VI Mitigation Work Plan

South Dayton Dump and Landfill Site
Moraine, Ohio

Submitted to:
US EPA Region 5
Emergency Response Branch
Cincinnati, OH
OSC Steve Renninger

651 Colby Drive Waterloo Ontario N2V 1C2 Canada

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1. Introduction

This Vapor Intrusion (VI) Mitigation Work Plan has been prepared by GHD (formerly Conestoga Rovers & Associates [CRA]) on behalf of the Respondents to the Administrative Settlement Agreement and Order on Consent for Removal Action (ASAOC or Removal Order) with United States Environmental Protection Agency (USEPA), Docket No. V-W-13-C010 (Respondents). A copy of the April 2013 USEPA Removal Order is included as Appendix A. In May 2014, Addenda 1 and 2 were included in the VI Mitigation Work Plan to describe hybrid proficiency sampling and methane sampling activities, respectively. This VI Mitigation Work Plan was revised (revision 1) to include additional criteria for determination of sub-slab depressurization system (SSDS) compliance, based on USEPA's proposals from the meeting with GHD held on September 10, 2015.

This Work Plan details mitigation measures that will be completed to address concentrations of volatile organic compounds (VOCs) and explosive gases detected in sub-slab soil vapor and indoor air in buildings on and off Site of the South Dayton Dump and Landfill Site (Site or Property) in Moraine, Ohio.

This Work Plan was prepared in accordance with the following documents:

- USEPA Vapor Intrusion Investigation Work Plan (USEPA, November 2011)
- USEPA Region 5 Vapor Intrusion Guidebook (USEPA, 2010) (USEPA Region 5 Guidance)
- Ohio Environmental Protection Agency (Ohio EPA) Sample Collection and Evaluation of Vapor Intrusion to Indoor Air Guidance Document, (Ohio EPA, May 2010)
- OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance) (USEPA, November 2002)
- OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway From Subsurface Vapor Sources to Indoor Air (Final Vapor Intrusion Guidance) (USEPA, June 2015)

GHD has also prepared this work plan to comply with the substantive requirements of Ohio Administrative Code (OAC) 3745-27-12 with respect to permanent monitoring for explosive gas in buildings located within the limits of waste. This mitigation work will be completed in accordance with Section 104(a)(1) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C § 9604(a)(1), and 40 C.F.R. § 300.415 (Removal action) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) to abate or eliminate the immediate threats posed to public health and/or the environment.

The sub-slab depressurization system (SSDS) installations for the project will require approximately 45 working days to complete. A Project Schedule detailing milestones and task duration is presented in Section 8.

As several buildings requiring mitigation are situated on property, both on and off Site, that is owned and occupied by third parties, coordination of mitigation work with the owner and tenants is important, and any mitigation systems that are eventually installed will require their consent and the design of the mitigation system(s) will need to be consistent with on-going operations.

1.1 Objectives of the VI Mitigation Activity

The VI Mitigation Activity is intended to directly address actual or potential releases of hazardous substance on Site, which may pose an imminent and substantial endangerment to public health, or welfare, or the environment. The VI Mitigation activity has two primary objectives:

1)Design and install a vapor abatement mitigation system in on or off Site residential or non-residential (commercial) structures impacted by subsurface gas migration, if the concentration(s) of contaminant(s) of concern (COCs) are greater than Ohio Department of Health (ODH)[1] sub-slab or indoor air screening levels and the presence of the COC is determined to be a result of vapor intrusion. The Respondents understand that Valley Asphalt will submit a separate Work Plan for their property and structures (i.e., Parcel 5054) to USEPA and that this work will be completed under a separate administrative order.

2)If levels of methane at the property boundary are greater than the lower explosive limit (LEL) (5 percent methane), design and install a landfill gas extraction system to prevent landfill gas migration off Site.

The 2012 ODH screening levels were calculated based on an attenuation factor (AF) of 10, reflective of the 2002 OSWER Subsurface Vapor Intrusion Guidance. The 2015 OSWER Final Vapor Intrusion Guidance utilizes attenuation factors of 30 to 33 for residential buildings. During the meeting with GHD on September 10, 2015, USEPA discussed the use of ODH sub-slab screening levels calculated based on an AF of 50 for the industrial buildings with SSDSs at the Site. USEPA proposed and GHD agreed that SSDSs would be in compliance if indoor air (IA) vapor intrusion-related concentrations were less than the 2012 ODH IA screening levels, and sub-slab concentrations were less than ODH sub-slab screening levels calculated based on an AF of 50. The ODH sub-slab screening levels calculated based on an AF of 50 are presented as follows:

Table 1.1 Sub-slab screening levels calculated based on an AF of 50

Chemical of Concern	ODH Non-Residential Sub-Slab Soil Gas Screening Level (ug/L) (AF = 50)
1,1-Dichloroethane	800
Benzene	100
Chloroform	4,000
cis-1,2-Dichloroethylene	1,850
Ethylbenzene	12,500
Tetrachloroethylene (PCE)	1,250
Trichloroethylene (TCE)	100
m,p-Xylenes	10,000
o-Xylenes	10,000
Vinyl chloride	100

The IA and methane screening levels issued by ODH in 2012 continue to apply for evaluation of the analytical results.

[1] ODH Health Assessment Section provided screening levels for sub-slab and indoor air contaminants of concern in a letter dated July 6, 2012. ODH screening levels for naphthalene were provided by electronic mail (email) on September 13, 2012. Revised ODH screening levels to correct the indoor air non-residential values for o-xylene were issued on October 9, 2012. The ODH letter and emails are provided in Appendix H.

To achieve these two primary objectives, the followings removal activities will be completed at a minimum:

- Develop and implement a Site Health and Safety Plan.
- Conduct subsurface gas sampling (including VOCs and methane) and conduct extent of contamination sampling utilizing groundwater, soil gas, sub-slab, and indoor air sampling techniques.
- The VI abatement systems will include installation of a SSDS or crawl space depressurization system, sealing cracks in walls and floors of the basement, and sealing drains that could be a pathway for vapor intrusion. The vapor abatement mitigation systems will be designed to control levels of methane and VOCs to below ODH sub-slab[2] and indoor air screening levels.
- The landfill gas system will be designed to control levels of methane at the property boundary to less than the lower explosive limit (5 percent methane).
- Develop and implement a performance sample plan to confirm that ODH screening levels are achieved for COCs following installation of on site or off Site vapor abatement mitigation system. If ODH screening levels are not achieved within 30 days of installation, Respondents will submit a Corrective Action Plan to USEPA. USEPA and Respondents will present final Corrective Action Plans to building tenants/owners following the Respondents and USEPA meeting anticipated to occur in Fall 2015.
- Develop and implement an operations and maintenance (O&M) plan at properties where SSDSs are installed including a long term inspection and monitoring plan.
- If necessary, develop and implement (1) a landfill gas extraction system performance sample plan including the installation of perimeter subsurface probes to confirm that methane action levels are achieved and (2) a landfill gas extraction system effluent sample plan.

1.2 Site Description

The Site is located at 1901 through 2153 Dryden Road and 2225 East River Road in Moraine, Ohio. The Site location is shown on Figure 1.1. The Site is bounded to the north and west by the Miami Conservancy District (MCD) floodway (part of which is included in the definition of the Site), the Great Miami River Recreational Trail, and the Great Miami River (GMR) beyond. The Site is bounded to the east by Dryden Road with light industrial facilities beyond, to the southeast by residential and commercial properties along East River Road with a residential trailer park beyond, and to the south by undeveloped land with industrial facilities beyond.

The northern and eastern portions of the Site are currently occupied by active businesses including an operating asphalt plant at the northern portion of the Site, and several other active businesses in the northeastern portion of the Site along Dryden Road. Additional active businesses are located in the southeastern portion of the Site along East River Road, including an auto salvage yard. The Site also includes an approximately 15-acre pond (Quarry Pond).

Commercial and industrial properties bound the Site to the east and south, including an approximately 30-acre maintenance facility owned by Dayton Power and Light (DP&L). Additional commercial and industrial properties are located on the opposite bank of the GMR to the northeast,

[2] A mitigation system is in compliance if the COC concentrations are less than ODH sub-slab screening levels calculated using an AF of 50 and ODH IA screening levels.

north, northwest, west, and southwest. The Montgomery County Sewage Disposal facility is located along the opposite bank of the GMR, southwest from the Site.

Approximately 25,060 people live within a 4-mile radius of the Site. Residential properties exist more than 1,500 feet (ft) north of the Site beyond the opposite bank of the GMR. A small trailer park is located 200 ft east southeast from the Site across Dryden Road. Six single family residences are located on the northwest side of East River Road and are adjacent to the southeast boundary of the Site. A seventh single family home is located on the southeast side of East River Road and is within 300 ft of the Site.

A landfill was operated on the approximately 80-acre Site from the 1940s until 1996. Municipal, commercial, industrial, and residual wastes, and construction and demolition debris were disposed of at the landfill over the years. Combustible wastes were often burned.

Fill, waste, and soil at the Site contains VOCs including, but not limited to, trichloroethene (TCE), cis-1,2-dichloroethene (cis,1-2,DCE), vinyl chloride (VC), and benzene; semi-volatile organic compounds (SVOCs) including, but not limited to, polynuclear aromatic hydrocarbons (PAHs) and naphthalene; polychlorinated biphenyls (PCBs); and metals, including lead, copper, arsenic, and other inorganic chemicals. Contaminants, including VOCs, arsenic, lead, and some other chemicals detected in the landfill, have been detected in groundwater samples collected from a number of monitoring wells at and near the Site. Naphthalene and VOCs, including benzene, chlorobenzene, cis-1,2-DCE, isopropyl benzene, ethylbenzene, TCE, and VC were also detected in samples collected from soil gas probes throughout the Site.

1.2.1 Geology, Hydrogeology, Topography

The Dayton area is located within the buried pre glacial valley system that underlies the present day GMR and its tributaries in southwestern Ohio. This pre-glacial valley system is known as the Miami Valley Aquifer System. The regional overburden geology of the Dayton area consists of glacial tills, and glaciofluvial sand and gravel deposits. Norris and Spieker (1966) defined the overburden units, based on general character and relative position to be (from top to bottom):

- Ground Moraine (glacial till) – composed of silt, gravel, and clay; found primarily in the uplands area (not present at the Site)
- Upper Aquifer Zone – the saturated glaciofluvial sand and gravel zone located above a major till rich zone
- Till Rich Zone – composed of discontinuous fine-grained glacial till and other fine-grained materials with substantial components of sand and gravel
- Lower Aquifer Zone – the glaciofluvial sand and gravel zone located beneath the Till Rich Zone

The subsurface geology in the vicinity of the Site, identified by GHD, consists of fill and waste underlain by glacial tills, and glaciofluvial sand and gravel deposits.

Norris and Spieker (1966) identified three principal hydrogeologic units in the Dayton area, as follows:

- Upper Aquifer Zone – the upper portion of the saturated glaciofluvial sand and gravel facies
- Till Rich Zone – a zone of discontinuous low permeability till facies interspersed with sand and gravel facies which acts as an aquitard in some areas

- Lower Aquifer Zone – the lower portion of the saturated glaciofluvial sand and gravel facies

The subsurface hydrostratigraphy in the vicinity of the Site is consistent with the regional geology of the Miami Valley Aquifer with the exception that the Till Rich Zone is highly discontinuous beneath the Site. Monitoring wells screened above approximately 675 ft above mean sea level (AMSL) appear to be representative of the Upper Aquifer Zone. Monitoring wells screened below 675 ft AMSL appear to be representative of the Lower Aquifer Zone. Due to the stratigraphic variation of the Till Rich Zone both vertically and laterally, the implied 675 ft AMSL boundary between the Upper and Lower Aquifer Zones is approximate and may vary in elevation across the Site.

Groundwater flow in the Upper Aquifer Zone is influenced by the presence of the GMR to the north and west of the Site. Shallow groundwater (i.e., Upper Aquifer Zone) typically flows west/southwest across the Site, and/or radially (in the northern part of the Site) towards the GMR. Occasional flow slightly to the southeast has been documented during extended periods of high flow in the GMR. Depending on surface water elevations at different times of the year, shallow groundwater discharges to, or is recharged by the GMR. During flood events, groundwater flow is occasionally reversed and migrates from the GMR to the Site. Groundwater flow in the Lower Aquifer Zone is predominantly to the southwest across the Site, with occasional slight southeasterly components, and is not significantly affected by the GMR. The groundwater level elevation in the vicinity of the Site is between 700 and 725 ft AMSL (likely closer to 710 ft AMSL at the Site).

A heavily vegetated man made embankment is present along the central (Parcel 5177) portion of the Site, and extends past the northern and western boundary of Parcel 5054, along the GMR. Portions of the berm are located on the MCD property. The grassy area between the berm and the GMR is part of the 100-year floodway and is owned by the MCD. The topography of the Site is fairly variable, with embankments along the west and north boundaries of the Site and the north boundary of the Quarry Pond, graded areas on Parcel 5054 and along Dryden and East River Roads, where the active businesses are located, a depressed area in the west central portion of Parcel 5177, several mounded areas of fill throughout the northern portion of Parcel 5177, a ravine along the south central part of the Parcel, and a low lying area along the entire southern portion of the Site. An unpaved access road, oriented east-west, extends from the undeveloped City of Moraine Road Allowance through the center of the Site. Portions of the Site are within the 100-year floodway, including the majority of the Site south of the Valley Asphalt property.

1.3 Site History

From 1941 to the present, various members of the Boesch and Grillot families have owned a major portion of the property where dumping was conducted. The majority of the properties that comprise the Site were acquired over time by Horace Boesch and Cyril Grillot.

The landfill operated from the early 1940s to 1996 and is a partially filled sand and gravel pit. The landfill contains household waste, drums, metal turnings, fly ash, foundry sand, demolition material, wooden pallets, and asphalt, and paint, paint thinner, oils, brake fluids, asbestos, solvents, transformers, and other industrial waste are known to have been brought to the Site. As the excavated areas of the Site were filled, some of the property was sold and/or leased to businesses including Valley Asphalt and other businesses along Dryden Road and East River Road. The Miami Conservancy District owns the southern part of the site including part of the Quarry Pond.

Disposal of waste materials began at the Site in the early 1940s. Materials dumped at the Site included drummed wastes. Known hazardous substances were brought to the Site, including

drums containing hazardous waste from nearby facilities. Some of the drums contained cleaning solvents (1,1,1-trichloroethane [TCA], methyl ethyl ketone [MEK], and xylenes); cutting oils; paint; Stoddard solvents; and machine tool, water based coolants. The Site previously accepted materials including oils, paint residue, brake fluids, chemicals for cleaning metals, solvents, etc. Large quantities of foundry sand and fly ash were dumped at the Site. Asbestos was also reportedly dumped at the Site.

USEPA conducted a screening site inspection of the Site in 1991. Ohio EPA conducted a site team evaluation prioritization of the landfill in 1996. In 2002, USEPA conducted an aerial photographic analysis of the Site.

In 1991, four underground storage tanks (USTs) were removed from Parcel 5054. Two 4,000-gallon steel USTs contained waste oil and gasoline, respectively. Two 3,000-gallon USTs contained diesel and kerosene, respectively.

In 1991, following a suspected release, a 20,000-gallon diesel fuel UST was removed from 1951 Dryden Road, on Parcel 5171. Custom Deliveries was operating at that location in 1991. Approximately 720 tons of soil was excavated and disposed of off Site. A concrete pad existed below the UST and it was not removed. The UST was disposed of off Site.

In 2000, Valley Asphalt removed five drums containing characteristic hazardous waste, PCBs, and VOCs and 2,217 tons of contaminated soils from their property (northern area of the Site) that were uncovered when a sewer line was being excavated.

USEPA proposed the Site to the National Priorities List in 2004. In 2008 to 2010, the Respondents completed several investigations at the Site, included geophysical surveys, test pit and test trench sampling, vertical aquifer sampling, landfill gas sampling, and groundwater monitoring well installation and sampling. From these investigations, the Respondents and USEPA determined that the groundwater beneath portions of the Site contains vinyl chloride, TCE, 1,2 DCE, arsenic, lead, and other chemicals. Based on the investigations, the Respondents and USEPA agreed to divide the Site work into two parts. The remedial strategy for Operable Unit One (OU1), which is shown on Figure 1.2, is expected to involve evaluating cleanup alternatives to address 55 acres of the landfill, and would include cleanup alternatives that would allow on Site businesses to remain safely operating at the Site. Respondents propose to complete additional investigations in order to determine a suitable remedial strategy for Operable Unit Two (OU2). In June 2012, USEPA, in consultation with Ohio EPA, determined that additional data must be collected on groundwater and potential hot spots before selecting a remedy for OU1. Additional investigation and remedy evaluation is ongoing.

1.3.1 Site History - Vapor Intrusion Sampling

In 2009 and 2010, GHD collected soil vapor samples from 21 permanently installed soil vapor probes at the Site and on an adjacent property. The samples were submitted to an accredited laboratory and analyzed for VOCs by USEPA Method TO 15. GHD compared the soil vapor sample results to generic soil vapor screening levels that were derived by applying the USEPA Region 5 Guidance (USEPA, 2010) default soil gas to indoor air attenuation factor of 0.1 to the USEPA indoor air regional screening levels (RSLs). The VOCs detected in soil vapor samples at concentrations greater than the generic soil vapor screening levels were 1,1-dichloroethane (DCA); benzene; chlorobenzene; chloroform; cis-1,2-DCE; ethylbenzene; naphthalene; tetrachloroethene

(PCE); TCE; vinyl chloride, and total xylenes. Exceedances of the generic soil vapor screening levels occurred at 16 of the 21 soil vapor probes.

GHD completed field screening for methane at the soil vapor probes in 2009. The soil vapor methane concentrations were compared to the upper explosive limit (UEL) (15 percent methane), and LEL (5 percent methane) for methane. Methane concentrations were greater than 10 percent of the LEL (0.5 percent methane) at 10 of the 21 soil vapor probe locations, the LEL at 5 of those 10 locations, and the UEL at 3 of those 5 soil vapor probe locations.

At the occupied building located at 2031 Dryden Road, methane was detected in a laboratory sub-slab sample at 0.97 percent, which is greater than the ODH sub-slab screening level of 0.5 percent for methane. Based on field data, methane was not detected in the indoor air. The Respondents manually measure the indoor air and sub-slab methane concentrations at this building on a weekly basis to ensure that methane concentrations do not increase and that methane is not migrating from beneath the slab into the building. On January 31, 2013, one Sierra Gas monitor (model 2001) was installed at 2031 Dryden Road. Appendix B presents the Sierra Gas monitor model 2001 specifications and manual; pictures of the installed monitor at 2031 Dryden Road; and copies of the instruction sheets provided to building tenants.

In the unoccupied storage building located at 1903 Dryden Road, methane was detected in a laboratory sub-slab sample at 6.6 percent, which is greater than 100 percent of the LEL. Based on field data, methane was not detected in the indoor air. This building is currently closed to access. On January 9, 2012, the Respondents provided email notification to USEPA and the Ohio EPA pertaining to explosive gas field readings from sub-slab soil vapor in 1903 Dryden Road warehouse probe (Probe A). On January 10, 2012, in accordance with Ohio Administrative Code (OAC) 3745-27-12, the Respondents contacted representatives of Public Health – Dayton and Montgomery County (PHDMC), City of Moraine Fire Division, and Moraine Police Division via telephone to provide verbal notification of the exceedance of the LEL. On January 11, 2012, the Respondents issued letters via email to the above mentioned agencies providing written notification of the exceedance of the LEL. The Respondents manually measure the indoor air and sub-slab methane concentrations at this building on a weekly basis to ensure that methane concentrations do not increase and that methane is not migrating from beneath the slab into the building. On January 24, 2013, one Sierra Gas monitor (model 2001) was installed at 1903 Dryden Road. Appendix B presents the Sierra Gas monitor model 2001 specifications and manual; pictures of the installed monitor at 1903 Dryden Road; and copies of the instruction sheets provided to building tenants.

Vapor intrusion sampling results from 2012 documented that vapor intrusion is occurring at the Site.

- Thirteen non-residential buildings showed sub-slab TCE levels greater than the ODH screening level of 20 parts per billion by volume (ppbv), with a high TCE concentration of 5,600 ppbv. Four of the thirteen non-residential buildings show indoor air TCE levels greater than the ODH indoor air screening level of 2 ppbv for TCE, with a high TCE concentration of 13 ppbv; this documents a completed exposure pathway for the four buildings.
- One non-residential building has shown a crawl space PCE concentration at 38 ppbv, which is greater than the ODH indoor air PCE screening level of 25 ppbv.
- One non-residential building (2003 Dryden Road, Parcel 5172 Building 14) showed a sub-slab 1,1-DCA level greater than the ODH sub-slab 1,1-DCA screening level of 160 ppbv, with a maximum 1,1-DCA concentration of 4,100 ppbv.

- Three non-residential buildings (1903 Dryden Road, Parcel 5054 Building 2; 2003 Dryden Road, Parcel 5172 Building 14; and 2031 Dryden Road, Parcel 5173 Building 15) showed sub-slab benzene levels greater than the ODH sub-slab benzene screening level of 20 ppbv, with a high benzene concentration of 540 ppbv in 2031 Dryden Road. An indoor air sample collected at 2003 Dryden Road, Parcel 5172 Building 14 showed a benzene concentration of 2.4 ppbv, which is greater than the ODH indoor air benzene screening level of 2 ppbv. This documents a completed exposure pathway for vapor intrusion in 2003 Dryden Road, Parcel 5172 Building 14.
- Two non-residential buildings (2015 & 2019 Dryden Road, Parcel 5172 Building 12; and 2031 Dryden Road, Parcel 5173 Building 15) showed sub-slab cis 1,2 DCE levels greater than the ODH sub-slab cis 1,2 DCE screening level of 370 ppbv, with a high cis 1,2 DCE concentration of 27,000 ppbv at 2031 Dryden Road, Parcel 5173 Building 15.
- Three non-residential buildings (1903 Dryden Road, Parcel 5054 Building 2; 2003 Dryden Road, Parcel 5172 Building 14; and 2031 Dryden Road, Parcel 5173 Building 15) showed sub-slab vinyl chloride levels greater than the ODH sub-slab vinyl chloride screening level of 20 ppbv, with a high vinyl chloride concentration of 5,500 ppbv.
- One non-residential building (2031 Dryden Road, Parcel 5173 Building 15) showed a sub-slab m,p-xylenes concentration of 2,100 ppbv, which exceeds the m,p-xylenes screening level of 2,000 ppbv; and an o-xylene sub-slab concentration of 2,000 ppbv, which equals the o-xylene screening level of 2,000 ppbv.

The maximum sub-slab and indoor air concentrations that were greater than the ODH screening levels for each building are presented on Figure 1.3. A copy of the April 2013 USEPA Removal Order is included as Appendix A.

2. Site Mobilization

2.1 Health and Safety Plan

A Health and Safety Plan (HASP) has been established for this Site (GHD, May 2008, and associated addenda). A HASP addendum will be submitted to provide specific guidelines and establishes procedures for the protection of personnel during the investigation and system installation activities planned at the residential and non-residential properties. HASP procedures will be updated if additional information is discovered which requires alteration of the plan. The HASP is provided under separate cover, accompanying this report.

Site control measures are addressed as Section L.6.0 of the HASP.

The Site office trailer is available for team communications, emergency response, and sanitary facilities (i.e., Porta Potty). A map to the hospital is posted in the trailer, and a first aid kit is available in the trailer. No potentially contaminated personnel or materials are allowed in the office trailer. The Site office trailer is available for meetings. The Respondents will provide sets of keys (i.e., a Site gate key and office trailer key) to USEPA and USEPA START (contractor).

2.2 Pre-work Meeting

A pre work meeting will be held between the Respondents, USEPA On-Scene Coordinator (OSC), ODH Licensed Radon contractor, and other contractors to discuss this approved work plan. All participants will read and formally acknowledge the provisions of the HASP before initiating on Site work. The following topics may be discussed in detail: provisions for Site security, mobilization, emergency procedures, delegation of responsibilities, and channels of communication.

2.3 Emergency Procedures

Emergency procedures have been established for this Site. Emergency procedures provide specific guidelines and establish procedures for the protection of personnel in the event of an emergency. The emergency procedures are included as Section L.7.0 of the HASP.

3. Sampling Activities

A Quality Assurance Project Plan (QAPP) and a Field Sampling Plan (FSP) have been established for this Site (GHD, September 2008, and associated addenda), to ensure data collected during any sample investigations are reliable. Copies of the QAPP and FSP are provided under separate cover, accompanying this report.

Field sampling activities will be completed in accordance with the sampling procedures, sampling plan, and associated analysis detailed in USEPA approved work plans.

The AOC requires subsurface gas sampling (including VOCs and methane) and sampling to determine extent of contamination utilizing groundwater, soil gas, sub-slab and indoor air sampling techniques. Groundwater sampling techniques to determine the extent of contamination are being discussed with USEPA Remedial Program and Ohio EPA representatives, and will be specified in a separate groundwater work plan. The sampling activities and techniques for soil gas, sub-slab and indoor air are presented below.

Gas sampling activities may include one or more of the following: collection of soil gas, sub-slab soil vapor, crawl space, ambient air, and/or indoor air samples. Gas samples will be collected, analyzed, and evaluated in accordance with the USEPA modified Vapor Intrusion Investigation Work Plan (VI Investigation Work Plan) (USEPA, November 2011), and in accordance with the following procedures. Gas samples will be analyzed for the parameters included in the TO-15 list of analytes. All existing soil gas probe locations are presented on Figure 3.1. All existing sub-slab soil vapor, crawl space and indoor air sample locations for all on- and off-Site buildings included in the vapor intrusion investigation that require mitigation are presented on Figures 3.2 to 3.10.

3.1 Sample Collection

All SUMMA canisters used for sample collection will be either batch certified (industrial and commercial buildings) or individually certified (residential buildings) by the analytical laboratory to ensure they are free of contamination before collecting the samples.

During sample collection, GHD will check each SUMMA canister periodically to ensure that the canister pressure has not reached zero; at a minimum, the canisters will be checked several hours before the end of the sampling period. In accordance with the sub-slab soil vapor sampling protocol

(Appendix J-F-36 of the FSP), some residual vacuum should be left in each canister following sample collection. A minimum 1-inch of mercury (" Hg) residual vacuum will be required for the sample to be considered valid, or the sampling will be repeated using a fresh SUMMA canister. In some instances, the canister pressure may decrease to below 5" Hg in less than the target amount of time. A SUMMA canister may be closed and sampling ended once the vacuum decreases below 5" Hg provided that at least 75 percent of the targeted sample time (i.e., 45 minutes for a 1-hour sample, 6 hours for an 8-hour sample, and 18 hours for a 24-hour sample) has elapsed. Provided the residual vacuum is a minimum of 1" Hg and the sample duration was at least 75 percent of the target duration, the sample will be considered a valid sample.

The target maximum residual vacuum is 5" Hg. If, after the required duration of sample collection (i.e., 1, 8, or 24 hours), the vacuum has not reached 5" Hg, the canister valve may be closed once the vacuum reaches a minimum of 10" Hg, as long as the specified duration of sample collection (i.e., 1, 8, or 24 hours) has elapsed. This will be considered a valid sample.

If the vacuum has not reached 10" Hg and access to the building is ending for the day, the Respondents will notify USEPA. If building access is provided for the following day, close the sample valve and record the canister vacuum and date. Return the following day, record the canister vacuum and date and complete sample collection. If building is not available for the following day, check with the laboratory if detection limits can be met and end sampling. If the detection limits cannot be achieved, re sampling will be required.

A summary of the acceptable sample canister end pressures and times is provided in the following table:

Duration of Sampling	Sample Canister Vacuum	Required Procedure
Less than 6 Hours	Less than or equal to 5" Hg	Invalid sample. Collect new sample with new canister.
More than 6 Hours	Less than or equal to 5" Hg	Acceptable sample. End sampling.
Less than 8 Hours	Less than 10" Hg	Continue sampling until vacuum reaches 5" Hg, or 8 hours have elapsed, whichever occurs first.
More than 8 Hours	Greater than 10" Hg	End sampling when vacuum reaches 10" Hg.
Less than 24 Hours	Less than 10" Hg	Continue sampling until vacuum reaches 5" Hg, or 24 hours have elapsed, whichever occurs first.
More than 24 Hours	Greater than 10" Hg	End sampling when vacuum reaches 10" Hg.

Duration of Sampling	Sample Canister Vacuum	Required Procedure
Building access issues necessitate an end to sampling	Greater than 10" Hg	Notify USEPA. Check if building access is available the next day. If building access is available the next day: Record canister end vacuum and date, close sample valve. Record day 2 canister start vacuum and date, continue sample. If building access is not available the next day: end sampling and check with laboratory if required detection limits can be met.
Exterior soil gas sampling	Greater than 10" Hg after 1 hour	Continue sampling until vacuum reaches 10" Hg. Should the vacuum gauge reading remain elevated above 10" Hg for more than 30 minutes (after the initial hour has been completed), this will be taken to indicate that the initial vacuum in the canister has not sufficiently dissipated, and that the soil screened by the soil gas probe does not produce sufficient soil gas to permit sample collection. In this case, submit the sample.
Exterior soil gas sampling	Less than 1" Hg	Invalid sample. Repeat sampling using a fresh SUMMA canister.

In accordance with the SOPs, canisters will be labeled noting the unique sample designation number, date, time, and sampler's initials. A bound field logbook will be maintained to record all sampling data. The unique sample designation numbers will have the following format:

MC - 38443-MMDDYY-XX-NNN

Where:

MC (Matrix Code) – Designates sample type (SG – soil gas; SS - sub-slab soil vapor; IA - indoor air; OA - outdoor air; CS - crawl space)

38443 – Project reference number

MMDDYYY – Designates date of collection presented as month, day, year

XX – Sampler's first and last initials

NNN – Sequential sample number for event

Details of the sampling will be recorded within a standard GHD field book and on an Air Sampling Field Data Sheet (Appendix C.1). Details should include:

- SUMMA canister, flow controller and pressure gauge IDs
- Sample start time and initial SUMMA canister pressure

- Outside temperatures and barometric pressures
- PID readings within the building
- Helium leak test concentration
- Sample end time and final SUMMA canister pressure
- Unique sample designation number

If requested, a sub-slab sample and/or indoor air sample will be collected from any location where the occupants previously denied access and any new locations that may be identified as requiring sampling. Sub-slab samples will be collected from the soil vapor located beneath the concrete slab beneath the lowest level of the building.

Sampling will not be performed during storm events or within 48 hours of a significant rain event (i.e., greater than 1 inch of rain in a 24-hour period) because of the potential influence such conditions may have on indoor air, outdoor air, and sub-slab soil vapor. Information on weather conditions (including barometric pressure, air temperature, wind direction, and wind speed) in Moraine, Ohio, during the sampling event will be obtained from the National Weather Service Forecast Office or National Climatic Data Center 'website. In fine-grained soil conditions, consideration will be given to allowing a greater amount of time for rainfall events to dissipate. The vadose zone soil types at the site are mainly sand and gravel fill, with some silt and clayey silt. The Respondents' field technicians in consultation with USEPA oversight consultants will determine if more than 48 hours should be allowed to elapse following a significant rain event for probes in areas of fine-grained soils.

3.2 Mitigation System Sampling

3.2.1 Proficiency Air Sampling

To verify that the mitigation systems are operating to reduce indoor air concentrations of VI contaminants to less than applicable criteria, the Respondents will complete post installation proficiency air sampling. The Respondents will collect indoor air samples or hybrid proficiency air samples (see Addendum 1) from all of the ~~8~~ 7 locations with an installed vapor abatement mitigation system, specified below, 30 days, 180 days, and 1 year, following system installation[3].

Parcel / Map Building Number	Address	Tenant
5171 / 8	1951 Dryden Road	B&G Trucking
5171 / 9	1951 Dryden Road	B&G Trucking
5172 / 12	2015 & 2019 Dryden Road	S&J Precision, Overstreet Painting
5172 / 14	2003 Dryden Road	Bullseye Amusements
5173 / 15	2031 Dryden Road	SIM Trainer
~~5174 / 16~~	~~2045 Dryden Road~~	~~Command Roofing~~
5175 / 17	2075 Dryden Road	Former Alliance Equipment and Supply
3207 / 24	2215 & 2219 East River Rd	Globe Equipment

Comment [vc1]: As agreed, no SSDS will be installed in Building 16, unless building occupancy changes.

[3] The SSDS in Buildings 14, 15, 17, and 24 are in compliance, and GHD will complete indoor air or hybrid proficiency sampling at these buildings annually, as agreed during the meeting held on September 10, 2015.

Valley Asphalt locations will be handled under a separate Work Plan.

The Respondents will complete annual indoor air or hybrid proficiency sampling at a subset of (20 percent) of operating systems, equivalent to two ~~samples~~buildings, at locations approved by USEPA prior to scheduling of the sampling for as long as the SSDSs remain operational. During the first year, the Respondents will collect the indoor air or hybrid proficiency samples in the two buildings with the greatest sub-slab soil vapor or indoor air concentrations. During subsequent years, the Respondents will propose locations and provide a rationale for sampling at the proposed locations for USEPA approval prior to collecting the samples. Proficiency air sampling will continue until USEPA notifies the Respondents that work is complete. The Respondents will provide the results and corresponding evaluation after each sampling event to USEPA within 30 days of receiving the complete set of final analytical data. If VI-related IA concentrations are greater than ODH IA screening levels ~~are exceeded~~, the Respondents will submit a Corrective Action Plan to USEPA within 30 days. Respondents and USEPA will present final Corrective Action Plans to building tenants/owners ~~in~~following the Respondents and USEPA meeting anticipated to occur in Fall 2015.

The indoor air or hybrid proficiency sampling events will be performed by ~~at least two CRA~~GHD field staff and are anticipated to take approximately 2 weeks for each of the 30-day, 180-day, and 1-year sampling events. The Respondents will provide USEPA with email notification regarding scheduling, a minimum of 2 weeks in advance of proficiency sampling events.

In the event that proficiency air sampling indicates the system has not reduced or maintained concentrations below the applicable indoor air screening levels, the Respondents will evaluate the performance of the SSDS and complete any necessary system modifications within 30 days of receiving validated analytical results. System modifications may include adding an additional extraction point(s), sealing cracks in the floors, and/or sealing or fixing drains or sub-slab sampling. If VI-related IA concentrations are greater than ODH IA screening levels ~~are exceeded,~~ a Corrective Action Plan will be submitted to USEPA within 30 days. Respondents and USEPA will present final Corrective Action Plans to building tenants/owners ~~in~~following the Respondents and USEPA meeting anticipated to occur in Fall 2015. All system modifications will be pre-approved by USEPA prior to implementation. Following completion of system modifications, the Respondents will complete a follow up indoor air sampling event within ~~30~~ 60 days of completion of system modifications.

USEPA will provide letters summarizing analytical data to property owners and tenants.

3.2.2 De Minimis Effluent Air Sampling

On January 10, 2013, Valerie Chan of GHD discussed de minimis emission and individual hazardous air pollutant (HAP) levels with Andy Roth of the Regional Air Pollution and Control Agency (RAPCA), by telephone and email.

On January 14, 2013, Andy Roth provided Valerie Chan with conservative initial calculations. Based on the greatest sub-slab TCE concentration of 5,600 ppbv (measured in a sample collected from 2015 Dryden Road, Building 12), a total SSDS flow rate of 2000 ft^3/min or less conforms to the Ohio EPA de minimis HAP emission rate of 1 ton per year. Accordingly, provided the total SSDS flow rate is equal to or less than 2000 ft^3/min, and maximum sub-slab soil vapor TCE concentration does not exceed 5,600 ppbv, effluent air sampling is not required by RAPCA. However, USEPA

has requested that the Respondents collect an annual sample of the effluent from the SSDS at the location with the highest sub-slab soil vapor concentrations of TCE.

Following installation of the SSDSs, GHD will collect one air grab sample from each of the discharge sampling ports (i.e., each location where there is a fan/blower) of the building with the greatest sub-slab TCE concentration (i.e., 2015 Dryden Road, occupied by S&J Precision). The samples will be collected and analyzed in accordance with procedures detailed in Section 3.7 below. GHD will collect one de minimis air sample from each of the discharge sampling ports annually from the building with the greatest sub-slab TCE concentration (based on the most recent sample results available at the time), for the duration of system operation.

In addition to the collection of air samples, velocity readings will be measured at each exhaust pipe with a velocity meter. Flow rates will be calculated for each emission discharge point. The flow rate and analytical data will be used to calculate the approximately daily, monthly, and yearly emission amounts. As a conservative measure, the preliminary calculations will assume that all buildings discharge at the same rate as the worst case building.

The effluent air sample results will be compared to State of Ohio de minimis levels, documented in Ohio Administrative Code 3745-15-05, to determine if off-gas treatment is required.

3.3 Indoor Air Sampling

As required, indoor and crawl space sampling will be performed in accordance with the SOP for indoor, outdoor, and crawl space air sampling (Appendix J-F-37 of the FSP). For mitigated buildings with areas less than 1,500 square feet, one indoor air sample will be collected. For buildings with areas greater than 1,500 square feet, multiple indoor air samples will be collected; the number of indoor air samples will be dependent upon the building configuration and locations will be chosen to minimize disruption to business operations.

On June 21 and 22, 2011, representatives of CH2M Hill, Ohio EPA, the Respondents and GHD completed building surveys at the parcels identified in the Dispute Resolution Agreement, which included a visual inspection of the parcels and the buildings located thereon. In December 2011 and July 2012, GHD completed building surveys of the remaining or additional buildings and parcels added to the scope of the VI investigation. The building surveys were completed in order to gather the information necessary to develop VI specific conceptual site models (CSMs) for each VI Study building. The building survey included collection of data related to indoor air quality such as use or storage of cleaning products, paints, and/or petroleum hydrocarbon products, aerosol consumer products, smoking, etc.

Before sampling, the buildings will be resurveyed to determine if conditions have changed since the building surveys. Undifferentiated VOC concentrations will be measured using a ppbRAE®, or equivalent, and recorded during the building resurveys to identify potential indoor air sources or the general location of potential indoor air sources. Where possible and reasonable, the indoor air sources will be removed or containerized from the buildings prior to proficiency air sampling. The Building Physical Survey Questionnaire will be updated as necessary for each building. The completed Building Physical Survey Questionnaires for the buildings requiring mitigation are provided in Appendix D. The Building Physical Survey Questionnaire is provided in Appendix C.2.

Typically, the intake point of the indoor air sample canisters will be located at the breathing zone height, between approximately 3 to 5 feet (1 to 1.5 meters) above floor level, in the lowest level of

the property (i.e., basement or first floor for slab on grade buildings). GHD will situate the indoor air sample canister as close as practical to the location of the original indoor air samples collected during the 2012 Vapor Intrusion Investigation. GHD will endeavor to situate the canisters in areas that are not subject to disturbances or locations that interfere with the occupants' operational activities which may lead to a false indication of an indoor air issue. GHD will collect indoor air samples at the actual or contingency indoor air locations specified in the figures for buildings with installed active SSDSs (Figures 3.2 through 3.10).

When indoor or crawl space air samples are collected, GHD will also collect an outdoor air sample in the vicinity of the structure as per GHD's SOP. Where samples are collected from adjacent or nearby buildings, one outdoor air sample may be sufficient for comparison to the indoor air sample results from more than one building.

Information on weather conditions (including barometric pressure, air temperature, wind direction, and wind speed) in Dayton, Ohio during the sampling event will be obtained from the National Weather Service Forecast Office or National Climatic Data Center website.

3.4 Sub-slab Soil Vapor Probe Sampling

Sub slab soil vapor probe installation and sampling, if required, will be performed in accordance with the SOP (Appendix J-F-36 of the FSP).

For buildings with areas less than 1,500 square feet, one sub-slab soil gas sample will be collected. For buildings with areas greater than 1,500 square feet, multiple sub-slab soil gas samples will be collected; the number of samples will be dependent upon the building configuration and locations will be chosen to minimize disruption to business operations.

GHD will complete leak testing prior to sub-slab soil vapor probe sample collection by injecting helium into a shroud covering the sub-slab probe, and monitoring for the presence of helium in the purged sub-slab soil vapor using a field meter.

GHD will purge stagnant air from the sub-slab soil vapor probes into Tedlar bags using a lung box sampler and pump. GHD will purge one to two liters of sub-slab soil vapor from the probe assembly, into a Tedlar bag. One liter of sub-slab soil vapor will be greater than three volumes from the sub-slab soil vapor probe assembly (probe and attached Teflon® tubing). This ensures that the sub-slab soil vapor sample is representative of actual vapor concentrations within the sub-slab bedding material.

In order to assess susceptibility of soil gas entry into a building, GHD will use a PID and LandTec GEM 2000, or equivalent, to directly survey preferential pathways for vapor migration (i.e. utility penetrations, cracks, sumps, floor drains, earthen floors, etc.). Readings will be recorded on the Air Sampling Field Data Sheet (Appendix C.1).

Information on weather conditions (including barometric pressure, air temperature, wind direction, and wind speed) in Dayton, Ohio during the sampling event will be obtained from the National Weather Service Forecast Office or National Climatic Data Center website.

3.4.1 Sub-slab Soil Vapor Probe Sampling for Methane

Following purging and leak checking of the sub-slab soil vapor probe, GHD will collect a second Tedlar bag sample of sub-slab soil vapor to measure post purge/pre sample values of methane, lower explosive limit (LEL), oxygen, and carbon dioxide, using appropriate meters. The Tedlar bag will be field screened and emptied outside the building to avoid releasing contaminants within the building.

The required sub-slab soil vapor samples will then be collected into SUMMA Canisters. Following sample collection, GHD will collect sub-slab soil vapor from the probes into Tedlar bags with a lung box sampler and pump in order to measure post sample methane, carbon dioxide, and oxygen values.

The following information from the USEPA (2005) Guidance for Evaluating Landfill Gas Emissions from Closed or Abandoned Facilities will be considered when selecting times for measuring methane levels: "Highest methane concentrations occur in the warmer summer months, and concentrations are higher during the heat of the day compared to measurements taken during morning hours. Landfill gas levels in soils tend to be higher during dry periods and lower after significant rainfall events."

Total VOCs in sub-slab soil vapor will be measured with a photoionization detector (PID) both times the methane, carbon dioxide, and oxygen concentrations are measured at each probe.

GHD will measure the levels of methane, carbon dioxide and oxygen using a portable combustible gas meter, specifically LandTec GEM 2000, or equivalent. GHD will measure filtered and unfiltered combustible gases with the LandTec GEM 2000. The LandTec GEM 2000 filtered measurements will be collected using a charcoal carbon filter. LandTec GEM 2000 reports the concentration of methane in units of percentage of the LEL of methane (i.e., 0 to 100 percent of LEL). The LandTec GEM 2000 measures the concentrations of oxygen, carbon dioxide, and carbon monoxide. The greatest values obtained during sampling will be recorded.

To confirm detections of methane using field instruments, separate sub-slab soil vapor or indoor air samples collected in SUMMA canisters will be submitted for analysis of fixed gases (methane, ethane, and ethene) by ASTM Method D1946. The confirmatory samples will be used to verify the detected methane readings measured with the field meters. If methane concentrations in indoor air are measured with the field meter above 25 percent of the lower explosive limit (i.e., 1.25 percent methane), an immediate or rapid response will be necessary to eliminate the explosive hazard and confirmatory laboratory samples aren't necessary.

3.5 Soil Gas Probe Installation and Sampling

Exterior soil gas probes will be installed to evaluate landfill gas (LFG) and soil vapor concentrations, as necessary, at locations within and adjacent to the Site, as detailed in Section 5 below.

3.5.1 Soil Gas Probe Installation

The borehole for each soil gas probe will be advanced to a target depth in the unsaturated zone [a maximum of 20 feet below ground surface (ft bgs) or 2 feet above the historic maximum water table level, whichever occurs first]. The average depth of the unsaturated zone across the Site is approximately 20 ft bgs; therefore, a target maximum depth of 20 ft bgs is based on the need to

place the gas probes in the unsaturated zone near the surface where soil vapor, if present, will diffuse and migrate.

Soil and fill materials encountered will be logged. The soil log information recorded will include a visual description of the types of materials (i.e., undisturbed native soil, spoils from quarry operations, domestic refuse, industrial refuse, metallic debris, ash, fly ash, construction and demolition debris, foundry sand, asphalt, slag, or other appropriate description), and if possible, a Unified Soil Classification System (USCS) description. Native soils will be logged using the USCS by GHD. A photograph of each core sample collected will be taken and a photographic log will be documented in the field notes. Should groundwater be encountered in any borehole, the tube will be pulled up a minimum of 2 feet above the water table. The void that is formed when the tube is pulled will be filled using No. 3 silica sand. The groundwater elevation of the nearest monitoring well will be used to determine the targeted depth of the borehole for the gas probes.

Soil samples will be collected from the surface and subsurface during the gas probe installation for the analysis of soil physical properties (i.e., grain size analyses, fraction of organic carbon content, plasticity index, porosity, permeability, and Atterburg limits). The procedures for collecting soil samples are presented in Appendix J-F-24 and J-F-34 of the FSP.

Soil vapor will not preferentially migrate through discrete intervals of fill material at the Site unless impermeable layers are present beneath or above the discrete intervals of fill material. Based on the available Site geological data, intervals that are impermeable to soil vapor have not been identified. Further, soil vapor migration to ambient air or into a building will occur from the shallow soil horizon. Accordingly, in areas where landfilled materials are not present, the screened interval of the gas probes will be installed in soil strata with a notably higher permeability than the surrounding geologic strata. The gas probe screen will be set as shallow as possible within the higher permeability stratum. In order to prevent short circuiting of ambient air into the gas probe and, consequently, dilution of soil vapor samples, the top of the gas probe screen will be installed a minimum of three feet below ground surface. The final depth of the gas probe screen will be dependent on the conditions observed at each location and will be determined in the field. The goal of soil gas sampling would be to collect and analyze soil vapor samples that are representative of soil vapor quality in the most permeable zone(s) in the vicinity of the probe, which is the zone(s) where soil vapor and non-methane organic compounds (NMOC) will migrate. If these soil borings encounter multiple, discrete permeable zones that appear to have vastly different soil vapor impacts based on field screening, then GHD will either consult with USEPA's field representatives and install more than one gas probe at that location or identify that area as potentially requiring additional investigation or remediation.

The screened interval(s) will be selected based on field observations that will identify the presence of landfill materials or, in the absence of such materials, a comparatively permeable region in the unsaturated zone that would be expected to transmit soil vapor. The selection of the most permeable zone will be based on soil descriptions and characterizations using the USCS. Where landfilled materials are present, the screen will be placed at a depth immediately above the landfilled materials. If the landfilled material extends to within three feet of the surface and it is, therefore, not possible to set the screen above the landfilled material, the screen will be placed within the landfilled material, with the screened interval set as close to the top of the landfilled materials as possible, but deep enough to minimize the breakthrough of ambient air from the surface (i.e., 3 to 5 ft bgs).

Gas probes will be installed using a 50 mm (2 inch) diameter Geoprobe dual tube direct push technique to minimize formation disturbance. The gas probes will be completed using 13-mm (0.5-inch) diameter schedule 40-PVC continuous piping (i.e., no joints) with a screened interval length of 0.3 meters (1 foot). The void space between the screened interval and formation will be filled with No. 3 silica sand (i.e., sand pack) to approximately 0.2 meters (8 inches) above the top of the screened interval. One foot of dry granular bentonite will be placed on top of the sand pack and then hydrated bentonite will be placed to just below ground surface. The sand pack and bentonite seal will be placed as the Geoprobe is withdrawn to ensure that the formation does not collapse around the screened interval or riser. A lockable surface casing will be set in concrete at the ground surface around each gas probe. The gas probe completion details are summarized in Appendix J-F-33 of the FSP. The gas probe stratigraphic and instrumentation log templates are presented in the FSP.

3.5.2 Landfill Gas and Soil Vapor Sampling

GHD will complete four rounds of landfill gas sampling of all newly installed soil gas probes. One sample round will occur in each season (i.e., in January, April, July, and October). GHD will also complete one synoptic monitoring round of all existing and newly installed soil gas probes under worst case barometric conditions (i.e., low pressure). The field measurements will consist of:

i) Measurement of gas pressure

ii) Screening for methane (v/v), VOCs, LEL, and oxygen (v/v)

Soil vapor probe VOC samples will be collected for laboratory analysis from newly installed soil gas probes if the soil gas probe shows a VOC detection greater than 5 parts per million (ppm) during field screening with a PID; samples will be collected from these soil gas probes during two of the four rounds, during worst case conditions (i.e., summer and winter seasons).

The 2012 vapor intrusion investigation included comparisons of field screened methane values to analytical results for methane. The field screened methane values correlated closely to the analytical results. Therefore, the Respondents propose to accept the methane values measured in the field using a LandTec GEM 2000, or equivalent, as the true methane values. The Respondents do not propose to collect any SUMMA canister samples for methane analysis.

Information on weather conditions (including barometric pressure, air temperature, wind direction, and wind speed) in Dayton, Ohio during the sampling event will be obtained from the National Weather Service Forecast Office or National Climatic Data Center website.

The initial landfill gas and soil vapor sampling round of newly installed soil gas probes will be conducted no sooner than one week following the installation of the gas probes and in the first appropriate month (i.e., January, April, July, or October) following the installation of gas probes unless there is a specific reason to sample the probes more expeditiously. One week is considered to be more than sufficient time for any formation disturbances created by drilling activities to dissipate and for equilibrium conditions to be reestablished in the unsaturated zone. As a result, the soil vapor samples are considered representative of conditions in the sampled intervals at the time the samples are collected. The remaining sampling events will be conducted during periods of low barometric pressure, during the heat of the day in the months specified above.

3.5.2.1 Measurement of Gas Pressure

A pressure gauge will be attached to the hose barb on the soil gas probe to measure the static gas pressure. The pressure gauge will be sufficiently sensitive to record gas pressure in inches of water column (w.c.). The highest value obtained during gas pressure readings will be recorded. Pressure is measured at the soil gas probe to indicate the potential for gas generation and migration; a sustained positive pressure is indicative of microbial activity when correlated to the soil gas quality measurements (methane, carbon dioxide, and oxygen). Coincidentally, a lack of pressure provides insight regarding the age of the carbon source (if present). The ambient barometric pressure will be recorded at each gas probe when soil gas pressure readings are being taken. The ambient barometric trends will also be noted (i.e., rising, falling, steady) from a local weather station during the time period of the monitoring event.

3.5.2.2 Collection of Summa Canister Soil Vapor Samples

While no VOC sampling of soil vapor probes is currently proposed, the sampling methodology is included herein for completeness. Soil vapor probe VOC samples will be collected for laboratory analysis from newly installed soil gas probes if the soil gas probe shows a VOC detection greater than 5 parts per million (ppm) during field screening with a PID; samples will be collected from these soil gas probes during two of the four rounds, during worst case conditions (i.e., summer and winter seasons).

If required, the 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 vapor sample over a 1-hour sample collection time.

The 2012 vapor intrusion investigation included comparisons of field screened methane values to analytical results for methane. The field screened methane values correlated closely to the analytical results. Therefore, the Respondents propose to accept the methane values measured in the field using a LandTec GEM 2000, or equivalent, as the true methane values. The Respondents do not propose to collect any SUMMA canister samples for methane analysis.

Following sample collection, GHD will collect soil vapor from the probe and measure post sample values of methane, carbon dioxide, and oxygen. GHD will measure the levels of methane, carbon dioxide, and oxygen using a portable combustible gas meter, specifically LandTec GEM 2000 or equivalent. GHD will measure filtered and unfiltered combustible gases with the LandTec GEM 2000. The LandTec GEM 2000 filtered measurements will be collected using a charcoal carbon filter. LandTec GEM 2000 reports the concentration of methane in units of percentage of the LEL of methane (i.e., 0 to 100 percent of LEL). The LandTec GEM 2000 measures the concentrations of oxygen, carbon dioxide, and carbon monoxide. The greatest values obtained during sampling will be recorded.

The SUMMA canisters will be fitted with laboratory calibrated critical orifice flow regulation devices sized to restrict the maximum soil gas sample collection flow rate to approximately 100 milliliters per minute (mL/min), which corresponds to the lower end of the maximum soil gas sampling flow rate of 100 to 200 mL/min recommended by the California Environmental Protection Agency (CalEPA, 2003). A flow rate of 100 mL/min is recommended to limit VOC stripping from soil and prevent the

short circuiting of ambient air from ground surface that would dilute the soil vapor sample. The low flow rate of 100 mL/min will increase the likelihood that a sample representative of in situ conditions is obtained. Prior to sample collection, soil gas probe purging will be conducted a maximum flow rate of 200 mL/min. Three soil gas probe volumes (calculated based on casing and sand pack volume) will be purged to remove potentially stagnant air from the internal volume of the soil gas probe. Section J F 11 of the FSP provides the soil gas purging and sampling procedures, including the calculation of purge volume, maximum purge volume, and maximum purging rates.

3.6 Quality Assurance / Quality Control Samples

Field duplicate samples will be collected at a frequency of 10 percent per sample media for VOC analysis. The sample media are (1) sub-slab soil vapor and soil vapor (2) indoor air, crawl space, and outdoor air. Duplicate samples will be collected in the same manner and from the same location as the normal samples are collected. A stainless steel T-connector will be used to connect two SUMMA canisters together so the parent and duplicate sample are collected concurrently from the same intake.

Quality assurance (QA)/quality control (QC) for the methane field screening results will be accomplished by: measuring methane twice, at least 8 hours apart, at each sub-slab soil vapor, indoor air, and crawl space air sample location.

USEPA reserves the right to collect split sub-slab or soil gas samples or side by side indoor air for any sample collected at the Site. The split samples will be collected in the same manner as duplicate samples.

3.7 Sample Analysis

The sub-slab, indoor air, outdoor air, and/or crawl space samples for VOC analysis will be collected in 6-liter SUMMA canisters equipped with flow controllers set to collect the samples over an 8-hour period for industrial and commercial buildings and a 24-hour period for residential buildings. The sampling period for soil gas samples is 1 hour, as detailed in Section 3.5.2.2 above.

The SSDS effluent grab samples for VOC analysis will be collected in 1 liter SUMMA canisters. Grab samples will be collected directly from the SSDS effluent sample ports of the building with the greatest sub-slab TCE concentration (based on the most recent sample results available at the time), for the duration of system operation. At each sampling port location, the male plug will be removed and silicon tubing will be attached to the sampling port and replaced with a male fitting with silicon tubing. The fitting will be attached from the SSDS regulator to the tubing attached to the sample port. The 1 liter SUMMA canister will be attached to the regulator. The sample port will be closed when the vacuum reading is between 10 to 1" Hg. The grab sampler will be removed from the SUMMA canister; the fitting/tubing will be removed from the sample port and regulator. The male plug will be reattached to the sample port.

GHD will submit SUMMA canister samples under chain of custody protocols to the laboratory for VOC analysis in accordance with USEPA TO-15. The full TO-15 list will be reported for each sample. The Respondents propose to accept the methane values measured in the field using a LandTec GEM 2000, or equivalent, as the true methane values. The Respondents do not propose to collect any SUMMA canister samples for methane analysis.

3.8 Cleanup Criteria

The Respondents will initially evaluate analytical results against ODH indoor air and sub-slab soil gas screening levels for residential and non-residential locations. ODH screening levels for naphthalene were provided by electronic mail (email) on September 13, 2012 (see Appendix H). Revised ODH screening levels to correct the indoor air non-residential values for o-xylene were issued on October 9, 2012. The ODH revised screening levels are presented in Table 3.1.

If necessary, Respondents will complete a secondary evaluation of analytical results for buildings that have a SSDS in the event that VI-related IA concentrations are less than ODH screening levels, but SS concentrations exceed 2012 ODH screening levels (AF=10). In the secondary evaluation, Respondents will compare SS concentrations to ODH screening levels calculated based on an AF of 50. As discussed in Section 1.1, SSDSs are in compliance if IA VI-related concentrations are less than 2012 ODH IA screening levels, and sub-slab concentrations are less than ODH screening levels calculated based on an AF of 50.

The Respondents will design and install a vapor abatement mitigation system in on- or off-Site residential or non-residential (commercial) structures impacted by subsurface gas migration, if the concentration(s) of COCs are greater than ODH sub-slab or indoor air screening levels and the presence of the COC is determined to be a result of vapor intrusion.

4. Mitigation Plan

One of the primary objectives of the VI Mitigation Activity is to design and install a vapor abatement mitigation system in on- or off-Site residential or non-residential (i.e., commercial) structures impacted by subsurface gas migration, if the concentration(s) of COC(s) are greater than ODH sub-slab or indoor air screening levels and the presence of the COC(s) is determined to be a result of vapor intrusion. Section 4.6 presents a summary of all buildings sampled during the VI Investigation and the associated mitigation decisions. The "Mitigation Summary Database" Excel file used to track the progress of mitigation is a living document, and the version current as of April 23, 2013, is included as Appendix E. This document will be updated as needed throughout the VI Mitigation Activity in order to reflect the status of the mitigation and any new information received.

Beginning on October 4, 2012, USEPA, Ohio EPA, USEPA START contractor, the Respondents, and GHD participated in weekly update conference calls regarding the Mitigation Summary Database and next steps. Appendix F presents the meeting minute summaries for the weekly conference calls.

If approved by the building tenants and owner(s), the abatement system will include installation of a SSDS or crawl space depressurization system (CSDS), sealing cracks in walls and floors of the basement or lowest building floor, and sealing drains that could be a pathway. Properties with sub-slab methane concentrations greater than 0.5 percent by volume will require an intrinsically safe SSDS. Active SSDSs will be designed and installed in the specified buildings to reduce potential indoor air inhalation issues. This is achieved by creating a lower air pressure beneath the floor slab than above the floor slab. The Respondents will work closely with an ODH Licensed Radon Contractor who will be responsible for installation to ensure proper installation and operation of the systems. The scope of work for the SSDSs will include:

Task 1 – Meeting with property owner(s) and tenants

Task 2 – Conduct a building inspection / engineering evaluation

Task 3 – Design and submit SSDS to USEPA and property owner for approval

Task 4 – Install SSDS

Task 5 – Perform Proficiency Sampling and Annual Inspections/Maintenance

4.1 Task 1 - Meeting with Property Owners

USEPA, Respondents, their consultants and a representative from the health department (Public Health – Dayton & Montgomery County) will meet with the property owner(s) and tenants of buildings for which vapor abatement mitigation systems are planned, following the signing and execution of the AOC. The meeting topics will include:

- Presentation and discussion of 2012 vapor intrusion sampling results
- Description of a generic vapor abatement mitigation system (i.e., SSDS)
- Associated maintenance and monitoring requirements (i.e., proficiency sampling, annual inspections)
- Stipend for electricity costs due to operation of the SSDS
- Signing of Acceptance Letter
- Building inspection / engineering evaluation
- Schedule meeting with property owner to review final SSDS plan and schedule installation (approximately two weeks later)

Stipends for electricity costs are discussed in Section 4.6.4 below.

4.2 Task 2 – Conduct Building Inspections/Engineering Evaluations

The Respondents will review and confirm building plans and blueprints, if available, and conduct pre design building inspections. This will include evaluation of the building layouts and construction components including HVAC, electrical and structural. Of particular interest are the building foundations, sub-slab layouts and orientations including materials of construction, utility connections and conduit layouts for future design purposes. Sealing of cracks may be completed at this stage, if appropriate.

4.3 Task 3 - Design Sub-slab Depressurization System

The information obtained from the Building Physical Survey and sub-slab probe installation(s) will be used to prepare conceptual layout design drawings. The system design will include the number and location of suction points, pipe routing, discharge point(s), fan location(s), and fan sizing. The Respondents will consult with the property owner and tenant for input on their preferences for system component locations. The basic design requirements will be prepared to a level acceptable for use for contractor bidding purposes. One or more contractors will participate in inspections of the buildings or, at the contractor's discretion, will agree to rely on inspections of the buildings completed by GHD. Following the building inspections, the contractor will prepare a Design Plan,

which, after it is approved by GHD and the Respondents, will be submitted to USEPA and the property owner. The designs will be based on industry standards, local code, and manufacturer information regarding equipment performance for an active depressurization system. Following receipt of USEPA approval, the contractors will proceed with the installation.

Following receipt of approvals from the property owner, tenant(s), and USEPA on the mitigation system design, the Respondents will solicit contractor proposals, and undertake contractor procurement. As noted above, the contractor will be a licensed ODH Licensed Radon Contractor. In the event that a design build approach is adopted, the Respondents will solicit contractor proposals prior to commencing the design and will commence installation of the SSDS following receipt of approval from the property owner, tenant and USEPA.

4.4 Task 4 – Install the SSDS

Any permitting requirements identified as part of the design phase and any required permits will be applied for and obtained prior to installation of startup of the SSDSs consistent with state and local requirements. Any electrical installation; roof, floor, and wall penetrations; epoxy coatings; and horizontal piping will be installed by licensed, bonded, and insured installers. The Respondents will commence system installations within 30 business days of USEPA approval of the Design-Build Plan by ODH licensed and insured Radon Mitigation Specialist who will perform all work in compliance with local code requirements. The Respondents have solicited and received contractor proposals from Environmental Doctor, and The Geiler Company, Inc. The contractor will install the SSDS following methods outlined in ASTM E2121 13, "Standard Practice for Installing Radon Mitigation Systems in Existing Low Rise Residential Buildings".

The exact design details will not be known until Tasks 1 and 2 have been completed, but a general discussion of the anticipated VI mitigation system is described below.

The SSDS in each building may consist of multiple vapor recovery points. Either fan(s) or larger blower(s) connected to extraction point(s) will be installed outside the building, mounted directly on the system piping and fastened to a supporting structure by means of mounting brackets. The fan(s) or blower(s) will operate continuously to pull a vacuum from the vapor recovery point(s). The vapors will discharge to the outdoor air above the building roof. This will allow any VOCs present to dissipate more readily. As methane is lighter than air, discharging the gases above the roof ensures that any methane that may be present will not create a localized explosion hazard near the ground surface where potential ignition sources could ignite it. A sample port and an air velocity monitoring access point will be installed in the discharge pipe at least two feet away from any constrictions (i.e., bends, elbows, etc.) and after (i.e., above) the fan. A common external fuse panel will be installed to power the SSDS system(s). The weatherproof panel will provide an uninterruptable power source, and be secured with a lock and tamper proof box. Equipment used to install the SSDS beneath buildings where explosive gases are present in the sub-slab vapor at concentrations greater than 10 percent of the LEL (i.e., greater than 0.5 percent methane) or where no sub-slab explosive gas data are available will be intrinsically safe, because of potential explosive situations.

Permanent vacuum monitoring points will be installed for each system, on the suction side of the fan. A permanent vacuum gauge will consist of a "U tube" manometer, or similar device, with a minimum vacuum of 1" w.c. The permanent vacuum monitoring points will document that the sub-slab beneath the entire building has been depressurized. The Respondents will verify that manometer vacuum is in the range of 1 to 4" w.c., and will mark the operating vacuum on the

manometer. The vacuum will be set to the minimum required to depressurize the entire slab and is expected to be in the range of 1 to 2" w.c. The number of vacuum monitoring points will be determined during the design process.

An SSDS vacuum greater than 4" w.c. may result in suction of air from a contaminant plume and may draw VOCs towards the building. As such, the systems will be designed and operated to be below this vacuum pressure.

Following the installation of the SSDSs, the radius of influence of each system will be checked using a digital manometer to determine if a vacuum is applied across the entire building slab. The digital manometer can be used at the sub-slab soil vapor probe locations, provided that they are located on opposite sides of the slab from the suction point. Additional sub-slab depressurization points and monitoring points can be installed if the resulting vacuum proves insufficient or more monitoring points are required.

USEPA 2008 guidance document titled "Indoor Air Vapor Intrusion Mitigation Approaches" states that the generally accepted target range for depressurization is 4 to 10 pascals or 0.0161 to 0.04" w.c., with a nominal continuous operating range of depressurization from 0.025 to 0.035" w.c. for standard permeability sub-slab material. However, differential pressure ranges as low as 0.001" w.c. is sufficient to effectively depressurize a sub-slab, according to USEPA 1993 guidance "Radon Reduction Techniques for Existing Detached Houses: Technical Guidance for Active Soil Depressurization Systems.

If the digital manometer shows a vacuum reading of negative 0.004" w.c. below the slab, then that indicates that the active system is successfully depressurizing the sub-slab area across the footprint of the building. During the operation and monitoring of the SSDSs, GHD will compare the vacuum measurements to the appropriate ranges, and if necessary, make adjustments to the SSDSs.

Following completion of the installation, a Mitigation System As-Built Report will be submitted to USEPA. This Mitigation System As-Built Report will be included in the O&M manual provided to the owner and tenant of each building or property. These reports will contain the following information:

- Data from the vacuum radius of influence testing, including sub-slab vacuum and flow measurements
- Static pressure at the fan inlet
- Figure(s) showing the number of extraction locations and performance monitoring points
- Figure(s) showing the route for the discharge piping system(s) and the location of the exhaust fan(s) for each building
- Photographs of the SSDS header and fan(s)
- Identification of materials and equipment used for each system (piping, blower sizing, vacuum monitoring, valving, etc.)
- Procedures for startup and performance testing following system installation
- Operational goals and objectives including radius of influence and vacuum field monitoring point vacuums
- An intrinsically safe system will be installed at properties which have methane beneath the sub-slab greater than 0.5 percent

A visual inspection will be completed to verify that no air intakes have been located near the proposed exhaust discharge point(s).

The Respondents will review the system components with each property owner and, if applicable, tenant(s) following completion of system installations. If the individual property owner or tenant notices damage to the SSDS or the system is not functioning within the range marked on the permanent vacuum monitoring points, they will be able to call a GHD contact. Labels on the system components will list a telephone number for a GHD contact.

Any gaps around the extraction point penetration and utility penetrations through the foundation floor will be appropriately sealed. Other openings and cracks in the foundation will be sealed where necessary and feasible.

As specified in Section 3.2.2 above, GHD will collect an effluent air sample from each of the discharge sampling points from the extraction pipes of the building with the greatest sub-slab TCE concentration (i.e., 2015 Dryden Road, occupied by S&J Precision) on an annual basis. The effluent air sample results will be compared to State of Ohio de minimis levels, documented in OAC 3745-15-05, to determine if off gas treatment is required.

4.5 Task 5 - Perform Proficiency Sampling and Annual Inspections/Maintenance

4.5.1 Maintenance of the SSDS

A general operation, maintenance, and monitoring (OM&M) plan will be completed within 60 days of system start up. The OM&M plan will detail activities required to operate the SSDS, perform repairs, and a guideline to evaluate the effectiveness of system operations. The contents of the OM&M manual will include, but not be limited to:

- Operator's manual for the system
- Contact information sheet
- System life expectancy
- Fan warranty information
- Baseline sample results (January - March and July - September 2012 sampling rounds)
- Proficiency sample results
- Annual inspection log sheets[4]
- Photographic documentation
- Copy of the Access Agreement (if available)
- Mitigation Acceptance Letter
- Mitigation System As Built Report (including map of system)
- Key to the padlock to turn the system "on" and "off"

[4] As proposed during the meeting held on September 10, 2015, Respondents will complete performance inspections of the SSDS quarterly until further notice.

The general OM&M plan will include an appendix containing any system specific information required for each building. The OM&M plans will be placed in binders to allow for easy updating of any required information and provided to property owners.

The SSDS maintenance program consists of an inspection and repair program for the system components. The Respondents will conduct a semi-annual inspection of the SSDSs in the first year of operation, and annually thereafter, to ensure proper functionality. The inspection program will include visual inspections of the SSDSs for deficiencies to verify that the system components are effectively performing their intended functions. The Inspection Checklist form, provided in Appendix C.3, will be included in the OM&M Plans:

4.5.2 Monitoring Program

The Respondents will complete a system startup monitoring program to document that the sub-slab beneath the entire area of concern in each building has been depressurized. The system startup monitoring will consist of monitoring and recording the vacuum at each of the vacuum monitoring points in each building using a digital manometer immediately following start up.

To verify that the mitigation systems are operating to reduce indoor air concentrations of VI contaminants to less than applicable criteria, the Respondents will complete post installation proficiency air sampling as discussed in Section 3.2. The Respondents will collect indoor air samples from all 8 locations with an installed vapor abatement mitigation system, (listed in Section 3.2.1), 30 days, 180 days, and 1 year, following system installation. The Respondents will also complete radius of influence testing at the same time as the indoor air sampling. If VI-related IA concentrations are greater than ODH IA screening levels, a Corrective Action Plan will be submitted to USEPA within 30 days. Respondents and USEPA will present final Corrective Action Plans to building tenants/owners following the Respondents and USEPA meeting anticipated to occur in Fall 2015. ~~If ODH screening levels are exceeded, the Respondents will submit a Corrective Action Plan to USEPA within 30 days.~~ The Respondents will complete indoor air sampling at a subset (20 percent of operating systems and approved by USEPA prior to scheduling) of the buildings at a frequency of every year from SSDS installation, provided the SSDS is still required. Proficiency air sampling will continue until USEPA notifies the Respondents that work is complete. The Respondents will provide the results and corresponding evaluation after each sampling event to USEPA within 30 days of receiving the complete set of final analytical data.

4.5.3 Annual Inspections of SSDS

The Respondents will complete annual performance inspections on all SSDSs installed to ensure that they are functioning properly. As proposed during the meeting held on September 10, 2015, Respondents will complete performance inspections of the SSDS quarterly until further notice.

System performance inspection activities will include, but are not limited to:

- System vacuum/pressure readings will be checked to ensure the system is operating in the design range
- Sub slab pressure field readings will be measured at permanent sub-slab sample points to ensure sub-slab depressurization is negative (for buildings with active SSDS and slab foundations)
- Visual inspection of system piping and components for damage

- Inspection of floor and wall seals, and seals around system piping penetrations, including checks for any additional areas requiring sealing
- Confirm operation of the blower fan, including checks for unusual noise or vibration
- Confirm padlock is attached to the on/off switch
- Confirm operation with tenants and inspection to determine if there have been any spills, releases, and/or operational changes that may influence the need for system operation
- Confirm copy of O&M Manual is in the building and update as necessary

A copy of the SSDS Inspection Checklist is included in Attachment C.3.

4.5.4 Electricity Stipends

The Respondents will provide an electricity stipend, to the individual or company that pays for electricity at each property with a SSDS installed, to offset the cost of operating the system. The stipend will be a one-time payment for an amount calculated on a building by building basis for a duration of 5 years. The need for continued system operation and additional electricity stipends will be evaluated by the Respondents and USEPA after 5 years of operation.

4.6 VI Investigation Building Mitigation Summary

In 2012, the Respondents completed vapor intrusion investigations of 33 buildings, including 7 buildings on Valley Asphalt Property (1901 and 1903 Dryden Road, Parcel 5054). The 33 buildings that were investigated are shown on Figure 4.1. In accordance with the Mitigation Summary Database Excel file, current as of April 23, 2013, of the 33 buildings investigated:

- 3 buildings are proposed for demolition, pending agreement of the owner
- 11 buildings will require a SSDS. The Respondents understand that Valley Asphalt will submit a separate Work Plan for their property and the three structures that require a SSDS (i.e., Parcel 5054) to USEPA and that this work will be completed under a separate administrative order.
- 19 buildings require no further action

The buildings are described in detail in Appendix G.

5. Landfill Gas Investigation Work Plan

Paragraph 16.b of AOC Docket No. V-W-13-C-010 requires the Respondents to

b. conduct subsurface gas sampling (including VOCs and methane), conduct extent of contamination sampling utilizing groundwater, soil gas, sub-slab, and indoor air sampling techniques, and complete an investigation to determine whether concentrations of methane <u>at the property boundary</u> are greater than the lower explosive limit (5% methane)

Additionally, Paragraph 16.e of the AOC states:

e. If, based upon the methane extent investigation conducted under paragraph 16.b of this Settlement Agreement, levels of methane at the property boundary are greater than the lower explosive limit (5% methane) and the methane is originating on the Site, design and install a

landfill gas extraction system designed to prevent landfill gas migration off site. The landfill gas system will be designed to control levels of methane at the property boundary to less than the lower explosive limit (5% methane)

This section provides the scope of work for the additional subsurface gas sampling required to confirm the levels of methane at the Property boundary in accordance with Paragraph 16.b. of the AOC.

5.1 Summary of Investigations Completed To Date and Existing Data

In 2009, the Respondents installed 21 soil gas probes in the following areas:

- The central portion of the Site in areas of suspected municipal waste disposal
- On or adjacent to the Site boundary
- In the vicinity of the commercial properties along Dryden Road and west of East River Road
- In the vicinity of the former underground storage tank and drum removals

In September 2009, GHD collected soil vapor samples from the GHD soil gas probes. Figure 5.1 presents the locations of the 21 GHD soil gas probes. GHD completed three rounds of landfill gas measurement between September and December 2009. Sections 2.8 and 4.4 of the Remedial Investigation Report Operable Unit 1 (OU1) (GHD, 2010) present detailed summaries of the 2009 landfill gas investigation and results. Potentially combustible concentrations of methane (i.e., between the LEL of 5 percent and the UEL of 15 percent), or above, were measured at five locations (GP01-09, GP02-09, GP04-09, GP18-09, and GP21-09). All of these locations are well within the Site boundaries and only one of these locations is near any building (there is an unused building, i.e., the Quonset Hut or Building 2) in the vicinity of GP18-09).

In 2012, USEPA installed six nested soil gas probes along Dryden Road, and one nested soil gas probe along East River Road. Five of the probes are installed along the Site boundary on the west side of Dryden and East River Roads and two of the probes are installed along the DP&L property boundary on the east side of Dryden Road. With the exception of GP-2, USEPA recorded methane values of 0 percent from these soil gas probes in 2012. At GP-2 (12-foot and 16-foot depths), USEPA recorded methane levels ranging from 2.5 to 24.1 percent in 2012. The methane concentrations measured by USEPA declined over time. Beginning October 31, 2012 and weekly thereafter, the Respondents measured GP-2 and recorded methane values of 0 percent. Given the presence of nearby source areas unrelated to the Site, the actual source of the detected methane is unknown. The Respondents weekly methane values measured at GP-2 are presented in Table 5.1.

Figure 5.1 presents the locations of the 21 GHD and 7 USEPA soil gas probes and the locations of the buildings containing sub-slab soil vapor probes.

The Respondents completed site wide synoptic methane monitoring rounds at a period of low barometric pressure (i.e., 28.3 to 29.13" Hg) between October 31 and November 2, 2012, and a period of high barometric pressure (i.e., 30.2 to 30.5" Hg) between January 8 and 10, 2013. Figures 5.2 and 5.3 present the methane monitoring results from the low and high pressure synoptic methane monitoring rounds.

5.2 ADDITIONAL INVESTIGATION REQUIRED

The purpose of the investigation is to determine whether methane is present at, and therefore, potentially migrating off Site across the Property boundary. The existing network of soil gas probes and sub-slab soil vapor probes near the Property boundary is extensive, and provides good delineation of subsurface methane concentrations along the Property boundary in areas where there are receptors (i.e., buildings) at or adjacent to the Site. There are, however, two areas along the Property boundary where Respondents will install additional gas probes.

One such area is between GP11 09, Building 17 and soil vapor probes GP12 09 and GP-7. As detailed above, USEPA measured methane concentrations as high as 24.1 percent at soil gas probe GP-2, which is located on the opposite side of the portion of Dryden Road between GP11-09 and Building 17/GP12-09/GP-7. Recent monitoring has not detected methane at GP-2.

The second area is between soil gas probes GP20-09/GP-4 and GP-6.

In order to determine the concentrations of methane at the property boundary the Respondents will install three soil gas probes along the eastern Site boundary with Dryden Road. The proposed locations of the three soil gas probes are presented on Figure 5.1. The soil gas probes are proposed in locations at which there are gaps in the Site boundary gas probe network along Dryden Road. The soil gas probes will ensure that a soil gas data point (i.e., either a soil gas probe or sub-slab soil gas probe) is present every 200 feet along the portion of the property line where off Site migration of methane might impact adjacent buildings.

GHD will complete four rounds of landfill gas sampling of newly installed soil gas probes. The field measurements will consist of:

i) Measurement of gas pressure

ii) Screening for methane (v/v), VOCs, LEL, and oxygen (v/v)

Soil vapor probe VOC samples will be collected for laboratory analysis from newly installed soil vapor probes if the probe shows a VOC detection greater than 5 parts per million (ppm) during field screening with a PID; samples will be collected from these soil vapor probes during two of the four rounds, during worst case conditions (i.e., summer and winter seasons).

The 2012 vapor intrusion investigation included comparisons of field screened methane values to analytical results for methane. The field screened methane values correlated closely to the analytical results. Therefore, the Respondents propose to accept the methane values measured in the field using a LandTec GEM 2000, or equivalent, as the true methane values. The Respondents do not propose to collect any SUMMA canister samples for methane analysis. USEPA may collect a SUMMA canister for methane analysis based on field measurements.

The Respondents will install and sample the soil gas probes in accordance with the procedures detailed in Section 3.5 above and the FSP. The Respondents will complete four rounds of landfill gas monitoring of the newly installed soil gas probes. The initial soil vapor monitoring of newly installed soil gas probes will be conducted one week following the installation of gas probes. One week is considered to be more than sufficient time for any formation disturbances created by drilling activities to dissipate and for equilibrium conditions to be reestablished in the unsaturated zone. As a result, the soil vapor samples are considered representative of conditions in the sampled intervals

at the time the samples are collected. The remaining sampling events will be conducted during periods of low barometric pressure, during the heat of the day in the months specified above.

The Respondents will proceed with the installation of the soil gas probes within 20 business days of receipt of USEPA approval of the Work Plan, or the effective date of the AOC, whichever is later, dependent on sub-contractor availability and ability to arrange access with the property owners. Within 30 days of completion of the last sampling event, the Respondents will submit a Landfill Gas Delineation Investigation Report to USEPA. The Landfill Gas Delineation Investigation Report will provide the results of the investigation and, if necessary, will provide a schedule and detailed Work Plan for the design and installation of a landfill gas extraction system in accordance with the requirements of Paragraph 16.e. of the AOC.

6. System Decommissioning / Project Close-Out Activities

Criteria to determine when it is appropriate to cease operation of individual vapor SSDSs will be decided at a future date. Respondents will submit criteria to USEPA for approval at a later date.

6.1 Abandonment of Gas Monitoring Probes

In the event that a gas monitoring or sub-slab soil vapor probe becomes damaged, plugged, or otherwise rendered unusable, or alternatively at the completion of all explosive gas monitoring requirements, the respective gas probe(s) will be abandoned in accordance with the procedures stipulated in OAC 3745-9-10. Such abandonment will consist of filling the gas probe(s) with a non-shrinking grout or over drilling the sub-slab probe(s) and filling it with cement, to mitigate the infiltration of surface waters. No gas monitoring probes will be abandoned without prior authorization from USEPA. If a damaged, plugged, or otherwise unusable probe is still required for monitoring sub-slab soil vapor conditions at a particular location, the Respondents will replace the probe following the procedures documented in Section 3.4.

7. Project Management

7.1 Responsibilities and Functions

The companies and individuals who will be responsible for the various aspects of the work are detailed in the organizational chart on Figure 7.1.

Contact numbers for each member are provided in the following table.

Contact Name	Phone #
Steven Renninger (USEPA OSC)	513-260-7849
Leslie Patterson (USEPA RPM)	312-886-4904
~~Laura Marshall~~Maddie Adams (Ohio EPA)	937-285-645~~652~~
Brett Fishwild (CH2M Hill)	937-220-2955
~~John Sherrard~~Brandon Helm (~~Dynamac Corporation~~Tetra-Tech, USEPA START contractor)	513-~~703-3092~~333-3664

Mark Case (Pubic Health – Dayton / Montgomery County)	937-225-4429
Bob Frey (ODH)	614-466-1069
~~Adam Loney~~Julian Hayward / Valerie Chan (~~CRA~~GHD)	519-884-0510
Greg Lewis ~~/ Nate Ziegler~~, Jason Close, Jeremy Teepan, (~~CRA~~GHD Cincinnati office)	513-942-4750
Greg Lewis (~~CRA~~GHD cell)	~~519~~513-200-8902

8. Project Schedule

Task	Schedule
Weekly Mitigation Status update conference calls with USEPA and Respondents	Thursdays
Work Plan Due Date	15 business days from the AOC Effective Date AOC Effective Date is April 8, 2013
Conduct building inspections / engineering evaluations	March 15, 2013
Ohio licensed radon subcontractor bid submission	April 12, 2013
Meeting with property owners/tenants	Following signing and execution of AOC. Anticipated dates: week of May 6th or 13th, 2013
Design sub-slab depressurization system	Within 4 weeks of meeting with property owners/tenants
Initiate Section 4.1 tasks (Meeting with Property Owners/Tenants)	Within 45 days of Work Plan approval
Initiate Installation of SSDS	Within 30 business days following USEPA approval of the final SSDS design
Progress Reports	Monthly, on the 10th day of each month, until termination of ASAOC
Oral notification of any delay in performance of ASAOC Obligations	Within 24 hours
Written notification of any delay in performance of ASAOC obligations in accordance with Paragraph 46 of the ASAOC	Within 7 days thereafter
New Sample Locations from any location where the occupants previously denied access and locations that may be identified as requiring sampling	Complete sampling with 60 days of receiving new access agreement from USEPA or property owner
O&M Manual submission to USEPA and property owners/tenants	Within 60 days of SSDS start-up
Annual SSDS Inspections	Complete within 30 days of receiving access agreements from USEPA or property owner (annually thereafter)
Proficiency indoor air sampling (new SSDS installations)	30, 180, and 365 days post-installation
Proficiency air sampling (sub-set of systems)	Beginning 2 years following SSDS installation
Submission of Corrective Action Plan	Within 30 days of receiving indoor air

Task	Schedule
	sampling results that are greater than ODH screening levels
SSDS Upgrades	Within 30 days of receiving validated proficiency air sampling analytical results
Indoor air proficiency sample following completion of SSDS Upgrades (if required)	Within ~~30~~ 60 days of completion of system modifications
Provision of analytical results and corresponding evaluation to USEPA following each sampling event	Within 30 days of receiving the complete set of final analytical results
Final Report summarizing actions completed to comply with AOC	Within 60 days of completion of all work specified in Section VIII of the AOC (i.e., following completion of proficiency indoor air sampling for new SSDS installations)
Submit Landfill Gas Investigation Report	30 days after completion of last sampling event