

STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE  
GOVERNOR

EUGENE A. CONTI, JR.  
SECRETARY

July 27, 2011

Division of Water Quality  
585 Waughton Street  
Winston-Salem, NC 27107

ATTN: Ms. Amy Euliss  
NCDOT Coordinator

SUBJECT: **Supplemental Information for Application for Section 404 Individual Permit and Section 401 Individual Water Quality Certification** for the proposed widening of R-2413C - US 220 south of the Haw River to the Intersection of US 220 and existing NC 68 in Guilford and Rockingham Counties, Division 7. State Project No. 6499008T, WBS Element No. 34429.1.1.

Dear Madame:

The North Carolina Department of Transportation (NCDOT) received questions on the above project via email on July 15, 2011. This letter and attachments address those questions.

DWQ

Site 8: I visited the site. At the culvert inlet and outlet, the channel width bumps out. If you go downstream of the existing culvert, the channel appears to narrow up to the width of a single barrel. Not installing a sill and restricting low flow into one barrel will result in the outlet of the extended culvert over widening. Please ask hydro to look at this in more detail.

*NCDOT*

*In the vicinity of the culvert, the field surveyed stream width is approximately the width of the proposed culvert. The water's edge lines nearly match the culvert at the inlet and outlet. See the attached Site 8 drawing that shows our surveyed water's edge lines (in blue). This appears to be beyond the limits of the channel widening due to the existing culvert. Also, the normal water depth in this culvert is nearly 3 feet deep, so adding a sill would block nearly a third of one barrel.*

DWQ

Site 13: I visited the site. Flow is currently going through both barrels. Just a couple feet upstream of the inlet the channel narrows to the width of a single pipe. The extension needs to have a sill installed, and have benches installed at the inlet and outlet.

*NCDOT*

*A sill has been specified along with channel benches for this stream crossing (see attached revised permit drawings Sheets 37 and 39 and Roadway detail drawing Sheet 2-G).*

DWQ

Stormwater Management Plan (SMP):

There are many more details that match grassed swale criteria than are listed in the SMP. Please clarify why these are not listed in the SMP.

*NCDOT*

*Only the ditches listed in the SMP meet all of the criteria for grassed swales (see attached SMP).*

DWQ

Include a statement in the SMP stating that stormwater has been treated to the maximum extent practicable. By this I mean, if topography allows, the most practicable BMPs have been utilized.

*NCDOT*

*The statement has been added to the SMP.*

DWQ

Can preformed scour holes (PFSH) be used at the following locations? If not, please explain why. The contour lines look like the area is relatively flat.

Sta 55-L and 56+50 L on revised permit drawing Sheets 26 and 26A of 40 and plan Sheet 14 (see attached)

*NCDOT: PFSH's have been added in these locations*

Sta 29+00 on revised permit drawing Sheet 18 of 40 and plan Sheet 10 (see attached)

*NCDOT: This outlet does not meet the requirements for a PFSH since it is a 24-inch pipe. A special cut ditch was added north of Site 6.*

Sta 11+00 SB 220 on revised permit drawing Sheet 14 of 40 and plan Sheet 7 (see attached)

*NCDOT: A PFSH has been added at this location.*

DWQ

I'm working on the impact tables, and I noticed that temporary impacts have not been included for most of the permitted sites on R2413C. Can you make sure this is right? I'm not sure how they will dewater without temporary impacts.

*NCDOT*

*Several permit drawings and the summary table have been updated to include approximately 15 feet of temporary impacts at the inlet and outlet of each pipe crossing (see attached revised permit drawings). A list of sites that temporary impacts were added is provided below.*

*Site 6: Sheet 18 of 40*

*Site 7: Sheet 22 of 40*

*Site 10: Sheet 32 of 40*

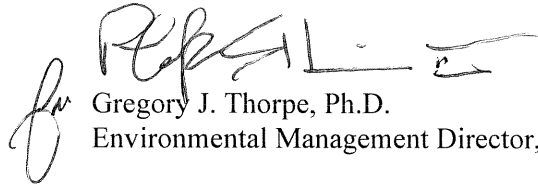
*Site 11 and 12: Sheet 25 of 40*

*Site 13: Sheets 37 and 39*

*Site 14: Sheet 16 of 40*

A copy of this supplemental permit application information and its distribution list will be posted on the NCDOT website at <http://www.ncdot.org/doh/preconstruct/pe/neu/permit.html>. Thank you for your time and assistance with this project. Please contact Deanna Riffey at either [driffey@ncdot.gov](mailto:driffey@ncdot.gov) or (919) 707-6151 if you have any questions or need additional information.

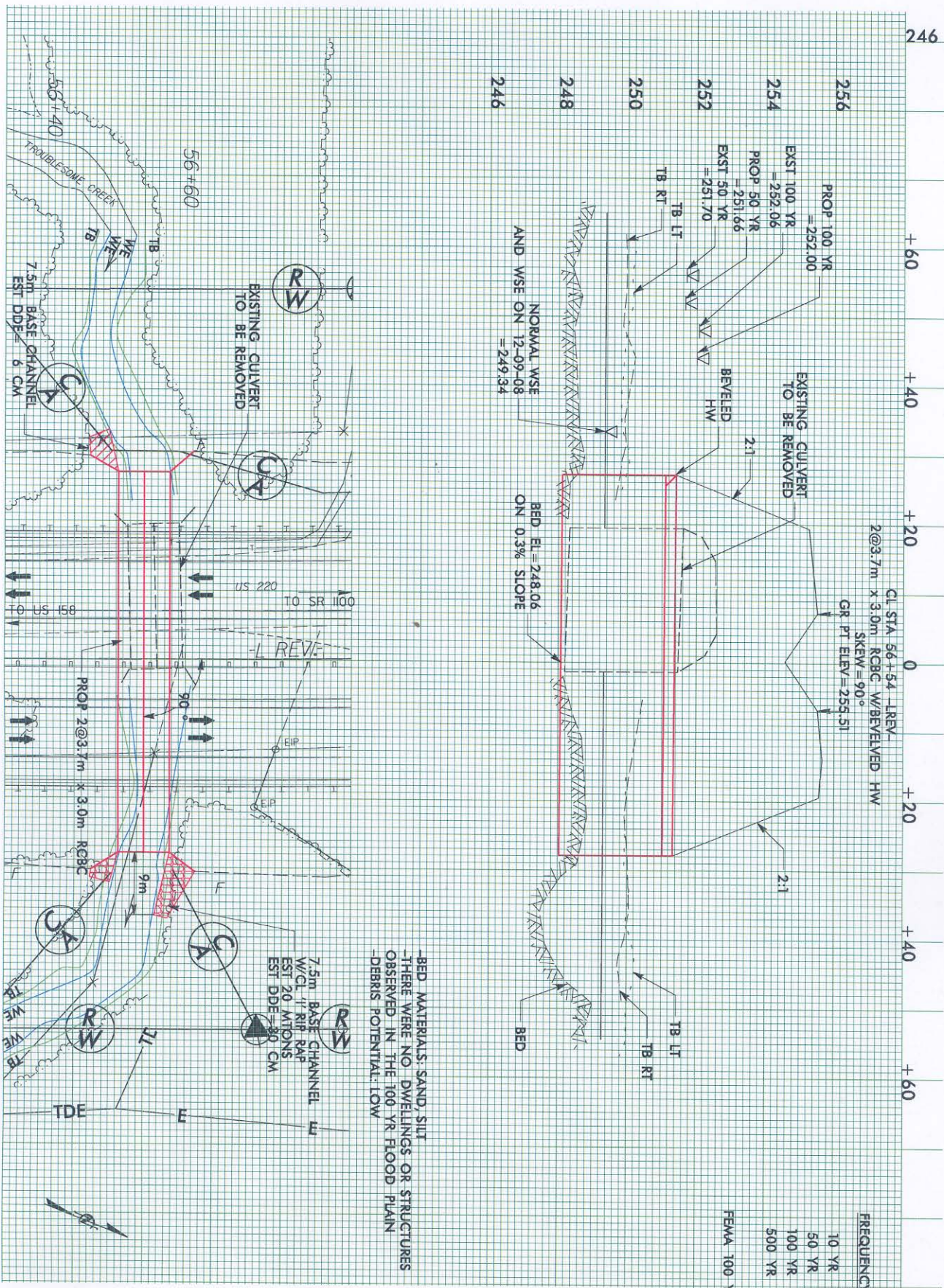
Sincerely,

  
Gregory J. Thorpe, Ph.D.  
Environmental Management Director, PDEA

cc:  
Andy Williams, USACE  
Brian Wrenn, NCDWQ  
NCDOT Permit Application Standard Distribution List



SITE 8



R-2413C  
7/27/11



# **STORMWATER MANAGEMENT PLAN**

Project: 6.499002T

TIP No. R-2413C

Guilford-Rockingham Counties

07/19/2011

Hydraulics Project Manager: Josh Dalton, P.E. (Sungate Design Group),  
Anne Gamber, P.E. (NCDOT Hydraulics Unit)

## **ROADWAY DESCRIPTION**

The project R-2413C consists of widening US 200 from south of the Haw River in Guilford County to the intersection of US 200 and existing NC 68 in Rockingham County. The total project length is 7.575 kilometers (4.73 miles). The proposed roadway (-L-) will consist of a 14 meter (46-foot) wide grassed median with two 3.6 meter (12-foot) wide lanes and 3.6 meter (12-foot) wide paved shoulders in each direction. The project storm drainage systems consist of cross-pipes, grated inlets and associated pipe systems, and grassed swales.

## **ENVIRONMENTAL DESCRIPTION**

The project is located within the Cape Fear River Basin in Guilford-Rockingham Counties. The project creates impacts to nine (9) jurisdictional stream including three (3) major crossing that include the Haw River, Troublesome Creek, and UT to Troublesome Creek. The Haw River is classified as WS-V and NSW at the project crossing. Troublesome Creek is classified as WS-III and NSW. Jacobs Creek is classified as Class C waters. No streams are currently shown by NCDWQ on the 2008 303d list. There are five wetland areas impacted by the project. The Cape Fear River Basin is not currently subject to buffer rules; however efforts have been taken to minimize buffer impacts where practicable.

Jurisdictional Streams: Haw River, three unnamed tributaries to Haw River, Troublesome Creek, two unnamed tributaries to Troublesome Creek, and two unnamed tributaries to Jacobs Creek

## **BEST MANAGEMENT PRACTICES AND MAJOR STRUCTURES**

The primary goal of Best Management Practices (BMPs) is to prevent degradation of the states surface waters by the location, construction and operation of the highway system. The BMPs are activities, practices and procedures taken to prevent or reduce stormwater pollution. Stormwater has been treated to the maximum extent practicable. The BMP measures used on this project to reduce stormwater impacts are:

**Grassed Swales:**

Grassed swales will utilize 3:1 side slopes or flatter and will provide for 10-year non-erosive velocities where topography allows.

33+80 to 34+60 –LREV- LT  
39+00 to 40+20 –LREV- RT  
70+54 to 71+40 –LREV- LT  
70+30 to 71+40 –LREV- RT  
91+20 to 93+00 –LREV- RT  
13+20 to 15+00 –RPA- LT  
13+45 to 13+80 –Y10- LT  
12+31 to 13+85 –Y23- LT  
11+30 to 12+07 –Y26- LT

**Preformed Scour Hole:**

Preformed scour holes have been specified to provide sheet flow from the outlet pipe at the following locations:

23+77 –LREV- RT  
55+00 –LREV- LT  
56+20 –LREV- LT  
11+04 –SB US 220 RP- RT

**Rip Rap Energy Dissipator Basin:**

A rip rap energy dissipator basin has been specified left of station 26+29 –L- at the outlet of the 1350mm RCP (54" RCP). The dissipator basin will slow the flow from the pipe while still allowing for hydrology to be provided to the large wetland downstream.

**Bottomless Culvert at UT to Troublesome Creek:**

Due to larger amounts of bedrock, a bottomless culvert will be used at the UT to Troublesome Creek crossing to reduce impacts.

**MINIMIZATION OF IMPACTS**

The impacts to wetlands and surface waters were minimized using 2:1 side slopes. Bridges are proposed for the Haw River crossings. The Box Culvert at the Troublesome Creek crossing will be buried one (1) foot. And all cross-pipes located on jurisdictional streams have been increased one pipe size and will be buried 20% of their pipe diameter.

**WETLAND PERMIT IMPACT SUMMARY**

| Site No. | Station (From/To)   | Structure Size / Type         | WETLAND IMPACTS                 |                             |                             |                                      | SURFACE WATER IMPACTS          |                           |                       |   |                                     |                            |     |  |
|----------|---------------------|-------------------------------|---------------------------------|-----------------------------|-----------------------------|--------------------------------------|--------------------------------|---------------------------|-----------------------|---|-------------------------------------|----------------------------|-----|--|
|          |                     |                               | Permanent Fill In Wetlands (ac) | Temp. Fill In Wetlands (ac) | Excavation in Wetlands (ac) | Mechanized Clearing in Wetlands (ac) | Hand Clearing in Wetlands (ac) | Permanent SW impacts (ac) | Temp. SW impacts (ac) | Existing Channel Impacts Permanent (ft) | Existing Channel Impacts Temp. (ft) | Natural Stream Design (ft) |     |  |
| 1        | 9+36/10+57 Y23      | 30" CSP                       |                                 |                             |                             |                                      |                                |                           |                       |   |                                     | 42                         |     |  |
| 2        | 23+23/24+15 LREV LT | Roadway Fill                  | 0.46                            |                             | 0.09                        |                                      |                                |                           |                       |   |                                     |                            |     |  |
| 3        | 22+45/23+61 LREV RT | Roadway Fill                  | 0.24                            |                             | 0.03                        |                                      |                                |                           |                       |   |                                     |                            |     |  |
| 4        | 23+91/24+83 LREV    | Work Bridge/Riprap            |                                 |                             |                             |                                      |                                |                           |                       |   |                                     |                            | 141 |  |
| 5        | 25+07/28+62 LREV    | 54" RCP                       | 0.65                            |                             | 0.06                        |                                      |                                |                           | 0.07                  |   |                                     | 894                        |     |  |
| 6        | 35+59/35+71 LREV LT | Rip Rap                       |                                 |                             |                             |                                      |                                |                           | 0.00                  |   |                                     | 36                         | 16  |  |
| 7        | 41+93/42+32 LREV RT | 42" RCP                       |                                 |                             |                             |                                      |                                |                           | 0.01                  |   |                                     | 220                        | 19  |  |
| 8        | 56+47/56+61 LREV    | 2-12' X 10' RCBC              |                                 |                             |                             |                                      |                                |                           | 0.07                  |   |                                     | 141                        | 48  |  |
| 9        | 57+19/57+80 LREV    | 1-20' X 7' Bottomless         |                                 |                             |                             |                                      |                                |                           | 0.09                  |   |                                     | 347                        |     |  |
| 10       | 66+24/66+74 LREV    | 36" RCP                       | 0.02                            |                             | 0.04                        |                                      |                                |                           | 0.01                  |   |                                     | 182                        | 33  |  |
| 11       | 75+98/77+07 LREV    | 54" RCP                       | 0.01                            |                             |                             |                                      |                                |                           | 0.02                  |   |                                     | 228                        | 33  |  |
| 12       | 77+09/77+15 LREV    | 36" RCP                       |                                 |                             |                             |                                      |                                |                           | 0.01                  |   |                                     | 154                        | 35  |  |
| 13       | 84+09/85+07 LREV    | 2 - 48" CSP                   |                                 |                             |                             |                                      |                                |                           | 0.00                  |   |                                     | 62                         | 63  |  |
| 14       | 11+70 Y27           | Bank Stabilization<br>48" RCP |                                 |                             |                             |                                      |                                |                           | 0.00                  |   |                                     | 46                         |     |  |
| TOTALS:  |                     |                               | 1.38                            |                             | 0.13                        | 0.09                                 |                                |                           | 0.29                  |   | 0.06                                | 2495                       | 415 |  |

**ENGLISH IMPACTS**

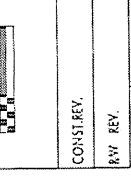
NC DEPARTMENT OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
GUILFORD-ROCKINGHAM COUNTY  
WBS - 6.499002T (R-2413C)

*Revised*

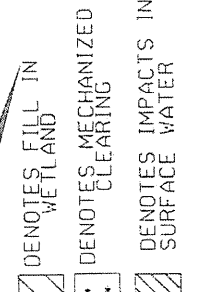


PLANS PREPARED BY:  
**FLORENCE & HUTCHESON, INC.**  
CONSULTING ENGINEERS  
4501 HANCOCK ROAD, SUITE 100  
RALEIGH, NC 27607

**PRELIMINARY PLANS**  
DO NOT USE FOR CONSTRUCTION  
Permit Drawing  
Sheet 14 of 40  
REVISED  
5/12/01



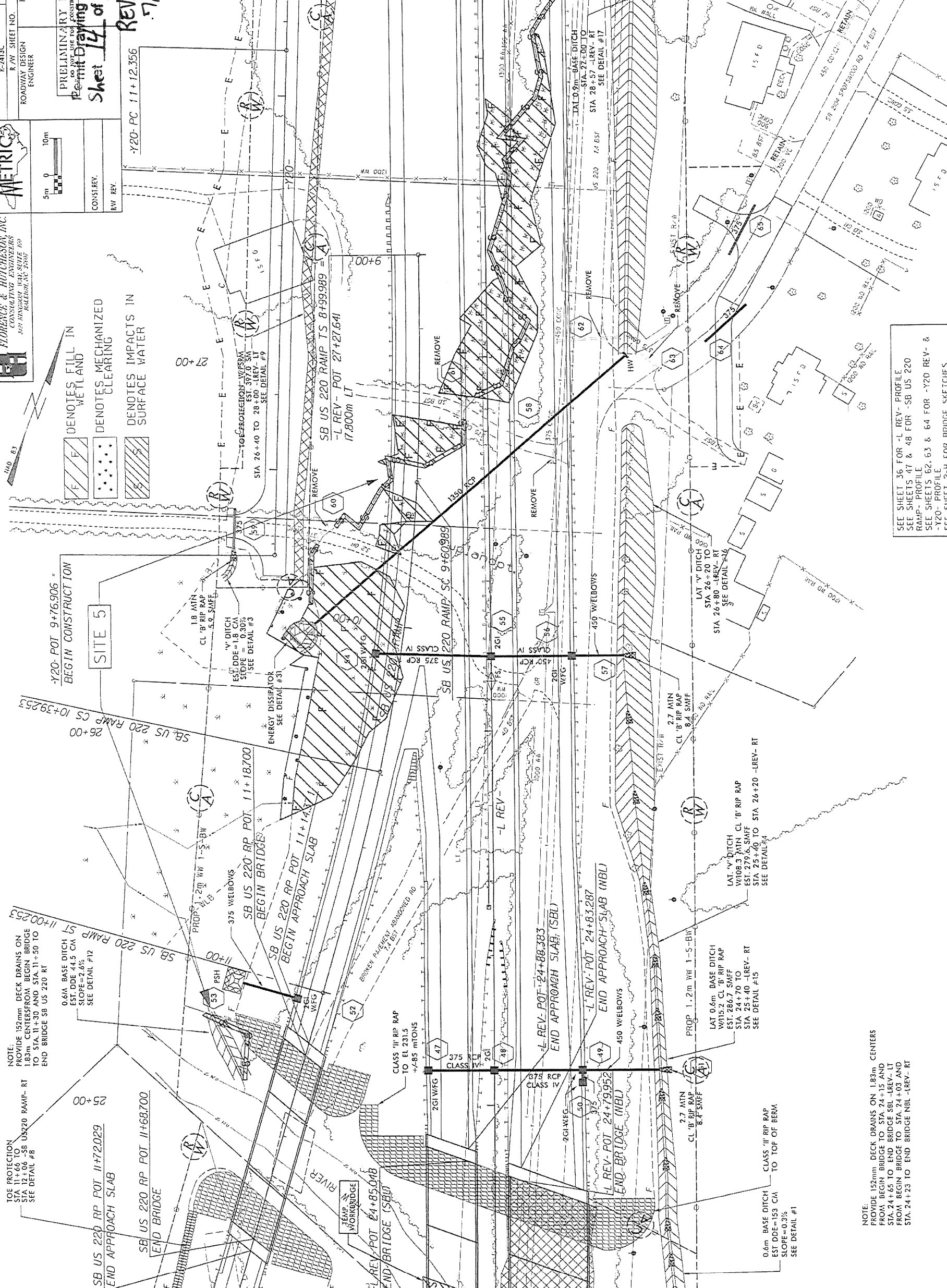
CONST. REV.  
R/W REV.



1/4" = 6.3'  
DENOTES FILL IN WETLAND  
DENOTES MECHANIZED CLEARING  
DENOTES IMPACTS IN SURFACE WATER

MATCH LINE STA. 28+00 -L REV.- SHEET 8

MATCH LINE STA. 24+50 -L REV.- SHEET 6



NOTE:  
PROVIDE 152mm DECK DRAINS ON 1.83m CENTERS FROM BEGIN BRIDGE TO STA. 11+30 AND STA. 11+50 TO END BRIDGE SB US 220 RT  
0.6m BASE DITCH EST. DDE=44.5 CA SLOPE=0.4% SEE DETAIL #12

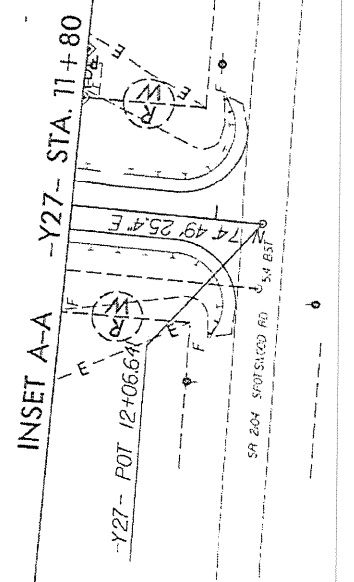
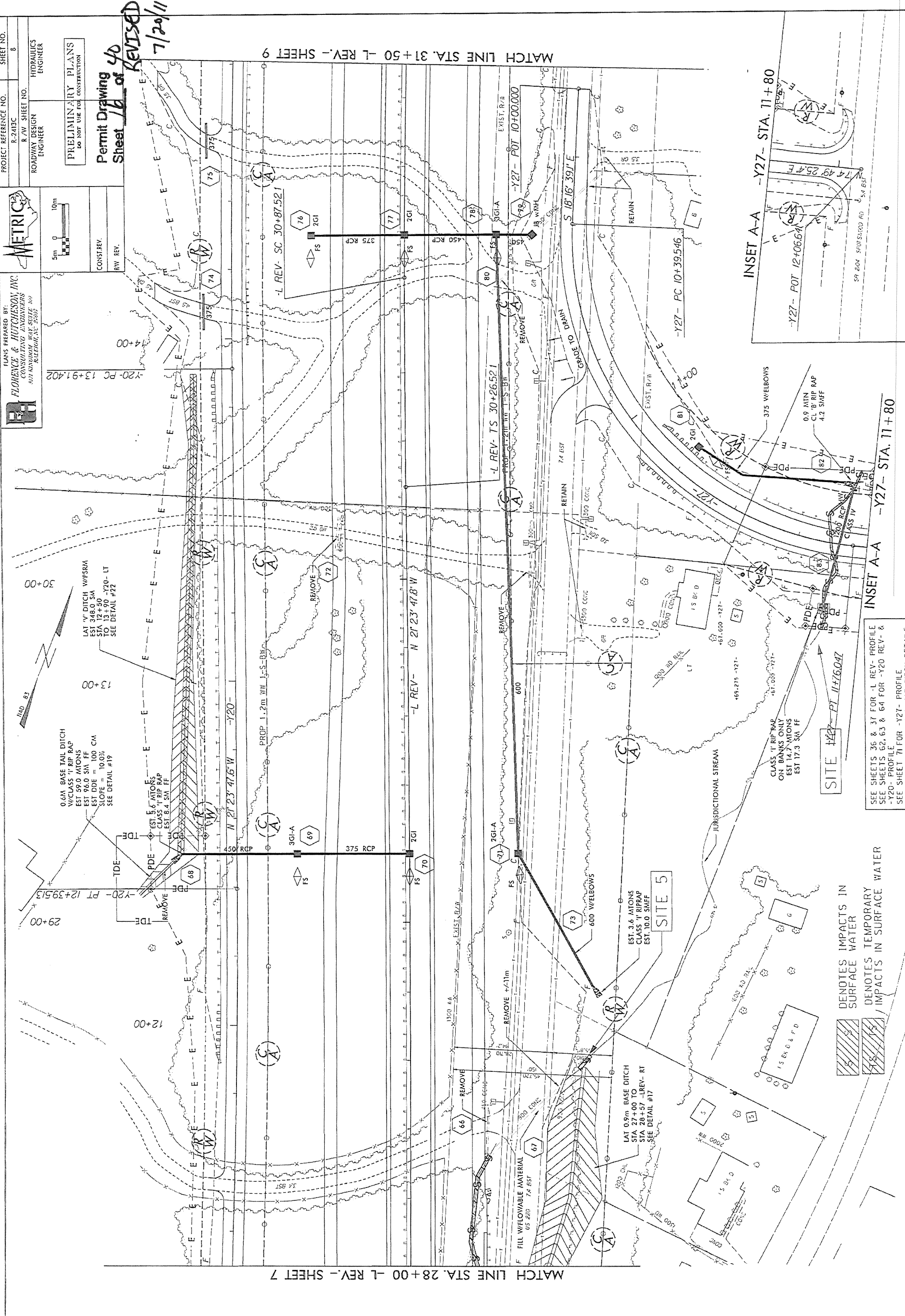
NOTE:  
PROVIDE 152mm DECK DRAINS ON 1.83m CENTERS FROM BEGIN BRIDGE TO STA. 24+15 AND STA. 24+65 TO END BRIDGE SBL -LREV.- LT FROM BEGIN BRIDGE TO STA. 24+03 AND STA. 24+23 TO END BRIDGE NBL -LREV.- RT

SEE SHEET 36 FOR -L REV- PROFILE  
SEE SHEETS 47 & 48 FOR -SB US 220 RAMP- PROFILE  
SEE SHEETS 62, 63 & 64 FOR -Y20 REV.- & -Y20- PROFILE  
SEE SHEET 2-H FOR BRIDGE SKETCHES  
SEE SHEETS 5-1 THRU 5-4 FOR BRIDGE PLANS  
SEE SHEETS 2-F & 2-G FOR DITCH DETAILS



FILE: S115  
 DATE: 02/15/2023  
 PLOT DRIVER: S115.DWG  
 PEN TABLE: S115.PEN

2/5/10 - PARCEL 182 ADDED TEMPORARY DRAINAGE EASEMENT  
 2/5/10 - PARCEL 192 ADDED PERMANENT DRAINAGE EASEMENT  
 2/5/10 - PARCEL 202 REVISED PERMANENT DRAINAGE EASEMENT



SEE SHEETS 36 & 37 FOR -L REV- PROFILE  
 SEE SHEETS 62, 63 & 64 FOR -Y20 REV- &  
 -Y20- PROFILE  
 SEE SHEET 71 FOR -Y27- PROFILE  
 SEE SHEETS 2-F & 2-G FOR DITCH DETAILS

DENOTES IMPACTS IN SURFACE WATER  
 DENOTES TEMPORARY IMPACTS IN SURFACE WATER

**FLORENCE & HUTCHESON, INC.**  
 CONSULTING ENGINEERS  
 503 N. WINDHAM WAY, SUITE 300  
 RALEIGH, NC 27607

PLANS PREPARED BY:  
 R. W. SHEET NO. 8  
 PROJECT REFERENCE NO. R-2413C  
 SHEET NO. B

ROADWAY DESIGN ENGINEER  
 HYDRAULICS ENGINEER

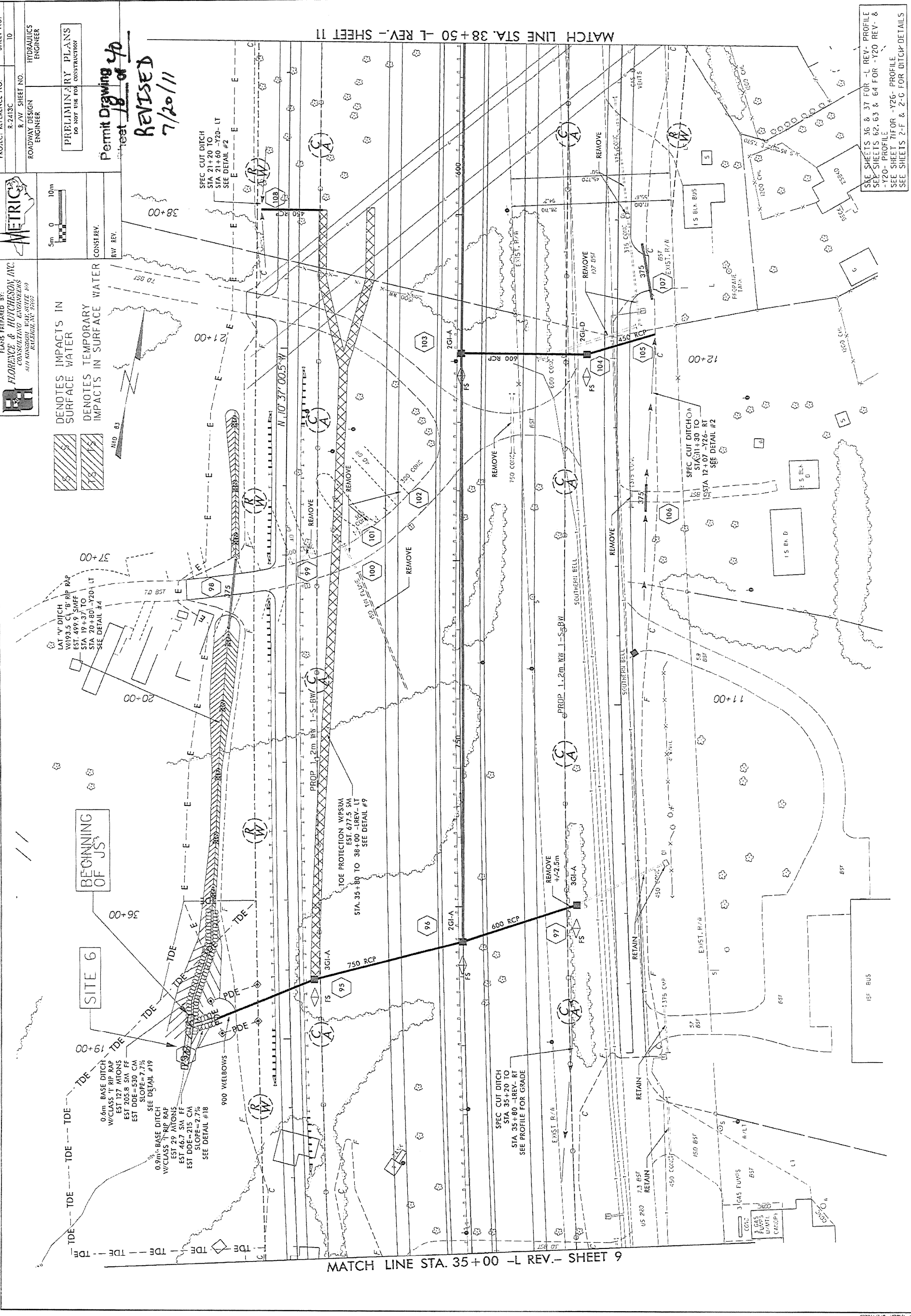
**METRIC**  
 5m 0 10m

PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION

Permit Drawing  
 Sheet 16 of 40  
 REVISED  
 7/20/11

CONST. REV.  
 RW. REV.

MATCH LINE STA. 28+00 -L REV.- SHEET 7  
 MATCH LINE STA. 31+50 -L REV.- SHEET 9



MATCH LINE STA. 35+00 -L REV.- SHEET 9

MATCH LINE STA. 38+50 -L REV.- SHEET 11

0.6m BASE DITCH  
W/CLASS 1- RIP RAP  
EST 127 ATONS  
EST 205.8 SM FF  
EST DDE=530 CM  
SLOPE=7.7%  
SEE DETAIL #19

0.9m BASE DITCH  
W/CLASS 1- RIP RAP  
EST 29 ATONS  
EST 46.7 SM FF  
EST DDE=215 CM  
SLOPE=7.7%  
SEE DETAIL #18

BEGINNING OF JS

SITE 6

LAT-VY DITCH  
W/193.5 CL-BE RIP RAP  
EST 499.9 SM FF  
STA 19+37 TO  
STA 20+80 -Y20-LT  
SEE DETAIL #4

DENOTES IMPACTS IN  
SURFACE WATER

DENOTES TEMPORARY  
IMPACTS IN SURFACE WATER

5m 10m  
CONSTRY.  
RW REV.

PRELIMINARY PLANS  
DO NOT USE FOR CONSTRUCTION

Permit Drawing  
Sheet 18 of 40  
REVISED  
7/20/11

PLANS PREPARED BY:  
**FLORENCE & HUTCHESON INC.**  
CONSULTING ENGINEERS  
404 KINGSWOOD PARK DRIVE #20  
RALEIGH, NC 27602

**METRIC**

PROJECT REFERENCE NO. R-2413C  
R/WY SHEET NO. 10  
ROADWAY DESIGN ENGINEER  
HYDRAULICS ENGINEER

SEE SHEETS 36 & 37 FOR -L REV- PROFILE  
SEE SHEETS 62, 63 & 64 FOR -Y20 REV- &  
-Y20- PROFILE  
SEE SHEET 71 FOR -Y26- PROFILE  
SEE SHEETS 2-F & 2-G FOR DITCH DETAILS

PLANS PREPARED BY:  
**FLORENCE & HUTTONSON, INC.**  
 CONSULTING ENGINEERS  
 3511 S. HAWTHORNE WAY, SUITE 103  
 RICHMOND, VA 23226

PROJECT REFERENCE NO. R-2413C  
 R/W SHEET NO. ROADWAY DESIGN ENGINEER  
 SHEET NO. IIA  
 HYDRAULICS ENGINEER

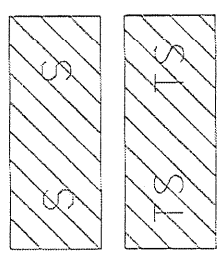
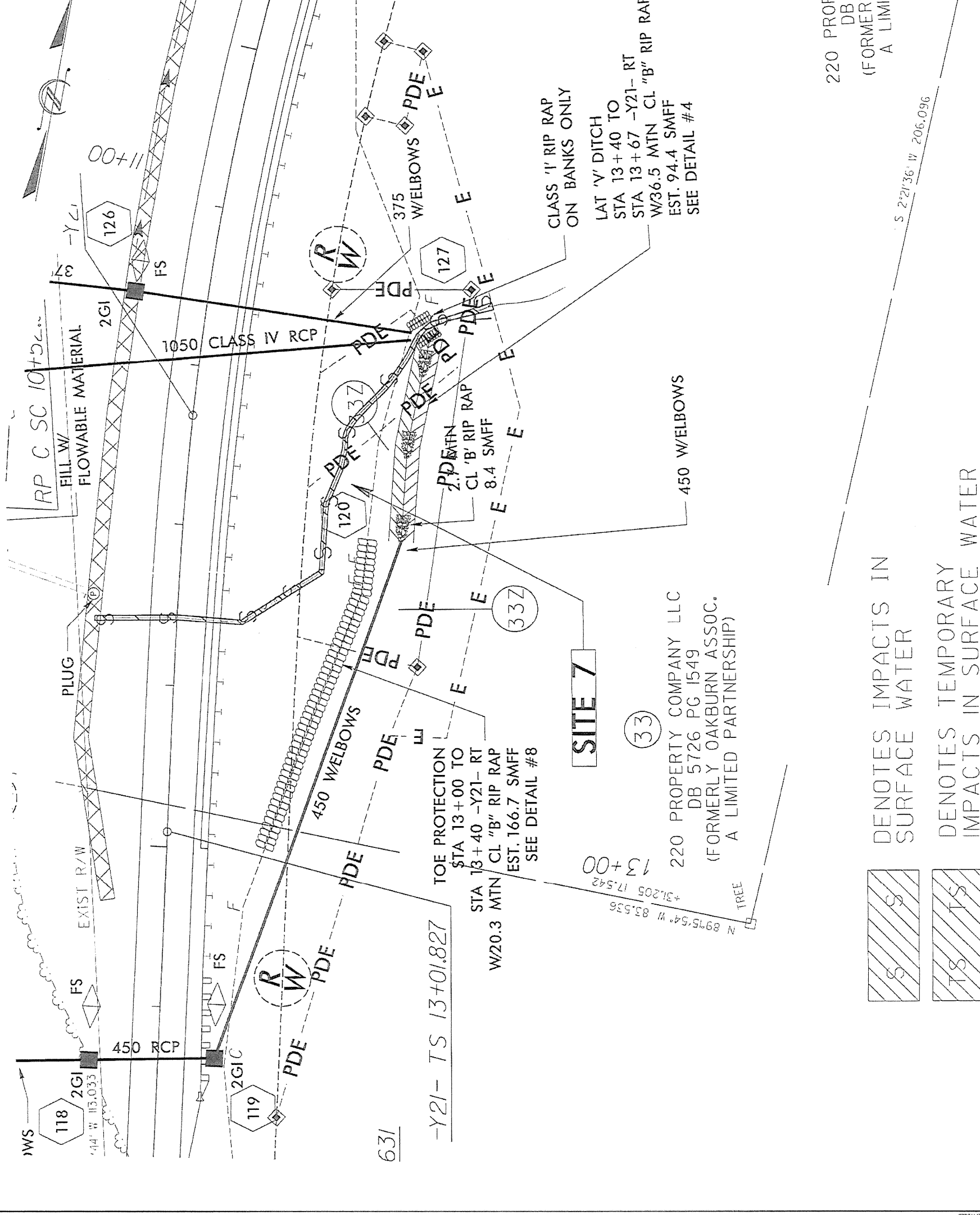
**METRIC**

5m 0 10m

CONSTRY.  
 RW REV.

Permit Drawing 40  
 Sheet 22 of 17/2d/11  
**REVISED**

SPEC DITCH GRADE  
 EST 355.0 SM PSRM  
 STA 13+73 TO  
 STA 14+80 -Y21- LT  
 SEE PROFILE FOR GF



33  
 220 PROPERTY COMPANY LLC  
 DB 5726 PG 1549  
 (FORMERLY OAKBURN ASSOC.  
 A LIMITED PARTNERSHIP)

33  
 STA 14+35 TO STA 14+ SE  
 SPEC CUT DIT

220 PROPERTY COMPANY LLC  
 DB 5726 PG 1549  
 (FORMERLY OAKBURN ASSOC.  
 A LIMITED PARTNERSHIP)

S 2°21'36" W 206.096





PROJECT REFERENCE NO. 3-2413C R/W SHEET NO. 14-A  
ROADWAY DESIGN ENGINEER  
HYDRAULICS ENGINEER

PRELIMINARY PLANS  
DO NOT USE FOR CONSTRUCTION

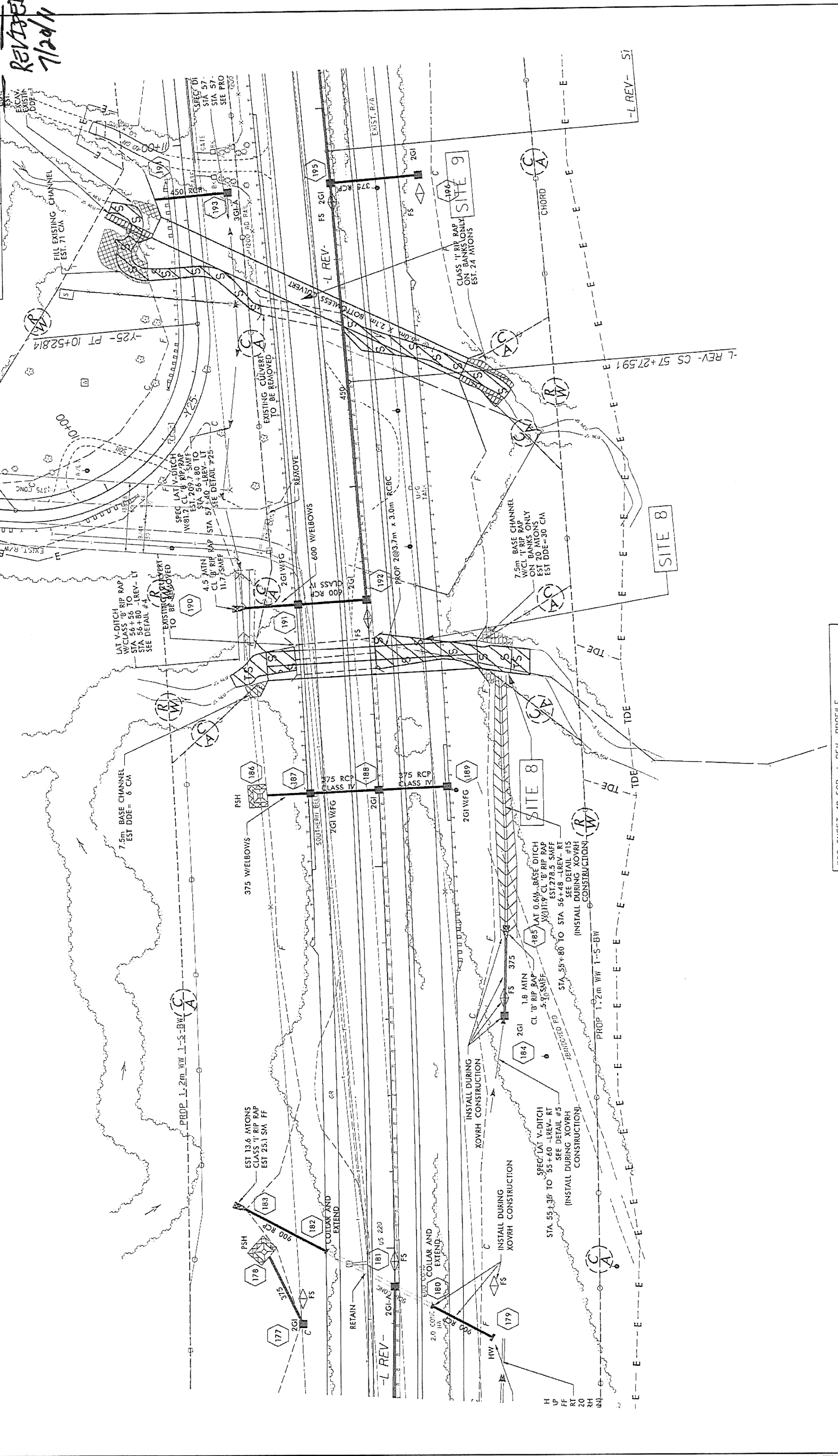
Permit Drawing  
Sheet No A of 40  
REVISED  
7/20/11

FLANS PREPARED BY:  
FLORENCE & HUTCHESON, INC.  
CONSULTING ENGINEERS  
3013 KENNEDY HWY. SUITE 300  
RUTHERFORD, N.J. 07070

5m 0 10m  
CONSTREV.  
RW REV.

DENOTES TEMPORARY IMPACTS IN SURFACE WATER

DENOTES IMPACTS IN SURFACE WATER



SEE SHEET 40 FOR -L REV- PROFILE  
SEE SHEET 77 FOR TEMP XOVRRH D PLAN & PROFILE  
SEE SHEET 81 & 82 FOR XOVRRH PLAN & PROFILE  
SEE SHEETS 2-F & 2-G FOR DITCH DETAILS

PLANS PREPARED BY:  
**FLORENCE & HUTCHESON, INC.**  
 CONSULTING ENGINEERS  
 511 ANGLADEM RD., SUITE 100  
 RALEIGH, NC 27604

PROJECT REFERENCE NO. R-2413C  
 R/W SHEET NO. 17  
 ROADWAY DESIGN ENGINEER  
 HYDRAULICS ENGINEER

**METRIC**

PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION

Permit Drawing  
 Sheet 32 of 40

REVISED 7/20/11

CONSTREV.  
 RW REV.

5m 0 10m

EDWARD AFRIDDLE FAMILY TRUST  
 DB 1229 PG 1585  
 (FORMERLY E. AUSTIN FRIDDLE)

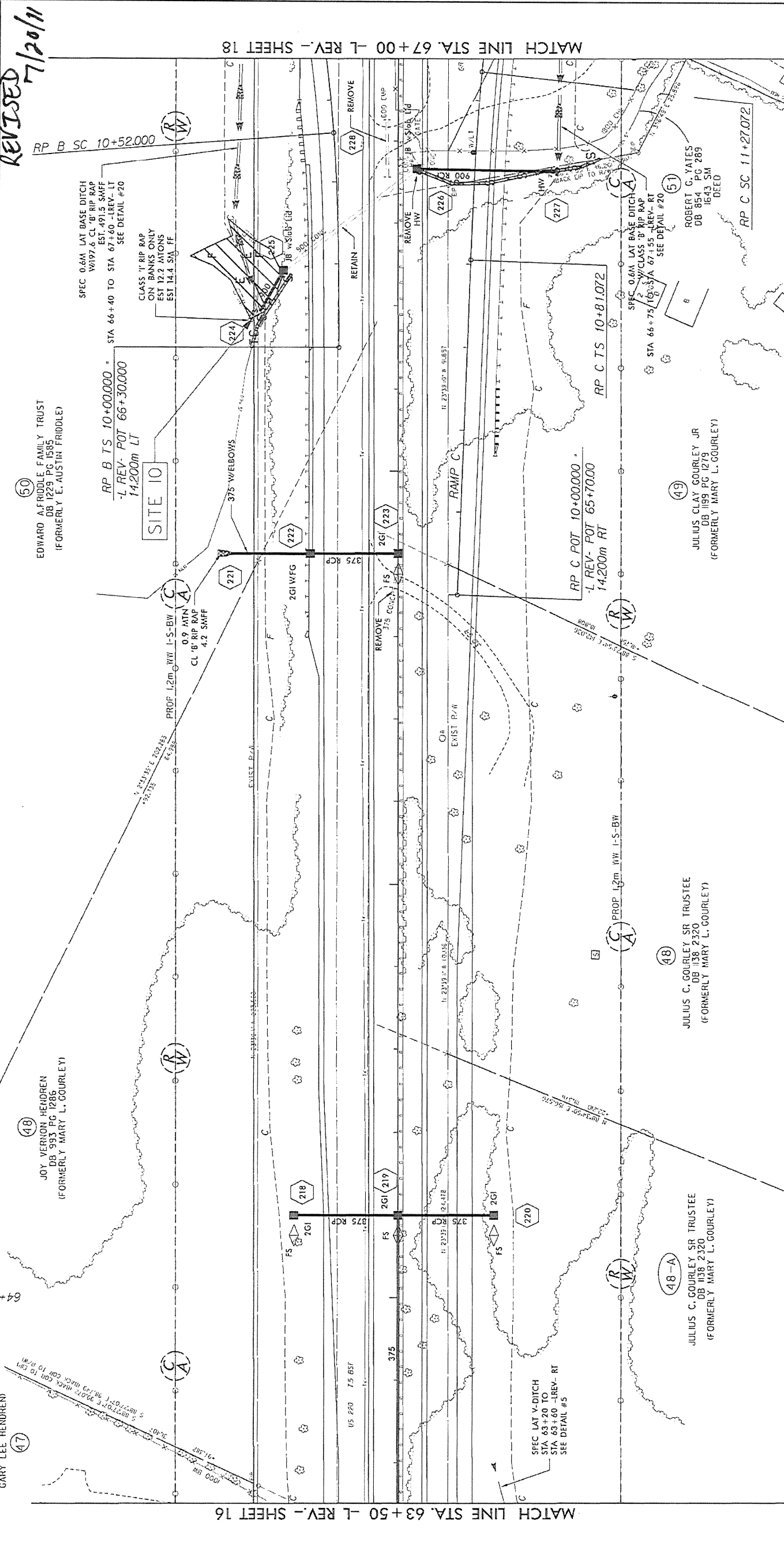
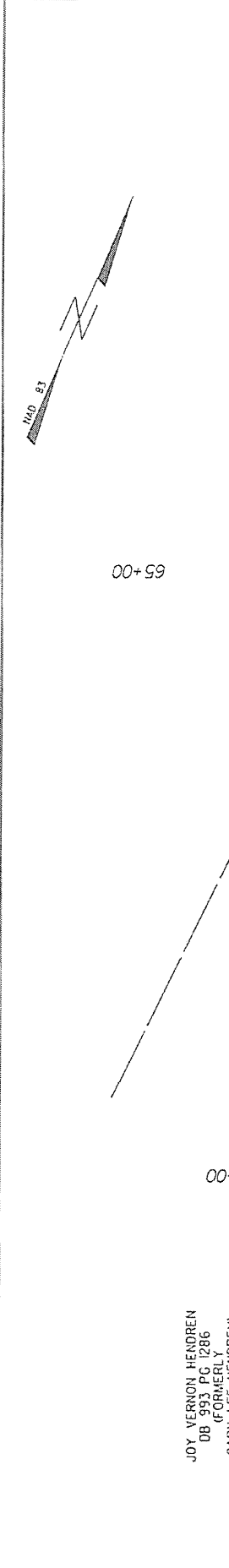
JOY VERNON HENDREN  
 DB 953 PG 1286  
 (FORMERLY MARY L. GOURLEY)


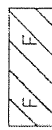
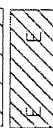
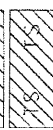
JOY VERNON HENDREN  
 DB 953 PG 1286  
 (FORMERLY GARY LEE HENDREN)

JULIUS C. GOURLEY SR TRUSTEE  
 DB 1138 2320  
 (FORMERLY MARY L. GOURLEY)

JULIUS C. GOURLEY JR  
 DB 1199 PG 1279  
 (FORMERLY MARY L. GOURLEY)

ROBERT G. YATES  
 DB 854 PG 285  
 (FORMERLY MARY L. GOURLEY)



-  DENOTES IMPACTS IN SURFACE WATER
  -  DENOTES FILL IN WETLAND
  -  DENOTES EXCAVATION IN WETLAND
  -  DENOTES TEMPORARY IMPACTS IN SURFACE WATER
- SEE SHEETS 41 & 42 FOR -L REV- PROFILE  
 SEE SHEET 55 FOR RP B PROFILE  
 SEE SHEET 56 FOR RP C PROFILE

MATCH LINE STA. 63+50 -L REV- SHEET 16

MATCH LINE STA. 67+00 -L REV- SHEET 18

PLANS PREPARED BY:  
**FLORENCE & HUTCHESON, INC.**  
 CONSULTING ENGINEERS  
 842 FAYWOOD WAY, SUITE 100  
 RALEIGH, NC 27607

PROJECT REFERENCE NO. R-2413C  
 R/W SHEET NO. 19  
 ROADWAY DESIGN ENGINEER  
 HYDRAULICS ENGINEER

PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION  
 Permit Drawing  
 Sheet 35 of 40  
**REVISED 7/20/11**

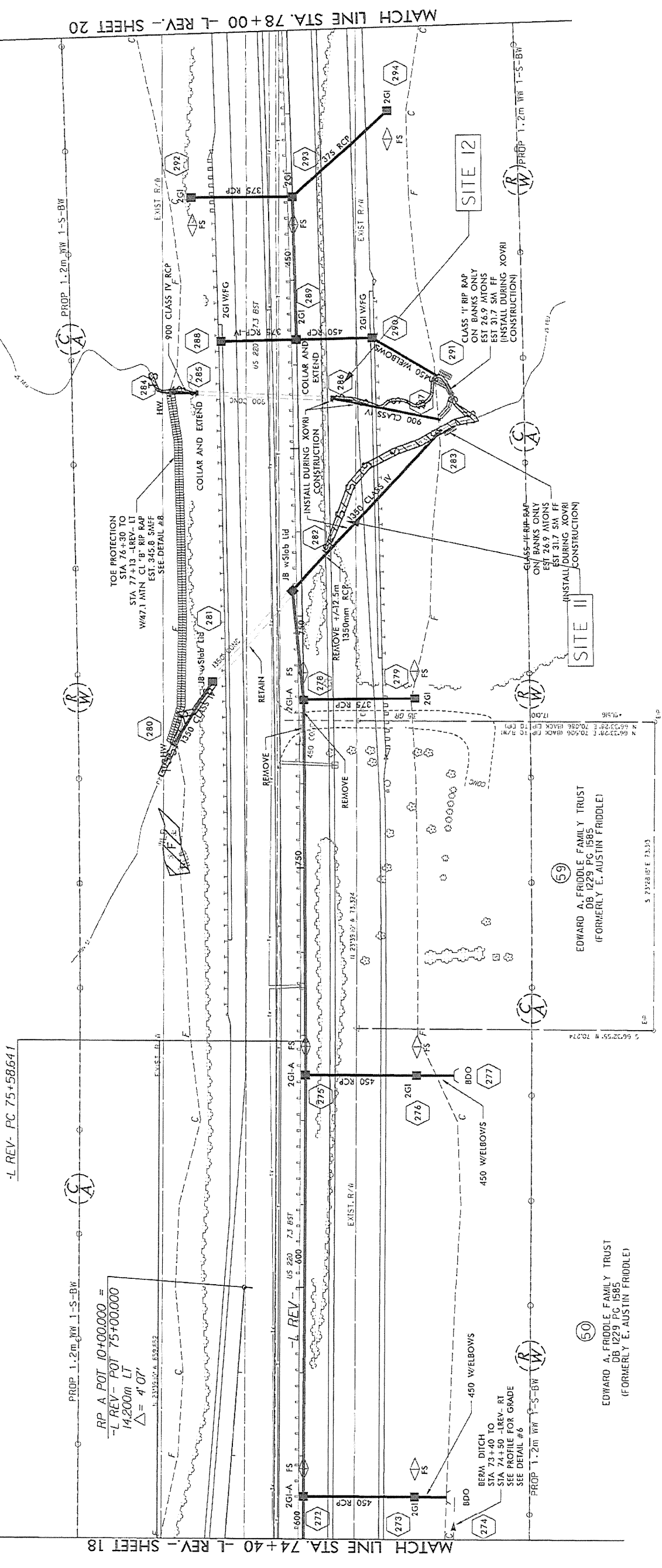
77+00



**F** DENOTES FILL IN WETLAND  
**S** DENOTES IMPACTS IN SURFACE WATER  
**TS** DENOTES TEMPORARY IMPACTS IN SURFACE WATER

75+00

**(50)**  
 EDWARD A. FRIDDLE FAMILY TRUST  
 DB 1229 PC 1585  
 (FORMERLY E. AUSTIN FRIDDLE)



MATCH LINE STA. 78+00 -L REV- SHEET 20

MATCH LINE STA. 74+40 -L REV- SHEET 18

**(59)**  
 EDWARD A. FRIDDLE FAMILY TRUST  
 DB 1229 PC 1585  
 (FORMERLY E. AUSTIN FRIDDLE)

**(50)**  
 EDWARD A. FRIDDLE FAMILY TRUST  
 DB 1229 PC 1585  
 (FORMERLY E. AUSTIN FRIDDLE)

SEE SHEET 43 FOR -L REV- PROFILE  
 SEE SHEET 54 FOR A PROFILE  
 SEE SHEETS 83 & 84 FOR XOVRI PLAN & PROFILE

FILE SHEETS  
 DATE: 5/21/11  
 DRAWN: S.M.  
 CHECKED: S.M.  
 PLOT: S.M.  
 PEN TABLE: S.M.

SEE SHEETS 43 & 44 FOR -L REV- PROFILE  
 SEE SHEET 85 FOR XOVER PLAN & PROFILE

SITE 13

JIMMY C. WADE & APRIL D.  
 DB 1168 PG 420  
 (FORMERLY TIMOTHY H. DAVIS)

(60)  
 W.H. KNIGHT TRUSTEE  
 DB 998 PG 1537  
 (FORMERLY WALDO H. KNIGHT)

(60)  
 W.H. KNIGHT TRUSTEE  
 DB 998 PG 1537  
 (FORMERLY WALDO H. KNIGHT)

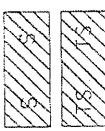
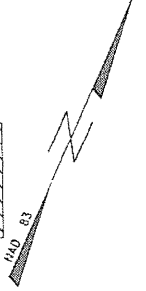
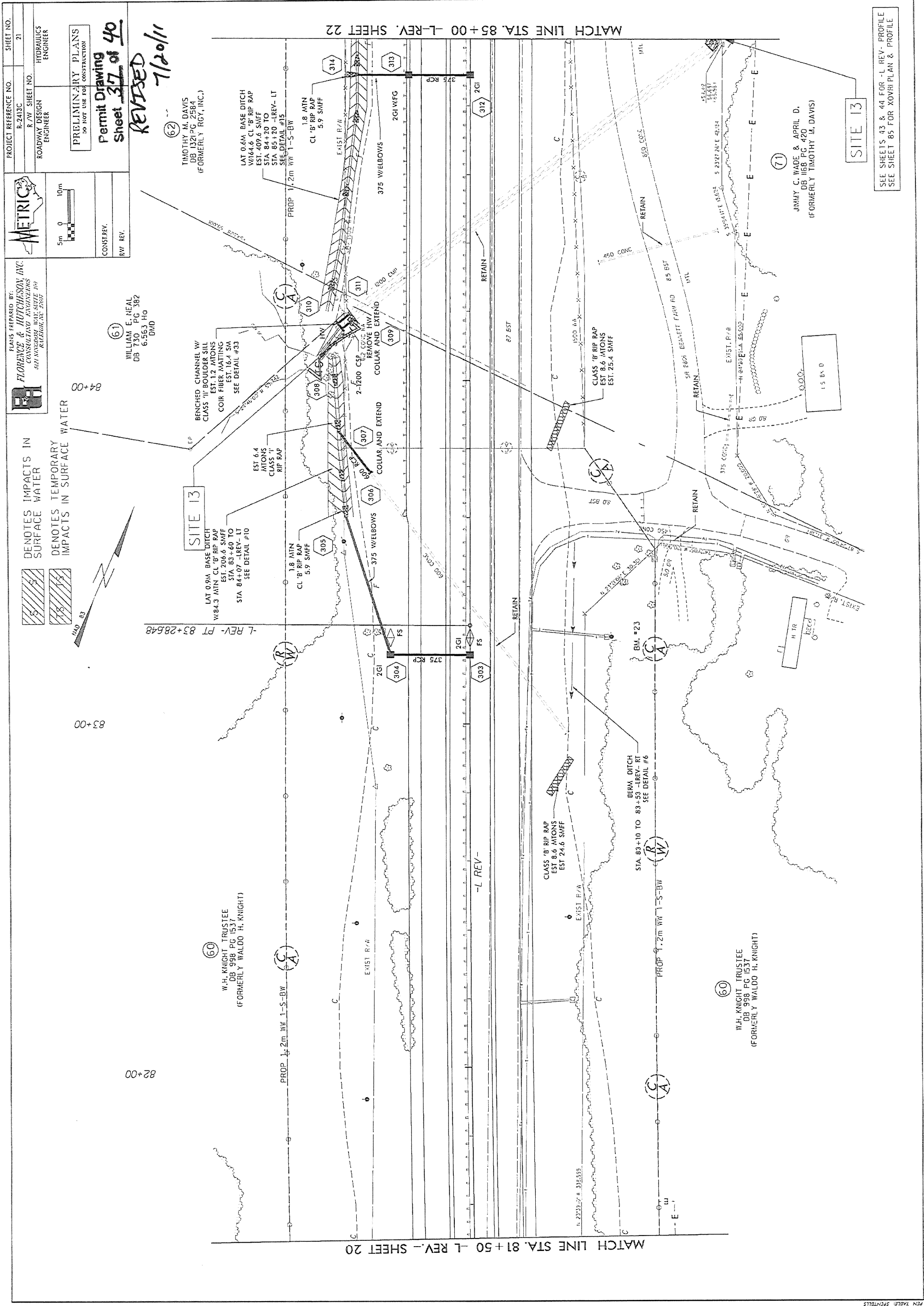
82+00

83+00

84+00

MATCH LINE STA. 85+00 -L-REV- SHEET 22

MATCH LINE STA. 81+50 -L-REV- SHEET 20



(61)  
 WILLIAM E. NEAL  
 DB 730 PG 382  
 6.563 HQ  
 DMD

CONSTREV.  
 RW REV.

5m 0 10m

PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION

Permit Drawing  
 Sheet 37 of 40  
 REVISED  
 7/20/11

PLANS PREPARED BY:  
**FLORENCE & HUTCHINSON, INC.**  
 CONSULTING ENGINEERS  
 801 NAVYBOND ROAD, SUITE 100  
 RENOIR, NE 28507

**METRIC**

PROJECT REFERENCE NO. R-2413C  
 R/W SHEET NO. 21  
 ROADWAY DESIGN ENGINEER  
 HYDRAULICS ENGINEER

SHEET NO. 21



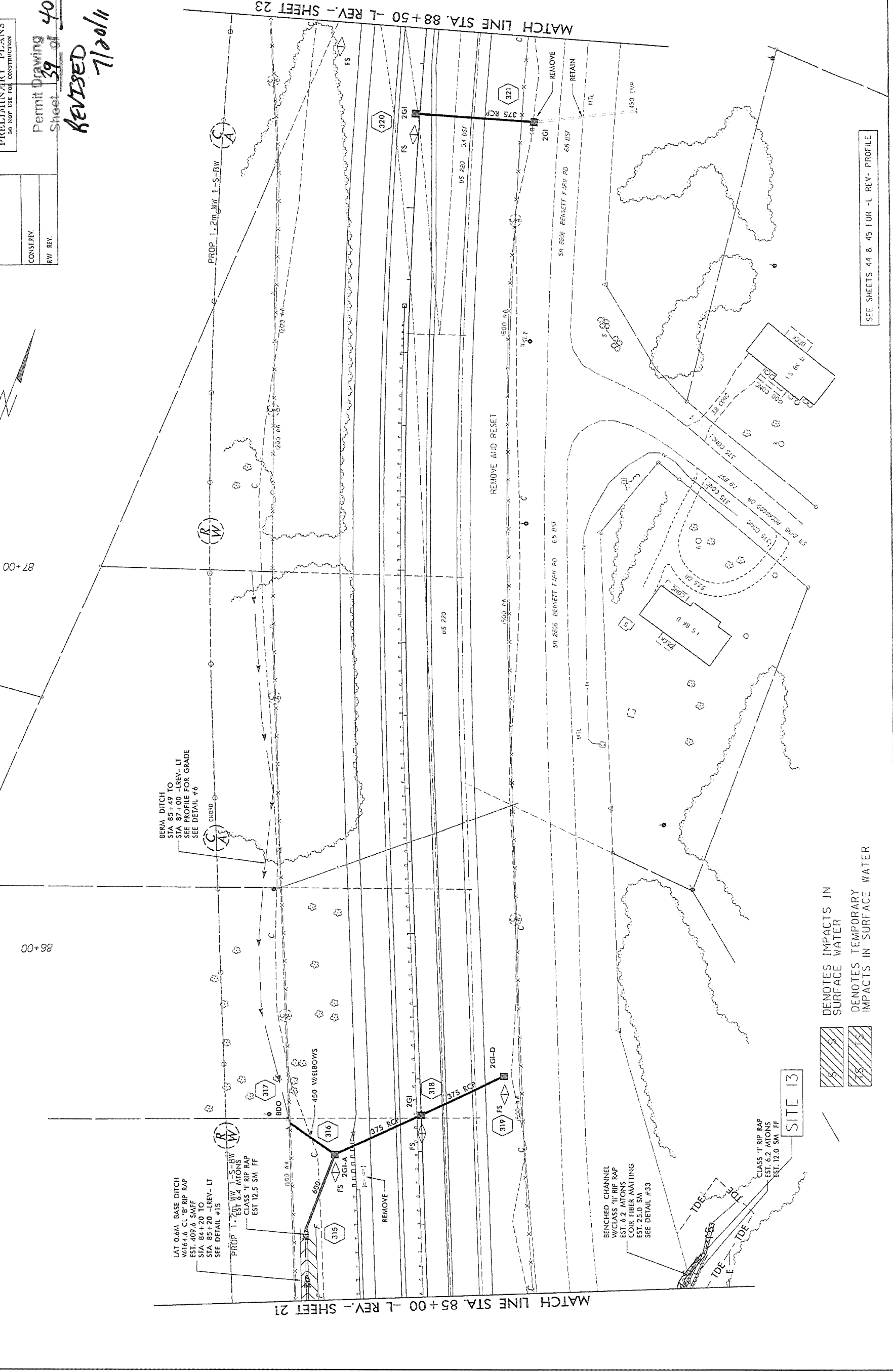
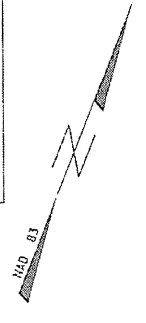
PLANS PREPARED BY:  
**FLORENCE & HUTCHESON, INC.**  
 CIVIL ENGINEERING & SURVEYING  
 487 HAYWARD, IRVING, TEXAS 75039  
 RALEIGH, NC 27602

PROJECT REFERENCE NO. R-2413C  
 R/W SHEET NO. 22  
 ROADWAY DESIGN ENGINEER  
 HYDRAULICS ENGINEER

PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION

Permit Drawing  
 Sheet 39 of 40  
 REVISED 7/12/01

CONSTRY  
 RW REV.



LAT 0.6M BASE DITCH  
 W/164.6 CL 'B' RIP RAP  
 EST. 407.6 SW/F  
 STA 84+20 TO  
 STA 85+20 - LREV- LT  
 SEE DETAIL #15

PROP 1'-2" RW 1'-S-BW  
 EST. 6.4 ATONS  
 CLASS 1' RIP RAP  
 EST. 12.5 SM FF

BERM DITCH  
 STA 85+49 TO  
 STA 87+00 - LREV- LT  
 SEE PROFILE FOR GRADE  
 SEE DETAIL #6

BENCHED CHANNEL  
 W/CLASS 1' RIP RAP  
 EST. 6.2 ATONS  
 COIR FIBER MATTING  
 EST. 25.0 SM  
 SEE DETAIL #33

CLASS 1' RIP RAP  
 EST. 6.2 ATONS  
 EST. 12.0 SM FF

- DENOTES IMPACTS IN SURFACE WATER
- DENOTES TEMPORARY IMPACTS IN SURFACE WATER

FILE: S115  
 DATE: 04/05  
 DRAWN: STAMES  
 PLOT DRIVER: S115  
 PEN: TABLE: S115

SEE SHEETS 44 & 45 FOR -L REV- PROFILE

PLANS PREPARED BY:  
**FLORENCE & HUTCHESON, INC.**  
 CONSULTING ENGINEERS  
 4510 WILSON ROAD, SUITE 300  
 RALEIGH, NC 27617

PROJECT REFERENCE NO. R-243C  
 R/W SHEET NO. ROADWAY DESIGN ENGINEER

SHEET NO. 2-G  
 HYDRAULICS ENGINEER

PRELIMINARY PLANS  
 DO NOT USE FOR CONSTRUCTION

*Roadway Plan*

CONST. REV.  
 R/W REV.

5m 0 10m

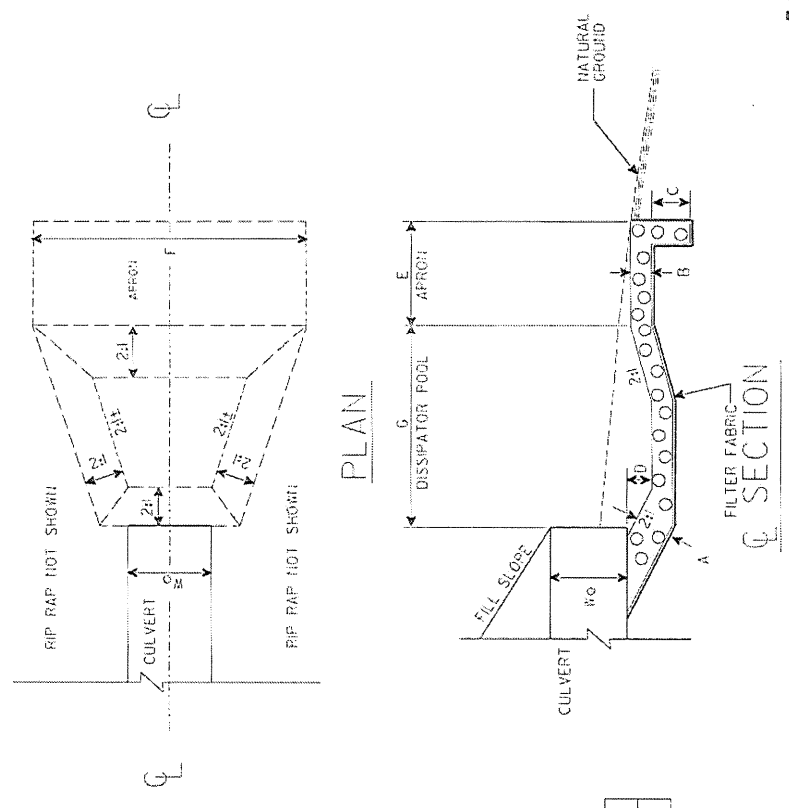
# DETAIL #31 RIP-RAPPED ENERGY DISSIPATOR BASIN

| DIM. (ft) | RIP RAP BASIN # |
|-----------|-----------------|
| A         | 0.6m            |
| B         | 0.6m            |
| C         | 0.6m            |
| D         | 0.9m            |
| E         | 1.8m            |
| F         | 4.8m            |
| G         | 7.8m            |

ALL DIMENSIONS APPROXIMATE

CLASS '1' RIPRAP  
 EST. 56.2 mTONS  
 EST. 55.7 SM F.F.

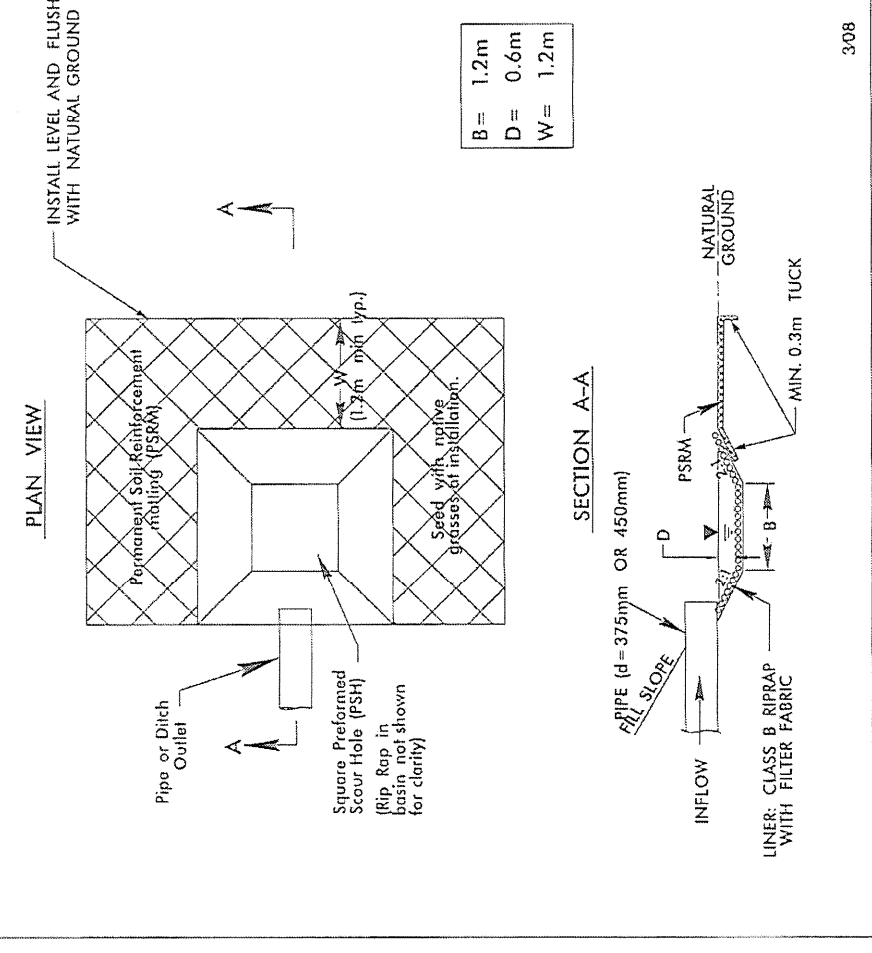
| BASIN # | LOCATION (AT OUTLET) |
|---------|----------------------|
| I       | 26+29 -LREV- LT      |



7/08

# DETAIL #32 PREFORMED SCOUR HOLE

\*NOT TO SCALE



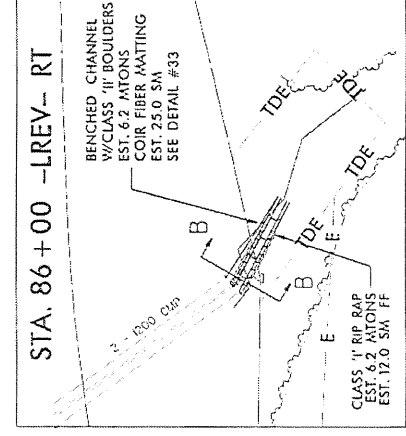
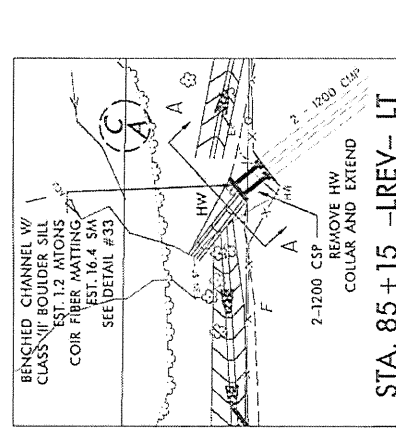
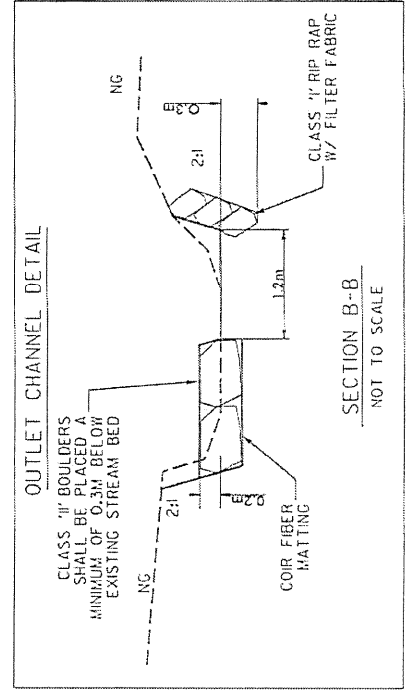
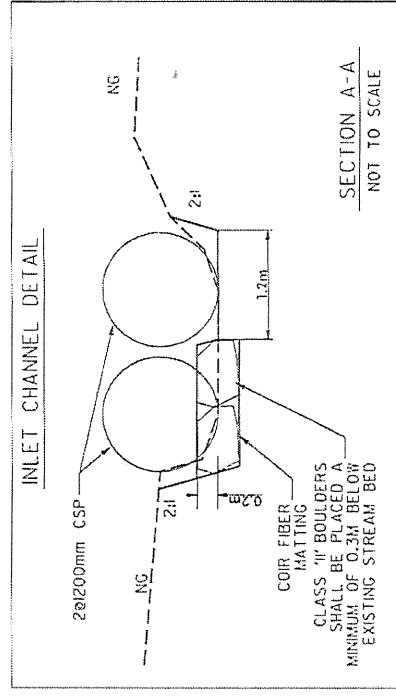
B = 1.2m  
 D = 0.6m  
 W = 1.2m

308

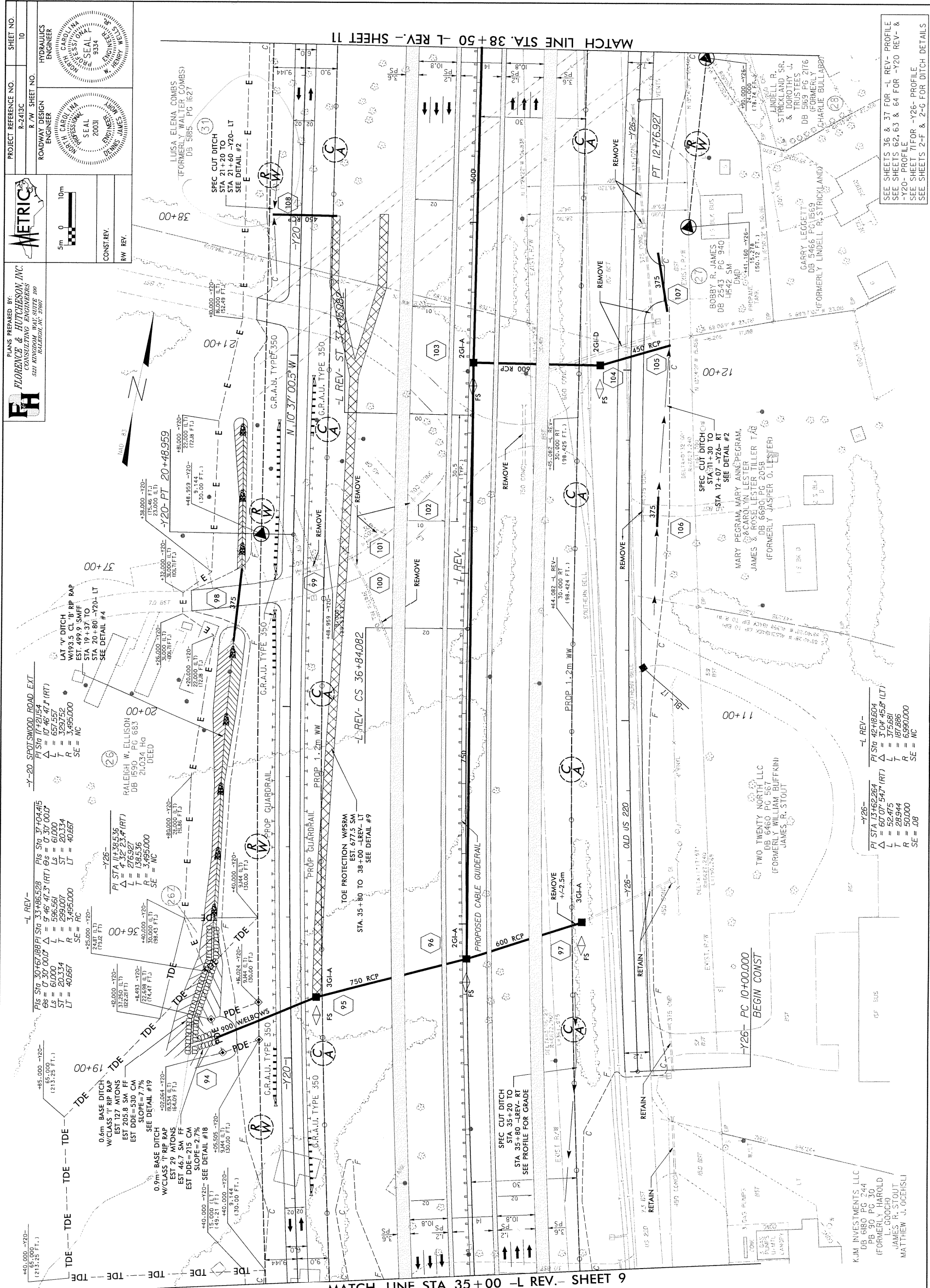
STA. 23+77 -LREV- RT  
 STA. 55+00 -LREV- LT  
 STA. 56+20 -LREV- LT  
 STA. 11+04 -SB US 220 RAMP- RT

# DETAIL #33

- NOTES:
1. A BENCH 0.2m ABOVE THE BED SHALL BE ARMORED WITH BOULDERS AS SHOWN ON THE PLAN VIEW. THE DEPTH OF ARMOR PROTECTION SHOULD EXTEND A MINIMUM OF 0.3M BELOW THE STREAM BED AND LINED WITH COIR FIBER MATTING.
  2. DIMENSIONS AND SLOPES MAY BE ADJUSTED TO FIT BY THE ENGINEER.
  3. EDGE ARMOR CAN BE NATURAL STREAM BOULDERS OR EXTRACTED FROM CLASS II RIPRAP OR SHOT ROCK MATERIAL AND CAN BE CUBICAL OR RECTANGULAR IN NATURE.
  4. ACCEPTABLE BOULDERS FOR THE EDGE ARMOR SHALL HAVE THE FOLLOWING APPROXIMATE DIMENSIONS: 0.3m x 0.6m x 0.3m. UNSUITABLE EDGE ARMOR MATERIAL THAT REMAINS FROM CLASS II RIP RAP OR SHOT ROCK STORES, MAY BE USED IN BACK FILL OF THE OVER BANK AREA OR DISCARDED.
  5. COIR FIBER MATTING SHALL EXTEND FROM THE BOTTOM OF THE FOOTER BOULDERS AND ACROSS THE BENCH AREA TO PREVENT WASHOUT OF SEDIMENT THROUGH BOULDER GAPS.







MATCH LINE STA. 35+00 -L REV.- SHEET 9

MATCH LINE STA. 38+50 -L REV.- SHEET 11

PLANS PREPARED BY:  
**FH** FLORENCE & HUTCHINSON, INC.  
 CONSULTING ENGINEERS  
 512 KAVANOH, SUITE 100  
 RALEIGH, NC 27607

PROJECT REFERENCE NO. R-2413C  
 R/W SHEET NO. 10

HYDRAULICS ENGINEER  
 ROADWAY DESIGN ENGINEER

CONST. REV. \_\_\_\_\_  
 RW REV. \_\_\_\_\_

5m 0 10m

Professional Engineer Seal: CHARLINA M. HARRIS, No. 9334, State of North Carolina

SEE SHEETS 36 & 37 FOR -L REV- PROFILE  
 SEE SHEETS 62, 63 & 64 FOR -Y20 REV- & -Y20 PROFILE  
 SEE SHEET 71 FOR -Y26- PROFILE  
 SEE SHEETS 2-F & 2-G FOR DITCH DETAILS

-L REV-  
 PI STA 42+48.604  
 $\Delta = 370' 45.8" (LT)$   
 $L = 375.661'$   
 $T = 187.886'$   
 $R = 6990.000'$   
 SE = NC

-Y26-  
 PI STA 13+62.264  
 $\Delta = 607' 54.7" (RT)$   
 $L = 52.475'$   
 $T = 28.944'$   
 $R = 50.000'$   
 SE = .08

-Y20- SPOT WOOD ROAD EXT  
 PI STA 17+20.165  
 $\Delta = 107' 46.4" (RT)$   
 $L = 667.557'$   
 $T = 329.752'$   
 $R = 3,495.000'$   
 SE = NC

-L REV-  
 PI STA 30+167.188  
 $\Delta = 374' 46.528"$   
 $L = 374' 46.528"$   
 $T = 187.264'$   
 $R = 6990.000'$   
 SE = NC

0.6m BASE DITCH  
 W/C CLASS 11 RIP RAP  
 EST 127 MTONS  
 EST 205.8 SM FF  
 EST DDE = 530 CM  
 SLOPE = 7.7%  
 SEE DETAIL #19

0.9m BASE DITCH  
 W/C CLASS 11 RIP RAP  
 EST 29 MTONS  
 EST 46.7 SM FF  
 EST DDE = 215 CM  
 SLOPE = 2.7%  
 SEE DETAIL #18

0.6m BASE DITCH  
 W/C CLASS 11 RIP RAP  
 EST 127 MTONS  
 EST 205.8 SM FF  
 EST DDE = 530 CM  
 SLOPE = 7.7%  
 SEE DETAIL #19

0.9m BASE DITCH  
 W/C CLASS 11 RIP RAP  
 EST 29 MTONS  
 EST 46.7 SM FF  
 EST DDE = 215 CM  
 SLOPE = 2.7%  
 SEE DETAIL #18





PLANS PREPARED BY:  
**FH** FLORENCE & HUTCHESON, INC.  
 CONSULTING ENGINEERS  
 401 RAILROAD AVENUE, SUITE 200  
 HALLMARK, NC 27027

PROJECT REFERENCE NO. R-2413C  
 R/W SHEET NO. 21

ROADWAY DESIGN ENGINEER  
 TIMOTHY M. DAVIS  
 DB 1321 PG 2584  
 (FORMERLY ROY, INC.)

HYDRAULICS ENGINEER  
 JIMMY C. WADE & APRIL D.  
 DB 116B PG 450  
 (FORMERLY TIMOTHY M. DAVIS)

PROFESSIONAL SEAL  
 ENGINEER  
 CAROLINA  
 20031  
 9334

PROFESSIONAL SEAL  
 ENGINEER  
 CAROLINA  
 20031  
 9334

CONST. REV.  
 RW REV.



WILLIAM E. NEAL  
 DB 730 PG 382  
 6-563 HG  
 DMD

LAT 0.9M BASE DITCH  
 W/84.3 MTN CL 'B' RIP RAP  
 EST. 206.6 SMFF  
 STA 83+60 TO  
 STA 84+07 -LREV- LT  
 SEE DETAIL #10

EST. 6.4  
 MTONS  
 CLASS 'I'  
 RIP RAP

BENCHED CHANNEL W/  
 CLASS 'II' BOULDER SILL  
 EST. 1.2 MTONS  
 COIR FIBER MATTING  
 EST. 16.4 SM  
 SEE DETAIL #33

LAT 0.6M BASE DITCH  
 W/64.6 CL 'B' RIP RAP  
 EST. 409.6 SMFF  
 STA 84+20 TO  
 STA 85+20 -LREV- LT  
 SEE DETAIL #15

CL 'B' RIP RAP  
 5.9' SMFF

375 WELBOWS

2GIWFG

LAT 0.9M BASE DITCH  
 W/84.3 MTN CL 'B' RIP RAP  
 EST. 206.6 SMFF  
 STA 83+60 TO  
 STA 84+07 -LREV- LT  
 SEE DETAIL #10

EST. 6.4  
 MTONS  
 CLASS 'I'  
 RIP RAP

BENCHED CHANNEL W/  
 CLASS 'II' BOULDER SILL  
 EST. 1.2 MTONS  
 COIR FIBER MATTING  
 EST. 16.4 SM  
 SEE DETAIL #33

LAT 0.6M BASE DITCH  
 W/64.6 CL 'B' RIP RAP  
 EST. 409.6 SMFF  
 STA 84+20 TO  
 STA 85+20 -LREV- LT  
 SEE DETAIL #15

CL 'B' RIP RAP  
 5.9' SMFF

375 WELBOWS

2GIWFG

LAT 0.9M BASE DITCH  
 W/84.3 MTN CL 'B' RIP RAP  
 EST. 206.6 SMFF  
 STA 83+60 TO  
 STA 84+07 -LREV- LT  
 SEE DETAIL #10

EST. 6.4  
 MTONS  
 CLASS 'I'  
 RIP RAP

BENCHED CHANNEL W/  
 CLASS 'II' BOULDER SILL  
 EST. 1.2 MTONS  
 COIR FIBER MATTING  
 EST. 16.4 SM  
 SEE DETAIL #33

LAT 0.6M BASE DITCH  
 W/64.6 CL 'B' RIP RAP  
 EST. 409.6 SMFF  
 STA 84+20 TO  
 STA 85+20 -LREV- LT  
 SEE DETAIL #15

CL 'B' RIP RAP  
 5.9' SMFF

375 WELBOWS

2GIWFG

LAT 0.9M BASE DITCH  
 W/84.3 MTN CL 'B' RIP RAP  
 EST. 206.6 SMFF  
 STA 83+60 TO  
 STA 84+07 -LREV- LT  
 SEE DETAIL #10

EST. 6.4  
 MTONS  
 CLASS 'I'  
 RIP RAP

BENCHED CHANNEL W/  
 CLASS 'II' BOULDER SILL  
 EST. 1.2 MTONS  
 COIR FIBER MATTING  
 EST. 16.4 SM  
 SEE DETAIL #33

LAT 0.6M BASE DITCH  
 W/64.6 CL 'B' RIP RAP  
 EST. 409.6 SMFF  
 STA 84+20 TO  
 STA 85+20 -LREV- LT  
 SEE DETAIL #15

CL 'B' RIP RAP  
 5.9' SMFF

375 WELBOWS

2GIWFG

LAT 0.9M BASE DITCH  
 W/84.3 MTN CL 'B' RIP RAP  
 EST. 206.6 SMFF  
 STA 83+60 TO  
 STA 84+07 -LREV- LT  
 SEE DETAIL #10

EST. 6.4  
 MTONS  
 CLASS 'I'  
 RIP RAP

BENCHED CHANNEL W/  
 CLASS 'II' BOULDER SILL  
 EST. 1.2 MTONS  
 COIR FIBER MATTING  
 EST. 16.4 SM  
 SEE DETAIL #33

LAT 0.6M BASE DITCH  
 W/64.6 CL 'B' RIP RAP  
 EST. 409.6 SMFF  
 STA 84+20 TO  
 STA 85+20 -LREV- LT  
 SEE DETAIL #15

CL 'B' RIP RAP  
 5.9' SMFF

375 WELBOWS

2GIWFG

LAT 0.9M BASE DITCH  
 W/84.3 MTN CL 'B' RIP RAP  
 EST. 206.6 SMFF  
 STA 83+60 TO  
 STA 84+07 -LREV- LT  
 SEE DETAIL #10

EST. 6.4  
 MTONS  
 CLASS 'I'  
 RIP RAP

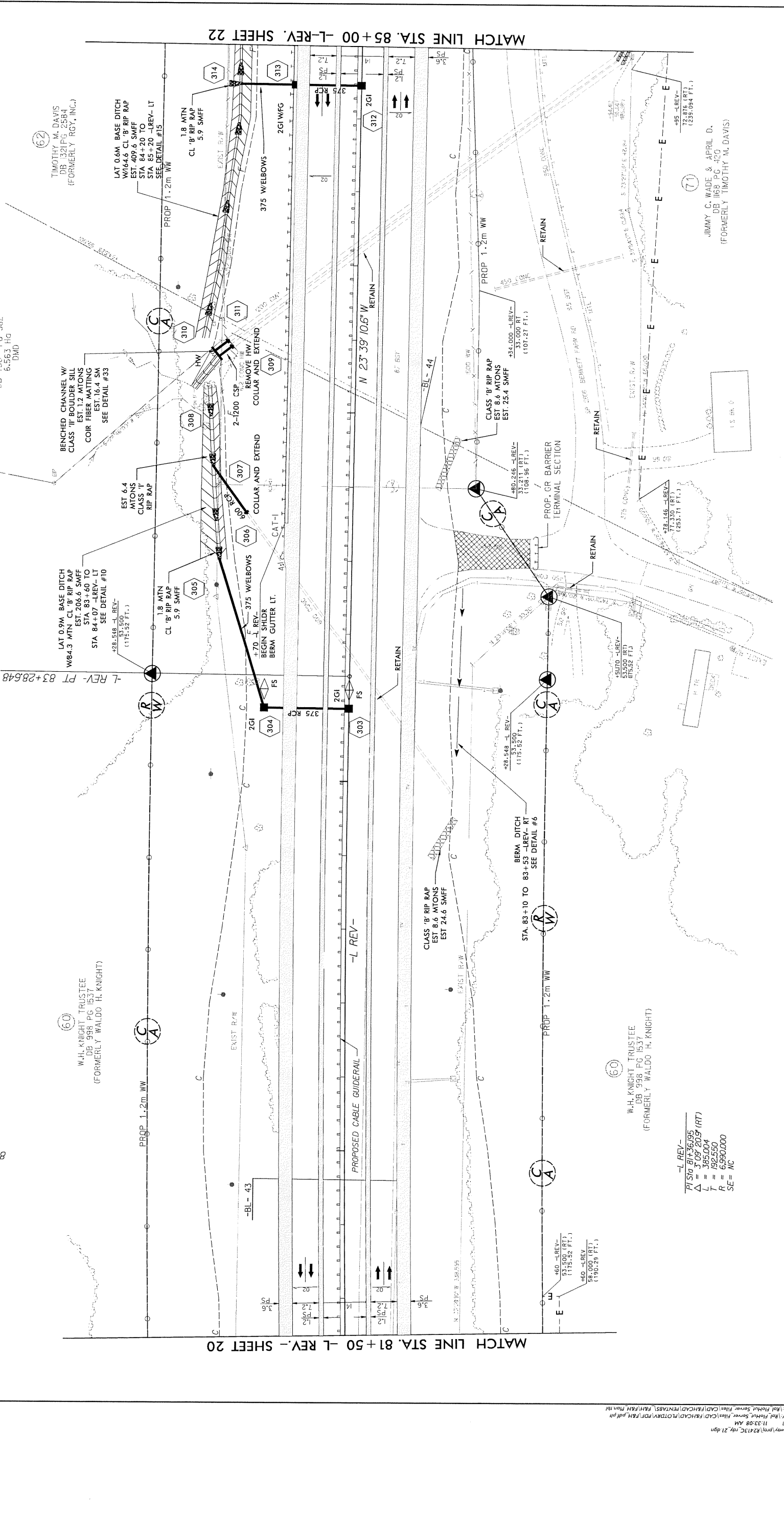
BENCHED CHANNEL W/  
 CLASS 'II' BOULDER SILL  
 EST. 1.2 MTONS  
 COIR FIBER MATTING  
 EST. 16.4 SM  
 SEE DETAIL #33

LAT 0.6M BASE DITCH  
 W/64.6 CL 'B' RIP RAP  
 EST. 409.6 SMFF  
 STA 84+20 TO  
 STA 85+20 -LREV- LT  
 SEE DETAIL #15

CL 'B' RIP RAP  
 5.9' SMFF

375 WELBOWS

2GIWFG



MATCH LINE STA. 81+50 -L REV- SHEET 20

MATCH LINE STA. 85+00 -L-REV. SHEET 22

-L REV-  
 P1 STA 81+56.095  
 Δ = 3709.209 (RT)  
 L = 385.004  
 T = 192.550  
 R = 6.990000  
 SE = NC

W.H. KNIGHT TRUSTEE  
 DB 998 PG 1537  
 (FORMERLY WALDO H. KNIGHT)

JIMMY C. WADE & APRIL D.  
 DB 116B PG 450  
 (FORMERLY TIMOTHY M. DAVIS)

SEE SHEETS 43 & 44 FOR -L REV- PROFILE  
 SEE SHEET 85 FOR XOVRI PLAN & PROFILE  
 SEE SHEETS 2-F & 2-G FOR DITCH DETAILS

PLOT DATE: 11/23/08 AM  
 FILE: R:\Roadway\proj\02413C\rv\_21.dgn  
 PLOT DRIVER: V:\Real\Raster Server\Files\CAD\FACAD\ROT\MOTR\MDF\FH.plt  
 PLOT TABLE: V:\Real\Raster Server\Files\CAD\FACAD\ROT\MOTR\MDF\FH.plt

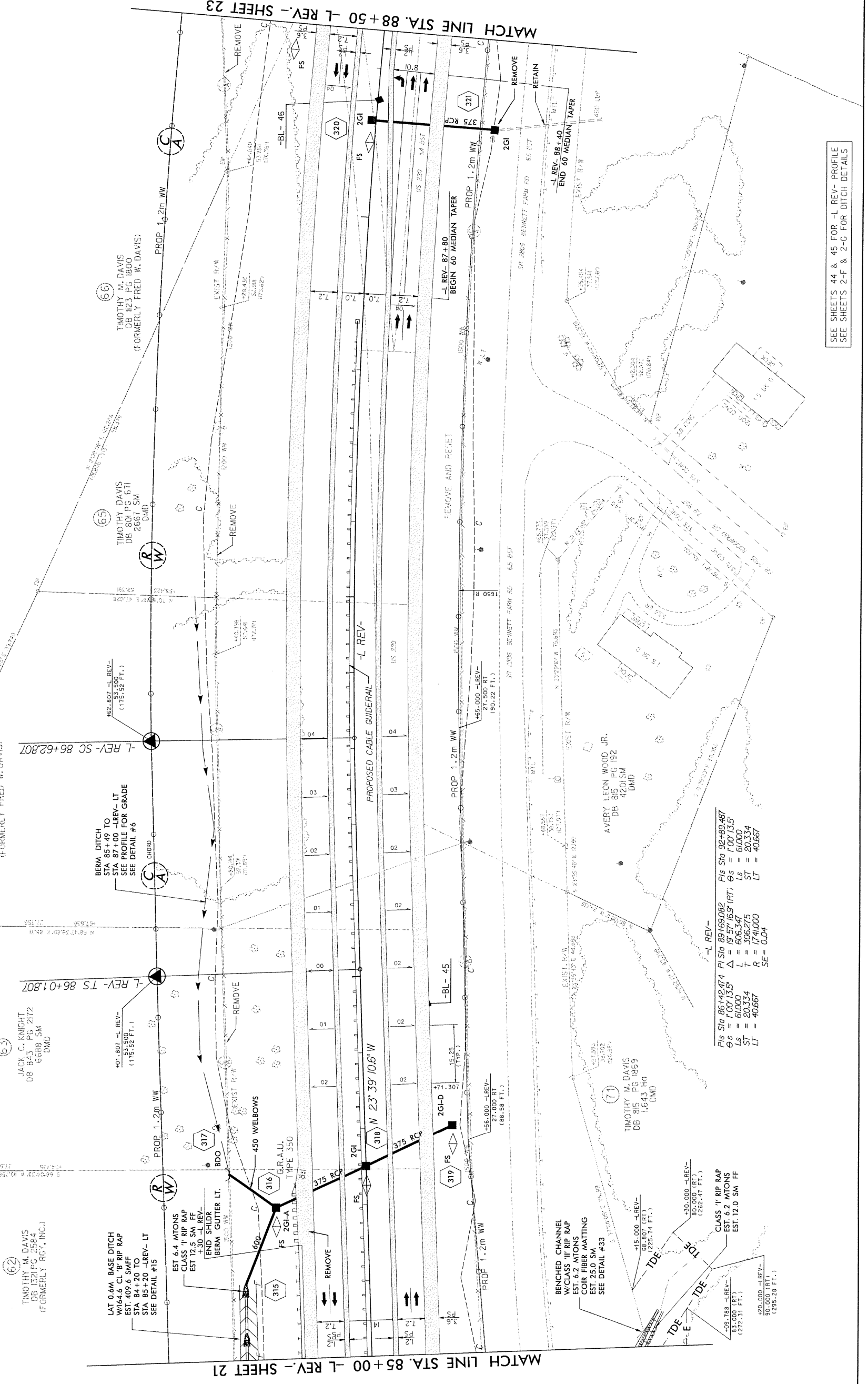
PLANS PREPARED BY  
**FH** FLORENCE & HUTCHESON, INC.  
 CONSULTING ENGINEERS  
 5121 ADVANCEWAY, SUITE 200  
 WASHINGTON, DC 20007

PROJECT REFERENCE NO. R-2413C  
 R/W SHEET NO. 22

ROADWAY DESIGN ENGINEER  
 H. CAROL TINA  
 PROFESSIONAL SEAL  
 20031

HYDRAULICS ENGINEER  
 CAROLINA  
 PROFESSIONAL SEAL  
 9334

CONST. REV.  
 RW REV.



**-L REV-**

|                             |                                |                             |
|-----------------------------|--------------------------------|-----------------------------|
| Sta 86+42.474               | PI Sta 89+69.082               | Sta 99+89.487               |
| $\theta_s = 1.007135^\circ$ | $\Delta = 19.57169^\circ$ (RT) | $\theta_s = 1.007135^\circ$ |
| LS = 61000                  | L = 606.347                    | LS = 61000                  |
| ST = 20.334                 | T = 306.275                    | ST = 20.334                 |
| LT = 40.667                 | R = 1741000                    | LT = 40.667                 |
|                             | SE = 0.04                      |                             |

SEE SHEETS 44 & 45 FOR -L REV- PROFILE  
 SEE SHEETS 2-F & 2-G FOR DITCH DETAILS