

September 4, 2009

Ms. Helen Corley, LG, Project Manager  
AMEC Earth and Environmental of North Carolina, Inc.  
101 W. Friendly Avenue, Suite 603  
Greensboro, NC 27401

Via email (pdf)

cc: Mr. Ethan Caldwell, NCDOT

RE: State Project: R-4047  
WBS Element: 34599.1.1  
County: Haywood  
Description: NC 209 From US 19-23-74 to SR 1523

SUBJECT: Report on Geophysical Surveys of Site 4  
Schnabel Engineering Project No. 09210013.01

Dear Ms. Corley:

This letter contains our report on the geophysical surveys we conducted on the subject property. The report includes one 8.5x11 color figure and two 11x17 color figures.

## **1.0 INTRODUCTION**

Schnabel Engineering conducted geophysical surveys on August 3 through August 6 and on August 12 and August 13, 2009, in the accessible areas of Site 4 (Michael D. Daggy Property, Clear View Glass & Mirror) under our 2009 contract with the NCDOT. Site 4 is located on the north side of Old Clyde Road approximately 130 feet east of Crabtree Road. The work was conducted in the accessible portions of the entire site as indicated by the NCDOT to support their environmental assessment of the subject parcel. The purpose of the geophysical surveys was to locate possible metal underground storage tanks (UST's) within the accessible areas of the site.

## **2.0 FIELD METHODOLOGY**

Locations of geophysical data points were obtained using a sub-meter Trimble Pro-XRS DGPS system. References to direction and location in this report are based on the US State Plane 1983 system, North Carolina 3200 zone, using the NAD 83 datum, with units in US survey feet. The locations of existing site features (building, curbs, signs, etc.) were recorded for later correlation with the geophysical data and for location references to the NCDOT drawings. The geophysical investigation consisted of an electromagnetic (EM) induction survey using a Geonics EM61-MK2 instrument, and a Ground-Penetrating Radar (GPR) survey using a Geophysical Survey Systems SIR-3000 system equipped with a 400 MHz antenna.

The EM61 data were collected along parallel survey lines spaced about 2.5 feet apart. The EM61 and DGPS data were recorded digitally using a field computer and later transferred to a desktop computer for data processing. The GPR data were collected along survey lines spaced one to two feet apart in orthogonal directions over areas of reinforced concrete and anomalous EM readings not attributed to known metallic features. Two possible UST's were located and marked on the ground at this site. Pictures of the locations of the possible UST's as marked in the field are shown in Figure 1.

Preliminary results were sent to Helen Corley of AMEC on August 21, 2009.

## **3.0 DISCUSSION OF RESULTS**

The contoured EM61 data are shown on Figures 2 and 3. The EM61 early time gate results are plotted on Figure 2. The early time gate data provide the more sensitive detection of metal object targets. Figure 3 shows the difference between the response of the top and bottom coils of the EM61 instrument (differential response). The difference is taken to remove the effect of surface and very shallowly buried metallic objects. Typically, the differential response emphasizes anomalies from deeper and larger objects such as UST's.

The early time gate and differential results show anomalies probably caused by buried utilities, reinforced concrete, and anomalies caused by known site features (Figures 2 and 3). GPR surveys near the southern corner of the building indicated the presence of two possible UST's. After further analysis of the GPR data, the western possible UST was determined to be more likely caused by a utility. Example GPR images showing the reflections from the eastern possible UST and the probable utility are included on Figures 2 and 3. Figures 2 and 3 also show the location of the possible UST as marked in the field. The GPR data indicate that the possible UST is buried about 2 to 3 feet below ground surface. The possible UST is about 3.5 feet in diameter and about 7.5 feet long, equivalent to a capacity of approximately 550 gallons.

#### **4.0 CONCLUSIONS**

Our evaluation of the geophysical data collected on Site 4 of Project R-4047 in Lake Junaluska, NC indicates the following:

- The geophysical data indicate the presence of one possible UST within the accessible portions of Site 4 near the southern corner of the building. The possible UST is about 550-gallon capacity and is buried about 2 to 3 feet below ground surface.
  
- A second possible UST was marked in the field but later interpretation of the data indicates that this is more likely to be a buried utility line.

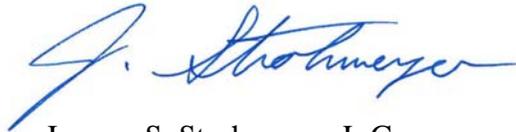
## 5.0 LIMITATIONS

These services have been performed and this report prepared for AMEC and the North Carolina Department of Transportation in accordance with generally accepted guidelines for conducting geophysical surveys. It is generally recognized that the results of geophysical surveys are non-unique and may not represent actual subsurface conditions.

Thank you for the opportunity to serve you on this project. Please call if you need additional information or have any questions.

Sincerely,

SCHNABEL ENGINEERING SOUTH, P.C.



Jeremy S. Strohmeyer, L.G.  
Project Manager



Edward D. Billington, L.G.  
Senior Vice President

JW/JS/NB

Attachment: Figures (3)

FILE: G:\2009 PROJECTS\09210013 (NCDOT 2009 GEOTECH UNIT SERVICES)\09210013.01 (R4047, HAYWOOD COUNTY GEOPHYSICS)\REPORT\REPORT ON SITE 4.DOC



Photograph of Site 4 (Daggy Property) looking north and showing the marked locations of a possible UST (background) and a probable utility (foreground, marked as UST in field).



Photograph of Site 4 (Daggy Property) looking northwest and showing the marked locations of a possible UST (on right) and a probable utility (on left, marked as UST in field).

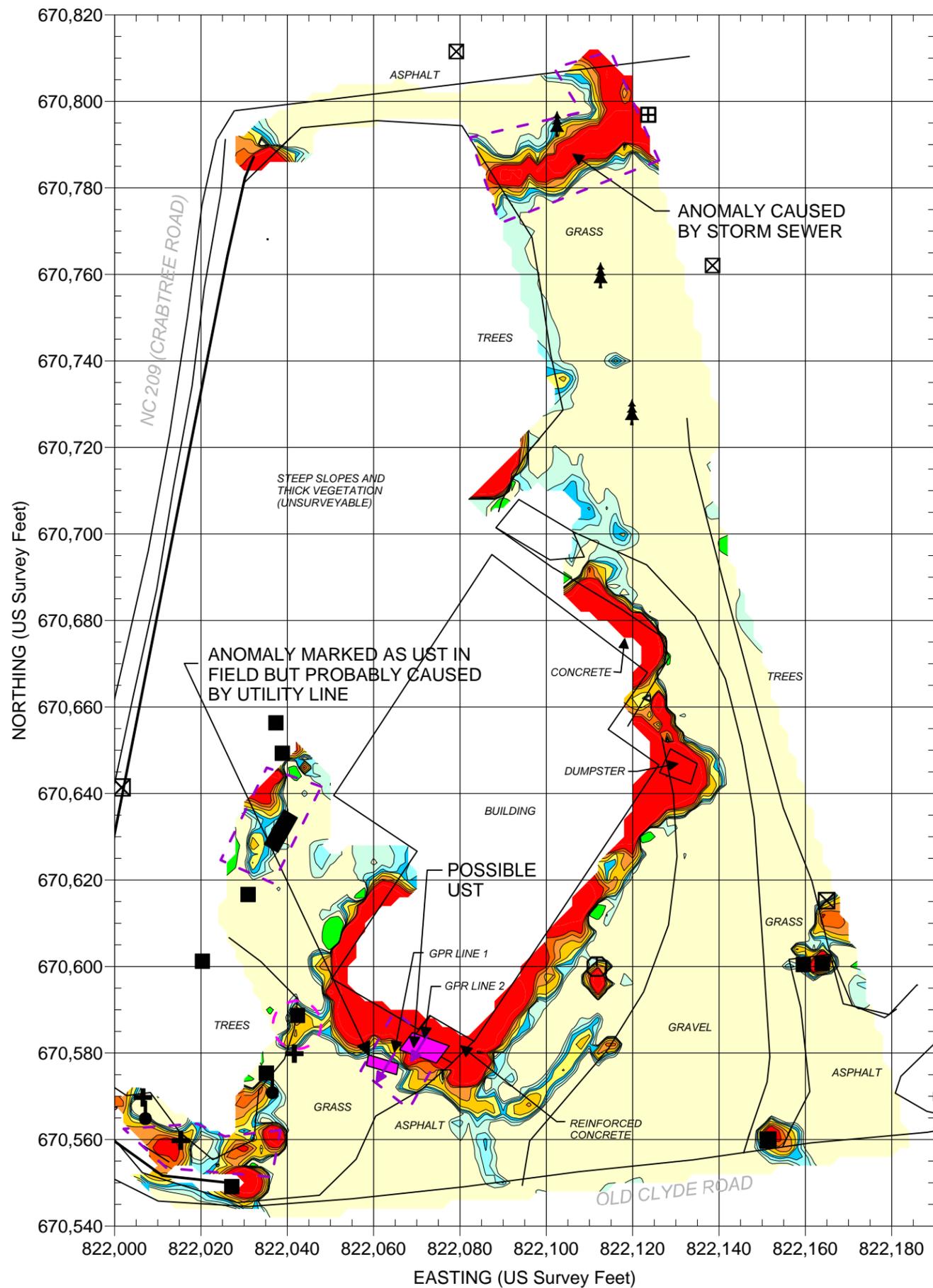


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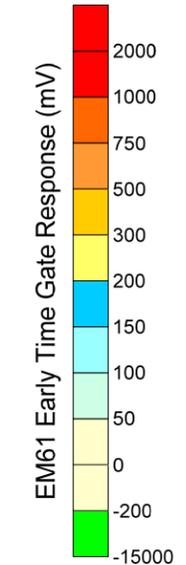
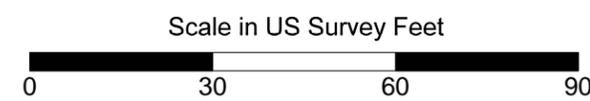
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**SITE 4**  
**PHOTOS OF MARKED**  
**UST LOCATIONS**

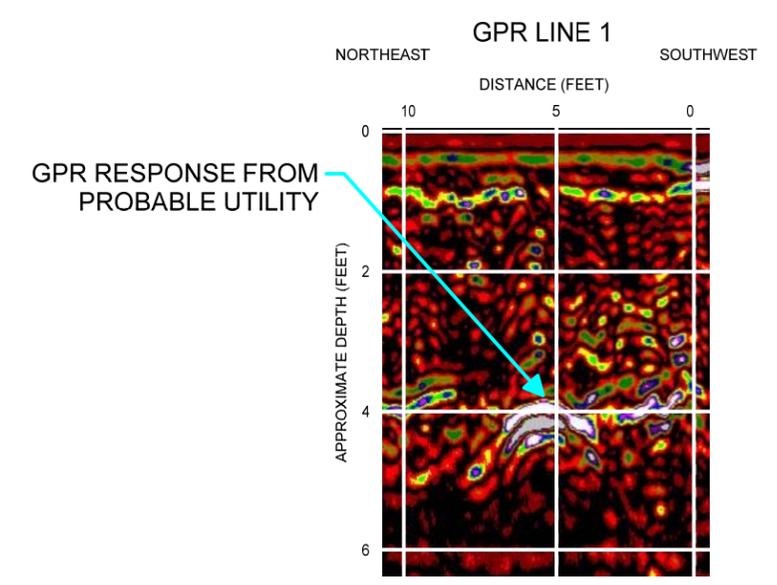
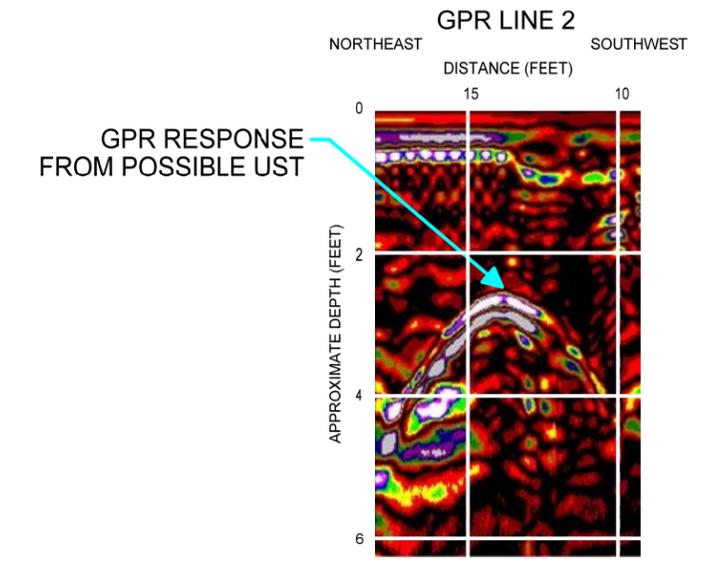
FIGURE 1



Site 4 - Michael D. Daggy Property



- EXPLANATION**
- EM61 SURVEY AREA - DATA ACQUIRED ALONG PARALLEL SURVEY LINES SPACED APPROXIMATELY 2.5 FEET APART
  - METALLIC OBJECT
  - LIGHT POLE
  - UTILITY POLE
  - STORMWATER GRATE
  - GPR SURVEY AREA
  - GUY WIRE
  - UTILITY MANHOLE OR BOX
  - MONITORING WELL
  - SIGN
  - LOCATION OF GPR SURVEY LINE SHOWN
  - LOCATION OF POSSIBLE UST (AS MARKED IN THE FIELD)

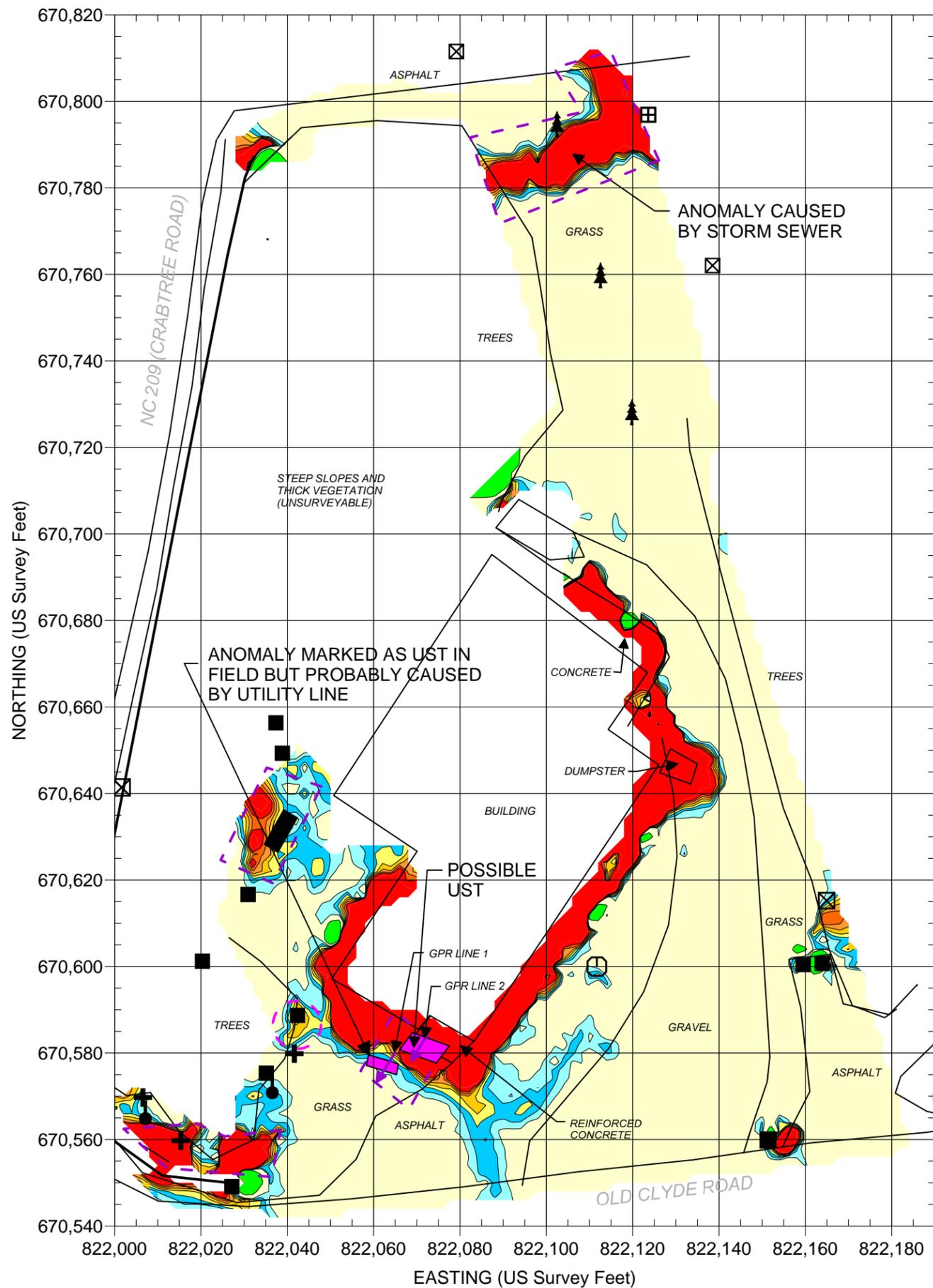


Note: The contour plot shows the earliest and most sensitive time gate of the EM61 bottom coil/channel in millivolts (mV). The EM data were collected on August 3 through August 6, 2009, using a Geonics EM61-MK2 instrument. Positioning for the EM61 survey was provided using a submeter Trimble ProXRS DGPS system. Coordinates are in the US State Plane 1983 System, North Carolina Zone 3200, using the NAD 1983 datum. GPR data were acquired on August 12 and August 13, 2009, using a Geophysical Survey Systems SIR 3000 equipped with a 400 MHz antenna.

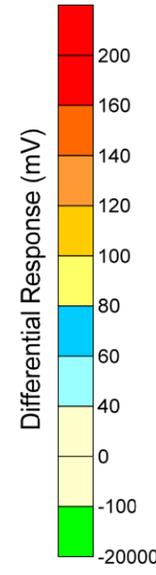
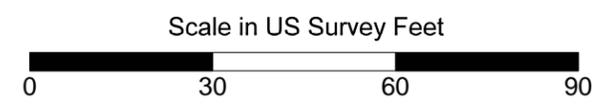


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**SITE 4  
EM61 EARLY TIME  
GATE RESPONSE**  
FIGURE 2

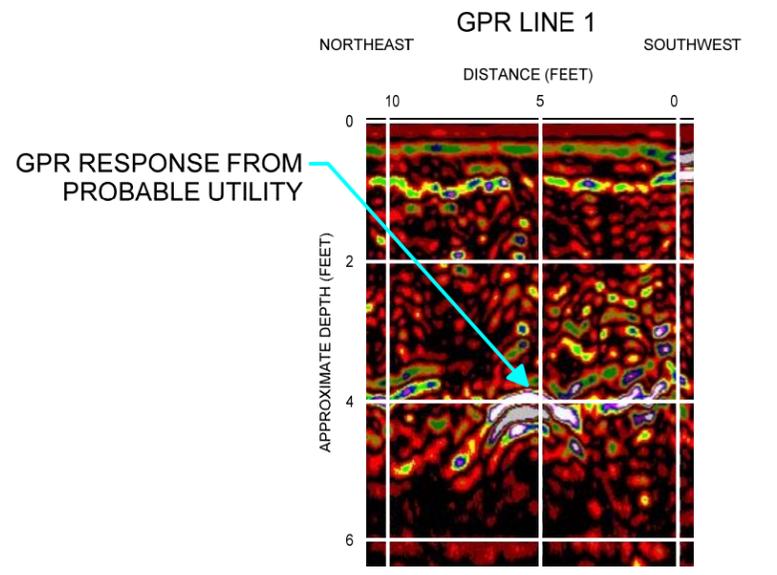
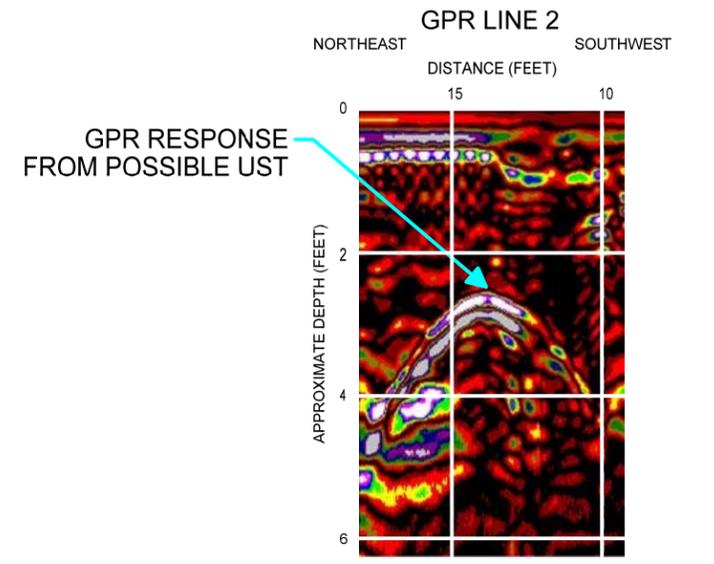


Site 4 - Michael D. Daggy Property



**EXPLANATION**

- EM61 SURVEY AREA - DATA ACQUIRED ALONG PARALLEL SURVEY LINES SPACED APPROXIMATELY 2.5 FEET APART
- METALLIC OBJECT
- LIGHT POLE
- UTILITY POLE
- STORMWATER GRATE
- GPR SURVEY AREA
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- MONITORING WELL
- SIGN
- LOCATION OF GPR SURVEY LINE SHOWN
- LOCATION OF POSSIBLE UST (AS MARKED IN THE FIELD)



Note: The contour plot shows the difference, in millivolts (mV), between the readings from the top and bottom coils of the EM61. The difference is taken to reduce the effect of shallow metal objects and emphasize anomalies caused by deeper metallic objects, such as drums and tanks. The EM data were collected on August 3 through August 6, 2009, using a Geonics EM61-MK2 instrument. Positioning for the EM61 survey was provided using a submeter Trimble ProXRS DGPS system. Coordinates are in the US State Plane 1983 System, North Carolina 3200 Zone, using the NAD 1983 datum. GPR data were acquired on August 12 and 13, 2009, using a Geophysical Survey Systems SIR 3000 equipped with a 400 MHz antenna.



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**SITE 4  
EM61 DIFFERENTIAL  
RESPONSE**  
FIGURE 3