GEOPHYSICAL ENGINEERING SURVEY REPORT

COMMERCIAL PROPERTY
450 UNION STREET
BROOKLYN, NEW YORK 11231

NOVA PROJECT NUMBER
16-0152

DATED
FEBRUARY 18, 2016

PREPARED FOR:
450 UNION LLC & LANGAN
C/O HORRIGAN DEVELOPMENT
13 WEST 36TH STREET, 7TH FLOOR
NEW YORK, NEW YORK 10018

PREPARED BY:

NOVA
GEOPHYSICAL
ENGINEERING
Subsurface Mapping Solutions
56-01 Marathon Parkway # 765
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NOVA GEOPHYSICAL SERVICES

SUBSURFACE MAPPING SOLUTIONS
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February 18, 2016

Matt Horrigan
450 Union LLC c/o Horrigan Development
13 West 36th Street, 7th Floor
New York, New York 10018
Direct: 347-853-2180

Re: Geophysical Engineering Survey (GES) Report
Commercial Property
450 Union Street
Brooklyn, New York 11231

Dear Mr. Horrigan:

Nova Geophysical Services (NOVA) is pleased to provide findings of the geophysical engineering survey (GES) at the above referenced project site: 450 Union Street, Brooklyn, New York (the "Site"). Please see attached Site Location and Geophysical Survey maps for more details.

INTRODUCTION TO GEOPHYSICAL ENGINEERING SURVEY (GES)

NOVA performed a Geophysical engineering surveys (GES) consisting of Ground Penetrating Radar (GPR) and Electromagnetic (EM) surveys at the project Site. The purpose of this survey is to clear and mark proposed environmental boring areas on February 11th, 2016.

The equipment selected for this investigation was an Electromagnetic Utility Detector (EUD-3) and Noggin's 250 MHz ground penetrating radar (GPR) shielded antenna and 3M DYNATL.

A GPR system consists of a radar control unit, control cable and a transducer (antenna). The control unit transmits a trigger pulse at a normal repetition rate of 250 MHz. The trigger pulse is sent to the transmitter electronics in the transducer via the control cable. The transmitter electronics amplify the trigger pulses into bipolar pulses that are radiated to the surface. The transformed pulses vary in shape and frequency according to the transducer used. In the subsurface, variations of the signal occur at boundaries where there is a dielectric contrast (void, steel, soil type, etc.). Signal reflections travel back to the control unit and are represented as color graphic images for interpolation.

GEOPHYSICAL METHODS

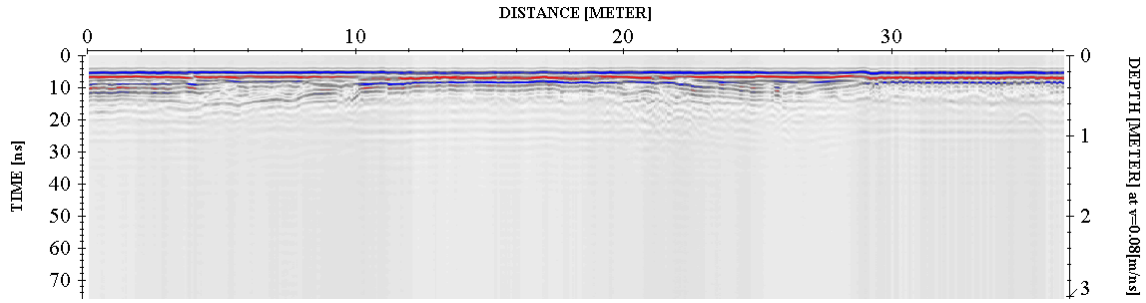
The project site was first screened using the Geonics(tm) electromagnetic detector by carrying the instrument over the project area at the site in 1' x 1' traverses. Finally, GPR profiles were collected over each anomaly and inspected for reflections, which could be indicative of major anomalies and substructures. Nova performed full scale multi-frequency GPR surveys for the targeted depths of approximately 3 to 10 feet below ground surface (bgs) pending quality of the data and sediments settings.

GPR data profiles were collected for the areas of the Site specified by the client. The surveyed areas consisted of paved & unpaved areas.

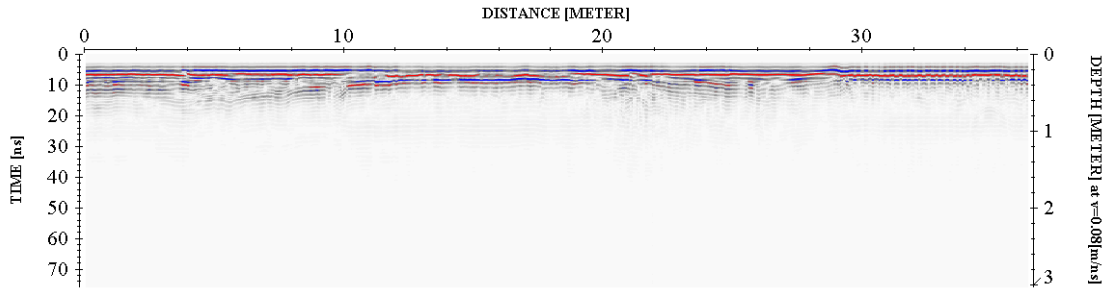
DATA PROCESSING

In order to improve the quality of the results and to better identify subsurface anomalies NOVA processed the collected data. The processes flow is briefly described at this section.

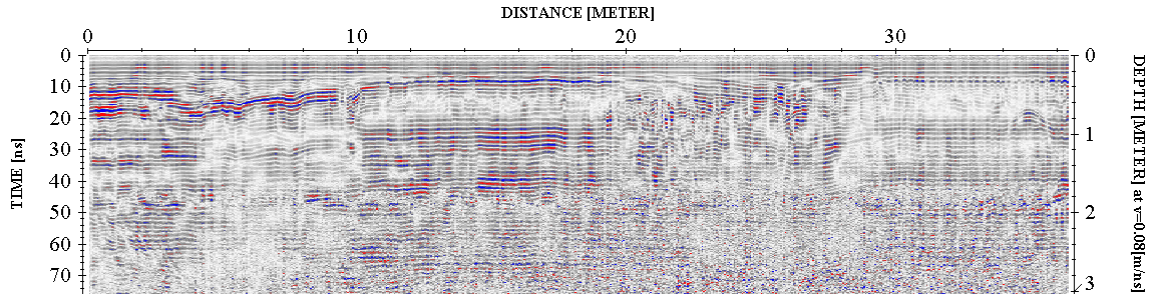
Step 1. Import raw RAMAC data to standard processing format



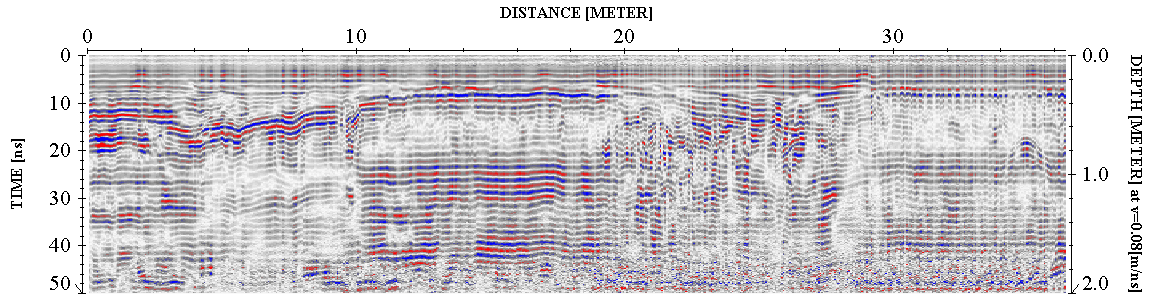
Step 2. Remove instrument noise *(dewow)*



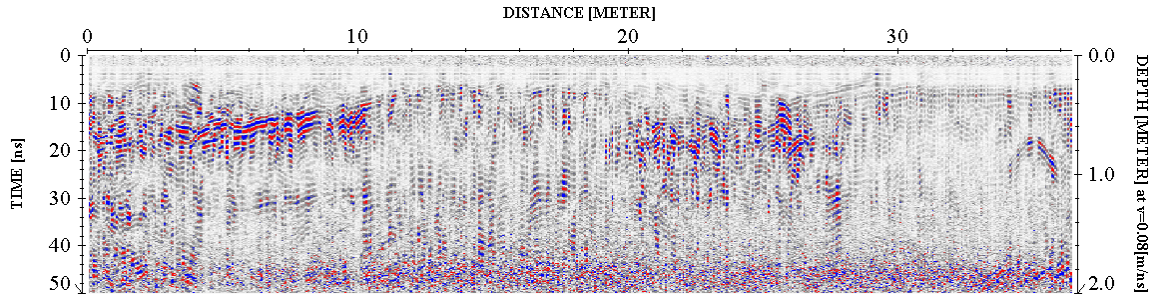
Step 3. Correct for attenuation losses *(energy decay function)*



Step 4. Remove static from bottom of profile *(time cut)*



Step 5. Mute horizontal ringing/noise *(subtracting average)*



The above example shows the significance of data processing. The last image (step 5) has higher resolution than the starting image (raw data – step 1) and describes the subsurface anomalies more accurately.

PHYSICAL SETTINGS

Nova observed following physical conditions at the time of the survey:

The weather: Mostly Cloudy.

Temp: 27 Degrees (F).

Surface: Paved (walkway-asphalt) none paved.

Geophysical Noise Level (GNL): Geophysical Noise Level (GNL) was medium to **high** at the time of the survey due to on-site business activities and on-site storage of metal containing materials, and etc. at the time of the survey.

RESULTS

The results of the geophysical engineering survey (GES) identified following at the project Site:

- GES identified anomalies located throughout of the project area. Based on their reflection rates, these anomalies were consistent with utilities (telephone, gas, electric, sewer line, and water line) and were located approximately 1 feet below ground surface (bgs) to 4 feet below ground surface facing Bond Street and Union Street.
- All anomalies including identified utilities were clearly marked during the field survey.
- GES identified an anomaly located along the south side of the site building. However, due to the limited access to this location at the time of the survey, NOVA could not verify the nature of this anomaly.
- Nova cleared and marked all of the proposed boring locations at the time of the survey.
- Geophysical Survey Plan portrays the areas investigated during the geophysical survey.

If you have any questions please do not hesitate to contact the undersigned.
Sincerely,

NOVA Geophysical Services

Levent Eskicakit, P.G., E.P.
Project Engineer

Attachments:
Figure 1 Site Location Map
Geophysical Survey Plan
Geophysical Images

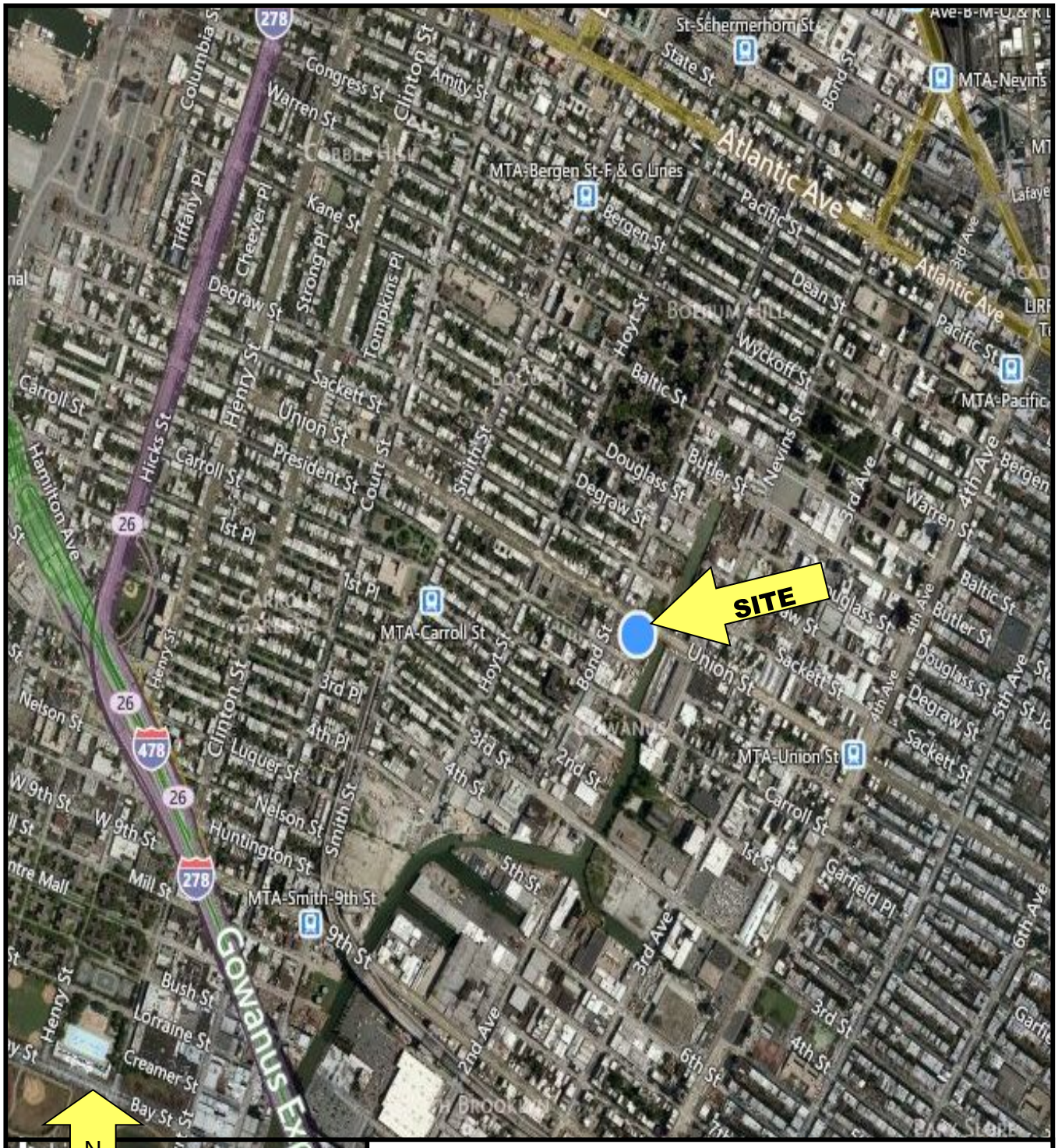


FIGURE 1

SITE LOCATION MAP

NOVA

Geophysical Services

Subsurface Mapping Solutions

56-01 Marathon Pkwy, # 765, Douglaston, NY11362

(347) 556-7787 Fax (718) 261-1528

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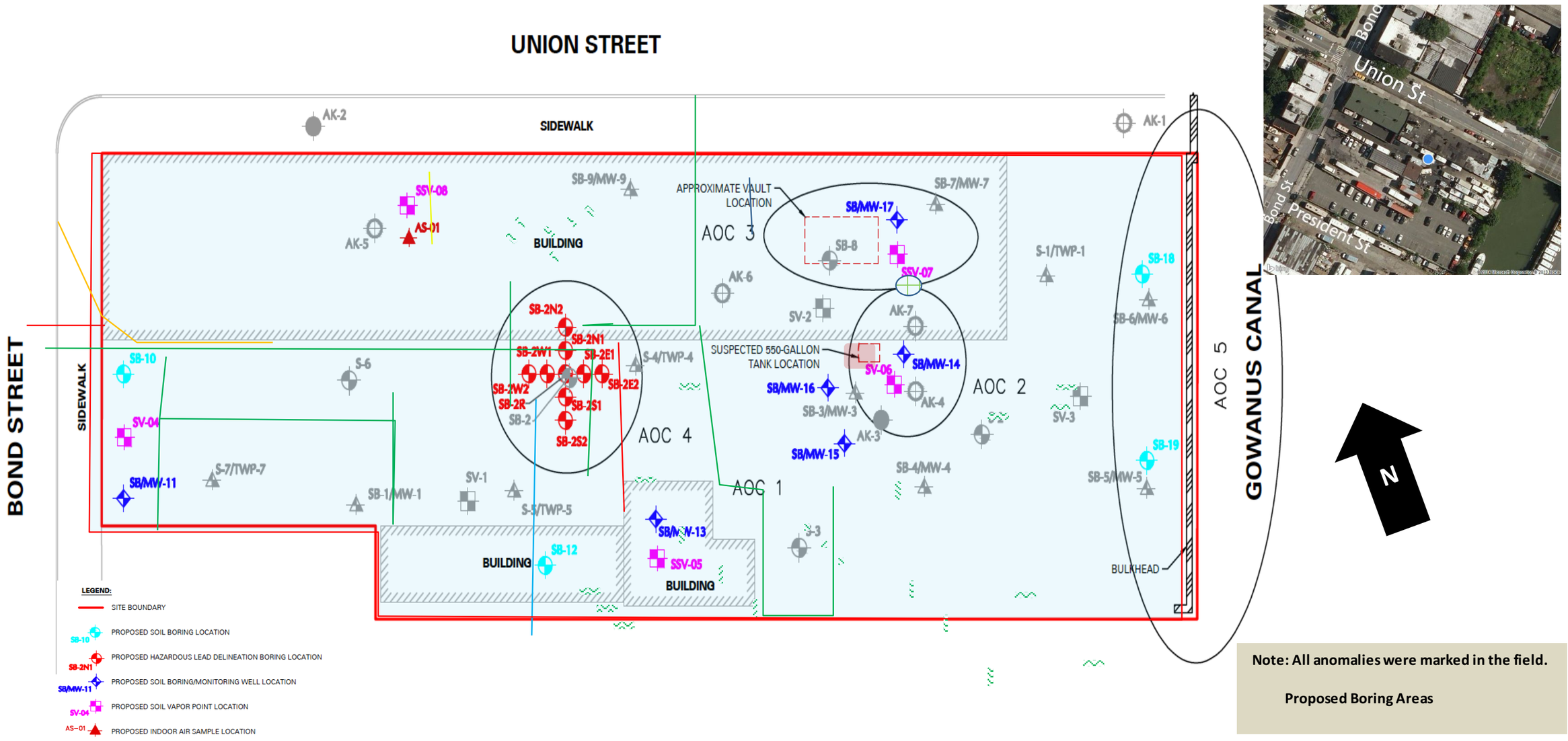
SITE: **Commercial Property**
450 Union Street
Brooklyn, New York 11231

SCALE: See Map



Note: All anomalies were marked in the field.

Proposed Boring Areas

NOVA
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GEOPHYSICAL SURVEY

SITE : **Commercial Property**
450 Union Street, Brooklyn New York 11231
CLIENT: Langan Engineering & Environmental Services
DATE: February 11, 2016
Scale See Map

INFORMATION

- Project Area
- Anomaly
- Scattered Anomalies
- Underground Utilities/Pipes

GEOPHYSICAL IMAGES

Commercial Property
450 Union Street, Brooklyn, New York
February 11, 2016

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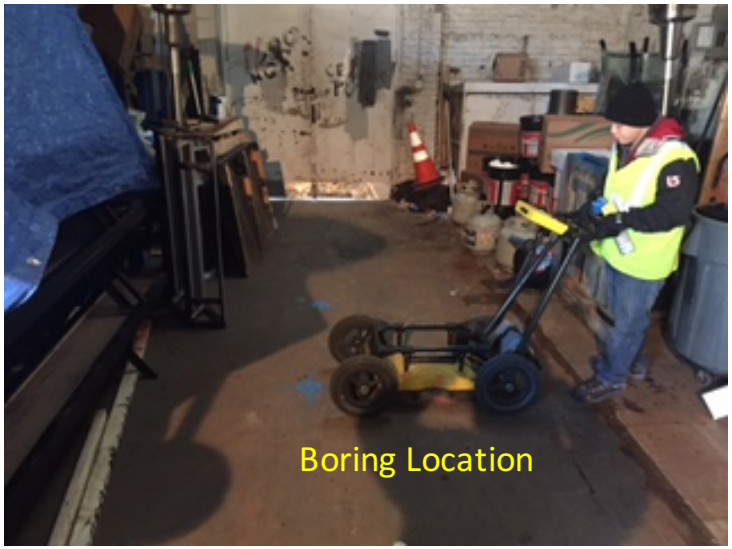
Commercial Property
450 Union Street, Brooklyn, New York
February 11, 2016



GEOPHYSICAL IMAGES

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