APPENDIX A

APPENDIX A

GEOPHYSICAL SURVEY REPORT

LANGAN

HAGER-RICHTER
GEOSCIENCE, INC.

GEOPHYSICAL SURVEY
ATLAS PARK PROJECT
QUEENS, NEW YORK
LANGAN PROJECT No: 55551079

Prepared for:

Langan Engineering & Environmental Services
21 Penn Plaza
360 West 31st Street Ste 900
New York, New York 01001

Prepared by:

Hager-Richter Geoscience, Inc.
417 Berkeley Avenue
Orange, New Jersey 07050

File 04MK34
August, 2004

HAGER-RICHTER
GEOSCIENCE, INC.

CONSULTANTS IN GEOLOGY & GEOPHYSICS
417 BERKELEY AVENUE
ORANGE, NEW JERSEY 07050-2106
TELEPHONE (973) 676-3001
FAX (973) 676-4599

August 6, 2004
File 04MK34

Ms. Smita Patel
Langan Engineering & Environmental Services
21 Penn Plaza
360 West 31st Street Ste 900
New York, New York 01001

Tel 212-479-5428
Fax 212-479-5444

RE: Geophysical Survey
Atlas Park Project
Queens, New York
Langan Project No: 55551079

Dear Ms. Patel:

In this report, we summarize the results of a geophysical survey conducted by Hager-Richter Geoscience, Inc. (H-R) at a site designated as the Atlas Park Project located in the Glendale section of the borough of Queens, New York for Langan Engineering & Environmental Services (Langan) on July 12 and 13, 2004. The geophysical scope of work and the area of interest (AOI) for the survey were specified by Langan.

INTRODUCTION

The site consists of a group of commercial/industrial properties including a number of industrial buildings. Some of the buildings are abandoned or demolished, and some occupied by remaining business tenants. The general location of the Site is shown in Figure 1, and Figure 2 is a site plan showing the approximate location of the geophysical survey.

Langan specified an AOI approximately one (1) acre in size, mostly asphalt paved, but with some sections of reinforced concrete pavement. Dumpsters, vehicles, and other obstructions were present in some parts of the AOI. Langan was interested in determining the location of possible USTs, underground utilities, and other subsurface objects that may be present in the AOI.

OBJECTIVE

The objective of the geophysical survey was to search for, and if detected, to locate USTs, underground utilities and other subsurface objects in the accessible portions of the specified area of interest.

THE SURVEY

Alexis Martínez of Hager-Richter conducted the field operations on July 13 and 14, 2004. The project was coordinated with Ms. Smita Patel of Langan, who specified the area of interest at the site.

The geophysical survey was conducted using three complementary geophysical methods: time domain electromagnetic induction (EM), ground penetrating radar (GPR), and precision utility location (PUL). The EM data were acquired at approximately 8-inch intervals along lines spaced 5 feet apart across the accessible portions of the AOI. The EM survey detects and outlines areas containing buried metal. However, the EM method cannot provide information on the type of objects causing the EM anomaly. In order to aid in the identification of the objects, a GPR survey was conducted along the accessible portions of the area of interest. The GPR system was used with a 250 MHZ antenna and a 50 ns[1] time window. The PUL method was used to trace utilities in the AOI.

EQUIPMENT

EM61. The EM survey was conducted using a Geonics EM61 time domain electromagnetic induction metal detector. The EM61 instrument was designed specifically for detecting buried metal objects such as USTs, drums, and utilities. An air-cored 1-meter square transmitter coil generates a pulsed primary magnetic field in the earth, thereby inducing eddy currents in nearby metal objects. The eddy current produces a secondary magnetic field that is sensed by two receiver coils, one coincident with the transmitter and one positioned 40 cm above the main coil. By measuring the secondary magnetic field after the current in the ground has dissipated but before the current in metal objects has dissipated, the instrument responds only to the secondary magnetic field produced by metal objects. Two channels of secondary response are measured in mV and are recorded on a digital data logger. The system is generally operated by pulling the coils configured as a trailer with an odometer mounted on the axle to trigger the data logger automatically at approximately 8-inch intervals.

GPR. The GPR survey was conducted using a Sensors & Software Smart Cart Noggin Plus digital subsurface imaging radar system. The system includes a survey wheel that triggers the recording of the data at fixed intervals, thereby increasing the accuracy of the locations of features detected along the survey lines.

---

[1]ns, abbreviation for nanosecond, 1/1,000,000,000 second. Light and the GPR signal require about 1 ns to travel 1 ft in air. The GPR signal requires about 3.5 ns to travel 1 ft in unsaturated sandy soil.

PUL. The precision utility locating (PUL) survey was conducted using two types of equipment. One type of PUL instrument is a precision electromagnetic pipe and cable locator, Radiodetection RD400 series. The RD400 series consists of separate transmitter and receiver. The system can be used in "passive" and "active" modes to locate buried pipes by detecting electromagnetic signals carried by the pipes. In the "passive" mode, only the receiver unit is used to detect signals carried by the pipe from nearby power lines, live signals transmitted along underground power cables, or very low frequency radio signals resulting from long wave radio transmissions that flow along buried conductors. In the "active" mode of operation, the transmitter is used to induce a signal on a target pipe, and the receiver is used to trace the signal along the length of the pipe.

The second type of PUL instrument is a CST MT-102 magnetic pipe locator. This instrument is a fluxgate magnetometer that measures variations in the vertical magnetic gradient and can detect shallow subsurface metal objects such as USTs.

LIMITATIONS OF THE METHODS

HAGER-RICHTER GEOSCIENCE, INC. MAKES NO GUARANTEE THAT ALL TARGETS WERE DETECTED IN A SURVEY. HAGER-RICHTER GEOSCIENCE, INC. IS NOT RESPONSIBLE FOR DETECTING TARGETS THAT CANNOT BE DETECTED BECAUSE OF SITE CONDITIONS. HAGER-RICHTER IS NOT RESPONSIBLE FOR MAINTAINING MARKOUTS. MARKOUTS MADE DURING INCLEMENT WEATHER MIGHT NOT LAST.

EM61. The data from an EM61 survey are adversely affected by surface metal debris, and subsurface information is eliminated at and near the surface metal. The EM61 has a depth sensitivity limited to about 12 feet. The instrument is relatively cumbersome, and works best where the 1-meter square transmit and receive coils can be hand pulled in a small trailer.

Detection and identification should be clearly differentiated. Detection is the recognition of the presence of a metal object, and the electromagnetic method is excellent for such purposes. Identification, on the other hand, is determination of the nature of the causative body (i.e., what is the body -- a cache of drums, UST, automobile, white goods, etc.?). Although the EM61 data cannot be used to *identify* all buried metal objects, they provide excellent guides to the identification of some objects. For example, buried metal utilities produce anomalies with lengths many times their widths.

GPR. There are limitations of the GPR technique as used to detect and/or locate targets such as those of the objectives of this survey: (1) surface conditions, (2) electrical conductivity of the ground, (3) contrast of the electrical properties of the target and the surrounding soil, and (4) spacing of the traverses. Of these restrictions, only the last is controllable by us.

The condition of the ground surface can affect the quality of the GPR data and the depth of penetration of the GPR signal. Sites covered with snow piles, high grass, bushes, landscape structures, debris, obstacles, soil mounds, etc. limit the survey access and the coupling of the GPR antenna with the ground. In many cases, the GPR signal will not penetrate below concrete pavement, especially inside buildings, and a target may not be detectable. The GPR method also commonly does not provide useful data under canopies found at some facilities.

The electrical conductivity of the ground determines the attenuation of the GPR signals, and thereby limits the maximum depth of exploration. For example, the GPR signal does not penetrate clay-rich soils, and targets buried in clay might not be detected.

A definite contrast in the electrical conductivities of the surrounding ground and the target material is required to obtain a reflection of the GPR signal. If the contrast is too small then the reflection may be too weak to recognize, possibly due to deeply corroded metal in the target, the target can be missed.

Spacing of the traverses is limited by access at many sites, but where flexibility of traverse spacing is possible, the spacing is adjusted to the size of the target.

PUL. The PUL equipment can detect only metal utilities. Utilities constructed of non-metallic materials without a metal "tracer" cannot be detected. The RD400 electromagnetic pipe location equipment works best when used in the "active" mode, with a direct connection to the target pipe. However, at many sites, physical access to the underground utilities is not possible. In areas with several buried utilities, other metal objects, and reinforced concrete, the receiver's strongest response might come from other shallow lines to which the signal has coupled. For example, in areas with reinforced concrete pavement, the rebar in the concrete distorts the electromagnetic signals, and pipes located below such pavement cannot be located with confidence. The electromagnetic pipe location method is also somewhat sensitive to the local soil conditions. The method works better in areas with conductive ground (e.g., moist, clay-rich soil) than in areas with resistive ground (e.g., dry sand).

RESULTS

The geophysical survey consisted of EM61, GPR and PUL in the accessible portions of the area of interest. Figure 3 is a color contour plot of the EM61 results, and Figure 4 shows the locations of the GPR traverses and our integrated interpretation of the geophysical data.

EM61. Interpretation of EM61 data is based on the *relative* response (in millivolts) of the top and bottom instrument coils to local conditions. The differential response, the difference between the top and bottom coils, is typically used as the best indication of the location of buried metal objects, and is shown on Figure 3 of this report. The instrument is not calibrated to provide an absolute measure of a particular property, such as the conductivity of the soil or the strength of the earth's magnetic field. Subsurface metal objects produce sharply defined positive anomalies when the EM61 is positioned directly over them. Such anomalies are colored red and yellow on the color plot presented herein. Collecting data at short intervals along closely spaced lines, as was done at the subject site, provides high spatial resolution of the location of the targets. Thus, buried metal is recognized in contour plots of EM data by positive anomalies (red or yellow zones) roughly corresponding to the dimensions of the buried metal.

Surface metal objects such as the metal components in buildings, monitoring wells, vehicles, dumpsters, etc. also produce EM anomalies. The locations of anomalies attributed to surface metal objects are noted on Figure 4 with a blue cross hatched pattern. We note that the presence or absence of buried metal objects such as USTs or metal utilities in such areas cannot be determined on the basis of the EM data alone.

High amplitude EM anomalies not associated with surface objects are present in several locations, suggesting the presence of concentrations of metal below the ground surface. The locations of EM anomalies attributed to subsurface metal are shown on Figure 4 by a red cross hatched pattern.

GPR. GPR traverses were completed at locations as shown on Figure 4. Signal penetration by GPR at this site was limited to a two-way traveltime of approximately 20-30 ns. Based on handbook time-to-depth conversions for the GPR signal in average soils, the GPR signal penetration is estimated to have been approximately 2 - 4 feet.

GPR reflections typical of a UST were recorded in the southeastern section of the AOI, between Buildings B7 and B29. It was not possible to fully delineate this subsurface feature due to limited access, and the outline as shown on Figure 4 is inferred.

A UST was observed visually at the "UST concrete pad" in the southeastern section of the AOI and its location is shown on Figure 4. This UST was not detected with GPR, possibly due to interference from reinforcing materials in the concrete pad.

No other GPR reflections typical of a UST were detected within the effective depth of GPR penetration (2 - 4 feet). *Whether a UST occurs at a depth greater than that of the GPR signal penetration cannot be determined from the GPR data alone.*

GPR reflections and PUL signals interpreted to represent possible utilities, buried railroad rails, and small unidentified buried objects were observed, and their locations are shown on Figure 4.

LIMITATIONS ON THE USE OF THIS REPORT

This letter report was prepared for the exclusive use of Langan (Client). No other party shall be entitled to rely on this Report or any information, documents, records, data, interpretations, advice or opinions given to Client by Hager-Richter Geoscience, Inc. (H-R) in the performance of its work. The Report relates solely to the specific project for which H-R has been retained and shall not be used or relied upon by Client or any third party for any variation or extension of this project, any other project or any other purpose without the express written permission of H-R. Any unpermitted use by Client or any third party shall be at Client's or such third party's own risk and without any liability to H-R.

H-R has used reasonable care, skill, competence and judgment in the performance of its services for this project consistent with professional standards for those providing similar services at the same time, in the same locale, and under like circumstances. Unless otherwise stated, the work performed by H-R should be understood to be exploratory and interpretational in character and any results, findings or recommendations contained in this Report or resulting from the work proposed may include decisions which are judgmental in nature and not necessarily based solely on pure science or engineering. It should be noted that our conclusions might be modified if subsurface conditions were better delineated with additional subsurface exploration including, but not limited to, test pits, soil borings with collection of soil and water samples, and laboratory testing.

Except as expressly provided in this limitations section, H-R makes no other representation or warranty of any kind whatsoever, oral or written, expressed or implied; and all implied warranties of merchantability and fitness for a particular purpose, are hereby disclaimed.

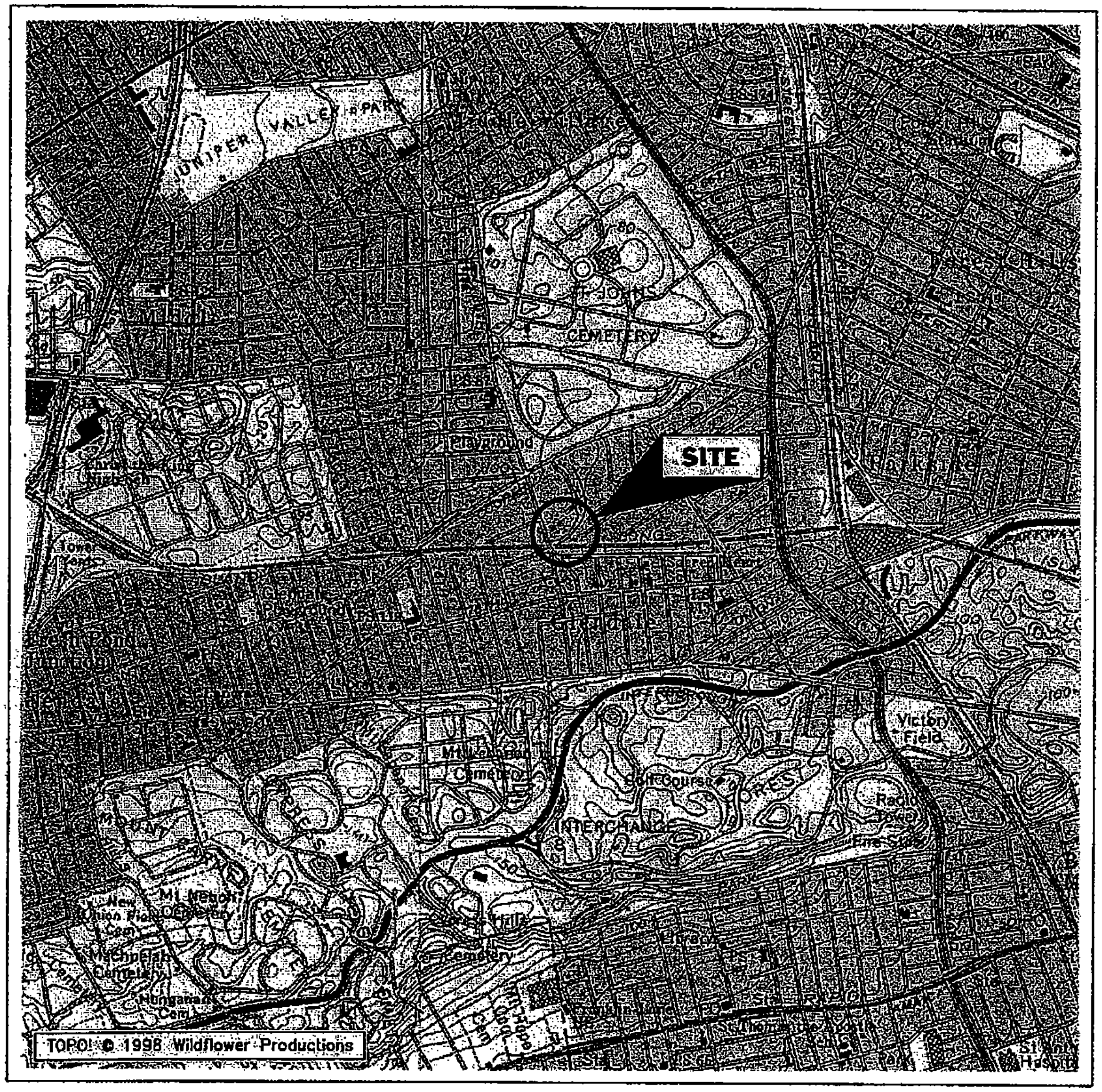
If you have any questions or comments on this letter report, please contact us at your convenience. It has been a pleasure to work with Langan on this project. We look forward to working with you again in the future.

Sincerely yours,
HAGER-RICHTER GEOSCIENCE, INC.

Mark Kick, P.G.
Project Manager

Dorothy Richter, P.G.
President

Attachments: Figures 1 - 4

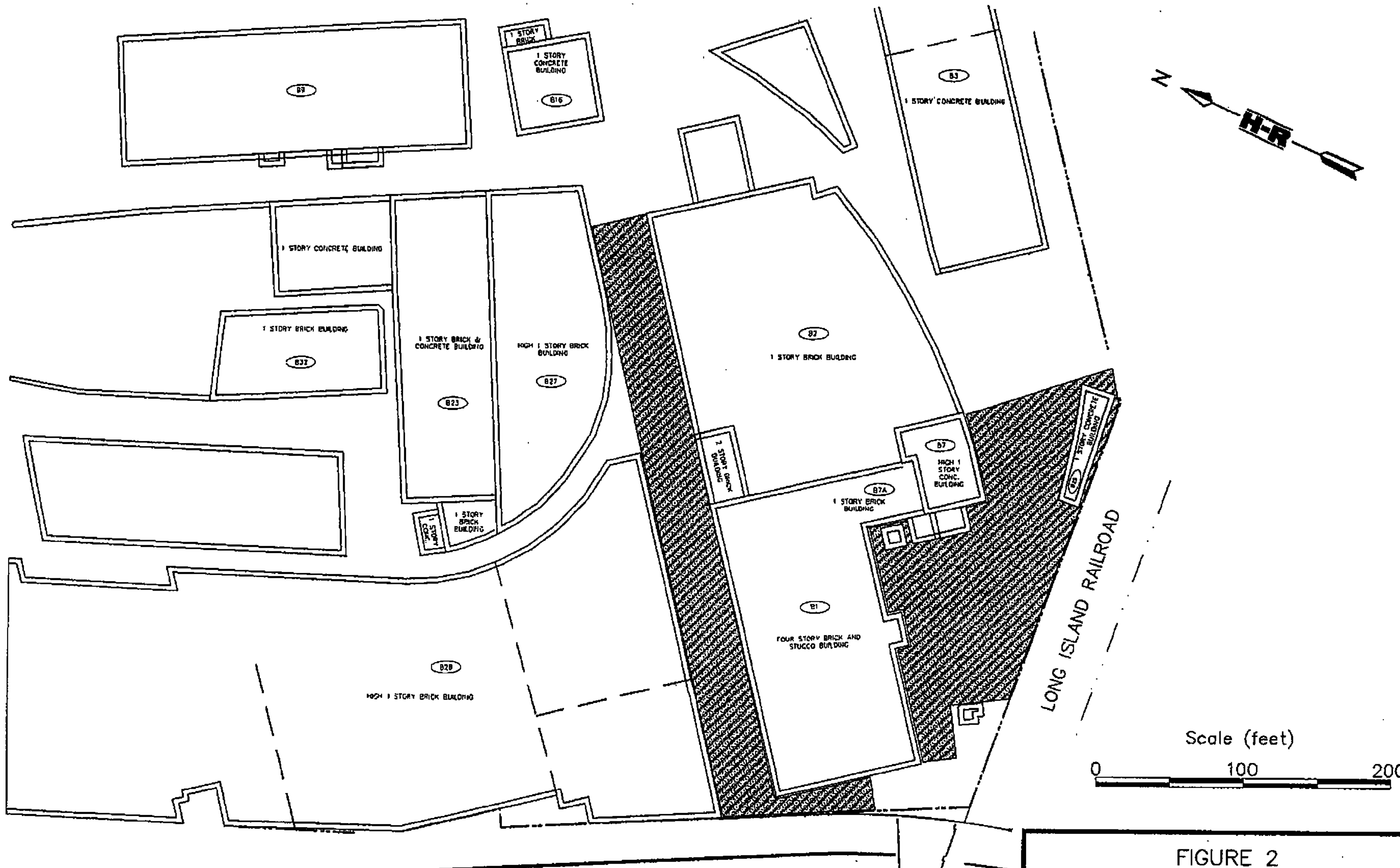


LOCATION

SCALE (feet)

0 2000 4000

Figure 1 General Site Location Atlas Park Queens, New York	
File 04MK34	August, 2004
HAGER–RICHTER GEOSCIENCE, INC. Orange, New Jersey	



LEGEND

APPROXIMATE GEOPHYSICAL SURVEY AREA

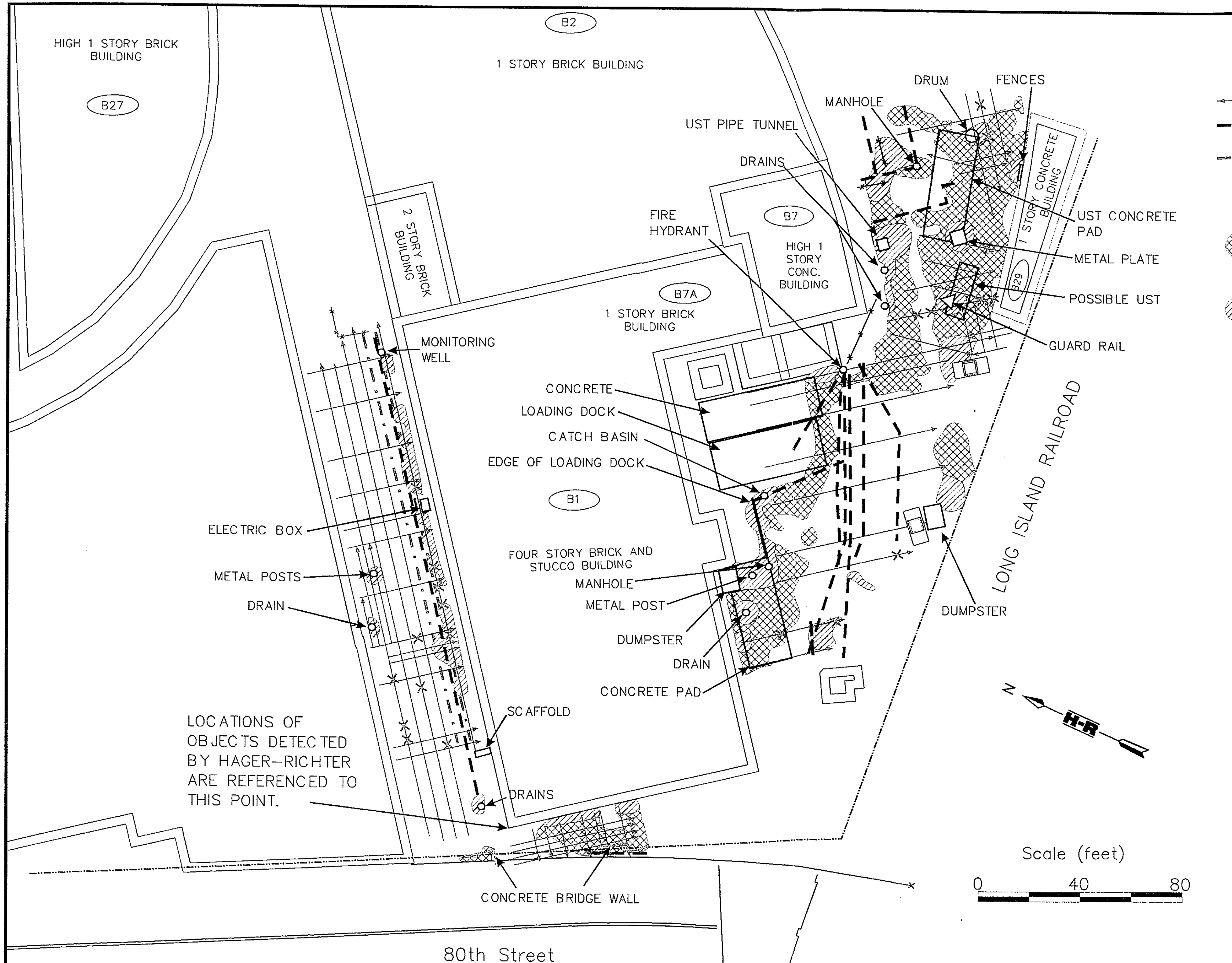
Note:
Modified from a site plan provided by Langan Engineering entitled Drawing Number 1, Site Location Map, dated 07/09/04.

FIGURE 2
SITE PLAN
ATLAS PARK
QUEENS, NEW YORK

FILE 04MK34	AUGUST 2004

HAGER–RICHTER GEOSCIENCE, INC.
ORANGE, NEW JERSEY


HIGH 1 STORY BRICK BUILDING
B27
B2
1 STORY BRICK BUILDING
2 STORY BRICK BUILDING
B7
HIGH 1 STORY CONC. BUILDING
B7A
1 STORY BRICK BUILDING
1 STORY CONCRETE BUILDING
B29
GUARD RAIL
CONCRETE
LOADING DOCK
CATCH BASIN
EDGE OF LOADING DOCK
B1
FOUR STORY BRICK AND STUCCO BUILDING
DUMPSTER
DUMPSTER
LONG ISLAND RAILROAD
SCAFFOLD
LOCATIONS OF OBJECTS DETECTED BY HAGER-RICHTER ARE REFERENCED TO THIS POINT.
CONCRETE BRIDGE WALL
80th Street
N
H-R
Scale (feet)
0 40 80
LEGEND
EM61 STATIONS
Notes:
1. Modified from a site plan provided by Langan Engineering entitled Drawing Number 1, Site Location Map, dated 07/09/04.
2. Locations of site features are based on field notes and should be considered approximate.
3. Data were recorded with EM61. Differential response shown.
4. Differential response equals top coil response – bottom coil response.
1000 950 900 850 800 750 700 650 600 550 500 450 400 350 300 250 200 150 100 50 0
Response (mV)
FIGURE 3
EM61 SURVEY
ATLAS PARK
QUEENS, NEW YORK
FILE 04MK34
AUGUST 2004
HAGER–RICHTER GEOSCIENCE, INC.
ORANGE, NEW JERSEY



LEGEND

- GPR TRAVERSE
- POSSIBLE UTILITY IDENTIFIED WITH GPR
- POSSIBLE BURIED RAILROAD
- UNIDENTIFIED BURIED OBJECT
- AREA OF POSSIBLE BURIED METAL
- EM ANOMALY ATTRIBUTED TO EFFECTS OF SURFACE OBJECTS. THE PRESENCE OR ABSENCE OF BURIED METAL WITHIN THIS AREA CANNOT BE DETERMINED ON THE BASIS OF THE EM61 DATA ALONE.
- VEHICLE
- FENCE

NOTES:

1. Locations of site features are based on field notes and should be considered approximate.
2. Figure 4 modified from a site plan provided by Langan Engineering entitled Drawing Number 1, Site Location Map, dated 07/09/04.

FIGURE 4
GPR SURVEY & INTEGRATED INTERPRETATION
ATLAS PARK
QUEENS, NEW YORK

FILE 04MK34	AUGUST 2004

HAGER-RICHTER GEOSCIENCE, INC.
ORANGE, NEW JERSEY