STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

J. ERIC BOYETTE
SECRETARY

October 12, 2021

Addendum No. 1
RE: Contract # C204657
WBS # 15614.1075010
FA# STATE FUNDED
Polk County
I-26 FROM MILE MARKER 62.5 TO MILE MARKER 64

October 19, 2021 Letting

To Whom It May Concern:

Reference is made to the plans and proposal form furnished to you on this project.

The following revisions have been made to the Roadway plans.

Sheet No.	Revision
2D-33	Removed SA boundary from pipe profile.
2D-35	Removed pipe lining from pipe profile. (0602 to 0542)
3D-2	Removed 156 LF of 36" Pipe Rehabilitation CIPP Liner from drainage summary. (0602 to 0542)
3D-6	Updated project totals for removal of 156 LF of 36" Pipe Rehabilitation CIPP Liner.
4	Added shading and note for allowable working area. Added note regarding the location of the existing ROW on the southern side of the alignment. Revised table to remove SA designation and added designation for allowable working area.
5	Removed "Line with CIPP" from plan view. (0602 to 0542) Added SA areas and labels to not disturb them.
6	Removed "Line with CIPP" from plan view. (0602 to 0542) Added shading and note for allowable working area. Revised table to remove SA designation and added designation for allowable working area.
7	Added shading and note for allowable working area. Revised table to remove SA designation and added designation for allowable working area.
8	Removed table with SA designation.

Mailing Address:
NC DEPARTMENT OF TRANSPORTATION
CONTRACT STANDARDS AND DEVELOPMENT
1591 MAIL SERVICE CENTER
RALEIGH, NC 27699-1591

Telephone: (919) 707-6900
Fax: (919) 250-4127
Customer Service: 1-877-368-4968

Location:
1020 BIRCH RIDGE DR.
RALEIGH, NC 27610

Website: www.ncdot.gov

9	Revised table to remove SA designation and revised note regarding the clearing limits.
EC-4	Added safety fence -I26- 415+00 to 417+00 LT & RT. Removed SA legend. Added note regarding the location of the existing ROW on the southern side of the alignment.
EC-5	Removed EC measures -HGR- 44+00 to 46+00 LT. Removed SA legend. Added SA areas and labels to not disturb them.
EC-6	Removed EC measures -HGR- 46+00 to 47+00 LT. Added safety fence -HGR- 50+50 to 54+00 LT & -HGR- 56+00 to 58+70 LT. Removed SA legend.
EC-7	Added safety fence -HGR- 58+70 to 62+00 LT. Removed SA legend.
EC-8	Removed SA legend.
EC-9	Removed SA boundary & legend.
EC-10	Added safety fence -I26- 415+00 to 417+00 LT & RT. Removed SA legend.
EC-11	Removed EC measures -HGR- 44+00 to 46+00 LT. Removed SA legend. Added SA areas and labels to not disturb them.
EC-12	Removed EC measures -HGR- 46+00 to 47+00 LT. Added safety fence -HGR- 50+50 to 54+00 LT & -HGR- 56+00 to 58+70 LT. Removed SA legend.
EC-13	Added safety fence -HGR- 58+70 to 62+00 LT. Removed SA legend.
EC-14	Removed SA legend.
EC-15	Removed SA boundary & legend.

Please void the above listed Sheets in your plans and staple the revised Sheets thereto.

The following revisions have been made to the proposal:

Page No.	Revisions
Proposal Cover	Note added that reads "Includes Addendum No. 1 Dated 10-12-2021"
PR-1 thru PR-18	Revised Unit Project Special Provision entitled **SPECIAL PROVISION FOR PIPE REHABILITATION** to remove 0602 to 0542 from "Designated Locations and Allowable Methods" table.

Please void the above listed existing Pages in your proposal and staple the revised Pages thereto.

C204657 (15614.1075010) Polk County

On the item sheets the following pay item revisions have been made:

Item	Description	Old Quantity	New Quantity
0035-0986000000-E-SP	36" PIPE REHABILITATION CIPP LINER	332 LF	176 LF
0114-6029000000-E-SP	SAFETY FENCE	2,880 LF	5,880 LF

The Contractor's bid must include these pay item revisions.

The electronic bidding file has been updated to reflect these revisions. Please download the Addendum File and follow the instructions for applying the addendum. Bid Express will not accept your bid unless the addendum has been applied.

The contract will be prepared accordingly.

Sincerely,

DocuSigned by:
Ronald E. Davenport, Jr.
F81B6038A47A442...

Ronald E. Davenport, Jr., PE
State Contract Officer

RED/cms
Attachments

cc: Mr. Lamar Sylvester, PE
Ms. Wanda Austin, PE
Ms. Lori Strickland
Mr. Boyd Tharrington, PE
Mr. Jon Weathersbee, PE
Mr. Ken Kennedy, PE
Project File (2)
Mr. Forrest Dungan, PE
Ms. Jaci Kincaid
Mr. Kyle Kempf
Mr. Mike Gwyn
Ms. Penny Higgins

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH, N.C.

PROPOSAL

INCLUDES ADDENDUM No.1 DATED 10-12-2021

DATE AND TIME OF BID OPENING: **OCTOBER 19, 2021 AT 2:00 PM**

CONTRACT ID	C204657
WBS	15614.1075010

FEDERAL-AID NO.	STATE FUNDED
COUNTY	POLK
T.I.P. NO.	
MILES	0.892
ROUTE NO.	I 26
LOCATION	I-26 FROM MILE MARKER 62.5 TO MILE MARKER 64.

TYPE OF WORK GRADING, DRAINAGE, AND PAVING.

NOTICE:

ALL BIDDERS SHALL COMPLY WITH ALL APPLICABLE LAWS REGULATING THE PRACTICE OF GENERAL CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA WHICH REQUIRES THE BIDDER TO BE LICENSED BY THE N.C. LICENSING BOARD FOR CONTRACTORS WHEN BIDDING ON ANY NON-FEDERAL AID PROJECT WHERE THE BID IS $30,000 OR MORE, EXCEPT FOR CERTAIN SPECIALTY WORK AS DETERMINED BY THE LICENSING BOARD. BIDDERS SHALL ALSO COMPLY WITH ALL OTHER APPLICABLE LAWS REGULATING THE PRACTICES OF ELECTRICAL, PLUMBING, HEATING AND AIR CONDITIONING AND REFRIGERATION CONTRACTING AS CONTAINED IN CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA. NOTWITHSTANDING THESE LIMITATIONS ON BIDDING, THE BIDDER WHO IS AWARDED ANY FEDERAL - AID FUNDED PROJECT SHALL COMPLY WITH CHAPTER 87 OF THE GENERAL STATUTES OF NORTH CAROLINA FOR LICENSING REQUIREMENTS WITHIN 60 CALENDAR DAYS OF BID OPENING.

BIDS WILL BE RECEIVED AS SHOWN BELOW:

THIS IS A ROADWAY PROPOSAL

5% BID BOND OR BID DEPOSIT REQUIRED

SPECIAL PROVISION FOR PIPE REHABILITATION

I. DESCRIPTION

This work shall consist of the rehabilitation of existing storm water pipes, or culverts by the method or methods specified at the designated locations described in the Contract.

Pipe liner systems used for rehabilitation shall be from the NCDOT Approved Products List and may be subject to limitations for use as specified herein, by site-specific limitations for those locations listed in the Contract, or limitations as shown on the NCDOT Approved Products List for the specific liner system. The Contractor shall consult the Contract to determine the method or methods that are permitted at each rehabilitation location.

Liners provided per this special provision shall be designed per the *NCDOT Manual for Pipe Rehabilitation.*

The Contractor shall provide contract submittals as called for herein to the Engineer a minimum of 10 days prior to start of installation.

Designated Locations and Allowable Methods

From Str.	To Str.	Alignment	Station	Offset	Allowable Liner Categories	Notes
0405	0402	-I26-	415+90	RT	Cured-in-Place (CIPP) Liner	Exist. 18" CMP
0406	0405	-I26-	415+76	LT	Cured-in-Place (CIPP) Liner	Exist. 18" CMP
0501	0541	-HGR-	32+05	CL	Cured-in-Place (CIPP) Liner	Exist. 36" CMP
0524	0526	-I26-	453+10	RT	Cured-in-Place (CIPP) Liner	Exist. 18" CMP
0531	0530	-I26-	457+06	LT	Smooth-Wall Steel Pipe Liner	Exist. 36" CMP / Lined w/ 18" WSP
0609	0610	-I26-	465+05	RT	Cured-in-Place (CIPP) Liner	Exist. 18" CMP
0612	0613	-I26-	467+54	RT	Cured-in-Place (CIPP) Liner	Exist. 18" CMP
0621	0620	-I26-	469+96	LT	Cured-in-Place (CIPP) Liner	Exist. 36" CMP
0622	0621	-I26-	470+06	RT	Cured-in-Place (CIPP) Liner	Exist. 36" CMP
0703	0702	-HGR-	60+23	LT	Cured-in-Place (CIPP) Liner	Exist. 30" CMP
0704	0703	-I26-	476+60	LT	Cured-in-Place (CIPP) Liner	Exist. 30" CMP
0705	0706	-I26-	475+32	RT	Cured-in-Place (CIPP) Liner	Exist. 15" CMP
0707	0704	-I26-	476+95	CL	Cured-in-Place (CIPP) Liner	Exist. 30" CMP
0708	0709	-I26-	479+49	RT	Cured-in-Place (CIPP) Liner	Exist. 18" CMP
0710	0701	-HGR-	63+58	RT	Solid Wall Thermoplastic Slip Liner	Exist. 42" CMP
0714	0719	-I26-	483+85	RT	Cured-in-Place (CIPP) Liner	Exist. 24" CMP
0715	0716	-I26-	486+35	LT	Cured-in-Place (CIPP) Liner	Exist. 18" CMP
0717	0710	-I26-	482+98	LT	Cured-in-Place (CIPP) Liner	Exist. 42" CMP
0801	0802	-I26-	489+15	LT	Cured-in-Place (CIPP) Liner	Exist. 24" CMP
0803	0802	-I26-	489+19	RT	Cured-in-Place (CIPP) Liner	Exist. 24" CMP
0805	0804	-I26-	491+75	RT	Cured-in-Place (CIPP) Liner	Exist. 24" CMP

From Str.	To Str.	Alignment	Station	Offset	Allowable Liner Categories	Notes
0806	0807	-I26-	494+62	LT	Cured-in-Place (CIPP) Liner	Exist. 18" CMP
0808	0807	-I26-	494+61	RT	Cured-in-Place (CIPP) Liner	Exist. 18" CMP
0809	0810	-I26-	497+22	LT	Cured-in-Place (CIPP) Liner	Exist. 24" CMP
0811	0810	-I26-	497+48	RT	Cured-in-Place (CIPP) Liner	Exist. 18" CMP

II. MATERIALS

Category A - Cured-In-Place Pipe (CIPP) liners are lining an existing culvert by either pulling or inverting a resin-impregnated fabric tube and curing the tube in place. When CIPP liners are specified, the liner system supplied by the Contractor shall conform to the following requirements as supported by contract submittals:

- Must list host pipe diameter ranges for which the product is applicable.
- Must indicate corrosion potential/acid reaction potential.
- Must list cure method (e.g., UV, steam, hot water, etc.).
- Must list typical, minimum, maximum application thicknesses.
- Calculated minimum thickness of liner
- Designation of air or water inversion or pull-in-place method
- Maximum allowable pulling force
- Site specific cure time
- Minimum pressure to hold liner tight against the host pipe
- Maximum pressure to ensure liner does not sustain damage
- Maximum and minimum cure temperatures
- Ambient temperature range allowable during installation
- Post cure temperature
- Temperature cure profile.
- Sample of temperature and pressure log to be used for monitoring the curing process
- Certification on manufacturer's letterhead indicating that the contractor is approved by the fabric tube and resin manufacturer to perform CIPP installation work.
- Manufacturer moisture limitations (e.g. installation in the dry, humidity restrictions, etc.).
- Material safety data sheets for all hazardous chemicals that will be used on the job site including resin, catalyst, cleaners, and repair agents. Identify the proposed use for each hazardous chemical and where it will be used in the work.
- Must provide and comply with specification for installation, and provide NCDOT Type 1 or Type 4 Certificates of compliance with material specifications as applicable to the below, or equivalent as approved by the Engineer:
    - ASTM D5813
    - ASTM F1216 for inverted CIPP
    - ASTM F1743 for pulled-in-place CIPP
    - ASTM F2019 for pulled-in-place GRP CIPP
    - ASTM F2599 for sectional inverted CIPP (applies to pipe sections, not full length)

- Long Term Modulus of Elasticity for calculations = 150,000 psi. NCDOT Type 2 or Type 5 certifications may be submitted by vendors or contractors for proof of alternate Long Term Modulus of Elasticity extrapolated from ASTM D2990, 10000-hour test. Design value of Long

Term Modulus of Elasticity may be no greater than 50% of Initial Modulus of Elasticity. Tested value must be greater than or equal to value used in design equations.

- Initial Modulus of Elasticity for calculations = 300,000 psi. NCDOT Type 2 or Type 5 certifications may be submitted by vendors or contractors for proof of alternate Initial Modulus of Elasticity based on ASTM D790. Tested value must be greater than or equal to value used in design equations.

- Long Term Flexural Strength = 2250 psi. NCDOT Type 2 or Type 5 certifications may be submitted by vendors or contractors for proof of alternate Long Term Flexural Strength extrapolated from ASTM D2990, 10000-hour test. Tested value must be greater than or equal to value used in design equations.

When **Category B Fold and Form flexible liners** are specified, the liner system supplied by the Contractor shall conform to the following requirements as supported by contract submittals:

- Must list host pipe diameter ranges for which the product is applicable.
- Must indicate corrosion potential/acid reaction potential.
- Must list type of reforming method (steam, hot water, etc.).
- Certification on manufacturer's letterhead indicating that the contractor is approved by the manufacturer to perform installation work.
- Material safety data sheets for all hazardous chemicals that will be used on the job site. Identify the proposed use for each hazardous chemical and where it will be used in the work.
- Calculated minimum thickness of liner.
- Maximum allowable pulling force
- Site specific reforming & cooling time
- Minimum pressure to hold liner tight against the host pipe
- Maximum pressure to ensure liner does not sustain damage
- Maximum and minimum forming temperatures
- Ambient temperature range for installation.
- Sample of temperature and pressure log to be used for monitoring the curing process.
- Must provide and comply with specification for installation, and provide NCDOT Type 1 or Type 4 Certificates of compliance with material specifications as applicable to the below, or equivalent as approved by the Engineer:
    - ASTM D1784 defines PVC cell class referenced below
    - ASTM F1504 for PVC cell classification 12334 or 13223
    - ASTM F1533 for polyethylene
    - ASTM F714 for polyethylene min. cell classification 335420 and 2-4% carbon black
    - ASTM F1606 for deformed polyethylene
    - ASTM F1947 for folded PVC
- Methods & pipe classification not permitted for use due to low pipe strength:
    - ASTM F1867 for folded / formed PVC Type A
    - ASTM F1871 for PVC Type A cell classification 12111

- NCDOT Type 2 or Type 5 certifications must be submitted by vendors or contractors for proof of Long Term Modulus of Elasticity, 50-year sustained loading value, if the following values are not used in design calculations: 22,000 psi shall be used for HDPE, PE, PP; and 140,000 psi shall be used for PVC; per AASHTO LRFD Bridge Design Specifications 8th ed., Table 12.12.3.3-1.

When **Category C HDPE, PE, PVC, PP, solid wall slip liners** are specified, the liner system supplied by the Contractor shall conform to the following requirements as supported by contract submittals:

- Must list host pipe diameter ranges for which the product is applicable.
- Must indicate corrosion potential/acid reaction potential.
- Must be closed profile; i.e. no definable bell and spigot that protrudes from the outer wall of the pipe.
- Certification on manufacturer's letterhead indicating that the contractor is approved by the manufacturer to perform installation work.
- Material safety data sheets for all hazardous chemicals that will be used on the job site. Identify the proposed use for each hazardous chemical and where it will be used in the work.
- Calculated minimum thickness of liner.
- Maximum allowable pulling and/or pushing force
- Grouting mix design and manufacturer recommendations
- Installation procedures and recommendations.
- Must provide inside diameter and outside diameter of pipe.

- Must provide and comply with specification for installation, and provide NCDOT Type 1 or Type 4 Certificates of compliance with material specifications as applicable to the below, or equivalent as approved by the Engineer:
    - ASTM D1784 defines PVC cell class referenced below
    - ASTM D3350 defines PE cell class referenced below
    - ASTM F714 for solid wall polyethylene min cell classification 345464 and 2–4% carbon black
    - AASHTO M326 for solid wall polyethylene
    - ASTM D3034 for solid wall PVC, min. cell classification 12454
    - ASTM F679 for solid wall PVC, large diameter, min. cell classification 12454
    - ASTM D2241 for solid wall PVC, min. cell classification 12454
    - ASTM F585 for polyethylene slip-line
    - ASTM F2620 for polyethylene heat fusion joining

- NCDOT Type 2 or Type 5 certifications must be submitted by vendors or contractors for proof of Long Term Modulus of Elasticity, 50-year sustained loading value, if the following values are not used in design calculations: 22,000 psi shall be used for HDPE, PE, PP; and 140,000 psi shall be used for PVC; per AASHTO LRFD Bridge Design Specifications 8th ed., Table 12.12.3.3-1.

When **Category D HDPE, PVC, PP corrugated, profile wall, steel reinforced, or spiral wound slip liners** are specified, the liner system supplied by the Contractor shall conform to the following requirements as supported by contract submittals:

- Must list host pipe diameter ranges for which the product is applicable.
- Must indicate corrosion potential/acid reaction potential.
- Certification on manufacturer's letterhead indicating that the contractor is approved by the manufacturer to perform installation work.
- Material safety data sheets for all hazardous chemicals that will be used on the job site. Identify the proposed use for each hazardous chemical and where it will be used in the work.
- Calculated minimum thickness of liner.

- Maximum allowable pulling and/or pushing force
- Grouting mix design and manufacturer recommendations
- Installation procedures and recommendations.

- Must provide and comply with specification for installation, and provide NCDOT Type 1 or Type 4 Certificates of compliance with material specifications as applicable to the below, or equivalent as determined by the Engineer:
    - ASTM D1784 defines PVC cell class referenced below
    - AASHTO M294 for polyethylene profile wall (See NCDOT Standard Specifications 1032-7)
    - ASTM F894 for profile polyethylene
    - ASTM F2562 or F2435 for steel reinforced polyethylene min. cell classification 334452 and 2-4% carbon black
    - AASHTO M304 for profile PVC (see NCDOT Standard Specifications 1032-8)
    - ASTM F1803 for closed profile PVC
    - ASTM F949 and F794 for corrugated PVC min cell classification 12454
    - AASHTO M330 for corrugated polypropylene
    - AASHTO MP20-13 for steel reinforced polyethylene ribbed
    - ASTM F1735 PVC for profile strip / spiral wound, min. cell classification 12454
        - Steel Reinforced – Resin conforms to ASTM D3350, min. cell classification 335420 and 2-4% carbon black. Steel fully encapsulated.
    - ASTM F1697 PVC for profile strip / machine spiral wound, min. cell classification 13354 (for Type A) or 12344 (for Type B) or higher, as defined in Specification D1784.
        - Steel Reinforced – Resin conforms to ASTM D3350, min. cell classification 335420 and 2-4% carbon black. Steel fully encapsulated.
    - ASTM F585 for polyethylene slip-line
    - ASTM F1698 for PVC spiral wound
    - ASTM F1741 for PVC machine spiral wound

- NCDOT Type 2 or Type 5 certifications must be submitted by vendors or contractors for proof of Long Term Modulus of Elasticity, 50-year sustained loading value, if the following values are not used in design calculations: 22,000 psi shall be used for HDPE, PE, PP; and 140,000 psi shall be used for PVC; per AASHTO LRFD Bridge Design Specifications 8th ed., Table 12.12.3.3-1.

Category E - Spray-on liners consist of conduit lining with spray applied, factory blended cementitious, geopolymer, or other material. The liner system supplied by the Contractor shall conform to the following requirements as supported by contract submittals:

- Must list host pipe diameter ranges for which the product is applicable.
- Must indicate corrosion potential/acid reaction potential.
- Must list liner material type.
- Must list typical, minimum, maximum application thicknesses.
- Must include documentation of specification or standard practice for installation.
- Minimum thickness of liner from design calculations.
- Manufacturer moisture limitations (e.g. installation in the dry, humidity restrictions, etc.).
- Certification on manufacturer's letterhead indicating that the contractor is approved by manufacturer to perform installation work.
- Material safety data sheets for all hazardous chemicals that will be used on the job site. Identify the proposed use for each hazardous chemical and where it will be used in the work.

- Site specific cure time
- Must provide volume (cubic yards or cubic feet) of liner material planned for use in each host pipe. For example, cubic yards of dry, unmixed cementitious liner material. This must match the value provided by design calculations.
- Ambient temperature range during installation.
- Other submittals as appropriate for the type of spray-on liner, as determined by the Engineer.

- Minimum thickness for cementitious or geopolymer liner material is 1 inch (clear of corrugations and / or bolt heads).

- For cementitious or geopolymer liners, submit to the Engineer NCDOT Type 2 or Type 5 certifications for the categories below, and a letter of certification from the manufacturer that states the material to be used conforms to manufacturer specifications. Actual properties must meet or exceed the values used in structural calculations when field tested.

Property	Test Method	Duration	Provide Value
Compressive Strength	AASHTO T106	3 Day	psi
		28 Days	psi
Flexural Strength	ASTM C 293	7 Days	psi
		28 Days	psi
Modulus of Elasticity	ASTM C 469	28 Days	psi
Tensile Strength	ASTM C 496	---	psi
Bond Strength	ASTM C 882	28 Days	psi

- For onsite or offsite Ready Mix or Project Produced cementitious or geopolymer liners (i.e. not "bag mixes" produced by a manufacturer), submit a mix design to the Engineer for approval.

- One of the following two submittal sets shall be required depending on whether the liner exhibits Rigid Pipe or Flexible Pipe behavior:

    - Liners which exhibit Rigid Pipe behavior, such as Cementitious or geopolymer liners, shall be treated as non-reinforced concrete pipe. Rigid Pipe behavior is characterized by cracking when subjected to 2% or greater deflection.

        - Provide NCDOT Type 2 or Type 5 certifications of allowable D-Load of proposed liner assuming fully deteriorated host pipe condition in accordance with ASTM C497 three edge bearing test for non-reinforced pipe.

            - The D-Load documentation submitted must be for test specimens that are less than or equal to the proposed liner thickness, equal to host pipe inside diameter and shape, and greater than or equal to host pipe ovality in the case of a deformed host pipe.

            - If manufacturer's ASTM C497 test is conducted on a smooth wall host form (such as a cardboard or plastic sonotube), and the proposed liner is to be installed in a host pipe with internal corrugations or bolt heads, only the liner thickness clear of the corrugations or bolt heads may be considered as structural.

- Liners which exhibit Flexible Pipe behavior (can withstand greater than 2% deflection without structural damage) shall be treated as Thermoplastic Pipe. Cementitious and geopolymer liners are not eligible for this method:

    - Long Term Modulus of Elasticity, 50-year sustained loading value shall be used. Vendor or contractor must provide value used in calculations. It shall be estimated by using 50% of the Initial Modulus of Elasticity value provided by ASTM D790. Provide NCDOT Type 2 or Type 5 certifications for value used in calculations.

    - Tensile Strength 50-year sustained loading value (Fu) shall be used. Vendor or contractor must provide value used in calculations. It shall be estimated by using 50% of the Initial Tensile Strength value provided by ASTM D638. Provide NCDOT Type 2 or Type 5 certifications for value used in calculations.

Category F - Smooth-wall steel pipe liner rehabilitation materials shall conform to 1032-5 of the Standard Specifications, except as altered herein.

Grade B pipe shall be used with minimum wall thicknesses as listed in the *NCDOT Manual for Pipe Rehabilitation.*

The Contractor shall submit the folllowing items to the Engineer:

- Material safety data sheets for all hazardous chemicals that will be used on the job site. Identify the proposed use for each hazardous chemical and where it will be used in the work.
- Grouting mix design and manufacturer recommendations.

III. CONSTRUCTION

Pre-Installation Inspection – The Contractor shall perform a pre-installation video inspection of pipe using NASSCO certified personnel. The camera shall be situated at the centerline of the pipe, and shall be mounted on a rubber tired or tracked pipe rover that allows for a 360-degree inspection. Inspection equipment shall be capable of measuring protrusions and obstructions of ½ inch or greater. Provide a pipe profile, on which deflections that may affect the installation of the liner are located and noted. The inspection shall be performed in the presence of the Engineer, unless waived by the Engineer. Dewater the host pipe to the satisfaction of the Engineer, and in accordance with NCDOT Best Management Practices for Construction and Maintenance Activities. A thorough culvert inspection is required to determine the number of existing "pipe to pipe" connections and the extent, if any, of obstruction removal and voids. The inspection shall be performed by experienced personnel trained in locating breaks, obstacles, voids and service connections. Video inspections shall be clearly labeled on the media with the time, date, and location of the pipe inspected. A copy of the video inspection shall be furnished to the Engineer at least 10 days prior to the start of rehabilitative construction. In the event the Contractor's inspection shows the method of rehabilitation the Contractor has selected is no longer viable at that location as verified by the Engineer, the Contractor shall select another allowable method, if specified, from those designated in the Contract.

Pipe Clean-out - The Contractor shall clear the existing pipe(s) designated for rehabilitation of any debris, sediment, protrusions greater than ½ inch in height, and any other potential obstructions prior to the start of rehabilitation efforts. The Contractor shall then thoroughly clean and prepare the host pipe

prior to the liner installation. Cleaning shall conform to the recommendations of the liner manufacturer, and any additional requirements of this special provision. In the absence of manufacturer recommendations, the Contractor shall submit his/her proposed method for cleaning and preparing the host pipe for the Engineer's review and acceptance at least 10 working days prior to beginning the work at that location.

Grouting Host Pipe - The Contractor shall perform grouting work described in the contract, prior to pipe liner installation to correct existing deficiencies, such as voids.

Inlet & Outlet Sealing – All pipe liner installations shall be sealed to the host pipe at the terminal ends of the liner to prevent flow between the liner and host pipe.

De-Watering – All pipe liners and grout shall be installed in dry conditions. The Contractor shall de-water by diverting, pumping, or bypassing any water flow through an existing pipe or drainage system prior to and during the lining process. The method of de-watering is to be determined by the contractor but must be approved by the Engineer prior to implementing.

Disposal Plan – The Contractor shall submit a Disposal Plan to the Engineer a minimum of 10 days prior to installation. The Disposal Plan shall indicate how by-products and waste are to be contained, captured, transported offsite, and disposed of in accordance with project permits and local, state and federal regulations. It shall be the Contractor's responsibility to report and take appropriate corrective actions to remediate any water quality alteration resulting from lining operations in accordance with project permits and applicable local, state or federal regulations. The cost for such remediation shall be at the Contractor's expense.

Category A – Cured-In-Place Pipe liner method. The Cured-In-Place Pipe liner system shall be fabricated and installed in such a manner as to result in a maintained full contact tight fit to the internal circumference of the host pipe for its entire length. The installation shall adhere to the cure times and temperatures stipulated in the manufacturer's recommended installation and cure specifications and the finished product shall be free of de-lamination, bubbling, rippling or other signs of installation failure.

Install per specification or standard practice for installation (ASTM F1216 inverted CIPP, or F1743 pulled-in-place CIPP, or F2019 pulled-in-place GRP CIPP, or F2599 sectional inverted CIPP for example).

Pulled-in-place liner installation must be accomplished without significant liner twisting, or stretching the liner greater than 1% of its original length during installation. At no time shall the pulling force, as measured by a contractor-provided dynamometer or load cell, exceed that established by the liner manufacturer. For liner lengths greater than 100 feet, protect the pipe liner end using a device that uniformly distributes the applied load around the perimeter of the liner.

Curing for styrene-based, epoxy-based, and vinyl ester-based CIPP may be accomplished by water, steam or ultraviolet light and shall be in accordance with the liner manufacturer's recommendations.

Installation and curing requirements of pipe sections shall be in accordance with the manufacturer's recommendations for the specific product, as applicable. The Contractor shall furnish installation and curing requirements for the various flexible liners including individual components of the system, tube type (reinforced or non-reinforced), manufacturer name and type of resin including catalyst, volume of resin required to achieve proper impregnation and curing. All components of the systems shall be as

recommended by the manufacturer for the specific system used, and all components shall include lot numbers and expiration dates.

The Contractor shall place an impermeable barrier immediately upstream and downstream of the host pipe, prior to liner insertion, to capture any possible raw resin spillage during installation and shall dispose of any materials in accordance with the submitted disposal plan.

Where the pulled-in-place method of installation is used, the Contractor shall install a semi-rigid plastic slip sheet over any interior portions of the host pipe that could tear the outer film or over any significant voids in the host pipe.

Reconnect the existing storm drain lateral connections immediately after the liner has been cured in place. Use robotic cutting devices to re-establish tie-ins in non-man accessible pipes.

The Contractor shall monitor temperature via a minimum of three thermocouples on the outer surface (interface between the host pipe and liner) of the liner (one each at the upstream and downstream ends and one approximately mid-length of the host pipe). The Contractor shall monitor pressure during inversion and curing, and maintain pressure between minimum and maximum allowable pressures as provided by the manufacturer. The Contractor shall automatically log cure time-temperature and time-pressure data at 30 second intervals with a data logger and provide such information in a format acceptable to the Engineer.

Submit the tape and log of recorded temperatures and pressure to the Engineer within 48 hours after completing the resin-curing process.

The Contractor shall thoroughly rinse the cured lined pipe with clean water prior to re-introducing flow. The Contractor shall capture all cure water and/or steam condensate and rinse water and dispose of, in accordance with the submitted disposal plan.

Within 21 days of completing the resin curing at a given culvert location, submit the test results from a ISO 17025 lab suitable to the Engineer. The report must be signed by a representative of the independent testing lab. The report must include:

- Flexural strength and flexural modulus test results for field samples.
- Thickness measurements for the liner using prepared core samples.
- Description of the defects in the tested samples in terms of the effect on CIPP performance.

Make cured samples from the identical materials (tube, resin and catalyst) to be used for the CIPP. Identify each sample by date, contract number, drainage system number of the corresponding culvert, thickness, name of resin, and name of catalyst.
The samples must be 6 by 16 inches in size: Comply with the following sampling procedures unless UV cured:

- Place 3 aluminum-plate clamped molds, each containing a flat plate sample, inside the downtube when heated circulated water is used, and in the silencer when steam is used during the resin curing period
- Seal each flat plate sample in a heavy-duty plastic envelope inside the mold
- Remove the 3 cured flat plate samples after draining all of the moisture from the cured CIPP

If UV cured, comply with field sampling procedures under ASTM F2019, Section 7: Recommended Inspection Practices.

Test the samples for flexural properties under ASTM D790, ASTM D5813, ASTM F1216, ASTM F1743, or ASTM F2019. Verify that physical properties of the field samples comply with the minimum values under:

- ASTM F1216, Table 1 (modified values), for heat cured polyester, vinyl ester, and epoxy resins. The flexural strength must be at least 5,000 psi. The flexural modulus must be at least 300,000 psi.
- ASTM F2019, Table 1, for UV cured CIPP. The flexural strength must be at least 6,500 psi. The flexural modulus must be at least 725,000 psi. Comply with sampling and testing procedures under ASTM F2019, Section 7: Recommended Inspection Practices.

Take core samples in the presence of the Engineer. Comply with the following core sample requirements:

- Take 2 samples. Take the samples at least 1 foot from each end of the culvert at a location near the top of the culvert. Samples must be at least 2 inches in diameter.
- If culvert material is corrugated metal, obtain samples at the corrugation crests.

Prepare the core samples by separating the CIPP material from the culvert material. If heat cured, remove the film from the inner lining or preliner. If UV cured, remove the film from the inner and outer foil. Measure the thickness of the liner at 3 spots on each sample. If the culvert material is corrugated metal, measure the thickness at 3 spots that are along a line corresponding to the corrugation crests. Calculate the thickness as an average of at least 6 measurements.

If UV cured, comply with sampling and testing procedures under ASTM F2019, Section 7: Recommended Inspection Practices. If the culvert material is corrugated metal, measure the thickness at 3 spots that are along a line corresponding to the corrugation crests. Calculate the thickness as an average of at least 6 measurements.

All voids from core samples are to be filled with Type 1 epoxy resin as specified in NCDOT Standard Specifications for Roads and Structures, Section 1081.

CIPP may be rejected if any of:

- Actual temperature and curing time and schedule do not comply with those shown in the authorized work plan
- Pressure deviates more than 1 psi from the required pressure
- At any time during installation the manufacturer's required minimum cool-down time or maximum cool-down rate is violated
- There are defects including:
    - Concentrated ridges, including folds and wrinkles exceeding 8 percent of the CIPP diameter
    - Dry spots
    - Lifts
    - Holes
    - Tears
    - Soft spots
    - Blisters or bubbles
    - Delaminations
    - Gaps in the length of the CIPP
    - Gaps or a loose fit between the exterior of the CIPP and the culvert
- Test results indicate one of the following:
    - If heat cured, 2 of the 3 flat plate samples do not have any of the following:
        - the specified modulus of elasticity
        - the specified flexural strength
        - either the specified modulus of elasticity or the specified flexural strength

    - If UV cured, 2 of the 3 cured samples do not have any of the following:
        - the specified modulus of elasticity
        - the specified flexural strength
        - either the specified modulus of elasticity or the specified flexural strength
- The liner thickness is less than the greater of either one of the following:
    - Specified thickness
    - Calculated minimum thickness shown in your authorized work plan
- Materials and installation methods are not those shown in your authorized installation plan
- Defects are excessive or unrepairable
- CIPP is not continuous or does not fit tightly for the full length of the culvert

If UV cured, and post installation inspections reveal signs of incomplete curing (dripping resin, etc), contractor will trim liner obscuring uncured liner, re-wet, and re-cure with UV.

Category B - Fold and form flexible liners shall be installed per specification or standard practice for installation (ASTM F1606 deformed polyethylene, ASTM F1867 folded/formed PVC Type A, or ASTM F1947 folded PVC, for example).

The liner system shall be fabricated and installed in such a manner as to result in a maintained full contact tight fit to the internal circumference of the host pipe for its entire length. The installation shall adhere to the reforming pressures and temperatures stipulated in the manufacturer's recommended installation specifications and the finished product shall be free of bubbling, rippling or other signs of installation failure.

Installation and reforming requirements of pipe sections shall be in accordance with the manufacturer recommendations for the specific product as applicable. All components of the systems shall be as recommended by the manufacturer for the specific system used, and all components shall include lot numbers. The Contractor shall submit documentation from the manufacturer to verify compliance with the requirements of this paragraph as well as installation recommendations to the Engineer.

Reconnect the existing storm drain lateral connections immediately after the liner has been installed in place. Use robotic cutting devices to re-establish tie-ins in non-man accessible pipes.

The Contractor shall monitor temperature via a minimum of three thermocouples on the outer surface (interface between host pipe and liner) of the liner (one each at the upstream and downstream ends and one approximately mid-length of the host pipe). The Contractor shall automatically log cure time-temperature and time-pressure data at 30 second intervals with a data logger and provide such information in a format acceptable to the Engineer.

Submit the tape and log of recorded temperatures to the Engineer within 48 hours after completing the lining process. Submit the recorded pressure to the Engineer within 48 hours after completing the lining process.

Liner may be rejected if any of:

- Actual temperature and curing time and schedule do not comply with those shown in the authorized work plan
- Pressure deviates more than 1 psi from the required pressure
- There are defects including:
    - Concentrated ridges, including folds and wrinkles exceeding 8 percent of the liner diameter
    - Lifts

  - Holes
  - Tears
  - Soft spots
  - Blisters or bubbles
  - Gaps in the length of the liner
  - Gaps or a loose fit between the exterior of the liner and the culvert
- The liner thickness is less than the greater of either one of the following:
  - Specified thickness
  - Calculated minimum thickness shown in your authorized work plan
- Materials and installation methods are not those shown in installation plan
- Defects are excessive or unrepairable
- Liner is not continuous or does not fit tightly for the full length of the culvert

Category C – HDPE, PE, PVC, or PP solid wall slip liner shall be installed per specification or standard practice for installation (ASTM F585 polyethylene slip-line, ASTM F2620 polyethylene heat fusion joining, for example).

Installation requirements of pipe sections shall be according the manufacturer recommendations for the specific product as applicable. All components of the systems shall be as recommended by the manufacturer for the specific system used, and all components shall include lot numbers.

Before lining, pull or push a mandrel through the existing pipe or perform laser survey to verify liner clearance. The liner must be positioned and secured to facilitate its complete encapsulation by grout. Follow the Manufacturer's recommendations for handling and assembling the pipe, and all provisions included in the design calculations. Reconnect the existing storm drain lateral connections immediately after the liner has been installed in place. Use robotic cutting devices to re-establish tie-ins in non-man accessible pipes. Prior to filling the annular space, connect and seal all laterals between the new liner pipe and the existing lateral.

Grout the entire annular space with non-shrink grout or an expansive admixture approved by the Manufacturer for use with the liner system. In the absence of Manufacturer recommendations for grout, refer to Section 1003 of Standard Specifications. Provide a minimum annular space of 1 inch for grouting between the new and existing pipes. Provide details on how to hold the liner pipe to line and grade until the grout has set. Ensure the maximum pressure developed by the grout does not exceed the manufacturer's recommendation for the maximum allowable external pressure for the liner pipe. If the volume of the grout used is less than the anticipated (calculated) volume, or an inspection of the relined culvert indicates that there are voids in the annular space, the Contractor must provide the Engineer with a plan to rehabilitate all identified voids. Depending on the location and size of the voids, additional grouting may be required in these areas. This may be accomplished by re-grouting in those areas from within the culvert. The voids must be filled to the satisfaction of the Engineer at no additional cost. Grouting is included with the cost of pipe liner installation.

Lining with HDPE or PP: Field cuts will be permitted only at the terminal ends. No pipe sections less than 3 feet long will be allowed in any lining projects. Perform all butt fusion, welding and extrusion welding of pipe in accordance with the Manufacturer's recommendation. Based on existence of alignment breaks or pinch points in the host pipe, all joints shall be butt fusion welded, or extrusion welded unless alternate joining methods are approved by the Engineer, in which case limit joint separations to less than ½ inch between adjoining sections.

Lining with Polyvinyl Chloride Pipe: Reline with a PVC Pipe with integral bell and spigot joints. Field cuts will be permitted only at the terminal ends. No pipe sections less than 3 feet long will be allowed in any lining projects. The submittals must address the following PVC specific issues: Will the PVC liner will be pulled or pushed through the culvert, along with the type of pushing or pulling ring/plate to be used? Will a nose cone or different device be used in the process? How will the jacking, pulling or pushing loads on the liner be monitored in order to conform to Manufacturer's specifications and guidelines?

Category D - HDPE, PVC, or PP corrugated, profile, or spiral wound slip liner shall be installed per specification or standard practice for installation (ASTM F585 polyethylene slip-line, ASTM F1698 PVC spiral wound, ASTM F1741 PVC machine spiral wound, for example).

Installation requirements of pipe sections shall be according the manufacturer recommendations for the specific product as applicable. All components of the systems shall be as recommended by the manufacturer for the specific system used, and all components shall include lot numbers.

Before lining, pull or push a mandrel through the existing pipe to verify liner clearance. The liner must be positioned and secured to facilitate its complete encapsulation by grout. Follow the Manufacturer's recommendations for handling and assembling the pipe, and all provisions included in the design calculations. Immediately reconnect the existing storm drain lateral connections after the liner has been installed in place. Use robotic cutting devices to re-establish tie-ins in non-man accessible pipes. Prior to filling the annular space, connect and seal all laterals between the new liner pipe and the existing lateral.

Grout the entire annular space with non-shrink grout approved by the Manufacturer for use with the liner system. In the absence of Manufacturer recommendations for grout, refer to Section 1003 of Standard Specifications. Provide a minimum annular space of 1 inch around the circumference for grouting between the new and existing pipes. (Spiral Wound liner that is designed to fit tightly to the interior wall of the host pipe is not subject to the 1 inch annular space and grouting.) Provide details on how to hold the liner pipe to line and grade until the grout has set. Ensure the maximum pressure developed by the grout does not exceed the manufacturer's recommendation for the maximum allowable external pressure for the liner pipe. If the volume of the grout used is less than the anticipated (calculated) volume, or an inspection of the relined culvert indicates that there are voids in the annular space, the Contractor must provide the Engineer with a plan to rehabilitate all identified voids. Depending on the location and size of the voids, additional grouting may be required in these areas. This may be accomplished by re-grouting in those areas from within the culvert. The voids must be filled to the satisfaction of the Engineer at no additional cost. Grouting is included with the cost of pipe liner installation.

Lining with HDPE or PP (does not apply to spiral-wound): Field cuts will be permitted only at the terminal ends. No pipe sections less than 3 feet long will be allowed in any lining projects. Perform all butt fusion, welding and extrusion welding of pipe in accordance with the Manufacturer's recommendation. Based on existence of alignment breaks or pinch points in the host pipe, all joints shall be butt fusion welded, or extrusion welded unless alternate joining methods are approved by the Engineer, in which case limit joint separations to less than ½ inch between adjoining sections.

Lining with Polyvinyl Chloride Pipe (does not apply to spiral-wound): Reline with a PVC Pipe with integral bell and spigot joints. Field cuts will be permitted only at the terminal ends. No pipe sections less than 3 feet long will be allowed in any lining projects. The submittals for this item provided for Department approval shall also address the following PVC specific issues prior to any work approval is granted: Will the PVC liner will be pulled or pushed through the culvert, along with the type of pushing or pulling ring/plate to be used? Will a nose cone or different device be used in the process? How will the

jacking, pulling or pushing loads on the liner be monitored in order to conform to Manufacturer's specifications and guidelines?

Category E - Spray-On cementitious, geopolymer, or other materials shall be installed in accordance with the liner material manufacturer's recommendations. For spray-on cementitious, geopolymer, or other liner systems, the following requirements shall apply:

Control the temperature and humidity in the host pipe according to the manufacturer's recommendation, including stopping air drafts through the pipe. Measure and record the temperature and humidity. The Contractor shall automatically log cure time-humidity and time-temperature data at 30 minute intervals with a data logger and provide such information in a format acceptable to the Engineer.

Patch and fill voids, holes, and gaps in the host pipe with an approved hydraulic cement or the same cementitious or geopolymer based material to be used for the liner to provide a solid continuous surface on which to spray. Stop water infiltration into the host pipe by applying dry hydraulic cement, or other methods approved by the Engineer. Prepare lateral connections to the host pipe according to the manufacturer's recommendations. Record the batch or lot number from the containers used each day.

To achieve bonding to the host pipe: Before placing liner, remove all coatings, corrosion, and other surface material until only base steel (or other host pipe material) is exposed by sandblasting the portion of the culvert to be coated. Where human access is limited, you must substitute sandblasting with mechanical scraping tools, water-jetting and a swab. Ensure cleaning methods will not affect chemical properties of liner, or adhesion of liner.

Application of liner material must be uninterrupted and continuous. Use a machine approved by the manufacturer, and capable of projecting liner material against the culvert wall without rebound and at a velocity sufficient to cause liner material to pack densely and adhere in place. Obtain authorization from the Engineer for placing liner material by hand to fill gaps left by dewatering pipe during the time period after application before fully cured, while material may be added.

The machine operator must continuously monitor the application of cementitious material.

The travel of the projecting machine and the discharge rate of liner material must be entirely mechanically controlled and must produce a uniform thickness of liner material without segregation around the perimeter and along the culvert length. The pipeliner must be free of sand pockets or visible lack of homogeneity.

Contractor must submit an installation plan to the Engineer which details the number of passes, sled travel speed, and installation parameters relevant to the work.

Remove splatter and the accumulation of other undesirable substances along the culvert invert.

Obtain authorization from the Engineer for placing liner material by hand methods at sharp bends and special locations where machine placement is impracticable.

Provide a smooth finished surface texture.

After placement, the lining must be the greater of 1 inch thick (cementitious or geopolymer), or calculated thickness. For corrugated pipe, the thickness must be measured over the top of the corrugation crests.

For host pipe with protruding bolt heads, the thickness must be measured over the top of the bolt heads. The tolerance for the pipe liner's thickness is plus 0.12 inch with no minus tolerance.

Depth gauges shall be installed in the soffit (12 o'clock position) of the host pipe every 10 feet along the length to allow determination of liner thickness. Depth gauges shall protrude from the host pipe wall a distance equivalent to the final surface of the liner, and shall remain in place permanently. Depth gauges shall be metal screws or rods with the shaft not greater than 3/16" diameter.

During the time period after application before fully cured, while material may be added, verify the applied thickness at least once every 10 feet to the satisfaction of the Engineer. Apply additional material to any areas found to be less than the design thickness.

Ensure the liner is continuous over the entire length of the host pipe and free from defects such as foreign inclusions, holes and cracks no larger than 0.01 inches wide. Ensure the renewed conduit is impervious to infiltration and exfiltration.

Protect walls, surfaces, streambed and plants at the entrance and exit of the host pipe from overspray. The Contractor shall install a temporary curtain at the outlet and inlet to prevent overspray during installation.

The Contractor shall thoroughly rinse the cured pipe with clean water and dispose of it in accordance with the disposal plan.

The Contractor shall reinstate water flow no sooner than recommended by manufacturer or 24 hours following installation, whichever is greater.

For cementitious or geopolymer spray-on liners, the Contractor shall prevent the escape of any rinse water from the lined pipe or otherwise capture it until he/she can either (1) dispose of it in accordance with the submitted disposal plan; or (2) continuously monitor the pH of the rinse water until the pH is less than 9 whereupon it may be released.

For other liner types, the Contractor shall capture and dispose of the rinse water in accordance with the submitted disposal plan, prior to reinstating flow.

Quality Control for Geopolymer or Cementitious Liner:

The Contractor shall submit NCDOT Type 1 or Type 4 certifications for each lined pipe in accordance with required cementitious liner properties table in the Materials section. Engineer, at his option, may collect concrete mix samples for testing. If the material does not achieve the specified properties listed in the Materials section, the pipe liner may be rejected. Submit a new work plan for the placement of material before replacing the rejected pipeliner.

The Contractor shall take core samples of the liner under direction and in the presence of the Engineer. Core sample diameter shall be at least twice the liner thickness. Repair cored area with liner material. The Department transports core samples to a Materials and Tests Regional Laboratory for testing.

- If there are visible defects in the pipeliner, submit a work plan for repairing the defects. Measure the length of the defect along the centerline of the culvert.
- If the length of the defect is 60 inches long or less, patch defects using the same cementitious material used in the work. Hand methods may be used.
- If the length of the defect is greater than 60 inches long, replace the defective length of the pipeliner for the full diameter of the pipeliner. Replace the defective length using machine methods.

Quality Control for other liner material will be determined per manufacturer recommendations and the Engineer.

Category F – Smooth wall steel pipe liner rehabilitation methods shall conform to Section 330 of the Standard Specifications, except as altered herein. The work shall be rehabilitation by the insertion of a smooth wall steel pipe into a host pipe. Where field welding is required, pipe shall be joined by butt welds in accordance with AWWA C-206. Field welded butt joints shall be complete joint penetration (CJP) and the adjoining members shall be assembled so that the seams in the adjacent pipe sections are offset from each other by at least five (5) times the thickness of the thinner member.

Welding procedures employed for welding shall be qualified by testing or prequalified in accordance with AWS D1.1

Personnel performing field welding operations shall have been tested and qualified by the Department.

The contractor shall provide a Certified Welding Inspector (CWI) on site during all welding and inspection operations to perform the necessary quality control examinations. Non-destructive testing/examination for testing to include visual outlined in the AWWA C-206 shall be provided at the contractor's expense.

Personnel performing these functions shall be qualified in accordance with AWS QC1 and/or the recommendations of the current edition of ASNT SNT-TC-1A. Radiographic and Hydrostatic testing is not required.

Before lining, pull or push a mandrel through the existing pipe to verify liner clearance. The liner must be positioned and secured to facilitate its complete encapsulation by grout. Follow the Manufacturer's recommendations for handling and assembling the pipe, and all provisions included in the design calculations. Reconnect the existing storm drain lateral connections after the liner has been installed in place. Use robotic cutting devices to re-establish tie-ins in non-man accessible pipes. Prior to filling the annular space, connect and seal all laterals between the new liner pipe and the existing lateral.

Grout the entire annular space with non-shrink grout approved by the Manufacturer for use with the liner system. In the absence of Manufacturer recommendations for grout, refer to Section 1003 of Standard Specifications. Provide a minimum annular space of 1 inch for grouting between the new and existing pipes. Provide details on how to hold the liner pipe to line and grade until the grout has set. Ensure the maximum pressure developed by the grout does not exceed the manufacturer's recommendation for the maximum allowable external pressure for the liner pipe. If the volume of the grout used is less than the anticipated (calculated) volume, or an inspection of the relined culvert indicates that there are voids in the annular space, the Contractor must provide the Engineer with a plan to rehabilitate all identified voids. Depending on the location and size of the voids, additional grouting may be required in these areas. This may be accomplished by re-grouting in those areas from within the culvert. The voids must be filled to the

satisfaction of the Engineer at no additional cost. Grouting is included with the cost of pipe liner installation.

Post Installation Inspection – In addition to the inspection performed by the Department, the Contractor shall perform two post-installation video inspections using NASSCO certified personnel. The first inspection shall take place between 90 and 100 calendar days after completion of installation for each culvert or system to a single outfall. The second inspection shall take place 30 calendar days prior to the end of the liner warranty period (5 years, secured by construction bond). The camera shall be situated at the centerline of the pipe, and shall be mounted on a rubber tired or tracked pipe rover that allows for a 360-degree inspection. Inspection equipment shall be capable of measuring protrusions and obstructions of ½ inch or greater. The inspection shall be performed in the presence of the Engineer. Dewater the host pipe to the satisfaction of the Engineer. Video inspections shall be clearly labeled on the media with the time, date, and location of the pipe inspected. A copy of the video inspection shall be furnished to the Engineer prior to acceptance of the work.

The finished liner may be rejected if not continuous over its entire length and free from visual defects such as foreign inclusions, joint separation, cracks, insufficient liner thickness, material loss, roughness, deformation, dry spots, pinholes, insufficient bonding to host pipe, delamination, or other material or installation deficiencies as described herein.

Remedies for rejection of liner - In the event the first post inspection of the installation reveals defects in localized areas of the liner pipe (comprising less than 20 percent of the pipe length) the localized defects shall be repaired as specified by the manufacturer. Where defects occur on 20 percent or more of the pipe length the defects shall be repaired, however, the Contractor will not be allowed to continue with his methodology of installation and/or the liner system used until he/she can demonstrate to the Engineer that he/she has remedied his/her operations to a sufficient level of quality as determined by the engineer. All such remedial efforts shall be at the Contractor's expense. Further failure(s) to perform a proper installation may result in the disallowance of the use of that liner system and an adjustment in the cost or non-payment of the failed installations depending on the severity of the failure.

In the event the first post installation inspection is not conducted until all or most of the locations in the Contract permitting this methodology have been performed, and the inspection reveals defects on 20 percent or more of the host pipe's length, then an adjustment in the cost or non-payment of the failed installations may be made by the Engineer depending on the severity of the failure.

In the event the second post inspection of the installation reveals defects, the Department may execute the option to call the construction bond to reimburse the Department for repairs or corrections, or to act as an adjustment in the cost, or both.

IV. MEASUREMENT AND PAYMENT

Pre-Installation Inspection will be measured and paid for as the actual number of linear feet of pipe inspected, including mobilization of equipment, and production of records. Linear footage is not increased for multiple passes of inspection equipment through a length of pipe.

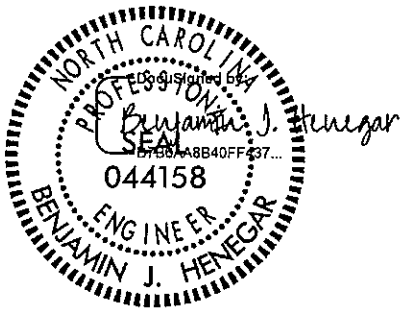
Pipe Rehabilitation will be measured and paid for as the actual number of linear feet of pipe for the Size, and Method that has been incorporated into the completed and accepted work. Note: At locations shown in the Contract where multiple methods are permitted, the Contractor may select any of the methods specified, however, if only one method is specified, this will be the only method permitted at that location.

This price shall include post installation inspection, cleaning and preparation of the host pipe, furnishing and installing the liner, lateral reconnection, coupling and expansion devices, annular cement grout, design (if necessary) and shop drawing preparation, furnishing and installing liner and all components of the liner system, capturing any discharges or releases during installation or curing operations, furnishing any documentation or fees required for effluent or condensate disposal, all testing and sampling including furnishing reports and pre and post installation video inspections, waste disposal costs, excavation, sheeting, shoring, disposing of surplus and unsuitable material; backfilling and backfill material; compaction, restoring existing surfaces, and clearing debris and obstructions.

De-Watering will be measured and paid as the actual number of water diversions or bypasses required to complete Pipe Rehabilitation work. Each instance of De-Watering paid includes De-Watering for pre-inspection, installation, post inspections, and remediation (if necessary). All materials, equipment, labor, or other resources required to de-watering a site shall be incidental to the unit cost for De-watering.

Payment will be made under:

Pay Item	**Pay Unit**
Pre-Installation Inspection	Linear Foot
(Size) Pipe Rehabilitation CIPP Liner	Linear Foot
(Size) Pipe Rehabilitation Solid Wall Thermoplastic Slip Liner	Linear Foot
(Size) Pipe Rehabilitation Smooth Wall Steel Slip Liner	Linear Foot
De-Watering	Each



10/7/2021

County : Polk

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
			ROADWAY ITEMS			
0001	0000100000-N	800	MOBILIZATION	Lump Sum	L.S.	
0002	0000400000-N	801	CONSTRUCTION SURVEYING	Lump Sum	L.S.	
0003	0036000000-E	225	UNDERCUT EXCAVATION	400 CY		
0004	0043000000-N	226	GRADING	Lump Sum	L.S.	
0005	0050000000-E	226	SUPPLEMENTARY CLEARING & GRUBBING	1 ACR		
0006	0134000000-E	240	DRAINAGE DITCH EXCAVATION	3,190 CY		
0007	0195000000-E	265	SELECT GRANULAR MATERIAL	400 CY		
0008	0196000000-E	270	GEOTEXTILE FOR SOIL STABILIZATION	700 SY		
0009	0199000000-E	SP	TEMPORARY SHORING	10,000 SF		
0010	0318000000-E	300	FOUNDATION CONDITIONING MATERIAL, MINOR STRUCTURES	930 TON		
0011	0320000000-E	300	FOUNDATION CONDITIONING GEOTEXTILE	2,900 SY		
0012	0448200000-E	310	15" RC PIPE CULVERTS, CLASS IV	1,088 LF		
0013	0448300000-E	310	18" RC PIPE CULVERTS, CLASS IV	504 LF		
0014	0448400000-E	310	24" RC PIPE CULVERTS, CLASS IV	680 LF		
0015	0448500000-E	310	30" RC PIPE CULVERTS, CLASS IV	2,268 LF		
0016	0448600000-E	310	36" RC PIPE CULVERTS, CLASS IV	480 LF		
0017	0448700000-E	310	42" RC PIPE CULVERTS, CLASS IV	280 LF		
0018	0576000000-E	310	**" CS PIPE CULVERTS, *****" THICK (18", 0.079")	340 LF		
0019	0576000000-E	310	**" CS PIPE CULVERTS, *****" THICK (24", 0.109")	156 LF		

County : Polk

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0020	0576000000-E	310	**" CS PIPE CULVERTS, *****" THICK (30", 0.138")	1,876 LF		
0021	0576000000-E	310	**" CS PIPE CULVERTS, *****" THICK (36", 0.138")	1,004 LF		
0022	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (18", 0.079")	4 EA		
0023	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (24", 0.109")	3 EA		
0024	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (30", 0.138")	20 EA		
0025	0636000000-E	310	**" CS PIPE ELBOWS, *****" THICK (36", 0.138')	15 EA		
0026	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (18", 0.500")	52 LF		
0027	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (54", 0.750")	218 LF		
0028	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (18", 0.500")	52 LF		
0029	0973300000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B NOT IN SOIL (54", 0.750")	218 LF		
0030	0986000000-E	SP	GENERIC PIPE ITEM 15" PIPE REHABILITATION CIPP LINER	92 LF		
0031	0986000000-E	SP	GENERIC PIPE ITEM 18" PIPE REHABILITATION CIPP LINER	688 LF		
0032	0986000000-E	SP	GENERIC PIPE ITEM 18" PIPE REHABILITATION SMOOTH WALL STEEL SLIP LINER	40 LF		

County : Polk

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0033	0986000000-E	SP	GENERIC PIPE ITEM 24" PIPE REHABILITATION CIPP LINER	364 LF		
0034	0986000000-E	SP	GENERIC PIPE ITEM 30" PIPE REHABILITATION CIPP LINER	262 LF		
0035	0986000000-E	SP	GENERIC PIPE ITEM 36" PIPE REHABILITATION CIPP LINER	176 LF		
0036	0986000000-E	SP	GENERIC PIPE ITEM 42" PIPE REHABILITATION SOLID WALL THERMOPLASTIC SLIP LINER	604 LF		
0037	0986000000-E	SP	GENERIC PIPE ITEM 42" PIPE REHABILITATION CIPP LINER	140 LF		
0038	0986000000-E	SP	GENERIC PIPE ITEM PRE-INSTALLATION INSPECTION	2,522 LF		
0039	0992000000-E	SP	GENERIC PIPE ITEM STANDARD CAST IRON MANHOLE FRAME AND VENTED MANHOLE GRATE	35 EA		
0040	0995000000-E	340	PIPE REMOVAL	3,606 LF		
0041	0996000000-N	350	PIPE CLEAN OUT	4 EA		
0042	1099500000-E	505	SHALLOW UNDERCUT	100 CY		
0043	1099700000-E	505	CLASS IV SUBGRADE STABILIZA-TION	200 TON		
0044	1220000000-E	545	INCIDENTAL STONE BASE	500 TON		
0045	1308000000-E	607	MILLING ASPHALT PAVEMENT, ***" TO *******" (0" TO 3")	4,790 SY		
0046	1491000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0C	2,200 TON		
0047	1503000000-E	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C	850 TON		

County : Polk

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0048	1523000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5C	1,600 TON		
0049	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	240 TON		
0050	1693000000-E	654	ASPHALT PLANT MIX, PAVEMENT REPAIR	175 TON		
0051	1840000000-E	665	MILLED RUMBLE STRIPS (ASPHALT CONCRETE)	6,100 LF		
0052	2022000000-E	815	SUBDRAIN EXCAVATION	1,276.8 CY		
0053	2026000000-E	815	GEOTEXTILE FOR SUBSURFACE DRAINS	5,700 SY		
0054	2036000000-E	815	SUBDRAIN COARSE AGGREGATE	957.6 CY		
0055	2044000000-E	815	6" PERFORATED SUBDRAIN PIPE	5,700 LF		
0056	2070000000-N	815	SUBDRAIN PIPE OUTLET	12 EA		
0057	2077000000-E	815	6" OUTLET PIPE	72 LF		
0058	2209000000-E	838	ENDWALLS	1.5 CY		
0059	2264000000-E	840	PIPE PLUGS	1.941 CY		
0060	2275000000-E	SP	FLOWABLE FILL	97 CY		
0061	2286000000-N	840	MASONRY DRAINAGE STRUCTURES	72 EA		
0062	2297000000-E	840	MASONRY DRAINAGE STRUCTURES	40 CY		
0063	2308000000-E	840	MASONRY DRAINAGE STRUCTURES	267.5 LF		
0064	2364200000-N	840	FRAME WITH TWO GRATES, STD 840.20	12 EA		
0065	2365000000-N	840	FRAME WITH TWO GRATES, STD 840.22	26 EA		
0066	2396000000-N	840	FRAME WITH COVER, STD 840.54	6 EA		

County : Polk

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0067	2473000000-N	SP	GENERIC DRAINAGE ITEM DE-WATERING	16 EA		
0068	2473000000-N	SP	GENERIC DRAINAGE ITEM HINGED GRATE	5 EA		
0069	2473000000-N	SP	GENERIC DRAINAGE ITEM SPECIAL DESIGN PIPE CONNECTION	85 EA		
0070	2556000000-E	846	SHOULDER BERM GUTTER	2,500 LF		
0071	2619000000-E	850	4" CONCRETE PAVED DITCH	5,750 SY		
0072	2738000000-E	SP	GENERIC PAVING ITEM 6" CONCRETE PAVED DITCH	1,220 SY		
0073	3030000000-E	862	STEEL BEAM GUARDRAIL	5,825 LF		
0074	3145000000-E	862	EXTRA LENGTH GUARDRAIL POST (**' STEEL) (8')	890 EA		
0075	3150000000-N	862	ADDITIONAL GUARDRAIL POSTS	5 EA		
0076	3210000000-N	862	GUARDRAIL END UNITS, TYPE CAT-1	1 EA		
0077	3317000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE B-77	1 EA		
0078	3360000000-E	863	REMOVE EXISTING GUARDRAIL	5,850 LF		
0079	3566000000-E	867	WOVEN WIRE FENCE RESET	200 LF		
0080	3628000000-E	876	RIP RAP, CLASS I	200 TON		
0081	3635000000-E	876	RIP RAP, CLASS II	625 TON		
0082	3656000000-E	876	GEOTEXTILE FOR DRAINAGE	1,960 SY		
0083	4400000000-E	1110	WORK ZONE SIGNS (STATIONARY)	164 SF		
0084	4402000000-E	SP	HIGH VISIBILITY STATIONARY SIGNS	164 SF		

County : Polk

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0085	4405000000-E	1110	WORK ZONE SIGNS (PORTABLE)	192 SF		
0086	4407000000-E	SP	HIGH VISIBILITY PORTABLE SIGNS	192 SF		
0087	4415000000-N	1115	FLASHING ARROW BOARD	6 EA		
0088	4420000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN	3 EA		
0089	4423000000-N	SP	WORK ZONE DIGITAL SPEED LIMIT SIGNS	2 EA		
0090	4424000000-N	SP	WORK ZONE PRESENCE LIGHTING	28 EA		
0091	4432000000-N	SP	HIGH VISIBILITY DRUMS	555 EA		
0092	4434000000-N	SP	SEQUENTIAL FLASHING WARNING LIGHTS	20 EA		
0093	4465000000-N	1160	TEMPORARY CRASH CUSHIONS	4 EA		
0094	4470000000-N	1160	REMOVE & RESET TEMPORARY CRASH CUSHION	3 EA		
0095	4480000000-N	1165	TMA	2 EA		
0096	4485000000-E	1170	PORTABLE CONCRETE BARRIER	1,325 LF		
0097	4490000000-E	1170	PORTABLE CONCRETE BARRIER (ANCHORED)	3,800 LF		
0098	4505000000-E	1170	REMOVE & RESET PORTABLE CONC-RETE BARRIER (ANCHORED)	6,980 LF		
0099	4510000000-N	1190	LAW ENFORCEMENT	2,400 HR		
0100	4589000000-N	SP	GENERIC TRAFFIC CONTROL ITEM DYNAMIC ZIPPER MERGE SYSTEM DEPLOYMENT	Lump Sum	L.S.	
0101	4600000000-N	SP	GENERIC TRAFFIC CONTROL ITEM CONNECTED LANE CLOSURE DEVICE	4 EA		
0102	4609000000-N	SP	GENERIC TRAFFIC CONTROL ITEM DYNAMIC ZIPPER MERGE SYSTEM	5 DAY		

County : Polk

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0103	4688000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (6", 90 MILS)	22,374 LF		
0104	4895000000-N	SP	GENERIC PAVEMENT MARKING ITEM NON-CAST IRON SNOWPLOWABLE PAVEMENT MARKER	177 EA		
0105	5255000000-N	1413	PORTABLE LIGHTING	Lump Sum	L.S.	
0106	6000000000-E	1605	TEMPORARY SILT FENCE	14,265 LF		
0107	6006000000-E	1610	STONE FOR EROSION CONTROL, CLASS A	1,280 TON		
0108	6009000000-E	1610	STONE FOR EROSION CONTROL, CLASS B	2,765 TON		
0109	6012000000-E	1610	SEDIMENT CONTROL STONE	2,400 TON		
0110	6015000000-E	1615	TEMPORARY MULCHING	3.5 ACR		
0111	6018000000-E	1620	SEED FOR TEMPORARY SEEDING	200 LB		
0112	6021000000-E	1620	FERTILIZER FOR TEMPORARY SEEDING	1 TON		
0113	6024000000-E	1622	TEMPORARY SLOPE DRAINS	200 LF		
0114	6029000000-E	SP	SAFETY FENCE	5,880 LF		
0115	6030000000-E	1630	SILT EXCAVATION	2,810 CY		
0116	6036000000-E	1631	MATTING FOR EROSION CONTROL	10,000 SY		
0117	6037000000-E	SP	COIR FIBER MAT	100 SY		
0118	6042000000-E	1632	1/4" HARDWARE CLOTH	1,915 LF		
0119	6046000000-E	1636	TEMPORARY PIPE FOR STREAM CROSSING	50 LF		
0120	6070000000-N	1639	SPECIAL STILLING BASINS	4 EA		
0121	6071020000-E	SP	POLYACRYLAMIDE (PAM)	555 LB		

County : Polk

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0122	6084000000-E	1660	SEEDING & MULCHING	3 ACR		
0123	6087000000-E	1660	MOWING	1.5 ACR		
0124	6090000000-E	1661	SEED FOR REPAIR SEEDING	50 LB		
0125	6093000000-E	1661	FERTILIZER FOR REPAIR SEEDING	0.25 TON		
0126	6096000000-E	1662	SEED FOR SUPPLEMENTAL SEEDING	75 LB		
0127	6108000000-E	1665	FERTILIZER TOPDRESSING	1.75 TON		
0128	6111000000-E	SP	IMPERVIOUS DIKE	60 LF		
0129	6114500000-N	1667	SPECIALIZED HAND MOWING	10 MHR		
0130	6117000000-N	SP	RESPONSE FOR EROSION CONTROL	100 EA		
0131	6117500000-N	SP	CONCRETE WASHOUT STRUCTURE	8 EA		
0132	6123000000-E	1670	REFORESTATION	1 ACR		
0133	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE	65 EA		
0134	6132000000-N	SP	GENERIC EROSION CONTROL ITEM FABRIC INSERT INLET PROTECTION DEVICE CLEANOUT	195 EA		

PIPE PROFILE – 0901 TO 0525

SHEET 1 OF 2

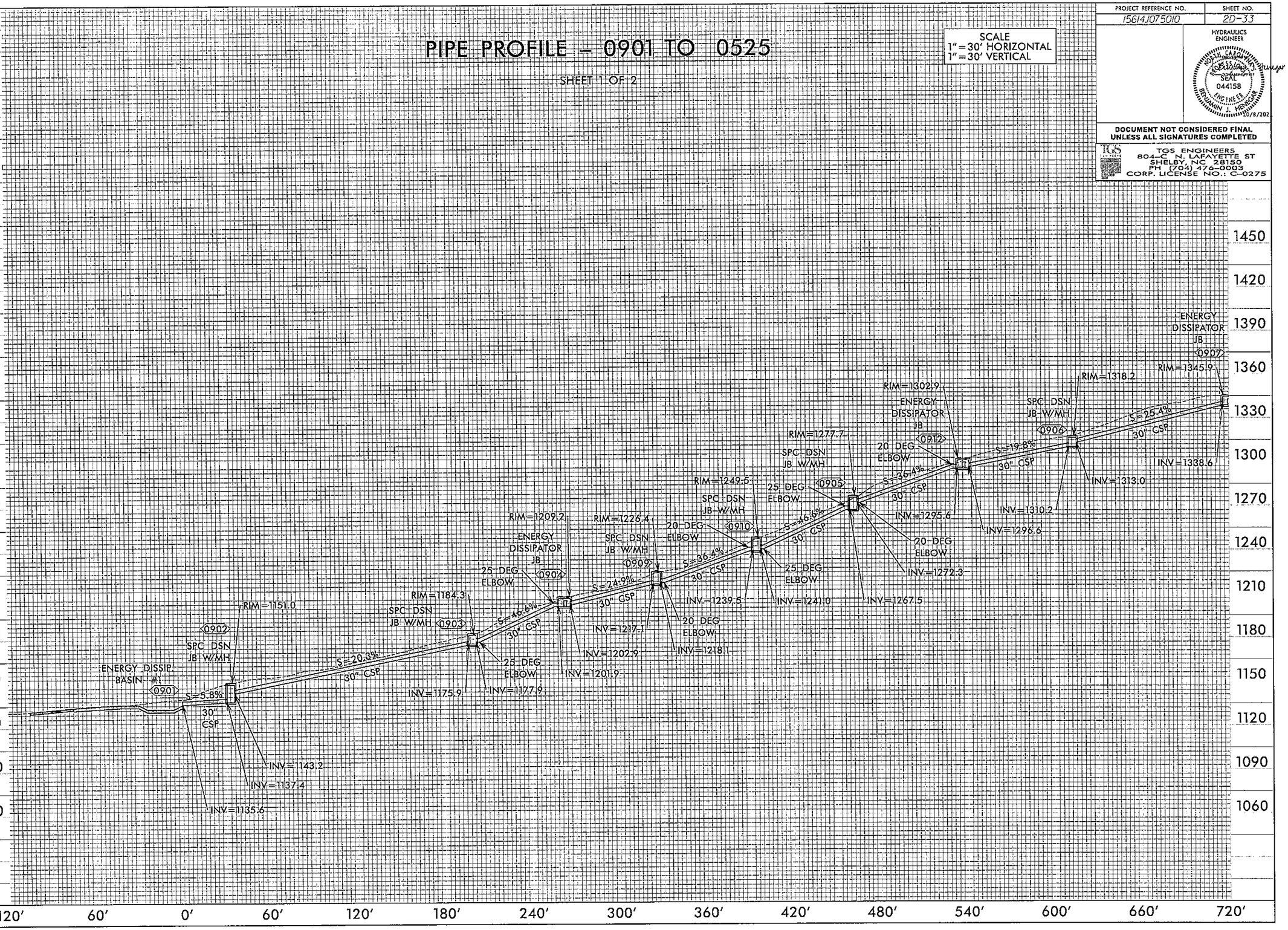
SCALE
1" = 30' HORIZONTAL
1" = 30' VERTICAL

PROJECT REFERENCE NO.	SHEET NO.
15614.1075010	2D-33

HYDRAULICS ENGINEER
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 044158 BENJAMIN J. HONEYCUTT
10/8/2021

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

TGS ENGINEERS
804-C N. LAFAYETTE ST
SHELBY, NC 28150
PH. (704) 476-0003
CORP. LICENSE NO.: C-0275



PROJECT REFERENCE NO.	SHEET NO.
15614J075010	2D-35

HYDRAULICS ENGINEER

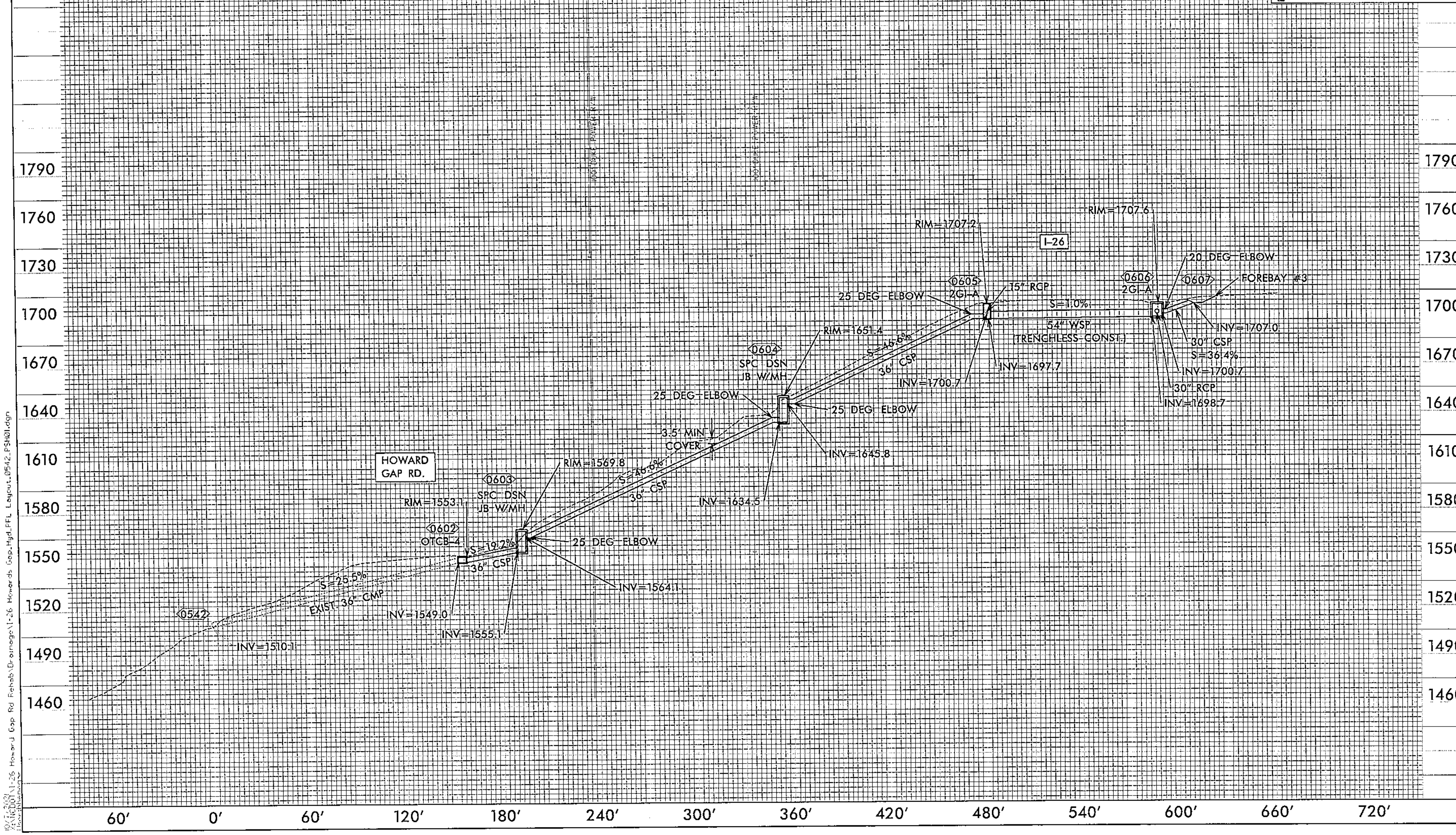
SEAL 044158 BENJAMIN J. HENEGAR 10/8/2021

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

TGS ENGINEERS
804-C N. LAFAYETTE ST
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

PIPE PROFILE - 0542 TO 0607

SCALE
1" = 30' HORIZONTAL
1" = 30' VERTICAL



TGSBEN-LAPTOP

COMPUTED BY: BAC DATE: 04-20-21

CHECKED BY: BJH DATE: 04-20-21

PROJECT NO.	SHEET NO.
15614.1075010	3D-2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

Note: Invert Elevations indicated are for Bid Purposes only and shall not be used for project construction stakeout.
See "Standard Specifications For Roads and Structures, Section 300-5".

LIST OF PIPES, ENDWALLS, ETC. (FOR PIPES 48 INCHES & UNDER)

LINE & STATION / SIZE / THICKNESS OR GAUGE	OFFSET	STRUCTURE NUMBER FROM	STRUCTURE NUMBER TO	TOP ELEVATION FT.	INVERT ELEVATION FT.	INVERT ELEVATION FT.	MINIMUM REQUIRED SLOPE %	C. S. PIPE(ALUMINIZED TYPE 2) 12 0.079	15 0.079	18 0.079	24 0.109	30 0.138	36 0.138	42 0.168	48 0.168	R. C. PIPE CLASS IV 12	15	18	24	30	36	42	48
I26 453+20	2 LT	0524																					
		0524	0526																				
I26 453+00	63 RT	0526		1655.6																			
		0526	0525		1649.1	1648.3	0.3															8	
I26 454+50	43 LT	0527		1668.7																			
		0527	0523		1665.2	1651.2												236					
I26 455+01	63 RT	0528		1668.1																			
		0528	0526		1662.3	1649.6	0.3														196		
I26 455+18	98 RT	0529																					
		0529	0528		1668.3	1662.3	0.8						40										
I26 457+05	43 LT	0530		1681.0																			
		0530	0527		1668.9	1665.2												256					
I26 457+07	3 LT	0531																					
		0531	0530																				
I26 457+72	43 LT	0532		1684.0																			
		0532	0530		1679.3	1676.2											64						
I26 457+13	62 RT	0533		1680.8																			
		0533	0528		1673.7	1662.8														208			
I26 459+01	63 RT	0534		1689.7																			
		0534	0533		1682.9	1673.7														184			
I26 460+72	43 LT	0535		1696.4																			
		0535	0532		1693.2	1679.3											296						
I26 460+89	53 RT	0536		1698.3																			
		0536	0534		1691.5	1682.9														196			
I26 453+29	113 RT	0537																					
		0537	0526		1660.6	1650.1	0.7					60											
I26 452+07	67 LT	0538		1645.2																			
		0538	0539		1638.5	1634.6	1.7			84													
		0539	0519		1631.6	1603.1	3.8						72										
HGR 35+74	49 RT	0540		1413.3																			
		0540	0510		1405.5	1402.5	3.8						20										
HGR 46+56	26 RT	0602		1553.1																			
HGR 46+69	60 RT	0603		1569.8																			
		0603	0602		1555.1	1549.0	2.7						36										
I26 463+18	169 LT	0604		1651.4																			
		0604	0603		1634.5	1564.1	2.7						164										
		0605	0604		1697.7	1645.8	2.7						124										
I26 463+27	84 RT	0607																					
		0607	0606		1707.0	1700.7	1.2					24											
I26 465+49	43 LT	0608		1717.6																			
		0608	0605		1714.4	1700.7											228						
I26 465+10	1 LT	0609																					
		0609	0610																				
I26 465+00	63 RT	0610		1715.8																			
		0610	0606		1708.9	1700.2	0.5													180			
I26 467+85	43 LT	0611		1728.2																			
		0611	0608		1725.0	1714.4											232						
I26 467+59	1 RT	0612																					
		0612	0613																				
SHEET TOTALS										84		84	456				820	492		768	196	8	

LINE & STATION	FROM	TO	15" PIPE REHABILITAION CIPP LINER	18" PIPE REHABILITAION CIPP LINER	18" PIPE REHABILITATION SMOOTH WALL STEEL SLIP LINER (0.5" THICK)	24" PIPE REHABILITAION CIPP LINER	30" PIPE REHABILITAION CIPP LINER	36" PIPE REHABILITAION CIPP LINER	42" PIPE REHABILITAION CIPP LINER	42" PIPE REHABILITAION SOLID WALL THERMOPLASTIC SLIP LINER	18" WELDED STEEL PIPE 0.5" THICK, GRADE B IN SOIL	18" WELDED STEEL PIPE 0.5" THICK, GRADE B NOT IN SOIL	ENDWALLS STD. 838.01 OR STD. 838.11 (UNLESS NOTED OTHERWISE) CY	QUANTITIES FOR DRAINAGE STRUCTURES (NOTE: TOTAL LIN. FT. FOR PAY QUANTITY SHALL BE A + (1.3 X B)) 0' THRU 5' EACH	A 5' THRU 10' LIN. FT.	B 10' AND ABOVE LIN. FT.	C.B. STD. 840.01 OR STD. 840.02	FRAME, GRATES, AND HOOD STD. 840.03 GRATE TYPE E	F	G	
I26 453+20	0524																				
	0524	0526		68																	
I26 453+00	0526													1	1.5						
	0526	0525																			
I26 454+50	0527													1							
	0527	0523																			
I26 455+01	0528													1	0.8						
	0528	0526																			
I26 455+18	0529																				
	0529	0528																			
I26 457+05	0530													1	5.0	2.1					
	0530	0527																			
I26 457+07	0531																				
	0531	0530			40																
I26 457+72	0532													1							
	0532	0530																			
I26 457+13	0533													1	2.1						
	0533	0528																			
I26 459+01	0534													1	1.8						
	0534	0533																			
I26 460+72	0535													1							
	0535	0532																			
I26 460+89	0536													1	1.8						
	0536	0534																			
I26 453+29	0537																				
	0537	0526																			
I26 452+07	0538													1	1.7						
	0538	0539																			
	0539	0519																			
HGR 35+74	0540													1	2.8						
	0540	0510																			
HGR 46+56	0602													1							
HGR 46+69	0603													1	5.0	4.7					
	0603	0602																			
I26 463+18	0604													1	5.0	6.9					
	0604	0603																			
	0605	0604																			
I26 463+27	0607																				
	0607	0606																			
I26 465+49	0608													1							
	0608	0605																			
I26 465+10	0609																				
	0609	0610		64																	
I26 465+00	0610													1	1.9						
	0610	0606																			
I26 467+85	0611													1							
	0611	0608																			
I26 467+59	0612																				
	0612	0613		60																	
SHEET TOTALS				192	40									17	29.4	13.7					

LINE & STATION	FROM	TO	CONCRETE TRANSITIONAL SECTION D.I. STD. 852.04 OR STD. 852.06	CONCRETE TRANSITIONAL SECTION C.B. STD. 852.05	OPEN THROAT C.B. STD. 840.04 OR STD. 840.05	CONCRETE BRIDGE APPROACH D.I. STD. 840.13	D.I. STD. 840.14 OR STD. 840.15	D.I. FRAME AND GRATES STD. 840.16	G.D.I. TYPE "A" STD. 840.17 OR STD. 840.26	G.D.I. TYPE "B" STD. 840.18 OR STD. 840.27	G.D.I. TYPE "D" STD. 840.19 OR STD. 840.28	G.D.I. (W.S. FLAT) FRAME WITH GRATE STD. 840.20	G.D.I. (W.S. FLAT) FRAME W/ 2 GRATES STD. 840.20	G.D.I. (W.S. SAG) FRAME W/ GRATE STD. 840.22	G.D.I. (W.S. SAG) FRAME W/ 2 GRATES STD. 840.22	G.D.I. (N.S. SAG) FRAME W/ GRATE STD. 840.24	G.D.I. (N.S. SAG) FRAME W/ 2 GRATES STD. 840.24	G.D.I. (N.S. FLAT) FRAME W/ GRATE STD. 840.29	G.D.I. (N.S. FLAT) FRAME W/ 2 GRATES STD. 840.29	J.B. STD. 840.31 OR STD. 840.32	T.B.J.B. STD. 840.34	T.B.D.I. STD. 840.35	M.H. STD. 840.51, STD. 840.52, OR STD. 840.53	M.H. FRAME AND COVER STD. 840.54	M.H. FRAME AND VENTED M.H. GRATE
I26 453+20	0524																								
	0524	0526																							
I26 453+00	0526								1						1										
	0526	0525																							
I26 454+50	0527									1			1												
	0527	0523																							
I26 455+01	0528								1						1										
	0528	0526																							
I26 455+18	0529																								
	0529	0528																							
I26 457+05	0530												1												
	0530	0527																							
I26 457+07	0531																								
	0531	0530																							
I26 457+72	0532									1			1												
	0532	0530																							
I26 457+13	0533								1						1										
	0533	0528																							
I26 459+01	0534								1						1										
	0534	0533																							
I26 460+72	0535									1			1												
	0535	0532																							
I26 460+89	0536								1						1										
	0536	0534																							
I26 453+29	0537																								
	0537	0526																							
I26 452+07	0538																				1				1	
	0538	0539																							
	0539	0519																							
HGR 35+74	0540																								2
	0540	0510																							
HGR 46+56	0602				1																				
HGR 46+69	0603																								1
	0603	0602																							
I26 463+18	0604																								1
	0604	0603																							
	0605	0604																							
I26 463+27	0607																								
	0607	0606																							
I26 465+49	0608									1			1												
	0608	0605																							
I26 465+10	0609																								
	0609	0610																							
I26 465+00	0610								1						1										
	0610	0606																							
I26 467+85	0611									1			1												
	0611	0608																							
I26 467+59	0612																								
	0612	0613																							
SHEET TOTALS					1				6	5			6		6					1				1	4

LINE & STATION	FROM	TO	ENERGY DISSIPATOR J.B. SEE DETAIL 2D-1	SPITTER BOX SEE DETAIL 2D-4	SPECIAL DESIGN J.B. W/ MH SEE DETAIL 2D-8	HINGED GRATE	G.D.I. TYPE "A" EXTRA DEPTH, SEE DETAIL 2D-12	CONVERT EXISTING D.I. TO J.B.	CONVERT EXISTING J.B. TO D.I.	ADJUST C.B.	ADJUST D.I.	15" C.S. ELBOW	18" C.S. ELBOW	24" C.S. ELBOW	30" C.S. ELBOW	36" C.S. ELBOW	SPEC. DSN. PIPE CONNECTION, SEE DETAIL 2D-11	BERM DITCH OUTLET STD. 850.11 (PER EACH)	PIPE CLEANOUT EA	FLOWABLE FILL CY	CONCRETE COLLARS CL. "B" STD. 840.72 CY	CONCRETE AND BRICK PIPE PLUG STD. 840.71 CY	PIPE REMOVAL LIN. FT.	REMARKS
I26 453+20	0524																							
	0524	0526																						RETAIN AND LINE W/ CIPP
I26 453+00	0526																							
	0526	0525																						
I26 454+50	0527																							
	0527	0523																						
I26 455+01	0528																							
	0528	0526																						
I26 455+18	0529					1																		FOREBAY #2, SEE DETAIL 2D-20
	0529	0528															1	1							ROD & LUG W/ GASKETS & ELBOW, 10 GAGE SPC. DSN. PIPE CONNECTION - 0528
I26 457+05	0530						1																	2GI-A SPECIAL DESIGN
	0530	0527																						
I26 457+07	0531																							
	0531	0530																						RETAIN AND LINE W/ 18" WSP
I26 457+72	0532																							
	0532	0530																						
I26 457+13	0533																							
	0533	0528																						
I26 459+01	0534																							
	0534	0533																						
I26 460+72	0535																							
	0535	0532																						
I26 460+89	0536																							
	0536	0534																						
I26 453+29	0537					1																		FOREBAY #1, SEE DETAIL 2D-18
	0537	0526													1		1							ROD & LUG W/ GASKETS & ELBOW, 10 GAGE SPC. DSN. PIPE CONNECTION - 0526
I26 452+07	0538																							JB W/ MH
	0538	0539															2							ROD & LUG W/ GASKETS, 14 GAGE SPC. DSN. PIPE CONNECTION - 0538 & 0539
	0539	0519														2	2							ROD & LUG W/ GASKETS & 2 ELBOWS, 10 GAGE SPC. DSN. PIPE CONECTION - 0539 & 0519
HGR 35+74	0540		1																					ENERGY DISSIPATOR JB, VENTED MH'S (BOLTED)
	0540	0510															2							ROD & LUG W/ GASKETS, 10 GAGE SPC. DSN. PIPE CONNECTION - 0540 & 0510
HGR 46+56	0602																							OTCB-4
HGR 46+69	0603				1																			SPECIAL DESIGN JB W/ VENTED MH (BOLTED)
	0603	0602															2							ROD & LUG W/ GASKETS, 10 GAGE SPC. DSN. PIPE CONNECTION - 0603 & 0602
I26 463+18	0604				1																			SPECIAL DESIGN JB W/ VENTED MH (BOLTED)
	0604	0603														2	2							ROD & LUG W/ GASKETS & 2 ELBOWS, 10 GAGE SPC. DSN. PIPE CONNECTION - 0604 & 0603
	0605	0604														2	2							ROD & LUG W/ GASKETS & 2 ELBOWS, 10 GAGE SPC. DSN. PIPE CONNECTION - 0605 & 0604
I26 463+27	0607					1																		FOREBAY #3, SEE DETAIL 2D-23
	0607	0606													1		1							ROD & LUG W/ GASKETS & ELBOW, 10 GAGE SPC. DSN. PIPE CONNECTION - 0606
I26 465+49	0608																							
	0608	0605																						
I26 465+10	0609																							
	0609	0610																						RETAIN AND LINE W/ CIPP
I26 465+00	0610																							
	0610	0606																						
I26 467+85	0611																							
	0611	0608																						
I26 467+59	0612																							
	0612	0613																						RETAIN AND LINE W/ CIPP
SHEET TOTALS			1		2	3	1								2	7	15							

ABBREVIATIONS

C.A.A.	CORRUGATED ALUMINIUM ALLOY
C.B.	CATCH BASIN
C.S.	CORRUGATED STEEL
D.I.	DROP INLET
G.D.I.	GRATED DROP INLET
H.D.P.E.	HIGH DENSITY POLYETHYLENE
J.B.	JUNCTION BOX
M.H.	MANHOLE
N.S.	NARROW SLOT
P.V.C.	POLYVINYL CHLORIDE
R.C.	REINFORCED CONCRETE
T.B.D.I.	TRAFFIC BEARING DROP INLET
T.B.J.B.	TRAFFIC BEARING JUNCTION BOX
W.S.	WIDE SLOT

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TGSBEN-LAPTOP

COMPUTED BY:	BAC	DATE:	04-20-21
CHECKED BY:	BJH	DATE:	04-20-21

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

PROJECT NO.	SHEET NO.
15614.1075010	3D-6

Note: Invert Elevations indicated are for Bid Purposes only and shall not be used for project construction stakeout.
See "Standard Specifications For Roads and Structures, Section 300-5".

LIST OF PIPES, ENDWALLS, ETC. (FOR PIPES 48 INCHES & UNDER)

LINE & STATION / SIZE / THICKNESS OR GAUGE	OFFSET	STRUCTURE NUMBER FROM	STRUCTURE NUMBER TO	TOP ELEVATION FT.	INVERT ELEVATION FT.	INVERT ELEVATION FT.	MINIMUM REQUIRED SLOPE %	C. S. PIPE(ALUMINIZED TYPE 2) 12 / 0.079	15 / 0.079	18 / 0.079	24 / 0.109	30 / 0.138	36 / 0.138	42 / 0.168	48 / 0.168	R. C. PIPE CLASS IV 12	15	18	24	30	36	42	48
HGR 53+24	17 RT																						
I26 416+05	72 LT																						
I26 416+04	5 RT																						
I26 416+06	103 RT																						
I26 489+25	86 LT																						
I26 494+62	29 LT																						
SHEET TOTALS																							
PROJECT TOTALS										340	156	1876	1004				1088	504	680	2268	480	280	

LINE & STATION	15" PIPE REHABILITAION CIPP LINER	18" PIPE REHABILITAION CIPP LINER	18" PIPE REHABILITATION SMOOTH WALL STEEL SLIP LINER (0.5" THICK)	24" PIPE REHABILITAION CIPP LINER	30" PIPE REHABILITAION CIPP LINER	36" PIPE REHABILITAION CIPP LINER	42" PIPE REHABILITAION CIPP LINER	42" PIPE REHABILITAION SOLID WALL THERMOPLASTIC SLIP LINER	18" WELDED STEEL PIPE 0.5" THICK, GRADE B IN SOIL	18" WELDED STEEL PIPE 0.5" THICK, GRADE B NOT IN SOIL	ENDWALLS STD. 838.01 OR STD. 838.11 (UNLESS NOTED OTHERWISE) CY	QUANTITIES FOR DRAINAGE STRUCTURES (NOTE: TOTAL LIN. FT. FOR PAY QUANTITY SHALL BE A + (1.3 X B)) 0' THRU 5' EACH	A 5' THRU 10' LIN. FT.	B 10' AND ABOVE LIN. FT.	C.B. STD. 840.01 OR STD. 840.02	FRAME, GRATES, AND HOOD STD. 840.03 GRATE TYPE E	F	G	
HGR 53+24																			
I26 416+05																			
I26 416+04																			
I26 416+06																			
I26 489+25																			
I26 494+62																			
SHEET TOTALS																			
PROJECT TOTALS	92	688	40	364	262	176	140	604	52	52	1.500	72	267.5						

LINE & STATION	CONCRETE TRANSITIONAL SECTION D.I. STD. 852.04 OR STD. 852.06	CONCRETE TRANSITIONAL SECTION C.B. STD. 852.05	OPEN THROAT C.B. STD. 840.04 OR STD. 840.05	CONCRETE BRIDGE APPROACH D.I. STD. 840.13	D.I. STD. 840.14 OR STD. 840.15	D.I. FRAME AND GRATES STD. 840.16	G.D.I. TYPE "A" STD. 840.17 OR STD. 840.26	G.D.I. TYPE "B" STD. 840.18 OR STD. 840.27	G.D.I. TYPE "D" STD. 840.19 OR STD. 840.28	G.D.I. (W.S. FLAT) FRAME WITH GRATE STD. 840.20	G.D.I. (W.S. FLAT) FRAME W/ 2 GRATES STD. 840.20	G.D.I. (W.S. SAG) FRAME W/ GRATE STD. 840.22	G.D.I. (W.S. SAG) FRAME W/ 2 GRATES STD. 840.22	G.D.I. (N.S. SAG) FRAME W/ GRATE STD. 840.24	G.D.I. (N.S. SAG) FRAME W/ 2 GRATES STD. 840.24	G.D.I. (N.S. FLAT) FRAME W/ GRATE STD. 840.29	G.D.I. (N.S. FLAT) FRAME W/ 2 GRATES STD. 840.29
HGR 53+24																	
I26 416+05																	
I26 416+04																	
I26 416+06																	
I26 489+25																	
I26 494+62																	
SHEET TOTALS																	
PROJECT TOTALS			6				18	10			11		23				

LINE & STATION	J.B. STD. 840.31 OR STD. 840.32	T.B.J.B. STD. 840.34	T.B.D.I. STD. 840.35	M.H. STD. 840.51, STD. 840.52, OR STD. 840.53	M.H. FRAME AND COVER STD. 840.54	M.H. FRAME AND VENTED M.H. GRATE	ENERGY DISSIPATOR J.B. SEE DETAIL 2D-1	SPITTER BOX SEE DETAIL 2D-4	SPECIAL DESIGN J.B. W/ MH SEE DETAIL 2D-8	HINGED GRATE	G.D.I. TYPE "A" EXTRA DEPTH, SEE DETAIL 2D-12	CONVERT EXISTING D.I. TO J.B.	CONVERT EXISTING J.B. TO D.I.	ADJUST C.B.	ADJUST D.I.	15" C.S. ELBOW	18" C.S. ELBOW	24" C.S. ELBOW	30" C.S. ELBOW	36" C.S. ELBOW	SPEC. DSN. PIPE CONNECTION, SEE DETAIL 2D-11	BERM DITCH OUTLET STD. 850.11 (PER EACH)	PIPE CLEANOUT EA	FLOWABLE FILL CY	CONCRETE COLLARS CL. "B" STD. 840.72 CY	CONCRETE AND BRICK PIPE PLUG STD. 840.71 CY	PIPE REMOVAL LIN. FT.	REMARKS
HGR 53+24																										0.262		PLUG EXIST. 36" CMP
I26 416+05																										0.116		PLUG EXIST. 24" CMP
I26 416+04																								18				FILL EXIST. 24" CMP
I26 416+06																											20	REMOVE EXIST. 24" CMP
I26 489+25																							1					CLEANOUT EXIST. 18" CMP
I26 494+62																							1					CLEANOUT EXIST. 18" CMP
SHEET TOTALS																							2	18		0.378	20	
PROJECT TOTALS	2	2	1	1	6	33	7	1	19	5	5						4	3	20	15	85	2	2	97		1.941	3606	

ABBREVIATIONS

C.A.A.	CORRUGATED ALUMINIUM ALLOY
C.B.	CATCH BASIN
C.S.	CORRUGATED STEEL
D.I.	DROP INLET
G.D.I.	GRATED DROP INLET
H.D.P.E.	HIGH DENSITY POLYETHYLENE
J.B.	JUNCTION BOX
M.H.	MANHOLE
N.S.	NARROW SLOT
P.V.C.	POLYVINYL CHLORIDE
R.C.	REINFORCED CONCRETE
T.B.D.I.	TRAFFIC BEARING DROP INLET
T.B.J.B.	TRAFFIC BEARING JUNCTION BOX
W.S.	WIDE SLOT

PROJECT REFERENCE NO.	SHEET NO.
15614J075010	4
RW SHEET NO.	

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
NORTH CAROLINA PROFESSIONAL SEAL 047943 ENGINEER CLINTON B. PRUETT 10/8/2021	NORTH CAROLINA PROFESSIONAL SEAL 044158 ENGINEER BENJAMIN J. HENEGAR 10/8/2021

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

TGS ENGINEERS
804-C N. LAFAYETTE ST
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

NOTE: ALL CSP GASKETS ARE TO BE SLEEVE GASKETS.

NOTE: EXISTING RIGHT OF WAY IS NOT SHOWN BUT EXTENDS OUTSIDE OF PROJECT LIMITS ON SOUTHERN SIDE OF ALIGNMENT.

-I26- CURVE DATA

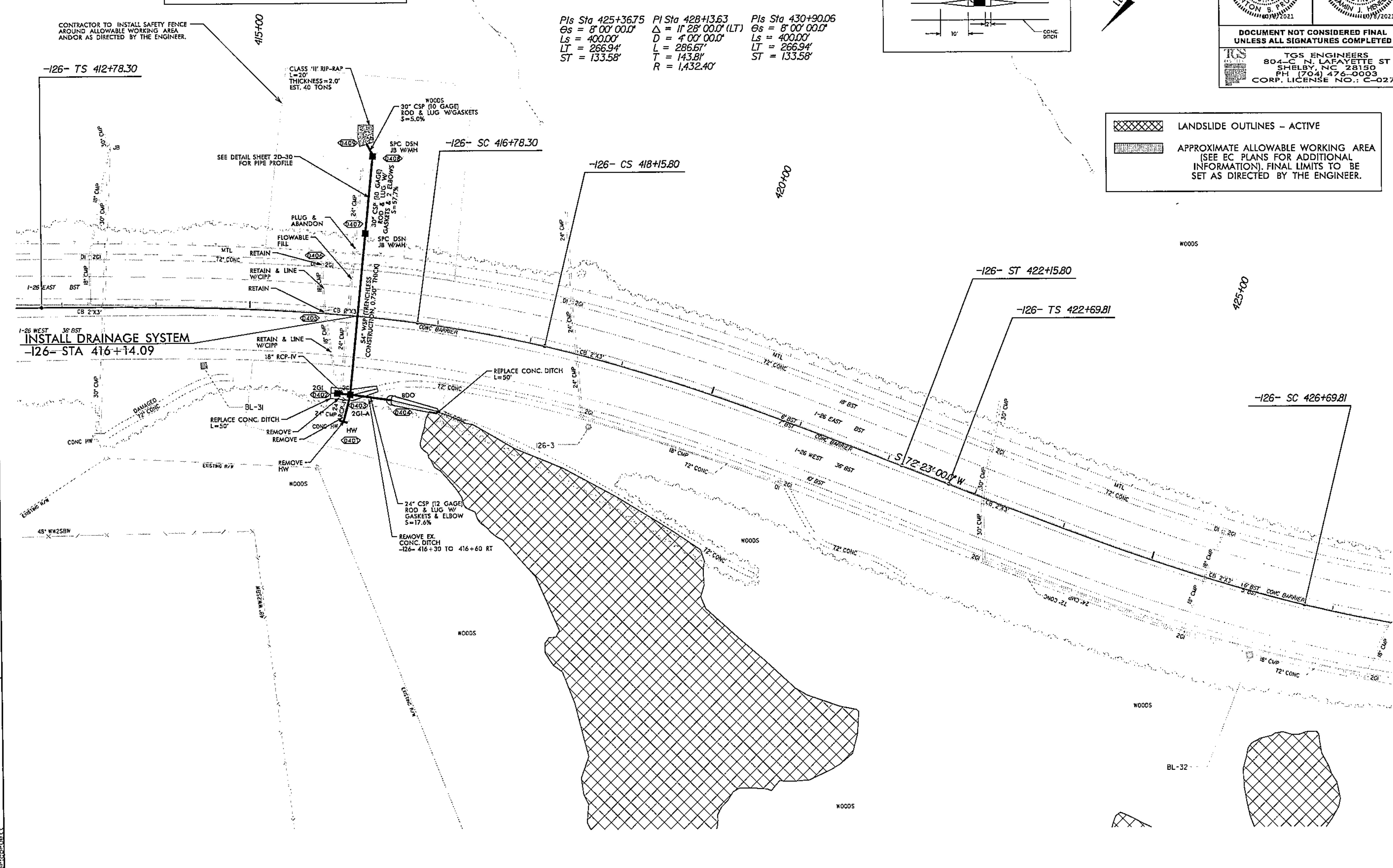
PIs Sta 415+45.24	PI Sta 417+47.11	PIs Sta 419+49.38
θs = 8° 00' 00.0"	Δ = 5° 30' 00.0" (RT)	θs = 8° 00' 00.0"
Ls = 400.00'	D = 4° 00' 00.0"	Ls = 400.00'
LT = 266.94'	L = 137.50'	LT = 266.94'
ST = 133.58'	T = 68.80'	ST = 133.58'
	R = 1,432.40'	
PIs Sta 425+36.75	PI Sta 428+13.63	PIs Sta 430+90.06
θs = 8° 00' 00.0"	Δ = 11° 28' 00.0" (LT)	θs = 8° 00' 00.0"
Ls = 400.00'	D = 4° 00' 00.0"	Ls = 400.00'
LT = 266.94'	L = 286.67'	LT = 266.94'
ST = 133.58'	T = 143.81'	ST = 133.58'
	R = 1,432.40'	

DETAIL 2
INSTALLATION OF 2GI IN CONCRETE DITCH

NAD 83/2011

LANDSLIDE OUTLINES - ACTIVE

APPROXIMATE ALLOWABLE WORKING AREA (SEE EC PLANS FOR ADDITIONAL INFORMATION). FINAL LIMITS TO BE SET AS DIRECTED BY THE ENGINEER.



REVISIONS

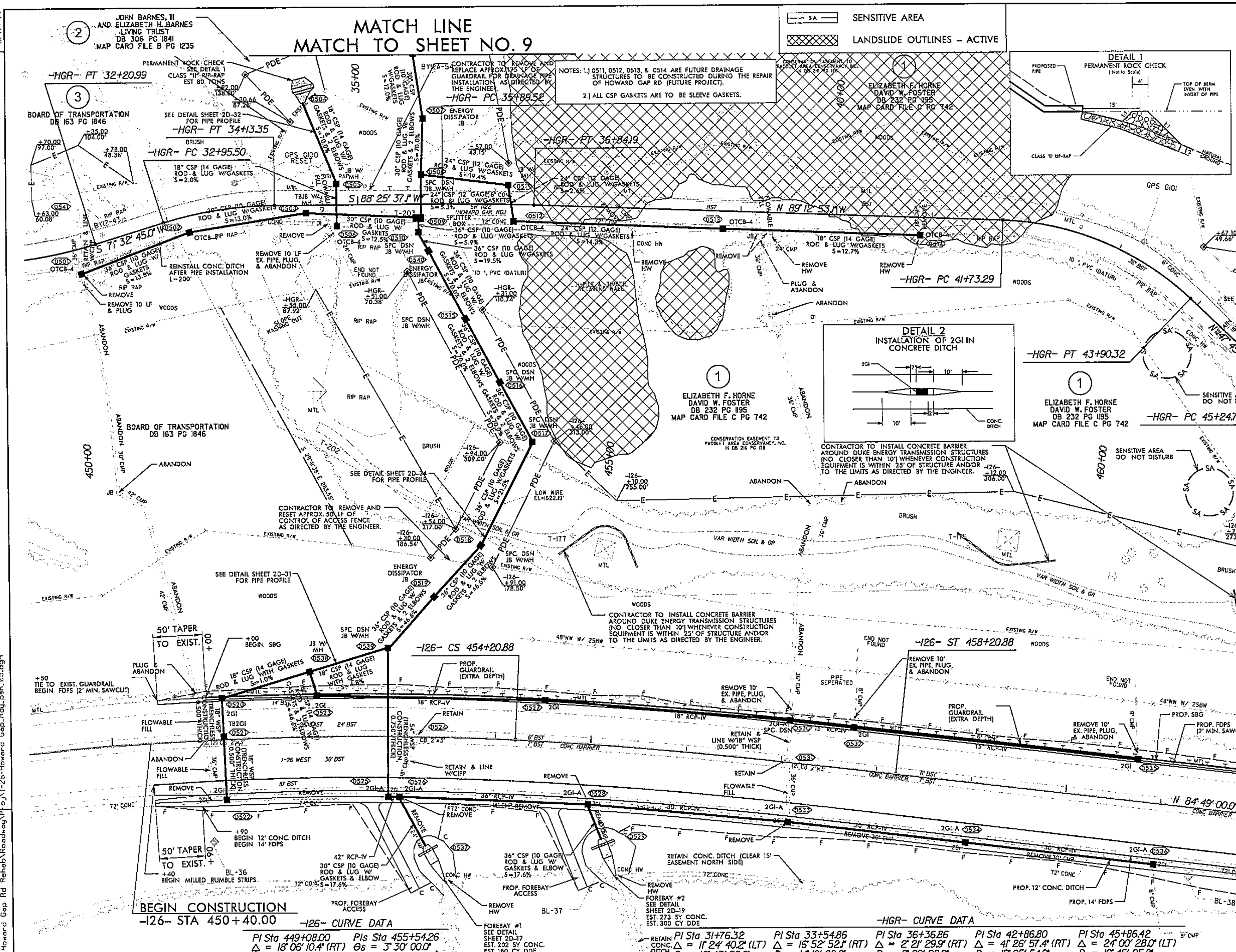
8/17/99

PROJECT REFERENCE NO.	SHEET NO.
15614J075010	5
R/W SHEET NO.	

ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
NORTH CAROLINA PROFESSIONAL SEAL 047943 ENGINEER CLINTON B. PRUETT 10/8/2021	NORTH CAROLINA PROFESSIONAL SEAL 044158 ENGINEER BENJAMIN J. HENEGAR 10/8/2021

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

TGS ENGINEERS
804-C N. LAFAYETTE ST
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275


MATCH LINE
MATCH TO SHEET NO. 9
SENSITIVE AREA
LANDSLIDE OUTLINES - ACTIVE
NOTES: 1.) 0511, 0512, 0513, & 0514 ARE FUTURE DRAINAGE STRUCTURES TO BE CONSTRUCTED DURING THE REPAIR OF HOWARD GAP RD (FUTURE PROJECT).
2.) ALL CSP GASKETS ARE TO BE SLEEVE GASKETS.
DETAIL 1
PERMANENT ROCK CHECK
DETAIL 2
INSTALLATION OF 2GI IN CONCRETE DITCH
JOHN BARNES, III AND ELIZABETH H. BARNES LIVING TRUST DB 306 PG 1841 MAP CARD FILE B PG 1235
BOARD OF TRANSPORTATION DB 163 PG 1846
ELIZABETH F. HORNE DAVID W. FOSTER DB 232 PG 1195 MAP CARD FILE C PG 742
-HGR- PT 32+20.99
-HGR- PT 34+13.35
-HGR- PC 32+95.50
-HGR- PC 35+89.52
-HGR- PT 36+84.19
-HGR- PC 41+73.29
-HGR- PT 43+90.32
-HGR- PC 45+24.76
-I26- CS 454+20.88
-I26- ST 458+20.88
CONTRACTOR TO INSTALL CONCRETE BARRIER AROUND DUKE ENERGY TRANSMISSION STRUCTURES (NO CLOSER THAN 10') WHENEVER CONSTRUCTION EQUIPMENT IS WITHIN 25' OF STRUCTURE AND/OR TO THE LIMITS AS DIRECTED BY THE ENGINEER.
CONTRACTOR TO REMOVE AND RESET APPROX. 50 LF OF CONTROL OF ACCESS FENCE AS DIRECTED BY THE ENGINEER.
N 84° 49' 00.0" W
MATCH LINE STA. -HGR- 46+00 MATCH TO SHEET NO. 6
MATCH LINE STA. -I26- 462+00 MATCH TO SHEET NO. 6
NAD 83/2011
BEGIN CONSTRUCTION -I26- STA 450+40.00
REVISIONS

ALL DUKE TRANSMISSION LINES ARE TO BE TREATED WITH CLEARANCE AND OFFSET GUIDELINES AS ESTABLISHED FOR 100kV POWERED RATING.

-I26- CURVE DATA

PI Sta 449+08.00	PIs Sta 455+54.26
Δ = 18° 06' 10.4" (RT)	θs = 3° 30' 00.0"
D = 1° 45' 00.0"	Ls = 400.00'
L = 1,034.45'	LT = 266.72'
T = 521.57'	ST = 133.38'
R = 3,274.05'	

-HGR- CURVE DATA

PI Sta 31+76.32	PI Sta 33+54.86	PI Sta 36+36.86	PI Sta 42+86.80	PI Sta 45+86.42
Δ = 11° 24' 40.2" (LT)	Δ = 16° 52' 52.1" (RT)	Δ = 2° 21' 29.9" (RT)	Δ = 41° 26' 57.4" (RT)	Δ = 24° 00' 28.0" (LT)
D = 12° 43' 56.6"	D = 14° 19' 26.2"	D = 2° 29' 28.0"	D = 19° 05' 54.9"	D = 19° 45' 25.8"
L = 89.62'	L = 117.85'	L = 94.67'	L = 217.03'	L = 121.51'
T = 44.96'	T = 59.36'	T = 47.34'	T = 113.51'	T = 61.66'
R = 450.00'	R = 400.00'	R = 2,300.00'	R = 300.00'	R = 290.00'

10/8/2021
X:\NCDOT\I-26\Howard Gap Rd Rehab\Roadway\Proj\I-26-Howard Gap_Rdy_psh_05.dgn

8/17/99

REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
15614.1075010	6
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 047943 — CLINTON B. PRUETT — 2021

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 044158 — BENJAMIN J. HENEGAR — 2021

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

TGS ENGINEERS
804-C N. LAFAYETTE ST
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

ALL DUKE TRANSMISSION LINES ARE TO BE TREATED WITH CLEARANCE AND OFFSET GUIDELINES AS ESTABLISHED FOR 100kV POWERED RATING.

LANDSLIDE OUTLINES – ACTIVE

APPROXIMATE ALLOWABLE WORKING AREA (SEE EC PLANS FOR ADDITIONAL INFORMATION). FINAL LIMITS TO BE SET AS DIRECTED BY THE ENGINEER.

NOTE: ALL CSP GASKETS ARE TO BE SLEEVE GASKETS.

-HGR- CURVE DATA

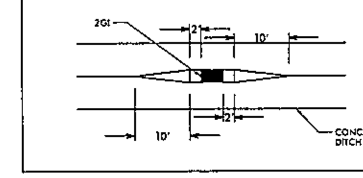
PI Sta 45+86.42	PI Sta 50+90.24	PI Sta 53+74.76	PI Sta 56+52.71
Δ = 24° 00' 28.0" (LT)	Δ = 10° 08' 44.8" (LT)	Δ = 13° 18' 26.3" (RT)	Δ = 12° 50' 07.5" (LT)
D = 19° 45' 25.8"	D = 5° 06' 56.5"	D = 6° 44' 26.4"	D = 5° 37' 02.0"
L = 121.51'	L = 198.33'	L = 197.42'	L = 228.50'
T = 61.66'	T = 99.42'	T = 99.16'	T = 114.73'
R = 290.00'	R = 1,120.00'	R = 850.00'	R = 1,020.00'

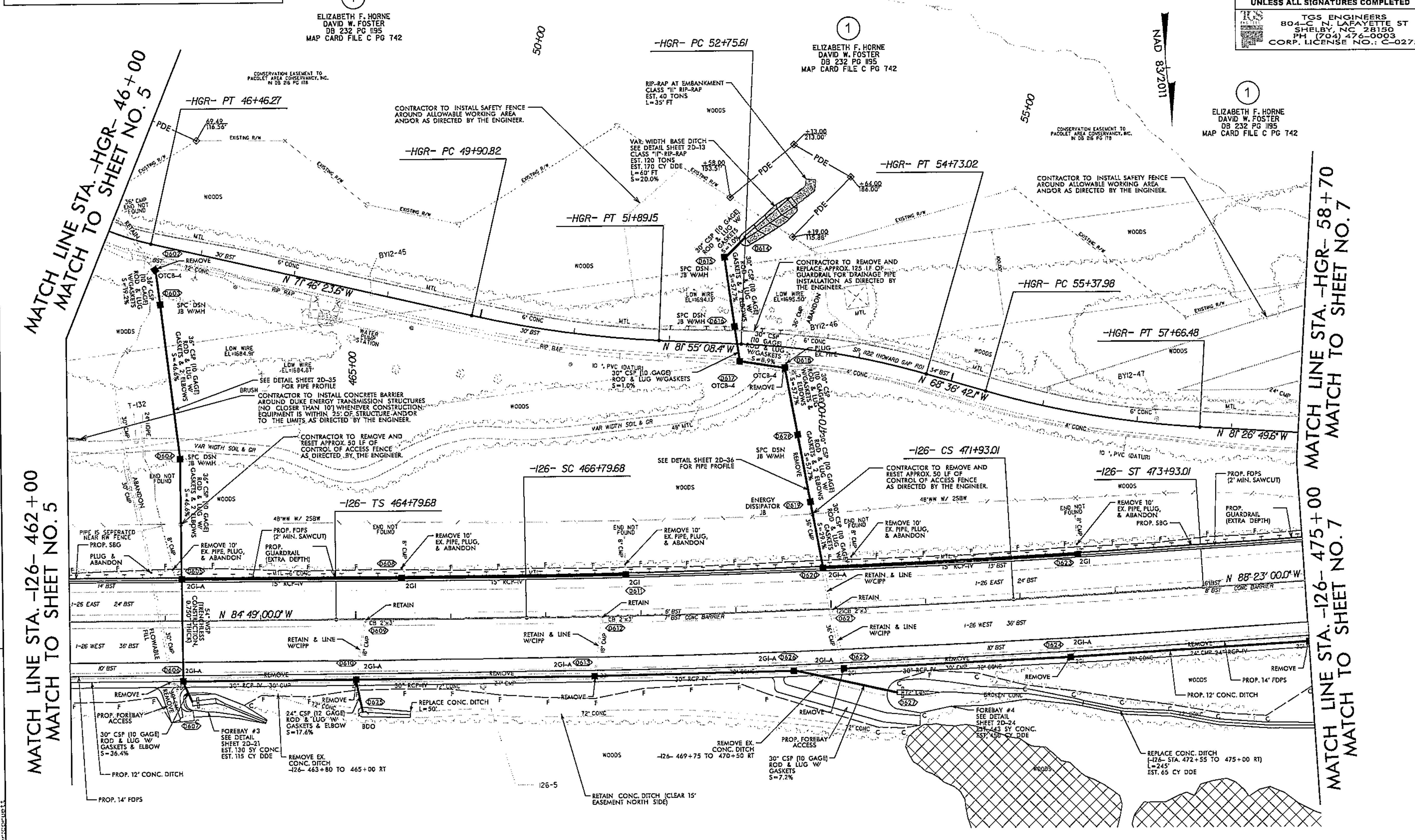
-I26- CURVE DATA

PIs Sta 466+13.01	PI Sta 469+36.39	PIs Sta 472+59.68
Θs = 0° 30' 00.0"	Δ = 2° 34' 00.0" (LT)	Θs = 0° 30' 00.0"
Ls = 200.00'	D = 0° 30' 00.0"	Ls = 200.00'
LT = 133.33'	L = 513.33'	LT = 133.33'
ST = 66.67'	T = 256.71'	ST = 66.67'
	R = 11,459.16'	

DETAIL 2

INSTALLATION OF 2GI IN CONCRETE DITCH





MATCH LINE STA. -HGR- 46+00 MATCH TO SHEET NO. 5
MATCH LINE STA. -HGR- 58+70 MATCH TO SHEET NO. 7
MATCH LINE STA. -I26- 462+00 MATCH TO SHEET NO. 5
MATCH LINE STA. -I26- 475+00 MATCH TO SHEET NO. 7
ELIZABETH F. HORNE DAVID W. FOSTER DB 232 PG 1195 MAP CARD FILE C PG 742
NAD 83/2011
-HGR- PT 46+46.27
-HGR- PC 49+90.82
-HGR- PT 51+89.15
-HGR- PC 52+75.61
-HGR- PT 54+73.02
-HGR- PC 55+37.98
-HGR- PT 57+66.48
N 71° 46' 23.6" W
N 81° 55' 08.4" W
N 68° 36' 42.1" W
N 81° 26' 49.6" W
N 84° 49' 00.0" W
N 88° 23' 00.0" W
-I26- TS 464+79.68
-I26- SC 466+79.68
-I26- CS 471+93.01
-I26- ST 473+93.01
CONTRACTOR TO INSTALL SAFETY FENCE AROUND ALLOWABLE WORKING AREA AND/OR AS DIRECTED BY THE ENGINEER.
CONTRACTOR TO INSTALL CONCRETE BARRIER AROUND DUKE ENERGY TRANSMISSION STRUCTURES (NO CLOSER THAN 10') WHENEVER CONSTRUCTION EQUIPMENT IS WITHIN 25' OF STRUCTURE AND/OR TO THE LIMITS AS DIRECTED BY THE ENGINEER.
CONTRACTOR TO REMOVE AND RESET APPROX. 50 LF OF CONTROL OF ACCESS FENCE AS DIRECTED BY THE ENGINEER.
CONTRACTOR TO REMOVE AND REPLACE APPROX. 125 LF OF GUARDRAIL FOR DRAINAGE PIPE INSTALLATION AS DIRECTED BY THE ENGINEER.
RIP-RAP AT EMBANKMENT CLASS "II" RIP-RAP EST. 40 TONS L=35' FT
VAR. WIDTH BASE DITCH SEE DETAIL SHEET 2D-13 CLASS "I" RIP-RAP EST. 120 TONS EST. 170 CY DDE L=60' FT S=20.0%
SEE DETAIL SHEET 2D-35 FOR PIPE PROFILE
SEE DETAIL SHEET 2D-36 FOR PIPE PROFILE
ENERGY DISSIPATOR JB
FOREBAY #3 SEE DETAIL SHEET 2D-21 EST. 130 SY CONC. EST. 115 CY DDE
FOREBAY #4 SEE DETAIL SHEET 2D-24 EST. 143 SY CONC. EST. 150 CY DDE
REPLACE CONC. DITCH L=50'
REMOVE EX. CONC. DITCH -I26- 463+80 TO 465+00 RT
REMOVE EX. CONC. DITCH -I26- 469+75 TO 470+50 RT
REPLACE CONC. DITCH (-I26- STA. 472+55 TO 475+00 RT) L=245' EST. 65 CY DDE
RETAIN CONC. DITCH (CLEAR 15' EASEMENT NORTH SIDE)
PROP. FOREBAY ACCESS
PROP. 12' CONC. DITCH
PROP. 14' FDPS
PROP. FDPS (2' MIN. SAWCUT)
PROP. GUARDRAIL (EXTRA DEPTH)
PROP. SBG
REMOVE 10' EX. PIPE, PLUG, & ABANDON
PIPE IS SEPERATED NEAR RW FENCE
PLUG & ABANDON
RETAIN & LINE W/CIPP
30" CSP (10 GAGE) ROD & LUG W/ GASKETS & ELBOW S=36.4%
24" CSP (12 GAGE) ROD & LUG W/ GASKETS & ELBOW S=17.6%
30" CSP (10 GAGE) ROD & LUG W/ GASKETS S=7.2%
CONSERVATION EASEMENT TO PACOLET AREA CONSERVANCY, INC. IN DB 216 PG 118
WOODS
50+00
55+00
465+00
I-26 EAST
I-26 WEST
SR 1122 (HOWARD GAP RD)
T-132
BY12-45
BY12-46
BY12-47
I26-5

X:\...\I-26 Howard Gap Rd Rehab\Roadway\Proj\I-26-Howard_Gap_Rdy_psh_06.dgn

10/7/2021

PROJECT REFERENCE NO.	SHEET NO.
15614J075010	7
R/W SHEET NO.	

ROADWAY DESIGN ENGINEER — NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 047943 CLINTON B. PRUETT 10/1/2021

HYDRAULICS ENGINEER — NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 044158 BENJAMIN J. HENEGAR 10/1/2021

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

TGS ENGINEERS
804-C N. LAFAYETTE ST
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

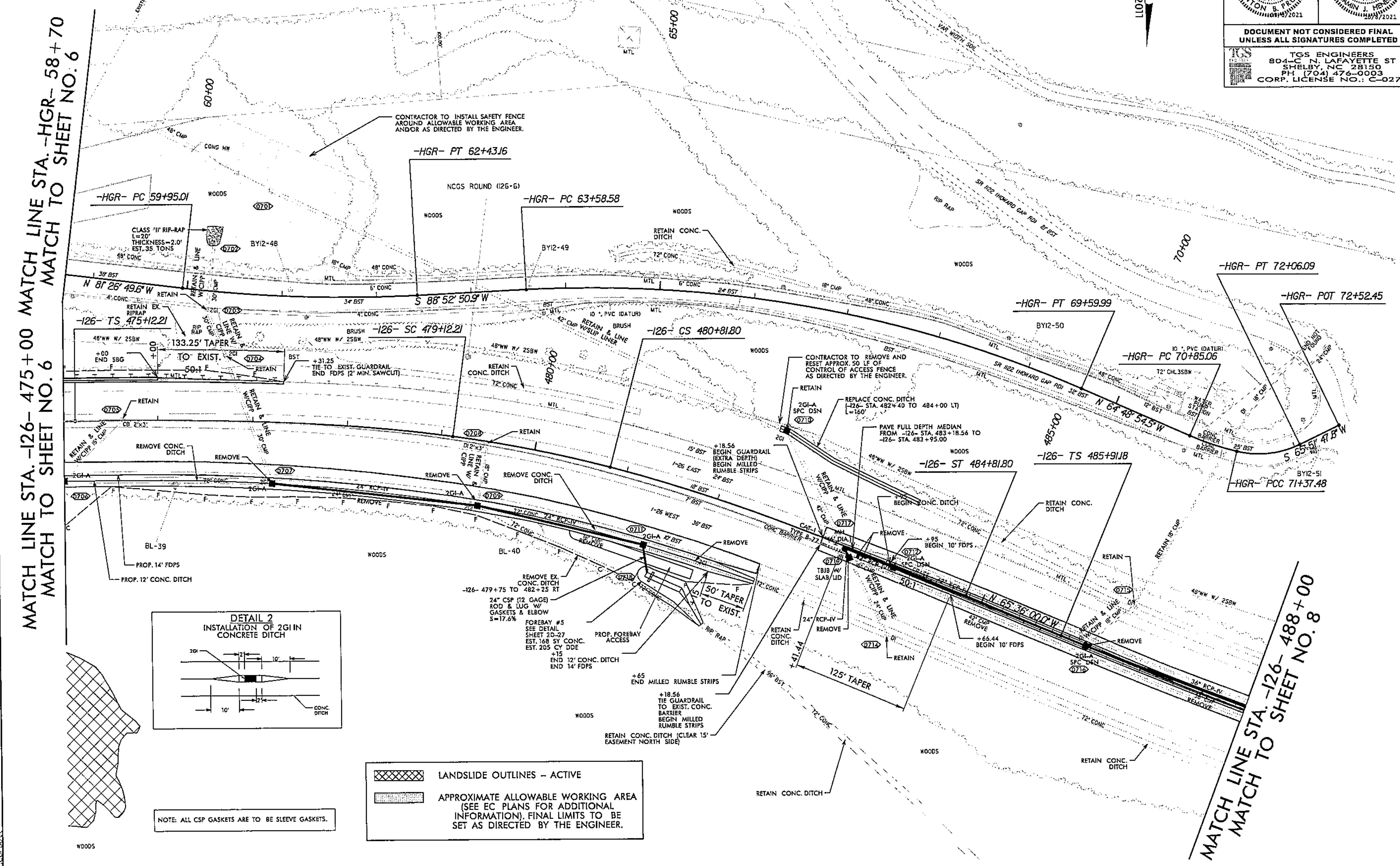
-I26- CURVE DATA

PIs Sta 477+79.15	PI Sta 479+97.10	PIs Sta 482+15.38	PIs Sta 487+91.25
Θs = 8° 00′ 00.0″	Δ = 6° 47′ 00.0″ (RT)	Θs = 8° 00′ 00.0″	Θs = 4° 30′ 00.0″
Ls = 400.00′	D = 4° 00′ 00.0″	Ls = 400.00′	Ls = 300.00′
LT = 266.94′	L = 169.58′	LT = 266.94′	LT = 200.06′
ST = 133.58′	T = 84.89′	ST = 133.58′	ST = 100.06′
	R = 1,432.39′		

-HGR- CURVE DATA

PI Sta 61+19.38	PI Sta 66+64.68	PI Sta 71+11.33	PI Sta 71+73.19
Δ = 9° 40′ 19.5″ (LT)	Δ = 26° 18′ 14.6″ (RT)	Δ = 10° 00′ 42.7″ (LT)	Δ = 39° 18′ 35.0″ (LT)
D = 3° 53′ 51.6″	D = 4° 22′ 25.4″	D = 19° 05′ 54.9″	D = 57° 17′ 44.8″
L = 248.15′	L = 601.41′	L = 52.42′	L = 68.61′
T = 124.37′	T = 306.10′	T = 26.28′	T = 35.72′
R = 1,470.00′	R = 1,310.00′	R = 300.00′	R = 100.00′

NAD 83/2011



MATCH LINE STA. -I26- 475+00 MATCH TO SHEET NO. 6
MATCH LINE STA. -HGR- 58+70 MATCH TO SHEET NO. 6
MATCH LINE STA. -I26- 488+00 MATCH TO SHEET NO. 8
CONTRACTOR TO INSTALL SAFETY FENCE AROUND ALLOWABLE WORKING AREA AND/OR AS DIRECTED BY THE ENGINEER.
-HGR- PC 59+95.01
-HGR- PT 62+43.16
-HGR- PC 63+58.58
NCGS ROUND (I26-G)
-HGR- PT 69+59.99
-HGR- PC 70+85.06
-HGR- PT 72+06.09
-HGR- POT 72+52.45
-HGR- PCC 71+37.48
-I26- TS 475+12.21
-I26- SC 479+12.21
-I26- CS 480+81.80
-I26- ST 484+81.80
-I26- TS 485+91.18
N 81° 26′ 49.6″ W
S 88° 52′ 50.9″ W
N 64° 48′ 54.5″ W
S 65° 51′ 47.8″ W
N 65° 36′ 00.0″ W
SR 1102 (HOWARD GAP RD)
CLASS 'II' RIP-RAP L=20′ THICKNESS=2.0′ EST. 35 TONS
133.25′ TAPER TO EXIST.
+31.25 TIE TO EXIST. GUARDRAIL END FDPS (2′ MIN. SAWCUT)
CONTRACTOR TO REMOVE AND RESET APPROX. 50 LF OF CONTROL OF ACCESS FENCE AS DIRECTED BY THE ENGINEER.
REPLACE CONC. DITCH (-I26- STA. 482+40 TO 484+00 LT) L=160′
PAVE FULL DEPTH MEDIAN FROM -I26- STA. 483+18.56 TO -I26- STA. 483+95.00
+18.56 BEGIN GUARDRAIL (EXTRA DEPTH) BEGIN MILLED RUMBLE STRIPS
REMOVE EX. CONC. DITCH -I26- 479+75 TO 482+25 RT
24″ CSP (12 GAGE) ROD & LUG W/ GASKETS & ELBOW S=17.6%
FOREBAY #5 SEE DETAIL SHEET 20-27 EST. 168 SY CONC. EST. 205 CY DDE
+15 END 12′ CONC. DITCH END 14′ FDPS
PROP. FOREBAY ACCESS
+65 END MILLED RUMBLE STRIPS
+18.56 TIE GUARDRAIL TO EXIST. CONC. BARRIER BEGIN MILLED RUMBLE STRIPS
RETAIN CONC. DITCH (CLEAR 15′ EASEMENT NORTH SIDE)
50′ TAPER TO EXIST.
125′ TAPER
+95 BEGIN 10′ FDPS
+66.44 BEGIN 10′ FDPS
PROP. 14′ FDPS
PROP. 12′ CONC. DITCH
DETAIL 2
INSTALLATION OF 2GI IN CONCRETE DITCH
NOTE: ALL CSP GASKETS ARE TO BE SLEEVE GASKETS.

(crosshatch)	LANDSLIDE OUTLINES – ACTIVE
(stipple)	APPROXIMATE ALLOWABLE WORKING AREA (SEE EC PLANS FOR ADDITIONAL INFORMATION). FINAL LIMITS TO BE SET AS DIRECTED BY THE ENGINEER.

REVISIONS

8/17/99

10/1/2021 X:\NCDOT\I-26 Howard Gap Rd Rehab\Roadway\Proj\I-26-Howard Gap_Rdy_psh_07.dgn

PROJECT REFERENCE NO.	SHEET NO.
15614J075010	8
R/W SHEET NO.	

ROADWAY DESIGN ENGINEER — NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 047943 CLINTON B. PRUETT 10/8/2021

HYDRAULICS ENGINEER — NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 044158 BENJAMIN J. HENEGAR 10/8/2021

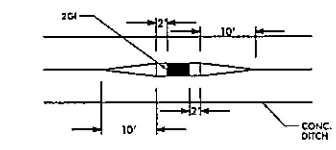
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

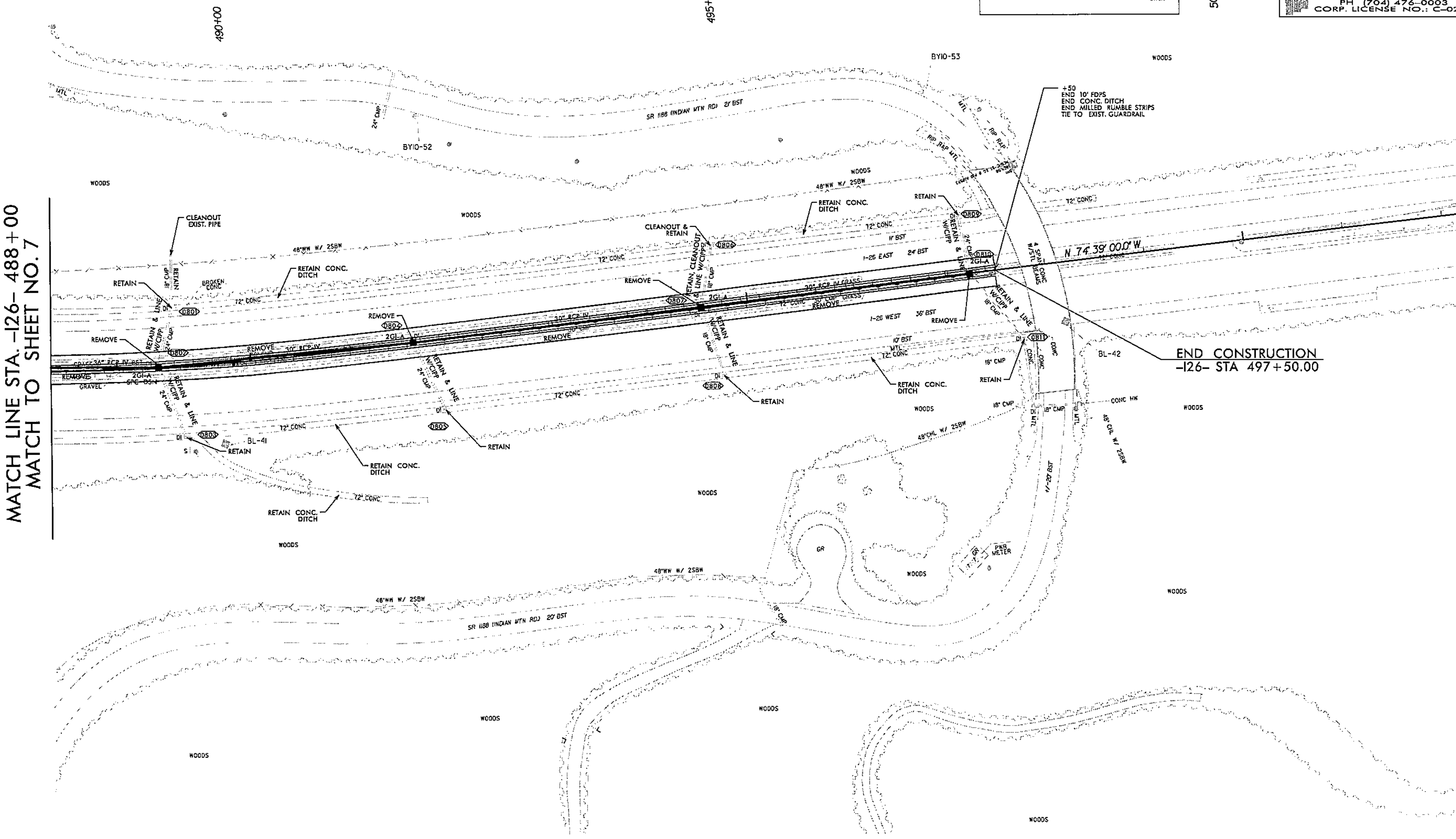
TGS ENGINEERS
804-C N. LAFAYETTE ST
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

-I26- CURVE DATA

PIs Sta 487+91.25	PI Sta 488+92.02	PIs Sta 489+92.91
Θs = 4° 30' 00.0"	Δ = 0° 03' 00.0" (LT)	Θs = 4° 30' 00.0"
Ls = 300.00'	D = 3° 00' 00.0"	Ls = 300.00'
LT = 200.06'	L = 1.67'	LT = 200.06'
ST = 100.06'	T = 0.83'	ST = 100.06'
	R = 1,909.86'	

DETAIL 2
INSTALLATION OF 2GI IN CONCRETE DITCH





REVISIONS

8/17/99

10/7/2021
X:\NCDOT\I-26 Howard Gap Rd Rehab\Roadway\Proj\I-26-Howard Gap_Rdy_psh_08.dgn
Username

PROJECT REFERENCE NO.	SHEET NO.
15614J075010	9
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

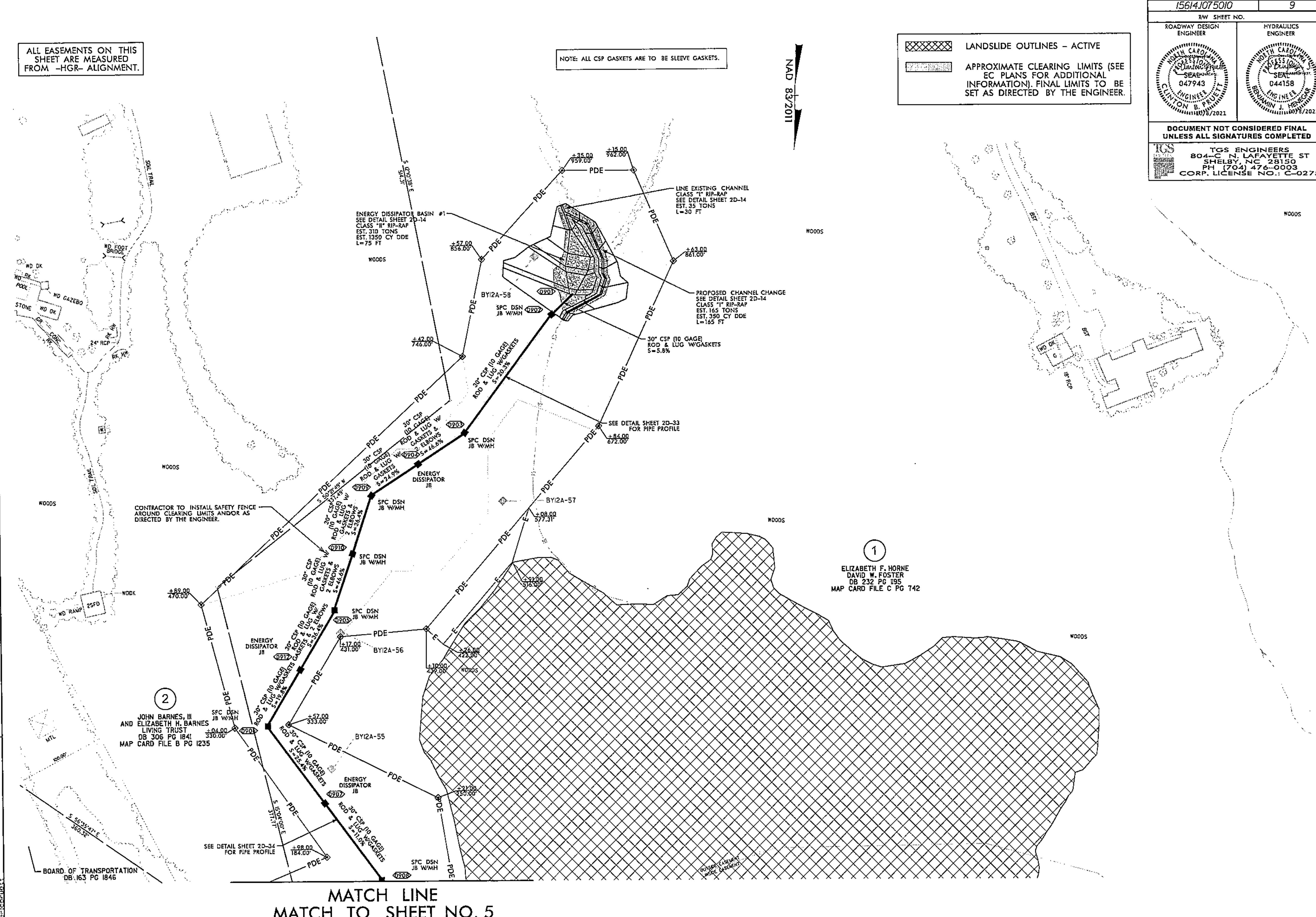
TGS ENGINEERS
804-C N. LAFAYETTE ST
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275

ALL EASEMENTS ON THIS SHEET ARE MEASURED FROM -HGR- ALIGNMENT.

NOTE: ALL CSP GASKETS ARE TO BE SLEEVE GASKETS.

LANDSLIDE OUTLINES - ACTIVE

APPROXIMATE CLEARING LIMITS (SEE EC PLANS FOR ADDITIONAL INFORMATION). FINAL LIMITS TO BE SET AS DIRECTED BY THE ENGINEER.



NAD 83/2011
ENERGY DISSIPATOR BASIN #1
SEE DETAIL SHEET 2D-14
CLASS "II" RIP-RAP
EST. 310 TONS
EST. 1350 CY DDE
L=75 FT
LINE EXISTING CHANNEL
CLASS "I" RIP-RAP
SEE DETAIL SHEET 2D-14
EST. 35 TONS
L=30 FT
PROPOSED CHANNEL CHANGE
SEE DETAIL SHEET 2D-14
CLASS "I" RIP-RAP
EST. 165 TONS
EST. 350 CY DDE
L=165 FT
30" CSP (10 GAGE)
ROD & LUG W/GASKETS
S=5.8%
SEE DETAIL SHEET 2D-33
FOR PIPE PROFILE
SEE DETAIL SHEET 2D-34
FOR PIPE PROFILE
CONTRACTOR TO INSTALL SAFETY FENCE AROUND CLEARING LIMITS AND/OR AS DIRECTED BY THE ENGINEER.
ENERGY DISSIPATOR JB
SPC DSN JB W/MH
BY12A-58
BY12A-57
BY12A-56
BY12A-55
WOODS
SOIL TRAIL
WD FOOT BRIDGE
WD GAZEBO
WD DK
POOL
STONE
24" RCP
WD RAMP
BST
18" RCP
PDE
1
ELIZABETH F. HORNE
DAVID W. FOSTER
DB 232 PG 1195
MAP CARD FILE C PG 742
2
JOHN BARNES, III
AND ELIZABETH H. BARNES
LIVING TRUST
DB 306 PG 1841
MAP CARD FILE B PG 1235
BOARD OF TRANSPORTATION
DB 163 PG 1846
REVISIONS
8/17/99

MATCH LINE
MATCH TO SHEET NO. 5

Polk County

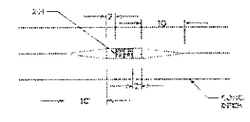
PROJECT REFERENCE NO.	SHEET NO.
15614.1075010	EC-4 CONST'N
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

TGS ENGINEERS
706 HILLSBOROUGH ST
SUITE 200
RALEIGH NC 27603
PH (919) 773-8887
CORP. LICENSE NO.: C-0275

NOTE: ALL CSP GASKETS ARE TO BE SLEEVE GASKETS

NOTE: EXISTING RIGHT OF WAY IS NOT SHOWN BUT EXTENDS OUTSIDE OF PROJECT LIMITS ON SOUTHERN SIDE OF ALIGNMENT.

DETAIL 2
INSTALLATION OF 2GI IN CONCRETE DITCH



NAD 83/2011

CONTRACTOR TO INSTALL SAFETY FENCE AROUND ALLOWABLE WORKING AREA AND/OR AS DIRECTED BY THE ENGINEER.

ORANGE SAFETY FENCE

INSTALL DRAINAGE SYSTEM
-I26- STA 416+14.09

IN LIEU OF ROCK INLET SEDIMENT TRAP TYPE C, UTILIZE FABRIC INSERT INLET PROTECTION DEVICES IN AREAS WHERE WATER MAY POND ON ROAD OPEN TO LIVE TRAFFIC AND ON JUNCTION BOXES INSTALLED ON STEEP SLOPES.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE – B AND TEMPORARY ROCK SILT CHECKS TYPE – A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 4

CLEARING AND GRUBBING
EROSION CONTROL FOR
CONSTRUCTION SHEET 5

MATCH LINE
MATCH TO SHEET NO. 9

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE - B AND TEMPORARY ROCK SILT CHECKS TYPE - A AT DRAINAGE OUTLETS.

IN LIEU OF ROCK INLET SEDIMENT TRAP TYPE C, UTILIZE FABRIC INSERT INLET PROTECTION DEVICES IN AREAS WHERE WATER MAY POND ON ROAD OPEN TO LIVE TRAFFIC AND ON JUNCTION BOXES INSTALLED ON STEEP SLOPES.

SA SENSITIVE AREA

Polk County

PROJECT REFERENCE NO.	SHEET NO.
15614.107.010	EC-5, CONT.5
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

TGS ENGINEERS
706 HILLSBOROUGH ST
SUITE 200
RALEIGH, NC 27603
PH (919) 773-8887
CORP. LICENSE NO.: C-0275

DETAIL 1
PERMANENT ROCK CHECK

DETAIL 2
INSTALLATION OF 2GI IN CONCRETE DITCH

NOTES 1) 0511, 0512, 0513, & 0514 ARE FUTURE DRAINAGE STRUCTURES TO BE CONSTRUCTED DURING THE REPAIR OF HOWARD GAP RD (FUTURE PROJECT)

2.) ALL CSP GASKETS ARE TO BE SLEEVE GASKETS.

BYCA-5 CONTRACTOR TO REMOVE AND REPLACE APPROX 225 LF OF GUARDRAIL FOR DRAINAGE PIPE INSTALLATION AS DIRECTED BY THE ENGINEER

CONTRACTOR TO INSTALL CONCRETE BARRIER AROUND DUKE ENERGY TRANSMISSION STRUCTURES AND CLOSER THAN 10' WHENEVER CONSTRUCTION EQUIPMENT IS WITHIN 25' OF STRUCTURE AND/OR TO THE LIMITS AS DIRECTED BY THE ENGINEER

CONTRACTOR TO REMOVE AND DISPOSE APPROX 10 CY OF CONCRETE AS DIRECTED BY ENGINEER

BEGIN CONSTRUCTION
-I26- STA. 450+40.00

MATCH LINE STA. -I26- 462+00
MATCH TO SHEET NO. 6

MATCH LINE STA. -HGR- 46+00
MATCH TO SHEET NO. 6

NAD 83/2011

Polk County

PROJECT REFERENCE NO.	SHEET NO.
15614.1.F.5010	EC-6 CONST.
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

TGS ENGINEERS
706 HILLSBOROUGH ST
SUITE 200
RALEIGH, NC 27603
PH (919) 773-8887
CORP. LICENSE NO.: C-0275

ORANGE SAFETY FENCE

IN LIEU OF ROCK INLET SEDIMENT TRAP TYPE C, UTILIZE FABRIC INSERT INLET PROTECTION DEVICES IN AREAS WHERE WATER MAY POND ON ROAD OPEN TO LIVE TRAFFIC AND ON JUNCTION BOXES INSTALLED ON STEEP SLOPES.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE – B AND TEMPORARY ROCK SILT CHECKS TYPE – A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 6

DETAIL 2
INSTALLATION OF 2GI IN CONCRETE DITCH

ENVIRONMENTALLY SENSITIVE AREA
SEE PROJECT SPECIAL PROVISIONS

NOTE: ALL CSP GASKETS ARE TO BE SLEEVE GASKETS.

CONTRACTOR TO INSTALL SAFETY FENCE AROUND ALLOWABLE WORKING AREA AND/OR AS DIRECTED BY THE ENGINEER.

CONTRACTOR TO INSTALL SAFETY FENCE AROUND ALLOWABLE WORKING AREA AND/OR AS DIRECTED BY THE ENGINEER.

NAD 83(2011)

MATCH LINE STA. -126- 462+00
MATCH TO SHEET NO. 5

MATCH LINE STA. -HGR- 46+00
MATCH TO SHEET NO. 5

MATCH LINE STA. -126- 475+00
MATCH TO SHEET NO. 7

MATCH LINE STA. -HGR- 58+70
MATCH TO SHEET NO. 7

Polk County

PROJECT REFERENCE NO.	SHEET NO.
15614.107501	E-7 SHEET 7
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

TGS ENGINEERS
706 HILLSBOROUGH ST
SUITE 200
RALEIGH, NC 27603
PH (919) 773-8887
CORP. LICENSE NO.: C-0275

NAD 83/2011

MATCH LINE STA. -I26- 475+00
MATCH TO SHEET NO. 6

MATCH LINE STA. -I26- 488+00
MATCH TO SHEET NO. 8

ENVIRONMENTALLY SENSITIVE AREA
SEE PROJECT SPECIAL PROVISIONS

ORANGE SAFETY FENCE

CONTRACTOR TO INSTALL SAFETY FENCE AROUND ALLOWABLE WORKING AREA AND/OR AS DIRECTED BY THE ENGINEER.

CONTRACTOR TO RESERVE AND FENCE APPROPRIATE ACCESS CONTROL OR ACCESS FENCE AS DIRECTED BY THE ENGINEER.

DETAIL 2
INSTALLATION OF 2GI IN CONCRETE DITCH

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 7

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE – B AND TEMPORARY ROCK SILT CHECKS TYPE – A AT DRAINAGE OUTLETS.

IN LIEU OF ROCK INLET SEDIMENT TRAP TYPE C, UTILIZE FABRIC INSERT INLET PROTECTION DEVICES IN AREAS WHERE WATER MAY POND ON ROAD OPEN TO LIVE TRAFFIC AND ON JUNCTION BOXES INSTALLED ON STEEP SLOPES.

NOTE: ALL CSP GASKETS ARE TO BE SLEEVE GASKETS

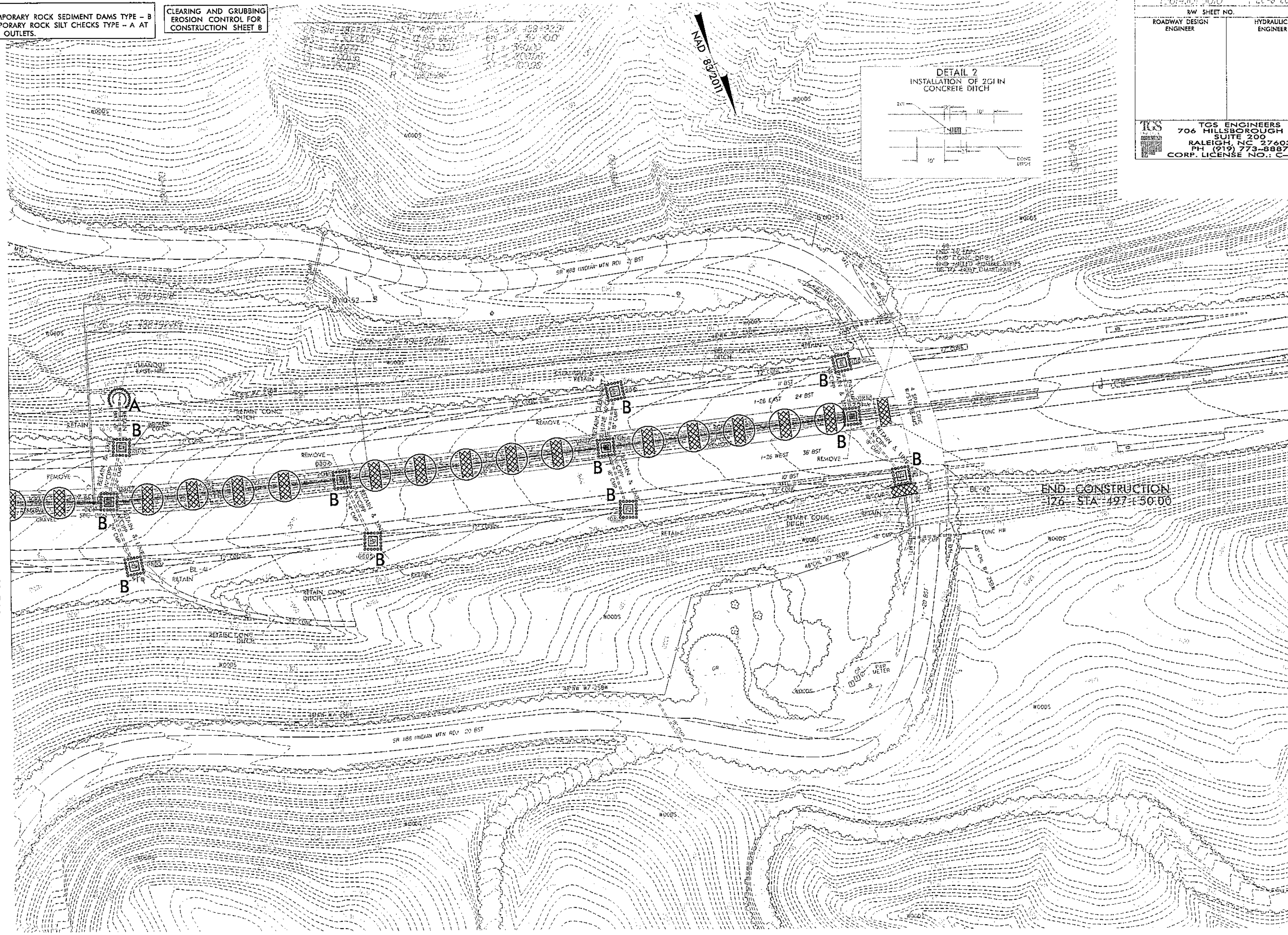
Polk County

PROJECT REFERENCE NO.	SHEET NO.
I56H.I075010	EC-8 CONST.8
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

TGS ENGINEERS
706 HILLSBOROUGH ST
SUITE 200
RALEIGH, NC 27603
PH (919) 773-8887
CORP. LICENSE NO.: C-0275

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE – B AND TEMPORARY ROCK SILT CHECKS TYPE – A AT DRAINAGE OUTLETS.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 8



NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE – B AND TEMPORARY ROCK SILT CHECKS TYPE – A AT DRAINAGE OUTLETS.

IN LIEU OF ROCK INLET SEDIMENT TRAP TYPE C, UTILIZE FABRIC INSERT INLET PROTECTION DEVICES IN AREAS WHERE WATER MAY POND ON ROAD OPEN TO LIVE TRAFFIC AND ON JUNCTION BOXES INSTALLED ON STEEP SLOPES.

CLEARING AND GRUBBING EROSION CONTROL FOR CONSTRUCTION SHEET 9

ENVIRONMENTALLY SENSITIVE AREA
SEE PROJECT SPECIAL PROVISIONS

ALL EASEMENTS ON THIS SHEET ARE MEASURED FROM –HGR– ALIGNMENT.

NOTE: ALL CSP GASKETS ARE TO BE SLEEVE GASKETS.

NAD 83/2011

ORANGE SAFETY FENCE

Polk County

PROJECT REFERENCE NO.	SHEET NO.
15BHJOT5010	EC-9 CONST.9
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

TGS ENGINEERS
706 HILLSBOROUGH ST
SUITE 200
RALEIGH, NC 27603
PH (919) 773-8887
CORP. LICENSE NO.: C-0275

CONTRACTOR TO INSTALL SAFETY FENCE AROUND ALLOWABLE WORKING AREA AND/OR AS DIRECTED BY THE ENGINEER.

UTILIZE PUMP AROUND OPERATION FOR CONSTRUCTION OF ENERGY DISSIPATOR BASIN AND CHANNEL CHANGE. REFER TO EC-2A.

MATCH LINE
MATCH TO SHEET NO. 5

Polk County

PROJECT REFERENCE NO.	SHEET NO.
15614.07.501	EC-10 CONST-1
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

TGS ENGINEERS
706 HILLSBOROUGH ST
SUITE 200
RALEIGH, NC 27603
PH (919) 773-8887
CORP. LICENSE NO.: C-0275

NOTE: ALL CSP GASKETS ARE TO BE SLEEVE GASKETS.

NOTE: EXISTING RIGHT OF WAY IS NOT SHOWN BUT EXTENDS OUTSIDE OF PROJECT LIMITS ON SOUTHERN SIDE OF ALIGNMENT.

-126- CURVE DATA

Pt's Sta 415+45.24	Pt Sta Pt =417.11	Pt's Sta 419+49.38
Θs = 8°00'00"	Δ = 5°10'03.04" (RT)	Θs = 8°00'00"
Ls = 400.00'	D = 4°00'00"	Ls = 400.00'
LT = 266.94'	L = 737.80'	LT = 266.94'
ST = 133.58'	T = 68.90'	ST = 133.58'
	R = 1432.40'	

Pt's Sta 425+36.75	Pt Sta 429+17.63	Pt's Sta 430+90.36
Θs = 8°00'00"	Δ = 11°28'03.0" (LT)	Θs = 8°00'00"
Ls = 400.00'	D = 4°00'00"	Ls = 400.00'
LT = 266.94'	L = 695.67'	LT = 266.94
ST = 133.58'	T = 143.81'	ST = 133.58
	R = 1432.40'	

DETAIL 2
INSTALLATION OF 2GI IN CONCRETE DITCH

NAD 83/2011

CONTRACTOR TO INSTALL SAFETY FENCE AROUND ALLOWABLE WORKING AREA AND/OR AS DIRECTED BY THE ENGINEER.

ORANGE SAFETY FENCE

-126- TS 412+78.30

-126- SC 416+78.30

-126- CS 418+15.80

-126- ST 422+15.20

-126- TS 422+69.20

-126- SC 426+63.81

INSTALL DRAINAGE SYSTEM
-126- STA 416+14.09

IN LIEU OF ROCK INLET SEDIMENT TRAP TYPE C, UTILIZE FABRIC INSERT INLET PROTECTION DEVICES IN AREAS WHERE WATER MAY POND ON ROAD OPEN TO LIVE TRAFFIC AND ON JUNCTION BOXES INSTALLED ON STEEP SLOPES.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE – B AND TEMPORARY ROCK SILT CHECKS TYPE – A AT DRAINAGE OUTLETS.

MATCH LINE
MATCH TO SHEET NO. 9

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE – B AND TEMPORARY ROCK SILT CHECKS TYPE – A AT DRAINAGE OUTLETS.

IN LIEU OF ROCK INLET SEDIMENT TRAP TYPE C, UTILIZE FABRIC INSERT INLET PROTECTION DEVICES IN AREAS WHERE WATER MAY POND ON ROAD OPEN TO LIVE TRAFFIC AND ON JUNCTION BOXES INSTALLED ON STEEP SLOPES.

SA SENSITIVE AREA

Polk County

PROJECT REFERENCE NO.	SHEET NO.
15BU.1(50)0	ES-1-CONST.5
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

TGS ENGINEERS
706 HILLSBOROUGH ST
SUITE 200
RALEIGH, NC 27603
PH (919) 773-8887
CORP. LICENSE NO.: C-0275

DETAIL 1
PERMANENT ROCK CHECK

DETAIL 2
INSTALLATION OF 2GI IN CONCRETE DITCH

-HGR- PC 41+73.29

-HGR- PT 43+90.32

-HGR- PC 45+24.76

-126- CS 454+20.98

-126- ST 458+20.98

-126- CURVE DATA

	PI Sta 449+05.00	PI Sta 455+54.26
	Δ = 16°36' 30.4" (RT)	Δ = 5°37' 09.0"
	D = 1°45' 00.0"	Ls = 400.00
	L = 1034.49	TT = 266.72
	T = 521.67	ST = 133.38
	R = 3,271.05'	

-HGR- CURVE DATA

	PI Sta 31+76.32	PI Sta 33+54.96	PI Sta 36+36.20	PI Sta 42+98.00	PI Sta 45+56.42
RETAIN CONC DITCH	Δ = 11°24' 40.2" (LT)	Δ = 16°52' 52.1" (RT)	Δ = 12°16' 29.9" (RT)	Δ = 41°16' 57.4" (RT)	Δ = 24°11' 40.0" (LT)
	D = 12°43' 56.6"	D = 14°19' 26.2"	D = 2°29' 26.0"	D = 19°05' 54.9"	D = 19°45' 25.9"
	L = 89.62	L = 97.85'	L = 94.27'	L = 211.03'	L = 121.5'
	T = 44.95'	T = 55.36'	T = 47.34'	T = 114.5'	T = 61.66'
	R = 450.00'	R = 400.00'	R = 2,300.00'	R = 300.00'	R = 290.00'

BEGIN CONSTRUCTION
-126- STA 450+40.00

MATCH LINE STA. -126- 462+00
MATCH TO SHEET NO. 6

MATCH LINE STA. -HGR- 46+00
MATCH TO SHEET NO. 6

NAD 83/2011

Polk County

PROJECT REFERENCE NO.	SHEET NO.
15BI-HJ0T501D	67-12 CONT'D
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

TGS ENGINEERS
706 HILLSBOROUGH ST
SUITE 200
RALEIGH, NC 27603
PH (919) 773-8887
CORP. LICENSE NO.: C-0275

ORANGE SAFETY FENCE

IN LIEU OF ROCK INLET SEDIMENT TRAP TYPE C, UTILIZE FABRIC INSERT INLET PROTECTION DEVICES IN AREAS WHERE WATER MAY POND ON ROAD OPEN TO LIVE TRAFFIC AND ON JUNCTION BOXES INSTALLED ON STEEP SLOPES.

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE – B AND TEMPORARY ROCK SILT CHECKS TYPE – A AT DRAINAGE OUTLETS.

-HGR- CURVE DATA

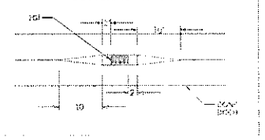
Pi Sta 45+36.43	Pi Sta 50+90.24	Pi Sta 53+74.05	Pi Sta 58+42.71
Δ = 2°55'25.0" (LT)	Δ = 10°06'44.3" (LT)	Δ = 17°18'26.3" (RT)	Δ = 12°50'07.5" (LT)
D = 12°45'25.6"	D = 5°06'56.5"	D = 6°44'26.4"	D = 8°37'62.0"
L = 121.51'	L = 492.33'	L = 180.76'	L = 226.50'
T = 60.80'	T = 99.42'	T = 90.85'	T = 113.73'
R = 450.00'	R = 1120.00'	R = 850.00'	R = 1,020.00'

NOTE: ALL CSP GASKETS ARE TO BE SLEEVE GASKETS.

-126- CURVE DATA

Pi Sta 466+53.01	Pi Sta 469+26.33	Pi Sta 474+55.68
Δs = (T 30.00'00")	Δ = 2°34'00.0" (LT)	Δs = (T 30.00'00")
Ls = 200.00'	D = 0°30'30.0"	Ls = 200.00'
LT = 133.33'	L = 551.33'	LT = 133.33'
ST = 66.67'	R = 225.71'	ST = 66.67'
	R = 11,459.16'	

DETAIL 2
INSTALLATION OF 2GI IN CONCRETE DITCH



NAD 83/2011

MATCH LINE STA. -HGR- 46+00
MATCH TO SHEET NO. 5

MATCH LINE STA. -126- 462+00
MATCH TO SHEET NO. 5

MATCH LINE STA. -HGR- 58+70
MATCH TO SHEET NO. 7

MATCH LINE STA. -126- 475+00
MATCH TO SHEET NO. 7

CONTRACTOR TO INSTALL SAFETY FENCE AROUND ALLOWABLE WORKING AREA AND/OR AS DIRECTED BY THE ENGINEER.

CONTRACTOR TO INSTALL SAFETY FENCE AROUND ALLOWABLE WORKING AREA AND/OR AS DIRECTED BY THE ENGINEER.

Place Matting for Erosion Control on Slope as Work Allows.
-L- Sta. 471+50 to 475+00 RT
EST. 2966 SY

Polk County

PROJECT REFERENCE NO.	SHEET NO.
1561402501	EC-13/CONST.P
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

TGS ENGINEERS
706 HILLSBOROUGH ST
SUITE 200
RALEIGH, NC 27603
PH (919) 773-8887
CORP. LICENSE NO.: C-0275

NAD 83/2011

-HGR- CURVE DATA

PI Sta 477+73.15	PI Sta 479+92.50	PI Sta 482+15.38	PI Sta 487+83.25
ES = 8°00'00"	Δ = 11°41'00" (LT)	ES = 8°00'00"	ES = 4°30'00"
Lg = 400.00'	D = 4°00'00"	Lc = 419.23'	Ls = 300.00'
LT = 244.94'	Lc = 162.56'	LT = 256.54'	LT = 200.06'
ST = 133.58'	T = 84.69'	ST = 133.58'	ST = 100.04'
	R = 1,432.69'		

-HGR- CURVE DATA

PI Sta 51+19.35	PI Sta 55+05.56	PI Sta 114+11.33	PI Sta 119+57.19
Δ = 9°41'55.5" (LT)	Δ = 10°18'45.8" (RT)	Δ = 10°00'42.2" (LT)	Δ = 39°19'15.4" (LT)
D = 3°53'52"	D = 2°22'05.4"	D = 9°35'54.8"	D = 57°19'44.2"
L = 249.15'	L = 611.41'	L = 532.42'	L = 686.61'
T = 124.97'	T = 306.10'	T = 276.28'	T = 375.76'
R = 1,470.00'	R = 1,500.00'	R = 600.00'	R = 100.00'

MATCH LINE STA. -126- 475+00
MATCH TO SHEET NO. 6

MATCH LINE STA. -126- 488+00
MATCH TO SHEET NO. 8

ORANGE SAFETY FENCE

CONTRACTOR TO INSTALL SAFETY FENCE AROUND ALLOWABLE WORKING AREA AND/OR AS DIRECTED BY THE ENGINEER.

-HGR- PC 59+95.01

-HGR- PT 62+43.15

-HGR- PT 63+58.59

-HGR- PT 69+59.99

-HGR- PT 72+06.28

-HGR- PRT 72+52.45

-HGR- PC 70+85.06

-126- PC 475+12.21

-126- SC 479+12.21

-126- CS 480+81.20

-126- ST 484+81.20

-126- TS 485+81.18

-HGR- PCC 71+57.49

CLASS II RIP-RAP L=20' THICKNESS=2.0' EST. 35 TONS

133.25' TAPER

EXIST. 30" CMP

END EXIST. GUARDRAIL

ENG FDFS (2' MIN. SAWCUT)

REMOVE CONC. DITCH

REMOVE

RETAIN

RETAIN CONC DITCH

RETAIN CONC. DITCH

REPLACE CONC. DITCH -126- STA. 482+10 TO 484+00 LT

PAVE FULL DEPTH MEDIAN FROM -126- STA. 483+18.50 TO -126- STA. 483+95.00

BEGIN SHOULDER DRAINAGE DITCH

BEGIN CONC DITCH

RETAIN CONC DITCH

REMOVE EX. CONC. DITCH -126- 479+75 TO 482+25 RT

24" CSP (12 GAGE) FDS & LUG W/ GASKETS & ELBOW S=17.6%

FOFEBAY #5 SEE DETAIL SHEET SD-27 EST. 168 SY CONC. EST 205 CY DSE

PROP FOREBAY ACCESS

END 12" CONC DITCH END 14" FDFS

#66 END MILLED RUMBLE STRIPS

19.84 TIE GUARDRAIL TO EXIST CONC. BARRIER BEGIN MILLED RUMBLE STRIPS

RETAIN CONC DITCH (CLEAR TS EASEMENT NORTH SIDE)

50' TAPER

125' TAPER

PROP. 14' FDFS

PROP 12" CONC DITCH

Place Matting for Erosion Control on Slope as Work Allows.
-L- Sta. 475+00 to 475+50 RT
EST. 254 SY

DETAIL 2
INSTALLATION OF 2GI IN CONCRETE DITCH

NOTE: ALL CSP GASKETS ARE TO BE SLEEVE GASKETS

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE – B AND TEMPORARY ROCK SILT CHECKS TYPE – A AT DRAINAGE OUTLETS.

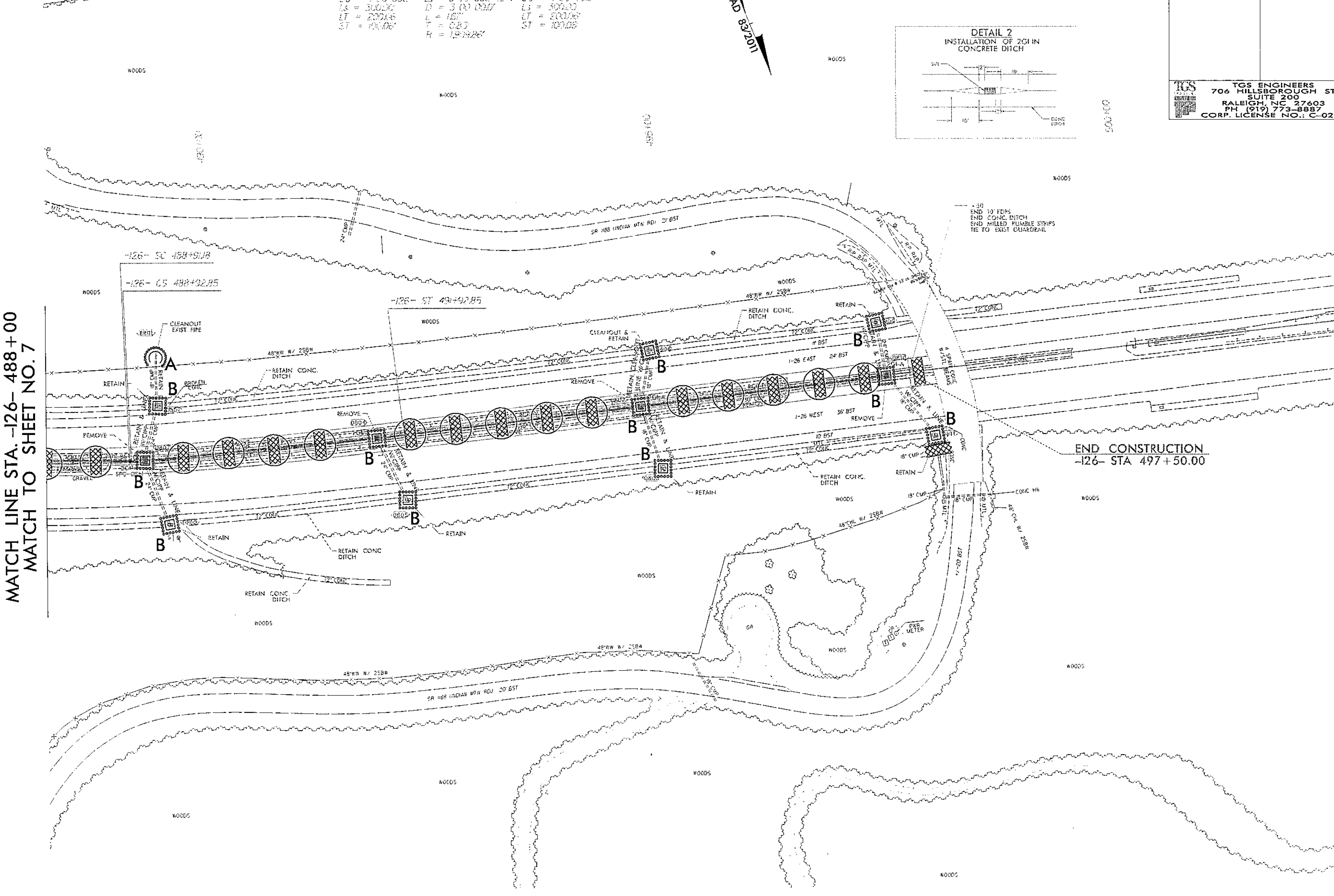
IN LIEU OF ROCK INLET SEDIMENT TRAP TYPE C, UTILIZE FABRIC INSERT INLET PROTECTION DEVICES IN AREAS WHERE WATER MAY POND ON ROAD OPEN TO LIVE TRAFFIC AND ON JUNCTION BOXES INSTALLED ON STEEP SLOPES.

Polk County

PROJECT REFERENCE NO.	SHEET NO.
15614.1075010	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

TGS ENGINEERS
706 HILLSBOROUGH ST
SUITE 200
RALEIGH, NC 27603
PH (919) 773-8887
CORP. LICENSE NO.: C-0275

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE – B AND TEMPORARY ROCK SILT CHECKS TYPE – A AT DRAINAGE OUTLETS.


-I26- CURVE DATA
NAD 83/2011
DETAIL 2
INSTALLATION OF 2GI IN CONCRETE DITCH
MATCH LINE STA. -I26- 488+00
MATCH TO SHEET NO. 7
-I26- SC 488+91.18
-I26- CS 488+92.85
-I26- ST 491+92.85
END CONSTRUCTION
-I26- STA 497+50.00
END 10' FDPS
END CONC. DITCH
END MILLED RUMBLE STRIPS
TIE TO EXIST GUARDRAIL
CLEANOUT EXIST. PIPE
CLEANOUT & RETAIN
RETAIN CONC. DITCH
RETAIN
REMOVE
I-26 EAST
I-26 WEST
SR 1188 (INDIAN MTN RD)
WOODS
A
B

NOTE:
PLACE TEMPORARY ROCK SEDIMENT DAMS TYPE – B AND TEMPORARY ROCK SILT CHECKS TYPE – A AT DRAINAGE OUTLETS.

IN LIEU OF ROCK INLET SEDIMENT TRAP TYPE C, UTILIZE FABRIC INSERT INLET PROTECTION DEVICES IN AREAS WHERE WATER MAY POND ON ROAD OPEN TO LIVE TRAFFIC AND ON JUNCTION BOXES INSTALLED ON STEEP SLOPES.

ALL EASEMENTS ON THIS SHEET ARE MEASURED FROM –HGR– ALIGNMENT.

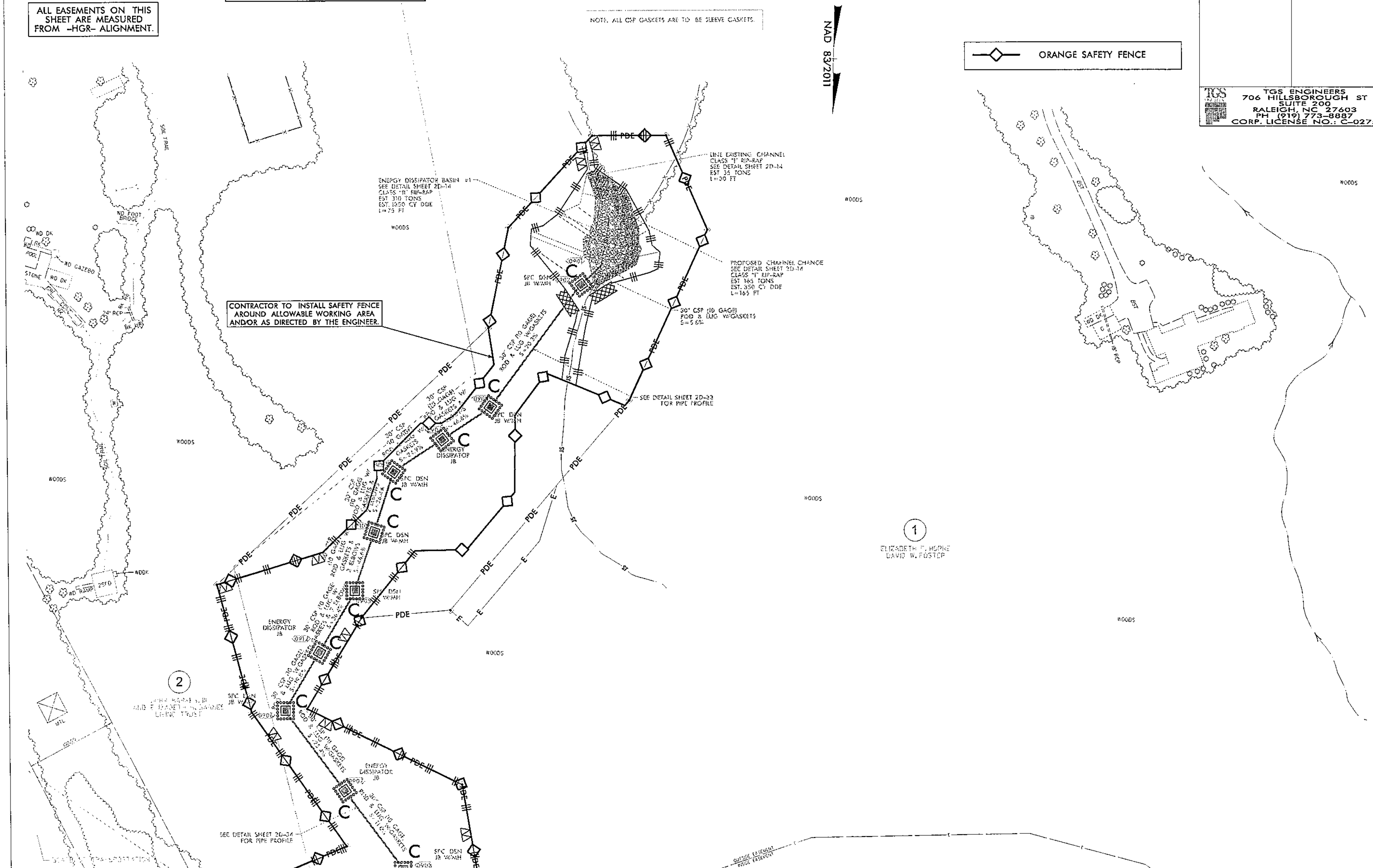
Polk County

PROJECT REFERENCE NO.	SHEET NO.
15614.ICT.5010	EC-15-CONST.9
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

TGS ENGINEERS
706 HILLSBOROUGH ST
SUITE 200
RALEIGH, NC 27603
PH (919) 773-8887
CORP. LICENSE NO.: C-0275

NOTE: ALL CSP GASKETS ARE TO BE SLEEVE GASKETS.

ORANGE SAFETY FENCE



MATCH LINE
MATCH TO SHEET NO. 5