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February 8, 2006

NYS Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau D - Floor 12
625 Broadway
Albany, NY 12233-7013

Attn: Ms. Valerie Woodward

Phone: (518) 402-9812
FAX: (518) 402-9819

Re: Soil Vapor Intrusion Investigation Work Plan
Haight Farms Site
Upper Holley Road
Clarendon, Genesee County
NYSDEC Site No. 837006
Empire Project No. BEV-04-015

Dear Ms. Woodward:

As per your request Empire Geoservices, Inc. (Empire) is submitting for your review and comment this proposed work plan for performing a soil vapor intrusion investigation of three residential properties located at the above referenced site. The procedures and methodologies to be employed for this investigation are presented herein, which have been used in similar types of investigations that also incorporates the protocols outlined within the NYSDOH draft guidance document for soil vapor intrusion studies dated February 2005 (*Guidance for Evaluating Soil Vapor Intrusion in the State of New York*).

1.0 OBJECTIVE AND SCOPE OF WORK

The objective of this investigation is to determine whether the indoor air quality of three residences at the above referenced site have been compromised by contaminated soil vapors entering those structures from the groundwater contaminant

plume that exists beneath the site. As documented by previous investigatory work completed at the site, the contaminants observed within groundwater beneath the site are chlorinated hydrocarbons or degreasing solvents that consist primarily of trichloroethene (TCE) and its degradation products. If it is determined that the indoor air quality of any of the residences has been compromised, this study will attempt to identify the source(s) and the potential pathways of the contaminant migration. The three residences targeted for this investigation are summarized below, and dependent upon the findings of this investigation a fourth residence may also have a vapor intrusion study performed on that residence. As the property owner name and address for the fourth residence were not provided to Empire by the NYSDEC, it was not included in the summary tabulation below.

Address	Property Owner
4859 Upper Holley Road	Shanna Johnson & James Gunn
4878 Upper Holley Road	Jessie Underwood
4885 Upper Holley Road	Frank Yacono

As outlined herein, the investigation will consist of performing one round of sampling at each of the residences that will consist of collecting a soil vapor sample from beneath the floor slab of each structure as well as an indoor and an outdoor air quality sample at each residence. All samples are to be collected during the heating season, as soil vapor intrusion is most likely to occur when a building's heating system is in operation and air is being drawn into the building. Prior to commencing with the sampling program, Empire will interview the building occupants and perform an inspection of each residence to collect information necessary for completing a building questionnaire and inventory form. Once the analytical results of the air quality and soil vapor samples have been received, the analytical data and the information collected during the building inspection will be evaluated to determine what, if any, remedial measures may be warranted to prevent exposure of the building occupants to contaminants within the structure. The procedures to be employed for this investigation are described in more detail below.

2.0 METHOD OF INVESTIGATION

2.1 Site Access

As currently understood, permission to access each of the properties will initially be obtained by the NYSDEC through a site access letter. Once all of the site access has been obtained by the NYSDEC,

Empire will contact each of the property owners to explain what will be take place during the investigation and make arrangements for completing the work at a time convenient to the property owner.

2.2 Building Questionnaire and Inventory

Attached (Attachment No. 1) is a copy of the questionnaire and inventory form that will used for each building inspection and interviewing the building occupants. The questionnaire and inventory form to be utilized was obtained from the NYSDOH latest guidance document dated February 2005 entitled *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*. A pre-sampling building inspection and inventory is to be completed by an environmental professional and a technician from Empire's staff prior to performing any sampling in each building so as to identify and minimize conditions that may interfere with the proposed testing. Information collected during the building inspection *(Section 2.2.1)*, along with the information collected during the product inventory *(Section 2.2.2)* will be utilized to determine the building features and conditions, identify the preferential pathways for vapor intrusion, background sources of volatile chemicals and real-time instrumentation of volatile organic compounds (VOCs).

2.2.1 Building Inspection and Pre-Sampling Preparation

The building inspection will evaluate the type of structure, floor layout, air flows and physical condition of the building being studied. This information, along with the information collected during the product inventory will be utilized to identify the preferential pathways for vapor intrusion and the potential sources of air contamination. To avoid potential interferences and dilution effects during the indoor air sampling event, every effort will be made to avoid the following for 24 hours prior to sampling:

- opening any windows, fireplace dampers, openings or vents;
- operating ventilation fans unless special arrangements are made;
- smoking in the building;
- painting;
- using a wood stove, fireplace or other auxiliary heating equipment (i.e., kerosene heater);
- operating or storing an automobile in an attached garage;
- allowing containers of gasoline or oil to remain within the house or garage area, except for fuel oil tanks;
- cleaning, waxing or polishing furniture, floors or other woodwork with petroleum- or oil-based products;
- using air fresheners, scented candles or odor eliminators;
- engaging in any hobbies that use materials that contain volatile chemical compounds;

- using cosmetics including hair spray, nail polish, nail polish removers, perfume/cologne, etc.;
- lawn mowing, paving with asphalt, or snow blowing;
- applying pesticides; and
- using building repair or maintenance products, such as caulk or roofing tar.

In addition, smoke tubes will be utilized during the building inspection to determine the pressure relationships and air flow patterns within each building, especially between floors, suspected contaminant sources and other areas.

2.2.2 Product Inventory

At the time of the building inspection, a product inventory will also be completed to identify potential sources of air sampling interference by characterizing the occurrence and use of chemicals and products throughout the building, keeping in mind the goal of the investigation and the site specific contaminants of concern, which are chlorinated hydrocarbons or degreasing solvents (TCE and its degradation products). For example, detailed information for each individual container of like items (i.e., paints, perfumes, etc.) will not be recorded, but rather the number of containers of like items with containers in good condition will be recorded (i.e., 12 cans of paint, 15 bottles of perfume, etc.). If available, chemical ingredients of interest (i.e., VOCs and chlorinated hydrocarbons) will be recorded for each product. If the ingredients are not listed on the label, the products full name and manufacturer's name, address and telephone number will be recorded, if available, and the manufacturer will be contacted to determine the ingredients of the product and whether it contains any VOCs. During the product inventory, Empire will attempt to take as many photographs as feasible of the products identified as potential sources of VOCs in the air.

The presence and description of odors (i.e., solvent, moldy) and portable vapor monitoring equipment readings will also be utilized to help evaluate potential sources and collect readings near products stored or used in the building. For the purpose of this investigation, it is planned to utilize a Photoionization Detector (PID) equipped with 10.6 eV lamp for the vapor monitoring during the building survey. Each room on the floor of the building being tested and on lower floors, if possible, will be inspected, as products stored in other areas of the building can affect the air of the room being tested.

2.3 Indoor Air Sampling

2.3.1 Sampling Locations

Based on the construction details of each building (i.e., basement, slab-on-grade, or multiple types

of foundations, HVAC systems, etc.) identified during the building inspection, indoor air samples will be collected in each building at the following locations to determine the indoor air quality and potential exposures to VOCs.

- From either the crawl space or basement of each building at a location where vapor infiltration is suspected or in a central location at a height approximately three feet above the floor to represent the height that the occupants are normally seated or sleep; and

- From the lowest level living space (excluding the basement) in a centrally located and high activity use area at a height approximately three feet above the floor to represent the height that the occupants are normally seated or sleep.

The following actions will be undertaken to document the conditions during the indoor air sampling event in each building, which will be utilized to aid in the interpretation of the sample results:

- Complete a product survey form;

- Use of the heating system during sampling will be noted;

- Floor plan sketches showing the layout of each floor, sampling locations, chemical storage areas, garages, doorways, stairways, basement sumps or subsurface drains and utility penetrations through the foundation walls, HVAC supply and return registers, and any other pertinent information or conditions;

- Photographs of conditions and features on each floor;

- Outdoor plot sketches showing the building site, area streets, outdoor air sample locations, footings that create separate foundation sections for the building, and paved areas;

- Weather conditions (i.e., precipitation, indoor and outdoor temperatures, and barometric pressure) and ventilation conditions (i.e., heating system active and windows closed);

- Results of smoke tube testing to determine the pressure relationships and air flow patterns, especially between floors, suspected contaminant sources and other areas; and

- Record any other pertinent observations, such as spills, floor stains, smoke tube results, odors and PID readings.

2.3.2 Sampling Protocol

All of the indoor air samples collected within each building will be collected concurrently and simultaneously with the outdoor air and sub-slab vapor samples described in *Sections 2.4* and *2.5*. Also, the samples will be collected when the heating system has been operating for at least 24 hours at normal indoor air temperatures (65 to 75°F), and will be collected in the following manner:

- Air samples will be collected using either large or mini Summa® canisters at the applicable sample flow rates for the respective sampling canister. All of the canisters are to be supplied and certified clean by the analytical laboratory performing the analysis.

- Samples will be collected over a 24 hour period to ensure the air is representative of the locations sampled and to avoid any undue influence by the sampling personnel.

- Sampling personnel will avoid lingering in the immediate area of the sampling device while the samples are being collected.

During the indoor air sample collection, the field sampling personnel will maintain a sample log sheet summarizing the following:

- Sample identification;
- Date and time of sample collection;
- Sampling height;
- Sampling methods and devices;
- Depending on the method, volume of air sampled;
- Vacuum of canisters before and after samples are collected; and
- Chain of custody protocols and records used.

2.4 Outdoor Air Sampling

An outdoor air sample is to be collected at an upwind location of the building at each property away from any wind obstructions (i.e., trees or bushes), and at a height of approximately three to five feet above the ground to represent breathing zones. The outdoor air sample will be collected simultaneously with the indoor air samples and the sub-slab vapor samples at each property, and will be collected in the same manner as the indoor air samples. During the collection of the outdoor air samples, the same actions as undertaken during the collection of the indoor air samples are to be performed to document the conditions during sampling and aid in the interpretation of the sampling

results. Field sampling personnel will also maintain a sample log sheet and record the same type information as that recorded for the indoor air samples. In addition, the weather conditions (i.e., precipitation, temperature, wind speed and barometric pressure) at the time of the sampling and for the past 24 hours will be noted, as well as the location of potential offsite and upwind sources of volatile contaminants (i.e., gas stations, oil storage tanks, industrial facilities, automobiles, lawnmowers, etc.) that may interfere with the sample collection.

2.5 Sub-Slab Vapor Sampling

2.5.1 Sampling Locations

Currently, it is planned to collect one soil vapor sample from beneath the floor slab of either the crawl space or basement of each building. The sub-slab vapor samples will be collected simultaneously with the indoor and outdoor air samples at each property. Each sub-slab vapor samples will be collected via a temporary soil vapor probe that will be installed in each building basement or crawl space at a central location away from any foundation footings. Prior to installing the temporary sub-slab vapor probe in each building, the basement or crawl space floor will be inspected to identify any floor penetrations or perforations (i.e., cracks, floor drains, utility penetrations, sumps, etc.) that may influence sample collection.

2.5.2 Sampling Protocol

Each vapor probe will be installed at locations where the potential for ambient air infiltration (i.e., short circuiting) via floor penetrations is minimal, and will be constructed and installed in the following manner:

- Drill a small diameter hole (¼-inch minimum diameter) through the floor into the underlying soil;
- Install small diameter (¼-inch minimum diameter) polyethylene tubing within the hole at a depth no more than two inches into the sub-slab soil;
- Seal the annular space around the tubing to the floor surface using melted beeswax. If the basement or crawl space of the structure has an earthen floor, then a bentonite (hydrated powder) seal will be installed rather than a beeswax seal.

Immediately after each sub-slab vapor probe has been installed, one to three volumes of the sample probe and tubing will be purged using an air sampling pump prior to collecting the vapor sample to ensure that the sample collected is representative. The flow rates for purging and sample collection will not exceed 0.2 liters per minute to minimize ambient air infiltration or short circuiting during sampling. Each sub-slab vapor sample will be collected using either a large or mini Summa® canister, which are to be supplied and certified clean by the analytical laboratory performing the analysis. Sample size will be dependent on the sample volume required to achieve the minimum reporting limit of 1 microgram per cubic meter (ug/m^3), the flow rate, and the sample duration. In addition, all of the sub-slab vapor samples are to be collected over the same period of time as the indoor and outdoor air samples. During the collection of the sub-slab vapor samples, the same actions as undertaken during the indoor air samples are to be performed to document the conditions during sampling and aid in the interpretation of the sample results.

2.5.3 QA/QC for Collection of Soil Vapor Samples

If any of the buildings have an earthen floor in the basement or crawl space of that structure, then it is planned to utilize a tracer gas to verify the integrity of the seal of the soil vapor probe and that the sample has not been diluted by the infiltration of ambient air. Conversely, if the building basement or crawl space does have a concrete floor, then a tracer gas analysis will not be performed on the soil vapor probe. If a tracer gas analysis is to be performed, then it is planned to use helium as the tracer gas, as real-time monitoring can be performed using a portable helium gas monitoring meter (Mark 9822 Helium Gas Detector or comparable with a detection limit of 0.01 to 100%). The procedure to be employed for using the tracer gas will consist of creating a helium rich atmosphere in the immediate vicinity of the vapor probe where it penetrates the floor, and collecting a vapor sample from the probe using an air sampling pump and screening the exhaust from the pump for the presence of high concentrations of helium (>20%).

To create a helium rich atmosphere at each vapor probe location, a plastic pail will be placed on the floor over the vapor probe to create an air tight enclosure. Hydrated bentonite will be utilized to create a surface seal where the pail meets the floor to prevent any air infiltration or short circuiting along this seam. The pail will be equipped with a bulkhead fitting and barbed adaptor that will be connected to a helium tank using polyethylene tubing, so that helium can be introduced into the enclosure. A second bulkhead fitting on the pail will be equipped with two barbed adaptors so that the tubing from the purge pump can be connected to the vapor probe. Care will be taken to avoid excessive purging before sample collection and prevent pressure buildup within the enclosure during the introduction of the helium gas.

2.6 Analytical Methods

All air (indoor and outdoor) and vapor samples are to be collected using either large or mini Summa® canisters that are to be supplied and certified clean by the analytical laboratory performing the analysis. All of the air and vapor samples are to be analyzed for VOCs using EPA Method TO-15 with a minimum reporting limit of 1 microgram per cubic meter (ug/m^3). Analysis of the samples is to be performed by Upstate Laboratories (Upstate) of Syracuse, New York, which is a NYSDOH certified environmental laboratory (ELAP ID No. 10170) and a NYSDEC standby contract laboratory. The analytical testing will be performed in accordance with NYSDEC ASP Category B and Data Usability Summary Report (DUSR) guidelines, which will also include matrix spike and matrix spike duplicate samples.

2.7 Report of Findings

Upon completion of the field activities and receipt of the analytical results of the air and vapor samples, Empire will prepare a summary report documenting all of the field activities completed and findings of the investigation along with recommendations for any additional work (investigatory or remedial) that may be warranted.

All of the work that will be completed by Empire equipment and personnel will be charged out in accordance with the rates that Empire has established within its current NYSDEC Standby Spill Investigation and Remediation contract. All items used during this investigation that are not listed in the contract will be invoiced to the NYSDEC by Empire at cost plus 10%, as per the spill contract As indicated herein, it is planned to have all samples submitted to Upstate Laboratories for analysis and that Upstate will invoice the NYSDEC directly using the rates established within its current NYSDEC Laboratory Services contract. If the scope of work outlined herein meets with your approval, please provide us with written authorization to proceed. Empire appreciates the opportunity to be of assistance on this project, and if you have any questions or comments regarding this proposed work, please do not hesitate to contact the undersigned.

Respectfully Submitted,
EMPIRE GEOSERVICES, INC.

Charles Guzzetta

Charles B. Guzzetta
Environmental Project Manager
Rochester District Manager

James Vincent

James C. Vincent, CPG
Senior Hydrogeologist
Corporate Environmental Manager

Attachments

ATTACHMENT NO. 1

NYSDOH Indoor Air Quality
Questionnaire and Building Inventory Form
(Dated February 2005)

NEW YORK STATE DEPARTMENT OF HEALTH
INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY
CENTER FOR ENVIRONMENTAL HEALTH

This form must be completed for each residence involved in indoor air testing.

Preparer's Name _____ Date/Time Prepared _____

Preparer's Affiliation _____ Phone No._____

Purpose of Investigation_____

1. OCCUPANT:

Interviewed: Y / N

Last Name: _____ First Name: _____

Address: _____

County: _____

Home Phone: _____ Office Phone: _____

Number of Occupants/persons at this location _____ Age of Occupants _____

2. OWNER OR LANDLORD: (Check if same as occupant ___)

Interviewed: Y / N

Last Name: _____ First Name: _____

Address: _____

County: _____

Home Phone: _____ Office Phone: _____

3. BUILDING CHARACTERISTICS

Type of Building: (Circle appropriate response)

Residential	School	Commercial/Multi-use
Industrial	Church	Other: _____

If the property is residential, type? (Circle appropriate response)

Ranch	2-Family	3-Family
Raised Ranch	Split Level	Colonial
Cape Cod	Contemporary	Mobile Home
Duplex	Apartment House	Townhouses/Condos
Modular	Log Home	Other:_____

If multiple units, how many? _____

If the property is commercial, type?

Business Type(s) _____

Does it include residences (i.e., multi-use)? Y / N If yes, how many? _____

Other characteristics:

Number of floors_____ Building age_____

Is the building insulated? Y / N How air tight? Tight / Average / Not Tight

4. AIRFLOW

Use air current tubes or tracer smoke to evaluate airflow patterns and qualitatively describe:

Airflow between floors

_____

_____

_____

Airflow near source

_____

_____

_____

Outdoor air infiltration

_____

_____

_____

Infiltration into air ducts

_____

_____

_____

5. BASEMENT AND CONSTRUCTION CHARACTERISTICS (Circle all that apply)

a. Above grade construction:	wood frame	concrete	stone	brick
b. Basement type:	full	crawlspace	slab	other _____
c. Basement floor:	concrete	dirt	stone	other _____
d. Basement floor:	uncovered	covered	covered with _____	
e. Concrete floor:	unsealed	sealed	sealed with _____	
f. Foundation walls:	poured	block	stone	other _____
g. Foundation walls:	unsealed	sealed	sealed with _____	
h. The basement is:	wet	damp	dry	moldy
i. The basement is:	finished	unfinished	partially finished	
j. Sump present?	Y / N			
k. Water in sump?	Y / N / not applicable			

Basement/Lowest level depth below grade: _____(feet)

Identify potential soil vapor entry points and approximate size (e.g., cracks, utility ports, drains)

_____

_____

6. HEATING, VENTING and AIR CONDITIONING (Circle all that apply)

Type of heating system(s) used in this building: (circle all that apply – note primary)

Hot air circulation	Heat pump	Hot water baseboard	
Space Heaters	Stream radiation	Radiant floor	
Electric baseboard	Wood stove	Outdoor wood boiler	Other _____

The primary type of fuel used is:

Natural Gas	Fuel Oil	Kerosene
Electric	Propane	Solar
Wood	Coal	

Domestic hot water tank fueled by: _____

Boiler/furnace located in:	Basement	Outdoors	Main Floor	Other_____
Air conditioning:	Central Air	Window units	Open Windows	None

Are there air distribution ducts present? Y / N

Describe the supply and cold air return ductwork, and its condition where visible, including whether there is a cold air return and the tightness of duct joints. Indicate the locations on the floor plan diagram.

_____

_____

_____

_____

7. OCCUPANCY

Is basement/lowest level occupied? Full-time Occasionally Seldom Almost Never

Level	**General Use of Each Floor (e.g., familyroom, bedroom, laundry, workshop, storage)**
Basement	_____
1st Floor	_____
2nd Floor	_____
3rd Floor	_____
4th Floor	_____

8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY

a. Is there an attached garage? Y / N

b. Does the garage have a separate heating unit? Y / N / NA

c. Are petroleum-powered machines or vehicles stored in the garage (e.g., lawnmower, atv, car) Y / N / NA Please specify_____

d. Has the building ever had a fire? Y / N When?_____

e. Is a kerosene or unvented gas space heater present? Y / N Where? _____

f. Is there a workshop or hobby/craft area? Y / N Where & Type? _____

g. Is there smoking in the building? Y / N How frequently? _____

h. Have cleaning products been used recently? Y / N When & Type? _____

i. Have cosmetic products been used recently? Y / N When & Type? _____

j. Has painting/staining been done in the last 6 months? Y / N Where & When? _____

k. Is there new carpet, drapes or other textiles? Y / N Where & When? _____

l. Have air fresheners been used recently? Y / N When & Type? _____

m. Is there a kitchen exhaust fan? Y / N If yes, where vented?_____

n. Is there a bathroom exhaust fan? Y / N If yes, where vented?_____

o. Is there a clothes dryer? Y / N If yes, is it vented outside? Y / N

p. Has there been a pesticide application? Y / N When & Type?_____

Are there odors in the building? Y / N
If yes, please describe: _____

Do any of the building occupants use solvents at work? Y / N
(e.g., chemical manufacturing or laboratory, auto mechanic or auto body shop, painting, fuel oil delivery, boiler mechanic, pesticide application, cosmetologist

If yes, what types of solvents are used? _____

If yes, are their clothes washed at work? Y / N

Do any of the building occupants regularly use or work at a dry-cleaning service? (Circle appropriate response)

Yes, use dry-cleaning regularly (weekly) No
Yes, use dry-cleaning infrequently (monthly or less) Unknown
Yes, work at a dry-cleaning service

Is there a radon mitigation system for the building/structure? Y / N Date of Installation: _____
Is the system active or passive? Active/Passive

9. WATER AND SEWAGE

Water Supply:	Public Water	Drilled Well	Driven Well	Dug Well	Other: _____
Sewage Disposal:	Public Sewer	Septic Tank	Leach Field	Dry Well	Other: _____

10. RELOCATION INFORMATION (for oil spill residential emergency)

a. Provide reasons why relocation is recommended: _____

b. Residents choose to: remain in home relocate to friends/family relocate to hotel/motel

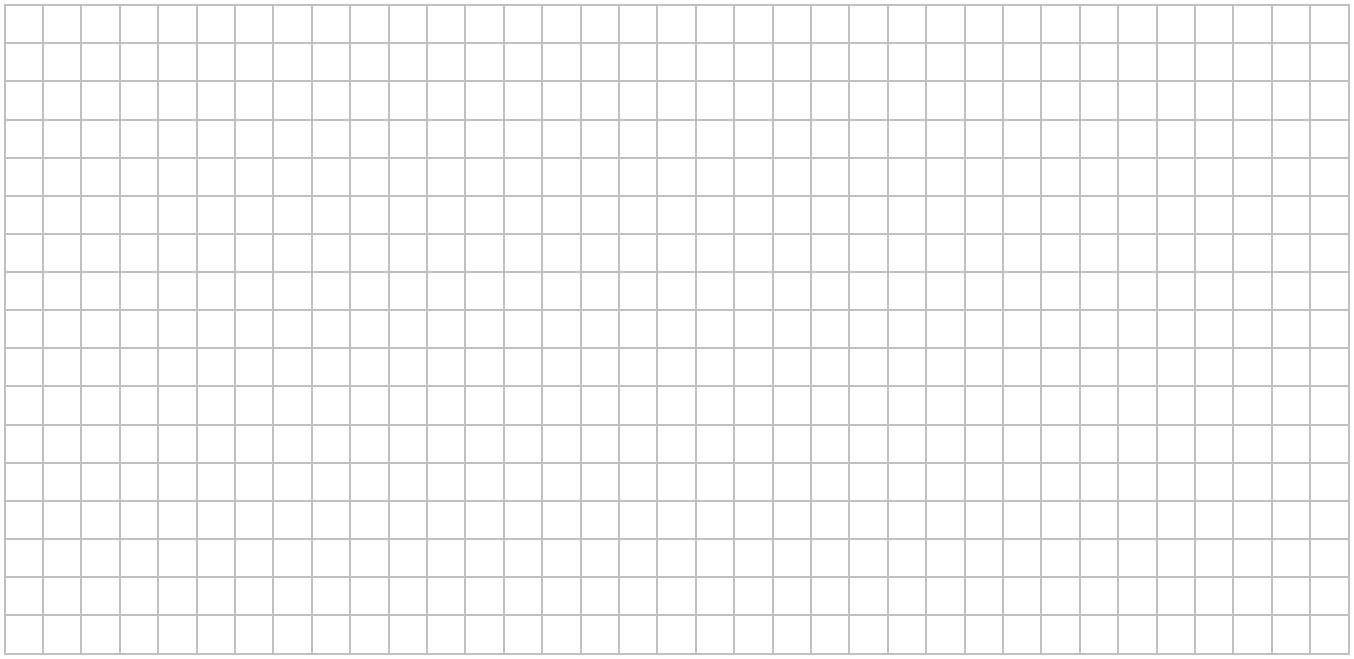
c. Responsibility for costs associated with reimbursement explained? Y / N

d. Relocation package provided and explained to residents? Y / N

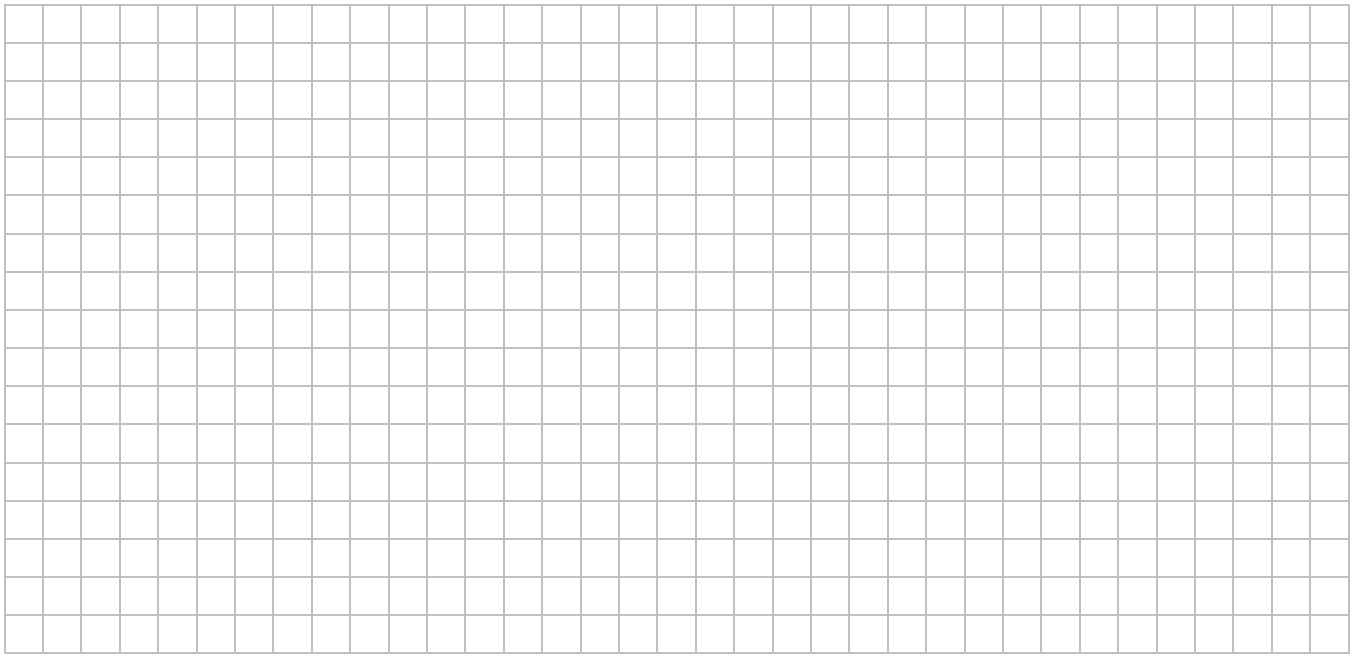
11. FLOOR PLANS

Draw a plan view sketch of the basement and first floor of the building. Indicate air sampling locations, possible indoor air pollution sources and PID meter readings. If the building does not have a basement, please note.

Basement:



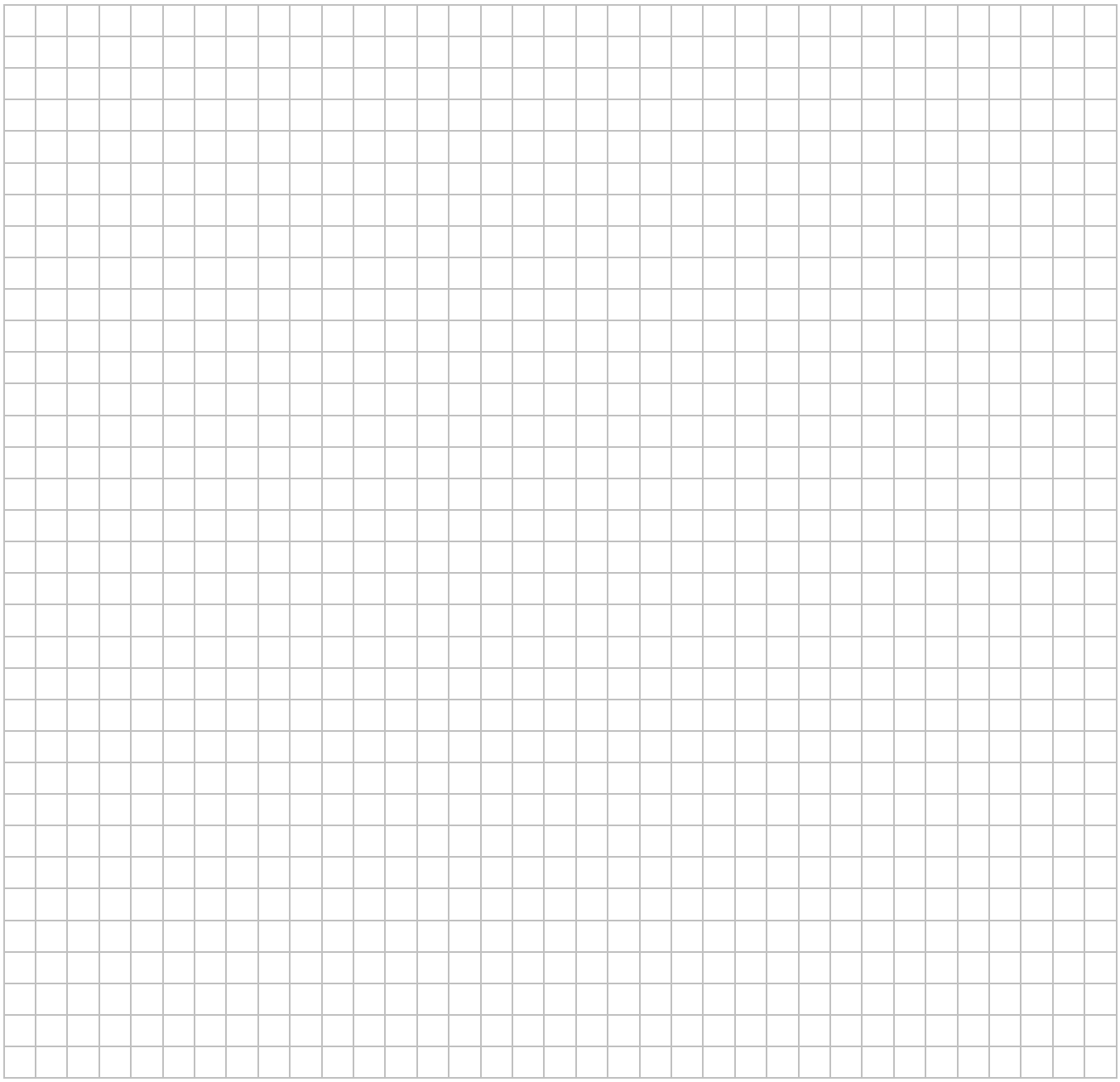
First Floor:



12. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s) and PID meter readings.

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system, if applicable, and a qualifying statement to help locate the site on a topographic map.



13. PRODUCT INVENTORY FORM

Make & Model of field instrument used: _____

List specific products found in the residence that have the potential to affect indoor air quality.

Location	Product Description	Size (units)	Condition*	Chemical Ingredients	Field Instrument Reading (units)	Photo ** Y / N

* Describe the condition of the product containers as **Unopened (UO), Used (U),** or **Deteriorated (D)**
** Photographs of the **front and back** of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.