

**GEOPHYSICAL INVESTIGATION REPORT**

***GEOPHYSICAL SURVEYS FOR THE  
DETECTION OF METALLIC USTS***

**US 1 from SR 1001 to the Richmond County Line**

**Richmond, North Carolina**

**State Project Number U-3459**

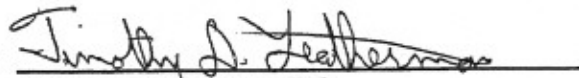
**September 1, 2006**

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**GEOPHYSICAL SURVEYS FOR THE DETECTION OF METALLIC USTS**  
**US 1 from SR 1001 to the Richmond County Line**  
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## 1.0 INTRODUCTION

Pyramid Environmental & Engineering, PC conducted geophysical investigations for Solutions IES during the period of July 26 through August 28, 2006, within the proposed Right-of-Way (ROW) areas at 10 sites located in Richmond County, North Carolina. The work was done as part of the North Carolina Department of Transportation (NCDOT) road-widening project under State Project number U-3459. The sites are located along the northern or western sides of US 1 from SR 1001 to the Richmond County Line. The geophysical surveys were conducted to determine if unknown metallic underground storage tanks (UST's) were present beneath the proposed ROW area of each site.

Solutions IES representative Ms. Sheri Knox, PE provided maps during the week of July 24, 2006 that outlined the geophysical survey area of each site. Ms. Knox also provided project management during the geophysical investigation of the sites. Geophysical surveys were conducted within the proposed ROW areas at the following 10 sites that are listed from the southern-most site to the northern-most site.

<u>Property Owner</u>	<u>Parcel</u>	<u>Present Use of Property</u>
Hillary McKay Property	(Parcel 6)	Grass-covered lot with garage
K.J. Lewis Property	(Parcel 9)	Vacant, wooded lot
James Brigman Property	(Parcel 21)	Vacant, grass-covered Lot
Roy Barry Bostick Property	(Parcel 48)	Grass-covered lot and garage
Pansy Ernest Property	(Parcel 50)	Grass-covered lot with vacant store
Church of Deliverance Prop.	(Parcel 51)	Asphalt lot with active church
Cooper & Brown Inc. Prop.	(Parcel 61)	Vacant lot and commercial building

Delia Lassiter Property	(Parcel 70)	Vacant lot and building
Ivey Little Property	(Parcel 22)	Vacant lot and building
James Pugh Property	(Parcel 68)	Vacant, wooded lot

Photographs of the above sites along with photographs of the geophysical equipment used for this project are presented in **Figure 1**.

## **2.0 FIELD METHODOLOGY**

Prior to conducting the geophysical investigations, a 10-foot by 10-foot or 10-foot by 20-foot survey grid was established across the proposed ROW areas of the 10 sites using water-based marking paint or pin flags. These marks were used as X-Y coordinates for location control when collecting the geophysical data and establishing base maps for the geophysical results.

The geophysical investigations consisted of electromagnetic (EM) induction-metal detection surveys and ground penetrating radar (GPR) surveys. The EM surveys were performed using a Geonics EM61-MK1 metal detection instrument. According to the instrument specifications, the EM61 can detect a metal drum down to a maximum depth of approximately 8 feet. The EM61 data were digitally collected at each site along parallel northerly-southerly or easterly-westerly trending survey lines spaced five feet apart. The data were downloaded to a computer and reviewed in the field and office using the Geonics DAT61W and Surfer for Windows Version 7.0 software programs.

Contour plots of the EM61 bottom coil results and the EM61 differential results for each site are included in this report. The bottom coil results represent the most sensitive component of the EM61 instrument and detect metal objects regardless of size. The bottom coil response can be used to

delineate metal conduits or utility lines, small, isolated metal objects, and areas containing insignificant metal debris.

The differential results are obtained from the difference between the top and bottom coils of the EM61 instrument. The differential results focus on the larger metal objects such as drums and USTs and ignore the smaller insignificant metal objects.

GPR surveys were conducted across selected EM61 differential anomalies and steel-reinforced concrete using a GSSI SIR-2000 unit equipped with a 400 MHz antenna. Surveys were also performed across several areas where parked vehicles that obstructed the EM61 survey had since been removed. GPR data were digitally collected in a continuous mode along X and/or Y survey lines, spaced two to five feet apart using a vertical scan of 512 samples, at a rate of 48 scans per second. An 80 MHz high pass filter and an 800 MHz low pass filter were used during data acquisition with the 400 MHz antenna. GPR data were collected down to a maximum depth of approximately five feet, based on an estimated two-way travel time of 9 nanoseconds per foot.

The GPR data were downloaded to a field computer and later reviewed in the office using Radprint and Radan 5.0 software programs. The locations of GPR survey areas or individual GPR survey lines are shown as solid, purple polygons or solid purple lines, respectively, on the EM61 differential contour plots. The approximate perimeters of probable or possible USTs, based on the geophysical results, were marked and labeled in the field using orange, water-based marking paint and pin flags (when possible). The approximate locations of probable or possible USTs are shown as magenta-colored rectangles on the EM61 bottom coil and differential contour plots.

During the weeks of August 7, August 14, and August 28, preliminary contour plots of the EM61 bottom coil and the differential results were emailed to Ms. Knox.

### **3.0 DISCUSSION OF RESULTS**

#### **3.1 Parcel 6 – Hillary McKay Property**

The Hillary McKay Property (Parcel 6) contains a former auto repair garage and a vacant wooden building. The ROW area consists of a flat-lying grass surface. The bottom coil results and the differential results are presented in **Figures 2 and 3**, respectively. GPR surveys conducted around the perimeter of the garage and wooden building, suggest that the EM61 anomalies surrounding the two buildings are in response to the structures and perhaps buried miscellaneous metal debris. The remaining EM61 anomalies are probably in response to buried miscellaneous metal debris. The geophysical results suggest that the proposed ROW area at Parcel 6 does not contain metallic UST's.

#### **3.2 Parcel 9 – K.J. Lewis Property**

The K.J. Lewis property (Parcel 9) is located immediately north of the Mercer Road and US 1 intersection, approximately 200 feet northeast of Parcel 6. The property consists of an abandoned building along the edge of US 1, which is surrounded by dense wooded terrain. A former pump island area is located in front of the building. The EM61 bottom coil results and the differential results are presented in **Figures 4 and 5**, respectively. Due to limited access to the site, the geophysical investigation was limited to the front portion of the property that is located along US 1.

The geophysical investigation detected the probable presence of two USTs located adjacent to the pump island area. The first UST is centered near grid coordinates X=84 Y=27, and buried approximately 1.5 feet below surface. The second UST is centered near grid coordinates X=103 Y=27, and is buried approximately 2.0 feet below surface. This latter UST appears to be partially beneath the former pump island area. The approximate locations of the USTs are shown as magenta-colored rectangles in Figures 4 and 5. Based on the GPR results, the probable USTs are approximately 10 feet long and 4 feet wide. A photograph showing the approximate locations of the two probable USTs and the image of GPR survey lines Y=27.5, which intersects the probable USTs, are presented in **Figure 6**.

The EM61 differential anomaly centered near grid coordinates X=118 Y=29, may possibly be in response to a UST or large metal object. However, GPR surveys could not be conducted across this EM anomaly due to the limited access caused by the dense wooded terrain. The approximate location of this possible UST is shown as a dashed, magenta-colored rectangle in Figures 4 and 5, and in the site photograph that is presented in Figure 6.

The remaining portion of the geophysical survey area does not appear to contain significant, buried, metal objects.

### **3.3 Parcel 21 – James Brigman Property**



The James Brigman property (Parcel 21) consists of an open, grass and asphalt-covered lot located along the western side of US 1. The EM61 bottom coil results and the differential results are presented in **Figures 7 and 8**, respectively.

GPR surveys conducted across the linear, EM61 bottom coil anomalies that intersect grid coordinates X=62 Y=70, X=66 Y=94, X=84 Y=94, and X=87.5 Y=75, suggest the anomalies are probably in response to buried utility lines or conduits. GPR data also suggest that the high amplitude anomalies centered near grid coordinates X=77 Y=84, and X=93 Y=66, are probably in response to buried miscellaneous metal objects or junction areas for the conduits or utility lines.

GPR surveys conducted across the large, high amplitude anomaly centered near X=45 Y=75, detected the probable presence of four metallic USTs. The four probable USTs are centered near grid coordinates X=43 Y=80, X=50 Y=80, X=42 Y=73, and X=48 Y=73. Based on the GPR data, the USTs appear to be approximately 9 feet long and 3.5 to 4 feet wide and buried approximately 1.5 to 2.0 feet below surface. The approximate locations of the probable USTs are shown as magenta-colored rectangles in Figures 7 and 8. A photograph showing the approximate locations of the four probable USTs and the image of GPR survey lines Y=80, which intersects the two probable USTs centered near X=43 Y=80, and X=50 Y=80, are presented in **Figure 9**.

The remaining EM61 anomalies recorded within the proposed ROW area are probably in response to miscellaneous metal debris.

### **3.4 Parcel 48 – Roy Barry Bostick Property**

The Roy Barry Bostick property (Parcel 48) consists of a red, brick building surrounded by flat-lying grass-covered terrain. The parcel is located along the northwestern side of US 1 approximately 300 feet southwest of the US 1 and Tilley Street intersection. The EM61 bottom coil results and the differential results are presented in **Figure 10**.

GPR surveys conducted across the EM61 anomaly centered near grid coordinates X=295 Y=60, suggest that the anomaly is probably in response to one or more large diameter (12 or more inches) conduits buried approximately 1.0 feet below surface. There is a possibility (although unlikely) that the anomaly may be in response to a very small UST centered near grid coordinates X=290 Y=59. The location of the possible, but unlikely UST is shown as a magenta-colored square in Figure 10.

GPR surveys conducted along the edge of the brick building suggest that the EM61 anomalies recorded in this area are probably in response to the building and/or buried miscellaneous debris. The remaining EM61 anomalies recorded within the proposed ROW area at Parcel 48 are probably in response to known cultural features and/or buried miscellaneous debris.

### **3.5 Parcel 50 – Pansy Ernest Property**

The Pansy Ernest property (Parcel 50) is located on the western corner of the Tilley Street and US1 intersection. The parcel contains the former Little Grace’s Variety store surrounded by a flat-lying grass-covered, terrain. An occupied house is located immediately west of the property. The EM61 bottom coil results and the differential results are presented in **Figures 11 and 12**, respectively. Please note that Figures 11 and 12 also contain the EM61 results for Church of Deliverance property (Parcel 51).

GPR surveys conducted across the backyard of Parcel 50 suggest the linear EM61 bottom coil anomalies intersecting grid coordinates X=570 Y=115, X=570 Y=126, X=580 Y=90, and X=586 Y=125, are probable in response to buried conduits or lines. Similarly, the locations of the linear EM61 anomalies intersecting grid coordinates X= 622 Y=80, X=622 Y=120, and X=640 Y=35, suggest these anomalies are probably in response to buried utility lines.

GPR surveys conduct across the high amplitude anomalies centered near grid coordinates X=575 Y=105, and X=590 Y=113, suggest the anomalies are probably in response to the “junction” of conduits and/or other miscellaneous objects. Although not confirmed by the GPR results, the EM61 anomaly located at X=575 Y=105, may be in response to a possible septic tank.

GPR surveys conducted across the EM61 anomaly centered near grid coordinates X=567 Y=55, detected the probably presence of two USTs buried approximately 0.75 feet below surface. The approximate locations of the probably USTs are shown as magenta-colored rectangles in Figures 11 and 12 and each UST appears to be approximately eight feet long and three feet wide. A photograph showing the approximate locations of the two probable USTs and the image of GPR survey line Y=55, which intersects the probable USTs, are presented in **Figure 13**.

The remaining EM61 anomalies recorded within the proposed ROW area at Parcel 50 are probably in response to known cultural features or buried miscellaneous metal debris.

### **3.6 Parcel 51 – Church of Deliverance Property**

The Church of Deliverance property (Parcel 51) contains an active church building surrounded by a grass, gravel or asphalt-covered parking area. The property is located on the northern corner of the Tilley Street and US 1 intersection immediately across the street from the Pansy Ernest property (Parcel 50). The EM61 bottom coil results and the differential results for Parcel 51 are presented in **Figures 11 and 12**, respectively along with the EM61 results for Parcel 50.

The linear EM61 bottom coil anomalies intersecting grid coordinates X=670 Y=50, X=700 Y=30, and X=700 Y=65, are probably in response to buried utility lines or conduits. GPR surveys conducted across the EM 61 differential anomaly centered near X=705 Y=105, and along the front edge of the church building suggest the anomalies are probably in response to miscellaneous debris and the building, respectively.

The remaining EM61 anomalies recorded within the proposed ROW area at Parcel 51 are probably in response to known cultural features or miscellaneous buried debris. The geophysical results also suggest that the proposed ROW area does not contain metallic USTs.

### **3.7 Parcel 61 – Cooper & Brown Inc. Property**

The Cooper & Brown Inc. property (Parcel 61) is located on the western side of the US 1 and Little Road intersection. The proposed ROW area of Parcel 61 contains a vacant business building surrounded by flat-lying grass or asphalt surfaces. A concrete pad is located in front of the building and probably identifies the former pump island area. An occupied house lies to the northwest of the proposed ROW area.

The EM61 bottom coil results and the differential results are presented in **Figures 14 and 15**, respectively. The linear EM61 bottom coil anomalies intersecting grid coordinates X=130 Y=34, X=142 Y=105, X=186 Y=100, X=210 Y=42, and X=213 Y=83, are probably in response to buried utility lines or conduits. The high amplitude anomalies centered near grid coordinates X=75 Y=67, and X=80 Y=50, are probably in response to steel reinforced concrete. GPR surveys conducted across these two areas did not detect the presence of USTs.

GPR surveys conducted across the high amplitude anomaly centered near X=226 Y=116, suggest the anomaly is probably in response to steel reinforced concrete and/or to the metal conduits that are visible at the surface. GPR surveys conducted along the perimeter of the building suggest that the EM61 anomalies are probably in response to the building and/or to miscellaneous debris. The remaining EM61 anomalies are probably in response to known cultural features and/or to buried miscellaneous metal debris.

The geophysical results suggest that the proposed ROW area at Parcel 61 does not contain metallic USTs.

### **3.8 Parcel 70 – Delia Lassiter Property**

The Delia Lassiter Property (Parcel 70) contains a vacant building surrounded primarily by grass yard and an asphalt driveway. An occupied house lies immediately north of the proposed ROW area. The EM61 bottom coil results and the differential results are presented in **Figures 16 and 17**, respectively.

The linear EM61 anomaly intersecting grid coordinates X=90 Y=110, is probably in response to a buried utility line or conduit. The remaining EM anomalies are probably in response to known cultural features or to buried miscellaneous debris. The geophysical results suggest that the proposed ROW area at the Delia Lassiter property does not contain metallic USTs.

### **3.9 Parcel 22 – Ivey Little Property**

The Ivey Little property (Parcel 22) is located along the northwest side of US 1 and consists of a vacant building surrounded by a gravel-covered driveway and grass-covered fields. The EM61 bottom coil results and the differential results are presented in **Figures 18 and 19**, respectively.

The linear EM61 anomaly intersecting grid coordinates X=354 Y=35, is probably in response to a buried utility line or conduit. The remaining EM anomalies are probably in response to known cultural features or to buried miscellaneous debris. The geophysical results suggest that the proposed ROW area at the Ivey Little property does not contain metallic USTs.

### **3.10 Parcel 68 – James Pugh Property**

The James Pugh Property (Parcel 68) is a former gas station site located on the northern side of US 1, approximately 0.25 miles west of the US 1 and Special Forces Way intersection. The site consists primarily of grass, trees and brush with a former pump island pad located near the edge of US 1. The EM61 bottom coil results and the differential results are presented in **Figure 20**.

GPR surveys conducted across the EM61 anomalies centered grid coordinates X=305 Y=35, and X=321 Y=37, suggest the anomalies are probably in response to the pump island pad and to the

buried pump island-related equipment. GPR surveys conducted across the EM61 anomaly centered near grid coordinates X=534 Y=92, suggest the anomaly is probably in response to buried miscellaneous debris or object. The remaining EM61 anomalies are probably in response to known cultural features and miscellaneous metal debris.

The geophysical investigation conducted at Parcel 68 suggests that the proposed ROW area does not contain metallic USTs.

#### **4.0 SUMMARY & CONCLUSIONS**

Our evaluation of the EM61 and GPR data collected across the proposed ROW areas at the 10 sites along US 1 in Richmond County, North Carolina provides the following summary and conclusions:

- The EM61 and GPR surveys provided reliable results for the detection of metallic USTs within the surveyed portions of the proposed ROW areas of each site.
- GPR surveys were conducted across selected EM61 differential anomalies and across areas containing steel reinforced concrete.
- Linear EM61 anomalies at the 10 sites are probably in response to buried utility lines and/or conduits. The majority of non-linear anomalies are probably in response to known cultural features or miscellaneous metal objects.

- The geophysical results suggest the proposed ROW areas at the following properties do not contain metallic USTs:

Hillary McKay Property	(Parcel 6)
Church of Deliverance Property	(Parcel 51)
Cooper & Brown Inc. Property	(Parcel 61)
Delia Lassiter Property	(Parcel 70)
Ivey Little Property	(Parcel 22)
James Pugh Property	(Parcel 68)

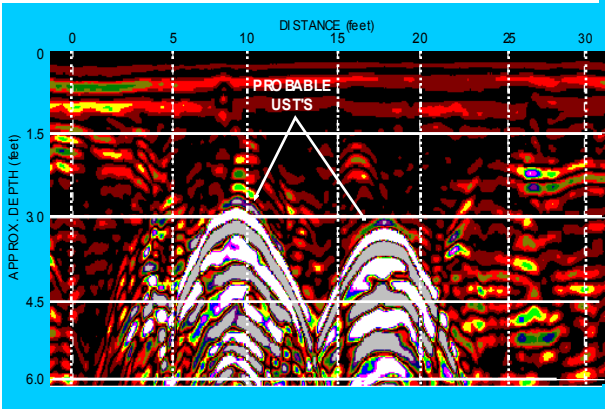
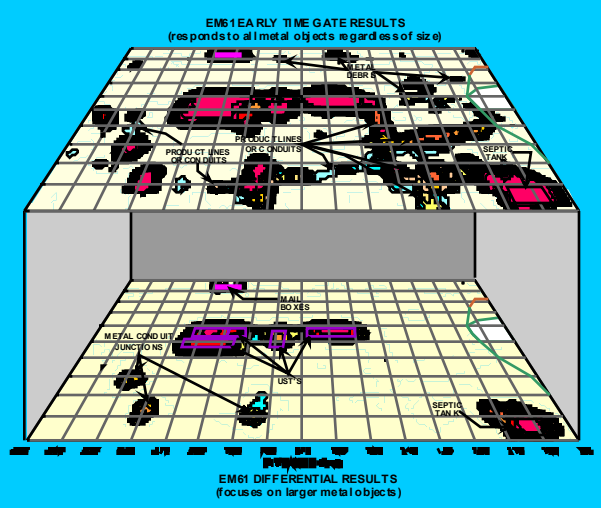
- K.J. Lewis Property (Parcel 9): Geophysical results suggest the probable presence of two USTs located adjacent to the pump island area. The first UST is centered near grid coordinates X=84 Y=27, and buried approximately 1.5 feet below surface. The second UST is centered near grid coordinates X=103 Y=27, and is buried approximately 2.0 feet below surface. The EM61 differential anomaly centered near grid coordinates X=118 Y=29, may possibly be in response to a UST or large metal object. However, GPR surveys could not be conducted across this EM anomaly due to the limited access caused by the dense wooded terrain.
- James Brigman Property (Parcel 21): Geophysical results detected the probable presence of four metallic USTs centered near grid coordinates X=43 Y=80, X=50 Y=80, X=42 Y=73, and X=48 Y=73. Based on the GPR data, the USTs appear to be approximately 9 feet long and 3.5 to 4 feet wide and buried approximately 1.5 to 2.0 feet below surface.



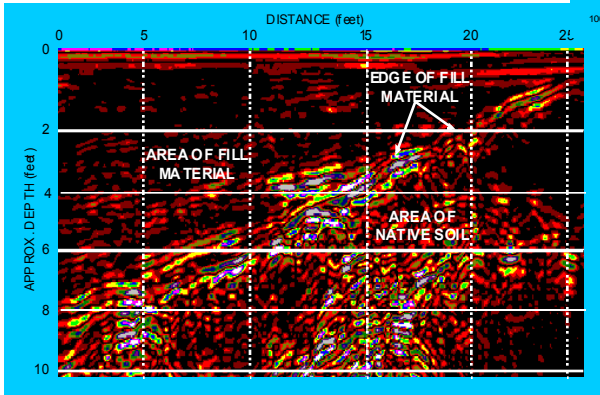
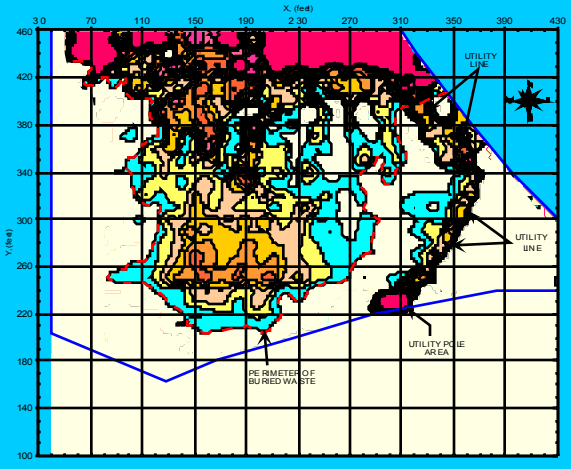
- Roy Barry Bostick Property (Parcel 48): GPR surveys conducted across the EM61 anomaly centered near grid coordinates X=295 Y=60, suggest that the anomaly is probably in response to one or more large diameter (12 or more inches) conduits buried approximately 1.0 feet below surface. There is a possibility (although unlikely) that the anomaly may be in response to a very small UST centered near grid coordinates X=290 Y=59.
- Pansy Ernest Property (Parcel 50): Geophysical results suggest the probable presence of two USTs centered near grid coordinates X=567 Y=55, and buried approximately 0.75 feet below surface. The USTs appear to be approximately eight feet long and three feet wide.

## **5.0 LIMITATIONS**

EM61 and GPR surveys have been performed and this report prepared for Solutions IES in accordance with generally accepted guidelines for EM61 and GPR surveys. It is generally recognized that the results of the EM61 and GPR are non-unique and may not represent actual subsurface conditions. The EM61 and GPR results obtained for this project do not conclusively define the locations of all metallic USTs but only suggest where some of the metallic USTs may be present. The EM61 and GPR anomalies, interpreted as probable or possible USTs or tanks, may be attributed to other surface or subsurface conditions or cultural interference.



# FIGURES





Parcel 6 - Hillary McKay Property



Parcel 9 - K.J. Lewis Property



Parcel 21 - James Brigman Property



Parcel 48 - Roy Barry Bostick Property



Parcel 50 - Pansy Earnest Property



Parcel 51 - Church of Deliverance Property



Parcel 61 - Cooper & Brown Property



Parcel 70 - Delia Lassiter Property



Parcel 22 - Ivey Little Property



Parcel 68 - James Pugh Property

GEOPHYSICAL EQUIPMENT



The photo shows the Geonics EM61 metal detector that was used to conduct the metal detection survey at the sites in Richmond County, North Carolina.



The photos show the SIR-2000 GPR system equipped with a 400 MHz antenna that was used to conduct the ground penetrating radar investigation at the sites in Richmond County, North Carolina.

SITE PHOTOGRAPHS

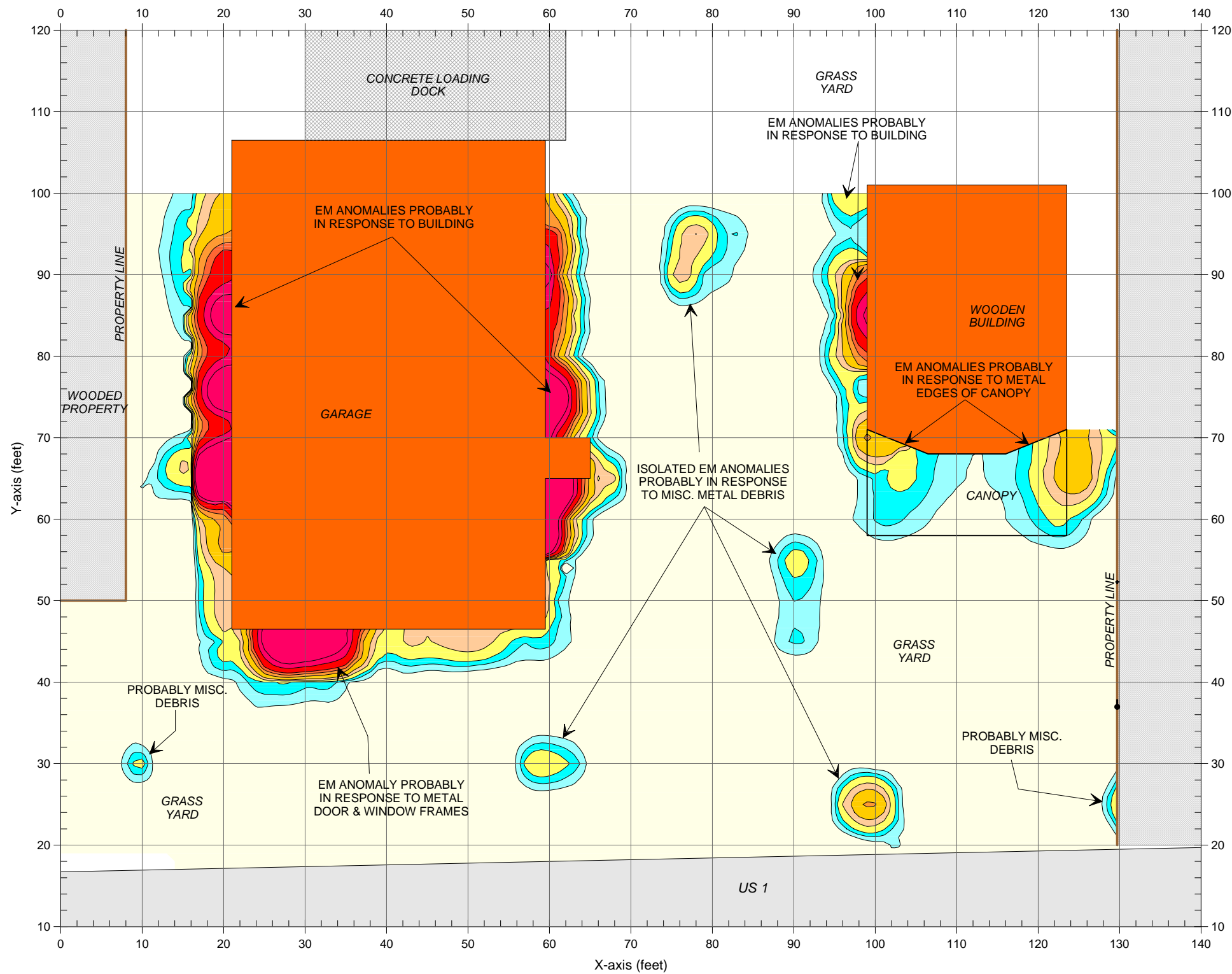
This figure shows the photographs of the ten sites located near Marston and Hoffman, North Carolina where geophysical investigations were conducted within the ROW areas for the detection of metallic USTs.

SITE PHOTOS

FIGURE 1

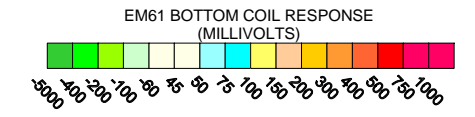
MJD		FIGURE		GRAPHIC SCALE IN FEET	
08/31/06		2006-200			
DATE	LNO.	DWG	LAY	DRWN	CHKD
SOLUTIONS IES			NORTH CAROLINA		
US 1 - RICHMOND COUNTY SITES			STATE		
MARSTON & HOFFMAN			CITY		
CLIENT			TITLE		
US 1 - RICHMOND COUNTY SITES			GEOPHYSICAL RESULTS		

**PYRAMID**  
ENVIRONMENTAL & ENGINEERING, P.C.



**LEGEND**

- EM61 SURVEY AREA: EM DATA ACQUIRED ALONG NORTHEAST-SOUTHWEST TRENDING LINES SPACED 5 FEET APART
- PROPERTY LINE (APPROX.)
- + GUY WIRE
- UTILITY POLE



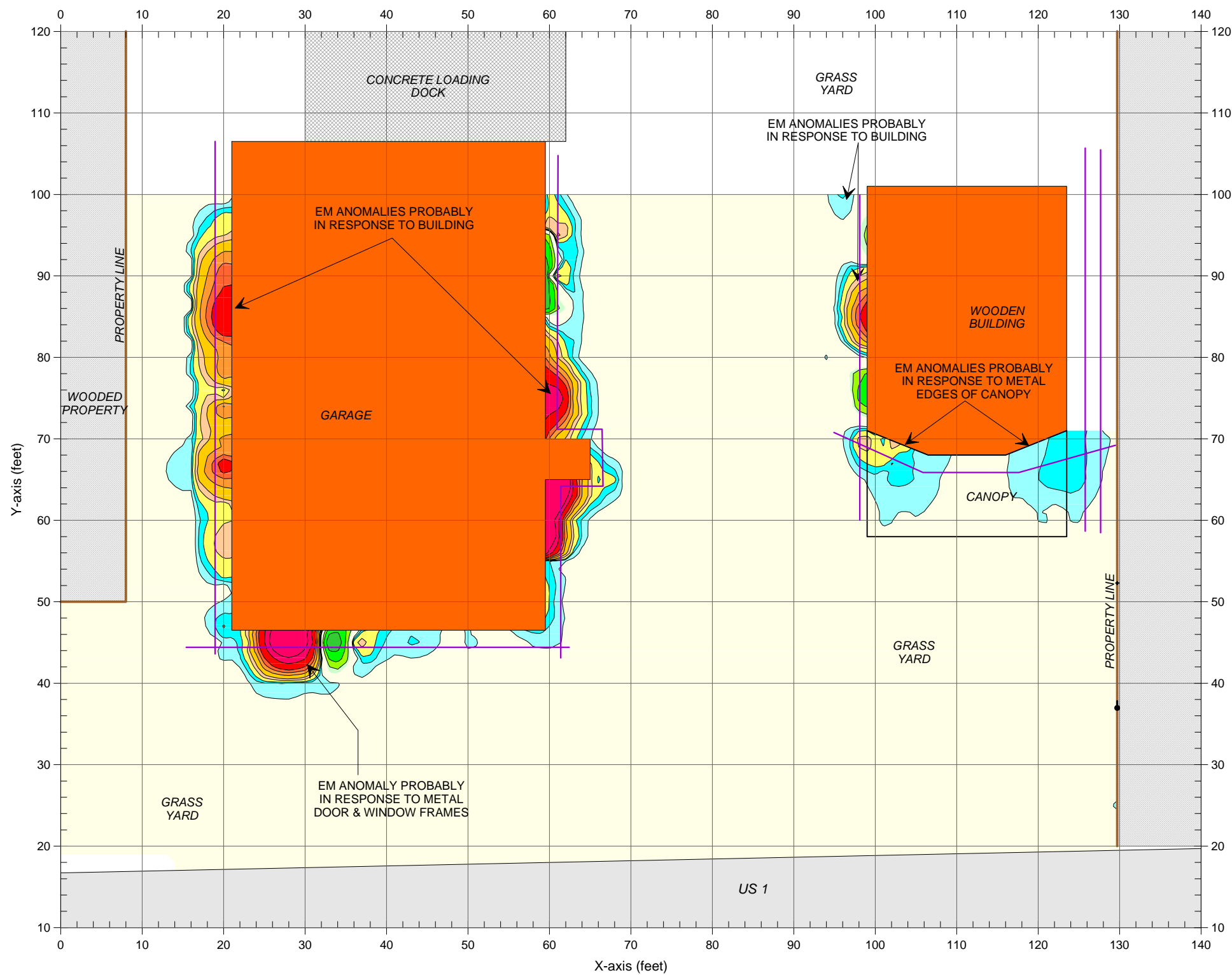
Note: The contour plot shows the bottom coil (most sensitive) response of the EM61 instrument in millivolts (mV). The bottom coil response shows buried metallic objects regardless of size. The EM metal detection data were collected on July 27, 2006 using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were acquired on August 16, 2006 using a Geophysical Survey Systems SIR 2000 instrument with a 400 MHz antenna.

The geophysical investigation suggests that the survey area does not contain metallic USTs.

	CLIENT	SOLUTIONS IES		DATE	08/01/06	DRWN	MJD
	SITE	PARCEL 6 - HILLARY MCKAY PROPERTY		LAY		CHKD	
	CITY	MARSTON	STATE	NORTH CAROLINA	DWG		
	TITLE	GEOPHYSICAL RESULTS		J-NO	2006-200	FIGURE	

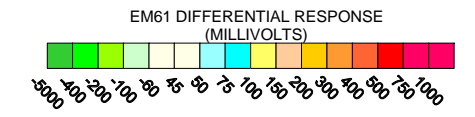
**EM61  
BOTTOM COIL  
RESULTS**

FIGURE 2



**LEGEND**

- EM61 SURVEY AREA: EM DATA ACQUIRED ALONG NORTHEAST-SOUTHWEST TRENDING LINES SPACED 5 FEET APART
- PROPERTY LINE (APPROX.)
- + GUY WIRE
- UTILITY POLE
- APPROX. LOCATION OF GPR SURVEY LINE



Note: The contour plot shows the differential results of the EM61 metal detection survey in millivolts (mV). The differential response focuses on larger, buried metallic objects such as drums and USTs and ignores smaller miscellaneous, buried, metal debris. The EM metal detection data were collected on July 27, 2006 using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were acquired on August 16, 2006 using a Geophysical Survey Systems SIR 2000 instrument with a 400 MHz antenna.

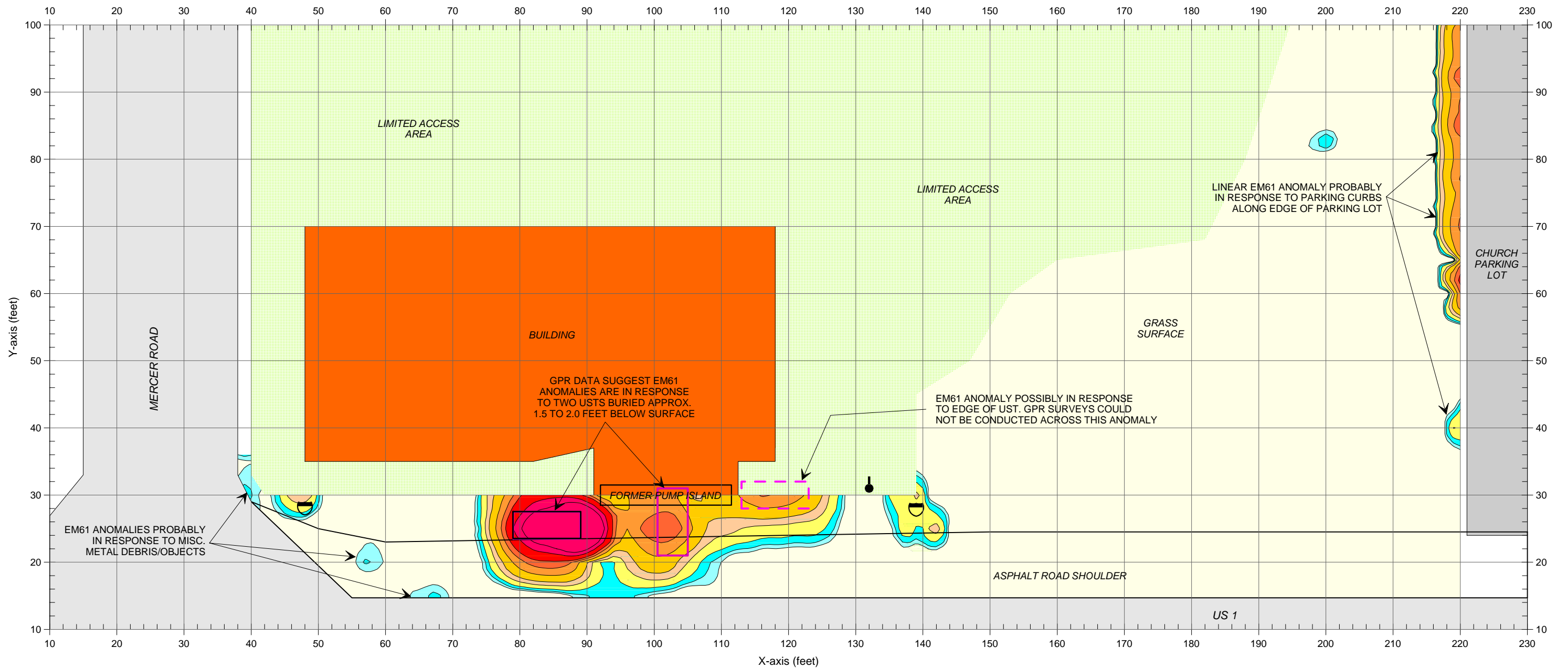
The geophysical investigation suggests that the survey area does not contain metallic USTs.



CLIENT	SOLUTIONS IES		DATE	08/01/06	DRWN	MJD
SITE	PARCEL 6 - HILLARY MCKAY PROPERTY		LAY		CHKD	
CITY	MARSTON	STATE	NORTH CAROLINA	DWG		
TITLE	GEOPHYSICAL RESULTS		J-NO.	2006-200	FIGURE	

**EM61 DIFFERENTIAL RESULTS**

FIGURE 3



EM61 ANOMALIES PROBABLY IN RESPONSE TO MISC. METAL DEBRIS/OBJECTS

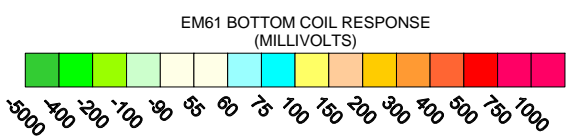
GPR DATA SUGGEST EM61 ANOMALIES ARE IN RESPONSE TO TWO USTS BURIED APPROX. 1.5 TO 2.0 FEET BELOW SURFACE

EM61 ANOMALY POSSIBLY IN RESPONSE TO EDGE OF UST. GPR SURVEYS COULD NOT BE CONDUCTED ACROSS THIS ANOMALY

LINEAR EM61 ANOMALY PROBABLY IN RESPONSE TO PARKING CURBS ALONG EDGE OF PARKING LOT

**LEGEND**

- EM61 SURVEY AREA: EM DATA ACQUIRED ALONG EASTERLY-WESTERLY OR NORTHERLY- SOUTHERLY TRENDING LINES SPACED 5 FEET APART
- UTILITY POLE
- TRAFFIC SIGN
- POSSIBLE UST, AS SUGGESTED BY EM61 ANOMALY
- PROBABLE UST, AS SUGGESTED BY GPR SURVEYS



Note: The contour plot shows the bottom coil (most sensitive) response of the EM61 instrument in millivolts (mV). The bottom coil response shows buried metallic objects regardless of size. The EM metal detection data were collected on August 15, 2006 using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were acquired on August 16, 2006 using a Geophysical Survey Systems SIR 2000 instrument with a 400 MHz antenna.

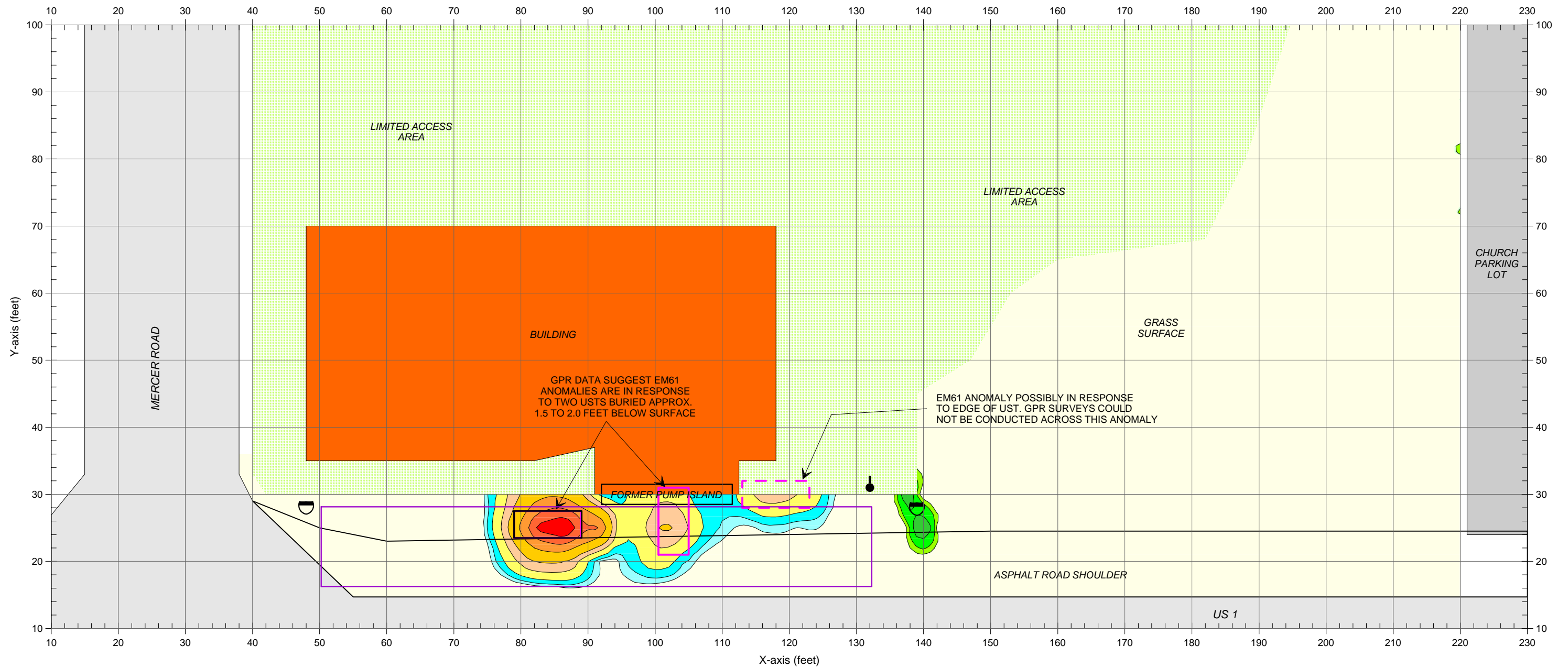
GPR surveys suggest that the EM61 anomalies recorded adjacent to the former pump island area are probably in response to metallic USTs.



CLIENT	SOLUTIONS IES		DATE	08/17/06	DRWN	MJD
SITE	PARCEL 9 - K. J. LEWIS PROPERTY		LAY		CHKD	
CITY	MARSTON	STATE	NORTH CAROLINA		DWG	
TITLE	GEOPHYSICAL RESULTS		J.NO.	2006-200	FIGURE	

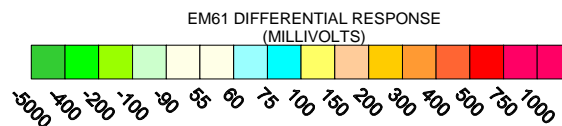
**EM61  
BOTTOM COIL  
RESULTS**

FIGURE 4



**LEGEND**

- EM61 SURVEY AREA: EM DATA ACQUIRED ALONG EASTERLY-WESTERLY OR NORTHERLY-SOUTHERLY TRENDING LINES SPACED 5 FEET APART
- UTILITY POLE
- TRAFFIC SIGN
- GPR SURVEY AREA
- POSSIBLE UST, AS SUGGESTED BY EM61 ANOMALY
- PROBABLE UST, AS SUGGESTED BY GPR SURVEYS



Note: The contour plot shows the differential results of the EM61 metal detection survey in millivolts (mV). The differential response focuses on larger, buried metallic objects such as drums and USTs and ignores smaller miscellaneous, buried, metal debris. The EM metal detection data were collected on August 15, 2006 using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were acquired on August 16, 2006 using a Geophysical Survey Systems SIR 2000 instrument with a 400 MHz antenna.

GPR surveys suggest that the EM61 anomalies recorded adjacent to the former pump island area are probably in response to metallic USTs.



CLIENT	SOLUTIONS IES		DATE	08/17/06	DRWN	MJD
SITE	PARCEL 9 - K. J. LEWIS PROPERTY		LAY		CHKD	
CITY	MARSTON	STATE	NORTH CAROLINA		DWG	
TITLE	GEOPHYSICAL RESULTS		J.NO.	2006-200	FIGURE	

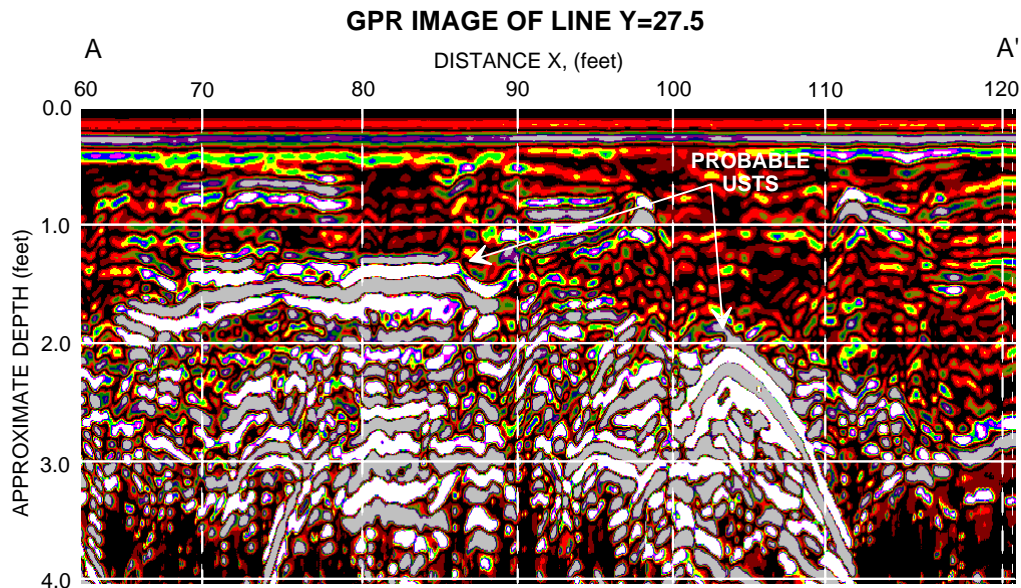
GRAPHIC SCALE IN FEET

**EM61 DIFFERENTIAL RESULTS**

FIGURE 5



The photograph shows the locations of two probable USTs and one possible UST buried 1.5 to 2.0 feet below surface, as suggested by the geophysical results at Parcel 9.



The GPR image obtained along a portion of survey line Y=27.5, shows the anomalies that are probably in response to USTs near X=84 and X=103, and buried approximately 1.5 and 2.0 feet below surface, respectively. The location of this GPR image is shown with a solid purple line in the above photograph.

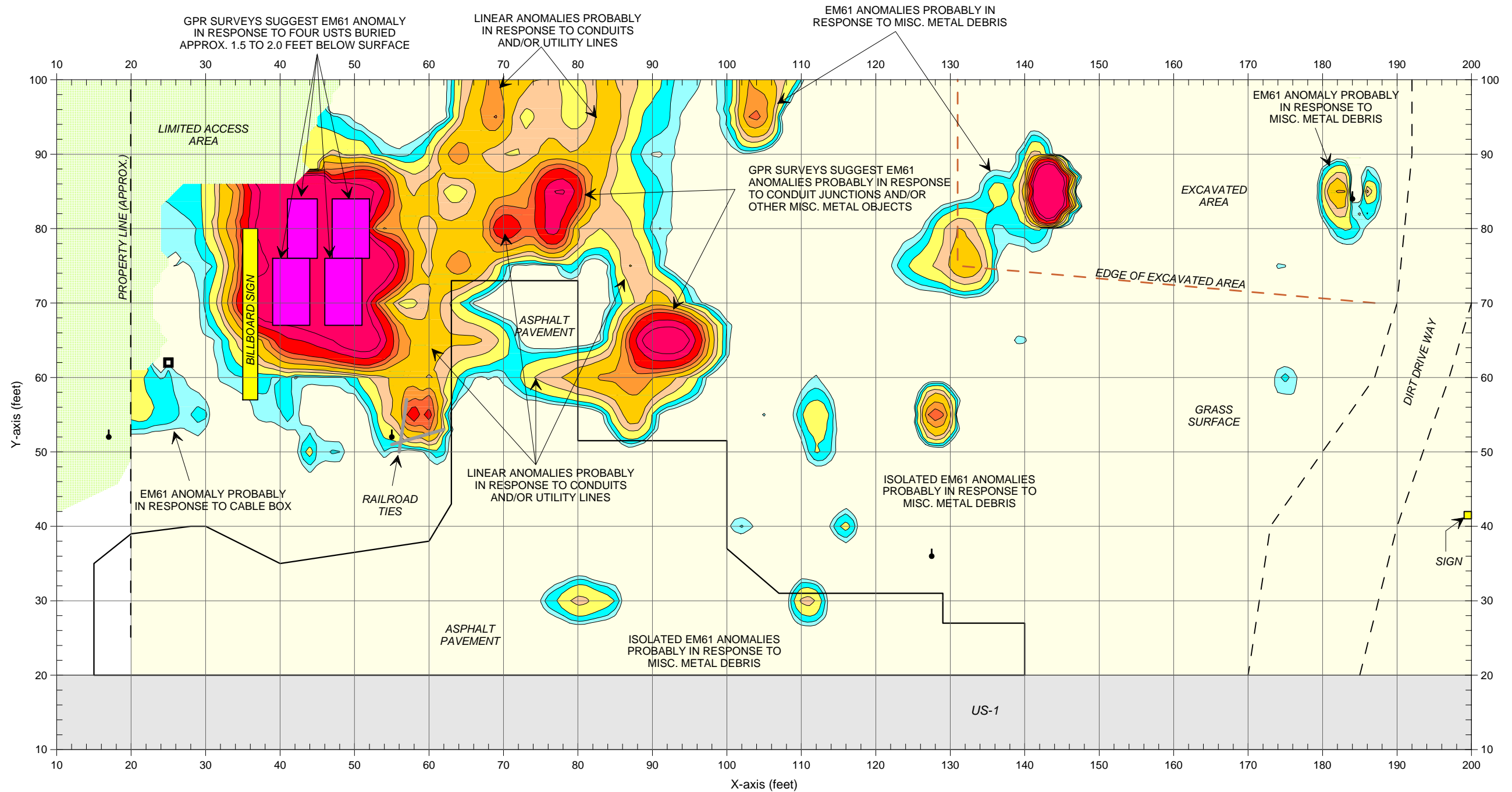


CLIENT	SOLUTIONS IES		DATE	08/26/05	BY	DRWN
SITE	PARCEL 9 - K. J. LEWIS PROPERTY		DATE		DATE	
CITY	MARSTON	STATE	NORTH CAROLINA		DATE	
TITLE	GEOPHYSICAL RESULTS		SCALE	2006-200	REVISION	

PHOTO & GPR IMAGE OF UST LOCATIONS (Parcel 9)

FIGURE 6



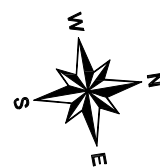


Note: The contour plot shows the bottom coil (most sensitive) response of the EM61 instrument in millivolts (mV). The bottom coil response shows buried metallic objects regardless of size. The EM metal detection data were collected on August 15, 2006 using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were acquired on August 16, 2006 using a Geophysical Survey Systems SIR 2000 instrument with a 400 MHz antenna.

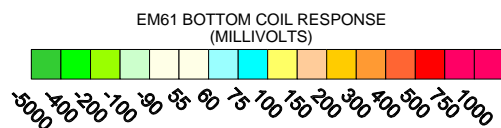
GPR surveys suggest that the large, high amplitude, EM61 anomaly in the southwest portion of the survey area is probably in response to four metallic USTs.

**LEGEND**

- EM61 SURVEY AREA: EM DATA ACQUIRED ALONG NORTHERLY-SOUTHERLY TRENDING LINES SPACED 5 FEET APART
- UTILITY POLE
- CABLE BOX
- PROBABLE UST, AS SUGGESTED BY GPR SURVEYS



APPROXIMATE NORTH

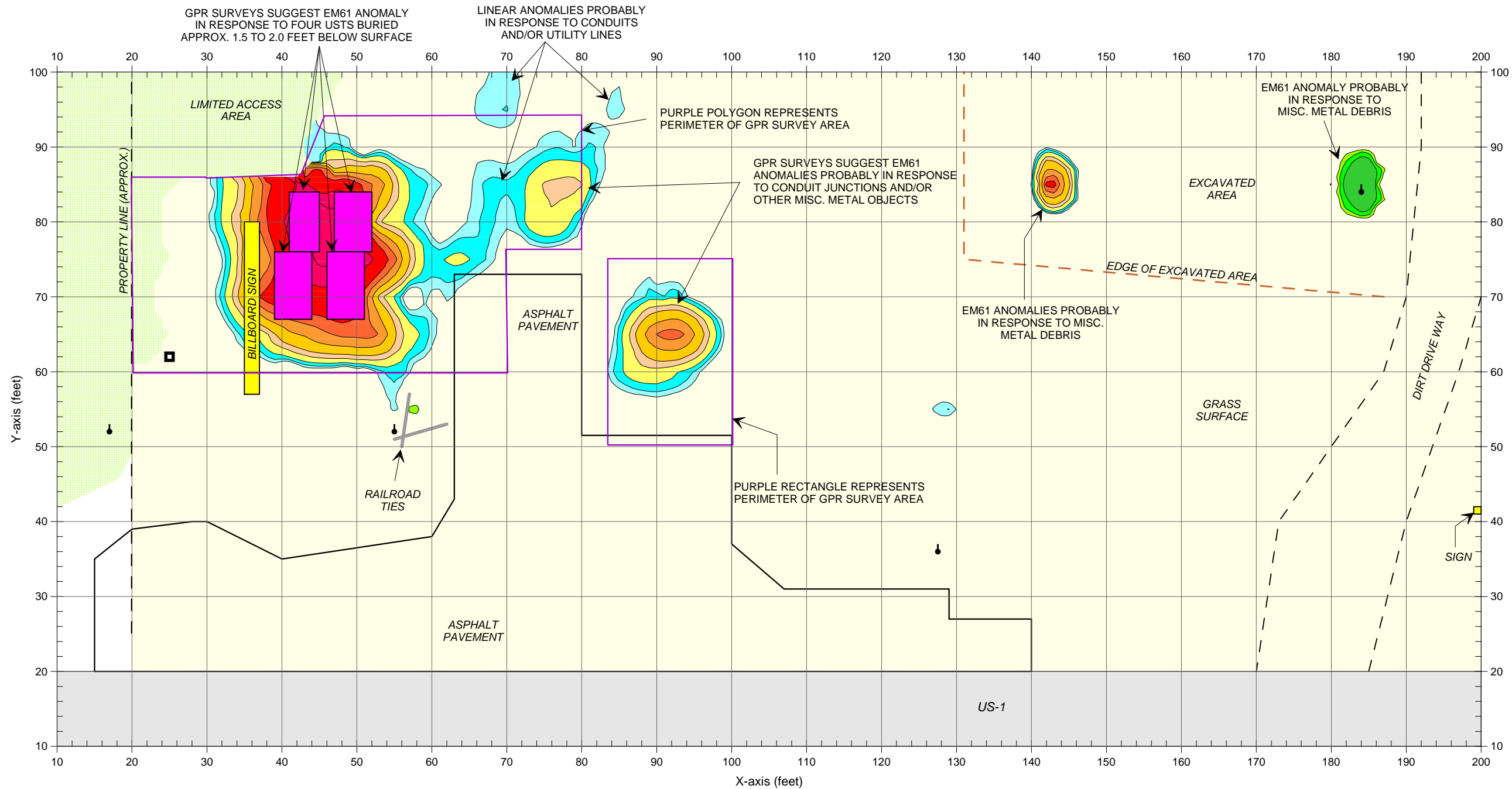


CLIENT	SOLUTIONS IES		DATE	08/17/06	DRWN	MJD
SITE	PARCEL 21 - JAMES BRIGMAN PROPERTY		LAY		CHKD	
CITY	MARSTON	STATE	NORTH CAROLINA	DWG		
TITLE	GEOPHYSICAL RESULTS		J.NO.	2006-200	FIGURE	

GRAPHIC SCALE IN FEET

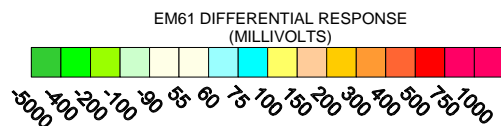
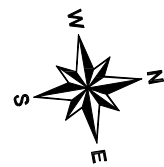
**EM61  
BOTTOM COIL  
RESULTS**

FIGURE 7



**LEGEND**

- EM61 SURVEY AREA: EM DATA ACQUIRED ALONG NORTHERLY- SOUTHERLY TRENDING LINES SPACED 5 FEET APART
- UTILITY POLE
- CABLE BOX
- PROBABLE UST, AS SUGGESTED BY GPR SURVEYS



Note: The contour plot shows the differential results of the EM61 metal detection survey in millivolts (mV). The differential response focuses on larger, buried metallic objects such as drums and USTs and ignores smaller miscellaneous, buried, metal debris. The EM metal detection data were collected on August 15, 2006 using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were acquired on August 16, 2006 using a Geophysical Survey Systems SIR 2000 instrument with a 400 MHz antenna.

GPR surveys suggest that the large, high amplitude, EM61 anomaly in the southwest portion of the survey area is probably in response to four metallic USTs.



CLIENT	SOLUTIONS IES		DATE	08/17/06	DRWN	MJD
SITE	PARCEL 21 - JAMES BRIGMAN PROPERTY		LAY		CHKD	
CITY	MARSTON	STATE	NORTH CAROLINA	DWG		
TITLE	GEOPHYSICAL RESULTS		J.ND	2006-200	FIGURE	

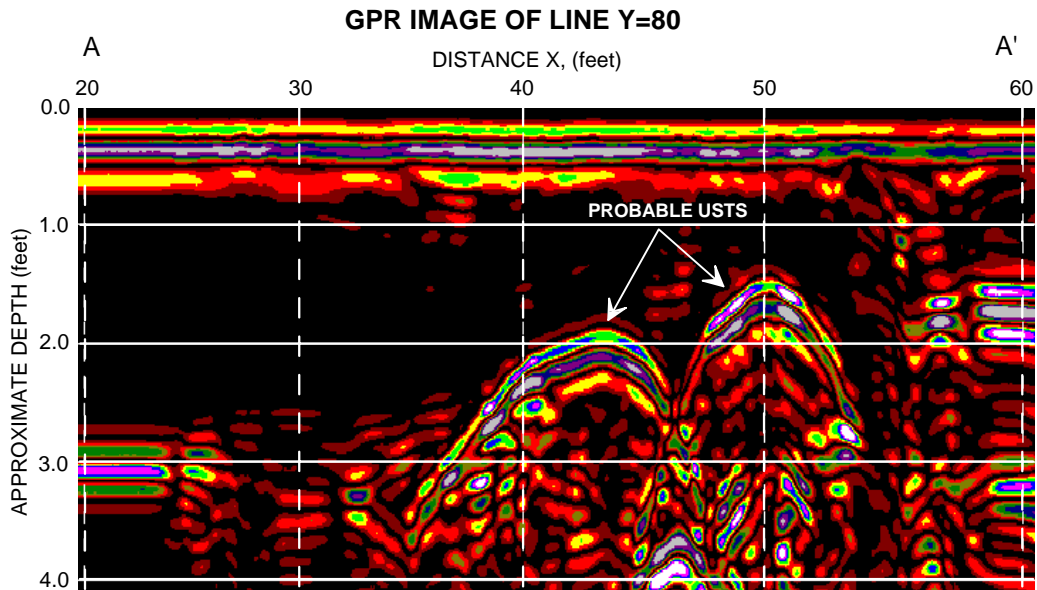
GRAPHIC SCALE IN FEET

EM61 DIFFERENTIAL RESULTS

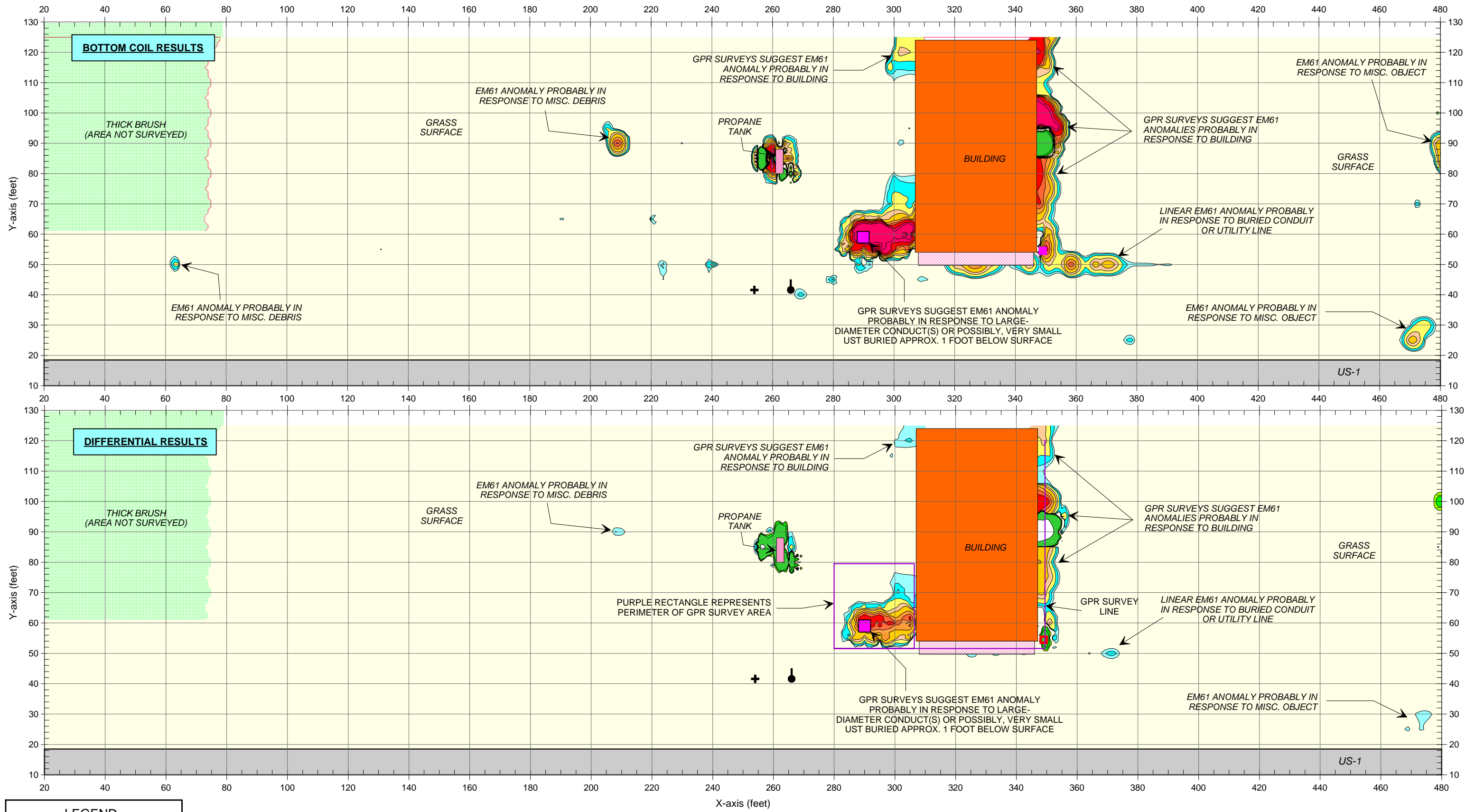
FIGURE 8



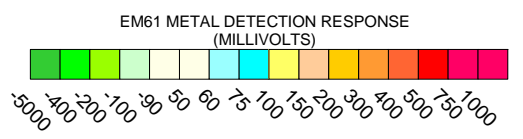
The photograph shows the location of four probable USTs buried 1.75 to 2.0 feet below surface, as suggested by the geophysical results at Parcel 21.



The GPR image obtained along a portion of survey line Y=80, shows the anomalies that are probably in response to USTs near X=43 and X=50, and buried approximately 2.0 and 1.5 feet below surface, respectively. The location of this GPR image is shown with a solid purple line in the above photograph.



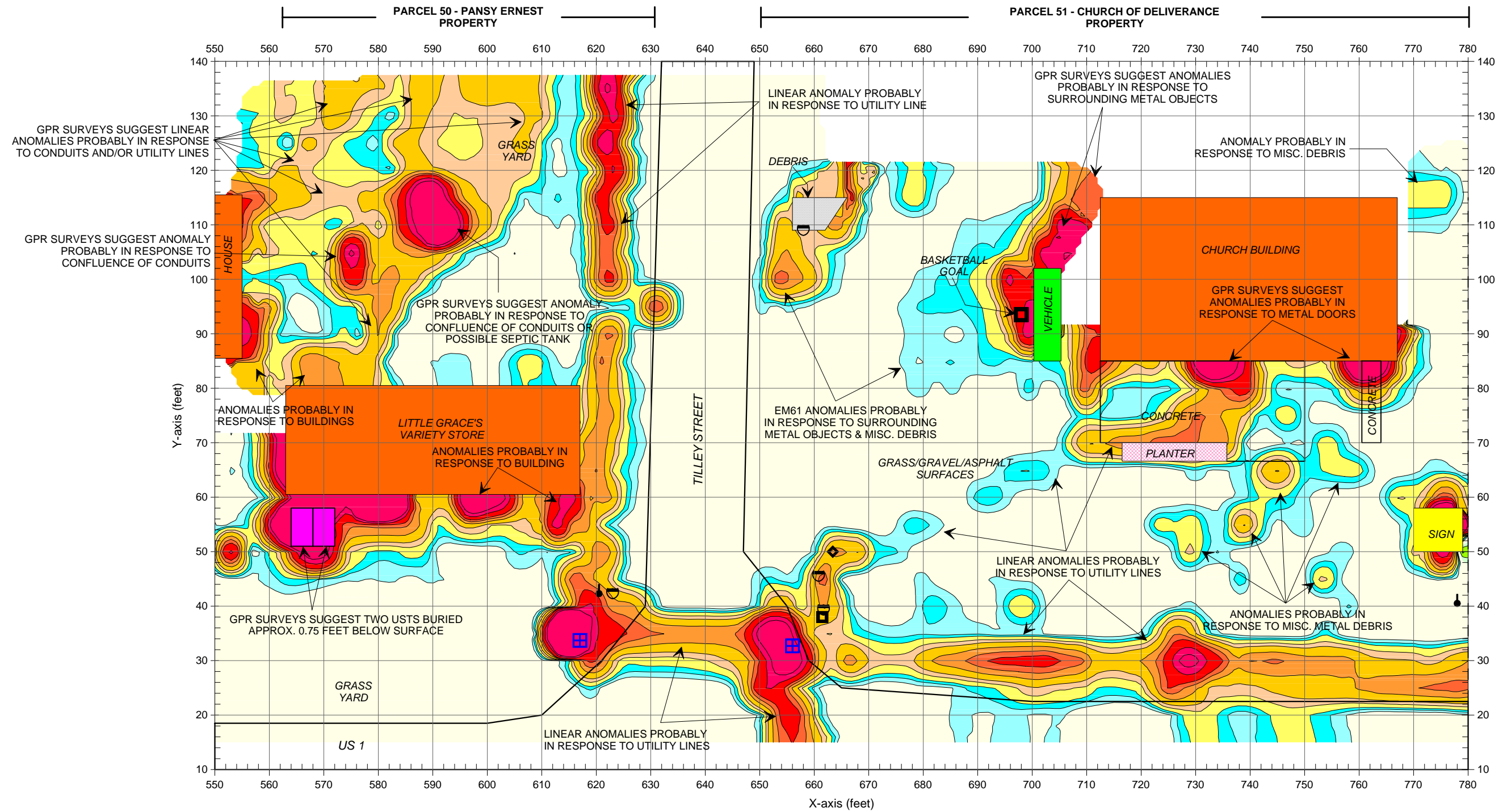
LEGEND	
	UTILITY CABLE BOX
	GUY WIRE
	UTILITY POLE
	PROBABLE CONDUIT OR POSSIBLE UST



CLIENT	SOLUTIONS IES	DATE	08/17/06	DRWN	MJD
SITE	PARCEL 48 - ROY BARRY BOSTICK PROPERTY	LAY		CHKD	
CITY	HOFFMAN	STATE	NORTH CAROLINA	DWG	
TITLE	GEOPHYSICAL RESULTS	J.N.O.	2006-200	FIGURE	

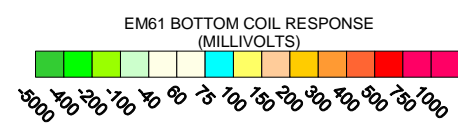
**EM61  
METAL DETECTION  
RESULTS**

FIGURE 10



Note: The contour plot shows the bottom coil (most sensitive) response of the EM61 instrument in millivolts (mV). The bottom coil response shows buried metallic objects regardless of size. The EM metal detection data were collected on July 26, 2006 using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were acquired on July 28, 2006 using a Geophysical Survey Systems SIR 2000 instrument with a 400 MHz antenna.

The majority of linear EM61 bottom coil anomalies shown above, are probably in response to buried utility lines or conduits. Negative EM anomalies (shaded in green) are probably in response to metallic surface objects. The geophysical investigation detected two probable USTs on Parcel 50.



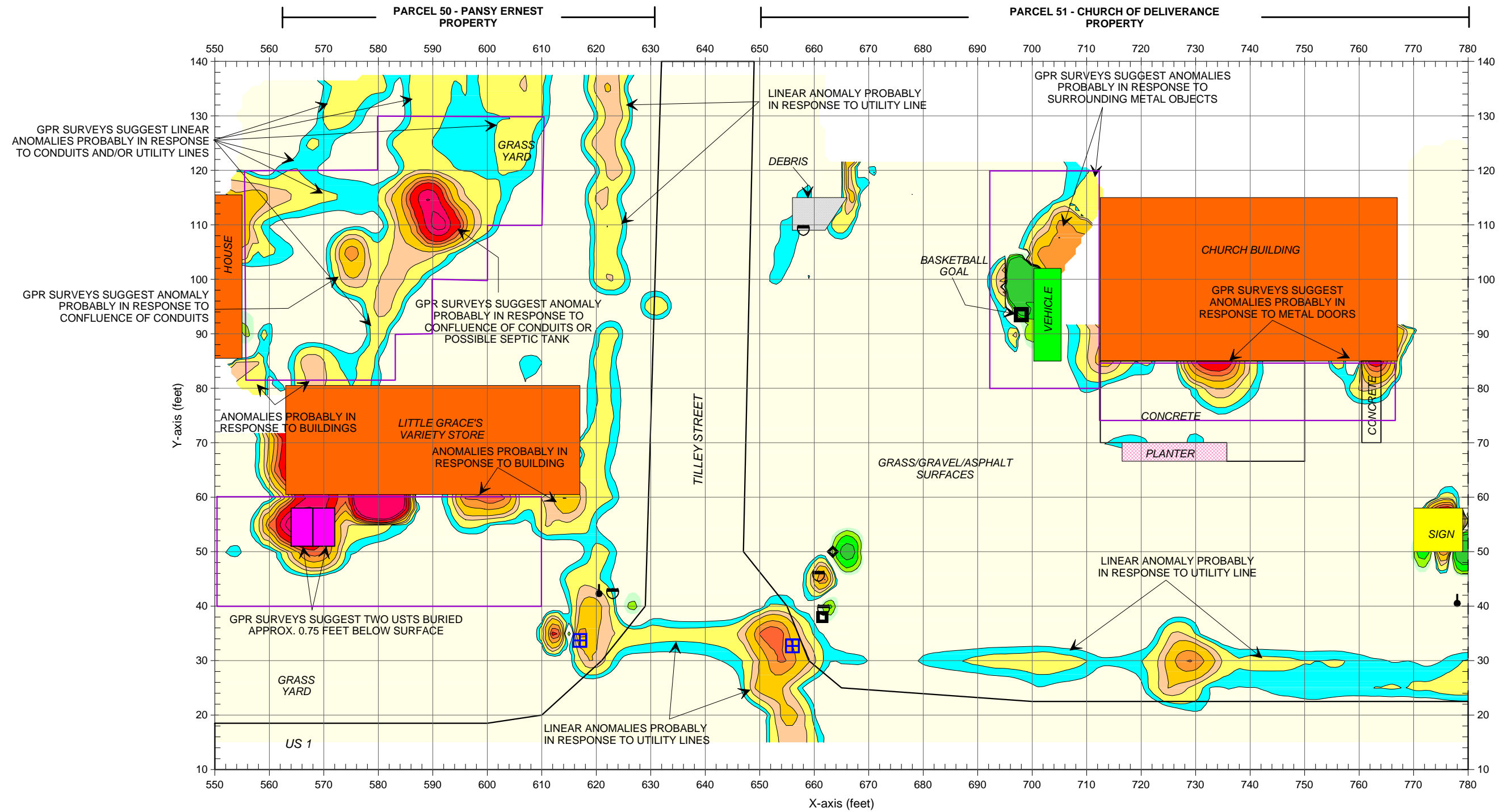
LEGEND	
	EM61 SURVEY AREA: EM DATA ACQUIRED ALONG NORTHEAST-SOUTHWEST TRENDING LINES SPACED 5 FEET APART
	STORM SEWER GRATE
	PHONE CABLE BOX
	GUY WIRE
	UTILITY POLE
	TRAFFIC SIGN
	STORM SEWER GRATE
	VENT/FILL PORT
	METAL POLE
	PROBABLE UST AS SUGGESTED BY THE GEOPHYSICAL RESULTS



CLIENT	SOLUTIONS IES		DATE	08/01/06	DRWN	MJD
SITE	PARCELS 50 & 51 (ERNEST & CHURCH PROPERTIES)		LAY		CHKD	
CITY	HOFFMAN	STATE	NORTH CAROLINA		DWG	
TITLE	GEOPHYSICAL RESULTS		J-NO.	2006-200	FIGURE	

**EM61  
BOTTOM COIL  
RESULTS**

FIGURE 11

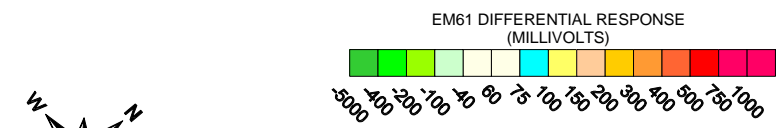


Note: The contour plot shows the differential results of the EM61 metal detection survey in millivolts (mV). The differential response focuses on larger, buried metallic objects such as drums and USTs and ignores smaller miscellaneous, buried, metal debris. The EM metal detection data were collected on July 26, 2006 using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were acquired on July 28, 2006 using a Geophysical Survey Systems SIR 2000 instrument with a 400 MHz antenna.

The majority of linear EM61 bottom coil anomalies shown above, are probably in response to buried utility lines or conduits. Negative EM anomalies (shaded in green) are probably in response to metallic surface objects. The geophysical investigation detected two probable USTs on Parcel 50.

**LEGEND**

EM61 SURVEY AREA: EM DATA ACQUIRED ALONG NORTHEAST-SOUTHWEST TRENDING LINES SPACED 5 FEET APART	TRAFFIC SIGN
STORM SEWER GRATE	STORM SEWER GRATE
PHONE CABLE BOX	VENT/FILL PORT
GUY WIRE	METAL POLE
UTILITY POLE	GPR SURVEY AREA
	PROBABLE UST AS SUGGESTED BY THE GEOPHYSICAL RESULTS



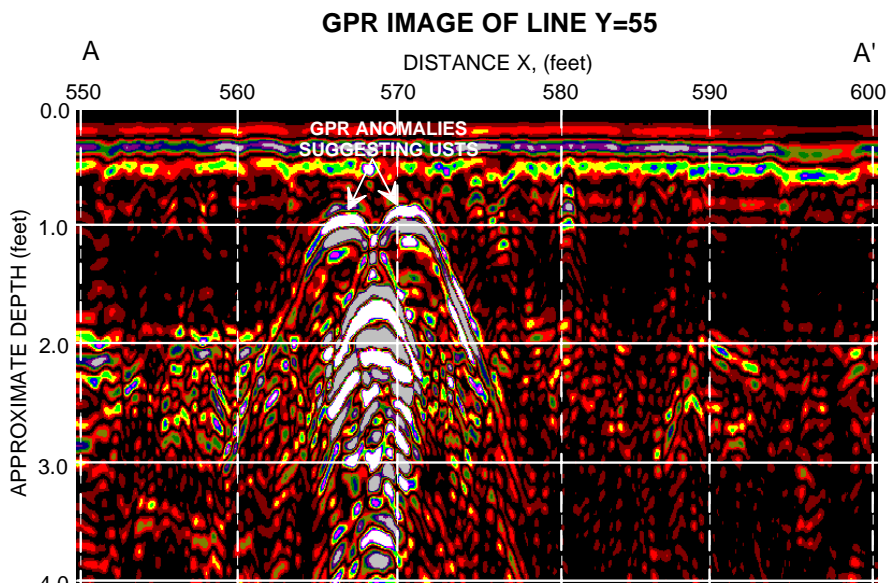
CLIENT	SOLUTIONS IES		DATE	08/01/06	DRWN	MJD
SITE	PARCELS 50 & 51 (ERNEST & CHURCH PROPERTIES)		LAY		CHKD	
CITY	HOFFMAN	STATE	NORTH CAROLINA		DWG	
TITLE	GEOPHYSICAL RESULTS		J-NO.	2006-200	FIGURE	

EM61 DIFFERENTIAL RESULTS

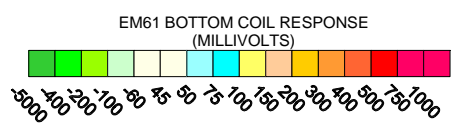
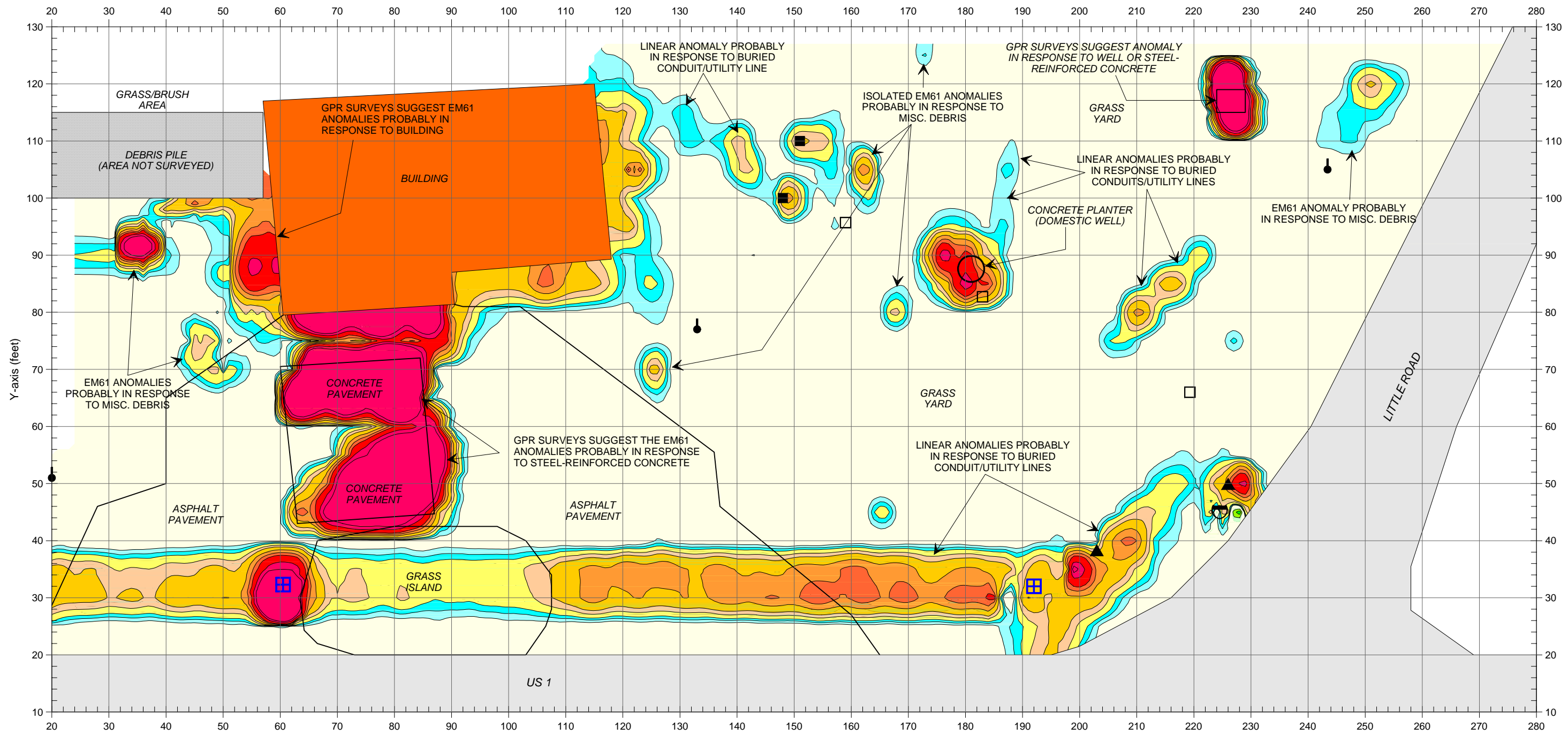
FIGURE 12



The photograph shows the location of two probable USTs buried approx. 0.75 feet below surface, as suggested by the geophysical results at Parcel 50.



The GPR image obtained along survey line Y=55 shows the anomalies that are probably in response to USTs near X=566 and X=570, and buried approximately 0.75 feet below surface. The location of this GPR image is shown with a solid purple line in the above photograph.



Note: The contour plot shows the bottom coil (most sensitive) response of the EM61 instrument in millivolts (mV). The bottom coil response shows buried metallic objects regardless of size. The EM metal detection data were collected on July 27, 2006 using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were acquired on August 16, 2006 using a Geophysical Survey Systems SIR 2000 instrument with a 400 MHz antenna.

The geophysical results suggest that the proposed ROW area does not contain metallic USTs.

LEGEND	
	EM61 SURVEY AREA: EM DATA ACQUIRED ALONG NORTHEAST-SOUTHWEST TRENDING LINES SPACED 5 FEET APART
	STORM SEWER GRATE
	CONCRETE BLOCK
	GUY WIRE
	UTILITY POLE
	TRAFFIC SIGN
	EDGE OF CULVERT
	CONCRETE ABUTMENT

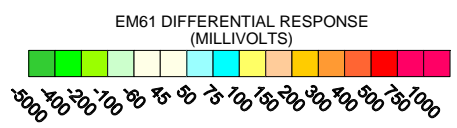
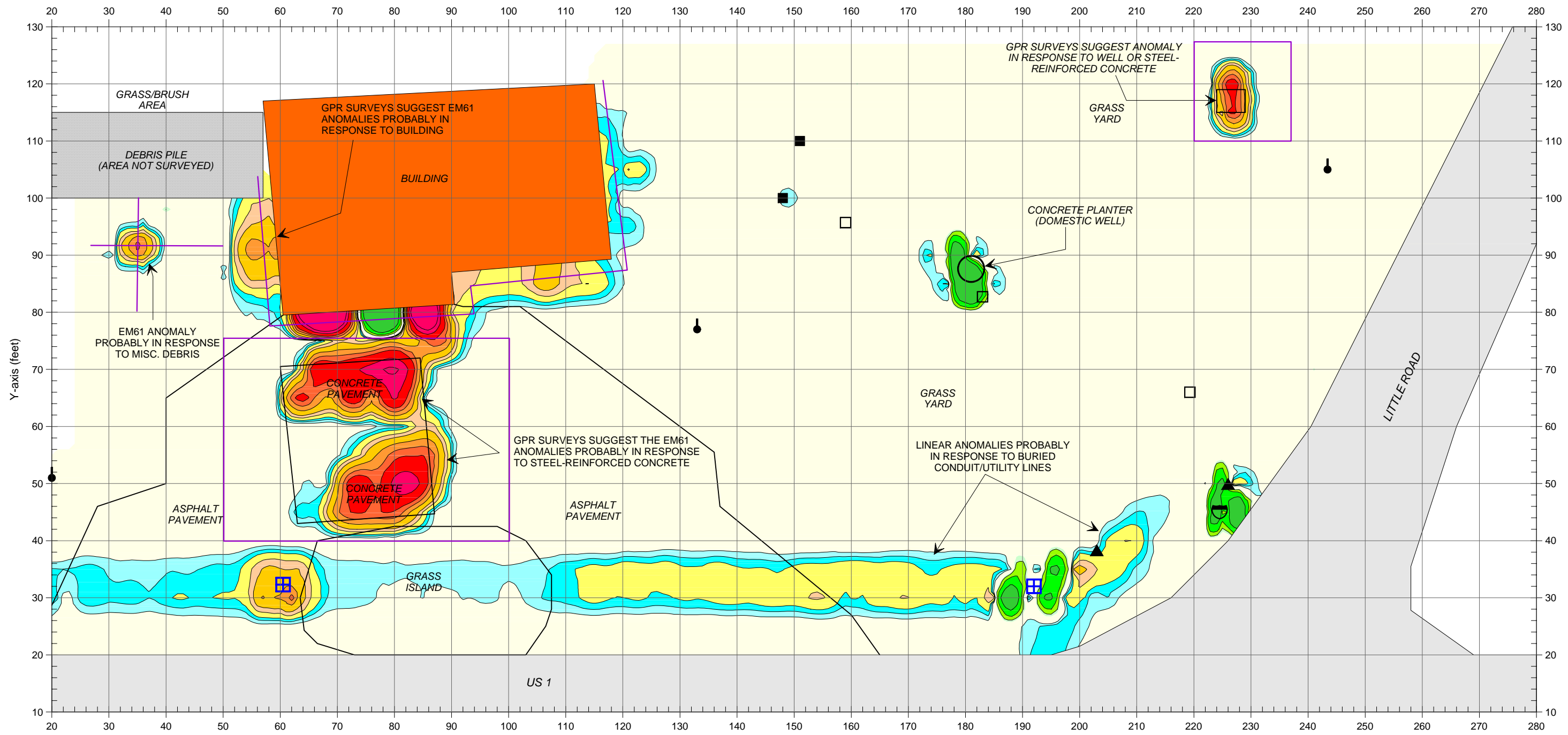


CLIENT	SOLUTIONS IES		DATE	08/01/06	DRWN	MJD
SITE	PARCEL 61 - COOPER & BROWN INC. PROPERTY		LAY		CHKD	
CITY	HOFFMAN	STATE	NORTH CAROLINA	DWG		
TITLE	GEOPHYSICAL RESULTS		JNO.	2006-200	FIGURE	

EM61  
BOTTOM COIL  
RESULTS

FIGURE 14





Note: The contour plot shows the differential results of the EM61 metal detection survey in millivolts (mV). The differential response focuses on larger, buried metallic objects such as drums and USTs and ignores smaller miscellaneous, buried, metal debris. The EM metal detection data were collected on July 27, 2006 using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were acquired on August 16, 2006 using a Geophysical Survey Systems SIR 2000 instrument with a 400 MHz antenna.

The geophysical results suggest the proposed ROW area does not contain metallic USTs.

LEGEND	
	EM61 SURVEY AREA: EM DATA ACQUIRED ALONG NORTHEAST-SOUTHWEST TRENDING LINES SPACED 5 FEET APART
	STORM SEWER GRATE
	CONCRETE BLOCK
	GUY WIRE
	UTILITY POLE
	TRAFFIC SIGN
	EDGE OF CULVERT
	CONCRETE ABUTMENT
	GPR SURVEY LINE
	GPR SURVEY AREA

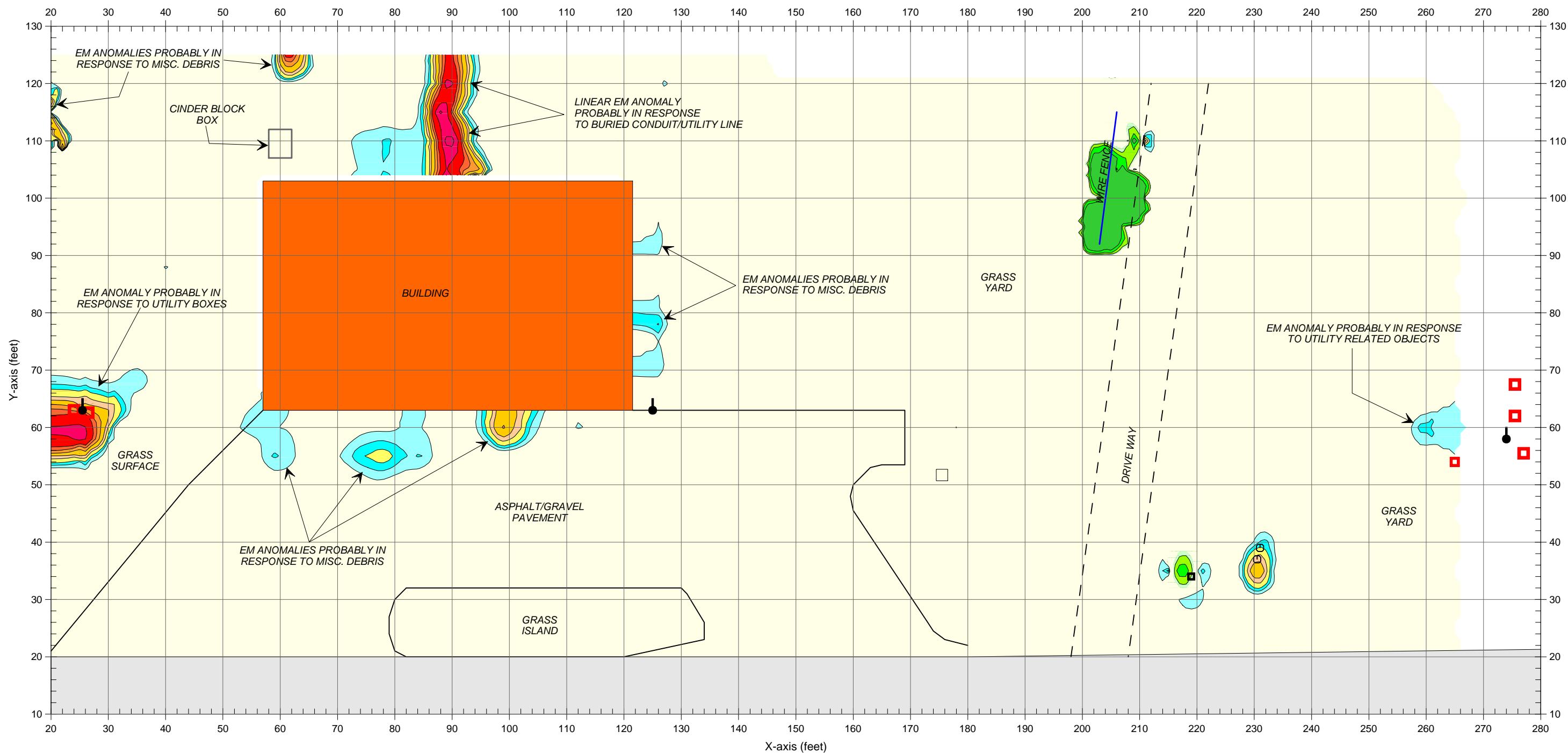


CLIENT	SOLUTIONS IES		DATE	08/01/06	DRWN	MJD
SITE	PARCEL 61 - COOPER & BROWN INC. PROPERTY		LAY		CHKD	
CITY	HOFFMAN	STATE	NORTH CAROLINA	DWG		
TITLE	GEOPHYSICAL RESULTS		JNO.	2006-200	FIGURE	

GRAPHIC SCALE IN METERS

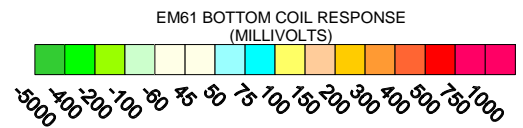
### EM61 DIFFERENTIAL RESULTS

FIGURE 15



**LEGEND**

- EM61 SURVEY AREA: EM DATA ACQUIRED ALONG NORTHERLY-SOUTHERLY TRENDING LINES SPACED 5 FEET APART
- ELECTRICAL OR UTILITY BOX
- WATER METER OR VALVE COVER
- GUY WIRE
- UTILITY POLE
- TRAFFIC SIGN
- MAIL BOX



Note: The contour plot shows the bottom coil (most sensitive) response of the EM61 instrument in millivolts (mV). The bottom coil response shows buried metallic objects regardless of size. The EM metal detection data were collected on July 27 and August 14, 2006 using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were acquired on July 28, 2006 using a Geophysical Survey Systems SIR 2000 instrument with a 400 MHz antenna.

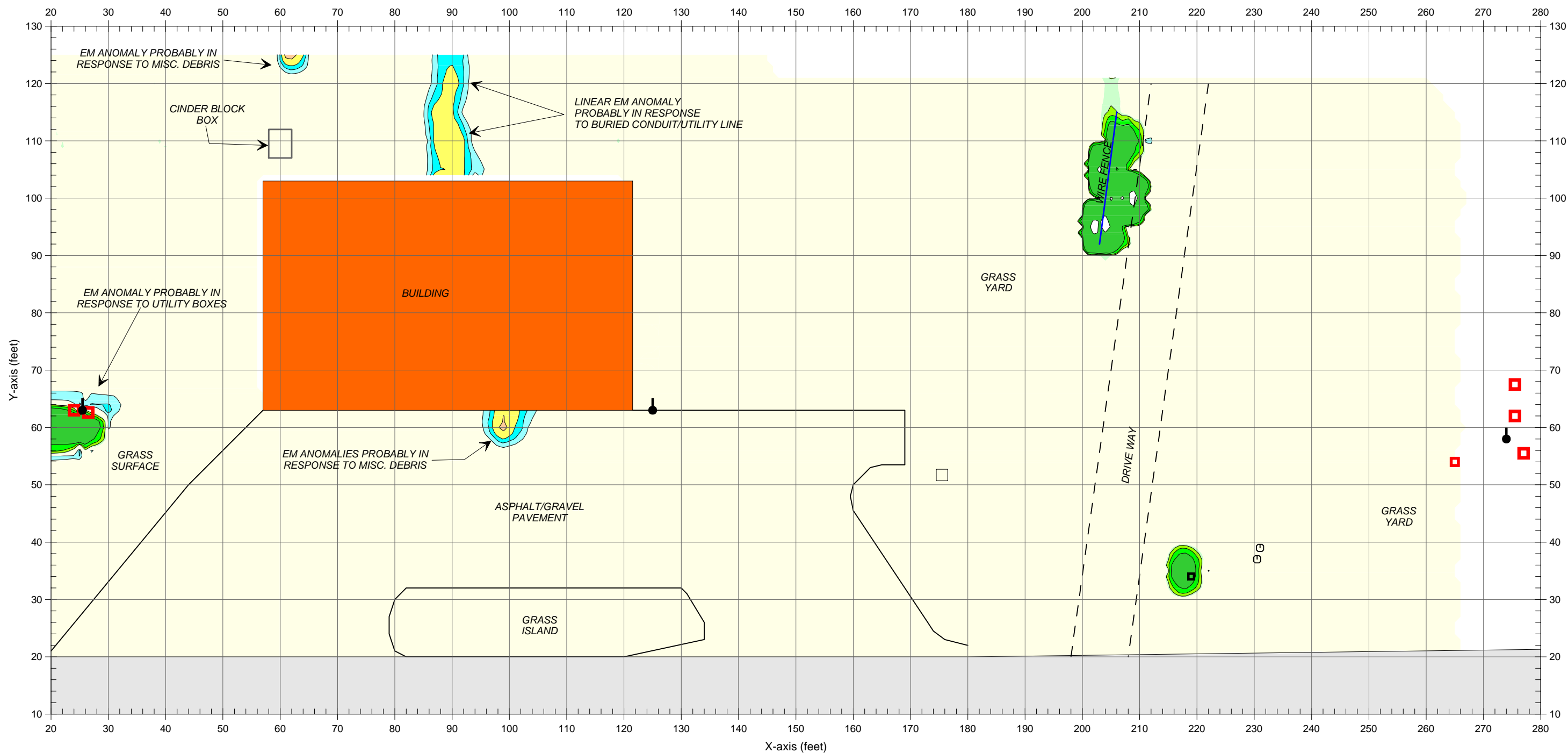
The geophysical investigation suggests that the survey area does not contain metallic USTs.



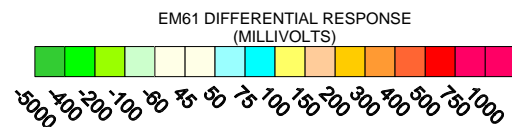
CLIENT	SOLUTIONS IES		DATE	08/17/06	DRWN	MJD
SITE	PARCEL 70 - DELIA LASSITER PROPERTY		LAY		CHKD	
CITY	HOFFMAN	STATE	NORTH CAROLINA	DWG		
TITLE	GEOPHYSICAL RESULTS		J-NO	2006-200	FIGURE	

EM61  
BOTTOM COIL  
RESULTS

FIGURE 16



LEGEND	
	EM61 SURVEY AREA: EM DATA ACQUIRED ALONG NORTHERLY-SOUTHERLY TRENDING LINES SPACED 5 FEET APART
	ELECTRICAL OR UTILITY BOX
	WATER METER OR VALVE COVER
	GUY WIRE
	UTILITY POLE
	TRAFFIC SIGN
	MAIL BOX



Note: The contour plot shows the differential results of the EM61 metal detection survey in millivolts (mV). The differential response focuses on larger, buried metallic objects such as drums and USTs and ignores smaller miscellaneous, buried, metal debris. The EM metal detection data were collected on July 27 and August 14, 2006 using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were acquired on July 28, 2006 using a Geophysical Survey Systems SIR 2000 instrument with a 400 MHz antenna.

The geophysical investigation suggests that the survey area does not contain metallic USTs.

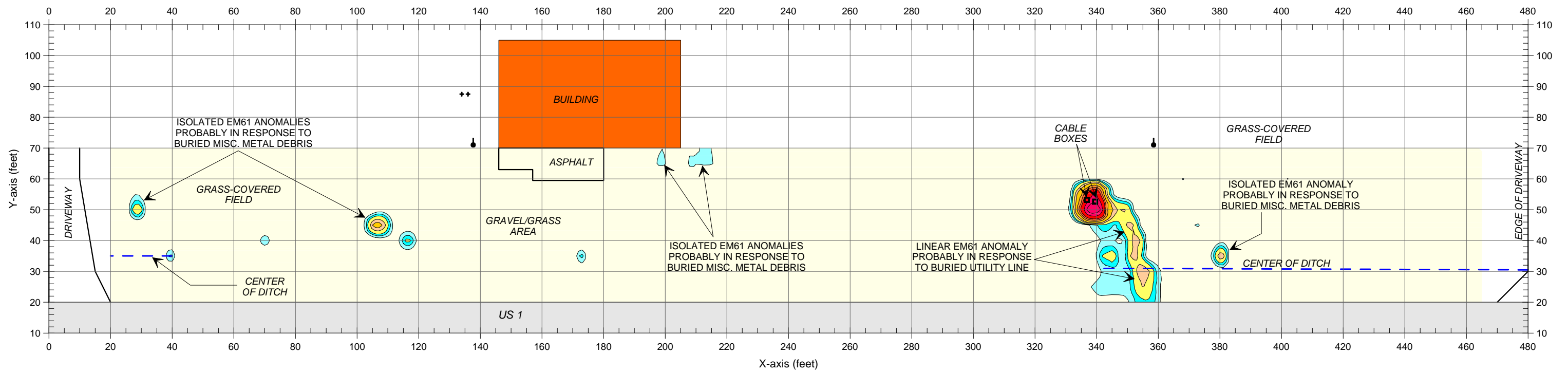


CLIENT	SOLUTIONS IES		DATE	08/17/06	DRWN	MJD
SITE	PARCEL 70 - DELIA LASSITER PROPERTY		LAY		CHKD	
CITY	HOFFMAN	STATE	NORTH CAROLINA	DWG		
TITLE	GEOPHYSICAL RESULTS		J-NO	2006-200	FIGURE	

GRAPHIC SCALE IN FEET

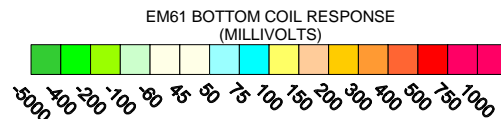
### EM61 DIFFERENTIAL RESULTS

FIGURE 17



**LEGEND**

- EM61 SURVEY AREA: EM DATA ACQUIRED ALONG NORTHEAST-SOUTHWEST TRENDING LINES SPACED 5 FEET APART
- PHONE CABLE BOX
- GUY WIRE
- UTILITY POLE



Note: The contour plot shows the bottom coil (most sensitive) response of the EM61 instrument in millivolts (mV). The bottom coil response shows buried metallic objects regardless of size. The EM metal detection data were collected on July 27, 2006 using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were acquired on July 28, 2006 using a Geophysical Survey Systems SIR 2000 instrument with a 400 MHz antenna.

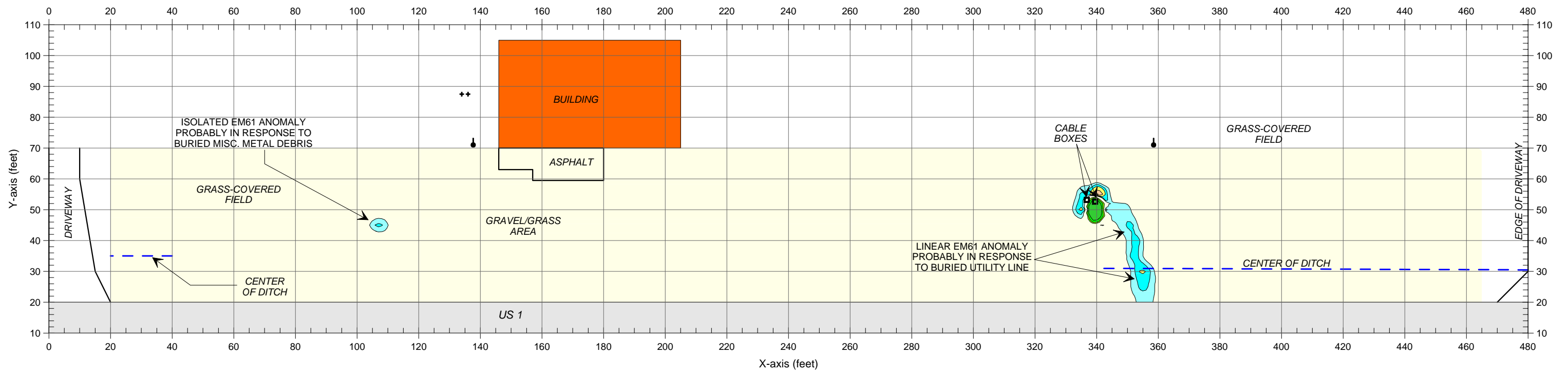
The geophysical investigation suggests that the survey area does not contain metallic USTs.



CLIENT	SOLUTIONS IES		DATE	08/01/06	DRWN	MJD
SITE	PARCEL 22 - IVEY LITTLE PROPERTY		LAY		CHKD	
CITY	HOFFMAN	STATE	NORTH CAROLINA	DWG		
TITLE	GEOPHYSICAL RESULTS		J-NO	2006-200	FIGURE	

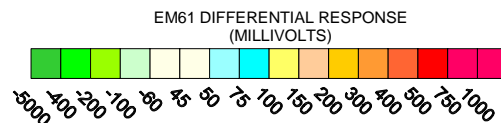
**EM61  
BOTTOM COIL  
RESULTS**

FIGURE 18



**LEGEND**

- EM61 SURVEY AREA: EM DATA ACQUIRED ALONG NORTHEAST-SOUTHWEST TRENDING LINES SPACED 5 FEET APART
- PHONE CABLE BOX
- GUY WIRE
- UTILITY POLE



Note: The contour plot shows the differential results of the EM61 metal detection survey in millivolts (mV). The differential response focuses on larger, buried metallic objects such as drums and USTs and ignores smaller miscellaneous, buried, metal debris. The EM metal detection data were collected on July 27, 2006 using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were acquired on July 28, 2006 using a Geophysical Survey Systems SIR 2000 instrument with a 400 MHz antenna.

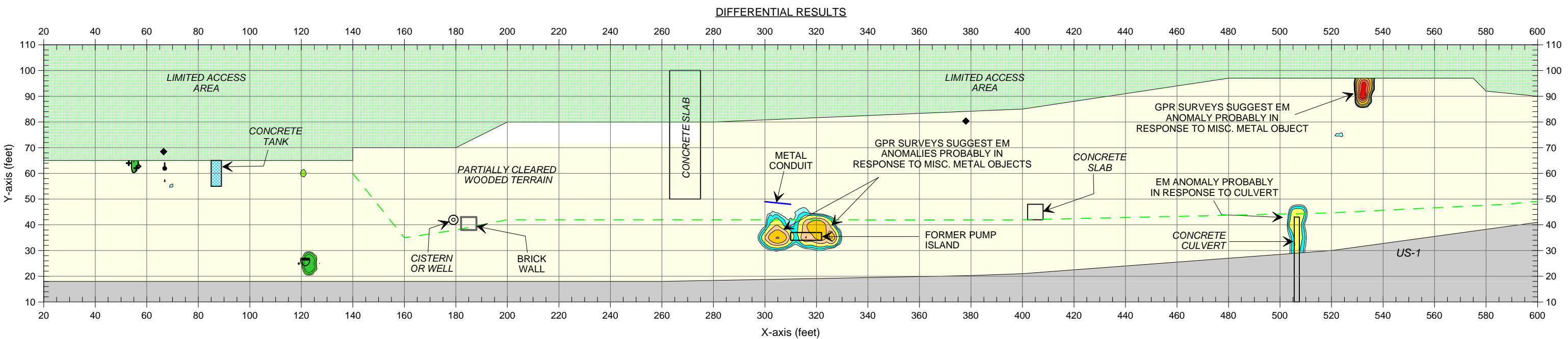
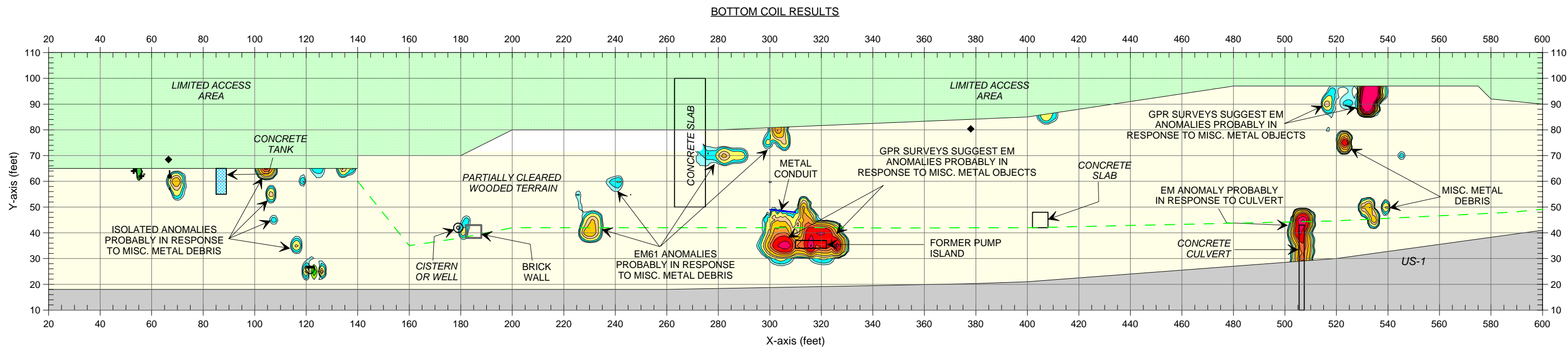
The geophysical investigation suggests that the survey area does not contain metallic USTs.



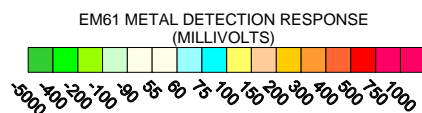
CLIENT	SOLUTIONS IES		DATE	08/01/06	DRWN	MJD
SITE	PARCEL 22 - IVEY LITTLE PROPERTY		LAY		CHKD	
CITY	HOFFMAN	STATE	NORTH CAROLINA	DWG		
TITLE	GEOPHYSICAL RESULTS		J-NO	2006-200	FIGURE	

GRAPHIC SCALE IN METERS

**EM61  
DIFFERENTIAL  
RESULTS**



LEGEND	
	EM61 SURVEY AREA: EM DATA ACQUIRED ALONG EASTERLY-WESTERLY TRENDING LINES SPACED 5 FEET APART
	RIGHT-OF-WAY MARKER
	GUY WIRE
	UTILITY POLE
	TRAFFIC SIGN



Note: The contour plots show the bottom coil (most sensitive) response of the EM61 instrument and the differential response in millivolts (mV). The bottom coil response shows buried metallic objects regardless of size. The differential response focuses on larger, buried metallic objects such as drums and USTs and ignores smaller miscellaneous, buried, metal debris. The EM metal detection data were collected on August 14 & 28, 2006 using a Geonics EM61 instrument. Ground penetrating radar (GPR) data were acquired on August 15 & 28, 2006 using a Geophysical Survey Systems SIR 2000 instrument with a 400 MHz antenna.

The geophysical investigation suggests that the survey area does not contain metallic USTs.



CLIENT	SOLUTIONS IES		DATE	08/17/06	DRAWN	MJD
SITE	PARCEL 68 - JAMES PUGH PROPERTY		LAY		CHECK	
CITY	HOFFMAN	STATE	NORTH CAROLINA		DWG	
TITLE	GEOPHYSICAL RESULTS		J.NO.	2006-200	FIGURE	

## EM61 METAL DETECTION RESULTS