

## **PRELIMINARY SITE ASSESSMENT REPORT**

**SR 1406 (Piney Green Road) from NC 24 to US 17  
2865 Piney Green Road, Parcel #346  
Midway Park, North Carolina  
State Project U-3810  
WBS Element # 35801.1.1  
Onslow County**

North Carolina Department of Transportation  
Geotechnical Engineering Unit  
1589 Mail Service Center  
Raleigh, North Carolina 27699-1589

April 16, 2010

**PRELIMINARY SITE ASSESSMENT REPORT**

**SR 1406 (Piney Green Road) from NC 24 to US 17  
2865 Piney Green Road, Parcel #346  
Midway Park, North Carolina  
State Project U-3810  
WBS Element # 35801.1.1  
Onslow County**

**TABLE OF CONTENTS**

<u>Section</u>	<u>Subject</u>	<u>Page</u>
Signature Page .....		ii
Executive Summary .....		iii
1.0	Introduction.....	1
2.0	Background.....	1
3.0	Local Geology and Surroundings .....	1
4.0	Subsurface Investigation.....	2
4.1	Geophysical Evaluation at Parcel #346 .....	2
	4.1.1 Ground Penetrating Radar Methodology .....	3
	4.1.2 Time Domain Electromagnetic Methodology .....	4
	4.1.3 Field Procedures .....	4
4.2	Subsurface Soil Investigation at Parcel #346.....	5
5.0	Conclusions and Recommendations .....	6

Figures

- 1 USGS Topographic Location Map
- 2 Site Sketch Showing Soil Boring Locations
- 3 Key Map Showing Parcel Location
- 4 Site Map Showing Results of Geophysical Survey Investigation, Parcel 346

Appendices

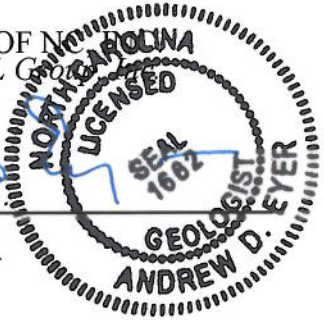
- I Soil Boring Lithologic Logs
- II Certificates of Analysis and Chain of Custody Record for Soil Samples
- III Photographs Showing Soil Boring Locations

## Signature Page

This document, entitled "Preliminary Site Assessment Report," has been prepared for Parcel #346, located at 2865 Piney Green Road in Midway Park, North Carolina (State Project U-3810, WBS Element # 35801.1.1, Onslow County). It has been prepared by GEL Engineering of NC, Inc. in accordance with the Notice to Proceed provided by the North Carolina Department of Transportation-GeoEnvironmental Section, Geotechnical Engineering Unit for the exclusive use of the North Carolina Department of Transportation. It has been prepared in accordance with accepted quality control practices and has been reviewed by the undersigned.

GEL ENGINEERING OF NORTH CAROLINA  
*an Affiliate of The GEL Group, Inc.*

Andrew D. Eyer, L.G.  
Senior Project Manager



Keith D. McCulloch, P.E.  
Senior Staff Engineer

04-16-10

Date

## **PRELIMINARY SITE ASSESSMENT REPORT**

**SR 1406 (Piney Green Road) from NC 24 to US 17  
2865 Piney Green Road, Parcel #346  
Midway Park, North Carolina  
State Project U-3810  
WBS Element # 35801.1.1  
Onslow County**

### **Executive Summary**

The subject site is Parcel #346, located at 2865 Piney Green Road in Midway Park, North Carolina. The primary purpose of this investigation was to determine the presence or absence of underground storage tanks (USTs) and constituents of concern in soil within the North Carolina Department of Transportation (NCDOT) proposed Rights-of-Way (ROWs) adjacent to Parcel #346. Currently, Parcel #346 contains an operating convenience store and service station, with four USTs.

GEL Engineering of NC, Inc. (GEL) performed a preliminary site assessment within the NCDOT proposed ROWs of NC 24 and Piney Green Road adjacent to Parcel #346 that included a geophysical survey, and the collection and analysis of soil samples. No subsurface anomalies were identified during the geophysical investigation, and it has been concluded that there are no known, probable, or possible USTs present within the proposed ROWs of NC 24 and Piney Green Road adjacent to the site. However, four known petroleum USTs are located onsite at Parcel #346, adjacent to the NCDOT proposed ROWs.

Soil samples were collected for analysis from six borings constructed within the NCDOT proposed ROWs for Hwy. NC 24 and Piney Green Road adjacent to Parcel #346. The soil samples were analyzed for diesel range organics (DRO) and gasoline range organics (GRO). Neither DRO nor GRO was detected in any of the collected soil samples.

Based on the data generated from this investigation, there is no evidence that a release of constituents of concern has occurred within the NCDOT proposed ROWs at Parcel #346. No additional environmental investigation of the soil at either site is recommended at this time.

# **PRELIMINARY SITE ASSESSMENT REPORT**

**SR 1406 (Piney Green Road) from NC 24 to US 17  
2865 Piney Green Road, Parcel #346  
Midway Park, North Carolina  
State Project U-3810  
WBS Element # 35801.1.1  
Onslow County**

## **1.0 Introduction**

This document presents the details of a preliminary site assessment performed within the proposed North Carolina Department of Transportation (NCDOT) Rights-of-Way (ROWs) at Parcel #346 located at 2865 Piney Green Road in Midway Park, North Carolina. Parcel #346 contains an operating convenience store and service station, with four petroleum underground storage tanks (USTs). The site location is shown on Figure 1, an excerpt from the United States Geological Survey (USGS) 7.5-minute quadrangle map of Camp Lejeune, North Carolina. The preliminary site assessment, which included a geophysical survey, was conducted by GEL Engineering of NC, Inc. (GEL) in accordance with the Notice to Proceed issued by NCDOT on February 9, 2010.

The primary purpose of this investigation was to determine the presence or absence of USTs and on-site constituents of concern in soil within the proposed NCDOT ROWs at the subject site as a result of current and/or former operations.

## **2.0 Background**

NCDOT is planning road improvements to SR 1406 (Piney Green Road) between NC 24 and US 17 in Onslow County, North Carolina. NCDOT wanted to assess the proposed ROWs adjacent to the site to evaluate the presence or absence of USTs and soil contamination related to the current and/or former on-site operations, and the impact (if any) of these operations on the proposed road improvements. Figures 2 and 3 show the general site layout for Parcel #346 and its location on Piney Green Road, respectively.

## **3.0 Local Geology and Surroundings**

Parcel #346 is in a developed area of Midway Park in Onslow County, North Carolina. Surrounding land uses include residential and commercial activities.

The site is located approximately 1 mile east of the center of Midway Park, North Carolina, and approximately 6.5 miles east of the center of Jacksonville, North Carolina. This area is located in the Coastal Plain physiographic province of North Carolina. The land surface of the area is characterized by nearly level, and gently sloping, well drained

**GEL Engineering of NC, Inc.**  
*an Affiliate of The GEL Group, Inc.*

**fc: ncdt00110**

soils. Coastal Plain geology in the vicinity of the site is characterized by undifferentiated post-Miocene interbedded sand and clay terrace deposits overlain by aqueous and aeolian deposits of marine and non-marine origin (USGS, 1955).

The United States Department of Agriculture's *Soil Survey of Onslow County, North Carolina* (1992) maps the area as Goldsboro-Urban Land Complex (GpB), typically composed of fine sandy loam grading to sandy clay loam with depth. The soils encountered at the site during the preliminary site assessment consisted predominantly of tan/grey/brown sandy silt and sandy clay to depths of 8 feet below land surface (bls).

Based on the moisture content of the subsurface soil encountered during the preliminary site assessment, the water table is located at approximately 7 to 8 feet bls. Based on the USGS topographic map presented as Figure 1, the site is located approximately 42 feet above mean sea level. The topography in Figure 1 indicates that groundwater in the vicinity of Parcel #346 most likely flows in a southeasterly direction towards an unnamed tributary of Wallace Creek.

#### **4.0 Subsurface Investigation**

To determine the presence or absence of USTs and impact to subsurface soil within the NCDOT proposed ROWs at Parcel #346, GEL performed a limited site assessment that consisted of the following tasks:

- Performance of a geophysical investigation to identify the presence or absence of USTs and associated appurtenances within the proposed northerly ROW of Hwy. NC 24 and the proposed easterly ROW of Piney Green Road adjacent to Parcel #346.
- Soil vapor screening of soil samples collected from subsurface soil borings at Parcel #346 within the proposed ROWs of Hwy. NC 24 and Piney Green Road to determine the potential presence or absence of soil impact from petroleum constituents of concern.
- Collection and laboratory analysis of soil samples from the proposed ROWs of Hwy. NC 24 and Piney Green Road at Parcel #346.

The details of these tasks are discussed in the following sections.

#### **4.1 Geophysical Evaluation at Parcel #346**

The geophysical investigation included the deployment of ground penetrating radar (GPR) technology and time domain electromagnetic technology (TDEM) to the site.

These technologies were used in concert with one another in order to identify subsurface

metallic anomalies and, more specifically, to identify the potential presence of USTs on site. A brief description of each technology is presented in the following paragraphs followed by a discussion of the results of the geophysical investigation.

#### **4.1.1 Ground Penetrating Radar Methodology**

A RAMAC digital radar control system configured with a 250 Megahertz (MHz) antenna array was used in this investigation. GPR is an electromagnetic geophysical method that detects interfaces between subsurface materials with differing dielectric constants. The GPR system consists of an antenna that houses the transmitter and receiver, a digital control unit that both generates and digitally records the GPR data, and a color video monitor to view data as they are collected in the field.

The transmitter radiates repetitive short-duration electromagnetic waves (at radar frequencies) into the earth from an antenna moving across the ground surface. These radar waves are reflected back to the receiver from the interface of materials with different dielectric constants. The intensity of the reflected signal is a function of the contrast in the dielectric constant between the materials, the conductivity of the material through which the wave is traveling, and the frequency of the signal. Subsurface features that commonly cause such reflections are: 1) natural geologic conditions, such as changes in sediment composition, bedding, and cementation horizons and voids; or 2) unnatural changes to the subsurface, such as disturbed soils, soil backfill, buried debris, tanks, pipelines, and utilities. The digital control unit processes the signal from the receiver and produces a continuous cross-section of the subsurface interface reflection events.

GPR data profiles are collected along transects, which are measured paths along which the GPR antenna is moved. During a survey, marks are placed in the data by the operator at designated points along the GPR transects or with a survey wheel odometer. These marks allow for a correlation between the GPR data and the position of the GPR antenna on the ground.

Depth of investigation of the GPR signal is highly site-specific and is limited by signal attenuation (absorption) in the subsurface materials. Signal attenuation is dependent on the electrical conductivity of the subsurface materials. Signal attenuation is greatest in materials with relatively high electrical conductivities, such as clays, brackish groundwater, or groundwater with a high dissolved solid content from natural or man-made sources. Signal attenuation is lowest in relatively low-conductivity materials, such as dry sand or rock. Depth of investigation is also dependent on the antenna's transmitting frequency. Depth of investigation generally increases as transmitting

frequency decreases; however, the ability to resolve smaller subsurface features is diminished as frequency is decreased.

The GPR antenna used at this site is internally shielded from aboveground interference sources. Accordingly, the GPR response is not affected by overhead power lines, metallic buildings, or nearby objects.

#### **4.1.2 Time Domain Electromagnetic Methodology**

The TDEM methods measure the electrical conductivity of subsurface materials. The conductivity is determined by inducing (from a transmitter) a time or frequency-varying magnetic field and measuring (with a receiver) the amplitude and phase shift of an induced secondary magnetic field. The secondary magnetic field is created by subsurface conductive materials behaving as an inductor as the primary magnetic field is passed through them.

The Geonics EM-61 system used in this investigation operates within these principles. However, the EM-61 TDEM system can discriminate between moderately conductive earth materials and very conductive metallic targets. The EM-61 consists of a portable coincident loop time domain transmitter and receiver with a 0.5-meter by 1.0-meter coil system. The EM-61 generates 150 pulses per second and measures the response from the ground after transmission or between pulses. The secondary EM responses from metallic targets are of longer duration than those created by conductive earth materials. By recording the later time EM arrivals, only the response from metallic targets is measured, rather than the field generated by the earth material.

#### **4.1.3 Field Procedures**

The GPR and TDEM field investigation was performed at Parcel #346 on March 3, 2010. The extent of the investigation covers only the proposed ROW indicated by NCDOT. A GPR system time range setting of 90 nanoseconds (ns) was used during the entire investigation. This range was determined after a series of test lines were conducted to evaluate the GPR response in the local geologic section. A preliminary interpretation of the GPR data was conducted in the field and potential USTs were marked on the ground. Following the completion of the fieldwork, the data were post-processed and analyzed in more detail. GPR data processing typically included band pass filtering, background removal, horizontal smoothing, and gain adjustments.

TDEM was also used to scan the project site. Electromagnetic anomalies indicative of buried metallic objects were marked in the field.



It should be noted that “One Call” underground utility locations had been performed within the ROWs of NC 24 and Piney Green Road at Parcel #346 prior to the initiation of the preliminary site assessment field activities at the site. Several underground utilities were marked by “One Call” within the NC 24 ROW at Parcel #346.

As shown on Figure 4, no EM or GPR anomalies indicated the potential presence of USTs; therefore, no USTs are suspected to be present in the subsurface of the investigation area. It should be noted that Parcel #346 is an active gas station with USTs located on the property but the USTs are located outside the investigation area.

#### **4.2 Subsurface Soil Investigation at Parcel #346**

To determine the presence or absence of impact to subsurface soil by constituents of concern, GEL collected soil samples from six subsurface soil borings, S1-1 through S1-6, at Parcel #346 on March 8, 2010, for analysis of total petroleum hydrocarbon indicator parameters. The soil borings were constructed within the NCDOT proposed ROWs of NC 24 and Piney Green Road, as shown on Figure 2 and in the photographs in Appendix III. The longitude and latitude coordinates for the boring locations are listed in the table below.

All borings were advanced to a total depth of 8 feet bls. Soil samples were collected at 3-4 feet and 7-8 feet bls from each borehole. All soil samples were inspected for indications of impact by constituents of concern, including petroleum hydrocarbons, such as odors, discoloration, or visible sheen. This sampling was accomplished using direct push technology (DPT) provided by Regional Probing Services of Wake Forest, North Carolina (Regional Probing). Soil boring lithologic logs are attached as Appendix I of this document. No groundwater was encountered during construction of the borings.

The soil samples were screened for the presence of organic vapors using a portable photoionization detector (PID). The PID measures the concentration of organic compounds in the vapor space above a soil sample resulting from volatilization of organic compounds contained in the soil. To screen the soils, each sample was placed in a clean, resealable polyethylene bag. The bag was sealed, and the sample was allowed to equilibrate for approximately 5 minutes, after which time a small opening was made in the bag. The probe of the PID was then inserted into the bag, and the airspace above the soil was screened for organic vapors.

To assess the subsurface soil quality, one soil sample was collected from each soil boring at the sampled depth interval with the highest PID reading and submitted for

laboratory analysis. The depth intervals and PID measurements of the collected soil samples submitted to the laboratory for analysis are listed below.

**Summary of Location Data and PID Measurements  
for Soil Samples Collected for Analysis at Parcel No. 346**

<b>Soil Boring</b>	<b>Depth Interval of Soil Sample Collected for Analysis (feet bls)</b>	<b>PID Reading (ppm)</b>	<b>Latitude/Longitude (NAD83)</b>
S1-1	3-4	0.5	34°42'57.84"N / 77°19'11.16"W
S1-2	7-8	0.5	34°42'57.96"N / 77°19'11.82"W
S1-3	7-8	0.6	34°42'58.08"N / 77°19'12.54"W
S1-4	7-8	0.9	34°42'58.44"N / 77°19'12.90"W
S1-5	3-4	0.7	34°42'59.40"N / 77°19'12.96"W
S1-6	7-8	0.7	34°43'00.72"N / 77°19'13.02"W

Notes:

- 1) Coordinates are based on North American Datum of 1983 (NAD83)
- 2) bls = below land surface
- 3) PID = photoionization detector
- 4) ppm = parts per million

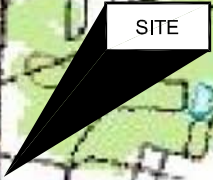
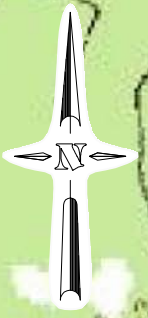
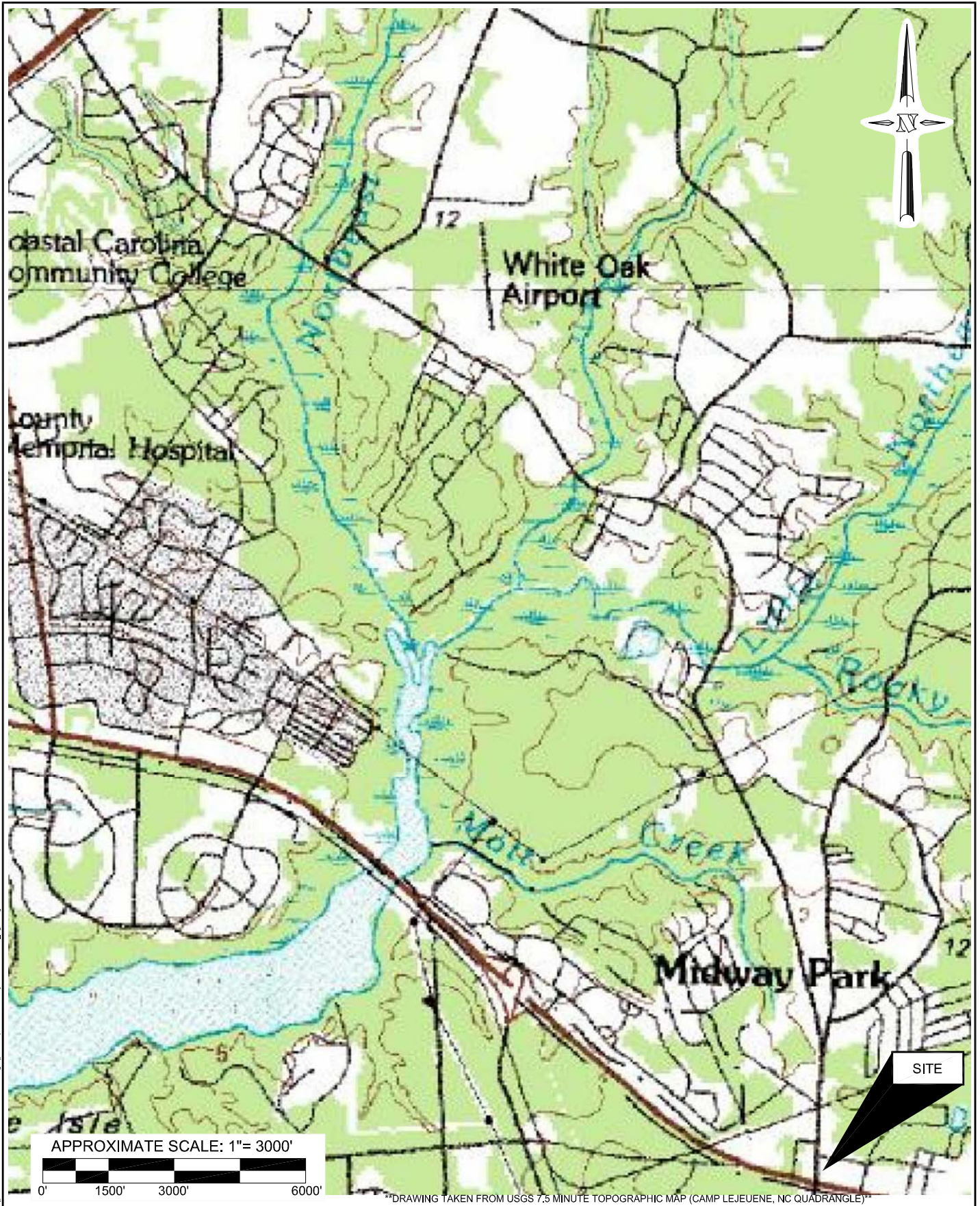
Following completion of the soil sampling activities, all borings were abandoned by filling the boreholes with soil cuttings and hydrated bentonite. Soil samples were submitted to SGS Laboratories, Inc. in Wilmington, North Carolina (North Carolina Certification No. 481) for analysis of diesel range organics (DRO) by EPA Method 8015 with EPA Method 3545 sample preparation, and gasoline range organics (GRO) by EPA Method 8015 with EPA Method 5035A/5030B sample preparation. The analytical results are included on the Certificates of Analysis provided in Appendix II. Neither DRO nor GRO was detected in any of the collected soil samples.

## **5.0 Conclusions and Recommendations**

GEL performed a preliminary site assessment within the NCDOT proposed ROWs of Hwy. NC 24 and Piney Green Road adjacent to Parcel #346 that included a geophysical survey, and the collection and analysis of soil samples. No subsurface anomalies were identified during the geophysical investigation, and it has been concluded that there are no known, probable, or possible USTs are present within the proposed ROWs of NC 24 and Piney Green Road adjacent to the site. However, four known petroleum USTs are located onsite at Parcel #346, adjacent to the NCDOT proposed ROWs.

Soil samples were collected for analysis from six borings constructed within the NCDOT proposed ROWs for Hwy. NC 24 and Piney Green Road adjacent to Parcel #346. The soil samples were analyzed for DRO and GRO. Neither DRO nor GRO was detected in any of the collected soil samples.

Based on the data generated from this investigation, there is no evidence that a release of constituents of concern has occurred within the NCDOT proposed ROWs at Parcel #346. No additional environmental investigation of the soil at either site is recommended at this time.



PLOTTED: Apr 08, 2010 - 2:08pm BY: sp FILE LOCATION: C:\Documents and Settings\sp\Desktop\0110\_Prelim\dwg\_LAYOUT TAB: 346



**Engineering of NC Inc.**

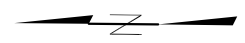
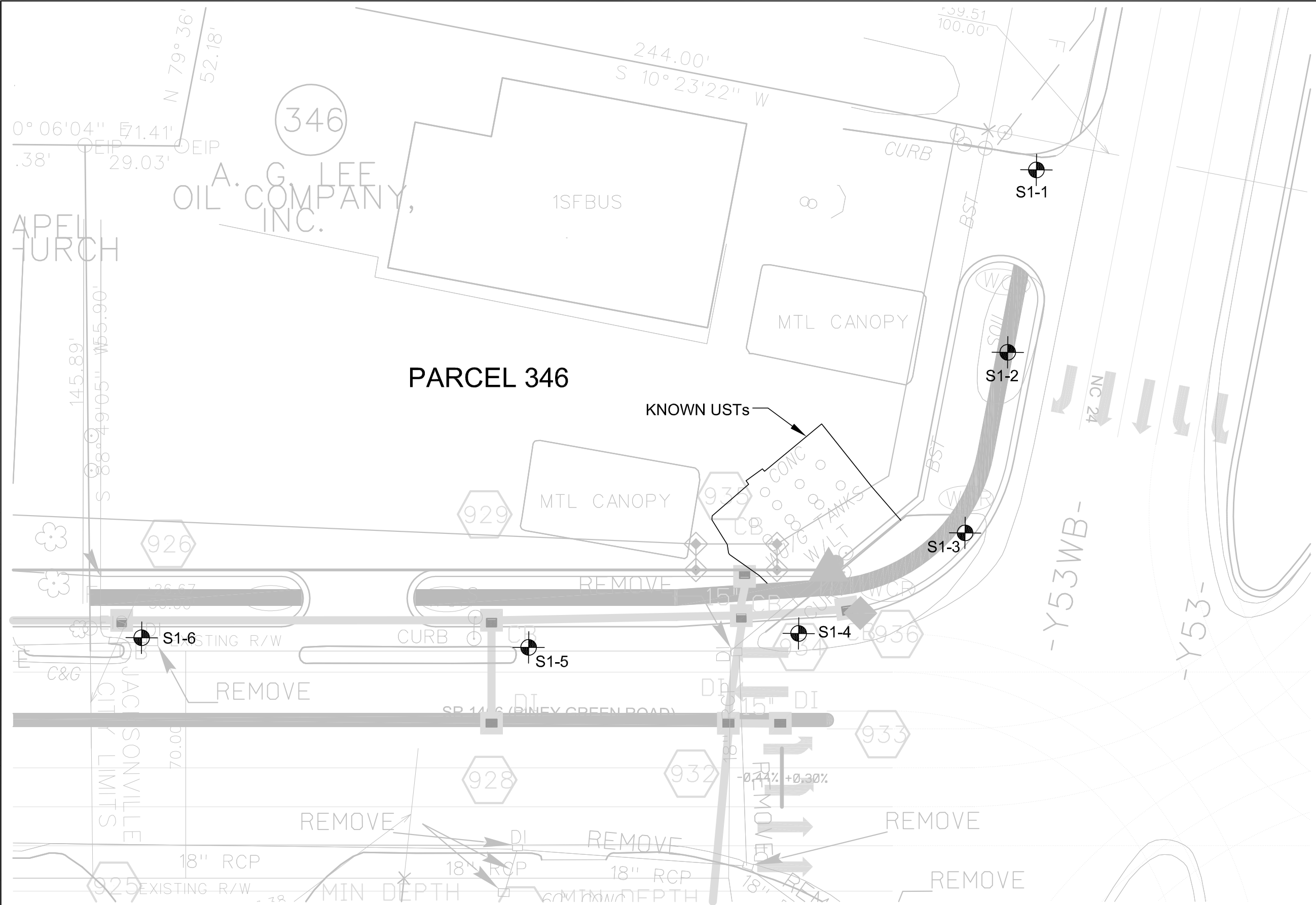
an Affiliate of THE GEL GROUP INC

Post Office Box 14262  
 Research Triangle Park, NC 27709  
 P 919-544-1100  
 F 919-406-1807  
 www.gel.com

problem solved

PROJECT: ncd100110	PRELIMINARY SITE ASSESSMENT REPORT PARCEL 346 MIDWAY PARK, NORTH CAROLINA STATE PROJECT U-3810, WBS# 35801.1.1	USGS TOPOGRAPHIC LOCATION MAP	FIGURE 1
DATE: April 6, 2010	DRAWN BY: TJP	APPRV. BY: ADE	

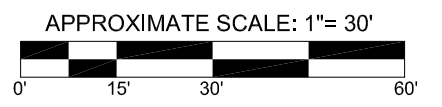
PLOTTED: May 06, 2010 - 3:57pm BY: tjp FILE LOCATION: H:\Consulting Client Files\K-R\N\ncdt00110\_Piney Green\ncdt00110\_Fig2s-C.dwg LAYOUT TAB: 346



**LEGEND**

S2-2 SOIL BORING LOCATION

**NOTE:**  
 SEE FIGURE 3 FOR KEY MAP  
 SHOWING PARCEL LOCATIONS



**GEL Engineering of NC Inc.**

an Affiliate of THE GEL GROUP INC

problem solved

Post Office Box 14262  
 Research Triangle Park, NC 27709  
 P 919-544-1100  
 F 919-406-1807  
 www.gel.com

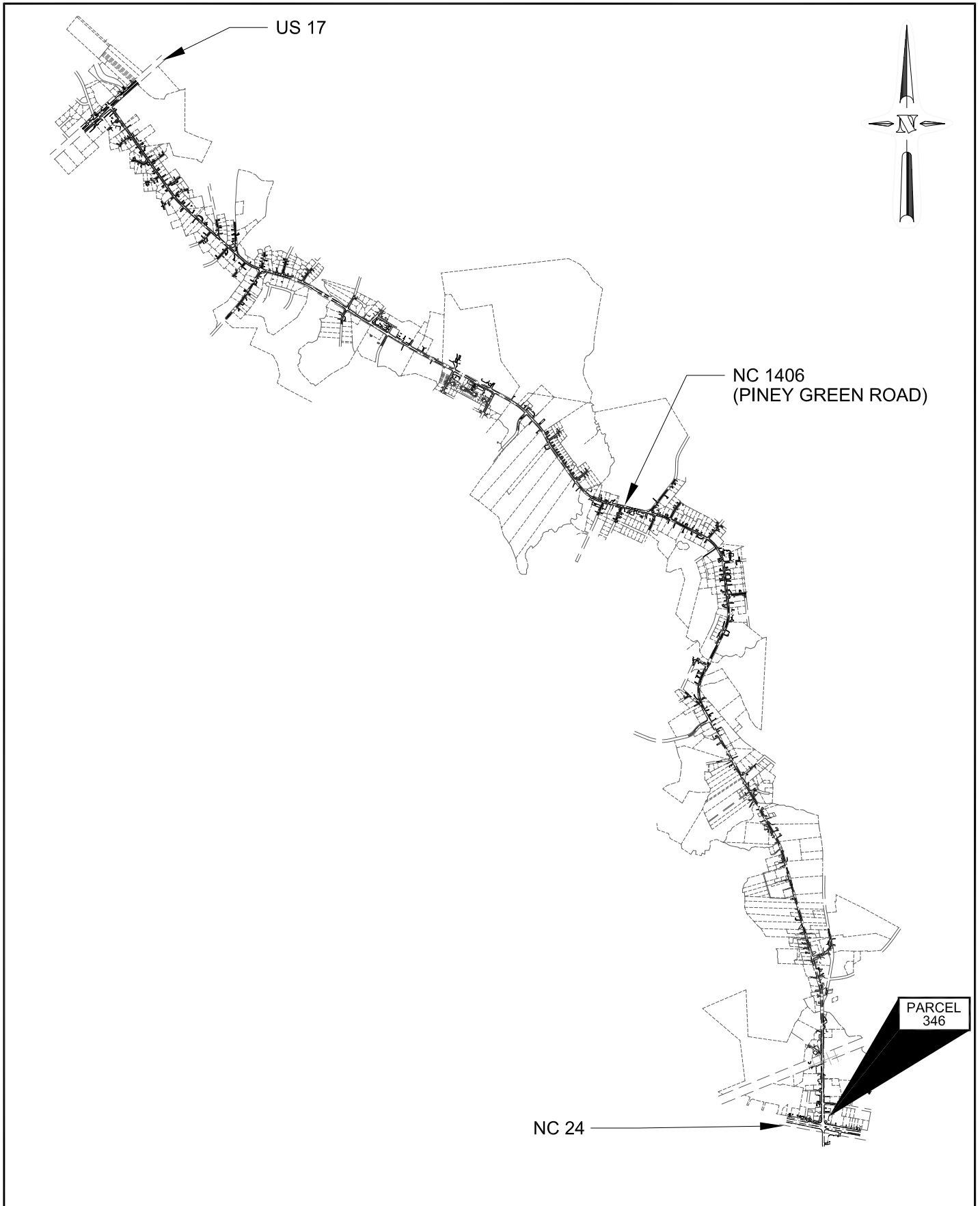
PROJECT: ncdt00110  
 PRELIMINARY SITE ASSESSMENT REPORT  
 PARCEL NO. 346, A.G. LEE OIL CO., INC  
 2865 PINEY GREEN ROAD  
 MIDWAY PARK, NORTH CAROLINA  
 STATE PROJECT U-3810, WBS #35801.1.1

DATE: May 3, 2010

SITE SKETCH SHOWING  
 SOIL BORING LOCATIONS

DRAWN BY: TJP      APPRV. BY: ADE

FIGURE  
 2



**Engineering of NC Inc.**

an Affiliate of THE GEL GROUP INC

problem solved

P.O. Box 14262  
 RTP, NC 27709  
 P: 919.544.1100  
 F: 919.406.1807  
 www.gel.com

PROJECT: ncdt00110

PRELIMINARY SITE ASSESSMENT REPORT  
 PARCEL 346  
 MIDWAY PARK, NORTH CAROLINA  
 STATE PROJECT U-3810, WBS# 35801.1.1

DATE: April 6, 2010

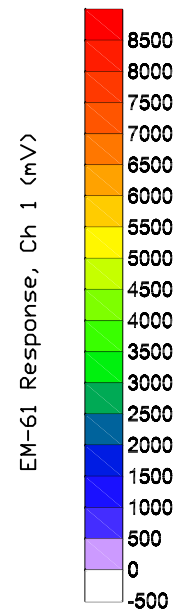
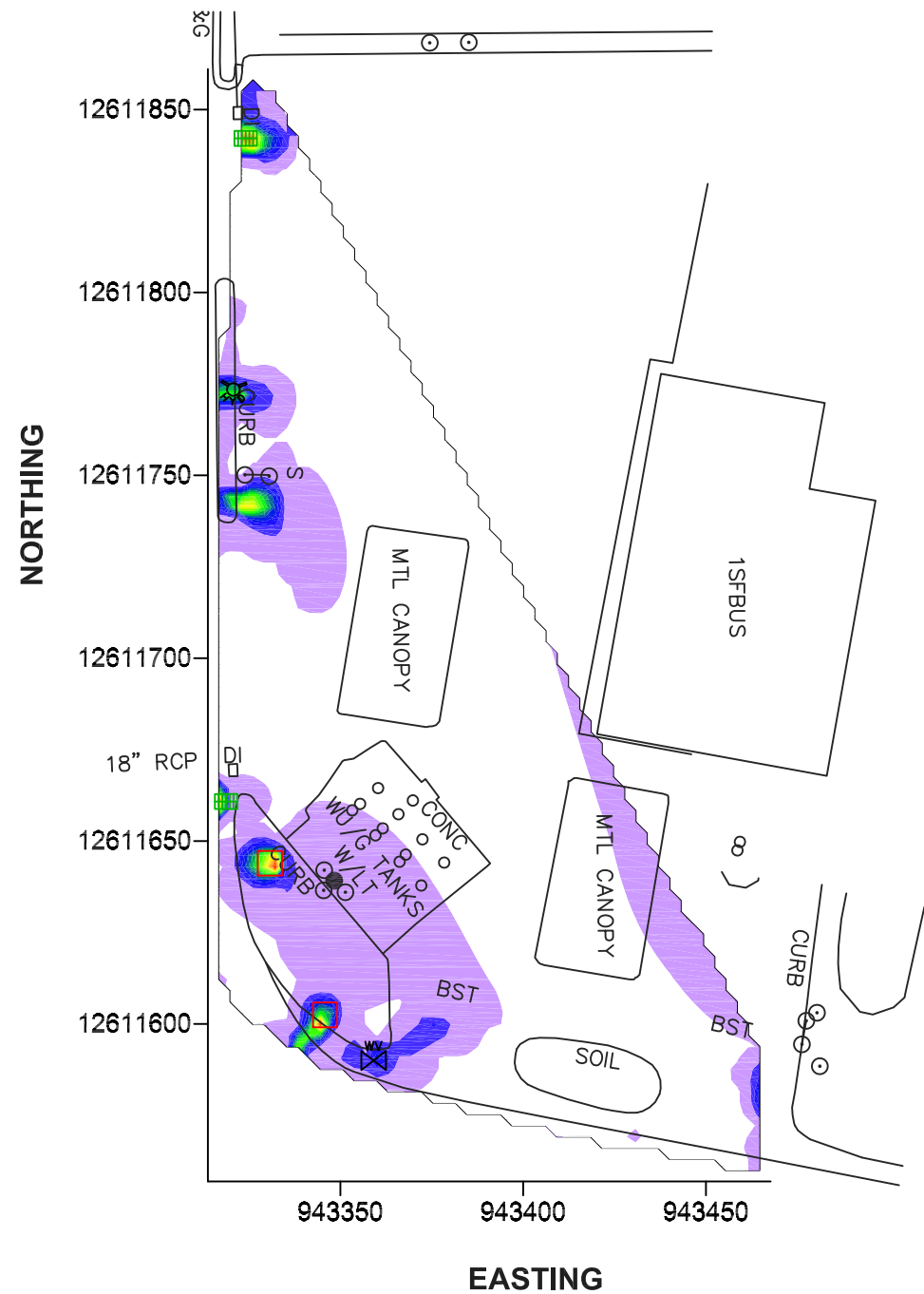
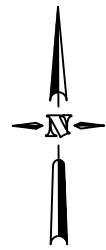
KEY MAP SHOWING  
 PARCEL LOCATION

DRAWN BY: TJP

APPRV. BY: ADE

FIGURE





3



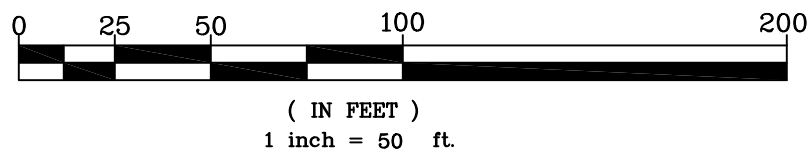
**NOTES**

- 1) UNDERGROUND FEATURES WERE LOCATED USING VISUAL EVIDENCE, GROUND PENETRATING RADAR (GPR), AND TIME DOMAIN ELECTROMAGNETIC (TDEM) METHODS. OTHER BURIED UTILITIES AND STRUCTURES MAY EXIST BUT WERE NOT DETECTED DUE TO LIMITATIONS OF THE GEOPHYSICAL METHODS, SITE ACCESS, AND/OR HIGH TARGET CONGESTION. THEREFORE, DUE CAUTION SHOULD BE USED WHEN PERFORMING SUBSURFACE EXCAVATION ACTIVITIES WHERE POTENTIAL CONFLICTS EXIST. GEL ENGINEERING OF NC INC. IS NOT RESPONSIBLE FOR DAMAGES THAT MAY OCCUR. IDENTIFYING THE LOCATION OF SOME UTILITIES AND/OR STRUCTURES MAY ONLY BE POSSIBLE WITH VACUUM OR OTHER EXCAVATION METHODS.
- 2) DATA FROM GEONICS, LTD. EM-61 MKII AND MALA GEOSCIENCE GROUND PENETRATING RADAR.
- 3) COORDINATES IN US STATE PLANE NAD 1983 DATUM.
- 4) PROJECT MICROSTATION BASEMAPS PROVIDED BY NCDOT.
- 5) **NO UNKNOWN UNDERGROUND STORAGE TANKS FOUND UNLESS NOTED IN DRAWING**

**LEGEND**

-  WATER VALVE
-  FIRE HYDRANT
-  UNKNOWN UTILITY
-  STORMWATER DRAINAGE GRATE

**GRAPHIC SCALE**



**GEL Engineering of NC INC.**

An Affiliate Of THE GEL GROUP, INC.

problem solved

P.O. Box 14262  
RTP, NC27709  
P: 919.544.1100  
F: 919.406.1807  
www.gel.com

PROJECT: NCDT00110

Preliminary Site Assessment  
SR 1406 (Piney Green Rd) From NC 24 to US 17  
Onslow County, North Carolina  
State Project U-3810, WBS# 35801.1.1

March 11, 2010

Site Map Showing Results  
Of Geophysical Survey Investigation  
Parcel 346

DRAWN BY: DEA

APPRV. BY: CMS

FIGURE  
4

**APPENDIX I**

**SOIL BORING LITHOLOGIC LOGS**



## SOIL BORING LOG

Boring/Well No.: 51-1-1

Date Started: 3/8/10

Date Completed: 3/8/10

No.	Depth Interval	Blow Counts	PID (ppm)	Soil Description	Soil Type
1	0-4	—	0.5	Dk. Gray-Tan Silty Sand, 0-1'; Damp Tan Sandy Clay 1-4'; Moist	
2	4-8	—	0.4	Tan-Lt. Tan, White Sandy Clay, Moist Med. Firm, Lt Tan Silty Sand (7-8') Moist-Wet	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

15.45

Notes:

- 1) 4-foot continuous cores using DPT..

34° 42.964 N

77° 19.186 W

## SOIL BORING LOG

Boring/Well No.: 51-2

Date Started: 3/8/10

Date Completed: 3/8/10

No.	Depth Interval	Blow Counts	PID (ppm)	Soil Description	Soil Type
1	0-4	—	0.3	Gray-DK Gray, Tan silty Sand (0-2') Damp Tan Sandy Clay (2-4') Moist	
15:55 * 2	4-8	—	0.5	Tan Sandy Clay / Tan, Orange-Lt. Gray Clayey sand, cohesive, plastic	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Notes:

- 1) 4-foot continuous cores using DPT..

340 42.966 N

77° 19.197 W

## SOIL BORING LOG

Boring/Well No.: 51-3  
 Date Started: 3/8/10  
 Date Completed: 3/8/10

16:10

No.	Depth Interval	Blow Counts	PID (ppm)	Soil Description	Soil Type
1	0-4'	-	0.3	Grass mat, organics Orange Brown sandy Clay → Dk. Gray, Brown Silty Sand - Moist	
2	4-8'	-	0.6	DK Gray - Brn Silty sand, Red Orange Gray mottled sandy clay, Firm - Moist	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Notes:

- 1) 4-foot continuous cores using DPT..

34° 42.968 N

77° 19.209 W

## SOIL BORING LOG

Boring/Well No.: 51-4  
 Date Started: 3/8/10  
 Date Completed: 3/8/10

16:25

No.	Depth Interval	Blow Counts	PID (ppm)	Soil Description	Soil Type
1	0-4	—	0.3	Brown, Dk. Gray Silty Sand, Damp Brown Tan Sandy Clay, Moist	
2	4-8	—	0.9	Brown Tan → Lt. Gray Sandy Clay Moist, Fine grained sand	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Notes:

- 1) 4-foot continuous cores using DPT..

34042, 974 N

77° 19, 215 W

## SOIL BORING LOG

Boring/Well No.: 51-5

Date Started: 3/8/10

Date Completed: 3/8/10

16:35 ★

No.	Depth Interval	Blow Counts	PID (ppm)	Soil Description	Soil Type
1	0-4'	—	0.7	Gray-Tan Fine grained silty sand, Dry-Damp Tan-Brown Sandy Clay, Moist	
2	4-8'	—	0.5	Tan, Red, Gray Mottled Sandy Clay, Moist Tan Silty Sand, Moist	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Notes:

- 1) 4-foot continuous cores using DPT..

340 42.990 N

770 19.216 W

## SOIL BORING LOG

Boring/Well No.: 51-6

Date Started: 3/8/10

Date Completed: 3/8/10

No.	Depth Interval	Blow Counts	PID (ppm)	Soil Description	Soil Type
1	0-4	—	0.6	DK. Gray - Brown Silty Sand, Dry - Damp Brown Tan Sandy Clay, Moist	
1645 ✖ 2	4-8	—	0.7	Tan - Red, Orange mottled Sandy Clay Moist, sandier towards bottom	
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

Notes:

- 1) 4-foot continuous cores using DPT..

34° 43.012 N

77° 19.217 W

**APPENDIX II**

**CERTIFICATES OF ANALYSIS AND  
CHAIN OF CUSTODY RECORD FOR SOIL SAMPLES**



Andrew Eyer  
GEL Engineering of NC, Inc.  
PO Box 14262  
RTP, NC 27709

Report Number: G341-616

Client Project: U-3810/NCDOT 001100

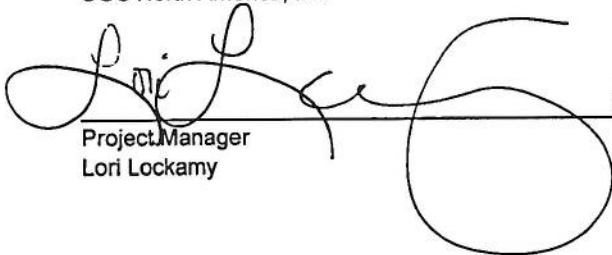
Dear Andrew Eyer,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of five years in the event they are required for future reference. Any samples submitted to our laboratory will be retained for a maximum of thirty (30) days from the date of this report unless other arrangements are requested.

If there are any questions about the report or services performed during this project, please call Lori Lockamy at (910) 350-1903. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America, Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,  
SGS North America, Inc.

A large, stylized handwritten signature in black ink, appearing to read 'Lori Lockamy', written over a horizontal line.

Project Manager  
Lori Lockamy

23 March 2010

Date



Case Narrative

GEL

SGS Project: G341-616

Project Name: U-3810/NCDT001100


SGS North America Inc.

March 22<sup>nd</sup>, 2010

- Seventy four soil samples were accepted into the laboratory on March 11<sup>th</sup>, 2010 at 1515 for analyses as indicated on the chain of custody. The samples were received in good condition, with a temperature range of 2.0-2.1°C.
- All extractions and analyses were completed within holding time limits, with the following quality control exceptions.

8260 Analyses

- The ICAL dated 9032110 has a reported linear  $r^2$  value for Acetone that is below 0.990. Only samples S8-2-8, S8-6-8, S8-8-4, S7-1-4, S7-2-4 and S7-3-4 were affected and these samples had no Acetone detected.
- Samples S8-4-4 and S8-7-8 have reported recoveries for 1,2-Dichloroethane-d4 that are above the QC limit. These recoveries were confirmed by duplicate analysis.

 \_\_\_\_\_ Date 3/23/10  
Craig R Tronzo  
Data Validation

SGS North America, Inc.  
List of Reporting Abbreviations  
And Data Qualifiers

B = Compound also detected in batch blank

BQL = Below Quantification Limit (RL or MDL)

DF = Dilution Factor

Dup = Duplicate

D = Detected, but RPD is > 40% between results in dual column method.

E = Estimated concentration, exceeds calibration range.

J = Estimated concentration, below calibration range and above MDL

LCS(D) = Laboratory Control Spike (Duplicate)

MDL = Method Detection Limit

MS(D) = Matrix Spike (Duplicate)

PQL = Practical Quantitation Limit

RL/CL = Reporting Limit / Control Limit

RPD = Relative Percent Difference

UJ = Target analytes with recoveries that are  $10\% < \%R < LCL$ ; # of MEs are allowable and compounds are not detected in the sample.

mg/kg = milligram per kilogram, ppm, parts per million

ug/kg = micrograms per kilogram, ppb, parts per billion

mg/L = milligram per liter, ppm, parts per million

ug/L = micrograms per liter, ppb, parts per billion

% Rec = Percent Recovery

% solids = Percent Solids

Special Notes:

- 1) Metals and mercury samples are digested with a hot block; see the standard operating procedure document for details.
- 2) Uncertainty for all reported data is less than or equal to 30 percent.

**Results for Total Petroleum Hydrocarbons**  
by GC/FID 8015

Client Sample ID: S1-1-4  
 Client Project ID: U-3810/NC DOT 001100  
 Lab Sample ID: G341-616-16A  
 Lab Project ID: G341-616  
 Report Basis: Dry Weight

Analyzed By: BAO  
 Date Collected: 3/8/2010 15:45  
 Date Received: 3/11/2010  
 Matrix: Soil  
 Solids 83.48

Analyte	Result	RL	Units	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	5.04	mg/Kg	1	03/16/10 13:48

**Surrogate Spike Results**

	Added	Result	Recovery	Flag	Limits
BFB	100	87.1	87.1		70-130

**Comments:**


**Batch Information**

Analytical Batch: VP031610  
 Analytical Method: 8015  
 Instrument ID: GC4  
 Analyst: BAO

Prep Method: 5035  
 Initial Wt/Vol: 7.13 g  
 Final Volume: 5 mL

Analyst: BAO

NC Certification #481

Reviewed By:   
GRO.XLS

**Results for Total Petroleum Hydrocarbons  
by GC/FID 8015**

Client Sample ID: S1-1-4  
 Client Project ID: U-3810/NC DOT 001100  
 Lab Sample ID: G341-616-16D  
 Lab Project ID: G341-616

Date Collected: 3/8/2010 15:45  
 Date Received: 3/11/2010  
 Matrix: Soil  
 Solids 83.48  
 Report Basis: Dry Weight

Parameter	Result	RL	Units	Dilution Factor	Date Analyzed
Diesel Range Organics	BQL	7.34	mg/Kg	1	03/16/10 22:51
<b>Surrogate Spike Results</b>		<b>Spike Added</b>	<b>Control Limits</b>	<b>Spike Result</b>	<b>Percent Recovery</b>
OTP		40	40-140	39.5	98.6

**Comments:**

**Batch Information**

Analytical Batch: EP031610  
 Analytical Method: 8015  
 Instrument: GC6  
 Analyst: DTF

Prep batch: 16210  
 Prep Method: 3541  
 Prep Date: 03/15/10  
 Initial Prep Wt/Vol: 32.62 G  
 Prep Final Vol: 10 mL

**Results for Total Petroleum Hydrocarbons**  
by GC/FID 8015

Client Sample ID: S1-2-8  
 Client Project ID: U-3810/NC DOT 001100  
 Lab Sample ID: G341-616-17A  
 Lab Project ID: G341-616  
 Report Basis: Dry Weight

Analyzed By: BAO  
 Date Collected: 3/8/2010 15:55  
 Date Received: 3/11/2010  
 Matrix: Soil  
 Solids 82.39

Analyte	Result	RL	Units	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	4.99	mg/Kg	1	03/16/10 14:42

**Surrogate Spike Results**

	Added	Result	Recovery	Flag	Limits
BFB	100	86.8	86.8		70-130

**Comments:**

**Batch Information**

Analytical Batch: VP031610  
 Analytical Method: 8015  
 Instrument ID: GC4  
 Analyst: BAO

Prep Method: 5035  
 Initial Wt/Vol: 7.3 g  
 Final Volume: 5 mL

Analyst: BAO

NC Certification #481

Reviewed By:   
 GRO.XLS

**Results for Total Petroleum Hydrocarbons**  
by GC/FID 8015

Client Sample ID: S1-2-8  
 Client Project ID: U-3810/NC DOT 001100  
 Lab Sample ID: G341-616-17D  
 Lab Project ID: G341-616

Date Collected: 3/8/2010 15:55  
 Date Received: 3/11/2010  
 Matrix: Soil  
 Solids 82.39  
 Report Basis: Dry Weight

Parameter	Result	RL	Units	Dilution Factor	Date Analyzed
Diesel Range Organics	BQL	7.46	mg/Kg	1	03/17/10 00:15
<b>Surrogate Spike Results</b>		<b>Spike Added</b>	<b>Control Limits</b>	<b>Spike Result</b>	<b>Percent Recovery</b>
OTP		40	40-140	38.6	96.4

Comments:

**Batch Information**

Analytical Batch: EP031610  
 Analytical Method: 8015  
 Instrument: GC6  
 Analyst: DTF

Prep batch: 16210  
 Prep Method: 3541  
 Prep Date: 03/15/10  
 Initial Prep Wt/Vol: 32.54 G  
 Prep Final Vol: 10 mL

Analyst: Fal

NC Certification #481

Reviewed By: MA  
 DRO.XLS  
 Page 171 of 230

**Results for Total Petroleum Hydrocarbons**  
by GC/FID 8015

Client Sample ID: S1-3-8  
 Client Project ID: U-3810/NC DOT 001100  
 Lab Sample ID: G341-616-18A  
 Lab Project ID: G341-616  
 Report Basis: Dry Weight

Analyzed By: BAO  
 Date Collected: 3/8/2010 16:10  
 Date Received: 3/11/2010  
 Matrix: Soil  
 Solids 83.72

Analyte	Result	RL	Units	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	5.04	mg/Kg	1	03/16/10 15:09

**Surrogate Spike Results**

	Added	Result	Recovery	Flag	Limits
BFB	100	88.3	88.3		70-130

**Comments:**


**Batch Information**

Analytical Batch: VP031610  
 Analytical Method: 8015  
 Instrument ID: GC4  
 Analyst: BAO

Prep Method: 5035  
 Initial Wt/Vol: 7.11 g  
 Final Volume: 5 mL

Analyst: BAO

NC Certification #481

Reviewed By:   
GRO.XLS

**Results for Total Petroleum Hydrocarbons**  
by GC/FID 8015

Client Sample ID: S1-3-8  
 Client Project ID: U-3810/NC DOT 001100  
 Lab Sample ID: G341-616-18D  
 Lab Project ID: G341-616

Date Collected: 3/8/2010 16:10  
 Date Received: 3/11/2010  
 Matrix: Soil  
 Solids 83.72  
 Report Basis: Dry Weight

Parameter	Result	RL	Units	Dilution Factor	Date Analyzed
Diesel Range Organics	BQL	7.23	mg/Kg	1	03/17/10 00:43
<b>Surrogate Spike Results</b>		<b>Spike Added</b>	<b>Control Limits</b>	<b>Spike Result</b>	<b>Percent Recovery</b>
OTP		40	40-140	37	92.4

Comments:

**Batch Information**

Analytical Batch: EP031610  
 Analytical Method: 8015  
 Instrument: GC6  
 Analyst: DTF

Prep batch: 16210  
 Prep Method: 3541  
 Prep Date: 03/15/10  
 Initial Prep Wt/Vol: 33.05 G  
 Prep Final Vol: 10 mL



**Results for Total Petroleum Hydrocarbons  
by GC/FID 8015**

Client Sample ID: S1-4-8  
 Client Project ID: U-3810/NC DOT 001100  
 Lab Sample ID: G341-616-19A  
 Lab Project ID: G341-616  
 Report Basis: Dry Weight

Analyzed By: BAO  
 Date Collected: 3/8/2010 16:25  
 Date Received: 3/11/2010  
 Matrix: Soil  
 Solids 81.90

Analyte	Result	RL	Units	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	5.20	mg/Kg	1	03/16/10 15:36

**Surrogate Spike Results**

	Added	Result	Recovery	Flag	Limits
BFB	100	85.1	85.1		70-130

**Comments:**


**Batch Information**

Analytical Batch: VP031610  
 Analytical Method: 8015  
 Instrument ID: GC4  
 Analyst: BAO

Prep Method: 5035  
 Initial Wt/Vol: 7.05 g  
 Final Volume: 5 mL

Analyst: BAO

NC Certification #481

Reviewed By:   
 GRO.XLS

**Results for Total Petroleum Hydrocarbons**  
by GC/FID 8015

Client Sample ID: S1-4-8  
 Client Project ID: U-3810/NC DOT 001100  
 Lab Sample ID: G341-616-19D  
 Lab Project ID: G341-616

Date Collected: 3/8/2010 16:25  
 Date Received: 3/11/2010  
 Matrix: Soil  
 Solids 81.90  
 Report Basis: Dry Weight

Parameter	Result	RL	Units	Dilution Factor	Date Analyzed
Diesel Range Organics	BQL	7.51	mg/Kg	1	03/17/10 01:11
<b>Surrogate Spike Results</b>		<b>Spike Added</b>	<b>Control Limits</b>	<b>Spike Result</b>	<b>Percent Recovery</b>
OTP		40	40-140	37.5	93.7

**Comments:**

**Batch Information**

Analytical Batch: EP031610  
 Analytical Method: 8015  
 Instrument: GC6  
 Analyst: DTF

Prep batch: 16210  
 Prep Method: 3541  
 Prep Date: 03/15/10  
 Initial Prep Wt/Vol: 32.52 G  
 Prep Final Vol: 10 mL

**Results for Total Petroleum Hydrocarbons  
by GC/FID 8015**

Client Sample ID: S1-5-4  
 Client Project ID: U-3810/NC DOT 001100  
 Lab Sample ID: G341-616-20A  
 Lab Project ID: G341-616  
 Report Basis: Dry Weight

Analyzed By: BAO  
 Date Collected: 3/8/2010 16:35  
 Date Received: 3/11/2010  
 Matrix: Soil  
 Solids 83.99

Analyte	Result	RL	Units	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	5.10	mg/Kg	1	03/16/10 16:03

**Surrogate Spike Results**

	Added	Result	Recovery	Flag	Limits
BFB	100	88.2	88.2		70-130

**Comments:**


**Batch Information**

Analytical Batch: VP031610  
 Analytical Method: 8015  
 Instrument ID: GC4  
 Analyst: BAO

Prep Method: 5035  
 Initial Wt/Vol: 7.01 g  
 Final Volume: 5 mL

Analyst: BAO

NC Certification #481

Reviewed By:   
 GRO.XLS

**Results for Total Petroleum Hydrocarbons  
by GC/FID 8015**

Client Sample ID: S1-5-4  
 Client Project ID: U-3810/NC DOT 001100  
 Lab Sample ID: G341-616-20D  
 Lab Project ID: G341-616

Date Collected: 3/8/2010 16:35  
 Date Received: 3/11/2010  
 Matrix: Soil  
 Solids 83.99  
 Report Basis: Dry Weight

Parameter	Result	RL	Units	Dilution Factor	Date Analyzed
Diesel Range Organics	BQL	7.08	mg/Kg	1	03/17/10 01:38
<b>Surrogate Spike Results</b>		<b>Spike Added</b>	<b>Control Limits</b>	<b>Spike Result</b>	<b>Percent Recovery</b>
OTP		40	40-140	37.1	92.7

**Comments:**

**Batch Information**

Analytical Batch: EP031610  
 Analytical Method: 8015  
 Instrument: GC6  
 Analyst: DTF

Prep batch: 16210  
 Prep Method: 3541  
 Prep Date: 03/15/10  
 Initial Prep Wt/Vol: 33.65 G  
 Prep Final Vol: 10 mL

**Results for Total Petroleum Hydrocarbons  
by GC/FID 8015**

Client Sample ID: S1-6-8  
 Client Project ID: U-3810/NC DOT 001100  
 Lab Sample ID: G341-616-1A  
 Lab Project ID: G341-616  
 Report Basis: Dry Weight

Analyzed By: BAO  
 Date Collected: 3/8/2010 16:45  
 Date Received: 3/11/2010  
 Matrix: Soil  
 Solids 82.63

Analyte	Result	RL	Units	Dilution Factor	Date Analyzed
Gasoline Range Organics	BQL	4.92	mg/Kg	1	03/13/10 03:23

**Surrogate Spike Results**

	Added	Result	Recovery	Flag	Limits
BFB	100	91.6	91.6		70-130

**Comments:**

**Batch Information**

Analytical Batch: VP031210  
 Analytical Method: 8015  
 Instrument ID: GC4  
 Analyst: BAO

Prep Method: 5035  
 Initial Wt/Vol: 7.38 g  
 Final Volume: 5 mL

Analyst: BAO

NC Certification #481

Reviewed By:   
GRO.XLS

**Results for Total Petroleum Hydrocarbons  
by GC/FID 8015**

Client Sample ID: S1-6-8  
 Client Project ID: U-3810/NC DOT 001100  
 Lab Sample ID: G341-616-1D  
 Lab Project ID: G341-616

Date Collected: 3/8/2010 16:45  
 Date Received: 3/11/2010  
 Matrix: Soil  
 Solids 82.63  
 Report Basis: Dry Weight

Parameter	Result	RL	Units	Dilution Factor	Date Analyzed
Diesel Range Organics	BQL	7.35	mg/Kg	1	03/16/10 15:50
<b>Surrogate Spike Results</b>		<b>Spike Added</b>	<b>Control Limits</b>	<b>Spike Result</b>	<b>Percent Recovery</b>
OTP		40	40-140	39.5	98.7

Comments:


**Batch Information**

Analytical Batch: EP031610  
 Analytical Method: 8015  
 Instrument: GC6  
 Analyst: DTF

Prep batch: 16210  
 Prep Method: 3541  
 Prep Date: 03/15/10  
 Initial Prep Wt/Vol: 32.94 G  
 Prep Final Vol: 10 mL

Analyst: FX

NC Certification #481

Reviewed By:   
 DRO.XLS  
 Page 158 of 230



# SGS Environmental Services Inc. CHAIN OF CUSTODY RECORD

- Locations Nationwide
- Alaska
  - Maryland
  - New Jersey
  - New York
  - North Carolina
  - Ohio
  - West Virginia
- www.us.sgs.com

1 CLIENT: GEL Eng. OF NC, Inc.  
 CONTACT: Andrew Eyer PHONE NO: 919-323-8828  
 PROJECT: U-3810/NC1010 SITE/PWSID#: ONSLOW Co.  
 REPORTS TO: Andrew Eyer EMAIL: ade@gel.com  
 INVOICE TO: NC DOT QUOTE #:  
WBS# 35801.1.1 P.O. #:

SGS Reference #: G341-616 page      of     

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX/MATRIX CODE	# CONTAINERS	SAMPLE TYPE C= COMP G= GRAB M= Multi Incremental Samples	Preservatives Used Analysis Required	REMARKS/LOC ID
11	52-1-8	3/8/10	14:25	50	3	G		
12	52-2-8		14:35		3	G		
13	52-3-8		14:45		3	G		
14	52-4-8		14:55		3	G		
15	52-5-8		15:05		3	G		
16	51-1-4		15:45		3	G		
17	51-2-8		15:55		3	G		
18	51-3-8		16:10		3	G		
19	51-4-8		16:25		3	G		
20	51-5-4		16:35		3	G		

2

Collected/Relinquished By: (1)	Date	Time	Received By:	Time
<u>Andrew Eyer</u>	3/11/10	15:15	<u>Andrew Eyer</u>	
Relinquished By: (2)	Date	Time	Received By:	Time
Relinquished By: (3)	Date	Time	Received By:	Time
Relinquished By: (4)	Date	Time	Received For Laboratory By:	Time

3

DOD Project?	YES	NO	Special Deliverable Requirements:
Cooler ID			Requested Turnaround Time and/or Special Instructions:

4

Samples Received Cold?	YES	NO	Chain of Custody Seal: (Circle)
			INTACT <u>BROKEN</u> <u>ABSENT</u>
Temperature °C: <u>2.0, 21.2, 20.0</u>			



**SGS Environmental Services Inc.**  
**CHAIN OF CUSTODY RECORD**

- Locations Nationwide
- Alaska
  - Maryland
  - New Jersey
  - New York
  - North Carolina
  - Ohio
  - West Virginia
- www.us.sgs.com

1 CLIENT: GEL ENG OF NC, INC PHONE NO: 919-323-8828

CONTACT: Andrew Eyer SITE/PWSID#: ONS Low Co.

PROJECT: V-3810/AUST00100 EMAIL: ade@gel.com

REPORTS TO: Andrew Eyer QUOTE #: \_\_\_\_\_ P.O. #: \_\_\_\_\_

INVOICE TO: NC DOT WBS# 35801.1.1

SGS Reference #: 6341-616 page \_\_\_\_\_ of \_\_\_\_\_

SGS North America, Inc.

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX/MATRIX CODE	# CONTAINERS	SAMPLE TYPE C= COMP G= GRAB MI= Multi Incremental Samples	Preservatives Used Analysis Required ③	REMARKS/LOC ID
1	51-6-8	3/8/10	16:45	50	3	G		
2	53-1-4	3/9/10	09:50	50	3	G		
3	53-2-4		09:00	50	3	G		
4	53-3-8		09:15	50	3	G		
5	53-4-8		09:40	50	3	G		
6	53-5-4		09:50	50	3	G		
7	55-1-4		10:45	50	3	G		
8	55-2-8		11:00	50	3	G		
9	55-3-4		11:15	50	3	G		
10	55-4-4		11:25	50	3	G		

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

59

60

61

62

63

64

65

66

67

68

69

70

71

72

73

74

75

76

77

78

79

80

81

82

83

84

85

86

87

88

89

90

91

92

93

94

95

96

97

98

99

100

Special Deliverable Requirements:

DOD Project? YES NO

Cooler ID \_\_\_\_\_

Requested Turnaround Time and/or Special Instructions:

Samples Received Cold? YES NO

Cooler TB

Temperature °C: 2.0 2.1 2.0

Chain of Custody Seal: (Circle) INTACT BROKEN **ABSENT**



**APPENDIX III**

**PHOTOGRAPHS SHOWING SOIL BORING LOCATIONS**



PINEY GREEN ROAD

ZIP MART  
2865 PINEY GREEN ROAD  
PARCEL NO. 346

S1-6

S1-5

S1-4

S1-3

S1-2

S1-1

NC 24

