# P S A  R E P O R T

**PRELIMINARY SITE ASSESSMENT**
**PARCEL #006**
**TOMMIE L. BAILEY PROPERTY**
**6708 ZEBULON ROAD**
**WAKE FOREST, WAKE COUNTY, NC**
**STATE PROJECT R-2814C**
**WBS ELEMENT 34506.1.4**

Prepared for

North Carolina Department of Transportation
Geotechnical Engineering Unit
Geoenvironmental Section
Century Center Complex, Building B
1020 Birch Ridge Drive
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23 March 2015

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**URS Job No. 3182 9895**

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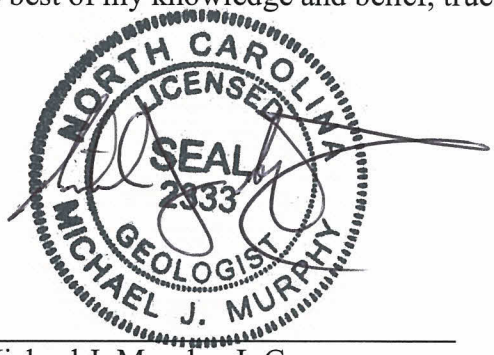
# Certification

This Report was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my thorough inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.




| Michael J. Murphy, L.G.<br>Project Manager<br>URS Corporation – North Carolina | 2333<br>NC License No. | 3/23/15<br>Date |
|---|---|---|

## 1.1 INTRODUCTION

This report documents a Preliminary Site Assessment (PSA) conducted by URS Corporation – North Carolina (URS) on behalf of the North Carolina Department of Transportation (NCDOT). This PSA was conducted at 6708 Zebulon Road, Wake Forest, Wake County, North Carolina (**Figure 1**), owned by Tommie L. Bailey of Wake Forest (the Site). The PSA was performed only within the proposed right-of-way and/or easement for this parcel.

This PSA was performed in general accordance with:

- NCDOT's 1 December 2014 Request for Technical and Cost Proposal (RFP) for the Site. The RFP established the following scope of work (SOW) for the project:
  - Locate USTs and estimate approximate size and contents (if any).
  - Determine if contaminated soils are present.
  - Test soil samples for petroleum using Ultra Violet Florescence Spectroscopy (UVF) methodology.
  - If contamination is evident, estimate the quantity of impacted soils and indicate the approximate area of soil contamination on a Site map.
  - Provide a MicroStation file with the location of (Underground Storage Tanks) USTs, soil contamination and monitoring wells.
  - Prepare a report including field activities, findings, and recommendations for each Site and submit to this office in triplicate and one electronic copy.
- URS's 17 December 2014 Technical and Cost Proposal for the Site.
- NCDOT's 10 January 2015 Notice to Proceed for the Site.

The scope of work included a geophysical survey, soil sampling using a direct push technology (DPT) rig and onsite soil testing services for Total Petroleum Hydrocarbons (TPH) using UVF technology. URS conducted the geophysical survey first in order to identify potential UST and/or anomaly locations within the Site. Based on the results of the geophysical survey and anecdotal evidence, boring locations were identified and completed by a drilling subcontractor (Regional Probing Services, of Wake Forest, North Carolina) under the supervision of a URS geologist. Soil borings were located in areas that were cleared of underground utilities by NC One-Call. Onsite analysis of soil samples were performed by QROS from Wilmington, NC.

## 1.2 BACKGROUND

The objective for this PSA is to assess the Site for USTs, impacted soil, and to delineate potential impacts found in soils. The major Site features and the surrounding area are shown on **Figures 1** and **2**. The parcel is directly north of the NC 96 (Zebulon Road) and US 401 (Louisburg Road) intersection. The property currently serves as a gas station and convenience store.

According to the UST Section Registry, there are three tanks currently in use. Two Above-ground Storage Tanks (ASTs) are located on the western side of the main building. There are no known ground water incidents associated with this location.

## 2.1 GEOPHYSICAL SURVEY

The primary objective of the geophysical survey was to locate potential USTs or anomalies within the property, and a secondary objective was to identify the general locations of underground utilities at the property in advance of the planned subsurface investigation. The geophysical survey for the property was conducted by URS during the week of January 5, 2015. Ground surface conditions consisted primarily of concrete, asphalt, and recently graded and seeded grass.

The geophysical investigation was conducted using the electromagnetic (EM) method augmented by ground-penetrating radar (GPR). The EM survey was completed using a Geonics, Ltd. EM-61 MK2A (EM-61). The GPR survey was completed using a Sensors & Software, Inc. Noggin PLUS Smart Cart System with a 250 MHz scanning antenna.

EM-61 data were collected along parallel profiles with a nominal spacing of 5 feet where accessible. EM-61 data were recorded at a rate of 8 readings per second, which equates to an along-profile data point spacing of less than 1 foot. In areas inaccessible to the EM-61 (e.g. between trees, man-made obstructions, etc.), data were interpolated to provide a continuous electromagnetic surface.

A Hemisphere A100 global positioning system (GPS) was used to record positional data coincident with the EM-61 data. The A100 system provided real-time differential corrections via an Omnistar subscription service. The horizontal accuracy of the differential GPS (DGPS) data is generally 3 feet or less. URS also used the GPS system to record the locations of relevant site features within the survey area (e.g. utility poles, parked cars, etc.).

URS performed in-field analysis of the EM-61 data to identify anomalies indicative of potential USTs. Preliminary interpretations were based on an evaluation of the magnitude of the EM response as well as the dimensions of the anomaly in plan view.

In areas where the EM-61 encountered heavy surficial interference or where EM anomalies could not be readily attributed to site features, GPR was used to conduct a search for potential USTs. GPR surveying consisted of in-field analysis of real-time data. As a result, no post-processing of the GPR data was completed. Relevant GPR profiles were saved to a data file. GPR was selected to augment the EM-61 data due to its effectiveness at characterizing large subsurface metallic objects such as USTs.

The EM-61 data were pre-processed utilizing the accompanying software package, DAT61 MK2 (Geonics, Ltd), which is required before the data can be contoured and graphically displayed via Surfer (Golden Software, Inc.). The presented contoured data represent the Channel 3 response. The Channel 3 response represents the amplitude recorded at the third time interval along the EM-61 response decay curve. These data are applicable to detection of subsurface objects including USTs and other underground obstructions while simultaneously reducing the near-surface component. Common USTs are of sufficient size to resonate the induced magnetic field for long enough to be recorded in this time gate.

## 2.2 SOIL BORING INSTALLATION AND MEDIA SAMPLING

Eleven direct-push soil borings, SB-1 through SB-11, were installed on 22 January 2015, to assess the Site for impacted soil, as shown on **Figure 2**. Soil samples were collected and logged continuously at each soil boring location. Soil sample aliquots were field screened for organic vapors with a MiniRae® brand photo-ionization detection (PID) instrument calibrated daily with 100 parts per million (ppm) isobutylene.

Based on field screening results or other evidence of contamination (e.g. visual, olfactory, etc.), soil samples from select intervals were collected from each boring for onsite soil analysis of TPH using UVF technology.

## 2.3 QUALITY CONTROL/QUALITY ASSURANCE PROCEDURES

While in the field, pertinent observations and copious field data collection activities were recorded in a logbook maintained by the URS field representative. Each sample collected was assigned a unique sample identification number and placed in a discrete container for UVF analyses. Quality Assurance/Quality Control (QA/QC) of field analyzed data was done by and in accordance with QROS Basic QED QA/QC Components. The QA/QC process includes a five point standard PAH curve, initial calibration, and final calibration after the analyses of each 10 sample set. If any QA/QC measures failed, the QED did not produce data.

## 3.1 GEOPHYSICAL SURVEY RESULTS

The results of the geophysical survey are presented in accordance with the NCDOT guidelines, dated May 19, 2009, for identifying and ranking potential USTs on NCDOT projects.

The EM-61 Channel 3 response results are provided as a plan view, color-enhanced contour map in **Figure 3**. The results presented in **Figure 3** are superimposed on the parcel base drawing provided by NCDOT. The interpreted background response is represented by the light blue to light green contours and generally corresponds to the range of -40 to 40 milliVolts (mV).

The Channel 3 results indicate an excited response (red) where known surface or near-surface metallic features exist. Observable surface features at the site include utility poles, signs, a traffic box, active USTs, and fuel dispensers. These features are responsible for higher than background near surface response over the site, as evident in **Figure 3**.

Two areas without obvious surface features creating elevated EM responses were noted along the west to northwest section of the survey area. A GPR sweep was performed across this area. Results from the GPR did not indicate any anomalies representative of a UST, therefore, the GPR data were not saved to disk. The EM anomaly may be an artifact of trash or fill in the subsurface. The active USTs at the site are outside the requested survey bounds.

## 3.2 SOIL SAMPLING RESULTS

A total of eleven soil borings were advanced to 8 ft bgs during the PSA investigation at the Site. Encountered soils consisted predominantly of yellow-orange silty clays and olive-grey silt. All borings reached termination at a depth of 8 ft bgs. Boring locations are shown in **Figure 2**, with complete boring logs provided as **Appendix A**.

As shown in **Appendix A**, soil headspace screening in the field detected organic vapors at levels ranging from 0.4 to 2,035 parts per million (ppm). The hydrocarbon analytical results for the eleven samples submitted to QROS for total petroleum hydrocarbons (TPH) analysis are shown in **Appendix B**. Six of the samples exceeded the NCDENR TPH Action Level of 10 milligrams per kilogram (mg/kg) for diesel range organics (DRO) and/or gasoline range organics (GRO). Exceedances of DRO ranged from 13.77 mg/kg in P006 SB-9-4 to 1,669 mg/kg in P006 SB-5-8. Exceedances of GRO ranged from 19.34 mg/kg in P006 SB-5-6 to 688.2 mg/kg in P006 SB-5-8.

The approximate extent of potential soil impacts are depicted on **Figure 2** as a conservative approach. The larger and primary area shown is approximately 7,500 square feet, and surrounds borings P006-SB5, P006-SB6, and P006-SB7 based on GRO and/or DRO exceedances of the NCDENR TPH Action Level (see **Figure 2** and **Appendix B**). A single pump dispenser is located northeast of SB5 in a largely unpaved area where fuel spills could occur at the surface. Using a uniform thickness of 8 feet (from 0 to 8 feet bgs); the estimated volume of impacted soil that may be encountered in this area is approximately 2200 cubic yards.

The second and smaller area shown is approximately 625 square feet, and surrounds boring P006-SB9 based on DRO exceedances of the NCDENR TPH Action Level. Using a uniform

depth of 8 feet (from 0 to 8 feet bgs); the estimated volume of impacted soil that may be encountered in this area is approximately 200 cubic yards.

## 3.3 SUMMARY

The following summarizes the findings of NCDOT Parcel 006, located at 6708 Zebulon Road, Wake Forest, Wake County, North Carolina:

- The geophysical survey did not detect the presence of subsurface anomalies indicative of USTs within the portion of the parcel surveyed.
- Field screening detected the presence of organic vapors above background in the majority of soil borings at the Site.
- Six of the samples collected for onsite TPH analysis by QROS exceeded the NCDENR TPH Action Level of 10 mg/kg for DRO and/or GRO.
- Based on the QROS results, approximately 2,400 cubic yards of impacted soil may be encountered within the upper 8 ft. in the areas noted.

Based on the site investigation, future site workers are likely to encounter impacted soil. If encountered, all impacted soil should be properly handled and disposed of in accordance with NCDENR regulations.

# SECTION FOUR Limitations

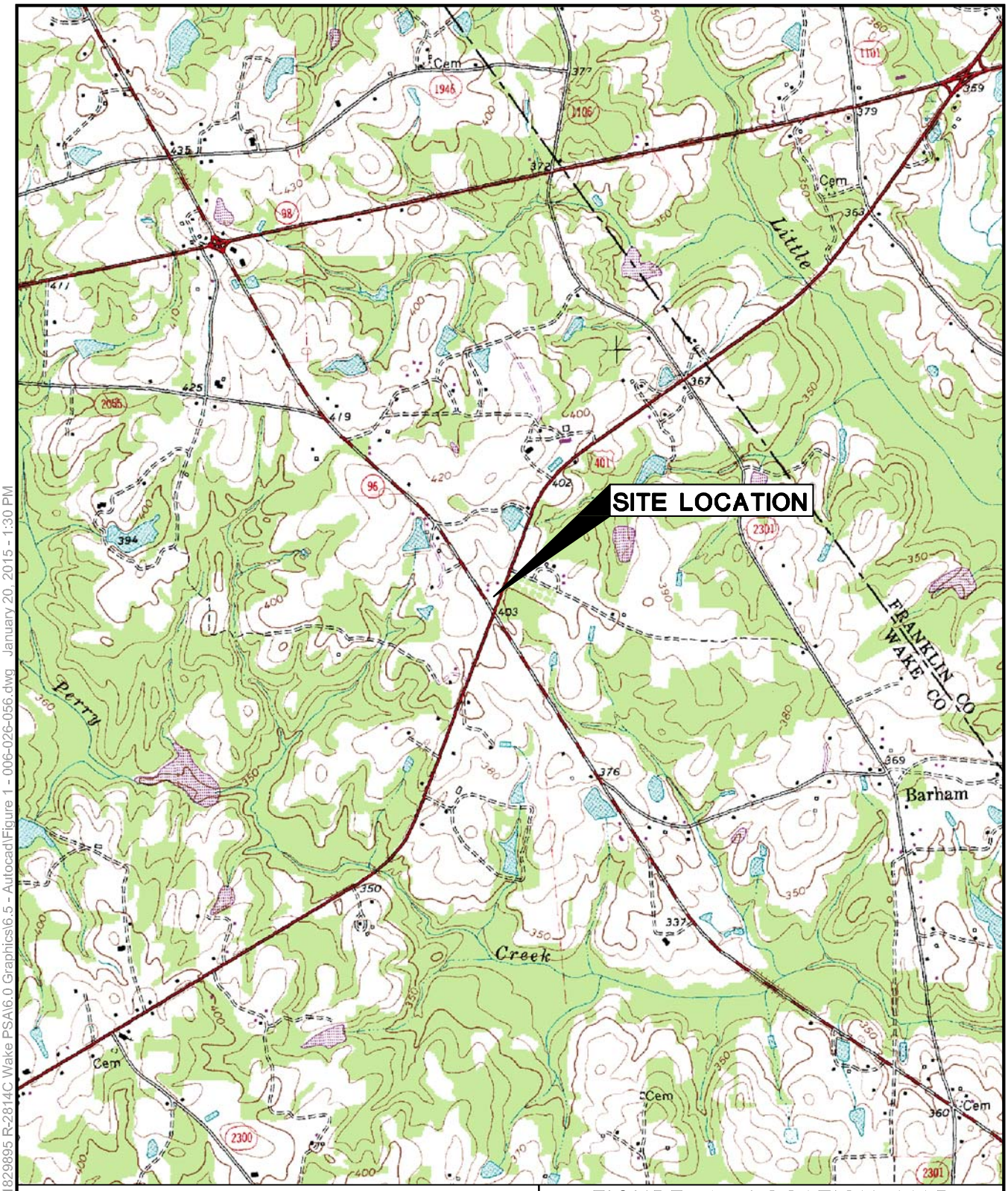
Opinions relating to environmental, geologic, and geotechnical conditions at this parcel are based on limited data, and actual conditions may vary from those encountered at the times and locations where the data was obtained, despite the use of due professional care. The geophysical investigation was conducted in accordance with reasonable and accepted engineering geophysics practices, and the interpretations and conclusions are rendered in a manner consistent with other consultants in our profession. All geophysical techniques have some level of uncertainty and limitations. No other representations of the reported information is expressed or implied, and no warranty or guarantee is included or intended. The results of the geophysical survey are presented in accordance with the NCDOT guidelines, dated 19 May 2009, for identifying and ranking potential USTs on NCDOT projects.

North Carolina Department of Transportation, Request for Technical and Cost Proposal, Preliminary Site Assessment, R-2814C, December 1, 2014.

North Carolina Department of Transportation, Notice to Proceed - Preliminary Site Assessment, R-2814C, January 10, 2015.

URS Corporation, Technical and Cost Proposal, Preliminary Site Assessment, Revision 1, R-2814, December 17, 2014.

# Figures




SOURCE: USGS 7.5' TOPOGRAPHIC QUADRANGLE
ROLESVILLE, NC – DATED 1967, PHOTOREVISED 1980

# FIGURE 1. LOCATION MAP

PARCEL 006, 6708 ZEBULON ROAD
STATE PROJECT R-2814
WAKE FOREST, NC

| | |
|---|---|
| Prepared for: NC DOT | URS RDU, NORTH CAROLINA 27560 |
| DRAWN BY: TSH | |
| DATE: 1/19/15 | Fig. 1 |
| PROJECT NO. 31829895 | |

P:\Jobs4_Projects\NCDOT\31829895 R-2814C Wake PSA\6.0 Graphics\6.5 - Autocad\Figure 1 - 006-026-056.dwg January 20, 2015 - 1:30 PM

| Hydrocarbon Analysis Results | | |
|---|---|---|
| Sample ID | GRO (C5 - C10) | DRO (C10 - C35) |
| P006 SB-5-6 | **19.34** | **65.7** |
| P006 SB-5-8 | **688.2** | **1669** |
| P006 SB-6-8 | **47.75** | **150.7** |
| P006 SB-7-6 | <0.4 | **42.36** |
| P006 SB-7-8 | <0.4 | **67.16** |
| P006 SB-9-4 | <0.7 | **13.77** |

Results generated by a QED HC-1 analyzer.
Concentration values in mg/kg for soil samples.
For clarity purposes, only those wells with exceedances are presented in the above table.
Bold data above the NCDENR Action Level
GRO = gasoline range organics
DRO = diesel range organics

| PROJECT REFERENCE NO. | SHEET |
|---|---|
| R-2814C | |

**GeoEnvironmental**

0 50 100
FEET

LEGEND

- P2-SB6 — SOIL BORING LOCATION
- R/W — PROPOSED RIGHT-OF-WAY
- E — PROPOSED EASEMENT
- PROPOSED DRAINAGE STRUCTURE
- KNOWN SOIL CONTAMINATION
- EXISTING MONITORING WELL
- UST — UNDERGROUND STORAGE TANK
- P2-SBI-I0 ID - DEPTH

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

N

P006-SB1 P006-SB2 P006-SB3 P006-SB4 P006-SB5 P006-SB6 P006-SB7 P006-SB8 P006-SB9 P006-SB10 P006-SB11

S 63°08'18" W 393.12'
N 21° 45' 09.7" E
S 48°46'04" E 200.93'
BL 179 POT 5+0
0.74' R/W TO EIP
EXISTING R/W
PUE
TOMMIE L. BAILEY DB 4276 PG 620 BM 1986 PG 678
TOMMIE LEWIS BAILEY D.P. 5068.Pg.701
ZEBULON RD
NC 96
LOUISBURG RD
US 401
GRADE TO DRAIN
3 GAS PUMPS U/CAN
GAS PUMP
TANK CAPS
ISBKBUS
HTR
W/LT
UST
BST
GR
HW
RCP
18" RCP
15" RCP
36" RCP-III
36" CHL
100.00'
6' GR
SPECI. SEE DL
I60
SIG 5

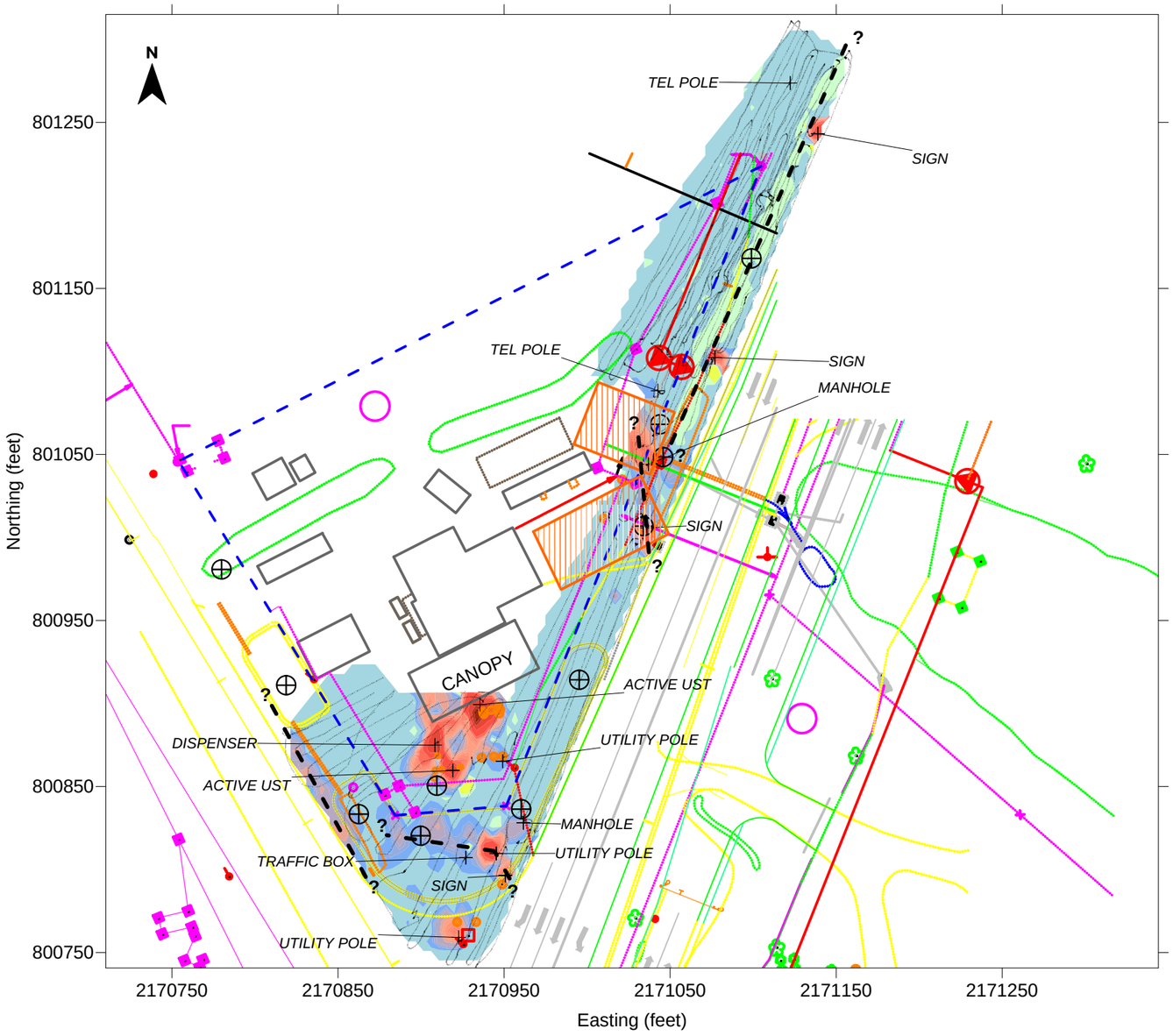
FIGURE 2 SOIL SAMPLING LOCATIONS
PARCEL 006 - TOMMIE L. BAILEY PROPERTY

STATE PROJECT R-2814C, WAKE COUNTY, NC


URS Corporation - North Carolina
1600 Perimeter Park Drive
Morrisville, North Carolina 27560
NC LIC # C-2243
TELEPHONE (919) 461-1100 FAX (919) 461-1415


| | | |
|---|---|---|
| DRN BY: LHM | DATE: 12-11-14 | STATE PROJECT: R-2814C |
| CHECKED BY: VK | DATE: 12-12-14 | |

PARCEL LOCATION MAP — FIGURE 2




**EM-61 MKII Channel 3 Response (milliVolts)**

Interpreted Increasing Response from Subsurface Metal

10000
6000
1500
900
700
500
300
140
40
-40
-10000

Interpreted Background Response

Interpreted Increasing Response from Subsurface Metal

Map Scale
(1 inch = 40 feet)

0' 80' 160'

Notes:

1. Coordinates in NC State Plane NAD 83 (US Feet).
2. Data from Geonics, Ltd. EM-61 MKII instrument.
3. Base drawing after file "Parcel 006.dxf" provided by NCDOT.
4. Location control from DGPS survey by URS.
5. GPR survey across indicated areas did not reflect any subsurface anomalies.

***Legend***

- Soil Boring Location
- Interpreted Subsurface Utility Center Line
- ? Utility Termination Point not Known
- Property Boundary
- Inaccessible Area
- EM Anomalies selected for GPR survey
- Proposed Right-of-Way

URS Geophysical Services
1600 Perimeter Park Drive, Suite 400
Raleigh, NC 27560
(919) 461-1387

EM-61 MKII Channel 3 Response Contours
Tommie L. Bailey Property
(Parcel #006; Tax PIN: 1870-00-9908)

NCDOT WBS 34506.1.4, Wake-Franklin County

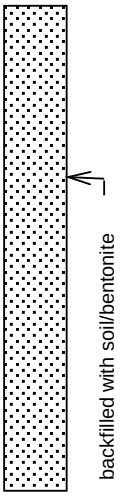
Wake Forest, Wake County, North Carolina

| DESIGNED BY | | DRAWN BY | | CHECKED BY | | JOB NUMBER | Figure |
|---|---|---|---|---|---|---|---|
| MJM | 02/03/15 | CMS | 02/03/15 | MJM | 02/03/15 | 31829895 | 3 |

# Appendix A
# Boring Logs

# BORING LOG: P006-SB1

| | | | | | |
|---|---|---|---|---|---|
| Permit # | | Drill Date | ***01/21/15*** | Site | ***Parcel #006*** |
| Client | ***NCDOT*** | Use | | URS Corporation | |
| Address | ***6708 Zebulon Rd, Wake Forest, NC 27587*** | | | Total Depth (ft) | ***8'*** |
| Drilling Method | ***Geoprobe Direct Push*** | Boring Depth (ft) | ***8'*** | Boring Diam. (in) | ***1.5*** |
| Backfill Material | ***Soil/Bentonite*** | | | Static Water Level | ***unknown*** |
| Remarks: | | TOC Elevation | **NA** | Sample Method | ***Acetate Liner (4 ft)*** |

| Depth (ft.) | Sample ID | Sample Depth (ft) | Blows/ 6" | OVA (ppm) | Geologic Description | Typical Diagram |
|---|---|---|---|---|---|---|
| 0 | P006-SB1-2 | 0-2' | | 2.2 | Yellowish-orange to olive gray SILT with organics |   **Not to Scale** |
| 2 | P006-SB1-4 | 2-4' | | 2.0 | Stiff, yellowish-orange silty CLAY, | |
| 4 | P006-SB1-6 | 4-6' | | 2.6 | Stiff, yellowish-orange sandy silty CLAY with mica (WEATHERED GRANITE) | |
| 6 | P006-SB1-8 | 6-8' | | 1.8 | | |
| 8 | | | | | Boring Terminated at 8' bgs | |
| 10 | | | | | | |

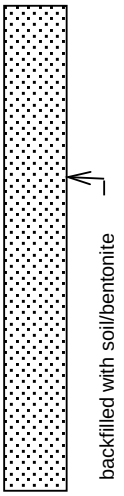
| | | | |
|---|---|---|---|
| Notes: | P006-SB1-6 and P006-SB1-8 submitted to QROS for analysis | | |
| Geologist: | ***Joseph Kiker*** | Driller: | ***RPS*** |

# BORING LOG: P006-SB2

| | | | | | |
|---|---|---|---|---|---|
| Permit # | | Drill Date | *01/21/15* | Site | *Parcel #006* |
| Client | *NCDOT* | Use | | URS Corporation | |
| Address | *6708 Zebulon Rd, Wake Forest, NC 27587* | | | Total Depth (ft) | *8'* |
| Drilling Method | *Geoprobe Direct Push* | Boring Depth (ft) | *8'* | Boring Diam. (in) | *1.5* |
| Backfill Material | *Soil/Bentonite* | | | Static Water Level | *unknown* |
| Remarks: | | TOC Elevation | **NA** | Sample Method | *Acetate Liner (4 ft)* |

| Depth (ft.) | Sample ID | Sample Depth (ft) | Blows/ 6" | OVA (ppm) | Geologic Description |
|---|---|---|---|---|---|
| 0 | P006-SB2-2 | 0-2' | | 3.5 | ASPHALT |
| | | | | | Stiff, yellowish-orange silty CLAY |
| 2 | P006-SB2-4 | 2-4' | | 4.6 | Olive gray clayey SILT |
| | | | | | Light gray SILT |
| 4 | P006-SB2-6 | 4-6' | | 1.9 | Stiff, yellowish-orange sandy silty CLAY, with mica (WEATHERED GRANITE) |
| 6 | P006-SB2-8 | 6-8' | | 3.2 | |
| 8 | | | | | Boring Terminated at 8' bgs |
| 10 | | | | | |

**Typical Diagram**




**Not to Scale**

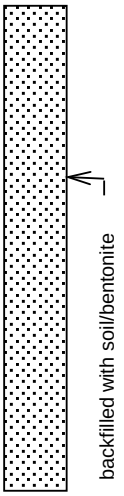
| | | | |
|---|---|---|---|
| Notes: | P006-SB2-6 and P006-SB2-8 submitted to QROS for analysis | | |
| Geologist: | *Joseph Kiker* | Driller: | *RPS* |

# BORING LOG: P006-SB3

| | | | | | |
|---|---|---|---|---|---|
| Permit # | | Drill Date | *01/21/15* | Site | ***Parcel #006*** |
| Client | ***NCDOT*** | Use | | URS Corporation | |
| Address | ***6708 Zebulon Rd, Wake Forest, NC 27587*** | | | Total Depth (ft) | ***8'*** |
| Drilling Method | ***Geoprobe Direct Push*** | Boring Depth (ft) | ***8'*** | Boring Diam. (in) | ***1.5*** |
| Backfill Material | ***Soil/Bentonite*** | | | Static Water Level | ***unknown*** |
| Remarks: | | TOC Elevation | **NA** | Sample Method | ***Acetate Liner (4 ft)*** |

| Depth (ft.) | Sample ID | Sample Depth (ft) | Blows/ 6" | OVA (ppm) | Geologic Description |
|---|---|---|---|---|---|
| 0 | P006-SB3-2 | 0-2' | | 2.9 | SILT to CLAY to sandy SILT (FILL) |
| 2 | P006-SB3-4 | 2-4' | | 2.7 | Olive gray, clayey SILT |
| 4 | P006-SB3-6 | 4-6' | | 2.0 | Stiff to med. stiff, yellowish-orange CLAY |
| 6 | P006-SB3-8 | 6-8' | | 3.5 | Stiff, yellowish-orange sandy silty CLAY with mica (WEATHERED GRANITE) |
| 8 | | | | | Boring Terminated at 8' bgs |
| 10 | | | | | |

**Typical Diagram**

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Notes: P006-SB3-6 and P006-SB3-8 submitted to QROS for analysis

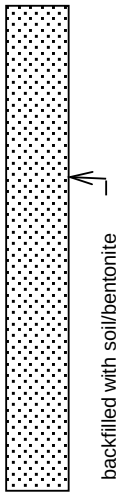
Geologist: ***Joseph Kiker*** Driller: ***RPS***

# BORING LOG: P006-SB4

| | | | | | |
|---|---|---|---|---|---|
| Permit # | | Drill Date | ***01/21/15*** | Site | ***Parcel #006*** |
| Client | ***NCDOT*** | Use | | URS Corporation | |
| Address | ***6708 Zebulon Rd, Wake Forest, NC 27587*** | | | Total Depth (ft) | ***8'*** |
| Drilling Method | ***Geoprobe Direct Push*** | Boring Depth (ft) | ***8'*** | Boring Diam. (in) | ***1.5*** |
| Backfill Material | ***Soil/Bentonite*** | | | Static Water Level | ***unknown*** |
| Remarks: | | TOC Elevation | **NA** | Sample Method | ***Acetate Liner (4 ft)*** |

| Depth (ft.) | Sample ID | Sample Depth (ft) | Blows/ 6" | OVA (ppm) | Geologic Description |
|---|---|---|---|---|---|
| 0 | P006-SB4-2 | 0-2' | | 2.5 | GRAVEL and sandy SILT (FILL) |
| 2 | P006-SB4-4 | 2-4' | | 3.6 | Olive gray to yellowish-orange SILT |
| 4 | P006-SB4-6 | 4-6' | | 12.9 | Stiff, yellowish-orange silty CLAY |
| 6 | P006-SB4-8 | 6-8' | | 23.3 | Stiff, yellowish-orange sandy silty CLAY with mica (WEATHERED GRANITE) |
| 8 | | | | | Boring Terminated at 8' bgs |
| 10 | | | | | |

**Typical Diagram**




**Not to Scale**

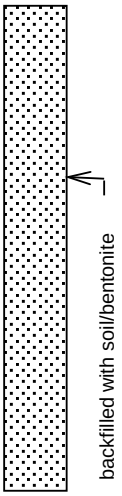
| | | | |
|---|---|---|---|
| Notes: | P006-SB4-6 and P006-SB4-8 submitted to QROS for analysis | | |
| Geologist: | ***Joseph Kiker*** | Driller: | ***RPS*** |

# BORING LOG: P006-SB5

| | | | | | |
|---|---|---|---|---|---|
| Permit # | | Drill Date | ***01/21/15*** | Site | ***Parcel #006*** |
| Client | ***NCDOT*** | Use | | URS Corporation | |
| Address | ***6708 Zebulon Rd, Wake Forest, NC 27587*** | | | Total Depth (ft) | ***8'*** |
| Drilling Method | ***Geoprobe Direct Push*** | Boring Depth (ft) | ***8'*** | Boring Diam. (in) | ***1.5*** |
| Backfill Material | ***Soil/Bentonite*** | | | Static Water Level | ***unknown*** |
| Remarks: | | TOC Elevation | **NA** | Sample Method | ***Acetate Liner (4 ft)*** |

| Depth (ft.) | Sample ID | Sample Depth (ft) | Blows/ 6" | OVA (ppm) | Geologic Description |
|---|---|---|---|---|---|
| 0 | | | | | |
| | P006-SB5-2 | 0-2' | | 60.6 | GRAVEL and SILT (FILL) |
| | | | | | Light gray SILT |
| 2 | P006-SB5-4 | 2-4' | | 239.9 | Stiff, yellowish-orange CLAY |
| 4 | P006-SB5-6 | 4-6' | | 2035 | Stiff, yellowish-orange sandy silty CLAY with mica with petroleum odor (WEATHERED GRANITE) |
| 6 | P006-SB5-8 | 6-8' | | 1571 | |
| 8 | | | | | Boring Terminated at 8' bgs |
| 10 | | | | | |

**Typical Diagram**




**Not to Scale**

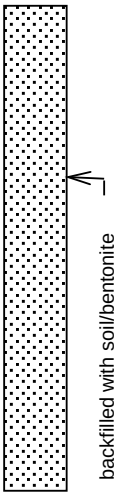
| | | | |
|---|---|---|---|
| Notes: | P006-SB5-4, P006-SB5-6 and P006-SB5-8 submitted to QROS for analysis | | |
| Geologist: | ***Joseph Kiker*** | Driller: | ***RPS*** |

# BORING LOG: P006-SB6

| | | | | | |
|---|---|---|---|---|---|
| Permit # | | Drill Date | *01/22/15* | Site | ***Parcel #006*** |
| Client | ***NCDOT*** | Use | | URS Corporation | |
| Address | ***6708 Zebulon Rd, Wake Forest, NC 27587*** | | | Total Depth (ft) | ***8'*** |
| Drilling Method | ***Geoprobe Direct Push*** | Boring Depth (ft) | ***8'*** | Boring Diam. (in) | ***1.5*** |
| Backfill Material | ***Soil/Bentonite*** | | | Static Water Level | ***unknown*** |
| Remarks: | | TOC Elevation | **NA** | Sample Method | ***Acetate Liner (4 ft)*** |

| Depth (ft.) | Sample ID | Sample Depth (ft) | Blows/ 6" | OVA (ppm) | Geologic Description |
|---|---|---|---|---|---|
| 0 | P006-SB6-2 | 0-2' | | 1.7 | Yellowish-orange sandy SILT to clayey SILT to sandy SILT (FILL) |
| 2 | P006-SB6-4 | 2-4' | | 12.8 | Stiff, yellowish-orange sandy silty CLAY with mica (WEATHERED GRANITE) |
| 4 | P006-SB6-6 | 4-6' | | 108.7 | |
| 6 | P006-SB6-8 | 6-8' | | 948.1 | |
| 8 | | | | | Boring Terminated at 8' bgs |
| 10 | | | | | |

**Typical Diagram**




**Not to Scale**

Notes: P006-SB6-6 and P006-SB6-8 submitted to QROS for analysis; petroleum odor

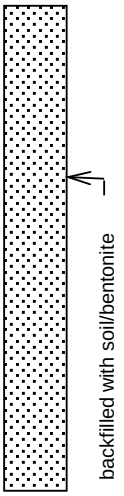
Geologist: ***Joseph Kiker*** Driller: ***RPS***

# BORING LOG: P006-SB7

| | | | | | |
|---|---|---|---|---|---|
| Permit # | | Drill Date | *01/22/15* | Site | *Parcel #006* |
| Client | *NCDOT* | Use | | URS Corporation | |
| Address | *6708 Zebulon Rd, Wake Forest, NC 27587* | | | Total Depth (ft) | *8'* |
| Drilling Method | *Geoprobe Direct Push* | Boring Depth (ft) | *8'* | Boring Diam. (in) | *1.5* |
| Backfill Material | *Soil/Bentonite* | | | Static Water Level | *unknown* |
| Remarks: | | TOC Elevation | **NA** | Sample Method | *Acetate Liner (4 ft)* |

| Depth (ft.) | Sample ID | Sample Depth (ft) | Blows/ 6" | OVA (ppm) | Geologic Description |
|---|---|---|---|---|---|
| 0 | P006-SB7-2 | 0-2' | | 14.8 | GRAVEL and olive gray sandy SILT (FILL) |
| | | | | | Stiff, yellowish-orange CLAY |
| 2 | P006-SB7-4 | 2-4' | | 3.9 | Olive gray to light gray to light brown sandy SILT |
| | | | | | Stiff, yellowish-orange CLAY to yellowish-orange and black mottled silty CLAY |
| 4 | P006-SB7-6 | 4-6' | | 14.8 | Stiff, greenish-gray to yellowish-orange sandy silty CLAY with mica (WEATHERED GRANITE) |
| 6 | P006-SB7-8 | 6-8' | | 15.9 | |
| 8 | | | | | Boring Terminated at 8' bgs |
| 10 | | | | | |

**Typical Diagram**




**Not to Scale**

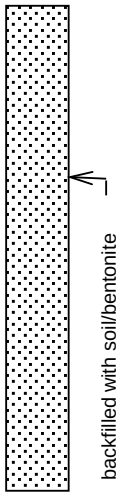
| | | | |
|---|---|---|---|
| Notes: | P006-SB7-6 and P006-SB7-8 submitted to QROS for analysis | | |
| Geologist: | *Joseph Kiker* | Driller: | *RPS* |

# BORING LOG: P006-SB8

| | | | | | |
|---|---|---|---|---|---|
| Permit # | | Drill Date | ***01/22/15*** | Site | ***Parcel #006*** |
| Client | ***NCDOT*** | Use | | URS Corporation | |
| Address | ***6708 Zebulon Rd, Wake Forest, NC 27587*** | | | Total Depth (ft) | ***8'*** |
| Drilling Method | ***Geoprobe Direct Push*** | Boring Depth (ft) | ***8'*** | Boring Diam. (in) | ***1.5*** |
| Backfill Material | ***Soil/Bentonite*** | | | Static Water Level | ***unknown*** |
| Remarks: | | TOC Elevation | **NA** | Sample Method | ***Acetate Liner (4 ft)*** |

| Depth (ft.) | Sample ID | Sample Depth (ft) | Blows/ 6" | OVA (ppm) | Geologic Description |
|---|---|---|---|---|---|
| 0 | P006-SB8-2 | 0-2' | | 1.8 | SILT to silty SAND to sandy SILT to silty CLAY with 1" layer of GRAVEL 2.40' (FILL) |
| 2 | P006-SB8-4 | 2-4' | | 1.8 | Olive gray clayey SILT |
| 4 | P006-SB8-6 | 4-6' | | 1.8 | Light gray f-m SAND with trace silt and clay, moist |
| 6 | P006-SB8-8 | 6-8' | | 0.9 | Very stiff, yellowish-orange sandy CLAY |
| 8 | | | | | Boring Terminated at 8' bgs |
| 10 | | | | | |

**Typical Diagram**




**Not to Scale**

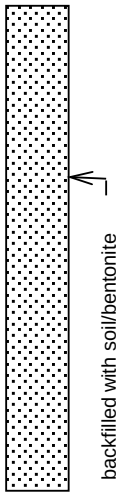
| | | | |
|---|---|---|---|
| Notes: | P006-SB8-6 and P006-SB8-8 submitted to QROS for analysis | | |
| Geologist: | ***Joseph Kiker*** | Driller: | ***RPS*** |

# BORING LOG: P006-SB9

| | | | | | |
|---|---|---|---|---|---|
| Permit # | | Drill Date | ***01/22/15*** | Site | ***Parcel #006*** |
| Client | ***NCDOT*** | Use | | URS Corporation | |
| Address | ***6708 Zebulon Rd, Wake Forest, NC 27587*** | | | Total Depth (ft) | ***8'*** |
| Drilling Method | ***Geoprobe Direct Push*** | Boring Depth (ft) | ***8'*** | Boring Diam. (in) | ***1.5*** |
| Backfill Material | ***Soil/Bentonite*** | | | Static Water Level | ***unknown*** |
| Remarks: | | TOC Elevation | **NA** | Sample Method | ***Acetate Liner (4 ft)*** |

| Depth (ft.) | Sample ID | Sample Depth (ft) | Blows/ 6" | OVA (ppm) | Geologic Description |
|---|---|---|---|---|---|
| 0 | P006-SB9-2 | 0-2' | | 14.0 | Olive gray to dark gray, SILT to silty CLAY with organics (FILL) |
| 2 | P006-SB9-4 | 2-4' | | 78.3 | |
| 4 | P006-SB9-6 | 4-6' | | 2.5 | Olive gray sandy SILT with organic odor, moist<br>Light gray to yellowish-orange f-m SAND with trace silt and clay |
| 6 | P006-SB9-8 | 6-8' | | 1.0 | Very stiff, yellowish-orange to light gray sandy CLAY |
| 8 | | | | | Boring Terminated at 8' bgs |
| 10 | | | | | |

**Typical Diagram**




**Not to Scale**

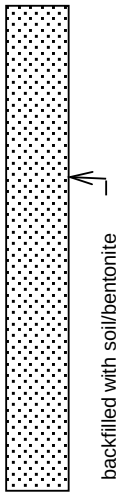
| | |
|---|---|
| Notes: | P006-SB9-4 and P006-SB9-6 submitted to QROS for analysis |
| Geologist: ***Joseph Kiker*** | Driller: ***RPS*** |

# BORING LOG: P006-SB10

| | | | | | |
|---|---|---|---|---|---|
| Permit # | | Drill Date | ***01/22/15*** | Site | ***Parcel #006*** |
| Client | ***NCDOT*** | Use | | URS Corporation | |
| Address | ***6708 Zebulon Rd, Wake Forest, NC 27587*** | | | Total Depth (ft) | ***8'*** |
| Drilling Method | ***Geoprobe Direct Push*** | Boring Depth (ft) | ***8'*** | Boring Diam. (in) | ***1.5*** |
| Backfill Material | ***Soil/Bentonite*** | | | Static Water Level | ***unknown*** |
| Remarks: | | TOC Elevation | **NA** | Sample Method | ***Acetate Liner (4 ft)*** |

| Depth (ft.) | Sample ID | Sample Depth (ft) | Blows/ 6" | OVA (ppm) | Geologic Description |
|---|---|---|---|---|---|
| 0 | P006-SB10-2 | 0-2' | | 1.4 | Olive gray clayey SILT |
| 2 | P006-SB10-4 | 2-4' | | 0.9 | Med. Stiff, olive gray silty CLAY |
| 4 | P006-SB10-6 | 4-6' | | 1.3 | Light gray f-m SAND with trace silt and clay |
| 6 | P006-SB10-8 | 6-8' | | 0.4 | Very stiff, yellowish-orange to light gray sandy CLAY |
| 8 | | | | | Boring Terminated at 8' bgs |
| 10 | | | | | |

**Typical Diagram**




**Not to Scale**

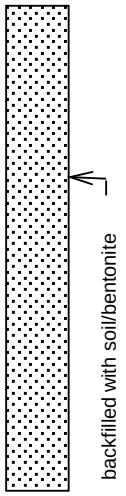
| | |
|---|---|
| Notes: | P006-SB10-6 and P006-SB10-8 submitted to QROS for analysis |
| Geologist: ***Joseph Kiker*** | Driller: ***RPS*** |

# BORING LOG: P006-SB11

| | | | | | |
|---|---|---|---|---|---|
| Permit # | | Drill Date | *01/22/15* | Site | ***Parcel #006*** |
| Client | ***NCDOT*** | Use | | URS Corporation | |
| Address | ***6708 Zebulon Rd, Wake Forest, NC 27587*** | | | Total Depth (ft) | ***8'*** |
| Drilling Method | ***Geoprobe Direct Push*** | Boring Depth (ft) | ***8'*** | Boring Diam. (in) | ***1.5*** |
| Backfill Material | ***Soil/Bentonite*** | | | Static Water Level | ***unknown*** |
| Remarks: | | TOC Elevation | **NA** | Sample Method | ***Acetate Liner (4 ft)*** |

| Depth (ft.) | Sample ID | Sample Depth (ft) | Blows/ 6" | OVA (ppm) | Geologic Description |
|---|---|---|---|---|---|
| 0 | | | | | |
| | P006-SB11-2 | 0-2' | | 0.7 | Light gray to yellowish-orange silty SAND to sandy SILT with trace clay |
| 2 | P006-SB11-4 | 2-4' | | 0.8 | Very stiff, yellowish-orange to light gray CLAY |
| 4 | P006-SB11-6 | 4-6' | | 2.2 | Very stiff, yellowish-orange to light gray to light brown mottled silty CLAY |
| 6 | P006-SB11-8 | 6-8' | | 2.2 | Stiff to med. Stiff, yellowish-orange sandy silty CLAY (WEATHERED GRANITE) |
| 8 | | | | | Boring Terminated at 8' bgs |
| 10 | | | | | |

**Typical Diagram**




**Not to Scale**

| | |
|---|---|
| Notes: | P006-SB11-6 and P006-SB11-8 submitted to QROS for analysis |
| Geologist: ***Joseph Kiker*** | Driller: ***RPS*** |

# Appendix B
# QED Hydrocarbon Analysis Results

QED

AQROS

## Hydrocarbon Analysis Results

**Client:** AECOM
**Address:**

**Samples taken** Wednesday, January 21, 2015
**Samples extracted** Thursday, January 22, 2015
**Samples analysed** Thursday, January 22, 2015

**Contact:** MIKE MURPHY

**Operator** RACHEL MENOHER

**Project:** P006

| Matrix | Sample ID | Dilution used | BTEX (C6 - C9) | GRO (C5 - C10) | DRO (C10 - C35) | TPH (C5 - C35) | Total Aromatics (C10-C35) | 16 EPA PAHs | BaP | Ratios | | | HC Fingerprint Match |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | % light | % mid | % heavy | |
| s | P006 SB-1-6 | 10.1 | <0.5 | <0.5 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | 0 | 4.1 | 95.9 | PAH |
| s | P006 SB-1-8 | 11.8 | <0.6 | <0.6 | <0.12 | <0.12 | <0.12 | <0.01 | <0.012 | 48.6 | 0 | 51.4 | Match not possible |
| s | P006 SB-2-6 | 14.0 | <0.7 | <0.7 | 1.21 | 1.21 | 0.93 | 0.04 | <0.014 | 40.7 | 40.9 | 18.4 | V.Deg.PHC (FCM) 97.3% |
| s | P006 SB-2-8 | 14.9 | <0.7 | <0.7 | <0.15 | <0.15 | <0.15 | <0.01 | <0.015 | 0 | 9 | 91 | Match not possible |
| s | P006 SB-3-6 | 15.1 | <0.8 | <0.8 | <0.15 | <0.15 | <0.15 | <0.02 | <0.015 | 0 | 0 | 100 | Pet.Hyd not Detected |
| s | P006 SB-3-8 | 16.7 | <0.8 | <0.8 | <0.17 | <0.17 | <0.17 | <0.02 | <0.017 | 0 | 0 | 100 | Pet.Hyd not Detected |
| s | P006 SB-4-6 | 12.7 | <0.6 | <0.6 | <0.13 | <0.13 | <0.13 | <0.01 | <0.013 | 0 | 14.4 | 85.6 | PAH |
| s | P006 SB-4-8 | 9.7 | <0.5 | <0.5 | <0.1 | <0.1 | <0.1 | <0.01 | <0.01 | 0 | 4.8 | 95.2 | Pet.Hyd not Detected |
| s | P006 SB-5-4 | 15.2 | <0.8 | 0.5 | 2.43 | 2.93 | 0.95 | 0.04 | <0.015 | 79.3 | 8.3 | 12.5 | Deg Fuel (PFM) (FCM) 58.4% |
| s | P006 SB-5-6 | 19.0 | <0.9 | 19.34 | 65.7 | 85.04 | 8.55 | 0.25 | <0.019 | 97.2 | 1.5 | 1.3 | Deg.Kerosene (FCM) 56.6% |
| | Initial Calibrator QC check | | | OK | | | | | Final FCM QC Check | | | OK | 101.5% |

Results generated by a QED HC-1 analyser. Concentration values in mg/kg for soil samples and mg/L for water samples. Soil values are not corrected for moisture or stone content

Fingerprints provide a tentative hydrocarbon identification. The abbreviations are:- FCM = Results calculated using Fundamental Calibration Mode : % = confidence for sample fingerprint match to library

(SBS) or (LBS) = Site Specific or Library Background Subtraction applied to result : (PFM) = Poor Fingerprint Match : (T) = Turbid : (P) = Particulate present

QED

AQROS

## Hydrocarbon Analysis Results

**Client:** AECOM
**Address:**

**Samples taken** Thursday, January 22, 2015
**Samples extracted** Thursday, January 22, 2015
**Samples analysed** Thursday, January 22, 2015

**Contact:** MIKE MURPHY

**Operator** RACHEL MENOHER

**Project:** P006

| Matrix | Sample ID | Dilution used | BTEX (C6 - C9) | GRO (C5 - C10) | DRO (C10 - C35) | TPH (C5 - C35) | Total Aromatics (C10-C35) | 16 EPA PAHs | BaP | Ratios | | | HC Fingerprint Match |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | % light | % mid | % heavy | |
| s | P006 SB-5-8 | 254.1 | 14.01 | 688.2 | 1669 | 2357.2 | 135.7 | 3.77 | <0.254 | 99.2 | 0.4 | 0.4 | Deg Gas (FCM) 79.3% |
| s | P006 SB 6-6 | 9.0 | <0.5 | 0.68 | 1.69 | 2.37 | 0.58 | 0.03 | <0.009 | 90.2 | 3.3 | 6.5 | Deg Fuel (FCM) 52.7% |
| s | P006 SB-6-8 | 12.3 | <0.6 | 47.75 | 150.7 | 198.45 | 22.94 | 0.65 | <0.012 | 98.5 | 1.2 | 0.3 | Deg.Kerosene (FCM) 71.3% |
| s | P006 SB-7-6 | 8.9 | <0.4 | <0.4 | 42.36 | 42.36 | 12.13 | 0.41 | <0.009 | 54 | 42 | 4 | Deg Fuel (FCM) 72.3% |
| s | P006 SB-7-8 | 8.7 | <0.4 | <0.4 | 67.16 | 67.16 | 19.22 | 0.67 | <0.009 | 49.7 | 46.5 | 3.8 | Deg Fuel (FCM) 75.4% |
| s | P006 SB-8-6 | 6.8 | <0.3 | <0.3 | 0.3 | 0.3 | 0.24 | <0.01 | <0.007 | 59.5 | 13.9 | 26.5 | V.Deg.PHC (FCM) 79.4% |
| s | P006 SB-8-8 | 14.3 | <0.7 | <0.7 | 0.77 | 0.77 | 0.21 | <0.01 | <0.014 | 0 | 17.1 | 82.9 | Deg Fuel (FCM) 75.6% |
| s | P006 SB-9-4 | 13.3 | <0.7 | <0.7 | 13.77 | 13.77 | 3.7 | 0.12 | <0.013 | 71.1 | 20.6 | 8.3 | Deg Fuel (PFM) (FCM) 67.9% |
| s | P006 SB-9-6 | 9.2 | <0.5 | <0.5 | 5.23 | 5.23 | 0.8 | 0.03 | <0.009 | 71.3 | 14.2 | 14.5 | Deg.Fuel (FCM) 80.8% |
| s | P006 SB-10-6 | 13.5 | <0.7 | <0.7 | <0.13 | <0.13 | <0.13 | <0.01 | <0.013 | 0 | 0 | 100 | Match not possible |
| | Initial Calibrator QC check | | | OK | | | | | Final FCM QC Check | | | OK | 103.6% |

Results generated by a QED HC-1 analyser. Concentration values in mg/kg for soil samples and mg/L for water samples. Soil values are not corrected for moisture or stone content

Fingerprints provide a tentative hydrocarbon identification. The abbreviations are:- FCM = Results calculated using Fundamental Calibration Mode : % = confidence for sample fingerprint match to library

(SBS) or (LBS) = Site Specific or Library Background Subtraction applied to result : (PFM) = Poor Fingerprint Match : (T) = Turbid : (P) = Particulate present

QED

AQROS

# Hydrocarbon Analysis Results

**Client:** AECOM
**Address:**

**Samples taken** Thursday, January 22, 2015
**Samples extracted** Thursday, January 22, 2015
**Samples analysed** Thursday, January 22, 2015

**Contact:** MIKE MURPHY

**Operator** RACHEL MENOHER

**Project:** P006

| Matrix | Sample ID | Dilution used | BTEX (C6 - C9) | GRO (C5 - C10) | DRO (C10 - C35) | TPH (C5 - C35) | Total Aromatics (C10-C35) | 16 EPA PAHs | BaP | Ratios | | | HC Fingerprint Match |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | % light | % mid | % heavy | |
| s | P006 SB-10-8 | 12.8 | <0.6 | 0.52 | <0.13 | 0.52 | <0.13 | <0.01 | <0.013 | 85.6 | 0.6 | 13.8 | Particulate (P) |
| s | P006 SB-11-6 | 9.6 | <0.5 | <0.5 | 0.84 | 0.84 | 0.39 | 0.02 | <0.01 | 67.4 | 15.8 | 16.8 | Deg Fuel (FCM) 87.6% |
| s | P006 SB-11-8 | 12.3 | <0.6 | <0.6 | <0.12 | <0.12 | <0.12 | <0.01 | <0.012 | 0 | 0 | 100 | Pet.Hyd not Detected |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

Initial Calibrator QC check OK

Final FCM QC Check OK 103.9%

Results generated by a QED HC-1 analyser. Concentration values in mg/kg for soil samples and mg/L for water samples. Soil values are not corrected for moisture or stone content

Fingerprints provide a tentative hydrocarbon identification. The abbreviations are:- FCM = Results calculated using Fundamental Calibration Mode : % = confidence for sample fingerprint match to library

(SBS) or (LBS) = Site Specific or Library Background Subtraction applied to result : (PFM) = Poor Fingerprint Match : (T) = Turbid : (P) = Particulate present