



November 23, 2012

Gordon Box, LG
NCDOT, Geotechnical Engineering Unit
1020 Birch Ridge Drive
Raleigh, NC 27610

RE: State Project: U-3315
 WBS Element: 35781.1.2
 County: Pitt
 Description: Stantonsburg Road/Tenth Street Connector from Memorial Drive (US 13)
 to Evans Street

**Subject: Project 11821014.17, Report on Geophysical Surveys
 Parcels 85, 87-91, & 911 Dickinson Avenue; Various Properties; Greenville, North
 Carolina**

Dear Mr. Box:

SCHNABEL ENGINEERING SOUTH, PC (Schnabel) is pleased to present this report on the geophysical surveys performed on the subject properties and in the adjacent roadway. The report includes three 11x17 color figures and three 8.5x11 color figures with relevant data collected for this study. This study was performed in accordance with our proposal for Geophysical Surveys to Locate Possible USTs dated July 3, 2012, as approved by Cathy Houser on July 26, 2012, the subsequent approval via Gordon Box to add these properties to the scope described in our proposal, and our agreement dated June 2, 2011.

INTRODUCTION

The field work described in this report was performed on October 30 and October 31, 2012, by Schnabel under our 2011 contract with the NCDOT. The purpose of the geophysical surveys was to investigate the presence of metal underground storage tanks (USTs) in the accessible areas of the right-of-way and/or easement and in the first adjacent roadway lane. The NCDOT provided a Sanborn map showing a suspected UST location, which is in the northeast-bound lane near the north edge of Parcel 87. The Sanborn map is shown in Appendix A. We performed the surveys over the accessible areas of the sites and roadway lane as defined by the NCDOT. Photographs of the sites are included on Figure 1. The sites are located on the southeast side of Dickinson Avenue near its intersection with Atlantic Avenue in Greenville, NC.

The geophysical surveys consisted of an electromagnetic (EM) induction survey and a ground penetrating radar (GPR) survey. The EM survey was performed using a Geonics EM61-MK2 instrument. The EM61 is a time domain metal detector that stores data digitally for later processing and review. Sensitivity to metallic objects is dependent on the size, depth and orientation of the buried object, and the amount of noise (i.e. response from spurious metallic objects) in the area. The EM61 can generally observe a single buried 55 gallon drum at a depth of more than 10 ft. The EM61 makes measurements by creating an electromagnetic pulse and then measuring the response from metallic objects with time after the pulse is generated. We recorded the response at several times after the pulse to help evaluate relative size and depth of metallic objects in the earth.

The GPR survey was performed over selected EM61 anomalies using a Geophysical Survey Systems SIR-3000 system equipped with a 400 MHz antenna to further evaluate EM responses that could indicate a potential UST.

Photographs of the geophysical instruments we used are shown on Figure 2.

FIELD METHODOLOGY

Locations of geophysical data points were obtained using a sub-meter Trimble Pro-XRT 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. We recorded the locations of existing site features (monitoring wells, signs, other metallic objects, etc.) with the Trimble system for later correlation with the geophysical data and locations provided by the NCDOT.

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 anomalous EM readings not attributed to cultural features. The GPR data were reviewed in the field to evaluate the presence of USTs. The GPR data also were recorded digitally and later transferred to a desktop computer for further review. A site plan containing GPS features collected by Schnabel, NCDOT microstation data, and EM61 and GPR survey areas is shown on Figure 3.

DISCUSSION OF RESULTS

The contoured EM61 data are shown on Figures 4 and 5. Early time data are plotted on Figure 4 and late time gate data (the latest response from the bottom coil of the EM61) is presented in Figure 5. The early time data provide a more sensitive detection of all metal objects than later time data, which tends to highlight deeper and/or larger objects. The differential response, between top and bottom coils of the EM61 instrument, is typically used to filter out the effect of surface and very shallowly buried metallic objects. Typically, the differential response emphasizes anomalies from deeper and larger objects such as USTs. In this case, the data from the top coil is highly variable throughout much of the survey area, which is likely related to an abundance of underground utilities. As a result we are presenting the late time gate data instead of the differential response.

The early time gate and late time gate results show an anomaly of unknown cause, in addition to those apparently caused by buried utilities or known site features (Figures 4 and 5). The GPR data collected near the northern edge of Parcel 87 over an EM anomaly of unknown cause did not indicate the presence of a probable UST. Possible UST No. 1 was marked at this location, which is adjacent to Parcel 87, based on the EM anomaly and the suspected UST location shown on the Sanborn map. The identification of Possible UST No. 1 was selected in accordance with the anomaly categories provided by the NCDOT in their letter, dated May 19, 2009, entitled "Geophysical Surveys to Identify USTs". The location of Possible UST No. 1 is shown on Figures 4 and 5. Example GPR images from lines oriented over the marked location of Possible UST No. 1 are also shown on Figures 4 and 5. The Sanborn map suggests Possible UST No. 1 is about 3 feet in diameter and about 5 feet long, equivalent to a capacity of about 270 to 280 gallons. Photographs of the approximate location of the possible UST that was marked in the field are included on Figure 6.

CONCLUSIONS

Our evaluation of the geophysical data collected on the subject property on Project U-3315 in Greenville, NC indicates the following:

The geophysical data indicate the presence of a possible UST within the roadway of Dickinson Avenue near the northern edge of Parcel 87. The historical data, and potentially the EM data, suggest Possible UST No. 1 is about 3 feet in diameter and about 5 feet long, equivalent to a capacity of about 270 to 280 gallons.

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



James W. Whitt, LG
Senior Staff Geophysicist



Nigel Miller, PE
Associate

JW:MHD:NM:GR

Attachments: Figures (6), Appendix (1)

FILE: G:\2011-SDE-JOBS\11821014_00_NCDOT_2011_GEOTECHNICAL_UNIT_SERVICES\11821014_17_U-3315_PITT_COUNTY\REPORT\PARCELS 85 & 87-91\SCHNABEL GEOPHYSICAL REPORT ON PARCELS 85 & 87-91 (U-3315).DOCX

Attachments:

- Figure 1 - Parcels 85 & 87-91 Site Photos
- Figure 2 - Photos of Geophysical Equipment Used
- Figure 3 - Site Plan
- Figure 4 - Parcels 85 & 87-91 Early Time Gate Response
- Figure 5 - Parcels 85 & 87-91 Differential Response
- Figure 6 - Parcels 85 & 87-91 Photos of Possible UST Location
- Appendix A - Sanborn Map (1916 sanborn parcel 190 & 87.pdf)



Parcels 85 & 87-91 & 911 Dickinson Ave. (Various Properties), looking east



Parcels 85 & 87-91 & 911 Dickinson Ave. (Various Properties), looking south



Geonics EM61-MK2 Metal Detector with Trimble DGPS Unit



GSSI SIR-3000 Ground-Penetrating Radar with 400 MHz Antenna

Note: Stock photographs – not taken on site.

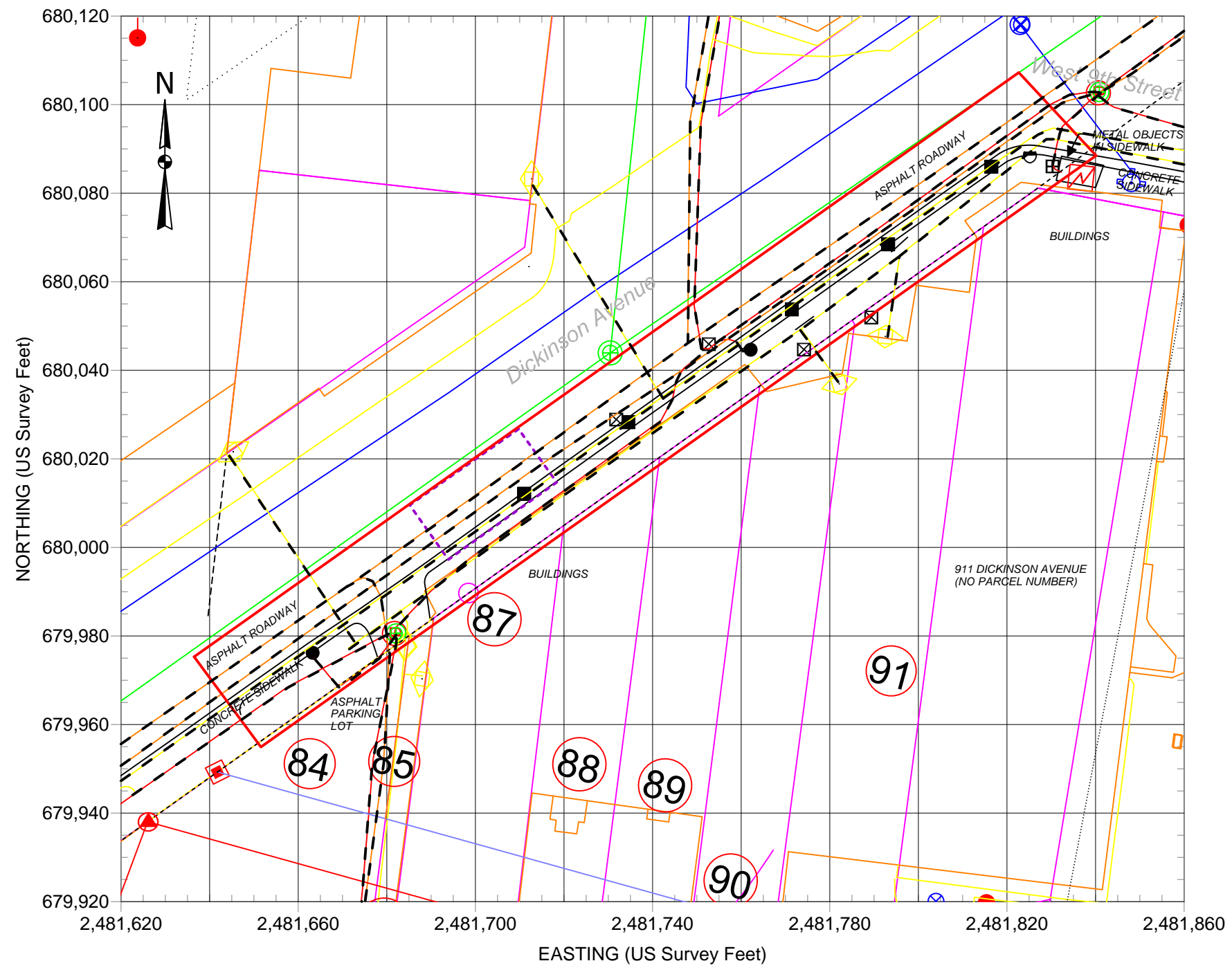


STATE PROJECT U-3315
NC DEPT. OF TRANSPORTATION
PITT COUNTY, NORTH CAROLINA
PROJECT NO. 11821014.17

PHOTOS OF
GEOPHYSICAL
EQUIPMENT USED

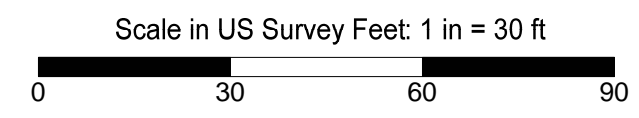
FIGURE 2

PARCELS 85 & 87-91



EXPLANATION	
	SIGN
	MISCELLANEOUS METALLIC OBJECT
	UTILITY MANHOLE, METER, BOX, ETC.
	STORMSEWER INLET
	LIGHTPOLE
	EDGE OF NCDOT PROPOSED RW
	PROPERTY LINE
	GPR SURVEY AREA
	EM61 SURVEY AREA
	UTILITY FROM NCDOT FILE (TRACED FOR CLARITY)

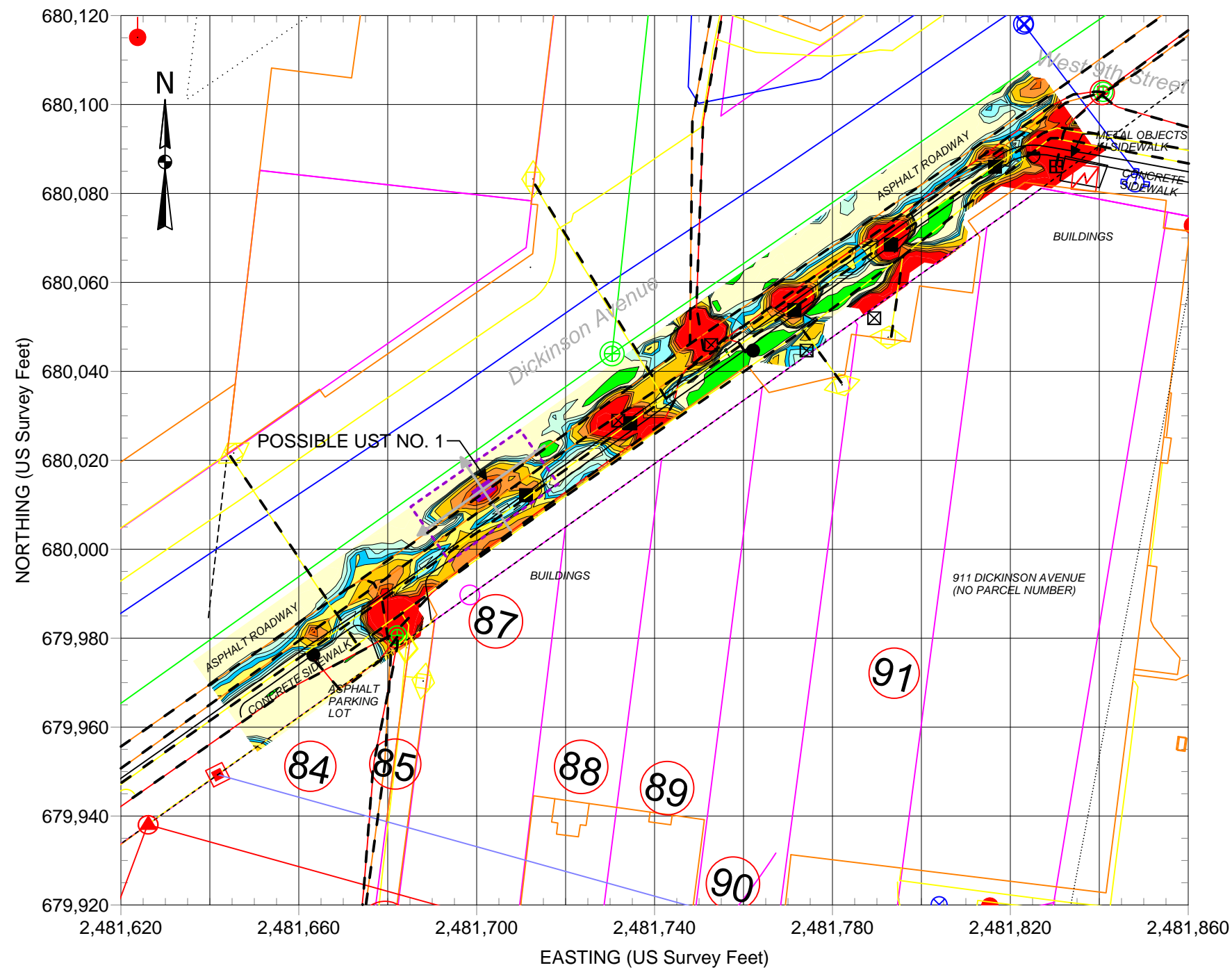
BASE PLAN FROM NCDOT FILE:
u3315_rdy_psh09.dgn
(FOR SOME SITE FEATURES)



Note: GPS data were collected using a submeter Trimble ProXRT DGPS system. Coordinates are in the US State Plane 1983 System, North Carolina 3200 Zone, using the NAD 1983 datum.

	STATE PROJECT U-3315 NC DEPARTMENT OF TRANSPORTATION PITT COUNTY, NC PROJECT NO. 11821014.17	PARCELS 85 & 87-91 SITE PLAN FIGURE 3
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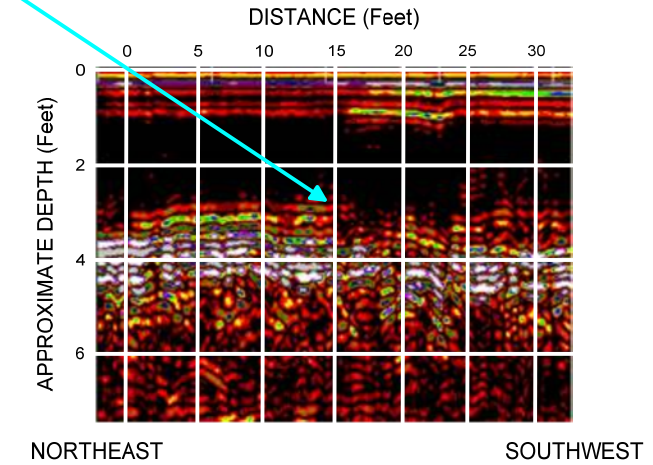
PARCELS 85 & 87-91



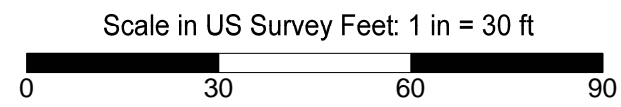
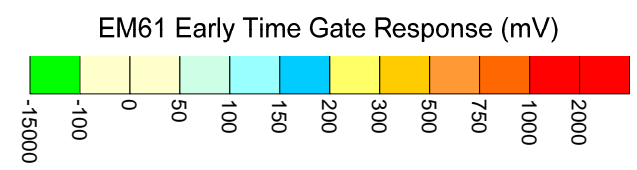
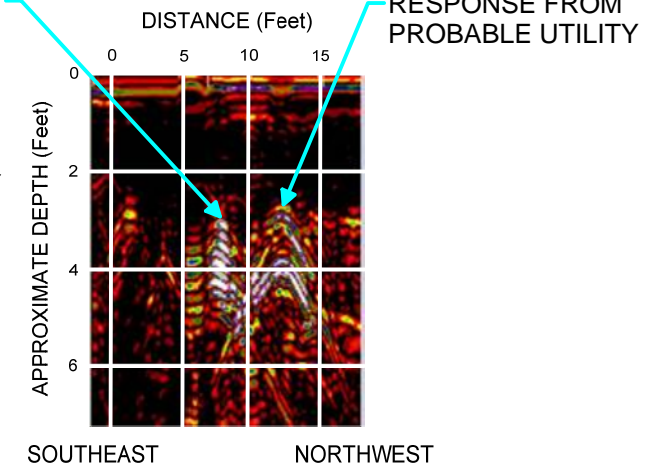
EXPLANATION	
	SIGN
	MISCELLANEOUS METALLIC OBJECT
	UTILITY MANHOLE, METER, BOX, ETC.
	STORMSEWER INLET
	LIGHTPOLE
	EDGE OF NCDOT PROPOSED RW
	PROPERTY LINE
	GPR SURVEY AREA
	LOCATION OF SUSPECT USTS MARKED ON SITE
	EXAMPLE GPR LINE LOCATION
	UTILITY FROM NCDOT FILE (TRACED FOR CLARITY)

BASE PLAN FROM NCDOT FILE:
u3315_rdy_psh09.dgn
(FOR SOME SITE FEATURES)

EXAMPLE GPR RESPONSE FROM THE LONG AXIS OF POSSIBLE UST NO. 1: POSSIBLE UST NO. 1 WAS MARKED FROM 12'-17' BASED ON AN EM61 ANOMALY



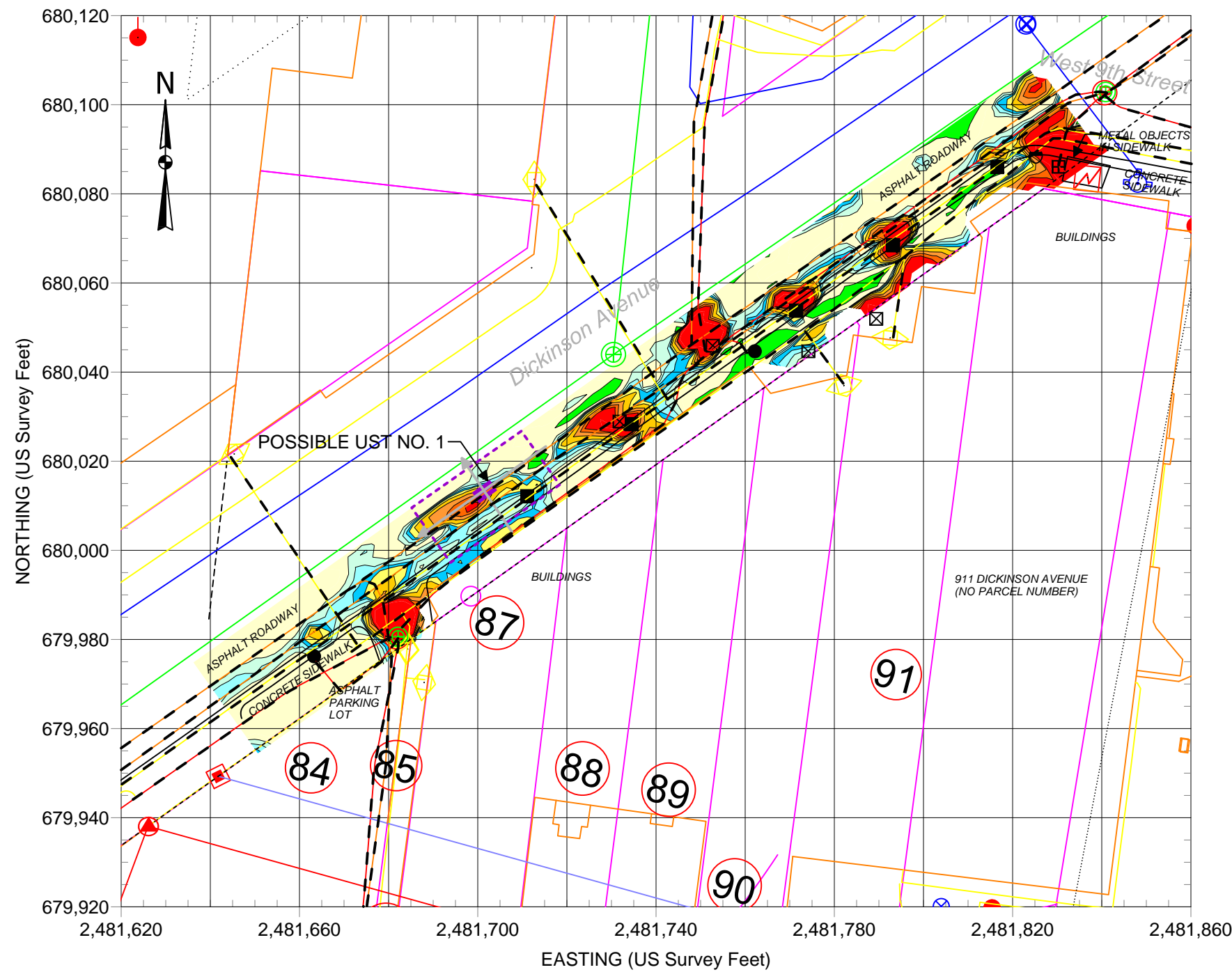
EXAMPLE GPR RESPONSE FROM THE SHORT AXIS OF POSSIBLE UST NO. 1: POSSIBLE UST NO. 1 WAS MARKED FROM 7'-10' BASED ON AN EM61 ANOMALY



Note: The contour plot shows the earliest and more sensitive time gate of the EM61 bottom coil/channel in millivolts (mV). The EM data were collected on October 30 and October 31, 2012, using a Geonics EM61-MK2 instrument. Positioning for the EM61 survey was provided using a submeter Trimble ProXRT 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 October 31, 2012, using a Geophysical Survey Systems SIR 3000 equipped with a 400 MHz antenna.

	STATE PROJECT U-3315	PARCELS 85 & 87-91 EM61
	NC DEPARTMENT OF TRANSPORTATION	EARLY TIME GATE RESPONSE
	PITT COUNTY, NC	& EXAMPLE GPR IMAGES
	PROJECT NO. 11821014.17	FIGURE 4

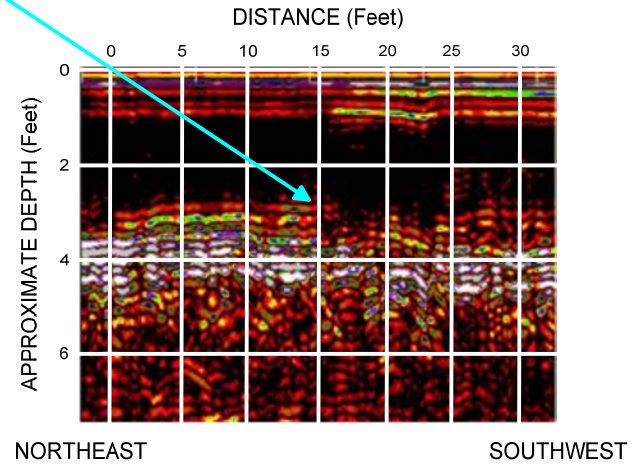
PARCELS 85 & 87-91



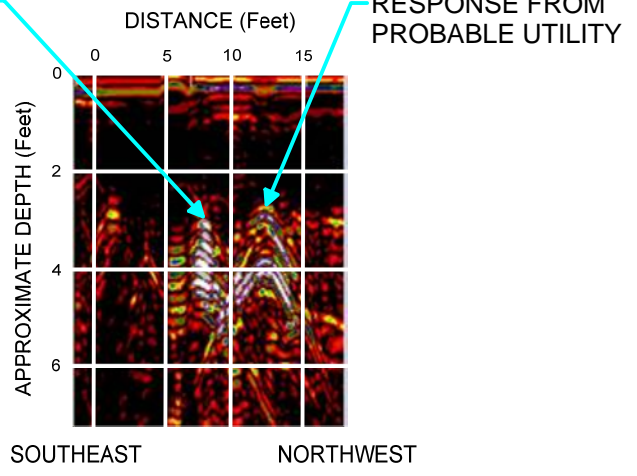
EXPLANATION	
	SIGN
	MISCELLANEOUS METALLIC OBJECT
	UTILITY MANHOLE, METER, BOX, ETC.
	STORMSEWER INLET
	LIGHTPOLE
	EDGE OF NCDOT PROPOSED RW
	PROPERTY LINE
	GPR SURVEY AREA
	LOCATION OF SUSPECT USTS MARKED ON SITE
	EXAMPLE GPR LINE LOCATION
	UTILITY FROM NCDOT FILE (TRACED FOR CLARITY)

BASE PLAN FROM NCDOT FILE:
u3315_rdy_psh09.dgn
(FOR SOME SITE FEATURES)

EXAMPLE GPR RESPONSE FROM THE LONG AXIS OF POSSIBLE UST NO. 1: POSSIBLE UST NO. 1 WAS MARKED FROM 12'-17' BASED ON AN EM61 ANOMALY



EXAMPLE GPR RESPONSE FROM THE SHORT AXIS OF POSSIBLE UST NO. 1: POSSIBLE UST NO. 1 WAS MARKED FROM 7'-10' BASED ON AN EM61 ANOMALY



Note: The contour plot shows the latest time gate from the bottom coil of the EM61, in millivolts (mV). The EM data were collected on October 30 and October 31, 2012, using a Geonics EM61-MK2 instrument. Positioning for the EM61 survey was provided using a submeter Trimble ProXRT 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 October 31, 2012, using a Geophysical Survey Systems SIR 3000 equipped with a 400 MHz antenna.

	STATE PROJECT U-3315 NC DEPARTMENT OF TRANSPORTATION PITT COUNTY, NC	PARCELS 85 & 87-91 EM61 LATE TIME GATE RESPONSE & EXAMPLE GPR IMAGES
	PROJECT NO. 11821014.17	
		FIGURE 5



Parcel 87 (First South Bank Property), looking northwest. Photo shows approximate marked location of Possible UST No. 1 near the northern edge of the parcel.



Parcel 87 (First South Bank Property), looking southeast. Photo shows approximate marked location of Possible UST No. 1 near the northern edge of the parcel.

APPENDIX A

