FINAL

SOIL VAPOR INTRUSION STUDY WORK PLAN

FORMER GRIFFIN TECHNOLOGY FACILITY
FARMINGTON, NEW YORK

Prepared for
Diebold, Inc.
Canton, Ohio

October 2006

URS

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This Work Plan was prepared to investigate the potential impact of contaminated groundwater on soil vapor quality in the vicinity of the former Griffin Technology Inc. (GTI) facility (Site) located at 6132 Victor-Manchester Road in the Town of Farmington, Ontario County, New York (Figure 1). This Work Plan has been prepared in response to a letter from the New York State Department of Environmental Conservation (NYSDEC) dated January 5, 2006 to Diebold Inc. (Diebold) which indicated that the Site has been selected to participate in a soil vapor intrusion evaluation. If soil vapor contamination is found at levels sufficient to warrant concern about possible soil vapor intrusion exposure pathways, NYSDEC and the New York State Department of Health (NYSDOH) may direct Diebold to implement indoor air sampling.

1.1 SITE DESCRIPTION AND BACKGROUND

The Site consists of three lots, totaling approximately 13 acres. A general Site Features map is included as Figure 2. The eastern and western parcels are undeveloped; two buildings occupy the central parcel. The manufacturing/office building (approximately 19,000 square feet) was constructed around 1970 and purchased by GTI from a pool manufacturer in 1975. An approximately 2,400-square foot warehouse building, used for storage and equipment painting is located in the back of the central parcel, north of the manufacturing building.

The surrounding areas are zoned general business. The property immediately west of the Site is an automotive servicing business; the property south-southwest of the Site is a grocery store (Wade's Market Center). Residential areas are located south beyond Beaver Creek and west on the other side of Mertensia Road (Figure 2).

At the Site, GTI manufactured plastic photo-identification and data cards used for electronic scanning devices in a two-step process consisting of a photo-developing step followed by a finishing process. Wastewater generated by these processes was dumped outside the western building door and on to the then-gravel driveway. This practice was discontinued in 1986.

The Site is located in the Central Lowland physiographic province, which is characterized by low surface relief, unconsolidated overburden derived from glacial deposition, and bedrock consisting of east-west striking, gently southerly dipping Ordovician to Upper Devonian sedimentary rocks.

The soil is typically silty at the surface with a silty-clay substratum with generally low permeability. The overburden materials at the Site are generally heterogeneous, consisting of varying amounts of brown silt, sand, and clay. Silt was typically the main soil component. The overburden varies in thickness from 3 feet to 30 feet across the area of investigation.

The bedrock consists of Upper Siluran dolomites that are generally light gray, massive, crystalline, vuggy, mottled and locally gypsiferous. Structurally the units are relatively underformed and dip consistently and gently to the south, but they also exhibit open folds, minor faults, steeply dipping joints, and other minor fractures of varying orientation. Fractures were observed in the core samples from all bedrock coreholes drilled during previous Site

investigations. The joints and fractures provide secondary porosity and are likely the principal pathways for groundwater flow through rock.

Measurements collected during the July 2005 annual event provide a more comprehensive understanding of groundwater flow patterns in the vicinity of the site. Overburden measurements collected during the annual event, shown on Figure 3, indicate that groundwater flow in the overburden water-bearing zone is typically to the south-southwest and may ultimately discharge to Beaver Creek. Annual event measurements also indicated that groundwater flow is to the west-northwest in the bedrock water-bearing zone, as shown on Figure 4.

The hydraulic conductivity in the sand and gravel overburden is on the order of 1E-03 cm/sec; the values reported for the bedrock range from approximately 1E-03 to 2E-02 cm/sec (Blasland et al., 1991). The variation in bedrock hydraulic conductivity values likely reflects the irregular distribution of fractures.

Surface drainage is to the south-southeast toward Beaver Creek, which is approximately 100 feet south of Wade's Market Center. Beaver Creek is a tributary of Mud Creek, which flows west into Ganargua Creek, which drains northward into the Erie Canal. It is not clear whether Beaver Creek is a locally gaining or losing stream.

Soil and groundwater sampling during subsurface investigations from the early 1990s to 1996 have confirmed the presence of volatile organic compounds (VOCs) at the Site, including trichloroethene (TCE), trichloroethane (TCA), cis-1,2-dichloroethene (DCE), acetone, and vinyl chloride. The distribution of these contaminants is more fully discussed in the following section.

1.2 ENVIRONMENTAL SITE HISTORY AND REMEDIAL ACTIONS

The suspected source of contamination is an area west of the manufacturing/office building. Information indicates that approximately 491 gallons of wastewater containing TCE were disposed on the ground surface adjacent to the west side of the building. The releases were estimated to be less than 5 gallons per incident. The approximate extent of soil contamination was established during a 1991 soil investigation, which was expanded in 1999 (Basland et al., 1991; URSWC, 1999).

The highest concentration of TCE in the shallow soil was 4,200 ug/kg. The deeper soil samples indicated an area of accumulation of TCE at the top of bedrock, with the next highest concentration (850 ug/kg) southwest of the suspected source area.

Shallow and deep (bedrock) wells have been installed at the Site and show the presence of chlorinated solvents and related degradation products in the groundwater. The groundwater plume resulting from the percolation of the waste solvent is being monitored by 13 wells installed between 1991 and 1996. Seven are screened in the bedrock, five in the overburden, and one straddles the contact between the two units.

An interim remedial measure (IRM) was conducted in 1997 as part of a consent order with the NYSDEC. The IRM is a groundwater recovery system consisting of groundwater recovery wells,

equipped with submersible electric pumps piped to discharge groundwater directly to the local sanitary sewer system. The system was placed on line with three recovery wells (RW-1 through RW-3); in 1999 monitoring well MW-2D was converted to a recovery well (RW-4) and brought on line. The IRM system includes monthly water level measurements in selected wells, recovery system effluent sampling and laboratory analysis, and monthly reporting. Semiannual groundwater monitoring events were conducted until 2002 when the frequency was reduced to an annual basis. The concentrations of TCE in the groundwater sampled during the July 2005 sampling event is shown on Figure 2.

The four recovery wells are capturing contaminants leaching from the source area; however, residual contamination is present in the water-bearing units downgradient of the recovery wells' capture zone. The data collected to date indicate that contaminants from the source area have migrated to the furthest downgradient well, approximately 1,100 feet from the source area. Both TCE and degradation products have been detected MW-10S and 10D located just north of Beaver Creek. The data also indicate that, in general, concentrations of the two major solvents TCE and TCA are decreasing while concentrations of their degradation product indicate an inconsistent trend. These data suggest that the chlorinated compounds are degrading through biological activity, but that the degradation is not progressing through all degradation products.

1.3 OBJECTIVE OF THIS WORK PLAN

The objective of this Work Plan is to describe field activities needed to evaluate and assess the extent of soil vapor potentially impacted by contaminated groundwater from the Site. This Work Plan will be used in conjunction with the Final Remedy Data Gap Work Plan (URS, 2006). If TCE is present in the soil vapor, then this could possibly present a vapor intrusion exposure pathway. This Work Plan describes the scope of each of the tasks and contingency tasks to be performed under this assignment. The protocol for this work will follow the NYSDOH "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" (Draft, February 2005).

Based on the historical data provided above and analytical results from annual groundwater sampling events, URS recommends a phased approach to investigate the potential extent of soil vapor impacted by contaminated groundwater from the site. Groundwater samples will be collected from new and existing monitoring wells as part of fieldwork performed under the Final Remedy Data Gap Work Plan (URS, 2006). URS proposes the following potential phases to the Soil Vapor Intrusion Study:

- Soil Vapor Survey
- Structure Sampling (Contingency, based upon soil vapor results)
- Reporting

2.1 TASK 1 - SOIL VAPOR SURVEY

URS will perform a soil vapor survey to determine the extent of potentially impacted soil vapor. The results of the soil vapor survey will be used to help determine the location of potential individual residences/commercial buildings that may be included in the indoor air sampling (Task 2) if required.

URS will install stainless steel soil vapor implants to collect soil vapor samples. The implants will be installed at a depth of approximately 8 feet below ground surface (bgs) or 2 feet above the water table (if the water table is less that 8 feet bgs) to measure soil vapor contamination at depths equivalent to the depths of basement slabs. The shallow (overburden) water table within the area of the investigation varies seasonally from less than 3 feet bgs up to approximately 20 feet bgs. It is anticipated that 17 soil vapor implants will be installed at the locations shown on Figure 5. The rationale for the location of each soil vapor implant location is presented in Table 1.

A truck-mounted Geoprobe® hydraulic push sampling unit will be used to advance a point holder to a maximum depth of 8 feet bgs. Six-inch (152 mm) long stainless steel vapor implants (i.e., Geoprobe® AT86 series, or approved equivalent) will be inserted down the boreholes and anchored at the depth determined by the URS geologist. The bottom of the implants must have a "PRT" style thread, the same fitting style used with Geoprobe® PRT vapor sampling tools. The implant will be connected to the Teflon or polyethylene tubing using a stainless steel swage-lock or clamp fitting to prevent leakage during sample collection. During construction of the soil vapor implant, as the probe rod is withdrawn, the annular space around the vapor implant (screen) will be filled with glass beads or appropriate size silica sand. The glass beads or sand will not extend more than 18 inches above the top of the soil vapor implant so that the sampling zone will be no longer than 2 feet in length. A minimum of a 3-foot thick bentonite slurry will be placed immediately above the sand for the seal, and a high-solids bentonite grout will be used from the top of the seal to one-foot below grade. The soil vapor implant seal will meet USEPA and ASTM D-5092 requirements. The seal will be allowed to cure for 24 hours prior to sampling. Complete soil vapor implant installation procedures are presented in Section 3.

A helium tracer gas will be used during the sampling of each soil vapor implant. The tracer gas will be applied in accordance with the NYSDOH guidance document. Following the application of the tracer gas, one to three volumes will be purged from each soil vapor implant at a flow rate of less than 0.2 liters per minute to minimize outdoor air infiltration. A helium detector will be used to check for the presence of the tracer gas in the soil vapor implant, if less that 20% of the tracer gas is detected, a sample will be collected using Summa canisters fitted with 1-hour flow regulators. The samples will be collected at no greater than 0.004 liter per minute. Following the collection of the soil vapor sample, a helium detector will be used to check for the presence of the trace gas in the soil vapor implant, if less that 20% of the tracer gas is detected the sample will be submitted for analyses. The Summa canisters will be analyzed by a NYSDOH Environmental Laboratory Approval Program (ELAP) certified laboratory using EPA method TO-15, with a minimum reporting limit of 1.0 ug/m^3. Sample parameters and QA/QC are provided in Table 2. Sample volume requirements and holding times are provided in Table 3. Laboratory detection limits for specific compounds are listed on Table 4. Complete sampling procedures for collection of the indoor air samples are presented in Section 3.

Preliminary sample results will be available within four weeks after the collection of each individual sample, with full data packages available one week after that. URS will perform a data usability review on all analytical data prior to release to NYSDEC and NYSDOH.

2.2 TASK 2 - STRUCTURE SAMPLING

If soil vapor contamination is found at levels sufficient to warrant concern about possible soil vapor intrusion exposure pathways, structure sampling may be performed. This task describes the activities that would be conducted to sample air from within structures over areas of elevated soil vapor contamination. If structure sampling is performed, the sampling will be performed during the heating season, which is generally accepted to be between November and March, weather dependent (the heating system should be operational at the time of sample collection).

The location and total number of structures sampled is unknown at this time. The location of potential structure samples will be determined based on the results of the soil vapor sampling. If structure sampling is determined to be required, up to four samples will be collected at each residence/commercial building: a sub-slab sample, a sample from the basement, a sample from the first floor living area and an outdoor ambient sample (a basement sample will not be collected from structures build upon a slab-on-grade). The indoor air sampling effort requires three visits to each residence/commercial building: one to perform a survey and inventory of the conditions within the residence/commercial building; a second to set up the sampling equipment; and a third to collect the samples.

Before sampling, URS will fill out the residential questionnaire from the latest version of NYSDOH's Soil Vapor Intrusion guidance document (Appendix A). This effort includes listing all possible contributors to indoor air contamination from common household items such as paints and lubricants. URS will use a low level photoionization detector (e.g., a ppbRAE) to measure whether these materials are emitting vapors. These findings will be recorded on the survey forms (Appendix A). During the survey visits, URS will provide instructions to the

residents/occupants for preparing for the sampling (e.g., keeping windows shut, avoiding painting activities, etc.).

URS will select and prepare a sub-slab sample collection location by observing the condition of the building floor slab for apparent penetrations such as concrete floor cracks, floor drains or sump holes. The location will ideally be central to the building away from the foundation walls, cracks, and apparent penetrations. The proposed location will be reviewed with the occupant/owner and a description will be given on how the sampling will be performed. After receiving permission for sampling from the occupant/owner, the location of sampling will be marked, documented and photographed. URS will use a ppbRAE to screen indoor air and penetrations such as concrete floor cracks, floor drains, and sump holes prior to collecting the air samples. If practicable, features such as floor drains or sumps will be sealed during the collection of the sub-slab sample.

The basement and first floor samples will be taken from areas frequented by the residents/occupants. URS will place the summa canister intakes at breathing zone height, which is approximately three feet above the floor.

Samples will be collected using Summa canisters fitted with 24-hour flow regulators. The samples will be collected at no greater than 0.004 liter per minute. The indoor and ambient outdoor Summa canisters will be analyzed by an off-site laboratory using EPA method TO-15 SIM, with a minimum reporting limit of 0.25 ug/m^3 (Table 2). The sub-slab Summa canisters will be analyzed by an off-site laboratory using EPA method TO-15, with a minimum-reporting limit of 1.0 ug/m^3. Sample parameters and QA/QC are provided in Table 2. Sample volume requirements and holding times are provided in Table 3. Laboratory detection limits for specific compounds are listed on Table 4. Complete sampling procedures for collection of the indoor air samples are presented in Section 3.

In general, areas near windows or other potential sources of air currents (drafts), and air supply vents will be avoided if possible. Sub-slab samples will be collected through Teflon or high-density polyethylene (HDPE) tubing inserted through a hole in the slab drilled with an electric hammer drill. Complete sampling procedures for collection of the indoor air samples are presented in Section 3.

This portion of the Work Plan describes the major elements for obtaining the necessary data identified in Section 2.0. In the Field Sampling Plan (Section 3.1), the methodologies and procedures for collecting the data are described; in the Quality Assurance Project Plan (QAPP) (Section 3.2), the procedures for assuring the quality of the analytical data generated by the collected soil vapor and indoor air samples are outlined.

In 1996, a Work Plan was prepared that included a Sampling and Analysis Plan for activities related to the implementation of the Interim Remedial Measure (Woodward-Clyde, 1996). This effort will use the procedures described in that plan, supplemented by the following additional information or clarifications.

3.1 FIELD SAMPLING PLAN

This Field Sampling Plan (FSP) is designed to provide detailed, step-by-step procedures for the field activities outlined above. It will serve as the field procedures manual to be strictly followed by all URS personnel. Adherence to these procedures will ensure the quality and defensibility of the data collected in the field.

3.1.1 Soil Vapor Implant Installation

Summary: A method for construction of soil vapor implants within unconsolidated material, which enables acquisition of soil vapor samples for laboratory testing. Up to 17 soil vapor implants (Figure 5) will be installed. The soil vapor implants will be installed using the procedures described below.

Installation:

1. Implants shall be 6 inches in length (e.g., Geoprobe® AT86 series) and are to be constructed of double woven stainless steel wire screen. Implants shall have a pore diameter of 0.0057 inch, which is equivalent to a 0.007 slot well screen. The bottom of the implants must have a post run tubing (PRT) style thread, the same fitting style used with Geoprobe® PRT vapor sampling tools. The top connection with the Teflon or polyethylene tubing shall be stainless steel swage-lock or clamp fitting to prevent leakage during sample collection. The connection to the sampling summa canister shall be made through the use of 1/8th inch ID Teflon or polyethylene tubing.

2. Once the rods have been advanced to the desired depth, attach appropriate tubing to the implant to be installed. **Allow at least 48 inches of tubing length longer than the required depth of the implant.** Cover or plug the end of the tubing.

3. Remove the pull cap from the rods and lower the implant and tubing down inside the diameter of the rods until the implant hits the top of the Anchor/Drive Point. Note the length of the tubing to ensure proper depth has been reached.

4. Rotate tubing counterclockwise while exerting a gentle downward force to engage the PRT threads. Pull up on the tubing lightly to test the connection. DO NOT cut excess tubing.

5. Position a probe rod pull plate or manual probe rod jack on the top of the probe rod. Exert downward pressure on the tubing while pulling the probe rods up. Pull up about 12 inches.

6. Thread excess tubing through the bottom of a funnel and position funnel over top of probe rod. The funnel will be used to facilitate installation of glass beads or appropriate size silica sand into the borehole around the screened portion of the implant. The glass beads or sand will not extend more than 18 inches above the top of the soil vapor implant so that the sampling zone will be no longer than 2 feet in length.

7. Pour glass beads into the funnel and down the inside diameter of the probe rods around the outside of the tubing and around the screen of the implant. Use tubing to "stir" beads or sand into place. [NOTE: beads and bentonite can only be installed in the Vadose (unsaturated zone above the water table)].

8. A minimum of a 3-foot thick bentonite slurry will be placed immediately above the sand for the seal, and a high-solids bentonite grout will be used from the top of the seal to one-foot below grade.

9. Cut any excess tubing to allow approximately 8 to 12 inches to extend above the ground surface. Plug the tubing with a cap or plug.

10. Initially all soil vapor implants will be considered temporary and will not be finished at the surface with a protective casing. At the completion of the soil vapor survey, the NYSDEC may recommend that the soil vapor implants become permanent monitoring points at which time these points will be finished with a protective casing. Soil vapor implants that do not become permanent will be removed and the borehole will be backfilled with bentonite chips.

11. Document well construction in the field notebook and later on a Soil Vapor Implant Construction Detail diagram (Appendix A).

3.1.2 Soil Vapor Implant Sampling Procedures

Summary: To collect representative soil vapor samples, soil vapor implant tubing must be adequately sealed to prevent ambient air from being sampled. A helium tracer gas will be used to verify the integrity of the soil vapor implant seal. The soil vapor implants must be purged prior to sampling. Sampling should commence immediately after purging.

The soil vapor implants will be sampled at least 24 hours after installation. The samples will be labeled following procedures described in Section 3.1.4. Sample parameters and QA/QC are provided in Table 2. Sample volume requirements and holding times are provided in Table 3. Laboratory detection limits for specific compounds are listed on Table 4.

1. Open the soil vapor implant well box (if present) and inspect the existing tubing. Check for any signs of cracks, clogging or any other characteristics that may impact the collection of a representative sample.

2. Apply a bentonite slurry to the ground surface in an approximate 2-ft diameter circle. Place an approximately 2 ft by 2 ft square of plastic sheeting over the bentonite slurry. Poke a hole, only as large as needed, for the sampling tube to penetrate the plastic. Seal the plastic sheeting/tube interface with a small amount of bentonite slurry.

3. Place the enclosure over the well head, run well tubing through in the top outlet. Use plumber's putty to seal the interface between the tubing and the top of the enclosure.

4. Seal enclosure at the ground surface with a bentonite slurry.

5. Connect helium (99.999%) cylinder to side port of enclosure.

6. Release enough helium to displace any ambient air in enclosure. Continue flushing the inside of the enclosure with helium gas.

7. Connect the tubing to the vacuum pump. Use only new Teflon or HDPE tubing if needed for length and new silicone tubing for leak free unions. Do not reuse any tubing between sample locations.

8. Purge the soil vapor implant; remove one to three volumes of soil vapor. Flow rates for purging and sampling must not exceed 0.2 liters per minute (L/min) to minimize outdoor air infiltration during purging/sampling. Record start and stop time on the Summa Canister Sampling Field Data Sheet (Appendix A). Verify air is being drawn from the monitoring well by placing finger on the vacuum pump outlet tube to check for positive pressure. Helium cylinder should be open during the purge time, enough to cause a positive pressure within the enclosure.

9. After purging completed, disconnect the vacuum pump from the tubing.

10. Connect the Mark Helium Detector (Model 9822) to soil vapor implant tubing. Obtain readings. Absence of helium (< 20%) assures that the implant seal is competent and ambient air is not entering the soil vapor implant.

Using Flow Controllers Without a Built-in Pressure Gauge

1. Attach the pressure gauge provided by the laboratory to the Summa canister, open valve completely, record reading on the Summa Canister Sampling Field Data Sheet (Appendix A), close valve completely, and remove the pressure gauge. If the canister does not show a vacuum, do not use. Record the canister's serial number on the Summa Canister Sampling Field Data Sheet (Appendix A). Assign sample identification to the canister identification tag and record on chain of custody (COC), and the Summa Canister Sampling Field Data Sheet (Appendix A).

2. Attach flow controller provided by the laboratory to the Summa canister inlet (one for each Summa canister). **Do not reuse flow controllers between locations**. Each flow controller is pre-set by the laboratory to collect the sample over a one-hour period.

3. Attach tubing from the soil vapor implant to the flow controller on the Summa canister. All tubing used in this step should be the same tubing that was used in the purging process.

4. Open canister valve to initiate sample collection and record start time and date on the canister identification tag and on the Summa Canister Sampling Field Data Sheet (Appendix A).

5. The helium cylinder should remain open during sampling set-up to cause a positive pressure in the enclosure. Because of the one-hour sampling time, more than one location may be sampled at the same time (with staggered starting times). When you are ready to move onto the next location, stop the flow of the helium with the valve on the regulator, and seal ports on the enclosure to maintain the helium atmosphere within the enclosure.

6. After one hour, close the Summa canister valve completely. Record the time on the Summa Canister Sampling Field Data Sheet (Appendix A).

7. Disconnect tubing.

8. Remove the flow controller, attach the pressure gauge to the Summa canister, open valve completely, record reading, close valve completely, and remove the pressure gauge. Record the pressure reading on the Summa Canister Sampling Field Data Sheet (Appendix A). There should still be a slight vacuum in the summa canister. If no vacuum remains in the canister, do not send the canister for analysis. Retake the sample using the same procedure with a fresh canister.

9. If the canister does not show a significant net loss in vacuum after sampling, evaluate and document the problem. If necessary, use another Summa canister to recollect the sample and **contact the project manager immediately**.

10. Connect the Mark Helium Detector (Model 9822) to soil vapor implant tubing. Obtain and record reading. Absence of helium (< 20%) assures that the conduit seal is competent and ambient air is not entering the soil vapor implant.

11. Replace box cover.

12. Ship canister standard overnight, with COC (Appendix A), to Con-Test Lab for TO-15 analysis.

Using Flow Controllers With a Built-in Pressure Gauge

1. Attach the flow controller provided by the laboratory to the Summa canister inlet (you must have one for each summa canister). **Do not reuse flow controllers** between locations. Each flow controller is pre-set by the laboratory to collect the sample over a one-hour period. Record the canister's serial number on the Summa Canister Sampling Field Data Sheet (Appendix A). Assign sample identification to the canister identification tag and record on COC and the Summa Canister Sampling Field Data Sheet (Appendix A).

2. Attach tubing from the soil vapor implant to the flow controller on the Summa canister. All tubing used in this step should be the same tubing that was used in the purging process.

3. Open Summa canister valve completely and record the time and pressure on the Summa Canister Sampling Field Data Sheet (Appendix A). If the canister does not show a vacuum, do not use.

4. The helium cylinder should remain open during sampling set-up to cause a positive pressure in the enclosure. Because of the one-hour sampling time, more than one location may be sampled at the same time (with staggered starting times). When you are ready to move onto the next location, stop the flow of the helium with the valve on the regulator, and seal ports on the enclosure to maintain the helium atmosphere within the enclosure.

5. After one hour, close the Summa canister valve completely and record the time and pressure on the Summa Canister Sampling Field Data Sheet (Appendix A). There should still be a slight vacuum in the Summa canister. If no vacuum remains in the canister, do not send the canister for analysis. Retake the sample using the same procedure with a fresh canister.

6. If the canister does not show a significant net loss in vacuum after sampling, evaluate and document the problem. If necessary, use another Summa canister to recollect the sample and **contact the project manager immediately.**

7. Connect the Mark Helium Detector (Model 9822) to soil-gas conduit tubing. Obtain and record readings. Absence of helium (< 20%) assures that the conduit seal is competent and ambient air is not entering the soil-gas conduit.

8. Disconnect tubing.

9. Replace the box cover.

10. Ship canister standard overnight, with COC (Appendix A), to Con-Test Lab for TO-15 analysis.

3.1.3 Structure Sampling

For purposes of this FSP, the procedures to conduct the indoor air sampling program at potentially impacted residential/commercial building locations are provided in the event this task becomes necessary based upon the soil vapor results and the direction of NYSDEC/NYSDOH. If necessary, the indoor air investigation program will generally include the following: 1) conducting interviews with homeowners/ occupants using air quality questionnaires provided by the NYSDOH (Appendix A); 2) conducting a survey of household chemicals present and evaluating their potential to affect air sample results; 3) collect one indoor air sample each from the breathing zones of the first floor and basement areas; (4) collect one vapor sample from beneath the basement concrete slab; and one outdoor ambient sampler per household.

The samples will be labeled following procedures described in Section 3.1.4. Sample parameters and QA/QC are provided in Table 2. Sample volume requirements and holding times are provided in Table 3. Laboratory detection limits for specific compounds are listed on Table 4. Complete sampling procedures for collection of the indoor air samples are presented in Section 3.

3.1.3.1 Indoor Air Quality Survey and Questionnaire

Once the homeowners/building owners have been contacted by the NYSDEC and/or NYSDOH, appointments will be made to conduct homeowner/occupant interviews and building inventory of household chemicals. Questionnaire and Building Inventory forms provided by the NYSDOH (Appendix A) will be used. Once the questionnaires have been completed, the building inventory (first floor, basements, and attached garages) for household chemicals will be prepared. Areas that may be inspected include kitchen and bathroom cabinets, basement shelves, and any other area commonly used for storage of household chemicals. During this inventory, a handout will be provided to the residents that list home activities that should be avoided prior to and during the air sampling. This handout is provided in Appendix A. The general procedures to be followed during the surveys are summarized below:

- Identify all areas on the first floor and basement levels that may be used for storage of chemical containers.
- Identify and record each container likely to contain chemicals that may affect air quality. These may include any of the following: cleaning products, cosmetic products, aerosol cans, paint or stain products, deodorants/air fresheners, solvents, glue or epoxy containers, caulks, petroleum-based soils and penetrants, sealants, fuel containers, scented natural products (e.g., Christmas trees, wreaths, potpourri, scented wood), and pesticide products.
- Other potential sources that may influence air quality testing that should be noted and scanned with field instrumentation include: new construction/remodeling/painting; new carpeting; freshly dry-cleaned clothing; and the presence of tobacco smokers.

- On the product inventory form provided in the Questionnaire/Building Inventory, record each container/potential source on the product inventory form. For each container, note the product description, container size, the condition of the container, and the chemical ingredients.

For each container, check the areas around the lids or other openings for the presence of VOCs using a ppbRAE. Move the tip of the ppbRAE around the entire area and record the highest reading measured. For aerosol cans with a slot in the cap, insert the ppbRAE in the slot.

3.1.3.2 Sub-Slab Air Sampling Procedures

The sub-slab air sampling procedures are summarized below:

1. Drill a 1-inch diameter hole about 1 inch into the concrete using an electric hammer drill. Extend the hole through the remaining thickness of the slab using a ½ -inch drill bit. Lengthen the hole about 3 inches beyond the sub-slab using either a drill bit or a steel probe rod.

2. Insert one end of a $^{3}/_{8}$-inch outside diameter by ¼-inch inside diameter Teflon-lined or HDPE tube into the ½-inch hole.

3. Seal the annular space with permagum grout, melted beeswax, putty or other non-VOC and non-shrinking product.

4. Connect the tubing to an air-sampling pump with polyethylene discharge tubing attached to a 1-liter Tedlar bag. Purge approximately 1 liter of gas from the subsurface probe into the Tedlar bag, using the air-sampling pump at a rate not exceeding 0.2 L/min. Analyze the 1-liter Tedlar bag containing the sub-slab purged air with the ppbRAE when **outside** the residence.

5. Record the canister's serial number on the Summa Canister Sampling Field Data Sheet (Appendix A).

6. Assign sample identification to the canister identification tag and record on chain of custody (COC), and the Summa Canister Sampling Field Data Sheet (Appendix A).

7. Remove brass plug from canister fitting.

Using Flow Controllers Without a Built-in Pressure Gauge

1. Attach the pressure gauge provided by the laboratory to the Summa canister, open valve completely, record reading on the Summa Canister Sampling Field Data Sheet (Appendix A), close valve completely, and remove the pressure gauge. If the canister does not show a vacuum, do not use.

2. Attach a pre-calibrated/certified 24-hour flow controller, and particulate filter to the Summa canister. Note: Some laboratories provide a built-in filter within the regulator apparatus. **Do not reuse flow controllers** between locations.

3. After purging the hole, remove the sampling pump from the sample tubing and attach the tubing to the Summa canister, via the flow controller/particulate filter assembly.

4. Open canister valve to initiate sample collection and record start time and date on the canister identification tag and on the Summa Canister Sampling Field Data Sheet (Appendix A).

5. Take a photograph of canister setup and surrounding area.

6. Clean up any dust/debris with a brush and dustpan. **Do not** use a vacuum based device.

7. After 24 hours, record sampling end time on the Summa Canister Sampling Field Data Sheet (Appendix A), and close valve.

8. Disconnect tubing and remove flow controller/particulate filter assembly from canister.

9. Upon removing the flow controller/particulate filter assembly, record gauge pressure using procedure outlined in "Step 1" and seal canister with brass plug.

10. Seal the hole in the basement slab with hydraulic cement patch.

11. Ship canister standard overnight, with COC (Appendix A), to Con-Test Lab for TO-15 analysis.

Using Flow Controllers With a Built-in Pressure Gauge

1. Attach the flow controller provided by the laboratory to the Summa canister inlet (you must have one for each summa canister). Read the pressure gauge. **Do not reuse flow controllers** between locations.

2. After purging the hole, remove the sampling pump from the Teflon-lined probe tube and attach tube to the Summa canister, via the flow controller/particulate filter assembly.

3. Open canister valve to initiate sample collection and record start time and date on the canister identification tag and on the Summa Canister Sampling Field Data Sheet (Appendix A).

4. After 24 hours, close the Summa canister valve completely and record the time.

5. Disconnect the tubing from the Summa canister.

6. Record the reading on the pressure gauge. There should still be a slight vacuum in the Summa canister. If no vacuum remains in the canister, do not send the canister for analysis. Retake the sample using the same procedure with a fresh canister.

7. Remove the flow controller.

8. If the canister does not show a significant net loss in vacuum after sampling, evaluate and document the problem. If necessary, use another summa canister to recollect the sample and **contact the project manager immediately.**

9. Seal the hole in the basement slab with hydraulic cement patch.

10. Ship canister standard overnight, with COC (Appendix A), to Con-Test Lab for TO-15 analysis.

3.1.3.3 Indoor Air and Outdoor Ambient Blank Air Sampling Procedure

The indoor air for the first floor, basement levels and outdoor ambient blank sampling procedures are summarized below:

1. Place indoor air Summa canister inlet at breathing height in the approximate center of the structure, or, for the ambient air sample, elevated on a table or other object in a location upwind of the samples collected that day. The breathing height which is approximately three feet above the floor. As an option, a length of Teflon-lined polyethylene tubing can be attached to the Summa canister inlet and raised to breathing zone height.

2. Record the canister and flow controller serial numbers on the Summa Canister Sampling Field Data Sheet (Appendix A) and the canister identification tag.

3. Assign sample identification to the canister identification tag and record on COC and the Summa Canister Sampling Field Data Sheet (Appendix A).

4. Remove brass plug from canister fitting and save.

Using Flow Controllers Without a Built-in Pressure Gauge

1. Attach the pressure gauge provided by the laboratory to the Summa canister, open valve completely, record reading on the Summa Canister Sampling Field Data Sheet (Appendix A), close valve completely, and remove the pressure gauge. If the canister does not show a vacuum, do not use.

2. Attach a pre-calibrated/certified 24-hour flow controller, and particulate filter to the Summa canister. Note: Some laboratories provide a built-in filter within the regulator apparatus.

3. Open canister valve to initiate sample collection and record start time and date on the canister identification tag and on the Summa Canister Sampling Field Data Sheet (Appendix A).

4. Take a photograph (digital or film photography) of canister setup and surrounding area.

5. After 24 hours, record end time on the Summa Canister Sampling Field Data Sheet (Appendix A), and close valve.

6. Disconnect flow controller/particulate filter assembly from canister.

7. Upon removing the flow controller/particulate filter assembly, record gauge pressure using procedure outlined in "Step 1" and seal canister with brass plug.

8. Ship canister standard overnight, with COC (Appendix A), to Con-Test Lab for TO-15 SIM analysis.

Using Flow Controllers With a Built-in Pressure Gauge

1. Attach the flow controller provided by the laboratory to the Summa canister inlet (you must have one for each summa canister). Read the pressure gauge. **Do not reuse flow controllers** between locations.

2. Open canister valve to initiate sample collection and record start time and date on the canister identification tag and on the Summa Canister Sampling Field Data Sheet (Appendix A).

3. Take a photograph (digital or film photography) of canister setup and surrounding area.

4. After 24 hours, record end time on the Summa Canister Sampling Field Data Sheet (Appendix A), and close valve.

5. Disconnect the tubing from the Summa canister.

6. Record the reading on the pressure gauge. There should still be a slight vacuum in the Summa canister. If no vacuum remains in the canister, do not send the canister for analysis. Retake the sample using the same procedure with a fresh canister.

7. Remove the flow controller.

8. If the canister does not show a significant net loss in vacuum after sampling, evaluate and document the problem. If necessary, use another summa canister to recollect the sample and **contact the project manager immediately.**

9. Replace the brass plug on the canister.

10. Ship canister standard overnight, with COC (Appendix A), to Con-Test Lab for TO-15 SIM analysis.

3.1.4 Sample Labeling

Summary: In order to prevent misidentification and to aid in the handling of environmental samples collected during the field investigation, the following procedures will be used:

Procedure: Each indoor air, outdoor air, and soil vapor sample will have the following information placed on the laboratory supplied sample label:

- Site name
- Sample identification
- Project number
- Date/time
- Sampler's initials
- Analysis required

The serial number of the canister and regulator used during sampling will also be noted on the label and on the COC (Appendix A).

The following terminology shall be used for the soil vapor sample identification:

Soil Vapor Sampling

SG-xx

Where SG designates that the sample is from a soil vapor point and xx is the numerical number assigned to the soil vapor implant location.

Field duplicate samples will be assigned a unique identification alphanumeric code that specifies the date of collection, the letters FD (for field duplicate) and an ascending number that records the number of duplicate samples collected that day. For example, the first field duplicate collected on July 22, 2006 would be assigned the following sample number using the code shown below:

YYYYMMDD-FD-1 = 20060722-FD-1

Subsequent duplicates collected on the same day would be assigned FD-2, FD-3 etc. Field sampling crew will record the duplicate sample information on the Summa Canister Sampling Field Data Sheets and also in the field book.

Structure Sampling

H-SS-xx (for sub-slab locations)

H-BS-xx (for basement indoor ambient air)

H-FF-xx (for first floor indoor ambient air)

H-OA-xx (for outdoor ambient air)

Where H designates a structure sample and xx is the ascending numerical number assigned to the sample location.

Field duplicate samples will be assigned a unique identification alphanumeric code that specifies the date of collection, the letters FD (for field duplicate) and an ascending number that records the number of duplicate samples collected that day. For example, the first field duplicate collected on July 22, 2006 would be assigned the following sample number using the code shown below:

YYYYMMDD-FD-1 = 20060722-FD-1

Subsequent duplicates collected on the same day would be assigned FD-2, FD-3 etc. Field sampling crew will record the duplicate sample information on the Summa Canister Sampling Field Data Sheets and also in the field book.

3.1.5 Field Documentation

Field notebooks will be used during all on-site work. The URS Geologist overseeing the site activities will maintain a dedicated field notebook. In addition to the notebook, any and all original sampling forms, purge forms and notebooks used during field activities will be submitted to the NYSDEC as part of the final report. Soil vapor and indoor air sampling procedures, including the installation of the soil vapor implant points, purging, sampling, backfilling, etc., should be photo-documented.

The field sampling team will maintain a sample log sheet summarizing the following data:

1. Sample Identification
2. Date and time of sample collection
3. Sampling depth
4. Identity of samplers
5. Sampling methods and devices

6. Purge volumes (soil vapor and groundwater)

7. Groundwater purge parameters

8. Volume of soil vapor extracted

9. The Summa canister vacuum before and after samples collected

10. Chain of custody and shipping information

The geologist will log the time and material expenditures for later verification of contractor invoices. Upon completion of daily drilling activities, the geologist will complete the daily drilling record form (Appendix A). Following completion of the program, the geologist will transfer field notes onto standard forms for the investigation report.

The proper completion of the following forms/logs will be considered correct procedure for documentation during the soil vapor intrusion investigation:

1. Field Log Book - weather-proof hand-bound field book

2. Daily Drilling Records (Appendix A)

3. Boring Logs (Appendix A)

4. Soil Vapor Implant Construction Detail Diagrams (Appendix A)

5. Summa Canister Sampling Field Data Sheet (Appendix A)

6. Chain of Custody (Appendix A)

7. Indoor Air Quality Questionnaire and Building Inventory (Appendix A)

3.1.6 Field Quality Control

Quality control of soil vapor sampling and structure sampling will include the collection of field duplicate samples. Field quality control samples will be collected in accordance with the 1996 Work Plan. Field duplicate samples will be collected at a rate of one per 10 samples (Table 2).

3.1.7 Decontamination Activities

Equipment cleaning and decontamination procedures described in the 1996 Work Plan will be adopted for this field effort.

3.1.8 Health and Safety

The Health and Safety Plan (HASP) currently being used in the IRM sampling will be revised and updated to include field activities not covered and any other appropriate changes. The HASP must be on site during all field activities.

3.2 QUALITY ASSURANCE PROJECT PLAN

The objective of the QAPP is to produce reliable data generated by the field investigation by:

- Ensuring the validity and integrity of the data,
- Ensuring and providing mechanisms for on-going control of data quality,
- Evaluating data in terms of quality objectives, and
- Providing useable, quantitative data for analysis, assessment, and decision making to meet project DQOs.

The sampling locations and analytical parameters were all discussed in previous sections of this Work Plan. The field QC samples were also described in a previous section.

The analytical program will be in general compliance with the most recent version of NYSDEC's Analytical Services Protocol (NYDSDEC, 2005). The QAPP included in the IRM Work Plan (Woodward-Clyde, 1996) will be followed for this data collection effort with additions or clarifications described in the following sections.

3.2.1 Project Organization

The project organization for this effort is as follows:

- Project Director: Mr. Dave Rinehart of Diebold, Inc.
- URS Project Manager: Ms. Janet Bishop
- URS Quality Assurance Officer: Ms. Peg Schuler
- URS Health and Safety Officer: Mr. Jim Anderson

Field personnel will not be assigned until Work Plan approval is received. The analytical laboratory will be Con-Test Laboratory in East Longmeadow, MA.

3.2.2 Measurement Quality Assurance Objectives

Measurement DQOs for this project will be addressed in terms of precision, accuracy, representativeness, completeness, comparability, and sensitivity. These objectives are discussed in the 1996 QAPP and are adopted for the field investigation proposed in this Work Plan.

Precision is the degree of agreement among repeated measurements of the same parameter under the same or similar conditions. Field precision will be assessed through the collection and analysis of duplicate samples.

Accuracy is the extent of agreement between a measured value and the accepted or true value of the parameter being measured. Since all disposable sampling equipment will be used, field blanks, or equipment blanks, will not be necessary, unless the proposed sampling procedures change.

Representativeness is a qualitative term that describes the extent to which the sampling design adequately reflects the environmental conditions. At this Site, this refers to the ability of the selected sampling locations to reflect actual Site conditions. Representativeness of soil vapor and indoor air samples will be assured by the collection of a sufficient number of these samples to reduce the uncertainty in determining the extent of contamination. Representativeness of laboratory data will also be assessed by evaluating adherence to prescribed analytical methods and procedures, including holding times, and duplicates.

Completeness is the measure of the valid data obtained compared to the quantity expected. Both field completeness (i.e., collecting all the necessary samples and getting them to the laboratory) and laboratory completeness (i.e., all samples analyzed and all data considered useable) are critical parameters.

Comparability refers to the confidence with which one data set can be compared to another. Consistency in field sampling and analytical protocols will be used to ensure comparability. In the laboratory, data are comparable when the analysis is done with the same standard method and reporting limits.

The sensitivity objective refers to the ability of the laboratory to achieve quantitation limits that are lower than that required by the NYSDOH. The selection of the analytical laboratory will be based, in part, on their demonstration that these limits can be routinely achieved.

3.2.3 Laboratory Quality Control Requirements

The samples will be analyzed by a NYSDOH ELAP certified laboratory. The laboratory will be required to maintain accuracy and precision in accordance with this Work Plan. Con-Test Laboratory will provide precision and accuracy control limits for the designated analytes.

Sample parameters and QA/QC are provided in Table 2. Sample volume requirements and holding times are provided in Table 3. Laboratory detection limits for specific compounds are listed on Table 4.

3.2.4 Data Assessment and Evaluation

All sampling, handling, and fixed laboratory data will be reviewed by a URS chemist. The review procedure will include verification of all quality control measures used in both the field and the laboratory. The review will include the following topics:

- Sample receipt and handling according to method requirements,
- An analysis of holding time criteria,
- An evaluation of blank data (laboratory method blanks),
- An evaluation of accuracy using the laboratory control sample (LCS),
- An evaluation of precision using field and laboratory duplicate samples, and
- An evaluation of sensitivity with respect to required quantitation limits.

A data assessment report will be generated for the field investigation. If any data are not useable to support the required decision, the data review will address resolution of this problem and the potential need for resampling.

Upon completion of the field program and the final validation of analytical data, a report will be prepared which details the findings of the study. The report will address:

- Summary of Field Work
- Copies of Field Logs and Sampling Forms
- Any Variation/Modification of Planned Scope of Work
- Contamination Assessment
- Data gaps (if any)
- Data Quality Evaluation and submittal of DUSR
- Evaluation of Groundwater Plume Migration
- Conclusions

URS will conduct a data quality evaluation for analytical data gathered as part of the study. The laboratory selected for analysis of project samples will be certified under the New York State Department of Health Environmental Laboratory Accreditation Program (ELAP). URS will perform a limited validation of laboratory data, sufficient to prepare a Data Usability Summary Report (DUSR). The DUSR will be developed from a full NYSDEC ASP Category B deliverables package. Upon validation, all sample results will be grouped by media (e.g., soil vapor, indoor air, and ambient outdoor air) and tabulated.

Data generated during the Soil Vapor Intrusion Study will be used to evaluate the concentrations and extent of site contamination in subsurface soil and groundwater. The data will be reduced to findings and provided to the NYSDEC and NYSDOH for review. The findings will be used to determine if additional investigations and data are required, or if sufficient data exist.

URS will critically evaluate the patterns of groundwater and soil vapor contamination to attempt to elucidate migration patterns, mechanisms, and barriers for transport of contaminant vapors from groundwater to indoor air.

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