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CONESTOGA-ROVERS & ASSOCIATES

SOIL VAPOR INTRUSION INVESTIGATION WORK PLAN

FORMER BUFFALO CHINA SITE
51 HAYES PLACE
BUFFALO, NEW YORK
BROWNFIELD CLEANUP SITE NO. C915209

MARCH 2009
REF. NO. 037191(7)

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1.0 INTRODUCTION

This Soil Vapor Intrusion Investigation (SVII) Work Plan was prepared to identify and evaluate potential off-Site soil vapor receptors as a result of previously identified environmental impacts at the former Buffalo China Site (Site). The SVII will focus on evaluating a select group of both residential and commercial properties located to the south of the Site.

The Site is currently owned by Niagara Ceramics and is located at 51 Hayes Place, Buffalo, New York, as shown on Figure 1. In March 2004, Buffalo China sold the property to Niagara Ceramics. Buffalo China has entered into a Brownfield Cleanup Agreement (BCA #C915209) with the New York State Department of Environmental Conservation (NYSDEC) to investigate and remediate, as appropriate, potential areas of environmental concern associated with the Site.

During previous investigation and sampling events conducted under this BCA, volatile organic compounds (VOCs), specifically trichloroethene and associated degradation products, have been identified as the contaminants of concern in groundwater at the Site.

This document presents the Work Plan for the completion of the SVII to define and delineate the nature and extent of chemical soil vapor presence associated with the Site's former operations in off-Site environmental media. This Work Plan has been prepared in accordance with the NYSDEC draft document DER-10, "Technical Guidance for Site Investigation and Remediation," dated December 2002 (DER-10), and the New York State Department of Health's (NYSDOH's) Final document, "Guidance for Evaluating Soil Vapor Intrusion in the State of New York," October 2006 (SVI Guidance).

In addition, SVI sampling will be conducted in accordance with the protocols and procedures described in this plan and corresponding plans such as the Soil Vapor Intrusion Field Sampling Plan provided as Appendix A, the Site-Specific Quality Assurance Project Plan (QAPP), and the Site-Specific Health and Safety Plan (HASP).

1.1 SAMPLING OBJECTIVES

The primary objective of the SVII presented herein has been developed based on the currently available knowledge of on-Site and off-Site conditions and represents a general approach to the collection of soil vapor samples for the purpose of evaluating potential soil vapor intrusion pathways. As such, this Work Plan may require modification

following further investigative work. Soil vapor quality data obtained through the procedure outlined below will be evaluated to assess potential human health risks related to soil vapor migration towards and into off-Site buildings. The proposed investigation will be focused on those areas where soil vapor concentrations of chemicals are suspected to be present downgradient of the Site at levels that may exceed the NYSDOH's *Action Levels Requiring Mitigation* (Action Levels). Once the investigation is complete, a determination will be made as to the need for additional investigation activities to completely define the nature and extent of any identified impacts or for the development of mitigation system(s).

1.2 REPORT ORGANIZATION

The Work Plan is organized as follows:

i) Section 1.0 – Introduction: The introduction presents an overview of the project to date;

ii) Section 2.0 – Site History and Description: Descriptions of the Site location, physical condition, and current and historic use are presented in Section 2.0;

iii) Section 3.0 – Objectives, Scope, and Rationale: Definitions of the objectives, scope, and rationale for the work to be conducted, and the tasks involved in examining the vapor intrusion pathway at the Site are presented in Section 3.0;

iv) Section 4.0 – Proposed Investigation Activities: The Work Plan for the proposed SOSSVII is presented in Section 4.0; and

v) Section 5.0 – Schedule: A preliminary project schedule is presented in Section 5.0.

The QAPP and HASP for the SVII have been prepared and submitted under separate covers.

2.0 SITE DESCRIPTION AND HISTORY

2.1 SITE DESCRIPTION

The Former Buffalo China Site is located at 51 Hayes Place in Buffalo, New York. The Site location and Site plan are shown on Figures 1 and 2, respectively. The Site comprises approximately 10 acres and is bounded on the north by Conrail Railroad tracks, on the east by an adjoining warehouse currently leased by Robinson Home Products and other commercial/industrial facilities, and on the south and west by commercial, industrial, and residential properties. Interstate I-190 is located nearby to the south of the Site, while the City of Buffalo School 26 and adjacent playground is located a few hundred feet to the southwest. The nearest body of water is the Buffalo River, located approximately 1/4 to 1/2 mile south and east of the Site. Figure 2 provides a layout of the Site.

The Site includes buildings, outdoor storage silos, a rail spur, roadways, and parking areas. The manufacturing building is a multi-story structure covering approximately 4 acres. The building is connected to the warehouse to the east. Another smaller building referred to as the Harrison Street warehouse is located in the northwest corner of the Site and covers an area of approximately 1/2 acre. The primary access to the Site is through the east side of the Site off of Bailey Avenue or via Hayes Place off of Seneca Street. The property has been used for the manufacture of china for the past 100 plus years. During that time period, the manufacturing facility expanded to adjacent industrial properties which included the Harrison Street Warehouse which was part of the former Standard Mirror Co. The Harrison Street Warehouse was a separate parcel located to the east of Harrison Street, while the remainder of the Standard Mirror facility was located on the west side of Harrison Street.

2.2 PHYSICAL SETTING

The Site lies within the City of Buffalo corporation limits on a relatively flat parcel of land. The Site is located in an urban-industrial area of the City. Previous Site investigations determined that the Site is underlain by fill materials ranging in thickness from 0 to 4 feet below ground surface (bgs). Fill materials are underlain by clay deposits which range in depth from 4 feet bgs extending to a depth of approximately 16.9 feet bgs. Underlying the clay deposits is bedrock, which for the Buffalo area typically consists of carbonate sedimentary rock.

2.2.1 GEOLOGY

According to the Phase I report prepared by Environmental Associates, Inc. (EA) in February 2004, the soils in the area of the Site were deposited by extensive glaciation forming a glacial till deposit underlain by limestone bedrock. The bedrock in the area of the Site, Onondaga Limestone is generally 5 feet or more bgs consisting of an intermixed light-grey limestone and dark-grey chert bedrock. Bedrock outcrops were not observed on the Site.

According to the Phase I report prepared by EA, the soils beneath the Site are classified as Urban land (Ud). Ud is generally covered by asphalt, concrete, buildings, and other impervious structures. It includes parking lots, shopping and business centers, and industrial parks. These areas generally range from 3 to 500 acres or more and are mostly level to gently sloping. The former Buffalo China Site and the surrounding neighborhood are consistent with this description of Ud.

The fill encountered at the Site ranged in thickness from 0.5 feet to 16 feet, with the thickest fill encountered along the soil mound at SB-2-07, SB-3-07, and SB-4-07, north of the Harrison Street Warehouse. It should be noted that the borings at these locations began at the top of the soil mound and extended through the mound to the top of rock, resulting in increased thicknesses of fill material. The soil mound is roughly 10 feet high. The fill consists of medium to coarse-grained sand and gravel, with clay present at deeper depths (6.5 to 8 feet bgs). Fill materials within the soil mound consisted of broken dishes, porcelain chunks, glass, and other assorted small building and process debris.

The native soils underlying the fill generally consist of dense clay underlying sand and/or silt; however, the soil stratigraphy is highly variable, and silt and clay generally underlies the fill at the Site.

2.2.2 TOPOGRAPHY AND SURFACE WATER DRAINAGE

The United States Geological Survey (USGS) 7.5-minute Topographic Quadrangle Map of Buffalo, SE, New York indicates that the Site's ground surface is generally level. Aside from the hilly nature of the Soil Mound, a visual inspection confirmed that the Site is generally flat with some gentle sloping for runoff to Site storm sewers or ditches. The general direction of on-Site surface water drainage appears to be toward a series of storm drains located throughout the paved portions of the Site. The on-Site storm sewers are connected to the City of Buffalo combined sewer system. Under normal

conditions the drainage flows to the Buffalo Sewer Authority Bird Island Treatment Plant. Under overflow conditions, the flow would be discharged through the Hamburg Drain to the mouth of the Buffalo River.

The nearest natural body of water is the Buffalo River, which is located approximately 0.4 miles south of the Site. The Buffalo River meanders in a westerly direction toward Lake Erie located approximately 2.8 miles west of the Site. The surface elevation for the Site is approximately 590 feet above mean sea level (AMSL).

2.2.3 GROUNDWATER CONDITIONS

Based on the EA Phase I report, shallow and regional (deep) groundwater both flow in a westerly-southwesterly direction toward Lake Erie. The Phase I report assumed that the groundwater table typically conforms to surface and bedrock topography. Multiple rounds of water level measurements in the overburden wells were completed in 2007, and 2008.

In December 2008, six bedrock groundwater monitoring wells were installed. Water level data was collected in January 2009 and March 2009 from both the overburden and bedrock wells.

Based on the data, groundwater flow in the overburden soil and the bedrock appears to be in a west-southwesterly (Figure south) direction towards the Buffalo River.

3.0 OBJECTIVES, SCOPE, AND RATIONALE

The objective of the soil vapor intrusion evaluation to be conducted by Conestoga-Rovers & Associates (CRA) is to define the nature and extent of off-Site vapor intrusion impacts related to past Site activities so that a response scenario, if necessary, can be developed that is protective of human health and the environment. The specific objectives of the scope of work presented in this Work Plan are:

- evaluate the potential off-Site migration of VOCs in the soil vapor west of the Site; and
- determine the impact or potential impact of the soil vapor to human health.

4.0 PROPOSED INVESTIGATION ACTIVITIES

4.1 PREPARATION OF DETAILED WORK PLANS

4.1.1 QUALITY ASSURANCE PROJECT PLAN

A QAPP has been prepared for the Site in accordance with the Resource Conservation and Recovery Act (RCRA) Quality Assurance Project Plan Guidance, NYSDEC, March 1991 and "EPA Guidance for Quality Assurance Project Plans," United States Environmental Protection Agency (USEPA) QA/G-5, USEPA/600/R-98/018, February 1998, NYSDEC's, December 2002, Draft DER-10 Technical Guidance for Site Investigation and Remediation, Section 2, Quality Assurance for Sampling, and Laboratory Analysis. The QAPP describes protocols necessary to achieve specified data quality objectives. The QAPP has been previously prepared and submitted under separate cover.

4.1.2 HEALTH AND SAFETY PLAN

A HASP has been prepared in accordance with 29 Code of Federal Regulations (CFR) Part 1910 and 29 CFR 1926 and has been reviewed and signed by an appropriate health and safety professional as specified in the NYSDEC's December 2002, *Draft DER-10 Technical Guidance for Site Investigation and Remediation*. The HASP specifies protective measures and procedures to be followed during the field activities to minimize exposure of workers and the surrounding community to hazardous Site-related materials. The Site-specific HASP has been previously prepared and submitted under separate cover.

4.2 FIELD INVESTIGATION

A series of sampling activities will be completed to characterize the off-Site conditions to delineate the extent of off-Site contaminant migration and the impact of soil vapor intrusion on the indoor air quality of the surrounding properties. The following subsections describe the field activities to be conducted during the SVII.

Based on the findings of the SVII, additional investigation activities and data analyses may be proposed to further define the impact to on-Site and off-Site receptors.

The following scope of work was designed to meet the objectives set forth in Section 3.0. The scope of work consists of:

- installation of sub-slab soil vapor sampling implants;
- collection of sub-slab soil vapor and indoor and outdoor ambient air samples;
- survey of sampling locations; and
- preparation of Soil Vapor Intrusion Evaluation Report.

In order to help delineate the potential source of VOCs, vapor sampling will be conducted in a selected group of both residential and commercial structures.

4.2.1 SOIL GAS QUALITY ASSESSMENT

Delineation of potential indoor sources within residential dwellings and commercial businesses is critical to evaluating the human health risk. Commercial facilities are inclined to have specific issues in terms of evaluating indoor sources of VOCs relative to their business. For example, carpeting is known to emit a number of VOCs, welding shops would be expected to use degreasing solvents, and auto repair and car dealer businesses are likely to have indoor air impacts from petroleum hydrocarbons. (Prior spills and diffusion into concrete floors could also represent an ongoing source of indoor VOCs.) In these cases, a variety of different indoor air environments are involved, and it may be difficult to differentiate sub-slab and indoor sources if VOCs are detected in the subsurface. In order to address this issue, it is proposed that both sub-slab and indoor air sampling should be undertaken concurrently at both residential and commercial facilities. Residential, commercial, indoor, and outdoor air samples would be analyzed for the full TO-15 list.

The tasks involved in the assessment of potential vapor intrusion into building indoor air are described below. It is recommended that a minimum of one round of sub-slab soil vapor, and indoor and outdoor ambient air sampling should be completed to properly evaluate soil vapor intrusion. Should the initial round of sampling indicate VOC concentrations in excess of "no further action levels" outlined on the NYSDOH mitigation matrices (NYSDOH, 2006) for soil vapors beneath the sub-slab, a second round of sub-slab sampling along with indoor air and soil vapor sampling will be conducted to verify results and further define soil vapor impacts at the off-Site locations. Proposed soil vapor sampling locations are shown on Figure 3. The following tasks represent the general approach that would be followed to complete the investigation.

4.2.1.1 TASK 1: SUB-SLAB PROBE/IMPLANT INSTALLATION

To investigate the potential for contaminants in the subsurface to volatilize from soil and groundwater to soil gas within the unsaturated overburden at off-Site locations, the installation and sampling of semi-permanent sub-slab soil gas probes at selected locations is proposed.

Before installing the sub-slab vapor probes, a building inventory will be conducted in accordance with the NYSDOH Guidance. The building inventory will be used to determine the final sample locations.

A total of seven semi-permanent sub-slab gas probes are proposed, as indicated on Figure 3. One sub-slab sample will be collected from each of these proposed locations. Each sub-slab gas probe will consist of one shallow soil gas probe installed in a central location away from foundation footings, just below the surface of the slab.

The sub-slab probe will be installed by drilling a 1/2- to 1-inch diameter hole through the slab with a drill and spline bit. Before drilling, the location of all sub-slab utilities, both public and building-specific, will be identified and marked. No water will be used during the installation of the probe. If dust prevention is necessary, the location may be covered by a towel or cloth and drilling will proceed through a pre-cut hole in the cloth.

After drilling though the slab, the slab thickness will be measured and recorded. A 1/8-inch diameter nylon sample tubing of sufficient length extending from the base of the slab to the ground surface will be installed. The drill hole will be filled with pre-hydrated granular cement/bentonite to ground surface. The tubing at ground surface will be terminated with a valve connection. A typical sub-slab soil vapor probe installation is depicted on Figure 4.

Drilling and sampling equipment will be decontaminated, as required, by washing with an Alconox detergent solution and rinsing with distilled water.

4.2.1.2 TASK 2: SUB-SLAB PROBE SAMPLING

The sub-slab probe sampling will be conducted a minimum of 72 hours following the installation of the soil gas probes. Equilibration time is needed since oxygen can be introduced into anaerobic portions of the vadose zone during soil probe installation. In

addition, sampling will not be performed during or within 24 hours of a significant rain event [i.e., ≥0.5 inches within 24 hours, Cal EPA (2003)].

Written documentation of all field activities, conditions, and sampling processes, including names of field personnel, dates and times, etc., will be collected. Weather conditions (temperature, barometric pressure, wind direction, wind speed, and humidity), surface conditions (presence of standing water and/or non-vegetative cover), and groundwater elevation measurements in monitoring wells in close proximity to the soil gas probes will be documented during soil gas sampling.

The sub-slab samples will be collected using 6-liter capacity Summa™ canisters fitted with a laboratory calibrated critical orifice flow regulation device sized to allow the collection of the soil gas samples over a 24-hour sample collection time. A typical soil vapor intrusion canister set-up is depicted in Figure 5. Only canisters laboratory batch certified clean at the 100 percent level will be used for sampling, so data can be evaluated for assessing potential human health risk. The 24-hour sample collection time for a 6-liter capacity Summa™ canister corresponds to a maximum soil gas sample collection flow rate of approximately 0.0042 liters per minute (L/min). This soil gas sample collection flow rate is well below the maximum flow rate of 0.2 L/min recommended by NYSDOH (2006). A maximum flow rate of 0.1 L/min is recommended to limit VOC stripping from soil, prevent the short-circuiting of ambient air from ground surface that would dilute the soil gas sample, and increase confidence regarding the location from which the soil gas sample is obtained. The low flow rate of 0.0042 L/min provides the most representative sample of in-situ conditions.

Prior to sample collection, soil gas probe purging will be conducted at a maximum flow rate of 0.1 L/min. A maximum of three soil gas probe "dead volumes" will be purged to remove potentially stagnant air from the internal volume of the soil gas probe and ensure that soil gas representative of the porous media beneath the sub-slab is drawn into the Summa™ canister. The soil gas probe "dead volumes" will be calculated based on field measurements of probe construction (i.e., tubing length and tubing inner diameter) and aboveground sampling equipment. A helium blanket over the sample probe will be used to evaluate short circuiting of the sampling train from the ambient air.

Concurrently with the sub-slab soil vapor samples, indoor and outdoor ambient air samples will be collected. Outdoor air samples will be collected upwind of the investigation area in which the sub-slab samples are being collected. Indoor air samples will be collected in the same areas as sub-slab samples, concurrently. There are seven residential locations proposed for sampling.

Since the previous FSP submitted for the Site does not contain soil vapor sampling procedures, detailed procedures for soil vapor sampling have been included in Appendix A of this Work Plan.

The soil gas samples will be analyzed using the USEPA's TO-15 gas chromatograph/mass spectrometer (GC/MS) methodology. This analysis will provide results for the full list of TO-15 VOCs (Table 1) for residential and commercial sub-slab and ambient indoor samples and outdoor samples.

All samples will be analyzed by a New York State Environmental Laboratory Approval Program (ELAP)-certified laboratory capable of providing Level B Analytical Services Protocol (ASP) deliverables.

Quality control/quality assurance (QC/QA) measures implemented during the soil gas sampling event will include maintaining a minimum residual negative pressure in the Summa™ canisters of approximately 1 to 5 inches of mercury following sample collection, and the collection of one field duplicate sample for every 20 samples collected.

4.2.1.3 TASK 3: INDOOR AIR SAMPLING

Indoor air soil vapor samples should be collected in the breathing zone between 3 and 5 feet above the ground, preferably during the heating season. Each sample will be collected from the lowest point within the home (i.e., basement, crawlspace, etc.) The sample will be collected for a 24-hour duration. The 24-hour sample collection time for a 6-litre capacity Summa™ canister corresponds to a maximum soil gas sample collection flow rate of approximately 0.0042 L/min.

The indoor air soil vapor samples will be analyzed using the USEPA's TO-15 gas GC/MS methodology. This analysis will provide results for full TO-15 list of VOCs. All soil vapor samples will be analyzed by a laboratory with appropriate ELAP certification, as specified in NYSDOH guidance (NYSDOH, 2006), and will be conducted in accordance with ASP Category B protocols.

QC/QA measures implemented during indoor air soil vapor sampling events will include maintaining a minimum residual negative pressure in the Summa™ canisters of approximately 1 to 5 inches of mercury. Collection of one field duplicate sample for

every 20 samples, or at least one duplicate sample per sampling event will also be conducted.

4.2.1.4 TASK 4: OUTDOOR AIR SAMPLING

Ambient outdoor air soil vapor samples will be collected upwind of the building in which the sub-slab and indoor air samples are collected. A typical indoor and outdoor air sampling canister set up is depicted in Figure 6. One ambient outdoor air sample per sample event/day will be collected concurrently with the proposed sub-slab soil vapor and indoor air samples. Outdoor air samples will be collected from the breathing zone between 3 and 5 feet above the ground surface over a 24-hour duration. The 24-hour sample collection time for a 6-litre capacity Summa™ canister corresponds to a maximum soil gas sample collection flow rate of approximately 0.0042 L/min.

The outdoor air soil vapor samples will be analyzed using the USEPA's TO-15 gas GC/MS methodology. This analysis will provide results for full TO-15 list of VOCs. All soil vapor samples will be analyzed by a laboratory with appropriate ELAP certification, as specified in NYSDOH guidance (NYSDOH, 2006), and will be conducted in accordance with ASP Category B protocols.

QC/QA measures implemented during outdoor air soil vapor sampling events will include maintaining a minimum residual negative pressure in the Summa™ canisters of approximately 1 to 5 inches of mercury. Collection of one field duplicate sample for every 20 samples, or at least one duplicate sample per sampling event will also be conducted during sub-slab soil vapor sampling.

The proposed sampling activities are summarized on Table 2.

4.2.1.5 TASK 5: SCREENING ASSESSMENT OF SOIL GAS QUALITY DATA

As an initial assessment of the significance of the soil gas sample analytical results, the chemical concentrations detected in the soil gas samples will be compared to, or screened against, chemical-specific generic soil gas screening criteria. The State of New York does not develop generic screening levels for volatile chemicals in soil vapor; however, it has developed target indoor air concentrations for only a very limited number of chemicals (specifically, four compounds: carbon tetrachloride, trichlorethene, tetrachloroethane, and 1,1,1-trichlorethane). In addition to the State of New York target

indoor air concentrations, the USEPA has developed chemical-specific generic soil gas screening criteria (USEPA 2002). Sub-slab soil vapor, indoor air and outdoor air sample analyte concentrations from each structure, in conjunction with other factors including but not limited to the nature and extent of environmental contamination in all media and the potential for preferential pathways, will be evaluated to assess the potential and extent of soil vapor intrusion.

The soil vapor data will be compared to both the NYSDOH target indoor air concentrations as well as the USEPA chemical-specific generic soil gas screening criteria. Should any volatile chemicals be detected in soil gas, indoor, or outdoor ambient air samples at concentrations greater than the New York State target indoor air concentrations or the USEPA generic soil gas screening criteria, the potential for these chemicals to impact indoor air quality will be assessed further.

4.3 SAMPLE ANALYSES AND DATA VALIDATION

Analytical data collected during the Site Investigation will be validated to demonstrate the usability of the data to support the conclusions of the Site Investigation.

All analytical work will be subcontracted to an ELAP- and CLP/ASP-certified laboratory(s) (e.g., Test America, Accutest, or Air Toxics). All analytical data generated by the subcontract laboratory(s) will be assessed and validated by a CRA Data Validator/Chemist in accordance with the requirements of the QAPP. Data validation and a Data Usability Summary Report will be conducted and prepared in accordance with DER-10 as outlined in the Site-specific QAPP.

4.4 EXPOSURE ASSESSMENT

A qualitative human health exposure assessment will be performed using the data collected during the SVII. The assessment will be performed in accordance with Appendix 3B of the NYSDEC DER-10 and the NYSDOH SVI Guidance.

4.5 SOIL VAPOR PROBE SURVEY

After the sub-slab vapor probes are installed, CRA will survey the newly installed well locations and elevations relative to mean sea level.

The top of each probe will be surveyed to the nearest 0.01 foot relative to the National Geodetic Vertical Datum (NGVD) and a survey point will be marked on the probe casing. The survey will also include the ground elevation at each probe to the nearest 0.10 foot relative to the NGVD. The probe location will be surveyed to the nearest 1.0 foot.

4.6 SOIL VAPOR INTRUSION EVALUATION REPORT

Following completion of all the SVII activities, a draft report will be prepared presenting the results. The SVII Report will include all background information, the analytical and testing data collected during the SVII, an evaluation of the current Site condition, exposure assessment results, references, and recommendations for additional work, if deemed necessary. Data will be presented in both tabulated and graphic forms.

The draft SVII Report will be submitted to the NYSDEC and NYSDOH. Comments by the NYSDEC and NYSDOH regarding the draft report will be addressed and the final report will be revised accordingly. The revised SVII Report will then be submitted final to the NYSDEC and NYSDOH.

5.0 SCHEDULE

The preliminary Project Schedule for the SVII is presented on Table 3.

6.0 REFERENCES

This Section lists the references used to prepare this report.

i) New York State Department of Environmental Conservation, December 25, 2002, *Draft DER-10 Technical Guidance for Site Investigation and Remediation.*

ii) New York State Department of Environmental Conservation, December 14, 2006, 6 *NYCRR Part 375, Environmental Remediation Programs Subparts 375-1 to 375-4 and 375-6.*

iii) New York State Department of Health, October 2006. *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York.*

iv) United States Environmental Protection Agency, January 1999, *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition.*