INTERIM REMEDIAL MEASURES WORK PLAN
Wills Building
43-01 21st Street
Long Island City, New York 11101
State ID #2-41-143

Prepared for:

Wills Family Group Limited Partnership
43-01 21st Street
Long Island City, New York 11101

Prepared by:

CORE
ENVIRONMENTAL CONSULTANTS

46-11 54th Ave
Maspeth, New York 11378

July 23, 2014

TABLE OF CONTENTS

FIGURES

APPENDICES

I, Sheila Ransbottom, certify that I am currently a New York State Registered Professional Engineer as defined in Title 6 of the New York Codes, Rules and Regulations Part 375 and that this Interim Remedial Measure Work Plan 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).

076355	7/23/14	
NYS Professional Engineer Number	Date	Signature

STATE OF NEW YORK
SHEILA A. RANSBOTTOM
NO. 076355
LICENSED PROFESSIONAL ENGINEER

1.0 INTRODUCTION

CORE Environmental Consultants, Inc. (CORE) has prepared this Interim Remedial Measures (IRM) Work Plan for the Wills Building located at 43-01 21st Street, Long Island City, New York (Site).

This IRM Work Plan identifies the processes for sampling indoor air and sub-slab vapor, conducting a sub-slab depressurization system (SSDS) pilot test, and subsequent design and installation of the SSDS to address known indoor air quality (IAQ) and sub-slab vapor issues.

1.1 SITE LOCATION AND DESCRIPTION

The Site is located at 43-01 21st Street in Long Island City, Queens, New York. The Wills Building is currently a mixed-use commercial and manufacturing space. The Site is located in an area zoned M1-4 by the New York City Department of City Planning, indicating that it can be used for manufacturing and commercial uses. The Site is presently owned by the Wills Family Group Limited Partnership and is bound by various commercial and industrial properties to the south, 21st Street to the west, 43rd Avenue to the north, and 22nd Street to the east. The East River is located approximately one-half mile northwest of the Site.

The Site is comprised of a large parcel occupying the entire block length between 21st and 22nd Streets. The parcel is approximately 261 feet along 43rd Avenue by 190 feet along the 21st Street frontage, and is identified as Block 441, Lot 16 by the New York City Department of Finance. The Site is currently occupied by one 124,000 square foot, three-story building that was originally constructed in approximately 1926. The property is relatively flat, with an approximate ground elevation 19 feet above mean sea level (msl). General topography in the area of the Site slopes slightly to the West. A Site Location Map is presented as Figure 1 and a Site Map is included as Figure 2.

1.2 SITE HISTORY

Sanborn maps and City Directory listings for the Site indicate the property has been formerly used as a medical equipment manufacturer, cosmetic manufacturer, and clothing manufacturer. A review of the Sanborn maps dated 1936, 1947, and 1950 indicate several properties in the vicinity of the Site had the potential for chlorinated volatile organic compound (CVOC) usage. The property at 13-06 43rd Avenue was occupied by the Careful Carpet Cleaning Company. The City Directory Abstracts also list the building as being operated as some form of carpet cleaning company and/or other textile conditioning lab between the years of 1934 and 1962. The property at 13-06 43rd Avenue is located approximately 200 feet in what is anticipated to be a hydraulically up- to cross-gradient location of the Site.

The property located adjacent to the Site at 21-03 44th Avenue had previous historical uses as a metal etching company and zipper manufacturer. This property, now known as the Queens Medallion Building, is a suspected source of CVOCs in soil and groundwater in the area.

The property located approximately 300 feet south of the Site at 21-16 44th Road operated as a metal plating and finishing facility. The property is currently operating as the Information Technology High School (ITHS) and is undergoing remediation to address elevated CVOC impacts to soil and groundwater. CVOC wastes from the plating and cleaning process, including tetrachloroethylene (PCE), was disposed of through any one of four dry wells, directly to soil and groundwater beneath the property.

1.3 PREVIOUS SITE INVESTIGATIONS

Previous Site investigation activities to date are associated with a RI performed by Arcadis US (Arcadis, 2012) under contract with the NYSDEC and the Limited Subsurface Investigation (LSI) performed by CORE in August 2013.

Remedial Investigation Report, 21-03 44th Avenue Site, Arcadis US (August, 2012)

The Arcadis/NYSDEC investigation was aimed at determining the nature and extent of CVOCs in the soil and groundwater in an area immediately south of the Queens Medallion Building (an adjacent property).   Results of this investigation indicated that PCE was found in all bedrock and overburden groundwater samples collected on, and in the immediate vicinity of, the Site. In general, bedrock concentrations were detected at higher levels than those in the overburden. PCE and trichloroethylene (TCE) were not detected in exceedence of applicable guidance criteria in any soil samples collected on, or in the immediate vicinity of, the Site. Sub-slab vapor and indoor air samples were collected from several locations inside the Wills Building during the investigation that indicated exceedences of the New York State Department of Health (NYSDOH) mitigation guidance values for PCE, with the highest values collected beneath the slab in the western portion of the building. Indoor air samples in the western portion of the building also contained concentrations of PCE and TCE exceeding NYSDOH mitigation guidance values.

The combination of analytical data, groundwater directions flow, and isotope analysis of the PCE plume led Arcadis to conclude that a continuing source of “new” PCE was located under both the Queens Medallion and Wills Buildings.

Remedial Investigation Report, Phase I – Limited Subsurface Investigation, Wills Building, CORE Environmental Consultants, Inc. (September, 2013)

Low-level concentrations of PCE and associated degradation products were detected in soil samples collected during the investigation, however, no detections were in exceedence of the applicable Part 375 Unrestricted or Commercial Use SCOs.

All overburden wells sampled during the LSI contained PCE in exceedence of Title 6 of the New York Codes, Rules and Regulations Part 703.5 (6 NYCRR 703.5) guidance criteria for Class GA waters. The highest concentration was detected at monitoring well MW-6BA in the Northern Alleyway (between the Site and the Queens Medallion property). All bedrock wells sampled during the investigation also contained exceedences of Class GA water guidance criteria for PCE.

Groundwater flow in the overburden in vicinity of the Site appeared to form a slight depression in the area of the Site. Groundwater flow in the bedrock is generally west, consistent with the previous Arcadis investigation in the area of the Site. Additional groundwater elevation monitoring should be performed in order to confirm groundwater flow in the vicinity of the site.

To address the issue of indoor air vapor migration of CVOCs, CORE recommended that a sub-slab depressurization system (SSDS) be installed at the Site. Historical sampling locations are presented on Figure 3.

2.0 INTERIM REMEDIAL MEASURES

Based on the results of previous investigations, an IRM will be completed to immediately address elevated levels of PCE and TCE in indoor air and sub-slab vapor. The goal of the IRM is to depressurize the entire building slab. The IRM will include the following tasks and will be performed in accordance with the Site-specific Health and Safety Plan (HASP) submitted under the Remedial Investigation Work Plan cover:

- Collection of IAQ and ambient air samples;
- Installation and sample collection form soil vapor monitoring points;
- Pilot testing for SSDS design;
- SSDS design; and
- SSDS installation.

The individual IRM tasks are discussed below.

All field activities will be performed in accordance with NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (2006). Intrusive subsurface activities that may generate excessive noise and/or airborne particulates and VOCs will be performed outside of normal business hours.

2.1 INDOOR AIR QUALITY

The IAQ survey will include the following tasks:

- A pre-sample collection inspection of the building, identifying potential cracks in the slab and locating all rooms, closets, and storage areas, etc.;
- A chemical inventory of all chemicals maintained and used by on-Site personnel;
- Collection of IAQ samples from locations similar to those where elevated concentrations of PCE and TCE were detected during the 2012 Arcadis investigation; and
- Collection of an ambient outdoor air sample for comparison purposes.

2.1.1 Heating, Ventilation, and Air Conditioning System

Heating, ventilation, and air conditioning (HVAC) at the Wills Building is a multi-faceted system. The first floor of the building contains one boiler and is heated via hot water baseboard heaters in each unit. The second floor contains one boiler and is heated with steam baseboard heaters. The third floor of the building contains two boilers and is heated via hot water baseboard heaters. All boilers located in the building run on natural gas fuel.

Air conditioning for exterior suites on all floors is provided by window units. A single condenser provides central air conditioning to the deli/restaurant located at the northern corner of the building. Interior units are ventilated with exhaust fans that ultimately vent to the exterior of the building. An additional vent located in the deli vents exhaust from the range hood directly to the roof.

Building exhaust from interior suites to the exterior of the facility causes depressurization of the building. This depressurization allows vapors from the higher-pressure sub-slab soils to rise and potentially enter the building through cracks or holes in the foundation. Continuous depressurization of the overlying structure via building exhaust will likely require additional suction on the SSDS to achieve the proper negative pressure ratio beneath the slab. The pilot test discussed in Section 2.3 will be performed while the building exhaust system is running.

2.1.2 Building Inspection and Chemical Inventory

Prior to sample collection, CORE will perform a thorough building inspection. During this inspection CORE personnel will identify cracks in the building slab, drains or sumps, or other irregularities that could contribute to vapor intrusion. During this inspection, an inventory of all chemicals kept by on-Site businesses will be recorded. A photoionization detector (PID) capable of detecting low levels of volatile organic compounds (VOCs) will be used to screen indoor air for organic vapors.

2.1.3 Indoor Air and Ambient Sample Collection

Indoor air samples will be collected in the vicinity of locations previously identified to have elevated concentrations of PCE or TCE in IAQ samples. The HVAC system will run in a manner consistent with normal building operations during sample collection. This will provide the most accurate simulation of potential exposure of workers on a regular basis. An ambient air sample will be collected from a location outside the exterior walls of the building to provide background information helpful in determining what, if any, influence outdoor conditions have on IAQ.

IAQ and ambient air samples will be collected using individually certified clean 6-liter Summa® canisters equipped with pre-calibrated flow controllers over an eight hour time period. The samples will be taken between 3 to 5 feet above ground to most accurately simulate the breathing zone of on-Site personnel. The initial vacuum of each Summa® canister will be recorded immediately after opening; the final vacuum immediately prior to closure.

Summa® canisters will be labeled and shipped under Chain-of-Custody procedures to York Analytical Laboratories, Inc. (York) of Stratford, Connecticut for analysis of VOCs by United States Environmental Protection Agency (USEPA) method TO-15. York is a NYSDOH Environmental Laboratory Approval Program (ELAP) certified laboratory for air quality sample analysis.

2.2 Sub-Slab Vapor

The sub-slab vapor survey will include the following tasks:

- Installation of permanent sub-slab vapor monitoring points; and
- Collection of sub-slab vapor samples.

2.2.1 Sub-Slab Vapor Monitoring Point Installation

PCE and TCE were detected in sub-slab vapor samples at concentrations in exceedence of NYSDOH mitigation guidance values during the 2012 Arcadis investigation. Exceedences of TCE were generally limited to the western half of the building; however, an exceedence of PCE was noted in one sub-slab vapor sample from the southern-central portion of the building.

CORE will install up to 10 Vapor Pin™ sub-slab vapor monitoring points. Each point will be installed and covered with a flush-mount, secure cover. The monitoring points can remain in place as long as necessary. The standard operating procedures for installing the Vapor Pin™ and secure cover are included as Attachment A.

2.2.2 Sub-Slab Vapor Sample Collection

Sub-slab vapor samples will be collected using individually certified clean 6-liter Summa® canisters equipped with pre-calibrated flow controllers over a one hour time period. The initial vacuum of each Summa® canister will be recorded immediately after opening; the final vacuum immediately prior to closure. Samples will be transported to York and analyzed for VOCs by USEPA method TO-15.

2.3 Sub-Slab Depressurization System Pilot Test

The purpose of this pilot test is to perform diagnostic pressure testing to evaluate appropriate fan speed and subsurface conditions for effectiveness of a sub-slab depressurization system to mitigate vapor migration into the overlying structure.

2.3.1 Suction- and Test-Hole Locations

Two primary suction holes will be installed in the hallways immediately adjacent to rooms 101 and 121C to establish the radius of influence in proximity to elevated sub-slab samples collected during the 2012 Arcadis investigation. A third primary section hole will be installed in the loading dock area in the eastern corner of the building. Remote radius of influence test holes will be installed in approximately 30 foot intervals through the building corridors. It is expected that the final system will be maintained within the building corridors to limit interference with operations of the businesses occupying building spaces. Refer to the attached Figure 4 for proposed pilot test hole locations.

Suction and Test-Hole Installation and Equipment

A six-inch diamond core bit and coring drill will be used to drill holes for the installation of suction-hole equipment. A void will be manually dug beneath the six-inch slab hole to create a preferential pathway for vapors to be collected. Perforated polyvinyl chloride (PVC) casing will be installed into the sub-slab void in order to provide surface area for vapor collection. The pipe will be sealed in place with caulking to prevent air leakage.

Remote test hole locations will be bored into the slab using a three-quarter-inch diamond core bit and core drill. Sampling tubes will be inserted into each test hole, without blocking the tube with sub-slab material, and sealed with caulk to prevent air leakage around the tube. Valves that can be opened for testing will be used to seal the top of each tube.

A micromanometer will be used to determine baseline pressure readings at all locations. The manometer will be attached to one test hole tube at a time with no vacuum applied, closing all test holes except the one being monitored. A baseline of measurements every 10 minutes for up to 60 minutes will be recorded for each test hole. A PID will be used to monitor ambient air for volatile organic compounds VOCs during coring and suction and test hole equipment installation.

2.3.2 Pilot Test

A regenerative blower will be used to produce a vacuum at both of the suction points individually. The blower will have a maximum air flow of 92 cubic feet per minute (CFM). It will be attached to the suction point with tubing to produce a sub-slab vacuum. Starting with the test hole closest to the suction point, each test hole will be measured every 10 minutes for up to 60 minutes. This will continue in succession until each test hole is measured while other test holes remain closed.

To best achieve sub-slab depressurization and to prevent the migration of impacted vapors into the overlying structure, a sub-slab pressure of at least -0.002 inches of water column (WC) should be achieved.

All air extracted from the sub-slab during the pilot test will be routed through activated granular carbon to adsorb chemicals present before being released to the atmosphere. The granular carbon will be disposed of by a certified disposal company. Following completion of the pilot test, all test holes will be back-filled with grout.

2.4 SUB-SLAB DEPRESSURIZATION SYSTEM DESIGN

The SSDS will be designed following the pilot testing to determine sub-slab connectivity and associated radius of influence at each potential location. The goal of the SSDS is to reduce the potential for sub-slab gas vapor to intrude into the overlying Wills Building.

Based on data previously collected at the Site, elevated levels of PCE have been detected in sub-slab vapor and indoor air sections in the western and central portions of the building.

Approximately nine new sub-slab depressurization sump (SDS) locations are proposed for installation, based on results of the proposed pilot test. The locations will be as follows:

- SDS locations will be located in the hallway immediately adjacent to rooms 102, 106, 110, 112B, 115, 121C, 124, and 130B to address elevated levels of PCE detected in sub-slab vapor samples; and

- Additional SDS locations may be located in the hallways immediately adjacent to room 121, the loading dock area, the southernmost corner, and the basement of the building based on the radius of influence at each point as determined during the pilot test.

These are preliminary locations. Additional locations may be added, or these locations altered based on pre-IRM sampling results and the SSDS pilot test discussed previously.

Design Parameters

Design parameters will be based on results of the pilot test discussed previously. It is anticipated that the design will consist of the following processes:

- 15-horsepower (HP) regenerative blower;

- 2-HP heat-exchanger;

- Removal of vapor-phase PCE and other organics with two or more vapor-phase granular activated carbon (VPGAC) units;

- Sub-slab depressurization using newly installed SDS locations; and

- Differential pressure monitoring at existing vapor monitoring points.

Full design parameters will be submitted to the NYSDEC for approval upon completion of the pilot test and design phases.

3.0 SCHEDULE

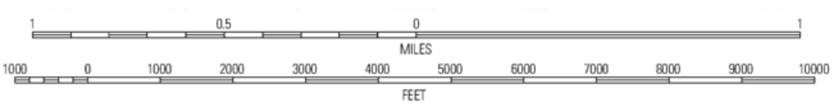
A schedule will be submitted to NYSDEC for review upon approval of this Work Plan.

4.0 REFERENCES

Arcadis US (Arcadis), 2012. *Remedial Investigation Report, 21-03 44th Avenue Site, Long Island City, New York, Site # 24110.*

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

FIGURES



Source: USGS Topographic map Brooklyn 2013
USGS Topographic map Central Park 2013

QUADRANGLE LOCATION

JOB TITLE AND LOCATION:		DRAWING TITLE:
WILLS BUILDING 43-01 21st STREET LONG ISLAND CITY, NEW YORK	CORE ENVIRONMENTAL CONSULTANTS	SITE LOCATION MAP

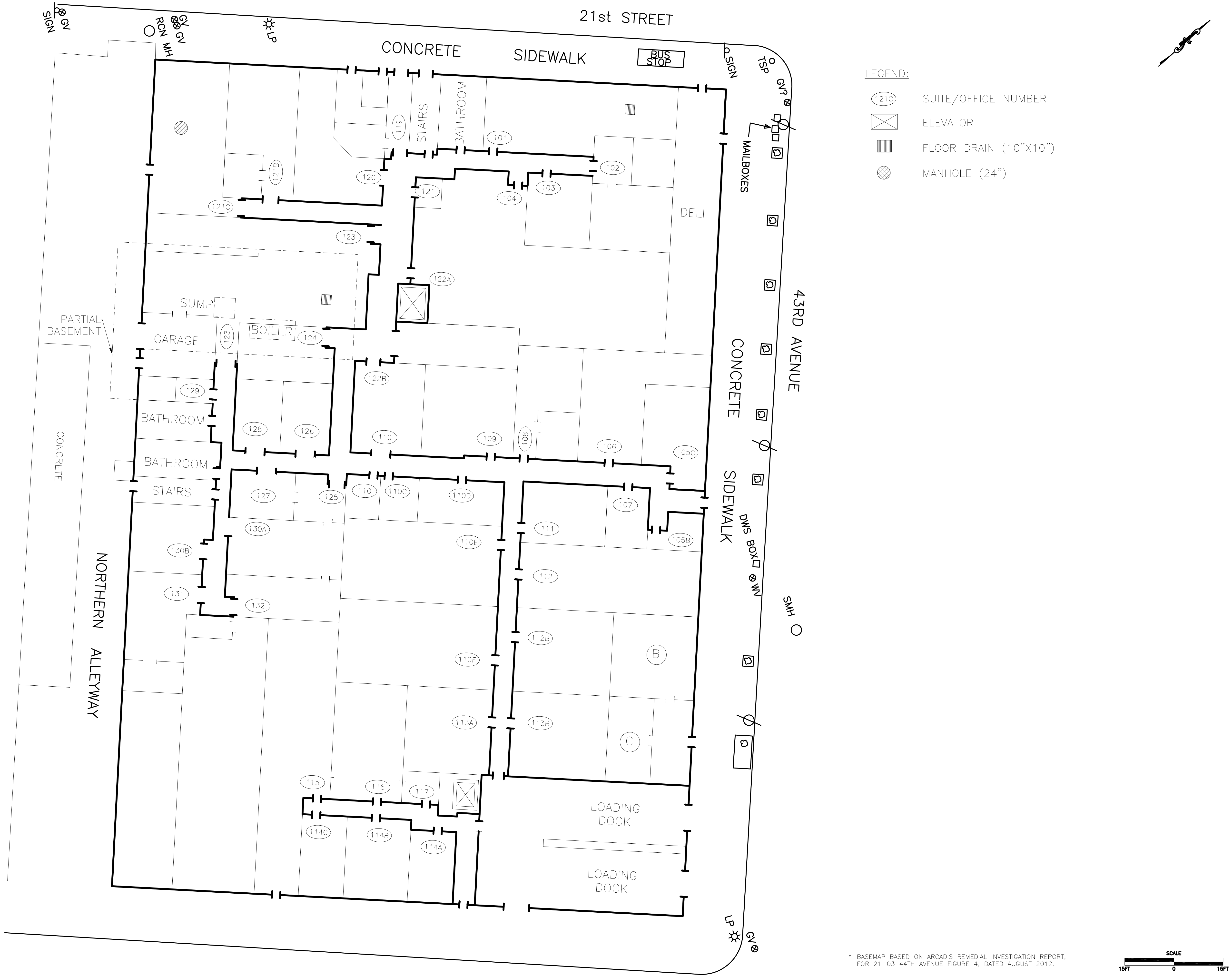
WARNING
IT IS A VIOLATION OF SECTION 7209, SUBDIVISION 2, OF THE NEW YORK STATE EDUCATION LAW FOR ANY PERSON, OTHER THAN THOSE WHOSE SEAL APPEARS ON THIS DRAWING, TO ALTER IN ANY WAY AN ITEM ON THIS DRAWING. IF AN ITEM IS ALTERED, THE ALTERING ENGINEER SHALL AFFIX TO THE ITEM HIS SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS SIGNATURE AND THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

46-11 54TH AVENUE
MASPETH, N.Y. 11378
T: 718-762-0544
F: 718-762-0545

2312 WEHRLE DRIVE
BUFFALO, N.Y. 14221
T: 716-204-8054
F: 716-204-8557

w w w . C O R E e n v . c o m

DATE:		JOB NO.:	FIGURE NO.:
9/6/2013			1
DESIGNED BY: BDB	CHECKED BY: RPT	SCALE: 1 : 24000	
DRAWN BY: BDB	PROJ ENG.: RPT	SHEET OF	



CLIENT NAME

SEAL & SIGNATURE

NO.	REVISIONS	DATE

THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF THE ENGINEER AND IS NOT TO BE USED IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF THE ENGINEER. UNAUTHORIZED ALTERATION OR ADDITION TO ANY DRAWING, DESIGN, SPECIFICATION, PLAN OR REPORT IS PROHIBITED IN ACCORDANCE WITH STATE LAW, CODE AND RULES.

CORE ENVIRONMENTAL CONSULTANTS
46-11 54TH AVENUE, MASPETH, N.Y. 11378, T: 718-762-0544, F: 718-762-0545
2312 WEHRLE DRIVE, BUFFALO, N.Y. 14221, T: 716-204-8054, F: 716-204-8557
www.COREenv.com

PROJECT TITLE:

WILLS BUILDING
43-01 21ST STREET
LONG ISLAND CITY, NY

DESCRIPTION:

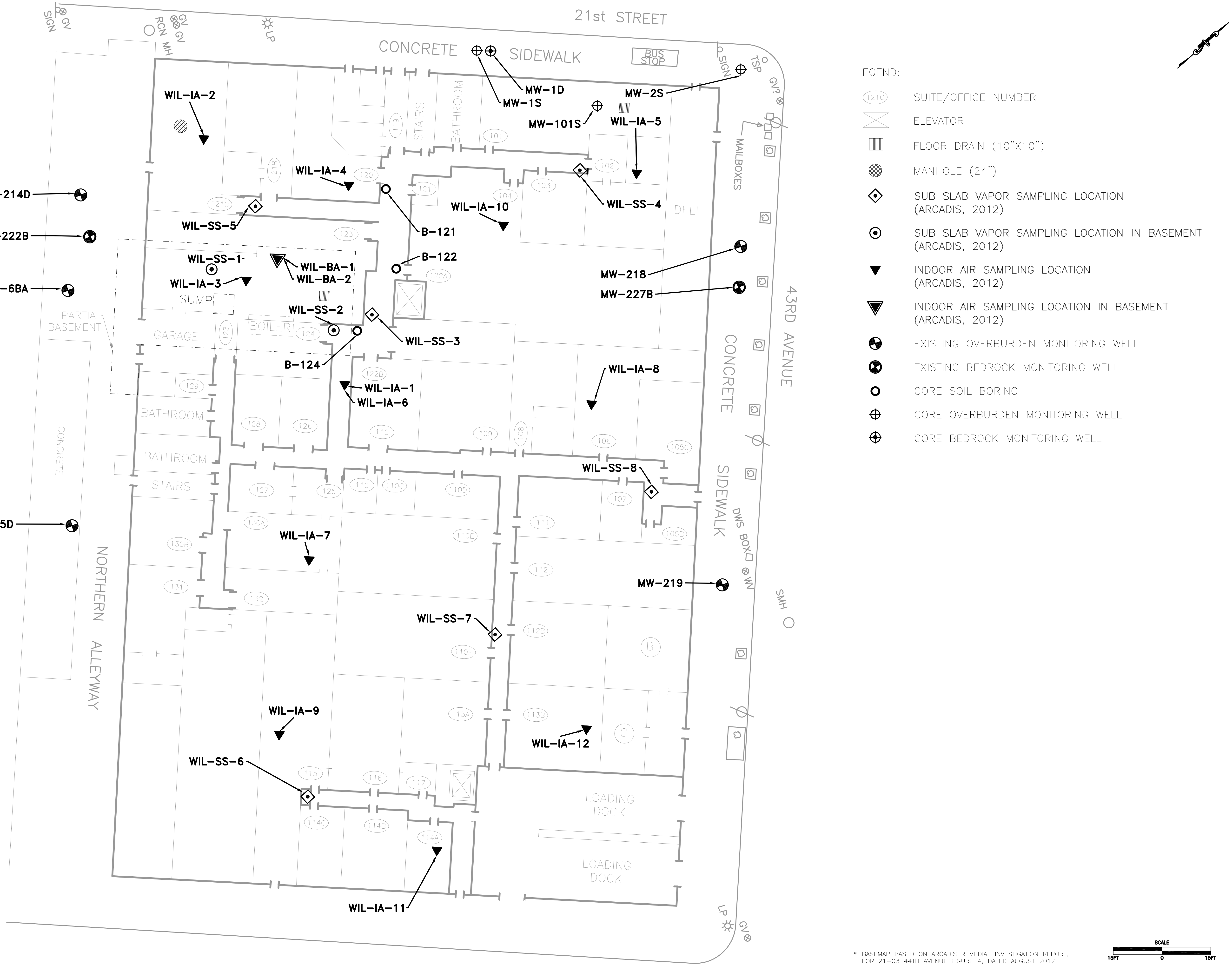
INTERIM
REMEDIAL INVESTIGATION

DRAWING TITLE:

SITE MAP

SEAL & SIGNATURE		
	DATE:	06/23/2014
	PROJECT No.:	–
	DRAWN BY:	BDB
	DESIGNED BY:	AKC
	CHECKED BY:	AKC
	APPROVED BY:	RPT
	FIGURE No.:	2
SCALE: 1"=30'	SHEET No.:	OF:
	REVISED BY:	–

J:\Wills Building\Work Plans\RI Work Plan\CAD\Figure 1 Work Plan.dwg



LEGEND:

- SUITE/OFFICE NUMBER
- ELEVATOR
- FLOOR DRAIN (10"X10")
- MANHOLE (24")
- SUB SLAB VAPOR SAMPLING LOCATION (ARCADIS, 2012)
- SUB SLAB VAPOR SAMPLING LOCATION IN BASEMENT (ARCADIS, 2012)
- INDOOR AIR SAMPLING LOCATION (ARCADIS, 2012)
- INDOOR AIR SAMPLING LOCATION IN BASEMENT (ARCADIS, 2012)
- EXISTING OVERBURDEN MONITORING WELL
- EXISTING BEDROCK MONITORING WELL
- CORE SOIL BORING
- CORE OVERBURDEN MONITORING WELL
- CORE BEDROCK MONITORING WELL

* BASEMAP BASED ON ARCADIS REMEDIAL INVESTIGATION REPORT, FOR 21-03 44TH AVENUE FIGURE 4, DATED AUGUST 2012.

SCALE
15FT 0 15FT

CLIENT NAME

SEAL & SIGNATURE

NO.	REVISIONS	DATE

THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF THE ENGINEER AND IS NOT TO BE USED IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF THE ENGINEER. UNAUTHORIZED ALTERATION OR ADDITION TO ANY DRAWING, DESIGN, SPECIFICATION, PLAN OR REPORT IS PROHIBITED IN ACCORDANCE WITH STATE LAW, CODE AND RULES.

CORE ENVIRONMENTAL CONSULTANTS
46-11 54TH AVENUE MASPETH, N.Y. 11378 T: 718-762-0544 F: 718-762-0545
2312 WEHRLE DRIVE BUFFALO, N.Y. 14221 T: 716-204-8054 F: 716-204-8557
www.COREenv.com

PROJECT TITLE:

WILLS BUILDING
43-01 21ST STREET
LONG ISLAND CITY, NY

DESCRIPTION:

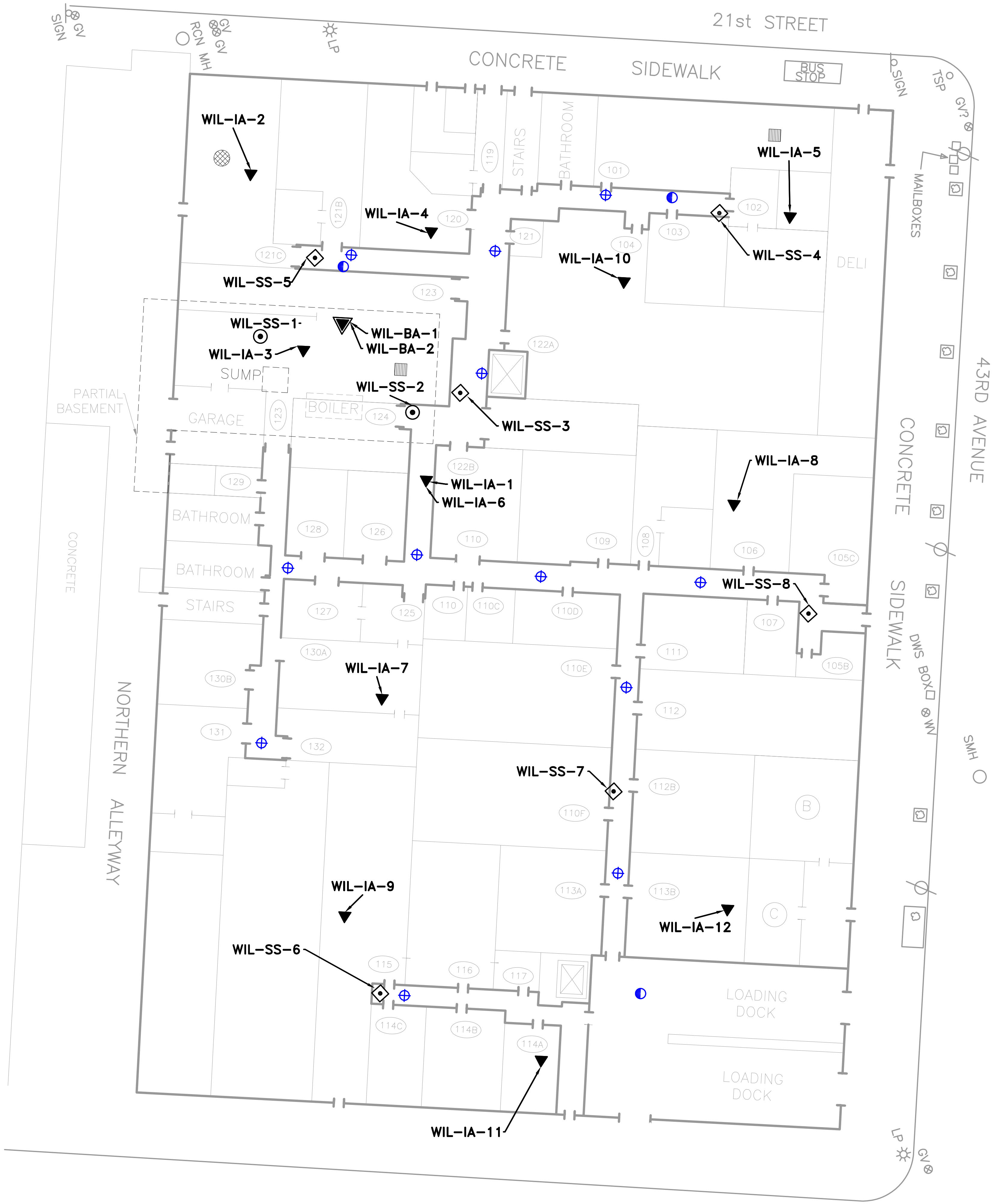
INTERIM REMEDIAL INVESTIGATION

DRAWING TITLE:

HISTORICAL SAMPLING LOCATIONS

SEAL & SIGNATURE		
	DATE:	06/23/2014
	PROJECT No.:	-
	DRAWN BY:	BDB
	DESIGNED BY:	AKC
	CHECKED BY:	AKC
	APPROVED BY:	RPT
	FIGURE No.:	3
SCALE: 1"=30'	SHEET No.:	OF:
	REVISED BY:	-

J:\Wills Building\Work Plans\IR Work Plan\CAD\Figure 1 Work Plan.dwg



LEGEND:

- SUITE/OFFICE NUMBER
- ELEVATOR
- FLOOR DRAIN (10"X10")
- MANHOLE (24")
- SUB SLAB VAPOR SAMPLING LOCATION (ARCADIS, 2012)
- SUB SLAB VAPOR SAMPLING LOCATION IN BASEMENT (ARCADIS, 2012)
- INDOOR AIR SAMPLING LOCATION (ARCADIS, 2012)
- INDOOR AIR SAMPLING LOCATION IN BASEMENT (ARCADIS, 2012)
- PROPOSED SUCTION HOLE
- PROPOSED TEST HOLE

* BASEMAP BASED ON ARCADIS REMEDIAL INVESTIGATION REPORT, FOR 21-03 44TH AVENUE FIGURE 4, DATED AUGUST 2012.

SCALE 15FT 0 15FT

CLIENT NAME

SEAL & SIGNATURE

NO.	REVISIONS	DATE

THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF THE ENGINEER AND IS NOT TO BE USED IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF THE ENGINEER. UNAUTHORIZED ALTERATION OR ADDITION TO ANY DRAWING, DESIGN, SPECIFICATION, PLAN OR REPORT IS PROHIBITED IN ACCORDANCE WITH STATE LAW, CODE AND RULES.

CORE ENVIRONMENTAL CONSULTANTS
46-11 54TH AVENUE MASPETH, N.Y. 11378 T: 718-762-0544 F: 718-762-0545
2312 WEHRLE DRIVE BUFFALO, N.Y. 14221 T: 716-204-8054 F: 716-204-8557
www.COREenv.com

PROJECT TITLE:
WILLS BUILDING
43-01 21ST STREET
LONG ISLAND CITY, NY

DESCRIPTION:
INTERIM REMEDIAL INVESTIGATION

DRAWING TITLE:
PROPOSED PILOT TEST HOLE LOCATIONS

SEAL & SIGNATURE		
	DATE:	06/23/2014
	PROJECT No.:	-
	DRAWN BY:	BDB
	DESIGNED BY:	AKC
	CHECKED BY:	AKC
	APPROVED BY:	RPT
	FIGURE No.:	4
SCALE: 1"=30'	SHEET No.:	OF:
	REVISED BY:	-

J:\Wills Building\Work Plans\8 Work Plan\CAD\Figure 1 Work Plan.dwg

APPENDIX

Vapor Pin™ Standard Operating Procedures

Standard Operating Procedure
Installation and Extraction of the Vapor Pin™

May 20, 2011

Scope:

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

Purpose:

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

Equipment Needed:

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

Figure 1. Assembled Vapor Pin™.

Installation Procedure:

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

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

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

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

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

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

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

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

Figure 2. Installing the Vapor Pin™.

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

Figure 3. Flush-mount installation.

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

Figure 4. Installed Vapor Pin™.

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

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

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

Figure 5. Vapor Pin™ sample connection.

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

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

Figure 6. Water dam used for leak detection.

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

Extraction Procedure:

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

Figure 7. Removing the Vapor Pin™.

Figure 8. Extracted Vapor Pin™.

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

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

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

Replacement Parts:

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

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

July 16, 2012

Scope:

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

Purpose:

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

Equipment Needed:

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

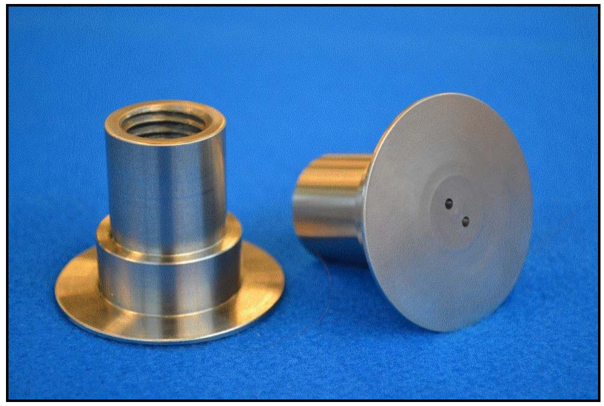


Figure 1. Vapor Pin™ Secure Cover.

Figure 2. Vapor Pin™ Drilling Guide.

Installation Procedure:

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

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

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

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

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

Figure 3. Installing the Drilling Guide.

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

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

Figure 4. Using the Drilling Guide.

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

Figure 5. Tightening the Secured Cover.

<u>Limitations:</u>

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