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17 June 2016

Melanie Morash
Remedial Project Manager
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street (SFD-7-1)
San Francisco, CA 94105

RE: Mitigation Plan
562 Britton Avenue, Small Gym
Offsite Operable Unit, Sunnyvale, California

Dear Ms. Morash:

Locus has prepared a mitigation plan for indoor air mitigation at the Small Gym. Locus will engage in discussions with the property owners and occupants regarding this plan, and implementation is contingent on their approval.

Building/Property Identification

The Small Gym is a one-story, one-room school building with approximately 2,360 square feet and a ceiling height of approximately 22 feet. There is no attached warehouse/shop space. The gym floor is wood throughout. Building construction is slab-on-grade. A building layout is attached. A building survey conducted on 9 February 2016 is also attached. The school was unable to furnish plan sets for this building, but a mitigation planning event was conducted onsite on 26 February with Locus' mitigation installer and EPA contractors.

Description of Potential Vapor Pathways

The building is slab-on-grade. The condition of the slab is uncertain since the gym floor is wood. If cracks in the slab have developed given the age of the building (over 25 years old according to historical imagery), the wood floor would not provide an airtight barrier. No utility conduits that penetrate the slab were identified.

Summary of All Relevant Data

Analytical results for trichloroethylene (TCE) from 2015 to date are shown in the table below. Air samples were collected by Locus and EPA's contractor. Values in bold exceed EPA long-term screening levels. Analytical results from all parameters tested by Locus are attached. Sample locations are identified on the building layout.

Sample Location	TCE Concentrations (micrograms per cubic meter or µg/m^3) from 2015 to Date							
	24 Jan 15	6 Apr 15	20 Jan 16	9 Feb 16	25 Feb 16	26 Feb 16	29 Feb 16	2 Mar 16
Indoor Air Sample	**0.60**	**0.85**	**2.2**	**0.92-1.4**	**2.2-2.3**	**2.7**	**2.3**	**1.5**
Outdoor Air Sample	0.44 (highest sample detected during these sampling events)							
EPA Residential Screening Levels (SL)								
Short-term SL	2.0							
Long-term SL	0.48							

The two EPA screening levels in the table above are based on a residential exposure scenario and are therefore conservative for this building. In particular, the long-term screening level (0.48 µg/m^3) assumes an exposure duration of 26 years, 350 days per year, 24 hours per day. A reduction in the exposure duration results in an increase to the screening level. The short-term screening level (also called the accelerated response action level: 2.0 µg/m^3) assumes continuous exposure. The action levels for shorter exposure durations are calculated based on a time-weighted average. For example, for an 8-hour workday, the screening level increases to 8 µg/m^3 (168 hours per week/40 hours per week x 2 µg/m^3 = 8 µg/m^3); for a 10-hour workday the screening level is 7 µg/m^3. Occupants of this property do not use the small gym continuously nor for 24 hours on the days that they actually do use the gym. Based on current gym usage, as provided by the school, the gym is used up to 82.5 hours per week (16.5 hours per weekday on average) during the winter/rainy season. The greatest use of the gym by a single party also occurs in the winter/rainy season: PE classes for up to 33 hours per week (less than 7 hours per weekday on average). These maximum exposure scenarios assume that the same people are using the gym for all class periods.

Proposed Mitigation Plan

Locus recommends installing a sub-slab depressurization system (SSDS) for this property based on the following considerations:

- Short-term ventilation enhancements are not feasible. Currently, the building has no active ventilation system. Based on two building inspections by separate mechanical engineers and HVAC experts, the window frame is fairly light weight and probably not capable of handling the weight of retrofit fans nor the moment forces that the fans would generate. Additionally, given the limited-egress (only two exits), mounting fans in a panel in the rear door would inhibit the ability to exit the building in case of fire or other emergency. Although the school currently labels the rear exit "Not an Exit" because it leads to an outdoor fenced-in area containing freestanding storage buildings, Locus does not recommend implementing solutions that restrict building exits. Furthermore, pushing outdoor air across the gym, in the event that the front door is left open by building occupants, could have the adverse effect of increasing TCE concentrations in the space. Given these building constraints, an effective short-term ventilation solution would require significant building modifications, which would take longer to install than the proposed long-term SSDS solution.

- The gym is used infrequently as compared to classrooms and is certainly occupied less than continuously. Therefore, an accelerated implementation of a long-term solution is protective of the health of building occupants. The proposed SSDS can be installed within an estimated two to three weeks of EPA approval, assuming prompt approval from the property owner and occupant.
- Additionally, the proposed SSDS avoids drilling through the wood gym floor and any other interior work that other solutions might entail. Therefore, this approach is more likely to be approvable to the building owner and occupant.

SSDS Description

Implementation of the SSDS will entail installation of an active system collection point (suction point) immediately beneath the slab. To access below the building's slab, a 3.5-inch core will be made through the outside footing. This will be located at the rear (south side) of the gym in the maintenance storage area. The piping will consist of 3-inch schedule 40 PVC, which will be connected to a suction fan located on the exterior wall, and the vent stack will discharge above the roof. The proposed vent stack location is based on discussion with the tenant and to allow continued use of the building; however, a central location in the interior of the building is optimal for mitigation if acceptable to the building owner.

The fan will have a molded plastic cover to hide it from view. There will be a muffler and fan guard with condensate bypass installed in the exhaust piping above the fan. There will be a weather proof electrical box next to the system, which will have the operation controls. An audible and visual alarm will be placed on the exterior of the building next to the front door, to ensure visibility and easy access. That location will also minimize the risk of damage to the equipment and obstruction to the gym users. If the alarm is difficult to detect inside the building, a remote alarm panel will also be installed inside the small gym at a location acceptable to the school. A magnehelic manometer will show system vacuum and will be located at the suction pipe for use during routine inspections. A screen/mesh not smaller than ½ inch will cover the opening of the vent stack. There will be a sampling port installed below the fan in the exhaust pipe for air sampling.

The alarm will be installed in a visible location that will sound and include a visual red light if fan operation fails (vacuum below 0.25" WC). A posted placard near the audible alarm will include instructions and contact information for the owner/occupant to call the Locus technician in the event of an alarm. Locus will discuss additional signage and alarm options available to the owner/occupant (e.g. indoor installations). If effective remote communication systems are feasible at the site, the alarm system may communicate with Locus directly.

Given the similarities to radon reduction systems, the standards written for radon mitigations in ASTM E2121-13 (Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings) will be employed as a baseline for this installation. Installation is expected to take one day. The occupants are expected to be able to maintain normal activities throughout the installation process.

After implementation, air sampling (described in a subsequent section of this plan) will be conducted in order to ensure mitigation effectiveness. The mitigation will be determined to be effective if air sample results in the occupiable space are at or below the EPA long-term screening level of 0.48 $\mu g/m^3$ for TCE.

SSDS Specifications

A generic system diagram is attached. The mitigation installer is licensed by the California State License Board #617021 (General Building Contractor; Warm-Air Heating, Ventilating, and Air-Conditioning; Sheet Metal) and is certified and listed by California for radon mitigations as well as the National Environmental Health Association #101023RMT and National Radon Safety Board #NRSB G31163, and is an active member of the American Association of Radon Scientists and Technologists (AARST). The mitigation installer will therefore inspect the gym and installation process for potential adverse effects. If any are identified they will be brought to Locus' attention to determine whether there exist feasible options to control for adverse effects.

Specifications for the following system components are attached:

- Model GP501 mitigation fan by RadonAway.
- Checkpoint IIa alarm by RadonAway, or similar, including audible and visual alarm and silencing capability. Alarm will sound (and red light appear) when vacuum is below 0.25" WC.
- Dwyer Series 2000 Magnehelic Manometer, Part # 2005, 0-5.0"WC

A gas-tight sampling port (1/4" pipe and sampling nipple with brass ball valve) will be installed below (upstream of) the fan for as needed vapor stack sampling and will also be used for taking vacuum and flow readings.

Weather-proof placards will be securely affixed at the alarm/fan location and will include the following information:

- Locus contact information
- Notification that the system is to remain on (e.g. "Do Not Turn Off") and instructions to call Locus immediately in the event of an alarm or system off condition
- Instructions on how to silence alarm
- Notification of mitigation system components and purpose, e.g. "TCE Reduction System" and "Do Not Alter"

EPA will have the opportunity to review final language of placards before posting.

Diagnostic Testing Description

The SSDS as described above is a presumptive design. However, if acceptable to the property owner and occupant, diagnostic testing can be performed to guide the design to ensure SSDS vacuum coverage across the slab. Ultimately, SSDS effectiveness will be based on indoor air sampling results. Therefore, the extension of the vacuum across the slab, as determined by diagnostic testing, is a secondary parameter for evaluating system effectiveness; system effectiveness criteria is based on indoor air concentrations. If diagnostic testing at the time of SSDS installation is not acceptable to the Fremont Union High School District and/or The King's Academy, it will not prevent evaluation of indoor air concentrations for determination of system effectiveness. If diagnostic testing is not approved by owner and/or tenant as a part of initial system installation and if system effectiveness is not initially met, diagnostic testing may be necessary as a *Potential Alternative* to troubleshoot system effectiveness (refer to Page 7).

Diagnostic testing would proceed with "pressure testing" as described (and attached) in the Department of Toxic Substances Control (DTSC) *Vapor Intrusion Mitigation Advisory (VIMA)*, October 2011, Revision 1, Appendix C. The smoke testing described in the DTSC VIMA is not proposed, and the description and *Diagnostic Testing Specifications* identified below override the DTSC VIMA in the case of discrepancies.

An observation hole would be installed through the floor of the gym and the underlying building slab in each of the four corners. The extraction hole would be located at the exterior extraction point intended for the SSDS installation, at the rear (south side) of the gym in the maintenance storage area. In order to avoid damaging sub-slab utilities or conduits, the locations where known utilities enter the building will be identified and avoided. Additionally, utilities are typically located well below the slab, whereas the drilling depth for diagnostic testing is up to one inch below the bottom of the slab.

If the GP501 mitigation fan by RadonAway provides insufficient vacuum coverage across the slab (refer to attached specifications for vacuum range), a shop vac will be used to see how much suction in inches of WC will be needed to obtain sufficient coverage, and a different fan will be selected based on that finding. Additional fans for consideration would include HS Series fans by RadonAway: HS2000, HS3000 and HS5000. Although a muffler will be installed, these fans may present noise concerns for the owner and occupant and increase the time required for installation. Ultimately, any marginal increase in sub-slab vacuum provided by noisier HS Series fans will be evaluated against the potential for the GP501 fan to provide sufficient vacuum to meet SSDS effectiveness criteria for air samples even if slab coverage is not 100%.

SSDS troubleshooting after system installation, if necessary, could be more comprehensive and accelerated if VAPOR PINs® are installed at observation holes in the gym floor (standard operating procedures, which include images, are attached). VAPOR PINs® would allow for repeat access to vacuum measurements to check sub-slab vacuum coverage.

Note that if diagnostic testing is conducted, drilled observation holes will prevent Locus from returning the wood floor to as-found condition upon removal of the mitigation system. Observation holes would be 1/4 inch in diameter. If the option for VAPOR PINS® is implemented and flush-mounted, observation holes would be 1½ inches in diameter. The installation of these borings in the floor is recommended by EPA, but is not necessary for successful implementation of the mitigation system.

Diagnostic Testing Contingencies

If diagnostic testing is conducted at the time of installation and an HS series fan is required, installation at the time of diagnostic testing would entail all system components except for the fan. The fan would be ordered and installed within 30 days of the initial installation.

If diagnostic testing is conducted at the time of installation and the GP501 and shop vacuum are unable to create a measureable effect at the observation holes at the opposite end (front) of the building, intermediate observation holes will be necessary in order to determine the extents of the vacuum coverage under the slab. Intermediate observation holes may be installed along the walls to avoid central wood floor damage. The number of intermediate observation holes would be kept to a minimum. Although 100% vacuum coverage may not be necessary to meet SSDS effectiveness criteria for air samples, a second extraction point would be expected to achieve 100% coverage, if required.

If installation of a second suction pipe is needed to meet the mitigation effectiveness criteria, a second mobilization would be required and would be completed within 30 days of the initial mobilization. A suction pipe location towards the front of the building would be selected (an exterior sidewall may be achievable if installation along the front exterior wall is not acceptable to the owner and/or tenant). Based on the existing grade (which is lower at the south end of the building), installation of a second suction pipe would require cutting out a section of paved surface and removing material to gain access for a 3.5-inch horizontal core below the slab. After extraction testing and installation, fill material would be replaced around the suction pipe and a concrete patch applied and painted to match the existing grade and color. Due to building use, this method would be preferable to drilling horizontally above-grade through the wall and then turning 90 degrees down through the wood floor on the interior of the gym. Extraction testing at both extraction points would be conducted as described for the initial mobilization in order to ensure vacuum coverage across the entire slab. The GP or HS Series fans would be selected based on extraction test results.

Diagnostic Testing Specifications

Specifications for the following testing components are attached.

- Model GP501 mitigation fan by RadonAway or HS Series fans by RadonAway (if greater vacuum is required and noise constraints are met)
- Radstar GM 1-2 micromanometer by RadonAway for vacuum measurements
- AAB Smart Tool SPM 100 velometer for air velocity measurements

- Contractor VAPOR PIN® Kit by Cox-Colvin (if this option is requested). SOP attached; limited additional specifications available online at: http://vaporpin.coxcolvin.com/product/contractor-vapor-pin-kit/.

Implementation Schedule

- Within 30 calendar days of the property owner's approval and EPA's final approval to proceed, the SSDS will be implemented, contingent on availability of system components, any permits required, and scheduling with the owner, occupant, and contractors. If an HS Series fan or a second suction point is required by EPA, up to 30 additional calendar days will be needed to arrange for and complete SSDS implementation.
- Within 30 calendar days of completion of mitigation activities, a final report will be submitted to EPA including copies of as-built drawings and O&M plans, and copies of documentation provided to owners and occupants. Mitigation activities will be considered complete upon determination by sample results that the system is effective.

Justification

Sub-slab depressurization systems are a proven technology installed throughout the country for residential mitigation of VOCs in indoor air[1]. The systems have an even longer record of effectiveness for the purposes of radon mitigation, complete with ASTM standards[1]. The mitigation system will reduce the entry of soil gases into the building by providing an active alternate ventilation pathway to the atmosphere. Due to the likelihood of success of this design, disruption to the school is expected to be minimized and the implementation process is expected to be efficient and expedient.

Potential Alternatives (if necessary)

If the SSDS does not initially meet effectiveness criteria, the potential contributions from indoor air background sources will be evaluated first (e.g. dry cleaned fabrics, painting). If no background sources are identified, the system will be inspected for: good vent stack seals, sufficient fan velocity, and other adjustments to improve effectiveness. If the SSDS still does not meet effectiveness criteria, alternatives will be implemented and tested. Alternatives or add-ons that may be considered include additional extraction point(s) or sealing of any cracks in the concrete slab. Additionally, if diagnostic testing is not conducted as a part of initial system installation and system effectiveness criteria is not initially met, diagnostic testing may be necessary as a *Potential Alternative* to troubleshoot system effectiveness.

[1] OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air, OSWER Publication 9200.2-154, EPA Office of Solid Waste and Emergency Response, June 2015; communication with vapor intrusion mitigation designers.

Operation and Maintenance of Proposed Mitigation - Framework

Following implementation, these operation and maintenance activities are expected:

- Quarterly inspections during the first year of operation and annual inspections thereafter (upon EPA approval), including checking and repairing, as necessary: rodent, trade, or other damage to the vent stack, seals on vent stack, fan operation (including velocity measurement in vent stack, vacuum, and fan amperage), electrical components. Expected length of time per inspection: two hours or less.
- If the fan's audible alarm sounds, owner/occupant will call the Locus technician for inspection and repair (contact information will be provided on a posted placard near the audible alarm). If effective remote communication systems are feasible at the site, the alarm may call Locus directly. In all cases, the technician will coordinate with owner and occupant prior to arriving on-site.
- At the time that the vapor intrusion mitigation is no longer needed to maintain concentrations within the health-protective range (refer to Mitigation Termination Criteria), the owner may continue to operate the system at the owner's expense, may turn the system off and leave it in place, or may request that it be disassembled and removed.

Further details on the ongoing operation, maintenance, and monitoring of the mitigation system will be communicated to EPA and the property owner in an Operation & Maintenance (O&M) Plan.

Post-Mitigation Sampling Plan to Confirm Success of Mitigation

After implementation of the SSDS, air samples will be collected from the occupiable space (see attached layout) using passive samplers. Sampling of indoor and outdoor air will be conducted 2 weeks following installation, a month following initial sampling, during the first winter and spring of operation, and during the second winter of operation. After that period, and upon EPA approval, annual monitoring will consist of physical inspections of the ventilation system as described above. Where concentrations do not meet effectiveness criteria, the building and mitigation system will be surveyed to evaluate for potential chemical sources. If it is found necessary to improve the mitigation system, the post-mitigation sampling schedule will start after improvements are implemented. If sampling conditions can be arranged such that interior ventilation is minimized in the occupiable space, effectiveness criteria will be evaluated under those conditions.

Mitigation Termination Criteria

The SSDS will be operated until air sample results meet the following criteria without operation of the SSDS: results in the occupiable space are at or below the EPA long-term screening level of 0.48 µg/m^3 for TCE. EPA approval will be obtained prior to mitigation termination. The trigger to begin sampling for the evaluation of mitigation termination may be determined based on a combination of factors, such as, standpipe vapor sample results, regional soil gas screening levels, site-specific fate and transport modeling, and local groundwater concentrations.

If you have any questions regarding this correspondence, please call me at (415) 799-9937.

Sincerely,

J. Wesley Hawthorne, PE, PG
Senior Vice President

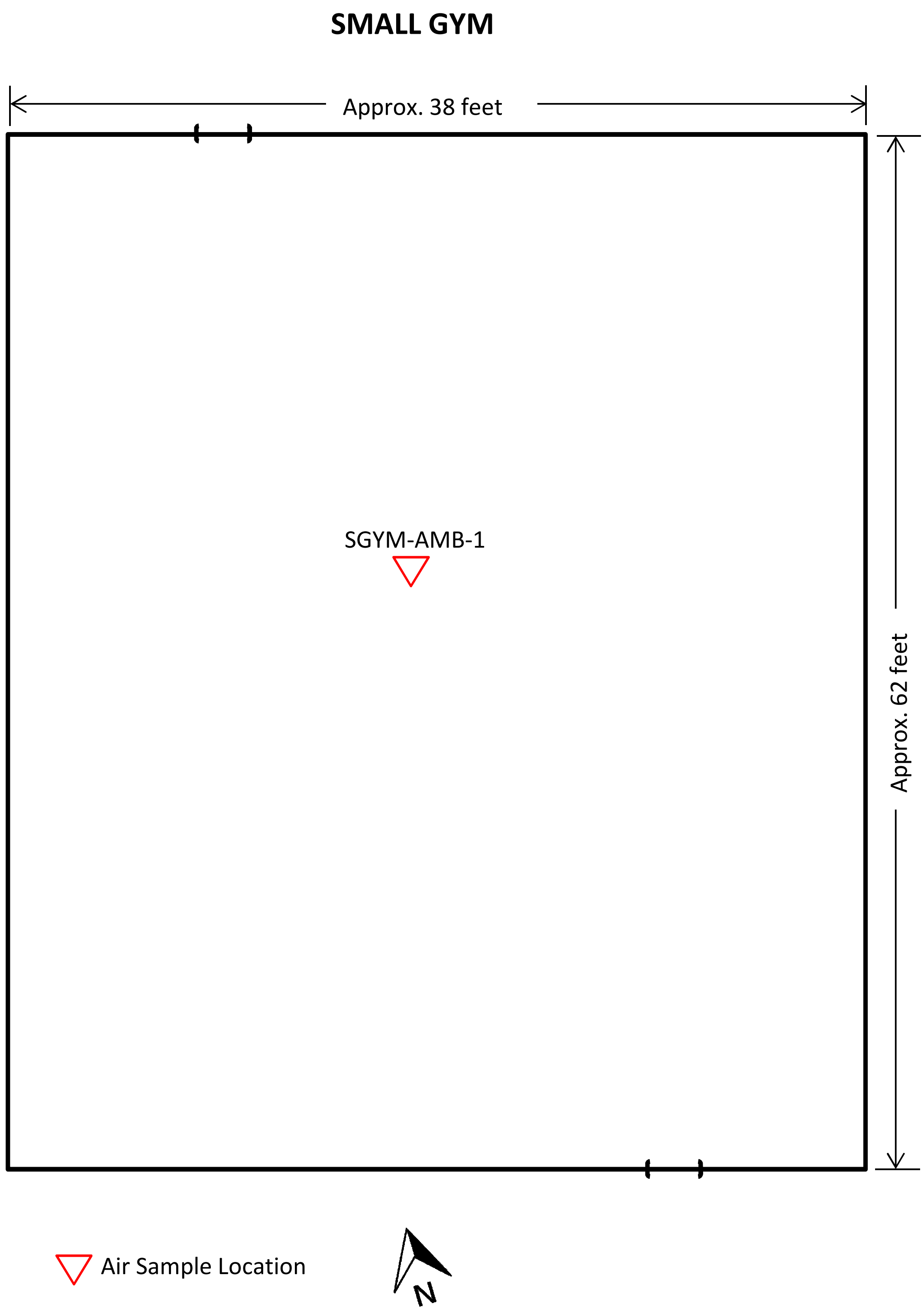
JWH/njl

Attachments:

A. Small Gym Layout with Sample Location(s)
B. Non-Residential Building Survey Dated 9 February 2016
C. System Design Diagram
D. Specifications for SSDS: GP and HS Series Fans, Alarm, and Magnehelic Manometer
E. Specifications for Diagnostic Testing: DTSC VIMA Appendix C, Manometer, Velometer, and VAPOR PINs® (if the latter option is selected)
F. Raw Data Package

cc: (electronic copies)
Shau-Luen Barker, Philips Semiconductors
Leslie Lundgren, CB&I
Todd Maiden, Reed Smith LLP
Linda Niemeyer, Northrop Grumman Systems Corporation
Heather O'Cleirigh, AMD

Attachment A
Small Gym Layout with Sample Location(s)


SMALL GYM
Approx. 38 feet
Approx. 62 feet
SGYM-AMB-1
Air Sample Location
N

Attachment B
Non-Residential Building Survey Dated 9 February 2016

Non-Residential Survey Form

Date: 2/9/2016 **Site:** TRIPLE SITE **EPA Building Number #:** SGYM

PART 1: General Information

Business Name: The King's Academy

Address: 562 Britton Avenue

Sunnyvale, CA

Tenant Information (if applicable)

Contact Name: Matt Nisbet Interviewed: ☒ Yes ☐ No

Phone: (858) 518-5343 Email: ____

Owner/Landlord Information **Consent Access** ☐ Yes ☐ No Date: ____

Name: ____ Interviewed: ☐ Yes ☐ No

Phone: ____ Email: ____

Building/Business Type (Check appropriate boxes)

☒ School/Day-Care ☐ Retail Store ☐ Office Space ☐ Warehouse ☐ Manufacturing

☐ Single level Office/Warehouse ☐ Multi-story ☐ Strip-mall ☐ Multi-tenant ☐ Warehouse

Other ☐ ____

Building Occupancy

Typical Days/Hours of occupancy: 6 days per week. Approx 6 AM - 7:30 PM

Typical Days/Hours of ventilation system operation: A few open windows, most are closed. No other ventilation.

Building Characteristics

Year/Decade Built: ____ Number of Stories: 1

Approximate Building Area (square feet): Total ____ First Floor ____

Is there an attached warehouse/shop space? No describe its use: ____

Foundation Type (Check appropriate boxes)

☒ Slab-on-Grade ☐ Slab-above-Grade (elevated/cap-slab on fill) ☐ Crawl Space ☐ Basement ☐ None

Describe ____

Non-Residential Survey Form

Date: 2/9/2016 **Site:** TRIPLE S ITE **EPA Building Number #:** 5GYM

PART 2: Factors Impacting Indoor Air Quality and Sampling

Questions

Describe renovation, painting, or significant cleaning activities that have occurred over the last 6 months (what was done, what area, and when):

Possibly a major cleaning event occured on winter break. The building is cleaned weekly/monthly

Describe any open combustion in the building. (smoking/incense/candles/cooking/burning)

No open combustion

Have site chemicals of concern been used or stored in the building or adjacent warehouse/shop?

☐ Yes ☒ No

Please list the general types of chemicals__________

Have any significant amounts of volatile chemicals been used recently? ☐ Yes ☒ No

Please list the chemicals__________

Describe any instance of water/groundwater present in the basement/crawlspace (including sumps):

____

Observations

What is the temperature relative to outside? Warmer

What pathways to the subsurface were observed? None

Were windows/doors/roll-up doors kept open? A few windows are kept open.

Is there evidence of significant negative pressure? No

Do parts of the indoor environment appear stagnant? No

Describe any strong odors. None

Building Construction

Building Construction Materials?

☐ Concrete ☐ Concrete Block ☐ Steel ☐ Wood ☐ Other __________

Does the building have an at-grade or below-grade garage? No

Does the building have an attached mechanical room? No

Is the building slab constructed with post-tension concrete? __________

What are the ceiling heights? __________

Non-Residential Survey Form

Date: 2/4/2016 **Site:** TRIPLE SITE **EPA Building Number #:** SGYM

Pathway Analysis

Does the building have a basement or sub-surface structures that are/have: No

☐ Unfinished ☐ Exposed soil ☐ Damp or flooded ☐ Unsealed utility lines ☐ Other ________

Are there utilities that penetrate the slab that may be conduits for soil vapor? ________
Are these:
Connected to subsurface vaults? ________
Connected to utilities closer to potential VI sources? ________
In areas where pressure differential would cause air to flow through them? ________

Is there non-ventilated space in the building (maintenance /electrical / server rooms)? No
Is this space occupied? ________ At what frequency/duration? ________
Are there potential pathways in this space? ________

Are there significant heat sources or other systems that may generate a significant negative pressure near the floor/slab? No

Are there elevators in the building? No
If the elevators are hydraulic plunger how deep does the piston penetrate below the slab? ________

Are there significant utilities penetrating the floor/slab? Not observed

What is the condition of the foundation/slab? Covered by hardwood floor

Was the building constructed with a subslab system or barrier? ________

Are there floor drains? ________

If the foundation design specifications and/or as-built drawings are available attach.

Other Information (that may be of importance in understanding the indoor air quality)

____

Potential Sampling Locations

General notes on potential sample locations and type. Tentative sampling date(s) and preferred times.

____

On a separate page, draw/attach the general floor plan of the building and denote potential locations of sample collection. Indicate locations of doors, windows, ventilation system components, indoor air contaminant sources and field instrument readings.

Non-Residential Survey Form

Date: 2/9/2016 **Site:** TRIPLE SITE **EPA Building Number #:** 56YM

PART 3: Inventory of Potential Indoor Chemical Sources:

Instructions: List items/products in the building or the attached warehouse/shop that may contain site compounds of concern. These should be removed prior to sampling. Also, list items/products that that give off significant volatiles. These may interfere with chemical analysis. Include chemicals that may be tracked into the house from an occupant. This could be chemical usage at work or in an attached workshop/garage. A portable instrument, such as a photo-ionization detector (PID) can be used to help locate volatile chemicals.

Examples of products that may contain trichloroethene (TCE): gun cleaner, rubber cement, solvent degreasers, spot removers, correction fluid, electrical motor cleaner (also be aware that older products are more likely to contain TCE).

Potential chemical source	Location of Product Source	Photograph, ingredients, PID reading?

Non-Residential Survey Form

Date: 2/9/2016 **Site:** TRIPLE SITE **EPA Building Number #:** SGYM

PART 4: Building Heating/Cooling/Ventilation Systems → Ventilation System consists of only open windows. There is heating system but is never used (might not work)

Systems Present

What types of systems are used for heating, cooling and ventilation? Check all that apply.

☐ Air Handler(s) ☐ Package Units ☐ Window/Wall systems ☐ Radiant heating (electric or water/steam)

☐ Evaporative Coolers ☐ Heat pump ☐ Built-up ☒ None Comments ____________________

Do the systems present provide make-up/fresh air? (Y/N) _________

Have the systems been evaluated for ASHRAE Standard 62 compliance? _____________

> **Fresh air should be supplied in all commercial/industrial/institutional settings. ASHRAE Standard 62, *Ventilation for Acceptable Indoor Air Quality*, has guidelines on how much air should be supplied. Meeting these requirements generally helps to mitigate VI impacts.**

When was the system last tested and balanced? ________________ (attach report if available)

Is the ventilation system automated (building automation system)? ____________

If yes is the data recorded or can it be recorded? ___________________

Note that the ventilation settings should be evaluated in the automation system and verified manually where possible.

System operations

For each of the ventilation systems describe how is outdoor air supplied?

- Economizers: ____________________
  - Are economizers opening and closing properly? ________________
  - minimum and maximum settings cfm or %____________________________
- Manual adjustable outdoor air intakes ___________________
  - Settings _________________________________
- Fixed outdoor air intakes? ___________________________________
- Potential outdoor air intake not installed? _________________________________
- Outdoor air intake not easily installed (e.g., split system, radiant heating) ________________

How frequently are the ventilation systems serviced? __________________________

Are filters in good condition (*i.e.* not restricting airflow)? __________________________

Days and hours of operation for each ventilation system __________________________________

Do any of the ventilation systems operate during nights and weekends? ______ reduced settings? ______

Are the temperature / ventilation settings locked or routinely adjusted by the occupants? ______________

What are the temperature settings? (note if seasonally variable) Days ____________ Nights __________
Weekends ____________

If there is an economizer, does the system control outdoor air supply using: (check all that apply)

☐ Outdoor air temperature/enthalpy ☐ CO_2 concentration ☐ Other _____________

Non-Residential Survey Form

Date: 2/9/2016 **Site:** TRIPLE SITE **EPA Building Number #:** SGYM

Is there power exhaust? _______

Is the power exhaust setting dependent on ☐ economizer damper position ☐ Static pressure

Does the system use variable air volume distribution (VAV)? _________

Can airflow be detected at indoor intakes and exhausts? _________

Other Ventilation Issues impacting vapor intrusion potential.

Does the ventilation system have any underground components? _______________

Is ventilation being supplied or returned under a false floor above the building slab? __________

Are ducting components routed through a basement, crawlspace, or utility vault area? ____________

Is a boiler or heater present in a basement or crawlspace? ______ describe______________

Outdoor air intakes

Where are the outdoor air intakes located? ______________________________

Are any outdoor air intakes physically obstructed? ______________________________

Are any intakes near sources of chemicals / sewer vents? ______________________________

Are there carbon filters present in the ventilation system? _______

What make and model of filters are present and how often are they changed? _______________

Ventilation zones and settings

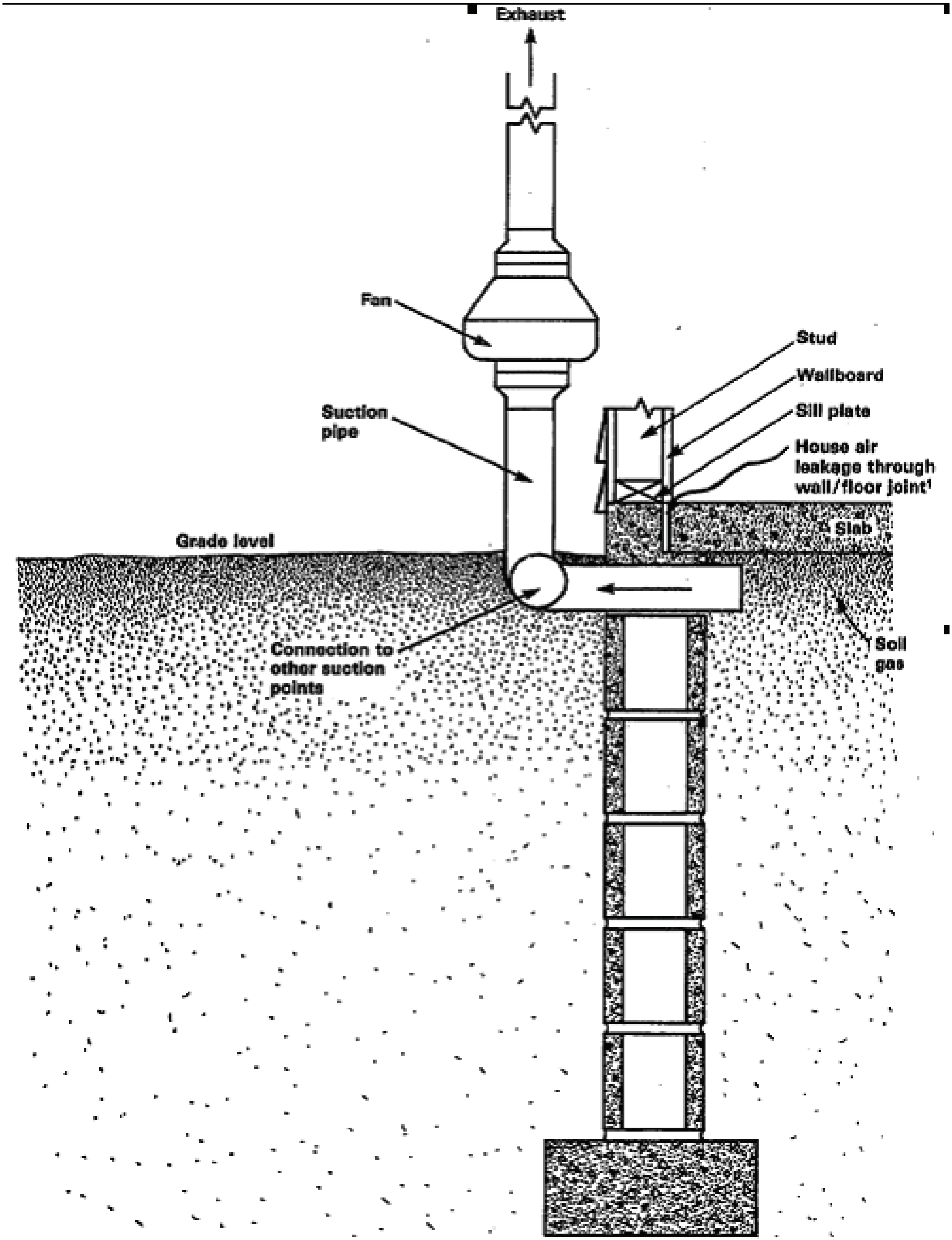
Zone/ Room	System Type	Supply Air Total cfm (range if VAV)	Supply Air % outdoor (range)	Ducted y/n	Return Air cfm	Ducted y/n

Non-Residential Survey Form

Date: 2/9/2016 **Site:** TRIPLE SITE **EPA Building Number #:** SGYM

Additional Notes:

Attachment C
System Design Diagram


Exhaust
Fan
Suction
pipe
Stud
Wallboard
Sill plate
House air
leakage through
wall/floor joint[1]
Slab
Grade level
Connection to
other suction
points
Soil
gas

Attachment D
Specifications for SSDS: GP and HS Series Fans, Alarm, and Magnehelic Manometer

GP Series

The world's leading radon fan manufacturer

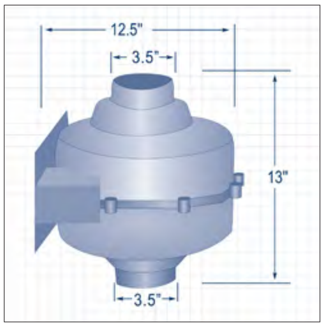
Radon Mitigation Fan

All RadonAway™ fans are specifically designed for radon mitigation. GP Series Fans offer a wide range of performance options that make them ideal for most sub-slab radon mitigation systems.

Features

- Quiet operation
- Water-hardened motor
- Seams sealed under negative pressure (to inhibit radon leakage)
- Mounts on duct pipe or with integral flange
- 3″ diameter ducts for use with 3″ or 4″ pipe
- Electrical box for hard wire or plug in
- ETL Listed - for indoor or outdoor use
- 4 interchangeable GP models

MODEL	P/N	FAN DUCT DIAMETER	WATTS	MAX. PRESSURE"WC	TYPICAL CFM vs. STATIC PRESSURE WC						
					1.0"	1.5"	2.0"	2.5"	3.0"	3.5"	4.0"
GP201	23007-1	3"	40-60	2.0	82	58	5	-	-	-	-
GP301	23006-1	3"	55-90	2.6	92	77	45	10	-	-	-
GP401	23009-1	3"	60-110	3.4	93	82	60	40	15	-	-
GP501	23005-1	3"	70-140	4.2	95	87	80	70	57	30	10



Made in USA with US and imported parts

ETL Listed

All RadonAway inline radon fans are covered by our 5-year, hassle-free warranty

For Further Information Contact

9/12
P/N 02002

PRODUCT SPECIFICATIONS

Model	Maximum Static Suction	Typical CFM vs Static Suction WC (Recommended Operating Range)						Power* Watts @ 115 VAC
		0"	10"	15"	20"	25"	35"	
HS2000	18"	110	72	40	-	-	-	150-270
HS3000	27"	40	33	30	23	18	-	105-195
HS5000	50"	53	47	42	38	34	24	180-320

*Power consumption varies with actual load conditions

Inlet: 3.0" PVC

Outlet: 2.0" PVC

Mounting: Brackets for vertical mount

Weight: Approximately 18 lbs.

Size: Approximately 15"W x 13"H x 8"D

Minimum recommended inlet ducting (greater diameter may always be used):

HS3000, HS5000 --- 2.0" PVC Pipe

HS2000 --- Main feeder line of 3.0" or greater PVC Pipe

Branch lines (if 3 or more) may be 2.0" PVC Pipe

Outlet ducting: 2.0" PVC

Storage temperature range: 32 - 100 degrees F.

Thermally protected

Locked rotor protection

Internal Condensate Bypass

INSTALLATION & OPERATING INSTRUCTIONS
Instruction P/N IN015 Rev E
FOR *CHECKPOINT IIa* TM P/N 28001-2 & 28001-3
RADON SYSTEM ALARM

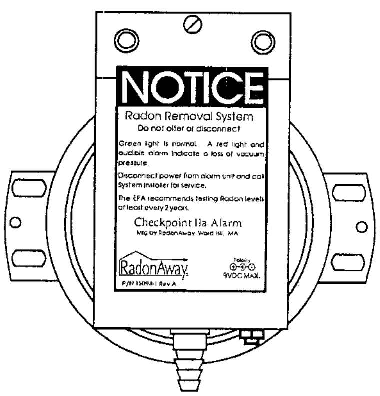
INSTALLATION INSTRUCTIONS
(WALL MOUNTING)

Select a suitable wall location near a vertical section of the suction pipe. The unit should be mounted about four or five feet above the floor and as close to the suction pipe as possible. Keep in mind that with the plug-in transformer provided, the unit must also be within six feet of a 120V receptacle. **NOTE: The Checkpoint IIa is calibrated for vertical mounting, horizontal mounting will affect switchpoint calibration.**

Drill two ¼” holes 4” apart horizontally where the unit is to be mounted.

Install the two ¼” wall anchors provided.

Hang the CHECKPOINT IIa from the two mouting holes located on the mounting bracket. Tighten the mounting screws so the unit fits snugly and securely against the wall.



Drill a 5/16” hole into the side of the vent pipe about 6” higher than the top of the unit.

Insert the vinyl tubing provided about 1” inside the suction pipe.

Cut a suitable length of vinyl tubing and attach it to the pressure switch connector on the CHECKPOINT IIa.

CALIBRATION AND OPERATION.

The CHECKPOINT IIa units are calibrated and sealed at the factory to alarm when the vacuum pressure falls below the factory setting and should not normally require field calibration. Factory Settings are:
28001-2 -.25” WC Vacuum
28001-3 -.10” WC Vacuum

To Verify Operation:

With the exhaust fan off or the pressure tubing disconnected and the CHECKPOINT IIa plugged in, both the red indicator light and the audible alarm should be on.

Turn the fan system on or connect the pressure tubing to the fan piping. The red light and the audible alarm should go off. The green light should come on.

Now turn the fan off. The red light and audible alarm should come on in about two or three seconds and the green light should go out.

WARRANTY INFORMATION

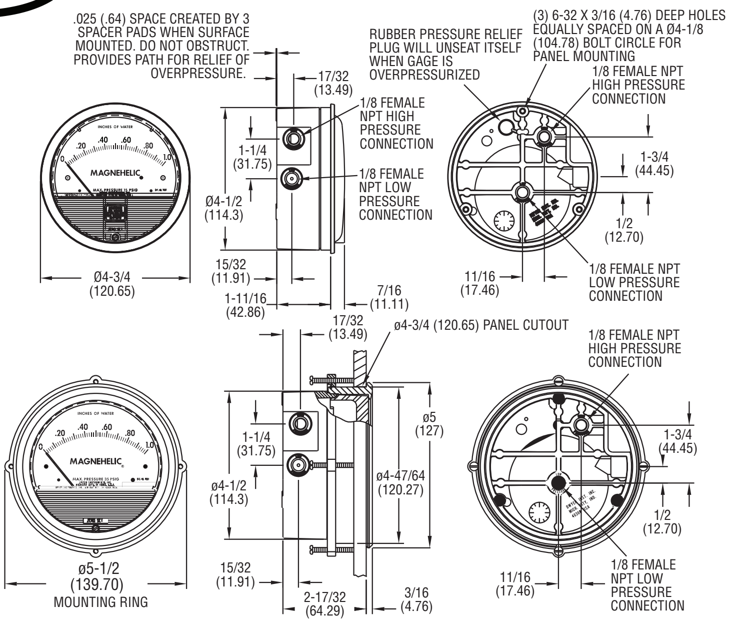
Subject to applicable consumer protection legislation, RadonAway warrants that the CHECKPOINT IIa will be free from defective material and workmanship for a period of (1) year from the date of purchase. Warranty is contingent on installation in accordance with the instructions provided. This warranty does not apply where repairs or alterations have been made or attempted by others; or the unit has been abused or misused. Warranty does not include damage in shipment unless the damage is due to the negligence of RadonAway. All other warranties, expressed or written, are not valid. To make a claim under these limited warranties, you must return the defective item to RadonAway with a copy of the purchase receipt. RadonAway is not responsible for installation or removal cost associated with this warranty. In no case is RadonAway liable beyond the repair or replacement of the defective product FOB RadonAway.

THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. THERE IS NO WARRANTY OF MERCHANTIBILITY. ALL OTHER WARRANTIES, EXPRESSED OR WRITTEN, ARE NOT VALID.

For service under these warranties, contact RadonAway for a Return Material Authorization (RMA) number and shipping information. **No returns can be accepted without an RMA.** If factory return is required, the customer assumes all shipping costs to and from factory.

Manufactured by:
RadonAway
Ward Hill, MA
(978)-521-3703

Magnehelic® Differential Pressure Gage



The blowout plug is not used on models above 180 inches of water pressure, medium or high pressure models, or on gages which require an elastomer other than silicone for the diaphragm.

STANDARD GAGE ACCESSORIES: Two 1/8˝ NPT plugs for duplicate pressure taps, two 1/8˝ pipe thread to rubber tubing adapters and three flush mounting adapters with screws.

MP AND HP GAGE ACCESSORIES: Mounting ring and snap ring retainer substituted for 3 adaptors, 1/4" compression fittings replace 1/8" pipe thread to rubber tubing adaptors.

OVERPRESSURE PROTECTION: Standard Magnehelic® Differential Pressure Gages are rated for a maximum pressure of 15 psig and should not be used where that limit could be exceeded. Models employ a rubber plug on the rear which functions as a relief valve by unseating and venting the gage interior when over pressure reaches approximately 25 psig (excludes MP and HP models). To provide a free path for pressure relief, there are four spacer pads which maintain .023˝ clearance when gage is surface mounted. Do not obstruct the gap created by these pads.

SPECIFICATIONS

Service: Air and non-combustible, compatible gases. (Natural Gas option available.)
Wetted Materials: Consult factory.
Housing: Die cast aluminum case and bezel, with acrylic cover. (MP model has polycarbonate cover).
Accuracy: ±2% of full scale (±3% on - 0, -100 Pa, -125 Pa, 10MM and ±4% on -00, - 00N, -60 Pa, -6MM ranges), throughout range at 70°F (21.1°C).
Pressure Limits: -20˝ Hg to 15 psig.† (-0.677 bar to 1.034 bar); MP option: 35 psig (2.41 bar), HP option: 80 psig (5.52 bar).
Overpressure: Relief plug opens at approximately 25 psig (1.72 bar), standard gages only. The blowout plug is not used on models above 180 inches of water pressure, medium or high pressure models, or on gages which require an elastomer other than silicone for the diaphragm.
Temperature Limits: 20 to 140°F (-6.67 to 60°C). *Low temperature models available as special option.
Size: 4˝ (101.6 mm) diameter dial face.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Process Connections: 1/8˝ female NPT duplicate high and low pressure taps - one pair side and one pair back.
Weight: 1 lb 2 oz (510 g), MP & HP 2 lb 2 oz (963 g).
Agency Approvals: RoHS.

†For applications with high cycle rate within gage total pressure rating, next higher rating is recommended. See Medium and High pressure options.

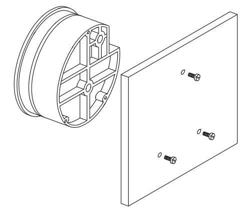
Note: May be used with hydrogen when ordering Buna-N diaphragm. Pressure must be less than 35 psi.

INSTALLATION

Select a location free from excessive vibration and where the ambient temperature will not exceed 140°F (60°C). Also, avoid direct sunlight which accelerates discoloration of the clear plastic cover. Sensing lines may be run any necessary distance. Long tubing lengths will not affect accuracy but will increase response time slightly. Do not restrict lines. If pulsating pressures or vibration cause excessive pointer oscillation, consult the factory for ways to provide additional damping.

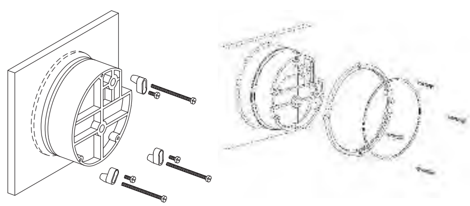
All standard Magnehelic® Differential Pressure Gages are calibrated with the diaphragm vertical and should be used in that position for maximum accuracy. If gages are to be used in other than vertical position, this should be specified on the order. Many higher range gages will perform within tolerance in other positions with only rezeroing. Low range models of 0.5" w.c. plus 0.25" w.c. and metric equivalents must be used in the vertical position only.

SURFACE MOUNTING



Locate mounting holes, 120° apart on a 4-1/8" dia. circle. Use No. 6-32 machine screws of appropriate length.

FLUSH MOUNTING



Provide a 4-9/16" dia. (116 mm) opening in panel. Provide a 4-3/4" dia. (120 mm) opening for MP and HP models. Insert gage and secure in place with No. 6-32 machine screws of appropriate length, with adapters, firmly secured in place.

PIPE MOUNTING

To mount gage on 1-1/4" - 2" pipe, order optional A-610 pipe mounting kit.

TO ZERO GAGE AFTER INSTALLATION

Set the indicating pointer exactly on the zero mark, using the external zero adjust screw on the cover at the bottom. Note that the zero check or adjustment can only be made with the high and low pressure taps both open to atmosphere.

OPERATION

Positive Pressure: Connect tubing from source of pressure to either of the two high pressure ports. Plug the port not used. Vent one or both low pressure ports to atmosphere.
Negative Pressure: Connect tubing from source of vacuum or negative pressure to either of the two low pressure ports. Plug the port not used. Vent one or both high pressure ports to atmosphere.
Differential Pressure: Connect tubing from the greater of two pressure sources to either high pressure port and the lower to either low pressure port. Plug both unused ports.
When one side of the gage is vented in dirty, dusty atmosphere, we suggest an A-331 Filter Vent Plug be installed in the open port to keep inside of gage clean.

A. For portable use of temporary installation use 1/8" pipe thread to rubber tubing adapter and connect to source of pressure with flexible rubber or vinyl tubing.
B. For permanent installation, 1/4" O.D., or larger, copper or aluminum tubing is recommended.

MAINTENANCE

No lubrication or periodic servicing is required. Keep case exterior and cover clean. Occasionally disconnect pressure lines to vent both sides of gage to atmosphere and re-zero. Optional vent valves should be used in permanent installations. The Series 2000 is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

WARNING

Attempted field repair may void your warranty. Recalibration or repair by the user is not recommended.

TROUBLE SHOOTING TIPS

Gage won't indicate or is sluggish.

1. Duplicate pressure port not plugged.
2. Diaphragm ruptured due to overpressure.
3. Fittings or sensing lines blocked, pinched, or leaking.
4. Cover loose or "O"ring damaged, missing.
5. Pressure sensor, (static tips, Pitot tube, etc.) improperly located.
6. Ambient temperature too low. For operation below 20°F (-7°C), order gage with low temperature, (LT) option.

DWYER INSTRUMENTS, INC.
P.O. BOX 373 • MICHIGAN CITY, INDIANA 46360 U.S.A.
Phone: 219/879-8000
Fax: 219/872-9057
www.dwyer-inst.com
e-mail: info@dwyer-inst.com

Attachment E
Specifications for Diagnostic Testing: DTSC VIMA Appendix C, Manometer, Velometer, and VAPOR PINs® (if the latter option is selected)

APPENDIX C
DIAGNOSTIC TESTING OF AIR FLOW CHARACTERISTICS BENEATH EXISTING BUILDINGS

Note: The content of this appendix is modified from the Massachusetts Department of Environmental Protection guidance entitled *Guidelines for the Design, Installation, and Operation of Sub-Slab Depressurization Systems* (1995).

The air flow characteristics and capacity of the material(s) beneath the slab should be quantitatively determined by diagnostic testing, a procedure analogous to conducting a soil vapor extraction pilot test. This is an important step in the SSD design process, and should always be performed prior to the design and installation of a SSD system. The objective of diagnostic testing is to investigate and evaluate the development of a negative pressure field, via the induced air flow beneath the existing building slab. This information is used to determine whether a low pressure/high flow or high pressure/low flow system is necessary, and to determine the number and location of necessary system extraction points.

The scope (or complexity) of the diagnostic testing is a function of the building size and the presence of structures that may interfere with air flow. For larger buildings, such as commercial buildings and school buildings, more extensive and involved sub-slab diagnostics are essential. Structures such as utility tunnel floors and walls, crawl spaces, internal continuous footings, and/or frost walls should be considered in the diagnostic evaluations, as they can impede air flow.

Diagnostic testing is conducted by drilling small diameter holes through a building slab, applying a vacuum to one hole (an extraction hole), and measuring pressure drops at surrounding test holes (observation holes). Extraction and observation holes should be placed in the most unobtrusive locations possible; utility rooms and closets are good choices. Care must be taken to avoid damaging sub-slab utilities or conduits. Generally, the extraction hole should be at least 3/4 inches in diameter and the test holes should be 3/8 to 5/8 inches in diameter. Test holes should be placed at representative locations, such that the size of the effective pressure field under the slab may be evaluated.

Typically, a "shop vacuum" unit is used to evacuate sub-slab air from the extraction hole. During the test, the extraction vacuum and flow rate should not exceed the capacity of potential SSD system fans. The pressure drop and flow rate at this extraction point should be monitored and recorded. Pressure drops at the test holes should be measured quantitatively with a pressure gauge (e.g., a magnehelic gauge).

The vacuum and flow rate of the “shop vacuum” used for testing should be recorded to provide an assessment of the testing parameters in conjunction with the test results. Literature regarding specifications for typical shop vacuums indicates a potential noise level of approximately 75 to 85 decibels. Therefore, the potential noise levels during testing procedures should be considered relative to impacts on building occupants and the need for worker hearing protection. An additional precaution during testing procedures is the consideration of the shop vacuum exhaust emissions. For health and safety considerations, the shop vacuum exhaust should be directed to and vented outside of the building.

Atmospheric pressure may be of importance at sites where diagnostic testing indicates marginal negative pressure readings. In such cases, barometric pressure data should be obtained and reviewed for the day of testing, and previous several days. A trend of rising barometric pressure tends to promote advection of air into the ground, which may be falsely interpreted as a negative pressure field created during diagnostic tests. Where this concern exists, the testing should be repeated during a time of falling barometric pressures.

Two approaches may be used to monitor and document the development of a negative pressure field: pressure testing and smoke testing. Pressure testing provides a direct and quantitative means to measure a negative pressure field. However, in cases where very permeable fills/subsoils are present, large volumes of air can be moved with relatively little pressure drop, undetectable by even the most sensitive gauge. In these cases, the creation of a negative pressure field can be verified by smoke tests, which demonstrate the advection of smoke (air) into the ground (i.e., through the slab).

Following the test, the diagnostic extraction and test holes (and any leaked areas) should be sealed with a Portland cement grout, although at least one or two holes should be temporarily sealed with a removable sealant, such as caulk, until after installation of the final SSD system, in order to provide points to demonstrate establishment of a negative pressure field.

The diagnostic testing should also address the potential for back drafting both during the testing procedures and in consideration of the mitigation design. See Section 6.1.3 for additional discussion of back drafting considerations.

RadonAway®
The world's leading radon fan manufacturer

RadStar GM 1-2

Grab Sampler / Micro Manometer

The **RadStar GM 1-2** is a one-of-a-kind diagnostic aid designed specifically for the needs of radon mitigation professionals. The radon grab sampler feature is the perfect diagnostic tool to assist you in finding radon sources. The micro manometer measures pressure field extension.

Specifications

- **Includes:** Charging Adapter, Micro Manometer Tubing, Grab Sampler Tubing and 6 Inline Filters
- **Radon Mode:** 6-minute Grab Sampler, Brushed DC Sampling Pump rated for 500 hrs
- **Range:** 0 to 999 picoCuries per liter (pCi/L) or 0 to 37,000 Bequerels per cubic meter (Bq/m^3)
- **Manometer Mode (2 Ranges):**
  0 to .250 inches WC or 0 to 62 Pascals
  0 to 8.00 inches WC or 0 to 2000 Pascals
- **User Selectable Options:** Units, Beep, Time Average
- **Power:** 120VAC 60Hz Transformer, Rechargeable NiCad Battery
- **Indicators:** 2 X 16 LCD Display, Green AC Power LED
- **Rotary Switch:** 2 Position, [Grab Sample] [Manometer]
- **Communication Port:** RS-232 Port, for use by manufacturer only
- **Pushbuttons:** Momentary [Enter] [Next/Zero] [Reset]
- **Operating Range:** Temperature 55°F to 85°F
  Humidity 0 to 80%, non-condensing

12/13
P/N 02027

RadStar GM 1-2

1 - Radon Grab Sampler

- Performs a 6-minute radon grab sample
- Displays real-time alpha particle counts
- Readings can be in pCi/L or Bq/m^3
- Approximately 5-hour battery life

2 - Micro Manometer

- Time Average option adjusts readings for high wind or other environmental conditions
- Readings can be in WC or Pascals
- Approximately 5-day battery life if only being used as a Micro Manometer

ADVANCED TECHNOLOGY:

Two Diagnostic Tools IN ONE Complete Package

RadStar

RadonAway
The world's leading radon fan manufacturer

radonaway.com
800-767-3703

AIRFLOW BALANCING METER

PRODUCT SPECIFICATION

ABM1.0-0315

WORKS WITH

All iPhones, iPads, and iPods

Most Android Phones

(there are a few lower end/older Android based phones that lack sufficient power through the audio jack to power our device)

To download the app please visit the iTunes Store or Android Market and search for AAB

SPECIFICATIONS

Weight .1 lbs

Dimensions 3.8” x 1.0” x 2.0” LWH

WARRANTY

The ABM-100 comes with a one year warranty from the time of purchase.

Warranty replacement units should be swapped from inventory at the place of purchase. If you have a faulty unit, or need help troubleshooting an issue please contact AAB support for a warranty replacement.

support@AABsmart.com

WHERE TO PURCHASE

This product is available at local HVAC wholesale distributors. For a list of local distributors please visit www.AABsmart.com.

ABM-100

The ABM-100 Airflow Balancing Meter is an anemometer that fits in your pocket. It’s our first of a series of tools that connect to smart devices and are specifically designed for the HVAC industry.

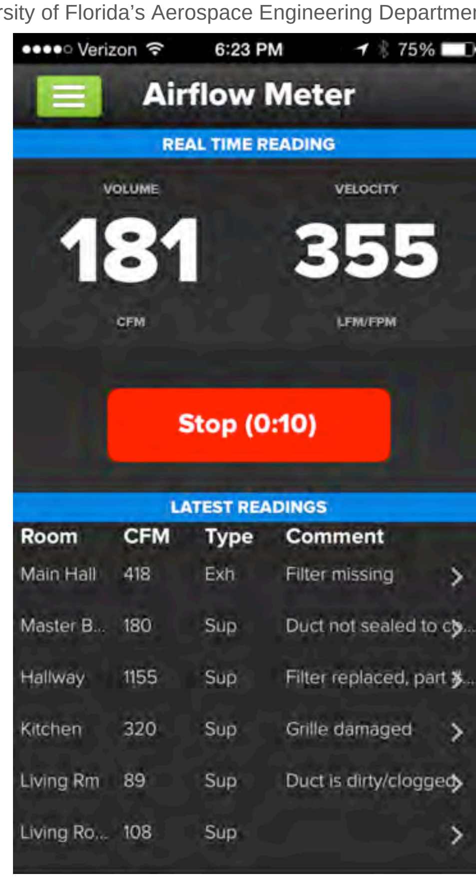
The ABM-100 easily and instantly converts air speed into air volume for you. Then it records the data to a history log, which can be emailed for professional looking reports.

Download one of our free apps for iOS or Android and plug in your ABM-100 meter - it’s really that easy. Enter the grille or duct dimensions and then hold it up to a grille or duct opening. Your phone does the rest. By using a series of algorithms the ABM automatically calculates the airflow volume. No more memorizing formulas and using a calculator and notepad. The ABM-100 also provides the ability to automatically adjust the free space calculation if a grille is present. It also has the ability to add comments with each reading if desired.

The ABM-100 is designed to be better than any other handheld anemometer on the market. The ABM-100 was calibrated for extreme accuracy at the University of Florida’s Aerospace Engineering Department.

Features

- Compatible with iPhone, iPad, iPod, and all major Android devices
- Measures airflow in:
  - Linear Feet Per Minute
  - Cubic Feet Per Minute
  - Cubic Meters Per Hour
  - Linear Meters Per Second
- Accurate to +/- 0.5% of the reading at up to 15° off-axis
- Range is from 160 FPM (1 m/s) to 11,000 FPM (56 m/s)
- Resolution is .19 FPM (0.001 m/s)
- Rugged and eco-friendly packaging that serves as a reusable storage case
- Sends onsite professional reports by email



Available on the iPhone App Store | Available on the Android Market

Designed for use with APPLE® products. APPLE® is a registered trademark in the United States and other countries.

Designed for use with Android® products. Android® is a registered trademark in the United States and other countries.

Standard Operating Procedure
Installation and Extraction of the Vapor Pin™

May 20, 2011

Scope:

This standard operating procedure describes the installation and extraction of the Vapor Pin™[1] for use in sub-slab soil-gas sampling.

Purpose:

The purpose of this procedure is to assure good quality control in field operations and uniformity between field personnel in the use of the Vapor Pin™ for the collection of sub-slab soil-gas samples.

Equipment Needed:

- Assembled Vapor Pin™ [Vapor Pin™ and silicone sleeve (Figure 1)];
- Hammer drill;
- 5/8-inch diameter hammer bit (Hilti™ TE-YX 5/8" x 22" #00206514 or equivalent);
- 1½-inch diameter hammer bit (Hilti™ TE-YX 1½" x 23" #00293032 or equivalent) for flush mount applications;
- ¾-inch diameter bottle brush;
- Wet/dry vacuum with HEPA filter (optional);
- Vapor Pin™ installation/extraction tool;
- Dead blow hammer;
- Vapor Pin™ flush mount cover, as necessary;
- Vapor Pin™ protective cap; and
- VOC-free hole patching material (hydraulic cement) and putty knife or trowel.

Figure 1. Assembled Vapor Pin™.

Installation Procedure:

1) Check for buried obstacles (pipes, electrical lines, etc.) prior to proceeding.

2) Set up wet/dry vacuum to collect drill cuttings.

3) If a flush mount installation is required, drill a 1½-inch diameter hole at least 1¾-inches into the slab.

4) Drill a 5/8-inch diameter hole through the slab and approximately 1-inch into the underlying soil to form a void.

5) Remove the drill bit, brush the hole with the bottle brush, and remove the loose cuttings with the vacuum.

6) Place the lower end of Vapor Pin™ assembly into the drilled hole. Place the small hole located in the handle of the extraction/installation tool over the Vapor Pin™ to protect the barb fitting and cap, and tap the Vapor Pin™ into place using a

[1] Cox-Colvin & Associates, Inc., designed and developed the Vapor Pin™; a patent is pending.

dead blow hammer (Figure 2). Make sure the extraction/installation tool is aligned parallel to the Vapor Pin™ to avoid damaging the barb fitting.

Figure 2. Installing the Vapor Pin™.

For flush mount installations, unscrew the threaded coupling from the installation/extraction handle and use the hole in the end of the tool to assist with the installation (Figure 3).

Figure 3. Flush-mount installation.

During installation, the silicone sleeve will form a slight bulge between the slab and the Vapor Pin™ shoulder. Place the protective cap on Vapor Pin™ to prevent vapor loss prior to sampling (Figure 4).

Figure 4. Installed Vapor Pin™.

7) For flush mount installations, cover the Vapor Pin™ with a flush mount cover.

8) Allow 20 minutes or more (consult applicable guidance for your situation) for the sub-slab soil-gas conditions to equilibrate prior to sampling.

9) Remove protective cap and connect sample tubing to the barb fitting of the Vapor Pin™ (Figure 5).

Figure 5. Vapor Pin™ sample connection.

10) Conduct leak tests [(e.g., real-time monitoring of oxygen levels on extracted sub-slab soil gas, or placement of a water

dam around the Vapor Pin™) Figure 6]. Consult your local guidance for possible tests.

Figure 6. Water dam used for leak detection.

11) Collect sub-slab soil gas sample. When finished sampling, replace the protective cap and flush mount cover until the next sampling event. If the sampling is complete, extract the Vapor Pin™.

Extraction Procedure:

1) Remove the protective cap, and thread the installation/extraction tool onto the barrel of the Vapor Pin™ (Figure 7). Continue turning the tool to assist in extraction, then pull the Vapor Pin™ from the hole (Figure 8).

Figure 7. Removing the Vapor Pin™.

Figure 8. Extracted Vapor Pin™.

2) Fill the void with hydraulic cement and smooth with the trowel or putty knife.

3) Prior to reuse, remove the silicone sleeve and discard. Decontaminate the Vapor Pin™ in a hot water and Alconox® wash, then heat in an oven to a temperature of 130° C.

The Vapor Pin™ to designed be used repeatedly; however, replacement parts and supplies will be required periodically. These parts are available on-line at www.CoxColvin.com.

Replacement Parts:

Vapor Pin™ Kit Case - VPC001
Vapor Pins™ - VPIN0522
Silicone Sleeves - VPTS077
Installation/Extraction Tool - VPIE023
Protective Caps - VPPC010
Flush Mount Covers - VPFM050
Water Dam - VPWD004
Brush - VPB026

Standard Operating Procedure
Use of the Vapor Pin™ Drilling Guide and Secure Cover

July 16, 2012

Scope:

This standard operating procedure (SOP) describes the methodology to use the Vapor Pin™ Drilling Guide and Secure Cover to install and secure a Vapor Pin™ in a flush mount configuration.

Purpose:

The purpose of this SOP is to detail the methodology for installing a Vapor Pin™ and Secure Cover in a flush mount configuration. The flush mount configuration reduces the risk of damage to the Vapor Pin™ by foot and vehicular traffic, keeps dust and debris from falling into the flush mount hole, and reduces the opportunity for tampering. This SOP is an optional process performed in conjunction with the SOP entitled "Installation and Extraction of the Vapor Pin™". However, portions of this SOP should be performed prior to installing the Vapor Pin™.

Equipment Needed:

- Vapor Pin™ Secure Cover (Figure 1);
- Vapor Pin™ Drilling Guide (Figure 2);
- Hammer drill;
- 1½-inch diameter hammer bit (Hilti™ TE-YX 1½" x 23" #00293032 or equivalent);
- 5/8-inch diameter hammer bit (Hilti™ TE-YX 5/8" x 22" #00226514 or equivalent);
- assembled Vapor Pin™;
- #14 spanner wrench;
- Wet/Dry vacuum with HEPA filter (optional); and
- personal protective equipment (PPE).

Figure 1. Vapor Pin™ Secure Cover.

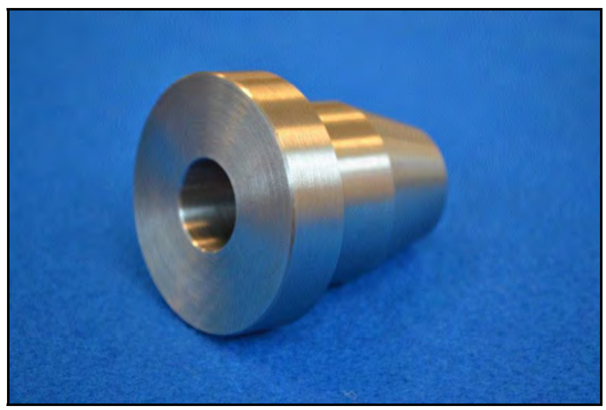


Figure 2. Vapor Pin™ Drilling Guide.

Installation Procedure:

1) Check for buried obstacles (pipes, electrical lines, etc.) prior to proceeding.

2) Set up wet/dry vacuum to collect drill cuttings.

3) While wearing PPE, drill a 1½-inch diameter hole into the concrete slab to a

depth of approximately 1 3/4 inches. Pre-marking the desired depth on the drill bit with tape will assist in this process.

4) Remove cuttings from the hole and place the Drilling Guide in the hole with the conical end down (Figure 3). The hole is sufficiently deep if the flange of the Drilling Guide lies flush with the surface of the slab. Deepen the hole as necessary, but avoid drilling more than 2 inches into the slab, as the threads on the Secure Cover may not engage properly with the threads on the Vapor Pin™.

Figure 3. Installing the Drilling Guide.

5) When the 1½-inch diameter hole is drilled to the proper depth, replace the drill bit with a $^{5}/_{8}$-inch diameter bit, insert the bit through the Drilling Guide (Figure 4), and drill through the slab. The Drilling Guide will help to center the hole for the Vapor Pin™, and keep the hole perpendicular to the slab.

6) Remove the bit and drilling guide, clean the hole, and install the Vapor Pin™ in accordance with the SOP "Installation and Extraction of the Vapor Pin™.

Figure 4. Using the Drilling Guide.

7) Screw the Secure Cover onto the Vapor Pin™ and tighten using a #14 spanner wrench by rotating it clockwise (Figure 5). Rotate the cover counter clockwise to remove it for subsequent access.

Figure 5. Tightening the Secured Cover.

<u>Limitations:</u>

On slabs less than 3 inches thick, it may be difficult to obtain a good seal in a flush mount configuration with the Vapor Pin™.

Attachment F
Raw Data Package

SGYM RAW DATA PACKAGE

	Parameter Name		1,1,1-Trichloroethane (TCA)	1,1,2-Trichlorotrifluoroethane (CFC 113)	1,1-Dichloroethane (1,1-DCA)	1,1-Dichloroethene (1,1-DCE)
	Report Units		ug/m3	ug/m3	ug/m3	ug/m3
Location ID	**Date Sampled**	**Sample Purpose**	**Report Result**	**Report Result**	**Report Result**	**Report Result**
BLE-OUT-1	**01/24/2015**	**REG**	ND 0.17	ND 1.2	ND 0.12	ND 0.061
SGYM-AMB-1	**01/24/2015**	**REG**	ND 0.17	ND 1.2	ND 0.13	ND 0.062
BLE-OUT-1	**04/06/2015**	**REG**	ND 0.20	0.88	ND 0.11	ND 0.088
SGYM-AMB-1	**04/06/2015**	**REG**	ND 0.19	0.93	ND 0.10	ND 0.082
BLE-OUT-1	**01/20/2016**	**REG**	ND 0.21	0.72	ND 0.11	ND 0.11
SGYM-AMB-1	**01/20/2016**	**REG**	ND 0.20	2.9	ND 0.11	ND 0.11
BLE-OUT-1	**02/09/2016**	**REG**	ND 0.20	0.70	ND 0.14	ND 0.11
SGYM-AMB-1	**02/09/2016**	**REG**	ND 0.20	0.84	ND 0.13	ND 0.11
SGYM-AMB-1	**02/09/2016**	**FD**	ND 0.20	0.87	ND 0.13	ND 0.11
BLANK-SGYM	**02/09/2016**	**FB**	ND 0.20	ND 0.12	ND 0.13	ND 0.11
BLE-OUT-1	**02/25/2016**	**REG**	ND 0.20	0.86	ND 0.11	ND 0.089
SGYM-AMB-1	**02/25/2016**	**REG**	ND 0.20	1.4	ND 0.10	ND 0.087
SGYM-AMB-1	**02/25/2016**	**FD**	ND 0.20	1.3	ND 0.10	ND 0.087
BLANK-SGYM	**02/25/2016**	**FB**	ND 0.20	ND 0.095	ND 0.10	ND 0.087

ND = non-detect

SGYM RAW DATA PACKAGE

	Parameter Name Report Units		cis-1,2-Dichloroethene ug/m3	Tetrachloroethene (PCE) ug/m3	trans-1,2-Dichloroethene ug/m3	Trichloroethene (TCE) ug/m3
Location ID	**Date Sampled**	**Sample Purpose**	**Report Result**	**Report Result**	**Report Result**	**Report Result**
BLE-OUT-1	**01/24/2015**	**REG**	ND 0.12	ND 0.21	ND 0.61	ND 0.16
SGYM-AMB-1	**01/24/2015**	**REG**	ND 0.12	ND 0.21	ND 0.62	0.60
BLE-OUT-1	**04/06/2015**	**REG**	ND 0.11	ND 0.098	ND 0.11	ND 0.072
SGYM-AMB-1	**04/06/2015**	**REG**	ND 0.10	ND 0.091	ND 0.10	0.85
BLE-OUT-1	**01/20/2016**	**REG**	ND 0.11	0.12	ND 0.12	0.27
SGYM-AMB-1	**01/20/2016**	**REG**	ND 0.11	0.15	ND 0.12	2.2
BLE-OUT-1	**02/09/2016**	**REG**	ND 0.14	0.14	ND 0.14	0.17
SGYM-AMB-1	**02/09/2016**	**REG**	ND 0.13	0.15	ND 0.14	0.94
SGYM-AMB-1	**02/09/2016**	**FD**	ND 0.13	0.17	ND 0.14	0.92
BLANK-SGYM	**02/09/2016**	**FB**	ND 0.13	ND 0.14	ND 0.14	ND 0.071
BLE-OUT-1	**02/25/2016**	**REG**	ND 0.11	0.14	ND 0.11	0.44
SGYM-AMB-1	**02/25/2016**	**REG**	ND 0.11	0.16	ND 0.11	2.3
SGYM-AMB-1	**02/25/2016**	**FD**	ND 0.11	0.18	ND 0.11	2.2
BLANK-SGYM	**02/25/2016**	**FB**	ND 0.11	ND 0.096	ND 0.11	ND 0.071

ND = non-detect