



May 20, 2011

Mr. Ethan J. Caldwell, LG, PE  
NCDOT, Geotechnical Engineering Unit  
1020 Birch Ridge Drive  
Raleigh, NC 27610

RE:           State Project: R-3405  
              WBS Element: 35579.1.1  
              County: Wilkes  
              Description: NC 18 from SR 1002 (Mountain View Road) to SR 1717 (Yellow Banks Road)

**Subject:       Project 09210013.34, Report on Supplemental Geophysical Surveys  
              Parcel 51, R.D. Mitchell Property, Wilkes County, North Carolina**

Dear Mr. Caldwell:

**SCHNABEL ENGINEERING SOUTH, PC** (Schnabel) is pleased to present this report on the geophysical surveys we conducted on the subject property. The report includes two 11x17 color figures and three 8.5x11 color figures.

## **INTRODUCTION**

The first phase of the work described in this report was conducted within the proposed right-of-way and/or easement on December 8 and 21, 2010. A report on the first phase was submitted to AMEC Earth and Environmental of North Carolina, Inc. on January 28, 2011. The remainder of the parcel was surveyed on May 2, 2011, under a separate notice to proceed. The combined results from both phases are the subject of this report.

The geophysical work was conducted over the accessible areas of the parcel as indicated by the NCDOT to support their environmental assessment of the subject property. Photographs of the parcel are included on Figure 1. The property is located on the west side of Sparta Road at the intersection of Cartpath Road in North Wilkesboro, NC. The purpose of the geophysical surveys was to locate known and suspect metal underground storage tanks (USTs) in the accessible areas of the right-of-way and/or easement.

The geophysical investigation consisted of electromagnetic (EM) induction surveys using a Geonics EM61-MK2 instrument. The EM61 metal detector is used to locate metal objects buried up to about eight

feet below ground surface. Ground-penetrating radar (GPR) investigations of selected EM61 anomalies, including areas of reinforced concrete, were conducted using a Geophysical Survey Systems SIR-3000 system equipped with a 400 MHz antenna. Photographs of the equipment used are shown on Figure 2.

## **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 (monitoring wells, signs, etc.) were recorded for later correlation with the geophysical data and for location references to the NCDOT drawings.

The EM61 data were collected along parallel survey lines spaced approximately 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 cultural features. The GPR data were reviewed in the field to evaluate the possible presence of USTs. The GPR data also were recorded digitally and later transferred to a desktop computer for further review.

## **DISCUSSION OF RESULTS**

The contoured EM61 data collected over Parcel 51 are shown on Figures 3 and 4. The EM61 early time gate results are plotted on Figure 3. The early time gate data provide the more sensitive detection of metal objects. Figure 4 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 USTs.

The early time gate and differential results show anomalies of unknown cause, in addition to those apparently caused by reinforced concrete, buried utilities, or known site features (Figures 3 and 4). The GPR data collected near the southern end of the building indicated the presence of three known USTs located approximately 20 to 30 feet south of the southeastern building corner. The USTs are inside the limits of the planned right-of way and/or easement. Figures 3 and 4 show the location of the known USTs as marked in the field and example GPR images showing the reflections from the known USTs. The GPR data indicate that the known USTs are buried approximately 1.5 to 3.5 feet below ground surface. The GPR data indicate that the southernmost UST (UST No. 3) is about 5.5 feet in diameter and about 12 feet long, equivalent to a capacity of about 2,000 gallons. The GPR data indicate that the other two known USTs (UST Nos. 1 and 2) are about 4 feet in diameter and about 10.5 feet long, equivalent to a capacity of about 1,000 gallons. Photographs of the known UST locations, as marked in the field, are included on Figure 5.

## **CONCLUSIONS**

Our evaluation of the geophysical data collected on the subject property on Project R-3405 in North Wilkesboro, NC indicates the following:

The geophysical data indicate the presence of three known USTs on Parcel 51. The USTs are inside the planned right-of-way and/or easement. The southernmost known UST is about 2,000-gallon capacity and is buried about 2.0 to 3.0 feet below ground surface. The other two known USTs are about 1,000-gallon capacity and are buried about 1.5 to 3.5 feet below ground surface.

## **LIMITATIONS**

These services have been performed and this report prepared for 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.

We appreciate the opportunity to have provided these services. Please call if you need additional information or have any questions.

Sincerely,

**SCHNABEL ENGINEERING SOUTH, PC**



Jeremy S. Strohmeyer, LG  
Project Manager



Edward D. Billington, LG  
Senior Vice President

JW:JS:NB

Attachments: Figures (5)

FILE: G:\2009 PROJECTS\09210013 (NCDOT 2009 GEOTECH UNIT SERVICES)\09210013.40 (R-3405, PARCEL 51, WILKES COUNTY)\REPORT\SCHNABEL GEOPHYSICAL REPORT ON PARCEL 51 (R-3405).DOCX



Parcel 51 – R.D. Mitchell Property, looking northwest



Parcel 51 – R.D. Mitchell Property, looking southwest



STATE PROJECT R-3405  
NC DEPT. OF TRANSPORTATION  
WILKES CO., NORTH CAROLINA  
PROJECT NO. 09210013.34

PARCEL 51  
SITE PHOTOS

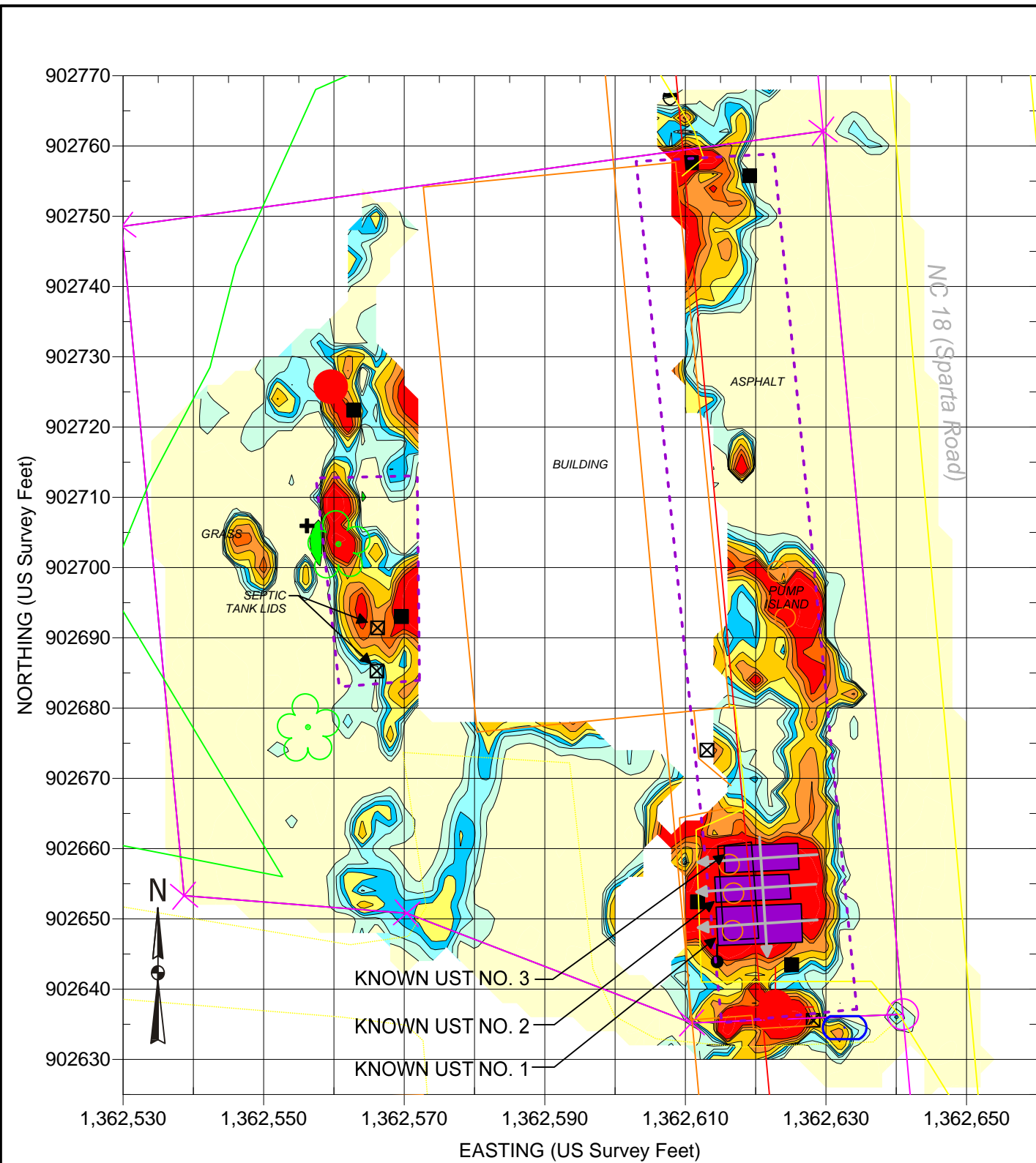
FIGURE 1



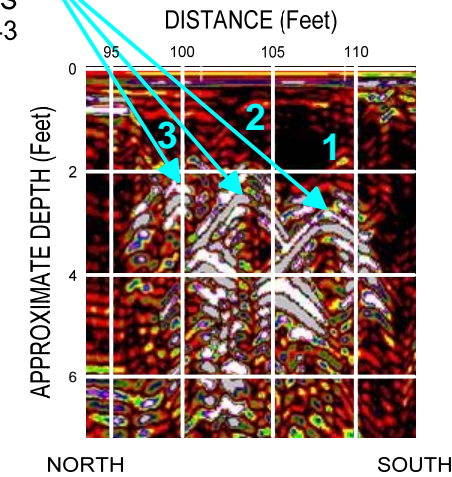
Geonics EM61-MK2



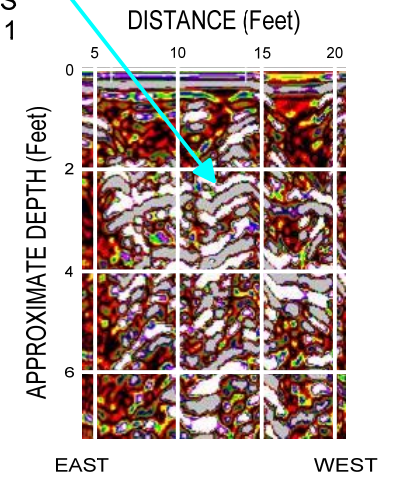
GSSI SIR-3000



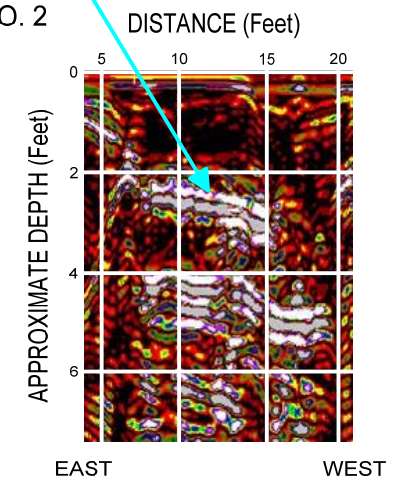
EXAMPLE GPR RESPONSE FROM THE SHORT AXES OF KNOWN UST NOS. 1-3



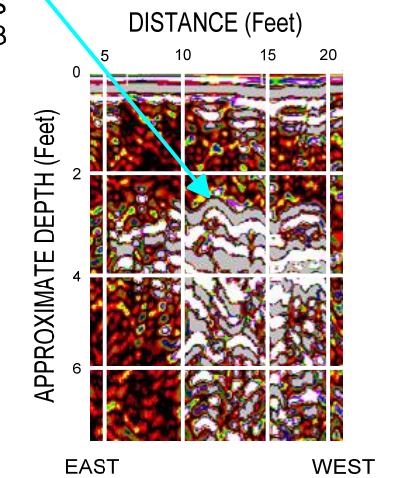
EXAMPLE GPR RESPONSE FROM THE LONG AXIS OF KNOWN UST NO. 1



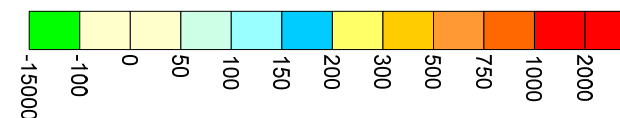
EXAMPLE GPR RESPONSE FROM THE LONG AXIS OF KNOWN UST NO. 2



EXAMPLE GPR RESPONSE FROM THE LONG AXIS OF KNOWN UST NO. 3



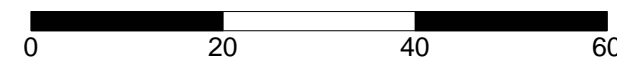
EM61 Early Time Gate Response (mV)



**EXPLANATION**

- SIGN
- UTILITY POLE
- GUY WIRE
- MISCELLANEOUS METALLIC OBJECT
- UTILITY MANHOLE, METER, BOX, ETC.
- LIGHT POLE
- STORM SEWER INLET
- UST LID
- DOT PROPOSED R/W
- DOT PROPOSED UTILITY EASEMENT
- PROPERTY LINE
- UTILITY (AS MARKED BY OTHERS OR AS PROVIDED BY NCDOT [VARIOUS COLORS])
- EXAMPLE GPR LINE LOCATION
- GPR SURVEY AREA
- LOCATION OF KNOWN OR SUSPECT USTS MARKED ON SITE

Scale in US Survey Feet



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 December 8, 2010, and May 2, 2011, 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 December 21, 2010, and May 2, 2011, using a Geophysical Survey Systems SIR 3000 equipped with a 400 MHz antenna.

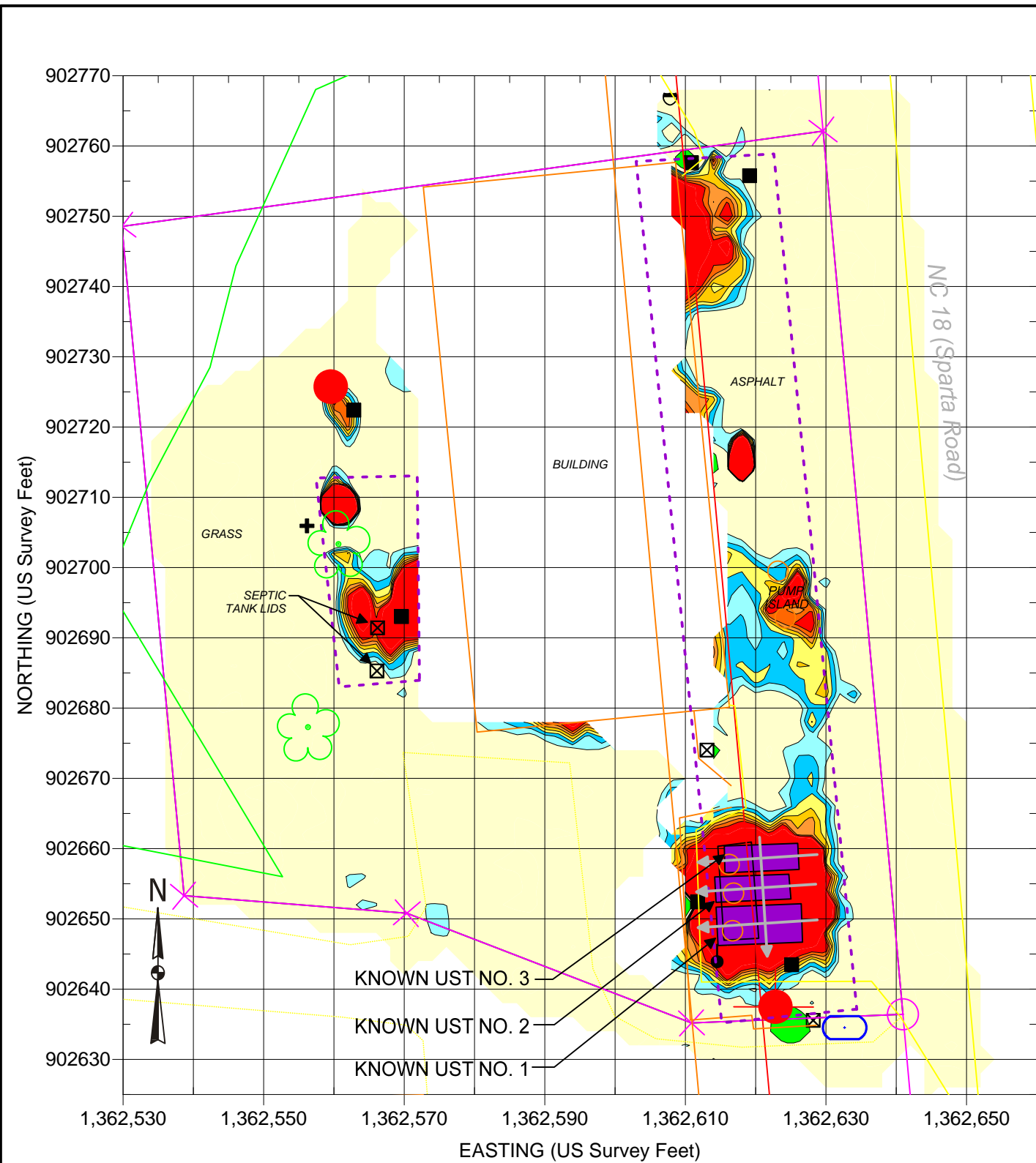
REF.: NCDOT FILE: r3405\_ddc\_psh05\_060530.dgn (FOR SOME SITE FEATURES)



STATE PROJECT R-3405  
WILKES COUNTY, NORTH CAROLINA  
NC DEPARTMENT OF TRANSPORTATION  
PROJECT NO. 09210013.40

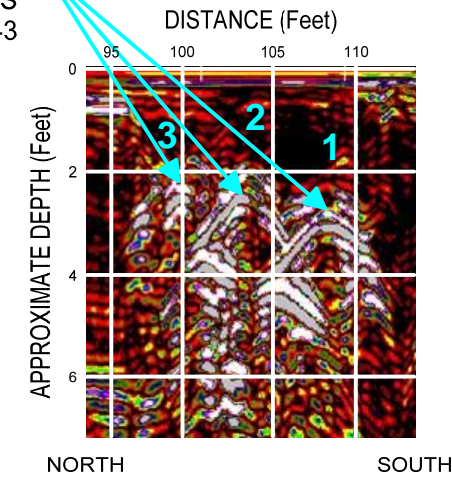
PARCEL 51  
EARLY TIME GATE  
RESPONSE

FIGURE 3

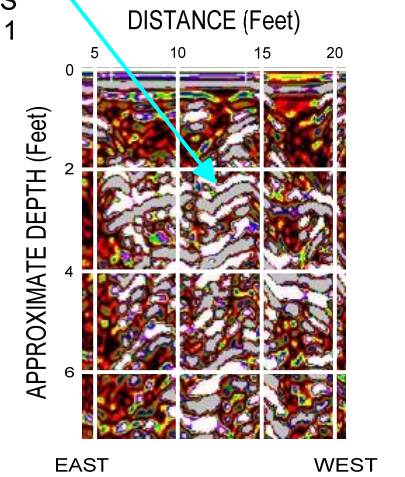


Note: The contour plot shows the difference, in millivolts (mV), between the readings from the top and bottom coils of the EM61. The difference is taken to reduce the effect of shallow metal objects and emphasize anomalies caused by deeper metallic objects, such as drums and tanks. The EM data were collected on December 8, 2010, and May 2, 2011, 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 December 21, 2010, and May 2, 2011, using a Geophysical Survey Systems SIR 3000 equipped with a 400 MHz antenna.

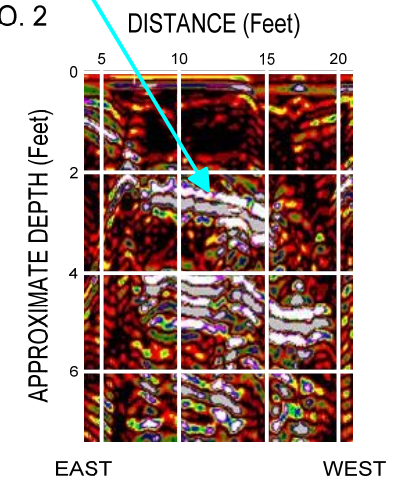
EXAMPLE GPR RESPONSE FROM THE SHORT AXES OF KNOWN UST NOS. 1-3



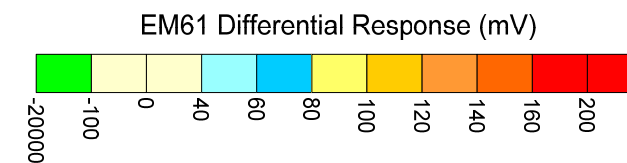
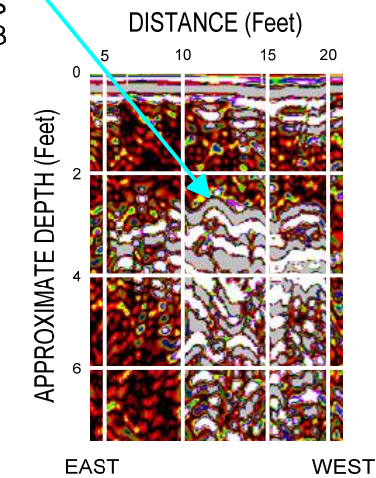
EXAMPLE GPR RESPONSE FROM THE LONG AXIS OF KNOWN UST NO. 1



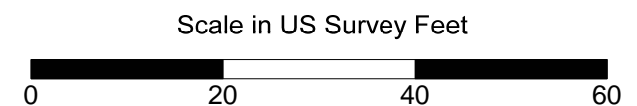
EXAMPLE GPR RESPONSE FROM THE LONG AXIS OF KNOWN UST NO. 2



EXAMPLE GPR RESPONSE FROM THE LONG AXIS OF KNOWN UST NO. 3



EXPLANATION	
	SIGN
	UTILITY POLE
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	MISCELLANEOUS METALLIC OBJECT
	UTILITY MANHOLE, METER, BOX, ETC.
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	EXAMPLE GPR LINE LOCATION
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REF.: NCDOT FILE: r3405\_ddc\_psh05\_060530.dgn (FOR SOME SITE FEATURES)

	STATE PROJECT R-3405 WILKES COUNTY, NORTH CAROLINA NC DEPARTMENT OF TRANSPORTATION PROJECT NO. 09210013.40	PARCEL 51 DIFFERENTIAL RESPONSE
	FIGURE 4	



Parcel 51 – R.D. Mitchell Property, looking north. Photo shows approximate marked location of the known USTs on the south side of the property.



Parcel 51 – R.D. Mitchell Property, looking northwest. Photo shows approximate marked location of the known USTs near the south side of the property.



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PHOTOS OF  
 KNOWN  
 UST LOCATIONS

FIGURE 5