Former Nessen Lamps Site

3200 Jerome Avenue

BRONX, NEW YORK

Soil Vapor Mitigation Remedial Design Work Plan

AKRF Project Number: 11455

NYSDEC Brownfield Cleanup Program Site Number: C203061

Prepared for:

Rinzler Family Limited Partnership
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APRIL 2014

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CERTIFICATIONS

I, Marc S. Godick, certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Remedial Design Work Plan (RDWP) was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all previously completed Remedial Investigation activities used to develop the RDWP were performed in full accordance with DER-approved work plans, work plan addenda, and any DER-approved modifications.

Signature

4-9-14
Date

I, Michelle Lapin, certify that I am currently a NYS registered Professional Engineer as defined in 6 NYCRR Part 375 and that this RDWP was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10). I have primary direct responsibility for implementation of the remedial program for the Former Nessen Lamps Site (NYSDEC Site No. C203061).

I certify that the Site description presented in this RDWP is identical to the Site descriptions presented in the NYSDEC Brownfield Cleanup Agreement executed February 16, 2012 for the Site.

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

STATE OF NEW YORK • MICHELLE LAPIN • No. 073934-1 • LICENSED PROFESSIONAL ENGINEER

NYS Professional Engineer #073934-1

4-9-14
Date

Signature

It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

1.0 INTRODUCTION

This Soil Vapor Mitigation Remedial Design Work Plan (RDWP) has been prepared by AKRF Engineering, P.C. (AKRF), on behalf of Rinzler Family Limited Partnership (the Volunteer), for New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) Site No. C203061 located at 3200 Jerome Avenue, Bronx, New York (Tax Block 3323, Lot 36), hereafter referred to as the "Site". The Site consists of a triangular-shaped, approximately 11,500-square foot (sf) property that is fully occupied by an approximately 18,500-sf two-story building. The Site building formerly served as the Bronx New School (aka PS 51X) elementary school for kindergarten through fifth grade.

As documented in monthly progress reports and document submissions, AKRF completed the Remedial Investigation (RI) at the Site to satisfy the requirements of the NYSDEC and New York State Department of Health (NYSDOH) in January 2013 and a remedy was proposed to allow for the re-use of the Site. Following the completion of a public meeting presenting the findings and outlining the proposed remedy, the NYSDEC and NYSDOH formally approved the Remedial Action Work Plan (RAWP) prepared by AKRF and issued a final Decision Document in June 2013. A copy of the Decision Document, which summarizes the nature and extent of contamination identified by the RI and the selected remedy to be implemented, is included as Appendix A. Additional details pertaining to the Site history, geology, hydrogeology, nearby properties, and the development of the conceptual site model are available for review in the June 2013 RI Report and RAWP. As of February 2014, the excavation and off-site disposal of contaminant source area soil containing contaminants of concern [including trichloroethene (TCE) and its degradation products, as well as benzene, toluene, ethylbenzene, xylenes (BTEX), and isopropylbenezene] has been completed to the extent practicable, based on the physical and structural constraints inside of the Site building. AKRF submitted a Groundwater Treatment RDWP in February 2014 addressing TCE and BTEX-contaminated groundwater, which was subsequently approved by NYSDEC in March 2014.

In accordance with AKRF's approved June 2013 RAWP and the associated June 2013 final Decision Document, this Soil Vapor Mitigation RDWP has been developed to describe the engineering control components to be installed and operated at the Site to prevent TCE-contaminated soil vapor from entering the building and affecting indoor air quality. All work outlined in this RDWP will be performed in accordance with the approved Site Specific Health and Safety Plan (HASP), Quality Assurance Project Plan (QAPP), and Community Air Monitoring Plan (CAMP) submitted as part of the June 2013 RAWP.

The proposed Soil Vapor Mitigation measures to be installed and implemented as described in this RDWP are consistent with the procedures defined in DER-10 and comply with all applicable standards, criteria and guidance. The remedy described in this document also complies with all applicable Federal, State, and local laws, regulations, and requirements. The Remedial Action to be performed under this RDWP is intended to make the Site protective of human health and the environment consistent with its contemplated Restricted Residential use. As currently contemplated, the structural integrity, size, and shape of the building will remain unchanged following the installation of the soil vapor mitigation controls and completion of other remedial actions (as outlined in the approved RAWP and Groundwater Treatment RDWP). It is expected that once all engineering and institutional controls are installed, the building will undergo interior renovations by the owner and be leased for use(s) consistent with the zoning allowed for the property. Following the completion of the remedy, the property will be used for Restricted Residential use (including multifamily apartments, institutional, educational, and/or community facilities, etc.) only, provided the long-term engineering and institutional controls included in the Site Management Plan are operated, monitored, and maintained appropriately.

2.0 DESIGN INVESTIGATIONS

2.1 Description of Areas of Concern

As outlined in the RI, the areas of concern at the Site are based on the former use of the Site as a lamp manufacturer who was known to have stored and disposed of trichloroethene (TCE)-related waste and the use of the Site as an automotive garage that maintained underground gasoline storage tanks. Releases from the use, storage, or disposal of the chlorinated solvent TCE, and to a lesser extent, petroleum-related compounds, have contaminated soil, groundwater, and soil vapor beneath the Site. The location of the source of both of these contaminants has been identified in the central portion of the Site.

2.1.1 Previously Identified Soil Vapor Contamination

Prior to the Site's acceptance into the BCP, TCE was identified on-site in indoor air and sub-slab vapor at concentrations that exceeded the NYSDOH Air Guideline Value (AGV) presented in the Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006 (NYSDOH Vapor Intrusion Guidance Document). Based on the NYSDOH Vapor Intrusion Guidance Document, the concentrations detected in the samples warranted mitigation. The maximum TCE concentration detected in sub-slab vapor samples beneath the building (in close proximity to the identified soil source) was 53,300 micrograms per cubic meter ($\mu g/m^3$). During the RI, TCE was detected in soil vapor below the sidewalk adjacent to the Site building at concentrations between 5.8 $\mu g/m^3$ to 110 $\mu g/m^3$ (two to four orders of magnitude lower than what was detected beneath the building slab). Additional off-site soil vapor and indoor air sampling conducted during the RI did not identify soil vapor contamination in the east-adjacent apartment building or in the sidewalk adjacent to the Toyota Automotive Garage warranting further investigation or mitigation.

2.1.2 End-Point Soil Sampling

Following the completion of the contaminated source removal in January 2014, end-point soil sampling conducted at the bottom of the excavation (11 to 12 feet below first floor grade) confirmed the presence of TCE concentrations slightly exceeding the remedial cleanup goal of 0.47 parts per million (ppm) in two soil samples. TCE was detected in soil sample NL-EP-WW-1(11-12) collected in the northwestern base of the excavation at a concentration of 0.51 ppm, and in soil sample NL-EP-BS-1(11-12) in the north central base of the excavation at a concentration of 3.7 ppm. In addition, an investigatory soil sample [NL-VF(10'-10.5')] collected at a depth of 10 to 10.5 feet below first floor grade, and immediately beneath a concrete vault identified in the northwestern portion of the soil removal area, identified TCE at a concentration of 57 ppm. Based on the physical and structural constraints within the Site building, additional soil removal activities could not be completed at these locations.

This end-point and investigatory soil sample data will undergo validation in accordance with the June 2013 RAWP prior to inclusion as part of the Final Engineering Report (FER). Based on AKRF's review of this data in consultation with NYSDEC, these results can be relied upon to determine remedial design components to both address residual contamination and prevent future exposure at the Site as confirmed during the February 6, 2014 Site meeting and subsequent correspondence.

Accordingly, the proposed engineering control to mitigate soil vapor (as described in the June 2013 RAWP) has been redesigned to include both an active sub-slab depressurization system (SSDS) and a soil vapor extraction (SVE) well to address residual TCE-contamination identified during end-point soil sampling. One SVE well will be installed within or adjacent to the concrete vault in the northwestern portion of the soil removal area.

2.2 Communication Testing

As documented in AKRF's November 2013 Communication Testing and SSDS Piping Layout letter submitted to NYSDEC, in an effort to assess existing subsurface vacuum communication conditions and design a conservative layout of suction pits and trenched piping associated with a SSDS, communication testing was completed at the Site in July 2013 under AKRF's oversight by Keystone Environmental Services (Keystone). The communication testing was performed prior to mobilization for the planned soil removal to ensure viable locations for the proposed pits and associated piping runs could be established for planning, designing, and contractor bidding purposes. The communication testing also assisted in the identification of potential subsurface obstructions, optimal SSDS pit placement, and the extent of radial flow from each SSDS pit. Communication testing was not performed within the extent of the proposed soil removal area (based on the design of the SSDS in this area, which will consist of slotted pipe within a coarse aggregate layer).

A shop vacuum was used to apply vacuum to small borings (vacuum points) drilled to a minimum depth of one foot beyond the existing concrete slab throughout the first floor and basement of the Site building (outside of the planned soil removal area). Additional borings (monitoring points) were installed at increasing radii away from the original vacuum points, and a vacuum gauge was used to measure the vacuum induced at these monitoring points at varying radii from the vacuum point. The vacuum monitoring was performed to determine the maximum distance at which a minimum vacuum of approximately 0.004 inches of water column (in H_2O) was induced. The testing was repeated in this manner until induced vacuum was assessed throughout the Site.

During the communication testing, an instantaneous positive pressure influence was observed to emanate upward from underneath the concrete slab in the southern portion of the Site building adjacent to the sidewalk along Van Cortlandt Avenue East. The positive pressure influence was believed to be associated with the passing of a subway car through the underground subway tunnel located south adjacent of the Site, which leads to the New York City Transit (NYCT) maintenance yard located beyond Jerome Avenue southwest of the Site.

The positive pressure influence and other results from the communication test were utilized to establish a conservative layout of SSDS pits, as described in Section 3.0 and shown on Figure 1, which overlap the theoretical radii of influence (ROIs) from each vacuum point (proposed SSDS pit locations) to ensure continuous vacuum coverage throughout the entire Site (outside of the soil removal area). Communication testing was not conducted in a small portion of the southeastern corner of the Site utilized as an elevated entrance along Van Cortland Avenue. The observed ROIs during communication testing for each of the SSDS pit locations are shown on Figure 2.

The November 2013 Communication Testing and SSDS Piping Layout letter (including Keystone's report showing the location of the vacuum and monitoring points, and the induced vacuum data observed during the testing) is included as Appendix B.

2.3 System Design and Pressure Loss

System design and pressure loss calculations for the SVE and SSDS were derived from the results of the communication testing conducted at the Site in July 2013. Nine system points (seven SSDS pits, one continuous section of slotted PVC pipe, and one SVE well point) and associated piping runs, connecting tees, and elbows were utilized to determine the required air flow rates and vacuum pressure to size a blower that would maintain negative pressure beneath the entire Site (in addition to built-in safety factors) and volatilize residual contamination in the area of the SVE well. System design calculations are further described in Section 3.2.

2.4 Carbon Treatment Sizing

Carbon treatment sizing for the SSDS and SVE design was determined based on the previous soil vapor concentrations identified at the Site, which identified total VOC concentrations ranging from approximately 820 $\mu g/m^3$ to 53,630 $\mu g/m^3$. Based on these results, a conservative estimate of 20,000 $\mu g/m^3$ of total VOCs was estimated to originate from each of the seven SSDS pits, one SVE well, and one slotted SSDS pipe section. Based on a proposed air flow rate of 575 cubic feet per minute (CFM), it is conservatively estimated that the system will utilize approximately 465 pounds of carbon per month during initial operation. Carbon treatment calculations are provided in Appendix C and further described in Section 3.2.

2.5 Screen Interval Determination for SVE Well

The proposed design of the SVE well currently includes a five-foot screened, targeted treatment interval starting from the bottom of the concrete vault at approximately 10 feet below first floor grade and terminating at approximately 15 feet below first floor grade. During installation of the SVE well, soil sampling activities will be performed in accordance with the June 2013 RAWP and QAPP to confirm that the intended treatment interval does not need to be extended further (by lengthening the SVE well) beneath the vault. Based on field conditions, a confirmatory end-point soil sample will be collected at the bottom of the SVE well treatment zone and analyzed for VOCs by EPA Method 8260. Investigation derived wastes associated with the installation of the SVE well will be properly containerized in 55-gallon drums and managed in accordance with the June 2013 RAWP and QAPP.

3.0 REMEDIAL ACTION DESIGN FOR SOIL VAPOR MITIGATION

Mitigation of soil vapor intrusion was initiated during the recently completed removal of contaminant sources (TCE and petroleum-contaminated soil) to ensure that contaminants in groundwater and soil vapor beneath the Site building will be reduced over time. The remedial action (in addition to the chemical treatment of contaminated groundwater as outlined in the February 2014 Groundwater Treatment RDWP) also includes the installation and operation of a sub-slab depressurization system (SSDS) with a soil vapor extraction (SVE) well to prevent the potential for vapor intrusion into the building. The SSDS will apply negative pressure beneath the entire first floor and basement concrete slabs, minimizing the potential for vapor intrusion into the Site building. The SVE component will treat residual TCE-contaminated soil left in place at the Site (due to physical and structural constraints) while also (in combination with the SSDS) preventing adverse effects to indoor air quality. A vapor barrier will also be installed in conjunction with the SSDS and SVE well during restoration activities above the soil removal area. An environmental easement on the property will ensure that these engineering controls are operated and maintained appropriately in the forthcoming Site Management Plan (SMP), and prevent the completion of an exposure pathway that could harm future occupants.

3.1 Treatment Area

The target area for the combined SSDS and SVE design is the entire Site and will be achieved through the installation of a combination of SSDS pits, slotted SSDS piping in a gas permeable aggregate layer, and an SVE well point. The proposed layout of the SSDS and SVE design is shown on Figure 1. Seven SSDS pit locations (six on the first floor and one in the basement), as determined by communication testing, will be connected to an operating blower in the basement of the Site building that will apply negative pressure through dedicated solid PVC piping connections installed in underground trenches beneath the existing concrete floor slab to capture soil vapor. Within the soil removal area, soil vapor will be captured through slotted PVC piping bedded in gas permeable aggregate (clean stone), which will also be connected to the blower. One SVE well point will be installed at soil sample location NL-VF(10’-10.5’) within or adjacent to the concrete vault in the northwestern portion of the soil removal area. The SVE well point will operate on the same blower and has been designed to include a radius of influence (ROI) that will encompass end-point soil samples NL-EP-WW-1(11-12) and NL-EP-BS-1(11-12), which identified residual concentrations of TCE-contaminated soil. Observed ROIs for the SSDS pits and assumed ROIs for the slotted PVC piping and the SVE well point are shown on Figure 2.

All captured vapors from the SSDS pits, the slotted pipe within the soil removal area, and the SVE well point will be manifolded to the basement and directed through two appropriately sized granular activated carbon (GAC) treatment units, and subsequently discharged to the atmosphere above the roof of the Site building. The application of negative pressure to the subsurface beneath the entire Site will also further reduce the potential for off-site migration of contaminated soil vapor.

3.2 System Performance

The layout of the SSDS and SVE design is provided on Figure 1. Based on field communication testing completed in July 2013, the ROI for SSDS pits varied slightly due to low permeability within sub-slab soil conditions, changes in floor slab thickness, off-site influences, and likely subsurface obstructions such as the building foundation. In the western portion (tip) of the Site building, a change in the first floor slab thickness from 4 inches to 9 inches was observed. In order to address the change in thickness and ensure negative pressure is delivered to the entire western portion of the Site, two SSDS pits (P-2 and P-3) are proposed to provide adequate vacuum in this area. SSDS pit P-4 was strategically positioned in the south-central portion of the Site to address the instantaneous positive pressure influence associated with the adjacent subway tunnel. Favorable communication results with high vacuum and flow rates were observed from locations selected for SSDS pits P-1, P-5, and P-6 on the first floor of the Site building and throughout the basement (P-7). The communication testing indicated favorable results at SSDS pits P-5 and P-6 located along the southeastern portion of the Site. While communication testing was not conducted at the small elevated portion of the southeastern corner of the Site, negative pressure along the base of the elevated section is expected following system installation. In addition, this area was not identified as a source area for elevated contaminant concentrations in soil, soil vapor, or groundwater during the RI.

Based on the ability to prepare the sub-grade and design backfill specifications within the soil removal area during slab restoration (as part of the Site cap/cover), a gas permeable aggregate layer (clean stone) and slotted PVC piping will be installed to ensure that negative pressure can be maintained throughout this portion of the Site.

While a communication test for the proposed SVE well point was not conducted as part of this RDWP, the proposed location has been selected to address the immediate vicinity of the highest concentration of residual TCE-contaminated soil beneath the concrete vault. An expected minimum ROI of 20 feet from the proposed SVE well point (based on the vacuum induced by the selected blower) will ensure that soil vapor in the vicinity of end-point samples NL-EP-WW-1(11-12) and NL-EP-BS-1(11-12) will also be collected and treated. The use of flowable fill as backfill within the bottom of the soil removal area (immediately south adjacent of the proposed SVE well location within the vault) to a depth of approximately 11 feet below first floor grade will further increase the influence of the SVE well (by minimizing short circuiting from the soil removal area) on the residual TCE-contaminated soil areas at the Site.

Based on the number of system design points and the communication testing completed at the Site, an average of approximately 50 CFM per system point, or approximately 450 CFM total, was considered as the minimum total design flow rate for the system.

Based on communication testing, a minimum applied vacuum of approximately 40 in H_2O would be required at each of the seven SSDS pits to maintain negative pressure beneath the entire floor slab. An adjusted total vacuum of 50 in H_2O was used for design purposes of the blower based on pressure losses across piping runs for the SSDS pits, piping manifold in the basement, carbon treatment units, and discharge stack design. The FPZ, Inc. Model K-08TS regenerative blower (see Appendix D) is currently proposed to be used with the system. The selected blower has a rating of 575 CFM to provide spare capacity in the event that specific points require additional flow or system expansion is necessary to ensure that the design objectives are achieved. The blower will be installed with a variable-frequency drive (VFD) to allow for a reduction in power consumption during system operation. One back-up/reduced sized SSDS blower will also be acquired and stored at the Site to be used in the event of a system failure or when Site conditions are observed that would allow for the removal of the SVE well and/or carbon treatment from the system. The FPZ, Inc. Model K-07TS regenerative blower is currently proposed as the back-up/reduced sized blower to be used with the system. Specifications for this blower (which operates at a lower horsepower and will also have its own VFD) are also included in Appendix D.

Based on previous investigations, a conservative design estimate of 20,000 $\mu g/m^3$ total VOCs from each of the nine extraction points at a proposed air flow rate of 575 CFM, it is conservatively estimated that the system will utilize approximately 465 pounds of carbon per month during initial operation. Accordingly, two GAC units (configured in series) have been sized at 400 pounds of carbon each to properly treat contaminated soil vapors collected from the system. Two Tetrasolv VR-400 carbon units (see Appendix E) are currently proposed for use with the system.

3.3 System Location and Components

The SSDS and SVE design to be installed under this RDWP, as shown on Figure 1, will consist of:

- Seven SSDS pits and associated solid PVC piping in sub-slab trenches, including six throughout the first floor of the building and one in the basement;
- Slotted PVC piping sections bedded in a gas permeable aggregate layer above the soil removal area in the central portion of the Site;
- One SVE well point installed within or adjacent to the concrete vault within the soil removal area;
- One appropriately sized variable-frequency drive (VFD) SSDS/SVE blower (FPZ, Inc. Model K-08TS);
- One back-up/reduced sized VFD SSDS blower (FPZ, Inc. Model K-07TS);
- Two appropriately sized GAC treatment units (Tetrasolv VR-400); and
- A 15-mil vapor barrier (StegoWrap®) installed over the soil removal area.

Outside of the soil removal area, 16-inch wide by 16-inch deep trenches will be dug beneath the existing concrete floor slabs in the basement and first floor of the Site building to allow for the installation of 4-inch solid PVC piping runs connected to each of the seven SSDS pits. The SSDS pits would be approximately 4 foot square and extend to approximately 18 inches beneath the existing first floor (P-1 through P-6) and basement floor (P-7) slabs. Cross-sectional details of the SSDS pits, piping, and trenched areas are included on Figure 3 (Details 5 and 6). Trenched areas would be filled with gravel and restored with concrete, and the solid PVC piping would be installed through the soil removal area in the central portion of the Site prior to penetrating through the western wall of the basement and connecting to the blower. Investigation derived waste associated with the installation of the trenches will be managed in accordance with the June 2013 RAWP and QAPP.

In conjunction with the backfilling and restoration process within the soil removal area in the central portion of the Site, geotextile fabric, gas-permeable aggregate, and 4-inch slotted PVC piping will be placed within the extent of the soil removal area in the central portion of the Site. The prepared subgrade would be compacted prior to the placement of the geotextile fabric across the area. A minimum of 6 inches of gas permeable aggregate bedding would be placed throughout the soil removal area prior to the installation of the 4-inch slotted PVC pipe in the location shown on Figure 1. The solid PVC piping runs traveling from the SSDS pits into and through the gas permeable aggregate layer within the soil removal area will be coordinated with the location of the slotted PVC pipe sections. Solid PVC piping would be installed on a minimum 1% slope toward the SSDS pits. In the event that a 1% slope cannot be completed due to field conditions, condensate sumps would be installed to prevent moisture buildup. A typical profile for the installation of a condensate sump is shown on Figure 3 (Detail 7). Following the installation of the slotted and solid PVC pipe sections through the soil removal area, 6 additional inches of gas permeable aggregate cover would be placed on top of the entire area. Cross-sectional details of the solid and slotted PVC piping within the soil removal area are shown on Figure 3 (Details 2 and 4).

Prior to installing the vapor barrier or restoring the concrete floor slab, the proposed SVE well will be installed within or adjacent to the concrete vault in the northwestern portion of the soil removal area. The SVE well will be constructed of 4-inch PVC with a proposed 5-foot section of screen. Field observations and confirmatory soil sampling activities (in accordance with the June 2013 RAWP and QAPP) will be performed to assess the need to extend the treatment zone/screened interval of the SVE well. Construction details associated with the SVE well are shown on Figure 4. Following the successful installation of the SVE well (but prior to the completion of the concrete pad or access manhole), the entire soil removal area (as shown on Figure 1) will be covered with StegoWrap® 15-mil vapor barrier prior to restoring the concrete floor slab. Specifications for the vapor barrier are included in Appendix F.

A conceptual process and instrumentation diagram (P&ID), detailing the SSDS and SVE design components as they lead from the first floor, protrude through the basement wall, combine into a manifold prior to leading into the blower, and carbon treatment units is provided as Figure 5. As shown on Figure 5, pressure and vacuum gauges, flow meters, butterfly throttling valves, and sample ports will be installed on each of the individual lines prior to connection to the SSDS/SVE blower, allowing for adjustments and monitoring of each point of the system. The individual 4-inch solid PVC lines originating from each of the SSDS pits from the first floor, the 4-inch slotted PVC line, and the 4-inch PVC SVE well will transfer to 4-inch steel lines as they protrude into the basement wall and will be manifolded into a single 8-inch steel line connected to the blower in the basement. Pre- and post-blower temperature/pressure gauges will be installed to monitor strain across the blower. The outlet of the blower will lead directly to the influent port of the carbon treatment system.

The carbon treatment system will comprise two Tetrasolv VR-400 GAC units, connected in series. Influent, intermediate, and effluent sample ports and pressure gauges will be installed on the carbon system for monitoring purposes. The outlet of the second GAC unit in series will lead to an effluent stack, piped to the exterior of the building with a final discharge point located at a minimum of 10 feet above the roof and at a minimum of 10 feet from any air intakes/vents, and the east-adjacent garage building. Roof and effluent stack details are shown on Figure 6.

Based on previous investigations and designed vacuum and flow rates, it is conservatively estimated that the SSDS and SVE design will utilize approximately 465 pounds of carbon per month during initial operation. More frequent change-outs of the carbon will likely be required following initial startup. However, extracted TCE concentrations are expected to reduce significantly over time following the extraction of initially higher levels of contaminated vapors.

3.4 System Operations and Maintenance

The SSDS and SVE components will be inspected once a month for a period of approximately six months, to ensure proper operation, with weekly checks during the first month of operation. Monthly checks will consist of individual SSDS pit gauge readings, blower inspections, alarm checks, and carbon vessel VOC screenings. The alarm system will be equipped with an internet connection and cellular service which will send an automatic notification to a designated contact list in the event of a power outage or blower/system failure.

In the event of a power outage at the Site, the system will be equipped with a battery operated valve (as shown on Figure 5) that would initiate passive ventilation to the exhaust stack without the use of the blower. More detailed system maintenance, alarm components, and safety instructions will be included in the SMP.

Four sub-slab vacuum monitoring points, as shown on Figures 1 and 2, will be installed at the Site during implementation of the soil vapor remedy and will be used to ensure that key indicator locations remain under vacuum. The points have been located based on identified subsurface obstructions and/or areas with low induced vacuum or poor ROI coverage during the communication testing. Sub-slab vacuum monitoring will be conducted in accordance with the guidelines set forth in the SMP. Proposed installation details for the vapor monitoring points are included on Figure 3 (Detail 3).

3.5 Confirmatory Sampling

Confirmatory communication testing will be conducted throughout the Site from vapor monitoring points during implementation of the remedy and will be used to assess induced vacuum conditions and the necessity for additional SSDS pits or SVE well points. The confirmatory communication testing will help confirm that proper vacuums are maintained across the Site, as subsurface conditions will have changed from previous testing conditions prior to conducting activities associated with the RAWP. If sub-slab vacuum is not adequately maintained in any portion of the Site, additional SSDS pits or SVE well points will be installed.

Confirmatory extracted vapor sampling will be conducted following startup as part of a reassessment of VOC emissions calculations under actual field conditions. Confirmatory sampling will comprise grab samples from select individual SSDS pits, the slotted piping section, and the SVE well (all sampled from the basement control manifold) and combined influent, intermediate, and effluent samples. Indoor air sampling within the building will also be completed following system startup and prior to occupancy of the Site. Indoor air sampling would be conducted to confirm that soil vapor intrusion is not occurring at the Site and the system is operating to protect public health. All vapor and indoor air samples will be collected in accordance with the QAPP established as part of the June 2013 RAWP and analyzed for VOCs by EPA Method TO-15.

3.6 Boiler Room Ventilation

An exhaust fan and a fresh air intake vent will be installed in the portion of the basement wall that extends above street level. The exhaust fan will discharge indoor air from the basement to the building exterior and will be equipped with a shut-off alarm. The exhaust fan will include a fresh air intake damper and be operated to allow for approximately one-half to one air exchange per hour within the basement but not create negative pressure within the basement space. This process will allow the boiler room to be ventilated, minimizing the potential for sub-slab vapor accumulation.

3.7 Criteria for Termination of SSDS and SVE

The need to continue the operation of the SSDS and SVE components will be determined in consultation with NYSDEC and NYSDOH. Monitoring will continue under a NYSDEC-approved Site Management Plan until approval to discontinue one or more components of the design is granted in writing by NYSDEC. As currently contemplated, the system will operate with the FPZ, Inc. Model K-08TS blower until the SVE well and/or the carbon treatment units are no longer required. The system would then be downsized to operate with the FPZ, Inc. Model K-07TS blower, which would utilize less energy but would maintain negative pressure across the entire Site.

4.0 REQUIRED PERMITS

Notifications to applicable New York City agencies that AKRF has coordinated with in the past for previous investigations (including New York City Department of Transportation and local utility companies) will be made prior to beginning the proposed remedial work outlined in the Soil Vapor Mitigation RDWP. No other permits or approvals (with the exception of NYSDEC and NYSDOH approval) are required to conduct the proposed activities outlined in this Soil Vapor Mitigation RDWP.

5.0 SCHEDULE

Soil Vapor Mitigation Event	Approximate Start Date*	Duration
Trench and SSDS Pit Installation (outside of Soil Removal/ GW Treatment Area)	May 2014	2-3 Weeks
Trench Restoration (outside of Soil Removal/ GW Treatment Area)	May 2014	2 Days
SVE Well Installation	June 2014	1-2 Days
Import Gravel, Install Slotted SSDS Pipe and Remaining Solid Pipe from SSDS Pits and Manifold to Basement	June 2014	1 Week
Install Vapor Barrier and Restore Concrete	July 2014	2 Days
SSDS/SVE Blower/Carbon Delivery and Install	July 2014	2 Days
Electrical Work and System Startup	July 2014	1 Day
* Contingent on NYSDEC and NYSDOH approval and schedule/completion of Groundwater Treatment		

The actual schedule may differ depending on such factors as contractor availability, Site constraints, complexity of data collected, agency approvals, access coordination, and completion of the groundwater treatment program. The NYSDEC Project Manager will be notified of significant changes to the schedule.

6.0 REPORTING

The results of the Soil Vapor mitigation activities proposed in this RDWP will be documented in the Final Engineering Report (FER) and Site Management Plan (SMP) to be submitted to NYSDEC following implementation. Laboratory analytical data generated as part of remedial activities outlined in this RDWP will be submitted to NYSDEC in electronic format using the EQuIS electronic data deliverable (EDD) format. EQuIS submittal will be completed prior to submittal of the final FER.

7.0 REFERENCES

AKRF, Inc., Phase I Environmental Site Assessment – The Bronx New School (PS 51X), 3200 Jerome Avenue, Bronx, New York, 10468, January 2011.

AKRF, Inc., Indoor Air Quality and Vapor Intrusion Survey – The Bronx New School (PS 51X), 3200 Jerome Avenue, Bronx, New York, 10468, June 2011.

New York State Department of Health, *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, October 2006.

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New York State Department of Environmental Conservation, *Site Characterization Work Plan Letter*, Former Nessen Lamps Inc. (aka PS 51X), 3200 Jerome Avenue, Bronx, New York, October 19, 2011.

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AKRF, Inc., *Remedial Investigation Work Plan Addendum,* Former Nessen Lamps, 3200 Jerome Avenue, Bronx, New York, July 2012.

AKRF, Inc., *Remedial Investigation Work Plan Addendum No. 2,* Former Nessen Lamps, 3200 Jerome Avenue, Bronx, New York, October 2012.

AKRF, Inc. *Remedial Investigation Report and Remedial Action Work Plan*, Former Nessen Lamps, 3200 Jerome Avenue, Bronx, New York, June 2013.

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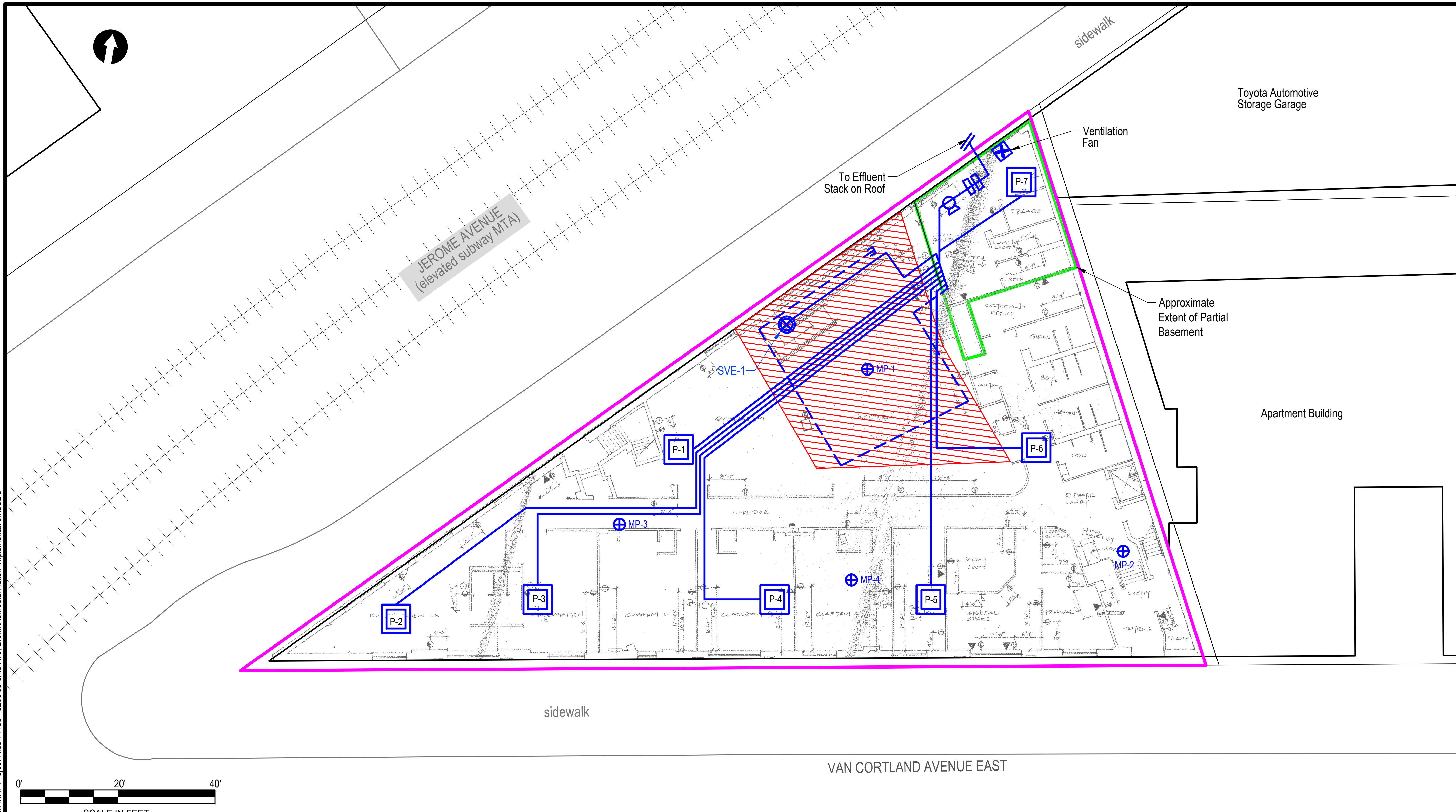
FIGURES



LEGEND:

- PROJECT SITE BOUNDARY
- BUILDING LINE
- 4-INCH SLOTTED PVC PIPE
- 4-INCH SOLID PVC PIPE (IN SUB-SLAB TRENCHES)
- SSDS/SVE BLOWER
- CARBON TREATMENT SYSTEM
- VENTILATION FAN
- MP-1 SUB-SLAB MONITORING POINT
- SVE-1 SOIL VAPOR EXTRACTION WELL
- P-1 SUBSLAB DEPRESSURIZATION PIT
- VAPOR BARRIER, GAS PERMEABLE AGGREGATE, AND CONCRETE SLAB RESTORATION ASSOCIATED WITH SOIL REMOVAL
- EXTENT OF BASEMENT

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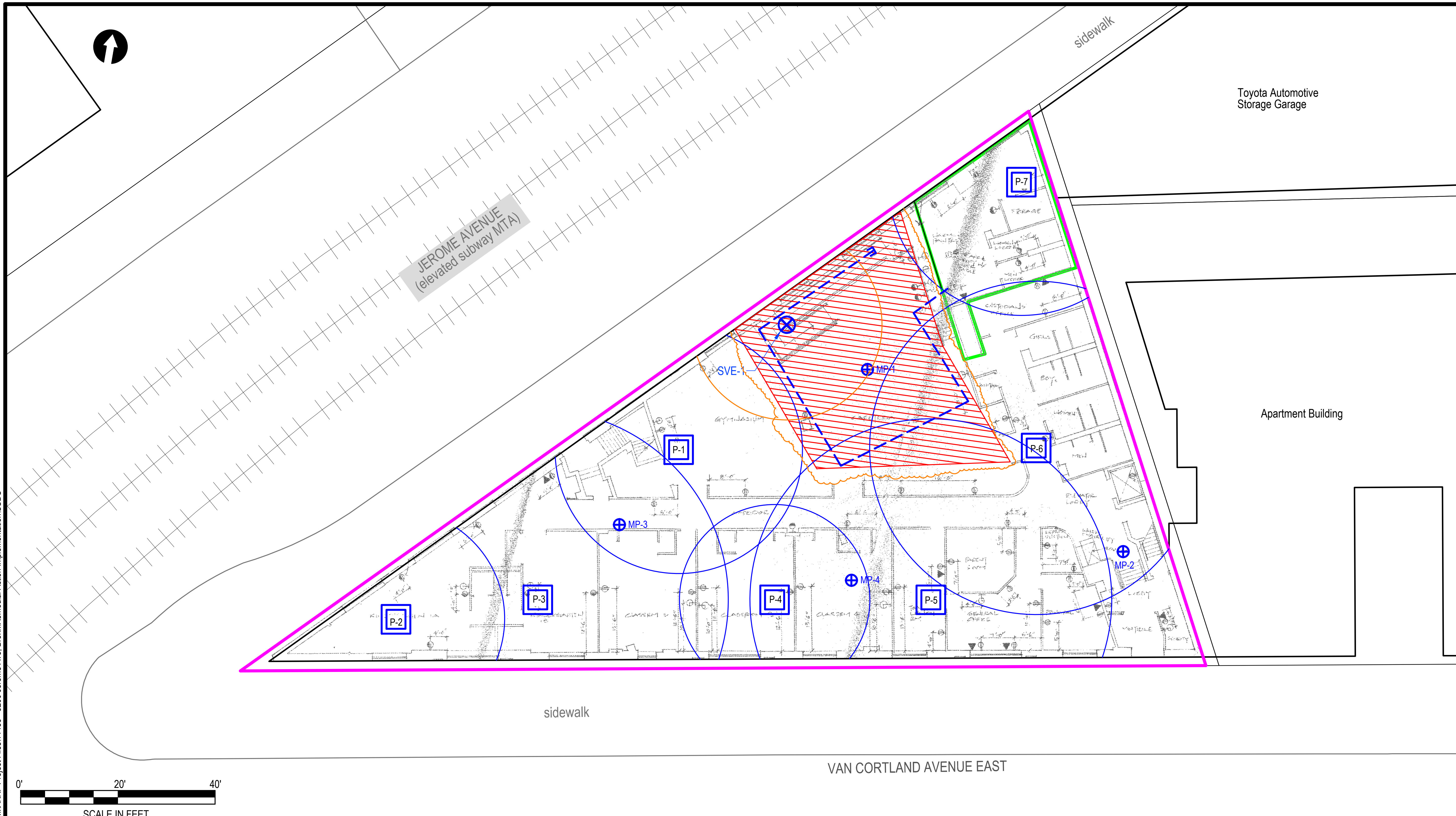
440 Park Avenue South, New York, NY 10016

FORMER NESSEN LAMP SITE
3200 JEROME AVENUE
BRONX, NEW YORK

SUB-SLAB DEPRESSURIZATION SYSTEM AND SOIL VAPOR EXTRACTION DESIGN LAYOUT

DATE	4/9/2014
PROJECT NO.	11455
SCALE	as shown
FIGURE	1



LEGEND:

PROJECT SITE BOUNDARY	
BUILDING LINE	
4-INCH SLOTTED PVC PIPE	
MP-1	SUB-SLAB MONITORING POINT
SVE-1	SOIL VAPOR EXTRACTION WELL
P-1	SUBSLAB DEPRESSURIZATION PIT
	OBSERVED RADIUS OF INFLUENCE FOR SSDS PIT
	PRESUMED RADII OF INFLUENCE FOR SVE WELL AND SLOTTED SSDS PIPE
	VAPOR BARRIER, GAS PERMEABLE AGGREGATE, AND CONCRETE SLAB RESTORATION ASSOCIATED WITH SOIL REMOVAL
	EXTENT OF BASEMENT

AKRF Environmental Consultants
440 Park Avenue South, New York, NY 10016

FORMER NESSEN LAMP SITE
3200 JEROME AVENUE
BRONX, NEW YORK

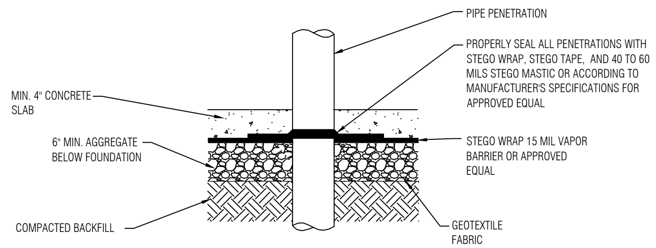
SUB-SLAB DEPRESSURIZATION SYSTEM AND SOIL VAPOR EXTRACTION RADII OF INFLUENCE DIAGRAM

DATE
4/8/2014

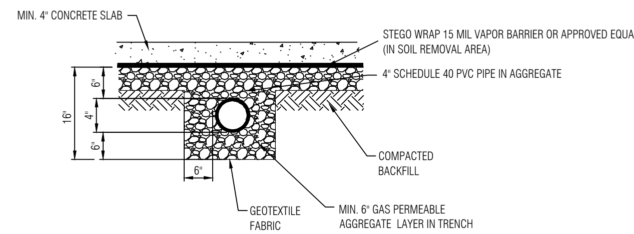
PROJECT NO.
11455

SCALE
as shown

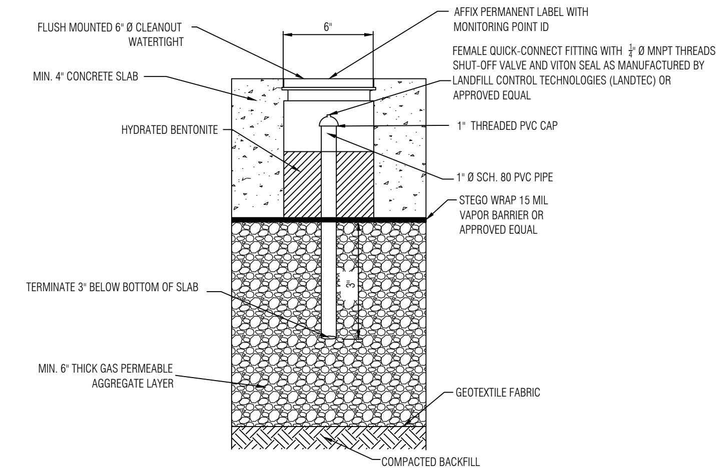
FIGURE
2



1 VAPOR BARRIER PENETRATION
N.T.S.



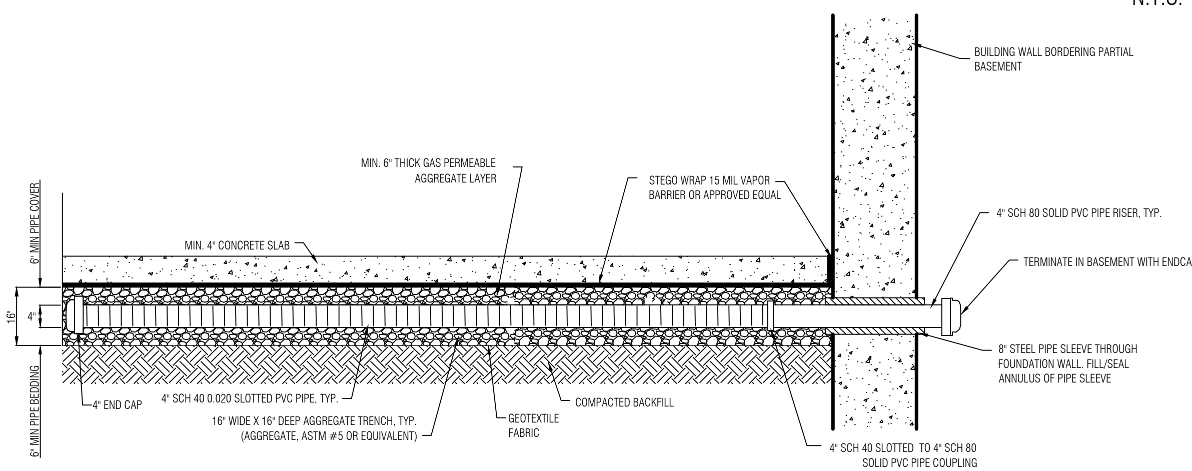
2 TRENCH DETAIL
N.T.S.



NOTES:

1. ANY DEVIATION FROM THIS INSTALLATION MUST BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

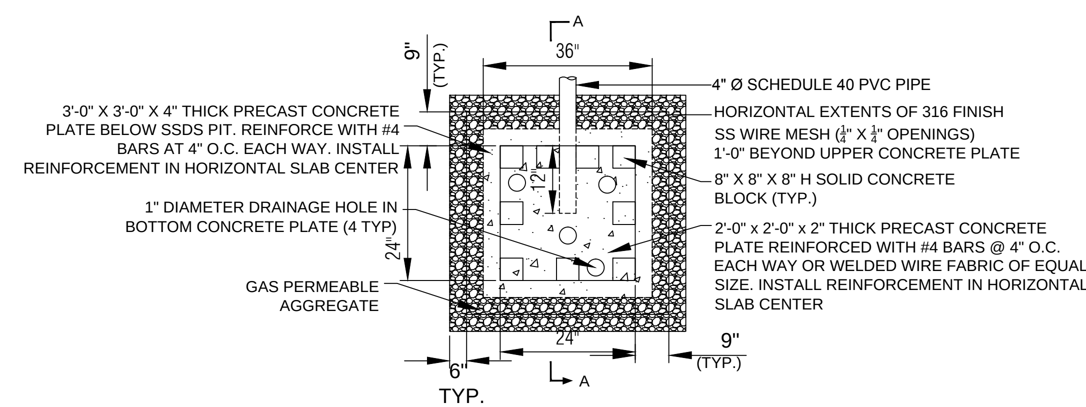
3 VAPOR MONITORING POINT DETAIL
N.T.S.



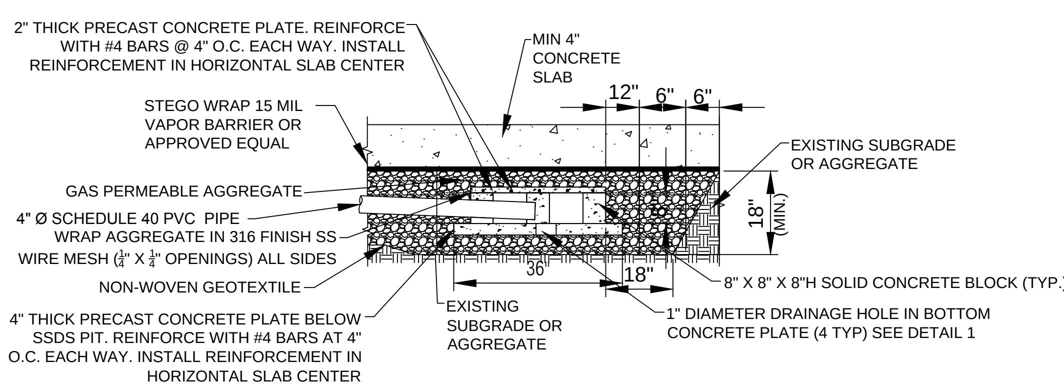
NOTES:

1. FOUNDATION TO BE UNDERLAIN BY MIN. 6" AGGREGATE IN ALL LOCATIONS OUTSIDE OF PIPING TRENCH.

4 TYPICAL PROFILE - VENT PIPING IN SOIL REMOVAL AREA
N.T.S.



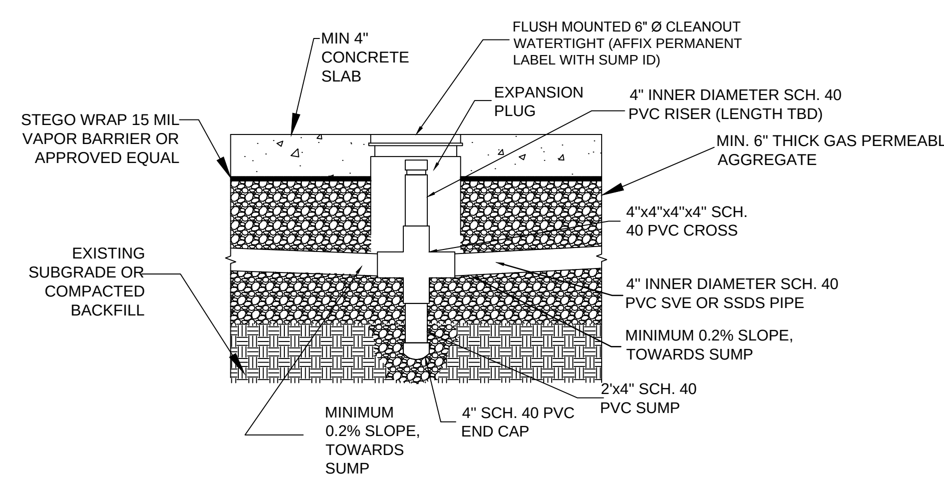
5 PLAN VIEW TYPICAL SUB-SLAB DEPRESSURIZATION PIT
N.T.S.



NOTE:

1. REPAIR AND REINFORCE CONCRETE SLAB AS NECESSARY.

SECTION A-A
6 TYPICAL SUB SLAB DEPRESSURIZATION PIT
N.T.S.



NOTE:

1. CONDENSATE SUMPS TO BE INSTALLED ONLY IF MINIMUM 1% SLOPE TOWARDS SSDS PITS/SVE WELLS CANNOT BE MAINTAINED ALONG SYSTEM PIPING RUNS

7 TYPICAL PROFILE SSDS/SVE CONDENSATE SUMP
N.T.S.

REVISIONS

No.	DATE	DESCRIPTION

PREPARED BY

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AKRF ENGINEERING, P.C.
440 PARK AVENUE SOUTH
NEW YORK, NY 10016
Tel:(212)696-0670 Fax:(212)726-0942

PREPARED FOR

RINZLER FAMILY LIMITED PARTINERSHIP

200 MADISON AVENUE, 24TH FLOOR
NEW YORK, NY 10016

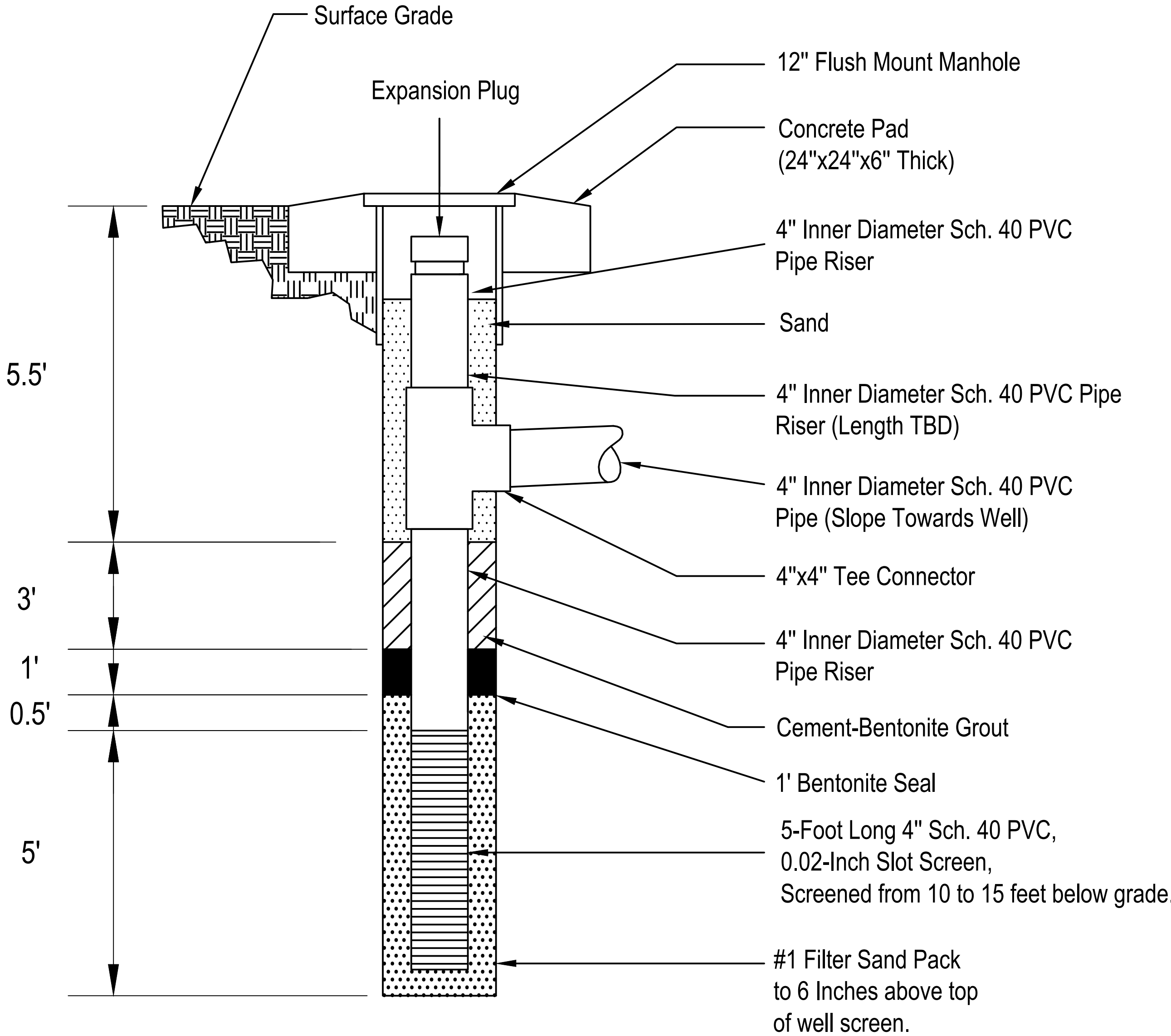
SHEET TITLE

FORMER NESSEN LAMPS SITE
VAPOR BARRIER AND SUB-SLAB DEPRESSURIZATION SYSTEM (SSDS) PIPING DETAILS

DRAWN BY SK/EP	ORIG. DATE 4/9/14
CHECKED BY MG	PROJECT No. 11455

FIGURE No.

3



Notes:

1. Extraction well installation to be completed in accordance with vapor barrier penetrations Detail 1 on Figure 3.

FORMER NESSEN LAMP SITE
3200 JEROME AVENUE
BRONX, NEW YORK

SOIL VAPOR EXTRACTION
WELL CONSTRUCTION

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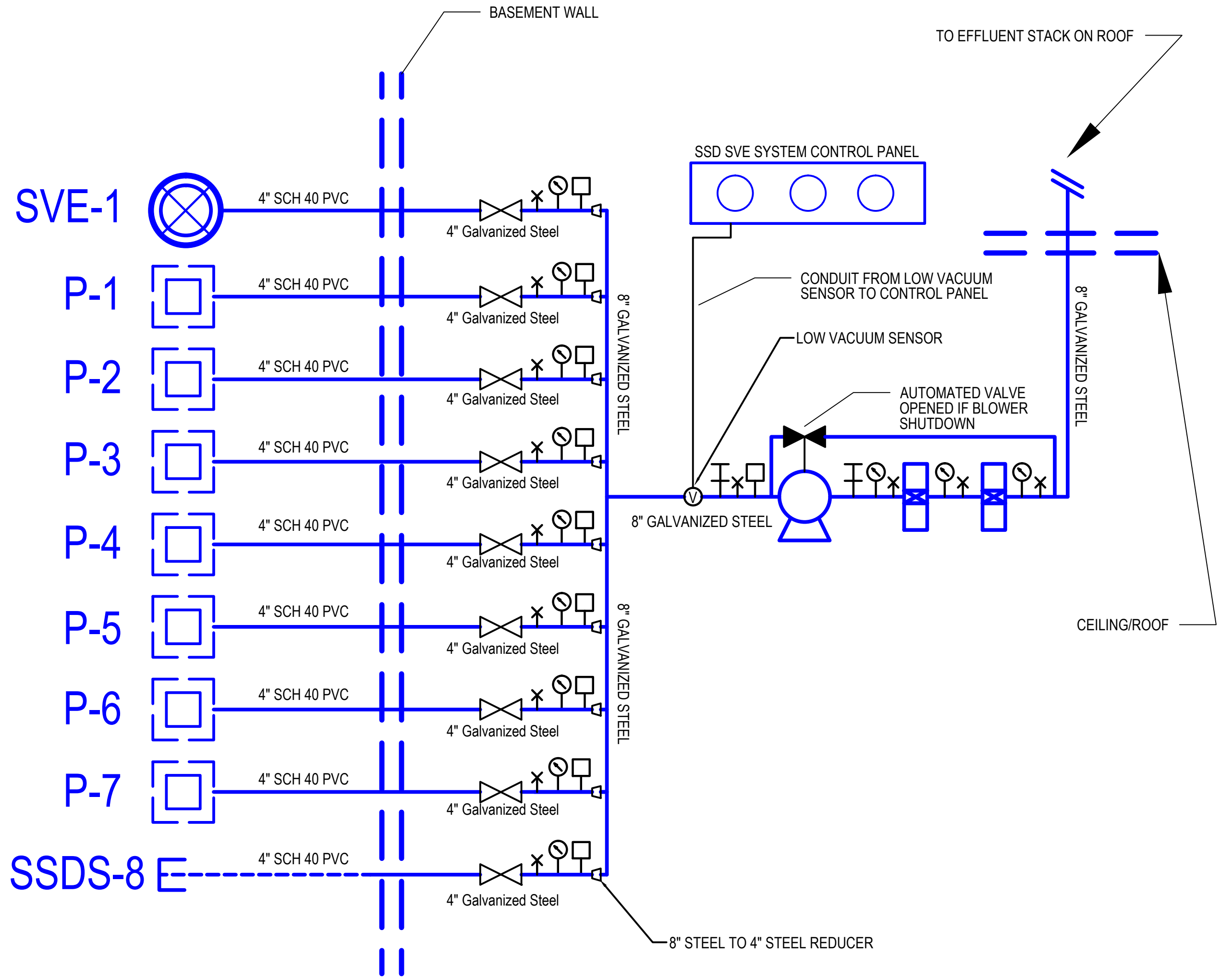
DATE **3.21.2014**
PROJECT No. **11455**
SCALE **NTS**
FIGURE **4**



LEGEND:

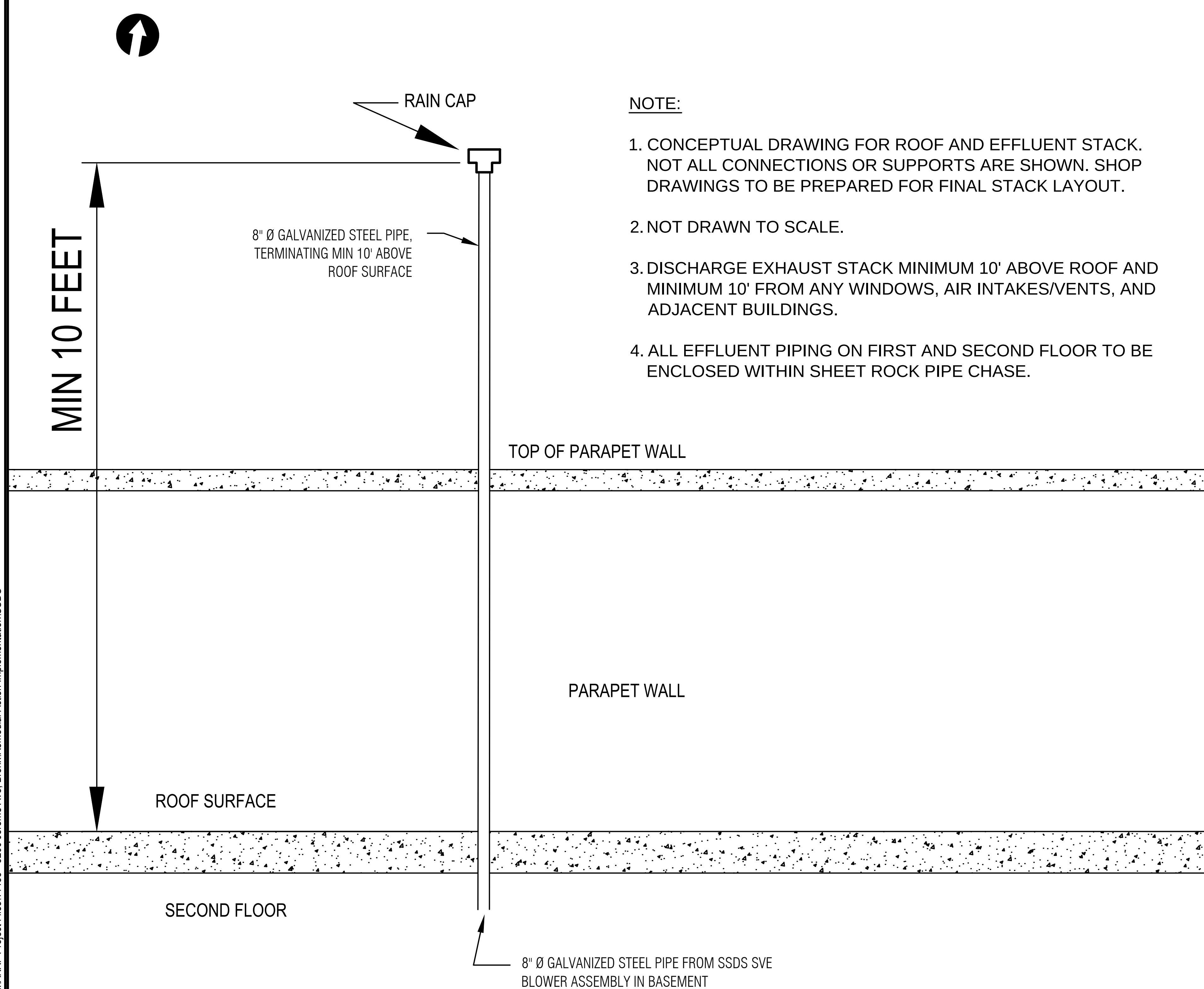
VACUUM BLOWER	LOW VACUUM SENSOR
CARBON TREATMENT SYSTEM	VACUUM/PRESSURE GAUGE
SVE-1 SOIL VAPOR EXTRACTION POINT	FLOW METER
P-1 SUBSLAB DEPRESSURIZATION PIT	SAMPLING PORT
4-INCH SLOTTED PVC PIPE	BATTERY-OPERATED BYPASS VALVE
	BUTTERFLY VALVE
	TEMPERATURE GAUGE
	4-INCH SOLID PVC PIPE (IN SUB-SLAB TRENCHES)

FORMER NESSEN LAMP SITE
3200 JEROME AVENUE
BRONX, NEW YORK

SUB-SLAB DEPRESSURIZATION AND SOIL VAPOR EXTRACTION SYSTEM PROCESS AND INSTRUMENTATION DIAGRAM

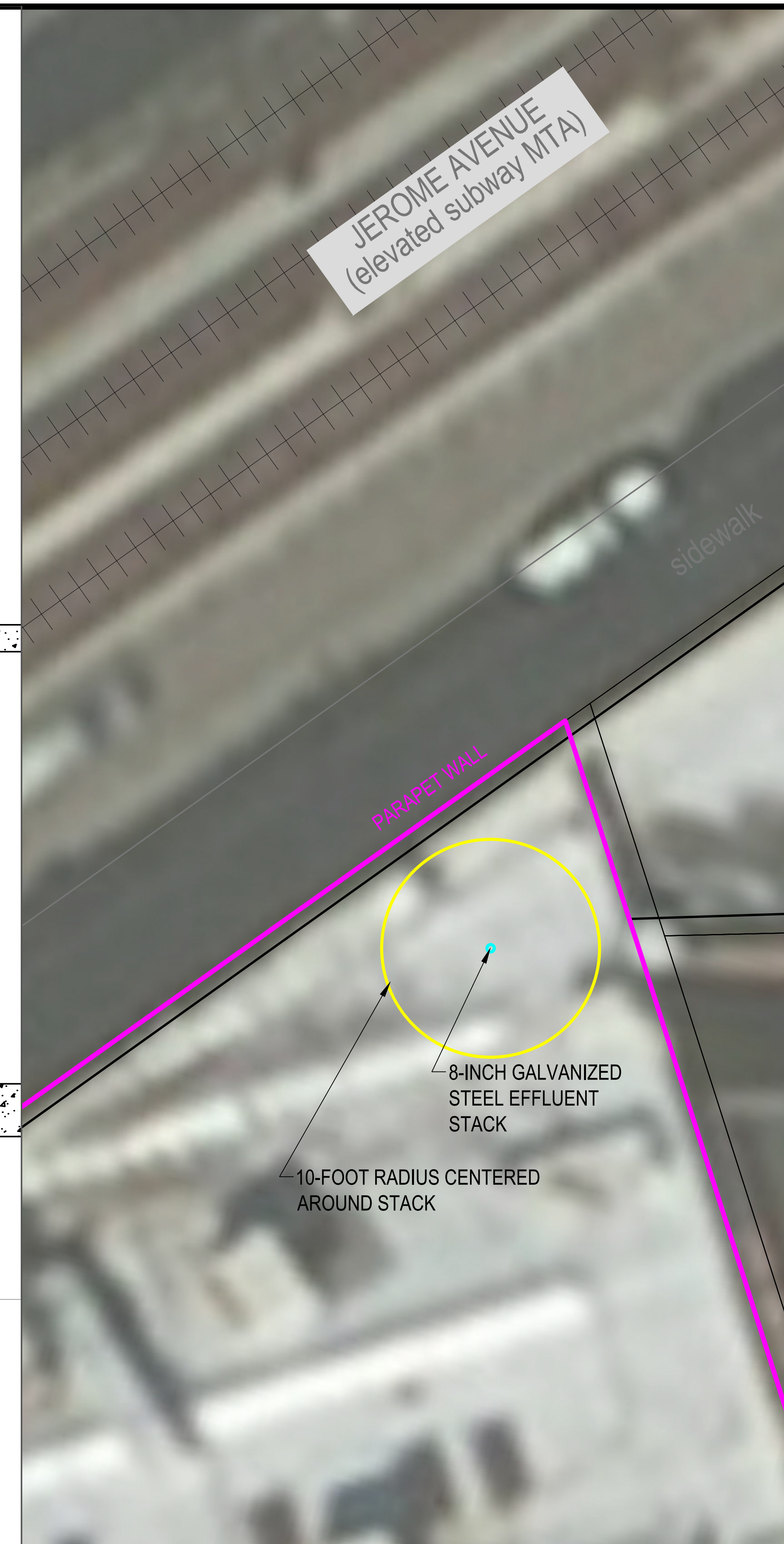
AKRF
Environmental Consultants
440 Park Avenue South, New York, N.Y. 10016

DATE **03.21.2014**
PROJECT No. **11455**
SCALE **NTS**
FIGURE **5**



NOTE:

1. CONCEPTUAL DRAWING FOR ROOF AND EFFLUENT STACK. NOT ALL CONNECTIONS OR SUPPORTS ARE SHOWN. SHOP DRAWINGS TO BE PREPARED FOR FINAL STACK LAYOUT.
2. NOT DRAWN TO SCALE.
3. DISCHARGE EXHAUST STACK MINIMUM 10' ABOVE ROOF AND MINIMUM 10' FROM ANY WINDOWS, AIR INTAKES/VENTS, AND ADJACENT BUILDINGS.
4. ALL EFFLUENT PIPING ON FIRST AND SECOND FLOOR TO BE ENCLOSED WITHIN SHEET ROCK PIPE CHASE.



LEGEND:

- PROJECT SITE BOUNDARY
- BUILDING LINE
- 10-FOOT RADIUS AROUND ROOF-MOUNTED EFFLUENT STACK
- 8-INCH GALVANIZED STEEL ROOF-MOUNTED EFFLUENT STACK WITH RAIN CAP

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Environmental Consultants
440 Park Avenue South, New York, NY 10016

FORMER NESSEN LAMP SITE
3200 JEROME AVENUE
BRONX, NEW YORK

ROOF AND EFFLUENT STACK DETAILS

DATE	3/21/2014
PROJECT NO.	11455
SCALE	as shown
FIGURE	6

APPENDIX A

DECISION DOCUMENT

Former Nessen Lamps Site (aka PS 51X)
Brownfield Cleanup Program
Bronx, Bronx County
Site No. C203061
June 2013

Prepared by
Division of Environmental Remediation
New York State Department of Environmental Conservation

DECLARATION STATEMENT - DECISION DOCUMENT

Former Nessen Lamps Site (aka PS 51X)
Brownfield Cleanup Program
Bronx, Bronx County
Site No. C203061
June 2013

Statement of Purpose and Basis

This document presents the remedy for the Former Nessen Lamps Site (aka PS 51X) site, a brownfield cleanup site. The remedial program was chosen in accordance with the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (the Department) for the Former Nessen Lamps Site (aka PS 51X) site and the public's input to the proposed remedy presented by the Department.

Description of Selected Remedy

The elements of the selected remedy are as follows:

1. Remedial Design

A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows;

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

2. Excavation

Excavation and off-site disposal of contaminant source area soil containing contaminants of concern that exceed the Soil Cleanup Objectives (SCOs) for Restricted Use – Protection of Groundwater, as defined by 6 NYCRR Part 375-6.8(b). Contaminants of concern include: trichloroethylene (TCE) and its degradation products, as well as benzene, toluene, ethylbenzene, xylenes (BTEX), and isopropylbenzene.

The contaminant source removal described above is limited to a 1,500 square foot area in the central portion of the Site beneath the building, between 5 and 11 feet below surface grade. Approximately 350 cubic yards of contaminated soil from this area will be excavated and properly disposed off-site.

On-site soil which does not exceed the SCOs described above may be used to backfill the excavation below the cover system described in remedy element 3.

Clean fill meeting the requirements for the identified site use as set forth in 6 NYCRR Part 375-6.7(d) will be brought in to complete the backfilling of the excavation and establish the designed grades at the site.

3. Cover System

A site cover, consisting of the concrete slab for the building, currently exists and will be maintained to allow for restricted residential use of the site. In the area that will be excavated as described in remedy element 2, the site cover will be replaced in-kind after the area is filled with clean backfill. The cover may consist either of structures such as buildings, pavement, and sidewalks comprising the site development; or a soil cover in areas where the upper two feet of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs). Where a soil cover is required it will be a minimum of two fee of soil, meeting the SCOs for cover material as set forth in 6 NYCRR Part 375-6.7(d) for restricted residential use. The soil cover will be placed over a demarcation layer, with the upper six inches of the soil of sufficient quality to maintain a vegetation layer. Any fill material brought to the site will meet the requirements for the identified site use as set forth in 6 NYCRR Part 375-6.7(d).

4. Groundwater Treatment

In-situ chemical oxidation or enhanced bioremediation via reductive dechlorination will be implemented to treat contaminants in groundwater. A chemical oxidant or reducing agent (to enhance biological degradation) will be injected into the subsurface in an approximately 3,000-square foot area located in the central portion of the site, where chlorinated solvents are present at the highest concentrations in groundwater. Injection will be performed via injection wells screened from approximately 17 feet to 24 feet below first floor grade. The precise method, dosage, and location and depth of injection wells will be determined during the remedial design. It is estimated that the chemical oxidant or reducing agent will be injected during 2 separate events over several months.

5. Vapor Mitigation

The existing building will be required to have a sub-slab depressurization system, or a similar engineered system, to prevent the migration of vapors into the building from any residual contaminated soil or groundwater.

6. Institutional Control

Imposition of an institutional control in the form of an environmental easement for the controlled property that:

- requires the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
- allows the use and development of the controlled property for restricted residential, commercial and industrial use as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or County DOH; and
- requires compliance with the Department approved Site Management Plan.

7. Site Management Plan

A Site Management Plan is required, which includes the following:

a. an Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

Institutional Controls: The Environmental Easement discussed above.
Engineering Controls: The composite cover system, groundwater treatment system, and vapor mitigation system described in remedy elements 3, 4, and 5, above.

This plan includes, but may not be limited to:

- an Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
- descriptions of the provisions of the environmental easement including any land use, and groundwater use restrictions;
- a provision for evaluation of the potential for soil vapor intrusion for any new buildings developed on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- provisions for the management and inspection of the identified engineering controls;
- maintaining site access controls and Department notification;
- the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

b. a Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:

- monitoring of groundwater and soil vapor to assess the performance and effectiveness of the remedy;
- a schedule of monitoring and frequency of submittals to the Department;
- monitoring for vapor intrusion for any new buildings developed on the site, as may be required by the Institutional and Engineering Control Plan discussed above.

c. an Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy. The plan includes, but is not limited to:

- compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
- maintaining site access controls and Department notification; and
- providing the Department access to the site and O&M records.

The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible.

<u>Declaration</u>

The remedy conforms with promulgated standards and criteria that are directly applicable, or that are relevant and appropriate and takes into consideration Department guidance, as appropriate. The remedy is protective of public health and the environment.

June 6, 2013	
Date	Robert J. Cozzy, Director Remedial Bureau B

DECISION DOCUMENT

Former Nessen Lamps Site (aka PS 51X)
Bronx, Bronx County
Site No. C203061
June 2013

SECTION 1: SUMMARY AND PURPOSE

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), has selected a remedy for the above referenced site. The disposal of contaminants at the site has resulted in threats to public health and the environment that would be addressed by the remedy. The disposal or release of contaminants at this site, as more fully described in this document, has contaminated various environmental media. Contaminants include hazardous waste and/or petroleum.

The New York State Brownfield Cleanup Program (BCP) is a voluntary program. The goal of the BCP is to enhance private-sector cleanups of brownfields and to reduce development pressure on "greenfields." A brownfield site is real property, the redevelopment or reuse of which may be complicated by the presence or potential presence of a contaminant.

The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and 6 NYCRR Part 375. This document is a summary of the information that can be found in the site-related reports and documents.

SECTION 2: CITIZEN PARTICIPATION

The Department seeks input from the community on all remedies. A public comment period was held, during which the public was encouraged to submit comment on the proposed remedy. All comments on the remedy received during the comment period were considered by the Department in selecting a remedy for the site. Site-related reports and documents were made available for review by the public at the following document repositories:

New York Public Library, Bronx Library Center
Attn: Sharon Jarvis
310 East Kingsbridge Road
(at Briggs Avenue)
Bronx, NY 10458
Phone: 718-579-4244

Bronx Community Board 7
229-A East 204th Street
Bronx, NY 10458

Phone: 718-993-5650

Receive Site Citizen Participation Information By Email

Please note that the Department's Division of Environmental Remediation (DER) is "going paperless" relative to citizen participation information. The ultimate goal is to distribute citizen participation information about contaminated sites electronically by way of county email listservs. Information will be distributed for all sites that are being investigated and cleaned up in a particular county under the State Superfund Program, Environmental Restoration Program, Brownfield Cleanup Program, Voluntary Cleanup Program, and Resource Conservation and Recovery Act Program. We encourage the public to sign up for one or more county listservs at http://www.dec.ny.gov/chemical/61092.html

SECTION 3: SITE DESCRIPTION AND HISTORY

Location:
The Former Nessen Lamps Site is located at 3200 Jerome Avenue in the Bronx. It is located at the northeast corner of Jerome Avenue and Van Cortlandt Avenue East. The site is identified as Block 3323, Lot 36 on the Bronx County Tax Map. The Site is surrounded by a garage and other commercial uses to the north/northeast; residential buildings to the east along Van Cortlandt Ave.; commercial and residential buildings to the south across Van Cortlandt Ave.; and a New York City Department of Environmental Protection (NYCDEP) facility and NYC Transit Authority train yard to the west.

Site Features:
The site consists of a triangular-shaped, approximately 11,500-square foot property that is fully occupied by an approximately 18,200 sf, 2-story building. The building is currently vacant.

Current Zoning:
The site is currently zoned C8-2 (commercial district). Most recently, the building was occupied by PS 51X (The Bronx New School), an elementary school serving Kindergarten through 5th grade. The building was leased by the New York City School Construction Authority and used for the school from 1993 to 2011.

Past Use of the Site:
The Site was historically used as a garage (approximately 1928 to 1956); a drug company (1956 to 1965); Nessen Lamps, Inc. for lamp manufacturing (1971 through 1988); and most recently the Bronx New School (PS51) from 1993 through June 2011. It has since been vacant. Four 550-gallon buried gasoline tanks were noted at the site between 1945 and 1992 prior to its use as a school. Nessen Lamps, Inc. is known to have generated hazardous waste (trichloroethene) at the site between 1982 and 1987, based on hazardous waste documentation available from that time period.

Site Geology and Hydrogeology:
Overburden soil beneath the Site is characterized by fill material, consisting of sand, with silt, gravel, brick, glass, coal, and ash present to depths of approximately 4 to 9 feet below surface

grade. The overburden beneath the fill material was documented as a generally brown glacial till consisting of fine to medium sand with varying amounts of silt, clay, gravel, cobbles, and weathered rock. The till material is underlain by bedrock that slopes downward in elevation from a high point in the southwestern portion of the Site at approximately 16 feet below sidewalk grade to a low point in the northeastern portion of the Site at approximately 32 feet below sidewalk grade. The topography of the Site slopes gently from the east to the west. The overburden groundwater aquifer is present at a depth of approximately 22 feet below the exterior sidewalk grade. Groundwater flow direction in the overburden groundwater aquifer is generally to the west and west-southwest.

A site location map is attached as Figure 1.

SECTION 4: LAND USE AND PHYSICAL SETTING

The Department may consider the current, intended, and reasonably anticipated future land use of the site and its surroundings when evaluating a remedy for soil remediation. For this site, alternatives that restrict the use of the site to restricted-residential use (which allows for commercial use and industrial use) as described in Part 375-1.8(g) were evaluated in addition to an alternative which would allow for unrestricted use of the site.

A comparison of the results of the Remedial Investigation (RI) to the appropriate standards, criteria and guidance values (SCGs) for the identified land use and the unrestricted use SCGs for the site contaminants is available in the RI Report.

SECTION 5: ENFORCEMENT STATUS

The Applicant under the Brownfield Cleanup Agreement is a Volunteer. The Volunteer does not have an obligation to address off-site contamination. The Department has determined that this site poses a significant threat to human health and the environment but there are no off-site impacts that require remedial activities; accordingly, enforcement actions are not necessary.

SECTION 6: SITE CONTAMINATION

6.1: Summary of the Remedial Investigation

A remedial investigation (RI) serves as the mechanism for collecting data to:

- characterize site conditions;
- determine the nature of the contamination; and
- assess risk to human health and the environment.

The RI is intended to identify the nature (or type) of contamination which may be present at a site and the extent of that contamination in the environment on the site, or leaving the site. The RI reports on data gathered to determine if the soil, groundwater, soil vapor, indoor air, surface water or sediments may have been contaminated. Monitoring wells are installed to assess groundwater and soil borings or test pits are installed to sample soil and/or waste(s) identified. If other natural resources are present, such as surface water bodies or wetlands, the water and sediment may be sampled as well. Based on the presence of contaminants in soil and groundwater, soil vapor will also be sampled for the presence of contamination. Data collected in the RI influence the development of remedial alternatives. The RI report is available for review in the site document repository and the results are summarized in section 6.3.

The analytical data collected on this site includes data for:

- groundwater
- soil
- soil vapor
- indoor air
- sub-slab vapor

6.1.1: Standards, Criteria, and Guidance (SCGs)

The remedy must conform to promulgated standards and criteria that are directly applicable or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, Criteria and Guidance are hereafter called SCGs.

To determine whether the contaminants identified in various media are present at levels of concern, the data from the RI were compared to media-specific SCGs. The Department has developed SCGs for groundwater, surface water, sediments, and soil. The NYSDOH has developed SCGs for drinking water and soil vapor intrusion. For a full listing of all SCGs see: http://www.dec.ny.gov/regulations/61794.html

6.1.2: RI Results

The data have identified contaminants of concern. A "contaminant of concern" is a contaminant that is sufficiently present in frequency and concentration in the environment to require evaluation for remedial action. Not all contaminants identified on the property are contaminants of concern. The nature and extent of contamination and environmental media requiring action are summarized below. Additionally, the RI Report contains a full discussion of the data. The contaminant(s) of concern identified at this site is/are:

TRICHLOROETHENE (TCE)	XYLENE (MIXED)
BENZENE	DICHLOROETHYLENE
ETHYLBENZENE	VINYL CHLORIDE
TOLUENE	Isopropylbenzene

The contaminant(s) of concern exceed the applicable SCGs for:

- groundwater
- soil
- soil vapor intrusion
- indoor air

6.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before issuance of the Decision Document.

There were no IRMs performed at this site during the RI.

6.3: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts may include existing and potential future exposure pathways to fish and wildlife receptors, wetlands, groundwater resources, and surface water. The RI report presents a detailed discussion of any existing and potential impacts from the site to fish and wildlife receptors.

Nature and Extent of Contamination:
The contaminants of concern in soil, groundwater and/or soil vapor are trichloroethene (TCE) and associated breakdown products. TCE is a Volatile Organic Compound (VOC) known to have been used on-site by the previous operator, Nessen Lamps Inc. Petroleum-related VOCs have been detected in soil and groundwater and are also of concern.

Soil:
TCE has been detected in soil at concentrations exceeding the Unrestricted Use Soil Cleanup Objective (UUSCO) in 4 samples. In these samples concentrations of TCE range from 1.5 parts per million (ppm) to 43 ppm, compared to the UUSCO of 0.47 ppm. Petroleum-related contaminants were detected at concentrations exceeding the UUSCO in a few samples, including: total mixed xylenes detected at a maximum concentration of 91 ppm compared to the UUSCO of 0.26 ppm; ethylbenzene detected at 9.8 ppm compared to the UUSCO of 1 ppm; and toluene detected at 1.6 ppm compared to the UUSCO of 0.7 ppm. Contaminants are limited to a defined area in the central portion of the Site, and at depths of 6 to 7 feet below surface grade.

Groundwater:
TCE has been detected at concentrations exceeding Ambient Water Quality Standards (AWQS) in 6 of 8 groundwater monitoring wells (three of which are located in the sidewalk outside of the site boundaries). In on-site monitoring wells, TCE has been detected at concentrations ranging from 16 parts per billion (ppb) to 6,400 ppb, compared to the AWQS of 5 ppb. In the off-site groundwater monitoring wells, located in the sidewalk on the western border of the Site, TCE was detected at concentrations ranging from 19 ppb to 410 ppb. The lower concentrations were detected in bedrock groundwater wells; higher concentrations are in the overburden groundwater. Breakdown products of TCE were also detected in groundwater at concentrations exceeding AWQS, including: cis-1,2-dichloroethene and trans-1,2-dichloroethene detected at maximum concentrations of 66 ppb and 61 ppb, respectively, compared to the AWQS of 5 ppb; and vinyl chloride detected at a maximum concentration of 9.1 ppb compared to the AWQS of 2 ppb. Petroleum-related contaminants detected in groundwater at concentrations exceeding AWQS include: benzene detected at 600 ppb compared to the AWQS of 1 ppb; and toluene detected at

160 ppb, ethylbenzene at 540 ppb, and total xylenes at 1,900 ppb compared to the AWQS of 5 ppb for these 3 contaminants.

Soil Vapor and Indoor Air:
In the on-site building, TCE has been detected in sub-slab soil vapor as high as 53,000 micrograms per cubic meter (mcg/m3), and in indoor air samples as high as 607 mcg/m3. When concurrent sub-slab soil vapor and indoor air samples were collected from the on-site building in April 2011, TCE was detected in sub-slab soil vapor at a concentration of 31,000 mcg/m3 and in indoor air at 310 mcg/m3. Concentrations of TCE detected in indoor air exceed the NYSDOH guideline of 5 mcg/m3. Tetrachloroethylene (PCE) and cis-1,2-dichloroethane were detected in sub-slab soil vapor at low concentrations; and were not detected in indoor air. Off-site soil vapor intrustion sampling at the adjacent building indicated that TCE and PCE were present in sub-slab soil vapor and indoor air at low concentrations, at levels below those that would suggest the potential for soil vapor intrusion and no further action is required in the adjacent residential building.

Significant Threat:
The Site represents a significant threat to public health due to the occurrence of soil vapor intrusion in the on-site building, and the resulting potential for human exposure to TCE in indoor air.

6.4: Summary of Human Exposure Pathways

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure.*

Direct contact with contaminants in the soil is unlikely because the site is covered with buildings and pavement. People are not drinking the contaminated groundwater because the area is served by a public water supply that is not affected by this contamination. Volatile organic compounds in the groundwater or soil may move into the soil vapor (air spaces within the soil), which in turn may move into overlying buildings and affect the indoor air quality. This process, which is similar to the movement of radon gas from the subsurface into the indoor air of buildings, is referred to as soil vapor intrusion. Soil vapor intrusion sampling identified impacts in indoor air quality in the on-site building. Although the building is currently unoccupied, the potential exists for people to inhale site contaminants in indoor air due to soil vapor intrusion in any future on-site building development and/or occupancy. Sampling of the neighboring apartment building indicates soil vapor intrusion is not a concern.

6.5: Summary of the Remediation Objectives

The objectives for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. The goal for the remedial program is to restore the site to pre-disposal conditions to the extent feasible. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified at the site through the proper application of scientific and engineering principles.

The remedial action objectives for this site are:

Groundwater

RAOs for Public Health Protection

- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

RAOs for Environmental Protection

- Remove the source of ground or surface water contamination.

Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

SECTION 7: ELEMENTS OF THE SELECTED REMEDY

The alternatives developed for the site and the evaluation of the remedial criteria are presented in the Alternative Analysis. The remedy is selected pursuant to the remedy selection criteria set forth in DER-10, Technical Guidance for Site Investigation and Remediation and 6 NYCRR Part 375.

The selected remedy is a Track 4: Restricted use with site-specific soil cleanup objectives remedy.

The selected remedy is referred to as the Excavation of source material, cover system and in-situ groundwater treatment remedy.

The elements of the selected remedy, as shown in Figures 2, 3, and 4 are as follows:

1. Remedial Design

A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows;

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

2. Excavation

Excavation and off-site disposal of contaminant source area soil containing contaminants of concern that exceed the Soil Cleanup Objectives (SCOs) for Restricted Use – Protection of Groundwater, as defined by 6 NYCRR Part 375-6.8(b). Contaminants of concern include: trichloroethylene (TCE) and its degradation products, as well as benzene, toluene, ethylbenzene, xylenes (BTEX), and isopropylbenzene.

The contaminant source removal described above is limited to a 1,500 square foot area in the central portion of the Site beneath the building, between 5 and 11 feet below surface grade. Approximately 350 cubic yards of contaminated soil from this area will be excavated and properly disposed off-site.

On-site soil which does not exceed the SCOs described above may be used to backfill the excavation below the cover system described in remedy element 3.

Clean fill meeting the requirements for the identified site use as set forth in 6 NYCRR Part 375-6.7(d) will be brought in to complete the backfilling of the excavation and establish the designed grades at the site.

3. Cover System

A site cover, consisting of the concrete slab for the building, currently exists and will be maintained to allow for restricted residential use of the site. In the area that will be excavated as described in remedy element 2, the site cover will be replaced in-kind after the area is filled with clean backfill. The cover may consist either of structures such as buildings, pavement, and sidewalks comprising the site development; or a soil cover in areas where the upper two feet of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs). Where a soil cover is required it will be a minimum of two fee of soil, meeting the SCOs for cover material as set forth in 6 NYCRR Part 375-6.7(d) for restricted residential use. The soil cover will be placed over a demarcation layer, with the upper six inches of the soil of sufficient quality to maintain a vegetation layer. Any fill material brought to the site will meet the requirements for the identified site use as set forth in 6 NYCRR Part 375-6.7(d).

4. Groundwater Treatment

In-situ chemical oxidation or enhanced bioremediation via reductive dechlorination will be implemented to treat contaminants in groundwater. A chemical oxidant or reducing agent (to enhance biological degradation) will be injected into the subsurface in an approximately 3,000-square foot area located in the central portion of the site, where chlorinated solvents are present at the highest concentrations in groundwater. Injection will be performed via injection wells screened from approximately 17 feet to 24 feet below first floor grade. The precise method, dosage, and location and depth of injection wells will be determined during the remedial design. It is estimated that the chemical oxidant or reducing agent will be injected during 2 separate events over several months.

5. Vapor Mitigation

The existing building will be required to have a sub-slab depressurization system, or a similar engineered system, to prevent the migration of vapors into the building from any residual contaminated soil or groundwater.

6. Institutional Control

Imposition of an institutional control in the form of an environmental easement for the controlled property that:

- requires the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
- allows the use and development of the controlled property for restricted residential, commercial and industrial use as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or County DOH; and
- requires compliance with the Department approved Site Management Plan.

7. Site Management Plan

A Site Management Plan is required, which includes the following:

a. an Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

Institutional Controls: The Environmental Easement discussed above.
Engineering Controls: The composite cover system, groundwater treatment system, and vapor mitigation system described in remedy elements 3, 4, and 5, above.

This plan includes, but may not be limited to:

- an Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
- descriptions of the provisions of the environmental easement including any land use, and groundwater use restrictions;

- a provision for evaluation of the potential for soil vapor intrusion for any new buildings developed on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- provisions for the management and inspection of the identified engineering controls;
- maintaining site access controls and Department notification;
- the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

b. a Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:

- monitoring of groundwater and soil vapor to assess the performance and effectiveness of the remedy;
- a schedule of monitoring and frequency of submittals to the Department;
- monitoring for vapor intrusion for any new buildings developed on the site, as may be required by the Institutional and Engineering Control Plan discussed above.

c. an Operation and Maintenance (O&M) Plan to ensure continued operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy. The plan includes, but is not limited to:

- compliance monitoring of treatment systems to ensure proper O&M as well as providing the data for any necessary permit or permit equivalent reporting;
- maintaining site access controls and Department notification; and
- providing the Department access to the site and O&M records.

The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible.

Figure 1 – Site Location Map

Figure 2 – Proposed Remedy – Excavation Area

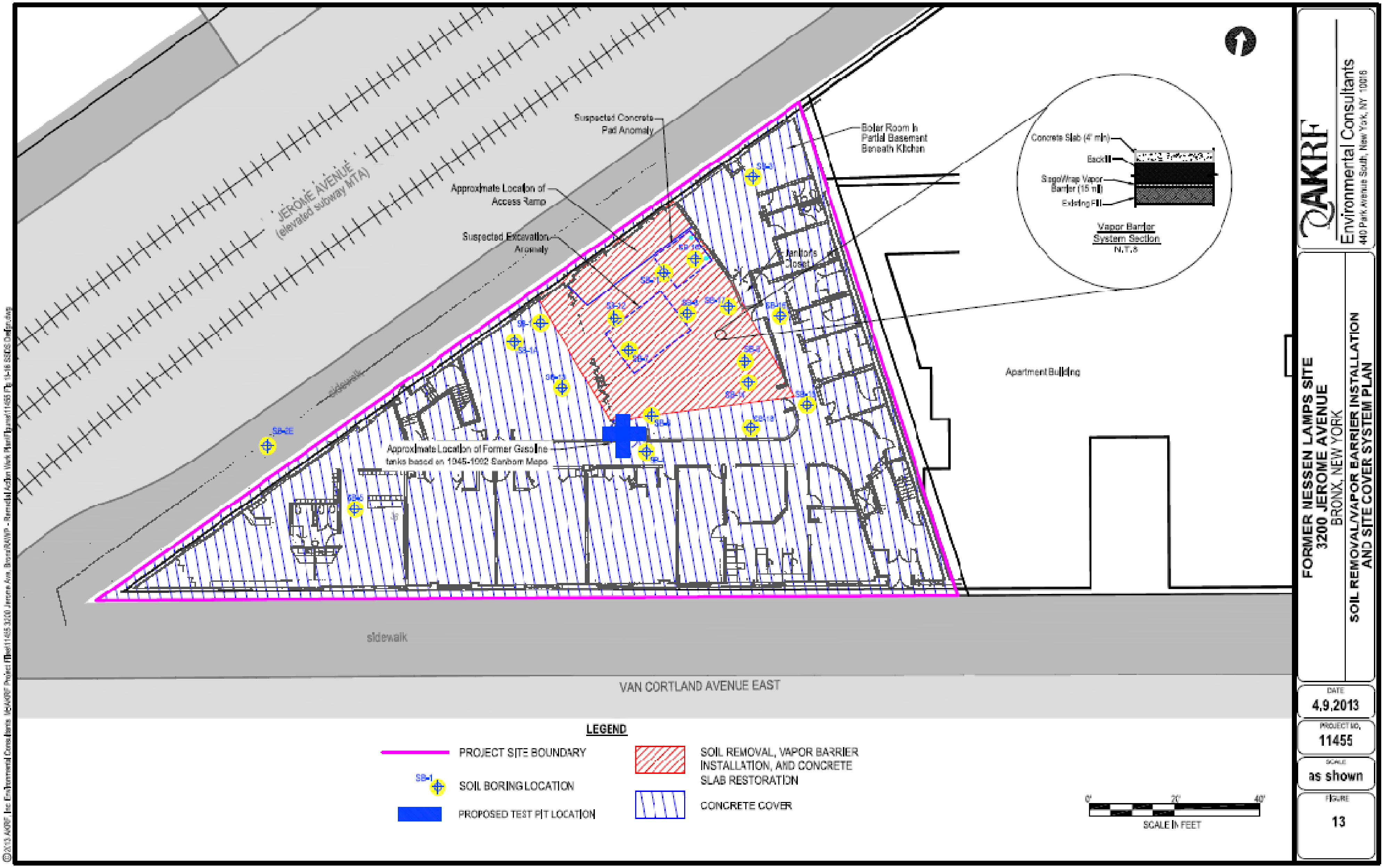


Figure 3 – Proposed Remedy – Groundwater Treatment Area

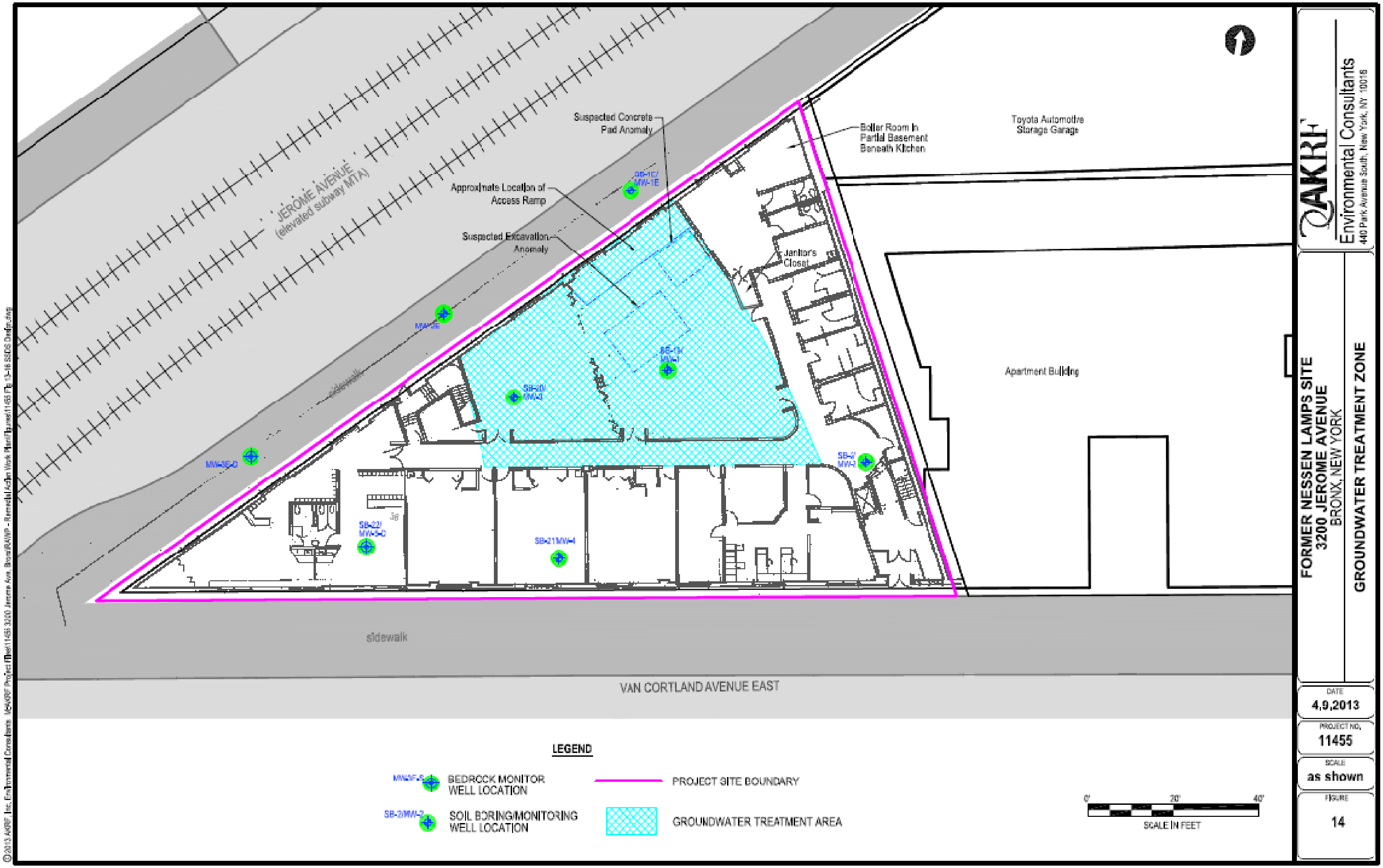
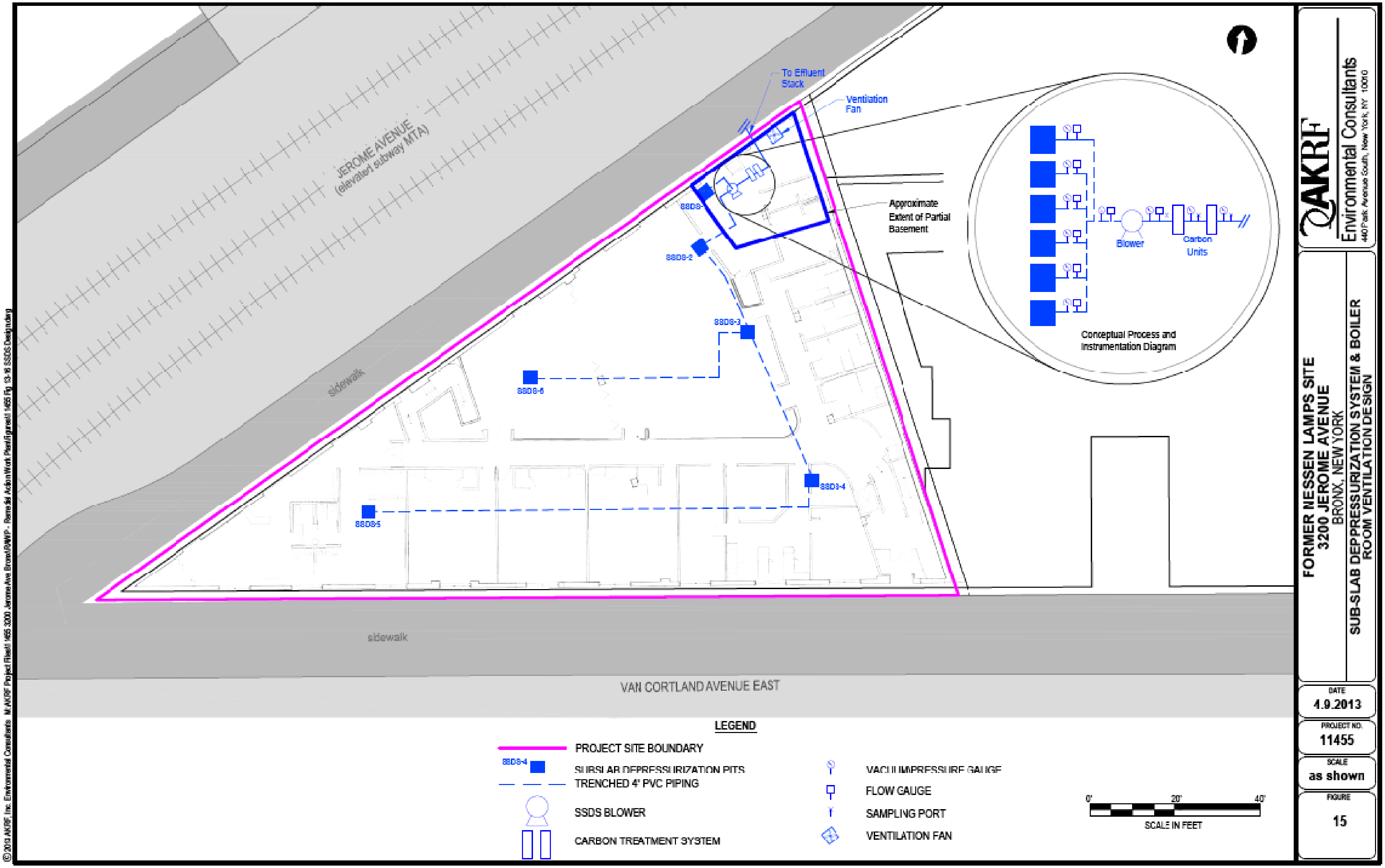


Figure 4 – Proposed Remedy – Vapor Mitigation System



APPENDIX B

AKRF
Environmental and Planning Consultants

440 Park Avenue South
7th Floor
New York, NY 10016
tel: 212 696-0670
fax: 212 213-3191
www.akrf.com

November 12, 2013

Ms. Dana Kaplan
Region 2 Division of Environmental Remediation
NYS Department of Environmental Conservation
47-40 21st Street
Long Island City, NY 11101

Re: Communication Testing and SSDS Piping Layout
Former Nessen Lamps Site
3200 Jerome Avenue, Bronx, NY
NYSDEC BCP Site No. C203061

Dear Ms. Kaplan:

In accordance with the New York State Department of Environmental Conservation (NYSDEC)-approved Remedial Action Work Plan (RAWP) submitted for Brownfield Cleanup Program (BCP) Site No. C203061 located at 3200 Jerome Avenue, Bronx, New York (Tax Block 3323, Lot 36) (Site), a sub-slab depressurization system (SSDS) will be installed as part of the remedy to mitigate the potential for soil vapor intrusion. The SSDS will apply negative pressure beneath the concrete slab, minimizing the potential for vapor intrusion into the Site building. The VOC-contaminated air captured by the SSDS system will be treated using activated carbon prior to discharge to the atmosphere. In an effort to assess existing subsurface vacuum communication conditions and design a conservative layout of suction pits and trenched piping associated with the SSDS, communication testing was completed at the Site in July 2013 under AKRF's oversight by Keystone Environmental Services (Keystone). The communication testing was performed prior to mobilization for the planned soil removal and SSDS piping installation to ensure viable locations for the proposed pits and piping runs could be established and provided to the installation contractor.

A shop vacuum was used to apply vacuum to small borings (vacuum points) drilled to a minimum depth of 1 foot beyond the existing concrete slab throughout the first floor and basement of the Site building. Additional borings (monitoring points) were installed at increasing radii away from the original vacuum points, and a vacuum gauge was used to measure the vacuum induced at these monitoring points at varying radii from the vacuum point. The vacuum monitoring was performed to determine the maximum distance at which a minimum vacuum of approximately 0.004 inches of water column (inH2O) was induced. The testing was repeated in this manner until induced vacuum was assessed throughout the Site. A copy of Keystone's communication testing report showing the location of the vacuum and monitoring points, and the induced vacuum observed during the testing is included in Attachment A.

Based on the communications testing results, a conservative layout of SSDS pits has been established, which overlap the theoretical radii of influence (ROIs) from each vacuum point (future SSDS pit location) to ensure continuous vacuum coverage throughout the entire Site. The SSDS pits will be connected through a network of underground piping, to a fan which will apply negative pressure to the target area to capture soil vapor. All captured vapors will be directed through a granular activated carbon (GAC) treatment system, and subsequently discharged to the atmosphere. The approximate proposed layout of the SSDS pits, trenched underground piping, and SSDS mechanical components are shown on Figure 1 in Attachment B.

In addition to the SSDS pits, permanent sub-slab monitoring points will be installed within the building during SSDS installation and will be used to ensure that key indicator locations remain under vacuum. Each SSDS pit will be fitted with a sampling port, vacuum gauge and air flow rate meter. The same appurtenances will be installed before and after the SSDS fan. A sample port will be installed before and after the carbon treatment unit(s) in series. Final details for the SSDS design, including specifications for the blower and GAC vessels, will be presented to NYSDEC and NYSDOH in P.E. certified drawings to be prepared prior to the installation and activation of the mechanical system components.

Please confirm that, based upon the communication testing results provided in this letter, that the locations of the proposed pits and piping runs are acceptable to NYSDEC and NYSDOH. Upon confirmation, this work will be completed in conjunction with the soil removal activities.

Please feel free to contact Marc at (914) 922-2356 or Dustin at (646) 388-9767 with any questions or concerns.

Sincerely,
AKRF, Inc.

Marc Godick, LEP
Senior Vice President

Dustin A. Kapson
Environmental Scientist

cc (electronic copy only):

Dawn Hettrick – NYSDOH
James Rinzler – The Rinzler Family Limited Partnership
Frances Stella, Esq., Brach Eichler LLC

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ATTACHMENT A

KEYSTONE
ENVIRONMENTAL SERVICES

A Division of Keystone Material Testing, LLC | **MBE - Minority Business Enterprise**

August 1, 2013

Mr. Dustin Kapson
Sr. Environmental Professional
440 Park Avenue South, 7th Floor
New York, NY 10016

Re: Soil Vapor Remediation
Field Diagnostic Testing
3200 Jerome Avenue
Bronx, New York
KES File 0232_10613

Dear Mr. Kapson:

Per our July 5, 2013 executed subcontract agreement, Keystone Environmental Services performed the above noted diagnostic testing.

Enclosed in Appendix A are our contractor daily reports outlining daily work activities.

Enclosed in Appendix B is our diagnostic data generated from our July 17, 2013 through July 18, 2013 on site inspections. The data is compiled in tabular format for your review. Also included in Appendix B is a figure showing the extent of sub-slab vacuum readings from each vacuum test hole.

After reviewing our data, please feel free to contact us with questions. Thank you.

Sincerely,

Richard J. Tarnowski, CEP, CEI
Member/Director of Environmental Services

RJT/tms

Enclosures

APPENDIX A

Contractor Daily Reports

KEYSTONE ENVIRONMENTAL SERVICES

Project # 0232_10613

Soil Vapor Mitigation Project: AKRF- 3200 Jerome Avenue

Contractor's Daily Report

Date	Address	Crew
7/17/2013	3200 Jerome Avenue, Bronx NY	Christian Tarnowski, Tim O'Connor

Provide a brief description of daily work performed:

5:00 AM - 8:30 AM **Travel**, 8:30 AM - 4:30 PM **Diagnostics**, 4:30 PM - 5:00 PM **Travel to hotel**

3.5 hours travel from Binghamton to project site.

1 hour unpacking/ building walkthrough.

7 hours performing diagnostic testing.

.5 hours travel from project site to hotel.

Manpower and Equipment

Provide a detailed list of manpower and equipment resources. The Trade field refers to type of manpower, i.e. Carpenter, Electrician, etc. The Classification field refers to qualifications, i.e. Foreman, Journeyman, Apprentice, etc.

HRS	NAME	CLASSIFICATION
12	Christian T	Foreman
12	Tim O	Field Tech

QTY	EQUIPMENT
1(2)	Large Hammer Drill, Small Hammer Drill
1(2)	6.5 HP Diagnostic Vac + Small Vac
1	Vane Anemometer
1	Manometer
1	Container of Plumbers Putty
1	Work Vehicle

Manpower Units: Manhours ☑ Mandays ☐ Other____________

Equipment Units: Days ☑ Hours ☐ Other___________

Events or Issues

Provide a description of any significant events or issues to report. Include quantities and units if applicable:

KEYSTONE
ENVIRONMENTAL SERVICES

Contractor's Daily Report

Project # 0232_10613
Soil Vapor Mitigation Project: AKRF- 3200 Jerome Avenue

Date	Address	Crew
7/18/2013	3200 Jerome Avenue, Bronx NY	Christian Tarnowski, Tim O'Connor

Provide a brief description of daily work performed:

7:00 AM-7:30 AM **Travel from hotel to job site**,7:30 AM-3:30 PM **Diagnostics**,3:30 PM-7:00 PM **Travel to Bing**

.5 hours travel from hotel to project site
8 hours performing Diagnostics
3.5 hours travel from project site to Binghamton NY

Manpower and Equipment

Provide a detailed list of manpower and equipment resources. The Trade field refers to type of manpower, i.e. Carpenter, Electrician, etc. The Classification field refers to qualifications, i.e. Foreman, Journeyman, Apprentice, etc.

HRS	NAME	CLASSIFICATION
12	Christian T	Foreman
12	Tim O	Field Tech

QTY	EQUIPMENT
1(2)	Large Hammer Drill, Small Hammer Drill
1(2)	6.5 HP Diagnostic Vac + Small Vac
1	Vane Anemometer
1	Manometer
1	Tube of Caulk
1	Work Vehicle

Manpower Units: Manhours ☑ Mandays ☐ Other____________

Equipment Units: Days ☑ Hours ☐ Other____________

Events or Issues

Provide a description of any significant events or issues to report. Include quantities and units if applicable:

APPENDIX B

Diagnostic Data and Diagrams

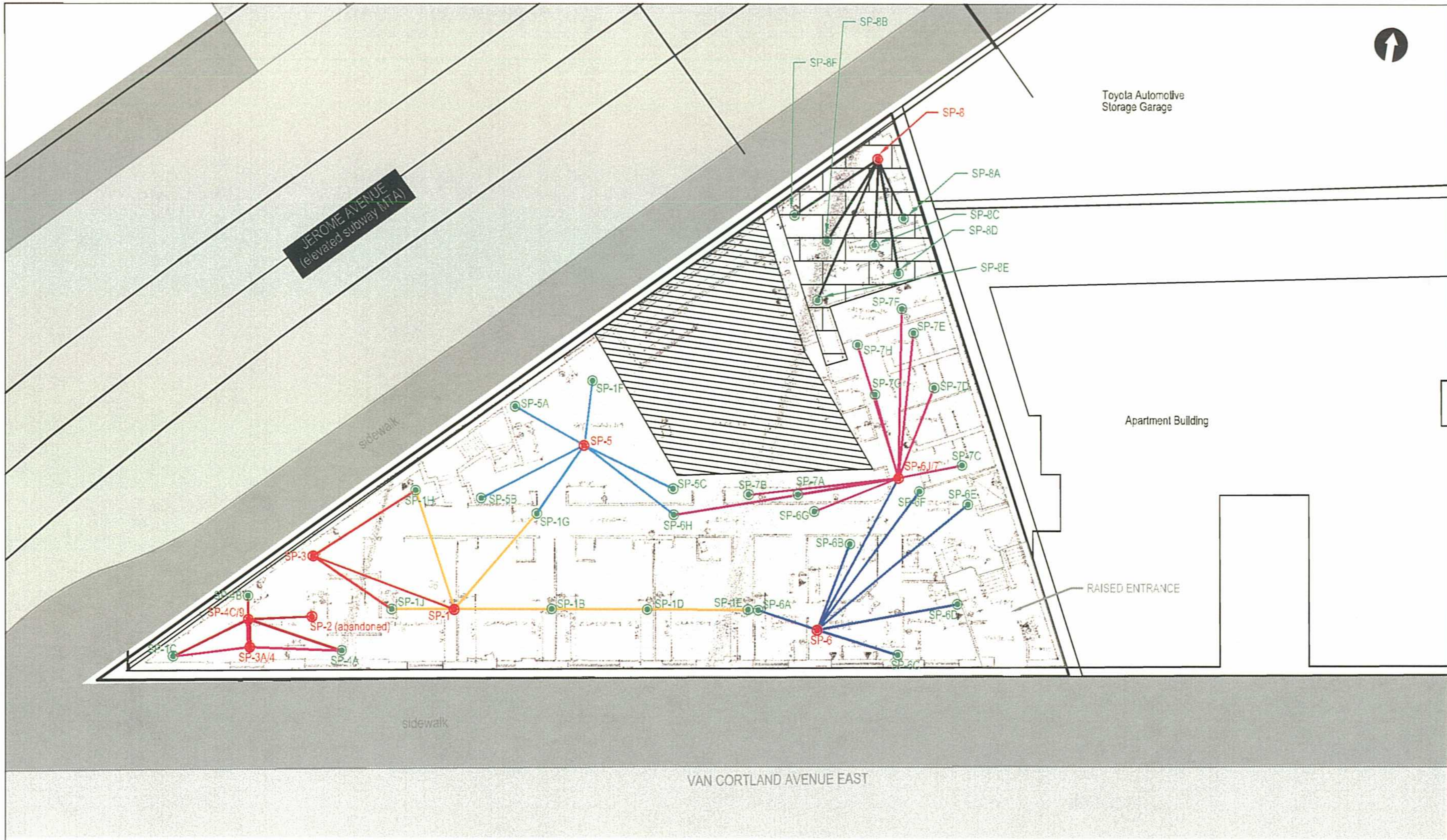
KEYSTONE ENVIRONMENTAL SERVICES

AKRF Diagnostics: 3200 Jerome Avenue, Bronx, New York
Date: 7-17-13 / 7-18-13
KES File #: 0232_10613

Suction Device	Date	Vacuum Test Point	Static Vacuum inch WC	Air Flow CFM	Diagnostic Test Hole	Approximate Distance in Feet from Vacuum Test Point	Suction Device Off (inch WC)	Suction Device On (inch WC)	Pressure Differential (inch WC)	Notes
6.5 HP Vac	7/17/13	SP1	39	29						9 Inch slab
6.5 HP Vac	7/17/13				SP1A	-	-	-		Abandoned, Possible Sub Slab Obstruction
6.5 HP Vac	7/17/13				SP1B	20'	-0.007	-0.060	-0.053	Possible Underground Subway influence
6.5 HP Vac	7/17/13				SP1C	58'	-0.003	-0.005	-0.002	Little to No Coverage
6.5 HP Vac	7/17/13				SP1D	40'	-0.001	-0.018	-0.017	
6.5 HP Vac	7/17/13				SP1E	60'	-0.001	-0.014	-0.015	
6.5 HP Vac	7/17/13				SP1F	48'	-0.001	-0.002	-0.001	Little to No Coverage
6.5 HP Vac	7/17/13				SP1G	32'	< -0.001	-0.005	-0.004	
6.5 HP Vac	7/17/13				SP1H	24' 6"	-0.001	-0.005	-0.004	
6.5 HP Vac	7/17/13				SP1J	13'	-0.001	-0.114	-0.113	
6.5 HP Vac	7/17/13	SP2	40	17		-	-	-		Abandoned, Possible Sub Slab Obstruction
6.5 HP Vac	7/17/13	SP3	39	27						4-6 Inch slab
6.5 HP Vac	7/17/13				SP1C	52'	-0.004	-0.005	-0.001	Little to No Coverage
6.5 HP Vac	7/17/13				SP1H	41'	< -0.001	-0.005	-0.004	
6.5 HP Vac	7/17/13				SP1J	20'	-0.001	-0.660	-0.659	
6.5 HP Vac	7/17/13				SP3A	16'	-0.003	-0.003	0.000	SP3A Converted Into Vacuum Test Point SP4
6.5 HP Vac	7/17/13				SP1	31'	-0.003	-0.009	-0.006	
6.5 HP Vac	7/17/13	SP4	39	26						9 Inch Slab, Former SP3A
6.5 HP Vac	7/17/13				SP1C	19' 6"	-0.001	-0.015	-0.014	
6.5 HP Vac	7/17/13				SP4A	20'	-0.002	-0.026	-0.024	
6.5 HP Vac	7/17/13				SP4B	22' 6"	-0.001	0.000	0.001	Little to No Coverage
6.5 HP Vac	7/17/13				SP4C	16' 6"	0.002	0.000	-0.002	SP4C Converted Into Vacuum Test Point SP9
6.5 HP Vac	7/17/13	SP5	44	29						4-6 Inch Slab
6.5 HP Vac	7/17/13				SP1F	13' 6"	-0.001	-0.014	-0.013	
6.5 HP Vac	7/17/13				SP5A	16' 6"	-0.001	-0.017	-0.016	
6.5 HP Vac	7/17/13				SP5B	25' 6"	0.000	-0.006	-0.006	
6.5 HP Vac	7/17/13				SP1G	17' 6"	-0.001	-0.073	-0.072	
6.5 HP Vac	7/17/13				SP5C	20' 6"	-0.002	-0.117	-0.115	
6.5 HP Vac	7/17/13				SP6H		-0.002	-0.069	-0.067	
6.5 HP Vac	7/17/13	SP6	33	77						4-6 Inch Slab
6.5 HP Vac	7/17/13				SP6A	13'	< -0.001	-0.080	-0.079	

Suction Device	Date	Vacuum Test Point	Static Vacuum inch WC	Air Flow CFM	Diagnostic Test Hole	Approximate Distance in Feet from Vacuum Test Point	Suction Device Off (inch WC)	Suction Device On (inch WC)	Pressure Differential (inch WC)	Notes
6.5 HP Vac	7/17/13				SP6B	19'	< -0.001	-0.035	-0.034	
6.5 HP Vac	7/17/13				SP6C	17' 6"	-0.001	-0.077	-0.076	
6.5 HP Vac	7/17/13				SP6D	31'	< -0.001	-0.065	-0.064	
6.5 HP Vac	7/17/13				SP6E	43'	< -0.001	-0.030	-0.029	
6.5 HP Vac	7/18/13				SP6F	40'	< -0.001	-0.007	-0.006	
6.5 HP Vac	7/18/13				SP6G	25'	0.000	0.000	0.000	Little to No Coverage
6.5 HP Vac	7/18/13				SP6H	40'	0.000	0.000	0.000	Little to No Coverage
6.5 HP Vac	7/18/13				SP6J	38'	-0.002	-0.024	-0.022	SP6J Converted Into Vacuum Test Point SP7
6.5 HP Vac	7/18/13	SP7	44	29						4-6 Inch Slab
6.5 HP Vac	7/18/13				SP6G	19'	0.000	-0.101	-0.101	
6.5 HP Vac	7/18/13				SP6H	48'	< -0.001	-0.0045	-0.003	
6.5 HP Vac	7/18/13				SP7A	21' 6"	< -0.001	-0.400	-0.399	
6.5 HP Vac	7/18/13				SP7B	31' 6"	< -0.001	-0.025	-0.024	
6.5 HP Vac	7/18/13				SP7C	13' 6"	-0.001	-0.110	-0.109	Bathroom Location with Door Shut
6.5 HP Vac	7/18/13				SP7D	24'	-0.004	-0.059	-0.055	Bathroom Location with Door Shut
6.5 HP Vac	7/18/13				SP7E	49'	< -0.001	-0.013	-0.012	Bathroom Location with Door Shut
6.5 HP Vac	7/18/13				SP7F	52'	-0.005	-0.010	-0.005	
6.5 HP Vac	7/18/13				SP7G	18'	< -0.001	-0.186	-0.185	
6.5 HP Vac	7/18/13				SP7H	36'	-0.004	-0.009	-0.005	
6.5 HP Vac	7/18/13	SP8	35	73						Basement Location, 4-6 Inch Slab
6.5 HP Vac	7/18/13				SP8A	13' 7"	0.000	-1.380	-1.380	
6.5 HP Vac	7/18/13				SP8B	20'	0.000	-0.007	-0.007	
6.5 HP Vac	7/18/13				SP8C	18'	0.000	-0.530	-0.530	
6.5 HP Vac	7/18/13				SP8D	24'	< -0.001	-0.680	-0.679	
6.5 HP Vac	7/18/13				SP8E	28'	0.000	-0.005	-0.005	
6.5 HP Vac	7/18/13				SP8F	21'	0.000	-0.007	-0.007	
6.5 HP Vac	7/18/13	SP9	42	23						9 Inch Slab- Former Diagnostic Test Hole SP4C
6.5 HP Vac	7/18/13				SP1C	22' 6"	-0.004	-0.012	-0.008	
6.5 HP Vac	7/18/13				SP3A/ SP4	6' 6"	-0.003	-0.060	-0.057	
6.5 HP Vac	7/18/13				SP4B	7'	-0.001	-0.036	-0.035	
6.5 HP Vac	7/18/13				SP4A	14'	-0.003	-0.017	-0.014	
6.5 HP Vac	7/18/13				SP2	7' 6"	-0.003	-1.500	-1.497	

NOTE: Weather conditions on both sampling dates 7-17-13 / 7-18-13 were satisfactory with little to no outside Interference. Air conditioning units were running during diagnostic testing



LEGEND:

- SP-1 = SUCTION POINT
- SP-1A = VACUUM TEST POINT
- *COMMUNICATION VARIES BY COLOR
- PROJECT SITE BOUNDARY
- LOT LINE
- BUILDING LINE
- SOIL REMOVAL, VAPOR BARRIER INSTALLATION, AND CONCRETE SLAB RESTORATION (EXCLUDED FROM COMMUNICATION TESTING)
- BASEMENT

0' 20' 40'
SCALE IN FEET

AKRF
Environmental Consultants
440 Park Avenue South, New York, NY 10016

FORMER NESSEN LAMP SITE
3200 JEROME AVENUE
BRONX, NEW YORK

SOIL VAPOR REMEDIATION FIELD DIAGNOSTIC TESTING
KEYSTONE ENVIRONMENTAL SERVICES FILE #0232 10613

DATE	7/17-18/2013
PROJECT NO.	11455
SCALE	as shown
FIGURE	A

APPENDIX C

<u>3200 Jerome Sample Calculation</u>

<u>Mass Loading</u>

Total VOC concentration from all points= **20,000 μg/m^3**

Air flow rate= [45 f^3/min]x[9 points]= **575 f^3/min**

VOC emissions per year (given *flow rate*= 575 f^3/min)=

[20,000 (μg/m^3)]x[575 (f^3/min)]x[0.027826 (m^3/f^3)]x[1x10^{-6} (g/μg)]x[1x10^{-3} (kg/g)]x[2.2 (lbs/kg)]x

[60 (min/hr)]x[24 (hr/day)]x[365 (days/year)] = **370 (lbs/year)**

VOC emissions per month = **31 (lbs/month)**

<u>GAC Sizing Assumptions</u>

50% Safety factor

10% VOC loading

GAC use per month= [(lbs/month)]x[(1+50%)/10%]

= **465 (lbs. carbon/month)**

APPENDIX D

FPZ, Inc
150 N. Progress Drive
Saukville, WI 53080 - **U.S.A.**
Tel. (262) 268-0180
Fax (262) 268-0415
E-mail usa@fpz.com

REGENERATIVE BLOWERS - **VACUUM**

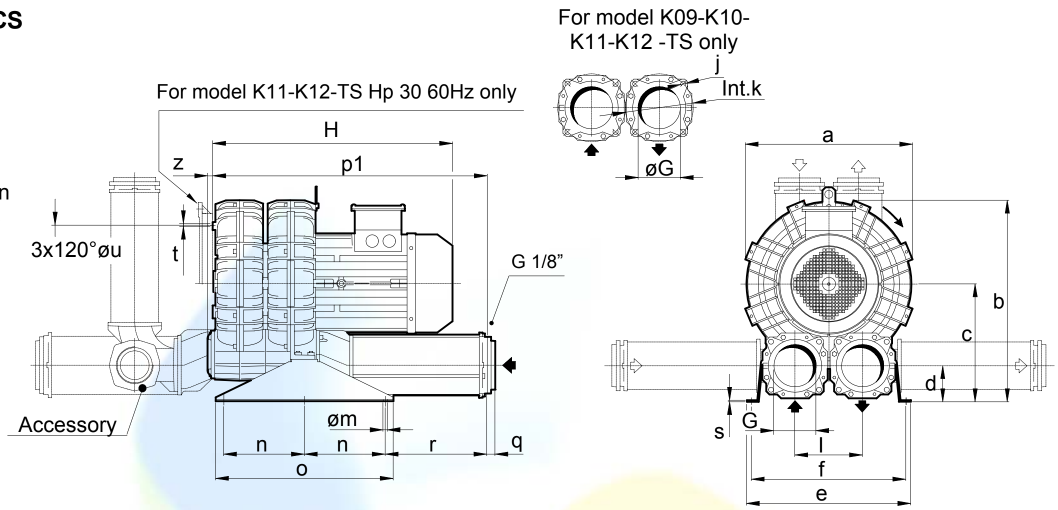
SCL K07 / K08 / K09 / K10 / K11 / K12
TS SERIES - MOR RANGE

TECHNICAL CHARACTERISTICS
- Aluminium alloy construction
- Smooth operation
- High efficiency impeller
- Maintenance free
- Mountable in any position
- Recognized TEFC - **cURus** motor
- G1/8" female thread on both suction and discharge silencer port flanges

OPTIONS
- Special voltages (IEC 38)
- Surface treatments

ACCESSORIES
- Inlet and/or inline filters
- Additional inlet/outlet silencers
- Safety valves
- Flow converting device
- Optional connectors

Possible alternative positions, please refer to drw SI 1825



Dimensions in inches.
Dimension for reference only.

Model	a	b	c	d	e	f	G	l	j	k	m	n	o	p1	q	r	s	t	u	z
K07-TS	16.69	20.91	12.56	3.86	18.43	17.24	4"NPT	7.17	-	-	0.51	9.84	21.65	31.57	0.98	11.77	0.20	M8	11.61	0.63
K08-TS	18.03	21.57	12.56	3.86	18.82	17.64	4"NPT	7.17	-	-	0.51	9.84	21.65	31.57	0.98	11.77	0.20	M8	12.20	0.63
K09-TS	19.37	24.02	14.37	4.41	20.00	18.82	5.12	8.27	M16	8.27	0.51	9.84	21.65	33.46	-	12.40	0.20	M8	14.17	0.63
K10-TS	20.31	24.53	14.37	4.41	20.00	18.82	5.12	8.27	M16	8.27	0.51	9.84	21.65	33.46	-	12.40	0.20	M8	14.17	0.63
K11-TS	21.26	25.59	14.96	4.17	21.26	20.08	5.12	8.98	M16	8.27	0.51	9.84	21.65	34.25	-	12.60	0.20	M8	15.35	0.63
K12-TS	21.57	25.66	14.96	4.17	21.26	20.08	5.12	8.98	M16	8.27	0.51	9.84	21.65	34.37	-	12.60	0.20	M8	15.35	0.63

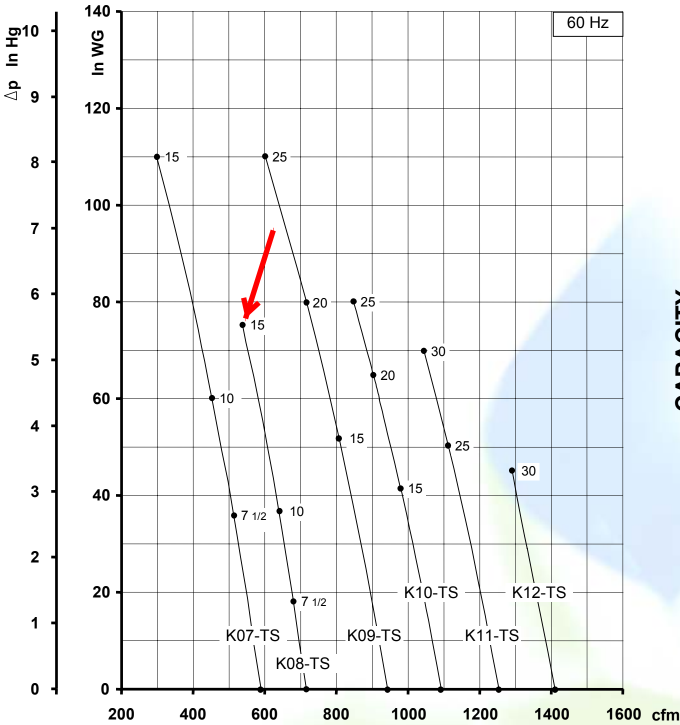
Model	Maximum flow cfm		Installed power Hp		Maximum differential pressure Δp (In Hg)		Noise level Lp dB (A) (1)		Overall dimensions H	Weight
	60 Hz 3500 rpm	50 Hz 2900 rpm	60 Hz 3500 rpm	50 Hz 2900 rpm	60 Hz 3500 rpm	50 Hz 2900 rpm	60 Hz 3500 rpm	50 Hz 2900 rpm	Inches	Lbs
K07-TS	588	487	7 ½	7 ½	2.6	3.5	84.5	82.5	23.76	197.31
			10	10	4.4	5.2	84.8	82.8	23.76	206.13
			15	15	8.1	8.9	85.4	83.4	24.55	223.77
K08-TS	715	592	7 ½	7 ½	1.3	2.2	80.9	78.9	23.76	205.47
			10	10	2.7	3.7	81.2	79.2	23.76	214.29
			15	15	5.5	6.4	82.9	80.9	24.55	231.92
K09-TS	941	780	15	15	3.8	4.5	82.2	80.2	25.81	270.06
			20	20	5.9	6.6	84.1	82.1	29.92	350.53
			25	25	8.1	8.8	86.1	84.1	30.79	383.60
K10-TS	1093	906	15	15	3.0	3.6	89.1	87.1	25.81	274.47
			20	20	4.8	5.5	89.4	87.4	29.92	354.94
			25	25	5.9	7.0	89.7	87.7	30.79	388.01
K11-TS	1254	1039	25	25	3.7	5.0	90.7	88.7	31.38	429.02
			30 (2)	30 (2)	5.1	6.6	91.3	89.3	31.38	434.53
K12-TS	1410	1168	30 (2)	30 (2)	3.3	5.9	91.9	89.9	31.50	436.75

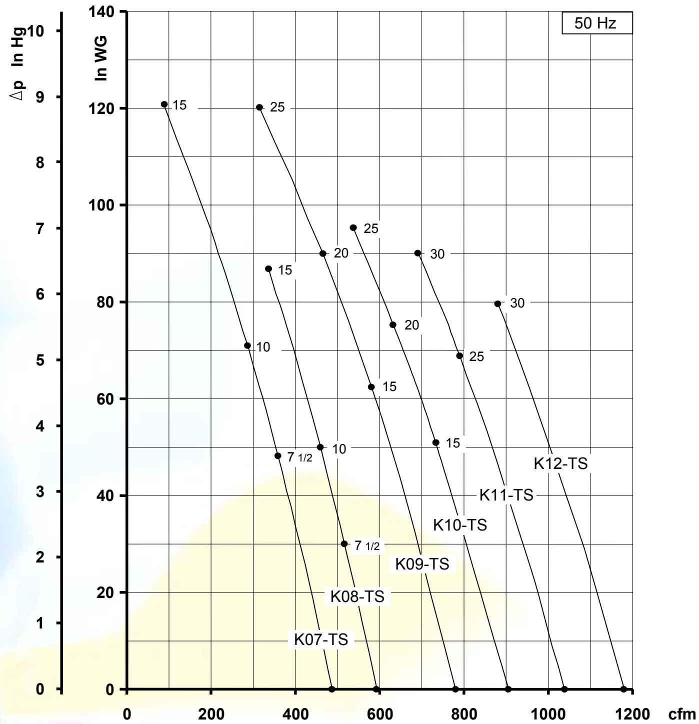
(1) Noise measured at 1 m distance with inlet and outlet ports piped, in accordance to ISO 3744.
(2) K11-K12-TS Hp 30 vertical assembly only.

- For proper use, the blower should be equipped with inlet filter and safety valve; other accessories available on request.
- Ambient temperature from +5° to +104°F.
- Specifications subject to change without notice.

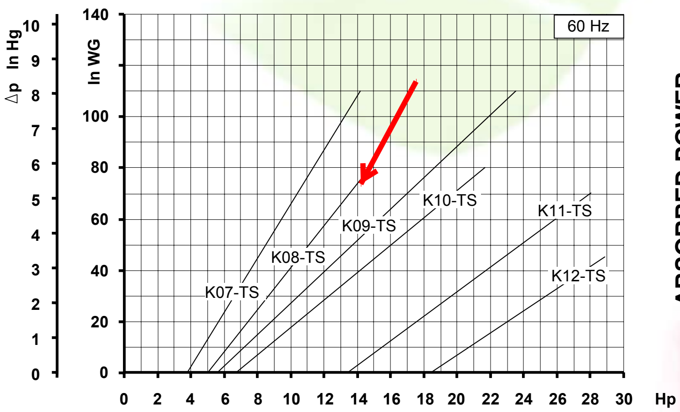
SCL K07 / K08 / K09 / K10 / K11 / K12
TS SERIES - MOR RANGE

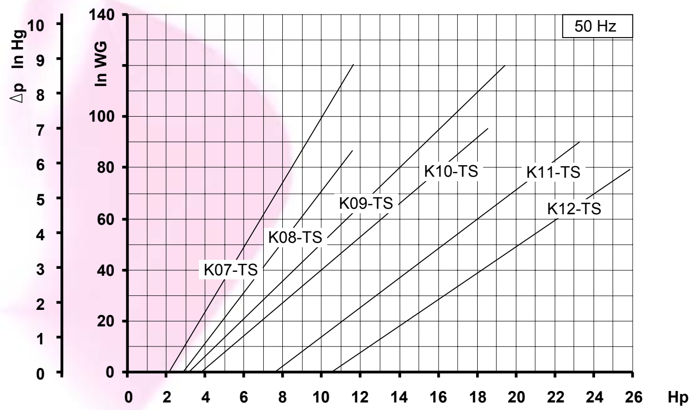
CAPACITY



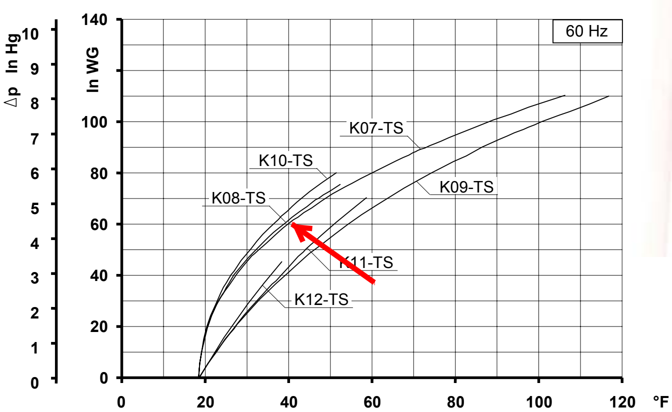


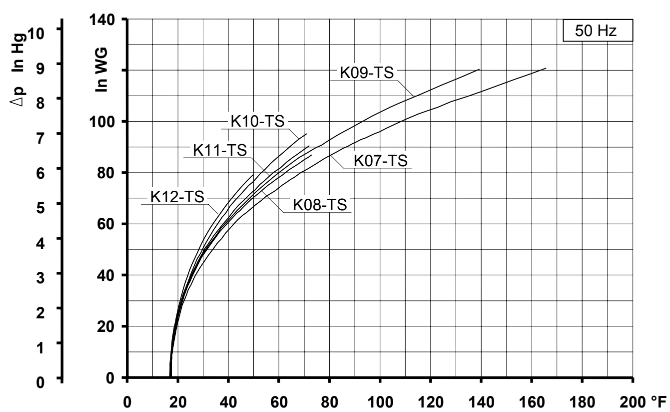
ABSORBED POWER





TEMPERATURE INCREASE





Curves refer to air at 68° F temperature, measured at inlet port and 29.92 In Hg atmospheric backpressure (abs).
Values for flow, power consumption and temperature rise: +/-10% tolerance.
Data subject to change without notice.

FPZ, Inc
150 N. Progress Drive
Saukville, WI 53080 - **U.S.A.**
Tel. (262) 268-0180
Fax (262) 268-0415
E-mail usa@fpz.com

REGENERATIVE BLOWERS - **VACUUM**

SCL K07 / K08 / K09 / K10 / K11 / K12

TS SERIES - MOR RANGE

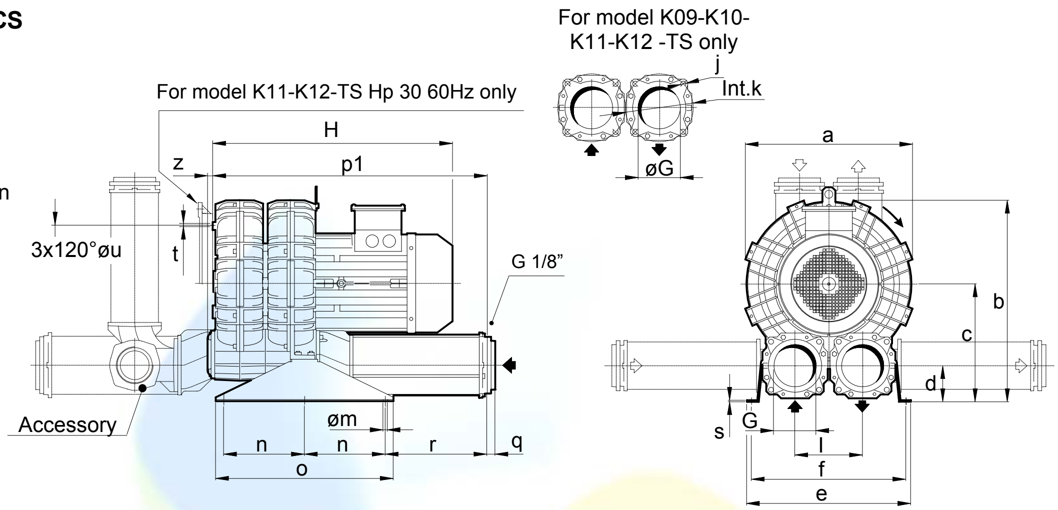
SN 1826-11 1/2

TECHNICAL CHARACTERISTICS
- Aluminium alloy construction
- Smooth operation
- High efficiency impeller
- Maintenance free
- Mountable in any position
- Recognized TEFC - **cURus** motor
- G1/8" female thread on both suction and discharge silencer port flanges

OPTIONS
- Special voltages (IEC 38)
- Surface treatments

ACCESSORIES
- Inlet and/or inline filters
- Additional inlet/outlet silencers
- Safety valves
- Flow converting device
- Optional connectors

Possible alternative positions, please refer to drw SI 1825



Dimensions in inches.
Dimension for reference only.

Model	a	b	c	d	e	f	G	l	j	k	m	n	o	p1	q	r	s	t	u	z
K07-TS	16.69	20.91	12.56	3.86	18.43	17.24	4"NPT	7.17	-	-	0.51	9.84	21.65	31.57	0.98	11.77	0.20	M8	11.61	0.63
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Model	Maximum flow cfm		Installed power Hp		Maximum differential pressure Δp (In Hg)		Noise level Lp dB (A) (1)		Overall dimensions H	Weight
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			20	20	5.9	6.6	84.1	82.1	29.92	350.53
			25	25	8.1	8.8	86.1	84.1	30.79	383.60
K10-TS	1093	906	15	15	3.0	3.6	89.1	87.1	25.81	274.47
			20	20	4.8	5.5	89.4	87.4	29.92	354.94
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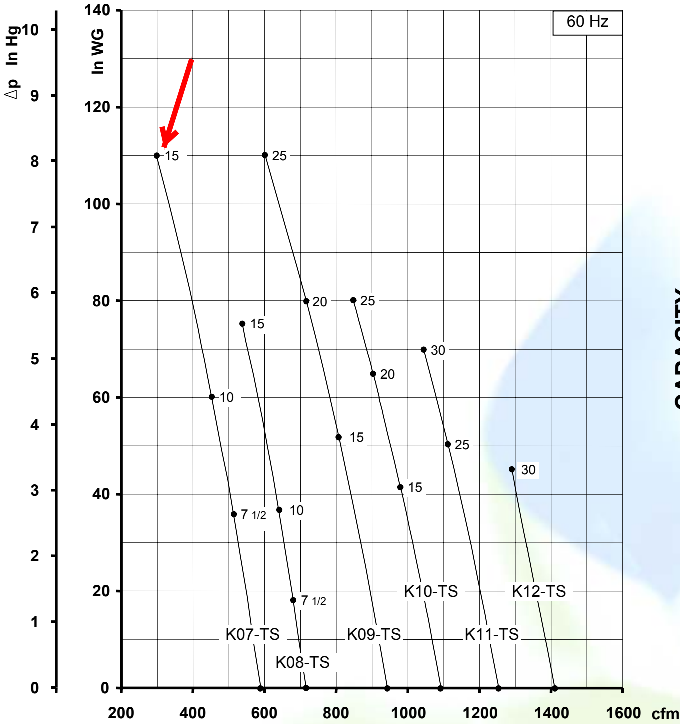
(1) Noise measured at 1 m distance with inlet and outlet ports piped, in accordance to ISO 3744.
(2) K11-K12-TS Hp 30 vertical assembly only.

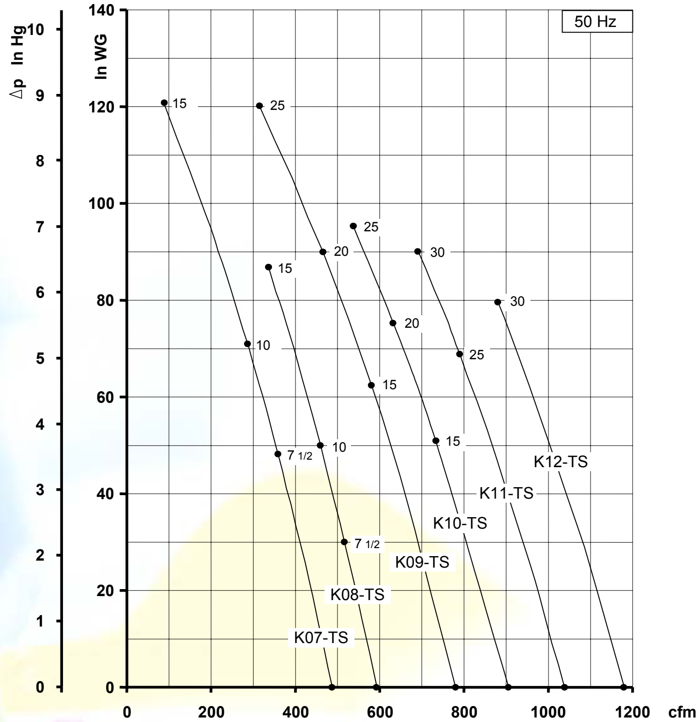
- For proper use, the blower should be equipped with inlet filter and safety valve; other accessories available on request.
- Ambient temperature from +5° to +104°F.
- Specifications subject to change without notice.

SCL K07 / K08 / K09 / K10 / K11 / K12

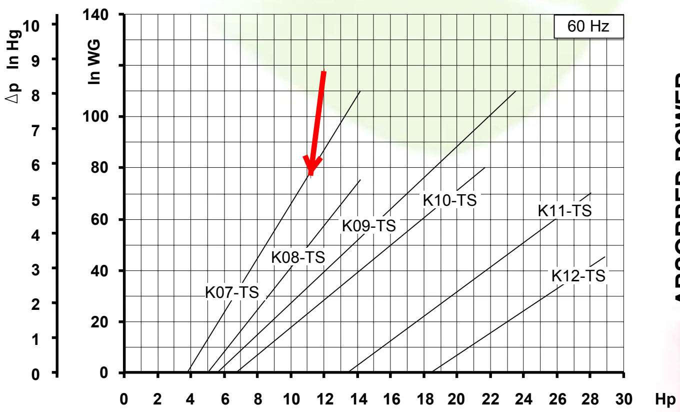
TS SERIES - MOR RANGE

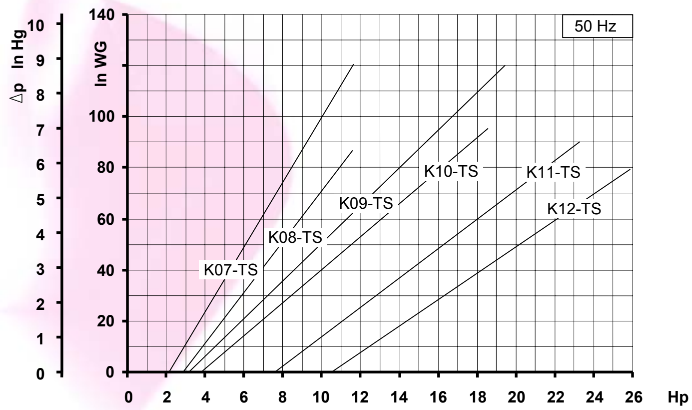
CAPACITY



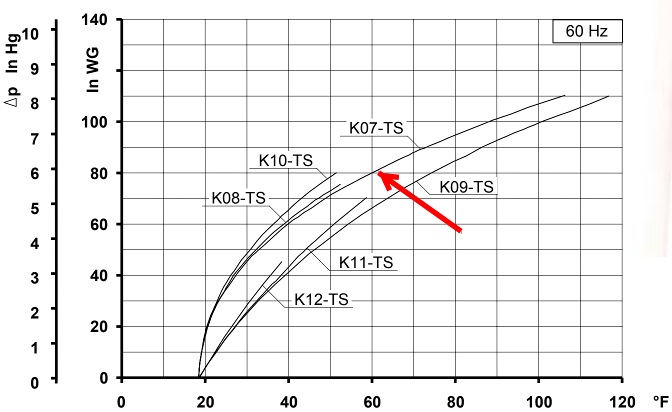


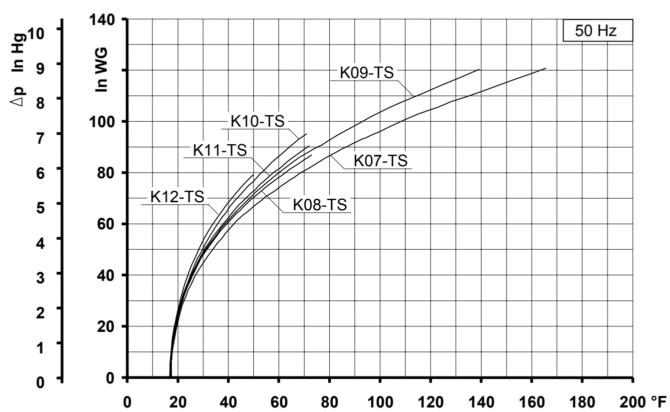
ABSORBED POWER





TEMPERATURE INCREASE



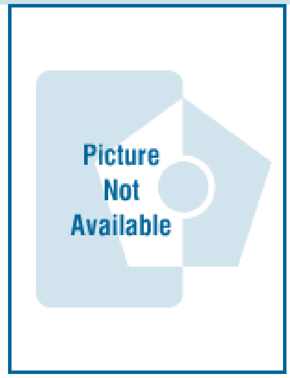


Curves refer to air at 68° F temperature, measured at inlet port and 29.92 In Hg atmospheric backpressure (abs).
Values for flow, power consumption and temperature rise: +/-10% tolerance.
Data subject to change without notice.

APPENDIX E

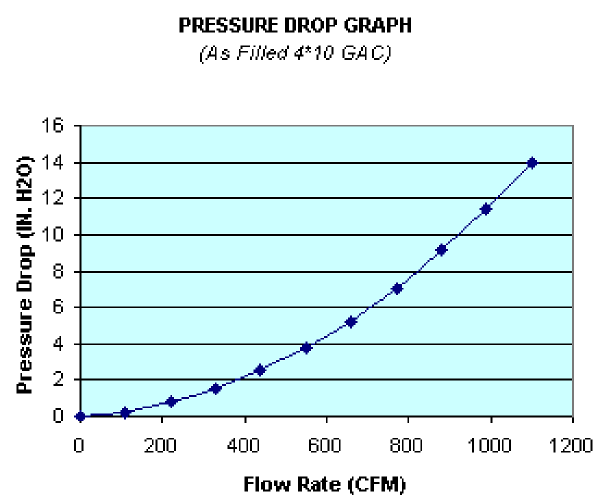
Contents:

VR SERIES FILTERS
MODEL VR-400



The VR-400 filter is a radial flow filter vessel designed to treat vapor streams where pressure drop is a strong concern. With the radial design in certain applications the user can obtain higher flow rates than could be obtained in similar upflow filters. Some applications include:

- Soil Vapor Extraction Treatment
- Air Stripper Off Gas Treatment
- Odor Removal System
- Storage Tank Purge Vapor Treatment
- Industrial Process Treatment



VR-400 SPECIFICATIONS			
Overall Height	3’11”	Vessel/Internal Piping Materials	CS/ SCH 40 PVC
Diameter	30”	Internal Coating	Polyamide Epoxy Resin

			Resin
Inlet / Outlet (FNPT)	6”	External Coating	Urethane Enamel
Drain / Vent (FNPT)	OPT	Maximum Pressure / Temp	2 PSIG / 150º F
GAC Fill (lbs)	400	Cross Sectional Bed Area	8.8 FT^2
Shipping / Operational Weight (lbs)	500/575	Bed Depth/Volume	11.7 IN / 14.25 FT^3

Tetrasolv Filtration, Inc. • 1200 East 26th Street • Anderson, Indiana 46016 • USA
Toll Free: 800-441-4034 Telephone: 765-643-3941 • Fax: 765-643-3949
www.tetrasolv.com • info@tetrasolv.com

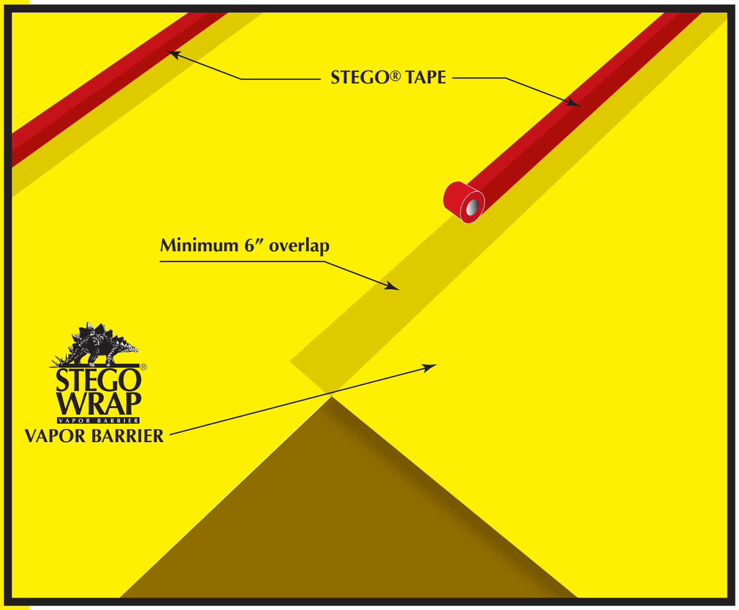
APPENDIX F

PART 1

STEGO WRAP VAPOR BARRIER/RETARDER INSTALLATION INSTRUCTIONS

IMPORTANT: Please read these installation instructions completely, prior to beginning any Stego Wrap installation to ensure suitable use of the product. The following installation instructions are based on ASTM E 1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.

FIGURE 1: UNDER-SLAB INSTALLATION



UNDER-SLAB INSTRUCTIONS:

1. Stego Wrap can be installed over an aggregate, sand, or tamped earth base. It is not necessary to have a cushion layer or sand base, as Stego Wrap is tough enough to withstand rugged construction environments.

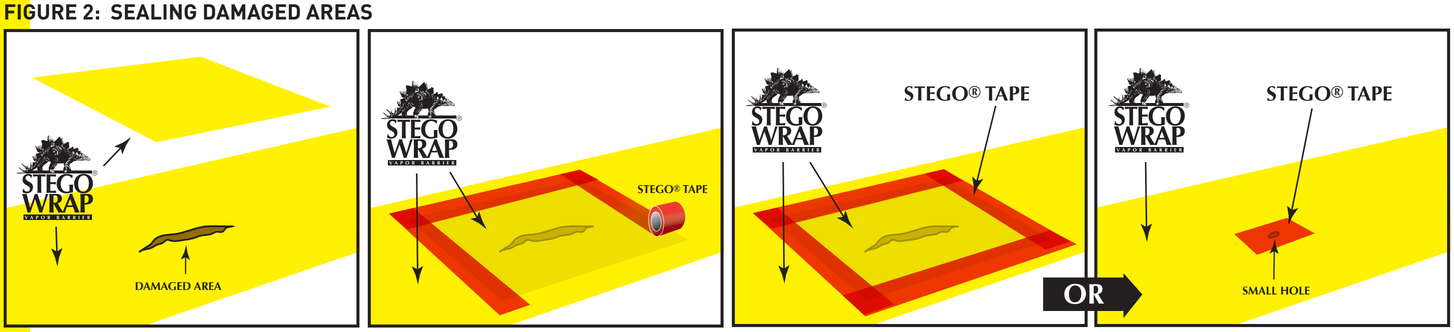
2. Unroll Stego Wrap over the area where the slab is to be placed. Stego Wrap should completely cover the concrete placement area. All joints/seams both lateral and butt should be overlapped six inches and taped using Stego Tape.

NOTE: The area of adhesion should be free from dust, dirt and moisture to allow maximum adhesion of the pressure sensitive tape.

3. The most effective installation method includes positioning Stego Wrap on top of the footing and against the vertical wall. Stego Wrap will then be sandwiched between the footing, vertical wall and placed concrete floor (see part 2, figure 6a, Basement/Below Grade Wall Installation). This method will help protect the concrete slab from external moisture sources after the slab has been placed.

4. In the event that Stego Wrap is damaged during or after installation, repairs must be made. Stego Tape can be used to repair small holes in the material. For larger holes, cut a piece of Stego Wrap to a size and shape that covers any damage by a minimum overlap of six inches in all directions. Clean all adhesion areas of dust, dirt and moisture. Tape down all edges using Stego Tape (see figure 2, Sealing Damaged Areas).

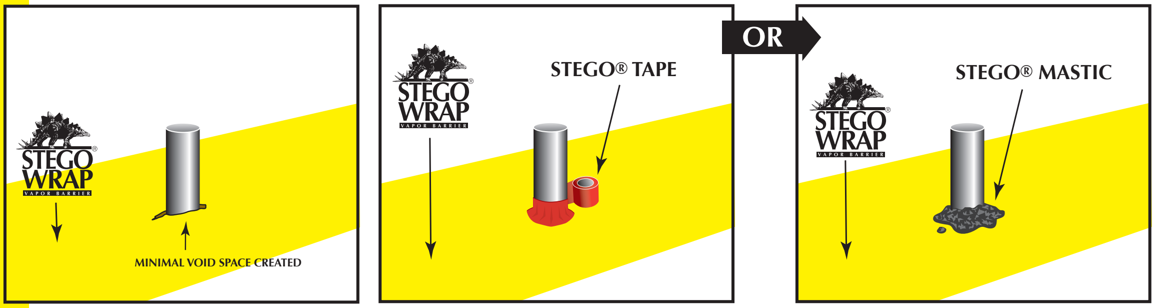
FIGURE 2: SEALING DAMAGED AREAS



NOTE: These installation instructions are based on practices outlined in ASTM E 1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs. These instructions are meant to be used as a guide, and do not take into account specific job site situations. Consult local building codes and regulations along with the building owner or owner's representative before proceeding. If you have any questions regarding the above mentioned installation instructions, Stego products, or a specific job site situation, please call us at 877-464-7834 for technical assistance.

5. **IMPORTANT: ALL PENETRATIONS MUST BE SEALED.** All pipe, ducting, rebar, wire penetrations and block outs should be sealed using Stego Wrap, Stego Tape and/or Stego Mastic (see figure 3a, Pipe Penetration Sealing).

FIGURE 3a: PIPE PENETRATION SEALING



STEGO WRAP PIPE PENETRATION REPAIR DETAIL:

1: Install Stego Wrap around pipe penetration by slitting/cutting material as needed. Try to minimize the void space created.

2: If Stego Wrap is close to pipe and void space is minimized then seal around pipe penetration with Stego Tape and/or Stego Mastic.

(See Figure 3a)

3: If detail patch is needed to minimize void space around penetration, then cut a detail patch to a size and shape that creates a six inch overlap on all edges around the void space at the base of the pipe. Stego Pre-Cut Pipe Boots are also available to speed up the installation.

4: Cut an "X" the size of the pipe diameter in the center of the pipe boot and slide tightly over pipe.

5: Tape down all sides of the pipe boot with Stego Tape.

6: Seal around the base of the pipe using Stego Tape and/or Stego Mastic.

(See Figure 3b)

FIGURE 3b: DETAIL PATCH FOR PIPE PENETRATION SEALING

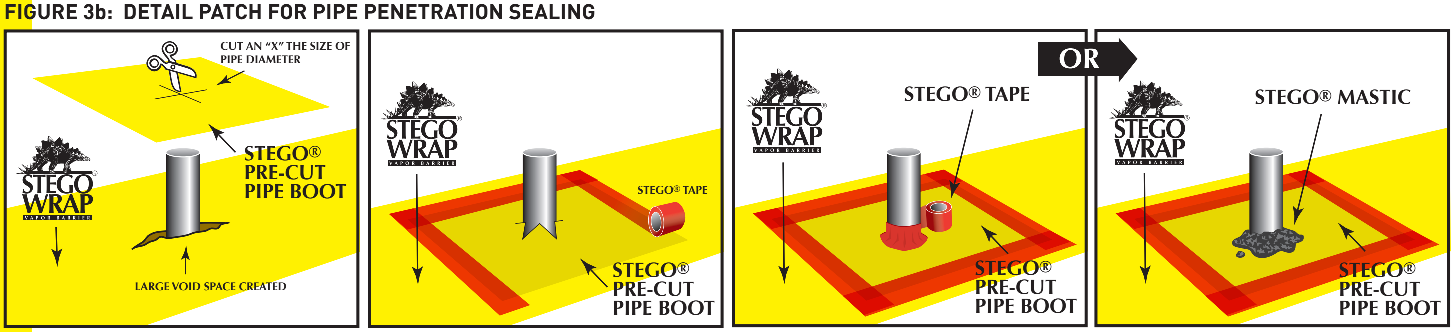
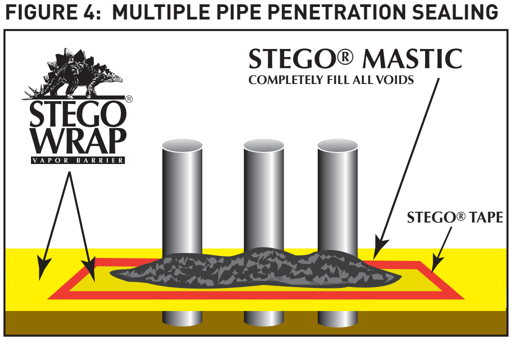


FIGURE 4: MULTIPLE PIPE PENETRATION SEALING



MULTIPLE PIPE PENETRATION SEALING:

Multiple pipe penetrations in close proximity and very small pipes may be sealed using Stego Wrap and Stego Mastic for ease of installation (see figure 4, Multiple Pipe Penetration Sealing).

6. Many vapor retarder manufacturers recommend a cushion layer (fine washed gravel or sand) on top of the retarder before the concrete placement to guard against the possibility of damage due to construction traffic. **This is permissible, but not a necessity with Stego Wrap.** Stego Wrap is strong enough to withstand normal construction traffic without a protective layer. In fact, ACI guidelines and many flooring companies recommend placement of the concrete slab directly on the vapor barrier/retarder. This eliminates the potential for water to be trapped in the blotter layer and ultimately resurfacing through the slab adversely effecting the flooring system.

NOTE: These instructions are meant to be used as a guide, and do not take into account specific job site situations. Consult local building codes and regulations along with the building owner or owner's representative before proceeding.

REMEMBER: If damaged, Stego Wrap must be repaired using the techniques outlined above.

PART 2

STEGO WRAP VAPOR BARRIER/RETARDER
INSTALLATION INSTRUCTIONS

CRAWL SPACE INSTALLATION INSTRUCTIONS:

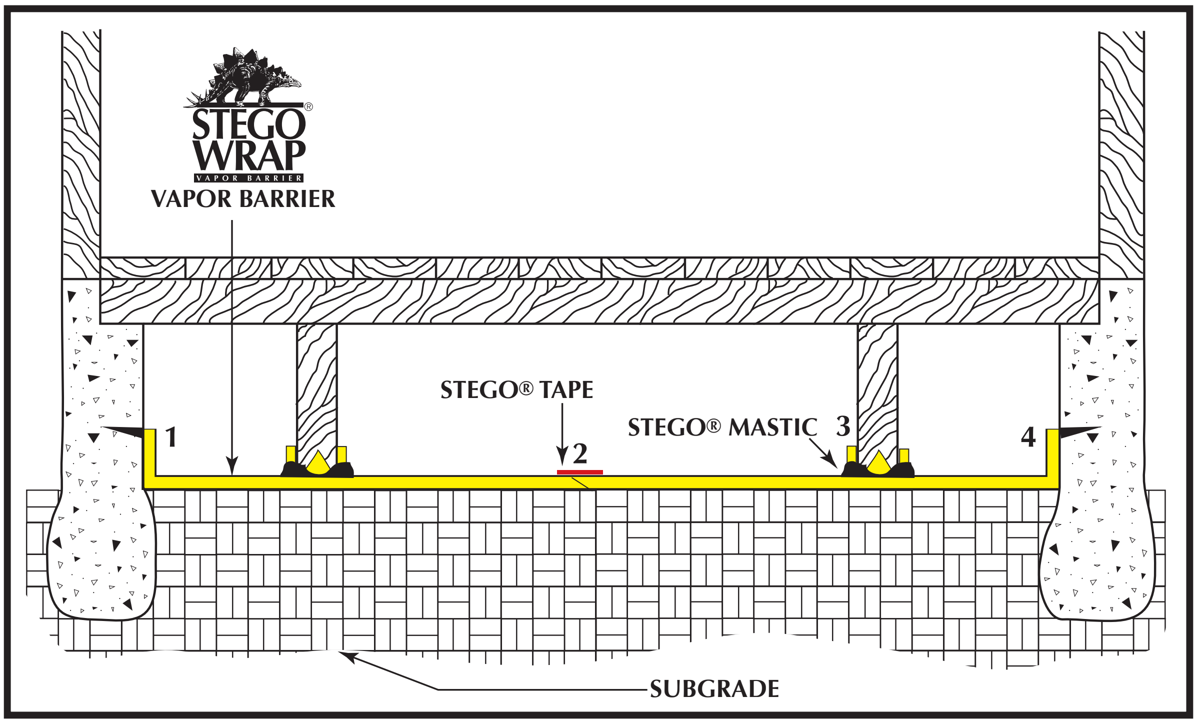
1. Place Stego Wrap directly over the crawl space floor. If rigid insulation is to be used, install Stego Wrap prior to insulation (under insulation and between the foundation wall and insulation).

2. Overlap seams a minimum of six inches and seal with Stego Tape.

3. Seal Stego Wrap around all penetrations and columns using Stego Tape and/or Stego Mastic.

4. Turn Stego Wrap up the foundation wall to a minimum height of six inches above the outside/exterior grade or in compliance with local building codes and terminate with pressure treated nail strip/termination bar or construction adhesive. If using a nail strip/termination bar, extend Stego Wrap above termination bar and fold back over nail strip/termination bar and tape with Stego Tape to seal nail holes.

FIGURE 5: CRAWL SPACE INSTALLATION



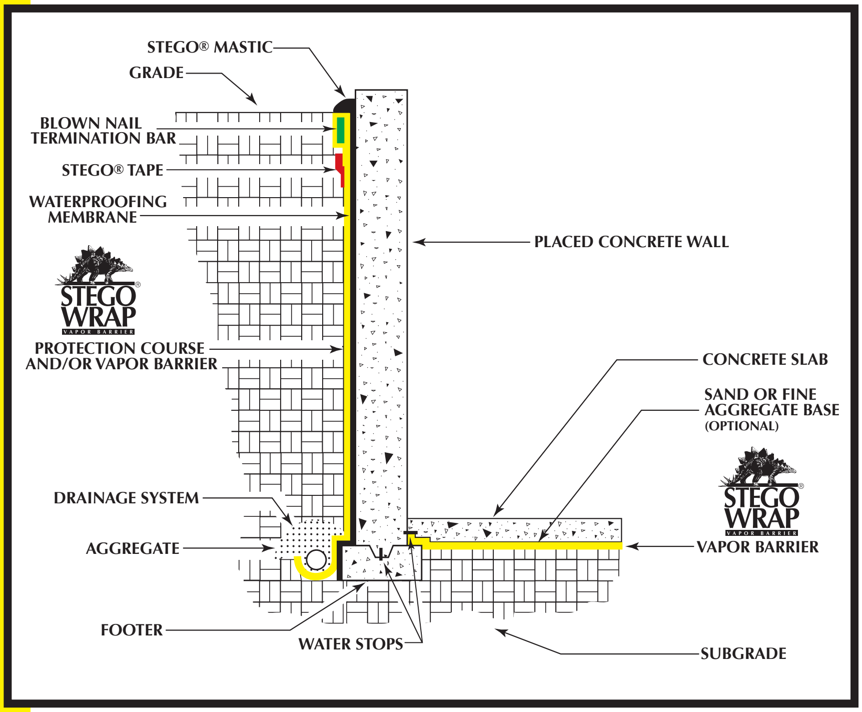
INSTALLATION TIPS:

1. For a cleaner look and to prevent against tenting of Stego Wrap at the foundation wall/foundation floor intersection, consider mechanically fastening Stego Wrap to base of foundation wall in addition to the above mentioned wall termination.

2. To provide additional protection against moisture migration through nail holes, consider applying a layer of Stego Mastic to the foundation wall prior to installing nail strip/termination bar. Allow one hour for Stego Mastic to cure prior to installing nail strip/termination bar.

NOTE: There are well-publicized pros and cons regarding different approaches to vapor barrier placement. Consult local building codes, regulations and ACI guidelines along with the design or architectural firm's recommendations before proceeding.

FIGURE 6a: BASEMENT/BELOW GRADE WALL INSTALLATION



BASEMENT/BELOW GRADE WALL INSTALLATION:

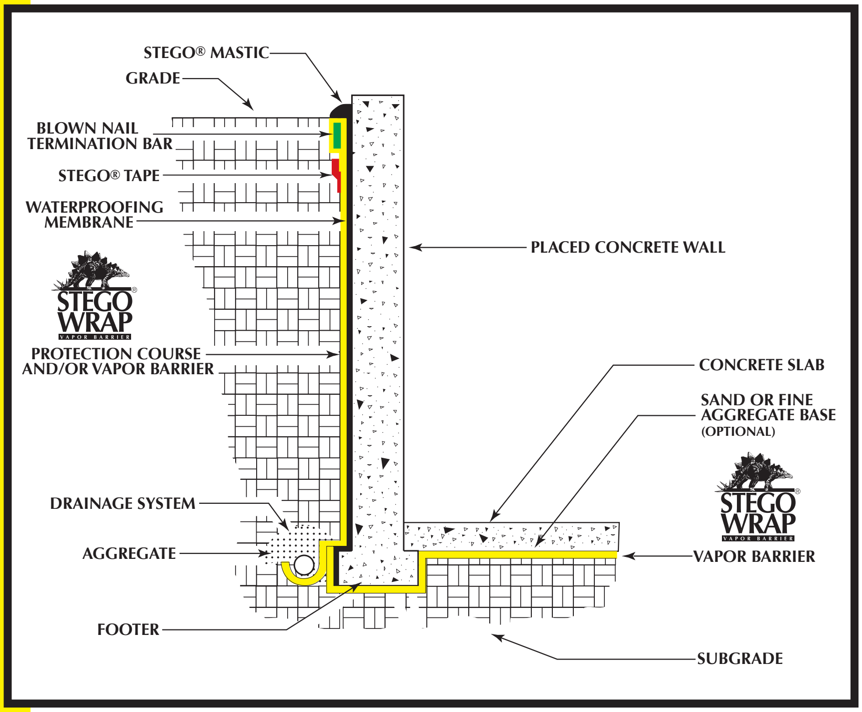
1. Install an approved waterproofing membrane according to the manufacturer's installation instructions. This may include sheet goods, or liquid applied membranes be they roll, brush or spray.

2. While the membrane is still tacky, install Stego Wrap as a protective course/vapor barrier over the applied waterproofing membrane. Using a termination bar with concrete nails at the termination of the waterproofing membrane is advisable in some applications (see figure 6a, Basement/ Below Grade Wall Installation).

3. Supervised care must be taken during back filling against the material so that it is not damaged or punctured. If damage occurs, patch using the techniques outlined in part 1.

WARNING: Any untreated punctures, tears or damage during back filling will greatly reduce the effectiveness of Stego Wrap as a protection course/vapor barrier.

FIGURE 6b: OPTIONAL INSTALLATION FOR FOOTING ENCAPSULATION AND WATERPROOFING TIE-IN



OPTIONAL INSTALLATION FOR FOOTING ENCAPSULATION AND WATER PROOFING TIE-IN:

1. Install Stego Wrap into footing depression prior to concrete placement.

2. Leave outside edge of footing exposed to allow for primary waterproofing application and tie-in (see figure 6b, Optional Installation For Footing Encapsulation and Waterproofing Tie-In).

NOTE: Consult Structural Engineer prior to footing encapsulation.

NOTE: These installation instructions are based on practices outlined in ASTM E 1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs. These instructions are meant to be used as a guide, and do not take into account specific job site situations. Consult local building codes and regulations along with the building owner or owner's representative before proceeding. If you have any questions regarding the above mentioned installation instructions, Stego products, or a specific job site situation, please call us at 877-464-7834 for technical assistance.

STEGO® INDUSTRIES, LLC