0.66	0.81
1,3,5-Trimethylbenzene	0.13	Not Detected	0.66	Not Detected
1,2,4-Trimethylbenzene	0.13	0.19	0.66	0.95
1,3-Dichlorobenzene	0.13	Not Detected	0.80	Not Detected
1,4-Dichlorobenzene	0.13	Not Detected J	0.80	Not Detected J
alpha-Chlorotoluene	0.13	Not Detected UJ	0.69	Not Detected UJ
1,2-Dichlorobenzene	0.13	Not Detected J	0.80	Not Detected J
1,2,4-Trichlorobenzene	0.67	Not Detected J	5.0	Not Detected J
Hexachlorobutadiene	0.67	Not Detected J	7.1	Not Detected J

Container Type: 6 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	114	70-130
Toluene-d8	106	70-130
4-Bromofluorobenzene	100	70-130

0038

Air Toxics LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: Rep 103108

Lab ID#: 0811050-03A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**z111708**	**Date of Collection:**	**10/31/08**
Dil. Factor:	**6.20**	**Date of Analysis:**	**11/17/08 02:01 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Freon 12	0.62	6.4	3.1	32
Freon 114	0.62	Not Detected	4.3	Not Detected
Chloromethane	0.62	Not Detected	1.3	Not Detected
Vinyl Chloride	0.62	Not Detected	1.6	Not Detected
1,3-Butadiene	0.62	0.72	1.4	1.6
Bromomethane	0.62	Not Detected	2.4	Not Detected
Chloroethane	0.62	4.1	1.6	11
Freon 11	0.62	1.6	3.5	8.8
Ethanol	3.1	3.8	5.8	7.2
Freon 113	0.62	10	4.8	77
1,1-Dichloroethene	0.62	2.4	2.4	9.5
Acetone	3.1	12	7.4	29
2-Propanol	3.1	Not Detected	7.6	Not Detected
Carbon Disulfide	3.1	Not Detected	9.6	Not Detected
Methylene Chloride	1.2	Not Detected UJ	4.3	Not Detected UJ
Methyl tert-butyl ether	0.62	Not Detected	2.2	Not Detected
trans-1,2-Dichloroethene	0.62	Not Detected	2.4	Not Detected
Hexane	0.62	0.77	2.2	2.7
1,1-Dichloroethane	0.62	60	2.5	240
2-Butanone (Methyl Ethyl Ketone)	0.62	4.0	1.8	12
cis-1,2-Dichloroethene	0.62	36	2.4	140
Tetrahydrofuran	3.1	Not Detected	9.1	Not Detected
Chloroform	0.62	4.8	3.0	23
1,1,1-Trichloroethane	0.62	130	3.4	730
Cyclohexane	0.62	Not Detected	2.1	Not Detected
Carbon Tetrachloride	0.62	4.2 J	3.9	26 J
Benzene	0.62	0.66	2.0	2.1
1,2-Dichloroethane	0.62	Not Detected	2.5	Not Detected
Heptane	0.62	Not Detected	2.5	Not Detected
Trichloroethene	0.62	100	3.3	540
1,2-Dichloropropane	0.62	Not Detected	2.9	Not Detected
1,4-Dioxane	0.62	Not Detected	2.2	Not Detected
Bromodichloromethane	0.62	Not Detected	4.2	Not Detected
cis-1,3-Dichloropropene	0.62	Not Detected	2.8	Not Detected
4-Methyl-2-pentanone	0.62	Not Detected	2.5	Not Detected
Toluene	0.62	Not Detected	2.3	Not Detected
trans-1,3-Dichloropropene	0.62	Not Detected	2.8	Not Detected
1,1,2-Trichloroethane	0.62	Not Detected	3.4	Not Detected
Tetrachloroethene	0.62	Not Detected	4.2	Not Detected

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: Rep 103108

Lab ID#: 0811050-03A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**z111708**	**Date of Collection:**	**10/31/08**
Dil. Factor:	**6.20**	**Date of Analysis:**	**11/17/08 02:01 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Hexanone	3.1	Not Detected	13	Not Detected
Dibromochloromethane	0.62	Not Detected	5.3	Not Detected
1,2-Dibromoethane (EDB)	0.62	Not Detected	4.8	Not Detected
Chlorobenzene	0.62	Not Detected	2.8	Not Detected
Ethyl Benzene	0.62	Not Detected	2.7	Not Detected
m,p-Xylene	0.62	Not Detected	2.7	Not Detected
o-Xylene	0.62	Not Detected	2.7	Not Detected
Styrene	0.62	Not Detected	2.6	Not Detected
Bromoform	0.62	Not Detected	6.4	Not Detected
Cumene	0.62	Not Detected	3.0	Not Detected
1,1,2,2-Tetrachloroethane	0.62	Not Detected	4.2	Not Detected
Propylbenzene	0.62	Not Detected	3.0	Not Detected
4-Ethyltoluene	0.62	Not Detected	3.0	Not Detected
1,3,5-Trimethylbenzene	0.62	Not Detected	3.0	Not Detected
1,2,4-Trimethylbenzene	0.62	Not Detected	3.0	Not Detected
1,3-Dichlorobenzene	0.62	Not Detected	3.7	Not Detected
1,4-Dichlorobenzene	0.62	Not Detected	3.7	Not Detected
alpha-Chlorotoluene	0.62	Not Detected UJ	3.2	Not Detected UJ
1,2-Dichlorobenzene	0.62	Not Detected	3.7	Not Detected
1,2,4-Trichlorobenzene	3.1	Not Detected	23	Not Detected
Hexachlorobutadiene	3.1	Not Detected	33	Not Detected

Container Type: 6 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	116	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	99	70-130

0068

Air Toxics Ltd.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: SV-4 (9')

Lab ID#: 0811050-04A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**z111707**	**Date of Collection:**	**10/31/08**
Dil. Factor:	**1.44**	**Date of Analysis:**	**11/17/08 01:11 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Freon 12	0.14	0.37	0.71	1.8
Freon 114	0.14	Not Detected	1.0	Not Detected
Chloromethane	0.14	0.46	0.30	0.94
Vinyl Chloride	0.14	Not Detected	0.37	Not Detected
1,3-Butadiene	0.14	4.2	0.32	9.2
Bromomethane	0.14	Not Detected	0.56	Not Detected
Chloroethane	0.14	Not Detected	0.38	Not Detected
Freon 11	0.14	0.35	0.81	2.0
Ethanol	0.72	2.9	1.4	5.4
Freon 113	0.14	0.91	1.1	6.9
1,1-Dichloroethene	0.14	Not Detected	0.57	Not Detected
Acetone	0.72	15	1.7	35
2-Propanol	0.72	Not Detected	1.8	Not Detected
Carbon Disulfide	0.72	1.1	2.2	3.4
Methylene Chloride	0.29	Not Detected WJ	1.0	Not Detected WJ
Methyl tert-butyl ether	0.14	Not Detected	0.52	Not Detected
trans-1,2-Dichloroethene	0.14	Not Detected	0.57	Not Detected
Hexane	0.14	16	0.51	57
1,1-Dichloroethane	0.14	0.58	0.58	2.3
2-Butanone (Methyl Ethyl Ketone)	0.14	2.4	0.42	7.2
cis-1,2-Dichloroethene	0.14	Not Detected	0.57	Not Detected
Tetrahydrofuran	0.72	Not Detected	2.1	Not Detected
Chloroform	0.14	0.62	0.70	3.0
1,1,1-Trichloroethane	0.14	2.8	0.78	15
Cyclohexane	0.14	5.2	0.50	18
Carbon Tetrachloride	0.14	Not Detected	0.91	Not Detected
Benzene	0.14	3.6	0.46	11
1,2-Dichloroethane	0.14	Not Detected	0.58	Not Detected
Heptane	0.14	8.3	0.59	34
Trichloroethene	0.14	0.42	0.77	2.3
1,2-Dichloropropane	0.14	Not Detected	0.66	Not Detected
1,4-Dioxane	0.14	Not Detected	0.52	Not Detected
Bromodichloromethane	0.14	Not Detected	0.96	Not Detected
cis-1,3-Dichloropropene	0.14	Not Detected	0.65	Not Detected
4-Methyl-2-pentanone	0.14	Not Detected	0.59	Not Detected
Toluene	0.14	1.8	0.54	6.8
trans-1,3-Dichloropropene	0.14	Not Detected	0.65	Not Detected
1,1,2-Trichloroethane	0.14	Not Detected	0.78	Not Detected
Tetrachloroethene	0.14	Not Detected	0.98	Not Detected

0093

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: SV-4 (9')

Lab ID#: 0811050-04A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**z111707**	**Date of Collection: 10/31/08**	
Dil. Factor:	**1.44**	**Date of Analysis: 11/17/08 01:11 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Hexanone	0.72	Not Detected	2.9	Not Detected
Dibromochloromethane	0.14	Not Detected	1.2	Not Detected
1,2-Dibromoethane (EDB)	0.14	Not Detected	1.1	Not Detected
Chlorobenzene	0.14	Not Detected	0.66	Not Detected
Ethyl Benzene	0.14	0.18	0.62	0.79
m,p-Xylene	0.14	0.30	0.62	1.3
o-Xylene	0.14	0.15	0.62	0.64
Styrene	0.14	Not Detected	0.61	Not Detected
Bromoform	0.14	Not Detected	1.5	Not Detected
Cumene	0.14	Not Detected	0.71	Not Detected
1,1,2,2-Tetrachloroethane	0.14	Not Detected	0.99	Not Detected
Propylbenzene	0.14	Not Detected	0.71	Not Detected
4-Ethyltoluene	0.14	Not Detected	0.71	Not Detected
1,3,5-Trimethylbenzene	0.14	Not Detected	0.71	Not Detected
1,2,4-Trimethylbenzene	0.14	Not Detected	0.71	Not Detected
1,3-Dichlorobenzene	0.14	Not Detected	0.86	Not Detected
1,4-Dichlorobenzene	0.14	Not Detected	0.86	Not Detected
alpha-Chlorotoluene	0.14	Not Detected UJ	0.74	Not Detected UJ
1,2-Dichlorobenzene	0.14	Not Detected	0.86	Not Detected
1,2,4-Trichlorobenzene	0.72	Not Detected	5.3	Not Detected
Hexachlorobutadiene	0.72	Not Detected	7.7	Not Detected

Container Type: 6 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	109	70-130
Toluene-d8	99	70-130
4-Bromofluorobenzene	103	70-130

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: SV-2 (8')

Lab ID#: 0811050-05A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**z111709**	**Date of Collection:**	**10/31/08**
Dil. Factor:	**6.20**	**Date of Analysis:**	**11/17/08 02:32 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Freon 12	0.62	6.3	3.1	31
Freon 114	0.62	Not Detected	4.3	Not Detected
Chloromethane	0.62	Not Detected	1.3	Not Detected
Vinyl Chloride	0.62	Not Detected	1.6	Not Detected
1,3-Butadiene	0.62	Not Detected	1.4	Not Detected
Bromomethane	0.62	Not Detected	2.4	Not Detected
Chloroethane	0.62	3.8	1.6	10
Freon 11	0.62	1.4	3.5	7.6
Ethanol	3.1	5.5	5.8	10
Freon 113	0.62	9.7	4.8	74
1,1-Dichloroethene	0.62	2.1	2.4	8.2
Acetone	3.1	14	7.4	34
2-Propanol	3.1	Not Detected	7.6	Not Detected
Carbon Disulfide	3.1	Not Detected	9.6	Not Detected
Methylene Chloride	1.2	Not Detected UJ	4.3	Not Detected UJ
Methyl tert-butyl ether	0.62	Not Detected	2.2	Not Detected
trans-1,2-Dichloroethene	0.62	0.82	2.4	3.2
Hexane	0.62	Not Detected	2.2	Not Detected
1,1-Dichloroethane	0.62	57	2.5	230
2-Butanone (Methyl Ethyl Ketone)	0.62	3.9	1.8	12
cis-1,2-Dichloroethene	0.62	34	2.4	130
Tetrahydrofuran	3.1	Not Detected	9.1	Not Detected
Chloroform	0.62	3.5	3.0	17
1,1,1-Trichloroethane	0.62	130	3.4	710
Cyclohexane	0.62	Not Detected	2.1	Not Detected
Carbon Tetrachloride	0.62	Not Detected J	3.9	Not Detected J
Benzene	0.62	Not Detected	2.0	Not Detected
1,2-Dichloroethane	0.62	Not Detected	2.5	Not Detected
Heptane	0.62	Not Detected	2.5	Not Detected
Trichloroethene	0.62	100	3.3	550
1,2-Dichloropropane	0.62	Not Detected	2.9	Not Detected
1,4-Dioxane	0.62	Not Detected	2.2	Not Detected
Bromodichloromethane	0.62	Not Detected	4.2	Not Detected
cis-1,3-Dichloropropene	0.62	Not Detected	2.8	Not Detected
4-Methyl-2-pentanone	0.62	Not Detected	2.5	Not Detected
Toluene	0.62	Not Detected	2.3	Not Detected
trans-1,3-Dichloropropene	0.62	Not Detected	2.8	Not Detected
1,1,2-Trichloroethane	0.62	Not Detected	3.4	Not Detected
Tetrachloroethene	0.62	Not Detected	4.2	Not Detected

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: SV-2 (8')

Lab ID#: 0811050-05A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**z111709**	**Date of Collection:**	**10/31/08**
Dil. Factor:	**6.20**	**Date of Analysis:**	**11/17/08 02:32 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Hexanone	3.1	Not Detected	13	Not Detected
Dibromochloromethane	0.62	Not Detected	5.3	Not Detected
1,2-Dibromoethane (EDB)	0.62	Not Detected	4.8	Not Detected
Chlorobenzene	0.62	Not Detected	2.8	Not Detected
Ethyl Benzene	0.62	Not Detected	2.7	Not Detected
m,p-Xylene	0.62	Not Detected	2.7	Not Detected
o-Xylene	0.62	Not Detected	2.7	Not Detected
Styrene	0.62	Not Detected	2.6	Not Detected
Bromoform	0.62	Not Detected	6.4	Not Detected
Cumene	0.62	Not Detected	3.0	Not Detected
1,1,2,2-Tetrachloroethane	0.62	Not Detected	4.2	Not Detected
Propylbenzene	0.62	Not Detected	3.0	Not Detected
4-Ethyltoluene	0.62	Not Detected	3.0	Not Detected
1,3,5-Trimethylbenzene	0.62	Not Detected	3.0	Not Detected
1,2,4-Trimethylbenzene	0.62	Not Detected	3.0	Not Detected
1,3-Dichlorobenzene	0.62	Not Detected	3.7	Not Detected
1,4-Dichlorobenzene	0.62	Not Detected	3.7	Not Detected
alpha-Chlorotoluene	0.62	Not Detected UJ	3.2	Not Detected UJ
1,2-Dichlorobenzene	0.62	Not Detected	3.7	Not Detected
1,2,4-Trichlorobenzene	3.1	Not Detected	23	Not Detected
Hexachlorobutadiene	3.1	Not Detected	33	Not Detected

Container Type: 6 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	114	70-130
Toluene-d8	98	70-130
4-Bromofluorobenzene	98	70-130

0125

AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: SV-1 (8')

Lab ID#: 0811050-06A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**g111419**	**Date of Collection:**	**10/31/08**
Dil. Factor:	**1.68**	**Date of Analysis:**	**11/14/08 10:36 PM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
Freon 12	0.17	0.30	0.83	1.5
Freon 114	0.17	Not Detected	1.2	Not Detected
Chloromethane	0.17	0.42	0.35	0.86
Vinyl Chloride	0.17	Not Detected	0.43	Not Detected
1,3-Butadiene	0.17	25	0.37	54
Bromomethane	0.17	0.72	0.65	2.8
Chloroethane	0.17	Not Detected	0.44	Not Detected
Freon 11	0.17	0.24	0.94	1.3
Ethanol	0.84	1.9	1.6	3.6
Freon 113	0.17	Not Detected	1.3	Not Detected
1,1-Dichloroethene	0.17	Not Detected	0.67	Not Detected
Acetone	0.84	55	2.0	130
2-Propanol	0.84	Not Detected	2.1	Not Detected
Carbon Disulfide	0.84	3.2	2.6	9.8
Methylene Chloride	0.34	Not Detected UJ	1.2	Not Detected UJ
Methyl tert-butyl ether	0.17	Not Detected	0.60	Not Detected
trans-1,2-Dichloroethene	0.17	Not Detected	0.67	Not Detected
Hexane	0.17	10	0.59	36
1,1-Dichloroethane	0.17	Not Detected	0.68	Not Detected
2-Butanone (Methyl Ethyl Ketone)	0.17	8.6	0.50	25
cis-1,2-Dichloroethene	0.17	Not Detected	0.67	Not Detected
Tetrahydrofuran	0.84	Not Detected	2.5	Not Detected
Chloroform	0.17	0.51	0.82	2.5
1,1,1-Trichloroethane	0.17	Not Detected	0.92	Not Detected
Cyclohexane	0.17	3.0	0.58	10
Carbon Tetrachloride	0.17	Not Detected	1.0	Not Detected
Benzene	0.17	8.2	0.54	26
1,2-Dichloroethane	0.17	Not Detected	0.68	Not Detected
Heptane	0.17	6.8	0.69	28
Trichloroethene	0.17	Not Detected	0.90	Not Detected
1,2-Dichloropropane	0.17	Not Detected	0.78	Not Detected
1,4-Dioxane	0.17	Not Detected	0.60	Not Detected
Bromodichloromethane	0.17	Not Detected	1.1	Not Detected
cis-1,3-Dichloropropene	0.17	Not Detected	0.76	Not Detected
4-Methyl-2-pentanone	0.17	Not Detected	0.69	Not Detected
Toluene	0.17	3.7	0.63	14
trans-1,3-Dichloropropene	0.17	Not Detected	0.76	Not Detected
1,1,2-Trichloroethane	0.17	Not Detected	0.92	Not Detected
Tetrachloroethene	0.17	Not Detected	1.1	Not Detected

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AN ENVIRONMENTAL ANALYTICAL LABORATORY

Client Sample ID: SV-1 (8')

Lab ID#: 0811050-06A

MODIFIED EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	g111419	**Date of Collection:**	10/31/08
Dil. Factor:	1.68	**Date of Analysis:**	11/14/08 10:36 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (uG/m3)	Amount (uG/m3)
2-Hexanone	0.84	Not Detected	3.4	Not Detected
Dibromochloromethane	0.17	Not Detected	1.4	Not Detected
1,2-Dibromoethane (EDB)	0.17	Not Detected	1.3	Not Detected
Chlorobenzene	0.17	Not Detected	0.77	Not Detected
Ethyl Benzene	0.17	0.21	0.73	0.90
m,p-Xylene	0.17	0.40	0.73	1.7
o-Xylene	0.17	0.19	0.73	0.84
Styrene	0.17	Not Detected	0.72	Not Detected
Bromoform	0.17	Not Detected	1.7	Not Detected
Cumene	0.17	Not Detected	0.82	Not Detected
1,1,2,2-Tetrachloroethane	0.17	Not Detected	1.2	Not Detected
Propylbenzene	0.17	Not Detected	0.82	Not Detected
4-Ethyltoluene	0.17	Not Detected	0.82	Not Detected
1,3,5-Trimethylbenzene	0.17	Not Detected	0.82	Not Detected
1,2,4-Trimethylbenzene	0.17	Not Detected	0.82	Not Detected
1,3-Dichlorobenzene	0.17	Not Detected	1.0	Not Detected
1,4-Dichlorobenzene	0.17	Not Detected	1.0	Not Detected
alpha-Chlorotoluene	0.17	Not Detected UJ	0.87	Not Detected UJ
1,2-Dichlorobenzene	0.17	Not Detected	1.0	Not Detected
1,2,4-Trichlorobenzene	0.84	Not Detected	6.2	Not Detected
Hexachlorobutadiene	0.84	Not Detected	9.0	Not Detected

Container Type: 6 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	119	70-130
Toluene-d8	108	70-130
4-Bromofluorobenzene	102	70-130

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Appendix B

Scenario-Specific Attenuation Factors
Rationale Information

Rationale for Selecting Semi-Site Specific Attenuation Factor and Reference(s):

SV-1 – Loamy Sand

1) 7.5 % Gravel
2) 70 % Sand
3) 14.7 % Silt
4) 7.7 % Clay

14.7 % (Silt) + 1.5 x 7.7 % (Clay) = 26.25 %

14.7 % (Silt) + 2 x 7.7 % (Clay) = 30.1 %

Loamy Sand:
1) Between 70 and 91 % Sand
2) % of Silt + 1.5 x % Clay >15 %
3) % of Silt + 2 x % Clay <30 %

Reference: United States Department of Agriculture Soil Survey Manual (USDA, 1993)

Rationale for Selecting Semi-Site Specific Attenuation Factor and Reference(s):

SV-2 – Loamy Sand

1) 47.7 % Gravel
2) 39.1 % Sand
3) 7 % Silt
4) 6.1 % (Clay)

7 % (Silt) + 1.5 x 6.1 % (Clay) = 16.15 %

7 % (Silt) + 2 x 6.1 % (Clay) = 19.2 %

Loamy Sand:
1) Between 70 and 91 % Sand
2) % of Silt + 1.5 x % Clay >15 %
3) % of Silt + 2 x % Clay <30 %

Reference: United States Department of Agriculture Soil Survey Manual (USDA, 1993)

Rationale for Selecting Semi-Site Specific Attenuation Factor and Reference(s):

SV-4 – Loamy Sand

1) 47.9 % Gravel
2) 39.4 % Sand
3) 7.7 % Silt
4) 5.1 % Clay

7.7 % (Silt) + 1.5 x 5.1 % (Clay) = 15.35 %

7.7 % (Silt) + 2 x 5.1 % (Clay) = 17.9 %

Loamy Sand:
1) Between 70 and 91 % Sand
2) % of Silt + 1.5 x % Clay >15 %
3) % of Silt + 2 x % Clay <30 %

Reference: United States Department of Agriculture Soil Survey Manual (USDA, 1993)

Rationale for Selecting Semi-Site Specific Attenuation Factor and Reference(s):

SV-5 – Loamy Sand

1) 46.8 % Gravel
2) 40.2 % Sand
3) 7.9 % Silt
4) 5.2 % Clay

7.9 % (Silt) + 1.5 x 5.2 % (Clay) = 15.7 %

7.9 % (Silt) + 2 x 5.2 % (Clay) = 18.3 %

Loamy Sand:
1) Between 70 and 91 % Sand
2) % of Silt + 1.5 x % Clay >15 %
3) % of Silt + 2 x % Clay <30 %

Reference: United States Department of Agriculture Soil Survey Manual (USDA, 1993)

Rationale for Selecting Semi-Site Specific Attenuation Factor and Reference(s):

SV-6 – Loam

1) 0.3 % Gravel
2) 49.0 % Sand
2) 32.4 % Silt
3) 18.4 % Clay

Loam:
1) 7 to 27 % Clay
2) 28 to 50 % Silt
3) 52 % or less Sand

Reference: United States Department of Agriculture Soil Survey Manual (USDA, 1993)

Loamy Sand - SV-1, SV-2, SV-4, and SV-5

Figure 3a- DRAFT
Vapor Attenuation Factors - Soil Vapor to Indoor Air Pathway
Basement Foundations

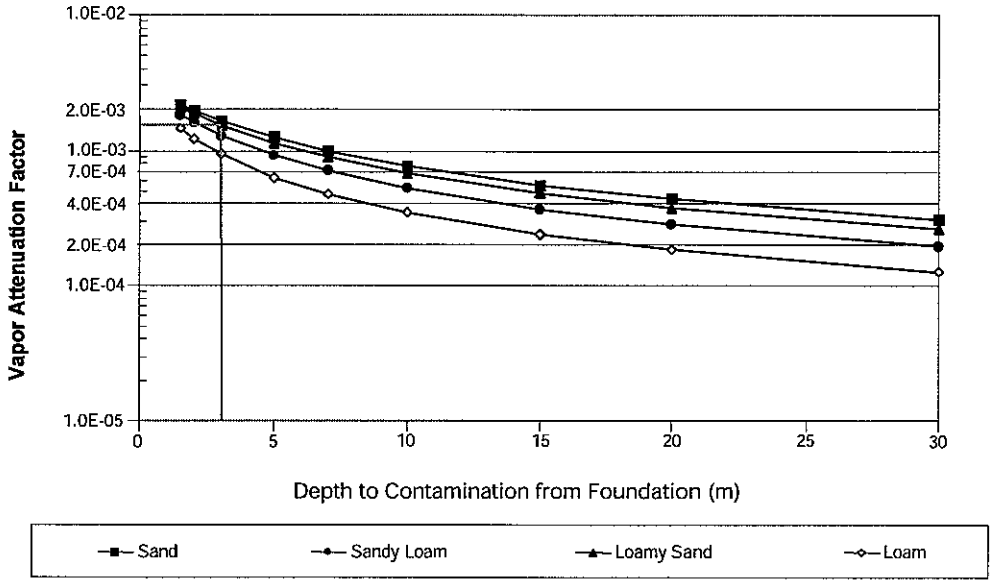
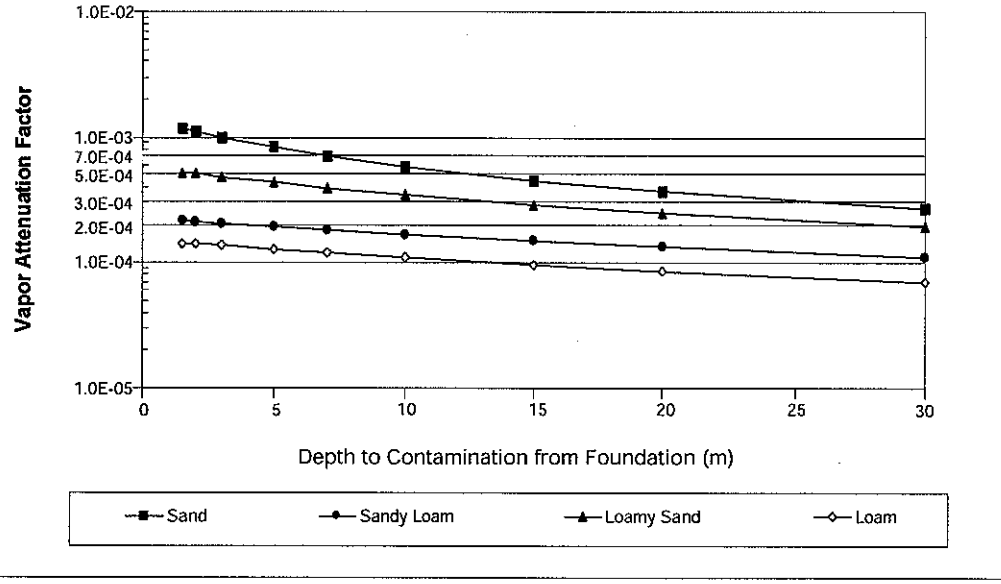


Figure 3b- DRAFT
Vapor Attenuation Factors - Ground Water to Indoor Air Pathway
Basement Foundations



Loam - SV-6

Figure 3a- DRAFT
Vapor Attenuation Factors - Soil Vapor to Indoor Air Pathway
Basement Foundations

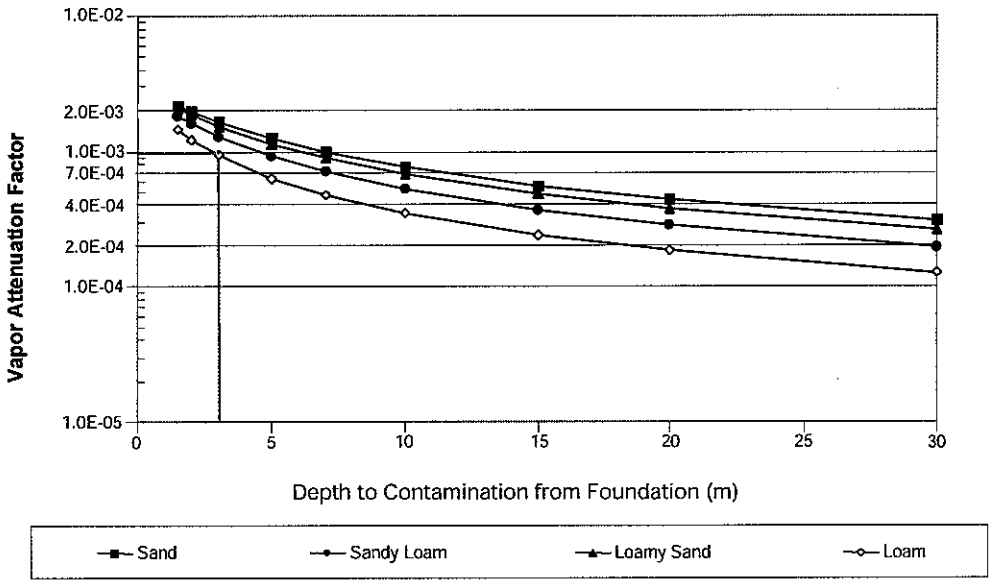
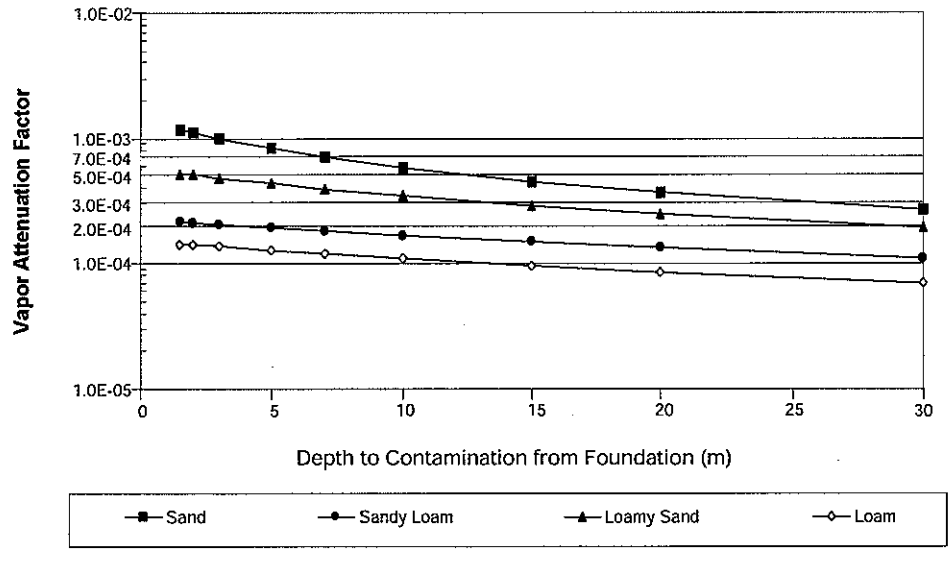


Figure 3b- DRAFT
Vapor Attenuation Factors - Ground Water to Indoor Air Pathway
Basement Foundations



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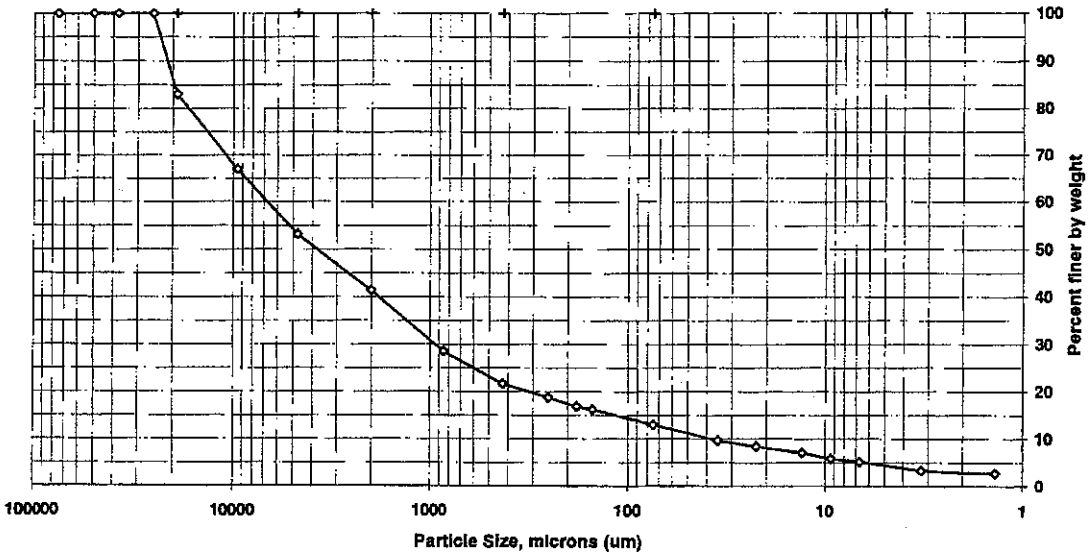
Appendix C

Particle Size Analyses Laboratory Data

Particle Size of Soils by ASTM D422

Client Code:	STLCTS	**SDG:**	22071081	**Date Received:**	11/5/2008
Sample ID:	SV-5(6.5-8.5)	**ETR(s):**	128675	**Start Date:**	11/10/2008
Lab ID:	774608			**End Date:**	12/1/2008

Percent Solids:	95.9%	**Non-soil material:**	na
Specific Gravity:	2.650	**Shape (> #10):**	subangular
Maximum Particle Size:	25 mm	**Hardness (> #10):**	hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	83.1	16.9
3/8 inch	9500	66.9	16.2
#4	4750	53.2	13.7
#10	2000	41.4	11.8
#20	850	28.6	12.8
#40	425	21.6	7.0
#60	250	18.8	2.8
#80	180	16.8	1.9
#100	150	16.3	0.6
#200	75	13.0	3.3
Hydrometer	35.2	9.7	3.3
I	22.5	8.4	1.3
I	13.1	7.1	1.3
I	9.3	5.8	1.3
I	6.7	5.2	0.6
I	3.2	3.3	1.8
V	1.4	2.7	0.6

Soil Classification	Percent of Total Sample
Gravel	46.8
Sand	40.2
Coarse Sand	11.8
Medium Sand	19.8
Fine Sand	8.6
Silt	7.9
Clay	5.2

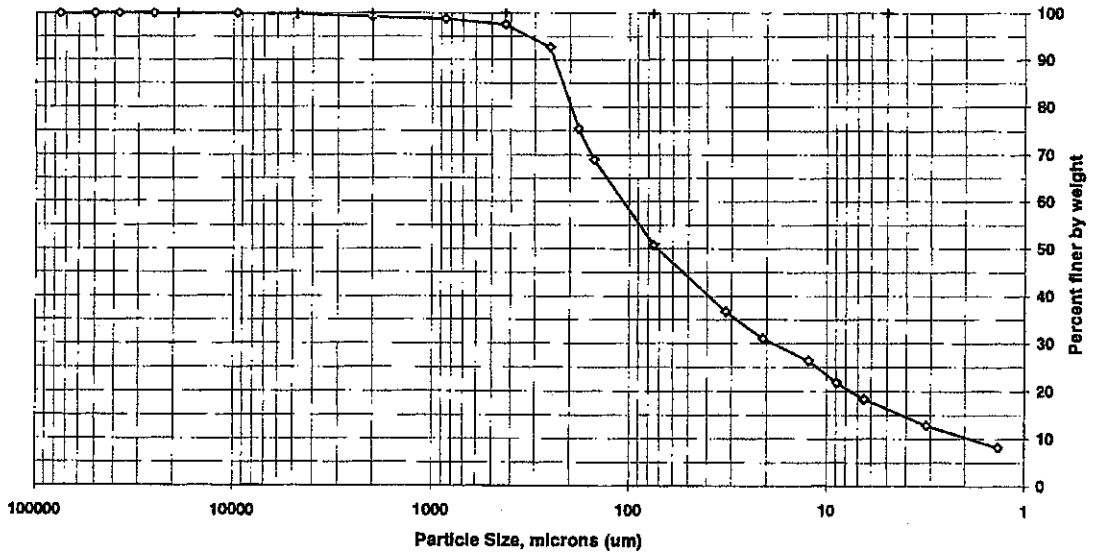
Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

FSL024:07.29.05:0

Particle Size of Soils by ASTM D422

Client Code:	STLCTS	**SDG:**	22071081	**Date Received:**	11/5/2008
Sample ID:	SV-6(2-4)	**ETR(s):**	128675	**Start Date:**	11/10/2008
Lab ID:	774609			**End Date:**	12/1/2008

Percent Solids:	85.0%	**Non-soil material:**	na
Specific Gravity:	2.650	**Shape (> #10):**	subangular
Maximum Particle Size:	9.5 mm	**Hardness (> #10):**	hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	99.7	0.3
#10	2000	99.2	0.5
#20	850	98.7	0.6
#40	425	97.5	1.1
#60	250	92.7	4.8
#80	180	75.5	17.2
#100	150	68.9	6.6
#200	75	50.8	18.1
Hydrometer	32.0	36.7	14.0
|	20.9	31.0	5.7
|	12.3	26.4	4.6
|	8.9	21.8	4.6
|	6.5	18.4	3.4
|	3.1	12.8	5.6
V	1.4	8.2	4.6

Soil Classification	Percent of Total Sample
Gravel	0.3
Sand	49.0
Coarse Sand	0.5
Medium Sand	1.7
Fine Sand	46.8
Silt	32.4
Clay	18.4

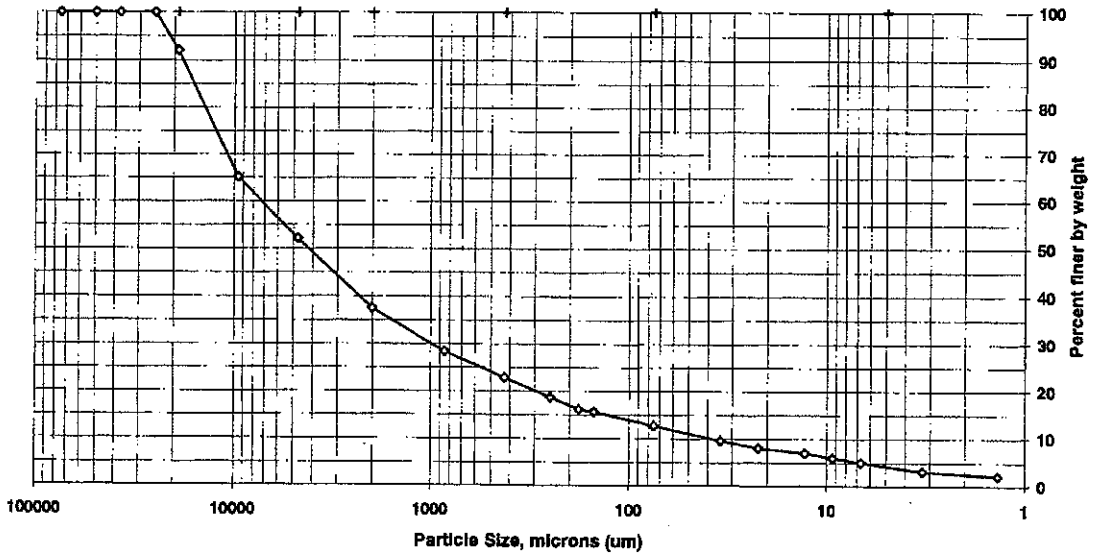
Preparation Method: **D2217**
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

FSL024:07.29.05:0

Particle Size of Soils by ASTM D422

Client Code:	STLCTS	**SDG:**	22071081	**Date Received:**	11/5/2008
Sample ID:	SV-4(7-9)	**ETR(s):**	128675	**Start Date:**	11/10/2008
Lab ID:	774610			**End Date:**	12/1/2008

Percent Solids:	95.3%	**Non-soil material:**	na
Specific Gravity:	2.650	**Shape (> #10):**	subrounded
Maximum Particle Size:	25 mm	**Hardness (> #10):**	hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	92.0	8.0
3/8 inch	9500	65.1	26.9
#4	4750	52.1	13.1
#10	2000	37.5	14.5
#20	850	28.4	9.1
#40	425	22.9	5.5
#60	250	18.8	4.1
#80	180	16.2	2.5
#100	150	15.7	0.5
#200	75	12.7	3.0
Hydrometer	34.4	9.6	3.1
|	22.1	8.1	1.5
|	12.9	7.1	1.0
|	9.4	6.1	1.0
|	6.7	5.1	1.0
|	3.3	3.1	1.9
V	1.4	2.1	1.0

Soil Classification	Percent of Total Sample
Gravel	47.9
Sand	39.4
Coarse Sand	14.5
Medium Sand	14.6
Fine Sand	10.2
Silt	7.7
Clay	5.1

Preparation Method: **D2217**
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

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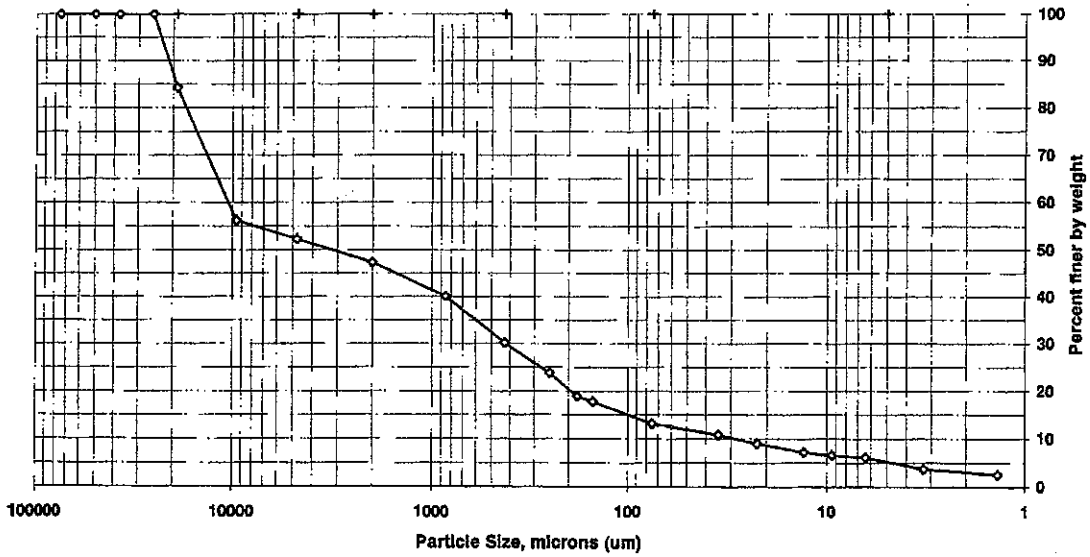
Particle Size of Soils by ASTM D422

Client Code:	STLCTS	**SDG:**	22071081	**Date Received:**	11/5/2008
Sample ID:	SV-2(6-8)	**ETR(s):**	128675	**Start Date:**	11/10/2008
Lab ID:	774611			**End Date:**	12/1/2008

Percent Solids:	93.8%	**Non-soil material:**	na
Specific Gravity:	2.650	**Shape (> #10):**	subrounded
Maximum Particle Size:	25 mm	**Hardness (> #10):**	hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	84.3	15.7
3/8 inch	9500	56.2	28.1
#4	4750	52.3	3.9
#10	2000	47.3	4.9
#20	850	40.1	7.2
#40	425	30.2	9.9
#60	250	23.8	6.4
#80	180	18.9	4.9
#100	150	17.7	1.2
#200	75	13.1	4.6
Hydrometer	34.6	10.8	2.3
|	22.2	9.0	1.8
|	13.0	7.2	1.8
|	9.4	6.6	0.6
|	6.4	6.1	0.5
|	3.3	3.7	2.4
V	1.4	2.5	1.2

Soil Classification	Percent of Total Sample
Gravel	47.7
Sand	39.1
Coarse Sand	4.9
Medium Sand	17.1
Fine Sand	17.1
Silt	7.0
Clay	6.1

Preparation Method: **D2217**
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

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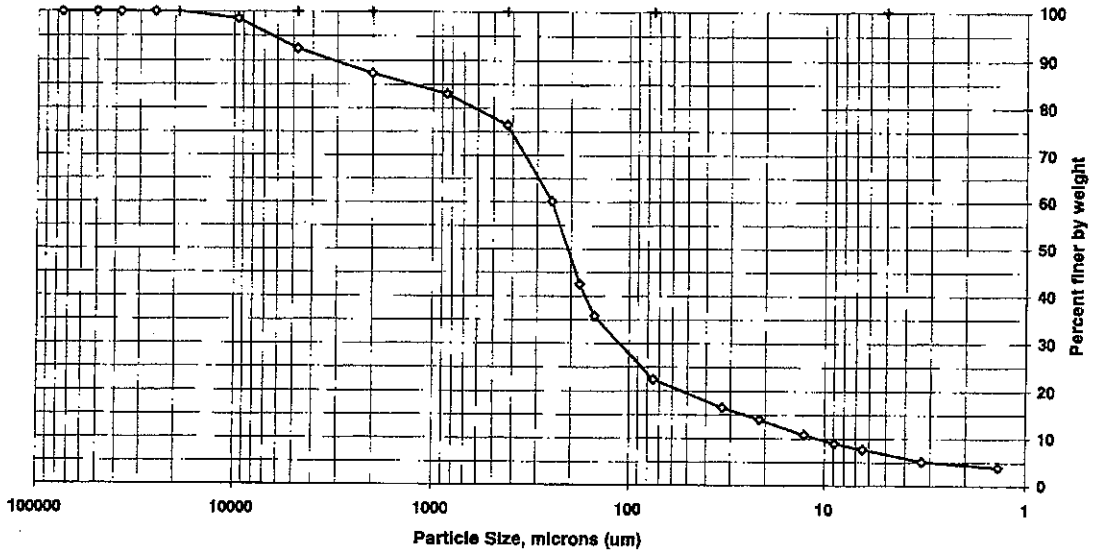
Particle Size of Soils by ASTM D422

Client Code:	STLCTS	**SDG:**	22071081	**Date Received:**	11/5/2008
Sample ID:	SV-1(6-8)	**ETR(s):**	128675	**Start Date:**	11/10/2008
Lab ID:	774612			**End Date:**	12/1/2008

Percent Solids:	90.6%	**Non-soil material:**	na
Specific Gravity:	2.650	**Shape (> #10):**	subangular
Maximum Particle Size:	19 mm	**Hardness (> #10):**	hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	98.6	1.4
#4	4750	92.5	6.1
#10	2000	87.3	5.1
#20	850	83.1	4.3
#40	425	76.4	6.7
#60	250	60.1	16.3
#80	180	42.5	17.7
#100	150	35.8	6.7
#200	75	22.4	13.3
Hydrometer	33.0	16.6	5.8
	21.3	14.1	2.5
	12.6	10.9	3.2
	8.9	9.0	1.9
	6.5	7.7	1.3
	3.3	5.2	2.5
V	1.4	3.9	1.3

Soil Classification	Percent of Total Sample
Gravel	7.5
Sand	70.0
Coarse Sand	5.1
Medium Sand	10.9
Fine Sand	54.0
Silt	14.7
Clay	7.7

Preparation Method: **D2217**
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

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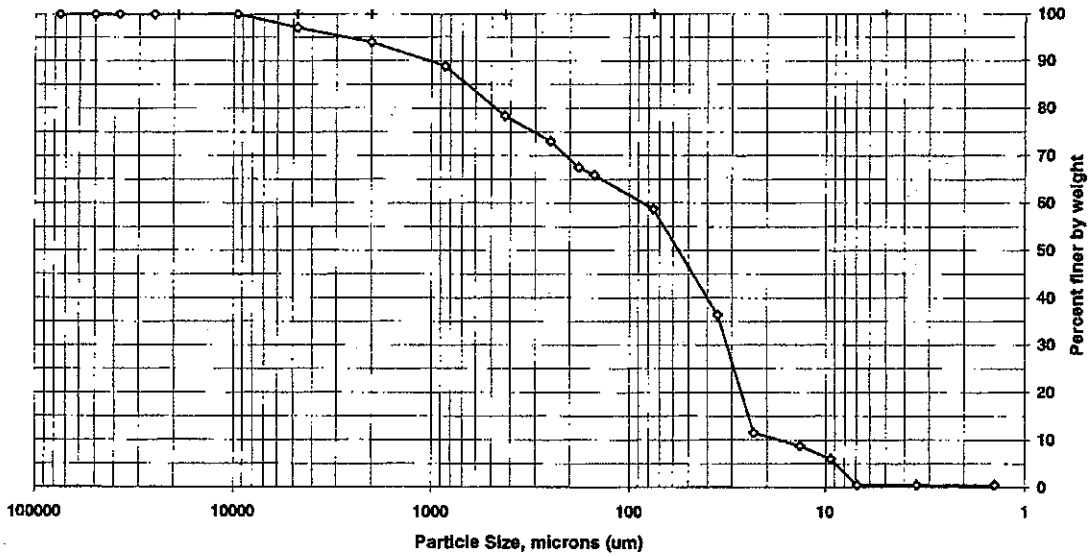
Particle Size of Soils by ASTM D422

Client Code:	STLCTS	**SDG:**	22071081	**Date Received:**	11/5/2008
Sample ID:	SV-3(3.2-5.2)	**ETR(s):**	128675	**Start Date:**	11/10/2008
Lab ID:	774613			**End Date:**	12/1/2008

Percent Solids:	28.3%	**Non-soil material:**	plant
Specific Gravity:	2.650	**Shape (> #10):**	subangular
Maximum Particle Size:	9.5 mm	**Hardness (> #10):**	hard



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	97.1	2.9
#10	2000	94.0	3.1
#20	850	88.8	5.2
#40	425	78.4	10.4
#60	250	73.0	5.4
#80	180	67.5	5.4
#100	150	65.9	1.6
#200	75	58.7	7.2
Hydrometer	35.3	36.4	22.4
I	23.3	11.5	24.9
I	13.5	8.7	2.8
I	9.4	6.0	2.8
I	6.9	0.5	5.5
I	3.5	0.5	0.0
V	1.4	0.5	0.0

Soil Classification	Percent of Total Sample
Gravel	2.9
Sand	38.4
Coarse Sand	3.1
Medium Sand	15.6
Fine Sand	19.7
Silt	58.3
Clay	0.5

Preparation Method: **D2217**
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

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