VAPOR INTRUSION MITIGATION SYSTEM OPERATION, MAINTENANCE, AND MONITORING CHECKLIST

1. Scope of Checklist

The purpose of this checklist is to guide the user during the inspection of a vapor intrusion mitigation system (VIMS) to (1) verify that the VIMS is operating as designed and (2) determine whether certain operation, maintenance, and monitoring (OM&M) activities are necessary for continued operation and effectiveness of the system. This checklist is intended to provide options to consider when documenting that the VIMS is operating and is effectively mitigating the vapor intrusion pathway during the life cycle of its operation. Not all the information presented below is necessary to document system operation for all types of systems on all types of buildings, and some items may not be needed during every monitoring event. The user should be able to identify which criteria below best represent effective operation and responsible maintenance of their specific VIMS and whether the conceptual site model (under which the system was designed) is still valid.

Prior to completing the inspection, it is recommended that the user review previously prepared OM&M plans. As-built drawings and performance (baseline) criteria are needed when conducting inspections of a VIMS. Monitoring scope, schedule, and methods may follow applicable agency requirements, which may be amended on a case-by-case basis through regulatory negotiation and approval. Where applicable, the monitoring and inspections must also comply with standards of practice and applicable codes (electrical code, building code).

In some situations, OM&M plans may not exist or be available or were not provided to a new operator or new building owner. Thus, the original as-built drawings and possibly the original performance criteria may not be known. In these cases, the checklist below can still be used to assist in developing the appropriate ongoing OM&M parameters for that particular site, although additional effort may be appropriate depending on the complexity of the building and site conditions.

2. Site Inspection Information

Address Inspected: _____

Date of inspection:_____ Date of last inspection:_____

Inspector(s):_____ Title: _____Company: _____

Building contact: _____Phone Number: _____

Frequency of inspections: ☐Annual ☐Semi-annual ☐Quarterly ☐Monthly

Other (specify): _____

Type of system being inspected: _____

3. Mitigation System Operation

3.1. Was the mitigation system functioning as designed and operating upon arrival? ☐Yes ☐No ☐N/A

If no, explain in Section 6 why the system was not operational and the steps taken to correct the problem.

If no and the cause of the system shutdown is determined, follow the start-up procedures as detailed in the system OM&M plan and complete the remainder of the checklist.

3.2. Are there/have there been any unusual noises (e.g., water sloshing, motor straining) indicating potential issues with VIMS piping, blower, and/or motor? ☐Yes ☐No ☐N/A

If yes, discuss changes and possible impacts in Section 6.

3.3. Has the mitigation system been altered from what is shown in the "as-built" drawings? ☐Yes ☐No ☐N/A

If yes, discuss changes and possible impacts in Section 6.

3.4. Has the mitigation system operated continuously since the last OM&M event? ☐Yes ☐No ☐N/A

If no, discuss changes and possible impacts in Section 6.

3.5. Have procedures and equipment been checked for proper and fail-safe operation? ☐Yes ☐No ☐N/A

If no, discuss changes and possible impacts in Section 6.

3.6. Are labels identifying the system components in place and legible? ☐Yes ☐No ☐N/A

If no, specify the date of replacement.

3.7. Conduct a visual inspection of accessible system piping and pipe seals, including membrane seals (if applicable), connections etc. Were any cracks/gaps or any changes in the system configuration observed? ☐Yes ☐No ☐N/A

If yes, list the inspection results in Section 6 and document the corrections to fix these problems.

4. Building Conditions and Use

4.1. Is the building's heating system or heating, ventilation, and air conditioning (HVAC) system operating? ☐Yes ☐No ☐N/A

If yes, provide a summary below and explain in Section 6 if the HVAC system operation could impact the effectiveness of the mitigation system.

Hours/day of HVAC Operation _____

Climate Controlled? ☐Yes ☐No ☐N/A

4.2. Is the building's heating system or HVAC system on during this OM&M event? ☐Yes ☐No ☐N/A

4.3. Is the building's heating system or HVAC system equipped with outside dampers? ☐Yes ☐No ☐N/A

If yes, how many? _____

Percent opened _____

4.4. Has the building had a change in use since the system began operation? (That is, are the exposure assumptions still appropriate?) ☐Yes ☐No ☐N/A

If yes, explain in Section 6 what these changes are and how they may impact the effectiveness of the mitigation system.

4.5. Has the building undergone any physical modifications (additions, changes to interior walls, new sumps or French drains, any new permits filed, etc.)? ☐Yes ☐No ☐N/A

If yes, explain in Section 6 the building changes and how they may impact the effectiveness of the passive mitigation system.

4.6. Has the condition of the basement (or the lowest floor) walls, floors, sumps, and utility penetrations been inspected for cracks, gaps, or seal failure? ☐Yes ☐No ☐N/A

If yes, list the inspection results in Section 6 and document the corrections (if necessary) to fix any problems.

4.7. Has a visual inspection been conducted assessing the presence of moisture and/or efflorescence as crystalline deposits in the basement or lowest floor, including any crawl spaces? ☐Yes ☐No ☐N/A

If yes, list the inspection results in Section 6 and document the corrections to fix these problems.

5. Monitoring and Diagnostic Measurements

5.1. Record vacuum and airflow at the suction point(s) and compare to baseline values (if applicable). ☐Yes ☐No ☐N/A

Note: Field instruments such as a micromanometer can be used if in-line gauges/displays are not built in.

Prepare and attach monitoring data table to summarize the results.

If consistent, note the conclusion in Section 6.

If not consistent, explain discrepancies in Section 6 and whether further corrective steps are necessary for the VIMS or actions taken.

5.2. Record fan or blower/fan airflow and vacuum and compare to baseline values (if applicable) ☐Yes ☐No ☐N/A

Note: Field instruments such as a hot wire anemometer can be used if in-line gauges/displays are not built in.

Prepare and attach monitoring data table to summarize the results.

If consistent, note the conclusion in Section 6.

If not consistent, explain discrepancies in Section 6 and whether further corrective steps are necessary for the VIMS or actions taken.

5.3. Are telemetry systems indicating normal operating conditions (if applicable)? ☐Yes ☐No ☐N/A

If no, describe the issues and any mitigative actions in Section 6.

Type of Telemetry: _____

Location _____

Summary of operating conditions: _____

_____

_____

_____

5.4. Did any telemetry system data show irregular entries or shutdown? ☐Yes ☐No ☐N/A

If yes, describe the issues and any mitigative actions in Section 6.

5.5. Conduct vapor concentration monitoring within system (if applicable). ☐Yes ☐No ☐N/A

Field instruments need to be calibrated and meet detection levels of vapors being monitored. If no sampling ports are built into the system, conduct monitoring at the piping discharge/exhaust. Monitoring options include the following:

a. field screening with a photoionization detector for total ionizable volatile organic compounds or flame ionization detector for total hydrocarbons including methane

b. landfill gas monitoring for oxygen, carbon dioxide, and methane to assess cross-slab leakage and sub-slab ventilation rates

c. whole gas (Tedlar bag, Summa canister, Bottle-Vac, etc. for analysis by U.S. Environmental Protection Agency Method TO-15 or similar) or sorbent sample (pumped analytical thermal desorption tube and TO-17 analysis, permeation-style passive sampler for solvent extraction gas chromatography / mass spectrometry); holding time requirements of vapor-forming chemical samples for laboratory analysis need to be followed.

5.6. Has there been a significant increase or decrease in concentrations since the previous monitoring event(s)? ☐Yes ☐No ☐N/A

Evaluating VIMS mass emission rates (i.e., multiplying the vapor concentration in the vent pipe by the flow rate) can be effective and/or required for VIMS monitoring. If mass emission rates are monitored, consider the following:

- If the emission rates are higher than permit discharge limits, if present, discontinue operation until off-gas treatment is in place and emissions are in compliance with permit requirements.
- If there has been a building depressurization test, is the initial mass removal rate from the system greater than the mass emissions through the building during depressurization?
- If the rate of mass removal from the system is too low to pose a potential risk to indoor air quality (i.e., the product of vent-pipe concentrations multiplied by vent-pipe flow rate is less than the product of the indoor air screening level multiplied by the building volume and air exchange rate), consider whether it may be appropriate to transition to a sub-slab ventilation system, semi-passive system (wind or solar fans), passive system (no fan, but open vent pipes), or a decommissioned system (see the **Vapor Intrusion Mitigation System Curtailment and Shutdown Fact Sheet** for further information and considerations regarding potential VIMS decommissioning).

Record the monitoring results in **Section 6** or the attached monitoring data tables.

Discuss the reason(s) for any significant changes observed in **Section 6**.

5.7. Record differential pressure (between sub-slab and indoor air) at monitoring points beneath the building floor slab if appropriate. Is the minimum differential pressure recorded at all monitoring points? ☐Yes ☐No ☐N/A

Record the monitoring results in the attached monitoring data tables.

Discuss the reason(s) for any significant changes observed in Section 6.

Conduct a periodic leak check of the sampling probes if collecting soil vapor samples.

For locations where the minimum vacuum is not observed, consider additional data collection. For example, connect a digital micromanometer to the probe, set datalogging to a 1-second frequency, and cycle the fan on and off (e.g., 1 minute on and then off, or until the micromanometer readings have stabilized). Repeat this cycle at least two times.

a. Does the trend show a characteristic saw-toothed pattern with a magnitude similar to the target vacuum level? ☐Yes ☐No ☐N/A

b. Hold a smoke pen over the probe when open. Is the smoke drawn strongly into the probe? ☐Yes ☐No ☐N/A

c. Consider collecting a soil vapor sample from the probe. If the vapor concentrations are below conservative sub-slab screening levels, it may not be necessary or appropriate to modify the system to exert additional vacuum to this location.

5.8. Were indoor air samples collected for laboratory analysis as performance metrics, as indicated in the VIMS OM&M Plan (and/or as stipulated by regulatory guidance)? ☐Yes ☐No ☐N/A

If yes, summarize the results for contaminants of concern and any mitigative actions in Section 6.

Background sources (consumer products and building materials inside buildings and exterior air vapor-forming chemicals) are a common confounding factor and must be explicitly considered when interpreting indoor air samples.

5.9. Has a smoke test been conducted (if necessary) to verify the continued integrity of the liner? ☐Yes ☐No ☐N/A

If yes, summarize the results and any corrective actions in Section 6.

5.10. Has the appropriate frequency for system inspections been completed to date? ☐Yes ☐No ☐N/A

If no, explain the discrepancy in Section 6.

Current frequency of inspections:_____

5.11. Were batteries replaced in any battery-powered alarms (if needed)? ☐Yes ☐No ☐N/A

5.12. Were additional items inspected? ☐Yes ☐No ☐N/A

If yes, explain the item(s) inspected and the findings from the inspection in Section 6.

5.13. Was system component maintenance completed per equipment manufacturer specifications? ☐Yes ☐No ☐N/A

If yes, explain the maintenance completed in Section 6.

6. Observations and Corrective Actions

Document observations and corrective actions or modifications made to or planned for the VIMS and the results employed to verify the effectiveness of the actions or modifications. Refer to the specific item number for each observation or corrective action. Use additional pages as necessary.

7. Photographic Log

Photographs taken and included as attachment? ☐Yes ☐No ☐N/A

8. Overall Vapor Intrusion Mitigation System Assessment

Is the mitigation system still protective? ☐Yes ☐No

9. Inspector Information

Date: _____

Inspector's Email: _____

Inspector's Name: _____

Inspector's Signature: _____