



Engineering of NC INC

an affiliate of **The GEL Group** INC

**REVISED PRELIMINARY SITE  
ASSESSMENT REPORT**

**115 Country Club Road  
Daughtride Enterprises Property, Parcel 10  
Rocky Mount, North Carolina  
State Project U-3331  
WBS Element #34927.1.1  
Nash County**

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

October 30, 2013

**REVISED PRELIMINARY SITE ASSESSMENT REPORT**

**Parcel 10  
115 Country Club Road  
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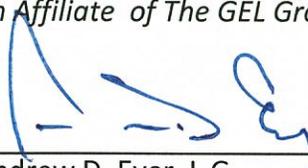
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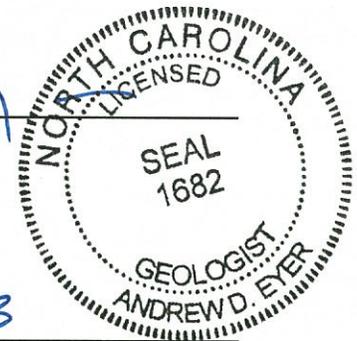
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Signature Page

This document, entitled *Revised Preliminary Site Assessment Report*, has been prepared for the Daughtridge Enterprises Property, Parcel 10, located at 115 Country Club Road in Rocky Mount, North Carolina (State Project U-3331, WBS Element # 34927.1.1, Nash 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 NC, INC.  
*an Affiliate of The GEL Group, Inc.*

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



10-30-13

\_\_\_\_\_  
Date

## **REVISED PRELIMINARY SITE ASSESSMENT REPORT**

**Parcel 10  
115 Country Club Road  
Rocky Mount, North Carolina  
State Project U-3331  
WBS Element #34927.1.1  
Nash County**

### **Executive Summary**

The subject site is Parcel 10, located at 115 Country Club Road in Rocky Mount, North Carolina. The primary purpose of this investigation was to evaluate the presence or absence of underground storage tanks (USTs) and constituents of concern in soil within the North Carolina Department of Transportation (NCDOT) easterly Right-of-Way (ROW) adjacent to Parcel 10, as a result of previous and/or current operations at the subject site.

Currently, Parcel 10 contains an operating convenience store and service station, with four petroleum underground storage tanks (USTs), and has operated as a convenience store and service station for several years. A groundwater contamination incident (No. 20696) was first reported in 1999 and is noted in the North Carolina Department of Environment and Natural resources (NCDENR) database. Incident No. 20696 is currently under corrective action, based on NCDENR files.

GEL Engineering of NC, Inc. (GEL) performed a preliminary site assessment within the NCDOT easterly ROW of Country Club Road adjacent to Parcel 10 that included a geophysical investigation, and the collection and analysis of soil samples. No subsurface anomalies indicative of suspected or known USTs were identified within the investigation area, and it has been concluded that there are no "Known USTs," "Probable USTs," or "Possible USTs" present within the easterly ROW of Country Club Road adjacent to the site. Furthermore, it has been concluded that there are no "Known USTs," "Probable USTs," or "Possible USTs" present in the proposed easement adjacent to the easterly ROW.

Soil samples were collected for analysis from three borings constructed within the easterly ROW. The soil samples were analyzed for Diesel Range Organics (DRO) and Gasoline Range Organics (GRO). DRO was detected at levels exceeding the NCDENR action level of 10 milligrams per kilogram (mg/kg) in two of the three soil samples.

Petroleum odors observed in soil in all three borings and the presence of two groundwater monitoring wells (assumed IDs of MW-1 and MW-2) in the investigation area also indicate the possibility of soil impact. However, further analysis of NCDENR risk-based constituents would be needed to confirm the presence or absence of soil impact from petroleum.

Groundwater was encountered in two of the borings (S-1 and S-2) at depths ranging from 7.0 to 7.5 feet below land surface. Collection and analysis of groundwater samples were not included in the scope for this project. However, available data for wells MW-1 and MW-2 in NCDENR files for Incident No. 20626 would indicate whether or not groundwater in the investigation area was impacted at the time the groundwater data were collected.

Based on the detection of elevated DRO concentrations in soil sample S-1 and S-2, it is estimated that there is an approximate total volume of 555 cubic yards of impacted soil (DRO >10 mg/kg) in the vicinity of borings S-1 and S-2.

# REVISED PRELIMINARY SITE ASSESSMENT REPORT

**Parcel 10  
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Nash County**

## **1.0 Introduction**

This document presents the details of a geophysical survey and preliminary site assessment performed within the North Carolina Department of Transportation (NCDOT) Right-of-Way (ROW) at Parcel 10 (the Daughtridge Enterprises Property), located at 115 Country Club Road in Rocky Mount, North Carolina.

Parcel 10 contains an operating convenience store and service station, with four petroleum underground storage tanks (USTs), and has operated as a convenience store and service station for several years. A groundwater contamination incident was first reported in 1999 and is noted in the North Carolina Department of Environment and Natural resources (NCDENR) database as Incident No. 20696. Representatives for NCDENR's UST Section indicated that the site is currently in corrective action, but there have been no assessment or remediation activities associated with Incident No. 20696 conducted at the site since 2002.

The site location is shown on Figure 1, an excerpt from the United States Geological Survey (USGS) 7.5-minute quadrangle map of Rocky Mount, North Carolina. The preliminary site assessment was conducted by GEL Engineering of NC, Inc. (GEL) in accordance with the Notice to Proceed issued by NCDOT on August 20, 2013.

The primary purpose of this investigation was to evaluate the presence or absence of underground storage tanks (USTs) and/or constituents of concern in soil within the NCDOT ROW at the subject site as a result of current and/or former operations.

## **2.0 Background**

NCDOT is planning road improvements to the area in the vicinity of Country Club Road in Rocky Mount, North Carolina. NCDOT wanted to assess the area in the easterly ROW of Country Club Road adjacent to Parcel 10 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 10.

A total of three (3) at-grade groundwater monitoring wells were observed on the property on September 10, 2013, at the approximate locations shown in Figure 2. The monitoring wells are also shown in photographs provided in Appendix I. A handheld Magellan 330 global positioning system (GPS) was used to measure the longitude and latitude coordinates for the wells, which are listed below.

### Existing Groundwater Monitoring Wells Located on Parcel 10

Well ID *	Latitude/Longitude (NAD83)
MW-1	35°57'51.76"N / 77°49'42.48"W
MW-2	35°57'51.36"N / 77°49'41.58"W
MW-3	35°57'50.64"N / 77°49'42.12"W

Notes:

- 1) \* Assumed IDs; correspond with assumed well IDs shown on Figure 2.
- 2) Coordinates are based on North American Datum of 1983 (NAD83)

A total of 14 monitoring wells were observed on the adjoining parcel (Parcel 11), which borders Parcel 10 to the southeast and northeast. One monitoring well (assumed ID of MW-4) is located within the NCDOT proposed easement for parcel 11, as shown in Figure 2. Based on discussions with representatives with the NCDENR UST Section, Parcel 11 is not listed on NCDENR's UST Incident database, there never has been any USTs registered for Parcel 11, and the monitoring wells located on Parcel 11 were used to evaluate groundwater as part of assessments conducted for Incident No. 20696 at Parcel 10. Other than monitoring well MW-4 shown in Figure 2, no other monitoring wells on Parcel 11 are currently located within or near NCDOT's proposed easement for Parcel 10 or Parcel 11.

### 3.0 Local Geology and Surroundings

Parcel 10 is in a developed area of Rocky Mount in Nash County, North Carolina. Surrounding land uses include residential and commercial activities.

The site is located approximately 3 miles northwest of the center of Rocky Mount, North Carolina. This area is located on the Fall Line separating the Inner Piedmont and Coastal Plain physiographic provinces of North Carolina. The land surface of the area is characterized by nearly level, and gently sloping, well drained to poorly drained soils. The Eastern Slate Belt of the Inner Piedmont east of the site is typified by mostly metamorphosed volcanic and sedimentary rocks that are Early Paleozoic in age. The Coastal Plain west of the site is comprised of mostly sand and clay sediments, and typifies the geology in the vicinity of the site.

The United States Department of Agriculture's *Web Soil Survey* (2013) (<http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>) maps the soil in the investigation area as "Urban Land" (Ur), which is characterized as non-native fill material. The soils encountered at the site during the preliminary site assessment consisted predominantly of brown, mottled, clayey, sandy silt, and are interpreted as fill material.

Groundwater was encountered at a depth of approximately 7 to 7.5 feet in borings S-1 and S-2, but was not encountered in boring S-3. Based on the USGS topographic map presented as Figure 1, the site is located approximately 90 feet above mean sea level. The topography in Figure 1 indicates that groundwater in the vicinity of Parcel 10 most likely flows in an easterly direction towards Stony Creek.

#### **4.0 Subsurface Investigation**

To evaluate the presence or absence of USTs and/or impact to subsurface soil within the NCDOT ROW of Parcel 10, 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 easterly ROW of Country Club Road at Parcel 10.
- Soil vapor screening of soil samples collected from subsurface soil borings at Parcel 10 within the easterly ROW of Country Club Road to evaluate the potential presence or absence of soil impact from petroleum constituents of concern.
- Collection and laboratory analysis of soil samples from the easterly ROW of Country Club Road.

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

#### **4.1 Geophysical Survey**

The geophysical survey 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 within the investigation area. 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 on August 26-27, 2013, within the easterly ROW of Country Club Road fronting Parcel 10, as shown in Figure 3. The investigation area extended from the pavement of Country Club Road to the existing easterly NCDOT ROW line. It did not include the proposed 5- to 10-foot wide easement fronting Parcel 10, east of and parallel to the existing ROW.

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. Interpretation of the GPR data was conducted in the field and any potential anomalies were marked in the field. GPR data processing typically included band pass filtering, background removal, horizontal smoothing, and gain adjustments. TDEM was also used to scan the project site. Any 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 easterly ROW of Country Club road at Parcel 10 prior to the initiation of the preliminary site assessment field activities at the site. A minimal number of underground utilities were marked by "One Call" within the investigation area.

As shown on Figure 3, an EM-61 anomaly was identified in the entrance apron for the site. The anomaly location corresponds with the location of an existing reinforced concrete culvert underling the apron. The anomaly is interpreted as an EM-61 response to the steel reinforcement rebar used as part of the culvert's construction. The TDEM and GPR data did not indicate the presence of "Known USTs," "Probable USTs," or "Possible USTs" in the subsurface of the investigation area. Additionally, there was no visual evidence of "Known USTs," "Probable USTs," or "Possible USTs" in the investigation area.

The investigation area did not extend into the proposed easement, as discussed above. However, if "Known USTs," "Probable USTs," or "Possible USTs" are located within the proposed easement, the eastern edge of the EM-61 response imagery shown in Figure 3 would be expected to show marginal imagery (red, orange, yellow colors) indicative of USTs present in the adjacent easement. Furthermore, there were no indications of

“Known USTs,” “Probable USTs,” or “Possible USTs” located within the proposed easement based on the absence of UST fill ports, vents, etc. Therefore, it has been concluded that no “Known USTs,” “Probable USTs,” or “Possible USTs” are present within the proposed easement area.

#### **4.2 Subsurface Soil Investigation**

To evaluate the presence or absence of impact to subsurface soil by constituents of concern, GEL collected soil samples from three subsurface soil borings, S-1 through S-3, at Parcel 10 on September 10, 2013, for analysis of total petroleum hydrocarbon indicator parameters. The soil borings were constructed within the easterly ROW of Country Club Road, as shown on Figure 2. The longitude and latitude coordinates for the boring locations are listed in the table below, and photographs of the boring locations are presented in Appendix I.

All borings were advanced to a total depth of 8 feet below land surface (bls). Soil samples were collected at 3-4 feet and 7-8 feet 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 II of this document. Groundwater was encountered in boring S-1 and S-2 during construction of the borings at depths of 7.5 and 7.0 feet bls, respectively.

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 10**

<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>
S-1	3-4	26	35°57'50.70"N / 77°49'42.54"W
S-2	3-4	28	35°57'51.00"N / 77°49'42.06"W
S-3	7-8	11.2	35°57'51.42"N / 77°49'41.79"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 Pace Analytical Services, Inc. in Huntersville, North Carolina 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 III. The results indicate that DRO and/or GRO were detected in soil samples collected from borings S-1 and S-2. As shown in the summary table below, DRO concentrations detected in the samples S-1 and S-2 exceed the recommended North Carolina Department of Environment and Natural Resources (NCDENR) action level for DRO (10 milligrams per kilogram (mg/kg)).

**Summary of Analytical Results for  
Soil Samples Collected for Analysis at Parcel 10**

<b>Soil Sample</b>	<b>Collection Depth (feet bls)</b>	<b>DRO</b>	<b>GRO</b>
S-1	3 - 4	<b>20.6</b>	7.9
S-2	3 - 4	<b>22.5</b>	ND
S-3	7 - 8	ND	6.2
<b><i>NCDENR Action Level</i></b>		<b>10</b>	<b>10</b>

Notes:

- 1) ND = Not Detected
- 2) Concentrations shown are in milligram per kilogram (mg/kg).
- 3) **Bold** = detected concentration above the NCDENR Action Level

The soil in the vicinity of borings S-1 and S-2 is assumed to be impacted by one or more releases from current or former petroleum dispensing operations at the site based on the detected DRO and GRO concentrations. Petroleum odors observed in soil in all three borings, as well as the presence of two groundwater monitoring wells in the investigation area also indicate the possibility of soil impact. However, further analysis of NCDENR risk-based constituents would be needed to confirm the presence or absence of soil impact from petroleum.

It is estimated that there is an approximate total volume of 975 cubic yards of impacted soil (DRO >10 mg/kg) in the vicinity of borings S-1 and S-2 based on the following assumed area within the ROW (as shown on Figure 2) and assumed depth of impacted soil:

- 2,000 square feet x 7.5 feet (depth to water table) = 555 cubic yards

## **5.0 Conclusions and Recommendations**

GEL performed a preliminary site assessment within the NCDOT easterly ROW of Country Club Road adjacent to Parcel 10 that included a geophysical investigation, and the collection and analysis of soil samples. No subsurface anomalies indicative of suspected or known USTs were identified within the investigation area, and it has been concluded that there are no USTs present within the easterly ROW of Country Club Road adjacent to the site. Furthermore, it has been concluded that there are no USTs present in the proposed easement adjacent to the easterly ROW.

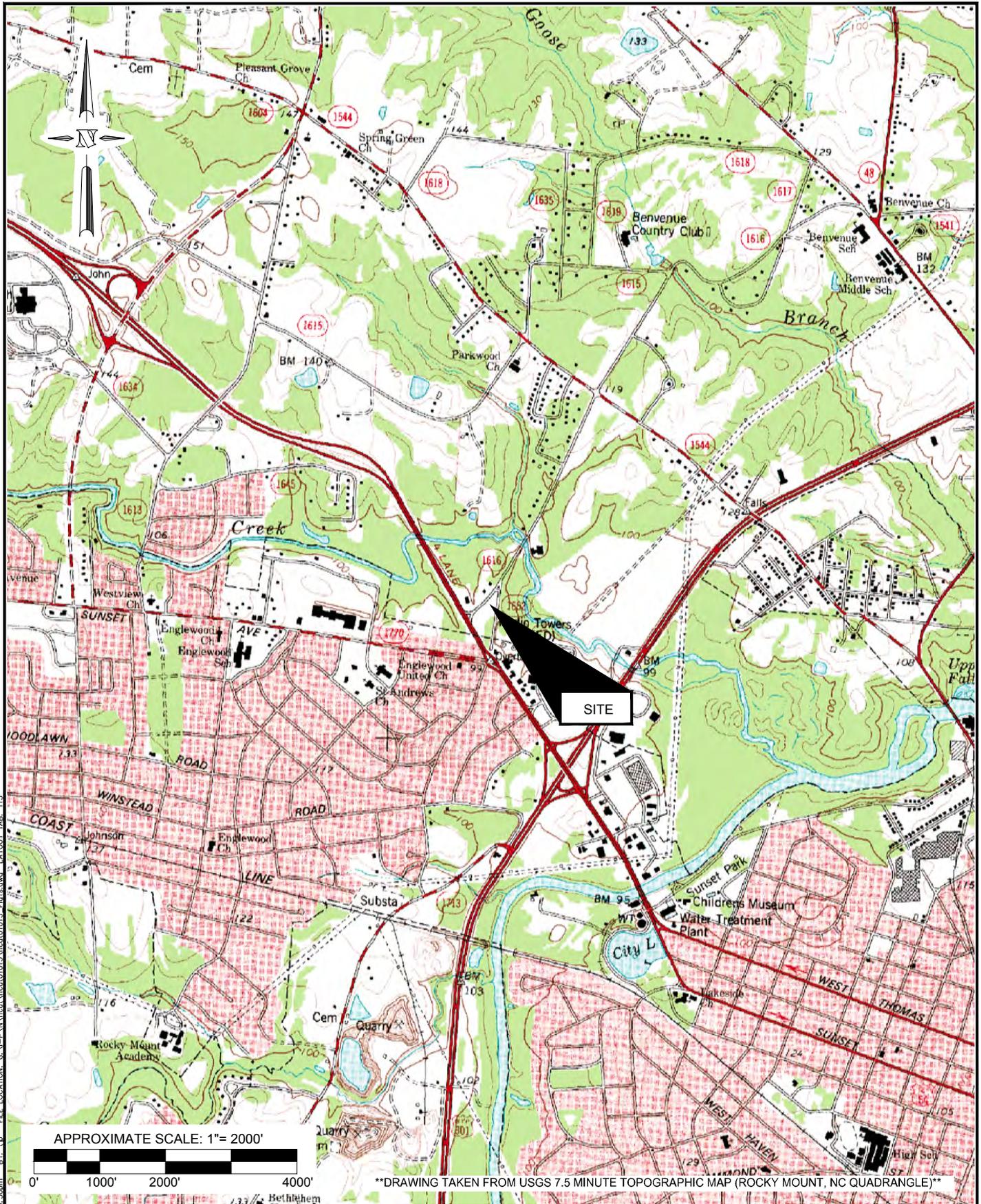
Soil samples were collected for analysis from three borings constructed within the easterly ROW. The soil samples were analyzed for DRO and GRO. DRO was detected at levels exceeding the NCDENR action level of 10 mg/kg in two of the three soil samples.

Petroleum odors observed in soil in all three borings and the presence of two groundwater monitoring wells (assumed IDs of MW-1 and MW-2) in the investigation area also indicate the possibility of soil impact. However, further analysis of NCDENR risk-based constituents would be needed to confirm the presence or absence of soil impact from petroleum.

Groundwater was encountered in two of the borings (S-1 and S-2) at depths ranging from 7.0 to 7.5 feet bls. Collection and analysis of groundwater samples were not included in the scope for this project. However, available data for wells MW-1 and MW-2 in NCDENR files for Incident No. 20626 would indicate whether or not groundwater in the investigation area was impacted at the time the groundwater data were collected.

Based on the detection of elevated DRO concentrations in soil sample S-1 and S-2, it is estimated that there is an approximate total volume of 555 cubic yards of impacted soil (DRO >10 mg/kg) in the vicinity of borings S-1 and S-2.

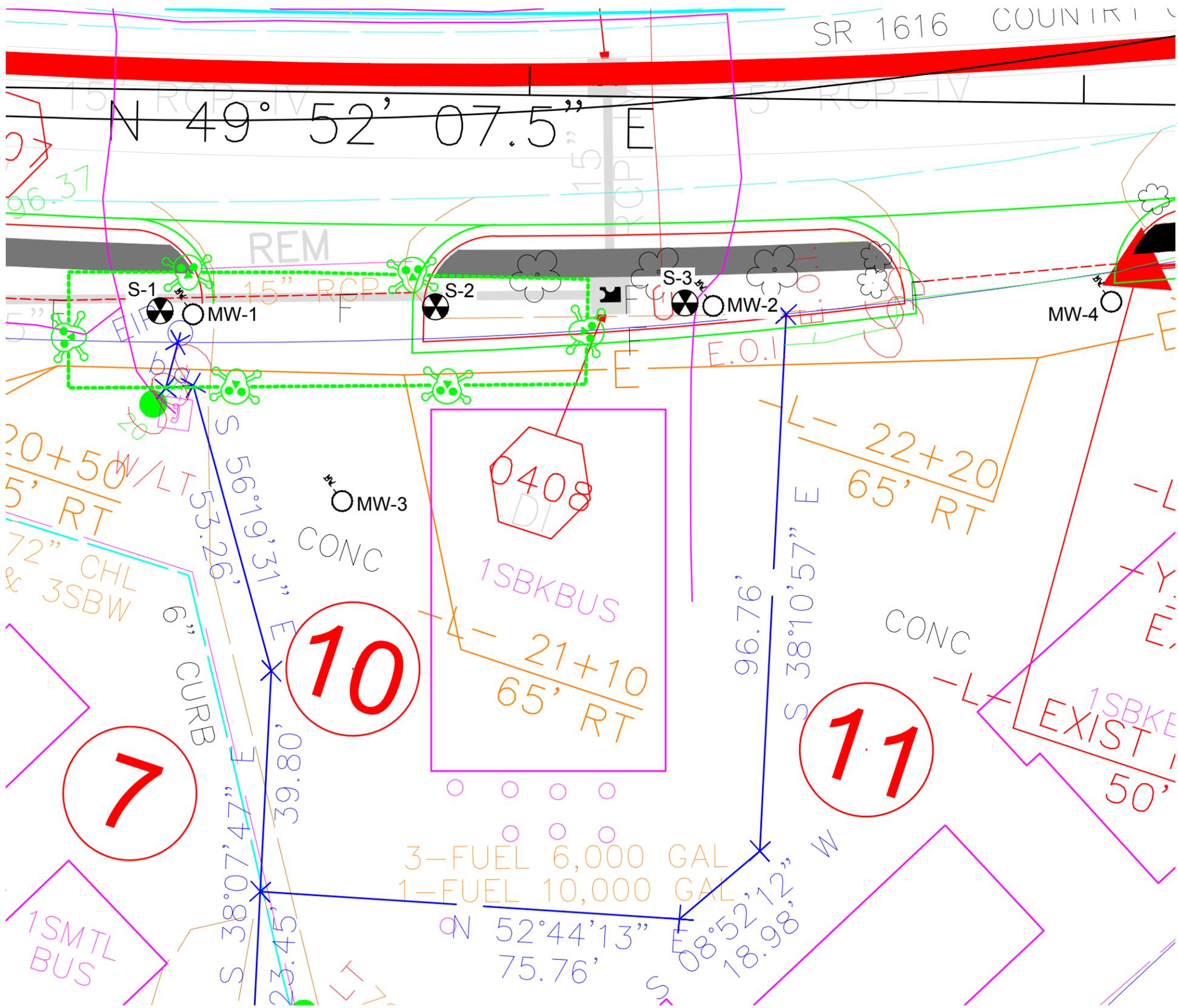
## FIGURES



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<b>GEL Engineering of NC INC</b> an affiliate of THE GEL GROUP INC ENVIRONMENTAL ■ ENGINEERING ■ SURVEYING Post Office Box 14262 Research Triangle Park, NC 27709 P 919-544-1100 F 919-544-4755 www.gel.com	PROJECT: ncd10103 PRELIMINARY SITE ASSESSMENT REPORT PARCEL 10 115 COUNTRY CLUB ROAD ROCKY MOUNT, NORTH CAROLINA STATE PROJECT U-3331, WBS ELEMENT #34927.1.1 NASH COUNTY	SITE LOCATION MAP FIGURE 1
	DATE: September 24, 2013	

problem solved



- LEGEND**
- S-1 SOIL BORING LOCATION
  - MW-1 EXISTING GROUNDWATER MONITORING WELL
  - KNOWN SOIL CONTAMINATION

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PROJECT: ncdt01013  
 PRELIMINARY SITE ASSESSMENT REPORT  
 115 COUNTRY CLUB DRIVE, PARCEL 10  
 ROCKY MOUNT, NASH COUNTY, NC  
 STATE PROJECT U-3331, WBS ELEMENT #34927.1.1

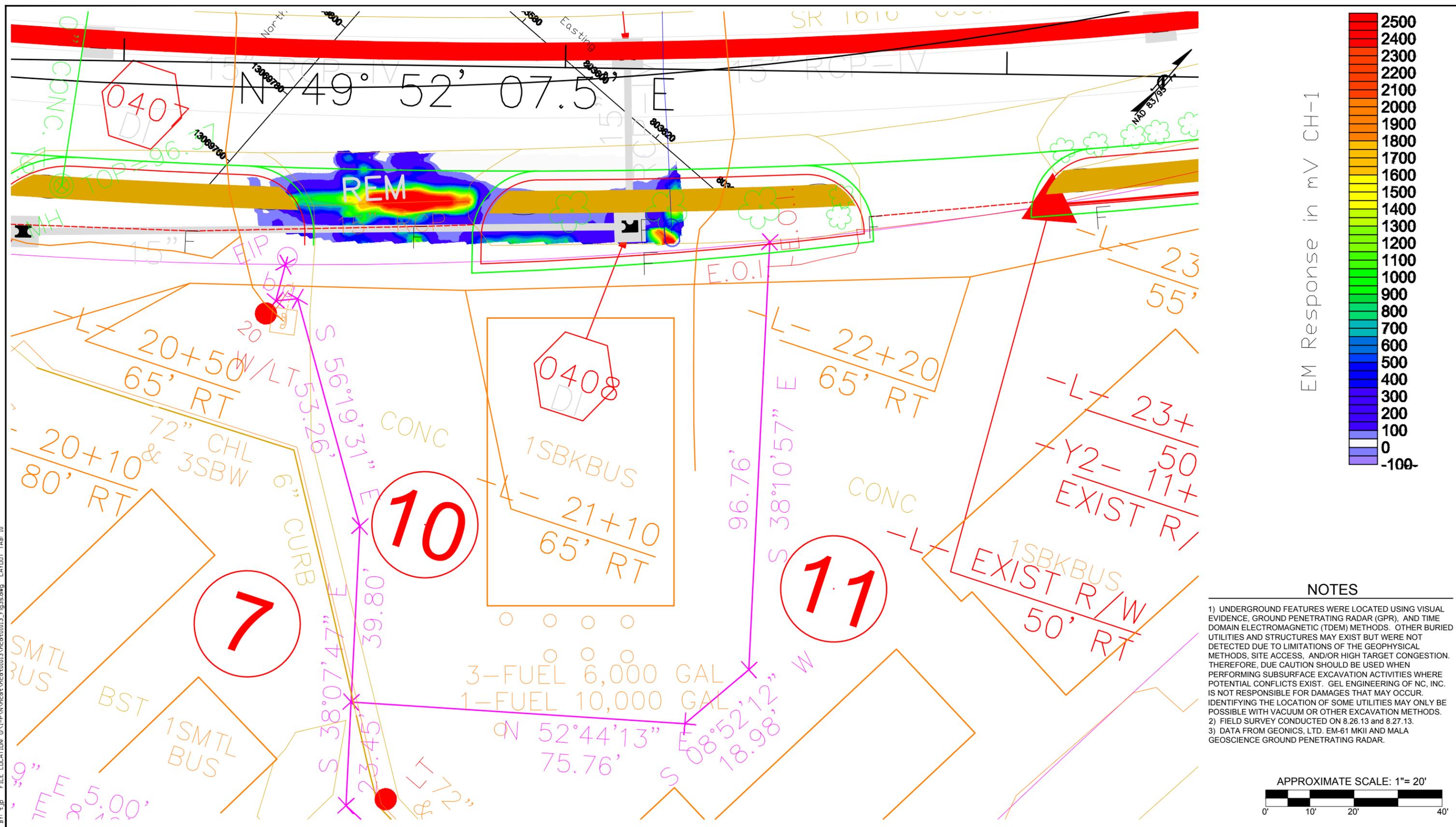
DATE: October 29, 2013

SITE MAP SHOWING LOCATIONS OF  
 SOIL BORINGS AND EXISTING  
 GROUNDWATER MONITORING WELLS

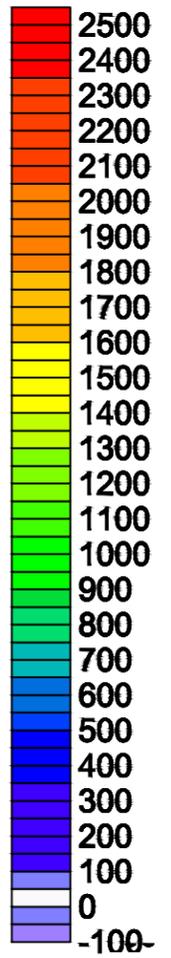
DRAWN BY: TJP APPRV. BY: ADE

FIGURE  
 2

problem solved



EM Response in mV CH-1



**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 MAY ONLY BE POSSIBLE WITH VACUUM OR OTHER EXCAVATION METHODS.
- 2) FIELD SURVEY CONDUCTED ON 8.26.13 and 8.27.13.
- 3) DATA FROM GEONICS, LTD. EM-61 MKII AND MALA GEOSCIENCE GROUND PENETRATING RADAR.



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PROJECT: ncdt01013  
 PRELIMINARY SITE ASSESSMENT REPORT  
 115 COUNTRY CLUB DRIVE, PARCEL 10  
 ROCKY MOUNT, NASH COUNTY, NC  
 STATE PROJECT U-3331, WBS ELEMENT #34927.1.1

DATE: October 17, 2013

SITE MAP SHOWING RESULTS OF  
 GEOPHYSICAL INVESTIGATION

DRAWN BY: TJP APPRV. BY: ADE

FIGURE  
 3

## **APPENDICES**

**APPENDIX I**  
**PHOTOGRAPHS**



Photograph 1: View looking northeast at soil boring locations S-1, S-2, and S-3, and monitoring well MW-1.



Photograph 2: View looking southeast at soil boring location S-3 and monitoring well MW-2.



Photograph 3: View looking northeast at monitoring well MW-3.

**APPENDIX II**

**SOIL BORING LITHOLOGIC LOGS**

## SOIL BORING LOG

Boring/Well No.: **S-1**

Date Started: 09/10/13

Date Completed: 09/10/13

No.	Depth Interval	Blow Counts	PID (ppm)	Soil Description	Soil Type
1	0.0' - 4.0'	--	26	Brown/tan loamy, sandy silt; moderate grading; dry to damp; friable; no odor	SW/SM
2	4.0' - 7.0'	--	--	Same; becoming and more clayey with depth; also damper with depth; slight petroleum odor at depth	SW/SM/ML
3	7.0' - 8.0'	--	11	Tan/grey mottled silty clay; soft, plastic; wet at 7.5'; old petroleum odor	ML/CL
4					
5				Total depth = 8 feet below land surface	
6					
7					
8					
9					
10					
11					
12					

**Notes:**

- 1) 4-foot continuous cores using DPT.
- 2) PID readings shown are for discrete samples collected at 3.0' to 4.0' and 7.0' to 8.0'.

## SOIL BORING LOG

Boring/Well No.: S-2  
 Date Started: 09/10/13  
 Date Completed: 09/10/13

No.	Depth Interval	Blow Counts	PID (ppm)	Soil Description	Soil Type
1	0.0' - 4.0'	--	28	Brown/tan loamy, sandy silt; moderate grading; dry to damp; friable; no odor	SW/SM
2	4.0' - 7.0'	--	--	Same; becoming and more clayey with depth; also damper with depth; slight petroleum odor at depth	SW/SM/ML
3	7.0' - 8.0'	--	7.2	Tan/grey mottled silty clay; soft, plastic; wet at 7.0'; old petroleum odor	ML/CL
4					
5				Total depth = 8 feet below land surface	
6					
7					
8					
9					
10					
11					
12					

**Notes:**

- 1) 4-foot continuous cores using DPT.
- 2) PID readings shown are for discrete samples collected at 3.0' to 4.0' and 7.0' to 8.0'.

## SOIL BORING LOG

Boring/Well No.: S-3

Date Started: 09/10/13

Date Completed: 09/10/13

No.	Depth Interval	Blow Counts	PID (ppm)	Soil Description	Soil Type
1	0.0' - 4.0'	--	6.1	Brown, mottled clayey silt; dry to damp; firm to stiff; no odor	GM/GC
2	4.0' - 7.0'	--	--	Same; becoming and more clayey with depth; damp; slight petroleum odor at depth	GM/GC/ML
3	7.0' - 8.0'	--	11	Tan/grey mottled silty clay; soft, plastic; damp; petroleum odor	ML/CL
4					
5				Total depth = 8 feet below land surface	
6					
7					
8					
9					
10					
11					
12					

Notes:

- 1) 4-foot continuous cores using DPT.
- 2) PID readings shown are for discrete samples collected at 3.0' to 4.0' and 7.0' to 8.0'.

**APPENDIX III**

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



Pace Analytical Services, Inc.  
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Pace Analytical Services, Inc.  
9800 Kinsey Ave. Suite 100  
Huntersville, NC 28078  
(704)875-9092

September 23, 2013

Andrew Eyer  
NCDOT North East

RE: Project: WBS34927.1.1 NASH CO.  
Pace Project No.: 92171841

Dear Andrew Eyer:

Enclosed are the analytical results for sample(s) received by the laboratory on September 11, 2013. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

Analyses were performed at the Pace Analytical Services location indicated on the sample analyte page for analysis unless otherwise footnoted.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Angela Baioni

angela.baioni@pacelabs.com  
Project Manager

Enclosures

cc: Chemical Testing Engineer, NCDOT



### REPORT OF LABORATORY ANALYSIS

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## CERTIFICATIONS

Project: WBS34927.1.1 NASH CO.  
Pace Project No.: 92171841

---

### Charlotte Certification IDs

9800 Kinsey Ave. Ste 100, Huntersville, NC 28078  
North Carolina Drinking Water Certification #: 37706  
North Carolina Field Services Certification #: 5342  
North Carolina Wastewater Certification #: 12  
South Carolina Certification #: 99006001

Florida/NELAP Certification #: E87627  
Kentucky UST Certification #: 84  
West Virginia Certification #: 357  
Virginia/VELAP Certification #: 460221

---

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### SAMPLE ANALYTE COUNT

Project: WBS34927.1.1 NASH CO.  
Pace Project No.: 92171841

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92171841001	S-1	EPA 8015 Modified	EJK	2	PASI-C
		EPA 8015 Modified	GAW	2	PASI-C
		ASTM D2974-87	TNM	1	PASI-C
92171841002	S-2	EPA 8015 Modified	EJK	2	PASI-C
		EPA 8015 Modified	GAW	2	PASI-C
		ASTM D2974-87	TNM	1	PASI-C
92171841003	S-3	EPA 8015 Modified	EJK	2	PASI-C
		EPA 8015 Modified	GAW	2	PASI-C
		ASTM D2974-87	TNM	1	PASI-C

### REPORT OF LABORATORY ANALYSIS

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### HITS ONLY

Project: WBS34927.1.1 NASH CO.

Pace Project No.: 92171841

Lab Sample ID Method	Client Sample ID Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
<b>92171841001</b>	<b>S-1</b>					
EPA 8015 Modified	Diesel Components	20.6 mg/kg		5.5	09/12/13 19:00	
EPA 8015 Modified	Gasoline Range Organics	7.9 mg/kg		5.1	09/18/13 12:10	
ASTM D2974-87	Percent Moisture	9.4 %		0.10	09/13/13 15:29	
<b>92171841002</b>	<b>S-2</b>					
EPA 8015 Modified	Diesel Components	22.5 mg/kg		5.8	09/12/13 19:23	
ASTM D2974-87	Percent Moisture	13.3 %		0.10	09/13/13 15:29	
<b>92171841003</b>	<b>S-3</b>					
EPA 8015 Modified	Gasoline Range Organics	6.2 mg/kg		4.8	09/18/13 13:18	
ASTM D2974-87	Percent Moisture	15.8 %		0.10	09/13/13 15:29	

### REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: WBS34927.1.1 NASH CO.

Pace Project No.: 92171841

**Sample: S-1**      **Lab ID: 92171841001**      Collected: 09/10/13 09:04      Received: 09/11/13 15:40      Matrix: Solid

**Results reported on a "dry-weight" basis**

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
<b>8015 GCS THC-Diesel</b>		Analytical Method: EPA 8015 Modified    Preparation Method: EPA 3546						
Diesel Components	<b>20.6</b>	mg/kg	5.5	1	09/11/13 17:06	09/12/13 19:00	68334-30-5	
<b>Surrogates</b>								
n-Pentacosane (S)	95 %		41-119	1	09/11/13 17:06	09/12/13 19:00	629-99-2	
<b>Gasoline Range Organics</b>		Analytical Method: EPA 8015 Modified    Preparation Method: EPA 5035A/5030B						
Gasoline Range Organics	<b>7.9</b>	mg/kg	5.1	1	09/18/13 09:25	09/18/13 12:10	8006-61-9	
<b>Surrogates</b>								
4-Bromofluorobenzene (S)	83 %		70-167	1	09/18/13 09:25	09/18/13 12:10	460-00-4	
<b>Percent Moisture</b>		Analytical Method: ASTM D2974-87						
Percent Moisture	<b>9.4</b>	%	0.10	1		09/13/13 15:29		

## REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: WBS34927.1.1 NASH CO.

Pace Project No.: 92171841

**Sample: S-2**      **Lab ID: 92171841002**      Collected: 09/10/13 10:05      Received: 09/11/13 15:40      Matrix: Solid

**Results reported on a "dry-weight" basis**

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
<b>8015 GCS THC-Diesel</b>		Analytical Method: EPA 8015 Modified    Preparation Method: EPA 3546						
Diesel Components	<b>22.5</b>	mg/kg	5.8	1	09/11/13 17:06	09/12/13 19:23	68334-30-5	
<b>Surrogates</b>								
n-Pentacosane (S)	89	%	41-119	1	09/11/13 17:06	09/12/13 19:23	629-99-2	
<b>Gasoline Range Organics</b>		Analytical Method: EPA 8015 Modified    Preparation Method: EPA 5035A/5030B						
Gasoline Range Organics	ND	mg/kg	5.8	1	09/18/13 09:25	09/18/13 14:26	8006-61-9	
<b>Surrogates</b>								
4-Bromofluorobenzene (S)	79	%	70-167	1	09/18/13 09:25	09/18/13 14:26	460-00-4	
<b>Percent Moisture</b>		Analytical Method: ASTM D2974-87						
Percent Moisture	<b>13.3</b>	%	0.10	1		09/13/13 15:29		

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 (704)875-9092

### ANALYTICAL RESULTS

Project: WBS34927.1.1 NASH CO.  
 Pace Project No.: 92171841

**Sample: S-3**      **Lab ID: 92171841003**      Collected: 09/10/13 10:54      Received: 09/11/13 15:40      Matrix: Solid

**Results reported on a "dry-weight" basis**

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
<b>8015 GCS THC-Diesel</b>		Analytical Method: EPA 8015 Modified    Preparation Method: EPA 3546						
Diesel Components	ND	mg/kg	5.9	1	09/11/13 17:06	09/12/13 19:23	68334-30-5	
<b>Surrogates</b>								
n-Pentacosane (S)	84 %		41-119	1	09/11/13 17:06	09/12/13 19:23	629-99-2	
<b>Gasoline Range Organics</b>		Analytical Method: EPA 8015 Modified    Preparation Method: EPA 5035A/5030B						
Gasoline Range Organics	6.2	mg/kg	4.8	1	09/18/13 09:25	09/18/13 13:18	8006-61-9	
<b>Surrogates</b>								
4-Bromofluorobenzene (S)	88 %		70-167	1	09/18/13 09:25	09/18/13 13:18	460-00-4	
<b>Percent Moisture</b>		Analytical Method: ASTM D2974-87						
Percent Moisture	15.8 %		0.10	1		09/13/13 15:29		

### REPORT OF LABORATORY ANALYSIS

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### QUALITY CONTROL DATA

Project: WBS34927.1.1 NASH CO.  
Pace Project No.: 92171841

QC Batch: GCV/7305 Analysis Method: EPA 8015 Modified  
QC Batch Method: EPA 5035A/5030B Analysis Description: Gasoline Range Organics  
Associated Lab Samples: 92171841001, 92171841002, 92171841003

METHOD BLANK: 1048949 Matrix: Solid

Associated Lab Samples: 92171841001, 92171841002, 92171841003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Gasoline Range Organics	mg/kg	ND	6.0	09/18/13 11:47	
4-Bromofluorobenzene (S)	%	84	70-167	09/18/13 11:47	

LABORATORY CONTROL SAMPLE: 1048950

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Gasoline Range Organics	mg/kg	50	55.3	111	70-165	
4-Bromofluorobenzene (S)	%			83	70-167	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1048951 1048952

Parameter	Units	92171841001		MS		MSD		MS		MSD		% Rec		RPD	Qual
		Result	Conc.	Spike Conc.	Spike Conc.	Result	Result	% Rec	% Rec	Limits	Limits				
Gasoline Range Organics	mg/kg	7.9	42.4	42.4	57.3	61.3	117	126	47-187	7					
4-Bromofluorobenzene (S)	%						87	83	70-167						

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1048953 1048954

Parameter	Units	92171841003		MS		MSD		MS		MSD		% Rec		RPD	Qual
		Result	Conc.	Spike Conc.	Spike Conc.	Result	Result	% Rec	% Rec	Limits	Limits				
Gasoline Range Organics	mg/kg	6.2	40.3	40.3	58.1	54.6	129	120	47-187	6					
4-Bromofluorobenzene (S)	%						87	87	70-167						

### REPORT OF LABORATORY ANALYSIS

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### QUALITY CONTROL DATA

Project: WBS34927.1.1 NASH CO.  
Pace Project No.: 92171841

QC Batch: OEXT/23812 Analysis Method: EPA 8015 Modified  
QC Batch Method: EPA 3546 Analysis Description: 8015 Solid GCSV  
Associated Lab Samples: 92171841001, 92171841002, 92171841003

METHOD BLANK: 1045409 Matrix: Solid  
Associated Lab Samples: 92171841001, 92171841002, 92171841003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Diesel Components	mg/kg	ND	5.0	09/12/13 17:27	
n-Pentacosane (S)	%	84	41-119	09/12/13 17:27	

LABORATORY CONTROL SAMPLE: 1045410

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Diesel Components	mg/kg	66.7	53.4	80	49-113	
n-Pentacosane (S)	%			91	41-119	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 1045411 1045412

Parameter	Units	92171745001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Qual
Diesel Components	mg/kg	ND	78.5	78.5	70.1	70.2	87	88	10-146	0	
n-Pentacosane (S)	%						91	88	41-119		

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**QUALITY CONTROL DATA**

Project: WBS34927.1.1 NASH CO.  
 Pace Project No.: 92171841

QC Batch: PMST/5831 Analysis Method: ASTM D2974-87  
 QC Batch Method: ASTM D2974-87 Analysis Description: Dry Weight/Percent Moisture  
 Associated Lab Samples: 92171841001, 92171841002, 92171841003

SAMPLE DUPLICATE: 1046642

Parameter	Units	92172053044 Result	Dup Result	RPD	Qualifiers
Percent Moisture	%	11.8	11.8	0	

SAMPLE DUPLICATE: 1046643

Parameter	Units	92171843005 Result	Dup Result	RPD	Qualifiers
Percent Moisture	%	12.9	12.7	1	

**REPORT OF LABORATORY ANALYSIS**

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## QUALIFIERS

Project: WBS34927.1.1 NASH CO.  
Pace Project No.: 92171841

---

### DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PRL - Pace Reporting Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Acid preservation may not be appropriate for 2-Chloroethylvinyl ether, Styrene, and Vinyl chloride.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

### LABORATORIES

PASI-C Pace Analytical Services - Charlotte

## REPORT OF LABORATORY ANALYSIS

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## QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: WBS34927.1.1 NASH CO.

Pace Project No.: 92171841

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
92171841001	S-1	EPA 3546	OEXT/23812	EPA 8015 Modified	GCSV/15522
92171841002	S-2	EPA 3546	OEXT/23812	EPA 8015 Modified	GCSV/15522
92171841003	S-3	EPA 3546	OEXT/23812	EPA 8015 Modified	GCSV/15522
92171841001	S-1	EPA 5035A/5030B	GCV/7305	EPA 8015 Modified	GCV/7315
92171841002	S-2	EPA 5035A/5030B	GCV/7305	EPA 8015 Modified	GCV/7315
92171841003	S-3	EPA 5035A/5030B	GCV/7305	EPA 8015 Modified	GCV/7315
92171841001	S-1	ASTM D2974-87	PMST/5831		
92171841002	S-2	ASTM D2974-87	PMST/5831		
92171841003	S-3	ASTM D2974-87	PMST/5831		

## REPORT OF LABORATORY ANALYSIS

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Document Name: **Sample Condition Upon Receipt (SCUR)**

Document Revised: June 12, 2013

Page 1 of 2

Document Number:  
**F-CHR-CS-03-rev.11**

Issuing Authority:  
Pace Huntersville Quality Office

Client Name: GFL / General Eng.

Where Received:  Huntersville  Asheville  Eden  Raleigh

Courier:  Fed Ex  UPS  USPS  Client  Commercial  Pace Other \_\_\_\_\_

Custody Seal on Cooler/Box Present:  yes  no Seals intact:  yes  no

Packing Material:  Bubble Wrap  Bubble Bags  None  Other \_\_\_\_\_

Thermometer Used: IR Gun T1102 **T1301** Type of Ice:  Wet  Blue  None  Samples on ice, cooling process has begun

Temp Correction Factor T1102: No Correction T1301: No Correction

Corrected Cooler Temp.: 2.1 C Biological Tissue is Frozen: Yes No N/A

Temp should be above freezing to 6°C

Date and Initials of person examining contents: mm - 5/11/13

Chain of Custody Present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	1.
Chain of Custody Filled Out:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	2.
Chain of Custody Relinquished:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	3.
Sampler Name & Signature on COC:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	4.
Samples Arrived within Hold Time:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	5.
Short Hold Time Analysis (<72hr):	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	6.
Rush Turn Around Time Requested:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	7.
Sufficient Volume:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	8.
Correct Containers Used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	9.
-Pace Containers Used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Containers Intact:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	10.
Filtered volume received for Dissolved tests	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	11.
Sample Labels match COC:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	12.
-Includes date/time/ID/Analysis Matrix:		
All containers needing preservation have been checked.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Samples checked for dechlorination:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	14.
Headspace in VOA Vials (>6mm):	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	15.
Trip Blank Present:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	16.
Trip Blank Custody Seals Present	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Pace Trip Blank Lot # (if purchased):		

**Client Notification/ Resolution:**

Field Data Required? Y / N

Person Contacted: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Comments/ Resolution: \_\_\_\_\_

SCURF Review:	<u>AMB</u>	Date:	<u>9-11-13</u>
SRF Review:	<u>AMB</u>	Date:	<u>9-11-13</u>

**WO# : 92171841**



92171841

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office ( i.e out of hold, incorrect preservative, out of temp, incorrect containers)

