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January 2, 2012

Mr. Andy Winch
Virginia Department of Transportation
1700 N. Main Street
Suffolk, Virginia 23434

Re: Geophysical Survey
Norfolk Naval Base (Interstate 564)
VDOT Project Number R000-122-108, 18968, 605
MM&A Project Number VHAMP204

Dear Mr. Winch:

Marshall Miller & Associates, Inc. (MM&A) assisted the Virginia Department of Transportation (VDOT) with a geophysical survey at the Naval Station Norfolk (NSN) in Norfolk, Virginia (see the Vicinity Map, **Attachment I**). The survey investigated a proposed railway realignment in conjunction with the Interstate 564 improvement project. The project involves relocating a section of railroad track onto portions of the NSN's Camp Allen Landfill (CALF) and Camp Allen Salvage Yard (CASY), which are Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) units. The geophysical survey was performed to evaluate for buried debris along the proposed rail corridor at these CERCLA units.

The geophysics was proposed in the May 5, 2011 *Sampling and Analysis Plan* (SAP) by MM&A, which was approved by the Navy on June 6, 2011. The geophysical study was performed from approximate railroad construction station numbers 118 to 130, which are shown on Plan Sheet Numbers 15 and 16 in **Attachment II**.

SITE HISTORY-CALF

The northern tip of the CALF *Area A* coincides with the proposed railroad corridor (see **Sheet 15, Attachment II**). The *Area A* landfill, which operated from the mid-1940's until approximately 1974, was used for the disposal of metal plating/parts cleaning sludge, paint-

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stripping residue, various chlorinated organic solvents, surplus chemicals, pesticides and power plant ash.

The U.S. Navy completed a remedial investigation and feasibility study (RI/FS) of the CALF in 1994. The Navy signed a Decision Document in July 1995 requiring localized treatment of groundwater and soil using vacuum extraction. A dual-phase vapor extraction (DPVE) for hot spots in the *Area A* landfill began operation in May 1998. The continuous groundwater extraction and treatment system began in November 1998. The Navy is performing a long term monitoring program for the CALF (and CASY area) to evaluate remedial performance.

SITE HISTORY-CASY

The northern portion of the CASY is located within the proposed railroad corridor (see **Sheet 16, Attachment II**). The CASY operated from the 1940s until 1995, providing an area for salvaging and processing scrap materials generated at the NSN. CASY activities have included storage of waste oils, used chemicals (acids, paint thinners, solvents, pesticides) and scrap industrial/commercial equipment. Metal smelting, miscellaneous burning and recycling also occurred at the CASY.

The Navy conducted a preliminary assessment/site investigation (PA/SI) for the CASY in May 1994. The investigation indicated that soils beneath the area were contaminated with polychlorinated biphenyls (PCBs), pesticides, and metals. A soil removal action was conducted for a portion of the site in 1998. Additional sampling was conducted in December 1998 to fill gaps in historical data for the northern portion of the site, and the *Final Remedial Investigation Report and Risk Assessment* was submitted in November 1999. The 1999 study concluded that the northern portion of the CASY posed no unacceptable human health risks. The Navy placed a one-foot thick (minimum) soil cover with a specified surface slope as part of the remedy prescribed in the CASY's Final Record of Decision (ROD). In 2010, the construction of a new sports recreational facility (Fleet Rec Park) was completed on the CASY.

CONSTRUCTION PLANS

VDOT and Norfolk Southern Corporation (NS) plan to obtain easements from the Navy to construct and/or operate the I-564 Intermodal Connector Highway and relocated railroad track. The current rail design sheets from **Attachment II** are summarized as follows:

- Approximately 1,900 linear feet of rail corridor is to be re-located, which includes portions of the CALF (approximately 75 feet) and CASY (approximately 360 feet).

- The average rail easement width is 82 feet.

- The approximate depths to proposed grade for the rail are as follows: 1.3 feet to 2 feet in the CALF area and at grade to 0.7 feet deep in the CASY. This grade does not include excavation depths to place the foundation (ballast) or potential "over excavation" of geotechnically unsuitable material.

- The design calls for an open stormwater drainage ditch paralleling the south side of the track. The approximate depths to the bottom of the proposed drainage ditch are as follows: 2.75 feet to 3 feet in the CALF area and 4 feet to 5 feet in the CASY. The drainage ditch is typically within 30 feet of the proposed track.

- The VDOT team is designing the rail and associated stormwater drainage elevation as high as practical to limit excavation and remain above the groundwater table. The VDOT team is also attempting to eliminate or reduce the number of cross drains beneath the rail in the CALF and CASY area to reduce restrictions for future maintenance of the rail line. Geotechnical information is being collected to advance the design details.

GEOPHYSICAL SURVEY

MM&A requested assistance from Geo Solutions Ltd. of Raleigh, North Carolina to complete the geophysical survey, which was performed on October 25, 2011. The survey was performed using a multifrequency electromagnetic (EM) detector and ground-penetrating radar (GPR). EM measures the electrical conductivity of earth materials beneath the area of interest. The instrument, which emits electromagnetic pulses of energy into the ground, receives a modified return signal, which is indicative of the type of materials in the subsurface. A limited GPR survey was conducted on a portion of the site where anomalous EM results indicate potential buried debris or other anomalous subsurface conditions. GPR is capable of detecting buried targets when the electrical conductivity of buried materials differs from that of the surrounding soil matrix, causing outgoing radar energy to be reflected back to the surface. The results of the geophysical survey are provided in **Attachment III** and summarized as follows.

- Suspected landfill material is present at the extreme western edge of the investigation area as evident by the presence of red hues in **Figures 2 and 3 (Attachment III)**. This anomalous area includes the northernmost extent of the CALF. With respect to road plans, the anomalous area extends from approximately stations 118 to 121, which is consistent with a *Phase II Environmental Site Assessment (ESA)* (MM&A, June 20, 2003) that encountered fill debris in that section.
- Based on GPR data, it is estimated that the depth of burial within the suspected landfill is approximately 7 to 9 feet below the surface. The 2003 ESA extended to a maximum depth of approximately 5.5 feet and encountered fill materials including metal, brick, concrete, glass, and plywood, in that section identified by the GPR study.
- The remaining anomalies along the proposed rail corridor appear related to underground utilities or obvious surface features such as a chain link fence (see **Figure 4, Attachment III**).

MM&A appreciates the opportunity to assist VDOT on this project. Please forward a copy of this geophysical survey to the project team including officials from the Navy and NS. MM&A recommends proceeding with the subsurface sampling once NS has concurred with the SAP approach. If you have any questions or require additional information, please do not hesitate to call our office.

Sincerely,

MARSHALL MILLER & ASSOCIATES, INC.

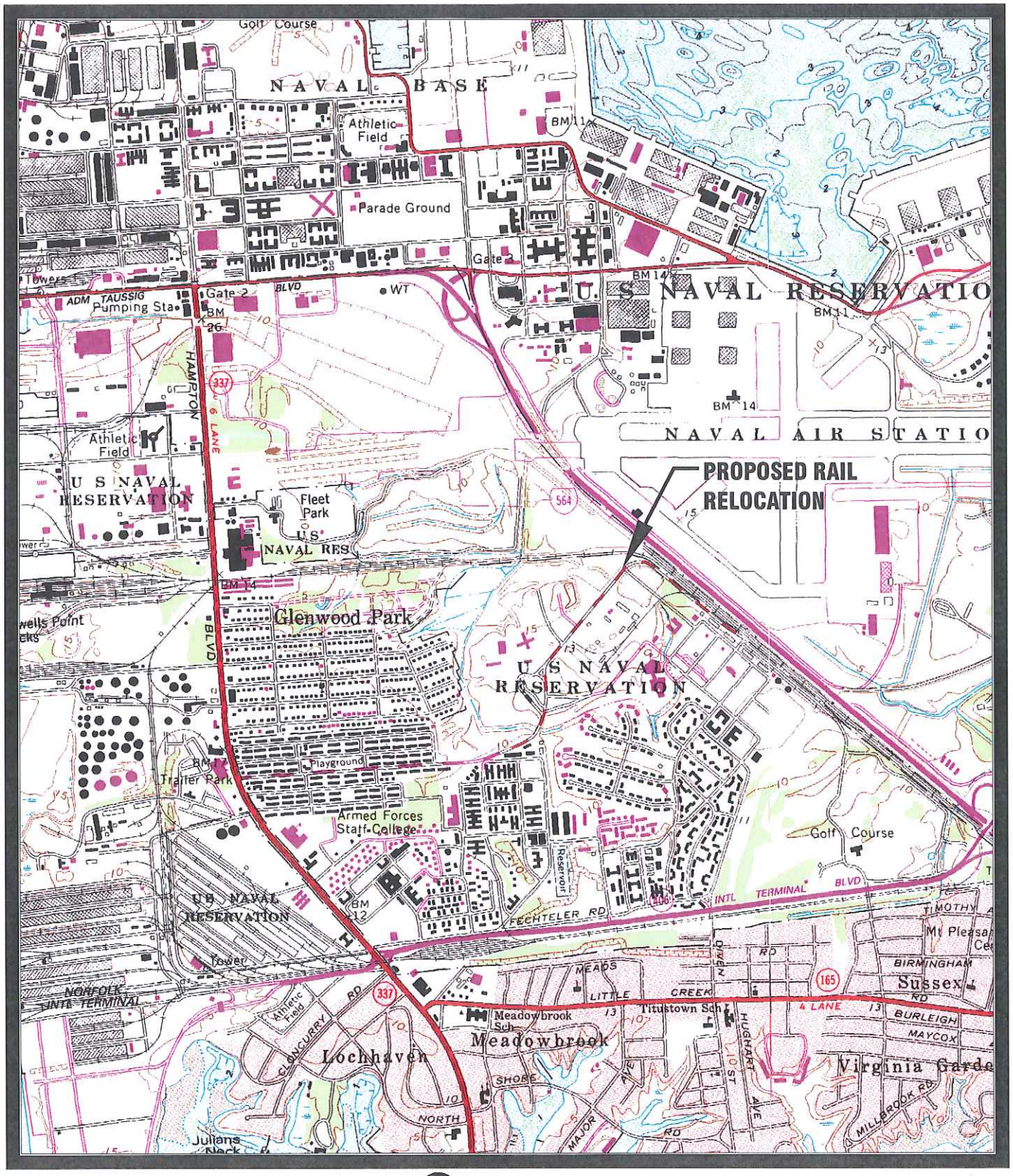
Joshua P. Shrader
Project Scientist

James T. Martin, Jr., P.G.
Senior Scientist

JPS/JTM/cj
Enclosures
cc: File: VHAMP204

Attachment I

Vicinity Map



Prepared by:

MARSHALL MILLER & ASSOCIATES®

VHAMP204 11/29/2011

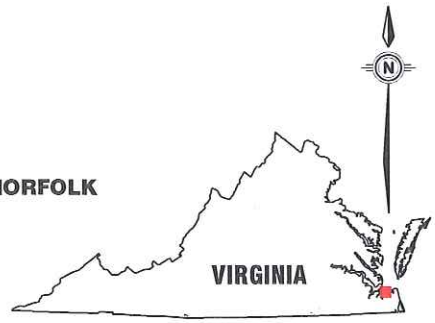
USGS 7.5' NORFOLK NORTH, VA QUADRANGLE - 1965
PHOTOREVISED 1986, PHOTOINSPECTED 1989
CONTOUR INTERVAL=5'

VICINITY MAP

I-564 INTERMODAL CONNECTOR - NAVAL STATION NORFOLK
NORFOLK, VIRGINIA

2,000' 0 2,000'

SCALE 1:24.000



Attachment II

VDOT Plan Sheets

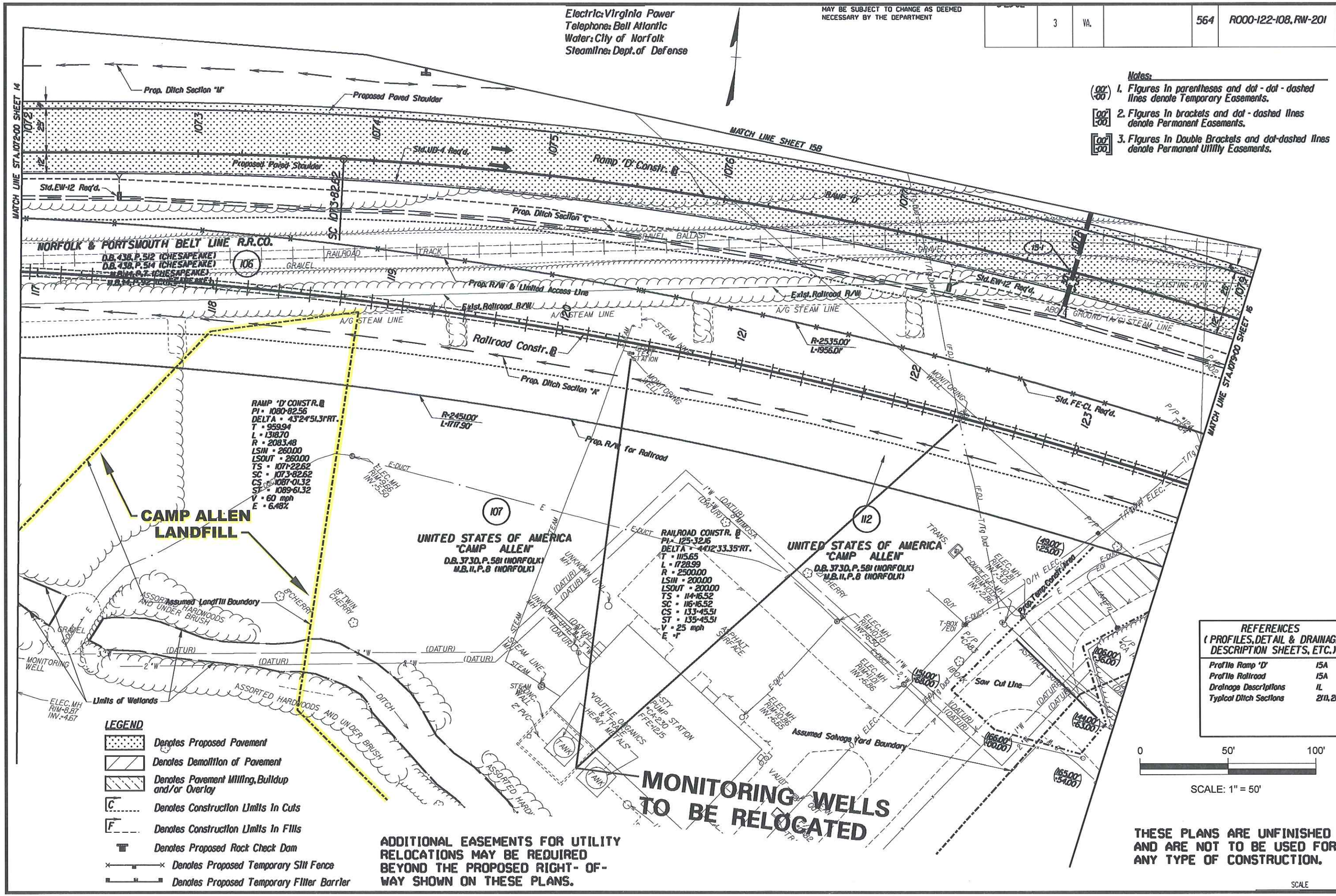
	3	VA.		564	R000-122-108, RW-201

MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

Electric: Virginia Power
Telephone: Bell Atlantic
Water: City of Norfolk
Steamline: Dept. of Defense

Notes:

1. Figures in parentheses and dot - dot - dashed lines denote Temporary Easements.
2. Figures in brackets and dot - dashed lines denote Permanent Easements.
3. Figures in Double Brackets and dot-dashed lines denote Permanent Utility Easements.



ADDITIONAL EASEMENTS FOR UTILITY RELOCATIONS MAY BE REQUIRED BEYOND THE PROPOSED RIGHT- OF- WAY SHOWN ON THESE PLANS.

REFERENCES (PROFILES, DETAIL & DRAINAGE DESCRIPTION SHEETS, ETC.)

Profile Ramp 'D'	15A
Profile Railroad	15A
Drainage Descriptions	1L
Typical Ditch Sections	2(1), 2J

0 50' 100'

SCALE: 1" = 50'

THESE PLANS ARE UNFINISHED AND ARE NOT TO BE USED FOR ANY TYPE OF CONSTRUCTION.

SCALE

Marshall Miller and Associates
Geology, Environmental Sciences & Engineering, Geophysics
Bluefield, VA · Lexington, KY · Raleigh, NC
Richmond, VA · Charleston, WV · Harrisburg, PA
Kansas City, KS · Kingsport, TN · Morgantown, WV
Bossier City, LA

Prepared By: MARSHALL MILLER & ASSOCIATES

Prepared For: VDOT

DESIGNED:	JTM
DRAWN:	DES
CHECKED:	JTM
DATE:	01/02/2012
SCALE:	AS SHOWN
PROJECT NO.:	VHAMP204
FILE NO.:	VHAMP204_SITE_GEO.dwg

I-564 INTERMODAL CONNECTOR
NORFOLK, VIRGINIA

SITE PLAN

SHEET 15

12-07.01	REGION		PROJECT	ROUTE
	3	VA.		564

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

UTILITY OWNERS
Electric: Virginia Power
Telephone: Bell Atlantic
Steamline: Dept. of Defense

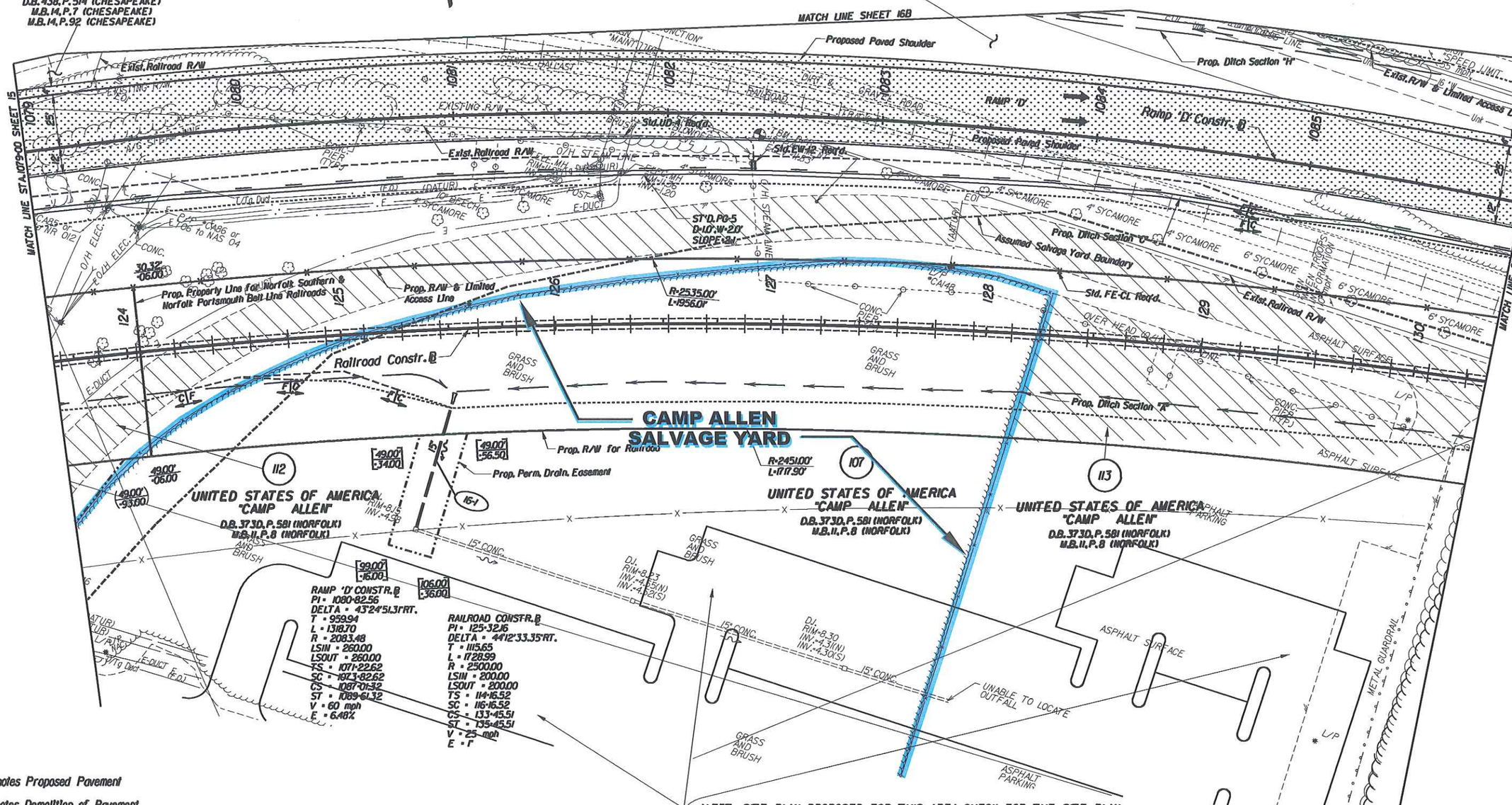
ADDITIONAL EASEMENTS FOR UTILITY RELOCATIONS MAY BE REQUIRED BEYOND THE PROPOSED RIGHT-OF-WAY SHOWN ON THESE PLANS.

(106)

NORFOLK & PORTSMOUTH BELT LINE R.R.CO.
D.B. 438, P. 512 (CHESAPEAKE)
D.B. 438, P. 514 (CHESAPEAKE)
M.B. 14, P. 7 (CHESAPEAKE)
M.B. 14, P. 92 (CHESAPEAKE)

(108)

NORFOLK SOUTHERN
D.B. 289, P. 449 (CHESAPEAKE)
D.B. 289, P. 451 (PLAT) (CHESAPEAKE)
D.B. 437, P. 669 (NORFOLK)
D.B. 428, P. 537 (NORFOLK)
D.B. 293, P. 295 (CHESAPEAKE)
D.B. 293, P. 296 (PLAT) (CHESAPEAKE)
D.B. 293, P. 489 (CHESAPEAKE)
D.B. 293, P. 491 (PLAT) (CHESAPEAKE)



ALERT: SITE PLAN PROPOSED FOR THIS AREA. CHECK FOR THE SITE PLAN CONSTRUCTION AT EACH STAGE OF PROJECT DEVELOPMENT AND ORDER ADDITIONAL SURVEY WHEN CONSTRUCTED. STATUS OF ANY PROFFERED R/W SHOULD BE CHECKED AT R/W STAGE.

SCALE: 1" = 50'

THESE PLANS A
AND ARE NOT T
ANY TYPE OF C

LEGEND

- Denotes Proposed Pavement
- Denotes Demolition of Pavement
- Denotes Pavement Milling, Buildup and/or Overlay
- C — Denotes Construction Limits In Cuts
- F — Denotes Construction Limits In Fills
- Denotes Proposed Rock Check Dam
- Denotes Proposed Temporary Silt Fence
- Denotes Proposed Temporary Filter Barrier

Notes:

(00'/-00') 1. Figures in parentheses and dot - dot - dashed lines denote Temporary Easements.

[00'/-00'] 2. Figures in brackets and dot - dashed lines denote Permanent Easements.

[[00'/-00']] 3. Figures in Double Brackets and dot-dashed lines denote Permanent Utility Easements.

REFERENCES (PROFILES, DETAIL & DRAINAGE DESCRIPTION SHEETS, ETC.)

Profile Ramp "D"	16A
Profile Railroad	16A
Drainage Descriptions	1L
Typical Ditch Sections	2(1), 2(J)

Prepared By: Marshall Miller and Associates
Geology, Environmental Sciences & Engineering, Geophysics
Bluefield, VA · Lexington, KY · Raleigh, NC
Richmond, VA · Charleston, WV · Harrisburg, PA
Kansas City, KS · Kingsport, TN · Morgantown, WV
Bossier City, LA

Prepared For: VDOT

DESIGNED:	JTM
DRAWN:	DES
CHECKED:	JTM
DATE:	01/02/2012
SCALE:	AS SHOWN
PROJECT NO.:	VHAMP204
FILE NO.:	VHAMP204_SITE_GEO.dwg

I-564 INTERMODAL CONNECTOR
NORFOLK, VIRGINIA

SITE PLAN

SHEET 16

Attachment III

Geophysical Survey

Geo Solutions Ltd.
P.O. Box 37698
Raleigh, North Carolina 27627
(919) 233-5858 (Phone)
(919) 233-9454 (Fax)

November 8, 2011

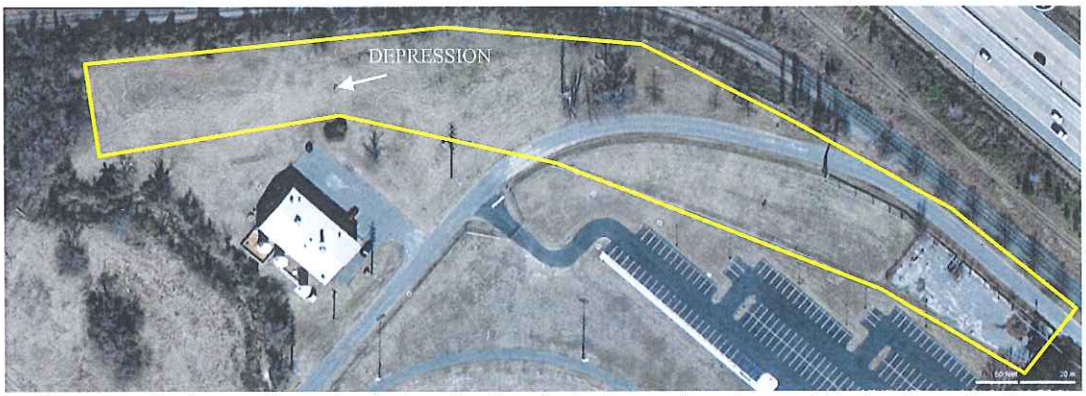
James Martin
Marshall Miller & Associates, Inc.
10988 Richardson Road
Ashland, VA 23005
Ph: (804) 798-6525

Re: **Geophysical Survey of proposed railway realignment at former landfill site, Norfolk Naval Base, Norfolk, Virginia**

File: Report

Dear Mr. Martin:

Geo Solutions Limited, Inc. (Geo Solutions) is pleased to submit the following information to supplement Marshall Miller and Assoicates (MMA) environmental evaluation of the proposed railway realignment along Interstate Highway 564.



Photograph of area of geophysical evaluation (note depression observed during investigation.

Background

MMA is providing environmental services to the Virginia Department of Transportation

in advance of construction along the I-564 corridor. Part of the planned work requires the realignment of a portion of a railway. Here the railway must be moved over a portion of a former landfill area. The exact location of the landfill proper is not known. As such MMA has been asked to provide services to better locate and characterize the potential area of fill.

Field Activities

Geo Solutions completed a detailed EM profile survey over the entire project area on October 25, 2011. Additionally, based on the results of the EM evaluation, Geo Solutions completed a limited ground-penetrating radar survey over the area of the property thought to contain buried material. The following is a description of the equipment utilized and the results of the investigation.

Electromagnetic Profiling

Geo Solutions utilized a high resolution multifrequency EM unit manufactured by Geophex (GEM-2). The GEM-2 was mounted to a plastic sled and towed behind an AWD Polaris Ranger. The location of each survey point was measured using a CSI sub-meter global positioning system unit. These data were collected at the same time the EM survey was being completed.

Geo Solutions collected the EM data as a series of parallel profile lines located on 5 ft spacing (Figure 1). EM data was collected every 0.5 inches along each profile line. The data was collected at 5 frequencies (1470 Hz, 4110 Hz, 11490 Hz, 32190 Hz, and 90030 Hz) for in-phase and conductivity values. Each of the results for these frequencies was examined and the 90030 in-phase frequency results were selected along with the average conductivity values to represent the extent of landfill material (Figures 2 and 3 respectively).

An byproduct of the EM evaluation is the GEM-2 ability to detect the 60 cycle alternating current electrical hum. This hum is usually associated with active buried electrical wires, or conductive material. The distribution of the AC hum is presented in Figure 4.

Ground-penetrating Radar

Geo Solutions also collected ground-penetrating radar (GPR) to better evaluate the extent and depth of the fill material where detected by the EM evaluation. The GPR unit for this project is manufactured by Geophysical Survey System Inc. (GSSI) and includes at GSSI Model 3000 CPU, and 200 MHz antenna. The location of the GPR profile lines is presented in Figure 1. Here, Geo Solutions identified the extent of the fill material to match the extent identified in Figures 2 and 3. Based on the GPR data, Geo Solutions estimates the depth of burial of the fill material in this area to be approximately 7 to 9 feet bls.

Conclusions

Geo Solutions has completed an EM and GPR evaluation at the proposed I-564 realignment at the Norfolk Naval Base, Norfolk, Virginia. We have concluded the following based on the results of a EM and GPR geophysical survey:

- Suspected landfill material is present at the extreme western edge of the investigation area as evident by the presence of area of red hues in Figures 2 and 3..
- Based on GPR data we estimate the depth of burial to be approximately 7 to 9 feet bls.
- Buried utilities are present within the proposed realignment area as evident by the presence of 60 cycle AC hum

Please give us a call should you have any questions concerning the above information.

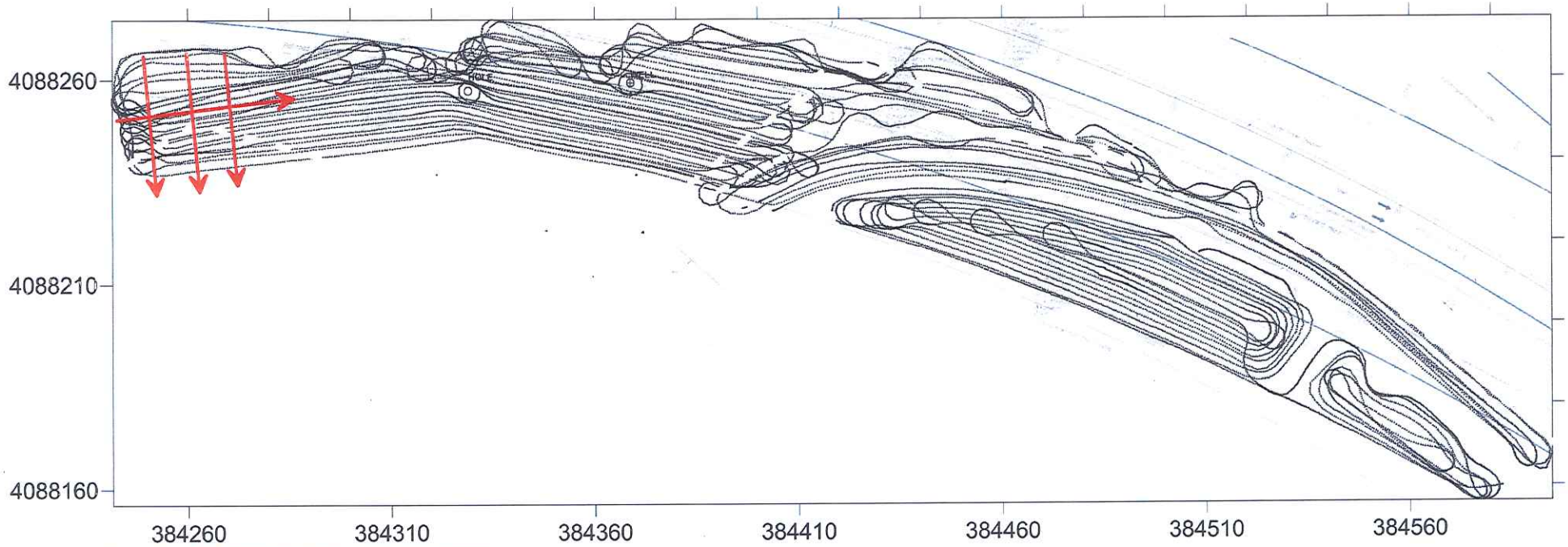
Very truly yours,

GEO SOLUTIONS LIMITED, INC.

Ronald A. Crowson, Geophysicist

FIGURES 1 THROUGH 4

LOCATION OF EM AND GPR PROFILE LINES



UTM COORDINATES (METRIC) BASEMAP PROVIDED BY MMA

LEGEND

LOCATION OF GPR PROFILE LINES

LOCATION OF EM PROFILE LINES

GEOPHYSICAL SURVEY
VIRGINIA DEPARTMENT OF TRANSPORTATION SITE
NORFOLK NAVAL BASE
NORFOLK, VIRGINIA

0 150

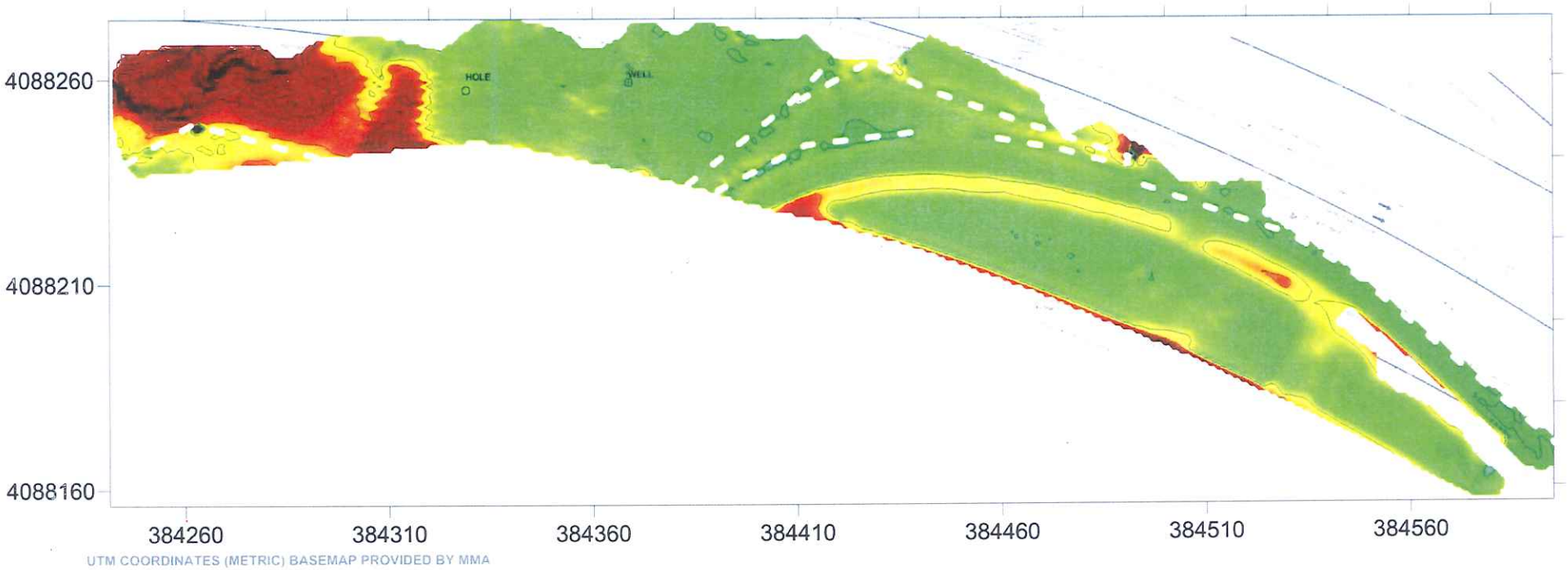
SCALE IN FEET

FIGURE 1

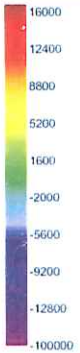
OCTOBER 2011

Geo Solutions Ltd.

90030 Hz IN-PHASE EM RESULTS



LEGEND



90030 Hz IN-PHASE (PPM)

GEOPHYSICAL SURVEY
VIRGINIA DEPARTMENT OF TRANSPORTATION SITE
NORFOLK NAVAL BASE
NORFOLK, VIRGINIA

0 150

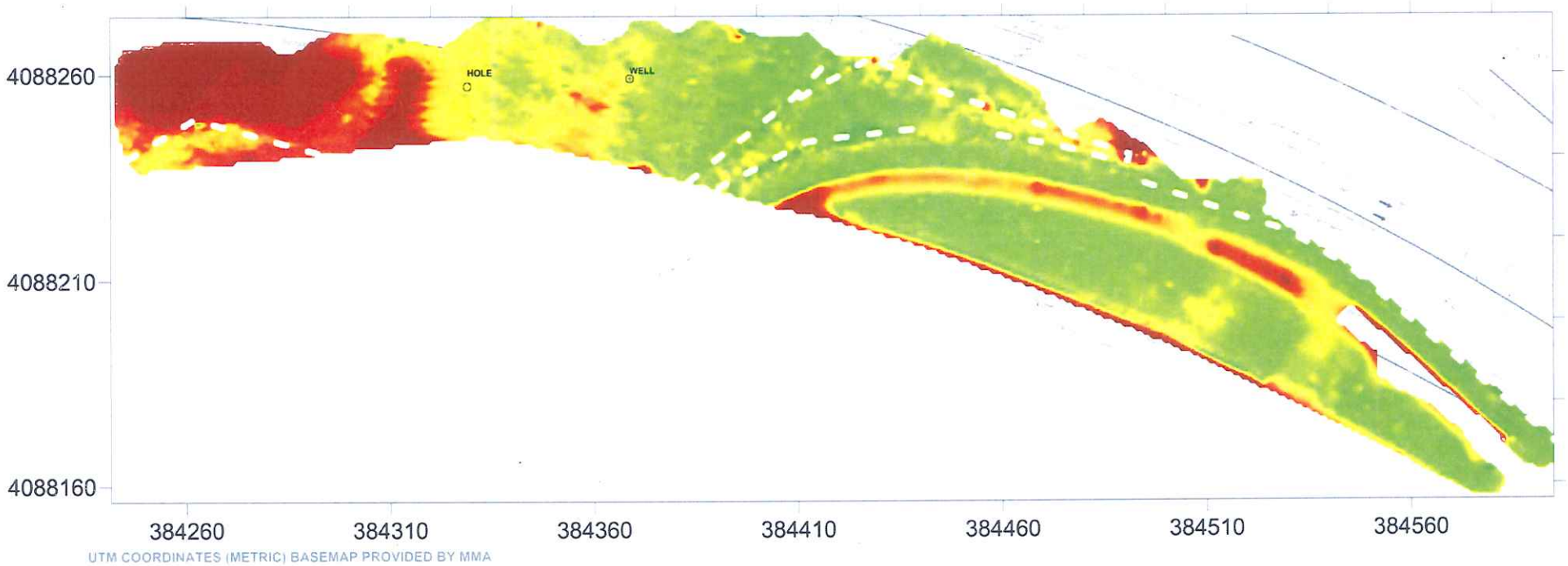
SCALE IN FEET

FIGURE 2

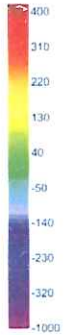
OCTOBER 2011

Geo Solutions Ltd.

AVERAGE CONDUCTIVITY EM RESULTS



LEGEND



AVERAGE CONDUCTIVITY
(mS/M)

GEOPHYSICAL SURVEY
VIRGINIA DEPARTMENT OF TRANSPORTATION SITE
NORFOLK NAVAL BASE
NORFOLK, VIRGINIA

0 150

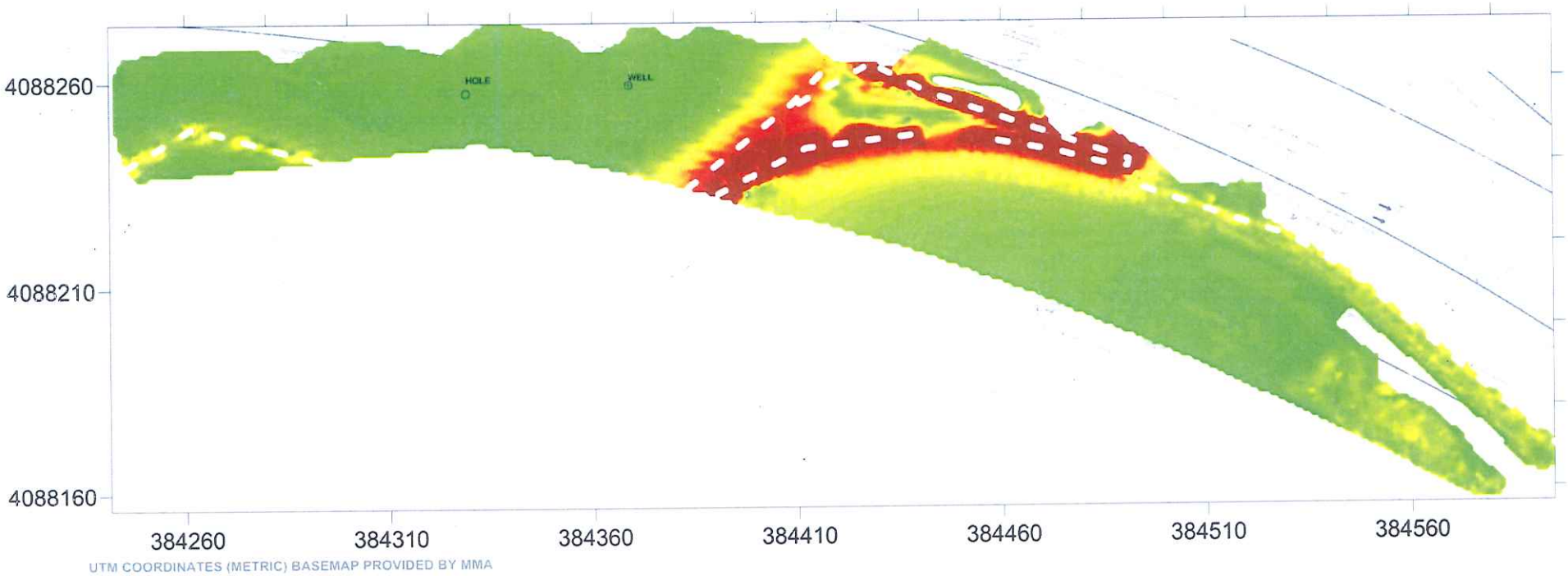
SCALE IN FEET

FIGURE 3

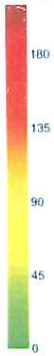
OCTOBER 2011

Geo Solutions Ltd.

DETECTED 60 CYCLE EM HUM



LEGEND



HUM INTENSITY
(PPM)

GEOPHYSICAL SURVEY
VIRGINIA DEPARTMENT OF TRANSPORTATION SITE
NORFOLK NAVAL BASE
NORFOLK, VIRGINIA

0 150

SCALE IN FEET

FIGURE 4

OCTOBER 2011

Geo Solutions Ltd.