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

PROPOSAL

DATE AND TIME OF BID OPENING: **JUNE 17, 2014 AT 2:00 PM**

CONTRACT ID	C203399
WBS	34821.3.S6
FEDERAL-AID NO.	STATE FUNDED
COUNTY	GUILFORD
T.I.P. NO.	U-2525B
MILES	5.491
ROUTE NO.	
LOCATION	GREENSBORO EASTERN LOOP FROM NORTH OF US-70 TO US-29 NORTH OF GREENSBORO.
TYPE OF WORK	GRADING, DRAINAGE, PAVING, SIGNALS, RET WALL AND STRUCTURES.

NOTICE:

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

BIDS WILL BE RECEIVED AS SHOWN BELOW:

THIS IS A <u>ROADWAY & STRUCTURE</u> PROPOSAL

5% BID BOND OR BID DEPOSIT REQUIRED

_____

PROPOSAL FOR THE CONSTRUCTION OF

CONTRACT No. C203399 IN GUILFORD COUNTY, NORTH CAROLINA

Date_____ 20_____

DEPARTMENT OF TRANSPORTATION,

RALEIGH, NORTH CAROLINA

The Bidder has carefully examined the location of the proposed work to be known as Contract No. **C203399**; has carefully examined the plans and specifications, which are acknowledged to be part of the proposal, the special provisions, the proposal, the form of contract, and the forms of contract payment bond and contract performance bond; and thoroughly understands the stipulations, requirements and provisions. The undersigned bidder agrees to bound upon his execution of the bid and subsequent award to him by the Board of Transportation in accordance with this proposal to provide the necessary contract payment bond and contract performance bond within fourteen days after the written notice of award is received by him. The undersigned Bidder further agrees to provide all necessary machinery, tools, labor, and other means of construction; and to do all the work and to furnish all materials, except as otherwise noted, necessary to perform and complete the said contract in accordance with *the 2012 Standard Specifications for Roads and Structures* by the dates(s) specified in the Project Special Provisions and in accordance with the requirements of the Engineer, and at the unit or lump sum prices, as the case may be, for the various items given on the sheets contained herein.

The Bidder shall provide and furnish all the materials, machinery, implements, appliances and tools, and perform the work and required labor to construct and complete State Highway Contract No. **C203399** in **Guilford County**, for the unit or lump sum prices, as the case may be, bid by the Bidder in his bid and according to the proposal, plans, and specifications prepared by said Department, which proposal, plans, and specifications show the details covering this project, and hereby become a part of this contract.

The published volume entitled *North Carolina Department of Transportation, Raleigh, Standard Specifications for Roads and Structures, January 2012* with all amendments and supplements thereto, is by reference incorporated into and made a part of this contract; that, except as herein modified, all the construction and work included in this contract is to be done in accordance with the specifications contained in said volume, and amendments and supplements thereto, under the direction of the Engineer.

If the proposal is accepted and the award is made, the contract is valid only when signed either by the Contract Officer or such other person as may be designated by the Secretary to sign for the Department of Transportation. The conditions and provisions herein cannot be changed except over the signature of the said Contract Officer.

The quantities shown in the itemized proposal for the project are considered to be approximate only and are given as the basis for comparison of bids. The Department of Transportation may increase or decrease the quantity of any item or portion of the work as may be deemed necessary or expedient.

An increase or decrease in the quantity of an item will not be regarded as sufficient ground for an increase or decrease in the unit prices, nor in the time allowed for the completion of the work, except as provided for the contract.

Accompanying this bid is a bid bond secured by a corporate surety, or certified check payable to the order of the Department of Transportation, for five percent of the total bid price, which deposit is to be forfeited as liquidated damages in case this bid is accepted and the Bidder shall fail to provide the required payment and performance bonds with the Department of Transportation, under the condition of this proposal, within 14 calendar days after the written notice of award is received by him, as provided in the *Standard Specifications*; otherwise said deposit will be returned to the Bidder.

NORTH CAROLINA PROFESSIONAL SEAL 21076 ENGINEER RANDY A. GARRIS

4/15/14

State Contract Officer

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PROJECT SPECIAL PROVISIONS

GENERAL

CONTRACT TIME AND LIQUIDATED DAMAGES:

(8-15-00) (Rev. 12-18-07) 108 SP1 G07 A

The date of availability for this contract is **July 28, 2014**, except that work in jurisdictional waters and wetlands shall not begin until a meeting between the DOT, Regulatory Agencies, and the Contractor is held as stipulated in the permits contained elsewhere in this proposal. This delay in availability has been considered in determining the contract time for this project.

The completion date for this contract is **December 28, 2018**.

Except where otherwise provided by the contract, observation periods required by the contract will not be a part of the work to be completed by the completion date and/or intermediate contract times stated in the contract. The acceptable completion of the observation periods that extend beyond the final completion date shall be a part of the work covered by the performance and payment bonds.

The liquidated damages for this contract are **Two Hundred Dollars ($200.00)** per calendar day. These liquidated damages will not be cumulative with any liquidated damages which may become chargeable under Intermediate Contract Time Number 1.

INTERMEDIATE CONTRACT TIME NUMBER 1 AND LIQUIDATED DAMAGES:

(7-1-95) (Rev. 2-21-12) 108 SP1 G13 A

Except for that work required under the Project Special Provisions entitled *Planting, Reforestation* and/or *Permanent Vegetation Establishment*, included elsewhere in this proposal, the Contractor will be required to complete all work included in this contract and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is **July 28, 2014**.

The completion date for this intermediate contract time is **July 1, 2018**.

The liquidated damages for this intermediate contract time are **Five Thousand Dollars ($5,000.00)** per calendar day.

Upon apparent completion of all the work required to be completed by this intermediate date, a final inspection will be held in accordance with Article 105-17 and upon acceptance, the Department will assume responsibility for the maintenance of all work except *Planting, Reforestation* and/or *Permanent Vegetation Establishment*. The Contractor will be responsible for and shall make corrections of all damages to the completed roadway caused by his planting operations, whether occurring prior to or after placing traffic through the project.

INTERMEDIATE CONTRACT TIME NUMBER 2 AND LIQUIDATED DAMAGES:
(2-20-07) 108 SP1 G14 A

The Contractor shall complete the required work of installing, maintaining, and removing the traffic control devices for lane closures and restoring traffic to the existing traffic pattern. The Contractor shall not close or narrow a lane of traffic on **US 29 (-Y13-), I-840 (-L-) and I-85** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday through Friday
6:00 a.m. – 8:00 p.m.

Saturday & Sunday
9:00 a.m. – 8:00 p.m.

In addition, the Contractor shall not close or narrow a lane of traffic on **US 29 (-Y13-), I-840 (-L-) and I-85** detain and/or alter the traffic flow on or during holidays, holiday weekends, special events, or any other time when traffic is unusually heavy, including the following schedules:

HOLIDAY AND HOLIDAY WEEKEND LANE CLOSURE RESTRICTIONS

1. For **unexpected occurrence** that creates unusually high traffic volumes, as directed by the Engineer.

2. For **New Year's Day**, between the hours of **6:00 a.m.** December 31st and **8:00 p.m.** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **8:00 p.m.** the following Tuesday.

3. For **Easter**, between the hours of **6:00 a.m.** Thursday and **8:00 p.m.** Monday.

4. For **Memorial Day**, between the hours of **6:00 a.m.** Friday and **8:00 p.m.** Tuesday.

5. For **Independence Day**, between the hours of **6:00 a.m.** the day before Independence Day and **8:00 p.m.** the day after Independence Day.

   If **Independence Day** is on a Friday, Saturday, Sunday or Monday, then between the hours of **6:00 a.m.** the Thursday before Independence Day and **8:00 p.m.** the Tuesday after Independence Day.

6. For **Labor Day**, between the hours of **6:00 a.m.** Friday and **8:00 p.m.** Tuesday.

7. For **Thanksgiving Day**, between the hours of **6:00 a.m.** Tuesday and **8:00 p.m.** Monday.

8. For **Christmas**, between the hours of **8:00 a.m.** the Friday before the week of Christmas Day and **6:00 p.m.** the following Tuesday after the week of Christmas Day.

9. For the **Wyndham Golf Tournament (typically held in August)**, between the hours of **6:00 a.m.** the **Friday before** the week of the **Wyndham Golf Tournament** and **8:00 p.m.** the following **Monday** after the week of the **Wyndham Golf Tournament**.

10. For the **Martinsville Nascar Cup Races (typically held in late March and late October)**, between the hours of **6:00 a.m.** the **Friday** before the **Martinsville Nascar Cup Races** and **8:00 p.m.** the following **Monday** after the **Martinsville Nascar Cup Races**.

Holidays and holiday weekends shall include New Year's, Easter, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas. The Contractor shall schedule his work so that lane closures will not be required during these periods, unless otherwise directed by the Engineer.

The time of availability for this intermediate contract work shall be the time the Contractor begins to install all traffic control devices for lane closures according to the time restrictions listed herein.

The completion time for this intermediate contract work shall be the time the Contractor is required to complete the removal of all traffic control devices for lane closures according to the time restrictions stated above and place traffic in the existing traffic pattern.

The liquidated damages are **One Thousand Dollars ($1,000.00)** per 15 minute time period.

INTERMEDIATE CONTRACT TIME NUMBER 3 AND LIQUIDATED DAMAGES:
(2-20-07) 108 SP1 G14 A

The Contractor shall complete the required work of installing, maintaining, and removing the traffic control devices for lane closures and restoring traffic to the existing traffic pattern. The Contractor shall not close or narrow a lane of traffic on **I-40/I-85 and I-40/I-85BUS** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday through Friday
6:00 a.m. – 8:00 p.m.

Saturday & Sunday
9:00 a.m. – 8:00 p.m.

In addition, the Contractor shall not close or narrow a lane of traffic on **I-40/I-85 and I-40/I-85BUS,** detain and/or alter the traffic flow on or during holidays, holiday weekends, special events, or any other time when traffic is unusually heavy, including the following schedules:

HOLIDAY AND HOLIDAY WEEKEND LANE CLOSURE RESTRICTIONS

1. For **unexpected occurrence** that creates unusually high traffic volumes, as directed by the Engineer.

2. For **New Year's Day**, between the hours of **6:00 a.m.** December 31st and **8:00 p.m.** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **8:00 p.m.** the following Tuesday.

3. For **Easter**, between the hours of **6:00 a.m.** Thursday and **8:00 p.m.** Monday.

4. For **Memorial Day**, between the hours of **6:00 a.m.** Friday and **8:00 p.m.** Tuesday.

5. For **Independence Day**, between the hours of **6:00 a.m.** the day before Independence Day and **8:00 p.m.** the day after Independence Day.

   If **Independence Day** is on a Friday, Saturday, Sunday or Monday, then between the hours of **6:00 a.m.** the Thursday before Independence Day and **8:00 p.m.** the Tuesday after Independence Day.

6. For **Labor Day**, between the hours of **6:00 a.m.** Friday and **8:00 p.m.** Tuesday.

7. For **Thanksgiving Day**, between the hours of **6:00 a.m.** Tuesday and **8:00 p.m.** Monday.

8. For **Christmas**, between the hours of **8:00 a.m.** the Friday before the week of Christmas Day and **6:00 p.m.** the following Tuesday after the week of Christmas Day.

9. For the **Wyndham Golf Tournament (typically held in August)**, between the hours of **6:00 a.m.** the **Friday before** the week of the **Wyndham Golf Tournament** and **8:00 p.m.** the following **Monday** after the week of the **Wyndham Golf Tournament**.

10. For the **Martinsville Nascar Cup Races (typically held in late March and late October)**, between the hours of **6:00 a.m.** the **Friday** before the **Martinsville Nascar Cup Races** and **8:00 p.m.** the following **Monday** after the **Martinsville Nascar Cup Races**.

Holidays and holiday weekends shall include New Year's, Easter, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas. The Contractor shall schedule his work so that lane closures will not be required during these periods, unless otherwise directed by the Engineer.

The time of availability for this intermediate contract work shall be the time the Contractor begins to install all traffic control devices for lane closures according to the time restrictions listed herein.

The completion time for this intermediate contract work shall be the time the Contractor is required to complete the removal of all traffic control devices for lane closures according to the time restrictions stated above and place traffic in the existing traffic pattern.

The liquidated damages are **Two Thousand Five Hundred Dollars ($2,500.00)** per 15 minute time period.

INTERMEDIATE CONTRACT TIME NUMBER 4 AND LIQUIDATED DAMAGES:
(2-20-07) 108 SPI G14 A

The Contractor shall complete the required work of installing, maintaining, and removing the traffic control devices for lane closures and restoring traffic to the existing traffic pattern. The Contractor shall not close or narrow a lane of traffic on **US 70 (-Y3-)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday through Friday
7:00 a.m. – 9:00 a.m. &
4:00 p.m. – 6:00 p.m.

In addition, the Contractor shall not close or narrow a lane of traffic on **US 70 (-Y3-)**, detain and/or alter the traffic flow on or during holidays, holiday weekends, special events, or any other time when traffic is unusually heavy, including the following schedules:

HOLIDAY AND HOLIDAY WEEKEND LANE CLOSURE RESTRICTIONS

1. For **unexpected occurrence** that creates unusually high traffic volumes, as directed by the Engineer.

2. For **New Year's Day**, between the hours of **7:00 a.m.** December 31st and **6:00 p.m.** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **6:00 p.m.** the following Tuesday.

3. For **Easter**, between the hours of **7:00 a.m.** Thursday and **6:00 p.m.** Monday.

4. For **Memorial Day**, between the hours of **7:00 a.m.** Friday and **6:00 p.m.** Tuesday.

5. For **Independence Day**, between the hours of **7:00 a.m.** the day before Independence Day and **6:00 p.m.** the day after Independence Day.

   If **Independence Day** is on a Friday, Saturday, Sunday or Monday, then between the hours of **7:00 a.m.** the Thursday before Independence Day and **6:00 p.m.** the Tuesday after Independence Day.

6. For **Labor Day**, between the hours of **7:00 a.m.** Friday and **6:00 p.m.** Tuesday.

7. For **Thanksgiving Day**, between the hours of **7:00 a.m.** Tuesday and **6:00 p.m.** Monday.

8. For **Christmas**, between the hours of **7:00 a.m.** the Friday before the week of Christmas Day and **6:00 p.m.** the following Tuesday after the week of Christmas Day.

Holidays and holiday weekends shall include New Year's, Easter, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas. The Contractor shall schedule his work so that lane closures will not be required during these periods, unless otherwise directed by the Engineer.

The time of availability for this intermediate contract work shall be the time the Contractor begins to install all traffic control devices for lane closures according to the time restrictions listed herein.

The completion time for this intermediate contract work shall be the time the Contractor is required to complete the removal of all traffic control devices for lane closures according to the time restrictions stated above and place traffic in the existing traffic pattern.

The liquidated damages are **One Thousand Dollars ($1,000.00)** per 15 minute time period.

INTERMEDIATE CONTRACT TIME NUMBER 5 AND LIQUIDATED DAMAGES:
(2-20-07) 108 SP1 G14 A

The Contractor shall complete the required work of installing, maintaining, and removing the traffic control devices for lane closures and restoring traffic to the existing traffic pattern. The Contractor shall not close or narrow a lane of traffic on **SR 2565 (-Y22-)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday through Friday
7:00 a.m. – 9:00 a.m. &
4:00 p.m. – 6:00 p.m.

In addition, the Contractor shall not close or narrow a lane of traffic on **SR 2565 (-Y22-)**, detain and/or alter the traffic flow on or during holidays, holiday weekends, special events, or any other time when traffic is unusually heavy, including the following schedules:

HOLIDAY AND HOLIDAY WEEKEND LANE CLOSURE RESTRICTIONS

1. For **unexpected occurrence** that creates unusually high traffic volumes, as directed by the Engineer.

2. For **New Year's Day**, between the hours of **7:00 a.m.** December 31st and **6:00 p.m.** January 2nd. If New Year's Day is on a Friday, Saturday, Sunday or Monday, then until **6:00 p.m.** the following Tuesday.

3. For **Easter**, between the hours of **7:00 a.m.** Thursday and **6:00 p.m.** Monday.

4. For **Memorial Day**, between the hours of **7:00 a.m.** Friday and **6:00 p.m.** Tuesday.

5. For **Independence Day**, between the hours of **7:00 a.m.** the day before Independence Day and **6:00 p.m.** the day after Independence Day.

   If **Independence Day** is on a Friday, Saturday, Sunday or Monday, then between the hours of **7:00 a.m.** the Thursday before Independence Day and **6:00 p.m.** the Tuesday after Independence Day.

6. For **Labor Day**, between the hours of **7:00 a.m.** Friday and **6:00 p.m.** Tuesday.

7. For **Thanksgiving Day**, between the hours of **7:00 a.m.** Tuesday and **6:00 p.m.** Monday.

8. For **Christmas**, between the hours of **7:00 a.m.** the Friday before the week of Christmas Day and **6:00 p.m.** the following Tuesday after the week of Christmas Day.

Holidays and holiday weekends shall include New Year's, Easter, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas. The Contractor shall schedule his work so that lane closures will not be required during these periods, unless otherwise directed by the Engineer.

The time of availability for this intermediate contract work shall be the time the Contractor begins to install all traffic control devices for lane closures according to the time restrictions listed herein.

The completion time for this intermediate contract work shall be the time the Contractor is required to complete the removal of all traffic control devices for lane closures according to the time restrictions stated above and place traffic in the existing traffic pattern.

The liquidated damages are **One Thousand Dollars ($1,000.00)** per hour.

INTERMEDIATE CONTRACT TIME NUMBER 6 AND LIQUIDATED DAMAGES:
(2-20-07) 108 SPI G14 D

The Contractor shall complete the required work of installing, maintaining and removing the traffic control devices for road closures and restoring traffic to the existing traffic pattern. The Contractor shall not close **Camp Burton Rd. (-Y7-), Rankin Mill Rd. (-Y8-) and Hines Chapel Rd. (-Y9-)** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday through Sunday
6:00 a.m. – 7:00 p.m.

The time of availability for this intermediate contract time will be the time the Contractor begins to install traffic control devices required for road closures according to the time restrictions stated herein.

The completion time for this intermediate contract time will be the time the Contractor is required to complete the removal of traffic control devices required for the road closures according to the time restrictions stated herein and restore traffic to the existing traffic pattern

The liquidated damages are **Five Hundred Dollars ($500.00)** per 15 minute time period.

INTERMEDIATE CONTRACT TIME NUMBER 7 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 10-15-13) 108 SPI G14 E

The Contractor shall complete the required work of installing, maintaining and removing the traffic control devices for road closures and restoring traffic to the existing traffic pattern. The Contractor shall not close **US 70 (-Y3-), US 29 (-Y13-), I-840 (-L-), I-40/I-85, I-40/I-85BUS and I-85** during the following time restrictions:

DAY AND TIME RESTRICTIONS

Monday – Sunday
5:00 a.m. – 12:00 a.m. (midnight)

The maximum allowable time for **girder installation or overhead sign installation** is **30** minutes for **US 70 (-Y3-), US 29 (-Y13-), I-840 (-L-), I-40/I-85, I-40/I-85BUS and I-85.** The Contractor shall reopen the travel lanes to traffic until any resulting traffic queue is depleted.

The time of availability for this intermediate contract time will be the time the Contractor begins to install traffic control devices required for the road closures according to the time restrictions stated herein.

The completion time for this intermediate contract time will be the time the Contractor is required to complete the removal of traffic control devices required for the road closures according to the time restrictions stated herein and restore traffic to the existing traffic pattern.

The liquidated damages are **Two Thousand Five Hundred Dollars ($2,500.00)** per 15 minute time period.

INTERMEDIATE CONTRACT TIME NUMBER 8 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SPI G14 H

The Contractor shall complete the work required of **AREA 3, PHASE I, STEPS 3 & 4** as shown on Sheet **TMP- 3A** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is the date the Contractor elects to begin the work.

The completion date for this intermediate contract time is the date which is **seven (7)** consecutive calendar days after and including the date the Contractor begins this work.

The liquidated damages are **One Thousand Dollars ($1,000.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 9 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 F

The Contractor shall complete the work required of **AREA 3, PHASE II, STEPS 3 & 4** as shown on Sheet **TMP-3A** and shall place and maintain traffic on same.

The time of availability for this intermediate contract time is the **Friday** at **8:00 PM** that the Contractor elects to begin the work.

The completion time for this intermediate contract time is the following **Monday** at **6:00 AM** after the time of availability.

The liquidated damages are **One Thousand Dollars ($1,000.00)** per hour.

INTERMEDIATE CONTRACT TIME NUMBER 10 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 H

The Contractor shall complete the work required of **AREA 7, PHASE II, STEPS 1 thru PHASE III, STEP 4** as shown on Sheet **TMP-3D** and shall place and maintain traffic on same.

The date of availability for this intermediate contract time is the date the Contractor elects to begin the work.

The completion date for this intermediate contract time is the date which is **three hundred (300)** consecutive calendar days after and including the date the Contractor begins this work.

The liquidated damages are **Ten Thousand Dollars ($10,000.00)** per calendar day.

INTERMEDIATE CONTRACT TIME NUMBER 11 AND LIQUIDATED DAMAGES:
(2-20-07) (Rev. 6-18-13) 108 SP1 G14 G

The Contractor prior to removing or disturbing the existing communications network associated with the Existing Splice Cabinet located in the northwestern quadrant of the I-40 and I-840 interchange; shall first install and have in place the new communications infrastructure so as to minimize down time when integrating and splicing the new ITS devices installed under U-2525B over to the Existing Splice Cabinet.

The Contractor is required to notify the Engineer a minimum of 5 days prior to the anticipated time of disturbing the existing communications infrastructure.

The time of availability for this intermediate contract time is the time the Contractor elects to disturb the existing communications system to begin switching devices over to the new communications system associated with the Existing Splice Cabinet.

The completion time for this intermediate contract time is the time which is **thirty six (36)** consecutive hours after the Contractor begins this work.

The liquidated damages are **One Thousand Five Hundred Dollars ($1,500.00)** per hour.

PERMANENT VEGETATION ESTABLISHMENT:

(2-16-12) (Rev. 10-15-13) 104 SP1 G16

Establish a permanent stand of the vegetation mixture shown in the contract. During the period between initial vegetation planting and final project acceptance, perform all work necessary to establish permanent vegetation on all erodible areas within the project limits, as well as, in borrow and waste pits. This work shall include erosion control device maintenance and installation, repair seeding and mulching, supplemental seeding and mulching, mowing, and fertilizer topdressing, as directed. All work shall be performed in accordance with the applicable section of the *2012 Standard Specifications*. All work required for initial vegetation planting shall be performed as a part of the work necessary for the completion and acceptance of the Intermediate Contract Time (ICT). Between the time of ICT and Final Project acceptance, or otherwise referred to as the vegetation establishment period, the Department will be responsible for preparing the required National Pollutant Discharge Elimination System (NPDES) inspection records.

Once the Engineer has determined that the permanent vegetation establishment requirement has been achieved at an 80% vegetation density (the amount of established vegetation per given area to stabilize the soil) and no erodible areas exist within the project limits, the Contractor will be notified to remove the remaining erosion control devices that are no longer needed. The Contractor will be responsible for, and shall correct any areas disturbed by operations performed in permanent vegetation establishment and the removal of temporary erosion control measures, whether occurring prior to or after placing traffic on the project.

Payment for *Response for Erosion Control*, *Seeding and Mulching*, *Repair Seeding*, *Supplemental Seeding*, *Mowing*, *Fertilizer Topdressing*, *Silt Excavation*, and *Stone for Erosion Control* will be made at contract unit prices for the affected items. Work required that is not represented by contract line items will be paid in accordance with Articles 104-7 or 104-3 of the *2012 Standard Specifications*. No additional compensation will be made for maintenance and removal of temporary erosion control items.

MAJOR CONTRACT ITEMS:

(2-19-02) 104 SP1 G28

The following listed items are the major contract items for this contract (see Article 104-5 of the *2012 Standard Specifications*):

Line #	Description
6	Unclassified Excavation
19	Borrow Excavation
97	10" Portland Cement Concrete Pavement, Through Lanes (w/Dowels)
497	Reinforced Concrete Deck Slab

SPECIALTY ITEMS:

(7-1-95)(Rev. 1-17-12) 108-6 SP1 G37

Items listed below will be the specialty items for this contract (see Article 108-6 of the *2012 Standard Specifications*).

Line #	Description
147 thru 168	Guardrail
169 thru 180	Fencing
187 thru 236	Signing
256 thru 270, 275 thru 276	Long-Life Pavement Markings
281	Temporary Pavement Markings
282 thru 283	Permanent Pavement Markers
285 thru 314	Lighting
315 thru 355	Utility Construction
356 thru 390, 393 thru 397	Erosion Control
391 thru 392	Reforestation
398 thru 463	Signals/ITS System
484 thru 492	Drilled Piers

FUEL PRICE ADJUSTMENT:

(11-15-05) (Rev. 2-18-14) 109-8 SP1 G43

Revise the *2012 Standard Specifications* as follows:

Page 1-83, Article 109-8, Fuel Price Adjustments, add the following:

The base index price for DIESEL #2 FUEL is **$ 3.1143** per gallon. Where any of the following are included as pay items in the contract, they will be eligible for fuel price adjustment.

The pay items and the fuel factor used in calculating adjustments to be made will be as follows:

Description	Units	Fuel Usage Factor Diesel
Unclassified Excavation	Gal/CY	0.29
Borrow Excavation	Gal/CY	0.29
Class IV Subgrade Stabilization	Gal/Ton	0.55
Aggregate Base Course	Gal/Ton	0.55
Sub-Ballast	Gal/Ton	0.55
Asphalt Concrete Base Course, Type ____	Gal/Ton	2.90
Asphalt Concrete Intermediate Course, Type ____	Gal/Ton	2.90
Asphalt Concrete Surface Course, Type ____	Gal/Ton	2.90
Open-Graded Asphalt Friction Course	Gal/Ton	2.90
Permeable Asphalt Drainage Course, Type ____	Gal/Ton	2.90
Sand Asphalt Surface Course, Type ____	Gal/Ton	2.90

Aggregate for Cement Treated Base Course	Gal/Ton	0.55
Portland Cement for Cement Treated Base Course	Gal/Ton	0.55
__" Portland Cement Concrete Pavement	Gal/SY	0.245
Concrete Shoulders Adjacent to __" Pavement	Gal/SY	0.245

PAYOUT SCHEDULE:
(1-19-10) (Rev. 1-17-12) 108 SP1 G57

Submit an Anticipated Monthly Payout Schedule prior to beginning construction. The Anticipated Monthly Payout Schedule will be used by the Department to monitor funding levels for this project. Include a monthly percentage breakdown (in terms of the total contract amount) of the work anticipated to be completed. The schedule should begin with the date the Contractor plans to begin construction and end with the anticipated completion date. Submit updates of the Anticipated Monthly Payout Schedule on March 15, June 15, September 15, and December 15 of each calendar year until project acceptance. Submit the original Anticipated Monthly Payout Schedule and all subsequent updates to the Resident Engineer with a copy to the State Construction Engineer at 1 South Wilmington Street, 1543 Mail Service Center, Raleigh, NC 27699-1543.

SCHEDULE OF ESTIMATED COMPLETION PROGRESS:
(7-15-08) (Rev. 5-20-14) 108-2 SP1 G58

The Contractor's attention is directed to the Standard Special Provision entitled *Availability of Funds Termination of Contracts* included elsewhere in this proposal. The Department of Transportation's schedule of estimated completion progress for this project as required by that Standard Special Provision is as follows:

	Fiscal Year	Progress (% of Dollar Value)
2015	(7/01/14 - 6/30/15)	33% of Total Amount Bid
2016	(7/01/15- 6/30/16)	30% of Total Amount Bid
2017	(7/01/16 - 6/30/17)	23% of Total Amount Bid
2018	(7/01/17 - 6/30/18)	14% of Total Amount Bid

The Contractor shall also furnish his own progress schedule in accordance with Article 108-2 of the *2012 Standard Specifications*. Any acceleration of the progress as shown by the Contractor's progress schedule over the progress as shown above shall be subject to the approval of the Engineer.

MINORITY BUSINESS ENTERPRISE AND WOMEN BUSINESS ENTERPRISE:
(10-16-07)(Rev. 12-17-13) 102-15(J) SP1 G66

Description

The purpose of this Special Provision is to carry out the North Carolina Department of Transportation's policy of ensuring nondiscrimination in the award and administration of contracts financed in whole or in part with State funds.

Definitions

Additional MBE/WBE Subcontractors - Any MBE/WBE submitted at the time of bid that will not be used to meet either the MBE or WBE goal. No submittal of a Letter of Intent is required, unless the additional participation is used for banking purposes.

Committed MBE/WBE Subcontractor - Any MBE/WBE submitted at the time of bid that is being used to meet either the MBE or WBE goal by submission of a Letter of Intent. Or any MBE or WBE used as a replacement for a previously committed MBE or WBE firm.

Contract Goals Requirement - The approved MBE and WBE participation at time of award, but not greater than the advertised contract goals for each.

Goal Confirmation Letter - Written documentation from the Department to the bidder confirming the Contractor's approved, committed MBE and WBE participation along with a listing of the committed MBE and WBE firms.

Manufacturer - A firm that operates or maintains a factory or establishment that produces on the premises, the materials or supplies obtained by the Contractor.

MBE Goal - A portion of the total contract, expressed as a percentage, that is to be performed by committed MBE subcontractor(s).

Minority Business Enterprise (MBE) - A firm certified as a Disadvantaged Minority-Owned Business Enterprise through the North Carolina Unified Certification Program.

Regular Dealer - A firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials or supplies required for the performance of the contract are bought, kept in stock, and regularly sold to the public in the usual course of business. A regular dealer engages in, as its principal business and in its own name, the purchase and sale or lease of the products in question. A regular dealer in such bulk items as steel, cement, gravel, stone, and petroleum products need not keep such products in stock, if it owns and operates distribution equipment for the products. Brokers and packagers are not regarded as manufacturers or regular dealers within the meaning of this section.

North Carolina Unified Certification Program (NCUCP) - A program that provides comprehensive services and information to applicants for MBE/WBE certification. The MBE/WBE program follows the same regulations as the federal Disadvantaged Business Enterprise (DBE) program in accordance with 49 CFR Part 26.

United States Department of Transportation (USDOT) - Federal agency responsible for issuing regulations (49 CFR Part 26) and official guidance for the DBE program.

WBE Goal - A portion of the total contract, expressed as a percentage, that is to be performed by committed WBE subcontractor(s).

Women Business Enterprise (WBE) - A firm certified as a Disadvantaged Women-Owned Business Enterprise through the North Carolina Unified Certification Program.

Forms and Websites Referenced in this Provision

Payment Tracking System - On-line system in which the Contractor enters the payments made to MBE and WBE subcontractors who have performed work on the project. https://apps.dot.state.nc.us/Vendor/PaymentTracking/

DBE-IS *Subcontractor Payment Information* - Form for reporting the payments made to all MBE/WBE firms working on the project. This form is for paper bid projects only. http://www.ncdot.org/doh/forms/files/DBE-IS.xls

RF-1 *MBE/WBE Replacement Request Form* - Form for replacing a committed MBE or WBE. http://connect.ncdot.gov/projects/construction/Construction%20Forms/DBE%20MBE%20WBE%20Replacement%20Request%20Form.pdf

SAF *Subcontract Approval Form* - Form required for approval to sublet the contract. http://connect.ncdot.gov/projects/construction/Construction%20Forms/Subcontract%20Approval%20Form%20Rev.%202012.zip

JC-1 *Joint Check Notification Form* - Form and procedures for joint check notification. The form acts as a written joint check agreement among the parties providing full and prompt disclosure of the expected use of joint checks. http://connect.ncdot.gov/projects/construction/Construction%20Forms/Joint%20Check%20Notification%20Form.pdf

Letter of Intent - Form signed by the Contractor and the MBE/WBE subcontractor, manufacturer or regular dealer that affirms that a portion of said contract is going to be performed by the signed MBE/WBE for the amount listed at the time of bid. http://connect.ncdot.gov/letting/LetCentral/Letter%20of%20Intent%20to%20Perform%20as%20a%20Subcontractor.pdf

Listing of MBE and WBE Subcontractors Form - Form for entering MBE/WBE subcontractors on a project that will meet this MBE and WBE goals. This form is for paper bids only. http://connect.ncdot.gov/municipalities/Bid%20Proposals%20for%20LGA%20Content/09%20MBE-WBE%20Subcontractors%20(State).doc

Subcontractor Quote Comparison Sheet - Spreadsheet for showing all subcontractor quotes in the work areas where MBEs and WBEs quoted on the project. This sheet is submitted with good faith effort packages. http://connect.ncdot.gov/business/SmallBusiness/Documents/DBE%20Subcontractor%20Quote%20Comparison%20Example.xls

MBE and WBE Goal

The following goals for participation by Minority Business Enterprises and Women Business Enterprises are established for this contract:

(A) Minority Business Enterprises **5.0%**

(1) *If the MBE goal is more than zero*, the Contractor shall exercise all necessary and reasonable steps to ensure that MBEs participate in at least the percent of the contract as set forth above as the MBE goal.

(2) *If the MBE goal is zero*, the Contractor shall make an effort to recruit and use MBEs during the performance of the contract. Any MBE participation obtained shall be reported to the Department.

(B) Women Business Enterprises **7.0%**

(1) *If the WBE goal is more than zero*, the Contractor shall exercise all necessary and reasonable steps to ensure that WBEs participate in at least the percent of the contract as set forth above as the WBE goal.

(2) *If the WBE goal is zero*, the Contractor shall make an effort to recruit and use WBEs during the performance of the contract. Any WBE participation obtained shall be reported to the Department.

Directory of Transportation Firms (Directory)

Real-time information is available about firms doing business with the Department and firms that are certified through NCUCP in the Directory of Transportation Firms. Only firms identified in the Directory as MBE and WBE certified shall be used to meet the MBE and WBE goals respectively. The Directory can be found at the following link. https://partner.ncdot.gov/VendorDirectory/default.html

The listing of an individual firm in the directory shall not be construed as an endorsement of the firm's capability to perform certain work.

Listing of MBE/WBE Subcontractors

At the time of bid, bidders shall submit <u>all</u> MBE and WBE participation that they anticipate to use during the life of the contract. Only those identified to meet the MBE goal and the WBE goal will be considered committed, even though the listing shall include both committed MBE/WBE subcontractors and additional MBE/WBE subcontractors. Any additional MBE/WBE subcontractor participation above the goal for which letters of intent are received will follow the banking guidelines found elsewhere in this provision. All other additional MBE/WBE subcontractor participation submitted at the time of bid will be used toward the Department's overall race-neutral goals. Only those firms with current MBE and

WBE certification at the time of bid opening will be acceptable for listing in the bidder's submittal of MBE and WBE participation. The Contractor shall indicate the following required information:

(A) Electronic Bids

Bidders shall submit a listing of MBE and WBE participation in the appropriate section of Expedite, the bidding software of Bid Express®.

(1) Submit the names and addresses of MBE and WBE firms identified to participate in the contract. If the bidder uses the updated listing of MBE and WBE firms shown in Expedite, the bidder may use the dropdown menu to access the name and address of the firms.

(2) Submit the contract line numbers of work to be performed by each MBE and WBE firm. When no figures or firms are entered, the bidder will be considered to have no MBE or WBE participation.

(3) The bidder shall be responsible for ensuring that the MBE and WBE are certified at the time of bid by checking the Directory of Transportation Firms. If the firm is not certified at the time of the bid-letting, that MBE's or WBE's participation will not count towards achieving either the MBE or WBE goal.

(B) Paper Bids

(1) *If either the MBE or WBE goal is more than zero,*

(a) Bidders, at the time the bid proposal is submitted, shall submit a listing of MBE/WBE participation, including the names and addresses on *Listing of MBE and WBE Subcontractors* contained elsewhere in the contract documents in order for the bid to be considered responsive. Bidders shall indicate the total dollar value of the MBE and WBE participation for the contract.

(b) If bidders have no MBE or WBE participation, they shall indicate this on the *Listing of MBE and WBE Subcontractors* by entering the word "None" or the number "0." This form shall be completed in its entirety. **Blank forms will not be deemed to represent zero participation.** Bids submitted that do not have MBE and WBE participation indicated on the appropriate form will not be read publicly during the opening of bids. The Department will not consider these bids for award and the proposal will be rejected.

(c) The bidder shall be responsible for ensuring that the MBE/WBE is certified at the time of bid by checking the Directory of Transportation Firms. If the firm is not certified at the time of the bid-letting, that MBE's or WBE's participation will not count towards achieving the corresponding goal.

(2) *If either the MBE or WBE goal is zero,* entries on the *Listing of MBE and WBE Subcontractors* are not required for the zero goal, however any MBE or WBE participation that is achieved during the project shall be reported in accordance with requirements contained elsewhere in the special provision.

MBE or WBE Prime Contractor

When a certified MBE or WBE firm bids on a contract that contains MBE and WBE goals, the firm is responsible for meeting the goals or making good faith efforts to meet the goals, just like any other bidder. In most cases, a MBE or WBE bidder on a contract will meet one of the goals by virtue of the work it performs on the contract with its own forces. However, all the work that is performed by the MBE or WBE bidder and any other similarly certified subcontractors will count toward the goal. The MBE or WBE bidder shall list itself along with any MBE or WBE subcontractors, if any, in order to receive credit toward the goals.

For example, on a proposed contract, the WBE goal is 10%, and the MBE goal is 8%. A WBE bidder puts in a bid where they will perform 40% of the contract work and have a WBE subcontractor which will perform another 5% of the work. Together the two WBE firms submit on the *Listing of MBE and WBE Subcontractors* a value of 45% of the contract which fulfills the WBE goal. The 8% MBE goal shall be obtained through MBE participation with MBE certified subcontractors or documented through a good faith effort. It should be noted that you cannot combine the two goals to meet an overall value. The two goals shall remain separate.

MBE/WBE prime contractors shall also follow Sections A and B listed under *Listing of MBE and WBE Subcontractor* just as a non-MBE/WBE bidder would.

Written Documentation – Letter of Intent

The bidder shall submit written documentation for each MBE/WBE that will be used to meet the MBE and WBE goals of the contract, indicating the bidder's commitment to use the MBE/WBE in the contract. This documentation shall be submitted on the Department's form titled *Letter of Intent.*

The documentation shall be received in the office of the State Contractor Utilization Engineer or at DBE@ncdot.gov no later than 12:00 noon of the sixth calendar day following opening of bids, unless the sixth day falls on an official state holiday. In that situation, it is due in the office of the State Contractor Utilization Engineer no later than 12:00 noon on the next official state business day.

If the bidder fails to submit the Letter of Intent from each committed MBE and WBE to be used toward the MBE and WBE goals, or if the form is incomplete (i.e. both signatures are not present), the MBE/WBE participation will not count toward meeting the MBE/WBE goal. If the lack of this participation drops the commitment below either the MBE or WBE goal, the Contractor shall submit evidence of good faith efforts for the goal not met, completed in its entirety, to the State Contractor Utilization Engineer or DBE@ncdot.gov no later than 12:00 noon on the eighth calendar day following opening of bids, unless the eighth day falls on an official state holiday. In that situation, it is due in the office of the State Contractor Utilization Engineer no later than 12:00 noon on the next official state business day.

Submission of Good Faith Effort

If the bidder fails to meet or exceed either the MBE or the WBE goal, the apparent lowest responsive bidder shall submit to the Department documentation of adequate good faith efforts made to reach that specific goal(s).

A hard copy and an electronic copy of this information shall be received in the office of the State Contractor Utilization Engineer or at DBE@ncdot.gov no later than 12:00 noon of the sixth calendar day following opening of bids unless the sixth day falls on an official state holiday. In that situation, it would be due in the office of the State Contractor Utilization Engineer the next official state business day. If the contractor cannot send the information electronically, then one complete set and 9 copies of this information shall be received under the same time constraints above.

Note: Where the information submitted includes repetitious solicitation letters, it will be acceptable to submit a representative letter along with a distribution list of the firms that were solicited. Documentation of MBE/WBE quotations shall be a part of the good faith effort submittal. This documentation may include written subcontractor quotations, telephone log notations of verbal quotations, or other types of quotation documentation.

Consideration of Good Faith Effort for Projects with MBE/WBE Goals More Than Zero

Adequate good faith efforts mean that the bidder took all necessary and reasonable steps to achieve the goal which, by their scope, intensity, and appropriateness, could reasonably be expected to obtain sufficient MBE/WBE participation. Adequate good faith efforts also mean that the bidder actively and aggressively sought MBE/WBE participation. Mere *pro forma* efforts are not considered good faith efforts.

The Department will consider the quality, quantity, and intensity of the different kinds of efforts a bidder has made. Listed below are examples of the types of actions a bidder will take in making a good faith effort to meet the goals and are not intended to be exclusive or exhaustive, nor is it intended to be a mandatory checklist.

(A) Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising, written notices, use of verifiable electronic means through the use of the NCDOT Directory of Transportation Firms) the interest of all certified MBEs/WBEs who have the capability to perform the work of the contract. The bidder must solicit this interest within at least 10 days prior to bid opening to allow the MBEs/WBEs to respond to the solicitation. Solicitation shall provide the opportunity to MBEs/WBEs within the Division and surrounding Divisions where the project is located. The bidder must determine with certainty if the MBEs/WBEs are interested by taking appropriate steps to follow up initial solicitations.

(B) Selecting portions of the work to be performed by MBEs/WBEs in order to increase the likelihood that the MBE and WBE goals will be achieved.

(1) Where appropriate, break out contract work items into economically feasible units to facilitate MBE/WBE participation, even when the prime contractor might otherwise prefer to perform these work items with its own forces.

(2) Negotiate with subcontractors to assume part of the responsibility to meet the contract MBE/WBE goals when the work to be sublet includes potential for MBE/WBE participation (2nd and 3rd tier subcontractors).

(C) Providing interested MBEs/WBEs with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.

(D) (1) Negotiating in good faith with interested MBEs/WBEs. It is the bidder's responsibility to make a portion of the work available to MBE/WBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available MBE/WBE subcontractors and suppliers, so as to facilitate MBE/WBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of MBEs/WBEs that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for MBEs/WBEs to perform the work.

(2) A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including MBE/WBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using MBEs/WBEs is not in itself sufficient reason for a bidder's failure to meet the contract MBE or WBE goals, as long as such costs are reasonable. Also, the ability or desire of a prime contractor to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Bidding contractors are not, however, required to accept higher quotes from MBEs/WBEs if the price difference is excessive or unreasonable.

(E) Not rejecting MBEs/WBEs as being unqualified without sound reasons based on a thorough investigation of their capabilities. The bidder's standing within its industry, membership in specific groups, organizations, or associates and political or social affiliations (for example, union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the bidder's efforts to meet the project goal.

(F) Making efforts to assist interested MBEs/WBEs in obtaining bonding, lines of credit, or insurance as required by the recipient or bidder.

(G) Making efforts to assist interested MBEs/WBEs in obtaining necessary equipment, supplies, materials, or related assistance or services.

(H) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; Federal, State, and local minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of MBEs/WBEs. Contact within 7 days from the bid opening the Business Development Manager in the Business Opportunity and Work Force Development Unit to give notification of the bidder's inability to get MBE or WBE quotes.

(I) Any other evidence that the bidder submits which shows that the bidder has made reasonable good faith efforts to meet the MBE and WBE goal.

In addition, the Department may take into account the following:

(1) Whether the bidder's documentation reflects a clear and realistic plan for achieving the MBE and WBE goals.

(2) The bidders' past performance in meeting the MBE and WBE goals.

(3) The performance of other bidders in meeting the MBE and WBE goals. For example, when the apparent successful bidder fails to meet the goals, but others meet it, you may reasonably raise the question of whether, with additional reasonable efforts the apparent successful bidder could have met the goals. If the apparent successful bidder fails to meet the MBE and WBE goals, but meets or exceeds the average MBE and WBE participation obtained by other bidders, the Department may view this, in conjunction with other factors, as evidence of the apparent successful bidder having made a good faith effort.

If the Department does not award the contract to the apparent lowest responsive bidder, the Department reserves the right to award the contract to the next lowest responsive bidder that can satisfy to the Department that the MBE and WBE goals can be met or that an adequate good faith effort has been made to meet the MBE and WBE goals.

Non-Good Faith Appeal

The State Contractor Utilization Engineer will notify the contractor verbally and in writing of non-good faith. A contractor may appeal a determination of non-good faith made by the Goal Compliance Committee. If a contractor wishes to appeal the determination made by the Committee, they shall provide written notification to the State Contractual Services Engineer or at DBE@ncdot.gov. The appeal shall be made within 2 business days of notification of the determination of non-good faith.

Counting MBE/WBE Participation Toward Meeting MBE/WBE Goals

(A) Participation

The total dollar value of the participation by a committed MBE/WBE will be counted toward the contract goal requirements. The total dollar value of participation by a committed MBE/WBE will be based upon the value of work actually performed by the MBE/WBE and the actual payments to MBE/WBE firms by the Contractor.

(B) Joint Checks

Prior notification of joint check use shall be required when counting MBE/WBE participation for services or purchases that involves the use of a joint check. Notification shall be through submission of Form JC-1 *(Joint Check Notification Form)* and the use of joint checks shall be in accordance with the Department's Joint Check Procedures.

(C) Subcontracts (Non-Trucking)

A MBE/WBE may enter into subcontracts. Work that a MBE subcontracts to another MBE firm may be counted toward the MBE contract goal requirement. The same holds for work that a WBE subcontracts to another WBE firm. Work that a MBE subcontracts to a non-MBE firm does <u>not</u> count toward the MBE contract goal requirement. Again, the same holds true for the work that a WBE subcontracts to a non-WBE firm. If a MBE or WBE contractor or subcontractor subcontracts a significantly greater portion of the work of the contract than would be expected on the basis of standard industry practices, it shall be presumed that the MBE or WBE is not performing a commercially useful function. The MBE/WBE may present evidence to rebut this presumption to the Department. The Department's decision on the rebuttal of this presumption may be subject to review by the Office of Inspector General, NCDOT.

(D) Joint Venture

When a MBE or WBE performs as a participant in a joint venture, the Contractor may count toward its contract goal requirement a portion of the total value of participation with the MBE or WBE in the joint venture, that portion of the total dollar value being a distinct clearly defined portion of work that the MBE or WBE performs with its forces.

(E) Suppliers

A contractor may count toward its MBE or WBE requirement 60 percent of its expenditures for materials and supplies required to complete the contract and obtained from a MBE or WBE regular dealer and 100 percent of such expenditures from a MBE or WBE manufacturer.

(F) Manufacturers and Regular Dealers

A contractor may count toward its MBE or WBE requirement the following expenditures to MBE/WBE firms that are not manufacturers or regular dealers:

(1) The fees or commissions charged by a MBE/WBE firm for providing a *bona fide* service, such as professional, technical, consultant, or managerial services, or for providing bonds or insurance specifically required for the performance of a DOT-assisted contract, provided the fees or commissions are determined to be reasonable and not excessive as compared with fees and commissions customarily allowed for similar services.

(2) With respect to materials or supplies purchased from a MBE/WBE, which is neither a manufacturer nor a regular dealer, count the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site (but not the cost of the materials and supplies themselves), provided the fees are determined to be reasonable and not excessive as compared with fees customarily allowed for similar services.

Commercially Useful Function

(A) MBE/WBE Utilization

The Contractor may count toward its contract goal requirement only expenditures to MBEs and WBEs that perform a commercially useful function in the work of a contract. A MBE/WBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. To perform a commercially useful function, the MBE/WBE shall also be responsible with respect to materials and supplies used on the contract, for negotiating price, determining quality and quantity, ordering the material and installing (where applicable) and paying for the material itself. To determine whether a MBE/WBE is performing a commercially useful function, the Department will evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the contract is commensurate with the work it is actually performing and the MBE/WBE credit claimed for its performance of the work, and any other relevant factors.

(B) MBE/WBE Utilization in Trucking

The following factors will be used to determine if a MBE or WBE trucking firm is performing a commercially useful function:

(1) The MBE/WBE shall be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there shall not be a contrived arrangement for the purpose of meeting the MBE or WBE goal.

(2) The MBE/WBE shall itself own and operate at least one fully licensed, insured, and operational truck used on the contract.

(3) The MBE/WBE receives credit for the total value of the transportation services it provides on the contract using trucks it owns, insures, and operates using drivers it employs.

(4) The MBE may subcontract the work to another MBE firm, including an owner-operator who is certified as a MBE. The same holds true that a WBE may subcontract the work to another WBE firm, including an owner-operator who is certified as a WBE. When this occurs, the MBE or WBE who subcontracts work receives credit for the total value of the transportation services the subcontracted MBE or WBE provides on the contract. It should be noted that every effort shall be made by MBE and WBE contractors to subcontract to the same certification (i.e., MBEs to MBEs and WBEs to WBEs), in order to fulfill the goal requirement. This, however, may not always be possible due to the limitation of firms in the area. If the MBE or WBE firm shows a good faith effort has been made to reach out to similarly certified transportation service providers and there is no interest or availability, and they can get assistance from other certified providers, the Engineer will not hold the prime liable for meeting the goal.

(5) The MBE/WBE may also subcontract the work to a non-MBE/WBE firm, including from an owner-operator. The MBE/WBE who subcontracts the work to a non-MBE/WBE is entitled to credit for the total value of transportation services provided by the non-MBE/WBE subcontractor not to exceed the value of transportation services provided by MBE/WBE-owned trucks on the contract. Additional participation by non-MBE/WBE subcontractors receives credit only for the fee or commission it receives as a result of the subcontract arrangement. The value of services performed under subcontract agreements between the MBE/WBE and the Contractor will not count towards the MBE/WBE contract requirement.

(6) A MBE/WBE may lease truck(s) from an established equipment leasing business open to the general public. The lease must indicate that the MBE/WBE has exclusive use of and control over the truck. This requirement does not preclude the leased truck from working for others during the term of the lease with the consent of the MBE/WBE, so long as the lease gives the MBE/WBE absolute priority for use of the leased truck. This type of lease may count toward the MBE/WBE's credit as long as the driver is under the MBE/WBE's payroll.

(7) Subcontracted/leased trucks shall display clearly on the dashboard the name of the MBE/WBE that they are subcontracted/leased to and their own company name if it is not identified on the truck itself. Magnetic door signs are not permitted.

Banking MBE/WBE Credit

If the bid of the lowest responsive bidder exceeds $500,000 and if the committed MBE/WBE participation submitted by Letter of Intent exceeds the algebraic sum of the MBE or WBE goal by $1,000 or more, the excess will be placed on deposit by the Department for future use by the bidder. Separate accounts will be maintained for MBE and WBE participation and these may accumulate for a period not to exceed 24 months.

When the apparent lowest responsive bidder fails to submit sufficient participation by MBE firms to meet the contract goal, as part of the good faith effort, the Department will consider allowing the bidder to withdraw funds to meet the MBE goal as long as there are adequate funds available from the bidder's MBE bank account.

When the apparent lowest responsive bidder fails to submit sufficient participation by WBE firms to meet the contract goal, as part of the good faith effort, the Department will consider allowing the bidder to withdraw funds to meet the WBE goal as long as there are adequate funds available from the bidder's WBE bank account.

MBE/WBE Replacement

When a Contractor has relied on a commitment to a MBE or WBE firm (or an approved substitute MBE or WBE firm) to meet all or part of a contract goal requirement, the contractor shall not terminate the MBE/WBE for convenience. This includes, but is not limited to, instances in which the Contractor seeks to perform the work of the terminated subcontractor with another MBE/WBE subcontractor, a non-MBE/WBE subcontractor, or with the Contractor's own forces or those of an affiliate. A MBE/WBE may only be terminated after receiving the Engineer's written approval based upon a finding of good cause for the termination.

All requests for replacement of a committed MBE/WBE firm shall be submitted to the Engineer for approval on Form RF-1 *(Replacement Request).* If the Contractor fails to follow this procedure, the Contractor may be disqualified from further bidding for a period of up to 6 months.

The Contractor shall comply with the following for replacement of a committed MBE/WBE:

(A) Performance Related Replacement

When a committed MBE is terminated for good cause as stated above, an additional MBE that was submitted at the time of bid may be used to fulfill the MBE commitment. The same holds true if a committed WBE is terminated for good cause, an additional WBE that was submitted at the time of bid may be used to fulfill the WBE goal. A good faith effort will only be required for removing a committed MBE/WBE if there were no additional MBEs/WBEs submitted at the time of bid to cover the same amount of work as the MBE/WBE that was terminated.

If a replacement MBE/WBE is not found that can perform at least the same amount of work as the terminated MBE/WBE, the Contractor shall submit a good faith effort documenting the steps taken. Such documentation shall include, but not be limited to, the following:

(1) Copies of written notification to MBEs/WBEs that their interest is solicited in contracting the work defaulted by the previous MBE/WBE or in subcontracting other items of work in the contract.

(2) Efforts to negotiate with MBEs/WBEs for specific subbids including, at a minimum:

(a) The names, addresses, and telephone numbers of MBEs/WBEs who were contacted.

(b) A description of the information provided to MBEs/WBEs regarding the plans and specifications for portions of the work to be performed.

(3) A list of reasons why MBE/WBE quotes were not accepted.

(4) Efforts made to assist the MBEs/WBEs contacted, if needed, in obtaining bonding or insurance required by the Contractor.

(B) Decertification Replacement

(1) When a committed MBE/WBE is decertified by the Department after the SAF (*Subcontract Approval Form*) has been received by the Department, the Department will not require the Contractor to solicit replacement MBE/WBE participation equal to the remaining work to be performed by the decertified firm. The participation equal to the remaining work performed by the decertified firm will count toward the contract goal requirement.

(2) When a committed MBE/WBE is decertified prior to the Department receiving the SAF (*Subcontract Approval Form*) for the named MBE/WBE firm, the Contractor shall take all necessary and reasonable steps to replace the MBE/WBE subcontractor with another similarly certified MBE/WBE subcontractor to perform at least the same amount of work to meet the MBE/WBE goal requirement. If a MBE/WBE firm is not found to do the same amount of work, a good faith effort must be submitted to NCDOT (see A herein for required documentation).

Changes in the Work

When the Engineer makes changes that result in the reduction or elimination of work to be performed by a committed MBE/WBE, the Contractor will not be required to seek additional participation. When the Engineer makes changes that result in additional work to be performed by a MBE/WBE based upon the Contractor's commitment, the MBE/WBE shall participate in additional work to the same extent as the MBE/WBE participated in the original contract work.

When the Engineer makes changes that result in extra work, which has more than a minimal impact on the contract amount, the Contractor shall seek additional participation by MBEs/WBEs unless otherwise approved by the Engineer.

When the Engineer makes changes that result in an alteration of plans or details of construction, and a portion or all of the work had been expected to be performed by a committed MBE/WBE, the Contractor shall seek participation by MBEs/WBEs unless otherwise approved by the Engineer.

When the Contractor requests changes in the work that result in the reduction or elimination of work that the Contractor committed to be performed by a MBE/WBE, the Contractor shall seek additional participation by MBEs/WBEs equal to the reduced MBE/WBE participation caused by the changes.

Reports and Documentation

A SAF (*Subcontract Approval Form*) shall be submitted for all work which is to be performed by a MBE/WBE subcontractor. The Department reserves the right to require copies of actual subcontract agreements involving MBE/WBE subcontractors.

When using transportation services to meet the contract commitment, the Contractor shall submit a proposed trucking plan in addition to the SAF. The plan shall be submitted prior to beginning construction on the project. The plan shall include the names of all trucking firms proposed for use, their certification type(s), the number of trucks owned by the firm, as well as the individual truck identification numbers, and the line item(s) being performed.

Within 30 calendar days of entering into an agreement with a MBE/WBE for materials, supplies or services, not otherwise documented by the SAF as specified above, the Contractor shall furnish the Engineer a copy of the agreement. The documentation shall also indicate the percentage (60% or 100%) of expenditures claimed for MBE/WBE credit.

Reporting Minority and Women Business Enterprise Participation

The Contractor shall provide the Engineer with an accounting of payments made to all MBE and WBE firms, including material suppliers and contractors at all levels (prime, subcontractor, or second tier subcontractor). This accounting shall be furnished to the Engineer for any given month by the end of the following month. Failure to submit this information accordingly may result in the following action:

(A) Withholding of money due in the next partial pay estimate; or

(B) Removal of an approved contractor from the prequalified bidders' list or the removal of other entities from the approved subcontractors list.

While each contractor (prime, subcontractor, 2nd tier subcontractor) is responsible for accurate accounting of payments to MBEs/WBEs, it shall be the prime contractor's responsibility to report all monthly and final payment information in the correct reporting manner.

Failure on the part of the Contractor to submit the required information in the time frame specified may result in the disqualification of that contractor and any affiliate companies from further bidding until the required information is submitted.

Failure on the part of any subcontractor to submit the required information in the time frame specified may result in the disqualification of that contractor and any affiliate companies from being approved for work on future DOT projects until the required information is submitted.

Contractors reporting transportation services provided by non-MBE/WBE lessees shall evaluate the value of services provided during the month of the reporting period only.

At any time, the Engineer can request written verification of subcontractor payments.

(A) Electronic Bids Reporting

The Contractor shall report the accounting of payments through the Department's Payment Tracking System.

(B) Paper Bids Reporting

The Contractor shall report the accounting of payments on the Department's DBE-IS *(Subcontractor Payment Information)* with each invoice. Invoices will not be processed for payment until the DBE-IS is received.

Failure to Meet Contract Requirements

Failure to meet contract requirements in accordance with Subarticle 102-15(J) of the *2012 Standard Specifications* may be cause to disqualify the Contractor.

CONTRACTOR'S LICENSE REQUIREMENTS:

(7-1-95) 102-14 SP1 G88

If the successful bidder does not hold the proper license to perform any plumbing, heating, air conditioning, or electrical work in this contract, he will be required to sublet such work to a contractor properly licensed in accordance with *Article 2 of Chapter 87 of the General Statutes* (licensing of heating, plumbing, and air conditioning contractors) and *Article 4 of Chapter 87* of the *General Statutes* (licensing of electrical contractors).

SUBSURFACE INFORMATION:

(7-1-95) 450 SP1 G112 D

Subsurface information is available on the roadway and structure portions of this project.

LOCATING EXISTING UNDERGROUND UTILITIES:
(3-20-12) 105 SP1 G115

Revise the *2012 Standard Specifications* as follows:

Page 1-43, Article 105-8, line 28, after the first sentence, add the following:

Identify excavation locations by means of pre-marking with white paint, flags, or stakes or provide a specific written description of the location in the locate request.

RESOURCE CONSERVATION:
(5-21-13) 104-13 SP1 G118

In accordance with North Carolina Executive Order 156, NCGS 130A-309.14(2), and NCGS 136-28.8, it is the policy of the Department to aid in the reduction of materials that become a part of our solid waste stream, to divert materials from landfills, and to find ways to recycle and reuse materials for the benefit of the Citizens of North Carolina.

Initiate, develop and use products and construction methods that incorporate the use of recycled or solid waste products in accordance with Article 104-13 of the *2012 Standard Specifications*. Report the quantities of reused or recycled materials either incorporated in the project or diverted from landfills on the Project Construction Reuse and Recycling Reporting Form.

A location-based tool for finding local recycling facilities and the Project Construction Reuse and Recycling Reporting Form are available at:

http://connect.ncdot.gov/resources/Environmental/Pages/North-Carolina-Recycling-Locations.aspx

DOMESTIC STEEL:
(4-16-13) 106 SP1 G120

Revise the *2012 Standard Specifications* as follows:

Page 1-49, Subarticle 106-1(B) Domestic Steel, lines 2-7, replace the first paragraph with the following:

All steel and iron products that are permanently incorporated into this project shall be produced in the United States except minimal amounts of foreign steel and iron products may be used provided the combined material cost of the items involved does not exceed 0.1% of the total amount bid for the entire project or $2,500, whichever is greater. If invoices showing the cost of the material are not provided, the amount of the bid item involving the foreign material will be used for calculations. This minimal amount of foreign produced steel and iron products permitted for use is not applicable to high strength fasteners. Domestically produced high strength fasteners are required.

PORTABLE CONCRETE BARRIER - (Partial Payments for Materials):
(7-1-95) (Rev. 8-16-11) 1170-4 SP1 G121

When so authorized by the Engineer, partial materials payments will be made up to 95 percent of the delivered cost of portable concrete barrier, provided that these materials have been delivered on the project and stored in an acceptable manner, and further provided the documents listed in Subarticle 109-5(C) of the *2012 Standard Specifications* have been furnished to the Engineer.

The provisions of Subarticle 109-5(B) of the *2012 Standard Specifications* will apply to the portable concrete barrier.

REMOVABLE PAVEMENT MARKINGS - (Partial Payments for Materials):
(7-1-95) (Rev. 8-16-11) 1205-10 SP1 G124

When so authorized by the Engineer, partial materials payments will be made up to 95 percent of the delivered cost of pavement marking tape, provided that these materials have been delivered on or in the vicinity of the project, stored in an acceptable manner, not to exceed the shelf life recommended by the manufacturer, and further provided the documents listed in Subarticle 109-5(C) of the *2012 Standard Specifications* have been furnished to the Engineer.

The Contractor shall be responsible for the material and the satisfactory performance of the material when used in the work.

The provisions of Article 109-6 of the *2012 Standard Specifications* will not apply to removable pavement marking materials.

MAINTENANCE OF THE PROJECT:
(11-20-07) (Rev. 1-17-12) 104-10 SP1 G125

Revise the *2012 Standard Specifications* as follows:

Page 1-35, Article 104-10 Maintenance of the Project, line 25, add the following after the first sentence of the first paragraph:

All guardrail/guiderail within the project limits shall be included in this maintenance.

Page 1-35, Article 104-10 Maintenance of the Project, line 30, add the following as the last sentence of the first paragraph:

The Contractor shall perform weekly inspections of guardrail and guiderail and shall report damages to the Engineer on the same day of the weekly inspection. *Where damaged guardrail or guiderail is repaired or replaced as a result of maintaining the project in* accordance with this article, such repair or replacement shall be performed within 7 consecutive calendar days of such inspection report.

Page 1-35, Article 104-10 Maintenance of the Project, lines 42-44, replace the last sentence of the last paragraph with the following:

The Contractor will not be directly compensated for any maintenance operations necessary, except for maintenance of guardrail/guiderail, as this work will be considered incidental to the work covered by the various contract items. The provisions of Article 104-7, Extra Work, and Article 104-8, Compensation and Record Keeping will apply to authorized maintenance of guardrail/guiderail. Performance of weekly inspections of guardrail/guiderail, and the damage reports required as described above, will be considered to be an incidental part of the work being paid for by the various contract items.

COOPERATION BETWEEN CONTRACTORS:

(7-1-95) 105-7 SP1 G133

The Contractor's attention is directed to Article 105-7 of the *2012 Standard Specifications*.

B-4758, Guilford County located in the vicinity of this project is scheduled to be under construction during the contract time of this project. Refer to TMP-1D, Local Notes LN-21 for coordinating with the Contractor for B-4758.

The Contractor on this project shall cooperate with the Contractor working within or adjacent to the limits of this project to the extent that the work can be carried out to the best advantage of all concerned.

BID DOCUMENTATION:

(1-1-02) (Rev. 9-18-12) 103 SP1 G142

General

The successful Bidder (Contractor) shall submit the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation used to prepare the bid for this contract to the Department within 10 days after receipt of notice of award of contract. Such documentation shall be placed in escrow with a banking institution or other bonded document storage facility selected by the Department.

The Department will not execute the contract until the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation has been received by the Department.

Terms

Bid Documentation - Bid Documentation shall mean all written information, working papers, computer printouts, electronic media, charts, and all other data compilations which contain or reflect information, data, and calculations used by the Bidder in the preparation of the bid. The term *bid documentation* includes, but is not limited to, contractor equipment rates, contractor overhead rates, labor rates, efficiency or productivity factors, arithmetical calculations, and quotations from subcontractors and material suppliers to the extent that such rates and quotations were used by the Bidder in formulating and determining the bid. The term *bid documentation* also includes any manuals, which are standard to the industry used by the Bidder in determining the bid. Such manuals may be included in the bid documentation by reference. Such reference shall include the name and date of the publication and the publisher. *Bid Documentation* does not include bid documents provided by the Department for use by the Bidder in bidding on this project.

Contractor's Representative - Officer of the Contractor's company; if not an officer, the Contractor shall supply a letter signed and notarized by an officer of the Contractor's company, granting permission for the representative to sign the escrow agreement on behalf of the Contractor.

Escrow Agent - Officer of the select banking institution or other bonded document storage facility authorized to receive and release bid documentation.

Escrow Agreement Information

A copy of the Escrow Agreement will be mailed to the Bidder with the notice of award for informational purposes. The Bidder and Department will sign the actual Escrow Agreement at the time the bid documentation is delivered to the escrow agent.

Failure to Provide Bid Documentation

The Bidder's failure to provide the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation within 10 days after the notice of award is received by him may be just cause for rescinding the award of the contract and may result in the removal of the Bidder from the Department's list of qualified bidders for a period of up to 180 days. Award may then be made to the next lowest responsible bidder or the work may be readvertised and constructed under the contract or otherwise, as the Department may decide.

Submittal of Bid Documentation

(A) Appointment – Email specs@ncdot.gov or call 919.707.6900 to schedule an appointment.

(B) Delivery - A representative of the Bidder shall deliver the original, unaltered bid documentation or a certified copy of the original, unaltered bid documentation to the Department, in a container suitable for sealing, within 10 days after the notice of award is received by him. Bid documentation will be considered a certified copy if the Bidder includes a letter to the Department from a chief officer of the company stating that the enclosed documentation is an *EXACT* copy of the original documentation. The letter shall be signed by a chief officer of the company, have the person's name and title typed below the signature, and the signature shall be notarized at the bottom of the letter.

(C) Packaging – The container shall be no larger than 15.5 inches in length by 12 inches wide by 11 inches high and shall be water resistant. The container shall be clearly marked on the face and the back of the container with the following information: Bid Documentation, Bidder's Name, Bidder's Address, Date of Escrow Submittal, Contract Number, TIP Number if applicable, and County.

Affidavit

In addition to the bid documentation, an affidavit signed under oath by an individual authorized by the Bidder to execute the bid shall be included. The affidavit shall list each bid document with sufficient specificity so a comparison may be made between the list and the bid documentation to ensure that all of the bid documentation listed in the affidavit has been enclosed. The affidavit shall attest that the affiant has personally examined the bid

documentation, that the affidavit lists all of the documents used by the Bidder to determine the bid for this project, and that all such bid documentation has been included.

Verification

Upon delivery of the bid documentation, the Department's Contract Officer and the Bidder's representative will verify the accuracy and completeness of the bid documentation compared to the affidavit. Should a discrepancy exist, the Bidder's representative shall immediately furnish the Department's Contract Officer with any other needed bid documentation. The Department's Contract Officer upon determining that the bid documentation is complete will, in the presence of the Bidder's representative, immediately place the complete bid documentation and affidavit in the container and seal it. Both parties will deliver the sealed container to the escrow agent for placement in a safety deposit box, vault, or other secure accommodation.

Confidentiality of Bid Documentation

The bid documentation and affidavit in escrow are, and will remain, the property of the Bidder. The Department has no interest in, or right to, the bid documentation and affidavit other than to verify the contents and legibility of the bid documentation unless the Contractor gives written notice of intent to file a claim, files a written claim, files a written and verified claim, or initiates litigation against the Department. In the event of such written notice of intent to file a claim, filing of a written claim, filing a written and verified claim, or initiation of litigation against the Department, or receipt of a letter from the Contractor authorizing release, the bid documentation and affidavit may become the property of the Department for use in considering any claim or in litigation as the Department may deem appropriate.

Any portion or portions of the bid documentation designated by the Bidder as a *trade secret* at the time the bid documentation is delivered to the Department's Contract Officer shall be protected from disclosure as provided by *G.S. 132-1.2*.

Duration and Use

The bid documentation and affidavit shall remain in escrow until 60 calendar days from the time the Contractor receives the final estimate; or until such time as the Contractor:

(A) Gives written notice of intent to file a claim,
(B) Files a written claim,
(C) Files a written and verified claim,
(D) Initiates litigation against the Department related to the contract; or
(E) Authorizes in writing its release.

Upon the giving of written notice of intent to file a claim, filing a written claim, filing a written and verified claim, or the initiation of litigation by the Contractor against the Department, or receipt of a letter from the Contractor authorizing release, the Department may obtain the release and custody of the bid documentation.

The Bidder certifies and agrees that the sealed container placed in escrow contains all of the bid documentation used to determine the bid and that no other bid documentation shall be relevant or material in litigation over claims brought by the Contractor arising out of this contract.

Release of Bid Documentation to the Contractor

If the bid documentation remains in escrow 60 calendar days after the time the Contractor receives the final estimate and the Contractor has not filed a written claim, filed a written and verified claim, or has not initiated litigation against the Department related to the contract, the Department will instruct the escrow agent to release the sealed container to the Contractor.

The Contractor will be notified by certified letter from the escrow agent that the bid documentation will be released to the Contractor. The Contractor or his representative shall retrieve the bid documentation from the escrow agent within 30 days of the receipt of the certified letter. If the Contractor does not receive the documents within 30 days of the receipt of the certified letter, the Department will contact the Contractor to determine final dispersion of the bid documentation.

Payment

The cost of the escrow will be borne by the Department. There will be no separate payment for all costs of compilation of the data, container, or verification of the bid documentation. Payment at the various contract unit or lump sum prices in the contract will be full compensation for all such costs.

TWELVE MONTH GUARANTEE:

(7-15-03) 108 SP1 G145

(A) The Contractor shall guarantee materials and workmanship against latent and patent defects arising from faulty materials, faulty workmanship or negligence for a period of twelve months following the date of final acceptance of the work for maintenance and shall replace such defective materials and workmanship without cost to the Department. The Contractor will not be responsible for damage due to faulty design, normal wear and tear, for negligence on the part of the Department, and/or for use in excess of the design.

(B) Where items of equipment or material carry a manufacturer's guarantee for any period in excess of twelve months, then the manufacturer's guarantee shall apply for that particular piece of equipment or material. The Department's first remedy shall be through the manufacturer although the Contractor is responsible for invoking the warranted repair work with the manufacturer. The Contractor's responsibility shall be limited to the term of the manufacturer's guarantee. NCDOT would be afforded the same warranty as provided by the Manufacturer.

This guarantee provision shall be invoked only for major components of work in which the Contractor would be wholly responsible for under the terms of the contract. Examples would include pavement structures, bridge components, and sign structures. This provision will not be used as a mechanism to force the Contractor to return to the project to make repairs or perform additional work that the Department would normally compensate the Contractor for. In addition, routine maintenance activities (i.e. mowing grass, debris removal, ruts in earth shoulders,) are not parts of this guarantee.

Appropriate provisions of the payment and/or performance bonds shall cover this guarantee for the project.

To ensure uniform application statewide the Division Engineer will forward details regarding the circumstances surrounding any proposed guarantee repairs to the Chief Engineer for review and approval prior to the work being performed.

OUTSOURCING OUTSIDE THE USA:

(9-21-04) (Rev. 5-16-06) SP1 G150

All work on consultant contracts, services contracts, and construction contracts shall be performed in the United States of America. No work shall be outsourced outside of the United States of America.

Outsourcing for the purpose of this provision is defined as the practice of subcontracting labor, work, services, staffing, or personnel to entities located outside of the United States.

The North Carolina Secretary of Transportation shall approve exceptions to this provision in writing.

GIFTS FROM VENDORS AND CONTRACTORS:

(12-15-09) 107-1 SP1 G152

By Executive Order 24, issued by Governor Perdue, and *N.C.G.S.§ 133-32,* it is unlawful for any vendor or contractor (i.e. architect, bidder, contractor, construction manager, design professional, engineer, landlord, offeror, seller, subcontractor, supplier, or vendor), to make gifts or to give favors to any State employee of the Governor's Cabinet Agencies (i.e. Administration, Commerce, Correction, Crime Control and Public Safety, Cultural Resources, Environment and Natural Resources, Health and Human Services, Juvenile Justice and Delinquency Prevention, Revenue, Transportation, and the Office of the Governor). This prohibition covers those vendors and contractors who:

(A) Have a contract with a governmental agency; or
(B) Have performed under such a contract within the past year; or
(C) Anticipate bidding on such a contract in the future.

For additional information regarding the specific requirements and exemptions, vendors and contractors are encouraged to review Executive Order 24 and *N.C.G.S. § 133-32.*

Executive Order 24 also encouraged and invited other State Agencies to implement the requirements and prohibitions of the Executive Order to their agencies. Vendors and contractors should contact other State Agencies to determine if those agencies have adopted Executive Order 24.

EROSION AND SEDIMENT CONTROL/STORMWATER CERTIFICATION:

(1-16-07) (Rev 9-18-12) 105-16, 225-2, 16 SP1 G180

General

Schedule and conduct construction activities in a manner that will minimize soil erosion and the resulting sedimentation and turbidity of surface waters. Comply with the requirements herein regardless of whether or not a National Pollution discharge Elimination System (NPDES) permit for the work is required.

Establish a chain of responsibility for operations and subcontractors' operations to ensure that the *Erosion and Sediment Control/Stormwater Pollution Prevention Plan* is implemented and maintained over the life of the contract.

(A) *Certified Supervisor* - Provide a certified Erosion and Sediment Control/Stormwater Supervisor to manage the Contractor and subcontractor operations, insure compliance with Federal, State and Local ordinances and regulations, and manage the Quality Control Program.

(B) *Certified Foreman* - Provide a certified, trained foreman for each construction operation that increases the potential for soil erosion or the possible sedimentation and turbidity of surface waters.

(C) *Certified Installer* - Provide a certified installer to install or direct the installation for erosion or sediment/stormwater control practices.

(D) *Certified Designer* - Provide a certified designer for the design of the erosion and sediment control/stormwater component of reclamation plans and, if applicable, for the design of the project erosion and sediment control/stormwater plan.

Roles and Responsibilities

(A) *Certified Erosion and Sediment Control/Stormwater Supervisor* - The Certified Supervisor shall be Level II and responsible for ensuring the erosion and sediment control/stormwater plan is adequately implemented and maintained on the project and for conducting the quality control program. The Certified Supervisor shall be on the project within 24 hours notice from initial exposure of an erodible surface to the project's final acceptance. Perform the following duties:

(1) Manage Operations - Coordinate and schedule the work of subcontractors so that erosion and sediment control/stormwater measures are fully executed for each operation and in a timely manner over the duration of the contract.

(a) Oversee the work of subcontractors so that appropriate erosion and sediment control/stormwater preventive measures are conformed to at each stage of the work.

(b) Prepare the required National Pollutant Discharge Elimination System (NPDES) Inspection Record and submit to the Engineer.

(c) Attend all weekly or monthly construction meetings to discuss the findings of the NPDES inspection and other related issues.

(d) Implement the erosion and sediment control/stormwater site plans requested.

(e) Provide any needed erosion and sediment control/stormwater practices for the Contractor's temporary work not shown on the plans, such as, but not limited to work platforms, temporary construction, pumping operations, plant and storage yards, and cofferdams.

(f) Acquire applicable permits and comply with requirements for borrow pits, dewatering, and any temporary work conducted by the Contractor in jurisdictional areas.

(g) Conduct all erosion and sediment control/stormwater work in a timely and workmanlike manner.

(h) Fully perform and install erosion and sediment control/stormwater work prior to any suspension of the work.

(i) Coordinate with Department, Federal, State and Local Regulatory agencies on resolution of erosion and sediment control/stormwater issues due to the Contractor's operations.

(j) Ensure that proper cleanup occurs from vehicle tracking on paved surfaces or any location where sediment leaves the Right-of-Way.

(k) Have available a set of erosion and sediment control/stormwater plans that are initialed and include the installation date of Best Management Practices. These practices shall include temporary and permanent groundcover and be properly updated to reflect necessary plan and field changes for use and review by Department personnel as well as regulatory agencies.

(2) Requirements set forth under the NPDES Permit - The Department's NPDES Stormwater permit (NCS000250) outlines certain objectives and management measures pertaining to construction activities. The permit references *NCG010000, General Permit to Discharge Stormwater* under the NPDES, and states that the Department shall incorporate the applicable requirements into its delegated Erosion and Sediment Control Program for construction activities disturbing one or more acres of land. The Department further incorporates these requirements on all contracted bridge and culvert work at jurisdictional waters, regardless of size. Some of the requirements are, but are not limited to:

(a) Control project site waste to prevent contamination of surface or ground waters of the state, i.e. from equipment operation/maintenance, construction materials, concrete washout, chemicals, litter, fuels, lubricants, coolants, hydraulic fluids, any other petroleum products, and sanitary waste.

(b) Inspect erosion and sediment control/stormwater devices and stormwater discharge outfalls at least once every 7 calendar days, twice weekly for construction related *Federal Clean Water Act, Section 303(d)* impaired streams with turbidity violations, and within 24 hours after a significant rainfall event of 0.5 inch that occurs within a 24 hour period.

(c) Maintain an onsite rain gauge or use the Department's Multi-Sensor Precipitation Estimate website to maintain a daily record of rainfall amounts and dates.
(d) Maintain erosion and sediment control/stormwater inspection records for review by Department and Regulatory personnel upon request.
(e) Implement approved reclamation plans on all borrow pits, waste sites and staging areas.
(f) Maintain a log of turbidity test results as outlined in the Department's Procedure for Monitoring Borrow Pit Discharge.
(g) Provide secondary containment for bulk storage of liquid materials.
(h) Provide training for employees concerning general erosion and sediment control/stormwater awareness, the Department's NPDES Stormwater Permit NCS000250 requirements, and the applicable requirements of the *General Permit, NCG010000.*
(i) Report violations of the NPDES permit to the Engineer immediately who will notify the Division of Water Quality Regional Office within 24 hours of becoming aware of the violation.

(3) Quality Control Program - Maintain a quality control program to control erosion, prevent sedimentation and follow provisions/conditions of permits. The quality control program shall:

(a) Follow permit requirements related to the Contractor and subcontractors' construction activities.
(b) Ensure that all operators and subcontractors on site have the proper erosion and sediment control/stormwater certification.
(c) Notify the Engineer when the required certified erosion and sediment control/stormwater personnel are not available on the job site when needed.
(d) Conduct the inspections required by the NPDES permit.
(e) Take corrective actions in the proper timeframe as required by the NPDES permit for problem areas identified during the NPDES inspections.
(f) Incorporate erosion control into the work in a timely manner and stabilize disturbed areas with mulch/seed or vegetative cover on a section-by-section basis.
(g) Use flocculants approved by state regulatory authorities where appropriate and where required for turbidity and sedimentation reduction.
(h) Ensure proper installation and maintenance of temporary erosion and sediment control devices.
(i) Remove temporary erosion or sediment control devices when they are no longer necessary as agreed upon by the Engineer.
(j) The Contractor's quality control and inspection procedures shall be subject to review by the Engineer. Maintain NPDES inspection records and make records available at all times for verification by the Engineer.

(B) *Certified Foreman* - At least one Certified Foreman shall be onsite for each type of work listed herein during the respective construction activities to control erosion, prevent sedimentation and follow permit provisions:

(1) Foreman in charge of grading activities
(2) Foreman in charge of bridge or culvert construction over jurisdictional areas
(3) Foreman in charge of utility activities

The Contractor may request to use the same person as the Level II Supervisor and Level II Foreman. This person shall be onsite whenever construction activities as described above are taking place. This request shall be approved by the Engineer prior to work beginning.

The Contractor may request to name a single Level II Foreman to oversee multiple construction activities on small bridge or culvert replacement projects. This request shall be approved by the Engineer prior to work beginning.

(C) *Certified Installers* - Provide at least one onsite, Level I Certified Installer for each of the following erosion and sediment control/stormwater crew:

(1) Seeding and Mulching
(2) Temporary Seeding
(3) Temporary Mulching
(4) Sodding
(5) Silt fence or other perimeter erosion/sediment control device installations
(6) Erosion control blanket installation
(7) Hydraulic tackifier installation
(8) Turbidity curtain installation
(9) Rock ditch check/sediment dam installation
(10) Ditch liner/matting installation
(11) Inlet protection
(12) Riprap placement
(13) Stormwater BMP installations (such as but not limited to level spreaders, retention/detention devices)
(14) Pipe installations within jurisdictional areas

If a Level I *Certified Installer* is not onsite, the Contractor may substitute a Level II Foreman for a Level I Installer, provided the Level II Foreman is not tasked to another crew requiring Level II Foreman oversight.

(D) *Certified Designer* - Include the certification number of the Level III-B Certified Designer on the erosion and sediment control/stormwater component of all reclamation plans and if applicable, the certification number of the Level III-A Certified Designer on the design of the project erosion and sediment control/stormwater plan.

Preconstruction Meeting

Furnish the names of the *Certified Erosion and Sediment Control/Stormwater Supervisor, Certified Foremen, Certified Installers* and *Certified Designer* and notify the Engineer of changes in certified personnel over the life of the contract within 2 days of change.

Ethical Responsibility

Any company performing work for the North Carolina Department of Transportation has the ethical responsibility to fully disclose any reprimand or dismissal of an employee resulting from improper testing or falsification of records.

Revocation or Suspension of Certification

Upon recommendation of the Chief Engineer to the certification entity, certification for *Supervisor*, *Certified Foremen*, *Certified Installers* and *Certified Designer* may be revoked or suspended with the issuance of an *Immediate Corrective Action (ICA), Notice of Violation (NOV),* or *Cease and Desist Order* for erosion and sediment control/stormwater related issues.

The Chief Engineer may recommend suspension or permanent revocation of certification due to the following:

(A) Failure to adequately perform the duties as defined within this certification provision.
(B) Issuance of an ICA, NOV, or Cease and Desist Order.
(C) Failure to fully perform environmental commitments as detailed within the permit conditions and specifications.
(D) Demonstration of erroneous documentation or reporting techniques.
(E) Cheating or copying another candidate's work on an examination.
(F) Intentional falsification of records.
(G) Directing a subordinate under direct or indirect supervision to perform any of the above actions.
(H) Dismissal from a company for any of the above reasons.
(I) Suspension or revocation of one's certification by another entity.

Suspension or revocation of a certification will be sent by certified mail to the certificant and the Corporate Head of the company that employs the certificant.

A certificant has the right to appeal any adverse action which results in suspension or permanent revocation of certification by responding, in writing, to the Chief Engineer within 10 calendar days after receiving notice of the proposed adverse action.

Chief Engineer
1536 Mail Service Center
Raleigh, NC 27699-1536

Failure to appeal within 10 calendar days will result in the proposed adverse action becoming effective on the date specified on the certified notice. Failure to appeal within the time specified will result in a waiver of all future appeal rights regarding the adverse action taken. The certificant will not be allowed to perform duties associated with the certification during the appeal process.

The Chief Engineer will hear the appeal and make a decision within 7 days of hearing the appeal. Decision of the Chief Engineer will be final and will be made in writing to the certificant.

If a certification is temporarily suspended, the certificant shall pass any applicable written examination and any proficiency examination, at the conclusion of the specified suspension period, prior to having the certification reinstated.

Measurement and Payment

Certified Erosion and Sediment Control/Stormwater Supervisor, Certified Foremen, Certified Installers and *Certified Designer* will be incidental to the project for which no direct compensation will be made.

PROCEDURE FOR MONITORING BORROW PIT DISCHARGE:

(2-20-07) (Rev. 3-19-13) 105-16, 230, 801 SP1 G181

Water discharge from borrow pit sites shall not cause surface waters to exceed 50 NTUs (nephelometric turbidity unit) in streams not designated as trout waters and 10 NTUs in streams, lakes or reservoirs designated as trout waters. For lakes and reservoirs not designated as trout waters, the turbidity shall not exceed 25 NTUs. If the turbidity exceeds these levels due to natural background conditions, the existing turbidity level shall not be increased.

If during any operating day, the downstream water quality exceeds the standard, the Contractor shall do all of the following:

(A) Either cease discharge or modify the discharge volume or turbidity levels to bring the downstream turbidity levels into compliance, or

(B) Evaluate the upstream conditions to determine if the exceedance of the standard is due to natural background conditions. If the background turbidity measurements exceed the standard, operation of the pit and discharge can continue as long as the stream turbidity levels are not increased due to the discharge.

(C) Measure and record the turbidity test results (time, date and sampler) at all defined sampling locations 30 minutes after startup and at a minimum, one additional sampling of all sampling locations during that 24-hour period in which the borrow pit is discharging.

(D) Notify DWQ within 24 hours of any stream turbidity standard exceedances that are not brought into compliance.

During the Environmental Assessment required by Article 230-4 of the *2012 Standard Specifications*, the Contractor shall define the point at which the discharge enters into the State's surface waters and the appropriate sampling locations. Sampling locations shall include points upstream and downstream from the point at which the discharge enters these waters. Upstream sampling location shall be located so that it is not influenced by backwater conditions and represents natural background conditions. Downstream sampling location shall be located at the point where complete mixing of the discharge and receiving water has occurred.

The discharge shall be closely monitored when water from the dewatering activities is introduced into jurisdictional wetlands. Any time visible sedimentation (deposition of sediment) on the wetland surface is observed, the dewatering activity will be suspended until turbidity levels in the stilling basin can be reduced to a level where sediment deposition does not occur. Staining of wetland surfaces from suspended clay particles, occurring after evaporation or infiltration, does not constitute sedimentation. No activities shall occur in wetlands that adversely affect the functioning of a wetland. Visible sedimentation will be considered an indication of possible adverse impacts on wetland use.

The Engineer will perform independent turbidity tests on a random basis. These results will be maintained in a log within the project records. Records will include, at a minimum, turbidity test results, time, date and name of sampler. Should the Department's test results exceed those of the Contractor's test results, an immediate test shall be performed jointly with the results superseding the previous test results of both the Department and the Contractor.

The Contractor shall use the *NCDOT Turbidity Reduction Options for Borrow Pits Matrix,* available at http://www.ncdot.gov/doh/operations/dp_chief_eng/roadside/fieldops/downloads/Files/TurbidityReductionOptionSheet.pdf to plan, design, construct, and maintain BMPs to address water quality standards. Tier I Methods include stilling basins which are standard compensatory BMPs. Other Tier I methods are noncompensatory and shall be used when needed to meet the stream turbidity standards. Tier II Methods are also noncompensatory and are options that may be needed for protection of rare or unique resources or where special environmental conditions exist at the site which have led to additional requirements being placed in the DWQ's 401 Certifications and approval letters, Isolated Wetland Permits, Riparian Buffer Authorization or a DOT Reclamation Plan's Environmental Assessment for the specific site. Should the Contractor exhaust all Tier I Methods on a site exclusive of rare or unique resources or special environmental conditions, Tier II Methods may be required by regulators on a case by case basis per supplemental agreement.

The Contractor may use cation exchange capacity (CEC) values from proposed site borings to plan and develop the bid for the project. CEC values exceeding 15 milliequivalents per 100 grams of soil may indicate a high potential for turbidity and should be avoided when dewatering into surface water is proposed.

No additional compensation for monitoring borrow pit discharge will be paid.

EMPLOYMENT:
(11-15-11) (Rev. 1-17-12) 108, 102 SP1 G184

Revise the *2012 Standard Specifications* as follows:

Page 1-20, Subarticle 102-15(O), delete and replace with the following:

(O) Failure to restrict a former Department employee as prohibited by Article 108-5.

Page 1-65, Article 108-5 Character of Workmen, Methods, and Equipment, line 32, delete all of line 32, the first sentence of the second paragraph and the first word of the second sentence of the second paragraph.

STATE HIGHWAY ADMINISTRATOR TITLE CHANGE:
(9-18-12) SP1 G185

Revise the *2012 Standard Specifications* as follows:

Replace all references to "State Highway Administrator" with "Chief Engineer".

E-VERIFY COMPLIANCE:
(2-18-14) SP1 G200

Contractors and subcontractors shall comply with the E-Verify requirements of N.C.G.S. Chapter 64, Article 2. Contractors are directed to review the foregoing laws. By signing this bid, any awarded Contractor certifies its compliance with the E-Verify requirements and will do so on a periodic basis thereafter as may be required by the Department.

NOTES TO CONTRACTOR:

1) Notify the Resident Engineer prior to beginning any ground disturbing activity within the limits of the Schoolfield-Hatcher Farm (Site 31GF452). The Resident Engineer will be responsible for notifying the NCDOT Archaeology Group. The Contractor shall not begin any ground disturbing activities within the Schoolfield-Hatcher Farm site until 48 hours after the NCDOT Archaeology Group has acknowledged that they have received notification. Cooperate with NCDOT Archaeology Group staff who will be onsite during ground disturbing activities in the Schoolfield-Hatcher Farm site cleaning and photographing exposed areas, mapping trenched areas and collecting artifacts exposed during construction activities. This cooperation may involve ceasing construction activities in order for the NCDOT Archaeology Group to assess the need for further archaeological excavations.

2) Existing concrete barrier shall be removed from this project at areas indicated in the plans. Removal of existing concrete barrier will be measured and paid in cubic yards as *Unclassified Excavation.*

3) The Contractor shall not remove or disconnect septic service to Parcel 117 (United Holy Church Of America, Inc.) until the City Of Greensboro sewer line and connection is in place.

DELAY IN RIGHT OF ENTRY:

(7-1-95) 108 SP1 G22 B

The Contractor will not be allowed right of entry to the following parcels prior to the listed dates unless otherwise permitted by the Engineer.

Parcel No.	Property Owner	Date
020	Albert Rhew Living Trust	08-01-14
026	NC Prison Department	11-01-14
104	YES Properties	06-01-14
137	John D. Love Oil Company	08-01-14
155	Barry Holyfield	06-15-14
196	Vernice Fuller	06-01-14
200	Patsy Moore - Susan Shuping	06-15-14

PROJECT SPECIAL PROVISIONS

ROADWAY

CLEARING AND GRUBBING - METHOD III:

(4-6-06) (Rev. 1-17-12) 200 SP2 R02B

Perform clearing on this project to the limits established by Method "III" shown on Standard Drawing No. 200.03 of the *2012 Roadway Standard Drawings*.

BURNING RESTRICTIONS:

(7-1-95) 200, 210, 215 SP2 R05

Open burning is not permitted on any portion of the right-of-way limits established for this project. Do not burn the clearing, grubbing or demolition debris designated for disposal and generated from the project at locations within the project limits, off the project limits or at any waste or borrow sites in this county. Dispose of the clearing, grubbing and demolition debris by means other than burning, according to state or local rules and regulations.

TEMPORARY DETOURS:

(7-1-95) (Rev. 11-19-13) 1101 SP2 R30B

Construct temporary detours required on this project in accordance with the typical sections in the plans or as directed.

After the detours have served their purpose, remove the portions deemed unsuitable for use as a permanent part of the project as directed by the Engineer. Salvage and stockpile the aggregate base course removed from the detours at locations within the right of way, as directed by the Engineer, for removal by State Forces. Place pavement and earth material removed from the detour in embankments or dispose of in waste areas furnished by the Contractor.

Aggregate base course and earth material that is removed will be measured and will be paid at the contract unit price per cubic yard for *Unclassified Excavation*. Pavement that is removed will be measured and will be paid at the contract unit price per square yard for *Removal of Existing Pavement*. Pipe culverts removed from the detours remain the property of the Contractor. Pipe culverts that are removed will be measured and will be paid at the contract unit price per linear foot for *Pipe Removal*. Payment for the construction of the detours will be made at the contract unit prices for the various items involved.

Such prices and payments will be full compensation for constructing the detours and for the work of removing, salvaging, and stockpiling aggregate base course; removing pipe culverts; and for placing earth material and pavement in embankments or disposing of earth material and pavement in waste areas.

SHOULDER AND FILL SLOPE MATERIAL:

(5-21-02) 235, 560 SP2 R45 B

Description

Perform the required shoulder and slope construction for this project in accordance with the applicable requirements of Section 560 and Section 235 of the *2012 Standard Specifications*.

Measurement and Payment

When the Contractor elects to obtain material from an area located beneath a proposed fill sections which does not require excavation for any reason other than to generate acceptable shoulder and fill slope material, the work of performing the excavation will be considered incidental to the item of *Borrow Excavation* or *Shoulder Borrow*. If there is no pay item for *Borrow* or *Shoulder Borrow* in the contract, this work will be considered incidental to *Unclassified Excavation*. Stockpile the excavated material in a manner to facilitate measurement by the Engineer. Fill the void created by the excavation of the shoulder and fill slope material with suitable material. Payment for material used from the stockpile will be made at the contract unit price for *Borrow Excavation* or *Shoulder Borrow*. If there is no pay item for *Borrow Excavation* or *Shoulder Borrow*, then the material will be paid for at the contract unit price for *Unclassified Excavation*. The material used to fill the void created by the excavation of the shoulder and fill slope material will be made at the contract unit price for *Unclassified Excavation*, *Borrow Excavation*, or *Shoulder Borrow*, depending on the source of the material.

Material generated from undercut excavation, unclassified excavation or clearing and grubbing operations that is placed directly on shoulders or slope areas, will not be measured separately for payment, as payment for the work requiring the excavation will be considered adequate compensation for depositing and grading the material on the shoulders or slopes.

When undercut excavation is performed at the direction of the Engineer and the material excavated is found to be suitable for use as shoulder and fill slope material, and there is no area on the project currently prepared to receive the material generated by the undercut operation, the Contractor may construct a stockpile for use as borrow at a later date. Payment for the material used from the stockpile will be made at the contract unit price for *Borrow Excavation* or *Shoulder Borrow*.

When shoulder material is obtained from borrow sources or from stockpiled material, payment for the work of shoulder construction will be made at the contract unit price per cubic yard for *Borrow Excavation* or *Shoulder Borrow* in accordance with the applicable provisions of Section 230 or Section 560 of the *2012 Standard Specifications*.

EMBANKMENT SETTLEMENT GAUGES:

(7-1-95) (Rev. 2-19-13) 235 SP2 R75

Revise the *2012 Standard Specifications* as follows:

Page 2-22, Article 235-1 DESCRIPTION, add the following:

Surcharges and waiting periods may be required for embankments and retaining walls to minimize and control the effects of settlement on structures, approach slabs, pavements, pipes,

utilities, etc. Settlement gauges may be required to monitor settlement at approximate locations shown in the plans and as directed.

Page 2-22, Article 235-2 MATERIALS, add the following:

Provide Schedule 40 black steel pipes and couplers with steel or wood bases for settlement gauges. Use steel plates with yield strength of at least 36 ksi and pressure treated wood boards for bases of settlement gauges.

Page 2-24, Article 235-3 CONSTRUCTION METHODS, add the following:

(E) Surcharges and Waiting Periods

Place surcharges at locations shown in the plans. Unless required otherwise in the contract, surcharge embankments after embankments are constructed to the grade and cross section shown in the plans. Construct surcharges with side slopes as directed, 2:1 (H:V) end slopes outside of surcharge limits and surcharge heights shown in the plans. Place and compact surcharge material in accordance with Subarticles 235-3(B) and 235-3(C). Construct and maintain adequate drainage of surface runoff to prevent erosion of surcharge material.

Waiting period durations are in accordance with the contract and as directed. Surcharge waiting periods apply to surcharge locations shown in the plans and begin after surcharges are constructed to the height shown in the plans.

Unless required otherwise in the contract, bridge waiting periods are required in accordance with the following:

(1) Apply to bridge embankments and retaining walls within 100 ft of end bent and bent locations shown in the plans and

(2) Begin after bridge embankments and retaining walls are constructed to the elevations noted in the plans.

Unless required otherwise in the contract, embankment waiting periods are required in accordance with the following:

(1) Apply to embankment locations shown in the plans and retaining walls for embankments with waiting periods and

(2) Begin after embankments and retaining walls are constructed to the elevations, grade and cross section shown in the plans.

Except for maintaining embankments, do not perform any work on embankments or structures with waiting periods until waiting periods end unless otherwise approved. Place and compact additional material in accordance with Subarticles 235-3(B) and 235-3(C) to maintain embankment grade elevations during waiting periods. Remove surcharges to the grade and cross section shown in the plans after surcharge waiting periods end.

(F) Embankment Monitoring

Fabricate and install settlement gauges in accordance with the contract. Make settlement gauges highly visible so gauges are not disturbed while monitoring settlement. Use only hand operated compaction equipment to compact fill material around gauges.

Do not damage settlement gauges. Damaged settlement gauges may require replacement or additional gauges and waiting period extensions as determined by the Engineer.

Page 2-24, Article 235-5 MEASUREMENT AND PAYMENT, add the following:

Borrow Excavation for surcharge material and additional material for maintaining embankment grade elevations will be measured and paid in accordance with Article 230-5. *Unclassified Excavation* for surcharge material, additional material for maintaining embankment grade elevations and removing surcharges will be measured and paid in accordance with Article 225-7. When there is no pay item for *Borrow Excavation* or *Unclassified Excavation* in the contract, surcharge and additional material and removing surcharges will be paid as extra work in accordance with Article 104-7.

Embankment Settlement Gauges will be measured and paid in units of each. Settlement gauges will be measured as one per gauge location. The contract unit price for *Embankment Settlement Gauges* will be full compensation for fabricating and installing settlement gauges including placing and compacting fill material around gauges, adding pipes and couplers until embankment monitoring ends and any incidentals necessary to monitor settlement. No payment will be made for interfering with the Contractor's operations due to embankment monitoring or damaged settlement gauges as determined by the Engineer.

Payment will be made under:

Pay Item	**Pay Unit**
Embankment Settlement Gauges	Each

PIPE INSTALLATION:

(11-20-12) 300 SP3 R01

Revise the *2012 Standard Specifications* as follows:

Page 3-1, Article 300-2, Materials, line 23-24, replace sentence with:

Provide foundation conditioning geotextile in accordance with Section 1056 for Type 4 geotextile.

FLOWABLE FILL:

(9-17-02) (Rev 1-17-12) 300, 340, 450, 1000, 1530, 1540, 1550 SP3 R30

Description

This work consists of all work necessary to place flowable fill in accordance with these provisions, the plans, and as directed.

Materials

Refer to Division 10 of the *2012 Standard Specifications*.

Item	Section
Flowable Fill	1000-6

Construction Methods

Discharge flowable fill material directly from the truck into the space to be filled, or by other approved methods. The mix may be placed full depth or in lifts as site conditions dictate. The Contractor shall provide a method to plug the ends of the existing pipe in order to contain the flowable fill.

Measurement and Payment

At locations where flowable fill is called for on the plans and a pay item for flowable fill is included in the contract, *Flowable Fill* will be measured in cubic yards and paid as the actual number of cubic yards that have been satisfactorily placed and accepted. Such price and payment will be full compensation for all work covered by this provision including, but not limited to, the mix design, furnishing, hauling, placing and containing the flowable fill.

Payment will be made under:

Pay Item	Pay Unit
Flowable Fill	Cubic Yard

BRIDGE APPROACH FILLS:

(10-19-10) (Rev. 1-17-12) 422 SP4 R02

Description

Bridge approach fills include bridge approach fills for sub regional tier bridges and reinforced bridge approach fills. Construct bridge approach fills in accordance with the contract and Standard Drawing No. 422.10 or 422.11 of the *2012 Roadway Standard Drawings*. Define "geosynthetics" as geotextiles or geomembranes.

Materials

Refer to Division 10 of the *2012 Standard Specifications*.

Item	Section
Anchor Pins	1056-2
Geotextiles	1056
Portland Cement Concrete	1000
Select Material	1016
Subsurface Drainage Materials	1044
Wire Staples	1060-8(D)

For bridge approach fills for sub regional tier bridges, provide Type 1 geotextile for filtration geotextiles. For reinforced bridge approach fills, provide Type 5 geotextile for geotextile reinforcement and Type 1 geotextile and No. 78M stone for drains. Use Class B concrete for concrete pads.

Use Class III or V select material for reinforced bridge approach fills and only Class V select material (standard size No. 78M stone) for bridge approach fills for sub regional tier bridges. Provide PVC pipes, fittings and outlet pipes for subsurface drainage materials. For drains and PVC pipes behind end bents, use pipes with perforations that meet AASHTO M 278.

Use PVC, HDPE or linear low density polyethylene (LLDPE) geomembranes for reinforced bridge approach fills. For PVC geomembranes, provide grade PVC30 geomembranes that meet ASTM D7176. For HDPE and LLDPE geomembranes, use geomembranes with a nominal thickness of at least 30 mils that meet Geosynthetic Research Institute Standard Specifications GM13 or GM17, respectively. Handle and store geomembranes in accordance with Article 1056-2 of the *2012 Standard Specifications*. Provide material certifications for geomembranes in accordance with Article 1056-3 of the *2012 Standard Specifications*.

Construction Methods

Excavate as necessary for bridge approach fills in accordance with the contract. Notify the Engineer when foundation excavation is complete. Do not place geomembranes or filtration geotextiles until excavation dimensions and foundation material are approved. Attach geomembranes and filtration geotextiles to end bent cap back and wing walls with adhesives, tapes or other approved methods. Glue or weld geomembrane seams to prevent leakage.

For reinforced bridge approach fills, place geotextile reinforcement within 3" of locations shown in Standard Drawing No. 422.10 of the *2012 Roadway Standard Drawings* and in slight tension free of kinks, folds, wrinkles or creases. Install geotextile reinforcement with the orientation, dimensions and number of layers shown in Standard Drawing No. 422.10 of the *2012 Roadway Standard Drawings*. Place first layer of geotextile reinforcement directly on geomembranes with no void or material in between. Install geotextile reinforcement with the machine direction (MD) parallel to the roadway centerline. The MD is the direction of the length or long dimension of the geotextile roll. Do not splice or overlap geotextile reinforcement in the MD so seams are perpendicular to the roadway centerline. Wrap geotextile reinforcement at end bent cap back and wing walls as shown in Standard Drawing No. 422.10 of the *2012 Roadway Standard Drawings* and directed by the Engineer. Extend geotextile reinforcement at least 4 ft back behind end bent cap back and wing walls into select material.

Overlap adjacent geotextiles at least 18" with seams oriented parallel to the roadway centerline. Hold geotextiles in place with wire staples or anchor pins as needed. Contact the Engineer when existing or future obstructions such as foundations, pavements, pipes, inlets or utilities will interfere with geosynthetics.

For reinforced bridge approach fills, construct one foot square drains consisting of 4" diameter continuous perforated PVC pipes surrounded by No. 78M stone wrapped in Type 1 geotextiles.

Install drains in accordance with Standard Drawing No. 422.10 of the *2012 Roadway Standard Drawings*. For bridge approach fills for sub regional tier bridges, install 4" diameter continuous perforated PVC drain pipes in accordance with Standard Drawing No. 422.11 of the *2012 Roadway Standard Drawings*.

Use solvent cement to connect PVC pipes so joints do not leak. Connect perforated pipes to outlet pipes just behind wing walls. Provide drain pipes and drains with positive drainage towards outlets. Place pipe sleeves in or under wing walls for outlet pipes so positive drainage is maintained. Use sleeves that can withstand wing wall loads.

Place select material in 8" to 10" thick lifts. Use only hand operated compaction equipment to compact select material for bridge approach fills. Compact Class III select material in accordance with Subarticle 235-3(C) of the *2012 Standard Specifications*. Compact No. 78M stone with a vibratory compactor to the satisfaction of the Engineer. Do not displace or damage geosynthetics, drain pipes or drains when placing and compacting select material. End dumping directly on geosynthetics is not permitted. Do not operate heavy equipment on geosynthetics, drain pipes or drains until they are covered with at least 8" of select material. Replace any damaged geosynthetics, drain pipes or drains to the satisfaction of the Engineer.

Cover open ends of outlet pipes with rodent screens as shown in Standard Drawing No. 815.03 of the *2012 Roadway Standard Drawings*. Connect ends of outlet pipes to concrete pads or existing drainage structures as directed by the Engineer. Construct concrete pads with an Ordinary surface finish that meets Subarticle 825-6(B) of the *2012 Standard Specifications*.

Measurement and Payment

Reinforced Bridge Approach Fill, Station ____ will be paid at the contract lump sum price. The contract lump sum price for *Reinforced Bridge Approach Fill, Station* ____ will be full compensation for labor, tools, equipment and reinforced bridge approach fill materials, excavating, backfilling, hauling and removing excavated materials, compacting select material, connecting outlet pipes to existing drainage structures and supplying select materials, geosynthetics, drains, pipe sleeves and outlet components and any incidentals necessary to construct all reinforced bridge approach fills at each bridge.

Bridge Approach Fill - Sub Regional Tier, Station ____ will be paid at the contract lump sum price. The contract lump sum price for *Bridge Approach Fill - Sub Regional Tier, Station* ____ will be full compensation for labor, tools, equipment and bridge approach fill materials, excavating, backfilling, hauling and removing excavated materials, compacting No. 78M stone, connecting outlet pipes to existing drainage structures and supplying No. 78M stone, filtration geotextiles, drain pipes, pipe sleeves and outlet components and any incidentals necessary to construct all bridge approach fills at each sub regional tier bridge.

Payment will be made under:

Pay Item	**Pay Unit**
Reinforced Bridge Approach Fill, Station ____	Lump Sum
Bridge Approach Fill - Sub Regional Tier, Station ____	Lump Sum

PREPARATION OF SUBGRADE AND BASE:

(1-16-96) 610 SP5 R05

On mainline portions and ramps of this project, prepare the subgrade and base beneath the pavement structure in accordance with the applicable sections of the *2012 Standard Specifications* except use an automatically controlled fine grading machine using string lines, laser controls or other approved methods to produce final subgrade and base surfaces meeting the lines, grades and cross sections required by the plans or established by the Engineer.

No direct payment will be made for the work required by this provision as it will be considered incidental to other work being paid for by the various items in the contract.

AUTOMATED MACHINE GUIDANCE

(1-2-11) SPI 5-5

General

This Special Provision contains requirements to be followed if the Contractor elects to use Global Positioning System (GPS) machine control grading and shall be used in conjunction with Section 801 of the *Standard Specifications*. The use of this technology is referenced as Automated Machine Guidance (AMG).

All equipment using AMG shall be able to generate end results that meet the *Standard Specifications*. Perform test sections for each type of work to be completed with AMG to demonstrate that the system has the capability to achieve acceptable results. If acceptable results can not be achieved, conform to the requirements for conventional stakeout.

The Contractor shall be responsible for all errors resulting from the use of AMG and shall correct deficiencies to the satisfaction of the Engineer at no cost to the Department.

Submittals

If the Contractor elects to use AMG, a Digital Terrain Model (DTM) of the design surface and all intermediate surfaces shall be developed and submitted to the Engineer for review.

At least 90 days prior to beginning grading operations, the Contractor shall submit to the Engineer an AMG work plan to include, but not limited to, proposed equipment, control software manufacturer and version, types of work to be completed using AMG, project site calibration report, repetitive calibration methods for construction equipment and rover units to be used for the duration of the project, and local GPS base station to be used for broadcasting differential correction data to rover units (this may include the NC Network RTK). All surveys must be tied to existing project control as established by NCDOT.

Inspection

The Engineer will perform quality assurance checks of all work associated with AMG. If it is determined that work is not being performed in a manner that will assure accurate results, the Engineer may require corrective action at no cost to the Department.

The Contractor shall provide the Engineer with one GPS rover unit for use during the duration of the contract. The rover will be loaded with the same model that is used with the AMG and have the same capability as rover units used by the Contractor. The rover will be kept in the possession of the Engineer and will be returned to the Contractor upon completion of the contract. Any maintenance or repairs required for the rover will be the responsibility of the Contractor. Formal training of at least 8 hours shall be provided to the Engineer by the Contractor on the use of the proposed AMG system.

Subgrade and Base Controls

If the Contractor elects to use AMG for fine grading and placement of base or other roadway materials, the GPS shall be supplemented with a laser or robotic total station. Include details of the proposed system in the AMG work plan. In addition, the following requirements apply for the use of AMG for subgrade and base construction.

Provide control points at intervals along the project not to exceed 1,000 feet. The horizontal position of these points shall be determined by static GPS sessions or by traverse connection from the original base line control points. The elevation of these control points shall be established using differential leveling from project benchmarks, forming closed loops where practical. A copy of all new control point information shall be provided to the Engineer prior to construction activities.

Provide control points and conventional survey grade stakes at 500 foot intervals and at critical points such as, but not limited to, PCs, PTs, superelevation transition points, and other critical points as requested by the Engineer.

Provide hubs at the top of the finished subgrade at all hinge points on the cross section at 500 foot intervals. These hubs shall be established using conventional survey methods for use by the Engineer to check the accuracy of construction.

Measurement and Payment

No direct payment will be made for work required to utilize this provision. All work will be considered incidental to various grading operations.

AGGREGATE STABILIZATION:

(11-19-13) 510 SP5 R10

Revise the *2012 Standard Specifications* as follows:

Replace Section 510 with the following:

SECTION 510
AGGREGATE STABILIZATION

510-1 DESCRIPTION

Stabilize subgrades with aggregate base course (ABC) in accordance with the contract or as directed. Define "aggregate" as ABC for stabilizer aggregate or Class IV aggregate stabilization. Define "stabilizer aggregate" as mixing aggregate with subgrade soils. Define "Class IV

aggregate stabilization" as replacing subgrade soils with aggregate. Remove material as needed in cut areas. Install geotextile for soil stabilization as needed and place aggregate at locations shown on the plans.

510-2 MATERIALS

Refer to Division 10.

Item	Section
Aggregate for Stabilization	1008
Geotextile for Soil Stabilization, Type 4	1056
Select Material, Class IV	1016

Use aggregate for stabilization for stabilizer aggregate and Class IV select material for Class IV aggregate stabilization.

510-3 CONSTRUCTION METHODS

When undercut is required for aggregate stabilization, undercut as needed to place aggregate as shown on the plans or as directed. Perform undercut excavation in accordance with Section 225.

(A) Stabilizer Aggregate

Spread aggregate uniformly and evenly with a mechanical spreader to the required thickness. Do not spread more aggregate than what can be mixed and compacted within a week. Mix aggregate with the top 3" of subgrade soils until aggregate and soils are uniformly mixed. Compact stabilizer aggregate to 100% of AASHTO T 99 as modified by the Department.

(B) Class IV Aggregate Stabilization

When geotextile for soil stabilization is required, install geotextiles in accordance with Article 270-3. Place aggregate by end dumping aggregate on geotextiles or subgrade soils. Do not operate heavy equipment on geotextiles until geotextiles are covered with the required thickness of aggregate. Compact Class IV aggregate stabilization less than 6" thick with a smooth wheeled roller without vibration to the satisfaction of the Engineer. Compact Class IV aggregate stabilization with a thickness of 6" or more to 92% of AASHTO T 180 as modified by the Department or to the highest density that can be reasonably obtained.

(C) Maintenance

Maintain aggregate stabilization in an acceptable condition and minimize the use of heavy equipment on aggregate in order to avoid damaging subgrades. Provide and maintain drainage ditches and drains as required to prevent entrapping water in aggregate stabilization.

510-4 MEASUREMENT AND PAYMENT

Stabilizer Aggregate and *Class IV Aggregate Stabilization* will be measured and paid in tons. Aggregate will be measured by weighing material in trucks in accordance with Article 106-7. The contract unit price for *Stabilizer Aggregate* and *Class IV Aggregate Stabilization* will be full compensation for furnishing, hauling, handling, placing, mixing, compacting and maintaining aggregate.

Geotextile for Soil Stabilization will be measured and paid in accordance with Article 270-4.

Materials excavated to place aggregate below the subgrade or ground line, whichever is lower, will be measured and paid in accordance with Article 225-7, except when undercut excavation is in accordance with Section 226 and the Engineer requires undercut to be backfilled with aggregate. When this occurs, the second sentence of the sixth paragraph of Article 226-3 will not apply, as payment for aggregate will be made as described in this article.

Payment will be made under:

Pay Item	**Pay Unit**
Stabilizer Aggregate	Ton
Class IV Aggregate Stabilization	Ton

ASPHALT PAVEMENTS - SUPERPAVE:

(6-19-12) (Rev. 2-18-14) 605, 609, 610, 650, 660 SP6 R01

Revise the *2012 Standard Specifications* as follows:

Page 6-3, Article 605-7 APPLICATION RATES AND TEMPERATURES, replace this article, including Table 601-1, with the following:

Apply tack coat uniformly across the existing surface at target application rates shown in Table 605-1.

TABLE 605-1
APPLICATION RATES FOR TACK COAT

Existing Surface	**Target Rate (gal/sy)**
	Emulsified Asphalt
New Asphalt	0.04 ± 0.01
Oxidized or Milled Asphalt	0.06 ± 0.01
Concrete	0.08 ± 0.01

Apply tack coat at a temperature within the ranges shown in Table 605-2. Tack coat shall not be overheated during storage, transport or at application.

TABLE 605-2
APPLICATION TEMPERATURE FOR TACK COAT

Asphalt Material	**Temperature Range**
Asphalt Binder, Grade PG 64-22	350 - 400°F
Emulsified Asphalt, Grade RS-1H	130 - 160°F
Emulsified Asphalt, Grade CRS-1	130 - 160°F
Emulsified Asphalt, Grade CRS-1H	130 - 160°F
Emulsified Asphalt, Grade HFMS-1	130 - 160°F
Emulsified Asphalt, Grade CRS-2	130 - 160°F

Page 6-7, Article 609-3 FIELD VERIFICATION OF MIXTURE AND JOB MIX FORMULA ADJUSTMENTS, lines 35-37, delete the second sentence of the second paragraph.

Page 6-18, Article 610-1 DESCRIPTION, lines 40-41, delete the last sentence of the last paragraph.

Page 6-19, Subarticle 610-3(A) Mix Design-General, line 5, add the following as the first paragraph:

Warm mix asphalt (WMA) is allowed for use at the Contractor's option in accordance with the NCDOT Approved Products List for WMA Technologies available at:

https://connect.ncdot.gov/resources/Materials/MaterialsResources/Warm%20Mix%20Asphalt%20Approved%20List.pdf

Page 6-21, Subarticle 610-3(C) Job Mix Formula (JMF), replace Table 610-1 with the following:

TABLE 610-1
DESIGN MIXING TEMPERATURE AT THE ASPHALT PLANT[A]

Binder Grade	HMA JMF Temperature	WMA JMF Temperature Range
PG 64-22	300°F	225 - 275°F
PG 70-22	315°F	240 - 290°F
PG 76-22	335°F	260 - 310°F

A. The mix temperature, when checked in the truck at the roadway, shall be within plus 15° and minus 25° of the temperature specified on the JMF.

Page 6-21, Subarticle 610-3(C) Job Mix Formula (JMF), lines 4-6, delete first sentence of the second paragraph. Line 7, in the second sentence of the second paragraph, replace "275°F" with "275°F or greater."

Page 6-22, Article 610-4 WEATHER, TEMPERATURE AND SEASONAL LIMITATIONS FOR PRODUCING AND PLACING ASPHALT MIXTURES, lines 15-17, replace the second sentence of the first paragraph with the following:

Do not place asphalt material when the air or surface temperatures, measured at the location of the paving operation away from artificial heat, do not meet Table 610-5.

Page 6-23, Article 610-4 WEATHER, TEMPERATURE AND SEASONAL LIMITATIONS FOR PRODUCING AND PLACING ASPHALT MIXTURES, replace Table 610-5 with the following:

TABLE 610-5
PLACEMENT TEMPERATURES FOR ASPHALT

Asphalt Concrete Mix Type	Minimum Surface and Air Temperature
B25.0B, C	35°F
I19.0B, C, D	35°F
SF9.5A, S9.5B	40°F
S9.5C, S12.5C	45°F
S9.5D, S12.5D	50°F

Page 6-26, Article 610-7 HAULING OF ASPHALT MIXTURE, lines 22-23, in the fourth sentence of the first paragraph replace "so as to overlap the top of the truck bed and" with "to".

Page 6-41, Subarticle 650-3(B) Mix Design Criteria, replace Table 650-1 with the following:

TABLE 650-1 OGAFC GRADATION CRITERIA			
Grading Requirements	**Total Percent Passing**		
Sieve Size (mm)	*Type FC-1*	*Type FC-1 Modified*	*Type FC-2 Modified*
19.0	-	-	100
12.5	100	100	**80** - 100
9.50	75 - 100	75 - 100	55 - **80**
4.75	25 - 45	25 - 45	15 - **30**
2.36	5 - 15	5 - 15	5 - **15**
0.075	1.0 - 3.0	1.0 - 3.0	2.0 - 4.0

Page 6-50, Table 660-1 MATERIAL APPLICATION RATES AND TEMPERATURES, lines 1-2, replace Note A in Table 660-1 with the following:

A. Use No. 6M, No. 67, No. 5 and No. 78M aggregate for retreatment before an asphalt overlay on existing pavement based on the width of the cracks in the existing pavement. Choose No. 78M for sections of roadway where the average width of existing cracks is 1/4" or less in width, No. 67 for sections of roadway where the average width of existing cracks are 1/4" to 5/8" in width and choose No. 5 for sections of roadway where the existing crack widths are greater than 5/8".

ASPHALT BINDER CONTENT OF ASPHALT PLANT MIXES:

(11-21-00) (Rev. 7-17-12) 609 SP6 R15

The approximate asphalt binder content of the asphalt concrete plant mixtures used on this project will be as follows:

Asphalt Concrete Base Course	Type B 25.0__	4.4%
Asphalt Concrete Intermediate Course	Type I 19.0__	4.8%
Asphalt Concrete Surface Course	Type S 4.75A	6.8%
Asphalt Concrete Surface Course	Type SA-1	6.8%
Asphalt Concrete Surface Course	Type SF 9.5A	6.7%
Asphalt Concrete Surface Course	Type S 9.5__	6.0%
Asphalt Concrete Surface Course	Type S 12.5__	5.6%

The actual asphalt binder content will be established during construction by the Engineer within the limits established in the *2012 Standard Specifications.*

ASPHALT PLANT MIXTURES:
(7-1-95) 609 SP6 R20

Place asphalt concrete base course material in trench sections with asphalt pavement spreaders made for the purpose or with other equipment approved by the Engineer.

PRICE ADJUSTMENT - ASPHALT BINDER FOR PLANT MIX:
(11-21-00) 620 SP6 R25

Price adjustments for asphalt binder for plant mix will be made in accordance with Section 620 of the *2012 Standard Specifications.*

The base price index for asphalt binder for plant mix is **$556.33** per ton.

This base price index represents an average of F.O.B. selling prices of asphalt binder at supplier's terminals on **April 1, 2014**.

OPEN GRADED ASPHALT FRICTION COURSE, PERMEABLE ASPHALT DRAINAGE COURSE, AND ULTRA-THIN BONDED WEARING COURSE:
(4-17-12) 609 SP6 R62

When producing and constructing open graded asphalt friction course, permeable asphalt drainage course, and ultra-thin bonded wearing course revise the *2012 Standard Specifications* as follows:

Page 6-10, Subarticle 609-6(B) Required Sampling and Testing Frequencies, delete the third paragraph and replace with the following:

Sample and test the completed mixture from each mix design per plant per year at the following minimum frequency during mix production:

Accumulative Production Increment	Number of Samples per Increment
500 tons	1

Page 6-10, Subarticle 609-6(C) Control Charts, delete the fourth paragraph and replace with the following:

Record the following data on the standardized control charts and in accordance with the requirements of Section 7.4 of the *HMA/QMS Manual*:

(a) Aggregate Gradation Test Results:

1. 12.5 mm (Types P57 & FC-2 Mod. Only)
2. 9.5 mm (Excluding Type P57)
3. 4.75 mm
4. 2.36 mm
5. 0.075 mm Sieves

(b) Binder Content, %, P_b

Page 6-11, Subarticle 609-6(D) Control Limits, Table 609-1 CONTROL LIMITS, replace with the following:

TABLE 609-1 CONTROL LIMITS			
Mix Control Criteria	**Target Source**	**Moving Average Limit**	**Individual Limit**
12.5 mm Sieve (Types P57 & FC-2 Mod)	JMF	± 4.0	± 8.0
9.5 mm Sieve (Excluding Type P57)	JMF	± 4.0	± 8.0
4.75 mm Sieve	JMF	± 4.0	± 8.0
2.36 mm Sieve	JMF	± 4.0	± 8.0
0.075 mm Sieve	JMF	± 1.5	± 2.5
Binder Content	JMF	± 0.3	± 0.7
TSR (Ultra-thin Only)	Min. Spec. Limit	-	- 15%

Page 6-12, Subarticle 609-6(F) Allowable Retesting for Mix Deficiencies, Table 609-2 RETEST LIMITS FOR MIX DEFICIENCIES, replace with the following:

TABLE 609-2 RETEST LIMITS FOR MIX DEFICIENCIES	
Property	**Limit**
% Binder Content	by more than ± 1.0%
12.5 mm Sieve (Types P 57 & FC-2 Mod)	by more than ± 9.0%
9.5 mm Sieve (Excluding Type P 57)	by more than ± 9.0%
4.75 mm sieve	by more than ± 9.0%
2.36 mm sieve	by more than ± 9.0%
0.075 mm sieve	by more than ± 3.0%
TSR (Ultra-thin only)	by more than -15% from Specification limit

Page 6-17, Subarticle 609-9(C) Limits of Precision, Table 609-3 LIMITS OF PRECISION FOR TEST RESULTS, replace with the following:

TABLE 609-3 LIMITS OF PRECISION FOR TEST RESULTS	
Mix Property	**Limits of Precision**
12.5 mm Sieve (Types P 57 & FC-2 Mod. Only)	± 6.0%
9.5 mm Sieve (Excluding Type P 57)	± 5.0%
4.75 mm Sieve	± 5.0%
2.36 mm Sieve	± 5.0%
0.075 mm Sieve	± 2.0%
Asphalt Binder Content	± 0.5%
TSR (Ultra-thin HMA Only)	± 15.0%

MILLED RUMBLE STRIPS (Concrete Shoulder):
(1-24-14) SPI 07-14

Description

Mill rumble strips on Portland cement concrete shoulders in accordance with *Roadway Standard Drawing* No. 720.01, the plans, and as directed by the Engineer.

Equipment

Provide equipment consisting of a rotary type cutting head with an outside diameter of no more than 24" and no less than 16" long. Provide a cutting head that has the cutting tips arranged in such a pattern as to provide a relatively smooth cut as well as a cutting head that is on its own independent suspension from that of the power unit to allow the tool to self align with the slope of the shoulder and/or any irregularities in the shoulder surface. Provide a cutting tool equipped with guides to establish consistent alignment and uniformity of each cut in relation to the roadway.

Construction Methods

Demonstrate the ability to achieve desired surface inside each depression without tearing or snagging the Portland cement concrete prior to beginning the work.

Provide rumble strips that have finished dimensions and pattern in accordance with *Roadway Standard Drawing* No. 720.01.

Material resulting from the operation shall become the property of the Contractor. Remove and dispose of material in accordance with Section 802 of the *Standard Specifications*.

Remove all equipment to a location where it does not present a traffic hazard and clean pavement before reopening work area to traffic.

Measurement and Payment

Milled Rumble Strips (Concrete Shoulder) will be measured and paid as the actual number of linear feet of shoulder, measured longitudinally along the surface of each shoulder, where rumble strips have been constructed and accepted.

Payment will be made under:

Pay Item	Pay Unit
Milled Rumble Strips (Concrete Shoulder)	Linear Foot

DIAMOND GRINDING CONCRETE PAVEMENT:

(4-15-08) (Rev 07-18-13) SPI 7-9

Description

Perform the work covered by this provision including but not limited to diamond grinding and regrinding concrete pavement to meet final surface testing requirements detailed in Article 710-7, selecting diamond tipped saw blades and configuration of cutting head; continual removal of residual slurry from pavement and disposal; furnishing all labor, materials, supplies, tools, equipment and incidentals as necessary. Perform this work at locations indicated in the plans or as directed by the Engineer.

Equipment

Use equipment with diamond tipped saw blades gang mounted on a power driven self propelled machine with a minimum wheel base length of 15 feet (4.6 meter) that is specifically designed to smooth and texture Portland Cement Concrete pavement. Utilize equipment that does not cause ravels; aggregate fracture; spalls or disturbance to the longitudinal or transverse joints; or damage and/or strain to the underlying surface of the pavement. Should any of the above problems occur immediately suspend operations.

Provide a minimum 3 feet (1 meter) wide grinding head with 50 (164) to 60 (200) evenly spaced grooves per foot (meter). Prior to designing the grinding head, evaluate the aggregate hardness of the concrete pavement and select the appropriate diamond size, diamond concentration and bond hardness for the individual saw blades.

Provide vacuuming equipment to continuously remove slurry residue and excess water from the pavement as part of the grinding operation. Transport slurry material off-site and dispose of this material appropriately. Do not allow the slurry material to flow into a travel lane occupied by traffic or into any drainage facility.

Method of Construction

Grind the pavement surface to a uniform appearance with a high skid resistant longitudinal corduroy type texture. Provide grooves between 0.09 (2.28mm) and 0.15 (3.81mm) inches wide with the land area between the grooves between 0.06 (1.52mm) and 0.13 (3.30mm) inches wide. Ensure a ridge peak of approximately 0.0625 inches (1.59mm) higher than the bottom of the grooves.

Begin and end diamond grinding at lines normal to the pavement centerline. Grind only in the longitudinal direction. All grooves and adjacent passes shall be parallel to each other with no variation. Completely lap adjacent passes with no unground surface remaining between passes and no overlap of more than 1½ inches (35 mm). Adjacent passes shall be within 1/8 inch (10 mm) of the same height as measured with a 3 foot (0.914 meter) straightedge. Maintain positive cross-slope drainage for the duration of the grinding operation.

Grind all travel lanes to include auxiliary lanes, ramps and loops with not less than 98 percent of the specified surface being textured by grinding. Grinding of the bridge decks and concrete shoulders will not be required. Remove a minimum 0.0625 inches at all locations except dips. Extra grinding to eliminate minor depressions is not required. It is anticipated that extra grinding will be required on the high side of existing faults in the pavement. There shall be no ridge between lanes. In a separate operation, transition the grinding of any remaining ridges greater than 1/8 inch (10mm) in height on the outside edge next to the shoulder or at a tie to an existing facility to the satisfaction of the Engineer.

Disposal of Residual Slurry

Diamond grinding slurry disposal shall be in accordance with the Statewide Permit for Land Application of Diamond Grinding Slurry (DGS), Permit No. WQ0035749 dated April 24, 2013. Submit a slurry disposal plan to the Engineer detailing method of handling and disposing of slurry from the diamond grinding operation a minimum of 60 days prior to beginning the diamond grinding operation. Engineer shall review the slurry disposal plan. Plan must be accepted prior to beginning the diamond grinding operation. DGS may also be transported beyond the project limits to an approved permitted site. No additional payment will be made for transporting this slurry material for disposal.

Other disposal options are:

(A) Concrete grinding residues (CGR) that are not liquid and otherwise not hazardous may be disposed of in a municipal solid waste landfill or utilized as an alternate daily cover (ADC). The sanitary landfill operator that requests the use of this material as ADC shall contact the N.C. Department of Environment and Natural Resources (DENR) inspector for approval. The definition of a solid, for solid waste disposal purposes, is a material that passes a Paint Filter test. CGR's may be eligible for disposal or use as ADC in an unlined sanitary landfill or a construction and demolition debris landfill. If CGR is disposed in an unlined-landfill, the Contractor shall submit samples of the material to a certified laboratory to verify that the CGR does not exceed Resource Conservation and Recovery Act (RCRA) regulatory limits for the following metals: Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium and Silver.

(B) Dewatered CGR's may be beneficially reused within the DOT project boundary or areas under DOT control at agronomic rates suitable for the establishment of vegetation. Dewatered CGR's that meet the solid waste definition for inert debris, North Carolina General Statute 130A-290(a)(14), may also be used within the roadbed at rates approved by the Engineer for soil modification purposes. If CGR is disposed as beneficial reuse within DOT project boundaries, the Contractor shall submit samples of the material to a certified laboratory to verify that the CGR does not exceed RCRA regulatory limits for the following metals: Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium and Silver.

Measurement and Payment

The quantity of Diamond Grinding PCC Pavement to be paid for at the contract unit price will be the actual number of square yards of pavement diamond ground in accordance with the requirements of this provision. In measuring this quantity, the length will be the actual length diamond ground measured along the pavement surface. The width will be the width required by the plans or directed, measured along the pavement surface. No separate payment will be made for any overlapping.

Payment is full compensation for the work and includes but is not limited to grinding, disposal of slurry, furnishing all materials, equipment, labor and all incidentals necessary to complete the work satisfactorily.

Payment will be made under:

Pay Item	Pay Unit
Diamond Grinding PCC Pavement	Square Yard

MODIFIED CONCRETE FLUME WITH CONCRETE OUTLET:

(3-19-96)(Rev. 6-17-08) 825 SP8 R10

At locations shown in the plans, construct concrete flumes, concrete curb, and apron in accordance with the details in the plans. Use materials meeting the requirements of Section 825 of the *2012 Standard Specifications* except that the concrete must be Class B or of higher compressive strength.

Each concrete flume, concrete curb, and apron completed and accepted will be paid at the contract unit price per each for *Modified Concrete Flume*. Such price and payment will be full compensation for all materials, labor, equipment, tools, removing and disposing of the temporary slope drains, and any other incidentals necessary to complete the work satisfactorily.

The concrete curb and ditch outside the pay limits of the apron will be measured and paid in accordance with Section 846 and 850 of the *2012 Standard Specifications*.

Payment will be made under:

Pay Item	Pay Unit
Modified Concrete Flume	Each

GUARDRAIL ANCHOR UNITS, TYPE M-350:

(4-20-04) (Rev. 1-17-12) 862 SP8 R60

Description

Furnish and install guardrail anchor units in accordance with the details in the plans, the applicable requirements of Section 862 of the *2012 Standard Specifications*, and at locations shown in the plans.

Materials

The Contractor may, at his option, furnish any one of the following guardrail anchor units or approved equal.

The guardrail anchor unit (SRT-350) as manufactured by:

Trinity Industries, Inc.
2525 N. Stemmons Freeway
Dallas, Texas 75207
Telephone: 800-644-7976

The guardrail anchor unit (FLEAT) as manufactured by:

Road Systems, Inc.
3616 Old Howard County Airport
Big Springs, Texas 79720
Telephone: 915-263-2435

The guardrail anchor unit (REGENT) as manufactured by:

Energy Absorption Systems, Inc.
One East Wacker Drive
Chicago, Illinois 60601-2076
Telephone: 888-32-ENERGY

Prior to installation the Contractor shall submit to the Engineer:

(A) FHWA acceptance letter for each guardrail anchor unit certifying it meets the requirements of NCHRP Report 350, Test Level 3, in accordance with Article 106-2 of the *2012 Standard Specifications*.

(B) Certified working drawings and assembling instructions from the manufacturer for each guardrail anchor unit in accordance with Article 105-2 of the *2012 Standard Specifications*.

No modifications shall be made to the guardrail anchor unit without the express written permission from the manufacturer. Perform installation in accordance with the details in the plans, and details and assembling instructions furnished by the manufacturer.

Construction Methods

Guardrail end delineation shall be required on all approach and trailing end sections for both temporary and permanent installations. Guardrail end delineation consists of yellow reflective sheeting applied to the entire end section of the guardrail in accordance with Article 1088-3 of the *2012 Standard Specifications* and is incidental to the cost of the guardrail anchor unit.

Measurement and Payment

Measurement and payment will be made in accordance with Article 862-6 of the *2012 Standard Specifications*.

Payment will be made under:

Pay Item	Pay Unit
Guardrail Anchor Units, Type M-350	Each

GUARDRAIL ANCHOR UNITS, TYPE 350:

(4-20-04) (Rev. 8-16-11) 862 SP8 R65

Description

Furnish and install guardrail anchor units in accordance with the details in the plans, the applicable requirements of Section 862 of the *2012 Standard Specifications*, and at locations shown in the plans.

Materials

The Contractor may at his option, furnish any one of the guardrail anchor units or approved equal.

Guardrail anchor unit (ET-Plus) as manufactured by:

Trinity Industries, Inc.
2525 N. Stemmons Freeway
Dallas, Texas 75207
Telephone: 800-644-7976

The guardrail anchor unit (SKT 350) as manufactured by:

Road Systems, Inc.
3616 Old Howard County Airport
Big Spring, Texas 79720
Telephone: 915-263-2435

Prior to installation the Contractor shall submit to the Engineer:

(A) FHWA acceptance letter for each guardrail anchor unit certifying it meets the requirements of NCHRP Report 350, Test Level 3, in accordance with Article 106-2 of the *2012 Standard Specifications*.

(B) Certified working drawings and assembling instructions from the manufacturer for each guardrail anchor unit in accordance with Article 105-2 of the *2012 Standard Specifications*.

No modifications shall be made to the guardrail anchor unit without the express written permission from the manufacturer. Perform installation in accordance with the details in the plans, and details and assembling instructions furnished by the manufacturer.

Construction Methods

Guardrail end delineation is required on all approach and trailing end sections for both temporary and permanent installations. Guardrail end delineation consists of yellow reflective sheeting applied to the entire end section of the guardrail in accordance with Article 1088-3 of the *2012 Standard Specifications* and is incidental to the cost of the guardrail anchor unit.

Measurement and Payment

Measurement and payment will be made in accordance with Article 862-6 of the *2012 Standard Specifications*.

Payment will be made under:

Pay Item	Pay Unit
Guardrail Anchor Units, Type 350	Each

IMPACT ATTENUATOR UNITS, TYPE 350:

(4-20-04) (Rev. 1-17-12) SP8 R75

Description

Furnish and install impact attenuator units and any components necessary to connect the impact attenuator units in accordance with the manufacturer's requirement, the details in the plans and at locations shown in the plans.

Materials

The Contractor may at his option, furnish any one of the **NON-GATING** impact attenuator units or approved equal:

The impact attenuator unit (QUADGUARD) as manufactured by:

Energy Absorption Systems, Inc.
One East Wacker Drive
Chicago, Illinois 60601-2076
Telephone: 312-467-6750

The impact attenuator unit (TRACC) as manufactured by:

Trinity Industries, Inc.
2525 N. Stemmons Freeway
Dallas, Texas 75207
Telephone: 800-644-7976

The Contractor may at his option, furnish any one of the **GATING** impact attenuator units or approved equal:

The impact attenuator unit (BRAKEMASTER) as manufactured by:

Energy Absorption Systems, Inc.
One East Wacker Drive
Chicago, Illinois 60601-2076
Telephone: 312-467-6750

The impact attenuator unit (CAT) as manufactured by:

Trinity Industries, Inc.
2525 N. Stemmons Freeway
Dallas, Texas 75207
Telephone: 800-644-7976

Prior to installation the Contractor shall submit to the Engineer:

(A) FHWA acceptance letter for each impact attenuator unit certifying it meets the requirements of NCHRP Report 350, Test Level 3, in accordance with Article 106-2 of the *2012 Standard Specifications*.

(B) Certified working drawings and assembling instructions from the manufacturer for each impact attenuator unit in accordance with Article 105-2 of the *2012 Standard Specifications*.

No modifications shall be made to the impact attenuator unit without the express written permission from the manufacturer. Perform installation in accordance with the details in the plans, and details and assembling instructions furnished by the manufacturer.

Construction Methods

If the median width is 40 feet or less, the Contractor shall supply one of the NON-GATING Impact Attenuator Units listed in the Materials Section herein.

If the median width is greater than 40 feet, the Contractor may use any of the GATING or NON-GATING Impact Attenuator Units listed in the Materials Section herein.

Measurement and Payment

Impact Attenuator Unit, Type 350 will be measured and paid at the contract unit price per each. Such prices and payment will be full compensation for all work covered by this provision including, but not limited to, furnishing, installing and all incidentals necessary to complete the work.

Payment will be made under:

Pay Item	**Pay Unit**
Impact Attenuator Units, Type 350	Each

PREFORMED SCOUR HOLE WITH LEVEL SPREADER APRON:

(10-15-02) (Rev. 10-20-09) 410 SP8 R105

Description

Construct and maintain preformed scour holes with spreader aprons at the locations shown on the plans and in accordance with the details in the plans. Work includes excavation, shaping and maintaining the hole and apron, furnishing and placing filter fabric, rip rap (class as specified in the plans) and permanent soil reinforcement matting.

Materials

Item	Section
Plain Rip Rap	1042
Filter Fabric	1056

The permanent soil reinforcement matting shall be permanent erosion control reinforcement mat and shall be constructed of synthetic or a combination of coconut and synthetic fibers evenly distributed throughout the mat between a bottom UV stabilized netting and a heavy duty UV stabilized top net. The matting shall be stitched together with UV stabilized polypropylene thread to form a permanent three dimensional structure. The mat shall have the following minimum physical properties:

Property	Test Method	Value Unit
Light Penetration	ASTM D6567	9 %
Thickness	ASTM D6525	0.40 in
Mass Per Unit Area	ASTM D6566	0.55 lb/sy
Tensile Strength	ASTM D6818	385 lb/ft
Elongation (Maximum)	ASTM D6818	49 %
Resiliency	ASTM D1777	>70 %
UV Stability *	ASTM 4355	≥80 %
Porosity (Permanent Net)	ECTC Guidelines	≥85 %
Maximum Permissible Shear Stress (Vegetated)	Performance Bench Test	≥8.0 lb/ft^2
Maximum Allowable Velocity (Vegetated)	Performance Bench Test	≥16.0 ft/s

*ASTM D1682 Tensile Strength and % strength retention of material after 1,000 hours of exposure.

Submit a certification (Type 1, 2, or 3) from the manufacturer showing:

(A) The chemical and physical properties of the mat used, and
(B) Conformance of the mat with this specification.

Construction Methods

All areas to be protected with the mat shall be brought to final grade and seeded in accordance with Section 1660 of the *2012 Standard Specifications*. The surface of the soil shall be smooth, firm, stable and free of rocks, clods, roots or other obstructions that would prevent the mat from lying in direct contact with the soil surface. Areas where the mat is to be placed will not need to be mulched.

Measurement and Payment

Preformed Scour Holes with Level Spreader Aprons will be measured and paid as the actual number incorporated into the completed and accepted work. Such price and payment will be full compensation for all work covered by this provision.

Payment will be made under:

Pay Item	Pay Unit
Preformed Scour Hole with Level Spreader Aprons	Each

DETECTABLE WARNINGS FOR PROPOSED CURB RAMPS:

(6-15-10) (Rev. 8-16-11) 848 SP8 R126

Description

Construct detectable warnings consisting of integrated raised truncated domes on proposed concrete curb ramps in accordance with the *2012 Standard Specifications,* plan details, the requirements of the *28 CFR Part 36 ADA Standards for Accessible Design* and this provision.

Materials

Detectable warning for proposed curb ramps shall consist of integrated raised truncated domes. The description, size and spacing shall conform to Section 848 of the *2012 Standard Specifications.*

Use material for detectable warning systems as shown herein. Material and coating specifications must be stated in the Manufacturers Type 3 Certification and all Detectable Warning systems must be on the NCDOT Approved Products List.

Install detectable warnings created from one of the following materials: precast concrete blocks or bricks, clay paving brick, gray or ductile iron castings, mild steel, stainless steel, and engineered plastics, rubber or composite tile. Only one material type for detectable warning will be permitted per project, unless otherwise approved by the Engineer.

(A) Detectable Warnings shall consist of a base with integrated raised truncated domes, and when constructed of precast concrete they shall conform to the material requirements of Article 848-2 of the *2012 Standard Specifications.*

(B) Detectable Warnings shall consist of a base with integrated raised truncated domes, and may be comprised of other materials including, but not limited, to clay paving brick, gray iron or ductile iron castings, mild steel, stainless steel, and engineered plastics, rubber or composite tile, which are cast into the concrete of the curb ramps. The material shall have an integral color throughout the thickness of the material. The detectable warning shall include fasteners or anchors for attachment in the concrete and shall be furnished as a system from the manufacturer.

Prior to installation, the Contractor shall submit to the Engineer assembling instructions from the manufacturer for each type of system used in accordance with Article 105-2 of the *2012 Standard Specifications*. The system shall be furnished as a kit containing all consumable materials and consumable tools, required for the application. They shall be capable of being affixed to or anchored in the concrete curb ramp, including green concrete (concrete that has set but not appreciably hardened). The system shall be solvent free and contain no volatile organic compounds (VOC). The static coefficient of friction shall be 0.8 or greater when measured on top of the truncated domes and when measured between the domes in accordance with ASTM C1028 (dry and wet). The system shall be resistant to deterioration due to exposure to sunlight, water, salt or adverse weather conditions and impervious to degradation by motor fuels, lubricants and antifreeze.

(C) When steel or gray iron or ductile iron casting products are provided, only products that meet the requirements of Subarticle 106-1(B) of the *2012 Standard Specifications* may be used. Submit to the Engineer a Type 6 Certification, catalog cuts and installation procedures at least 30 days prior to installation for all.

Construction Methods

(A) Prior to placing detectable warnings in proposed concrete curb ramps, adjust the existing subgrade to the proper grade and in accordance with Article 848-3 of the *2012 Standard Specifications*.

(B) Install all detectable warning in proposed concrete curb ramps in accordance with the manufacturer's recommendations.

Measurement and Payment

Detectable Warnings installed for construction of proposed curb ramps will not be paid for separately. Such payment will be included in the price bid for *Concrete Curb Ramps*.

FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES:

(1-17-12) (Rev. 5-21-13) 9, 14, 17 SP9 R05

Description

Foundations for metal poles include foundations for signals, cameras, overhead and dynamic message signs (DMS) and high mount and low level light standards supported by metal poles or upright trusses. Foundations consist of footings with pedestals and drilled piers with or without grade beams or wings. Anchor rod assemblies consist of anchor rods (also called anchor bolts)

with nuts and washers on the exposed ends of rods and nuts and a plate or washers on the other ends of rods embedded in the foundation.

Construct concrete foundations with the required resistances and dimensions and install anchor rod assemblies in accordance with the contract and accepted submittals. Construct drilled piers consisting of cast-in-place reinforced concrete cylindrical sections in excavated holes. Provide temporary casings or polymer slurry as needed to stabilize drilled pier excavations. Use a prequalified Drilled Pier Contractor to construct drilled piers for metal poles. Define "excavation" and "hole" as a drilled pier excavation and "pier" as a drilled pier.

This provision does not apply to materials and anchor rod assemblies for standard foundations for low level light standards. See Section 1405 of the *2012 Standard Specifications* and Standard Drawing No. 1405.01 of the *2012 Roadway Standard Drawings* for materials and anchor rod assemblies for standard foundations. For construction of standard foundations for low level light standards, standard foundations are considered footings in this provision.

This provision does not apply to foundations for signal pedestals; see Section 1743 of the *2012 Standard Specifications* and Standard Drawing No. 1743.01 of the *2012 Roadway Standard Drawings*.

Materials

Refer to the *2012 Standard Specifications*.

Item	**Section**
Conduit	1091-3
Grout, Nonshrink	1003
Polymer Slurry	411-2(B)
Portland Cement Concrete	1000
Reinforcing Steel	1070
Rollers and Chairs	411-2(C)
Temporary Casings	411-2(A)

Provide Type 3 material certifications in accordance with Article 106-3 of the *2012 Standard Specifications* for conduit, rollers, chairs and anchor rod assemblies. Store steel materials on blocking at least 12" above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Load, transport, unload and store foundation and anchor rod assembly materials so materials are kept clean and free of damage. Bent, damaged or defective materials will be rejected.

Use conduit type in accordance with the contract. Use Class A concrete for footings and pedestals, Class Drilled Pier concrete for drilled piers and Class AA concrete for grade beams and wings including portions of drilled piers above bottom of wings elevations. Corrugated temporary casings may be accepted at the discretion of the Engineer. A list of approved polymer slurry products is available from:
connect.ncdot.gov/resources/Geological/Pages/Products.aspx

Provide anchor rod assemblies in accordance with the contract consisting of the following:

(A) Straight anchor rods,

(B) Heavy hex top and leveling nuts and flat washers on exposed ends of rods, and

(C) Nuts and either flat plates or washers on the other ends of anchor rods embedded in foundations.

Do not use lock washers. Use steel anchor rods, nuts and washers that meet ASTM F1554 for Grade 55 rods and Grade A nuts. Use steel plates and washers embedded in concrete with a thickness of at least 1/4". Galvanize anchor rods and exposed nuts and washers in accordance with Article 1076-4 of the *2012 Standard Specifications*. It is not necessary to galvanize nuts, plates and washers embedded in concrete.

Construction Methods

Install the required size and number of conduits in foundations in accordance with the plans and accepted submittals. Construct top of piers, footings, pedestals, grade beams and wings flat, level and within 1" of elevations shown in the plans or approved by the Engineer. Provide an Ordinary Surface finish in accordance with Subarticle 825-6(B) of the *2012 Standard Specifications* for portions of foundations exposed above finished grade. Do not remove anchor bolt templates or pedestal or grade beam forms or erect metal poles or upright trusses onto foundations until concrete attains a compressive strength of at least 3,000 psi.

(A) Drilled Piers

Before starting drilled pier construction, hold a predrill meeting to discuss the installation, monitoring and inspection of the drilled piers. Schedule this meeting after the Drilled Pier Contractor has mobilized to the site. The Resident or Division Traffic Engineer, Contractor and Drilled Pier Contractor Superintendent will attend this predrill meeting.

Do not excavate holes, install piles or allow equipment wheel loads or vibrations within 20 ft of completed piers until 16 hours after Drilled Pier concrete reaches initial set.

Check for correct drilled pier alignment and location before beginning drilling. Check plumbness of holes frequently during drilling.

Construct drilled piers with the minimum required diameters shown in the plans. Install piers with tip elevations no higher than shown in the plans or approved by the Engineer.

Excavate holes with equipment of the sizes required to construct drilled piers. Depending on the subsurface conditions encountered, drilling through rock and boulders may be required. Do not use blasting for drilled pier excavations.

Contain and dispose of drilling spoils and waste concrete as directed and in accordance with Section 802 of the *2012 Standard Specifications*. Drilling spoils consist of all materials and fluids removed from excavations.

If unstable, caving or sloughing materials are anticipated or encountered, stabilize holes with temporary casings and/or polymer slurry. Do not use telescoping temporary casings. If it becomes necessary to replace a temporary casing during drilling, backfill the excavation, insert a larger casing around the casing to be replaced or stabilize the excavation with polymer slurry before removing the temporary casing.

If temporary casings become stuck or the Contractor proposes leaving casings in place, temporary casings should be installed against undisturbed material. Unless otherwise approved, do not leave temporary casings in place for mast arm poles and cantilever signs. The Engineer will determine if casings may remain in place. If the Contractor proposes leaving temporary casings in place, do not begin drilling until a casing installation method is approved.

Use polymer slurry and additives to stabilize holes in accordance with the slurry manufacturer's recommendations. Provide mixing water and equipment suitable for polymer slurry. Maintain polymer slurry at all times so slurry meets Table 411-3 of the *2012 Standard Specifications* except for sand content.

Define a "sample set" as slurry samples collected from mid-height and within 2 ft of the bottom of holes. Take sample sets from excavations to test polymer slurry immediately after filling holes with slurry, at least every 4 hours thereafter and immediately before placing concrete. Do not place Drilled Pier concrete until both slurry samples from an excavation meet the required polymer slurry properties. If any slurry test results do not meet the requirements, the Engineer may suspend drilling until both samples from a sample set meet the required slurry properties.

Remove soft and loose material from bottom of holes using augers to the satisfaction of the Engineer. Assemble rebar cages and place cages and Drilled Pier concrete in accordance with Subarticle 411-4(E) of the *2012 Standard Specifications* except for the following:

(1) Inspections for tip resistance and bottom cleanliness are not required,
(2) Temporary casings may remain in place if approved, and
(3) Concrete placement may be paused near the top of pier elevations for anchor rod assembly installation and conduit placement or
(4) If applicable, concrete placement may be stopped at bottom of grade beam or wings elevations for grade beam or wing construction.

If wet placement of concrete is anticipated or encountered, do not place Drilled Pier concrete until a concrete placement procedure is approved. If applicable, temporary casings and fluids may be removed when concrete placement is paused or stopped in accordance with the exceptions above provided holes are stable. Remove contaminated

concrete from exposed Drilled Pier concrete after removing casings and fluids. If holes are unstable, do not remove temporary casings until a procedure for placing anchor rod assemblies and conduit or constructing grade beams or wings is approved.

Use collars to extend drilled piers above finished grade. Remove collars after Drilled Pier concrete sets and round top edges of piers.

If drilled piers are questionable, pile integrity testing (PIT) and further investigation may be required in accordance with Article 411-5 of the *2012 Standard Specifications*. A drilled pier will be considered defective in accordance with Subarticle 411-5(D) of the *2012 Standard Specifications* and drilled pier acceptance is based in part on the criteria in Article 411-6 of the *2012 Standard Specifications* except for the top of pier tolerances in Subarticle 411-6(C) of the *2012 Standard Specifications*.

If a drilled pier is under further investigation, do not grout core holes, backfill around the pier or perform any work on the drilled pier until the Engineer accepts the pier. If the drilled pier is accepted, dewater and grout core holes and backfill around the pier with approved material to finished grade. If the Engineer determines a pier is unacceptable, remediation is required in accordance with Article 411-6 of the *2012 Standard Specifications*. No extension of completion date or time will be allowed for remediation of unacceptable drilled piers or post repair testing.

Permanently embed a plate in or mark top of piers with the pier diameter and depth, size and number of vertical reinforcing bars and the minimum compressive strength of the concrete mix at 28 days.

(B) Footings, Pedestals, Grade Beams and Wings

Excavate as necessary for footings, grade beams and wings in accordance with the plans, accepted submittals and Section 410 of the *2012 Standard Specifications*. If unstable, caving or sloughing materials are anticipated or encountered, shore foundation excavations as needed with an approved method. Notify the Engineer when foundation excavation is complete. Do not place concrete or reinforcing steel until excavation dimensions and foundation material are approved.

Construct cast-in-place reinforced concrete footings, pedestals, grade beams and wings with the dimensions shown in the plans and in accordance with Section 825 of the *2012 Standard Specifications*. Use forms to construct portions of pedestals and grade beams protruding above finished grade. Provide a chamfer with a 3/4" horizontal width for pedestal and grade beam edges exposed above finished grade. Backfill and fill in accordance with Article 410-8 of the *2012 Standard Specifications*. Proper compaction around footings and wings is critical for foundations to resist uplift and torsion forces. Place concrete against undisturbed soil and do not use forms for standard foundations for low level light standards.

(C) Anchor Rod Assemblies

Size anchor rods for design and the required projection above top of foundations. Determine required anchor rod projections from nut, washer and base plate thicknesses, the protrusion of 3 to 5 anchor rod threads above top nuts after tightening and the distance of one nut thickness between top of foundations and bottom of leveling nuts.

Protect anchor rod threads from damage during storage and installation of anchor rod assemblies. Before placing anchor rods in foundations, turn nuts onto and off rods past leveling nut locations. Turn nuts with the effort of one workman using an ordinary wrench without a cheater bar. Report any thread damage to the Engineer that requires extra effort to turn nuts.

Arrange anchor rods symmetrically about center of base plate locations as shown in the plans. Set anchor rod elevations based on required projections above top of foundations. Securely brace and hold rods in the correct position, orientation and alignment with a steel template. Do not weld to reinforcing steel, temporary casings or anchor rods.

Install top and leveling (bottom) nuts, washers and the base plate for each anchor rod assembly in accordance with the following procedure:

(1) Turn leveling nuts onto anchor rods to a distance of one nut thickness between the top of foundation and bottom of leveling nuts. Place washers over anchor rods on top of leveling nuts.
(2) Determine if nuts are level using a flat rigid template on top of washers. If necessary, lower leveling nuts to level the template in all directions or if applicable, lower nuts to tilt the template so the metal pole or upright truss will lean as shown in the plans. If leveling nuts and washers are not in full contact with the template, replace washers with galvanized beveled washers.
(3) Verify the distance between the foundation and leveling nuts is no more than one nut thickness.
(4) Place base plate with metal pole or upright truss over anchor rods on top of washers. High mount luminaires may be attached before erecting metal poles but do not attach cables, mast arms or trusses to metal poles or upright trusses at this time.
(5) Place washers over anchor rods on top of base plate. Lubricate top nut bearing surfaces and exposed anchor rod threads above washers with beeswax, paraffin or other approved lubricant.
(6) Turn top nuts onto anchor rods. If nuts are not in full contact with washers or washers are not in full contact with the base plate, replace washers with galvanized beveled washers.
(7) Tighten top nuts to snug-tight with the full effort of one workman using a 12" wrench. Do not tighten any nut all at once. Turn top nuts in increments. Follow a star pattern cycling through each nut at least twice.
(8) Repeat (7) for leveling nuts.
(9) Replace washers above and below the base plate with galvanized beveled washers if the slope of any base plate face exceeds 1:20 (5%), any washer is not in firm

contact with the base plate or any nut is not in firm contact with a washer. If any washers are replaced, repeat (7) and (8).

(10) With top and leveling nuts snug-tight, mark each top nut on a corner at the intersection of 2 flats and a corresponding reference mark on the base plate. Mark top nuts and base plate with ink or paint that is not water-soluble. Use the turn-of-nut method for pretensioning. Do not pretension any nut all at once. Turn top nuts in increments for a total turn that meets the following nut rotation requirements:

NUT ROTATION REQUIREMENTS (Turn-of-Nut Pretensioning Method)	
Anchor Rod Diameter, inch	**Requirement**
≤ 1 1/2	1/3 turn (2 flats)
> 1 1/2	1/6 turn (1 flat)

Follow a star pattern cycling through each top nut at least twice.

(11) Ensure nuts, washers and base plate are in firm contact with each other for each anchor rod. Cables, mast arms and trusses may now be attached to metal poles and upright trusses.

(12) Between 4 and 14 days after pretensioning top nuts, use a torque wrench calibrated within the last 12 months to check nuts in the presence of the Engineer. Completely erect mast arm poles and cantilever signs and attach any hardware before checking top nuts for these structures. Check that top nuts meet the following torque requirements:

TORQUE REQUIREMENTS	
Anchor Rod Diameter, inch	**Requirement, ft-lb**
7/8	180
1	270
1 1/8	380
1 1/4	420
≥ 1 1/2	600

If necessary, retighten top nuts in the presence of the Engineer with a calibrated torque wrench to within ± 10 ft-lb of the required torque. Do not overtighten top nuts.

(13) Do not grout under base plate.

Measurement and Payment

Foundations and anchor rod assemblies for metal poles and upright trusses will be measured and paid for elsewhere in the contract.

No payment will be made for temporary casings that remain in drilled pier excavations. No payment will be made for PIT. No payment will be made for further investigation of defective piers. Further investigation of piers that are not defective will be paid as extra work in accordance with Article 104-7 of the *2012 Standard Specifications*. No payment will be made for remediation of unacceptable drilled piers or post repair testing.

MATERIALS:

(2-21-12) (Rev. 5-20-14) 1000, 1002, 1005, 1024, 1050, 1056, 1074, 1078, 1080, 1081, 1086, 1084, 1087, 1092 SP10 R01

Revise the *2012 Standard Specifications* as follows:

Page 10-1, Article 1000-1, DESCRIPTION, lines 9-10, replace the last sentence of the first paragraph with the following:

Type IL, IP, IS or IT blended cement may be used instead of Portland cement.

Page 10-1, Article 1000-1, DESCRIPTION, line 14, add the following:

Use materials which do not produce a mottled appearance through rusting or other staining of the finished concrete surface.

Page 10-5, Table 1000-1, REQUIREMENTS FOR CONCRETE, replace with the following:

TABLE 1000-1
REQUIREMENTS FOR CONCRETE

Class of Concrete	Min. Comp. Strength at 28 days	Maximum Water-Cement Ratio				Consistency Max. Slump		Cement Content			
		Air-Entrained Concrete		Non Air-Entrained Concrete		Vibrated	Non-Vibrated	Vibrated		Non- Vibrated	
		Rounded Aggregate	Angular Aggre-gate	Rounded Aggregate	Angular Aggre-gate			Min.	Max.	Min.	Max.
Units	*psi*					*inch*	*inch*	*lb/cy*	*lb/cy*	*lb/cy*	*lb/cy*
AA	4,500	0.381	0.426	-	-	3.5	-	639	715	-	-
AA Slip Form	4,500	0.381	0.426	-	-	1.5	-	639	715	-	-
Drilled Pier	4,500	-	-	0.450	0.450	-	5-7 dry 7-9 wet	-	-	640	800
A	3,000	0.488	0.532	0.550	0.594	3.5	4	564	-	602	-
B	2,500	0.488	0.567	0.559	0.630	2.5	4	508	-	545	-
B Slip Formed	2,500	0.488	0.567	-	-	1.5	-	508	-	-	-
Sand Light-weight	4,500	-	0.420	-	-	4	-	715	-	-	-
Latex Modified	3,000 7 day	0.400	0.400	-	-	6	-	658	-	-	-
Flowable Fill excavatable	150 max. at 56 days	as needed	as needed	as needed	as needed	-	Flow-able	-	-	40	100
Flowable Fill non-excavatable	125	as needed	as needed	as needed	as needed	-	Flow-able	-	-	100	as needed
Pavement	4,500 design, field 650 flexural, design only	0.559	0.559	-	-	1.5 slip form 3.0 hand place	-	526	-	-	-
Precast	See Table 1077-1	as needed	as needed	-	-	6	as needed	as needed	as needed	as needed	as needed
Prestress	per contract	See Table 1078-1	See Table 1078-1	-	-	8	-	564	as needed	-	-

Page 10-1, Article 1000-2, MATERIALS, line 16; Page 10-8, Subarticle 1000-7(A), MATERIALS, line 8; and Page 10-18, Article 1002-2, MATERIALS, line 9, add the following to the table of item references:

Item	Section
Type IL Blended Cement	1024-1

Page 10-23, Table 1005-1, AGGREGATE GRADATION-COARSE AGGREGATE, replace with the following:

TABLE 1005-1
AGGREGATE GRADATION - COARSE AGGREGATE

Std. Size #	2"	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#10	#16	#40	#200	Remarks
	Percentage of Total by Weight Passing												
4	100	90-100	20-55	0-15	-	0-5	-	-	-	-	-	A	Asphalt Plant Mix
467M	100	95-100	-	35-70	-	0-30	0-5	-	-	-	-	A	Asphalt Plant Mix
5	-	100	90-100	20-55	0-10	0-5	-	-	-	-	-	A	AST, Sediment Control Stone
57	-	100	95-100	-	25-60	-	0-10	0-5	-	-	-	A	AST, Str. Concrete, Shoulder Drain, Sediment Control Stone
57M	-	100	95-100	-	25-45	-	0-10	0-5	-	-	-	A	AST, Concrete Pavement
6M	-	-	100	90-100	20-55	0-20	0-8	-	-	-	-	A	AST
67	-	-	100	90-100	-	20-55	0-10	0-5	-	-	-	A	AST, Str. Concrete, Asphalt Plant Mix
78M	-	-	-	100	98-100	75-100	20-45	0-15	-	-	-	A	Asphalt Plant Mix, AST, Str. Conc, Weep Hole Drains
14M	-	-	-	-	-	100	35-70	5-20	-	0-8	-	A	Asphalt Plant Mix, AST, Weep Hole Drains, Str. Concrete
9	-	-	-	-	-	100	85-100	10-40	-	0-10	-	A	AST
ABC	-	100	75-97	-	55-80	-	35-55	-	25-45	-	14-30	4-12[B]	Aggregate Base Course, Aggregate Stabilization
ABC (M)	-	100	75-100	-	45-79	-	20-40	-	0-25	-	-	0-12[B]	Maintenance Stabilization
Light-weight[C]	-	-	-	-	100	80-100	5-40	0-20	-	0-10	-	0-2.5	AST

A. See Subarticle 1005-4(A).
B. See Subarticle 1005-4(B).
C. For Lightweight Aggregate used in Structural Concrete, see Subarticle 1014-2(E)(6).

Page 10-46, Article 1024-1, PORTLAND CEMENT, line 33, add the following as the ninth paragraph:

Use Type IL blended cement that meets AASHTO M 240, except that the limestone content is limited to between 5 and 12% by weight and the constituents shall be interground. Class F fly ash can replace a portion of Type IL blended cement and shall be replaced as outlined in Subarticle 1000-4(I) for Portland cement. For mixes that contain cement with alkali content

between 0.6% and 1.0% and for mixes that contain a reactive aggregate documented by the Department, use a pozzolan in the amount shown in Table 1024-1.

Page 10-65, Article 1050-1, GENERAL, line 41, replace the first sentence with the following:

All fencing material and accessories shall meet Section 106.

Page 10-73, Article 1056-1 DESCRIPTION, lines 7-8, delete the first sentence of the second paragraph and replace with the following:

Use geotextile fabrics that are on the NCDOT Approved Products List.

Page 10-73, Article 1056-2 HANDLING AND STORING, line 17, replace "mechanically stabilized earth (MSE) wall faces" with "temporary wall faces".

Page 10-74, TABLE 1056-1 GEOTEXTILE REQUIREMENTS, replace table with the following:

TABLE 1056-1
GEOTEXTILE REQUIREMENTS

Property	**Requirement (MARV[A])**					**Test Method**
	Type 1	**Type 2**	**Type 3[B]**	**Type 4**	**Type 5[C]**	
Typical Application	*Shoulder Drains*	*Under Rip Rap*	*Temporary Silt Fence*	*Soil Stabilization*	*Temporary Walls*	
Elongation (MD & CD)	≥ 50%	≥ 50%	≤ 25%	< 50%	< 50%	ASTM D4632
Grab Strength (MD & CD)	Table 1[D], Class 3	Table 1[D], Class 1	100 lb	Table 1[D], Class 3	-	ASTM D4632
Tear Strength (MD & CD)			-		-	ASTM D4533
Puncture Strength			-		-	ASTM D6241
Ultimate Tensile Strength (MD & CD)	-	-	-	-	2,400 lb/ft (unless required otherwise in the contract)	ASTM D4595
Permittivity	Table 2[D], 15% to 50% *in Situ* Soil Passing No. 200[E]		Table 7[D]	Table 5[D]	0.20 sec^{-1}	ASTM D4491
Apparent Opening Size					No. 30[E]	ASTM D4751
UV Stability (Retained Strength)					70%	ASTM D4355

A. MARV does not apply to elongation
B. Minimum roll width of 36" required
C. Minimum roll width of 13 ft required
D. AASHTO M 288
E. US Sieve No. per AASHTO M 92

Page 10-115, Subarticle 1074-7(B), Gray Iron Castings, lines 10-11, replace with the first two sentences with the following:

Supply gray iron castings meeting all facets of AASHTO M 306 excluding proof load. Proof load testing will only be required for new casting designs during the design process, and conformance to M306 loading (40,000 lbs.) will be required only when noted on the design documents.

Page 10-126, Table 1078-1, REQUIREMENTS FOR CONCRETE, replace with the following:

TABLE 1078-1
REQUIREMENTS FOR CONCRETE

Property	28 Day Design Compressive Strength 6,000 psi or less	28 Day Design Compressive Strength greater than 6,000 psi
Maximum Water/Cementitious Material Ratio	0.45	0.40
Maximum Slump without HRWR	3.5"	3.5"
Maximum Slump with HRWR	8"	8"
Air Content (upon discharge into forms)	5 + 2%	5 + 2%

Page 10-151, Article 1080-4 Inspection and Sampling, lines 18-22, replace (B), (C) and (D) with the following:

(B) At least 3 panels prepared as specified in 5.5.10 of AASHTO M 300, Bullet Hole Immersion Test.

(C) At least 3 panels of 4"x6"x1/4" for the Elcometer Adhesion Pull Off Test, ASTM D4541.

(D) A certified test report from an approved independent testing laboratory for the Salt Fog Resistance Test, Cyclic Weathering Resistance Test, and Bullet Hole Immersion Test as specified in AASHTO M 300.

(E) A certified test report from an approved independent testing laboratory that the product has been tested for slip coefficient and meets AASHTO M253, Class B.

Page 10-161, Subarticle 1081-1(A) Classifications, lines 29-33, delete first 3 sentences of the description for Type 2 and replace with the following:

Type 2 - A low-modulus, general-purpose adhesive used in epoxy mortar repairs. It may be used to patch spalled, cracked or broken concrete where vibration, shock or expansion and contraction are expected.

Page 10-162, Subarticle 1081-1(A) Classifications, lines 4-7, delete the second and third sentences of the description for Type 3A. **Lines 16-22,** delete Types 6A, 6B and 6C.

Page 10-162, Subarticle 1081-1(B) Requirements, lines 26-30, replace the second paragraph with the following:

For epoxy resin systems used for embedding dowel bars, threaded rods, rebar, anchor bolts and other fixtures in hardened concrete, the manufacturer shall submit test results showing that the

bonding system will obtain 125% of the specified required yield strength of the fixture. Furnish certification that, for the particular bolt grade, diameter and embedment depth required, the anchor system will not fail by adhesive failure and that there is no movement of the anchor bolt. For certification and anchorage, use 3,000 psi as the minimum Portland cement concrete compressive strength used in this test. Use adhesives that meet Section 1081.

List the properties of the adhesive on the container and include density, minimum and maximum temperature application, setting time, shelf life, pot life, shear strength and compressive strength.

Page 10-163, Table 1081-1 Properties of Mixed Epoxy Resin Systems, replace table with the following:

Table 1081-1
Properties of Mixed Epoxy Resin Systems

Property	Type 1	Type 2	Type 3	Type 3A	Type 4A	Type 4B	Type 5
Viscosity-Poises at 77°F ± 2°F	Gel	10-30	25-75	Gel	40-150	40-150	1-6
Spindle No.	-	3	4	--	4	4	2
Speed (RPM)	-	20	20	--	10	10	50
Pot Life (Minutes)	20-50	30-60	20-50	5-50	40-80	40-80	20-60
Minimum Tensile Strength at 7 days (psi)	1,500	2,000	4,000	4,000	1,500	1,500	4,000
Tensile Elongation at 7 days (%)	30 min.	30 min.	2-5	2-5	5-15	5-15	2-5
Min. Compressive Strength of 2". mortar cubes at 24 hours	3,000 (Neat)	4,000-	6,000-	6,000 (Neat)	3,000	3,000	6,000
Min. Compressive Strength of 2" mortar cubes at 7 days	5,000 (Neat)	-	-	-	-	5,000	-
Maximum Water Absorption (%)	1.5	1.0	1.0	1.5	1.0	1.0	1.0
Min. Bond Strength Slant Shear Test at 14 days (psi)	1,500	1,500	2,000	2,000	1,500	1,500	1,500

Page 10-164, Subarticle 1081-1(E) Prequalification, lines 31-33, replace the second sentence of the first paragraph with the following:

Manufacturers choosing to supply material for Department jobs must submit an application through the Value Management Unit with the following information for each type and brand name:

Page 10-164, Subarticle 1081-1(E)(3), line 37, replace this subarticle with the following:

(3) Type of the material in accordance with Articles 1081-1 and 1081-4,

Page 10-165, Subarticle 1081-1(E)(6), line 1, in the first sentence of the first paragraph replace "AASHTO M 237" with "the specifications".

Page 10-165, Subarticle 1081-1(E) Prequalification, line 9-10, delete the second sentence of the last paragraph.

Page 10-165, Subarticle 1081-1(F) Acceptance, line 14, in the first sentence of the first paragraph replace "Type 1" with "Type 3".

Page 10-169, Subarticle 1081-3(G) Anchor Bolt Adhesives, delete this subarticle.

Page 10-170, Article 1081-3 Hot Bitumen, line 9, add the following at the end of Section 1081:

1081-4 EPOXY RESIN ADHESIVE FOR BONDING TRAFFIC MARKINGS

(A) General

This section covers epoxy resin adhesive for bonding traffic markers to pavement surfaces.

(B) Classification

The types of epoxies and their uses are as shown below:

Type I – Rapid Setting, High Viscosity, Epoxy Adhesive. This type of adhesive provides rapid adherence to traffic markers to the surface of pavement.

Type II – Standard Setting, High Viscosity, Epoxy Adhesive. This type of adhesive is recommended for adherence of traffic markers to pavement surfaces when rapid set is not required.

Type III – Rapid Setting, Low Viscosity, Water Resistant, Epoxy Adhesive. This type of rapid setting adhesive, due to its low viscosity, is appropriate only for use with embedded traffic markers.

Type IV – Standard Set Epoxy for Blade Deflecting-Type Plowable Markers.

(C) Requirements

Epoxies shall conform to the requirements set forth in AASHTO M 237.

(D) Prequalification

Refer to Subarticle 1081-1(E).

(E) Acceptance

Refer to Subarticle 1081-1(F).

Page 10-173, Article 1084-2 STEEL SHEET PILES, lines 37-38, replace first paragraph with the following:

Steel sheet piles detailed for permanent applications shall be hot rolled and meet ASTM A572 or ASTM A690 unless otherwise required by the plans. Steel sheet piles shall be coated as required by the plans. Galvanized sheet piles shall be coated in accordance with Section 1076. Metallized sheet piles shall be metallized in accordance to the Project Special Provision "Thermal Sprayed Coatings (Metallization)" with an 8 mil, 99.9% aluminum alloy coating and a 0.5 mil seal coating. Any portion of the metallized sheet piling encased in concrete shall receive a barrier coat. The barrier coat shall be an approved waterborne coating with a low-viscosity which readily absorbs into the pores of the aluminum thermal sprayed coating. The waterborne coating shall be applied at a spreading rate that results in a theoretical 1.5 mil dry film thickness. The manufacturer shall issue a letter of certification that the resin chemistry of the waterborne coating is compatible with the 99.9% aluminum thermal sprayed alloy and suitable for tidal water applications.

Page 10-174, Subarticle 1086-1(B)(1) Epoxy, lines 18-24, replace this subarticle with the following:

The epoxy shall meet Article 1081-4.

The 2 types of epoxy adhesive which may be used are Type I, Rapid Setting, and Type II, Standard Setting. Use Type II when the pavement temperature is above 60°F or per the manufacturer's recommendations whichever is more stringent. Use Type I when the pavement temperature is between 50°F and 60°F or per the manufacturer's recommendations whichever is more stringent. Epoxy adhesive Type I, Cold Set, may be used to attach temporary pavement markers to the pavement surface when the pavement temperature is between 32°F and 50°F or per the manufacturer's recommendations whichever is more stringent.

Page 10-175, Subarticle 1086-2(E) Epoxy Adhesives, line 27, replace "Section 1081" with "Article 1081-4".

Page 10-177, Subarticle 1086-3(E) Epoxy Adhesives, line 22, replace "Section 1081" with "Article 1081-4".

Page 10-179, Subarticle 1087-4(A) Composition, lines 39-41, replace the third paragraph with the following:

All intermixed and drop-on glass beads shall not contain more than 75 ppm arsenic or 200 ppm lead.

Page 10-180, Subarticle 1087-4(B) Physical Characteristics, line 8, replace the second paragraph with the following:

All intermixed and drop-on glass beads shall comply with NCGS § 136-30.2 and 23 USC § 109(r).

Page 10-181, Subarticle 1087-7(A) Intermixed and Drop-on Glass Beads, line 24, add the following after the first paragraph:

Use X-ray Fluorescence for the normal sampling procedure for intermixed and drop-on beads, without crushing, to check for any levels of arsenic and lead. If any arsenic or lead is detected, the sample shall be crushed and repeat the test using X-ray Fluorescence. If the X-ray Fluorescence test shows more than a LOD of 5 ppm, test the beads using United States Environmental Protection Agency Method 6010B, 6010C or 3052 for no more than 75 ppm arsenic or 200 ppm lead.

Page 10-204, Subarticle 1092-2(A) Performance and Test Requirements, replace **Table 1092-3 Minimum Coefficient of Retroreflection for NC Grade A** with the following:

TABLE 1092-3
MINIMUM COEFFICIENT OF RETROREFLECTION FOR NC GRADE A
(Candelas Per Lux Per Square Meter)

Observation Angle, degrees	Entrance Angle, degrees	White	Yellow	Green	Red	Blue	Fluorescent Yellow Green	Fluorescent Yellow
0.2	-4.0	525	395	52	95	30	420	315
0.2	30.0	215	162	22	43	10	170	130
0.5	-4.0	310	230	31	56	18	245	185
0.5	30.0	135	100	14	27	6	110	81
1.0	-4.0	**120**	60	8	16	3.6	64	48
1.0	30.0	45	34	4.5	9	2	36	27

HIGH STRENGTH CONCRETE FOR DRIVEWAYS:

(11-21-00) (Rev. 1-17-12) 848 SP10 R02(Rev)

Use high early strength concrete for driveways as directed by the Engineer. Provide high early strength concrete that meets the requirements of Article 1000-5 of the *2012 Standard Specifications*.

Measurement and payment will be in accordance with Section 848 of the *2012 Standard Specifications*.

SELECT MATERIAL, CLASS III, TYPE 3:

(1-17-12) 1016, 1044 SP10 R05

Revise the *2012 Standard Specifications* as follows:

Page 10-39, Article 1016-3, CLASS III, add the following after line 14:

Type 3 Select Material

Type 3 select material is a natural or manufactured fine aggregate material meeting the following gradation requirements and as described in Sections 1005 and 1006:

Percentage of Total by Weight Passing							
3/8"	#4	#8	#16	#30	#50	#100	#200
100	95-100	65-100	35-95	15-75	5-35	0-25	0-8

Page 10-39, Article 1016-3, CLASS III, line 15, replace "either type" with "Type 1, Type 2 or Type 3".

Page 10-62, Article 1044-1, line 36, delete the sentence and replace with the following:

Subdrain fine aggregate shall meet Class III select material, Type 1 or Type 3.

Page 10-63, Article 1044-2, line 2, delete the sentence and replace with the following:

Subdrain coarse aggregate shall meet Class V select material.

SHOULDER AND SLOPE BORROW:

(3-19-13) 1019 SP10 R10

Use soil in accordance with Section 1019 of the *2012 Standard Specifications*. Use soil consisting of loose, friable, sandy material with a PI greater than 6 and less than 25 and a pH ranging from 5.5 to 7.0.

Soil with a pH ranging from 4.0 to 5.5 will be accepted without further testing if additional limestone is provided in accordance with the application rates shown in Table 1019-1A. Soil type is identified during the soil analysis. Soils with a pH above 7.0 require acidic amendments to be added. Submit proposed acidic amendments to the Engineer for review and approval. Soils with a pH below 4.0 or that do not meet the PI requirements shall not be used.

TABLE 1019-1A
ADDITIONAL LIMESTONE APPLICATION RATE TO RAISE pH

pH TEST RESULT	Sandy Soils Additional Rate (lbs. / Acre)	Silt Loam Soils Additional Rate (lbs. / Acre)	Clay Loam Soils Additional Rate (lbs. / Acre)
4.0 - 4.4	1,000	4,000	6,000
4.5 - 4.9	500	3,000	5,000
5.0 - 5.4	NA	2,000	4,000

Note: Limestone application rates shown in this table are in addition to the standard rate of 4000 lbs. / acre required for seeding and mulching.

No direct payment will be made for providing additional lime or acidic amendments for Ph adjustment.

TEMPORARY SHORING:

(2-20-07) (Rev. 5-21-13) SP11 R02

Description

Temporary shoring includes cantilever, braced and anchored shoring and temporary mechanically stabilized earth (MSE) walls. Temporary shoring does not include trench boxes. At the Contractor's option, use any type of temporary shoring unless noted otherwise in the plans or as directed. Design and construct temporary shoring based on actual elevations and shoring dimensions in accordance with the contract and accepted submittals. Construct temporary shoring at locations shown in the plans and as directed. Temporary shoring is required to maintain traffic when a 2:1 (H:V) slope from the top of an embankment or bottom of an excavation will intersect the existing ground line less than 5 ft from the edge of pavement of an open travelway. This provision does not apply to pipe, inlet or utility installation unless noted otherwise in the plans.

Positive protection includes concrete barrier and temporary guardrail. Provide positive protection for temporary shoring at locations shown in the plans and as directed. Positive protection is required if temporary shoring is located in the clear zone in accordance with the *AASHTO Roadside Design Guide.*

(A) Cantilever and Braced Shoring

Cantilever shoring consists of steel sheet piles or H-piles with timber lagging. Braced shoring consists of sheet piles or H-piles with timber lagging and bracing such as beams, plates, walers, struts, rakers, etc. Define "piles" as sheet piles or H-piles.

(B) Anchored Shoring

Anchored shoring consists of sheet piles with walers or H-piles with timber lagging anchored with ground or helical anchors. Driven anchors may be accepted at the discretion of the Engineer. A ground anchor consists of a grouted steel bar or multi-strand tendon with an anchorage. A helical anchor consists of a lead section with a central steel shaft and at least one helix steel plate followed by extensions with only central shafts (no helixes) and an anchorage. Anchorages consist of steel bearing plates with washers and hex nuts for bars or steel wedge plates and wedges for strands. Use a prequalified Anchored Wall Contractor to install ground anchors. Define "anchors" as ground, helical or driven anchors.

(C) Temporary MSE Walls

Temporary MSE walls include temporary geosynthetic and wire walls. Define "temporary wall" as a temporary MSE wall. Define "reinforcement" as geotextile, geogrid, welded wire grid or metallic strip reinforcement.

Temporary geosynthetic walls consist of geotextile or geogrid reinforcement wrapped behind welded wire facing. Define "temporary geotextile wall" as a temporary geosynthetic wall with geotextile reinforcement and "temporary geogrid wall" as a temporary geosynthetic wall with geogrid reinforcement.

Temporary wire walls consist of welded wire grid or metallic strip reinforcement connected to welded wire facing. Define "Wire Wall Vendor" as the vendor supplying the temporary wire wall.

(D) Embedment

Define "embedment" for cantilever, braced and anchored shoring as the pile depth below the grade in front of shoring. Define "embedment" for temporary walls as the wall height below the grade in front of walls.

(E) Positive Protection

Define "unanchored or anchored portable concrete barrier" as portable concrete barrier (PCB) that meets Standard Drawing No. 1170.01 of the *2012 Roadway Standard Drawings*. Define "concrete barrier" as unanchored or anchored PCB or an approved equal. Define "temporary guardrail" as temporary steel beam guardrail that meets Standard Drawing No. 862.02 of the *2012 Roadway Standard Drawings*.

Materials

Refer to the *2012 Standard Specifications*.

Item	**Section**
Anchor Pins	1056-2
Concrete Barrier Materials	1170-2
Flowable Fill, Excavatable	1000-6
Geotextiles	1056
Neat Cement Grout	1003
Portland Cement Concrete	1000
Select Material	1016
Steel Beam Guardrail Materials	862-2
Steel Plates	1072-2
Steel Sheet Piles and H-Piles	1084
Untreated Timber	1082-2
Welded Wire Reinforcement	1070-3
Wire Staples	1060-8(D)

Provide Type 6 material certifications for shoring materials in accordance with Article 106-3 of the *2012 Standard Specifications*. Use Class IV select material (standard size No. ABC) for temporary guardrail. Use nonshrink neat cement grout or Class A concrete that meets Article 450-2 of the *2012 Standard Specifications* for drilled-in piles. Use untreated timber with a thickness of at least 3" and a bending stress of at least 1,000 psi for timber lagging. Provide steel bracing that meets ASTM A36.

(A) Shoring Backfill

Use Class II, Type 1, Class III, Class V or Class VI select material or material that meets AASHTO M 145 for soil classification A-2-4 with a maximum PI of 6 for shoring backfill except do not use A-2-4 soil for backfill around culverts.

(B) Anchors

Store anchor materials on blocking a minimum of 12" above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Load, transport, unload and store anchor materials so materials are kept clean and free of damage. Bent, damaged or defective materials will be rejected.

(1) Ground Anchors

Use high-strength deformed steel bars that meet AASHTO M 275 or seven-wire strands that meet ASTM A886 or Article 1070-5 of the *2012 Standard Specifications*. Splice bars in accordance with Article 1070-9 of the *2012 Standard Specifications*. Do not splice strands. Use bondbreakers, spacers and centralizers that meet Article 6.3.5 of the *AASHTO LRFD Bridge Construction Specifications*.

(2) Helical Anchors

Use helical anchors with an ICC Evaluation Service, Inc. (ICC-ES) report. Helical anchors without an ICC-ES report may be approved at the discretion of the Engineer. Provide couplers, thread bar adapters and bolts recommended by the Anchor Manufacturer to connect helical anchors together and to piles.

(3) Anchorages

Provide steel plates for bearing plates and steel washers, hex nuts, wedge plates and wedges recommended by the Anchor Manufacturer.

(C) Temporary Walls

(1) Welded Wire Facing

Use welded wire reinforcement for welded wire facing, struts and wires. For temporary wire walls, provide welded wire facing supplied by the Wire Wall Vendor or a manufacturer approved or licensed by the vendor. For temporary wire walls with separate reinforcement and facing components, provide connectors (e.g., bars, clamps, plates, etc.) and fasteners (e.g., bolts, nuts, washers, etc.) required by the Wire Wall Vendor.

(2) Geotextiles

Provide Type 2 geotextile for separation and retention geotextiles. Provide Type 5 geotextile for geotextile reinforcement with ultimate tensile strengths in accordance with the accepted submittals.

(3) Geogrid Reinforcement

Handle and store geogrids in accordance with Article 1056-2 of the *2012 Standard Specifications*. Define "machine direction" (MD) and "cross-machine direction" (CD) for geogrids in accordance with ASTM D4439.

Use geogrids with a roll width of at least 4 ft and an "approved" or "approved for provisional use" status code. The list of approved geogrids is available from: connect.ncdot.gov/resources/Materials/Pages/SoilsLaboratory.aspx

Provide geogrids for geogrid reinforcement with design strengths in accordance with the accepted submittals. Geogrids are typically approved for ultimate tensile strengths in the MD and CD or short-term design strengths for a 3-year design life in the MD based on material type. Define material type from the website above for shoring backfill as follows:

Material Type	Shoring Backfill
Borrow	A-2-4 Soil
Fine Aggregate	Class II, Type 1 or Class III Select Material
Coarse Aggregate	Class V or VI Select Material

(4) Welded Wire Grid and Metallic Strip Reinforcement

Provide welded wire grid and metallic strip reinforcement supplied by the Wire Wall Vendor or a manufacturer approved or licensed by the vendor. Use welded wire grid reinforcement ("mesh", "mats" and "ladders") that meet Article 1070-3 of the *2012 Standard Specifications* and metallic strip reinforcement ("straps") that meet ASTM A572 or A1011.

Preconstruction Requirements

(A) Concrete Barrier

Define "clear distance" behind concrete barrier as the horizontal distance between the barrier and edge of pavement. The minimum required clear distance for concrete barrier is shown in the plans. At the Contractor's option or if the minimum required clear distance is not available, set concrete barrier next to and up against traffic side of temporary shoring except for barrier above temporary walls. Concrete barrier with the minimum required clear distance is required above temporary walls.

(B) Temporary Guardrail

Define "clear distance" behind temporary guardrail as the horizontal distance between guardrail posts and temporary shoring. At the Contractor's option or if clear distance for cantilever, braced and anchored shoring is less than 4 ft, attach guardrail to traffic side of shoring as shown in the plans. Place ABC in clear distance and around guardrail posts instead of pavement. Do not use temporary guardrail above temporary walls.

(C) Temporary Shoring Designs

Before beginning temporary shoring design, survey existing ground elevations in the vicinity of shoring locations to determine actual design heights (H). Submit 8 copies of working drawings and 3 copies of design calculations and a PDF copy of each for temporary shoring designs in accordance with Article 105-2 of the *2012 Standard Specifications*. Submit working drawings showing plan views, shoring profiles, typical sections and details of temporary shoring design and construction sequence. Do not begin shoring construction until a design submittal is accepted.

Have cantilever and braced shoring designed, detailed and sealed by an engineer licensed in the state of North Carolina. Use a prequalified Anchored Wall Design Consultant to design anchored shoring. Provide anchored shoring designs sealed by a Design Engineer approved as a Geotechnical Engineer (key person) for an Anchored Wall Design Consultant. Include details in anchored shoring working drawings of anchor locations and lock-off loads, unit grout/ground bond strengths for ground anchors or minimum installation torque and torsional strength rating for helical anchors and if necessary, obstructions extending through shoring or interfering with anchors. Include details in the anchored shoring construction sequence of pile and anchor installation, excavation and anchor testing.

Use a prequalified MSE Wall Design Consultant to design temporary walls. Provide temporary wall designs sealed by a Design Engineer approved as a Geotechnical Engineer (key person) for the MSE Wall Design Consultant. Include details in temporary wall working drawings of geotextile and reinforcement types, locations and directions and obstructions extending through walls or interfering with reinforcement.

(1) Soil Parameters

Design temporary shoring for the assumed soil parameters and groundwater elevations shown in the plans. Assume the following soil parameters for shoring backfill:

(a) Unit weight (γ) = 120 lb/cf;

(b)

Friction Angle (ϕ)	**Shoring Backfill**
30°	A-2-4 Soil
34°	Class II, Type 1 or Class III Select Material
38°	Class V or VI Select Material

(c) Cohesion (c) = 0 lb/sf.

(2) Traffic Surcharge

Design temporary shoring for a traffic surcharge of 250 lb/sf if traffic will be above and within H of shoring. This traffic surcharge does not apply to construction traffic. Design temporary shoring for any construction surcharge if construction traffic will be above and within H of shoring. For LRFD shoring designs, apply traffic (live load) surcharge in accordance with Figure C11.5.5-3 of the *AASHTO LRFD Bridge Design Specifications*.

(3) Cantilever, Braced and Anchored Shoring Designs

Use shoring backfill for fill sections and voids between cantilever, braced and anchored shoring and the critical failure surface. Use concrete or grout for embedded portions of drilled-in H-piles. Do not use drilled-in sheet piles.

Define "top of shoring" for cantilever, braced and anchored shoring as where the grade intersects the back of sheet piles or H-piles and timber lagging. Design cantilever, braced and anchored shoring for a traffic impact load of 2,000 lb/ft applied 18" above top of shoring if concrete barrier is above and next to shoring or temporary guardrail is above and attached to shoring. For anchored shoring designs, apply traffic impact load as horizontal load (P_{HI}) in accordance with Figure 3.11.6.3-2(a) of the AASHTO LRFD specifications.

Extend cantilever, braced and anchored shoring at least 32" above top of shoring if shoring is designed for traffic impact. Otherwise, extend shoring at least 6" above top of shoring.

Design cantilever, braced and anchored shoring for a maximum deflection of 3" if the horizontal distance to the closest edge of pavement or structure is less than H. Otherwise, design shoring for a maximum deflection of 6". Design cantilever and braced shoring in accordance with the plans and *AASHTO Guide Design Specifications for Bridge Temporary Works*.

Design anchored shoring in accordance with the plans and Article 11.9 of the *AASHTO LRFD Bridge Design Specifications*. Use a resistance factor of 0.80 for tensile resistance of anchors with bars, strands or shafts. Extend the unbonded length for ground anchors and the shallowest helix for helical anchors at least 5 ft behind the critical failure surface. Do not extend anchors beyond right-of-way or easement limits. If existing or future obstructions such as foundations, guardrail posts, pavements, pipes, inlets or utilities will interfere with anchors, maintain a clearance of at least 6" between obstructions and anchors.

(4) Temporary Wall Designs

Use shoring backfill in the reinforced zone of temporary walls. Separation geotextiles are required between shoring backfill and backfill, natural ground or culverts along the sides of the reinforced zone perpendicular to the wall face. For

Class V or VI select material in the reinforced zone, separation geotextiles are also required between shoring backfill and backfill or natural ground on top of and at the back of the reinforced zone.

Design temporary walls in accordance with the plans and Article 11.10 of the *AASHTO LRFD Bridge Design Specifications*. Embed temporary walls at least 18" except for walls on structures or rock as determined by the Engineer. Use a uniform reinforcement length throughout the wall height of at least 0.7H or 6 ft, whichever is greater. Extend the reinforced zone at least 6" beyond end of reinforcement. Do not locate the reinforced zone outside right-of-way or easement limits.

Use the simplified method for determining maximum reinforcement loads in accordance with the AASHTO LRFD specifications. For geotextile reinforcement, use geotextile properties approved by the Department or default values in accordance with the AASHTO LRFD specifications. For geogrid reinforcement, use approved geogrid properties available from the website shown elsewhere in this provision. If the website does not list a short-term design strength for an approved geogrid, use a short-term design strength equal to the ultimate tensile strength divided by 3.5 for the geogrid reinforcement. Use geosynthetic properties for the direction reinforcement will be installed, a 3-year design life and shoring backfill to be used in the reinforced zone.

Do not use more than 4 different reinforcement strengths for each temporary geosynthetic wall. Design temporary geotextile walls for a reinforcement coverage ratio (R_c) of 1.0 and temporary geogrid walls for an R_c of at least 0.8. For geogrid reinforcement with an R_c of less than 1.0, use a maximum horizontal clearance between geogrids of 3 ft and stagger reinforcement so geogrids are centered over gaps in the reinforcement layer below.

For temporary geosynthetic walls, use "L" shaped welded wire facing with 18" to 24" long legs. Locate geotextile or geogrid reinforcement so reinforcement layers are at the same level as the horizontal legs of welded wire facing. Use vertical reinforcement spacing equal to facing height. Wrap geotextile or geogrid reinforcement behind welded wire facing and extend reinforcement at least 3 ft back behind facing into shoring backfill.

For temporary wire walls with separate reinforcement and facing components, attach welded wire grid or metallic strip reinforcement to welded wire facing with a connection approved by the Department. For temporary geogrid and wire walls, retain shoring backfill at welded wire facing with retention geotextiles and extend geotextiles at least 3 ft back behind facing into backfill.

(D) Preconstruction Meeting

The Engineer may require a shoring preconstruction meeting to discuss the construction, inspection and testing of the temporary shoring. If required, schedule this meeting after all shoring submittals have been accepted. The Resident, District or Bridge Maintenance Engineer, Bridge or Roadway Construction Engineer, Geotechnical Operations Engineer, Contractor and Shoring Contractor Superintendent will attend this preconstruction meeting.

Construction Methods

Control drainage during construction in the vicinity of shoring. Direct run off away from shoring and shoring backfill. Contain and maintain backfill and protect material from erosion.

Install positive protection in accordance with the contract and accepted submittals. Use PCB in accordance with Section 1170 of the *2012 Standard Specifications* and Standard Drawing No. 1170.01 of the *2012 Roadway Standard Drawings*. Use temporary guardrail in accordance with Section 862 of the *2012 Standard Specifications* and Standard Drawing No. 862.01, 862.02 and 862.03 of the *2012 Roadway Standard Drawings*.

(A) Tolerances

Construct shoring with the following tolerances:

(1) Horizontal wires of welded wire facing are level in all directions,

(2) Shoring location is within 6" of horizontal and vertical alignment shown in the accepted submittals, and

(3) Shoring plumbness (batter) is not negative and within 2° of vertical.

(B) Cantilever, Braced and Anchored Shoring Installation

If overexcavation behind cantilever, braced or anchored shoring is shown in the accepted submittals, excavate before installing piles. Otherwise, install piles before excavating for shoring. Install cantilever, braced or anchored shoring in accordance with the construction sequence shown in the accepted submittals. Remove piles and if applicable, timber lagging when shoring is no longer needed.

(1) Pile Installation

Install piles with the minimum required embedment and extension in accordance with Subarticles 450-3(D) and 450-3(E) of the *2012 Standard Specifications* except that a pile driving equipment data form is not required. Piles may be installed with a vibratory hammer as approved by the Engineer.

Do not splice sheet piles. Use pile excavation to install drilled-in H-piles. After filling holes with concrete or grout to the elevations shown in the accepted submittals, remove any fluids and fill remaining portions of holes with flowable fill. Cure concrete or grout at least 7 days before excavating.

Notify the Engineer if refusal is reached before pile excavation or driven piles attain the minimum required embedment. When this occurs, a revised design submittal may be required.

(2) Excavation

Excavate in front of piles from the top down in accordance with the accepted submittals. For H-piles with timber lagging and braced and anchored shoring, excavate in staged horizontal lifts with a maximum height of 5 ft. Remove flowable fill and material in between H-piles as needed to install timber lagging. Position lagging with at least 3" of contact in the horizontal direction between the lagging and pile flanges. Do not excavate the next lift until timber lagging for the current lift is installed and if applicable, bracing and anchors for the current lift are accepted. Backfill behind cantilever, braced or anchored shoring with shoring backfill.

(3) Anchor Installation

If applicable, install foundations located behind anchored shoring before installing anchors. Fabricate and install ground anchors in accordance with the accepted submittals, Articles 6.4 and 6.5 of the *AASHTO LRFD Bridge Construction Specifications* and the following unless otherwise approved:

(a) Materials in accordance with this provision are required instead of materials conforming to Articles 6.4 and 6.5.3 of the AASHTO LRFD Specifications,

(b) Encapsulation-protected ground anchors in accordance with Article 6.4.1.2 of the AASHTO LRFD specifications are not required, and

(c) Corrosion protection for unbonded lengths of ground anchors and anchorage covers are not required.

Install helical anchors in accordance with the accepted submittals and Anchor Manufacturer's instructions. Measure torque during installation and do not exceed the torsional strength rating of the helical anchor. Attain the minimum required installation torque and penetration before terminating anchor installation. When replacing a helical anchor, embed last helix of the replacement anchor at least 3 helix plate diameters past the location of the first helix of the previous anchor.

(4) Anchor Testing

Proof test and lock-off anchors in accordance with the accepted submittals and Article 6.5.5 of the *AASHTO LRFD Bridge Construction Specifications* except for the acceptance criteria in Article 6.5.5.5. For the AASHTO LRFD specifications, "ground anchor" refers to a ground or helical anchor and "tendon" refers to a bar, strand or shaft.

(a) Anchor Acceptance

Anchor acceptance is based in part on the following criteria.

(i) For ground and helical anchors, total movement is less than 0.04" between the 1 and 10 minute readings or less than 0.08" between the 6 and 60 minute readings.

(ii) For ground anchors, total movement at maximum test load exceeds 80% of the theoretical elastic elongation of the unbonded length.

(b) Anchor Test Results

Submit 2 copies of anchor test records including movement versus load plots for each load increment within 24 hours of completing each row of anchors. The Engineer will review the test records to determine if the anchors are acceptable.

If the Engineer determines an anchor is unacceptable, revise the anchor design or installation methods. Submit a revised anchored shoring design for acceptance and provide an acceptable anchor with the revised design or installation methods. If required, replace the anchor or provide additional anchors with the revised design or installation methods.

(C) Temporary Wall Installation

Excavate as necessary for temporary walls in accordance with the plans and accepted submittals. If applicable, install foundations located in the reinforced zone before placing shoring backfill or reinforcement unless otherwise approved. Notify the Engineer when foundation excavation is complete. Do not place shoring backfill or reinforcement until excavation dimensions and foundation material are approved.

Erect welded wire facing so the wall position is as shown in the plans and accepted submittals. Set welded wire facing adjacent to each other in the horizontal and vertical direction to completely cover the wall face with facing. Stagger welded wire facing to create a running bond by centering facing over joints in the row below.

Wrap geotextile reinforcement and retention geotextiles behind welded wire facing as shown in the plans and accepted submittals and cover geotextiles with at least 3" of shoring backfill. Overlap adjacent geotextile reinforcement and retention and separation geotextiles at least 18" with seams oriented perpendicular to the wall face. Hold geotextiles in place with wire staples or anchor pins as needed.

Place reinforcement within 3" of locations shown in the plans and accepted submittals and in slight tension free of kinks, folds, wrinkles or creases. Install reinforcement with the direction shown in the plans and accepted submittals. For temporary wire walls with separate reinforcement and facing components, attach welded wire grid or metallic strip reinforcement to welded wire facing as shown in the accepted submittals. Do not splice or overlap reinforcement so seams are parallel to the wall face. Contact the Engineer when unanticipated existing or future obstructions such as foundations, pavements, pipes, inlets or utilities will interfere with reinforcement.

Place shoring backfill in the reinforced zone in 8" to 10" thick lifts. Compact A-2-4 soil and Class II, Type 1 and Class III select material in accordance with Subarticle 235-3(C) of the *2012 Standard Specifications*. Use only hand operated compaction equipment to compact backfill within 3 ft of welded wire facing. At a distance greater than 3 ft, compact shoring backfill with at least 4 passes of an 8 ton to 10 ton vibratory roller in a direction parallel to the wall face. Smooth wheeled or rubber tired rollers are also acceptable for compacting backfill. Do not use sheepsfoot, grid rollers or other types of compaction equipment with feet. Do not displace or damage reinforcement when placing and compacting shoring backfill. End dumping directly on geotextile or geogrid reinforcement is not permitted. Do not operate heavy equipment on reinforcement until it is covered with at least 8" of shoring backfill. Replace any damaged reinforcement to the satisfaction of the Engineer.

Backfill for temporary walls outside the reinforced zone in accordance with Article 410-8 of the *2012 Standard Specifications*. Bench temporary walls into the sides of excavations where applicable. For temporary geosynthetic walls with top of wall within 5 ft of finished grade, remove top facing and incorporate top reinforcement layer into fill when placing fill in front of wall. Temporary walls remain in place permanently unless otherwise required.

Measurement and Payment

Temporary Shoring will be measured and paid in square feet. Temporary walls will be measured as the square feet of exposed wall face area. Cantilever, braced or anchored shoring will be measured as the square feet of exposed shoring face area with the shoring height equal to the difference between the top and bottom of shoring elevations. Define "top of shoring" as where the grade intersects the back of sheet piles or H-piles and timber lagging. Define "bottom of shoring" as where the grade intersects front of sheet piles or H-piles and timber lagging. No measurement will be made for any embedment, shoring extension above top of shoring or pavement thickness above temporary walls.

The contract unit price for *Temporary Shoring* will be full compensation for providing shoring designs, submittals and materials, excavating, backfilling, hauling and removing excavated materials and supplying all labor, tools, equipment and incidentals necessary to construct temporary shoring.

No payment will be made for temporary shoring not shown in the plans or required by the Engineer including shoring for OSHA reasons or the Contractor's convenience. No value engineering proposals will be accepted based solely on revising or eliminating shoring locations shown in the plans or estimated quantities shown in the bid item sheets as a result of actual field measurements or site conditions.

PCB will be measured and paid in accordance with Section 1170 of the *2012 Standard Specifications*. No additional payment will be made for anchoring PCB for temporary shoring. Costs for anchoring PCB will be incidental to temporary shoring.

Temporary guardrail will be measured and paid for in accordance with Section 862 of the *2012 Standard Specifications*.

Payment will be made under:

Pay Item	**Pay Unit**
Temporary Shoring	Square Foot

TRUCK MOUNTED CHANGEABLE MESSAGE SIGNS:

(8-21-12) 1101.02 SP11 R10

Revise the *2012 Roadway Standard Drawings* as follows:

Drawing No. 1101.02, Sheet 12, TEMPORARY LANE CLOSURES, replace General Note #11 with the following:

11- TRUCK MOUNTED CHANGEABLE MESSAGE SIGNS (TMCMS) USED ON SHADOW VEHICLES FOR "IN LANE" ACTIVITIES SHALL BE A MINIMUM OF 43" X 73". THE DISPLAY PANEL SHALL HAVE FULL MATRIX CAPABILITY WITH THE CAPABILITY TO PROVIDE 2 MESSAGE LINES WITH 7 CHARACTERS PER LINE WITH A MINIMUM CHARACTER HEIGHT OF 18". FOR ADDITIONAL MESSAGING, CONTACT THE WORK ZONE TRAFFIC CONTROL SECTION.

12- TMCMS USED FOR ADVANCED WARNING ON VEHICLES LOCATED ON THE SHOULDER MAY BE SMALLER THAN 43" X 73". THE DISPLAY PANEL SHALL HAVE THE CAPABILITY TO PROVIDE 2 MESSAGE LINES WITH 7 CHARACTERS PER LINE WITH A MINIMUM CHARACTER HEIGHT OF 18". FOR ADDITIONAL MESSAGING, CONTACT THE WORK ZONE TRAFFIC CONTROL SECTION.

Drawing No. 1101.02, Sheet 13, TEMPORARY LANE CLOSURES, replace General Note #12 with the following:

12- TRUCK MOUNTED CHANGEABLE MESSAGE SIGNS (TMCMS) USED ON SHADOW VEHICLES FOR "IN LANE" ACTIVITIES SHALL BE A MINIMUM OF 43" X 73". THE DISPLAY PANEL SHALL HAVE FULL MATRIX CAPABILITY WITH THE CAPABILITY TO PROVIDE 2 MESSAGE LINES WITH 7 CHARACTERS PER LINE WITH A MINIMUM CHARACTER HEIGHT OF 18". FOR ADDITIONAL MESSAGING, CONTACT THE WORK ZONE TRAFFIC CONTROL SECTION.

13- TMCMS USED FOR ADVANCED WARNING ON VEHICLES LOCATED ON THE SHOULDER MAY BE SMALLER THAN 43" X 73". THE DISPLAY PANEL SHALL HAVE THE CAPABILITY TO PROVIDE 2 MESSAGE LINES WITH 7 CHARACTERS PER LINE WITH A MINIMUM CHARACTER HEIGHT OF 18". FOR ADDITIONAL MESSAGING, CONTACT THE WORK ZONE TRAFFIC CONTROL SECTION.

COORDINATION OF EXISTING LIGHTING WORK:

(7-1-95) (Rev. 8-21-12) 105 SP14 R02

Maintain operation of the existing lighting systems until such time that it becomes in conflict with the actual construction work, or it becomes a hazard to traffic as determined by the Engineer.

Use care in working around the lights and circuitry and phase operations so that the disruption of existing lighting systems will be minimized. Make repairs or replacements in conformance with the contract. Should the Contractor fail to make such repairs within the time allowed, the Department will cause the necessary repairs to be made by others. The costs of such repairs will be deducted from any monies due the Contractor on the next subsequent monthly or final payment.

PERMANENT SEEDING AND MULCHING:

(7-1-95) 1660 SP16 R02

The Department desires that permanent seeding and mulching be established on this project as soon as practical after slopes or portions of slopes have been graded. As an incentive to obtain an early stand of vegetation on this project, the Contractor's attention is called to the following:

For all permanent seeding and mulching that is satisfactorily completed in accordance with the requirements of Section 1660 in the *2012 Standard Specifications* and within the following percentages of elapsed contract times, an additional payment will be made to the Contractor as an incentive additive. The incentive additive will be determined by multiplying the number of acres of seeding and mulching satisfactorily completed times the contract unit bid price per acre for Seeding and Mulching times the appropriate percentage additive.

Percentage of Elapsed Contract Time	Percentage Additive
0% - 30%	30%
30.01% - 50%	15%

Percentage of elapsed contract time is defined as the number of calendar days from the date of availability of the contract to the date the permanent seeding and mulching is acceptably completed divided by the total original contract time.

ROCK EMBANKMENTS: **(1-17-12)**

Description

Construct rock embankments in accordance with the contract. Use core material as necessary or required where piles will be driven through rock embankments and as shown in the plans. Rock embankments are required to construct embankments in water at locations shown in the plans and as directed.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Geotextile for Rock Embankments, Type 2	1056
Select Material	1016

Provide Type 2 geotextile for filtration geotextiles. Use Class VII select material for rock embankments. Use Class VI select material (standard size No. 57) for core material and over Class VII.

Construction Methods

Construct rock embankments in accordance with the slopes, dimensions and elevations shown in the plans and Section 235 of the *Standard Specifications*. If piles will be installed through rock embankments, place Class VII so there will be at least 5 ft between rock and piles. Place Class VII so smaller rocks are uniformly distributed throughout rock embankments. Provide a uniform surface free of obstructions, debris and groups of large rocks that could cause voids in embankments. When placing Class VII in lifts, place core material to top of the current lift before placing the next lift of Class VII.

Place and compact a layer of No. 57 stone at least 12" thick over rock embankments and core material. Install filtration geotextiles on top of No. 57 stone in accordance with Article 270-3 of the *Standard Specifications* before placing embankment fill material.

Measurement and Payment

Rock Embankments and *#57 Stone* will be measured and paid in tons. Select material will be measured by weighing material in trucks in accordance with Article 106-7 of the *Standard Specifications*. The contract unit prices for *Rock Embankments* and *#57 Stone* will be full compensation for providing, hauling, handling, placing, compacting and maintaining select material.

Geotextile for Rock Embankments will be measured and paid in square yards. Geotextiles will be measured along the top of the No. 57 stone layer as the square yards of exposed geotextiles before placing embankment fill. No measurement will be made for overlapping geotextiles. The contract unit price for *Geotextile for Rock Embankments* will be full compensation for providing, transporting and placing geotextiles.

Payment will be made under:

Pay Item	Pay Unit
Rock Embankments	Ton
#57 Stone	Ton

Geotextile for Rock Embankments Square Yard

GEOTEXTILE FOR PAVEMENT STABILIZATION: (1-21-14)

Description

Furnish and place geotextile for pavement stabilization in accordance with the contract. Geotextile for pavement stabilization may be required to prevent pavement cracking and provide separation between the subgrade and pavement section at locations shown in the plans and as directed.

Materials

Refer to Division 10 of the *Standard Specifications*.

Item	Section
Geotextiles	1056

Provide Type 5 geotextile for geotextile for pavement stabilization that meets the following requirements:

GEOTEXTILE FOR PAVEMENT STABILIZATION REQUIREMENTS		
Property	**Requirement (MARV[A])**	**Test Method**
Tensile Strength @ 5% Strain (MD & CD[A])	1,900 lb/ft	ASTM D4595
Ultimate Tensile Strength (MD & CD[A])	4,800 lb/ft	ASTM D4595
Melting Point	300° F	ASTM D276

A. Define "minimum average roll value" (MARV), "machine direction" (MD) and "cross-machine direction" (CD) in accordance with ASTM D4439.

Construction Methods

Notify the Engineer when the roadbed is completed within 2" of subgrade elevation. The Engineer will sample and test subgrade soils for quality to determine if geotextile for pavement stabilization is required at locations shown in the plans and other locations as directed. For subgrades without stabilization, allow 24 days to determine if geotextile for pavement stabilization is required. For stabilized subgrades with geotextile for pavement stabilization, stabilize subgrade soils to 12" beyond the base course as shown in the plans.

Place geotextile for pavement stabilization on subgrades immediately below pavement sections as shown in the plans and in slight tension free of kinks, folds, wrinkles or creases. Install geotextiles with the MD perpendicular to the roadway centerline. The MD is the direction of the length or long dimension of the geotextile roll. Do not splice or overlap geotextiles in the MD so splices or overlaps are parallel to the roadway centerline. Extend geotextile for pavement stabilization 12" beyond the base course as shown in the plans.

Completely cover subgrades with geotextile for pavement stabilization so geotextiles are adjacent to each other in the CD, i.e., perpendicular to the MD. The CD is the direction of the width or short dimension of the geotextile roll. Overlapping geotextiles in the CD is permitted but not required. Overlap geotextiles in the direction that base course will be placed to prevent lifting the edge of the top geotextile.

For asphalt base courses, asphalt mixture temperatures in the truck may not exceed 315° F at the time of placement. Do not damage geotextile for pavement stabilization when constructing base

courses. Place and compact base courses in accordance with the *Standard Specifications*. Do not operate heavy equipment on geotextiles any more than necessary to construct pavement sections. Replace any damaged geotextiles to the satisfaction of the Engineer.

Measurement and Payment

Geotextile for Pavement Stabilization will be measured and paid in square yards. Geotextiles will be measured along subgrades as the square yards of exposed geotextiles before placing base courses. No measurement will be made for overlapping geotextiles. The contract unit price for *Geotextile for Pavement Stabilization* will be full compensation for providing, transporting and placing geotextiles.

Payment will be made under:

Pay Item	Pay Unit
Geotextile for Pavement Stabilization	Square Yard

STANDARD SHORING: **(11-19-13)**

Description

Standard shoring includes standard temporary shoring and standard temporary mechanically stabilized earth (MSE) walls. At the Contractor's option, use standard shoring as noted in the plans or as directed. When using standard shoring, a temporary shoring design submittal is not required. Construct standard shoring based on actual elevations and shoring dimensions in accordance with the contract and Standard Drawing No. 1801.01 or 1801.02.

Define "standard temporary shoring" as cantilever shoring that meets the standard temporary shoring drawing (Standard Drawing No. 1801.01). Define "standard temporary wall" as a temporary MSE wall with geotextile or geogrid reinforcement that meets the standard temporary wall drawing (Standard Drawing No. 1801.02). Define "standard temporary geotextile wall" as a standard temporary wall with geotextile reinforcement and "standard temporary geogrid wall" as a standard temporary wall with geogrid reinforcement. Define "geosynthetics" as geotextiles or geogrids.

Provide positive protection for standard shoring at locations shown in the plans and as directed. See *Temporary Shoring* provision for positive protection types and definitions.

Materials

Refer to the *Standard Specifications*.

Item	Section
Anchor Pins	1056-2
Concrete Barrier Materials	1170-2
Flowable Fill, Excavatable	1000-6
Geotextiles	1056
Neat Cement Grout	1003
Portland Cement Concrete	1000
Select Material	1016
Steel Beam Guardrail Materials	862-2
Steel Sheet Piles and H-Piles	1084
Untreated Timber	1082-2
Welded Wire Reinforcement	1070-3
Wire Staples	1060-8(D)

Provide Type 6 material certifications for shoring materials. Use Class IV select material (standard size No. ABC) for temporary guardrail.

For drilled-in H-piles, use nonshrink neat cement grout or Class A concrete that meets Article 1000-4 of the *Standard Specifications* except as modified herein. Provide concrete with a slump of 6" to 8". Use an approved high-range water reducer to achieve this slump.

Based on actual shoring height, positive protection, groundwater elevation, slope or surcharge case and traffic impact at each standard temporary shoring location, use sheet piles with the minimum required section modulus or H-piles with the sizes shown in Standard Drawing No. 1801.01. Use untreated timber with a thickness of at least 3" and a bending stress of at least 1,000 psi for timber lagging.

(A) Shoring Backfill

Use Class II, Type 1, Class III, Class V or Class VI select material or material that meets AASHTO M 145 for soil classification A-2-4 with a maximum PI of 6 for shoring backfill except do not use the following:

(1) A-2-4 soil for backfill around culverts,

(2) A-2-4 soil in the reinforced zone of standard temporary walls with a back slope and

(3) Class VI select material in the reinforced zone of standard temporary geotextile walls.

(B) Standard Temporary Walls

Use welded wire reinforcement for welded wire facing, struts and wires with the dimensions and minimum wire sizes shown in Standard Drawing No. 1801.02. Provide Type 2 geotextile for separation and retention geotextiles. Define "machine direction" (MD) and "cross-machine direction" (CD) for geosynthetics in accordance with ASTM D4439. Do not use more than 4 different reinforcement strengths for each standard temporary wall.

(1) Geotextile Reinforcement

Provide Type 5 geotextile for geotextile reinforcement with a mass per unit area of at least 8 oz/sy in accordance with ASTM D5261. Based on actual wall height, groundwater elevation, slope or surcharge case and shoring backfill to be used in the reinforced zone at each standard temporary geotextile wall location, provide geotextiles with ultimate tensile strengths as shown in Standard Drawing No. 1801.02.

(2) Geogrid Reinforcement

Handle and store geogrids in accordance with Article 1056-2 of the *Standard Specifications*. Use geogrids with a roll width of at least 4 ft and an "approved" or "approved for provisional use" status code. The list of approved geogrids is available from:
connect.ncdot.gov/resources/Materials/Pages/SoilsLaboratory.aspx

Based on actual wall height, groundwater elevation, slope or surcharge case and shoring backfill to be used in the reinforced zone at each standard temporary geogrid wall location, provide geogrids for geogrid reinforcement with short-term design strengths as shown in Standard Drawing No. 1801.02. Geogrids are typically approved for ultimate tensile strengths in the MD and CD or short-term design strengths for a 3-year design life in the MD based on material type. Define material type from the website above for shoring backfill as follows:

Material Type	Shoring Backfill
Borrow	A-2-4 Soil
Fine Aggregate	Class II, Type 1 or Class III Select Material
Coarse Aggregate	Class V or VI Select Material

If the website does not list a short-term design strength for an approved geogrid, use a short-term design strength equal to the ultimate tensile strength divided by 3.5 for the geogrid reinforcement.

Preconstruction Requirements

(A) Concrete Barrier

Define "clear distance" behind concrete barrier as the horizontal distance between the barrier and edge of pavement. The minimum required clear distance for concrete barrier is shown in the plans. At the Contractor's option or if the minimum required clear distance is not available, set concrete barrier next to and up against traffic side of standard shoring except for barrier above standard temporary walls. Concrete barrier with the minimum required clear distance is required above standard temporary walls.

(B) Temporary Guardrail

Define "clear distance" behind temporary guardrail as the horizontal distance between guardrail posts and standard shoring. At the Contractor's option or if clear distance for standard temporary shoring is less than 4 ft, attach guardrail to traffic side of shoring as shown in the plans. Place ABC in clear distance and around guardrail posts instead of pavement. Do not use temporary guardrail above standard temporary walls.

(C) Standard Shoring Selection Forms

Before beginning standard shoring construction, survey existing ground elevations in the vicinity of standard shoring locations to determine actual shoring or wall heights (H). Submit a standard shoring selection form for each location at least 7 days before starting standard shoring construction. Standard shoring selection forms are available from: connect.ncdot.gov/resources/Geological/Pages/Geotech_Forms_Details.aspx

(D) Preconstruction Meeting

The Engineer may require a shoring preconstruction meeting to discuss the construction and inspection of the standard shoring. If required, schedule this meeting after all standard shoring selection forms have been submitted. The Resident, District or Bridge Maintenance Engineer, Bridge or Roadway Construction Engineer, Geotechnical Operations Engineer, Contractor and Shoring Contractor Superintendent will attend this preconstruction meeting.

Construction Methods

Construct standard shoring in accordance with the *Temporary Shoring* provision.

(A) Standard Temporary Shoring Installation

Based on actual shoring height, positive protection, groundwater elevation, slope or surcharge case and traffic impact at each standard temporary shoring location, install piles with the minimum required embedment and extension for each shoring section in accordance with Standard Drawing No. 1801.01. For concrete barrier above and next to standard temporary shoring and temporary guardrail above and attached to standard temporary shoring, use "surcharge case with traffic impact" in accordance with Standard Drawing No. 1801.01. Otherwise, use "slope or surcharge case with no traffic impact" in accordance with Standard Drawing No. 1801.01. If refusal is reached before driven piles

attain the minimum required embedment, use drilled-in H-piles with timber lagging for standard temporary shoring.

(B) Standard Temporary Walls Installation

Based on actual wall height, groundwater elevation, slope or surcharge case, geotextile or geogrid reinforcement and shoring backfill in the reinforced zone at each standard temporary wall location, construct walls with the minimum required reinforcement length and number of reinforcement layers for each wall section in accordance with Standard Drawing No. 1801.02. For standard temporary walls with pile foundations in the reinforced zone, drive piles through reinforcement after constructing temporary walls.

For standard temporary walls with interior angles less than 90°, wrap geosynthetics at acute corners as directed by the Engineer. Place geosynthetics as shown in Standard Drawing No. 1801.02. Place separation geotextiles between shoring backfill and backfill, natural ground or culverts along the sides of the reinforced zone perpendicular to the wall face. For Class V or VI select material in the reinforced zone, place separation geotextiles between shoring backfill and backfill or natural ground on top of and at the back of the reinforced zone.

Measurement and Payment

Standard shoring will be measured and paid in accordance with the *Temporary Shoring* provision.

MECHANICALLY STABILIZED EARTH RETAINING WALLS (11-19-13)

1.0 GENERAL

Construct mechanically stabilized earth (MSE) retaining walls consisting of steel or geosynthetic reinforcement in the reinforced zone connected to vertical facing elements. The facing elements may be precast concrete panels or segmental retaining wall (SRW) units unless required otherwise in the plans or the *NCDOT Policy for Mechanically Stabilized Earth Retaining Walls* prohibits the use of SRW units. At the Contractor's option, use coarse or fine aggregate in the reinforced zone of MSE retaining walls except do not use fine aggregate for walls subject to scour, walls that support or are adjacent to railroads or walls with design heights greater than 35 ft or internal acute corners less than 45°. Provide reinforced concrete coping as required. Design and construct MSE retaining walls based on actual elevations and wall dimensions in accordance with the contract and accepted submittals. Use a prequalified MSE Wall Installer to construct MSE retaining walls.

Define "MSE wall" as a mechanically stabilized earth retaining wall and "MSE Wall Vendor" as the vendor supplying the chosen MSE wall system. Define a "segmental retaining wall" as an MSE wall with SRW units. Define an "abutment wall" as an MSE wall with bridge foundations in any portion of the reinforced zone or an MSE wall connected to an abutment wall. Even if bridge foundations only penetrate a small part of the reinforced zone, the entire MSE wall is considered an abutment wall.

Define "reinforcement" as steel or geosynthetic reinforcement and "geosynthetics" as geosynthetic grids (geogrids) or strips (geostrips). Define "aggregate" as coarse or fine aggregate. Define "panel" as a precast concrete panel and "coping" as precast or cast-in-place concrete coping.

Use an approved MSE wall system in accordance with the plans, NCDOT MSE wall policy and any NCDOT restrictions for the chosen system. Value engineering proposals for other MSE wall systems will not be considered. Do not use segmental retaining walls or MSE wall systems with an "approved for provisional use" status code for critical walls or MSE walls connected to critical walls. Critical walls are defined in the NCDOT MSE wall policy. The list of approved MSE wall systems and NCDOT MSE wall policy are available from:
connect.ncdot.gov/resources/Geological/Pages/Products.aspx

2.0 MATERIALS

Refer to the *Standard Specifications*.

Item	Section
Aggregate	1014
Anchor Pins	1056-2
Curing Agents	1026
Geotextiles, Type 2	1056
Joint Materials	1028

Portland Cement Concrete, Class A	1000
Precast Retaining Wall Coping	1077
Reinforcing Steel	1070
Retaining Wall Panels	1077
Segmental Retaining Wall Units	1040-4
Shoulder Drain Materials	816-2
Wire Staples	1060-8(D)

Provide Type 2 geotextile for filtration and separation geotextiles. Use Class A concrete for cast-in-place coping, leveling concrete and pads.

Use panels and SRW units from producers approved by the Department and licensed by the MSE Wall Vendor. Unless required otherwise in the contract, produce panels with a smooth flat final finish that meets Article 1077-11 of the *Standard Specifications*. Accurately locate and secure reinforcement connectors in panels and maintain required concrete cover. Produce panels within 1/4" of the panel dimensions shown in the accepted submittals.

Damaged panels or SRW units with excessive discoloration, chips or cracks as determined by the Engineer will be rejected. Do not damage reinforcement connection devices or mechanisms in handling or storing panels and SRW units.

Store steel materials on blocking at least 12" above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Handle and store geosynthetics in accordance with Article 1056-2 of the *Standard Specifications*. Load, transport, unload and store MSE wall materials so materials are kept clean and free of damage. Bent, damaged or defective materials will be rejected.

A. Aggregate

Use standard size No. 57, 57M, 67 or 78M that meets Table 1005-1 of the *Standard Specifications* for coarse aggregate except do not use No. 57 or 57M stone in the reinforced zone of MSE walls with geosynthetic reinforcement. Use the following for fine aggregate:

1. Standard size No. 1S, 2S, 2MS or 4S that meets Table 1005-2 of the *Standard Specifications* or
2. Gradation that meets Class III, Type 3 select material in accordance with Article 1016-3 of the *Standard Specifications*.

Fine aggregate is exempt from mortar strength in Subarticle 1014-1(E) of the *Standard Specifications*. Provide fine aggregate that meets the following requirements:

FINE AGGREGATE REQUIREMENTS					
Reinforcement or Connector Material	**pH**	**Resistivity**	**Chlorides**	**Sulfates**	**Organics**
Steel	5-10	$\geq 3{,}000\ \Omega \cdot cm$	≤ 100 ppm	≤ 200 ppm	$\leq 1\%$

Polyester Type (PET) Geogrid	5-8	N/A*	N/A*	N/A*	≤ 1%
Geostrip or Polyolefin Geogrid	4.5-9	N/A*	N/A*	N/A*	≤ 1%

* Resistivity, chlorides and sulfates are not applicable to geosynthetics.

Use fine aggregate from a source that meets the *Mechanically Stabilized Earth Wall Fine Aggregate Sampling and Testing Manual.* Perform organic content tests in accordance with AASHTO T 267 instead of Subarticle 1014-1(D) of the *Standard Specifications*. Perform electrochemical tests in accordance with the following test procedures:

Property	**Test Method**
pH	AASHTO T 289
Resistivity	AASHTO T 288
Chlorides	AASHTO T 291
Sulfates	AASHTO T 290

B. Reinforcement

Provide steel or geosynthetic reinforcement supplied by the MSE Wall Vendor or a manufacturer approved or licensed by the vendor. Use approved reinforcement for the chosen MSE wall system. The list of approved reinforcement for each MSE wall system is available from the website shown elsewhere in this provision.

1.S teel Reinforcement

Provide Type 1 material certifications in accordance with Article 106-3 of the *Standard Specifications* for steel reinforcement. Use welded wire grid reinforcement ("mesh", "mats" and "ladders") that meet Article 1070-3 of the *Standard Specifications* and metallic strip reinforcement ("straps") that meet ASTM A572 or A1011. Galvanize steel reinforcement in accordance with Section 1076 of the *Standard Specifications*.

2.Ge osynthetic Reinforcement

Define "machine direction" (MD) for geosynthetics in accordance with ASTM D4439. Provide Type 1 material certifications for geosynthetic strengths in the MD in accordance with Article 1056-3 of the *Standard Specifications*. Test geosynthetics in accordance with ASTM D6637.

C. Bearing Pads

For MSE walls with panels, use bearing pads that meet Section 3.6.1.a of the *FHWA Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes – Volume I* (Publication No. FHWA-NHI-10-024). Provide bearing pads that meet the following requirements:

BEARING PAD THICKNESS REQUIREMENTS

Panel Facing Area (A)	Minimum Pad Thickness After Compression (based on 2 times panel weight above pads)
$A \leq 30$ sf	1/2"
30 sf $< A \leq 75$ sf	3/4"

D. Miscellaneous Components

Miscellaneous components may include connectors (e.g., anchors, bars, clamps, pins, plates, ties, etc.), fasteners (e.g., bolts, nuts, washers, etc.) and any other MSE wall components not included above. Galvanize steel components in accordance with Section 1076 of the *Standard Specifications*. Provide approved miscellaneous components for the chosen MSE wall system. The list of approved miscellaneous components for each MSE wall system is available from the website shown elsewhere in this provision.

3.0 PRECONSTRUCTION REQUIREMENTS

A. MSE Wall Surveys

The Retaining Wall Plans show a plan view, typical sections, details, notes and an elevation or profile view (wall envelope) for each MSE wall. Before beginning MSE wall design, survey existing ground elevations shown in the plans and other elevations in the vicinity of MSE wall locations as needed. Based on these elevations, finished grades and actual MSE wall dimensions and details, submit revised wall envelopes for acceptance. Use accepted wall envelopes for design.

B. MSE Wall Designs

Submit 11 copies of working drawings and 3 copies of design calculations and a PDF copy of each for MSE wall designs at least 30 days before the preconstruction meeting. Note name and NCDOT ID number of the panel or SRW unit production facility on the working drawings. Do not begin MSE wall construction until a design submittal is accepted.

Use a prequalified MSE Wall Design Consultant to design MSE walls. Provide designs sealed by a Design Engineer approved as a Geotechnical Engineer (key person) for the MSE Wall Design Consultant.

Design MSE walls in accordance with the plans, *AASHTO LRFD Bridge Design Specifications* and any NCDOT restrictions for the chosen MSE wall system unless otherwise required. Design MSE walls for seismic if walls are located in seismic zone 2 based on Figure 2-1 of the *Structure Design Manual*. Use a uniform reinforcement length throughout the wall height of at least 0.7H with H as defined for the embedment requirements in this provision or 6 ft, whichever is greater, unless shown otherwise in the plans. Extend the reinforced zone at least 6" beyond end of reinforcement. Do not locate drains, the reinforced zone or leveling pads outside right-of-way or easement limits.

Use the simplified method for determining maximum reinforcement loads and approved design parameters for the chosen MSE wall system or default values in accordance with the AASHTO LRFD specifications. Design steel components including reinforcement and connectors for the design life noted in the plans and aggregate type in the reinforced zone. Use corrosion loss rates for galvanizing in accordance with the AASHTO LRFD specifications for nonaggressive backfill and carbon steel corrosion rates in accordance with the following:

CARBON STEEL CORROSION RATES	
Aggregate Type (in the reinforced zone)	**Corrosion Loss Rate (after zinc depletion)**
Coarse	0.47 mil/year
Fine (except abutment walls)	0.58 mil/year
Fine (abutment walls)	0.70 mil/year

For geosynthetic reinforcement and connectors, use approved geosynthetic properties for the design life noted in the plans and aggregate type in the reinforced zone.

When noted in the plans, design MSE walls for a live load (traffic) surcharge of 250 lb/sf in accordance with Figure C11.5.6-3(b) of the AASHTO LRFD specifications. For steel beam guardrail with 8 ft posts or concrete barrier rail above MSE walls, analyze top 2 reinforcement layers for traffic impact loads in accordance with Section 7.2 of the FHWA MSE wall manual shown elsewhere in this provision except use the following for geosynthetic reinforcement rupture:

$$\phi\, T_{al}\, R_c \geq T_{max} + (T_I / RF_{CR})$$

Where,

ϕ = resistance factor for tensile resistance in accordance with Section 7.2.1 of the FHWA MSE wall manual,

T_{al} = long-term geosynthetic design strength approved for chosen MSE wall system,

R_c = reinforcement coverage ratio = 1 for continuous geosynthetic reinforcement,

T_{max} = factored static load in accordance with Section 7.2 of the FHWA MSE wall manual,

T_I = factored impact load in accordance with Section 7.2 of the FHWA MSE wall manual and

RF_{CR} = creep reduction factor approved for chosen MSE wall system.

If existing or future obstructions such as foundations, guardrail, fence or handrail posts, moment slabs, pavements, pipes, inlets or utilities will interfere with reinforcement, maintain a clearance of at least 3" between obstructions and reinforcement unless otherwise approved. Locate reinforcement layers so all of reinforcement length is within 3" of corresponding connection elevations.

Use 6" thick cast-in-place unreinforced concrete leveling pads beneath panels and SRW units that are continuous at steps and extend at least 6" in front of and behind bottom

row of panels or SRW units. Unless required otherwise in the plans, embed top of leveling pads in accordance with the following requirements:

EMBEDMENT REQUIREMENTS		
Front Slope[1] (H:V)	**Minimum Embedment Depth[2] (whichever is greater)**	
6:1 or flatter (except abutment walls)	H/20	1 ft for H ≤ 10 ft 2 ft for H > 10 ft
6:1 or flatter (abutment walls)	H/10	2 ft
> 6:1 to < 3:1	H/10	2 ft
3:1 to 2:1	H/7	2 ft

1. Front slope is as shown in the plans.
2. Define "H" as the maximum design height plus embedment per wall with the design height and embedment as shown in the plans.

When noted in the plans, locate a continuous aggregate shoulder drain along base of reinforced zone behind aggregate. Provide wall drainage systems consisting of drains and outlet components in accordance with Standard Drawing No. 816.02 of the *Roadway Standard Drawings*.

For MSE walls with panels, place at least 2 bearing pads in each horizontal panel joint so the final horizontal joint opening is between 5/8" and 7/8". Additional bearing pads may be required for panels wider than 5 ft as determined by the Engineer. Cover joints at back of panels with filtration geotextiles at least 12" wide.

For segmental retaining walls, fill SRW unit core spaces with coarse aggregate and between and behind SRW units with coarse aggregate for a horizontal distance of at least 18".

Separation geotextiles are required between aggregate and overlying fill or pavement sections except when concrete pavement, full depth asphalt or cement treated base is placed directly on aggregate. Separation geotextiles may also be required between coarse aggregate and backfill or natural ground as determined by the Engineer.

Unless required otherwise in the plans, use reinforced concrete coping at top of walls. Use coping dimensions shown in the plans and cast-in-place concrete coping for segmental retaining walls and when noted in the plans. When shown in the plans and at the Contractor's option, connect cast-in-place concrete coping to panels and SRW units with dowels or extend coping down back of MSE walls. Also, connect cast-in-place leveling concrete for precast concrete coping to panels with dowels. When concrete barrier rail is required above MSE walls, use concrete barrier rail with moment slab as shown in the plans.

Submit working drawings and design calculations for acceptance in accordance with Article 105-2 of the *Standard Specifications*. Submit working drawings showing plan views, wall profiles with required resistances, typical sections with reinforcement and

connection details, aggregate locations and types, geotextile locations and details of leveling pads, panels or SRW units, coping, bin walls, slip joints, etc. If necessary, include details on working drawings for concrete barrier rail with moment slab, reinforcement splices if allowed for the chosen MSE wall system, reinforcement connected to end bent caps and obstructions extending through walls or interfering with reinforcement, leveling pads, barriers or moment slabs. Submit design calculations for each wall section with different surcharge loads, geometry or material parameters. At least one analysis is required for each wall section with different reinforcement lengths. When designing MSE walls with computer software other than MSEW, use MSEW version 3.0 with update 14.93 or later, manufactured by ADAMA Engineering, Inc. to verify the design. At least one MSEW analysis is required per 100 ft of wall length with at least one MSEW analysis for the wall section with the longest reinforcement. Submit electronic MSEW input files and PDF output files with design calculations.

C. Preconstruction Meeting

Before starting MSE wall construction, hold a preconstruction meeting to discuss the construction and inspection of the MSE walls. Schedule this meeting after all MSE wall submittals have been accepted. The Resident or Bridge Maintenance Engineer, Bridge Construction Engineer, Geotechnical Operations Engineer, Contractor and MSE Wall Installer Superintendent will attend this preconstruction meeting.

4.0 CORROSION MONITORING

Corrosion monitoring is required for MSE walls with steel reinforcement. The Engineer will determine the number of monitoring locations and where to install the instrumentation. Contact the Materials and Tests (M&T) Unit before beginning wall construction. M&T will provide the corrosion monitoring instrumentation kits and if necessary, assistance with installation.

5.0 SITE ASSISTANCE

Unless otherwise approved, provide an MSE Wall Vendor representative to assist and guide the MSE Wall Installer on-site for at least 8 hours when the first panels or SRW units and reinforcement layer are placed. If problems are encountered during construction, the Engineer may require the vendor representative to return to the site for a time period determined by the Engineer.

6.0 CONSTRUCTION METHODS

Control drainage during construction in the vicinity of MSE walls. Direct run off away from MSE walls, aggregate and backfill. Contain and maintain aggregate and backfill and protect material from erosion.

Excavate as necessary for MSE walls in accordance with the accepted submittals. If applicable and at the Contractor's option, use temporary shoring for wall construction instead of temporary slopes to construct MSE walls. Define "temporary shoring for wall construction" as temporary shoring not shown in the plans or required by the Engineer

including shoring for OSHA reasons or the Contractor's convenience.

Unless required otherwise in the plans, install foundations located in the reinforced zone before placing aggregate or reinforcement. Notify the Engineer when foundation excavation is complete. Do not place leveling pad concrete, aggregate or reinforcement until excavation dimensions and foundation material are approved.

Construct cast-in-place concrete leveling pads at elevations and with dimensions shown in the accepted submittals and in accordance with Section 420 of the *Standard Specifications*. Cure leveling pads at least 24 hours before placing panels or SRW units.

Erect and support panels and stack SRW units so the final wall position is as shown in the accepted submittals. Place SRW units with a maximum vertical joint width of 3/8".

Set panels with a vertical joint width of 3/4". Place bearing pads in horizontal panel joints and cover all panel joints with filtration geotextiles as shown in the accepted submittals. Attach filtration geotextiles to back of panels with adhesives, tapes or other approved methods.

Stagger panels and SRW units to create a running bond by centering panels or SRW units over joints in the row below as shown in the accepted submittals. Construct MSE walls with the following tolerances:

A. SRW units are level from front to back and between units when checked with a 3 ft long level,

B. Final wall face is within 3/4" of horizontal and vertical alignment shown in the accepted submittals when measured along a 10 ft straightedge and

C. Final wall plumbness (batter) is not negative and within 0.5° of vertical unless otherwise approved.

Place reinforcement at locations and elevations shown in the accepted submittals and within 3" of corresponding connection elevations. Install reinforcement with the direction shown in the accepted submittals. Place reinforcement in slight tension free of kinks, folds, wrinkles or creases. Reinforcement may be spliced once per reinforcement length if shown in the accepted submittals. Use reinforcement pieces at least 6 ft long. Contact the Engineer when unanticipated existing or future obstructions such as foundations, guardrail, fence or handrail posts, pavements, pipes, inlets or utilities will interfere with reinforcement. To avoid obstructions, deflect, skew or modify reinforcement as shown in the accepted submittals.

Place aggregate in the reinforced zone in 8" to 10" thick lifts. Compact fine aggregate in accordance with Subarticle 235-3(C) of the *Standard Specifications*. Use only hand operated compaction equipment to compact aggregate within 3 ft of panels or SRW units. At a distance greater than 3 ft, compact aggregate with at least 4 passes of an 8 ton to 10 ton vibratory roller in a direction parallel to the wall face. Smooth wheeled or rubber tired rollers are also acceptable for compacting aggregate. Do not use sheepsfoot, grid rollers or other types of compaction equipment with feet. Do not displace or damage

reinforcement when placing and compacting aggregate. End dumping directly on geosynthetics is not permitted. Do not operate heavy equipment on reinforcement until it is covered with at least 8" of aggregate. Replace any damaged reinforcement to the satisfaction of the Engineer.

Backfill for MSE walls outside the reinforced zone in accordance with Article 410-8 of the *Standard Specifications*. If a drain is required, install wall drainage systems as shown in the accepted submittals and in accordance with Section 816 of the *Standard Specifications*.

Place and construct coping and leveling concrete as shown in the accepted submittals. Construct leveling concrete in accordance with Section 420 of the *Standard Specifications*. Construct cast-in-place concrete coping in accordance with Subarticle 452-3(C) of the *Standard Specifications*. When single faced precast concrete barrier is required in front of and against MSE walls, stop coping just above barrier so coping does not interfere with placing barrier up against wall faces.

When separation geotextiles are required, overlap adjacent geotextiles at least 18" and hold separation geotextiles in place with wire staples or anchor pins as needed. Seal joints above and behind MSE walls between coping and concrete slope protection with silicone sealant.

7.0 MEASUREMENT AND PAYMENT

MSE Retaining Wall No. __ will be measured and paid in square feet. MSE walls will be measured as the square feet of exposed wall face area with the height equal to the difference between top and bottom of wall elevations. Define "top of wall" as top of coping or top of panels or SRW units for MSE walls without coping. Define "bottom of wall" as shown in the plans and no measurement will be made for portions of MSE walls embedded below bottom of wall elevations.

The contract unit price for *MSE Retaining Wall No.* __ will be full compensation for providing designs, submittals, labor, tools, equipment and MSE wall materials, excavating, backfilling, hauling and removing excavated materials and supplying site assistance, leveling pads, panels, SRW units, reinforcement, aggregate, wall drainage systems, geotextiles, bearing pads, coping, miscellaneous components and any incidentals necessary to construct MSE walls. The contract unit price for *MSE Retaining Wall No.* __ will also be full compensation for reinforcement connected to and aggregate behind end bent caps in the reinforced zone, if required.

No separate payment will be made for temporary shoring for wall construction. Temporary shoring for wall construction will be incidental to the contract unit price for *MSE Retaining Wall No.* __.

The contract unit price for *MSE Retaining Wall No.* __ does not include the cost for ditches, fences, handrails, barrier or guardrail associated with MSE walls as these items will be paid for elsewhere in the contract.

Where it is necessary to provide backfill material behind the reinforced zone from sources

other than excavated areas or borrow sources used in connection with other work in the contract, payment for furnishing and hauling such backfill material will be paid as extra work in accordance with Article 104-7 of the *Standard Specifications*. Placing and compacting such backfill material is not considered extra work but is incidental to the work being performed.

Payment will be made under:

Pay Item	**Pay Unit**
MSE Retaining Wall No. __	Square Foot

MODIFIED BRIDGE APPROACH FILLS:

(SPECIAL)

Description

Modified Bridge Approach Fills utilize steel or geosynthetic reinforcement in the reinforced zone connected to the backwall of bridge end bent caps to provide the required lateral resistance. Construct modified bridge approach fills in accordance with the details in the plan and as specified in the provision. Define "reinforcement" as steel or geosynthetic reinforcement and "geosynthetics" as geosynthetic grids (geogrids) or strips (geostrips). Define "aggregate" as coarse or fine aggregate. Design and construct the reinforced zone in accordance with "Mechanically Stabilized Earth Retaining Walls" provision unless otherwise specified in this provision.

Materials

Refer to Division 10 of the *2012 Standard Specifications*.

Item	Section
Aggregate	1014
Anchor Pins	1056-2
Geotextiles	1056
Portland Cement Concrete	1000
Select Material	1016
Subsurface Drainage Materials	1044
Wire Staples	1060-8(D)
Reinforcing Steel	1070

Supply reinforcement, aggregate, and miscellaneous components of the reinforcement zone in accordance with "Mechanically Stabilized Earth Retaining Walls" provision.

Provide Type 2 geotextile for filtration and separation geotextiles, and No. 78M stone for drains. Use Class B concrete for concrete pads.

Provide PVC pipes, fittings and outlet pipes for subsurface drainage materials. For drains and PVC pipes behind end bents, use pipes with perforations that meet AASHTO M 278.

Use PVC, HDPE or linear low density polyethylene (LLDPE) geomembranes for modified reinforced bridge approach fills. For PVC geomembranes, provide grade PVC30 geomembranes that meet ASTM D7176. For HDPE and LLDPE geomembranes, use geomembranes with a nominal thickness of at least 30 mils that meet Geosynthetic Research Institute Standard Specifications GM13 and GM17, respectively. Handle and store geomembranes in accordance with Article 1056-2 of the *2012 Standard Specifications*. Provide material certifications for geomembranes in accordance with Article 1056-3 of the *2012 Standard Specifications*.

Preconstruction Requirements

Submit working drawing and design calculations for the reinforced zone in accordance with "Mechanically Stabilized Earth Retaining Walls" provision.

Construction Methods

Excavate as necessary for modified bridge approach fills in accordance with the contract. Notify the Engineer when foundation excavation is complete. Do not place geomembranes or filtration geotextiles until excavation dimensions and foundation material are approved. Attach geomembranes and filtration geotextiles to end bent cap back and wing walls with adhesives, tapes or other approved methods. Glue or weld geomembrane seams to prevent leakage.

Construct one foot square drains consisting of 4" diameter continuous perforated PVC pipes surrounded by No. 78M stone wrapped in Type 2 geotextiles. Install drains in accordance with the details in the plan.

Use solvent cement to connect PVC pipes so joints do not leak. Connect perforated pipes to outlet pipes just behind wing walls. Provide drain pipes and drains with positive drainage towards outlets. Place pipe sleeves in or under wing walls for outlet pipes so positive drainage is maintained. Use sleeves that can withstand wing wall loads.

Construct the reinforced zone (aggregate and reinforcement) in accordance with "Mechanically Stabilized Earth Retaining Walls" provision. Place and compact aggregate outside the reinforced zone the same way as aggregate within the reinforced zone. Do not displace or damage geotextiles, geomembranes, drain pipes or drains when placing and compacting aggregate. End dumping directly on geotextile and geomembrane is not permitted. Do not operate heavy equipment on geotextiles or geomembranes, drain pipes or drains until they are covered with at least 8" of aggregate. Replace any damaged geotextiles, geomembranes, drain pipes or drains to the satisfaction of the Engineer.

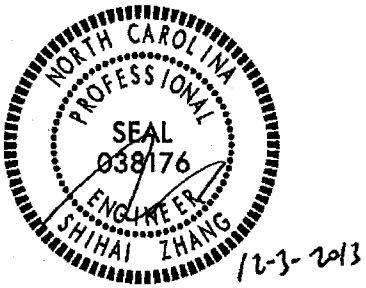
Cover open ends of outlet pipes with rodent screens as shown in Standard Drawing No. 815.03 of the *2012 Roadway Standard Drawings*. Connect ends of outlet pipes to concrete pads or existing drainage structures as directed by the Engineer. Construct concrete pads with an Ordinary surface finish that meets Subarticle 825-6(B) of the *2012 Standard Specifications*.

Measurement and Payment

Modified Bridge Approach Fill, Station 268+22.89 -L- will be paid at the contract lump sum price. The contract lump sum price for *Modified Bridge Approach Fill, Station 268+22.89 –L-* will be full compensation for providing designs, submittals, labor, tools, equipment, reinforcement, aggregate, miscellaneous components for the reinforcement zones, excavating, backfilling, hauling and removing excavated materials and site assistance, compacting aggregate, connecting outlet pipes to existing drainage structures and supplying geotextiles, geomembranes, drains, pipe sleeves and outlet components and any incidentals necessary to construct modified bridge approach fills at both end bents of the bridge.

Payment will be made under:

Pay Item	**Pay Unit**
Modified Bridge Approach Fill, Station 268+22.89 -L-	Lump Sum



PROJECT SPECIAL PROVISIONS
GEOENVIRONMENTAL

CONTAMINATED SOIL (2/25/2014)

The Contractor's attention is directed to the fact that soil contaminated with petroleum hydrocarbon compounds exist within the project area. The known areas of contamination are indicated on corresponding plans sheets. Information relating to these contaminated areas, sample locations, and investigation reports are available at the following web address by navigating to the correct letting year and month then selecting, "Plans and Proposals", "Guilford U-2525B", "GeoEnvironmental":

http://dotw-xfer01.dot.state.nc.us/dsplan/

Petroleum contaminated soil may be encountered during any earthwork activities on the project. The Contractor shall only excavate those soils that the Engineer designates necessary to complete a particular task. The Engineer shall determine if soil is contaminated based on petroleum odors and unusual soil staining. Contaminated soil not required to be excavated is to remain in place and undisturbed. Undisturbed soil shall remain in place, whether contaminated or not. The Contractor shall transport all contaminated soil excavated from the project to a facility licensed to accept contaminated soil.

In the event that the Contractor chooses to stockpile the soil temporarily, the stockpile shall be created within the property boundaries of the source material and in accordance with the Stockpile Detail found in the plans. If the volume of contaminated material exceeds available space on site, the Contractor shall obtain a permit from the NCDENR UST Section's Regional Office for off-site temporary storage. Stockpiling contaminated soil will be incidental to the project. The Contractor shall provide disposal manifests and weigh tickets to the Engineer for review and approval. The Engineer will in turn provide the GeoEnvironmental Section with a copy of the disposal manifests and weigh tickets for their records.

Measurement and Payment:

The quantity of contaminated soil hauled, and disposed of shall be the actual number of tons of material, which has been acceptably transported and weighed with certified scales as documented by disposal manifests and weigh tickets. The quantity of contaminated soil, measured as provided above, shall be paid for at the contract unit price per ton for "Hauling, and Disposal of Petroleum Contaminated Soil".

The above price and payment shall be full compensation for all work covered by this section, including, but not limited to loading, transportation, weighing, laboratory testing, disposal, equipment, decontamination of equipment, labor, and personal protective equipment. Excavation of petroleum contaminated soil will be incidental to the project.

Payment shall be made under: 2-27-2014

Pay Item	Pay Unit
Hauling and Disposal of Petroleum Contaminated Soil	Ton

NORTH CAROLINA PROFESSIONAL SEAL 31499 ENGINEER CYRUS F. PARKER

TIP # U-2525B **Guilford County**

NORTH CAROLINA PROFESSIONAL SEAL 022959 ENGINEER RONALD W. KIRK

1/7/14

OVERHEAD AND DYNAMIC MESSAGE SIGN FOUNDATIONS:

Description

Sign foundations include foundations for overhead and dynamic message signs (DMS) supported by metal poles or upright trusses. Sign foundations consist of footings with pedestals or drilled piers with or without grade beams or wings, conduit and anchor rod assemblies. Construct sign foundations in accordance with the contract and accepted submittals. Define "cantilever sign" as an overhead cantilever sign support in accordance with Figure 1-1 of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.*

Materials

Use sign foundation materials that meet the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

Assumed Subsurface Conditions

Assume the following soil parameters and groundwater elevation for sign foundations unless these subsurface conditions are not applicable to sign locations:

(A) Unit weight (γ) = 120 lb/cf,

(B) Friction angle (ϕ) = 30°,

(C) Cohesion (c) = 0 lb/sf and

(D) Groundwater 7 ft below finished grade.

A subsurface investigation is required if the Engineer determines these assumed subsurface conditions do not apply to a sign location and the sign cannot be moved. Subsurface conditions requiring a subsurface investigation include but are not limited to weathered or hard rock, boulders, very soft or loose soil, muck or shallow groundwater. No extension of completion date or time will be allowed for subsurface investigations.

Subsurface Investigations

Use a prequalified geotechnical consultant to perform one standard penetration test (SPT) boring in accordance with ASTM D1586 at each sign location requiring a subsurface investigation. Rough grade sign locations to within 2 ft of finished grade before beginning drilling. Drill borings to 2 drilled pier diameters below anticipated pier tip elevations or refusal, whichever is higher.

Use the computer software gINT version V8i or later manufactured by Bentley Systems, Inc. with the current NCDOT gINT library and data template to produce SPT boring logs. Provide boring logs sealed by a geologist or engineer licensed in the state of North Carolina.

Sign Foundation Designs

Design sign foundations for the wind zone and clearances shown in the plans and the slope of finished grade at each sign location. Use the assumed soil parameters and groundwater elevation

above for sign foundation designs unless a subsurface investigation is required. For sign locations requiring a subsurface investigation, design sign foundations for the subsurface conditions at each sign location. Design footings, pedestals, drilled piers, grade beams and wings in accordance with the 6th Edition of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*. In some instances, conflicts with drainage structures may dictate sign foundation types.

Design footings in accordance with Section 4.4 of the *AASHTO Standard Specifications for Highway Bridges*. Do not use an allowable bearing pressure of more than 3,000 lb/sf for footings.

Design drilled piers for side resistance only in accordance with Section 4.6 of the *AASHTO Standard Specifications for Highway Bridges* except reduce ultimate side resistance by 25% for uplift. Use the computer software LPILE version 6.0 or later manufactured by Ensoft, Inc. to analyze drilled piers. Provide drilled pier designs with a horizontal deflection of less than 1" at top of piers. For cantilever signs with single drilled pier foundations supporting metal poles, use wings to resist torsion forces. Provide drilled pier designs with a factor of safety of at least 2.0 for torsion.

For drilled pier sign foundations supporting upright trusses, use dual drilled piers connected with a grade beam having a moment of inertia approximately equal to that of either pier. The Broms' method is acceptable to analyze drilled piers with grade beams instead of LPILE. Use a safety factor of at least 3.5 for the Broms' design method in accordance with C13.6.1.1 of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*.

Submit boring logs, if any, working drawings and design calculations for acceptance in accordance with Article 105-2 of the *2012 Standard Specifications*. Submit working drawings showing plan views, required foundation dimensions and elevations and typical sections with reinforcement, conduit and anchor rod assembly details. Include all boring logs, design calculations and LPILE output for sign foundation design submittals. Have sign foundations designed, detailed and sealed by an engineer licensed in the state of North Carolina.

Construction Methods

Construct footings, pedestals, drilled piers, grade beams and wings and install anchor rod assemblies for sign foundations in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

Measurement and Payment

Overhead Footings will be measured and paid in cubic yards. Sign foundations will be measured as the cubic yards of foundation concrete for footings, pedestals, drilled piers, grade beams and wings shown on the accepted submittals. The contract unit price for *Overhead Footings* will be full compensation for providing labor, tools, equipment and foundation materials, stabilizing or shoring excavations and supplying concrete, reinforcing steel, conduit, anchor rod assemblies and any incidentals necessary to construct sign foundations. Subsurface investigations required by the Engineer will be paid as extra work in accordance with Article 104-7 of the *2012 Standard Specifications*.

Payment will be made under:

Pay Item	**Pay Unit**
Overhead Footings	Cubic Yard

NORTH CAROLINA PROFESSIONAL SEAL 022059 ENGINEER RONALD W. KING

7/7/14

OVERHEAD SIGN SUPPORTS:

Description

Design, fabricate, furnish and erect various types of overhead sign assemblies. Fabricate supporting structures using tubular members of either aluminum or steel. The types of overhead sign assemblies included in this specification are span structures, cantilever structures and sign structures attached to bridges.

Materials

Structural Steel	Section 1072
Overhead Sign Structures	Section 1096
Signing Materials	Section 1092
Organic Zinc Repair Paint	Article 1080-9
Reinforcing Steel	Section 1070
Direct Tension Indicators	Sections 440 and 1072

Construction Methods

A. General

Fabricate overhead sign assemblies in accordance with the details shown in the approved working drawings and the requirements of these specifications.

No welding, cutting or drilling will be permitted in the field, unless approved by the Engineer.

Drill bolt holes and slots to finished size. Holes may also be punched to finished size, provided the diameter of the punched holes is at least twice the thickness of the metal being punched. Flame cutting of bolt holes and slots is not permitted.

Erect sign panels in accordance with the requirements for Type A or B signs as indicated in the plans or Roadway Standard Drawings. Field drill two holes per connection in the Z bars for attaching signs to overhead structures. Provide two U-bolts at each U-bolt connection such as each truss chord to sign hanger and each truss chord to walkway support or light support. Provide two U-bolts at each U-bolt connection where ends of truss chords are supported. The minimum diameter of all U-bolts is ½ inch.

For all U-bolt connections of hanger beams to overhead assembly truss chords, provide all U-bolts with a flat washer and double nuts at each end of the U-bolts. All double nuts that are on any U-bolt shall be the same thickness and weight. When

assembled, the double nuts shall be brought tight against each other by the use of two wrenches.

Use two coats of a zinc-rich paint to touch up minor scars on all galvanized materials.

For high strength bolted connections, use direct tension indicators. Galvanize bolts, nuts and washers in accordance with the Standard Specifications.

B. Shop Drawings

Design the overhead sign supports, including foundations, prior to fabrication. Submit design calculations and working drawings of the designs to the Engineer for review and acceptance.

Have a professional engineer registered in the State of North Carolina perform the computations and render a set of sealed, signed and dated drawings detailing the construction of each structure.

Submit to the Engineer for review and acceptance complete design and fabrication details for each overhead sign assembly, including foundations and brackets for supporting the signs and maintenance walkways, if applicable, electrical control boxes, and lighting luminaires. Base design upon the revised structure line drawings, wind load area and the wind speed shown in the plans, and in accordance with the *Standard Specifications for Structural Structures for Highway Signs, Luminaires and Traffic Signals*.

Submit thirteen (13) copies of completely detailed working drawings and one copy of the design calculations including all design assumptions for each overhead sign assembly to the Engineer for approval prior to fabrication. Working drawings shall include complete design and fabrication details (including foundations); provisions for attaching signs, maintenance walkways (when applicable), lighting luminaires to supporting structures, applicable material specifications, and any other information necessary for procuring and replacing any part of the complete overhead sign assembly.

Allow 40 days for initial working drawing review after the Engineer receives them. If revisions to working drawings are required, an additional 40 days shall be required for review and approval of the final working drawings.

Approval of working drawings by the Engineer shall not relieve the Contractor of responsibility for the correctness of the drawings, or for the fit of all shop and field connections and anchors.

C. Design and Fabrication

The following criteria govern the design of overhead sign assemblies:

Design shall be in accordance with the *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition, 2009* and the 2010 and 2011 Interim Revisions.

Within this Specification, there are several design criteria that are owner specified. They include:

- Overhead cantilever sign structures shall include galloping loads (exclude four-chord horizontal trusses).
- The natural wind gust speed in North Carolina shall be assumed to be 11.6 mph.
- The fatigue importance category used in the design, for each type of structure, shall be for:
- Cantilever structures with span greater than 50 feet – Fatigue Category I.
-
- Cantilever structures with span less than or equal to 50 feet – Fatigue Category II.
- Non-cantilever structures – Fatigue Category II

The following Specification interpretations or criteria shall be used in the design of overhead sign assemblies:

- For design of supporting upright posts or columns, the effective length factor for columns "K", as provided for in Appendix B, Section B.5, shall be taken as the following, unless otherwise approved by the Engineer:

  Case 1 For a single upright post of cantilever or span type overhead sign structure, the effective column length factor, "K", shall be taken as 2.0.

  Case 2 For twin post truss-type upright post with the post connected to one chord of a horizontal truss, the effective column length factor for that column shall be taken as 2.0.

  Case 3 For twin post truss-type upright post with the post connected to two truss chords of a horizontal tri-chord or box truss, the effective column length factor for that column shall be taken as 1.65

- For twin post truss-type uprights, the unbraced length of the post shall be from the chord to post connection to the top of base plate

- For twin post truss-type uprights when the post is subject to axial compression, bending moment, shear, and torsion, the post shall satisfy *Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals* Equations 5-17, 5-18 and 5-19. To reduce the effects of secondary bending, in lieu of Equation 5-18, the following equation may be used:

$$\frac{f_a}{F_a} + \frac{f_b}{\left(1 - \frac{0.6 f_a}{F_é}\right) F_b} + \left(\frac{f_v}{F_v}\right)^2 \leq 1.0$$

Where fa = Computed axial compression stress at base of post

- The base plate thickness for all uprights and poles shall be a minimum of 2" but not less than that determined by the following criteria and design.

Case 1 Circular or rectangular solid base plates with the upright pole welded to the top surface of base plate with full penetration butt weld, and where no stiffeners are provided. A base plate with a small center hole, which is less than 1/5 of the upright diameter, and located concentrically with the upright pole, may be considered as a solid base plate.

The magnitude of bending moment in the base plate, induced by the anchoring force of each anchor bolt shall be calculated as $M = (P \times D_1) / 2$.

Case 2 Circular or rectangular base plate with the upright pole socketed into and attached to the base plate with two lines of fillet weld, and where no stiffeners are provided, or any base plate with a center hole that is larger in diameter than 1/5 of the upright diameter
The magnitude of bending moment induced by the anchoring force of each anchor bolt shall be calculated as $M = P \times D_2$.

- M - bending moment at the critical section of the base plate induced by one anchor bolt
- P - anchoring force of each anchor bolt
- D_1 - horizontal distance between the center of the anchor bolt and the outer face of the upright, or the difference between the radius of the bolt circle and the outside radius of the upright
- D_2 - horizontal distance between the face of the upright and the face of the anchor bolt nut

- The critical section shall be located at the face of the anchor bolt and perpendicular to the radius of the bolt circle. The overlapped part of two adjacent critical sections shall be considered ineffective.

- The thickness of Case 1 base plate shall not be less than that calculated based on formula for Case 2.

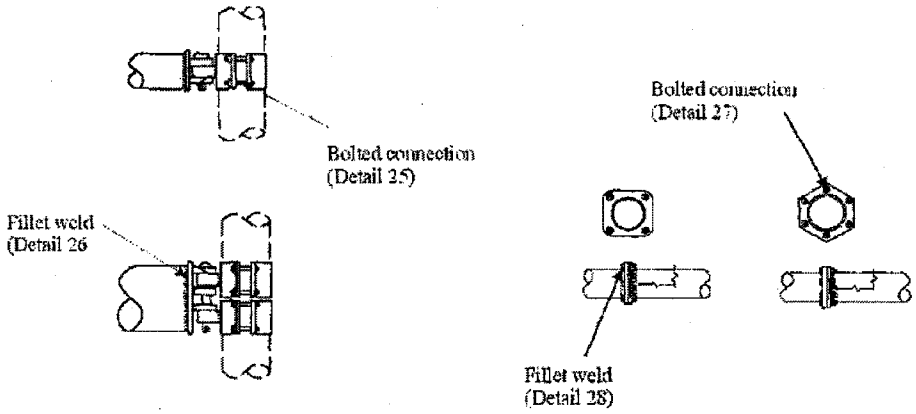
- Uprights, foundations, and trusses that support overhead signs shall be designed in accordance with the Overhead and Dynamic Message Sign Foundations Project Special Provision for the effects of torsion. Torsion shall be considered from dead load eccentricity of these attachments, as well as for attachments such as walkways, supporting brackets, lights, etc., that add to the torsion in the assembly. Truss vertical and horizontal truss diagonals in particular and any other assembly members shall be appropriately sized for these loads.

- Uprights, foundations, and trusses that support overhead mounted signs shall be designed for the proposed sign wind area and future wind areas. The design shall consider the effect of torsion induced by the eccentric force location of the center of wind force above (or below) the center of the supporting truss. Truss vertical and horizontal truss diagonals in particular and any other assembly members shall be appropriately sized for these loads.

For non-cantilevered monotube sign support structures, the following table and figures are considered as a required addition to the Standard Specifications for Structural Support for Highway Signs, Luminaires and Traffic Signals, 5th Edition, 2009:

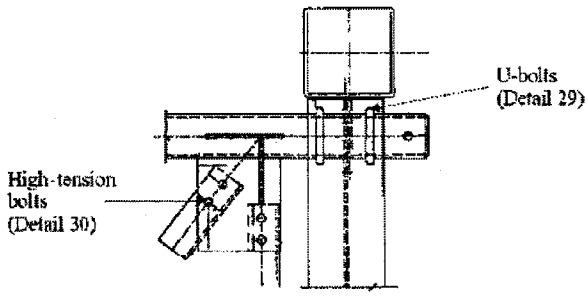
Construction	Detail	Stress Category	Application	Example
Mechanically Fastened Connections	25. Bolts in Tension	D	Beam column connection for monotube structures	16
Fillet Weld Connections	26. Fillet welded with one side normal to applied stress	E'	Beam column connection for monotube structures	17
Mechanically Fastened Connections	27. High strength bolts in tension	D	Monotube or truss-chord splice	17
Fillet Weld Connections	28. Fillet welded with one side normal to applied stress	E'	Monotube or truss-chord splice	17
Mechanically Fastened Connections	29. U-bolts tied to transverse truss column to keep chords in place	D	Horizontal truss connection with vertical truss	18
Mechanically Fastened Connections	30. Net section of full-tightened, high tension bolts in shear	B	Truss bolted joint	18

Add to the Specifications, Figure 11-1:



Beam-Column Connection for monotube structure
Example 16

Monotube beam splice
Example 17



Beam-Column Connection for Truss Structure
Example 18

Fabricate all overhead sign assemblies, including but not limited to foundations, in accordance with the details shown on the approved shop drawings and with the requirements of these Specifications.

Fabricate the span and cantilever supporting structures using tubular members of either aluminum or steel, using only one type of material throughout the project. Sign support structures that are to be attached to bridges shall be fabricated using other structural shapes.

Horizontal components of the supporting structures for overhead signs may be of a truss design or a design using singular (monotube) horizontal members to support the sign panels.

Truss or singular member centerline must coincide with the centerline of sign design area shown on the structure line drawing.

Provide permanent camber in addition to dead load camber in accordance with the *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*. Indicate on the shop drawings the amount of camber provided and the method employed in the fabrication of the support to obtain the camber.

Use cantilever sign structures that meet the following design criteria:

a. Do not exceed an L / 150 vertical dead load deflection at the end of the arm due to distortions in the arm and vertical support, where L is the length of the arm from the center of the vertical support to the outer edge of the sign.

b. Do not exceed an L / 40 horizontal deflection at the end of the arm due to distortions in the arm and vertical support, as a result of design wind load.

Fabricate attachment assemblies for mounting signs in a manner that allows easy removal of sign panels for repair.

Compensation

The work covered by this section will be paid for at the contract lump sum for each *Supports, Overhead Sign Structure* @ _____. Such price will be full compensation for all work covered by this specification includes all design, fabrication, construction, transportation, and erection of the complete overhead sign structure, supporting structure, hardware, lighting support brackets, preparing and furnishing shop drawings, and attaching the signs to the overhead assembly.

Payment will be made under:

Supports, Overhead Sign Structure @ _____	Lump Sum

NORTH CAROLINA PROFESSIONAL SEAL 023521 ENGINEER RHONDA B. EARLY
4/7/14

WORK ZONE TRAFFIC CONTROL
Project Special Provisions

TEMPORARY RUMBLE STRIPS
(07/10/2013)

Description

Furnish, install, maintain, relocate, and remove Temporary Rumble Strips in accordance with the plans and /or drawings.

Materials

Provide Temporary Rumble Strips which can be modular units or a continuous piece. Provide rumble strips manufactured from durable high impact resistant, non-warping, rubber or recycled rubber material or temporary tape at 4", 240mil.

When installed transversely in the travel lane, they are to provide an auditory and vibratory alert to the motorists.

When installed transversely in the travel lane, either singularly or by a combination of interlocked sections, they are to be a minimum of 11feet in length, nominal widths between 12 inches and 13 inches and a thickness of between 3/4 inches and 1inch.

The colors of the temporary rumble strips may be completely black or a combination of black, white and orange.

The temporary rumble strips shall maintain position on both asphalt and concrete roads when impacted without the use of adhesives or fasteners.

The temporary rumble strips shall have beveled edges on each side for ease of installation.

The temporary rumble strips shall be installed and removed without the aid of auxiliary equipment or machinery.

Method of Measurement

The quantity to be paid for will be the maximum number Linear Foot (LF) of Temporary Rumble Strips acceptably installed during any one time during the life of the project in accordance with the plans.

No measurement or payment will be made for the relocation, maintenance, or removal of Temporary Rumble Strips.

Basis of Payment

The quantity of Temporary Rumble Strips as provided above will be paid for at the contract unit price per LF.

Payment will be made under:

Pay Item	**Pay Unit**
Temporary Rumble Strip	LF

Law Enforcement:
(02/06/2013)

NORTH CAROLINA PROFESSIONAL SEAL 023521 ENGINEER LINDA B. EARLY 1-9-14

Description

Furnish Law Enforcement Officers and marked Law Enforcement vehicles to direct traffic in accordance with the contract.

Construction Methods

Use uniformed Law Enforcement Officers and marked Law Enforcement vehicles equipped with blue lights mounted on top of the vehicle, and Law Enforcement vehicle emblems to direct or control traffic as required by the plans or by the Engineer.

Measurement and Payment

Law Enforcement will be measured and paid for in the actual number of hours that each Law Enforcement Officer is provided during the life of the project as approved by the Engineer. There will be no direct payment for marked Law Enforcement vehicles as they are considered incidental to the pay item.

Payment will be made under:

Pay Item	Pay Unit
Law Enforcement	Hour

TRAFFIC CONTROL DEVICES TO REMAIN ON PROJECT:

(02/05/2013)

NORTH CAROLINA PROFESSIONAL SEAL 023521 ENGINEER RHONDA B. EARLY

1-9-14

Description

Furnish, install, maintain during the life of the project, and leave Traffic Control Devices on the project at its completion in accordance with the plans and specifications.

Construction Methods

Install and leave on the project the Traffic Control Devices necessary to accommodate the traffic pattern shown on sheet **TMP-89** of the Traffic Control Plan and sheet **PMP-27** of Final Pavement Marking Plan, unless otherwise directed by the Engineer.

Provide devices to remain on the project, which meet the requirements of their respective specifications in the 2012 Standard Specifications or their respective special provisions.

Provide devices to remain on the project that are in good condition and subject to the approval of the Engineer.

The devices required to remain on the project at its completion will become the property of the Department.

Basis Of Payment

No additional payment will be made specifically for leaving devices on the project. These devices will be paid under their respective pay items in the Contract which will include full compensation for furnishing, installing, maintaining during the life of the project, and leaving the devices on the project at its completion.

NORTH CAROLINA PROFESSIONAL SEAL 022582 ENGINEER PAUL KI-BUN CHAN 2-28-14

PROJECT SPECIAL PROVISIONS
LIGHTING

1.00 DESCRIPTION

The work covered by this section consists of furnishing, installing, connecting, and placing into satisfactory operating condition roadway lighting at locations shown on the plans. The work involves removing, and/or relocating existing lighting equipment and replacing circuitry. All removed material shall be coordinated with the Division Traffic Engineer, Dawn McPherson (336) 487-0175, and delivered in good condition to the NCDOT warehouse.

Division Traffic Services
4256 Camp Burton Road
McLeansville, NC

All work shall be performed in accordance with these Special Provisions, the Plans, the National Electrical Code, and North Carolina Department of Transportation "Standard Specifications for Roads and Structures" (Standard Specifications).

Perform all work in conformance with Division 14 of the Standard Specifications except as modified or added to by these Special Provisions. Install all bore pits outside the clear zone, as defined in the AASHTO Roadside Design Guide or as directed by the Engineer.

2.00 HIGH MOUNT FOUNDATIONS

2.10 DESCRIPTION

High mount foundations for high mount standards consist of drilled piers or footings with pedestals, conduit and anchor rod assemblies. Construct high mount foundations in accordance with the contract and either *Roadway Standard Drawings* No. 1402.01 or the accepted submittals. Define "high mount standard foundation" as a drilled pier including the conduit and anchor rod assembly that meets Standard Drawing No. 1402.01.

2.20 MATERIALS

Use high mount foundation materials that meet the *Foundations and Anchor Rod Assemblies for Metal Poles* provision found in the Roadway Project Special Provisions.

2.30 HIGH MOUNT STANDARD FOUNDATIONS

Construct high mount standard foundations for the wind zone and high mount heights shown in the plans unless the following assumed site conditions are not applicable to high mount locations:

A. Soil with unit weight (γ) $\geq$ 120 lb/cf and friction angle (ϕ) $\geq$ 30°,
B. Groundwater at least 7 ft below finished grade and

C. Slope of finished grade 6:1 (H:V) or flatter.

A subsurface investigation and high mount foundation design are required if the Engineer determines these assumed site conditions do not apply to a high mount location and the high mount cannot be moved. Subsurface conditions requiring a high mount foundation design include but are not limited to weathered or hard rock, boulders, very soft or loose soil, muck or shallow groundwater. No extension of completion date or time will be allowed for subsurface investigations or high mount foundation designs.

2.40 SUBSUFACE INVESTIGATIONS

Use a prequalified geotechnical consultant to perform one standard penetration test (SPT) boring in accordance with ASTM D1586 at each high mount location requiring a subsurface investigation. Rough grade high mount locations to within 2 ft of finished grade before beginning drilling. Drill borings to 2 drilled pier diameters below anticipated pier tip elevations or refusal, whichever is higher.

Use the computer software gINT version 8.0 or later manufactured by Bentley Systems, Inc. with the current NCDOT gINT library and data template to produce SPT boring logs. Provide boring logs sealed by a geologist or engineer licensed in the state of North Carolina.

2.50 HIGH MOUNT FOUNDATION DESIGNS

Design high mount foundations for the wind zone and high mount heights shown in the plans and the slope of finished grade and subsurface conditions at each high mount location. Design drilled piers, footings and pedestals in accordance with the 4th Edition of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*.

Design drilled piers for side resistance only in accordance with Section 4.6 of the *AASHTO Standard Specifications for Highway Bridges*. Use the computer software LPILE version 5.0 or later manufactured by Ensoft, Inc. to analyze drilled piers. Provide drilled pier designs with a horizontal deflection of less than 0.5" at top of piers.

Design footings in accordance with Section 4.4 of the *AASHTO Standard Specifications for Highway Bridges*. Do not use an allowable bearing pressure of more than 3,000 lb/sf for footings.

Submit boring logs, working drawings and design calculations for acceptance in accordance with Article 105-2 of the *Standard Specifications*. Submit working drawings showing plan views, required foundation dimensions and elevations and typical sections with reinforcement, conduit and anchor rod assembly details. Include all boring logs, design calculations and LPILE output for high mount foundation design submittals. Have high mount foundations designed, detailed and sealed by an engineer licensed in the state of North Carolina.

2.60 CONSTRUCTION METHODS

Grade a 3 ft diameter level work area around high mount locations with cut and fill slopes as shown on Standard Drawing No. 1402.01. Construct drilled piers, footings and pedestals and

install anchor rod assemblies for high mount foundations in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

2.70 MEASUREMENT AND PAYMENT

High Mount Foundations will be measured and paid in cubic yards. High mount standard foundations will be measured as the cubic yards of concrete shown on Standard Drawing No. 1402.01 for the high mount height and wind zone shown in the plans. All other high mount foundations will be measured as the cubic yards of foundation concrete for drilled piers, footings and pedestals shown on the accepted submittals. The contract unit price for *High Mount Foundations* will be full compensation for providing labor, tools, equipment and foundation materials, stabilizing or shoring excavations and supplying concrete, reinforcing steel, conduit, installation of anchor rod assemblies and any incidentals necessary to construct high mount foundations. Subsurface investigations and high mount foundation designs required by the Engineer will be paid as extra work in accordance with Article 104-7 of the *Standard Specifications*.

Payment will be made under:

High Mount Foundations.....Cubic Yard

3.00 REMOVE LIGHT STANDARDS

3.10 DESCRIPTION

The work covered by this section consists of the removal of existing metal single arm standards with concrete foundations at locations shown on the plans. The single arm standards are 45' mounting height. Single arm standards are attached to in ground concrete foundations with anchor bolts.

Removed single arm light standards to be relocated shall be stored until such time that they are to be relocated in new locations. Refer to the plans and the section of these provisions titled "Relocate Light Standard" for more information.

The Contractor is responsible for the storage and protection of the materials to be reused against loss or damage.

3.20 MATERIALS

No materials are required for this work except such miscellaneous items as tape and terminal devices to dead-end circuits serving the light standards.

3.30 CONSTRUCTION METHODS

The existing light system shall be left in operation until such time that it becomes in conflict with the actual construction work or it becomes a hazard to traffic as determined by the Engineer.

Coordinate work with the NC DOT Traffic Services Supervisor to assure that circuits can be de-energized where and when necessary.

The Contractor shall conduct work so that portions of the lighting system, which are not in conflict with construction, will be maintained in continuous nighttime operation.

Luminaires shall be removed from arms and delivered in good condition to the NCDOT warehouse.

Breakaway devices, including transformer bases with doors, couplings, anchor nuts, washers and connecting bolts, shall be detached from the standard and bundled together and delivered in good condition to the NCDOT warehouse.

Breakaway fuse holders shall be disconnected from the circuitry. If circuitry connections to the fuse holders are by compression connectors, then the connector shall be left intact, and the conductors shall be cut leaving a 12" lead to the connector. Fuse holders shall be delivered in good condition to the NCDOT warehouse.

The D.O.T. warehouse will be within 20 miles of the project and all salvaged materials (luminaires, standards, breakaway devices, and fuseholders) can be delivered to the same location. The Engineer will provide the exact location, name of person to contact and time when delivery may be made.

All hoisting and lifting shall be with rope or web slings fastened in such a manner as to prevent damaging or marking any of the salvaged materials. The Contractor shall provide proper transportation and supports so that standards will not be warped and shall provide protection so that the luminaire and circuitry will not be damaged by rain, etc. The Contractor shall furnish cranes, labor, and blocking materials to unload and properly store all salvaged materials at the NCDOT warehouse.

Circuitry to be retained shall be safely terminated. Circuitry to removed light standards shall become the property of the Contractor and shall be removed or abandoned.

Remove or abandon existing concrete light standard foundations. Dispose of the removed concrete, reinforcing steel, and anchor bolts in manner acceptable to the Engineer. Backfill the holes with suitable material and compact the material as required.

3.40 MEASUREMENT AND PAYMENT

The quantity of removed light standards to be paid for will be the actual number which have been dismounted from existing foundations and delivered to the NCDOT warehouse in good condition and accepted.

The quantity of removed foundations to be paid for will be the actual number which have been removed or abandoned and accepted.

The removed light standards measured as provided above will be paid for at the contract unit price per each "Remove Light Standard". Such price and payment will be considered full compensation for disassembly and delivery of the base, shaft with arm, luminaire, fuseholders and hardware to the NCDOT warehouse. It also includes the removal, disposal and backfilling associated with the concrete foundation.

Payment will be made under:
Remove Light Standard.....Each

4.00 RELOCATE LIGHT STANDARDS

4.10 DESCRIPTION

The work covered by this section consists of providing all equipment, labor and materials necessary to move an existing single arm light standard to a new foundation at locations shown on the plans. The standard to be relocated may be near the proposed final location, or may be one removed from another location. Refer to the plans and the section of these provisions titled "Remove Light Standards" for more information. Construction of a new foundation is not included in this section.

4.20 MATERIALS

Reuse existing materials, including the light standard, breakaway base and arm. Shims and washers may be reused, but new connecting bolts are required. Replace materials that are to be reused if they are damaged during relocation. Materials damaged during relocation will be replaced with new materials at no additional cost to the Department.

If an existing transformer bases for relocated single arm standards are damaged prior to the date of availability, the Contractor shall install acceptable transformer base from one of the twenty-two removed light standards at this location. Refer to the plans for these locations, and to Special Provisions titled "Remove Single Arm Light Standards."

The Contractor is responsible for the storage and protection of the reused materials against loss or damage.

4.30 CONSTRUCTION METHODS

Dismount the light standard from the existing standard foundation. Reassemble and reinstall light standards on a new foundation and reuse the existing breakaway base. Replace the connecting bolts joining the standard to the breakaway base and attachment hardware for the standard-to-arm connection. Use rope or web slings when hoisting or lifting the light standard, to prevent damage or marking. If the light standards are to be stored between dismounting and reinstalling, provide proper transportation and supports to prevent warping. Provide protection against the elements.

Remove or abandon existing concrete light standard foundations. Dispose of the removed concrete, reinforcing steel, and anchor bolts in manner acceptable to the Engineer. Backfill the holes with suitable material and compact the material as required.

Abandon or remove the conductors and conduit as required by construction. Refer to Standard Specifications Section 1400-10. Install new circuitry inside the standard, and install new feeder circuitry as shown on the plans.

Install new luminaire and new conductors inside the standard as detailed in the section of these Special Provisions titled "Replace Luminaires".

4.40 MEASUREMENT AND PAYMENT

The quantity of relocated light standards to be paid for will be the actual number, which have been removed from existing locations installed at proposed locations in a satisfactory manner and have been accepted by the Engineer.

Relocated light standards measured as provided above will be paid for at the contract unit bid price per each "Relocate Light Standard". Such price and payment will be considered full compensation for disconnecting circuitry, disassembly, transportation, storage, reassembly, installing new connecting bolts, connection of new circuitry, removal of foundation, disposing of concrete, backfilling, compaction and all incidentals necessary to complete the work.

Payment will be made under:

Relocate Light Standard ..... Each

5.00 RELOCATE CONTROL SYSTEM

5.10 DESCRIPTION

The work covered by this section consists of providing all equipment, labor and materials necessary to move an existing control system to a new foundation at the location shown on the plans. It also includes storage of materials to be reused, removal of the existing foundation, construction of a new foundation and replacement of the existing breakers and contactors.

5.20 MATERIALS

Reuse existing materials, including control system enclosure and all internal components. Replace materials that are to be reused if they are damaged during relocation. Materials damaged during relocation will be replaced with new materials at no additional cost to the Department.

The Contractor is responsible for the storage and protection of the reused materials against loss or damage.

The existing lightning arrestor installed inside the cabinet shall be removed and reinstalled outside of the cabinet assembly.

5.30 CONSTRUCTION METHODS

The existing lighting control system shall be left in operation until determined by the Engineer.

Coordinate work with the NC DOT Traffic Services Supervisor to assure that circuits can be de-energized where and when necessary.

Disconnect circuitry and remove control system enclosure from conduit and support structure, leaving all internal components intact. Abandon or remove underground circuitry, concrete pad and support structure.

All hoisting and lifting shall be with rope or web slings fastened in such a manner as to prevent damaging or marking any of the salvaged materials. The Contractor shall provide proper transportation, protection and supports so that rain, etc. will not damage equipment. The Contractor shall furnish labor, blocking materials and equipment to unload and properly store all salvaged materials.

Dispose of the removed concrete, reinforcing steel, support structure and conduit in a manner acceptable to the Engineer.

Abandon or remove the conductors and conduit as required by construction. Refer to Standard Specifications Section 1400-10. Install new rigid galvanized conduit above ground and new feeder circuitry as shown on the plans.

See Section 1408 of the Standard Specifications and Standard Drawings for installation of relocated control system and foundation.

The existing lightning arrestor installed inside the cabinet shall be removed and reinstalled outside and on the bottom of the cabinet assembly. Contractor shall tap a hole sized for the lightning arrestor mounting stub and attach arrestor to cabinet using existing lock nuts.

5.40 MEASUREMENT AND PAYMENT

The relocated control system measured as provided above will be paid for at the contract unit price per each "Relocate Control System". Such price and payment will be considered full compensation for disconnecting circuitry, disassembly, transportation, storage, reassembly, installing new connecting hardware and conduit, connection of new circuitry, removal of existing foundation and support structure, disposing of concrete, backfilling, compaction, construction of new foundation and support structure and all incidentals necessary to complete the work.

The quantity of relocated control systems to be paid for will be the actual number which have been dismantled and relocated to new proposed location.

Payment will be made under:

Relocate Control System.....Each

6.00 RELOCATE HIGH MOUNT STANDARDS

6.10 DESCRIPTION

The work covered in this section involves providing all equipment, labor and materials necessary to move an existing high mount standard to a new foundation at a location shown on the plans. It also includes numbering the poles with numbers shown in the plans.

6.20 MATERIALS

Existing materials, which include the high mount standard shaft, lowering device head frame, luminaire carrier ring, luminaires, winch assembly, hoist cables, enclosed circuit breaker, connectors and branch circuitry shall be reused. New anchor bolts, nuts and washers will be required. Existing materials, which are to be reused, which are damaged by the Contractor, shall be replaced by the Contractor without additional cost to the Department. Material furnished by the Contractor shall be new.

Materials removed by the contractor, which are to be reused, shall be stored by the Contractor and will remain his responsibility for protection against loss or damage.

New anchor bolts, nuts and washers shall be provided by the Contractor. The Contractor shall verify that the anchor bolts he furnished on the project are equal to the existing anchor bolts for Union Metal High Masts. Union Metal Corporation can be contacted at (330) 456-7653. Approved Existing High Mast pole submittals can be furnished by Lighting & Electrical Squad Leader of Roadway Design at (919) 707-6227 upon request.

6.30 CONSTRUCTION METHODS

The high mount standard shall be dismounted from the existing foundation and reinstalled on a new foundation. All hoisting and lifting shall be with rope or web slings fastened in such manner as to prevent damaging or marking any part of the high mount standard. The high mount standard will be relocated during day light hours so that the normal nightly operation of the light system will not be disrupted.

The existing concrete high mount foundation will be abandoned or removed by the Contractor. The removed concreter, reinforcing steel, and anchor bolts shall be disposed in waste areas to be furnished by the Contractor. The holes shall be back filled with suitable material and compacted as required. The existing underground circuit shall be abandoned or removed as required by construction.

Grounding conductors in feeder circuit and grounding electrode conductors shall be bonded together and to the shaft of high mount standard.

After relocation of the high mount standard, the operation of the lowering device shall be demonstrated by the Contractor by raising and lowering the carrier ring with luminaires a minimum of two (2) times. The raising and lowering demonstration shall include latching and unlatching at the top and connection of the test cables at the bottom. Twisting of the cables, failure of the carrier ring to latch or unlatch, unlevelness of the carrier, or hang up of the guide arms shall be sufficient reason for the engineer not to accept the relocated high mount.

6.40 MEASUREMENT AND PAYMENT

The quantity of relocated High Mount Standards to be paid for will be the actual number which have been relocated and installed at the proposed locations in a satisfactory manner and have been accepted by the engineer.

Relocate high mount standards measured as provided above will be paid for at the contract unit bid price per each "Relocate High Mount Standard". Such price and payment will be considered full compensation for disconnecting circuitry, disassembly, transportation, storage, providing new anchor bolts, nuts and washers, reassembly and connection of circuitry, removal of foundation, disposing of concrete, backfilling, compaction and all incidentals necessary to complete the work.

Payment will be made under:

Relocate High Mount Standard.....Each

7.00 REPLACE LUMINAIRES

7.10 DESCRIPTION

The work covered in this section involves removing existing luminaires on 100' high mast standards and 45' single arm standards and installing new luminaires on all standards and circuitry inside the single arm standards. It also includes numbering the poles with numbers shown in the plans.

7.20 MATERIALS

Provide materials as described in Sections 1400-2 (C), 1403-2 and 1406-2 of the Standard Specifications.

7.30 CONSTRUCTION METHODS

For all relocated single arm standards not removed as part of this contract, remove existing luminaires, fuseholders and circuitry inside the standard. Deliver the luminaires and fuseholders, in good condition to the NCDOT Warehouse. Replace single arm with the appropriate luminaires shown in the plans and detailed in the Standard Specification and Standard Drawings. Replace the circuitry inside the standard with type SO cable from the luminaire to feeder circuitry at the base, and replace the breakaway fuseholders.

Remove existing high mast luminaires during relocation of high mast standards item as described in Section 6.00. Deliver the high mast luminaires, in good condition, to the NCDOT Warehouse. Replace high mast luminaires with the appropriate luminaires shown in the plans and detailed in the Standard Specification and Standard Drawings.

Install identifying numbers on each light standard, as shown on Standard Drawing 1404.01, sheet 1 of 3.

7.40 MEASUREMENT AND PAYMENT

The quantity of replaced luminaires to be paid for will be the actual number and type which have been removed from remaining light standards and delivered to the NCDOT Warehouse, in good condition, and accepted, and have been replaced and accepted with like kind.

Such price and payment will be considered full compensation for disassembly and delivery of the existing luminaires and fuseholders (where fuseholders were used), installation of the new luminaires, new circuitry inside the single arm light standard and new breakaway fuseholders at the base of each single arm standard. Numbering each light standard as shown on the plans is also included.

Payment will be made under:

Replace Luminaire (type).....Each

Project: U-2525B County: Guilford

PROJECT SPECIAL PROVISIONS
Utility Construction

DAVIS • MARTIN • POWELL dmp
ENGINEERS & SURVEYORS
T: 336-886-4821 | F: 336-886-4458 | License: F-0245
6415 Old Plank Road, High Point, NC 27265 | www.dmp-inc.com

NORTH CAROLINA PROFESSIONAL SEAL 26457 ENGINEER ANDREW P. LARRICK
4-8-2014

Revise the 2012 Standard Specifications as follows:

Page 10-58, Sub-article 1036-1 General
Add the following sentence:

All materials in contact with potable water shall be in conformance with Section 1417 of the Safe Drinking Water Act.

Page 15-1, Sub-article 1500-2 Cooperation with the Utility Owner, paragraph 2:
Add the following sentences:

The utility owner is the City of Greensboro. For work involving Greensboro's facilities, the Contractor shall contact the City of Greensboro Service Center at (336) 373-2033, the City of Greensboro Water Resources Department Administration at (336) 373-2055, and the City of Greensboro Water and Sewer Inspections Department at (336) 373-2377.

A representative from the City of Greensboro shall witness all tests performed on their water and sewer facilities. Test results shall be provided to the City of Greensboro for any tests involving their facilities.

Page 15-2, Sub-article 1500-9 Placing Pipelines into Service
Add the following sentence:

Obtain approval from the NCDENR-Public Water Supply Section prior to placing a new water line into service. Use backflow prevention assemblies for temporary connections to isolate new water lines from existing water line.

Page 15-6, Sub-article 1510-3 (B), Testing and Sterilization
Change the allowable leakage formula to:

$$W = LD\sqrt{P} \div 148,000$$

PROJECT SPECIAL PROVISIONS
Utility Construction

Page 15-6, Sub-article 1510-3 (B), Testing and Sterilization, sixth paragraph:
Replace the paragraph with the following:

Sterilize water lines in accordance with Section 1003 of The Rules Governing Public Water supply and AWWA C651 Section 4.4.3, the Continuous Feed Method. Provide a chlorine solution with between 50 parts per million and 100 parts per million in the initial feed. If the chlorine level drops below 10 parts per million during a 24 hour period, then flush, refill with fresh chlorine solution, and repeat for 24 hours. Provide certified bacteriological and contaminant test results from a state-approved or state-certified laboratory. Operate all valves and controls to assure thorough sterilization.

Page 15-6, Sub-article 1510-3 (B), Testing and Sterilization, seventh paragraph:
Delete the words "may be performed concurrently or consecutively."
and replace with "shall be performed consecutively."

Page 15-7, Sub-article 1515-2 Materials,
Replace paragraph beginning "Double check valves…" with the following:

Double Check valves (DCV) and Reduced Pressure Zone principal (RPZ) backflow prevention assemblies shall be listed on the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research list of approved backflow devices.

Page 15-9, Sub-article 1515-4, Measurement and Payment, fifth paragraph:
Add the following sentence:

Bollards, as shown on the plans, for locating valves are incidental to the pay item for "__" Valve".

Page 15-11, Sub-article 1520-3(A)(2) Testing, line 5,
Replace the second paragraph with the following:

Test all 24" and smaller gravity sewer lines for leakage using infiltration, exfiltration, or air test. Perform visual inspection on gravity sewer lines larger than 24". Perform line and grade testing and deflection testing on all gravity sewer lines.

Page 15-17, Sub-article 1540-3(C), Marker Posts:
Replace with the following:

(C) Bollards

Mark encasements for future use with a concrete-filled steel bollard as shown on the plans. Place bollard at the right of way or at the ends of encasements if encasements extend beyond the right of way.

PROJECT SPECIAL PROVISIONS
Utilities by Others (UbO)

SO-DEEP ® US, P.C.

4650 Paragon Park Road, Raleigh, NC 27616

General:

The following utility companies have facilities that will be in conflict with the construction of this project:

A. AT&T – Communications
B. AT&T Legacy – Communications
C. Duke Energy – Power (Distribution)
D. Duke Energy – Power (Transmission)
E. Piedmont Natural Gas – Gas (Distribution)
F. Piedmont Natural Gas – Gas (Transmission)
G. Time Warner Cable – Communications
H. City of Greensboro – Water & Sewer

The conflicting facilities of these concerns will be adjusted prior to the date of availability, unless otherwise noted and are therefore listed in these special provisions for the benefit of the Contractor. All utility work listed herein will be done by the utility owners. All utilities are shown on the plans from the best available information.

The Contractor's attention is directed to Article 105.8 of the Standard Specifications.

Utilities Requiring Adjustment:

Utility relocations are shown on the Utilities by Others Plans.

A) AT&T – Communications

1) AT&T will install aerial cables on Duke Energy's new utility poles within the project limits by April 1, 2015.

2) AT&T's existing underground facilities in conflict with construction along –Y8- and –Y10-will be retired in place by the Date of Availability.

3) AT&T's existing underground facilities along –Y9- is to remain in service, one storm drain crossing will be adjusted if necessary. The Contractor will give AT&T two weeks' notice and one week to make adjustments.

PROJECT SPECIAL PROVISIONS
Utilities by Others (UbO)

4) Contact person for AT&T is Mr. Butch Bunton at (336) 379-5936 or bb0477@att.com.

B) AT&T Legacy – Communications

1) AT&T Legacy will relocate their facilities at –L- station 76+65 by the Date of Availability.

2) Contact person for AT&T Legacy is Mr. Homer Marona at (910) 638-1798 or hmarona@emabarqmail.com.

C) Duke Energy – Power (Distribution)

1) Duke Energy will install new utility poles, aerial lines, and underground cables within the project limits by November 1, 2014.

2) Duke Energy requires one weeks' notice by contractor and one week to cover up lines and have safety inspector onsite for the traffic signal pole placement – Y3- station 22+50.

3) Contact person for Duke Energy is Mr. Donnie Williams at (336) 854-4720 or donnie.williams@duke-energy.com.

D) Duke Energy – Power (Transmission)

1) Duke Energy will relocate their facilities from –L- station 127+00 to station 124+34 by the Date of Availability.

2) Duke Energy will relocate their facilities at –Y13- station 120+80 by the Date of Availability.

3) Contact person for Duke Energy is Ruth Neely at (704) 382-7820 or ruth.neely@duke-energy.com.

E) Piedmont Natural Gas – Gas (Distribution)

1) Piedmont Natural Gas will relocate their facilities by September 1, 2014.

2) Contact person for Piedmont Natural Gas is Mr. Philip ("Andy") Rumley at (336) 222-7108 or philip.rumley@piedmontng.com.

F) Piedmont Natural Gas – Gas (Transmission)

1) Piedmont Natural Gas will relocate their facilities at –L- station 104+28 by February 15, 2015
2) Contact person for Piedmont Natural Gas Transmission is Mr. David Vena, PE, at (704) 731-4496 or david.vena@piedmontng.com.

PROJECT SPECIAL PROVISIONS
Utilities by Others (UbO)

G) Time Warner Cable – Communications

1) Time Warner Cable will install aerial cables on Duke Energy's new utility poles within the project limits by December 1, 2014.

2) Contact person for Time Warner Cable is Mr. Roger Stanfield at (336) 217-3460, or roger.stanfield@twcable.com.

H) City of Greensboro – Sewer

1) The City will abandon the 10" force main crossing Line –L- at Station 103+25 by April 30, 2015.

2) For all other water and sewer relocations, see the Utility Construction Plans and Special Provisions.

3) The City will relocate the private sewer force main owned by the United Church of America outside the project limits. Existing force main at –Y21- station 35+60 continues north running parallel on the east side of Dunstan Road to Hicone Road, -Y22- at station 29+80, continues east to end construction station 45+00. The force main will remain in service until March 1, 2015

4) Contact person for the City of Greensboro is Mr. Kenny Treadway at (336) 373-2897 or kenny.treadway@greensboro-nc.gov.

Project Special Provisions
Erosion Control

STABILIZATION REQUIREMENTS:

Stabilization for this project shall comply with the time frame guidelines as specified by the NCG-010000 general construction permit effective August 3, 2011 issued by the North Carolina Department of Environment and Natural Resources Division of Water Quality. Temporary or permanent ground cover stabilization shall occur within 7 calendar days from the last land-disturbing activity, with the following exceptions in which temporary or permanent ground cover shall be provided in 14 calendar days from the last land-disturbing activity:

- Slopes between 2:1 and 3:1, with a slope length of 10 ft. or less
- Slopes 3:1 or flatter, with a slope of length of 50 ft. or less
- Slopes 4:1 or flatter

The stabilization timeframe for High Quality Water (HQW) Zones shall be 7 calendar days with no exceptions for slope grades or lengths. High Quality Water Zones (HQW) Zones are defined by North Carolina Administrative Code 15A NCAC 04A.0105 (25). Temporary and permanent ground cover stabilization shall be achieved in accordance with the provisions in this contract and as directed.

SEEDING AND MULCHING: (East)

The kinds of seed and fertilizer, and the rates of application of seed, fertilizer, and limestone, shall be as stated below. During periods of overlapping dates, the kind of seed to be used shall be determined. All rates are in pounds per acre.

All Roadway Areas

March 1 - August 31		**September 1 - February 28**	
50#	Tall Fescue	50#	Tall Fescue
10#	Centipede	10#	Centipede
25#	Bermudagrass (hulled)	35#	Bermudagrass (unhulled)
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Waste and Borrow Locations

March 1 – August 31		**September 1 - February 28**	
75#	Tall Fescue	75#	Tall Fescue
25#	Bermudagrass (hulled)	35#	Bermudagrass (unhulled)
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Note: 50# of Bahiagrass may be substituted for either Centipede or Bermudagrass only upon Engineer's request.

Approved Tall Fescue Cultivars

2nd Millennium	Duster	Magellan	Rendition
Avenger	Endeavor	Masterpiece	Scorpion
Barlexas	Escalade	Matador	Shelby
Barlexas II	Falcon II, III, IV & V	Matador GT	Signia
Barrera	Fidelity	Millennium	Silverstar
Barrington	Finesse II	Montauk	Southern Choice II
Biltmore	Firebird	Mustang 3	Stetson
Bingo	Focus	Olympic Gold	Tarheel
Bravo	Grande II	Padre	Titan Ltd
Cayenne	Greenkeeper	Paraiso	Titanium
Chapel Hill	Greystone	Picasso	Tomahawk
Chesapeake	Inferno	Piedmont	Tacer
Constitution	Justice	Pure Gold	Trooper
Chipper	Jaguar 3	Prospect	Turbo
Coronado	Kalahari	Quest	Ultimate
Coyote	Kentucky 31	Rebel Exeda	Watchdog
Davinci	Kitty Hawk	Rebel Sentry	Wolfpack
Dynasty	Kitty Hawk 2000	Regiment II	
Dominion	Lexington	Rembrandt	

On cut and fill slopes 2:1 or steeper Centipede shall be applied at the rate of 5 pounds per acre and add 20# of Sericea Lespedeza from January 1 - December 31.

Fertilizer shall be 10-20-20 analysis. A different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as a 10-20-20 analysis and as directed.

Native Grass Seeding And Mulching **(West)**

Native Grass Seeding and Mulching shall be performed on the disturbed areas of wetlands and riparian areas, and adjacent to Stream Relocation and/or trout stream construction within a 50 foot zone on both sides of the stream or depression, measured from top of stream bank or center of depression. The stream bank of the stream relocation shall be seeded by a method that does not alter the typical cross section of the stream bank. Native Grass Seeding and Mulching shall also be performed in the permanent soil reinforcement mat section of preformed scour holes, and in other areas as directed.

The kinds of seed and fertilizer, and the rates of application of seed, fertilizer, and limestone, shall be as stated below. During periods of overlapping dates, the kind of seed to be used shall be determined. All rates are in pounds per acre.

August 1 - June 1		May 1 – September 1	
18#	Creeping Red Fescue	18#	Creeping Red Fescue
8#	Big Bluestem	8#	Big Bluestem
6#	Indiangrass	6#	Indiangrass
4#	Switchgrass	4#	Switchgrass
35#	Rye Grain	25#	German or Browntop Millet
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Approved Creeping Red Fescue Cultivars:

Aberdeen	Boreal	Epic	Cindy Lou

Fertilizer shall be 10-20-20 analysis. A different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as a 10-20-20 analysis and as directed.

Native Grass Seeding and Mulching shall be performed in accordance with Section 1660 of the *Standard Specifications* and vegetative cover sufficient to restrain erosion shall be installed immediately following grade establishment.

Measurement and Payment

Native Grass *Seeding and Mulching* will be measured and paid for in accordance with Article 1660-8 of the *Standard Specifications*.

TEMPORARY SEEDING:

Fertilizer shall be the same analysis as specified for *Seeding and Mulching* and applied at the rate of 400 pounds and seeded at the rate of 50 pounds per acre. Sweet Sudan Grass, German Millet or Browntop Millet shall be used in summer months and Rye Grain during the remainder of the year. The Engineer will determine the exact dates for using each kind of seed.

FERTILIZER TOPDRESSING:

Fertilizer used for topdressing on all roadway areas except slopes 2:1 and steeper shall be 10-20-20 grade and shall be applied at the rate of 500 pounds per acre. A different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as 10-20-20 analysis and as directed.

Fertilizer used for topdressing on slopes 2:1 and steeper and waste and borrow areas shall be 16-8-8 grade and shall be applied at the rate of 500 pounds per acre. A different analysis of fertilizer may be used provided the 2-1-1 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as 16-8-8 analysis and as directed.

SUPPLEMENTAL SEEDING:

The kinds of seed and proportions shall be the same as specified for *Seeding and Mulching*, with the exception that no centipede seed will be used in the seed mix for supplemental seeding. The rate of application for supplemental seeding may vary from 25# to 75# per acre. The actual rate per acre will be determined prior to the time of topdressing and the Contractor will be notified in writing of the rate per acre, total quantity needed, and areas on which to apply the supplemental seed. Minimum tillage equipment, consisting of a sod seeder shall be used for incorporating seed into the soil as to prevent disturbance of existing vegetation. A clodbuster (ball and chain) may be used where degree of slope prevents the use of a sod seeder.

MOWING:

The minimum mowing height on this project shall be 4 inches.

LAWN TYPE APPEARANCE:

All areas adjacent to lawns must be hand finished as directed to give a lawn type appearance. Remove all trash, debris, and stones ¾" and larger in diameter or other obstructions that could interfere with providing a smooth lawn type appearance. These areas shall be reseeded to match their original vegetative conditions, unless directed otherwise by the Field Operations Engineer.

REFORESTATION:

Description

Reforestation will be planted within interchanges and along the outside borders of the road, and in other areas as directed. *Reforestation* is not shown on the plan sheets. See the Reforestation Detail Sheet.

All non-maintained riparian buffers impacted by the placement of temporary fill or clearing activities shall be restored to the preconstruction contours and revegetated with native woody species.

The entire *Reforestation* operation shall comply with the requirements of Section 1670 of the *Standard Specifications*.

Materials

Reforestation shall be bare root seedlings 12"-18" tall.

Construction Methods

Reforestation shall be shall be planted as soon as practical following permanent S*eeding and Mulching*. The seedlings shall be planted in a 16-foot wide swath adjacent to mowing pattern line, or as directed.

Root dip: The roots of reforestation seedlings shall be coated with a slurry of water, and either a fine clay (kaolin) or a superabsorbent that is designated as a bare root dip. The type, mixture ratio, method of application, and the time of application shall be submitted to the Engineer for approval.

With the approval of the Engineer, seedlings may be coated before delivery to the job or at the time of planting, but at no time shall the roots of the seedlings be allowed to dry out. The roots shall be moistened immediately prior to planting.

Seasonal Limitations: *Reforestation* shall be planted from November 15 through March 15.

Measurement and Payment

Reforestation will be measured and paid for in accordance with Article 1670-17 of the *Standard Specifications*.

RESPONSE FOR EROSION CONTROL:

Description

Furnish the labor, materials, tools and equipment necessary to move personnel, equipment, and supplies to the project necessary for the pursuit of any or all of the following work as shown herein, by an approved subcontractor.

Section	Erosion Control Item	Unit
1605	Temporary Silt Fence	LF
1606	Special Sediment Control Fence	LF/TON
1615	Temporary Mulching	ACR
1620	Seed - Temporary Seeding	LB
1620	Fertilizer - Temporary Seeding	TN
1631	Matting for Erosion Control	SY
SP	Coir Fiber Mat	SY
1640	Coir Fiber Baffles	LF
SP	Permanent Soil Reinforcement Mat	SY
1660	Seeding and Mulching	ACR
1661	Seed - Repair Seeding	LB
1661	Fertilizer - Repair Seeding	TON
1662	Seed - Supplemental Seeding	LB
1665	Fertilizer Topdressing	TON

SP	Safety/Highly Visible Fencing	LF
SP	Response for Erosion Control	EA

Construction Methods

Provide an approved subcontractor who performs an erosion control action as described in the NPDES Inspection Form SPPP30. Each erosion control action may include one or more of the above work items.

Measurement and Payment

Response for Erosion Control will be measured and paid for by counting the actual number of times the subcontractor moves onto the project, including borrow and waste sites, and satisfactorily completes an erosion control action described in Form 1675. The provisions of Article 104-5 of the *Standard Specifications* will not apply to this item of work.

Payment will be made under:

Pay Item	Pay Unit
Response for Erosion Control	Each

MINIMIZE REMOVAL OF VEGETATION:

The Contractor shall minimize removal of vegetation at stream banks and disturbed areas within the project limits as directed.

STOCKPILE AREAS:

The Contractor shall install and maintain erosion control devices sufficient to contain sediment around any erodible material stockpile areas as directed.

ACCESS AND HAUL ROADS:

At the end of each working day, the Contractor shall install or re-establish temporary diversions or earth berms across access/haul roads to direct runoff into sediment devices. Silt fence sections that are temporarily removed shall be reinstalled across access/haul roads at the end of each working day.

WASTE AND BORROW SOURCES:

Payment for temporary erosion control measures, except those made necessary by the Contractor's own negligence or for his own convenience, will be paid for at the appropriate contract unit price for the devices or measures utilized in borrow sources and waste areas.

No additional payment will be made for erosion control devices or permanent seeding and mulching in any commercial borrow or waste pit. All erosion and sediment control practices that may be required on a commercial borrow or waste site will be done at the Contractor's expense.

All offsite Staging Areas, Borrow and Waste sites shall be in accordance with "Borrow and Waste Site Reclamation Procedures for Contracted Projects" located at:

http://www.ncdot.gov/doh/operations/dp_chief_eng/roadside/fieldops/downloads/Files/ContractedReclamationProcedures.pdf

All forms and documents referenced in the "Borrow and Waste Site Reclamation Procedures for Contracted Projects" shall be included with the reclamation plans for offsite staging areas, and borrow and waste sites.

TEMPORARY DIVERSION:

This work consists of installation, maintenance, and cleanout of *Temporary Diversions* in accordance with Section 1630 of the *Standard Specifications*. The quantity of excavation for installation and cleanout will be measured and paid for as *Silt Excavation* in accordance with Article 1630-4 of the *Standard Specifications*.

CLEAN WATER DIVERSION:

Description

This work consists of installing, maintaining, and removing any and all material required for the construction of clean water diversions. The clean water diversions shall be used to direct water flowing from offsite around/away from specific area(s) of construction.

Materials

Refer to Division 10

Item	Section
Geotextile for Soil Stabilization, Type 4	1056

Construction Methods

The Contractor shall install the clean water diversions in accordance with the details in the plans and at locations indicated in the plans, and as directed. Upon installation, the excavated material shall be immediately stabilized as provided in Section 1620 of the *Standard Specifications*. Other stabilization methods may be utilized with prior approval from the Engineer.

Line clean water diversion with geotextile unrolled in the direction of flow and lay smoothly but loosely on soil surface without creases. Bury top of slope geotextile edge in a trench at least 5"

deep and tamp securely. Make vertical overlaps a minimum of 18" with upstream geotextile overlapping the downstream geotextile.

Secure geotextile with eleven gauge wire staples shaped into a *u* shape with a length of not less than 6" and a throat not less than 1" in width. Place staples along outer edges and throughout the geotextile a maximum of 3 ft. horizontally and vertically.

Measurement and Payment

Silt Excavation will be measured and paid for in accordance with Article 1630-4 of the *Standard Specifications*.

Geotextile for Soil Stabilization will be measured and paid for in accordance with Article 270-4 of the *Standard Specifications*.

Stabilization of the excavated material will be paid for as *Temporary Seeding* as provided in Section 1620 of the *Standard Specifications*.

Such price and payment shall be considered full compensation for all work covered by this section including all materials, construction, maintenance, and removal of the clean water diversions.

SAFETY FENCE AND JURISDICTIONAL FLAGGING:

Description

Safety Fence shall consist of furnishing materials, installing and maintaining polyethylene or polypropylene fence along the outside riparian buffer, wetland, or water boundary, or other boundaries located within the construction corridor to mark the areas that have been approved to infringe within the buffer, wetland, endangered vegetation, culturally sensitive areas or water. The fence shall be installed prior to any land disturbing activities.

Interior boundaries for jurisdictional areas noted above shall be delineated by stakes and highly visible flagging.

Jurisdictional boundaries at staging areas, waste sites, or borrow pits, whether considered outside or interior boundaries shall be delineated by stakes and highly visible flagging.

Materials

(A) Safety Fencing

Polyethylene or polypropylene fence shall be a highly visible preconstructed safety fence approved by the Engineer. The fence material shall have an ultraviolet coating.

Either wood posts or steel posts may be used. Wood posts shall be hardwood with a wedge or pencil tip at one end, and shall be at least 5 ft. in length with a minimum nominal 2" x 2" cross section. Steel posts shall be at least 5 ft. in length, and have a minimum weight of 0.85 lb/ft of length.

(B) Boundary Flagging

Wooden stakes shall be 4 feet in length with a minimum nominal 3/4" x 1-3/4" cross section. The flagging shall be at least 1" in width. The flagging material shall be vinyl and shall be orange in color and highly visible.

Construction Methods

No additional clearing and grubbing is anticipated for the installation of this fence. The fence shall be erected to conform to the general contour of the ground.

(A) Safety Fencing

Posts shall be set at a maximum spacing of 10 ft., maintained in a vertical position and hand set or set with a post driver. If hand set, all backfill material shall be thoroughly tamped. Wood posts may be sharpened to a dull point if power driven. Posts damaged by power driving shall be removed and replaced prior to final acceptance. The tops of all wood posts shall be cut at a 30-degree angle. The wood posts may, at the option of the Contractor, be cut at this angle either before or after the posts are erected.

The fence geotextile shall be attached to the wood posts with one 2" galvanized wire staple across each cable or to the steel posts with wire or other acceptable means.

Place construction stakes to establish the location of the safety fence in accordance with Article 105-9 or Article 801-1 of the *Standard Specifications.* No direct pay will be made for the staking of the safety fence. All stakeouts for safety fence shall be considered incidental to the work being paid for as "Construction Surveying", except that where there is no pay item for construction surveying, all safety fence stakeout will be performed by state forces.

The Contractor shall be required to maintain the safety fence in a satisfactory condition for the duration of the project as determined by the Engineer.

(B) Boundary Flagging

Boundary flagging delineation of interior boundaries shall consist of wooden stakes on 25 feet maximum intervals with highly visible orange flagging attached. Stakes shall be installed a minimum of 6" into the ground. Interior boundaries may be staked on a tangent that runs parallel to buffer but must not encroach on the buffer at any location. Interior boundaries of hand clearing shall be identified with a different colored flagging to distinguish it from mechanized clearing.

Boundary flagging delineation of interior boundaries will be placed in accordance with Article 105-9 or Article 801-1 of the *Standard Specifications*. No direct pay will be made for delineation of the interior boundaries. This delineation will be considered incidental to the work being paid for as *Construction Surveying,* except that where there is no pay item or construction surveying the cost of boundary flagging delineation shall be included in the unit prices bid for the various items in the contract. Installation for delineation of all jurisdictional boundaries at staging areas, waste sites, or borrow pits shall consist of wooden stakes on 25 feet maximum intervals with highly visible orange flagging attached. Stakes shall be installed a minimum of 6" into the ground. Additional flagging may be placed on overhanging vegetation to enhance visibility but does not substitute for installation of stakes.

Installation of boundary flagging for delineation of all jurisdictional boundaries at staging areas, waste sites, or borrow pits shall be performed in accordance with Subarticle 230-4(B)(3)(d) or Subarticle 802-2(F) of the *Standard Specifications*. No direct pay will be made for this delineation, as the cost of same shall be included in the unit prices bid for the various items in the contract.

The Contractor shall be required to maintain alternative stakes and highly visible flagging in a satisfactory condition for the duration of the project as determined by the Engineer.

Measurement and Payment

Safety Fence will be measured and paid as the actual number of linear feet of polyethylene or polypropylene fence installed in place and accepted. Such payment will be full compensation including but not limited to furnishing and installing fence geotextile with necessary posts and post bracing, staples, tie wires, tools, equipment and incidentals necessary to complete this work.

Payment will be made under:

Pay Item	**Pay Unit**
Safety Fence	Linear Foot

PERMANENT SOIL REINFORCEMENT MAT:

Description

This work consists of furnishing and placing *Permanent Soil Reinforcement Mat*, of the type specified, over previously prepared areas as directed.

Materials

The product shall be a permanent erosion control reinforcement mat and shall be constructed of synthetic or a combination of coconut and synthetic fibers evenly distributed throughout the mat between a bottom UV stabilized netting and a heavy duty UV stabilized top net. The matting shall be stitched together with UV stabilized polypropylene thread to form a permanent three-dimensional structure. The mat shall have the following minimum physical properties:

Property	Test Method	Value	Unit
Light Penetration	ASTM D6567	9	%
Thickness	ASTM D6525	0.40	in
Mass Per Unit Area	ASTM D6566	0.55	lb/sy
Tensile Strength	ASTM D6818	385	lb/ft
Elongation (Maximum)	ASTM D6818	49	%
Resiliency	ASTM D1777	>70	%
UV Stability *	ASTM D4355	≥80	%
Porosity (Permanent Net)	ECTC Guidelines	≥85	%
Maximum Permissible Shear Stress (Vegetated)	Performance Bench Test	≥8.0	lb/ft^2
Maximum Allowable Velocity (Vegetated)	Performance Bench Test	≥16.0	ft/s

*ASTM D1682 Tensile Strength and % strength retention of material after 1000 hours of exposure.

Submit a certification (Type 1, 2, or 3) from the manufacturer showing:

(A) the chemical and physical properties of the mat used, and
(B) conformance of the mat with this specification.

Construction Methods

Matting shall be installed in accordance with Subarticle 1631-3(B) of the *Standard Specifications*.

All areas to be protected with the mat shall be brought to final grade and seeded in accordance with Section 1660 of the *Standard Specifications*. The surface of the soil shall be smooth, firm, stable and free of rocks, clods, roots or other obstructions that would prevent the mat from lying in direct contact with the soil surface. Areas where the mat is to be placed will not need to be mulched.

Measurement and Payment

Permanent Soil Reinforcement Mat will be measured and paid for as the actual number of square yards measured along the surface of the ground over which Permanent Soil Reinforcement Mat is installed and accepted. Overlaps will not be included in the measurement, and will be considered as incidental to the work. Such payment shall be full compensation for furnishing and installing the mat, including overlaps, and for all required maintenance.

Payment will be made under:

Pay Item	Pay Unit
Permanent Soil Reinforcement Mat	Square Yard

SKIMMER BASIN WITH BAFFLES:

Description

Provide a skimmer basin to remove sediment from construction site runoff at locations shown in the erosion control plans. See the Skimmer Basin with Baffles Detail sheet provided in the erosion control plans. Work includes constructing sediment basin, installation of temporary slope drain pipe and coir fiber baffles, furnishing, installation and cleanout of skimmer, providing and placing stone pad on bottom of basin underneath skimmer device, providing and placing a geotextile spillway liner, providing coir fiber mat stabilization for the skimmer outlet, disposing of excess materials, removing temporary slope drain, coir fiber baffles, geotextile liner and skimmer device, backfilling basin area with suitable material and providing proper drainage when basin area is abandoned.

Materials

Item	Section
Stone for Erosion Control, Class B	1042
Geotextile for Soil Stabilization, Type 4	1056
Fertilizer for Temporary Seeding	1060-2
Seed for Temporary Seeding	1060-4
Seeding and Mulching	1060-4
Matting for Erosion Control	1060-8
Staples	1060-8
Coir Fiber Mat	1060-14
Temporary Slope Drain	1622-2
Coir Fiber Baffle	1640

Provide appropriately sized and approved skimmer device.

Provide Schedule 40 PVC pipe with a length of 6 ft. to attach to the skimmer and the coupling connection to serve as the arm pipe. For skimmer sizes of 2.5 in. and smaller, the arm pipe diameter shall be 1.5 inches. For skimmer sizes of 3 in. and larger, refer to manufacturer recommendation.

Provide 4" diameter Schedule 40 PVC pipe to attach to coupling connection of skimmer to serve as the barrel pipe through the earthen dam.

Anchors: Staples, stakes, or reinforcement bars shall be used as anchors.

Wooden Stakes:

Provide hardwood stakes 12"- 24" long with a 2" x 2" nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving through the coir fiber mat and down into the underlying soil. The other end of the stake needs to have a 1"- 2" long head at the top with a 1"- 2" notch following to catch and secure the coir fiber mat.

Steel Reinforcement Bars:

Provide uncoated #10 steel reinforcement bars 24" nominal length. The bars shall have a 4" diameter bend at one end with a 4" straight section at the tip to catch and secure the coir fiber mat.

Staples:

Provide staples made of 0.125" diameter new steel wire formed into a *u* shape not less than 12" in length with a throat of 1" in width.

Construction Methods

Excavate basin according to the erosion control plans with basin surface free of obstructions, debris, and pockets of low-density material. Install temporary slope drain pipe and construct the primary spillway according to the Skimmer Basin with Baffles Detail sheet in the erosion control plans. Temporary slope drain pipe at inlet of basin may be replaced by geotextile as directed. Construct the coir fiber baffles according to *Roadway Standard Drawings* No. 1640.01 and Section 1640 of the *Standard Specifications*.

Install skimmer device according to manufacturer recommendations. Install 4" Schedule 40 PVC pipe into dam on the lower side of basin 1 ft. from the bottom of the basin and according to the detail, and extend the pipe so the basin will drain. Attach a 6 ft. arm pipe to the coupling connection and skimmer according to manufacturer recommendations. Attach the rope included with the skimmer to the tee between the vent socket and the tube inlet, and the other end to a wooden stake or metal post. Clean out skimmer device when it becomes clogged with sediment and/or debris and is unable to float at the top of water in skimmer basin. Take appropriate measures to avoid ice accumulation in the skimmer device. Construct a stone pad of Class B stone directly underneath the skimmer device at bottom of basin. The pad shall be a minimum of 12" in height, and shall have a minimum cross sectional area of 4 ft. by 4 ft.

Line primary spillway with geotextile unrolled in the direction of flow and lay smoothly but loosely on soil surface without creases. Bury edges of geotextile in a trench at least 5" deep and tamp firmly. If geotextile for the primary spillway is not one continuous piece of material, make horizontal overlaps a minimum of 18" with upstream geotextile overlapping the downstream geotextile. Secure geotextile with eleven gauge wire staples shaped into a *u* shape with a length of not less than 12" and a throat not less than 1" in width. Place staples along outer edges and throughout the geotextile a maximum of 3 ft. horizontally and vertically. Geotextile shall be placed to the bottom and across the entire width of the basin according to the Skimmer Basin with Baffles detail. Place sealant inside basin around barrel pipe on top of geotextile with a minimum width of 6 in.

At the skimmer outlet, provide a smooth soil surface free from stones, clods, or debris that will prevent contact of the coir fiber matting with the soil. Unroll the matting and apply without stretching such that it will lie smoothly but loosely on the soil surface. Wooden stakes,

reinforcement bars, or staples may be used as anchors in accordance with the details in the plans and as directed. Place anchors across the matting at the ends approximately 1 ft. apart. Place anchors along the outer edges and down the center of the matting 3 ft. apart.

All bare side slope sections of the skimmer basin shall be seeded with a temporary or permanent seed mix as directed and in accordance with Articles 1620-3, 1620-4, 1620-5, 1660-4, 1660-5 and 1660-7 of the *Standard Specifications*. Straw or excelsior matting shall be installed on all bare side slope sections immediately upon the completion of seeding and in accordance with Article 1631-3 of the *Standard Specifications*.

Measurement and Payment

Silt Excavation will be measured and paid for in accordance with Article 1630-4 of the *Standard Specifications*, as calculated from the typical section throughout the length of the basin as shown on the final approved plans.

Geotextile for Soil Stabilization will be measured and paid for in accordance with Article 270-4 of the *Standard Specifications*.

Coir Fiber Baffles will be measured and paid for in accordance with Article 1640-4 of the *Standard Specifications*.

__" *Skimmer* will be measured in units of each. __" *Skimmer* will be measured and paid for as the maximum number of each size skimmer acceptably installed and in use at any one time during the life of the project. Barrel and arm pipe, cleanout, relocation and reinstallation of __" *Skimmer* is considered incidental to the measurement of the quantity of __" *Skimmer* and no separate payment will be made. No separate payment shall be made if __" *Skimmer*, barrel and/or arm pipe(s) are damaged by ice accumulation.

Coir Fiber Mat will be measured and paid for as the actual number of square yards measured along the surface of the ground over which coir fiber mat is installed and accepted.

Temporary Slope Drain will be measured and paid for in accordance with Article 1622-4 of the *Standard Specifications*.

Stone for Erosion Control, Class __ will be measured and paid for in accordance with Article 1610-4 of the *Standard Specifications*.

Seeding and Mulching will be measured and paid for in accordance with Article 1660-8 of the *Standard Specifications*.

Seed for Temporary Seeding will be measured and paid for in accordance with Article 1620-6 of the *Standard Specifications*.

Fertilizer for Temporary Seeding will be measured and paid for in accordance with Article 1620-6 of the *Standard Specifications*.

Matting for Erosion Control will be measured and paid for in accordance with Article 1631-4 of the *Standard Specifications*.

No measurement will be made for other items or for over excavation or stockpiling.

Payment will be made under:

Pay Item	Pay Unit
__" Skimmer	Each
Coir Fiber Mat	Square Yard

TIERED SKIMMER BASIN WITH BAFFLES:

Description

Provide a tiered skimmer basin to remove sediment from construction site runoff at locations shown in the erosion control plans. See the Tiered Skimmer Basin Detail sheet provided in the erosion control plans. Tiered Skimmer Basins shall be installed in areas where topography creates a large elevation difference between the inlet and outlet of a single skimmer basin. Work includes constructing sediment basins, installation of coir fiber baffles, installation of temporary slope drains, furnishing, installation and cleanout of skimmer, providing and placing stone pad on bottom of basin underneath skimmer device, providing and placing geotextile spillway liners, providing coir fiber mat stabilization for the skimmer outlet, disposing of excess materials, removing temporary slope drains, coir fiber baffles, geotextile liner and skimmer device, backfilling basin area with suitable material and providing proper drainage when basin area is abandoned.

Materials

Item	Section
Stone for Erosion Control, Class B	1042
Geotextile for Soil Stabilization, Type 4	1056
Fertilizer for Temporary Seeding	1060-2
Seed for Temporary Seeding	1060-4
Seeding and Mulching	1060-4
Matting for Erosion Control	1060-8
Staples	1060-8
Coir Fiber Mat	1060-14
Temporary Slope Drain	1622-2
Coir Fiber Baffle	1640

Provide appropriately sized and approved skimmer device.

Provide Schedule 40 PVC pipe with a length of 6 ft. to attach to the skimmer and the coupling connection to serve as the arm pipe. For skimmer sizes of 2.5 in. and smaller, the arm pipe

diameter shall be 1.5 inches. For skimmer sizes of 3 in. and larger, refer to manufacturer recommendation.

Provide 4" diameter Schedule 40 PVC pipe to attach to coupling connection of skimmer to serve as the barrel pipe through the earthen dam.

Anchors: Staples, stakes, or reinforcement bars shall be used as anchors.

Wooden Stakes:

Provide hardwood stakes 12"- 24" long with a 2" x 2" nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving through the coir fiber mat and down into the underlying soil. The other end of the stake needs to have a 1"- 2" long head at the top with a 1"- 2" notch following to catch and secure the coir fiber mat.

Steel Reinforcement Bars:

Provide uncoated #10 steel reinforcement bars 24" nominal length. The bars shall have a 4" diameter bend at one end with a 4" straight section at the tip to catch and secure the coir fiber mat.

Staples:

Provide staples made of 0.125" diameter new steel wire formed into a *u* shape not less than 12" in length with a throat of 1" in width.

Construction Methods

Excavate basins according to the erosion control plans with basin surface free of obstructions, debris, and pockets of low-density material. Install temporary slope drains and construct the primary spillways according to the Tiered Skimmer Basin Detail sheet in the erosion control plans. Construct the coir fiber baffles according to *Roadway Standard Drawings* No. 1640.01 and Section 1640 of the *Standard Specifications*. Multiple upper basins, or Modified Silt Basins Type 'B' as labeled on the detail, may be required based on site conditions and as directed.

Install skimmer device according to manufacturer recommendations. Install 4" Schedule 40 PVC pipe into dam on the lower side of basin 1 ft. from the bottom of the basin and according to the detail, and extend the pipe so the basin will drain. Attach a 6 ft. arm pipe to the coupling connection and skimmer according to manufacturer recommendations. Attach the rope included with the skimmer to the tee between the vent socket and the tube inlet, and the other end to a wooden stake or metal post. Clean out skimmer device when it becomes clogged with sediment and/or debris and is unable to float at the top of water in skimmer basin. Take appropriate measures to avoid ice accumulation in the skimmer device. Construct a stone pad of Class B stone directly underneath the skimmer device at bottom of basin. The pad shall be a minimum of 12" in height, and shall have a minimum cross sectional area of 4 ft. by 4 ft.

Install a minimum of 2 (two) temporary slope drains to dewater the upper basin to the lower basin. The slope drains shall be installed a minimum of 6 inches, or one radius width of the temporary slope drain pipe, below the base of the primary spillway section of the upper basin. The outlet of the slope drains shall be placed on the bottom elevation of the lower basin.

Line primary spillways with geotextile unrolled in the direction of flow and lay smoothly but loosely on soil surface without creases. Bury edges of geotextile in a trench at least 5" deep and tamp firmly. If geotextile for primary spillways is not one continuous piece of material, make horizontal overlaps a minimum of 18" with upstream geotextile overlapping the downstream geotextile. Secure geotextile with eleven gauge wire staples shaped into a *u* shape with a length of not less than 12" and a throat not less than 1" in width. Place staples along outer edges and throughout the geotextile a maximum of 3 ft. horizontally and vertically. Geotextile shall be placed to the bottom and across the entire width of the basin according to the Tiered Skimmer Basin with Baffles detail.

At the skimmer outlet, provide a smooth soil surface free from stones, clods, or debris that will prevent contact of the coir fiber matting with the soil. Unroll the matting and apply without stretching such that it will lie smoothly but loosely on the soil surface. Wooden stakes, reinforcement bars, or staples may be used as anchors in accordance with the details in the plans and as directed. Place anchors across the matting at the ends approximately 1 ft. apart. Place anchors along the outer edges and down the center of the matting 3 ft. apart. Place sealant inside basin around barrel pipe on top of geotextile with a minimum width of 6 in.

All bare side slope sections of the skimmer basin shall be seeded with a temporary or permanent seed mix as directed and in accordance with Articles 1620-3, 1620-4, 1620-5, 1660-4, 1660-5 and 1660-7 of the *Standard Specifications*. Straw or excelsior matting shall be installed on all bare side slope sections immediately upon the completion of seeding and in accordance with Article 1631-3 of the *Standard Specifications*.

Measurement and Payment

Silt Excavation will be measured and paid for in accordance with Article 1630-4 of the *Standard Specifications*, as calculated from the typical section throughout the length of the basin as shown on the final approved plans.

Geotextile for Soil Stabilization will be measured and paid for in accordance with Article 270-4 of the *Standard Specifications*.

Coir Fiber Baffles will be measured and paid for in accordance with Article 1640-4 of the *Standard Specifications*.

__" *Skimmer* will be measured in units of each. __" *Skimmer* will be measured and paid for as the maximum number of each size skimmer acceptably installed and in use at any one time during the life of the project. Barrel and arm pipe, cleanout, relocation and reinstallation of __" *Skimmer* is considered incidental to the measurement of the quantity of __" *Skimmer* and no

separate payment will be made. No separate payment shall be made if __" *Skimmer*, barrel and/or arm pipe(s) are damaged by ice accumulation.

Coir Fiber Mat will be measured and paid for as the actual number of square yards measured along the surface of the ground over which coir fiber mat is installed and accepted.

Temporary Slope Drain will be measured and paid for in accordance with Article 1622-4 of the *Standard Specifications*.

Stone for Erosion Control, Class __ will be measured and paid for in accordance with Article 1610-4 of the *Standard Specifications*.

Seeding and Mulching will be measured and paid for in accordance with Article 1660-8 of the *Standard Specifications*.

Seed for Temporary Seeding will be measured and paid for in accordance with Article 1620-6 of the *Standard Specifications*.

Fertilizer for Temporary Seeding will be measured and paid for in accordance with Article 1620-6 of the *Standard Specifications*.

Matting for Erosion Control will be measured and paid for in accordance with Article 1631-4 of the *Standard Specifications*.

No measurement will be made for other items or for over excavation or stockpiling.

Payment will be made under:

Pay Item	**Pay Unit**
__" Skimmer	Each
Coir Fiber Mat	Square Yard

<u>COIR FIBER WATTLES WITH POLYACRYLAMIDE (PAM):</u>

Description

Coir Fiber Wattles are tubular products consisting of coir fibers (coconut fibers) encased in coir fiber netting. Coir Fiber Wattles are used on slopes or channels to intercept runoff and act as a velocity break. Coir Fiber Wattles are to be placed at locations shown on the plans or as directed. Installation shall follow the detail provided in the plans and as directed. Work includes furnishing materials, installation of coir fiber wattles, matting installation, PAM application, and removing wattles.

Materials

Coir Fiber Wattle shall meet the following specifications:

100% Coir (Coconut) Fibers	
Minimum Diameter	12 in.
Minimum Density	3.5 lb/ft^3 +/- 10%
Net Material	Coir Fiber
Net Openings	2 in. x 2 in.
Net Strength	90 lbs.
Minimum Weight	2.6 lbs./ft. +/- 10%

Anchors: Stakes shall be used as anchors.

Wooden Stakes:

Provide hardwood stakes a minimum of 2-ft. long with a 2 in. x 2 in. nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving down into the underlying soil.

Matting shall meet the requirements of Article 1060-8 of the *Standard Specifications*, or shall meet specifications provided elsewhere in this contract.

Provide staples made of 0.125" diameter new steel wire formed into a *u* shape not less than 12" in length with a throat of 1" in width.

Polyacrylamide (PAM) shall be applied in powder form and shall be anionic or neutrally charged. Soil samples shall be obtained in areas where the wattles will be placed, and from offsite material used to construct the roadway, and analyzed for the appropriate PAM flocculant to be utilized with each wattle. The PAM product used shall be listed on the North Carolina Department of Environment and Natural Resources (NCDENR) Division of Water Quality (DWQ) web site as an approved PAM product for use in North Carolina.

Construction Methods

Coir Fiber Wattles shall be secured to the soil by wire staples approximately every 1 linear foot and at the end of each section of wattle. A minimum of 4 stakes shall be installed on the downstream side of the wattle with a maximum spacing of 2 linear feet along the wattle, and according to the detail. Install a minimum of 2 stakes on the upstream side of the wattle according to the detail provided in the plans. Stakes shall be driven into the ground a minimum of 10 in. with no more than 2 in. projecting from the top of the wattle. Drive stakes at an angle according to the detail provided in the plans.

Only install coir fiber wattle(s) to a height in ditch so flow will not wash around wattle and scour ditch slopes and according to the detail provided in the plans and as directed. Overlap adjoining sections of wattles a minimum of 6 in.

Installation of matting shall be in accordance with the detail provided in the plans, and in accordance with Article 1631-3 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Apply PAM over the lower center portion of the coir fiber wattle where the water is going to flow over at a rate of 2 ounces per wattle, and 1 ounce of PAM on matting on each side of the wattle. PAM applications shall be done during construction activities after every rainfall event that is equal to or exceeds 0.50 in.

The Contractor shall maintain the coir fiber wattles until the project is accepted or until the wattles are removed, and shall remove and dispose of silt accumulations at the wattles when so directed in accordance with the requirements of Section 1630 of the *Standard Specifications*.

Measurement and Payment

Coir Fiber Wattles will be measured and paid for by the actual number of linear feet of wattles which are installed and accepted. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to install the *Coir Fiber Wattles*.

Matting will be measured and paid for in accordance with Article 1631-4 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Polyacrylamide(PAM) will be measured and paid for by the actual weight in pounds of PAM applied to the coir fiber wattles. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to apply the *Polyacrylamide(PAM)*.

Payment will be made under:

Pay Item	**Pay Unit**
Polyacrylamide(PAM)	Pound
Coir Fiber Wattle	Linear Foot

<u>SILT FENCE COIR FIBER WATTLE BREAK:</u>
(8-21-12) 1605,1630

Description

Silt fence coir fiber wattle breaks are tubular products consisting of coir fibers (coconut fibers) encased in coir fiber netting and used in conjunction with temporary silt fence at the toe of fills to intercept runoff. Silt fence coir fiber wattle breaks are to be placed at locations shown on the plans or as directed. Installation shall follow the detail provided in the plans and as directed. Work includes furnishing materials, installation, maintenance and removing Silt fence coir fiber wattle breaks.

Materials

Coir fiber wattle shall meet the following specifications:

100% Coir (Coconut) Fibers	
Minimum Diameter	12"
Minimum Length	10 ft
Minimum Density	3.5 lb/cf ± 10%
Net Material	Coir Fiber
Net Openings	2" x 2"
Net Strength	90 lb.
Minimum Weight	2.6 lb/ft ± 10%

Stakes shall be used as anchors. Provide hardwood stakes a minimum of 2-ft long with a 2" x 2" nominal square cross section. One end of the stake shall be sharpened or beveled to facilitate driving down into the underlying soil.

Provide staples made of 0.125" diameter new steel wire formed into a U-shape not less than 12" in length with a throat of 1" in width.

Construction Methods

Excavate a trench the entire length of each wattle with a depth of 1" to 2" for the wattle to be placed. Secure silt fence coir fiber wattle breaks to the soil by wire staples approximately every linear foot and at the end of each wattle. Install at least 4 stakes on the downslope side of the wattle with a maximum spacing of 2 linear feet and according to the detail. Install at least 2 stakes on the upslope side of the silt fence coir fiber wattle break according to the detail provided in the plans. Drive stakes into the ground at least 10" with no more than 2" projecting from the top of the wattle. Drive stakes at an angle according to the detail provided in the plans.

Install temporary silt fence in accordance with Section 1605 of the *2012 Standard Specifications* and overlap each downslope side of silt fence wattle break by 6".

Maintain the silt fence coir fiber wattle breaks until the project is accepted or until the silt fence coir fiber wattle breaks are removed, and remove and dispose of silt accumulations at the silt fence coir fiber wattle breaks when so directed in accordance with Section 1630 of the *2012 Standard Specifications*.

Measurement and Payment

Coir Fiber Wattle will be measured and paid as the actual number of linear feet of wattles installed and accepted. Such price and payment will be full compensation for all work covered by this provision, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to install the silt fence coir fiber wattle break.

Payment will be made under:

Pay Item	**Pay Unit**
Coir Fiber Wattle	Linear Foot

TEMPORARY ROCK SILT CHECK TYPE A WITH EXCELSIOR MATTING AND POLYACRYLAMIDE (PAM):

Description

Temporary Rock Silt Checks Type A with Excelsior Matting and Polyacrylamide (PAM) are devices utilized in temporary and permanent ditches to reduce runoff velocity and incorporate PAM into the construction runoff to increase settling of sediment particles and reduce turbidity of runoff. Temporary Rock Silt Checks Type A with Excelsior Matting and PAM are to be placed at locations shown on the plans or as directed. Installation shall follow the detail provided in the plans and as directed. Work includes furnishing materials, installation of Temporary Rock Silt Checks Type A, matting installation, PAM application, and removing Temporary Rock Silt Checks Type A with Excelsior Matting and PAM.

Materials

Structural stone shall be class B stone that meets the requirements of Section 1042 of the *Standard Specifications* for Stone for Erosion Control, Class B.

Sediment control stone shall be #5 or #57 stone, which meets the requirements of Section 1005 of the *Standard Specifications* for these stone sizes.

Matting shall meet the requirements of Excelsior Matting in Subarticle 1060-8(B) of the *Standard Specifications*, or shall meet specifications provided elsewhere in this contract.

Polyacrylamide (PAM) shall be applied in powder form and shall be anionic or neutrally charged. Soil samples shall be obtained in areas where the Temporary Rock Silt Checks Type A with Excelsior Matting and PAM will be placed, and from offsite material used to construct the roadway, and analyzed for the appropriate PAM flocculant to be utilized with each Temporary Rock Silt Check Type A. The PAM product used shall be listed on the North Carolina Department of Environment and Natural Resources (NCDENR) Division of Water Quality (DWQ) web site as an approved PAM product for use in North Carolina.

Construction Methods

Temporary Rock Silt Checks Type A shall be installed in accordance with Subarticle 1633-3(A) of the *Standard Specifications*, Roadway Standard Drawing No. 1633.01 and the detail provided in the plans.

Installation of matting shall be in accordance with the detail provided in the plans, and anchored by placing Class B stone on top of the matting at the upper and lower ends.

Apply PAM at a rate of 4 ounces over the center portion of the Temporary Rock Silt Checks Type A and matting where the water is going to flow over. PAM applications shall be done during construction activities and after every rainfall event that is equal to or exceeds 0.50 in.

The Contractor shall maintain the Temporary Rock Silt Checks Type A with Excelsior Matting and PAM until the project is accepted or until the Temporary Rock Silt Checks Type A with Excelsior Matting and PAM are removed, and shall remove and dispose of silt accumulations at the Temporary Rock Silt Checks Type A with Excelsior Matting and PAM when so directed in accordance with the requirements of Section 1630 of the *Standard Specifications*.

Measurement and Payment

Temporary Rock Silt Checks Type A will be measured and paid for in accordance with Article 1633-5 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Matting will be measured and paid for in accordance with Article 1631-4 of the *Standard Specifications*, or in accordance with specifications provided elsewhere in this contract.

Polyacrylamide(PAM) will be measured and paid for by the actual weight in pounds of PAM applied to the Temporary Rock Silt Checks Type A. Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to apply the *Polyacrylamide(PAM)*.

Payment will be made under:

Pay Item	Pay Unit
Polyacrylamide(PAM)	Pound

CULVERT DIVERSION CHANNEL:

Description

This work consists of providing a *Culvert Diversion Channel* to detour the existing stream around the culvert construction site at locations shown on the plans. Work includes constructing the diversion channel, disposing of excess materials, providing and placing geotextile liner, maintaining the diversion area in an acceptable condition, removing geotextile liner, backfilling diversion channel area with suitable material, and providing proper drainage when diversion channel area is abandoned.

Materials

Refer to Division 10

Item	Section
Geotextile for Soil Stabilization, Type 4	1056

Construction Methods

Grade channel according to the plans with channel surface free of obstructions, debris, and pockets of low-density material. Utilize suitable material and provide disposal area for unsuitable material.

Line channel with geotextile unrolled in the direction of flow and lay smoothly but loosely on soil surface without creases. Bury top of slope geotextile edge in a trench at least 5" deep and tamp securely. Make vertical overlaps a minimum of 18" with upstream geotextile overlapping the downstream geotextile.

Secure geotextile with eleven gauge wire staples shaped into a *u* shape with a length of not less than 6" and a throat not less than 1" in width. Place staples along outer edges and throughout the geotextile a maximum of 3 ft. horizontally and vertically.

Measurement and Payment

Culvert Diversion Channel will be measured and paid for as the actual number of cubic yards excavated, as calculated from the typical section throughout the length of the diversion channel as shown on the final approved plans.

Geotextile for Soil Stabilization will be measured and paid for in accordance with Article 270-4 of the *Standard Specifications*.

Such price and payment shall be considered full compensation for all work covered by this section including all materials, construction, maintenance, and removal of *Culvert Diversion Channel*.

Payment will be made under:

Pay Item	**Pay Unit**
Culvert Diversion Channel	Cubic Yard

<u>IMPERVIOUS DIKE:</u>

Description

This work consists of furnishing, installing, maintaining, and removing an *Impervious Dike* for the purpose of diverting normal stream flow around the construction site. The Contractor shall construct an impervious dike in such a manner approved by the Engineer. The impervious dike shall not permit seepage of water into the construction site or contribute to siltation of the stream. The impervious dike shall be constructed of an acceptable material in the locations noted on the plans or as directed.

Materials

Acceptable materials shall include but not be limited to sheet piles, sandbags, and/or the placement of an acceptable size stone lined with polypropylene or other impervious geotextile.

Earth material shall not be used to construct an impervious dike when it is in direct contact with the stream unless vegetation can be established before contact with the stream takes place.

Measurement and Payment

Impervious Dike will be measured and paid as the actual number of linear feet of impervious dike(s) constructed, measured in place from end to end of each separate installation that has been completed and accepted. Such price and payment will be full compensation for all work including but not limited to furnishing materials, construction, maintenance, and removal of the impervious dike.

Payment will be made under:

Pay Item	Pay Unit
Impervious Dike	Linear Foot

<u>COIR FIBER MAT:</u>

Description

Furnish material, install and maintain coir fiber mat in locations shown on the plans or in locations as directed. Work includes providing all materials, excavating and backfilling, and placing and securing coir fiber mat with stakes, steel reinforcement bars or staples as directed.

Materials

Item	Section
Coir Fiber Mat	1060-14

Anchors: Stakes, reinforcement bars, or staples shall be used as anchors.

Wooden Stakes:

Provide hardwood stakes 12"- 24" long with a 2" x 2" nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving through the coir fiber mat and down into the underlying soil. The other end of the stake needs to have a 1"- 2" long head at the top with a 1"- 2" notch following to catch and secure the coir fiber mat.

Steel Reinforcement Bars:

Provide uncoated #10 steel reinforcement bars 24" nominal length. The bars shall have a 4" diameter bend at one end with a 4" straight section at the tip to catch and secure the coir fiber mat.

Staples:

Provide staples made of 0.125" diameter new steel wire formed into a *u* shape not less than 12" in length with a throat of 1" in width.

Construction Methods

Place the coir fiber mat immediately upon final grading. Provide a smooth soil surface free from stones, clods, or debris that will prevent the contact of the mat with the soil. Unroll the mat and apply without stretching such that it will lie smoothly but loosely on the soil surface.

For stream relocation applications, take care to preserve the required line, grade, and cross section of the area covered. Bury the top slope end of each piece of mat in a narrow trench at least 6 in. deep and tamp firmly. Where one roll of matting ends and a second roll begins, overlap the end of the upper roll over the buried end of the second roll so there is a 6 in. overlap. Construct check trenches at least 12 in. deep every 50 ft. longitudinally along the edges of the mat or as directed. Fold over and bury mat to the full depth of the trench, close and tamp firmly. Overlap mat at least 6 in. where 2 or more widths of mat are installed side by side.

Place anchors across the mat at the ends approximately 1 ft. apart. Place anchors along the outer edges and down the center of the mat 3 ft. apart.

Adjustments in the trenching or anchoring requirements to fit individual site conditions may be required.

Measurement and Payment

Coir Fiber Mat will be measured and paid for as the actual number of square yards measured along the surface of the ground over which coir fiber mat is installed and accepted.

No measurement will be made for anchor items.

Payment will be made under:

Pay Item	**Pay Unit**
Coir Fiber Mat	Square Yard

FLOATING TURBIDITY CURTAIN:

Description

This work consists of furnishing a *Floating Turbidity Curtain* to deter silt suspension and movement of silt particles during construction. The floating turbidity curtain shall be constructed at locations as directed.

Materials

The curtain material shall be made of a tightly woven nylon, plastic or other non-deteriorating material meeting the following specifications:

Property	Value
Grab tensile strength	*md-370 lbs *cd-250 lbs
Mullen burst stength	480 psi
Trapezoid tear strength	*md-100 lbs *cd-60 lbs
Apparent opening size	70 US standard sieve
Percent open area	4% permittivity 0.28 sec-1

*md - machine direction
*cd - cross machine direction

In the event that more than one width of fabric is required, a 6" overlap of the material shall also be required.

The curtain material shall be supported by a flotation material having over 29 lbs/ft buoyancy. The floating curtain shall have a 5/16" galvanized chain as ballast and dual 5/16" galvanized wire ropes with a heavy vinyl coating as load lines.

Construction Methods

The Contractor shall maintain the *Floating Turbidity Curtain* in a satisfactory condition until its removal is requested by the Engineer. The curtain shall extend to the bottom of the jurisdictional resource. Anchor the curtain according to manufacturer recommendations.

Measurement and Payment

Floating Turbidity Curtain will be measured and paid for as the actual number of square yards of curtain furnished as specified and accepted. Such price and payment will be full compensation for the work as described in this section including but not limited to furnishing all materials, tools, equipment, and all incidentals necessary to complete the work.

Payment will be made under:

Pay Item	Pay Unit
Floating Turbidity Curtain	Square Yard

STREAM CHANNEL RELOCATION LIMITATIONS:

The following sequence of construction shall be followed in the areas designated on the plans as stream relocations. Failure on the part of the Contractor to follow this sequence, and complete each step prior to proceeding in this area as specified, will be just cause for the Engineer to direct the suspension of work in accordance with Article 108-7 of the *Standard Specifications*.

(A) Clear, but do not grub area within the Environmentally Sensitive Area on the existing stream to be relocated.
(B) Construct and stabilize, with vegetation or erosion control materials sufficient to restrain erosion, the proposed stream channel relocation as shown on the plans.
(C) Divert water into newly constructed channel only after it has been stabilized and approved.
(D) Begin grubbing and/or grading within the Environmentally Sensitive Area of the existing stream.

The Contractor shall perform seeding and mulching and install erosion control matting to all cut/fill slopes adjacent to stream relocations in accordance with the contract.

The above requirements apply to the stream channels being constructed at the following stations:

Approx. Sta. 61+50 to 73+70 -L-
Approx. Sta. 217+00 to 220+10 -L-
Approx. Sta. 242+08 to 245+03 -L-

STREAMBANK REFORESTATION:

Description

Streambank Reforestation will be planted in areas designated on the plans and as directed. See the Streambank Reforestation Detail Sheets.

The entire *Streambank Reforestation* operation shall comply with the requirements of Section 1670 of the *Standard Specifications*.

Materials

Item	Section
Coir Fiber Mat	1060-14

Live Stakes:

Type I Streambank Reforestation shall be live stakes, planted along both streambanks. Live stakes shall be ½"- 2" in diameter. Stakes shall also be 2 ft. - 3 ft. in length.

Live staking plant material shall consist of a random mix made up of 50% Black Willow (*Salix nigra*) and 50% Silky Dogwood (*Cornus amomum*). Other species may be substituted upon approval of the Engineer. All plant material shall be harvested locally (within the same physiographic ecoregion and plant hardiness zone) or purchased from a local nursery, with the approval of the Engineer. All live stakes shall be dormant at time of acquisition and planting.

Staples, stakes, or reinforcement bars shall be used as anchors and shall meet the following requirements:

Wooden Stakes:

Provide hardwood stakes 12"- 24" long with a 2" x 2" nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving through the coir fiber mat and down into the underlying soil. The other end of the stake needs to have a 1"- 2" long head at the top with a 1"- 2" notch following to catch and secure the coir fiber mat.

Steel Reinforcement Bars:

Provide uncoated #10 steel reinforcement bars 24" nominal length. The bars shall have a 4" diameter bend at one end with a 4" straight section at the tip to catch and secure the coir fiber mat.

Staples:

Provide staples made of 0.125" diameter new steel wire formed into a *u* shape not less than 12" in length with a throat of 1" in width.

Bare Root Seedlings:

Type II Streambank Reforestation shall be bare root seedlings 12"-18" tall.

Construction Methods

Coir fiber matting shall be installed on the streambanks where live staking is to be planted as shown on the Streambank Reforestation Detail Sheets and in locations as directed. Work includes providing all materials, excavating and backfilling, and placing and securing coir fiber mat.

Provide a smooth soil surface free from stones, clods, or debris that will prevent the contact of the matting with the soil. Place the matting immediately upon final grading and permanent seeding. Take care to preserve the required line, grade, and cross section of the area covered.

Unroll the matting and apply without stretching such that it will lie smoothly but loosely on the soil surface. Bury the top slope end of each piece of matting in a narrow trench at least 6" deep and tamp firmly. Where one roll of matting ends and a second roll begins, overlap the end of the upper roll over the buried end of the second roll so there is a 6" overlap. Construct check trenches at least 12" deep every 50 ft. longitudinally along the edges of the matting, or as directed. Fold over and bury matting to the full depth of the trench, close and tamp firmly. Overlap matting at least 6" where 2 or more widths of matting are installed side by side.

Wooden stakes, reinforcement bars, or staples may be used as anchors in accordance with the Streambank Reforestation Detail Sheets and as directed. Place anchors across the matting at ends, junctions, and check trenches approximately 1 ft. apart. Place anchors down the center of each strip of matting 3 ft. apart. Place anchors along all lapped edges 1 ft. apart. Refer to the Streambank Reforestation Detail Sheets for anchoring pattern. The Engineer may require adjustments in the trenching or anchoring requirements to fit individual site conditions.

During preparation of the live stakes, the basal ends shall be cleanly cut at an angle to facilitate easy insertion into the soil, while the tops shall be cut square or blunt for tamping. All limbs shall be removed from the sides of the live cutting prior to installation.

Live stakes shall be installed within 48 hours of cutting. Outside storage locations should be continually shaded and protected from wind and direct sunlight. Live cut plant material shall remain moist at all times before planting.

Stakes shall be spaced approximately 4 ft. on center. Live stakes shall be installed according to the configuration presented on the Streambank Reforestation Detail Sheets.

Tamp live stakes perpendicularly into the finished bank slope with a dead blow hammer, with buds oriented in an upward direction. Stakes should be tamped until approximately ¾ of the stake length is within the ground. The area around each live stake shall be compacted by foot after the live stake has been installed.

1"- 2" shall be cut cleanly off of the top of each live stake with loppers at an angle of approximately 15 degrees following installation. Any stakes that are split or damaged during installation shall be removed and replaced.

The bare root seedlings shall be planted as soon as practical following permanent *Seeding and Mulching*. The seedlings shall be planted from top of bank out, along both sides of the stream, as designated on the plans.

Root dip: The roots of reforestation seedlings shall be coated with a slurry of water, and either a fine clay (kaolin) or a superabsorbent that is designated as a bare root dip. The type, mixture ratio, method of application, and the time of application shall be submitted to the Engineer for approval.

With the approval of the Engineer, seedlings may be coated before delivery to the job or at the time of planting, but at no time shall the roots of the seedlings be allowed to dry out. The roots shall be moistened immediately prior to planting.

Seasonal Limitations: Streambank reforestation shall be planted from November 15 through March 15.

Measurement and Payment

Streambank Reforestation will be measured and paid for as the actual number of acres of land measured along the surface of the ground, which has been acceptably planted in accordance with this section.

Payment will be made under:

Pay Item	Pay Unit
Streambank Reforestation	Acre

CONTRACTOR REQUIREMENTS FOR STREAM RELOCATIONS, RESTORATIONS AND ENHANCEMENTS:

If the successful bidder has not completed at least two (2) stream relocation, restoration, or enhancement projects, a minimum of 1000 linear feet each or one(1) project of minimum length of 2500 linear feet, that have included channel reconstruction or relocation based upon natural geomorphic designs incorporating in-stream structures (i.e., rock cross vanes, rock vanes, j-hook vanes and rootwads), they will be required to sublet such work to a contractor who has the experience in this type of work. Documentation of past experience must be submitted to the Resident Engineer before any work begins on the stream relocation, restoration, or enhancement.

If the Resident Engineer deems that the qualified contractor is performing unsatisfactory work, the Resident Engineer reserves the right to request another qualified contractor to complete the work.

STRUCTURE STONE:

Description

This work consists of furnishing, stockpiling, placing and maintaining approved stone used to construct rock cross-vanes, rock vanes, j-hook vanes, w-rock cross vanes, log vanes, root wad/log vanes, log cross vanes, root wad structures, rock cross vanes for step pools, channel blocks, double wing deflectors, single wing deflectors, stream crossings, rock energy dissipaters, constructed riffles, and for use in other locations as directed.

The quantity of stone to be installed will be affected by the actual conditions that occur during the construction of the project. The quantity of stone may be increased, decreased, or eliminated

entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Materials

Refer to Division 10

Item	Section
No. 57 Stone	1005
Riprap, Class A, B, 1, and 2	1042
Geotextile for Drainage, Type 2	1056

Boulders shall meet the requirements of Section 1042 of the *Standard Specifications*. Boulders of minimum dimension 48" x 36" x 24" shall be individually picked for use in the structures. Boulders shall be relatively flat on either side in the same dimension, preferably the long dimension.

Construction Methods

The Contractor shall place Geotextile and stone in locations and to the thickness, widths, and lengths as shown on the plans or as directed. All stone shall be placed to form a sediment and erosion control device, an in-stream structure, or a channel lining neatly and uniformly with an even surface in accordance with the contract and shall meet the approval of the Engineer.

Measurement and Payment

No. 57 Stone will be measured and paid as the actual number of tons that have been incorporated into the work, or have been delivered to and stockpiled on the project as directed. No. 57 stone that has been stockpiled will not be measured a second time.

Riprap, Class __ will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Geotextile for Drainage will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Boulders will be measured and paid for as the actual number of tons that have been incorporated into the work, or have been delivered to and stockpiled on the project as directed. Stone that has been stockpiled will not be measured a second time.

Such price and payment will be full compensation for all work covered by this section, including but not limited to furnishing, weighing, stockpiling, re-handling, placing, and maintaining the stone and disposal of any materials not incorporated into the project.

Payment will be made under:

Pay Item	Pay Unit
No. 57 Stone	Ton
Boulder	Ton

GRADING FOR MITIGATION:

Description

The Contractor shall perform grading as necessary to attain final surface elevations as shown on the plans and in the details.

Construction Methods

(A) Site Grading

The Contractor shall perform grading as necessary to attain final surface elevations as shown on the plans and in the details. Field modifications shall be approved by the Engineer. Final grades shall meet the plan and stream dimensions within a tolerance of +/- 0.2 feet (2.4 inches).

(B) Stream Excavation/Ditch Filling

In areas where ditches are to be filled, the Contractor shall comply with the requirements of Subarticle 235-4(C) of the *Standard Specifications* to obtain a minimum 95% compaction rate. Lift thickness shall not exceed 1 ft. and compaction shall be achieved by use of mechanical compaction equipment only. Fill material shall be such that the Plasticity Index (PI) shall be equal to or greater than that of the PI in each surrounding soil strata. Organic material shall not exceed 10% of the total volume of the fill material used. No compaction shall be performed for graded areas unless directed.

Excess material shall be disposed of as shown on the plans or as directed.

Measurement and Payment

All work completed under this section will be measured paid for as lump sum for *Grading for Mitigation*

The above prices and payments will be full compensation for all work covered by this section.

Payment will be made under:

Pay Item	Pay Unit
Grading for Mitigation	Lump Sum

CONSTRUCTION SURVEYING FOR MITIGATION:

Description

Construction Surveying for Mitigation shall be performed in accordance with Section 801 of the *Standard Specifications* and shall include but not be limited to the layout of the stream channel, temporary and permanent easements, and all sensitive areas associated with the implementation of the design as indicated in the plans. The contractor shall maintain a level and rod onsite at all times for use by the Engineer to ensure adequate stream grades are achieved. This will not alleviate the contractor's responsibility to make certain that the stream is constructed in accordance with the project plans and provisions.

Construction Methods

Stakeout of the stream channel in its entirety shall be performed in such a way that the Engineer can verify the layout of the stream channel prior to construction activities commencing. The Contractor shall mark the proposed location of the top of banks and centerline of the channel. At a minimum, ditch stakes shall be placed to indicate the head of riffle and max pool locations within the proposed channel. Differing front and back slopes shall be indicated on the stake. Stakes should be maintained until final inspection of the project. There will be no additional payment for re-staking.

Upon completion of the stakeout and prior to beginning construction, the contractor shall give the Engineer a 48-hour notice in order to approve the stream alignment.

Measurement and Payment

Payment for construction surveying will be made provided all construction layout, boundary surveying, and engineering necessary for the proper construction of the project has been completed in accordance with the project plans and special provisions. Any adjustments to the stream alignment shall be considered incidental to the lump sum price for *Construction Surveying for Mitigation.*

Pay Item	Pay Unit
Construction Surveying for Mitigation	Lump Sum

PUMP AROUND OPERATION:

Description

The work covered by this section consists of furnishing, installing, maintaining and removing any and all pump around systems used on this project. The Contractor shall install a pump around system in locations chosen by the contractor and approved by the Engineer. The pump around system shall provide a passageway for the stream flow around the work site.

The quantity of pump around systems may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work. See example pump around operation detail on the plans.

Construction Methods

Install a temporary impervious dike as shown on the detail. Pump water around the work site. If the water is turbid or exposed to bare soil, pump through a special stilling basin. Follow detail for the pump around operation. Once the work is complete in an area remove the impervious dike and pump system. Place structures in the area and stabilize immediately following removal of pump around system.

Measurement and Payment

Temporary impervious dikes will be considered incidental to the pump around operation.

The pump around operation will be measured and paid for as lump sum for *Diversion Pumping for Mitigation.* This measurement shall include multiple installations and removals of the pump around system.

The above prices and payments will be full compensation for all work covered by this section including, but not limited to furnishing all of the necessary materials, construction, maintenance and removal of the impervious dike and pump around system.

Payment will be made under:

Pay Item	Pay Unit
Diversion Pumping For Mitigation	Lump Sum

<u>BOULDER TOE PROTECTION</u>

Description

The work covered by this section consists of the construction of physical barriers placed along the banks of the stream at locations designated on the plans.

The quantity of Boulder Toe Protection to be installed will be affected by the actual conditions that occur during the construction of the project. The quantity of boulder toe protection may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Materials

Item	Section
Geotextile for Drainage, Type 2	1056

Boulder	1042 and SP for Structure Stone
No. 57 Stone	1005
Rip Rap, Class A	1042

Construction Methods

Boulder Toe Protection shall be constructed according to the Boulder Toe Protection shown on the plans or as directed by the Engineer. The footer boulders shall be set where the top of the rock shall be at the channel invert elevation. Rip Rap Class A and No. 57 stone shall be used to fill the voids and backfill behind the structure. Geotextile for Drainage should be used behind the structure as shown in the detail.

Measurement and Payment

Boulders will be measured and paid for as provided elsewhere in this contract.

No. 57 Stone will be measured and paid for as provided elsewhere in this contract.

Riprap, Class A will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Geotextile for Drainage will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to construct the boulder toe protection.

ROCK VANE:

Description

This work consists of the construction and maintenance of physical barriers placed in and along the stream at locations designated on the plans to direct the stream flow (thalweg) toward the center of the channel.

The quantity of rock vanes to be installed will be affected by the actual conditions that occur during the construction of the project. The quantity of rock vanes may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Materials

Refer to Division 10

Item	Section
Boulder	1042 and SP for Structure Stone
No. 57 Stone	1005
Riprap, Class A	1042-1
Geotextile for Drainage, Type 2	1056

Boulders shall be used as header and footer rocks for this device.

Construction Methods

Rock vanes shall be constructed in accordance with the Rock Vane Detail shown in the plans or as directed. A vane, each approximately 1/3 of the stream channel's bankfull width, will form a 20°– 30° angle out from the streambank toward upstream. The top elevation of the vane will decrease from bankfull elevation toward the center of the channel at a slope of 4 to 20 percent. Install header and footer rocks according to the detail and plate the upstream side with Type 2 Geotextile and No. 57 stone. Voids between the header and footer rocks can be filled with hand-placed Class A riprap as directed. Footer rocks shall be placed such that the header rock is at streambed elevation. The rock vane shall be keyed into the bank at the downstream end as shown on the Rock Vane Detail.

Measurement and Payment

Boulders will be measured and paid for as provided elsewhere in this contract.

No. 57 Stone will be measured and paid for as provided elsewhere in this contract.

Riprap, Class __ will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Geotextile for Drainage will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Such price and payment will be full compensation for all work covered by this section, including, but not limited to furnishing all materials, labor, equipment, and incidentals necessary to construct the rock vanes.

ROCK CROSS VANE:

Description

This work consists of the construction and maintenance of physical barriers placed in and along the stream at locations designated on the plans to direct the stream flow (thalweg) toward the center of the channel and to provide grade control.

The quantity of rock cross vanes to be installed will be affected by the actual conditions that occur during the construction of the project. The quantity of rock cross vanes may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Materials

Refer to Division 10

Item	Section
Boulder	1042 and SP for Structure Stone
No. 57 Stone	1005
Riprap, Class A	1042-1
Geotextile for Drainage, Type 2	1056

Boulders shall be used as header and footer rocks for this device.

Construction Methods

Rock cross vanes shall be constructed in accordance with the Rock Cross Vane Detail shown in the plans or as directed. Two vanes, each approximately 1/3 of the stream channel's bankfull width, will form a 20°– 30° angle out from the streambank toward upstream. The top elevation of both vanes will decrease from bankfull elevation toward the center of the channel at a slope of 4 to 10 percent. A vane running perpendicular to the stream's flow will connect the two outside vanes on the upstream end. Install header and footer rocks according to the detail and plate the upstream side with Type 2 Geotextile and No. 57 stone. Voids between the header and footer rocks can be filled with hand-placed Class A riprap as directed. Footer rocks shall be placed such that the header rock is at streambed elevation. The rock cross vane shall be keyed into the bank at the downstream end as shown on the Rock Cross Vane Detail.

Measurement and Payment

Boulders will be measured and paid for as provided elsewhere in this contract.

No. 57 Stone will be measured and paid for as provided elsewhere in this contract.

Riprap, Class __ will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Geotextile for Drainage will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Such price and payment will be full compensation for all work covered by this section, including, but not limited to furnishing all materials, labor, equipment, and incidentals necessary to construct the rock cross vanes.

STORMWATER STEP POOL PROTECTION STRUCTURE:

Description

This work consists of the construction and maintenance of physical barriers placed in and along the stream at locations designated on the plans to direct the stream flow (thalweg) toward the center of the channel and to provide grade control.

The quantity of rock cross vanes to be installed for step pools will be affected by the actual conditions that occur during the construction of the project. The quantity of rock cross vanes for step pools may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Materials

Refer to Division 10

Item	Section
Boulder	1042 and SP for Structure Stone
No. 57 Stone	1005
Riprap, Class A	1042-1
Riprap, Class B	1042-1
Geotextile for Drainage, Type 2	1056

Boulders shall be used as header and footer rocks for this device.

Construction Methods

Rock cross vanes for step pools shall be constructed according to the Stormwater Step Pool Protection Structure Detail shown on the plans or as directed. Two vanes each approximately 1/3 of the stream channel's bankfull width will form a 20°– 30° angle out from the streambank toward upstream. The top elevation of both vanes will decrease from bankfull elevation toward the center of the channel at a slope of 4 to 10 percent. A vane running perpendicular to the stream's flow will connect the two outside vanes on the upstream end. Install header and footer rocks according to the detail and plate the upstream side with Type 2 Geotextile and No. 57 stone. Voids between the header and footer rocks can be filled with hand-placed Class A riprap as directed. Footer rocks shall be placed such that the header rock is at streambed elevation. The rock cross vane shall be keyed into the bank at the downstream end as shown on the Rock Cross

Vane detail. The spacing of the rock cross vanes used to create the step pools shall be as shown on the Step Pool detail or as directed. The excavated pools shall be lined with No. 57 stone and backfill as shown on the Step Pool Detail.

Measurement and Payment

Boulders will be measured and paid for as provided elsewhere in this contract.

No. 57 Stone will be measured and paid for as provided elsewhere in this contract.

Riprap, Class __ will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Geotextile for Drainage will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to construct the rock cross vanes for step pools.

ROCK A- VANE:

Description

This work consists of the construction and maintenance of physical barriers placed in and along the stream at locations designated on the plans to direct the stream flow (thalweg) toward the center of the channel and to provide grade control.

The quantity of rock cross vanes to be installed will be affected by the actual conditions that occur during the construction of the project. The quantity of rock cross vanes may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Materials

Refer to Division 10

Item	Section
Boulder	1042 and SP for Structure Stone
No. 57 Stone	1005
Riprap, Class A	1042-1
Geotextile for Drainage, Type 2	1056

Boulders shall be used as header and footer rocks for this device.

Construction Methods

Rock cross vanes shall be constructed in accordance with the Rock A-Vane Detail shown in the plans or as directed. Two vanes, each approximately 1/3 of the stream channel's bankfull width, will form a 20°– 30° angle out from the streambank toward upstream. The top elevation of both vanes will decrease from bankfull elevation toward the center of the channel at a slope of 4 to 20 percent. A vane running perpendicular to the stream's flow will connect the two outside vanes on the upstream end. Install header and footer rocks according to the detail and plate the upstream side with Type 2 geotextile and No. 57 stone. Voids between the header and footer rocks can be filled with hand-placed Class A rip rap as directed. Footer rocks shall be placed such that the header rock is at streambed elevation. The rock a-vane shall be keyed into the bank at the downstream end as shown on the Rock A-Vane Detail.

Measurement and Payment

Boulders will be measured and paid for as provided elsewhere in this contract.

No. 57 Stone will be measured and paid for as provided elsewhere in this contract.

Riprap, Class __ will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Geotextile for Drainage will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Such price and payment will be full compensation for all work covered by this section, including, but not limited to furnishing all materials, labor, equipment, and incidentals necessary to construct the rock cross vanes.

CONSTRUCTED RIFFLE:

Description

This work consists of the construction and maintenance of physical barriers placed in and along the stream at locations designated on the plans to provide grade control.

The quantity of constructed riffles to be installed will be affected by the actual conditions that occur during the construction of the project. The quantity of constructed riffles may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Materials

Item	Section
No. 57 Stone	1005
Riprap, Class A	1042
Riprap, Class B	1042

Construction Methods

Constructed riffles shall be constructed according to the Constructed Riffle Detail shown on the plans or as directed.

Measurement and Payment

No. 57 Stone will be measured and paid for as provided elsewhere in this contract.

Riprap, Class ___ will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to construct the constructed riffles.

LOG VANE:

Description

The work covered by this section consists of the construction and maintenance of physical barriers placed in and along the stream at locations designated on the plans to direct the stream flow (thalweg) toward the center of the channel.

The quantity of log vanes to be installed will be affected by the actual conditions that occur during the construction of the project. The quantity of log vanes may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Materials

Logs: Hardwood tree species with a minimum trunk diameter of 12". The length of each log shall be sufficient to allow proper construction in accordance with the Log Vane Detail.

Refer to Division 10

Item	Section
Boulder	1042 and SP for Structure Stone
No. 57 Stone	1005

Riprap, Class A	1042-1
Geotextile for Drainage, Type 2	1056

Boulders shall be used as header and footer rocks for this device.

Construction Methods

Log vanes shall be constructed according to the log vane detail shown on the plans or as directed. A vane each approximately 1/3 of the stream channel's bankfull width will form a 20°– 30° angle out from the streambank toward upstream. The top elevation of the vane will decrease from bankfull elevation toward the center of the channel at a slope of 4 to 10 percent. Install header and footer rocks and bury the upstream end of the log under the streambed according to the detail and plate the upstream side of the vane with Type 2 Geotextile and No. 57 stone. The Geotextile shall be securely fastened to the back of the log using galvanized roofing nails on approximately 8" centers. Voids between the header and footer rocks can be filled with hand-placed Class A riprap as directed. Footer rocks shall be placed such that the header rock is at streambed elevation. The downstream end of the log at the bankfull elevation shall be anchored by pinning with header and footer rocks. The log vane shall be keyed into the bank at the downstream end as shown on the log vane detail. Native hardwood trees encountered during clearing and grubbing may be identified and stockpiled for use as logs for the log vanes.

Method of Measurement

Logs will be measured and paid for as the actual number of logs of each acceptable species and size, which have been incorporated into the work, or have been delivered to and stockpiled on the project as directed. Logs that have been stockpiled will not be measured a second time.

Boulders will be measured and paid for as provided elsewhere in this contract.

No. 57 Stone will be measured and paid for as provided elsewhere in this contract.

Riprap, Class __ will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Geotextile for Drainage will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to construct the log vanes.

Payment will be made under:

Pay Item	**Pay Unit**
Log	Each

LOG CROSS VANE:

Description

This work consists of the construction and maintenance of physical barriers placed in and along the stream at locations designated on the plans to direct the stream flow (thalweg) toward the center of the channel and to provide grade control.

The quantity of log cross vanes to be installed will be affected by the actual conditions that occur during the construction of the project. The quantity of log cross vanes may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Materials

Rootwads: Hardwood tree species with a minimum trunk diameter of 12" and should have 15 to 20 ft. of the trunk length remaining.

Logs: Hardwood tree species with a minimum trunk diameter of 12". The length of each log shall be sufficient to allow proper construction in accordance with the Log Cross Vane Detail.

Refer to Division 10

Item	Section
No. 57 Stone	1005
Geotextile for Drainage, Type 2	1056

Construction Methods

Log cross vanes shall be constructed according to the Log Cross Vane Detail shown on the plans or as directed. Two vanes approximately 1/3 of the stream channel's bankfull width will form a 20°– 30° angle out from the streambank toward upstream. The top elevation of both vanes will decrease from ½ bankfull elevation toward the center of the channel at a slope of 4 to 20 percent. A vane running perpendicular to the stream's flow and at the streambed elevation will connect the two outside vanes on the upstream end. The perpendicular vane log and the vane arm logs shall be anchored together by pinning with rebar or cabling and anchored to the streambed as directed. The vane shall be anchored to the streambed with cabled earth anchors. Earth anchors shall have a minimum bearing capacity of 500 pounds. Install the upstream end of the vane arms, secure to the perpendicular vane log, and bury them under the streambed according to the detail. Plate the upstream side of the vane with Type 2 Geotextile and No. 57 stone. The Geotextile shall be securely fastened to the back of the log using galvanized roofing nails on approximately 8" centers. The downstream end of the log at the ½ bankfull elevation shall be anchored to the rootwad by pinning with rebar or cabling as directed. The log cross vane shall be keyed into the bank at the downstream end using the rootwads as shown on the Log Cross Vane Detail. Cable used to secure and anchor vane logs and rootwads shall be a minimum of

7x7, 1/8" diameter, stainless steel wire rope. The Contractor shall furnish and install all rootwads per the plans or as directed. Hardwood trees encountered during clearing and grubbing may be identified and stockpiled for use as rootwads or logs. The Contractor, upon removal of the trunk and root, shall remove soil to the extent acceptable by the Engineer. Care shall be taken to preserve the root structure on the harvested trees to be used as rootwads as shown on the detail in the plans.

Measurement and Payment

Rootwads will be measured and paid for as the actual number of rootwads of each acceptable species and size, which have been installed as part of the log cross vane and accepted.

Logs will be measured and paid for as the actual number of logs of each acceptable species and size, which have been incorporated into the work, or have been delivered to and stockpiled on the project as directed. Logs that have been stockpiled will not be measured a second time.

No. 57 Stone will be measured and paid for as provided elsewhere in this contract.

Geotextile for Drainage will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to construct the log cross vanes.
Payment will be made under:

Pay Item	Pay Unit
Rootwad	Each
Log	Each

<u>ROOTWAD:</u>

Description

This work consists of collecting or furnishing, storage, preparation and installation of all materials required for proper installation of *Rootwads*.

The quantity of rootwads to be installed will be affected by the actual conditions that occur during the construction of the project. The quantity of rootwads may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Materials

Rootwads: Hardwood tree species with a minimum trunk diameter of 12" and should have 15 to 20 ft. of the trunk length remaining.

Refer to Division 10

Item	Section
Boulder	1042 and SP for Structure Stone

Construction Methods

The Contractor shall furnish and install all rootwads as shown on the plans or as directed. Hardwood trees encountered during clearing and grubbing may be identified and stockpiled for use as rootwads. The Contractor, upon removal of the trunk and root, shall remove soil to the extent acceptable by the Engineer. Care shall be taken to preserve the root structure on the harvested trees to be used as rootwads as shown on the Rootwad Detail in the plans.

Rootwad sections shall be constructed by the drive point or trenching method, according to the Rootwad Detail shown on the plans or as directed. Place the rootwad on top of the boulders. For rootwads installed using the trenching method, pin the rootwad down using boulders and place fill material over the structure.

Measurement and Payment

Rootwads will be measured and paid for as the actual number of rootwads of each acceptable species and size, which have been installed and accepted.

Boulders will be measured and paid for as provided elsewhere in this contract.

Such price and payment will be full compensation for all work covered by this section, including but not limited to excavation, furnishing and installing all rootwads, boulders, and fill material necessary to construct the rootwads.

Payment will be made under:

Pay Item	Pay Unit
Rootwad	Each

<u>STREAM PLUG:</u>

Description

This work consists of the construction, maintenance, and removal of physical barriers placed in ditches, diversions or swales to reduce water flow.

The quantity of stream plugs to be constructed will be affected by the actual conditions that occur during the construction of the project. The quantity of stream plugs may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Materials

Stream plugs shall consist of *Impervious Select Material* that shall meet the specifications as provided elsewhere in this contract.

Construction Methods

Stream plugs shall be constructed at locations as shown on the plans or as directed. Clear and grub all side slopes of the channel. Place stream plug in channel ensuring that there is at least 5 ft. of embankment material between the plug and the face of the restored stream bank. Construct the stream plug across the entire width of the channel and to an elevation of 2 ft below the proposed fill elevation as shown on the plans. The length of the stream plug is to be a minimum of 10 ft.

Measurement and Payment

Stream plugs will not be measured for payment under this article. *Impervious Select Material* will be measured and paid for as provided elsewhere in this contract. This payment shall be considered full compensation for all materials, labor, equipment, and incidentals necessary to construct the stream plug.

The removal and disposal of silt accumulations will be measured and paid for as *Silt Excavation* in accordance with Article 1630-4 of the *Standard Specifications*

IMPERVIOUS SELECT MATERIAL:

Description

This work consists of furnishing, stockpiling, placing and maintaining impervious select material for stream plugs in locations as shown on the plans and cross-sections or as directed.

The quantity of impervious select material to be installed will be affected by the actual conditions that occur during the construction of the project. The quantity of impervious select material may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Materials

Materials that will function as impervious barriers to water movement shall be a silty or clay soil material meeting the requirements of AASHTP M 145 for soil classification A-2, A-6 and A-7 provided such materials do not have a Liquid Limit (LL) greater than 50. To maintain soil workability for placement and compaction, the following criteria shall apply for Plasticity Index (PI):

Position of Borrow Material	Constraints on Plasticity Index (PI)
Below the water table	Must be greater than 7 and less than 25
Above the water table	Must be greater than 7 and less than 35

Plasticity Index shall be determined in accordance with AASHTO T90 and the Liquid Limit shall be determined in accordance with AASHTO T89. The Contractor is cautioned that soils tend to become less workable as the PI increases above 20. Although a PI of 35 may be acceptable, the Contractor should be aware that additional efforts might be necessary to work the soil in order to achieve the minimum compaction standards.

Construction Methods

Impervious select material for stream plugs shall be constructed at locations as shown on the plans and cross-sections or as directed. Impervious select material for stream plugs shall be used at the outlet end of uncompacted channel fills, and may be used at other locations to provide surface drainage relief from the uncompacted fills.

(A) Clearing and Grubbing

Clear and Grub the stream plug cross-section on all sides to remove all vegetation and root mat material as directed to an elevation at least 1 ft. below the elevation of the existing channel cross-section.

(B) Construction

Construct the stream plug using material that meets the requirements of the Materials section listed above. Construct the stream plug to the dimensions detailed on the plans.

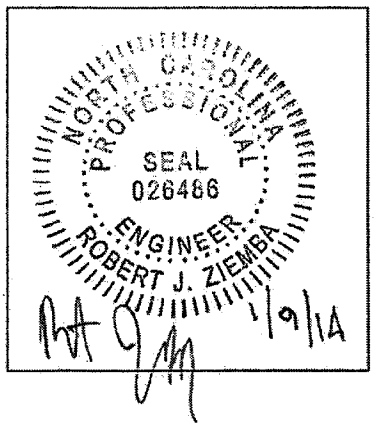
Measurement and Payment

Impervious Select Material will be measured and paid for as the actual number of cubic yards of material, measured in their original position and computed by the average end area method, which has been acceptably excavated in accordance with the plans and specifications. Original cross-sections for the determination of the excavation quantities will be taken before any grading begins. Final cross-sections will be taken after the excavation has been completed, except that the plan typical sections will be used for the final cross-sections where, in the opinion of the Engineer, the work has been constructed in reasonably close conformity to the plan typical section. Original and final cross-sections will be taken by either ground or aerial survey methods, as determined by the Engineer.

Such price and payment will be full compensation for all work covered by this section, including but not limited to furnishing the source of the impervious select material, providing and implementing a development, use and reclamation plan; building, maintaining and obliterating haul roads; clearing and grubbing the source; removal and disposition of overburden and other unsuitable material; excavation; hauling; restoration of the source and haul roads to an acceptable condition, seeding and mulching and maintaining the work.

Payment will be made under:

Pay Item	Pay Unit
Impervious Select Material	Cubic Yard



U-2525B

Project Special Provisions
(Version 12.2)
Signals and Intelligent Transportation Systems

Prepared By: IOU
9-Jan-14

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1. 2012 Standard Specifications for Roads & Structures

The 2012 Standard Specifications are revised as follows:

1.1. Polymer Concrete (PC) Junction Boxes (1091-5(B))

Page 10-202, revise paragraph starting on line 9 to read "Provide polymer concrete (PC) boxes which have bolted covers and open bottoms. Provide vertical extensions of 6" to 12" as required by project special provisions."

Page 10-202, revise sentence beginning on line 14 to read "Other thermoplastic materials may be used for components which are not normally exposed to sunlight."

1.2. Junction Boxes (1098-5)

Page 10-212, sub-Section 1098-5(C) Oversized Junction Boxes

Revise sentence to read, "Provide oversized junction boxes and covers with minimum inside dimensions of 28"(l) x 15"(w) x 22"(h)."

1.3. Controllers with Cabinets – Material (1751-2)

Page 17-37, Section 1751-2 Material

Add the following paragraph:

When the plans or specifications require a Type 2070L controller, contractor may provide a Type 2070E controller. Unless otherwise allowed by the Engineer, provide controllers of only one type.

1.4. Pedestals (1743)

Page 17-34, Add the following new sub-Section:

1743-4 - Screw-In Helical Foundation Anchor Assembly

Description:

Furnish and install screw-in helical foundation as an alternative to the standard reinforced concrete foundation specified in Article 1743 "Pedestals" of the Standard Specifications, for supporting Type I and Type II Pedestals. Do not use for Type III Pedestals.

Materials for Type I – Pedestrian Pushbutton Post:

Fabricate pipe assembly consisting of a 4" diameter x 56" long pipe, single helical blade and square fixed attachment plate. Furnish pipe in accordance with ASTM A-53 ERW Grade B and include a 2" x 3" cable opening in the pipe at 18" below the attachment plate. Furnish steel attachment plate and helical blade in accordance with ASTM A-36. Include (4) slotted mounting holes in the attachment plate to fit bolt circles ranging from 7-3/4" to 14-3/4" diameter. Furnish additional 3/4" keyholes at slotted holes to permit anchor bolt installation and replacement from top surface. Include combination bolt-head retainer and dirt scrapers at the attachment plate underside to allow for a level or flush-mount plate installation with respect to the finished grade. Galvanize pipe assembly components in accordance with AASHTO M 111 or an approved equivalent.

Furnish (4) 3/4"-10NC x 3" square head anchor bolts to meet the requirements of ASTM 325. Provide (4) 3/4" plain flat galvanized washers, (4) 3/16" thick galvanized plate washers and (4) 3/4" galvanized hex nuts. Galvanize in accordance with AASHTO M 111 or an approved equivalent.

Construction Methods for Type I – Pedestrian Pushbutton Post:

Advance or mechanically screw foundation into soil up until top of attachment plate is level with finished grade. Slide the anchor bolt heads through the keyhole openings and under the attachment plate with threads pointing up. Bolt the pedestal base to the foundation attachment plate. For further construction methods, see manufacturer's installation drawings.

Materials for Type II – Normal-Duty Pedestal:

Fabricate pipe assembly consisting of a 6" diameter x 60" long, single helical blade, 1-1/4" diameter stinger rod and square fixed attachment plate. Furnish pipe in accordance with ASTM A-53 ERW Grade B using schedule 40 wall thickness and include a 2" x 3" cable opening in the pipe at 18" below the attachment plate. Furnish steel attachment plate, helical blade and stinger rod in accordance with ASTM A-36. Include (4) slotted mounting holes in the attachment plate to fit bolt circles ranging from 10" to 15" diameter. Furnish additional 1-1/4" keyholes at slotted holes to permit anchor bolt installation and replacement from top surface. Include combination bolt-head retainer and dirt scrapers at the attachment plate underside to allow for a level or flush-mount plate installation with respect to the finished grade. Galvanize pipe assembly components in accordance with AASHTO M 111 or an approved equivalent.

Furnish (4) 1"-8NC x 4" galvanized Grade 5 square head anchor bolts. Provide (4) 1" plain flat galvanized washers and (4) 1" galvanized hex nuts. Galvanize in accordance with AASHTO M 111 or an approved equivalent.

Construction Methods for Type II – Normal-Duty Pedestal:

Advance or mechanically screw foundation into soil up until top of attachment plate is level with finished grade. Slide the anchor bolt heads through the keyhole openings and under the attachment plate with threads pointing up. Bolt the pedestal base to the foundation attachment plate.

For further construction methods, see manufacturer's installation drawings.

Page 17-34, revise Measurement and Payment to sub-Section 1743-5.
Revise the last paragraph to read:

No measurement will be made for pedestal foundations, pedestal screw-in helical foundations, grounding systems and any peripheral pedestal mounting hardware as these are incidental to furnishing and installing pedestals.

2. SIGNAL HEADS

2.1. MATERIALS

A. General:

Fabricate vehicle signal head housings and end caps from die-cast aluminum. Fabricate 16-inch pedestrian signal head housings and end caps from die-cast aluminum. Provide visor mounting screws, door latches, and hinge pins fabricated from stainless steel. Provide interior screws, fasteners, and metal parts fabricated from stainless steel or corrosion resistant material.

Fabricate tunnel and traditional visors from sheet aluminum.

Paint all surfaces inside and outside of signal housings and doors. Paint outside surfaces of tunnel and traditional visors, messenger cable mounting assemblies, pole and pedestal mounting assemblies, and pedestrian pushbutton housings. Have electrostatically-applied, fused-polyester paint in highway yellow (Federal Standard 595C, Color Chip Number 13538) a minimum of 2.5 to

3.5 mils thick. Do not apply paint to the latching hardware or rigid vehicle signal head mounting brackets for mast-arm attachments.

Have the interior surfaces of tunnel and traditional visors painted an alkyd urea black synthetic baking enamel with a minimum gloss reflectance and meeting the requirements of MIL-E-10169, "Enamel Heat Resisting, Instrument Black."

For pole mounting, provide side of pole mounting assemblies with framework and all other hardware necessary to make complete, watertight connections of the signal heads to the poles and pedestals. Fabricate the mounting assemblies and frames from aluminum with all necessary hardware, screws, washers, etc. to be stainless steel. Provide mounting fittings that match the positive locking device on the signal head with the serrations integrally cast into the brackets. Provide upper and lower pole plates that have a 1 ¼-inch vertical conduit entrance hubs with the hubs capped on the lower plate and 1 ½-inch horizontal hubs. Ensure that the assemblies provide rigid attachments to poles and pedestals so as to allow no twisting or swaying of the signal heads. Ensure that all raceways are free of sharp edges and protrusions, and can accommodate a minimum of ten Number 14 AWG conductors.

For pedestal mounting, provide a post-top slipfitter mounting assembly that matches the positive locking device on the signal head with serrations integrally cast into the slipfitter. Provide stainless steel hardware, screws, washers, etc. Provide a minimum of six 3/8 X 3/4-inch long square head bolts for attachment to pedestal. Provide a center post for multi-way slipfitters.

For light emitting diode (LED) traffic signal modules, provide the following requirements for inclusion on the Department's Qualified Products List for traffic signal equipment.

1. Sample submittal,
2. Third-party independent laboratory testing results for each submitted module with evidence of testing and conformance with all of the Design Qualification Testing specified in section 6.4 of each of the following Institute of Transportation Engineers (ITE) specifications:
   - Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement
   - Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement
   - Pedestrian Traffic Control Signal Indications –Light Emitting Diode (LED) Signal Modules.

   (Note: The Department currently recognizes two approved independent testing laboratories. They are Intertek ETL Semko and Light Metrics, Incorporated with Garwood Laboratories. Independent laboratory tests from other laboratories may be considered as part of the QPL submittal at the discretion of the Department,
3. Evidence of conformance with the requirements of these specifications,
4. A manufacturer's warranty statement in accordance with the required warranty, and
5. Submittal of manufacturer's design and production documentation for the model, including but not limited to, electrical schematics, electronic component values, proprietary part numbers, bill of materials, and production electrical and photometric test parameters.

6. Evidence of approval of the product to bear the Intertek ETL Verified product label for LED traffic signal modules.

In addition to meeting the performance requirements for the minimum period of 60 months, provide a written warranty against defects in materials and workmanship for the modules for a period of 60 months after installation of the modules. During the warranty period, the manufacturer must provide new replacement modules within 45 days of receipt of modules that have failed at no cost to the State. Repaired or refurbished modules may not be used to fulfill the manufacturer's warranty obligations. Provide manufacturer's warranty documentation to the Department during evaluation of product for inclusion on Qualified Products List (QPL).

B. Vehicle Signal Heads:

Comply with the ITE standard "Vehicle Traffic Control Signal Heads". Provide housings with provisions for attaching backplates.

Provide visors that are 10 inches in length for 12-inch vehicle signal heads.

Provide a termination block with one empty terminal for field wiring for each indication plus one empty terminal for the neutral conductor. Have all signal sections wired to the termination block. Provide barriers between the terminals that have terminal screws with a minimum Number 8 thread size and that will accommodate and secure spade lugs sized for a Number 10 terminal screw.

Mount termination blocks in the yellow signal head sections on all in-line vehicle signal heads. Mount the termination block in the red section on five-section vehicle signal heads.

Furnish vehicle signal head interconnecting brackets. Provide one-piece aluminum brackets less than 4.5 inches in height and with no threaded pipe connections. Provide hand holes on the bottom of the brackets to aid in installing wires to the signal heads. Lower brackets that carry no wires and are used only for connecting the bottom signal sections together may be flat in construction.

For messenger cable mounting, provide messenger cable hangers, wire outlet bodies, balance adjusters, bottom caps, wire entrance fitting brackets, and all other hardware necessary to make complete, watertight connections of the vehicle signal heads to the messenger cable. Fabricate mounting assemblies from malleable iron or steel and provide serrated rings made of aluminum. Provide messenger cable hangers and balance adjusters that are galvanized before being painted. Fabricate balance adjuster eyebolt and eyebolt nut from stainless steel or galvanized malleable iron. Provide messenger cable hangers with U-bolt clamps. Fabricate washers, screws, bolts, clevis pins, cotter pins, nuts, and U-bolt clamps from stainless steel.

Provide LED vehicular traffic signal modules (hereafter referred to as modules) that consist of an assembly that uses LEDs as the light source in lieu of an incandescent lamp for use in traffic signal sections. Use LEDs that are aluminum indium gallium phosphorus (AlInGaP) technology for red and yellow indications and indium gallium nitride (InGaN) for green indications. Install the ultra bright type LEDs that are rated for 100,000 hours of continuous operation from -40°F to +165°F. Design modules to have a minimum useful life of 60 months and to meet all parameters of this specification during this period of useful life.

For the modules, provide spade terminals crimped to the lead wires and sized for a #10 screw connection to the existing terminal block in a standard signal head. Do not provide other types of crimped terminals with a spade adapter.

Ensure the power supply is integral to the module assembly. On the back of the module, permanently mark the date of manufacture (month & year) or some other method of identifying date of manufacture.

Tint the red, yellow and green lenses to correspond with the wavelength (chromaticity) of the LED. Transparent tinting films are unacceptable. Provide a lens that is integral to the unit with a smooth outer surface.

1. LED Circular Signal Modules:

Provide modules in the following configurations: 12-inch circular sections. All makes and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal Qualified Products List (QPL).

Provide the manufacturer's model number and the product number (assigned by the Department) for each module that appears on the 2012 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications,* that each module meets or exceeds the ITE "Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement" dated June 27, 2005 (hereafter referred to as VTCSH Circular Supplement) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the VTCSH Circular Supplement:

Module Type	Max. Wattage at 165° F	Nominal Wattage at 77° F
12-inch red circular	17	11
12-inch green circular	15	15

For yellow circular signal modules, provide modules tested under the procedures outlined in the VTCSH Circular Supplement to insure power required at 77° F is 22 Watts or less for the 12-inch circular module.

Note: Use a wattmeter having an accuracy of ±1% to measure the nominal wattage and maximum wattage of a circular traffic signal module. Power may also be derived from voltage, current and power factor measurements.

2. LED Arrow Signal Modules

Provide 12-inch omnidirectional arrow signal modules. All makes and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal Qualified Products List (QPL).

Provide the manufacturer's model number and the product number (assigned by the Department) for each module that appears on the 2012 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications,* that each module meets or exceeds the requirements for 12-inch omnidirectional modules specified in the ITE "Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement" dated July 1, 2007 (hereafter referred to as VTCSH Arrow Supplement) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the VTCSH Arrow Supplement:

Module Type	Max. Wattage at 165° F	Nominal Wattage at 77° F
12-inch red arrow	12	9
12-inch green arrow	11	11

For yellow arrow signal modules, provide modules tested under the procedures outlined in the VTCSH Arrow Supplement to insure power required at 77° F is 12 Watts or less.

Note: Use a wattmeter having an accuracy of ±1% to measure the nominal wattage and maximum wattage of an arrow traffic signal module. Power may also be derived from voltage, current and power factor measurements.

C. Pedestrian Signal Heads:

Provide pedestrian signal heads with international symbols that meet the MUTCD. Do not provide letter indications.

Comply with the ITE standard for "Pedestrian Traffic Control Signal Indications" and the following sections of the ITE standard for "Vehicle Traffic Control Signal Heads" in effect on the date of advertisement:

- Section 3.00 - "Physical and Mechanical Requirements"
- Section 4.01 - "Housing, Door, and Visor: General"
- Section 4.04 - "Housing, Door, and Visor: Materials and Fabrication"
- Section 7.00 - "Exterior Finish"

Provide a double-row termination block with three empty terminals and number 10 screws for field wiring. Provide barriers between the terminals that accommodate a spade lug sized for number 10 terminal screws. Mount the termination block in the hand section. Wire all signal sections to the terminal block.

Where required by the plans, provide 16-inch pedestrian signal heads with traditional three-sided, rectangular visors, 6 inches long.

Provide 2-inch diameter pedestrian push-buttons with weather-tight housings fabricated from die-cast aluminum and threading in compliance with the NEC for rigid metal conduit. Provide a weep hole in the housing bottom and ensure that the unit is vandal resistant.

Provide push-button housings that are suitable for mounting on flat or curved surfaces and that will accept 1/2-inch conduit installed in the top. Provide units that have a heavy duty push-button assembly with a sturdy, momentary, normally-open switch. Have contacts that are electrically insulated from the housing and push-button. Ensure that the push-buttons are rated for a minimum of 5 mA at 24 volts DC and 250 mA at 12 volts AC.

Provide standard R10-3 signs with mounting hardware that comply with the MUTCD in effect on the date of advertisement. Provide R10-3E signs for countdown pedestrian heads and R10-3B for non-countdown pedestrian heads.

Design the LED pedestrian traffic signal modules (hereafter referred to as modules) for installation into standard pedestrian traffic signal sections that do not contain the incandescent signal section reflector, lens, eggcrate visor, gasket, or socket. Provide modules that consist of an assembly that uses LEDs as the light source in lieu of an incandescent lamp. Use LEDs that are of the latest

aluminum indium gallium phosphorus (AlInGaP) technology for the Portland Orange hand and countdown displays. Use LEDs that are of the latest indium gallium nitride (InGaN) technology for the Lunar White walking man displays. Install the ultra-bright type LEDs that are rated for 100,000 hours of continuous operation from -40°F to +165°F. Design modules to have a minimum useful life of 60 months and to meet all parameters of this specification during this period of useful life.

Design all modules to operate using a standard 3 - wire field installation. Provide spade terminals crimped to the lead wires and sized for a #10 screw connection to the existing terminal block in a standard pedestrian signal housing. Do not provide other types of crimped terminals with a spade adapter.

Ensure the power supply is integral to the module assembly. On the back of the module, permanently mark the date of manufacture (month & year) or some other method of identifying date of manufacture.

Provide modules in the following configuration: 16-inch displays which have the solid hand/walking man overlay on the left and the countdown on the right. All makes and models of LED modules purchased for use on the State Highway System shall appear on the current NCDOT Traffic Signal Qualified Products List (QPL).

Provide the manufacturer's model number and the product number (assigned by the Department) for each module that appears on the 2012 or most recent Qualified Products List. In addition, provide manufacturer's certification in accordance with Article 106-3 of the *Standard Specifications*, that each module meets or exceeds the ITE "Pedestrian Traffic Control Signal Indicators - Light Emitting Diode (LED) Signal Modules" dated August 04, 2010 (hereafter referred to as PTCSI Pedestrian Standard) and other requirements stated in this specification.

Provide modules that meet the following requirements when tested under the procedures outlined in the PTCSI Pedestrian Standard:

Module Type	Max. Wattage at 165° F	Nominal Wattage at 77° F
Hand Indication	16	13
Walking Man Indication	12	9
Countdown Indication	16	13

Note: Use a wattmeter having an accuracy of ±1% to measure the nominal wattage and maximum wattage of a circular traffic signal module. Power may also be derived from voltage, current and power factor measurements.

Provide module lens that is hard coated or otherwise made to comply with the material exposure and weathering effects requirements of the Society of Automotive Engineers (SAE) J576. Ensure all exposed components of the module are suitable for prolonged exposure to the environment, without appreciable degradation that would interfere with function or appearance.

Ensure the countdown display continuously monitors the traffic controller to automatically learn the pedestrian phase time and update for subsequent changes to the pedestrian phase time.

Ensure the countdown display begins normal operation upon the completion of the preemption sequence and no more than one pedestrian clearance cycle.

D. Signal Cable:

Furnish 16-4 and 16-7 signal cable that complies with IMSA specification 20-1 except provide the following conductor insulation colors:

- For 16-4 cable: white, yellow, red, and green
- For 16-7 cable: white, yellow, red, green, yellow with black stripe tracer, red with black stripe tracer, and green with black stripe tracer. Apply continuous stripe tracer on conductor insulation with a longitudinal or spiral pattern.

Provide a ripcord to allow the cable jacket to be opened without using a cutter. IMSA specification 19-1 will not be acceptable. Provide a cable jacket labeled with the IMSA specification number and provide conductors constructed of stranded copper.

3. MICROWAVE VEHICLE DETECTOR

3.1. DESCRIPTION

Furnish and install a microwave vehicle detection unit and manufacturer recommended cables and hardware in accordance with the plans and specifications.

3.2. MATERIALS

Furnish material, equipment, and hardware under this section that is pre-approved on the ITS and Signals QPL.

Provide a detector for either side-fire or forward-fire configuration with a mounting height of 16 inches or greater for normal operation. Ensure the detector will detect vehicle in sunny, cloudy, rainy, snowy, and foggy weather conditions with self-tuning to auto-adjust in changing environmental conditions. Ensure the detector can operate from the voltage supplied by a NEMA and Type-170 traffic signal cabinet. Ensure the detector can provide detection calls to the traffic signal controller within a NEMA and Type-170 cabinet. Ensure the detector will put out a constant call in the event of a component failure or loss of power. Ensure the detector has an operating temperature range of -20 to 150 degrees F. Ensure a water resistant housing for the detector.

For advance pulse detection, ensure the detector senses vehicles in motion at a range of 200 feet with an operating frequency of 10.525 GHz +/- 25MHz.

For stop bar presence detection, ensure the detector outputs a constant call while a vehicle is in the detection zone. Ensure the presence detection unit can cover a detection zone as shown on the plans and has an effective range of at least 75 feet from the detector unit to the aim point on the road surface.

For units without an integrated card rack interface, provide Form C output relay contacts rated a minimum of 3A, 24VDC.

If a laptop is used to adjust detector settings, ensure that software is licensed for use by the Department and by any other agency responsible for maintaining or operating the microwave detection system. Provide the Department with a license to duplicate and distribute the software as necessary for design and maintenance support.

3.3. CONSTRUCTION METHODS

Install the microwave vehicle detector in accordance with the manufacturer's recommendations.

Monitor and maintain the detector unit during construction to ensure microwave vehicle detector is functioning properly and aimed for the detection zone shown in the plans. Refer to Subarticle 1700-3 (D) Maintenance and Repair of Materials of the *Standard Specifications* for failure to maintain the microwave detection system.

3.4. MEASUREMENT AND PAYMENT

Actual number of microwave vehicle detector units furnished, installed, and accepted.

No measurement will be made of cables or hardware, as these will be considered incidental to furnishing and installing microwave vehicle detectors.

Payment will be made under:

Microwave Vehicle Detector ..... Each

4. CONTROLLERS WITH CABINETS

4.1 MATERIALS – TYPE 2070L CONTROLLERS

Conform to CALTRANS *Transportation Electrical Equipment Specifications* (TEES) (dated August 16, 2002, plus Errata 1 dated October 27, 2003 and Errata 2 dated June 08, 2004) except as required herein.

Furnish Model 2070L controllers. Ensure that removal of the CPU module from the controller will place the intersection into flash.

The Department will provide software at the beginning of the burning-in period. Contractor shall give 5 working days notice before needing software. Program software provided by the Department.

Provide model 2070L controllers with the latest version of OS9 operating software and device drivers, composed of the unit chassis and at a minimum the following modules and assemblies:

- MODEL 2070 1B, CPU Module, Single Board
- MODEL 2070-2A, Field I/O Module (FI/O)
  - Note: Configure the Field I/O Module to disable both the External WDT Shunt/Toggle Switch and SP3 (SP3 active indicator is "off")
- MODEL 2070-3B, Front Panel Module (FP), Display B (8x40)
- MODEL 2070-4A, Power Supply Module, 10 AMP
- MODEL 2070-7A, Async Serial Com Module (9-pin RS-232)

Furnish one additional MODEL 2070-7A, Async Serial Com Module (9-pin RS-232) for all master controller locations.

For each master location and central control center, furnish a U.S. Robotics V.92 or approved equivalent auto-dial/auto-answer external modem to accomplish the interface to the Department-furnished microcomputers. Include all necessary hardware to ensure telecommunications.

4.2 MATERIALS – GENERAL CABINETS

Provide a moisture resistant coating on all circuit boards.

Provide one 20 mm diameter radial lead UL-recognized metal oxide varistor (MOV) between each load switch field terminal and equipment ground. Electrical performance is outlined below.

PROPERTIES OF MOV SURGE PROTECTOR	
Maximum Continuous Applied Voltage at 185° F	150 VAC (RMS) 200 VDC
Maximum Peak 8x20µs Current at 185° F	6500 A
Maximum Energy Rating at 185° F	80 J
Voltage Range 1 mA DC Test at 77° F	212-268 V
Max. Clamping Voltage 8x20µs, 100A at 77° F	395 V
Typical Capacitance (1 MHz) at 77° F	1600 pF

Provide a power line surge protector that is a two-stage device that will allow connection of the radio frequency interference filter between the stages of the device. Ensure that a maximum continuous current is at least 10A at 120V. Ensure that the device can withstand a minimum of 20 peak surge current occurrences at 20,000A for an 8x20 microsecond waveform. Provide a maximum clamp voltage of 395V at 20,000A with a nominal series inductance of 200µh. Ensure that the voltage does not exceed 395V. Provide devices that comply with the following:

Frequency (Hz)	Minimum Insertion Loss (dB)
60	0
10,000	30
50,000	55
100,000	50
500,000	50
2,000,000	60
5,000,000	40
10,000,000	20
20,000,000	25

4.3 MATERIALS – TYPE 170E CABINETS

A. Type 170 E Cabinets General:

Conform to the city of Los Angeles' Specification No. 54-053-08, *Traffic Signal Cabinet Assembly Specification* (dated July 2008), except as required herein.

Furnish model 332 base mounted cabinets configured for 8 vehicle phases, 4 pedestrian phases, and 6 overlaps. When overlaps are required, provide auxiliary output files for the overlaps. Do not reassign load switches to accommodate overlaps unless shown on electrical details.

Provide model 200 load switches, model 222 loop detector sensors, model 252 AC isolators, and model 242 DC isolators according to the electrical details. As a minimum, provide one (1) model 2018 conflict monitor, one (1) model 206L power supply unit, two (2) model 204 flashers, one (1) DC isolator (located in slot I14), and four (4) model 430 flash transfer relays (provide seven (7) model 430 flash transfer relays if auxiliary output file is installed) with each cabinet.

B. Type 170 E Cabinet Electrical Requirements:

Provide a cabinet assembly designed to ensure that upon leaving any cabinet switch or conflict monitor initiated flashing operation, the controller starts up in the programmed start up phases and start up interval.

Furnish two sets of non-fading cabinet wiring diagrams and schematics in a paper envelope or container and placed in the cabinet drawer.

All AC+ power is subject to radio frequency signal suppression.

Provide surge suppression in the cabinet for each type of cabinet device. Provide surge protection for the full capacity of the cabinet input file. Provide surge suppression devices that operate properly over a temperature range of -40° F to +185° F. Ensure the surge suppression devices provide both common and differential modes of protection.

Provide a pluggable power line surge protector that is installed on the back of the PDA (power distribution assembly) chassis to filter and absorb power line noise and switching transients. Ensure the device incorporates LEDs for failure indication and provides a dry relay contact closure for the purpose of remote sensing. Ensure the device meets the following specifications:

- Peak Surge Current (Single pulse, 8x20µs).....20,000A
- Occurrences (8x20µs waveform).....10 minimum @ 20,000A
- Maximum Clamp Voltage.....395VAC
- Operating Current.....15 amps
- Response Time.....< 5 nanoseconds

Provide a loop surge suppressor for each set of loop terminals in the cabinet. Ensure the device meets the following specifications:

- Peak Surge Current (6 times, 8x20µs)
  - (Differential Mode).....400A
  - (Common Mode).....1,000A

- Occurrences (8x20µs waveform).....500 min @ 200A
- Maximum Clamp Voltage
  - (Differential Mode @400A).....35V
  - (Common Mode @1,000A).....35V
- Response Time.....< 5 nanoseconds
- Maximum Capacitance.....35 pF

Provide a data communications surge suppressor for each communications line entering or leaving the cabinet. Ensure the device meets the following specifications:

- Peak Surge Current (Single pulse, 8x20µs).....10,000A
- Occurrences (8x20µs waveform).....100 min @ 2,000A
- Maximum Clamp Voltage.....Rated for equipment protected
- Response Time.....< 1 nanosecond
- Maximum Capacitance.....1,500 pF
- Maximum Series Resistance.....15Ω

Provide a DC signal surge suppressor for each DC input channel in the cabinet. Ensure the device meets the following specifications:

- Peak Surge Current (Single pulse, 8x20µs).....10,000A
- Occurrences (8x20µs waveform).....100 @ 2,000A
- Maximum Clamp Voltage.....30V
- Response Time.....< 1 nanosecond

Provide a 120 VAC signal surge suppressor for each AC+ interconnect signal input. Ensure the device meets the following specifications:

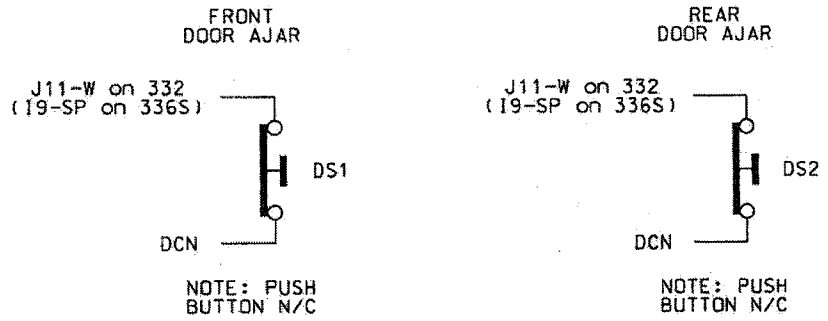
- Peak Surge Current (Single pulse, 8x20µs).....20,000A
- Maximum Clamp Voltage.....350VAC
- Response Time.....< 200 nanoseconds
- Discharge Voltage.....<200 Volts @ 1,000A
- Insulation Resistance.....≥100 MΩ

Provide conductors for surge protection wiring that are of sufficient size (ampacity) to withstand maximum overcurrents which could occur before protective device thresholds are attained and current flow is interrupted.

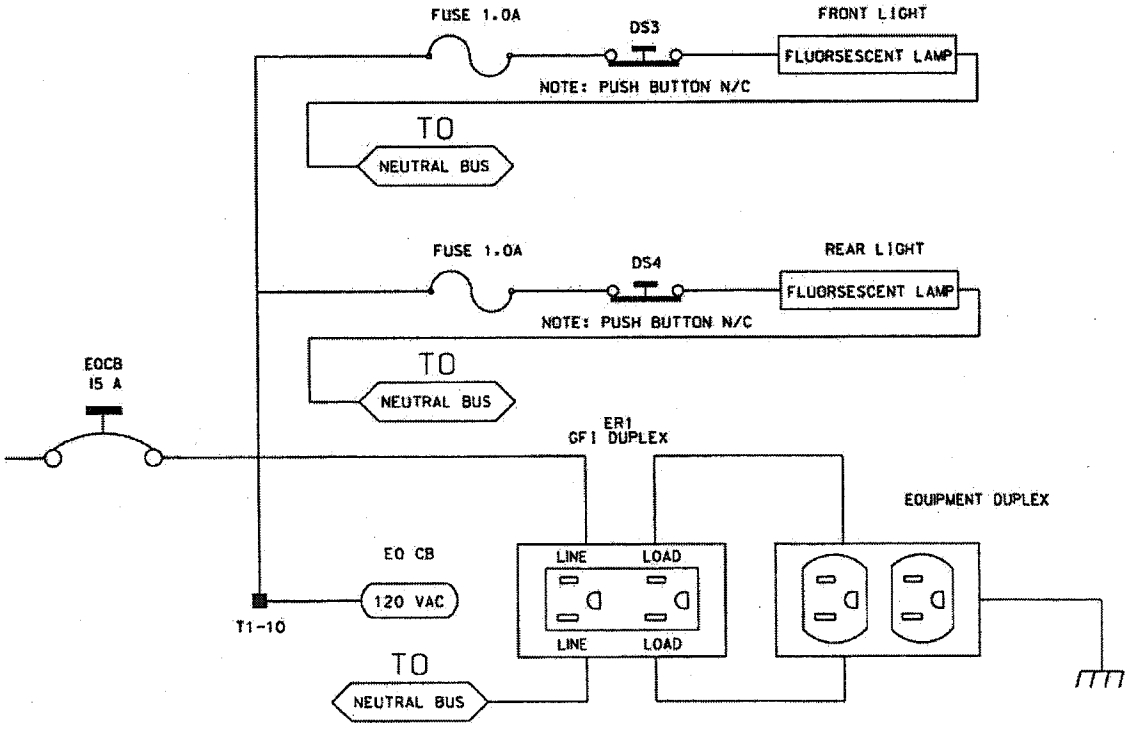
If additional surge protected power outlets are needed to accommodate fiber transceivers, modems, etc., install a UL listed, industrial, heavy-duty type power outlet strip with a minimum rating of 15 A / 125 VAC, 60 Hz. Provide a strip that has a minimum of 3 grounded outlets. Ensure

the power outlet strip plugs into one of the controller unit receptacles located on the rear of the PDA. Ensure power outlet strip is mounted securely; provide strain relief if necessary.

Provide a door switch in the front and a door switch in the rear of the cabinet that will provide the controller unit with a Door Ajar alarm when either the front or the rear door is open. Ensure the door switches apply DC ground to the Input File when either the front door or the rear door is open.



Furnish a fluorescent fixture in the rear across the top of the cabinet and another fluorescent fixture in the front across the top of the cabinet at a minimum. Ensure that the fixtures provide sufficient light to illuminate all terminals, labels, switches, and devices in the cabinet. Conveniently locate the fixtures so as not to interfere with a technician's ability to perform work on any devices or terminals in the cabinet. Provide a protective diffuser to cover exposed bulbs. Install 16 watt T-4 lamps in the fluorescent fixtures. Provide a door switch to provide power to each fixture when the respective door is open. Wire the fluorescent fixtures to the 15 amp ECB (equipment circuit breaker).



Furnish a police panel with a police panel door. Ensure that the police panel door permits access to the police panel when the main door is closed. Ensure that no rainwater can enter the cabinet even with the police panel door open. Provide a police panel door hinged on the right side as viewed from the front. Provide a police panel door lock that is keyed to a standard police/fire call box key. In addition to the requirements of LA Specification No. 54-053-08, provide the police panel with a toggle switch connected to switch the intersection operation between normal stop-and-go operation (AUTO) and manual operation (MANUAL). Ensure that manual control can be implemented using inputs and software such that the controller provides full programmed clearance times for the yellow clearance and red clearance for each phase while under manual control.

Provide a 1/4-inch locking phone jack in the police panel for a hand control to manually control the intersection. Provide sufficient room in the police panel for storage of a hand control and cord.

For model 332 base mounted cabinets, ensure terminals J14-E and J14-K are wired together on the rear of the Input File. Connect TB9-12 (J14 Common) on the Input Panel to T1-2 (AC-) on the rear of the PDA.

Provide detector test switches mounted at the top of the cabinet rack or other convenient location which may be used to place a call on each of eight phases based on the chart below. Provide three positions for each switch: On (place call), Off (normal detector operation), and Momentary On (place momentary call and return to normal detector operation after switch is released). Ensure that the switches are located such that the technician can read the controller display and observe the intersection.

Connect detector test switches for cabinets as follows:

332 Cabinet	
Detector Call Switches	**Terminals**
Phase 1	I1-W
Phase 2	I4-W
Phase 3	I5-W
Phase 4	I8-W
Phase 5	J1-W
Phase 6	J4-W
Phase 7	J5-W
Phase 8	J8-W

Provide the PCB 28/56 connector for the conflict monitor unit (CMU) with 28 independent contacts per side, dual-sided with 0.156 inch contact centers. Provide the PCB 28/56 connector contacts with solder eyelet terminations. Ensure all connections to the PCB 28/56 connector are soldered to the solder eyelet terminations.

Ensure that all cabinets have the CMU connector wired according to the 332 cabinet connector pin assignments (include all wires for auxiliary output file connection). Wire pins 13, 16, R, and U of the CMU connector to a separate 4 pin plug, P1, as shown below. Provide a second plug, P2,

which will mate with P1 and is wired to the auxiliary output file as shown below. Provide an additional plug, P3, which will mate with P1 and is wired to the pedestrian yellow circuits as shown below. When no auxiliary output file is installed in the cabinet, provide wires for the green and yellow inputs for channels 11, 12, 17, and 18, the red inputs for channels 17 and 18, and the wires for the P2 plug. Terminate the two-foot wires with ring type lugs, insulated, and bundled for optional use.

	P1		P2		P3	
PIN	FUNCTION	CONN TO	FUNCTION	CONN TO	FUNCTION	CONN TO
1	CH-9G	CMU-13	OLA-GRN	A123	2P-YEL	114
2	CH-9Y	CMU-16	OLA-YEL	A122	4P-YEL	105
3	CH-10G	CMU-R	OLB-GRN	A126	6P-YEL	120
4	CH-10Y	CMU-U	OLB-YEL	A125	8P-YEL	111

Do not provide the P20 terminal assembly (red monitor board) or red interface ribbon cable as specified in LA Specification No. 54-053-08.

Provide a P20 connector that mates with and is compatible with the red interface connector mounted on the front of the conflict monitor. Ensure that the P20 connector and the red interface connector on the conflict monitor are center polarized to ensure proper connection. Ensure that removal of the P20 connector will cause the conflict monitor to recognize a latching fault condition and place the cabinet into flashing operation.

Wire the P20 connector to the output file and auxiliary output file using 22 AWG stranded wires. Ensure the length of these wires is a minimum of 42 inches in length. Provide a durable braided sleeve around the wires to organize and protect the wires.

Wire the P20 connector to the traffic signal red displays to provide inputs to the conflict monitor as shown below. Ensure the pedestrian Don't Walk circuits are wired to channels 13 through 16 of the P20 connector. When no auxiliary output file is installed in the cabinet, provide wires for channels 9 through 12 reds. Provide a wire for special function 1. Terminate the unused wires with ring type lugs, insulated, and bundled for optional use.

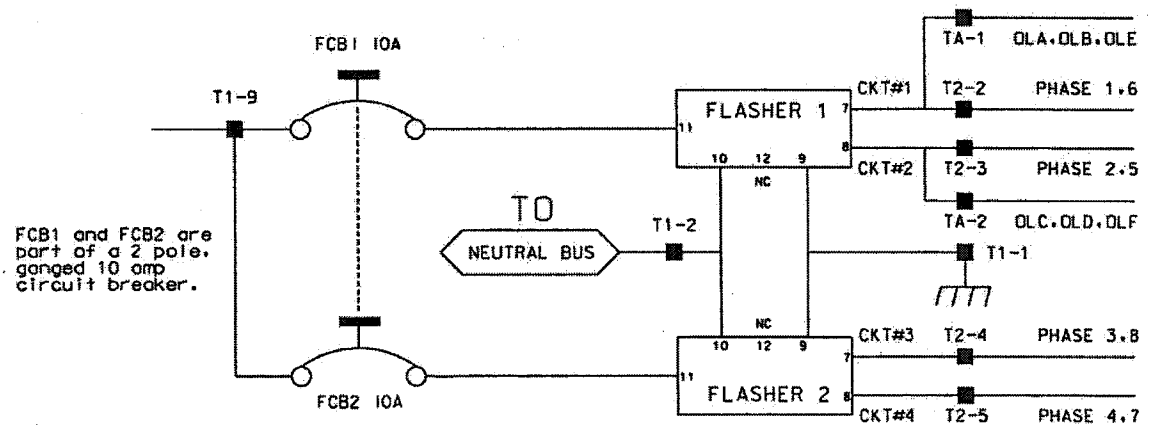
	P20 Connector				
PIN	**FUNCTION**	**CONN TO**	**PIN**	**FUNCTION**	**CONN TO**
1	Channel 15 Red	119	2	Channel 16 Red	110
3	Channel 14 Red	104	4	Chassis GND	01-9
5	Channel 13 Red	113	6	N/C	
7	Channel 12 Red	AUX 101	8	Spec Function 1	
9	Channel 10 Red	AUX 124	10	Channel 11 Red	AUX 114
11	Channel 9 Red	AUX 121	12	Channel 8 Red	107
13	Channel 7 Red	122	14	Channel 6 Red	134
15	Channel 5 Red	131	16	Channel 4 Red	101
17	Channel 3 Red	116	18	Channel 2 Red	128
19	Channel 1 Red	125	20	Red Enable	01-14

Ensure the controller unit outputs to the auxiliary output file are pre-wired to the C5 connector. When no auxiliary output file is installed in the cabinet, connect the C5 connector to a storage socket located on the Input Panel or on the rear of the PDA.

Do not wire pin 12 of the load switch sockets.

In addition to the requirements of LA Specification No. 54-053-08, ensure relay K1 on the Power Distribution Assembly (PDA) is a four pole relay and K2 on the PDA is a two pole relay.

Provide a two pole, ganged circuit breaker for the flash bus circuit. Ensure the flash bus circuit breaker is an inverse time circuit breaker rated for 10 amps at 120 VAC with a minimum of 10,000 RMS symmetrical amperes short circuit current rating. Do not provide the auxiliary switch feature on the flash bus circuit breaker. Ensure the ganged flash bus circuit breaker is certified by the circuit breaker manufacturer to provide gang tripping operation.



Ensure auxiliary output files are wired as follows:

AUXILIARY OUTPUT FILE TERMINAL BLOCK TA ASSIGNMENTS	
POSITION	**FUNCTION**
1	Flasher Unit #1, Circuit 1/FTR1 (OLA, OLB)/FTR3 (OLE)
2	Flasher Unit #1, Circuit 2/FTR2 (OLC, OLD)/FTR3 (OLF)
3	Flash Transfer Relay Coils
4	AC -
5	Power Circuit 5
6	Power Circuit 5
7	Equipment Ground Bus
8	NC

Provide four spare load resistors mounted in each cabinet. Ensure each load resistor is rated as shown in the table below. Wire one side of each load resistor to AC-. Connect the other side of each resistor to a separate terminal on a four (4) position terminal block. Mount the load resistors and terminal block either inside the back of Output File No. 1 or on the upper area of the Service Panel.

ACCEPTABLE LOAD RESISTOR VALUES	
VALUE (ohms)	**WATTAGE**
1.5K – 1.9 K	25W (min)
2.0K – 3.0K	10W (min)

Provide Model 200 load switches, Model 204 flashers, Model 242 DC isolators, Model 252 AC isolators, and Model 206L power supply units that conform to CALTRANS' "*Transportation Electrical Equipment Specifications*" dated March 12, 2009 with Erratum 1.

C. Type 170 E Cabinet Physical Requirements:

Do not mold, cast, or scribe the name "City of Los Angeles" on the outside of the cabinet door as specified in LA Specification No. 54-053-08. Do not provide a Communications Terminal Panel as specified in LA Specification No. 54-053-08. Do not provide terminal block TBB on the Service Panel. Do not provide Cabinet Verification Test Program software or associated test jigs as specified in LA Specification No. 54-053-08.

Furnish unpainted, natural, aluminum cabinet shells. Ensure that all non-aluminum hardware on the cabinet is stainless steel or a Department approved non-corrosive alternate.

Ensure the lifting eyes, gasket channels, police panel, and all supports welded to the enclosure and doors are fabricated from 0.125 inch minimum thickness aluminum sheet and meet the same standards as the cabinet and doors.

Provide front and rear doors with latching handles that allow padlocking in the closed position. Furnish 0.75 inch minimum diameter stainless steel handles with a minimum 0.5 inch shank. Place the padlocking attachment at 4.0 inches from the handle shank center to clear the lock and key. Provide an additional 4.0 inches minimum gripping length.

Provide Corbin #2 locks on the front and rear doors. Provide one (1) Corbin #2 and one (1) police master key with each cabinet. Ensure main door locks allow removal of keys in the locked position only.

Provide a surge protection panel with 16 loop surge protection devices and designed to allow sufficient free space for wire connection/disconnection and surge protection device replacement. For model 332 cabinets, provide an additional 20 loop surge protection devices. Provide an additional two AC+ interconnect surge devices to protect one slot and eight DC surge protection devices to protect four slots. Provide no protection devices on slot I14.

For base mounted cabinets, mount surge protection panels on the left side of the cabinet as viewed from the rear. Attach each panel to the cabinet rack assembly using bolts and make it easily removable. Mount the surge protection devices in vertical rows on each panel and connect the devices to one side of 12 position, double row terminal blocks with #8 screws. For each surge protection panel, terminate all grounds from the surge protection devices on a copper equipment ground bus attached to the surge protection panel. Wire the terminals to the rear of a standard input file using spade lugs for input file protection.

Provide permanent labels that indicate the slot and the pins connected to each terminal that may be viewed from the rear cabinet door. Label and orient terminals so that each pair of inputs is next to each other. Indicate on the labeling the input file (I or J), the slot number (1-14) and the terminal pins of the input slots (either D & E for upper or J & K for lower).

Provide a minimum 14 x 16 inch pull out, hinged top shelf located immediately below controller mounting section of the cabinet. Ensure the shelf is designed to fully expose the table surface outside the controller at a height approximately even with the bottom of the controller. Ensure the shelf has a storage bin interior which is a minimum of 1 inch deep and approximately the same dimensions as the shelf. Provide an access to the storage area by lifting the hinged top of the shelf. Fabricate the shelf and slide from aluminum or stainless steel and ensure the assembly can support the 2070L controller plus 15 pounds of additional weight. Ensure shelf has a locking mechanism to secure it in the fully extended position and does not inhibit the removal of the 2070L controller or removal of cards inside the controller when fully extended. Provide a locking mechanism that is easily released when the shelf is to be returned to its non-use position directly under the controller.

D. Model 2018 Enhanced Conflict Monitor:

Furnish Model 2018 Enhanced Conflict Monitors that provide monitoring of 18 channels. Ensure each channel consists of a green, yellow, and red field signal input. Ensure that the conflict monitor meets or exceeds CALTRANS' Transportation Electrical Equipment Specifications dated

March 12, 2009 with Erratum 1 (hereafter referred to as CALTRANS' 2009 TEES) for a model 210 monitor unit and other requirements stated in this specification.

Ensure the conflict monitor is provided with an 18 channel conflict programming card. Pin EE and Pin T of the conflict programming card shall be connected together. Pin 16 of the conflict programming card shall be floating. Ensure that the absence of the conflict programming card will cause the conflict monitor to trigger (enter into fault mode), and remain in the triggered state until the programming card is properly inserted and the conflict monitor is reset.

Provide a conflict monitor that incorporates LED indicators into the front panel to dynamically display the status of the monitor under normal conditions and to provide a comprehensive review of field inputs with monitor status under fault conditions. Ensure that the monitor indicates the channels that were active during a conflict condition and the channels that experienced a failure for all other per channel fault conditions detected. Ensure that these indications and the status of each channel are retained until the Conflict Monitor is reset. Furnish LED indicators for the following:

- AC Power (Green LED indicator)
- VDC Failed (Red LED indicator)
- WDT Error (Red LED indicator)
- Conflict (Red LED indicator)
- Red Fail (Red LED indicator)
- Dual Indication (Red LED indicator)
- Yellow/Clearance Failure (Red LED indicator)
- PCA/PC Ajar (Red LED indicator)
- Monitor Fail/Diagnostic Failure (Red LED indicator)
- 54 Channel Status Indicators (1 Red, 1 Yellow, and 1 Green LED indicator for each of the 18 channels)

Provide a switch to set the Red Fail fault timing. Ensure that when the switch is in the ON position the Red Fail fault timing value is set to 1350 +/- 150ms (2018 mode). Ensure that when the switch is in the OFF position the Red Fail fault timing value is set to 850 +/- 150ms (210 mode).

Provide a switch to set the Watchdog fault timing. Ensure that when the switch is in the ON position the Watchdog fault timing value is set to 1.0 +/- 0.1s (2018 mode). Ensure that when the switch is in the OFF position the Watchdog fault timing value is set to 1.5 +/- 0.1s (210 mode).

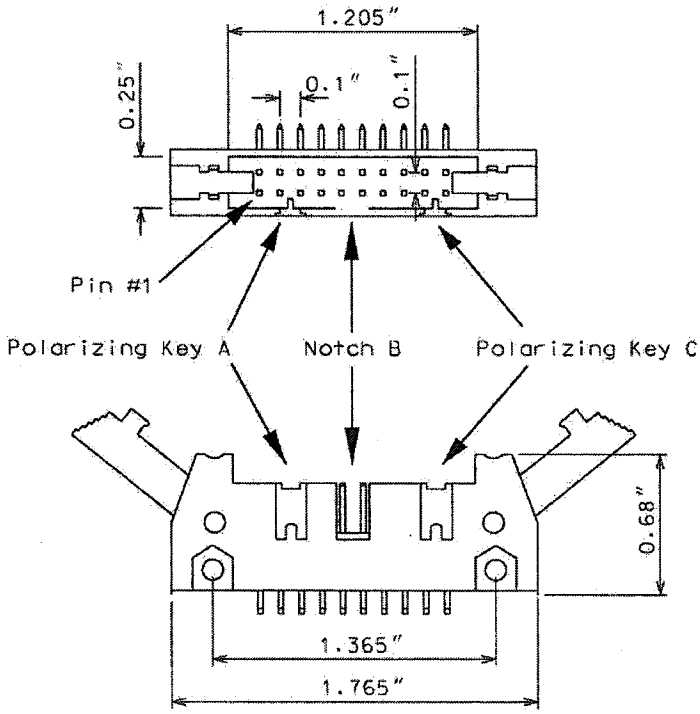
Provide a jumper or switch to set the AC line brown-out levels. Ensure that when the jumper is present or the switch is in the ON position the AC line dropout voltage threshold is 98 +/- 2 Vrms, the AC line restore voltage threshold is 103 +/- 2 Vrms, and the AC line brown-out timing value is set to 400 +/- 50ms (2018 mode). Ensure that when the jumper is not present or the switch is in the OFF position the AC line dropout voltage threshold is 92 +/- 2 Vrms, the AC line restore voltage threshold is 98 +/- 2 Vrms, and the AC line brown-out timing value is set to 80 +/- 17ms (210 mode).

Provide a jumper or switch that will enable and disable the Watchdog Latch function. Ensure that when the jumper is not present or the switch is in the OFF position the Watchdog Latch function

is disabled. In this mode of operation, a Watchdog fault will be reset following a power loss, brownout, or power interruption. Ensure that when the jumper is present or the switch is in the ON position the Watchdog Latch function is enabled. In this mode of operation, a Watchdog fault will be retained until a Reset command is issued.

Provide a jumper that will reverse the active polarity for pin #EE (output relay common). Ensure that when the jumper is not present pin #EE (output relay common) will be considered 'Active' at a voltage greater than 70 Vrms and 'Not Active' at a voltage less than 50 Vrms (Caltrans mode). Ensure that when the jumper is present pin #EE (output relay common) will be considered 'Active' at a voltage less than 50 Vrms and 'Not Active' at a voltage greater than 70 Vrms (Failsafe mode).

In addition to the connectors required by CALTRANS' 2009 TEES, provide the conflict monitor with a red interface connector mounted on the front of the monitor. Ensure the connector is a 20 pin, right angle, center polarized, male connector with latching clip locks and polarizing keys. Ensure the right angle solder tails are designed for a 0.062" thick printed circuit board. Keying of the connector shall be between pins 3 and 5, and between 17 and 19. Ensure the connector has two rows of pins with the odd numbered pins on one row and the even pins on the other row. Ensure the connector pin row spacing is 0.10" and pitch is 0.10". Ensure the mating length of the connector pins is 0.24". Ensure the pins are finished with gold plating 30μ" thick.



Ensure the red interface connector pins on the monitor have the following functions:

Pin #	Function	Pin #	Function
1	Channel 15 Red	2	Channel 16 Red
3	Channel 14 Red	4	Chassis Ground
5	Channel 13 Red	6	Special Function 2
7	Channel 12 Red	8	Special Function 1
9	Channel 10 Red	10	Channel 11 Red
11	Channel 9 Red	12	Channel 8 Red
13	Channel 7 Red	14	Channel 6 Red
15	Channel 5 Red	16	Channel 4 Red
17	Channel 3 Red	18	Channel 2 Red
19	Channel 1 Red	20	Red Enable

Ensure that removal of the P20 cable connector will cause the conflict monitor to recognize a latching fault condition and place the cabinet into flashing operation.

Provide Special Function 1 and Special Function 2 inputs to the unit which shall disable only Red Fail Monitoring when either input is sensed active. A Special Function input shall be sensed active when the input voltage exceeds 70 Vrms with a minimum duration of 550 ms. A Special Function input shall be sensed not active when the input voltage is less than 50 Vrms or the duration is less than 250 ms. A Special Function input is undefined by these specifications and may or may not be sensed active when the input voltage is between 50 Vrms and 70 Vrms or the duration is between 250 ms and 550 ms.

Ensure the conflict monitor recognizes field signal inputs for each channel that meet the following requirements:

- consider a Red input greater than 70 Vrms and with a duration of at least 500 ms as an "on" condition;
- consider a Red input less than 50 Vrms or with a duration of less than 200 ms as an "off" condition (no valid signal);
- consider a Red input between 50 Vrms and 70 Vrms or with a duration between 200 ms and 500 ms to be undefined by these specifications;
- consider a Green or Yellow input greater than 25 Vrms and with a duration of at least 500 ms as an "on" condition;
- consider a Green or Yellow input less than 15 Vrms or with a duration of less than 200 ms as an "off" condition; and
- consider a Green or Yellow input between 15 Vrms and 25 Vrms or with a duration between 200 ms and 500 ms to be undefined by these specifications.

Provide a conflict monitor that recognizes the faults specified by CALTRANS' 2009 TEES and the following additional faults. Ensure the conflict monitor will trigger upon detection of a fault and

will remain in the triggered (in fault mode) state until the unit is reset at the front panel or through the external remote reset input for the following failures:

1. **Red Monitoring or Absence of Any Indication (Red Failure):** A condition in which no "on" voltage signal is detected on any of the green, yellow, or red inputs to a given monitor channel. If a signal is not detected on at least one input (R, Y, or G) of a conflict monitor channel for a period greater than 1000 ms when used with a 170 controller and 1500 ms when used with a 2070L controller, ensure monitor will trigger and put the intersection into flash. If the absence of any indication condition lasts less that 750 ms when used with a 170 controller and 1200 ms when used with a 2070L controller, ensure conflict monitor will not trigger. Red fail monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. Have red monitoring occur when all of the following input conditions are in effect:

   a) Red Enable input to monitor is active (Red Enable voltages are "on" at greater than 70 Vrms, off at less than 50 Vrms, undefined between 50 and 70 Vrms), and

   b) Neither Special Function 1 nor Special Function 2 inputs are active.

   c) Pin #EE (output relay common) is not active

2. **Short/Missing Yellow Indication Fault (Clearance Error):** Yellow indication following a green is missing or shorter than 2.7 seconds (with ± 0.1-second accuracy). If a channel fails to detect an "on" signal at the Yellow input for a minimum of 2.7 seconds (± 0.1 second) following the detection of an "on" signal at a Green input for that channel, ensure that the monitor triggers and generates a clearance/short yellow error fault indication. Short/missing yellow (clearance) monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. This fault shall not occur when the channel is programmed for Yellow Inhibit, when the Red Enable signal is inactive or pin #EE (output relay common) is active.

3. **Dual Indications on the Same Channel:** In this condition, more than one indication (R,Y,G) is detected as "on" at the same time on the same channel. If dual indications are detected for a period greater than 500 ms, ensure that the conflict monitor triggers and displays the proper failure indication (Dual Ind fault). If this condition is detected for less than 200 ms, ensure that the monitor does not trigger. G-Y-R dual indication monitoring shall be enabled on a per channel basis by the use of switches located on the conflict monitor. G-Y dual indication monitoring shall be enabled for all channels by use of a switch located on the conflict monitor. This fault shall not occur when the Red Enable signal is inactive or pin #EE (output relay common) is active.

4. **Configuration Settings Change:** The configuration settings are comprised of (as a minimum) the permissive diode matrix, dual indication switches, yellow disable jumpers, any option switches, any option jumpers, and the Watchdog Enable switch. Ensure the conflict monitor compares the current configuration settings with the previous stored configuration settings on power-up, on reset, and periodically during operation. If any of the configuration settings are changed, ensure that the conflict monitor triggers and causes the program card indicator to flash. Ensure that configuration change faults are only reset by depressing and holding the front panel reset button for a minimum of three seconds. Ensure the external remote reset input does not reset configuration change faults.

Ensure the conflict monitor will trigger and the AC Power indicator will flash at a rate of 2 Hz ± 20% with a 50% duty cycle when the AC Line voltage falls below the "drop-out" level. Ensure the conflict monitor will resume normal operation when the AC Line voltage returns above the "restore" level. Ensure the AC Power indicator will remain illuminated when the AC voltage returns above the "restore" level. Should an AC Line power interruption occur while the monitor is in the fault mode, then upon restoration of AC Line power, the monitor will remain in the fault mode and the correct fault and channel indicators will be displayed.

Provide a flash interval of at least 6 seconds and at most 10 seconds in duration following a power-up, an AC Line interruption, or a brownout restore. Ensure the conflict monitor will suspend all fault monitoring functions, close the Output relay contacts, and flash the AC indicator at a rate of 4 Hz ± 20% with a 50% duty cycle during this interval. Ensure the termination of the flash interval after at least 6 seconds if the Watchdog input has made 5 transitions between the True and False state and the AC Line voltage is greater than the "restore" level. If the watchdog input has not made 5 transitions between the True and False state within 10 ± 0.5 seconds, the monitor shall enter a WDT error fault condition.

Ensure the conflict monitor will monitor an intersection with a minimum of four approaches using the four-section Flashing Yellow Arrow (FYA) vehicle traffic signal as outlined by the NCHRP 3-54 research project for protected-permissive left turn signal displays. Ensure the conflict monitor will operate in the FYA mode and FYAc (Compact) mode as specified below to monitor each channel for the following fault conditions: Conflict, Red Fail, Dual Indication, and Clearance. Provide a switch to select between the FYA mode and FYAc mode. Provide a switch to select each FYA phase movement for monitoring.

FYA mode

FYA Signal Head	Phase 1	Phase 3	Phase 5	Phase 7
Red Arrow	Channel 9 Red	Channel 10 Red	Channel 11 Red	Channel 12 Red
Yellow Arrow	Channel 9 Yellow	Channel 10 Yellow	Channel 11 Yellow	Channel 12 Yellow
Flashing Yellow Arrow	Channel 9 Green	Channel 10 Green	Channel 11 Green	Channel 12 Green
Green Arrow	Channel 1 Green	Channel 3 Green	Channel 5 Green	Channel 7 Green

FYAc mode

FYA Signal Head	Phase 1	Phase 3	Phase 5	Phase 7
Red Arrow	Channel 1 Red	Channel 3 Red	Channel 5 Red	Channel 7 Red
Yellow Arrow	Channel 1 Yellow	Channel 3 Yellow	Channel 5 Yellow	Channel 7 Yellow
Flashing Yellow Arrow	Channel 1 Green	Channel 3 Green	Channel 5 Green	Channel 7 Green
Green Arrow	Channel 9 Green	Channel 9 Yellow	Channel 10 Green	Channel 10 Yellow

Ensure that the conflict monitor will log at least nine of the most recent events detected by the monitor in non-volatile EEPROM memory (or equivalent). For each event, record at a minimum the time, date, type of event, status of each field signal indication with RMS voltage, and specific channels involved with the event. Ensure the conflict monitor will log the following events: monitor reset, configuration, previous fault, and AC line. Furnish the signal sequence log that shows all channel states (Greens, Yellows, and Reds) and the Red Enable State for a minimum of 2 seconds prior to the current fault trigger point. Ensure the display resolution of the inputs for the signal sequence log is not greater than 50 ms.

Provide a RS-232C/D compliant port (DB-9 female connector) on the front panel of the conflict monitor in order to provide communications from the conflict monitor to the 170/2070L controller or to a Department-furnished laptop computer. Electrically isolate the port interface electronics from all monitor electronics, excluding Chassis Ground. Ensure that the controller can receive all event log information through a controller Asynchronous Communications Interface Adapter (Type 170E) or Async Serial Comm Module (2070L). Provide a Windows based graphic user interface software to communicate directly through the same monitor RS-232C/D compliant port to retrieve and view all event log information to a Department-furnished laptop computer. The RS-232C/D compliant port on the monitor shall allow the monitor to function as a DCE device with pin connections as follows:

Conflict Monitor RS-232C/D (DB-9 Female) Pinout		
Pin Number	**Function**	**I/O**
1	DCD	O
2	TX Data	O
3	RX Data	I
4	DTR	I
5	Ground	-
6	DSR	O
7	CTS	I
8	RTS	O
9	NC	-

MONITOR BOARD EDGE CONNECTOR

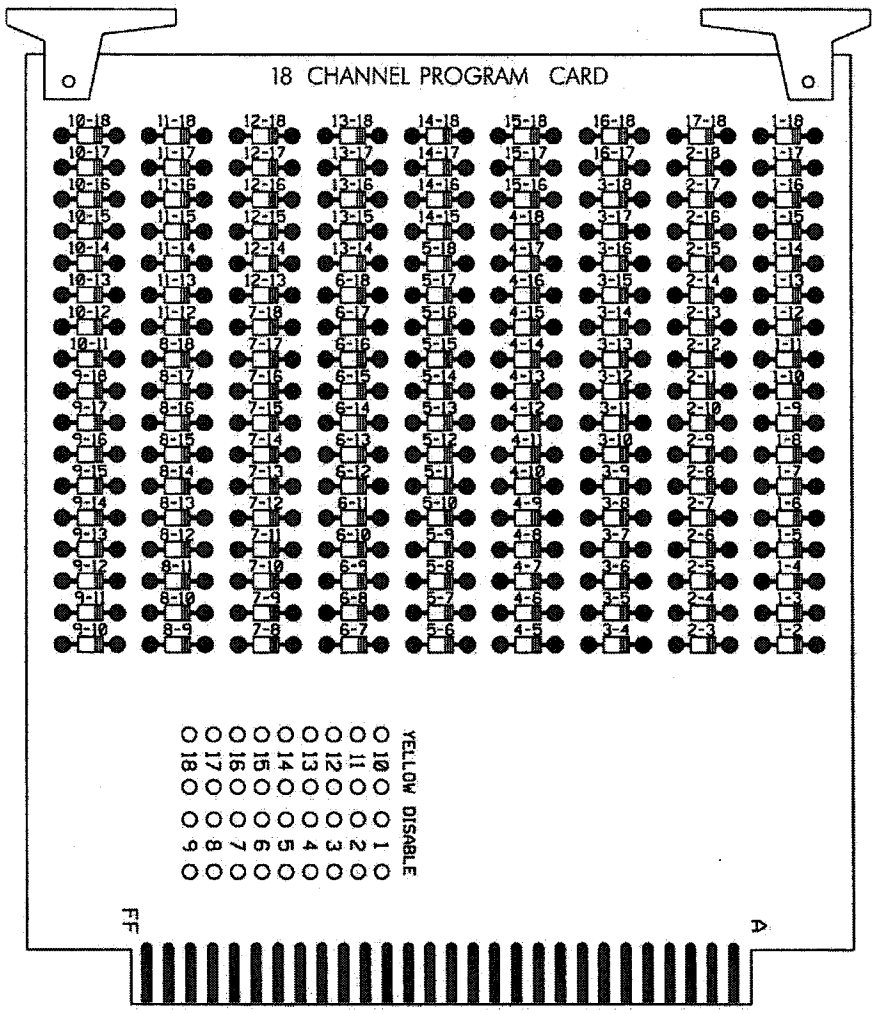
Pin #	Function (Back Side)	Pin #	Function (Component Side)
1	Channel 2 Green	A	Channel 2 Yellow
2	Channel 13 Green	B	Channel 6 Green
3	Channel 6 Yellow	C	Channel 15 Green
4	Channel 4 Green	D	Channel 4 Yellow
5	Channel 14 Green	E	Channel 8 Green
6	Channel 8 Yellow	F	Channel 16 Green
7	Channel 5 Green	H	Channel 5 Yellow
8	Channel 13 Yellow	J	Channel 1 Green
9	Channel 1 Yellow	K	Channel 15 Yellow
10	Channel 7 Green	L	Channel 7 Yellow
11	Channel 14 Yellow	M	Channel 3 Green
12	Channel 3 Yellow	N	Channel 16 Yellow
13	Channel 9 Green	P	Channel 17 Yellow
14	Channel 17 Green	R	Channel 10 Green
15	Channel 11 Yellow	S	Channel 11 Green
16	Channel 9 Yellow	T	Channel 18 Yellow
17	Channel 18 Green	U	Channel 10 Yellow
--		--	
18	Channel 12 Yellow	V	Channel 12 Green
19	Channel 17 Red	W	Channel 18 Red
20	Chassis Ground	X	Not Assigned
21	AC-	Y	DC Common
22	Watchdog Timer	Z	External Test Reset
23	+24VDC	AA	+24VDC
24	Tied to Pin 25	BB	Stop Time (Output)
25	Tied to Pin 24	CC	Not Assigned
26	Not Assigned	DD	Not Assigned
27	Relay Output, Side #3, N.O.	EE	Relay Output,Side #2,Common
28	Relay Output, Side #1, N.C.	FF	AC+

-- Slotted for keying between Pins 17/U and 18/V

CONFLICT PROGRAM CARD PIN ASSIGNMENTS

Pin #	Function (Back Side)	Pin #	Function (Component Side)
1	Channel 2 Green	A	Channel 1 Green
2	Channel 3 Green	B	Channel 2 Green
3	Channel 4 Green	C	Channel 3 Green
4	Channel 5 Green	D	Channel 4 Green
5	Channel 6 Green	E	Channel 5 Green
6	Channel 7 Green	F	Channel 6 Green
7	Channel 8 Green	H	Channel 7 Green
8	Channel 9 Green	J	Channel 8 Green
9	Channel 10 Green	K	Channel 9 Green
10	Channel 11 Green	L	Channel 10 Green
11	Channel 12 Green	M	Channel 11 Green
12	Channel 13 Green	N	Channel 12 Green
13	Channel 14 Green	P	Channel 13 Green
14	Channel 15 Green	R	Channel 14 Green
15	Channel 16 Green	S	Channel 15 Green
16	N/C	T	PC AJAR
17	Channel 1 Yellow	U	Channel 9 Yellow
18	Channel 2 Yellow	V	Channel 10 Yellow
19	Channel 3 Yellow	W	Channel 11 Yellow
20	Channel 4 Yellow	X	Channel 12 Yellow
21	Channel 5 Yellow	Y	Channel 13 Yellow
22	Channel 6 Yellow	Z	Channel 14 Yellow
23	Channel 7 Yellow	AA	Channel 15 Yellow
24	Channel 8 Yellow	BB	Channel 16 Yellow
--		--	
25	Channel 17 Green	CC	Channel 17 Yellow
26	Channel 18 Green	DD	Channel 18 Yellow
27	Channel 16 Green	EE	PC AJAR (Program Card)
28	Yellow Inhibit Common	FF	Channel 17 Green

-- Slotted for keying between Pins 24/BB and 25/CC



4.4 MATERIALS – TYPE 2070E CONTROLLERS

Conform to CALTRANS *Transportation Electrical Equipment Specifications* (TEES) (dated March 12, 2009, plus Errata 1 dated January 21, 2010) except as required herein.

Furnish Model 2070E controllers. Ensure that removal of the CPU module from the controller will place the intersection into flash.

The Department will provide software at the beginning of the burning-in period. Contractor shall give 5 working days notice before needing software. Program software provided by the Department.

Provide Model 2070E controllers with the latest version of OS9 operating software and device drivers, composed of the unit chassis and at a minimum the following modules and assemblies:

- MODEL 2070-1E, CPU Module, Single Board, with 8Mb Datakey (blue in color)
- MODEL 2070-2A or approved MODEL 2070-2E, Field I/O Module (FI/O)
  - Note: Configure the Field I/O Module to disable both the External WDT Shunt/Toggle Switch and SP3 (SP3 active indicator is "off")
- MODEL 2070-3B, Front Panel Module (FP), Display B (8x40)

- MODEL 2070-4, Power Supply Module, 10 AMP
- MODEL 2070-7A, Async Serial Com Module (9-pin RS-232)

Furnish one additional MODEL 2070-7A, Async Serial Com Module (9-pin RS-232) for all master controller locations.

For each master location and central control center, furnish a U.S. Robotics V.92 or approved equivalent auto-dial/auto-answer external modem to accomplish the interface to the Department-furnished microcomputers. Include all necessary hardware to ensure telecommunications.

5. ELECTRICAL SERVICE

5.1. DESCRIPTION

Install new electrical service equipment as shown in the Plans. The first item of work on this project is the installation of all electrical service poles and meter base/disconnect combination panels to expedite the power service connections. Comply with the National Electrical Code (NEC), the National Electrical Safety Code (NESC), the Standard Specifications, the Project Special Provisions, and all local ordinances. All work involving electrical service shall be coordinated with the appropriate utility company and the Engineer. In addition to the service equipment and disconnect, install feeder conductors and equipment service disconnect.

5.2. MATERIALS

A. Signal Equipment Cabinet Disconnect

Provide new signal equipment cabinet disconnects at the locations shown in the Plans. Furnish single pole 50A circuit breakers at traffic signal locations. Furnish panels that have a minimum of eight (8) spaces in the disconnect. Furnish circuit breakers with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure signal equipment cabinet disconnects are listed as meeting UL-67 and marked as being suitable for use as service equipment. Ensure circuit breakers are listed as meeting UL-489. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint finish, light gray in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces must be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals and a minimum wire capacity range of number 8 through number 1/0 AWG.

B. 3 -Wire Copper Feeder Conductors

Furnish #6 AWG 3-wire stranded copper feeder conductors with THWN rating for supplying power to traffic signal field equipment cabinets. Provide conductors with black or red, white, and green insulation that are intended for power circuits at 600 Volts or less and comply with the following:

- Listed as meeting UL-83
- Meets ASTM B-3 and B-8 or B-787 standards.

C. Grounding System

Furnish #4 AWG solid bare copper conductors, and exothermic welding kits for grounding system installations. Comply with the NEC, Standard Specifications, these Project Special Provisions, and the Plans.

5.3. CONSTRUCTION METHODS

Permanently label cables at all access points using nylon tags labeled with permanent ink. Ensure each cable has a unique identifier. Label cables immediately upon installation. Use component name and labeling scheme approved by the Engineer.

A. Signal Equipment Cabinet Disconnect

Install signal equipment cabinet disconnects and circuit breakers as called for in the Plans. Install THWN stranded copper feeder conductors as shown in Plans between the electrical service disconnect and the signal equipment cabinet disconnect. Route the conductors from the signal equipment cabinet disconnect to the equipment cabinet in rigid galvanized steel conduit. Bond the signal equipment cabinet disconnect in accordance with the NEC. Ensure that the grounding system complies with the grounding requirements of these Project Special Provisions, the Standard Specifications and the Plans.

B. 3-Wire Copper Feeder Conductors

At locations shown in the Plans, install #6 AWG 3-wire THWN stranded copper feeder conductors to supply 120 VAC to the traffic signal field equipment cabinets. Size the conductors as specified in the Plans. Comply with the Standard Specifications and Standard Drawings and all applicable electrical codes.

C. Equipment Cabinet Disconnect Grounding System

At signal equipment cabinet disconnect, connect #4 AWG solid bare copper conductor to the ground bus and exothermically weld conductor to the grounding electrode (ground rod) at the pole.

5.4. MEASUREMENT AND PAYMENT

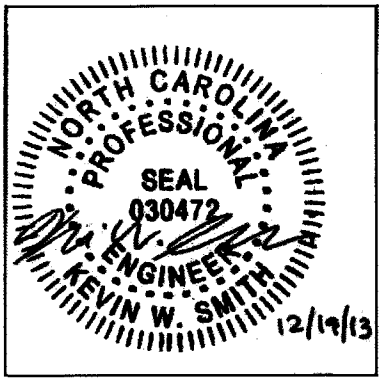
Signal equipment cabinet disconnect will be measured and paid as the actual number of complete and functional signal equipment cabinet disconnects furnished, installed and accepted. Breakers, exposed vertical conduit runs to the cabinet, ground rods, ground wire and any remaining hardware and conduit to connect the signal equipment cabinet disconnect to the cabinet will be considered incidental to the equipment cabinet disconnect.

#6 AWG 3-Wire copper feeder conductors will be measured and paid as the actual linear feet of 3-wire THWN stranded copper feeder conductors furnished, installed and accepted. Payment is for all three conductors. Measurement will be for the actual linear footage of combined conductors after all terminations are complete. No separate payment will be made for each individual conductor. No separate payment will be made for different wire sizes. No payment will be made for excess wire in the cabinets.

#4 solid bare grounding conductor will be measured and paid as the actual linear feet of #4 AWG solid bare copper grounding conductor furnished, installed and accepted. Measurement will be along the approximate centerline from the base of the electrical service disconnect to the last grounding electrode.

Payment will be made under:

Signal Equipment Cabinet Disconnect ..... Each
#6 AWG 3-Wire Copper Feeder Conductors ..... Linear Foot
#4 Solid Bare Copper Grounding Conductor ..... Linear Foot



Not Valid Unless Signed

U-2525B
INTELLIGENT TRANSPORTATION SYSTEMS
CCTV AND DMS INSTALLATIONS

FINAL
PROJECT SPECIAL PROVISIONS

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1. GENERAL REQUIREMENTS

1.1. DESCRIPTION

A. General

Conform to these Project Special Provisions, Project Plans, and the *2012 Standard Specifications for Roads and Structures* (also referred to hereinafter as the "Standard Specifications"). The current edition of these specifications and publications in effect on the date of advertisement will apply.

In the event of a conflict between these Project Special Provisions and the Standard Specifications, these Project Special Provisions govern.

B. Scope

The scope of this project includes the installation new fiber optic cable communications, three (3) new pedestal mount dynamic message signs (DMS) and eight (8) new closed circuit television (CCTV) cameras. New fiber optic cables will be installed in new underground conduit and on new aerial messenger cable. New electrical service will be installed at each new DMS and CCTV. The Contractor shall coordinate with the appropriate electric utility company in the area to establish service.

Note that the locations of each proposed device shown in the Plans are an approximation. Locate and mark proposed device locations in the field and receive approval from the Regional ITS Engineer before beginning construction.

Integrate the new fiber optic cables with existing fiber optic cables installed under project U-2524E so that the new DMS and CCTV devices are accessible and controlled by the existing computer and network hardware and software at the NCDOT Triad Regional Transportation Management Center (TRTMC) located at 201 South Chimney Rock Road in Greensboro.

Conduct device and system tests as described in these Project Special Provisions.

1.2. MATERIAL

A. Qualified Products

Furnish new equipment, materials, and hardware unless otherwise required. Inscribe manufacturer's name, model number, serial number, and any additional information needed for proper identification on each piece of equipment housed in a case or housing.

Furnish factory assembled cables without adapters, unless otherwise approved by the Engineer, for all cables required to interconnect any field or central equipment.

Certain equipment listed in these Project Special Provisions must be pre-approved on the Department's ITS & Signals Qualified Products List (QPL) by the date of installation. Equipment, material, and hardware not pre-approved when required will not be allowed for use on the project.

The QPL is available on the Department's website. The QPL website is:

https://connect.ncdot.gov/resources/safety/Pages/ITS-and-Signals-Qualified-Products.aspx

B. Plan of Record Documentation

Comply with all requirements of Article 1098-1(F) of the Standard Specifications for providing plan of record documentation for all work performed under this Project.

1.3. REQUIREMENTS FOR CABLES CROSSING NORFOLK SOUTHERN RAILROADS

Copies of all executed railroad agreements and related correspondence may be obtained from the Resident Engineer.

A. Railroad Crossings

Do not commence cable routings over or under railroad-owned facilities until notification and coordination with Engineer and the appropriate railroad company has occurred. As shown on the Plans, one affected railroad facility on this project is owned by the Norfolk Southern Railway Company herein called the Railroad Company. Install fiber optic communications cable as shown on the Plans.

B. Requirements for Insurance

The Contractor will be required to provide coverage conforming to the requirements of the Federal-Aid Policy Guide outlined under 23 CFR 646A for all work to be performed on the Railroad rights(s) of way under the terms of the contract by carrying insurance of the following kinds:

Contractor's General Liability and Railroad Protective Liability Insurance

i. Furnish a certificate of general liability insurance and railroad protective liability insurance evidencing a combined single limit of a minimum of $1,000,000.00 per occurrence of general liability insurance and $1,000,000.00 per occurrence of railroad protective liability insurance naming Norfolk Southern Railway Company as the certificate holder and as an additional insured on both the general and railroad protective liability insurance policy.

ii. If any part of the work is sublet, similar insurance and evidence thereof in the same amounts as required of the Prime Contractor, shall be provided by the subcontractor to cover his operations on railroad right of way. As an alternative, the Prime Contractor may provide for the subcontractor by means of separate and individual policies.

iii. Certificates shall make reference to the project, milepost and county. Certificate description and project designation to include the following information: Installation of fiber optic communications cable over tracks of the Norfolk Southern Railway Company, Guilford County (include Railroad Milepost) identified as NC Project U-2525B.

Use the address below for the Certificates of Insurance holder:

Norfolk Southern Corporation

Attn. Risk Manager

Three Commercial Place

Norfolk, VA 23510

iv. All policies and certificates shall contain a clause requiring that thirty (30) days written notice be given the Department of Transportation and the Railroad Company prior to cancellation or change. The notices shall make reference to the project, milepost and county.

NOTICE TO:

Norfolk Southern Corporation

Attn. Risk Manager

Three Commercial Place

Norfolk, VA 23510

COPY NOTICE TO:

Department of Transportation

Utilities Coordination Unit

c/o State Railroad Agent

1556 Mail Service Center

Raleigh, NC 27699-1556

v. Carry all insurance herein specified until the final inspection and acceptance of the project, or that portion of the project within railroad right of way, by the Department of Transportation or, in the case of subcontractors, until the Contractor furnishes a letter to the Engineer stating that the subcontractor has completed his subcontracted work within railroad right of way to the satisfaction of the Contractor and the Contractor will accomplish any additional work necessary on railroad right of way with his own forces. It is understood that the amounts specified are minimum amounts and that the Contractor may carry insurance in larger amounts if he so desires. As to "aggregate limits", if the insurer establishes loss reserves equal to or in excess of the aggregate limit specified in any of the required insurance policies, immediately notify the Department of Transportation and cease all operations until the aggregate limit is reinstated. If the insurer establishes loss reserves equal to or in excess of one/half of the aggregate limit, arrange to restore the aggregate limit to at least the minimum amount stated in these requirements. Any insurance policies and certificates taken out and furnished due to these requirements shall be approved by the Department of Transportation and the Railroad Company as to form and amount prior to beginning work on railroad right of way.

No extra allowance will be made for the insurance required hereunder. The entire cost shall be included in the unit contract bid price for other pay items.

vi. Furnish evidence of insurance as required above for review to the Department of Transportation at the address shown below after which it will be forwarded by the Department of Transportation to the Railroad.

Send to Department:

Department of Transportation

Utilities Coordination Unit

c/o State Railroad Agent

1556 Mail Service Center

Raleigh, NC 27699-1556

C. Delays Caused By Operations of Others

Neither the Department of Transportation nor the Railroad Company assumes any responsibility for any work performed by others in connection with the construction of the project, and the Contractor shall have no claim whatsoever against the Department of Transportation, or the Railroad Company for any inconvenience, delay, or additional cost incurred by him on account of such operations by others.

D. Cooperation with Others

Cooperate with others participating in the construction of the project to the end that all work may be carried on to the best advantage.

E. Authority of Railroad Engineer

The authorized representative of the Railroad Company hereinafter referred to as the Railroad Engineer, shall have the final authority in all matters affecting the safe maintenance of railroad traffic of his company.

F. Interference with Railroad Operations

Arrange and conduct work so that there will be no interference with railroad operations, including train, signal, telephone and telegraphic services, or damage to the property of the Railroad Company or to the poles, wire, and other facilities of tenants on the rights of way of the Railroad Company. Wherever work is liable to affect the operations or safety of trains, the method of doing such work shall first be submitted to the Railroad Engineer for approval, but such approval shall not relieve the Contractor from liability.

Should conditions arising from or in connection with the work, require that immediate and unusual provisions be made to protect train operations and property of the Railroad Company, it shall be a part of the required services by the Contractor to make such provisions and if, in the judgment of the Railroad Engineer such provisions is insufficient, the Railroad Engineer or the Department of Transportation, may at the expense of the Contractor, require or provide such provisions as may be deemed necessary.

G. Storage of Materials

Materials and equipment shall not be stored where they will interfere with railroad operations, nor on the rights of way of the Railroad Company without first having obtained permission from the Railroad Engineer, and such permission will be with the understanding that the Railroad Company will not be liable or damage to such material and equipment from any cause and that the Railroad Engineer may move or require the Contractor to move, at the Contractor's expense, such material and equipment.

H. Flagging Protection or Watchman Service

The Contractor shall give 72 hours advance notice to the Railroad Company in order that flagging service can be arranged and provided. No work shall be undertaken until the flagman is at the job site.

I. Completion and Acceptance of Work

Upon completion of the work, remove from within the limits of the railroad right of way all machinery, equipment, surplus materials, or rubbish and leave said rights of way in a neat and orderly condition. After the final inspection has been made and work found to be completed in a satisfactory manner acceptable to the Department of Transportation and the Railroad Company, the Department of Transportation will be notified of the Railroad Company's acceptance in writing by the Railroad Company.

2. UNDERGROUND CONDUIT

2.1. DESCRIPTION

Furnish and install conduit for underground installation with tracer wire, miscellaneous fittings, all necessary hardware, marker tape, backfill, graded stone, paving materials, and seeding and mulching in accordance with Section 1715 of the Standard Specifications

2.2. MATERIAL

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

Refer to Articles 1091-3 (Conduit), 1091-4 (Duct and Conduit Sealer), 1018-2 (Backfill), and 545-2 and 545-3 (Graded Stone) of the Standard Specifications.

Furnish underground HDPE conduits as shown in the Plans. All vertical conduits (entrance to electrical service and equipment disconnect and pole mounted cabinet) must be rigid galvanized steel.

2.3. CONSTRUCTION METHODS

Install underground conduit in compliance with all requirements of Section1715-3 of the Standard Specifications.

2.4. MEASUREMENT AND PAYMENT

Tracer wire will be measured along the horizontal linear feet of tracer wire furnished, installed, and accepted. Measurement will be along the approximate centerline of the conduit system. Payment will be made in linear feet. No payment will be made for excess tracer wire in junction boxes and/or cabinets.

Unpaved Trenching (qty) (size) will be measured horizontal linear feet of trenching for underground conduit installation of each type furnished, installed, and accepted. Measurement will be along the approximate centerline of the conduit system. Payment will be in linear feet.

Directional Drill (qty) (size) will be measured horizontal linear feet of directional drill for underground conduit installation furnished, installed, and accepted. Measurement will be along the approximate centerline of the conduit system. Payment will be in linear feet.

No measurement will be made of vertical segments, non-metallic conduit, metallic conduit, conduit sealing material, backfill, graded stone, paved materials, miscellaneous fittings, non-detectable marker tape, pull lines, seeding and mulching as these will be considered incidental to conduit installation.

Payment will be made under:

Pay Item	**Pay Unit**
Tracer Wire	Linear Foot
Unpaved Trenching (4) (1.25")	Linear Foot
Unpaved Trenching (2) (2")	Linear Foot
Directional Drill (4) (1.25")	Linear Foot
Directional Drill (2) (2")	Linear Foot

3. JUNCTION BOXES

3.1. DESCRIPTION

Furnish and install junction boxes (pull boxes) with covers, graded stone, grounding systems, and all necessary hardware. Comply with Section 1716 of the Standard Specifications.

3.2. MATERIAL

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

Refer to Article 1098-5 (Junction Boxes) and Section 545 (Graded Stone) of the Standard Specifications.

3.3. CONSTRUCTION METHODS

Install junction boxes in compliance with all requirements of Section1716-3 of the Standard Specifications.

Install oversized heavy-duty junction boxes with minimum inside dimensions of 30" x 15" (length x width) for storage of fiber optic communications cables. Install special oversized heavy-duty junction boxes with minimum inside dimensions of 48" x 48" (length x width) for underground splice enclosures.

3.4. MEASUREMENT AND PAYMENT

Junction Box (_____) will be measured and paid in actual number of junction boxes of each size and type furnished, installed, and accepted.

No measurement will be made of covers, graded stone, and grounding systems as these will be considered incidental to furnishing and installing junction boxes.

Payment will be made under:

Pay Item	Pay Unit
Junction Box (Standard Size)	Each
Junction Box (Oversized)	Each
Junction Box (Special Oversized Heavy-Duty)	Each

4. WOOD POLES

4.1. DESCRIPTION

Furnish and install wood poles with grounding systems and all necessary hardware in accordance with Section 1720 of the Standard Specifications.

4.2. MATERIAL

A. General

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

Refer to Articles 1082-3 (Treated Timber and Lumber), 1082-4 (Preservative Treatment), 1091-2 (Wire), and 1091-6 (Grounding Electrodes) of the Standard Specifications.

B. Wood Pedestal

Furnish 6" x 6" x 8' wood pedestals for electrical service equipment as shown in the Plans.

C. Wood Pole

Furnish 40' Class 4 or better wood poles for attaching messenger cable and communications cable or for mounting electrical service equipment as shown in the Plans.

4.3. CONSTRUCTION METHOD

Install wood poles and wood posts in compliance with all requirements of Section1720-3 of the Standard Specifications.

4.4. MEASUREMENT AND PAYMENT

Wood Pedestal will be measured and paid as the actual number of 8' wood pedestals furnished, installed, and accepted.

Wood Pole will be measured and paid as the actual number of 40' wood poles furnished, installed, and accepted.

No measurement will be made for installing grounding systems as these will be incidental to furnishing and installing poles.

Payment will be made under:

Pay Item	Pay Unit
Wood Pedestal	Each
Wood Pole	Each

5. RISER ASSEMBLIES

5.1. DESCRIPTION

Furnish and install riser assemblies with clamp-on, aluminum weatherheads or heat shrink tubing, galvanized pole attachment fittings and all necessary hardware.

5.2. MATERIAL

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

Refer to 1091-2 (Wire), 1091-3 (Rigid Metallic Conduit), 1091-6 (Grounding Electrodes), 1098-4 (Riser Sealing Devices), and 1098-6 (Pole Line Hardware) of the Standard Specifications.

5.3. CONSTRUCTION METHOD

Install riser assemblies in compliance with all requirements of Section1722-3 of the Standard Specifications.

5.4. MEASUREMENT AND PAYMENT

__" *Riser with* ____ will be measured and paid as the actual number of risers of each type and size furnished, installed and accepted. No measurement will be made of weatherheads, heat shrink tubing or pole attachment fittings as these will be incidental to furnishing and installing risers.

Payment will be made under:

Pay Item	Pay Unit
1.5" Riser with Weatherhead	Each
2" Riser with Heat Shrink Tubing	Each

6. GUY ASSEMBLIES

6.1. DESCRIPTION

Furnish and install guy assemblies with all necessary hardware.

6.2. MATERIAL

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

Refer to 1098-6 (Pole Line Hardware) and 1098-7 (Guy Assembly) of the Standard Specifications.

6.3. CONSTRUCTION METHOD

When installing messenger cable for supporting only communications cable, use approved one-bolt attachment method for attaching messenger cable and guy assembly.

Bond guy assembly to existing pole ground using parallel groove clamp or equivalent. If existing poles do not have a grounding system, install new grounding system for bonding guy assembly that complies with Article 1720-3.

Do not attach to existing guy assemblies unless specifically approved by owner.

6.4. MEASUREMENT AND PAYMENT

Guy Assembly will be measured and paid as the actual number of guy assemblies furnished, installed and accepted.

No measurement will be made of guy cable, guy guards, anchors, clamps, grounding systems or fittings as these will be incidental to furnishing and installing guy assemblies.

Payment will be made under:

Pay Item	Pay Unit
Guy Assembly	Each

7. MESSENGER CABLE

7.1. DESCRIPTION

Furnish and install messenger cable (spanwire) with cable clamps, machine bolts, eye bolts, 3-bolt clamps, eye nuts, split-bolt connectors and all necessary hardware.

7.2. MATERIAL

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

Refer to 1091-2 (Wire), 1091-6 (Grounding Electrode), 1098-3 (Messenger Cable), and 1098-6 (Pole Line Hardware) of the Standard Specifications.

7.3. CONSTRUCTION METHOD

Comply with Section 1710-3 of the Standard Specifications.

7.4. MEASUREMENT AND PAYMENT

Messenger Cable (____) will be measured and paid as actual horizontal linear feet of messenger cable furnished, installed and accepted. Measurement will be point to point with no allowance for sag.

No measurement will be made of cable clamps, machine bolts, eye bolts, 3-bolt assemblies, eye nuts, split bolt connectors and pole grounding systems as these will be incidental to furnishing and installing messenger cable.

Payment will be made under:

Pay Item	Pay Unit
Messenger Cable (1/4")	Linear Foot

8. FIBER-OPTIC CABLE

8.1. DESCRIPTION

Furnish and install single mode fiber-optic (SMFO) communications cable and drop cable assemblies with grounding systems, fiber-optic cable storage racks (snow shoes), communications cable identification markers, lashing wire, and all necessary hardware.

8.2. MATERIAL

Furnish material, equipment, and hardware under this section that is pre-approved on the Department's QPL.

Refer to Articles 1098-10(A) (SMFO Communications Cable), 1098-10(C) (Communications Cable Identification Markers), 1098-10(D) (Fiber-Optic Cable Storage Guides), and 1098-6 (Pole Line Hardware) of the Standard Specifications.

Provide communications cable identification markers with 336-315-7080 as the contact telephone number.

8.3. CONSTRUCTION METHODS

Install fiber-optic cable in compliance with all requirements of Section1730-3 of the Standard Specifications.

Do not install any communications cables in the same conduit or junction box as power cables.

Store 30 feet of each fiber optic cable entering a junction box. Store 100 feet of each fiber optic cable being spliced in an underground splice enclosure located in a junction box. Coil all stored cable in the bottom of the junction box and in a manner that does not violate the maximum bending radius of the cable.

8.4. MEASUREMENT AND PAYMENT

Communications cable (____-fiber) will be measured and paid as the actual linear feet of fiber-optic cable of each fiber count furnished, installed, and accepted. Measurement will be made by calculating the difference in length markings located on outer jacket from start of run to end of run for each run. Terminate all fibers before determining length of cable run.

Drop Cable will be measured and paid as linear feet of fiber-optic drop cable (6-fiber) assemblies furnished, installed and accepted. Sag and vertical segments will not be paid as these distances are incidental to the installation of drop cable assemblies.

No measurement will be made for terminating, splicing, and testing fiber-optic cable, communications cable identification markers, or fiber-optic cable storage racks, as these will be considered incidental to the installation of fiber-optic cable.

Payment will be made under:

Pay Item	Pay Unit
Communications Cable (144-Fiber)	Linear Foot
Drop Cable	Linear Foot

9. DELINEATOR MARKERS

9.1. DESCRIPTION

Furnish and install delineator markers with all necessary hardware.

9.2. MATERIALS

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL. Refer to Article 1098-13 (Delineator Markers) of the Standard Specifications.

Provide delineator markers with 336-315-7080 as the contact telephone number.

9.3. CONSTRUCTION METHODS

Install delineator markers in compliance with all requirements of Section1733-3 of the Standard Specifications.

9.4. MEASUREMENT AND PAYMENT

Delineator marker will be paid for by the actual number furnished, installed, and accepted.

Payment will be made under:

Pay Item	Pay Unit
Delineator Marker	Each

10. FIBER-OPTIC SPLICE CENTERS

10.1. DESCRIPTION

Furnish and install fiber-optic interconnect centers, fiber-optic splice enclosures, and all necessary hardware.

Modify existing fiber optic interconnect centers and/or splice enclosures as shown in the plans. Refer to manufacturer's recommendations for opening, modifying and re-sealing the existing fiber optic interconnect center and/or fiber optic splice enclosures.

10.2. MATERIALS

Material, equipment, and hardware furnished under this section shall be pre-approved on the Department's QPL.

Refer to Article 1098-11 (Fiber-Optic Splice Centers) of the Standard Specifications.

10.3. CONSTRUCTION METHODS

Install fiber-optic splice centers, perform termination and splicing, and test in compliance with all requirements of Section1731-3 of the Standard Specifications.

10.4. MEASUREMENT AND PAYMENT

Interconnect center will be measured and paid as the actual number of fiber-optic interconnect centers furnished, installed, and accepted.

Splice enclosure will be measured and paid as the actual number of fiber-optic splice enclosures furnished, installed, and accepted. No measurement will be made between aerial, underground, manhole, or junction box installation of the fiber-optic splice enclosure.

Modify splice enclosure will be measured and paid as the actual number of existing fiber-optic splice enclosures or interconnect centers modified and accepted.

No measurement will be made of splice trays, pigtails, jumpers, connector panels, testing and any corrective actions, repairs and replacements needed for exceeding maximum allowable attenuation or other defects, as these will be considered incidental to furnishing and installing fiber-optic interconnect centers and splice enclosures and modifying splice enclosures.

Payment will be made under:

Pay Item	Pay Unit
Interconnect Center	Each
Splice Enclosure	Each
Modify Splice Enclosure	Each

11. ELECTRICAL SERVICE

11.1. DESCRIPTION

Install new electrical service equipment as shown in the Plans. The first item of work on this project is the installation of all electrical service poles and meter base/disconnect combination panels to expedite the power service connections. Comply with the National Electrical Code (NEC), the National Electrical Safety Code (NESC), the Standard Specifications, the Project Special Provisions, and all local ordinances. All work involving electrical service shall be coordinated with the appropriate utility company and the Engineer.

11.2. MATERIAL

A. Meter Base/Disconnect Combination Panel

Furnish and install new meter base/disconnect combination panels as shown in the Plans. Provide meter base/disconnect combination panels that have a minimum of eight (8) spaces in the disconnect. Furnish a single pole 15A circuit breaker at CCTV-2, 3, 5, 6, 7, and 8 locations. Furnish a double pole 70A circuit breaker at DMS-1/CCTV-1 location. Furnish a double pole 100A circuit breaker at CCTV-4/DMS-2/DMS-3 location. Furnish each with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure meter base/ disconnect combination panel is listed as meeting UL Standard UL-67 and marked as being suitable for use as service equipment. Ensure circuit breakers are listed as meeting UL-489. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint finish, light gray in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces must be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals and a minimum wire capacity range of number 8 through number 1/0 AWG.

Furnish NEMA Type 3R combinational panel rated 200 Ampere minimum that meets the requirements of the local utility. Provide meter base with sockets' ampere rating based on sockets being wired with a minimum of 167 degrees F insulated wire. Furnish 4 terminal, 600 volt, single phase, 3-wire meter bases that comply with the following:

- Line, Load, and Neutral Terminals accept 4/0 AWG and smaller Copper/Aluminum wire
- With or without horn bypass
- Made of galvanized steel
- Listed as meeting UL Standard US-414
- Overhead or underground service entrance specified.

Furnish 1.5" watertight hub for threaded rigid conduit with meter base.

At the main service disconnect, furnish and install UL-approved lightning arrestors that meet the following requirements:

Type of design	Silicon Oxide Varistor
Voltage	120/240 Single Phase, 3 wire
Maximum current	100,000 amps

Maximum energy	3000 joules per pole
Maximum number of surges	Unlimited
Response time one milliamp test	5 nanoseconds
Response time to clamp 10,000 amps	10 nanoseconds
Response time to clamp 50,000 amps	25 nanoseconds
Leak current at double the rated voltage	None
Ground wire	Separate

B. Equipment Cabinet Disconnect

Provide new equipment cabinet disconnects at the locations shown in the Plans. Furnish double pole 50A circuit breakers at DMS locations. Furnish single pole 15A circuit breaker at CCTV locations. Furnish panels that have a minimum of eight (8) spaces in the disconnect. Furnish circuit breakers with a minimum of 10,000 RMS symmetrical amperes short circuit current rating in a lockable NEMA 3R enclosure. Ensure meter base/ disconnect combination panel is listed as meeting UL Standard UL-67 and marked as being suitable for use as service equipment. Ensure circuit breakers are listed as meeting UL-489. Fabricate enclosure from galvanized steel and electrostatically apply dry powder paint finish, light gray in color, to yield a minimum thickness of 2.4 mils. All exterior surfaces must be powder coated steel. Provide ground bus and neutral bus with a minimum of four terminals and a minimum wire capacity range of number 8 through number 1/0 AWG.

C. 3-Wire Copper Service Entrance Conductors

Furnish 3-wire stranded copper service entrance conductors with THWN rating. Provide conductors with black, red, and white insulation that are intended for power circuits at 600 Volts or less and comply with the following:

- Listed as meeting UL Standard UL-83
- Meets ASTM B-3 and B-8 or B-787 standards.

See the Plans for wire sizes and quantities.

D. 4-Wire Copper Feeder Conductors

Furnish 4-wire stranded copper feeder conductors with THWN rating for supplying power to DMS field equipment cabinets. Provide conductors with black, red, white, and green insulation that are intended for power circuits at 600 Volts or less and comply with the following:

- Listed as meeting UL Standard UL-83
- Meets ASTM B-3 and B-8 or B-787 standards.

See the Plans for wire sizes and quantities.

E. 3-Wire Copper Feeder Conductors

Furnish 3-wire stranded copper feeder conductors with THWN rating for supplying power to CCTV field equipment cabinets. Provide conductors with black or red, white, and green insulation that are intended for power circuits at 600 Volts or less and comply with the following:

- Listed as meeting UL Standard UL-83
- Meets ASTM B-3 and B-8 or B-787 standards.

See the Plans for wire sizes and quantities.

F. Grounding System

Furnish 5/8"x10' copper clad steel grounding electrodes (ground rods), #4 AWG solid bare copper conductors, and exothermic welding kits for grounding system installations. Comply with the NEC, Standard Specifications, these Project Special Provisions, and the Plans.

11.3. CONSTRUCTION METHODS

A. General

Coordinate with the Engineer and the utility company to de-energize the existing service temporarily prior to starting any modifications.

Permanently label cables at all access points using nylon tags labeled with permanent ink. Ensure each cable has a unique identifier. Label cables immediately upon installation. Use component name and labeling scheme approved by the Engineer.

B. Meter Base/Disconnect Combination Panel

Install meter base/disconnect combination panels with lightning arrestors as called for in the Plans. At all new DMS locations, route the feeder conductors from the meter base/disconnect to the DMS equipment cabinet in conduit. At all new CCTV locations, route the feeder conductors from the meter base/disconnect to the CCTV equipment cabinet in conduit. Provide rigid galvanized conduit for above ground and PVC for below ground installations.

C. Electrical Service Disconnect

Install equipment cabinet disconnects and circuit breakers as called for in the Plans. Install THWN stranded copper feeder conductors as shown in Plans between the electrical service disconnect and the equipment cabinet disconnect. Route the conductors from the equipment cabinet disconnect to the equipment cabinet in rigid galvanized steel conduit. Bond the equipment cabinet disconnect in accordance with the NEC. Ensure that the grounding system complies with the grounding requirements of these Project Special Provisions, the Standard Specifications and the Plans.

D. 3-Wire Copper Service Entrance Conductors

At locations shown in the Plans, furnish and install 3-wire THWN stranded copper service entrance conductors in 1.25 inch rigid galvanized risers as shown in the plans. Install a waterproof hub on top of the electrical service disconnect for riser entrance/exit. Size the conductors as specified in the Plans. Comply with the Standard Specifications and Standard Drawings and all applicable electrical codes.

E. 4-Wire Copper Feeder Conductors

At locations shown in the Plans, install 4-wire THWN stranded copper feeder conductors to supply 240/120 VAC to the DMS field equipment cabinets. Size the conductors as specified in the Plans. Comply with the Standard Specifications and Standard Drawings and all applicable electrical codes.

F. 3-Wire Copper Feeder Conductors

At locations shown in the Plans, install 3-wire THWN stranded copper feeder conductors to supply 120 VAC to the CCTV field equipment cabinets. Size the conductors as specified in the Plans. Comply with the Standard Specifications and Standard Drawings and all applicable electrical codes.

G. Grounding System

Install ground rods as indicated in the Plans. Connect the #4 AWG grounding conductor to ground rods using an exothermic welding process. Test the system to ensure a ground resistance of 20-ohms or less is achieved. Drive additional ground rods as necessary or as directed by the Engineer to achieve the proper ground resistance.

11.4. MEASUREMENT AND PAYMENT

Meter base/disconnect combination panel will be measured and paid as the actual number of complete and functional meter base/disconnect combination panel service locations furnished, installed and accepted. Breakers, lightning arrestors, exposed vertical conduit runs to the cabinet, and any remaining hardware, fittings, and conduit bodies to connect the electrical service to the cabinet will be considered incidental to meter base/disconnect combination panels. <u>All other required feeder conductors will be paid for separately.</u>

Equipment cabinet disconnect will be measured and paid as the actual number of complete and functional equipment cabinet disconnects furnished, installed and accepted. Breakers, exposed vertical conduit runs to the cabinet, ground rods, ground wire and any remaining hardware and conduit to connect the equipment cabinet disconnect to the cabinet will be considered incidental to the equipment cabinet subpanel.

3-Wire copper service entrance conductors will be incidental to furnish and installing the meter base/disconnect combination panel.

4-Wire copper feeder conductors will be measured and paid as the actual linear feet of 4-wire THWN stranded copper feeder conductors furnished, installed and accepted. Payment is for all four conductors. Measurement will be for the actual linear footage of combined conductors after all terminations are complete. No separate payment will be made for each individual conductor. No separate payment will be made for different wire sizes. No payment will be made for excess wire in the cabinets.

3-Wire copper feeder conductors will be measured and paid as the actual linear feet of 3-wire THWN stranded copper feeder conductors furnished, installed and accepted. Payment is for all three conductors. Measurement will be for the actual linear footage of combined conductors after all terminations are complete. No separate payment will be made for each individual conductor. No separate payment will be made for different wire sizes. No payment will be made for excess wire in the cabinets.

5/8" X 10' grounding electrode (ground rod) will be measured and paid as the actual number of 5/8" copper clad steel ground rods furnished, installed and accepted. No separate payment will be made for exothermic welding kit as they will be considered incidental to the installation of the ground rod.

#4 solid bare grounding conductor will be measured and paid as the actual linear feet of #4 AWG solid bare copper grounding conductor furnished, installed and accepted. Measurement will be along the approximate centerline from the base of the electrical service disconnect to the last grounding electrode.

Payment will be made under:

Pay Item	**Pay Unit**
Meter Base/Disconnect Combination Panel	Each
Equipment Cabinet Disconnect	Each
3-Wire Copper Service Entrance Conductors	Linear Foot
4-Wire Copper Feeder Conductors	Linear Foot
3-Wire Copper Feeder Conductors	Linear Foot
5/8" X 10' Grounding Electrode	Each
#4 Solid Bare Grounding Conductor	Linear Foot

12. CCTV EQUIPMENT

12.1. DESCRIPTION

Furnish and install CCTV equipment described in these Project Special Provisions. Furnish equipment that is compatible, interoperable, and completely interchangeable with existing Pelco Spectra IV high performance dome equipment currently in use by NCDOT in this Region. Ensure that the equipment is fully compatible with all features of the existing *VideoPro* video management software currently in use by NCDOT in this Region.

Contact the Regional ITS Engineer to confirm all CCTV locations prior to beginning construction.

12.2. MATERIAL

A. General

Furnish and install new CCTV camera assemblies at the locations shown on the Plans. Each assembly consists of the following:

- One Dome CCTV camera that contains in a single enclosed unit the following functionality and accessories:
  1. CCTV color digital signal processing camera unit with zoom lens, filter, control circuit, and accessories
  2. Motorized pan, tilt, and zoom
  3. Pole-mount camera attachment assembly
  4. All necessary cable, connectors and incidental hardware to make a complete and operable system
- A lightning arrestor installed in-line between the CCTV camera and the equipment cabinet components.
- A NEMA Type 4 enclosure constructed of aluminum with a clear acrylic dome or approved equal Camera Unit housing.

B. Camera and Lens

1. Cameras

Furnish new charged-coupled device (CCD) color cameras. Furnish cameras with automatic gain control (AGC) for clear images in varying light levels. The camera must meet the following minimum requirements:

- Video signal format: NTSC composite color video output, 1 volt peak to peak
- Automatic Gain Control (AGC): 0-20 dB, peak-average adjustable
- Automatic focus: Automatic with manual override
- White balance: Automatic through the lens with manual override
- Electronic-Shutter: dip-switch selectable electronic shutter with speed range from 1/60 of a second (off) to 1/30,000th of a second
- Overexposure protection: The camera must have built-in circuitry or a protection device to prevent any damage to the camera when pointed at strong light sources, including the sun
- Sensitivity: 1.5 lux at 90% scene reflectance
- Signal to noise ratio: Greater than 48-dB

- Video output Connection: 1-volt peak to peak, 75 ohms terminated, BNC connector
- Power: 24 VAC or less

2. Zoom Lens

Furnish each camera with a motorized zoom lens that is high performance integrated dome system or approved equivalent with automatic iris control with manual override and neutral density spot filter. Furnish lenses that meet the following optical specifications:

- Focal length: 0.16" – 3.45", 35X optical zoom, and 12X electronic zoom
- Preset positioning: 64 Presets

The lens must be capable of both automatic and remote manual control iris and focus override operation. The lens must be equipped for remote control of zoom and focus, including automatic movement to any of the preset zoom and focus positions. Mechanical or electrical means must be provided to protect the motors from overrunning in extreme positions. The operating voltages of the lens must be compatible with the outputs of the camera control.

C. Camera Housing

Furnish new dome style enclosure for the CCTV assemblies. Equip each housing with mounting assembly for attachment to the CCTV camera pole. The enclosures must be equipped with a sunshield and be fabricated from corrosion resistant aluminum and finished in a neutral color of weather resistant enamel. The enclosure must meet or exceed NEMA 4X ratings. The viewing area of the enclosure must be tempered glass.

D. Pan and Tilt Unit

Equip each new dome style assembly with a pan and tilt unit. The pan and tilt unit must be integral to the high performance integrated dome system. The pan and tilt unit must be rated for outdoor operation, provide dynamic braking for instantaneous stopping, prevent drift, and have minimum backlash. The pan and tilt units must meet or exceed the following specifications:

- Pan: continuous 360 Degrees
- Tilt: up/down 180 degrees minimum
- Input voltage: 24 VAC 50/60Hz
- Motors: Two-phase induction type, continuous duty, instantaneous reversing
- Preset Positioning: 64 PTZ presets per camera

E. Control Receiver/Driver

Provide each new camera unit with a control receiver/driver that is integral to the CCTV dome assembly. The control receiver/driver will receive serial asynchronous data initiated from a camera control unit, decode the command data, perform error checking, and drive the pan/tilt unit, camera controls, and motorized lens. As a minimum, the control receiver/drivers must provide the following functions:

- Zoom in/out
- Automatic focus with manual override
- Tilt up/down
- Automatic iris with manual override
- Pan right/left

- Minimum 64 preset positions for pan, tilt, and zoom

In addition, each control receiver/driver must accept status information from the pan/tilt unit and motorized lens for preset positioning of those components. The control receiver/driver will relay pan, tilt, zoom, and focus positions from the field to the remote camera control unit. The control receiver/driver must accept "goto" preset commands from the camera control unit, decode the command data, perform error checking, and drive the pan/tilt and motorized zoom lens to the correct preset position. The preset commands from the camera control unit will consist of unique values for the desired pan, tilt, zoom, and focus positions.

F. CCTV Camera Attachment to Pole

At locations shown in the Plans where new CCTV cameras are to be installed on new CCTV poles, furnish an attachment assembly for the CCTV camera unit. Use stainless steel banding approved by the Engineer. Submit shop drawings for review and approval by the Engineer prior to installation.

Furnish CCTV attachments that allow for the removal and replacement of the CCTV enclosure as well as providing a weatherproof, weather tight, seal that does not allow moisture to enter the enclosure.

Furnish a CCTV Camera Attachment Assembly that is able to withstand wind loading at the maximum wind speed and gust factor called for in these Special Provisions and can support a minimum camera unit dead load of 45 pounds (20.4 kg).

G. Surge Suppression

Protect all equipment at the top of the pole grounded metal oxide varistors connecting each power conductor to ground.

Protect coaxial cable from each camera by a surge protector at each end of the cable.

12.3. CONSTRUCTION METHODS

A. General

Mount CCTV camera units at a height sufficient to adequately see traffic in all directions and as approved by the Engineer. The maximum attachment height is 45 feet above ground level.

Mount the CCTV camera units such that a minimum 5 feet of clearance is maintained between the camera and the top of the pole.

Obtain approval of the camera locations and orientation from the Engineer prior to installing the CCTV camera assemblies.

Mount CCTV cameras on the side of poles nearest intended field of view. Avoid occluding the view with the pole.

B. Electrical and Mechanical Requirements

Ground all equipment as called for in the Standard Specifications, these Special Provisions, and the Plans.

Install surge protectors on all ungrounded conductors entering the CCTV enclosure. House the protectors in a small, ventilated weatherproof cabinet attached near the CCTV attachment point in a manner approved by the Engineer.

12.4. MEASUREMENT AND PAYMENT

CCTV camera assembly will be measured and paid as the actual number of CCTV assemblies furnished, installed, integrated, and accepted. No separate measurement will be made for cabling, connectors, CCTV camera attachment assemblies, conduit, condulets, grounding equipment, surge protectors, CCTV control software, or any other equipment or labor required to install the CCTV assembly.

No separate payment will be made for coaxial cable. Coaxial cable, furnished and installed in the quantities required, will be incidental to the "CCTV Assembly" pay item.

Payment will be made under:

Pay Item	Pay Unit
CCTV Camera Assembly	Each

13. CCTV FIELD EQUIPMENT CABINET

13.1. DESCRIPTION

Furnish 336S pole mounted cabinets to house CCTV control and transmission equipment. The cabinets must consist of a cabinet housing, 19-inch EIA mounting cage, and power distribution assembly (PDA #3 as described in the CALTRANS TSCES).

The cabinet housing must conform to sections 6.2.2 (Housing Construction), 6.2.3 (Door Latches and Locks), 6.2.4 (Housing Ventilation), and 6.2.5 (Hinges and Door Catches) of the CALTRANS TSCES. Do not equip the cabinet housings with a police panel.

The cabinet cage must conform to section 6.3 of the CALTRANS TSCES.

Terminal blocks on the PDA #3 Assembly have internal wiring for the Model 200 switch pack sockets. Do not use terminal blocks on PDA #3 as power terminals for cabinet devices. Do not furnish cabinet with "Input Panels" described in section 6.4.7.1 of the TSCES. Do furnish cabinet with "Service Panels" as described in section 6.4.7.1 of the TSCES and as depicted on drawing TSCES-9 in the TSCES. Use service panel #2.

Furnish terminal blocks for power for cabinet CCTV and communications devices as needed to accommodate the number of devices in the cabinet.

Do not furnish cabinets with C1, C5, or C6 harness, input file, output file, monitor units, model 208 unit, model 430 unit, or switch packs.

Furnish all conduits, shelving, mounting adapters, and other equipment as necessary to route cabling, mount equipment, and terminate conduit in equipment cabinet.

13.2. MATERIAL

A. Shelf Drawer

Provide a pull out, hinged-top drawer, having sliding tracks, with lockout and quick disconnect feature, such as a Vent-Rak Retractable Writing Shelf, #D-4090-13 or equivalent in the equipment cabinet. Furnish a pullout drawer that extends a minimum of 14 inches that is capable of being lifted to gain access to the interior of the drawer. Minimum interior dimensions of the drawer are to be 1 inch high, 13 inches deep, and 16 inches wide. Provide drawers capable of supporting a 40-pound device or component when fully extended.

B. Cabinet Light

Each cabinet must include two (2) fluorescent lighting fixtures (one front, one back) mounted horizontally inside the top portion of the cabinet. The fixtures must include a cool white lamp, and must be operated by normal power factor UL-listed ballast. A door-actuated switch must be installed to turn on the applicable cabinet light when the front door or back door is opened. The lights must be mounted not to interfere with the upper door stay.

C. Surge Protection for System Equipment

Each cabinet must be provided with devices to protect the CCTV and communications equipment from electrical surges and over voltages as described below.

1. Main AC Power Input

Each cabinet must be provided with a hybrid-type, power line surge protection device mounted inside the power distribution assembly. The protector must be installed between the applied line voltage and earth ground. The surge protector must be capable of reducing the effect of lighting transient voltages applied to the AC line. The protector must be mounted inside the Power Distribution Assembly housing facing the rear of the cabinet. The protector must include the following features and functions:

- Maximum AC line voltage: 140 VAC.
- Twenty pulses of peak current, each of which must rise in 8 microseconds and fall in 20 microseconds to ½ the peak: 20000 Amperes.
- The protector must be provided with the following terminals:
  - Main Line (AC Line first stage terminal).
  - Main Neutral (AC Neutral input terminal).
  - Equipment Line Out (AC line second state output terminal, 19 amps).
  - Equipment Neutral Out (Neutral terminal to protected equipment).
  - GND (Earth connection).
- The Main AC line in and the Equipment Line out terminals must be separated by a 200 Microhenry (minimum) inductor rated to handle 10 AMP AC Service.
- The first stage clamp must be between Main Line and Ground terminals.
- The second stage clamp must be between Equipment Line Out and Equipment Neutral.
- The protector for the first and second stage clamp must have an MOV or similar solid state device rated at 20 KA and must be of a completely solid state design (i.e., no gas discharge tubes allowed).
- The Main Neutral and Equipment Neutral Out must be connected together internally and must have an MOV similar solid state device or gas discharge tube rated at 20 KA between Main Neutral and Ground terminals.
- Peak Clamp Voltage: 350 volts at 20 KA. (Voltage measured between Equipment Line Out and Equipment Neutral Out terminals. Current applied between Main Line and Ground Terminals with Ground and Main Neutral terminals externally tied together).
- Voltage must never exceed 350 volts.
- The Protector must be epoxy-encapsulated in a flame-retardant material.
- Continuous service current: 10 Amps at 120 VAC RMS.
- The Equipment Line Out must provide power to cabinet CCTV and communications equipment and to the 24V power supply.

2. Ground Bus

Provide a neutral bus that is not connected to the earth ground or the logic ground anywhere within the cabinet. Ensure that the earth ground bus and the neutral ground bus each have ten compression type terminals, each of which can accommodate wires ranging from number 14 through number 4 AWG.

3. Uninterruptible Power Supply (UPS)

Furnish and install one rack mounted UPS in each new cabinet that meet the following minimum specifications:

Output	
Output Power Capacity	480 Watts / 750 VA
Max Configurable Power	480 Watts / 750 VA
Nominal Output Voltage	120V
Output Voltage Distortion	Less than 5% at full load
Output Frequency (sync to mains)	57 - 63 Hz for 60 Hz nominal
Crest Factor	up to 5:1
Waveform Type	Sine wave
Output Connections	(4) NEMA 5-15R
Input	
Nominal Input Voltage	120V
Input Frequency	50/60 Hz +/- 3 Hz (auto sensing)
Input Connections	NEMA 5-15P
Cord Length	6 feet
Input voltage range for main operations	82 - 144V
Input voltage adjustable range for mains operation	75 -154 V
Battery Type	
Maintenance-free sealed Lead-Acid battery with suspended electrolyte, leak-proof.	
Typical recharge time	2 hours
Communications & Management	
Interface Port(s)	DB-9 RS-232, USB
Control panel	LED status display with load and battery bar-graphs
Surge Protection and Filtering	
Surge energy rating	480 Joules
Environmental	
Operating Environment	32 - 104 °F
Operating Relative Humidity	0 - 95%
Storage Temperature	5 - 113 °F
Storage Relative Humidity	0 - 95%

Conformance

Regulatory Approvals	FCC Part 15 Class A,UL 1778

13.3. CONSTRUCTION METHODS

For each field equipment cabinet installation, use stainless steel banding or other method approved by the Engineer to fasten cabinet to pole. Install field equipment cabinets so that the height to the middle of the enclosure is 4 feet from ground level. No risers shall enter the top or sides of the equipment cabinet.

Install all conduits, condulets, and attachments to equipment cabinets in a manner that preserves the minimum bending radius of cables and creates water proof connections and seals.

Install a UPS in each cabinet and power all CCTV cameras from the UPS.

13.4. MEASUREMENT AND PAYMENT

Field equipment cabinet will be measured and paid as the actual number of CCTV equipment cabinets furnished, installed and accepted.

No payment will be made for the UPS, cabling, connectors, cabinet attachment assemblies, conduit, condulets, risers, grounding equipment, surge protectors, or any other equipment or labor required to install the field equipment cabinet and integrate the cabinets with the CCTV equipment.

Payment will be made under:

Pay Item	Pay Unit
Field Equipment Cabinet	Each

14. CCTV METAL POLES

14.1. CCTV METAL POLES

A. General:

Furnish and install CCTV metal poles, grounding systems, and all necessary hardware. The work covered by this special provision includes requirements for the design, fabrication, and installation of custom designed CCTV metal poles and associated foundations.

Provide designs of completed assemblies with hardware that equals or exceeds AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals* 6th Edition, 2013 (hereafter called 6th Edition AASHTO), including the latest interim specifications. Provide assemblies with a round or near-round (18 sides or more) cross-section, or a multi sided cross section with no less than six sides. The sides may be straight, convex, or concave.

CCTV pole heights are 50 feet as indicated in the plans.

After fabrication, have steel poles, required mast arms, and all parts used in the assembly hot-dip galvanized per section 1076. Design structural assemblies with weep holes large enough and properly located to drain molten zinc during galvanization process. Provide hot-dip galvanizing on structures that meets or exceeds ASTM Standard A-123. Provide galvanizing on hardware that meets or exceeds ASTM Standard A-153. Ensure that threaded material is brushed and retapped as necessary after galvanizing. Perform repair of damaged galvanizing that complies with the following:

Repair of Galvanizing.....Article 1076-6

Standard Drawings for Metal Poles are available that supplement these project special provisions. These drawings are located on the Department's website:

http://www.ncdot.gov/doh/preconstruct/traffic/ITSS/ws/mpoles/poles.html

Comply with article 1098-1B "General Requirements" of the *2012 STANDARD SPECIFICATIONS FOR ROADS & STRUCTURES*, hereinafter referred to as the *Standard Specifications* for submittal requirements. Furnish shop drawings for approval. Provide the copies of detailed shop drawings for each type of structure as summarized below. Ensure that shop drawings include material specifications for each component and identify welds by type and size on the drawing details, not in table format. Do not release structures for fabrication until shop drawings have been approved by NCDOT. Provide an itemized bill of materials for all structural components and associated connecting hardware on the drawings.

Comply with article 1098-1A "General Requirements" of the *Standard Specifications* for Qualified Products List (QPL) submittals. All shop drawings must include project location description, CCTV inventory number(s), and a project number or work order number on the drawings.

Summary of information required for metal pole review submittal:

Item	Hardcopy Submittal	Electronic Submittal	Comments / Special Instructions
Sealed, Approved ITS Plan/Loading Diagram	1	1	All structure design information needs to reflect the latest approved ITS plans
Custom Pole Shop Drawings	4 sets	1 set	Submit drawings on 11" x 17" format media Show NCDOT inventory number(s) in or above the title block
Standard Pole Shop Drawings (from the QPL)	4 sets	1 set	Submit drawings on 11" x 17" format media Show NCDOT inventory number(s) in or above the title block
Structure Calculations	1 set	1 set	Not required for Standard QPL Poles
Standard Pole Foundation Drawings	1 set	1 set	Submit drawings on 11" x 17" format media. Submit a completed Standard Foundation Selection form for each pole using foundation table on Metal Pole Drawing M-8.
Custom Foundation Drawings	4 sets	1 set	Submit drawings on 11" x 17" format media. If QPL Poles are used, include the corresponding QPL pole shop drawings with this submittal.
Foundation Calculations	1	1	Not required for Standard QPL Poles
Soil Boring Logs and Report	1	1	Report should include a location plan and a soil classification report including soil capacity, water level, hammer efficiency, soil bearing pressure, soil density, etc. for each pole.

NOTE – All shop drawings and custom foundation design drawings must be sealed by a professional Engineer licensed in the state of North Carolina. All geotechnical information must be sealed by either a Professional Engineer or geologist licensed in the state of North Carolina. Include a title block and revision block on the shop drawings and foundation designs showing the NCDOT inventory number.

Shop drawings and foundation drawings may be submitted together or separately for approval. However, shop drawings must be approved before foundations can be reviewed. Foundation designs will be returned without review if the associated shop drawing has not been approved. Incomplete submittals will be returned without review.

B. Materials:

Fabricate CCTV metal pole from coil or plate steel to meet the requirements of ASTM A 595 Grade A tubes. For structural steel shapes, plates and bars use A572 Gr 50 min or ASTM A709 Gr 50 min.. Provide poles that are round in cross section or multisided tubular shapes and have a uniform linear taper of 0.14 in/ft. Construct shafts from one piece of single ply plate or coil so there are no circumferential weld splices. Galvanize in accordance with AASHTO M 111 and/or ASTM A 123 or an approved equivalent.

Ensure that allowable pole deflection does not exceed that allowed per 6th Edition AASHTO. Ensure that maximum deflection at the top of the pole does not exceed 2.5 percent of the pole height.

Use the submerged arc process or other NCDOT previously approved process suitable for poles to continuously weld pole shafts along their entire length. The longitudinal seam weld will be finished flush to the outside contour of the base metal. Ensure shafts have no circumferential welds except at the lower end joining the shaft to the pole base. Provide welding that conforms to Article 1072-20 of the *Standard Specifications*, except that no field welding on any part of the pole will be permitted unless approved by a qualified engineer.

Refer to Metal Pole Standard Drawing Sheets M2 through M5 for fabrication details. Fabricate anchor bases from plate steel meeting, as a minimum, the requirements of ASTM A 36M or cast steel meeting the requirements of ASTM A 27M Grade 485-250, AASHTO M270 Gr 36 or an approved equivalent. Conform to the applicable bolt pattern and orientation as shown on Metal Pole Standard Drawing Sheet M2.

Ensure all hardware is galvanized steel or stainless steel. The Contractor is responsible for ensuring that the designer/fabricator specifies connecting hardware and/or materials that do not create a dissimilar metal corrosive reaction.

Unless otherwise required by the design, ensure each anchor rod is 2" diameter and 60" length. Provide 10" minimum thread projection at the top of the rod, and 8" minimum at the bottom of the rod. Use anchor rod assembly and drilled pier foundation materials that meet the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

For each structural bolt and other steel hardware, hot dip galvanizing shall conform to the requirements of AASHTO M 232 (ASTM A 153). Ensure end caps for poles are constructed of cast aluminum conforming to Aluminum Alloy 356.0F.

Provide a circular anchor bolt lock plate that will be secured to the anchor bolts at the embedded end with 2 washers and 2 nuts. Provide a base plate template that matches the bolt circle diameter of the anchor bolt lock plate. Construct plates and templates from ¼" minimum thick steel with a minimum width of 4". Galvanizing is not required.

Provide 4 heavy hex nuts and 4 flat washers for each anchor bolt. For nuts, use AASHTO M291 grade 2H, DH, or DH3 or equivalent material. For flat washers, use AASHTO M293 or equivalent material.

Provide a 2 inch hole equipped with an associated coupling and weatherhead approximately 5 feet below the top of the pole to accommodate passage of CCTV cables from inside the pole to the CCTV camera.

Provide a 2 inch hole equipped with an associated coupling and conduit fittings/bodies approximately 18 inches above the base of the pole accommodate passage of CCTV cables from the CCTV cabinet to the inside of the pole. Refer to Metal Pole Standard Drawing Sheet M3 for fabrication details.

Have poles permanently stamped above the base hand hole with the identification tag details as shown on Metal Pole Standard Drawing Sheet M2.

For each pole, provide a 1/2 inch minimum thread diameter, coarse thread stud and nut for grounding which will accommodate #4 AWG ground wire. Ensure that the lug is electrically bonded to the pole and is conveniently located inside the pole at the hand hole.

Provide a removable pole cap with stainless steel attachment screws for the top of each pole. Ensure that the cap is cast aluminum conforming to Aluminum Association Alloy 356.0F. Furnish cap attached to the pole with a sturdy chain or cable approved by the Engineer. Ensure that the chain or cable is long enough to permit the cap to hang clear of the pole-top opening when the cap is removed.

C. Construction Methods:

Install anchor rod assemblies in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

Erect CCTV metal poles only after concrete has attained a minimum allowable compressive strength of 3000 psi. For further construction methods, see construction methods for Metal Strain Pole.

Connect poles to grounding electrodes and bond them to the electrical service grounding electrodes.

For holes in the poles used to accommodate cables, install grommets before wiring pole or arm. Do not cut or split grommets.

Attach the hand hole covers to the pole by a sturdy chain or cable. Ensure the chain or cable is long enough to permit the cover to hang clear of the opening when the cover is removed, and is strong enough to prevent vandalism. Ensure the chain or cable will not interfere with service to the cables in the pole.

Attach cap to pole with a sturdy chain or cable. Ensure the chain or cable is long enough to permit the cap to hang clear of the opening when the cap is removed.

Perform repair of damaged galvanizing that complies with the *Standard Specifications*, Article 1076-6 "Repair of Galvanizing."

Install galvanized wire mesh around the perimeter of the base plate to cover the gap between the base plate and top of foundation for debris and pest control.

Install a ¼" thick plate for concrete foundation tag to include: concrete grade, depth, diameter, and reinforcement sizes of the installed foundation.

Install CCTV metal poles, hardware, and fittings as shown on the manufacturer's installation drawings. Install poles so that when the pole is fully loaded it is within 2 degrees of vertical.

14.2. DRILLED PIER FOUNDATIONS

Analysis procedures and formulas shall be based on AASHTO, ACI code and per FHWA manuals. Design methods based on engineering publications or research papers needs to have prior approval from NCDOT. The Department reserves the right to accept or disapprove any method used for the analysis.

Use a Factor of Safety of 1.33 for torsion and 2.0 for bending for the foundation design.

Foundation design for lateral load shall not exceed 1" lateral deflection at top of foundation.

Design all custom foundations to carry the maximum capacity of each metal pole. For standard case strain poles only, if a custom foundation is designed, use the actual moment reactions from the Standard Foundation Selection Table shown on Standard Drawing No. M8.

When poor soil conditions are encountered which could create an excessively large foundation design, consideration may be given to allowing an exemption to the maximum capacity design. The contractor must gain approval from the engineer before reducing a foundation's capacity. On projects where poor soil is known to be present, it is advisable that the contractor consider getting foundations approved before releasing poles for fabrication.

A. Description:

Furnish and install foundations for NCDOT metal poles with all necessary hardware in accordance with the plans and specifications.

Metal Pole Standards have been developed and implemented by NCDOT for use at signalized intersections in North Carolina. If the plans call for a standard pole, then a standard foundation may be selected from the plans. However, the Contractor is not required to use a standard foundation. If the Contractor chooses to design a non-standard site-specific foundation for a standard pole or if the plans call for a non-standard site-specific pole, design the foundation to conform to the applicable provisions in the NCDOT Metal Pole Standards and Section B4 (Non-Standard Foundation Design) below. If non-standard site specific foundations are designed for standard QPL approved strain poles, the foundation designer must use the design moment specified by load case on Metal Pole Standard Drawing Sheet M8. Failure to conform to this requirement will be grounds for rejection of the design.

If the Contractor chooses to design a non-standard foundation for a standard pole and the soil test results indicate a standard foundation is feasible for the site, the Contractor will be paid the cost of the standard foundation (drilled pier and wing wall, if applicable). Any additional costs associated with a non-standard site-specific foundation including additional materials, labor and equipment will be considered incidental to the cost of the standard foundation. All costs for the non-standard foundation design will also be considered incidental to the cost of the standard foundation.

B. Soil Test and Foundation Determination:

1. General:

Drilled piers are reinforced concrete sections, cast-in-place against in situ, undisturbed material. Drilled piers are of straight shaft type and vertical.

Some standard drilled piers for supporting poles with mast arms may require wing walls to resist torsional rotation. Based upon this provision and the results of the required soil test, a drilled pier length and wing wall requirement may be determined and constructed in accordance with the plans.

For non-standard site-specific poles, the contractor-selected pole fabricator will determine if the addition of wing walls is necessary for the supporting foundations.

2. Soil Test:

Perform a soil test at each proposed metal pole location. Complete all required fill placement and excavation at each signal pole location to finished grade before drilling each boring. Soil tests performed that are not in compliance with this requirement may be rejected and will not be paid. Drill one boring to a depth of 26 feet within a 25 foot radius of each proposed foundation.

Perform standard penetration tests (SPT) in accordance with ASTM D 1586 at depths of 1, 2.5, 5, 7.5, 10, 15, 20 and 26 feet. Discontinue the boring if one of the following occurs:

- A total of 100 blows have been applied in any 2 consecutive 6-in. intervals.
- A total of 50 blows have been applied with < 3-in. penetration.

Describe each intersection as the "Intersection of *(Route or SR #)*, *(Street Name)* and *(Route or SR #)*, *(Street Name)*, _____ County, Signal Inventory No. _____". Label borings with "B- *N, S, E, W, NE, NW, SE or SW*" corresponding to the quadrant location within the intersection. Pole numbers should be made available to the Drill Contractor. Include pole numbers in the boring label if they are available. If they are not available, ensure the boring labels can be cross-referenced to corresponding pole numbers. For each boring, submit a legible (hand written or typed) boring log signed and sealed by a licensed Geologist or Professional Engineer registered in North Carolina. Include on each boring the SPT blow counts and N-values at each depth, depth of the boring, and a general description of the soil types encountered.

3. Standard Foundation Determination:

Use the following method for determining the Design N-value:

$$N_{AVG} = \frac{(N@1' + N@2.5' + \ldots\ldots\ldots N@\text{Deepest Boring Depth})}{\text{Total Number of N-values}}$$

$$Y = (N@1')^2 + (N@2.5')^2 + \ldots\ldots\ldots (N@\text{Deepest Boring Depth})^2$$

$$Z = (N@1' + N@2.5' + \ldots\ldots\ldots N@\text{Deepest Boring Depth})$$

$$N_{STD\ DEV} = \left(\frac{(\text{Total Number of N-values} \times Y) - Z^2}{(\text{Total Number of N-values}) \times (\text{Total Number of N-values} - 1)} \right)^{0.5}$$

Design N-value equals lesser of the following two conditions:

$N_{AVG} - (N_{STD\ DEV} \times 0.45)$

Or

$$\text{Average of First Four N-Values} = \frac{(N@1' + N@2.5' + N@5' + N@7.5')}{4}$$

Note: If less than 4 N-values are obtained because of criteria listed in Section 2 above, use average of N-values collected for second condition. Do not include the N-value at the deepest boring depth for above calculations if the boring is discontinued at or before the required boring depth because of criteria listed in Section 2 above. Use N-value of zero for weight of hammer or weight of rod. If N-value is greater than 50, reduce N-value to 50 for calculations.

If standard NCDOT strain poles are shown on the plans and the Contractor chooses to use standard foundations, determine a drilled pier length, "L," for each signal pole from the Standard Foundations Chart (sheet M 8) based on the Design N-value and the predominant soil type. For each standard pole location, submit a completed "Metal Pole Standard Foundation Selection Form" signed by the Contractor's representative. Signature on form is for verification purposes only. Include the Design N-value calculation and resulting drilled pier length, "L," on each form.

If non-standard site-specific poles are shown on the plans, submit completed boring logs collected in accordance with Section 2 (Soil Test) above along with pole loading diagrams from the plans to the contractor-selected pole fabricator to assist in the pole and foundation design.

If one of the following occurs, the Standard Foundations Chart shown on the plans may not be used and a non-standard foundation may be required. In such case, contact the Engineer.

- The Design N-value is less than 4.
- The drilled pier length, "L", determined from the Standard Foundations Chart, is greater than the depth of the corresponding boring.

In the case where a standard foundation cannot be used, the Department will be responsible for the additional cost of the non-standard foundation.

Foundation designs are based on level ground around the traffic signal pole. If the slope around the edge of the drilled pier is steeper than 8:1 (H:V) or the proposed foundation will be less than 10 feet from the top of an embankment slope, the Contractor is responsible for providing slope information to the foundation designer and to the Engineer so it can be considered in the design.

The "Metal Pole Standard Foundation Selection Form" may be found at:

http://www.ncdot.gov/doh/preconstruct/highway/geotech/formdet/misc/MetalPole.pdf

If assistance is needed, contact the Engineer.

4. Non-Standard Foundation Design:

Design non-standard foundations based upon site-specific soil test information collected in accordance with Section 2 (Soil Test) above. Design drilled piers for side resistance only in accordance with Section 4.6 of the *AASHTO Standard Specifications for Highway Bridges*. Use the computer software LPILE version 5.0 or later manufactured by Ensoft, Inc. to analyze drilled piers. Use the computer software gINT version 8.0 or later manufactured by Bentley Systems, Inc. with the current NCDOT gINT library and data template to produce SPT boring logs. Provide a drilled pier foundation for each pole with a length and diameter that result in a horizontal lateral movement of less than 1 inch at the top of the pier and a horizontal rotational movement of less than 1 inch at the edge of the pier. Contact the Engineer for pole loading diagrams for standard poles to be used for non-standard foundation designs. Submit any non-standard foundation designs including drawings, calculations, and soil boring logs to the Engineer for review and approval before construction.

C. Drilled Pier Construction:

Construct drilled pier foundations in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

14.3. MEASUREMENT AND PAYMENT

Actual number of CCTV Metal Poles furnished, installed and accepted.

Actual number of Soil Tests with SPT borings drilled furnished and accepted.

Actual volume of concrete poured in cubic yards of Drilled Pier Foundation furnished, installed and accepted.

No measurement will be made for CCTV Metal Pole designs and foundation designs, as these will be considered incidental to CCTV Metal Poles and Drilled Pier Foundations.

Payment will be made under:

CCTV Metal Pole ..... Each
Soil Test ..... Each
Drilled Pier Foundation ..... Cubic Yard

15. DYNAMIC MESSAGE SIGN (DMS)

15.1. DESCRIPTION

DMSs used on the State Highway System shall be preapproved on the current NCDOT ITS & Signals 2012 Qualified Products List (QPL) by the date of installation. DMSs not preapproved will not be allowed for use on the project. To ensure compatibility with the existing DMS Control Software deployed in the State, furnish NTCIP compliant DMSs that are fully compatible with Daktronics, Inc. Vanguard V4 software (also referred to hereinafter as the "Control Software").

Furnish and install DMSs compliant with UL standards 48, 50, 879, and 1433.

Add and configure the new DMSs in the system using the Control Software and computer system. Furnish, install, test, integrate and make fully operational the new DMSs at locations shown in the Plans.

Contact the Regional ITS Engineer to confirm all DMS locations prior to beginning construction.

Furnish operating DMS systems consisting of, but not limited to, the following:

- Walk-In Enclosure DMS
  - Full Matrix, 27 pixel high and 90 pixels wide LED Walk-In DMS
  - Pedestal type DMS support structures and mounting hardware
- DMS controllers, Uninterruptible Power Supplies (UPS), cabinets and accessories with interconnect and power cabling and conduit
- Branch circuit conductors and related equipment
- All other equipment and incidentals required for furnishing, installing, and testing the DMS system and system components

Use only UL listed and approved electronic and electrical components in the DMS system.

15.2. MATERIALS

A. Environmental Requirements

Construct the DMS and DMS controller cabinet so the equipment within is protected against moisture, dust, corrosion, and vandalism.

Design the DMS system to comply with the requirements of Section 2.1 (Environmental and Operating Standards) of NEMA TS 4-2005.

B. Full Matrix LED Dynamic Message Sign (DMS)

Construct the DMS to display at least three lines of text that, when installed, are clearly visible and legible to a person with 20/20 corrected vision from a distance of 900 feet in advance of the DMS at an eye height of 3.5 feet along the axis.

When displaying three lines, each line must display at least 15 equally spaced and equally sized alphanumeric individual characters. Each character must be at least 18 inches in height and composed from a luminous dot matrix. Provide an entire LED matrix that is a minimum of 27 pixels high and 90 pixels wide.

1. DMS Enclosure

Comply with the requirements of Section 3 (Sign Mechanical Construction) of NEMA TS 4-2005 as it applies to walk-in enclosures. The following requirements complement TS 4-2005.

Construct the DMS with a metal walk-in enclosure excluding the face. Provide an aluminum walking platform inside the enclosure that is at least 28 inches wide. Ensure the width of the walking platform is free of obstructions to a height of 7 feet. Construct the enclosure of welded aluminum type 6061-T6, 5052-H38, 5052-H34, or of an Engineer approved alternate at least 1/8-inch thick. Perform all welding of aluminum and aluminum alloys in accordance with the latest edition of AWS D1.2, Structural Welding Code - Aluminum. Continuously weld the seams using Gas Metal Arc Welding (GMAW).

Provide all exterior and interior DMS enclosure surfaces with natural, mill-finish aluminum. Remove all grind marks and discoloration from the surfaces.

Provide corrosion resistant nuts, bolts, washers, and other mounting and bonding parts and components used on the exterior of the DMS enclosure and ensure they are sealed against water intrusion.

Provide one key lockable, hinged, gasket-sealed inspection door for service and maintenance along each side of the enclosure. Install one appropriately sized fire extinguisher within 12 inches of each maintenance door. Equip the DMS enclosure with internal fluorescent lighting controlled by timers installed close to each inspection door. Make certain no light emitted from the fluorescent tubes or any other light source inside the enclosure not comprising the display is leaked to the outside of the enclosure. Equip the door with a door-hold-open device. Install GFCI duplex utility receptacles every 6 feet along the width of the DMS in convenient locations for powered service tools.

Do not place a manufacturer name, logo, or other information on the front face of the DMS or shield visible to the motorist.

Provide power supply monitoring circuitry to detect power failure in the DMS and to automatically report this fault to the Control Software. This requirement is in addition to reporting power failure at the controller cabinet.

Do not paint the stainless steel bolts on the Z-bar assemblies used for mounting the enclosure.

2. DMS Interior Environment Control

Design the local field controller to monitor and control the interior DMS environment. Design environmental control to maintain the internal DMS temperature within +/- 10° F of the outdoor ambient temperature. Provide the DMS environmental control system with four primary subsystems as follows:

Internal Temperature Sensors – Provide the DMS with two internally mounted temperature sensors which are equipped with external thermocouples and which the field controller continuously monitors. Design the field controller to use this temperature information to determine when to activate and deactivate the environmental control systems described herein. Locate sensors on opposite ends of the upper 1/3 of the LED display matrix with their external thermocouples attached to and making contact with an LED pixel circuit board. Design the thermocouple and LED board to be easily detachable, in the event that one of the units requires

removal and replacement. Provide sensors capable of measuring temperatures from -40° F to +185° F. Design the field controller to automatically shut down the LED display whenever one or both sensors indicates that LED board temperature has exceeded +140° F, and to automatically restart the LED display whenever the temperature falls below +130° F. Design both shutdown and re-start temperature thresholds to be user-programmable. Design the field controller to report sensor temperatures and DMS shutdown/re-start events to the DMS Control Software.

Housing Cooling System – Provide the DMS housing with a cooling system that circulates outside air into the DMS housing whenever the LED board temperature exceeds a user-programmable threshold. Provide this system with enough ventilation fans to exchange the internal DMS housing air volume at a minimum rate of 2 times per minute. Provide steel ball-bearing type fans. Mount fans in a line across the upper rear wall of the DMS housing to direct air out of the cabinet. Provide one filtered air intake port for each exhaust fan. Locate intake ports in a line across the lower rear wall of the DMS housing. Provide intake ports with a removable filter that will remove airborne particles measuring 500 microns in diameter and larger. Provide a filter that is of a size and style that is commercially readily available. Program the field controller to activate the DMS housing cooling system whenever the LED board temperature exceeds +90° F and to turn the cooling system off whenever LED board temperature falls below +85° F. On the DMS housing rear exterior wall, cover all air intake and exhaust ports on their top, front, and sides by an aluminum shroud fabricated from 0.090-inch aluminum sheeting. Taper the shrouds at the top. Securely fasten shrouds to the DMS housing, and provide gaskets at the interface to prevent water from entering the DMS. Design all air filters and fans to be removable from inside the DMS housing. Provide the DMS housing cooling system with an adjustable timer that will turn fans off after the set time has expired. Provide a timer that is adjustable to at least 4 hours, and locate it just inside the DMS housing door, within easy reach of a maintenance technician standing outside the DMS doorway.

LED Display Cooling System – Provide the DMS with an LED display cooling system which directs air across the LED display modules whenever LED board temperature exceeds a user-programmable threshold. Direct fan-forced air vertically across the backside of the entire LED display matrix using multiple ball-bearing fans. Program the field controller to activate the LED cooling fan system whenever LED board temperature exceeds +90° F and to deactivate the system whenever LED board temperature falls to +85° F. Locate cooling fans so as not to hinder removal of LED display modules and driver boards.

Front Face Panel Defog/Defrost System – Provide the DMS with a defog/defrost system which circulates warm, fan-forced air across the inside of the polycarbonate front face whenever LED board temperature falls below a user-programmable threshold. Provide multiple steel ball-bearing fans that provide uniform airflow across the face panel. Program the field controller to activate the defog/defrost system whenever LED board temperature falls below +40° F and to deactivate the defog/defrost system whenever LED board temperature exceeds +106° F. Mount a 100-watt pencil-style heating element in front of each defog/defrost fan to warm the air directed across the DMS face. Design heating elements to be on only when the defog/defrost fans are on.

Install additional fans and/or heaters as needed to maintain the temperature inside the DMS enclosure within the operating temperature range of the equipment within the DMS enclosure as recommended by the equipment manufacturer(s).

3. Front Panel

Protect the DMS face with contiguous, weather-tight, removable panels. These panels must be a polycarbonate material that is ultraviolet protected, have an antireflection coating, and are a minimum of 1/8- inch thick.

Furnish polycarbonate panels with the following characteristics:

- Tensile Strength, Ultimate: 10,000 PSI
- Tensile Strength, Yield: 9,300 PSI
- Tensile Strain at Break: 125%
- Tensile Modulus: 330,000 PSI
- Flexural Modulus: 330,000 PSI
- Impact Strength, Izod (1/8", notched): 17 ft-lbs/inch of notch
- Rockwell Hardness: M75, R118
- Heat Deflection Temperature Under Load: 264 PSI at 270F and 66 PSI at 288F
- Coefficient of Thermal Expansion: 3.9X10-5 in/in/F
- Specific Heat: 0.30 BTU/lb/F
- Initial Light Transmittance: 85% minimum
- Change in Light Transmittance, 3 years exposure in a Southern latitude: 3%
- Change in Yellowness Index, 3 years exposure in a Southern latitude: less than 5%

For substitutes, submit one 12" x 12" sample of the proposed material together with a description of the material attributes to the Engineer for review and approval. Install a .09" aluminum mask on the front of the panel (facing the motorists) that contains a circular opening for each LED pixel. Prime and coat the front side of the aluminum mask, which faces the viewing motorists, with automotive-grade flat black acrylic enamel paint or an approved equivalent. Guarantee all painted surfaces provide a minimum outdoor service life of 20 years.

Design the panels so they will not warp nor reduce the legibility of the characters. Differential expansion of the DMS housing and the front panel must not cause damage to any DMS component or allow openings for moisture or dust. Glare from sunlight, roadway lighting, commercial lighting, or vehicle headlights must not reduce the legibility or visibility of the DMS. Install the panels so that a maintenance person can easily remove or open them for cleaning.

4. Display Modules

Manufacture each display module with a standard number of pixels, not to exceed an array of 9 x 5, which can be easily removed. Assemble the modules onto the DMS assemblies contiguously to form a continuous matrix to display the required number of lines, characters, and character height.

Design display modules that are interchangeable and replaceable without using special tools. Provide plug-in type power and communication cables to connect to a display module.

Construct each display module as a rectangular array of 5 horizontal pixels by 7 to 9 vertical pixels. Provide the module with an equal vertical and horizontal pitch between pixels, and columns that are perpendicular to the rows (i.e., no slant). Design each module to display:

- All upper and lower case letters.
- All punctuation marks.
- All numerals 0 to 9.
- Special user-created characters.

Display upper-case letters and numerals over the complete height of the module. Optimize the LED grouping and mounting angle within a pixel for maximum readability.

Furnish two (2) spare display modules per each DMS installed for emergency restoration.

5. Discrete LEDs

Provide discrete LEDs with a nominal viewing cone of **30 degrees** with a half-power angle of 15 degrees measured from the longitudinal axis of the LED. Make certain, the viewing cone tolerances are as specified in the LED manufacturer's product specifications and do not exceed +/- 3 degrees half-power viewing angle of 30 degrees.

Provide LEDs that are untinted, non-diffused, high output solid state lamps utilizing indium gallium aluminum phosphide (InGaAlP) technology. No substitutions will be allowed. Provide T1 ¾, 0.2 inch size LEDs that emit a true amber color at a wavelength of 590 ± 5 nm.

Provide LEDs with a MTBF (Mean Time Before Failure) of at least 100,000 hours of permanent use at an operating point of 140° F or below at a specific forward current of 20mA. Discrete LED failure is defined as the point at which the LED's luminous intensity has degraded to 50% or less of its original level.

Obtain the LEDs used in the display from a single LED manufacturer that have a single part number. Obtain them from batches sorted for luminous output, where the highest luminosity LED is not more than fifty percent more luminous than the lowest luminosity LED when the LEDs are driven at the same forward current. Do not use more than two successive and overlapping batches in the LED display. Document the procedure to be used to comply with this requirement as part of the material submittal.

Individually mount the LEDs on circuit boards that are at least 1/16" thick FR-4 fiberglass, flat black printed circuit board in a manner that promotes cooling. Protect all exposed metal on both sides of the LED pixel board (except the power connector) from water and humidity exposure by a thorough application of acrylic conformal coating. Design the boards so bench level repairs to individual pixels, including discrete LED replacement and conformal coating repair is possible.

Operate the LED display at a low internal DC voltage not to exceed 24 Volts.

Design the LED display operating range to be –20° F to +140° F at 95% relative humidity, non-condensing.

Supply the LED manufacturer's technical specification sheet with the material submittals.

6. LED Power Supplies

Power the LED Display by means of multiple regulated switching DC power supplies that operate from 120 volts AC input power and have an output of 48 volts DC or less. Wire the supplies in a redundant parallel configuration that uses multiple power supplies per display. Provide the supplies with current sharing capability that allows equal amounts of current to their portion of the LED display. Provide power supplies rated such that if one supply fails the remaining supplies will be able to operate their portion of the display under full load conditions (i.e. all pixels on at maximum brightness) and at a temperature of 140° F.

Provide power supplies to operate within a minimum input voltage range of +90 to +135 volts AC and within a temperature range of –22° F to 140° F. Power supply output at 140° F must not deteriorate to less than 65% of its specified output at 70° F. Provide power supplies that are overload protected by means of circuit breakers, that have an efficiency rating of at least 75%, a power factor rating of at least .95, and are UL listed. Provide all power supplies from the same manufacturer and with the same model number. Design the power driver circuitry to minimize power consumption.

Design the field controller to monitor the operational status (normal or failed) of each individual power supply and be able to display this information on the Client Computer screen.

7. LED Pixels

A pixel is defined as the smallest programmable portion of a display module that consists of a cluster of closely spaced discrete LEDs. Design each pixel to be a maximum of 2 inches in diameter.

Construct the pixels with two strings of LEDs. It is the manufacturer's responsibility to determine the number of LEDs in each string to produce the candela requirement as stated herein.

Ensure each pixel produces a luminous intensity of 40 Cd when driven with an LED drive current of 20 mA per string.

Power the LEDs in each pixel in strings. Use a redundant design so that the failure of an LED in one string does not affect the operation of any other string within the pixel. Provide the sign controller with the ability to detect the failure of any LED string and identify which LED string has failed. Submit a complete schematic of the LED power and driver circuits with the material submittals.

8. Character Display

Design display modules to be easily removable without the use of tools. Position cooling fans so they do not prevent removal of an LED pixel board or driver board.

Use continuous current to drive the LEDs at the maximum brightness level. Design the light levels to be adjustable for each DMS / controller so the Engineer may set levels to match the luminance requirements at each installation site.

Design the controller to automatically detect failed LED strings or drivers and initiate a report of the event to the Control Software. Design the controller to be able to read the internal temperature of the DMS enclosure and the ambient temperature outside the DMS enclosure and report these to the Control Software.

9. Display Capabilities

Design the DMS with at least the following message displays:

- Static display
- Flashing display with Dynamic flash rates
- At least two alternating Static and / or Flashing sequences (multi-page messages)

10. DMS Mini Controller

Furnish and install a mini controller inside the DMS that is interconnected with the main controller using a fiber optic cable, CAT-5 cable, or an approved alternate. The mini controller will enable a technician to perform all functions available from the main controller. Provide the mini controller with an LCD/keypad interface. Size the LCD display screen to allow preview of an entire one-page message on one screen. Provide a 4 X 4 keypad.

Alternatively, install an EIA/TIA-232E port inside the DMS enclosure to enable a maintenance technician to communicate with the DMS main controller and obtain access to and perform all functions of the main controller using a laptop computer.

C. DMS Enclosure Structure Mounting

Mount the DMS enclosure and interconnect system securely to the supporting structures. Design the DMS enclosure supports and structure to allow full access to the DMS enclosure inspection door.

Furnish and install U-bolt connections of hanger beams to overhead assembly truss chords with a double nut at each end of the U-bolt. Bring the double nuts tight against each other by the use of two wrenches.

Submit plans for the DMS enclosure, structure, mounting description and calculations to the Engineer for approval. Have such calculations and drawings approved by a Professional Engineer registered in the state of North Carolina, and bear his signature, seal, and date of acceptance.

Provide removable lifting eyes or the equivalent on the DMS enclosure rated for its total weight to facilitate handling and mounting the DMS enclosure.

Design the DMS structure to conform to the applicable requirements of the *Standard Specifications for Structural Supports for Highway Signs, Luminaires*, and the section titled "DMS Assemblies" of these Project Special Provisions.

D. DMS / DMS Controller Interconnect

Furnish and install all necessary cabling, conduit, and terminal blocks to connect the DMS and the DMS controller. Use approved manufacturer's specifications and the Plans for cable and conduit types and sizes. Use fiber optic cable to interconnect sign and controller. Install fiber optic interconnect centers in the sign enclosure and cabinet to securely install and terminate the fiber optic cable. Submit material submittal cut sheets for the interconnect center.

E. DMS Controller and DMS Cabinet

Furnish and install one DMS controller with accessories per DMS in a protective cabinet. Mount the controller cabinet on the DMS support structure. Install cabinet so that the height from the ground to the middle of the cabinet is 4 feet. Ensure a minimum of 3 feet level working surface under each cabinet that provides maintenance technicians with a safe working environment.

Provide the DMS controller as a software-oriented microprocessor and with resident software stored in non-volatile memory. The Control Software, controller and communications must comply with the NTCIP Standards identified in these Project Special Provisions. Provide sufficient non-volatile memory to allow storage of at least 500 multi-page messages and a test pattern program.

Furnish the controller cabinet with, but not limited to, the following:

- Power supply and distribution assemblies
- Power line filtering hybrid surge protectors
- Radio Interference Suppressor
- Communications surge protection devices
- Industrial-Grade UPS system and local disconnect
- Microprocessor-based controller
- Display driver and control system (unless integral to the DMS)
- Industrial-grade telephone line surge and lightning protector
- Serial interface port for local laptop computer
- Local user interface
- Interior lighting and duplex receptacle
- Adjustable shelves as required for components
- Temperature control system
- All interconnect harnesses, connectors, and terminal blocks
- All necessary installation and mounting hardware

Furnish the DMS controller and associated equipment completely housed in a NEMA 3R cabinet made from 5052-H32 sheet aluminum at least 1/8" thick. Use natural aluminum cabinets. Perform all welding of aluminum and aluminum alloys in accordance with the latest edition of AWS D1.2, Structural Welding Code - Aluminum. Continuously weld the seams using Gas Metal Arc Welding (GMAW).

Slant the cabinet roof away from the front of the cabinet to prevent water from collecting on it.

Do not place a manufacturer name, logo, or other information on the faces of the controller cabinet visible to the motorist.

Provide cabinets capable of housing the components and sized to fit space requirement. Design the cabinet layout for ease of maintenance and operation, with all components easily accessible. Submit a cabinet layout plan for approval by the Engineer.

Locate louvered vents with filters in the cabinet to direct airflow over the controller and auxiliary equipment, and in a manner that prevents rain from entering the cabinet. Fit the inside of the cabinet, directly behind the vents, with a replaceable, standard-size, commercially available air filter of sufficient size to cover the entire vented area.

Provide a torsionally rigid door with a continuous stainless steel hinge on the side that permits complete access to the cabinet interior. Provide a gasket as a permanent and weather resistant seal at the cabinet door and at the edges of the fan / exhaust openings. Use a non-absorbent gasket material that will maintain its resiliency after long-term exposure to the outdoor environment. Construct the doors so that they fit firmly and evenly against the gasket material when closed. Provide the cabinet door with louvered vents and air filters near the bottom as described in the paragraph above.

The cabinet shall contain a full-height standard EIA 19-inch rack. The rack shall be secured within the cabinet by mounts at the top and bottom.

The rack shall contain a minimum of one (1) pullout drawer. The drawer shall be suitable for storing manuals and small tools, such as screwdrivers. The drawer shall be able to latch in the out position to function as a laptop/utility shelf.

Provide a convenient location on the inside of the door to store the cabinet wiring diagrams and other related cabinet drawings. Provide a Corbin #2 main door lock made of non-ferrous or stainless steel material. Key all locks on the project alike, and provide 10 keys to the Engineer. In addition, design the handle to permit pad-locking.

Provide the interior of the cabinet with ample space for housing the controller and all associated equipment and wiring; use no more than 75% of the useable space in the cabinet. Provide ample space in the bottom of the cabinet for the entrance and exit of all power, communications, and grounding conductors and conduit.

Arrange the equipment so as to permit easy installation of the cabling through the conduit so that they will not interfere with the operation, inspection, or maintenance of the unit. Provide adjustable metal shelves, brackets, or other support for the controller unit and auxiliary equipment. Leave a 3 inch minimum clearance from the bottom of the cabinet to all equipment, terminals, and bus bars.

Provide power supply monitoring circuitry to detect power failure and to automatically report the occurrence to the Control Software.

Install two 15-watt fluorescent light strips with shields, one in the top of the cabinet and the other under the bottom shelf. Design both lights to automatically turn on when the cabinet door is opened and turn off when the door closes.

Mount and wire a 120V (±10%) GFCI duplex receptacle of the 3-wire grounding type in the cabinet in a location that presents no electrical hazard when used by service personnel for the operation of power tools and work lights.

<u>No cabinet resident equipment may utilize the GFCI receptacle. Furnish one spare non-GFCI receptacle for future equipment.</u>

Mount a bug-proof and weatherproof thermostatically controlled fan and safety shield in the top of the cabinet. Size the fan to provide at least for two air exchanges per minute. Fuse the fan at 125% of the capacity of the motor. The magnetic field of the fan motor must not affect the performance of the control equipment. Use a fan thermostat that is manually adjustable to turn on between 80°F and 160°F with a differential of not more than 10°F between automatic turn-on and turn-off. Mount it in an easily accessible location, but not within 6 inches of the fan.

Install additional fans and/or heaters as needed to maintain the temperature inside the cabinet within the operating temperature range of the equipment within the cabinet as recommended by equipment manufacturer(s).

1. Wiring

The requirements stated herein apply wherever electrical wiring is needed for any DMS system assemblies and subassemblies such as controller cabinet, DMS enclosure, electrical panel boards and etc.

Neatly arrange and secure the wiring inside the cabinet. Where cable wires are clamped to the walls of the control cabinet, provide clamps made of nylon, metal, plastic with rubber or neoprene protectors, or similar. Lace and jacket all harnesses, or tie them with nylon tie wraps spaced at 6 inches maximum to prevent separation of the individual conductors.

Individually and uniquely label all conductors. Ensure all conductor labels are clearly visible without moving the conductor. Connect all terminal conductors to the terminal strip in right angles. Remove excess conductor before termination of the conductor. Mold the conductor in such a fashion as to retain its relative position to the terminal strip if removed from the strip. Do not run a conductor across a work surface with the exception of connecting to that work surface. No conductor bundles can be support by fasteners that support work surfaces. Install all connectors, devices and conductors in accordance to manufactures guidelines. Comply with the latest NEC guideline in effect during installation. No conductor or conductor bundle may hang loose or create a snag hazard. Protect all conductors from damage. Ensure all solder joints are completed using industry accepted practices and will not fail due to vibration or movement. Protect lamps and control boards from damage.

No splicing will be allowed for feeder conductors and communication cables from the equipment cabinet to the DMS enclosure.

Insulate all conductors and live terminals so they are not hazardous to maintenance personnel.

Route and bundle all wiring containing line voltage AC and / or shield it from all low voltage control circuits. Install safety covers to prevent accidental contact with all live AC terminals located inside the cabinet.

Use industry standard, keyed-type connectors with a retaining feature for connections to the controller.

Label all equipment and equipment controls clearly.

Supply each cabinet with one complete set of wiring diagrams that identify the color-coding or wire tagging used in all connections. Furnish a water-resistant packet adequate for storing wiring diagrams, operating instructions, and maintenance manuals with each cabinet.

2. Power Supply and Circuit Protection

Design the DMS and controller for use on a system with a line voltage of 120V $\pm$ 10% at a frequency of 60 Hz $\pm$ 3 Hz. Under normal operation, do not allow the voltage drop between no load and full load of the DMS and its controller to exceed 3% of the nominal voltage.

Blackout, brownout, line noise, chronic over-voltage, sag, spike, surge, and transient effects are considered typical AC voltage defects. Protect the DMS system equipment so that these defects do not damage the DMS equipment or interrupt their operation. Equip all cabinets with devices to protect the equipment in the cabinet from damage due to lightning and external circuit power and current surges.

3. Circuit Breakers

Protect the DMS controller, accessories, and cabinet utilities with thermal magnetic circuit breakers. Provide the controller cabinet with a main circuit breaker sized according to the NEC. Use appropriately sized branch circuit breakers to protect the controller and accessories and for servicing DMS equipment and cabinet utilities.

4. Surge Suppressor

Install and clearly label filtering hybrid power line surge protectors on the load side of the branch circuit breakers in a manner that permits easy servicing. Ground and electrically bond the surge protector to the cabinet within 2 inches.

Provide power line surge protector that meets the following requirements:

Peak surge current occurrences	20 minimum
Peak surge current for an 8 x 20 microsecond waveshape	50,000 amperes
Energy Absorption	> 500 Joules
Clamp voltage	240 volts
Response time	<1 nanosecond
Minimum current for filtered output	15 amperes for 120VAC*
Temperature range	-40°F to +158°F

*Capable of handling the continuous current to the equipment

5. Radio Interference Suppressor

Provide each controller cabinet with sufficient electrical and electronic noise suppression to enable all equipment in it to function properly. Provide one or more radio interference suppressors (RIS) connected between the stages of the power line surge suppressor that minimize interference generated in the cabinet in both the broadcast and the aircraft frequencies. Each RIS must provide a minimum attenuation of 50 decibels over a frequency range of 200 KHz to 75 MHz. Clearly label the suppressor(s) and size them at least at the rated current of the main circuit breaker but not less than 50 amperes.

Provide RIS that are hermetically sealed in a substantial metal case which is filled with a suitable insulating compound and have nickel-plated 10/24 brass stud terminals of sufficient external length to provide space to connect #8 AWG wires. Mount them so that the studs cannot be turned in the case. Properly insulate ungrounded terminals from each other, and maintain a surface linkage distance of not less than ¼" between any exposed current conductor and any other metallic parts. The terminals must have an insulation factor of 100-200 MΩ, dependent on external circuit conditions. Use RIS designed for 120 VAC ± 10%, 60Hz, and which meet the standards of UL and the Radio Manufacturers Association.

6. Communications Surge Protector

Equip the cabinet with properly labeled hybrid data line surge protectors that meet the following general requirements:

Surge current occurrences at 2000 ampere, 8 x 20 microsecond waveform	> 80
Surge current occurrences at 400 ampere, 10x700 microsecond waveform	> 80
Peak surge current for 8 x 20 microsecond waveform	10,000 A (2500 A/line)
Peak surge current for 10x700 microsecond waveform	500 A/line
Response time	< 1 nanosecond
Series resistance	< 15 Ω
Average capacitance	1500 pF
Temperature range	-10°F to 150°F
Clamp Voltage	As required to match equipment in application

7. Lightning Arrester

Protect the system with an UL-approved lightning arrester installed at the main service disconnect that meets the following requirements:

Type of design	Silicon Oxide Varistor
Voltage	120/240 Single phase, 3 wires
Maximum current	100,000 amps
Maximum energy	3000 joules per pole
Maximum number of surges	Unlimited
Response time one milliamp test	5 nanoseconds
Response time to clamp 10,000 amps	10 nanoseconds
Response time to clamp 50,000 amps	25 nanoseconds
Leak current at double the rated voltage	None
Ground Wire	Separate

8. Uninterruptible Power Supply (UPS)

Provide the cabinet with an industrial grade power conditioning UPS unit to supply continuous power to operate the equipment connected to it if the primary power fails. The UPS must detect a power failure and provide backup power within 20 milliseconds. Transition to the UPS source from primary power must not cause loss of data or damage to the equipment being supplied with backup power. Provide an UPS with at least three outlets for supplying conditioned AC voltage to the DMS controller. Provide a unit to meet the following requirements:

- Input Voltage Range: 120VAC +12%, -25%
- Power Rating: 1000 VA, 700 Watts

- Input Frequency: 45 to 65 Hz
- Input Current: 7.2A
- Output Voltage: 120VAC +/- 3%
- Output Frequency: 50/60 +/-1 Hz
- Output Current: 8.3A
- Output Crest Factor Ration: @50% Load Up to 4.8:1
  @75% Load Up to 3.2:1
  @100% Load Up to 2.4:1
- Output THD: 3% Max. (Linear)
  5% Max. (Non-Linear)
- Output Overload: 110% for 10 min; 200% for 0.05 sec.
- Output Dynamic Response: +/- 4% for 100% Step Load Change
  0.5 ms Recovery Time.
- Output Efficiency @ 100% Load:90% (Normal Mode)
- Operating Temperature: -40 °F to +165 °F
- Humidity: 0% to 95% Non-condensing
- Remote Monitoring Interface: RS-232
- Protection: Input/Output Short Circuit
  Input/Output Overload
  Excessive Battery Discharge
- Specifications: UL1778, FCC Class A, IEEE 587

Provide the UPS unit capable of supplying 30 minutes of continuous backup power to the equipment connected to it when the equipment is operating at full load.

9. Controller Communications Interface

Provide the controller with the following interface ports:

- An EIA/TIA-232E port for remote communication using NTCIP
- An 10/100 Ethernet port for remote communication using NTCIP
- An EIA/TIA-232E port for onsite access using a laptop
- An EIA/TIA-232E auxiliary port for communication with a field device such as a UPS
- Fiber Optic ports for communication with the sign
- RJ45 ports for communication with the sign using CAT-5 cable
- RJ45 ports for communication with mini-controller located inside the sign enclosure

10. Controller Local User Interface

Provide the controller with a Local User Interface (LUI) for at least the following functions:

- On / Off Switch: controls power to the controller.
- Control Mode Switch: for setting the controller operation mode to either remote or local mode.
- LCD Display and Keypad: Allow user to navigate through the controller menu for configuration (display, communications parameter, etc) running diagnostics, viewing peripherals status, message creation, message preview, message activation, and etc. Furnish a LCD display with a minimum size of 240x64 dots with LED back light.

11. Controller Address

Assign each DMS controller a unique address. Preface all commands from the Control Software with a particular DMS controller address. The DMS controller compares its address with the address transmitted; if the addresses match, then the controller processes the accompanying data.

12. Controller Functions

Design the DMS controller to continuously control and monitor the DMS independent of the Control Software. Design the controller to display a message on the sign sent by the Control Software, a message stored in the sign controller memory, or a message created on-site by an operator using the controller keypad.

Provide the DMS controller with a watchdog timer to detect controller failures and to reset the microprocessor, and with a battery backed-up clock to maintain an accurate time and date reference. Set the clock through an external command from the Control Software or the Local User Interface.

13. DMS Controller Memory

Furnish each DMS controller with non-volatile memory. Use the non-volatile memory to store and reprogram at least one test pattern sequence and 500 messages containing a minimum of two pages of 45 characters per page. The Control Software can upload messages into and download messages from each controller's non-volatile memory remotely.

Messages uploaded and stored in the controller's non-volatile memory may be erased and edited using the Control Software and the controller. New messages may be uploaded to and stored in the controller's non-volatile memory using the Control Software and the controller.

F. Photo-Electric Sensors

Install three photoelectric sensors with ½ inch minimum diameter photosensitive lens inside the DMS enclosure. Use sensors that will operate normally despite continual exposure to direct sunlight. Place the sensors so they are accessible and field adjustable. Point one sensor north or bottom of the sign. Place the other two, one on the back wall and one on the front wall of the sign enclosure. Alternate designs maybe accepted, provided the sensor assemblies are accessible and serviceable from inside the sign enclosure.

Provide controls so that the Engineer can field adjust the following:

- The light level emitted by the pixels elements in each Light Level Mode.

- The ambient light level at which each Light Level Mode is activated.

G. Equipment List

Provide a general description of all equipment and all information necessary to describe the basic use or function of the major system components. Include a general "block diagram" presentation. Include tabular charts listing auxiliary equipment, if any is required. Include the nomenclature, physical and electrical characteristics, and functions of the auxiliary equipment unless such information is contained in an associated manual; in this case include a reference to the location of the information. Include an itemized list of equipment costs.

Include a table itemizing the estimated average and maximum power consumption for each major piece of equipment.

H. Physical Description

Provide a detailed physical description of size, weight, center of gravity, special mounting requirements, electrical connections, and all other pertinent information necessary for proper installation and operation of the equipment.

I. Parts List

Provide a parts list that contains all information needed to describe the characteristics of the individual parts, as required for identification. Include a list of all equipment within a group and a list of all assemblies, sub-assemblies, and replacement parts of all units. Arrange this data in a table, in alpha-numerical order of the schematic reference symbols, which gives the associated description, manufacturer's name, and part number, as well as alternate manufacturers and part numbers. Provide a table of contents or other appropriate grouping to identify major components, assemblies, etc.

J. Character Set Submittal

Submit an engineering drawing of the DMS character set including 26 upper case and lower case letters, 10 numerals, an asterisk (*), a dash, a plus sign (+), a designated lane diamond, a slash, an ampersand, and arrows at 0, 45, 90, 135, 180, 225, 270, and 315 degrees.

K. Wiring Diagrams

Provide a wiring diagram for each DMS and each controller cabinet, as well as interconnection wiring diagrams for the system as a whole.

Provide complete and detailed schematic diagrams to component level for all DMS assemblies and subassemblies such as driver boards, control boards, DMS controller, power supplies, and etc. Ensure that each schematic enables an electronics technician to successfully identify any component on a board or assemblies and trace its incoming and outgoing signals.

L. Routine of Operation

Describe the operational routine, from necessary preparations for placing the equipment into operation to securing the equipment after operation. Show appropriate illustrations with the sequence of operations presented in tabular form wherever applicable. Include in this section a total list of the test instruments, aids and tools required to perform necessary measurements and measurement techniques for each component, as well as set-up, test, and calibration procedures.

M. Maintenance Procedures

Specify the recommended preventative maintenance procedures and checks at pre-operation, monthly, quarterly, semi-annual, annual, and "as required" periods to assure equipment operates reliably. List specifications (including tolerances) for all electrical, mechanical, and other applicable measurements and / or adjustments.

N. Repair Procedures

Include in this section all data and step-by-step procedures necessary to isolate and repair failures or malfunctions, assuming the maintenance technicians are capable of analytical reasoning using the information provided in the section titled "Wiring Diagrams and Theory of Operation."

Describe accuracy, limits, and tolerances for all electrical, physical, or other applicable measurements. Include instructions for disassemblies, overhaul, and re-assemblies, with shop specifications and performance requirements.

Give detailed instructions only where failure to follow special procedures would result in damage to equipment, improper operation, danger to operating or maintenance personnel, etc. Include such instructions and specifications only for maintenance that specialized technicians and engineers in a modern electromechanical shop would perform. Describe special test set-up, component fabrication, and the use of special tools, jigs, and test equipment.

O. Field Trial

At the request of the Engineer, supply a three character demonstration module with characters of the size and type specified for the project, an appropriate control device and power supply to allow character display within 30 working days of the request. Perform a field trial on this module at a time and location selected by the Engineer.

This trial will allow the Engineer or his selected representatives to test the readability of the DMS at the maximum distance required for specified character size. Test the module with the sun directly above the DMS, and near the horizon in front of and behind the DMS (washout and back-lit conditions).

15.3. CONSTRUCTION METHODS

A. Description

This article establishes practices and procedures and gives minimum standards and requirements for the installation of Dynamic Message Sign systems, auxiliary equipment and the construction of related structures.

Provide electrical equipment described in this specification that conforms to the standards of NEMA, UL, or Electronic Industries Association (EIA), wherever applicable. Provide connections between controllers and electric utilities that conform to NEC standards. Express wire sizes according to the American Wire Gauge (AWG).

Provide stainless steel screws, nuts, and locking washers in all external locations. Do not use self-tapping screws unless specifically approved by the Engineer. Use parts made of corrosion-resistant materials, such as plastic, stainless steel, brass, or aluminum. Use construction materials that resist fungus growth and moisture deterioration. Separate dissimilar metals by an inert dielectric material.

B. Layout

The Engineer will establish the actual location of each Dynamic Message Sign assemblies. It is the Contractor's responsibility to ensure proper elevation, offset, and orientation of all DMS assemblies. The location of service poles as well as conduit lengths shown in the Plans, are approximate based on available project data. Make actual field measurements to place conduit and equipment at the required location.

C. Construction Submittal

When the work is complete, submit "as built" plans, inventory sheets, and any other data required by the Engineer to show the details of actual construction and installation and any modifications made during installation.

The "as built" plans will show: the DMS, controller, and service pole locations; DMS enclosure and controller cabinet wiring layouts; and wire and conduit routing. Show all underground conduits and cables dimensioned from fixed objects.

Include detailed drawings that identify the routing of all conductors in the system by cable type, color code, and function. Clearly label all equipment in the DMS system, controller cabinet, and DMS enclosure.

D. Conduit

Install the conduit system in accordance with section 1715 of Standard Specification and NEC requirements for an approved watertight raceway.

Make bends in the conduit so as not to damage it or change its internal diameter. Install watertight and continuous conduit with as few couplings as standard lengths permit.

Clean conduit before, during, and after installation. Install conduit in such a manner that temperature changes will not cause elongation or contraction that might damage the system.

Attach the conduit system to and install along the structural components of the DMS structure assemblies with beam clamps or stainless steel strapping. Install strapping according to the strapping manufacturer's recommendations. Do not use welding or drilling to fasten conduit to structural components. Space the fasteners at no more than 4 feet for conduit 1.5 inches and larger or 6 feet for conduit smaller than 1.25 inches. Place fasteners no more than 3 feet from the center of bends, fittings, boxes, switches, and devices.

Flexible conduit will only be allowed when the conduits transition from the horizontal structure segment to the horizontal truss segment and from the horizontal truss segment to the rear entrance of the DMS when installing the DMS communications and feeder cables. The maximum length of flexible conduit allowed at each transition will be 5 feet.

Locate underground conduit as shown in the Plans in a manner consistent with these Project Special Provisions.

Do not exceed the appropriate fill ratio on all cable installed in conduit as specified in the NEC.

E. Wiring Methods

Do not pull permanent wire through a conduit system until the system is complete and has been cleaned.

Color-code all conductors per the NEC. Use approved marking tape, paint, sleeves or continuous colored conductors for No.8 AWG and larger. Do not mark a white conductor in a cable assemblies any other color.

Bury underground circuits at the depth shown in the Plans and surround it with at least 3 inches of sand or earth back-fill free of rocks and debris. Compact backfill in 6 inch layers. Do not splice underground circuits unless specifically noted in the Plans.

F. Equipment and Cabinet Mounting

Mount equipment securely at the locations shown in the Plans, in conformance with the dimensions shown. Install fasteners as recommended by the manufacturer and space them evenly. Use all mounting holes and attachment points for attaching DMS enclosures and controller cabinets to the structures.

Drill holes for expansion anchors of the size recommended by the manufacturer of the anchors and thoroughly clean them of all debris.

Provide one key-operated, pin tumbler, dead bolt padlock, with brass or bronze shackle and case, conforming to Military Specification MIL-P-17802E (Grade I, Class 2, Size 2, Style A) for each electrical panel and switch on the project. Key all padlocks alike, and provide 10 keys to the Engineer.

Provide cabinets with all mounting plates, anchor bolts, and any other necessary mounting hardware in accordance with these Project Special Provisions and the Plans.

Seal all unused conduit installed in cabinets at both ends to prevent water and dirt from entering the conduit and cabinet with approved sealing material.

Install a ground bushing attached inside the cabinet on all metal conduits entering the cabinet. Connect these ground bushings to the cabinet ground bus.

G. Work Site Clean-Up

Clean the site of all debris, excess excavation, waste packing material, wire, etc. Clean and clear the work site at the end of each workday. Do not throw waste material in storm drains or sewers.

15.4. MEASUREMENT AND PAYMENT

DMS will be measured and paid as the actual number of DMS furnished, installed, and accepted. Each DMS consists of a LED Dynamic Message Sign, spare display modules, communications equipment, strapping hardware, controller, UPS, controller cabinet, conduit, fittings, couplings, sweeps, conduit bodies, wire, flexible conduit, feeder conductors and communications cable between the controller cabinet and the DMS enclosure, connectors, circuit protection equipment, photo-electric sensors, tools, materials, all related testing, cost of labor, cost of transportation, incidentals, and all other equipment necessary to furnish and install the DMS system.

Payment will be made under:

Pay Item	Pay Unit
DMS	Each

16. NTCIP REQUIREMENTS

This section defines the detailed NTCIP requirements for the DMSs covered by these Project Special Provisions and Plans.

16.1. REFERENCES

This specification references several standards through their NTCIP designated names. The following list provides the full reference to the current version of each of these standards.

Implement the most recent version of the standard including any and all Approved or Recommended Amendments to these standards for each NTCIP Component covered by these project specifications.

Table 1: NTCIP Standards

Abbreviated Number	Full Number	Title
NTCIP 1101	**NTCIP 1101:1997**	*Simple Transportation Management Framework*
NTCIP 1201	**NTCIP 1201:1997**	*Global Object Definitions*
NTCIP 1203	**NTCIP 1203:1997**	*Object Definitions for Dynamic Message Signs*
NTCIP 2001	**NTCIP 2001:1997**	*Class B Profile*
NTCIP 2101	**NTCIP 2101**	*SP-PMPP/232* *Subnet Profile for PMPP over RS-232*
NTCIP 2102	**NTCIP 2102**	*SP-PMPP/FSK* *Subnet Profile for PMPP over FSK Modem*
NTCIP 2103	**NTCIP 2103**	*SP-PPP/232* *Subnetwork Profile for PPP over RS232 (Dial Up)*
NTCIP 2104	**NTCIP 2104**	*SP-Ethernet* *Subnet Profile for Ethernet*

Abbreviated Number	Full Number	Title
NTCIP 2201	**NTCIP 2201**	*TP-Null* *Transport Profile*
NTCIP 2202	**NTCIP 2202**	*TP-Internet* *Internet Transport Profile (TCP/IP and UDP/IP)*
NTCIP 2301	**NTCIP 2301**	AP-STMF AP for Simple Transportation Management Framework

A. General Requirements

Subnet Level

Ensure each serial port on each NTCIP Component supports NTCIP 2103 over a dial-up connection with a contractor provided external modem with data rates of 28.8 kbps, 19.2 kbps, 14.4 kbps, 9600 bps, 4800 bps, 2400 bps, 1200 bps, 600 bps, and 300 bps. Enable the NTCIP Component to make outgoing and receive incoming calls as necessary and support the following modem command sets:

- Hayes AT - Command Set
- MNP5
- MNP10
- V.42bis

Ensure each serial port on each NTCIP Component supports NTCIP 2103 over a null-modem connection with data rates of 19.2 kbps, 14.4 kbps, 9600 bps, 4800 bps, 2400 bps, 1200 bps, 600 bps, and 300 bps.

Ensure each serial port on each NTCIP Component supports NTCIP 2101 with data rates of 9600 bps, 4800 bps, 2400 bps, 1200 bps, 600 bps, and 300 bps.

Ensure NTCIP components support NTCIP 2102 and NTCIP 2104.

NTCIP Components may support additional Subnet Profiles at the manufacturer's option. At any one time, make certain only one Subnet Profile is active on a given serial port of the NTCIP Component. Ensure the NTCIP Component can be configured to allow the field technician to activate the desired Subnet Profile and provide a visual indication of the currently selected Subnet Profile.

Transport Level

Ensure each NTCIP Component complies with NTCIP 2201 and 2202.

NTCIP Components may support additional Transport Profiles at the manufacturer's option. Ensure Response datagrams use the same Transport Profile used in the request. Ensure each NTCIP

Component supports the receipt of datagrams conforming to any of the identified Transport Profiles at any time.

Application Level

Ensure each NTCIP Component complies with NTCIP 1101 and 2301 and meets the requirements for Conformance Level 1 (NOTE - See Amendment to standard).

Ensure each NTCIP Component supports SNMP traps. An NTCIP Component may support additional Application Profiles at the manufacturer's option. Ensure Responses use the same Application Profile used by the request. Ensure each NTCIP Component supports the receipt of Application data packets at any time allowed by the subject standards.

Information Level

Guarantee each NTCIP Component provides Full, Standardized Object Range Support of all objects required by these Special Provisions unless otherwise indicated below. Make certain the maximum Response Time for any object or group of objects is 200 milliseconds.

Design the DMS to support all mandatory objects of all mandatory Conformance Groups as defined in NTCIP 1201 and NTCIP 1203. Table 2 indicates the modified object requirements for these mandatory objects.

Table 2: Modified Object Ranges for Mandatory Objects

Object	Reference	Project Requirement
ModuleTableEntry	NTCIP 1201 Clause 2.2.3	Contains at least one row with moduleType equal to 3 (software). The moduleMake specifies the name of the manufacturer, the moduleModel specifies the manufacturer's name of the component and the modelVersion indicates the model version number of the component.
MaxGroupAddresses	NTCIP 1201 Clause 2.7.1	At least 1
CommunityNamesMax	NTCIP 1201 Clause 2.8.2	At least 3
DmsNumPermanentMsg	NTCIP 1203 Clause 2.6.1.1.1.1	At least 1*
DmsMaxChangeableMsg	NTCIP 1203 Clause 2.6.1.1.1.3	At least 21
DmsFreeChangeableMemory	NTCIP 1203 Clause 2.6.1.1.1.4	At least 20 when no messages are stored.

Object	Reference	Project Requirement
DmsMessageMultiString	NTCIP 1203 Clause 2.6.1.1.1.8.3	The DMS supports any valid MULTI string containing any subset of those MULTI tags listed in Table 4
DmsControlMode	NTCIP 1203 Clause 2.7.1.1.1.1	Support at least the following modes: Local External central CentralOverride

* Ensure the Permanent Messages display the content shown in Table 3.

Ensure the sign blanks if a command to display a message contains an invalid Message CRC value for the desired message.

Table 3: Content of Permanent Messages

Perm. Msg. Num.	Description
1	Permanent Message #1 blanks the display (i.e., consist of and empty MULTI string). It has a run-time priority of one (1).

Table 4: Required MULTI Tags

Code	Feature
f1	field 1 - time (12hr)
f2	field 2 - time (24hr)
f8	field 8 – day of month
f9	field 9 – month
f10	field 10 - 2 digit year
f11	field 11 - 4 digit year
fl (and /fl)	flashing text on a line by line basis with flash rates controllable in 0.5 second increments.
fo	Font

Code	Feature
jl2	Justification – line – left
jl3	Justification – line – center
jl4	Justification – line – right
jl5	Justification – line – full
jp2	Justification – page – top
jp3	Justification – page – middle
jp4	Justification – page – bottom
Mv	moving text
Nl	new line
Np	new page, up to 2 instances in a message (i.e., up to 3 pages/frames in a message counting first page)
Pt	page times controllable in 0.5 second increments.

The NTCIP Component implements all mandatory and optional objects of the following optional conformance groups with FSORS.

Test Heading

a. Time Management

As defined in NTCIP 1201

b. Timebase Event Schedule

As defined in NTCIP 1201. The following list indicates the modified object requirements for this conformance group.

Table 5: Modified Object Ranges for the Timebase Event Schedule Conformance Group

Object	Reference	Project Requirement
MaxTimeBaseScheduleEntries	NTCIP 1201 Clause 2.4.3.1	At least 28
maxDayPlans	NTCIP 1201 Clause 2.4.4.1	At least 14
maxDayPlanEvents	NTCIP 1201 Clause 2.4.4.2	At least 10

c. Report

As defined in NTCIP 1201. The following list indicates the modified object requirements for this conformance group.

Table 6: Modified Object Ranges for the Report Conformance Group

Object	Reference	Project Requirement
maxEventLogConfigs	NTCIP 1201 Clause 2.5.1	At least 50
eventConfigurationMode	NTCIP 1201 Clause 2.4.3.1	The NTCIP Component supports the following Event Configuration Modes: onChange greaterThanValue smallerThanValue
MaxEventLogSize	NTCIP 1201 Clause 2.5.3	At least 200
MaxEventClasses	NTCIP 1201 Clause 2.5.5	At least 16

d. PMPP

e. Font Configuration

As defined in NTCIP 1203. The following list indicates the modified object requirements for this conformance group.

Table 7: Modified Object Ranges for the Font Configuration Conformance Group

Object	Reference	Project Requirement
NumFonts	NTCIP 1203 Clause 2.4.1.1.1.1	At least 4*
MaxFontCharacters	NTCIP 1203 Clause 2.4.1.1.1.3	At least 127**

*Upon delivery, the first font is a standard 18" font. The second font is a double-stroke 18" font. The third font is a 28" font. The fourth font is empty.

**Upon delivery, the first three font sets are configured in accordance with the ASCII character set for the following characters:

- "A" thru "Z"- All upper case letters.
- "0" thru "9"- All decimal digits.
- Space (i.e., ASCII code 0x20).
- Punctuation marks shown in brackets [. , ! ? - ' ' " " / ( )]
- Special characters shown in brackets [# & * +< >]

f. DMS Configuration

As defined in NTCIP 1203.

g. MULTI Configuration

As defined in NTCIP 1203. The following list indicates the modified object requirements for this conformance group.

Table 8: Modified Object Ranges for the MULTI Configuration Conformance Group

Object	Reference	Project Requirement
DefaultBackgroundColor	NTCIP 1203 Clause 2.5.1.1.1.1	The DMS supports the following background colors: black
DefaultForegroundColor	NTCIP 1203 Clause 2.5.1.1.1.2	The DMS supports the following foreground colors: amber
DefaultJustificationLine	NTCIP 1203 Clause 2.5.1.1.1.6	The DMS supports the following forms of line justification: left center right full
defaultJustificationPage	NTCIP 1203 Clause 2.5.1.1.1.7	The DMS supports the following forms of page justification: top middle bottom
defaultPageOnTime	NTCIP 1203 Clause 2.5.1.1.1.8	The DMS supports the full range of these objects with step sizes no larger than 0.5 seconds
defaultPageOffTime	NTCIP 1203 Clause 2.5.1.1.1.9	The DMS supports the full range of these objects with step sizes no larger than 0.5 seconds
defaultCharacterSet	NTCIP 1203 Clause 2.5.1.1.1.10	The DMS supports the following character sets: eightBit

h. Default Message Control as defined in NTCIP 1203

i. Pixel Service Control as defined in NTCIP 1203

j. **MULTI Error Control** as defined in NTCIP 1203

k. **Illumination/Brightness Control**

As defined in NTCIP 1203. The following list indicates the modified object requirements for this conformance group.

Table 9: Modified Object Ranges for the Illumination/Brightness Control Conformance Group

Object	Reference	Project Requirement
dmsIllumControl	NTCIP 1203 Clause 2.8.1.1.1.1	The DMS supports the following illumination control modes: photocell timer manual
dmsIllumNumBrightLevels	NTCIP 1203 Clause 2.8.1.1.1.4	At least 16

l. **Auxiliary I/O**

m. **Scheduling**

As defined in NTCIP 1203. The following list indicates the modified object requirements for this conformance group.

Table 10: Modified Object Ranges for the Scheduling Conformance Group

Object	Reference	Project Requirement
NumActionTableEntries	NTCIP 1203 Clause 2.9.1.1.1.1	At least 21

n. **Sign Status** as defined in NTCIP 1203

o. **Status Error** as defined in NTCIP 1203

p. **Pixel Error Status** as defined in NTCIP 1203

q. **Fan Error Status** as defined in NTCIP 1203

r. **Power Status as** defined in NTCIP 1203

s. **Temperature Status** as defined in NTCIP 1203

Install necessary hardware for the support of items q, r, and s above.

Table 11: Some Optional Object Requirements

Object	Reference	Project Requirement
DefaultFlashOn	NTCIP 1203 Clause 2.5.1.1.1.3	The DMS supports the full range of these objects with step sizes no larger than 0.5 seconds
DefaultFlashOff	NTCIP 1203 Clause 2.5.1.1.1.4	The DMS supports the full range of these objects with step sizes no larger than 0.5 seconds
DmsMultiOtherErrorDescription	NTCIP 1203 Clause 2.7.1.1.1.20	If the vendor implements any vendor-specific MULTI tags, the DMS shall provide meaningful error messages within this object whenever one of these tags generates an error.

Documentation

Supply software with full documentation, including a CD-ROM containing ASCII versions of the following MIB files in Abstract Syntax Notation 1 (ASN.1) format:

- The relevant version of each official standard MIB Module referenced by the device functionality.
- If the device does not support the full range of any given object within a Standard MIB Module, a manufacturer specific version of the official Standard MIB Module with the supported range indicated in ASN.1 format in the SYNTAX and/or DESCRIPTION fields of the associated OBJECT TYPE macro. Name this file identical to the standard MIB Module, except that it will have the extension ".man".
- A MIB Module in ASN.1 format containing any and all manufacturer-specific objects supported by the device with accurate and meaningful DESCRIPTION fields and supported ranges indicated in the SYNTAX field of the OBJECT-TYPE macros.
- A MIB containing any other objects supported by the device.

Allow the use of any and all of this documentation by any party authorized by the Department for systems integration purposes at any time initially or in the future, regardless of what parties are involved in the systems integration effort.

B. NTCIP Acceptance Testing

Test the NTCIP requirements outlined above by a third party testing firm. Submit to the Engineer for approval a portfolio of the selected firm. Include the name, address, and a history of the selected firm in performing NTCIP testing along with references. Also provide a contact person's name and phone number. Submit detailed NTCIP testing plans and procedures, including a list of hardware

and software, to the Engineer for review and approval 10 days in advance of a scheduled testing date. Develop test documents based on the NTCIP requirements of these Project Special Provisions. The acceptance test will use the NTCIP Exerciser, and/or other authorized testing tools and will follow the guidelines established in the ENTERPRISE Test Procedures. Conduct the test in North Carolina on the installed system in the presence of the Engineer. Document and certify the results of the test by the firm conducting the test and submit the Engineer for review and approval. In case of failures, remedy the problem and have the firm retest in North Carolina. Continue process until all failures are resolved. The Department reserves the right to enhance these tests as deemed appropriate to ensure device compliance.

16.2. MEASUREMENT AND PAYMENT

There will be no direct payment for the work covered by this section.

Payment for this work will be covered in the applicable sections of these Project Special Provisions at the contract unit price for "DMS" and will be full compensation for all work listed above.

17. DMS ASSEMBLIES

17.1. DESCRIPTION

This section includes all design, fabrication, furnishing, and erection of the DMS assemblies, platforms, walkways, CCTV extension poles, ladders for access to the DMS inspection doors, and attachment of the DMS enclosures to the structures in accordance with the requirements of these Project Special Provisions and the Plans. Fabricate the supporting DMS assemblies from tubular steel. Furnish pedestal type DMS assemblies as shown in the Plans. Furnish one pedestal type, back-to-back DMS assembly as shown in the Plans.

Provide pedestal DMS structures with a minimum of 25 feet clearance from the high point of the road to the bottom of the DMS enclosure. Furnish a pedestal DMS structure with extension pole for a CCTV camera at the DMS-1 location.

Furnish the back-to-back, pedestal type DMS structure at the DMS-2/DMS-3 location with one ladder, safety cage, and maintenance platform to service both DMS.

Design the new DMS assemblies (including footings), DMS mounting assemblies, maintenance platforms, and access ladders and submit shop drawings for approval. A Professional Engineer that is registered in the state of North Carolina will prepare such computations and drawings. These must bear his signature, seal, and date of acceptance.

The provisions of Section 900 of the Standard Specifications apply to all work covered by this section.

It is the Contractor's responsibility to provide DMS S-dimension elevation drawings for the DMS-1 and DMS-2/DMS-3 locations to the Engineer for approval.

17.2. MATERIAL

Use materials that meet the following requirements of the Standard Specifications:

Structural Steel	Section 1072
Overhead Sign Structures	Section 1096
Signing Materials	Section 1092
Organic-Zinc Repair Paint	Article 1080-9
Reinforcing Steel	Sub-article 1070
Direct Tension Indicators	Sections 440 and 1072

17.3. CONSTRUCTION METHODS

A. General

Fabricate the new DMS assemblies, access platforms, walkway platforms, and access ladders in accordance with the details shown in the approved shop drawings and the requirements of these Project Special Provisions.

No welding, cutting, or drilling in any manner will be permitted in the field, unless approved by the Engineer.

Drill bolt holes and slots to finished size. Holes may also be punched to finished size, provided the diameter of the punched holes are at least twice the thickness of the metal being punched. Flame cutting of bolt holes and slots is not permitted.

Erect DMS in accordance with the requirements indicated on the Plans and in these Project Special Provisions. Field drill two holes per connection in the Z bars for attaching the DMS to the structure. Use two bolts at each connection. Provide two (2) U-bolts at each U-bolt connection such as 1) each truss chord to sign hanger, or 2) each truss chord to platform support. Provide two (2) U-bolts at each U-bolts connection where ends of truss chords are supported. Minimum diameter of all U-bolts is to be ½ inch.

Use two coats of a zinc-rich paint to touch up minor scars on all galvanized materials. See Standard Specifications for Roads and Structures Section 1076-6.

For high strength bolted connections, provide direct tension indicator washer.

B. Shop Drawing

Submit to the Engineer for approval a complete design for the DMS assemblies (including footings) access platforms, walkway platforms, access ladders, DMS assembly hardware, brackets for supporting the DMS and the access platform. Base the design on the line drawings and correct wind speed in accordance with the latest edition of AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals, 6th Edition, 2013."

The manufacturer of the DMS assembly must ensure that design of the assembly is compatible with the DMSs for mounting and attachment.

Submit six copies of complete detailed shop drawings and one copy of the design computations for the DMS assembly to the Engineer for approval prior to fabrication. Show in the shop drawings complete design and fabrication details including foundations, provisions for attaching the DMS and walkway platform to supporting structures, applicable material specifications, and any other information necessary for procuring and replacing any part of the complete DMS assembly.

Allow a minimum of 40 working days for shop drawing approval after the Engineer receives them. If revised drawings are necessary, allow appropriate additional time for review and approval of final shop drawings.

Approval of shop drawings by the Engineer will not relieve the Contractor of his responsibility for the correctness of drawings, or for the fit of all shop and field connections and anchors.

C. Design and Fabrication

1. Dynamic Message Sign Assembly

- Design must be in accordance with the Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition, 2013, and the latest Interim Specifications.
- The wind pressure map that is developed from the 3-second gust speeds, as provided in Article 3.8, shall be used.
- The natural wind gust speed in North Carolina shall be assumed to be 5 meters per second or 11.6 mph for inland areas, and 7 meters per second or 15.7 mph for coastal areas. The coastal area shall be defined as any area within 2 miles from the waterfront facing the ocean

or sound and all area where the design basic wind speed is above 120 mph, as shown in Figure 3-2.

- The fatigue importance category used in the design, for each type of structure, as provided for in Article 11.6, Fatigue Importance Factors, shall be Category II unless otherwise shown on the contract plans.
- Wind drag coefficient for Dynamic Message Sign enclosures shall be 1.7.

The following Specification interpretations or criteria shall be used in the design of overhead sign assemblies:

- For design of supporting upright posts or columns, the effective length factor for columns "K", as provided for in Appendix B, Section B.5, shall be taken as the following, unless otherwise approved by the Engineer:

  Case 1 For a single upright post of span type overhead sign structure, the effective column length factor, "K", shall be taken as 2.0.

  Case 2 For twin post truss-type upright post with the post connected to one chord of a horizontal truss, the effective column length factor for that column shall be taken as 2.0.

  Case 3 For twin post truss-type upright post with the post connected to two truss chords of a horizontal tri-chord or box truss, the effective column length factor for that column shall be taken as 1.65.

- For twin post truss-type upright post, the unbraced length shall be from the chord to post connection to the top of base plate.
- For twin post truss-type upright post that is subject to axial compression, bending moment, shear, and torsion the post shall satisfy Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals Equations 5-17, 5-18 and 5-19. To reduce the effects of secondary bending, in lieu of Equation 5-18, the following equation may be used:

$$\frac{f_a}{F_a} + \frac{f_b}{\left(1 - \frac{0.6 f_a}{F_{é}}\right) F_b} + \left(\frac{f_v}{F_v}\right)^2 \leq 1.0$$

  Where
  fa = Computed axial compression stress at base of post

- The base plate thickness for all uprights and poles shall be a minimum of 2" but not less than that determined by the following criteria and design.

  Case 1 Circular or rectangular solid base plates with the upright pole welded to the top surface of base plate with full penetration butt weld, and where no stiffeners are provided. A base plate with a small center hole, which is less than 1/5 of the upright diameter, and located concentrically with the upright pole, may be considered as a solid base plate.

The magnitude of bending moment in the base plate, induced by the anchoring force of each anchor bolt shall be calculated using equation $M = (P \times D_1) / 2$.

Case 2 Circular or rectangular base plate with the upright pole socketed into and attached to the base plate with two lines of fillet weld, and where no stiffeners are provided, or any base plate with a center hole that is larger in diameter than 1/5 of the upright diameter.

The magnitude of bending moment induced by the anchoring force of each anchor bolt shall be calculated using equation $M = P \times D_2$.

- M, bending moment at the critical section of the base plate induced by one anchor bolt
- P, anchoring force of each anchor bolt
- D_1, horizontal distance between the center of the anchor bolt and the outer face of the upright, or the difference between the radius of the bolt circle and the outside radius of the upright
- D_2, horizontal distance between the face of the upright and the face of the anchor bolt nut

- The critical section shall be located at the face of the anchor bolt and perpendicular to the radius of the bolt circle. The overlapped part of two adjacent critical sections shall be considered ineffective.
- The thickness of base plate of Case 1 shall not be less than that calculated based on formula for Case 2.
- Uprights, foundations, and trusses shall be designed in accordance with the DMS Foundation Special Provision for the effects of torsion. Torsion shall be considered from dead load eccentricity of these attachments, as well as for attachments such as walkway platforms, supporting brackets, etc., that add to the torsion in the assembly. Truss vertical and horizontal truss diagonals in particular and any other assembly members shall be appropriately sized for these loads.
- Uprights, foundations, and trusses shall be designed for the proposed sign wind area and future wind areas. The design shall consider the effect of torsion induced by the eccentric force location of the center of wind force above (or below) the center of the supporting truss. Truss vertical and horizontal truss diagonals in particular and any other assembly members shall be appropriately sized for these loads.

Fabricate the supporting structures using tubular members of either aluminum or steel, using only one type of material throughout the project.

Horizontal components of the supporting structures for overhead DMS must be of a truss design to support the DMS. Truss centerline must coincide with centerline of the DMS design area shown on the structure line drawing. Provide permanent camber in addition to dead load camber in

accordance with the "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals." Indicate on the shop drawings the amount of camber provided and the method employed in the fabrication of the support to obtain the camber.

For all U-bolt connections of hanger beams to overhead assembly truss chords, provide all U-bolts with a flat washer, a lock washer and double nuts at each end of the U-bolts. All double nuts that are on any U-bolt shall be the same thickness and weight. When assembled, the double nuts shall be brought tight against each other by the use of two wrenches.

Fabricate attachment assemblies for the mounting DMS in a manner that allows easy removal of the sign.

2. DMS Maintenance Platform (Walkway)

Provide a maintenance platform (walkway), a minimum of three feet wide with open skid-resistant surface and safety railing on the DMS assemblies for access to the DMS inspection door. Provide platforms with fixed safety railings along both sides from the beginning of the platform to the inspection door.

Ensure the design, fabrication and installation of the access platforms on new DMS structures complies with the following:

1. The top of the platform grading surface is vertically aligned with the bottom of the DMS door.
2. The DMS door will open 90-degrees from its closed position without any obstruction from the platform or safety handrails.
3. The platform is rigidly and directly connected to the walkway brackets and there is no uneven surface between sections.
4. Install a 4" x 4" safety angle parallel to and along both sides of the platform and extend it the entire length of the platform. Design the safety angle to withstand loading equivalent to the platform.
5. Ensure the platform design allows full access to the DMS enclosure inspection door with no interference or obstructions.

3. DMS Access Ladder

Provide a fixed ladder, of the same material as the pedestal structures, leading to and ending at the access platform. Equip the ladder with a security cover (ladder guard) and lock to prohibit access by unauthorized persons. Design the rungs on 12-inch center to center typical spacing. Start the first ladder rung no more than 18 inches above the landing pad. Attach the security cover approximately 6 feet above the finished ground. Design the ladder and security cover as a permanent part of the DMS assembly and include complete design details in the DMS assembly shop drawings. Fabricate the ladder and cover to meet all OSHA requirements and applicable state and local codes, including but not limited to providing a ladder cage.

Furnish and install a level concrete pad a minimum of 4 inches deep, 24 inches wide, and 36 inches long to service as a landing pad for accessing the ladder. Design the landing pad to be directly below the bottom rung. Access to the ladder shall not be obstructed by the DMS foundation. Provide pre-formed or cast-in place concrete pads.

4. CCTV Extension Pole

Design the DMS assembly with provisions to allow for the attachment of a CCTV camera to the assembly. Design the CCTV extension pole to provide an attachment height of 45 feet above the finished grade for the camera. The maximum deflection at the top of the CCTV supporting member at 30 mph, non-gusting wind, shall be no more than 1 inch in any direction. The ultimate design load for the CCTV extension pole shall be AASHTO 2002 50 year wind speed for the area plus 50 lbs camera deadload. Design the CCTV extension pole as an integral part of the DMS assembly and submit the design along with the structural calculation for review and approval by the Engineer.

17.4. MEASUREMENT AND PAYMENT

DMS Pedestal Structure (___) will be measured and paid as the actual number of dynamic message sign assemblies furnished, installed, and accepted. Payment includes all design, fabrication, construction, transportation, and attachment of the complete dynamic message sign assemblies, supporting structure, hardware, access platform, direct tension indicators, preparing and furnishing shop drawings, additional documentation, incidentals, and all other equipment and features necessary to furnish the system described above.

The Type A DMS pedestal structure shall accommodate a single DMS while the Type B DMS pedestal structure shall accommodate two DMS in a back-to-back configuration at the DMS-2/DMS-3 location.

DMS Access Ladder will be measured and paid as the actual number of DMS access ladders furnished, installed and accepted. Payment includes design, fabrication, transportation, and attachment to the DMS assembly as described above.

CCTV Extension Pole will be measured and paid as the actual number of CCTV extension poles furnished, installed and accepted. Payment includes design, fabrication, transportation, and attachment to the DMS assembly as described above.

Payment will be made under:

Pay Item	Pay Unit
DMS Pedestal Structure (Type A)	Each
DMS Pedestal Structure (Type B)	Each
DMS Access Ladder	Each
CCTV Extension Pole	Each

18. FOUNDATIONS AND ANCHOR ROD ASSEMBLIES FOR METAL POLES

18.1. DESCRIPTION

Foundations for metal poles include foundations for signals, cameras, overhead and dynamic message signs (DMS) and high mount and low level light standards supported by metal poles or upright trusses. Foundations consist of footings with pedestals and drilled piers with or without grade beams or wings. Anchor rod assemblies consist of anchor rods (also called anchor bolts) with nuts and washers on the exposed ends of rods and nuts and a plate or washers on the other ends of rods embedded in the foundation.

Construct concrete foundations with the required resistances and dimensions and install anchor rod assemblies in accordance with the contract and accepted submittals. Construct drilled piers consisting of cast-in-place reinforced concrete cylindrical sections in excavated holes. Provide temporary casings or polymer slurry as needed to stabilize drilled pier excavations. Use a prequalified Drilled Pier Contractor to construct drilled piers for metal poles. Define "excavation" and "hole" as a drilled pier excavation and "pier" as a drilled pier.

This provision does not apply to materials and anchor rod assemblies for standard foundations for low level light standards. See Section 1405 of the *2012 Standard Specifications* and Standard Drawing No. 1405.01 of the *2012 Roadway Standard Drawings* for materials and anchor rod assemblies for standard foundations. For construction of standard foundations for low level light standards, standard foundations are considered footings in this provision.

This provision does not apply to foundations for signal pedestals; see Section 1743 of the *2012 Standard Specifications* and Standard Drawing No. 1743.01 of the *2012 Roadway Standard Drawings*.

18.2. MATERIAL

Refer to the *2012 Standard Specifications*.

Item	Section
Conduit	1091-3
Grout, Nonshrink	1003
Polymer Slurry	411-2(B)
Portland Cement Concrete	1000
Reinforcing Steel	1070
Rollers and Chairs	411-2(C)
Temporary Casings	411-2(A)

Provide Type 3 material certifications in accordance with Article 106-3 of the *2012 Standard Specifications* for conduit, rollers, chairs and anchor rod assemblies. Store steel materials on blocking at least 12" above the ground and protect it at all times from damage; and when placing in the work make sure it is free from dirt, dust, loose mill scale, loose rust, paint, oil or other foreign materials. Load, transport, unload and store foundation and anchor rod assembly materials so materials are kept clean and free of damage. Damaged or deformed materials will be rejected.

Use conduit type in accordance with the contract. Use Class A concrete for footings and pedestals, Class Drilled Pier concrete for drilled piers and Class AA concrete for grade beams and wings including portions of drilled piers above bottom of wings elevations. Corrugated temporary casings may be accepted at the discretion of the Engineer. A list of approved polymer slurry products is available from:

www.ncdot.org/doh/preconstruct/highway/geotech/leftmenu/Polymer.html

Provide anchor rod assemblies in accordance with the contract consisting of the following:

A. Straight anchor rods,

B. Heavy hex top and leveling nuts and flat washers on exposed ends of rods, and

C. Nuts and either flat plates or washers on the other ends of anchor rods embedded in foundations.

Do not use lock washers. Use steel anchor rods, nuts and washers that meet ASTM F1554 for Grade 55 rods and Grade A nuts. Use steel plates and washers embedded in concrete with a nominal thickness of at least 1/4". Galvanize anchor rods and exposed nuts and washers in accordance with Article 1076-4 of the *2012 Standard Specifications*. It is not necessary to galvanize nuts, plates and washers embedded in concrete.

18.3. CONSTRUCTION METHODS

Install the required size and number of conduits in foundations in accordance with the plans and accepted submittals. Construct top of piers, footings, pedestals, grade beams and wings flat, level and within 1" of elevations shown in the plans or approved by the Engineer. Provide an Ordinary Surface finish in accordance with Subarticle 825-6(B) of the *2012 Standard Specifications* for portions of foundations exposed above finished grade. Do not remove anchor bolt templates or pedestal or grade beam forms or erect metal poles or upright trusses onto foundations until concrete attains a compressive strength of at least 3,000 psi.

A. Drilled Piers

Before starting drilled pier construction, hold a predrill meeting to discuss the installation, monitoring and inspection of the drilled piers. Schedule this meeting after the Drilled Pier Contractor has mobilized to the site. The Resident or Division Traffic Engineer, Contractor and Drilled Pier Contractor Superintendent will attend this predrill meeting.

Do not excavate holes, install piles or allow equipment wheel loads or vibrations within 20 ft of completed piers until 16 hours after Drilled Pier concrete reaches initial set.

Check for correct drilled pier alignment and location before beginning drilling. Check plumbness of holes frequently during drilling.

Construct drilled piers with the minimum required diameters shown in the plans. Install piers with tip elevations no higher than shown in the plans or approved by the Engineer.

Excavate holes with equipment of the sizes required to construct drilled piers. Depending on the subsurface conditions encountered, drilling through rock and boulders may be required. Do not use blasting for drilled pier excavations.

Contain and dispose of drilling spoils and waste concrete as directed and in accordance with Section 802 of the *2012 Standard Specifications*. Drilling spoils consist of all materials and fluids removed from excavations.

If unstable, caving or sloughing materials are anticipated or encountered, stabilize holes with temporary casings and/or polymer slurry. Do not use telescoping temporary casings. If it becomes necessary to replace a temporary casing during drilling, backfill the excavation, insert a larger casing around the casing to be replaced or stabilize the excavation with polymer slurry before removing the temporary casing.

If temporary casings become stuck or the Contractor proposes leaving casings in place, temporary casings should be installed against undisturbed material. Unless otherwise approved, do not leave temporary casings in place for mast arm poles and cantilever signs. The Engineer will determine if casings may remain in place. If the Contractor proposes leaving temporary casings in place, do not begin drilling until a casing installation method is approved.

Use polymer slurry and additives to stabilize holes in accordance with the slurry manufacturer's recommendations. Provide mixing water and equipment suitable for polymer slurry. Maintain polymer slurry at all times so slurry meets Table 411-3 of the *2012 Standard Specifications* except for sand content.

Define a "sample set" as slurry samples collected from mid-height and within 2 ft of the bottom of holes. Take sample sets from excavations to test polymer slurry immediately after filling holes with slurry, at least every 4 hours thereafter and immediately before placing concrete. Do not place Drilled Pier concrete until both slurry samples from an excavation meet the required polymer slurry properties. If any slurry test results do not meet the requirements, the Engineer may suspend drilling until both samples from a sample set meet the required slurry properties.

Remove soft and loose material from bottom of holes using augers to the satisfaction of the Engineer. Assemble rebar cages and place cages and Drilled Pier concrete in accordance with Subarticle 411-4(E) of the 2012 *Standard Specifications* except for the following:

1) Inspections for tip resistance and bottom cleanliness are not required,
2) Temporary casings may remain in place if approved, and
3) Concrete placement may be paused near the top of pier elevations for anchor rod assembly installation and conduit placement or
4) If applicable, concrete placement may be stopped at bottom of grade beam or wings elevations for grade beam or wing construction.

If wet placement of concrete is anticipated or encountered, do not place Drilled Pier concrete until a concrete placement procedure is approved. If applicable, temporary casings and fluids may be removed when concrete placement is paused or stopped in accordance with the exceptions above provided holes are stable. Remove contaminated concrete from exposed Drilled Pier concrete after removing casings and fluids. If holes are unstable, do not remove temporary casings until a procedure for placing anchor rod assemblies and conduit or constructing grade beams or wings is approved.

Use collars to extend drilled piers above finished grade. Remove collars after Drilled Pier concrete sets and round top edges of piers.

If drilled piers are questionable, pile integrity testing (PIT) and further investigation may be required in accordance with Article 411-5 of the *2012 Standard Specifications*. A drilled pier will be considered defective in accordance with Subarticle 411-5(D) of the *2012 Standard Specifications* and drilled pier acceptance is based in part on the criteria in Article 411-6 of the *2012 Standard Specifications* except for the top of pier tolerances in Subarticle 411-6(C) of the *2012 Standard Specifications*.

If a drilled pier is under further investigation, do not grout core holes, backfill around the pier or perform any work on the drilled pier until the Engineer accepts the pier. If the drilled pier is accepted, dewater and grout core holes and backfill around the pier with approved material to finished grade. If the Engineer determines a pier is unacceptable, remediation is required in accordance with Article 411-6 of the *2012 Standard Specifications*. No extension of completion date or time will be allowed for remediation of unacceptable drilled piers or post repair testing.

Permanently embed a plate in or mark top of piers with the pier diameter and depth, size and number of vertical reinforcing bars and the minimum compressive strength of the concrete mix at 28 days.

B. Footings, Pedestals, Grade Beams and Wings

Excavate as necessary for footings, grade beams and wings in accordance with the plans, accepted submittals and Section 410 of the *2012 Standard Specifications*. If unstable, caving or sloughing materials are anticipated or encountered, shore foundation excavations as needed with an approved method. Notify the Engineer when foundation excavation is complete. Do not place concrete or reinforcing steel until excavation dimensions and foundation material are approved.

Construct cast-in-place reinforced concrete footings, pedestals, grade beams and wings with the dimensions shown in the plans and in accordance with Section 825 of the *2012 Standard Specifications*. Use forms to construct portions of pedestals and grade beams protruding above finished grade. Provide a chamfer with a 3/4" horizontal width for pedestal and grade beam edges exposed above finished grade. Backfill and fill in accordance with Article 410-8 of the *2012 Standard Specifications*. Proper compaction around footings and wings is critical for foundations to resist uplift and torsion forces. Place concrete against undisturbed soil and do not use forms for standard foundations for low level light standards.

C. Anchor Rod Assemblies

Size anchor rods for design and the required projection above top of foundations. Determine required anchor rod projections from nut, washer and base plate thicknesses, the protrusion of 3 to 5 anchor rod threads above top nuts after tightening and the distance of one nut thickness between top of foundations and bottom of leveling nuts.

Protect anchor rod threads from damage during storage and installation of anchor rod assemblies. Before placing anchor rods in foundations, turn nuts onto and off rods past leveling nut locations. Turn nuts with the effort of one workman using an ordinary wrench without a cheater bar. Report any thread damage to the Engineer that requires extra effort to turn nuts.

Arrange anchor rods symmetrically about center of base plate locations as shown in the plans. Set anchor rod elevations based on required projections above top of foundations. Securely brace and hold rods in the correct position, orientation and alignment with a steel template. Do not weld to reinforcing steel, temporary casings or anchor rods.

Install top and leveling (bottom) nuts, washers and the base plate for each anchor rod assembly in accordance with the following procedure:

1) Turn leveling nuts onto anchor rods to a distance of one nut thickness between the top of foundation and bottom of leveling nuts. Place washers over anchor rods on top of leveling nuts.
2) Determine if nuts are level using a flat rigid template on top of washers. If necessary, lower leveling nuts to level the template in all directions or if applicable, lower nuts to tilt the template so the metal pole or upright truss will lean as shown in the plans. If leveling nuts and washers are not in full contact with the template, replace washers with galvanized beveled washers.
3) Verify the distance between the foundation and leveling nuts is no more than one nut thickness.
4) Place base plate with metal pole or upright truss over anchor rods on top of washers. High mount luminaires may be attached before erecting metal poles but do not attach cables, mast arms or trusses to metal poles or upright trusses at this time.
5) Place washers over anchor rods on top of base plate. Lubricate top nut bearing surfaces and exposed anchor rod threads above washers with beeswax, paraffin or other approved lubricant.
6) Turn top nuts onto anchor rods. If nuts are not in full contact with washers or washers are not in full contact with the base plate, replace washers with galvanized beveled washers.
7) Tighten top nuts to snug-tight with the full effort of one workman using a 12" wrench. Do not tighten any nut all at once. Turn top nuts in increments. Follow a star pattern cycling through each nut at least twice.
8) Repeat (7) for leveling nuts.
9) Replace washers above and below the base plate with galvanized beveled washers if the slope of any base plate face exceeds 1:20 (5%), any washer is not in firm contact with the base plate or any nut is not in firm contact with a washer. If any washers are replaced, repeat (7) and (8).
10) With top and leveling nuts snug-tight, mark each top nut on a corner at the intersection of 2 flats and a corresponding reference mark on the base plate. Mark top nuts and base plate with ink or paint that is not water-soluble. Use the turn-of-nut method for pretensioning. Do not pretension any nut all at once. Turn top nuts in increments for a total of one flat (1/6 revolution) for anchor rod diameters greater than 1 1/2" and 2 flats (1/3 revolution) for anchor rod diameters 1 1/2" or less. Follow a star pattern cycling through each top nut at least twice.
11) Ensure nuts, washers and base plate are in firm contact with each other for each anchor rod. Cables, mast arms and trusses may now be attached to metal poles and upright trusses.
12) Between 4 and 14 days after pretensioning top nuts, use a torque wrench calibrated within the last 12 months to check nuts in the presence of the Engineer. Completely erect

mast arm poles and cantilever signs and attach any hardware before checking top nuts for these structures. Check that top nuts meet the following torque requirements:

TORQUE REQUIREMENTS	
Anchor Rod Diameter, inch	Requirement, ft-lb
7/8	180
1	270
1 1/8	380
1 1/4	420
≥ 1 1/2	600

If necessary, retighten top nuts in the presence of the Engineer with a calibrated torque wrench to within ± 10 ft-lb of the required torque. Do not overtighten top nuts.

(13) Do not grout under base plate.

18.4. MEASUREMENT AND PAYMENT

Foundations and anchor rod assemblies for metal poles and upright trusses will be measured and paid for elsewhere in the contract.

No payment will be made for temporary casings that remain in drilled pier excavations. No payment will be made for PIT. No payment will be made for further investigation of defective piers. Further investigation of piers that are not defective will be paid as extra work in accordance with Article 104-7 of the *2012 Standard Specifications*. No payment will be made for remediation of unacceptable drilled piers or post repair testing.

19. OVERHEAD AND DYNAMIC MESSAGE SIGN FOUNDATIONS

19.1. DESCRIPTION

Sign foundations include foundations for overhead and dynamic message signs (DMS) supported by metal poles or upright trusses. Sign foundations consist of footings with pedestals or drilled piers with or without grade beams or wings, conduit and anchor rod assemblies. Construct sign foundations in accordance with the contract and accepted submittals. Define "cantilever sign" as an overhead cantilever sign support in accordance with Figure 1-1 of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*.

19.2. MATERIAL

Use sign foundation materials that meet the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

A. Assumed Subsurface Conditions

Assume the following soil parameters and groundwater elevation for sign foundations unless these subsurface conditions are not applicable to sign locations:

A. Unit weight (γ) = 120 lb/cf,

B. Friction angle (ϕ) = 30°,

C. Cohesion (c) = 0 lb/sf, and

D. Groundwater 7 ft below finished grade.

A subsurface investigation is required if the Engineer determines these assumed subsurface conditions do not apply to a sign location and the sign cannot be moved. Subsurface conditions requiring a subsurface investigation include but are not limited to weathered or hard rock, boulders, very soft or loose soil, muck or shallow groundwater. No extension of completion date or time will be allowed for subsurface investigations.

B. Subsurface Investigations

Use a prequalified geotechnical consultant to perform one standard penetration test (SPT) boring in accordance with ASTM D1586 at each sign location requiring a subsurface investigation. Rough grade sign locations to within 2 ft of finished grade before beginning drilling. Drill borings to 2 drilled pier diameters below anticipated pier tip elevations or refusal, whichever is higher.

Use the computer software gINT version 8.0 or later manufactured by Bentley Systems, Inc. with the current NCDOT gINT library and data template to produce SPT boring logs. Provide boring logs sealed by a geologist or engineer licensed in the state of North Carolina.

C. Sign Foundation Designs

Design sign foundations for the wind zone and clearances shown in the plans and the slope of finished grade at each sign location. Use the assumed soil parameters and groundwater elevation above for sign foundation designs unless a subsurface investigation is required. For sign locations requiring a subsurface investigation, design sign foundations for the subsurface conditions at each sign location. Design footings, pedestals, drilled piers, grade beams and wings in accordance with the 6th Edition of the *AASHTO Standard Specifications for Structural Supports for Highway Signs,*

Luminaires and Traffic Signals. In some instances, conflicts with drainage structures may dictate sign foundation types.

Design footings in accordance with Section 4.4 of the *AASHTO Standard Specifications for Highway Bridges*. Do not use an allowable bearing pressure of more than 3,000 lb/sf for footings.

Design drilled piers for side resistance only in accordance with Section 4.6 of the *AASHTO Standard Specifications for Highway Bridges* except reduce ultimate side resistance by 25% for uplift. Use the computer software LPILE version 5.0 or later manufactured by Ensoft, Inc. to analyze drilled piers. Provide drilled pier designs with a horizontal deflection of less than 1" at top of piers. For cantilever signs with single drilled pier foundations supporting metal poles, use wings to resist torsion forces. Provide drilled pier designs with a factor of safety of at least 2.0 for torsion.

For drilled pier sign foundations supporting upright trusses, use dual drilled piers connected with a grade beam having a moment of inertia approximately equal to that of either pier. The Broms' method is acceptable to analyze drilled piers with grade beams instead of LPILE. Use a safety factor of at least 3.5 for the Broms' design method in accordance with C13.6.1.1 of the *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*.

Submit boring logs, if any, working drawings and design calculations for acceptance in accordance with Article 105-2 of the *2012 Standard Specifications*. Submit working drawings showing plan views, required foundation dimensions and elevations and typical sections with reinforcement, conduit and anchor rod assembly details. Include all boring logs, design calculations and LPILE output for sign foundation design submittals. Have sign foundations designed, detailed and sealed by an engineer licensed in the state of North Carolina.

19.3. CONSTRUCTION METHODS

Construct footings, pedestals, drilled piers, grade beams and wings and install anchor rod assemblies for sign foundations in accordance with the *Foundations and Anchor Rod Assemblies for Metal Poles* provision.

19.4. MEASUREMENT AND PAYMENT

ITS Overhead Footings will be measured and paid in cubic yards. Sign foundations will be measured as the cubic yards of foundation concrete for footings, pedestals, drilled piers, grade beams and wings shown on the accepted submittals. The contract unit price for *ITS Overhead Footings* will be full compensation for providing labor, tools, equipment and foundation materials, stabilizing or shoring excavations and supplying concrete, reinforcing steel, conduit, anchor rod assemblies and any incidentals necessary to construct sign foundations. Subsurface investigations required by the Engineer will be paid as extra work in accordance with Article 104-7 of the *2012 Standard Specifications*.

Payment will be made under:

Pay Item	Pay Unit
ITS Overhead Footings	Cubic Yards

20. LOCAL AREA NETWORK EQUIPMENT

20.1. DESCRIPTION

Furnish, install, and fully integrate new local area network (LAN) equipment as called for in the Plans.

20.2. MATERIAL

A. General

Furnish equipment for the LAN that complies with IEEE standard 802. Furnish Ethernet Switches that comply with the following electrical safety requirements: UL60950 or CSA C22.2 No. 60950 (safety requirements for IT equipment) and FCC Part15 Class A for EMI emissions.

B. Field Video CODEC Unit

Furnish a field-hardened video encoder designed for unheated/uncooled "outdoor" applications such as roadside control cabinets. The video encoder shall be installed in equipment cabinet and shall allow for the encoding and transmission of analog NTSC video signals from new CCTV units that will be provided under this Project.

Furnish a shelf-mountable, field-hardened video encoder to convert analog NTSC video signals into two digital video streams that can be transported over Ethernet. The video encoder shall allow for the simultaneous encoding and transmission of the two digital video streams - one in MPEG-2 or MPEG-4 format (high-resolution) and one in MPEG-4 format (low-resolution). High resolution streams shall allow video bit rates from 1 to 4 Mbps and the low resolution stream shall allow video bit rates from 64 kbps to 2 Mbps. The Contractor shall configure these formats for 2 Mbps and 384kbps, respectively. The video encoder shall also transmit pan-tilt-zoom control data from all CCTV control points to the CCTV camera via a serial connection to the CCTV camera resident on the CODEC.

The video encoder shall support the following digital transport standards at a minimum: RTP/IP, UDP/IP, TCP/IP, and unicast/multicast IP. The Contractor shall use UDP/IP for video transport and TCP/IP for camera control transport unless otherwise approved by the Engineer.

The video shall support resolutions of CIF (352 (H) x 240 (V)), 1/2 D1 (352 (H) x 480 (V)), and D1 (720 (H) x 480 (V)) at a minimum. The video encoder units shall provide a display showing diagnostic data such as data rate, quality level, frame rate, and video status on the front panel. All supporting user interface software shall be provided with each encoder unit.

The video encoder shall be equipped with at least one NTSC video input, two RS-232/422 serial ports and one 10/100BaseTX Ethernet port. The 10/100BaseTX port shall support half-duplex or full-duplex and provide auto negotiation, and shall be configured for full-duplex.

The video encoder shall be remotely manageable using standard network applications such as telnet, SNMP monitors, and/or web interface administration. The video encoder shall be equipped with LED or other approved indicators for the following functions:

- Power
- Link
- Activity

1. Electrical Requirements

The video encoder shall operate from 115 VAC (+/-10%) power at 60 Hz. The Contractor shall furnish any external step down transformers, power converters, and/or regulation equipment needed to operate the video encoder.

2. Physical and Environmental Requirements

The video encoder enclosure shall be constructed of high-strength galvanized steel. For Contractor-supplied cameras, the video encoder shall be installed in equipment cabinets and secured to the cabinet in a manner that is approved by the Engineer. The video encoder enclosure, including adapters/connectors, shall fit neatly within the confines of the equipment cabinet. All necessary mounting hardware shall be provided by the Contractor.

The video encoder shall meet or exceed NEMA TS-2 requirements for shock, temperature, humidity, and vibration. The video encoder shall operate at ambient temperatures from -40° to 185° F (-40° to 85° C) and ambient relative humidity from 0% to 90% (non-condensing). No cooling airflow shall be required.

3. Communication Interface Requirements

The video encoder shall comply with the 10/100BaseTX standard and have at least one standard RJ-45 interface. The 10/100BaseTX port shall operate as half-duplex or full-duplex and provide auto negotiation.

The video encoder shall have at least one video input that supports composite NTSC format compatible with the CCTV video interface cables. Interconnection with the NTSC video input shall be made with a surge protector that provides an external electrical ground bonding capability and does not require an electrical receptacle. The CCTV coaxial surge protector shall provide a clamping voltage no greater than 30 volts.

The video encoder shall have at least two serial ports – one for pan-tilt-zoom camera control and the other for local maintenance or data transport. The two serial ports shall support RS-232 and RS-422 data transmission and shall be transparent to the central system using TCP/IP network access methods. Interconnection with camera control receivers with or without adapters or converters (i.e. RS-422/232 for compatibility with CCTVs) shall provide opto-isolated surge suppression. The optical isolation shall provide an isolation of no greater than 2000 VAC for data signals and ground.

4. Cables and Connectors

The Contractor shall furnish and install all cables and connectors necessary for video encoder installation. This shall include at a minimum CAT 5E cables with RJ-45 connectors to connect the Video Encoder to the Field Ethernet Switch in the equipment cabinet or traffic controller cabinet and standard serial data cables to connect the Video Encoder to the CCTV camera for pan-tilt-zoom functions and local configuration administration.

C. Central Video CODEC Unit

Furnish central video CODEC units to decode the transmission from the field video CODEC units to analog NTSC video and serial data. Furnish central COCEC units from the same manufacturer as the field CODEC units installed under this project. Furnish central CODEC units that are card-based and chassis installed.

D. Central Media Converter

Furnish central media converters that serve as a wiring concentrator to provide connectivity of existing central DMS server with serial, EIA-232, compliant ports to the LAN, as shown on the Plans.

The central media converters shall have the following features:

- A minimum 10 Base-T port for connectivity to the core Ethernet switch.
- A minimum of four (4) EIA-232 serial ports, each of which shall support data rates up to 115.2 kbps.
- Multi-protocol support of LAT, Novell, IPX, Telnet 3270, and TCP/IP
- TCP/IP support of RLOGIN, Dynamic SLIP, PPP, BOOTP, TFTP and SNMP.
- Minimum 2 MB RAM.
- Standard 19" Equipment Rack-mountable.
- Contain all software and drivers required to support access of serial ports from servers and client workstations.

E. Field Ethernet Switch

Furnish Field Ethernet switches fabricated for use in field equipment cabinets that are ruggedized to meet or exceed NEMA TS-2 requirements for temperature, shock, humidity, and vibration.

Furnish Field Ethernet Switches that are DIN rail mounted and come equipped with hardware to permit mounting in an EIA 19" equipment rack.

Furnish Field Ethernet Switches that weigh no more than 15 lbs. and are no more than 250 cubic inches in volume.

Furnish Field Ethernet Switches with the following minimum characteristics and features:

- Six (6) 10BASE-T/100BASE-TX ports:
- Minimum of two (2) 1000 BaseX Optical uplink ports that utilize small form-factor pluggable (SFP) connectors.
- Furnish SFP modules rated to service the Field Ethernet to Field Ethernet optical uplinks and Field Ethernet to Core Ethernet rated for optical attenuation required to service the link. Use SFP modules that are LX and are matched and compatible with the SFP module it is mated with. Furnish attenuators if required to service link without saturation receiving optics.
- Furnish SFP modules rated for use with the existing optical cable integrated under this project.
- Furnish SFP modules with LC connectors.
- SFP modules shall be considered incidental to the field Ethernet switch.
- Management console port

Furnish Field Ethernet switches with the following features:

- 10/100BaseTX ports:

- RJ45 connectors
- Cable type: Category 5e, unshielded twisted pair
- Segment Length: 100m
- Auto-negotiation support (10/100Mbps)
- Auto MDIX crossover capability
- Full Duplex operation (IEEE 802.3x)
- TVS (transient voltage suppression) between Line +/-, Line +/ground, and Line - ground to protect the circuitry

Furnish Field Ethernet switches with the following networking requirements:

- The switch shall support automatic address learning of up to 8192 MAC addresses.
- The switch shall support the following advanced layer 2 functions:
  - IEEE 802.1Q VLAN, with support for up to 4096 VLANs
  - IEEE 802.1p priority queuing
  - IEEE 802.1w rapid spanning tree
  - IEEE 802.1s multiple spanning tree
  - IEEE802.1AD link aggregation
  - IEEE 802.3x flow control
  - IGMPv2 with 256 IGMP groups
  - Port Rate Limiting
  - Configuration via test file which can be modified through standard text editor
  - Forwarding/filtering rate shall be 14,880 packets per second (PPS) for 10Mps,148,800 for 100Mps, 1,488,000 for 1000Mps
  - DHCP Option 82

Furnish Field Ethernet switches with the following network management functionality requirements:

- SNMPv2, SNMPv3
- RMON
- GVRP
- Port Mirroring
- 802.1x port security
- Radius Server
- TACACS+ Server
- SSL – Secure Socket Layer

- SSH – Secure Shell
- TFTP
- Network Time Protocol (NTP)
- Simple Network Time Protocol (SNTP)
- Management via web or Telnet

20.3. CONSTRUCTION METHODS

A. General

Furnish media access control (MAC) addresses for all equipment utilized as part of this project. Affix MAC Address label to each device utilized. Furnish IP addresses for all equipment utilized as part of this project. Affix final IP address each device utilized. Use labels that do not smear or fade.

In field equipment cabinets, fully integrate new Ethernet switches with the fiber optic interconnect centers. Integrate all field equipment as call for.

Fully integrate LAN to accomplish local device failover and fault tolerance.

Fully integrate LAN equipment to provide virus protection, user authentication, and security functions to prevent unauthorized users and data from entering the LAN.

B. Requirements Definition Document

Prior to commencing work, the Contractor shall develop a Requirements Definition Document (RDD) that will form the basis for the overall network architecture and design.

- Complete description of the proposed implementation of the access, distribution and core layers for the network as described in the Plans and these Project Special Provisions
- Development of an IP Design Scheme with ranges assigned to each node to be integrated by the Contractor (address ranges, geographic distribution, standards for addresses within each cabinet)
- Proposed IP subnet definition and addressing including any and all masks
- Proposed IP multicast configuration including multicast routing (i.e., PIM sparse or dense) and Rendezvous Point (RP) designation as necessary
- Proposed recommendations for failover and redundancy including network device power, supervisor cards, and network ports
- Proposed configuration and guidelines for L3 routing (OSPF, VRRP, EIGRP, RIP, etc.);
- Proposed configuration and guidelines for Virtual LAN assignments including management VLANs, device VLANs and routing VLANs; and
- Proposed configuration and guidelines for L2 broadcast storm prevention, loop prevention and fault tolerance mechanisms. (Spanning Tree diagram with designated, blocking and forwarding ports indicated. Root bridge and backup root bridge must also be specified.) Incorporation of Multiple Spanning Tree Protocol.
- Proposed configuration and guidelines to mitigate common security threats such as denial of service, man in the middle, MAC/IP spoofing and brute force dictionary attacks.

- Proposed configuration and guidelines for 802.1p Class of Service (COS) queue assignments
- Proposed configuration and guidelines for specific port assignments on each of the L2 and L3 devices

The RDD shall be prepared and signed by a qualified networking professional (minimum CCNA or a manufacturer-approved equivalent based on the approved hardware vendor) and will be approved by the Engineer. The Qualified network professional will be present during the installation and testing of the local area network as well as during system testing.

C. Field Video CODEC Unit

At locations where the field Video CODEC unit is called for installation into new equipment cabinet, integrate field CODEC with Ethernet switch, CCTV assembly, CCTV test panel, power distribution assembly, and surge protection. Ground and provide electrical transient protection to the CODEC in accord with these Project Special Provisions and the CODEC manufactures requirements.

D. Central Video CODEC Unit

Install the central video CODEC units in the existing rack cabinet at the TRTMC as shown in the Plans. Integrate the CODEC units with the rack cabinet power supply and UPS. Integrate the decoder with the existing core Ethernet switch. Integrate the CODEC video outputs with the inputs on the existing video matrix switch at the TRTMC.

E. Central Media Converter

Install one multiple-port central media converter in the existing rack cabinet at the TRTMC. Integrate with the existing core Ethernet switch and existing DMS server to facilitate communications with the field DMS units.

F. Field Ethernet Switch

Install and integrate all field Ethernet switches at field locations as depicted in the diagrams and tables and called for in these Project Special Provisions. Integrate with equipment cabinet hardware and fiber optic communications equipment.

Provide inline surge protection for all Ethernet connections in field cabinets.

20.4. MEASUREMENT AND PAYMENT

(___) Video CODEC Unit will be measured and paid for as the actual number of units, furnished, installed, integrated, and accepted. All cabling and patch cables, integration, and configuration required to install the field video CODEC unit shall be incidental and not be paid for separately.

Central Media Converter will be measured and paid for as the actual number of units furnished, installed, integrated, and accepted. All cabling and patch cables, integration, and configuration required to install the media converter shall be incidental and not be paid for separately.

Field Ethernet Switch will be measured and paid as the actual number furnished, installed, integrated, and accepted. All SFP modules, optics, cabling, attenuators, configuration, and testing or other labor or materials required to install and integrate the Ethernet Switch will be considered incidental and not be paid for separately.

Payment for all LAN integration, RDD development, cabling, jumpers, adapters, sockets, LAN patch panels, and other hardware shall be considered incidental and no separate payment will be made.

Payment will be made under:

Pay Item	Pay Unit
Field Video CODEC Unit	Each
Central Video CODEC Unit	Each
Central Media Converter	Each
Field Ethernet Switch	Each

21. INTEGRATION AND CONFIGURATION

21.1. DESCRIPTION

Install and fully integrate new central equipment at the TRTMC. Fully configure existing central hardware and software at the TRTMC to establish communications with new CCTV and DMS devices.

Coordinate the working hours and building access for all central configuration activities with the Engineer.

21.2. CENTRAL INTEGRATION

Furnish media access control (MAC) addresses for all equipment utilized as part of this project. Affix MAC Address label to each device utilized. Furnish IP addresses for all equipment utilized as part of this project. Affix final IP address each device utilized. Use labels that do not smear or fade.

Install central video CODEC units, and terminal device servers in the existing rack cabinets at the TRTMC as shown on the Block Diagram in the Plans.

Integrate the existing core Ethernet switch with the existing fiber optic interconnect center such that the current communications topology is preserved. Configure the core Ethernet switch and ports as required to establish communications to field Ethernet switches.

Integrate the central video CODEC units with the core Ethernet switch and existing video matrix switch. Configure the video matrix switch to add the new CCTV devices as new inputs to the switch.

Configure the existing CCTV server to recognize the new CCTV units and process the video and control data for sharing with the TRTMC.

Integrate the serial device servers with the core Ethernet switch and existing DMS server.

Configure the existing DMS server to recognize the new DMS units and process control data for sharing with the TRTMC.

21.3. CENTRAL CONFIGURATION

The existing DMS central software that controls the DMS units at the TRTMC is Daktronic's Vanguard. Modify the existing DMS central software configuration at the TRTMC to display and map the new DMS units in the software GUI. Ensure that the software also allows for full communications and control of the DMS unit.

The existing CCTV central software that controls the existing video matrix switch at the TRTMC is Protronix's VideoPro. This software includes on-screen pan-tilt-zoom controls of each camera in the system. Modify the Protronix CCTV central software configuration at the TRTMC to display and map the new CCTV devices so that the CCTV video can be displayed on the existing monitors and display devices at the TRTMC.

Integrate the new CCTV units with NCDOT's regional video sharing and distribution system to allow for remote users to view and control the new CCTV units that terminate on the NCDOT analog video matrix switch through the Ethernet network connection between the remote user and the NCDOT VideoPro server at the TRTMC.

21.4. MEASUREMENT AND PAYMENT

Integration and Configuration will be measured and paid as a lump sum price. This item shall include the installation, testing, and all materials, equipment, labor, tools, storage, shipping, and incidentals necessary to complete the integration and configuration of CCTV and DMS devices with the existing systems at the TRTMC.

All cabling, labeling, sockets, or other accessories required to configure, integrate, and interconnect computer equipment shall be considered incidental and shall not be paid for separately.

All central equipment installed for communications to new CCTV and DMS units will be measured and paid for under the applicable Section of these Project Special Provisions.

Payment will be made under:

Pay Item	Pay Unit
Integration and Configuration	Lump Sum

22. TESTING & ACCEPTANCE

22.1. GENERAL TEST PROCEDURE

Test the DMS and CCTV systems in a series of design approval and functional tests. The results of each test must meet the specified requirements. These tests should not damage the equipment. The Engineer will reject equipment that fails to fulfill the requirements of any test. Resubmit rejected equipment after correcting non-conformities and re-testing; completely document all diagnoses and corrective actions. Modify all equipment furnished under this contract, without additional cost to the North Carolina Department of Transportation, to incorporate all design changes necessary to pass the required tests.

Provide 4 copies of all test procedures and requirements to the Engineer for review and approval at least 30 days prior to the testing start date.

Only use approved procedures for the tests. Include the following in the test procedures:

- A step-by-step outline of the test sequence, showing a test of every function of the equipment or system tested
- A description of the expected nominal operation, output, and test results, and the pass / fail criteria
- An estimate of the test duration and a proposed test schedule
- A data form to record all data and quantitative results obtained during the test
- A description of any special equipment, setup, manpower, or conditions required by the test

Provide all necessary test equipment and technical support. Use test equipment calibrated to National Institute of Standards and Technology (NIST) standards. Provide calibration documentation upon request.

Conform to these testing requirements and the requirements of these specifications. The Engineer will reject all equipment not tested according to these requirements. It is the Contractor's responsibility to ensure the system functions properly even after the Engineer accepts the DMS test results.

Provide 4 copies of the quantitative test results and data forms containing all data taken, highlighting any non-conforming results and remedies taken, to the Engineer for approval. An authorized representative of the manufacturer must sign the test results and data forms.

22.2. DESIGN APPROVAL TESTS

A. DMS System

Design Approval Tests are applicable to DMS systems not currently on the QPL.

The Design Approval Tests consists of all tests described in Section 2.2 "DMS Equipment Tests" of NEMA TS 4-2005 (Hardware Standards for Dynamic Message Signs with NTCIP Requirements). Perform all tests and submit certified results for review and approval.

PROTOTYPE – Manufacture a prototype DMS and controller of the type and size described in the Project Special Provisions. In the presence of the Engineer, test the prototype according to the

Design Approval and Operational Tests. When all corrections and changes (if any) have been made, the Department may accept the prototype DMS and controller as the physical and functional standard for the system furnished under this contract. You may use the prototype units on this project if, after inspection and rework (if necessary), they meet all physical and functional specifications. In the case of standard product line equipment, if the Contractor can provide test results certified by an independent testing facility as evidence of prior completion of successful design approval tests, then the Engineer may choose to waive these tests.

In each Design Approval Test, successfully perform the Functional Tests described below. Apply the extreme conditions to all associated equipment unless stated otherwise in these Project Special Provisions.

B. CCTV System

No design approval test is required.

C. Fiber Optic Communications

No design approval test is required.

D. Central Hardware

No design approval test is required.

22.3. COMPATIBILITY TESTS

A. DMS System

No compatibility test is required.

B. CCTV System

Compatibility Tests are applicable to CCTV cameras and video transceivers that the Contractor wishes to furnish but are of a different manufacturer or model series than the existing units in the field or existing units installed at the TRTMC. If required, the Compatibility Test shall be completed and accepted by the Engineer prior to approval of the material submittal.

The Compatibility Test shall be performed in a laboratory environment at a facility chosen by the Engineer based on the type of unit being tested. Provide notice to the Engineer with the material submitted that a Compatibility Test is requested. The notice shall include a detailed test plan that will show compatibility with existing equipment. The notice shall be given a minimum of 15 calendar days prior to the beginning of the Compatibility Test.

The Contractor shall provide, install, and integrate a full-functioning unit to be tested. The Department will provide access to existing equipment to facilitate these testing procedures. The Contractor is responsible for configuring proposed equipment at the TRTMC and proving compatibility. The Engineer will determine if the Compatibility Test was acceptable for each proposed device.

C. Fiber Optic Communications

No compatibility test is required.

D. Central Hardware

Compatibility Tests are applicable to central and field Ethernet switches that the Contractor wishes to furnish but are of a different manufacturer or model series than the existing units in the

field or existing units installed at the TRTMC. If required, the Compatibility Test shall be completed and accepted by the Engineer prior to approval of the material submittal.

The Compatibility Test shall be performed in a laboratory environment at a facility chosen by the Engineer based on the type of unit being tested. Provide notice to the Engineer with the material submitted that a Compatibility Test is requested. The notice shall include a detailed test plan that will show compatibility with existing equipment. The notice shall be given a minimum of 15 calendar days prior to the beginning of the Compatibility Test.

The Contractor shall provide, install, and integrate a full-functioning unit to be tested. The Department will provide access to existing equipment to facilitate these testing procedures. The Contractor is responsible for configuring proposed equipment at the TRTMC and proving compatibility. The Engineer will determine if the Compatibility Test was acceptable for each proposed device.

22.4. OPERATIONAL FIELD TEST (ON-SITE COMMISSIONING)

A. DMS System

Conduct an Operational Field Test of the DMS system installed on the project to exercise the normal operational functions of the equipment. The Operational Field Test will consist of the following tests as a minimum:

1. Physical Examination

Examine each piece of equipment to verify that the materials, design, construction, markings, and workmanship comply with the mechanical, dimensional, and assembly requirements of these Project Special Provisions.

Perform the following tests as a minimum:

- Verify that all surfaces are free of dents, scratches, weld burns, or abrasions. Round sharp edges and corners.
- Verify bend radius of cables is not excessive or could potentially cause damage.
- Verify all modules, lamps, and components are properly secured.
- Verify that there are no exposed live terminals.

2. Continuity Tests

Check the wiring to assure it conforms to the requirements of these Project Special Provisions.

3. Functional Tests

Perform the following functional tests:

- Start-up and operate the DMS locally using a laptop computer.
- Use automatic (photo-electric sensor controlled) DMS Control Software to switch between “dim”, “normal”, and “bright” light levels.
- Operate the DMS with all display elements flashing continuously for 10 minutes at the maximum flash rate.

- Exercise the DMS by displaying static messages, flashing messages, and alternating static and flashing message sequences.
- Automatic poll the DMS by the Control Software at various intervals and verify the data received by Control Software from DMS.
- Download and edit messages using Control Software.
- Execute status request on the DMS controller.
- Observe normal operations during uploading and downloading messages.
- Input and select messages from the sign controller's local user interface.
- Test sequence activation at chosen intervals.
- Display and verify all stored messages.
- Verify resumption of standard operation upon interruption of electrical power.
- Demonstrate detected failures and response functions.
- Demonstrate proper operation of the Failure Log.
- Set controller clock using the Control Software.
- Execute system shutdown using the Control Software and local user interface.
- Verify detection of a power failure in the DMS enclosure and the report feature of the failure to the Control Software.

Approval of Operational Field Test results does not relieve the Contractor to conform to the requirements in these Project Special Provisions. If the DMS system does not pass these tests, document a correction or substitute a new unit as approved by the Engineer. Re-test the system until it passes all requirements.

B. CCTV System

Perform the following local operational field tests at the camera assembly field site in accordance with the test plans. A laptop computer shall provide camera control and positioning. After completing the installation of the camera assembly, including the camera hardware, video transceiver unit, power supply, and connecting cables:

- Furnish all equipment, appliances, and labor necessary to test the installed cable and to perform the following tests before any connections are made;
- Verify that physical construction has been completed;
- Inspect the quality and tightness of ground and surge protector connections;
- Check the power supply voltages and outputs;
- Connect devices to the power sources;
- Verify installation of specified cables and connections between the camera, PTZ, camera control receiver, and control cabinet;
- Perform the CCTV assembly manufacturer's initial power-on test in accordance with the manufacturer's recommendation;

- Set the camera control address;
- Verify the presence and quality of the video image with a portable NTSC-approved monitor;
- Exercise the pan, tilt, zoom, focus, iris opening, and manual iris control selections, and the operation, preset positioning, and power on/off functions;
- Demonstrate the pan and tilt speeds and extent of movement to meet all applicable standards, specifications, and requirements;
- Verify proper voltage of all power supplies; and
- Interconnect the communication interface device with the communication network's assigned fiber-optic trunk cable and verify that there is a transmission LED illuminated.
- Verify that the video codec unit is properly encoding the video from the field camera

Approval of Operational Field Test results does not relieve the Contractor to conform to the requirements in these Project Special Provisions. If the CCTV system does not pass these tests, document a correction or substitute a new unit as approved by the Engineer. Re-test the system until it passes all requirements.

C. Fiber Optic Communications

Conduct optical time domain reflectometer (OTDR) tests on the cable on the reel and after the cable is installed and terminated. Provide written notification a minimum of ten days before beginning fiber-optic cable testing.

After splicing is completed, perform bi-directional OTDR tests on each fiber, including unused fibers, to ensure the following:

- Fusion splice loss does not exceed 0.05 dB,
- Terminations and connections have a loss of 0.5 dB or less, and
- Reflection loss is 40 dB or greater for each connector.

Install a 1000-foot pre-tested launch cable between the OTDR and fiber-optic cable to be tested.

If exceeded, remake splices until the loss falls below 0.05 dB. The Department will record each attempt for purposes of acceptance.

Furnish durable labeled plots and electronic copies on a CD or DVD of test results for each fiber including engineering calculations demonstrating that OTDR test results meet or exceed the attenuation requirements and that optical properties of the cable have not been impaired. Label all test results (plots and discs) with the manufacturer and model number of the OTDR testing equipment.

Provide a tabular summary or spreadsheet detailing and comparing the loss budget and actual loss calculations per link. Provide test results for fiber-optic cable that demonstrates the loss budget where the fiber originates and the point where the fiber meets an electronic device.

If any fiber exceeds the maximum allowable attenuation or if the fiber-optic properties of the cable have been impaired, take approved corrective action including replacement of complete

segments of fiber-optic cable if required. Corrective action will be at no additional cost to the Department.

D. Central Hardware

The Contractor shall perform a Network System Test (NST) on the local area network. During the NST, the Contractor must demonstrate successful local operation of field equipment operating from the field Ethernet switches as well as successful control of the equipment from the TRTMC.

In the event of a failed NST, the Contractor, at his expense, must perform all necessary activities required to provide proper operation of the LAN, which can include full replacement of field equipment or cabling.

The Engineer or his representative will witness all NSTs. Documentation of all testing procedures and activities must be provided to the Engineer prior to full acceptance of the system ring.

22.5. 30-DAY OBSERVATION PERIOD

The 30-Day Observation Period shall not be considered part of work to be completed by the project completion date.

Upon successful completion of all project work, the component tests, the System Test, and the correction of all deficiencies, including minor construction items, the 30-day Observation Period may commence. This observation consists of a 30-day period of normal, day-to-day operations of the new field equipment in operation with the new central equipment without any failures. The purpose of this period is to ensure that all components of the system function in accordance with the Plans and these Project Special Provisions.

Respond to system or component failures (or reported failures) that occur during the 30-day Observation Period within twenty-four (24) hours. Correct said failures within forty-eight (48) hours. Any failure that affects a major system component as defined below for more than forty-eight (48) hours will suspend the timing of the 30-day Observation Period beginning at the time when the failure occurred. After the cause of such failures has been corrected, timing of the 30-day Observation Period will resume. System or component failures that necessitate a redesign of any component or failure in any of the major system components exceeding a total of three (3) occurrences will terminate the 30-day Observation Period and cause the 30-day Observation Period to be restarted from day zero when the redesigned components have been installed and/or the failures corrected. The major system components are:

- DMS Field Controller and Display Module
- CCTV Camera, PTZ, and Video Transceivers
- Fiber Optic Communications Cables and Splices
- Local Area Network including Ethernet switches

22.6. FINAL ACCEPTANCE

Final system acceptance is defined as the time when all work and materials described in the Plans and these Project Special Provisions have been furnished and completely installed by the

Contractor; all parts of the work have been approved and accepted by the Engineer; and successful completion of the 30-day observation period.

The project will be ready for final acceptance upon the satisfactory completion of all tests detailed in this Section of the Project Special provisions; the rectification of all punch-list discrepancies; and the submittal of all project documentation.

22.7. MEASUREMENT AND PAYMENT

There will be no direct payment for the work covered in this section.

Payment for this work will be covered in the applicable sections of these Project Special Provisions at the contract unit price for other items furnished on this Project.

Project U-2525B **Guilford County**

Project Special Provisions
Structures and Culverts

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For Modified Bridge Approach Fills, see Geotechnical special provisions.

NORTH CAROLINA PROFESSIONAL SEAL 26936 ENGINEER DAVID S. STUTTS

4/8/14

EXCEPT FOR RAILROAD PROVISIONS

PROJECT SPECIAL PROVISIONS
STRUCTURES

PROJECT U-2525B **GUILFORD COUNTY**

MAINTENANCE AND PROTECTION OF TRAFFIC BENEATH PROPOSED STRUCTURE **(SPECIAL)**

1.0 GENERAL

Maintain traffic on the travelways listed in Table 1 as shown in Traffic Control Plans and as directed by the Engineer.

Provide a minimum temporary vertical clearance as shown in Table 1 at all times during construction.

Table 1

STATION	TRAVELWAY	MIN TEMP VERT CLR.
26+21.65 –L-	US 70	15'-3"
268+22.89 –L-	US 29	16'-9"
144+60.63 –L- 144+90.00 –L-	SR 2832	16'-8 1/8"
129+37.56 –L-	SR 2825	15'-3"
26+17.64 –Y22-	US-29	16'-8 ¼"
174+72.46 –L-	SR 2732	16'-4"
14+99.25 –L-	SR 4762 NSRR	21'-10" 24'-1"

Submit plans and calculations for review and approval for protecting traffic and bracing girders, as described herein, at the above station before beginning work at this location. Have the drawings and design calculations prepared, signed, and sealed by a North Carolina Registered Professional Engineer. The approval of the Engineer will not relieve the Contractor of the responsibility for the safety of the method or equipment.

PROTECTION OF TRAFFIC

Protect traffic from any operation that affords the opportunity for construction materials, equipment, tools, etc. to be dropped into the path of traffic beneath the structure. Based on Contractor means and methods determine and clearly define all dead and live loads for this system, which, at a minimum, shall be installed between beams or girders over any travelway or shoulder area where traffic is maintained. Install the protective system before beginning any construction operations over traffic. In addition, for these same areas, keep the overhang falsework in place until after the rails have been poured.

2.0 BRACING GIRDERS

Brace girders to resist wind forces, weight of forms and other temporary loads, especially those eccentric to the vertical axis of the member during all stages of erection and construction. Before casting of intermediate diaphragms, decks, or connecting steel diaphragms do not allow the horizontal movement of girders to exceed ½ inch.

3.0 BASIS OF PAYMENT

Payment at the contract unit prices for the various pay items will be full compensation for the above work.

TEMPORARY BENTS (9-30-11)

When girder erection requires the use of temporary bents, design, construct, maintain and afterwards remove the temporary bents in accordance with the Standard Specifications and this Special Provision. For the purpose of this Special Provision, the term "temporary bents" includes girder erection temporary bents, vertical shoring and proprietary shoring systems.

Temporary bents for structures over railroads shall maintain a minimum horizontal clearance of 25' from center of track.

Design temporary bents in accordance with the 1995 AASHTO Guide Design Specification for Bridge Temporary Works (including the 2008 Interim Revisions) and the Project Special Provision entitled "Falsework and Formwork". The design calculations and detailed drawings of the structural components shall be signed and sealed by a North Carolina Registered Professional Engineer.

Submit design calculations and detailed drawings of temporary bents to the Engineer for review and approval. The detailed drawings shall show the position of the temporary bents in relationship to the existing travel way, the location of the temporary bents with respect to the ends of the girders, the top of support elevations for setting girders in the cambered position, and a girder erection procedure. For stream crossings, determine the bent stability assuming a scour depth equal to 250% of the pile diameter or width below the existing bed elevation. The

Engineer may require a more detailed analysis of scour depth for temporary bents containing more than a single row of piles.

Include all material specifications for new and used materials in the detail drawings. In addition, show the location of the used materials indicating condition of the material, the location and geometry of existing but unused holes, attachments left over from previous use and any other irregularities in the material. Account for the condition of all used materials in the design calculations.

For all manufactured components, provide engineering data supplied by the manufacturer. For proprietary shoring systems, evaluate differential leg loading.

Provide access to all new and used materials for inspection prior to assembly.

Before the temporary bent is loaded, the contractor shall inspect the bent in the presence of the Engineer, and submit a written statement certifying that the erected bent complies with the approved detailed drawings. Any condition or material that does not comply with the accepted drawings, or any other condition deemed unsatisfactory by the Engineer, is cause for rejection until corrections are made.

Remove temporary bents in such a manner as to permit the structure to uniformly and gradually take the stresses due to its own weight. During removal do not disturb or otherwise damage the finished work.

Unless otherwise specified, temporary bents will not be directly measured. Payment will be full compensation at the contract unit prices for the various pay items requiring temporary bents.

BRIDGE DECK RIDEABILITY AND GROOVING AT STATION 144+60.63 –L- & 144+90.00 –L- **(9-30-11)**

1.0 GENERAL

This Special Provision shall govern the testing, diamond grinding, transverse grooving and all other related work associated with obtaining satisfactory rideability and surface texture of the bridge deck surface. Provide a surface finish in accordance with Article 420-14(B) of the Standard Specifications.

2.0 TESTING REQUIREMENTS

Perform acceptance testing of the longitudinal profile of the finished bridge deck in each wheel path of each lane in the presence of the Engineer. It is the Contractor's responsibility to submit a proposed plan of action and schedule for profilograph testing. Use a certified independent provider, approved by the Engineer, to perform the profilograph test.

Prior to profilograph testing, placement of the bridge deck and barrier rail within the section to be tested shall be complete, with the exception of blockouts required for the

installation of joints. Do not install joints until the Engineer determines that the rideability requirements herein have been met. Joint locations should be temporarily bridged sufficiently to facilitate operation of the profilograph and corrective equipment across the joint. Remove all obstructions from the bridge deck and sweep the surface clean of debris prior to testing. If automated profilograph equipment is used, there shall be no radio transmissions or other activities that might disrupt the automated profilograph equipment during the testing.

Ensure that the profilograph is in good operating condition per the manufacturer's recommendations. Maintain tires free of debris and buildup during each test run. Operate the profilograph at a maximum speed of 2 miles per hour. If a propulsion vehicle is used, it shall be approved, and the gross vehicle weight shall not exceed 1,000 pounds.

At the beginning and end of each day's testing, and at other times determined to be necessary by the Engineer, operate the profilograph over a calibration strip so the Engineer can verify correct operation of the profilograph. The calibration strip shall be a 100 foot section of pavement that is reasonably level and smooth. Submit each day's calibration graphs with that day's test section graphs to the Engineer. Calibrate the profilograph in accordance with the current NCDOT procedure entitled "Determination of Profile Index". Copies of this procedure may be obtained from the NCDOT Construction Unit.

Plot each profilogram on a continuous graph at a horizontal scale of 25 feet per inch with the vertical scale plotted at a true scale. Station numbers shall be recorded on the profilogram at distances not to exceed 200 feet. Note joint locations on the profilogram.

Take profiles with the recording wheel in each wheel path of each lane. The wheel paths of a lane are considered parallel to and approximately 3.5 feet inside both edges of the travel lane. Take profiles over the entire length of the travel lanes on the bridge deck including approach slabs. Upon completion of testing, submit the profilograms for each wheelpath to the Engineer for analysis. The Engineer will retain the profilograms.

The Engineer will determine the Profile Index for each wheel path in accordance with the procedure entitled "Determination of Profile Index".

A test section is defined as a 600 foot length of each travel lane. The maximum allowable Profile Index per lane shall not exceed 25" per mile as determined with a 0.0" blanking band over any 600 foot test section. The Contractor will correct individual deviations in excess of 0.3" over any 25 foot length on the line tested by diamond grinding. Additionally, the entire deck surface shall meet a 0.125" in 10 feet straightedge check made atop the deck either transversely or longitudinally as deemed necessary by the Engineer.

3.0 DIAMOND GRINDING

If the deck does not meet the testing requirements, diamond grinding is required to make corrections. Diamond grind the full width of all lanes and shoulders in the direction of travel.

Diamond grinding shall be performed using a Boart Longyear PC 5000, a Target 3804 or an approved equal. Submit grinding equipment specifications to the Engineer for approval before any grinding is performed. Use a grinding machine capable of removing a minimum of 3 feet of width with each pass. Multiple passes may be needed to achieve the required depth of removal. In addition, hand grinding may be required to remove vertical steps between passes.

The ground surface shall consist of between 50 and 60 grooves per foot of width. The grooves shall be between 0.09" and 0.15" in width and 0.0625" in depth. The area between the grooves shall be between 0.06" and 0.13" in width. The final concrete texture shall be uniform.

Construct and operate the grinding machine such that it will not cause strain or damage to the deck surface, excessive ravels, aggregate fractures, spalls, or disturbance of transverse joints. Longitudinally grind the deck parallel to the roadway centerline.

Continuously remove all slurry or other debris resulting from the grinding operations by vacuum pick-up or other approved methods. Prevent the slurry from flowing into floor drains, onto the ground or into the body of water under the bridge. Dispose of all residues off the project.

In completing all corrective work on the deck surface to satisfy the rideability criteria stated herein, limit grinding such that the final reinforcement cover is not less than the plan cover minus ½ inch. In cases where this cannot be achieved, other corrective work may be required as directed by the Engineer.

Provide additional profilograph testing as necessary following grinding until the rideability requirements above are satisfied.

4.0 GROOVING BRIDGE FLOORS

After the concrete surface profile has been accepted by the Engineer, the concrete blockouts poured, and the joints installed, groove the bridge deck in accordance with Article 420-14(B) of the Standard Specifications. If a substantial amount of bridge deck surface has been diamond ground and/or the concrete cover over the slab reinforcement has been reduced to the minimum, the Engineer may delete all or a portion of the requirement of grooving in that area. In this instance, no additional compensation shall be made for underruns in grooving.

5.0 BASIS OF PAYMENT

No separate payment will be made for profilograph testing or diamond grinding of the bridge deck. The cost of the testing procedure, equipment, grinding operation, and removal and disposal of slurry resulting from the grinding operation is considered incidental to the contract bid price for "Reinforced Concrete Deck Slab".

PLACING LOAD ON STRUCTURE MEMBERS (11-27-12)

The 2012 Standard Specifications shall be revised as follows:
In **Section 420-20 – Placing Load on Structure Members** replace the first sentence of the fifth paragraph with the following:

Do not place vehicles or construction equipment on a bridge deck until the deck concrete develops the minimum specified 28 day compressive strength and attains an age of at least 7 curing days.

ELECTRICAL CONDUIT SYSTEM FOR SIGNALS (9-30-11)

1.0 GENERAL

The work covered by this section consists of furnishing and installing a conduit system suspended beneath structures and buried. Perform all work in accordance with these special provisions, the plans, and the National Electrical Code (NEC). Install the conduit system in accordance with NEC requirements as an approved raceway for electrical circuits.

The Contractor actually performing the work described in these special provisions is required to have a license of the proper classification from the North Carolina State Board of Examiners of Electrical Contractors.

The licensed Electrical Contractor is required to be available on the job site when the work is being performed or when requested by the Engineer. The licensed Electrical Contractor is required to have a set of plans and special provisions in his possession on the job site, and must maintain accurate "as built" plans.

2.0 MATERIALS

Submit eight (8) copies of catalog cuts and/or drawings for all proposed materials for the Engineer's review and approval. Include the brand name, stock number, description, size, rating, manufacturing specification, and applicable contract item number(s) on each submittal. Allow forty (40) days for submittal review. The Engineer will advise the Contractor of reasons for rejected submittals and will return approved submittals to the Contractor. Do not deliver material to the project prior to submittal approval.

For the work covered by this section, the term conduit applies to a system of components consisting of an outer duct, 4 inner ducts, internal spacers, special-purpose spin couplings and all necessary components, referred to as a multi-cell raceway system.

For the outer duct of RGC multi-cell raceway, use rigid galvanized conduit per UL 6 "Rigid Metallic Conduit" with rigid full weight galvanized threaded fittings. Provide factory installed reverse-spin couplings with 3 set screws, to allow assembly without turning the outer duct, and prevent the coupling from backing off before and after installation. Provide an O-ring gasket in the coupling body to resist pullout and to create a

watertight seal. Provide pre-installed, smooth walled, pre-lubricated PVC inner ducts, with one white "tracer" duct and internal spacers to maintain alignment throughout the raceway system. Do not use materials provided by more than one manufacturer.

When deflection couplers are detailed on the plans, use deflection couplers that are designed for use with RGC multi-cell raceway, and meet all the requirements for RGC outer duct stated above. Provide deflection couplers that allow a 30 degree bend in any direction and ¾ inch mis-alignment in all axis. Provide factory installed reverse-spin couplings with 3 set screws, to allow assembly without turning the outer duct, and prevent the coupling from backing off before and after installation. Provide deflection couplers with a middle section consisting of a rubber boot attached by spin couplings and galvanized straps, with inner ducts that bend in unison with the rubber boot.

Use expansion joints that are designed for use with RGC multi-cell raceway, and meet the requirements for RGC outer duct stated above. Provide expansion joints that allow 8 inches of longitudinal movement. Use expansion joints consisting of a female end with a lead-in coupling body and spin coupling, an exterior sliding joint, and a fixed inner duct with an internal sliding joint. Provide expansion joints that have factory installed reverse-spin couplings with 3 set screws, to allow assembly without turning the outer duct and prevent the coupling from backing off before and after installation.

Use transition adapters that allow RGC raceway and PVC raceway to be coupled together while maintaining the same inner duct alignment. Provide adapters consisting of a threaded female adapter, an outer duct adapter, and a modified coupling body with a sleeve, thin wall couplings and an end spacer.

For the outer duct of PVC multi-cell raceway use schedule 40 PVC per UL 651 "Rigid Nonmetallic Conduit." Use PVC raceway with 6 inch bell ends and an O-ring gasket to resist pullout and provide a watertight seal. Provide PVC raceway having a print line that states "Install Print Line Up" to help facilitate correct installation. Use PVC raceway with pre-lubricated PVC inner ducts, with one white "tracer" duct and internal spacers to maintain alignment throughout the raceway system. Do not use material provided by more than one manufacturer.

Use terminations designed for PVC raceway, to seal each inner duct and the outer duct, and to provide watertight protection.

Use schedule 40 PVC for sleeves in accordance with UL 651 "Rigid Nonmetallic Conduit."

Provide concrete inserts made of galvanized malleable iron, with internal threads for suspending loads from a fixed point beneath a concrete ceiling or deck where no lateral adjustment is required. Use inserts that can be secured to the concrete forms, preventing movement during concrete placement.

For stabilizers and hangers, use galvanized rods that conform to ASTM-A36 or A-575. Galvanized rods may be threaded on both ends or threaded continuously. Use steel stabilizer clamps and attachment brackets, sized as noted in the plans and hot dipped

galvanized per ASTM-A123. Provide high strength bolts, nuts and washers that are galvanized in accordance with Article 1072-5 of the Standard Specifications.

Use adjustable clevis-type pipe hangers that allow for vertical adjustment and limited movement of the pipe. Use galvanized pipe hangers that are listed with Underwriters Laboratories, or are Factory Mutual approved for the size conduit shown in the plans. Use hangers that comply with Federal Specification WW-H-171E Type 1 and Manufacturers Standardization Society SP-69 Type 1. Plastic-coat the saddle area of the hanger.

Provide pull lines specifically designed for pulling rope through conduit. Use pull lines made of 2-ply line, with a tensile strength of 240 pounds minimum. Use rot and mildew resistant pull lines that are resistant to tangling when being dispensed.

Use mastic that is a permanent, non-hardening, water sealing compound that adheres to metal, plastic, and concrete.

Provide jute that is a burlap-like material used for filling voids and protecting components from waterproofing and adhesive compounds.

Provide zinc rich paint conforming to Section 1080-9 of the Standard Specifications.

3.0 INSTALLATION

To ensure against corrosion in the area where hot dipped galvanizing has been damaged, cover all raw metal surfaces with a cold galvanized, zinc rich paint.

Stub the raceway out at an accessible location and seal with termination kits designed specifically for that purpose. Use termination kits of the same material as the raceway.

Install Stabilizers as shown on the plans to assure proper movement of the conduit expansion joints. Securely fasten the clamps with attachment brackets and stabilizer rods to the conduit at the indicated locations to assure these locations remain stationary. Install the stabilizer rods parallel to the alignment of the conduit, and tilt rod upward at an orientation of 45 degrees to the bottom of the bridge deck.

Insert a pull line in each inner duct with sufficient slack for future use.

Securely fasten all components to prevent movement during concrete placement.

Smooth all sleeve ends and make them flush with surrounding concrete surfaces. Remove burrs and rough edges by filing or grinding. A torch may be used to cut the ends of metal sleeves. Use shields to protect all surfaces during torch-cutting operations.

Place backfill in accordance with Section 300-7 of the Standard Specifications.

Fill the space between the raceway and the sleeve with mastic and jute. Install the mastic with a minimum distance of 2 inches at each end of the sleeve and the remaining interior space filled with jute. Finish the mastic by making it smooth and flush with the concrete.

Coordinate electrical conduit system work with work by others, and allow installation of circuitry or fiber optic cables during the construction process as directed by the Engineer.

Ensure that the concrete inserts are in the proper position and installed correctly, including when they are located in prestressed concrete deck panels.

Keep the raceway system clean of all debris during construction, with the completed system clean and ready for installation of circuitry or fiber optic cables.

The Engineer must inspect and approve all work before concealment.

4.0 BASIS OF PAYMENT

No direct measurement will be made for the conduit system, since it will be paid for on a lump sum basis.

Payment for the conduit system will be made at the contract lump sum price for "Electrical Conduit System for Signals at station _____".

Such price and payment for the conduit system as provided above will be considered full compensation for all materials, equipment, and labor necessary to complete the work in accordance with the plans and these special provisions.

Payment will be made under:

Electrical Conduit System for Signals at station _____ Lump Sum

STEEL REINFORCED ELASTOMERIC BEARINGS **(11-27-12)**

The 2012 Standard Specifications shall be revised as follows:
In **Section 1079-1 – Preformed Bearing Pads** add the following after the second paragraph:

Internal holding pins are required for all shim plates when the contract plans indicate the structure contains the necessary corrosion protection for a corrosive site.

Repair laminated (reinforced) bearing pads utilizing external holding pins via vulcanization. Submit product data for repair material and a detailed application procedure to the Materials and Tests Unit for approval before use and annually thereafter.

POT BEARINGS **(9-30-11)**

1.0 GENERAL

This item consists of furnishing, fabrication and installation of pot bearings in accordance with AASHTO LRFD Bridge Design Specifications, the Standard Specifications, the recommendations of the manufacturer and the details shown on the plans and as specified herein.

Fixed pot bearings consist of a sole plate, a disc of elastomer in a steel cylinder with a snug fitting steel piston, masonry plate, anchor bolts, nuts and washers. Expansion pot bearings consist of a sole plate, a top steel plate with a polished stainless steel sheet facing bearing on a fixed pot bearing with a layer of virgin polytetraflouroethylene (PTFE) material on its top, masonry plate, anchor bolt assembly which includes anchor bolts, nuts, washers, pipe sleeves, a closure plate, grout and various sizes of standard pipe and any other necessary material as detailed on the plans.

2.0 MATERIALS

Use pot bearings produced by the same manufacturer.

Use AASHTO M270 Grade 50W (345W) for all steel in the pot bearings. Clean, coat, and seal the plates in the pot bearing assemblies except for the areas with special facings and the internal surfaces of pot, in accordance with the Special Provision for "Thermal Sprayed Coatings (Metallization)". Metallization of the internal surfaces of the pot is permitted provided these surfaces are then polished to a surface smoother than 60 micro inches. The surfaces shall be coated to a thickness of 8 mils minimum on all external parts. Repair surfaces that are abraded or damaged after the application of metallizing in accordance with the Special Provision for "Thermal Sprayed Coatings (Metallization)".

Galvanize all fill plates specified on the plans. Provide anchor bolts and nuts in accordance with the Standard Specifications.

When the maximum plan dimension of the sheet is 12" or less, provide a stainless steel sheet in expansion pot bearings that is at least 16 gage or 1/16". When the maximum plan dimension is greater than 12", provide a stainless steel sheet that is at least 11 gage or 1/8". Ensure that all stainless steel sheets are in conformance with ASTM A240/A167 Type 304 and polished to a minimum #8 mirror surface finish.

Blast clean the surface of the plate that will be attached to the stainless sheet to a near white condition in accordance with the Standard Specifications. Position and clamp the back of the stainless sheet that is to be in contact with the steel plate on the steel plate. Apply the stainless steel to the blast cleaned surface of the steel plate as soon as possible after blasting and before any visible oxidation of the blast cleaned surface occurs. Weld the stainless sheet continuously around its perimeter using a tungsten inert gas, wire-fed welder.

For the PTFE sheet, used as a mating surface for the stainless sheet, provide an unfilled virgin PTFE Sheet (Recessed) or a glass-fiber filled PTFE sheet, resulting from skiving billets formed under hydraulic pressure and heat. Provide resin that conforms to the requirements of ASTM D4894 or D4895.

To bond the PTFE and the piston, use heat cured high temperature epoxy capable of withstanding temperature of -320°F to 500°F.

Provide a neoprene or natural rubber elastomer with a durometer hardness of 50 that allows for a minimum rotation of 0.02 radians. Place a 1/64" thick unfilled PTFE disc or other

approved lubricant that is not detrimental to the elastomer on either side of the elastomer inside the bearing. Use a brass sealing ring with the neoprene or natural rubber elastomer.

3.0 DESIGN

Have the manufacturer design the pot bearings for the loads and movements shown on the contract plans. However, use the anchor bolt size, length, spacing and masonry plate thickness as shown on the contract plans and provide an overall height of the bearing assembly that is at least the height shown on the contract plans, but no more than 1/2 inch greater than this height. Either combine, cast as a single piece, or weld together the sole plate and top plate/piston and the cylinder with the masonry plate.

When designing the bearings, use the following allowable bearing stresses:

- On confined elastomer: 3500 psi
- On PTFE Sliding Surface, filled or unfilled PTFE (recessed): 3500 psi

Submit eight sets of shop drawings and one set of design calculations for review, comments and acceptance. Have a North Carolina Registered Professional Engineer check and seal the shop drawings and design calculations.

After the Engineer reviews the drawings and, if necessary, corrections are made, submit one 22" x 34" reproducible set of the working drawings.

4.0 SAMPLING AND TESTING

A. Sampling

The manufacturer is responsible for randomly selecting and testing sample bearings from completed lots of bearings. The manufacturer is also responsible for certifying that the completed bearings and their components have been tested and are in compliance with the requirements of this Special Provision. The manufacturer shall furnish results of the tests to the Materials and Tests Engineer.

B. Testing

1. Proof Load Test

Load a test bearing to 150% of the bearing's rated design capacity and simultaneously subject it to a rotational range of 0.02 radians (1.146°) for a period of 1 hour.

Have the bearing visually examined both during the test and upon disassembly after the test. Any resultant visual defects, such as extruded or deformed elastomer or PTFE, damaged seals or rings, or cracked steel is cause for rejection.

Keep the steel bearing plate and steel piston in continuous and uniform contact for the duration of the test. Any observed lift-off is cause for rejection.

2. Sliding Coefficient of Friction

For all guided and non-guided expansion type bearings, measure the sliding coefficient of friction at the bearing's design capacity in accordance with the test method described below, and on the fifth and fiftieth cycles, at a sliding speed of 1 in/min.

Calculate the sliding coefficient of friction as the horizontal load required to maintain continuous sliding of one bearing, divided by the bearing's vertical design capacity.

The test results are evaluated as follows:

- A maximum measured sliding coefficients of friction of 3%.
- A visual examination both during and after the test. Any resultant visual defects, such as bond failure, physical destruction, cold flow of PTFE to the point of debonding, or damaged components is cause for rejection of the lot.

Using undamaged test bearings in the work is permitted.

3. Test Method

For the test method and equipment, meet the following requirements:

a. Arrange the test to determine the coefficient of friction on the first movement of the manufactured bearing.

b. Clean the bearing surface prior to testing.

c. Conduct the test at maximum working stress for the PTFE surface with the test load applied continuously for 12 hours prior to measuring friction.

d. Determine the first movement static and dynamic coefficient of friction of the test bearing at a sliding speed of less than 1 in/min, not to exceed:
   0.04 unfilled PTFE
   0.08 filled PTFE

e. Subject the bearing specimen to 100 movements of at least 1 inch of relative movement and, if the test facility permits, the full design movement at a speed of less than 1 ft/min. Following this test determine the static and kinetic coefficient of friction again. The specimen is considered a failure if it exceeds the values measured in (d) above or if it shows any signs of bond failure or other defects.

Bearings represented by test specimens passing the above requirements are approved for use in the structure subject to on-site inspection for visible defects.

5.0 INSTALLATION

Prior to shipment, seal the joint between the steel piston and the steel cylinder with a bead of caulk. Store pot bearings delivered to the bridge site under cover on a platform above the ground surface. Protect the bearings from injury at all times and, before placing the bearings, dry and clean all dirt, oil, grease or other foreign substances from the bearing. Do not disassemble the bearings during installation, except at the manufacturer's direction. Place the bearings in accordance with the recommendations of the manufacturer, Contract Drawings, and as directed by the Engineer. If there is any discrepancy between the recommendations of the manufacturer, Special Provisions, and Contract Drawings, the Engineer is the sole judge in reconciling any such discrepancy.

Provide preformed bearing pads under the masonry plates in accordance with Article 1079-1 of the Standard Specifications.

Do not install any bearing before the Engineer approves it.

6.0 BASIS OF PAYMENT

Payment will be at the lump sum contract price bid for "Pot Bearings" which price will be full compensation for furnishing all labor, materials, tools, equipment and incidentals required to complete the work in accordance with the Standard Specifications, this Special Provision, the manufacturer's requirements and as directed by the Engineer.

OPTIONAL DISC BEARINGS (9-30-11)

1.0 GENERAL

This item consists of furnishing, fabrication and installation of disc bearings in accordance with AASHTO LRFD Bridge Design Specifications, the Standard Specifications, the recommendations of the manufacturer and as specified herein. In addition, all plan notes pertaining to furnishing and installing pot bearing assemblies shall also apply to disc bearing assemblies, except as noted herein.

Disc Bearings consist of a polyether urethane structural element (disc) confined by upper and lower steel bearing plates. Equip disc bearings with a shear restriction mechanism to prevent movement of the disc. Supply disc bearings as fixed bearings and guided expansion bearings as designated by the Contract Documents.

Fixed disc bearings allow rotation but no longitudinal or transverse movement in the bearing plane. Fixed bearings consist of a sole plate, an elastomer disc, upper bearing plate, lower bearing plate, masonry plate, anchor bolts, nuts and washers.

Guided expansion disc bearings allow rotation and only longitudinal movement in the bearing plane. Guided expansion disc bearings consist of a sole plate, a top steel plate with a polished stainless steel sheet facing bearing on a fixed disc bearing with a layer of virgin

polytetraflouroethylene (PTFE) material on its top, masonry plate, anchor bolt assembly which includes anchor bolts, nuts, washers, pipe sleeves, a closure plate, grout and various sizes of standard pipe and any other necessary material as detailed on the plans. To allow longitudinal movement, bond a polytetraflouroethylene (PTFE) sheet to the upper steel bearing plate. Support a sliding steel top bearing plate with the upper steel bearing plate. Face the mating surface of the sliding steel top bearing plate with polished stainless steel. Use either a guide bar or keyway system to restrict transverse movement. Face the sliding surfaces of the guide bar or keyway systems with either PTFE sheets or stainless steel.

2.0 MATERIALS

Use disc bearings produced by the same manufacturer.

Use AASHTO M270 Grade 50W (345W) for all steel in the disc bearings. Clean, coat, and seal the plates in the disc bearing assemblies except for the areas with special facings and the areas that come in contact with the elastomer disc, in accordance with the Special Provision for "Thermal Sprayed Coatings (Metallization)". The surfaces shall be coated to a thickness of 8 mils minimum on all external parts. Repair surfaces that are abraded or damaged after the application of metallizing in accordance with the Special Provision for "Thermal Sprayed Coatings (Metallization)".

Provide anchor bolts and nuts in accordance with the Standard Specifications.

When the maximum plan dimension of the sheet is 12" or less, provide a stainless steel sheet in expansion disc bearings that is at least 16 gage or 1/16". When the maximum plan dimension is greater than 12", provide a stainless steel sheet that is at least 11 gage or 1/8". Ensure that all stainless steel sheets are in conformance with ASTM A240/A167 Type 304 and polished to a minimum #8 mirror surface finish.

Blast clean the surface of the plate that will be attached to the stainless sheet to a near white condition in accordance with the Standard Specifications. Position and clamp the back of the stainless sheet that is to be in contact with the steel plate on the steel plate. Apply the stainless steel to the blast cleaned surface of the steel plate as soon as possible after blasting and before any visible oxidation of the blast cleaned surface occurs. Weld the stainless sheet continuously around its perimeter using a tungsten inert gas, wire-fed welder.

For the PTFE sheet, used as a mating surface for the stainless sheet, provide an unfilled virgin PTFE Sheet (Recessed) or a glass-fiber filled PTFE sheet, resulting from skiving billets formed under hydraulic pressure and heat. Provide resin that conforms to the requirements of ASTM D4894 or D4895.

To bond the PTFE and the bearing plate, use heat cured high temperature epoxy capable of withstanding temperature of –320°F to 500°F.

Mold the polyether urethane structural element from a polyether urethane compound. Conform the physical properties of the polyether urethane to the following requirements:

Physical Property	ASTM Test Method	Requirements Min.	Max.
Hardness, Type D Durometer	D2240	60	64
Tensile Stress psi At 100% elongation At 200% elongation	D412	 2000 3700	----
Tensile Strength psi	D412	5000	----
Ultimate Elongation %	D412	220	----
Compression Set % 22 hrs. at 158°F	D395	----	40

3.0 DESIGN

Design the disc bearings for the loads and movements shown on the contract plans. However, use the anchor bolt size, length, spacing and masonry plate thickness as shown on the contract plans and provide an overall height of the bearing assembly that is at least the height shown on the contract plans, but no more than 1/2 inch greater than this height. Either combine and cast the sole plate and top plate/upper bearing plate and the lower bearing plate and masonry plate as a single unit or weld together prior to the installation of the disc.

When designing the bearings, use the following allowable bearing stresses:

- On polyether urethane structural element: 5000 psi
- On PTFE Sliding Surface, filled or unfilled PTFE (recessed): 3500 psi

Submit eight sets of shop drawings and one set of design calculations for review, comments and acceptance. Have a North Carolina Registered Professional Engineer check and seal the shop drawings and design calculations.

After the Engineer reviews the drawings and, if necessary, corrections are made, submit one 22" x 34" reproducible set of the working drawings.

4.0 SAMPLING AND TESTING

A. Sampling

The manufacturer is responsible for randomly selecting and testing sample bearings from completed lots of bearings. The manufacturer is also responsible for certifying that the completed bearings and their components have been tested and are in compliance with the requirements of this Special Provision. The manufacturer shall furnish the results of the tests to the Materials and Tests Engineer.

B. Testing

1. Proof Load Test

Load a test bearing to 150% of the bearing's rated design capacity and simultaneously subject it to a rotational range of 0.02 radians (1.146°) for a period of 1 hour.

Have the bearing visually examined both during the test and upon disassembly after the test. Any resultant visual defects, such as extruded or deformed elastomer or PTFE, damaged seals or rings, or cracked steel is cause for rejection.

Keep continuous and uniform contact between the polyether urethane element and the bearing plates and between the sliding steel top plate and the upper bearing plate for the durat ion of the test. Any observed lift-off is cause for rejection.

2. Sliding Coefficient of Friction

For all guided and non-guided expansion type bearings, measure the sliding coefficient of friction at the bearing's design capacity in accordance with the test method described below, and on the fifth and fiftieth cycles, at a sliding speed of 1 in/min.

Calculate the sliding coefficient of friction as the horizontal load required to maintain continuous sliding of one bearing, divided by the bearing's vertical design capacity.

The test results are evaluated as follows:

- A maximum measured sliding coefficient of friction of 3%.
- A visual examination both during and after the test. Any resultant visual defects, such as bond failure, physical destruction, cold flow of PTFE to the point of debonding, or damaged components is cause for rejection of the lot.

Using undamaged test bearings in the work is permitted.

3. Test Method

The test method and equipment shall meet the following requirements:

f. Arrange the test to determine the coefficient of friction on the first movement of the manufactured bearing.

g. Clean the bearing surface prior to testing.

h. Conduct the test at maximum working stress for the PTFE surface with the test load applied continuously for 12 hours prior to measuring friction.

i. Determine the first movement static and dynamic coefficient of friction of the test bearing at a sliding speed of less than 1 in/min, not to exceed:
   0.04 unfilled PTFE
   0.08 filled PTFE

j. Subject the bearing specimen to 100 movements of at least 1 inch of relative movement and, if the test facility permits, the full design movement at a speed of less than 1 ft/min. Following this test determine the static and kinetic coefficient of friction again. The specimen is considered a failure if it exceeds the values measured in (d) above or if it shows any signs of bond failure or other defects.

Bearings represented by test specimens passing the above requirements are approved for use in the structure subject to on-site inspection for visible defects.

5.0 INSTALLATION

Store disc bearings delivered to the bridge site under cover on a platform above the ground surface. Protect the bearings from injury at all times and, before placing the bearings, dry and clean all dirt, oil, grease or other foreign substances from the bearing. Do not disassemble the bearings during installation, except at the manufacturer's direction. Place the bearings in accordance with the recommendations of the manufacturer, Contract Drawings, and as directed by the Engineer. If there is any discrepancy between the recommendations of the manufacturer, Special Provisions, and Contract Drawings, the Engineer is the sole judge in reconciling any such discrepancy.

Provide preformed bearing pads under the masonry plates in accordance with Article 1079-1 of the Standard Specifications.

Do not install any bearing before the Engineer approves it.

6.0 BASIS OF PAYMENT

Payment for all optional disc bearings will be at the lump sum contract price bid for "Pot Bearings" which includes full compensation for furnishing all disc bearings, labor, materials, tools, equipment, testing and incidentals required to complete the work in accordance with the Standard Specifications, this Special Provision, the manufacturer's requirements and as directed by the Engineer.

THERMAL SPRAYED COATINGS (METALLIZATION) (9-30-11)

1.0 DESCRIPTION

Apply a thermal sprayed coating (TSC) and sealer to metal surfaces as specified herein when called for on the plans or by other Special Provisions, or when otherwise approved by the Engineer in accordance with the SSPC-CS 23.00/AWS C2.23/NACE No. 12

Specification. Only Arc Sprayed application methods are used to apply TSC coatings, the Engineer must approve other methods of application.

2.0 QUALIFICATIONS

Only use NCDOT approved TSC Contractors meeting the following requirements:

1. The capability of blast cleaning steel surfaces to SSPC SP-5 and SP-10 Finishes.

2. Employ Spray Operator(s) qualified in accordance with AWS C.16/C2.16M2002 and Quality Control Inspector(s) who have documented training in the applicable test procedures of ASTM D-3276 and SSPC-CS 23.00.

A summary of the contractor's related work experience and the documents verifying each Spray Operator's and Quality Control Inspector's qualifications are submitted to the Engineer before any work is performed.

3.0 MATERIALS

Provide wire in accordance with the metallizing equipment manufacturer's recommendations. Use the wire alloy specified on the plans which meets the requirements in Annex **C** of the SSPC-CS 23.00 Specification. Have the contractor provide a certified analysis (NCDOT Type 2 Certification) for each lot of wire material.

Apply an approved sealer to all metallized surfaces in accordance with Section 9 of SSPC-CS 23. The sealer must either meet SSPC Paint 27 or is an alternate approved by the Engineer.

4.0 SURFACE PREPARATION AND TSC APPLICATION

Grind flame cut edges to remove the carbonized surface prior to blasting. Bevel all flame cut edges in accordance with Article 442-10(D) regardless of included angle. Blast clean surfaces to be metallized with grit or mineral abrasive in accordance with Steel Structures Painting Council SSPC SP-5/10(as specified) to impart an angular surface profile of 2.5 - 4.0 mils. Surface preparation hold times are in accordance with Section 7.32 of SSPC-CS 23. If flash rusting occurs prior to metallizing, blast clean the metal surface again. Apply the thermal sprayed coating only when the surface temperature of the steel is at least 5°F above the dew point.

At the beginning of each work period or shift, conduct bend tests in accordance with Section 6.5 of SSPC-CS 23.00. Any disbonding or delamination of the coating that exposes the substrate requires corrective action, additional testing, and the Engineer's approval before resuming the metallizing process.

Apply TSC with the alloy to the thickness specified on the plans or as provided in the table below. All spot results (the average of 3 to 5 readings) must meet the minimum requirement. No additional tolerance (as allowed by SSPC PA-2) is permitted. (For Steel

Beams: For pieces with less than 200 ft^2 measure 2 spots/surface per piece and for pieces greater than 200 ft^2 add 1 additional spots/surface for each 500 ft^2).

Application	Thickness	Alloy	Seal Coat
Pot Bearings	8 mil	85/15 Zinc (W-Zn-Al-2)	0.5 mil
Armored Joint Angles	8 mil	85/15 Zinc (W-Zn-Al-2)	0.5 mil
Modular Joints	8 mil	99.99% Zn (W-Zn-1)	0.5 mil
Expansion Joint Seals	8 mil	99.99% Zn (W-Zn-1)	0.5 mil
Optional Disc Bearings	8 mil	85/15 Zinc (W-Zn-Al-2)	0.5 mil

When noted on the plans or as specified in the above chart, apply the sealer to all metallized surfaces in accordance with the manufacturer's recommendations and these provisions. Apply the seal coat only when the air temperature is above 40°F and the surface temperature of the steel is at least 5°F above the dew point. If the sealer is not applied within eight hours after the final application of TSC, the applicator verifies acceptable TSC surfaces and obtains approval from the Engineer before applying the sealer.

5.0 INSPECTION FREQUENCY

The TSC Contractor must conduct the following tests at the specified frequency and the results documented in a format approved by the Engineer.

Test/Standard	Location	Frequency	Specification
Ambient Conditions	Site	Each Process	5°F above the dew point
Abrasive Properties	Site	Each Day	Size, angularity, cleanliness
Surface Cleanliness SSPC Vis 1	All Surfaces	Visual All Surfaces	SSPC-SP-10 Atmospheric Service SSPC-SP - 5 Immersion Service
Surface Profile ASTM D-4417 Method C	Random Surfaces	3 per 500 ft^2	2.5 - 4.0 mils
Bend Test SSPC-CS 23.00	Site	5 per shift	Pass Visual
Thickness SSPC PA-2R SSPC-CS 23.00	Each Surface	Use the method in PA-2 Appendix 3 for Girders and Appendix 4 for frames and miscellaneous steel. See Note 1.	Zn - 8 mils minimum Al - 8 mils minimum Zn Al - 8 mils minimum Areas with more than twice the minimum thickness are inspected for compliance to the adhesion and cut testing requirements of this specification.
Adhesion ASTM 4541	Random Surfaces Splice Areas	1 set of 3 per 500 ft^2	Zn > 500 psi Al > 1000 psi Zn Al > 750 psi
Cut Test - SSPC-CS 23.00	Random Surfaces	3 sets of 3 per 500 ft^2	No peeling or delamination
Job Reference Std. SSPC-CS 23.00	Site	1 per job	Meets all the above requirements

6.0 REPAIRS

All Repairs are to be performed in accordance with the procedures below, depending on whether the repair surface is hidden or exposed. As an exception to the following, field welded splices on joint angles and field welding bearing plates to girders may be repaired in accordance with the procedures for hidden surfaces.

For hidden surfaces (including but not limited to interior girders, interior faces of exterior girders, and below-grade sections of piles):

1. Welding of metallized surfaces may be performed only if specifically permitted by the Engineer. Remove metallizing at the location of field welds by blast cleaning (SSPC SP-6

finish), or hand (SSPC SP-2 finish) or power tool cleaning (SSPC SP-3 finish) just prior to welding. Clean sufficiently to prevent contamination of the weld. All repairs to welded connections are metallized in accordance with SSPC CS 23.00.

2. Minor areas less than or equal to 0.1 ft^2 exposing the substrate are metallized in accordance with SSPC CS 23.00 or painted in accordance with ASTM A780, "Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings."
3. Large areas greater than 0.1 ft^2 exposing the substrate are metallized in accordance with SSPC CS 23.00.
4. Damaged (burnished) areas not exposing the substrate with less than the specified coating thickness are metallized in accordance with SSPC CS 23.00 or painted in accordance with ASTM A780, "Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings."
5. Damaged (burnished) areas not exposing the substrate with more than the specified coating thickness are not repaired.
6. Defective coating is repaired by either method 2 or 3 depending on the area of the defect.

For Exposed Surfaces (including but not limited to exterior faces of exterior girders and above-grade sections of piles):

1. Welding of metallized surfaces may be performed only if specifically permitted by the Engineer. Remove metallization at the location of field welds by blast cleaning (SSPC SP-6 finish), or hand (SSPC SP-2 finish) or power tool cleaning (SSPC SP-3 finish) just prior to welding. Clean sufficiently to prevent contamination of the weld. All repairs to welded connections are metallized in accordance with SSPC CS 23.00.
2. All areas exposing the substrate are metallized in accordance with SSPC CS 23.00
3. Defective coating is repaired by either method 2 or 3 depending on the area of the defect.

7.0 TWELVE MONTH OBSERVATION PERIOD

The contractor maintains responsibility for the coating system for a twelve (12) month observation period beginning upon the satisfactory completion of all the work required in the plans or as directed by the engineer. The contractor must guarantee the coating system under the payment and performance bond (refer to Article 109-10). To successfully complete the observation period, the coating system must meet the following requirements after twelve(12) months service:

- No visible rust, contamination or application defect is observed in any coated area.
- Painted surfaces have a uniform color and gloss.
- Surfaces have an adhesion of no less than 500 psi when tested in accordance with ASTM D-4541.

8.0 BASIS OF PAYMENT

The contract price bid for the bridge component to which the coating is applied will be full compensation for the thermal sprayed coating.

ELASTOMERIC CONCRETE (9-27-12)

1.0 DESCRIPTION

Elastomeric concrete is a mixture of a two-part polymer consisting of polyurethane and/or epoxy and kiln-dried aggregate. Provide an elastomeric concrete and binder system that is preapproved. Use the concrete in the blocked out areas on both sides of the bridge deck joints as indicated on the plans.

2.0 MATERIALS

Provide materials that comply with the following minimum requirements at 14 days (or at the end of the specified curing time).

ELASTOMERIC CONCRETE PROPERTIES	TEST METHOD	MINIMUM REQUIREMENT
Compressive Strength, psi	*ASTM D695*	2000
5% Deflection Resilience	ASTM D695	95
Splitting Tensile Strength, psi	ASTM D3967	625
Bond Strength to Concrete, psi	ASTM D882 (D882M)	450
Durometer Hardness	ASTM D2240	50

BINDER PROPERTIES (without aggregate)	TEST METHOD	MINIMUM REQUIREMENT
Tensile Strength, psi	ASTM D638	1000
Ultimate Elongation	ASTM D638	150%
Tear Resistance, lb/in	ASTM D624	200

In addition to the requirements above, the elastomeric concrete must be resistant to water, chemical, UV and ozone exposure and withstand temperature extremes. Elastomeric concrete systems requiring preheated aggregates are not allowed.

3.0 PREQUALIFICATION

Manufacturers of elastomeric concrete materials shall submit samples (including aggregate, primer and binder materials) and a Type 3 certification in accordance with Article 106-3 of the Standard Specifications for prequalification to:

North Carolina Department of Transportation
Materials and Tests Unit
1801 Blue Ridge Road
Raleigh, NC 27607

Prequalification will be determined for the system. Individual components will not be evaluated, nor will individual components of previously evaluated systems be deemed prequalified for use.

The submitted binder (a minimum volume of 1 gallon) and corresponding aggregate samples will be evaluated for compliance with the Materials requirements specified above. Systems satisfying all of the Materials requirements will be prequalified for a one year period. Before the end of this period new product samples shall be resubmitted for prequalification evaluation.

If, at any time, any formulation or component modifications are made to a prequalified system that system will no longer be approved for use.

4.0 INSTALLATION

The elastomeric concrete shall not be placed until the reinforced concrete deck slab has cured for seven full days and reached a minimum strength of 3000 psi.

Provide a manufacturer's representative at the bridge site during the installation of the elastomeric concrete to ensure that all steps being performed comply with all manufacturer installation requirements including, but not limited to weather conditions (ambient temperature, relative humidity, precipitation, wind, etc), concrete deck surface preparation, binder and aggregate mixing, primer application, elastomeric concrete placement, curing conditions and minimum curing time before joint exposure to traffic. Do not place elastomeric concrete if the ambient air or surface temperature is below 45°F.

Prepare the concrete surface within 48 hours prior to placing the elastomeric concrete. Before placing the elastomeric concrete, all concrete surfaces shall be thoroughly cleaned and dry. Sandblast the concrete surface in the blockout and clear the surface of all loose debris. Do not place the elastomeric concrete until the surface preparation is completed and approved.

Prepare and apply a primer, as per manufacturer's recommendations, to all concrete faces to be in contact with elastomeric concrete, and to areas specified by the manufacturer.

Prepare, batch, and place the elastomeric concrete in accordance with the manufacturer's instructions. Place the elastomeric concrete in the areas specified on the plans while the primer is still tacky and within 2 hours after applying the primer. Trowel the elastomeric concrete to a smooth finish.

The joint opening in the elastomeric concrete shall match the formed opening in the concrete deck prior to sawing the joint.

5.0 FIELD SAMPLING

Provide additional production material to allow freshly mixed elastomeric concrete to be sampled for acceptance. A minimum of six 2 inch cube molds and three 3x6 inch cylinders will be taken by the Department for each day's production. Compression, splitting tensile, and durometer hardness testing will be performed by the Department to determine acceptance. Materials failing to meet the requirements listed above are subject to removal and replacement at no cost to the Department.

6.0 BASIS OF PAYMENT

No separate payment will be made for elastomeric concrete. The lump sum contract price bid for "Foam Joint Seals" will be full compensation for furnishing and placing the Elastomeric Concrete.

FOAM JOINT SEALS (9-27-12)

1.0 SEALS

Use preformed seals compatible with concrete and resistant to abrasion, oxidation, oils, gasoline, salt and other materials that are spilled on or applied to the surface. Use a resilient, UV stable, preformed, impermeable, flexible, expansion joint seal. The joint seal shall consist of low-density, closed cell, cross-linked polyethylene non-extrudable, foam. The joint seal shall contain no EVA (Ethylene Vinyl Acetate). Cell generation shall be achieved by being physically blown using nitrogen. No chemical blowing agents shall be used in the cell generation process.

Use seals manufactured with grooves 1/8"± wide by 1/8"± deep and spaced between 1/4" and 1/2" apart along the bond surface running the length of the joint. Use seals with a depth that meets the manufacturer's recommendation, but is not less than 70% of the uncompressed width. Provide a seal designed so that, when compressed, the center portion of the top does not extend upward above the original height of the seal by more than 1/4".

Provide a seal that has a working range of 30% tension and 60% compression and meets the requirements given below.

TEST	TEST METHOD	REQUIREMENT
Tensile strength	ASTM D3575-08, Suffix T	110 – 130 psi
Compression Set	ASTM D1056 Suffix B, 2 hr recovery	10% - 16%
Water Absorption	ASTM D3575	< 0.03 lb/ft^2
Elongation at Break	ASTM D3575	180% - 210%
Tear Strength	ASTM D624 (D3575-08, Suffix G)	14 – 20 pli
Density	ASTM D3575-08, Suffix W, Method A	1.8 – 2.2 lb/ft^3
Toxicity	ISO-10993.5	Pass (not cytotoxic)

Have the top of the joint seal clearly shop marked. Inspect the joint seals upon receipt to ensure that the marks are clearly visible before installation.

2.0 BONDING ADHESIVE

Use a two component, 100% solid, modified epoxy adhesive supplied by the joint seal manufacturer that meets the requirements given below.

TEST	TEST METHOD	REQUIREMENT
Tensile strength	ASTM D638	3000 psi (min.)
Compressive strength	ASTM D695	7000 psi (min.)
Hardness	Shore D Scale	75-85 psi
Water Absorption	ASTM D570	0.25% by weight max.
Elongation to Break	ASTM D638	5% (max.)
Bond Strength	ASTM C882	2000 psi (min.)

Use an adhesive that is workable to 40°F. When installing in ambient air or surface temperatures below 40°F or for application on moist, difficult to dry concrete surfaces, use an adhesive specified by the manufacturer of the joint seal.

3.0 SAWING THE JOINT

The joint opening shall be initially formed to the width shown on the plans including the blockout for the elastomeric concrete.

The elastomeric concrete shall have sufficient time to cure such that no damage can occur to the elastomeric concrete prior to sawing to the final width and depth as specified in the plans.

When sawing the joint to receive the foam seal, always use a rigid guide to control the saw in the desired direction. To control the saw and to produce a straight line as indicated on the plans, anchor and positively connect a template or a track to the bridge deck. Do not saw the joint by visual means such as a chalk line. Fill the holes used for holding the template or track to the deck with an approved, flowable non-shrink, non-metallic grout.

Saw cut to the desired width and depth in one or two passes of the saw by placing and spacing two metal blades on the saw shaft to the desired width for the joint opening.

The desired depth is the depth of the seal plus 1/4" above the top of the seal plus approximately 1" below the bottom of the seal. An irregular bottom of sawed joint is permitted as indicated on the plans. Grind exposed corners on saw cut edges to a 1/4" chamfer.

Saw cut a straight joint, centered over the formed opening and to the desired width specified in the plans. Prevent any chipping or damage to the sawed edges of the joint.

Remove any staining or deposited material resulting from sawing with a wet blade to the satisfaction of the Engineer.

4.0 PREPARATION OF SAWED JOINT FOR SEAL INSTALLATION

The elastomeric concrete shall cure a minimum of 24 hours prior to seal installation.

After sawing the joint, the Engineer will thoroughly inspect the sawed joint opening for spalls, popouts, cracks, etc. All necessary repairs will be made by the Contractor prior to blast cleaning and installing the seal.

Clean the joints by sandblasting with clean dry sand immediately before placing the bonding agent. Sandblast the joint opening to provide a firm, clean joint surface free of curing compound, loose material and any foreign matter. Sandblast the joint opening without causing pitting or uneven surfaces. The aggregate in the elastomeric concrete may be exposed after sandblasting.

After blasting, either brush the surface with clean brushes made of hair, bristle or fiber, blow the surface with compressed air, or vacuum the surface until all traces of blast products and abrasives are removed from the surface, pockets, and corners.

If nozzle blasting is used to clean the joint opening, use compressed air that does not contain detrimental amounts of water or oil.

Examine the blast cleaned surface and remove any traces of oil, grease or smudge deposited in the cleaning operations.

Bond the seal to the blast cleaned surface on the same day the surface is blast cleaned.

5.0 SEAL INSTALLATION

Install the joint seal according to the manufacturer's procedures and recommendations and as recommended below. Do not install the joint seal if the ambient air or surface temperature is below 45°F. Have a manufacturer's certified trained factory representative present during the installation of the first seal of the project.

Before installing the joint seal, check the uninstalled seal length to insure the seal is the same length as the deck opening. When the joint seal requires splicing, use the heat welding method by placing the joint material ends against a teflon heating iron of 425-475°F for 7 - 10 seconds, then pressing the ends together tightly. Do not test the welding until the material has completely cooled.

Begin installation by protecting the top edges of the concrete deck adjacent to the vertical walls of the joint as a means to minimize clean up. After opening both cans of the bonding agent, stir each can using separate stirring rods for each component to prevent premature curing of the bonding agent. Pour the two components, at the specified mixing ratio, into a clean mixing bucket. Mix the components with a low speed drill (400 rpm max.) until a uniform gray color is achieved without visible marbling. Apply bonding agent to both sides of the elastomeric concrete as well as both sides of the joint seal, making certain to completely fill the grooves with epoxy. With gloved hands, compress the joint seal and with the help of a blunt probe, push the seal into the joint opening until the seal is recessed approximately 1/4" below the surface. When pushing down on the joint seal, apply pressure only in a downward direction. Do not push the joint seal into the joint opening at an angle that would stretch the material. Seals that are stretched during installation shall be removed and rejected. Once work on placing a seal begins, do not stop until it is completed. Clean the excess epoxy from the top of the joint seal immediately with a trowel. Do not use solvents or any cleaners to remove the excess epoxy from the top of the seal. Remove the protective cover at the joint edges and check for any excess epoxy on the surface. Remove excess epoxy with a trowel, the use of solvents or any cleaners will not be allowed.

The installed system shall be watertight and will be monitored until final inspection and approval. Do not place pavement markings on top of foam joint seals.

6.0 BASIS OF PAYMENT

Payment for all foam joint seals will be at the lump sum contract price bid for "Foam Joint Seals". Prices and payment will be full compensation for furnishing all material, including elastomeric concrete, labor, tools and equipment necessary for installing these units in place and accepted.

EXPANSION JOINT SEALS (9-30-11)

1.0 GENERAL

The work covered by this Special Provision consists of furnishing and installing the expansion joint seals as shown on the contract drawings. All materials, labor, equipment and incidentals necessary for the proper installation of the expansion joint seals are included.

2.0 MATERIAL

Provide expansion joint seals capable of accommodating a total movement measured parallel to the centerline of the roadway as shown on plans.

Provide an elastomeric component for each expansion joint seal that is a continuous unit for the entire length of the joint. Do not field splice the elastomeric component. Only vulcanized shop splicing of the elastomeric component is permitted. The minimum length of an elastomeric component before shop splicing is 20 feet. However, one piece shorter than 20 feet is permitted. Provide an elastomeric component that is clearly shop marked to indicate the top side and joint location of the elastomeric component. On skewed bridges, or under unsymmetrical conditions, clearly mark the left side of the elastomeric component. Left is defined as being on the left when facing in the direction of increasing station. Inspect the seals upon receipt to ensure that the marks are clearly visible upon installation.

Make sure the convolution of the gland does not project above the top of the hold-down plates when the joint opening is in the most compressed condition. Use either elastic polychloroprene (neoprene) or ethyl propylene diene monomer (EPDM) for the elastomer that meets the following minimum properties:

	ASTM TEST METHOD	REQUIREMENTS
Hardness, Durometer - Shore A	D2240	60 ± 5, Neoprene (upward corrugated shape - fabric reinforced) 75 ± 5, EPDM and Neoprene (upward non-corrugated shape) 80 ± 5, EPDM (upward corrugated shape-fabric reinforced)
Tensile Strength	D412	2000 psi (min.)
Elongation at Break	D412	250% (min.)
Width of Gland in Relaxed Condition	N/A	10" ± 0.25"
Thickness of Upturned portion of gland	N/A	0.25" non-corrugated shape, -0.032" to +0.032"
Thickness of Upturned portion of gland	N/A	0.1875" corrugated shape, -0.032" to +0.032"
Thickness of Flat portion of gland	N/A	0.1563", -0.032" to +0.032"

For fabric reinforced glands, submit one unreinforced sample per lot number, up to 500 feet of Expansion Joint Seal, to the Engineer for testing.

Only field splice hold-down plates at crown points, at abrupt changes in the deck slab cross slope, and on lane lines. Splicing within travel lanes is not permitted and splicing on edge lines is not required. Field splice hold-down plates between the edge line and gutter upturn and where necessary for proper installation and alignment is permitted. Show all splice locations on the working drawings for approval. For the location of lane markings at the expansion joint seal, see the Structure plans. At the splice locations, locate the hold-down bolts 3 inches from the end of the hold-down plate. At splice locations where changes in deck slab cross slope occur, cut the ends of hold-down plates parallel to the bridge centerline for skews less than 80° and greater than 100°.

Do not use welded shop splices in hold-down plates.

3.0 SHOP DRAWINGS

Submit nine sets of working drawings to the Engineer for review, comments and acceptance. Show complete details drawn to scale and include:

- The proposed template details including the makeup of the template
- The proposed method of holding the base angle assembly in place while concrete is cast around it
- The proposed procedure to correct for the effects of beam movement and rotation when setting width of joint opening
- The proposed chronology of installation including the sequence and direction of the concrete casting
- The details of cross connectors between base angles, such as steel bars with slots bolted to angles, to maintain evenness between the adjacent base angles while accommodating movement that occurs when concrete is cast. Indicate when bolts are loosened to allow movement.
- The proposed method for removing the hold-down plate
- A section detail through the joint showing horizontal offset dimensions of the base angles from the centerline joint. This detail is required when the vertical face of the joint opening is not perpendicular to the roadway surface (e.g. when the roadway grade is significant).

Have someone other than the one who prepares the drawing check all detailed drawings and include the signatures of both the drafter and checker on each sheet of the drawings. The Engineer returns unchecked drawings to the Contractor. Provide all completed drawings well in advance of the scheduled installation time for the expansion joint seal.

4.0 INSTALLATION

Provide supports for the base angle assembly at a maximum spacing of 9 feet. Place supports near field splices of base angles to ensure that field splices are straight and even. Provide base angles with ½" diameter weep holes at 12 inch centers to allow bleeding of trapped air and/or water. Do not obstruct the weep holes with falsework. Make the bottom of the trough parallel to grade and the sides parallel to the sides of the expansion joint seal.

For damaged areas, depressions, spalls, cracks, or irregularities of curbs or decks adjacent to the expansion joint, submit a proposed method of repair and repair material specifications for approval.

If the Engineer deems any aspects of the expansion joint seals unacceptable, make necessary corrections.

5.0 INSPECTION

When concrete is cast, use a non-aluminum, 10 foot, true to line straight edge to check and grade the top of the slab on each side of the joint to ensure smooth transition between spans.

Watertight Integrity Test

- Upon completion of an expansion joint seal, perform a water test on the top surface to detect any leakage. Cover the roadway section of the joint from curb to curb, or barrier rail to barrier rail, with water, either ponded or flowing, not less than 1 inch above the roadway surface at all points. Block sidewalk sections and secure an unnozzled water hose delivering approximately 1 gallon of water per minute to the inside face of the bridge railing, trained in a downward position about 6 inches above the sidewalks, such that there is continuous flow of water across the sidewalk and down the curb face of the joint.
- Maintain the ponding or flowing of water on the roadway and continuous flow across sidewalks and curbs for a period of 5 hours. At the conclusion of the test, the underside of the joint is closely examined for leakage. The expansion joint seal is considered watertight if no obvious wetness is visible on the Engineer's finger after touching a number of underdeck areas. Damp concrete that does not impart wetness to the finger is not a sign of leakage.
- If the joint system leaks, locate the place(s) of leakage and take any repair measures necessary to stop the leakage at no additional cost to the Department. Use repair measures recommended by the manufacturer and approved by the Engineer prior to beginning corrective work.
- If measures to eliminate leakage are taken, perform a subsequent water integrity test subject to the same conditions as the original test. Subsequent tests carry the same responsibility as the original test and are performed at no extra cost to the Department.

6.0 BASIS OF PAYMENT

Basis of payment for all expansion joint seals will be at the lump sum contract price for "Expansion Joint Seals" which price and payment will be full compensation for furnishing all material, including any steel accessory plates for sidewalks, medians and rails, labor, tools, and incidentals necessary for installing the expansion joint seal in place and including all materials, labor, tools and incidentals for performing the original watertight integrity test.

MODULAR EXPANSION JOINT SEALS (9-30-11)

1.0 GENERAL

Furnish and install modular expansion joint seals within the limits indicated on the plans.

Obtain modular expansion joint seals from Fabricators that are AISC certified in Category I.

Use a modular expansion joint seal that is a waterproof system such as WABOMODULAR as manufactured by Watson Bowman and Acme Corporation of Amherst New York, BROWN/MAURER as manufactured by the D. S. Brown Company of North Baltimore, Ohio or an approved equal. Do not use aluminum components in the modular expansion joint. Use a modular expansion joint seal consisting of three or more transverse rails holding two or more elastomeric seals in place and a support mechanism that ensures the rails maintain parallel and equidistant spacing. Do not use bolts to connect the rails to the support mechanism.

Provide an elastomeric component for each modular expansion joint seal that is one continuous unit for the entire length of the joint. Do not field splice the elastomeric component. Only vulcanized shop splicing of the elastomeric component is permitted. Provide an elastomeric component that is clearly shop marked to indicate the top side and joint location of the elastomeric component. On skewed bridges, or under unsymmetrical conditions, clearly mark the left side of the elastomeric component also. Left is defined as being on the left when facing in the direction of increasing station. Inspect the seals upon receipt to ensure that the marks are clearly visible upon installation.

Provide modular expansion joint seals capable of handling a total movement measured parallel to the centerline of the roadway as shown on plans. Limit clear distance between centerbeams, and edgebeams and centerbeams, to 3½". Limit centerbeam spans to approximately 48".

2.0 DRAWING AND SPECIFICATION SUBMITTAL

Submit Shop Drawings for Fabrication and Installation Procedure and Revised Contract Plan Sheets, showing revised details of the Structure contract plans.

A. Shop Fabrication and Installation Procedure Drawings

The deck slab is detailed in the contract plans with a required full depth transverse construction joint separating the main slab pour from the blockout area for the modular joint assembly. Position the modular joint assembly in the blockout area only after the main slab pours adjacent to the blockout area have been made and the girder rotation, deflection, and longitudinal movement due to slab pours have occurred.

Detail the method of positioning and securing the modular assembly in the blockout prior to the closure pour on the working drawings.

Submit two complete sets of working drawings for review. Submit these drawings well in advance of the scheduled installation time for the modular expansion joint seals. Include material requirements and installation procedures and specifications in the drawings.

After the drawings have been reviewed and, if necessary, corrections have been made, submit nine additional sets of the working drawings.

B. Revised Contract Plan Sheets

Concurrent with the submission of the working drawings, submit two sets of revised Structure plans for review. In the revised plans, include necessary changes in dimensions, reinforcing steel, and concrete blockouts to accommodate modular expansion joint seals. Have a North Carolina Registered Professional Engineer prepare and seal the revised plans. No adjustment will be made in the contract price for any bid item due to revisions necessary to accommodate the modular expansion joint seals. This cost is included in the lump sum price bid for furnishing and installing the modular expansion joint seal.

After the revised plans have been reviewed and, if necessary, corrections have been made, submit one 22" x 34" reproducible set of revised structure contract plans.

3.0 FABRICATION AND INSTALLATION

Protect the components of the modular expansion joint seal in the following manner. Upon completion of any shop fabrication, commercially blast clean (SP-6) all steel components, excluding stainless steel parts. Metallize to a minimum thickness of 8 mils on these surfaces. Metallize in accordance with the Special Provision for "Thermal Sprayed Coatings (Metallization)". Repair abraded or damaged coated surfaces anytime after applying the coating as specified for repair of galvanizing in the Standard Specifications. As an alternative to Metallizing, galvanizing in accordance with the Standard Specifications is permitted.

Install the modular expansion joint seals according to the procedures and recommendations of the manufacturer, except as amended in the next paragraph.

Limit modular expansion joint seal splices to crown points, abrupt changes in deck slab cross slope, lane lines, or as necessary for proper installation and alignment. All splice locations and details must be shown on the submitted working drawings and are subject to the Engineer's approval. For shop splices, full penetration welds are required for centerbeam splices. For shop splices, partial penetration welds are not allowed for centerbeam splices, except at barrier rail upturns or sidewalk upturns. For field splices, partial penetration welds are not allowed for centerbeam splices. Show and submit for approval all splice locations on the working drawings. For location of lane markings at the modular expansion joint seals, see the Structure plans.

When indicated on the plans, provide special snowplow protection, such as a snowplow blade guide or steel ribs, to prevent the blade from entering the joint recess.

If the Engineer deems any aspects of the modular expansion joint seals unacceptable, make necessary corrections.

Watertight Integrity Test

- Upon completion of each modular expansion joint seal, perform a water test on the top surface to detect any leakage. Cover the roadway section of the joint from curb to curb, or barrier rail to barrier rail, with water, either ponded or flowing, not less than 1 inch above the roadway surface at all points. Block sidewalk sections and secure an unnozzled water hose delivering approximately 1 gallon of water per minute to the inside face of the bridge railing, trained in a downward position about 6 inches above the sidewalk, such that there is continuous flow of water across the sidewalk and down the curb face of the joint.
- Maintain the ponding or flowing of water on the roadway and continuous flow across sidewalks and curbs for a period of 5 hours. At the conclusion of the test, the underside of the joint is closely examined for leakage. The modular expansion joint seal is considered watertight if no obvious wetness is visible on the Engineer's finger after touching a number of underdeck areas. Damp concrete that does not impart wetness to the finger is not considered a sign of leakage.
- If the joint system leaks, locate the place(s) of leakage and take any repair measures necessary to stop the leakage at no additional cost to the Department. Use repair measures recommended by the manufacturer and approved by the Engineer prior to beginning corrective work.
- If measures to eliminate leakage are taken, perform a subsequent water integrity test subject to the same conditions as the original test. Subsequent tests carry the same responsibility as the original test and are performed at no additional cost to the Department.

4.0 BASIS OF PAYMENT

Basis of payment for all modular expansion joint seals will be at the lump sum contract price for "Modular Expansion Joint Seals" which price and payment will be full compensation for furnishing all material, including steel accessory plates for sidewalks, medians and rails, labor, tools, and incidentals necessary for installing the modular expansion joint seals in place and including all materials, labor, tools and incidentals for performing the original watertight integrity test.

OPTIONAL PRECAST REINFORCED CONCRETE BOX CULVERT AT STATION 114+55 –L- & 218+00 –L- (12-12-13)

1.0 GENERAL

This Special Provision covers the design, fabrication and construction of precast reinforced concrete box culverts intended for the conveyance of storm water.

If the option is indicated on the plans, the submittal for a precast reinforced box culvert in lieu of a cast-in-place culvert is permitted. Design the precast culvert sections in accordance with ASTM C1577 or the current edition of the AASHTO LRFD Bridge Design Specifications. Rate all sizes of precast reinforced concrete box culverts in accordance with the current edition of the AASHTO Manual for Bridge Evaluation. Ensure the culvert rates for the AASHTO design loads and North Carolina's legal loads (see Section 2.0 for North Carolina's legal loads). Provide the size and number of barrels as indicated on the plans. Detail the culvert with cast-in-place wings walls and footings. Precast wing walls and footings will not be allowed. Provide a precast box culvert that meets the requirements of Section 1077 and any other applicable parts of the Standard Specifications.

The design and rating of the precast and cast-in-place members is the responsibility of the Contractor and is subject to review, comments and approval. Submit two sets of detailed plans and rating sheets for review. Include all details in the plans, including the size and spacing of the required reinforcement necessary to build the precast box and cast-in-place members. Have a North Carolina Registered Professional Engineer check and seal the plans, rating sheets and design calculations. After the plans, rating sheets and design calculations are reviewed and, if necessary, the corrections made, submit one set of plans and rating sheets on 22" x 34" sheets to become part of the contract plans.

If the span, rise and design earth cover for the precast reinforced concrete box culvert are identical to a previously approved submittal, the Contractor may request the previously approved design calculations and plans be considered as the submittal for review and approval. However, a set of plans and rating sheets will need to be submitted to become part of the contract plans.

2.0 North Carolina's Legal Loads

Apply the following legal loads to all structures carrying interstate traffic:

SINGLE VEHICLE(SV)		
REF. #	SCHEMATIC	
SH	5K 20K 14'	25K 12.5 TON
S3A	7.5K 19K 19K 9' 4' 13'	45.5K 22.75 TON
S3C	5K 19K 19K 11' 4' 15'	43K 21.5 TON
S4A	11.5K 4K 19K 19K 9' 4' 4' 17'	53.5K 26.75 TON
S5A	11K 6K 19K 19K 6K 9' 4' 4' 4' 21'	61K 30.5 TON
S6A	11K 6.66K 6.67K 19K 19K 6.67K 9' 4' 4' 4' 4' 25'	69K 34.5 TON
S7A	11K 6.66K 6.67K 19K 19K 6.67K 11K 9' 4' 4' 4' 4' 9' 34'	80K 40 TON
S7B	11K 7K 7K 19K 19K 7K 7K 9' 4' 4' 4' 4' 4' 29'	77K 38.5 TON

TRUCK TRACTOR SEMI-TRAILER(TTST)		
REF. #	SCHEMATIC	
T4A	11K 7.5K 19K 19K 9' 9' 4' 22'	56.5K 28.25 TON
T5B	6.5K 19K 19K 9.75K 9.75K 9' 4' 9' 4' 26'	64K 32 TON
T6A	11K 4K 19K 19K 9.5K 9.5K 9' 4' 4' 9' 4' 30'	72K 36 TON
T7A	11K 4K 19K 19K 9K 9K 9K 9' 4' 4' 9' 4' 4' 34'	80K 40 TON
T7B	11K 9.5K 9.5K 6K 6K 19K 19K 9' 4' 9' 4' 4' 4' 34'	80K 40 TON

Apply the following legal loads to all structures carrying non-interstate traffic:

SINGLE VEHICLE (SV)			TRUCK TRACTOR SEMI-TRAILER (TTST)		
REF. #	SCHEMATIC		REF. #	SCHEMATIC	
SNSH	5K 22K 14'	27K 13.5 TON	TNAGRIT3	22K 22K 22K 9' 9' 18'	66K 33 Ton
SNGARBS2	23.5K 16.5K 14'	40K 20 TON	TNT4A	12.1K 12.05K 21K 21K 9' 9' 4' 22'	66.15K 33.075 TON
SNAGRIS2	22K 22K 14'	44K 22 Ton	TNAGRIT4	22K 22K 21K 21K 9' 9' 4' 22'	86K 43 TON
SNCOTTS3	4.5K 25K 25K 11' 4' 15'	54.5K 27.25 TON	TNAGT5A	22K 21K 21K 13K 13K 9' 4' 9' 4' 26'	90K 45 TON
SNAGGRS4	16K 15.85K 19K 19K 9' 4' 4' 17'	69.85K 34.925 TON	TNAGT5B	6K 21K 21K 21K 21K 9' 4' 9' 4' 26'	90K 45 TON
SNS5A	12.1K 8.5K 21K 21K 8.5K 9' 4' 4' 4' 21'	71.1K 35.55 TON	TNT6A	12.1K 8.2K 21K 21K 10.45K 10.45K 9' 4' 4' 9' 4' 30'	83.2K 41.6 TON
SNS6A	12.1K 8.6K 8.6K 21K 21K 8.6K 9' 4' 4' 4' 4' 25'	79.9K 39.95 TON	TNT7A	4.1K 4K 21K 21K 11.3K 11.3K 11.3K 9' 4' 4' 9' 4' 4' 34'	84K 42 TON
SNS7B	7.6K 8.6K 8.6K 21K 21K 8.6K 8.6K 9' 4' 4' 4' 4' 4' 29'	84K 42 TON	TNT7B	4.1K 10.5K 10.5K 8.45K 8.45K 21K 21K 9' 4' 9' 4' 4' 4' 34'	84K 42 TON

3.0 PRECAST REINFORCED CONCRETE BOX SECTIONS

The precast reinforced concrete box culvert sections shall match the size and hydraulic opening indicated in the contract plans.

A. Design

1. Design Fill – The design earth cover is reported on the plans as the elevation difference between the point of maximum fill and the bottom of the top slab.

2. Placement of Reinforcement – Provide a 1 inch concrete cover over the reinforcement subject to the provisions of Section F. Extend the inside reinforcement into the tongue portion of the joint and the outside reinforcement into the groove portion of the joint. Detail the clear distance of the end wires so it is not less than 1/2 inch or more than 2 inches from the ends of the box section. Assemble reinforcement per the requirements of ASTM C1577 or the approved design. The exposure of the ends of the wires used to position the reinforcement is not a cause for rejection.

3. Laps and Spacing – Use lap splices for the transverse reinforcement. Detail the transverse wires so that the center to center spacing is not less than 2 inches or more than 4 inches. Do not detail the longitudinal wires with a center to center spacing of more than 8 inches.

B. Joints

1. Produce the precast reinforced concrete box section with tongue and groove ends. Design and form these ends of the box section so, when the sections are laid together, they make a continuous line of box sections with a smooth interior free of appreciable irregularities in the flowline, all compatible with the permissible variations given in Section F. The internal joint formed at the tongue and groove ends of the precast units shall be sealed with either bitumen/butyl sealant or closed-cell neoprene material. The internal joint material shall be installed in accordance with the manufacturer's recommendations. The material shall be shown on the shop drawings when they are submitted for review.

2. Seal the external joint with an outside sealer wrap conforming to ASTM C877 that is at least 12 inches wide and covers the joint on both the sides and the top of the box section. Use ConWrap CS-212 from Concrete Sealants, Inc., EZ-Wrap from Press-Seal Gasket Corporation, Seal Wrap from Mar-Mac Manufacturing Co., Inc., Cadilloc External Pipe Joint from Cadilloc, or an approved equal for the outside sealer wrap. If the outside sealer wrap is not applied in a continuous strip along the entire joint, a 12 inch minimum lap of the outside sealer wrap is permitted. Before placing the outside sealer wrap, clean and prime the area receiving the outside sealer wrap in accordance with the sealer wrap manufacturer recommendations. The joint wrap manufacturer installation recommendations shall be included with shop drawings submitted for review. The external joint wrap shall be installed in pieces, as indicated on Figure 1 below:

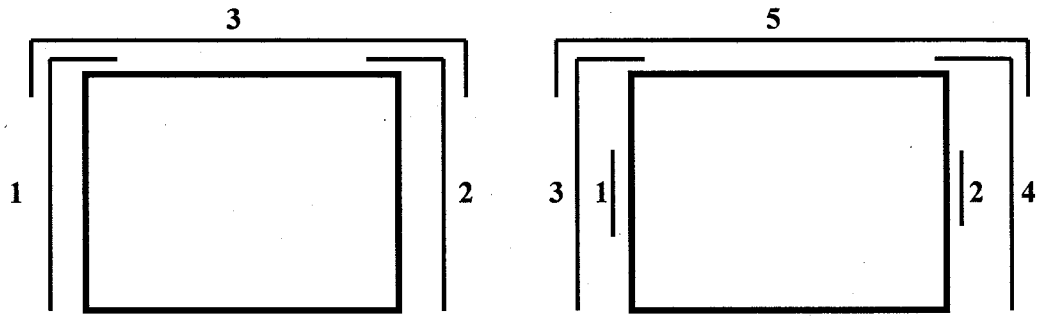

Figure 1

Cover the external joint sealer with a 3 foot strip of filter fabric conforming to Type 4 requirements in Section 1056 of the Standard Specifications.

Place multiple lines of a precast reinforced concrete box culvert such that the longitudinal joint between the sections has a minimum width of 3 inches. Fill the joint between multiple lines of precast box sections with Class A concrete. Use Class A concrete that meets the requirements listed in the Standard Specifications except that Field Compressive Strength Specimens are not required.

C. Manufacture

Manufacture precast reinforced concrete box culvert sections by either the wet cast method or dry cast method.

1. Mixture – In addition to the requirements of Section 1077 of the Standard Specifications, do not proportion the mix with less than 564 lb/yd^3 of portland cement.

2. Strength – Concrete shall develop a minimum 28-day compressive strength of 5000 psi. Movement of the precast sections should be minimized during the initial curing period. Any damage caused by moving or handling during the initial curing phase will be grounds for rejection of that precast section.

3. Air Entrainment – Air entrain the concrete in accordance with Section 1077 - 5(A) of the Standard Specifications. For dry cast manufacturing, air entrainment is not required.

4. Testing – Test the concrete in accordance with the requirements of Section 1077 - 5(B).

5. Handling – Handling devices or holes are permitted in each box section for the purpose of handling and placing. Submit details of handling devices or holes for approval and do not cast any concrete until approval is granted. Remove all

handling devices flush with concrete surfaces as directed. Fill holes in a neat and workmanlike manner with an approved non-metallic non-shrink grout, concrete, or hole plug.

D. Physical Requirements

Acceptability of precast culvert sections is based on concrete cylinders made and tested in accordance with ASTM C31 and ASTM C39.

E. Permissible Variations

1. Flatness – All external surfaces shall be flat, true, and plumb. Irregularities, depressions, or high spots on all external surfaces shall not exceed 1/2 inch in 8 feet.

2. Internal Dimensions – Produce sections so that the internal and haunch dimensions do not vary more than 1/4 inch from the plan dimensions.

3. Adjacent Sections - Internal, external, and haunch dimensions for connecting sections shall not vary more than 1/2 inch.

4. Length of Tongue and Groove – The minimum length of the tongue shall be 4 inches. The minimum length of the groove shall be 4 inches. The dimensions of the tongue and groove shall not vary more than 1/4 inch from the plan dimensions.

5. Slab and Wall Thickness – Produce sections so that the slab and wall thickness are not less than that shown on the plans by more than 5% or 3/16 inch, whichever is greater. A thickness more than that required on the plans is not a cause for rejection.

6. Length of Opposite Surfaces – Produce sections so that variations in laying lengths of two opposite surfaces of the box section meet the requirements of ASTM C1577, Section 11.3.

7. Length of Section – Produce sections so that the underrun in length of a section is not more than 1/2 inch in any box section.

8. Position of Reinforcement – Produce sections so that the maximum variation in the position of the reinforcement is ±3/8 inch for slab and wall thicknesses of 5 inches or less and ±1/2 inch for slab and wall thicknesses greater than 5 inches. Produce sections so that the concrete cover is never less than 5/8 inch as measured to the internal surface or the external surface. The preceding minimum cover limitations do not apply at the mating surfaces of the joint.

9. Area of Reinforcement – Use the design steel shown on the plans for the steel reinforcement. Steel areas greater than those required are not cause for rejection. The permissible variation in diameter of any wire in finished fabric is prescribed for the wire before fabrication by either AASHTO M32 or M225.

F. Marking

1. Each section shall be match-marked in order of intended installation as indicated on the approved shop drawings. Ensure that pieces fit together neatly and in a workmanlike manner. In order to ensure a good, neat field fit, the Department will verify assembly of the first five adjacent sections or 20% of the total culvert length, whichever is greater, at the producer's facility and match-mark the pieces. This will require that a minimum of three adjacent sections of the culvert be fitted at the production yard at a time and then match-marked. Once three sections have been match-marked, the first section may be removed for shipment and a fourth section set for marking. Continue in a progressive manner until all sections have been properly match-marked. The producer shall document the GO-NO-GO dimensional measurements of each box culvert section produced through the post-pour inspection process.

2. Clearly mark each section of the box culvert in accordance with ASTM C1577, Section 15. The information requirements of Section 15.1 shall be clearly marked on the inner surface of each section.

G. Construction

1. Pre-installation Meeting – A pre-installation meeting is required prior to installation. Representatives from the Contractor, the precast box manufacturer, and the Department should attend this meeting. The precast box manufacturer representative shall be on site during installation.

2. Foundation – Foundation for precast box culvert shall meet the requirements of Section 414 of the Standard Specifications. In addition, Type VI foundation material shall be encapsulated in filter fabric conforming to Type 4 requirements in Section 1056 of the Standard Specifications. The filter fabric shall be placed perpendicular to the culvert barrel. Provide sufficient overhang beyond the excavation to allow a minimum lap of 3 feet when the foundation material is placed and fabric wrapped on top. Perpendicular sections of fabric shall be continuous. A minimum lap of 2 feet shall be provided between sections of fabric.

3. Installation – Sections shall be placed at the beginning of the outlet end of the culvert with the groove end being laid upgrade. Tongue sections shall be laid into the groove sections. Positive means shall be provided to pull each section firmly into the previously placed section so that the joints are tightly homed. Use a "come-along", box pullers or other approved methods to create a positive means of joining box sections. Construction equipment shall not have direct contact with the box section. The load of the box shall be suspended by lifting device during joining procedure.

4. Backfill – Complete backfill in accordance with Section 414 of the Standard Specifications.

4.0 BASIS OF PAYMENT

Any additional cost of redesigning will be paid for by the Contractor if Precast Reinforced Concrete Culvert is used in lieu of the cast-in-place culvert shown on the plans. Except for Foundation Conditioning Material and Culvert Excavation, payment for the Precast Box Culvert will be a lump sum amount equal to the payment that would be allowed for construction of a Cast-in-Place Box Culvert. Plan quantities and unit bid prices will be used to compute the lump sum amount. Such price and payment will be full compensation for all work covered by this Special Provision, the plans and applicable parts of the Standard Specifications and will include, but not be limited to, furnishing all labor, materials (including all filter fabric), equipment and other incidentals necessary to complete this work. Such price and payment will also be full compensation for concrete, reinforcing steel, labor, equipment and all other related materials necessary for the completion of the barrel section, and the construction of the headwalls, leveling pad, end curtain walls, wings and wing footings.

FALSEWORK AND FORMWORK (4-5-12)

1.0 DESCRIPTION

Use this Special Provision as a guide to develop temporary works submittals required by the Standard Specifications or other provisions; no additional submittals are required herein. Such temporary works include, but are not limited to, falsework and formwork.

Falsework is any temporary construction used to support the permanent structure until it becomes self-supporting. Formwork is the temporary structure or mold used to retain plastic or fluid concrete in its designated shape until it hardens. Access scaffolding is a temporary structure that functions as a work platform that supports construction personnel, materials, and tools, but is not intended to support the structure. Scaffolding systems that are used to temporarily support permanent structures (as opposed to functioning as work platforms) are considered to be falsework under the definitions given. Shoring is a component of falsework such as horizontal, vertical, or inclined support members. Where the term "temporary works" is used, it includes all of the temporary facilities used in bridge construction that do not become part of the permanent structure.

Design and construct safe and adequate temporary works that will support all loads imposed and provide the necessary rigidity to achieve the lines and grades shown on the plans in the final structure.

2.0 MATERIALS

Select materials suitable for temporary works; however, select materials that also ensure the safety and quality required by the design assumptions. The Engineer has authority to reject material on the basis of its condition, inappropriate use, safety, or nonconformance with the plans. Clearly identify allowable loads or stresses for all materials or

manufactured devices on the plans. Revise the plan and notify the Engineer if any change to materials or material strengths is required.

3.0 DESIGN REQUIREMENTS

A. Working Drawings

Provide working drawings for items as specified in the contract, or as required by the Engineer, with design calculations and supporting data in sufficient detail to permit a structural and safety review of the proposed design of the temporary work.

On the drawings, show all information necessary to allow the design of any component to be checked independently as determined by the Engineer.

When concrete placement is involved, include data such as the drawings of proposed sequence, rate of placement, direction of placement, and location of all construction joints. Submit the number of copies as called for by the contract.

When required, have the drawings and calculations prepared under the guidance of, and sealed by, a North Carolina Registered Professional Engineer who is knowledgeable in temporary works design.

If requested by the Engineer, submit with the working drawings manufacturer's catalog data listing the weight of all construction equipment that will be supported on the temporary work. Show anticipated total settlements and/or deflections of falsework and forms on the working drawings. Include falsework footing settlements, joint take-up, and deflection of beams or girders.

As an option for the Contractor, overhang falsework hangers may be uniformly spaced, at a maximum of 36 inches, provided the following conditions are met:

Member Type (PCG)	Member Depth, (inches)	Max. Overhang Width, (inches)	Max. Slab Edge Thickness, (inches)	Max. Screed Wheel Weight, (lbs.)	Bracket Min. Vertical Leg Extension, (inches)
II	36	39	14	2000	26
III	45	42	14	2000	35
IV	54	45	14	2000	44
MBT	63	51	12	2000	50
MBT	72	55	12	1700	48

Overhang width is measured from the centerline of the girder to the edge of the deck slab.

For Type II, III & IV prestressed concrete girders (PCG), 45-degree cast-in-place half hangers and rods must have a minimum safe working load of 6,000 lbs.

For MBT prestressed concrete girders, 45-degree angle holes for falsework hanger rods shall be cast through the girder top flange and located, measuring along the top of the member, 1'-2 ½" from the edge of the top flange. Hanger hardware and rods must have a minimum safe working load of 6,000 lbs.

The overhang bracket provided for the diagonal leg shall have a minimum safe working load of 3,750 lbs. The vertical leg of the bracket shall extend to the point that the heel bears on the girder bottom flange, no closer than 4 inches from the bottom of the member. However, for 72-inch members, the heel of the bracket shall bear on the web, near the bottom flange transition.

Provide adequate overhang falsework and determine the appropriate adjustments for deck geometry, equipment, casting procedures and casting conditions.

If the optional overhang falsework spacing is used, indicate this on the falsework submittal and advise the girder producer of the proposed details. Failure to notify the Engineer of hanger type and hanger spacing on prestressed concrete girder casting drawings may delay the approval of those drawings.

Falsework hangers that support concentrated loads and are installed at the edge of thin top flange concrete girders (such as bulb tee girders) shall be spaced so as not to exceed 75% of the manufacturer's stated safe working load. Use of dual leg hangers (such as Meadow Burke HF-42 and HF-43) are not allowed on concrete girders with thin top flanges. Design the falsework and forms supporting deck slabs and overhangs on girder bridges so that there will be no differential settlement between the girders and the deck forms during placement of deck concrete.

When staged construction of the bridge deck is required, detail falsework and forms for screed and fluid concrete loads to be independent of any previous deck pour components when the mid-span girder deflection due to deck weight is greater than ¾".

Note on the working drawings any anchorages, connectors, inserts, steel sleeves or other such devices used as part of the falsework or formwork that remains in the permanent structure. If the plan notes indicate that the structure contains the necessary corrosion protection required for a Corrosive Site, epoxy coat, galvanize or metalize these devices. Electroplating will not be allowed. Any coating required by the Engineer will be considered incidental to the various pay items requiring temporary works.

Design falsework and formwork requiring submittals in accordance with the 1995 AASHTO *Guide Design Specifications for Bridge Temporary Works* except as noted herein.

1. Wind Loads

Table 2.2 of Article 2.2.5.1 is modified to include wind velocities up to 110 mph. In addition, Table 2.2A is included to provide the maximum wind speeds by county in North Carolina.

Table 2.2 - Wind Pressure Values

Height Zone	Pressure, lb/ft^2 for Indicated Wind Velocity, mph				
feet above ground	70	80	90	100	110
0 to 30	15	20	25	30	35
30 to 50	20	25	30	35	40
50 to 100	25	30	35	40	45
over 100	30	35	40	45	50

2. Time of Removal

The following requirements replace those of Article 3.4.8.2.

Do not remove forms until the concrete has attained strengths required in Article 420-16 of the Standard Specifications and these Special Provisions.

Do not remove forms until the concrete has sufficient strength to prevent damage to the surface.

Table 2.2A - Steady State Maximum Wind Speeds by Counties in North Carolina

COUNTY	25 YR (mph)	COUNTY	25 YR (mph)	COUNTY	25 YR (mph)
Alamance	70	Franklin	70	Pamlico	100
Alexander	70	Gaston	70	Pasquotank	100
Alleghany	70	Gates	90	Pender	100
Anson	70	Graham	80	Perquimans	100
Ashe	70	Granville	70	Person	70
Avery	70	Greene	80	Pitt	90
Beaufort	100	Guilford	70	Polk	80
Bertie	90	Halifax	80	Randolph	70
Bladen	90	Harnett	70	Richmond	70
Brunswick	100	Haywood	80	Robeson	80
Buncombe	80	Henderson	80	Rockingham	70
Burke	70	Hertford	90	Rowan	70
Cabarrus	70	Hoke	70	Rutherford	70
Caldwell	70	Hyde	110	Sampson	90
Camden	100	Iredell	70	Scotland	70
Carteret	110	Jackson	80	Stanley	70
Caswell	70	Johnston	80	Stokes	70
Catawba	70	Jones	100	Surry	70
Cherokee	80	Lee	70	Swain	80
Chatham	70	Lenoir	90	Transylvania	80
Chowan	90	Lincoln	70	Tyrell	100
Clay	80	Macon	80	Union	70
Cleveland	70	Madison	80	Vance	70
Columbus	90	Martin	90	Wake	70
Craven	100	McDowell	70	Warren	70
Cumberland	80	Mecklenburg	70	Washington	100
Currituck	100	Mitchell	70	Watauga	70
Dare	110	Montgomery	70	Wayne	80
Davidson	70	Moore	70	Wilkes	70
Davie	70	Nash	80	Wilson	80
Duplin	90	New Hanover	100	Yadkin	70
Durham	70	Northampton	80	Yancey	70
Edgecombe	80	Onslow	100		
Forsyth	70	Orange	70		

B. Review and Approval

The Engineer is responsible for the review and approval of temporary works' drawings.

Submit the working drawings sufficiently in advance of proposed use to allow for their review, revision (if needed), and approval without delay to the work.

The time period for review of the working drawings does not begin until complete drawings and design calculations, when required, are received by the Engineer.

Do not start construction of any temporary work for which working drawings are required until the drawings have been approved. Such approval does not relieve the Contractor of the responsibility for the accuracy and adequacy of the working drawings.

4.0 CONSTRUCTION REQUIREMENTS

All requirements of Section 420 of the Standard Specifications apply.

Construct temporary works in conformance with the approved working drawings. Ensure that the quality of materials and workmanship employed is consistent with that assumed in the design of the temporary works. Do not weld falsework members to any portion of the permanent structure unless approved. Show any welding to the permanent structure on the approved construction drawings.

Provide tell-tales attached to the forms and extending to the ground, or other means, for accurate measurement of falsework settlement. Make sure that the anticipated compressive settlement and/or deflection of falsework does not exceed 1 inch. For cast-in-place concrete structures, make sure that the calculated deflection of falsework flexural members does not exceed 1/240 of their span regardless of whether or not the deflection is compensated by camber strips.

A. Maintenance and Inspection

Inspect and maintain the temporary work in an acceptable condition throughout the period of its use. Certify that the manufactured devices have been maintained in a condition to allow them to safely carry their rated loads. Clearly mark each piece so that its capacity can be readily determined at the job site.

Perform an in-depth inspection of an applicable portion(s) of the temporary works, in the presence of the Engineer, not more than 24 hours prior to the beginning of each concrete placement. Inspect other temporary works at least once a month to ensure that they are functioning properly. Have a North Carolina Registered Professional Engineer inspect the cofferdams, shoring, sheathing, support of excavation structures, and support systems for load tests prior to loading.

B. Foundations

Determine the safe bearing capacity of the foundation material on which the supports for temporary works rest. If required by the Engineer, conduct load tests to verify proposed bearing capacity values that are marginal or in other high-risk situations.

The use of the foundation support values shown on the contract plans of the permanent structure is permitted if the foundations are on the same level and on the same soil as those of the permanent structure.

Allow for adequate site drainage or soil protection to prevent soil saturation and washout of the soil supporting the temporary works supports.

If piles are used, the estimation of capacities and later confirmation during construction using standard procedures based on the driving characteristics of the pile is permitted. If preferred, use load tests to confirm the estimated capacities; or, if required by the Engineer conduct load tests to verify bearing capacity values that are marginal or in other high risk situations.

The Engineer reviews and approves the proposed pile and soil bearing capacities.

5.0 REMOVAL

Unless otherwise permitted, remove and keep all temporary works upon completion of the work. Do not disturb or otherwise damage the finished work.

Remove temporary works in conformance with the contract documents. Remove them in such a manner as to permit the structure to uniformly and gradually take the stresses due to its own weight.

6.0 METHOD OF MEASUREMENT

Unless otherwise specified, temporary works will not be directly measured.

7.0 BASIS OF PAYMENT

Payment at the contract unit prices for the various pay items requiring temporary works will be full compensation for the above falsework and formwork.

SUBMITTAL OF WORKING DRAWINGS (8-9-13)

1.0 GENERAL

Submit working drawings in accordance with Article 105-2 of the *Standard Specifications* and this provision. For this provision, "submittals" refers to only those listed in this provision. The list of submittals contained herein does not represent a list of required submittals for the project. Submittals are only necessary for those items as required by the

contract. Make submittals that are not specifically noted in this provision directly to the Resident Engineer. Either the Structure Design Unit or the Geotechnical Engineering Unit or both units will jointly review submittals.

If a submittal contains variations from plan details or specifications or significantly affects project cost, field construction or operations, discuss the submittal with and submit all copies to the Resident Engineer. State the reason for the proposed variation in the submittal. To minimize review time, make sure all submittals are complete when initially submitted. Provide a contact name and information with each submittal. Direct any questions regarding submittal requirements to the Resident Engineer, Structure Design Unit contacts or the Geotechnical Engineering Unit contacts noted below.

In order to facilitate in-plant inspection by NCDOT and approval of working drawings, provide the name, address and telephone number of the facility where fabrication will actually be done if different than shown on the title block of the submitted working drawings. This includes, but is not limited to, precast concrete items, prestressed concrete items and fabricated steel or aluminum items.

2.0 ADDRESSES AND CONTACTS

For submittals to the Structure Design Unit, use the following addresses:

Via US mail:

Mr. G. R. Perfetti, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1581 Mail Service Center
Raleigh, NC 27699-1581

Attention: Mr. P. D. Lambert, P. E.

Via other delivery service:

Mr. G. R. Perfetti, P. E.
State Structures Engineer
North Carolina Department
of Transportation
Structures Management Unit
1000 Birch Ridge Drive
Raleigh, NC 27610

Attention: Mr. P. D. Lambert, P. E.

Submittals may also be made via email.

Send submittals to:

plambert@ncdot.gov (Paul Lambert)

Send an additional e-copy of the submittal to the following address:

jgaither@ncdot.gov (James Gaither)

jlbolden@ncdot.gov (James Bolden)

For submittals to the Geotechnical Engineering Unit, use the following addresses:

For projects in Divisions 1-7, use the following Eastern Regional Office address:

Via US mail:

Mr. K. J. Kim, Ph. D., P. E.
Eastern Regional Geotechnical Manager
North Carolina Department of Transportation
Geotechnical Engineering Unit
Eastern Regional Office
1570 Mail Service Center
Raleigh, NC 27699-1570

Via other delivery service:

Mr. K. J. Kim, Ph. D., P. E.
Eastern Regional Geotechnical Manager
North Carolina Department of Transportation
Geotechnical Engineering Unit
Eastern Regional Office
3301 Jones Sausage Road, Suite 100
Garner, NC 27529

For projects in Divisions 8-14, use the following Western Regional Office address:

Via US mail:

Mr. Eric Williams, P. E.
Western Regional Geotechnical Manager
North Carolina Department of Transportation
Geotechnical Engineering Unit
Western Regional Office
5253 Z Max Boulevard
Harrisburg, NC 28075

Via other delivery service:

Mr. Eric Williams, P. E.
Western Region Geotechnical Manager
North Carolina Department of Transportation
Geotechnical Engineering Unit
Western Regional Office
5253 Z Max Boulevard
Harrisburg, NC 28075

The status of the review of structure-related submittals sent to the Structure Design Unit can be viewed from the Unit's web site, via the "Contractor Submittal" link.

Direct any questions concerning submittal review status, review comments or drawing markups to the following contacts:

Primary Structures Contact: Paul Lambert (919) 707 – 6407
(919) 250 – 4082 facsimile
plambert@ncdot.gov

Secondary Structures Contacts: James Gaither (919) 707 – 6409
James Bolden (919) 707 – 6408

Eastern Regional Geotechnical Contact (Divisions 1-7):
K. J. Kim (919) 662 – 4710
(919) 662 – 3095 facsimile
kkim@ncdot.gov

Western Regional Geotechnical Contact (Divisions 8-14):

Eric Williams (704) 455 – 8902
(704) 455 – 8912 facsimile
ewilliams@ncdot.gov

3.0 SUBMITTAL COPIES

• Furnish one complete copy of each submittal, including all attachments, to the Resident Engineer. At the same time, submit the number of hard copies shown below of the same complete submittal directly to the Structure Design Unit and/or the Geotechnical Engineering Unit.

• The first table below covers "Structure Submittals". The Resident Engineer will receive review comments and drawing markups for these submittals from the Structure Design Unit. The second table in this section covers "Geotechnical Submittals". The Resident Engineer will receive review comments and drawing markups for these submittals from the Geotechnical Engineering Unit.

• Unless otherwise required, submit one set of supporting calculations to either the Structure Design Unit or the Geotechnical Engineering Unit unless both units require submittal copies in which case submit a set of supporting calculations to each unit. Provide additional copies of any submittal as directed.

STRUCTURE SUBMITTALS

Submittal	Copies Required by Structure Design Unit	Copies Required by Geotechnical Engineering Unit	Contract Reference Requiring Submittal [1]
Arch Culvert Falsework	5	0	Plan Note, SN Sheet & "Falsework and Formwork"
Box Culvert Falsework [7]	5	0	Plan Note, SN Sheet & "Falsework and Formwork"
Cofferdams	6	2	Article 410-4
Foam Joint Seals [6]	9	0	"Foam Joint Seals"
Expansion Joint Seals (hold down plate type with base angle)	9	0	"Expansion Joint Seals"
Expansion Joint Seals (modular)	2, then 9	0	"Modular Expansion Joint Seals"
Expansion Joint Seals (strip seals)	9	0	"Strip Seals"

Falsework & Forms [2] (substructure)	8	0	Article 420-3 & "Falsework and Formwork"
Falsework & Forms (superstructure)	8	0	Article 420-3 & "Falsework and Formwork"
Girder Erection over Railroad	5	0	Railroad Provisions
Maintenance and Protection of Traffic Beneath Proposed Structure	8	0	"Maintenance and Protection of Traffic Beneath Proposed Structure at Station ___"
Metal Bridge Railing	8	0	Plan Note
Metal Stay-in-Place Forms	8	0	Article 420-3
Metalwork for Elastomeric Bearings [4,5]	7	0	Article 1072-8
Miscellaneous Metalwork [4,5]	7	0	Article 1072-8
Optional Disc Bearings [4]	8	0	"Optional Disc Bearings"
Overhead and Digital Message Signs (DMS) (metalwork and foundations)	13	0	Applicable Provisions
Placement of Equipment on Structures (cranes, etc.)	7	0	Article 420-20
Pot Bearings [4]	8	0	"Pot Bearings"
Precast Concrete Box Culverts	2, then 1 reproducible	0	"Optional Precast Reinforced Concrete Box Culvert at Station ___"
Prestressed Concrete Cored Slab (detensioning sequences) [3]	6	0	Article 1078-11
Prestressed Concrete Deck Panels	6 and 1 reproducible	0	Article 420-3
Prestressed Concrete Girder (strand elongation and detensioning sequences)	6	0	Articles 1078-8 and 1078-11
Removal of Existing Structure over Railroad	5	0	Railroad Provisions
Revised Bridge Deck Plans (adaptation to prestressed deck panels)	2, then 1 reproducible	0	Article 420-3

Revised Bridge Deck Plans (adaptation to modular expansion joint seals)	2, then 1 reproducible	0	"Modular Expansion Joint Seals"
Sound Barrier Wall (precast items)	10	0	Article 1077-2 & "Sound Barrier Wall"
Sound Barrier Wall Steel Fabrication Plans [5]	7	0	Article 1072-8 & "Sound Barrier Wall"
Structural Steel [4]	2, then 7	0	Article 1072-8
Temporary Detour Structures	10	2	Article 400-3 & "Construction, Maintenance and Removal of Temporary Structure at Station ____"
TFE Expansion Bearings [4]	8	0	Article 1072-8

FOOTNOTES

1. References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the provision by that name. Articles refer to the *Standard Specifications*.
2. Submittals for these items are necessary only when required by a note on plans.
3. Submittals for these items may not be required. A list of pre-approved sequences is available from the producer or the Materials & Tests Unit.
4. The fabricator may submit these items directly to the Structure Design Unit.
5. The two sets of preliminary submittals required by Article 1072-8 of the *Standard Specifications* are not required for these items.
6. Submittals for Fabrication Drawings are not required. Submittals for Catalogue Cuts of Proposed Material are required. See Section 5.A of the referenced provision.
7. Submittals are necessary only when the top slab thickness is 18" or greater.

GEOTECHNICAL SUBMITTALS

Submittal	Copies Required by Geotechnical Engineering Unit	Copies Required by Structure Design Unit	Contract Reference Requiring Submittal [1]
Drilled Pier Construction Plans [2]	1	0	Subarticle 411-3(A)
Crosshole Sonic Logging (CSL) Reports [2]	1	0	Subarticle 411-5(A)(2)
Pile Driving Equipment Data Forms [2,3]	1	0	Subarticle 450-3(D)(2)
Pile Driving Analyzer (PDA) Reports [2]	1	0	Subarticle 450-3(F)(3)
Retaining Walls [4]	8 drawings, 2 calculations	2 drawings	Applicable Provisions
Temporary Shoring [4]	5 drawings, 2 calculations	2 drawings	"Temporary Shoring" & "Temporary Soil Nail Walls"

FOOTNOTES

1. References are provided to help locate the part of the contract where the submittals are required. References in quotes refer to the provision by that name. Subarticles refer to the *Standard Specifications*.

2. Submit one hard copy of submittal to the Resident or Bridge Maintenance Engineer. Submit a second copy of submittal electronically (PDF via email) or by facsimile, US mail or other delivery service to the appropriate Geotechnical Engineering Unit regional office. Electronic submission is preferred.

3. The Pile Driving Equipment Data Form is available from: https://connect.ncdot.gov/resources/Geological/Pages/Geotech_Forms_Details.aspx See second page of form for submittal instructions.

4. Electronic copy of submittal is required. See referenced provision.

CRANE SAFETY (8-15-05)

Comply with the manufacturer specifications and limitations applicable to the operation of any and all cranes and derricks. Prime contractors, sub-contractors, and fully operated rental companies shall comply with the current Occupational Safety and Health Administration regulations (OSHA).

Submit all items listed below to the Engineer prior to beginning crane operations involving critical lifts. A critical lift is defined as any lift that exceeds 75 percent of the manufacturer's crane chart capacity for the radius at which the load will be lifted or requires the use of more than one crane. Changes in personnel or equipment must be reported to the Engineer and all applicable items listed below must be updated and submitted prior to continuing with crane operations.

CRANE SAFETY SUBMITTAL LIST

A. **Competent Person:** Provide the name and qualifications of the "Competent Person" responsible for crane safety and lifting operations. The named competent person will have the responsibility and authority to stop any work activity due to safety concerns.

B. **Riggers:** Provide the qualifications and experience of the persons responsible for rigging operations. Qualifications and experience should include, but not be limited to, weight calculations, center of gravity determinations, selection and inspection of sling and rigging equipment, and safe rigging practices.

C. **Crane Inspections:** Inspection records for all cranes shall be current and readily accessible for review upon request.

D. **Certifications:** **By July 1, 2006**, crane operators performing critical lifts shall be certified by NC CCO (National Commission for the Certification of Crane Operators), or satisfactorily complete the Carolinas AGC's Professional Crane Operator's Proficiency Program. Other approved nationally accredited programs will be considered upon request. All crane operators shall also have a current CDL medical card. Submit a list of anticipated critical lifts and corresponding crane operator(s). Include current certification for the type of crane operated (small hydraulic, large hydraulic, small lattice, large lattice) and medical evaluations for each operator.

GROUT FOR STRUCTURES (9-30-11)

1.0 DESCRIPTION

This special provision addresses grout for use in pile blockouts, grout pockets, shear keys, dowel holes and recesses for structures. This provision does not apply to grout placed in post-tensioning ducts for bridge beams, girders, or decks. Mix and place grout in accordance with the manufacturer's recommendations, the applicable sections of the Standard Specifications and this provision.

2.0 MATERIAL REQUIREMENTS

Use a Department approved pre-packaged, non-shrink, non-metallic grout. Contact the Materials and Tests Unit for a list of approved pre-packaged grouts and consult the manufacturer to determine if the pre-packaged grout selected is suitable for the required application.

When using an approved pre-packaged grout, a grout mix design submittal is not required.

The grout shall be free of soluble chlorides and contain less than one percent soluble sulfate. Supply water in compliance with Article 1024-4 of the Standard Specifications.

Aggregate may be added to the mix only where recommended or permitted by the manufacturer and Engineer. The quantity and gradation of the aggregate shall be in accordance with the manufacturer's recommendations.

Admixtures, if approved by the Department, shall be used in accordance with the manufacturer's recommendations. The manufacture date shall be clearly stamped on each container. Admixtures with an expired shelf life shall not be used.

The Engineer reserves the right to reject material based on unsatisfactory performance.

Initial setting time shall not be less than 10 minutes when tested in accordance with ASTM C266.

Test the expansion and shrinkage of the grout in accordance with ASTM C1090. The grout shall expand no more than 0.2% and shall exhibit no shrinkage. Furnish a Type 4 material certification showing results of tests conducted to determine the properties listed in the Standard Specifications and to assure the material is non-shrink.

Unless required elsewhere in the contract the compressive strength at 3 days shall be at least 5000 psi. Compressive strength in the laboratory shall be determined in accordance with ASTM C109 except the test mix shall contain only water and the dry manufactured material. Compressive strength in the field will be determined by molding and testing 4" x 8" cylinders in accordance with AASHTO T22. Construction loading and traffic loading shall not be allowed until the 3 day compressive strength is achieved.

When tested in accordance with ASTM C666, Procedure A, the durability factor of the grout shall not be less than 80.

3.0 SAMPLING AND PLACEMENT

Place and maintain components in final position until grout placement is complete and accepted. Concrete surfaces to receive grout shall be free of defective concrete, laitance, oil, grease and other foreign matter. Saturate concrete surfaces with clean water and remove excess water prior to placing grout.

Do not place grout if the grout temperature is less than 50°F or more than 90°F or if the air temperature measured at the location of the grouting operation in the shade away from artificial heat is below 45°F.

Provide grout at a rate that permits proper handling, placing and finishing in accordance with the manufacturer's recommendations unless directed otherwise by the Engineer. Use grout free of any lumps and undispersed cement. Agitate grout continuously before placement.

Control grout delivery so the interval between placing batches in the same component does not exceed 20 minutes.

The Engineer will determine the locations to sample grout and the number and type of samples collected for field and laboratory testing. The compressive strength of the grout will be considered the average compressive strength test results of 3 cube or 2 cylinder specimens at 28 days.

4.0 BASIS OF PAYMENT

No separate payment will be made for "Grout for Structures". The cost of the material, equipment, labor, placement, and any incidentals necessary to complete the work shall be considered incidental to the structure item requiring grout.

MASS CONCRETE **(SPECIAL)**

Elements of interior bents as called out on the plans, at Station 144+90.00 –L- (Str 6) and 144+65.00 –L- (Str 7), are considered mass concrete.

The Contractor shall provide an analysis of the anticipated thermal developments in the mass concrete elements using his proposed mix design, casting procedures, and materials. Additionally, the Contractor shall describe the measures and procedures he intends to use to limit the temperature differential to 35°F or less between the interior and exterior of the designated mass concrete elements during curing. The proposed plan to control the temperature differential shall be submitted to the Department for review and comments at the time approval is requested for the mass concrete mix design.

Maintenance of the specified thermal differential may be accomplished through a combination of the following:

A. Selection of concrete ingredients to minimize the heat generated by hydration of the cement.

B. Cooling component materials to reduce the temperature of the concrete while in its plastic state.

C. Controlling the rate of placing the concrete.

D. Insulating the surface of the concrete to prevent heat loss.

E. Providing supplemental heat at the surface of the concrete to prevent heat loss.

F. Other acceptable methods which may be developed by the Contractor.

Mass concrete shall be the Class A Concrete as shown on the plans, vibrated, air-entrained, and shall contain an approved set-retarding, water-reducing admixture, and 30% flyash by weight of the total cementitious material. The total cementitious material shall not exceed 690 lbs. per cubic yard of concrete. The maximum water-cementitious material ratio shall be 0.366 for rounded aggregate and 0.410 for angular aggregate. The slump of the concrete shall not exceed 6 inches. The Contractor shall submit compressive strength results, the average of at least three cylinders made in the laboratory, of his proposed mix design. These cylinders shall show a minimum strength of 3500 psi for Class A concrete at 28 days.

Minimum compressive strength at 28 days of field placed Class A concrete shall be 3000 psi.

Flyash used in the mass concrete mix shall meet the requirements of Article 1024-5 and 1024-7 of the Standard Specifications. Portland Cement shall meet the requirements of AASHTO M85 for Portland Cement Type II.

The temperature of mass concrete at the time of placement shall not be less than 40°F nor more than 75°F.

The placement of the mass concrete shall be continuous until the work is completed and the resulting structures shall be monolithic and homogeneous.

The entire cost of this work shall be included in the unit contract price bid for Class A concrete.

SPECIAL PROVISIONS FOR PROTECTION OF RAILWAY INTEREST

Under the terms of these provisions, the North Carolina Department of Transportation shall hereinafter be called "Department", North Carolina Railroad Company herein called "Company" and the Norfolk Southern Railway Company shall hereinafter be called "Railroad".

1. AUTHORITY OF RAILROAD ENGINEER AND DEPARTMENT ENGINEER:

The Railroad's Public Projects Engineer, hereinafter referred to as Railroad Engineer, shall have final authority in all matters affecting the safe maintenance of Railroad traffic including the adequacy of the foundations and structures supporting the Railroad tracks.

The authorized representative of the North Carolina Department of Transportation, hereinafter referred to as the Department Engineer, shall have authority over all other matters as prescribed herein including Project Specifications, Special Provisions, and the plans.

2. NOTICE OF STARTING WORK:

A. The Contractor shall not commence any work on Company's corridor until he has complied with the following conditions:

(1) Sign and receive back from the Railroad Engineer a fully executed copy of the required Norfolk Southern Construction Right of Entry Agreement (attached as an addendum.)

(2) Give the Railroad written notice, in electronic format, with copy to the Department Engineer who is designated to be in charge of the work, at least ten (10) days in advance of the date he proposes to begin work on Railroad right of way to:

Mr. Scott Overbey
Public Projects Engineer
scott.overbey@nscorp.com

(3) Obtain written approval from the Company and Railroad of Railroad Protective Liability Insurance coverage as required by section 14 herein. The Railroad does not accept notation of Railroad protective insurance on a certificate of liability insurance form or Binders as Railroad must have the full original countersigned policy. The policy will be reviewed for compliance prior to written approval. Due to the number of projects system-wide, it typically takes a minimum of 30-45 days for Railroad to review.

(4) Obtain Railroad's Flagging Services as required by Section 7 herein.

(5) Obtain written authorization from the Railroad to begin work on Company's corridor, such authorization to include an outline of specific conditions with which he must comply.

(6) Furnish a schedule for all work within the Company corridor as required by section 7-B-1 herein.

B. The Railroad's written authorization to proceed with the work will include the names, addresses, and telephone numbers of the Railroad's representatives who are to be notified as hereinafter required. Where more than one representative is designated, the area of responsibility of each representative will be specified.

3. INTERFERENCE WITH RAILROAD OPERATIONS:

A. The Contractor shall so arrange and conduct his work that there will be no interference with Railroad operations, including train, signal, telephone and telegraphic services, or damage to the property of the Company or Railroad or to poles, wires, and other facilities of tenants on the corridor of the Company. Whenever work is liable to affect the operations or safety of trains, the method of doing such work shall first be submitted to the Railroad Engineer for approval, but such approval shall not relieve the Contractor from liability. Any work to be performed by the Contractor which requires flagging service or inspection service (watchman) shall be deferred by the Contractor until the flagging protection or inspection service required by the Railroad is available at the job site.

B. Whenever work within Company's corridor is of such a nature that impediment to Railroad operations such as use of runaround tracks or necessity for reduced speed is unavoidable, the Contractor shall schedule and conduct his operations so that such impediment is reduced to the absolute minimum.

C. Should conditions arising from, or in connection with the work, require that immediate and unusual provisions be made to protect operations and property of the Company and Railroad, the Contractor shall make such provisions. If in the judgment of the Railroad Engineer, or in his absence, the Railroad's Division Engineer, such provision is insufficient, either may require or provide such provisions as he deems necessary. In any event, such unusual provisions shall be at the Contractor's expense and without cost to the Company, Railroad or the Department.

D. "One Call" Services do not locate buried Railroad utilities. The contractor shall contact the Railroad's representative 2 days in advance of work at those places where excavation, Pile driving, or heavy loads may damage the Railroad's underground facilities. Upon request from the Contractor or Department, Railroad forces will locate and paint mark or flag the Railroad's underground facilities. The Contractor shall avoid excavation or other disturbances of these facilities. If disturbance or excavation is required near a buried Railroad facility, the contractor shall coordinate with the Railroad to have the facility potholed manually with careful hand excavation. The facility shall be protected by the Contractor during the course of the disturbance under the supervision and direction of the Railroad's representative

4. TRACK CLEARANCES:

A. The minimum track clearances to be maintained by the Contractor during construction are shown on the Plans. If temporary clearances are not shown on the plans, the following criteria shall govern the use of falsework and formwork above or adjacent to operated tracks.

(1) A minimum vertical clearance of 22'-0" above top of highest rail shall be maintained at all times.

(2) A minimum horizontal clearance of 13'-0" from centerline of tangent track or 14'- 0" from centerline of curved track shall be maintained at all times. Additional horizontal clearance may be required in special cases to be safe for operating conditions. This additional clearance will be as determined by the Railroad Engineer.

(3) All proposed temporary clearances which are less than those listed above must be submitted to Railroad Engineer for approval prior to construction and must also be authorized by the regulatory body of the State if less than the legally prescribed clearances

(4) The temporary clearance requirements noted above shall also apply to all other physical obstructions including, but not limited to: stockpiled materials, parked equipment, placement or driving of piles, and bracing or other construction supports.

B. However, before undertaking any work within Company's corridor, or before placing any obstruction over any track, the Contractor shall:

(1) Notify the Railroad Engineer at least 72 hours in advance of the work.

(2) Receive assurance from the Railroad Engineer that arrangements have been made for flagging service as may be necessary.

(3) Receive permission from the Railroad Engineer to proceed with the work.

(4) Ascertain that the Department Engineer has received copies of notice to the Railroad and of the Railroad's response thereto.

5. CONSTRUCTION PROCEDURES:

A. General:

Construction work and operations by the Contractor on Company's corridor shall be:

(1) Subject to the inspection and approval of the Railroad Engineer or their designated Construction Engineering Representative.

(2) In accord with the Railroad's written outline of specific conditions.

(3) In accord with the Railroad's general rules, regulations and requirements including those relating to safety, fall protection and personal protective equipment.

(4) In accord with these Special Provisions.

B. Submittal Requirements

(1) The Contractor shall submit all construction related correspondence and submittals electronically to the Railroad Engineer.

(2) The Contractor shall allow for 30 days for the Railroad's review and response.

(3) All work in the vicinity of the Railroad's property that has the potential to affect the Railroad's train operations or disturb the Company's corridor must be submitted and approved by the Railroad prior to work being performed.

(4) All submittals and calculations must be signed and sealed by a North Carolina Registered Professional Engineer.

(5) All submittals shall first be approved by the Department Engineer and the Railroad Engineer, but such approval shall not relieve the Contractor from liability.

(6) For all construction projects, the following submittals, but not limited to those listed below, shall be provided for review and approval when applicable:

(a) General Means and Methods.

(b) Ballast Protection.

(c) Construction Excavation & Shoring.

(d) Pipe, Culvert, & Tunnel Installations.

(e) Demolition Procedure.

(f) Erection & Hoisting Procedure.

(g) Debris Shielding or Containment.

(h) Blasting.

(i) Formwork for the bridge deck, diaphragms, overhang brackets, and protective platforms.

(j) Bent Cap Falsework. A lift plan will be required if the contractor wants to move the falsework over the track.

(7) The Contractor shall include in all submissions a detailed narrative indicating the progression of work with the anticipated timeframe to complete each task. Work will not be permitted to commence until the Contractor has provided the Railroad with a satisfactory plan that the project will be undertaken without scheduling, performance or safety related issues. Submission shall also provide a listing of the anticipated equipment to be used, the location of all equipment to be used and insure a contingency plan of action is in place should a primary piece of equipment malfunction.

C. Ballast Protection

(1) The Contractor shall submit the proposed ballast protection system detailing the specific filter fabric and anchorage system to be used during all construction activities.

(2) The ballast protection is to extend 25' beyond the proposed limit of work, be installed at the start of the project and be continuously maintained to prevent all contaminants from entering the ballast section of all tracks for the entire duration of the project.

D. Excavation:

(1) The subgrade of an operated track shall be maintained with edge of berm at least 10'-0" from centerline of track and not more than 24 inches below top of rail. The Contractor will not be required to make existing section meet this specification if substandard, in which case existing section will be maintained.

(2) Additionally, the Railroad Engineer may require the Contractor to install orange construction safety fencing for protection of the work area.

E. Excavation for Structures and Shoring Protection:

(1) The Contractor will be required to take special precaution and care in connection with excavating and shoring pits, and in driving piles or sheeting, for footings adjacent to tracks to provide adequate lateral support for the tracks and the loads which they carry, without disturbance of track alignment and surface, and to avoid obstructing track clearances with working equipment, tools or other material.

(2) All plans and calculations for shoring shall be prepared and signed by a North Carolina Registered Professional Engineer, in accordance with Norfolk Southern's Overhead Grade Separation Design Criteria, subsection H.1.4.E-Construction Excavation (Refer to Norfolk Southern Public Projects Manual Appendix H). The Professional Engineer will be responsible for the accuracy for all controlling dimensions as well as the selection of soil design values which will accurately reflect the actual field conditions.

(3) The Contractor shall provide a detailed installation and removal plan of the shoring components. Any component that will be installed via the use of a crane or any other lifting device shall be subject to the guidelines outlined in section 5-G of these provisions.

(4) The Contractor shall be required to survey the track(s) and Railroad embankment and provide a cross section of the proposed excavation in relation to the tracks.

(5) Calculations for the proposed shoring should include deflection calculations. The maximum deflection for excavations within 18'-0" of the centerline of the nearest track shall be 3/8". For all other cases, the max deflection shall not exceed ½". Additionally, a walkway with OSHA approved handrail protection and orange construction fencing will be required for all excavations in the Company's corridor.

E. Pipe, Culvert, & Tunnel Installations

Pipe, Culvert, & Tunnel Installations shall be in accordance with the appropriate Norfolk Southern Design Specification as noted below:

(a) For Open Cut Method refer to Norfolk Southern Public Projects Manual Appendix H.4.6.

(b) For Jack and Bore Method refer to Norfolk Southern Public Projects Manual Appendix H.4.7.

(c) For Tunneling Method refer to Norfolk Southern Public Projects Manual Appendix H.4.8.

F. Demolition Procedures

(1) General

(a) Demolition plans are required for all spans over the track(s), for all spans adjacent to the track(s), if located on (or partially on) Railroad right-of-way; and in all situations where cranes will be situated on, over, or adjacent to Railroad right-of-way and within a distance of the boom length plus 15'-0" from the centerline of track.

(b) Railroad tracks and other Company and Railroad property must be protected from damage during the procedure.

(c) A pre-demolition meeting shall be conducted with the Department, the Railroad Engineer or their representative, and the key Contractor's personnel prior to the start of the demolition procedure.

(d) The Railroad Engineer or his designated representative must be present at the site during the entire demolition procedure period.

(e) Existing, obsolete, bridge piers shall be removed to a sufficient depth below grade to enable restoration of the existing/proposed track ditch, but in no case less than 2'-0" below final grade.

(2) Submittal Requirements

In addition to the submittal requirements outlined in Section 5-A-2 of these provisions, the Contractor shall submit the following for approval by the Railroad Engineer:

(a) A plan showing the location of cranes, horizontally and vertically, operating radii, with delivery or disposal locations shown. The location of all tracks and other Railroad facilities as well as all obstructions such as wire lines, poles, adjacent structures, etc. must also be shown.

(b) Rating sheets showing cranes or lifting devices to be adequate for 150% of the actual weight of the pick, including all rigging components. A complete set of crane charts, including crane, counterweight, and boom nomenclature is to be submitted. Safety factors that may have been "built-in" to the crane charts are not to be considered when determining the 150% factor of safety.

(c) Plans and computations showing the weight of the pick must be submitted. Calculations shall be made from plans of the existing structure showing complete and sufficient details with supporting data for the demolition the structure. If plans do not exist, lifting weights must be calculated from field measurements. The field measurements are to be made under the supervision of the Registered Professional Engineer submitting the procedure and calculations.

(d) The Contractor shall provide a sketch of all rigging components from the crane's hook block to the beam. Catalog cuts or information sheets of all rigging components with their lifting capacities shall be provided. All rigging must be adequate for 150% of the actual weight of the pick. Safety factors that may have been "built-in" to the rating charts are not to be considered when determining the 150% factor of safety. All rigging components shall be clearly identified and tagged with their rated lifting capacities. The position of the rigging in the field shall not differ from what is shown on the final plan without prior review from the Department and the Railroad.

(e) A complete demolition procedure, including the order of lifts, time required for each lift, and any repositioning or re-hitching of the crane or cranes.

(f) Design and supporting calculations for the temporary support of components, including but not limited to the stability of the superstructure

during the temporary condition, temporary girder tiedowns and falsework.

(3) Overhead Demolition Debris Shield

(a) The demolition debris shield shall be installed prior to the demolition of the bridge deck or other relevant portions of the superstructure over the track area to catch all falling debris.

(b) The demolition debris shield shall provide a minimum vertical clearance as specified in Section 4.A.1 of these provisions or maintain the existing vertical clearance if the existing clearance is less than that specified in Section 4.A.1.

(c) The Contractor shall include the demolition debris shield installation/removal means and methods as part of the proposed demolition procedure submission.

(d) The Contractor shall submit the demolition debris shield design and supporting calculations for approval by the Railroad Engineer.

(e) The demolition debris shield shall have a minimum design load of 50 Pounds per square foot plus the weight of the equipment, debris, personnel, and other loads to be carried.

(f) The Contractor shall include the proposed bridge deck removal procedure in its demolition means and methods and shall verify that the size and quantity of the demolition debris generated by the procedure does not exceed the shield design loads.

(g) The Contractor shall clean the demolition debris shield daily or more frequently as dictated either by the approved design parameters or as directed by the Railroad Engineer.

(4) Vertical Demolition Debris Shield

A vertical demolition debris shield may be required for substructure removals in close proximity to the Railroad's track and other facilities, as determined by the Railroad Engineer.

G. Erection and Hoisting:

(1) General

(a) Erection plans are required for all spans over the track(s), for all spans adjacent to the track(s), if located on (or partially on) Company corridor; and in all situations where cranes will be situated on, over, or adjacent to Company corridor and within a distance of the boom length plus 15'- 0" from the centerline of track.

(b) Railroad tracks and other Company or Railroad property must be protected from damage during the procedure.

(c) A pre-erection meeting shall be conducted with the Department, the Railroad Engineer or their representative, and the key Contractor's personnel prior to the start of the erection procedure.

(d) The Railroad Engineer or his designated representative must be present at the site during the entire erection procedure period.

(e) For field splices located over Company corridor, a minimum of 50% of the holes for each connection shall be filled with bolts or pins prior to releasing the crane. A minimum of 50% of the holes filled shall be filled with bolts. All bolts must be appropriately tightened.

(2) Submittal Requirements

In addition the submittal requirements outlined in Section 5.A.2 of these provisions, the Contractor shall submit the following for approval by the Railroad Engineer:

(a) As-built bridge seat elevations - All as-built bridge seats and top of rail elevations shall be furnished to the Railroad Engineer for review and verification at least 30 days in advance of the erection, to ensure that minimum vertical clearances as approved in the plans will be achieved.

(b) A plan showing the locations of cranes, horizontally and vertically, operating radii, with delivery or disposal locations shown. The location of all tracks and other railroad facilities as well as wire lines, poles, adjacent structures, etc. must also be shown.

(c) Rating sheets showing cranes or lifting devices to be adequate for 150% of the actual weight of the pick, including all rigging components. A complete set of crane charts, including crane, counterweight, and boom nomenclature is to be submitted. Safety factors that may have been "built-in" to the crane charts are not to be considered when determining the 150% factor of safety.

(d) Plans and computations showing the weight of the picks must be submitted. Calculations shall be made from plans of the existing and/or proposed structure showing complete and sufficient details with supporting data for the demolition or erection of the structure. If plans do not exist, lifting weights must be calculated from filed measurements. The field measurements are to be made under the supervision of the North Carolina Registered Professional Engineer submitting the procedure and calculations.

(e) The Contractor shall provide a sketch of all rigging components from the crane's hook block to the beam. Catalog cuts or information sheets of all rigging components with their lifting capacities shall be provided. All rigging must be adequate for 150% of the actual weight of the pick. Safety factors that may have been "built-in" to the rating charts are not to be considered when determining the 150% factor of safety. All rigging components shall be clearly identified and tagged with their rated lifting capacities. The position of the rigging in the field shall not differ from what is shown on the final plan without prior review from the Department and the Railroad.

(f) A complete erection procedure is to be submitted, including the order of lifts, time required for each lift, and any repositioning or re-hitching of the crane or cranes.

(e) Design and supporting calculations for the temporary support of components, including but not limited to temporary girder tie-downs and falsework.

H. Blasting:

(1) The Contractor shall obtain advance approval of the Railroad Engineer and Department Engineer for use of explosives on or adjacent to Company corridor. The request for permission to use explosives shall include a detailed blasting plan. If permission for use of explosives is granted, the Contractor will be required to comply with the following:

(a) Blasting shall be done with light charges under the direct supervision of a responsible officer or employee of the Contractor and a licensed blaster.

(b) Electric detonating fuses shall not be used because of the possibility of premature explosions resulting from operation of two-way train radios.

(c) No blasting shall be done without the presence of the Railroad Engineer or his authorized representative. At least 72 hours advance notice to the person designated in the Railroad's notice of authorization to proceed (see section 2B above) will be required to arrange for the presence of an authorized Railroad representative and such flagging as the Railroad may require.

(d) Have at the job site adequate equipment, labor and materials and allow sufficient time to clean up debris resulting from the blasting without delay to trains, as well as correcting at his expense any track misalignment or other damage to Railroad property resulting from the blasting as directed by the Railroad Engineer. If his actions result in delay of trains, the

Contractor shall bear the entire cost thereof.

(e) The blasting Contractor shall have a copy of the approved blasting plan on hand while on the site.

(f) Explosive materials or loaded holes shall not be left unattended at the blast site.

(g) A seismograph shall be placed on the track shoulder adjacent to each blast which will govern the peak particle velocity of two inches per second measurement shall also be taken on the ground adjacent to structures as designated by a qualified and independent blasting consultant. The Railroad reserves the option to direct the placement of additional seismographs at structures or other locations of concern, without regard to scaled distance.

(h) After each blast, the blasting Contractor shall provide a copy of their drill log and blast report, which includes number of holes, depth of holes, number of decks, type and pounds of explosives used per deck.

(i) The Railroad may require top of rail elevations and track centers taken before, during and after the blasting and excavation operation to check for any track misalignment resulting from the Contractor's activities.

(2) The Railroad Engineer will:

(a) Determine the approximate location of trains and advise the Contractor the approximate amount of time available for the blasting operation and clean-up.

(b) Have the authority to order discontinuance of blasting if, in his opinion, blasting is too hazardous or is not in accord with these special provisions.

I. Track Monitoring

(1) At the direction of the Railroad Engineer, any activity that has the potential to disturb the Railroad track structure may require the Contractor to submit a detailed track monitoring program for approval by the Railroad Engineer.

(2) The program shall specify the survey locations, the distance between the location points, and frequency of monitoring before, during, and after construction. Railroad reserves the right to modify the survey locations and monitoring frequency as necessary during the project.

(3) The survey data shall be collected in accordance with the approved frequency and immediately furnished to the Railroad Engineer for analysis.

(4) If any movement has occurred as determined by the Railroad Engineer, the Railroad will be immediately notified. Railroad, at its sole discretion, shall have the right to immediately require all Contractor operations to be ceased and determine what corrective action is required. Any corrective action required by the Railroad or performed by the Railroad including the monitoring of corrective action of the Contractor will be at project expense.

J. Maintenance of Railroad Facilities:

(1) The Contractor will be required to maintain all ditches and drainage structures free of silt or other obstructions which may result from his operations and provide and maintain any erosion control measures as required. The Contractor will promptly repair eroded areas within Railroad's right of way and repair any other damage to the property of the Railroad or its tenants.

(2) If, in the course of construction, it may be necessary to block a ditch, pipe or other drainage facility, temporary pipes, ditches or other drainage facilities shall be installed to maintain adequate drainage, as approved by the Railroad. Upon completion of the work, the temporary facilities shall be removed and the permanent facilities restored.

(3) All such maintenance and repair of damages due to the Contractor's operations shall be done at the Contractor's expense.

K. Storage of Materials and Equipment:

Materials and equipment shall not be stored where they will interfere with Railroad operations, nor on the Company's corridor without first having obtained permission from the Railroad Engineer, and such permission will be with the understanding that the Railroad will not be liable for damage to such material and equipment from any cause and that the Railroad Engineer may move or require the Contractor to move, at the Contractor's expense, such material and equipment.

All grading or construction machinery that is left parked near the track unattended by a watchman shall be effectively immobilized so that it cannot be moved by unauthorized persons. The Contractor shall protect, defend, indemnify and save Company and Railroad, and any associated, controlled or affiliated corporation, harmless from and against all losses, costs, expenses, claim or liability for loss or damage to property or the loss of life or personal injury, arising out of or incident to the Contractor's failure to immobilize grading or construction machinery.

L. Cleanup

Upon completion of the work, the Contractor shall remove from within the limits of the Company's corridor, all machinery, equipment, surplus materials, falsework, rubbish or temporary buildings of the Contractor, and leave said right of way in a neat condition satisfactory to the Railroad Engineer or his authorized representative.

6. **DAMAGES**

A. The Contractor shall assume all liability for any and all damages to his work, employees, servants, equipment and materials caused by Railroad traffic.

B. Any cost incurred by the Company or Railroad for repairing damages to its property or to property of its tenants, caused by or resulting from the operations of the Contractor, shall be paid directly to the Company or Railroad by the Contractor.

7. **FLAGGING SERVICES:**

A. Requirements:

(1) Flagging services will not be provided until the Contractor's insurance has been reviewed and approved by the Railroad.

(2) Under the terms of the agreement between the Department, Company, and Railroad, the Railroad has sole authority to determine the need for flagging required to protect its operations. In general, the requirements of such services will be whenever the Contractor's men or equipment are, or are likely to be, working on the Railroad's right of way, or across, over, adjacent to or under a track, or when such work has disturbed or is likely to disturb a Railroad structure, Railroad roadbed, or surface and alignment of any track to such extent that the movement of trains must be controlled by flagging.

(3) Normally, the Railroad will assign one flagman to a project; but in some cases, more than one may be necessary, such as yard limits where three (3) flagmen may be required. However, if the Contractor works within distances that violate instructions given by the Railroad Engineer or performs work that has not been scheduled with the Railroad Engineer, a flagman or flagmen may be required full time until the project has been completed. Should such violations or unscheduled, unauthorized work by the Contractor result in full time flagging being required by the Railroad, the additional cost of such flagging above normal flagging cost shall be deducted from the final payment to the Contractor as provided in Article 109-9 of the Standard Specifications. Neither Department nor Company nor Railroad will be liable for damages resulting from unscheduled or unauthorized work.

B. Scheduling and Notification:

(1) The Contractor's work requiring railroad flagging should be scheduled to limit the presence of a flagman at the site to a maximum of 50 hours per week. The Contractor shall receive Railroad approval of work schedules requiring a flagman presence in excess of 40 hours per week.

(2) No later than the time that approval is initially requested to begin work on Railroad

right of way, the Contractor shall furnish to the Department, Company and Railroad a schedule for all work required to complete the portion of the project within the Company's corridor and arrange for a job site meeting between the Contractor, Department, Company and Railroad. Flagman or flagmen may not be provided until the job site meeting has been conducted and the Contractor's work scheduled.

(3) The Contractor will be required to give the Railroad Engineer at least 10 working days of advance written notice of intent to begin work within Railroad's right of way in accordance with this special provision. Once begun, when such work is then suspended at any time, or for any reason, the Contractor will be required to give the Railroad Engineer at least 3 working days of advance notice before resuming work on Railroad's right of way. Such notices shall include sufficient details of the proposed work to enable the Railroad Engineer to determine if flagging will be required. If such notice is in writing, the Contractor shall furnish the Department Engineer a copy; if notice is given verbally, it shall be confirmed in writing with a copy to the Department Engineer.

(4) If flagging is required, no work shall be undertaken until the flagman, or flagmen, is present at the job site. It may take up to 30 days to obtain flagging initially from the Railroad. When flagging begins, the flagman is usually assigned by the Railroad to work at the project site on a continual basis until no longer needed and cannot be called for on a spot basis. If flagging becomes unnecessary and is suspended, it may take up to 30 days to again obtain from the Railroad. Due to labor agreements, it is necessary to give 5 working days' notice before flagging service may be discontinued and responsibility for payment stopped.

(5) If, after the flagman is assigned to the project site, emergencies arise which require the flagman's presence elsewhere, the Contractor shall delay work on Railroad right of way until such time as the flagman is again available. Any additional costs resulting from such delay shall be borne by the Contractor and not the Department, Company or Railroad.

C. Payment:

(1) The Department will be responsible for paying the Railroad directly for any and all costs of flagging which may be required to accomplish the construction. The Contractor shall reimburse the Railroad for any costs of the flagging which is required for work for the benefit of the Contractor.

(2) The estimated cost of flagging service is the current rate per day based on a 10-hour work day. This cost includes the base pay for each flagman, overhead, and a per diem charge for travel expenses, meals and lodging. The charge by the Railroad will be the actual cost based on the rate of pay for the Railroad's employees who are available for flagging service at the time the service is required.

(3) Work by a flagman in excess of 8 hours per day or 40 hours per week, but not more than 12 hours a day will result in overtime pay at 1½ times the appropriate rate. Work by a flagman in excess of 12 hours per day will result in overtime pay at 2 times the appropriate rate. If work is performed on a holiday, the flagging rate is 2½ times the normal rate Railroad work involved in preparing and handling bills will also be charged to the

Department. Charges to the Department by the Railroad shall be in accordance with applicable provisions of the Federal-Aid Policy Guide, Title 23 Subchapter B, Part 140I and Subchapter G, Part 646B issued by the Federal Highway Administration on December 9, 1991, including all current amendments. Flagging costs are subject to change. The above estimates of flagging costs are provided for information only and are not binding in any way.

D. Verification:

(1) Railroad's flagman will electronically enter flagging time via Railroad's electronic billing system. Any complaints concerning flagman or flagmen must be resolved in a timely manner. If need for flagman or flagmen is questioned, please contact Railroad's System Engineer of Public Improvements at (404) 529-1641. All verbal complaints must be confirmed in writing by the Contractor within 5 working days with copy to the Department Engineer. Address all written correspondence electronically to the Railroad Engineer:

Mr. Scott Overbey – Public Projects Engineer
saoverbey@nscorp.com

(2) The Railroad flagman assigned to the project will be responsible for notifying the Department Engineer upon arrival at the job site on the first day (or as soon thereafter as possible) that flagging services begin and on the last day that he performs such services for each separate period that services are provided. The Department Engineer will document such notification and general flagging times for verification purposes in the project records. When requested, the Department Engineer will also sign the flagman's diary showing daily time spent and activity at the project site. Also if requested, the flagman will cooperate with the Department by submitting daily timesheets or signing the Department Engineer's diary showing daily time spent at the project site.

8. HAUL ACROSS RAILROADS:

A. Where the plans show or imply that materials of any nature must be hauled across a Railroad, unless the plans clearly show that the Department has included arrangements for such haul in its agreement with the Railroad, the Contractor will be required to make all necessary arrangements with the Railroad regarding means of transporting such materials across the Railroad. The Contractor will be required to bear all costs incidental, including flagging, to such crossings whether services are performed by his own forces or by Railroad personnel.

B. No crossing may be established for use of the Contractor for transporting materials or equipment across the tracks of the Railroad unless specific authority for its installation, maintenance, necessary watching and flagging thereof and removal, all at the expense of the Contractor, is first obtained from the Railroad Engineer. The approval process for a temporary private crossing agreement executed between the Contractor and Railroad normally takes 90 days.

9. WORK FOR THE BENEFIT OF THE CONTRACTOR:

A. All temporary or permanent changes in wire lines or other facilities which are considered necessary to the project are shown on the plans and included in the force account agreement between the Department, Company and the Railroad; or will be covered by appropriate revisions to same which will be initiated and approved by the Department and/or Railroad.

B. Should the Contractor desire any changes in addition to the above, then he shall make separate arrangements with the Railroad for same to be accomplished at the Contractor's expense.

10. COOPERATION AND DELAYS:

A. It shall be the Contractor's responsibility to arrange a schedule with the Company and Railroad for accomplishing stage construction involving work by the Company or Railroad or tenants of the Company or Railroad. In arranging his schedule he shall ascertain, from the Company and Railroad, the lead time required for assembling crews and materials and shall make due allowance therefore. The Contractor shall cooperate with others in the construction of the project to the end that all work may be accomplished to the best advantage.

B. No charge or claims of the Contractor against either the Department, Company or Railroad will be allowed for hindrance or delay on account of railroad traffic, any work done by the Company or Railroad or other delay incident to or necessary for safe maintenance of railroad traffic or for any delays due to compliance with these special provisions.

C. The Contractor's attention is called to the fact that neither the Department nor Company or Railroad assumes any responsibility for any work performed by others in connection with the construction of the project, and the Contractor shall have no claim whatsoever against the Department, Company or Railroad for any inconvenience, delay, or additional cost incurred by him on account of such operations by others.

11. TRAINMAN'S WALKWAYS:

Along the outer side of each exterior track of multiple operated tracks, and on each side of single operated track, an unobstructed continuous space suitable for trainman's use in walking along trains, extending to a line not less than 10' from centerline of track, shall be maintained. Any temporary impediments to walkways and track drainage encroachments or obstructions allowed during work hours while Railroad's protective service is provided shall be removed before the close of each work day. If there is any excavation near the walkway, a handrail, with 10'-0" minimum clearance from centerline of track shall be placed and must conform to AREMA and/or FRA standards .

12. GUIDELINES FOR PERSONNEL ON COMPANY'S CORRIDOR:

A. All persons shall wear hard hats. Appropriate eye and hearing protection must be used. Working in shorts is prohibited. Shirts must cover shoulders, back and abdomen. Working in tennis or jogging shoes, sandals, boots with high heels, cowboy and other slip-on type

boots is prohibited. Hard-sole, lace-up footwear, zippered boots or boots cinched up with straps which fit snugly about the ankle are adequate. Wearing Safety boots is strongly recommended. In the vicinity of at-grade crossings, it is strongly recommended to wear reflective vests.

B. No one is allowed within 25' of the centerline of track without specific authorization from the flagman.

C. All persons working near track while train is passing are to lookout for dragging bands, chains and protruding or shifted cargo.

D. No one is allowed to cross tracks without specific authorization from the flagman.

E. All welders and cutting torches working within 25' of track must stop when train is passing.

F. No steel tape or chain will be allowed to cross or touch rails without permission from the Railroad.

13. <u>GUIDELINES FOR EQUIPMENT ON COMPANY'S CORRIDOR:</u>

A. No crane or boom equipment will be allowed to set up to work or park within boom distance plus 15 ft. of centerline of track without specific permission from Railroad Engineer and flagman.

B. No crane or boom equipment will be allowed to foul track or lift a load over the track without flag protection and track time.

C. All employees will stay with their machines when crane or boom equipment is pointed toward track.

D. All cranes and boom equipment under load will stop work while train is passing (including pile driving).

E. Swinging loads must be secured to prevent movement while train is passing.

F. No loads will be suspended above a moving train.

G. No equipment will be allowed within 25' of centerline of track without specific authorization of the flagman.

H. Trucks, tractors or any equipment will not touch ballast line without specific permission from railroad official and flagman. Orange construction fencing may be required as directed.

I. No equipment or load movement within 25' or above a standing train or railroad equipment without specific authorization of the flagman.

J. All operating equipment within 25' of track must halt operations when a train is passing. All other operating equipment may be halted by the flagman if the flagman views the operation to be dangerous to the passing train.

K. All equipment, loads and cables are prohibited from touching rails.

L. While clearing and grubbing, no vegetation will be removed from Railroad embankment with heavy equipment without specific permission from the Railroad Engineer and flagman.

M. No equipment or materials will be parked or stored on Railroad's property unless specific authorization is granted from the Railroad Engineer.

N. All unattended equipment that is left parked on Railroad's property shall be effectively immobilized so that it cannot be moved by unauthorized persons.

O. All cranes and boom equipment will be turned away from track after each work day or whenever unattended by an operator.

P. Prior to performing any crane operations, the Contractor shall establish a single point of contact for the Railroad flagman to remain in communication with at all times. Person must also be in direct contact with the individual(s) directing the crane operation(s).

14. INSURANCE:

A. In addition to any other forms of insurance or bonds required under the terms of the contract and specifications, the Prime Contractor will be required to provide coverage conforming to the requirements of the Federal-Aid Policy Guide outlined under Title 23 Subchapter G, Part 646A for all work to be performed on Company's corridor by carrying insurance of the following kinds and amounts:

(1) **Commercial General Liability Insurance** having a combined single limit of not less than $2,000,000 per occurrence for all loss, damage, cost and expense, including attorneys' fees, arising out of bodily injury liability and property damage liability during the policy period. Said policy shall include explosion, collapse, and underground hazard (XCU) coverage, shall be endorsed to name Company and Railroad specified in section 14A2(c) below both as the certificate holder and as an additional insured, and shall include a severability of interests provision.

(2) **Railroad Protective Liability Insurance** having a combined single limit of not less than $2,000,000 each occurrence and $6,000,000 in the aggregate applying separately to each annual period. If the project involves track over which passenger trains operate, the insurance limits required are not less than a combined single limit of $5,000,000 each occurrence and $10,000,000 in the aggregate applying separately to each annual period. Said policy shall provide coverage for all loss, damage or expense arising from bodily injury and property damage liability, and physical damage to property attributed to acts or missions at the job site.

The standards for the Railroad Protective Liability Insurance are as follows:

(a) The insurer must be rated A- or better by A.M. Best Company, Inc.

NOTE: NS does not accept from insurers Chartis (AIG or Affiliated Railroad including Lexington Insurance Railroad), Hudson Group or ACE.

(b) The policy must be written using one of the following combinations of Insurance Services Office ("ISO") Railroad Protective Liability Insurance Form Numbers:

(1) CG 00 35 01 96 and CG 28 31 10 93; or
(2) CG 00 35 07 98 and CG 28 31 07 98; or
(3) CG 00 35 10 01; or
(4) CG 00 35 12 04; or
(5) CG 00 35 12 07

(c) The named insured shall read:

North Carolina Railroad Company
2809 Highwoods Blvd., Suite 100
Raleigh, NC 27604-1000
Attn: Property Department; and

Norfolk Southern Railway Company
Three Commercial Place
Norfolk, Virginia 23510-2191
Attn: Risk Management

(d) The description of operations must appear on the Declarations, must match the project description in this agreement, and must include the appropriate Department project and contract identification numbers.

The Description and Designation shall read:

Description and Designation: Construct Grade Separation on Greensboro Eastern Loop over the tracks owned by North Carolina Railroad Company operated by Norfolk Southern Railway Company near Milepost H-5.5 in Guilford County, North Carolina identified as State Project 34821.1.3 (U-2525B)

(e) The job location must appear on the Declarations and must include the city, state, and appropriate highway name/number.

NOTE: Do not include any references to milepost on the insurance policy.

(f) The name and address of the prime contractor must appear on the

Declarations.

(g) The name and address of the Department must be identified on the Declarations as the "Involved Governmental Authority or Other Contracting Party."

(h) Other endorsements/forms that will be accepted are:

Broad Form Nuclear Exclusion – Form IL 00 21
30-day Advance Notice of Non-renewal or cancellation
60-day written notice to the Department prior to cancellation or change
Quick Reference or Index Form CL/IL 240

(i) Endorsements/forms that are **NOT** acceptable are:

(1) Any Pollution Exclusion Endorsement except CG 28 31
(2) Any Punitive or Exemplary Damages Exclusion
(3) Known injury or Damage Exclusion form CG 00 59
(4) Any Common Policy Conditions form
(5) Any other endorsement/form not specifically authorized in section 14A2(h) above.

B. If any part of the work is sublet, similar insurance, and evidence thereof as specified in section 14A1 above, shall be provided by or on behalf of the subcontractor to cover its operations on Company's corridor. As an alternative, the Prime Contractor may provide insurance for the subcontractor by means of separate and individual policies.

C. Prior to entry on Company's corridor, the original and one duplicate copy of the Railroad Protective Liability Insurance Policy shall be submitted by the Prime Contractor to the Department at the address below for its review and transmittal to the Company and Railroad. In addition, certificates of insurance evidencing the Prime Contractor's and any subcontractors' Commercial General Liability Insurance shall be issued to the Department, Company and Railroad at the addresses below, and one certified copy of the Prime Contractor and any Subcontractors policy is to be forwarded to the Department for its review and transmittal to the Company and Railroad. All policies and certificates of insurance shall state that the insurance coverage will not be suspended, voided, canceled, or reduced in coverage or limits without (30) days advance written notice to the Department, Company and Railroad. The Company will not permit any work on its corridor until it has reviewed and approved the evidence of insurance required herein.

DEPARTMENT:
NCDOT Rail Division
Engineering & Safety Branch
C/O State Railroad Agent
1556 Mail Service Center
Raleigh, NC 27699-1556

RAILROAD:
Risk Management
Norfolk Southern Railway Company
Three Commercial Place
Norfolk, Virginia 23510-2191

COMPANY
North Carolina Railroad Company
2809 Highwoods Blvd., Suite 100
Raleigh, NC 27604-1000
Attn: Property Department

D. The insurance required herein shall in no way serve to limit the liability of Department or its Contractors under the terms of this agreement.

E. The insurance amounts specified are minimum amounts and the Contractor may carry insurance in larger amounts if he so desires. As to "aggregate limits", if the insurer establishes loss reserves equal to or in excess of the aggregate limit specified in any of the required insurance policies, the Contractor shall immediately notify the Department and shall cease all operations until the aggregate limit is reinstated. If the insurer establishes loss reserves equal to or in excess of one/half of the aggregate limit, the Contractor shall arrange to restore the aggregate limit to at least the minimum amount stated in these requirements. Any insurance policies and certificates taken out and furnished due to these requirements shall be approved by the Department, Company and Railroad as to form and amount prior to beginning work on Railroad's right of way.

F. Insurance Submission Procedures

(1) Norfolk Southern will only accept initial insurance submissions via US Mail or Overnight carrier to the address noted in C above. NS will NOT accept initial insurance submissions via email or faxes.

(2) Norfolk Southern requires the following two (2) forms of insurance in the initial insurance submission to be submitted under a cover letter providing details of the project and contact information:

(3) The full original or certified true countersigned copy of the railroad protective liability insurance policy in its entirely inclusive of all declarations, schedule of forms and endorsements along with the policy forms and endorsements.

(4) The Contractor's commercial general, automobile, and workers compensation liability insurance certificate of liability insurance evidencing a combined single limit of a minimum of $2M per occurrence of general and $1M per occurrence of automobile liability insurance naming Norfolk Southern Railway Company, Three Commercial Place, Norfolk, VA 23510 as the certificate holder and as an additional insured on both the general and automobile liability insurance policy

(5) It should be noted that the Railroad does not accept notation of Railroad Protective insurance on a certificate of liability insurance form or Binders as Railroad must have the full original countersigned policy. Further, please note that mere receipt of the policy is not the only issue but review for compliance. Due to the number of projects system-wide, it typically takes a minimum of 30-45 days for the Railroad to review.

G. All insurance herein before specified shall be carried until the final inspection and acceptance of the project by the Department, Company and Railroad, or acceptance of that portion of the project within Company's corridor. At this point, no work or any other activities by the Contractor shall take place in Company's corridor without written permission from both the Department, Company and Railroad.

15. FAILURE TO COMPLY:

A. In the event the Contractor violates or fails to comply with any of the requirements of these Special Provisions:

(1) The Railroad Engineer may require that the Contractor vacate Company's property.

(2) The Department Engineer may withhold all monies due the Contractor on monthly statements.

Any such orders shall remain in effect until the Contractor has remedied the situation to the satisfaction of the Department Engineer and the Railroad Engineer.

16. PAYMENT FOR COST OF COMPLIANCE:

No separate payment will be made for any extra cost incurred on account of compliance with these special provisions. All such cost shall be included in the various prices bid to perform the work.

17. COMPLETION AND ACCEPTANCE:

Upon completion of the work, the Contractor shall remove from within the limits of the Company's corridor all machinery, equipment, surplus materials, rubbish or temporary buildings of the Contractor, and leave said corridor in a neat and orderly condition. After the final inspection has been made and work found to be completed in a satisfactory manner acceptable to the Department, Company and Railroad, the Department will be notified of the Company's and Railroad's acceptance in writing by the Railroad's Chief Engineer or his authorized representative within ten (10) days or as soon thereafter as practicable.

Railroad Site Data:

The following information was received from the Railroad on April 8, 2014, and is provided as a convenience to the Contractor in bidding this project. This information is subject to change and the Contractor may, at his discretion, contact the Railroad directly to verify its current accuracy. Since this information is shown as a convenience to the Contractor, but is subject to change, the Contractor shall have no claims whatsoever against either the Railroad or the Department of Transportation for any delays or additional costs incurred based on changes in this information which occur after the above date of receipt.

Type and number of tracks within 50 ft. of project (mainline, branchline, siding, yard, etc.).

1 - Mainline

Number of trains on affected track per day.

14

Type of trains (passenger or freight).

Passenger

Maximum authorized operating speed of trains.

79 mph

Type and number of RR employees assigned to job.

1 – Flagman

PROJECT SPECIAL PROVISION

(10-18-95) (Rev. 10-15-13) Z-1

PERMITS

The Contractor's attention is directed to the following permits, which have been issued to the Department of Transportation by the authority granting the permit.

PERMIT	AUTHORITY GRANTING THE PERMIT
Dredge and Fill and/or Work in Navigable Waters (404)	U. S. Army Corps of Engineers
Water Quality (401)	Division of Environmental Management, DENR State of North Carolina

The Contractor shall comply with all applicable permit conditions during construction of this project. Those conditions marked by * are the responsibility of the Department and the Contractor has no responsibility in accomplishing those conditions.

Agents of the permitting authority will periodically inspect the project for adherence to the permits.

The Contractor's attention is also directed to Articles 107-10 and 107-13 of the *2012 Standard Specifications* and the following:

Should the Contractor propose to utilize construction methods (such as temporary structures or fill in waters and/or wetlands for haul roads, work platforms, cofferdams, etc.) not specifically identified in the permit (individual, general, or nationwide) authorizing the project it shall be the Contractor's responsibility to coordinate with the Engineer to determine what, if any, additional permit action is required. The Contractor shall also be responsible for initiating the request for the authorization of such construction method by the permitting agency. The request shall be submitted through the Engineer. The Contractor shall not utilize the construction method until it is approved by the permitting agency. The request normally takes approximately 60 days to process; however, no extensions of time or additional compensation will be granted for delays resulting from the Contractor's request for approval of construction methods not specifically identified in the permit.

Where construction moratoriums are contained in a permit condition which restricts the Contractor's activities to certain times of the year, those moratoriums will apply only to the portions of the work taking place in the waters or wetlands provided that activities outside those areas is done in such a manner as to not affect the waters or wetlands.

P-2

DEPARTMENT OF THE ARMY PERMIT

Permittee: **NORTH CAROLINA DEPARTMENT OF TRANSPORTATION - ATTN: MS. DEBORAH BARBOUR**

Permit No: **SAW-2005-21386**

Issuing Office: **USAED, WILMINGTON**

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of the office acting under the authority of the commanding officer.

You are authorized to perform work in the accordance with the terms and conditions specified below.

Project Description: The project, identified as U-2525 B and C, consists of the construction of a 9.7 mile, four lane freeway from US 70 Relocation to US 29 and a six-lane freeway from US 29 to Lawndale Drive on new location. U-2525 B and C begins at US 70 Relocation and terminates at SR 2303 (Lawndale Drive) in Greensboro, Guilford County, North Carolina. Total permanent impacts for the construction of this project are 22,901 linear feet of jurisdictional stream channel, 9.94 acres of adjacent wetlands and 2.32 acres of jurisdictional open waters. Total temporary impacts for the construction of this project are 607 linear feet of jurisdictional stream channel and 0.12 acre of adjacent wetlands associated with the relocation of utility lines. All impacts are within the Cape Fear River basin (Hydrologic Categorical Unit 03030002). THIS IS A PHASED PERMIT AUTHORIZATION: **This permit only authorizes work on Section B of TIP U-2525.** Construction on Section C of TIP U-2525 shall not commence until final design has been completed for this section, the permittee has minimized impacts to waters and wetlands to the maximum extent practicable, any modifications to the plans, and a compensatory mitigation plan, have been approved by the US Army Corps of Engineers (the Corps).

In order to compensate for impacts associated with this permit, mitigation shall be provided in accordance with the provisions outlined on the most recent version of the attached Compensatory Mitigation Responsibility Transfer Form. The requirements of this form, including any special conditions listed on this form, are hereby incorporated as special conditions of this permit authorization.

Project Location: The project, identified as U-2525 B and C is located on the north side of Greensboro and extends from US 70 Relocation to SR 2303 (Lawndale Drive) in Guilford County, North Carolina. Section B begins at US 70 Relocation and terminates at US 29 and Section C begins at US 29 and ends at SR 2303 (Lawndale Drive). Coordinates (in decimal degrees) for the site are 36.1271° N, -79.7120° W (NAD83/WGS84). The site contains a portions of four (4) unnamed tributaries to South Buffalo Creek, twenty (20) unnamed tributaries to North Buffalo Creek, five (5) unnamed tributaries to an unnamed tributary at Camp Herman, fourteen (14) unnamed tributaries to Reedy Fork, ten (10) unnamed tributaries to Richland Creek and a portion of Richland Creek. The project also contains fifty (50) adjacent wetlands sites and five (5) open waters pond sites. All jurisdictional waters are located within the Cape Fear River Basin (8-Digit Cataloging Unit 03030002).

Permit Conditions:

General Conditions:

1. The time Limit for completing the work authorized ends on December 31, 2019. **If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.**

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Conditions 4 below. Should you wish to

cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

*SEE ATTACHED SPECIAL CONDITIONS

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S. C. 403).

(X) Section 404 of the clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United states in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

 *U.S. GOVERNMENT PRINTING OFFICE: 1986 – 717-425

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (see 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measure by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

Leekam Pargh 4/14/14

(PERMITTEE) NORTH CAROLINA DEPARTMENT OF TRANSPORTATION *(DATE)*
for ATTN: DEBORAH BARBOUR

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

(DISTRICT Engineer) STEVEN A. BAKER, COLONEL *(DATE)*

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(Transferee) (Date)

 *U.S. GOVERNMENT PRINTING OFFICE: 1986 – 717-425

SPECIAL CONDITIONS
ACTION ID: SAW-2005-21386
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION U-2525 B & C

WORK LIMITS

1. CONSTRUCTION PLANS: All work authorized by this permit must be performed in strict compliance with the attached application and plans for U-2525B received August 28, 2013 (application sheets 1-3 and plan sheets 1-93) and October 17, 2013 (application sheets 4-10) and for the Utility Permit Drawings dated October 18, 2013 (sheets 1-3), which are a part of this permit. Any modification to these plans must be approved by the US Army Corps of Engineers (USACE) prior to implementation.

2. PHASED PERMIT: This permit only authorizes work on Section B of TIP U-2525. Construction on Sections C of TIP U-2525 shall not commence until final design has been completed for this section, the permittee has minimized impacts to waters and wetlands to the maximum extent practicable, any modifications to the plans, and a compensatory mitigation plan, have been approved by the US Army Corps of Engineers (the Corps). Preliminary plans for U-2525C were provided with the August 28, 2013 application (sheets 1-89) however, these plans are not to be used for construction purposes.

3. PLANS:

A. The permittee will ensure that the construction design plans for this project do not deviate from the permit plans attached to this authorization. Written verification shall be provided that the final construction drawings comply with the attached permit drawings prior to any active construction in waters of the United States, including wetlands. Any deviation in the construction design plans will be brought to the attention of the Corps of Engineers, Raleigh Regulatory Field Office prior to any active construction in waters or wetlands.

4.UNAUTHORIZED DREDGE OR FILL: Except as authorized by this permit or any USACE approved modification to this permit, no excavation, fill or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, within waters or wetlands. This permit does not authorize temporary placement or double handling of excavated or fill material within waters or wetlands outside the permitted area. This prohibition applies to all borrow and fill activities connected with this project.

5. MAINTAIN CIRCULATION AND FLOW OF WATERS: Except as specified in the plans attached to this permit, no excavation, fill or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, in such a manner as to impair normal flows and circulation patterns within waters or wetlands or to reduce the reach of waters or wetlands.

SPECIAL CONDITIONS
ACTION ID: SAW-2005-21386
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION U-2525 B & C

6. DEVIATION FROM PERMITTED PLANS: Except as authorized by this permit or any USACE approved modification to this permit, no excavation, fill, or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, within waters or wetlands, or shall any activities take place that cause the degradation of waters or wetlands. There shall be no excavation from, waste disposal into, or degradation of, jurisdictional wetlands or waters associated with this permit without appropriate modification of this permit, including appropriate compensatory mitigation. This prohibition applies to all borrow and fill activities connected with this project. In addition, except as specified in the plans attached to this permit, no excavation, fill or mechanized land-clearing activities shall take place at any time in the construction or maintenance of this project, in such a manner as to impair normal flows and circulation patterns within, into, or out of waters or wetlands or to reduce the reach of waters or wetlands.

7. PRECONSTRUCTION MEETING: The permittee shall schedule and attend a preconstruction meeting between its representatives, the contractors representatives, and the Corps of Engineers, Raleigh Field Office, NCDOT Regulatory Project Manager, prior to any work within jurisdictional waters and wetlands to ensure that there is a mutual understanding of all the terms and conditions contained with this Department of Army Permit. The permittee shall provide the USACE, Raleigh Field Office, NCDOT Project Manager, with a copy of the final permit plans at least two weeks prior to the preconstruction meeting along with a description of any changes that have been made to the project's design, construction methodology or construction timeframe. The permittee shall schedule the preconstruction meeting for a time frame when the USACE, NCDCM, and NCDWR Project Managers can attend. The permittee shall invite the Corps, NCDCM, and NCDWQ Project Managers a minimum of thirty (30) days in advance of the scheduled meeting in order to provide those individuals with ample opportunity to schedules and participate in the required meeting.

RELATED LAWS

8. WATER CONTAMINATION: All mechanized equipment will be regularly inspected and maintained to prevent contamination of waters and wetlands from fuels, lubricants, hydraulic fluids, or other toxic materials. In the event of a spill of petroleum products or any other hazardous waste, the permittee shall immediately report it to the N.C. Division of Water Resources at (919) 733-3300 or (800) 858-0368 and provisions of the North Carolina Oil Pollution and Hazardous Substances Control Act will be followed.

SPECIAL CONDITIONS
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PROJECT MAINTENANCE

9. NOTIFICATION OF CONSTRUCTION COMMENCEMENT AND COMPLETION: The permittee shall advise the Corps in writing prior to beginning the work authorized by this permit and again upon completion of the work authorized by this permit.

10. CLEAN FILL: Unless otherwise authorized by this permit, all fill material placed in waters or wetlands shall be generated from an upland source and will be clean and free of any pollutants except in trace quantities. Metal products, organic materials (including debris from land clearing activities), or unsightly debris will not be used. Soils used for fill shall not be contaminated with any toxic substance in concentrations governed by Section 307 of the Clean Water Act.

11. PERMIT DISTRIBUTION: The permittee shall require its contractors and/or agents to comply with the terms and conditions of this permit in the construction and maintenance of this project, and shall provide each of its contractors and/or agents associated with the construction or maintenance of this project with a copy of this permit. A copy of this permit, including all conditions, shall be available at the project site during construction and maintenance of this project.

12. SILT-FENCING: The permittee shall employ all sedimentation and erosion control measures necessary to prevent an increase in sedimentation or turbidity within waters and wetlands outside the permit area. This shall include, but is not limited to, the immediate installation of silt fencing or similar appropriate devices around all areas subject to soil disturbance or the movement of earthen fill, and the immediate stabilization of all disturbed areas. Additionally, the project must remain in full compliance with all aspects of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statutes Chapter 113A Article 4).

13. PERMIT REVOCATION: The permittee, upon receipt of a notice of revocation of this permit or upon its expiration before completion of the work will, without expense to the United States and in such time and manner as the Secretary of the Army or his authorized representative may direct, restore the water or wetland to its pre-project condition.

14. EROSION CONTROL MEASURES IN WETLANDS: The permittee shall remove all sediment and erosion control measures placed in wetlands or waters, and shall restore natural grades in those areas, prior to project completion.

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ENFORCEMENT

15. REPORTING ADDRESS: All reports, documentation and correspondence required by the conditions of this permit shall be submitted to the following address: U.S. Army Corps of Engineers, Regulatory Division, Raleigh Regulatory Field Office, c/o Mr. Andrew Williams, 3331 Heritage Trade Drive, Wake Forest, NC 27587, and by telephone at: 919-554-4884 extension 26. The Permittee shall reference the following permit number, SAW-2001-21125, on all submittals.

16. REPORTING VIOLATIONS OF THE CLEAN WATER ACT AND RIVERS AND HARBORS ACT: Violation of these conditions or violation of Section 404 of the Clean Water Act of Section 10 of the Rivers and Harbors Act must be reported in writing to the Wilmington District U.S. Army Corps of Engineers within 24 hours of the permitee's discovery of the violation.

17. COMPLIANCE INSPECTION: A representative of the Corps of Engineers will periodically and randomly inspect the work for compliance with these conditions. Deviations from these procedures may result in an administrative financial penalty and/or directive to cease work until the problem is resolved to the satisfaction of the Corps.

UTILITY LINES

18. TEMPORARY IMPACTS RESTORATION MEASURES: Temporary discharge of excavated or fill material into wetlands and waters of the United States will be for the absolute minimum period of time necessary to accomplish the work. All authorized temporary wetland, stream, and tributary impacts will be returned to pre-disturbance grade and contour, and re-vegetated. In wetland areas where pipeline installation via trenching is authorized, wetland topsoil will be segregated from the underlying subsoil, and the top 6 to 12 inches of the trench will be backfilled with topsoil from the trench.

19. The permittee shall submit to the U.S. Army Corps of Engineers, Wilmington District as-built surveys of each of the authorized jurisdictional crossings associated with the utility line installation. The permittee must submit the surveys within 30 days of construction completion of the subject utilities.

20. Cleared wetland areas shall be re-vegetated with a wetland seed mix or a mix of native woody species. Fescue grass or any invasive species such as Lespedeza shall not be used within the wetland areas.

SPECIAL CONDITIONS
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21. Prior to construction within any jurisdictional areas, the permittee must correctly install silt fencing (with or without safety fencing) parallel with the utility line corridor, on both sides of the jurisdictional crossing. This barrier is to serve both as an erosion control measure and a visual identifier of the limits of construction within any jurisdictional area. The permittee must maintain the fencing, at minimum, until the wetlands have re-vegetated and stabilized.

22. CULVERTS:

A. Unless otherwise requested in the applicant's application and depicted on the approved work plans, culverts greater than 48 inches in diameter will be buried at least one foot below the bed of the stream. Culverts 48 inches in diameter and less shall be buried or placed on the stream bed as practicable and appropriate to maintain aquatic passage, and every effort shall be made to maintain existing channel slope. The bottom of the culvert must be placed at a depth below the natural stream bottom to provide for passage during drought or low flow conditions. Destabilizing the channel and head cutting upstream should be considered in the placement of the culvert.

B. Measures will be included in the construction/installation that will promote the safe passage of fish and other aquatic organisms. The dimension, pattern, and profile of the stream above and below a pipe or culvert should not be modified by widening the stream channel or by reducing the depth of the stream in connection with the construction activity. The width, height, and gradient of a proposed opening should be such as to pass the average historical low flow and spring flow without adversely altering flow velocity. Spring flow should be determined from gauge data, if available. In the absence of such data, bankfull flow can be used as a comparable level.

23. Sediment Erosion Control:

A. During the clearing phase of the project, heavy equipment must not be operated in surface waters or stream channels. Temporary stream crossings will be used to access the opposite sides of stream channels. All temporary diversion channels and stream crossings will be constructed of non-erodible materials. Grubbing of riparian vegetation will not occur until immediately before construction begins on a given segment of stream channel.

B. No fill or excavation impacts for the purposes of sedimentation and erosion control shall occur within jurisdictional waters, including wetlands, unless the impacts are included on the plan drawings and specifically authorized by this permit.

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C. The permittee shall remove all sediment and erosion control measures placed in wetlands or waters, and shall restore natural grades on those areas, prior to project completion.

D. The permittee shall use appropriate sediment and erosion control practices which equal or exceed those outlined in the most recent version of the "North Carolina Sediment and Erosion Control Planning and Design Manual" to assure compliance with the appropriate turbidity water quality standard. Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to assure compliance with the appropriate turbidity water quality standards. This shall include, but is not limited to, the immediate installation of silt fencing or similar appropriate devices around all areas subject to soil disturbance or the movement of earthen fill, and the immediate stabilization of all disturbed areas. Additionally, the project must remain in full compliance with all aspects of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statutes Chapter 113A Article 4). Adequate sedimentation and erosion control measures must be implemented prior to any ground disturbing activities to minimize impacts to downstream aquatic resources. These measures must be inspected and maintained regularly, especially following rainfall events. All fill material must be adequately stabilized at the earliest practicable date to prevent sediment from entering into adjacent waters or wetlands.

24. Temporary Fills: Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

25. Borrow and Waste:

A. To ensure that all borrow and waste activities occur on high ground and do not result in the degradation of adjacent wetlands and streams, except as authorized by this permit, the permittee shall require its contractors and/or agents to identify all areas to be used to borrow material, or to dispose of dredged, fill, or waste material. The permittee shall provide the USACE with appropriate maps indicating the locations of proposed borrow or waste sites as soon as the permittee has that information. The permittee will coordinate with the USACE before approving any borrow or waste sites that are within 400 feet of any streams or wetlands.

B. All jurisdictional wetland delineations on borrow and waste areas shall be verified by the Corps of Engineers and shown on the approved reclamation plans. The permittee shall ensure that all such areas comply with the Special Condition 4 of this permit and shall require and maintain documentation of the location and characteristics of all borrow and disposal sites associated with this

project. This documentation will include data regarding soils, vegetation and hydrology sufficient to clearly demonstrate compliance with Special Condition 4. All information will be available to the Corps of Engineers upon request. The permittee shall require its contractors to complete and execute reclamation plans for each waste and borrow site and provide written documentation that the reclamation plans have been implemented and all work is completed. This documentation will be provided to the Corps of Engineers within 30 days of the completion of the reclamation work.

26. Mitigation:

A. In Lieu Fee: In order to compensate for impacts associated with this permit, mitigation shall be provided in accordance with the provisions outlined on the most recent version of the attached Compensatory Mitigation Responsibility Transfer Form. The requirements of this form, including any special conditions listed on this form, are hereby incorporated as special conditions of this permit authorization.

B. Permittee Responsible Mitigation:

1. The Permittee shall fully implement the compensatory mitigation plan, entitled, Mitigation Plan Greensboro Eastern Loop, Guilford County North Carolina T.I.P Number U-2525B dated August 12, 2013 and revised March 17, 2014. The mitigation plan includes 14 plan sheets received on August 28, 2013 (OSM-1, OSM-1A, OSM-1B, OSM-2, OSM-2A, OSM-2B, OSM-2C, OSM-2D, OSM-2E, OSM-2F, OSM-3, OSM-4, OSM-5, OSM-6, OSM-7). These mitigation plans are for the unavoidable impacts to 2,055 linear feet of streams. Activities prescribed by this plan shall be initiated prior to, or concurrently with, commencement of any construction activities within jurisdictional areas authorized by this permit. The permittee shall relocate and restore 2,055 linear feet of streams in accordance with the plan with the following conditions:

a) The permittee, NCDOT, is the party responsible for the implementation, performance and long term management of the compensatory mitigation project.

b) Any changes or modifications to your mitigation plan shall be approved by the Corps.

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c) The permittee shall maintain the entire mitigation site in its natural condition, as altered by the work in the mitigation plan, in perpetuity. Prohibited activities within the mitigation site specifically include, but are not limited to: Filling; grading; excavating; earth movement of any kind; construction of roads, walkways, buildings, signs, or any other structure; any activity that may alter the drainage patterns on the property; the destruction, cutting, removal, mowing, or other alteration of vegetation on the property; disposal or storage of any garbage, trash, debris or other waste material; graze or water animals, or use for any agricultural or horticultural purpose; or any other activity which would result in the property being adversely impacted or destroyed, except as specifically authorized by this permit.

d) All mitigation areas shall be monitored for a minimum of 5 years or until deemed successful by the Corps in accordance with the monitoring requirements included in the mitigation plan.

2. Remedial Mitigation Plan: If the compensatory mitigation fails to meet the performance standards 5 years after completion of the compensatory mitigation objectives, the compensatory mitigation will be deemed unsuccessful. Within 60 days of notification by the Corps that the compensatory mitigation is unsuccessful, the Permittee shall submit to the Corps an alternate compensatory mitigation proposal to fully offset the functional loss that occurred as a result of the project. The alternate compensatory mitigation proposal may be required to include additional mitigation to compensate for the temporal loss of wetland function associated with the unsuccessful compensatory mitigation activities. The Corps reserves the right to fully evaluate, amend, and approve or reject the alternate compensatory mitigation proposal. Within 120 days of Corps approval, the Permittee will complete the alternate compensatory mitigation proposal.

3. Mitigation Release: The Permittee's responsibility to complete the required compensatory mitigation, as set forth in the Compensatory Mitigation Special Condition of this permit will not be considered fulfilled until mitigation success has been demonstrated and written verification has been provided by the Corps. A mitigation area which has been released will no longer require monitoring or reporting by the Permittee; however the Permittee, Successors and subsequent Transferees remain perpetually responsible to ensure that the mitigation area(s) remain in a condition appropriate to offset the authorized impacts in accordance with the approved mitigation and monitoring plan and the general and special conditions of this permit.

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION U-2525 B & C

27. The final designs will be coordinated with appropriate state and local officials and the Federal Emergency Management Agency (FEMA) to assure compliance with FEMA, state, and local floodway and floodplain regulations.

28. Geodetic survey control monuments will be located during design, and the U.S. Coast and Geodetic Survey and North Carolina Geodetic Survey will be notified of their location.

29. NCDOT's "Best Management Practices for Protection of Surface Waters" will be implemented, where applicable, including hazardous spill catch basins in water supply watershed critical areas where the roadway crosses a water supply.

30. Any underground storage tanks discovered during construction will be reported to the North Carolina Division of Environmental Management.

31. The Permittee shall fully implement the Memorandum of Agreement between the Permittee, the North Carolina State Historic Preservation Officer and the Wilmington District US Army Corps of Engineers, finalized on October 2, 2008, which is incorporated herein by reference.

32. The Permittee shall fully implement the Archaeological Monitoring Plan, which was one of the environmental commitments agreed to by NCDOT and listed in the Project Environmental Consultation Form dated February 10, 2014 and listed below:

A) The contractor will contact the NCDOT (Archaeology Group) when ground-disturbing activities are anticipated within the property limits of Site 31GF452** (Schoolfield-Hatcher Farm) and Site 31GF466 (i.e., SE quadrant of Elm Street Interchange).

B) The contractor will provide 48-hours notice to the NCDOT (Archaeology Group) prior to ground-disturbing activities within the property limits of Site 31GF452** (Schoolfield Hatcher Farm) and Site 31GF466 (i.e., SE quadrant of Elm Street Interchange). The 48-hour period will begin upon acknowledgment by the NCDOT (Archaeology Group) that the contractor has contacted them.

C) The NCDOT (Archaeology Group) will be on-site during ground-disturbing activities in order to monitor said activities within the property limits of Site 31GF452** (Schoolfield Hatcher Farm) and Site 31GF466 (i.e., SE quadrant of Elm Street Interchange). Monitoring activities may include, but not be limited to: 1) cleaning and photographing areas exposed during construction, 2) mapping both plan and profile views of open trenches, and 3) collecting

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION U-2525 B & C

materials or artifacts exposed during construction. The NCDOT (Archaeology Group) will have the authority to halt all construction work within the property limits of Site 31GF452** (Schoolfield-Hatcher Farm) and Site 31GF466 (i.e., SE quadrant of Elm Street Interchange) in order to assess the need for further archaeological excavations.

D) Should archaeological resource(s) deemed eligible for the National Register of Historic Places (NRHP) be discovered during the monitoring phase as determined by the NCDOT (Archaeology Group), then all work will be halted within the limits of the NRHP resource and the State Historic Preservation Office will be contacted as per the Memorandum of Agreement (MOA), the SHPO will consult with the NCDOT (Archaeology Group), on-site if necessary, in order to develop appropriate protection/mitigation measures for the resource(s). Appropriate measures for the resource(s) may include preservation in place, photographing and mapping, and/or additional archaeological excavations.

E) Both the SHPO and the NCDOT (Archaeology Group) will agree upon and provide to the contractor a written description of the measures required for the resource(s). The description will include a schedule for implementing and completing the measures. Upon receipt of written confirmation from the NCDOT (Archaeology Group) that the resource measures have been completed, construction activities may resume in the location containing the resource.

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: **NCDOT-DEBORAH BARBOUR, P.E.**	File Number: **SAW-2005-21386**	Date: **04/14/2014**

Attached is:		See Section below
X	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at or http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits.aspx or the Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

1. **B: PROFFERED PERMIT: You may accept or appeal the permit**

2.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.

- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the district engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact: **District Engineer, Wilmington Regulatory Division,** **Attn: Andrew Williams** **3331 Heritiage Trade Drive, Suite 105** **Wake Forest, North Carolina 27587**	If you only have questions regarding the appeal process you may also contact: Mr. Jason Steele, Administrative Appeal Review Officer CESAD-PDO U.S. Army Corps of Engineers, South Atlantic Division 60 Forsyth Street, Room 10M15 Atlanta, Georgia 30303-8801 Phone: (404) 562-5137

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

_____ Signature of appellant or agent.	Date:	Telephone number:

For Permit denials, Proffered Permits and approved Jurisdictional Determinations send this form to:

District Engineer, Wilmington Regulatory Division, Attn: Mr. Andrew Williams, Regulatory Project Manager, 3331 Heritage Trade Drive, Suite 105, Wake Forest, North Carolina, 27587
Phone: (919) 5554-4884 ex.26

U.S. ARMY CORPS OF ENGINEERS

Wilmington District

Compensatory Mitigation Responsibility Transfer Form

Permittee: North Carolina Department of Transportation **Action ID:** SAW-2005-21386
Project Name: NCDOT/U-2525 B and C/Division 7 **County:** Guilford

Instructions to Permittee: The Permittee must provide a copy of this form to the Mitigation Sponsor, either an approved Mitigation Bank or the North Carolina Ecosystem Enhancement Program (NCEEP), who will then sign the form to verify the transfer of the mitigation responsibility. Once the Sponsor has signed this form, it is the Permittee's responsibility to ensure that to the U.S. Army Corps of Engineers (USACE) Project Manager identified on page two is in receipt of a signed copy of this form before conducting authorized impacts, unless otherwise specified below. If more than one mitigation Sponsor will be used to provide the mitigation associated with the permit, or if the impacts and/or the mitigation will occur in more than one 8-digit Hydrologic Unit Code (HUC), multiple forms will be attached to the permit, and the separate forms for each Sponsor and/or HUC must be provided to the appropriate mitigation Sponsors.

Instructions to Sponsor: The Sponsor must verify that the mitigation requirements shown below are available at the identified site. By signing below, the Sponsor is accepting full responsibility for the identified mitigation, regardless of whether or not they have received payment from the Permittee. Once the form is signed, the Sponsor must update the appropriate ledger and provide a copy of the signed form to the Permittee and to the USACE Bank/In-Lieu Fee Program Manager. The Sponsor must also comply with all reporting requirements established in their authorizing instrument.

Permitted Impacts and Compensatory Mitigation Requirements:

Permitted Impacts Requiring Mitigation* **8-digit HUC and Basin:** 03030002, Cape Fear River Basin

Stream Impacts (linear feet)			Wetland Impacts (acres)			
Warm	Cool	Cold	Riparian Riverine	Riparian Non-riverine	Non-Riparian	Coastal
20,369	0	0	0	9.94	0	0

*If more than one mitigation sponsor will be used for the permit, only include impacts to be mitigated by this sponsor.

Compensatory Mitigation Requirements: **8-digit HUC and Basin:** 03030002, Cape Fear River Basin

Stream Mitigation (credits)			Wetland Mitigation (credits)			
Warm	Cool	Cold	Riparian Riverine	Riparian Non-riverine	Non-Riparian	Coastal
37,761	0	0	0	19.86	0	0

Mitigation Site Debited: North Carolina Ecosystem Enhancement Program (NCEEP)
(List the name of the bank to be debited. For umbrella banks, also list the specific site. For NCEEP, list NCEEP. If the NCEEP acceptance letter identifies a specific site, also list the specific site to be debited).

Section to be completed by the Mitigation Sponsor

Statement of Mitigation Liability Acceptance: I, the undersigned, verify that I am authorized to approve mitigation transactions for the Mitigation Sponsor shown below, and I certify that the Sponsor agrees to accept full responsibility for providing the mitigation identified in this document (see the table above), associated with the USACE Permittee and Action ID number shown. I also verify that released credits (and/or advance credits for NCEEP), as approved by the USACE, are currently available at the mitigation site identified above. Further, I understand that if the Sponsor fails to provide the required compensatory mitigation, the USACE Wilmington District Engineer may pursue measures against the Sponsor to ensure compliance associated with the mitigation requirements.

Mitigation Sponsor Name:_____

Name of Sponsor's Authorized Representative:_____

_____ _____
Signature of Sponsor's Authorized Representative **Date of Signature**

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USACE Wilmington District
Compensatory Mitigation Responsibility Transfer Form, Page 2

Conditions for Transfer of Compensatory Mitigation Credit:

- Once this document has been signed by the Mitigation Sponsor and the USACE is in receipt of the signed form, the Permittee is no longer responsible for providing the mitigation identified in this form, though the Permittee remains responsible for any other mitigation requirements stated in the permit conditions.
- Construction within jurisdictional areas authorized by the permit identified on page one of this form can begin only after the USACE is in receipt of a copy of this document signed by the Sponsor, confirming that the Sponsor has accepted responsibility for providing the mitigation requirements listed herein. For authorized impacts conducted by the North Carolina Department of Transportation (NCDOT), construction within jurisdictional areas may proceed upon permit issuance; however, a copy of this form signed by the Sponsor must be provided to the USACE within 30 days of permit issuance. NCDOT remains fully responsible for the mitigation until the USACE has received this form, confirming that the Sponsor has accepted responsibility for providing the mitigation requirements listed herein.
- Signed copies of this document must be retained by the Permittee, Mitigation Sponsor, and in the USACE administrative records for both the permit and the Bank/ILF Instrument. It is the Permittee's responsibility to ensure that the USACE Project Manager (address below) is provided with a signed copy of this form.
- If changes are proposed to the type, amount, or location of mitigation after this form has been signed and returned to the USACE, the Sponsor must obtain case-by-case approval from the USACE Project Manager and/or North Carolina Interagency Review Team (NCIRT). If approved, higher mitigation ratios may be applied, as per current District guidance and a new version of this form must be completed and included in the USACE administrative records for both the permit and the Bank/ILF Instrument.

Comments/Additional Conditions: Additional on site mitigation was required by special permit condition.

This form is not valid unless signed by the mitigation Sponsor and USACE Project Manager. For questions regarding this form or any of the conditions of the permit authorization, contact the Project Manager at the address below.

USACE Project Manager: Andy Williams
USACE Field Office: Raleigh Regulatory Field Office
US Army Corps of Engineers
3331 Heritage Trade Drive, Suite 105
Wake Forest, North Carolina 27587

Email: Andrew.e.williams2@usace.army.mil

Andrew E. Williams
USACE Project Manager Signature

April 14, 2014
Date of Signature

Current Wilmington District mitigation guidance, including information on mitigation ratios, functional assessments, and mitigation bank location and availability, and credit classifications (including stream temperature and wetland groupings) is available at http://ribits.usace.army.mil.

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete the Customer Satisfaction Survey located at our website at http://regulatory.usacesurvey.com/ to complete the survey online.

NCDENR
North Carolina Department of Environment and Natural Resources
Division of Water Resources
Water Quality Programs
Thomas A. Reeder
Director

Pat McCrory
Governor

RECEIVED
FEB 1 2014
John E. Skvarla, III
OFFICE OF NATURAL ENVIRONMENT

February 6, 2014

Mr. Richard W. Hancock, P.E., Manager
Project Development and Environmental Analysis
North Carolina Department of Transportation
1598 Mail Service Center
Raleigh, North Carolina, 27699-1598

Subject: 401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS for the proposed Greensboro Eastern Loop (from US 70 relocation to SR 2303) in Guilford County, TIP U-2525B & U-2525C
NCDWR Project No. 20130918v1

Dear Mr. Hancock:

Attached hereto is a copy of Certification No. 003978 issued to The North Carolina Department of Transportation (NCDOT) dated February 6, 2014.

If we can be of further assistance, do not hesitate to contact us.

Sincerely,

Thomas A. Reeder

Attachments

cc: Andy Williams, US Army Corps of Engineers, Raleigh Field Office (electronic copy only)
Mike Mills, PE, Division 7 Engineer
Jerry Parker, Division 7 Environmental Officer
Chris Militscher, Environmental Protection Agency (electronic copy only)
Travis Wilson, NC Wildlife Resources Commission (electronic copy only)
Jason Elliott, NCDOT, Roadside Environmental Unit (electronic copy only)
Beth Harmon, Ecosystem Enhancement Program (electronic copy only)
Dave Wanucha Winston-Salem Regional Office (electronic copy only)
File Copy

Transportation and Permitting Unit
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
Location: 512 N. Salisbury St. Raleigh, North Carolina 27604
Phone: 919-807-6300 \ FAX: 919-733-1290
Internet: www.ncwaterquality.org

An Equal Opportunity \ Affirmative Action Employer

One NorthCarolina Naturally

401 Water Quality Certification Pursuant to Section 401 of the Federal Clean Water Act with ADDITIONAL CONDITIONS

THIS CERTIFICATION is issued in conformity with the requirements of Section 401 Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Division of Water Resources (NCDWR) Regulations in 15 NCAC 2H .0500. This certification authorizes the NCDOT to impact 9.25 acres of jurisdictional wetlands, 23,508 linear feet of stream, and 2.31 acres of open water in Guilford County. The project shall be constructed pursuant to the application dated received August 27, 2013. The authorized impacts are as described below:

Stream Impacts in the Cape Fear River Basin

Site	Permanent Fill in Intermittent Stream (linear ft)	Temporary Fill in Intermittent Stream (linear ft)	Permanent Fill in Perennial Stream (linear ft)	Temporary Fill in Perennial Stream (linear ft)	Total Stream Impact (linear ft)	Stream Impacts Requiring Mitigation (linear ft)
U-2525B						
1	332	--	1,352	--	1,684	1,352
4	--	--	492	153	645	492
5	--	--	1,598	20	1,618	1,598
6	138	10	--	--	148	0
9	--	--	462	10	472	462
9A	84	--	--	--	84	0
10	--	--	309	29	338	309
11	--	--	18	--	18	0
12	--	--	316	22	338	316
13	32	--	147	7	186	0
14	357	35	--	--	392	0
15	--	--	312	26	338	312
16	--	--	394	43	437	394
17	51	20	--	--	71	0
18	--	--	271	20	291	271
20	--	--	815	49	864	815
20A	--	--	236	29	265	236
20B	--	--	29	--	29	0
21	--	--	374	10	384	374
22A	152	10	--	--	162	0
25	24	10	--	--	34	0
26	--	--	331	11	342	331
27	215	10	--	--	225	0
28	461	--	--	--	461	0
29	--	--	300	4	304	300
31	--	--	212	27	239	212
32A	--	--	179	25	204	179
33	132	10	--	--	142	0
35	--	--	130	17	147	130
TOTAL	**1,978**	**105**	**8,277**	**502**	**10,862**	**8,083**
U-2525C (Anticipated Impacts)						
N/A	--	--	12,646	--	12,646	12,646
TOTAL	**0**	**0**	**12,646**	**0**	**12,646**	**12,646**
PROJECT TOTAL						
PROJECT TOTAL	**1,978**	**105**	**20,923**	**502**	**23,508**	**20,729**

Total Stream Impact for Project: 23,508 linear feet

Wetland Impacts in the Cape Fear River Basin

Site	Fill (ac)	Fill (temporary) (ac)	Excavation (ac)	Mechanized Clearing (ac)	Hand Clearing (ac)	Total Wetland Impact (ac)	Impacts Requiring Mitigation (ac)
U-2525B							
1	0.57	--	0.04	--	--	0.61	0.61
1A	0.03	--	--	--	--	0.03	0.03
1B	0.01	--	--	--	--	0.01	0.01
2	0.05	--	--	<0.01	--	0.05	0.05
3	0.12	--	--	--	--	0.12	0.12
3A	0.03	--	--	--	--	0.03	0.03
3B	0.02	--	--	--	--	0.02	0.02
3C	0.25	--	0.02	0.02	--	0.29	0.29
4	0.02	--	--	--	--	0.02	0.02
5A	0.08	--	--	--	--	0.08	0.08
5B	0.02	--	--	--	--	0.02	0.02
6	0.03	--	--	--	--	0.03	0.03
6A	0.05	--	--	<0.01	--	0.05	0.05
7	1.29	--	0.05	0.03	--	1.37	1.37
8	0.83	--	--	0.09	--	0.92	0.92
8A	--	--	<0.01	--	--	0.01	0.01
9	2.01	--	--	0.15	--	2.16	2.16
10	--	--	<0.01	--	--	0.01	0.01
10A	0.02	--	--	0.02	--	0.04	0.04
10B	0.03	--	<0.01	<0.01	--	0.03	0.03
10C	0.25	--	0.04	--	--	0.29	0.29
11	0.33	--	--	--	--	0.33	0.33
13	0.02	--	--	0.01	--	0.03	0.03
16	<0.01	--	--	--	--	0.00	0.00
18	0.03	--	--	0.01	--	0.04	0.04
19	--	--	0.14	--	--	0.14	0.14
20B	0.02	--	--	--	--	0.02	0.02
21	0.34	--	--	0.04	--	0.38	0.38
22	0.03	--	--	--	--	0.03	0.03
22A	0.02	--	--	--	--	0.02	0.02
22B	0.01	--	--	--	--	0.01	0.01
23	0.02	--	--	--	--	0.02	0.02
24	0.19	--	--	--	--	0.19	0.19
27	0.10	--	--	--	--	0.10	0.10
30	0.03	--	<0.01	--	--	0.03	0.03
34	<0.01	--	--	--	--	0.01	0.01
Utilities	--	--	--	--	0.12	0.12	0.00
TOTAL	**6.85**	**0.00**	**0.31**	**0.38**	**0.12**	**7.54**	**7.54**
U-2525C (Anticipated Impacts)							
N/A	2.4	--	--	--	--	2.4	2.4
TOTAL	**2.4**	**0**	**0**	**0**	**0**	**2.4**	**2.4**
PROJECT TOTAL							
PROJECT TOTAL	**9.25**	**0.00**	**0.31**	**0.38**	**0.12**	**9.25**	**9.25**

Total Wetland Impact for Project: 9.25 acres.

Open Water Impacts in the Cape Fear River Basin

Site	Permanent Fill in Open Waters (ac)	Temporary Fill in Open Waters (ac)	Total Fill in Open Waters (ac)
U-2525B			
28	0.58	--	0.58
32	0.03	--	0.03
TOTAL	**0.61**	**0.00**	**0.61**
U-2525C (Anticipated Impacts)			
N/A	1.7	--	1.7
TOTAL	**1.7**	**--**	**1.7**
PROJECT TOTAL			
TOTAL	**2.31**	**0.00**	**2.31**

Total Open Water Impact for Project: 2.31 acres.

The application provides adequate assurance that the discharge of fill material into the waters of the Cape Fear River Basin in conjunction with the proposed development will not result in a violation of applicable Water Quality Standards and discharge guidelines. Therefore, the State of North Carolina certifies that this activity will not violate the applicable portions of Sections 301, 302, 303, 306, 307 of PL 92-500 and PL 95-217 if conducted in accordance with the application and conditions hereinafter set forth.

This approval is only valid for the purpose and design that you submitted in your application dated received August 27, 2013. Should your project change, you are required to notify the NCDWR and submit a new application. If the property is sold, the new owner must be given a copy of this Certification and approval letter, and is thereby responsible for complying with all the conditions. If any additional wetland impacts, or stream impacts, for this project (now or in the future) exceed one acre or 150 linear feet, respectively, additional compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h) (6) and (7). For this approval to remain valid, you are required to comply with all the conditions listed below. In addition, you should obtain all other federal, state or local permits before proceeding with your project including (but not limited to) Sediment and Erosion control, Coastal Stormwater, Non-discharge and Water Supply watershed regulations. This Certification shall expire on the same day as the expiration date of the corresponding Corps of Engineers Permit.

Conditions of Certification:

Project Specific Conditions:

1. The NCDOT Division Environmental Officer or Environmental Assistant will conduct a pre-construction meeting with all appropriate staff to ensure that the project supervisor and essential staff understand the potential issues with stream and pipe alignment at permitted sites. NCDWR staff shall be invited to the pre-construction meeting.

2. Mitigation For U-2525B:
   a. Compensatory mitigation for impacts to 8,083 linear feet of streams at a replacement ratio of 1:1 is required. Partial compensatory mitigation for impacts to jurisdictional streams shall be provided by onsite stream relocations of 2,055 linear feet of stream. The onsite stream relocation shall be constructed in accordance with the design submitted in your August 27, 2013 application. All on-site mitigation sites shall be protected in perpetuity by a conservation easement or through NCDOT fee simple acquisition and recorded in the NCDOT Natural Environment Unit mitigation geodatabase. Please be reminded that as-builts for the completed streams shall be submitted to the North Carolina Division of Water Resources 401 Wetlands Unit with the as-builts for the rest of the project. If the parameters of this condition are not met, then the permittee shall supply additional stream mitigation for the 2,055 linear feet of impacts. All channel relocations will be constructed in a dry work area, will be completed and stabilized, and must be approved on site by NCDWR staff prior to diverting water into the new channel. Whenever possible, channel relocations shall be allowed to stabilize for an entire growing season. All stream relocations shall have a 50-foot wide native wooded buffer planted on both sides of the stream unless otherwise authorized by this Certification. A transitional phase incorporating rolled erosion control product (RECP) and appropriate temporary ground cover is allowable.
   The stream mitigation site shall be monitored annually for five years or until success criteria are satisfied. Monitoring protocols shall follow the Monitoring Level I outlined in the Stream Mitigation Guidelines, April 2003.

Success of the mitigation site shall be determined by the NCDWR during an on-site visit at or near the end of the monitoring period.

b. For the remaining required compensatory mitigation of 6,028 linear feet, we understand that you have chosen to perform compensatory mitigation for impacts to streams through the North Carolina Ecosystem Enhancement Program (EEP), and that the EEP has agreed to implement the mitigation for the project. EEP has indicated in a letter dated October 22, 2013 that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above-referenced project, in accordance with the EEP Mitigation Banking Instrument signed July 28, 2010.

c. Compensatory mitigation for impacts to 7.54 acres of wetlands is required. We understand that you have chosen to perform compensatory mitigation for impacts to wetlands through the North Carolina Ecosystem Enhancement Program (EEP), and that the EEP has agreed to implement the mitigation for the project. EEP has indicated in a letter dated October 22, 2013 that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above-referenced project, in accordance with EEP's Mitigation Banking Instrument signed July 28, 2010.

d. This project is located within the Jordan Lake watershed and therefore requires mitigation for impacts to riparian buffers per 15A NCAC 02b .0262. However, Merger 01 Concurrence Point 4A (avoidance and minimization) occurred in April 2006, prior to the implementation of this rule, thereby exempting this project from required riparian buffer mitigation. Appropriate avoidance, minimization, and BMPs shall still be implemented.

3. Mitigation for U-2525C:
   a. Compensatory mitigation for 12,646 linear feet of impact to streams is required. We understand that you have chosen to perform compensatory mitigation for impacts to streams through the North Carolina Ecosystem Enhancement Program (EEP), and that the EEP has agreed to implement the mitigation for the project. EEP has indicated in a letter dated October 22, 2013 that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above-referenced project, in accordance with the EEP Mitigation Banking Instrument signed July 28, 2010.

   b. Compensatory mitigation for impacts to 2.4 acres of wetlands is required. We understand that you have chosen to perform compensatory mitigation for impacts to wetlands through the North Carolina Ecosystem Enhancement Program (EEP), and that the EEP has agreed to implement the mitigation for the project. EEP has indicated in a letter dated October 22, 2013 that they will assume responsibility for satisfying the federal Clean Water Act compensatory mitigation requirements for the above-referenced project, in accordance with EEP's Mitigation Banking Instrument signed July 28, 2010.

   c. This project is located within the Jordan Lake watershed and therefore requires mitigation for impacts to riparian buffers per 15A NCAC 02b .0262. However, Merger 01 Concurrence Point 4A (avoidance and minimization) occurred in April 2006, prior to the implementation of this rule, thereby exempting this project from required riparian buffer mitigation. Appropriate avoidance, minimization, and BMPs shall still be implemented.

4. When final design plans are completed for U-2525C, a modification to the 401 Water Quality Certification shall be submitted with five copies and fees to the NC Division of Water Resources. Final designs shall reflect all appropriate avoidance, minimization, and mitigation for impacts to wetlands, streams, and other surface waters, and buffers. No construction activities that impact any wetlands, streams, surface waters, or buffers located in U-2525C shall begin until after the permittee applies for, and receives a written modification of the 401 Water Quality Certification from the NC Division of Water Resources.

General Conditions:

5. If multiple pipes or barrels are required, they shall be designed to mimic natural stream cross section as closely as possible including pipes or barrels at flood plain elevation and/or sills where appropriate. Widening the stream channel should be avoided. Stream channel widening at the inlet or outlet end of structures typically decreases water velocity causing sediment deposition that requires increased maintenance and disrupts aquatic life passage.

6. Riprap shall not be placed in the active thalweg channel or placed in the streambed in a manner that precludes aquatic life passage. Bioengineering boulders or structures should be properly designed, sized and installed.

7. The stream channel shall be excavated no deeper than the natural bed material of the stream, to the maximum extent practicable. Efforts must be made to minimize impacts to the stream banks, as well as to vegetation responsible for maintaining the stream bank stability. Any applicable riparian buffer impact for access to stream channel shall be temporary and be revegetated with native riparian species.

8. Pipes and culverts used exclusively to maintain equilibrium in wetlands, where aquatic life passage is not a concern, shall not be buried. These pipes shall be installed at natural ground elevation.

9. NCDOT shall be in compliance with the NCS00250 issued to the NCDOT, including the applicable requirements of the NCG01000. Please note the extra protections for the sensitive watersheds.

10. Tall fescue shall not be used in the establishment of temporary or permanent groundcover within riparian areas. For the establishment of permanent herbaceous cover, erosion control matting shall be used in conjunction with an appropriate native seed mix on disturbed soils within the riparian area and on disturbed steep slopes with the following exception. Erosion control matting is not necessary if the area is contained by perimeter erosion control devices such as silt fence, temporary sediment ditches, basins, etc. Matting should be secured in place with staples, stakes, or wherever possible, live stakes of native trees. Erosion control matting placed in riparian areas shall not contain a nylon mesh grid, which can impinge and entrap small animals. For the establishment of temporary groundcover within riparian areas, hydroseeding along with wood or cellulose based hydro mulch applied from a fertilizer- and limestone-free tank is allowable at the appropriate rate in conjunction with the erosion control measures. Discharging hydroseed mixtures and wood or cellulose mulch into surface waters in prohibited. Riparian areas are defined as a distance 25 feet landward from top of stream bank.

11. Unless otherwise approved in this certification, placement of culverts and other structures in open waters and streams shall be placed below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20 percent of the culvert diameter for culverts having a diameter less than 48 inches, to allow low flow passage of water and aquatic life. Design and placement of culverts and other structures including temporary erosion control measures shall not be conducted in a manner that may result in dis-equilibrium of wetlands or streambeds or banks, adjacent to or upstream and down stream of the above structures. The applicant is required to provide evidence that the equilibrium is being maintained if requested in writing by NCDWR. If this condition is unable to be met due to bedrock or other limiting features encountered during construction, please contact NCDWR for guidance on how to proceed and to determine whether or not a permit modification will be required.

12. If concrete is used during construction, a dry work area shall be maintained to prevent direct contact between curing concrete and stream water. Water that inadvertently contacts uncured concrete shall not be discharged to surface waters due to the potential for elevated pH and possible aquatic life and fish kills.

13. During the construction of the project, no staging of equipment of any kind is permitted in waters of the U.S., or protected riparian buffers.

14. The dimension, pattern and profile of the stream above and below the crossing shall not be modified. Disturbed floodplains and streams shall be restored to natural geomorphic conditions.

15. The use of rip-rap above the Normal High Water Mark shall be minimized. Any rip-rap placed for stream stabilization shall be placed in stream channels in such a manner that it does not impede aquatic life passage.

16. All work in or adjacent to stream waters shall be conducted in a dry work area. Approved BMP measures from the most current version of NCDOT Construction and Maintenance Activities manual such as sandbags, rock berms, cofferdams and other diversion structures shall be used to prevent excavation in flowing water.

17. Heavy equipment shall be operated from the banks rather than in the stream channel in order to minimize sedimentation and reduce the introduction of other pollutants into the stream.

18. All mechanized equipment operated near surface waters must be regularly inspected and maintained to prevent contamination of stream waters from fuels, lubricants, hydraulic fluids, or other toxic materials.

19. No rock, sand or other materials shall be dredged from the stream channel except where authorized by this certification.

20. Sediment and erosion control measures shall not be placed in wetlands or waters unless otherwise approved by this Certification.

21. Discharging hydroseed mixtures and washing out hydroseeders and other equipment in or adjacent to surface waters is prohibited.

22. The permittee and its authorized agents shall conduct its activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with §303(d) of the Clean Water Act) and any other appropriate requirements of State and Federal law. If the NCDWR determines that such standards or laws are not being met (including the failure to sustain a designated or achieved use) or that State or federal law is being violated, or that further conditions are necessary to assure compliance, the NCDWR may reevaluate and modify this certification.

23. All fill slopes located in jurisdictional wetlands shall be placed at slopes no flatter than 3:1, unless otherwise authorized by this certification.

24. The outside buffer, wetland or water boundary located within the construction corridor approved by this authorization shall be clearly marked by highly visible fencing prior to any land disturbing activities. Impacts to areas within the fencing are prohibited unless otherwise authorized by this certification.

25. The issuance of this certification does not exempt the Permittee from complying with any and all statutes, rules, regulations, or ordinances that may be imposed by other government agencies (i.e. local, state, and federal) having jurisdiction, including but not limited to applicable buffer rules, stormwater management rules, soil erosion and sedimentation control requirements, etc.

26. Native riparian vegetation must be reestablished in the riparian areas within the construction limits of the project by the end of the growing season following completion of construction.

27. There shall be no excavation from, or waste disposal into, jurisdictional wetlands or waters associated with this permit without appropriate modification. Should waste or borrow sites, or access roads to waste or borrow sites, be located in wetlands or streams, compensatory mitigation will be required since that is a direct impact from road construction activities.

28. Erosion and sediment control practices must be in full compliance with all specifications governing the proper design, installation and operation and maintenance of such Best Management Practices in order to protect surface waters standards:

    a. The erosion and sediment control measures for the project must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Sediment and Erosion Control Planning and Design Manual*.
    b. The design, installation, operation, and maintenance of the sediment and erosion control measures must be such that they equal, or exceed, the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual*. The devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) projects, including contractor-owned or leased borrow pits associated with the project.
    c. For borrow pit sites, the erosion and sediment control measures must be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual*.
    d. The reclamation measures and implementation must comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act.

* 29. The Permittee shall ensure that the final design drawings adhere to the permit and to the permit drawings submitted for approval.

30. The Permittee shall report any violations of this certification to the Division of Water Resources within 24 hours of discovery.

31. A copy of this Water Quality Certification shall be maintained on the construction site at all times. In addition, the Water Quality Certification and all subsequent modifications, if any, shall be maintained with the Division Engineer and the on-site project manager.

* 32. Upon completion of the project (including any impacts at associated borrow or waste sites), the NCDOT Division Engineer shall complete and return the enclosed "Certification of Completion Form" to notify NCDWR when all work included in the 401 Certification has been completed.

Any modifications to this 401 Water Quality Certification that propose additional stream impacts or increased impervious surface requiring additional stormwater management may be subject the Jordan Water Supply Nutrient Strategy (15A NCAC02B .0267). The NCDOT shall coordinate with the NCDWR prior to submitting a modification request to determine the applicability of the Jordan Water Supply Nutrient Strategy. This condition does not apply to major modifications for additional sections of the project that were covered under the Finding of No Significant Impact or approved in the Avoidance and Minimization stage of the project.

Violations of any condition herein set forth may result in revocation of this Certification and may result in criminal and/or civil penalties. This Certification shall become null and void unless the above conditions are made conditions of the Federal 404 and/or Coastal Area Management Act Permit. This Certification shall expire upon the expiration of the 404 or CAMA permit.

If you wish to contest any statement in the attached Certification you must file a petition for an administrative hearing. You may obtain the petition form from the office of Administrative hearings. You must file the petition with the office of Administrative Hearings within sixty (60) days of receipt of this notice. A petition is considered filed when it is received in the office of Administrative Hearings during normal office hours. The Office of Administrative Hearings accepts filings Monday through Friday between the hours of 8:00am and 5:00pm, except for official state holidays. The original and one (1) copy of the petition must be filed with the Office of Administrative Hearings.

The petition may be faxed-provided the original and one copy of the document is received by the Office of Administrative Hearings within five (5) business days following the faxed transmission.
The mailing address for the Office of Administrative Hearings is:

Office of Administrative Hearings
6714 Mail Service Center
Raleigh, NC 27699-6714
Telephone: (919)-431-3000, Facsimile: (919)-431-3100

A copy of the petition must also be served on DENR as follows:

Mr. Lacy Presnell, General Counsel
Department of Environment and Natural Resources
1601 Mail Service Center

This the 6th day of February 2014

DIVISION OF WATER RESOURCES

Thomas A. Reeder

WQC No. 003978

Mitigation Plan
Greensboro Eastern Loop
Guilford County, North Carolina
T.I.P. Number U-2525B
WBS No. 34821.1.1
August 12, 2013- (Revised March 17, 2014)

1.0 BASELINE INFORMATION

Transportation Improvement Project (TIP) U-2525B involves the construction of a new section of highway known as the Greensboro Eastern Loop in Guilford County (Appendix A-Figure 1). The proposed construction of U-2525B involves unavoidable impacts to jurisdictional resources within USGS Hydrologic Unit 03030002 of the Cape Fear River Basin. NCDOT proposes to offset a portion of these impacts with on-site mitigation.

TIP U-2525B is located in the Central Piedmont Ecoregion. The topography in the project study area is generally characterized as rolling hills with moderately steep slopes along the drainage ways. Elevations in the study area range from 700 to 750 feet above mean sea level (USGS 1968). The project study area and surrounding area consists of low density rural, residential, commercial, agricultural, and forested areas.

The mitigation site selection and mitigation work plan sections of this plan will refer to the identification labels given the affected jurisdictional resources in the onsite mitigation review.

2.0 OBJECTIVES

NCDOT proposes to fulfill a portion of its mitigation requirements associated with the unavoidable impacts of this project with on-site and in-kind mitigation, as allowable per the Federal Mitigation Rule, 33 CFR 332.3. The remainder of the mitigation required for this project will be acquired through the North Carolina Ecosystem Enhancement Program.

The goal of the proposed onsite mitigation is to offset and mitigate for a portion of the impacts due to U-2525B by relocating and/or restoring adjacent stream systems to their natural conditions through the removal of in-stream structures, restoration of channel dimensions and profiles through natural channel design, and establishment of riparian buffer areas. This will be achieved on three individual sites described below on a total of 2,055 linear feet of stream. These mitigation sites are located within the same USGS hydrologic unit, as well as within the same watershed as the associated permitted impacts, where it is the most likely that the mitigation will replace the loss of aquatic functions and services incurred by both the associated impact and the project as a whole. This will be achieved by: improving the floodplain functions; establishing protected riparian buffers; improving water quality within the watershed by reducing sediment, nutrient, and pollution inputs; and increasing channel stability while reducing bank erosion.

NCDOT has been providing mitigation for road projects for more than 20 years and has an established record of acquiring, designing, and constructing successful mitigation sites with over 225 closed out sites protected in perpetuity through fee simple ownership or conservation

easements throughout the state. NCDOT has invested a significant amount of research and analysis on the proposed stream mitigation sites including measuring and classifying the existing streams, identifying and measuring reference reaches, and evaluating the watershed based on the current land use and the projected future land use. A rigorous analysis of the proposed mitigation streams and local watershed has been performed and has been used in the design of the proposed mitigation and will result in a high probability of success. Currently, EEP has a deficient of approximately 37,000 feet of stream mitigation credits within HUC 03030002 for projects scheduled to let through June 2015. Onsite stream relocation and restoration will result in reduced temporal lag in the replacement for lost aquatic resources. North Buffalo Creek and South Buffalo Creek are currently on the Final 2012 North Carolina 303(d) lists of impaired waterways. Reducing impacts to tributaries of these impaired waterways will prevent further degradation to the local watershed.

3.0 SITE SELECTION

All sites are located within the proposed, new right-of-way for U-2525B. Each site was evaluated both internally as well as discussed and reviewed with regulatory personnel during concurrence meetings and field visits. Existing conditions for each site is provided in this section. Additional information on existing conditions, geomorphology parameters, and proposed stream measurements are provided in Appendix D.

SITE 2-UT to South Buffalo Creek-ONEID 041-029

Site 2 (Site 5 in the Permit Drawings) is located approximately from Station 61+50 to 73+70 and scored 59 on the USACE Stream Quality Assessment Worksheet (Appendix G). Site 2 includes the relocation and restoration of 1307 linear feet of UT to South Buffalo Creek. UT to South Buffalo Creek has a NCDWQ Best Usage Classification of WS-V; NSW. Within Site 2, UT to South Buffalo Creek flows from its headwaters toward a confluence with a larger reach through two distinct valley sections (Appendix A-Figure 2A). Within the upper section, the west side (river right) valley wall is relatively steep. The east side valley wall and surrounding valley of the lower section are relatively flat. The riparian buffer of the upper section has been cleared within the last 5-10 years. The subsequent revegetation has led to a landscape with a high density of scrub-shrub successional species. Within the lower section, the riparian buffer consists of more widely spaced, larger mature woody vegetation. Throughout both valley sections, the channel is incised and entrenched and exhibits signs of instability. These moderately sinuous channels classify as Rosgen B5 streams. Sand materials dominate the channel, but there are also inclusions of gravel and bed rock. The watershed for this UT to South Buffalo Creek is 0.10 square miles at the downstream end of the site. The watershed is approximately 55% forested, 40% agricultural fields, and 5% impervious. Future zoning of the watershed is split between low (3 to 5 dwelling units/acre), interim, and moderate (5 to 12 dwelling units/acre) residential.

SITE 4-UT to North Buffalo Creek- ONEID 041-031

Site 4 (Site 18 in the Permit Drawings) is located approximately from Station 217+00 to 220+10 and scored 52 on the USACE Stream Quality Assessment Worksheet (Appendix G). Site 4 includes restoration of approximately 386 linear feet of UT to North Buffalo Creek. UT to North Buffalo Creek has a best usage classification WS-V; NSW. UT to North Buffalo Creek flows through Site 4 within a broad and gently sloping valley (Appendix A-Figure 2B). The riparian

area has been greatly disturbed with some portions remaining cleared of woody vegetation and other areas consisting of scattered large woody vegetation. For most of the stream length, the riparian buffer is densely vegetated with a mix of shrubs and trees. The channel is incised and the upper section is moderately entrenched. The channel appears to have been modified. An earthen dam is located within the bottom third of the reach. This moderately sinuous reach classifies as a Rosgen B5 stream type. An existing 15 foot wide sanitary sewer line is located along the left bank (east side) of the existing channel approximately 25 to 30 feet from the left bank. The watershed is 0.57 square miles at the downstream end of the site. The watershed is 50% forested, 40% agricultural fields, 5% light residential, and 5% impervious. Future zoning of the watershed is primarily low residential (3 to 5 dwelling units/acre) with some moderate residential (5 to 12 dwelling units/acre).

SITE 5-UT to North Buffalo Creek- ONEID 041-032

Site 5 (Site 20 in the Permit Drawings) is located approximately from Station 242+08 to 245+03 and scored 57 on the USACE Stream Quality Assessment Worksheet (Appendix G). Site 5 includes relocation and restoration of approximately 362 linear feet of North Buffalo Creek. UT to North Buffalo Creek has a best usage classification WS-V; NSW. UT to North Buffalo Creek flows within Site 5 from its headwaters to confluence with a larger reach (Appendix A-Figure 2C). The stream valley is relatively broad with a flat down valley slope. The immediate riparian buffer consists of mature woody vegetation and kudzu on portions of the hillside that are located outside of the proposed right of way. The channel is slightly to moderately incised and appears relatively stable with the exception of about 100 feet of channel that is cutting through a meander bend. This moderately sinuous reach classifies as a Rosgen E5 stream type. The channel bed includes a significant amount of artificially introduced large stone. The watershed is 0.51 square miles at the downstream end of the site. The watershed is 50% forested, 5% agricultural fields, 30% light residential, and 15% impervious.

4.0 MITIGATION WORK PLAN

Each mitigation site will be constructed in conjunction with the construction of the roadway project. Following the successful completion of site grading and stabilization, each site will be reforested with a mix of bare-root tree species and live stakes as described in the Streambank Reforestation Specifications in Appendix F. The stream channels will be stabilized by planting live stakes on three foot centers and matting with coir fiber on the banks as necessary. Morphological characteristics of the proposed streams are provided in Appendix D.

In accordance with the guidance and standard procedures of NCDOT's Roadside Environmental Unit (REU), seeding and mulching will be performed on all disturbed areas within the mitigation sites for stabilization purposes. All floodplains and floodplain slopes will be over-excavated 6 inches starting 3 feet from top of stream bank and backfilled with topsoil to final grade (see detail on OSM-2 in design plan sheets). Additionally, per NCDOT's Native Seeding and Mulching Provision, 4000 lbs/acre of lime will be applied and 500 lbs/acre of 10-20-20 fertilizer will be applied. An as-built report will be submitted within 60 days of completion of the project. On sites that have kudzu present within the ROW limits, NCDOT proposes to minimize the potential spread of this species from construction-related activities. NCDOT will attempt to suppress the Kudzu within the ROW of the mitigation sites by herbicide applications prior to reforestation and

during the required post construction monitoring period.

The Natural Environment Section shall be contacted to provide construction assistance to ensure that each mitigation area is constructed appropriately.

SITE 2-UT to South Buffalo
This site includes the relocation and restoration of 1307 feet of UT to South Buffalo Creek that is currently located within the footprint of the proposed roadway through a priority II restoration approach. The channel is currently an incised B5 Rosgen stream type channel that will be restored to a stable B5 channel by establishing a lower valley at the bankfull elevation. Proper sinuosity and radius of curvature will be restored to the channel to provide stability. The channel will be elevated to its historic floodplain in some locations where possible, improving its dimension and allowing bankfull and higher flows to access the floodplain. Proper riffle-pool sequencing will also be restored to the channel with corrected pattern and the installation of rock and log structures. The installation of these structures will increase stability of the profile and banks while allowing time for vegetation to establish and natural bed materials to be transported throughout the system.

Special attention was given to the possible change in flow regime in this system as it may be influenced by storm water runoff from the proposed roadway. To account for this change the stream design uses dimensionless ratios that lean toward natural channel systems with a more urban watershed than a rural watershed. For instance, the radius of curvature tends to be on the larger side to ensure that the bends in the stream channel will be gradual enough to accommodate the flashy flows that come with increased impervious area. Additionally, the belt width of the proposed channels were designed slightly more narrow than a system with no development in its watershed and the curvature of floodplains were reduced to account for increased flood flows over time as the watersheds develop. Designing the floodplain to be less sinuous allows for the new system to convey flood flows without excessively increasing shear stress along the edges of the newly constructed floodplain. The buffer for this channel will extend 50 feet from the top of bank on both sides and totals approximately 3.14 acres, all of which lies within the proposed U-2525B right-of-way.

SITE 4-UT to North Buffalo Creek
This site includes the restoration of 386 linear feet of UT to North Buffalo Creek through a Priority II restoration approach. The appropriate dimension, pattern, and profile will be restored to the channel. The dimension will be corrected by connecting the bankfull stream channel to a floodplain bench. A C5 Rosgen stream type channel is proposed. The pattern will be re-adjusted to return the proper pool to pool spacing and radius of curvature to the channel. This channel is confined along the left bank by the adjacent sanitary sewer line. The right bank is densely wooded. Therefore, it is necessary for the proposed stream channel to cross over the existing channel location several times to create the desired pattern. The profile will be corrected and stabilized by using rock structures. These structures will hold the profile in place and prevent head cuts until the proper bed material has had a chance to be distributed through the stream channel and vegetation has had a chance to stabilize the banks. Proposed design parameters for the proposed stream can be found in the morphological table in Appendix C. The buffer for this channel will extend 50 feet from the top of bank on both sides and totals approximately 1.01 acres, all of which lies within the proposed U-2525B right-of-way. Currently, an existing 15 foot wide sewer easement encroaches

on the left side of the 50 foot wide buffer.

SITE 5-UT to North Buffalo Creek
This site includes the relocation and restoration of 362 linear feet of UT to North Buffalo Creek with a Priority II restoration approach. The stream will be relocated outside of the fill slope of the proposed roadway. The appropriate dimension, pattern, and profile will be constructed on the relocated channel. A Rosgen type C5 channel is proposed for this stream. A lower belt width ratio is proposed due to the urbanized watershed with potential for flashy flows. The proposed channel profile will be stabilized by rock structures. The structures will provide stability and allow time for native bed materials to be transported through the newly constructed stream and for vegetation to stabilize the banks. Proposed design parameters for the proposed stream can be found in the morphological table in Appendix D. The buffer for this channel will extend 50 feet from the top of bank on both sides and totals approximately 0.91 acres, all of which lies within the proposed U-2525B right-of-way. An existing 15 foot wide sewer easement will make a perpendicular crossing of the stream near the culvert inlet.

During the "4C" Meeting held on March 21, 2013 there was a discussion about the "potential road" shown on the plans at Site 5 and if NCDOT could acquire right of way between the road and mitigation site. There is a no future road planned at this location. That information was from old plans and has been removed from the plans.

5.0 PERFORMANCE STANDARDS

An As-built will be submitted within 60 days of completion of the project. The As-built will document changes in the dimension, pattern, profile, vegetation plantings, and structures of the constructed channels.

Success for vegetation monitoring within the riparian buffer areas are based on the survival of at least 260 stems of five year old trees at year five. Assessment of channel stability will be based on the survival of riparian vegetation and visual observation of channel dimensions, pattern or profile as well as inspection of in stream structure.

6.0 MONITORING REQUIREMENTS

All of the mitigation sites will be monitored according to the April 2003 Stream Mitigation Guidelines. The following components of Level 1 monitoring will be performed each year of the 5-year monitoring period: reference photos, plant survival (identification of specific problem areas, estimated causes and proposed/required remedial action); visual inspection of channel stability. Physical measurements of channel stability/morphology will not be performed. A monitoring report will be submitted within 60 days after completing the monitoring.

7.0 OTHER INFORMATION: STREAM REFERENCE RESTORATION STUDIES

A reference reach is a stream segment that represents a stable channel within a particular valley morphology. A stable stream is defined as a stream, which over time and in the present climate transports the flows and sediment produced by its watershed in such a manner that the dimension, pattern, and profile are maintained without either aggrading or degrading (Rosgen, 1996, 1998).

The methodology used for the reference reach analysis consisted of the following tasks: (1)

identify reference quality sections of the project reaches that could be used for dimension and/or pattern analysis, (2) identify nearby reference reaches that have been previously located and surveyed and can be used to provide pattern data, (3) survey and classify the stream morphology for the on-site reference reaches, and (4) develop dimensionless ratios based on reference reach data and past project data under similar morphological conditions.

Several locations were identified and surveyed (Appendix C) within the project reaches where stable bankfull features had developed and provided information regarding bankfull dimension. These locations were identified by the presence of a consistent bankfull indicator, typically a well formed bankfull bench, and stable, vegetated stream banks. Cross-section surveys were conducted in these locations to evaluate stream dimension. The bankfull cross-section areas were then plotted versus drainage area and compared to published Rural Piedmont regional curve data, provided by the North Carolina Stream Restoration Institute (SRI) (See Appendix C-Figure 3).

As illustrated in Figure 3, the cross sectional areas surveyed at stable on-site reference reach locations correlates with the Rural Piedmont Regional Curve Data. Also, three of the four off-site reference reach locations correspond with the Rural Piedmont Regional Curve Data. More consideration is given to the cross sectional data gathered at stable reaches on-site because they more accurately reflect the conditions that will provide stability for that particular stream's flow regime. The three off-site reference reaches that correlate with the Rural Piedmont Regional Curve Data have been used previously in other natural channel designs. The stream designs were based on the collected data since this data was verified by the Rural Piedmont Regional Curve Data.

Shear stress calculations were completed for all reaches and are included in Appendix D. The data shows that the shear stresses for the proposed designs will be able to move the bed material of the streams. Shear stress is reduced on Sites 2 and 5, and slightly increased on site 4. Although most reaches have decreases in shear stress, incorporation of in-stream structures for grade control is implemented on all reaches. This is especially important since all restoration/relocation sites will be excavated on new location and will not immediately have the properly sorted materials transported in from upstream immediately after construction. Constructed riffles and harvesting of existing bed material will be used to the extent feasible to provide this immediate supply of properly sorted bed material.

8.0 DETERMINATION OF CREDITS

NCDOT proposes to supplement mitigation provided by EEP with 2055 feet of onsite stream mitigation. All of the proposed mitigation sites exhibit some form of degradation. Site 2 and Site 5 include relocation of the channels that would be under fill slopes of the original roadway design.

Based on field and meeting discussions with agency representatives and per the NCDOT plans and 401/404 permit application for U-2525B; NCDOT proposes a 1:1 mitigation ratio for a total of 2055 feet of stream credits.

An as-built report will be submitted within 60 days of completion of the each mitigation site to verify actual mitigation areas constructed and planted. The success of the mitigation areas and determination of final credits will be based upon successful completion and closeout of the monitoring period.

8.1 CREDIT RELEASE SCHEDULE

NCDOT proposes immediate, full release of the proposed mitigation to offset the unavoidable impacts associated with U-2525B.

9.0 GEOGRAPHIC SERVICE AREA

The proposed Geographic Service Area (GSA) for the mitigation sites is composed of the 8-digit Hydrologic Cataloging Unit (HUC) 03030002.

10.0 SITE PROTECTION INSTRUMENT

The mitigation areas are within the NCDOT Right-of-Way for the project. They will be managed to prohibit all use inconsistent with their use as mitigation properties, including any activity that would materially alter the biological integrity or functional and educational value of the sites, consistent with the mitigation plan.

The sites will be placed on the Natural Environment Section's (NES) Mitigation GeoDatabase. This database is provided to all NCDOT personnel as a record of mitigation sites and their attributes, including prohibited activities. NCDOT is held by virtue of the permit associated with these mitigation sites and the associated roadway impacts to protect the sites in perpetuity.

11.0 MAINTENANCE PLAN

The mitigation sites will be held by NCDOT and placed on the NES Mitigation GeoDatabase. Once monitoring is completed and the sites are closed out, they will be placed in the NCDOT Stewardship Program for long term maintenance and protection.

If an appropriate third party recipient is identified in the future, then the transfer of the property will include a conservation easement or other measure to protect the natural features and mitigation value of the site in perpetuity.

12.0 LONG TERM ADAPTIVE MANAGEMENT PLAN

The sites will be managed by NCDOT according to the mitigation plan. Encroachments into the areas will be investigated and appropriate measures taken to minimize any negative effects. In the event that unforeseen issues arise that affect the management of the site, any remediation will be addressed by NCDOT in coordination with the Interagency Review Team.

13.0 FINANCIAL ASSURANCES

NCDOT is held by permit conditions associated with U-2525B to construct, monitor, and steward the mitigation sites. NCDOT has established funds for each project and within each Division to monitor mitigation sites and protect them in perpetuity.

TIP PROJECT: U-2525B

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

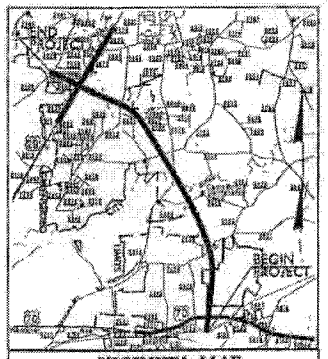
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-2525B	OSM-1	30

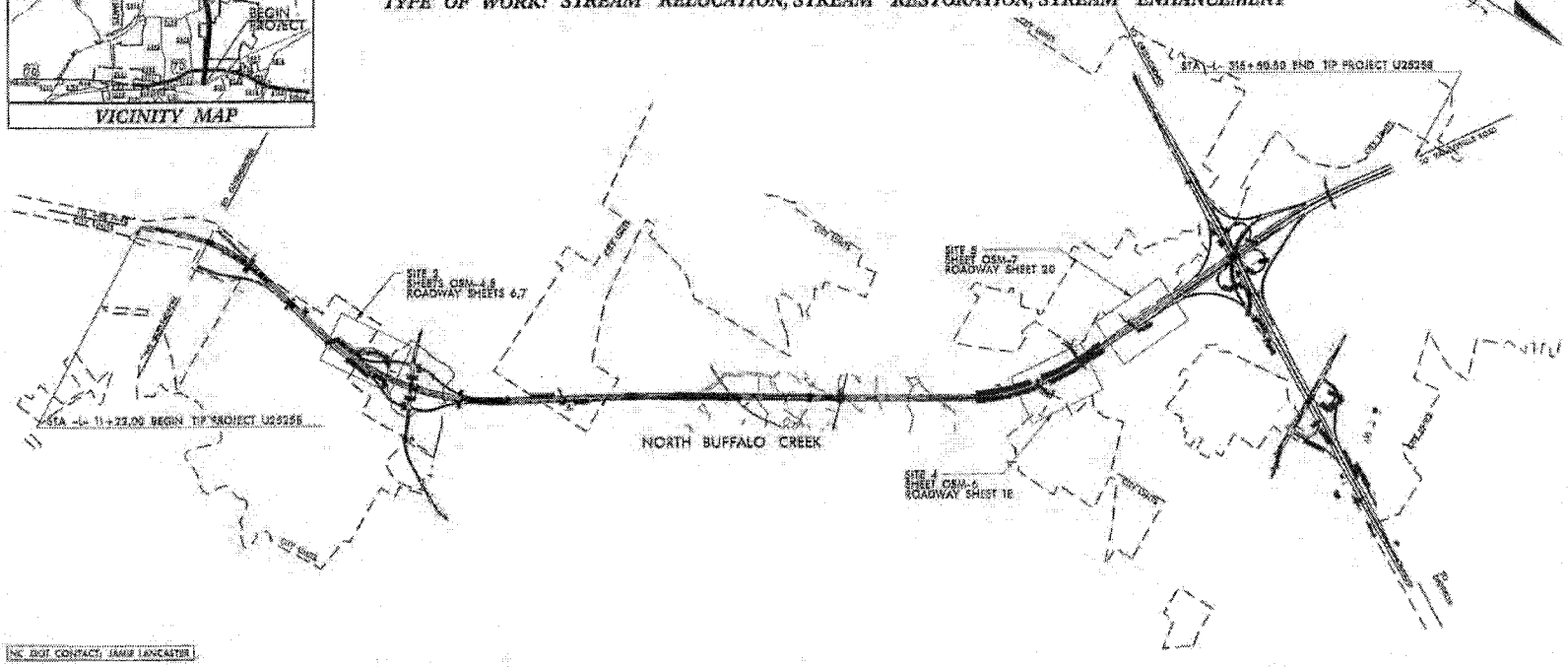
STATE APPROVAL	FHWA APPROVAL	DESCRIPTION
34821.1.3		PE
34821.2.3		ROW
34821.3.4		CONST.

PLAN FOR ON-SITE MITIGATION GUILFORD COUNTY

LOCATION: GREENSBORO EASTERN LOOP FROM NORTH OF US 70 TO US 29 NORTH OF GREENSBORO

TYPE OF WORK: STREAM RELOCATION, STREAM RESTORATION, STREAM ENHANCEMENT





NC DOT CONTACT: (MAR LANCASTER)

GRAPHIC SCALES

30 15 0 30 60
PLANS

30 15 0 30 60
PROFILE (HORIZONTAL)

6 3 0 6 12
PROFILE (VERTICAL)

DESIGN DATA

PROJECT LENGTH

MITIGATION SITE	MITIGATION TYPE	LENGTH
SITE 2	RESTORATION/RELOCATION	1,307LF
SITE 4	RESTORATION	386LF
SITE 5	RELOCATION	362LF

Kimley-Horn and Associates, Inc.

DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 13002 ENGINEER JAMES H. FITT

P.E.

P-34

GENERAL NOTES

ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING STANDARDS:

A) NORTH CAROLINA DEPARTMENT OF TRANSPORTATION 'STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES', DATED JANUARY 2012, AND ANY SUPPLEMENTS THERETO ISSUED PRIOR TO THE DATE OF RECEIPT OF BIDS.

B) NORTH CAROLINA DEPARTMENT OF TRANSPORTATION 'ROADWAY STANDARD DRAWINGS, ENGLISH' DATED JANUARY 2012, AND ANY SUPPLEMENTS ISSUED THERETO PRIOR TO THE DATE OF RECEIPT OF BIDS.

ALL RIGHT OF WAY CORNER MARKERS OR FENCING SHALL BE PLACED BY OTHERS AS NECESSARY.

THE CONTRACTOR IS RESPONSIBLE FOR AVOIDING ANY DISTURBANCE OR DAMAGE TO EXISTING UTILITIES AND SHALL BE RESPONSIBLE FOR IMMEDIATELY REPAIRING ANY DAMAGES AT A COST INCIDENT TO THIS CONTRACT.

ABANDONED SECTIONS OF THE EXISTING CHANNEL SHALL BE FILLED TO THE MAXIMUM EXTENT FEASIBLE WITH MATERIAL EXCAVATED ON-SITE. THIS EXCAVATED MATERIAL SHALL BE STOCKPILED ADJACENT TO THE REACHES OF CHANNEL OR DITCHES TO BE BACKFILLED.

THE CONTRACTOR MAY UTILIZE THE DESIGNATED STAGING AREA AND THE AREA INSIDE THE PROPOSED RIGHT OF WAY FOR STAGING AND STOCKPILING EQUIPMENT AND MATERIALS.

THE STREAM SHALL BE CONSTRUCTED IN ACCORDANCE TO THE TYPICAL SECTIONS.

SUBSURFACE PLANS: NO SUBSURFACE PLANS ARE AVAILABLE ON THE PROJECT. THE CONTRACTOR SHOULD MAKE HIS OWN INVESTIGATION AS TO THE SUBSURFACE CONDITIONS.

ROADWAY STANDARD DRAWINGS

(REV. JANUARY 2012)

THE FOLLOWING ROADWAY STANDARDS AS APPEAR IN 'ROADWAY STANDARD DRAWINGS', ROADWAY DESIGN UNIT, N.C. DEPARTMENT OF TRANSPORTATION RALEIGH, N.C., DATED JANUARY 2012 AND THE LATEST REVISION THERETO ARE APPLICABLE TO THIS PROJECT AND BY REFERENCE HEREIN ARE CONSIDERED A PART OF THESE PLANS:

CONSTRUCTION SEQUENCING

THIS STREAM MITIGATION PROJECT CONSISTS OF THREE SITES. ONCE WORK BEGINS ON A STREAM SITE, THE CONTRACTOR MUST COMPLETE THAT SITE BEFORE MOVING WORK CREWS AND EQUIPMENT TO A DIFFERENT SITE, UNLESS APPROVED TO DO SO BY THE ENGINEER.

LAYOUT LOCATION OF THE NEW STREAM CHANNEL, CONSTRUCTION EASEMENT LIMITS, AND GRADE STAKES. THE ENGINEER MUST INSPECT AND APPROVE ALL LAYOUT WORK BEFORE CONSTRUCTION MAY BEGIN.

MOBILIZE EQUIPMENT AND MATERIALS TO THE SITE.

INSTALL CONSTRUCTION ENTRANCE PER EROSION CONTROL PLAN.

ESTABLISH STAGING AREAS AND MARK CONSTRUCTION EQUIPMENT ACCESS LOCATIONS WITH VISIBLE MARKERS. CONSTRUCTION EQUIPMENT SHALL BE CONTAINED WITHIN THE LIMITS OF CONSTRUCTION AS DEPICTED IN THE PLANS OR SPECIFIED BY THE ENGINEER.

INSTALL TEMPORARY EROSION CONTROL MEASURES.

BEGIN FLOODPLAIN GRADING, INCLUDING EXCAVATION OF BANKFULL BENCHES AT LOCATIONS DEPICTED IN THE PLANS AND AS DIRECTED BY THE ENGINEER. STOCKPILE MATERIALS IN AREAS DESIGNATED ON THE PLANS. KEEP TOPSOIL SEPARATE FROM OTHER STOCKPILE MATERIAL. TOPSOIL MATERIAL WILL BE USED LATER ON FLOODPLAIN.

TOPSOIL SHALL BE EXCAVATED AND STOCKPILED SEPARATELY FROM THE WASTE MATERIAL SO THAT IT CAN BE PLACED BACK ON THE FLOODPLAIN ONCE GRADING IS COMPLETE. NO DIRECT PAYMENT WILL BE MADE FOR THIS EXCAVATION. OVER-EXCAVATE FLOODPLAIN AND FLOODPLAIN BENCHES TO A DEPTH OF 6" BELOW FINAL GRADE AND PLACE 6" OF TOPSOIL TO FILL TO FINAL GRADE. OVER-EXCAVATION SHOULD BEGIN 2' FROM TOP OF BANK AND EXTEND TO EXCAVATION LIMITS. SEE TYPICAL SECTIONS FOR DETAIL.
INSTALL IMPERVIOUS DIKES AND PUMP AROUND SYSTEM TO PUMP STREAM DISCHARGE AROUND THE IMMEDIATE WORK AREA AS NECESSARY.

CONSTRUCTION SHALL PROCEED IN SUCCESSIVE REACHES WITH THE UPSTREAM REACH BEING COMPLETED PRIOR TO INITIATING CONSTRUCTION OF THE ADJACENT DOWNSTREAM REACH. EACH REACH SHALL BE LIMITED IN LENGTH TO WORK THAT CAN BE COMPLETED BEFORE ALLOWING WATER TO FLOW THROUGH THAT REACH. CONSTRUCTION OF A REACH SHALL CONSIST OF CHANNEL CONSTRUCTION, FLOODPLAIN GRADING, IN-STREAM STRUCTURE INSTALLATION, SEED MATERIAL INSTALLATION, AND EROSION CONTROL MEASURES. CONSTRUCTION SHALL BE DONE IN THE DRY, WITH THE CHANNEL FLOW PUMPED AROUND THE REACH UNDER CONSTRUCTION AS NECESSARY.

AT THE END OF EACH DAY'S CONSTRUCTION WORK, THE CONTRACTOR SHALL SEED ALL DISTURBED AREAS AND COVER THE STREAM BANKS AND BANKFULL BENCHES WITH COIR FIBER MATTING. IN ADDITION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL TEMPORARY EROSION CONTROL MEASURES ON A DAILY BASIS THROUGHOUT THE CONSTRUCTION PROCESS.

ONCE NEW CHANNEL CONSTRUCTION IS COMPLETE, THE CONTRACTOR SHALL INSTALL STREAM PLUGS TO DIRECT STREAM FLOW INTO THE NEW CHANNEL. THE CONTRACTOR SHALL THEN FILL IN THE ABANDONED SECTIONS OF THE EXISTING CHANNEL TO THE EXTENT FEASIBLE AND AS DIRECTED BY THE ENGINEER. CONTRACTOR WILL ENSURE THAT VEGETATION HAS BEEN ESTABLISHED ALONG THE BANKS OF THE NEW STREAM CHANNEL BEFORE DIRECTING FLOW INTO THE NEW STREAM CHANNEL. FOR NEW STREAM CHANNEL REACHES WHERE THIS IS NOT POSSIBLE, THE CONTRACTOR SHOULD GET APPROVAL FROM THE ENGINEER BEFORE DIRECTING FLOW INTO THE NEW STREAM CHANNEL.

AFTER ALL IN-STREAM WORK IS COMPLETED, THE CONTRACTOR SHALL REMOVE TEMPORARY EROSION CONTROL MEASURES AND REMOVE STREAM ACCESS AND SCARIFY ANY COMPACTED AREAS AS DIRECTED BY THE ENGINEER. ALL PORTIONS OF THE SITE SHALL BE STABILIZED WITH TEMPORARY EROSION CONTROL MEASURES.

PREPARED IN THE OFFICES OF:
Kimley-Horn and Associates, Inc.
P.O. BOX 33068 - RALEIGH, NORTH CAROLINA 27636-3068
PHONE: (919) 677-2000 FAX: (919) 677-2050
NC LICENSE F-0102

PROJECT REFERENCE NO. U-2525B | SHEET NO. GSN-1A

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL ENGINEER SEAL 019463 ENGINEERING

REVIEWED BY:

DATE:

U-2525B
ON-SITE MITIGATION
GUILFORD COUNTY

INDEX OF SHEETS

GSN-1	TITLE SHEET
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GSN-1B	CONVENTIONAL PLAN SHEET SYMBOLS
GSN-2	TYPICAL SECTIONS
GSN-2A	DETAILS -COIR FIBER MATTING -ROCK CROSS VANE -LOG CROSS VANE -STORMWATER STEP POOL PROTECTION STRUCTURE
GSN-2B	-ROCK A-VANE -CONSTRUCTED RIFFLE -ROOTWAD -BOULDER TOE PROTECTION
GSN-2C	-ROCK VANE -LOG VANE -STREAM PLUG
GSN-2D	PUMP AROUND OPERATION
GSN-2E-2F	HORMOLOGICAL TABLES
GSN-3	SUMMARY OF QUANTITIES EARTHWORK SUMMARY
GSN-4-7	PLAN SHEETS
GSN-8-11	PROFILE SHEETS
GSN-12-22	CROSS SECTIONS

STREAM SYMBOLS

PLAN VIEW SYMBOLS

ROCK VANE

LOG VANE

LOG CROSS VANE

STORMWATER OUTLET STEP POOL

FP FLOODPLAIN LINE

BOULDER TOE PROTECTION

ROCK A-VANE

ROCK CROSS VANE

CONSTRUCTED RIFFLE

STREAM PLUG

BACKFILL EXISTING CHANNEL

PROFILE SYMBOLS

EXISTING GROUND ELEVATION

PROPOSED GROUND ELEVATION

PROPOSED BANKFULL

PROPOSED LOG SILL

PROPOSED LOG CROSS VANE

CONSTRUCTED RIFFLE

PROPOSED ROCK CROSS VANE

PROPOSED ROCK A-VANE

PROPOSED STEP POOL STRUCTURE

PLANTING SYMBOLS

TYPE I

TYPE II

Note: Not to Scale

**S.U.E. = Subsurface Utility Engineering*

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CONVENTIONAL PLAN SHEET SYMBOLS

BOUNDARIES AND PROPERTY:

- State Line
- County Line
- Township Line
- City Line
- Reservation Line
- Property Line
- Existing Iron Pin
- Property Corner
- Property Monument
- Parcel/Sequence Number
- Existing Fence Line
- Proposed Woven Wire Fence
- Proposed Chain Link Fence
- Proposed Barbed Wire Fence
- Existing Wetland Boundary
- Proposed Wetland Boundary
- Existing Endangered Animal Boundary
- Existing Endangered Plant Boundary

BUILDINGS AND OTHER CULTURE:

- Gas Pump Vent or U/G Tank Cap
- Sign
- Well
- Small Mine
- Foundation
- Area Outline
- Cemetery
- Building
- School
- Church
- Dam

HYDROLOGY:

- Stream or Body of Water
- Hydro, Pond or Reservoir
- Jurisdictional Stream
- Buffer Zone 1
- Buffer Zone 2
- Flow Arrow
- Disappearing Stream
- Spring
- Wetland
- Proposed Lateral, Toll, Head Ditch
- False Sump

RAILROADS:

- Standard Gauge
- RR Signal Milepost
- Switch
- RR Abandoned
- RR Dismantled

RIGHT OF WAY:

- Baseline Control Point
- Existing Right of Way Marker
- Existing Right of Way Line
- Proposed Right of Way Line
- Proposed Right of Way Line with Iron Pin and Cap Marker
- Proposed Right of Way Line with Concrete or Granite Marker
- Existing Control of Access
- Proposed Control of Access
- Existing Easement Line
- Proposed Temporary Construction Easement
- Proposed Temporary Drainage Easement
- Proposed Permanent Drainage Easement
- Proposed Permanent Utility Easement

ROADS AND RELATED FEATURES:

- Existing Edge of Pavement
- Existing Curb
- Proposed Slope Stakes Cut
- Proposed Slope Stakes Fill
- Proposed Wheel Chair Ramp
- Existing Metal Guardrail
- Proposed Guardrail
- Existing Cable Guiderail
- Proposed Cable Guiderail
- Equality Symbol
- Pavement Removal

VEGETATION:

- Single Tree
- Single Shrub
- Hedge
- Woods Line
- Orchard
- Vineyard

EXISTING STRUCTURES:

MAJOR:

- Bridge, Tunnel or Box Culvert
- Bridge Wing Wall, Head Wall and End Wall

MINOR:

- Head and End Wall
- Pipe Culvert
- Footbridge
- Drainage Box: Catch Basin, DI or JB
- Paved Ditch Gutter
- Storm Sewer Manhole
- Storm Sewer

UTILITIES:

POWER:

- Existing Power Pole
- Proposed Power Pole
- Existing Joint Use Pole
- Proposed Joint Use Pole
- Power Manhole
- Power Line Tower
- Power Transformer
- U/G Power Cable Hand Hole
- H-Frame Pole
- Recorded U/G Power Line
- Designated U/G Power Line (S.U.E.*)

TELEPHONE:

- Existing Telephone Pole
- Proposed Telephone Pole
- Telephone Manhole
- Telephone Booth
- Telephone Pedestal
- Telephone Cell Tower
- U/G Telephone Cable Hand Hole
- Recorded U/G Telephone Cable
- Designated U/G Telephone Cable (S.U.E.*)
- Recorded U/G Telephone Conduit
- Designated U/G Telephone Conduit (S.U.E.*)
- Recorded U/G Fiber Optics Cable
- Designated U/G Fiber Optics Cable (S.U.E.*)

WATER:

- Water Manhole
- Water Meter
- Water Valve
- Water Hydrant
- Recorded U/G Water Line
- Designated U/G Water Line (S.U.E.*)
- Above Ground Water Line

TV:

- TV Satellite Dish
- TV Pedestal
- TV Tower
- U/G TV Cable Hand Hole
- Recorded U/G TV Cable
- Designated U/G TV Cable (S.U.E.*)
- Recorded U/G Fiber Optic Cable
- Designated U/G Fiber Optic Cable (S.U.E.*)

GAS:

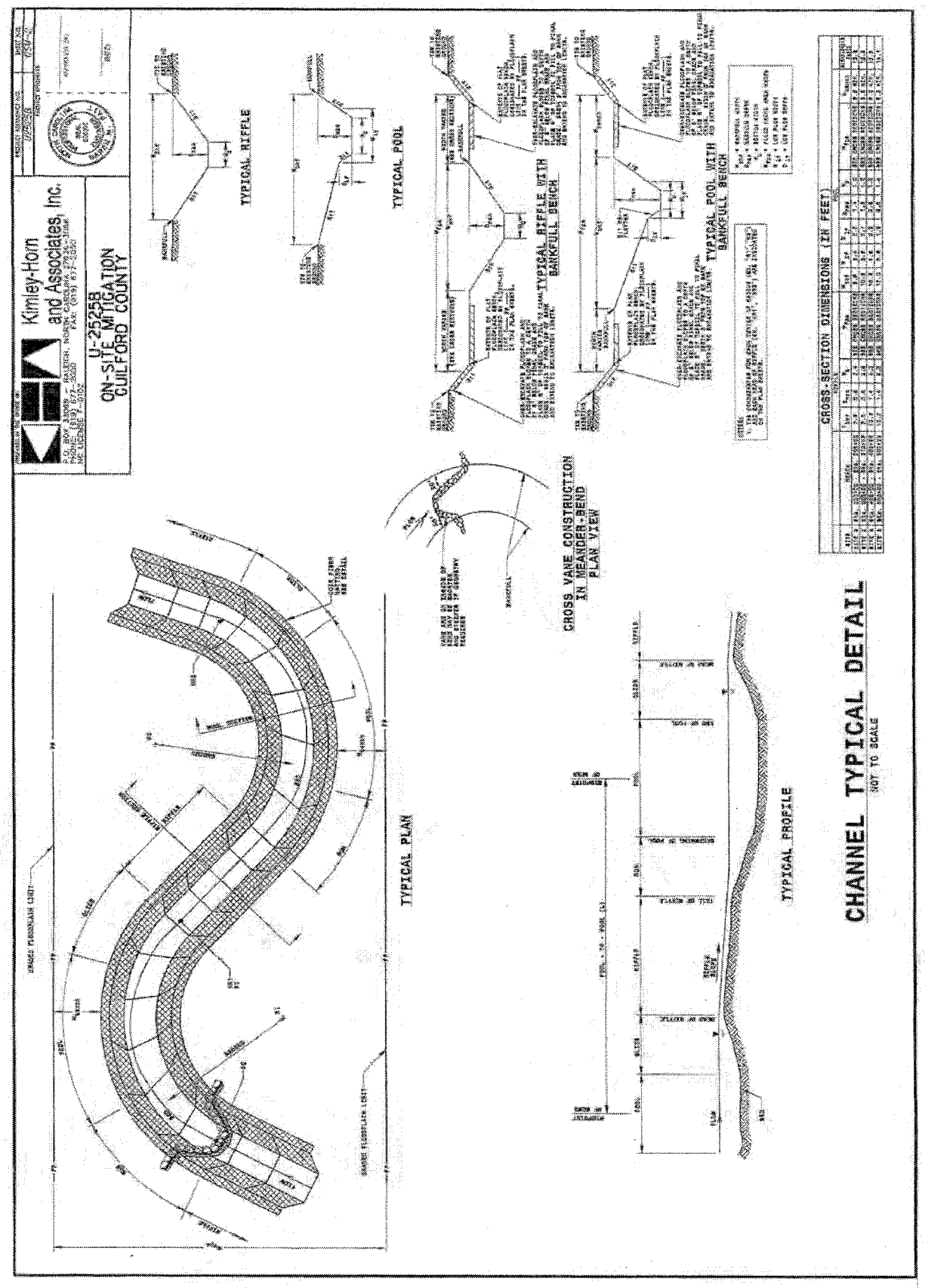
- Gas Valve
- Gas Meter
- Recorded U/G Gas Line
- Designated U/G Gas Line (S.U.E.*)
- Above Ground Gas Line

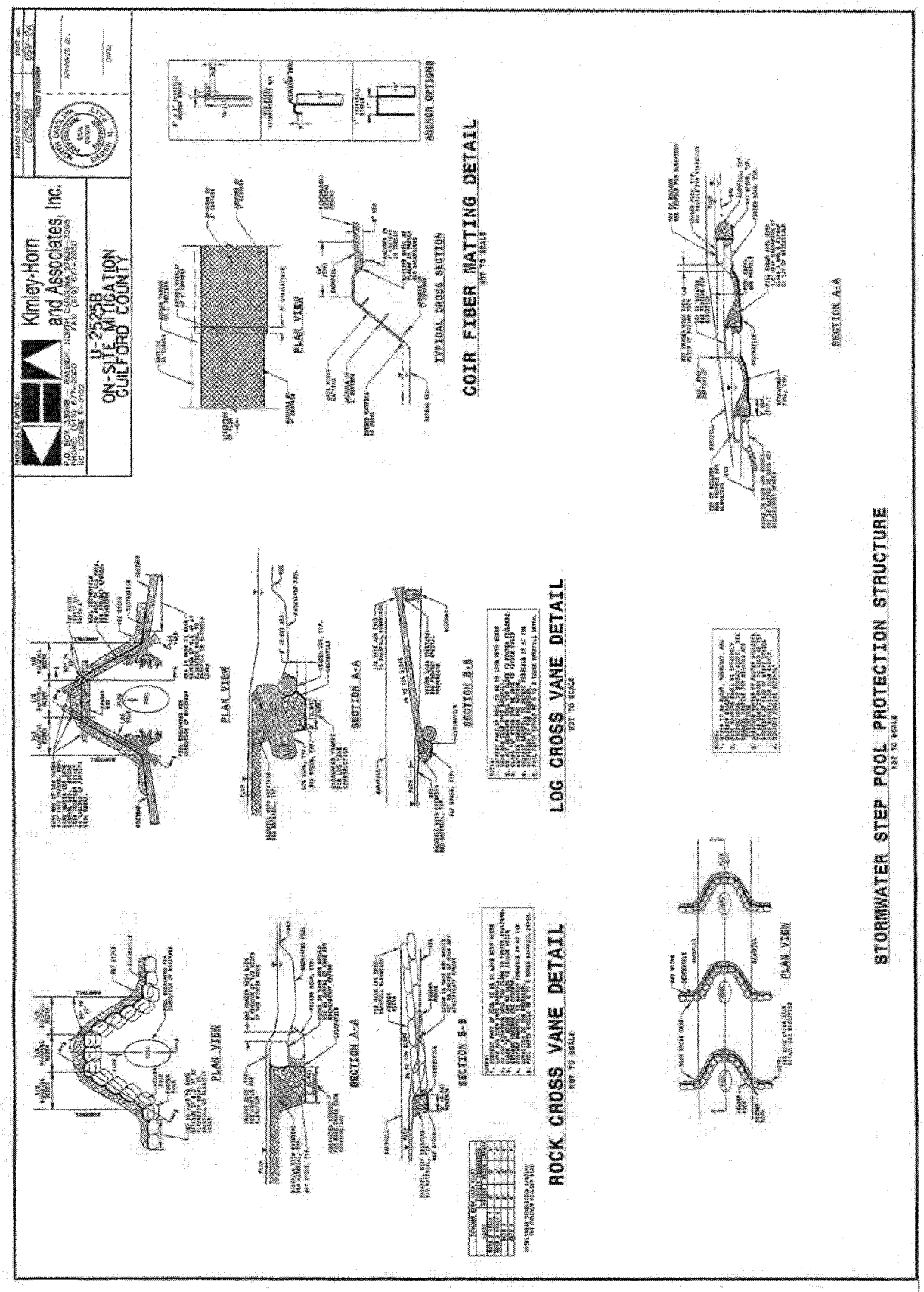
SANITARY SEWER:

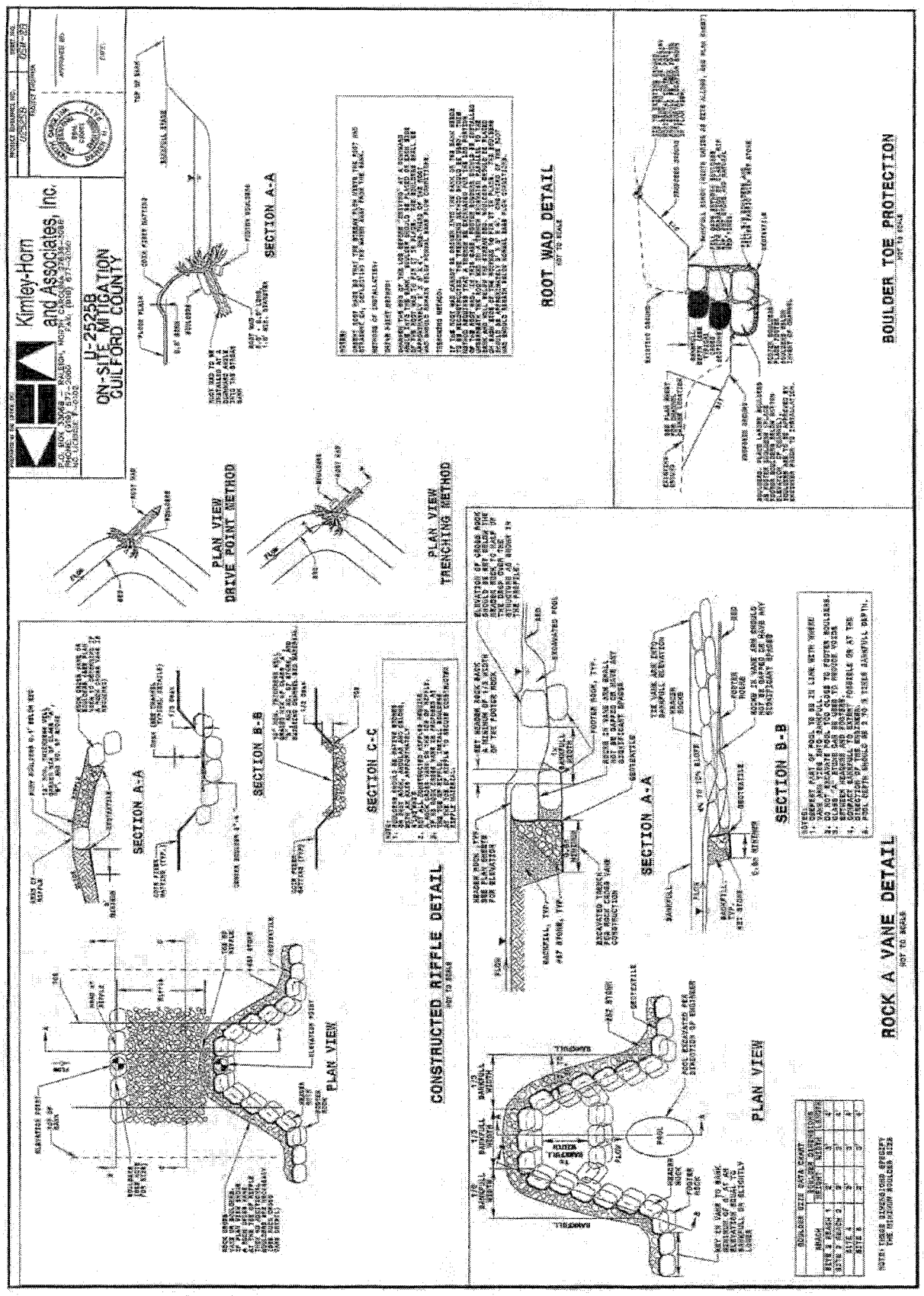
- Sanitary Sewer Manhole
- Sanitary Sewer Cleanout
- U/G Sanitary Sewer Line
- Above Ground Sanitary Sewer
- Recorded SS Forced Main Line
- Designated SS Forced Main Line (S.U.E.*)

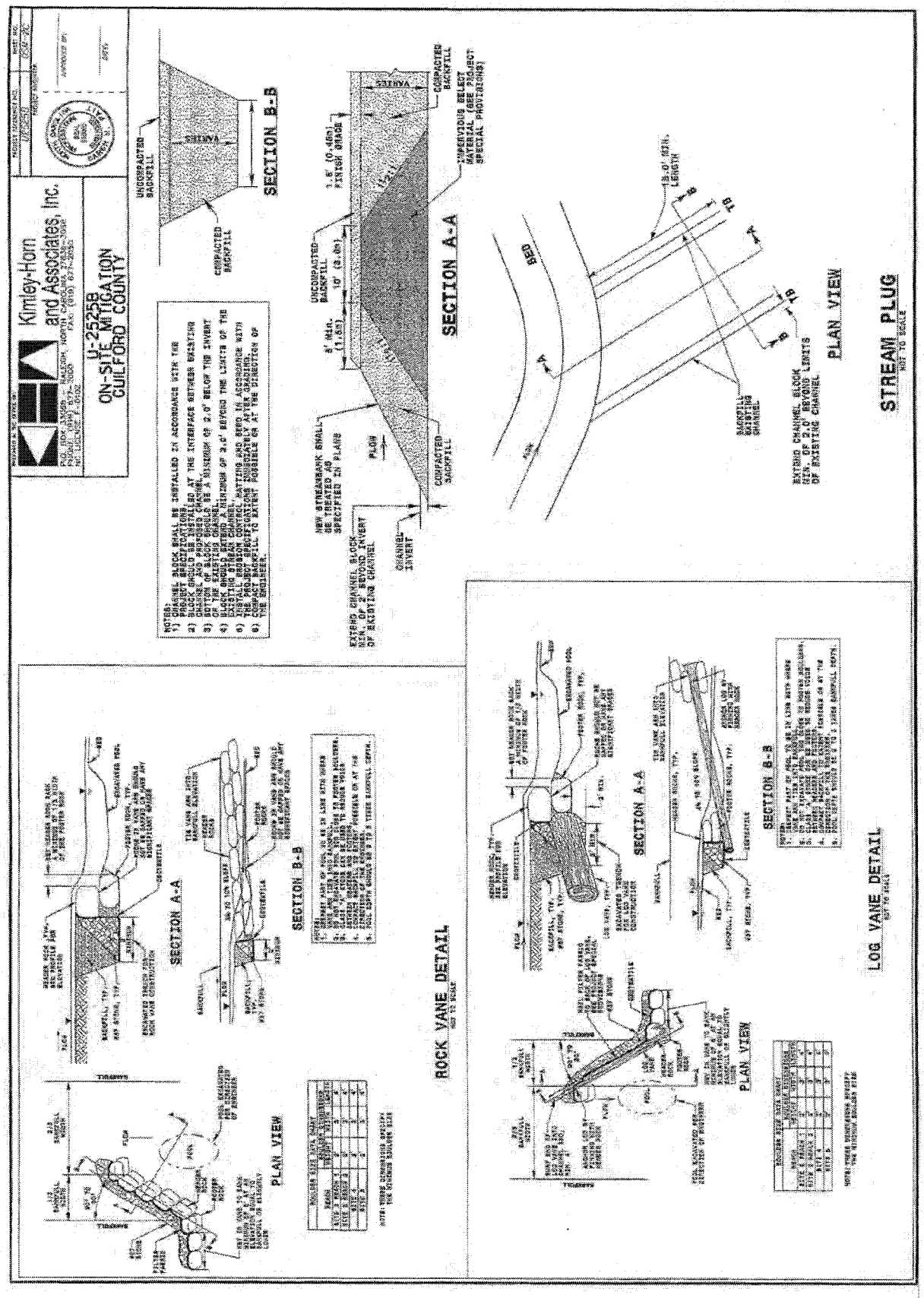
MISCELLANEOUS:

- Utility Pole
- Utility Pole with Base
- Utility Located Object
- Utility Traffic Signal Box
- Utility Unknown U/G Line
- U/G Tank; Water, Gas, Oil
- A/G Tank; Water, Gas, Oil
- U/G Test Hole (S.U.E.*)
- Abandoned According to Utility Records — AATUR
- End of Information — E.O.I.


Kimley-Horn and Associates, Inc.
U-2525B
ON-SITE MITIGATION
GUILFORD COUNTY
TYPICAL RIFFLE
TYPICAL POOL
TYPICAL RIFFLE WITH BANKFULL BENCH
TYPICAL POOL WITH BANKFULL BENCH
CROSS-SECTION DIMENSIONS (IN FEET)
CROSS VANE CONSTRUCTION IN MEANDER-BEND PLAN VIEW
TYPICAL PLAN
TYPICAL PROFILE
CHANNEL TYPICAL DETAIL
NOT TO SCALE


Kimley-Horn and Associates, Inc.
U-2525B
ON-SITE MITIGATION
GUILFORD COUNTY
PLAN VIEW
TYPICAL CROSS SECTION
ANCHOR OPTIONS
COIR FIBER MATTING DETAIL
NOT TO SCALE
SECTION A-A
SECTION B-B
LOG CROSS VANE DETAIL
NOT TO SCALE
ROCK CROSS VANE DETAIL
NOT TO SCALE
STORMWATER STEP POOL PROTECTION STRUCTURE
NOT TO SCALE


Kimley-Horn and Associates, Inc.
U-2525B
ON-SITE MITIGATION
GUILFORD COUNTY
SECTION A-A
PLAN VIEW
DRIVE POINT METHOD
PLAN VIEW
TRENCHING METHOD
ROOT WAD DETAIL
BOULDER TOE PROTECTION
SECTION A-A
SECTION B-B
SECTION C-C
PLAN VIEW
CONSTRUCTED RIFFLE DETAIL
SECTION A-A
SECTION B-B
PLAN VIEW
ROCK A VANE DETAIL


Kimley-Horn and Associates, Inc.
U-2525B
ON-SITE MITIGATION
GUILFORD COUNTY
SECTION B-B
SECTION A-A
PLAN VIEW
STREAM PLUG
NOT TO SCALE
ROCK VANE DETAIL
NOT TO SCALE
LOG VANE DETAIL
NOT TO SCALE

Kimley-Horn and Associates, Inc.
P.O. BOX 33068 – RALEIGH, NORTH CAROLINA 27636-3068
PHONE: (919) 677-2000 FAX: (919) 677-2050
NC LICENSE F-0102

U-2525B
ON-SITE MITIGATION
GUILFORD COUNTY

PROJECT REFERENCE NO.	SHEET NO.
U2525B	059-20

PROJECT ENGINEER

APPROVED BY:

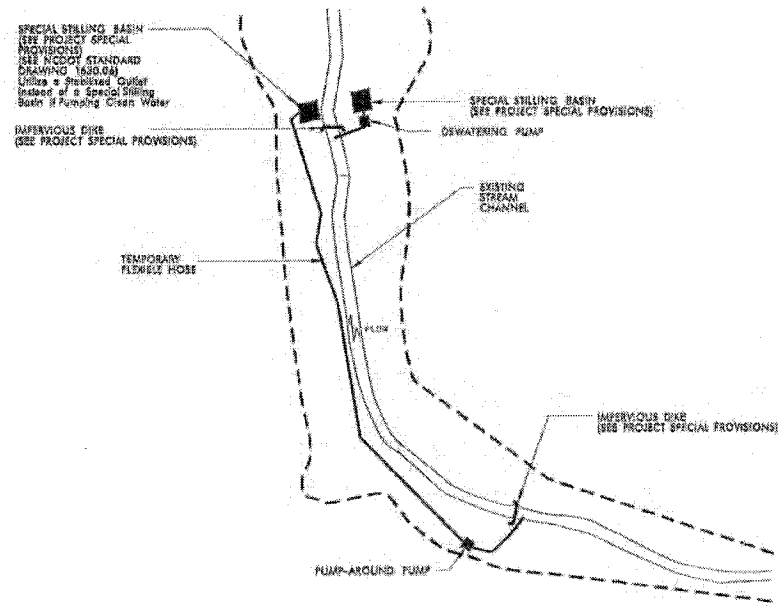
DATE:

NOTES:
1) All excavation shall be performed in only dry or isolated sections of channel.
2) Impervious dikes are to be used to isolate work from stream flow when necessary.
3) All graded areas shall be stabilized within 24 hours.
4) Maintenance of stream flow operations shall be incidental to the work. This includes polyethylene sheeting, diversion pipes, pumps and hoses.
5) Pumps and hoses shall be of sufficient size to dewater the work area.

SEQUENCE OF CONSTRUCTION FOR PUMP AROUND OPERATION

1. INSTALL SPECIAL STILLING BASIN(S).
2. INSTALL UPSTREAM PUMP AND TEMPORARY FLEXIBLE HOSE.
3. PLACE UPSTREAM IMPERVIOUS DIKE AND BEGIN PUMPING OPERATIONS FOR STREAM DIVERSION.
4. PLACE DOWNSTREAM IMPERVIOUS DIKE AND PUMPING APPARATUS. DEWATER ENTRAPPED AREA. AREA TO BE DEWATERED SHALL BE EQUAL TO ONE DAY'S WORK.
5. PERFORM STREAM RESTORATION WORK IN ACCORDANCE WITH THE PLANS.
6. EXCAVATE ANY ACCUMULATED SILT AND DEWATER BEFORE REMOVAL OF IMPERVIOUS DIKES. REMOVE IMPERVIOUS DIKES, PUMPS AND TEMPORARY FLEXIBLE HOSE. (DOWNSTREAM IMPERVIOUS DIKE FIRST).
7. ALL GRADING AND STABILIZATION MUST BE COMPLETED IN ONE DAY WITHIN THE PUMP AROUND AREAS BETWEEN THE IMPERVIOUS DIKES. THE IMPERVIOUS DIKE LOCATIONS AS SHOWN ON THIS SHEET ONLY SHOW THE UPPER AND LOWER EXTENT OF WORK FOR EACH STREAM SEGMENT. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE LOCATION OF THE IMPERVIOUS DIKE(S) FOR EACH DAY'S WORK.
8. REMOVE SPECIAL STILLING BASIN(S) AND BACKFILL. STABILIZE DISTURBED AREA WITH SEED AND MULCH.

EXAMPLE OF PUMP-AROUND OPERATION



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PROJECT REFERENCE NO. 0025B | SHEET NO. DSM-2C

U-2525B
ON-SITE MITIGATION
GUILFORD COUNTY

VARIABLES		Reference Reach Tributary to Reddick Creek (RRR)	Reference Reach Reddick Creek (RRR)	Reference Reach Tributary to Lake Mackie (NCDOT)	Reference Reach Tributary to Rich Fork (RRR)	Existing Site 2 Reach 1	Regional Curve Bankfull Hydraulic Reference Values	Site 2 Reach 1 Design Reach	Existing Site 2 Reach 2	Regional Curve Bankfull Hydraulic Reference Values	Site 2 Reach 2 Design Reach
STATION		-	-	-	-	-	-	200+00 to 206+00	-	-	206+00 to 213+07
1. Stream Type		C5	E5	B5	B5	Incised B5	C5	B5	Incised B5	C5	B5
2. Drainage Area (sq. miles)		0.19	0.27	0.15	1.12	0.08	0.68	0.08	0.10	0.68	0.10
3. Bankfull Width (W_bkf)	Mean										
	Range										
4. Bankfull Mean Depth (d_bkf)	Mean	0.5	0.6	1.6	1.9	0.7	0.7	0.5	1.0	0.7	0.5
	Range	- -	0.7 0.8	1.4 1.7	- -	- -	- -	- -	- -	- -	- -
5. Bankfull Max Depth (d_mbkf)	Mean										
	Range										
6. Bankfull Cross Sectional Area (sq ft)	Mean	4.8	5.1	15.4	50.8	5.5	4.0	3.8	4.8	5.3	4.0
	Range	- -	4.5 6.1	15.5 20.0	- -	- -	- -	- -	- -	- -	- -
7. Bankfull Bankline Length (L_bkf)	Mean										
	Range										
8. Bankfull Discharge, cfs	Mean	Not Reported	Not Reported	28.3	95.0	16.8	15.0	30.0	18.1	16.4	18.1
	Range	- -	- -	25.7 119.5	- -	- -	- -	- -	- -	- -	- -
9. Bankfull Velocity (m/s)	Mean										
	Range										
10. Max d_{mbkf}/d_{bkf}	Mean	1.7	2.9	2.1	1.6	1.3	1.3	1.8	1.3	1.4	1.5
	Range	- -	1.9 1.9	Not Reported	- -	- -	1.2 1.6	- -	- -	1.3 1.6	- -
11. Bankfull Width/Depth Ratio (W_bkf/d_bkf)	Mean										
	Range										
12. Width of Flood Prone Area (W_fpa)	Mean	41.0	27.4	42.0	25.3	12.0	-	14.0	5.1	-	10.0
	Range	- -	36.3 14.8	- -	- -	- -	- -	- -	- -	- -	- -
13. Entrenchment Ratio (W_fpa/W_bkf)	Mean										
	Range										
14. Bankfull Length (L_bkf)	Mean	85.8	32.3	22.8	-	27.9	-	40.0	42.3	-	46.6
	Range	54.0 97.6	28.0 46.9	22.0 58.0	- -	13.2 54.1	- -	58.4 75.6	14.2 72.8	- -	62.0 73.0
15. Bankfull Meander Length (L_m)	Mean										
	Range										
16. Radius of Curvature (R_c)	Mean	14.4	11.4	7.2	-	10.8	-	12.3	9.4	-	9.0
	Range	4.5 20.0	4.7 18.8	7.2 17.3	- -	7.1 17.1	- -	15.3 18.8	5.6 18.9	- -	6.3 19.6
17. Meander Belt Width (W_blt)	Mean										
	Range										
18. Belt Width/Bankfull Width (W_blt/W_bkf)	Mean	8.0	15.8	45.8	-	12.5	-	12.9	16.1	-	20.6
	Range	- -	10.5 22.0	- -	- -	8.1 25.2	- -	11.1 14.5	8.9 69.7	- -	18.2 20.3
19. Meander Width Ratio (W_blt/L_bkf)	Mean										
	Range										
20. Sinuosity (L/L_v)	Mean	1.10	1.18	Not Reported	1.07	1.16	-	1.07	1.19	-	1.05
	Range	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
21. Valley Slope (S_v)	Mean	0.0017	Not Reported	-	0.0015	0.0134	-	0.0134	0.0148	-	0.0148
	Range	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
22. Average Riffle Slope (S_r)	Mean	0.0011	0.0061	0.0038	0.0027	0.0138	-	0.0132	0.0148	-	0.0139
	Range	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
23. Pool Slope (S_p)	Mean	0.0045	0.0027	Not Reported	0.0021	0.0021	-	0.0021	0.0021	-	0.0021
	Range	0.0000 0.0127	0.0000 0.0127	- -	0.0000 0.0042	0.0000 0.0042	- -	0.0000 0.0042	0.0000 0.0042	- -	0.0000 0.0042
24. Ratio of Riffle Slope to Avg. Slope (S_r/S_avg)	Mean	0.7	3.8	2.1	1.3	2.9	1.0	1.5	1.4	1.7	1.8
	Range	0.0 26.3	0.5 4.6	- -	- -	1.3 4.9	0.5 2.0	0.8 2.1	0.5 3.1	1.5 2.0	1.5 2.0
25. Pool Slope (S_p/S_avg)	Mean	0.3	0.3	Not Reported	0.1	0.2	-	0.2	0.2	-	0.2
	Range	0.0 1.0	0.0 0.5	- -	0.0 0.2	0.0 0.4	- -	0.0 0.4	0.0 0.4	- -	0.0 0.4
26. Ratio of Pool Slope to Avg. Slope (S_p/S_avg)	Mean	0.1	0.1	-	0.0	0.7	0.0	0.6	0.9	-	0.8
	Range	0.0 0.4	0.0 0.6	- -	0.0 0.2	0.4 1.1	0.0 0.1	0.0 0.9	0.2 0.4	0.0 0.1	0.5 0.1
27. Maximum Riffle Depth (d_mr)	Mean	2.0	2.1	4.0	5.0	2.0	-	2.0	1.9	-	2.0
	Range	1.0 3.0	1.0 3.0	- -	4.0 6.0	1.0 3.0	- -	1.0 3.0	1.0 3.0	- -	1.0 3.0
28. Ratio of Pool Riffle to Avg. Depth (d_mr/d_avg)	Mean	3.4	2.5	2.0	2.5	2.9	3.0	2.8	2.5	3.0	3.0
	Range	- -	- -	- -	1.667 3.000	2.0 3.0	2.5 3.5	- -	1.6 2.0	2.1 3.5	- -
29. Bankfull Cross Sectional Area Variability											
30. Maximum Pool Width (W_mp)	Mean	1.5	3.2	11	1	0.9	1	1.4	1.1	1.5	1.3
	Range	- -	- -	- -	- -	- -	1.3 1.7	- -	- -	1.3 1.7	- -
31. Bankfull Width (W_bkf/W_mp)	Mean	5.8	8.4	2.8	1						
	Range										
32. Ratio of Pool Area to Bankfull Area (A_p/A_bkf)	Mean			1.5		1.0		1.7	1.2		1.9
	Range										
33. Ratio of Pool Depth to Bankfull Depth (d_p/d_bkf)	Mean										
	Range										
34. Ratio of Riffle to Pool Spacing to Bankfull Width (L_p/W_bkf)	Mean	4.9	4.5			2.0	4.0	4.4	2.8	4.0	4.5
	Range	2.1 5.8	1.1 7.5	- -	- -	0.9 3.5	3.0 5.0	3.6 5.7	0.9 6.0	3.0 5.0	3.0 5.8

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NC LICENSE F-0102

PROJECT REFERENCE NO. U-2525B
SHEET NO. CSM-27

U-2525B
ON-SITE MITIGATION
GUILFORD COUNTY

VARIABLES	Reference Reach Tributary to Buffalo Creek (RB4)	Reference Reach Buffalo Creek (RB3)	Reference Reach Tributary to Lake Jeanette (RC3D)	Reference Reach Tributary to High Rock (RD1)	Existing Site 4	Regional Curves/Piedmont Rural/Rougan Reference Values	Site 4 Design Reach	Existing Site 5	Regional Curves/Piedmont Rural/Rougan Reference Values	Site 5 Design Reach
STATION	--	--	--	--	--	--	100+00 to 102+00	--	--	500+00 to 503+02
1 Stream Type	E5	E5	E5	B4	Varied B5	C5	C5	E5	C5	C5
2 Drainage Area (sq. miles)	0.19	0.87	0.75	1.10	0.57	0.67	0.57	0.81	0.81	0.81
3 Bankfull Elevation	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:
4 Bankfull Width (ft)	Mean: 8.6	Mean: 3.8	Mean: 1.6	Mean: 1.9	Mean: 1.3	Mean: 1.3	Mean: 0.9	Mean: 1.1	Mean: 1.0	Mean: 1.0
Depth (ft)	Range: -- --	Range: 0.7 0.8	Range: 1.4 1.7	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --
Width/Depth Ratio	Mean: 11.6	Mean:	Mean:	Mean:	Mean:	Mean:	Mean: 9.0	Mean:	Mean:	Mean: 9.1
Flood Prone Area	Range:	Range: 2.7 3.2	Range: 3.1 3.5	Range:	Range:	Range:	Range:	Range:	Range:	Range:
5 Bankfull cross sectional area (sq. ft)	Mean: 4.0	Mean: 2.1	Mean: 1.9 4	Mean: 1.07	Mean: 1.18	Mean: 0.9	Mean: 1.2	Mean: 0.3	Mean: 0.6	Mean: 0.3
Area (sq. ft)	Range: -- --	Range: 1.8 2.1	Range: 1.6 2.3	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --
6 Bankfull Elevation (ft)	Mean: Not Recorded	Mean: Not Recorded	Mean:	Mean: 102.2	Mean: 24.5	Mean: 24.1	Mean: 24.5	Mean: 24.5	Mean: 24.9	Mean: 24.5
(Flow)	Range: -- --	Range: -- --	Range: 100.1 100.9	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --
7 Bankfull Cross Section Depth (ft)	Mean:	Mean: 0.8	Mean:	Mean: 2.4	Mean: 1.3	Mean: 1.4	Mean: 1.5	Mean: 1.4	Mean: 1.4	Mean: 1.4
10 Max Riffle Depth (ft)	Mean: 1.7	Mean: 2.0	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:
Ratio	Range: -- --	Range: 1.9 2.0	Range:	Range:	Range: -- --	Range: 1.2 1.8	Range: -- --	Range: -- --	Range: 1.3 1.5	Range: -- --
11 Low Bank Height (ft)	Mean:	Mean:	Mean:	Not Recorded	Mean:	Mean:	Mean:	Mean: 0.61	Mean:	Mean:
12 Width of Flood Prone Area (ft)	Mean: 35.0	Mean: 27.4	Mean:	44.0	Mean: 23.1	Mean:	Mean: 60.0	Mean: 60.0	Mean:	Mean: 100.0
	Range: -- --	Range: 23.0 24.0	Range:	-- --	Range: -- --	Range:	Range: -- --	Range: -- --	Range: -- --	Range: -- --
13 Flood Prone Area (ft)	Mean:	Mean: 4.6	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:
14 Meander Length (ft)	Mean: 33.5	Mean: 32.0	Mean:	25.8	Mean:	Mean:	Mean: 52.8	Mean: 46.2	Mean:	Mean: 125.0
	Range: 26.0 40.0	Range: 23.0 45.0	Range: 22.5 68.0	Range:	Range: 257 53.3	Range:	Range: 32.0 140.0	Range: 37.5 130.0	Range: -- --	Range: 100.0 151.2
15 Radius of Curvature (ft)	Mean: 13.4	Mean: 7.3	Mean:	Mean: 7.5	Mean: 10	Mean:	Mean: 5.8	Mean: 21.0	Mean:	Mean: 47
	Range: 8.5 20.0	Range: 5.7 10.8	Range: 7.3 77.3	Range:	Range: 12.9 66.9	Range: -- --	Range: 35.5 36.5	Range: 8.6 71.0	Range: -- --	Range: 31.9 37.8
16 Belt Width (ft)	Mean: 23.0	Mean: 5.3	Mean:	48.0	Mean: 14.3	Mean:	Mean: 42.7	Mean: 33.5	Mean:	Mean: 84.4
	Range: -- --	Range: 13.5 23.0	Range:	-- --	Range: 7.4 17.7	Range: -- --	Range: 26.5 64.9	Range: 17.6 53.7	Range: -- --	Range: 34.0 42.7
17 Meander Belt Width (Wm/Wbf)	Mean:	Mean: 2.1	Mean:	Mean:	Mean:	Mean:	Mean:	Mean: 2.3	Mean:	Mean: 4.6
18 Meandering Ratio	Mean: 1.40	Mean: 1.40	Range: Not Recorded	Mean: 1.07	Mean: 1.08	Mean:	Mean: 1.08	Mean: 1.05	Mean:	Mean: 1.13
Meander Length / Riffle Length	Range: -- --	Range: -- --	Range:	Range:	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --
19 Bankfull Slope (ft/ft)	Mean: 0.0010	Mean: 0.0003	Range: No Slope Data	Mean: 0.0010	Mean:	Mean:	Mean: 0.0015	Mean:	Mean:	Mean:
	Range: -- --	Range: -- --	Range:	Range:	Range: 0.0004	Range: -- --	Range: -- --	Range: 0.0012	Range: -- --	Range: 0.0006
20 Average Slope Slope (Sbankfull = Sflood)	Mean: 0.0010	Mean: 0.0003	Mean:	0.0010	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:
	Range: -- --	Range: -- --	Range:	Range:	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --
21 Pool Slope (Spool)	Mean: 0.0010	Mean: 0.0003	Mean:	Mean: 0.0010	Mean: 0.0010	Mean:	Mean: 0.0010	Mean: 0.0010	Mean:	Mean: 0.0010
	Range: -- --	Range: -- --	Range:	Range:	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --	Range: -- --
22 Ratio of Pool Slope to Avg Slope (Spool/Savg)	Mean: 1.0	Mean: 1.0	Mean:	Mean: 1.0	Mean: 1.0	Mean:	Mean: 1.0	Mean: 1.0	Mean:	Mean: 1.0
	Range: 0.9 9.5	Range: 2.9 9.6	Range:	Range: -- --	Range: 2.3 3.3	Range: 0.9 9.1	Range: 0.9 6.5	Range: 0.8 9.1	Range: 0.9 9.1	Range: 0.8 6.5
23 Max Pool Depth (ft)	Mean: 3.3	Mean: 2.0	Mean:	Mean: 1.1	Mean: 1.1	Mean:	Mean: 1.1	Mean: 1.1	Mean:	Mean: 1.1
	Range: -- --	Range: -- --	Range:	Range:	Range: -- --	Range:	Range: -- --	Range: -- --	Range: -- --	Range: -- --
24 Ratio of Pool Depth to Avg Depth (dpool/davg)	Mean: 3.3	Mean: 2.3	Mean:	Mean: 2.3	Mean: 1.0	Mean:	Mean: 2.3	Mean: 2.1	Mean: 1.0	Mean: 1.7
	Range: -- --	Range: -- --	Range:	Range: -- --	Range: 1.9 2.1	Range:	Range: 2.5 3.9	Range: 1.7 2.3	Range: 2.6 3.8	Range: -- --
25 Pool Width (ft)	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:
	Range:	Range:	Range:	Range:	Range:	Range:	Range:	Range:	Range:	Range:
26 Ratio of Pool Width to Bankfull Width (Wpool/Wbf)	Mean: 1.5	Mean: 1.3	Mean:	Mean: 1.1	Mean: 1.5	Mean:	Mean: 1.2	Mean: 1.1	Mean: 0.5	Mean: 1.2
	Range: -- --	Range: -- --	Range:	Range:	Range: -- --	Range:	Range: 1.3 1.7	Range: -- --	Range: 1.3 1.7	Range: -- --
27 Pool Area	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:
28 Ratio of Pool Area to Bankfull Area (Apool/Abf)	Mean:	Mean:	Mean:	Mean: 1.7	Mean: 2.4	Mean:	Mean: 1.7	Mean: 1.0	Mean:	Mean: 1.0
	Range:	Range:	Range:	Range: -- --	Range:	Range:	Range:	Range: -- --	Range:	Range:
29 Pool Spacing (Wpool/Wbf)	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:	Mean:
	Range:	Range:	Range:	Range:	Range:	Range:	Range:	Range:	Range:	Range:
30 Ratio of Pool to Pool Spacing to Bankfull Width (Lp/Wbf)	Mean: 4.5	Mean: 2.5	Mean:	Mean: 2.5	Mean: 2.7	Mean:	Mean: 1.5	Mean: 2.9	Mean: 0.8	Mean: 1.1
	Range: 3.3 9.8	Range: 1.1 7.3	Range:	Range: -- --	Range: 0.7 2.4	Range: 4.6 2.0	Range: 1.3 8.7	Range: 1.6 4.3	Range: 0.8 2.0	Range: 1.1 3.2

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Kimley-Horn and Associates, Inc.
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NC LICENSE F-0102

U-2525B
ON-SITE MITIGATION
GUILFORD COUNTY

PROJECT REFERENCE NO. U2525B
SHEET NO. OSM-3
PROJECT ENGINEER
APPROVED BY
DATE

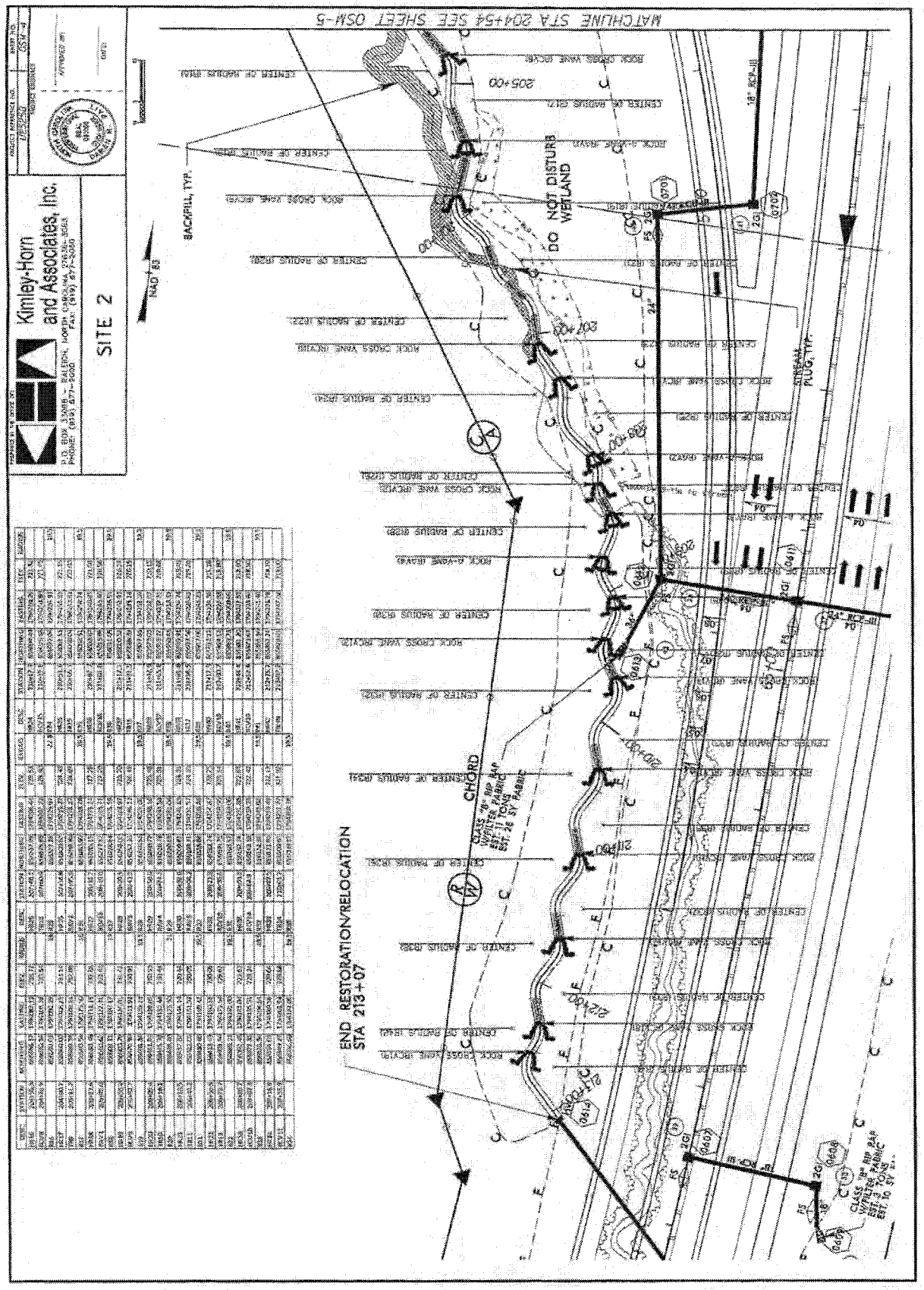
SUMMARY OF QUANTITIES

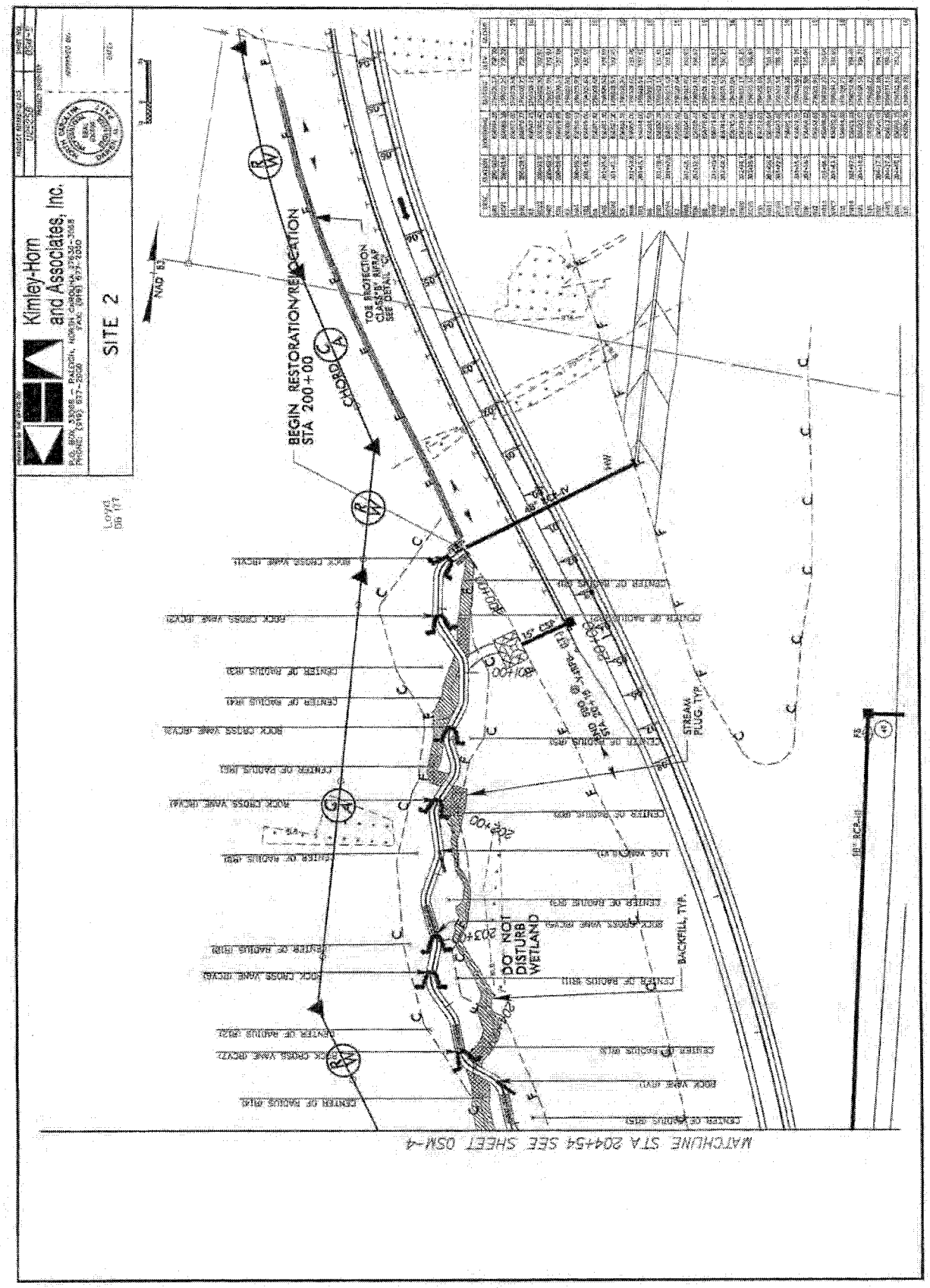
DESCRIPTION	SECTION	QUANTITIY	UNIT	ITEM DESCRIPTION
6133000000-N	SP	1	LS	CONSTRUCTION SURVEYING FOR MITIGATION
6133000000-N	SP	1	LS	GRADING FOR MITIGATION
1077000000-E	SP	600	TON	#57 STONE
3656000000-E	876	1,250	SY	FILTER FABRIC FOR DRAINAGE
3661000000-E	SP	975	TON	BOULDER
3642000000-E	876	60	TON	PLAIN RIP RAP, CLASS A
3649000000-E	876	50	TON	PLAIN RIP RAP, CLASS B
6133000000-N	SP	1	LS	DIVERSION PUMPING FOR MITIGATION
6132000000-N	SP	6	EA	LOGS
6132000000-N	SP	2	EA	ROOTWADS

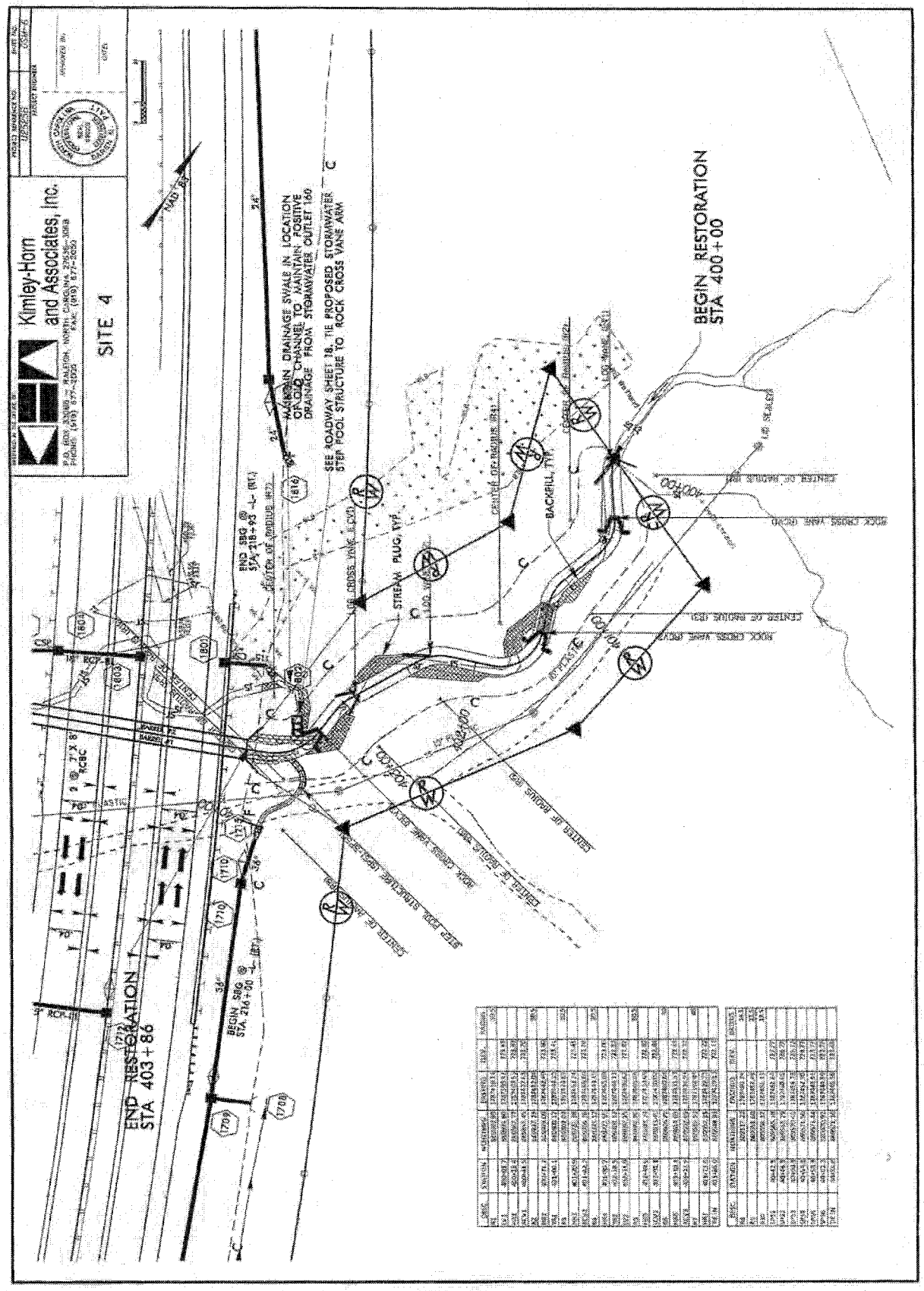
SUMMARY OF EARTHWORK FOR MITIGATION

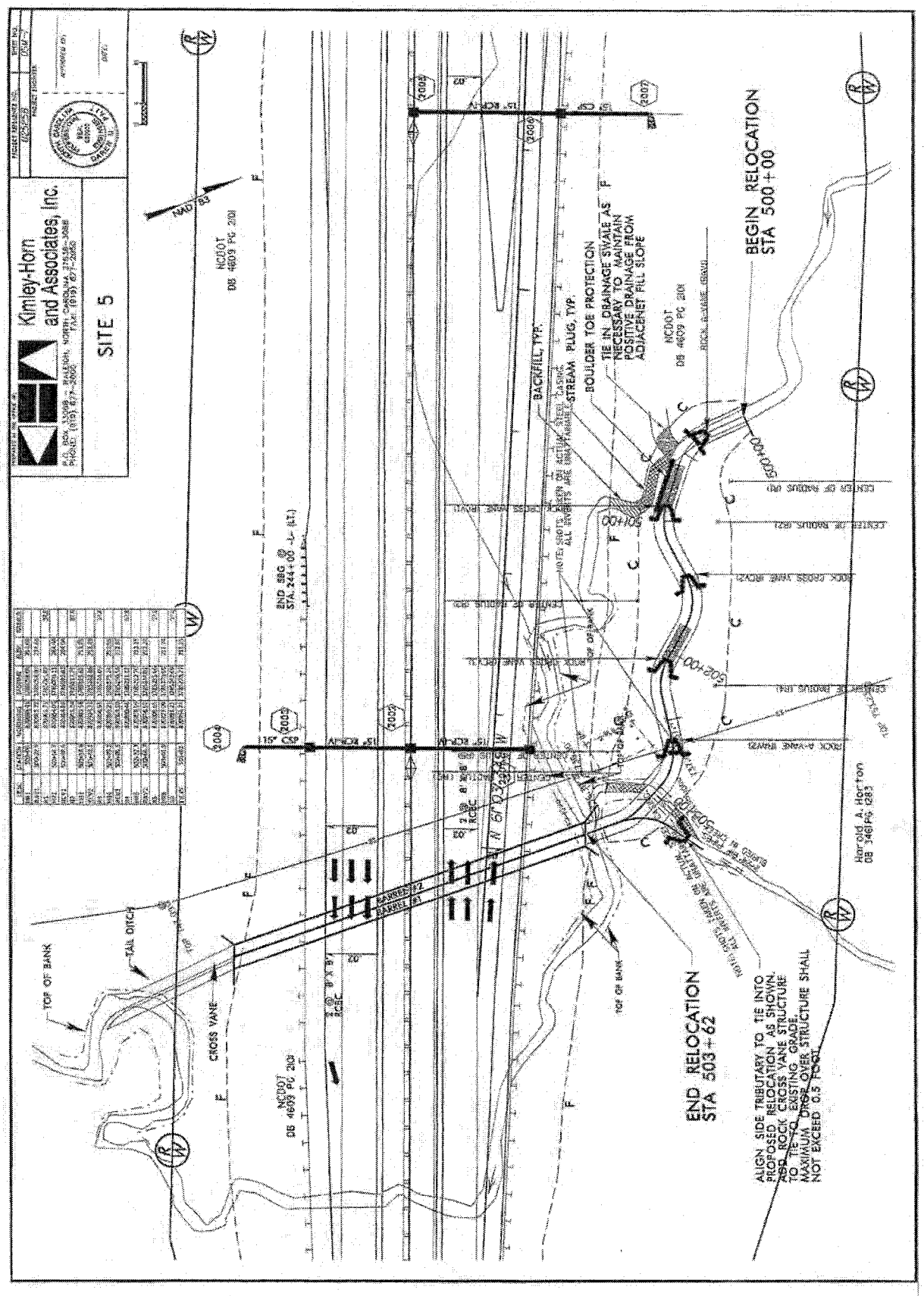
LOCATION	MITIGATION UNCLASSIFIED EXCAV. (CU.YD.)	MITIGATION EMBANKMENT	MITIGATION BORROW (CU.YD.)	MITIGATION WASTE (CU.YD.)
SITE 2	7,304	785	0	6,519
SITE 4	1,369	235	0	1,134
SITE 5	1,810	31	0	1,779
SUBTOTAL	10,483	1,051	0	9,432

APPROXIMATE QUANTITIES ONLY, MITIGATION UNCLASSIFIED EXCAVATION, MITIGATION BORROW EXCAVATION, MITIGATION FINE GRADING AND MITIGATION CLEARING AND GRUBBING WILL BE PAID FOR AT THE CONTRACT LUMP SUM PRICE FOR "GRADING FOR MITIGATION".

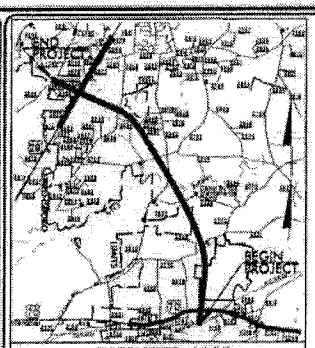

Kimley-Horn and Associates, Inc.
SITE 2
MATCHLINE STA 204+54 SEE SHEET OSM-5
DO NOT DISTURB WETLAND
BACKFILL, TYP.
STREAM PLUG, TYP.
CHORD
END RESTORATION/RELOCATION
STA 213+07


Kimley-Horn and Associates, Inc.
SITE 2
BEGIN RESTORATION/RELOCATION STA 200+00
TOE PROTECTION CLASS "B" RIPRAP SEE DETAIL "C"
DO NOT DISTURB WETLAND
BACKFILL, TYP.
STREAM PLUG, TYP.
MATCHLINE STA 204+54 SEE SHEET OSW-4


Kimley-Horn and Associates, Inc.
SITE 4
END RESTORATION STA 403+86
BEGIN SBG @ STA 218+00
END SBG @ STA 218+93
MAINTAIN DRAINAGE SWALE IN LOCATION OF OLD CHANNEL TO MAINTAIN POSITIVE DRAINAGE FROM STORMWATER OUTLET 160
SEE ROADWAY SHEET 18. TIE PROPOSED STORMWATER STEP POOL STRUCTURE TO ROCK CROSS VANE ARM
STREAM PLUG, TYP.
BACKFILL, TYP.
BEGIN RESTORATION STA 400+00


Kimley-Horn and Associates, Inc.
SITE 5
BEGIN RELOCATION
STA 500+00
END RELOCATION
STA 503+62
BACKFILL, TYP.
STREAM PLUG, TYP.
BOULDER TOE PROTECTION
TIE IN DRAINAGE SWALE AS NECESSARY TO MAINTAIN POSITIVE DRAINAGE FROM ADJACENET FILL SLOPE
NCDOT
DB 4609 PG 2101
END SBG @
STA. 244+00 -L- (LT.)
TOP OF BANK
TAIL DITCH
CROSS VANE
BARREL #2
BARREL #1
ALIGN SIDE TRIBUTARY TO TIE INTO PROPOSED RELOCATION AS SHOWN. ADD ROCK CROSS VANE STRUCTURE TO TIE TO EXISTING GRADE. MAXIMUM DROP OVER STRUCTURE SHALL NOT EXCEED 0.5 FOOT.
Harold A. Horton
DB 3461 PG 1283

TIP PROJECT: U-2525B



VICINITY MAP

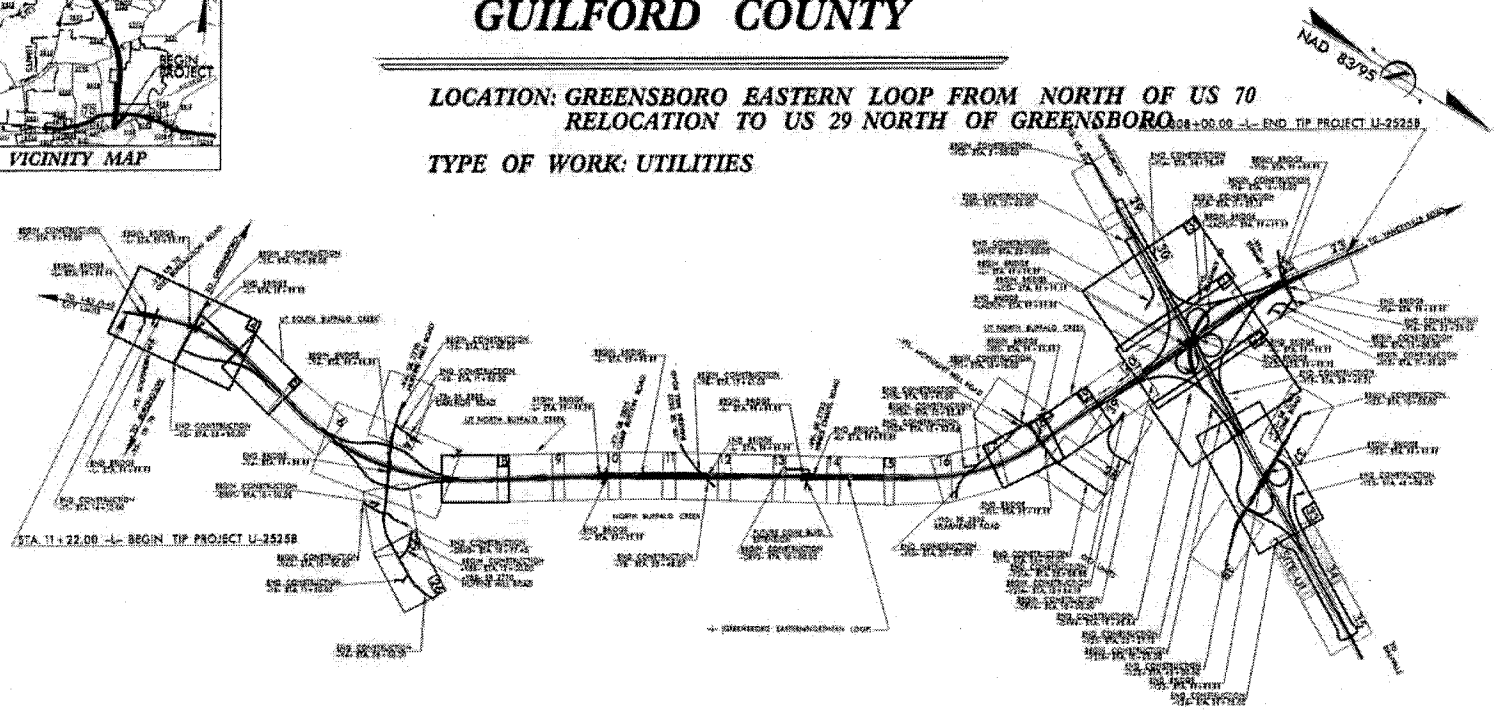
T.I.P. NO.	SHEET NO.
U-2525B	UEP-1

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

UTILITY ENVIROMENTAL PLANS
GUILFORD COUNTY

LOCATION: GREENSBORO EASTERN LOOP FROM NORTH OF US 70 RELOCATION TO US 29 NORTH OF GREENSBORO

TYPE OF WORK: UTILITIES



GRAPHIC SCALES

50 25 0 50 100
PLANS

50 25 0 50 100
PROFILE (HORIZONTAL)

10 5 0 10 20
PROFILE (VERTICAL)

INDEX OF SHEETS

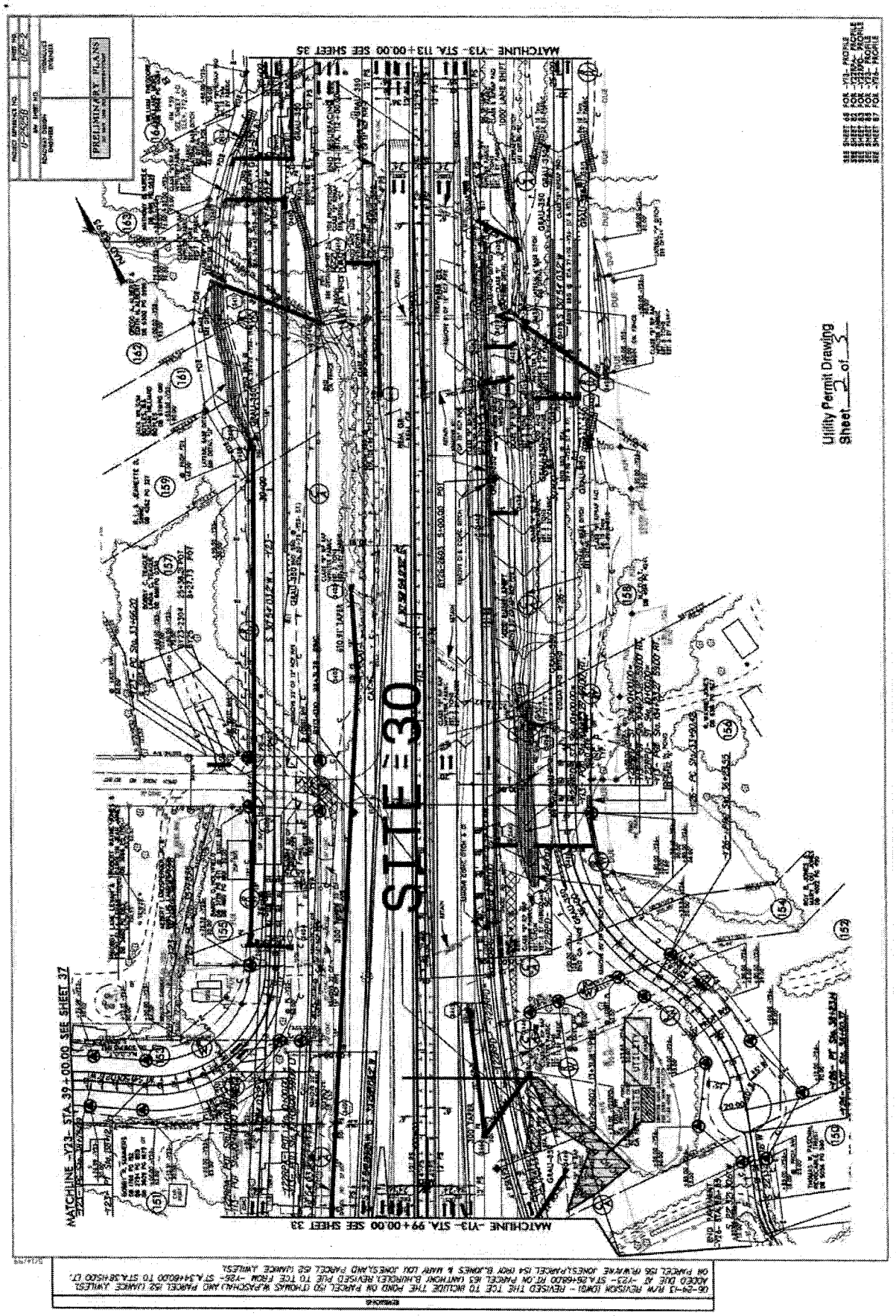
SHEET NO.	DESCRIPTION
UEP-1	TITLE SHEET
UEP-2	UTILITY IMPACT SITE 1

Utility Permit Drawing
Sheet 1 of 3

PREPARED IN THE OFFICE OF:
DIVISION OF HIGHWAYS
UTILITIES UNIT
UTILITIES ENGINEERING

1511 MAIL SERVICES CENTER
RALEIGH, NC 27699-1511
PHONE (919) 715-4000
FAX (919) 715-4151

Roger Worthington, P.E. UTILITIES SECTION ENGINEER
Steve McKee, P.E. UTILITIES SQUAD LEADER PROJECT ENGINEER
Jamshid Hafshejani UTILITIES PROJECT DESIGNER


MATCHLINE -Y23- STA. 39+00.00 SEE SHEET 37
MATCHLINE -Y13- STA. 99+00.00 SEE SHEET 33
MATCHLINE -Y13- STA. 113+00.00 SEE SHEET 35
SITE 30
PRELIMINARY PLANS
Utility Permit Drawing
Sheet 2 of 3

WETLAND PERMIT IMPACT SUMMARY

			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Site No	Station (From/To)	Structure Size / Type	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	69+08/100+73 -L-	UTILITIES SITE 1					0.12					
TOTALS							0.12					

Utility Permit Drawing
Sheet 3 of 3

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

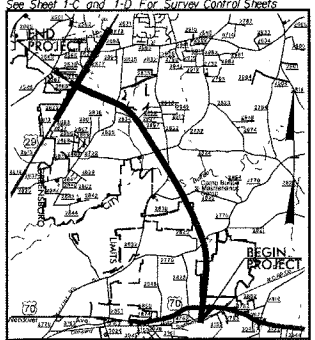
GUILFORD COUNTY
PROJECT: 34923.1.1 (U-2526B)

P-51

TIP PROJECT: U-2525B

CONTRACT:

See Sheet 1-A For Index of Sheets
See Sheet 1-B For Conventional Plan Sheet Symbols
See Sheet 1-C and 1-D For Survey Control Sheets



VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

GUILFORD COUNTY

LOCATION: GREENSBORO EASTERN LOOP FROM NORTH OF US 70 RELOCATION TO US 29 NORTH OF GREENSBORO

TYPE OF WORK: GRADING, DRAINAGE, PAVING, SIGNALS, CULVERTS, RETAINING WALLS, AND STRUCTURES

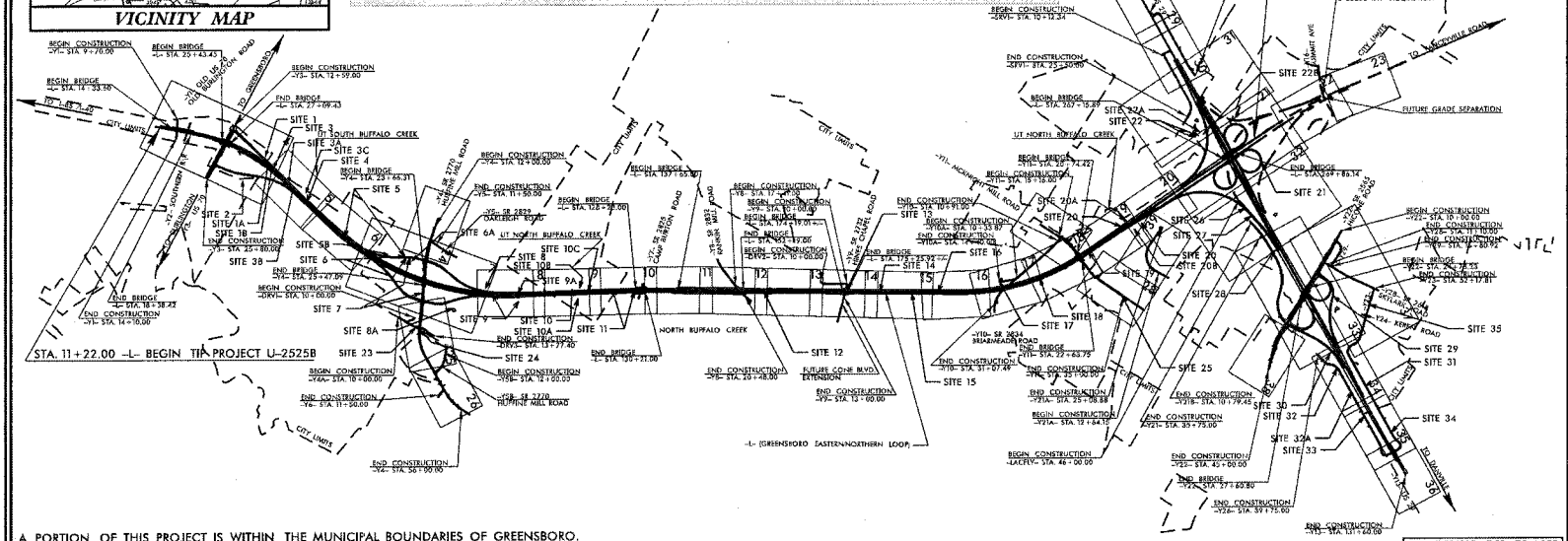
PERMIT DRAWINGS
SHEET 1 OF 93

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-2525B	1	

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
34821.1.3		PE
34821.2.3		R/W & UTILITIES

NAD 83/95

WETLAND AND SURFACE WATER IMPACTS PERMIT



A PORTION OF THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF GREENSBORO.
THIS IS A CONTROLLED-ACCESS PROJECT WITH ACCESS BEING LIMITED TO INTERCHANGES.
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD III.

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

GRAPHIC SCALES

50 25 0 50 100 — PLANS

50 25 0 50 100 — PROFILE (HORIZONTAL)

10 5 0 10 20 — PROFILE (VERTICAL)

DESIGN DATA

ADT 2014 = N/A
ADT 2030 = 20000
DHV = 10 %
D = 60 %
T = 16 % *
V = 70 MPH

* TTST 5% DUAL 11%
FUNC CLASS = INTERSTATE
"STATEWIDE TIER"

PROJECT LENGTH

LENGTH ROADWAY TIP PROJECT U-2525B	=	4.504 Miles
LENGTH STRUCTURE TIP PROJECT U-2525B	=	0.492 Miles
TOTAL LENGTH OF TIP PROJECT U-2525B	=	4.996 Miles

Prepared in the Office of:
DIVISION OF HIGHWAYS
1000 Birch Ridge Dr., Raleigh NC, 27610

2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE: MAY 22, 2012

LETTING DATE: MAY 20, 2014

JAMES A. SPEER, PE
PROJECT ENGINEER

DANIEL W. GARDNER JR., PE
PROJECT DESIGN ENGINEER

HYDRAULICS ENGINEER

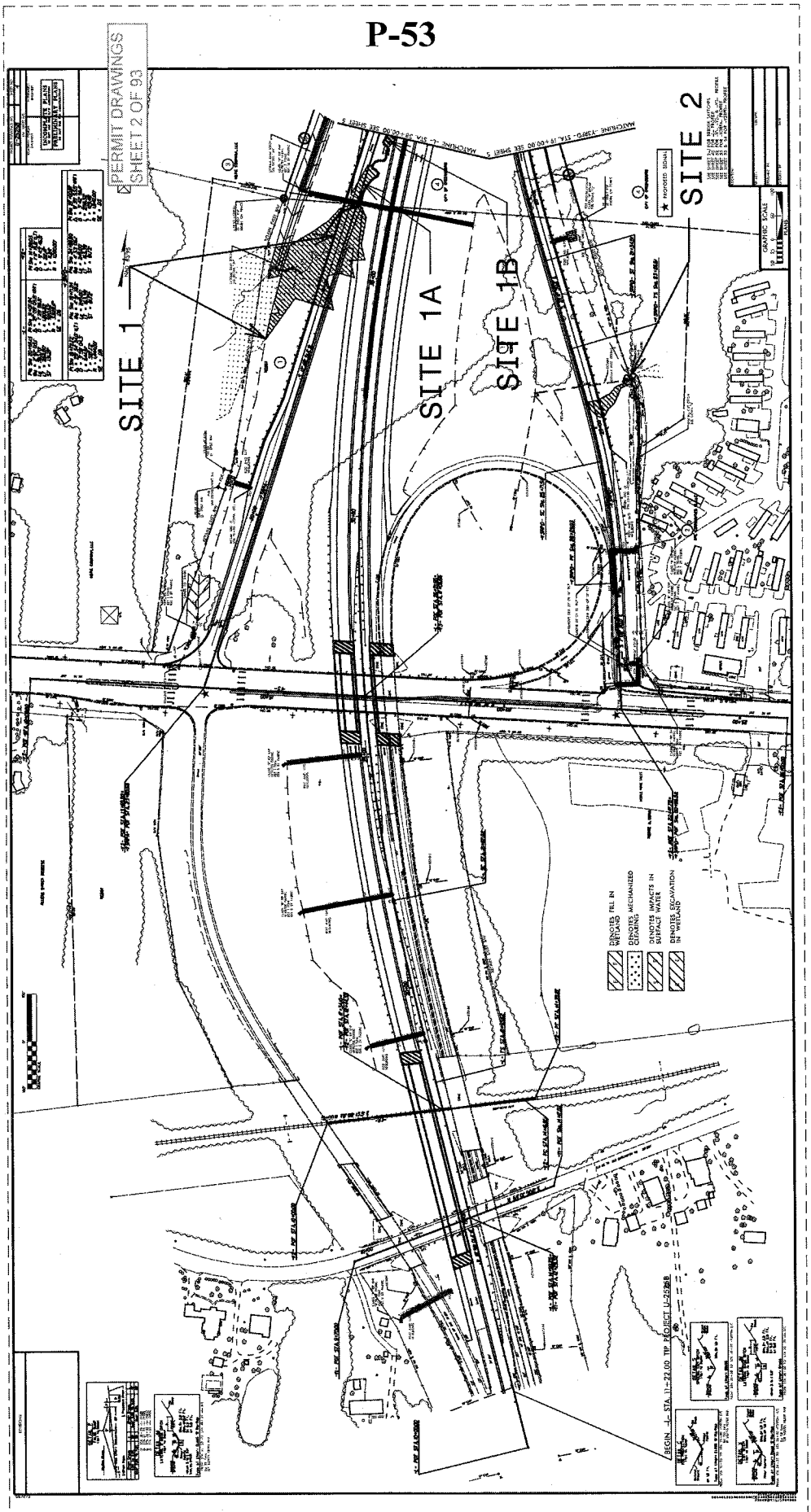
SIGNATURE P.E.

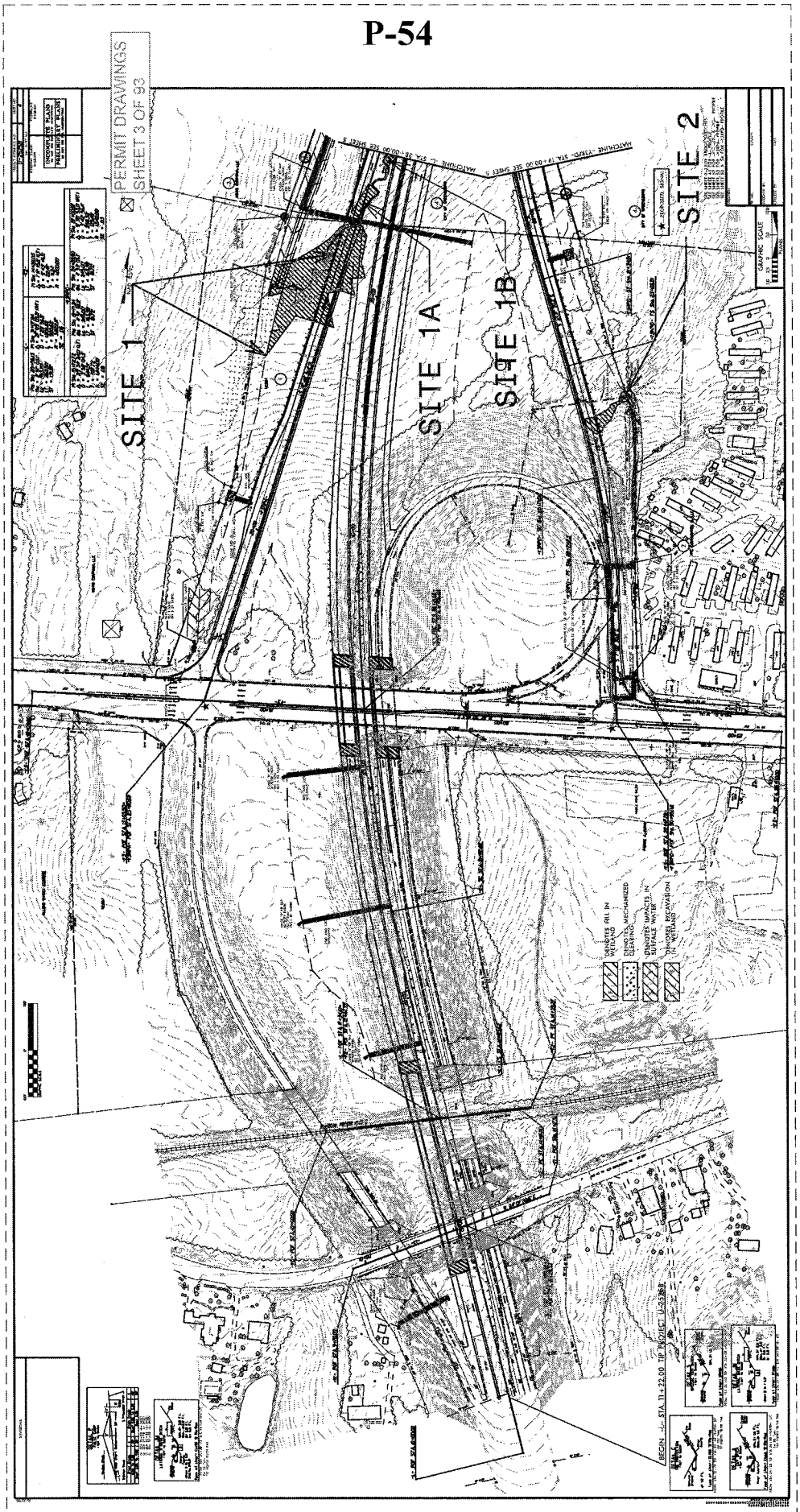
ROADWAY DESIGN ENGINEER

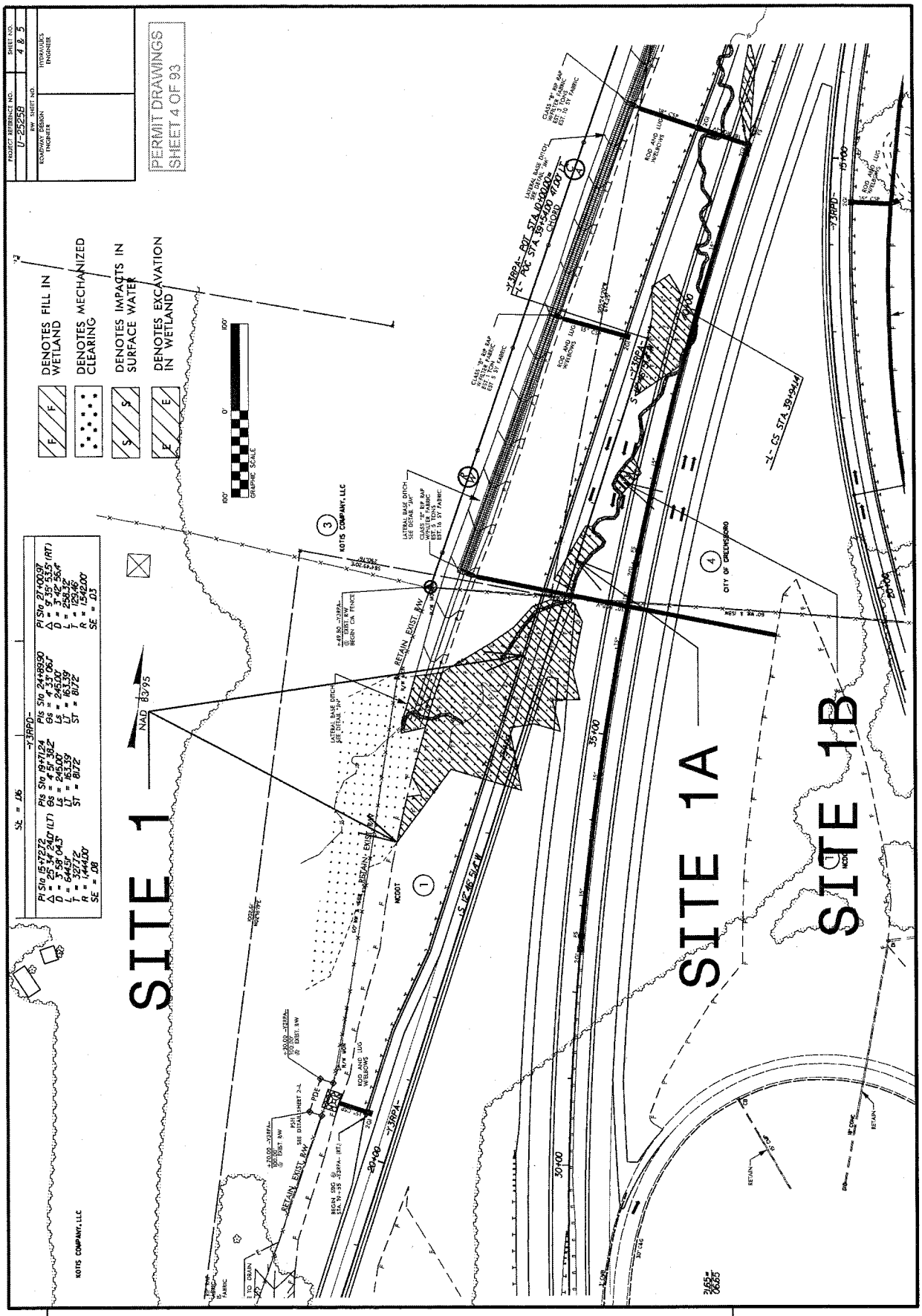
SIGNATURE P.E.

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

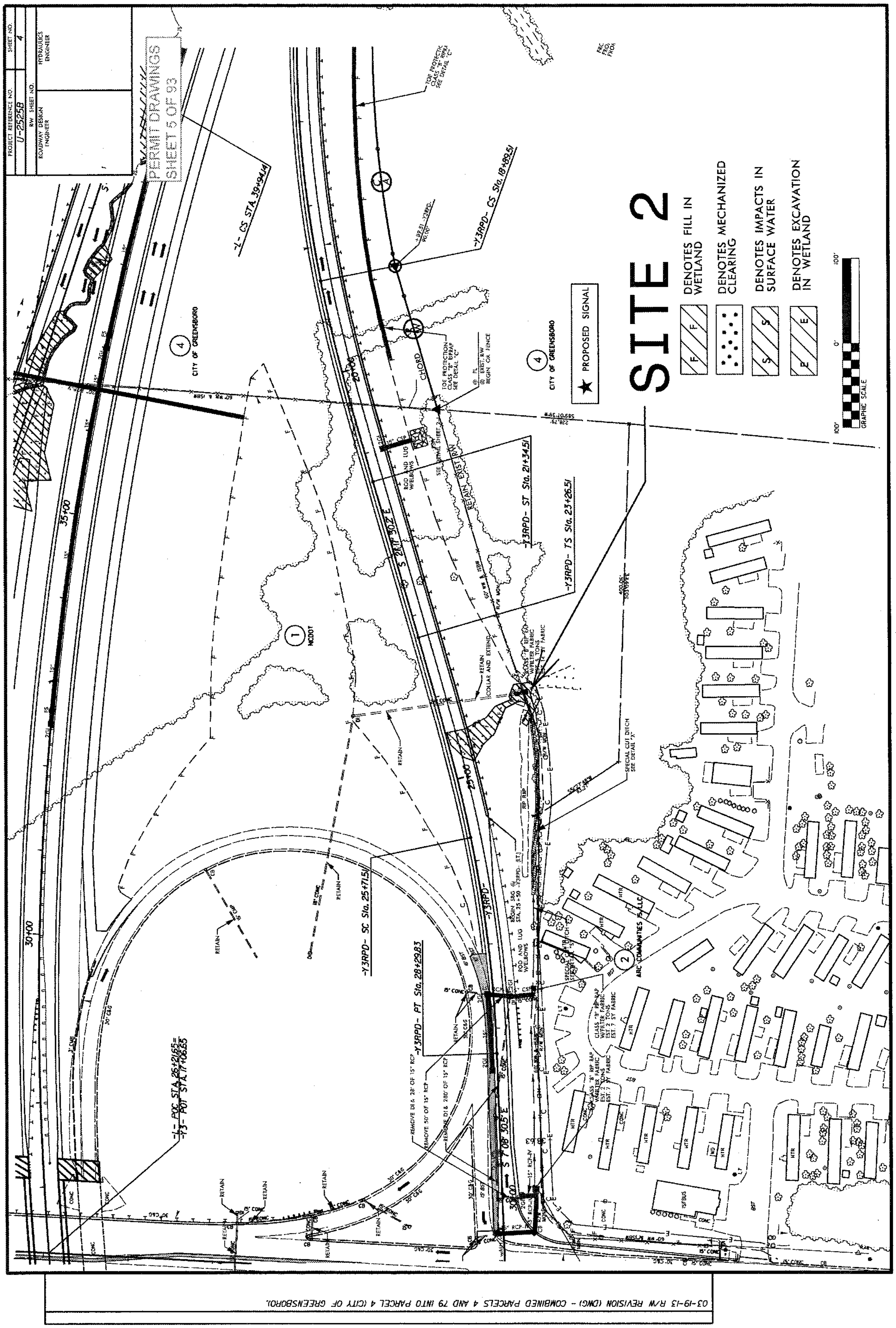
$$$$$$$$SCTNME$$$$$$
$$$$$$$$SCTNUM$$$$$$
$$$$$$$$USERNAME$$$$$$

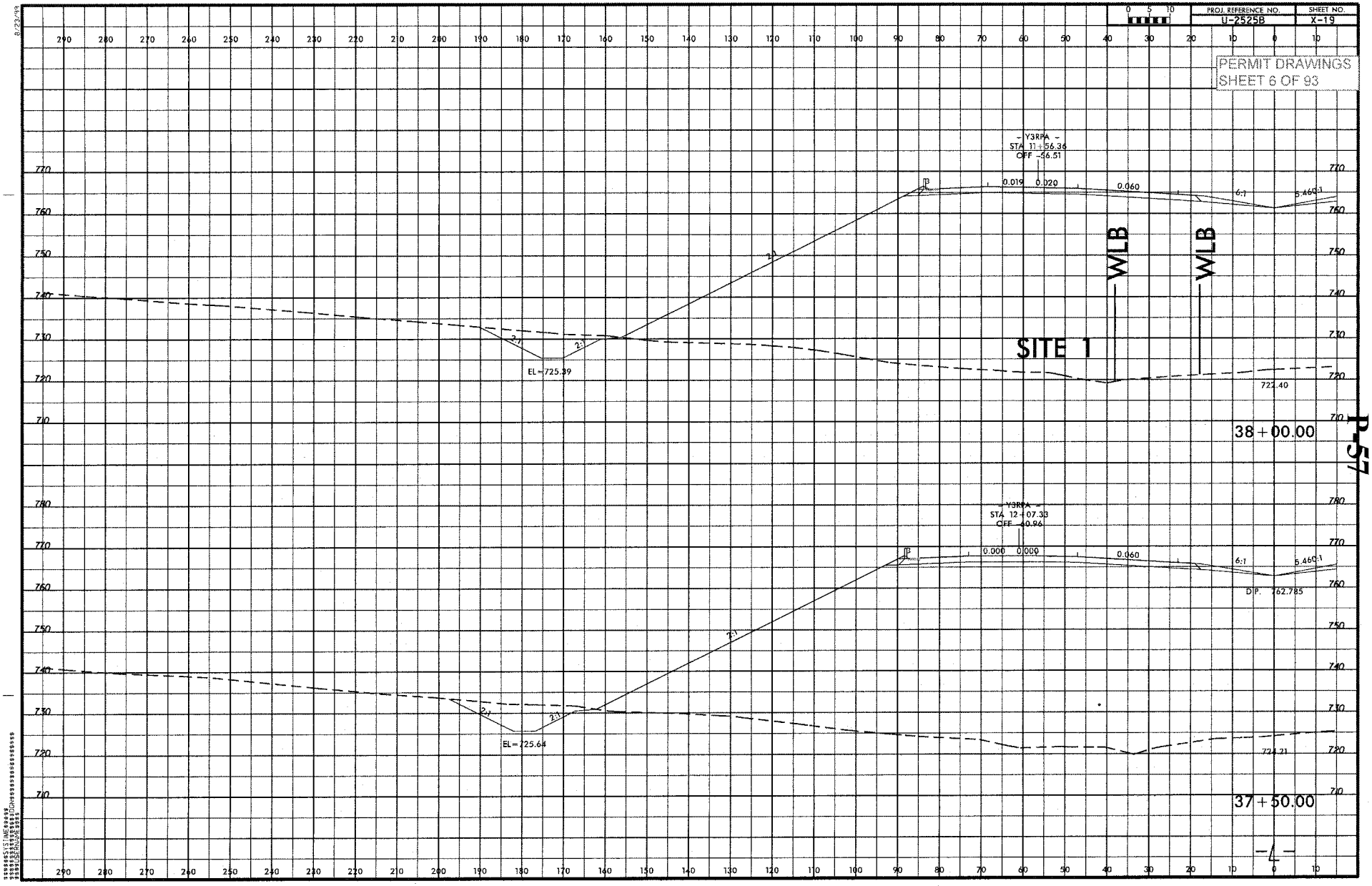

PERMIT DRAWINGS
SHEET 2 OF 93
SITE 1
SITE 1A
SITE 1B
SITE 2
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
BEGIN ⊥ STA. 11+22.00 TIP PROJECT U-2528B


PERMIT DRAWINGS
SHEET 3 OF 93
SITE 1
SITE 1A
SITE 1B
SITE 2
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND


PERMIT DRAWINGS
SHEET 4 OF 93
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
GRAPHIC SCALE
SITE 1
SITE 1A
SITE 1B
NAD 83/95
KOTIS COMPANY, LLC
CITY OF GREENSBORO
RETAIN EXIST. R/W
03-19-13 R/W REVISION (DWG) - COMBINED PARCELS 4 AND 79 INTO PARCEL 4 (CITY OF GREENSBORO).

P-56

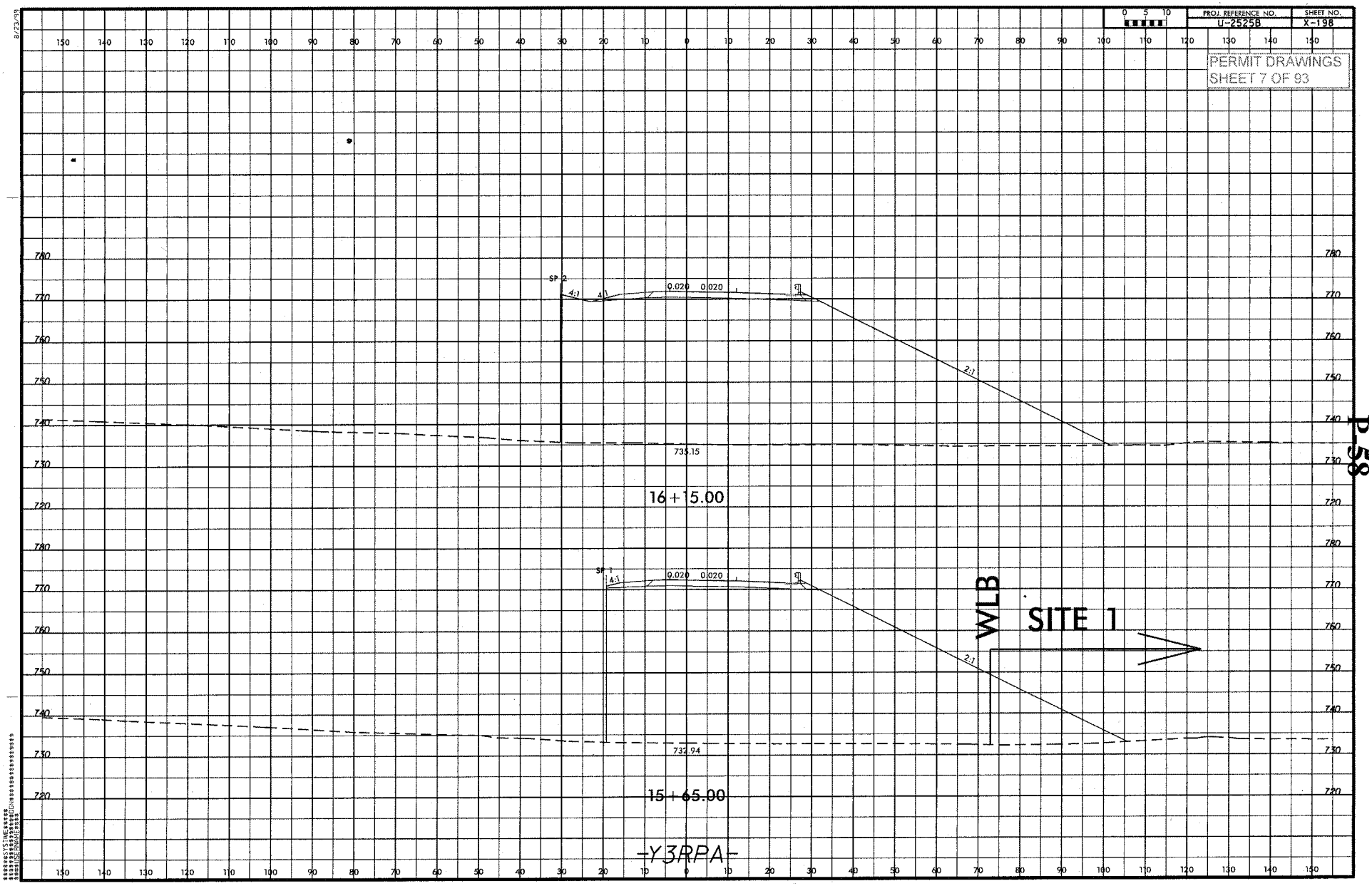

PROJECT REFERENCE NO.
U-2525B
SHEET NO.
4
RW SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PERMIT DRAWINGS
SHEET 5 OF 93
SITE 2
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
PROPOSED SIGNAL
GRAPHIC SCALE
CITY OF GREENSBORO
NCDOT
-L- CS STA. 39+94.14
-Y3RPD- CS Sta. 18+89.51
-Y3RPD- ST Sta. 21+34.51
-Y3RPD- TS Sta. 23+26.51
-Y3RPD- SC Sta. 25+71.51
-Y3RPD- PT Sta. 28+29.83
-L- POC STA. 26+21.65=
-Y3- POT STA. 11+06.65
ARC COMMUNITIES 7 LLC
03-19-13 R/W REVISION (DWG) - COMBINED PARCELS 4 AND 79 INTO PARCEL 4 (CITY OF GREENSBORO).

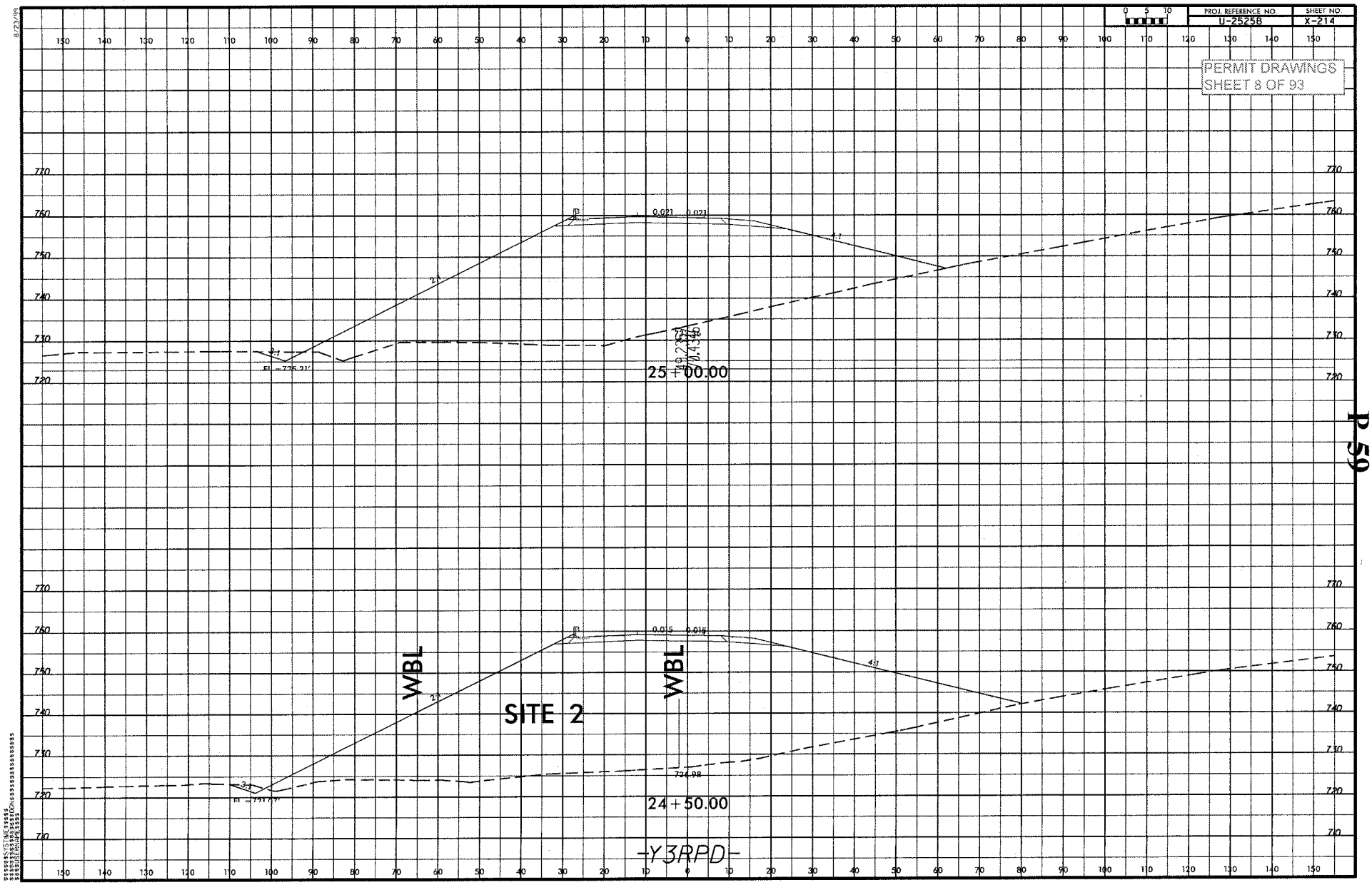

PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-19
PERMIT DRAWINGS
SHEET 6 OF 93
- Y3RPA -
STA 11+56.36
OFF -56.51
0.019
0.020
0.060
6:1
5.460:1
2:1
EL=725.39
722.40
WLB
WLB
SITE 1
38+00.00
- Y3RPA -
STA 12+07.33
OFF -60.96
0.000
0.000
0.060
6:1
5.460:1
D.P. 762.785
EL=725.64
724.21
37+50.00
-L-

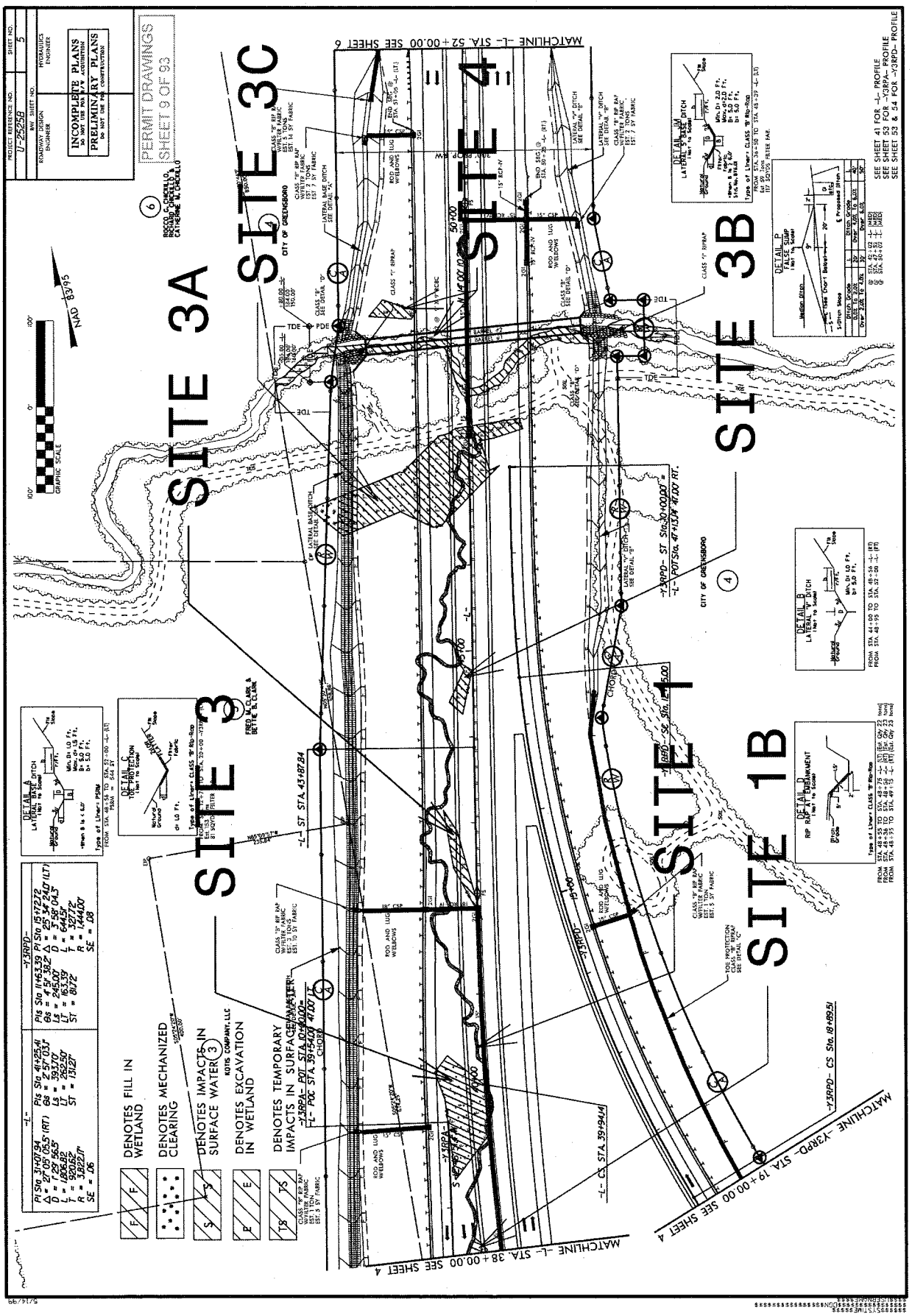
P-57

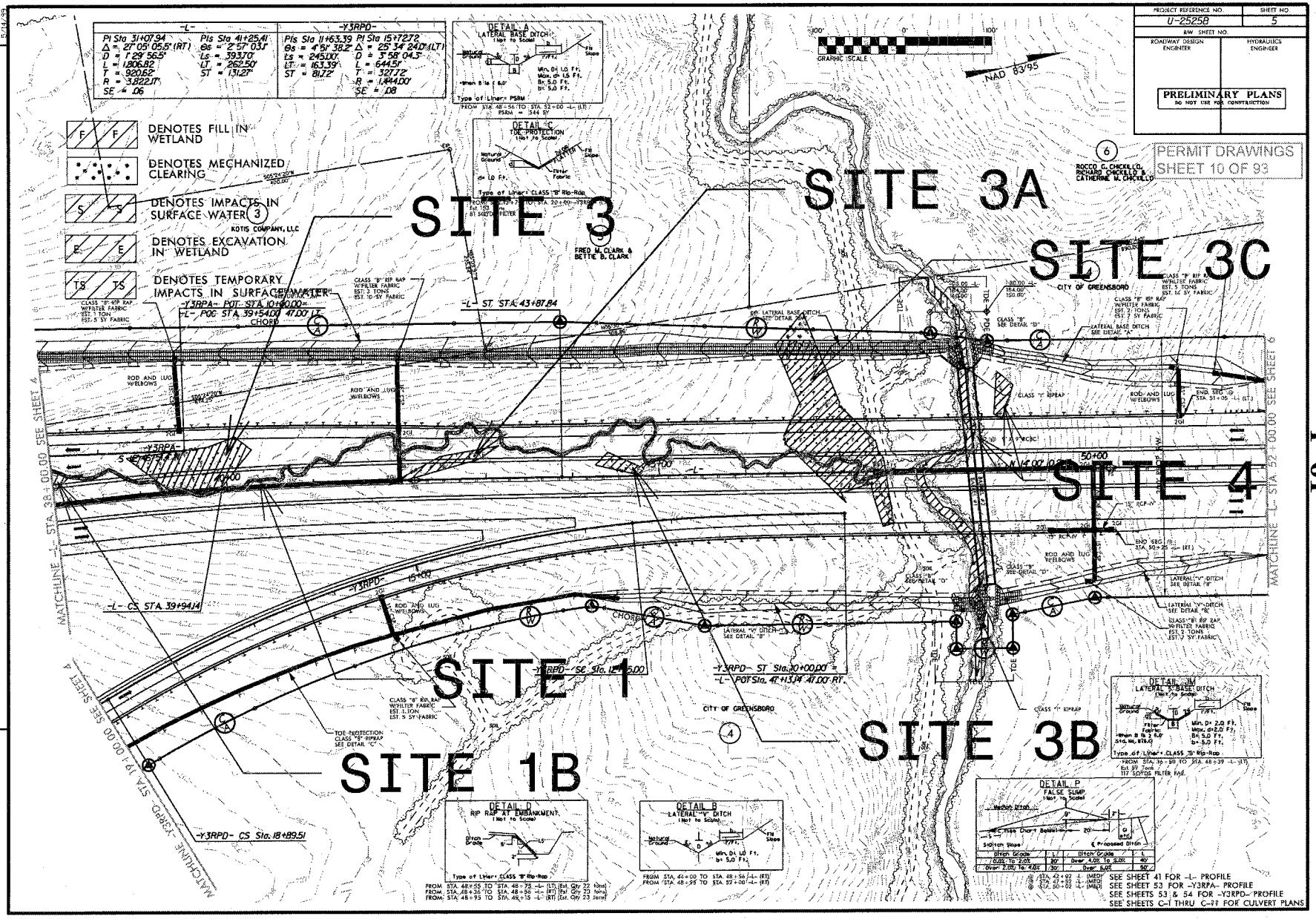
PROJ. REFERENCE NO.	SHEET NO.
U-2525B	X-198

PERMIT DRAWINGS
SHEET 7 OF 93

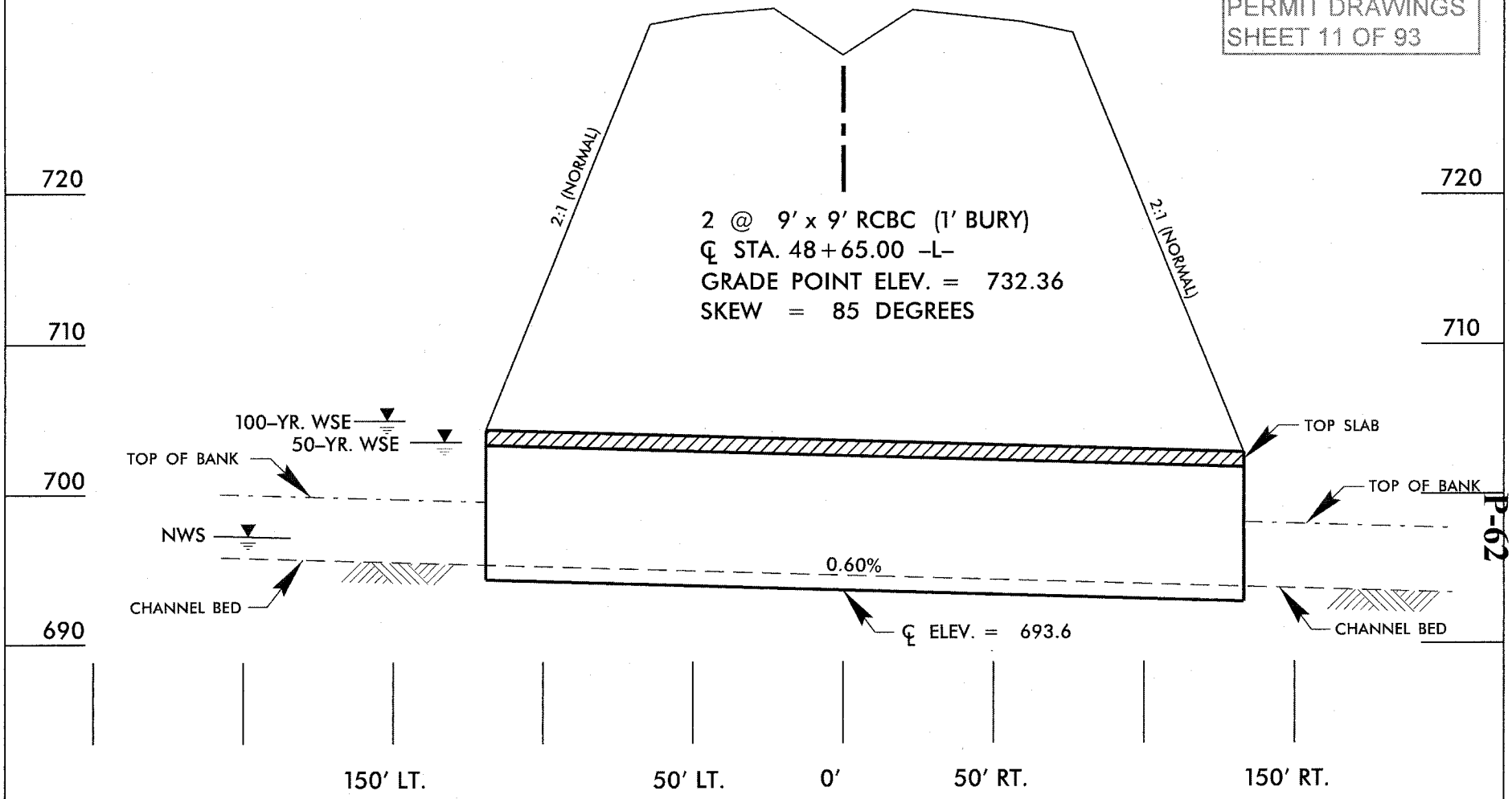



PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-214
PERMIT DRAWINGS
SHEET 8 OF 93
25+00.00
24+50.00
WBL
WBL
SITE 2
-Y3RPD-


PERMIT DRAWINGS
SHEET 9 OF 93
INCOMPLETE PLANS
PRELIMINARY PLANS
SITE 3A
SITE 3C
SITE 4
SITE 3B
SITE 3
SITE 1
SITE 1B
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
MATCHLINE -L- STA. 52+00.00 SEE SHEET 6
MATCHLINE -L- STA. 38+00.00 SEE SHEET 4
MATCHLINE -Y3RPD- STA. 19+00.00 SEE SHEET 4
SEE SHEET 41 FOR -L- PROFILE
SEE SHEET 53 FOR -Y3RPA- PROFILE
SEE SHEET 53 & 54 FOR -Y3RPD- PROFILE
GRAPHIC SCALE
NAD 83/95


PROJECT REFERENCE NO.
U-2525B
SHEET NO.
5
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PERMIT DRAWINGS
SHEET 10 OF 93
GRAPHIC SCALE
NAD 83/95
-L-
PI Sta 31+07.94
Δ = 27° 05' 05.5" (RT)
D = 1° 29' 56.5"
L = 1,806.82'
T = 920.62'
R = 3,822.11'
SE = .06
PIs Sta 41+25.41'
Es = 2° 57' 03.5"
Ls = 393.70'
LT = 262.50'
ST = 131.21'
-Y3RPD-
PIs Sta 11+63.39
Es = 4° 51' 38.2"
Ls = 245.00'
LT = 163.39'
ST = 81.72'
PI Sta 15+72.72
Δ = 25° 34' 24.0" (LT)
D = 3° 58' 04.5"
L = 644.51'
T = 321.72'
R = 1,444.00'
SE = .08
DETAIL A
LATERAL BASE DITCH
(Not to Scale)
Type of Liner: PSRM
FROM STA. 48+56 TO STA. 52+00 -L- (LT)
PSRM = 544 SY
DETAIL C
TOE PROTECTION
(Not to Scale)
Type of Liner: CLASS "B" Rip-Rap
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
KOTIS COMPANY, LLC
FRED W. CLARK & BETTIE B. CLARK
ROCCO G. CHICKILLO, RICHARD CHICKILLO & CATHERINE M. CHICKILLO
CITY OF GREENSBORO
SITE 3
SITE 3A
SITE 3C
SITE 4
SITE 1
SITE 1B
SITE 3B
-Y3RPA- POT STA. 10+00.00
-L- POC STA. 39+54.00 47.00' LT
-L- ST STA. 43+87.84
-L- CS STA. 39+94.14
-Y3RPD- ST Sta. 30+00.00
-L- POT Sta. 47+13.14 47.00' RT
-Y3RPD- CS Sta. 18+89.51
MATCHLINE -L- STA. 38+00.00 SEE SHEET 4
MATCHLINE -L- STA. 52+00.00 SEE SHEET 6
MATCHLINE -Y3RPD- STA. 19+00.00 SEE SHEET 4
DETAIL D
RIP RAP AT EMBANKMENT
(Not to Scale)
Type of Liner: CLASS "B" Rip-Rap
FROM STA. 48+55 TO STA. 48+75 -L- (LT) (Est. Qty 22 tons)
FROM STA. 48+36 TO STA. 48+50 -L- (RT) (Est. Qty 20 tons)
FROM STA. 48+93 TO STA. 49+15 -L- (RT) (Est. Qty 23 tons)
DETAIL B
LATERAL "V" DITCH
(Not to Scale)
FROM STA. 44+00 TO STA. 48+56 -L- (RT)
FROM STA. 48+95 TO STA. 57+00 -L- (RT)
DETAIL M
LATERAL "V" BASE DITCH
(Not to Scale)
Type of Liner: CLASS "B" Rip-Rap
FROM STA. 39+50 TO STA. 48+39 -L- (LT)
Est. 87 Tons
117 SQ.YDS. FILTER FABRIC
DETAIL P
FALSE SUMP
(Not to Scale)
Proposed Ditch
Ditch Grade
Over 0.02 To 2.0%
Over 2.0% To 4.0%
Over 4.0% To 8.0%
Over 8.0%
SEE SHEET 41 FOR -L- PROFILE
SEE SHEET 53 FOR -Y3RPA- PROFILE
SEE SHEETS 53 & 54 FOR -Y3RPD- PROFILE
SEE SHEETS C-1 THRU C-9 FOR CULVERT PLANS
REVISIONS
03-19-13 R/W REVISION (DWG) - COMBINED PARCELS 4 AND 79 INTO PARCEL 4 (CITY OF GREENSBORO).

PERMIT DRAWINGS
SHEET 11 OF 93



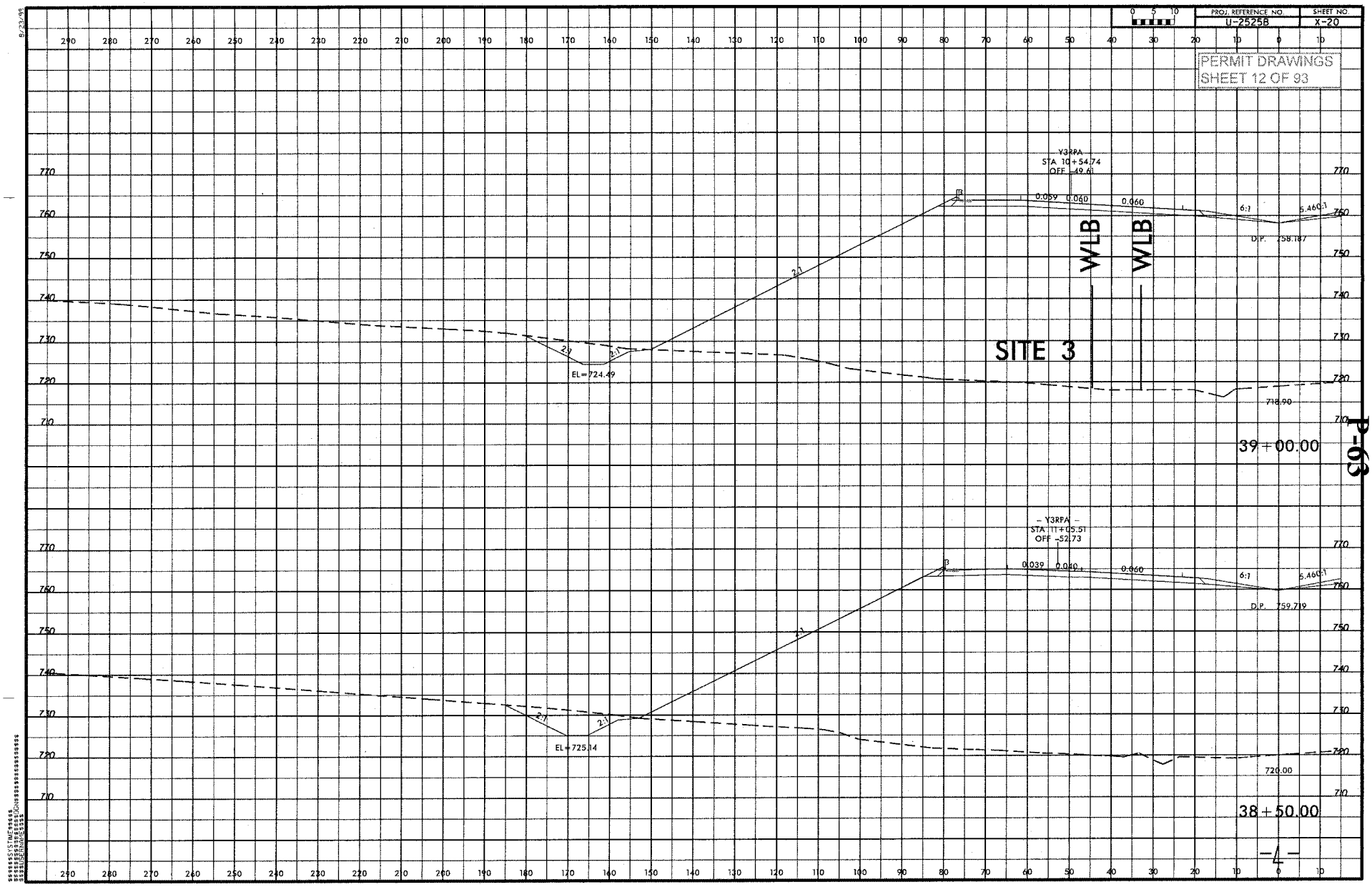
PROFILE

P-62

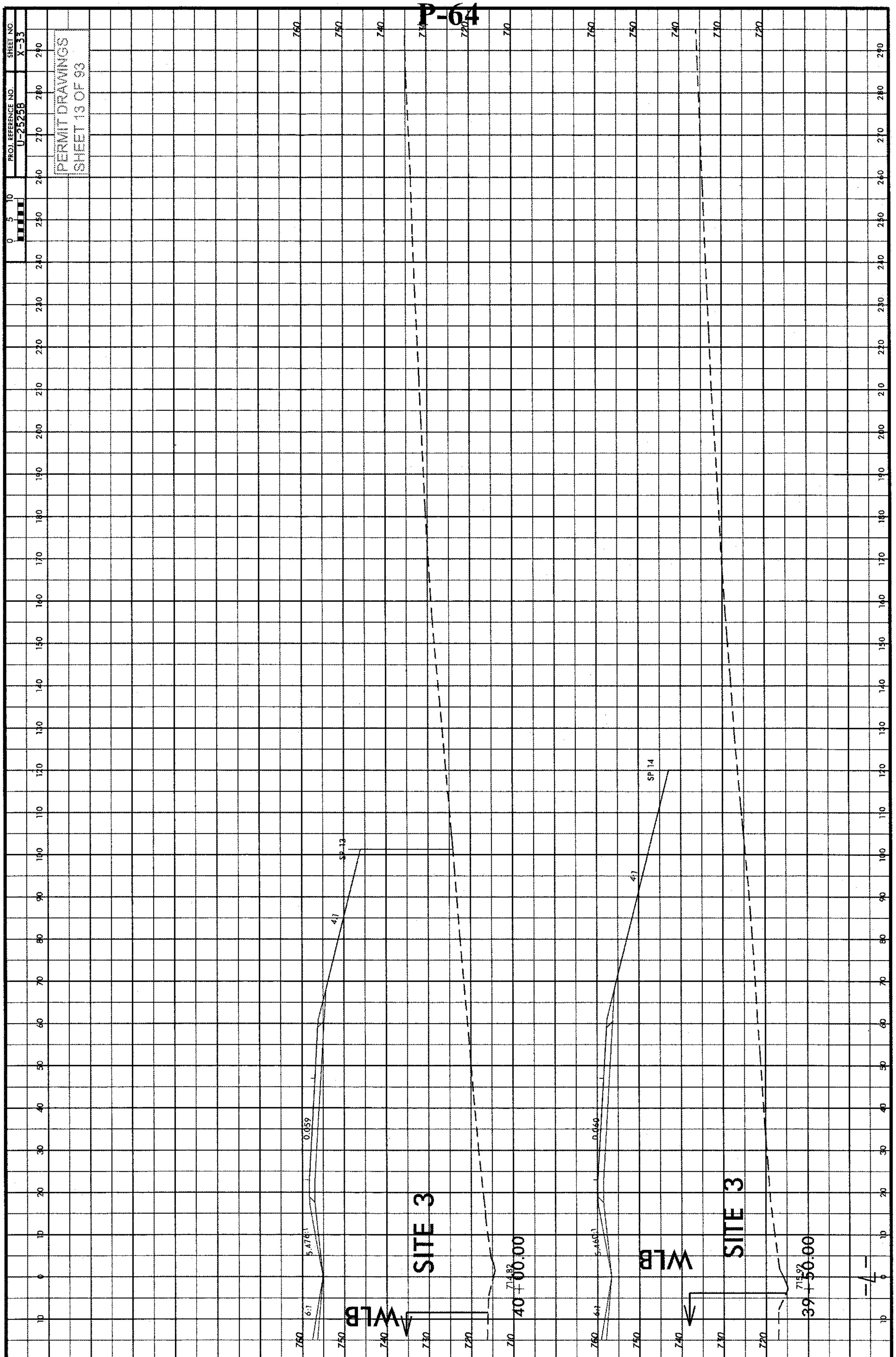
NCDOT

DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34821.1.1 (U-2525B)
GREENSBORO EASTERN LOOP
FROM NORTH OF US 70
RELOCATION TO US 29 NORTH
OF GREENSBORO

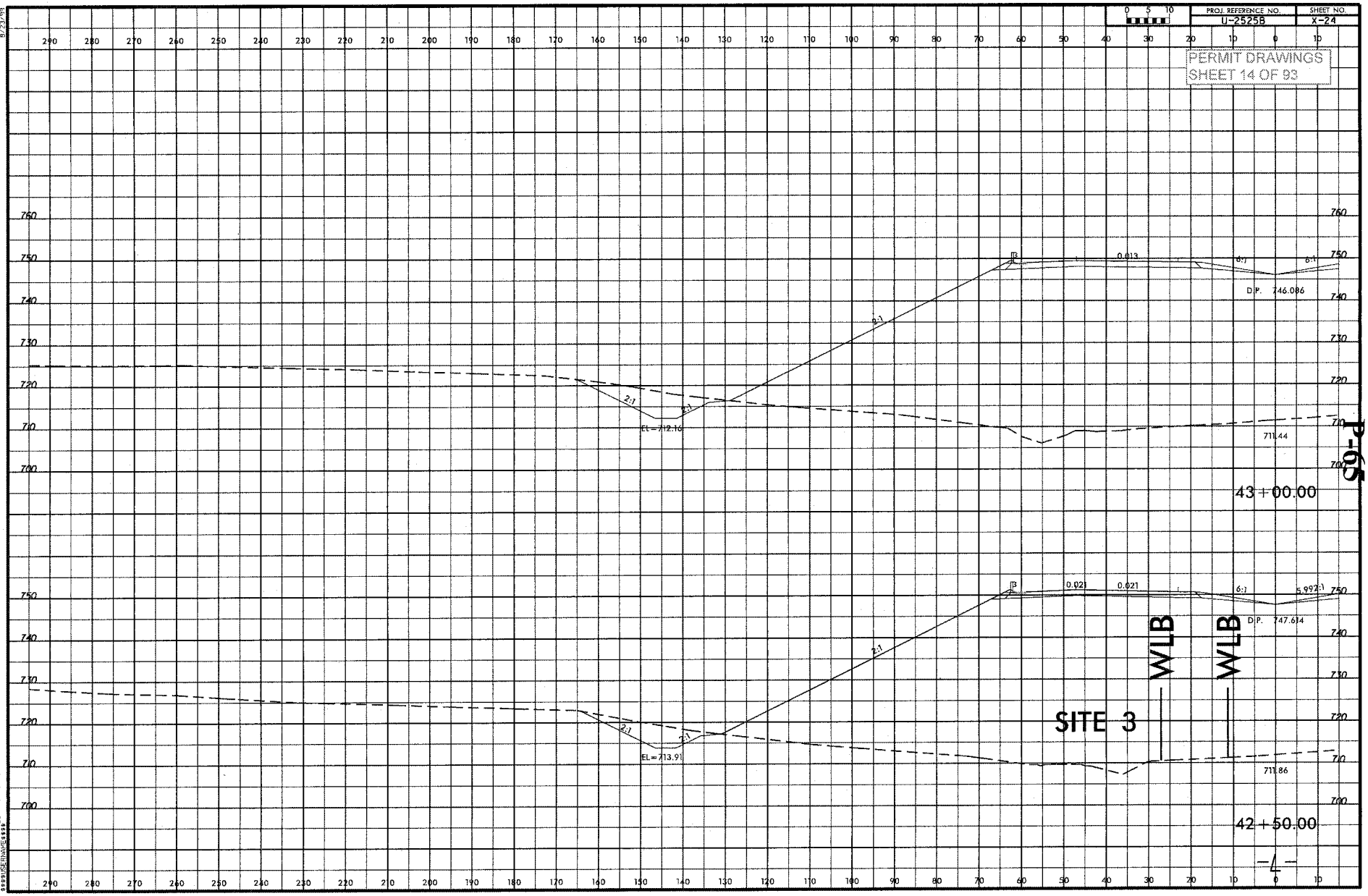
SHEET OF 03/08/13


PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-20
PERMIT DRAWINGS
SHEET 12 OF 93
Y3RPA
STA 10+54.74
OFF -49.61
0.059
0.060
0.060
6:1
5.460:1
D.P. 758.187
WLB
WLB
SITE 3
2:1
EL=724.49
718.90
39+00.00
Y3RPA
STA 11+05.51
OFF -52.73
0.039
0.040
0.060
6:1
5.460:1
D.P. 759.719
EL=725.14
720.00
38+50.00
-L-

P-63

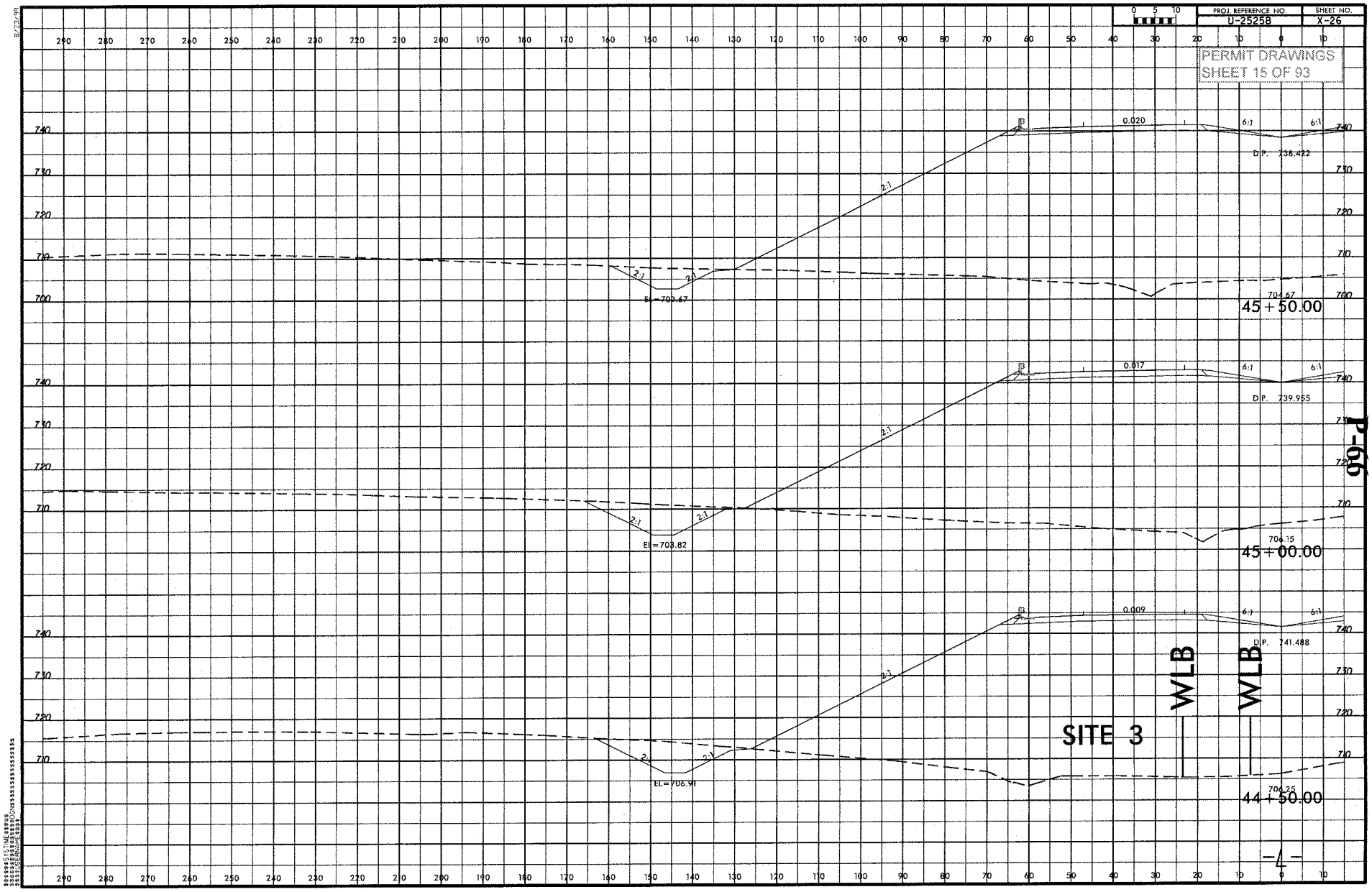


PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-33
PERMIT DRAWINGS
SHEET 13 OF 93
SITE 3
WLB
40+00.00
714.82
SP 13
4:1
0.059
5.47:1
6:1
SITE 3
WLB
39+50.00
715.92
SP 14
4:1
0.060
5.46:1
6:1
8/23/99



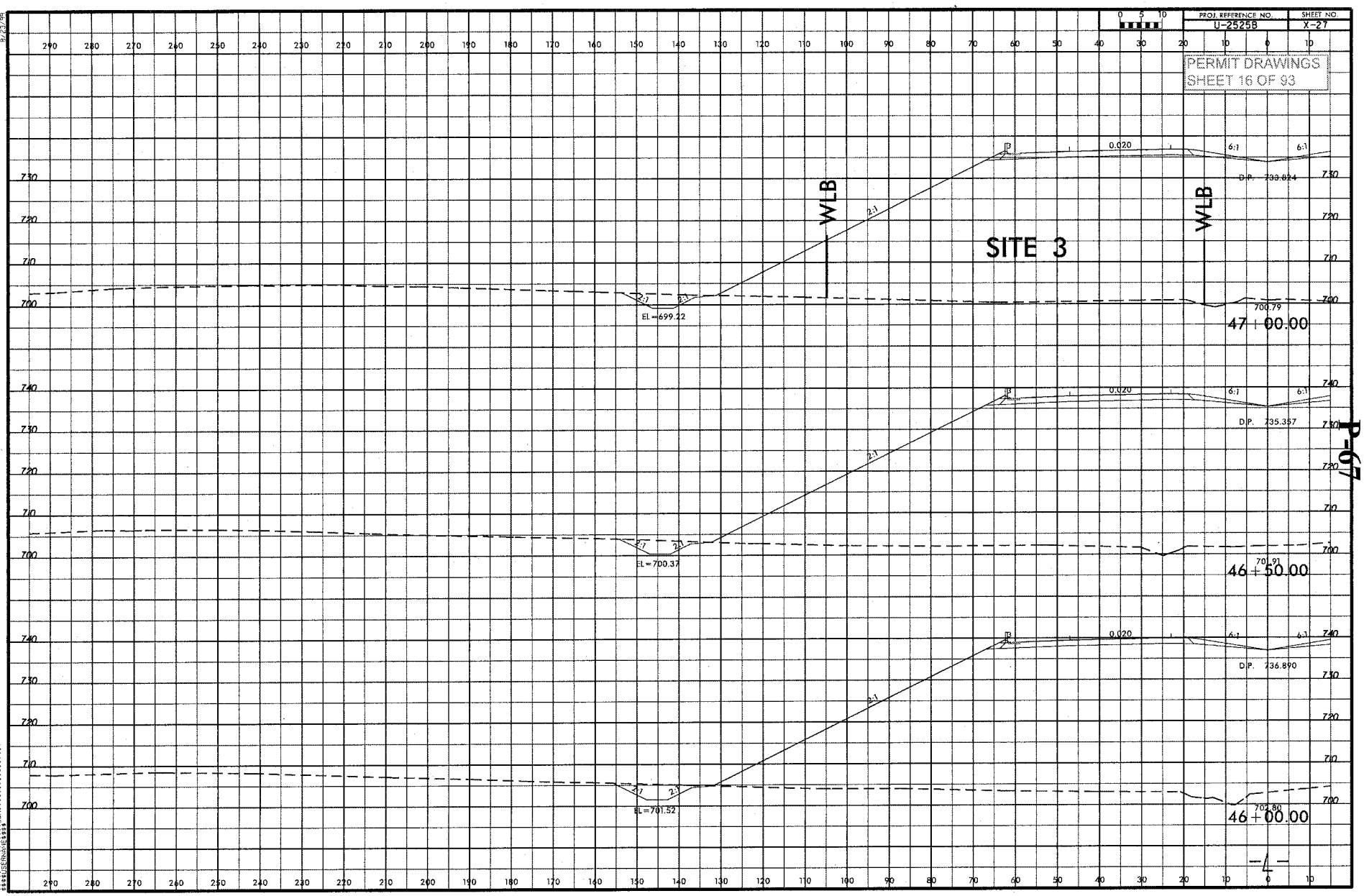
PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-24
PERMIT DRAWINGS
SHEET 14 OF 93
0.013
6:1
D.P. 746.086
2:1
EL=712.16
711.44
43+00.00
0.021
5.992:1
D.P. 747.614
WLB
WLB
SITE 3
EL=713.91
711.86
42+50.00
-L-

P-65

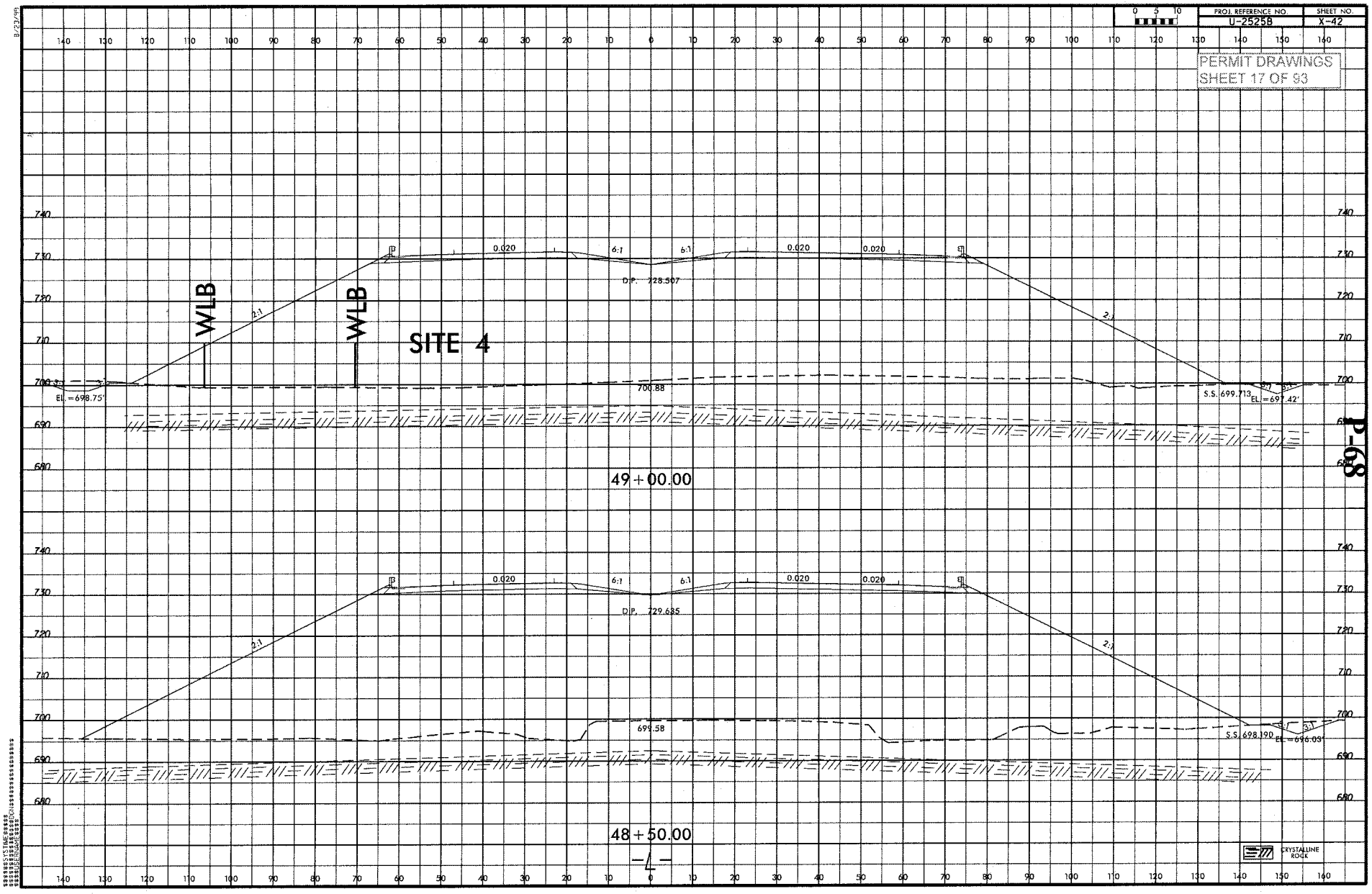


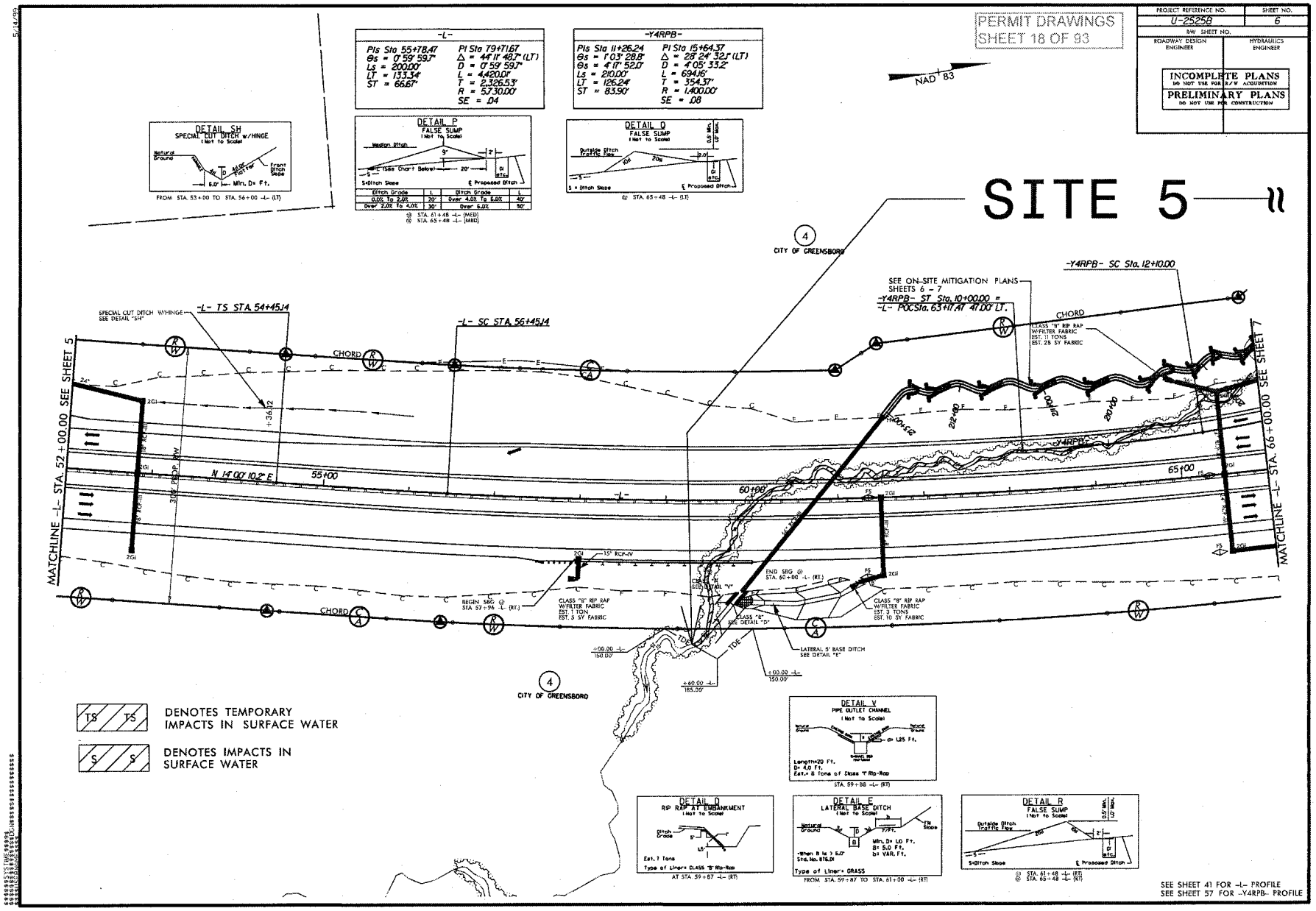
PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-26
PERMIT DRAWINGS
SHEET 15 OF 93
0.020
6:1
6:1
D.P. 738.422
2:1
2:1
2:1
EL=702.67
704.67
45+50.00
0.017
6:1
6:1
D.P. 739.955
2:1
2:1
2:1
EL=703.82
706.15
45+00.00
0.009
6:1
6:1
D.P. 741.488
2:1
2:1
2:1
EL=706.91
706.25
44+50.00
WLB
WLB
SITE 3
-L-

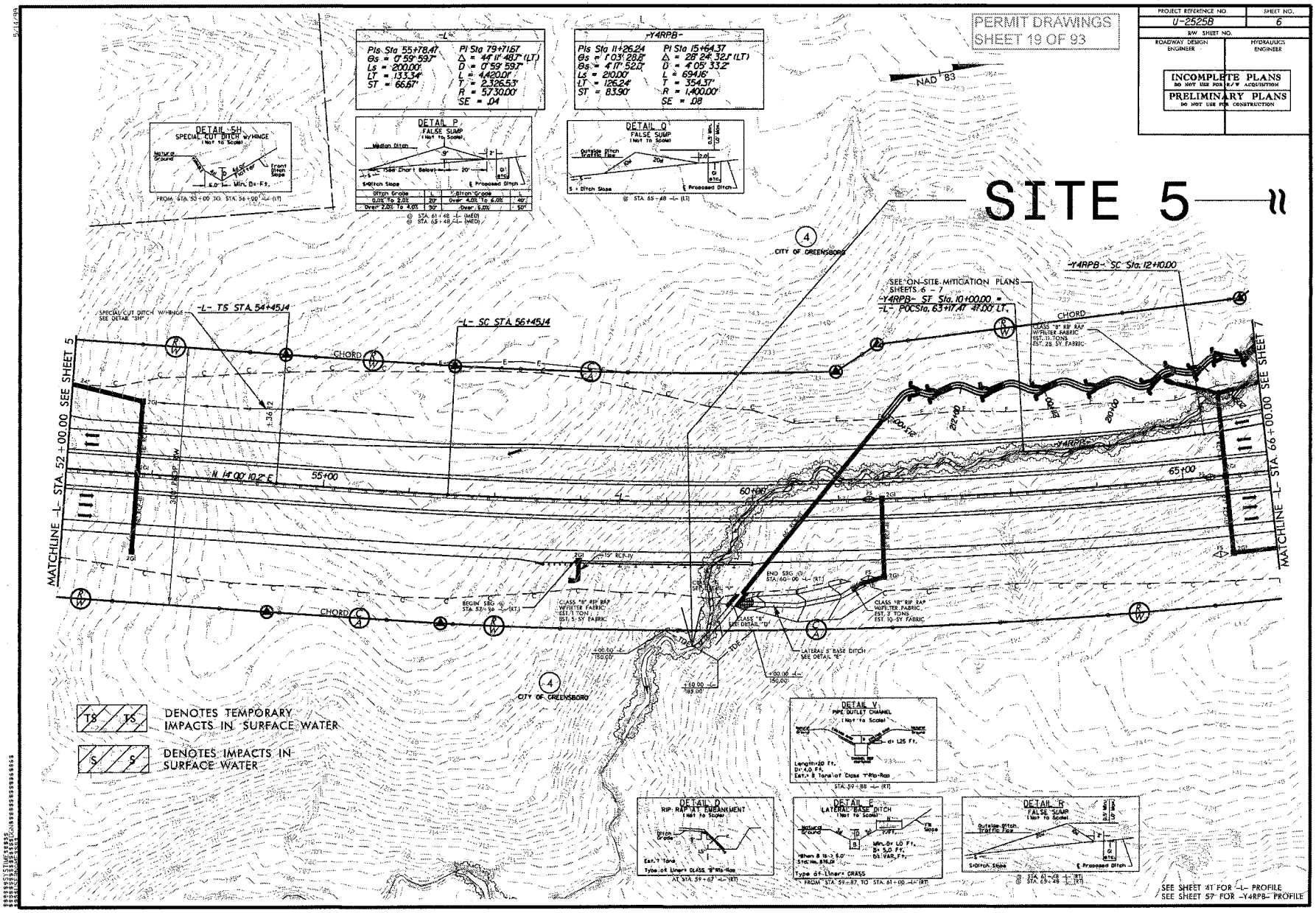
P-66

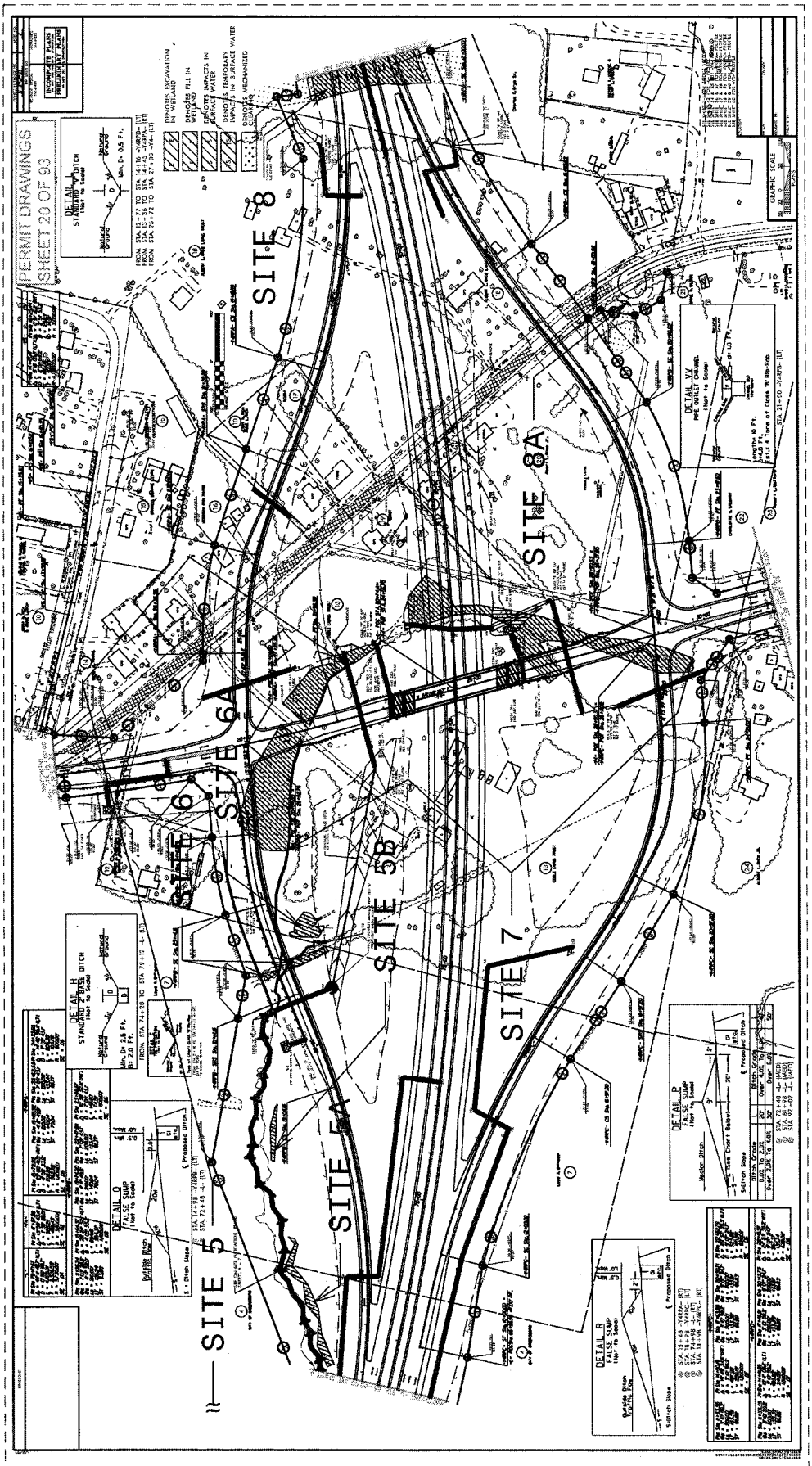

PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-27
PERMIT DRAWINGS
SHEET 16 OF 93
SITE 3
WLB
WLB
0.020
6:1
6:1
D.P. 733.624
2:1
2:1
2:1
EL=699.22
700.79
47+00.00
0.020
6:1
6:1
D.P. 735.357
2:1
2:1
2:1
EL=700.37
701.91
46+50.00
0.020
6:1
6:1
D.P. 736.890
2:1
2:1
2:1
EL=701.52
702.80
46+00.00
-L-
P-67

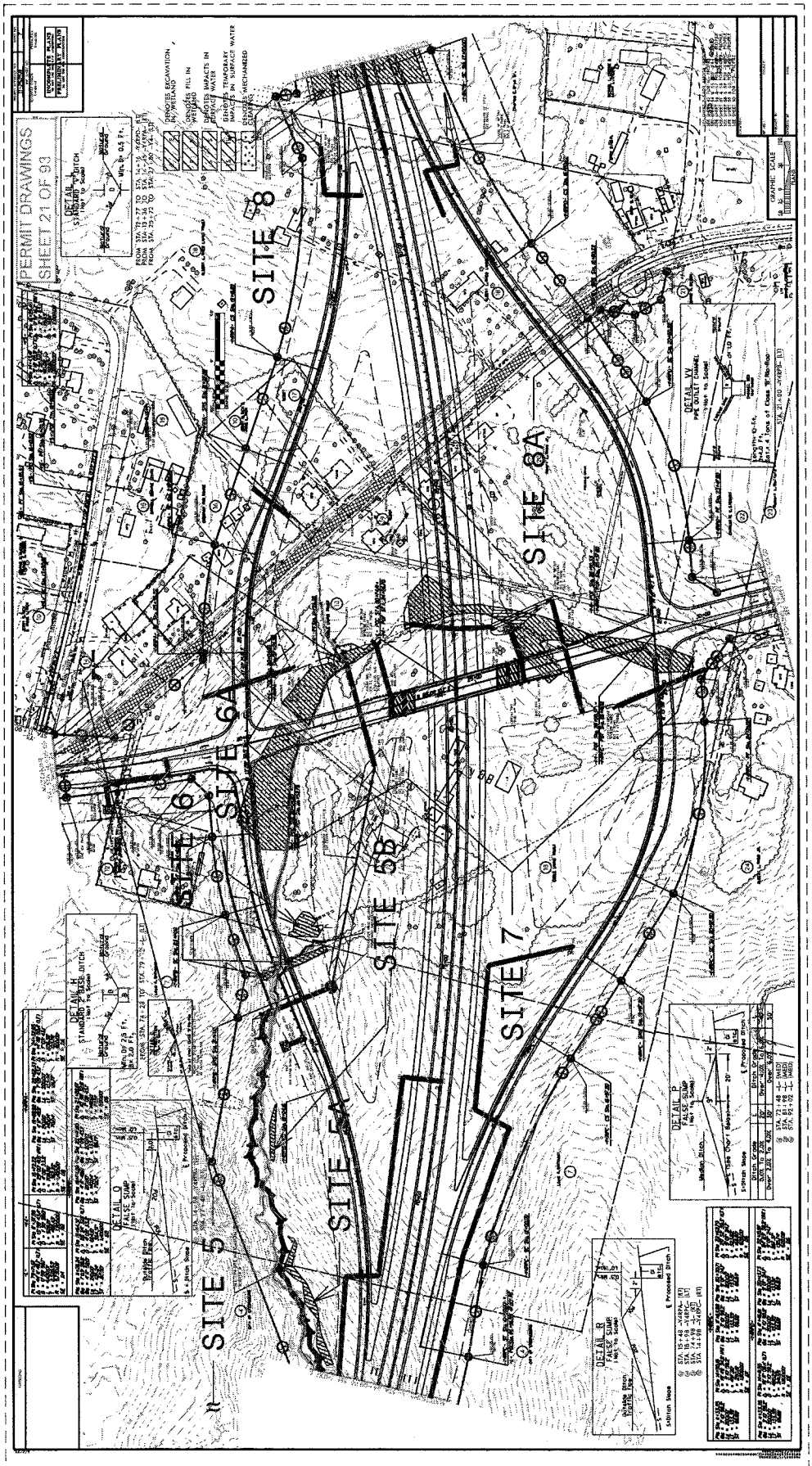
PERMIT DRAWINGS
SHEET 17 OF 93

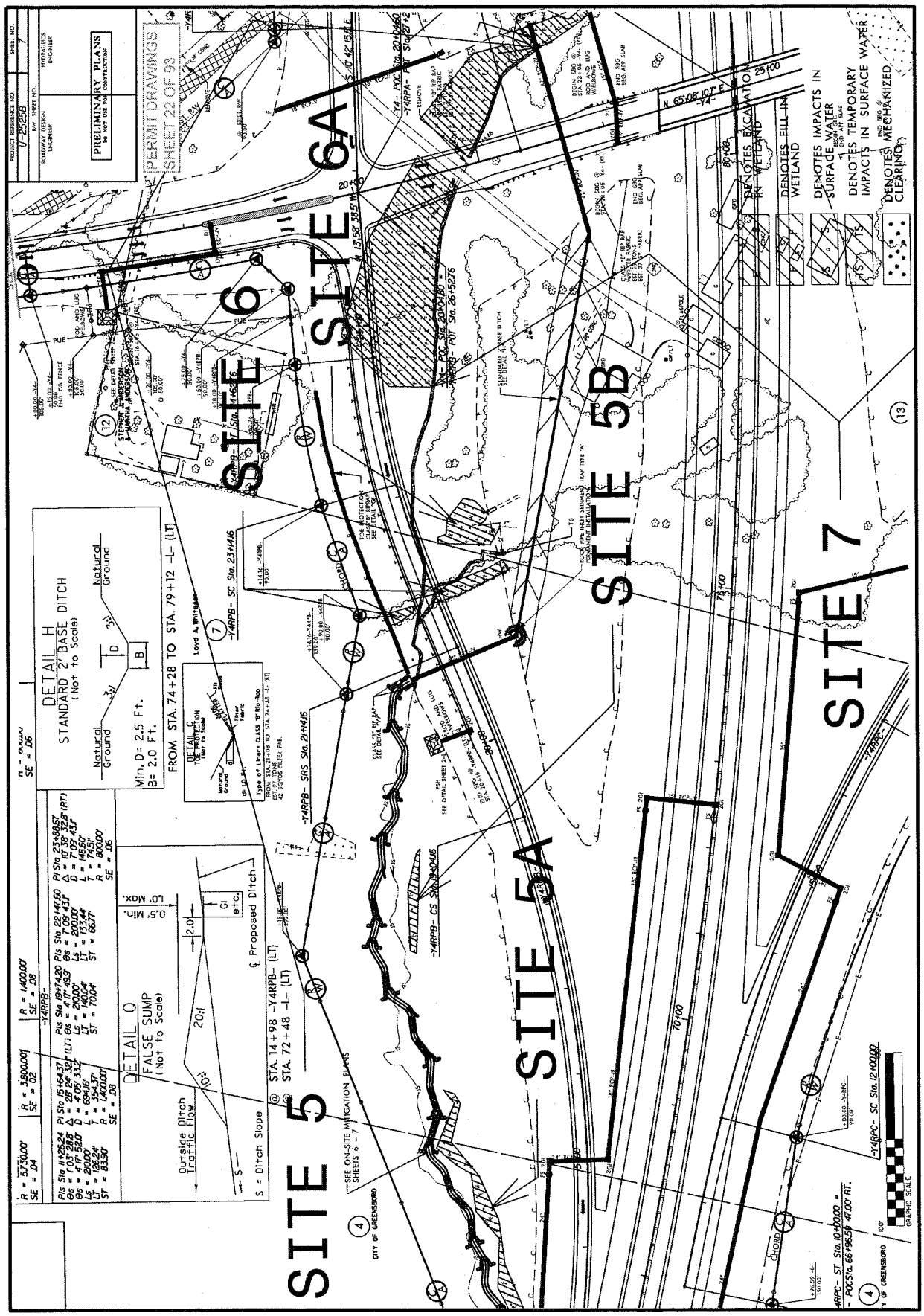


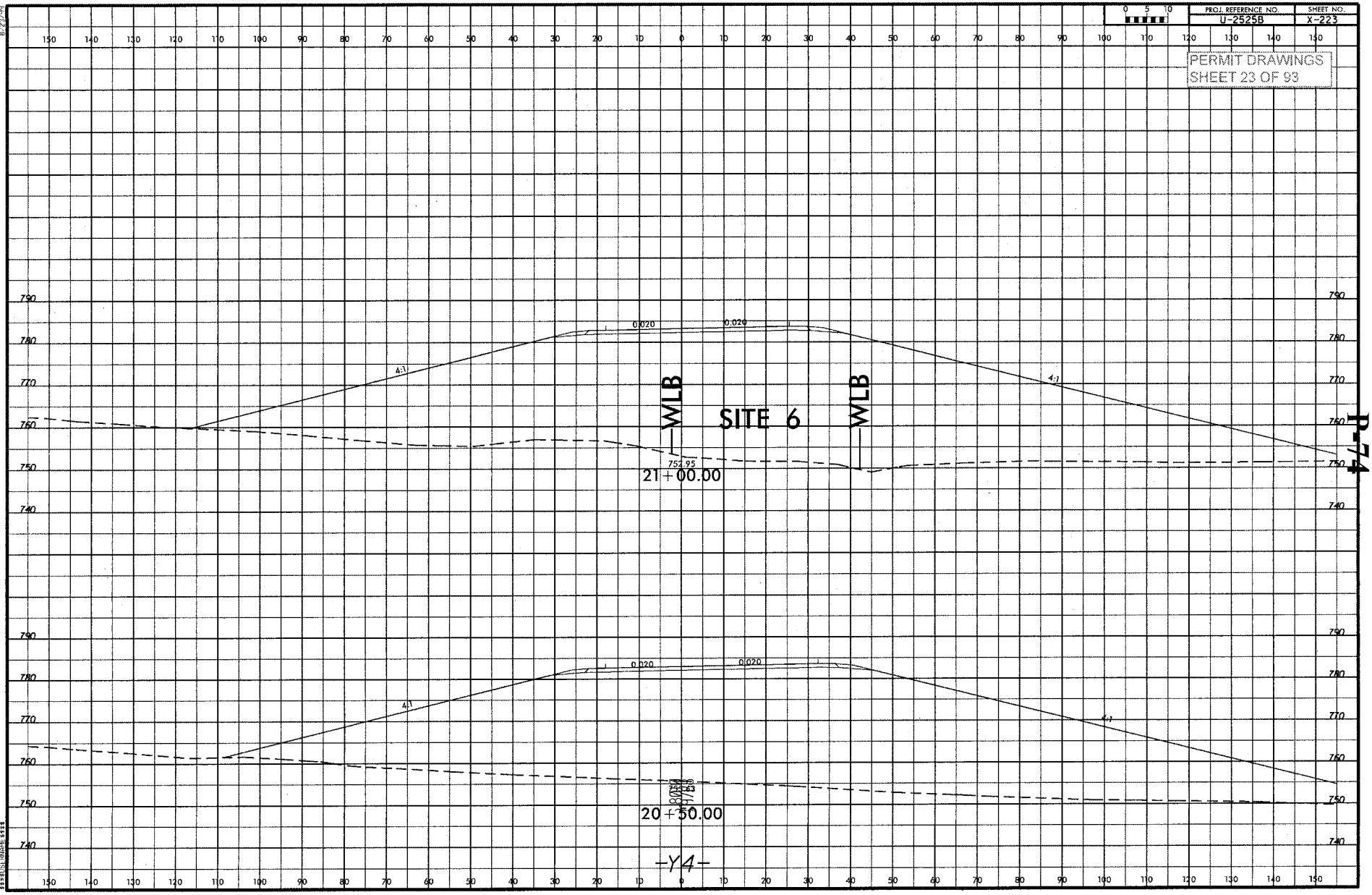

PERMIT DRAWINGS
SHEET 18 OF 93
PROJECT REFERENCE NO.
U-2525B
SHEET NO.
6
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
NAD 83
SITE 5
-L-
PIs Sta 55+78.47
Θs = 0° 59' 59.7"
Ls = 200.00'
LT = 133.34'
ST = 66.67'
PI Sta 79+71.67
Δ = 44° 11' 48.7" (LT)
D = 0° 59' 59.7"
L = 4,420.01'
T = 2,326.53'
R = 5,730.00'
SE = .04
-Y4RPB-
PIs Sta 11+26.24
Θs = 1° 03' 28.8"
Θs = 4° 17' 52.0"
Ls = 210.00'
LT = 126.24'
ST = 83.90'
PI Sta 15+64.37
Δ = 28° 24' 32.1" (LT)
D = 4° 05' 33.2"
L = 694.16'
T = 354.37'
R = 1,400.00'
SE = .08
DETAIL SH
SPECIAL CUT DITCH w/HINGE
(Not to Scale)
FROM STA. 53+00 TO STA. 56+00 -L- (LT)
DETAIL P
FALSE SUMP
(Not to Scale)
@ STA. 61+48 -L- (MED)
@ STA. 65+48 -L- (MED)
DETAIL Q
FALSE SUMP
(Not to Scale)
@ STA. 65+48 -L- (LT)
CITY OF GREENSBORO
SEE ON-SITE MITIGATION PLANS SHEETS 6 - 7
-Y4RPB- ST Sta. 10+00.00 =
-L- POCSta. 63+17.47 47.00' LT.
-Y4RPB- SC Sta. 12+10.00
-L- TS STA. 54+45.14
-L- SC STA. 56+45.14
SPECIAL CUT DITCH W/HINGE SEE DETAIL "SH"
CHORD
CLASS "B" RIP RAP W/FILTER FABRIC EST. 11 TONS EST. 28 SY FABRIC
MATCHLINE -L- STA. 52+00.00 SEE SHEET 5
MATCHLINE -L- STA. 66+00.00 SEE SHEET 7
N 14° 00' 10.2" E
55+00
60+00
65+00
BEGIN SBG @ STA 57+96 -L- (RT.)
CLASS "B" RIP RAP W/FILTER FABRIC EST. 1 TON EST. 5 SY FABRIC
END SBG @ STA. 60+00 -L- (RT.)
CLASS "B" RIP RAP W/FILTER FABRIC EST. 3 TONS EST. 10 SY FABRIC
CLASS "E" SEE DETAIL "D"
LATERAL 5' BASE DITCH SEE DETAIL "E"
TDE
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER
DETAIL V
PIPE OUTLET CHANNEL
(Not to Scale)
STA. 59+88 -L- (RT)
DETAIL D
RIP RAP AT EMBANKMENT
(Not to Scale)
AT STA. 59+87 -L- (RT)
DETAIL E
LATERAL BASE DITCH
(Not to Scale)
FROM STA. 59+87 TO STA. 61+00 -L- (RT)
DETAIL R
FALSE SUMP
(Not to Scale)
@ STA. 61+48 -L- (RT)
@ STA. 65+48 -L- (RT)
SEE SHEET 41 FOR -L- PROFILE
SEE SHEET 57 FOR -Y4RPB- PROFILE


PERMIT DRAWINGS
SHEET 19 OF 93
PROJECT REFERENCE NO.
U-2525B
SHEET NO.
6
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
SITE 5
NAD 83
-L-
PI Sta 55+78.47
Θs = 0°59'59.7"
Ls = 200.00'
LT = 133.34'
ST = 66.67'
PI Sta 79+71.67
Δ = 44°11'48.7" (LT)
D = 0°59'59.7"
L = 4,420.01'
T = 2,326.53'
R = 5,730.00'
SE = .04
-Y4RPB-
PI Sta 11+26.24
Θs = 1°03'28.8"
Θs = 4°17'52.0"
Ls = 210.00'
LT = 126.24'
ST = 83.90'
PI Sta 15+64.37
Δ = 28°24'32.1" (LT)
D = 4°05'33.2"
L = 694.16'
T = 354.37'
R = 1,400.00'
SE = .08
DETAIL SH
SPECIAL CUT DITCH W/HINGE
(Not to Scale)
DETAIL P
FALSE SUMP
(Not to Scale)
DETAIL Q
FALSE SUMP
(Not to Scale)
CITY OF GREENSBORO
SEE ON-SITE MITIGATION PLANS
SHEETS 6 - 7
-Y4RPB- ST Sta. 10+00.00 =
-L- POCSta. 63+17.47 47.00' LT.
-Y4RPB- SC Sta. 12+10.00
-L- TS STA. 54+45.14
-L- SC STA. 56+45.14
CHORD
MATCHLINE -L- STA. 52+00.00 SEE SHEET 5
MATCHLINE -L- STA. 66+00.00 SEE SHEET 7
N 14°00'10.2" E
55+00
60+00
65+00
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER
DETAIL V
PIPE OUTLET CHANNEL
(Not to Scale)
DETAIL D
RIP RAP AT EMBANKMENT
(Not to Scale)
DETAIL E
LATERAL BASE DITCH
(Not to Scale)
DETAIL R
FALSE SUMP
(Not to Scale)
SEE SHEET 41 FOR -L- PROFILE
SEE SHEET 57 FOR -Y4RPB- PROFILE


PERMIT DRAWINGS
SHEET 20 OF 93
SITE 5
SITE 5A
SITE 5B
SITE 6
SITE 6A
SITE 7
SITE 8
SITE 8A
DETAIL H
STANDARD 2' BASE DITCH
DETAIL O
FALSE SUMP
DETAIL P
FALSE SUMP
DETAIL R
FALSE SUMP
DETAIL VV
PIPE OUTLET CHANNEL
GRAPHIC SCALE

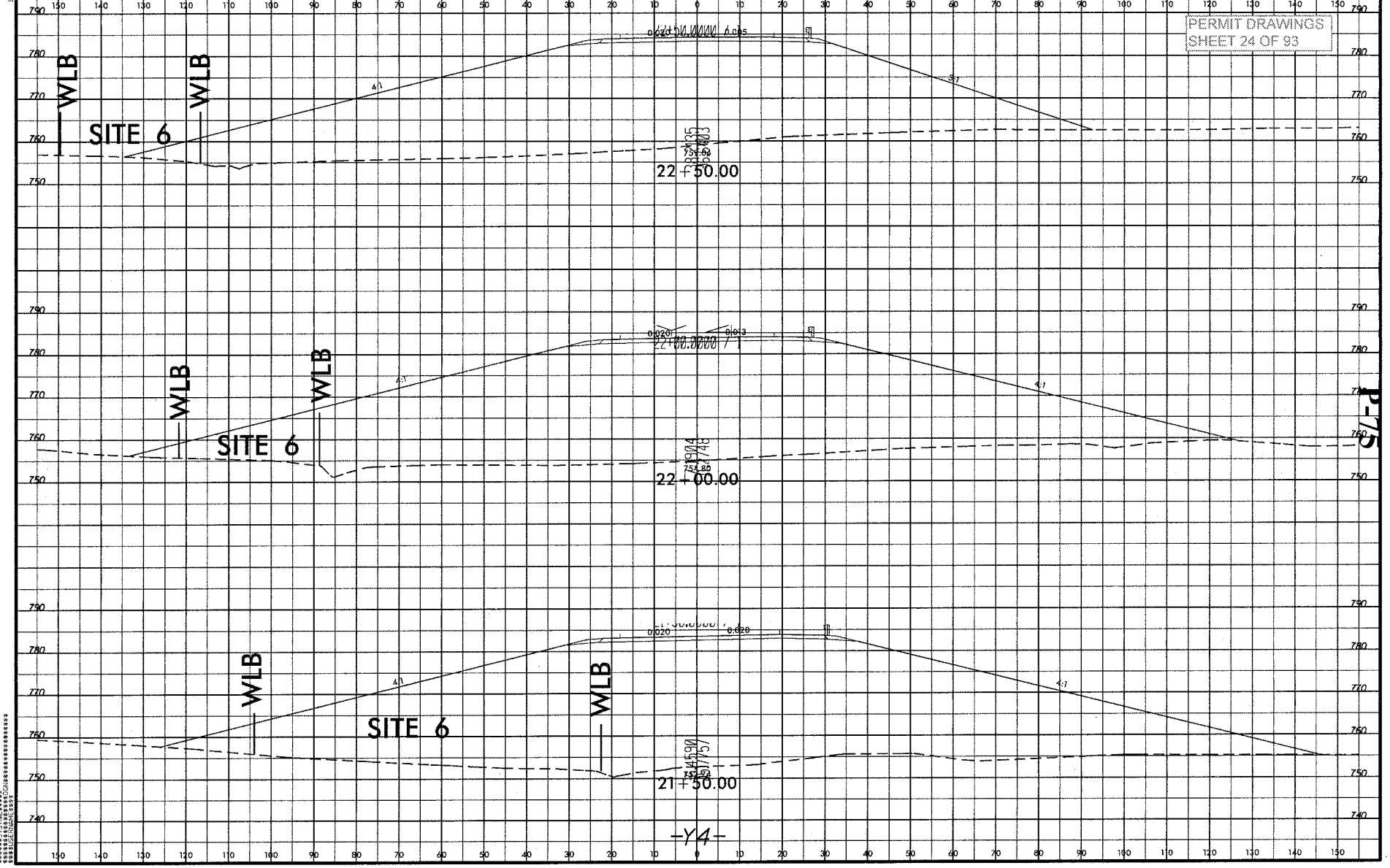

PERMIT DRAWINGS
SHEET 21 OF 93
SITE 5
SITE 5A
SITE 5B
SITE 6
SITE 6A
SITE 7
SITE 8
SITE 8A
DETAIL H
DETAIL O
DETAIL P
DETAIL R
DETAIL VV

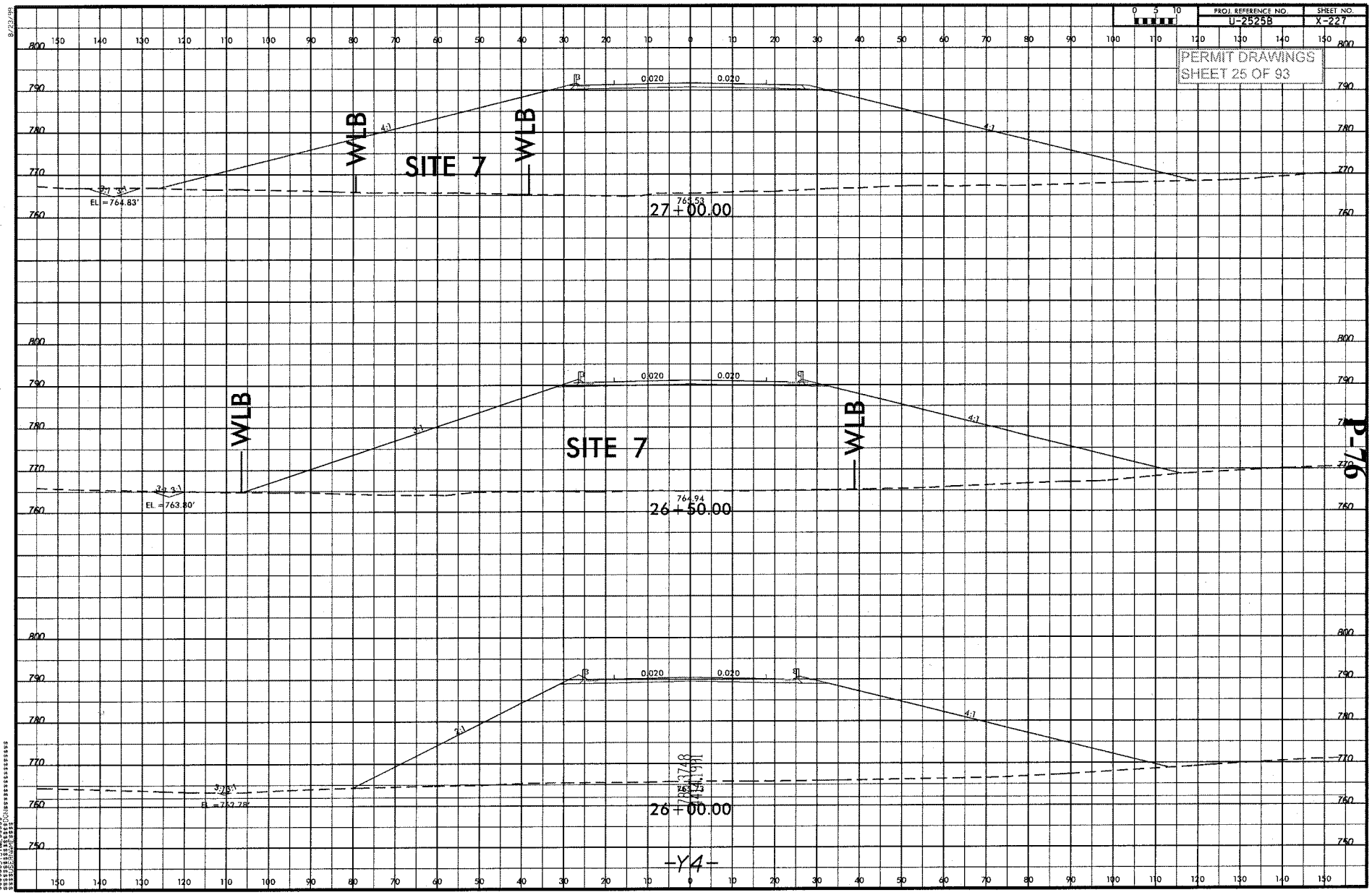

SITE 5
SITE 6
SITE 6A
SITE 5A
SITE 5B
SITE 7
DETAIL H
STANDARD 2' BASE DITCH
(Not to Scale)
Min. D= 2.5 Ft.
B= 2.0 Ft.
FROM STA. 74+28 TO STA. 79+12 -L- (LT)
DETAIL Q
FALSE SUMP
(Not to Scale)
Outside Ditch Traffic Flow
S = Ditch Slope
STA. 14+98 -Y4RPB- (LT)
STA. 72+48 -L- (LT)
PERMIT DRAWINGS
SHEET 22 OF 93
PRELIMINARY PLANS
DENOTES EXCAVATION IN WETLAND
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
GRAPHIC SCALE

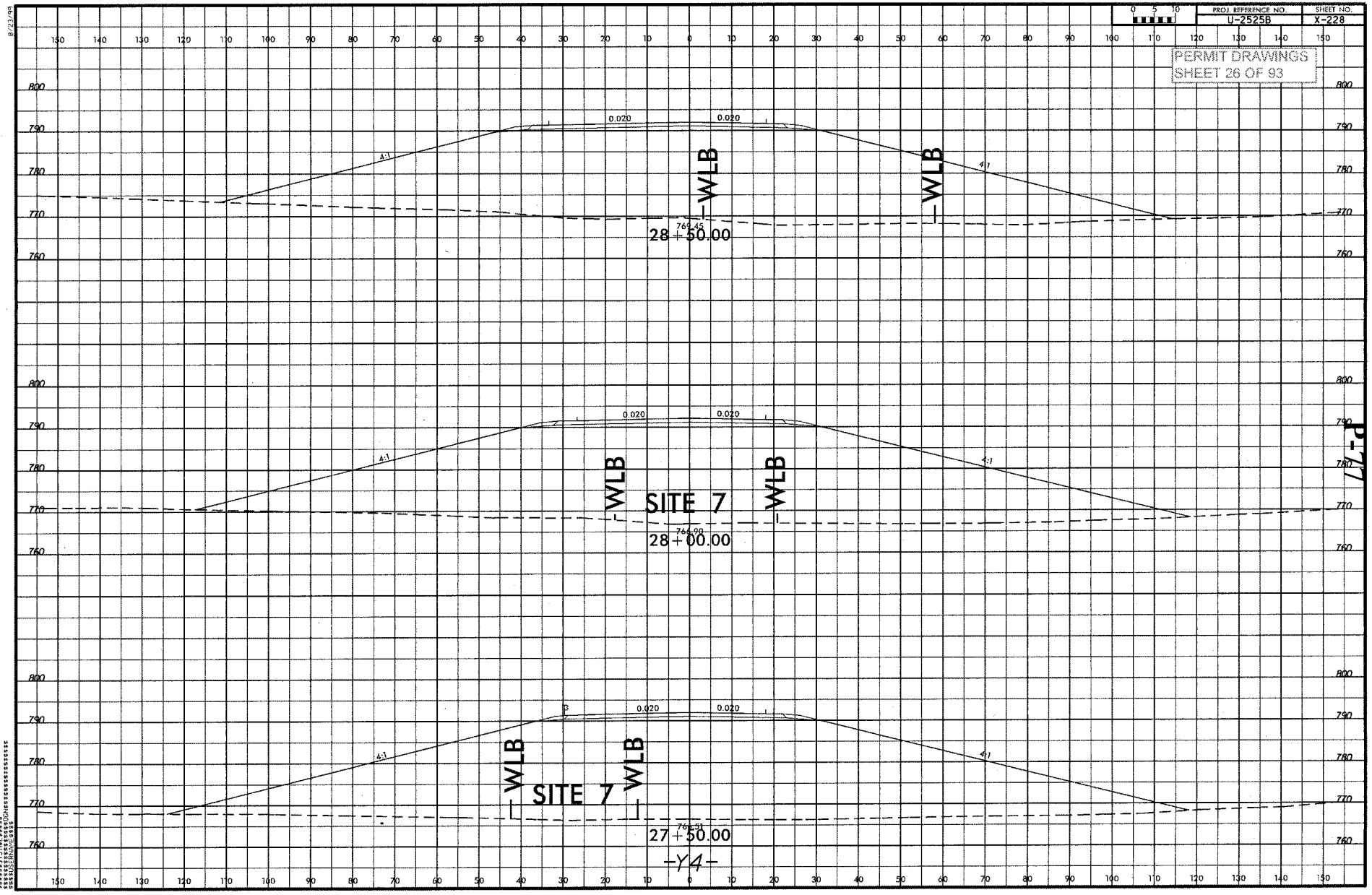

PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-223
PERMIT DRAWINGS
SHEET 23 OF 93
SITE 6
WLB
WLB
0.020
0.020
4:1
4:1
752.95
21+00.00
20+50.00
-Y4-
790
780
770
760
750
740

P-74

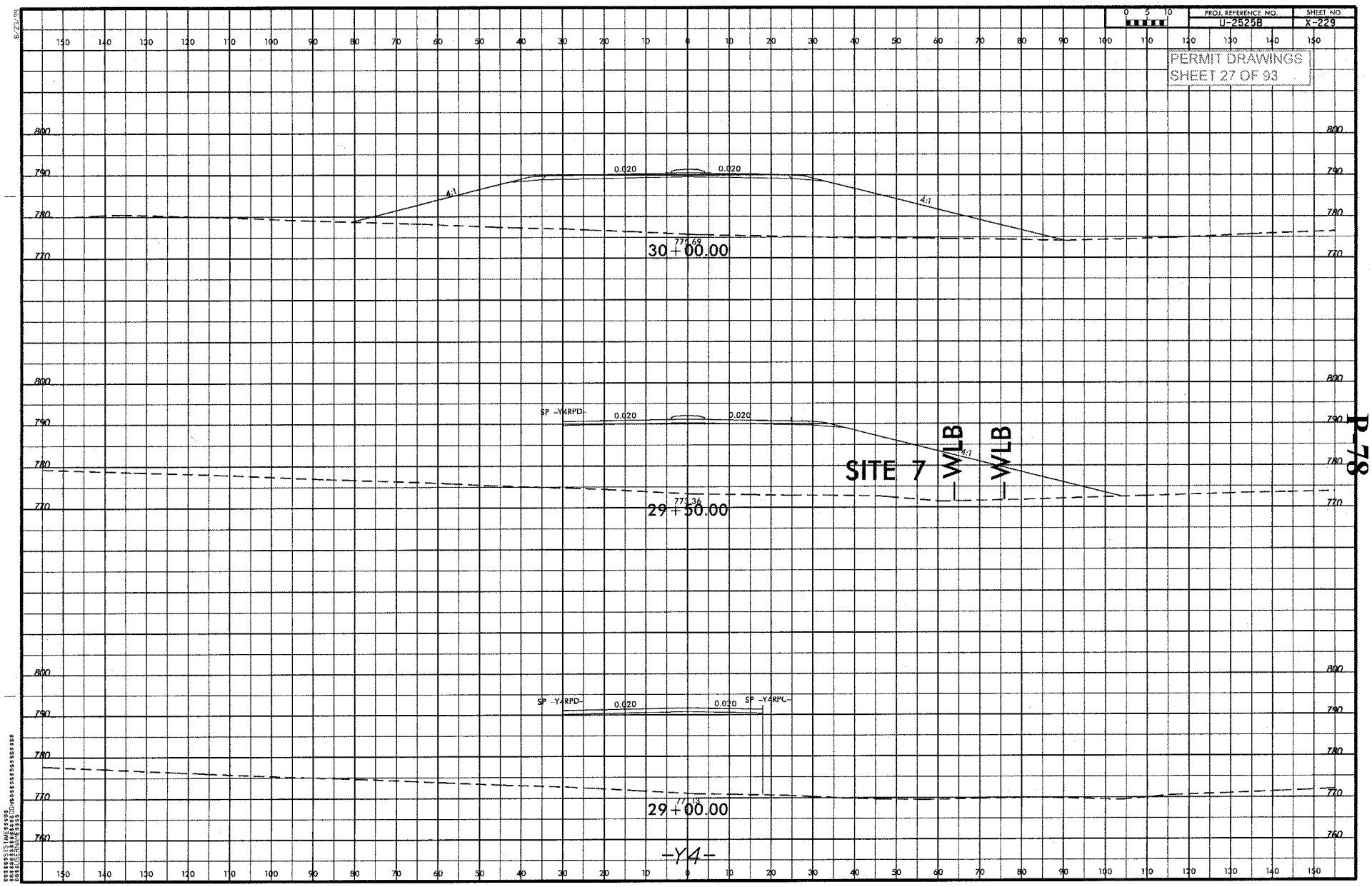
PERMIT DRAWINGS
SHEET 24 OF 93

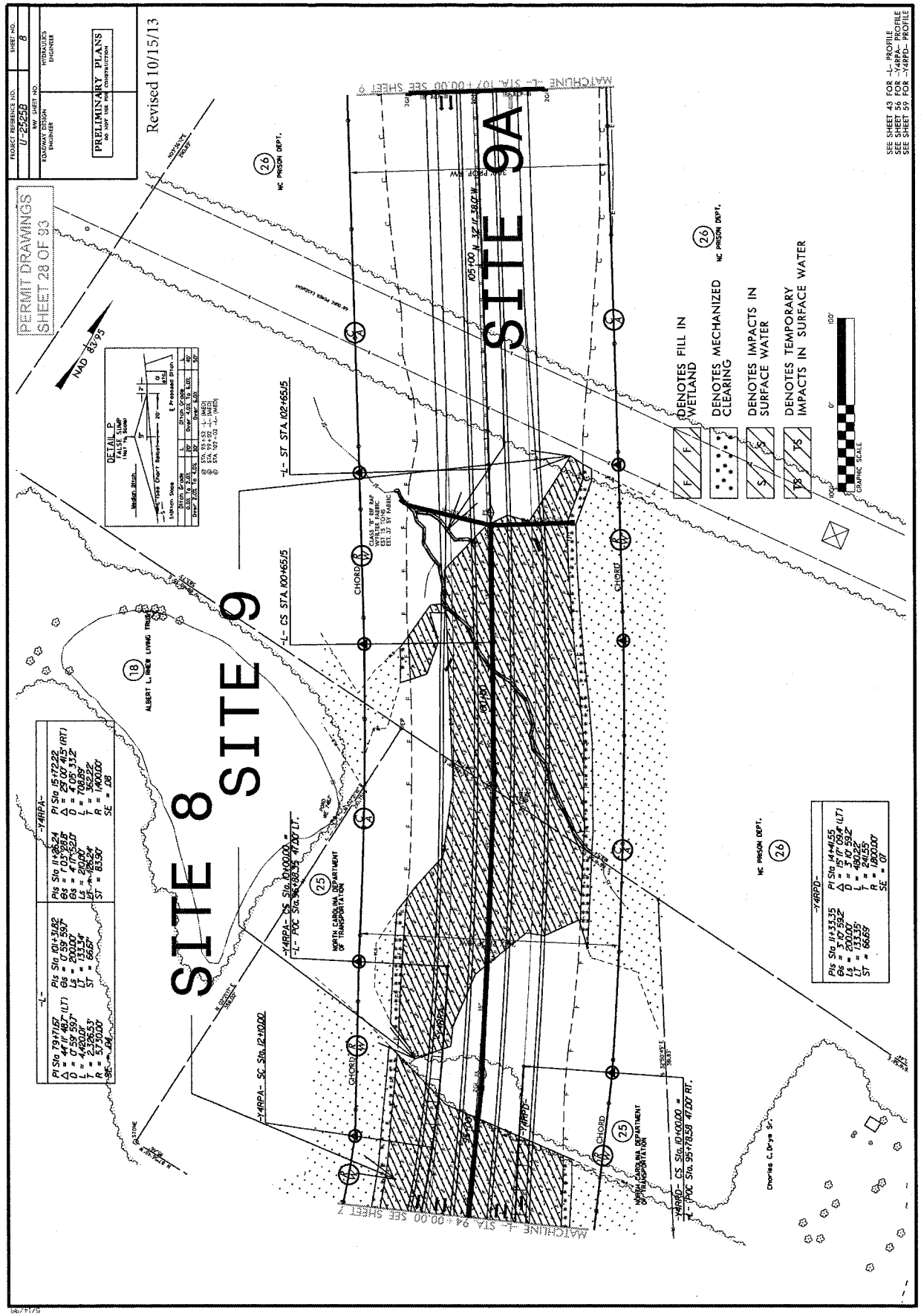


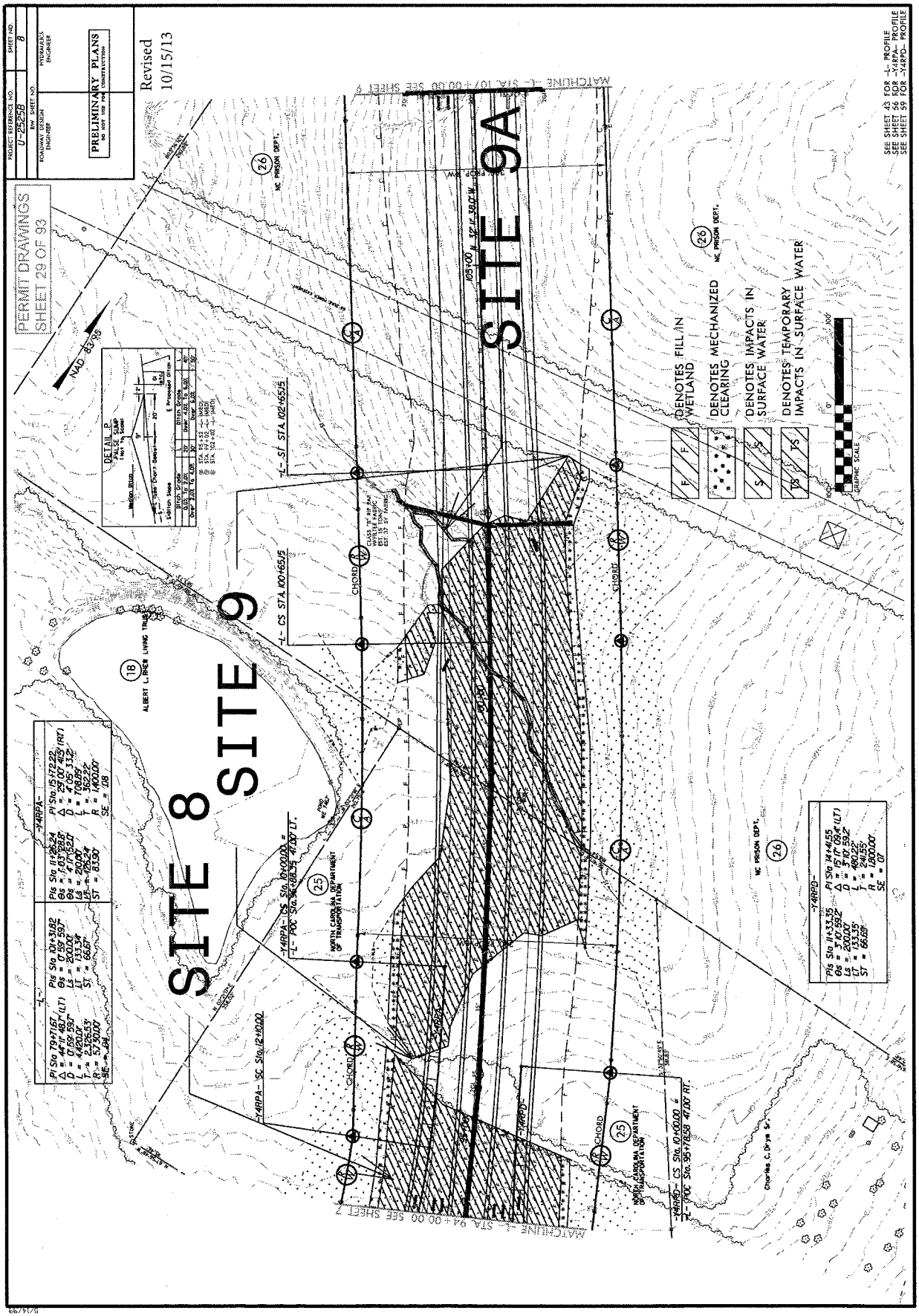

PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-227
PERMIT DRAWINGS
SHEET 25 OF 93
SITE 7
WLB
WLB
0.020
0.020
4:1
3:1
EL = 764.83'
765.53
27+00.00
SITE 7
WLB
WLB
0.020
0.020
3:1
4:1
EL = 763.80'
764.94
26+50.00
0.020
0.020
3:1
4:1
EL = 762.78'
26+00.00
-Y4-
P-76

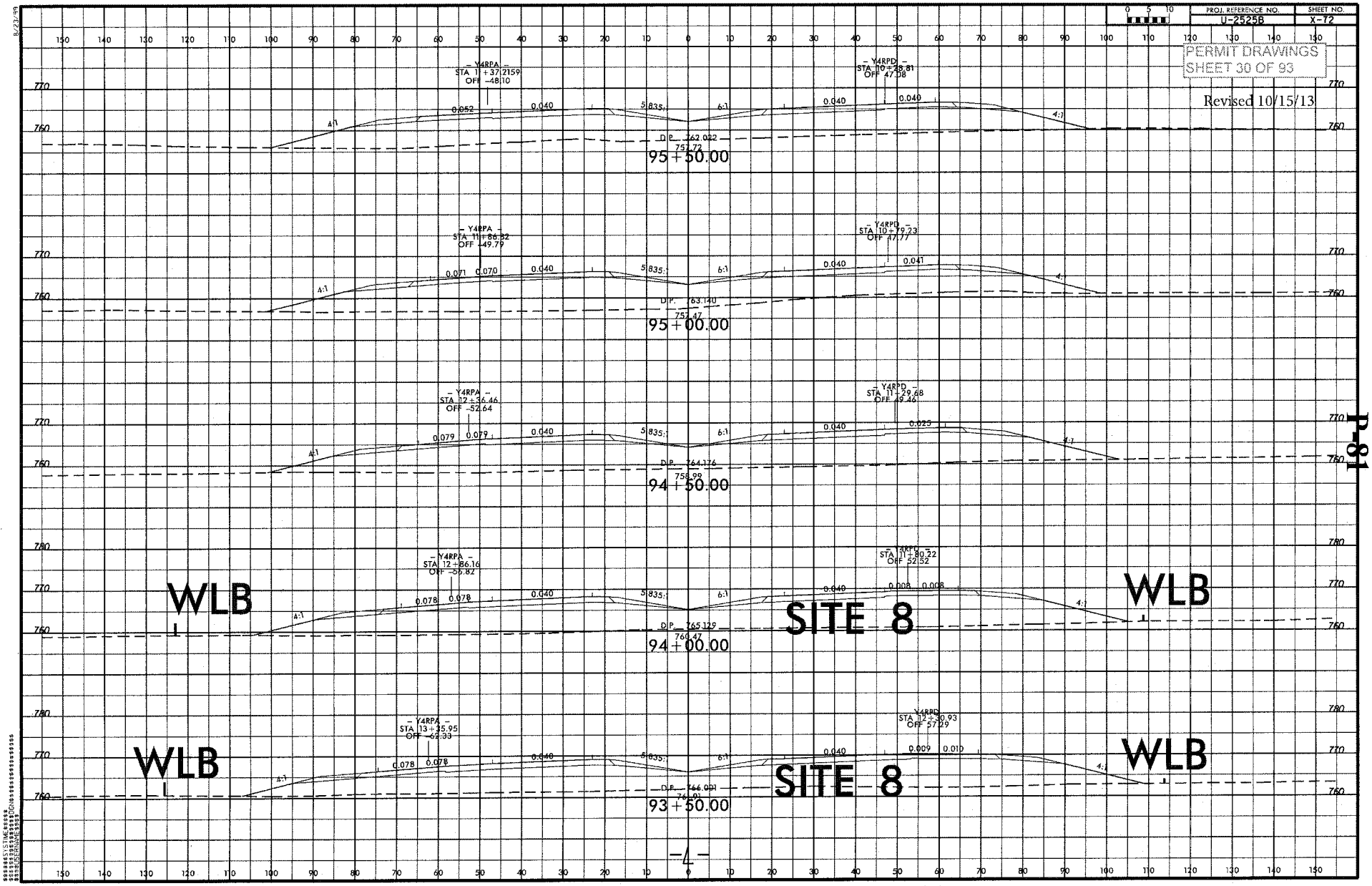


PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-228
PERMIT DRAWINGS
SHEET 26 OF 93
0.020
0.020
4:1
4:1
WLB
WLB
769.45
28+50.00
0.020
0.020
4:1
4:1
WLB
SITE 7
WLB
766.90
28+00.00
0.020
0.020
4:1
4:1
WLB
SITE 7
WLB
766.51
27+50.00
-Y4-
P-77

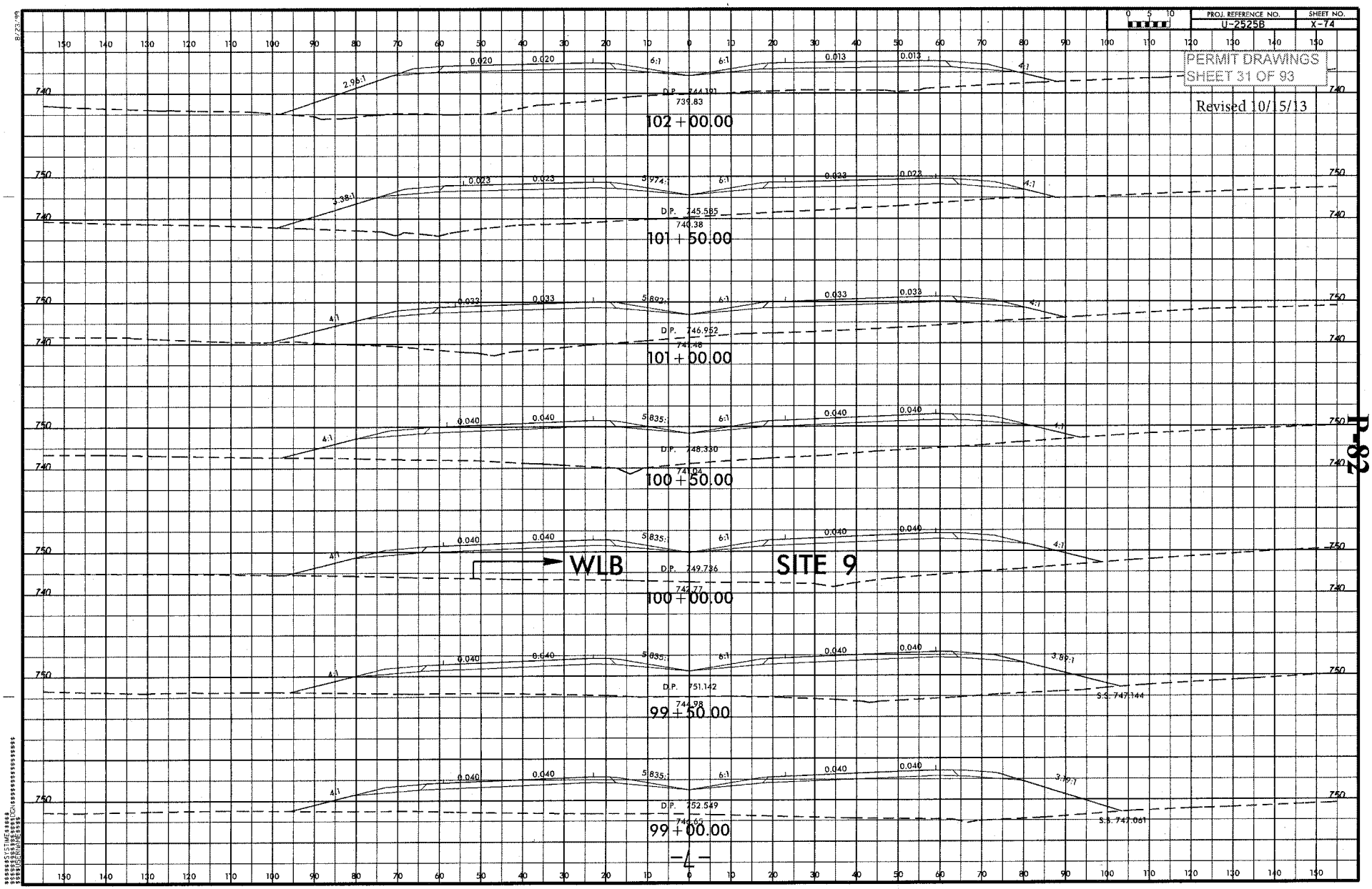

PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-229
PERMIT DRAWINGS
SHEET 27 OF 93
0.020
0.020
4:1
4:1
775.62
30+00.00
SP -Y4RPD-
0.020
0.020
4:1
SITE 7
-WLB
-WLB
773.36
29+50.00
SP -Y4RPD-
0.020
0.020
SP -Y4RPC-
771.18
29+00.00
-Y4-
8/23/99


PROJECT REFERENCE NO.
U-2525B
SHEET NO.
8
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
Revised 10/15/13
PERMIT DRAWINGS
SHEET 28 OF 93
NAD 83/95
SITE 8
SITE 9
SITE 9A
DETAIL P
FALSE SUMP
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE
SEE SHEET 43 FOR -L- PROFILE
SEE SHEET 56 FOR -Y4RPA- PROFILE
SEE SHEET 59 FOR -Y4RPD- PROFILE
NC PRISON DEPT.
ALBERT L. RHEW LIVING TRUST
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
CHORD
-L- ST STA 102+65.15
-L- CS STA 100+65.15
-Y4RPA- CS Sta. 10+00.00 = -L- POC Sta. 96+88.35 47.00' LT.
-Y4RPA- SC Sta. 12+10.00
-Y4RPD- CS Sta. 10+00.00 = -L- POC Sta. 95+78.58 47.00' RT.
-Y4RPD-
Pls Sta 11+33.35
Θs = 3°10'59.2"
Ls = 200.00'
LT = 133.35'
ST = 66.69'
Pl Sta 14+41.55
Δ = 15°17'09.4" (LT)
D = 3°10'59.2"
L = 480.22'
T = 241.55'
R = 1,800.00'
SE = .07
-L-
Pl Sta 79+71.67
Δ = 44°11'48.7" (LT)
D = 0°59'59.7"
L = 4,420.01'
T = 2,326.53'
R = 5,730.00'
SE = .04
Pls Sta 101+31.82
Θs = 0°59'59.7"
Ls = 200.00'
LT = 133.34'
ST = 66.67'
Pls Sta 11+26.24
Θs = 1°03'28.8"
Θs = 4°17'52.0"
Ls = 210.00'
LT = 126.24'
ST = 83.90'
Pl Sta 15+72.22
Δ = 29°00'41.5" (RT)
D = 4°05'33.2"
L = 708.89'
T = 362.22'
R = 1,400.00'
SE = .08
-Y4RPA-
Chorles C. Drye Sr.

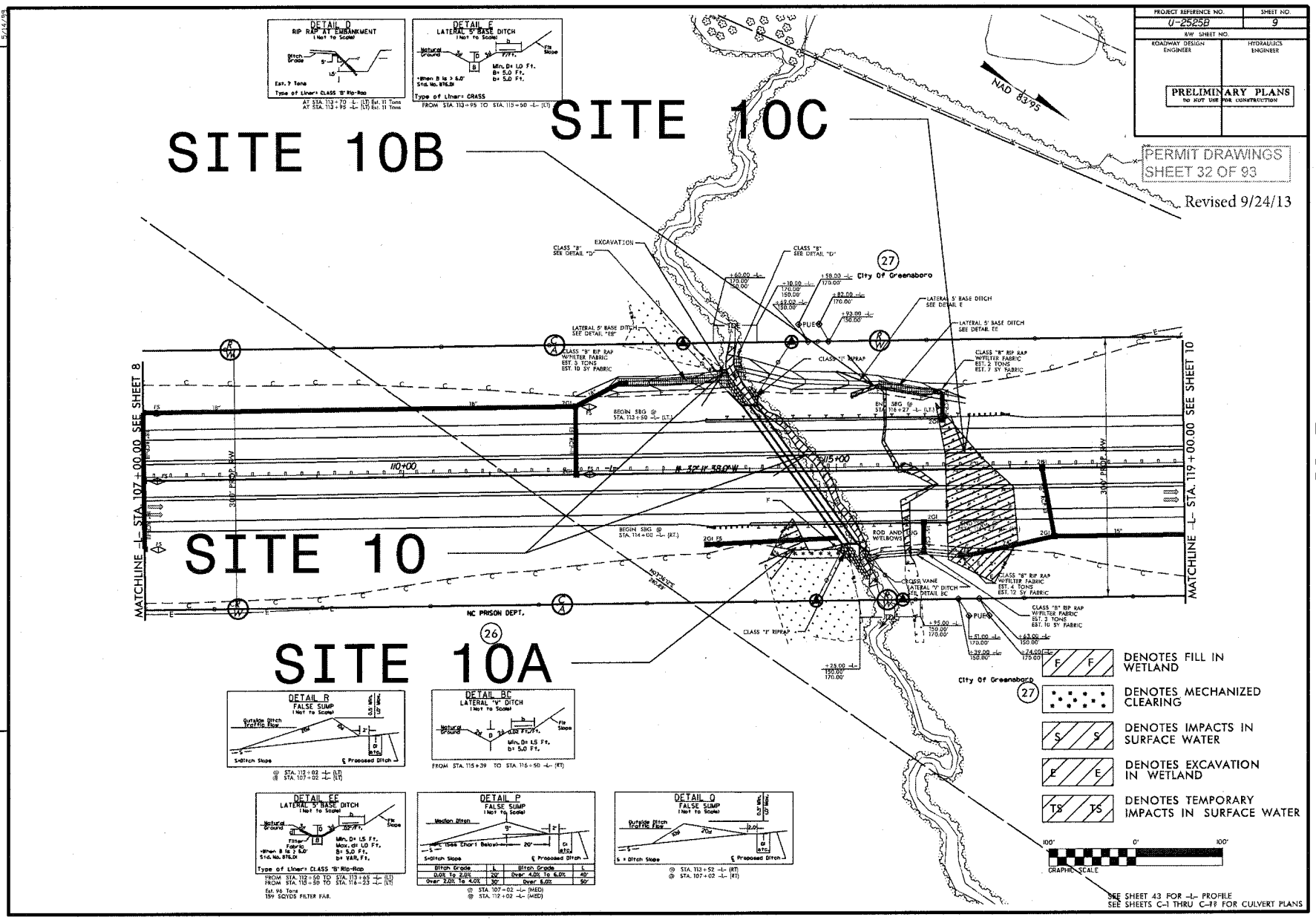

PERMIT DRAWINGS
SHEET 29 OF 93
PRELIMINARY PLANS
Revised
10/15/13
SITE 8
SITE 9
SITE 9A
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE
NAD 83/95
ALBERT L. RHEW LIVING TRUST
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
NC PRISON DEPT.
CHORD
MATCHLINE -L- STA. 107+00.00 SEE SHEET 9
MATCHLINE -L- STA. 94+00.00 SEE SHEET 7
SEE SHEET 43 FOR -L- PROFILE
SEE SHEET 56 FOR -Y4RPA- PROFILE
SEE SHEET 59 FOR -Y4RPD- PROFILE


PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-72
PERMIT DRAWINGS
SHEET 30 OF 93
Revised 10/15/13
Y4RPA
STA 11+37.2159
OFF -48.10
Y4RPD
STA 10+28.81
OFF 47.08
D.P. 762.022
757.72
95+50.00
Y4RPA
STA 11+86.32
OFF -49.79
Y4RPD
STA 10+79.23
OFF 47.77
D.P. 763.140
757.47
95+00.00
Y4RPA
STA 12+36.46
OFF -52.64
Y4RPD
STA 11+29.68
OFF 49.46
D.P. 764.176
758.99
94+50.00
Y4RPA
STA 12+86.16
OFF -56.82
Y4RPD
STA 11+80.22
OFF 52.52
WLB
SITE 8
WLB
D.P. 765.129
760.47
94+00.00
Y4RPA
STA 13+35.95
OFF -62.33
Y4RPD
STA 12+30.93
OFF 57.29
WLB
SITE 8
WLB
D.P. 766.001
761.91
93+50.00
-L-

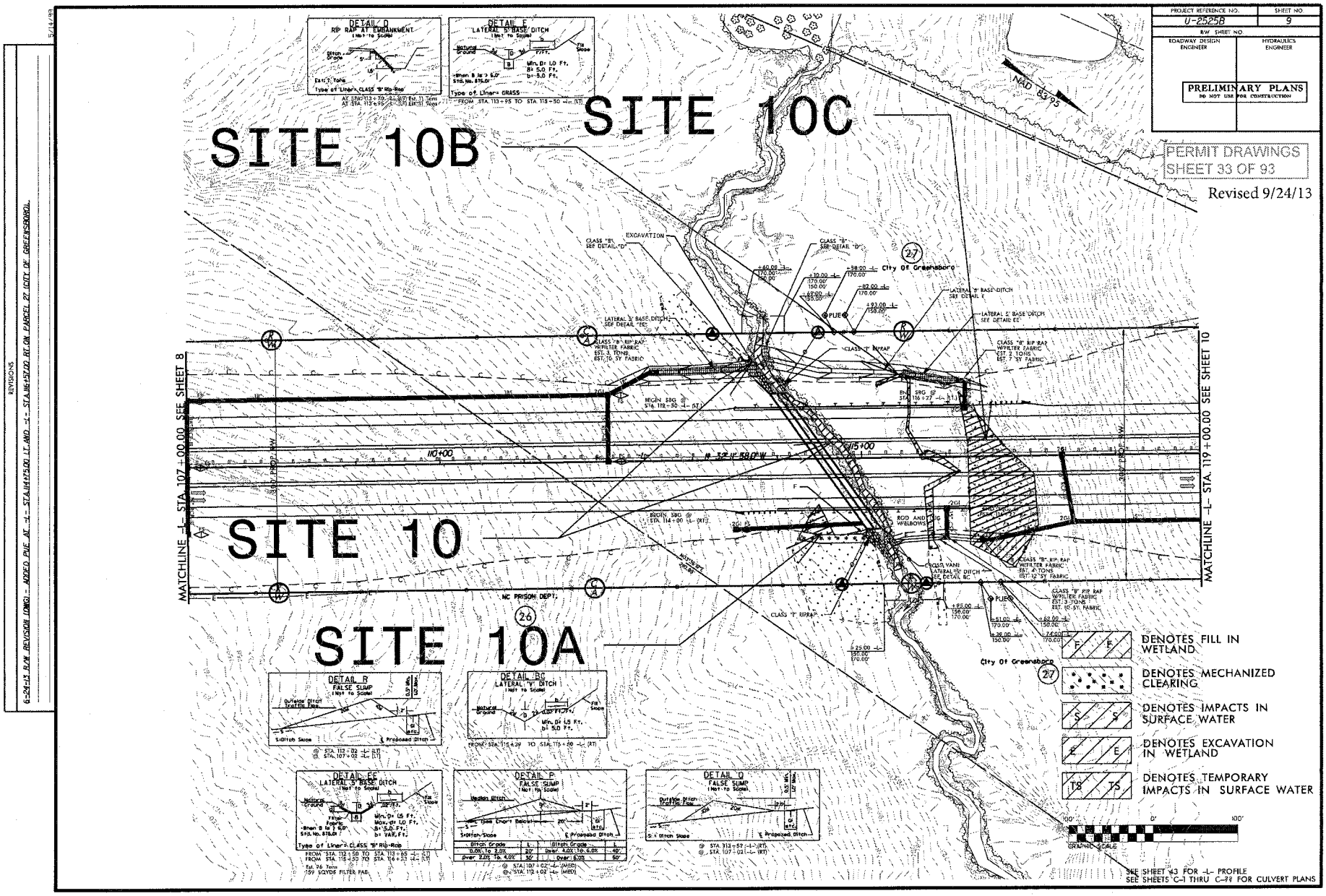
P-81


PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-74
PERMIT DRAWINGS
SHEET 31 OF 93
Revised 10/15/13
102 + 00.00
D.P. 744.191
739.83
101 + 50.00
D.P. 745.585
740.38
101 + 00.00
D.P. 746.952
741.48
100 + 50.00
D.P. 748.330
741.04
WLB
SITE 9
100 + 00.00
D.P. 749.736
742.77
99 + 50.00
D.P. 751.142
744.98
S.S. 747.144
99 + 00.00
D.P. 752.549
746.65
S.S. 747.061
-L-

P-82

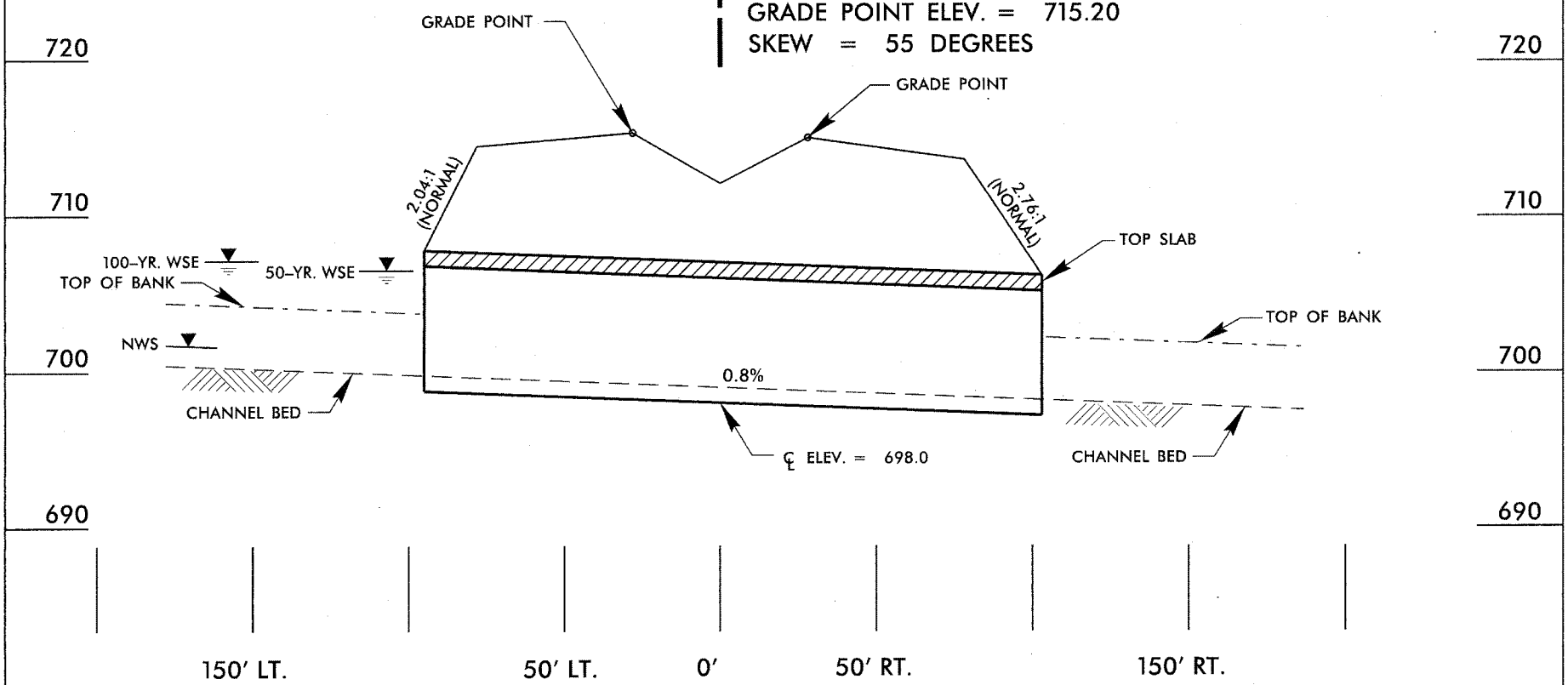


PROJECT REFERENCE NO.
U-2525B
SHEET NO.
9
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PERMIT DRAWINGS
SHEET 32 OF 93
Revised 9/24/13
SITE 10B
SITE 10C
SITE 10
SITE 10A
NAD 83/95
MATCHLINE -L- STA. 107+00.00 SEE SHEET 8
MATCHLINE -L- STA. 119+00.00 SEE SHEET 10
City Of Greensboro
NC PRISON DEPT.
DETAIL D
RIP RAP AT EMBANKMENT
DETAIL E
LATERAL 5' BASE DITCH
DETAIL R
FALSE SUMP
DETAIL BC
LATERAL 'V' DITCH
DETAIL EE
LATERAL 5' BASE DITCH
DETAIL P
FALSE SUMP
DETAIL Q
FALSE SUMP
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE
SEE SHEET 43 FOR -L- PROFILE
SEE SHEETS C-1 THRU C-?? FOR CULVERT PLANS
REVISIONS
6-24-13 R/W REVISION (DWG) - ADDED PUE AT -L- STA.114+75.00 LT. AND -L- STA.116+57.00 RT. ON PARCEL 27 (CITY OF GREENSBORO).


PROJECT REFERENCE NO.
U-2525B
SHEET NO.
9
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PERMIT DRAWINGS
SHEET 33 OF 93
Revised 9/24/13
SITE 10B
SITE 10C
SITE 10
SITE 10A
MATCHLINE -L- STA. 107+00.00 SEE SHEET 8
MATCHLINE -L- STA. 119+00.00 SEE SHEET 10
NAD 83/95
City Of Greensboro
NC PRISON DEPT.
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SEE SHEET 43 FOR -L- PROFILE
SEE SHEETS C-1 THRU C-?? FOR CULVERT PLANS
REVISIONS
6-24-13 R/W REVISION (DWG) - ADDED PUE AT -L- STA.114+75.00 LT. AND -L- STA.116+57.00 RT. ON PARCEL 27 (CITY OF GREENSBORO).

PERMIT DRAWINGS
SHEET 34 OF 93

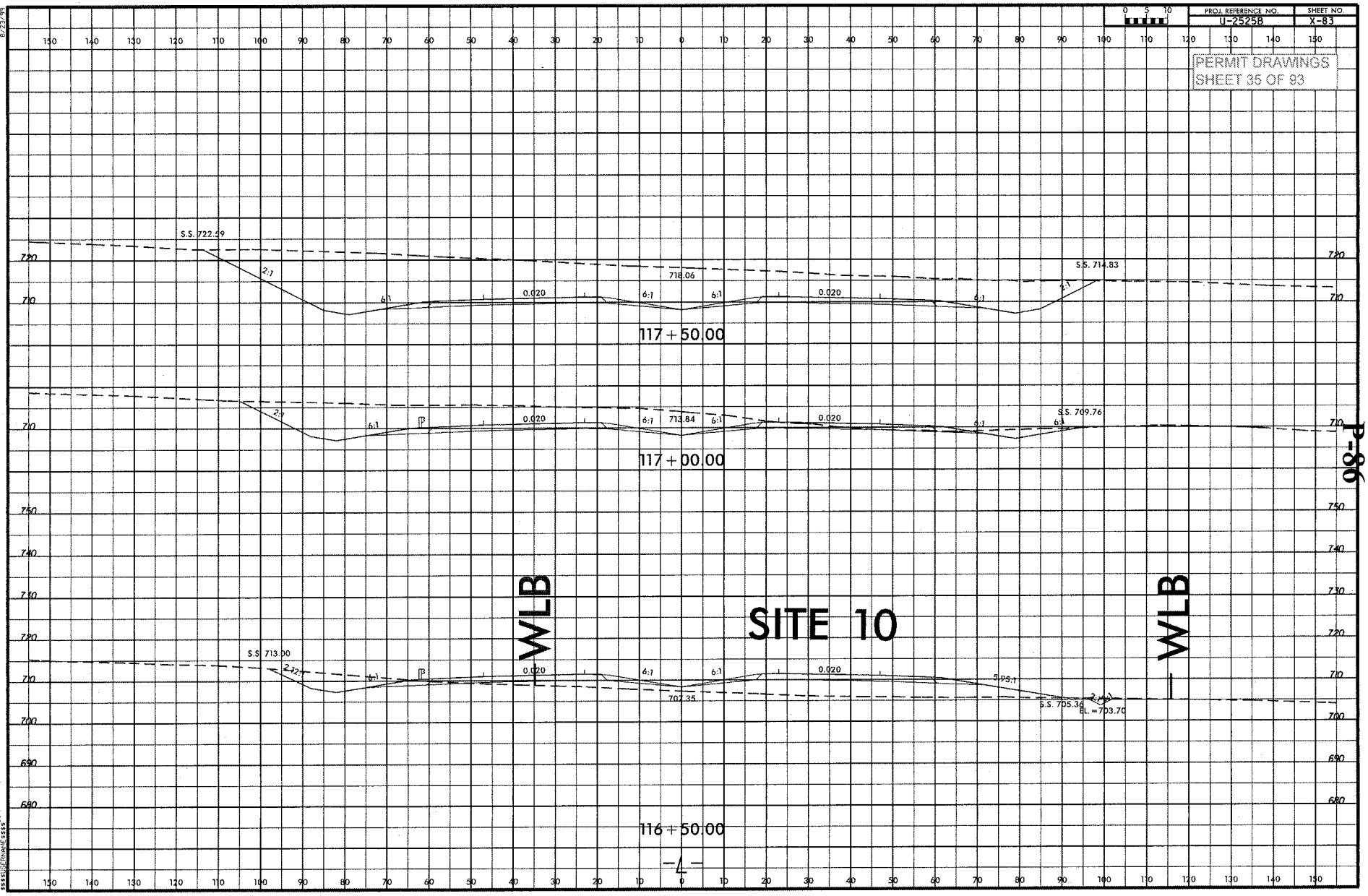
2 @ 7' x 8' RCBC (1' BURY)
℄ STA. 114+55.00 -L-
GRADE POINT ELEV. = 715.20
SKEW = 55 DEGREES



PROFILE

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34821.1.1 (U-2525B)
GREENSBORO EASTERN LOOP
FROM NORTH OF US 70
RELOCATION TO US 29 NORTH
OF GREENSBORO

SHEET OF 03/08/13


PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-83
PERMIT DRAWINGS
SHEET 35 OF 93
S.S. 722.59
2:1
6:1
0.020
718.06
S.S. 714.83
117 + 50.00
713.84
S.S. 709.76
117 + 00.00
SITE 10
WLB
S.S. 713.00
707.35
5:95.1
S.S. 705.36
EL. = 703.70
116 + 50.00
-L-
P-86

PROJECT REFERENCE NO.	SHEET NO.
U-2525B	10
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

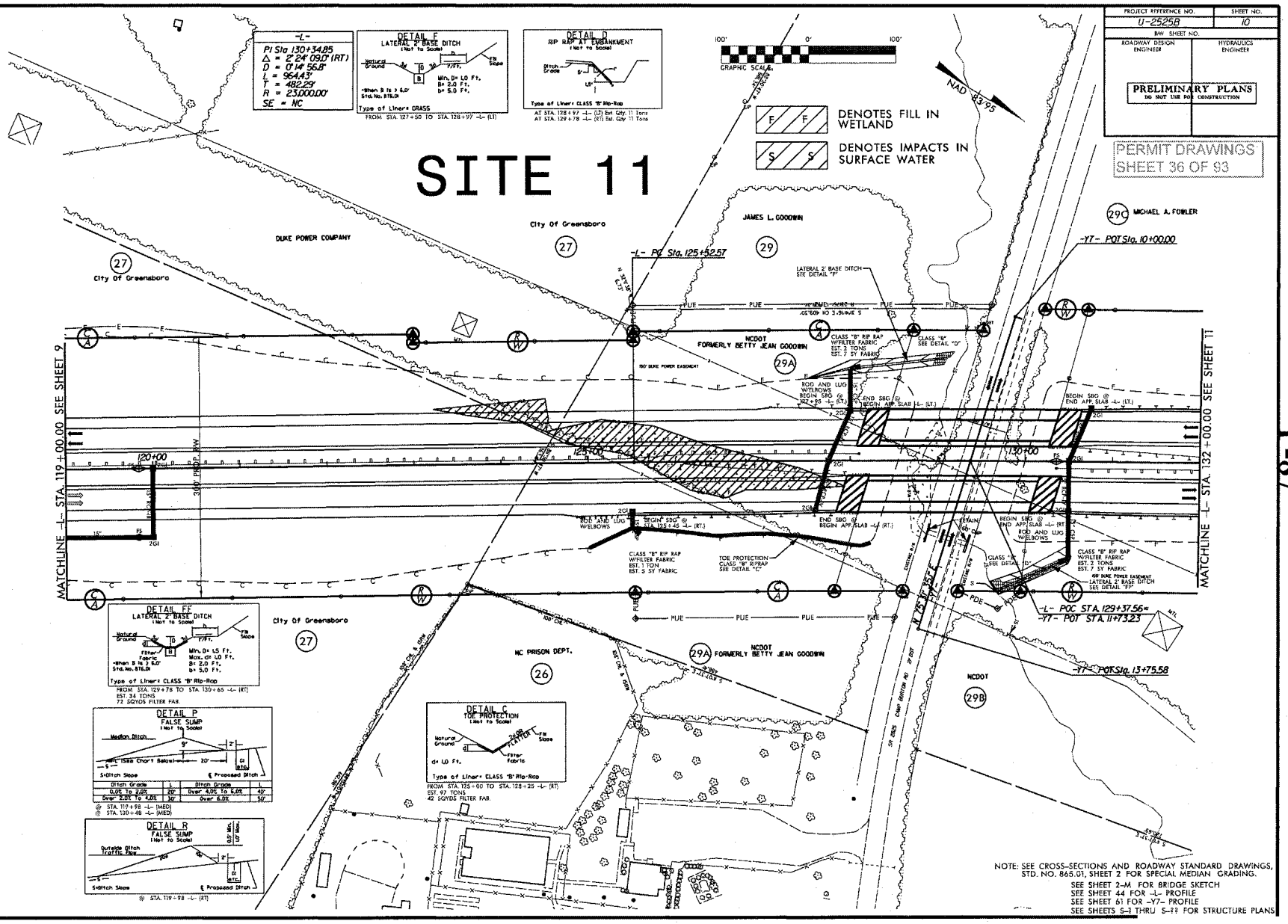
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PERMIT DRAWINGS
SHEET 36 OF 93

REVISIONS

03-09-13 R/W REVISION (DNG) - PARCEL 29 JAMES L. GOODWIN WAS SUBDIVIDED ADDING PARCEL 29A (NCDOT FORMERLY BETTY JEAN GOODWIN) PARCEL 29B (NCDOT) AND PARCEL 29C MICHAEL A. FOWLER. ALSO ADDING PARCEL 29A AND THE SOUTHERN PROPERTY LINE ON PARCEL 29B (NCDOT) AND R/W REVISED COMPLETELY. MOVED THE NORTHERN PROPERTY LINE ON PARCEL 26 NC PRISON DEPT. REVISED THE NORTHERN PROPERTY LINE ON PARCEL 27 CITY OF GREENSBORO AND THE ADDING SOUTHERN PROPERTY LINES ON PARCELS 26 NC PRISON DEPT. 29 JAMES L. GOODWIN AND 29A (NCDOT FORMERLY BETTY JEAN GOODWIN) REVISED THE LOCATION OF THE R/W AND C/A TO THE WESTERN PROPERTY LINE ON PARCEL 29B (NCDOT).

5/14/99



NOTE: SEE CROSS-SECTIONS AND ROADWAY STANDARD DRAWINGS, STD. NO. 865.01, SHEET 2 FOR SPECIAL MEDIAN GRADING.

SEE SHEET 2-M FOR BRIDGE SKETCH
SEE SHEET 44 FOR -L- PROFILE
SEE SHEET 61 FOR -Y7- PROFILE
SEE SHEETS S-1 THRU S-?? FOR STRUCTURE PLANS

REVISIONS

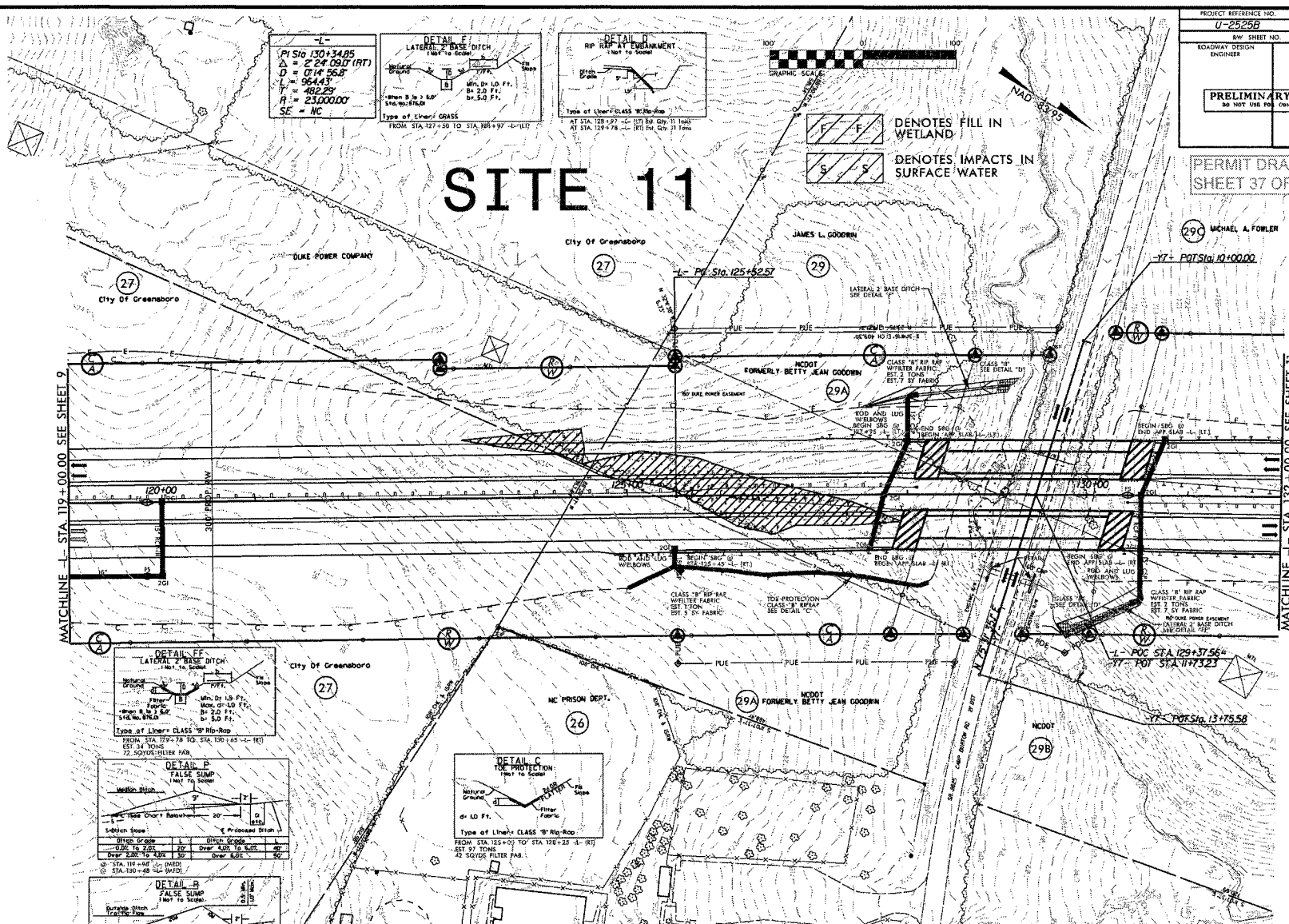
03-19-13 R/W REVISION (DWG) - PARCEL 29 (JAMES L. GOODWIN) WAS SUBDIVIDED INTO PARCEL 29A (NCDOT, FORMERLY BETTY JEAN GOODWIN) PARCEL 29B (NCDOT) AND PARCEL 29C (MICHAEL A. FOWLER). CHANGED THE NORTHERN PROPERTY LINE ON PARCEL 29A AND THE SOUTHERN PROPERTY LINE ON PARCEL 29B TO R/W. DELETED PARCEL 28 (DUKE POWER COMPANY) DUE TO PROPERTY LINE DELINEATION CHANGING TO EASEMENT. REVISED THE NORTHERN PROPERTY LINE ON PARCEL 27 (CITY OF GREENSBORO) AND THE ADJOINING SOUTHERN PROPERTY LINES ON PARCELS 26 (NC PRISON DEPT.) AND 29A (NCDOT FORMERLY BETTY JEAN GOODWIN). REVISED THE LOCATION OF THE R/W AND C/A TO THE WESTERN PROPERTY LINE ON PARCEL 29B (NCDOT).

5/14/13

PROJECT REFERENCE NO.	SHEET NO.
U-2525B	10
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

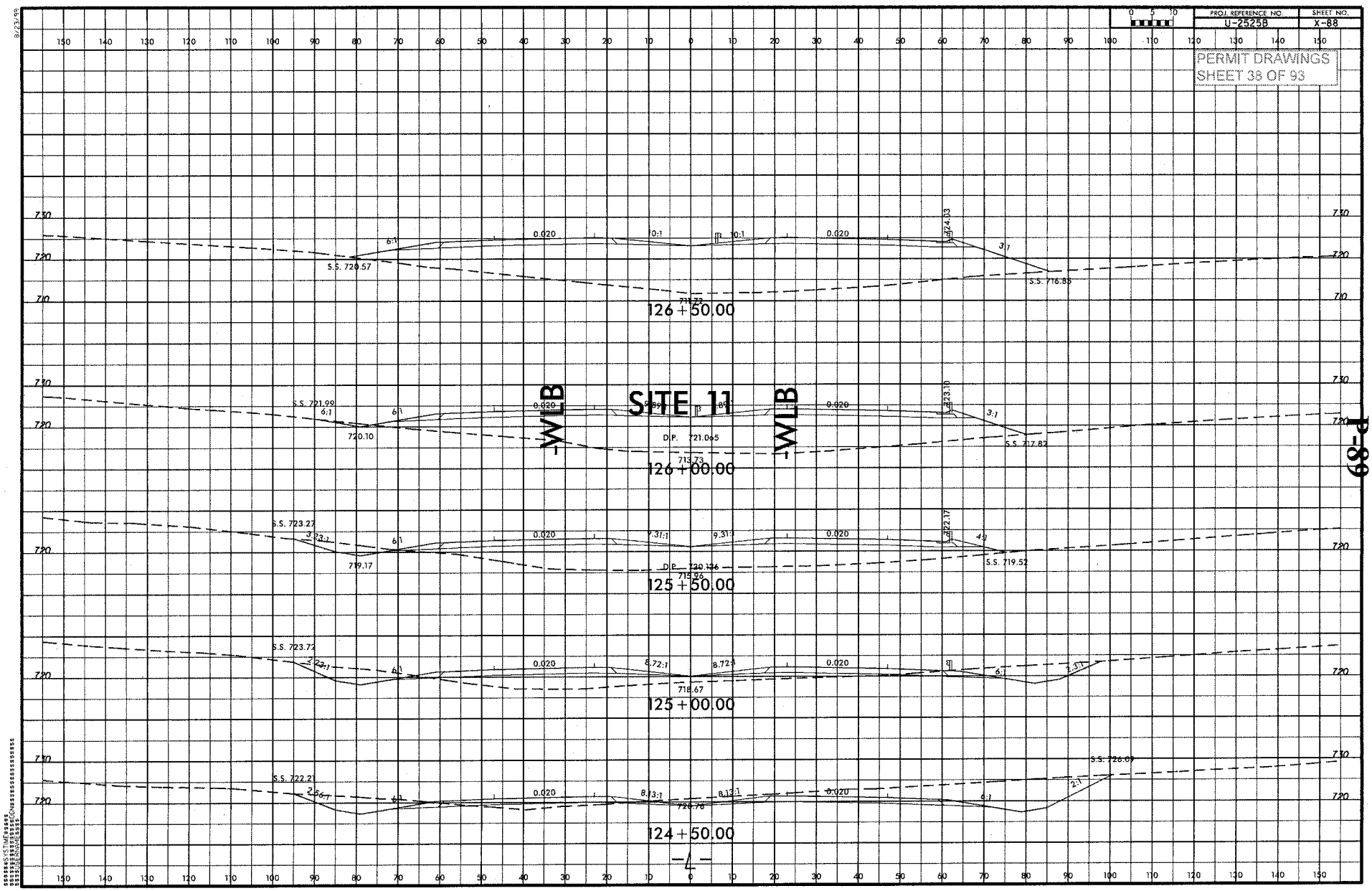
PERMIT DRAWINGS
SHEET 37 OF 93



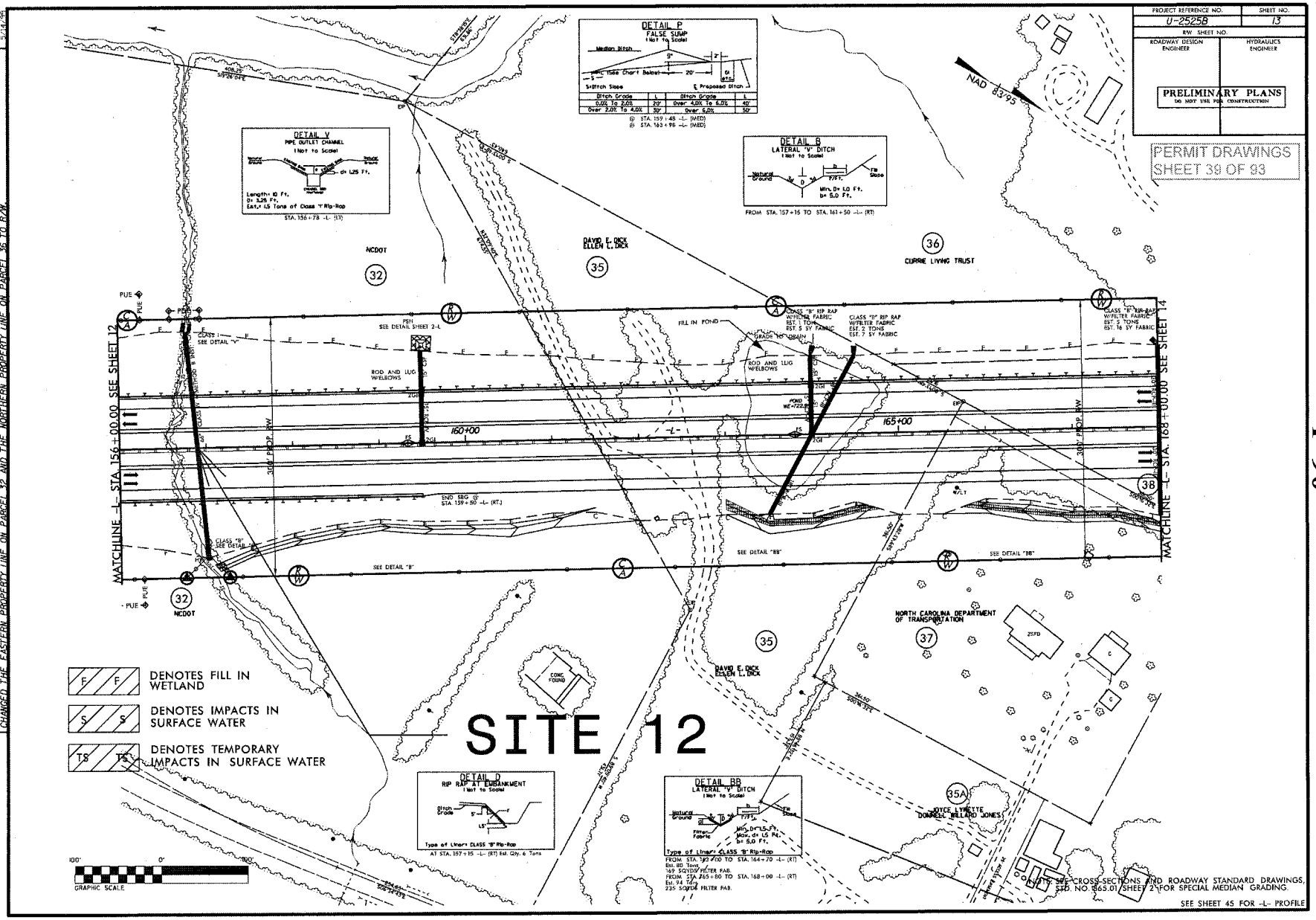
NOTE: SEE CROSS-SECTIONS AND ROADWAY STANDARD DRAWINGS, STD. NO. 865.01, SHEET 2 FOR SPECIAL MEDIAN GRADING.

SEE SHEET 2-M FOR BRIDGE SKETCH
SEE SHEET 44 FOR -L- PROFILE
SEE SHEET 61 FOR -Y7- PROFILE
SEE SHEETS S-1 THRU S-89 FOR STRUCTURE PLANS

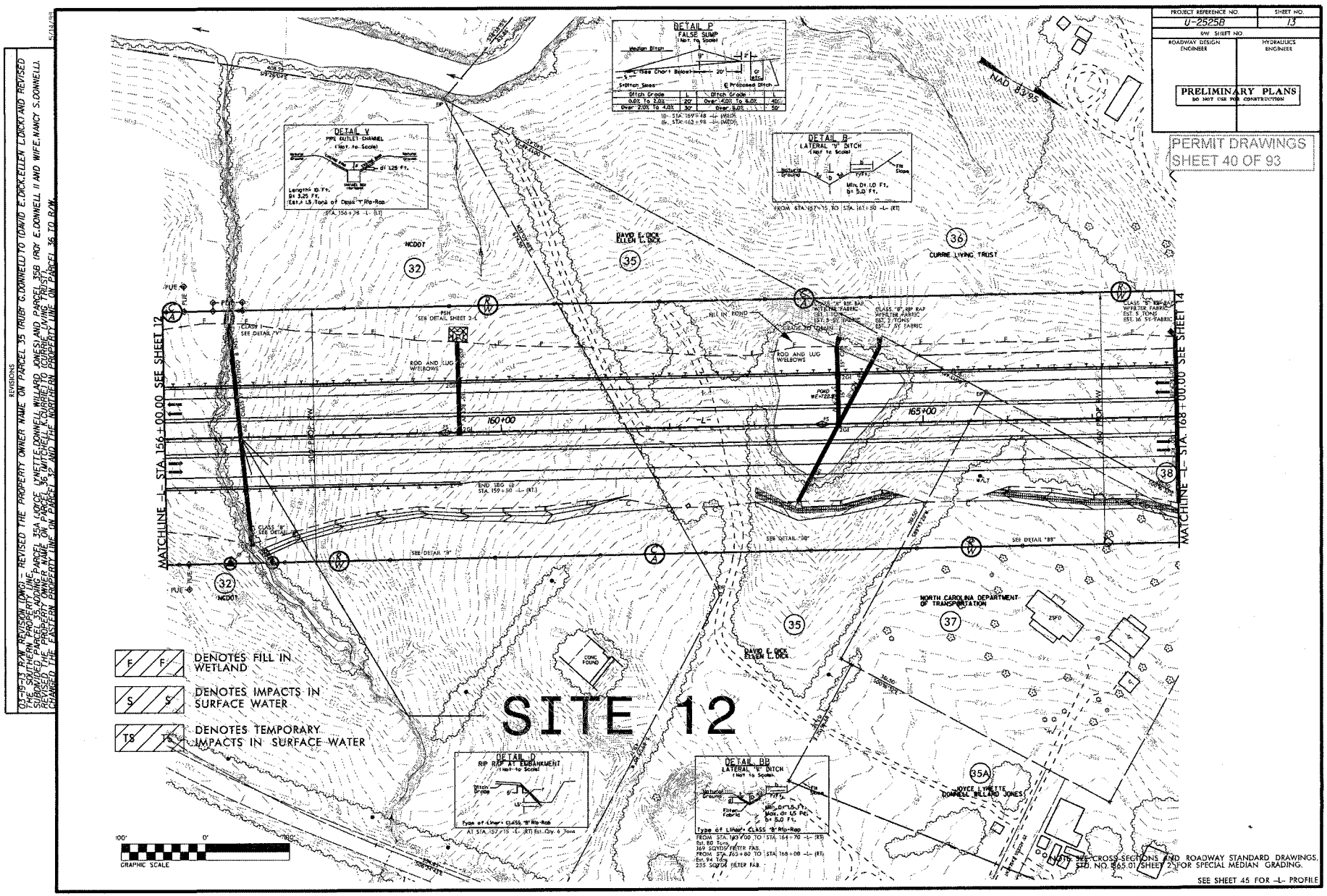
PERMIT DRAWINGS
SHEET 38 OF 93

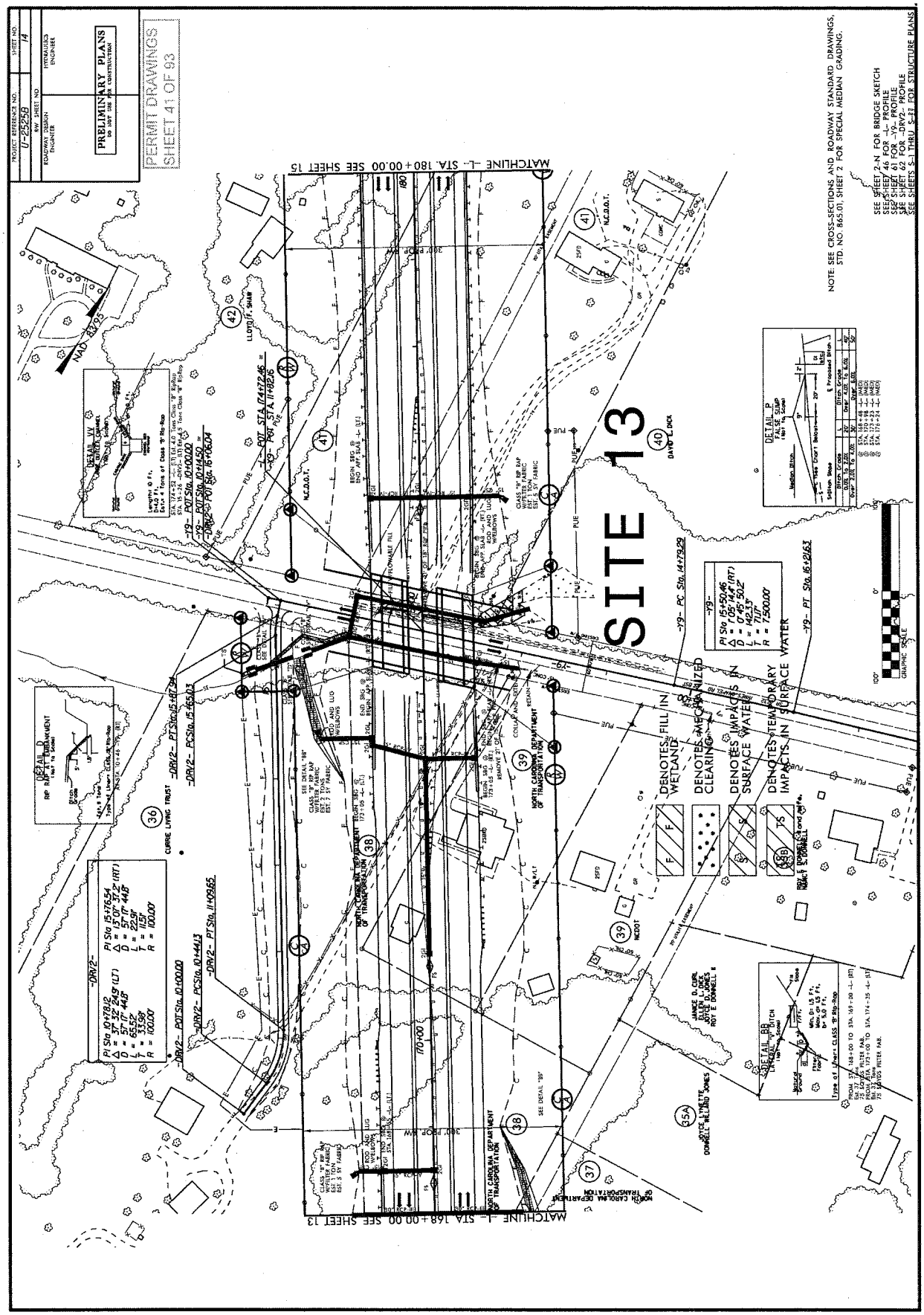


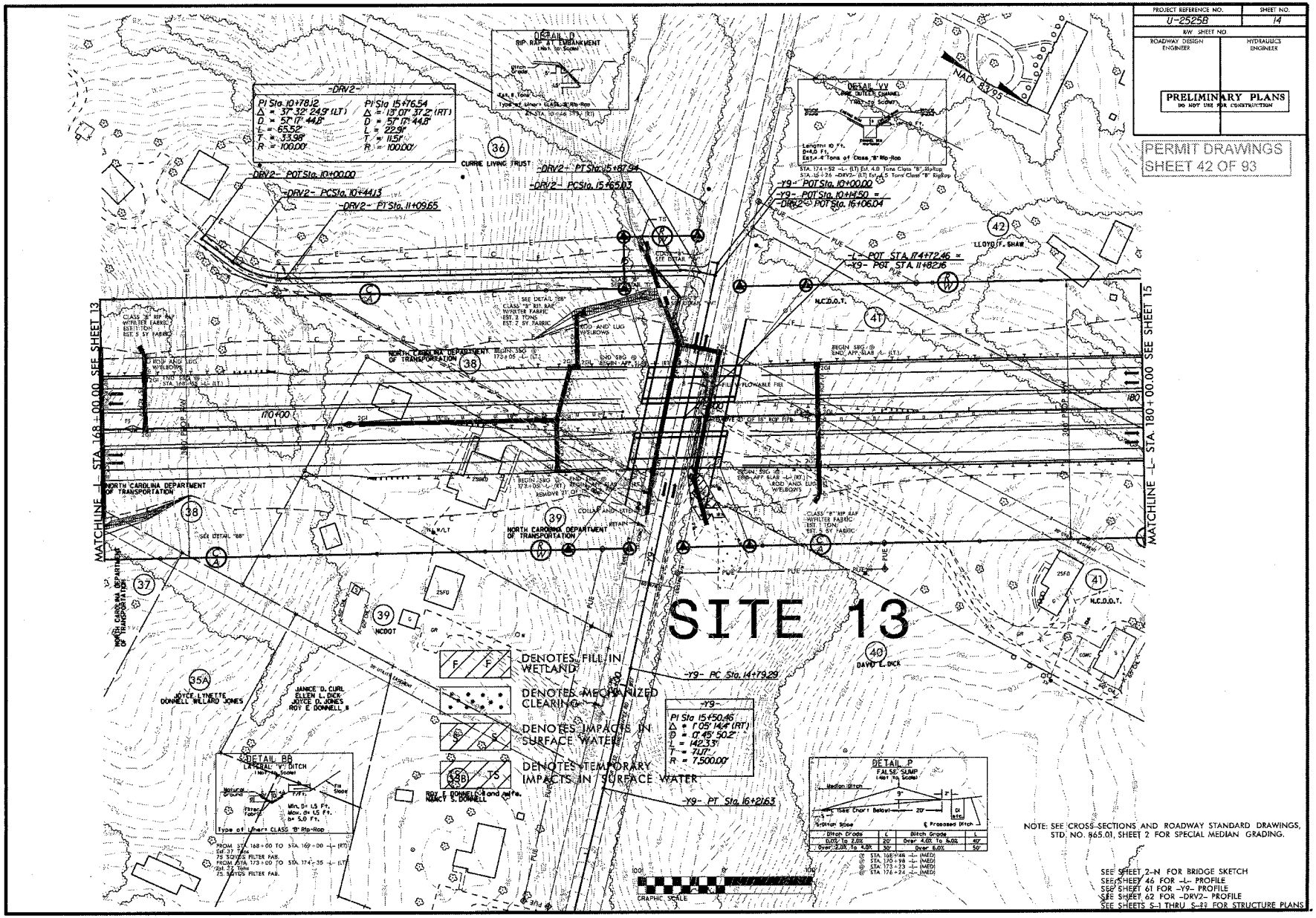
P-89

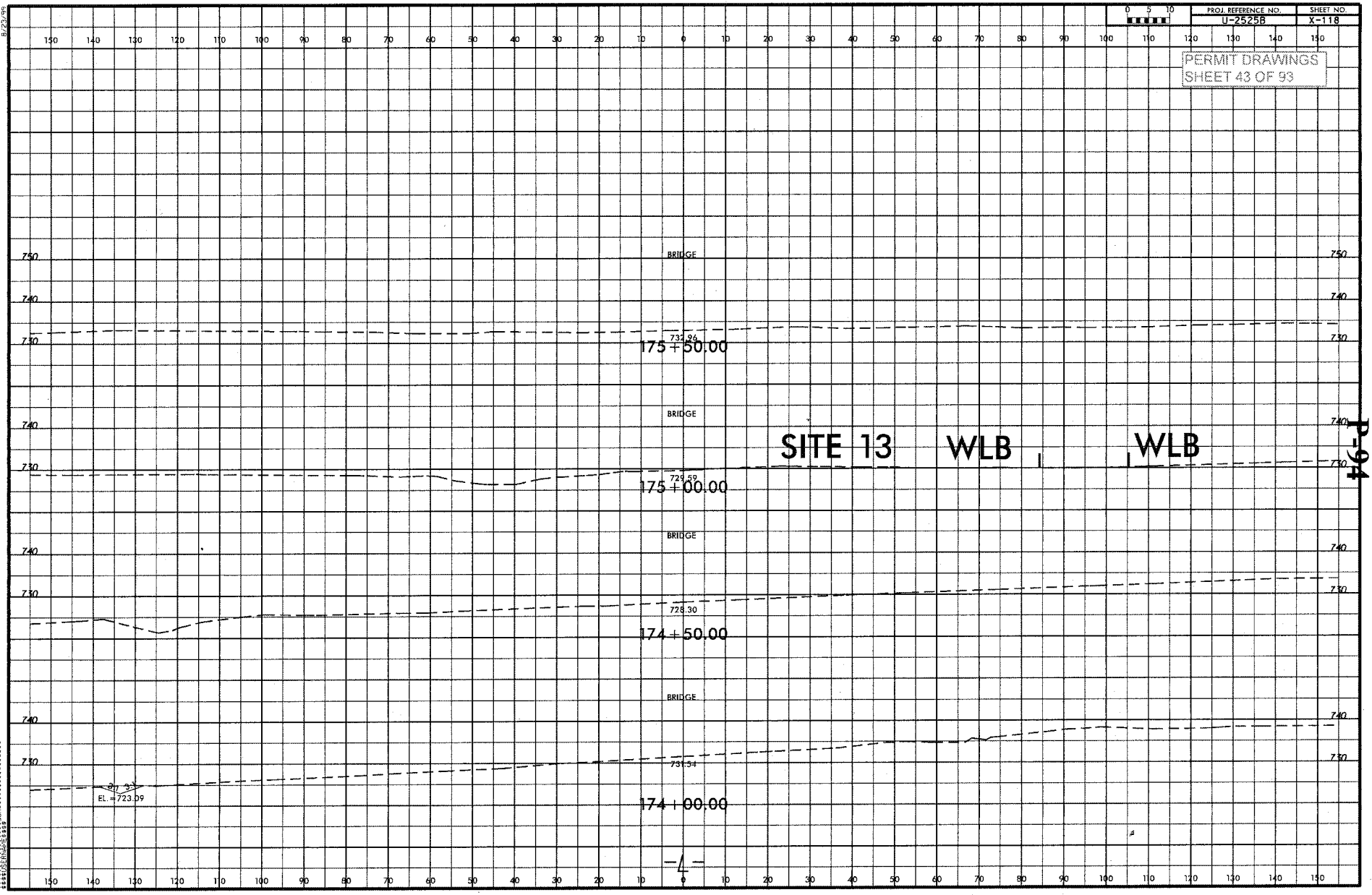

PROJECT REFERENCE NO.
U-2525B
SHEET NO.
13
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PERMIT DRAWINGS
SHEET 39 OF 93
NAD 83/95
DETAIL P
FALSE SUMP
(Not to Scale)
Median Ditch
Slope Chart Below
Sideslopes
Ditch Grade
L
Over 4.0% To 6.0%
40'
Over 6.0%
50'
Over 2.0% To 4.0%
30'
@ STA. 159+48 -L- (MED)
@ STA. 163+96 -L- (MED)
DETAIL V
PIPE OUTLET CHANNEL
(Not to Scale)
Length= 10 Ft.
D= 3.25 Ft.
Est.= 1.5 Tons of Class "I" Rip-Rap
STA. 156+78 -L- (LT)
DETAIL B
LATERAL "V" DITCH
(Not to Scale)
Natural Ground
Fill Slope
Min. D= 1.0 Ft.
b= 5.0 Ft.
FROM STA. 157+15 TO STA. 161+50 -L- (RT)
DETAIL D
RIP RAP AT EMBANKMENT
(Not to Scale)
Ditch Grade
Type of Linear CLASS "B" Rip-Rap
AT STA. 157+15 -L- (RT) Est. Qty. 6 Tons
DETAIL BB
LATERAL "V" DITCH
(Not to Scale)
Natural Ground
Filter Fabric
Fill Slope
Min. D= 1.5 Ft.
Max. d= 1.5 Ft.
b= 5.0 Ft.
Type of Linear CLASS "B" Rip-Rap
FROM STA. 163+00 TO STA. 164+70 -L- (RT)
Est. 80 Tons
169 SQYDS FILTER FAB.
FROM STA. 165+80 TO STA. 168+00 -L- (RT)
Est. 94 Tons
235 SQYDS FILTER FAB.
NCDOT
32
DAVID E. DICK
ELLEN L. DICK
35
CURRIE LIVING TRUST
36
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
37
38
35A
JOYCE LYNETTE DONNELL WILLARD JONES
MATCHLINE -L- STA. 156+00.00 SEE SHEET 12
MATCHLINE -L- STA. 168+00.00 SEE SHEET 14
160+00
165+00
PUE
CLASS "B" SEE DETAIL "V"
PSH SEE DETAIL SHEET 2-L
ROD AND LUG W/ELBOWS
END RBG @ STA. 159+50 -L- (RT.)
FILL IN POND
GRADE TO DRAIN
CLASS "B" RIP RAP W/FILTER FABRIC EST. 1 TONS EST. 5 SY FABRIC
CLASS "B" RIP RAP W/FILTER FABRIC EST. 2 TONS EST. 7 SY FABRIC
CLASS "B" RIP-RAP W/FILTER FABRIC EST. 5 TONS EST. 16 SY FABRIC
SEE DETAIL "B"
SEE DETAIL "BB"
CONC FOUND
25FD
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SITE 12
100'
0'
100'
GRAPHIC SCALE
NOTE: SEE CROSS SECTIONS AND ROADWAY STANDARD DRAWINGS, STD. NO. 1605.01 SHEET 2 FOR SPECIAL MEDIAN GRADING.
SEE SHEET 45 FOR -L- PROFILE
REVISIONS
07-09-03 R/W REVISION (DWG) REVISED THE PROPERTY OWNER NAME ON PARCEL 35 (RUBY G.DONNELL) TO (DAVID E.DICK,ELLEN L.DICK) AND REVISED SUBDIVIDED PARCEL 35 INTO PARCEL 35A (JOYCE LYNETTE DONNELL WILLARD JONES) AND PARCEL 35B (ROY E.DONNELL II AND WIFE,NANCY S.DONNELL). ADDED PARCEL 36 (MITCHELL K.CURRIE) TO (CURRIE LIVING TRUST). REVISED THE PROPERTY OWNER NAME ON PARCEL 36 (MITCHELL K.CURRIE) TO (CURRIE LIVING TRUST). CHANGED THE EASTERN PROPERTY LINE ON PARCEL 32 AND THE NORTHERN PROPERTY LINE ON PARCEL 35 TO R/W.
5/14/96

P-90


PROJECT REFERENCE NO.
U-2525B
SHEET NO.
13
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PERMIT DRAWINGS
SHEET 40 OF 93
REVISIONS
03-19-13 R/W REVISION (DWG) - REVISED THE PROPERTY OWNER NAME ON PARCEL 35 (RUBY G.DONNELL) TO (DAVID E.DICK,ELLEN L.DICK) AND REVISED THE SOUTHERN PROPERTY LINE.
SUBDIVIDED PARCEL 35, ADDING PARCEL 35A (JOYCE LYNETTE,DONNELL WILLARD JONES) AND PARCEL 35B (ROY E.DONNELL II AND WIFE,NANCY S.DONNELL).
REVISED THE PROPERTY OWNER NAME ON PARCEL 36 (MITCHELL K.CURRIE) TO (CURRIE LIVING TRUST).
CHANGED THE EASTERN PROPERTY LINE ON PARCEL 32 AND THE NORTHERN PROPERTY LINE ON PARCEL 36 TO R/W.
DETAIL P
FALSE SUMP
DETAIL V
PIPE OUTLET CHANNEL
DETAIL B
LATERAL "V" DITCH
DETAIL D
RIP RAP AT EMBANKMENT
DETAIL BB
LATERAL "V" DITCH
NAD 83/95
MATCHLINE -L- STA. 156+00.00 SEE SHEET 12
MATCHLINE -L- STA. 168+00.00 SEE SHEET 14
160+00
165+00
ROD AND LUG W/ELBOWS
FILL IN POND
CURRIE LIVING TRUST
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
JOYCE LYNETTE DONNELL WILLARD JONES
DAVID E. DICK ELLEN L. DICK
NCDOT
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SITE 12
GRAPHIC SCALE
NOTE: SEE CROSS-SECTIONS AND ROADWAY STANDARD DRAWINGS, STD. NO. 865.01 SHEET 2 FOR SPECIAL MEDIAN GRADING.
SEE SHEET 45 FOR -L- PROFILE

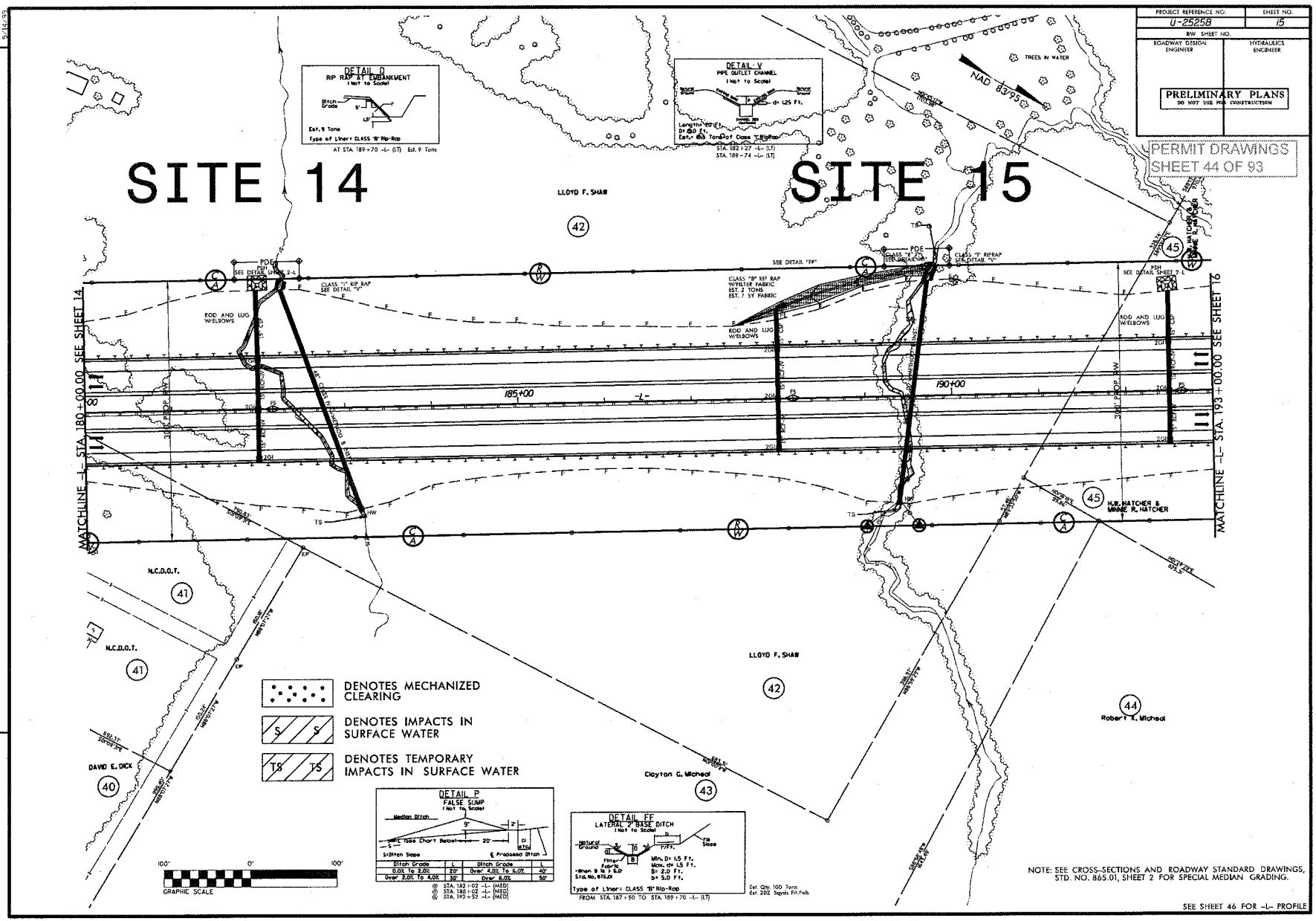

PROJECT REFERENCE NO. U-2525B
SHEET NO. 14
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PERMIT DRAWINGS
SHEET 41 OF 93
NOTE: SEE CROSS-SECTIONS AND ROADWAY STANDARD DRAWINGS, STD. NO. 865.01, SHEET 2 FOR SPECIAL MEDIAN GRADING.
SEE SHEET 2-N FOR BRIDGE SKETCH
SEE SHEET 46 FOR -L- PROFILE
SEE SHEET 61 FOR -Y9- PROFILE
SEE SHEET 62 FOR -DRV2- PROFILE
SEE SHEETS S-1 THRU S-37 FOR STRUCTURE PLANS
SITE 13
MATCHLINE -L- STA. 180+00.00 SEE SHEET 15
MATCHLINE -L- STA 168+00.00 SEE SHEET 13
NAD 83/95
DETAIL VV
DETAIL U
DETAIL P
DETAIL BB
DETAIL DD
RIP RAP 1' TO EMBANKMENT
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE
CURRIE LIVING TRUST
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DAVID E. DICK
JANICE D. CURL
JOYCE L. JONES
ROY E. DONNELL II
DONNELL WILLIAM JONES
ROY S. DONNELL
-Y9- PC Sta. 14+79.29
-Y9- PT Sta. 16+21.63
PI Sta. 15+50.46
Δ = 09°44'47" (RT)
D = 0°45'52"
L = 142.13'
T = 71.17'
R = 7500.00'
-DRV2- PI Sta. 10+78.12
Δ = 37°32'24" (LT)
D = 57°17'44"
L = 65.52'
T = 33.98'
R = 100.00'
-DRV2- PC Sta. 10+44.13
-DRV2- PT Sta. 11+09.65
-DRV2- PC Sta. 15+45.03
-DRV2- PT Sta. 15+47.34
-DRV2- POT Sta. 10+00.00
-Y9- POT Sta. 10+00.00
-Y9- POT Sta. 10+14.50
-DRV2- POT Sta. 15+06.04
-L- POT STA. 14+72.46
-Y9- POT STA. 11+82.16
Type of Liner: CLASS "B" RIP-RAP
FROM STA. 168+00 TO STA. 169+00 -L- (RT)
25 SQ.YDS. FILTER FAB.
ENTIRE STA. 173+00 TO STA. 174+35 -L- (LT)
75 SQ.YDS. FILTER FAB.


PROJECT REFERENCE NO.
U-2525B
SHEET NO.
14
R/W SHEET NO
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PERMIT DRAWINGS
SHEET 42 OF 93
SITE 13
MATCHLINE -L- STA. 168+00.00 SEE SHEET 13
MATCHLINE -L- STA. 180+00.00 SEE SHEET 15
NAD 83/95
DETAIL D
RIP-RAP AT EMBANKMENT
DETAIL VV
PIPE OUTLET CHANNEL
DETAIL BB
LATERAL "V" DITCH
DETAIL P
FALSE SUMP
-DRV2-
PI Sta. 10+78.12
Δ = 37° 32' 24.9" (LT)
D = 57° 17' 44.8"
L = 65.52'
T = 33.98'
R = 100.00'
PI Sta. 15+76.54
Δ = 13° 07' 37.2" (RT)
D = 57° 17' 44.8"
L = 22.91'
T = 11.5'
R = 100.00'
-DRV2- POT Sta. 10+00.00
-DRV2- PCS Sta. 10+44.13
-DRV2- PT Sta. 11+09.65
-DRV2- PT Sta. 15+87.94
-DRV2- PCS Sta. 15+65.03
-DRV2- POT Sta. 16+06.04
-Y9- POT Sta. 10+00.00
-Y9- POT Sta. 10+18.50
-L- POT STA. 174+72.46
-Y9- POT STA. 11+82.16
-Y9- PC Sta. 14+79.29
-Y9- PT Sta. 16+21.63
-Y9-
PI Sta. 15+50.46
Δ = 1°05' 14.4" (RT)
D = 0°45' 50.2"
L = 142.33'
T = 71.17'
R = 7,500.00'
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
CURRE LIVING TRUST
LLOYD F. SHAW
N.C.D.O.T.
NCDOT
DAVID L. DICK
JOYCE LYNETTE DONNELL WELLARD JONES
JANICE D. CURL
ELLEN L. DICK
JOYCE D. JONES
ROY E. DONNELL II
ROY E. DONNELL II and wife, NANCY S. DONNELL
GRAPHIC SCALE
NOTE: SEE CROSS-SECTIONS AND ROADWAY STANDARD DRAWINGS, STD. NO. 865.01, SHEET 2 FOR SPECIAL MEDIAN GRADING.
SEE SHEET 2-N FOR BRIDGE SKETCH
SEE SHEET 46 FOR -L- PROFILE
SEE SHEET 61 FOR -Y9- PROFILE
SEE SHEET 62 FOR -DRV2- PROFILE
SEE SHEETS S-1 THRU S-23 FOR STRUCTURE PLANS



PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-118
PERMIT DRAWINGS
SHEET 43 OF 93
BRIDGE
732.96
175+50.00
BRIDGE
SITE 13
WLB
WLB
729.59
175+00.00
BRIDGE
728.30
174+50.00
BRIDGE
731.54
174+00.00
EL. = 723.09
-L-

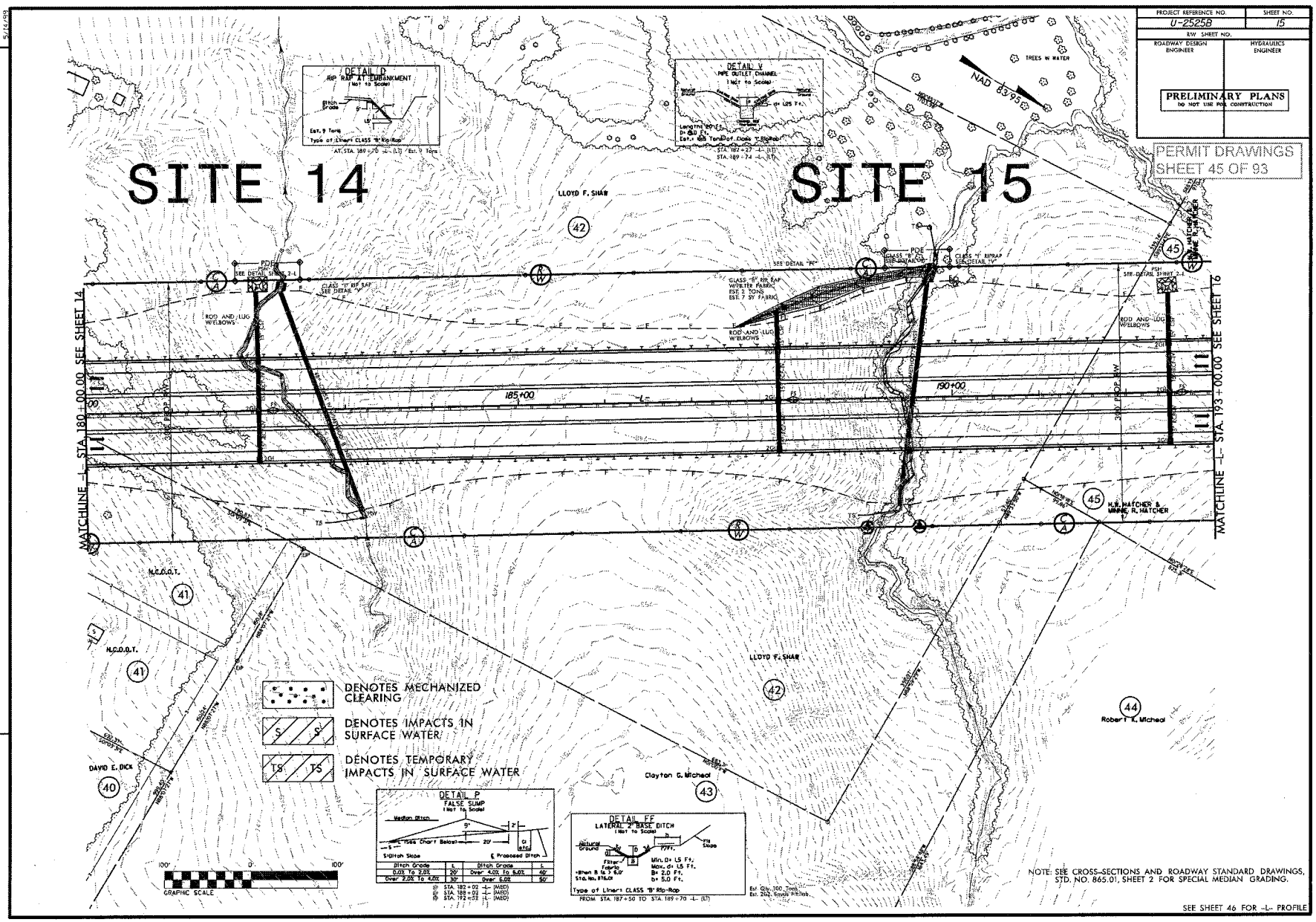
P-94



REVISIONS

03-19-13 R/W REVISION (DWG) - CHANGED THE SOUTHERN PROPERTY LINES ON PARCELS 40, 41, AND 42 TO R/W.

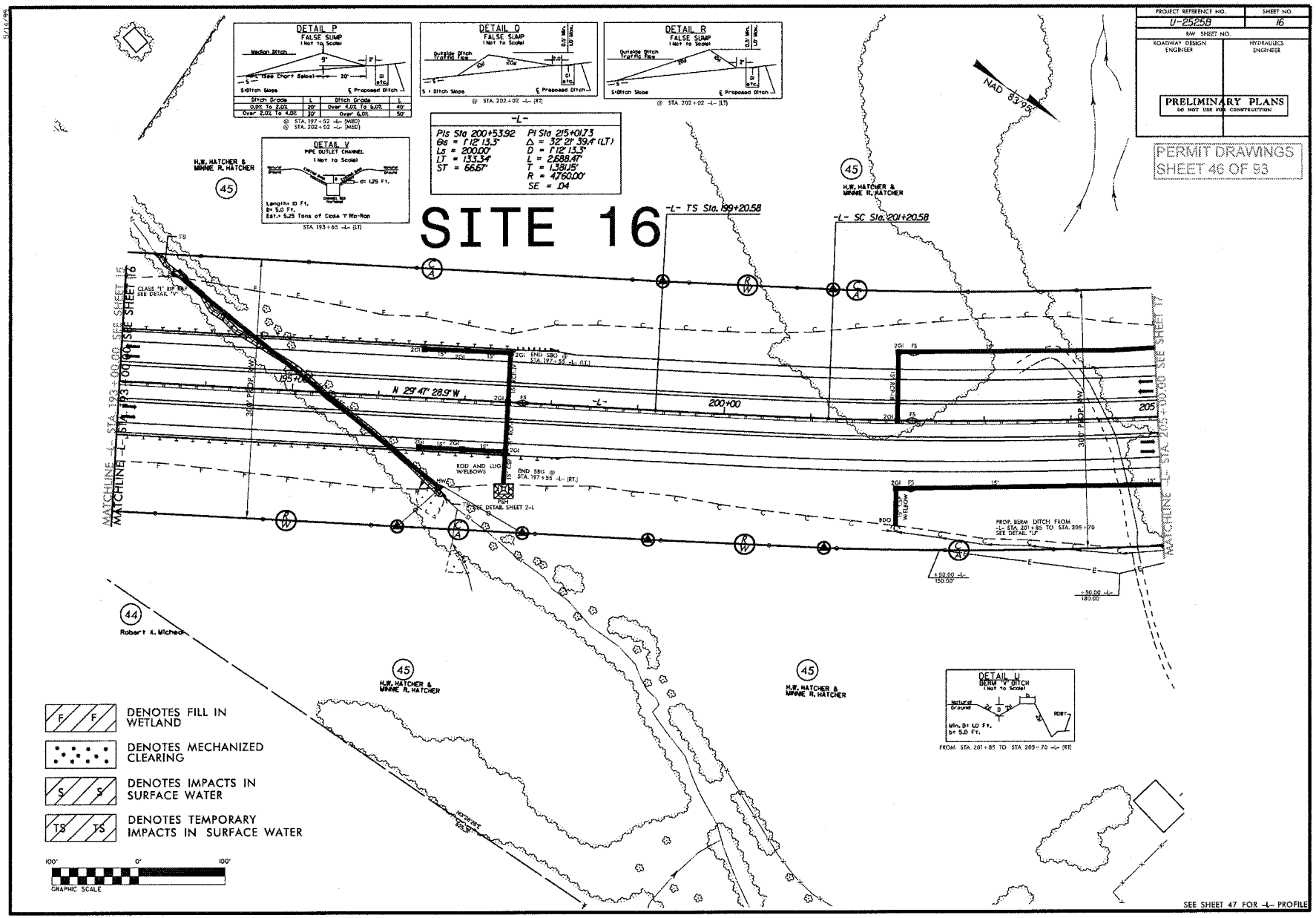
5/14/99

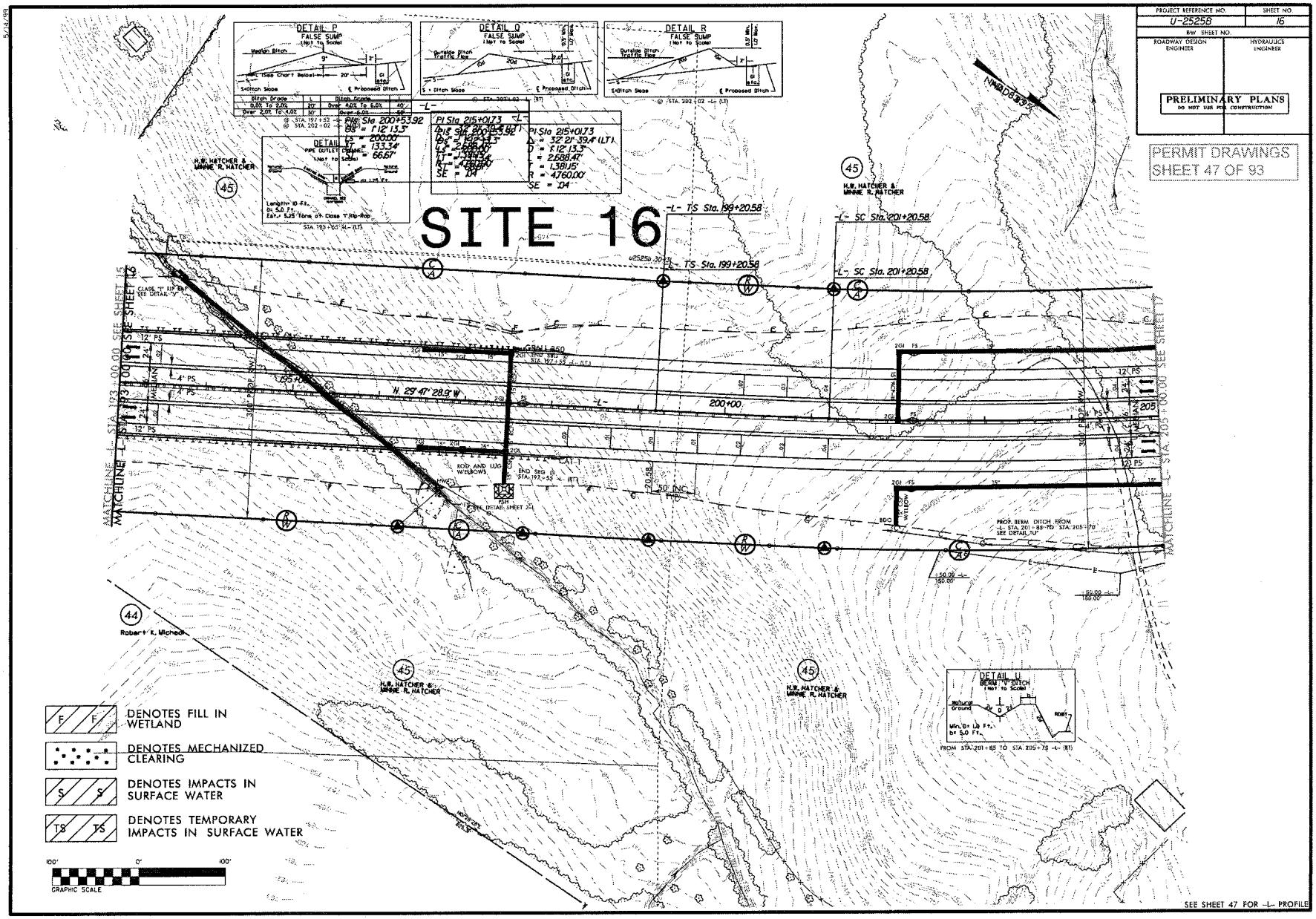


REVISIONS

03-19-13 R/W REVISION (DWG) - CHANGED THE SOUTHERN PROPERTY LINES ON PARCELS 40, 41, AND 42 TO R/W.

5/14/99


PROJECT REFERENCE NO.
U-2525B
SHEET NO.
16
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PERMIT DRAWINGS
SHEET 46 OF 93
SITE 16
DETAIL P
FALSE SUMP
(Not to Scale)
DETAIL Q
FALSE SUMP
(Not to Scale)
DETAIL R
FALSE SUMP
(Not to Scale)
DETAIL V
PIPE OUTLET CHANNEL
(Not to Scale)
-L-
PIs Sta 200+53.92
θs = 1°12' 13.3"
Ls = 200.00'
LT = 133.34'
ST = 66.67'
PI Sta 215+01.73
Δ = 32° 21' 39.4" (LT)
D = 1°12' 13.3"
L = 2,688.47'
T = 1,381.15'
R = 4,760.00'
SE = .04
-L- TS Sta. 189+20.58
-L- SC Sta. 201+20.58
NAD 83/95
H.W. HATCHER & MINNIE R. HATCHER
45
44
Robert K. Michael
N 29° 47' 28.9" W
-L-
200+00
205
MATCHLINE -L- STA. 193+00.00 SEE SHEET 16
MATCHLINE -L- STA. 205+00.00 SEE SHEET 17
300' PROP. R/W
END SBG @ STA. 197+55 -L- (LT.)
END SBG @ STA. 197+55 -L- (RT.)
ROD AND LUG W/ELBOWS
SEE DETAIL SHEET 2-L
PROP. BERM DITCH FROM -L- STA. 201+85 TO STA. 205+70 SEE DETAIL "U"
DETAIL U
BERM "U" DITCH
(Not to Scale)
FROM STA. 201+85 TO STA. 205+70 -L- (RT)
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE
SEE SHEET 47 FOR -L- PROFILE

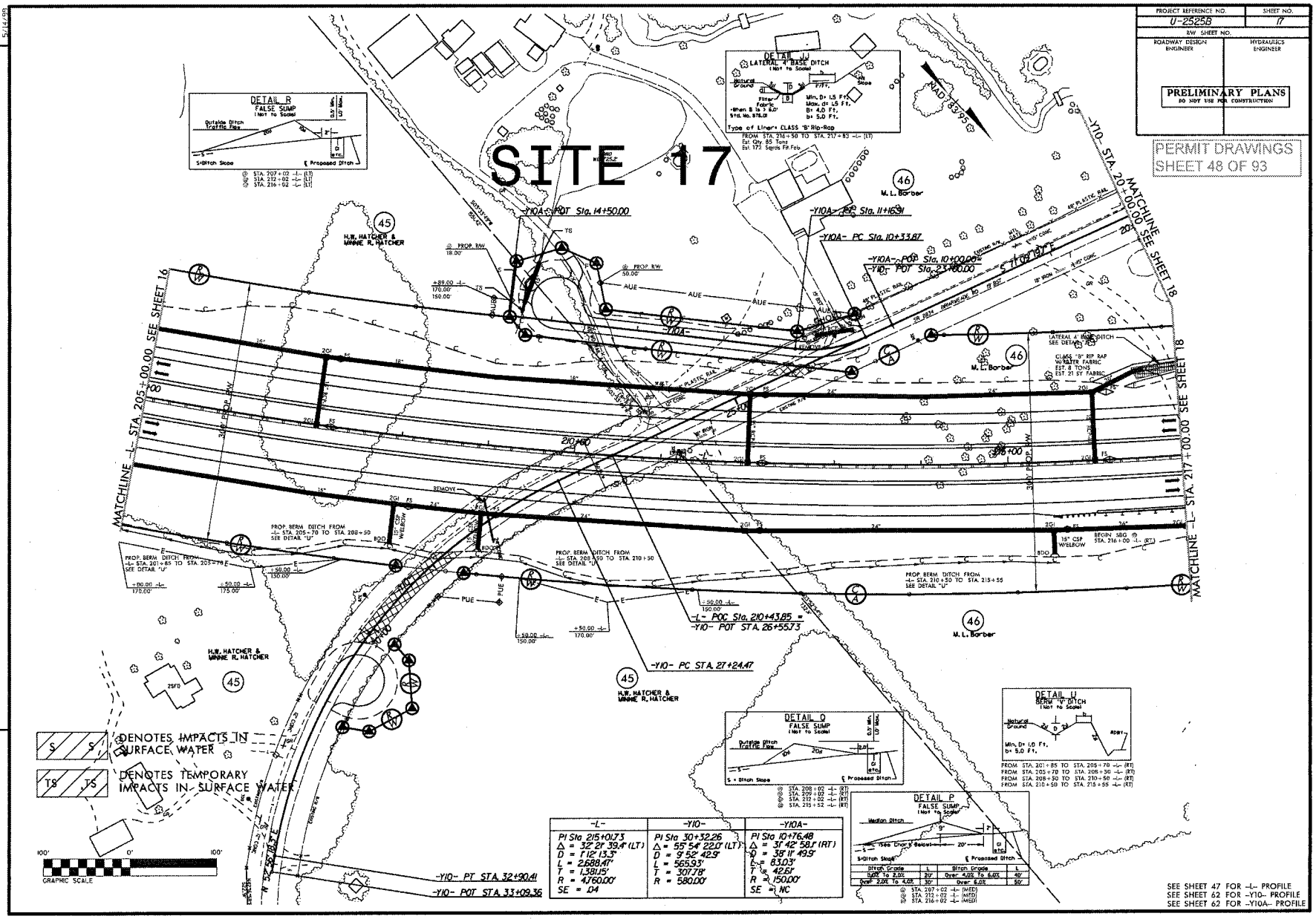

PROJECT REFERENCE NO.
U-2525B
SHEET NO.
16
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PERMIT DRAWINGS
SHEET 47 OF 93
SITE 16
DETAIL P
FALSE SUMP
DETAIL Q
FALSE SUMP
DETAIL R
FALSE SUMP
DETAIL T
PIPE OUTLET CHANNEL
DETAIL U
BERM "V" DITCH
H.W. HATCHER & MINNIE R. HATCHER
Robert K. Michael
-L- TS Sta. 199+20.58
-L- SC Sta. 201+20.58
N 29° 47' 28.9" W
200+00
MATCHLINE -L- STA. 193+00.00 SEE SHEET 16
MATCHLINE -L- STA. 205+00.00 SEE SHEET 17
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE
SEE SHEET 47 FOR -L- PROFILE

PROJECT REFERENCE NO.	SHEET NO.
U-2525B	17
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PERMIT DRAWINGS
SHEET 48 OF 93

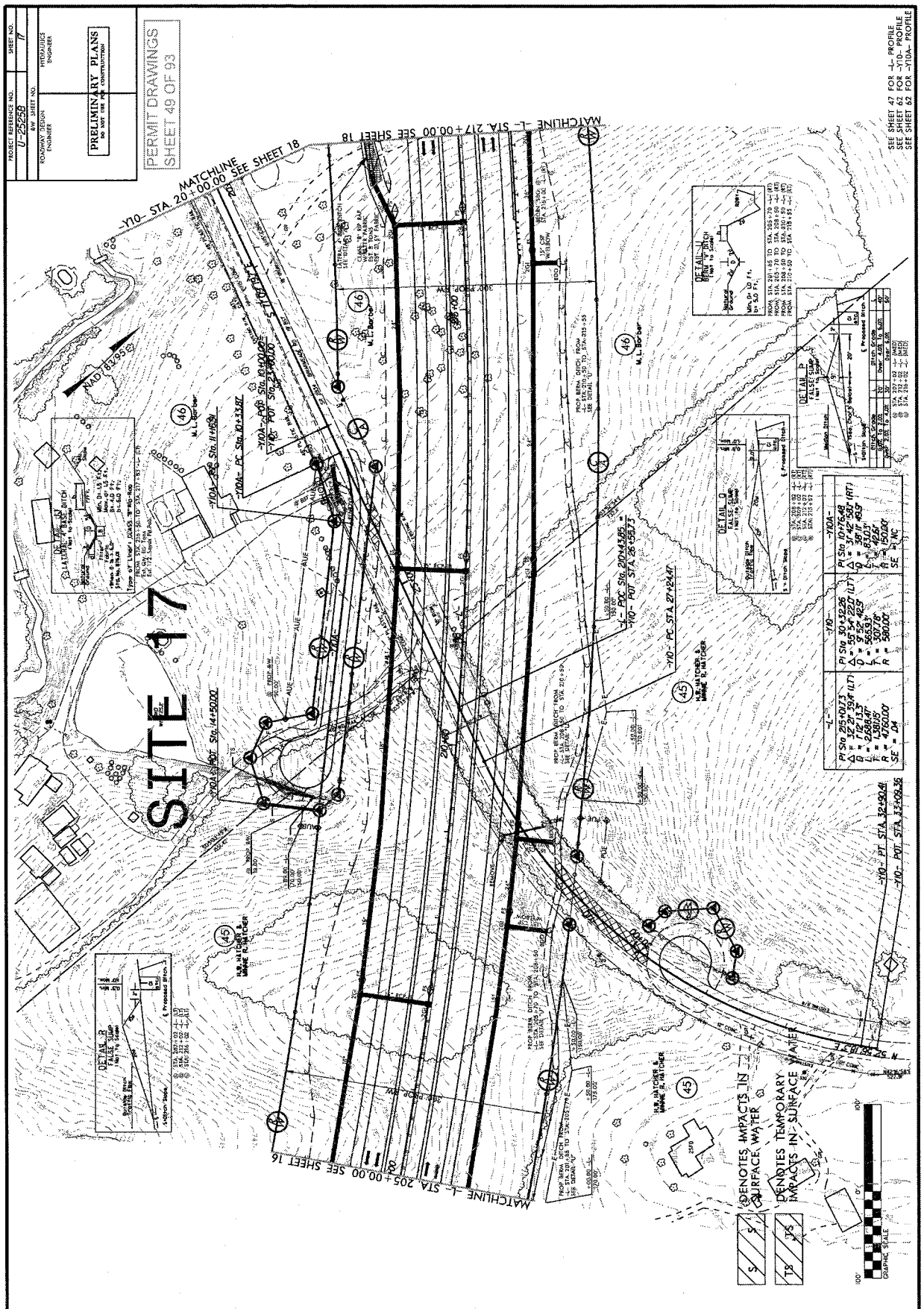
SITE 17



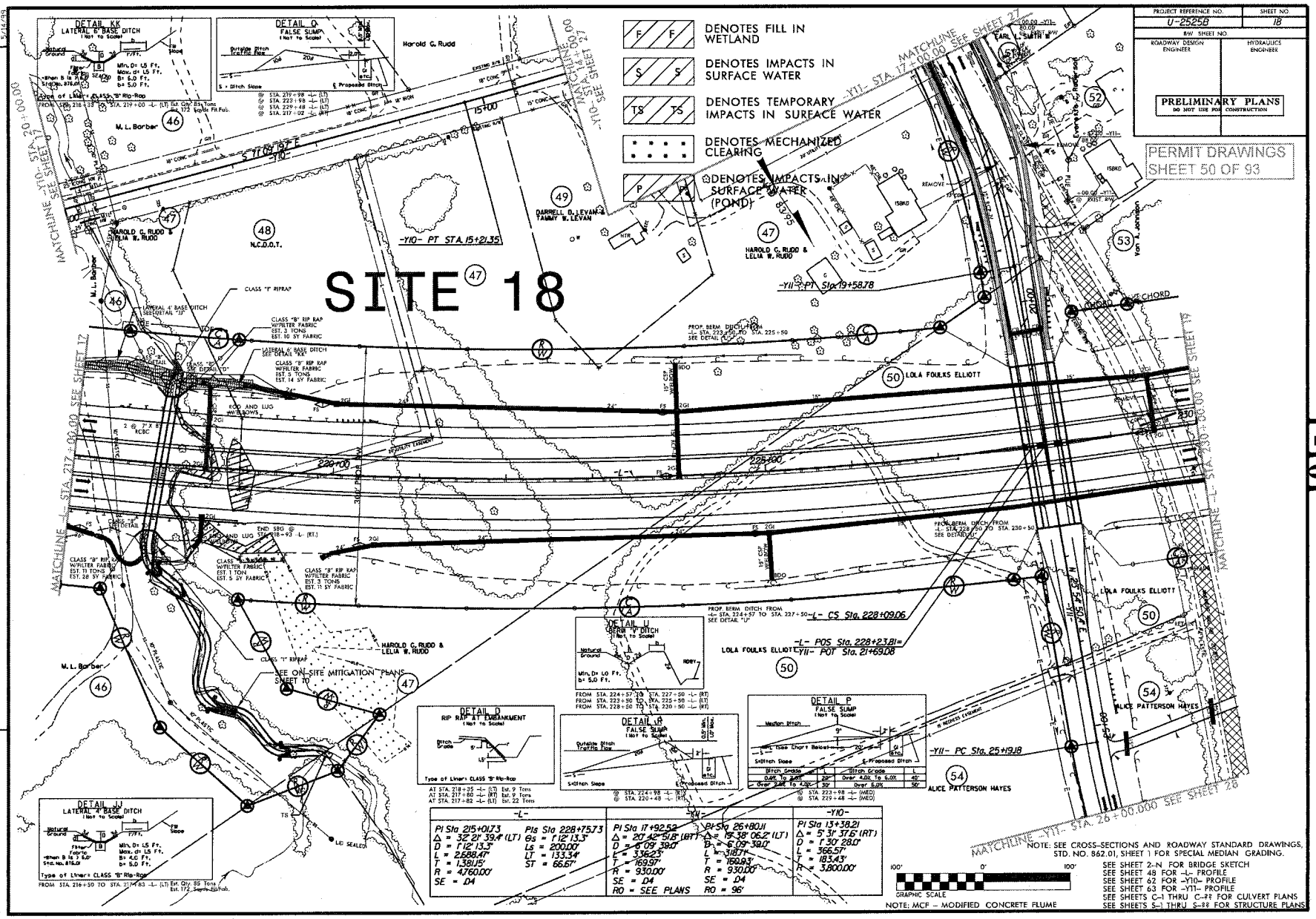
-L-	-Y10-	-Y10A-
PI Sta 215+01.73	PI Sta 30+32.26	PI Sta 10+76.48
Δ = 32° 21' 39.4" (LT)	Δ = 55° 54' 22.0" (LT)	Δ = 31° 42' 58.1" (RT)
D = 1°12' 13.3"	D = 9° 52' 42.9"	D = 38° 11' 49.9"
L = 2,688.41'	L = 565.93'	L = 83.03'
T = 1,381.15'	T = 307.78'	T = 42.51'
R = 4,760.00'	R = 580.00'	R = 150.00'
SE = .04		SE = NC

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'

P-100

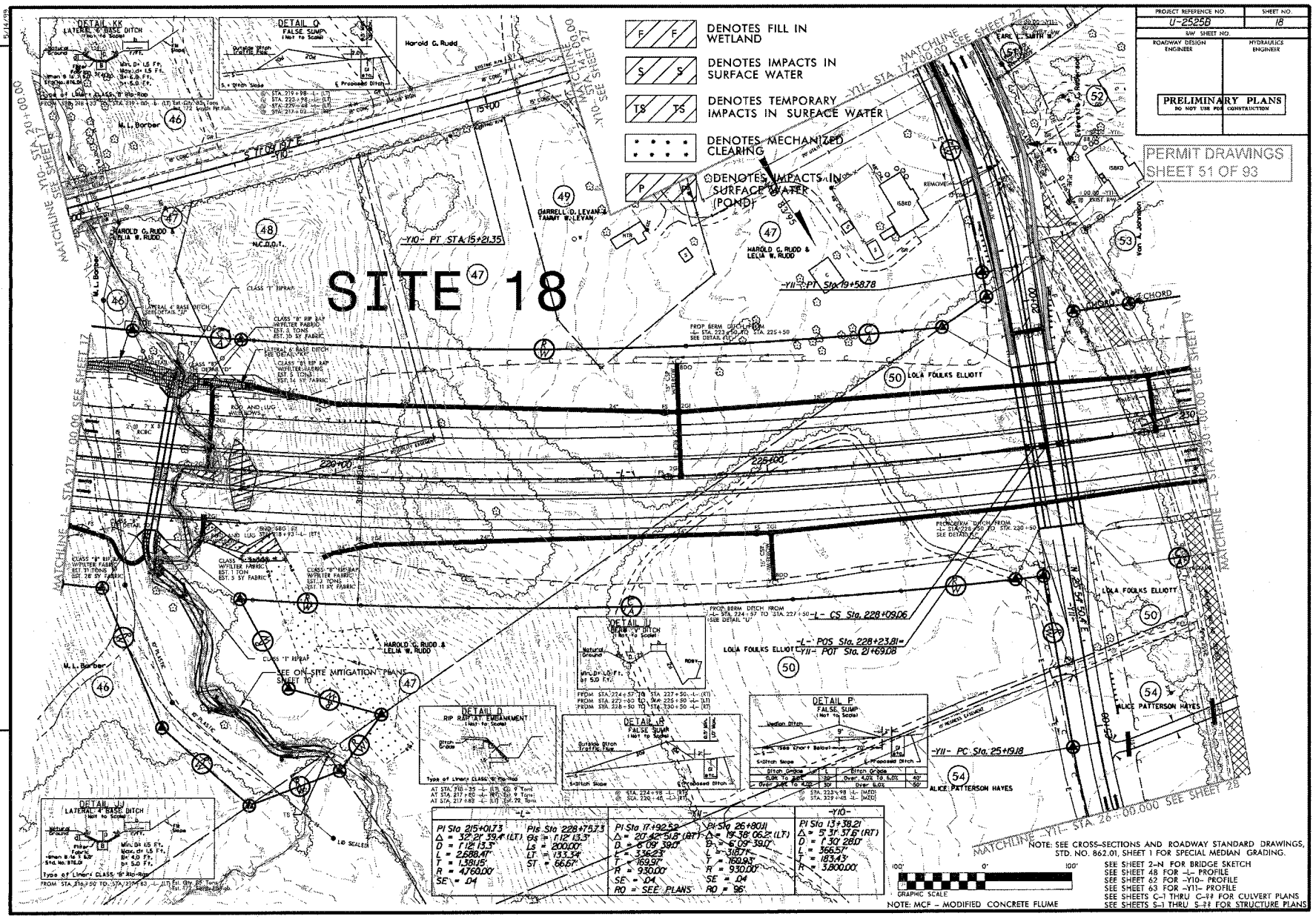


PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PERMIT DRAWINGS
SHEET 49 OF 93
SITE 17
MATCHLINE -L- STA. 217+00.00 SEE SHEET 18
MATCHLINE -L- STA. 205+00.00 SEE SHEET 16
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE



PROJECT REFERENCE NO.
U-2525B
SHEET NO.
18
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PERMIT DRAWINGS
SHEET 50 OF 93
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER (POND)
SITE 18
DETAIL KK
LATERAL 6' BASE DITCH
DETAIL O
FALSE SUMP
DETAIL U
BERM "V" DITCH
DETAIL D
RIP RAP AT EMBANKMENT
DETAIL R
FALSE SUMP
DETAIL P
FALSE SUMP
DETAIL JJ
LATERAL 4' BASE DITCH
Harold G. Rudd
M. L. Barber
N.C.D.O.T.
DARRELL D. LEVAN & TAMMY W. LEVAN
HAROLD G. RUDD & LELIA W. RUDD
LOLA FOULKS ELLIOTT
ALICE PATTERSON HAYES
-Y10- PT STA. 15+21.35
-Y11- PT Sta. 19+58.78
-L- CS Sta. 228+09.06
-L- POS Sta. 228+23.81=
-Y11- POT Sta. 21+69.08
-Y11- PC Sta. 25+19.18
SEE ON-SITE MITIGATION PLANS SHEET 10
MATCHLINE -Y10- STA. 20+00.00 SEE SHEET 17
MATCHLINE -Y10- STA. 14+00.00 SEE SHEET 27
MATCHLINE -Y11- STA. 17+00.00 SEE SHEET 27
MATCHLINE -Y11- STA. 26+00.000 SEE SHEET 28
MATCHLINE -L- STA. 217+00.00 SEE SHEET 17
MATCHLINE -L- STA. 230+00.00 SEE SHEET 19
-L-
PI Sta 215+01.73
Δ = 32° 21' 39.4" (LT)
D = 1° 12' 13.3"
L = 2,688.47'
T = 1,381.15'
R = 4,760.00'
SE = .04
PIs Sta 228+75.73
θs = 1° 12' 13.3"
Ls = 200.00'
LT = 133.34'
ST = 66.67'
-Y11-
PI Sta 17+92.52
Δ = 20° 42' 51.8" (RT)
D = 6° 09' 39.0"
L = 336.23'
T = 169.97'
R = 930.00'
SE = .04
RO = SEE PLANS
PI Sta 26+80.11
Δ = 19° 38' 06.2" (LT)
D = 6° 09' 39.0"
L = 318.71'
T = 160.93'
R = 930.00'
SE = .04
RO = 96'
-Y10-
PI Sta 13+38.21
Δ = 5° 31' 37.6" (RT)
D = 1° 30' 28.0"
L = 366.57'
T = 183.43'
R = 3,800.00'
GRAPHIC SCALE
NOTE: MCF – MODIFIED CONCRETE FLUME
NOTE: SEE CROSS-SECTIONS AND ROADWAY STANDARD DRAWINGS, STD. NO. 862.01, SHEET 1 FOR SPECIAL MEDIAN GRADING.
SEE SHEET 2-N FOR BRIDGE SKETCH
SEE SHEET 48 FOR -L- PROFILE
SEE SHEET 62 FOR -Y10- PROFILE
SEE SHEET 63 FOR -Y11- PROFILE
SEE SHEETS C-1 THRU C-?? FOR CULVERT PLANS
SEE SHEETS S-1 THRU S-?? FOR STRUCTURE PLANS
REVISIONS

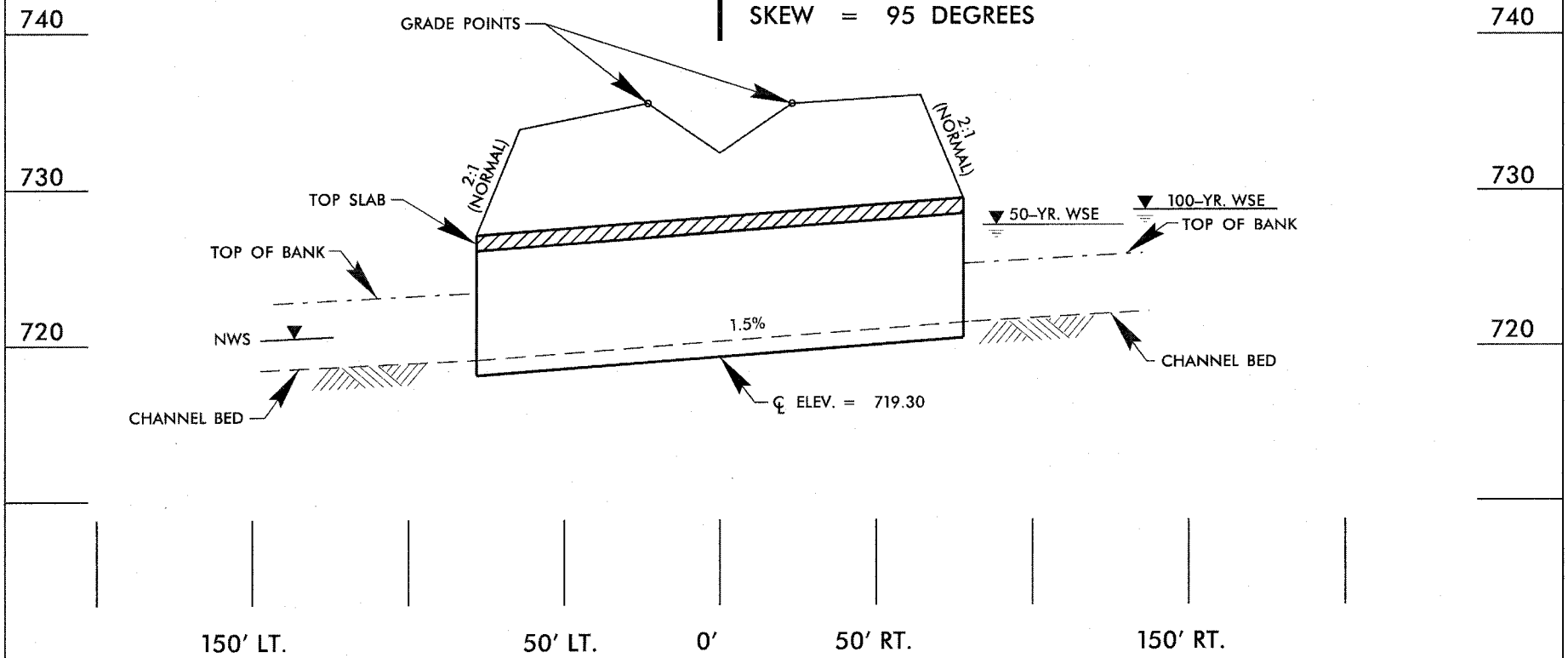
P-101



PROJECT REFERENCE NO.
U-2525B
SHEET NO.
18
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PERMIT DRAWINGS
SHEET 51 OF 93
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER (POND)
SITE 18
DETAIL KK
LATERAL 6' BASE DITCH
DETAIL Q
FALSE SUMP
DETAIL J
LATERAL 4' BASE DITCH
DETAIL D
RIP RAP AT EMBANKMENT
DETAIL R
FALSE SUMP
DETAIL P
FALSE SUMP
DETAIL U
BERM 'V' DITCH
-L- CS Sta. 228+09.06
-L- POS Sta. 228+23.81
-Y11- POT Sta. 21+69.08
-Y11- PC Sta. 25+19.18
-Y10- PT STA. 15+21.35
-Y11- PT Sta. 19+58.78
-Y11- STA. 17+00.00 SEE SHEET 27
-Y10- STA. 14+00.00 SEE SHEET 27
-Y11- STA. 26+00.000 SEE SHEET 28
MATCHLINE -Y10- STA. 20+00.00 SEE SHEET 17
MATCHLINE -Y11- STA. 27+00.00 SEE SHEET 17
MATCHLINE -Y11- STA. 26+00.000 SEE SHEET 28
HAROLD G. RUDD & LELIA W. RUDD
LOLA FOULKS ELLIOTT
ALICE PATTERSON HAYES
DARRELL D. LEVAN & TAMMY W. LEVAN
N.C.D.O.T.
M. L. Barber
Harold G. Rudd
SEE ON-SITE MITIGATION PLANS SHEET 10
220+00
225+00
15+00
20+00
25+00
-L-
PI Sta 215+01.73
Δ = 32° 21' 39.4" (LT)
D = 1° 12' 13.3"
L = 2,688.47'
T = 1,381.15'
R = 4,760.00'
SE = .04
PIs Sta 228+75.73
Θs = 1° 12' 13.3"
Ls = 200.00'
LT = 133.34'
ST = 66.67'
-Y11-
PI Sta 17+92.52
Δ = 20° 42' 51.8" (RT)
D = 6° 09' 39.0"
L = 336.23'
T = 169.97'
R = 930.00'
SE = .04
RO = SEE PLANS
PI Sta 26+80.11
Δ = 19° 38' 06.2" (LT)
D = 6° 09' 39.0"
L = 318.71'
T = 160.93'
R = 930.00'
SE = .04
RO = 96'
-Y10-
PI Sta 13+38.21
Δ = 5° 31' 37.6" (RT)
D = 1° 30' 28.0"
L = 366.57'
T = 183.43'
R = 3,800.00'
GRAPHIC SCALE
NOTE: MCF - MODIFIED CONCRETE FLUME
NOTE: SEE CROSS-SECTIONS AND ROADWAY STANDARD DRAWINGS, STD. NO. 862.01, SHEET 1 FOR SPECIAL MEDIAN GRADING.
SEE SHEET 2-N FOR BRIDGE SKETCH
SEE SHEET 48 FOR -L- PROFILE
SEE SHEET 62 FOR -Y10- PROFILE
SEE SHEET 63 FOR -Y11- PROFILE
SEE SHEETS C-1 THRU C-?? FOR CULVERT PLANS
SEE SHEETS S-1 THRU S-?? FOR STRUCTURE PLANS
REVISIONS

2 @ 7′ x 8′ RCBC (1′ BURY)
℄ STA. 218+00.00 –L–
GRADE POINT ELEV. = 735.57
SKEW = 95 DEGREES

PERMIT DRAWINGS
SHEET 52 OF 93



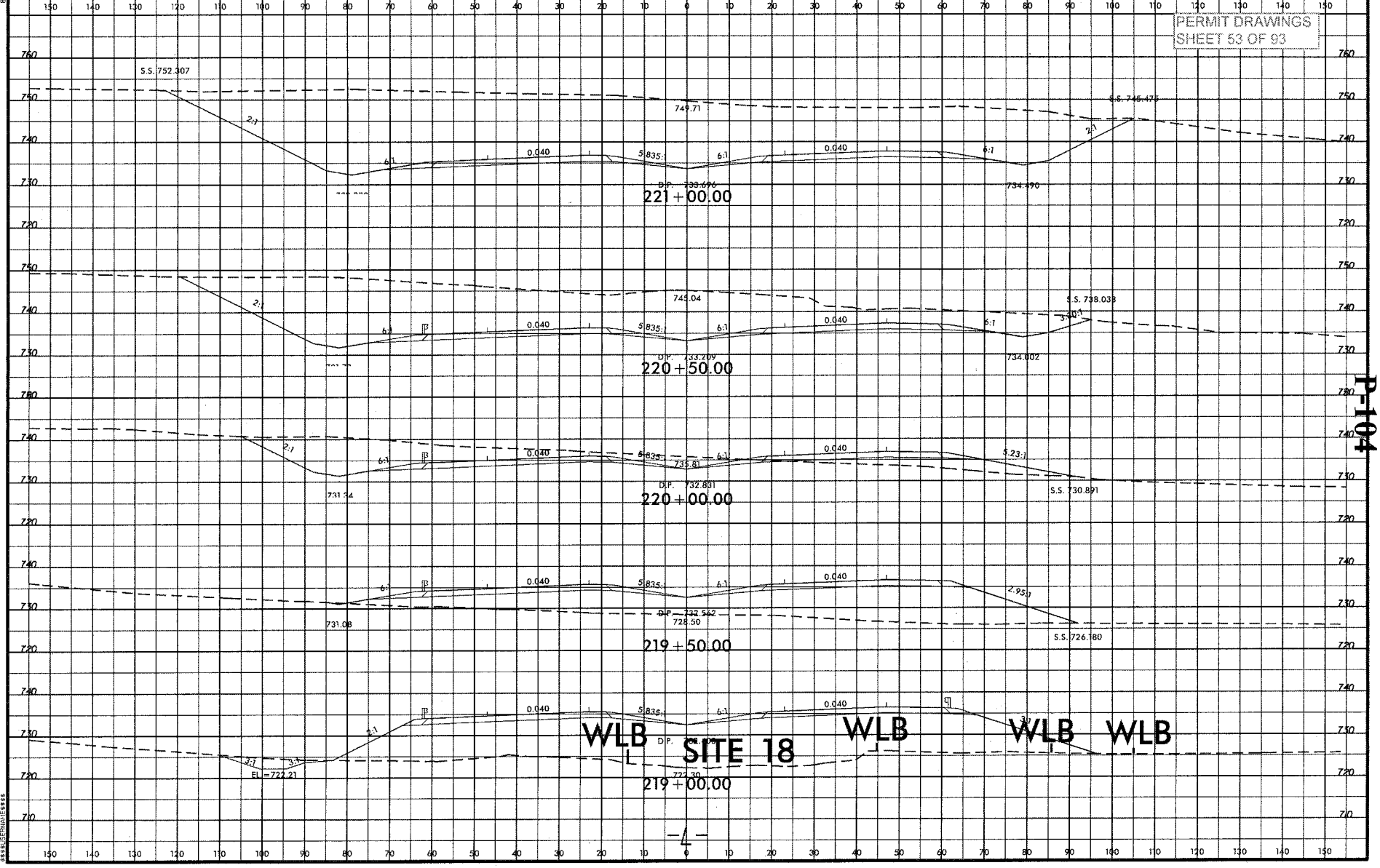
PROFILE

NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34821.1.1 (U-2525B)
GREENSBORO EASTERN LOOP
FROM NORTH OF US 70
RELOCATION TO US 29 NORTH
OF GREENSBORO

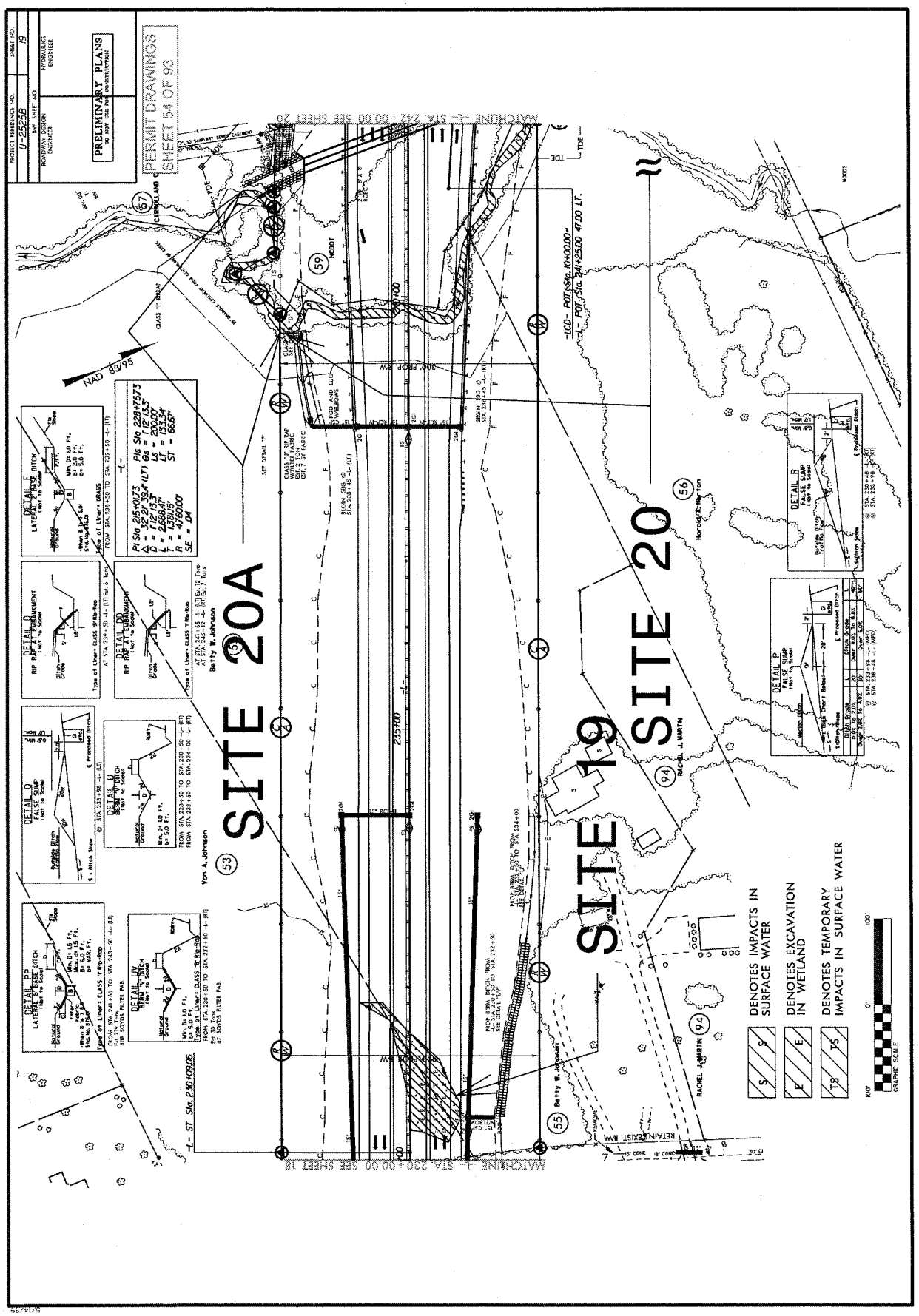
SHEET OF 03/08/13

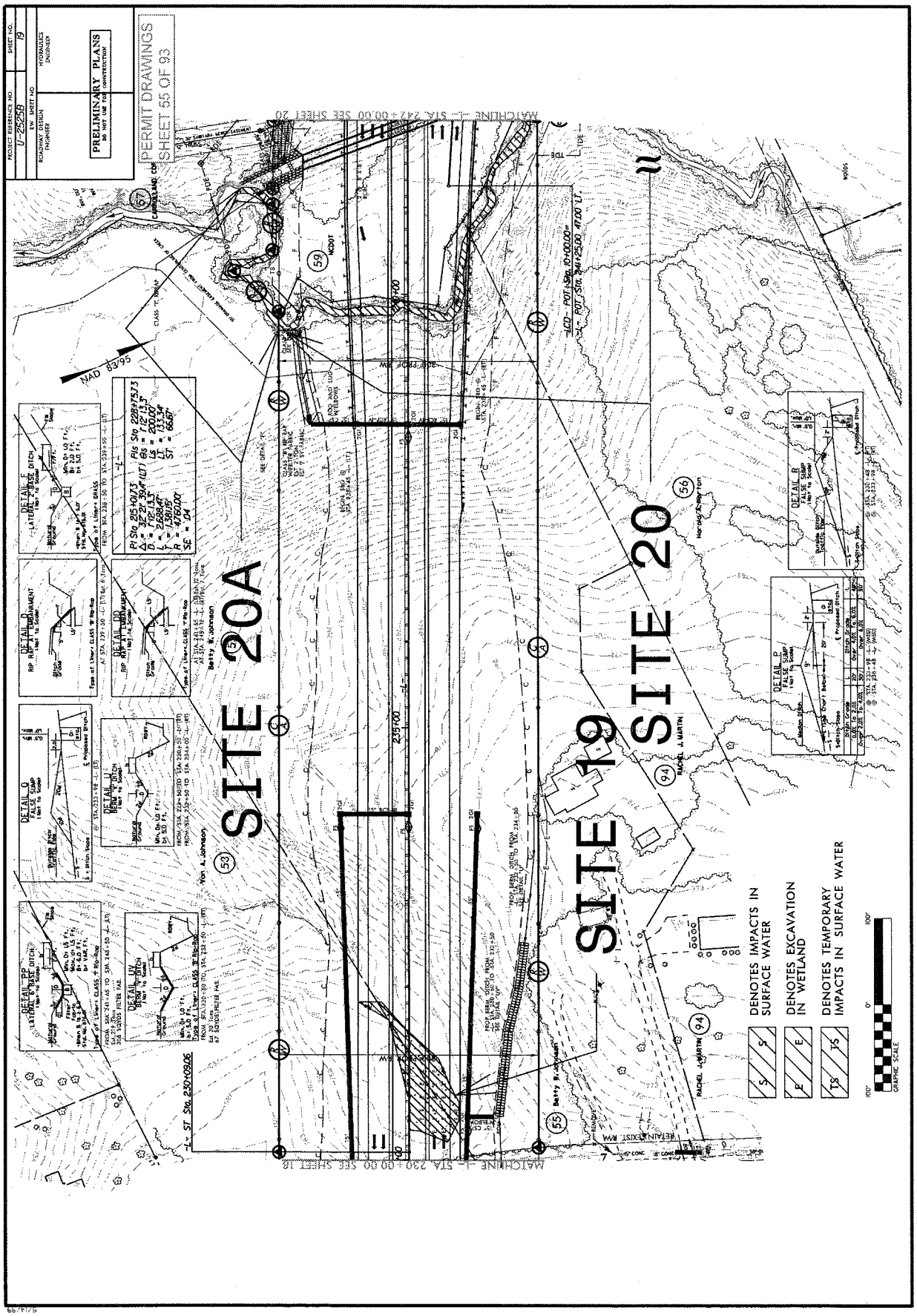
P-103

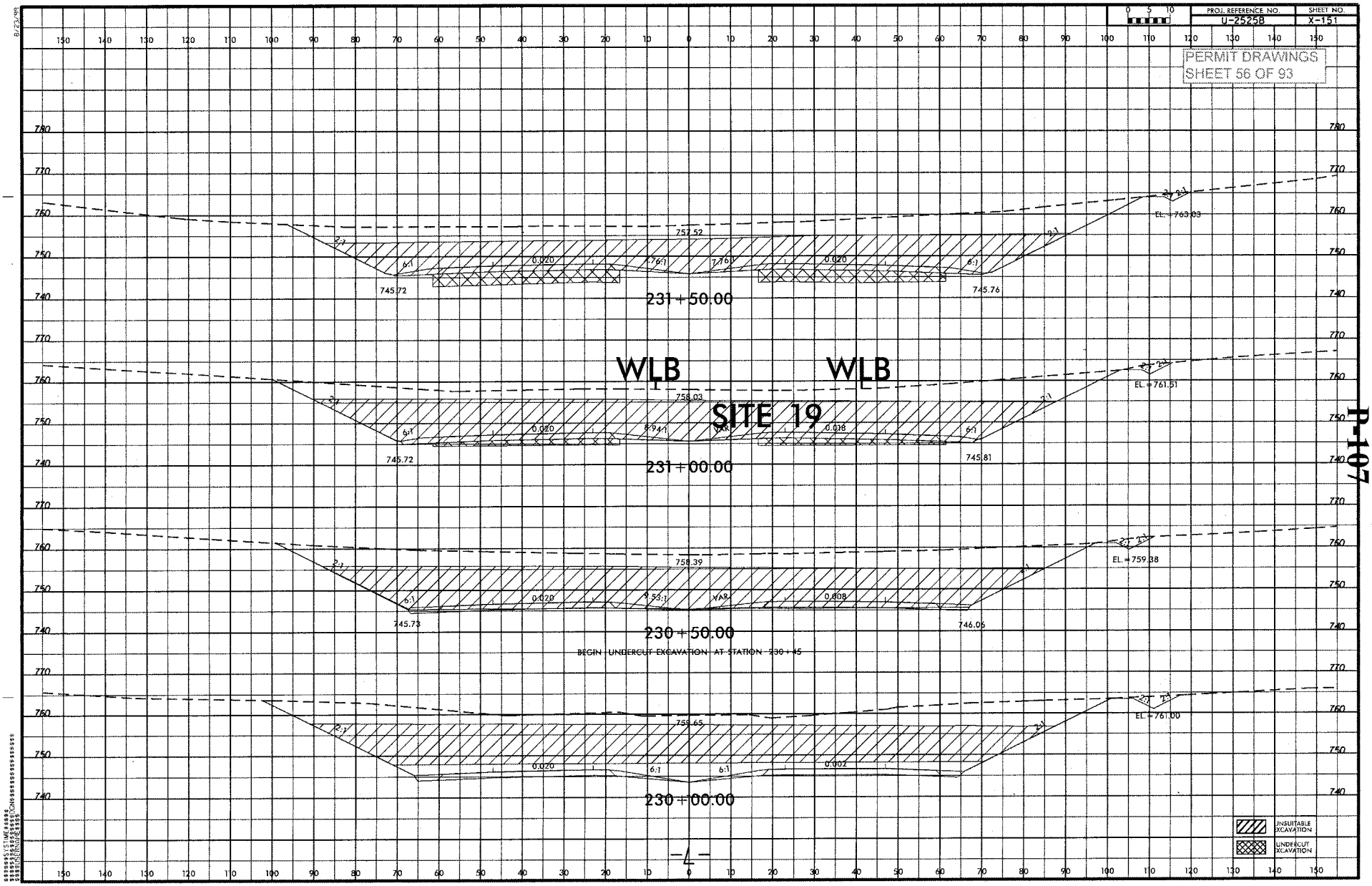
PERMIT DRAWINGS
SHEET 53 OF 93



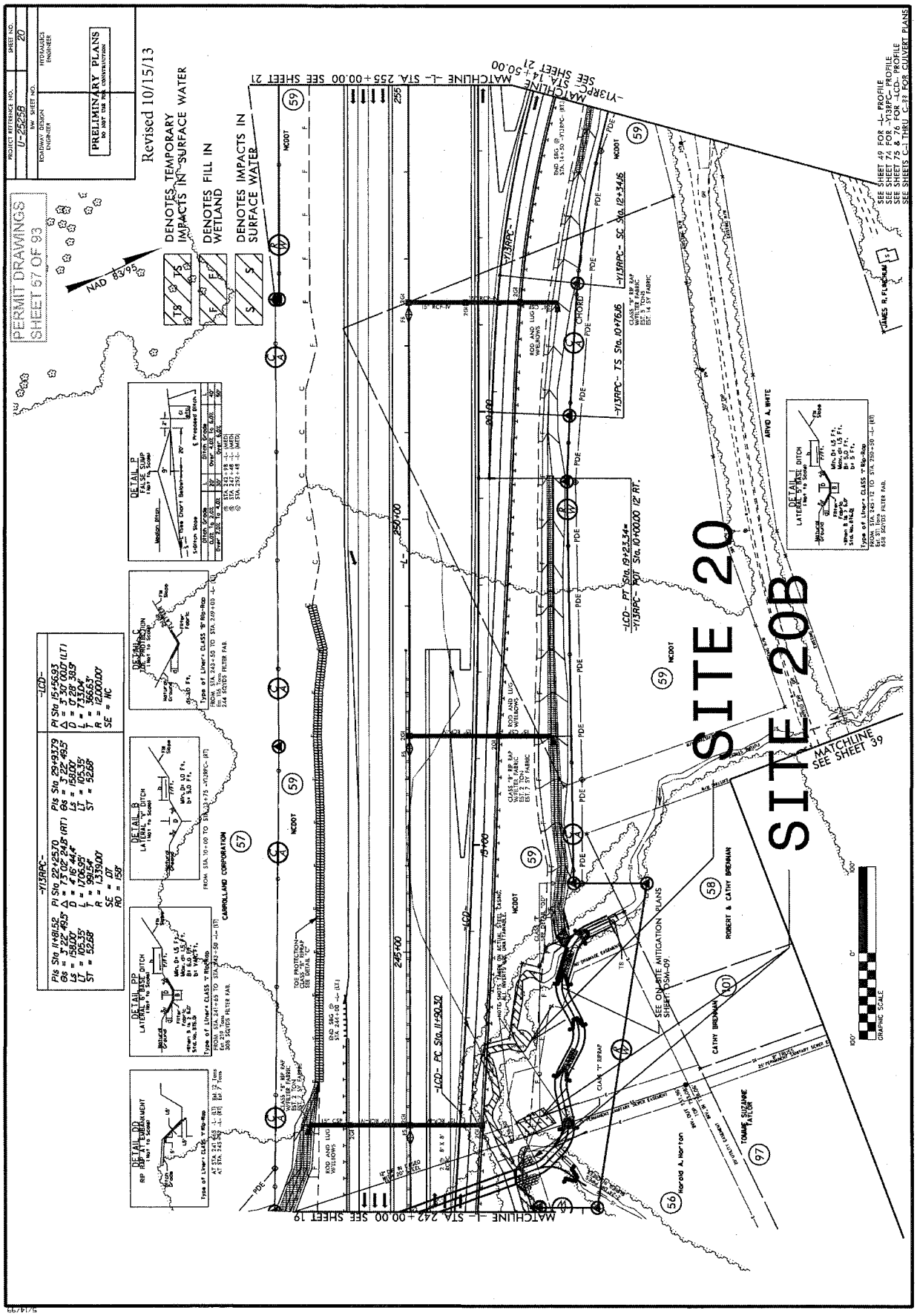
P-104

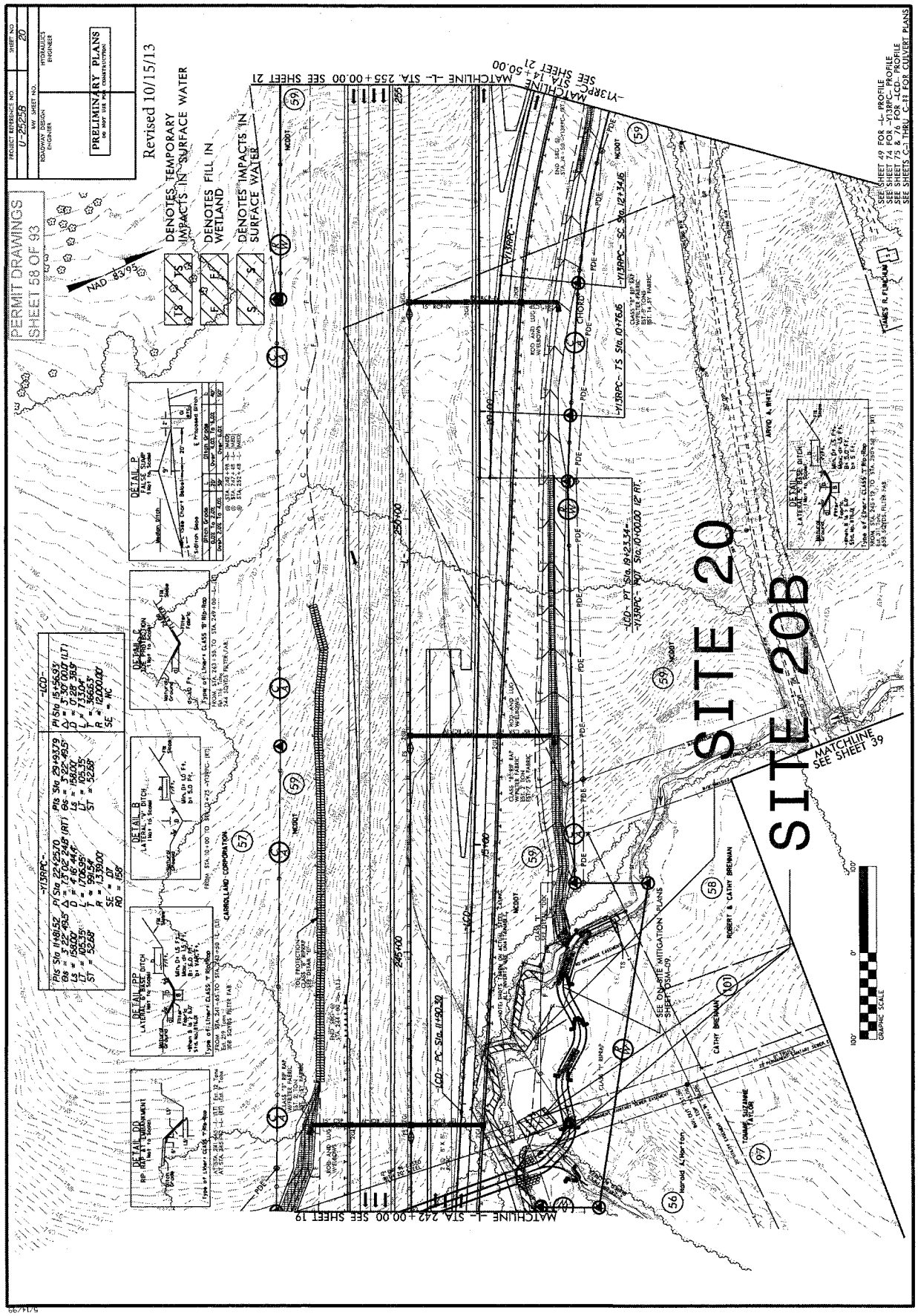

PROJECT REFERENCE NO.
U-2525B
SHEET NO.
19
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PERMIT DRAWINGS
SHEET 54 OF 93
SITE 20A
SITE 19
SITE 20
NAD 83/95
DENOTES IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE


PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
PERMIT DRAWINGS
SHEET 55 OF 93
NAD 83/95
SITE 20A
SITE 19
SITE 20
DENOTES IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE


PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-151
PERMIT DRAWINGS
SHEET 56 OF 93
WLB
WLB
SITE 19
231+50.00
757.52
745.72
745.76
EL. = 763.03
231+00.00
758.03
745.72
745.81
EL. = 761.51
230+50.00
758.39
745.73
746.06
EL. = 759.38
BEGIN UNDERCUT EXCAVATION AT STATION 230+45
230+00.00
759.65
EL. = 761.00
UNSUITABLE EXCAVATION
UNDERCUT EXCAVATION
-L-

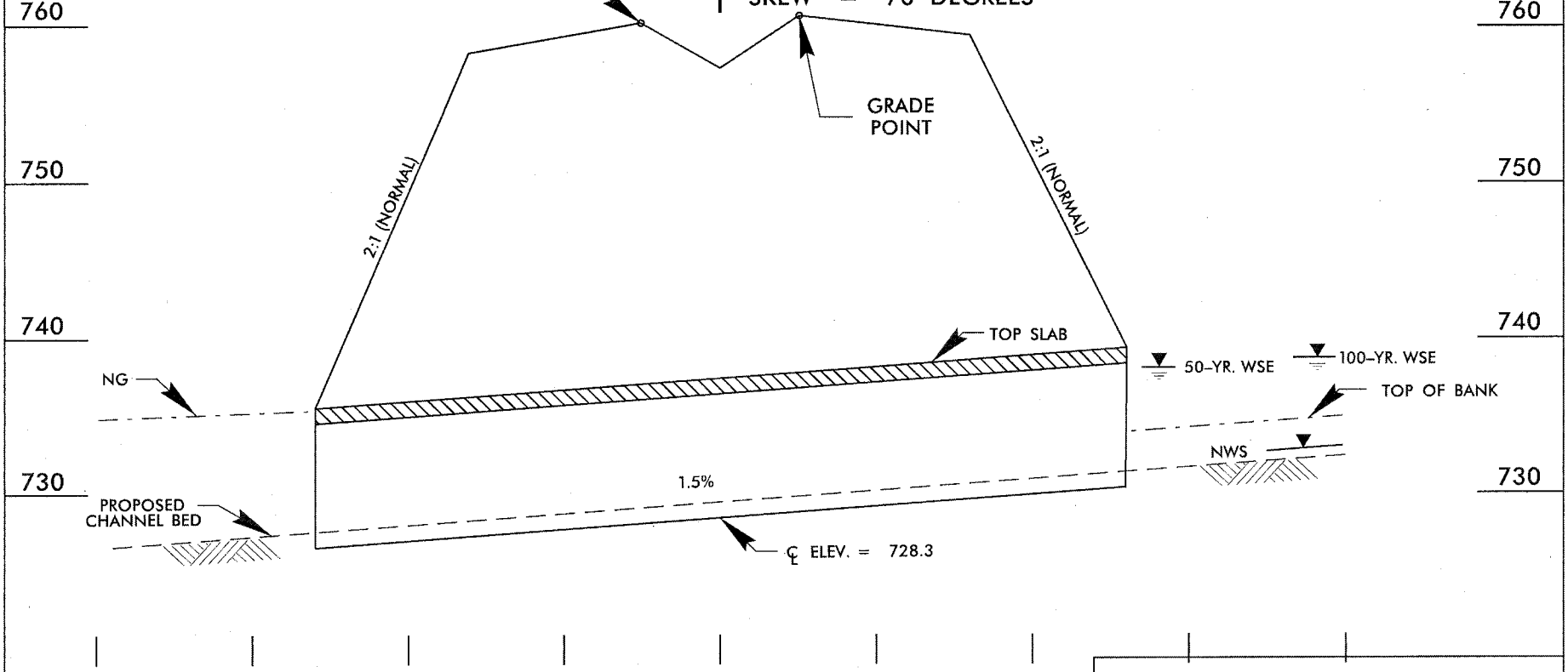
P-107


PROJECT REFERENCE NO.
U-2525B
SHEET NO.
20
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
NOT FOR CONSTRUCTION
PERMIT DRAWINGS
SHEET 57 OF 93
Revised 10/15/13
NAD 83/95
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
MATCHLINE -L- STA. 255+00.00 SEE SHEET 21
MATCHLINE -L- STA 242+00.00 SEE SHEET 19
SEE SHEET 49 FOR -L- PROFILE
SEE SHEET 74 FOR -Y13RPC- PROFILE
SEE SHEET 75 & 76 FOR -LCD- PROFILE
SEE SHEETS C-1 THRU C-33 FOR CULVERT PLANS
SITE 20
SITE 20B
MATCHLINE SEE SHEET 39
CARROLLAND CORPORATION
ROBERT & CATHY BRENNAN
CATHY BRENNAN
TOMMIE SUZANNE TAYLOR
Harold A. Horton
ARVID A. WHITE
JAMES R. FLINCHUM
NCDOT
SEE ON-SITE MITIGATION PLANS SHEET CSM-01
GRAPHIC SCALE


PERMIT DRAWINGS
SHEET 58 OF 93
PRELIMINARY PLANS
Revised 10/15/13
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
NAD 83/95
SITE 20
SITE 20B
MATCHLINE SEE SHEET 39
MATCHLINE -L- STA. 242+00.00 SEE SHEET 19
MATCHLINE -L- STA. 255+00.00 SEE SHEET 21
GRAPHIC SCALE

PERMIT DRAWINGS
SHEET 59 OF 93

2 @ 8' x 8' RCBC (1' BURY)
℄ STA. 241+96 -L-
GRADE POINT ELEV. = 760.16
SKEW = 70 DEGREES

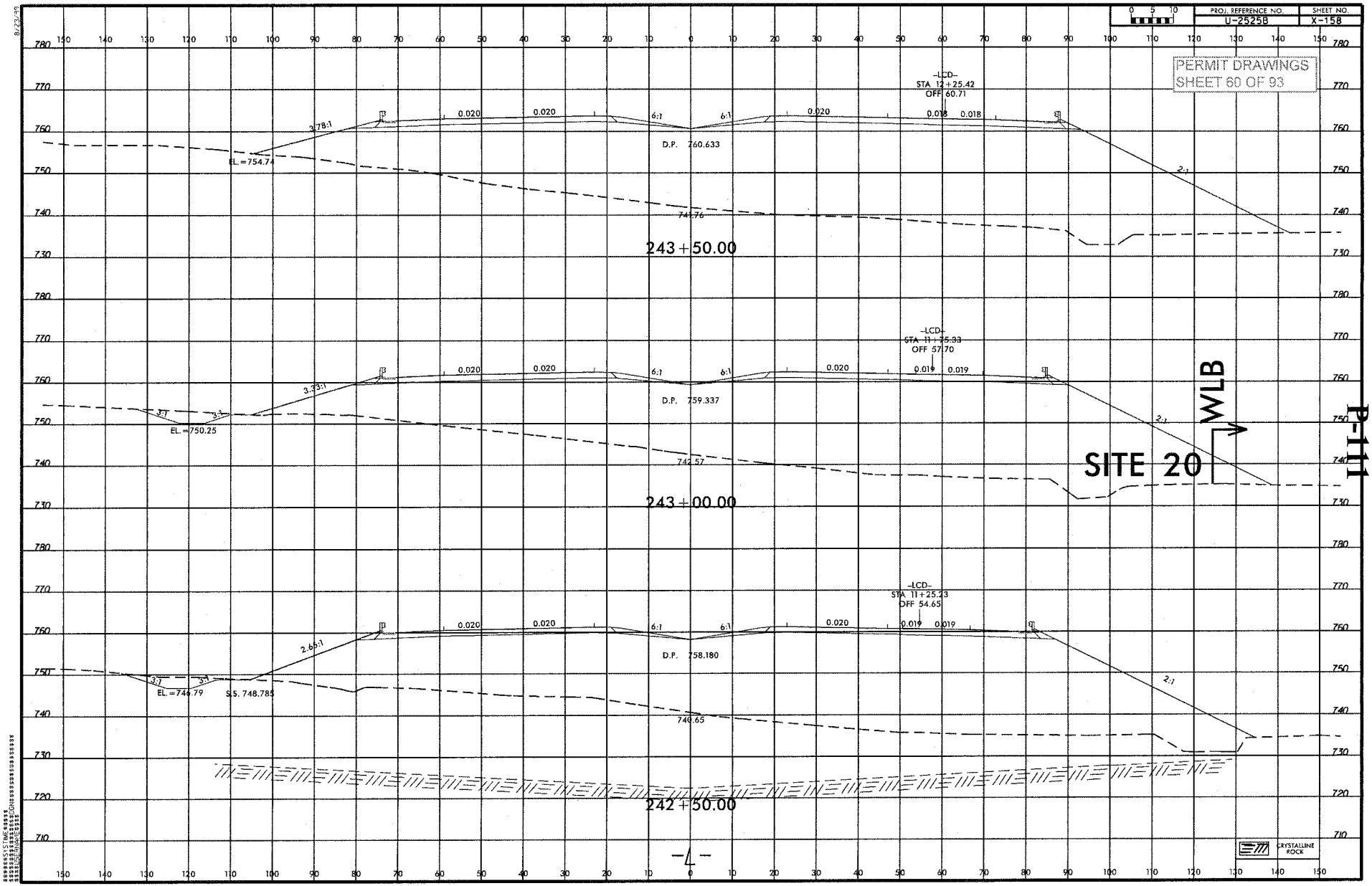


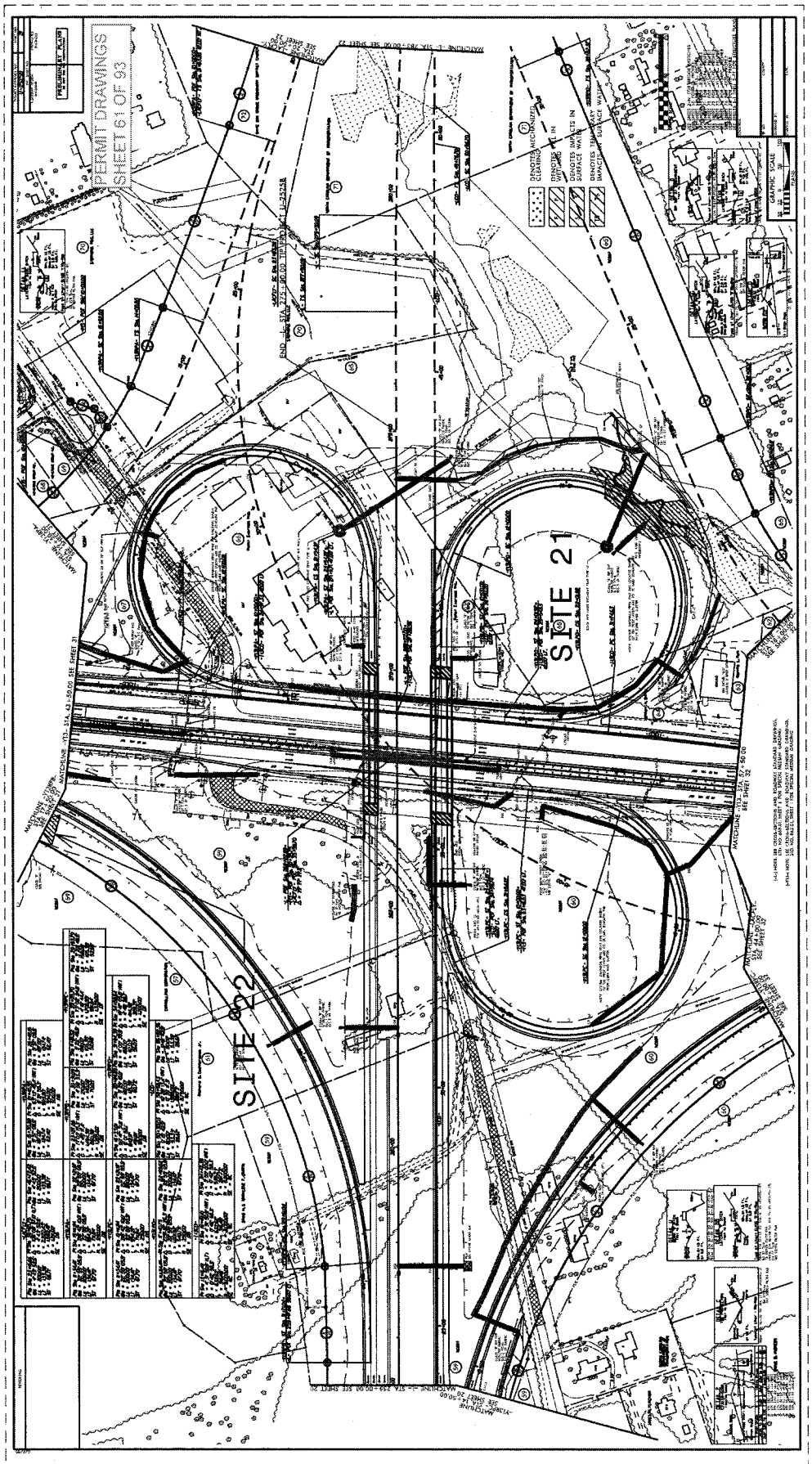
PROFILE

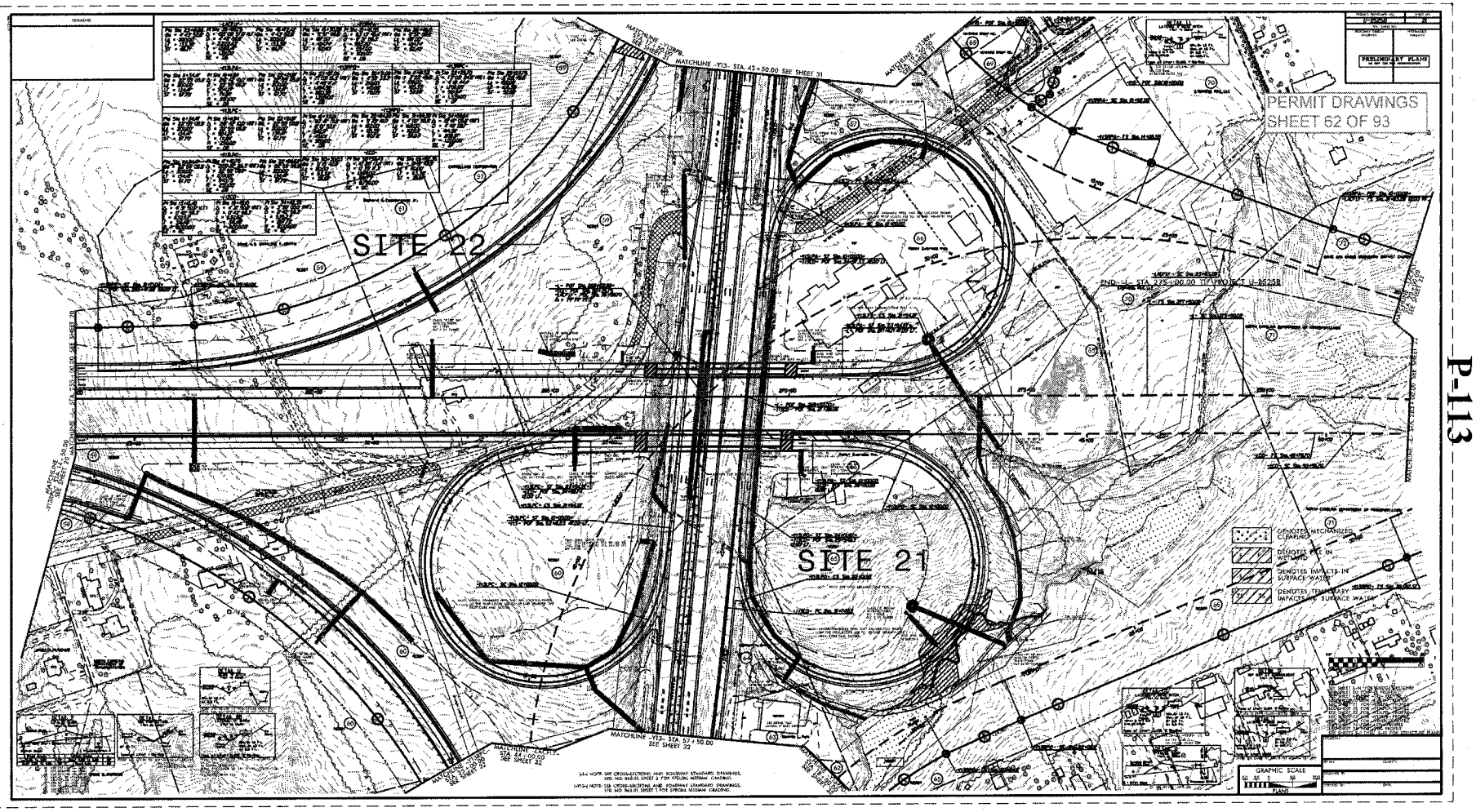
NCDOT
DIVISION OF HIGHWAYS
GUILFORD COUNTY
PROJECT: 34821.1.1 (U-2525B)
GREENSBORO EASTERN LOOP
FROM NORTH OF US 70
RELOCATION TO US 29 NORTH
OF GREENSBORO

SHEET OF 03/08/13

P-110

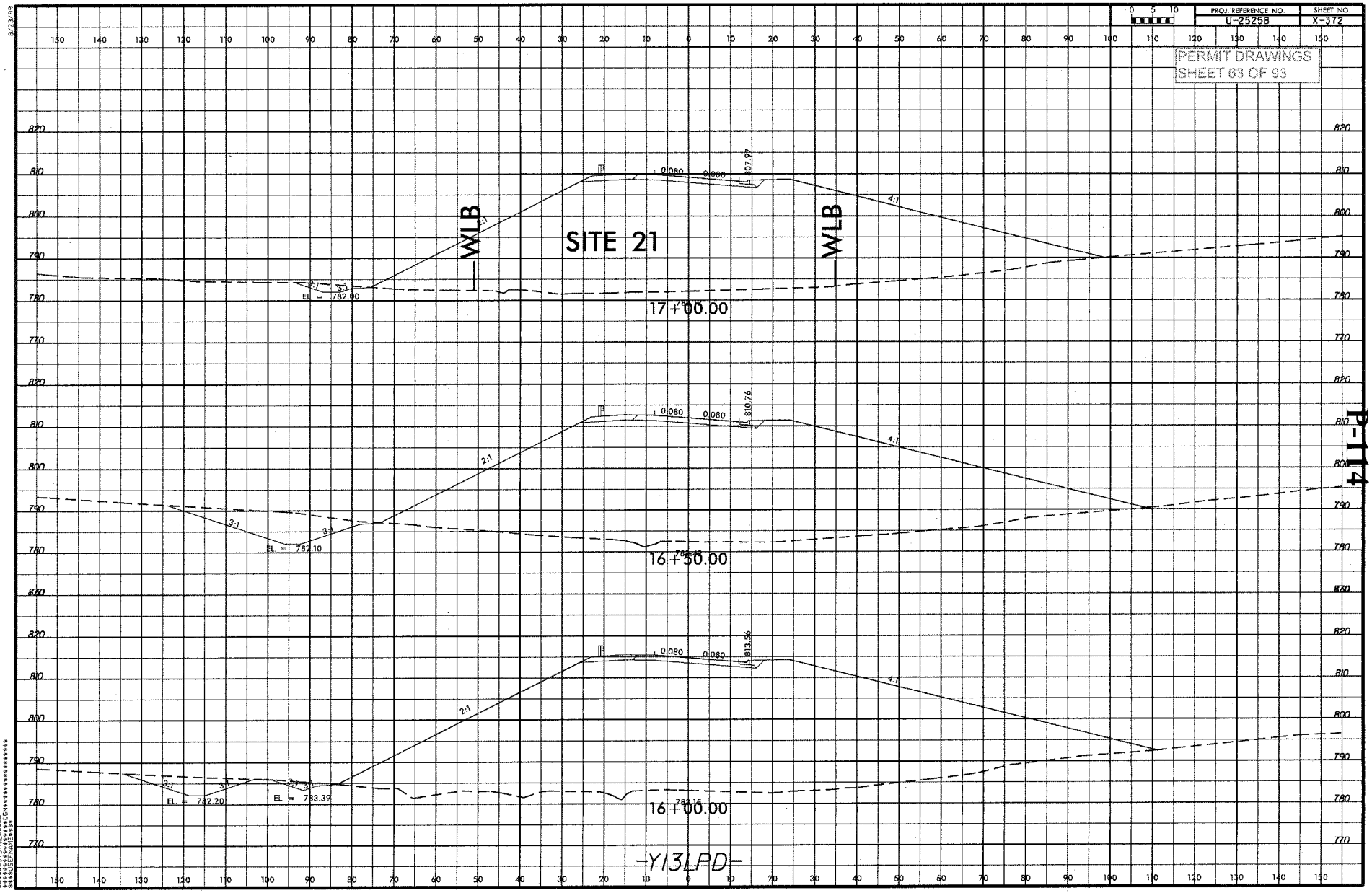

PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-158
PERMIT DRAWINGS
SHEET 60 OF 93
-LCD-
STA 12+25.42
OFF 60.71
D.P. 760.633
EL.=754.74
744.76
243+50.00
-LCD-
STA 11+75.33
OFF 57.70
D.P. 759.337
EL.=750.25
742.57
243+00.00
-LCD-
STA 11+25.23
OFF 54.65
D.P. 758.180
EL.=746.79
S.S. 748.785
740.65
242+50.00
WLB
SITE 20
P-111
CRYSTALLINE ROCK

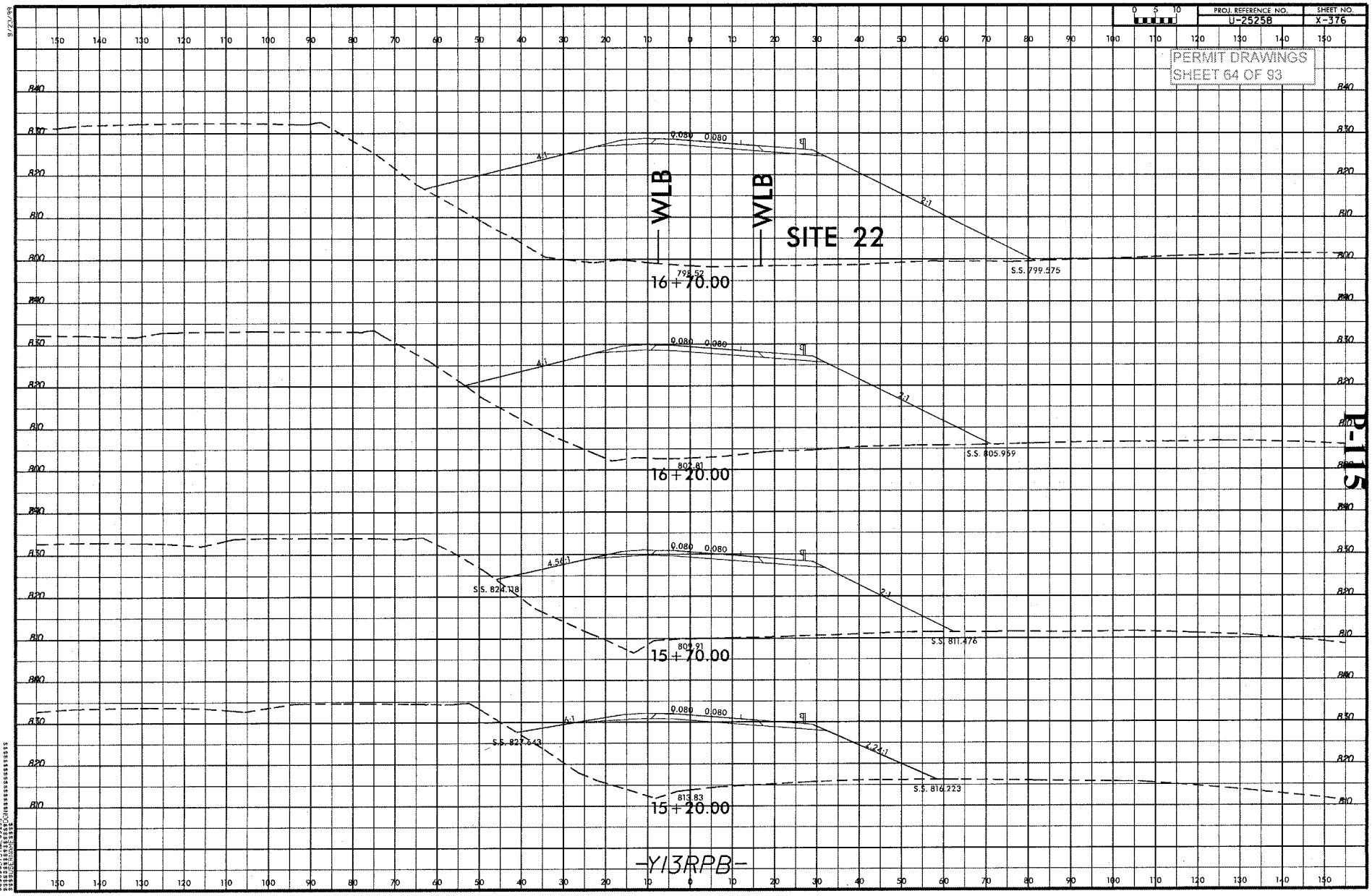

PERMIT DRAWINGS
SHEET 61 OF 93
SITE 21
SITE 22

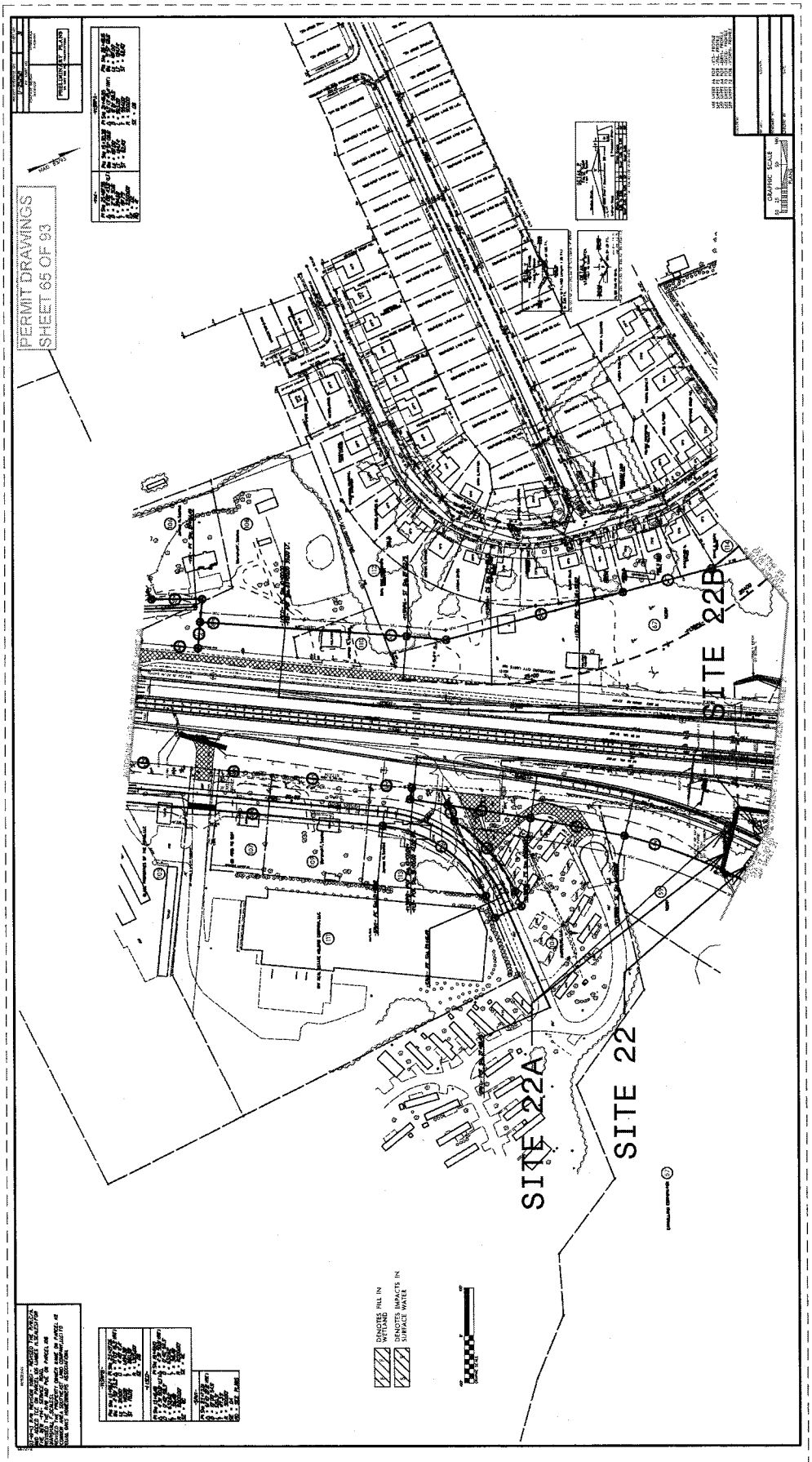

PERMIT DRAWINGS
SHEET 62 OF 93
SITE 22
SITE 21
PRELIMINARY PLANS
MATCHLINE -Y13- STA. 43+59.00 SEE SHEET 31
MATCHLINE -Y13- STA. 57+50.00 SEE SHEET 32
END -L- STA. 275+00.00 TIP PROJECT U-2525B
DENOTES MECHANIZED CLEARING
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE
PLANS

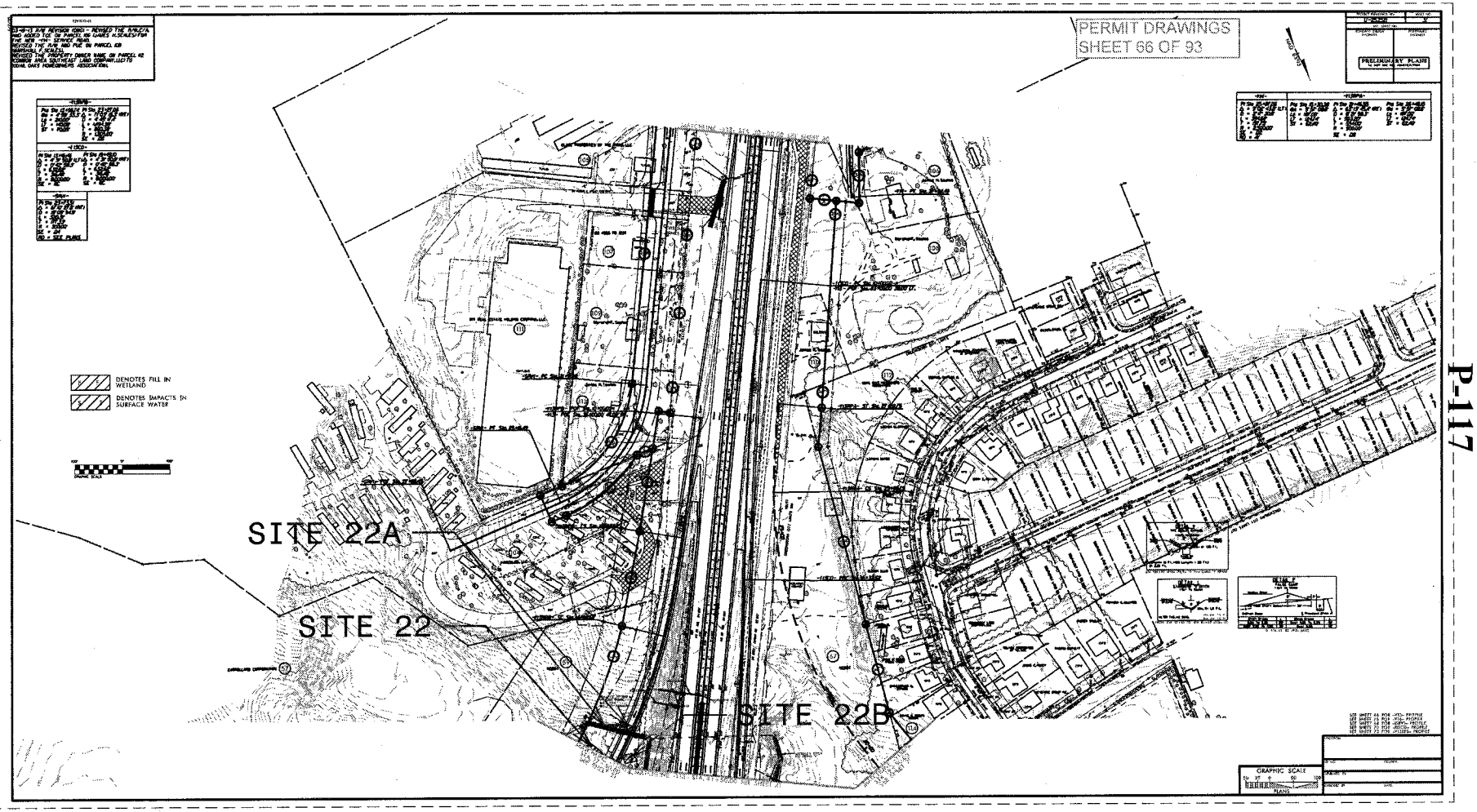
P-113

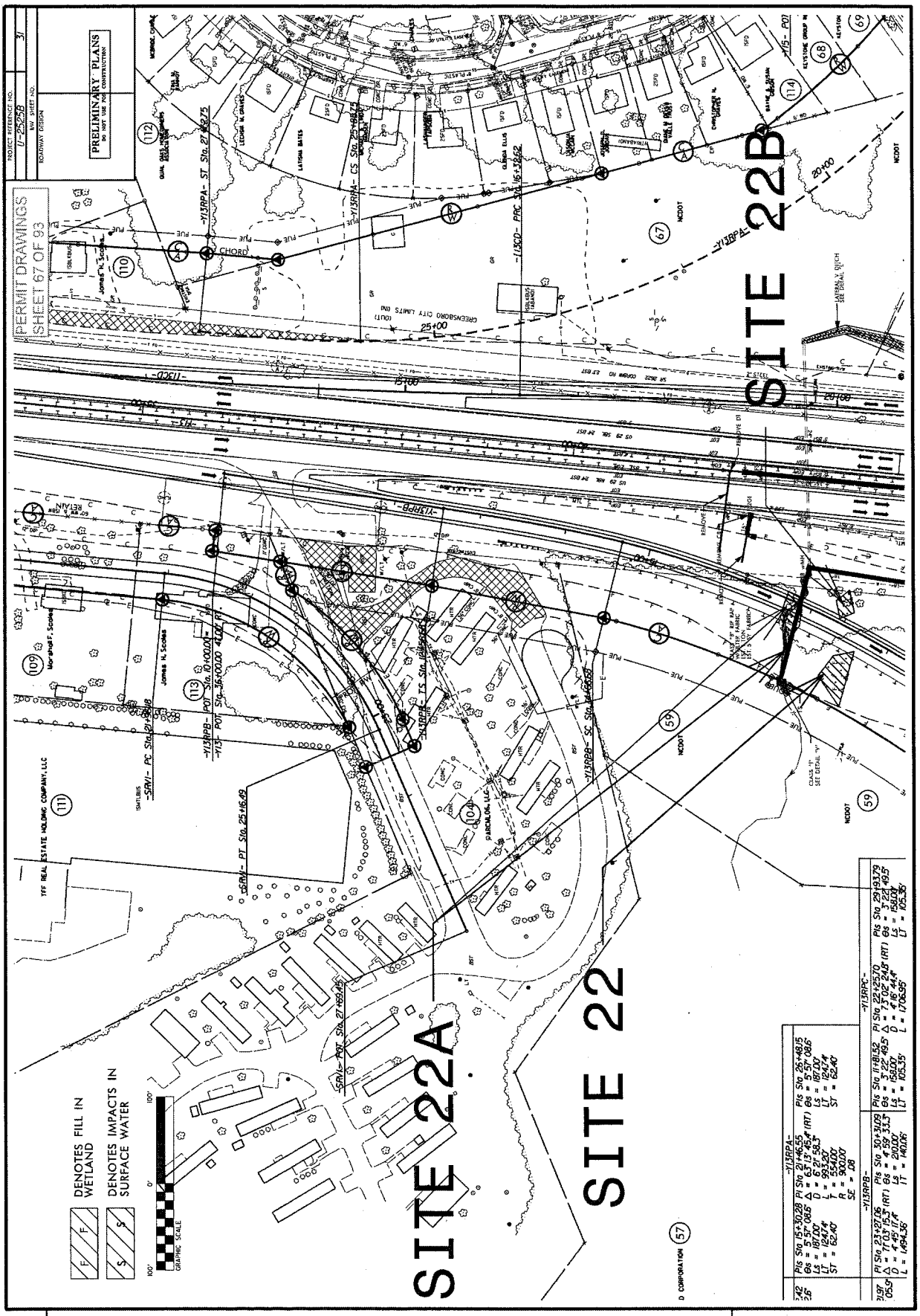
PERMIT DRAWINGS
SHEET 63 OF 93




PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-376
PERMIT DRAWINGS
SHEET 64 OF 93
SITE 22
WLB
WLB
16+70.00
798.52
S.S. 799.575
16+20.00
802.81
S.S. 805.959
15+70.00
802.91
S.S. 824.118
S.S. 811.476
15+20.00
813.83
S.S. 827.643
S.S. 816.223
0.080
0.080
4:1
2:1
4.50:1
6:1
4.24:1
-Y13RPB-
P-115


PERMIT DRAWINGS
SHEET 65 OF 93
SITE 22A
SITE 22
SITE 22B
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
GRAPHIC SCALE


PERMIT DRAWINGS
SHEET 66 OF 93
SITE 22A
SITE 22
SITE 22B
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
PRELIMINARY PLANS
GRAPHIC SCALE


PRELIMINARY PLANS
PERMIT DRAWINGS
SHEET 67 OF 93
SITE 22A
SITE 22
SITE 22B
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
GRAPHIC SCALE

PROJECT REFERENCE NO.	SHEET NO.
U-2525B	25
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

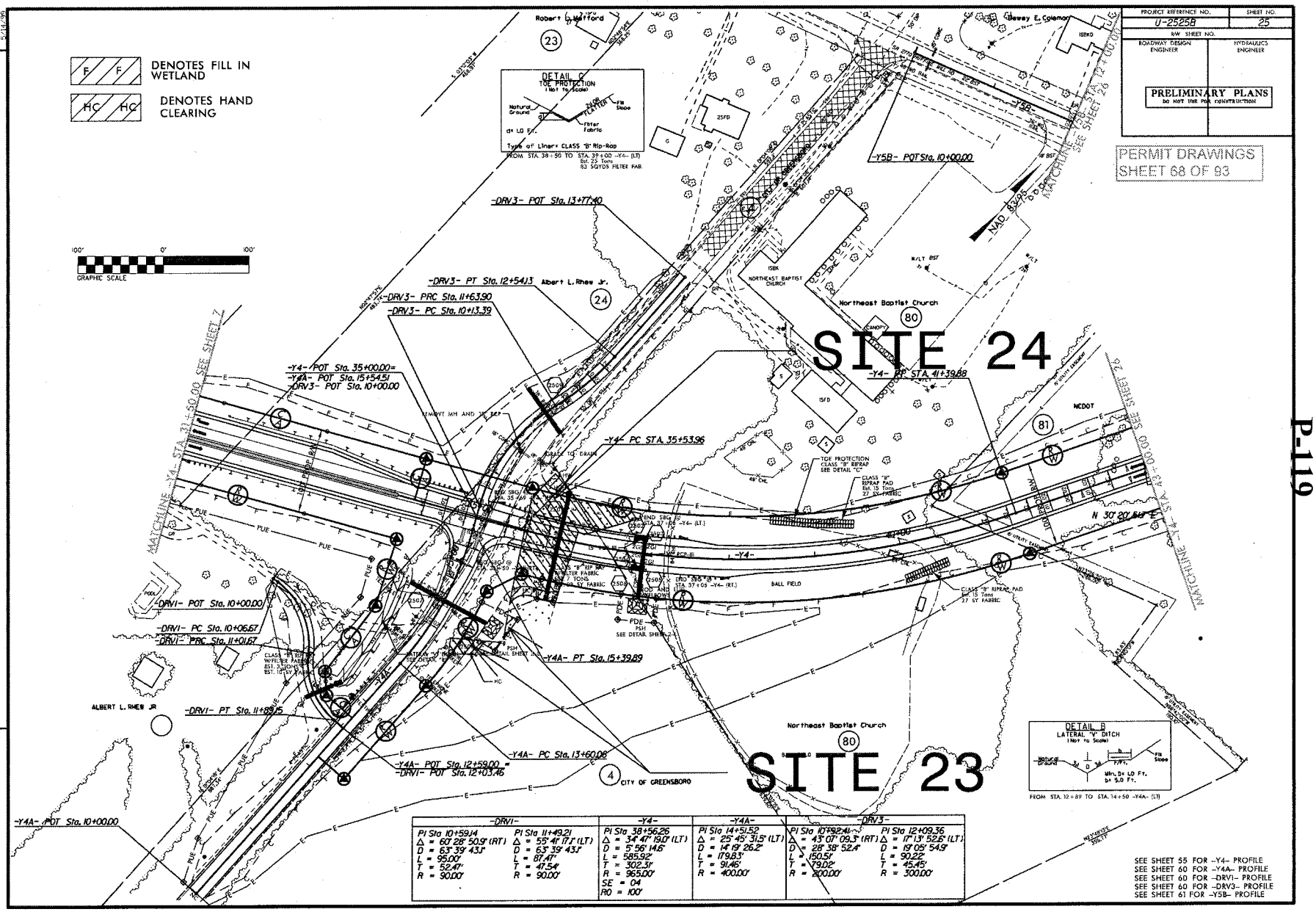
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PERMIT DRAWINGS
SHEET 68 OF 93

REVISIONS

03-10-17 R/W REVISION (DWG.- COMBINED PARCELS 4 AND 79 INTO PARCEL 4 (CITY OF GREENSBORO) REVISED THE PROPERTY OWNER NAME ON PARCEL 24 (JOHN L. & BRENDA W. WHITE) TO ALBERT L. RHEW JR. (PARCEL 24) ALSO COMBINED PARCEL 24 (ALBERT L. RHEW JR.) AND PARCEL 80 (NORTHEAST BAPTIST CHURCH) - PROPERTY LINE CHANGED TO THE EXISTING R/W LINES TO PROPERTY LINES BETWEEN PARCEL 24 (ALBERT L. RHEW JR.) AND PARCEL 80 (NORTHEAST BAPTIST CHURCH) - THIS AREA IS DEEDED TO PARCEL 4 (CITY OF GREENSBORO)

5/14/99



-DRV1-		-Y4-	-Y4A-	-DRV3-	
PI Sta 10+59.14	PI Sta 11+49.21	PI Sta 38+56.26	PI Sta 14+51.52	PI Sta 10+92.41	PI Sta 12+09.36
Δ = 60° 28' 50.9" (RT)	Δ = 55° 41' 17.1" (LT)	Δ = 34° 47' 19.0" (LT)	Δ = 25° 45' 31.5" (LT)	Δ = 43° 07' 09.3" (RT)	Δ = 17° 13' 52.6" (LT)
D = 63° 39' 43.1"	D = 63° 39' 43.1"	D = 5° 56' 14.6"	D = 14° 19' 26.2"	D = 28° 38' 52.4"	D = 19° 05' 54.9"
L = 95.00'	L = 87.47'	L = 585.92'	L = 179.83'	L = 150.51'	L = 90.22'
T = 52.47'	T = 47.54'	T = 302.31'	T = 91.46'	T = 79.02'	T = 45.45'
R = 90.00'	R = 90.00'	R = 965.00'	R = 400.00'	R = 200.00'	R = 300.00'
		SE = 04			
		R0 = 100'			

SEE SHEET 55 FOR -Y4- PROFILE
SEE SHEET 60 FOR -Y4A- PROFILE
SEE SHEET 60 FOR -DRV1- PROFILE
SEE SHEET 60 FOR -DRV3- PROFILE
SEE SHEET 61 FOR -Y5B- PROFILE

PROJECT REFERENCE NO.	SHEET NO.
U-2525B	25
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

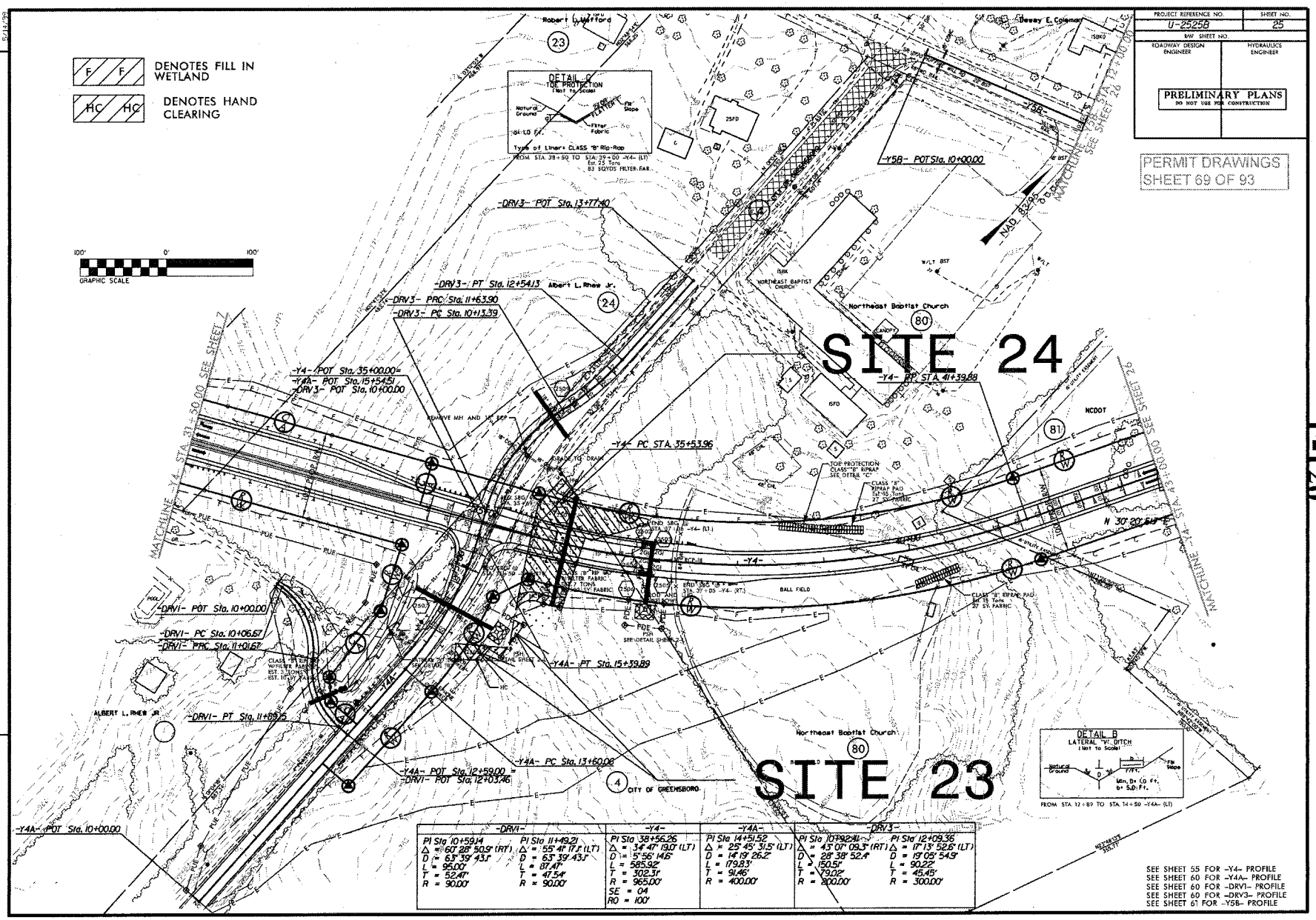
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PERMIT DRAWINGS
SHEET 69 OF 93

REVISIONS

03-19-15 R/W REVISION (DMG) - COMBINED PARCELS 4 AND 79 INTO PARCEL 4 (CITY OF GREENSBORO) REVISED THE PROPERTY OWNER NAME ON PARCEL 24 (JOHN LEE BRACKWAY & TIFFANY N. BRACKWAY) TO 24-BCFP. LAWREN JR. COMBINED PARCELS 24 AND 78 INTO PARCEL 24 (ALBERT L. RHEW JR.) AND REVISED THE PROPERTY LINES BETWEEN PARCEL 24 (ALBERT L. RHEW JR.) AND PARCEL 80 (NORTHEAST BAPTIST CHURCH) - THIS AREA WAS DEEDED TO PARCEL 4 (CITY OF GREENSBORO).

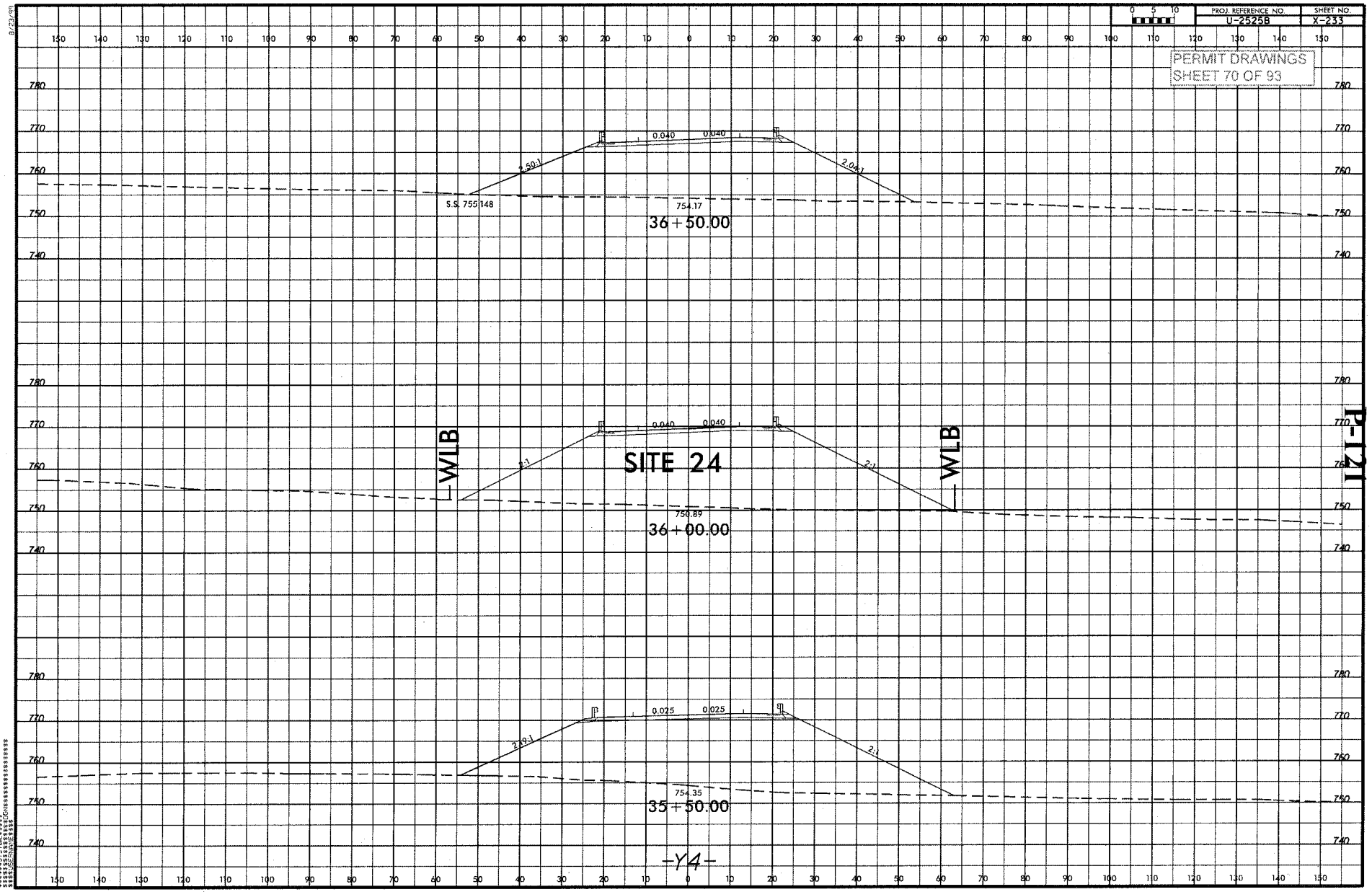
5/13/99



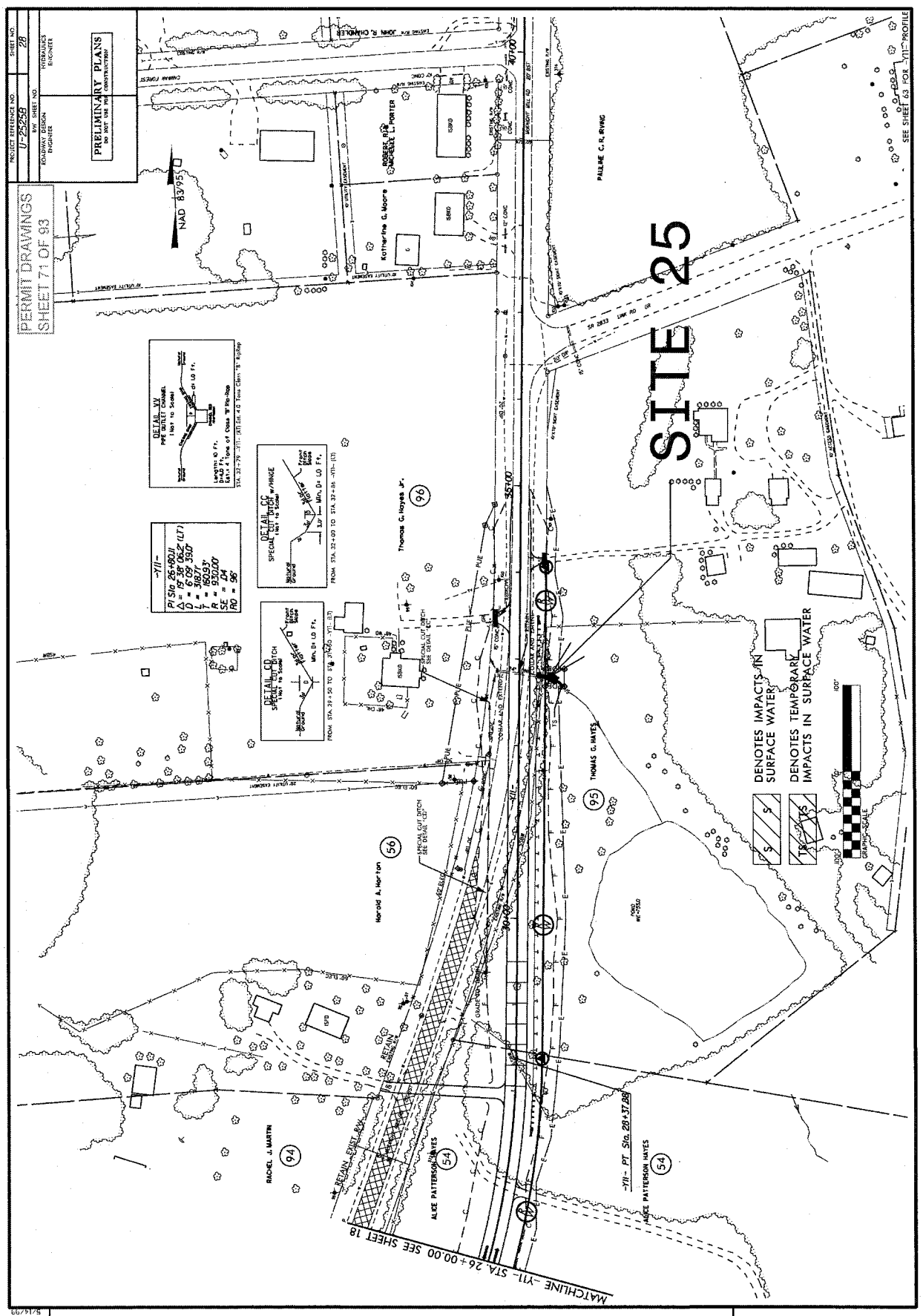
-DRV1-		-Y4-	-Y4A-	-DRV3-	
PI Sta 10+59.14	PI Sta 11+49.21	PI Sta 38+56.26	PI Sta 14+51.52	PI Sta 10+92.41	PI Sta 12+09.36
Δ = 60° 28' 50.9" (RT)	Δ = 55° 41' 17.1" (LT)	Δ = 34° 47' 19.0" (LT)	Δ = 25° 45' 31.5" (LT)	Δ = 43° 01' 09.3" (RT)	Δ = 17° 13' 52.6" (LT)
D = 63° 39' 43.1"	D = 63° 39' 43.1"	D = 5° 56' 14.6"	D = 14° 19' 26.2"	D = 28° 38' 52.4"	D = 19° 05' 54.9"
L = 95.00'	L = 87.47'	L = 585.92'	L = 179.23'	L = 150.51'	L = 90.22'
T = 52.47'	T = 47.54'	T = 302.31'	T = 91.46'	T = 79.02'	T = 45.45'
R = 90.00'	R = 90.00'	R = 965.00'	R = 400.00'	R = 200.00'	R = 300.00'
		SE = 04			
		RO = 100'			

SEE SHEET 55 FOR -Y4- PROFILE
SEE SHEET 60 FOR -Y4A- PROFILE
SEE SHEET 60 FOR -DRV1- PROFILE
SEE SHEET 60 FOR -DRV3- PROFILE
SEE SHEET 61 FOR -Y5B- PROFILE

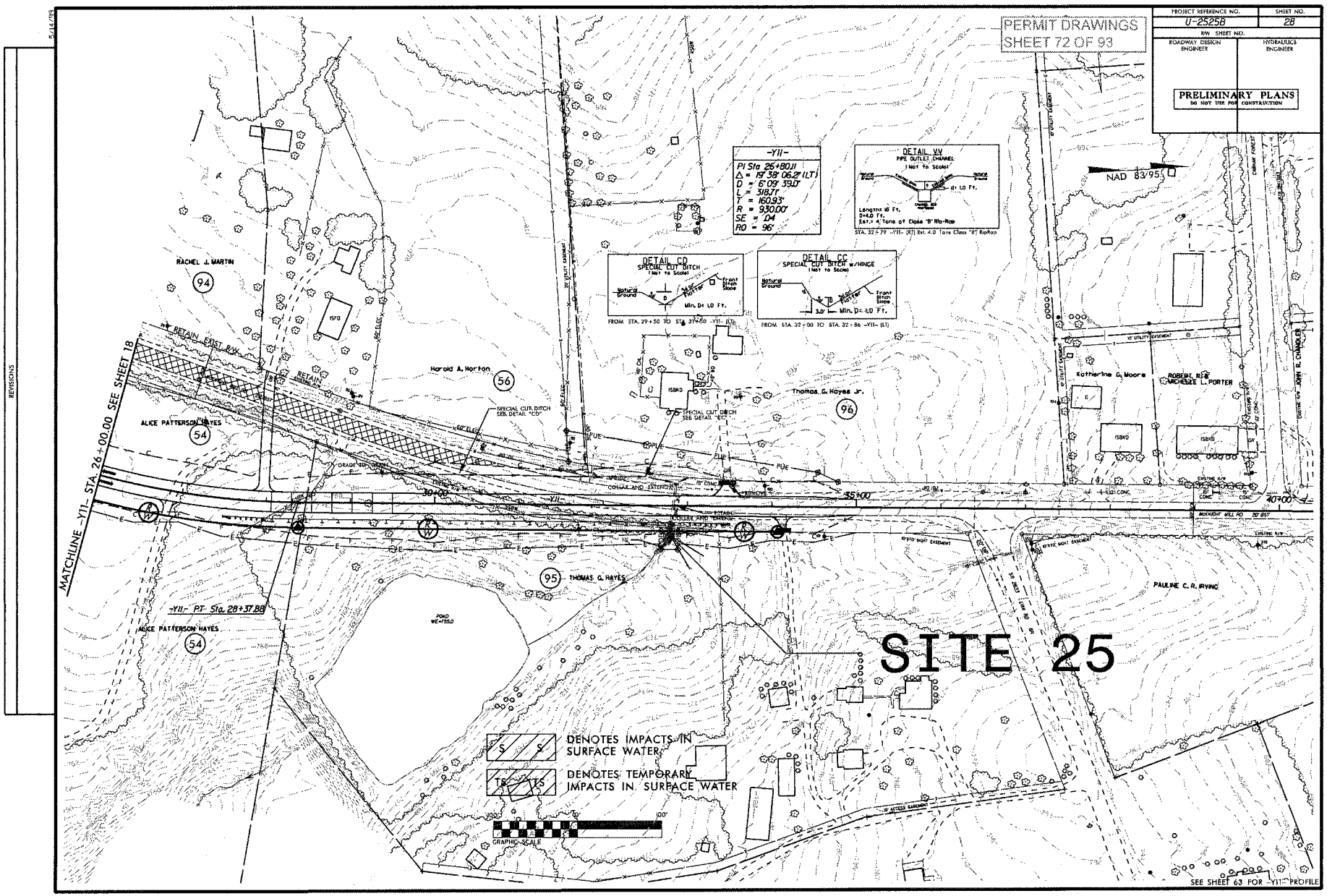
P-120

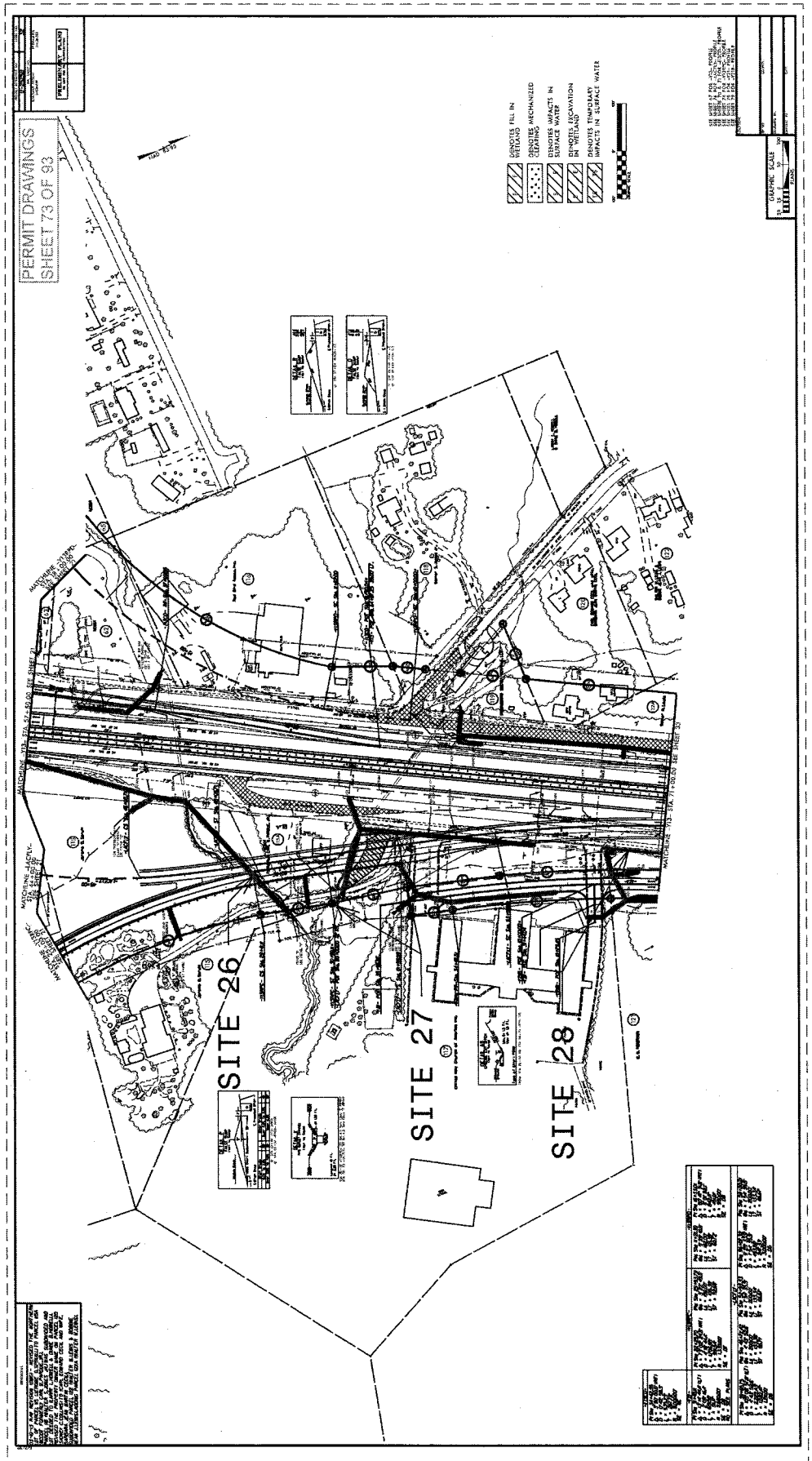

PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-233
PERMIT DRAWINGS
SHEET 70 OF 93
0.040
0.040
2.50:1
2.04:1
S.S. 755.148
754.17
36+50.00
WLB
SITE 24
WLB
2:1
2:1
750.89
36+00.00
0.025
0.025
2.49:1
2:1
754.35
35+50.00
-Y4-
P-121

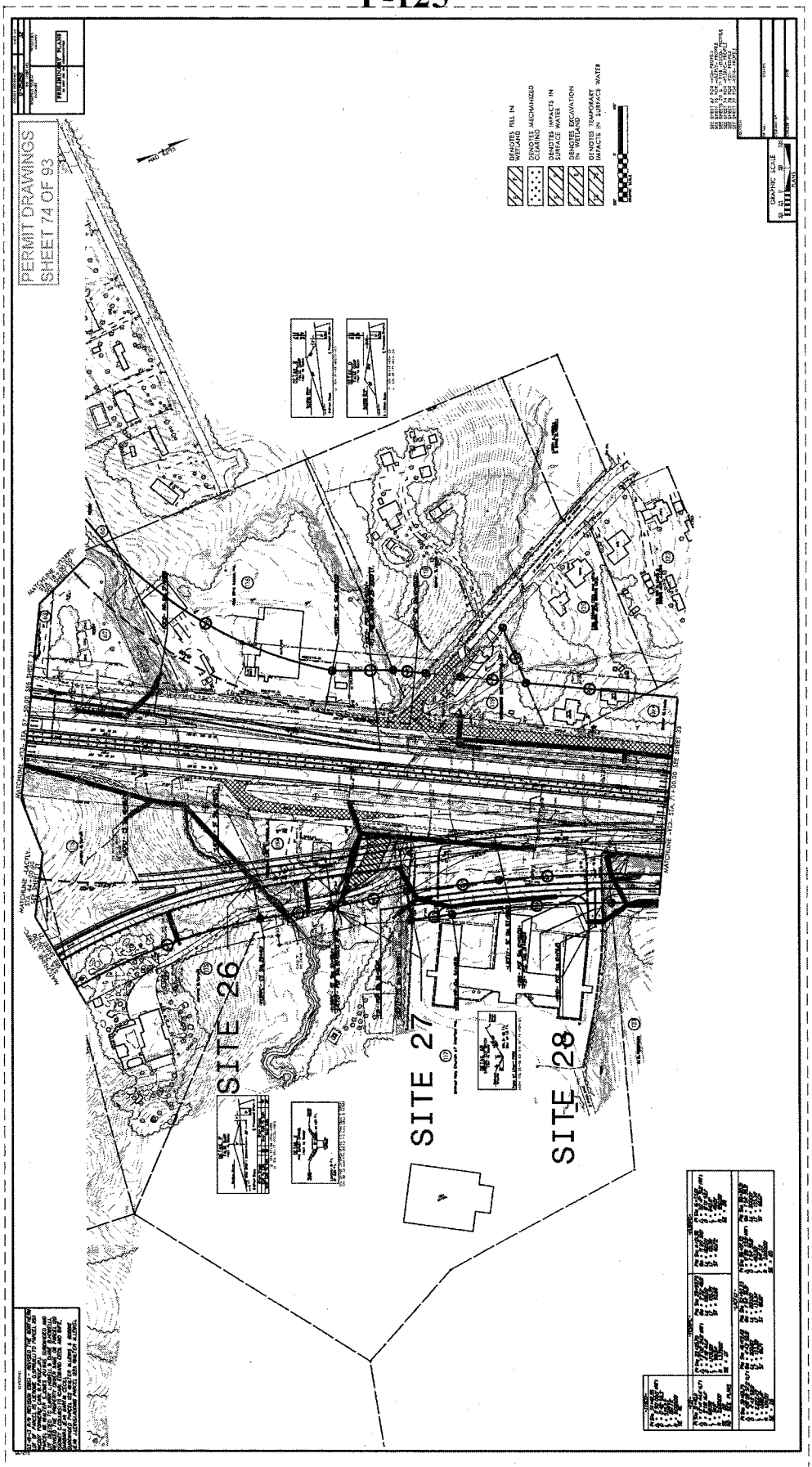
P-122

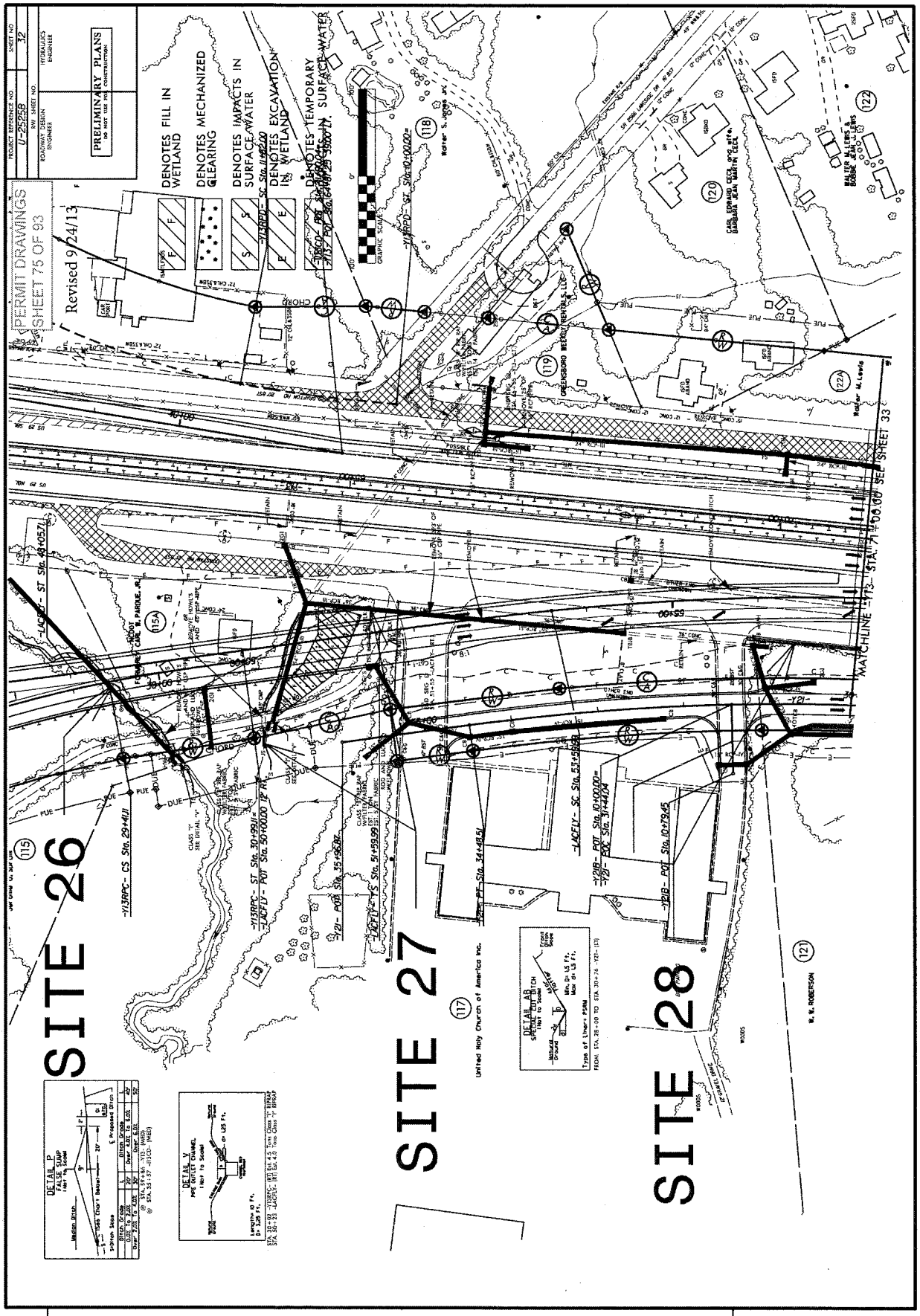


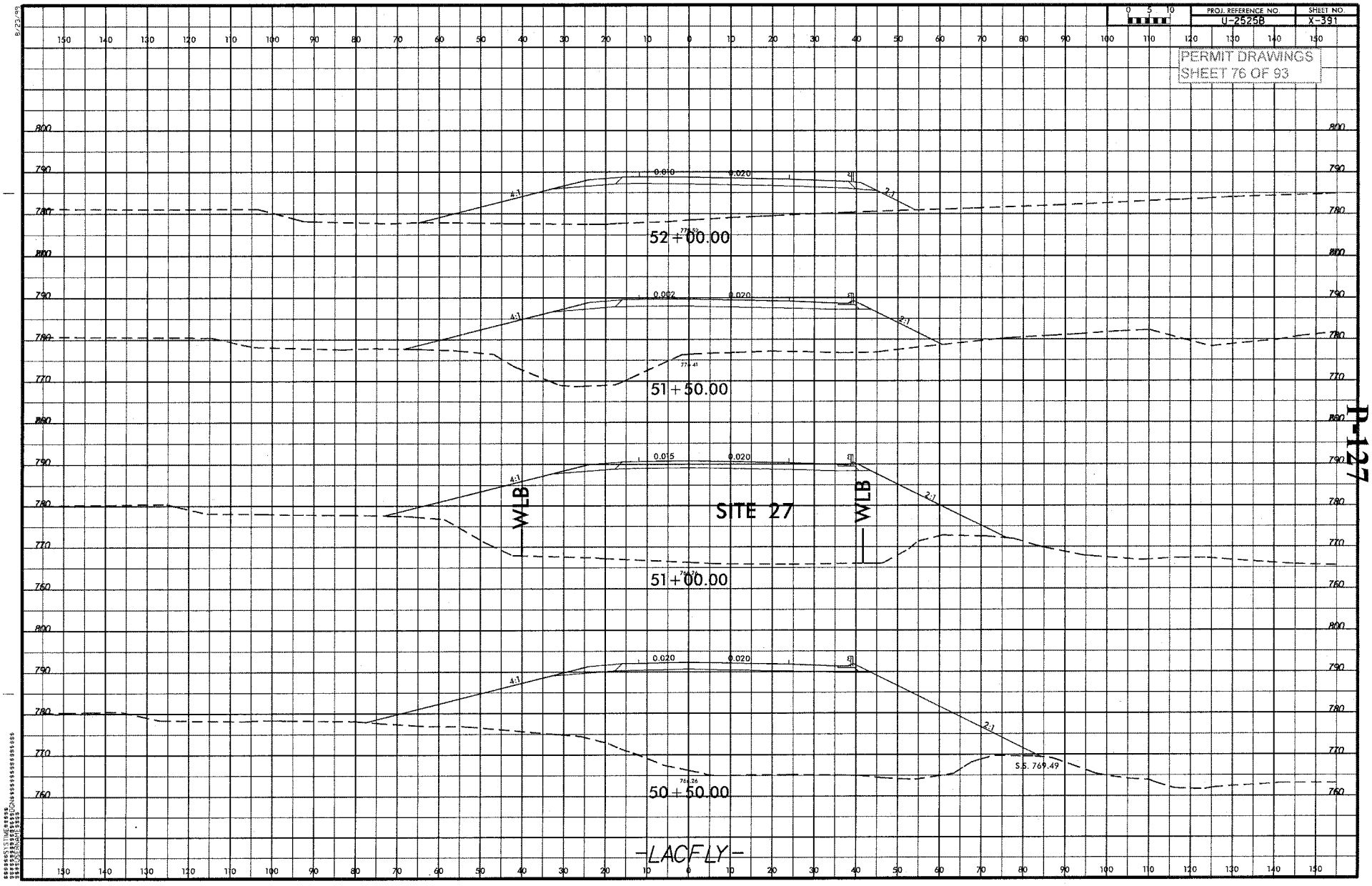
PERMIT DRAWINGS
SHEET 71 OF 93
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
U-2525B
SHEET NO. 28
NAD 83/95
SITE 25
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE
MATCHLINE -Y11- STA. 26+00.00 SEE SHEET 18
-Y11- PT Sta. 28+37.88
SEE SHEET 63 FOR -Y11- PROFILE
Katherine G. Moore
Thomas G. Hayes Jr.
Harold A. Horton
THOMAS G. HAYES
RACHEL J. MARTIN
ALICE PATTERSON HAYES
PAULINE C. R. IRVING
DETAIL VV
DETAIL CC
DETAIL CD
REVISIONS

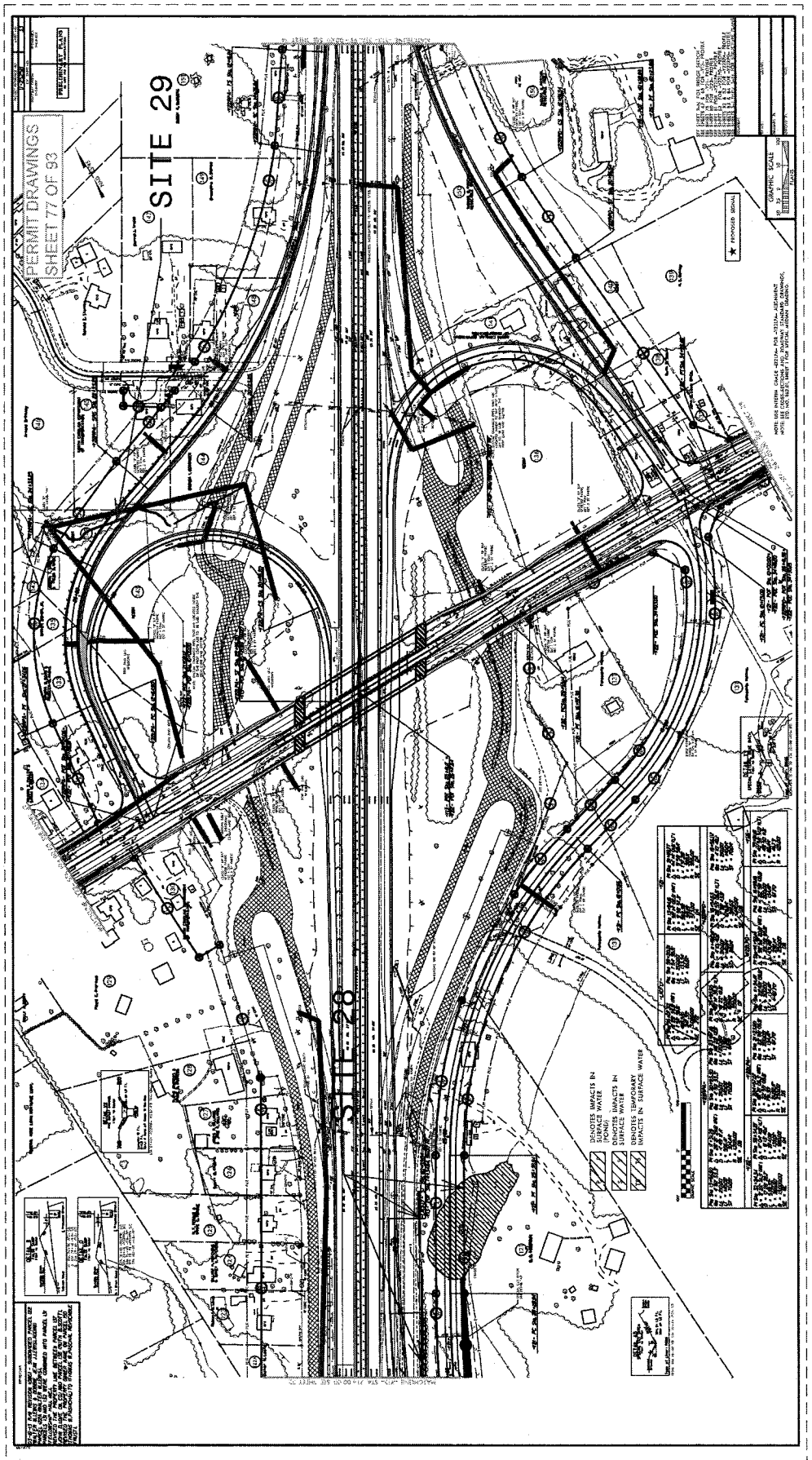

PERMIT DRAWINGS
SHEET 72 OF 93
PROJECT REFERENCE NO.
U-2525B
SHEET NO.
28
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
-Y11-
PI Sta 26+80.11
Δ = 19° 38' 06.2" (LT)
D = 6° 09' 39.0"
L = 318.71'
T = 160.93'
R = 930.00'
SE = .04
RO = 96'
DETAIL VV
PIPE OUTLET CHANNEL
(Not to Scale)
DETAIL CD
SPECIAL CUT DITCH
(Not to Scale)
DETAIL CC
SPECIAL CUT DITCH w/HINGE
(Not to Scale)
NAD 83/95
RACHEL J. MARTIN
94
Harold A. Horton
56
Thomas G. Hayes Jr.
96
Katherine G. Moore
ROBERT R. & MICHELLE L. PORTER
ALICE PATTERSON HAYES
54
95
THOMAS G. HAYES
PAULINE C. R. IRVING
MATCHLINE -Y11- STA. 26+00.00 SEE SHEET 18
-Y11- PT Sta. 28+37.88
ALICE PATTERSON HAYES
54
SITE 25
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE
SEE SHEET 63 FOR -Y11- PROFILE
REVISIONS
5/14/99

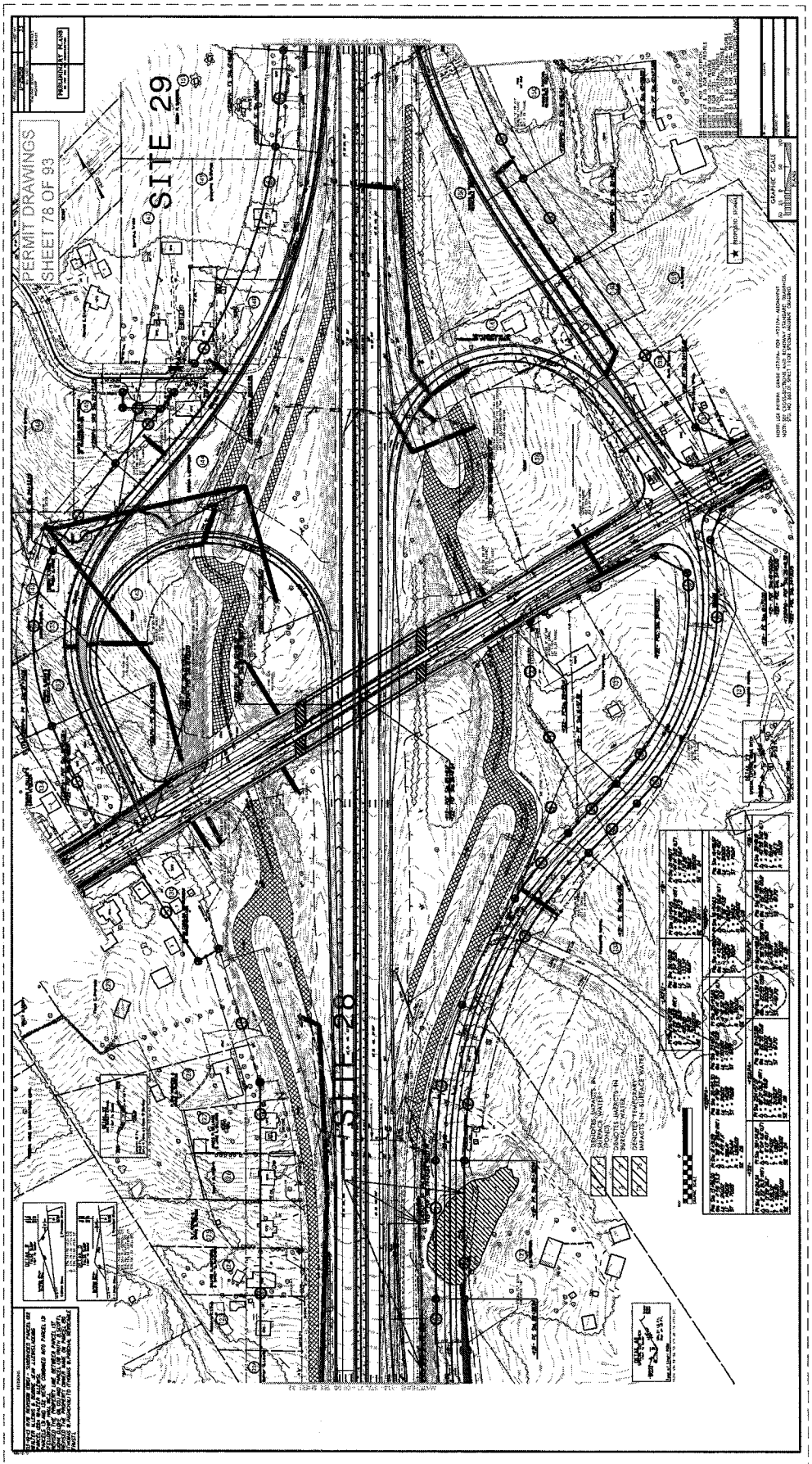

PERMIT DRAWINGS
SHEET 73 OF 93
PRELIMINARY PLANS
DENOTES FILL IN WETLANDS
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLANDS
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE
SITE 26
SITE 27
SITE 28


PERMIT DRAWINGS
SHEET 74 OF 93
SITE 26
SITE 27
SITE 28
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE

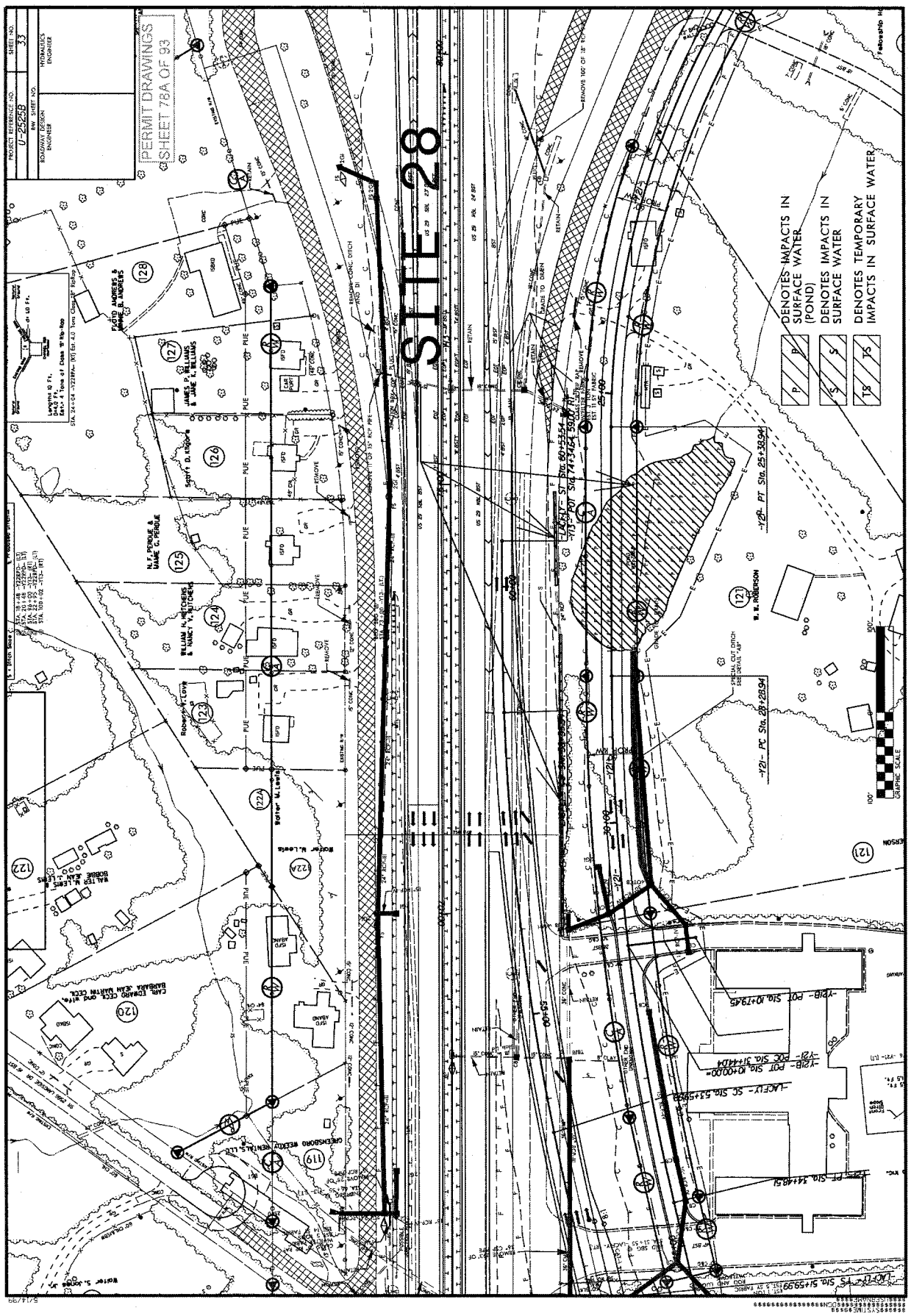

PERMIT DRAWINGS
SHEET 75 OF 93
Revised 9/24/13
PRELIMINARY PLANS
DENOTES FILL IN WETLAND
DENOTES MECHANIZED CLEARING
DENOTES IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SITE 26
SITE 27
SITE 28
MATCHLINE -Y13- STA. 71+00.00 SEE SHEET 33
United Holy Church of America Inc.
W. W. ROBERSON
DETAIL P
DETAIL V
DETAIL AB

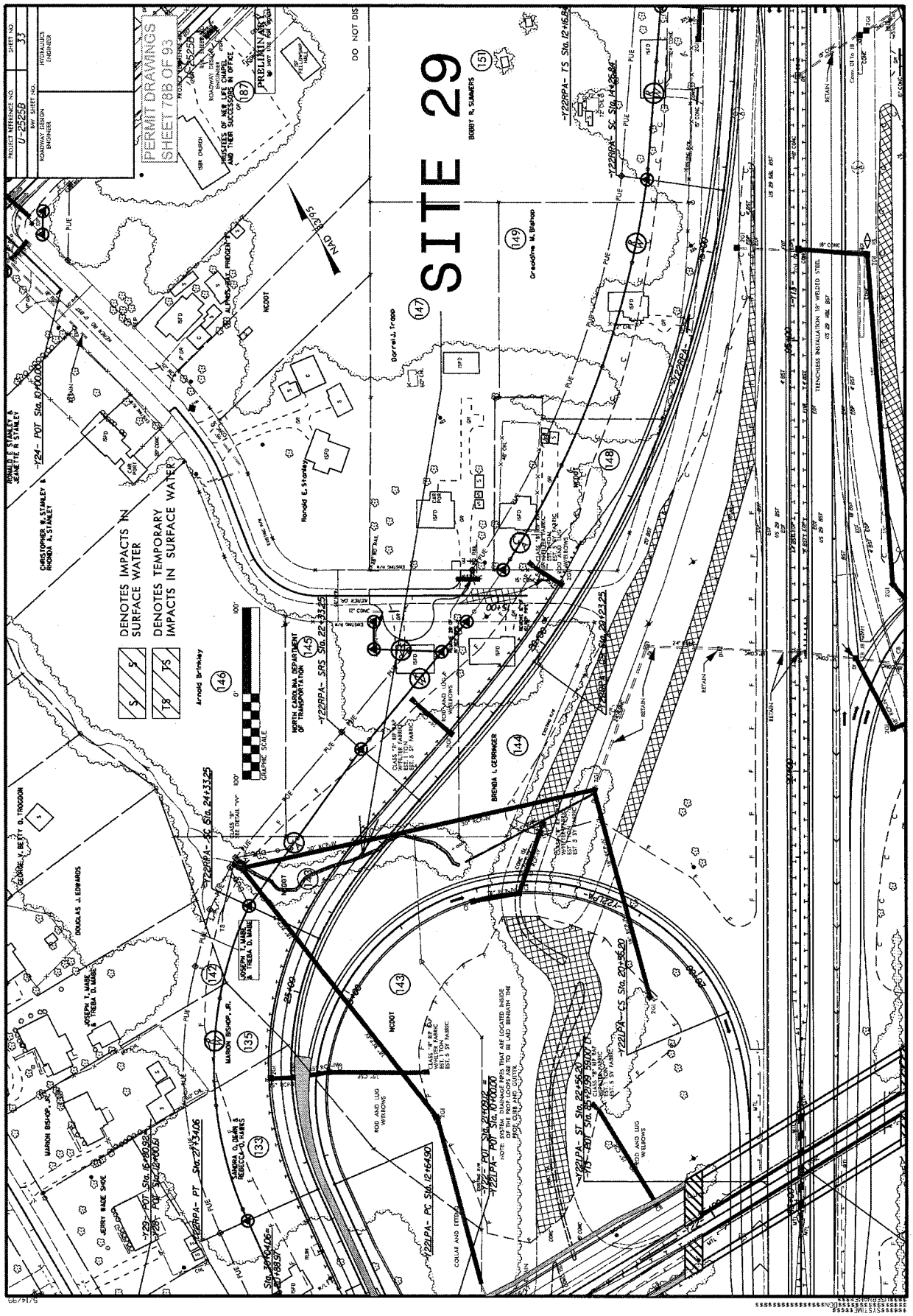

PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-391
PERMIT DRAWINGS
SHEET 76 OF 93
52+00.00
51+50.00
51+00.00
50+50.00
SITE 27
WLB
WLB
S.S. 769.49
-LACFLY-

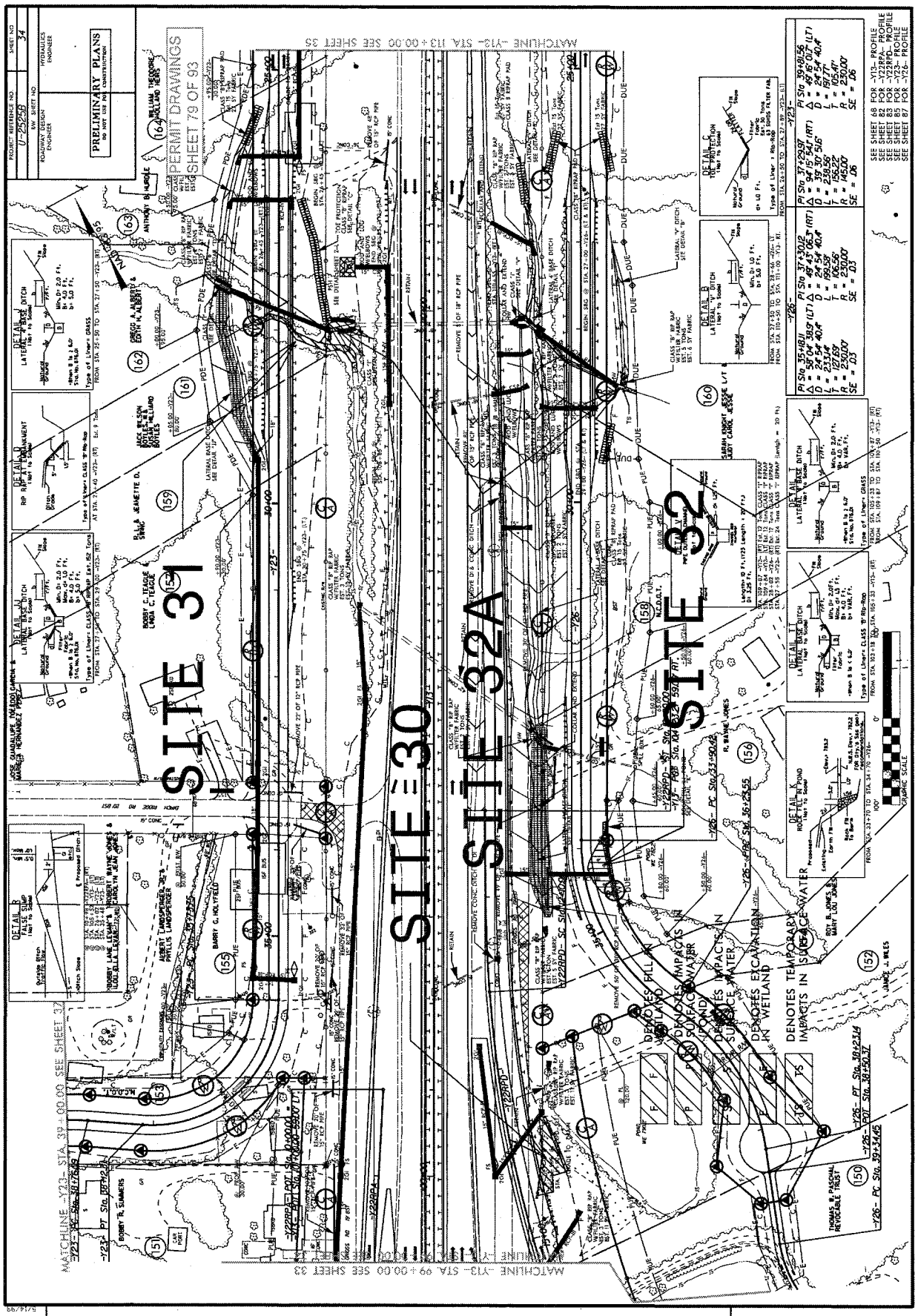

PERMIT DRAWINGS
SHEET 77 OF 93
SITE 29
SITE 28
DENOTES IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE


PERMIT DRAWINGS
SHEET 78 OF 93
SITE 29
SITE 28
GRAPHIC SCALE

P-130

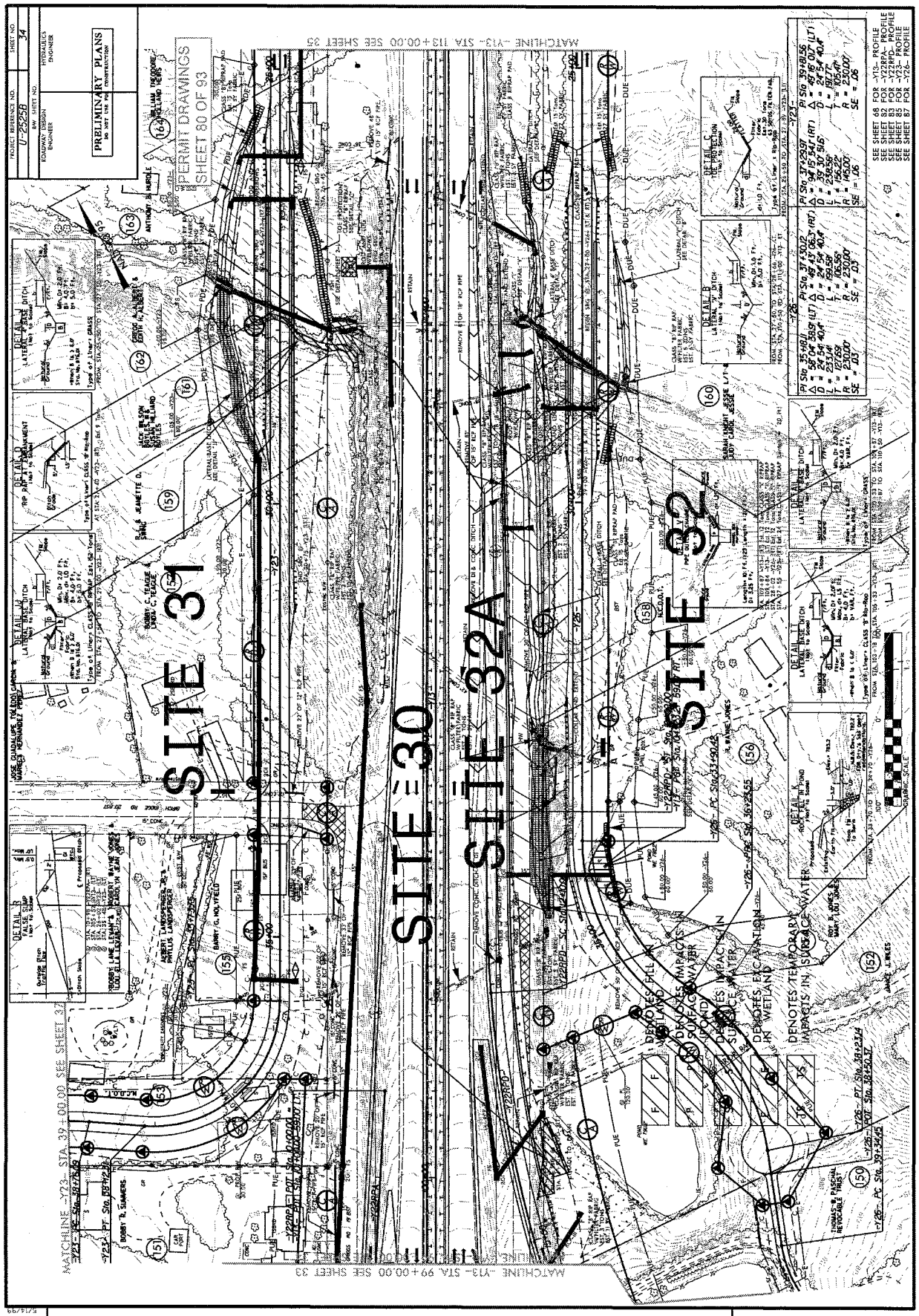

PERMIT DRAWINGS
SHEET 78A OF 93
PROJECT REFERENCE NO.
U-2525B
SHEET NO.
33
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
STIE 28
DENOTES IMPACTS IN SURFACE WATER
DENOTES IMPACTS IN SURFACE WATER (POND)
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE
5/14/99

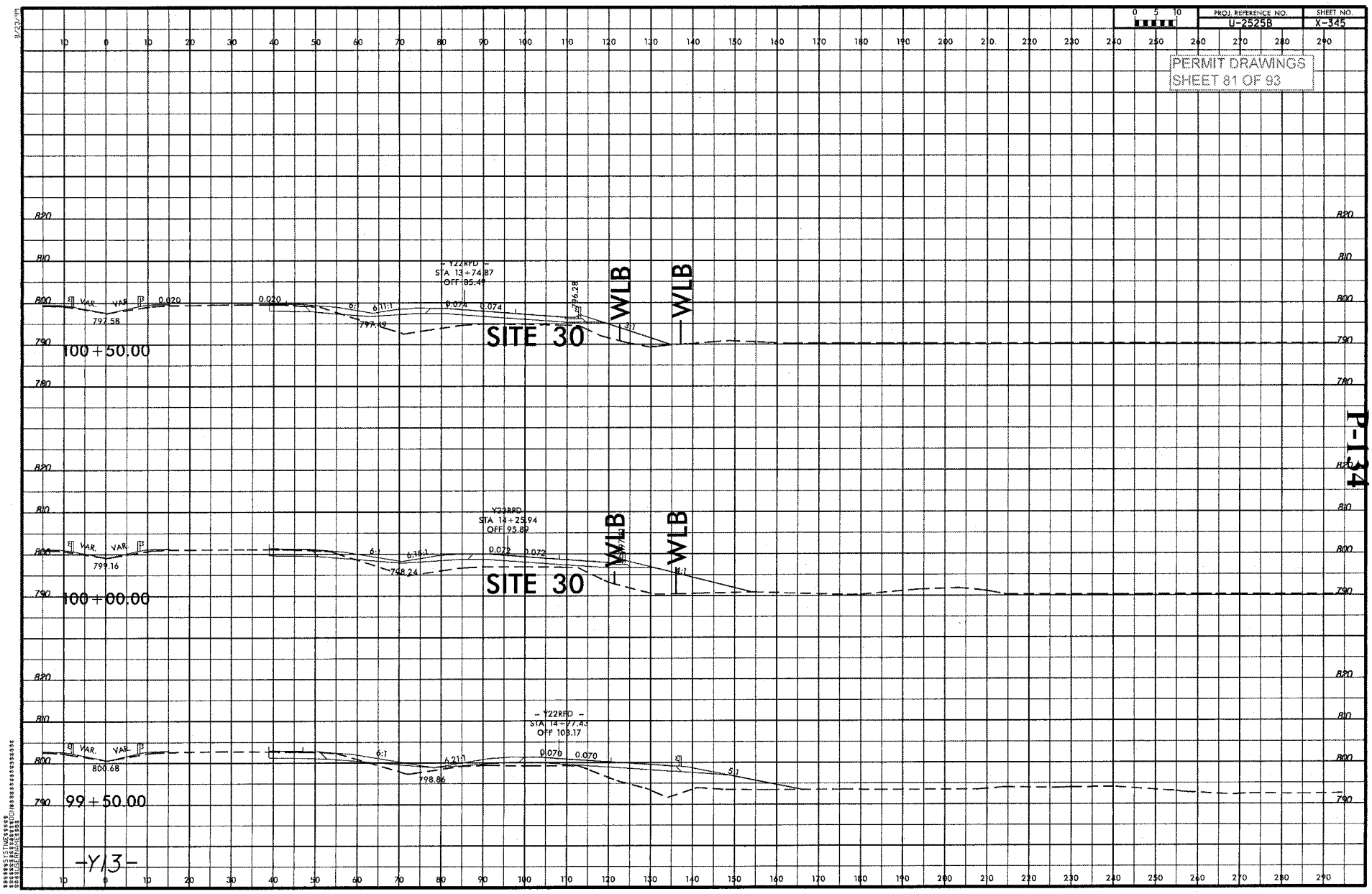

SITE 29
PERMIT DRAWINGS
SHEET 78B OF 93
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE
NCDOT
Arnold Brinkley
Ronald E. Stanley
Darrel J. Trapp
Greadine M. Bishop
BOBBY R. SUMMERS
BRENDA L. GERRINGER
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DOUGLAS J. EDWARDS
MARION BISHOP, JR.
JERRY WADE SHOE
TRENCHLESS INSTALLATION 18" WELDED STEEL
ROD AND LUG WELDOWS
COLLAR AND EXTEND
DO NOT DIS

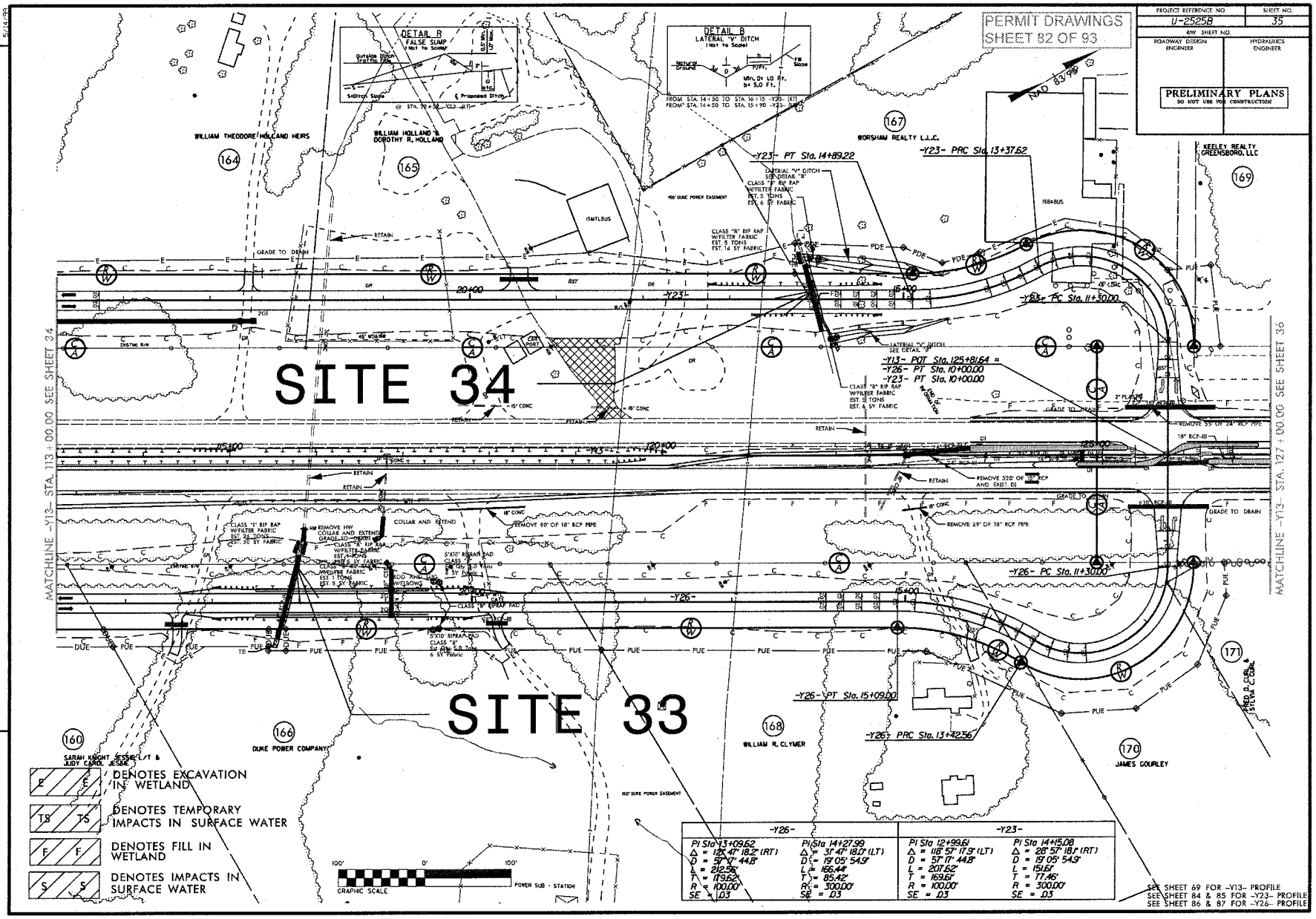


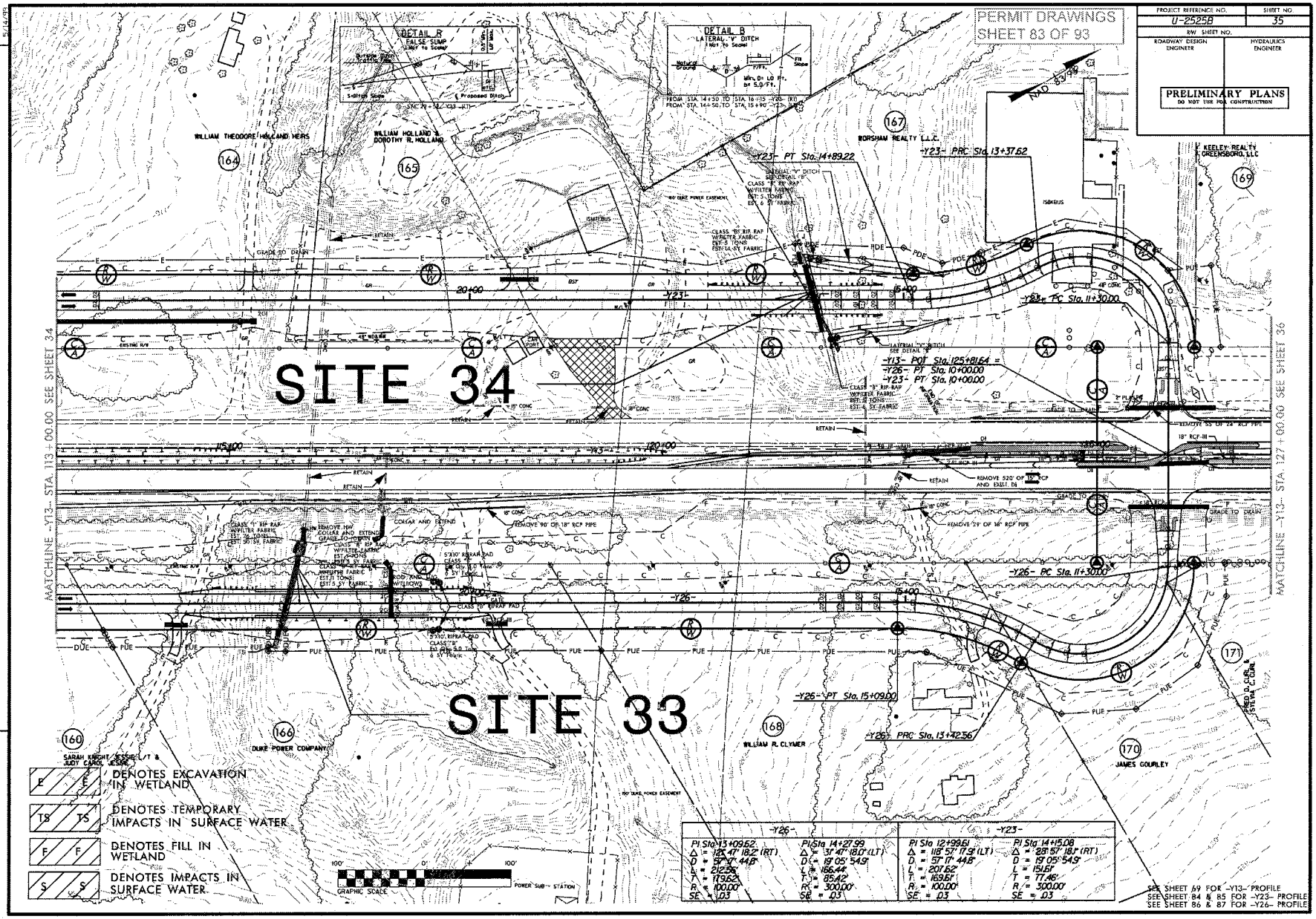
03-19-13 R/W REVISION (DMG) - REVISED THE PROPERTY OWNER NAME ON PARCEL 150 (THOMAS W. PASCHAL) TO (THOMAS W. PASCHAL REVOCABLE TRUST).

REVISIONS


PRELIMINARY PLANS
PERMIT DRAWINGS
SHEET 80 OF 93
SITE 31
SITE 30
SITE 32A
SITE 32
MATCHLINE -Y13- STA 113+00.00 SEE SHEET 35
MATCHLINE -Y13- STA 99+00.00 SEE SHEET 33
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
DENOTES EXCAVATION IN WETLAND
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
SEE SHEET 68 FOR -Y13- PROFILE
SEE SHEET 82 FOR -Y22RPA- PROFILE
SEE SHEET 83 FOR -Y22RPD- PROFILE
SEE SHEET 85 FOR -Y23- PROFILE
SEE SHEET 87 FOR -Y26- PROFILE
03-19-13 R/W REVISION (DWG) - REVISED THE PROPERTY OWNER NAME ON PARCEL 150 (THOMAS W. PASCHAL) TO (THOMAS W. PASCHAL REVOCABLE TRUST).
REVISIONS


PROJ. REFERENCE NO.
U-2525B
SHEET NO.
X-345
PERMIT DRAWINGS
SHEET 81 OF 93
P-134
Y22RPD
STA 13+74.87
OFF 85.49
SITE 30
WLB
WLB
100+50.00
Y22RPD
STA 14+25.94
OFF 95.89
SITE 30
WLB
WLB
100+00.00
Y22RPD
STA 14+77.43
OFF 103.17
99+50.00
-Y13-

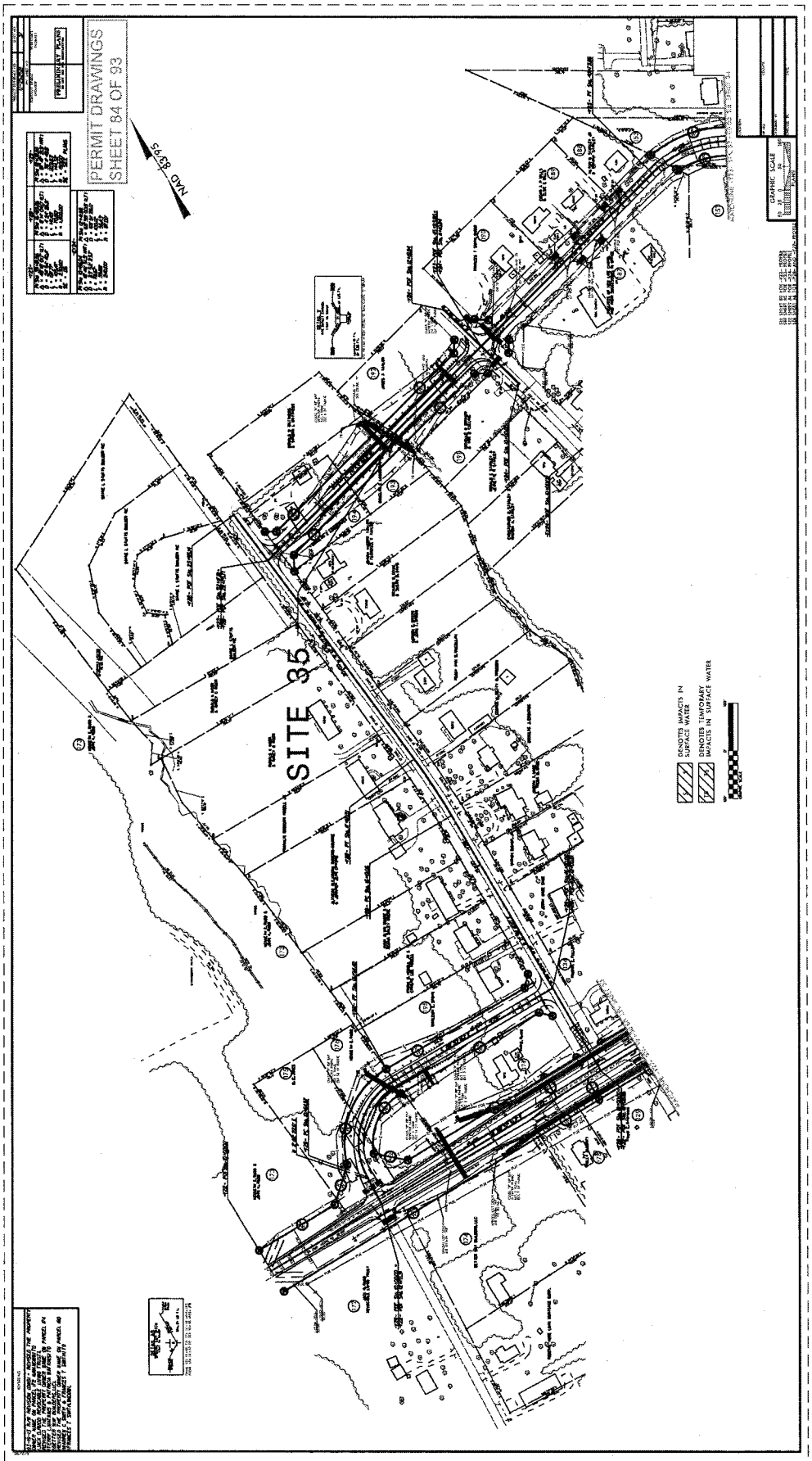

PERMIT DRAWINGS
SHEET 82 OF 93
PROJECT REFERENCE NO.
U-2525B
SHEET NO.
35
R/W SHEET NO.
ROADWAY DESIGN ENGINEER
HYDRAULICS ENGINEER
PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION
DETAIL R
FALSE SUMP
DETAIL B
LATERAL "V" DITCH
WILLIAM THEODORE HOLLAND HEIRS
WILLIAM HOLLAND & DOROTHY R. HOLLAND
WORSHAM REALTY L.L.C.
KEELEY REALTY GREENSBORO, LLC
SITE 34
SITE 33
MATCHLINE -Y12- STA. 113+00.00 SEE SHEET 34
MATCHLINE -Y13- STA. 127+00.00 SEE SHEET 36
-Y23- PT Sta. 14+89.22
-Y23- PRC Sta. 13+37.62
-Y23- PC Sta. 11+30.00
-Y13- POT Sta. 125+81.64 =
-Y26- PT Sta. 10+00.00
-Y23- PT Sta. 10+00.00
-Y26- PC Sta. 11+30.00
-Y26- PT Sta. 15+09.00
-Y26- PRC Sta. 13+42.56
SARAH KNIGHT JESSIE L/T & JUDY CAROL JESSIE
DUKE POWER COMPANY
WILLIAM R. CLYMER
JAMES GOURLEY
FRED D. CURL & SYLVIA C. CURL
DENOTES EXCAVATION IN WETLAND
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
DENOTES FILL IN WETLAND
DENOTES IMPACTS IN SURFACE WATER
GRAPHIC SCALE
POWER SUB - STATION
-Y26-
PI Sta 13+09.62
Δ = 12° 47' 18.2" (RT)
D = 57° 17' 44.8"
L = 212.56'
T = 179.62'
R = 100.00'
SE = .03
PI Sta 14+27.99
Δ = 31° 47' 18.0" (LT)
D = 19° 05' 54.9"
L = 166.44'
T = 85.42'
R = 300.00'
SE = .03
-Y23-
PI Sta 12+99.61
Δ = 118° 57' 17.9" (LT)
D = 57° 17' 44.8"
L = 207.62'
T = 169.61'
R = 100.00'
SE = .03
PI Sta 14+15.08
Δ = 28° 57' 18.1" (RT)
D = 19° 05' 54.9"
L = 151.61'
T = 77.46'
R = 300.00'
SE = .03
SEE SHEET 69 FOR -Y13- PROFILE
SEE SHEET 84 & 85 FOR -Y23- PROFILE
SEE SHEET 86 & 87 FOR -Y26- PROFILE
REVISIONS
03-19-13 R/W REVISION (DWG) - REVISED THE PROPERTY OWNER NAME ON PARCEL 168 (KENNETH C. CLYMER) TO (WILLIAM R. CLYMER).
REVISED THE PROPERTY OWNER NAME ON PARCEL 169 (CHARLES A.S. KEELEY) TO (KEELEY REALTY GREENSBORO, LLC).



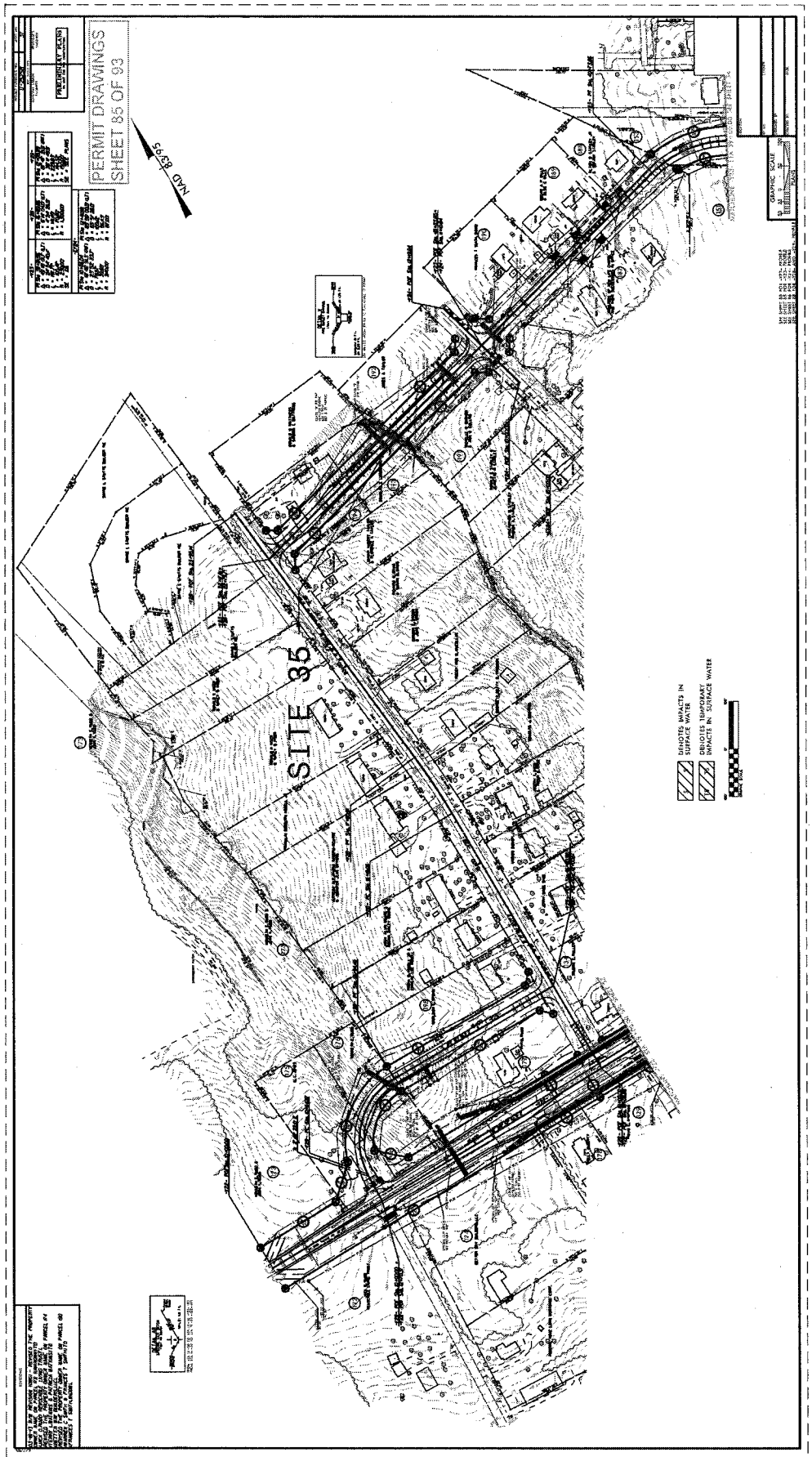
REVISIONS

03-19-13 R/W REVISION (DWG) - REVISED THE PROPERTY OWNER NAME ON PARCEL 168 (KENNETH C.CLYMER) TO (WILLIAM R.CLYMER). REVISED THE PROPERTY OWNER NAME ON PARCEL 169 (CHARLES A.S.KEELEY) TO (KEELEY REALTY GREENSBORO,LLC).

5/14/99


PERMIT DRAWINGS
SHEET 84 OF 93
NAD 83-95
SITE 35
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE

P-138


PERMIT DRAWINGS
SHEET 85 OF 93
NAD 83/95
SITE 35
DENOTES IMPACTS IN SURFACE WATER
DENOTES TEMPORARY IMPACTS IN SURFACE WATER
GRAPHIC SCALE

PROJECT REFERENCE NO.	SHEET NO.
U-2525B	37
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

PRELIMINARY PLANS
DO NOT USE FOR CONSTRUCTION

PERMIT DRAWINGS
SHEET 86 OF 93

03-9-13 R/W REVISION (DMG) - REVISED THE PROPERTY OWNER NAME ON PARCEL 168 (KENNETH C.CLYMER,TO (WILLIAM R.CLYMER).
REVISED THE PROPERTY OWNER NAME ON PARCEL 169 (CHARLES A.S.KEELEY) TO (KEELEY REALTY GREENSBORO,LLC).

S DENOTES IMPACTS IN SURFACE WATER

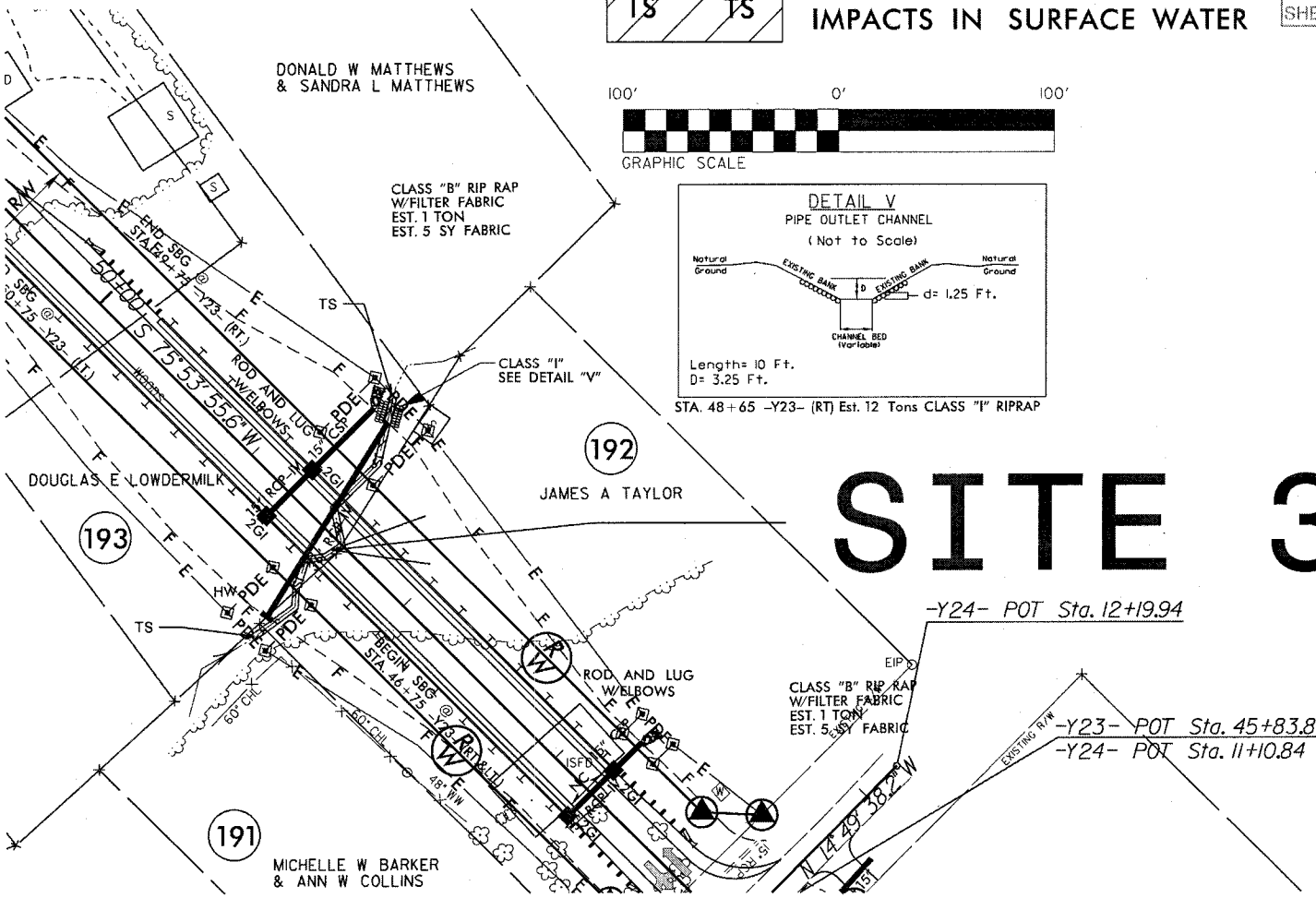
TS DENOTES TEMPORARY IMPACTS IN SURFACE WATER

100' 0' 100'
GRAPHIC SCALE

DETAIL V
PIPE OUTLET CHANNEL
(Not to Scale)

Length= 10 Ft.
D= 3.25 Ft.

STA. 48+65 -Y23- (RT) Est. 12 Tons CLASS "I" RIPRAP



SITE 35

-Y24- POT Sta. 12+19.94

-Y23- POT Sta. 45+83.85=
-Y24- POT Sta. 11+10.84

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WETLAND PERMIT IMPACT SUMMARY

			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Site No.	Station (From/To)	Structure Size / Type	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	27+25 -Y3RPA- (RT) TO	30" RCP	0.57		0.04			0.09		1684		
	47+94 -L- (LT)											
1A	24+84 -Y3RPA- (LT)		0.03									
	12+26 -Y3RPA- (LT)											
1B	37+76 -L- (LT) TO		0.01									
	38+18 -L- (LT)											
2	24+84 -Y3RPD- (LT)	24" RCP	0.05			<0.01						
3	38+87 -L- (LT) TO		0.12									
	40+30 -L- (LT)											
3A	41+86 -L- (RT) TO		0.03									
	43+15 -L- (LT)											
3B	44+26 -L- (LT) TO		0.02									
	44+86 -L- (LT)											
3C	46+46 -L- (LT) TO		0.25		0.02	0.02						
	47+70 -L- (RT)											
SUBTOTALS:			1.08		0.06	0.03		0.09		1684		

PERMIT DRAWINGS
SHEET 87 OF 93

NOTE: Rounded totals are based upon sum of actual impacts. Also, Site 1 has 332 linear feet of intermittent stream at 1:1 mitigation; 1352 linear feet of perennial stream at 2:1 mitigation.

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY
WBS - 34821.1.1 (U-2525B)

SHEET 4/8/2013

ATN Revised 3/31/05

P-140

WETLAND PERMIT IMPACT SUMMARY

			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Site No.	Station (From/To)	Structure Size / Type	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)
4	48+65 -L-	2 @ 9' X 9' RCBC	0.02					0.10	0.04	394	153	
	Bank Stabilization									98		
5	59+31 -L- (RT) TO	66" RCP,24"RCP, &						0.09	<0.01	1117	20	
	81+35 -L- (LT)	42" RCP										
	Restoration							0.04		481		1307
5A	66+14 -L- (LT) TO		0.08									
	68+72 -L- (LT)											
5B	70+32 -L- (LT) TO		0.02									
	71+59 -L- (LT)											
6	21+56 -Y4 RPB-(LT) TO		0.03					0.01		138	10	
	22+00 -Y4 RPB- (RT)											
6A	22+11 -RPB-(RT) TO		0.05			<0.01						
	22+75 -RPB-(RT)											
7	77+25 -L-(LT) TO		1.29		0.05	0.03						
	25+57 -RPC-(RT)											
8	93+50 -L- TO		0.83			0.09						
	95+95 -L-(LT)											
SUBTOTALS:			2.32		0.05	0.12		0.24	0.04	2228	183	1307

PERMIT DRAWINGS
SHEET 88 OF 93
Revised 10/15/13

NOTE: Rounded totals are based upon sum of actual impacts.

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY
WBS - 34821.1.1 (U-2525B)

SHEET 4/8/2013

ATN Revised 3/31/05

P-141

WETLAND PERMIT IMPACT SUMMARY

			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Site No.	Station (From/To)	Structure Size / Type	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)
8A	33+23 -EY4-				<0.01							
9	95+78 -L- (LT) TO	15" RCP	2.01			0.15		0.03	<0.01	462	10	
	102+77 -L-(RT)											
9A	101+78 -L- (LT) TO	42" RCP						<0.01		84		
	102+19 -L-(LT)											
10	113+64 -L- (LT) TO	2 @ 7' X 8' RCBC			<0.01			0.03	<0.01	212	29	
	117+08 -L-(RT)											
	Bank Stabilization									97		
10A	114+23 -L- (RT) TO		0.02			0.02						
	115+15 -L-(RT)											
10B	115+19 -L- (LT) TO		0.03		<0.01	<0.01						
	116+17 -L-(RT)											
10C	116+15 -L- (LT) TO		0.25		0.04							
	117+08 -L-(RT)											
11	123+22 -L- (LT) TO		0.33									
	127+94 -L-(RT)											
	Bank Stabilization									18		
SUBTOTALS:			2.64		0.05	0.17		0.06	<0.01	873	39	

PERMIT DRAWINGS
SHEET 89 OF 93
Revised 10/15/13

NOTE: Rounded totals are based upon sum of actual impacts.

NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GUILFORD COUNTY
WBS - 34821.1.1 (U-2525B)

SHEET 4/8/2013

ATN Revised 3/31/05

P-142

WETLAND PERMIT IMPACT SUMMARY

Site No.	Station (From/To)	Structure Size / Type	WETLAND 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)	SURFACE WATER IMPACTS: Permanent SW impacts (ac)	Temp. SW impacts (ac)	Existing Channel Impacts Permanent (ft)	Existing Channel Impacts Temp. (ft)	Natural Stream Design (ft)
12	156+90 -L-	66" RCP						0.03	<0.01	286	22	
	Bank Stabilization									30		
13	174+72 -L- (RT)	DUAL BRIDGES	0.02			0.01		0.01		*169	7	
	Bank Stabilization									10		
14	182+76 -L-	48" RCP						0.03	<0.01	347	35	
	Bank Stabilization									10		
15	189+55 -L-	60" RCP						0.03	<0.01	292	26	
	Bank Stabilization									20		
16	195+35 -L-	66" RCP	<0.01					0.05	<0.01	382	43	
	Bank Stabilization									12		
17	14+26 -Y10A- (RT)	15" RCP						<0.01	<0.01	51	20	
18	218+00 -L- TO	2 @ 7' X 8' RCBC	0.03			0.01		0.03	<0.01	241	10	
	219+51 -L- (RT)											
	POND							0.04				
	Bank Stabilization									30		
	Restoration								<0.01		10	386
19	230+21 -L- (RT) TO				0.14							
	230+83 -L- (LT)											
20	239+57 -L- (LT) TO	2 @ 8' X 8' RCBC						0.09	<0.01	520	39	
	245+33 -L- (RT)											
	Relocation							0.06	<0.01	295	10	362
SUBTOTALS:			0.05		0.14	0.02		0.46	0.03	2695	222	748

PERMIT DRAWINGS

SHEET 90 OF 93

NOTE: Rounded totals are based upon sum of actual impacts.

*SITE 13 - Has 32 feet of non-migitable stream impact.

NC DEPARTMENT OF TRANSPORTATION
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ATN Revised 3/31/05

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WETLAND PERMIT IMPACT SUMMARY

			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Site No.	Station (From/To)	Structure Size / Type	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)
20A	239+59 -L- (LT) TO							0.04	<0.01	236	29	
	241+22 -L- (LT)											
20B	11+05 -LCD- (RT) TO		0.02					<0.01		29		
	11+57 -LCD-											
21	16+35 -Y13LPD-	24" RCP	0.34			0.04		0.03	<0.01	374	10	
22	17+40 -Y13RPB- (RT) TO		0.03									
	17+81 -Y13RPB- (RT)											
22A	16+67 -Y13RPB- (LT) TO	36" RCP	0.02					0.01	<0.01	142	10	
	17+13 -Y13RPB- (LT)											
	Bank Stabilization									10		
22B	17+21 -Y13RPB- (LT) TO		0.01									
	17+46 -Y13RPB- (LT)											
23	16+35 -Y4A- (RT)	18" RCP	0.02				<0.01					
24	36+00 -Y4-	36" RCP	0.19				0.02					
25	33+80 -Y11- (RT)	24" RCP							<0.01	12	10	
	Bank Stabilization									12		
26	29+38 -Y13RPC-	60" RCP						0.03	<0.01	319	11	
	Bank Stabilization									12		
SUBTOTALS:			0.62			0.04	0.03	0.11	0.01	1146	70	

PERMIT DRAWINGS
SHEET 91 OF 93

NOTE: Rounded totals are based upon sum of actual impacts.

SITE 20A requires 1:1 mitigation.
SITE 23 & 24 Have <0.01 ac. of Temp. Fill in Wetlands in Hand Clearing areas for erosion control measures.

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WETLAND PERMIT IMPACT SUMMARY

			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Site No.	Station (From/To)	Structure Size / Type	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)
27	50+09-LACFLY- (RT)TO	54" RCP	0.10					0.01	<0.01	215	10	
	51+53-LACFLY- (LT)											
28	31+25 -Y21- (RT) TO	30" RCP						0.03		461		
	27+81-Y21- (RT)											
	POND							0.58				
29	22+88 -Y22RPA-	30" RCP & 18" RCP						0.02	<0.01	290	4	
	Bank Stabilization									10		
30	13+63 -Y22 RPD- TO	15" RCP W/ 2GI	0.03		<0.01							
	15+35 -Y22 RPD-											
31	16+35 -Y23-	66" RCP						0.03	<0.01	191	27	
	Bank Stabilization									21		
32	34+30 -Y26- (LT)	12" RCP						0.03				
32A	28+37 -Y26-	48" RCP						0.01	<0.01	151	25	
	Bank Stabilization									28		
33	22+14 -Y26-	48" RCP						0.01	<0.01	115	10	
	Bank Stabilization									17		
34	16+03 -Y23-	24" RCP	<0.01									
SUBTOTALS:			0.14		<0.01			0.74	<0.01	1499	76	

NOTE: Rounded totals are based upon sum of actual impacts.

PERMIT DRAWINGS
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GUILFORD COUNTY
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SHEET 4/8/2013

ATN Revised 3/31/05

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WETLAND PERMIT IMPACT SUMMARY

			WETLAND IMPACTS					SURFACE WATER IMPACTS				
Site No.	Station (From/To)	Structure Size / Type	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)
35	48+53 -Y23-	36" RCP						<0.01	<0.01	120	17	
	Bank Stabilization									10		
	THIS SHEET	SUBTOTALS:						<0.01	<0.01	130	17	
SUBTOTALS OF ALL OTHER:			6.85	0.00	0.31	0.38	0.03	1.70	0.09	10125	590	2055
TOTALS:			**6.85**	**0.00**	**0.31**	**0.38**	**0.03**	**1.72**	**0.10**	**10255**	**607**	**2055**

PERMIT DRAWINGS
SHEET 93 OF 93

Revised 10/15/13

NOTE: Rounded totals are based upon sum of actual impacts.

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SHEET 4/8/2013

ATN Revised 3/31/05

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STANDARD SPECIAL PROVISION
AVAILABILITY OF FUNDS – TERMINATION OF CONTRACTS

(5-20-08) Z-2

General Statute 143C-6-11. (h) Highway Appropriation is hereby incorporated verbatim in this contract as follows:

(h) Amounts Encumbered. – Transportation project appropriations may be encumbered in the amount of allotments made to the Department of Transportation by the Director for the estimated payments for transportation project contract work to be performed in the appropriation fiscal year. The allotments shall be multiyear allotments and shall be based on estimated revenues and shall be subject to the maximum contract authority contained in *General Statute 143C-6-11(c)*. Payment for transportation project work performed pursuant to contract in any fiscal year other than the current fiscal year is subject to appropriations by the General Assembly. Transportation project contracts shall contain a schedule of estimated completion progress, and any acceleration of this progress shall be subject to the approval of the Department of Transportation provided funds are available. The State reserves the right to terminate or suspend any transportation project contract, and any transportation project contract shall be so terminated or suspended if funds will not be available for payment of the work to be performed during that fiscal year pursuant to the contract. In the event of termination of any contract, the contractor shall be given a written notice of termination at least 60 days before completion of scheduled work for which funds are available. In the event of termination, the contractor shall be paid for the work already performed in accordance with the contract specifications.

Payment will be made on any contract terminated pursuant to the special provision in accordance with Subarticle 108-13(E) of the *2012 Standard Specifications*.

STANDARD SPECIAL PROVISION
NCDOT GENERAL SEED SPECIFICATION FOR SEED QUALITY

(5-17-11) Z-3

Seed shall be sampled and tested by the North Carolina Department of Agriculture and Consumer Services, Seed Testing Laboratory. When said samples are collected, the vendor shall supply an independent laboratory report for each lot to be tested. Results from seed so sampled shall be final. Seed not meeting the specifications shall be rejected by the Department of Transportation and shall not be delivered to North Carolina Department of Transportation warehouses. If seed has been delivered it shall be available for pickup and replacement at the supplier's expense.

Any re-labeling required by the North Carolina Department of Agriculture and Consumer Services, Seed Testing Laboratory, that would cause the label to reflect as otherwise specified herein shall be rejected by the North Carolina Department of Transportation.

Seed shall be free from seeds of the noxious weeds Johnsongrass, Balloonvine, Jimsonweed, Witchweed, Itchgrass, Serrated Tussock, Showy Crotalaria, Smooth Crotalaria, Sicklepod, Sandbur, Wild Onion, and Wild Garlic. Seed shall not be labeled with the above weed species on the seed analysis label. Tolerances as applied by the Association of Official Seed Analysts will NOT be allowed for the above noxious weeds except for Wild Onion and Wild Garlic.

Tolerances established by the Association of Official Seed Analysts will generally be recognized. However, for the purpose of figuring pure live seed, the found pure seed and found germination percentages as reported by the North Carolina Department of Agriculture and Consumer Services, Seed Testing Laboratory will be used. Allowances, as established by the NCDOT, will be recognized for minimum pure live seed as listed on the following pages.

The specifications for restricted noxious weed seed refers to the number per pound as follows:

Restricted Noxious **Weed**	Limitations per Lb. Of Seed	Restricted Noxious **Weed**	Limitations per Lb. of Seed
Blessed Thistle	4 seeds	Cornflower (Ragged Robin)	27 seeds
Cocklebur	4 seeds	Texas Panicum	27 seeds
Spurred Anoda	4 seeds	Bracted Plantain	54 seeds
Velvetleaf	4 seeds	Buckhorn Plantain	54 seeds
Morning-glory	8 seeds	Broadleaf Dock	54 seeds
Corn Cockle	10 seeds	Curly Dock	54 seeds
Wild Radish	12 seeds	Dodder	54 seeds
Purple Nutsedge	27 seeds	Giant Foxtail	54 seeds
Yellow Nutsedge	27 seeds	Horsenettle	54 seeds
Canada Thistle	27 seeds	Quackgrass	54 seeds
Field Bindweed	27 seeds	Wild Mustard	54 seeds
Hedge Bindweed	27 seeds		

Seed of Pensacola Bahiagrass shall not contain more than 7% inert matter, Kentucky Bluegrass, Centipede and Fine or Hard Fescue shall not contain more than 5% inert matter whereas a maximum of 2% inert matter will be allowed on all other kinds of seed. In addition, all seed shall not contain more than 2% other crop seed nor more than 1% total weed seed. The germination rate as tested by the North Carolina Department of Agriculture shall not fall below 70%, which includes both dormant and hard seed. Seed shall be labeled with not more than 7%, 5% or 2% inert matter (according to above specifications), 2% other crop seed and 1% total weed seed.

Exceptions may be made for minimum pure live seed allowances when cases of seed variety shortages are verified. Pure live seed percentages will be applied in a verified shortage situation. Those purchase orders of deficient seed lots will be credited with the percentage that the seed is deficient.

FURTHER SPECIFICATIONS FOR EACH SEED GROUP ARE GIVEN BELOW:

Minimum 85% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 83% pure live seed will not be approved.

Sericea Lespedeza
Oats (seeds)

Minimum 80% pure live seed; maximum 1% total weed seed; maximum 2% total other crop; maximum 144 restricted noxious weed seed per pound. Seed less than 78% pure live seed will not be approved.

Tall Fescue (all approved varieties)
Kobe Lespedeza
Korean Lespedeza
Weeping Lovegrass
Carpetgrass
Bermudagrass
Browntop Millet
German Millet – Strain R
Clover – Red/White/Crimson

Minimum 78% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 76% pure live seed will not be approved.

Common or Sweet Sundangrass

Minimum 76% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 restricted noxious weed seed per pound. Seed less than 74% pure live seed will not be approved.

Rye (grain; all varieties)
Kentucky Bluegrass (all approved varieties)
Hard Fescue (all approved varieties)
Shrub (bicolor) Lespedeza

Minimum 70% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 144 noxious weed seed per pound. Seed less than 70% pure live seed will not be approved.

Centipedegrass
Crownvetch
Pensacola Bahiagrass
Creeping Red Fescue
Japanese Millet
Reed Canary Grass
Zoysia

Minimum 70% pure live seed; maximum 1% total weed seed; maximum 2% total other crop seed; maximum 5% inert matter; maximum 144 restricted noxious weed seed per pound.

Barnyard Grass
Big Bluestem
Little Bluestem
Bristly Locust
Birdsfoot Trefoil
Indiangrass
Orchardgrass
Switchgrass
Yellow Blossom Sweet Clover

STANDARD SPECIAL PROVISION

ERRATA

(1-17-12) (Rev. 1-21-14) Z-4

Revise the *2012 Standard Specifications* as follows:

Division 2

Page 2-7, line 31, Article 215-2 Construction Methods, replace "Article 107-26" with "Article 107-25".

Page 2-17, Article 226-3, Measurement and Payment, line 2, delete "pipe culverts,".

Page 2-20, Subarticle 230-4(B), Contractor Furnished Sources, change references as follows: Line 1, replace "(4) Buffer Zone" with "(c) Buffer Zone"; **Line 12,** replace "(5) Evaluation for Potential Wetlands and Endangered Species" with "(d) Evaluation for Potential Wetlands and Endangered Species"; and **Line 33,** replace "(6) Approval" with "(4) Approval".

Division 3

Page 3-1, after line 15, Article 300-2 Materials, replace "1032-9(F)" with "1032-6(F)".

Division 4

Page 4-77, line 27, Subarticle 452-3(C) Concrete Coping, replace "sheet pile" with "reinforcement".

Division 6

Page 6-7, line 31, Article 609-3 Field Verification of Mixture and Job Mix Formula Adjustments, replace "30" with "45".

Page 6-10, line 42, Subarticle 609-6(C)(2), replace "Subarticle 609-6(E)" with "Subarticle 609-6(D)".

Page 6-11, Table 609-1 Control Limits, replace "Max. Spec. Limit" for the Target Source of $P_{0.075}/P_{be}$ Ratio with "1.0".

Page 6-40, Article 650-2 Materials, replace "Subarticle 1012-1(F)" with "Subarticle 1012-1(E)"

Division 8

Page 8-23, line 10, Article 838-2 Materials, replace "Portland Cement Concrete, Class B" with "Portland Cement Concrete, Class A".

Division 12

Page 12-7, Table 1205-3, add "FOR THERMOPLASTIC" to the end of the title.

Page 12-8, Subarticle 1205-5(B), line 13, replace "Table 1205-2" with "Table 1205-4".

Page 12-8, Table 1205-4 and 1205-5, replace "THERMOPLASTIC" in the title of these tables with "POLYUREA".

Page 12-9, Subarticle 1205-6(B), line 21, replace "Table 1205-4" with "Table 1205-6".

Page 12-11, Subarticle 1205-8(C), line 25, replace "Table 1205-5" with "Table 1205-7".

Division 15

Page 15-4, Subarticle 1505-3(F) Backfilling, line 26, replace "Subarticle 235-4(C)" with "Subarticle 235-3(C)".

Page 15-6, Subarticle 1510-3(B), after line 21, replace the allowable leakage formula with the following: $\boldsymbol{W = LD\sqrt{P} \div 148,000}$

Page 15-6, Subarticle 1510-3(B), line 32, delete "may be performed concurrently or" and replace with "shall be performed".

Page 15-17, Subarticle 1540-3(E), line 27, delete "Type 1".

Division 17

Page 17-26, line 42, Subarticle 1731-3(D) Termination and Splicing within Interconnect Center, delete this subarticle.

Revise the *2012 Roadway Standard Drawings* as follows:

1633.01 Sheet 1 of 1, English Standard Drawing for Matting Installation, replace "1633.01" with "1631.01".

STANDARD SPECIAL PROVISION

PLANT AND PEST QUARANTINES
(Imported Fire Ant, Gypsy Moth, Witchweed, And Other Noxious Weeds)

(3-18-03) (Rev. 10-15-13) Z-04a

Within Quarantined Area

This project may be within a county regulated for plant and/or pests. If the project or any part of the Contractor's operations is located within a quarantined area, thoroughly clean all equipment prior to moving out of the quarantined area. Comply with federal/state regulations by obtaining a certificate or limited permit for any regulated article moving from the quarantined area.

Originating in a Quarantined County

Obtain a certificate or limited permit issued by the N.C. Department of Agriculture/United States Department of Agriculture. Have the certificate or limited permit accompany the article when it arrives at the project site.

Contact

Contact the N.C. Department of Agriculture/United States Department of Agriculture at 1-800-206-9333, 919-733-6932, or *http://www.ncagr.gov/plantind/* to determine those specific project sites located in the quarantined area or for any regulated article used on this project originating in a quarantined county.

Regulated Articles Include

1. Soil, sand, gravel, compost, peat, humus, muck, and decomposed manure, separately or with other articles. This includes movement of articles listed above that may be associated with cut/waste, ditch pulling, and shoulder cutting.
2. Plants with roots including grass sod.
3. Plant crowns and roots.
4. Bulbs, corms, rhizomes, and tubers of ornamental plants.
5. Hay, straw, fodder, and plant litter of any kind.
6. Clearing and grubbing debris.
7. Used agricultural cultivating and harvesting equipment.
8. Used earth-moving equipment.
9. Any other products, articles, or means of conveyance, of any character, if determined by an inspector to present a hazard of spreading imported fire ant, gypsy moth, witchweed or other noxious weeds.

STANDARD SPECIAL PROVISION

MINIMUM WAGES

(7-21-09) Z-5

FEDERAL: The Fair Labor Standards Act provides that with certain exceptions every employer shall pay wages at the rate of not less than SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

STATE: The North Carolina Minimum Wage Act provides that every employer shall pay to each of his employees, wages at a rate of not less than SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

The minimum wage paid to all skilled labor employed on this contract shall be SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

The minimum wage paid to all intermediate labor employed on this contract shall be SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

The minimum wage paid to all unskilled labor on this contract shall be SEVEN DOLLARS AND TWENTY FIVE CENTS ($7.25) per hour.

This determination of the intent of the application of this act to the contract on this project is the responsibility of the Contractor.

The Contractor shall have no claim against the Department of Transportation for any changes in the minimum wage laws, Federal or State. It is the responsibility of the Contractor to keep fully informed of all Federal and State Laws affecting his contract.

STANDARD SPECIAL PROVISION

ON-THE-JOB TRAINING

(10-16-07) (Rev. 5-21-13) Z-10

Description

The North Carolina Department of Transportation will administer a custom version of the Federal On-the-Job Training (OJT) Program, commonly referred to as the Alternate OJT Program. All contractors (existing and newcomers) will be automatically placed in the Alternate Program. Standard OJT requirements typically associated with individual projects will no longer be applied at the project level. Instead, these requirements will be applicable on an annual basis for each contractor administered by the OJT Program Manager.

On the Job Training shall meet the requirements of 23 CFR 230.107 (b), 23 USC – Section 140, this provision and the On-the-Job Training Program Manual.

The Alternate OJT Program will allow a contractor to train employees on Federal, State and privately funded projects located in North Carolina. However, priority shall be given to training employees on NCDOT Federal-Aid funded projects.

Minorities and Women

Developing, training and upgrading of minorities and women toward journeyman level status is a primary objective of this special training provision. Accordingly, the Contractor shall make every effort to enroll minority and women as trainees to the extent that such persons are available within a reasonable area of recruitment. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

Assigning Training Goals

The Department, through the OJT Program Manager, will assign training goals for a calendar year based on the contractors' past three years' activity and the contractors' anticipated upcoming year's activity with the Department. At the beginning of each year, all contractors eligible will be contacted by the Department to determine the number of trainees that will be assigned for the upcoming calendar year. At that time the Contractor shall enter into an agreement with the Department to provide a self-imposed on-the-job training program for the calendar year. This agreement will include a specific number of annual training goals agreed to by both parties. The number of training assignments may range from 1 to 15 per contractor per calendar year. The Contractor shall sign an agreement to fulfill their annual goal for the year. A sample agreement is available at www.ncbowd.com/section/on-the-job-training.

Training Classifications

The Contractor shall provide on-the-job training aimed at developing full journeyman level workers in the construction craft/operator positions. Preference shall be given to providing training in the following skilled work classifications:

Equipment Operators	Office Engineers
Truck Drivers	Estimators
Carpenters	Iron / Reinforcing Steel Workers
Concrete Finishers	Mechanics
Pipe Layers	Welders

The Department has established common training classifications and their respective training requirements that may be used by the contractors. However, the classifications established are not all-inclusive. Where the training is oriented toward construction applications, training will be allowed in lower-level management positions such as office engineers and estimators. Contractors shall submit new classifications for specific job functions that their employees are performing. The Department will review and recommend for acceptance to FHWA the new classifications proposed by contractors, if applicable. New classifications shall meet the following requirements:

Proposed training classifications are reasonable and realistic based on the job skill classification needs, and

The number of training hours specified in the training classification is consistent with common practices and provides enough time for the trainee to obtain journeyman level status.

The Contractor may allow trainees to be trained by a subcontractor provided that the Contractor retains primary responsibility for meeting the training and this provision is made applicable to the subcontract. However, only the Contractor will receive credit towards the annual goal for the trainee.

Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment.

No employee shall be employed as a trainee in any classification in which they have successfully completed a training course leading to journeyman level status or in which they have been employed as a journeyman.

Records and Reports

The Contractor shall maintain enrollment, monthly and completion reports documenting company compliance under these contract documents. These documents and any other information as requested shall be submitted to the OJT Program Manager.

Upon completion and graduation of the program, the Contractor shall provide each trainee with a certification Certificate showing the type and length of training satisfactorily completed.

Trainee Interviews

All trainees enrolled in the program will receive an initial and Trainee/Post graduate interview conducted by the OJT program staff.

Trainee Wages

Contractors shall compensate trainees on a graduating pay scale based upon a percentage of the prevailing minimum journeyman wages (Davis-Bacon Act). Minimum pay shall be as follows:

60 percent	of the journeyman wage for the first half of the training period
75 percent	of the journeyman wage for the third quarter of the training period
90 percent	of the journeyman wage for the last quarter of the training period

In no instance shall a trainee be paid less than the local minimum wage. The Contractor shall adhere to the minimum hourly wage rate that will satisfy both the NC Department of Labor (NCDOL) and the Department.

Achieving or Failing to Meet Training Goals

The Contractor will be credited for each trainee employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and who receives training for at least 50 percent of the specific program requirement. Trainees will be allowed to be transferred between projects if required by the Contractor's scheduled workload to meet training goals.

If a contractor fails to attain their training assignments for the calendar year, they may be taken off the NCDOT's Bidders List.

Measurement and Payment

No compensation will be made for providing required training in accordance with these contract documents.

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
			ROADWAY ITEMS			
0001	0000100000-N	800	MOBILIZATION	Lump Sum	L.S.	
0002	0000400000-N	801	CONSTRUCTION SURVEYING	Lump Sum	L.S.	
0003	0001000000-E	200	CLEARING & GRUBBING .. ACRE(S)	Lump Sum	L.S.	
0004	0008000000-E	200	SUPPLEMENTARY CLEARING & GRUB-BING	5.25 ACR		
0005	0015000000-N	205	SEALING ABANDONED WELLS	5 EA		
0006	0022000000-E	225	UNCLASSIFIED EXCAVATION	1,279,300 CY		
0007	0029000000-N	SP	REINFORCED BRIDGE APPROACH FILL, STATION ********** (129+37.56 -L- LT)	Lump Sum	L.S.	
0008	0029000000-N	SP	REINFORCED BRIDGE APPROACH FILL, STATION ********** (129+37.56 -L- RT)	Lump Sum	L.S.	
0009	0029000000-N	SP	REINFORCED BRIDGE APPROACH FILL, STATION ********** (14+99.25 -L- LT)	Lump Sum	L.S.	
0010	0029000000-N	SP	REINFORCED BRIDGE APPROACH FILL, STATION ********** (144+60.63 -L- RT)	Lump Sum	L.S.	
0011	0029000000-N	SP	REINFORCED BRIDGE APPROACH FILL, STATION ********** (144+90.00 -L- LT)	Lump Sum	L.S.	
0012	0029000000-N	SP	REINFORCED BRIDGE APPROACH FILL, STATION ********** (21+69.08-Y11- CL)	Lump Sum	L.S.	
0013	0029000000-N	SP	REINFORCED BRIDGE APPROACH FILL, STATION ********** (24+56.70 -Y4- CL)	Lump Sum	L.S.	
0014	0029000000-N	SP	REINFORCED BRIDGE APPROACH FILL, STATION ********** (26+17.64 -Y22- LT)	Lump Sum	L.S.	
0015	0029000000-N	SP	REINFORCED BRIDGE APPROACH FILL, STATION ********** (26+17.64 -Y22- RT)	Lump Sum	L.S.	

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0016	0029000000-N	SP	REINFORCED BRIDGE APPROACH FILL, STATION ********** (26+21.65 -L- LT)	Lump Sum	L.S.	
0017	0029000000-N	SP	REINFORCED BRIDGE APPROACH FILL, STATION ********** (26+21.65 -L- RT)	Lump Sum	L.S.	
0018	0036000000-E	225	UNDERCUT EXCAVATION	15,000 CY		
0019	0106000000-E	230	BORROW EXCAVATION	2,188,200 CY		
0020	0127000000-N	SP	EMBANKMENT SETTLEMENT GAUGES	2 EA		
0021	0134000000-E	240	DRAINAGE DITCH EXCAVATION	24,195 CY		
0022	0141000000-E	240	BERM DITCH CONSTRUCTION	2,570 LF		
0023	0156000000-E	250	REMOVAL OF EXISTING ASPHALT PAVEMENT	47,700 SY		
0024	0163000000-E	250	REMOVAL OF EXISTING CONCRETE PAVEMENT	12,350 SY		
0025	0177000000-E	250	BREAKING OF EXISTING ASPHALT PAVEMENT	5,300 SY		
0026	0185000000-E	250	BREAKING OF EXISTING CONCRETE PAVEMENT	600 SY		
0027	0192000000-N	260	PROOF ROLLING	55 HR		
0028	0195000000-E	265	SELECT GRANULAR MATERIAL	17,000 CY		
0029	0196000000-E	270	GEOTEXTILE FOR SOIL STABILIZA-TION	36,300 SY		
0030	0199000000-E	SP	TEMPORARY SHORING	254 SF		
0031	0220000000-E	SP	ROCK EMBANKMENTS	280 TON		
0032	0222000000-E	SP	GEOTEXTILE FOR ROCK EMBANK-MENTS	160 SY		
0033	0223000000-E	275	ROCK PLATING	230 SY		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0034	0255000000-E	SP	GENERIC GRADING ITEM HAULING AND DISPOSAL OF PETROLEUM CONTAMINATED SOIL	175 TON		
0035	0318000000-E	300	FOUNDATION CONDITIONING MATERIAL, MINOR STRUCTURES	5,912 TON		
0036	0320000000-E	300	FOUNDATION CONDITIONING GEOTEXTILE	18,407 SY		
0037	0342000000-E	310	**" SIDE DRAIN PIPE (30")	484 LF		
0038	0342000000-E	310	**" SIDE DRAIN PIPE (36")	304 LF		
0039	0342000000-E	310	**" SIDE DRAIN PIPE (42")	48 LF		
0040	0343000000-E	310	15" SIDE DRAIN PIPE	13,484 LF		
0041	0344000000-E	310	18" SIDE DRAIN PIPE	2,440 LF		
0042	0345000000-E	310	24" SIDE DRAIN PIPE	3,696 LF		
0043	0348000000-E	310	**" SIDE DRAIN PIPE ELBOWS (15")	119 EA		
0044	0348000000-E	310	**" SIDE DRAIN PIPE ELBOWS (18")	6 EA		
0045	0348000000-E	310	**" SIDE DRAIN PIPE ELBOWS (24")	4 EA		
0046	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (18", V)	200 LF		
0047	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (30", V)	356 LF		
0048	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (48", V)	272 LF		
0049	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (60", V)	320 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0050	0354000000-E	310	***" RC PIPE CULVERTS, CLASS ***** (66", V)	652 LF		
0051	0360000000-E	310	12" RC PIPE CULVERTS, CLASS III	76 LF		
0052	0366000000-E	310	15" RC PIPE CULVERTS, CLASS III	3,280 LF		
0053	0372000000-E	310	18" RC PIPE CULVERTS, CLASS III	3,124 LF		
0054	0378000000-E	310	24" RC PIPE CULVERTS, CLASS III	1,984 LF		
0055	0384000000-E	310	30" RC PIPE CULVERTS, CLASS III	264 LF		
0056	0390000000-E	310	36" RC PIPE CULVERTS, CLASS III	712 LF		
0057	0396000000-E	310	42" RC PIPE CULVERTS, CLASS III	196 LF		
0058	0402000000-E	310	48" RC PIPE CULVERTS, CLASS III	220 LF		
0059	0408000000-E	310	54" RC PIPE CULVERTS, CLASS III	232 LF		
0060	0420000000-E	310	66" RC PIPE CULVERTS, CLASS III	388 LF		
0061	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (48")	136 LF		
0062	0448000000-E	310	****" RC PIPE CULVERTS, CLASS IV (60")	260 LF		
0063	0448200000-E	310	15" RC PIPE CULVERTS, CLASS IV	9,164 LF		
0064	0448300000-E	310	18" RC PIPE CULVERTS, CLASS IV	1,828 LF		
0065	0448400000-E	310	24" RC PIPE CULVERTS, CLASS IV	1,044 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0066	0448500000-E	310	30" RC PIPE CULVERTS, CLASS IV	484 LF		
0067	0448600000-E	310	36" RC PIPE CULVERTS, CLASS IV	292 LF		
0068	0448700000-E	310	42" RC PIPE CULVERTS, CLASS IV	248 LF		
0069	0570000000-E	310	6" CS PIPE CULVERTS, 0.064" THICK (SPRING BOX)	8 LF		
0070	0973100000-E	330	**" WELDED STEEL PIPE, ****" THICK, GRADE B IN SOIL (18", 0.250")	80 LF		
0071	0995000000-E	340	PIPE REMOVAL	5,720 LF		
0072	1011000000-N	500	FINE GRADING	Lump Sum	L.S.	
0073	1044000000-E	501	LIME TREATED SOIL (SLURRY METHOD)	111,600 SY		
0074	1066000000-E	501	LIME FOR LIME TREATED SOIL	1,120 TON		
0075	1077000000-E	SP	#57 STONE	780 TON		
0076	1110000000-E	510	STABILIZER AGGREGATE	500 TON		
0077	1115000000-E	SP	GEOTEXTILE FOR PAVEMENT STA-BILIZATION	110,341 SY		
0078	1121000000-E	520	AGGREGATE BASE COURSE	95,000 TON		
0079	1176000000-E	542	SOIL CEMENT BASE	111,600 SY		
0080	1187000000-E	542	PORTLAND CEMENT FOR SOIL CE-MENT BASE	3,070 TON		
0081	1209000000-E	543	ASPHALT CURING SEAL	33,480 GAL		
0082	1220000000-E	545	INCIDENTAL STONE BASE	5,110 TON		
0083	1275000000-E	600	PRIME COAT	24,000 GAL		
0084	1308000000-E	607	MILLING ASPHALT PAVEMENT, ***" TO ******" (0" TO 1-1/2")	3,030 SY		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0085	1330000000-E	607	INCIDENTAL MILLING	7,900 SY		
0086	1489000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0B	9,600 TON		
0087	1491000000-E	610	ASPHALT CONC BASE COURSE, TYPE B25.0C	32,300 TON		
0088	1498000000-E	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0B	12,200 TON		
0089	1503000000-E	610	ASPHALT CONC INTERMEDIATE COURSE, TYPE I19.0C	17,800 TON		
0090	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	17,300 TON		
0091	1523000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5C	26,500 TON		
0092	1525000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE SF9.5A	16,000 TON		
0093	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	7,410 TON		
0094	1682000000-E	652	PERMEABLE ASPHALT DRAINAGE COURSE, TYPE P-57	18,000 TON		
0095	1693000000-E	654	ASPHALT PLANT MIX, PAVEMENT REPAIR	100 TON		
0096	1840000000-E	665	MILLED RUMBLE STRIPS (ASPHALT CONCRETE)	45,000 LF		
0097	1847000000-E	710	******" PORT CEM CONC PAVEMENT, THROUGH LANES (WITH DOWELS) (10")	137,500 SY		
0098	1881000000-E	SP	GENERIC PAVING ITEM MILLED RUMBLE STRIPS (CONCRETE SHOULDER)	83,000 LF		
0099	1891000000-E	SP	GENERIC PAVING ITEM DIAMOND GRINDING PCC PAVEMENT	131,000 SY		
0100	1892000000-E	710	GENERIC PAVING ITEM VARIABLE DEPTH CONCRETE SHOUL-DER ADJA-CENT TO 10" PAVEMENT - MIN 7" THICKNESS	50,700 SY		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0101	1902000000-N	710	SURFACE TESTING CONCRETE PAVEMENT	Lump Sum	L.S.	
0102	1913000000-E	720	CONCRETE SHOULDERS ADJACENT TO ******" PAVEMENT (10")	22,400 SY		
0103	1924000000-N	725	FIELD LABORATORY RENTAL, PORT CEM CONC PAVEMENT	Lump Sum	L.S.	
0104	2000000000-N	806	RIGHT OF WAY MARKERS	400 EA		
0105	2022000000-E	815	SUBDRAIN EXCAVATION	17,500 CY		
0106	2033000000-E	815	SUBDRAIN FINE AGGREGATE	8,800 CY		
0107	2044000000-E	815	6" PERFORATED SUBDRAIN PIPE	52,000 LF		
0108	2070000000-N	815	SUBDRAIN PIPE OUTLET	104 EA		
0109	2077000000-E	815	6" OUTLET PIPE	624 LF		
0110	2099000000-E	816	SHOULDER DRAIN	42,700 LF		
0111	2110000000-E	816	4" SHOULDER DRAIN PIPE	42,700 LF		
0112	2121000000-E	816	4" OUTLET PIPE FOR SHOULDER DRAINS	2,390 LF		
0113	2132000000-N	816	CONCRETE PAD FOR SHOULDER DRAIN PIPE OUTLET	50 EA		
0114	2143000000-E	818	BLOTTING SAND	20 TON		
0115	2190000000-N	828	TEMPORARY STEEL PLATE COVERS FOR MASONRY DRAINAGE STRUCTURE	2 EA		
0116	2209000000-E	838	ENDWALLS	51 CY		
0117	2220000000-E	838	REINFORCED ENDWALLS	42 CY		
0118	2253000000-E	840	PIPE COLLARS	10 CY		
0119	2264000000-E	840	PIPE PLUGS	2 CY		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0120	2275000000-E	SP	FLOWABLE FILL	10 CY		
0121	2286000000-N	840	MASONRY DRAINAGE STRUCTURES	338 EA		
0122	2297000000-E	840	MASONRY DRAINAGE STRUCTURES	9 CY		
0123	2308000000-E	840	MASONRY DRAINAGE STRUCTURES	30 LF		
0124	2364000000-N	840	FRAME WITH TWO GRATES, STD 840.16	12 EA		
0125	2364200000-N	840	FRAME WITH TWO GRATES, STD 840.20	93 EA		
0126	2365000000-N	840	FRAME WITH TWO GRATES, STD 840.22	154 EA		
0127	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (E)	8 EA		
0128	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (F)	20 EA		
0129	2374000000-N	840	FRAME WITH GRATE & HOOD, STD 840.03, TYPE ** (G)	26 EA		
0130	2396000000-N	840	FRAME WITH COVER, STD 840.54	15 EA		
0131	2407000000-N	840	STEEL FRAME WITH TWO GRATES, STD 840.37	5 EA		
0132	2451000000-N	852	CONCRETE TRANSITIONAL SECTION FOR DROP INLET	13 EA		
0133	2542000000-E	846	1'-6" CONCRETE CURB & GUTTER	3,700 LF		
0134	2549000000-E	846	2'-6" CONCRETE CURB & GUTTER	10,400 LF		
0135	2556000000-E	846	SHOULDER BERM GUTTER	23,000 LF		
0136	2570000000-N	SP	MODIFIED CONCRETE FLUME	1 EA		
0137	2591000000-E	848	4" CONCRETE SIDEWALK	2,500 SY		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0138	2605000000-N	848	CONCRETE CURB RAMP	13 EA		
0139	2612000000-E	848	6" CONCRETE DRIVEWAY	700 SY		
0140	2619000000-E	850	4" CONCRETE PAVED DITCH	125 SY		
0141	2655000000-E	852	5" MONOLITHIC CONCRETE ISLANDS (KEYED IN)	2,100 SY		
0142	2724000000-E	857	PRECAST REINFORCED CONCRETE BARRIER, SINGLE FACED	1,000 LF		
0143	2815000000-N	858	ADJUSTMENT OF DROP INLETS	6 EA		
0144	2830000000-N	858	ADJUSTMENT OF MANHOLES	6 EA		
0145	2845000000-N	858	ADJUSTMENT OF METER BOXES OR VALVE BOXES	4 EA		
0146	2905000000-N	859	CONVERT EXISTING DROP INLET TO JUNCTION BOX	1 EA		
0147	3000000000-N	SP	IMPACT ATTENUATOR UNIT, TYPE 350	18 EA		
0148	3030000000-E	862	STEEL BM GUARDRAIL	57,500 LF		
0149	3045000000-E	862	STEEL BM GUARDRAIL, SHOP CURVED	175 LF		
0150	3105000000-N	862	STEEL BM GUARDRAIL TERMINAL SECTIONS	8 EA		
0151	3150000000-N	862	ADDITIONAL GUARDRAIL POSTS	50 EA		
0152	3210000000-N	862	GUARDRAIL ANCHOR UNITS, TYPE CAT-1	46 EA		
0153	3215000000-N	862	GUARDRAIL ANCHOR UNITS, TYPE III	6 EA		
0154	3270000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE 350	100 EA		
0155	3285000000-N	SP	GUARDRAIL ANCHOR UNITS, TYPE M-350	23 EA		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0156	3317000000-N	862	GUARDRAIL ANCHOR UNITS, TYPE B-77	53 EA		
0157	3345000000-E	864	REMOVE & RESET EXISTING GUARD-RAIL	100 LF		
0158	3360000000-E	863	REMOVE EXISTING GUARDRAIL	3,695 LF		
0159	3380000000-E	862	TEMPORARY STEEL BM GUARDRAIL	1,875 LF		
0160	3387000000-N	862	TEMPORARY GUARDRAIL ANCHOR UNITS, TYPE ********** (B-77)	4 EA		
0161	3387000000-N	862	TEMPORARY GUARDRAIL ANCHOR UNITS, TYPE ********** (CAT-1)	1 EA		
0162	3389000000-N	SP	TEMPORARY GUARDRAIL ANCHOR UNITS, TYPE ********** (M-350)	1 EA		
0163	3389100000-N	SP	TEMPORARY GUARDRAIL ANCHOR UNITS, TYPE 350	2 EA		
0164	3389200000-E	865	CABLE GUIDERAIL	18,100 LF		
0165	3389500000-N	865	ADDITIONAL GUIDERAIL POSTS	30 EA		
0166	3389600000-N	865	CABLE GUIDERAIL ANCHOR UNITS	36 EA		
0167	3435000000-N	SP	GENERIC GUARDRAIL ITEM TEMP IMPACT ATTENUATOR UNIT, TYPE 350	2 EA		
0168	3436000000-N	862	GENERIC GUARDRAIL ITEM TEMPORARY ADDITIONAL GUARDRAIL POSTS	10 EA		
0169	3503000000-E	866	WOVEN WIRE FENCE, 47" FABRIC	68,300 LF		
0170	3509000000-E	866	4" TIMBER FENCE POSTS, 7'-6" LONG	4,410 EA		
0171	3515000000-E	866	5" TIMBER FENCE POSTS, 8'-0" LONG	1,110 EA		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0172	3533000000-E	866	CHAIN LINK FENCE, **" FABRIC (72")	700 LF		
0173	3539000000-E	866	METAL LINE POSTS FOR **" CHAIN LINK FENCE (72')	60 EA		
0174	3545000000-E	866	METAL TERMINAL POSTS FOR **" CHAIN LINK FENCE (72')	4 EA		
0175	3557000000-E	866	ADDITIONAL BARBED WIRE	1,000 LF		
0176	3564000000-E	866	SINGLE GATES, **" HIGH, **' WIDE, **' OPENING (47", 12', 12')	2 EA		
0177	3565000000-E	866	DOUBLE GATES, **" HIGH, **' WIDE, **' OPENING (47", 10', 20')	1 EA		
0178	3566000000-E	867	WOVEN WIRE FENCE RESET	640 LF		
0179	3569000000-E	867	BARBED WIRE FENCE RESET	830 LF		
0180	3572000000-E	867	CHAIN LINK FENCE RESET	400 LF		
0181	3628000000-E	876	RIP RAP, CLASS I	740 TON		
0182	3642000000-E	876	RIP RAP, CLASS A	60 TON		
0183	3649000000-E	876	RIP RAP, CLASS B	3,197 TON		
0184	3651000000-E	SP	BOULDERS	975 TON		
0185	3656000000-E	876	GEOTEXTILE FOR DRAINAGE	50,861 SY		
0186	3659000000-N	SP	PREFORMED SCOUR HOLES WITH LEVEL SPREADER APRON	15 EA		
0187	4048000000-E	902	REINFORCED CONCRETE SIGN FOUN-DATIONS	43 CY		
0188	4057000000-E	SP	OVERHEAD FOOTING	642 CY		
0189	4060000000-E	903	SUPPORTS, BREAKAWAY STEEL BEAM	27,630 LB		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0190	4066000000-E	903	SUPPORTS, SIMPLE STEEL BEAM	2,459 LB		
0191	4072000000-E	903	SUPPORTS, 3-LB STEEL U-CHANNEL	7,484 LF		
0192	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (100+00 -Y13-)	Lump Sum	L.S.	
0193	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (123+00 -L-)	Lump Sum	L.S.	
0194	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (127+50 -Y13-)	Lump Sum	L.S.	
0195	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (135+50 -L-)	Lump Sum	L.S.	
0196	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (187+50 -L-)	Lump Sum	L.S.	
0197	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (241+60 -L-)	Lump Sum	L.S.	
0198	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (251+50 -L-)	Lump Sum	L.S.	
0199	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (28+00 -L-)	Lump Sum	L.S.	
0200	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (29+00 -I13CD-)	Lump Sum	L.S.	
0201	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (30+00 -Y13RPC-)	Lump Sum	L.S.	
0202	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (36+50 -Y13-)	Lump Sum	L.S.	
0203	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (39+00 -L-)	Lump Sum	L.S.	

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0204	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (47+00 -L-)	Lump Sum	L.S.	
0205	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (48+50 -Y13-)	Lump Sum	L.S.	
0206	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (65+00 -Y13-)	Lump Sum	L.S.	
0207	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (69+00 -L-)	Lump Sum	L.S.	
0208	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (77+50 -Y13-)	Lump Sum	L.S.	
0209	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (8+00 -Y13-)	Lump Sum	L.S.	
0210	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (90+75 -Y13-)	Lump Sum	L.S.	
0211	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (94+25 -L-)	Lump Sum	L.S.	
0212	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (A AT 75' WEST OF EXISTING STRUCTURE)	Lump Sum	L.S.	
0213	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (AC AT 50' WEST OF EXISTING STRUCTURE)	Lump Sum	L.S.	
0214	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (AD AT 500' SOUTH OF EXISTING OVERHEAD ASSEMBLY 'PP')	Lump Sum	L.S.	
0215	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (B ON RAMP TO I-85 SB & I-785 NB)	Lump Sum	L.S.	

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0216	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (C AT 50' EAST OF EXISTING STRUCTURE)	Lump Sum	L.S.	
0217	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (D AT 50' EAST OF EXISTING STRUCTURE)	Lump Sum	L.S.	
0218	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (E AT 100' EAST OF EXISTING STRUCTURE)	Lump Sum	L.S.	
0219	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (F AT 400' WEST OF EXISTING STRUCTURE)	Lump Sum	L.S.	
0220	4082100000-N	SP	SUPPORTS, OVERHEAD SIGN STRUCTURE AT STA ****** (G AT 100' WEST OF EXISTING STRUCTURE)	Lump Sum	L.S.	
0221	4096000000-N	904	SIGN ERECTION, TYPE D	30 EA		
0222	4102000000-N	904	SIGN ERECTION, TYPE E	277 EA		
0223	4108000000-N	904	SIGN ERECTION, TYPE F	34 EA		
0224	4109000000-N	904	SIGN ERECTION, TYPE *** (OVERHEAD) (A)	28 EA		
0225	4109000000-N	904	SIGN ERECTION, TYPE *** (OVERHEAD) (B)	19 EA		
0226	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (A)	29 EA		
0227	4110000000-N	904	SIGN ERECTION, TYPE *** (GROUND MOUNTED) (B)	13 EA		
0228	4114000000-N	904	SIGN ERECTION, MILEMARKERS	36 EA		
0229	4149000000-N	907	DISPOSAL OF SIGN SYSTEM, OVERHEAD	7 EA		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0230	4152000000-N	907	DISPOSAL OF SIGN SYSTEM, STEEL BEAM	3 EA		
0231	4155000000-N	907	DISPOSAL OF SIGN SYSTEM, U-CHANNEL	106 EA		
0232	4234000000-N	907	DISPOSAL OF SIGN, A OR B (OVERHEAD)	47 EA		
0233	4236000000-N	907	DISPOSAL OF SIGN, A, B OR C (GROUND MOUNTED)	1 EA		
0234	4238000000-N	907	DISPOSAL OF SIGN, D, E OR F	5 EA		
0235	4251000000-N	907	DISPOSAL OF LIGHTING SYSTEM	18 EA		
0236	4263000000-N	907	DISPOSAL OF WALKWAY	18 EA		
0237	4400000000-E	1110	WORK ZONE SIGNS (STATIONARY)	5,773 SF		
0238	4405000000-E	1110	WORK ZONE SIGNS (PORTABLE)	2,982 SF		
0239	4410000000-E	1110	WORK ZONE SIGNS (BARRICADE MOUNTED)	1,531 SF		
0240	4415000000-N	1115	FLASHING ARROW BOARD	10 EA		
0241	4420000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN	8 EA		
0242	4422000000-N	1120	PORTABLE CHANGEABLE MESSAGE SIGN (SHORT TERM)	32 DAY		
0243	4430000000-N	1130	DRUMS	926 EA		
0244	4435000000-N	1135	CONES	298 EA		
0245	4445000000-E	1145	BARRICADES (TYPE III)	2,389 LF		
0246	4455000000-N	1150	FLAGGER	256 DAY		
0247	4465000000-N	1160	TEMPORARY CRASH CUSHIONS	10 EA		
0248	4470000000-N	1160	RESET TEMPORARY CRASH CUSHION	6 EA		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0249	4480000000-N	1165	TMA	14 EA		
0250	4485000000-E	1170	PORTABLE CONCRETE BARRIER	3,190 LF		
0251	4490000000-E	1170	PORTABLE CONCRETE BARRIER (ANCHORED)	5,565 LF		
0252	4500000000-E	1170	RESET PORTABLE CONCRETE BARRIER	4,500 LF		
0253	4510000000-N	SP	LAW ENFORCEMENT	240 HR		
0254	4516000000-N	1180	SKINNY DRUM	385 EA		
0255	4650000000-N	1251	TEMPORARY RAISED PAVEMENT MARKERS	1,289 EA		
0256	4685000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (4", 90 MILS)	56,688 LF		
0257	4686000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (4", 120 MILS)	53,535 LF		
0258	4688000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (6", 90 MILS)	79,984 LF		
0259	4690000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (6", 120 MILS)	11,812 LF		
0260	4695000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (8", 90 MILS)	1,987 LF		
0261	4697000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (8", 120 MILS)	982 LF		
0262	4700000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (12", 90 MILS)	12,941 LF		
0263	4710000000-E	1205	THERMOPLASTIC PAVEMENT MARKING LINES (24", 120 MILS)	1,059 LF		
0264	4721000000-E	1205	THERMOPLASTIC PAVEMENT MARKING CHARACTER (120 MILS)	4 EA		
0265	4725000000-E	1205	THERMOPLASTIC PAVEMENT MARKING SYMBOL (90 MILS)	120 EA		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0266	4770000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (4") (II)	4,405 LF		
0267	4780000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (8") (II)	112 LF		
0268	4785000000-E	1205	COLD APPLIED PLASTIC PAVEMENT MARKING LINES, TYPE ** (12") (II)	737 LF		
0269	4800000000-N	1205	COLD APPLIED PLASTIC PAVEMENT MARKING CHARACTER, TYPE ** (II)	4 EA		
0270	4805000000-N	1205	COLD APPLIED PLASTIC PAVEMENT MARKING SYMBOL, TYPE ** (II)	15 EA		
0271	4810000000-E	1205	PAINT PAVEMENT MARKING LINES (4")	482,552 LF		
0272	4820000000-E	1205	PAINT PAVEMENT MARKING LINES (8")	32,852 LF		
0273	4835000000-E	1205	PAINT PAVEMENT MARKING LINES (24")	1,277 LF		
0274	4845000000-N	1205	PAINT PAVEMENT MARKING SYMBOL	174 EA		
0275	4847100000-E	1205	POLYUREA PAVEMENT MARKING LINES (6", **********) (HIGHLY REFLECTIVE ELEMENTS)	109,493 LF		
0276	4847120000-E	1205	POLYUREA PAVEMENT MARKING LINES (12", **********) (HIGHLY REFLECTIVE ELEMENTS)	5,510 LF		
0277	4850000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (4")	35,649 LF		
0278	4860000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (8")	1,438 LF		
0279	4870000000-E	1205	REMOVAL OF PAVEMENT MARKING LINES (24")	59 LF		
0280	4875000000-N	1205	REMOVAL OF PAVEMENT MARKING SYMBOLS & CHARACTERS	15 EA		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0281	4890000000-E	SP	GENERIC PAVEMENT MARKING ITEM TEMPORARY RUMBLE STRIPS	6,828 LF		
0282	4900000000-N	1251	PERMANENT RAISED PAVEMENT MARKERS	45 EA		
0283	4905000000-N	1253	SNOWPLOWABLE PAVEMENT MARKERS	2,804 EA		
0284	4955000000-N	1264	OBJECT MARKERS (END OF ROAD)	21 EA		
0285	5005000000-E	1401	80' HIGH MOUNT STANDARD	1 EA		
0286	5015000000-E	1401	120' HIGH MOUNT STANDARD	1 EA		
0287	5020000000-N	1401	PORTABLE DRIVE UNIT	1 EA		
0288	5025000000-E	SP	HIGH MOUNT FOUNDATIONS	28 CY		
0289	5030000000-N	1403	HIGH MOUNT LUMINAIRES ******** (400W HPS)	8 EA		
0290	5030000000-N	1403	HIGH MOUNT LUMINAIRES ******** (750W HPS)	8 EA		
0291	5070000000-N	1405	STANDARD FOUNDATION ********* (TYPE R1)	6 EA		
0292	5070000000-N	1405	STANDARD FOUNDATION ********* (TYPE R2)	2 EA		
0293	5120000000-N	1407	ELECTRIC SERVICE POLE **** ******** (30' CLASS 4)	1 EA		
0294	5125000000-E	1407	ELECTRIC SERVICE LATERAL ********** (3 #1/0 USE)	100 LF		
0295	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (2")	200 LF		
0296	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (3")	370 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0297	5155000000-E	1409	ELECTRICAL DUCT, TYPE BD, SIZE ***** (6")	110 LF		
0298	5160000000-E	1409	ELECTRICAL DUCT, TYPE JA, SIZE ***** (4")	180 LF		
0299	5175000000-E	1410	** #6 W/G FEEDER CIRCUIT (2")	170 LF		
0300	5180000000-E	1410	** #4 W/G FEEDER CIRCUIT (2")	560 LF		
0301	5185000000-E	1410	** #2 W/G FEEDER CIRCUIT (2")	390 LF		
0302	5205000000-E	1410	** #8 W/G FEEDER CIRCUIT IN *****" CONDUIT (2, 1.5)	190 LF		
0303	5210000000-E	1410	** #6 W/G FEEDER CIRCUIT IN *****" CONDUIT (2, 1.5)	520 LF		
0304	5215000000-E	1410	** #4 W/G FEEDER CIRCUIT IN *****" CONDUIT (2, 1.5)	3,710 LF		
0305	5220000000-E	1410	** #2 W/G FEEDER CIRCUIT IN *****" CONDUIT (2, 1.5)	2,600 LF		
0306	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (PC18)	16 EA		
0307	5240000000-N	1411	ELECTRICAL JUNCTION BOXES ********** (PC30)	3 EA		
0308	5255000000-N	1413	PORTABLE LIGHTING	Lump Sum	L.S.	
0309	5270000000-N	SP	GENERIC LIGHTING ITEM RELOCATE CONTROL SYSTEM	1 EA		
0310	5270000000-N	SP	GENERIC LIGHTING ITEM RELOCATE HIGH MOUNT STANDARD	2 EA		
0311	5270000000-N	SP	GENERIC LIGHTING ITEM RELOCATE LIGHT STANDARD	8 EA		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0312	5270000000-N	SP	GENERIC LIGHTING ITEM REMOVE LIGHT STANDARD	14 EA		
0313	5270000000-N	SP	GENERIC LIGHTING ITEM REPLACE LUMINAIRE (HIGH MAST)	8 EA		
0314	5270000000-N	SP	GENERIC LIGHTING ITEM REPLACE LUMINAIRE (SINGLE ARM)	8 EA		
0315	5325600000-E	1510	6" WATER LINE	165 LF		
0316	5325800000-E	1510	8" WATER LINE	2,899 LF		
0317	5326200000-E	1510	12" WATER LINE	3,803 LF		
0318	5326600000-E	1510	16" WATER LINE	4,504 LF		
0319	5328000000-E	1510	30" WATER LINE	3,957 LF		
0320	5540000000-E	1515	6" VALVE	9 EA		
0321	5546000000-E	1515	8" VALVE	2 EA		
0322	5552000000-E	1515	10" VALVE	1 EA		
0323	5558000000-E	1515	12" VALVE	6 EA		
0324	5558600000-E	1515	16" VALVE	5 EA		
0325	5560000000-E	1515	30" VALVE	6 EA		
0326	5589200000-E	1515	2" AIR RELEASE VALVE	1 EA		
0327	5606600000-E	1515	6" BLOW OFF	2 EA		
0328	5666000000-E	1515	FIRE HYDRANT	9 EA		
0329	5672000000-N	1515	RELOCATE FIRE HYDRANT	4 EA		
0330	5691400000-E	1520	10" SANITARY GRAVITY SEWER	330 LF		
0331	5691700000-E	1520	18" SANITARY GRAVITY SEWER	435 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0332	5709000000-E	1520	**" FORCE MAIN SEWER (30")	949 LF		
0333	5709000000-E	1520	**" FORCE MAIN SEWER (54")	236 LF		
0334	5776000000-E	1525	5' DIA UTILITY MANHOLE	4 EA		
0335	5782000000-E	1525	UTILITY MANHOLE WALL, 5' DIA	15 LF		
0336	5802000000-E	1530	ABANDON 10" UTILITY PIPE	175 LF		
0337	5804000000-E	1530	ABANDON 12" UTILITY PIPE	873 LF		
0338	5811000000-E	1530	ABANDON 18" UTILITY PIPE	430 LF		
0339	5814000000-E	1530	ABANDON 30" UTILITY PIPE	2,295 LF		
0340	5815500000-N	1530	REMOVE FIRE HYDRANT	1 EA		
0341	5816000000-N	1530	ABANDON UTILITY MANHOLE	2 EA		
0342	5835000000-E	1540	**" ENCASEMENT PIPE (48")	599 LF		
0343	5835000000-E	1540	**" ENCASEMENT PIPE (60")	230 LF		
0344	5835000000-E	1540	**" ENCASEMENT PIPE (72")	94 LF		
0345	5836000000-E	1540	24" ENCASEMENT PIPE	4,458 LF		
0346	5836200000-E	1540	30" ENCASEMENT PIPE	1,370 LF		
0347	5836400000-E	1540	36" ENCASEMENT PIPE	353 LF		
0348	5871000000-E	1550	TRENCHLESS INSTALLATION OF **" IN SOIL (48")	75 LF		
0349	5871010000-E	1550	TRENCHLESS INSTALLATION OF **" NOT IN SOIL (48")	75 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0350	5872200000-E	1550	TRENCHLESS INSTALLATION OF 24" IN SOIL	1,293 LF		
0351	5872210000-E	1550	TRENCHLESS INSTALLATION OF 24" NOT IN SOIL	1,292 LF		
0352	5872300000-E	1550	TRENCHLESS INSTALLATION OF 30" IN SOIL	425 LF		
0353	5872310000-E	1550	TRENCHLESS INSTALLATION OF 30" NOT IN SOIL	425 LF		
0354	5872400000-E	1550	TRENCHLESS INSTALLATION OF 36" IN SOIL	176.5 LF		
0355	5872410000-E	1550	TRENCHLESS INSTALLATION OF 36" NOT IN SOIL	176.5 LF		
0356	6000000000-E	1605	TEMPORARY SILT FENCE	148,000 LF		
0357	6006000000-E	1610	STONE FOR EROSION CONTROL, CLASS A	6,460 TON		
0358	6009000000-E	1610	STONE FOR EROSION CONTROL, CLASS B	63,380 TON		
0359	6012000000-E	1610	SEDIMENT CONTROL STONE	57,265 TON		
0360	6015000000-E	1615	TEMPORARY MULCHING	700 ACR		
0361	6018000000-E	1620	SEED FOR TEMPORARY SEEDING	18,550 LB		
0362	6021000000-E	1620	FERTILIZER FOR TEMPORARY SEED-ING	76.5 TON		
0363	6024000000-E	1622	TEMPORARY SLOPE DRAINS	24,000 LF		
0364	6029000000-E	SP	SAFETY FENCE	43,400 LF		
0365	6030000000-E	1630	SILT EXCAVATION	112,850 CY		
0366	6036000000-E	1631	MATTING FOR EROSION CONTROL	200,000 SY		
0367	6037000000-E	SP	COIR FIBER MAT	4,000 SY		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0368	6038000000-E	SP	PERMANENT SOIL REINFORCEMENT MAT	10,500 SY		
0369	6042000000-E	1632	1/4" HARDWARE CLOTH	25,710 LF		
0370	6046000000-E	1636	TEMPORARY PIPE FOR STREAM CROSSING	250 LF		
0371	6048000000-E	SP	FLOATING TURBIDITY CURTAIN	1,025 SY		
0372	6069000000-E	1638	STILLING BASINS	1,130 CY		
0373	6070000000-N	1639	SPECIAL STILLING BASINS	100 EA		
0374	6071012000-E	SP	COIR FIBER WATTLE	34,200 LF		
0375	6071020000-E	SP	POLYACRYLAMIDE (PAM)	27,460 LB		
0376	6071030000-E	1640	COIR FIBER BAFFLE	20,000 LF		
0377	6071050000-E	SP	**" SKIMMER (1-1/2")	60 EA		
0378	6071050000-E	SP	**" SKIMMER (2")	5 EA		
0379	6071050000-E	SP	**" SKIMMER (2-1/2")	1 EA		
0380	6084000000-E	1660	SEEDING & MULCHING	633 ACR		
0381	6087000000-E	1660	MOWING	300 ACR		
0382	6090000000-E	1661	SEED FOR REPAIR SEEDING	8,100 LB		
0383	6093000000-E	1661	FERTILIZER FOR REPAIR SEEDING	26.5 TON		
0384	6096000000-E	1662	SEED FOR SUPPLEMENTAL SEEDING	14,675 LB		
0385	6108000000-E	1665	FERTILIZER TOPDRESSING	440 TON		
0386	6111000000-E	SP	IMPERVIOUS DIKE	682 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0387	6114500000-N	1667	SPECIALIZED HAND MOWING	365 MHR		
0388	6117000000-N	SP	RESPONSE FOR EROSION CONTROL	125 EA		
0389	6118000000-N	SP	ROOTWADS	2 EA		
0390	6120000000-E	SP	CULVERT DIVERSION CHANNEL	663 CY		
0391	6123000000-E	1670	REFORESTATION	5 ACR		
0392	6126000000-E	SP	STREAMBANK REFORESTATION	5.34 ACR		
0393	6132000000-N	SP	GENERIC EROSION CONTROL ITEM LOGS	6 EA		
0394	6133000000-N	SP	GENERIC EROSION CONTROL ITEM CONSTRUCTION SURVEYING FOR MITIGATION	Lump Sum	L.S.	
0395	6133000000-N	SP	GENERIC EROSION CONTROL ITEM DIVERSION PUMPING FOR MITIGATION	Lump Sum	L.S.	
0396	6133000000-N	SP	GENERIC EROSION CONTROL ITEM GRADING FOR MITIGATION	Lump Sum	L.S.	
0397	6138000000-E	SP	GENERIC EROSION CONTROL ITEM IMPERVIOUS SELECT MATERIAL	175 CY		
0398	7048500000-E	1705	PEDESTRIAN SIGNAL HEAD (16", 1 SECTION W/COUNTDOWN)	10 EA		
0399	7060000000-E	1705	SIGNAL CABLE	8,750 LF		
0400	7120000000-E	1705	VEHICLE SIGNAL HEAD (12", 3 SECTION)	51 EA		
0401	7132000000-E	1705	VEHICLE SIGNAL HEAD (12", 4 SECTION)	8 EA		
0402	7144000000-E	1705	VEHICLE SIGNAL HEAD (12", 5 SECTION)	3 EA		
0403	7252000000-E	1710	MESSENGER CABLE (1/4")	4,215 LF		
0404	7279000000-E	1715	TRACER WIRE	38,000 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0405	7300000000-E	1715	UNPAVED TRENCHING (**********) (1, 2")	5,220 LF		
0406	7300000000-E	1715	UNPAVED TRENCHING (**********) (2, 2")	5,800 LF		
0407	7300000000-E	1715	UNPAVED TRENCHING (**********) (4, 1-1/4")	31,200 LF		
0408	7300100000-E	1715	UNPAVED TRENCHING FOR TEMP-ORARY LEAD-IN	300 LF		
0409	7301000000-E	1715	DIRECTIONAL DRILL (**********) (2, 2")	1,500 LF		
0410	7301000000-E	1715	DIRECTIONAL DRILL (**********) (4, 1-1/4")	1,300 LF		
0411	7324000000-N	1716	JUNCTION BOX (STANDARD SIZE)	81 EA		
0412	7348000000-N	1716	JUNCTION BOX (OVER-SIZED, HEA-VY DUTY)	85 EA		
0413	7360000000-N	1720	WOOD POLE	37 EA		
0414	7372000000-N	1721	GUY ASSEMBLY	64 EA		
0415	7384000000-E	1722	***" RISER WITH ********** (1-1/2", WEATHERHEAD)	2 EA		
0416	7408000000-E	1722	1" RISER WITH WEATHERHEAD	9 EA		
0417	7420000000-E	1722	2" RISER WITH WEATHERHEAD	43 EA		
0418	7432000000-E	1722	2" RISER WITH HEAT SHRINK TUBING	2 EA		
0419	7444000000-E	1725	INDUCTIVE LOOP SAWCUT	4,840 LF		
0420	7456000000-E	1726	LEAD-IN CABLE (**********) (14-2)	18,400 LF		
0421	7484000000-N	SP	MICROWAVE VEHICLE DETECTOR	1 EA		
0422	7516000000-E	1730	COMMUNICATIONS CABLE (**FIBER) (144)	37,500 LF		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0423	7528000000-E	1730	DROP CABLE	7,000 LF		
0424	7540000000-N	1731	SPLICE ENCLOSURE	7 EA		
0425	7541000000-N	1731	MODIFY SPLICE ENCLOSURE	1 EA		
0426	7552000000-N	1731	INTERCONNECT CENTER	9 EA		
0427	7566000000-N	1733	DELINEATOR MARKER	84 EA		
0428	7575142000-N	1736	900MHZ RADIO	6 EA		
0429	7613000000-N	SP	SOIL TEST	7 EA		
0430	7614100000-E	SP	DRILLED PIER FOUNDATION	35 CY		
0431	7636000000-N	1745	SIGN FOR SIGNALS	9 EA		
0432	7642100000-N	1743	TYPE I POST WITH FOUNDATION	2 EA		
0433	7642200000-N	1743	TYPE II PEDESTAL WITH FOUND-ATION	7 EA		
0434	7684000000-N	1750	SIGNAL CABINET FOUNDATION	8 EA		
0435	7756000000-N	1751	CONTROLLER WITH CABINET (TYPE 2070L, BASE MOUNTED)	8 EA		
0436	7780000000-N	1751	DETECTOR CARD (TYPE 2070L)	34 EA		
0437	7901000000-N	1753	CABINET BASE EXTENDER	8 EA		
0438	7980000000-N	SP	GENERIC SIGNAL ITEM 5/8" X 10' GROUNDING ELECTRODE	54 EA		
0439	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV CAMERA ASSEMBLY	8 EA		
0440	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV EXTENSION POLE	1 EA		
0441	7980000000-N	SP	GENERIC SIGNAL ITEM CCTV METAL POLE	7 EA		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0442	7980000000-N	SP	GENERIC SIGNAL ITEM CENTRAL MEDIA CONVERTER	1 EA		
0443	7980000000-N	SP	GENERIC SIGNAL ITEM CENTRAL VIDEO CODEC UNIT	8 EA		
0444	7980000000-N	SP	GENERIC SIGNAL ITEM DMS	3 EA		
0445	7980000000-N	SP	GENERIC SIGNAL ITEM DMS ACCESS LADDER	2 EA		
0446	7980000000-N	SP	GENERIC SIGNAL ITEM DMS PEDESTAL STRUCTURE(TYPE A)	1 EA		
0447	7980000000-N	SP	GENERIC SIGNAL ITEM DMS PEDESTAL STRUCTURE(TYPE B)	1 EA		
0448	7980000000-N	SP	GENERIC SIGNAL ITEM EQUIPMENT CABINET DISCONNECT	7 EA		
0449	7980000000-N	SP	GENERIC SIGNAL ITEM FIELD EQUIPMENT CABINET	8 EA		
0450	7980000000-N	SP	GENERIC SIGNAL ITEM FIELD ETHERNET SWITCH	9 EA		
0451	7980000000-N	SP	GENERIC SIGNAL ITEM FIELD VIDEO CODEC UNIT	8 EA		
0452	7980000000-N	SP	GENERIC SIGNAL ITEM JUNCTION BOX (SPECIAL OVER-SIZED, HEAVY-DUTY)	7 EA		
0453	7980000000-N	SP	GENERIC SIGNAL ITEM METER BASE/DISCONNECT COMBIN-ATION PANEL	8 EA		
0454	7980000000-N	SP	GENERIC SIGNAL ITEM SIGNAL EQUIPMENT CABINET DISCONNECT	1 EA		
0455	7980000000-N	SP	GENERIC SIGNAL ITEM WOOD PEDESTAL	8 EA		
0456	7985000000-N	SP	GENERIC SIGNAL ITEM INTEGRATION AND CONFIGURATION	Lump Sum	L.S.	

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0457	7990000000-E	SP	GENERIC SIGNAL ITEM #4 SOLID BARE COPPER GROUNDING CONDUCTOR	20 LF		
0458	7990000000-E	SP	GENERIC SIGNAL ITEM #4 SOLID BARE GROUNDING CONDUCTOR	240 LF		
0459	7990000000-E	SP	GENERIC SIGNAL ITEM #6 AWG 3-WIRE COPPER FEEDER CONDUCTORS	200 LF		
0460	7990000000-E	SP	GENERIC SIGNAL ITEM 3-WIRE COPPER FEEDER CONDUCTORS	1,800 LF		
0461	7990000000-E	SP	GENERIC SIGNAL ITEM 3-WIRE COPPER SERVICE ENTRANCE CONDUCTORS	50 LF		
0462	7990000000-E	SP	GENERIC SIGNAL ITEM 4-WIRE COPPER FEEDER CONDUCTORS	600 LF		
0463	7992000000-E	SP	GENERIC SIGNAL ITEM ITS OVERHEAD FOOTINGS	16 CY		
			CULVERT ITEMS			
0464	8126000000-N	414	CULVERT EXCAVATION, STA ****** (114+55.00-L-)	Lump Sum	L.S.	
0465	8126000000-N	414	CULVERT EXCAVATION, STA ****** (218+00.00-L-)	Lump Sum	L.S.	
0466	8126000000-N	414	CULVERT EXCAVATION, STA ****** (241+96.00-L-)	Lump Sum	L.S.	
0467	8126000000-N	414	CULVERT EXCAVATION, STA ****** (48+65.00-L-)	Lump Sum	L.S.	
0468	8133000000-E	414	FOUNDATION CONDITIONING MATERIAL, BOX CULVERT	1,101 TON		
0469	8196000000-E	420	CLASS A CONCRETE (CULVERT)	2,131.9 CY		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0470	8245000000-E	425	REINFORCING STEEL (CULVERT)	210,757 LB		
			WALL ITEMS			
0471	8801000000-E	SP	MSE RETAINING WALL NO **** (1)	3,200 SF		
0472	8801000000-E	SP	MSE RETAINING WALL NO **** (2)	3,600 SF		
			STRUCTURE ITEMS			
0473	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (26+17.64-Y22-LT)	Lump Sum	L.S.	
0474	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION ********** (26+21.65-L-RT)	Lump Sum	L.S.	
0475	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 228+23.81-L-)	Lump Sum	L.S.	
0476	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 26+17.64-Y22-LT)	Lump Sum	L.S.	
0477	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 26+17.64-Y22-RT)	Lump Sum	L.S.	
0478	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 268+22.89-L-)	Lump Sum	L.S.	
0479	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (1, 80+74.41-L-)	Lump Sum	L.S.	
0480	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (3, 14+99.25-L-)	Lump Sum	L.S.	

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0481	8091000000-N	410	FOUNDATION EXCAVATION FOR BENT ** AT STATION ********** (4, 14+99.25-L-)	Lump Sum	L.S.	
0482	8096000000-E	450	PILE EXCAVATION IN SOIL	83 LF		
0483	8097000000-E	450	PILE EXCAVATION NOT IN SOIL	67 LF		
0484	8105500000-E	411	**'-**" DIA DRILLED PIERS IN SOIL (4'-6")	304.75 LF		
0485	8105500000-E	411	**'-**" DIA DRILLED PIERS IN SOIL (8'-0")	199 LF		
0486	8105560000-E	411	4'-0" DIA DRILLED PIERS IN SOIL	25 LF		
0487	8105600000-E	411	**'-**" DIA DRILLED PIERS NOT IN SOIL (4'-6")	103 LF		
0488	8105600000-E	411	**'-**" DIA DRILLED PIERS NOT IN SOIL (8'-0")	232 LF		
0489	8105660000-E	411	4'-0" DIA DRILLED PIERS NOT IN SOIL	50 LF		
0490	8113000000-N	411	SID INSPECTIONS	20 EA		
0491	8114000000-N	411	SPT TESTING	2 EA		
0492	8115000000-N	411	CSL TESTING	18 EA		
0493	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (14+99.25-L-)	Lump Sum	L.S.	
0494	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (26+17.64-Y22-LT)	Lump Sum	L.S.	
0495	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (26+17.64-Y22-RT)	Lump Sum	L.S.	

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0496	8121000000-N	412	UNCLASSIFIED STRUCTURE EXCAVATION AT STATION ******** (268+22.89-L-)	Lump Sum	L.S.	
0497	8147000000-E	420	REINFORCED CONCRETE DECK SLAB	251,548 SF		
0498	8161000000-E	420	GROOVING BRIDGE FLOORS	238,237 SF		
0499	8182000000-E	420	CLASS A CONCRETE (BRIDGE)	3,754 CY		
0500	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (129+37.56-L-LT)	Lump Sum	L.S.	
0501	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (129+37.56-L-RT)	Lump Sum	L.S.	
0502	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (14+99.25-L-)	Lump Sum	L.S.	
0503	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (144+60.63-L-)	Lump Sum	L.S.	
0504	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (144+90.00-L-)	Lump Sum	L.S.	
0505	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (174+72.46-L-LT)	Lump Sum	L.S.	
0506	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (174+72.46-L-RT)	Lump Sum	L.S.	
0507	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (228+23.81-L-)	Lump Sum	L.S.	
0508	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (26+17.64-Y22-LT)	Lump Sum	L.S.	
0509	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (26+17.64-Y22-RT)	Lump Sum	L.S.	

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0510	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (26+21.65-L-LT)	Lump Sum	L.S.	
0511	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (26+21.65-L-RT)	Lump Sum	L.S.	
0512	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (268+22.89-L-)	Lump Sum	L.S.	
0513	8210000000-N	422	BRIDGE APPROACH SLABS, STATION ********** (80+74.41-L-)	Lump Sum	L.S.	
0514	8217000000-E	425	REINFORCING STEEL (BRIDGE)	874,201 LB		
0515	8238000000-E	425	SPIRAL COLUMN REINFORCING STEEL (BRIDGE)	76,356 LB		
0516	8265000000-E	430	54" PRESTRESSED CONCRETE GIR-DERS	5,929.19 LF		
0517	8277000000-E	430	MODIFIED 72" PRESTRESSED CONC GIRDERS	4,291.18 LF		
0518	8280000000-E	440	APPROX ..... LBS STRUCTURAL STEEL	7,728,200 LS		
0519	8364000000-E	450	HP12X53 STEEL PILES	13,815.5 LF		
0520	8391000000-N	450	STEEL PILE POINTS	80 EA		
0521	8475000000-E	460	TWO BAR METAL RAIL	1,051.2 LF		
0522	8482000000-E	460	THREE BAR METAL RAIL	363.67 LF		
0523	8503000000-E	460	CONCRETE BARRIER RAIL	9,584.15 LF		
0524	8517000000-E	460	1'-**"X *****" CONCRETE PARA-PET (1'-2" X 2'-6")	1,081.2 LF		
0525	8531000000-E	462	4" SLOPE PROTECTION	6,481 SY		
0526	8608000000-E	876	RIP RAP CLASS II (2'-0" THICK)	3,087 TON		

Line #	Item Number	Sec #	Description	Quantity	Unit Cost	Amount
0527	8622000000-E	876	GEOTEXTILE FOR DRAINAGE	3,482 SY		
0528	8650000000-N	SP	POT BEARINGS	Lump Sum	L.S.	
0529	8657000000-N	430	ELASTOMERIC BEARINGS	Lump Sum	L.S.	
0530	8692000000-N	SP	FOAM JOINT SEALS	Lump Sum	L.S.	
0531	8706000000-N	SP	EXPANSION JOINT SEALS	Lump Sum	L.S.	
0532	8713000000-N	SP	MODULAR EXPANSION JOINT SEALS	Lump Sum	L.S.	
0533	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (129+37.56-L-RT)	Lump Sum	L.S.	
0534	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (14+99.25-L-)	Lump Sum	L.S.	
0535	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (144+60.63-L-)	Lump Sum	L.S.	
0536	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (174+72.46-L-RT)	Lump Sum	L.S.	
0537	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (26+21.65-L-LT)	Lump Sum	L.S.	
0538	8727000000-N	SP	ELECTRICAL CONDUIT SYSTEM FOR SIGNALS AT STA********** (268+22.89-L-)	Lump Sum	L.S.	
0539	8860000000-N	SP	GENERIC STRUCTURE ITEM MODIFIED BRIDGE APPROACH FILL, STATION 268+22.89-L-	Lump Sum	L.S.	