MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

Attachment A.5

Active Vapor Mitigation Systems

Table of Contents for Submittals

Prepared by:
Michigan Department of Environment, Great Lakes, and Energy
Remediation and Redevelopment Division
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Appendix A.1 – Design of an Active Vapor Mitigation System

The submittal of an AVMS design to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) should include information necessary to ensure the proposed system has a reasonable likelihood of effectively mitigating unacceptable exposures for the volatilization to the indoor air pathway (VIAP). This Table of Contents (TOC) may contain information not necessarily critical for the review and approval of the mitigation strategy; however, it is included in the design to ensure that the necessary information is available if approval of the installed system is required in the future.

The obligation of ensuring the designed system is effectively mitigating the unacceptable exposures for the VIAP ***is that of the person proposing the plan***. EGLE's approval of this plan does not guarantee that it will be effective in mitigating the unacceptable risk, nor that additional response activities are not warranted. The design submittal should provide key design elements, but focus on identifying performance metrics, how and where they are measured, why they are appropriate for the design, and identifying the construction quality assurance and quality control (QA/QC) plan.

Include a description of the overall goal of the AVMS, an understanding and discussion of how the AVMS will function, the specific performance metrics used to verify function, and an outline of the operation, maintenance, and monitoring (OM&M) program.

Coversheet

The cover sheet for the system design submittal should contain the following information:

- Site - Site address with regulatory identifiers (Facility or Site name and ID#).
- Owner - Entity, address, contact information.
- System Designer and/or Environmental Consultant – Entity, address, contact information.
- Building Engineer and/or Architect (if applicable) – Entity, address, contact information.
- Submittal Date

1. Introduction and Conceptual Site Model (CSM)

1.1 Introduction and Overview

This section should briefly describe the submittal.

1.2 Site Setting and Description of Structure(s)

This section should describe the site setting including the location, current and planned use, and current and future structures with proposed vapor mitigation. Include a description of the height, size, and general construction characteristics.

For an existing building, a building survey should have been conducted. See Attachment 1 for an example of a building survey. The results of a building survey should identify specific

building characteristics, features, and configurations that may affect the design, installation, and effectiveness of the AVMS. If the planned building is not yet constructed, this information should be evaluated from design plans, and discussions with the site development team.

NOTE: Many buildings (particularly larger commercial/industrial buildings) have multiple foundation types due to building additions over time; slab and sub-slab conditions often vary between building areas and foundation walls or changes in floor elevation may prevent airflow from one slab area to another. Other foundation features such as elevators, pits, sumps, floor drains, utilities, utility tunnels, and other structures located below the slab or floor level should be considered for their potential effect on the mitigation system design.

Key Supporting Information

- Topographic Site Location Map (from USGS or site plans as available)
- General Site Feature Map that includes existing and proposed structures to scale with any property lines, right-of-way (ROW), and major utilities.
- Figure(s) in the plan view of the structure to be mitigated, including the room divisions, footings known and estimated, and other key features such as the location of pits, sumps, vents, basements
- Cross-sectional view figures and drawings may be helpful for depicting other key features relative to the proposed mitigation system.
- Appendix with Building survey that includes a photo log (see Attachment 1).

1.3 Site History

This section should describe the current and past site use, operational history as well as the type of hazardous or regulated substances currently and previously used at the property.

NOTE: Describing the site use and history aids in identifying the presence or likely presence of hazardous substances or petroleum products in, on, or at a property due to any release to the environment or conditions indicative of a release to the environment and may provide some general information on the concentrations of hazardous substances that could be expected to be encountered.

Key Supporting Information

- Table (optional depending on the complexity of the site) that provides a list of known activities or operational history that may have led to a release of hazardous substances into the environment.
- Figure that identifies the locations of current and past activities and operations that may have or are known to have led to a release of a hazardous substance into the environment. These areas are typically referred to as recognized environmental conditions (RECs).

1.4 Geology/Hydrogeology

This section should describe the site geology and hydrogeology. Information should include a description of soil type(s) and depth to groundwater. Supporting data, including boring logs, should be provided. Soils may be described using either the USCS, USDA, or other soil classification system such as AASHTO/MDOT, but the classification system should be identified. The lithology and presence or absence of groundwater, including seasonal groundwater, should be evaluated to at least five feet (5') below the lowest part of the structure. The lowest part of the structure includes the maximum depth of any footings, sumps, drains, pits, and elevator shafts, etc. The potential for known or estimated seasonal variations in groundwater should be described where the groundwater needs to be evaluated.

A cross-section of the structure that is being mitigated should be provided with the site geology and hydrogeology information shown. Structures that have various footing depths, such as basements, elevators, tunnels, or pits and that are larger than 5,000 square feet may require more than one cross-section to clearly depict these features to aid in the review.

Soil that will be brought on-site beneath the structure, or as a component of the mitigation system, should also be identified and described including information on the type, characteristics, and where it will be placed.

NOTE: Engineered and construction soils should be described based on the available information and should include a description of the subgrade, sub-base, and base-course soils to a depth of at least 12" below the lowest part of the structure.

Key Supporting Information

- Figure identifying boring locations used to classify geological and hydrogeological information.
- Boring logs.
- Cross-section(s) depicting the current or proposed structure, below grade site features (foundations, utilities, etc.) and geological and hydrogeological information.
- Tables, as necessary, identifying any monitoring wells installed, depth of the wells, and the elevation of the groundwater.

1.5 Detailed Building Information

1.5.1 Below Grade Building Features and Foundations

This section should describe the foundation type (i.e., footings, pier, columns, cast pilings, etc.) and building portions that are below grade (basements, crawlspaces, elevator sumps, pits, utilities, tunnels, etc.) that are in contact with the soil. If there are any foundations that are unknown, they should be discussed here and addressed in Section 2.2.

Key Supporting Information

- All below-grade building features and foundations should be identified in the plan view.
- Subsurface features should be depicted on the cross-sections developed in Section 1.4.

1.5.2 Heating, Ventilation, and Air Conditioning (HVAC)

This section should describe the current or proposed HVAC system, including any of the location of air intakes and exhaust that are required for its operation.

Key Supporting Information

- Figure(s) – should depict the location of any air intakes, vents, and discharge points including components on the roof or side of the structure.

1.5.3 Floor Slab and Condition

For an existing building, this section should describe and document the current condition of the floor. It should identify cracks with a width greater than 1/2-inch that may impact the operation of the AVMS, areas where concrete is not present, or areas that the concrete needs repair or replacement. For new or proposed floor slabs, this section only needs to identify the type and thickness of the floors that will be installed as part of the development.

Key Supporting Information

- Figure(s) – identify the location, type and condition of the floor slabs including cracks with a width greater than 1/2-inch, areas that concrete is not present, or areas that the concrete is likely to need repair or replacement based on the information collected during the building survey.
- Appendix – if applicable, with building survey and photolog with representative photos, especially in areas that repairs to the slab or building may be warranted.

1.5.4 Utility Penetrations and Man-Made Preferential Pathways

This section should describe and document the location of penetrations and sumps in which soil gas may enter and directly vent into the structure and utilities that directly come into contact with a vapor source. This evaluation is limited to those utilities that are in direct contact with a vapor source. For new construction, this section should identify any penetrations that are known or expected to occur.

Key Supporting Information

- Figure(s) and cross-section(s) – identify the location of penetrations, sumps, and preferential pathways.

1.5.5 Historic Buildings (if applicable)

This section should describe any limitations to the system design or layout that may need to be considered and are imposed on the structure due to a historic designation.

1.6 Source Areas and Contaminant

1.6.1 Applicable Criterion

This section should identify the applicable criteria used to demonstrate that the response activity or corrective action is necessary to protect the public health, safety, welfare, or the environment, and identify the assumptions used in their development.

- **Generic Criteria or Risked Based Screening Levels (RBSLs)**: If the use of the generic criteria is appropriate, supporting information should be described and presented.
- **Site Specific Volatilization to Indoor Air Criteria (SSVIAC) or Site-Specific Target Levels (SSTLs)**: When developed for the site or if VIAP Screening Levels (SLs) are used, the supporting documentation should be provided demonstrating the criteria are appropriate for use.

Key Supporting Information

- Table identifying the criteria used.
- Appendix that provides supporting documentation for use of the VIAP Criteria, including any previous approvals and the evaluation for the use of the site-specific criteria.

1.6.2 Vapor Source

This section should identify the concentrations of the volatile regulated or hazardous substances or regulated substances that pose an unacceptable risk to the structure(s). The text should include a discussion of how the sample data aligns with the site history (Section 1.3). Representative soil, groundwater, and soil gas concentrations include any samples collected above and near the vapor source where vapors may enter the structure. Soil gas and vapor samples should be collected when site conditions allow, to confirm that mitigation is necessary.

Data must be provided that supports the design of the AVMS, including a demonstration that mitigation is warranted. Sample data must also support delineation of soil gas impacts in any areas where an AVMS is not proposed (i.e., outside of the planned mitigation footprint).

Key Supporting Information

- Tables that provide representative soil, groundwater, and vapor data compared to the applicable criteria.
- Figure(s) that identifies where the data was collected, including the sampled media and location of samples depicted on a scaled figure(s) relative to the structure(s).
- Figure(s) depicting detections above applicable criteria relative to the structure(s).
- Appendix should include all analytical data sheets and field forms obtained during their collection.
- Cross-section(s) should include below grade features and show the chemical data that exceeds the appropriate criteria.

1.7 Man-Made Preferential Pathway Evaluation (if applicable)

This section should include an analysis of Section 1.5.4 and if there is a need to design or propose a mitigation strategy for man-made preferential pathways or other preferential pathways that may not be addressed through the operation of the AVMS.

Key Supporting Information (As Warranted)

- Text should reference the Figures identified in Section 1.6.2, as necessary.

2. AVMS Design and Plans

2.1 Overview of AVMS

This section should include a design basis that explains how vapors are entering, or may enter, the structure and how the AVMS will prevent unacceptable soil vapor concentrations from entering the structure. It should include an overview of the type and functionality of the mitigation system proposed (e.g., sub-slab venting, sub-slab depressurization, etc.) and portions of the structure requiring mitigation.

2.2 Design Testing

2.2.1 Overview

This section should include an overview of the diagnostic tools that will be used for proposed structures or were used for existing structures to develop the AVMS design. Information gaps identified should be discussed.

2.2.2 Pre-design Sub-slab Diagnostics: Pressure Field Extension (PFE Testing

This section should describe the PFE testing procedure and results including:

- An evaluation of pressure differential between the building and sub-slab prior to testing for an existing structure
- An evaluation of the findings and how they relate to the proposed design (e.g., testing flow/vacuum correlated with design flow/vacuum)
- A discussion of known subsurface features (see Section 1.5, 1.6, and 1.7) and if/how they influenced the PFE testing
- A discussion of any evidence of poor effectiveness (i.e., unexpected low vacuum measurements at test ports associated with the tested exhaust vent pipe)
- A discussion of any inconsistencies identified (i.e., unexpected differences between vacuum at one test port compared to another test port that is associated with the same suction point).
- A discussion of any design consideration(s) for the AVMS based on the results

If the PFE will not be completed at the time of the submittal because a building will not be built, this section should describe and provide information about how the above items and analysis will be performed.

Key Supporting Information

- Figure(s) that identifies where the PFE tests were completed or are proposed.
- Figure(s) that depicts the PFE testing data, including maps showing the extraction point(s) and the influence of the system.
- Table(s) that summarizes the data collected.

2.2.3 Building HVAC Testing and Evaluation (Required)

This section should include an evaluation and analysis of the proposed or installed HVAC system(s) and the potential pressure gradients generated by the AVMS. Testing should be conducted in accordance with recognized national standards or other similar procedures. This section should also include an analysis of the findings and the impact on the design. If any natural draft appliance(s) such as fireplaces or hot water heaters are present, or will be installed, include a description of the backdraft testing that has or will be performed during the installation process.

Alternate Definitive Statement that may be utilized: All building pressure and/or alterations to the pressures and venting will be analyzed and evaluated. Any natural drafting appliances will be backdraft tested in accordance with Section 11.5 of EPA 1993 or similar procedure and documentation will be made available as part of any installation and commissioning process.

Key Supporting Information

- Data as required to make the evaluation.

2.2.4 Other Testing (if necessary)

This section should include any other diagnostic evaluation or testing that was, or will be, performed, including:

- Characterization of pressure or air exchange rates between indoors and outdoors
- Characterization of pressure or air exchange rates between floors or adjoining air spaces
- Diagnostic radon measurements or other contaminant measurements at locations of interest

The need to perform additional diagnostic testing is typically done when installers are trying to obtain additional information to design the AVMS or to obtain baseline information that, after a system is installed, will support that the AVMS is effective in mitigating an unacceptable risk.

Key Supporting Information

- Data required to make the evaluation.
- Figure(s) that identifies where the tests were completed.
- Table(s) that summarizes the data collected.
- All information should be included in a separate appendix.

2.3 Plan of Proposed System

2.3.1 Suction Pit and Vent Lines

This section should describe the suction pit construction or the mechanism(s) creating depressurization of the area beneath the building that is demonstrated as necessary to be mitigated.

Key Supporting Information

- Figure that depicts the suction pit or piping, and vent lines beneath the slab.

2.3.2 Horizontal Conveyance Piping (if installed or proposed)

This section should include a general description of the horizontal conveyance piping used to direct the vapors through the structure. In addition, any slopes in the piping that need to be maintained should be described, including that pipes should be sloped back toward suction pits or points to allow potential condensation to drain out of the conveyance piping.

Key Supporting Information

- Figure that depicts horizontal conveyance piping layout of the AMS.

2.3.3 Vertical Vent Risers and Height of Building

This section should include a general description with any limitations that must be addressed when routing the vertical piping to and above the roof.

Key Supporting Information

- Figure(s) in the plan view that depict the vertical piping run locations (may be identified on Figures for Section 2.3.3.
- Cross-section(s) of structure that details the vertical piping runs.

2.3.4 Fans

This section should identify the fan-type that is to be used. In addition, general operational parameters of the fan, such as vacuum and air flow, should be provided and discussion of how it will match the design flow and vacuum is required. If a fan has not been selected, then this section should detail how the data will be used to select the fan(s).

2.3.5 Exhaust Vents

This section should include a general description of the proposed location(s) of the AVMS exhaust point(s). This section should identify the distance that must be considered and met as measured from the AVMS exhaust point(s) location(s) including height above structure or roof, other air intake(s), window(s), structure access point(s) such as a door or patio, and HVAC components based on AARST SGM-SF-2017.

NOTE: All distances should be measured between the closest point of the exhaust opening and the closest point of all location requirements specified.

Key Supporting Information

- Figure(s) – plan view that depicts the piping roofing locations and any other vents or air intakes that influences the location of the exhaust.
- Figure(s) – cross-section of structure that details the exhaust vents height above the structure.

2.3.6 Materials and Other Specifications

2.3.6.1 Sealing Cracks, Joints, and Other Openings

This section should include the proposed sealing of cracks, joints, or other openings that is necessary to obtain and maintain the necessary pressure gradients generated by the AVMS. Alternatively, a person may use the alternate definitive statement: “Where it is necessary to seal a crack, joints, or other opening, AARST standards similar to SGM-SF-2017 will be followed. Documentation of the type and location of the sealant used will be provided in the installation and commissioning documentation.”

2.3.6.2 Component Labeling

This section should include the proposed labeling, example wording, and locations consistent with standards similar to AARST SGM-SF-2017. Alternatively, a person may use the statement: “Labels for the system will be developed and utilized as identified in AARST standards such as SGM SF 2017.”

2.3.6.3 Other Specifications (if necessary)

Additional information can be provided in this section if the design firm believes that the information is critical to the success of the AVMS design and has not been included elsewhere in this document.

Key Supporting Information

- Figures, tables, or appendices may be provided as appropriate.

2.3.7 Barrier Membrane (if proposed to be installed)

If a membrane will be installed as part of the AVMS, this section should provide information on the selected barrier and how it will be installed, including any oversight that will be performed. If a barrier membrane is necessary to meet performance metrics other than desired vacuum, the passive mitigation system design TOC should be reviewed for additional information that needs to be included in this section.

Key Supporting Information

- Figure(s) that detail the barrier installation.
- A separate appendix may be warranted to provide additional supporting information.

2.3.8 Preferential Pathways and Other Unique Features (if necessary)

This section should describe the mitigation strategy for any preferential pathways identified in Section 1.7 that need mitigation or additional considerations.

Key Supporting Information

- Figure(s) that detail each unique mitigation strategy for the identified preferential pathways.

2.3.9 Elevators and Below Grade Pits or Tunnels (if necessary)

This section should describe the mitigation strategy and how it will be effective for each elevator shaft, pit, sump, or tunnel that are part of the structure.

Key Supporting Information

- Figure(s) that detail each unique mitigation strategy for any elevator shafts, pits, or tunnels.

2.3.10 Vertical/Sidewalls Below Grade (if necessary)

This section should describe the mitigation strategy for any vertical sidewall below grade where mitigation is necessary.

Key Supporting Information

- Figure(s) that detail the mitigation strategy for the vertical wall(s) below grade.
- Separate appendix, if necessary, to provide additional supporting information.

2.3.11 Groundwater in Contact (if necessary)

If groundwater is in contact or may come into contact with the structure (see Section 1.4), this section should describe how the shallow groundwater will be addressed to allow for the proper function of the AVMS. If the AVMS will not include any mechanism to address groundwater that may come into contact with the lowest part of the structure, and there is not sufficient data from a nearby monitoring well to confirm that groundwater will not come into contact with the structure, then the monitoring that will be performed to confirm that the AVMS will remain effective should be described.

Key Supporting Information

- Figure(s) detailing the mitigation strategy for shallow groundwater.
- Separate appendix providing additional supporting information may be warranted.

2.3.12 Alarm and Performance Indicator (if proposed to be installed)

This section should describe any alarms and monitoring system(s) proposed as part of the AVMS and its function and purpose. The section should specify any warnings that will be relayed, if data is stored, and what documentation (if any) will be retained.

NOTE: Alarms and monitoring systems can provide immediate feedback on system operation and can be useful tools to utilize if high concentrations are present or where acute contaminants are located. Telemetric alarms may provide immediate feedback about the function of an AVMS to the owner/operator and record the data of the system operation which is a critical component of documenting compliance with an owner/operator's obligations. Visual alarms require a person to physically observe some type of indicator and record if the AVMS is actually operating. Audible alarms may not require a person to physically observe whether the AVMS is operation but must be placed in a location that will be heard by building occupants.

Key Supporting Information

- Figure(s) that detail where the alarms will be installed.

2.4. Building Codes and Permits

This section should clearly state that permits necessary for the installation of the AVMS, which are not regulated by the Remediation and Redevelopment Division (RRD), will be obtained, met, and complied with (e.g., building codes and air quality permits) through the following affirmative statement or similar: "The system will be installed and operated in accordance with all local, state, and federal laws and rules outside of RRD's review and consideration, which includes but is not limited to, building codes and air quality regulations."

2.5 Monitoring Points and Test Ports

This section should describe the locations that are proposed to facilitate future confirmation of PFE effectiveness, system operation, and/or soil gas concentrations. It should also describe how the penetrations of the slab will be sealed in a permanent, airtight manner with appropriate materials and configuration to durably secure the test port in place. Additional information on the selection of the locations of the test ports can be found in ANSI/AARST SGM-SF 2017. Special consideration should be paid to placement of monitoring points within and around areas that may inhibit vacuum or flow due to features that extend beneath the floor slab, such as building footers, floor drains, trenches, elevator pits, collection pits, and utilities.

Key Supporting Information

- Figure(s) in the plan view depicting the location of each monitoring point in relation to any suction point or subsurface AVMS component.
- Detailed figure(s) depicting how each type of monitoring or test point will be installed.

3. Performance Objectives

3.1 System Performance Metrics

This section should reiterate the system type and function as well as identify and establish the performance metrics that will be met, how each performance metric will be measured, and where the performance metrics will be measured. This section should also include a discussion on the appropriateness of the selected performance metrics to evaluate the efficacy of the AVMS given the site conditions, system type, and function.

NOTE: It is the responsibility of the person proposing the plan to ensure that VMS is protective of public health and RRD's appropriate is based on the system meeting the performance metrics outlined in this section. It is understood that modification of the design may be necessary during the installation process to meet the performance metrics.

Key Supporting Information

- Table, if more than one performance metric is required, that identifies the location and the specific performance metrics.
- Figure that identifies the location that the performance metric will be measured.

3.2 AVMS Operational Downtime

This section should specify how and when an owner/operator becomes aware the system is down, the response time that is appropriate to bring the system back to full operation if it is greater than two (2) weeks, and how the response time was determined. This section should also include any alarms identified in Section 2.4 and how they relate to notification and response timeframes.

4. Proposed System Installation Oversight

This section should include a description of the oversight that will be performed and the construction quality assurance measures that will be incorporated and documented throughout the installation process. Justification of the level of oversight must be included.

Key Supporting Information

- It is not anticipated that a figure is warranted, though an example of a daily field log or other specific documentation may be appropriate as an attachment.

5. System Commissioning

5.1 System Commissioning

This section should provide a general description of the system commissioning and monitoring program that will be implemented to confirm the AVMS was installed correctly, equipment is working, and able to meet the proposed performance metrics during the AVMS startup (see Section 3.1).

The recommended time frames for system commissioning are provided in Table 1, following, ***except*** when any of the following conditions are present, then Table 2 should be followed:

1. Groundwater, considering season variation, is within three (3) feet of the lowest elevation of the structure to be mitigated that can transmit vapor into the structure, such as a basement or elevator shaft;
2. Documented indoor air concentrations are near or above the acceptable indoor air concentrations for acute compounds;
3. Structure being mitigated is a school, daycare, or medical facility; or
4. Acute compounds at concentrations greater than 10x the applicable SSVIAC or SSTLs in the sub slab soil gas are present.

Alternate proposals based on site specific considerations can always be made for EGLE review. If continuous tracking through telemetry is incorporated into the monitoring program at points of compliance as well as in the exhaust stack(s) and the response time will be less than one (1) week, a reduction in monitoring frequency may be acceptable with appropriate justification (i.e., appropriate monitoring data and frequency of data collection).

5.2 Operation, Maintenance and Monitoring (OM&M)

An OM&M Plan is developed during the commissioning phase after the installation has taken place. The design document **should not** include the specific details of the OM&M Plan. This section is included in the design document only as a reminder for the design firm to consider how and where the AVMS will be monitored so that the monitoring points and components will be installed during the installation process. If an OM&M Plan is not provided (recommended), this section should identify that one will be developed based on the information obtained during the commissioning process, so that the installed AVMS, the maintenance requirements of the equipment utilized, and the final operating parameters are accounted for in the OM&M Plan.

If specific details are provided, EGLE will review the proposed OM&M Plan as if the AVMS was installed which may result in unnecessary complications during the review of the AVMS design submittal. The approval for this type of review will contain language that modification to the OM&M Plan may be necessary, depending on the final installed system.

Table 1: Recommended Time Frames – AVMS Commissioning

Monitoring Time Frame(s)	Time-period #1 Duration: 4 Days [Week 1] *1st Month of Operation*	Time-period #2 Duration: 3 Week(s) [Weeks 2, 3, 4] *1st Month of Operation*	Time-period #3 Duration: 2 Months [Months 2 and 3] *1st Quarter*
Meets previous performance metrics for previous period	Performance metrics are measured and met daily from Day 1 through Day 4	Performance metrics are measured and met Week 2 through Week 4	Performance metrics are measured and met monthly from Month 2 and Month 3
Visual inspection of equipment and labels	As necessary	Weekly	Monthly
Verification of system operation	Daily	Weekly	Monthly
Pressure Field Extension (PFE) monitoring	Daily	Weekly	Monthly
Notice to tenants	Initial date of notification shall be based upon system activation and updated if any modifications to the AVMS are required.	Initial date of notification shall be based upon system activation and updated if any modifications to the AVMS are required.	Initial date of notification shall be based upon system activation and updated if any modifications to the AVMS are required.
Identification of changes to the building and surrounding area	Owner should notify an appropriate contractor when changes occur to prompt further evaluation. Changes should be confirmed through site visits.	Owner should notify an appropriate contractor when changes occur to prompt further evaluation. Changes should be confirmed through site visits.	Owner should notify an appropriate contractor when changes occur to prompt further evaluation. Changes should be confirmed through site visits.
System maintenance	Information and timeframes should be established during commissioning and based on the installed equipment or materials.	Information and timeframes should be established during commissioning and based on the installed equipment or materials.	Information and timeframes should be established during commissioning and based on the installed equipment or materials.

Table 2: Recommended Time Frames – AVMS Commissioning

Monitoring Time Frame(s)	Time-period #1 Duration: 4 Days [Week 1] *1st Month of Operation*	Time-period #2 Duration: 3 Week(s) [Weeks 2, 3, 4] *1st Month of Operation*	Time-period #3 Duration: 3 Months [Months 2, 3, 4] *1st Quarter*	Time-period #4 Duration: 3 Quarters [Months 5-12] *Remaining Year*
Meets previous performance metrics for previous period	Performance metrics are measured and met daily from Day 1 through Day 4	Performance metrics are measured and met Week 2 through Week 4	Performance metrics are measured and met monthly from Month 1 through Month 4	Performance metrics are measured and met quarterly from Month 5 through Month 12
Visual inspection on equipment and labels	As necessary	Weekly	Monthly	Quarterly
Verification of system operation	Every day or every other day	Weekly	Monthly	Quarterly
Air monitoring as a performance specification	Information will be identified	Information will be identified	Information will be identified	Information will be identified
Air monitoring and discharge calculations	Information will be identified	Information will be identified	Information will be identified	Information will be identified
Pressure Field Extension (PFE) monitoring	Daily	Weekly	Monthly	Quarterly
Notice to tenants	Initial date shall be based upon AVMS activation and updated if any modifications to the system are required.	Initial date shall be based upon AVMS activation and updated if any modifications to the system are required.	Initial date shall be based upon AVMS activation and updated if any modifications to the system are required.	Initial date shall be based upon AVMS activation and updated if any modifications to the system are required.
Identification of changes to the building and surrounding area	Owner should identify when changes occur to the oversight contactor for further evaluation. It should be confirmed through site visits.	Owner should identify when changes occur to the oversight contactor for further evaluation. It should be confirmed through site visits.	Owner should identify when changes occur to the oversight contactor for further evaluation. It should be confirmed through site visits.	Owner should identify when changes occur to the oversight contactor for further evaluation. It should be confirmed through site visits.
System maintenance and modifications	As identified through monitoring and specifications.	As identified through monitoring and specifications.	As identified through monitoring and specifications.	As identified through monitoring and specifications.

6. State Funded AVMS Design (for EGLE Contracted and Funded AVMS Only)

Section 6.0, and its associated subsections, is ***limited to those designs*** for an AVMS that EGLE has contracted and is funded by public money or dollars. An owner/operator is not required to and should not include this section for a submittal to EGLE for official review. The information in this section is based on the State Occupation Code, Act 299, Article 20 Section 339.2011 which requires any public works in excess of $15,000 to be prepared, reviewed, and overseen by a licensed professional engineer (PE). Though 339.2012 exempts single family home construction less than 3,500 sq ft, for AVMS systems where the estimated cost of the installed AVMS (based on design, installation, and commissioning) is expected to be greater than $15,000, the additional information in this section must be provided.

6.1 AVMS Design Professional Engineer and License Number

6.2 Engineers Estimated Cost of the AVMS considering Design, Installation, and Commissioning

In order for EGLE to complete its review the following information must be included in the identified subsections (even if it otherwise appears):

6.3. Design Flow (total and at each suction pit/extraction point)

6.4. Design Vacuum (at the fan and at each suction/extraction point)

6.5. Selected Blower/Fan with pump curves

6.6. System total dynamic head

6.7. Pipe Sizing

6.8. Pipe layout schematic w/ any valving

6.9. Suction pit/extraction point(s) design/layout

6.10. Location and selection of all flow and pressure gauges

6.11. Sampling locations

6.12. Failsafe devices

6.13. Permitting evaluation and information

6.14. Sealant Information

6.15. HVAC and Back drafting evaluation

Information provided in Section 6.3 through 6.12 should be based on the Pre-Design Sub-Slab Testing that was completed in Section 2. Typically, EGLE will not contract for a presumptive mitigation system without a building and known or potential unacceptable exposures; however, if pre-design sub-slab testing cannot be completed due to a structure not being present, the submitter should contact EGLE on how to provide sufficient information to complete the requirements of this section. Each section identified above must provide the necessary supporting documentation, calculations, and figures as required to support the conclusions being drawn.

Attachment 1 – Building Survey

NOTE: This building survey is intended to be used only as an example in developing a building survey that is specific to the site with the appropriate information for the structure in which a vapor mitigation system has been proposed or installed. This form may not contain all of the information necessary to design a vapor mitigation system for a particular structure. The development and use of this form is fundamentally important to document site conditions during future inspections to confirm if any modifications to the structure have been made, and whether a more detailed assessment is warranted. It should be updated on an annual basis.

Survey performed by:

Date:

Address:

1. OCCUPANT

Owner Occupied: ☐ Yes ☐ No

2. OWNER OR LANDLORD

Name:

Address:

City and State:

County:

Home Phone

Office Phone:

3. BUILDING CHARACTERISTICS

General description of property use and construction:

☐ Residential ☐ Multi-family Residential ☐ Office

☐ Strip Mall ☐ Commercial ☐ Industrial

☐ School ☐ Restaurant ☐ Other: _____

Building Description:

Building Footprint: _____ ft^2

Year Constructed:

Number of floors at or above grade:

Number of floors below grade:

General Description of structure(s) below grade:

☐ Basement ☐ Crawl space ☐ Slab on grade ☐ Not Applicable

☐ Other: _____

Any structures (besides footings) below grade:

Depth of structure below grade: _____ ft

Footprint: _____ ft^2

If residential use, which of the following describes the property?

☐ Ranch ☐ Multi-family ☐ Two-story single family

☐ Duplex ☐ Split Leve ☐ Mobile Home

☐ Apartment ☐ Townhouses/Condos ☐ Modular

☐ Log Home ☐ Other: _____

If commercial use:

Business type(s):

Does it include residences (i.e., multi-use)? ☐ Yes ☐ No

If yes, how many units?

If industrial use:

Type:

Level	**General Use** (e.g., family room, bedroom, laundry, workshop, storage)
Basement:	
1st Floor:	
2nd Floor:	
3rd Floor:	
4th Floor:	

Use additional page(s) as necessary.

4. CONSTRUCTION CHARACTERISTICS

General description of above grade construction

☐ Wood frame ☐ Concrete/Cement ☐ Stone ☐ Brick ☐ Other: _____

General Description of structure(s) below grade structures

☐ Basement ☐ Crawl space ☐ Slab on grade ☐ Not Applicable
☐ Foundation/Footings ☐ Other: _____

General Description of below grade construction

☐ Wood frame ☐ Concrete/Cement ☐ Stone ☐ Brick ☐ Other:

General Description of Basement Type

☐ Full ☐ Crawlspace ☐ Slab ☐ Other:

General Description of Lowest level flooring

☐ Concrete ☐ Dirt ☐ Stone ☐ Other: _____

General Description of foundation walls:

☐ Block ☐ Stone ☐ Poured concrete/cement ☐ Other:

Is there an attached garage? ☐ Yes ☐ No

If yes, does it have a separate heating unit? ☐ Yes ☐ No

Sump's present? ☐ Yes ☐ No

If yes, how many?

Sumps sealed: ☐ Yes ☐ No ☐ Not Applicable

Water in Sump: ☐ Yes ☐ No ☐ Not Applicable

General description of location of each sump:

Type of ground cover outside of building:

☐ Grass ☐ Concrete ☐ Asphalt ☐ Other: _____

5. HEATING, VENTING, and AIR CONDITIONING

General Description of heating system(s) used in this building:

☐ Hot Air Circulation ☐ Heat Pump ☐ Hot Water Baseboard
☐ Space Heaters ☐ Steam Radiation ☐ Radiant Floor
☐ Electric Baseboard ☐ Wood Stove ☐ Outdoor Wood Boiler
☐ Other:

General Description primary fuel type used:

☐ Natural Gas ☐ Fuel Oil ☐ Kerosene ☐ Electric
☐ Propane ☐ Solar ☐ Wood ☐ Coal

General location of boiler/furnace:

☐ Basement ☐ Outdoors ☐ Main Floor ☐ Other

General location of hot water heater:

☐ Basement ☐ Outdoors ☐ Main Floor ☐ Other:

Type of venting for HVAC components and hot water heater:

☐ Direct-vent ☐ Power-vent

Air Conditioning present? ☐ Yes ☐ No

Whole house or attic fan? ☐ Yes ☐ No

6. UTILITIES

Identify all utilities that enter below grade into the structure:

☐ Electric ☐ Gas ☐ Sewer ☐ Cable ☐ Communications
☐ Other:

7. DOCUMENTATION

Pictures that document items 3-6 above and the conditions at the time of the survey

Pictures attached: ☐ Yes ☐ No

Scaled drawings of the building floor plan and configuration at the time of the survey

Figures attached: ☐ Yes ☐ No

Appendix A.2 – Installation and Commissioning of an Active Vapor Mitigation System (AVMS)

The Installation and Commissioning of an AVMS includes the installation of the system, verification that the system was installed correctly and is functioning as designed (commissioning), and the documentation necessary to show how the AVMS was installed (as-builts) and is meeting the performance metrics. Upon successful completion, a baseline for the operating parameters specific to the mitigation system are established and the necessary activities to maintain the effectiveness of the system will be identified.

Therefore, completion of this phase is based on the mitigation system being fully installed and shown to be successful in mitigating vapor intrusion. Documentation includes the final performance metrics and monitoring locations, as-built drawings, and system performance documentation of the installed AVMS. This report also should identify the specifics of the Operation, Maintenance and Monitoring (OM&M) Plan as the system is installed and all information is available to provide a detailed step by step process of the information and assessments necessary to document that the system remains in operation.

Coversheet

The cover sheet should contain the following information:

- Site – site address with regulatory identifiers (Facility or Site name and ID#s).
- Owner – entity, address, contact information.
- System Designer and/or Environmental Consultant – entity, address, contact information.
- Building Engineer and/or Architect (if applicable) – entity, address, contact information.
- Submittal Date

1.0 Introduction and Conceptual Site Model

1.1 Introduction and Overview

This section should briefly describe the purpose of this document.

1.2 Site Setting and Description of Structure(s)

This section should describe the site setting including the location and use of each structure with an AVMS. This section should also include a description of the height, size, and general construction characteristics.

The results of the building survey should identify specific building characteristics, features, and configurations that affect the design and effectiveness of the AVMS. See Attachment 1 for an example of a building survey that should be performed immediately after the installation of the AVMS.

NOTE: Many buildings (particularly larger commercial/industrial buildings) have multiple foundation types and locations due to building additions over time; slab and sub-slab conditions often vary between building areas, and foundation walls or changes in floor elevation may prevent airflow from one slab area to another. Other foundation features such as elevators, pits, sumps, floor drains, utilities, utility tunnels, and other structures located below the slab or floor level should be considered for their potential effect on AVMS designs.

Key Supporting Information

- Topographic Site Location Map (from USGS or site plans as available).
- General Site Feature Map that includes structures to scale with any property lines, right-of-way (ROW), and major utilities.
- Figure(s) in the plan view of the structure to be mitigated and that identifies the room divisions, footings known and estimated, and other key features such as the location of pits, sumps, vents, basements.
- Cross-sectional view figures and drawings may be helpful for depicting other key features relative to the proposed mitigation.
- Appendix with building survey that includes a photo log (see Attachment 1).

1.3 Site History

This section describes the activities and operational history that occurred, any current use, as well as the hazardous substances or regulated substances were or are used.

NOTE: Describing the site history aids in identifying the presence or likely presence of hazardous or regulated substances in, on, or at a property due to any release to the environment or conditions indicative of a release to the environment and may provide some general information on the concentrations of hazardous substances that could be expected to be encountered.

Key Supporting Information

- Table (optional depending on the complexity of the site) that provides a list of known environmental activities or historical operations that may have led to a release of hazardous or regulated substances into the environment.
- Figure that identifies the location of each environmental activity or historical operation that may have or are known to have led to a release of a hazardous or regulated substance into the environment.

1.4 Geology/Hydrogeology

This section should describe the site geology and hydrogeology information.

Soils may be described using either the USCS, USDA, or other such as AASHTO/MDOT classifications, but the classification system should be identified. Supporting data including boring logs and any well construction logs. The lithology and presence or absence of groundwater, including seasonal groundwater or estimations in the expected variation, should be evaluated to at least 5' below the lowest part of the structure unless the variation of the site groundwater is greater than 5’ or would come into contact with it.

A cross section of the structure that is being mitigated should be provided with the site geology and hydrogeology information self-imposed on it. Structures that have various footing depths, such as basements, elevators, tunnels, or pits, and those that are larger than >5,000 sq ft should include more than one cross-section to aid in the review and these types of features should be clearly depicted on them. The lowest part of the structure should include the depth of any footings, sumps, drains, pits, and elevator shafts.

If soils such as fill were brought on-site that is intended to either aid or be a component of the mitigation system, information on the type and characteristics, as well as the were it was placed should be identified, described, and supported through records.

NOTE: Soils within 12" of the structure should be described based on the available information and should include the subgrade, sub-base, and base-course soils with deeper or other information that is available that may be either influenced by the AVMS or connects the vapor source to the structure.

Key Supporting Information

- Figure identifying borings used to classify the geological and hydrogeological information.
- Cross-section of the structure, or proposed structure, with the geological and hydrogeological information identified.
- Table identifying any wells installed, depth of the wells, and the elevation of the groundwater.

1.5 Detailed Building Information

1.5.1 Below Grade Building Features and Foundations

This section should describe the foundation (i.e., footings, pier, columns, cast pilings, etc.) and building portions that are below grade (basements, crawlspaces, elevator sumps, pits, utility tunnels, storage areas, etc.) that are in contact with the soil. If there are any foundations that are unknown that may impact the function of the AVMS, they should be identified here and addressed in Section 2.2.

Key Supporting Information

- All features above should be identified in the plan view.
- Subsurface features identified should also be depicted on cross sections developed in Section 1.3.

1.5.2 Heating, Ventilation, and Air Conditioning (HVAC)

This section describes the HVAC system including any air intakes or exhaust that are required for its operation.

Key Supporting Information

- Figure(s) that depicts the location of any air intakes, vents, and includes components that are on the roof or side of the structure including air intakes or discharge points based on the information collected during the building survey.

1.5.3 Slab Condition

This section describes and documents the current condition of the floor for an existing building.

Key Supporting Information

- Figure(s) document the current location of any cracks with a width greater than 1/2-inch, areas that concrete is not present, or areas that the concrete is likely to need repair or replacement based on the information collected during the building survey.
- Appendix with building survey should contain a photolog with representative photos, especially in those areas that repairs to the slab or building may be warranted.

1.5.4 Utility Penetrations and Man-Made Preferential Pathways

This section should describe and document the location of penetrations and sumps in which vapor may enter and directly vent into the structure. This is limited to those utilities that are in direct contact with a vapor source, or which vapor may directly enter into a structure.

Key Supporting Information

- Figure(s) should identify the location of penetrations and sumps.

1.5.5 Historic Buildings (if necessary)

This section should describe any design or layout limitations that are imposed on the structure due to a historic designation or other limitation.

1.6 Source Areas and Contaminant Conditions

1.6.1 Applicable Criterion

This section should identify the VIAP screening levels and/or criteria used to demonstrate that the response activity is necessary to protect the public health, safety, or welfare, or the environment, and identify the assumptions used in their development, the supporting information that the criteria are appropriate for use, and the values.

- **Generic Criteria or Risk Based Screening Levels (RBSLs)**: If the use of the generic criteria is appropriate, supporting information should be described and presented.
- **Site-Specific Criteria or Site-Specific Target Levels (SSTLs)**: When developed for the site or if VIAP Screening Levels (SLs) are used, the supporting documentation should be provided demonstrating the criteria are appropriate for use.

Key Supporting Information

- Table that identifies the criteria used.
- Separate appendix unique to the criteria that provides the supporting documentation, including any previous approvals and the evaluation for the use of the site-specific criteria.

1.6.2 Vapor Source

This section should identify the concentrations of the volatile substances that pose an unacceptable risk to the subject structures(s). The sampled media and location of samples collected should be depicted on a scaled figure relative to the structure to assist interpretation of the relationship between the vapor source and the structure for which the AVMS is installed. It also includes a discussion on how that data aligns with the volatile substance associated with the site history (Section 1.2), Representative soil, groundwater, and soil gas concentrations that include any samples collected above and near the vapor source, and where vapors may enter within the mitigation footprint of the structure should be identified and provided.

Data that supports the design of the AVMS must be provided, especially in areas where an AVMS is not installed. Cross-sections should include below grade features but with the chemical data depicted.

Key Supporting Information

- Tables that provide representative soil, groundwater, and vapor data that allows an evaluation of the maximum concentration that the AVMS will need to account for.
- Figure(s) that identify where the data was collected.

1.7 Man-Made Preferential Pathways (if necessary)

This section should include an analysis of Section 1.5.4 above and if there is a need to design or propose a mitigation strategy for man-made preferential pathways or other preferential pathways that may not be addressed through the operation of the AVMS.

Key Supporting Information (as warranted)

- Tables that provided the collected soil, groundwater, and vapor data.
- Figure that identifies where the data was collected.
- Appendix should include all analytical data sheets.

2.0 AVMS Documentation and As-Builts

2.1 Overview of AVMS

This section should include the design basis that explains how vapors are, or may, enter the structure and how the AVMS will mitigate unacceptable soil vapor concentrations from entering the building.

2.2 Design

2.2.1 Overview

This section should include the diagnostic tools that were used to develop the AVMS design. Information gaps identified in Section 1.5.4 and 1.6 should be discussed.

2.2.2 Pre-Design Sub-Slab Diagnostics (PFE) Testing (Required)

The section should include the PFE testing results which includes:

- An evaluation of the findings and how it relates to the AVMS.
- Known subsurface features (see Section 1.5.1, 1.5.4 and 1.6) and if/how they influenced the PFE testing.
- A discussion of any evidence of poor effectiveness (i.e., unexpectedly low vacuum at test ports associated with the tested exhaust vent pipe).
- A discussion of any inconsistencies identified (i.e., unexpected differences between vacuum at one test port compared to another test port that is associated with the same exhaust vent pipe).
- A discussion of any design consideration based on the results.

NOTE: The number of PFE tests and locations is dependent on multiple factors (see ANSI/AARST SGM-SF-2017 (updated in 2020). If the number of PFE tests does not align, this section should identify that what additional supporting information makes the additional testing locations unnecessary.

Key Supporting Information

- Figure(s) that identify where the PFE tests were completed.
- Table(s) that present the data collected.

2.2.3 Building HVAC Testing (Required)

The section should include the data and the analysis of the evaluation of the HVAC system(s) and any influence on the pressure gradients generated by the HVAC on the AVMS. If any natural back drafting appliance(s) are present, data that confirms that the AVMS does not influence the normal operation the results must be included.

Key Supporting Information

- Table(s) with the testing results.

2.2.4 Other Testing (if necessary

The section should include any other diagnostic testing that was performed and aided in the design of the mitigation system including:

- Characterization of pressure or air exchange rates between indoors and outdoors.
- Characterization of pressure or air exchange rates between floors or adjoining air spaces.
- Diagnostic radon measurements or other contaminant measurements at locations of interest.

Key Supporting Information

- All information should be included in a separate appendix.
- Figure(s) that identify where the tests were completed.
- Table(s) that summarize the data collected.

2.3 As-Builts of the AVMS

2.3.1 Suction Pit and Vent Lines

This section should describe the installed suction pits or the mechanism(s), such as vent lines, that produce vacuum beneath the slab, liner, or walls if necessary.

Key Supporting Information

- Figure that details the suction pit or piping, and vent lines beneath the slab that will produce or introduce a negative vacuum.

2.3.2 Horizontal Conveyance Piping

This section should describe the installed horizontal conveyance piping used to direct the vapors through the structure. In addition, any slopes that were installed to encourage drainage.

Key Supporting Information

- Figure that details horizontal conveyance piping layout.

2.3.3 Vertical Vent Risers and Height of Building

This section should describe the installed vertical piping to and above the roof.

Key Supporting Information

- Figure(s) in the plan view that depicts the vertical piping run locations (may be identified on Figures for Section 2.3.3).
- Cross section(s) that details the vertical piping runs.

2.3.4 Fans

This section should identify the fan-type that was used in the final design.

2.3.5 Exhaust Vents

This section should describe the installed point(s) of exhaust for the AVMS and identify what distances are met for air intake(s), window(s), vents, structure access point(s) such as a door or patio, and HVAC components based on AARST SGM-SF-2017. This section should also provide the height above the structure or roof where the exhaust gas exits the system.

NOTE: All distances should be measured between the closest point of the exhaust opening and the closest point of all location requirements specified using the shortest distance.

Key Supporting Information

- Figure(s) in the plan view that details the where the exhaust was installed and distances for structure openings that have been met.
- Cross section(s) that provide construction details.

2.3.6 Materials and Other Specifications

2.3.6.1 Sealing Cracks, Joints, and Other Openings

This section should reaffirm that when sealing cracks, joints, or other openings was warranted that all sealants followed standards such as AARST SGM-SF 2017 and, in addition to assisting in the effectiveness of the system, it has been affirmed that there are no adverse effects to occupants. The documentation, including a figure that identifies the location, is either attached to this submittal or can be made available upon request by RRD.

Key Supporting Information

- Figure(s) in the plan view identifying the location where each sealant was applied.
- Detailed or expanded figure view showing the application and supporting photo documentation.

2.3.6.2 Component Labeling

This section should reaffirm that labeling practices followed standards such as AARST SGM-SF-2017 when and where labeling was warranted.

Key Supporting Information

- List of required labels as per SGM-SF 2017.
- Figure(s) depicting final labels and language.
- Figure(s) identifying the physical location of each label.

2.3.6.3 Other Specifications (if necessary)

This section can be provided if the design firm feels there is additional information necessary warranted to establish that an AVMS is effective.

Key Supporting Information

- Figures, tables, or appendices may be provided as appropriate.

2.3.7 Barrier Membrane (if installed)

If a membrane was installed as part of the AVMS, this section should provide information on the barrier and how it was installed including any documentation of the oversight that was performed. Barrier Membranes that are installed to meet performance factors other than vacuum or flow should consult the passive mitigation system install and commissioning document for the additional information that should be included.

Key Supporting Information

- Figure(s) that detail the barrier installation.
- A separate appendix is warranted to provide supporting information.

2.3.8 Preferential Pathways and other Unique Features (if necessary)

This section should describe the mitigation strategy for any preferential pathways that was required to be implemented as part of the mitigation strategy (Section 1.6), how it is documented to be effective, or identifies that one was not necessary and includes the evaluation that was completed.

Key Supporting Information

- Figure(s) that detail each unique mitigation approach implemented for any preferential pathways.

2.3.9 Elevators and below grade pits or tunnels (if necessary)

This section should describe the mitigation strategy and how it is documented to be effective for each elevator shaft, pit, or tunnel that is part of the structure, if required.

Key Supporting Information

- Figure(s) that detail each unique mitigation strategy for any elevator shafts, pits, or tunnels.

2.3.10 Vertical/Sidewalls Below Grade (if necessary)

This section should describe the mitigation strategy if there is a source of vapors (Section 1.6.2) that is adjacent (i.e., lateral) to the structure and there are vertical walls below grade that are associated with a basement, elevator shaft, pit, or tunnel.

Key Supporting Information

- Figure(s) that detail the mitigation strategy for the walls of the vertical wall(s) below grade as identified above.
- A separate appendix may be warranted to provide additional supporting information.

2.3.11 Groundwater in Contact (if necessary)

If groundwater is in contact or may become in contact with the structure (Section 1.3), this section should describe how the shallow groundwater was addressed to allow the proper function of AVMS. If the AVMS will not contain any mechanism for addressing groundwater that may be in contact with the lowest part of the structure, the data analysis that supports that it is unwarranted is described.

Key Supporting Information

- Figure(s) that detail the mitigation strategy for shallow groundwater
- Data tables that support the strategy.
- A separate appendix may be warranted to provide additional supporting information.

2.4 Alarm and Performance Indicator (if installed)

This section describes any monitoring system(s) installed as part of the AVMS and describes the function of the alarm or performance indicator, what it measures, and how it relates to the system function. The section should be specific about any warnings that are relayed, if and how data is stored, how any alarms that are identified are documented, and what documentation (if any) is produced.

NOTE: Alarms and monitoring systems can provide immediate feedback on system operation and can be useful tools if high concentrations are present or where acute contaminants are located and are highly recommended by RRD. Telemetric alarms allow the most freedom as most telemetric systems provide immediate feedback to an operator and record the data of the system operation, which is a critical component of a party's due care obligations. Visual alarms require a party to physical observe some type of indicator and record if the VIMS is operating. Audible alarms may not require a person to physically observe the operation but must be placed in a location that will be heard by building occupants.

Key Supporting Information

- Figure(s) that detail where the alarms are located.
- Table that identifies any alarms that have been triggered to date and the response.

2.5 Building Codes and Permits

This section should clearly state that other permits necessary for the installation of the AVMS that are not regulated by RRD have been met and are complied with (e.g., building codes and air quality permits) through an affirmative statement similar to: "The system was installed and is operating in accordance with all local, state, and federal laws and rules, including but not limited to, building codes and air quality regulations."

2.6 Monitoring Points and Test Ports

This section should describe the locations that are proposed to facilitate future confirmation of PFE effectiveness, system operation, and/or soil gas concentrations. Additional information on the locations of the test ports can be found in ANSI/AARST SGM-SF-4 2017.

NOTE: Special consideration should be paid to placement of monitoring points within and around areas that may inhibit vacuum or flow due to features that extend beneath the floor slab, such as building footers, floor drains, trenches, elevator pits, collection pits, and utilities.

Key Supporting Information

- Figure in the plan view depicting the location of each monitoring point in relation to any suction point or subsurface AVMS component.
- Table that provides detail on how each monitoring or test point will be installed.

2.7 Performance Objectives

2.7.1 System Performance Metrics

This section should identify and establish the performance metrics that are met at each monitoring point identified in Section 2.6 above. It also describes how each performance metric is measured and obtained. It presents why the proposed performance metrics are appropriate to evaluate the efficacy of the AVMS.

Key Supporting Information

- Table, if more than one performance metric is required or selected, identify the location and the specific performance metric(s) that are being measured and/or achieved.
- Figure identifying the location that the performance metric is being evaluated.

2.7.2. AVMS Downtime

This section should identify how and when a party becomes aware the system is down, the response time that is appropriate to bring the system back to full operation (if it is greater than two (2) weeks), and how that was the response time was determined. This section should also include any alarms identified in Section 2.4 above and how it fits into the response time.

2.7.3. Proposed System Installation Oversight Performed

This section should include a description of the oversight that was performed and a summary of the construction quality assurance measures that were documented throughout the installation process. Justification of the level of oversight and that the oversight was performed must be included.

Key Supporting Information

- It is not anticipated that any figure is warranted, though daily field logs are appropriate.

2.8 System Commissioning Documentation

This section should provide a general description of commissioning monitoring program that was implemented and is being used to confirm the AVMS meets the proposed performance metrics identified in Section 2.7 at the locations identified in Section 2.6. In addition to the data collected during the commissioning monitoring program, this section should include an analysis of the data, whether the data met the performance metrics or not, and why it should be considered to be commissioned.

Generally, the recommended time frames for system commissioning provided on Table 1, should be complied with, except when the following conditions are present, then Table 2 should be followed:

1. Groundwater within three feet of the lowest subsurface feature of the structure that can transmit vapor such as a basement or elevator shaft;
2. Documented indoor air concentrations near or above the acceptable indoor air concentrations of acute compounds;
3. Structure being mitigated is a school, daycare, or medical facility; or
4. Acute compounds greater than 10x the SSTLs or criteria in the sub slab soil gas.

Alternate proposals based on site specific consideration can always be made for EGLE review. If continuous tracking through telemetry is incorporated into the monitoring program at points of compliance as well as in exhaust stacks and the response time will be less than one week, a reduction in monitoring frequency may be acceptable with appropriate justification (i.e., appropriate monitoring data and frequency of data collection).

Key Supporting Information

- Appendix with all supporting commissioning data.
- Table that identifies the performance specifications, the locations monitored, and the associated reading.

Table 1: Recommended Time Frames – System Commissioning

Monitoring Time Frame(s)	Time-period #1 Duration: 4 Days [Week 1] *1st Month of Operation*	Time-period #2 Duration: 3 Week(s) [Weeks 2, 3, 4] *1st Month of Operation*	Time-period #3 Duration: 2 Months [Months 2 and 3] *1st Quarter*
Meets previous performance metrics for previous period	Performance metrics are measured and met daily from Day 1 through Day 4	Performance metrics are measured and met Week 2 through Week 4	Performance metrics are measured and met monthly from Month 2 and Month 3
Visual inspection of equipment and labels	As necessary	Weekly	Monthly
Verification of system operation	Daily	Weekly	Monthly
Pressure Field Extension (PFE) monitoring	Daily	Weekly	Monthly

Monitoring Time Frame(s)	Time-period #1 Duration: 4 Days [Week 1] *1st Month of Operation*	Time-period #2 Duration: 3 Week(s) [Weeks 2, 3, 4] *1st Month of Operation*	Time-period #3 Duration: 2 Months [Months 2 and 3] *1st Quarter*
Notice to tenants	Initial date of notification shall be based upon system activation and updated if any modifications to the system are required.	Initial date of notification shall be based upon system activation and updated if any modifications to the system are required.	Initial date of notification shall be based upon system activation and updated if any modifications to the system are required.
Identification of changes to the building and surrounding area	Owner should notify an appropriate contractor when changes occur to prompt further evaluation. Changes should be confirmed through site visits.	Owner should notify an appropriate contractor when changes occur to prompt further evaluation. Changes should be confirmed through site visits.	Owner should notify an appropriate contractor when changes occur to prompt further evaluation. Changes should be confirmed through site visits.
System maintenance	Information and timeframes should be established during commissioning and the installed equipment or materials.	Information and timeframes should be established during commissioning and the installed equipment or materials.	Information and timeframes should be established during commissioning and the installed equipment or materials.

Table 2: Recommended Time Frames – System Commissioning

Monitoring Time Frame(s)	Time-period #1 Duration: 4 Days [Week 1] *1st Month of Operation*	Time-period #2 Duration: 3 Week(s) [Weeks 2, 3, 4] *1st Month of Operation*	Time-period #3 Duration: 2 Months [Months 2 and 3] *1st Quarter*	Time-period #4 Duration: 3 Quarters [Months 5-12] *Remaining Year*
Meets previous performance metrics for previous period	Performance metrics are measured and met daily from Day 1 – Day 4	Performance metrics are measured and met Week 2 – Week 4	Performance metrics are measured and met monthly from Month 2 and Month 3	Performance metrics are measured and met quarterly from Month 5 – Month 12
Visual inspection of equipment and labels	As necessary	Weekly	Monthly	Quarterly
Verification of system operation	Daily	Weekly	Monthly	Quarterly
Air monitoring as a performance specification	Information will be identified	Information will be identified	Information will be identified	Information will be identified
Air monitoring and discharge calculations	Information will be identified	Information will be identified	Information will be identified	Information will be identified
Pressure Field Extension (PFE) monitoring	Daily	Weekly	Monthly	Quarterly
Notice to tenants	Initial date of notification shall be based upon system activation and updated if any modifications to the system are required.	Initial date of notification shall be based upon system activation and updated if any modifications to the system are required.	Initial date of notification shall be based upon system activation and updated if any modifications to the system are required.	Initial date shall be based upon system activation and updated if any modifications to the system are required.

Monitoring Time Frame(s)	Time-period #1 Duration: 4 Days [Week 1] *1st Month of Operation*	Time-period #2 Duration: 3 Week(s) [Weeks 2, 3, 4] *1st Month of Operation*	Time-period #3 Duration: 2 Months [Months 2 and 3] *1st Quarter*	Time-period #4 Duration: 3 Quarters [Months 5-12] *Remaining Year*
Identification of changes to the building and surrounding area	Owner should notify an appropriate contractor when changes occur to prompt further evaluation. Changes should be confirmed through site visits.	Owner should notify an appropriate contractor when changes occur to prompt further evaluation. Changes should be confirmed through site visits.	Owner should notify an appropriate contractor when changes occur to prompt further evaluation. Changes should be confirmed through site visits.	Owner should identify when changes occur to the oversight contactor for further evaluation. It should be confirmed through site visits.
System maintenance	Information and timeframes should be established during commissioning and the installed equipment or materials.	Information and timeframes should be established during commissioning and the installed equipment or materials.	Information and timeframes should be established during commissioning and the installed equipment or materials.	As identified through monitoring and specifications.

3.0 Operation, Maintenance, and Monitoring (OM&M) PLAN

This section should include a brief overview of the OM&M Plan specific to the installed AVMS that is contained within a supplemental addendum and provide a summary table. The OM&M plan that is required must be based upon the installed equipment, specified equipment maintenance or calibration periods, required performance monitoring, and expected component life.

The supplemental addendum (see attached) should contain all supporting information necessary for the actual OM&M plan and it should be formatted as a standalone document that contains the following information:

- General Description of the System
- Emergency contact and installer information
- Equipment and supplies necessary to perform the OM&M inspections and monitoring
- Installed alarms and appropriate responses for the alarms

- Inspection form(s)
- Survey and inspection of the structure where the AVMS is installed for changes or modifications in use, operation, configuration, or size
- Verification and calibration of the operation of any installed telemetry, monitoring equipment, or alarms
- A description of the visual inspection of system components
- Established system operating specifications
- A description of what the inspector is looking for to evaluate whether repair is necessary
- Monitoring frequency and location
- The collection and the recording of system measurements
- Installed equipment maintenance schedule
- Performance metrics that must be met and where
- What actions will be undertaken when the performance metrics are not met
- An assessment of the inspections that were completed
- Where the inspection notes and documentation are stored
- Building Owner/Tenant Engagement Notification Forms and Documentation

Depending on the complexity of the system and the need for monitoring or documenting different processes, unique inspection forms are recommended to be included. The documentation necessary to maintain is identified in the OM&M Plan.

Key Supporting Information

- Supplemental addendum (see attached)
- Table(s) that identify the final performance specifications, the monitoring locations, required inspection locations, and required routine maintenance

Addendum A – Operation Maintenance and Monitoring Plan (OM&M) Plan

1.0 Introduction

1.1 Site Information

The following information shall be identified:

- Site – site address with regulatory identifiers (Facility name and ID#s)
- Owner – entity, address, contacts
- Building Survey

1.2 Purpose of the Document

This section should identify the purpose of this document.

This plan can be submitted as an appendix to the install and commissioning documentation or submitted as a stand-alone document. However, if the OM&M Plan is submitted as a standalone document, the information provided in the installation and commission report is still required to complete the review (see Section 1.6 below).

1.3 Installer and Design Firm

This section should identify the installer and the design firm.

1.4 Party Responsible for Data Collection

This section should identify who is collecting data, for what purpose, and where it will be stored.

1.5 Design and Commissioning Information

(Required only if the OM&M is submitted apart from the Installation and Commissioning Report)

This section should include, in an appendix, all the information contained in the Installation and Commissioning Report or reference where it can be found. If not previously provided, it can be provided as a separate appendix.

Key Supporting Information

- Appendix – System installation and commissioning information.

1.6 System Operation Documentation

This section should discuss how the system operation will be documented.

1.7 Installed Alarms

This section should identify the installed alarms, the appropriate response times, and procedures to follow if a warning or alarm has gone off.

1.8 OM&M Inspections and Monitoring Equipment

This section should identify what tools, instruments (and their associated calibration), monitoring frequency, and forms are necessary to perform the OM&M identified.

2.0 Maintenance and Visual Inspections

2.1 Mechanical Equipment (if applicable)

This section should identify the expected operating life of the equipment and any routine maintenance that must occur to ensure that the system continues to function as designed.

Key Supporting Information

- Figure(s) that identifies the location of the equipment.
- Table that identifies the equipment, maintenance that will be performed, and when it will occur.
- Inspection Form (optional) documenting that maintenance was performed.

2.2 Calibration and Testing for Alarms, and Telemetry

This section should identify the expected operating life and any required calibration procedures to ensure that any alarm(s) or telemetry continues to function as installed and within operating parameters.

Key Supporting Information

- Figure(s) that identifies the location of the equipment.
- Table that identifies the equipment and what maintenance or calibration should be performed and when it should occur.
- Inspection Form (optional) documenting that calibration was performed.

2.3 Sealants, Barriers, Batteries

This section should identify the expected life for any expendable supplies and where materials are used such as sealants, barriers, batteries, and signage.

Key Supporting Information

- Figure(s) that identifies the locations of any sealants, barrier, and/or batteries.
- Table that identifies the equipment, required maintenance, calibration, and/or replacement should be performed, and when it should occur.
- Inspection Form (optional) documenting the maintenance, calibration, or replacement.

3.0 Monitoring and Measurements

3.1. Visual Indicators of System Operation and Effectiveness

This section should identify the visual inspections that will occur and the frequency required. Visual inspections should be based on previously reported and documented information obtained during the latest building survey or from interviews with on-site personnel or individuals with appropriate firsthand knowledge. Items that should be reported on the visual inspection forms include the following:

- Changes or modifications in use, operation, configuration, structural changes, or size of the structure.
- Visual, non-mechanical AVMS components such as piping for any changes in condition and joint sealants.
- Mechanical AVMS components for audible or visual indicators that a repair or replacement may be necessary.

Other information that should be described in this section includes:

- Location – Where the inspection will occur
- Frequency – How often the inspection will occur
- Observations – What observations should be made and noted
- Operation – That the AVMS is operating
- Response – What steps should be taken if the visual inspection identifies a response is necessary

Key Supporting Information

- Figure(s) that identifies the inspection points.
- Table that identifies what is being inspected and what information should be documented.
- Inspection Form (optional) that allows the inspection to be performed in a standardized and routine manner and produces a record that that the inspections have occurred and that the system continues to function as designed.

3.2 Performance Metrics

This section should identify the performance measurements to evaluate if the system is meeting the established performance metrics. Performance measurements are standalone measurements that must be recorded to document the system performance.

This includes:

- Location – Where the inspection will occur
- Frequency – How often the inspection will occur
- Instrumentation – What instrument and instrument accuracy is necessary for the measurement
- Units – What units should the performance measurement be measured in
- Readings – What measurement should be recorded
- Operation – That the AVMS is operating
- Performance Metrics - Performance Measurement that must be achieved based on prove-out information
- System Operation – Document the system operation and any downtimes
- Data Evaluation – Identification of any data analysis that should be performed
- Response – What steps should be taken if the inspection identifies that a performance measurement does not meet a performance objective and a response is necessary or warranted

Readings that identify that the AVMS is not meeting the performance metrics may require modifications to the system.

Key Supporting Information

- Figure(s) that identifies the inspection point or where the reading should occur.
- Table that identifies what is being inspected and what information should be documented.

Inspection Form (optional) that allows the inspection to be performed in a standardized and routine manner and produces a record that the inspection occurred and that the system continues to function as designed.

4.0 Data and documentation

4.1 Data Documentation

This section should identify how the information collected above is stored (i.e., inspection forms, other supporting documentation, repair, and telemetric records), analyzed, and who is responsible to correct any issues identified. All data and inspection forms should be included as a separate appendix based on purpose and type of information collected.

4.2 Data Analysis

This section should include how the data collected in Section 2 and Section 3 will be evaluated for effectiveness and include an evaluation to identify the cause of any downtime.

4.3 Building Owner/Tenant Engagement Notification Forms and Documentation

This section should identify how key information about the AVMS including operation, notice, and, if appropriate, installed alarms, will be provided to the building owner and/or tenants. If a notice is prepared, an example should be included as an attachment and the process that will be used to provide the information should be described.

Key Supporting Information

- In an attachment, examples of the notices.
- In an attachment, a copy of a simplified document for an owner or occupant that will be implementing part of the OM&M.

Attachment 1 – Building Survey

NOTE: This building survey is intended to be used only as an example in developing a building survey that is specific to the site with the appropriate information for the structure in which a vapor mitigation system has been installed. This form may not contain all of the information necessary. The development and use of this form is fundamentally important in documenting site conditions during future inspections to confirm if any modifications to the structure have been made, and whether a more detailed assessment is warranted. It should be updated on an annual basis.

Survey performed by:

Date:
Address:

1. OCCUPANT

Owner Occupied: ☐ Yes ☐ No

2. OWNER OR LANDLORD

Name:
Address:
City and State:
County:
Home Phone
Office Phone:

3. BUILDING CHARACTERISTICS

General description of property use and construction:

☐ Residential ☐ Multi-family Residential ☐ Office
☐ Strip Mall ☐ Commercial ☐ Industrial
☐ School ☐ Restaurant ☐ Other: _____

Building Description:
Building Footprint: _____ ft^2
Year Constructed:
Number of floors at or above grade:
Number of floors below grade:

General Description of structure(s) below grade:

☐ Basement ☐ Crawl space ☐ Slab on grade ☐ Not Applicable
☐ Other: _____

If the property includes any structures (besides footings) below grade:

Depth of structure below grade: _____ ft
Footprint: _____ ft^2

If the property includes residential, which of the following describes the property?

☐ Ranch ☐ Multi-family ☐ Two-story single family
☐ Duplex ☐ Split Leve ☐ Mobile Home
☐ Apartment ☐ Townhouses/Condos ☐ Modular
☐ Log Home ☐ Other: _____

If the property includes commercial use:

Business type(s):
Does it include residences (i.e., multi-use)? ☐ Yes ☐ No
If yes, how many units?

If industrial use:

Type:

Level	**General Use** (e.g., family room, bedroom, laundry, workshop, storage)
Basement:	
1st Floor:	
2nd Floor:	
3rd Floor:	
4th Floor:	

Use additional page(s) as necessary.

4. CONSTRUCTION CHARACTERISTICS

General description of above grade construction

☐ Wood frame ☐ Concrete/Cement ☐ Stone ☐ Brick ☐ Other: _____

General Description of structure(s) below grade structures

☐ Basement ☐ Crawl space ☐ Slab on grade ☐ Not Applicable
☐ Foundation/Footings ☐ Other: _____

General Description of below grade construction

☐ Wood frame ☐ Concrete/Cement ☐ Stone ☐ Brick ☐ Other:

General Description of Basement Type

☐ Full ☐ Crawlspace ☐ Slab ☐ Other:

General Description of Lowest Level flooring

☐ Concrete ☐ Dirt ☐ Stone ☐ Other: _____

General Description of foundation walls:

☐ Block ☐ Stone ☐ Poured concrete/cement ☐ Other:

Is there an attached garage? ☐ Yes ☐ No
If yes, does it have a separate heating unit? ☐ Yes ☐ No

Sump's present? ☐ Yes ☐ No
If yes, how many?

Sumps sealed: ☐ Yes ☐ No ☐ Not Applicable

Water in Sump: ☐ Yes ☐ No ☐ Not Applicable

General description of location of each sump:

Type of ground cover outside of building:

☐ Grass ☐ Concrete ☐ Asphalt ☐ Other: _____

5. HEATING, VENTING, and AIR CONDITIONING

General Description of heating system(s) used in this building:

☐ Hot Air Circulation ☐ Heat Pump ☐ Hot Water Baseboard
☐ Space Heaters ☐ Steam Radiation ☐ Radiant Floor
☐ Electric Baseboard ☐ Wood Stove ☐ Outdoor Wood Boiler
☐ Other:

General Description primary fuel type used:

☐ Natural Gas ☐ Fuel Oil ☐ Kerosene ☐ Electric
☐ Propane ☐ Solar ☐ Wood ☐ Coal

General location of boiler/furnace:

☐ Basement ☐ Outdoors ☐ Main Floor ☐ Other

General location of hot water heater:

☐ Basement ☐ Outdoors ☐ Main Floor ☐ Other:

Type of venting for HVAC components and hot water heater:

☐ Direct-vent ☐ Power-vent

Air Conditioning present? ☐ Yes ☐ No

Whole house or attic fan? ☐ Yes ☐ No

6. UTILITIES

Identify all utilities that enter below grade into the structure:

☐ Electric ☐ Gas ☐ Sewer ☐ Cable ☐ Communications
☐ Other:

7. DOCUMENTATION

Pictures that document items 3-6 above and the conditions at the time of the survey

Pictures attached: ☐ Yes ☐ No

Scaled drawings of the building floor plan and configuration at the time of the survey

Figures attached: ☐ Yes ☐ No

Appendix A.3 – Operation, Maintenance, and Monitoring (OM&M) of an Active Vapor Mitigation System (AVMS) Report

The purpose of OM&M is to ensure the AVMS continues to function as designed until the vapor source(s) no longer poses an unacceptable risk to receptors. During the OM&M, the AVMS continues to be operated, maintained/repaired, and monitored in accordance with the performance metrics confirmed during the Installation and Commissioning.

Repairs or modifications to the AVMS should be handled in a manner consistent with contingency actions or a contingency plan established for non-performance of specific system components and the design performance requirements associated with each. Any new additions or significant modifications to the AVMS moves the AVMS back into Phase 2 – System Installation/Commissioning.

Coversheet

The cover sheet for the AVMS design should contain the following information:

- Site – site address with regulatory identifiers (Facility or Site name and ID#s).
- Owner – entity, address, contact information.
- System Designer and/or Environmental Consultant – entity, address, contact information.
- Building Engineer and/or Architect (if applicable) – entity, address, contact information.
- Submittal Date

1.0 Introduction

1.1 Site Information

The following information shall be identified:

- Site – site address with regulatory identifiers (Facility or Site name and ID#s).
- Owner – entity, address, contacts.
- Building Survey (current, see Attachment 1, update as necessary)
- AVMS Installation Date
- Last OM&M Report submittal
- OM&M Report Period

1.2 Purpose of the Document

This section should identify the purpose of this document.

1.3 Installer and Design Firm

This section should identify the installer and the design firm.

1.4 Data Collection and Oversight

This section should identify who collected what data and where it is stored.

1.5 As Built and Commissioning Information

This section should provide a description of the AVMS, the installation oversight documentation, the commissioning information, the performance metrics, and an as-built drawing set of the installed mitigation system.

Key Supporting Information

- As-builds done to scale or other information that includes any key components or the location that was monitored as part of the OM&M.
- Appendix with the install and commissioning information from the Installation and Commissioning TOC.

1.6 System Operation Documentation

This section should discuss the timeframes that the system operation can be documented and provide the supporting documentation.

Key Supporting Information

- Appendix with the supporting information.

1.7 Alarms

This section should identify the installed alarms, if any alarms have been triggered during this reporting period, the response times, and any supporting documentation.

Key Supporting Information

- Appendix with the supporting information.

1.8 OM&M Inspections and Monitoring Equipment

This section should identify what tools, instruments (and their calibration), frequency, and forms were used to perform the OM&M identified.

1.9 Changes and System Modifications

This section should identify any changes or modifications to the system or building (Building Inspection Reports) since the last reporting period and any modifications as a result of any identified changes or modifications.

Key Supporting Information

- Appendix with the supporting information.

2.0 Maintenance and INSPECTIONS

2.1 Mechanical Equipment (if applicable)

This section should identify and discuss the equipment and what maintenance or equipment repair was performed. If any of the mechanical equipment was repaired or replaced it should be described here.

Key Supporting Information

- Figure(s) – Identifying the location of the equipment.
- Table – Identifying the equipment and what and when maintenance should be performed.
- Inspection Form (optional) documenting that maintenance was performed.

2.2 Calibration and Testing for Alarms, and Telemetry

This section should identify and discuss any calibration or testing of alarms or telemetry that was performed and when the next calibration and testing will occur.

Key Supporting Information

- Figure(s) – identifying the location of the equipment.
- Table – identifying the equipment and what and when maintenance or calibration should be performed.
- Inspection Form (optional) documenting that calibration was performed.

2.3 Sealants, Barriers, Batteries

This section should identify and discuss any inspections on sealants, barriers, batteries, and signage that was performed, and any replacement or repairs that were made.

Key Supporting Information

- Figure(s) – identifying the location.
- Table – identifying the equipment and what maintenance, calibration, or replacement was performed and when it occurred.
- Inspection Form (optional) documenting that it was performed.

3.0 Monitoring and Measurements

3.1 Visual Indicators of System Operation and Effectivenss

This section should identify the inspections that occurred and provide a discussion of the following:

- Changes or modifications in use, operation, configuration, structural changes, or size of the structure.
- Visual non-mechanical AVMS components such as labels for readability and presence, sealants, and building system.
- Mechanical AVMS components for audible or visual indicators that a repair or replacement was necessary.

Other information that should be described in this section includes:

- Location – where the inspection occurred.
- Frequency – how often the inspection occurred.
- Observations – what observations were made and noted.
- Operation – that the AVMS continues to operate.
- Response – what steps were taken if the visual inspection identified a response was necessary or warranted.

Key Supporting Information

- Figure(s) – identifying the inspection point.
- Table – identifying what was inspected and what information was document.
- Inspection Form (optional) allowing the inspection to be performed in a standardize and routine approach, a record that the inspection(s) occurred, and that the system continues to function as designed.

3.2 Performance Metrics

This section should identify the performance measurements evaluated to confirm the system has met the performance metrics. Performance measurements are standalone measurements that must be recorded to document the system performance.

This includes:

- Location – Where the inspection occurred
- Frequency – How often the inspection occurred
- Instrumentation – What instrument and instrument accuracy is necessary for the measurement

- Units – What units the performance measurement were measured in
- Readings – What measurement were recorded
- Operation – That the AVMS is operating
- Performance Metrics - Performance Measurement that were achieved based on prove-out information
- System Operation – Documentation of the system operation and any downtimes
- Data Evaluation – Identification of any data analysis that was performed
- Response – What steps were taken if/when the inspection identified that a performance measurement has not meet a performance objective and if a response was necessary or warranted

Readings that identify that the AVMS is not meeting the performance metrics may require modifications to the system.

Key Supporting Information

- Figure(s) that identifies the inspection point or where the reading occurred.
- Table that identifies what has been inspected and what information was documented.
- Inspection Form (optional) that allowed the inspection to be performed in a standardized and routine manner, the record that the inspection(s) occurred and that the system continues to function as designed.

4.0 Data and documentation

4.1 Data Documentation

This section should identify how the information collected above is stored (i.e., inspection forms, other supporting documentation, repair, and telemetric records), analyzed, and who is responsible to correct any issues identified. All data and inspection forms are placed in a unique appendix based on purpose and type of information collected.

4.2 Data Analysis

This section should include how the collected data collected in Section 2 and Section 3 was evaluated for effectiveness and include the cause of any downtime, if any downtime has occurred during the OM&M reporting period.

4.3 Building Owner/Tenant Engagement Notification Forms and Documentation

This section should identify how key information about the AVMS was provided, including operation, notice, and, if appropriate, installed alarms, and a record that documents it. If a notice was prepared, include a copy.

Attachment 1 – Building Survey

NOTE: This building survey is intended to be used only as an example in developing a building survey that is specific to the site with the appropriate information for the structure in which a vapor mitigation system has been installed. This form may not contain all of the necessary information for a particular structure. The development and use of this form is fundamentally important in documenting site conditions during future inspections to confirm if any modifications to the structure have been made, and whether a more detailed assessment is warranted. It should be updated on an annual basis.

Survey performed by:

Date:

Address:

1. OCCUPANT

Owner Occupied: ☐ Yes ☐ No

2. OWNER OR LANDLORD

Name:

Address:

City and State:

County:

Home Phone

Office Phone:

3. BUILDING CHARACTERISTICS

General description of property use and construction:

☐ Residential ☐ Multi-family Residential ☐ Office

☐ Strip Mall ☐ Commercial ☐ Industrial

☐ School ☐ Restaurant ☐ Other: _____

Building Description:

Building Footprint: _____ ft^2

Year Constructed:

Number of floors at or above grade:

Number of floors below grade:

General Description of structure(s) below grade:

☐ Basement ☐ Crawl space ☐ Slab on grade ☐ Not Applicable

☐ Other: _____

If the property includes any structures (besides footings) below grade:

Depth of structure below grade: _____ ft

Footprint: _____ ft^2

If the property includes residential, which of the following describes the property?

☐ Ranch ☐ Multi-family ☐ Two-story single family

☐ Duplex ☐ Split Leve ☐ Mobile Home

☐ Apartment ☐ Townhouses/Condos ☐ Modular

☐ Log Home ☐ Other: _____

If the property includes commercial use:

Business type(s):

Does it include residences (i.e., multi-use)? ☐ Yes ☐ No

If yes, how many units?

If industrial use:

Type:

Level	**General Use** (e.g., family room, bedroom, laundry, workshop, storage)
Basement:	
1st Floor:	
2nd Floor:	
3rd Floor:	
4th Floor:	

Use additional page(s) as necessary.

4. CONSTRUCTION CHARACTERISTICS

General description of above grade construction

☐ Wood frame ☐ Concrete/Cement ☐ Stone ☐ Brick ☐ Other: _____

General Description of structure(s) below grade structures

☐ Basement ☐ Crawl space ☐ Slab on grade ☐ Not Applicable
☐ Foundation/Footings ☐ Other: _____

General Description of below grade construction

☐ Wood frame ☐ Concrete/Cement ☐ Stone ☐ Brick ☐ Other:

General Description of Basement Type

☐ Full ☐ Crawlspace ☐ Slab ☐ Other:

General Description of Lowest Level flooring

☐ Concrete ☐ Dirt ☐ Stone ☐ Other: _____

General Description of foundation walls:

☐ Block ☐ Stone ☐ Poured concrete/cement ☐ Other:

Is there an attached garage? ☐ Yes ☐ No
If yes, does it have a separate heating unit? ☐ Yes ☐ No

Sump's present? ☐ Yes ☐ No

If yes, how many?

Sumps sealed: ☐ Yes ☐ No ☐ Not Applicable

Water in Sump: ☐ Yes ☐ No ☐ Not Applicable

General description of location of each sump:

Type of ground cover outside of building:

☐ Grass ☐ Concrete ☐ Asphalt ☐ Other: _____

5. HEATING, VENTING, and AIR CONDITIONING

General Description of heating system(s) used in this building:

☐ Hot Air Circulation ☐ Heat Pump ☐ Hot Water Baseboard
☐ Space Heaters ☐ Steam Radiation ☐ Radiant Floor
☐ Electric Baseboard ☐ Wood Stove ☐ Outdoor Wood Boiler
☐ Other:

General Description primary fuel type used:

☐ Natural Gas ☐ Fuel Oil ☐ Kerosene ☐ Electric
☐ Propane ☐ Solar ☐ Wood ☐ Coal

General location of boiler/furnace:

☐ Basement ☐ Outdoors ☐ Main Floor ☐ Other

General location of hot water heater:

☐ Basement ☐ Outdoors ☐ Main Floor ☐ Other:

Type of venting for HVAC components and hot water heater:

☐ Direct-vent ☐ Power-vent

Air Conditioning present? ☐ Yes ☐ No

Whole house or attic fan? ☐ Yes ☐ No

6. UTILITIES

Identify all utilities that enter below grade into the structure:

☐ Electric ☐ Gas ☐ Sewer ☐ Cable ☐ Communications
☐ Other:

7. DOCUMENTATION

Pictures that document items 3-6 above and the conditions at the time of the survey

Pictures attached: ☐ Yes ☐ No

Scaled drawings of the building floor plan and configuration at the time of the survey

Figures attached: ☐ Yes ☐ No