



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

ROY COOPER  
GOVERNOR

J.R. "JOEY" HOPKINS  
SECRETARY

June 4, 2024

U.S. Army Corps of Engineers  
Asheville Regulatory Field Office  
151 Patton Avenue, Room 208  
Asheville, NC 28801-5006

N.C. Division of Water Resources  
Mooresville Regional Office  
610 East Center Avenue, Suite 301  
Mooresville, NC 28115

ATTN: Ms. Crystal Amschler  
NCDOT Coordinator

ATTN: Ms. Beth Plummer  
NCDOT Coordinator

**Subject: Request for Modification and Renewal of the Section 404 Individual Permit and Section 401 Individual Water Quality Certification, and Catawba Riparian Buffer Authorization** for the Widening of NC 150 from the NC 16 Bypass in Catawba County to just west of the US 21/NC 150 Interchange in Iredell County, including the Interchange with I-77. Federal Aid Project No. STP-150(19), Division 12, TIP No. R-2307 and I-5717.

**References:** 1) Section 404 Individual Permit, Action ID No. SAW-2018-02343, issued September 3, 2020;  
2) Section 401 Individual Water Quality Certification and Catawba Riparian Buffer Authorization, NCDWR Project No. 20181732, issued April 17, 2019

Dear Madams:

The purpose of this letter is to request renewal of the existing U. S. Army Corps of Engineers (USACE) Section 404 Individual Permit and N.C. Division of Water Resources (NCDWR) Section 401 Water Quality Certification (WQC) and Catawba Riparian Buffer Authorization.

The North Carolina Department of Transportation (NCDOT) was issued a Clean Water Act Section 404 Individual Permit from the USACE on September 3, 2020 for the above-referenced project. The project letting has been delayed and will not be completed prior to the December 31, 2025 expiration date. Therefore, NCDOT requests renewal of the Section 404 Individual Permit.

NCDOT was also issued an Individual Section 401 WQC and Catawba Riparian Buffer Authorization from NCDWR on April 17, 2019. Therefore, a renewal of these approvals is also requested.

*Mailing Address:*  
NC DEPARTMENT OF TRANSPORTATION  
ENVIRONMENTAL ANALYSIS UNIT  
1598 MAIL SERVICE CENTER  
RALEIGH, NC 27699-1598

*Telephone:* (919) 707-6000  
*Fax:* (919) 250-4224  
*Customer Service:* 1-877-368-4968

*Location:*  
1000 BIRCH DRIVE  
RALEIGH, NC 27610

*Website:* [ncdot.gov](http://ncdot.gov)

### **Impacts to Waters of the US**

No changes have occurred to the special commitments for this project, however several minor revisions have been made to permitted impact totals which are summarized below.

#### *Wetland & Stream Impact changes:*

1. Site 3: Permanent Surface Water Impacts decreased from 3.11 acres to 3.079 acres due to minor slope stake changes at Lake Norman.
2. Site 3: Three temporary Surface Water Impacts were added down to elevation 750 ft on Permit Drawing Sheets 2-5. Temporary Surface Water Impacts increased from 0 to 0.070 acre.
3. Due to concerns from Duke Energy regarding boater safety and the alignment of bridge piers with the existing structure, the proposed bridge span arrangement was modified to better match the existing bridge. Permit Drawing Sheets 4-6 and associated footnote on the Impact Summary Sheet were updated.
4. Site 4: Permanent Surface Water Impacts decreased from 3.91 acres to 3.859 acres due to minor slope changes at Lake Norman.
5. Site 4: Two temporary Surface Water Impacts were added down to elevation 750 ft on Permit Drawing Sheets 7-8. Temporary Surface Water Impacts increased from 0 to 0.162 acre.
6. Site 10: The previous design proposed a 9' diameter precast manhole connecting an existing RCBC to a proposed 78" RCP at the downstream culvert extension at 784+50 RT (Permit Site 10). NCDOT determined that attaching a precast manhole to the existing RCBC is not feasible and would require a cast in place connection. To avoid this situation, the existing 5'W x 6'H RCBC will be extended. This will result in the outlet of the RCBC shifting 3' west of the previous 78" RCP outlet. However, the inverts, lengths, and channel layout will remain the same. There are no changes to stream impacts.
7. Site 12: Permanent impact decreased from 28 to 27 linear feet due to a corrected measurement (The change is only reflected on the Impact Summary Sheet, no change to the plan view).
8. Impact Summary Sheet: Impacts on the previous version were shown to nearest 0.01 acre and now show the nearest 0.001 acre.

#### *Buffer Impact changes:*

1. Site 5: Buffer Zone 1 impacts decreased from 5,745 SF to 5,565 SF due to easements changing.
2. Site 8: Buffer Zone 1 impacts decreased from 3,449 SF to 3,364 SF due to impacts being corrected to be fully within the buffer zone 1 area and a minor change to the Permanent Utility Easement.
3. Site 8: Buffer Zone 2 impacts increased from 5,164 SF to 5,171 SF due to a minor change to the Permanent Utility Easement.

#### *Mitigation*

No changes to the previously accepted mitigation is proposed.

### **Federally Protected Species**

The United States Fish and Wildlife Service (USFWS) list the following federally protected species within the study area, under the Endangered Species Act (ESA).

Table 1. ESA federally protected species within the R-2307 and I-5717 Study Areas<sup>1</sup>

County	Name	Listing Since Previous Permit Issuance	Federal Status	Habitat Present	Biological Conclusion	Last Survey
Catawba & Iredell	tricolored bat	Added	Proposed Endangered	Yes	Not Required	--
Catawba & Iredell	bog turtle	Added to Catawba County	Threatened due to similarity of appearance	No	Not Required	n/a
Catawba & Iredell	dwarf-flowered heartleaf	Unchanged	Threatened	Yes	No Effect	3/25/2024
Catawba & Iredell	Schweinitz's sunflower	Added to Iredell County	Endangered	Yes	No Effect	10/18/2023
Catawba & Iredell	Northern long-eared bat	Now Outside of Range	Threatened	n/a	n/a	n/a
Catawba & Iredell	Michaux's sumac	Now Outside of Range	Endangered	n/a	n/a	n/a

<sup>1</sup> IPaC data checked on April 15, 2024

On September 14, 2022, the USFWS announced a proposal to list the tricolored bat (*Perimyotis subflavus* - PESU) as endangered under the Endangered Species Act. NCDOT has requested Informal Concurrence/Conference from the USFWS in advance of the official listing of this species. Construction activities for this project will not take place until NCDOT (in coordination with our lead federal agency) satisfies Endangered Species Act compliance for PESU.

NCDOT submitted Section 7 Concurrence (informal) to the USFWS on March 7, 2024, and received informal concurrence from the USFWS on May 28, 2024. The letter is included with this application.

### **Cultural Resources**

No changes have occurred since the previously issued permit related to Section 106 resources.

### **Regulatory Approvals**

Application is hereby made for a modification and renewal of the USACE 404 permit and the 401 Water Quality Certification and Catawba Riparian Buffer Authorization from NCDWR. NCDOT requests to renew the permits and buffer authorization for this project with an expiration date of December 31, 2034.

A copy of this permit renewal request and its distribution list will be posted in the NCDOT website at <http://connect.ncdot.gov/resources/Environmental>.

Thank you for your assistance with this project. If you have any questions or need additional information, please contact me at either [maturchy@ncdot.gov](mailto:maturchy@ncdot.gov) or (919) 707-6157.

Sincerely,



Michael Turchy  
 Environmental Coordination and Permitting Group Leader  
 NCDOT Environmental Analysis Unit

# Project Submittal Interim Form



Updated December 4, 2023

*Please note: fields marked with a red asterisk \* below are required. You will not be able to submit the form until all mandatory questions are answered.*

- Project Type: \***
- For the Record Only (Courtesy Copy)
  - New Project
  - Modification/New Project with Existing ID
  - More Information Response
  - Other Agency Comments
  - Pre-Application Submittal
  - Re-Issuance\Renewal Request
  - Stream or Buffer Appeal

## Project Contact Information

**Name:** Michael Turchy  
*Who is submitting the information?*

**Email Address: \*** maturchy@ncdot.gov

## Project Information

<b>Existing ID #: *</b>	<b>Existing Version: *</b>
20181732	1
<i>20170001 (no dashes)</i>	<i>1</i>

**Project Name: \*** R-2307 Widening of NC 150 in Iredell and Catawba Counties

**Is this a public transportation project? \***

- Yes
- No

**Is this a DOT project? \***

- Yes
- No

**Is the project located within a NC DCM Area of Environmental Concern (AEC)? \***

- Yes  No  Unknown

**Does this project involve maintenance dredging funded by the Shallow Draft Navigation Channel Dredging and Aquatic Weed Fund or involve the distribution or transmission of energy or fuel, including natural gas, diesel, petroleum, or electricity? \***

- Yes  No

**Is this project connected with ARPA funding? \***

- Yes  No

**TIP#:**

R-2307

**WBS#:**

37944.1.FR5

(Applies to DOT projects only)

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**County (ies) \***

Catawba

Iredell

**Please upload all files that need to be submitted.**[Click the upload button or drag and drop files here to attach document](#)

R-2307 I-5717 Permit Renewal and Modification

17.85MB

Iredell.pdf

Only pdf or kmz files are accepted.

**Describe the attachments or add comments:**

Cover letter (site descriptions) and permit/buffer drawings.

**\***  By checking the box and signing box below, I certify that:

- I, the project proponent, hereby certifies that all information contained herein is true, accurate, and complete to the best of my knowledge and belief.
- I, the project proponent, hereby requests that the certifying authority review and take action on this CWA 401 certification request within the applicable reasonable period of time.
- I agree that submission of this online form is a "transaction" subject to Chapter 66, Article 40 of the NC General Statutes (the "Uniform Electronic Transactions Act");
- I agree to conduct this transaction by electronic means pursuant to Chapter 66, Article 40 of the NC General Statutes (the "Uniform Electronic Transactions Act");
- I understand that an electronic signature has the same legal effect and can be enforced in the same way as a written signature; AND
- I intend to electronically sign and submit the online form.

**Signature: \***Michael Turchy**Submittal Date:**



# United States Department of the Interior



## FISH AND WILDLIFE SERVICE

Asheville Field Office  
160 Zillicoa Street Suite B  
Asheville, North Carolina 28801

May 28, 2024

Michael Turchy  
ECAP Group Leader, Environmental Analysis Unit  
North Carolina Department of Transportation  
1598 Mail Service Center  
Raleigh, North Carolina 27699

Subject: Informal Conference for Widening of NC 150 from the NC 16 Bypass in Catawba County to West of the US 21/NC 150 Interchange in Iredell County, Including the I-77 Interchange (TIP Nos. R-2307 and I-5717; Service Log #24-212)

Dear Michael Turchy:

On March 7, 2024, we received your request to initiate informal conference procedures for effects the subject project may have on federally proposed species. We have reviewed the information you submitted along with additional information received on May 15, 2024, and the following is provided in accordance with the provisions of the National Environmental Policy Act (42 U.S.C. § 4321 et seq.); the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661 - 667e); Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d)(BGEPA); and section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 - 1543) (Act).

### **Project Description**

According to the information provided, the North Carolina Department of Transportation (NCDOT) proposes to widen NC 150 from the NC 16 Bypass in Catawba County to west of the US 21/NC 150 Interchange in Iredell County, including the interchange with I-77. The work will involve the replacement of Bridge 138, approximately 7 acres of tree clearing, percussive activities such as pile driving and guardrail installation during any time of year, temporary lighting for night work, and the replacement of permanent lighting. Blasting is not expected but may occur. The Federal Highway Administration (FHWA) is the federal lead for this project for section 7 purposes, with authority delegated to NCDOT.

NCDOT has agreed to implement the following conservation measures for the project:

1. Tree clearing will take place from October 16 to March 31, outside of the bat active season.
2. Tree clearing from December 15 – February 15 (the winter torpor season for tricolored bat in the year-round active zone 1) will be avoided and minimized to the maximum extent practical.
3. The existing bridge and culverts  $\geq 3$  feet in manufactured diameter within the action area will be surveyed during the summer of 2024. Additionally, structures will be surveyed within 30 days of letting. The U.S. Fish and Wildlife Service (Service) Asheville Field Office will be contacted immediately if bats are observed.
4. Temporary lighting for night work will be aimed at the direction of work to minimize lighting the surrounding landscape, and will be turned off when not needed for project work.
5. The replacement of permanent lighting will be downcast and will not be in excess of what currently exists within the action area.

6. Should blasting occur, it will take place after tree clearing within the action area has been completed.

### **Federally Listed Species**

The information provided indicates that “No Effect” (NE) determinations have been made for dwarf-flowered heartleaf (*Hexastylis naniflora*) and Schweinitz’s sunflower (*Helianthus schweinitzii*). In instances of suitable habitat being absent from the action area, we would agree that NE determinations are appropriate. In instances where suitable habitat is present and botanical surveys conducted during the optimal survey window and within the past 1 or 2 years (depending on the species) have negative results, we would concur with a biological determination of “may affect, not likely to adversely affect” (NLAA). This information is provided for the sake of the administrative record.

The correspondence received from NCDOT requests conference for tricolored bat (*Perimyotis subflavus*).

According to the information provided, a suitable bridge roost and suitable roosting, commuting, and foraging habitat for tricolored bat occur within the action area. Several suitable culverts occur within the action area. The bridge and culverts have not been surveyed. NCDOT has committed to surveying suitable structures during the summer of 2024 and will also conduct surveys prior to the project’s let date. There is element occurrence data for the tricolored bat approximately 16 miles west of the project area.

The proposed conservation measures minimize effects to bats potentially occurring within the action area. Effects from construction noise to unknown tree roosts within the action area but outside the construction limits, while minimized, are not avoided. Bats that are present in proximity to transportation corridors are expected to be tolerant of baseline noise and vibration levels (or have already modified their behaviors to avoid them). How temporary increases in noise and vibration from construction activities effect bats within existing transportation corridors has not been well studied, though one study found that bats habituated rapidly to traffic noise (Luo et al. 2014). Given the information available and conservation measures above, we do not believe any response to project noise and vibration by bats that are already tree-roosting in the area is expected to rise to the level of harm (as defined at 50 CFR 17.3).

On September 14, 2022, the Service published a proposal in the Federal Register to list the tricolored bat as endangered under the Act. As a result, NCDOT has requested a conference for the tricolored bat as the project may be on-going after the effective date of any final listing rule, if one is published. Based on the information provided, the analysis above, and the commitments to minimize project impacts, we have determined that the proposed project will not jeopardize the continued existence of the tricolored bat. Additionally, we would concur with the NCDOT’s determination that the project is NLAA the tricolored bat should it become listed.

### **Bald Eagle**

The bald eagle (*Haliaeetus leucocephalus*) has been removed from the federal list of endangered and threatened species due to its recovery. However, this species continues to be afforded protection by the BGEPA. The BGEPA, enacted in 1940, and amended several times, prohibits anyone without a permit issued by the Secretary of the Interior from “taking” bald eagles, including their parts, nests, or eggs. “Take” is defined as to “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb.” “Disturb” means “to agitate or bother a bald or golden eagle to the degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, causing injury, death, or nest abandonment.”

The project is located adjacent to current element occurrence (EO) # 31,301 records for nesting bald eagle. The closest point associated with this record is within approximately 380 feet of the project action area. However, according to 2023 survey data obtained by the Service, the point located approximately

860 feet from the action area is the active nest. Given the distance of this nest from the action area, it is unlikely that project actions would result in disturbance to breeding or nesting eagles, should they continue to utilize that more distant nest location.

### **Conservation Recommendations**

Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. General recommendations for the benefit of fish and wildlife resources are provided here:

- **Bald Eagle:** Prior to project construction, conduct surveys of the bald eagle nest site EOs adjacent to the action area. Eagles can be expected to be present and active on the site from October through June. If eagles are observed nesting at the location closer to the action area (which is closer than 660 feet), coordinate with the Service to ensure that project actions will not result in unlawful take.
- **Pre-construction Surveys for Bats:** While the commitment to survey structures within 30 days of the let date is a helpful measure, it may not ensure absence of bats prior to construction and demolition, considering that the let date and construction dates are not synonymous. Therefore, we recommend conducting structure surveys in accordance with the Service's Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines (which includes tricolored bat), ideally within 14 days of construction, or, alternatively, within 30 days of construction.
- **Noise Considerations for Bats:** If suitable roost trees are present near high-decibel activity (81 – 162 dBA) and would experience noise above background levels (41 – 70 dBA), avoid conducting those high-decibel activities during the bat summer occupancy season (April 1 – September 30). Alternatively, activity could avoid the pup season (May 15 - July 31). To minimize noise levels, incorporate sound-dampening devices such as noise shrouds for pile driving.
- **Lighting:**
  - Lighting should only be on when needed, only lighting the needed area, be no brighter than necessary, minimize blue light emissions, and be fully shielded (pointing downward).
  - Avoid lighting landscape features such as trees, shrubs, building facades, adjacent wooded areas, and the surface waters of rivers and streams that provide suitable habitat for bats, pollinators, and other wildlife species.
  - When installing new or replacing existing permanent lights, use downward-facing, full cut-off lens lights (with same intensity or less for replacement lighting); or for those transportation agencies using the Backlight-Uplight-Glare (BUG) system developed by the Illuminating Engineering Society, the goal is to be as close to 0 for all three ratings with a priority of "uplight" of 0 and "backlight" as low as practicable.
  - Use light fixtures with a lower lumen output, reducing overall brightness.
  - Use the shortest light poles that meet highway and safety requirements.
  - If using LEDs, use lights with Type I or II distribution patterns that create rectangular lighting patterns that limit light spill into adjacent habitats.
  - For bridge projects, consider design features that block automobile headlights from reaching surface waters and surrounding riparian habitats.
  - Prioritize use of low-pressure sodium (LPS), high-pressure sodium (HPS), or LED light sources that emit "warm" light. "Warm" light sources are those that contain low amounts of blue light in their spectrum. Choosing light sources with a color temperature of no more than 3,000 Kelvins will minimize the effects of blue light exposure.
- **Provide Terrestrial Wildlife Passage:** Where riparian corridors suitable for wildlife movement occur adjacent to a project, a spanning structure that also spans a portion of the floodplain and provides or maintains a riprap-free level path underneath for wildlife passage would provide a



safer roadway and facilitate wildlife passage. A 10-foot strip may be ideal, though smaller widths can also be beneficial. Alternatively, a “wildlife path” can be constructed with a top-dressing of finer stone (such as smaller aggregate or on-site alluvial material) to fill riprap voids if full bank plating is required. If a multi-barrel culvert is used, the low flow barrel(s) should accommodate the entire stream width and the other barrel should have sills to the floodplain level and be back-filled to provide dry, riprap-free wildlife passage and well as periodic floodwater passage.

- **Riparian Replanting:** Because the removal of forested riparian habitat can affect the quality and suitability of foraging and commuting habitat for bats and the water quality for aquatic organisms, we recommend replanting the riparian zone with native, fast-growing trees and shrubs that would serve to stabilize the stream bank, filter runoff and reduce erosion and sedimentation, block light pollution, and generally improve the quality of the habitat for bats and aquatic species. Examples of potential native tree species to plant include: Sycamore, tulip poplar, black cherry and river birch. Planting with established (e.g. containerized) young trees can increase the survival rate of plantings and contribute to faster improvement of riparian habitat.

### **Reinitiation Notice**

We believe the requirements under section 7 of the Act are fulfilled for the federally listed species discussed above. However, obligations under section 7 must be reconsidered if: (1) new information reveals impacts of this proposed action may affect listed species or critical habitat in a manner not previously considered, (2) this proposed action is subsequently modified in a manner that was not considered in this review, or (3) a new species is listed, or critical habitat is determined that may be affected by the proposed action.

We appreciate the opportunity to provide these comments. Please contact Ms. Holland Youngman of our staff at [holland\\_youngman@fws.gov](mailto:holland_youngman@fws.gov) if you have any questions. In any future correspondence concerning this project, please reference our Service Log #24-212.

Sincerely,

*- - original signed - -*

Janet Mizzi  
Field Supervisor



**North Carolina Department of Transportation**  
**Highway Stormwater Program**  
**STORMWATER MANAGEMENT PLAN**  
 FOR NCDOT PROJECTS



(Version 2.07; Released October 2016)

**WBS Element:** 37944.1.FR5/50134. **TIP No.:** R-2307B/I-5717 **County(ies):** Catawba Iredell **Page** 1 **of** 6

**General Project Information**

<b>WBS Element:</b>	37944.1.FR5/50134.1.FS1	<b>TIP Number:</b>	R-2307B/I-5717	<b>Project Type:</b>	Roadway Relocation	<b>Date:</b>	12/22/2017
<b>NCDOT Contact:</b>	Craig A. Freeman, PE		<b>Contractor / Designer:</b>	TGS Engineers (David B. Petty, PE)			
<b>Address:</b>	1590 Mail Service Center Raleigh, NC 27699-1590		<b>Address:</b>	706 Hillsborough Street Suite 200 Raleigh NC, 27603			
	<b>Phone:</b>	919-707-6721		<b>Phone:</b>	919-773-8887 ext. 104		
	<b>Email:</b>	cafreeman2@ncdot.gov		<b>Email:</b>	dpetty@tgsengineers.com		
<b>City/Town:</b>	Mooresville, NC		<b>County(ies):</b>	Catawba	Iredell		
<b>River Basin(s):</b>	Catawba	<b>CAMA County?</b>	No	No			
<b>Wetlands within Project Limits?</b>	Yes						

**Project Description**

<b>Project Length (lin. miles or feet):</b>	6.94 miles	<b>Surrounding Land Use:</b>	Commercial, Medium Density Residential					
<b>Project Built-Up Area (ac.)</b>	121.0		69.0		ac.			
	Proposed Project		Existing Site					
<b>Typical Cross Section Description:</b>	four lane shoulder section with 23'+ grassed median and four to six lane curb and gutter section with 0' to 23' raised grassed median - all 12' lanes			two lane undivided shoulder section and four lane undivided curb and gutter section - all 12' lanes				
<b>Annual Avg Daily Traffic (veh/hr/day):</b>	<b>Design/Future:</b>	58860	<b>Year:</b>	2039	<b>Existing:</b>	47900	<b>Year:</b>	2019
<b>General Project Narrative: (Description of Minimization of Water Quality Impacts)</b>	<p>The proposed project involves widening NC 150, an existing two &amp; four-lane undivided arterial, to a four &amp; six-lane median divided superstreet to improve vehicular mobility and safety from Greenwood Rd (SR 1840) in Catawba County to US 21 in Iredell County. The existing 10-span, approximately 1170-ft long by 34-ft wide bridge over Lake Norman will remain in place and transition from one lane in each direction to two eastbound lanes. A proposed 9-span, approx. 1210-ft by 52-ft wide bridge will carry two westbound lanes and a 10-ft multiuse path just upstream of the existing bridge. Bridge to be constructed from anchored barges. Existing causeways will be widened on the upstream side using rock fill up to 2 ft above Duke Energy Full Pond elevation and then grassed sideslopes from there up. There are five proposed culvert extensions over UT's toward end of project – riprap is proposed in base of channels to reduce discharge velocities.</p> <p>Roadway runoff in the vicinity of the Lake Norman crossing is routed to two hazardous spill basins. Dry detention/filtration basins are proposed on sheets 14, 17(dry detention only) 19, 20 &amp; 22 for both peak attenuation and treatment. Otherwise, stormwater diversion has been minimized. Grassed swales are used for treatment throughout the project, where practical. Outlet pipe slopes are minimized. All BMP's have been incorporated throughout the project to the maximum extent practicable.</p>							

**Waterbody Information**

<b>Surface Water Body (1):</b>	Catawba River (Lake Norman below elevation 760)		<b>NCDWR Stream Index No.:</b>	11-(75)		
<b>NCDWR Surface Water Classification for Water Body</b>	<b>Primary Classification:</b>	Water Supply IV (WS-IV)	<b>Class B</b>	<b>Critical Area (CA)</b>		
	<b>Supplemental Classification:</b>	None				
<b>Other Stream Classification:</b>	None					
<b>Impairments:</b>	None					
<b>Aquatic T&amp;E Species?</b>	Yes	Comments: per EA: no effect on Dwarf-flowered heartleaf&Schweinitz's sunflower; unresolved on Northern long-eared bat				
<b>NRTR Stream ID:</b>				<b>Buffer Rules in Effect:</b>	Catawba	
<b>Project Includes Bridge Spanning Water Body?</b>	Yes	<b>Deck Drains Discharge Over Buffer?</b>	No	<b>Dissipator Pads Provided in Buffer?</b>	N/A	
<b>Deck Drains Discharge Over Water Body?</b>	No	(If yes, provide justification in the General Project Narrative)		(If yes, describe in the General Project Narrative; if no, justify in the General Project Narrative)		
(If yes, provide justification in the General Project Narrative)						



**North Carolina Department of Transportation**  
**Highway Stormwater Program**  
**STORMWATER MANAGEMENT PLAN**  
 FOR NCDOT PROJECTS



(Version 2.07; Released October 2016)

**WBS Element:** 37944.1.FR5/50134.   
 **TIP No.:** R-2307B/l-5717   
 **County(ies):** Catawba Iredell   
 **Page** 2 **of** 6

**Additional Waterbody Information**

<b>Surface Water Body (2):</b>	McCrary Creek		<b>NCDWR Stream Index No.:</b>	11-91	
<b>NCDWR Surface Water Classification for Water Body</b>	<b>Primary Classification:</b>	Water Supply IV (WS-IV)	Class B	Critical Area (CA)	
	<b>Supplemental Classification:</b>	None			
<b>Other Stream Classification:</b>	None				
<b>Impairments:</b>	None				
<b>Aquatic T&amp;E Species?</b>	Yes	Comments: per EA: no effect on Dwarf-flowered heartleaf&Schweinitz's sunflower; unresolved on Northern long-eared bat			
<b>NRTR Stream ID:</b>			<b>Buffer Rules in Effect:</b>	N/A	
<b>Project Includes Bridge Spanning Water Body?</b>	No	<b>Deck Drains Discharge Over Buffer?</b>	N/A	<b>Dissipator Pads Provided in Buffer?</b>	N/A
<b>Deck Drains Discharge Over Water Body?</b>	N/A	(If yes, provide justification in the General Project Narrative)		(If yes, describe in the General Project Narrative; if no, justify in the General Project Narrative)	
(If yes, provide justification in the General Project Narrative)					



Swales															
Sheet No.	Station & Coordinates (Road and Non Road Projects)	Surface Water Body	Base Width (ft)	Front Slope (H:1)	Back Slope (H:1)	Drainage Area (ac)	Recommended Treatm't Length (ft)	Actual Length (ft)	Longitudinal Slope (%)	Q2 (cfs)	V2 (fps)	Q10 (cfs)	V10 (fps)	Rock Checks Used	BMP Associated w/ Buffer Rules?
4	-Y- 10+50 RT	(1)Catawba River (Lake)	0.0	3.0	3.0	0.3	33	50	2.30%	0.6	1.4	0.7	1.5	No	Yes
	-Y- 11+00 RT	(1)Catawba River (Lake)	0.0	3.0	3.0	0.3	33	50	2.30%	0.6	1.4	0.7	1.5	No	Yes
4	-L- 433+00 LT	(1)Catawba River (Lake)	0.0	6.0	6.0	1.0	100	100	2.40%	3.0	1.9	3.9	2.0	No	Yes
	-L- 434+00 LT	(1)Catawba River (Lake)	0.0	6.0	6.0	1.0	100	100	2.40%	3.0	1.9	3.9	2.0	No	Yes
5	-L- 436+50 RT	(1)Catawba River (Lake)	0.0	6.0	4.0	1.0	103	350	2.60%	2.6	1.9	3.3	2.0	No	Yes
	-L- 440+00 RT	(1)Catawba River (Lake)	0.0	6.0	4.0	1.0	103	350	2.60%	2.6	1.9	3.3	2.0	No	Yes
5	-L- 443+20 RT	(1)Catawba River (Lake)	0.0	6.0	4.0	0.5	50	245	2.60%	1.3	1.6	1.7	1.7	No	Yes
	-L- 445+65 RT	(1)Catawba River (Lake)	0.0	6.0	4.0	0.5	50	245	2.60%	1.3	1.6	1.7	1.7	No	Yes
5	-L- 440+20 LT	(1)Catawba River (Lake)	0.0	6.0	4.0	0.7	72	230	2.60%	2.1	1.8	2.7	1.9	No	Yes
	-L- 442+50 LT	(1)Catawba River (Lake)	0.0	6.0	4.0	0.7	72	230	2.60%	2.1	1.8	2.7	1.9	No	Yes
5	-L- 442+50 LT	(1)Catawba River (Lake)	0.0	6.0	4.0	0.9	85	300	2.60%	2.3	1.9	3.0	2.3	No	Yes
	-L- 445+50 LT	(1)Catawba River (Lake)	0.0	6.0	4.0	0.9	85	300	2.60%	2.3	1.9	3.0	2.3	No	Yes
5/6	-L- 445+50 LT	(1)Catawba River (Lake)	0.0	6.0	4.0	1.0	97	450	0.3 to 2.2%	2.6	1.9	3.4	2.0	No	Yes
	-L- 450+00 LT	(1)Catawba River (Lake)	0.0	6.0	4.0	1.0	97	450	0.3 to 2.2%	2.6	1.9	3.4	2.0	No	Yes
6	-L- 449+00 MED	(1)Catawba River (Lake)	0.0	3.0	4.0	0.4	41	50	1.0 to 0.7%	1.2	1.2	1.5	1.3	No	Yes
	-L- 453+50 MED	(1)Catawba River (Lake)	0.0	3.0	4.0	0.4	41	50	1.0 to 0.7%	1.2	1.2	1.5	1.3	No	Yes
6	-L- 453+50 MED	(1)Catawba River (Lake)	0.0	3.0	4.0	0.7	72	400	0.50%	1.9	1.2	2.5	1.3	No	Yes
	-L- 457+50 MED	(1)Catawba River (Lake)	0.0	3.0	4.0	0.7	72	400	0.50%	1.9	1.2	2.5	1.3	No	Yes
6	-L- 457+50 MED	(1)Catawba River (Lake)	0.0	4.0	4.6	0.3	31	150	0.50%	0.8	0.8	1.0	0.9	No	Yes
	-L- 459+00 MED	(1)Catawba River (Lake)	0.0	4.0	4.6	0.3	31	150	0.50%	0.8	0.8	1.0	0.9	No	Yes
6/7	-L- 459+00 MED	(1)Catawba River (Lake)	0.0	4.0	4.6	1.1	114	650	0.30%	2.9	1.1	3.8	1.2	No	Yes
	-L- 465+50 MED	(1)Catawba River (Lake)	0.0	4.0	4.6	1.1	114	650	0.30%	2.9	1.1	3.8	1.2	No	Yes
8	-L- 478+00 MED	(1)Catawba River (Lake)	0.0	5.0	4.0	0.3	26	125	0.40%	0.6	0.7	0.8	0.7	No	Yes
	-L- 479+25 MED	(1)Catawba River (Lake)	0.0	5.0	4.0	0.3	26	125	0.40%	0.6	0.7	0.8	0.7	No	Yes
8	-L- 479+25 MED	(1)Catawba River (Lake)	0.0	5.0	4.0	0.6	63	225	0.40%	1.5	1.0	1.9	1.1	No	Yes
	-L- 481+50 MED	(1)Catawba River (Lake)	0.0	5.0	4.0	0.6	63	225	0.40%	1.5	1.0	1.9	1.1	No	Yes
8	-L- 481+50 MED	(1)Catawba River (Lake)	0.0	4.4	4.0	0.7	71	350	0.30%	1.9	1.0	2.5	1.0	No	Yes
	-L- 485+00 MED	(1)Catawba River (Lake)	0.0	4.4	4.0	0.7	71	350	0.30%	1.9	1.0	2.5	1.0	No	Yes
8	-L- 485+00 MED	(1)Catawba River (Lake)	0.0	4.4	4.0	0.6	60	350	0.30%	1.7	1.0	2.3	1.0	No	Yes
	-L- 488+50 MED	(1)Catawba River (Lake)	0.0	4.4	4.0	0.6	60	350	0.30%	1.7	1.0	2.3	1.0	No	Yes
9	-L- 497+50 RT	(1)Catawba River (Lake)	0.0	6.0	4.0	0.4	42	200	3.00%	1.1	1.7	1.5	1.8	No	Yes
	-L- 499+50 RT	(1)Catawba River (Lake)	0.0	6.0	4.0	0.4	42	200	3.00%	1.1	1.7	1.5	1.8	No	Yes
9	-L- 501+00 RT	(1)Catawba River (Lake)	0.0	3.0	3.0	1.9	193	500	0.40%	5.3	1.6	6.9	1.8	No	Yes
	-L- 506+00 RT	(1)Catawba River (Lake)	0.0	3.0	3.0	1.9	193	500	0.40%	5.3	1.6	6.9	1.8	No	Yes
9	-L- 503+50 LT	(1)Catawba River (Lake)	0.0	4.0	6.0	0.4	44	150	0.60%	0.8	0.8	1.0	0.9	No	Yes
	-L- 505+00 LT	(1)Catawba River (Lake)	0.0	4.0	6.0	0.4	44	150	0.60%	0.8	0.8	1.0	0.9	No	Yes
9*	-Y2- 13+00 LT	(1)Catawba River (Lake)	2.0	4.0	4.0	1.5	152	95	1.90%	3.5	1.9	4.5	2.0	No	Yes
	-Y2- 14+40 LT	(1)Catawba River (Lake)	2.0	4.0	4.0	1.5	152	95	1.90%	3.5	1.9	4.5	2.0	No	Yes

**Additional Comments**

Swales have been added to attenuate runoff and promote sedimentation and infiltration before discharging through the riparian buffer. Where slope (and drainage area/discharge) vary, max. applicable velocity is entered.  
 \*200+ ft of existing swale upstream of Sheet 9 -Y2- swale.



Swales															
Sheet No.	Station & Coordinates (Road and Non Road Projects)	Surface Water Body	Base Width (ft)	Front Slope (H:1)	Back Slope (H:1)	Drainage Area (ac)	Recommended Treatm't Length (ft)	Actual Length (ft)	Longitudinal Slope (%)	Q2 (cfs)	V2 (fps)	Q10 (cfs)	V10 (fps)	Rock Checks Used	BMP Associated w/ Buffer Rules?
9	-Y2- 13+70 RT -Y2- 14+40 RT	(1)Catawba River (Lake)	0.0	4.0	4.0	0.4	44	70	1.30%	1.2	1.6	1.6	1.7	No	Yes
10	-L- 505+50 LT -L- 508+50 LT	(1)Catawba River (Lake)	0.0	6.0	4.0	1.1	110	300	0.3 to 2.0%	2.4	2.0	3.1	2.2	No	Yes
10	-L- 516+00 RT -L- 517+50 RT	(1)Catawba River (Lake)	6.0	3.0	3.0	1.7	170	150	2.00%	5.4	2.0	7.0	2.2	No	Yes
11	-L- 523+50 RT -L- 525+75 RT	(1)Catawba River (Lake)	0.0	6.0	4.0	0.5	46	225	3.10%	1.3	1.8	1.7	1.9	No	Yes
11	-L- 526+50 RT -L- 529+50 RT	(1)Catawba River (Lake)	0.0	6.0	4.0	0.8	82	300	2.4 to 0.8%	2.4	1.9	3.1	2.4	No	Yes
11	-L- 527+50 LT -L- 529+50 LT	(1)Catawba River (Lake)	0.0	6.0	4.0	0.5	46	200	2.30%	1.3	1.8	1.7	2.0	No	Yes
12*	-L- 532+50 RT -L- 534+00 RT	(1)Catawba River (Lake)	2.0	4.0	4.0	2.7	273	150	0.80%	6.4	1.9	8.3	2.0	No	Yes
12*	-L- 539+50 RT -L- 541+00 RT	(1)Catawba River (Lake)	2.0	3.0	3.0	1.7	167	150	1.40%	4.7	1.8	6.1	2.3	No	Yes
12*	-L- 546+00 RT -L- 547+50 RT	(1)Catawba River (Lake)	0.0	6.0	4.0	0.3	34	150	2.90%	1.0	1.9	1.3	2.0	No	Yes
25	-Y31- 29+85 LT -Y31- 31+50 LT	(1)Catawba River (Lake)	0.0	6.0	4.0	1.1	110	165	1.70%	1.9	1.5	2.5	1.9	No	Yes
25	-Y31- 34+60 LT -Y31- 35+50 LT	(1)Catawba River (Lake)	0.0	6.0	6.0	0.4	40	90	1.50%	0.9	1.2	1.2	1.2	No	Yes
25	-Y31- 29+63 RT -Y31- 31+50 RT	(1)Catawba River (Lake)	0.0	6.0	4.0	0.7	70	187	1.00%	1.2	1.1	1.5	1.2	No	Yes
25	-Y31- 34+10 RT -Y31- 36+70 RT	(1)Catawba River (Lake)	0.0	6.0	4.0	1.6	160	260	1.80%	3.6	1.8	4.7	1.9	No	Yes
33	-Y17- 27+00 RT -Y17- 34+50 RT	(1)Catawba River (Lake)	0.0	4.0	4.0	1.1	112	750	1.9 to 0.3%	1.8 to 3.1	1.9	2.4 to 4.0	2.1	No	Yes
35**	-Y26A- 19+20 RT -Y26A- 20+15 RT	(2)McCrary Creek	4.0	3.0	3.0	2.6	260	65	0.30%	9.2	1.5	11.9	1.6	No	Yes
36***	-Y39- 13+50 RT -Y39- 14+25 RT	(1)Catawba River (Lake)	6.0	4.0	3.0	2.3	230	75	2.10%	5.9	2.0	7.7	2.2	No	Yes
6	-L- 455+50 LT -L- 457+50 LT	(1)Catawba River (Lake)	0.0	3.0	4.0	0.2	21	200	0.40%	0.4	0.7	0.6	0.7	No	Yes

**Additional Comments**

Swales have been added to attenuate runoff and promote sedimentation and infiltration before discharging through the riparian buffer.

Where slope (and drainage area/discharge) vary, max. applicable velocity is entered.

\*Sheet 12 has three separate swales inline for total DA of 2.73 ac (recommend treatment=273 ft) with 450 ft provided.

\*\*Sheet 35 swale ties into an existing 115 ft swale.

\*\*\* 400+ ft of existing swale upstream of Sheet 36 swale.

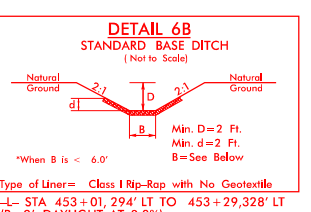
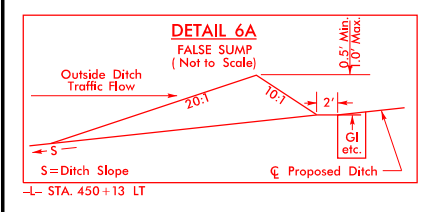






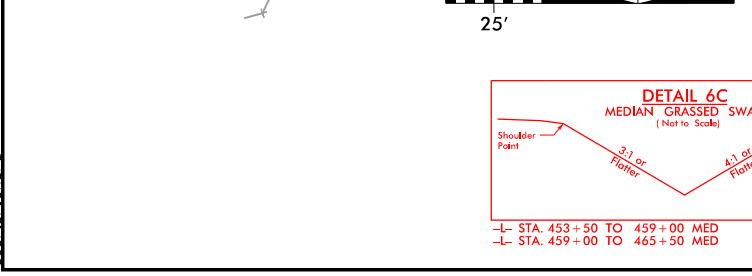
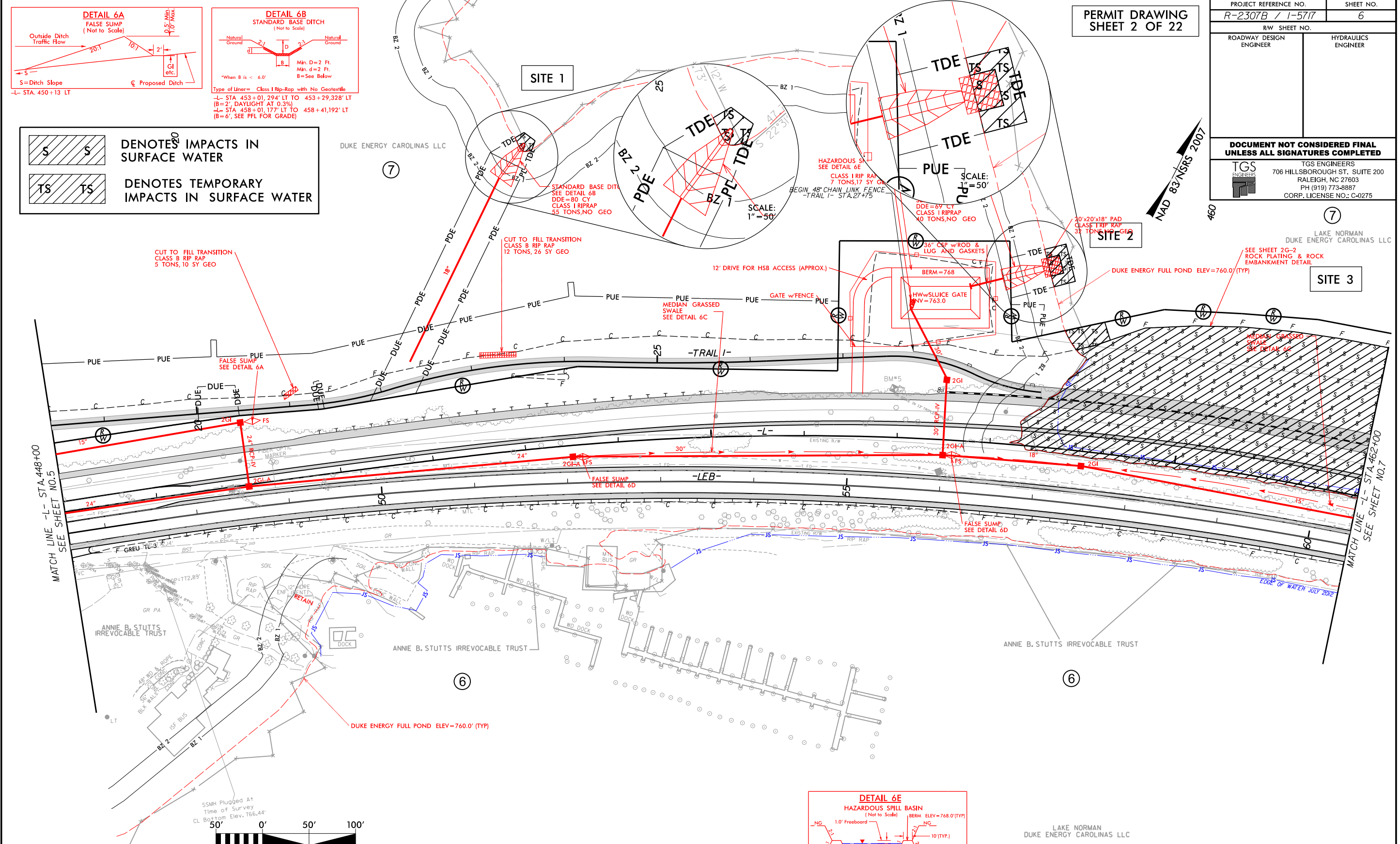
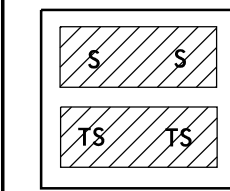


**PERMIT DRAWING  
SHEET 2 OF 22**



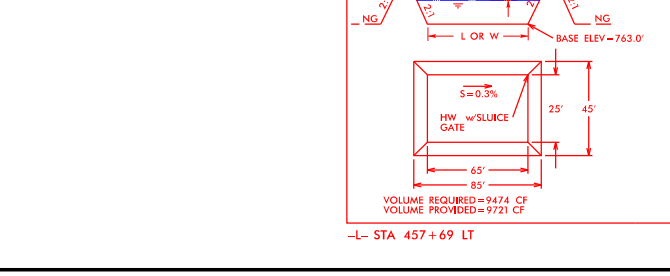
**DENOTES IMPACTS IN SURFACE WATER**

**DENOTES TEMPORARY IMPACTS IN SURFACE WATER**



**DETAIL 6D FALSE SUMP (Not to Scale)**

Ditch Grade	L	Ditch Grade	L
0.0% To 2.0%	20'	Over 4.0% To 6.0%	40'
Over 2.0% To 4.0%	30'	Over 6.0%	50'

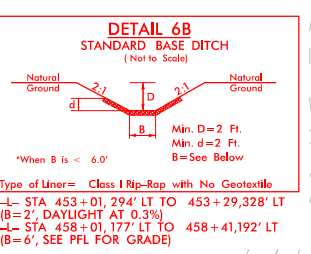
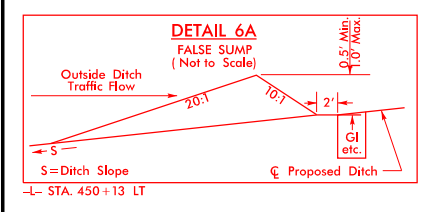


SEE SHEET 38 FOR -L- PROFILE  
SEE SHEET 53 FOR -LEB- PROFILE  
SEE SHEET 73 FOR -TRAIL- PROFILE  
SEE SHEET 2B-1 FOR CURVE DATA

CHANNELIZATION RADII ARE 3' UNLESS NOTED OTHERWISE  
DRIVEWAY RADII ARE 10' UNLESS NOTED OTHERWISE

8/17/99  
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**PERMIT DRAWING  
SHEET 3 OF 22**



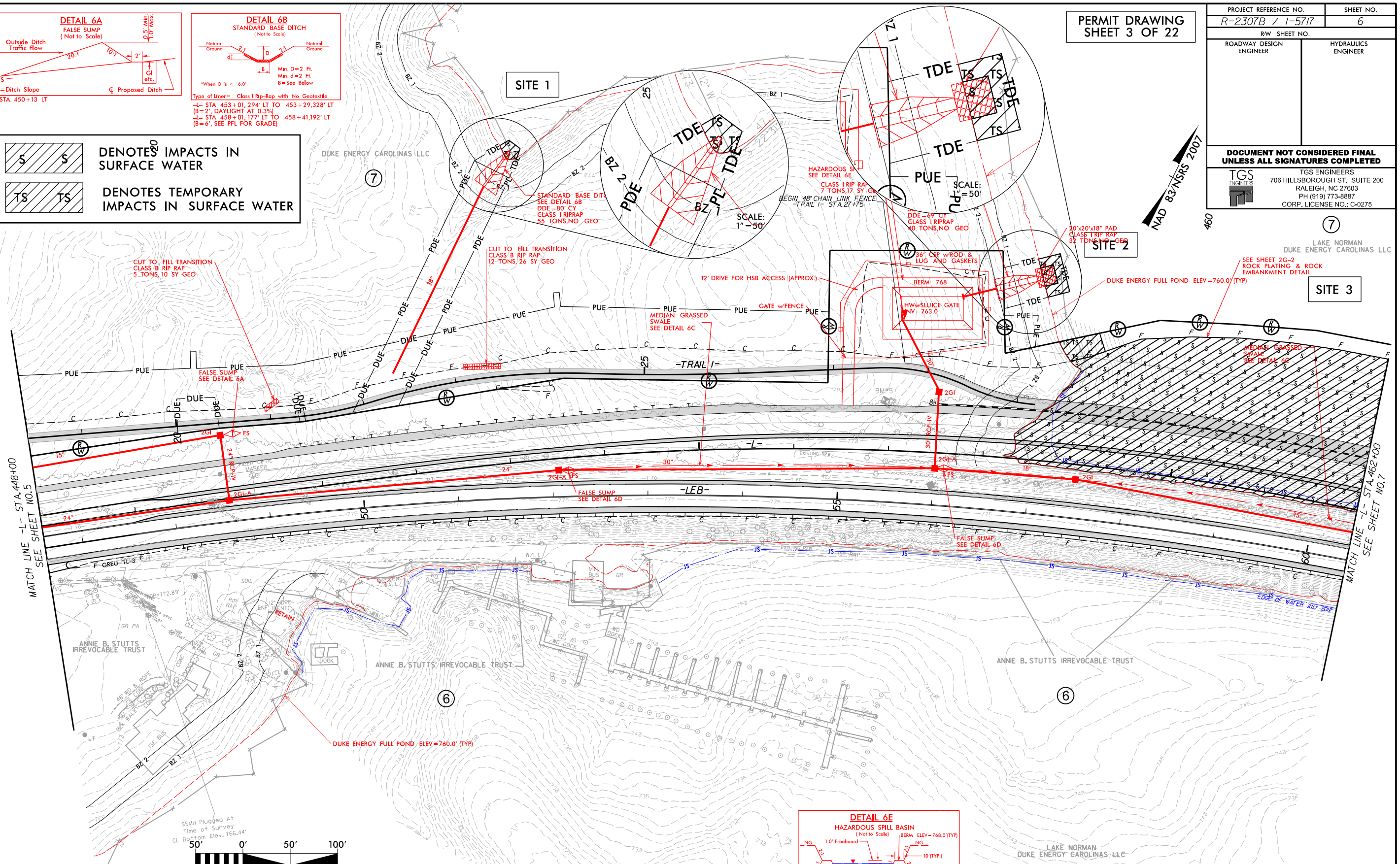
**IMPACTS IN SURFACE WATER**

**S S** DENOTES IMPACTS IN SURFACE WATER

**TS TS** DENOTES TEMPORARY IMPACTS IN SURFACE WATER

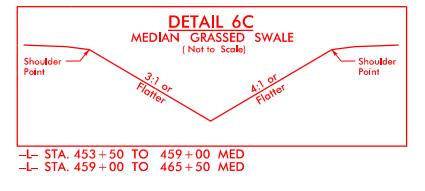
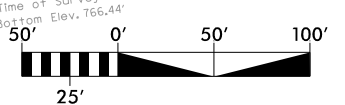
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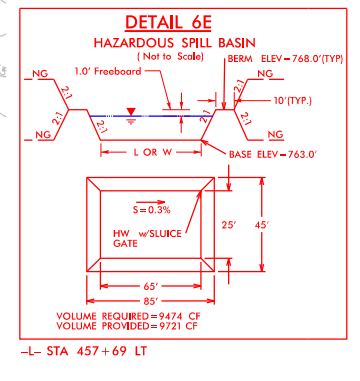
MATCH LINE -L- STA. 448+00  
SEE SHEET NO.5

MATCH LINE -L- STA. 462+00  
SEE SHEET NO.7



**DETAIL 6D: FALSE SUMP (Not to Scale)**

Ditch Grade	L	Ditch Grade	L
0.0% To 2.0%	20'	Over 4.0% To 6.0%	40'
Over 2.0% To 4.0%	30'	Over 6.0%	50'




— PTE — PERMANENT TRAIL EASEMENT



SEE SHEET 38 FOR -L- PROFILE  
SEE SHEET 53 FOR -LEB- PROFILE  
SEE SHEET 73 FOR -TRAIL- PROFILE  
SEE SHEET 2B-1 FOR CURVE DATA

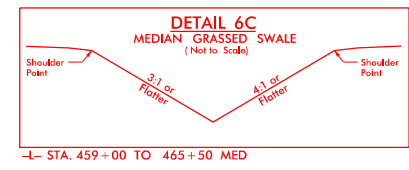
CHANNELIZATION RADII ARE 3' UNLESS NOTED OTHERWISE  
DRIVEWAY RADII ARE 10' UNLESS NOTED OTHERWISE

8/17/99

PROJECT REFERENCE NO. R-2307B / 1-5717	SHEET NO. 7
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
 <b>TGS ENGINEERS</b> 706 HILLSBOROUGH ST., SUITE 200 RALEIGH, NC 27603 PH (919) 773-8887 CORP. LICENSE NO.: C-0275	

PERMIT DRAWING  
SHEET 4 OF 22

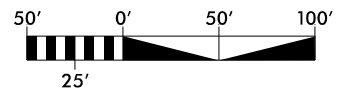
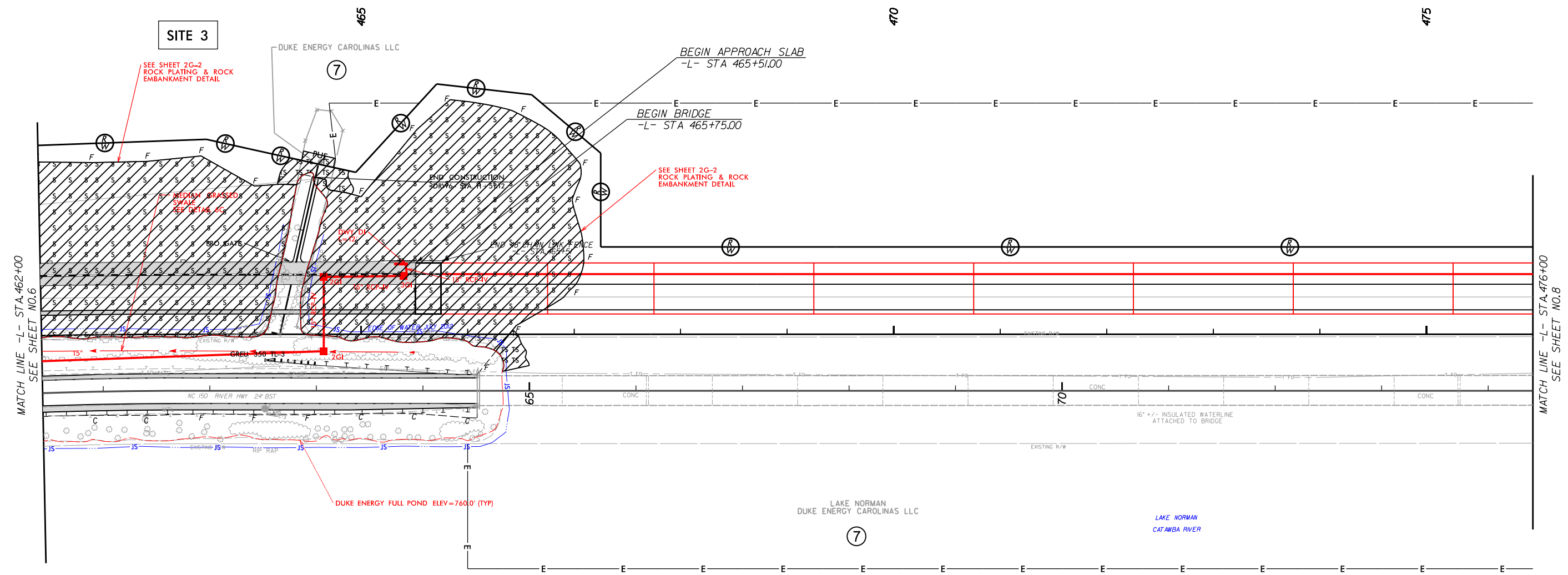
	DENOTES IMPACTS IN SURFACE WATER
	DENOTES TEMPORARY IMPACTS IN SURFACE WATER



LAKE NORMAN  
DUKE ENERGY CAROLINAS LLC

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NAD 83 NSRS 2007





SEE SHEET 39 FOR -L- PROFILE  
 SEE SHEETS 53 THRU 54 FOR -LEB- PROFILE  
 SEE SHEET 2B-1 FOR CURVE DATA

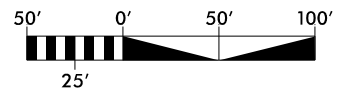
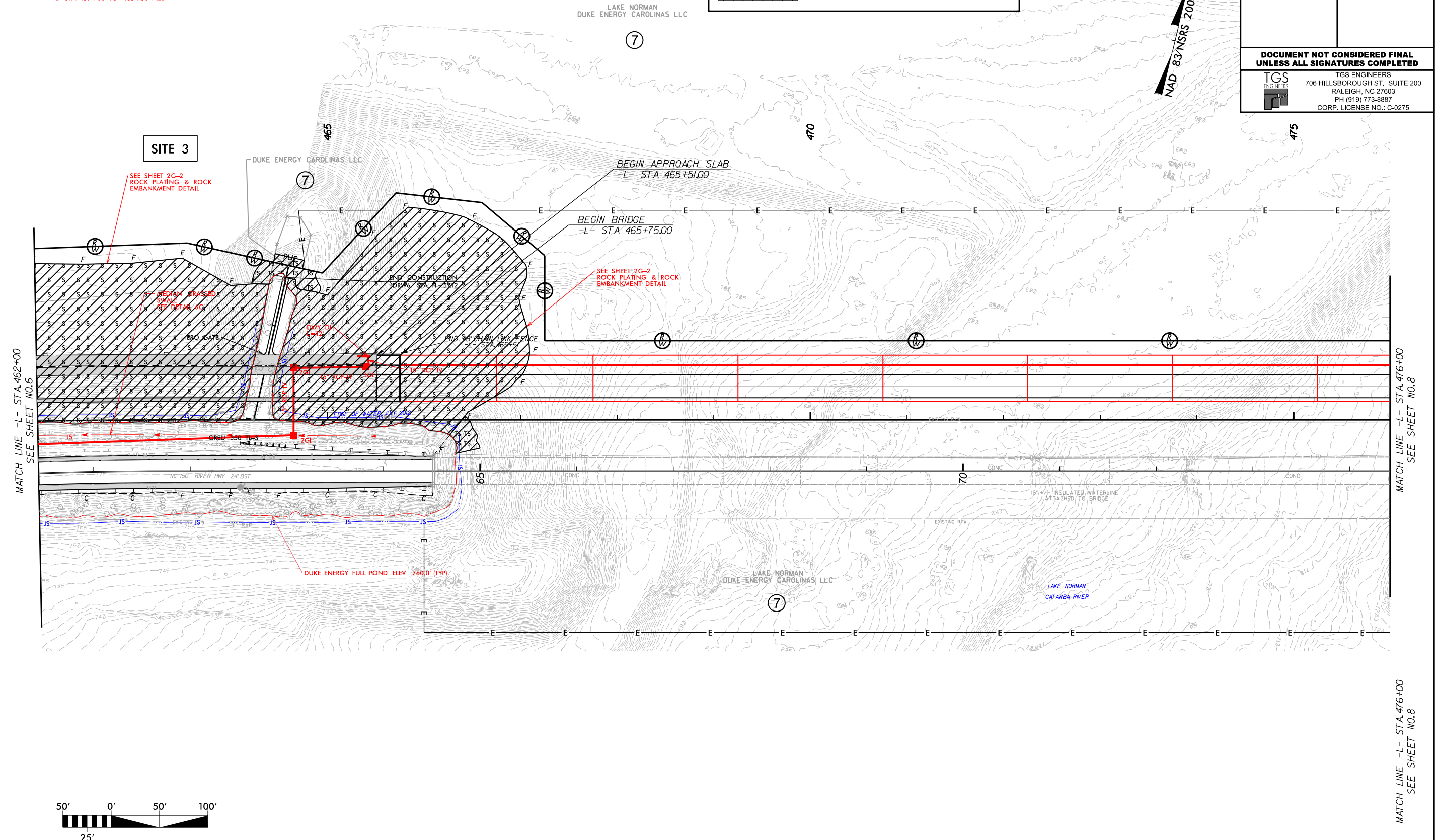
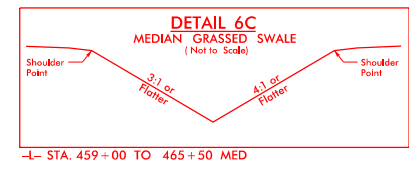
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8/17/99

PROJECT REFERENCE NO. R-2307B / 1-5717	SHEET NO. 7
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
 <b>TGS ENGINEERS</b> 706 HILLSBOROUGH ST., SUITE 200 RALEIGH, NC 27603 PH (919) 773-8887 CORP. LICENSE NO.: C-0275	

PERMIT DRAWING  
SHEET 5 OF 22

	DENOTES IMPACTS IN SURFACE WATER
	DENOTES TEMPORARY IMPACTS IN SURFACE WATER



SEE SHEET 39 FOR -L- PROFILE  
 SEE SHEETS 53 THRU 54 FOR -LEB- PROFILE  
 SEE SHEET 2B-1 FOR CURVE DATA

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5/14/99

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

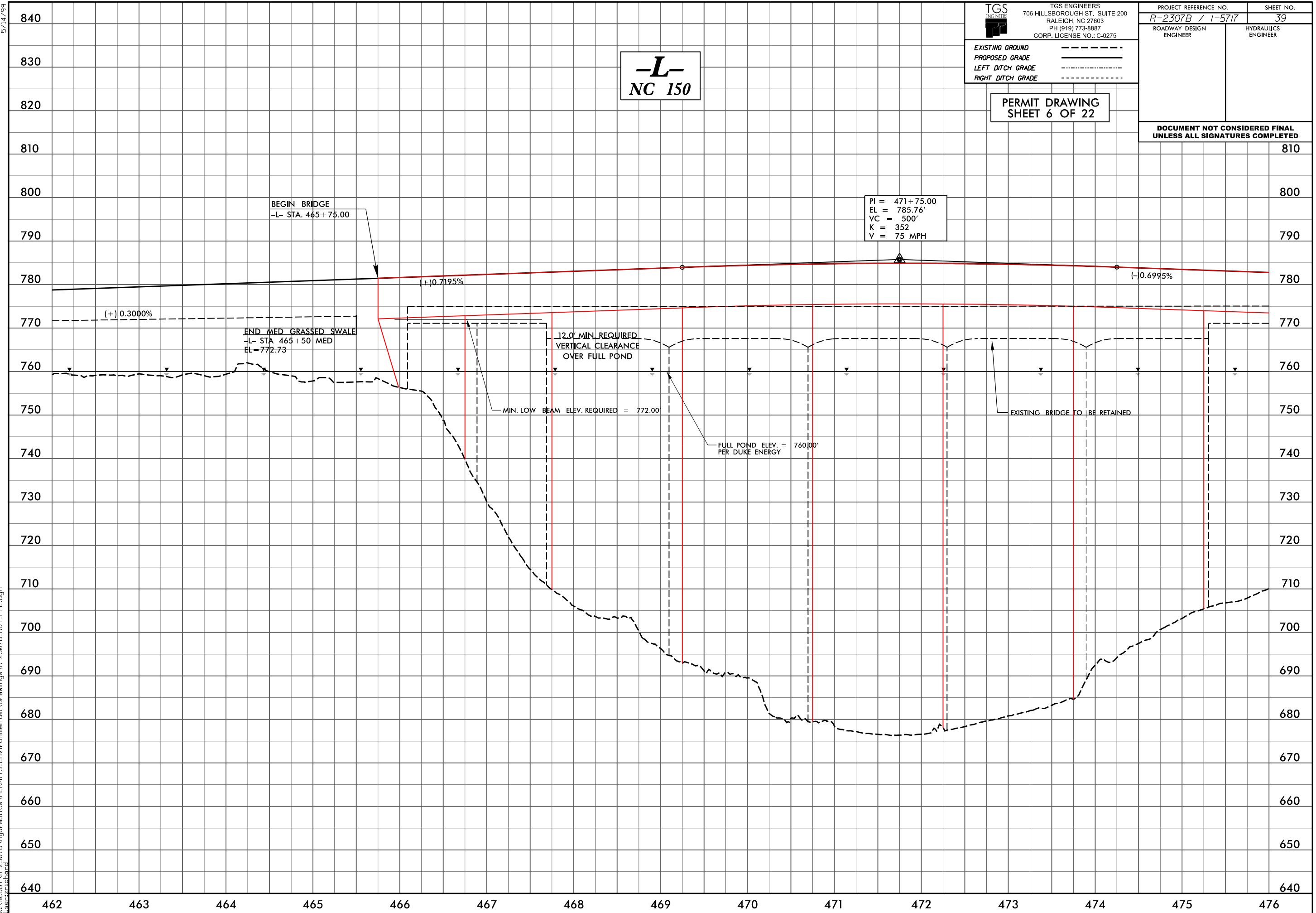
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 PROPOSED GRADE \_\_\_\_\_  
 LEFT DITCH GRADE - - - - -  
 RIGHT DITCH GRADE - - - - -

PROJECT REFERENCE NO. <i>R-2307B / 1-5717</i>	SHEET NO. <i>39</i>
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PERMIT DRAWING  
SHEET 6 OF 22

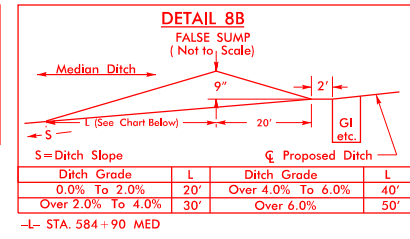
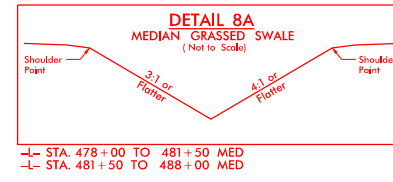
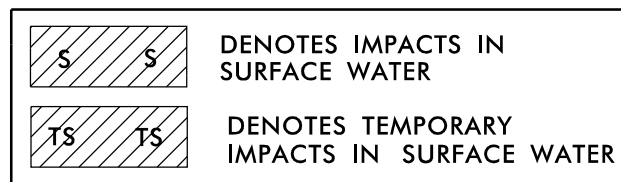
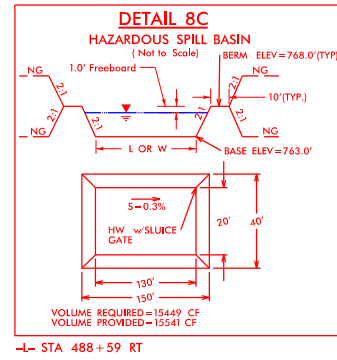
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UNLESS ALL SIGNATURES COMPLETED

**-L-**  
**NC 150**

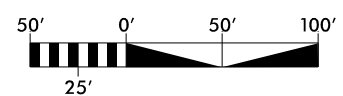
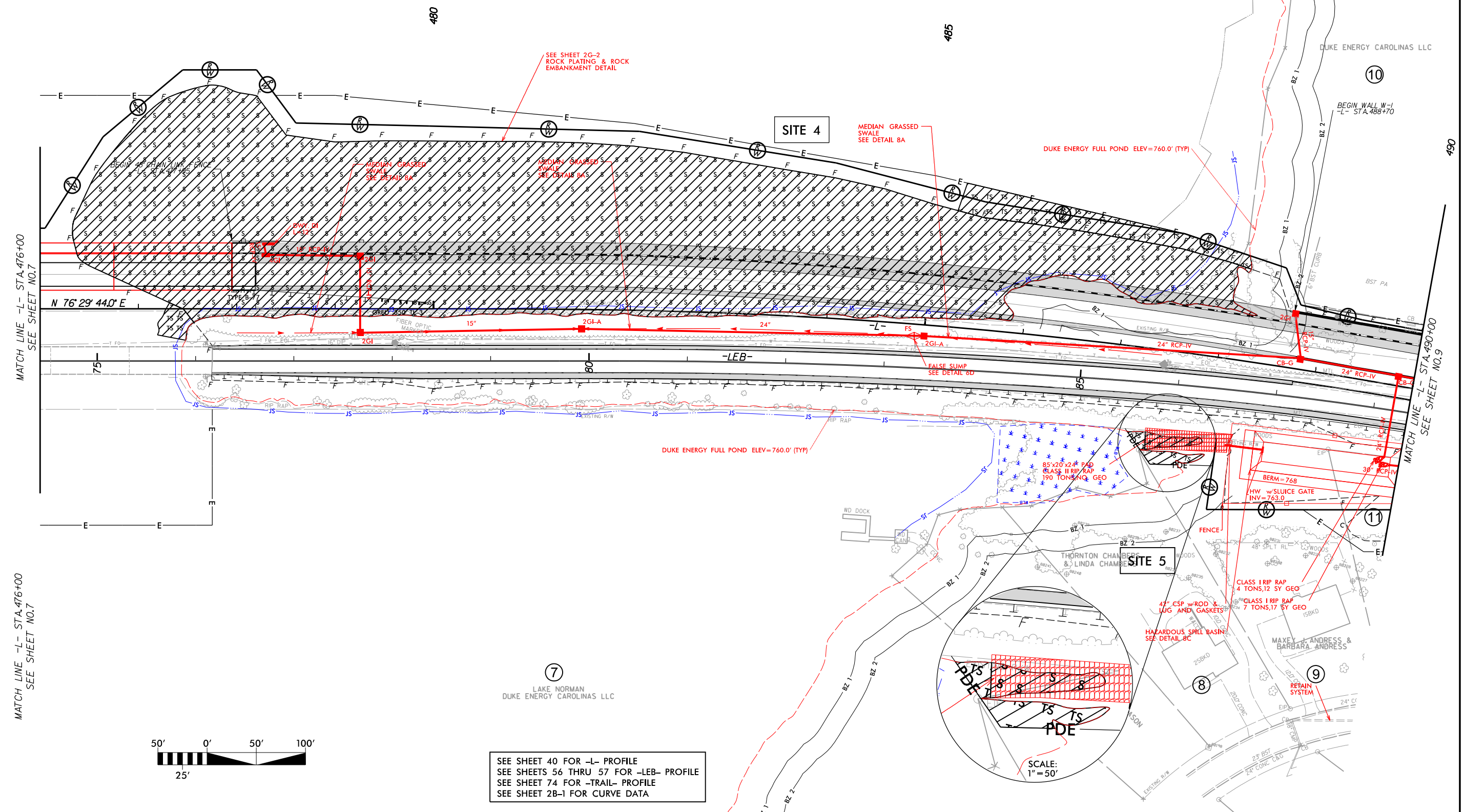


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PROJECT REFERENCE NO. R-2307B / 1-5717	SHEET NO. 8
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
TGS ENGINEERS 706 HILLSBOROUGH ST., SUITE 200 RALEIGH, NC 27603 PH (919) 773-8887 CORP. LICENSE NO.: C-0275	



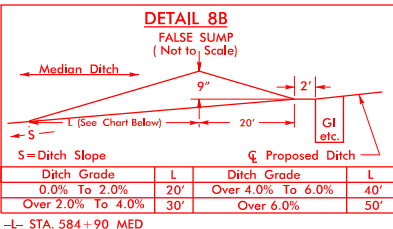
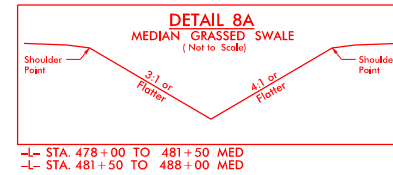
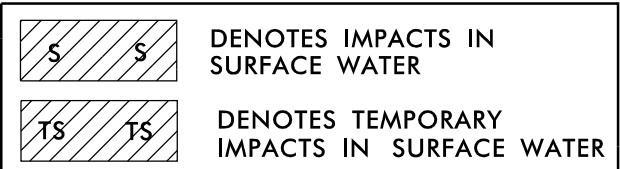
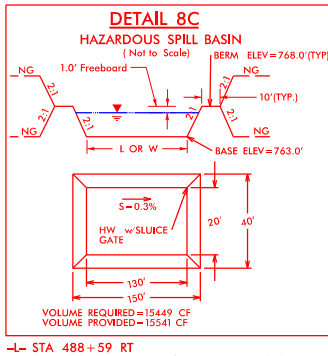
PERMIT DRAWING  
SHEET 7 OF 22



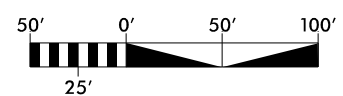
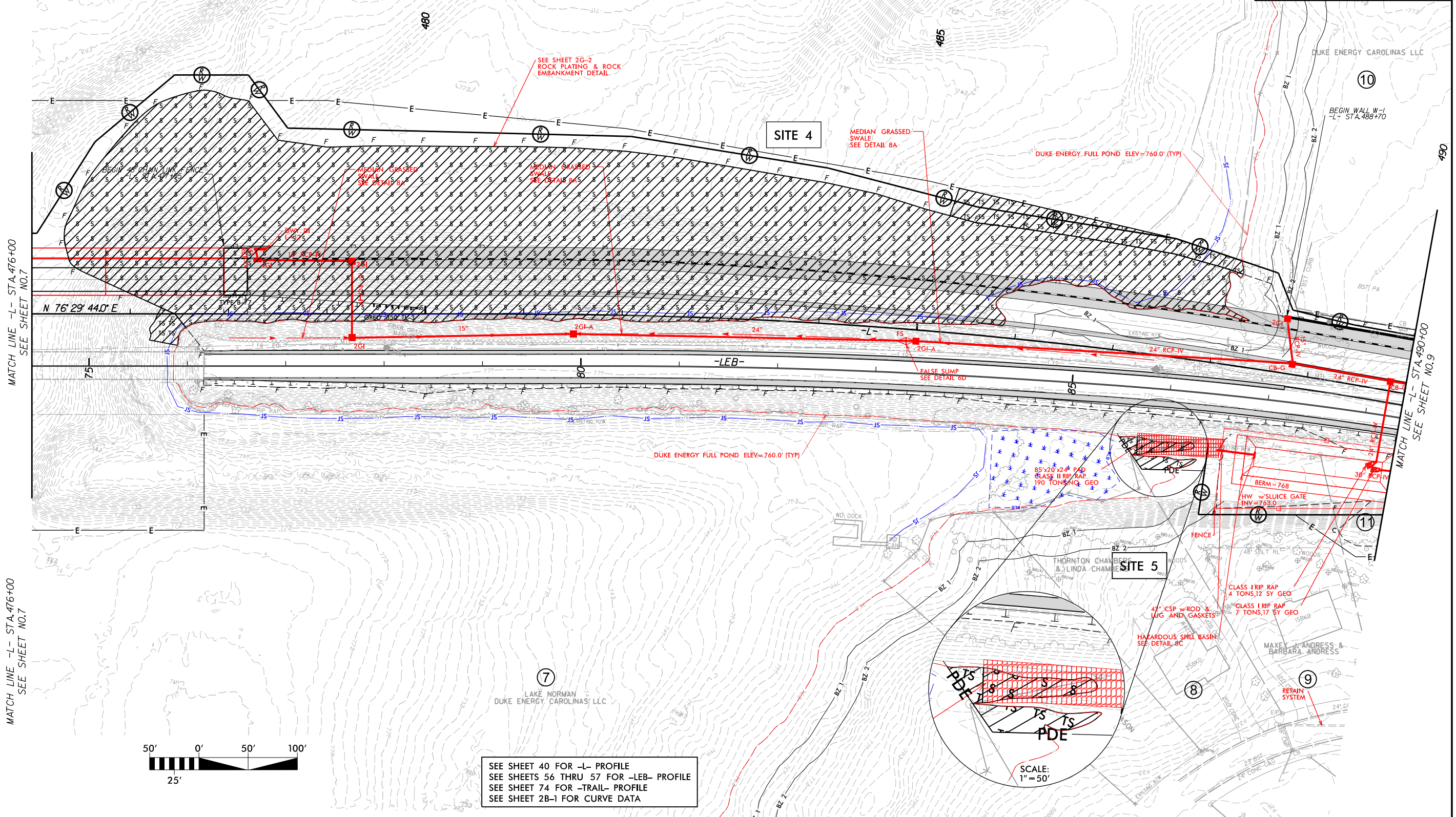
SEE SHEET 40 FOR -L- PROFILE  
 SEE SHEETS 56 THRU 57 FOR -LEB- PROFILE  
 SEE SHEET 74 FOR -TRAIL- PROFILE  
 SEE SHEET 2B-1 FOR CURVE DATA

I:\26\2024\X:\NCDDT\R-2307B\Hydraulics\PERMITS\_Environmental\Drawings\R-2307B\_RDY\_PSH\_08.dgn  
 User: jrbled

PROJECT REFERENCE NO. R-2307B / 1-5717	SHEET NO. 8
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
TGS ENGINEERS 706 HILLSBOROUGH ST., SUITE 200 RALEIGH, NC 27603 PH (919) 773-8887 CORP. LICENSE NO.: C-0275	



PERMIT DRAWING  
SHEET 8 OF 22



SEE SHEET 40 FOR -L- PROFILE  
 SEE SHEETS 56 THRU 57 FOR -LEB- PROFILE  
 SEE SHEET 74 FOR -TRAIL- PROFILE  
 SEE SHEET 2B-1 FOR CURVE DATA

5/14/99

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

EXISTING GROUND      - - - - -  
 PROPOSED GRADE      - - - - -  
 LEFT DITCH GRADE    - - - - -  
 RIGHT DITCH GRADE   - - - - -

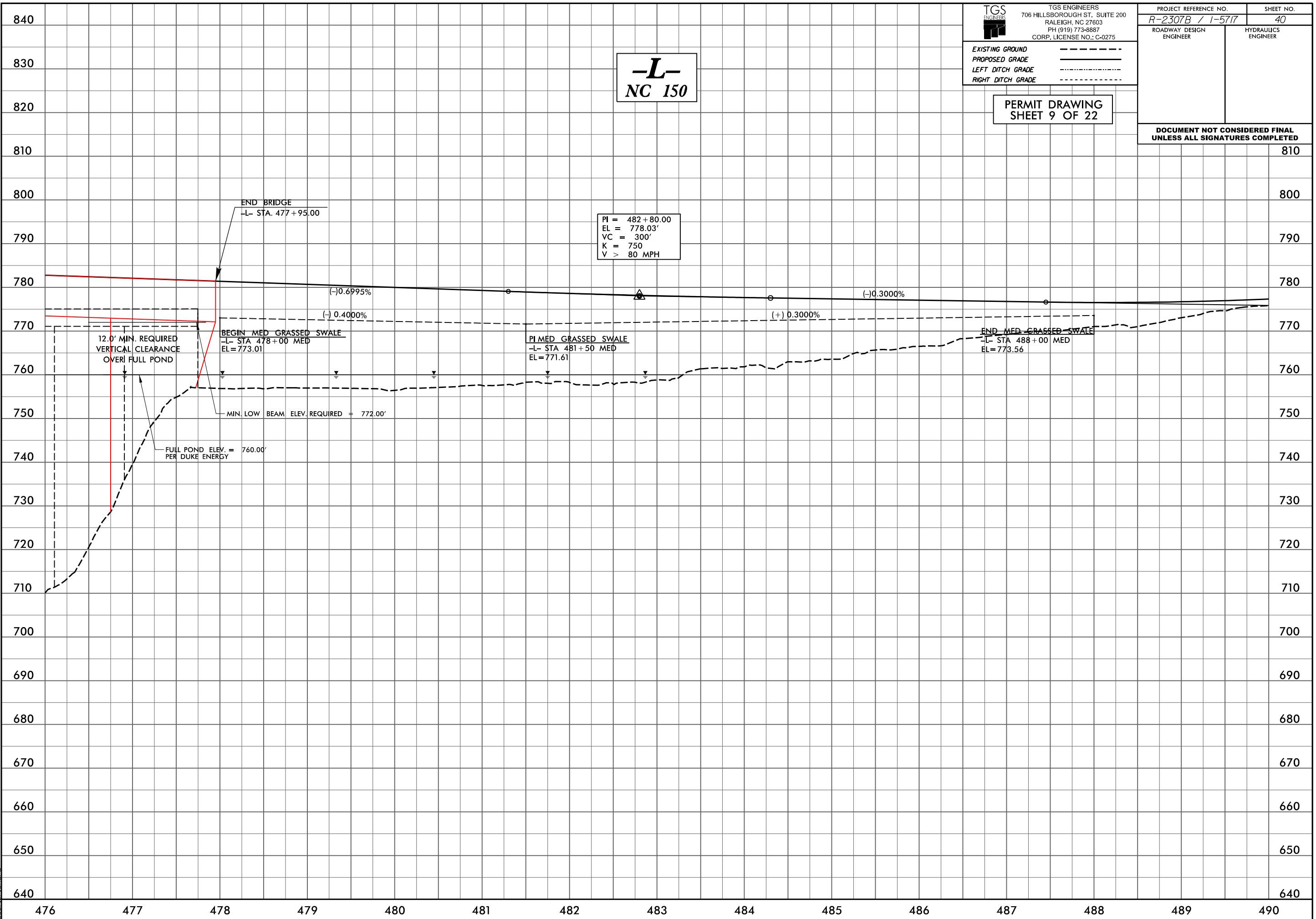
PROJECT REFERENCE NO. <i>R-2307B / 1-5717</i>	SHEET NO. 40
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PERMIT DRAWING  
SHEET 9 OF 22

DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED

**-L-**  
**NC 150**

PI = 482+80.00  
 EL = 778.03'  
 VC = 300'  
 K = 750  
 V > 80 MPH

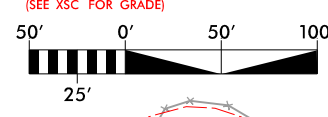
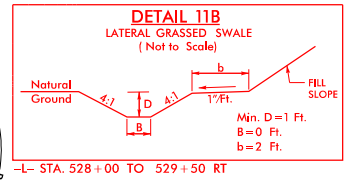
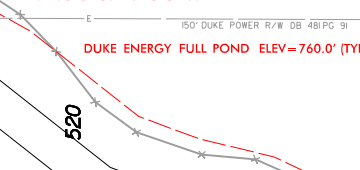
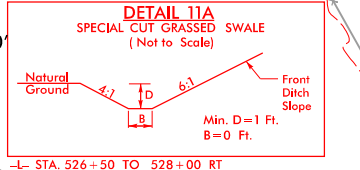
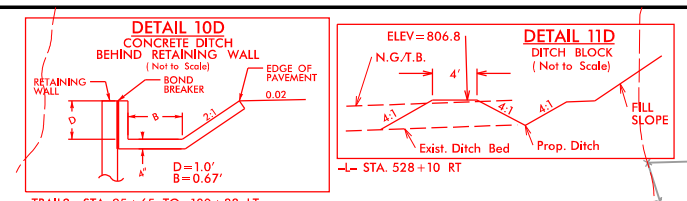


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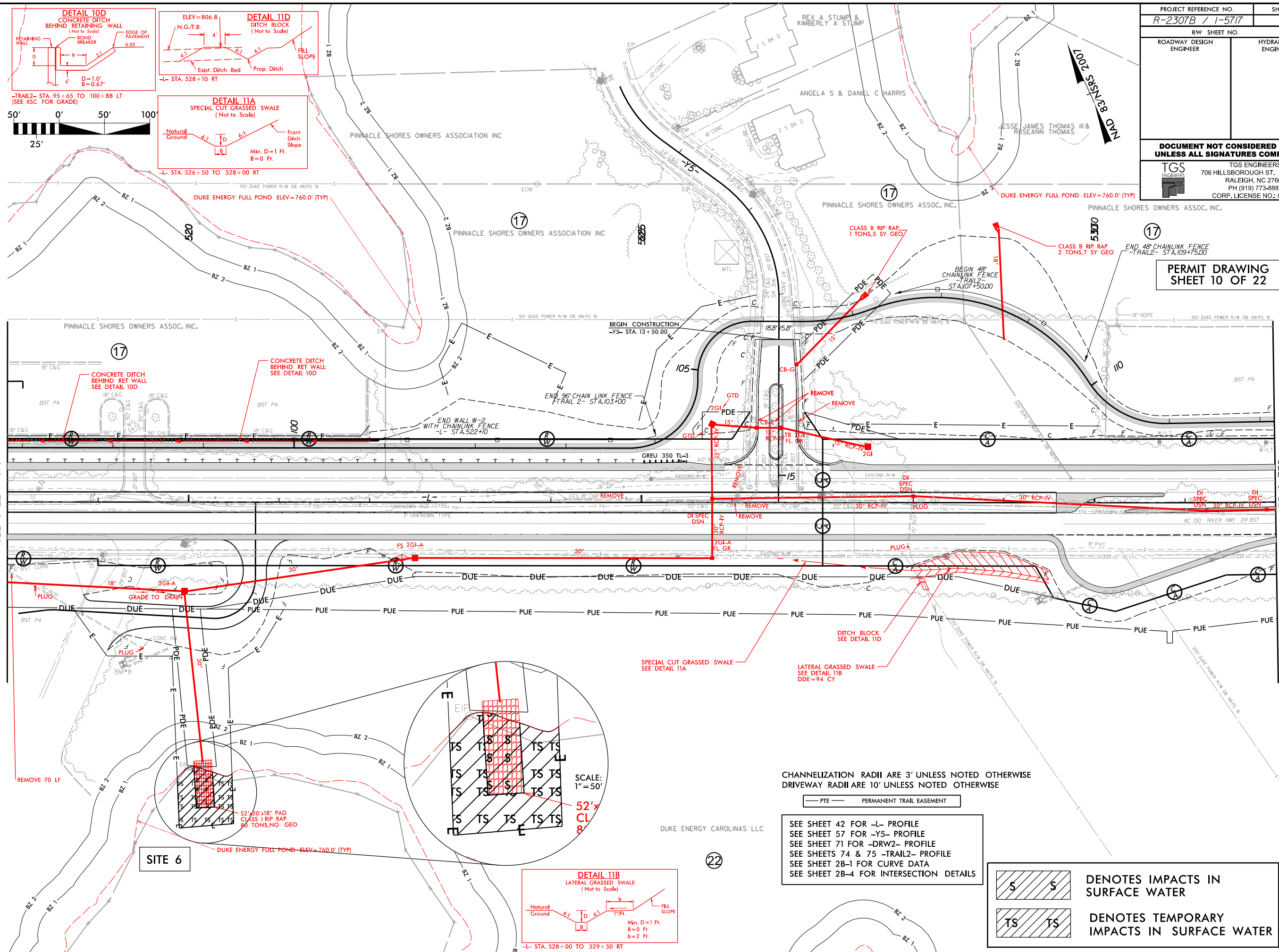
8/17/99

PROJECT REFERENCE NO. R-2307B / 1-5717	SHEET NO. 11
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
 <b>TGS ENGINEERS</b> 706 HILLSBOROUGH ST., SUITE 200 RALEIGH, NC 27603 PH (919) 773-8887 CORP. LICENSE NO.: C-0275	



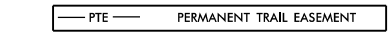
MATCH LINE -L- STA. 518+00  
SEE SHEET NO. 10

MATCH LINE -L- STA. 532+00  
SEE SHEET NO. 12

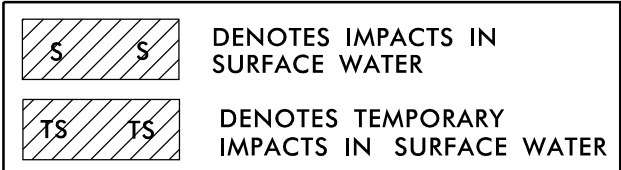


**PERMIT DRAWING  
SHEET 10 OF 22**


CHANNELIZATION RADII ARE 3' UNLESS NOTED OTHERWISE  
DRIVEWAY RADII ARE 10' UNLESS NOTED OTHERWISE

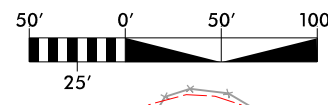
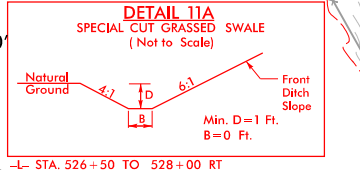
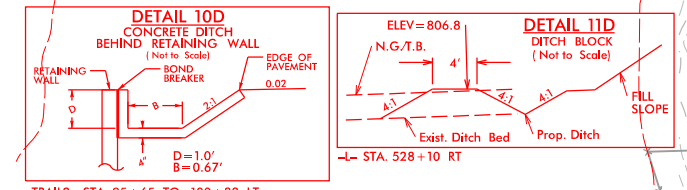


SEE SHEET 42 FOR -L- PROFILE  
 SEE SHEET 57 FOR -Y5- PROFILE  
 SEE SHEET 71 FOR -DRW2- PROFILE  
 SEE SHEETS 74 & 75 -TRAIL2- PROFILE  
 SEE SHEET 2B-1 FOR CURVE DATA  
 SEE SHEET 2B-4 FOR INTERSECTION DETAILS



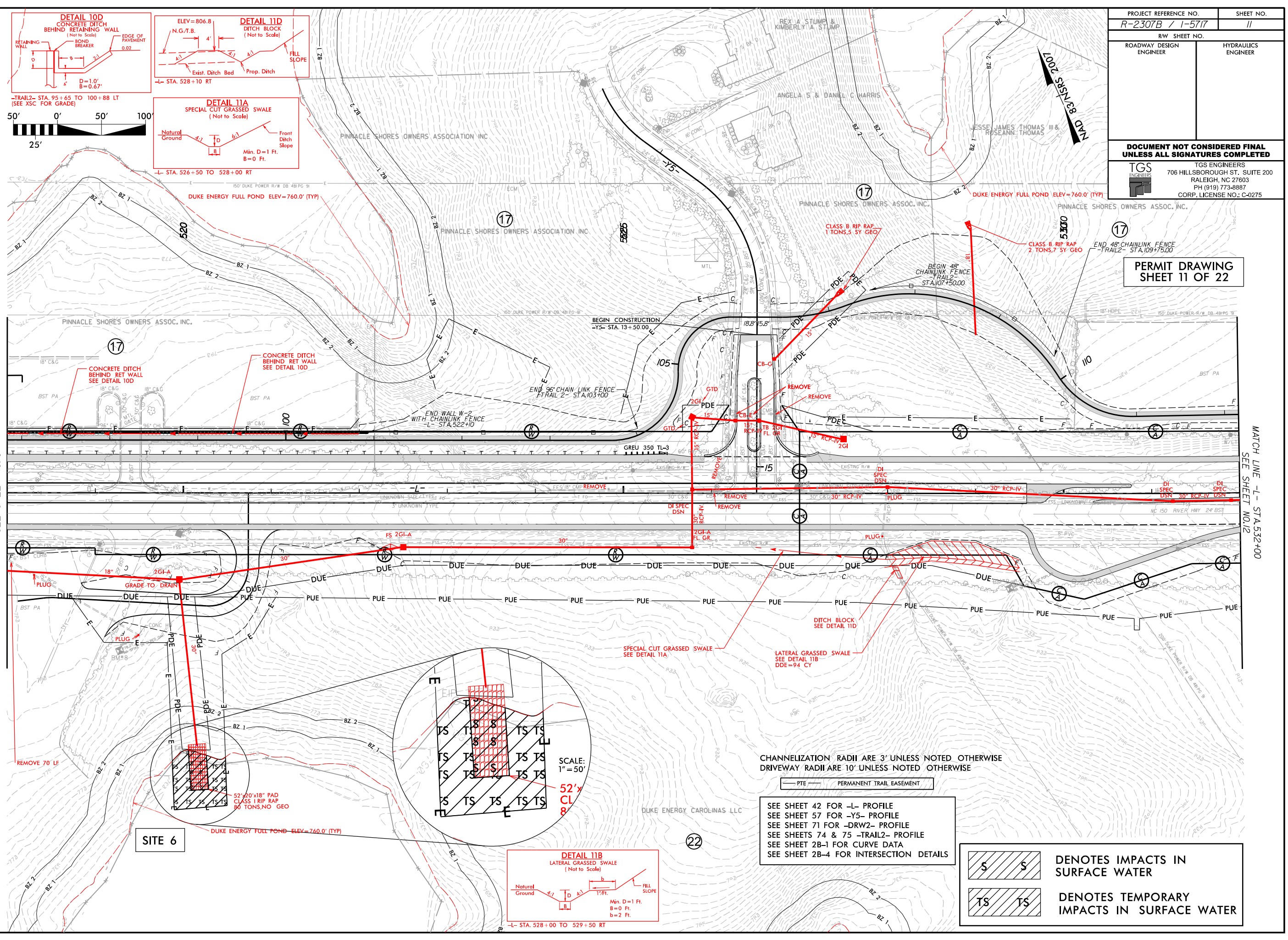
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User:rschick

PROJECT REFERENCE NO. R-2307B / 1-5717	SHEET NO. 11
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
 <b>TGS ENGINEERS</b> 706 HILLSBOROUGH ST., SUITE 200 RALEIGH, NC 27603 PH (919) 773-8887 CORP. LICENSE NO.: C-0275	

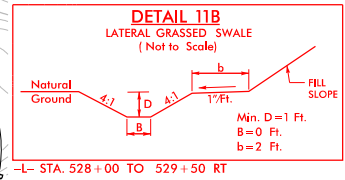
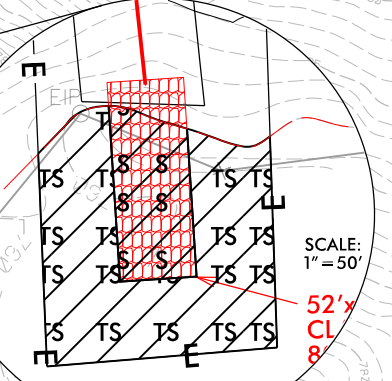


MATCH LINE -L- STA. 518+00  
SEE SHEET NO. 10

MATCH LINE -L- STA. 532+00  
SEE SHEET NO. 12





**PERMIT DRAWING  
SHEET 11 OF 22**



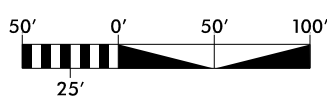
CHANNELIZATION RADII ARE 3' UNLESS NOTED OTHERWISE  
DRIVEWAY RADII ARE 10' UNLESS NOTED OTHERWISE

SEE SHEET 42 FOR -L- PROFILE  
SEE SHEET 57 FOR -Y5- PROFILE  
SEE SHEET 71 FOR -DRW2- PROFILE  
SEE SHEETS 74 & 75 -TRAIL2- PROFILE  
SEE SHEET 2B-1 FOR CURVE DATA  
SEE SHEET 2B-4 FOR INTERSECTION DETAILS

	DENOTES IMPACTS IN SURFACE WATER
	DENOTES TEMPORARY IMPACTS IN SURFACE WATER

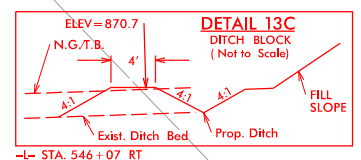
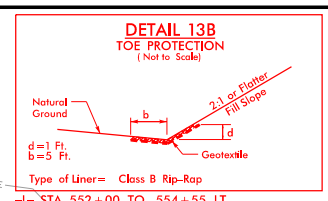
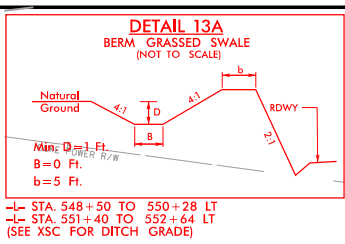
8/17/19  
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User:rschick

8/17/99

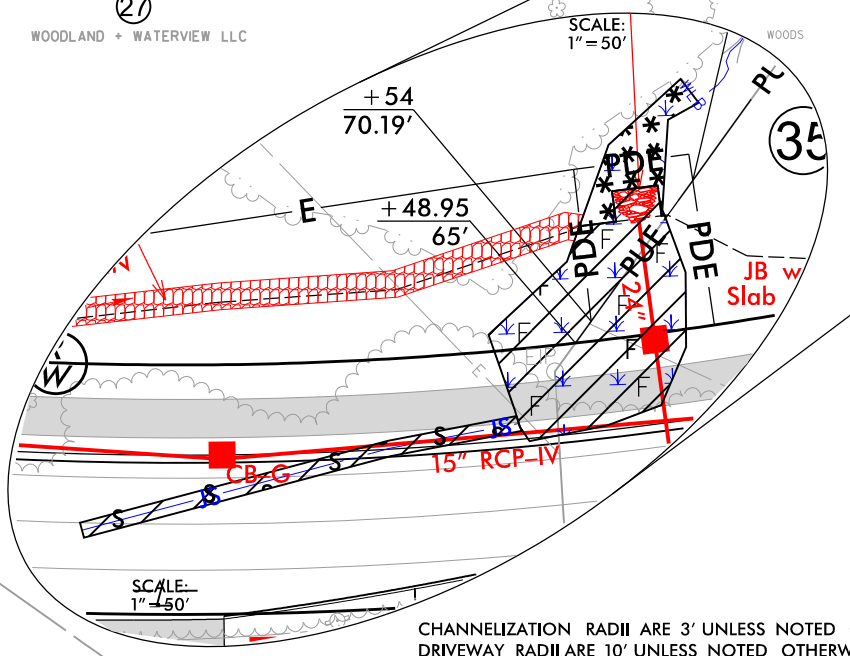
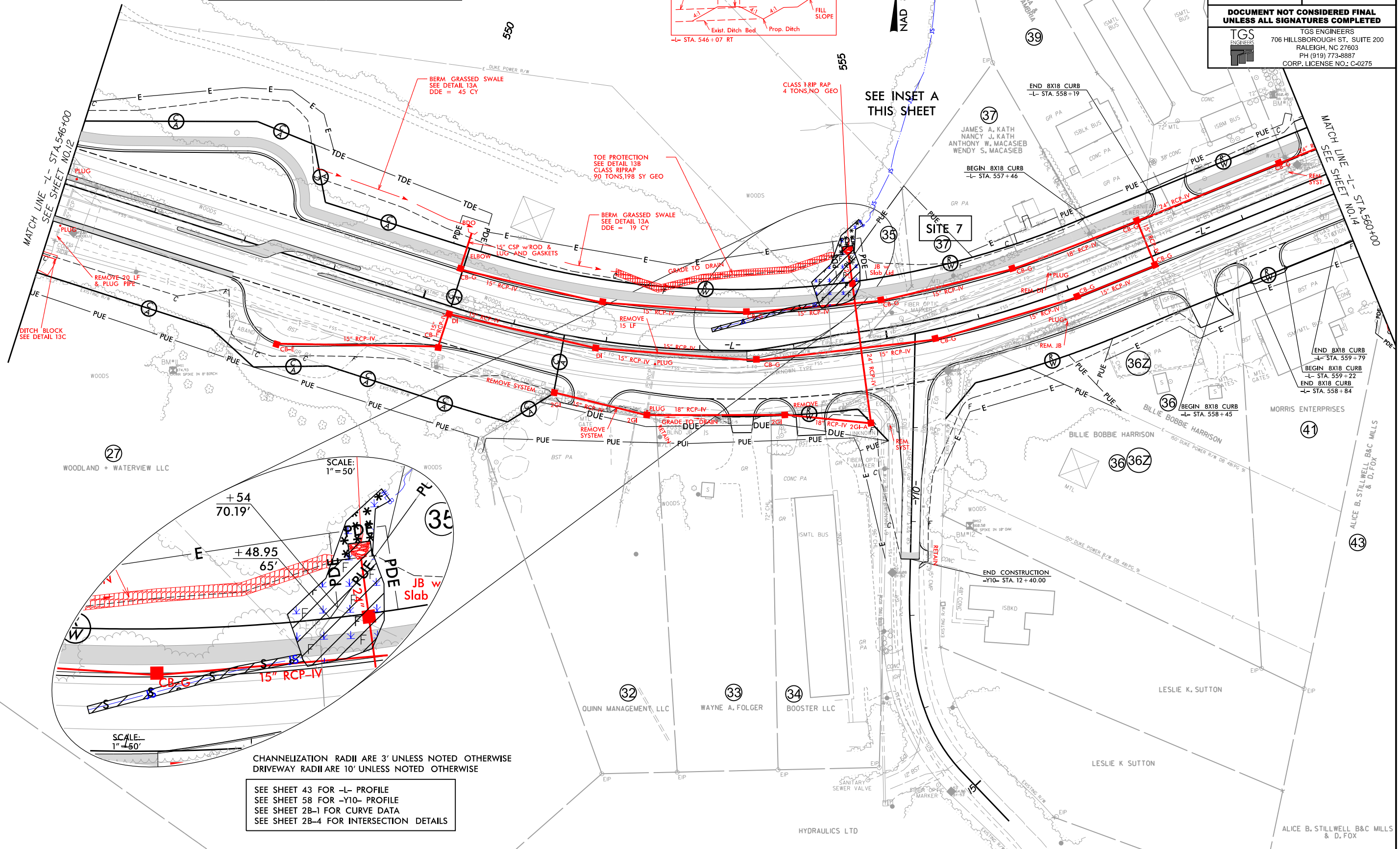


**LEGEND**

- DENOTES FILL IN WETLAND
- DENOTES MECHANIZED CLEARING
- DENOTES IMPACTS IN SURFACE WATER



PROJECT REFERENCE NO. R-2307B / 1-5717	SHEET NO. 13
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>PERMIT DRAWING SHEET 12 OF 22</b>	
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
 TGS ENGINEERS 706 HILLSBOROUGH ST., SUITE 200 RALEIGH, NC 27603 PH (919) 773-8887 CORP. LICENSE NO.: C-0275	



CHANNELIZATION RADII ARE 3' UNLESS NOTED OTHERWISE  
DRIVEWAY RADII ARE 10' UNLESS NOTED OTHERWISE

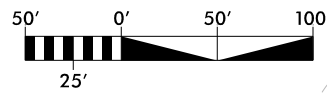
SEE SHEET 43 FOR -L- PROFILE  
SEE SHEET 58 FOR -Y10- PROFILE  
SEE SHEET 2B-1 FOR CURVE DATA  
SEE SHEET 2B-4 FOR INTERSECTION DETAILS

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HYDRAULICS LTD

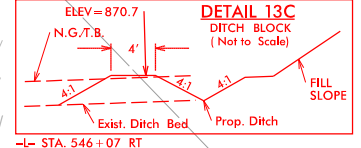
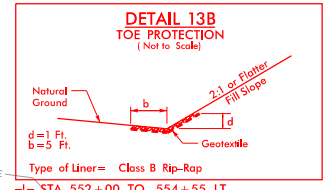
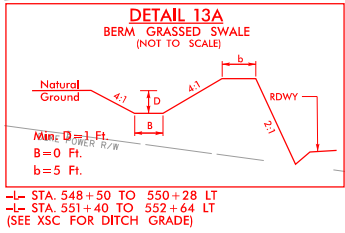
ALICE B. STILLWELL B&C MILLS & D. FOX

8/17/99



**Legend:**

- DENOTES FILL IN WETLAND
- DENOTES MECHANIZED CLEARING
- DENOTES IMPACTS IN SURFACE WATER

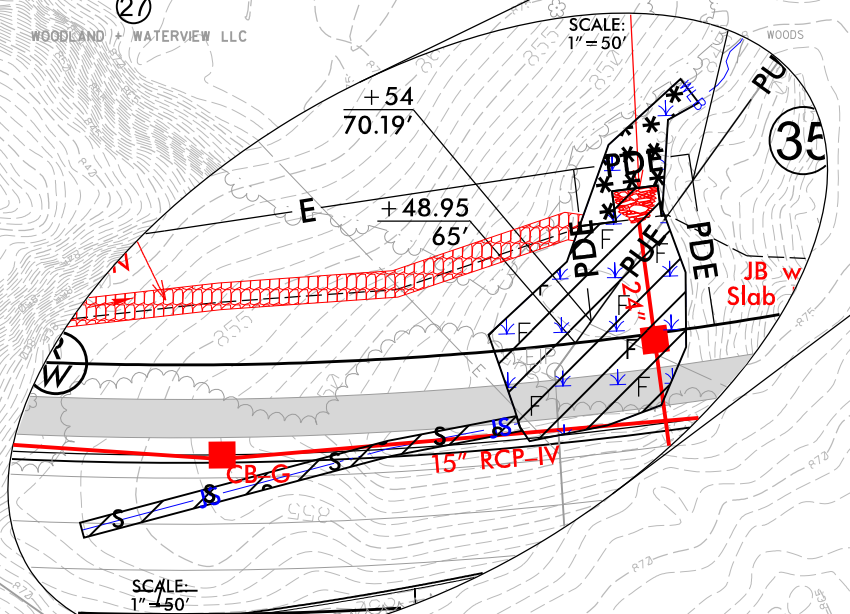
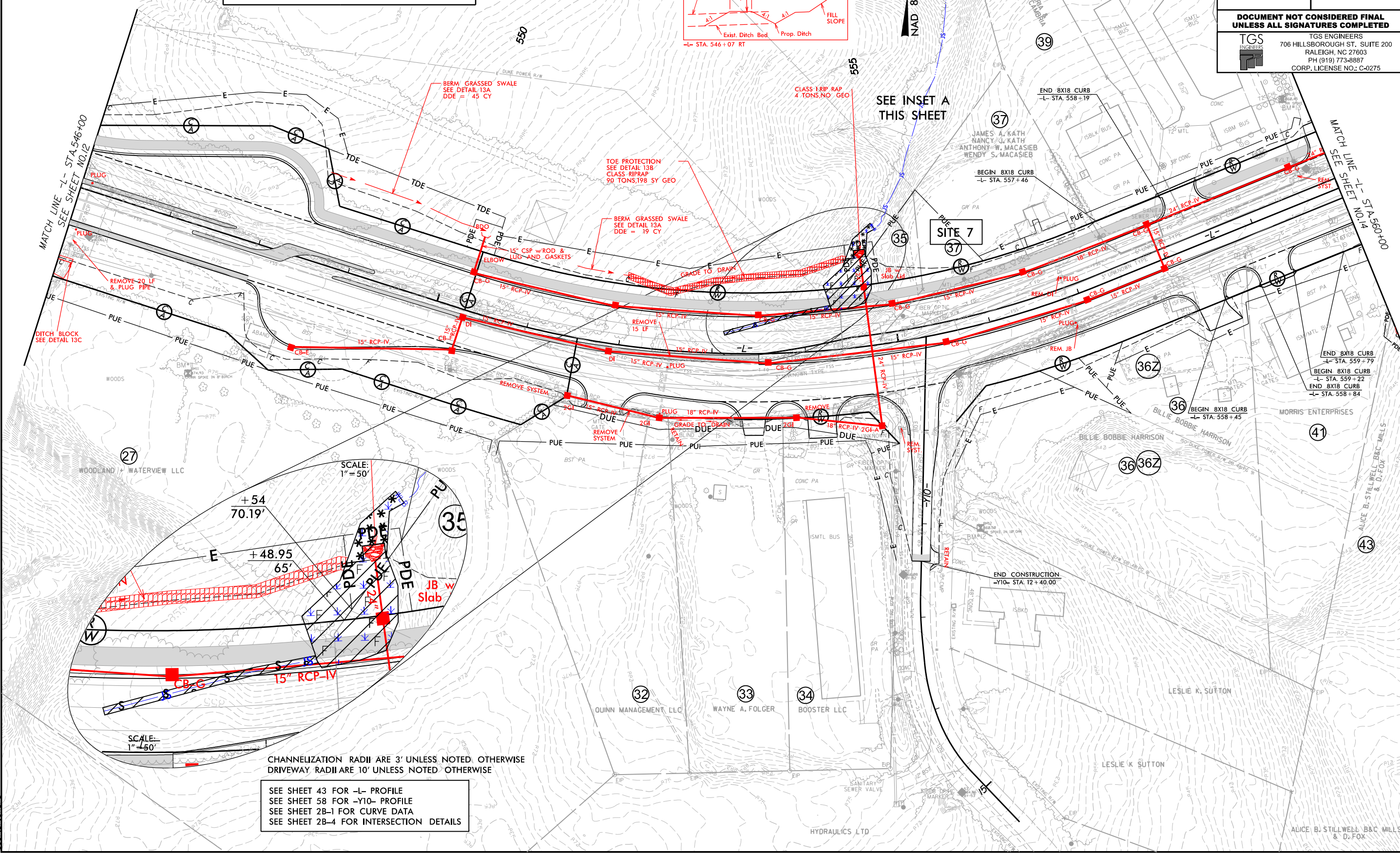


PROJECT REFERENCE NO. R-2307B / 1-5717	SHEET NO. 13
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

**PERMIT DRAWING SHEET 13 OF 22**

**DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED**

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



CHANNELIZATION RADII ARE 3' UNLESS NOTED OTHERWISE  
DRIVEWAY RADII ARE 10' UNLESS NOTED OTHERWISE

SEE SHEET 43 FOR -L- PROFILE  
SEE SHEET 58 FOR -Y10- PROFILE  
SEE SHEET 2B-1 FOR CURVE DATA  
SEE SHEET 2B-4 FOR INTERSECTION DETAILS

I:\26\2024\1\26\2024\Hydraulics\PERMITS\Environmental\Drawings\R-2307B.RDY\_PSH.13.dgn

6/23/16

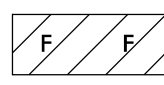


PROJ. REFERENCE NO.  
R-2307B

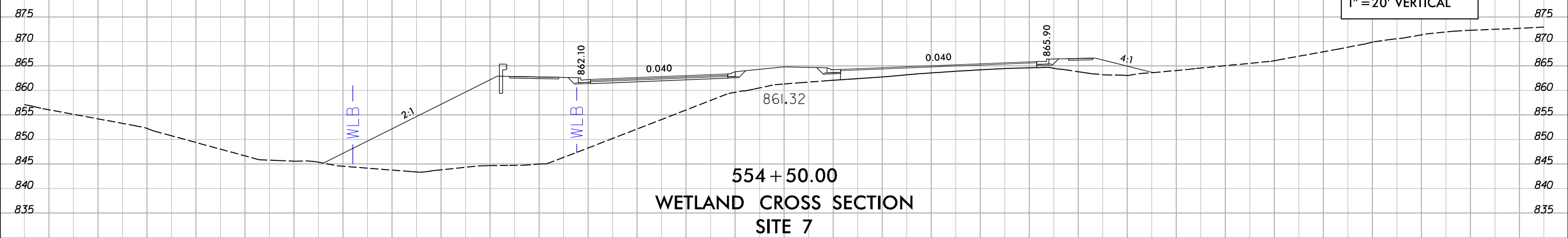
SHEET NO.  
X-69

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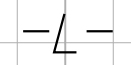
# PERMIT DRAWING SHEET 14 OF 22

 DENOTES FILL IN WETLAND

SCALE  
1" = 20' HORIZONTAL  
1" = 20' VERTICAL

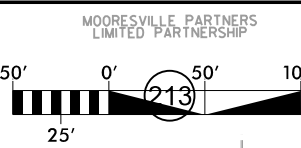


1/26/2024  
X:\NCID01\A-R-2307B\Hydraulics\PERMITS\Environmental\Drawings\A-R-2307B\_RDY\_XPL\_L.dgn  
User:zr1chard



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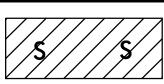
8/17/99



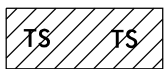
CHANNELIZATION RADII ARE 3' UNLESS NOTED OTHERWISE  
DRIVEWAY RADII ARE 10' UNLESS NOTED OTHERWISE

PERMIT DRAWING  
SHEET 15 OF 22

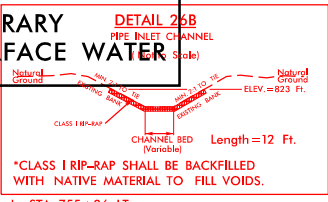
SEE SHEET 50 FOR -L- PROFILE  
SEE SHEET 67 FOR -Y34- & -Y35- PROFILES  
SEE SHEET 68 FOR -Y36- & -Y37- PROFILES  
SEE SHEETS 2B-1 & 2B-3 FOR CURVE DATA  
SEE SHEET 26A FOR RW & EASEMENT DATA



DENOTES IMPACTS IN  
SURFACE WATER

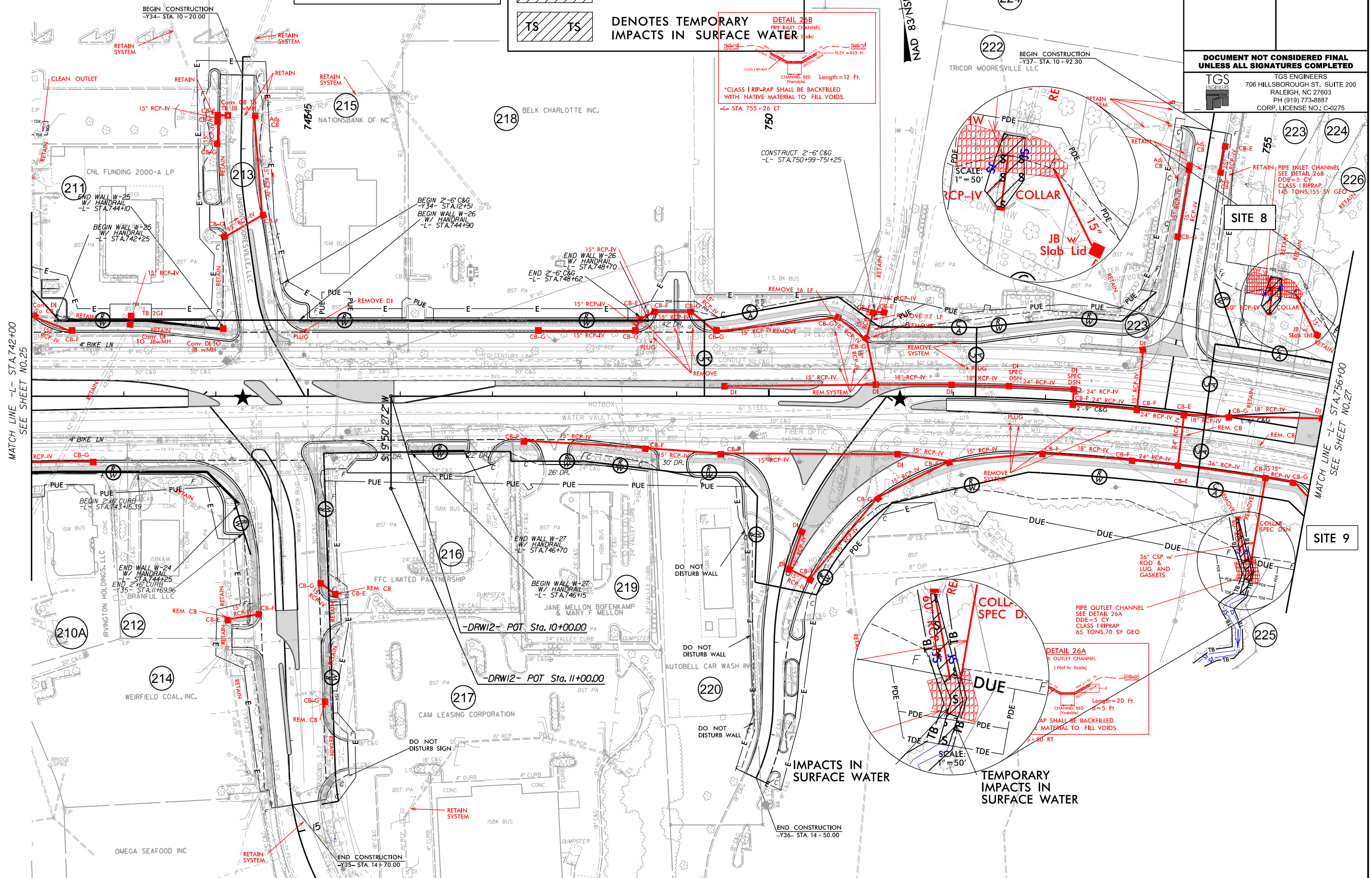


DENOTES TEMPORARY  
IMPACTS IN SURFACE WATER



NAD 83/NSRS 2007

PROJECT REFERENCE NO. R-2307B / 1-5717	SHEET NO. 26
RW SHEET NO.	HYDRAULICS ENGINEER
ROADWAY DESIGN ENGINEER	
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
TGS ENGINEERS 706 HILLSBOROUGH ST., SUITE 200 RALEIGH, NC 27603 PH (919) 773-8887 CORP. LICENSE NO.: C-0275	



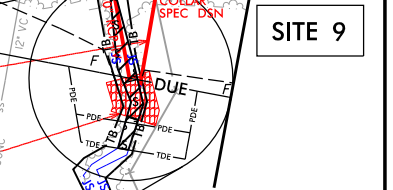
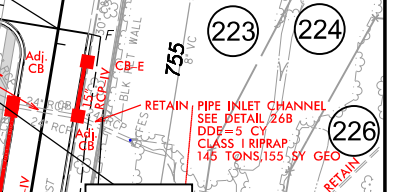
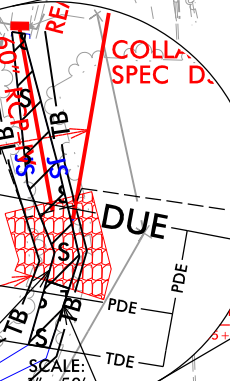
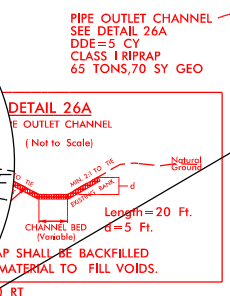
REVISIONS  
10-5-2017 REVISED EASEMENTS ON PARCELS 218,219 & 222

MATCH LINE -L- STA.742+00  
SEE SHEET NO.25

MATCH LINE -L- STA.756+00  
SEE SHEET NO.27

IMPACTS IN SURFACE WATER

TEMPORARY IMPACTS IN SURFACE WATER



END CONSTRUCTION  
-Y34- STA. 10+20.00

END CONSTRUCTION  
-Y35- STA. 14+70.00

END CONSTRUCTION  
-Y36- STA. 14+50.00

BEGIN CONSTRUCTION  
-Y37- STA. 10+92.30

BEGIN WALL W-25  
W/ HANDRAIL  
-L- STA.744+10

BEGIN WALL W-26  
W/ HANDRAIL  
-L- STA.742+25

BEGIN 2'-6\"/>

END WALL W-27  
W/ HANDRAIL  
-L- STA.746+70

END 2'-6\"/>

END WALL W-26  
W/ HANDRAIL  
-L- STA.748+70

END 2'-6\"/>

END WALL W-25  
W/ HANDRAIL  
-L- STA.744+10

END 2'-6\"/>

END WALL W-24  
W/ HANDRAIL  
-L- STA.742+25

END 2'-6\"/>

END WALL W-23  
W/ HANDRAIL  
-L- STA.740+25

END 2'-6\"/>

END WALL W-22  
W/ HANDRAIL  
-L- STA.738+25

END 2'-6\"/>

END WALL W-21  
W/ HANDRAIL  
-L- STA.736+25

END 2'-6\"/>

END WALL W-20  
W/ HANDRAIL  
-L- STA.734+25

END 2'-6\"/>

END WALL W-19  
W/ HANDRAIL  
-L- STA.732+25

END 2'-6\"/>

END WALL W-18  
W/ HANDRAIL  
-L- STA.730+25

END 2'-6\"/>

END WALL W-17  
W/ HANDRAIL  
-L- STA.728+25

END 2'-6\"/>

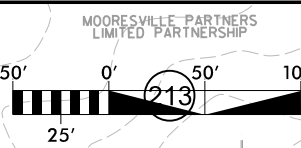
END WALL W-16  
W/ HANDRAIL  
-L- STA.726+25

END 2'-6\"/>

END WALL W-15  
W/ HANDRAIL  
-L- STA.724+25

END 2'-6\"/>

8/17/99



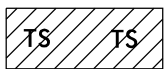
CHANNELIZATION RADII ARE 3' UNLESS NOTED OTHERWISE  
DRIVEWAY RADII ARE 10' UNLESS NOTED OTHERWISE

PERMIT DRAWING  
SHEET 16 OF 22

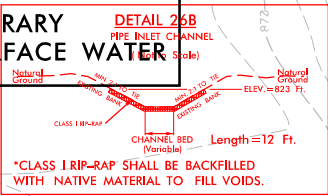
SEE SHEET 50 FOR -L- PROFILE  
SEE SHEET 67 FOR -Y34- & -Y35- PROFILES  
SEE SHEET 68 FOR -Y36- & -Y37- PROFILES  
SEE SHEETS 2B-1 & 2B-3 FOR CURVE DATA  
SEE SHEET 26A FOR RW & EASEMENT DATA



DENOTES IMPACTS IN SURFACE WATER



DENOTES TEMPORARY IMPACTS IN SURFACE WATER



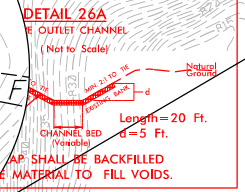
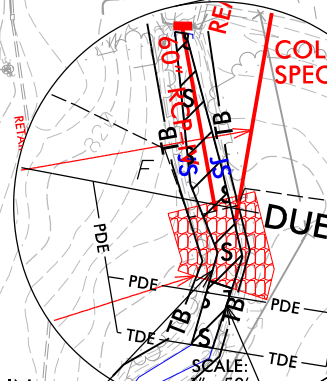
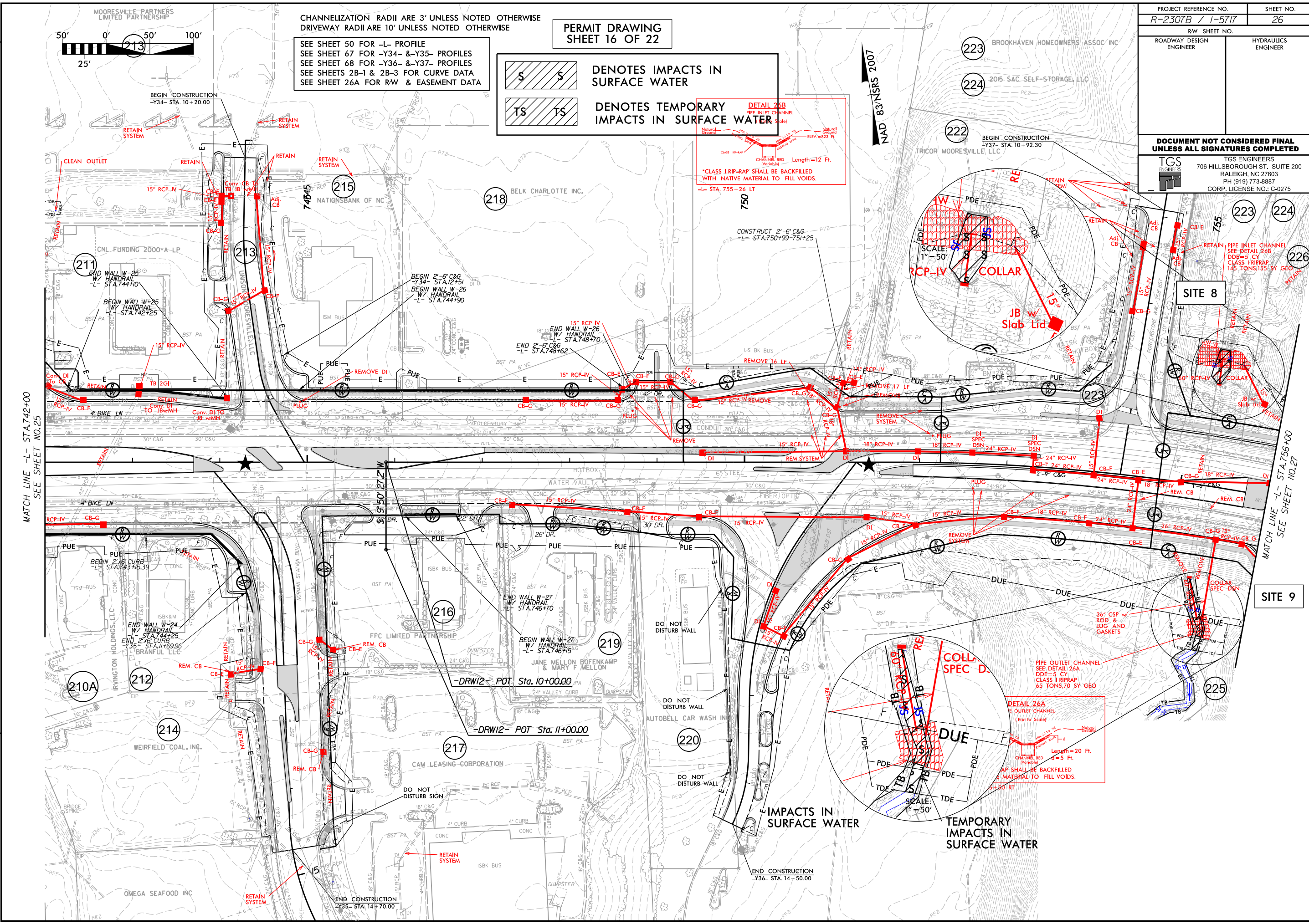
NAD 83 NSRS 2007

PROJECT REFERENCE NO. R-2307B / 1-5717	SHEET NO. 26
RW SHEET NO.	HYDRAULICS ENGINEER
ROADWAY DESIGN ENGINEER	
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
TGS ENGINEERS 706 HILLSBOROUGH ST., SUITE 200 RALEIGH, NC 27603 PH (919) 773-8887 CORP. LICENSE NO.: C-0275	

REVISIONS  
10-5-2017 REVISED EASEMENTS ON PARCELS 218, 219 & 222

MATCH LINE -L- STA. 742+00  
SEE SHEET NO. 25

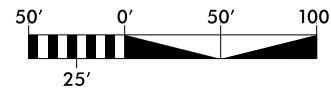
MATCH LINE -L- STA. 756+00  
SEE SHEET NO. 27



IMPACTS IN SURFACE WATER

TEMPORARY IMPACTS IN SURFACE WATER

8/17/99

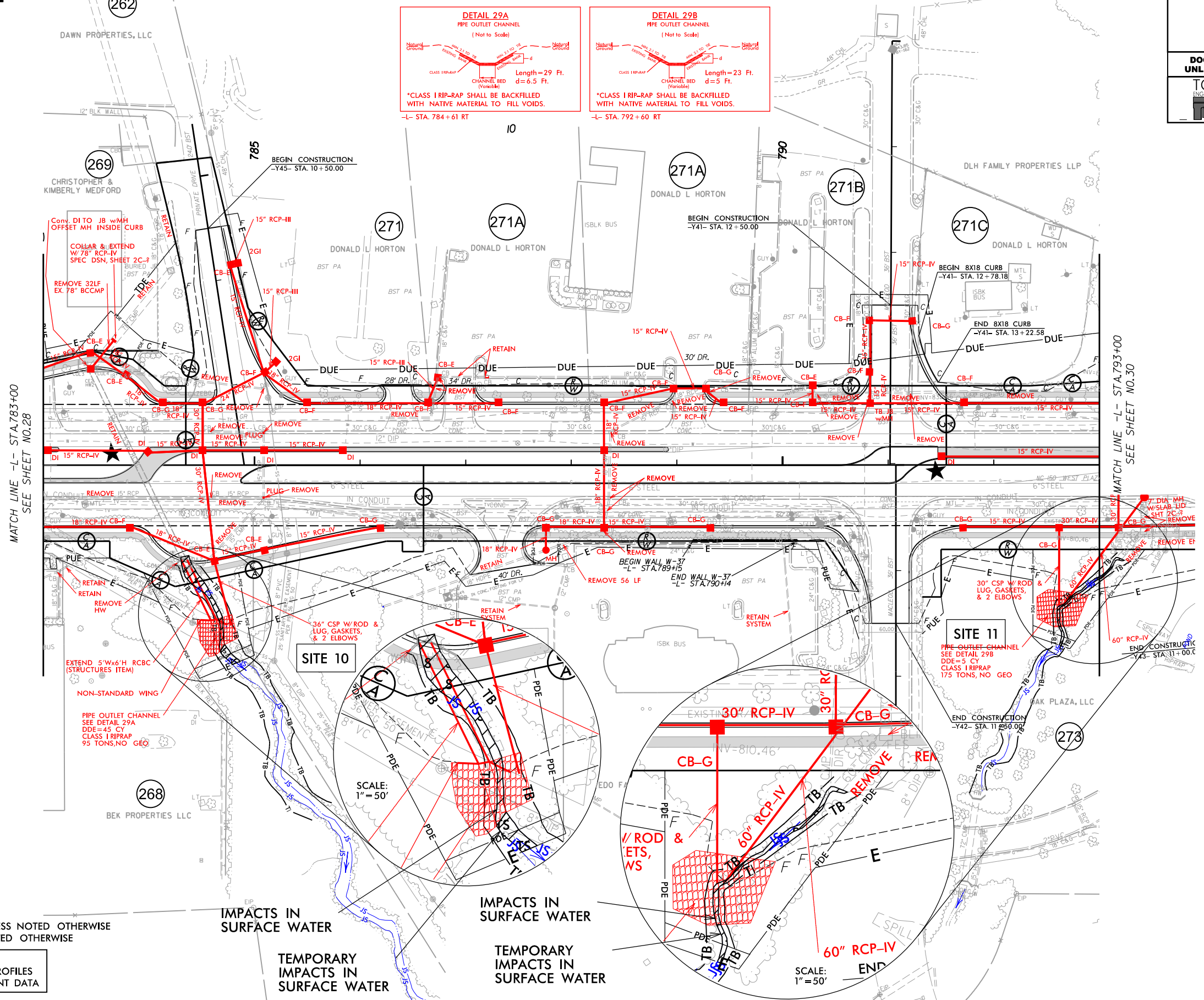


**S S** DENOTES IMPACTS IN SURFACE WATER

**TS TS** DENOTES TEMPORARY IMPACTS IN SURFACE WATER

PERMIT DRAWING  
SHEET 17 OF 22

PROJECT REFERENCE NO. R-2307B / 1-5717	SHEET NO. 29
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
TGS ENGINEERS 706 HILLSBOROUGH ST., SUITE 200 RALEIGH, NC 27603 PH (919) 773-8887 CORP. LICENSE NO.: C-0275	



-Y40- MACLEOD	2019 ADT	2039 ADT
500	980	
39,470	250	250
51,310	490	490
	-L- NC 150	
1,440	2,600	40,640
1,600	3,080	52,800
	4,030	
	4,670	
	-Y40- MACLEOD	

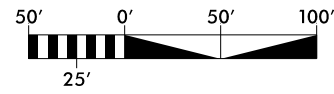
CHANNELIZATION RADII ARE 3' UNLESS NOTED OTHERWISE  
DRIVEWAY RADII ARE 10' UNLESS NOTED OTHERWISE

SEE SHEET 51 FOR -L- PROFILE  
SEE SHEET 70 FOR -Y41- & -Y42- PROFILES  
SEE SHEET 29A FOR RW & EASEMENT DATA

I:\26\2024\X:\NCDOT\1R-2307B\Hydraulics\PERMITS\Environmental\Drawings\1R-2307B\_RDY\_PSH\_29.dgn



8/17/99

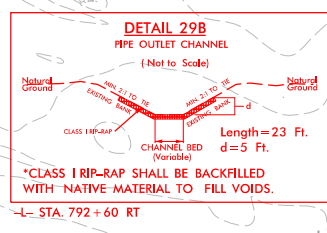
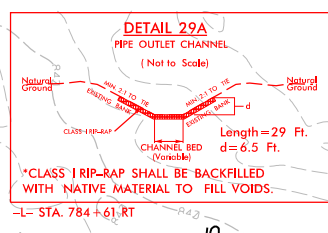
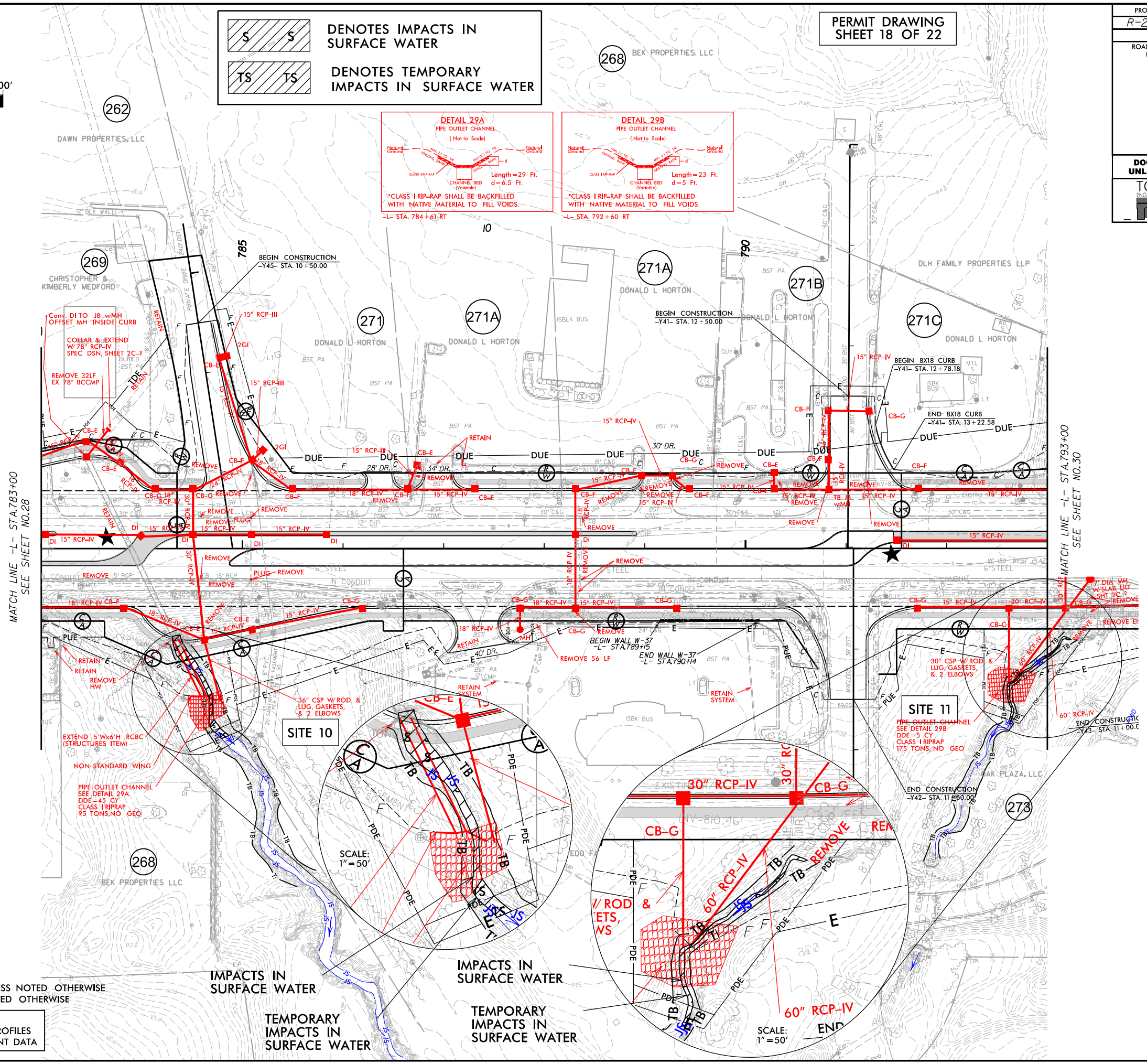


**S S** DENOTES IMPACTS IN SURFACE WATER

**TS TS** DENOTES TEMPORARY IMPACTS IN SURFACE WATER

PERMIT DRAWING SHEET 18 OF 22

PROJECT REFERENCE NO. R-2307B / 1-5717	SHEET NO. 29
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
TGS ENGINEERS 706 HILLSBOROUGH ST., SUITE 200 RALEIGH, NC 27603 PH (919) 773-8887 CORP. LICENSE NO.: C-0275	



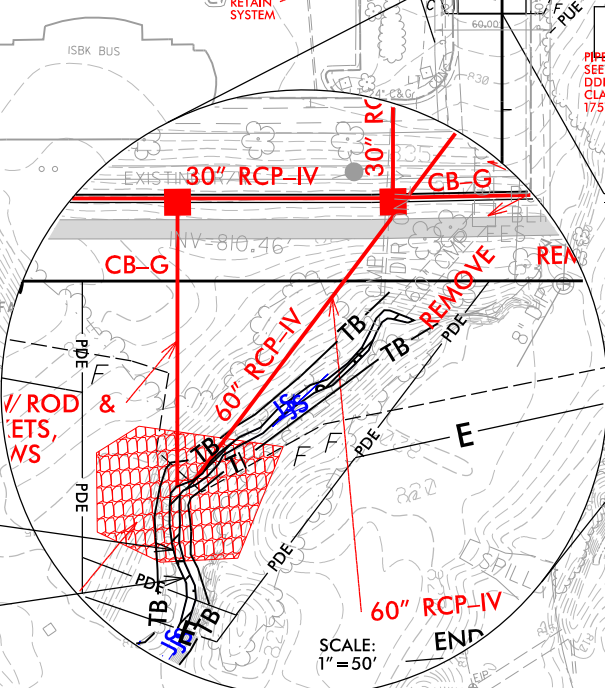
-Y40- MACLEOD	2019 ADT	2039 ADT
500	980	
39,470	250	250
51,310	490	490
	-L- NC 150	
1,440	2,600	40,640
1,600	3,080	52,800
	4,030	4,670
	-Y40- MACLEOD	

CHANNELIZATION RADII ARE 3' UNLESS NOTED OTHERWISE  
DRIVEWAY RADII ARE 10' UNLESS NOTED OTHERWISE

SEE SHEET 51 FOR -L- PROFILE  
SEE SHEET 70 FOR -Y41- & -Y42- PROFILES  
SEE SHEET 29A FOR RW & EASEMENT DATA

IMPACTS IN SURFACE WATER

TEMPORARY IMPACTS IN SURFACE WATER



I:\26\2024\X:\NCDOT\IR-2307B\Hydr-aulics\PERMITS\Environmental\Drawings\IR-2307B\_RDY\_PSH\_29.dgn

1002 SUSSEX ROAD

5/14/99

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

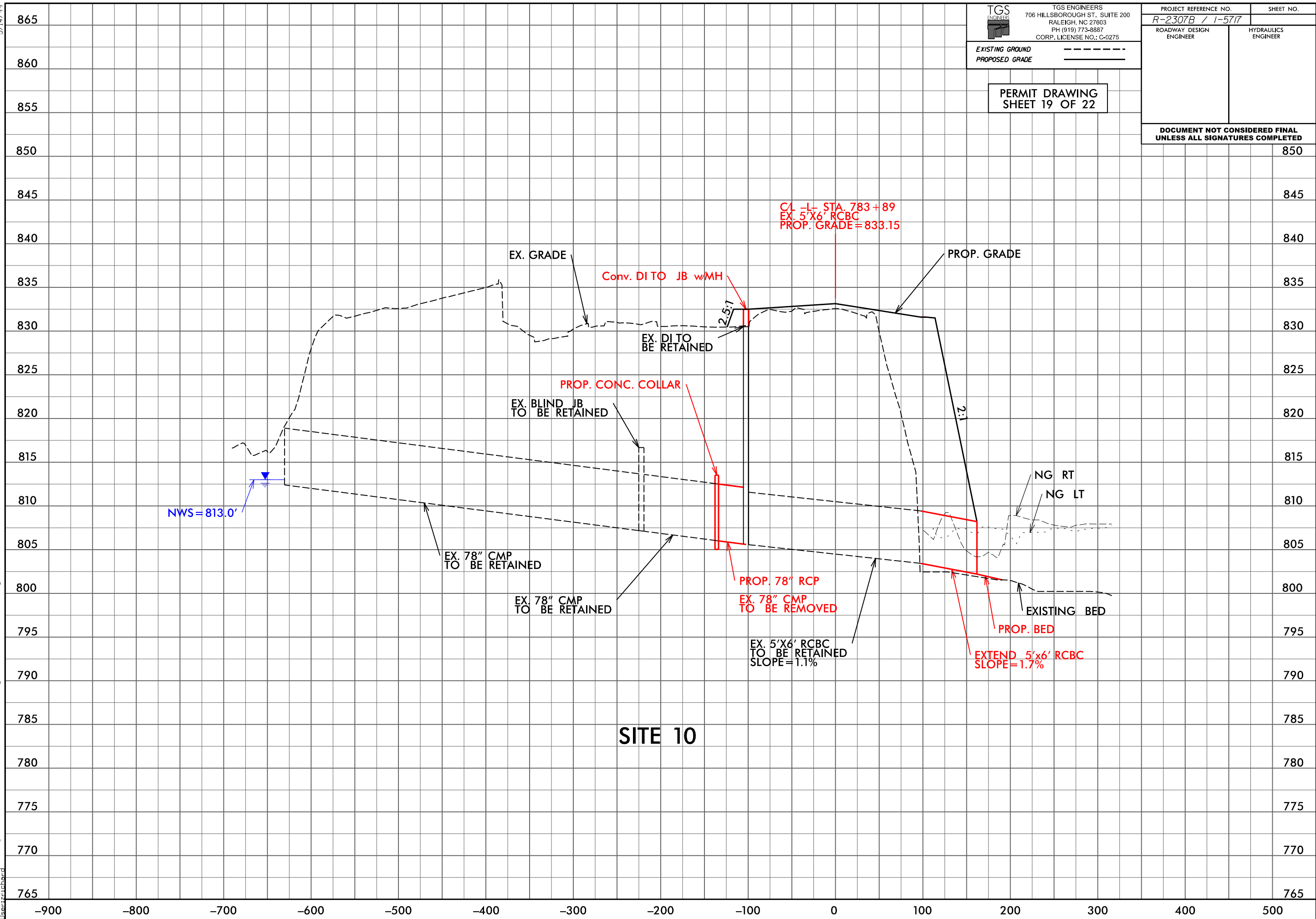
EXISTING GROUND -----  
 PROPOSED GRADE \_\_\_\_\_

PROJECT REFERENCE NO. <i>R-2307B / 1-5717</i>	SHEET NO.
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PERMIT DRAWING  
SHEET 19 OF 22

DOCUMENT NOT CONSIDERED FINAL  
UNLESS ALL SIGNATURES COMPLETED


X:\2004\2004\2307B\Hydraulics\PERMITS\Environmental\Drawings\R-2307B\_Culvert\_PFL.dgn  
User:zschard





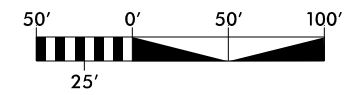
SITE 10

-900 -800 -700 -600 -500 -400 -300 -200 -100 0 100 200 300 400 500

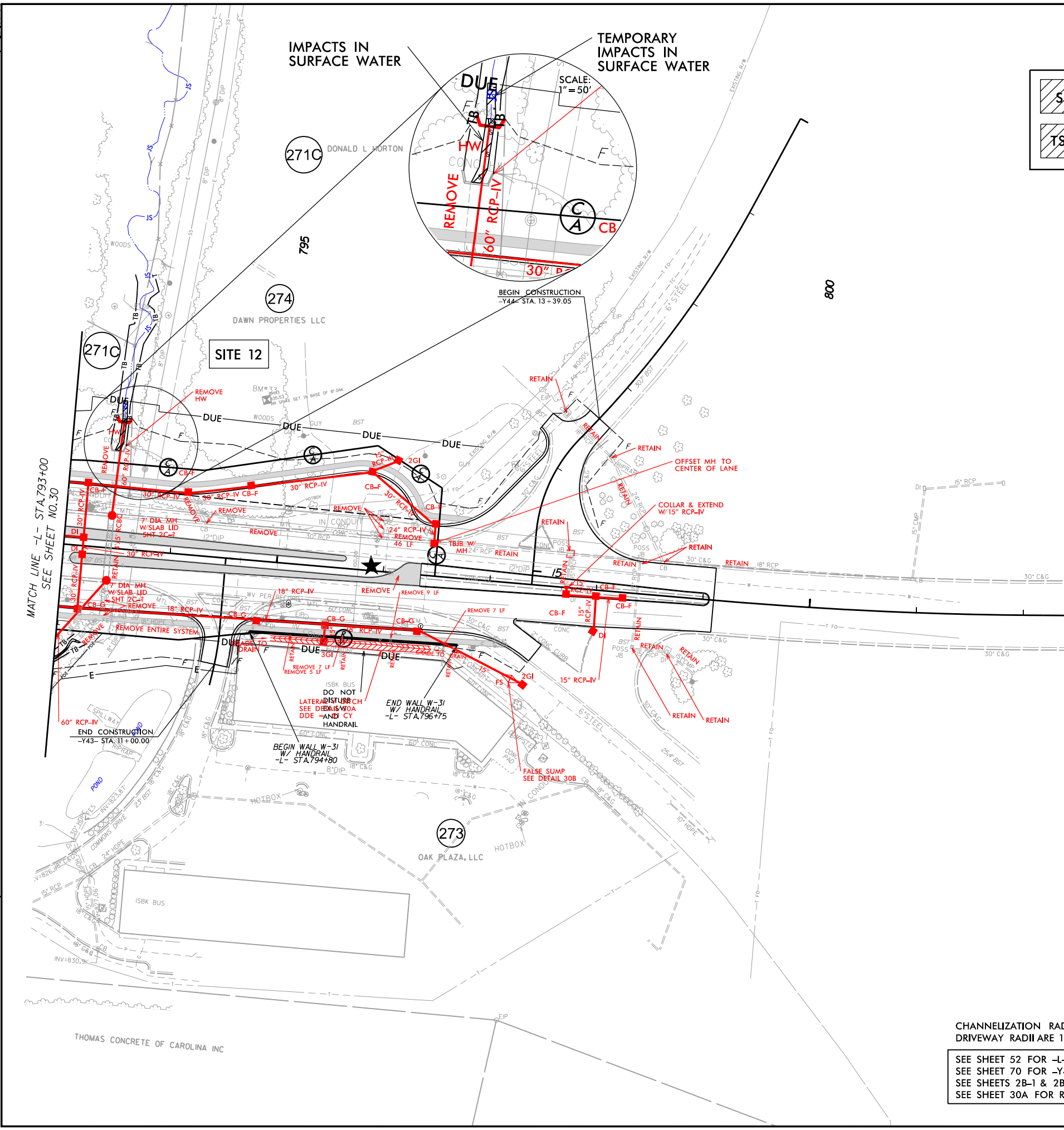
PERMIT DRAWING  
SHEET 20 OF 22

PROJECT REFERENCE NO. R-2307B / 1-5717	SHEET NO. 30
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
 TGS ENGINEERS 706 HILLSBOROUGH ST. SUITE 200 RALEIGH, NC 27603 PH (919) 773-8887 CORP. LICENSE NO.: C-0275	

	DENOTES IMPACTS IN SURFACE WATER
	DENOTES TEMPORARY IMPACTS IN SURFACE WATER



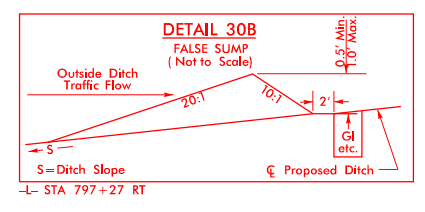
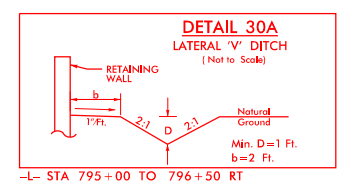
NAD 83 N/SRS 2007



MATCH LINE -L- STA. 793+00  
SEE SHEET NO. 30

10-5-2017 REVISED DUES ON PARCELS 271 & 274.


X:\2017\2017 R-2307B\Hydraulics\PERMITS\_Environment\1\Drawings\1R-2307B\_PSH\_30.dgn  
User: zrichard





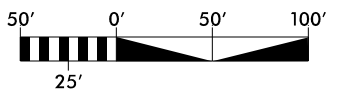
CHANNELIZATION RADII ARE 3' UNLESS NOTED OTHERWISE  
DRIVEWAY RADII ARE 10' UNLESS NOTED OTHERWISE

SEE SHEET 52 FOR -L- PROFILE  
SEE SHEET 70 FOR -Y43- & -Y44- PROFILES  
SEE SHEETS 2B-1 & 2B-3 FOR CURVE DATA  
SEE SHEET 30A FOR RW & EASEMENT DATA

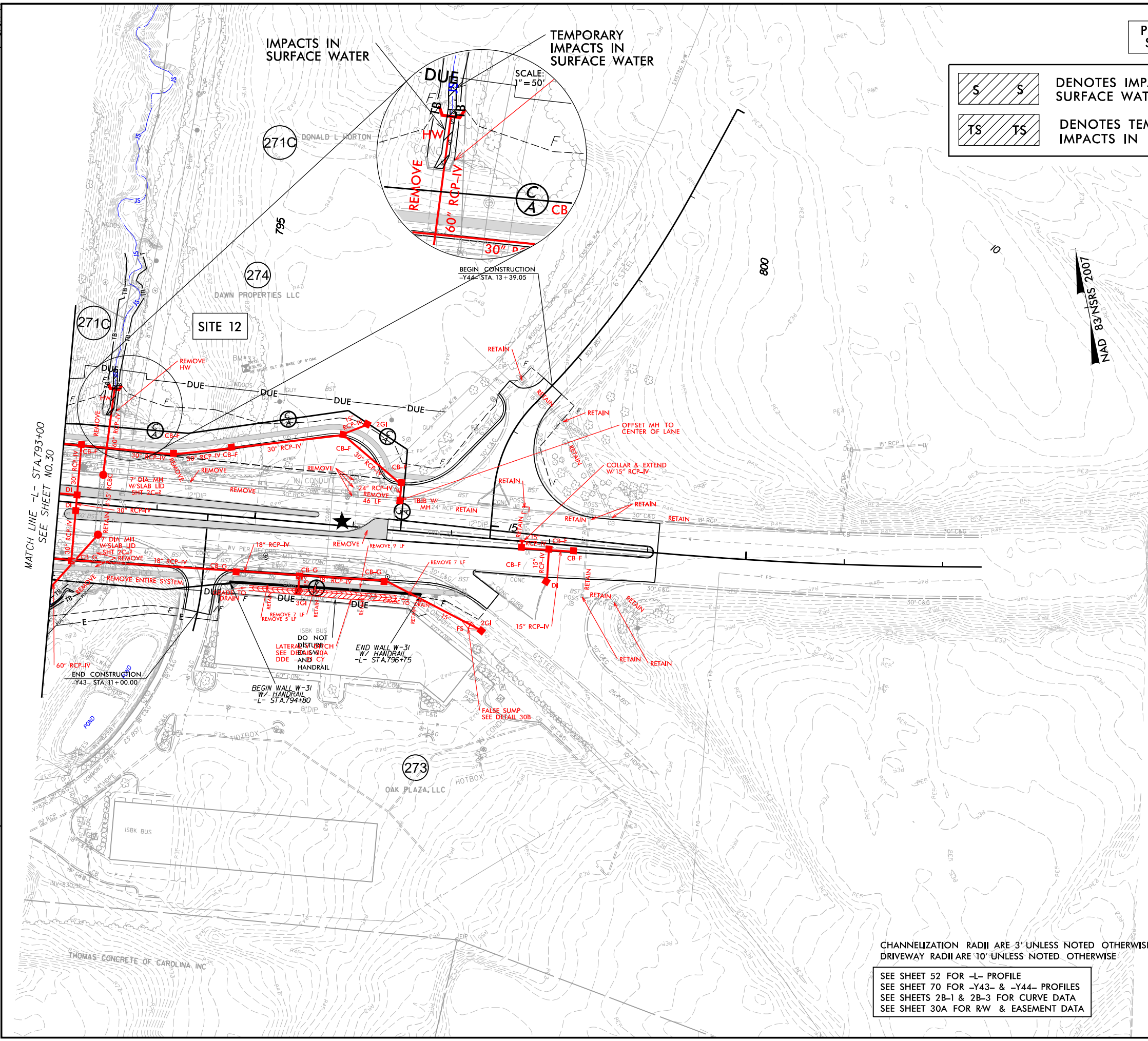
PERMIT DRAWING  
SHEET 21 OF 22

PROJECT REFERENCE NO. R-2307B / 1-5717	SHEET NO. 30
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
 <b>TGS ENGINEERS</b> 706 HILLSBOROUGH ST., SUITE 200 RALEIGH, NC 27603 PH (919) 773-8887 CORP. LICENSE NO.: C-0275	

	DENOTES IMPACTS IN SURFACE WATER
	DENOTES TEMPORARY IMPACTS IN SURFACE WATER



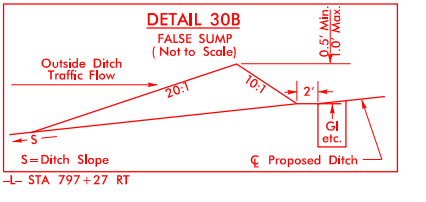
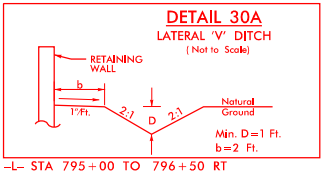
NAD 83 N/SRS 2007



MATCH LINE -L- STA. 793+00  
SEE SHEET NO. 30

10-5-2017 REVISED DUES ON PARCELS 271 & 274.

X:\2307B\Hydraulics\PERMITS\_Environment\Drawings\2307B\_PSH\_30.dgn  
User: zschard



CHANNELIZATION RADII ARE 3' UNLESS NOTED OTHERWISE  
DRIVEWAY RADII ARE 10' UNLESS NOTED OTHERWISE

SEE SHEET 52 FOR -L- PROFILE  
SEE SHEET 70 FOR -Y43- & -Y44- PROFILES  
SEE SHEETS 2B-1 & 2B-3 FOR CURVE DATA  
SEE SHEET 30A FOR RW & EASEMENT DATA

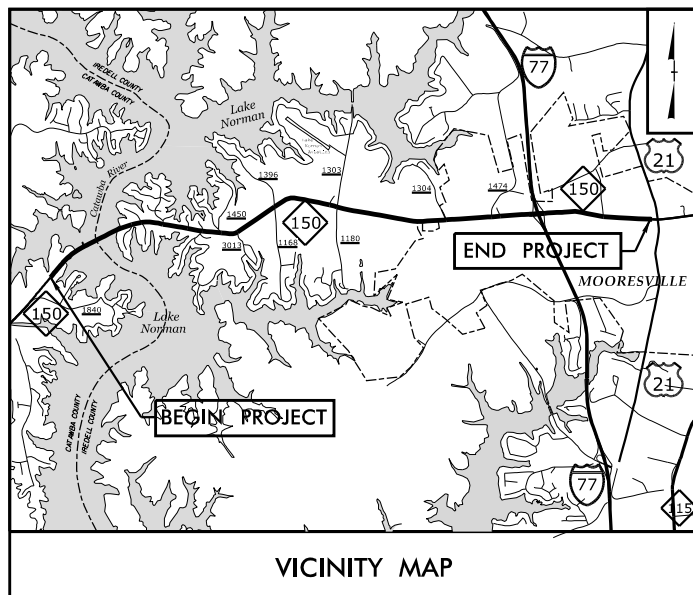


09/28/24

X:\NCDOT\R-2307B\Hydraulics\PERMITS\_Environmental\Drawings\Buffer Plansheets\R-2307B\_RDY\_TSH.dgn User:zrichard

**CONTRACT:** TIP PROJECTS: R-2307B & I-5717

See Sheet 1-A For Index of Sheets



VICINITY MAP

STATE OF NORTH CAROLINA  
DIVISION OF HIGHWAYS

# CATAWBA & IREDELL COUNTIES

LOCATION: NC 150 FROM SR 1840 (GREENWOOD RD) IN CATAWBA COUNTY TO US 21 IN IREDELL COUNTY

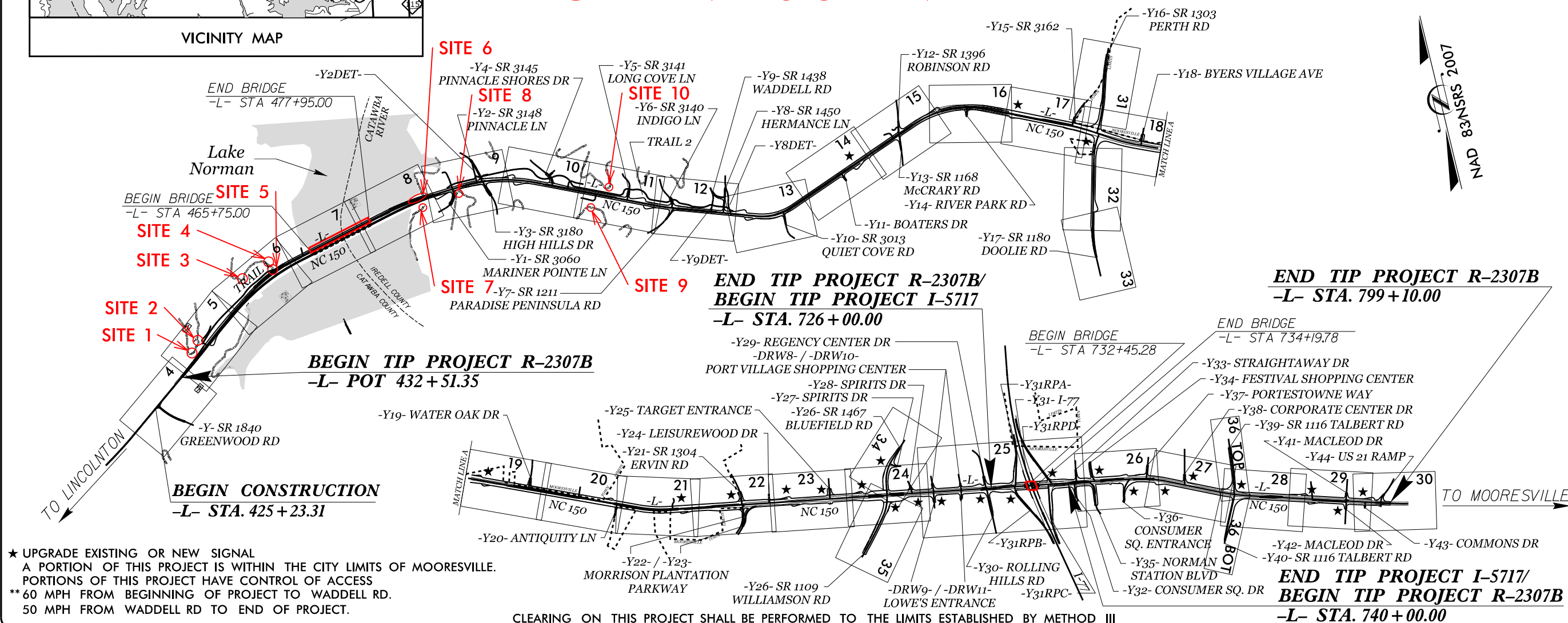
TYPE OF WORK: GRADING, DRAINAGE, PAVING, STRUCTURES, AND SIGNALS

## BUFFER IMPACTS PERMIT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2307B, I-5717	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
37944.1.FR5	STP-0150(36)	PE (R-2307B)	
50134.1.FS1	NHPP-077-1(221)37	PE (I-5717)	
37944.2.4	STP-0150(036)	R/W (R-2307B)	
37944.2.5	STP-0150(036)	UTILITIES (R-2307B)	
50134.2.1	NHPP-077-1(221)37	R/W, UTILITIES (I-5717)	

**BUFFER DRAWING SHEET 1 OF 7**

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED



**GRAPHIC SCALES**



**DESIGN DATA**

ADT 2019 = 47,900  
 ADT 2039 = 58,860  
 K = 8%  
 D = 55%  
 T = 6%\*  
 V = \*\*  
 \* TTST 2%+ DUAL 4%  
 FUNC CLASS =  
 PRINCIPAL ARTERIAL  
 STATEWIDE TIER

**PROJECT LENGTH**

LENGTH ROADWAY TIP PROJECT R-2307B = 6.447 mile  
 LENGTH STRUCTURES TIP PROJECT R-2307B = 0.231 mile  
 TOTAL LENGTH TIP PROJECT R-2307B = 6.678 mile  
 LENGTH ROADWAY TIP PROJECT I-5717 = 0.232 mile  
 LENGTH STRUCTURES TIP PROJECT I-5717 = 0.033 mile  
 TOTAL LENGTH TIP PROJECT I-5717 = 0.265 mile  
 TOTAL LENGTH TIP PROJECT R-2307B / I-5717 = 6.943 mile

Prepared For:  
**DIVISION OF HIGHWAYS**

1000 Birch Ridge Dr., Raleigh NC, 27610

By:  
**TGS ENGINEERS**  
 706 HILLSBOROUGH ST  
 SUITE 200  
 RALEIGH, NC 27603

PH (919) 773-8887  
 CORP. LICENSE NO.: C-0275

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:  
AUGUST 31, 2017

LETTING DATE:  
JUNE 17, 2025

**BURKE EVANS, PE**  
PROJECT ENGINEER

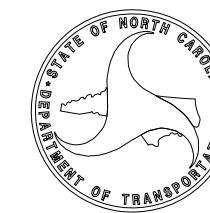
**NATHAN ADIMA, PE**  
NCDOT CONTACT

**HYDRAULICS ENGINEER**


SIGNATURE: \_\_\_\_\_ P.E.

**ROADWAY DESIGN ENGINEER**

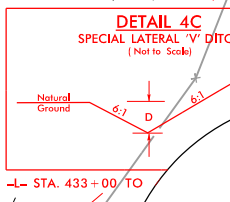
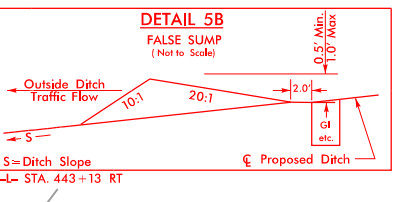
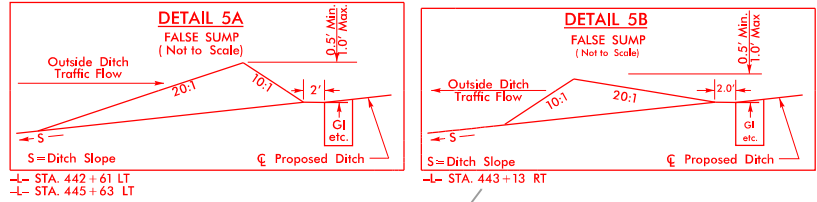
SIGNATURE: \_\_\_\_\_ P.E.



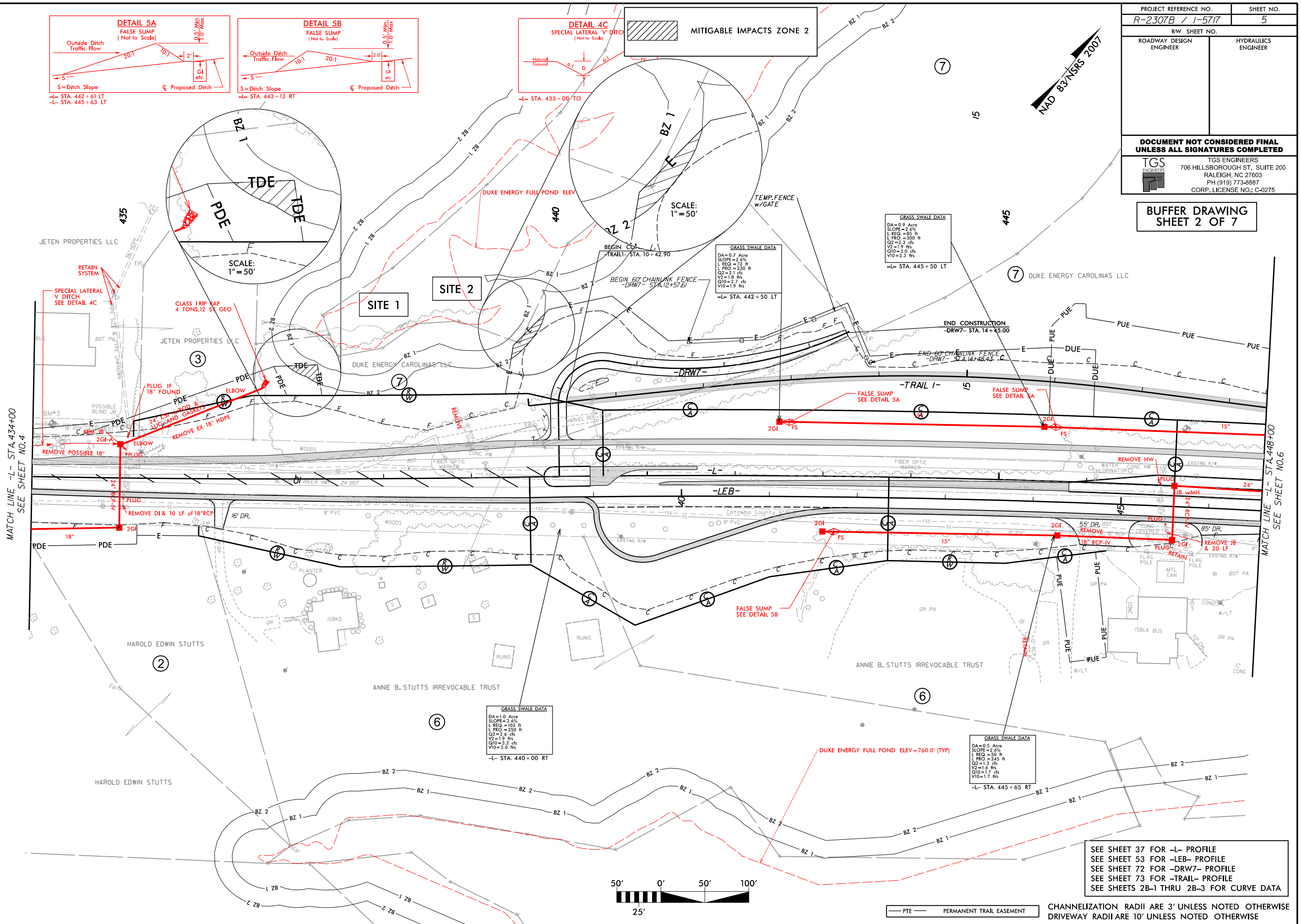
8/17/99

PROJECT REFERENCE NO. R-2307B / 1-5717	SHEET NO. 5
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
 <b>TGS ENGINEERS</b> 706 HILLSBOROUGH ST., SUITE 200 RALEIGH, NC 27603 PH (919) 773-8887 CORP. LICENSE NO.: C-0275	

**BUFFER DRAWING  
SHEET 2 OF 7**



**MITIGABLE IMPACTS ZONE 2**

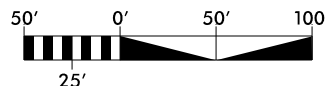


MATCH LINE -L- STA. 434+00  
SEE SHEET NO. 4

MATCH LINE -L- STA. 448+00  
SEE SHEET NO. 6

I:\26\2024\X:\NCDOT\R-2307B\Hydraulics\PERMITS\Environmental\Drawings\Buffer\_Plansheets\R-2307B\_RDY\_PSH\_05.dgn  
User:rschick

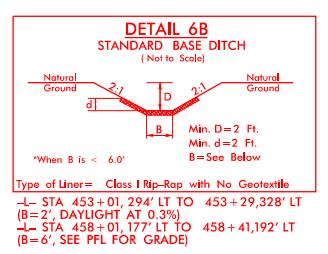
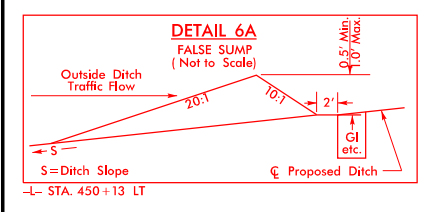
SEE SHEET 37 FOR -L- PROFILE  
SEE SHEET 53 FOR -LEB- PROFILE  
SEE SHEET 72 FOR -DRW7- PROFILE  
SEE SHEET 73 FOR -TRAIL- PROFILE  
SEE SHEETS 2B-1 THRU 2B-3 FOR CURVE DATA



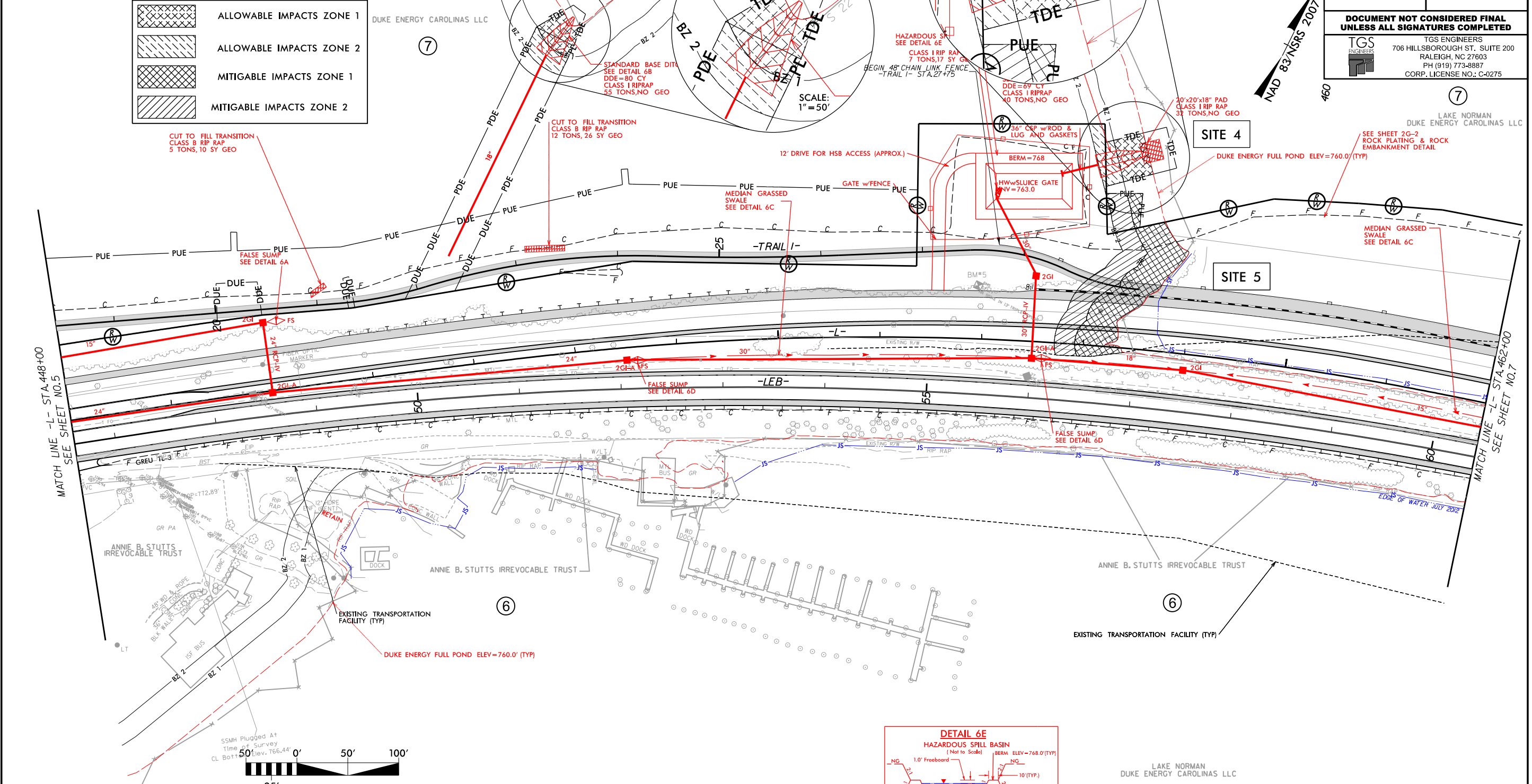
 PERMANENT TRAIL EASEMENT

CHANNELIZATION RADII ARE 3' UNLESS NOTED OTHERWISE  
DRIVEWAY RADII ARE 10' UNLESS NOTED OTHERWISE

**BUFFER DRAWING  
SHEET 3 OF 7**

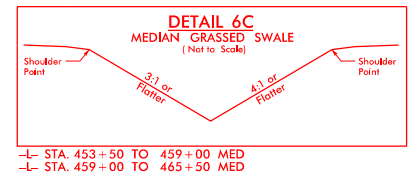
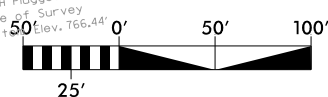


- ALLOWABLE IMPACTS ZONE 1
- ALLOWABLE IMPACTS ZONE 2
- MITIGABLE IMPACTS ZONE 1
- MITIGABLE IMPACTS ZONE 2



MATCH LINE -L- STA. 448+00  
SEE SHEET NO. 5

MATCH LINE -L- STA. 462+00  
SEE SHEET NO. 7



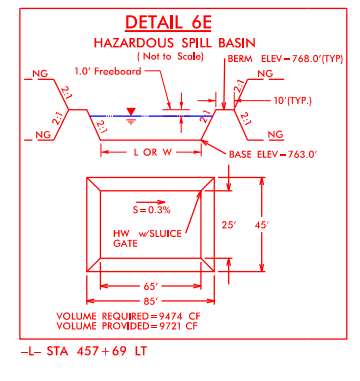
**DETAIL 6D: FALSE SUMP (Not to Scale)**

Median Ditch

S = Ditch Slope

Ditch Grade	L	Ditch Grade	L
0.0% To 2.0%	20'	Over 4.0% To 6.0%	40'
Over 2.0% To 4.0%	30'	Over 6.0%	50'

STA. 543+61 MED; STA. 547+60 MED



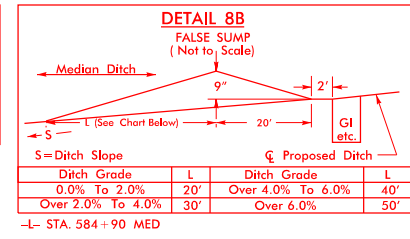
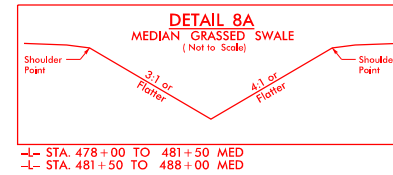
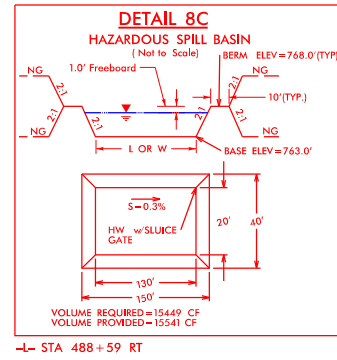
— PTE — PERMANENT TRAIL EASEMENT

SEE SHEET 38 FOR -L- PROFILE  
SEE SHEET 53 FOR -LEB- PROFILE  
SEE SHEET 73 FOR -TRAIL- PROFILE  
SEE SHEET 2B-1 FOR CURVE DATA

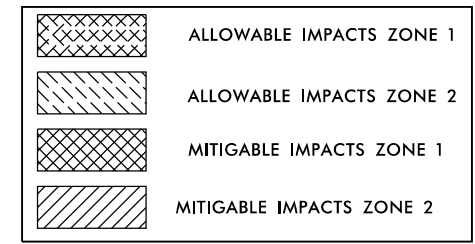
CHANNELIZATION RADII ARE 3' UNLESS NOTED OTHERWISE  
DRIVEWAY RADII ARE 10' UNLESS NOTED OTHERWISE

8/17/99  
I:\26\2024\X:\NCDDT\R-2307B\Hydraulics\PERMITS\Environmental\Drawings\Buffer\_Plansheets\R-2307B\_RDY\_PSH\_06.dgn  
User:rlabrad



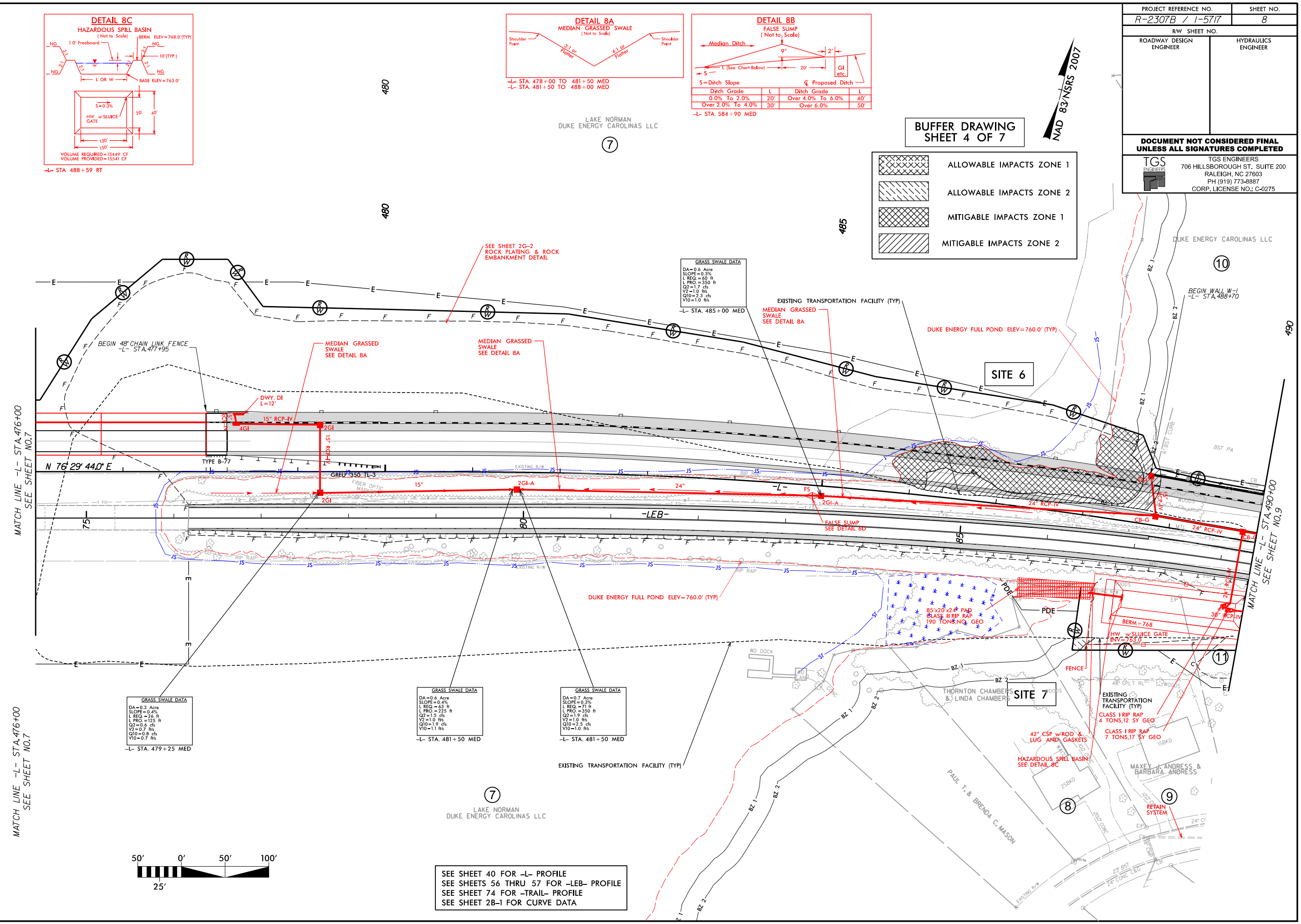


**BUFFER DRAWING  
SHEET 4 OF 7**



NAD 83 NSRS 2007

8/17/99  
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User:rlabrad

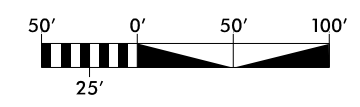


GRASS SWALE DATA  
DA=0.3 Acre  
SLOPE=0.4%  
L REQ=26 ft  
L PRO=15 ft  
Q2=0.6 cfs  
V2=0.7 ffs  
Q10=0.8 cfs  
V10=0.7 ffs  
-L- STA. 479+25 MED

GRASS SWALE DATA  
DA=0.6 Acre  
SLOPE=0.4%  
L REQ=63 ft  
L PRO=350 ft  
Q2=1.5 cfs  
V2=1.0 ffs  
Q10=1.9 cfs  
V10=1.1 ffs  
-L- STA. 481+50 MED

GRASS SWALE DATA  
DA=0.7 Acre  
SLOPE=0.3%  
L REQ=71 ft  
L PRO=350 ft  
Q2=1.9 cfs  
V2=1.0 ffs  
Q10=2.5 cfs  
V10=1.0 ffs  
-L- STA. 481+50 MED

GRASS SWALE DATA  
DA=0.6 Acre  
SLOPE=0.3%  
L REQ=60 ft  
L PRO=350 ft  
Q2=1.7 cfs  
V2=1.0 ffs  
Q10=2.3 cfs  
V10=1.0 ffs  
-L- STA. 485+00 MED

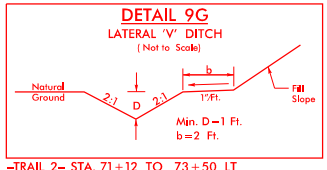
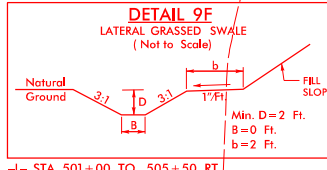
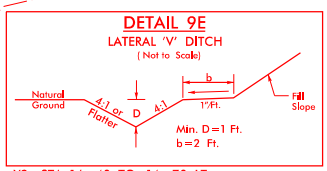
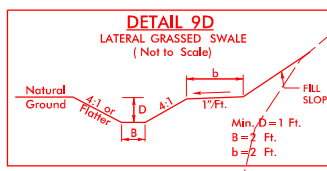
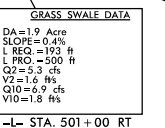
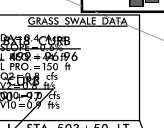
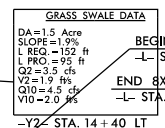
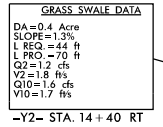
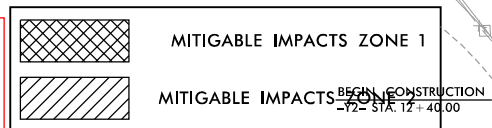
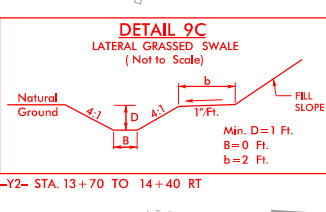
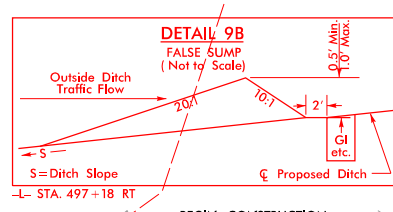
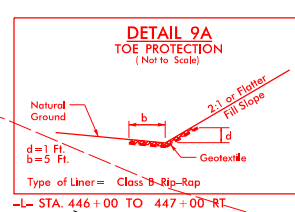
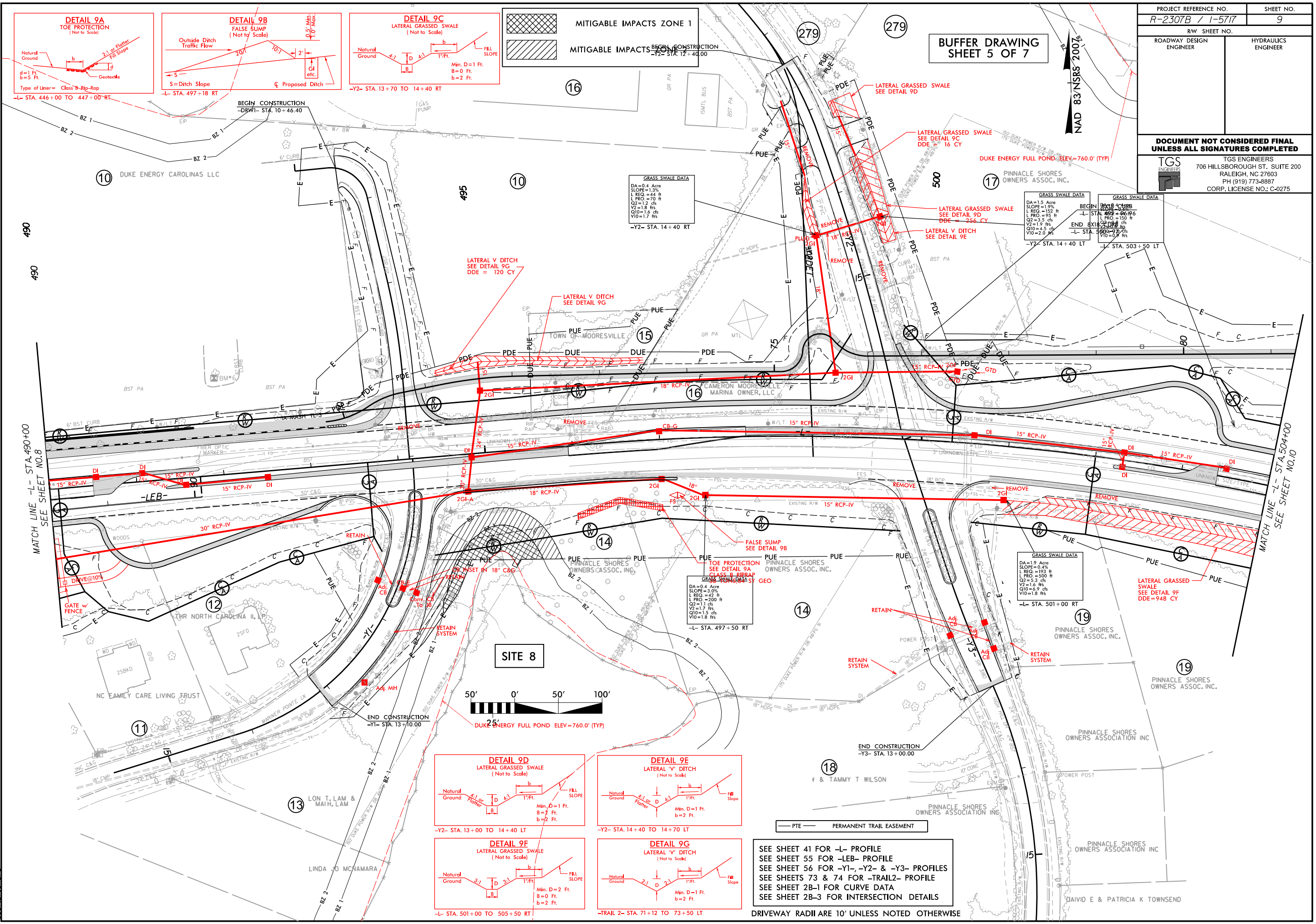


SEE SHEET 40 FOR -L- PROFILE  
SEE SHEETS 56 THRU 57 FOR -LEB- PROFILE  
SEE SHEET 74 FOR -TRAIL- PROFILE  
SEE SHEET 2B-1 FOR CURVE DATA

PROJECT REFERENCE NO. R-2307B / 1-5717	SHEET NO. 9
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
<b>DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED</b>	
 <b>TGS ENGINEERS</b> 706 HILLSBOROUGH ST., SUITE 200 RALEIGH, NC 27603 PH (919) 773-8887 CORP. LICENSE NO.: C-0275	

**BUFFER DRAWING  
SHEET 5 OF 7**

NAD 83/NSRS 2007



SEE SHEET 41 FOR -L- PROFILE  
SEE SHEET 55 FOR -LEB- PROFILE  
SEE SHEET 56 FOR -Y1-, -Y2- & -Y3- PROFILES  
SEE SHEETS 73 & 74 FOR -TRAIL2- PROFILE  
SEE SHEET 2B-1 FOR CURVE DATA  
SEE SHEET 2B-3 FOR INTERSECTION DETAILS

DRIVEWAY RADII ARE 10' UNLESS NOTED OTHERWISE

8/17/99  
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 User: jrb



