ADVANCED GEOLOGICAL SERVICES

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Mr. David Winslow
GZA GeoEnvironmental of New York, Inc
Two Pennsylvania Plaza, 18th Floor
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Subject: Geophysical Investigation Results
Indian Point Nuclear Power Plant Site
Buchanan, New York

Dear Mr. Winslow:

Advanced Geological Services (AGS) presents this letter report to GZA GeoEnvironmental (GZA) of New York, New York detailing the methods and results of a geophysical investigation conducted at the Indian Point Nuclear Power Plant Site in Buchanan, New York. The area of investigation included the asphalt region around the Turbine Generator Building of Unit 2. The objective of this report was to reanalyze data collected for a previous study to identify the depth to bedrock for the asphalt region around the Turbine Generator Building.

Methods

AGS used the ground penetrating radar (GPR) method. GPR profiles were collected in a grid pattern with a spacing of ten feet throughout the survey area, except for areas with significant surficial obstructions, like dumpsters and large snow drifts.

The depth to bedrock, as defined by the onsite GZA representative, at MW52 was approximately 12 feet, with the depth to the storm sewer 7.5 feet. There was a GPR profile near monitoring well 52 and the profile was closely analyzed to correlate the known depth to bedrock with a specific reflector or group of reflectors. Then the reflector was extrapolated on every GPR profile throughout the entire survey area. Using a velocity function obtained through correlating the depth of the storm sewer to its observed location in the GPR profile, approximate depths to bedrock, measured from the ground surface, were calculated and contoured (Figure 1).

Ground Penetrating Radar (GPR) Method

The GPR method is based upon the transmission of repetitive, radio-frequency electromagnetic (EM) pulses into the subsurface. When the transmitted energy of down-going wave contacts an interface of dissimilar electrical character, part of the energy is returned to the surface in the form of a reflected signal. This reflected signal is detected by a receiving transducer and is displayed on the screen of the GPR unit as well as being recorded on the internal hard-drive. The received GPR response remains constant as long as the electrical contrast between media is present and constant. Lateral or vertical changes in the electrical properties of the subsurface result in equivalent changes in the GPR responses. The system records a continuous image of the subsurface by plotting two-way travel time of the reflected EM pulse versus distance traveled along the ground surface. Two-way travel time values are then converted to depth using soil velocity functions.

The GPR field procedures involved (1) instrument calibration, (2) test run completion, (3) production profile collection and recording, and (4) data storage for subsequent processing and analysis in the office. Each radar profile was examined for characteristic GPR signatures that may indicate the presence of buried targets. A Geophysical Survey System SIR System 2 and a 200 megahertz (MHz) antenna were used with a recording window of 150 nanoseconds (ns) to provide the required depth penetration and subsurface detail.

Results

A site map, containing the approximate depth to bedrock and a representative GPR profile, is shown on Figure 1, with north towards the bottom of the map.

The approximate depth to bedrock ranged between 8.5 and 13.5 feet (Figure 1). Bedrock location should be considered approximate due to the difficulty in prescribing a specific reflector or group of reflectors to bedrock. Data coverage is good throughout the entire area shown except for an area with high signal attenuation (Figure 1). Signal penetration in this area was poor and no bedrock reflections were observed. It is possible that a different type of fill was used in this region.

The storm sewer location is shown on figure 1. The storm sewer excavation appears to be separate from the service water pipe excavation that is next to them. This is based on several GPR profiles where there is a distinct difference between the fill over the service water pipes and the storm sewer. The crest of the storm sewer appears to be deeper than the crest of the service water pipes, however it is unknown which utility has the

deeper excavation.

Closing

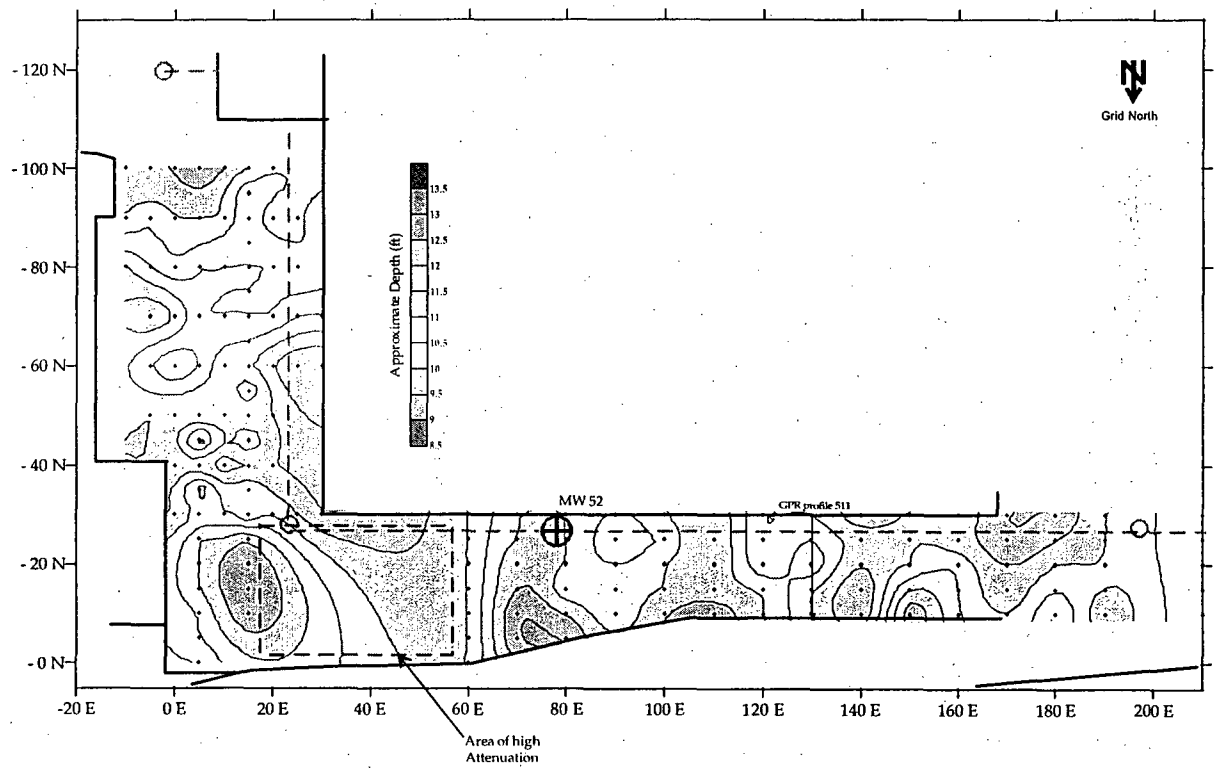
All geophysical data and field notes collected as a part of this investigation will be archived at the AGS office. The data collection and interpretation methods used in this investigation are consistent with standard practices applied to similar geophysical investigations. The correlation of geophysical responses with probable subsurface features is based on the past results of similar surveys although it is possible that some variation could exist at this site. Due to the nature of geophysical data, no guarantees can be made or implied regarding the presence or absence of additional objects or targets beyond those identified.

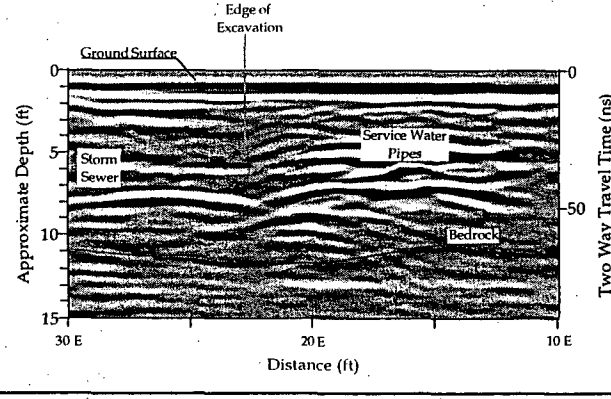
If you have any questions regarding the results of this field investigation, please contact me at 610-722-5500. It was a pleasure working with you on this project and we look forward to being able to provide you with sub-surface imaging services in the future.

Sincerely,

Christopher Call M.S.
Project Geophysicist, AGS

Encl.: Figure 1 – Depth to Bedrock Contour Map





Legend:

- Storm Sewer Line
- Storm sewer man hole
- GPR Profile

1 in = 25 ft

0 10 20 30 40 50 (Feet)

Notes

(1) A SIR2 GPR System by GSSI was used for this survey. One monitoring well was located in the survey area. MW52 has a recorded depth to bedrock of approximately 12 feet. GPR data was synthesized and correlated with the depths associated with this monitoring well to identify the depth and location to bedrock.
(2) GPR profiles were collected in a grid pattern with a ten foot spacing. Depths taken from these GPR profiles are shown on this figure. A Representative GPR profile showing bedrock and the storm sewer excavation is also shown.
(3) The maximum depth of penetration for the GPR profiles was approximately 20 feet, however some areas had a high amount of signal attenuation.
(4) The storm sewer excavation appears to be separate from the excavation related to the service water pipes. Both the storm sewer, the approximate edge of the storm sewer excavation, approximate location of bedrock and service water pipes are marked on the representative GPR profile.
(5) The field positions were not survey by a licensed surveyor and should be considered approximate.

Figure 1
Depth to Bedrock Contour Map
Site Features
Potential void Survey

GZA GeoEnvironmental of New York, Inc.
Indian Point Nuclear Power Plant
Area Outside of Turbine Generator Building, Unit 2
Buchanan, New York

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