PRELIMINARY SITE ASSESSMENT

SR 1100 (BRAWLEY SCHOOL ROAD) IMPROVEMENTS
TIP NO. R-3833C, WBS NO. 34554.2.4

NCDOT PARCEL NOS. 33, 34, 35, 36, 37, 38, 39, 40, 43, 46, 73, AND 82
BRAWLEY SCHOOL COAL ASH STRUCTURAL FILL SITE
MOORESVILLE, IREDELL COUNTY, NORTH CAROLINA

PREPARED FOR:
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
C/O STANTEC
801 JONES FRANKLIN ROAD SUITE 300
RALEIGH NORTH CAROLINA 27606-3394

PREPARED BY:
FALCON ENGINEERING, INC.
1210 TRINITY ROAD, SUITE 110
CARY, NC 27513

PROJECT NUMBER: G18063.02
OCTOBER 30, 2019

October 30, 2019

Mr. A. Dean Sarvis PE
Stantec
801 Jones Franklin Road, Suite 300
Raleigh, North Carolina 27606-3394

Re: **Preliminary Site Assessment**
SR 1100 (Brawley School Road) Improvements
TIP No. R-3833C, WBS No. 34554.2.4
NCDOT Parcel Nos. 33, 34, 35, 36, 37, 38, 39, 40, 43, 46 73, and 82
Brawley School Road Coal Ash Structural Fill Site
Mooresville, Iredell County, North Carolina

Dear: Mr. Sarvis:

Falcon is pleased to present the attached Geophysical report in support of the above-mentioned Project. Falcon performed a Phase I Environmental Site Assessment (ESA) for R-3833C under Project No. G18063.01 dated March 2019. The ESA identified the permitted Brawley School Road Coal Ash Structural Fill Site (Fill Site) within the R-3833C Study Area.

Falcon reviewed available information from The North Carolina Department of Environmental Quality (NCDEQ) Mooresville Regional Office concerning the Fill Site. The State file contained an Acknowledgment and Consent form dated February 27, 1995. This form documents the landowner's (at the time) consent to the use of coal combustion by-products (ash) as structural fill and estimates the volume of ash at 100,000 tons.

The State file also included a Structural Fill Notification from Duke Power Company dated February 28, 1995. The Notification states; "*The proposed project will utilize approximately 60,000 cubic yards of ash in a structural fill application to develop the property for marketing. The Fill Site is located at the intersection of US highway 21 and State Road 1100 (Brawley School Road) in Iredell County.*" A Map of the limits of the permitted site was included in the state file. The map indicates the above parcels are within the limits of the fill site.

Falcon directed Pyramid Environmental (Pyramid) to perform a EM31 Conductivity Survey from within the existing edge of pavement to the proposed Right-Of-Way (ROW) and/or easements at each parcel listed above, whichever distance was greater. The purpose of the geophysical investigation was to locate and delineate the horizontal extents of the buried ash deposit (if present) across the portion of each property where proposed ROW and/or easements were present. Based on Pyramid's expertise and experience it was expected that the presence of buried ash would result in a significant increase in ground conductivity relative to the surrounding native soil.

Three distinct zones of increased conductivity that do not correspond to buried utilities were observed. These areas indicate the potential presence of ash. These areas are located:

- On the south side of Parcel 43
- On the west side of Parcel 39
- On the west and south sides of Parcel 34 which is also the north side of Parcel 82

A map of the areas interpreted to contain possible buried ash is included as Figure 3 in the attached Geophysical Report.

Please review this report and advise us if you have any questions or concerns. We appreciate this opportunity to provide services to you and look forward to partnering with you on future projects. If you have any questions, please give Falcon a call at (919) 871-0800.

Sincerely,
FALCON ENGINEERING, INC.

Christopher J. Burkhardt
Environmental Services Manager

Jeremy R. Hamm, PE
Geotechnical Services Manager

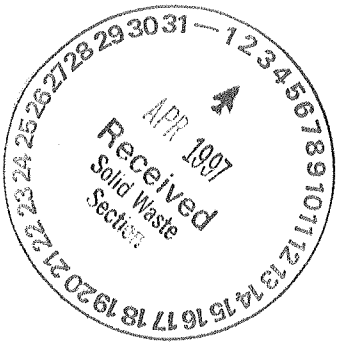
Attachments: Brawley School Road Coal Ash Structural Fill Site File Review Documents and Maps
Geophysical Report

Duke Project As Listed On The NC Solid Waste Section's List of All Coal Ash Structural Fills:

Iredell; Brawley School Road;
Duke Power (L Evans); Duke Power; Marlo Corporation;
March, 1995; May 1, 1995;

Duke Power Company
Electric System Support
13339 Hagers Ferry Road
Huntersville, NC 28078-7929

DUKE POWER



March 31, 1997

William Hocutt
North Carolina Department of Environment,
Health and Natural Resources
Solid Waste Section
P.O. Box 27687
Raleigh, NC 27611-7687

SUBJECT: Structural Fill Closure Requirement
Record Number: 006021

Mr. Hocutt:

In accordance with Section .1706(d) of the Solid Waste Management Rules for the Beneficial Use of Coal Combustion By-Products, please find attached "Closure Certifications" for all of the coal ash structural fill projects conducted by Duke Power Company as listed on the NC Solid Waste Section's "List of All Coal Ash Structural Fills". In addition, a copy of the "Recordation Statement" for each project is also included. Please note that the "Recordation Statement" is a requirement of the land owner and is being provided by Duke Power as a courtesy/service to the land owner.

The information attached will supersede the closure certifications previously submitted on January 2, 1997. Therefore, the previously submitted closure information should be deleted from your file(s) and replaced with the attached.

If you have any questions concerning these documents, please contact me at 704-875-5956.

Larry D. Evans

L. D. Evans, CHMM
Scientist
Environmental Division - Waste Management

LDE/E03972

Attachments

RDDAVIS
CONSULTING
ENGINEERS

December 12, 1995

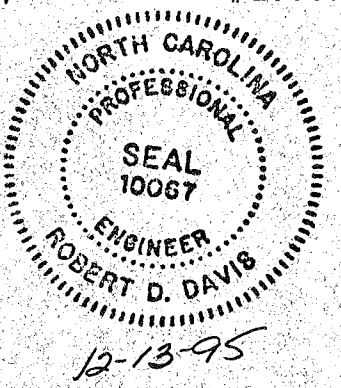
Re: Certificate of Compliance

This document shall serve as notice that property owned by Floyd Greene and William Grigg, located on Brawley School Road (known as the Brawley School Road Retail Site) has been developed with coal ash provided by Duke Power Company.

Whereas, this document is provided as evidence of compliance with all the requirements of Solid Waste Regulation Section 1700 and specifically to meet Section 1706 Closure of Structural Fill Facilities, part (d).

(9)

Robert D. Davis, P.E. N.C. #10067



12-13-95

P.O. Box 471851 • Charlotte, NC 28247-1851 • (704) 544-2223

BK0973PG0647

FILED
IREDELL COUNTY
96 FEB -2 AM 11:43

1/2

NORTH CAROLINA

IREDELL COUNTY

000139

BRENDA D. BELL
REGISTER OF DEEDS

ACKNOWLEDGMENT AND CONSENT

The undersigned, Marlo Corporation, a North Carolina corporation, and Monticello-Jefferson Corp., a North Carolina Corporation, in accordance with the provisions of N.C.G.S 130A-294 and 15A NCAC 13B.1703, acknowledge that they are the owners of the real property located in Davidson Township, Iredell County, North Carolina, and more specifically described on Schedule A attached hereto.

The undersigned further acknowledge and consent to the use of coal combustion by-products as structural fill on the real property described on Schedule A. The volume of coal combustion by-products placed on this property is estimated to be 102,578 tons.

The undersigned further agree to record this document as required by 15A NCAC 13B.1707.

IN WITNESS WHEREOF, Marlo Corporation has caused this instrument to be signed in its corporate name by its President and attested by its Secretary with its corporate seal to be hereunto affixed, and Monticello-Jefferson Corp. has caused this instrument to be signed in its corporate name by its President and attested by its Secretary with its corporate seal to be hereunto affixed, this 22nd day of January, 1996.

MARLO CORPORATION

BY: _____ President

(CORPORATE SEAL)

ATTEST: _____ Secretary

MONTICELLO-JEFFERSON CORP.

BY: _____ President

(CORPORATE SEAL)

ATTEST: _____ Secretary

Prepared by and returned to William E. Neel, Attorney, Mooresville, NC.

State of North Carolina
Department of Environment,
Health and Natural Resources
Division of Solid Waste Management

James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
William L. Meyer, Director

March 3, 1995

Mr. Larry D. Evans, Scientist
Electric System Support
Duke Power Company
13339 Hagers Ferry Road
Huntersville, NC 28078-7929

Subject: Coal Fly Ash Structural Fill at Brawley School Road Near Mooresville, NC in Iredell County Scheduled to Begin in Early March, 1995.

We are in receipt of your February 28, 1995 proposal for constructing the subject structural fill beginning as soon as possible and planned for completion by May 1, 1995. The information submitted satisfies the requirements for coal ash structural fill activities as set forth in Solid Waste Management Rules 15A NCAC 13B Section .1700 concerning beneficial use of coal combustion by-products.

We appreciate the additional information supplied by you to Bill Hocutt on March 3, 1995 about the french drain shown on your construction drawing. Our concern was that this might involve a perennial stream. That would have at least required additional separation of the fly ash from the stream. We are satisfied with the five feet of earthen cover since you state that any water at that location would arise from precipitation run-off and that the specified five feet cover was for the entire length of the french drain. You further stated that this did not involve ground water flowing through the site.

(over)

P.O. Box 27687, Raleigh, North Carolina 27611-7687 Telephone 919-733-4996 FAX 919-715-3605

As previously agreed to between Duke Power and the Solid Waste Management Division, Duke Power is accepting the responsibility of informing the landowner(s) of their responsibility should any groundwater contamination occur due to this structural fill activity.

Sincerely,

James C. Coffey

James C. Coffey
Permitting Branch Supervisor
Solid Waste Section

cc: Julian Foscue
Anthony Foster
Bill Hocutt
John P. Nerison, P.E.
Larry S. Harper

Duke Power Company
Electric System Support
13339 Hagers Ferry Road
Huntersville, NC 28078-7929

DUKE POWER

February 28, 1995

William Hocutt
North Carolina Department of Environment,
Health and Natural Resources
Solid Waste Section
401 Oberline Road
Suite 150
Raleigh, N. C. 27605

SUBJECT: Structural Fill Notification
Brawley School Road Property
Marlo Corporation & Grigg Investment
File: GS-707.02 (Fossil)

Mr. Hocutt:

In accordance with Section .1706 of the Solid Waste Management Rules (Requirements For Beneficial Use Of Coal Combustion By-Products), please find attached the required written notification for the referenced structural fill project. Included in the notification are construction plans required for coal combustion by-products applications greater than 10,000 cubic yards.

If you have any questions concerning the notification, please contact me at 704-875-5956.

Larry D. Evans

L. D. Evans, Scientist
Environmental Protection - Waste Management

LDE/D029519

Attachments

STRUCTURAL FILL NOTIFICATION

Duke Power Company
Brawley School Road Property
Marlo Corporation & Grigg Investment

The proposed project will utilize approximately 60,000 cubic yards of fly ash in a structural fill application to develop the property for marketing. The property is located at the intersection of US highway 21 and State Road 1100 (Brawley School Road) in Iredell County as indicated on the attached USGS map (Mooresville Quanrangle, North Carolina - 7.5 minute series). The project is scheduled to commence as soon as possible and to be completed on May 1, 1995. The fly ash will be supplied from Duke Power's Marshall Steam Station located on Highway 150 in eastern Catawba County at the following address:

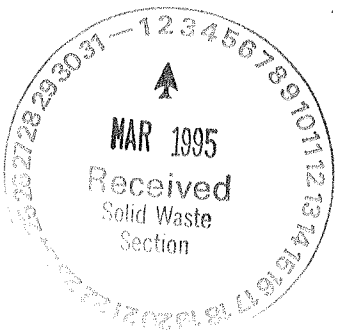
Duke Power Company
Marshall Steam Station
PO Box 210
Terrell, N.C. 28682

Larry Evans will serve as the Generator Contact and can be contacted at:

Larry Evans
Duke Power Company
13339 Hagers Ferry Road (MG03A5)
Huntersville, N.C. 28078-7929
Phone: 704-875-5956

The following documents are attached:

- Signed statement of acknowledgement and consent from property owner
- TCLP data and certification
- USGS Topographic map showing location of project
- Construction Plans



I certify that the TCLP analysis is representative of the fly ash to be used for this project.

Larry D. Evans

Larry D. Evans

HAZARDOUS WASTE SAMPLE RESULTS
APPLIED SCIENCE CENTER

STATION : Marshall

SAMPLE ID. : Marshall U-1 ash Leach

LAB.SERV. #: 9402095

TCLP Leach

ANALYSIS	RESULT		LIMIT	
AG:	< 0.20	mg/l	5.0	mg/l
BA:	0.47	mg/l	100	mg/l
CD:	< 0.03	mg/l	1.0	mg/l
CR:	0.77	mg/l	5.0	mg/l
PB:	< 1.0	mg/l	5.0	mg/l
AS:	< 0.10	mg/l	5.0	mg/l
SE:	0.27	mg/l	1.0	mg/l
HG:	< 0.001	mg/l	0.2	mg/l
NI:	NR	mg/l	134	mg/l
TL:	NR	mg/l	130	mg/l
% ASH:	NR	%	NO LIMIT	
BTU:	NR	BTU/lb	NO LIMIT	
TOT. S	NR	% wt.	NO LIMIT	
TOT. CL	NR	% wt.	NO LIMIT	
FLASH PT.	NR	Deg. F	< 140 Deg. F	
pH:	NR	Value	<2.0 or >12.5	
% WATER	NR	% wt.	NO LIMIT	

N/R: NOT REQUESTED.
* EXCEEDS RCRA LIMITS.

NORTH CAROLINA

IREDELL COUNTY

ACKNOWLEDGMENT AND CONSENT

The undersigned, Marlo Corporation, a North Carolina corporation, and William G. Grigg and wife, Jacqulinn O. Grigg, in accordance with the provisions of N.C.G.S 130A-294 and 15A NCAC 13B.1703, acknowledge that they are the owners of the real property located in Davidson Township, Iredell County, North Carolina, and more specifically described on Schedule A attached hereto.

The undersigned further acknowledge and consent to the use of coal combustion by-products as structural fill on the real property described on Schedule A. The volume of coal combustion by-products placed on this property is estimated to be 100,000 tons.

The undersigned further agree to record this document as required by 15A NCAC 13B.1707.

IN WITNESS WHEREOF, said individual parties have hereunto set their hand and said corporate party has caused this instrument to be signed in its corporate name by its President and attested with its corporate seal, this 27th day of February 1995.

MARLO CORPORATION

BY: _____
President

(CORPORATE SEAL)

ATTEST: Jennifer D. Robinson
Secretary

NORTH CAROLINA, IREDELL COUNTY.

I, Marcia K. Long, a Notary Public of the County and State aforesaid, certify that Jennifer D. Robinson personally came before me this day and acknowledged that she is _____ Secretary of Marlo Corporation, a North Carolina corporation, and that by authority duly given and as the act of the corporation, the foregoing instrument was signed in its name by its _____ President, sealed with its corporate seal and attested by her as its _____ Secretary. Witness my hand and official stamp or seal, this 27th day of February 1995.

Marcia K. Long
Notary Public

My Commission Expires:

11-6-98

NORTH CAROLINA, IREDELL COUNTY.

I, Marcia K. Long, a Notary Public of the County and State aforesaid, certify that William G. Grigg and wife, Jacqulinn O. Grigg, personally appeared before me this day and acknowledged the execution of the foregoing instrument. Witness my hand and official stamp or seal, this 27th day of February 1995.

Marcia K. Long
Notary Public

My Commission Expires:

11-6-98

NORTH CAROLINA. IREDELL COUNTY.

William G. Grigg (SEAL)

Jacqulinn O. Grigg (SEAL)

Schedule A

TRACT ONE:

BEGINNING at an existing iron pin in the line of Judith A. Lattavo, the northwest corner of First Church of the Nazarene of Mooresville, N.C., Inc. as described in Deed Book 882, page 79, Iredell County Registry; thence with the line of Lattavo North 84 deg. 33 min. 11 sec. West 1,708.29 feet to a point in the center of a creek, Lattavo corner; thence with center of creek South 19 deg.18 min. 37 sec. West 7.27 feet to a point in said creek; thence North 84 deg. 47 min. 23 sec. West 197.89 feet to an iron pin, Mary B. Hager corner; thence with Mary B. Hager line South 05 deg. 42 min. 37 sec. West 957 feet to a point in center of State Road No. 1100, Mary B. Hager corner; thence with center of State Road No. 1100 South 49 deg. 48 min. 12 sec. East 90.52 feet to a point in center of bridge on State Road No. 1100; thence South 55 deg. 25 min. 20 sec. East 122.28 feet to a nail in center of State Road No. 1100; thence South 60 deg. 34 min. 11 sec. East 60 feet to a nail in center of State Road No. 1100; thence South 67 deg. 29 min. 23 sec. East 50.85 feet to an iron pin at the south edge of pavement on State Road No. 1100; thence South 60 deg. 27 min. 52 sec. East 258.24 feet to an iron pin on the south side of State Road No. 1100, a corner of John C. Craver; thence with Craver line North 57 deg. 36 min. 11 sec. East 325.88 feet to an iron pin on the north side of State Road No. 1100, Craver corner; thence North 71 deg. 42 min. 28 sec. East 458.70 feet to an iron pin, Craver corner; thence with Craver line South 79 deg. 47 min. 32 sec. East 458.70 feet to an iron pin, Craver corner; thence North 76 deg. 12 min. 28 sec. East 301.13 feet to an iron pin in line of First Church of the Nazarene of Mooresville, N. C., Inc., Craver corner; thence with church line North 03 deg. 22 min. 39 sec. East 110 feet to an existing iron pin, Church corner; thence North 03 deg. 47 min. 32 sec. East 673.54 feet to the point of Beginning, containing 43.046 acres, more or less.

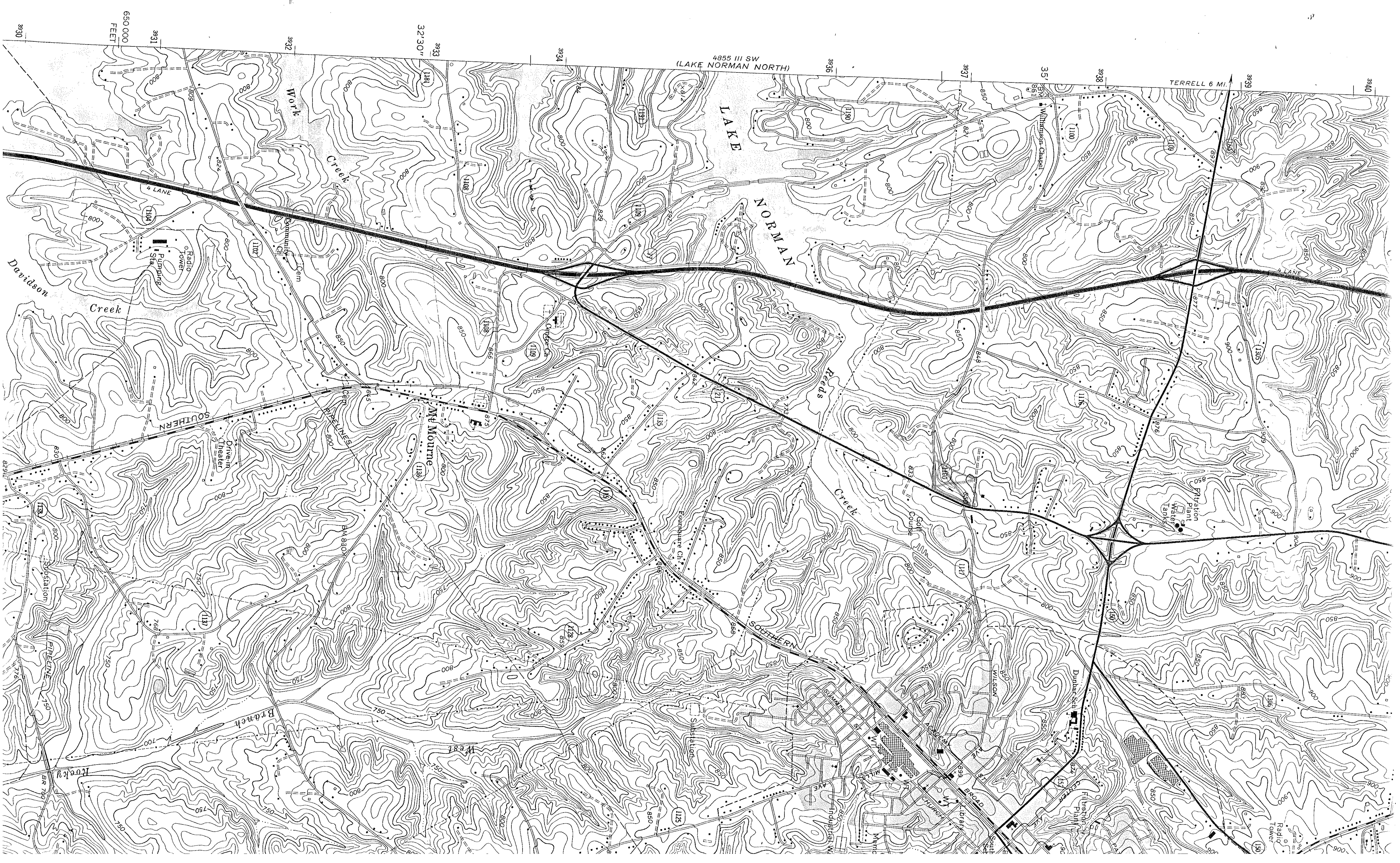
TRACT TWO:

BEGINNING at an existing iron pin in the western line of First Church of the Nazarene of Mooresville, Inc., the southeast corner of Miriam Hobbs Cooke et al (formerly Edith M. Hobbs) corner; thence with the line of the First Church of the Nazarene of Mooresville, Inc. South 03 deg. 22 min. 39 sec. West 155 feet passing over a concrete monument in the west edge of the right of way of U. S. Highway No. 21 to a point in the paved portion of N. C. State Road No. 1100 (Brawley School Road); thence with the pavement for State Road No. 1100 South 87 deg. 35 min. 41 sec. West 300.31 feet to a p.k. nail in pavement for State Road No. 1100; thence continuing with pavement for State Road No. 1100 South 87 deg. 52 min. 22 sec. West 461.37 feet to a p.k. nail in the pavement for State Road No. 1100; thence continuing with the pavement in State Road No. 1100 South 87 deg. 48 min. 47 sec. West 535.71 feet to a point in the pavement for State Road No. 1100, a corner of John C. Craver in the line of Miriam Hobbs Cooke, et al; thence with the line of Miriam Hobbs Cooke, et al North 57 deg. 36 min. 11 sec. East 150.09 feet to an iron pin, a corner of Miriam Hobbs Cooke et al; thence continuing with Miriam Hobbs Cooke, et al line North 71 deg. 42 min. 28 sec. East 458.70 feet to an iron pin, a corner of Miriam Hobbs Cooke, et al; thence continuing with Miriam Hobbs Cooke, et al line South 79 deg. 47 min. 32 sec. East 458.70 feet to an iron pin, a corner of Miriam Hobbs Cooke, et al; thence with line of Miriam Hobbs Cooke, et al North 76 deg. 12 min. 28 sec. East 301.13 feet to the beginning corner, containing 3.882 acres, more or less.

TRACT THREE:

BEGINNING at a point marked by a concrete monument, which monument marks the northwesternmost corner of the fifty-third tract described in the deed to Burlington Industries, Inc. from Mooresville Mills dated April 16, 1955, and being recorded in Deed Book 259, page 408, et seq., in the office of the Register of Deeds of Iredell County, North Carolina; and running from said

margin of land owned by Hobbs 944.50 feet to an iron pin in the center of the road, Floyd Harwell's corner in the original line; thence North 70 degrees 49 minutes 40 seconds East 74 feet, more or less, to a point in the centerline of U. S. Highway No. 21; thence northerly along the centerline of U. S. Highway No. 21, 1,000 feet, more or less, to a point on the northern margin of the original fifth-third tract as described in said deeds; thence South 89 degrees 15 minutes 40 seconds West along the northern margin of the original fifty-third tract 404 feet, more or less, to the point and place of beginning.



650 000 FEET
32'30"
35'
4855 III SW
(LAKE NORMAN NORTH)
TERRELL 6 MI.
LAKE NORMAN
Work Creek
Davidson Creek
Reeds Creek
4 LANE
Williamson Chapel
Pumping Sta
Radio Tower
Community Ch
Cem
Center Ch
Mt Mourne
SOUTHERN
PIPELINES
Drive-in Theater
Foursquare Ch
Golf Course
Filtration Plant
Water Tanks
Dunbar Sch
Substation
West Branch
Rocky
PIPELINE
WILSON
BROAD
CHURCH
Library
Radio Tower

SCALE 1:24 000

0 1 MILE

3000 4000 5000 6000 7000 FEET

0 1 KILOMETER

INTERVAL 10 FEET

TIC VERTICAL DATUM OF 1929

NATIONAL MAP ACCURACY STANDARDS
J. S. GEOLOGICAL SURVEY
0225, OR RESTON, VIRGINIA 22092
MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

N. C.

QUADRANGLE LOCATION

ROAD CLASSIFICATION

Primary highway, hard surface

Secondary highway, hard surface

Light-duty road, hard or improved surface

Unimproved road

Interstate Route U. S. Route State Route

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1988

MOORESVILLE, N. C.

35080-E7-TF-024

PHOTOINSPECTED 1983

1969

DMA 4855 III SE—SERIES V842

GENERAL NOTES

1) THE PROPOSED PROJECT IS LOCATED ON THE MOORESVILLE SIDE ON USGS MAP. THE PROJECT WILL ALLOW THE PROPERTY TO BE MARKETED.
2) START CONSTRUCTION: MARCH 1, 1995
COMPLETE CONSTRUCTION: MAY 1, 1995
3) APPROXIMATELY 60,000 CY'S OF FLY ASH ARE NEEDED TO COMPLETE THE PROJECT.
4) COAL COMBUSTION BY-PRODUCT GENERATOR:
DUKE POWER COMPANY
MARSHALL STEAM STATION
PWR.# BOX 210
TERRELL, N.C. 28682
LARRY D. EVANS
(704)875-5956
5) FLY ASH SHALL BE PLACED IN 12" MAXIMUM LIFT THICKNESSES.
6) FLY ASH SHALL BE PLACED AT OR NEAR OPTIMUM MOISTURE CONTENT AND COMPACTED TO 95% OF THE STANDARD PROCTOR.
7) FIELD DENSITY TESTS SHALL BE TAKEN FOR EACH 2500 CY OF FLY ASH PLACED.
8) HAUL TRUCKS SHALL BE COVERED DURING TRANSPORT TO PREVENT FLY ASH FROM BLOWING OUT ON THE HIGHWAY AND CREATING A NUISANCE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANING UP ANY SPILLAGE.
9) SOIL COVER OVER ASH SHALL BE GRASSED AS INDICATED ON RETAIL SHEETS.
10) THE ASH SEDIMENTATION POND IS SIZED PER THE REQUIREMENTS OF THE N.C. EROSION CONTROL MANUAL. OUTLET PROJECTION IS PROVED SUCH THAT ZERO DISCHARGE OF FLY ASH PARTICLES FROM THE SITE OCCURS. SPECIFIC GRAVITY OF FLY ASH PARTICLES IS 2.55.
11) AT CLOSURE, THE SEDIMENTATION POND SHALL BE EMPTIED OF WATER, FILLED WITH COMPACTED ASH, COVERED WITH SOIL AND GRASSED.
12) PLACEMENT OF ASH IS IN ACCORDANCE WITH N.C. SOLID WASTE REGULATIONS SECTION 1700 "REQUIREMENTS FOR BENEFICIAL USE OF COAL COMBUSTION BY PRODUCTS".
13) COAL COMBUSTION BY-PRODUCTS USED AS A STRUCTURAL FILL SHALL NO BE PLACED:
A. WITHIN 50 HORIZONTAL FEET OF A JURISDICTIONAL WETLAND UNLESS AFTER CONSIDERATION OF THE CHEMICAL AND PHYSICAL IMPACT ON THE WETLAND, THE U.S. CORPS OF ENGINEERS ISSUES A PERMIT OR WAIVER FOR THE FILL:
B. WITHIN 50 HORIZONTAL FEET OF THE TOP OF THE BANK OF A PERENNIAL STREAM OR OTHER SURFACE WATER BODY:
C. WITHIN TWO FEET OF THE SEASONAL HIGH GROUND WATER TABLE:
D. WITHIN 100 HORIZONTAL FEET OF ANY SOURCE OF DRINKING WATER, SUCH AS A WELL, SPRING OR OTHER GROUNDWATER SOURCE OF DRINKING WATER:
E. WITHIN A AREA SUBJECT TO A ONE-HUNDRED YEAR FLOOD, UNLESS IT CAN BE DEMONSTRATED TO THE DIVISION THAT THE FACILITY WILL BE PROTECTED FROM INUNDATION, AND WASHOUT, AND THE FLOW OF WATER IS NOT RESTRICTED AND THE STORAGE VOLUME OF THE FLOOD PLAIN WILL NOT BE SIGNIFICANTLY REDUCED:
F. WITHIN 25 FEET OF ANY PROPERTY BOUNDARY:
G. WITHIN 25 FEET OF A BEDROCK OUTCROP.

GENERAL NOTES:

1. TOPOGRAPHIC SURVEY FURNISHED BY Piedmont Dynamics Corp.
2. SOIL TYPES: SANDY SILTS - HYDROLOGIC GROUP C
3. ALL CONSTRUCTION TO MEET STATE AND LOCAL STANDARDS.
4. OWNER/DEVELOPERS:

FLOYD GREENE
MARLO CORPORATION
P.O. BOX 1144
MOORESVILLE, NC 28115

WILLIAM CRIGG
WILLIAM G. CRIGG INVESTMENTS
RT. 9, BOX 519
MOORESVILLE, NC 28115

CONSTRUCTION SEQUENCE - BRAWLEY SCHOOL ROAD RETAIL SITE

1. OBTAIN PLAN APPROVAL FROM N.C. DEPARTMENT OF HEALTH AND NATURAL RESOURCES, AND LAND QUALITY SECTION AND ANY OTHER APPLICABLE PERMITS.
2. HOLD A PRECONSTRUCTION CONFERENCE WITH NCDHNR-LQ AT LEAST ONCE A WEEK PRIOR TO BEGINNING CONSTRUCTION.
3. CLEAR ONLY AS REQUIRED TO INSTALL SEDIMENT BASINS, AND CONSTRUCTION ENTRANCES.
4. HAVE EROSION CONTROL DEVICES INSPECTED BY NCDHNR-LQ.
5. CLEAR AND GRUB SITE.
6. GRADE ACCORDING TO CONTRACT DOCUMENTS.
7. GRASS OR OTHERWISE STABILIZE ALL DISTURBED AREAS.
8. REMOVE ALL OR ANY EROSION CONTROL DEVICES BY PERMISSION FROM NCDHNR-LQ.
9. AFTER REMOVAL OF EACH AND ALL DEVICES, RESHAPE AREAS AND GRASS OR OTHERWISE STABILIZE.
10. ALL EROSION CONTROL MEASURES SHALL BE IN ACCORDANCE WITH NCDHNR-LQ "EROSION SEDIMENT CONTROL PLANNING AND DESIGN MANUAL", LATEST EDITION.
11. ALL EROSION DEVICES TO BE INSPECTED WEEKLY AND AFTER EACH RAINFALL. NEEDED REPAIRS ARE TO BE MADE IMMEDIATELY.

SEDIMENT BASIN NOTES:

1. DIMENSIONS SHOWN FOR BASIN #1 ARE BASED ON 2.5:1 SIDE SLOPES.
2. ELEVATIONS AND EXACT LOCATION ON BASIN #1, TO BE FIELD SET TO MAXIMIZE EFFICIENCY.
3. SHAPES OF BASINS MAY BE MODIFIED TO FIT TERRAIN; VOLUMES SHALL HOLD.
4. ALL DESIGN PARAMETERS ARE TO BE MAINTAINED.
5. REMOVE SILT IN BASIN #1 WHEN SILT REACHES TOP OF STONE AROUND RISER.
6. ANTI-SEEP COLLARS IN BASIN #1 NOT TO BE LOCATED WITHIN 2.0' OF A PIPE JOINT.

SEDIMENT BASIN TO BE AS SHOWN
ON RESIDENTIAL PLANS AS APPROVED
BY NCDEHNR-LQ - SEE SHEETS 3&4 OF 20 ATTACHED

DENUDED AREA
781,374 sq. ft.
17.93 acres

DRAINAGE AREA1
1,337,135 sq. ft.
30.69 acres

EMERGENCY SPILLWAY

POND AREA SEDIMENT BASIN #1
44,145 sq. ft.
1.01 acres

HW 4 INV = 787.0

65 LF 48" RCP
US INV. = 808.0
DS INV. = 787.24

MH - 3
INV = 787.24
RIM = 802.50
5' DIA. MH MIN

DI 2 - INV = 808.5
RIM = 818.70
5' DIA. MH MIN

65 LF 48" RCP
US INV. = 810.5
DS INV. = 808.50

DI 1 INV = 810.5
RIM = 817.70
5' DIA. MH MIN

65 LF 48" RCP
US INV. = 787.24
DS INV. = 787.00

SPOIL AREA
GRADE TO DRAIN

SWALE LINED WITH NORTH AMERICAN GREEN C125 OR EQUAL

FFE 829.67

FFE 831.67

FFE 834.00

FFE 834.00

S. R. 1117

Brawley School Road

U.S. Highway #21

North

1 inch = 60 ft.

NOTES:
STRIPPINGS TO BE USED IN SLOPES OUTSIDE OF 45 DEGREES AND PLACED UNDER DEEP PARKING AREA FILLS AS APPROVED BY SOILS ENGINEER.
ALL FINNISHED GRADES SHOWN ARE TOP OF PAVEMENT/SLAB - ASSUME 8" FOR SUBGRADE.
VOLUMES SHOWN AT LEFT ARE CALCULATED FROM PROPOSED GRADES SHOWN TO EXISTING GROUND. NO ALLOWANCES HAVE BEEN MADE FOR STRIPPINGS OR SHRINKAGE. NO WARRENTIES ARE MADE OR IMPLIED FOR ACCURACY. CONTRACTOR TO MAKE INDEPENDENT VOLUME ANALISIS

Site Volume Table: Unadjusted

Site	Stratum	Surf1	Surf2	Cut	Fill	Net	Method
duke	new	eg	new	108610	162378	53768 (F)	Grid

NORTH CAROLINA PROFESSIONAL SEAL 10067 ENGINEER ROBERT D. DAVIS
2/23/95

Mario Corporation
and William G. Grigg Investments
Mooresville NC 28115
(704) 664-6353

1:5 MIN — COMPACTED EARTH SURFACE CAP
FLYASH
VARIES
EXISTING EARTH
5'- COMPACTED EARTH
FRENCH DRAIN

SECTION A-A
Not to Scale

Project Location Map

RD DAVIS CONSULTING ENGINEERS
6401 CARMEL ROAD
SUITE 110
P.O. BOX 471851
CHLT. N.C. 28247-1851
704-544-2223 - FAX 544-9976

Owner(s)
MARLO CORPORATION
&
GRIGG INVESTMENTS

Project
BRAWLEY SCHOOL RD PROPERTY
MIXED USE SUBDIVISION

Sheet Title
RETAIL SITE
REVISED GRADING PLAN
DUKE POWER FLYASH

RDD
ENGINEER
RDD
Drawn By
2-20-95
Date Drawn
ECPLAN2.DWG
CADD Dwg. Name
VIEW; PLOT1
Revisions
No ____ Date ____
No ____ Date ____
No ____ Date ____
No ____ Date ____
Issue Date 2-23-95

Project Number
121.001

Sheet Of
C1 2

6.06 TEMPORARY GRAVEL CONSTRUCTION ENTRANCE/EXIT

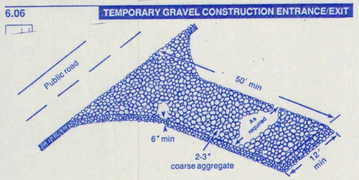


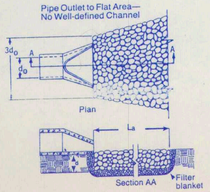
Figure 6.06a Gravel entrance/exit keeps sediment from leaving the construction site (modified from Va SWCC).

Maintenance Maintain the gravel pad in a condition to prevent mud or sediment from leaving the construction site. This may require periodic topdressing with 2-inch stone. After each rainfall, inspect any structure used to trap sediment and clean it out as necessary. Immediately remove all objectionable materials spilled, washed, or tracked onto public roadways.

Construction Specifications

1. Clear the entrance and exit area of all vegetation, roots, and other objectionable material and properly grade it.
2. Place the gravel to the specific grade and dimensions shown on the plans, and smooth it.
3. Provide drainage to carry water to a sediment trap or other suitable outlet.
4. Use geotextile fabrics because they improve stability of the foundation in locations subject to seepage or high water table.

6.41 OUTLET STABILIZATION STRUCTURE



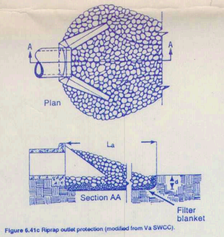


Figure 6.41c Riprap outlet protection (modified from Va SWCC).

Notes

1. L_a is the length of the riprap apron.
2. d = 1.5 times the maximum stone diameter but not less than 6".
3. In a well-defined channel extend the apron up the channel banks to an elevation of 6" above the maximum tailwater depth or to the top of the bank, whichever is less.
4. A filter blanket or filter fabric should be installed between the riprap and soil foundation.

Construction Specifications

1. Ensure that the subgrade for the filter and riprap follows the required lines and grades shown in the plan. Compact any fill required in the subgrade to the density of the surrounding undisturbed material. Low areas in the subgrade on undisturbed soil may also be filled by increasing the riprap thickness.
2. The riprap and gravel filter must conform to the specified grading limits shown on the plans.
3. Filter cloth, when used, must meet design requirements and be properly protected from punching or tearing during installation. Repair any damage by removing the riprap and placing another piece of filter cloth over the damaged area. All connecting joints should overlap a minimum of 1 ft. If the damage is extensive, replace the entire filter cloth.
4. Riprap may be placed by equipment, but take care to avoid damaging the filter.
5. The minimum thickness of the riprap should be 1.5 times the maximum stone diameter.
6. Riprap may be field stone or rough quarry stone. It should be hard, angular, highly weather-resistant and well graded.
7. Construct the apron on zero grade with no overfall at the end. Make the top of the riprap at the downstream end level with the receiving area or slightly below it.
8. Ensure that the apron is properly aligned with the receiving stream and preferably straight throughout its length. If a curve is needed to fit site conditions, place it in the upper section of the apron.
9. Immediately after construction, stabilize all disturbed areas with vegetation (Practices 6.10, *Temporary Seeding*, and 6.11, *Permanent Seeding*).

Maintenance Inspect riprap outlet structures after heavy rains to see if any erosion around or below the riprap has taken place or if stones have been dislodged. Immediately make all needed repairs to prevent further damage.

OUTLET STRUCTURE CHART

	Qo	do	Vo	d50	d	La	W
HW4	121	48"	9.6fps	0.4'	0.9'	22'	12.8'
SED BAS.	14	18"	5.5	0.4'	0.9'	20	9.5'

6.32 TEMPORARY SLOPE DRAINS

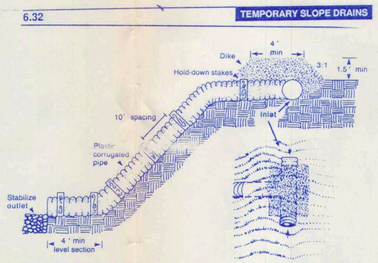


Figure 6.32a Cross section of temporary slope drain.

Construction Specifications

Entrance—Construct the entrance to the slope drain of a standard flared-end section of pipe with a minimum 6-inch metal toe plate (Figure 6.32a). Make all fittings watertight. A standard T-section fitting may also be used at the inlet.

Temporary diversion—Generally, use an earthen diversion with a dike ridge to direct surface runoff into the temporary slope drain. Make the height of the ridge over the drain conduit a minimum of 1.5 foot and at least 6 inches higher than the adjoining ridge on either side. The lowest point of the diversion ridge should be a minimum of 1 ft above the top of the drain so that design flow can freely enter the pipe.

Outlet protection—Protect the outlet of the slope drain from erosion (Practice 6.41, *Outlet Stabilization Structure*).

Construction Specifications A common failure of slope drains is caused by water saturating the soil and seeping along the pipe. This creates voids from consolidation and piping and causes washouts. Proper backfilling around and under the pipe "haunches" with stable soil material and hand compacting in 6-inch lifts so achieve firm contact between the pipe and the soil at all points will eliminate this type of failure.

1. Place slope drains on undisturbed soil or well-compacted fill at locations and elevations shown on the plans.
2. Slightly slope the section of pipe under the dike toward its outlet.
3. Hand tamp the soil under and around the entrance section in lifts not to exceed 6 inches.
4. Ensure that fill over the drain at the top of the slope has minimum dimensions of 1.5 ft depth, 4 ft top width, and 3:1 side slopes.
5. Ensure that all slope drain connections are watertight.
6. Ensure that all fill material is well-compacted. Securely fasten the exposed section of the drain with grommets or stakes spaced no more than 10 ft apart.
7. Extend the drain beyond the toe of the slope and adequately protect the outlet from erosion.
8. Make the seated, compacted dike ridge no less than 1 ft above the top of the pipe at every point.
9. Immediately stabilize all disturbed areas following construction.

Maintenance Inspect the slope drain and supporting diversion after every rainfall and promptly make necessary repairs. When the protected area has been permanently stabilized, temporary measures may be removed, materials disposed of properly, and all disturbed areas stabilized appropriately.

6.81 SUBSURFACE DRAIN

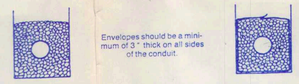


Figure 6.81c Drainage envelopes and filters (modified from USDA-SCS)

Construction Specifications

Outlet—Ensure that the outlet of a drain empties into a channel or other watercourse above the normal water level.

Use outlet pipe of corrugated metal, cast iron, steel pipe, or heavy-duty plastic without perforations and at least 10 ft long. Do not use an envelope or filter material around the outlet pipe, and bury at least two-thirds of the pipe length.

When outlet velocities exceed those allowable for the receiving stream, outlet protection must be provided (*References: Outlet Protection*).

Secure an animal guard to the outlet end of the pipe to keep out rodents.

Material—Acceptable materials for subsurface drains include perforated, continuous closed-joint conduits of corrugated plastic, corrugated metal, concrete, and bituminized fiber. Ensure that the strength and durability of the pipe meet the requirements of the site and are in keeping with the appropriate ASTM specification for the materials used.

Construction Specifications

1. Dig a trench to grade 3 inches below the design bottom elevation of the pipe to accommodate the envelope or filter material.
2. Stabilize any soft, yielding soils under the drain with gravel or other suitable material.
3. Lay pipe on the design grade and elevation avoiding reverse grade or low spots.
4. Do not use damaged, deformed, warped, or otherwise unsuitable pipe.
5. Place envelope or filter material around pipe with at least 3 inches of material on all sides.
6. Ensure that gravel for envelopes around flexible pipe does not exceed 3/4 inch in size to prevent damage to the pipe.
7. Place filter cloth over gravel envelopes to prevent movement of soil into the gravel.
8. Backfill immediately after placement of the pipe. Ensure that the backfill material does not contain rocks or other sharp objects and place it in the trench in a manner that will not damage or displace the pipe. Overfill the trench slightly to allow for settlement.
9. For the outlet section of the drain, use at least 10 ft of nonperforated corrugated metal, cast iron, steel, or heavy-duty plastic pipe. Cover at least two-thirds of the pipe length with well-compacted soil.
10. Keep the seated fill over the pipe outlet slightly higher than the surrounding ground to prevent erosion and wash-out from surface runoff.
11. Place a suitable animal guard securely over the pipe outlet to keep out rodents.
12. Cap the upper end of each drain with a standard cap made for this purpose or with concrete or other suitable material to prevent soil from entering the open end.

Maintenance A properly designed and installed subsurface drain requires little maintenance. However, check drains periodically and especially after heavy rains to see that they are operating properly. Keep the outlet free of sediment and other debris, and keep the animal guard in place and functional. Investigate any wet areas along the line for possible cave-in due to vehicle traffic, blockage by roots, or other problems. Make all needed repairs promptly.

6.62 SEDIMENT FENCE (SILT FENCE)

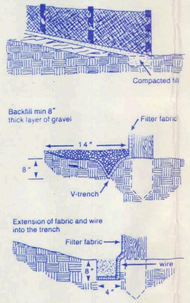


Figure 6.62a Installation detail of a sediment fence.

Construction Specifications

MATERIALS

1. Use a synthetic filter fabric or a pervious sheet of polypropylene, nylon, polyester, or polyethylene yarn, which is certified by the manufacturer or supplier as conforming to the requirements shown in Table 6.62b.

Synthetic filter fabric should contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0 to 120° F.

2. Ensure that posts for sediment fences are either 4-inch diameter pine, 2-inch diameter oak, or 1.33 lb/linear ft steel with a minimum length of 4 ft. Make sure that steel posts have projections to facilitate fastening the fabric.
3. For reinforcement of standard strength filter fabric, use wire fence with a minimum 14 gauge and a maximum mesh spacing of 6 inches.

Table 6.62b Specifications For Sediment Fence Fabric

Physical Property	Requirements
Filtering Efficiency	85% (min)
Tensile Strength at 20% (max.) Elongation	Standard Strength-30 lb/in in (min) Extra Strength-50 lb/in in (min)
Slurry Flow Rate	0.3 gal/sq ft/min (min)

CONSTRUCTION

1. Construct the sediment barrier of standard strength or extra strength synthetic filter fabrics.
2. Ensure that the height of the sediment fence does not exceed 18 inches above the ground surface. (Higher fences may impound volumes of water sufficient to cause failure of the structure.)
3. Construct the filter fabric from a continuous roll cut to the length of the barrier to avoid joints. When joints are necessary, securely fasten the filter cloth only as a support post with overlap to the next post.
4. Support standard strength filter fabric by wire mesh fastened securely to the upslope side of the posts using heavy duty wire staples at least 1 inch long or tie wires. Extend the wire mesh support to the bottom of the trench.
5. When a wire mesh support fence is used, space posts a maximum of 8 ft apart. Support posts should be driven securely into the ground to a minimum of 18 inches.
6. Extra strength filter fabric with 6-ft post spacing does not require wire mesh support fence. Staple or wire the filter fabric directly to posts.
7. Excavate a trench approximately 4 inches wide and 8 inches deep along the proposed line of posts and upslope from the barrier (Figure 6.62a).
8. Backfill the trench with compacted soil or gravel placed over the filter fabric.
9. Do not attach filter fabric to existing trees.

Maintenance Inspect sediment fences at least once a week and after each rainfall. Make any required repairs immediately.

Should the fabric of a sediment fence collapse, tear, decompose or become ineffective, replace it promptly. Replace burlap every 60 days.

Remove sediment deposits as necessary to provide adequate storage volume for the next rain and to reduce pressure on the fence. Take care to avoid undermining the fence during cleanout.

Remove all fencing materials and unstable sediment deposits and bring the area to grade and stabilize it after the contributing drainage area has been properly stabilized.

6.50 EXCAVATED DROP INLET PROTECTION (Temporary)

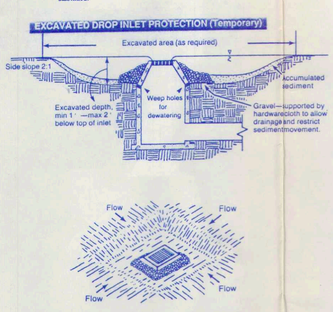


Figure 6.50a Excavated drop inlet protection.

Construction Specifications

1. Clear the area of all debris that might hinder excavation and disposal of spoil.
2. Grade the approach to the inlet uniformly.
3. Protect weep holes by gravel.
4. When the contributing drainage area has been permanently stabilized, seal weep holes, fill the basin with stable soil to final grading elevations, compact properly, and stabilize.

Maintenance Inspect, clean, and properly maintain the excavated basin after every storm until the contributing drainage area has been permanently stabilized. To provide satisfactory basin efficiency, remove sediment when the volume of the basin has been reduced by one-half. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize it appropriately.

ROCK DAM

Construction Specifications

1. Clear the areas under the embankment and strip it of roots and other objectionable material. Clear the reservoir area to facilitate sediment removal.
2. Excavate a cutoff trench a minimum of 2 ft deep and 2 ft wide with 1:1 side slopes under the total length of the dam at its centerline. Line the trench with extra-strength filter fabric before backfilling with rock. Apply filter fabric under the rockfill embankment, from the upstream edge of the keyway to the downstream edge of the apron. Overlap filter material a minimum of 1 ft at all joints, with the upstream strip laid over the downstream strip.
3. Construct the embankment with well-graded rock and gravel to the size and dimensions shown on the drawings. It is important that rock abutments be at least 2 ft higher than the spillway crest and at least 1 ft higher than the downstream face of the dam, all the way to the toe, to prevent scour and erosion at the abutments.
4. Sediment-laden water from the construction site should be diverted into the basin reservoir at the furthest area from the dam.
5. Construct the rock dam before the basin area is cleared to minimize sediment yield from construction of the basin. Stabilize immediately all areas disturbed during the construction of the dam except the sediment pool (*References: Surface Stabilization*).
6. Safety—Sediment basins should be considered dangerous because they attract children. Steep side slopes should be avoided. Fences with warning signs may be needed if trespassing is likely. All state and local requirements must be followed.

Maintenance Check sediment basins after each rainfall. Remove sediment and restore original volume when sediment accumulates to about one-half the design volume.

Check the structure for erosion, piping, and rock displacement after each significant rainstorm and repair immediately.

Remove the structure and any unstable sediment immediately after the construction site has been permanently stabilized. Smooth the basin site to blend with the surrounding area and stabilize. All water and sediment should be removed from the basin prior to dam removal. Sediment should be placed in designated disposal areas and not allowed to flow into streams or drainageways during structure removal.

TEMPORARY ROCK DAM

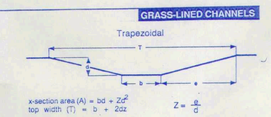
DRAINAGE AREA	10.00 AC
RUNOFF COEFF.(C)	0.4
10YR INTENSITY	7.0 IN/HR
10YR DISCARGE	28.00 CFS
DENUDED AREA	10.00 AC
STORAGE REQUIRED	18,000 CF
STORAGE PROVIDED	18,843 CF
TOP OF DAM/BERM	106.00
WIER ELEVATION	104.00
BOTTOM OF BASIN	100.00 (DATUM)
WIER WIDTH	10.00 FT
DRIVING HEAD	1.00 FT
BASIN SIDE SLOPES	2:1
BASIN DIMENSIONS	50'X 100' BOTT.
EMBANKMENT WIDTH	5.00 FT
EMBANKMENT SLOPES	2:1 upstream 3:1 downstream

WIER CALCULATION

$Q=CWLH^{(3/2)}$

Q = DISCHARGE (CFS)
Cw = WIER COEFF. (3.0)
L = WIER LENGTH (FT)
H = DRIVING HEAD (FT)

6.30 GRASS-LINED CHANNELS



Construction Specifications

Drainage—Install subsurface drains in locations with high water tables or seepage problems that would inhibit establishment of vegetation in the channel. Stone channel bottom lining may be needed where prolonged low flow is anticipated.

Outlets—Evaluate the outlets of all channels for carrying capacity and stability and protect them from erosion by limiting the exit velocity (Practice 6.41, *Outlet Stabilization Structure*).

Sedimentation protection—Protect permanent grass channels from sediment produced in the watershed, especially during the construction period. This can be accomplished by the effective use of diversions, sediment traps, protected side inlets, and vegetative filter strips along the channel.

Construction Specifications

1. Remove all trees, brush, stumps, and other objectionable material from the foundation area and dispose of properly.
2. Excavate the channel and shape it to neat lines and dimensions shown on the plans plus a 0.2-ft overcut around the channel perimeter to allow for bulking during seedbed preparations and sod buildup.
3. Remove and properly dispose of all excess soil so that surface water may enter the channel freely.
4. The procedure used to establish grass in the channel will depend upon the severity of the conditions and selection of species. Protect the channel with mulch or a temporary liner sufficient to withstand anticipated velocities during the establishment period (*Appendix 8.05*).

Maintenance During the establishment period, check grass-lined channels after every rainfall. After grass is established, periodically check the channel; check it after every heavy rainfall event. Immediately make repairs. It is particularly important to check the channel outlet and all road crossings for bank stability and evidence of piping or scour holes. Remove all significant sediment accumulations to maintain the designed carrying capacity. Keep the grass in a healthy, vigorous condition at all times, since it is the primary erosion protection for the channel (Practice 6.11, *Permanent Seeding*).

6.20 TEMPORARY DIVERSIONS

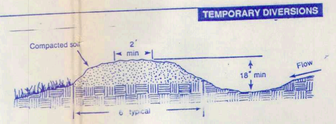


Figure 6.20a Temporary earthen diversion dike.

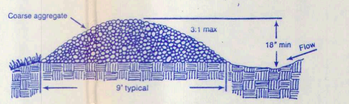


Figure 6.20b Temporary gravel diversion dike for vehicle crossing (modified from Va SWCC).

Construction Specifications

1. Remove and properly dispose of all trees, brush, stumps, and other objectionable material.
2. Ensure that the minimum constructed cross section meets all design requirements.
3. Ensure that the top of the dike is not lower at any point than the design elevation plus the specified settlement.
4. Provide sufficient room around diversions to permit machine regrading and cleanout.
5. Vegetate the ridge immediately after construction, unless it will remain in place less than 30 working days.

Maintenance Inspect temporary diversions once a week and after every rainfall. Immediately remove sediment from the flow area and repair the diversion ridge. Carefully check outlets and make timely repairs as needed. When the area protected is permanently stabilized, remove the ridge and the channel to blend with the natural ground level and appropriately stabilize it.

Table 6.10a Temporary Seeding Recommendations for Late Winter and Early Spring

Seeding mixture Species	Rate (lb/acre)
Rye (grain)	120
Annual lespedeza (Kobe in Piedmont and Coastal Plain, Korean in Mountains)	50

Omit annual lespedeza when duration of temporary cover is not to extend beyond June.

Seeding dates
Mountains—Above 2500 ft: Feb. 15 - May 15
Below 2500 ft: Feb. 1 - May 1
Piedmont—Jan. 1 - May 1
Coastal Plain—Dec. 1 - Apr. 15

Soil amendments
Follow recommendations of soil tests or apply 2,000 lb/acre ground agricultural limestone and 750 lb/acre 10-10-10 fertilizer.

Mulch
Apply 4,000 lb/acre straw. Anchor straw by tacking with asphalt, netting, or a mulch anchoring tool. A disk with blades set nearly straight can be used as a mulch anchoring tool.

Maintenance
Refertilize if growth is not fully adequate. Reseed, refertilize and mulch immediately following erosion or other damage.

Table 6.11c Seeding No. 4P for Gentle Slopes, Ione Somewhat Warmer or Drier than 3P, or with Physical Limitations; High Maintenance

Seeding mixture Species[1]	Rate (lb/acre)
Blend of 50% KY-31 tall fescue and 50% mixture of two or more turf-type tall fescues or	200-250
Blend of three or more turf-type tall fescues	200-250

Seeding dates

	Best	Possible
Fall:	Aug. 25 - Sept. 15	Aug. 20 - Oct. 25
Winter:	—	Feb. 1 - Mar. 31

For quality turf avoid spring seeding. Where grading is completed during late winter or spring, an alternative is to seed 30 lb/acre Kobe lespedeza, keep mowed, prepare seedbed, and seed permanent mixture between Aug. 25 and Sept. 15.

Soil amendments
Apply lime and fertilizer according to soil tests, or apply 4,000 lb/acre ground agricultural limestone and 1,000 lb/acre 10-10-10 fertilizer.

Mulch
Apply 4,000 lb/acre grain straw or equivalent cover of another suitable mulch. Anchor straw by tacking with asphalt, roving, or netting or by crimping with a mulch anchoring tool. A disk with blades set nearly straight can be used as a mulch anchoring tool.

Maintenance
Fertilize according to soil tests or apply 40 lb/acre nitrogen in Jan. or Feb., 40 lb in Sept., and 40 lb in Nov., from a 12-4-8, 16-4-8, or similar turf fertilizer. Avoid fertilizer applications during warm weather, as this increases stand losses to disease. Reseed, fertilize, and mulch damaged areas immediately. Mow to a height of 2.5-3.5 inches as needed.

[1]Refer to *Appendix 8.02* for botanical names.

PRELIMINARY DRAWINGS
DO NOT USE FOR
CONSTRUCTION

R DAVIS
CONSULTING ENGINEERS

Owner: MARLO CORPORATION & GRIGG INVESTMENTS

Project: BRAWLEY SCHOOL RD PROPERTY
MIXED USE SUBDIVISION
RETAIL AREA

Sheet Title: SITE PREP DETAILS

ROD
ENGINEER
ROD
Drawn By
8-26-93
Date Drawn
DETAILS.DWG
CADD Dwg. Name
VIEW: PLOT1
Revisions
No. ____ Date ____
No. ____ Date ____
No. ____ Date ____
No. 1 Date 2/20/95
Issue Date 2/23/95

Project Number
121.001

Sheet C2 Of 2

NORTH CAROLINA PROFESSIONAL SEAL 10087 ENGINEER ROBERT D. DAVIS

PYRAMID ENVIRONMENTAL & ENGINEERING
(PROJECT 2019-260)

GEOPHYSICAL SURVEY

GEOPHYSICAL INVESTIGATION TO DELINEATE BURIED ASH

NCDOT PROJECT R-3833C
MOORESVILLE, NC

SEPTEMBER 6, 2019

Report prepared for: **Christopher J. Burkhardt, PWS**
Falcon Engineers
1210 Trinity Rd. #110
Raleigh, NC 27607

Prepared by: _____
Eric C. Cross, P.G.
NC License #2181

Reviewed by: _____
Douglas A. Canavello, P.G.
NC License #1066

503 INDUSTRIAL AVENUE, GREENSBORO, NC 27406
P: 336.335.3174 F: 336.691.0648
C257: GEOLOGY C1251: ENGINEERING

GEOPHYSICAL INVESTIGATION REPORT
R-3833C, Multiple Parcels
Mooresville, North Carolina

Table of Contents

Figures

EXECUTIVE SUMMARY

Project Description: Pyramid Environmental (Pyramid) conducted a geophysical investigation for Falcon Engineers (Falcon) at multiple parcels (33, 34, 35, 36, 37, 38, 39, 40, 43, 46 and 73) in Mooresville, NC as part of the North Carolina Department of Transportation (NCDOT) Project R-3833C. Falcon directed Pyramid as to the geophysical survey boundaries, which were designed to extend from the existing edge of pavement into the proposed Right-Of-Way (ROW) and/or easements at each parcel, whichever distance was greater. Historical research suggested that a large volume of coal ash had been deposited in this area. The purpose of the geophysical investigation was to locate and delineate the horizontal extents of the buried ash deposit (if present) across the portion of each property where proposed ROW and/or easements were present.

Geophysical Results:

- The EM31 mapping was successful in delineating a zone of high conductivity soils across the site.
- Analysis of conductivity trends resulted in the interpretation that buried ash may be represented by conductivity values greater than 30 millisiemens per meter (mS/m).
- Extensive buried metal utilities were also present across the project site that resulted in zones of elevated conductivity associated with the buried metal.
- Three distinct zones of increased conductivity were observed at the project site that do not correspond to buried utilities. These areas are located:
    - 1) On the south side of Parcel 43
    - 2) On the west side of Parcel 39
    - 3) On the west and south sides of Parcel 34
- Using a threshold of 30 mS/m, Pyramid estimates that these areas of possible buried ash cover an area of approximately 1.2 acres at within the survey boundaries. The buried ash may also extend further into the properties beyond the survey limits.
- The presence of buried metal utilities may skew these interpretations and/or result in interference that is obscuring additional ash deposits.
- It is recommended that invasive testing (i.e., soil borings) be performed to depths of at least 20 feet across the property within the various ranges of conductivities to verify the threshold that represents the boundary between ash and native soil. The geophysical results can then be used to extrapolate this boundary around the perimeter of the entire site with greater accuracy.

INTRODUCTION

Pyramid Environmental (Pyramid) conducted a geophysical investigation for Falcon Engineers (Falcon) at multiple parcels (33, 34, 35, 36, 37, 38, 39, 40, 43, 46 and 73) in Mooresville, NC as part of the North Carolina Department of Transportation (NCDOT) Project R-3833C. Falcon directed Pyramid as to the geophysical survey boundaries, which were designed to extend from the existing edge of pavement into the proposed Right-Of-Way (ROW) and/or easements at each parcel, whichever distance was greater. Historical research suggested that a large volume of coal ash had been deposited in this area. The purpose of the geophysical investigation was to locate and delineate the horizontal extents of the buried ash deposit (if present) across the portion of each property where proposed ROW and/or easements were present.

The survey area included grass and asphalt road shoulders, parking lots, and medians surrounding multiple commercial buildings and residential properties. It should be noted that dense vegetation prevented full access along specific residential properties on the north side of Brawley School Road. It should also be noted that review of the Final Survey *.dgn MicroStation file provided to Pyramid by the NCDOT indicated that multiple buried metal utility lines (water, sewer and gas) extended across various portions of the survey areas. Such buried metal utility lines can result in localized conductivity increases that can create interference anomalies in the conductivity results.

Figure 1 provides a map showing the geophysical survey boundaries, the inaccessible areas, and ground-level site photographs.

FIELD METHODOLOGY

Pyramid utilized electromagnetic geophysical methods to delineate the horizontal extents of ash at the subject property. Specifically, Pyramid utilized a Geonics EM31-MK1 (EM 31) ground conductivity meter which measures apparent ground conductivity and metal detection down to a maximum depth of 17 feet below ground surface. The EM31 instrument was coupled to a Trimble AG-114 GPS unit to record the position of the EM data to sub-meter accuracy during the survey.

The EM31 ground conductivity meter measures apparent ground conductivity (quadrature phase) and metal detection (in-phase) conditions down to a maximum depth of 15 to 17 feet below ground surface. The EM31 method determines electrical properties of the earth

materials by inducing electromagnetic currents in the ground and measuring the secondary magnetic field produced by these currents. An alternating current is generated in the transmitter coil located at one end of the instrument. The secondary magnetic field, which is produced by currents through the earth, induces a corresponding alternating current in the receiver coil located at the opposite end of the instrument. The instrument runs at an operating frequency of 9.8 kilohertz (kHz).

After compensating for the primary field, which can be computed from the relative positions and orientations of both coils, the magnitude and relative phase of the secondary field are measured. These measurements are then converted to components of in-phase and 90 degrees out-of-phase (quadrature) with the transmitted field. The out-of-phase or quadrature component, using certain simple assumptions, is converted to a measurement of apparent ground conductivity in millisiemens per meter (mS/m). These conductivity values can be used to infer changes related to anomalous subsurface deposits such as coal ash. The in-phase component responds to high conductive areas (above 100 mS/m) or to areas containing metallic objects and debris and the values are expressed in terms of relative units or parts per thousand. Therefore, the in-phase data can be used to identify areas that may contain buried metallic material across areas recording lower conductivity values.

A series of transects were performed using the EM31 instrument generally spaced 10 feet apart and extending typically parallel to the direction of Brawley School Road. Subsequent to the initial data collection, Pyramid collected additional reconnaissance EM data along transects at a coarser spacing in the north-central portion of the survey area. Following the field survey, data were downloaded and processed using TrackMaker31 EM processing software, and a contour map of conductivity was generated using Surfer 16.0 contouring software (see **Figure 2**).

DISCUSSION OF RESULTS

A contour map of the EM31 quadrature results (conductivity) is presented in **Figure 2**. It was expected that the presence of buried ash would result in a significant increase in ground conductivity relative to the surrounding native soil. The figure shows a wide range of conductivity values across the property. As mentioned previously, Pyramid has analyzed the locations of buried metal utility lines using the MicroStation files provided by the NCDOT. These metal utility lines can result in conductivity increases that are unrelated to geologic conditions. The metal utility lines have been extracted from the MicroStation file and overlain on the conductivity results for reference. The majority of the metal utility lines

are running parallel to the roadways in the road shoulders, and clearly show linear increases in conductivity at the locations of the utilities.

Review of the collective conductivity results indicate that background soil conditions are generally represented by conductivity values ranging from approximately 5 to 30 mS/m. Negative conductivity values are typically indicative of surface metal objects such as signs, light poles, vehicles, and other objects. These features can generally be ignored for the purposes of analyzing possible buried coal ash.

Specific to coal ash, Pyramid examined all areas where conductivity values increased to approximately 30 mS/m and higher. Analysis of the locations of buried metal utilities indicate that the majority of the zones where elevated conductivity was observed correlate to the locations of utilities. However, three distinct zones of increased conductivity are observed at the project site that do not correspond to buried utilities. These areas are located: 1) On the south side of Parcel 43, 2) On the west side of Parcel 39, and 3) On the west and south sides of Parcel 34. These zones are interpreted to contain possible buried coal ash. It is also likely that, if these areas are representative of coal ash, the coal ash extends further into the interior of each parcel.

Soil borings have not yet been performed at the site. Boring data would allow Pyramid to verify if these zones contain coal ash and determine the exact conductivity value that represents the boundary between native soil and ash. However, the trend observed in the geophysical data suggests that there is a sharp decrease in conductivity surrounding the possible ash deposits at a value of approximately 30 mS/m.

The relative consistency of soil conductivity lower than 30 mS/m across the site indicates that this value can be used as an approximate threshold to distinguish between native soil and the ash deposit. The yellow areas shown on **Figure 3** use this threshold to provide estimated boundaries of the ash deposits. This interpretation results in a total combined area of approximately 1.2 acres containing buried ash within the survey boundaries. The results also suggest that the ash deposit may extend further into the properties beyond the survey limits. If these zones are representative of containing buried ash, it is apparent that the NCDOT would likely encounter ash during construction depending on the depth of the ash deposit relative to the depth of excavation.

Figure 3 also includes recommended boring/soil sampling locations within the possible ash deposits, as well as in specific areas outside of the ash to help constrain its extents (if present) and differentiate between conductivity increases related to soil conditions versus buried metal utilities. Pyramid recommends performing soil sampling in the majority of these locations as well as other areas for additional background information.

In summary, the EM31 mapping at the R-3833C project site site was successful in delineating multiple areas of high conductivity soils across the site that may be associated with buried ash. The presence of buried metal utilities may skew these interpretations and/or result in interference that is obscuring additional ash deposits.

SUMMARY & CONCLUSIONS

Pyramid's evaluation of the geophysical data collected at the NCDOT Project R-3833C project site provides the following summary and conclusions:

- The EM31 mapping was successful in delineating a zone of high conductivity soils across the site.
- Analysis of conductivity trends resulted in the interpretation that buried ash may be represented by conductivity values greater than 30 mS/m.
- Extensive buried metal utilities were also present across the project site that resulted in zones of elevated conductivity associated with the buried metal.
- Three distinct zones of increased conductivity were observed at the project site that do not correspond to buried utilities. These areas are located:
    - 1) On the south side of Parcel 43
    - 2) On the west side of Parcel 39
    - 3) On the west and south sides of Parcel 34
- Using a threshold of 30 mS/m, Pyramid estimates that these areas of possible buried ash cover an area of approximately 1.2 acres within the survey boundaries. The buried ash may also extend further into the properties beyond the survey limits.
- The presence of buried metal utilities may skew these interpretations and/or result in interference that is obscuring additional ash deposits.
- It is recommended that invasive testing (i.e., soil borings) be performed to depths of at least 20 feet across the property within the various ranges of conductivities to verify the threshold that represents the boundary between ash and native soil. The geophysical results can then be used to extrapolate this boundary around the perimeter of the entire site with greater accuracy.

LIMITATIONS

Geophysical surveys have been performed and this report prepared for Falcon in accordance with generally accepted guidelines for EM31 surveys. It is generally recognized that the results of the geophysical surveys are non-unique and may not represent actual subsurface conditions. The EM31 results obtained for this project have been used to delineate the suspected ash deposit. However, some of the ash may not be detected by the EM31 investigation. Furthermore, some EM31 apparent conductivity anomalies may be in response to other hydrologic or geologic factors. The EM31 data is a function of the average conditions within the upper 15-17 feet of soil directly underlying the instrument at the time of data collection.

APPROXIMATE BOUNDARIES OF GEOPHYSICAL SURVEY AREA

View of Survey Area
(Facing Approximately Northeast)

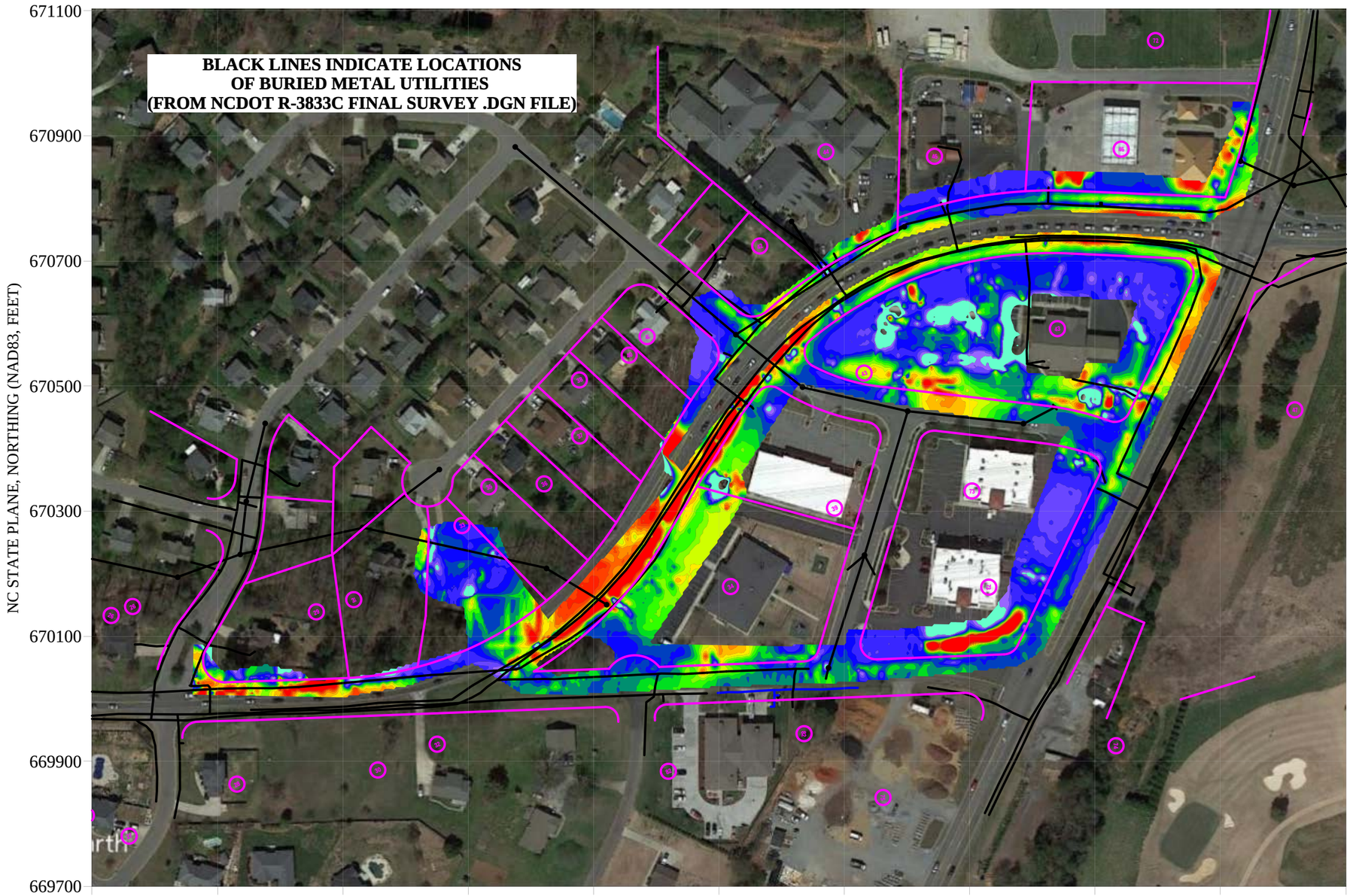
View of Survey Area
(Facing Approximately North)

N

PYRAMID GEOPHYSICS
503 INDUSTRIAL AVENUE
GREENSBORO, NC 27406
(336) 335-3174 (p) (336) 691-0648 (f)
License # C1251 Eng. / License # C257 Geology

PROJECT	CONDUCTIVITY SURVEY FOR SUSPECTED COAL ASH NCDOT PROJECT R-3833C
TITLE	GEOPHYSICAL SURVEY BOUNDARIES AND SITE PHOTOGRAPHS
DATE	9/3/2019
PYRAMID PROJECT #:	2019-260
CLIENT	FALCON ENGINEERS
	FIGURE 1

EM31 CONDUCTIVITY SURVEY RESULTS
(WITH OVERLAY OF BURIED METAL UTILITIES)

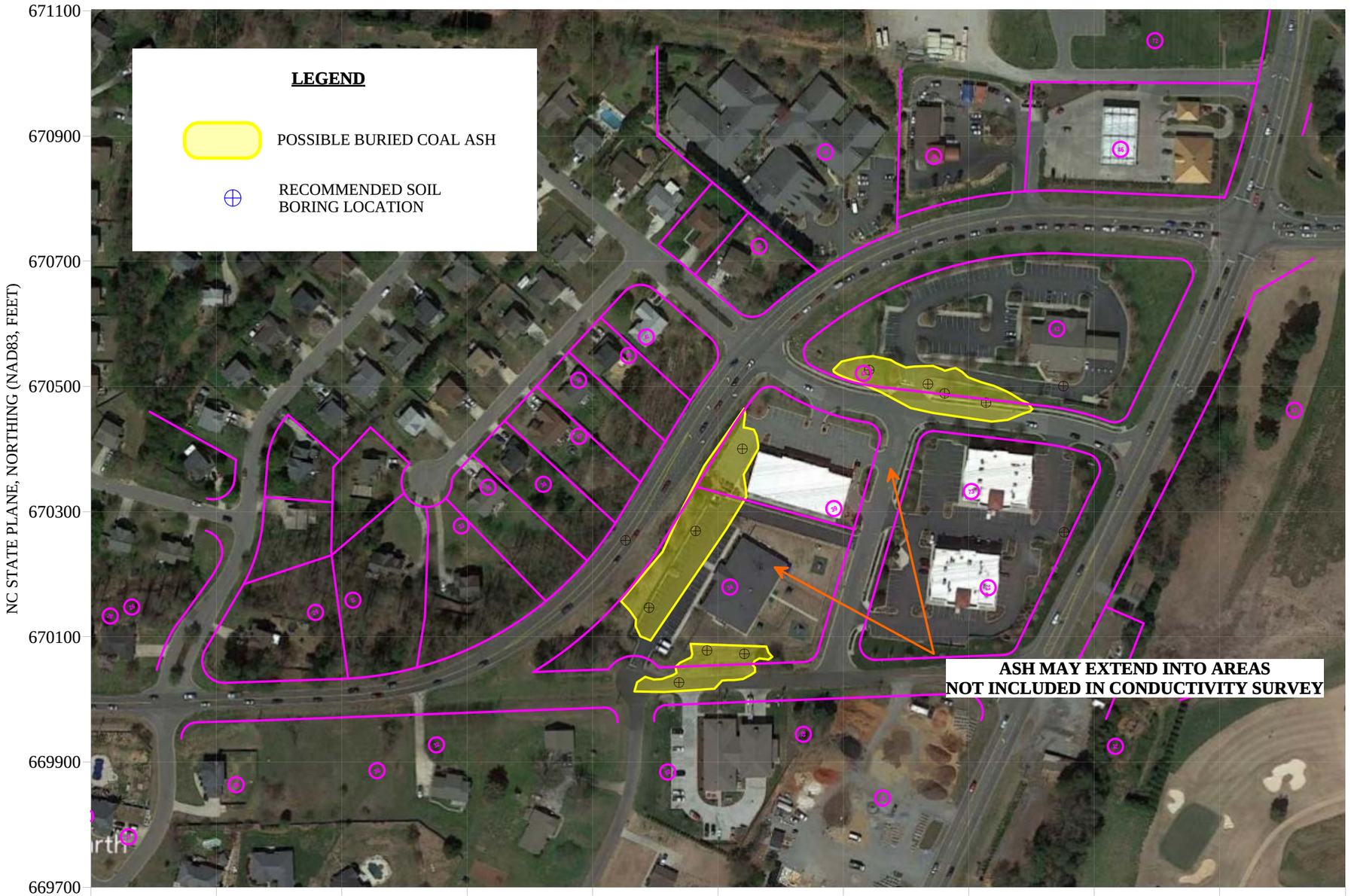


PYRAMID GEOPHYSICS

503 INDUSTRIAL AVENUE
GREENSBORO, NC 27406
(336) 335-3174 (p) (336) 691-0648 (f)
License # C1251 Eng. / License # C257 Geology

PROJECT: CONDUCTIVITY SURVEY FOR SUSPECTED COAL ASH NCDOT PROJECT R-3833C	TITLE: EM31 CONDUCTIVITY SURVEY RESULTS	DATE: 9/3/2019	CLIENT: FALCON ENGINEERS
		PYRAMID PROJECT #: 2019-260	**FIGURE 2**

INTERPRETED AREAS CONTAINING
POSSIBLE BURIED COAL ASH
AND RECOMMENDED BORING LOCATIONS



PYRAMID GEOPHYSICS 503 INDUSTRIAL AVENUE GREENSBORO, NC 27406 (336) 335-3174 (p) (336) 691-0648 (f) License # C1251 Eng. / License # C257 Geology	PROJECT CONDUCTIVITY SURVEY FOR SUSPECTED COAL ASH NCDOT PROJECT R-3833C	TITLE INTERPRETED AREAS CONTAINING BURIED COAL ASH AND RECOMMENDED BORING LOCATIONS	DATE 9/3/2019 PYRAMID PROJECT #: 2019-260	CLIENT FALCON ENGINEERS **FIGURE 3**