GENERAL PROVISIONS:

DNREC-SIRS has created this standard operating procedure (SOP) as a default procedure to be followed for indoor air sampling. Any deviation from this procedure will require DNREC-SIRS’ approval prior to implementation.

EQUIPMENT LIST:

1) Pre-cleaned and individually certified summa canister*
2) Field Sampling Form
3) Photo Ionization Detector (PID)
   * DNREC recommends, but does not require, that summa canister be pre-cleaned and individually certified.

CONSIDERATION FOR INDOOR AIR SAMPLING WHEN ALSO CONDUCTING SUB-SLAB:

- During sub-slab vapor probe installation, air from under the slab may be released into the indoor air. Time is required for this air to move out of the building prior to indoor air sampling. Based on indoor air exchange rates (indoor air being exchanged for outside air), EPA recommends waiting from one (1) to three (3) days after sub-slab probe installation to sample the indoor air. This requirement is not necessary if the HVAC is turned off prior to sampling. If the air exchange rate of the building is one (1) air exchange unit per hour, then collect the indoor air samples one (1) day after the sub-slab probe installation. If the air exchange rate of the building is 0.25 air exchanges per hour, then three (3) days after the sub-slab probe installation would be required before collecting the indoor air samples.

PREPARATIONS FOR INDOOR AIR SAMPLING:

Prior to the collection of indoor air samples, the following preparations should be made:

a) De-activate HVAC systems in advance of sampling to more accurately determine natural migration of sub-slab air into the building.
b) **Contact the laboratory to confirm the required sample size** necessary to obtain the desired reporting limit.

c) **Conduct a pre-sampling inspection** (Attachment I – Parts I – V)

1) Prior to each sampling event, identify conditions that may affect or interfere with the proposed testing. Include the inspection checklist in the investigation report.

2) The inspection should evaluate the type of structure, floor layout, physical conditions, and airflows of the building(s) being studied.

3) Perform a product inventory to identify potential sources of interference. Use a photo ionization detector (PID) capable of screening to the low parts per billion (ppb) or a portable GC to screen containers for potential interference. If possible/available, record product name and manufacturer.

d) **Eliminate potential interference**

Potential interference from products or activities releasing volatile chemicals may need to be controlled. Removing the sources from the indoor environment a minimum of 72 hours prior to testing (EPA 2015) is the most effective means of reducing the interference. In addition, for the 72-hour period preceding indoor air sampling, avoid the following activities:

- opening any windows, fireplace dampers, openings, or vents
- operating ventilation fans unless special arrangements are made
- smoking in the building
- painting
- operating wood stoves, fireplaces or other auxiliary heating equipment (e.g., kerosene heaters)
- operating or storing automobiles in an attached garage
- storing containers of gasoline or oil within the building,
- cleaning, waxing, or polishing furniture or floors with petroleum- or oil-based products
- using air fresheners or odor eliminators
SAMPLE COLLECTION

*NOTE: Sampling personnel should avoid lingering in the immediate area of the sampling device while samples are being collected to avoid undue influence from sampling.

Location
1) Any indoor air samples collected should be co-located with a sub-slab sample for ease of comparison of the results.

2) Sample collection intakes should be located in the approximate breathing zone for building occupants (typically three feet above the floor level where occupants are normally seated or sleeping). Breathing zone level may vary depending on building use and should be modified accordingly for sampling.

3) Air samples should be collected from the basement (1 exposure unit), as applicable, and first floor (1 exposure unit).

Frequency
1) A minimum of one (1) indoor air sample per exposure unit should be collected to assess potential exposure of building occupants to volatile chemicals from a sub-surface source.

2) The number of ambient air samples collected should be based on Site-specific conditions (e.g., wind direction – is it changing?), but each air sampling event should include at least one (1) outdoor ambient air sample.

3) Please see the Active Soil SOP for more details on ambient air samples.

Duration

1) EPA recommends collecting ambient air samples 1-2 hours prior to collecting indoor air samples (EPA 2015).

2) Collect samples for either 8 hours (commercial exposure scenario) or for 24 hours (residential exposure scenario) depending on the current or anticipated building use to ensure that an air sample is representative of the conditions being tested.

3) In non-residential buildings, samples should be collected during normally-occupied periods to be representative of typical exposure. Canister should be retrieved within 10% of the total sample time. NOTE: Longer duration
sampling periods may be appropriate depending on the goals of the investigation.

Procedure

1. The summa canister should be used within 24 hours of shipment to avoid cross-contamination. Canister can be stored longer with DNREC-SIRS permission. Record the vacuum pressure in each summa canister. If the value you just recorded is not within ± 2 psi of the value recorded by the lab prior to shipment, it cannot be used (EPA, 1992).

2. Place a summa canister on a flat surface in the building in the approximate breathing zone of occupants.

3. Prior to completing the sampling, personnel will complete a sampling form by filling in the appropriate sections (Attachment 3) noting pertinent weather conditions, vacuum present in the canister when the sampling began, whether it passed QA/QC testing, etc.

4. A Summa® canister sample valve will be opened to collect the sample for either 8 hour or 24 hour sample time depending on the appropriate exposure scenario.

5. The canister must be shut off while vacuum still remains the canister. Note the remaining vacuum from the vacuum gauge on the sampling form. Summa canisters length of actual sample collection time must be within 10% of the required sampling time interval in order to be considered a valid sample and have a minimum of 1 in of vacuum remaining in the canister (Eurofins). For example, 7 hours for 8 hour sample time or 22 hours for a 24 hour sample. Please contact DNREC as soon as possible regarding any sampling issues to discuss the data usability.
ATTACHMENT I

INDOOR AIR BUILDING SURVEY & SAMPLING FORM

Survey Completed by: ______________________________ Date: _____________

Site Name: ______________________________

DE#: ______________________________

Part I – Building Occupants

Building Address: ______________________________

Property Contact: ______________________________ Owner/Renter/Other: ______________________________

Contact’s Phone: home ( ) ___________ work ( ) ___________

               cell ( ) ___________

Contact’s Email: ______________________________

Ages of occupants: Children under age 13 _____ Children age 13-18 _____ Adults _____

Special Health Conditions (respiratory, cardiovascular; partially able or homebound?)

______________________________________________________________

______________________________________________________________

______________________________________________________________

Allergies ________________________________ Other (describe) ________________________________

Part II – Building Characteristics

Building type: single-family residential / trailer or mobile / multi-family residential (duplex, row, apartment?) / office / strip mall / commercial / industrial
Describe building:
1) age
2) construction frame / masonry / steel / other;
3) type of insulation;
4) type of roof
5) general condition and air tightness
6) fireplace or chimney (serviced recently?)

______________________________________________________________________________

______________________________________________________________________________

Number of floors - below grade: ______ (full basement / crawl space / slab) at or above grade:
______________________________________________________________________________

Number of rooms _____________ Do windows open? _________________________________
______________________________________________________________________________

Basement size: _______ ft² Basement floor:   concrete / dirt / floating / other (specify): ___
______________________________________________________________________________

Foundation type:  poured concrete / cinder blocks (hollow?) / stone /  other (specify):
______________________________________________________________________________

Type of ground cover around outside of building:  grass / concrete / asphalt / other (specify):
______________________________________________________________________________

If vegetation, does it appear stressed? _____________ French drain? ________ Flooding
experienced? _____________
Floor drains present? ________ If yes, trap present? _____________ Water in trap? ________

Connected to a:  a) sanitary sewer        b) storm sewer         c) septic system
d) surface discharge e) unknown

Basement sump present?   Yes / No   Sump pump?  Yes / No

Type of heating system (circle all that apply):

hot air circulation hot air radiation wood steam radiation
hot water radiation kerosene heater electric baseboard heat pump
solar/air solar/glycol or other heat transfer fluid
solar/water other (specify): _____________________________

If air, when were filters changed last?
Type of ventilation system (circle all that apply):
- central air conditioning
- mechanical fans
- bathroom ventilation fans
- individual air conditioning units
- kitchen
- range hood fan
- other (specify): _________________

Type of fuel utilized (circle all that apply):
- Natural gas
- electric
- fuel oil
- wood-wood pellets
- coal
- solar
- kerosene
- waste oil
- outside (fresh) air intake

Septic system?  Yes / Yes (but not used) / No
Irrigation/private well?  Yes / Yes (but not used) / No

Public or private well  Yes / No  If public, name of company ____________________________

Existing subsurface depressurization (radon) system in place? Yes / No
and running?  Yes / No

Part III - Outside Contaminant Sources

DNREC  DEN/Marplot/Brownfields lists (1000-ft. radius):

Previous land use in area:
______________________________________________________________________________

Other stationary sources nearby:

- Gas stations
- Emission stacks
- Refineries/chemical plants
- Fuel oil tanks
- Waste disposal facilities (LFS & WWTPs)
- Hot-mix plants
- Dry cleaners
- Road or roof repair with tar
- Auto repair/body shops
- Beauty shops

Wetlands nearby? (If so, indicate distance and direction from property)
______________________________________________________________________________

Heavy vehicular traffic nearby (or other mobile sources):
______________________________________________________________________________

Known groundwater or soil contamination within 1000 feet
______________________________________________________________________________
Physical parameters of unsaturated zone (summarize or attach)

Sinkholes or Debris Pits

---

**Part IV – Indoor Contaminant Sources**

Identify all potential indoor sources found in the building (including attached garages), the location of the source (floor & room), and whether the item was removed from the building 48 hours prior to indoor air sampling event.

<table>
<thead>
<tr>
<th>Potential Sources</th>
<th>Location(s)</th>
<th>Removed Prior to Sampling? (Yes / No / NA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline storage cans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas-powered equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kerosene storage cans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paints / thinners / strippers / glues / caulks</td>
<td></td>
<td></td>
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<tr>
<td>Cleaning solvents</td>
<td></td>
<td></td>
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<tr>
<td>Oven cleaners</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carpet / upholstery cleaners</td>
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<td></td>
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<tr>
<td>Other house cleaning products/laundry products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moth balls</td>
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<td></td>
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<tr>
<td>Polishes / waxes</td>
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<td></td>
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<tr>
<td>Insecticides</td>
<td></td>
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<tr>
<td>Furniture / floor polish</td>
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<td></td>
</tr>
<tr>
<td>Nail polish / polish remover</td>
<td></td>
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<tr>
<td>Hairspray</td>
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<tr>
<td>Cologne / perfume / after-shave, etc.</td>
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<tr>
<td>Air fresheners</td>
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<tr>
<td>Fuel tank (inside building) (outside)</td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Wood stove or fireplace</td>
<td></td>
<td>NA</td>
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<tr>
<td>New furniture / upholstery</td>
<td></td>
<td></td>
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<tr>
<td>New carpeting / flooring / paneling</td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Recent painting in building? Roof repair?</td>
<td></td>
<td>NA</td>
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<tr>
<td>Hobbies - glues, paints, etc.</td>
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<tr>
<td>Toilet or septic additives</td>
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<tr>
<td><strong>Dry drain traps, plugged drains, toilets won’t flush</strong></td>
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<tr>
<td><strong>Garbage/spoiled food</strong></td>
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<tr>
<td><strong>Standing water/tire piles/recent flooding</strong></td>
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<tr>
<td><strong>Sewage/septic</strong></td>
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<td><strong>Dead animals (including unusual numbers of insects)?</strong></td>
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<tr>
<td><strong>Mold/mildew</strong></td>
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<tr>
<td><strong>Wet sheetrock/paneling/flooring</strong></td>
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<tr>
<td><strong>Neighbors making drugs/Explosives</strong></td>
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<tr>
<td><strong>Mercury-containing switches or instruments</strong></td>
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<tr>
<td><strong>Alcohol/bleach/disinfectants</strong></td>
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<tr>
<td><strong>Recent concrete/masonry work</strong></td>
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<tr>
<td><strong>Flowers</strong></td>
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<tr>
<td><strong>Pets (specify); scented kitty litter</strong></td>
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<tr>
<td><strong>Compost/manure</strong></td>
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**Part V – Miscellaneous Items**

Do any occupants of the building smoke?  *Yes / No*  If so, how often?  ___________

Any chronic health problems?  *Yes / No*

Has anyone smoked within the building within the last 48 hours?  *Yes / No*

Does the building have an attached garage?  *Yes / No*  If yes, does garage have heat/ventilation?  
Connected to house or separate?  ___________________________  Windows?  *Yes / No*

If so, is a car usually parked in the garage?  *Yes / No*

Do the occupants of the building have their clothes dry-cleaned?  *Yes / No*  If yes, name of dry cleaner  ____________________________________________

When were dry-cleaned clothes last brought into the building?  

____________________________________________________________

Have the occupants ever noticed any unusual odors in the building?  *Yes / No*

Describe (with location):  Date ________________  Amount  

____________________________________________________________
Have any known spills of a chemical, fuel or sewage occurred immediately inside or immediately outside the building?  Yes / No  Fires? Yes / No

Describe (with location):

______________________________________________________________________________

______________________________________________________________________________

Have any pesticides/herbicides been applied around the building foundation or in the yard/gardens? Yes / No

Have any pesticides been applied regionally, e.g. by Mosquito Control or DSWC? Yes / No

If so, when and which chemicals?

______________________________________________________________________________

______________________________________________________________________________

Are odors more noticeable under certain weather conditions? Describe (wind direction/speed/precipitation/temperature/humidity):

______________________________________________________________________________

______________________________________________________________________________

Part VI – Sampling Information

Sample Technician: ________________________ Phone number: (      ) _______ - _________

Sampler Type: Tedlar / Sorbent / Canister

Analytical Method: TO-15 / TO-17 / other: _______________________________________

Laboratory: _________________________________ DE HSCA-Certified Lab? Yes / No

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Floor</th>
<th>Room</th>
<th>Canister/#</th>
<th>Pump ID # (if applicable)</th>
<th>Sample Start Date / Time</th>
<th>Sample End Date / Time</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>
Sample location(s): Provide Drawing of Sample Location(s) in Building

Sample # _____ - _________________________
Sample # _____ - _________________________
Sample # _____ - _________________________
Sample # _____ - _________________________

Did the occupants **not** follow any of the “Instructions for Residents” directions?  Yes / No

If so, describe modifications: ________________________________

**Part VII - Weather Conditions**

Outside temperature at time of sampling: _____ °F

Expected high temperature: _____ °F    Expected low temperature: _____ °F

Humidity: _________    Barometric pressure: _________________    Ozone: Red/Orange alert?

Was there significant precipitation within 12 hours of (or during) the sampling event?  Yes / No

Wind direction and speed

____________________________________________________________________________

Describe the general weather conditions:

____________________________________________________________________________
Fill out and attach DNREC SIRS' Vapor Intrusion Guidance Document Field Sampling Form 1 to this form.

Part VIII – General Observations

Provide any information that may be pertinent to the sampling event and may assist in the data interpretation process.