GEI Consultants

Geotechnical
Environmental and
Water Resources
Engineering

May 26, 2009

Mr. William S. Ottaway
Project Manager
Remedial Bureau C, MGP Section
Division of Environmental Remediation
NYS Dept. of Environmental Conservation
625 Broadway
Albany, NY 12233-7014

Re: Sub Slab Depressurization System – Completion Report
Former Gastown MGP Site
Tonawanda, New York

Dear Mr. Ottaway:

On behalf of National Fuel Gas Distribution Company (National Fuel), GEI Consultants, Inc. (GEI) is pleased to submit this Completion Report to the New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH) for the installation of Sub-Slab Depressurization Systems (SSDSs) at four residential properties: the Open Bible Baptist School (School), the Gastown Sportsmen's Club (Sportsmen's Club), and a vapor barrier at one residential property near the Former Gastown Manufactured Gas Plant (MGP) Site (the "Site") located at 126 East Niagara Street, Tonawanda, New York (Fig.1). The report documents the installation of the SSDSs and the vapor barrier installed per the requirements summarized below.

NYSDEC issued to National Fuel an Order on Consent, Index #A9-0599-05-08, effective July 26, 2008 (the "Order"). The Order and a Record of Decision dated March 30, 2007 (the "ROD") provide for, among other things, the installation of SSDSs for certain properties in the vicinity of the Site.

The ROD included a provision for the installation of SSDSs at five residential dwellings physically located at 80 East Niagara Street, 84-86 East Niagara Street, 96 East Niagara Street, 13 East Avenue, and 16 East Avenue. NYSDOH also required that SSDSs be installed at the Sportsmen's Club located at 154-156 East Niagara Street and the School located at 72 East Niagara Street.

NYSDOH and NYSDEC had previously tested soil vapor beneath the buildings at each of these addresses. On July 23, 2008, NYSDOH sent letters to the owners of each of the properties, concluding that soil vapor conditions beneath the buildings were not affecting the indoor air quality at each of the properties. Regardless of these findings, NYSDEC concluded that installation of the systems would provide an additional margin of safety to mitigate the potential for soil vapor intrusion to occur and as such, instructed National Fuel to install the systems.

On October 13, 2008, on behalf of National Fuel, GEI submitted a Work Plan for the installation of the SSDSs at four residential dwellings located at 80 East Niagara Street, 84-86 East Niagara Street, 96 East Niagara Street, and 16 East Avenue. The work plan also described SSDSs for the Sportsmen's Club located at 154-156 East Niagara Street, and the School located at 72 East Niagara Street. A vapor barrier installation was described for the crawl space beneath the residence located at 13 East Avenue.

The Work Plan was verbally approved by NYSDEC on October 17, 2008 for the residential and Sportsmen's Club SSDSs, and the vapor barrier installation. The SSDS design for the School was verbally approved by NYSDEC on October 23, 2008. These verbal approvals were documented by NYSDEC via email on October 18, 2008 and October 28, 2008. Installation of the residential and Sportsmen's Club SSDSs and the vapor barrier began on October 20, 2008, and were completed on October 24, 2008. SSDS installation at the School began on October 27, 2008, and was completed on October 31, 2008.

Summary of System Design

GEI conducted Site visits in September and October 2008 to obtain property access and collect information necessary for SSDS design. The first Site visit allowed GEI design staff to inspect the Site and properties slated for SSDS installation, meet with stakeholders, obtain legal access, and verify the scope of data collection efforts necessary to design the systems. During follow-up Site visits, we conducted the following:

- Detailed inspections of each building to collect information including the type and condition of the foundation and the heating and cooling system.
- Installation of two sub-slab soil vapor monitoring points in each residential basement, if present, four at the Sportsmen's Club, and thirteen at the School.
- Collection of sub-slab soil vapor samples using Summa® canisters at 154-156 East Niagara Street, 84-86 East Niagara Street, 80 East Niagara Street, and 72 East Niagara Street.
- Soil communication testing at six of the seven properties to evaluate the radius of sub-slab vacuum influence.

The design process involved reviewing data and information collected during the aforementioned Site visits to design building specific SSDSs. The systems were designed in general accordance with the NYSDOH 2006 Soil Vapor Intrusion guidance document.

SSDS Installation

This Completion Report follows the same outline as the Work Plan dated October 13, 2008, and has been divided into sections that describe the individual SSDSs that were installed at six of the properties, and the vapor barrier installed at 13 East Avenue.

The SSDS systems generally consist of vapor extraction points installed through an existing basement slab. These points are connected to 3 to 4-inch diameter Poly Vinyl Chloride (PVC) piping that exits the building envelope near the sill elevation. Once the piping is plumbed outside the building envelope, a radon fan or regenerative blower is installed inline and the exhaust vent piping continued up the side of the building above the eave line. The fan or blower is wired into the existing electrical service and a circuit breaker or fuse dedicated to the fan or blower. U-tube liquid manometers or magnehelic gauges were installed on interior extraction pipes as well as labeling instructing the property owners to call a National Fuel representative if the manometer or gauge indicates no vacuum in the piping. Locations of the installations are shown on Fig. 1.

154-156 East Niagara Street – Gastown Sportsmen's Club

The Sportsmen's Club at 154-156 East Niagara Street is a one-story building, constructed in 1981, with a full basement and a footprint area of approximately 1,984 ft^2. The foundation is comprised of a 3-inch poured concrete slab and poured concrete walls. Beneath the concrete slab is a perimeter drain which is plumbed via perforated piping to two sump pump pits. The sump pump pits are covered with a ventilated plywood box (installed by NYSDEC) to intercept vapors. The sump pumps discharge to a coal tar recovery and groundwater treatment system installed by and currently operated by the NYSDEC.

We installed five extraction points (including one in the sump pit box) to ventilate sub slab soil vapor. Fig. 2 shows the differences between the Work Plan and the installed piping layout. A RadonAway™ HS-5000 high suction radon fan was installed outside the building envelope. A technical data sheet for this fan is provided in Appendix A. To prevent short circuiting, the two perimeter floor drains were sealed and larger cracks in the concrete floor slab were filled with a flexible sealant. The existing plywood sump cover was incorporated into the new SSDS ventilation piping, but was otherwise unaltered. A damper was installed on the sump pit ventilation piping to distribute vacuum more effectively under the entire slab. The previous ventilation fan for the plywood sump cover was removed and stored in the basement.

Sub-slab vacuum measurements were taken immediately following installation (October 23, 2008) and during post mitigation monitoring (December 1, 2008). Data from these measurements are presented in Table 1. These data indicate adequate sub-slab vacuum coverage to mitigate potential soil vapor intrusion.

96 East Niagara Street – Bardo Residence

The property at 96 East Niagara Street consists of a two story residence, constructed in 1920, with a full basement and a footprint area of 684 ft^2. The basement slab is approximately 2-inches thick. The foundation walls are constructed of poured concrete below grade and concrete blocks above grade to the sill. The slab and foundation walls are in good condition. There is no sump pump and the owner did not report water in the basement.

Two extraction points were installed to ventilate sub-slab soil vapor. The difference between the proposed and installed system was the piping and extraction point layout as shown in Fig. 3. A RadonAway™ GP-501 radon fan was installed outside the building envelope near the sill elevation. A technical data sheet for this fan is provided in Appendix A.

Sub-slab vacuum measurements were taken immediately following installation (October 22, 2008) and during post mitigation monitoring (December 3, 2008). Data from these measurements are presented in Table 2. These data indicate adequate sub slab vacuum coverage to mitigate potential soil vapor intrusion.

84-86 East Niagara Street – Hockenberry Residence

The property at 84-86 East Niagara Street is a two-story residence, constructed in 1900, with a full basement and a footprint area of 823 ft^2. The basement slab is approximately 3-inches thick and is underlain by brick, fill material, and sandy silt. The foundation walls are constructed of limestone block from the slab to the sill.

We installed five extraction points to ventilate sub slab soil vapor (Fig. 4). Several cracks and small openings in the slab were sealed with Portland cement to prevent short-circuiting. The difference between the proposed and installed system was the piping and extraction point layout as shown in Fig. 4. A RadonAway™ HS-5000 high suction radon fan was installed outside the building envelope near the sill elevation. A technical data sheet for this fan is provided in Appendix A.

Sub-slab vacuum measurements were taken immediately following installation (October 23, 2008) and during post-mitigation monitoring (December 3, 2008). Data from these measurements are presented in Table 3. These data indicate vacuum present beneath the slab in certain locations but not consistent distribution. The magnitude of observed vacuum beneath the slab decreased significantly between installation and post mitigation monitoring, which is indicative of perched surface water infiltration after rain events. We believe that low/intermittent vacuum is related to the presence of perched water, and these conditions are not related to an undersized fan or too widely spaced vapor extraction points.

On December 11, 2008, the homeowner notified National Fuel and GEI of "water gurgling" in the northwestern extraction point piping. On December 17, 2008, we installed a vacuum relief valve in the fan influent pipe and a magnehelic gauge to monitor vacuum more precisely. The purpose of the vacuum relief valve is to provide adequate air supply to the fan when surface water infiltration fills the sub slab extraction points. When surface water infiltrates into the extraction points, air flow is reduced significantly and vacuum increases enough to draw water vertically into the ventilation piping. By providing outside make-up air when the vacuum increases significantly, the vacuum is lowered enough to reduce "water gurgling" in the piping. The system typically operates at approximately 6.5 inches of water column (w.c.) during dry conditions. The vacuum relief valve was set to open at 15 inches of water column (w.c.), initially.

To verify the water was from surface water infiltration and not a rising water table, we measured the depth to groundwater in monitoring well DPW-57, surveyed the well casing and 84-86 East Niagara Street basement slab elevation. We calculated the water table was 3.1 feet below the slab which is at an elevation at approximately 570.6 feet and the water table at approximately 567.5 feet.

On December 24, 2008, the homeowner again notified GEI of "water gurgling" in the northwestern extraction point. On January 7, 2009, CIR Electric personnel reduced the setting on the vacuum relief valve. The lower setting on the vacuum relief valve should have supplied adequate flow to minimize "water gurgling" in the ventilation piping under wet conditions.

In February 2009, the homeowner again notified GEI of "water gurgling" in the northwestern extraction point. On March 2, 2009, GEI reduced the setting on the vacuum relief valve to open at approximately 9 inches of w.c. and to further minimize "water gurgling".

On April 14, 2009, the homeowner reported to GEI that after several rain events in March and April 2009 he did not observe "water gurgling" in the system piping.

Under dry conditions, sub-slab vacuum distribution is adequate to prevent potential soil vapor intrusion. Under wet conditions, the vadose zone (unsaturated soil) under the slab becomes saturated from water infiltration, thereby, preventing possible soil vapor intrusion.

80 East Niagara Street – Cehulik Residence

The property at 80 East Niagara Street is a two-story residence, constructed in 1910, with a full basement and a footprint area of 1,122 ft^2. The basement slab is approximately 3-inches thick, and the foundation walls are constructed of poured concrete below grade and concrete blocks above grade to the sill.

Two extraction points were installed to ventilate sub slab soil vapor. The difference between the proposed and installed system was the piping and extraction point layout and fan location as shown in Fig. 5. A RadonAway™ GP-501 radon fan was installed outside the building envelope near the sill elevation. A technical data sheet for this fan is provided in Appendix A.

During SSDS installation, the owner reported water seeping through basement walls during heavy rain. To help reduce surface water infiltration into sub slab vapor extraction pits, we applied a rubberized asphalt sealant to the cracks around the outer foundation wall at the ground surface. The sealant was only applied to cracks where the foundation abutted asphalt. Sealant was not applied to the foundation where it abutted landscaped areas.

Sub-slab vacuum measurements were taken immediately following installation (October 24, 2008) and during post mitigation monitoring (December 3, 2008). Data from these measurements are presented in Table 4. These data indicate adequate sub slab vacuum coverage to mitigate potential soil vapor intrusion.

13 East Avenue – Hazen Residence

The property at 13 East Avenue is a one and a half story residence, constructed in 1926, with a crawl space, no basement, and a footprint area of 790 ft^2. The house is supported by wood posts on concrete piers creating an approximately 18-inch high crawl space below the first floor. The crawl space is enclosed by plywood boards which are attached to the rim joists and vertical supports. The floor of the crawl space is comprised of several inches of crushed stone. The presence of the crawl space creates a break for potential soil vapor intrusion. To add another measure of safety, beyond the crawl space break, we installed a vapor barrier on top of the crawl space floor.

We installed a 40-mil High Density Polyethylene (HDPE) vapor barrier membrane over the entire crawl space floor. The membrane is sealed to the concrete support piers using HDPE tape and mastic. This membrane is thicker than the 20-mil HDPE vapor barrier specified in the Work Plan and was installed at a greater thickness to replace the proposed filter fabric. With the exception of this modification, the vapor barrier was installed as described in the Work Plan. Figure 6 illustrates the vapor barrier installation.

16 East Avenue – Fisher Residence

The property at 16 East Avenue is a two-story residence, constructed in 1895, and reportedly moved in the 1970s onto the present foundation. The basement slab is approximately 5-inches thick and the foundation walls are constructed of poured concrete below grade and concrete block above grade to the sill. There is no sump pump and the owner did not report water seepage into the basement.

The difference between the planned and installed system was the location of the piping and the exhaust fan. Fig. 7 shows the differences between the Work Plan and installed piping layout. We installed the planned four extraction points to capture sub slab soil gas. A high suction RadonAway™ HS-5000 radon fan was installed outside the building footprint. A technical data sheet for this fan is provided in Appendix A.

Sub-slab vacuum measurements were taken immediately following installation (October 21, 2008) and during post mitigation monitoring (December 1, 2008). Data from these measurements are presented in Table 5. These data indicate adequate sub slab vacuum coverage to mitigate potential soil vapor intrusion.

72 East Niagara Street – Open Bible Baptist School

The School is a three-story (including basement) brick building, constructed in 1924, with an adjoining two-story concrete addition constructed in 1982 (Fig. 7). The older building has a poured concrete foundation wall below grade with concrete block from grade to the sill elevation. The floor slab is approximately 8-inches thick and the basement space includes two large storage rooms beneath stairwells, a boiler room, a workshop, bathrooms, a gymnasium and two sump pumps. The new building has a poured concrete foundation below grade with concrete blocks above grade. The slab is approximately 5-inches thick and the space includes several classrooms, a computer room, a cafeteria, and two sump pumps (Fig. 8).

In the Work Plan, we referred to three separate areas of the buildings, the gymnasium elevation, boiler room elevation, and the new portion. During installation, we segregated the building differently and into the North, South, and East zones based on logistical layout of the piping network. These zones are illustrated in Figure 8.

Differences between the Work Plan and installed piping layout are shown in Fig. 8. Principle differences include the number of extraction points, and the precise location of piping, manifold, and main header pipe.

We installed ten instead of the planned nine extraction points among three zones to ventilate sub slab soil vapor. The north and south zones each include three extraction points and the east zone includes four extraction points. In certain instances, extraction points were located to also provide condensation drainage. Soil vapor from the three zones merge at a manifold located on the south wall of the boiler room instead of the planned west wall. The manifold includes three butterfly valves and four vacuum gauges to monitor system operation without accessing the roof. The butterfly valves are used to balance the flow and distribute vacuum more effectively.

A single 4-inch diameter main header pipe located above a drop ceiling exits the building through the south wall and carries the combined soil vapor flow from the three zones. The main header pipe extends up the side of the building and is connected to a Republic HRB-

501 3-horsepower regenerative blower located on the roof. A technical data sheet for this fan is provided in Appendix A. The blower operates at approximately 115 cubic feet per minute (cfm) at 4.5 inches of w.c. vacuum. The blower is enclosed in a shed and the exhaust is vented approximately 10 feet above the roofline. An auto dialer was installed to notify National Fuel or their representative in the event of power loss or flow reduction. A high vacuum relief valve was installed to protect the blower should the water table rise and fill the sub slab vapor extraction points. A silencer was installed on the effluent blower discharge in the shed to reduce noise. We measured a sound level of 79 decibels (db) inside the shed with the blower operating and 68 db outside the shed with the door closed. We have not received any complaints from School personnel or neighbors regarding blower noise.

Sub-slab vacuum measurements were taken immediately following installation (October 31, 2008) and during post mitigation monitoring (December 2, 2008). During post mitigation monitoring, piping in the vicinity of extraction point EX-3 was modified to mitigate condensation accumulation. Data from these measurements are presented in Table 6. These data indicate adequate sub slab vacuum coverage to mitigate potential soil vapor intrusion.

System Operation & Monitoring

National Fuel or a representative will perform annual inspections of the systems at the convenience of the property owner. SSDS annual inspections will include checking for system power and vacuum to verify proper system operation. The vapor barrier membrane at 13 East Avenue will be inspected for alteration. The School SSDS has an automated notification system. The Sportsmen's Club and residences have liquid manometers or a magnehelic gauge indicating proper operation that can be monitored by the property owner.

Very truly yours,
GEI Consultants, Inc.

David Terry P.G., LEP
Program Manager / Vice President

Attachments

Tables:
1. Summary of Sub-Slab Vacuum Testing at 154-156 East Niagara Street
2. Summary of Sub-Slab Vacuum Testing at 96 East Niagara Street
3. Summary of Sub-Slab Vacuum Testing at 84-86 East Niagara Street
4. Summary of Sub-Slab Vacuum Testing at 80 East Niagara Street

Tables continued:
5. Summary of Sub-Slab Vacuum Testing at 16 East Niagara Street
6. Summary of Sub-Slab Vacuum Testing at 72 East Niagara Street

Figures:
1. Site Plan
2. 154-156 East Niagara Street
3. 96 East Niagara Street
4. 84-86 East Niagara Street
5. 80 East Niagara Street
6. 13 East Avenue
7. 16 East Avenue
8. 72 East Niagara Street

Appendices:
A. SSDS Fan and Blower Technical Data Sheets

c: R. Schick, NYSDEC
M. Lesser, NYSDEC
M. Baetzhold, NYSDEC
G. May, NYSDEC
G. Litwin, NYSDOH
C.O'Connor, NYSDOH
J. LaMonaco, City of Tonawanda
T. Alexander, National Fuel
J. Greenthal, Nixon Peabody
M. Zukauskas, P.E.
B. Simons, P.G., LSP

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Table 1
Summary of Sub-Slab Vacuum Testing at 154-156 East Niagara Street
Tonawanda, New York

		Date:	10/23/08	12/1/08
Property Address	**Owner**	**Sub-Slab Monitoring Point**	**Vacuum (inches w.c.)**	
156 East Niagara Street	Gastown Sportsmens Club	SS1	-0.155	-0.117
		SS2	-0.137	-0.076
		SS3	-0.061	-0.048
		SS4	-0.023	-0.013

General Notes:
1. See Fig. 2 for monitoring point locations.
2. Sub-slab depressurization system (SSDS) began operation on 10/23/08.
3. w.c. = water column

Table 2
Summary of Sub-Slab Vacuum Testing at 96 East Niagara Street
Tonawanda, New York

		Date:	10/22/08	12/3/08
Property Address	**Owner**	**Sub-Slab Monitoring Point**	**Vacuum (inches w.c.)**	
96 East Niagara Street	David & Pamela Bardo	SS1	NM	NM
		SS2	-1.050	-1.036
		SS3	-0.333	-0.317
		SS4	-0.693	-0.683

General Notes:
1. See Fig. 3 for monitoring point locations.
2. Sub-slab depressurization system (SSDS) began operation on 10/22/08.
3. NM = not measured

Table 3
Summary of Sub-Slab Vacuum Testing at 84-86 East Niagara Street
Tonawanda, New York

		Date:	10/23/08	12/3/08
Property Address	**Owner**	**Sub-Slab Monitoring Point**	**Vacuum (inches w.c.)**	
86 East Niagara Street	Robert & Judith Hockenberry	SS1	-0.600	0
		SS2	-0.275	-0.049
		SS3	0	0
		SS4	-0.336	-0.073

General Notes:
1. See Fig. 4 for monitoring point locations.
2. Sub-slab depressurization system (SSDS) began operation on 10/23/08.
3. Monitoring point SS3 is adjacent to a floor drain pipe that may cause localized short circuiting.
4. Monitoring point SS1 fluctuated between negative and positive values. Average is reported here.
5. w.c. = water column

Table 4
Summary of Sub-Slab Vacuum Testing at 80 East Niagara Street
Tonawanda, New York

		Date:	10/24/08	12/2/08
Property Address	**Owner**	**Sub-Slab Monitoring Point**	**Vacuum (inches w.c.)**	
80 East Niagara Street	Frank J. and Pattie R. Cehulik	SS1	-0.715	-0.707
		SS2	-0.125	-0.121
		SS3	-0.969	-0.952

General Notes:
1. See Fig. 5 for monitoring point locations.
2. Sub-slab depressurization system (SSDS) began operation on 10/24/08.
3. w.c. = water column

Table 5
Summary of Sub-Slab Vacuum Testing at 16 East Avenue
Tonawanda, New York

		Date:	10/21/08	12/1/08
Property Address	**Owner**	**Sub-Slab Monitoring Point**	**Vacuum (inches w.c.)**	
16 East Avenue	Richard and Ruth Fisher	SS1	NM	-0.299
		SS2	-0.182	-0.191
		SS3	-0.173	-0.178
		SS4	-0.195	-0.183

General Notes:
1. See Fig. 6 for monitoring point locations.
2. Sub-slab depressurization system (SSDS) began operation on 10/21/08.
3. NM = not measured
4. w.c. = water column

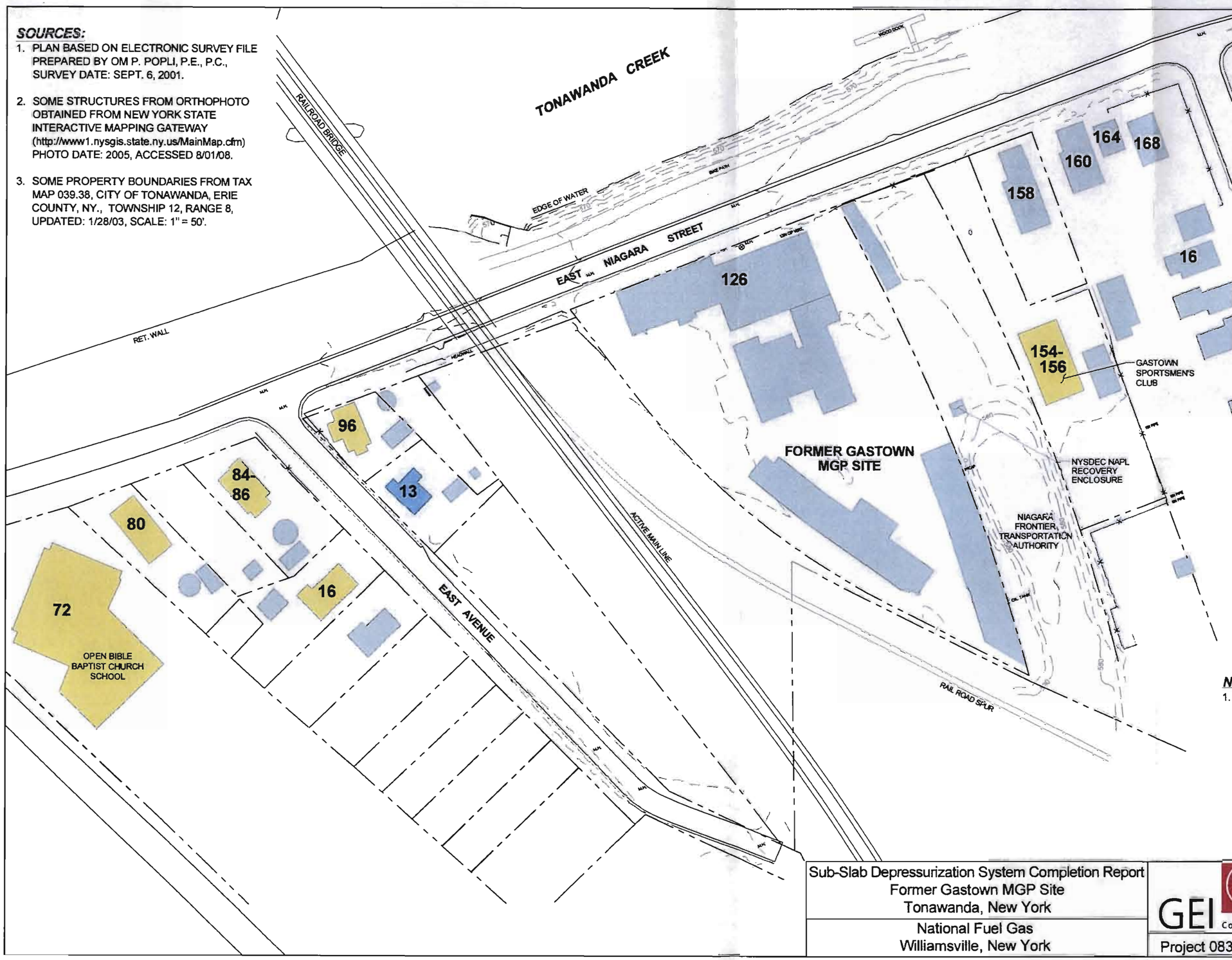
Table 6
Summary of Sub-Slab Vacuum Testing at 72 East Niagara Street
Tonawanda, New York

		Date:	10/31/08	12/2/08
Property Address	**Owner**	**Monitoring Point**	**Vacuum (inches wc.)**	**Vacuum (inches wc.)**
72 East Niagara Street	Open Bible Baptist Church, Pastor Neisen	A1	-0.108	-0.075
		A2	-0.065	NM
		A4	-0.009	NM
		A5	-0.076	-0.060
		B2	0	0
		B3	-0.008	-0.004
		B4	0	0
		C1	-0.235	-0.26
		C2	-0.330	-0.374
		C3	-0.117	-0.171
		C5	-0.251	-0.246
		Combined Header	NM	-4.1
		D3	-0.022	-0.016
		East Header	NM	-1.6
		E3	-0.028	-0.045
		E4	-0.104	-0.113
		E6	-0.015	-0.015
		EX1	-0.315	-0.478
		EX2	-0.301	-0.471
		EX3	-0.407	-0.582
		EX4	-0.568	-0.804
		F6	-0.018	-0.016
		G3	-0.016	-0.014
		G4	-0.029	-0.026
		G5	-0.025	-0.017
		G6	-0.011	-0.012
		North Header	NM	-3.7
		NX1	-2.522	-3.209
		NX2	-2.579	-3.225
		NX3	-2.598	-3.224
		South Header	NM	-3.8
		SS1	-0.028	-0.024
		SS2	NM	-0.090
		SX1	-2.890	-3.652
		SX2	-2.910	-3.648
		SX3	-2.967	-3.683

General Notes:
1. See Fig. 7 for monitoring point locations.
2. Sub-slab depressurization system (SSDS) began operation on 10/31/08.
3. w.c. = water column
4. NM = not measured
5. NA = not applicable

SOURCES:

1. PLAN BASED ON ELECTRONIC SURVEY FILE PREPARED BY OM P. POPLI, P.E., P.C., SURVEY DATE: SEPT. 6, 2001.
2. SOME STRUCTURES FROM ORTHOPHOTO OBTAINED FROM NEW YORK STATE INTERACTIVE MAPPING GATEWAY (http://www1.nysgis.state.ny.us/MainMap.cfm) PHOTO DATE: 2005, ACCESSED 8/01/08.
3. SOME PROPERTY BOUNDARIES FROM TAX MAP 039.38, CITY OF TONAWANDA, ERIE COUNTY, NY., TOWNSHIP 12, RANGE 8, UPDATED: 1/28/03, SCALE: 1" = 50'.



NOTES:

1. OWNER OR OCCUPANT INFORMATION IS BASED ON AN UNDATED DRAWING PROVIDED BY JACK HOLLER AND AUGUST 5, 2008 SITE VISIT.

0 80 160

SCALE, FEET

Sub-Slab Depressurization System Completion Report
Former Gastown MGP Site
Tonawanda, New York

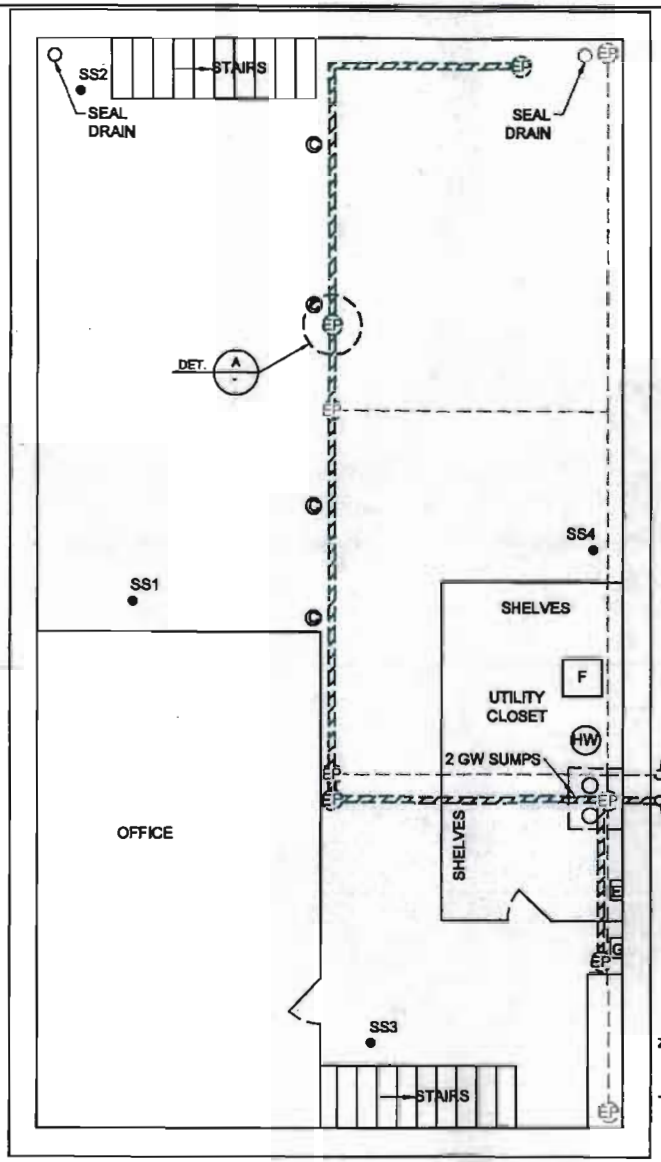
National Fuel Gas
Williamsville, New York

GEI Consultants

SITE PLAN

Project 08334-0 | April 2009 | Fig. 1

M:\DRAFTING\2008\083340 Gas Town\SSDS REPORT



APPROXIMATE NORTH

SPECIFICATIONS:

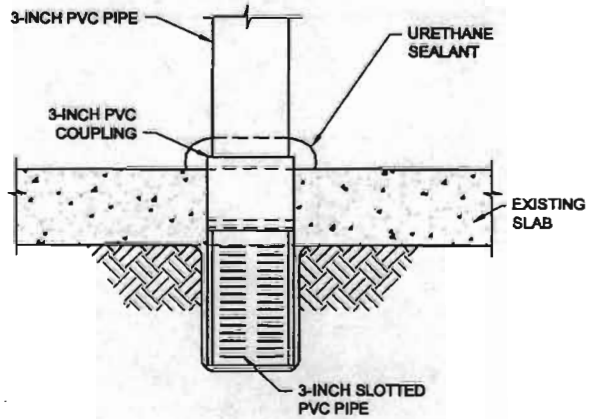
1) SOLID PVC PIPE: ASTM D1785, SCHEDULE 40
2) PERFORATED PVC PIPE: ASTM D2729
3) URETHANE SEALANT: CHEM CAULK ® 916 TEXTURED
4) VENTILATION PIPING EXITS BUILDING ENVELOPE ABOVE SILL ELEVATION
5) RADONAWAY HS 5000 FAN

NOTE:

1. SITE PLAN BASED ON GEI FIELD MEASUREMENTS.

LEGEND:

- C: COLUMN
- E: ELECTRICAL PANEL
- EP: EXTRACTION POINT
- F: FURNACE
- G: GAS METER
- HW: HOT WATER HEATER
- OVERHEAD PIPING INSTALLED OCTOBER 23, 2008
- OVERHEAD PIPING AND EXTRACTION POINTS PROPOSED IN WORK PLAN DATED OCTOBER 13, 2008 (NOT INSTALLED)
- SS1: SUB-SLAB MONITORING POINT



DETAIL - VENT PIPE PENETRATION THRU BASEMENT FLOOR SLAB (A)

EXTRACTION PIT
NOT TO SCALE

BASEMENT
0 5 10
1/10" = 1'-0"

Sub-Slab Depressurization System Completion Report
Former Gastown MGP Site
Tonawanda, New York

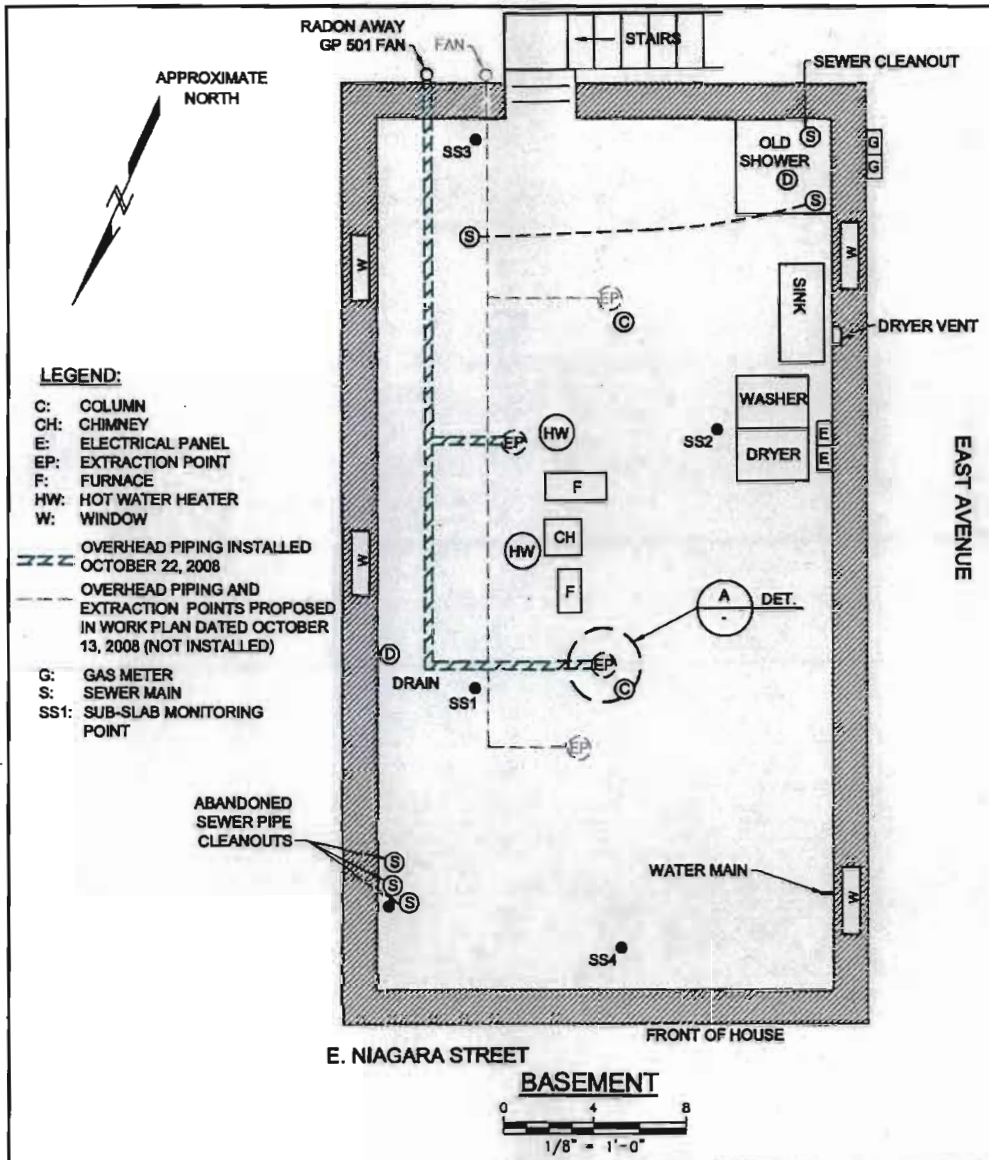
National Fuel Gas
Williamsville, New York

GEI Consultants

SUB-SLAB DEPRESSURIZATION SYSTEM
154-156 EAST NIAGARA STREET
TONAWANDA, NY

Project 08334-0 | April 2009 | Fig. 2

M:\DRAFTING\2008\083340 Gas Town\RVM 156 East Niagara Street



BASEMENT

0 4 8

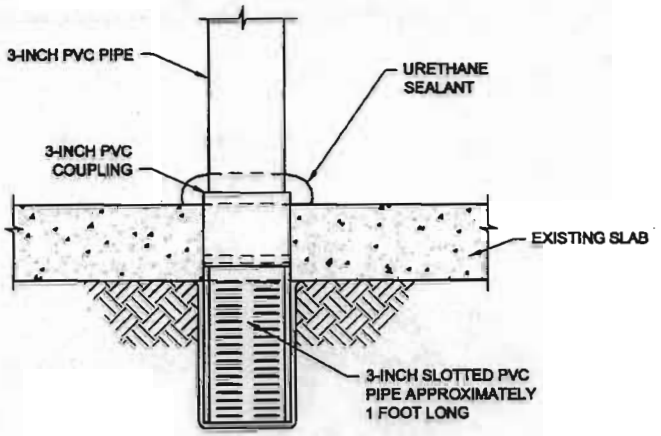
1/8" = 1'-0"

SPECIFICATIONS:

1) SOLID PVC PIPE: ASTM D1785, SCHEDULE 40
2) PERFORATED PVC PIPE: ASTM D2729
3) URETHANE SEALANT: CHEM CAULK ® 916 TEXTURED
4) VENTILATION PIPING EXITS BUILDING ENVELOPE ABOVE SILL ELEVATION
5) RADONAWAY GP 501 FAN

NOTE:

1. SITE PLAN BASED ON GEI FIELD MEASUREMENTS.



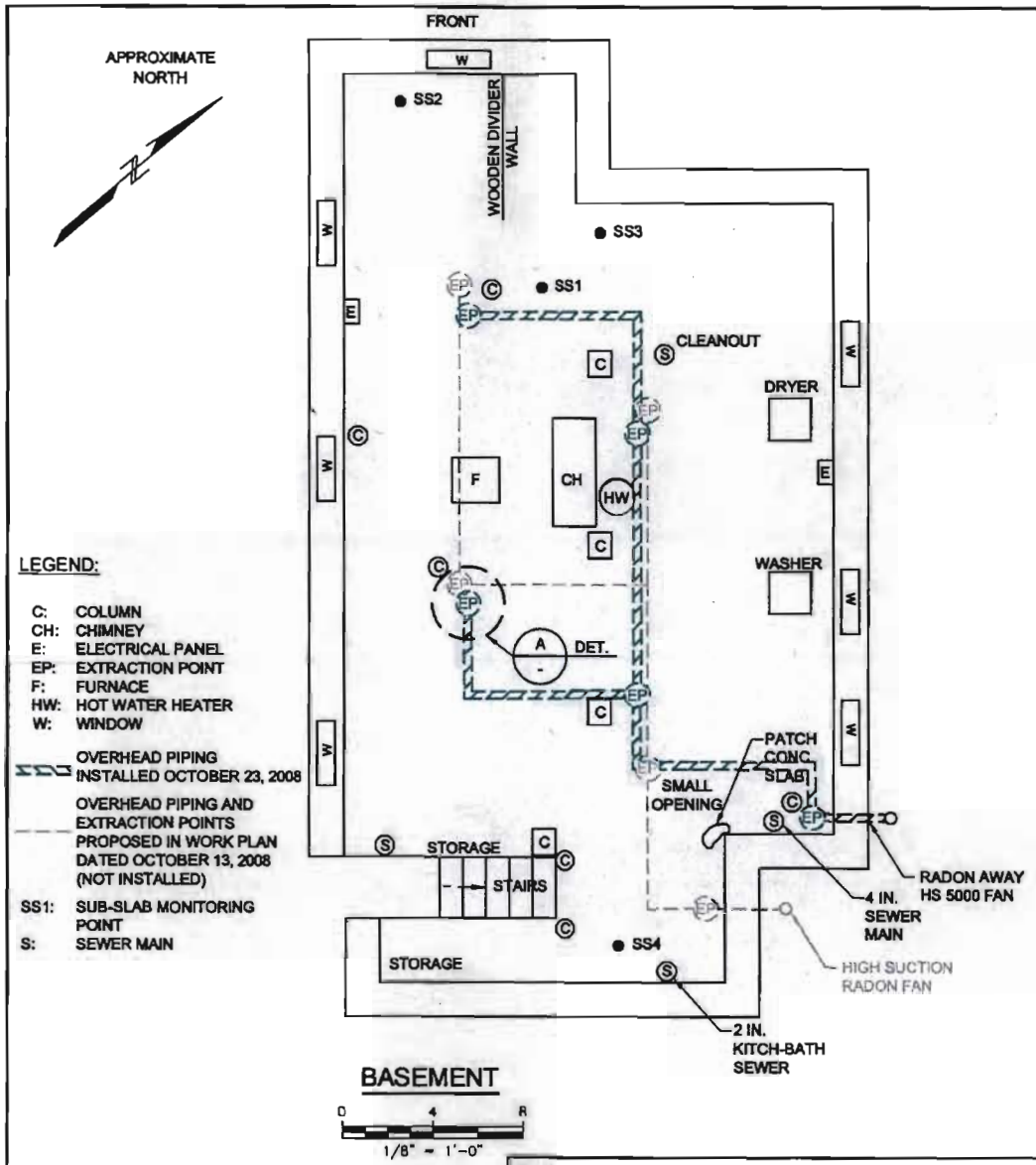
DETAIL - VENT PIPE PENETRATION THRU BASEMENT FLOOR SLAB (A/-)

EXTRACTION PIT

NOT TO SCALE

Sub-Slab Depressurization System Completion Report Former Gastown MGP Site Tonawanda, New York	GEI Consultants	SUB-SLAB DEPRESSURIZATION SYSTEM 96 EAST NIAGARA STREET TONAWANDA, NY
National Fuel Gas Williamsville, New York	Project 08334-0	April 2009 Fig. 3

M:\DRAFTING\2008\083340 Gas Town\RVM 96 East Niagara Street

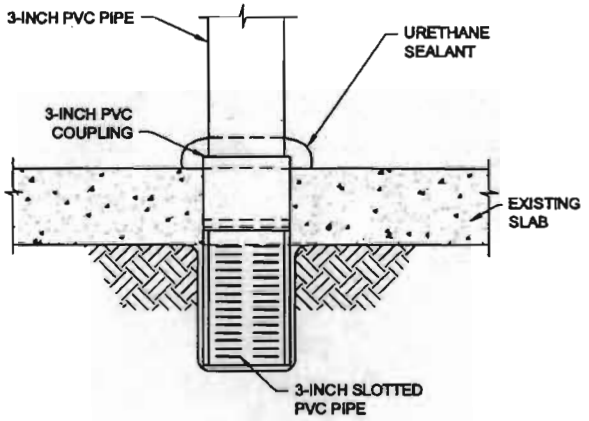


SPECIFICATIONS:

1) SOLID PVC PIPE: ASTM D1785, SCHEDULE 40
2) PERFORATED PVC PIPE: ASTM D2729
3) URETHANE SEALANT: CHEM CAULK ® 916 TEXTURED
4) VENTILATION PIPING EXITS BUILDING ENVELOPE ABOVE SILL ELEVATION
5) PORTLAND CEMENT (ASTM C150): TYPE II OR IIA
6) RADONAWAY HS 5000 FAN

NOTE:

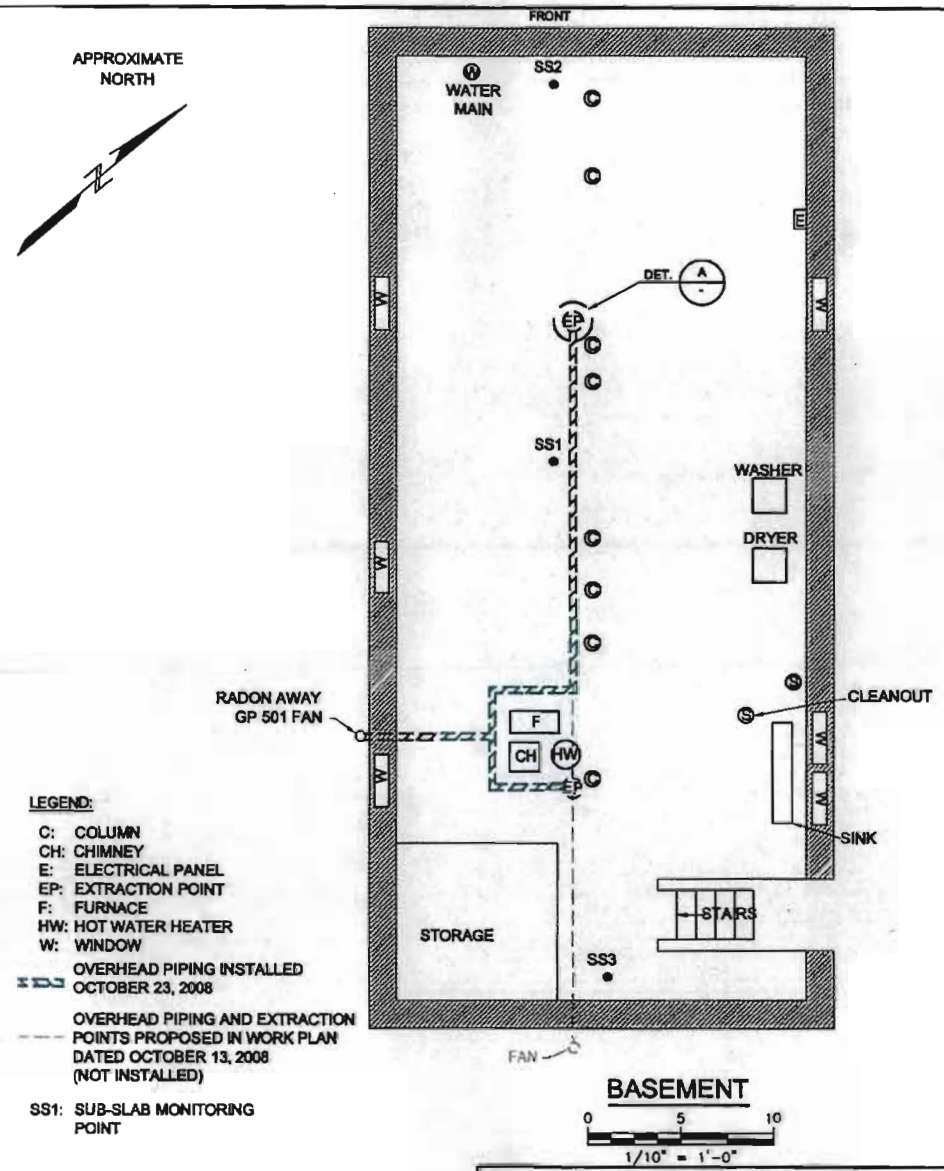
1. SITE PLAN BASED ON GEI FIELD MEASUREMENTS.



DETAIL - VENT PIPE
PENETRATION THRU BASEMENT FLOOR SLAB (A / -)
EXTRACTION PIT
NOT TO SCALE

Sub-Slab Depressurization System Completion Report Former Gastown MGP Site Tonawanda, New York	GEI Consultants	SUB-SLAB DEPRESSURIZATION SYSTEM 84-86 EAST NIAGARA STREET TONAWANDA, NY
National Fuel Gas Williamsville, New York	Project 08334-0	April 2009 Fig. 4

M:\DRAFTING\2008\083340 Gas Town\RVM 84-86 East Niagara Street

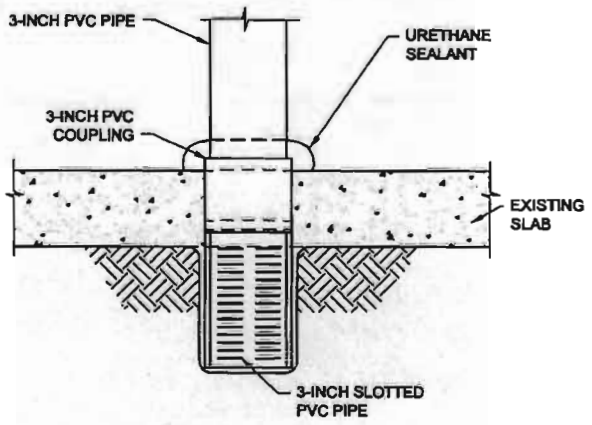


SPECIFICATIONS:

1) SOLID PVC PIPE: ASTM D1785, SCHEDULE 40
2) PERFORATED PVC PIPE: ASTM D2729
3) URETHANE SEALANT: CHEM CAULK ® 916 TEXTURED
4) VENTILATION PIPING EXITS BUILDING ENVELOPE ABOVE SILL ELEVATION
5) RADONAWAY GP 501 FAN

NOTE:

1. SITE PLAN BASED ON GEI FIELD MEASUREMENTS.



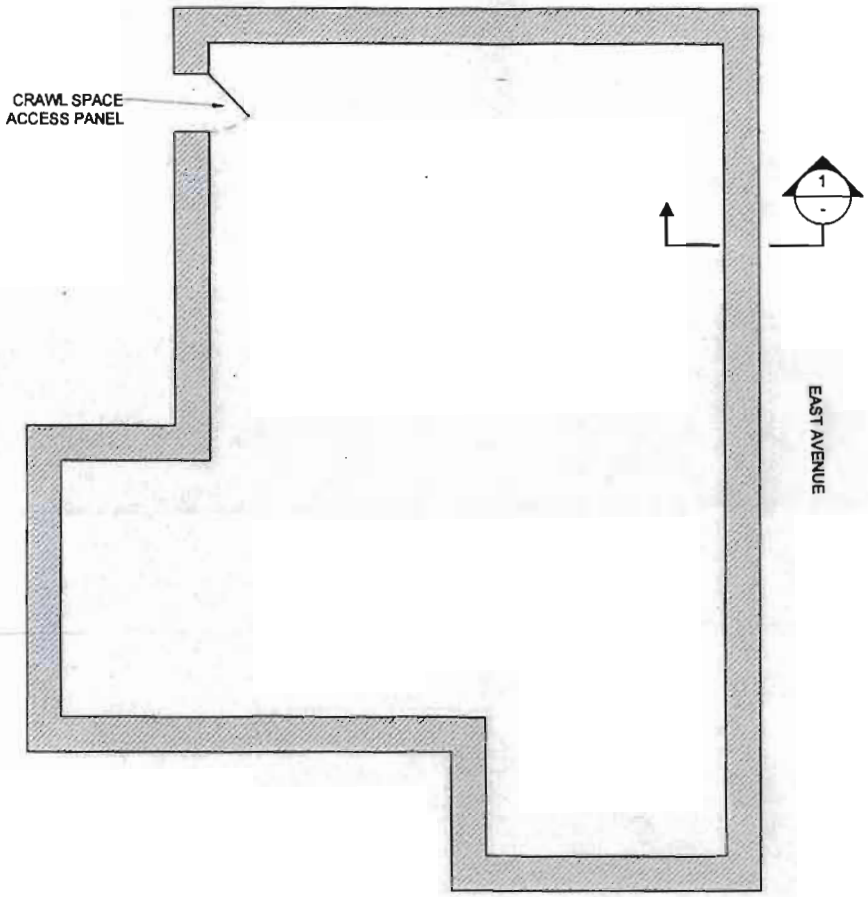
DETAIL - VENT PIPE
PENETRATION THRU BASEMENT FLOOR SLAB A -

EXTRACTION PIT

NOT TO SCALE

Sub-Slab Depressurization System Completion Report Former Gastown MGP Site Tonawanda, New York	GEI Consultants	SUB-SLAB DEPRESSURIZATION SYSTEM 80 EAST NIAGARA STREET TONAWANDA, NY
National Fuel Gas Williamsville, New York	Project 08334-0	April 2009 Fig. 5

M:\DRAFTING\2008\083340 Gas Town\RVM 80 East Niagara Street



APPROXIMATE NORTH

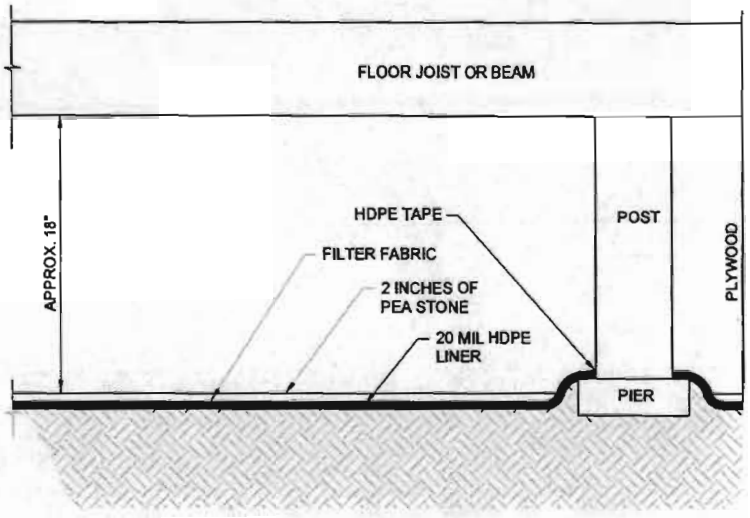
1
-

SPECIFICATIONS:

1) POLYPROPYLENE FILTER FABRIC 20 MIL HDPE LINER. SEAMS SEALED WITH HDPE TAPE
2) FILTER FABRIC: 12 OZ. POLYPROPYLENE NON-WOVEN GEOTEXTILE

NOTE:

1. SITE PLAN BASED ON GEI FIELD MEASUREMENTS.



CRAWL SPACE

0 4 8

1/8" = 1'-0"

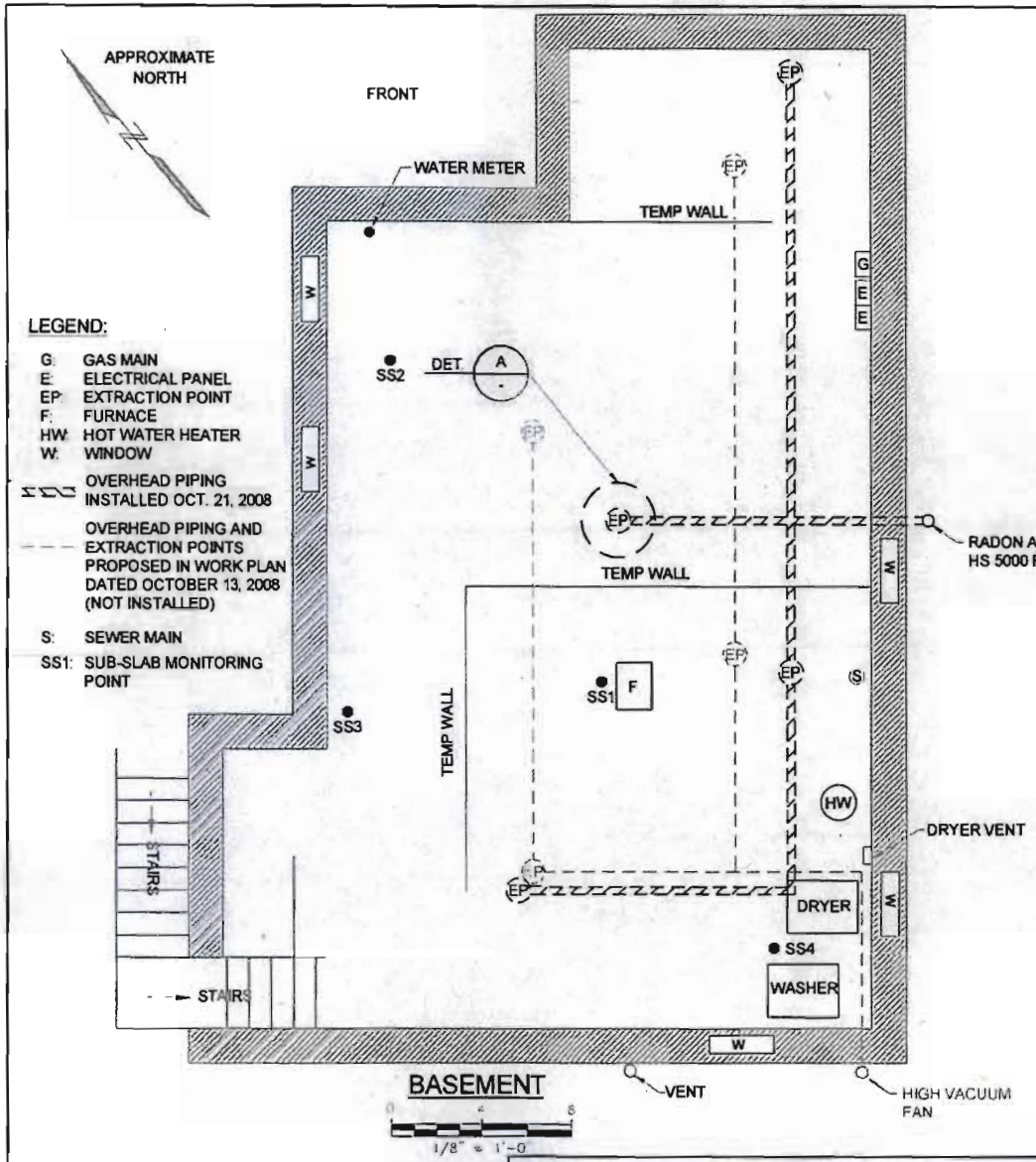
SECTION 1/-

VAPOR BARRIER MEMBRANE

NOT TO SCALE

Sub-Slab Depressurization System Completion Report Former Gastown MGP Site Tonawanda, New York	GEI Consultants	VAPOR BARRIER MEMBRANE 13 EAST AVENUE TONAWANDA, NY
National Fuel Gas Williamsville, New York	Project 08334-0	April 2009 Fig. 6

M:\DRAFTING\2008\083340 Gas Town\RVM 13 East avenue

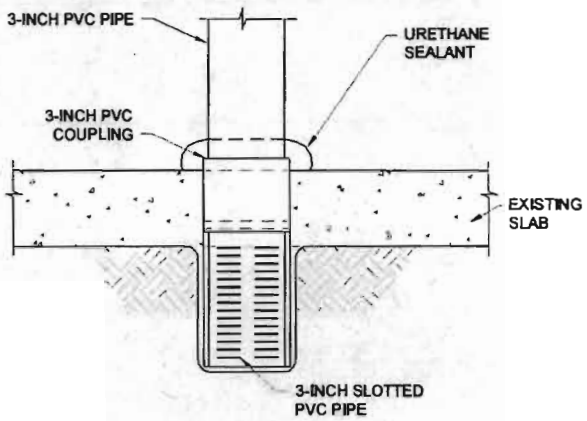


SPECIFICATIONS:

1) SOLID PVC PIPE: ASTM D1785, SCHEDULE 40
2) PERFORATED PVC PIPE: ASTM D2729
3) URETHANE SEALANT: CHEM CAULK ® 916 TEXTURED
4) VENTILATION PIPING EXITS BUILDING ENVELOPE ABOVE SILL ELEVATION
5) RADONAWAY HS 5000 FAN

NOTE:

1. SITE PLAN BASED ON GEI FIELD MEASUREMENTS.



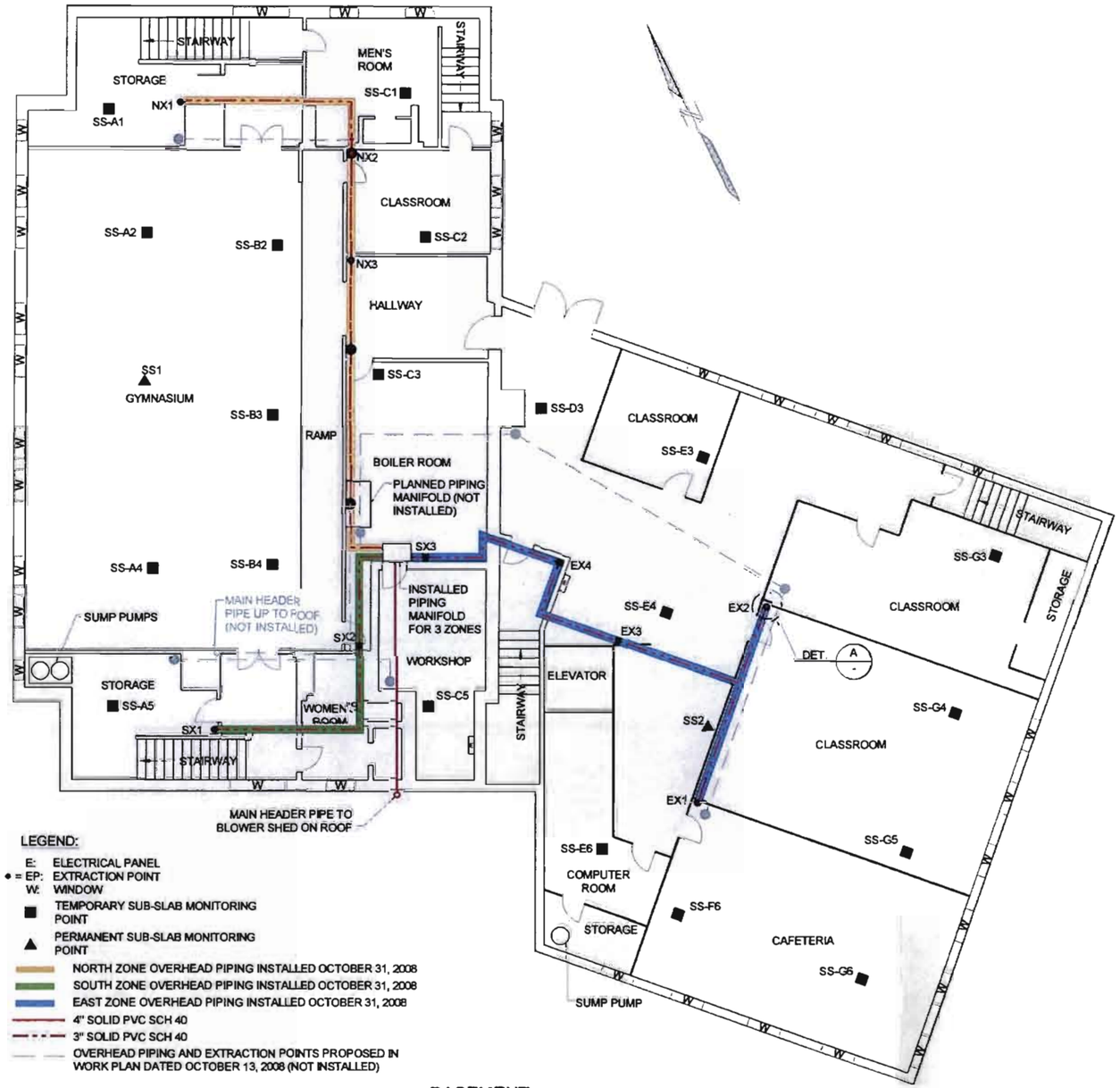
DETAIL - VENT PIPE PENETRATION THRU BASEMENT FLOOR SLAB (A)

EXTRACTION PIT

NOT TO SCALE

Sub-Slab Depressurization System Completion Report Former Gastown MGP Site Tonawanda, New York	GEI Consultants	SUB-SLAB DEPRESSURIZATION SYSTEM 16 EAST AVENUE TONAWANDA, NY
National Fuel Gas Williamsville, New York	Project 08334-0	February 2009 Fig. 7

M:\DRAFTING\2008\083340 Gas Town\RVM 16 East Avenue



LEGEND:

- E: ELECTRICAL PANEL
- ● = EP: EXTRACTION POINT
- W: WINDOW
- ■ TEMPORARY SUB-SLAB MONITORING POINT
- ▲ PERMANENT SUB-SLAB MONITORING POINT
- NORTH ZONE OVERHEAD PIPING INSTALLED OCTOBER 31, 2008
- SOUTH ZONE OVERHEAD PIPING INSTALLED OCTOBER 31, 2008
- EAST ZONE OVERHEAD PIPING INSTALLED OCTOBER 31, 2008
- 4" SOLID PVC SCH 40
- 3" SOLID PVC SCH 40
- OVERHEAD PIPING AND EXTRACTION POINTS PROPOSED IN WORK PLAN DATED OCTOBER 13, 2008 (NOT INSTALLED)

BASEMENT

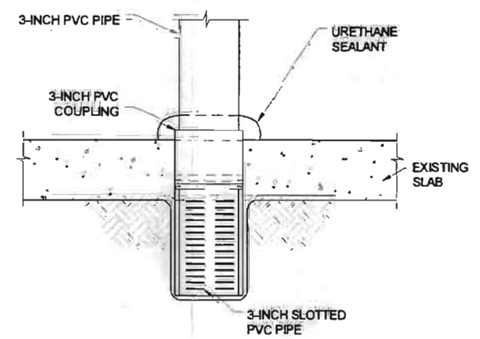
0 8 16
1/16" = 1'-0"

SPECIFICATIONS:

1) SOLID PVC PIPE: ASTM D1785, SCHEDULE 40
2) PERFORATED PVC PIPE: ASTM D2729
3) URETHANE SEALANT: CHEM CAULK ® 916 TEXTURED

NOTES:

1. SITE PLAN BASED ON RUSSEL ASSOCIATES DRAWINGS AND GEI FIELD MEASUREMENTS.
2. 3 HORSEPPOWER BLOWER TO BE PLACED ON ROOF.
3. EXACT PIPING LAYOUT TO BE DETERMINED IN THE FIELD.



DETAIL - VENT PIPE
PENETRATION THRU BASEMENT FLOOR SLAB (A / -)
EXTRACTION PIT
NOT TO SCALE

Sub-Slab Depressurization System Completion Report Former Gastown MGP Site Tonawanda, New York	GEI Consultants	SUB-SLAB - PERM-SLAB DEPRESSURIZATION SYSTEM 72 EAST NIAGARA STREET TONAWANDA, NY
National Fuel Gas Williamsville, New York	Project 08334-0	April 2009 Fig. 8

M:\DRAFTING\2008\083340 Gas Town\RVM 72 East Niagara Street-2

APPENDIX A

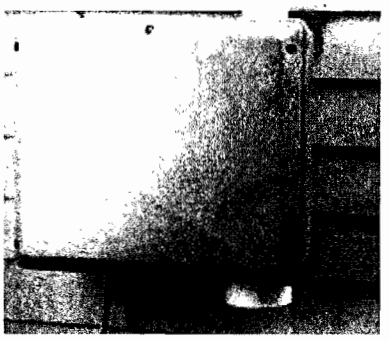
SSDS Fan and Blower Technical Data Sheets

RadonAway

MAKING HOMES SAFER. EVERYDAY.

- PRODUCTS
  - Fan Replacement Guide
  - RP Series
  - XP/XR Series
  - GP Series
  - GP 500
  - **HS Series**
  - AIRaider Series
  - System Monitors/Alarms
- RADON INFO
- TRAINING & EVENTS
- COMPANY NEWS & INFO
- CONTACT US

HS Series



RadonAway's HS Series fans are a proven solution to tough mitigations, providing up to 25 times the suction of inline tube fans to deal with sand, dirt or clay sub-slab material.

Features:

- Internal condensate bypass
- Mounts vertically indoors or outdoors
- Inlet: 3.0" PVC/Outlet: 2.0" PVC
- Weight: 18 lbs.
- Size: 15"W x 13"H x 8"D
- Warranty: 1 year (3-year option available)

Model Selection Guidelines:

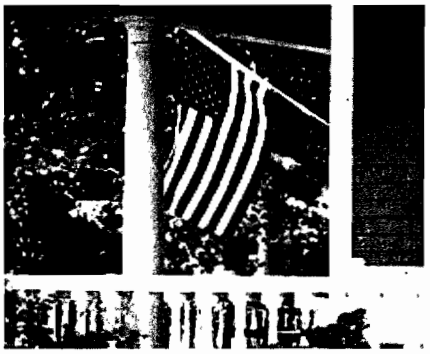
HS2000 - High suction and high flow for large areas such as schools and commercial buildings

HS3000 - Single family homes with very tight sub-slab material

HS5000 - For extremely tight sub-slab material or where the number of holes is restricted; also useful for high altitudes

Additional Fan Information:

Downloadable Fan Installation Instructions (PDF format)

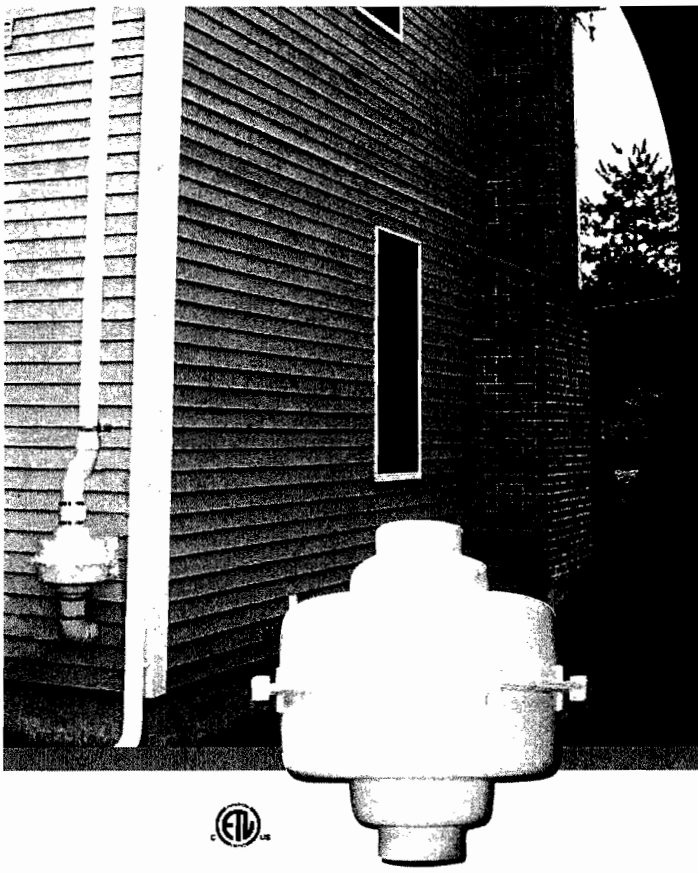


Model	P/N	Watts	Maximum Pressure "WC	Typical CFM vs. Static Pressure WC					
				0"	10"	15"	20"	25"	35"
HS2000	23004-1	150-270	18	110	72	40	-	-	-
HS3000	23004-2	105-195	27	40	33	30	23	18	-
HS5000	23004-3	180-320	50	53	47	42	38	34	24

Each fan includes 6 ft. 18 ga. power cord with 3 prong plug.

RadonAway™
The World's Leading Radon Fan Manufacturer

GP Series



Radon Mitigation Fans

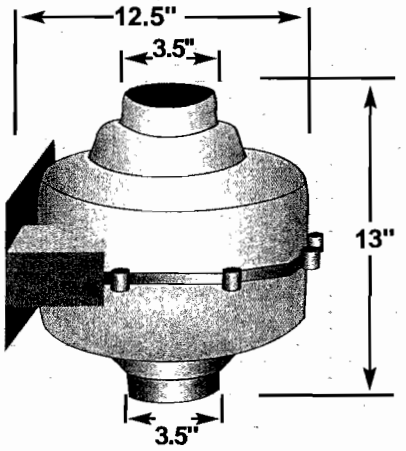
All RadonAway fans are specifically designed for radon mitigation. GP Series Fans provide a wide range of performance that makes them ideal for most sub-slab radon mitigation systems.

Features:

- Five-year hassle-free warranty
- Mounts on duct pipe or with integral flange
- 3.5" diameter ducts for use with 3" or 4" pipe
- Electrical box for hard wire or plug in
- ETL Listed - for indoor or outdoor use
- Meets all electrical code requirements
- Thermally protected
- Rated for commercial and residential use.

Model	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	40-60	2.0	82	58	5	-	-	-	-
GP301	55-90	2.6	92	77	45	10	-	-	-
GP401	60-110	3.4	93	82	60	40	15	-	-
GP501	70-140	4.2	95	87	80	70	57	30	10

Choice of model is dependent on building characteristics including sub-slab materials and should be made by a radon professional.

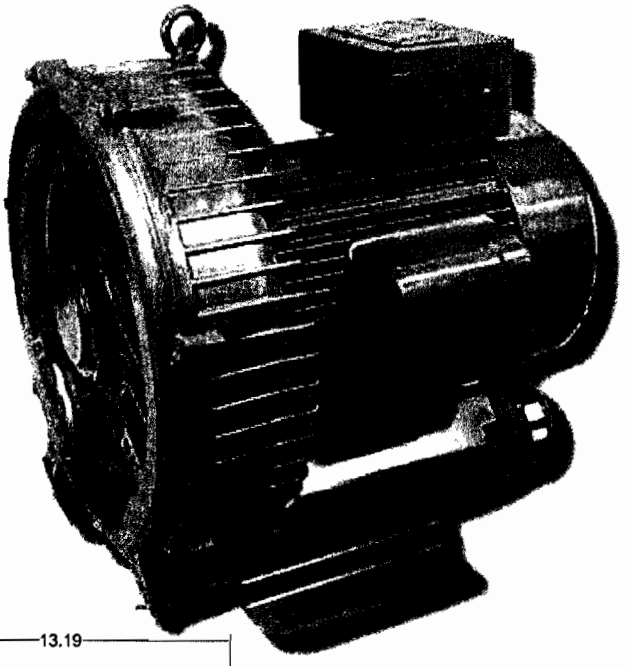


For Further Information Contact:

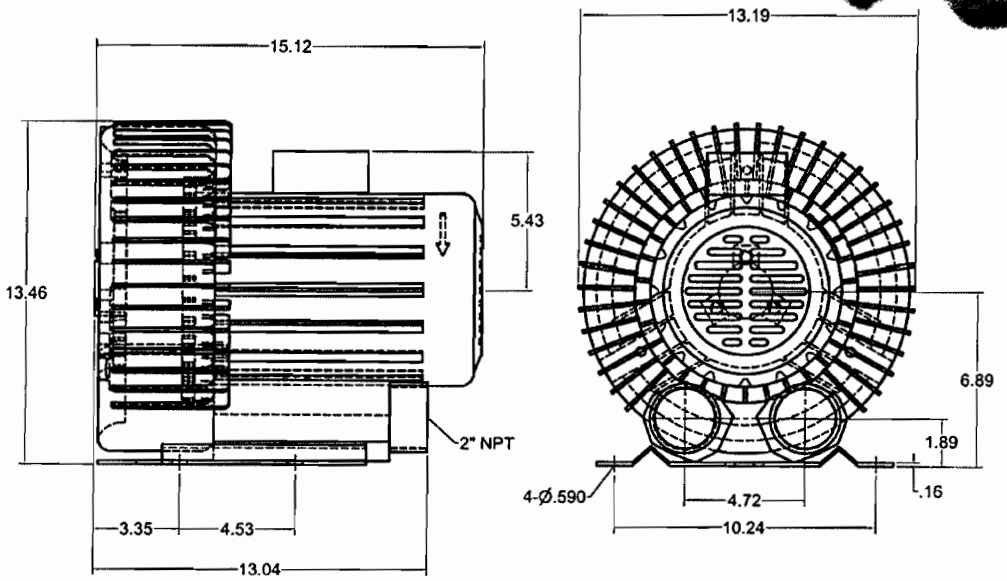
03/08
P/N 02002

REPUBLIC
Blower Systems ®

Republic Regenerative Blower
HRB 501



Republic offers a complete line of regenerative blowers for high vacuum or compressed air applications in both horizontal and vertical mounted postions. TEFC motors are UL, cUL and CE certified. The impeller is directly connected to the motor shaft, providing powerful air force without undue friction. The bearings are outside the compression chamber, ensuring maximum operational reliability under high differential pressure. This low-maintenance, oil-free design provides continuous, dependable service to our customers.



Advantages

- ▲ Low noise 76dB
- ▲ Continuous, low-maintenance operation
- ▲ Saves space and electricity
- ▲ Trouble-free installation
- ▲ Easy replacement of parts
- ▲ Outboard bearings yielding longer life
- ▲ Dual voltage 110/220

Product Options

- ▲ 2" Relief Valve (recommended)
- ▲ Inlet Filter (recommended)
- ▲ Liquid filled gauge
- ▲ Check Valve
- ▲ Belt-driven bare shaft blowers are available
- ▲ Explosion proof motors available
  (Class 2/GroupB/Division 1 Certified)

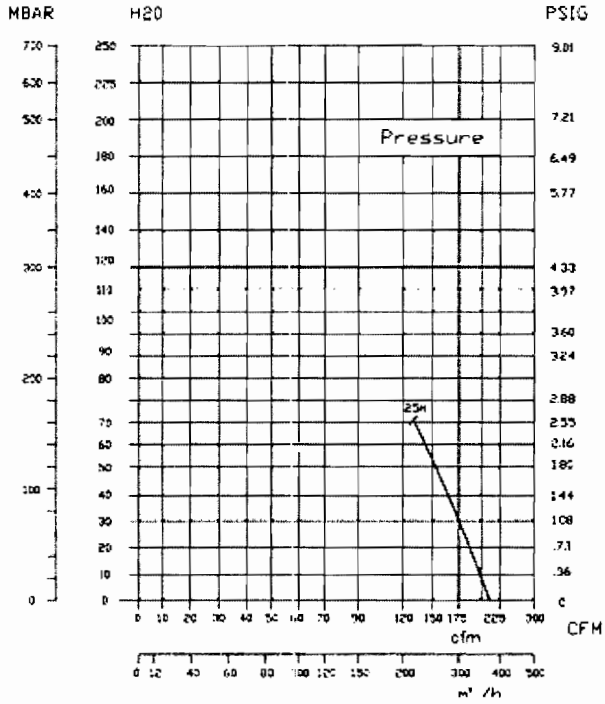
Model	Phase	Motor (HP)	Current @110 V	Current @220 V	Sound Level (dB)	Rated Pressure (in. H_2O)	Rated Vacuum (in. H_2O)	Air flow (cfm)	Weight (lbs)
HRB501	1	3	15.5	78	76	83	79	212	82

5131 Cash Road ▲ Dallas, TX 75247 ▲ P 214.631.8070 ▲ F 214.631.3673 ▲ 800.847.0380
www.republicsales.com

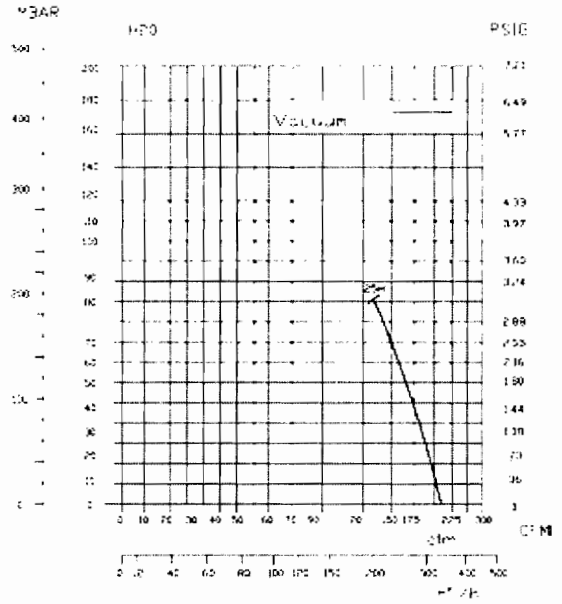
Republic Regenerative Blower
HRB 501

REPUBLIC
Blower Systems ®

Pressure vs. CFM



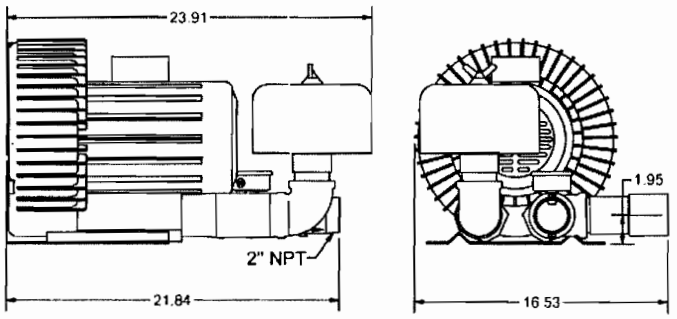
Vacuum vs. CFM



Performance for all blowers is 60 Hz. Ask for information on 50 Hz.

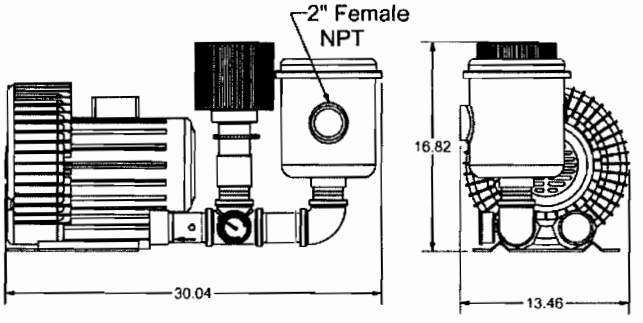
All Republic Regenerative Blowers are available in preassembled kits for either pressure or vacuum applications. These kits include an inlet filter and relief valve, and have been tested prior to shipment. Optional items for these kits include check valve and gauge.

KPHRB501 - Pressure Kit Drawing



Kit Pressure 2" NPT	KPHRB501

KVHRB501 - Vacuum Kit Drawing



Kit Vacuum 2" NPT	KVHRB501

5131 Cash Road ▲ Dallas, TX 75247 ▲ P 214.631.8070 ▲ F 214.631.3673 ▲ 800.847.0380

www.republicsales.com