2002-2024 Cropsey Avenue Site
Brooklyn, New York
NYSDEC BCP# C224169

Prepared for:

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Date Submitted:

January 19, 2017

INTERIM REMEDIAL MEASURES WORK PLAN

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CERTIFICATION

I, Daniel Smith, certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this Interim Remedial Measures 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).

STATE OF NEW YORK ★ DANIEL J. SMITH ★ 073173 ★ LICENSED PROFESSIONAL ENGINEER

DANIEL J. SMITH, PE
Name

1/19/17
Signature

JANUARY 19, 2017
Date

INTERIM REMEDIAL MEASURES WORK PLAN

2002-2024 CROPSEY AVE SITE
BROOKLYN, NEW YORK
NYSDEC BCP# C224169

1.0 INTRODUCTION AND BACKGROUND

This Interim Remedial Measures (IRM) Work Plan presents the proposed activities to mitigate soil vapor intrusion from the elevated chlorinated organic compounds concentrations detected in the sub-slab vapor samples collected at the 2002-2024 Cropsey Ave Site (hereinafter referred to as the Site) located at 2002-2024 Cropsey Ave, Brooklyn, New York (Figure 1). The responsible party for the Property is known as 2002 Cropsey Associates, LLC.

The IRM was prepared in accordance with the Remedial Investigation (RI) Work Plan submitted to the New York State Department of Environmental Conservation (NYSDEC) in July 2015. The application for the NYSDEC Brownfield Cleanup Program (BCP) was submitted on behalf of 2002 Cropsey Associates, LLC (the Participant) and was accepted on August 4, 2014. The Brownfield Cleanup Agreement (BCA) was executed with the NYSDEC on September 30, 2014.

Environmental Site Characterizations investigations (ESCs) were completed at the Site between 2004 and 2013. Based on the findings of the ESCs and a June 2, 2014 meeting between the NYSDEC 2002 Cropsey Associates, LLC, and Apex, the RI will be conducted on three (3) parcels: 2002 – 2024 Cropsey Avenue (Block 6467, Lot 1: the Site), 8831 and 8841 20th Avenue (Block 6467, Lot 12) and 2036 Cropsey Avenue (Block 6469, Lot 1) located along Cropsey Avenue, 20th Avenue and Bay 25th Street (Figure 1).

The results of the ESCs and initial remedial investigations determined concentrations of volatile organic compounds (VOCs) were present in the sub-slab soil vapor under the strip mall building at address 2002-2024 Cropsey Ave that exceed the New York State Department of Health (NYSDOH) Matrix 1 and Matrix 2 values for Sub-Slab Vapor Intrusion Mitigation as required by the NYSDOH "*Guidance for Evaluating Soil Vapor Intrusion in the State of New York*", October 2006 (as amended) (herein after referred to as the Guidance Document). In order to expedite remediation, an IRM is proposed to install a Sub-Slab Depressurization System to mitigate soil vapor intrusion of elevated concentrations detected in the sub-slab vapor into the shopping center located at 2002-2024 Cropsey Ave. The following sections of this Work Plan present the basis for the proposed IRM as well as the scope of work to be completed.

1.1 Objectives

The components of the IRM Work Plan have been designed to meet the following specific objectives:

- Describe IRM implementation activities including field application, data collection and analyses and project schedule; and,
- Collect sufficient data to evaluate effectiveness of the proposed interim remedial approach and support additional remedial actions if necessary following completion of this IRM.

1.2 Site Description and Location

The Site is located at 2002-2024 Cropsey Avenue in the Borough of Brooklyn, New York City, New York and occupies a parcel that is identified by Tax Map Number: Block 6467, Lot 1. The Site consists of a single-story multi-unit retail building which has a full basement and encompasses approximately 15,000 square feet.

The Site is bounded by Cropsey Avenue to the northeast, 20th Avenue to the northwest, a residential building with subgrade parking to the southwest, and Bay 25th Street to the southeast. Local groundwater flow is generally from the north and moving southeast towards Gravesend Bay.

The elevation of the Site is approximately 20 feet above mean sea level (msl). Surface topography consists of a gentle downward slope to the south towards Gravesend Bay, which is approximately 1,000 feet from the Site. A narrow undeveloped strip of land extends along the entire south (rear) side of the Site building and is not part of the site property. The layout of the Site and surrounding properties is presented on **Figure 2**. Currently, the Site is developed with a retail shopping center. Land use and zoning at the Site and the other properties in the area is commercial and residential.

Current shopping center tenants include a luncheonette and restaurant, a nail salon, convenience / drug store, distributors / traders, and a dry cleaner (not the same as the historic dry cleaner associated with contamination at the site). The current dry cleaner operation, GLY Cleaners, consists of a closed loop hydrocarbon cleaning system. GLY Cleaners also offers tailoring services.

1.3 Site Subsurface Geology and Hydrogeology

The following is a brief summary of the geology and hydrogeology at the Site as determined during the ESCs.

1.3.1 Geology

The Site is located south of the Harbor Hill terminal moraine and the surficial deposits consist of glacial outwash deposits (Upper Glacial aquifer) at the Site. Based on a review of the U.S. Geological Survey publication titled Hydrologic Framework of Long Island, New York, U.S. Geological Survey Hydrologic Investigations Atlas HA-709 (Smolensky, et al, 1989), bedrock beneath the Site is expected to occur at an approximate elevation of 650 feet below msl. The Lloyd aquifer, which overlies bedrock, has a surface elevation of approximately 500 feet below msl. The Raritan Clay has a surface elevation of approximately 400 feet below msl. The Magothy aquifer has a surface elevation of approximately 250 feet below msl. The Jameco aquifer has a surface elevation of approximately 200 feet below msl. The Gardiners Clay has a surface elevation of approximately 150 feet below msl. The Upper Glacial aquifer corresponds to the saturated upper part of the highly permeable Pleistocene deposits of sand and gravel.

Based on the soil borings installed during the ESCs and the soil borings and associated monitoring wells installed during the Remedial Investigation (RI), fine to coarse sand deposits (glacial outwash deposits [Upper Glacial aquifer]) were encountered. No confining layers were observed during the drilling activities. Soil borings were advanced to 50 feet bgs.

1.3.2 Hydrogeology

The principal aquifers underlying the Site are the Upper Glacial aquifer, Jameco aquifer, and Magothy aquifer. The Gardiners Clay hydraulically confines the Magothy and Jameco aquifers in most of Brooklyn; the Jameco aquifer and Magothy aquifer hydrogeologic units are in direct hydraulic connection with each other. Groundwater in the Upper Glacial aquifer occurs under unconfined conditions at and near the Site. Within the project area, the average horizontal hydraulic conductivity of the Upper Glacial aquifer is approximately 270 feet per day (ft/d), with an anisotropy ratio of approximately 10:1 (horizontal to vertical, respectively) (McClymonds and Franke, 1972). The average horizontal hydraulic conductivity of the Jameco aquifer in the project area is approximately 200 to 300 ft/d, with an anisotropy ratio of approximately 10:1 (horizontal to vertical, respectively) (McClymonds and Franke, 1972). The average horizontal hydraulic conductivity of the Magothy aquifer in the project area is approximately 50 ft/d, with an anisotropy ratio of approximately 100:1 (horizontal to vertical, respectively) (McClymonds and Franke, 1972).

The Site is located approximately 1,000 feet northeast of Gravesend Bay. Based on data collected from monitoring wells installed during the RI, groundwater is at a depth of 20 ft bgs and the shallow groundwater flow is to the southeast toward Gravesend Bay.

1.3.3 Property and Environmental History

The following is a summary of the environmental history of the Site. Additional information is available in the Phase II Report (Apex, July 2013).

Based on a review of available historical information, the Site was vacant land prior to the construction of the current structures in 1950. The site buildings configuration and site use have been relatively unchanged since 1950. At least four dry cleaners have operated at the Site: Augies Cleaners (1991 to 1996), Michaels Cleaners (1996 to 2005), Ida Cleaners (2005 to 2007) and GLY Cleaners (2007 to current). No information is available regarding tenants at the Site prior to 1991.

2.0 REMEDIAL INVESTIGATION FINDINGS

2.1 Soil Vapor and Indoor Air Quality Data

Apex conducted soil vapor and indoor air quality testing at locations in the basement of the on-site shopping center, along the perimeter of the building, across Cropsey Avenue, and in the parking garages of the surrounding apartment complexes. The locations of the samples are included in **Figure 3**.

Soil vapor and indoor air quality samples were collected during the heating season between October 2015 and March 2016 using six-liter Suma canisters with eight-hour flow control regulators. The Sumas were placed in the specified sample location and allowed to draw air over the course of eight hours. Soil-vapor and indoor air quality samples were analyzed by Accutest Laboratories for volatile organic compounds (VOCs) by Environmental Protection Agency (EPA) Method TO-15. For the purposes of this report the sub-slab soil vapor analytical data were primarily compared to the NYSDOH Guidance Document, Table 3.1. Cumulative soil vapor sample results for tetrachloroethene (PCE) and trichloroethene (TCE) are summarized in **Figure 3**.

2.2 Sub-Slab Depressurization Pilot Test

A pilot study was conducted in March 2016 per request of the NYSDEC to confirm the applicability of an SSDS for the on-site commercial structure. Locations of the vacuum points and test points are plotted in **Figure 4**.

Three conductivity tests were completed: V-1 with respect to points M-1, M-2, M-3, and M-4; V-2 with respect to monitoring points M-1, M-2, M-3, and M-4; and V-3 with respect to monitoring points M-5 and SV-6. The test location SV-6 is a permanent soil vapor test point and was the only point that was installed at a depth of 5 feet. The other vapor screens were installed immediately below the slab.

The pilot test was conducted from three extraction points, each over a period of thirty minutes. The first set of pressure readings were collected from the test points after a period of 15 minutes. Results of the first readings are illustrated in **Figure 4a**. The second set of readings were collected after 30 minutes; results of this reading are illustrated in **Figure 4b**.

- Test 1 - Vacuum pressure influence was verified after 15 minutes between the temporary vacuum source location at V-1 and the test points (M-1 at a distance of 9 feet, M-2 at 26 feet, M-3 at 17 feet, and M-4 at 52 feet) within the dry cleaners and the adjacent tenant space at a pressure range of 0.024 in wc in test point M-4 to 0.393 in wc in test point M-1. After a time period of 30 minutes, vacuum pressure influence increased slightly. Between vacuum point V-1 and the test points in the dry cleaners and CVS, the pressure ranged from 0.026 in wc in test point M-4 to 0.377 in test point wc in M-1.
- Test 2 - After a period of 15 minutes, vacuum pressure was verified between V-2 and the two test points inside the basement of the CVS (M-3 at a distance of 23 feet, and M-4 at a distance of 13 feet) at pressures of 0.038 in wc and 0.176 in wc, respectively. Communication between inside the building to the outside of the building is confirmed. Minimal pressure difference was observed between V-2 and the test points located in the dry cleaners after 15 minutes (M-1 at a distance of 34 feet, and M-2 at a distance of 79 feet) at 0.003 and 0.007 in wc, respectively. After a period of 30 minutes, vacuum pressure between V-2 and the test points M-3 and M-4 inside the CVS increased to 0.052 and 0.242, respectively. Between V-2 and points M-1 and M-2 inside of the dry cleaners, the pressure increased to 0.035 in wc and 0.045 in wc, respectively. The increase in pressures between the 15 and 30 minute test periods confirm that the radius of influence increases as the vacuum is applied for a longer period of time.
- Test 3 - Vacuum influence was verified between vacuum point V-3 and the test points in the basement of the Pizza restaurant and the back hallway (M-5 at a distance of 30 feet, and SV-6 at a distance of 26 feet) at pressures of 0.005 and 0.008 in wc, respectively. After 30 minutes, vacuum pressure between V-3 and points 5 and SV-6 increased to 0.014 and 0.019 in wc, respectively.

Based on the results of the pilot study, the lateral extent of an adequate vacuum field was shown to extend within each tenant space, between tenant spaces, and in between the interior and exterior of the building to a maximum distance of 78 feet from the vacuum source. Apex concludes that the installation and operation of the SSDS is an appropriate and effective response action, and proposes this as the remedy to mitigate the potential for vapor intrusion in the tenant spaces at the subject property. Design criteria for the system will include a conservative radius of influence of 60 feet to account for potential losses in the system.

3.0 PROPOSED SUB-SLAB DEPRESSURIZATION SYSTEM

3.1 Basis for Design

The Soil Vapor Intrusion (SVI) mitigation system was designed as a sub-slab depressurization system (SSDS) in order to prevent vapors related to historic site activities from entering the facility. Based upon review of soil vapor data, it is understood that the contaminants of concern are primarily chlorinated VOCs. The soil vapor data indicate that the highest levels of concern are located underlying the retail shopping center. The SVI mitigation design focused on the entirety of the shopping center.

The property is located on a parcel of land that has homogeneous sandy soils with high conductivity and the depth to groundwater at the Site is approximately 20 feet bgs. These site conditions facilitate the design for a successful SSDS. As noted in Section 1.2 Site Description and Location, there is a basement in the building that extends to approximately 8 feet below ground surface. The SSDS wells will be installed below the basement layer and potential foundation footers to account for the subterranean obstructions.

With this information and technical design constraints, the most effective SSDS design would include three extraction wells located on the Site. Two wells will be installed in the basement of the shopping center: one in GLY Cleaners, proximal to the original source, and the other in the Chinese restaurant. The third well will be installed in the rear of the building in the open undeveloped courtyard and will extend to a depth below the building footers. The proposed well locations are indicated in **Attachment 1, Sheet 2**. Assuming an effective radius of influence of approximately 60 feet (common for SSDS systems with similar geology and more conservative than the results of the pilot test indicated), this array of SVI mitigation wells will cover the area of concern and reduce sub-slab pressure by creating a vacuum that limits movement of contaminated vapors into the structure. It is very important to note that the 60 foot radius of influence is realistic for a SSDS and should not be compared to the radius of influence necessary for Soil Vapor Extraction (VE) designed to remediate contamination which is typically much smaller (i.e., 30 to 50 feet). The intent of the SSDS system is solely to create a pressure differential between the subsurface and the interior of the building and it is not to remove contaminant mass. As such, much smaller blowers are necessary and the effective radius of influence for SSDS systems is much greater than for SVE systems.

All elements of the design were completed in general accordance with the requirements of the NYSDOH Guidance Document.

3.2 SVI Well Design

Three (3) SVI mitigation extraction wells are proposed to create sub-slab depressurization. The well locations are indicated in **Attachment 1, Sheet 2** and the details including screened intervals and piping to bring the wells to the surface at each location are indicated in **Attachment 1, Sheets 3 and 4**. The screened interval design for the interior wells (VE-1 and VE-3) accounts for the potential for 3-foot building foundation footers; the screened interval was selected to be between three and seven feet. The screened interval design for the exterior well (VE-2) accounts for the approximately 8-foot depth of the basement and the potential for 3-foot building foundation footers. The screened interval was selected to be between 11 feet and 16 feet bgs to avoid short-circuiting to the basement walls and footers.

The two SVI mitigation wells in the basement of the building (VE-1 and VE-3) are to be located in the approximate middle of the tenant basement space as indicated on **Sheet 2**. The external SVI mitigation well (VE-2) is to be placed approximately four feet from the back wall and in the approximate middle of the length of the building. This will provide a substantial overlap in coverage area along the center of the building and in the areas where soil vapor readings have indicated the highest levels of impact. This design will also minimize trenching as the wells are all located within 10 feet of the walls of the tenant spaces which will serve as supports for the piping leading to the roof manifold. Each SVI mitigation well has been designed to run at a minimum of 38 cubic feet per minute (cfm) and in actuality higher flows will be obtained as head losses in the manifold system have been minimized through short piping runs as the extracted vapors flow toward the SVI system blowers. SVI mitigation wells are to be constructed as 4 inch diameter polyvinyl chloride (PVC) wells.

3.3 Interior and Ceiling Manifold System

As indicated in **Attachment 1, Sheet 4**, the piping leaving the wells in the basement (VE-1 and VE-3) shall be 4" diameter chlorinated PVC (CPVC) and the piping is to be trenched into the existing floor slab to the nearest wall. The piping will be secured to the wall by pipe supports then will run the length of the ceiling to the rear of the building. CPVC is proposed to be installed on the interior piping and manifold sections to comply with NYC Fire Marshal code. Upon reaching the rear exterior of the building, the 4" CPVC piping will transition to 4" PVC piping as it emerges from the interior of the building and runs to the roof manifold. The piping leaving the exterior well (VE-2) shall be 4" diameter PVC and will be trenched to the exterior back wall of the building. The 4" PVC piping from all of the wells will be run along the exterior walls to the roof to provide stability for the piping. A ball valve will be provided at each SVI well location and before each blower on the manifold to allow flow and vacuum regulation so that the system can be optimized during operation as necessary. The design indicates a transition to 8" PVC piping after the blowers. The manifold emission point will extend a minimum of 12 inches above the roof floor and will be finished with a rain cap. If necessary, the manifold emissions will be filtered through two granulated activated carbon (GAC) filters. The primary GAC will filter the emission, and the secondary GAC will provide back-up filtration if the primary GAC reaches breakthrough.

In order to minimize exterior penetrations, individual laterals from VE-1 and VE-3 will be individually run to dedicated blower systems (i.e., "homerun" piping with one blower for each SVI) which will be installed on the roof in the center rear of the building (closest to the undeveloped courtyard area). The roof manifold plan is provided in **Attachment 1, Sheet 4**. This design allows great operational flexibility and also ensures that in the event of one blower failure, the majority of the building will still be under the influence of the other blower system to provide an added measure of protection to site occupants. In addition, the effective radius of influence will be improved due to the additional blower capacity at each SVI well. This modular design also permits easy expansion of the system if operational data indicates the need for an additional extraction well.

The trenching and piping layout plan (**Attachment 1, Sheet 3**) indicates the approximate location of the new piping and blower systems. The complete piping systems are indicated in the piping and instrumentation diagram (**Attachment 1, Sheet 5**).

3.4 Blower Systems and Rooftop Piping

No roof penetrations are required for this project as the effluent from the blower systems will exit at a minimum of 12 inches above the roof floor. All piping and wall penetrations are to be performed by licensed contractors and the exterior wall repair is to be completed in strict accordance with wall material manufacturer recommendations to ensure a liquid tight seal.

The three (3) blowers (B-1 through B-3 corresponding to VE-1 through VE-3, respectively) are to be installed on the roof near close to the rear of the building and the vacant courtyard (see **Attachment 1, Sheet 3**). Three Radonaway RP380 Blower systems (B-1 through B-3) are proposed. The installation details for the blower systems and the piping and controls necessary are indicated on **Attachment 1, Sheet 4** and **Sheet 5**, respectively.

Each of the five blowers will require a 120VAC, 60Hz receptacle within several feet of the blower. The receptacles are to be designed and installed by others in accordance with all New York City Codes.

As indicated on **Attachment 1, Sheet 5**, emissions controls systems including the installation of two, 55-gallon drum type, vapor granular activated carbon vessels piped in series are proposed. Vessels are proposed for series installation so that once breakthrough is detected in the lead vessel, arrangements for GAC replacement can be made before breakthrough in the lag vessel, thereby preventing discharge of contaminants to the atmosphere.

After leaving the GAC vessels, the discharge piping will exit the manifold on the roof. The discharge piping should extend a minimum of twelve inches above the roofline and should be placed away from any fresh air intakes for the building. A rain cap should be fitted on the discharge. In addition, since piping will be leaving the interior of the building and then run along the exterior, there is the potential for condensate buildup. The contractor should install low point vents for condensate removal as appropriate near the point where the effluent piping exits the building. The blower manufacturer should be consulted to ensure proper condensate handling during installation.

3.5 Post-Installation Testing

Once the SVI mitigation system is installed, the NYSDOH Guidance Document recommends conducting a pressure field extension test to evaluate the radius of influence of the system. The test is conducted similarly to the initial conductivity pilot test; test holes will be installed at distances within the proposed radius of influence and the system induced vacuum is measured using a digital micromanometer to evaluate the effectiveness of the SSDS.

Apex will install four pressure field extension test points to assist in evaluating actual vacuum response as a function of distance. The following pressure field extension testing locations have been selected to ensure sub-slab depressurization in the following areas:

- One (1) probe in the basement of the liquor store on the northwest side of the on-site building at the front of the store and closest to Cropsey Avenue;
- One (1) probe in the basement of the liquor store on the northwest side of the on-site building in the back of the store and closest to the courtyard area;
- One (1) in the basement of the Royal Deli on the northeast side of the on-site commercial structure in the front of the store closest to the intersection of Cropsey Avenue and Bay 25th Street; and,
- One (1) in the basement of the Royal Deli on the northeast side of the on-site building in the back of the store closest to the courtyard behind the building.

In addition to ensuring the vacuum draw from the system, the NYSDOH Guidance Document recommends (for buildings with a basement) collecting post-installation indoor air samples in the same locations that the baseline samples were collected as follows:

- One (1) in the basement of the dry cleaner nearest to the source of the contamination; and
- One (1) in the basement of the Pizzeria near the SV-6 probe location.

Sampling should occur no earlier than 30 days after the SVI mitigation system installation. The proposed locations of the pressure field extension test and the indoor air quality sampling are illustrated in **Figure 5**.

4.0 REPORTING

Apex will prepare a report containing a description of installation events, baseline soil vapor and indoor air quality data, post-installation indoor air quality data, and description and summary of the post-installation pressure field extension test. This report will also include, based on the analysis of the data, recommendations and upgrades for changing the SSDS to achieve proper depressurization.

Apex will prepare the IRM Summary report within 120 days from completion of field activities. The IRM Summary Report will include at a minimum:

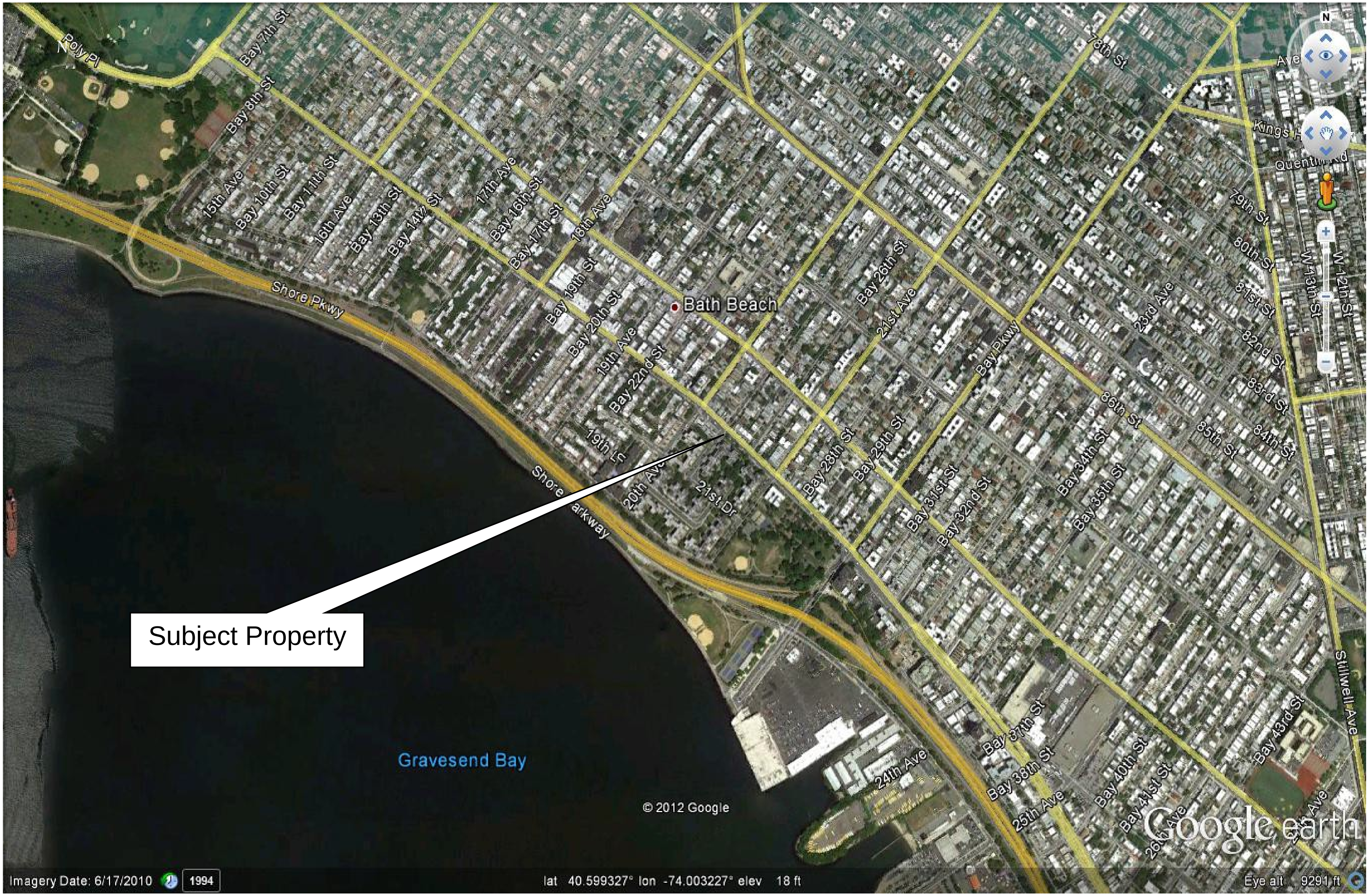
- Description of work performed at the site (including site maps, as-built design package, field screening data, etc.);
- A summary of the analytical data obtained during the proposed activities (a copy of the post-installation pressure field extension test and un-validated data will be provided to NYSDEC and NYSDOH as soon as it is available); and,
- Conclusions and recommendations for further corrective actions, if warranted.

5.0 PROJECT SCHEDULE

The time required to complete the installation and post-installation testing will vary based upon field conditions; however Apex estimates the installation, pressure field extension test, and post-installation indoor and outdoor air sampling can be completed in a two to three month period following approval.

Apex estimates completion date of the installation activities can be completed within thirty working days following approval. IRM Summary Report will be prepared within 120 days from completion of all field and sampling activities to allow for data collection and analysis.

FIGURES



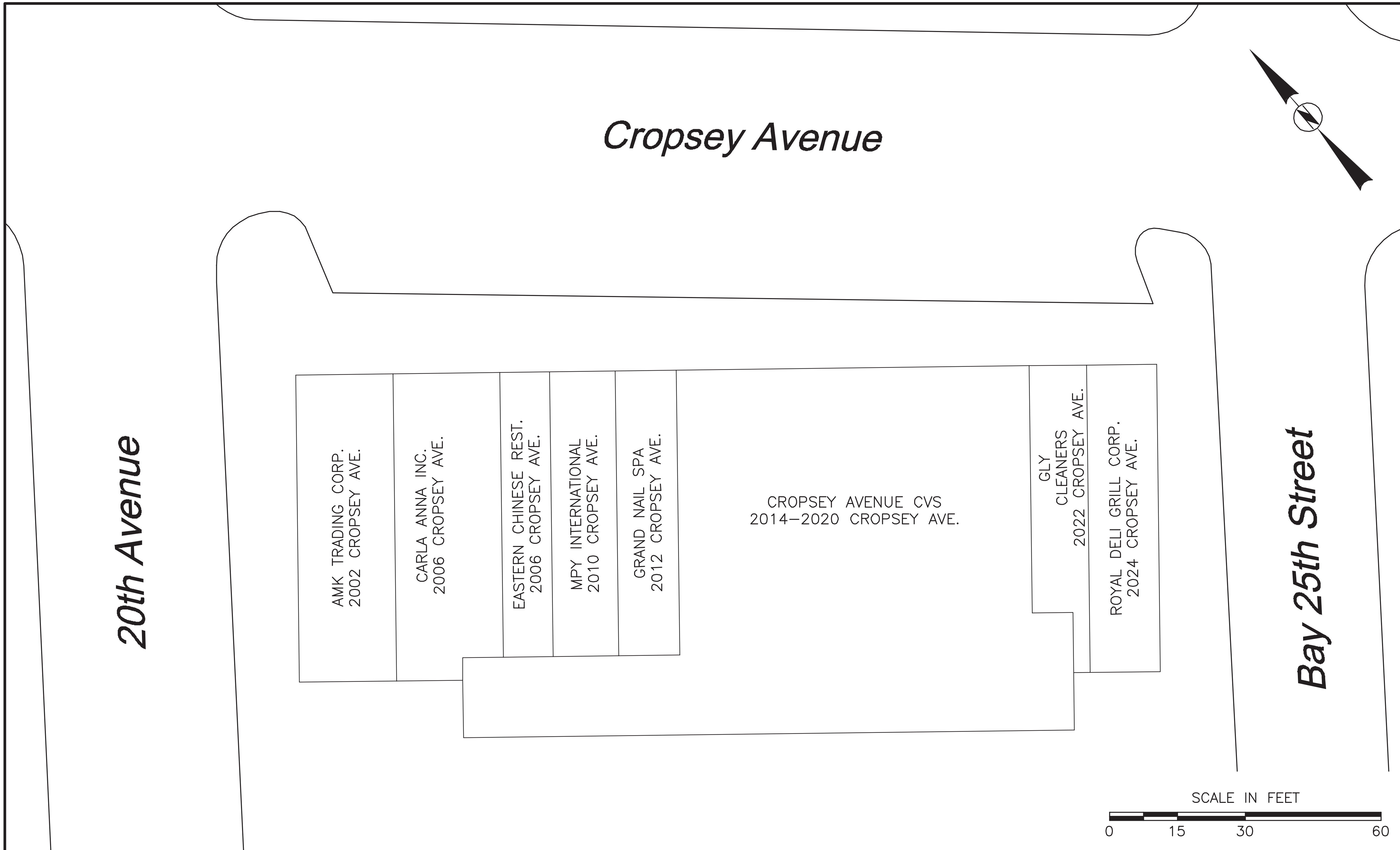
APEX

Site Location Map

2002-2022 Cropsey Avenue, Brooklyn, NY

Client: 2002 Cropsey Associates, LLC
Project No.: 85265.001
Project: Remedial Investigation Work Plan
Date: January 2014

FIG. 1



CHK BY	AN
DWN BY	OS
DATE	4–2–16
SCALE	AS SHOWN
CAD NO.	85265.01A
PRJ NO.	85265

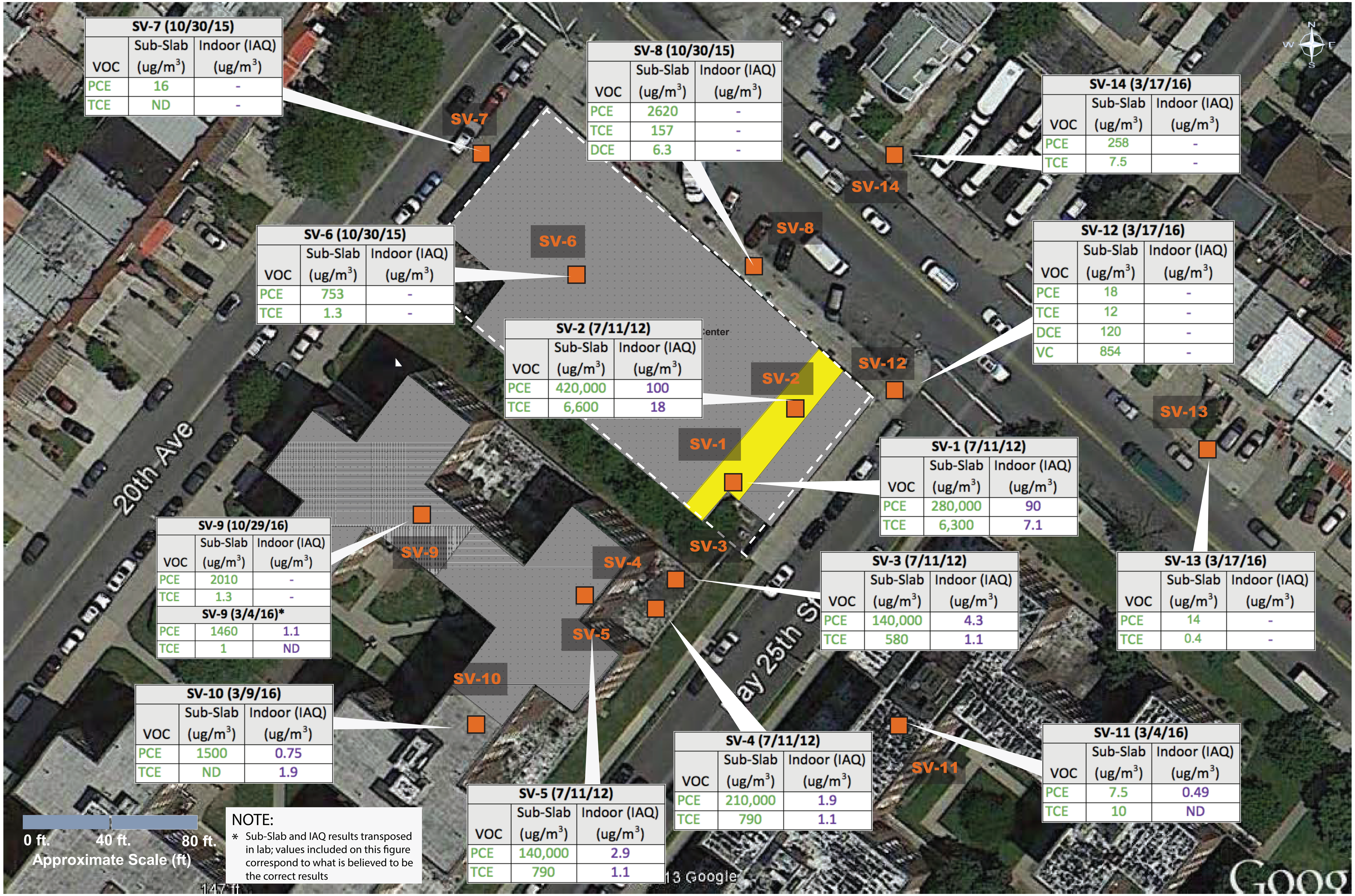
Site Plan

CROPSEY AVENUE SITE
BROOKLYN, NEW YORK

APEX

FIGURE

2



SV-7 (10/30/15)		
VOC	Sub-Slab (ug/m^3)	Indoor (IAQ) (ug/m^3)
PCE	16	-
TCE	ND	-

SV-8 (10/30/15)		
VOC	Sub-Slab (ug/m^3)	Indoor (IAQ) (ug/m^3)
PCE	2620	-
TCE	157	-
DCE	6.3	-

SV-14 (3/17/16)		
VOC	Sub-Slab (ug/m^3)	Indoor (IAQ) (ug/m^3)
PCE	258	-
TCE	7.5	-

SV-6 (10/30/15)		
VOC	Sub-Slab (ug/m^3)	Indoor (IAQ) (ug/m^3)
PCE	753	-
TCE	1.3	-

SV-12 (3/17/16)		
VOC	Sub-Slab (ug/m^3)	Indoor (IAQ) (ug/m^3)
PCE	18	-
TCE	12	-
DCE	120	-
VC	854	-

SV-2 (7/11/12)		
VOC	Sub-Slab (ug/m^3)	Indoor (IAQ) (ug/m^3)
PCE	420,000	100
TCE	6,600	18

SV-1 (7/11/12)		
VOC	Sub-Slab (ug/m^3)	Indoor (IAQ) (ug/m^3)
PCE	280,000	90
TCE	6,300	7.1

SV-9 (10/29/16)		
VOC	Sub-Slab (ug/m^3)	Indoor (IAQ) (ug/m^3)
PCE	2010	-
TCE	1.3	-
SV-9 (3/4/16)*		
PCE	1460	1.1
TCE	1	ND

SV-3 (7/11/12)		
VOC	Sub-Slab (ug/m^3)	Indoor (IAQ) (ug/m^3)
PCE	140,000	4.3
TCE	580	1.1

SV-13 (3/17/16)		
VOC	Sub-Slab (ug/m^3)	Indoor (IAQ) (ug/m^3)
PCE	14	-
TCE	0.4	-

SV-10 (3/9/16)		
VOC	Sub-Slab (ug/m^3)	Indoor (IAQ) (ug/m^3)
PCE	1500	0.75
TCE	ND	1.9

SV-4 (7/11/12)		
VOC	Sub-Slab (ug/m^3)	Indoor (IAQ) (ug/m^3)
PCE	210,000	1.9
TCE	790	1.1

SV-11 (3/4/16)		
VOC	Sub-Slab (ug/m^3)	Indoor (IAQ) (ug/m^3)
PCE	7.5	0.49
TCE	10	ND

SV-5 (7/11/12)		
VOC	Sub-Slab (ug/m^3)	Indoor (IAQ) (ug/m^3)
PCE	140,000	2.9
TCE	790	1.1

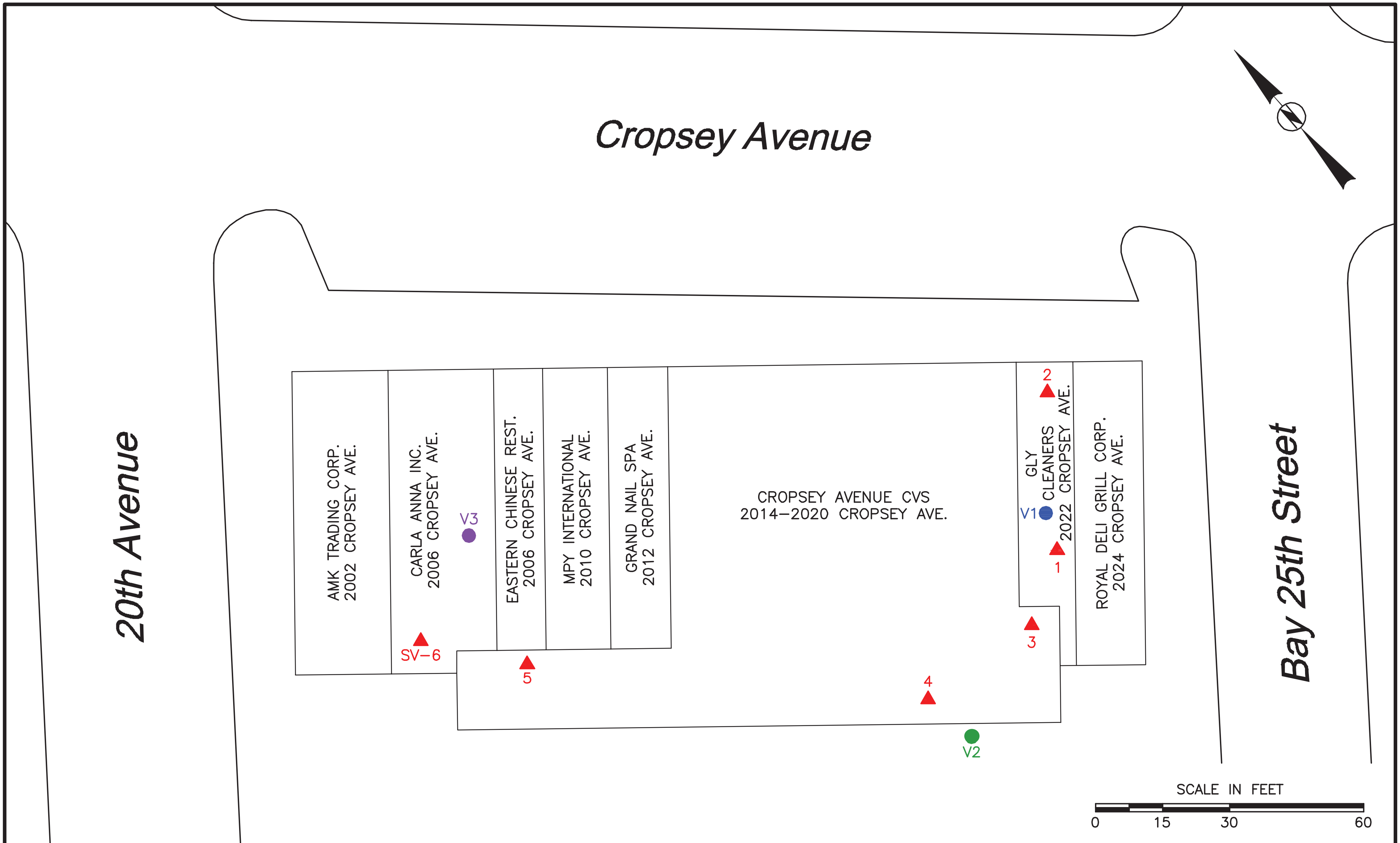
NOTE:
* Sub-Slab and IAQ results transposed in lab; values included on this figure correspond to what is believed to be the correct results

APEX

Apex Sub Slab Vapor and IAQ Summary
2002-2024 Cropsey Ave. and Adjacent Properties

Client: 2002 Cropsey Associates, LLC
Project No.: 85265.001
Project: Remedial Investigation Work Plan
Date: March 2016

FIG. 3



LEGEND

Test Point		
Vacuum 1	0.001	Vacuum Pressure from V-1
Vacuum 2	0.001	Vacuum Pressure from V-2
Vacuum 3	0.001	Vacuum Pressure from V-3

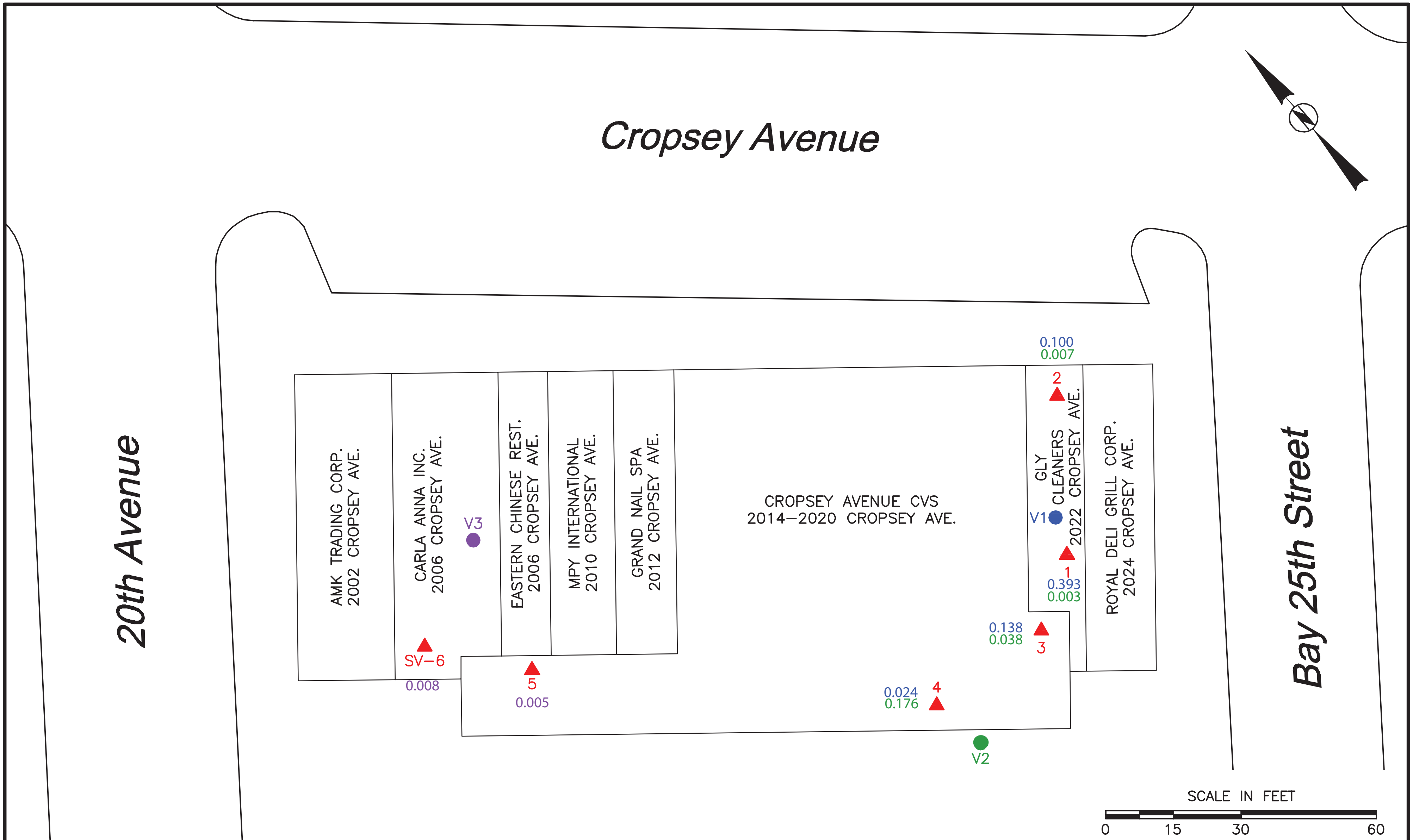
CHK BY	AN
DWN BY	OS
DATE	4–2–16
SCALE	AS SHOWN
CAD NO.	85265.01A
PRJ NO.	85265

Pilot Test Vacuum and Monitoring Point Locations

CROPSEY AVENUE SITE
BROOKLYN, NEW YORK

APEX

FIGURE
4



LEGEND

- Test Point
- Vacuum 1 — 0.001 Vacuum Pressure from V-1
- Vacuum 2 — 0.001 Vacuum Pressure from V-2
- Vacuum 3 — 0.001 Vacuum Pressure from V-3

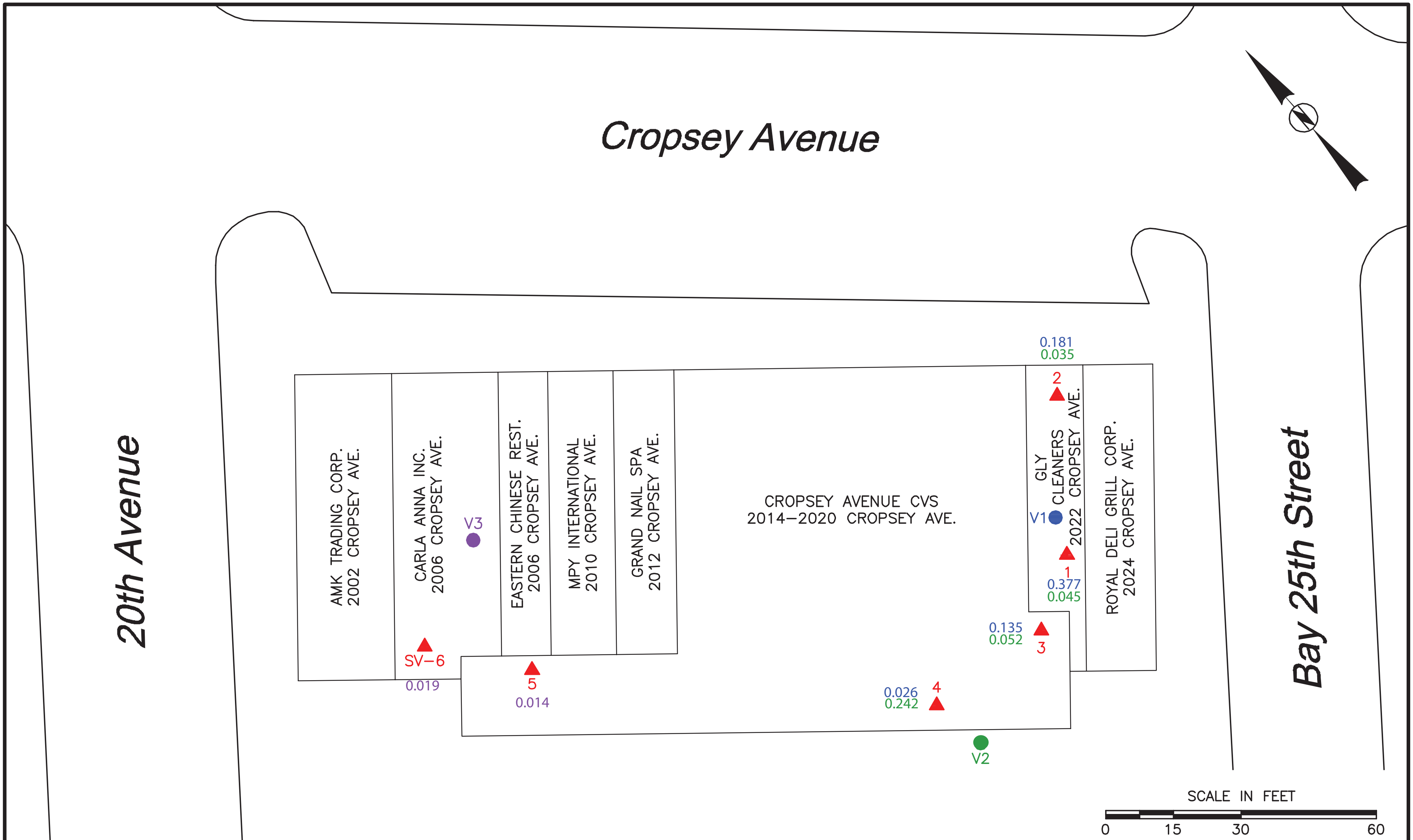
CHK BY	AN
DWN BY	OS
DATE	4–2–16
SCALE	AS SHOWN
CAD NO.	85265.01A
PRJ NO.	85265

Conductivity Test Results
Pressure in inches wc after 15 minutes

CROPSEY AVENUE SITE
BROOKLYN, NEW YORK

APEX

FIGURE
4a



LEGEND

- ▲ Test Point
- ● Vacuum 1 — 0.001 Vacuum Pressure from V-1
- ● Vacuum 2 — 0.001 Vacuum Pressure from V-2
- ● Vacuum 3 — 0.001 Vacuum Pressure from V-3

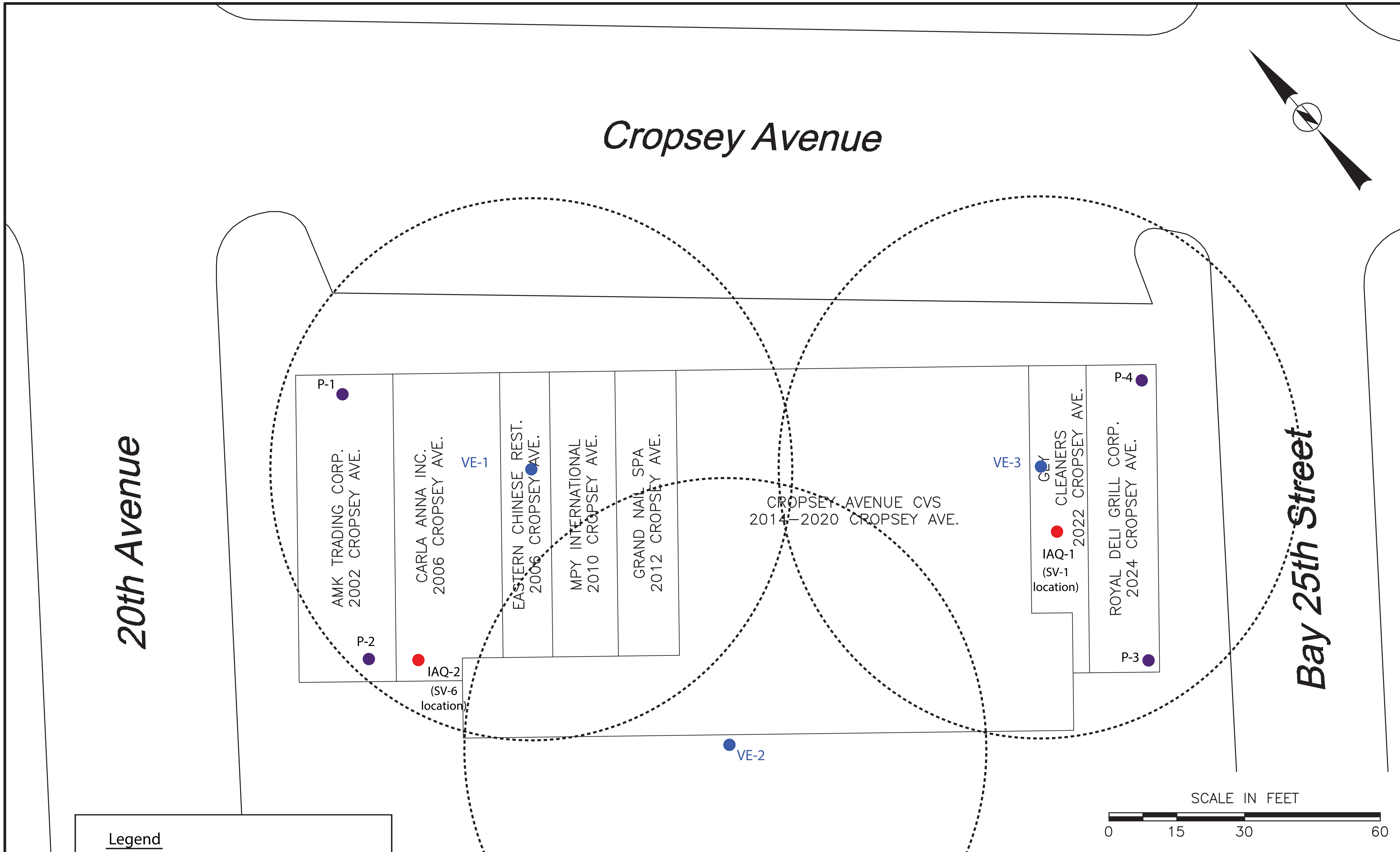
CHK BY	AN
DWN BY	OS
DATE	4–2–16
SCALE	AS SHOWN
CAD NO.	85265.01A
PRJ NO.	85265

Pilot Test Results
Pressure in inches wc after 30 minutes

CROPSEY AVENUE SITE
BROOKLYN, NEW YORK

APEX

FIGURE
4b



CHK BY AN	Proposed Monitoring Point Locations	APEX	FIGURE
DWN BY OS			5
DATE 4–2–16	CROPSEY AVENUE SITE		
SCALE AS SHOWN	BROOKLYN, NEW YORK		
CAD NO. 85265.01A			
PRJ NO. 85265			

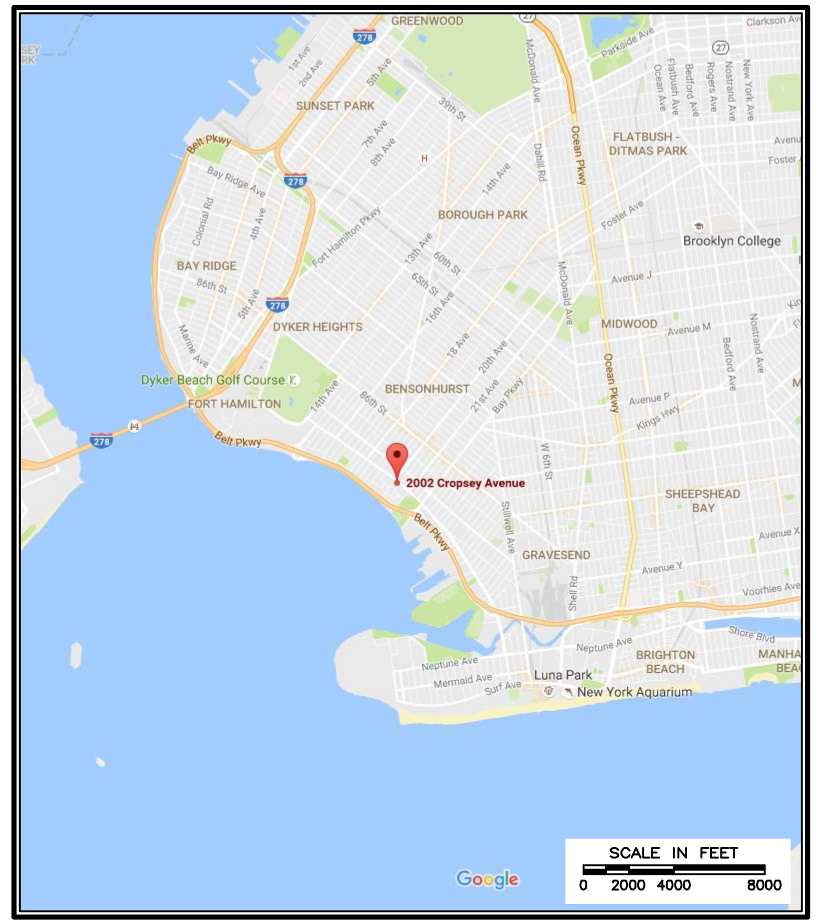
ATTACHMENTS

APEX

SUB-SLAB DEPRESSURIZATION SYSTEM

CROPSEY SITE
2002-2024 CROPSEY AVENUE
BROOKLYN, NEW YORK
BCP# C224169

SITE LOCATION MAP



SCHEDULE OF DRAWINGS:

SHEET NO.	TITLE
1	SITE PLAN
2	SVI MITIGATION WELL INSTALLATION PLAN
3	TRENCHING AND PIPING LAYOUT
4	BLOWER MANIFOLD DETAILS
5	PIPING AND INSTRUMENTATION DIAGRAM AND CONTROLS
6	PIPING AND INSTRUMENTATION DIAGRAM AND CONTROLS LEGEND

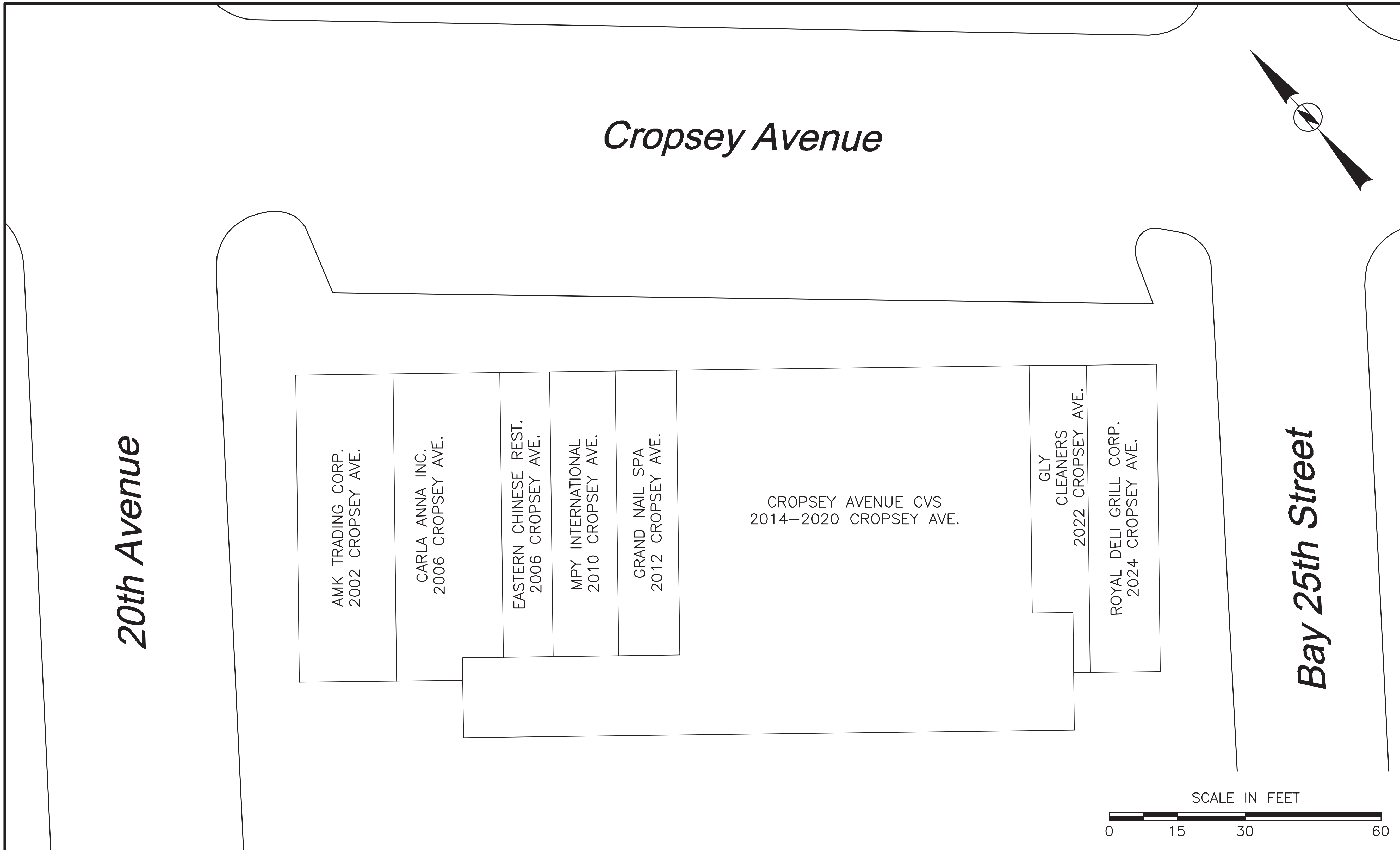
PRELIMINARY ONLY
NOT FOR CONSTRUCTION

APEX
Apex Companies, LLC
223 Route 18 South, Suite 201
East Brunswick, NJ 08816
www.apexcos.com

PREPARED FOR:

2002-2024 CROPSEY AVENUE
BROOKLYN, NEW YORK

COVER SHEET



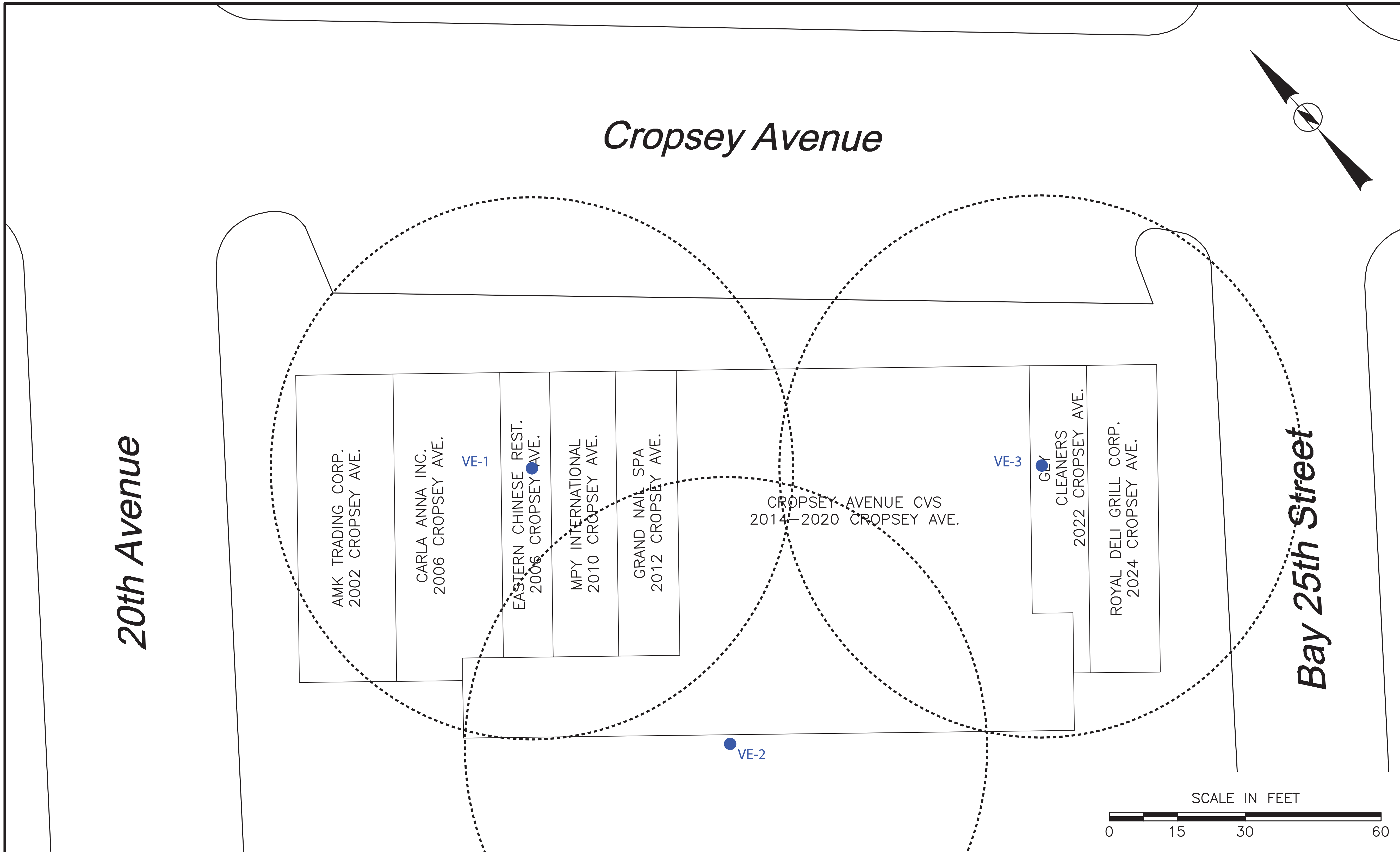
CHK BY	AN
DWN BY	OS
DATE	4–2–16
SCALE	AS SHOWN
CAD NO.	85265.01A
PRJ NO.	85265

Site Plan

CROPSEY AVENUE SITE
BROOKLYN, NEW YORK

APEX

FIGURE
1



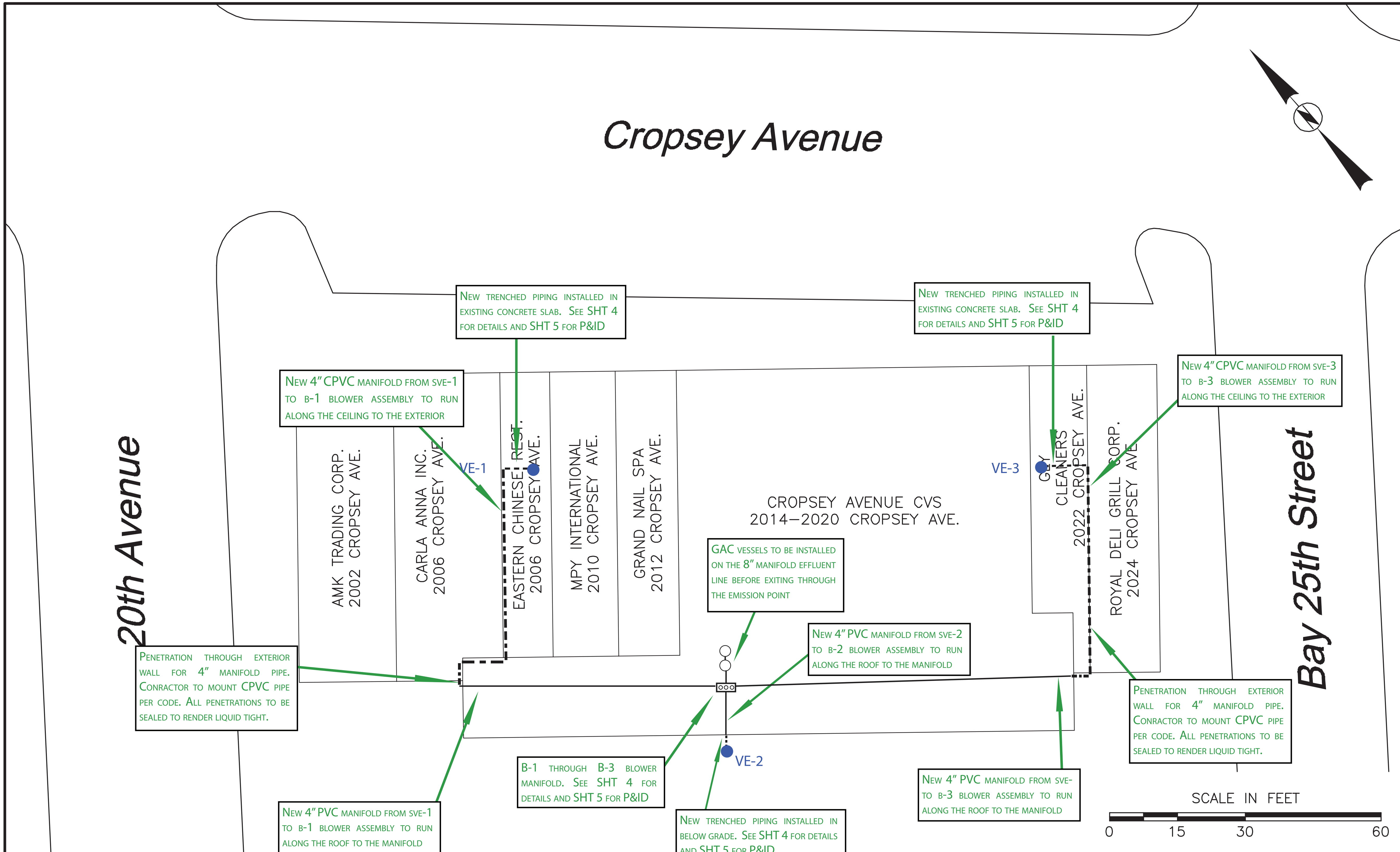
CHK BY	AN
DWN BY	OS
DATE	4–2–16
SCALE	AS SHOWN
CAD NO.	85265.01A
PRJ NO.	85265

SVI Mitigation Well Installation Plan

CROPSEY AVENUE SITE
BROOKLYN, NEW YORK

APEX

FIGURE
2



CHK BY	AN
DWN BY	OS
DATE	4–2–16
SCALE	AS SHOWN
CAD NO.	85265.01A
PRJ NO.	85265

Trenching and Piping Layout Plan

CROPSEY AVENUE SITE
BROOKLYN, NEW YORK

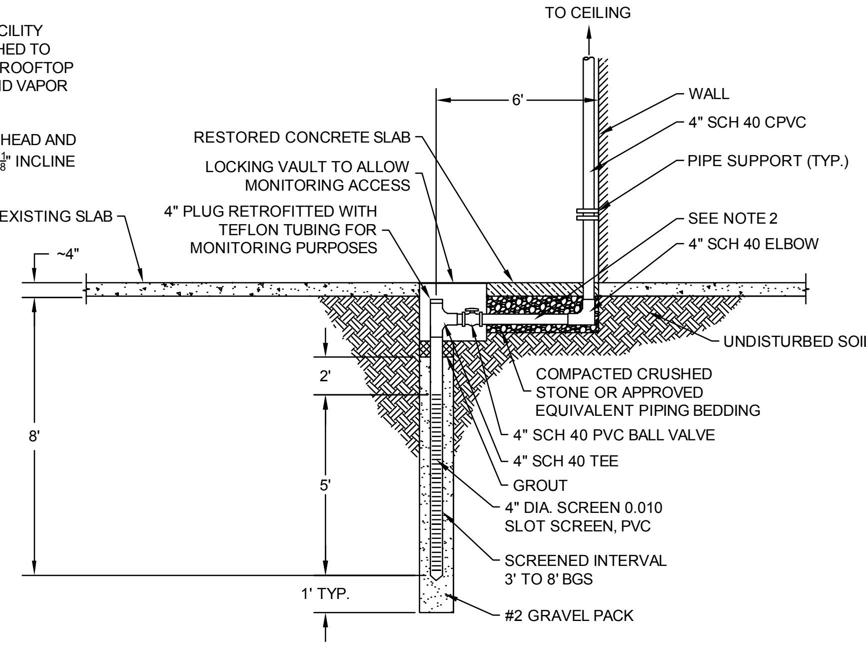
APEX

FIGURE

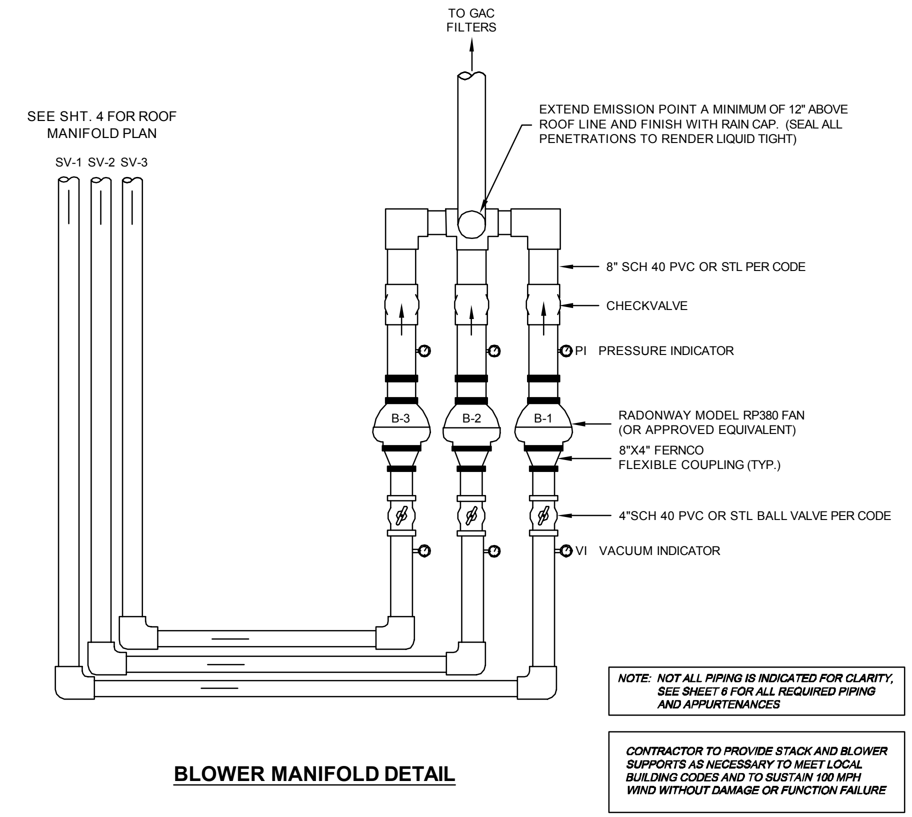
3

NOTE 1: TO MINIMIZE INTERFERENCE TO FACILITY OPERATIONS, ALL SVI PIPING TO BE TRENCHED TO NEAREST WALL OR COLUMN, THEN RUN TO ROOFTOP BLOWER SYSTEMS. BALANCING VALVES AND VAPOR TREATMENT TO BE ACCESSIBLE AT ROOF.

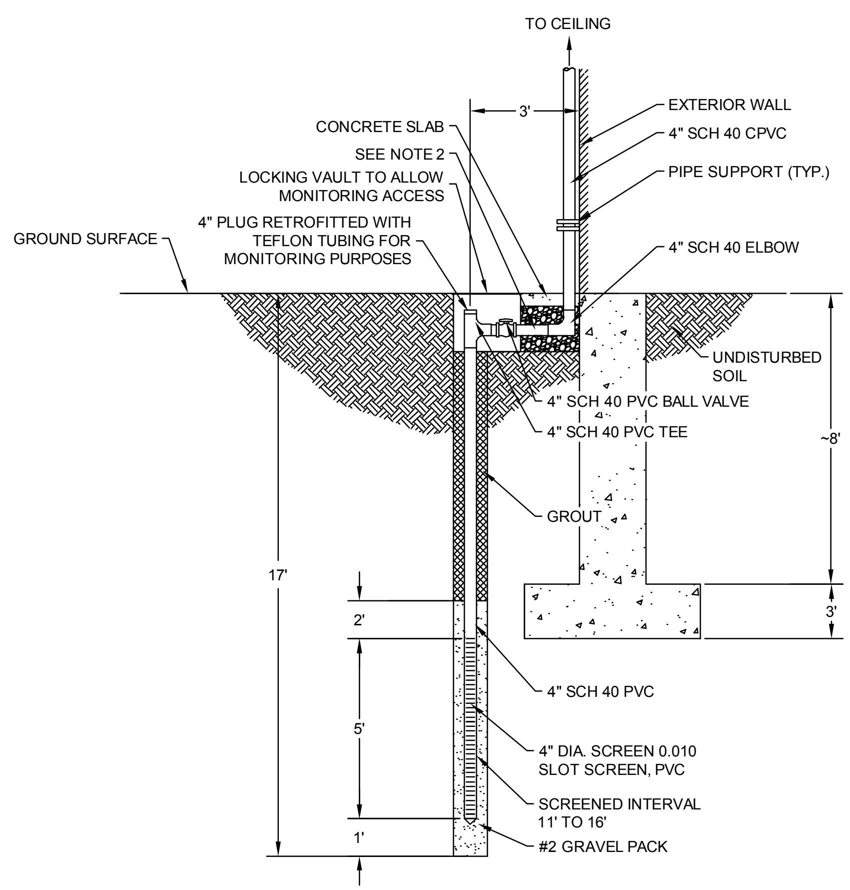
NOTE 2: TRENCHED PIPING BETWEEN WELL HEAD AND WALL IS TO BE INSTALLED WITH A PITCH OF $\frac{1}{8}$" INCLINE PER FOOT OF PVC.



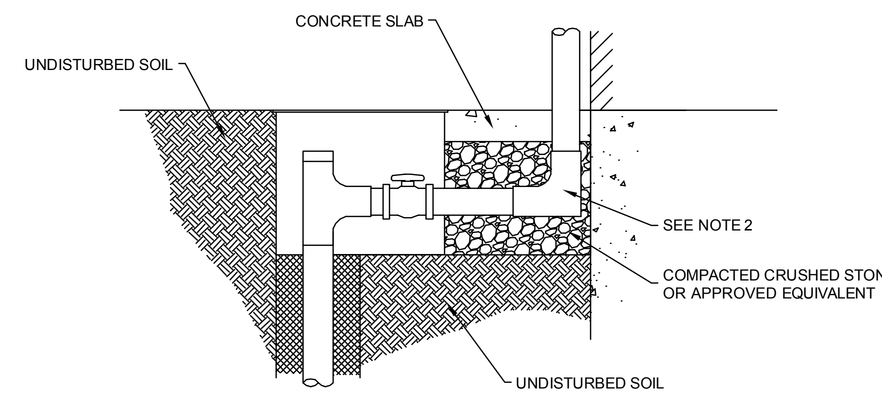
INTERIOR SV EXTRACTION WELL AND PIPING DETAIL



BLOWER MANIFOLD DETAIL



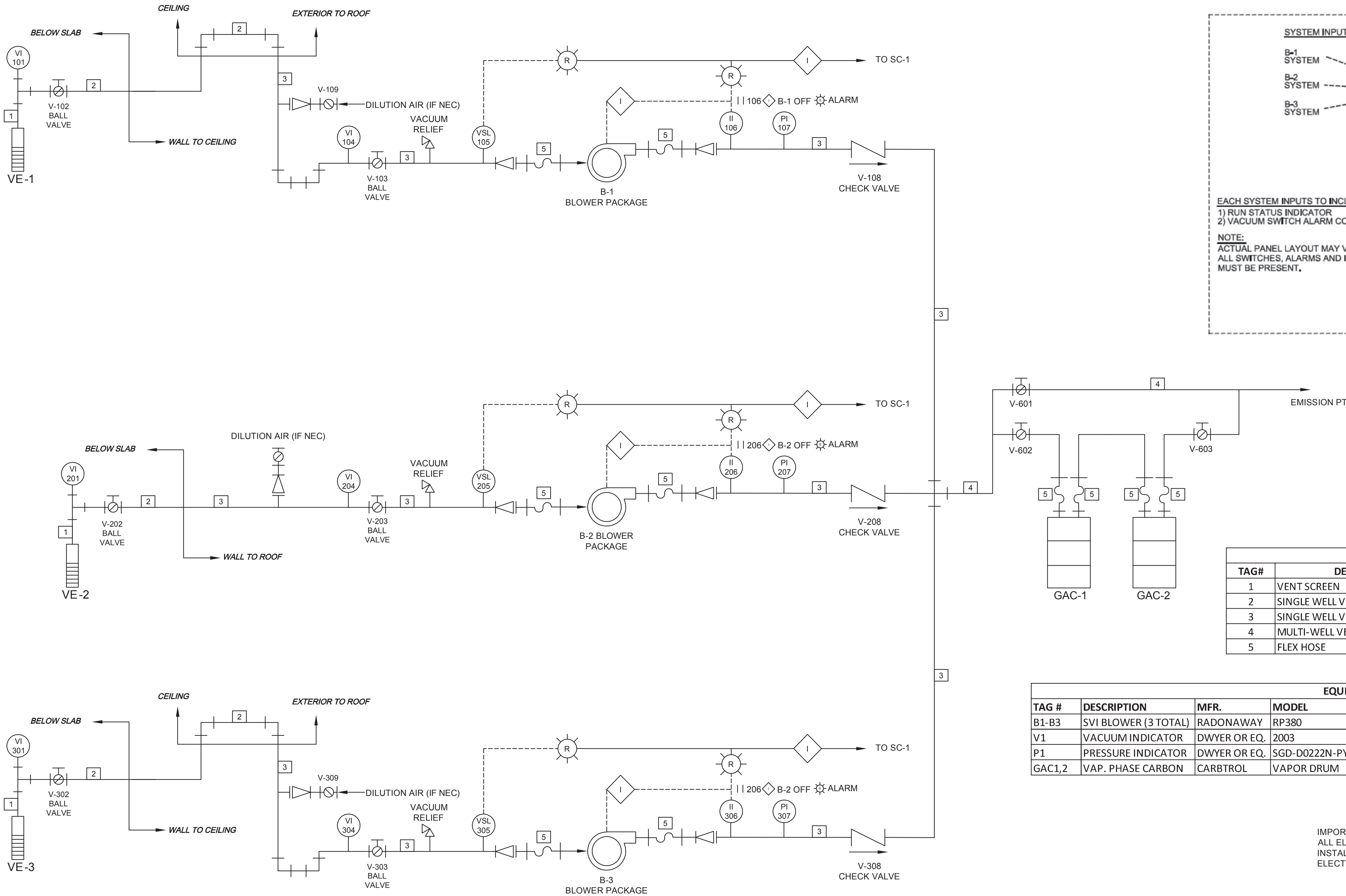
EXTERIOR SV EXTRACTION WELL AND PIPING DETAIL

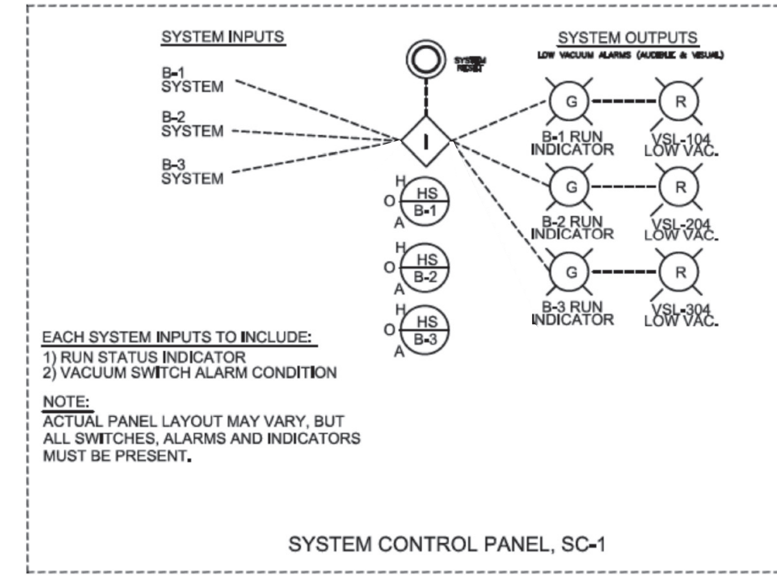


WELL HEAD DETAIL

CHECK BY	AN	BLOWER MANIFOLD DETAIL AMA CROPSEY 2202-2024 CROPSEY AVENUE BROOKLYN, NEW YORK	FIGURE 4
DRAWN BY	OS		
DATE	5-25-16		
SCALE	AS SHOWN		
CAD NO.	85265.01C		
PRJ NO.	85265.001		

APEX





PIPING SCHEDULE

TAG#	DESCRIPTION	DIA.	MATL.
1	VENT SCREEN	4"	PVC
2	SINGLE WELL VENT PIPE/MANIFOLDS	4"	CPVC
3	SINGLE WELL VENT PIPE/MANIFOLDS	4"	PVC
4	MULTI-WELL VENT PIPE/MANIFOLD	6"	PVC
5	FLEX HOSE	VARIES	VARIES

EQUIPMENT SCHEDULE

TAG #	DESCRIPTION	MFR.	MODEL	COMMENTS / NOTES
B1-B3	SVI BLOWER (3 TOTAL)	RADONAWAY	RP380	220 CFM @ 1" WC, 130 CFM @1.5" WC, 38 CFM@2" WC, 115 VAC, SINGLE PH
V1	VACUUM INDICATOR	DWYER OR EQ.	2003	0 TO 3.0 IN. W.C., 0.1 INCREMENTS
P1	PRESSURE INDICATOR	DWYER OR EQ.	SGD-D0222N-PY	0 TO 15 PSI, GLYCERIN FILLED
GAC1,2	VAP. PHASE CARBON	CARBTROL	VAPOR DRUM	APPROX. 55 GAL. DRUM, OR EQUAL

IMPORTANT ELECTRICAL NOTE:
ALL ELECTRICAL CONNECTIONS TO BE DESIGNED AND INSTALLED BY OTHERS IN ACCORDANCE WITH NYC ELECTRICAL AND BUILDING CODES

CHECK BY	AN
DRAWN BY	OS
DATE	7-7-16
SCALE	AS SHOWN
CAD NO.	85265.01C
PRJ NO.	85265

PIPING & INSTRUMENTATION DIAGRAM & CONTROLS

AMA CROPSEY
2002-2024 CROPSEY AVENUE
BROOKLYN, NEW YORK

APEX

FIGURE
5

VALVE AND PIPING SYMBOLS

- GLOBE VALVE
- GATE VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- PLUG VALVE
- 3-WAY VALVE
- ANGLE VALVE
- **RELIEF OR SAFETY VALVE**
- DIAPHRAGM VALVE
- BALL VALVE
- GLOBE VALVE
- SELF-CONTAINED PRESSURE REGULATING VALVE W/RELIEF
- KNIFE GATE VALVE
- BACKFLOW PREVENTER
- NO NORMALLY OPEN
- NC NORMALLY CLOSED
- SP SAMPLE PORT
- FLEXIBLE HOSE
- BASKET TYPE STRAINER
- Y-TYPE STRAINER
- DUPLEX STRAINER
- SLEEVE COUPLING (SC)
- FLOOR DRAIN
- EQUIPMENT DRAIN
- CLEANOUT (CO)
- REMOVABLE PLUG
- REMOVABLE CAP
- BLIND FLANGE
- EXHAUST TO ATMOSPHERE (INSIDE)
- EXHAUST TO ATMOSPHERE (OUTSIDE)
- REDUCER
- UNION
- QUICK DISCONNECT COUPLING
- GAUGE SEAL
- DAMPER

VALVE OPERATOR SYMBOLS

- SOLENOID
- MOTOR, ELECTRIC
- DIAPHRAGM
- DIAPHRAGM WITH POSITIONER
- HANDWHEEL OR LEVER
- CHAINWHEEL

PRIMARY ELEMENT SYMBOLS - FLOW

- ORIFICE PLATE
- PITOT TUBE
- AVERAGING PITOT TUBE
- VENTURI OR FLOW TUBE
- TOTALIZING FLOWMETER
- FLUME
- WEIR
- TURBINE OR PROPELLOR TYPE METER
- MAGNETIC FLOW METER
- ROTAMETER

EQUIPMENT SYMBOLS

- SUBMERSIBLE PUMP
- PUMP
- BLOWER
- PNEUMATIC DIAPHRAGM PUMP
- AIR COMPRESSOR

GENERAL INSTRUMENT SYMBOLS

ONE VARIABLE / TWO VARIABLES

- LOCALLY MOUNTED
- PANEL MOUNTED
- REAR-OF-PANEL MOUNTED
- INTERLOCK
- PURGE

LINE SYMBOLS

- PROCESS PIPES OR CHANNELS
- CONNECTION TO PROCESS, MECHANICAL LINK OR INSTRUMENT SUPPLY
- PNEUMATIC SIGNAL
- ELECTRIC SIGNAL
- CAPILLARY TUBING (FILLED SYSTEM)
- HYDRAULIC SIGNAL
- ELECTROMAGNETIC OR SONIC SIGNAL NO WIRING OR TUBING

PROCESS LINE ABBREVIATIONS

AIR	AIR, ATMOSPHERIC PRESSURE
BW	BACKWASH
CA	COMPRESSED AIR
CGW	CONTAMINATED GROUNDWATER
D	DRAIN
EFF	EFFLUENT
EXH	EXHAUST
GW	GROUNDWATER
NPW	NON-POTABLE WATER
P	PRODUCT
PW	POTABLE WATER
S	SANITARY
SL	SLUDGE
SP	SAMPLE PORT
SS	STORM SEWER
TF	TOTAL FLUIDS
V	VENT
VAP	VAPOR

PIPING MATERIAL IDENTIFICATION

CPVC	CHLORINATED POLYVINYL CHLORIDE
CSP	CARBON STEEL PIPE
COP	COPPER
CMP	CORRUGATED METAL PIPE
CIP	CAST IRON PIPE
DIP	DUCTILE IRON PIPE
GAL	GALVANIZED STEEL PIPE
PE	POLYETHYLENE PIPE
PP	POLYPROPYLENE PIPE
PVC	POLYVINYL CHLORIDE PIPE
RCP	REINFORCED CONCRETE PIPE
RUB	RUBBER HOSE
SS	STAINLESS STEEL PIPE
VCP	VITRIFIED CLAY PIPE

INSTRUMENT IDENTIFICATION TABLE

FIRST LETTER			SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER FLAME				
C	CONDUCTIVITY			CONTROL	
D	DENSITY (SP. GR.)	DIFFERENTIAL			
E	VOLTAGE		PRIMARY ELEMENT		
F	FLOW RATE	RATIO			
G	GAUGING (DIMENSIONAL)		GLASS		
H	HAND (MANUAL)				HIGH
I	CURRENT		INDICATE		
J	POWER	SCAN			
K	TIME OR SCHEDULE			CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOISTURE OR HUMIDITY				MIDDLE
N					
O			ORIFICE		
P	PRESSURE OR VACUUM		POINT (TEST)		
Q	QUANT. OR EVENT	INTEGRATE			
R	RADIOACTIVITY		RECORD OR PRINT		
S	SPEED OR FREQ.	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION		
V	VACUUM			VALVE OR DAMPER	
W	WEIGHT OR FORCE		WELL		
X	UNCLASSIFIED		UNCLASSIFIED		
Y				RELAY OR COMPUTE	
Z	POSITION			DRIVE, ACTUATE	

PROCESS PIPING IDENTIFICATION

PROCESS PIPE

PIPE DIAMETER (INCHES)

2" XXX-YY-Z

- **INSULATION CLASS**
- **PIPING DESIGN TABLE NUMBER**
- **PROCESS LINE ABBREVIATION**

INSTRUMENT IDENTIFICATION

FIT 100A

FIT-100A

- **SUFFIX (NOT NORMALLY USED)**
- **LOOP NUMBER**
- **SUCCEEDING LETTERS**
- **FIRST LETTER**

FUNCTION ABBREVIATIONS

DO	DISSOLVED OXYGEN	OC	OPEN-CLOSE
FC	FAIL CLOSED	OO	ON-OFF (MAINTAINED)
FI	FAIL INDETERMINATE	ORP	OXIDATION REDUCTION POTENTIAL
FL	FAIL LOCKED	OSC	OPEN-STOP-CLOSE (MOMENTARY)
FO	FAIL OPEN	SS	START-STOP (MOMENTARY)
HOA	HAND-OFF-AUTOMATIC	>	HIGH SELECT
I/I	CURRENT-TO-CURRENT	<	LOW SELECT
I/P	CURRENT-TO-PNEUMATIC	$\sqrt{\ }$	SQUARE ROOT
LEL	LOWER EXPLOSIVE LIMIT	Σ	ADD OR TOTALIZE
LR	LOCAL-REMOTE		

CHECK BY	AN
DRAWN BY	OS
DATE	4-6-16
SCALE	AS SHOWN
CAD NO.	JPMC85120.01B
PRJ NO.	JPMC85120

PIPING & INSTRUMENTATION DIAGRAM & CONTROLS

APEX

FIGURE

6