

**Workplan for Soil-Vapor Investigation
MND #054497052
111 – 22nd Avenue Northeast
Minneapolis, Minnesota**

Submitted for:
Univar USA Inc., Kirkland , Washington

Submitted by:
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Project 004623.000.0

AMEC Geomatrix

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WORKPLAN FOR SOIL-VAPOR INVESTIGATION

MND#054497052

111 – 22nd Avenue Northeast
Minneapolis, Minnesota

1.0 INTRODUCTION

In a letter dated March 13, 2009 to Univar USA Inc. (Univar) the Minnesota Pollution Control Agency (MPCA) requested that Univar prepare a work plan for additional soil-vapor investigation in connection with the referenced site (Figure 1). This letter provides the work plan and is submitted to the MPCA for review and comment. The following elements are included: 1) background information, 2) a description of the rationale for the scope of the investigation and 3) a specific plan for data collection with a schedule.

2.0 BACKGROUND INFORMATION

As noted by the MPCA, Univar has conducted significant investigation into soil-vapor conditions both on and off the site. Investigations conducted in 2004 and 2006 included the sampling of soil vapor and indoor air at 55 locations. The source for VOCs in soil vapor is VOCs in relatively shallow (e.g., 12 feet below ground surface) groundwater. Univar focused these investigations where soil-vapor concentrations exceeded U.S. EPA screening levels (i.e., above 4,100 micrograms per cubic meter [$\mu\text{g}/\text{m}^3$] for PCE [tetrachloroethene] and above 110 $\mu\text{g}/\text{m}^3$ for TCE [trichloroethene]) because these were the areas with the greatest potential for vapor-intrusion concerns. The results of the previous investigations, as reported to the MPCA in 2004 and 2006, showed that the vapor intrusion pathway is not complete in these areas.

At the locations sampled in the previous investigations, except at the MP23 area (Figure 1), nearby soil-vapor extraction systems were operating at the time data were collected. This suggests that the mitigating effects of the soil-vapor extraction systems may have caused the vapor intrusion pathway to be incomplete. It may also be that the attenuation from soil vapor to indoor air is sufficient to prevent the completion of the intrusion pathway. The latter is supported by observations at the MP23 area, where data were collected while no extraction systems were operating. Under these conditions, the vapor intrusion pathway was not complete.

In addition to the investigation activities, Univar has taken interim remedial measures and implemented an extensive soil-vapor monitoring program. The interim remedial measures consist of soil-vapor extraction systems, as depicted on Figure 1, operating in areas with the

highest soil-vapor concentrations to impose a pneumatic barrier to the migration of impacted soil vapor. The soil-vapor monitoring program includes 31 monitoring points designed specifically for sampling soil vapor that are located both on and off site. The primary goals of the soil-vapor monitoring program are to evaluate the potential for vapor intrusion concerns and to detect changes in soil-vapor concentrations over time.

The monitoring network includes soil-vapor monitoring point MP31 (Figure 1), which was referenced in the MPCA's March 13, 2009 letter and is the focus of the currently planned investigation. The specific purpose for monitoring at MP31 is to assess soil-vapor conditions in an area where TCE has been detected in groundwater at concentrations up to 350 µg/L (micrograms per liter). These concentrations suggested that the potential for TCE impacts to soil vapor from groundwater could not be ruled out. Subsequent sampling of MP31 indicated TCE concentrations ranging from 60 to 510 µg/m³ (4 samples), as compared to the MPCA soil-vapor screening value of 30 µg/m³. The soil-vapor results at MP31 are much lower than the soil-vapor concentration at MP23 prior to SVE operation in that area (11,000 µg/m³) and are similar to the range of concentrations that have been detected at MP23 since SVE operation began (6 to 860 µg/m³). PCE concentrations are comparable to those for TCE, but TCE screening values are lower. The same issues described above for TCE apply to PCE.

3.0 PURPOSE OF THE INVESTIGATION

The purpose of the investigation described in this work plan is to evaluate the potential vapor intrusion concern for houses in the MP31/MW11 area (Figure 2). In the process, this evaluation is anticipated to provide additional information relating to the migration of VOCs in soil vapor at this site.

The spatial extent of the investigation is based (primarily) on the results of previous sampling in the area between MP31 and the site (Figure 1). This includes groundwater sampling at SB24 through SB29 and MW10 through MW13, and soil-vapor sampling at MP31 and SG34. VOC concentrations in groundwater at MW11 have been consistently greater than concentrations at the other monitoring wells (MW12 and MW13) in the area. Soil-vapor sample results from SG34 and groundwater sample results from direct-push borings SB27 and SB28, which are located between the site and MW11, were below screening values. VOCs have not been detected in groundwater samples at MW10, which is located 590 feet south of MW11, and were not detected in groundwater samples collected at SB26, 27 and 28. The investigation is therefore focused on houses in the MP31/MW11 area.

4.0 INVESTIGATION APPROACH

The investigation will include soil-vapor sampling and a contingent building survey that is focused on the houses located within 100 feet of MP31, which is shown as Area 1 on Figure 2. Area 1 includes six houses. The sampling will consist of collecting soil-vapor samples near (e.g., within three feet) each building foundation. The implementation of a building survey will be contingent upon the results of the respective soil-vapor sampling.

Based on the results from Area 1, the investigation may be extended to Area 2 (Figure 2). The investigation of Area 2 is planned to be a contingency because the results at MP23 suggest the likelihood that vapor-intrusion impacts will not be identified. However, the investigation of Area 2 is integral to this work plan and will not be delayed if the findings from Area 1 support it.

Decision-making based on the results of the investigation will proceed as follows. The subsurface soil-vapor sampling results will be compared to screening values. If the results are less than screening values, the conclusion will be that the vapor-intrusion pathway is not complete for that building and no further investigation will be conducted. If a result is greater than a screening value, a building survey will be conducted for the house at which the screening value was exceeded. The building survey will include the collection and analysis of an indoor air sample, which will follow the protocol previously used at the site in 2004 and 2006 and approved by the MDH.

The indoor-air sampling results will be compared to MPCA/MDH ISVs (intrusion screening values) to decide the continuing scope of the investigation, after first ruling out the potential for cross contamination from above-ground sources. If the results exceed screening values, the investigation will be extended into Area 2 (Figure 2). The investigation of Area 2 will proceed in the same manner as Area 1.

5.0 DATA COLLECTION PLAN

The plan for data collection includes the following activities: 1) soil-vapor sampling and analysis and 2) a building survey. The building survey includes performing a building inspection and indoor air sampling and analysis.

Access to privately owned property is required to implement this data collection plan. The owner of record for each property has been identified through County property tax records. Access will be requested from each property owner through a telephone call and mailing. The MPCA may be asked to assist with this request.

5.1 SOIL-VAPOR SAMPLING AND ANALYSIS

Two soil-vapor samples will be collected per house (houses are generally about 1,000 sf [square foot] footprint or smaller). Samples will be collected at approximately 8 feet below ground surface, which is approximately 2 feet below the foundation if the building has a basement, and immediately adjacent to the house (within three feet of foundation). Each of the houses in Area 1 appears to have a basement. In the request for access, the property owner will be asked to confirm whether the house has the following: 1) a basement, 2) a crawl space or 3) no basement or crawl space. The sampling depths will be adjusted to 4 feet if the owner reports there is no full basement.

Gopher State One Call will be contacted 72 hours prior to sampling so that subsurface utilities can be located and marked. Each sampling location will be located using measurements from the closest building corner.

A temporary soil-vapor probe with an expendable drive point will be advanced using direct-push techniques (or manually if restricted by access and site conditions allow) to the target depth at each sampling location. At the target depth, inert tubing (e.g., Teflon, polyethylene or equivalent) with a stainless steel adaptor (e.g., Geoprobe® post-run tubing [PRT] system, or equivalent) will be inserted into the soil-vapor probe and attached to the drive point. The drive rods will be pulled back slightly to expose the inlets of the soil-vapor probe. An appropriate sealing material (e.g., hydrated bentonite) will be placed around the probe rod at grade. The probe hole will be abandoned in accordance with State of Minnesota guidelines after sample collection.

The soil-vapor sample will be collected in an evacuated, 1 L (liter) Summa canister equipped with a dedicated pneumatic flow controller. A 6 L Summa canister may be used if the 1 L size is not available. The canisters will be received from the laboratory leak checked, cleaned, tested for contamination, evacuated, and certified for reuse.

Prior to collecting a sample, two tubing volumes (i.e., volume of air in tubing plus inlet of soil-vapor probe), at a minimum, will be purged from the sampling train using a hand-operated graduated syringe. To prepare the canister for sample collection, the brass caps will be removed from the pneumatic flow controller and canister and the flow controller will be connected to the canister by inserting the canister connection to the canister inlet and hand tightening the Swagelok® nut. The fitting will not be over-tightened and Teflon tape will not be used. A sampling line (i.e., ¼-inch outer diameter [O.D.] Teflon tubing) will then be attached to the canister inlet using a Swagelok® nut and set of nylon ferrules. The sampling line will be attached to the tubing in the soil vapor probe (typically 3/8-inch O.D.) using a small length of new silicon tubing. The pneumatic flow controller will be set so that the canister fills at a rate

no greater than 200 mL (milliliters) per minute. The canister will be equipped with a pressure gauge to monitor vacuum and an in-line moisture trap to prevent moisture from entering the canister.

To begin sampling, the valve on the flow regulator will be opened. The vacuum of the canister as measured with the pressure gauge, the sample identification and the start time of sampling will be recorded on the sample identification tag for that canister and on a sampling log. The pressure gauge will be monitored during sample collection to check the progress of the canister filling and ensure that an adequate volume of sample is collected. Once the pressure gauge indicates that the canister is full, or the required time has elapsed for an adequate volume of soil vapor to be collected, the canister valve will be closed. The canister pressure and time at the end of sampling will be recorded on the sample identification tag for that canister and on the sampling log. Sample components will be disassembled in reverse order, returned to original canister cartons, and repackaged as received in preparation for transport to the laboratory.

After sample collection with the canister is complete, the sampling line will be connected to an organic vapor meter (e.g., calibrated photoionization detector with a 10.2 eV lamp) and the total organic vapor concentration will be measured. The measurement will be recorded on the sampling log.

Pace Analytical Services (Pace), Minneapolis, Minnesota, will analyze the samples for VOCs (volatile organic compounds), including the targets analytes PCE and TCE using USEPA Method TO-15. Analytical instrumentation for Method TO-15 includes a high-resolution gas chromatograph (GC) coupled to a mass spectrometer (MS). Analysis by Method TO-15 will follow the laboratory-specific standard operating procedure (SOP) for the analysis of whole air samples for VOCs by gas chromatography/mass spectrometry. The reporting limits are sufficient to allow a comparison to MPCA screening values.

5.2 BUILDING SURVEY

The building survey will include the following two parts: 1) a building inspection and 2) indoor-air sampling and analysis.

5.2.1 Building Inspection

The following will be documented as part of the building inspection:

- Type of building construction;
- Number, location and use of occupied spaces;

- Type of heating and cooling system;
- Type of building foundation;
- Type and location of potential vapor entry points (e.g., sumps, perforations through basement floor or walls, earthen floor in crawl space); and
- Suitable locations for indoor-air sampling.

The building inspection will take place at least 48 hours prior to indoor-air sampling. If potential sources of VOCs are identified in the building, the owner will be asked to relocate the potential source outside of the house, such as in the garage. If this is not possible for some reason, this will be documented.

5.2.2 Indoor-Air Sampling

Indoor air samples will be collected by sampling technician(s) from Pace's field services division. One duplicate indoor air sample and one concurrent outdoor ambient air sample will be collected in each area (i.e., Area 1 and Area 2, if necessary).

The indoor samples will be collected over a 20 to 24-hour time period with passivated (inert) 6 L Summa canisters prepared for the specific project. The canisters will be received from the laboratory cleaned, evacuated, and prepared for sampling. The canisters will be fitted with a pneumatic flow controller that is sized to allow a sample to be collected over a 24-hour period.

A 24-hour average measurement is planned (e.g., instead of an 8-hour measurement) because each home 'breathes' in 24-hour cycles. A house typically breathes the 'heaviest' in the early morning hours, and 24-hour average measurements provide a representation of average air quality resulting from this pattern.

Indoor-air samples will be collected from the basement, or lowest level of the structure if there is no basement, near suspected vapor entry points (if any). If there is a sump or other "intrusion" through the basement floor, the canister will be placed near the intrusion. The canister will be placed in the breathing zone at a height of 3 to 5 feet above the floor. The sampling technician(s) will pick up the instrument the next day.

To begin sampling, the valve on the canister will be opened, and the pressure of the canister, as measured with a pressure gauge, and the time of sampling will be recorded on the sample identification tag for that canister and in a sampling log. After sampling begins and the canister is verified to be operating correctly and filling at the correct rate, the canister will be left to fill.

The sampler(s) will return after approximately 20 hours to check the canisters to ensure that they are operating properly. The accuracy of the flow regulators can vary slightly, potentially causing the canisters to fill faster than expected. The valve on the canisters will be closed when the pressure on the canisters reaches approximately -5 to -6 inches mercury or after 24 hours have elapsed, whichever comes first. The pressure of the canister at the end of sampling will be recorded on the sample identification tag for that canister and in the sampling log.

An outdoor, ambient air sample will be collected concurrently with the collection of the indoor air samples. The sample collection and analysis method for the ambient air sample will be the same as for the indoor air samples. The canister will be placed no lower than 6 feet above ground level.

A duplicate (co-located) sample will be collected to provide data on the variability of the sample results, including potential sampling and analytical biases. The co-located canister sample will be collected at a randomly-selected indoor air sampling location. This QC sample will be handled, labeled, and collected by the same procedure as the monitoring samples.

The sample containers will be labeled with the following information: sample identification, starting and ending date and time, starting and ending canister pressure and the identity of the sampler(s). This information will also be recorded on a sampling log.

Samples will be shipped to the laboratory in boxes sealed with tamper-evident tape. A chain of custody will be maintained for all canisters, from time of receipt from the laboratory to the time of analysis.

Pace will analyze the indoor air samples for VOCs including the target analytes TCE and PCE by US EPA Method TO-15, with the mass spectrometer operated in selective ion monitoring mode (SIM). The SIM mode allows for lower detection limits for the chemicals of concern than does a full scan. The SIM reporting limits for the site are estimated to be 0.05 parts per billion by volume (ppbv) (i.e., less than $1 \mu\text{g}/\text{m}^3$, which is less than the ISVs). It is important to note that the reporting limits do not take into account sample dilution due to canister pressurization (i.e., actual reporting limits will vary slightly depending on canister pressurization).

6.0 DATA REVIEW AND EVALUATION

The following describes the data review and evaluation protocol for soil-vapor sampling and indoor-air sampling results. The data review and evaluation process will be the same for Area 2 as for Area 1.

6.1 SOIL-VAPOR SAMPLES

The data review will include a comparison of soil-vapor samples to the following screening values:

TCE 30 $\mu\text{g}/\text{m}^3$
PCE 200 $\mu\text{g}/\text{m}^3$

If the screening values are not exceeded in the sample results, no further action will be taken. If these values are exceeded, then the building survey will be conducted.

6.2 INDOOR-AIR SAMPLES

The data review will include evaluating for potential cross contamination and making a comparison of indoor-air concentrations to ISVs as follows:

TCE 3 $\mu\text{g}/\text{m}^3$
PCE 20 $\mu\text{g}/\text{m}^3$

If the ISVs are not exceeded in the sample results, then no further action will be taken. If an ISV is exceeded at a location and the results appear to have a soil vapor source, then the Area 2 investigation will be implemented.

If sample results in each of the sampled houses are less than ISVs, this supports the findings from the MP23 area that the migration of VOC-impacted soil vapor into nearby buildings is not significant. This suggests that screening values greater than 30 $\mu\text{g}/\text{m}^3$ for TCE and greater than 200 $\mu\text{g}/\text{m}^3$ for PCE are appropriate for triggering further action (e.g., performing a building survey). Based on results at MP23, site-specific screening values on the order of 300 $\mu\text{g}/\text{m}^3$ for TCE and 2,000 $\mu\text{g}/\text{m}^3$ for PCE appear to be appropriate for evaluating the potential for vapor intrusion at the site.

If, on the other hand, sample results fall above the ISVs, then the conceptual model needs to be revised to account for VOC migration in soil vapor capable of impacting buildings above ISVs. In this case, the screening values listed in Section 6.1 are appropriate for the site and additional delineation may be needed beyond Area 2, depending on the results from that area.

7.0 SCHEDULE

Plan approval	May 2009
Access	May 2009
Soil-vapor sampling and analysis	June 2009
Data review	June 2009

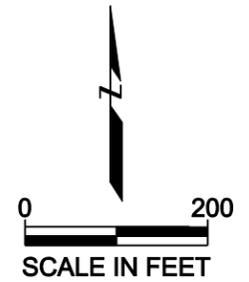
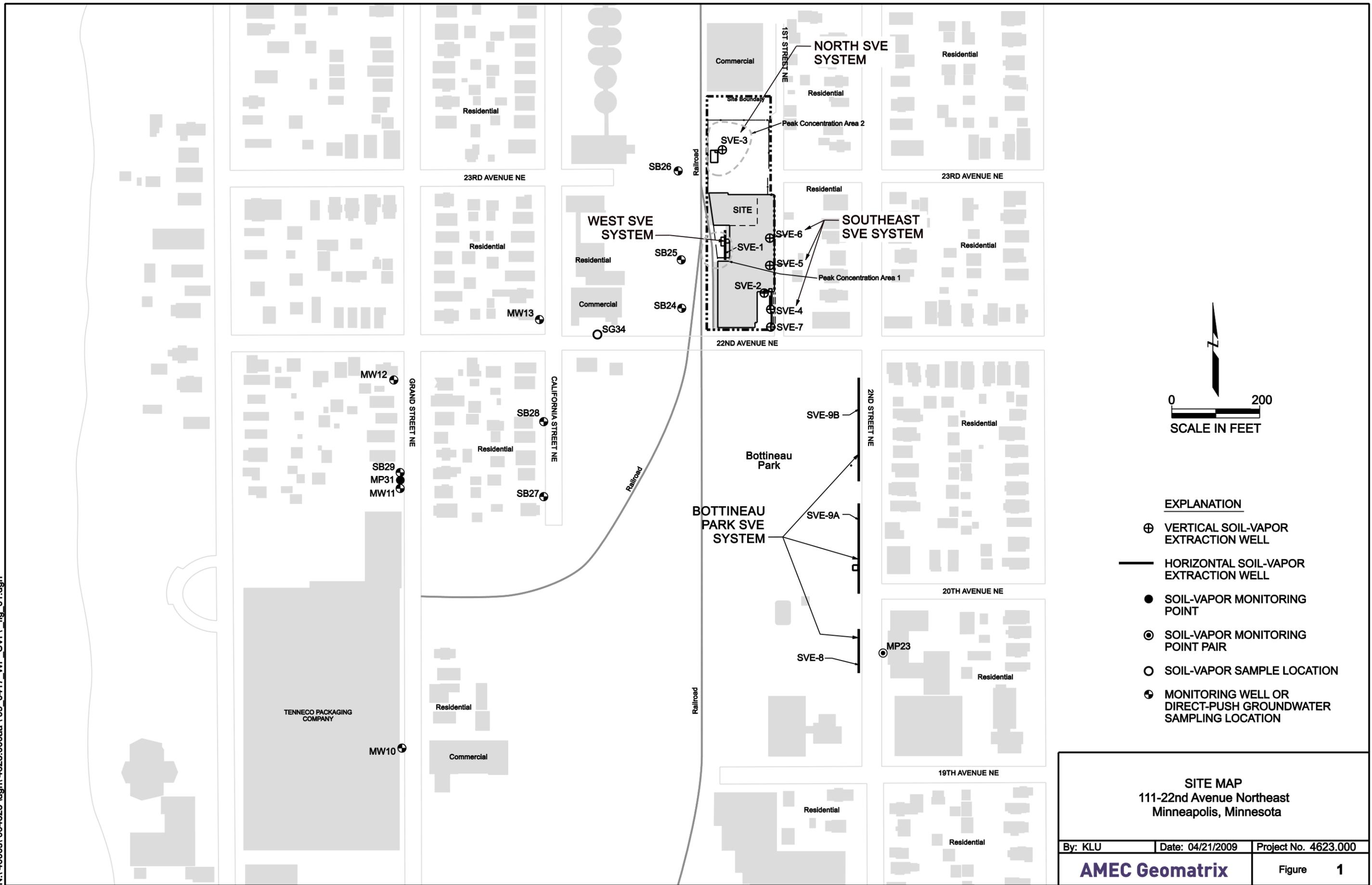
Indoor-air sampling
Area 2 sampling

July 2009
August 2009

Findings will be reported to the MPCA at the data review stage and at the conclusion of the investigation.

FIGURES

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EXPLANATION

- ⊕ VERTICAL SOIL-VAPOR EXTRACTION WELL
- HORIZONTAL SOIL-VAPOR EXTRACTION WELL
- SOIL-VAPOR MONITORING POINT
- ⊙ SOIL-VAPOR MONITORING POINT PAIR
- SOIL-VAPOR SAMPLE LOCATION
- ⊕ MONITORING WELL OR DIRECT-PUSH GROUNDWATER SAMPLING LOCATION

SITE MAP 111-22nd Avenue Northeast Minneapolis, Minnesota		
By: KLU	Date: 04/21/2009	Project No. 4623.000
AMEC Geomatrix		Figure 1



EXPLANATION:

-  Monitoring Well or Direct-Push Groundwater Sampling Location
-  Temporary or Permanent Soil-Vapor Monitoring Point
-  Area 2
-  Area 1



100 50 0 100 Feet



AREAS OF SOIL VAPOR INVESTIGATION
111 - 22nd Avenue NE
Minneapolis, Minnesota

By: MJC

Date: 4/14/2009

Project No. 4623.000

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Figure **2**