TIP#: R-2559WM

WBS#: 34464.4.3

Final Plans 7/7/04

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | R-2559WM | 1 | 31 |

| STATE PROJ. NO. | F.A. PROJ. NO. | DESCRIPTION |
|---|---|---|
| 34464.4.1 | | P.E. |
| 34464.4.2 | | R/W |
| 34464.4.3 | | CONST. |

AS-Built

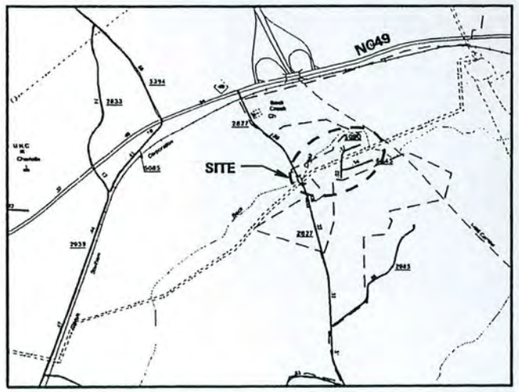
# STATE OF NORTH CAROLINA
# DIVISION OF HIGHWAYS

# *MECKLENBURG COUNTY*

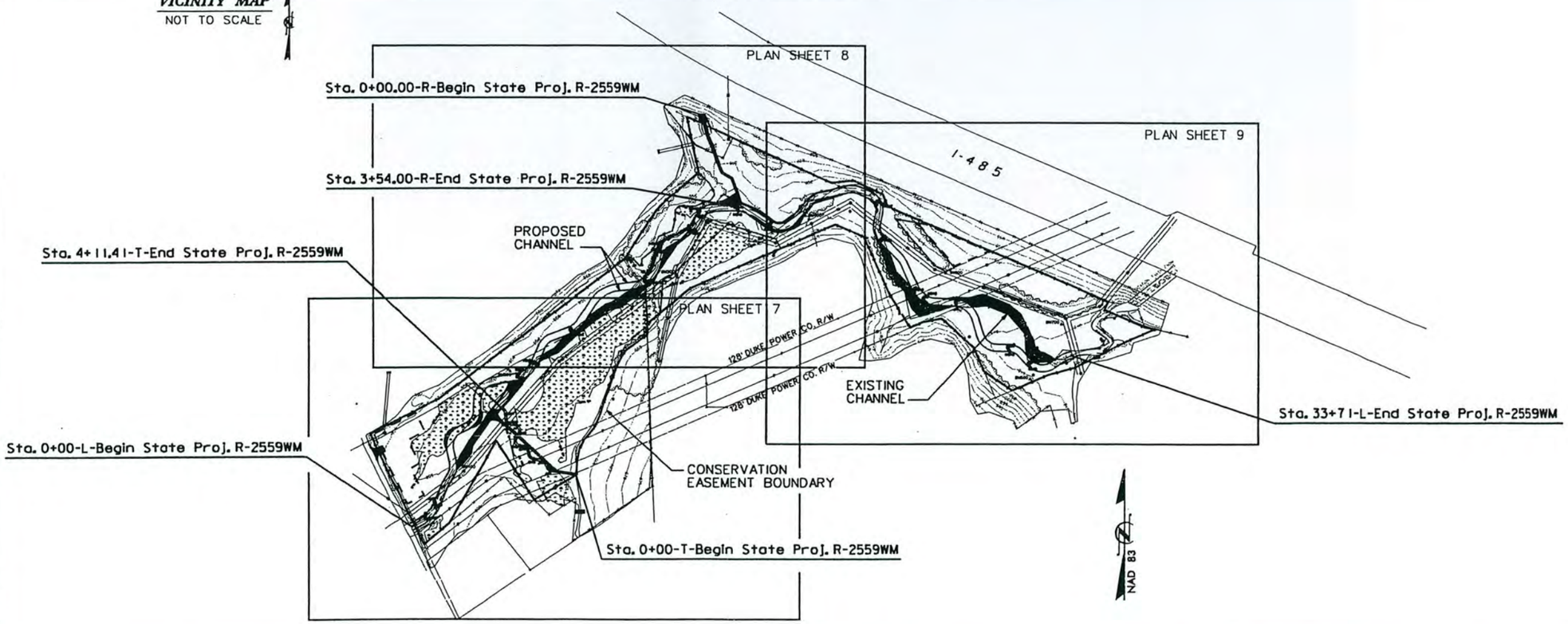
***LOCATION: BACK CREEK STREAM RESTORATION/ENHANCEMENT***

***TYPE OF WORK:***

- IN-STREAM STRUCTURES
- FLOODPLAIN GRADING / SCARIFICATION
- NEW CHANNEL CONSTRUCTION




***VICINITY MAP***
NOT TO SCALE




***SITE AREA:*** 20.1± ACRES

***DESIGN DATA:***

| STREAM | L | T | R |
|---|---|---|---|
| STREAM CHANNEL TYPE: | E | E | B |
| STREAM LENGTH EXISTING: | 3332± lin. ft. | 359± lin. ft. | 354± lin. ft. |
| STREAM LENGTH PROPOSED: | 3310± lin. ft. | 411± lin. ft. | 354± lin. ft. |
| BANKFULL CROSS-SECTIONAL AREA: | 53.3 sf. | 4.8 sf. | 2.3 sf. |
| BANKFULL WIDTH: | 23.6 ft. | 6.9 ft. | 5.5 ft. |
| BANKFULL AVERAGE DEPTH: | 2.3 ft. | 0.7 ft. | 0.4 ft. |
| WIDTH/DEPTH RATIO: | 10.3 | 9.9 | 13.8 |

***GRAPHIC SCALES***

***OVERALL DESIGN SHEETS:***
100 0 100
SCALE IN FEET

***PLAN SHEETS:***
40 0 40
SCALE IN FEET

*Prepared for:*

***NORTH CAROLINA DEPARTMENT OF TRANSPORTATION***

| No. | Revisions | Date |
|---|---|---|
| | | |

*Prepared in the office of:*

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| Des. By: | Dwn. By: | Chk. By: |
|---|---|---|
| WGL / JD | MAF | DGM |

Date: JUNE 2004

DESIGN ENGINEER: DAVID G. MODLIN, JR.

PROJECT MANAGER: W. GRANT LEWIS

***SEAL:***

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

7/7/04

PROJECT ENGINEER:

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | 1A |

PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MOODY, JR.

2/7/04

## INDEX OF SHEETS


1: TITLE SHEET
1A: INDEX OF SHEETS
GENERAL NOTES
CONSTRUCTION SEQUENCING
MORPHOLOGICAL TABLE
1B: CONVENTIONAL SYMBOLS - NCDOT
2-2B: DETAIL SHEETS - NCDOT
2C: ELEMENT SYMBOLOGY - ESC
2D-2E: DETAIL SHEETS - ESC
2F: NEW CHANNEL LINE DATA
2G: RIFFLE AND POOL DATA TABLES
3: SUMMARY OF QUANTITIES / SUMMARY OF EARTHWORK
4: EXISTING CONDITIONS
5: NEW CHANNEL LAYOUT
6: OVERALL SITE PLAN
7-9: PLAN SHEETS
10: PROFILE SHEET
X1-X8: STREAM CROSS-SECTIONS
EC1-EC4: EROSION CONTROL PLANS


## CONSTRUCTION SEQUENCING

MOBILIZE EQUIPMENT AND MATERIALS TO THE SITE.

INSTALL CONSTRUCTION ENTRANCE PER EROSION CONTROL PLAN..

ESTABLISH A STAGING AREA AS DEPICTED ON THE PLANS AND MARK CONSTRUCTION EQUIPMENT ACCESS LOCATIONS WITH VISIBLE MARKERS. CONSTRUCTION EQUIPMENT SHALL BE CONTAINED WITHIN THE LIMITS OF CONSTRUCTION ACCESS AS DEPICTED IN THE PLANS OR SPECIFIED BY THE ENGINEER.

INSTALL TEMPORARY EROSION CONTROL MEASURES.

REMOVE AND DISPOSE OF EXISTING FENCE AND INSTALL FENCING AND GATES AS DEPICTED IN THE PLANS AND AS DIRECTED BY THE ENGINEER.

BEGIN FLOODPLAIN GRADING, INCLUDING EXCAVATION OF BANKFULL BENCHES AT LOCATIONS DEPICTED IN THE PLANS AND AS DIRECTED BY THE ENGINEER. STOCKPILE SOIL MATERIAL IN AREAS DESIGNATED ON THE PLANS.

INSTALL IMPERVIOUS DIKES AND PUMP-AROUND SYSTEM TO PUMP STREAM DISCHARGE AROUND THE IMMEDIATE WORK AREA.

BEGIN STREAM CONSTRUCTION FROM STATION 0+00. 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 WITHIN ONE DAY. COMPLETION OF A REACH SHALL CONSIST OF CHANNEL CONSTRUCTION, FLOODPLAIN GRADING, IN-STREAM STRUCTURE INSTALLATION, BED MATERIAL INSTALLATION, AND EROSION CONTROL MEASURES. CONSTRUCTION SHALL BE DONE IN THE DRY, WITH THE CHANNEL FLOW PUMPED AROUND THE REACH UNDER CONSTRUCTION.

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 CHANNEL CONSTRUCTION IS COMPLETE, THE CONTRACTOR SHALL INSTALL CHANNEL PLUGS TO DIRECT STREAM FLOW INTO THE NEW CHANNEL. THE CONTRACTOR SHALL THEN FILL IN THE EXISTING CHANNEL TO THE EXTENT FEASIBLE AND AS DIRECTED BY THE ENGINEER.

AFTER ALL INSTREAM WORK IS COMPLETED, THE CONTRACTOR SHALL REMOVE TEMPORARY EROSION CONTROL MEASURES AND TEMPORARY 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.

## MORPHOLOGICAL TABLE

| BACK CREEK STREAM RESTORATION SITE<br>Morphological Characteristics of Proposed Channel | | |
|---|---|---|
| | | Proposed Reach |
| Variables | | Back Creek |
| 1 Stream Type | | E4/5 |
| 2 Drainage Area ($m^2$) | | 3.7-4.1 |
| 3 Bankfull Discharge (cfs) | | 250-300 |
| **Dimension Variables (ft.)** | | |
| 4 Bankfull Cross Sectional Area (Abkf) | | 56 |
| 5 Bankfull Width ($W_{bkf}$) | Mean: 22.4 | Range: 21.2-23.7 |
| 6 Bankfull Mean Depth (Dbkf) | Mean: 2.5 | Range: 2.4-2.6 |
| 7 Bankfull Maximum Depth (Dmax) | Mean: 3.3 | Range: 2.8-3.8 |
| 8 Pool Width ($W_{pool}$) | Mean: 29.1 | Range: 22.4-33.6 |
| 9 Maximum Pool Depth (Dpool) | Mean: 4.3 | Range: 3.5-7.5 |
| 10 Width of Floodprone Area (Wfpa) | Mean: 230 | Range: 114-297 |
| **Dimension Ratios** | | |
| 11 Entrenchment Ratio (Wfpa/Wbkf) | Mean: 10.3 | Range: 5.1-13.3 |
| 12 Width/Depth Ratio (Wbkf/Dbkf) | Mean: 9 | Range: 6-10 |
| 13 Max. $D_{pf}/D_{bkf}$ Ratio | Mean: 1.3 | Range: 1.1-1.5 |
| 14 Low Bank Height/Max. Dbkf Ratio | Mean: 1.0 | Range: 1.0-1.2 |
| 15 Pool Depth/Bankfull Mean Depth (Dpool/Dbkf) | Mean: 1.7 | Range: 1.4-3.0 |
| 16 Pool width/Bankfull Width (Wpool/Wbkf) | Mean: 1.3 | Range: 1.0-1.5 |
| 17 Pool Area/Bankfull Cross Sectional Area | Mean: 1.2 | Range: 1.1-1.4 |
| **Pattern Variablies** | | |
| 18 Pool to Pool Spacing (Lp-p) | Mean: 126 | Range: 60-210 |
| 19 Meander Length ($L_m$) | Mean: 220 | Range: 166-347 |
| 20 Belt Width ($W_{belt}$) | Mean: 57 | Range: 25-140 |
| 21 Radius of Curvature ($R_c$) | Mean: 58 | Range: 43-100 |
| 22 Sinuosity (Sin) | | 1.5 |
| **Pattern Ratios** | | |
| 23 Pool to Pool Spacing/Bankfull Width (Lp-p/Wbkf) | Mean: 5.6 | Range: 2.7-9.4 |
| 24 Meander Length/Bankfull Width (Lm/Wbkf) | Mean: 9.8 | Range: 7.4-15.5 |
| 25 Meander Width Ratio (Wbelt/Wbkf) | Mean: 2.5 | Range: 1.1-6.3 |
| 26 Radius of Curvature/Bankfull Width (Rc/Wbkf) | Mean: 2.6 | Range: 2.0-4.5 |
| **Profile Variables** | | |
| 27 Average Water SurfaceSlope (Save) | | 0.0034 |
| 28 Valley Slope ($S_{valley}$) | | 0.0051 |
| 29 Riffle Slope ($S_{riffle}$) | Mean: 0.005 | Range: 0.0033-0.0079 |
| 30 Pool Slope ($S_{pool}$) | Mean: 0.0017 | Range: 0-0.003 |
| **Profile Ratios** | | |
| 31 Riffle Slope/ Water Surface Slope (Sriffle/Save) | Mean: 1.5 | Range: 1.0-2.3 |
| 32 Pool Slope/Water Surface Slope (Spool/Save) | Mean: 0.5 | Range: 0.1-0.9 |

## GENERAL NOTES

TOPOGRAPHIC SURVEY PERFORMED FOR NORTH CAROLINA DEPARTMENT OF TRANSPORTATION BY ESP ASSOCIATES, P. A.

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 2002, 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 2002, AND ANY SUPPLIMENTS ISSUED THERETO PRIOR TO THE DATE OF RECIEPT OF BIDS.

ALL CONSERVATION EASEMENT CORNER MARKERS SHALL BE PLACED BY OTHERS.

THE CONTRACTOR IS REPONSIBLE 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.

ALL FENCING, EXCEPT FOR STREAM CROSSINGS, SHALL BE WOVEN WIRE WITH 4"X 4" TREATED POSTS SET ON 14' CENTERS AS DETAILED IN NCDOT STANDARD DRAWING NO. 866.02. WOVEN WIRE SHALL BE OF HIGH TENSILE STEEL. GATES SHALL FOLLOW NCDOT STANDARD DRAWING NO. 866.04 FOR ALTERNATE CATTLE GATE. GATES INDICATED AS 16' SHALL CONSIST OF SINGLE 16' GATE WITH HINGE AND LATCH ASSEMBLIES AS APPROVED BY THE ENGINEER. BARBED WIRE FENCING FOR STREAM CROSSINGS SHALL CONFORM TO NCDOT STANDARD DRAWING NO. 866.02.

THE EXISTING CHANNEL SHALL BE FILLED TO THE MAXIMUM EXTENT FEASIBLE WITH MATERIAL EXCAVATED ON-SITE AND STOCKPILED ADJACENT TO REACHES OF CHANNEL OR DITCHES TO BE BACKFILLED.

THE CONTRACTOR MAY UTILIZE THE DESIGNATED STAGING AREA AND THE AREA INSIDE THE PROPOSED CONSERVATION EASEMENT FOR STAGING AND STOCKPILING EQUIPMENT AND MATERIALS.

THE STREAM SHALL BE CONSTRUCTED BY THE TYPICAL SECTIONS. THE GRADING CONTOURS ARE PROVIDED FOR REFERENCE ONLY.

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | 1B |

*S.U.E = SUBSURFACE UTILITY ENGINEER

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

# CONVENTIONAL SYMBOLS

## *ROADS & RELATED ITEMS*

Edge of Pavement
Curb
Prop. Slope Stakes Cut — C
Prop. Slope Stakes Fill — F
Prop. Woven Wire Fence
Prop. Chain Link Fence
Prop. Barbed Wire Fence
Prop. Wheelchair Ramp — WCR
Curb Cut for Future Wheelchair Ramp — CCFR
Exist. Guardrail
Prop. Guardrail
Equality Symbol
Pavement Removal

## *RIGHT OF WAY*

Baseline Control Point
Existing Right of Way Marker
Exist. Right of Way Line w/Marker
Prop. Right of Way Line with Proposed R/W Marker (Iron Pin & Cap)
Prop. Right of Way Line with Proposed (Concrete or Granite) R/W Marker
Exist. Control of Access Line — CA
Prop. Control of Access Line — CA
Exist. Easement Line — E
Prop. Temp. Construction Easement Line — E
Prop. Temp. Drainage Easement Line — TDE
Prop. Perm. Drainage Easement Line — PDE

## *HYDROLOGY*

Stream or Body of Water
River Basin Buffer — RBB
Flow Arrow
Disappearing Stream
Spring
Swamp Marsh
Shoreline
Falls, Rapids
Prop Lateral, Tail, Head Ditches — FLOW

## *STRUCTURES*

MAJOR
Bridge, Tunnel, or Box Culvert — CONC
Bridge Wing Wall, Head Wall and End Wall — CONC WW

MINOR
Head & End Wall — CONC HW
Pipe Culvert
Footbridge
Drainage Boxes — CB
Paved Ditch Gutter

## *UTILITIES*

Exist. Pole
Exist. Power Pole
Prop. Power Pole
Exist. Telephone Pole
Prop. Telephone Pole
Exist. Joint Use Pole
Prop. Joint Use Pole
Telephone Pedestal — T
U/G Telephone Cable Hand Hold — HH
Cable TV Pedestal — C
U/G TV Cable Hand Hold — HH
U/G Power Cable Hand Hold — HH
Hydrant
Satellite Dish
Exist. Water Valve
Sewer Clean Out
Power Manhole — P
Telephone Booth
Cellular Telephone Tower
Water Manhole — W
Light Pole
H-Frame Pole
Power Line Tower
Pole with Base
Gas Valve
Gas Meter
Telephone Manhole — T
Power Transformer
Sanitary Sewer Manhole
Storm Sewer Manhole — S
Tank; Water, Gas, Oil
Water Tank With Legs
Traffic Signal Junction Box — S
Fiber Optic Splice Box — F
Television or Radio Tower
Utility Power Line Connects to Traffic Signal Lines Cut Into the Pavement — TS — TS

Recorded Water Line — W
Designated Water Line (S.U.E.*) — W
Sanitary Sewer — SS
Recorded Sanitary Sewer Force Main — FSS
Designated Sanitary Sewer Force Main(S.U.E.*) — FSS
Recorded Gas Line — G
Designated Gas Line (S.U.E.*) — G
Storm Sewer — S
Recorded Power Line — P
Designated Power Line (S.U.E.*) — P
Recorded Telephone Cable — T
Designated Telephone Cable (S.U.E.*) — T
Recorded U/G Telephone Conduit — TC
Designated U/G Telephone Conduit (S.U.E.*) — TC
Unknown Utility (S.U.E.*) — TUTL
Recorded Television Cable — TV
Designated Television Cable (S.U.E.*) — TV
Recorded Fiber Optics Cable — FO
Designated Fiber Optics Cable (S.U.E.*) — FO
Exist. Water Meter — 0
U/G Test Hole (S.U.E.*) — ATTUR
Abandoned According to U/G Record
End of Information — E.O.I.

## *BOUNDARIES & PROPERTIES*

State Line
County Line
Township Line
City Line
Reservation Line
Property Line
Property Line Symbol — PL
Exist. Iron Pin — EIP
Property Corner
Property Monument — ECM
Property Number — 123
Parcel Number — 6
Fence Line — WW & ISBW
Existing Wetland Boundaries — WLB
High Quality Wetland Boundary — HQ WLB
Medium Quality Wetland Boundaries — MQ WLB
Low Quality Wetland Boundaries — LQ WLB
Proposed Wetland Boundaries — WLB
Existing Endangered Animal Boundaries — EAB
Existing Endangered Plant Boundaries — EPB

## *BUILDINGS & OTHER CULTURE*

Buildings
Foundations
Area Outline
Gate
Gas Pump Vent or U/G Tank Cap
Church
School
Park
Cemetery
Dam
Sign — S
Well — W
Small Mine
Swimming Pool

## *TOPOGRAPHY*

Loose Surface
Hard Surface
Change in Road Surface
Curb
Right of Way Symbol — R/W
Guard Post — GP
Paved Walk
Bridge
Box Culvert or Tunnel
Ferry
Culvert
Footbridge
Trail, Footpath
Light House

## *VEGETATION*

Single Tree
Single Shrub
Hedge
Woods Line
Orchard
Vineyard — VINEYARD

## *RAILROADS*

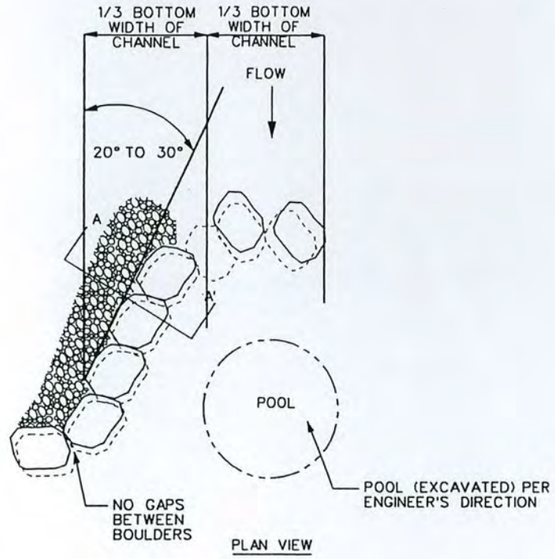
Standard Gauge — CSX TRANSPORTATION
RR Signal Milepost — MILEPOST 35
Switch — SWITCH

revised 02/02/00

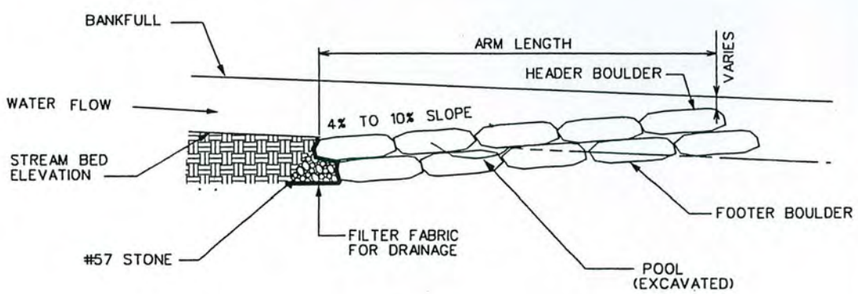
| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | 2 |

PROJECT DESIGN ENGINEER

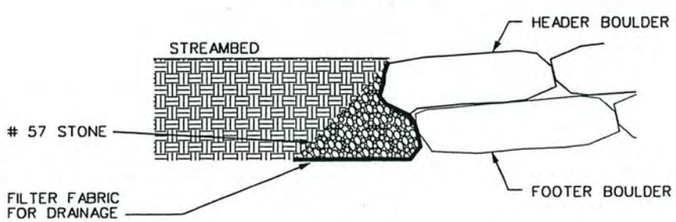
NORTH CAROLINA PROFESSIONAL SEAL 8807 ENGINEER DAVID G. MOODY, JR.




PLAN VIEW




PROFILE VIEW



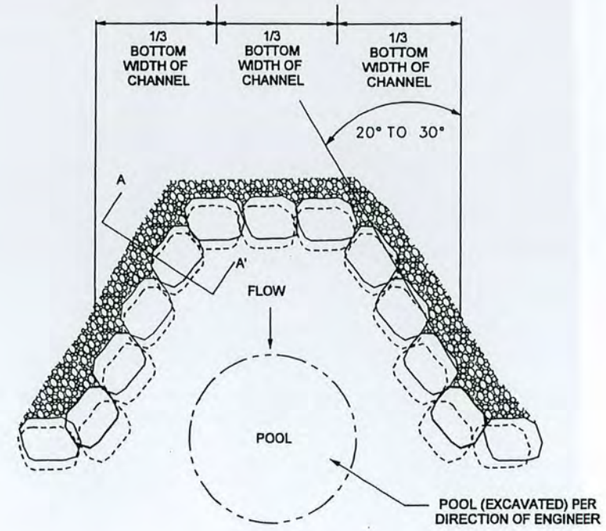

SECTION A-A'

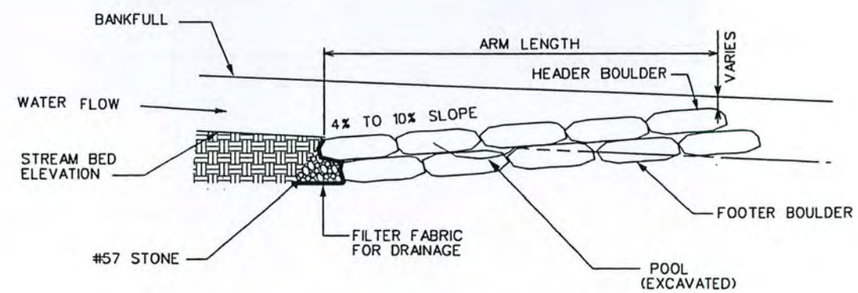
NOTES:

1. FILTER FABRIC TOED IN AND DRAPED ON UPSTREAM SIDE OF CROSS-VANE PRIOR TO BACKFILL.
2. HEADER AND FOOTER BOULDERS ARE LARGE, ANGULAR BOULDERS APPROXIMATELY 48"L x 36"W x 24"D IN SIZE (SEE PROJECT SPECIAL PROVISIONS).

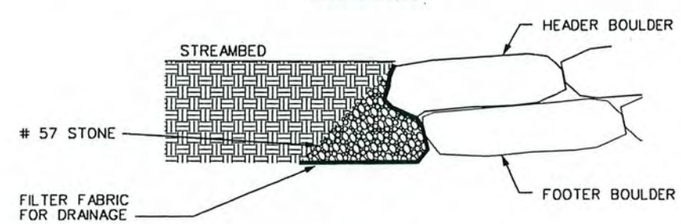
| STREAM | ARM LENGTH (FT.) | TIE IN BELOW BANKFULL |
|---|---|---|
| L | 25.0 | 0.5 |
| T | 7.0 | 0.3 |

## TYPICAL J-HOOK VANE




PROFILE VIEW




SECTION A-A'

NOTES:

1. FILTER FABRIC TOED IN AND DRAPED ON UPSTREAM SIDE OF CROSS-VANE PRIOR TO BACKFILL.
2. HEADER AND FOOTER BOULDERS ARE LARGE, ANGULAR BOULDERS APPROXIMATELY 48"L x 36"W x 24"D IN SIZE.
3. STEP CROSS-VANES ARE TYPICAL CROSS-VANES WITH AN ADDITIONAL ROCK SILL CONSTRUCTED WITH HEADER AND FOOTER STONES WHICH SEPARATE PRIMARY AND INTERMEDIATE POOLS.
4. MODIFIED CROSS-VANES ARE TYPICAL CROSS-VANES WITH ONE ARM SHORTENED.

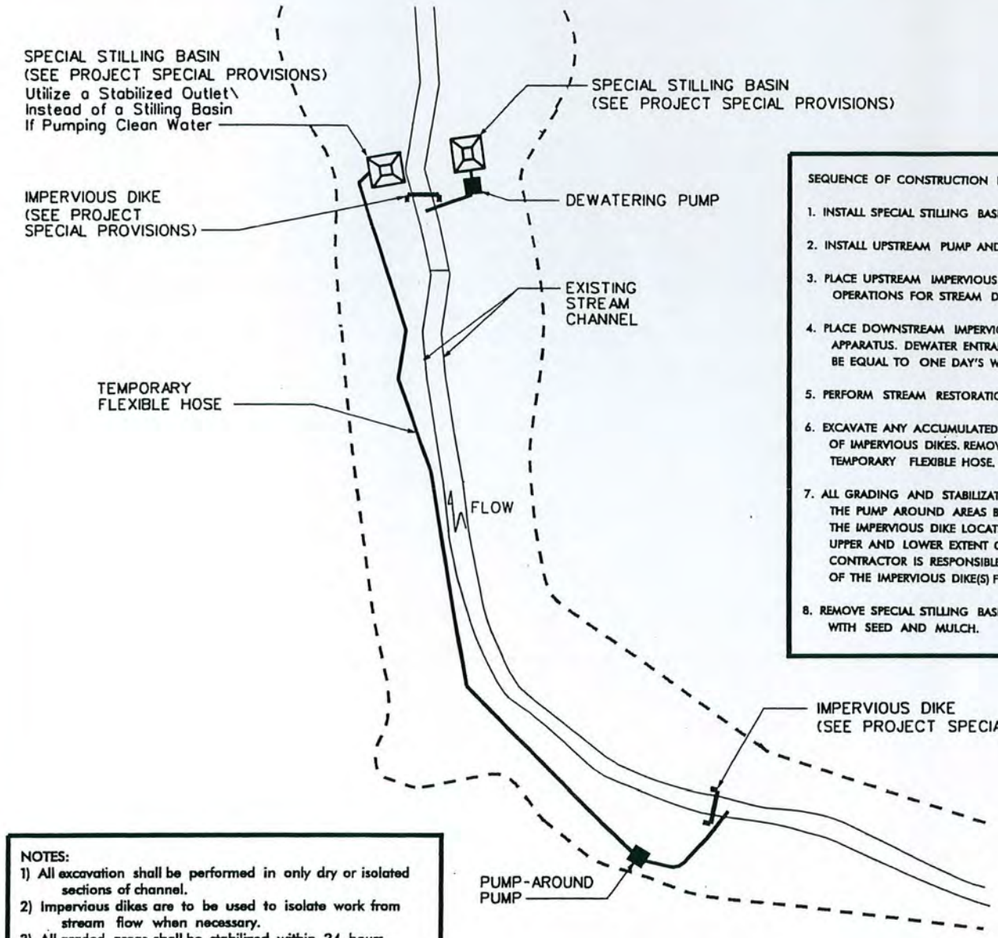
| STREAM | ARM LENGTH (FT.) | TIE IN BELOW BANKFULL |
|---|---|---|
| L | 25.0 | 0.5 |
| T | 7.0 | 0.3 |

## TYPICAL CROSS-VANE

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | 2A |

PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MOORE, JR.

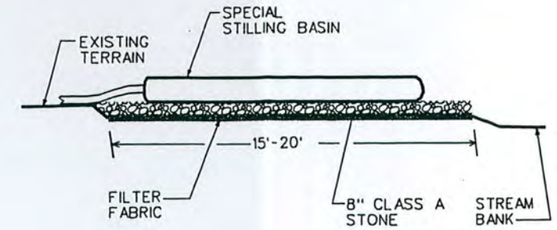



SEQUENCE OF CONSTRUCTION FOR TYPICAL WORK AREA

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 DIKES 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.

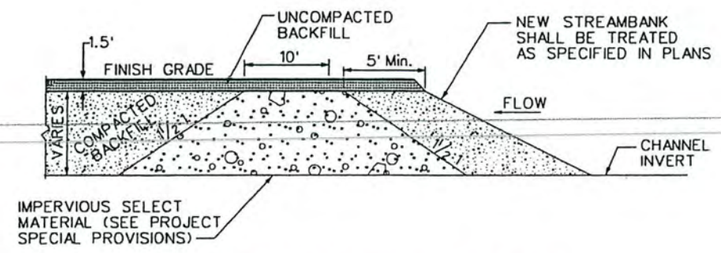
NOTES:
1) All excavation shall be performed in only dry or isolated sections of channel.
2) Impervious dikes are to be used to isolate work from stream flow when necessary.
3) All graded areas shall be stabilized within 24 hours.
4) Maintenance of stream flow operations shall be incidental to the work. This includes polyethylene sheeting, diversion pipes, pumps and hoses.
5) Pumps and hoses shall be of sufficient size to dewater the work area.

## TYPICAL PUMP-AROUND OPERATION

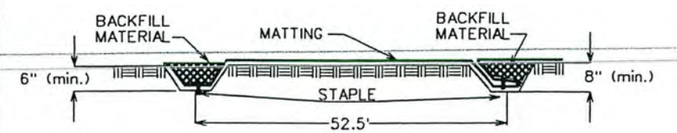


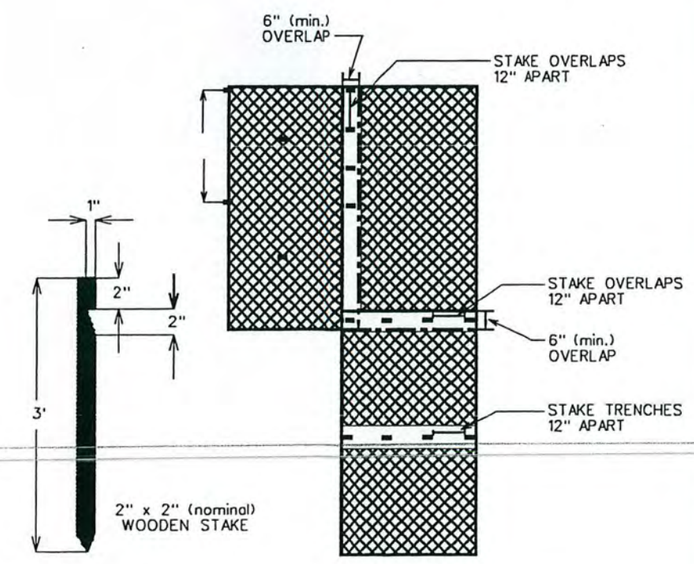

NOTE: PROVIDE STABILIZED OUTLET TO STREAMBANK.

## SPECIAL STILLING BASIN W/ROCK PAD




## IMPERVIOUS CHANNEL BLOCK



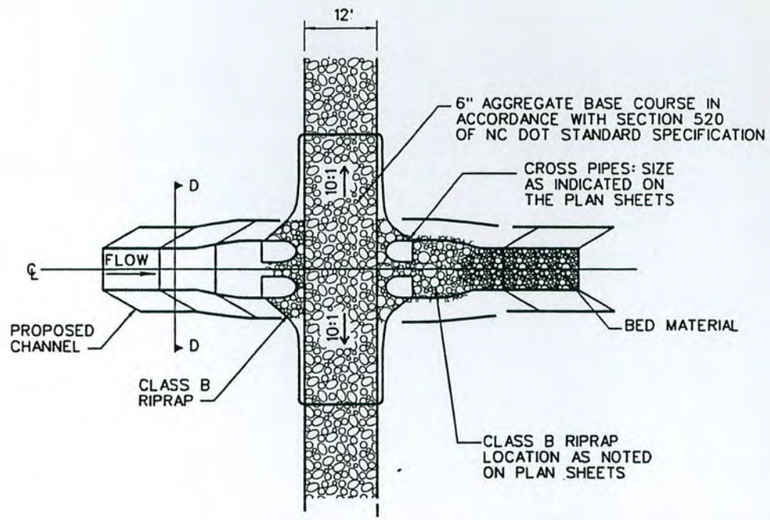




## COIR FIBER MATTING DETAIL

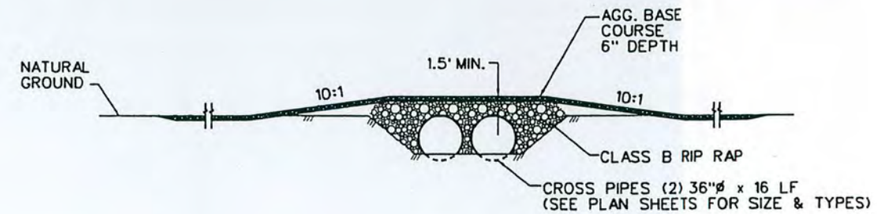
| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | 2B |

PROJECT DESIGN ENGINEER 2/7/04

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MOULTON, JR.

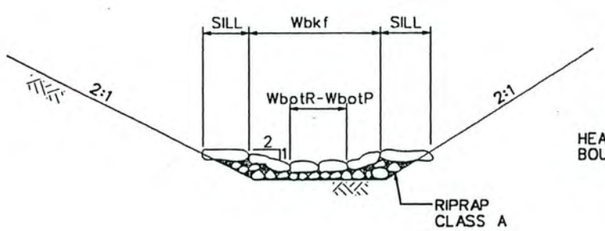



PLAN VIEW

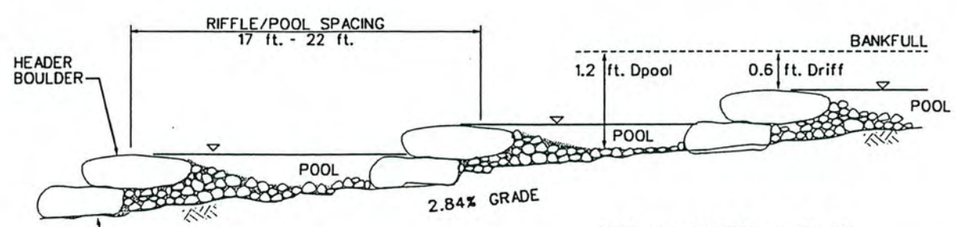



SECTION D-D

## CHANNEL CROSSING DETAIL

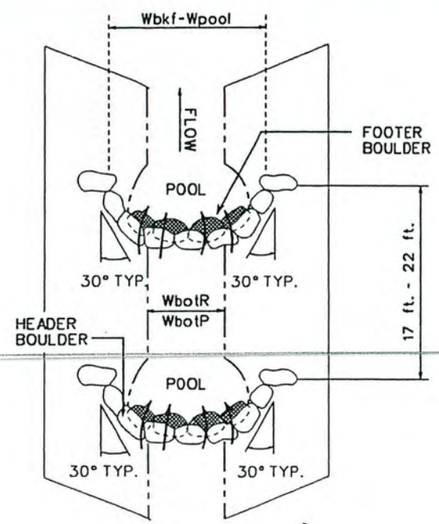



TYPICAL CROSS SECTION




PROFILE

NOTE: BED MATERIAL IS TO BE RIPRAP, CLASS A.




PLAN VIEW

NOTES:

1. COVER CHANNEL BED W/ RIPRAP, CLASS A.
2. FILL VOIDS BETWEEN ANGULAR BOULDERS APPROXIMATELY 48"L x 36"W x 24"D IN SIZE W/ RIPRAP, CLASS A .
3. RIPRAP, CLASS A INSTALLED TO A MINIMUM DEPTH OF 12 INCHES.
4. THE CHANNEL SHALL BE LINED WITH FILTER FABRIC FOR DRAINAGE BEFORE INSTALLATION OF BED MATERIAL.

## STEP-POOL STRUCTURE

SEE TABLE 1, SHEET 2D.

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | 2C |

# ECOSCIENCE CORPORATION

# ELEMENT SYMBOLOGY

## *TOPOGRAPHY & HYDROGRAPHY*

- MAJOR CONTOUR — 650
- MINOR CONTOUR
- GRAVEL /DIRT ROAD
- PAVED ROAD
- WETLAND /SWAMP
- DIRECTION OF FLOW
- EXISTING STREAM
- EXISTING WETLAND BOUNDARY — WLB
- HIGH QUALITY WETLAND BOUNDARY — HQ WLB
- MEDIUM QUALITY WETLAND BOUNDARY — MQ WLB
- LOW QUALITY WETLAND BOUNDARY — LQ WLB
- PROPOSED WETLAND BOUNDARY — WLB
- SPOT ELEVATION — 648

## *BOUNDARIES, PROPERTIES, AND EASEMENTS*

- COUNTY LINE
- CITY LINE
- PROPERTY LINE — PL
- EXISTING IRON PIN — EIP
- RIGHT OF WAY — R/W
- PROPERTY MONUMENT — ECM
- PARCEL NUMBER — 6
- BENCHMARK — BM300
- NCDOT MONUMENT — BL-5
- UTILITY EASEMENT — E
- POWER LINE — P
- EXISTING EASEMENT — E
- PROPOSED CONSERVATION EASEMENT — C/E

## *BUILDINGS & OTHER STRUCTURES*

- BUILDINGS
- WELL — W
- BRIDGE
- BOX CULVERT OR TUNNEL
- CULVERT
- BRIDGE WING WALL, HEAD WALL, AND END WALL — CONC WW
- HEAD AND END WALL — CONC HW
- PIPE CULVERT
- FOOTBRIDGE
- DRAINAGE BOXES — CB
- EXISTING FENCE
- POWER POLE
- TELEPHONE POLE
- LIGHT POLE
- POWER LINE TOWER
- SANITARY SEWER MANHOLE
- STORM SEWER MANHOLE — S
- SANITARY SEWER — SS
- STORM SEWER — S
- FOOTBRIDGE
- TRAIL, FOOTPATH
- RAIL ROAD — CSX TRANSPORTATION

## *PROPOSED FEATURES AND STRUCTURES*

- CROSS-VANE
- RADIUS OF CURVATURE CENTER MARK — R2
- CHANNEL CROSSING
- MODIFIED CROSS-VANE
- J-HOOK VANE
- STEP CROSS-VANE
- TEMPORARY STAGING AREA, SOIL STOCKPILING
- NEW CHANNEL
- BORROW AREA
- CHANNEL BACKFILL
- GRADE CONTROL SILL
- MEANDER REVETMENT
- RIPRAP APRON
- IMPERVIOUS CHANNEL BLOCK
- TOP OF RIFFLE — TR1
- BOTTOM OF RIFFLE — BR1
- CONSTRUCTED BERM
- PROPOSED WOVEN WIRE FENCE
- PROPOSED BARBED WIRE FENCE
- PROPOSED MAJOR CONTOURS — 755
- PROPOSED MINOR CONTOURS
- PROPOSED DIVERSION DITCH
- LIMITS OF CONSTRUCTION
- PROPOSED SAFETY FENCE — SF
- PROPOSED ACCESS ROAD

## *VEGETATION*

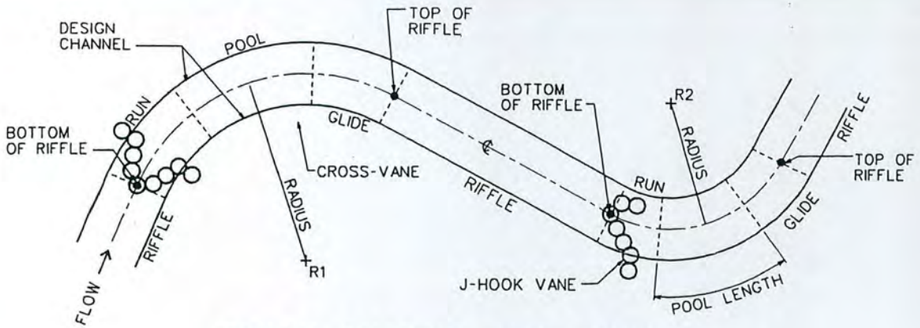
- SINGLE TREE
- SINGLE SHRUB
- EXISTING WOODS LINE
- PROPOSED CLEARING LIMITS

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | 2D |

PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MOBLEY, JR.

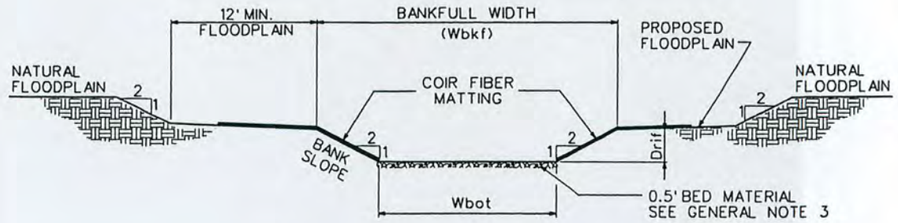
7/7/04




## TYPICAL CHANNEL PLAN VIEW

NOTE:

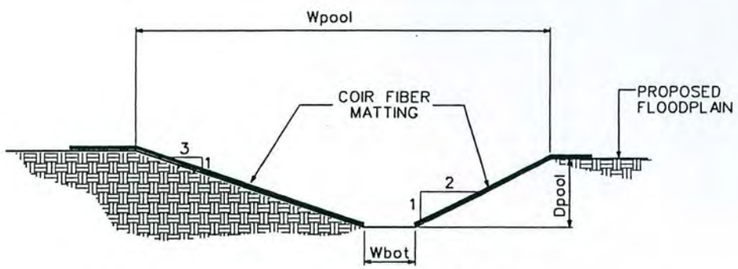
1. THE COORDINATES FOR EACH CENTER OF RADIUS (R), TOP OF RIFFLE (TR), AND BOTTOM OF RIFFLE (BR) ARE INDICATED ON SHEET 2G.




## TYPICAL RIFFLE CROSS-SECTION

GENERAL NOTES:

1. CONSTRUCTION OF THE PROPOSED CHANNEL SHALL INCLUDE EXCAVATION OF THE CHANNEL SECTIONS AT THE LOCATIONS DEPICTED ON THE PLAN SHEETS.
2. MATERIAL EXCAVATED FROM THE PROPOSED CHANNEL SHALL BE STOCKPILED AT LOCATIONS DEPICTED ON THE PLAN SHEETS, AND SHALL BE UTILIZED TO FILL THE ABANDONED CHANNEL REACH. BACKFILL MATERIAL SHALL BE COMPACTED TO THE SATISFACTION OF THE ENGINEER.
3. CONTRACTOR SHALL PROVIDE CLASS A EROSION CONTROL STONE SUBSTRATE MATERIAL FOR PROPOSED RIFFLES. SUBSTRATE SHALL BE COMPACTED TO THE SATISFACTION OF THE ENGINEER.



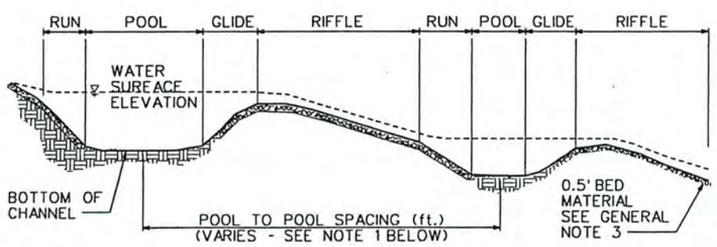

## TYPICAL POOL CROSS-SECTION

NOTE:

1. POOL SHOWN FOR LEFT TYPICAL POOL; REVERSE FOR RIGHT TYPICAL POOL

**TABLE 1 - CROSS-SECTION DIMENSIONS**

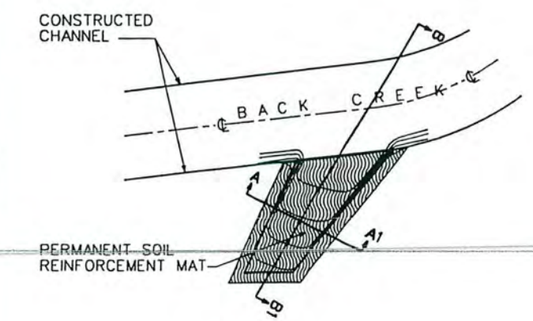
| STREAM | REACH | Wbkf (ft.) | Wbot (ft.) Riffle | Driff (ft.) | Wpool (ft.) | Wbot (ft.) Pool | Dpool (ft.) | Width/Depth Ratio |
|---|---|---|---|---|---|---|---|---|
| L | Sta. 0+00 - Sta. 10+25 | 23.2 | 11.2 | 3.0 | 27.8 | 5.3 | 4.5 | 10.5 |
| L | Sta. 10+25 - Sta. 19+90 | 23.7 | 11.7 | 3.0 | 28.4 | 5.9 | 4.5 | 10.6 |
| L | Sta. 19+90 - Sta. 29+50 | 23.7 | 11.5 | 3.1 | 28.4 | 5.4 | 4.6 | 10.4 |
| L | Sta. 29+50 - Sta. 33+70 | 23.8 | 11.4 | 3.1 | 28.6 | 5.1 | 4.7 | 10.4 |
| T | Sta. 0+00 - Sta. 4+11 | 6.9 | 3.1 | 0.95 | 8.3 | 1.3 | 1.4 | 9.9 |
| R | Sta. 0+00 - Sta. 1+90 | 5.5 | 3.1 | 0.6 | 5.5 | 0.7 | 1.2 | 11.7 |
| R | Sta. 1+90 - Sta. 3+54 | 4.9 | 2.5 | 0.6 | 5.9 | 1.1 | 0.9 | 11.0 |



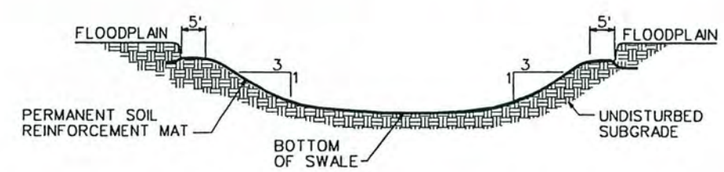

## TYPICAL CHANNEL PROFILE

NOTES:

1. POOL TO POOL SPACING (Lp-p) IS MEASURED FROM MIDPOINT OF POOL BEND TO MIDPOINT OF THE DOWNSTREAM POOL BEND.



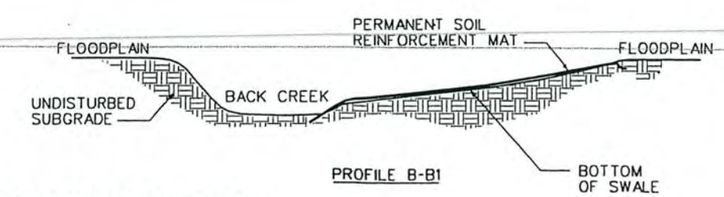

PLAN VIEW




CROSS-SECTION A-A1

NOTE:

BOTTOM OF SWALE TO TIE TO NEW CHANNEL CENTERLINE ELEVATION




PROFILE B-B1

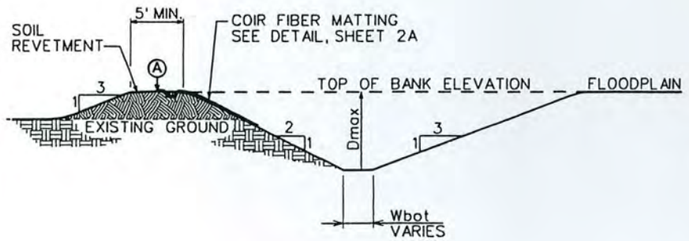
## PERMANENT SOIL REINFORCEMENT MAT

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | 2E |

PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MOSELEY, JR.

7/7/04

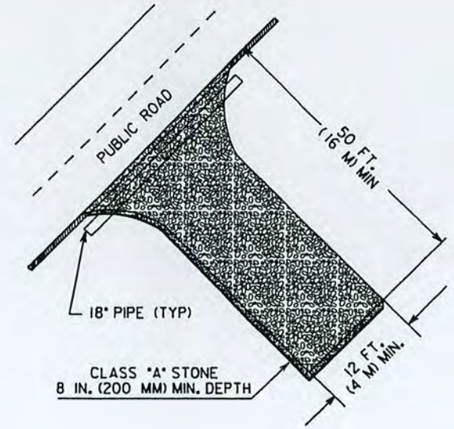



TYPICAL POOL

## MEANDER REVETMENT DATA

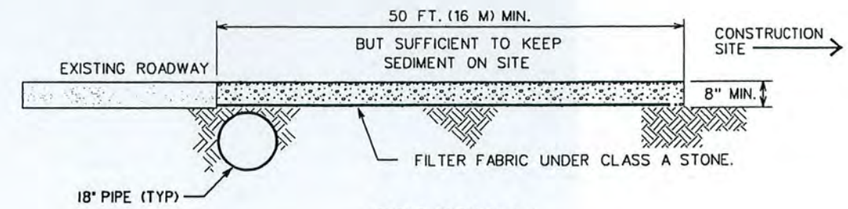
| LOCATION | STATION | ELEVATION AT PT. Ⓐ |
|---|---|---|
| POOL 5 OUTER BEND | 03+23<br>03+96 | 648.91<br>648.82 |
| POOL 6 OUTER BEND | 04+35<br>04+95 | 648.65<br>648.58 |
| POOL 12 OUTER BEND | 12+62<br>13+68 | 646.27<br>646.10 |

## MEANDER REVETMENT



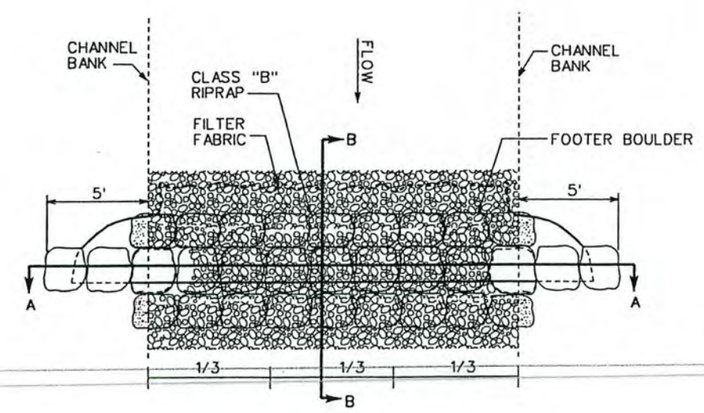

NOTES:
1. TURNING RADIUS SUFFICIENT TO ACCOMODATE LARGE TRUCKS SHALL BE PROVIDED.
2. ENTRANCE(S) SHOULD BE LOCATED TO PROVIDE FOR UTILIZATION BY ALL CONSTRUCTION VEHICLES.
3. MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW OF MUD ONTO STREETS. PERIODIC TOPDRESSING WITH STONE WILL BE NECESSARY.
4. ANY MATERIAL TRACKED ONTO THE ROADWAY MUST BE CLEANED UP IMMEDIATELY.
5. GRAVEL CONSTRUCTION ENTRANCE SHALL BE LOCATED AT ALL POINTS OF INGRESS AND EGRESS UNTIL SITE IS STABILIZED. FREQUENT CHECKS OF THE DEVICE AND TIMELY MAINTENANCE MUST BE PROVIDED.
6. NUMBER AND LOCATION OF CONSTRUCTION ENTRANCES TO BE DETERMINED BY THE ENGINEER

NOTE: FILTER FABRIC TO BE PLACED BENEATH STONE

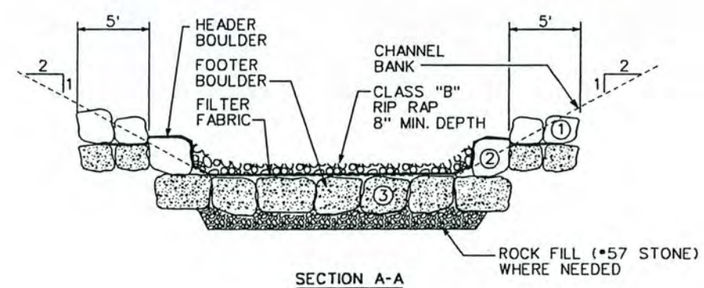



CROSS SECTION A-A

## PERMANENT CONSTRUCTION ENTRANCE

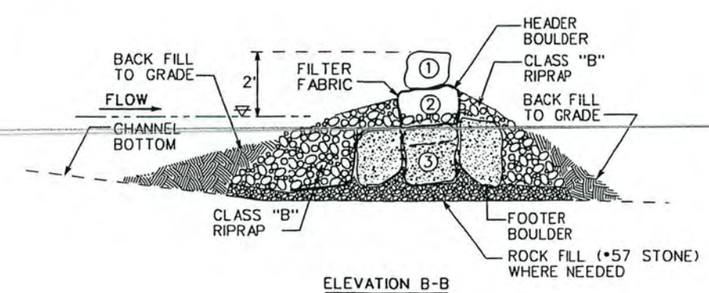



PLAN VIEW




SECTION A-A

NOTES:
1. FOR STATIONING AND ELEVATIONS OF EACH STRUCTURE, SEE SHEET 1D.
2. HEADER AND FOOTER STONES ARE LARGE ANGULAR BOULDERS APPROXIMATELY 48"L x 36"W x 24"D IN SIZE.




ELEVATION B-B

## TYPICAL RIPRAP GRADE CONTROL SILL

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559W | 2F |

PROJECT DESIGN ENGINEER
NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MODLIN, JR.

# POOL CURVE DATA

## STREAM L

**1**
PI Sta 00+45.08
D = 14° 41' 12.66" (LT)
L = 14.99'
T = 7.59'
R = 58.00'
PC Sta 00+37.58
PT Sta 00+52.57

**2**
PI Sta 00+96.41
D = 24° 47' 22.15" (LT)
L = 26.16'
T = 13.31'
R = 60.00'
PC Sta 00+83.33
PT Sta 01+09.49

**3**
PI Sta 01+87.93
D = 09° 00' 59.33" (RT)
L = 11.80'
T = 5.91'
R = 75.00'
PC Sta 01+82.03
PT Sta 01+93.83

**4**
PI Sta 02+49.51
D = 43° 12' 40.24" (LT)
L = 49.02
T = 25.74
R = 65.00'
PC Sta 02+25.00
PT Sta 02+74.02

**5**
PI Sta 03+59.63
D = 74° 12' 18.46" (RT)
L = 77.71'
T = 45.38'
R = 60.00'
PC Sta 03+20.77
PT Sta 03+98.48

**6**
PI Sta 04+62.51
D = 60° 51' 39.00" (LT)
L = 54.17'
T = 29.96'
R = 51.00'
PC Sta 04+35.43
PT Sta 04+89.60

**7**
PI Sta 05+79.74
D = 78° 45' 11.21" (RT)
L = 94.84'
T = 56.52'
* R = ~~69.00'~~ 56.00'
PC Sta 05+32.32
PT Sta 06+27.16

**8**
PI Sta 07+45.38
D = 56° 35' 27.64" (LT)
L = 74.08'
T = 40.31'
R = 75.00'
PC Sta 07+08.34
PT Sta 07+82.41

Sta. 7+82 BACK -L- =
Sta. 7+89 AHEAD -L-

**9**
PI Sta 08+79.61
D = 44° 51' 55.64" (RT)
L = 50.24'
T = 26.42'
R = 64.00'
PC Sta 08+54.49
PT Sta 09+04.73

**10**
PI Sta 09+93.48
D = 34° 53' 25.51" (LT)
L = 45.67'
T = 23.57'
R = 75.00'
PC Sta 09+70.64
PT Sta 10+16.32

**11**
PI Sta 11+44.93
D = 48° 47' 36.69" (RT)
L = 102.19'
T = 54.30'
* R = ~~120.00'~~ 104.00'
PC Sta 10+93.84
PT Sta 11+96.03

**12**
PI Sta 13+11.71
D = 65° 09' 22.62" (LT)
L = 113.72'
T = 75.09'
R = 100.00'
PC Sta 12+54.85
PT Sta 13+68.57

Sta. 14+16 BACK -L- =
Sta. 14+39 AHEAD -L-

**13**
PI Sta 14+62.76
D = 41° 48' 47.89" (RT)
L = 47.71'
T = 26.99'
R = 65.29'
PC Sta 14+38.90
PT Sta 14+86.61

**14**
PI Sta 15+81.39
D = 31° 49' 35.51" (LT)
L = 37.66'
T = 19.37'
R = 66.76'
PC Sta 15+62.56
PT Sta 16+00.22

**15**
PI Sta 16+55.48
D = 60° 03' 30.50" (RT)
L = 64.42'
T = 37.85'
R = 61.35'
PC Sta 16+23.27
PT Sta 16+87.69

**16**
PI Sta 18+88.19
D = 35° 06' 04.50" (RT)
L = 49.01'
T = 25.30'
R = 80.00'
PC Sta 17+63.68
PT Sta 18+12.69

**17**
PI Sta 19+41.30
D = 81° 25' 30.46" (LT)
L = 95.04'
T = 58.67'
R = 65.56'
PC Sta 18+93.78
PT Sta 19+88.82

**18**
PI Sta 20+95.62
D = 35° 53' 38.24" (RT)
L = 42.80'
T = 24.70'
R = 77.04'
PC Sta 20+74.22
PT Sta 21+17.02

**19a**
PI Sta 22+30.91
D = 36° 52' 59.46" (RT)
L = 51.76'
T = 26.87'
R = 80.00'
PC Sta 22+05.03
PT Sta 22+56.78

**19b**
PI Sta 23+22.67
D = 77° 19' 46.83" (RT)
L = 73.69'
T = 48.03'
R = 54.56'
PC Sta 22+85.82
PT Sta 23+59.51

**20**
PI Sta 24+29.19
D = 55° 52' 23.38" (LT)
L = 52.83'
T = 39.04'
R = 54.26'
PC Sta 24+02.77
PT Sta 24+55.60

**21**
PI Sta 25+60.11
D = 19° 42' 34.27" (RT)
L = 25.80'
T = 13.03'
R = 75.00'
PC Sta 25+47.21
PT Sta 25+73.01

**22**
PI Sta 27+10.55
D = 62° 16' 44.34" (LT)
L = 86.96'
T = 48.33'
R = 80.00'
PC Sta 26+67.08
PT Sta 27+54.03

**23**
PI Sta 28+71.67
D = 70° 16' 52.97" (RT)
L = 98.13'
T = 56.31'
R = 80.00'
PC Sta 28+22.61
PT Sta 29+20.74

Sta. 29+74 BACK -L- =
Sta. 30+05 AHEAD -L-

**24**
PI Sta 30+43.47
D = 73° 24' 29.14" (LT)
L = 77.79'
T = 44.96'
R = 60.32'
PC Sta 30+04.57
PT Sta 30+82.36

**25**
PI Sta 31+42.17
D = 46° 13' 26.89" (RT)
L = 52.44'
T = 27.74'
R = 65.00'
PC Sta 31+15.95
PT Sta 31+68.39

**26**
PI Sta 32+57.19
D = 81° 45' 57.83" (LT)
L = 92.76'
T = 56.27'
R = 65.00'
PC Sta 32+10.81
PT Sta 33+03.57

## STREAM T

T1 AND T2 NOT APPLICABLE

**T3**
PI Sta 00+93.95
D = 53° 41' 43.58" (RT)
L = 17.90'
T = 9.76'
R = 19.00'
PC Sta 00+85.00
PT Sta 01+02.90

**T4**
PI Sta 01+28.11
D = 54° 47' 40.92" (LT)
L = 18.17'
T = 9.85'
R = 18.97'
PC Sta 01+19.02
PT Sta 01+37.19

**T5**
PI Sta 01+73.20
D = 65° 31' 08.60" (RT)
L = 25.16'
T = 14.16'
R = 22.00'
PC Sta 01+60.60
PT Sta 01+85.76

**T6**
PI Sta 02+11.20
D = 66° 18' 03.23" (LT)
L = 17.40'
T = 9.80'
R = 15.00'
PC Sta 02+02.50
PT Sta 02+19.90

**T7**
PI Sta 02+52.72
D = 121° 01' 01.32" (RT)
L = 39.94'
T = 33.33'
R = 19.00'
PC Sta 02+32.75
PT Sta 02+72.69

**T8**
PI Sta 03+04.85
D = 117° 40' 15.54" (LT)
L = 45.24'
T = 36.38'
R = 22.00'
PC Sta 02+82.23
PT Sta 03+27.47

**T9**
PI Sta 03+55.91
D = 82° 17' 13.45" (RT)
L = 24.42'
T = 14.85'
R = 17.00'
PC Sta 03+43.70
PT Sta 03+68.12

## STREAM R

R1 THROUGH R9

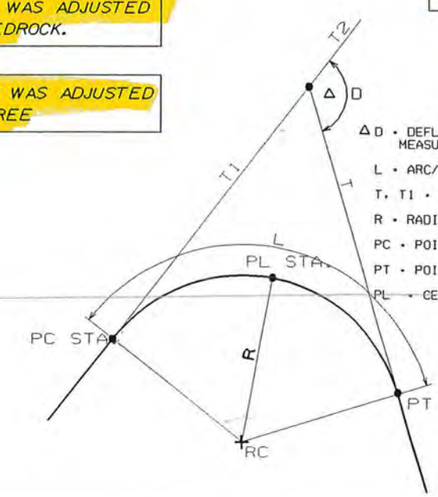
NOTE:

1. POOLS R1-R9 REPRESENT POOL-STEP STRUCTURE. POOL CURVE DATA AND RIFFLE BEARING DATA NOT APPLICABLE.

*R11 RADIUS WAS ADJUSTED DUE TO BEDROCK.

*R7 RADIUS WAS ADJUSTED TO MISS TREE

* AS-BUILT




ΔD - DEFLECTION ∠ BETWEEN TANGENT LINES T2 AND T MEASURED ALONG DIECTION OF TRAVEL
L - ARC/POOL LENGTH
T, T1 - TANGENT LENGTH
R - RADIUS OF CURVATURE
PC - POINT OF CURVATURE (WHERE ARC/POOL BEGINS)
PT - POINT OF TERMINUS (WHERE ARC/POOL ENDS)
PL - CENTER OF POOL

# RIFFLE BEARING DATA

## STREAM L

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | N 62° 15' 39.68" E | 9 | N 68° 57' 44.63" E | 18 | N 77° 19' 28.35" E | 26 | N 54° 25' 34.08" E |
| 1 | N 47° 34' 27.02" E | 10 | N 34° 04 19.12" E | 19a | S 65° 47' 32.19" E | | |
| 2 | N 22° 47' 04.87" E | 11 | N 82° 51' 55.81" E | 19b | S 11° 32' 14.64" W | | |
| 3 | N 31 48' 04.20" E | 12 | N 17° 42' 33.19" E | 20 | S 44° 20' 08.74" E | | |
| 4 | N 11° 24 36.04" W | 13 | N 59° 31' 21.08" E | 21 | S 24° 37 34.47° E | | |
| 5 | N 62° 47' 42.42" E | 14 | N 27° 41' 45.57" E | 22 | S 86° 54' 18.81" E | | |
| 6 | N 01° 56' 03.42" E | 15 | N 87° 45' 16.07" E | 23 | S 16° 37' 25.84" E | | |
| 7 | N 80° 41' 14.63" E | 16 | S 57° 08' 39.43" E | 24 | N 89° 58' 05.02" E | | |
| 8 | N 24° 05' 47.99" E | 17 | N 41° 25' 50.11" E | 25 | S 43° 48' 28.09" E | | |

## STREAM T

| | | | |
|---|---|---|---|
| T0 | N 78° 37' 28.95" W | T5 | N 16° 13' 58.65" W |
| T1 | N 80° 23' 11.38" W | T6 | N 82° 32' 01.88" W |
| T2 | N 80° 39' 09.91" W | T7 | N 38° 28' 59.44" E |
| T3 | N 26° 57' 26.33" W | T8 | N 79° 11' 16.10" W |
| T4 | N 81° 45' 07.25" W | T9 | N 03° 05' 57.35" E |

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | 2G |

## STREAM T RIFFLE DATA

| Riffle ID | Northing | Easting | Station | Elevation | Riffle ID | Northing | Easting | Station | Elevation | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TTR2 | 570616.939 | 1491206.934 | 0+70 | 652.14 | TBR2 | 570619.375 | 1491192.134 | 0+85 | 651.73 | 15.0000 | 0.0270 |
| TTR3 | 570629.524 | 1491178.196 | 1+03 | 651.64 | TBR3 | 570644.530 | 1491170.564 | 1+20 | 651.19 | 16.8359 | 0.0270 |
| TTR4 | 570654.721 | 1491156.354 | 1+38 | 651.03 | TBR4 | 570658.081 | 1491133.171 | 1+61 | 650.40 | 23.4248 | 0.0270 |
| TTR5 | 570673.704 | 1491115.205 | 1+86 | 650.18 | TBR5 | 570690.444 | 1491110.331 | 2+04 | 649.71 | 17.4355 | 0.0270 |
| TTR6 | 570701.130 | 1491097.833 | 2+21 | 649.55 | TBR6 | 570702.799 | 1491085.094 | 2+34 | 649.20 | 12.8479 | 0.0270 |
| TTR7 | 570733.261 | 1491072.455 | 2+74 | 648.96 | TBR7 | 570741.290 | 1491078.838 | 2+84 | 648.67 | 10.2566 | 0.0270 |
| TTR8 | 570776.636 | 1491065.781 | 3+30 | 648.45 | TBR8 | 570779.681 | 1491049.837 | 3+46 | 648.01 | 16.2324 | 0.0270 |
| TTR9 | 570797.299 | 1491036.050 | 3+70 | 647.87 | TBR9 | 570808.259 | 1491036.644 | 3+81 | 647.57 | 10.9766 | 0.0270 |
| TTR10 | 570832.486 | 1491021.869 | 4+11 | 647.41 | — | — | — | — | — | — | — |

## STREAM T POOL DATA

| RADIUS ID | NORTHING | EASTING | RADIUS (ft) |
|---|---|---|---|
| R3T | 570638.137 | 1491195.132 | 19.0 |
| R4T | 570635.942 | 1491153.645 | 19.0 |
| R5T | 570679.854 | 1491136.328 | 22.0 |
| R6T | 570686.251 | 1491095.929 | 15.0 |
| R7T | 570721.647 | 1491087.493 | 19.0 |
| R8T | 570755.027 | 1491061.654 | 22.0 |
| R9T | 570796.380 | 1491053.026 | 17.0 |
| R10T | 570809.675 | 1491011.716 | 25.0 |

## TRIBUTARY -R-

| RIFFLE ID | STATION | ELEVATION | SLOPE |
|---|---|---|---|
| TRI0 | 1+93 | 644.90 | |
| BRI0 | 2+16 | 643.75 | 0.05 |
| TRI1 | 2+38 | 643.74 | |
| BRI1 | 2+54 | 643.13 | 0.038 |
| TRI2 | 2+54 | 643.10 | |
| BRI2 | 2+84 | 642.60 | 0.023 |
| TRI3 | 3+12 | 642.50 | |
| BRI3 | 3+40 | 642.00 | 0.018 |

x AS-BUILT NOTES

## STREAM L POOL DATA

| Radius ID | Northing | Easting | Radius (ft) |
|---|---|---|---|
| R1 | 570496.260 | 1490716.334 | 58.0 |
| R2 | 570532.040 | 1490720.415 | 81.7 |
| R3 | 570538.650 | 1490875.441 | 59.5 |
| R4 | 570633.494 | 1490787.842 | 65.0 |
| R5 | 570703.974 | 1490901.138 | 60.0 |
| R6 | 570819.640 | 1490883.358 | 51.0 |
| R7 | 570858.289 | 1491004.732 | x ~~69.0~~ 56.0 |
| R8 | 571013.527 | 1491061.535 | 75.0 |
| R9 | 571016.431 | 1491215.102 | 64.0 |
| R10 | 571169.828 | 1491226.723 | 75.0 |
| R11 | 571124.795 | 1491431.677 | x ~~130.0~~ 104.0 |
| R12 | 571350.398 | 1491462.722 | 100.0 |
| R13 | 571343.614 | 1491634.028 | 65.3 |
| R14 | 571497.079 | 1491634.508 | 66.8 |
| R15 | 571456.428 | 1491757.801 | 61.3 |
| R16 | 571440.805 | 1491836.654 | 80.0 |
| R17 | 571519.119 | 1491983.686 | 65.6 |
| R18 | 571486.306 | 1492144.600 | 77.0 |
| R19A | 571502.765 | 1492231.276 | 80.0 |
| R19B | 571512.344 | 1492272.473 | 54.6 |
| R20 | 571452.746 | 1492371.185 | 54.3 |
| R21 | 571296.8712 | 1492342.7673 | 75.0 |
| R22 | 571278.4880 | 1492521.7038 | 80.0 |
| R23 | 571115.0197 | 1492581.5451 | 80.0 |
| R24 | 571100.872 | 1492732.206 | 60.3 |
| R25 | 570975.574 | 1492765.861 | 65.0 |
| R26 | 571034.949 | 1492889.045 | 65.0 |
| R27 | 570947.566 | 1492994.632 | 67.5 |

x RADIUS R7 ADJUSTED TO MISS TREE AND R11 ADJUSTED DUE TO BEDROCK.

## STREAM R STRUCTURE DATA TABLE

| STRUCTURE ID | TYPE | STATION | NORTHING | EASTING | ELEVATION |
|---|---|---|---|---|---|
| SP1 | STEP/POOL | 0+22 | N/A | N/A | 651.15 |
| SP2 | STEP/POOL | 0+44 | N/A | N/A | 650.48 |
| SP3 | STEP/POOL | 0+60 | N/A | N/A | 649.81 |
| SP4 | STEP/POOL | 0+79 | N/A | N/A | 649.14 |
| SP5 | STEP/POOL | 1+01 | N/A | N/A | 648.31 |
| SP6 | STEP/POOL | 1+18 | N/A | N/A | 647.81 |
| SP7 | STEP/POOL | 1+37 | N/A | N/A | 647.14 |
| SP8 | STEP/POOL | 1+55 | N/A | N/A | x ~~646.56~~ 646.86 |
| SP9 | EXISTING | 1+73 | N/A | N/A | 646.24 |

## STREAM L RIFFLE DATA

| Riffle ID | Northing | Easting | Station | Elevation | Riffle ID | Northing | Easting | Station | Elevation | Length | Slope |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TR0 | 570427.4327 | 1490710.0665 | 00+00 | 646.62 | BR0 | 570444.9250 | 1490743.3293 | 00+38 | 646.53 | 37.58 | 0.0025 |
| TR1 | 570453.5270 | 1490755.5503 | 00+53 | 646.52 | BR1 | 570474.2825 | 1490778.2598 | 00+83 | 646.44 | 30.77 | 0.0026 |
| TR2 | 570504.1192 | 1490797.2418 | 01+19 | 646.43 | BR2 | 570557.7370 | 1490819.0677 | 01+77 | 646.29 | 57.89 | 0.0024 |
| TR3 | 570572.8437 | 1490826.7165 | 02+05 | 646.27 | BR3 | 570599.2407 | 1490843.0843 | 02+25 | 646.18 | 19.50 | 0.0045 |
| TR4 | 570646.3532 | 1490851.5573 | 02+74 | 646.12 | BR4 | 570692.1040 | 1490842.3240 | 03+21 | 645.91 | 46.67 | 0.0045 |
| TR5 | 570757.3365 | 1490873.7080 | 03+98 | 645.82 | BR5 | 570774.2824 | 1490906.6742 | 04+35 | 645.65 | 37.07 | 0.0045 |
| TR6 | 570817.9193 | 1490934.3292 | 04+90 | 645.58 | BR6 | 570860.6179 | 1490935.7713 | 05+32 | 645.41 | 42.72 | 0.0039 |
| TR7 | 570926.3796 | 1490993.5663 | 06+27 | 645.29 | BR7 | 570939.5154 | 1491073.6714 | 07+08 | 644.90 | 81.17 | 0.0048 |
| TR8 | 570982.9062 | 1491129.9993 | 07+82 = 07+89 | 644.81 | BR8 | 571042.4505 | 1491156.6302 | 08+55 | 644.48 | 65.23 | 0.0050 |
| TR9 | 571076.1645 | 1491192.1268 | 09+05 | 644.42 | BR9 | 571099.8273 | 1491253.6474 | 09+71 | 644.09 | 65.91 | 0.0050 |
| TR10 | 571127.8111 | 1491288.8486 | 10+16 | 644.01 | BR10 | 571192.0217 | 1491332.2755 | 10+94 | 643.62 | 77.52 | 0.0051 |
| TR11 | 571243.8656 | 1491416.7712 | 11+96 | 643.49 | BR11 | N/A | N/A | 12+55 | 643.27 | 58.82 | 0.0038 |
| TR12 | 571319.9796 | 1491557.9756 | 13+69 | ~~643.61~~ 643.01 | BR12 | 571365.3592 | 1491572.4656 | 14+16=14+39 | ~~642.88~~ 643.21 | 47.64 | 0.0061 |
| TR13 | 571400.8966 | 1491602.7004 | 14+87 | ~~642.95~~ 642.95 | BR13 | 571439.4229 | 1491668.1621 | 15+63 | ~~642.20~~ 642.39 | 75.96 | 0.0060 |
| TR14 | 571466.3521 | 1491693.7759 | 16+00 | 642.25 | BR14 | 571486.9535 | 1491704.5897 | 16+24 | 642.09 | 23.27 | 0.0070 |
| TR15 | 571517.7738 | 1491757.8109 | 16+88 | 642.01 | BR15 | 571520.7433 | 1491833.5183 | 17+64 | 641.48 | 75.77 | 0.0070 |
| TR16 | 571508.0084 | 1491880.0551 | 18+13 | 641.42 | BR16 | 571463.8460 | 1491948.4374 | 18+94 | 640.77 | 81.40 | 0.0080 |
| TR17 | 571477.4536 | 1492034.2975 | 19+89 | 640.65 | BR17 | 571541.2483 | 1492090.5993 | 20+74 | 639.97 | 85.09 | 0.0080 |
| TR18 | 571562.4525 | 1492132.9176 | 21+22 | 639.91 | BR18 | 571580.7792 | 1492213.5627 | 22+05 | 639.25 | 82.70 | 0.0080 |
| TR19 | 571505.8440 | 1492326.6425 | 23+60 | ~~639.26~~ 639.60 | BR19 | 571463.4605 | 1492317.9913 | 24+03 | ~~638.73~~ 639.20 | 43.26 | 0.0080 |
| TR20 | 571414.7845 | 1492332.4129 | 24+56 | ~~638.65~~ 639.00 | BR20 | 571349.2866 | 1492396.4110 | 25+47 | ~~638.32~~ 638.80 | 91.57 | 0.0080 |
| TR21 | 571328.1244 | 1492410.9454 | 25+73 | ~~637.86~~ 638.20 | BR21 | 571245.1514 | 1492448.9806 | 26+64 | ~~637.24~~ 637.44 | 91.28 | 0.0068 |
| TR22 | ~~571198.6047~~ | ~~1492517.3856~~ | ~~29+69~~ 27+26 | 637.11 | BR22 | 571194.9030 | 1492585.8633 | 28+20 | 636.55 | 68.58 | 0.0082 |
| TR23 | 571137.9074 | 1492658.2012 | 29+18 | 636.42 | BR23 | 571084.1075 | 1492674.2646 | 29+74=30+05 | 636.02 | 56.15 | 0.0071 |
| TR24 | 571040.5541 | 1492732.2403 | 30+82 | 635.92 | BR24 | 571040.5732 | 1492765.8236 | 31+16 | 635.65 | 33.58 | 0.0080 |
| TR25 | 571020.5693 | 1492812.7683 | 31+68 | 635.59 | BR25 | 570989.9528 | 1492842.1371 | 32+11 | 635.25 | 42.43 | 0.0080 |
| TR26 | 570982.0805 | 1492926.8595 | 33+04 | 635.14 | BR26 | 571002.4676 | 1492955.3625 | 33+39 | 634.86 | 35.04 | 0.0080 |
| TR27 | 571014.3225 | 1492984.6402 | 33+71 | 634.82 | | | | | | | |

## STRUCTURE DATA TABLE

| STRUCTURE ID | TYPE | STATION | NORTHING | EASTING | ELEVATION |
|---|---|---|---|---|---|
| CV1 | CROSS-VANE | 00+53 | 570453.5270 | 1490755.5503 | 646.52 |
| CV2 | CROSS-VANE | 01+19 | 570504.1192 | 1490797.2418 | 646.43 |
| MCV1 | MODIFIED CROSS VANE | 07+08 | 570939.5154 | 1491073.6714 | 644.90 |
| RS1 | GRADE CONTROL SILL | 07+89 | 570982.9062 | 1491129.9993 | 644.81 |
| JH1 | J-HOOK VANE | 09+71 | 571099.8273 | 1491253.6474 | 644.09 |
| JH6 | J-HOOK VANE | 00+85 | 570619.3750 | 1491192.1335 | 651.73 |
| JH7 | J-HOOK VANE | 01+20 | 570644.5305 | 1491170.5638 | 651.19 |
| x CV3 MCV | CROSS-VANE MODIFIED CROSS VANE | 01+61 | 570658.0812 | 1491133.1715 | 650.40 |
| x CV4 MCV | CROSS-VANE MODIFIED CROSS VANE | 02+04 | 570690.4443 | 1491110.3307 | 649.71 |
| x CV5 MCV | CROSS-VANE MODIFIED CROSS VANE | 02+34 | 570702.7993 | 1491085.0935 | 649.20 |
| x RS2 MCV | GRADE CONTROL SILL MODIFIED CROSS VANE | 02+74 | 570733.261 | 1491072.455 | 648.96 |
| x CV6 MCV | CROSS-VANE MODIFIED CROSS VANE | 03+46 | 570779.6812 | 1491049.8365 | 648.01 |
| x CV7 MCV | CROSS-VANE MODIFIED CROSS VANE | 03+81 | 570808.2593 | 1491036.6437 | 647.57 |
| MCV2 | MODIFIED CROSS-VANE | ~~13+12~~ 13+25 | 571279.6705 | 1491533.4079 | x ~~643.18~~ 643.69 |
| MCV3 | MODIFIED CROSS-VANE | ~~14+39~~ 14+49 | 571365.3592 | 1491572.4656 | x ~~642.81~~ 643.21 |
| MCV4 | MODIFIED CROSS-VANE | 15+63 | 571439.4229 | 1491668.1621 | x ~~642.29~~ 642.39 |
| MCV5 | MODIFIED CROSS-VANE | 16+24 | 571486.9535 | 1491704.5897 | 642.09 |
| x ~~MCV6~~ | ~~MODIFIED CROSS-VANE~~ | ~~17+64~~ | ~~571520.7433~~ | ~~1491833.5183~~ | ~~641.48~~ |
| JH2 | J-HOOK VANE | 18+94 | 571463.8460 | 1491948.4374 | 640.77 |
| x ~~BSV1~~ | ~~STEP CROSS-VANE~~ | ~~N/A~~ | ~~N/A~~ | ~~N/A~~ | ~~648.85~~ |
| x ~~BSV2~~ | ~~STEP CROSS-VANE~~ | ~~N/A~~ | ~~N/A~~ | ~~N/A~~ | ~~647.18~~ |
| x ~~BSV3~~ | ~~STEP CROSS-VANE~~ | ~~N/A~~ | ~~N/A~~ | ~~N/A~~ | ~~646.80~~ |
| x ~~BSV4~~ | ~~STEP CROSS-VANE~~ | ~~N/A~~ | ~~N/A~~ | ~~N/A~~ | ~~645.80~~ |
| x BRSA MCV | GRADE CONTROL SILL MODIFIED CROSS VANE | N/A | N/A | N/A | x ~~644.46~~ 644.58 |
| MCV7 | MODIFIED CROSS-VANE | 23+21 | 571549.5327 | 1492312.3910 | x ~~638.31~~ 640.10 |
| x RS3 MCV | GRADE CONTROL SILL MODIFIED CROSS VANE | 24+56 | 571414.7845 | 1492332.4129 | x ~~638.65~~ 639.0 |
| x JH3 MCV | J-HOOK VANE MODIFIED CROSS-VANE | 26+64 | 571245.1514 | 1492448.9806 | x ~~637.24~~ 637.44 |
| x MCV8 | MODIFIED CROSS VANE | ~~27+97~~ 27+26 | ~~571212.3599~~ | ~~1492476.6867~~ | 637.17 |
| x JH4 MCV | J-HOOK VANE MODIFIED CROSS-VANE | 28+20 | 571194.9030 | 1492585.8633 | 636.55 |
| MCV9 | MODIFIED CROSS VANE | 31+16 | 571040.5732 | 1492765.8236 | 635.65 |
| x JH5 MCV | J-HOOK VANE MODIFIED CROSS-VANE | 32+11 | 570989.9528 | 1492842.1371 | 635.25 |

STRUCTURES LOCATED AS DEPICTED IN PLAN SHEETS AND AS APPROVED BY ENGINEER.

STRUCTURES BSV1, BSV2, BSV3 & BSV4 WERE DELETED DUE TO BEDROCK.

STRUCTURES JH3, JH4, & JH5 WERE CHANGE TO MODIFIED CROSS VANE.

STRUCTURES CV3, CV4, CV5, RS2, CV6 & CV7 WERE CHANGE TO MODIFIED CROSS VANE.

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | 3 |

PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MORGAN, JR.

## BENCHMARK DESCRIPTION TABLE

| LABEL | TYPE | ELEVATION | NORTHING | EASTING |
|---|---|---|---|---|
| BL-5 | NCDOT CAPPED REBAR-PERMANENT MONUMENT | 649.66 | 570767.0770 | 1490929.5710 |
| BL-6 | NCDOT CAPPED REBAR-PERMANENT MONUMENT | 647.65 | 571135.7180 | 1491285.7050 |
| BL-7 | NCDOT CAPPED REBAR-PERMANENT MONUMENT | 648.96 | 571290.2190 | 1491482.0690 |
| BL-8 | NCDOT CAPPED REBAR-PERMANENT MONUMENT | 646.29 | 571376.0330 | 1491873.1600 |
| BL-9 | NCDOT CAPPED REBAR-PERMANENT MONUMENT | 643.28 | 571513.4600 | 1492185.0560 |
| BL-10 | NCDOT CAPPED REBAR-PERMANENT MONUMENT | 641.67 | 571297.6060 | 1492531.6600 |
| BL-11 | NCDOT CAPPED REBAR-PERMANENT MONUMENT | 640.42 | 571104.6480 | 1492980.9510 |
| BL-12 | NCDOT CAPPED REBAR-PERMANENT MONUMENT | 666.30 | 571246.8870 | 1493195.4690 |

## SUMMARY OF EARTHWORK

| BACK CREEK LOCATION | | | | | | | Xsection | Total Cut | | EXCAVATION | | Total Fill | | FILL | BORROW | WASTE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | sq ft | cu ft | | sq ft | cu ft | cu ft + % | | | |
| | | | | | | | 0+00 | 16 | 0 | | 8.8 | 0 | | | | |
| 0 | + | 00 | TO | 1 | + | 00 | 1+00 | 34.8 | 2540.0 | 94 | 0.0 | 440.0 | 616 | 23 | 0 | 71 |
| 1 | + | 00 | TO | 2 | + | 00 | 2+00 | 74.6 | 5470.0 | 203 | 0.0 | 0.0 | 0 | 0 | 0 | 203 |
| 2 | + | 00 | TO | 3 | + | 00 | 3+00 | 48.9 | 6175.0 | 229 | 67.8 | 3390.0 | 4746 | 176 | 0 | 53 |
| 3 | + | 00 | TO | 4 | + | 00 | 4+00 | 54.5 | 5170.0 | 191 | 75.3 | 7155.0 | 10017 | 371 | 180 | 0 |
| 4 | + | 00 | TO | 5 | + | 00 | 5+00 | 48.6 | 5155.0 | 191 | 0.0 | 3765.0 | 5271 | 195 | 4 | 0 |
| 5 | + | 00 | TO | 6 | + | 00 | 6+00 | 123.8 | 8620.0 | 319 | 0.0 | 0.0 | 0 | 0 | 0 | 319 |
| 6 | + | 00 | TO | 7 | + | 00 | 7+00 | 83.7 | 10375.0 | 384 | 71.3 | 3565.0 | 4991 | 185 | 0 | 199 |
| 7 | + | 00 | TO | 8 | + | 00 | 8+00 | 30.1 | 5690.0 | 211 | 22.4 | 4685.0 | 6559 | 243 | 32 | 0 |
| 8 | + | 00 | TO | 9 | + | 00 | 9+00 | 78.8 | 5445.0 | 202 | 40.4 | 3140.0 | 4396 | 163 | 0 | 39 |
| 9 | + | 00 | TO | 10 | + | 00 | 10+00 | 54.9 | 6685.0 | 248 | 40.9 | 4065.0 | 5691 | 211 | 0 | 37 |
| 10 | + | 00 | TO | 11 | + | 00 | 11+00 | 156.0 | 10545.0 | 391 | 80.0 | 6045.0 | 8463 | 313 | 0 | 77 |
| 11 | + | 00 | TO | 12 | + | 00 | 12+00 | 198.0 | 17700.0 | 656 | 45.6 | 6280.0 | 8792 | 326 | 0 | 330 |
| 12 | + | 00 | TO | 13 | + | 00 | 13+00 | 28.0 | 11300.0 | 419 | 54.5 | 5005.0 | 7007 | 260 | 0 | 159 |
| 13 | + | 00 | TO | 14 | + | 00 | 14+00 | 2.6 | 1530.0 | 57 | 0.0 | 2725.0 | 3815 | 141 | 85 | 0 |
| 14 | + | 00 | TO | 15 | + | 00 | 15+00 | 2.8 | 270.0 | 10 | 16.1 | 805.0 | 1127 | 42 | 32 | 0 |
| 15 | + | 00 | TO | 16 | + | 00 | 16+00 | 3.3 | 305.0 | 11 | 13.8 | 1495.0 | 2093 | 78 | 66 | 0 |
| 16 | + | 00 | TO | 17 | + | 00 | 17+00 | 2.4 | 285.0 | 11 | 12.8 | 1330.0 | 1862 | 69 | 58 | 0 |
| 17 | + | 00 | TO | 18 | + | 00 | 18+00 | 0.0 | 120.0 | 4 | 34.0 | 2340.0 | 3276 | 121 | 117 | 0 |
| 18 | + | 00 | TO | 19 | + | 00 | 19+00 | 41.5 | 2075.0 | 77 | 5.1 | 1955.0 | 2737 | 101 | 25 | 0 |
| 19 | + | 00 | TO | 20 | + | 00 | 20+00 | 39.1 | 4030.0 | 149 | 0.0 | 255.0 | 357 | 13 | 0 | 136 |
| 20 | + | 00 | TO | 21 | + | 00 | 21+00 | 56.3 | 4770.0 | 177 | 0.0 | 0.0 | 0 | 0 | 0 | 177 |
| 21 | + | 00 | TO | 22 | + | 00 | 22+00 | 30.9 | 4360.0 | 161 | 0.0 | 0.0 | 0 | 0 | 0 | 161 |
| 22 | + | 00 | TO | 23 | + | 00 | 23+00 | 24.3 | 2760.0 | 102 | 1.0 | 50.0 | 70 | 3 | 0 | 100 |
| 23 | + | 00 | TO | 24 | + | 00 | 24+00 | 29.7 | 2700.0 | 100 | 0.0 | 50.0 | 70 | 3 | 0 | 97 |
| 24 | + | 00 | TO | 25 | + | 00 | 25+00 | 75.5 | 5260.0 | 195 | 56.5 | 2825.0 | 3955 | 146 | 0 | 48 |
| 25 | + | 00 | TO | 26 | + | 00 | 26+00 | 125.0 | 10025.0 | 371 | 41.2 | 4885.0 | 6839 | 253 | 0 | 118 |
| 26 | + | 00 | TO | 27 | + | 00 | 27+00 | 47.1 | 8605.0 | 319 | 36.9 | 3905.0 | 5467 | 202 | 0 | 116 |
| 27 | + | 00 | TO | 28 | + | 00 | 28+00 | 42.1 | 4460.0 | 165 | 38.7 | 3780.0 | 5292 | 196 | 31 | 0 |
| 28 | + | 00 | TO | 29 | + | 00 | 29+00 | 100.0 | 7105.0 | 263 | 34.4 | 3655.0 | 5117 | 190 | 0 | 74 |
| 29 | + | 00 | TO | 30 | + | 00 | 30+00 | 171.1 | 13555.0 | 502 | 115.3 | 7485.0 | 10479 | 388 | 0 | 114 |
| 30 | + | 00 | TO | 31 | + | 00 | 31+00 | 111.0 | 14105.0 | 522 | 49.1 | 8220.0 | 11508 | 426 | 0 | 96 |
| 31 | + | 00 | TO | 32 | + | 00 | 32+00 | 64.8 | 8790.0 | 326 | 104.9 | 7700.0 | 10780 | 399 | 74 | 0 |
| 32 | + | 00 | TO | 33 | + | 00 | 33+00 | 48.6 | 5670.0 | 210 | 115.7 | 11030.0 | 15442 | 572 | 362 | 0 |
| 33 | + | 00 | TO | 33 | + | 71 | | 0.0 | 1725.3 | 64 | 0.0 | 4107.4 | 5750 | 213 | 149 | 0 |
| SUBTOTAL | | | | | | | | 2049 | 203375 | 7532 | 1183 | 116132 | 162585 | 6022 | 1214 | 2725 |
| WASTE / (-BORROW) | | | | | | | | | | | | | | | | 1511 |
| PROJECT TOTALS | | | | | | | | | | 7532 | | | | 6022 | | 1511 |
| SAY | | | | | | | | | | 7600 | | | | 6100 | | 1500 |

APPROXIMATE QUANTITIES ONLY, UNCLASSIFIED EXCAVATION,\BORROW EXCAVATION, FINE GRADING AND CLEARING AND GRUBBING WILL BE PAID FOR AT THE CONTRACT LUMP SUM PRICE FOR "GRADING." A SHRINKAGE FACTOR OF 1.4 WAS ASSUMED.

## SUMMARY OF QUANTITIES

| Section | Item | Quantity | Units |
|---|---|---|---|
| 800 | Mobilization | 1 | LS |
| SP | Construction Surveying | 1 | LS |
| SP | Grading | 1 | LS |
| 802 | Fence Removal and Disposal | 660 | LF |
| 866 | Woven Wire Fence, 47" Fabric | 7044 | LF |
| 866 | 4-strand Barbed Wire Fence | 216 | LF |
| 866 | 4" Timber Fence Posts, 8' Long | 827 | EA |
| 866 | 16' Single Gates | 2 | EA |
| 866 | 12' Single Gates | 2 | EA |
| 1110 | Work Zone Signs | 68 | SF |
| 1032 | 18-inch Corragated Metal Pipe | 28 | LF |
| 1032 | 36-inch Aluminized Pipe | 32 | LF |
| 1042 | Filter Fabric for Drainage | 3010 | SY |
| 1605 | Temporary Silt Fence | 2925 | LF |
| 1610 | Stone for Erosion Control, Class A | 56 | TON |
| 1610 | Stone for Erosion Control, Class B | 241 | TON |
| 1610 | #57 Stone | 409 | TON |
| 1610 | ABC Stone | 54 | TON |
| 1610 | Sediment Control Stone | 100 | TON |
| 1615 | Temporary Mulching | 27 | ACR |
| 1620 | Seed for Temporary Seeding | 1000 | LB |
| 1620 | Fertilizer for Temporary Seeding | 4 | TON |
| 1630 | Silt Excavation | 170 | CY |
| 1660 | Seeding and Mulching | 26 | ACR |
| 1661 | Seed for Repair Seeding | 250 | LB |
| 1661 | Fertilizer for Repair Seeding | 0.75 | TON |
| 1662 | Seed for Supplemental Seeding | 650 | LB |
| 1665 | Fertilizer Topdressing | 19.25 | TON |
| SP | Safety Fence | 1870 | LF |
| SP | Special Stilling Basin | 4 | EA |
| SP | Temporary Stream Diversion | 1 | LS |
| SP | Impervious Select Material | 579 | CY |
| SP | Channel Substrate Material, Rip Rap, Class A | 1211 | TON |
| SP | Coir Fiber Matting | 12314 | SY |
| SP | Permanent Soil Reinforcement Mat | 107 | SY |
| SP | Boulder, Header/Footer | 2734 | TON |
| SP | Rip Rap-Class B | 219 | TON |
| SP | Rip Rap-Class A | 33 | TON |
| SP | Disking | 18 | ACR |

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | 4 |

PROJECT DESIGN ENGINEER

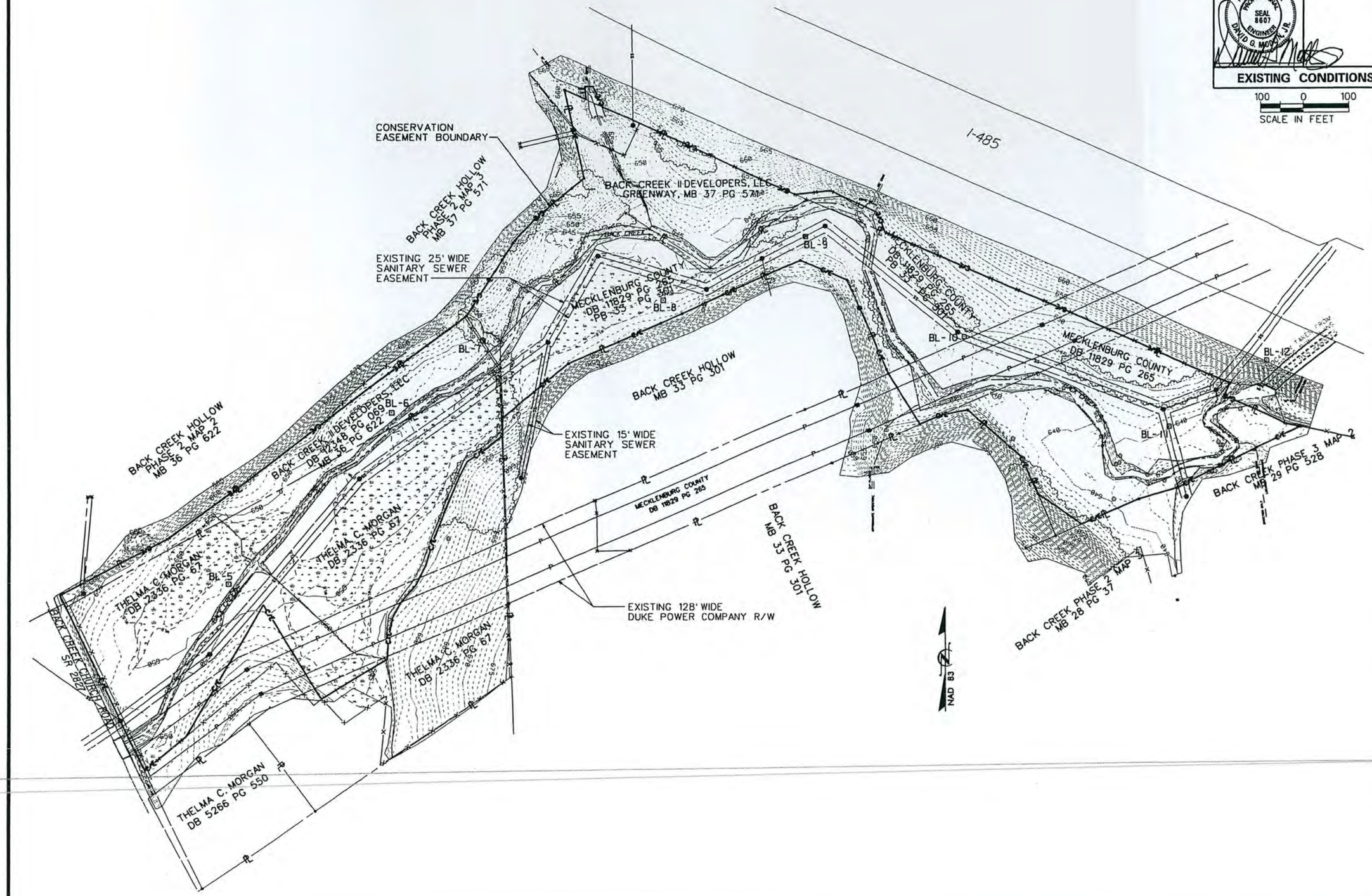
NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MOYER, J.R.

7/8/04

## EXISTING CONDITIONS

100 0 100

SCALE IN FEET



| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | 5 |

PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MOBLIN, JR.

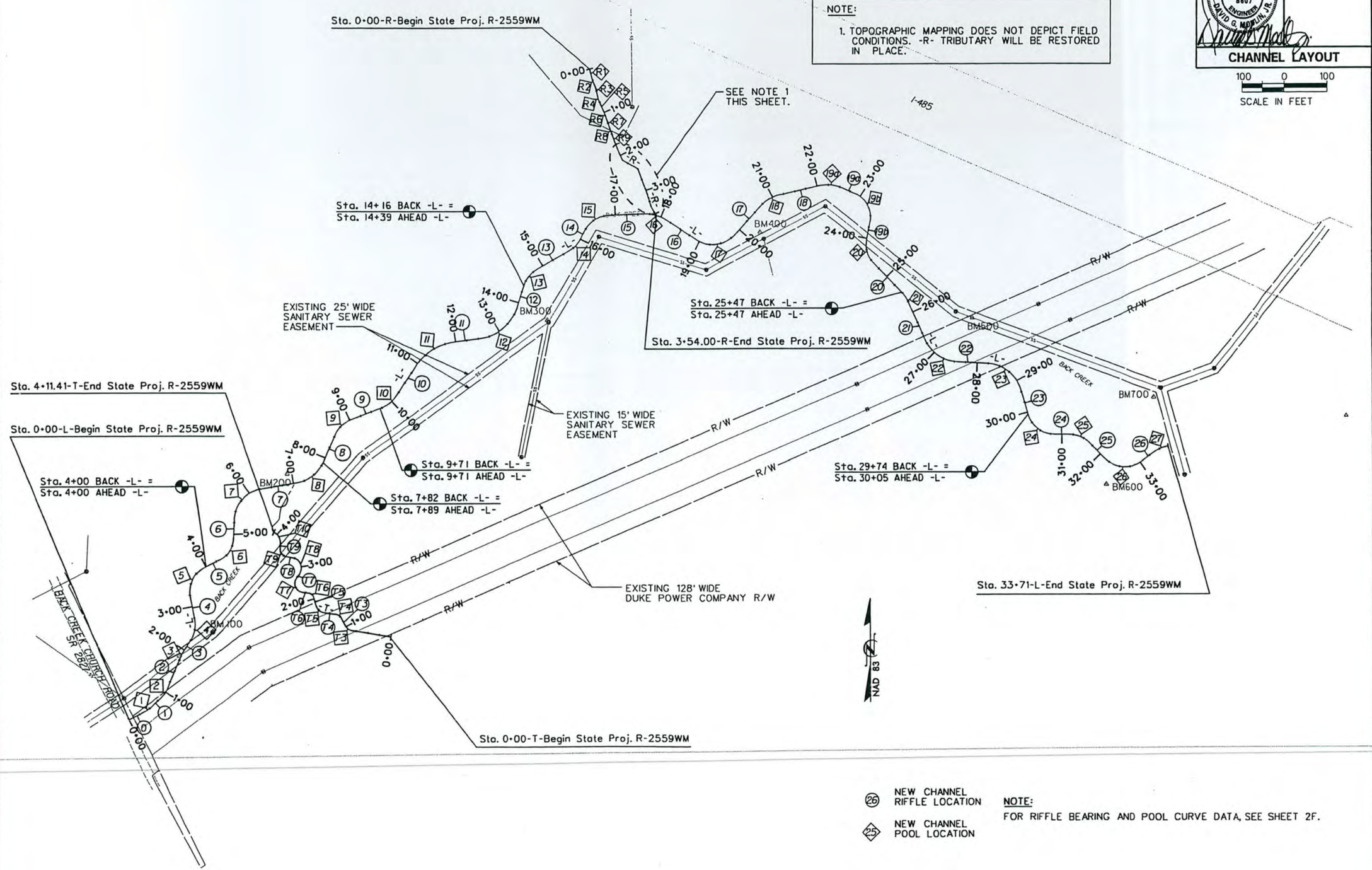
# CHANNEL LAYOUT

100 0 100

SCALE IN FEET

NOTE:

1. TOPOGRAPHIC MAPPING DOES NOT DEPICT FIELD CONDITIONS. -R- TRIBUTARY WILL BE RESTORED IN PLACE.




(26) NEW CHANNEL RIFFLE LOCATION

(25) NEW CHANNEL POOL LOCATION

NOTE:

FOR RIFFLE BEARING AND POOL CURVE DATA, SEE SHEET 2F.

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | 6 |

PROJECT DESIGN ENGINEER

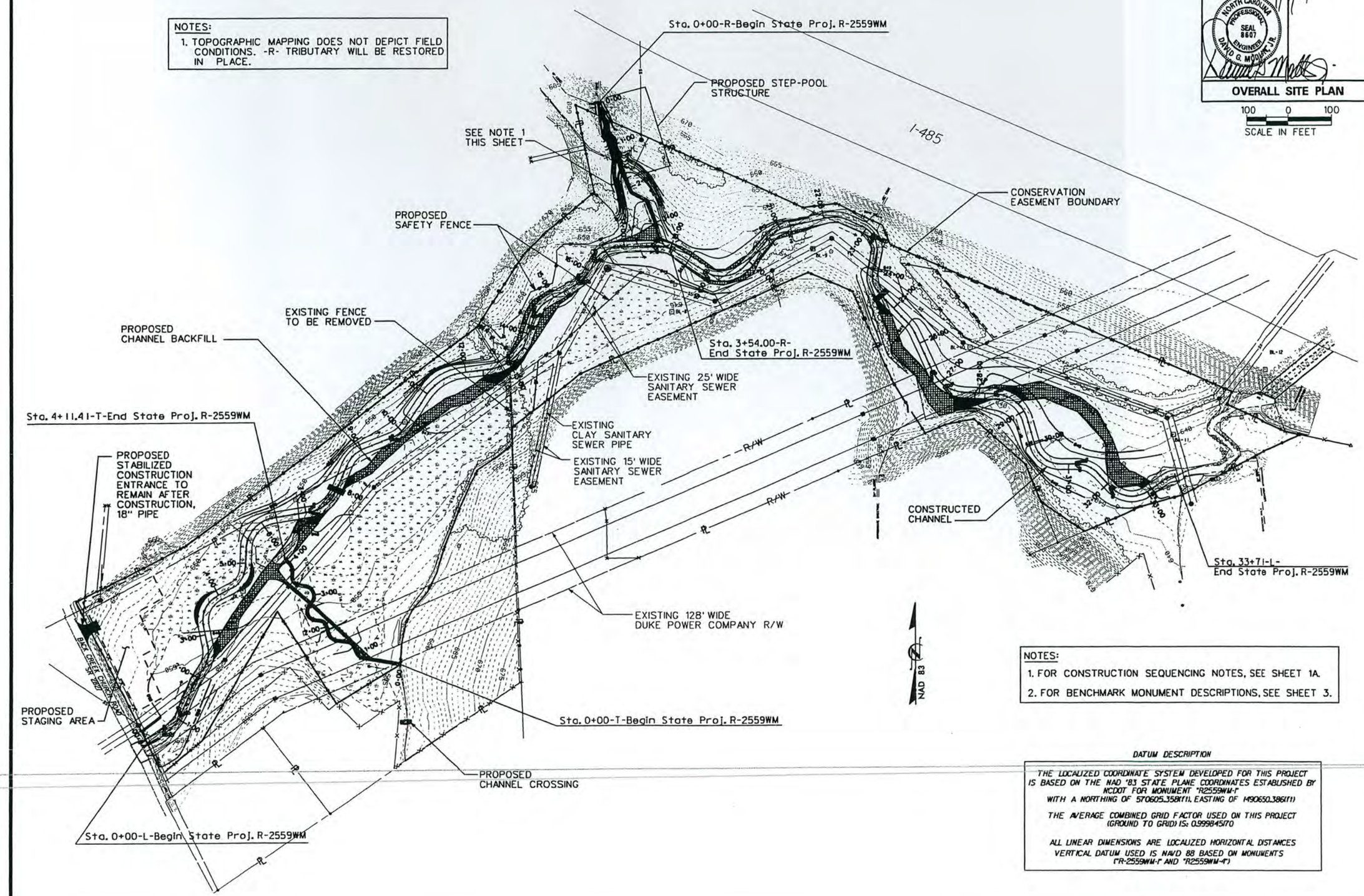
NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MOORE, JR.

7/7/04

# OVERALL SITE PLAN

100 0 100
SCALE IN FEET

NOTES:
1. TOPOGRAPHIC MAPPING DOES NOT DEPICT FIELD CONDITIONS. -R- TRIBUTARY WILL BE RESTORED IN PLACE.




NOTES:
1. FOR CONSTRUCTION SEQUENCING NOTES, SEE SHEET 1A.
2. FOR BENCHMARK MONUMENT DESCRIPTIONS, SEE SHEET 3.

*DATUM DESCRIPTION*

*THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE NAD '83 STATE PLANE COORDINATES ESTABLISHED BY NCDOT FOR MONUMENT "R2559WM-1"*
*WITH A NORTHING OF 570605.358(ft), EASTING OF 1490650.386(ft)*

*THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.999845170*

*ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES*
*VERTICAL DATUM USED IS NAVD 88 BASED ON MONUMENTS ("R-2559WM-1" AND "R2559WM-4")*

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | 7 |

PROJECT DESIGN ENGINEER

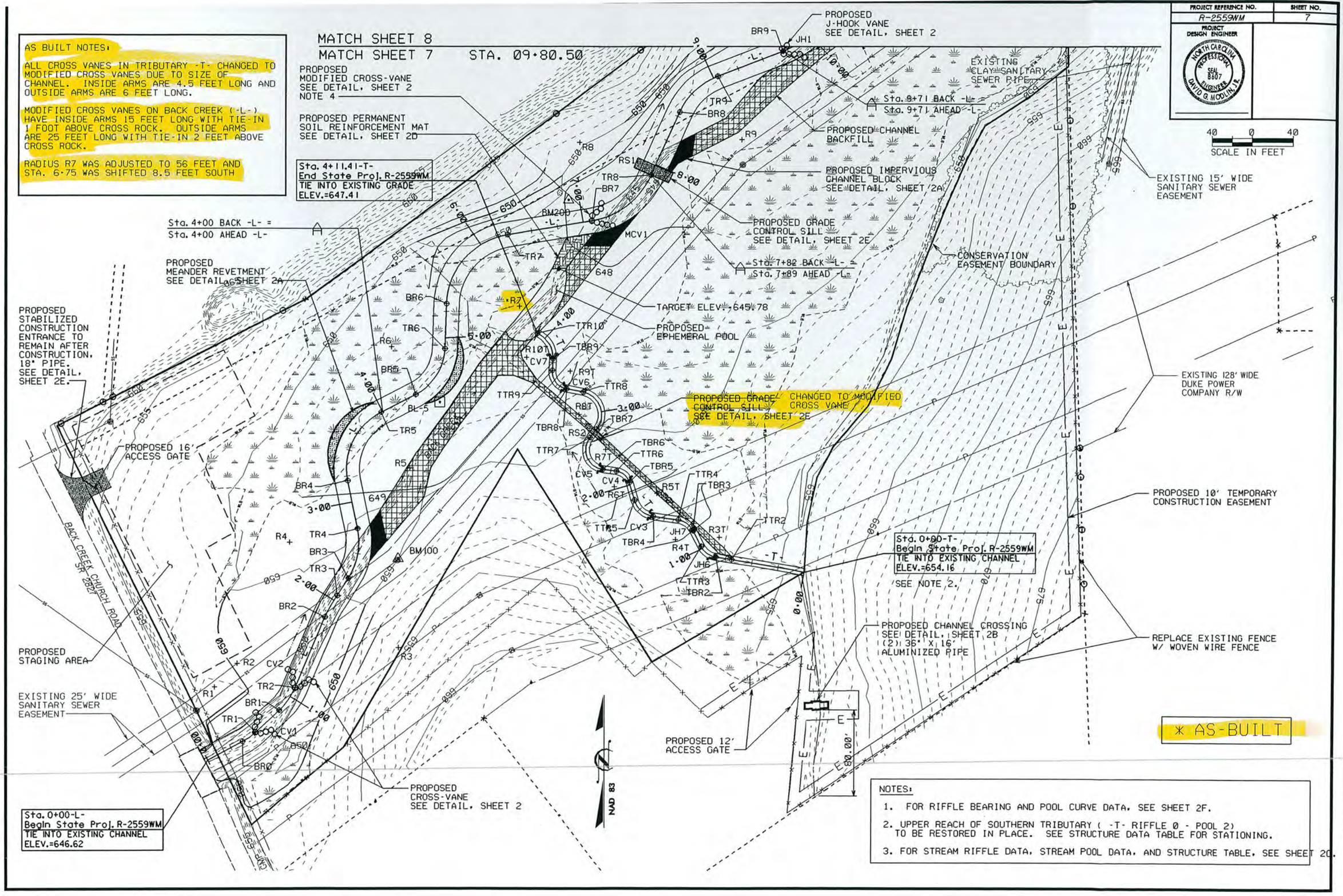
NORTH CAROLINA PROFESSIONAL SEAL 8807 ENGINEER DAVID G. MOOLINA, JR.

AS BUILT NOTES:

ALL CROSS VANES IN TRIBUTARY -T- CHANGED TO MODIFIED CROSS VANES DUE TO SIZE OF CHANNEL. INSIDE ARMS ARE 4.5 FEET LONG AND OUTSIDE ARMS ARE 6 FEET LONG.

MODIFIED CROSS VANES ON BACK CREEK (-L-) HAVE INSIDE ARMS 15 FEET LONG WITH TIE-IN 1 FOOT ABOVE CROSS ROCK. OUTSIDE ARMS ARE 25 FEET LONG WITH TIE-IN 2 FEET ABOVE CROSS ROCK.

RADIUS R7 WAS ADJUSTED TO 56 FEET AND STA. 6+75 WAS SHIFTED 8.5 FEET SOUTH




NOTES:

1. FOR RIFFLE BEARING AND POOL CURVE DATA, SEE SHEET 2F.
2. UPPER REACH OF SOUTHERN TRIBUTARY ( -T- RIFFLE 0 - POOL 2) TO BE RESTORED IN PLACE. SEE STRUCTURE DATA TABLE FOR STATIONING.
3. FOR STREAM RIFFLE DATA, STREAM POOL DATA, AND STRUCTURE TABLE, SEE SHEET 2C.

AS BUILT

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | 8 |

PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MOOLINI, JR.

NOTES:

1. TOPOGRAPHIC MAPPING DOES NOT DEPICT FIELD CONDITIONS. -R- TRIBUTARY WILL BE RESTORED IN PLACE.
2. BACK CREEK RIFFLES 12 THROUGH 16 WILL BE BACKFILLED TO DESIGN ELEVATION AND GRADE.
3. FOR RIFFLE BEARING AND POOL CURVE DATA, SEE SHEET 2F.
4. FOR STREAM RIFFLE DATA, STREAM POOL DATA AND STRUCTURE TABLE, SEE SHEET 2G.

AS BUILT NOTES

DUE TO BEDROCK BEING ENCOUNTERED AT STA. 12+25 THAT CAUSED THE DESIGN ELEVATION TO BE RAISED BY 0.85 FEET, THE FOLLOWING ADJUSTMENTS WERE MADE TO THE CHANNEL:

BOULDER TOE PROTECTION INSTALLED FROM APPROXIMATELY STA. 12+50 TO 13+00 RT. -L-

RADIUS 11 ADJUSTED TO 104 FEET AND BR 11 SHIFTED SOUTH 14 FEET

MCV 2 MOVED TO STA. 13+25 AT ELEVATION 643.69

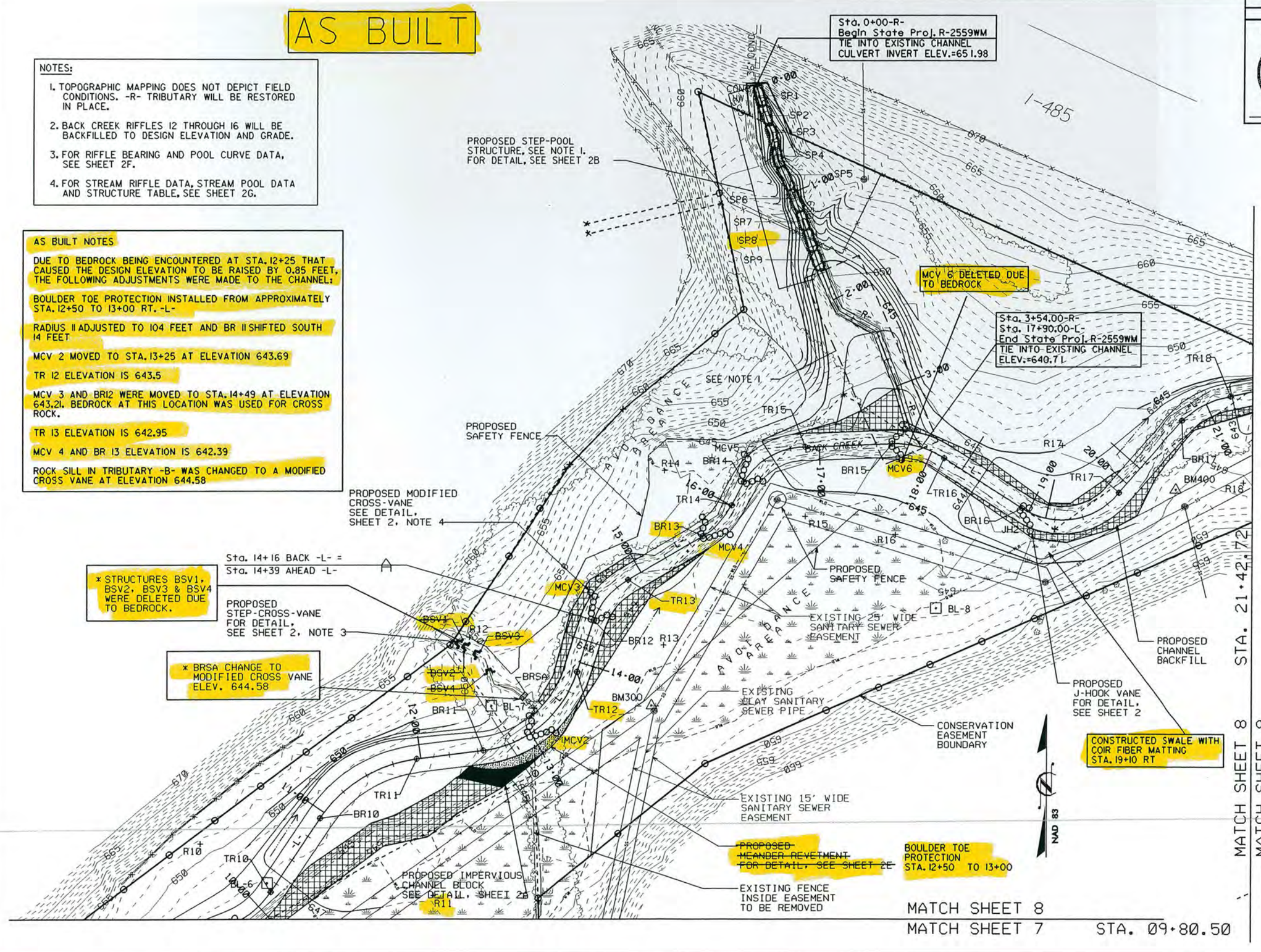
TR 12 ELEVATION IS 643.5

MCV 3 AND BR12 WERE MOVED TO STA. 14+49 AT ELEVATION 643.21. BEDROCK AT THIS LOCATION WAS USED FOR CROSS ROCK.

TR 13 ELEVATION IS 642.95

MCV 4 AND BR 13 ELEVATION IS 642.39

ROCK SILL IN TRIBUTARY -B- WAS CHANGED TO A MODIFIED CROSS VANE AT ELEVATION 644.58

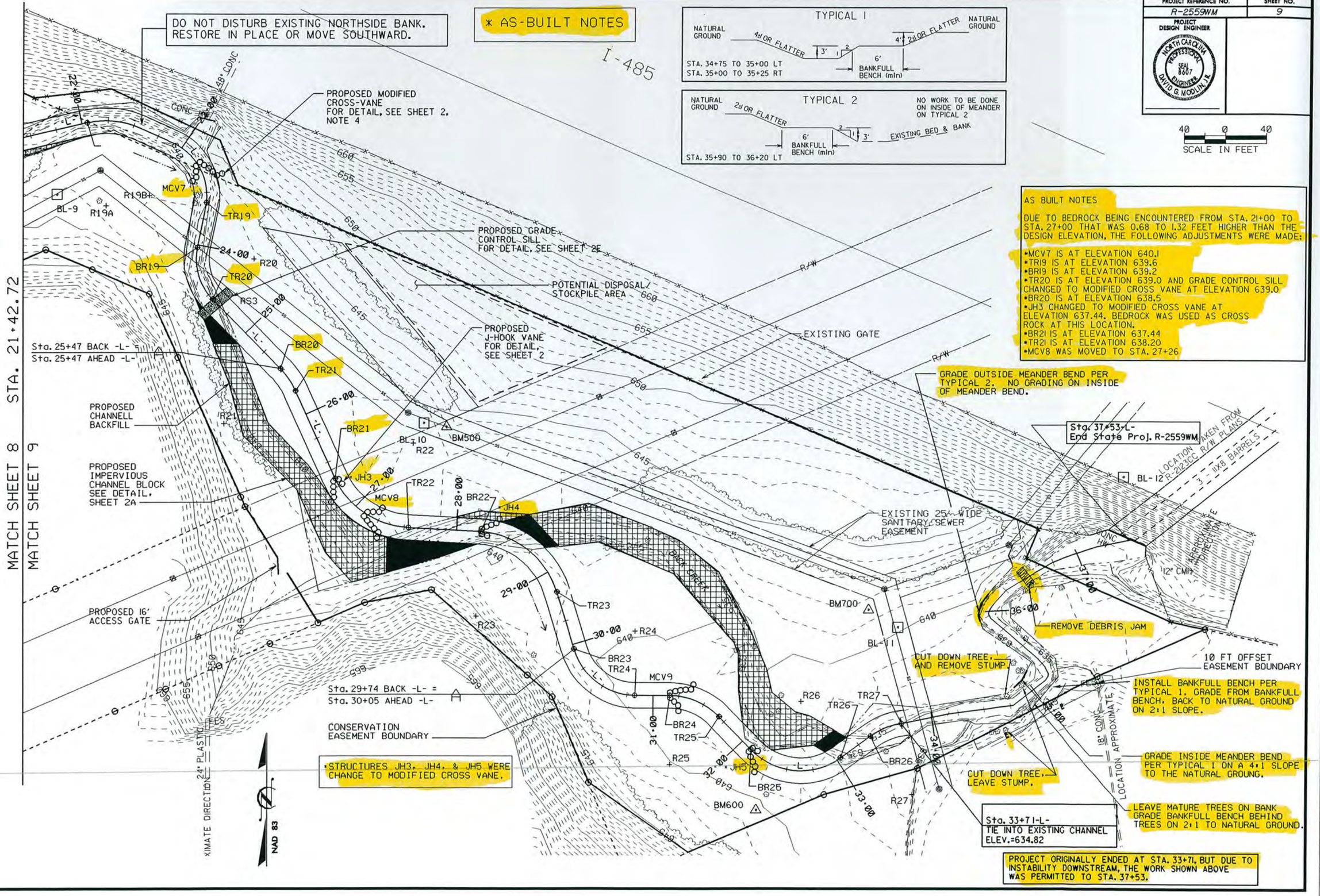



40 0 40
SCALE IN FEET

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | 9 |

PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MOOLIN, JR.



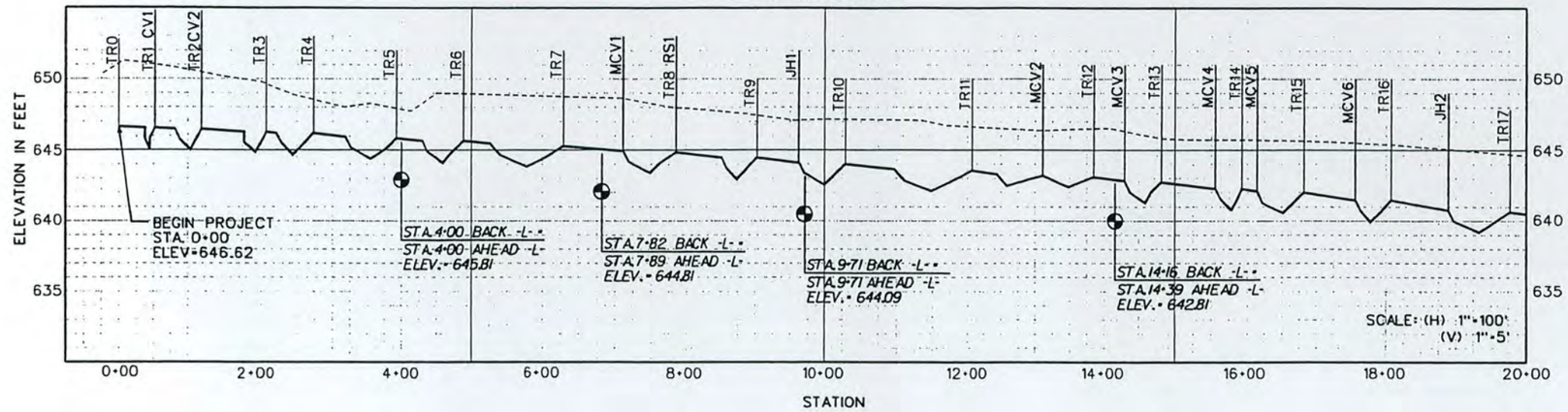
| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | 10 |

PROJECT DESIGN ENGINEER

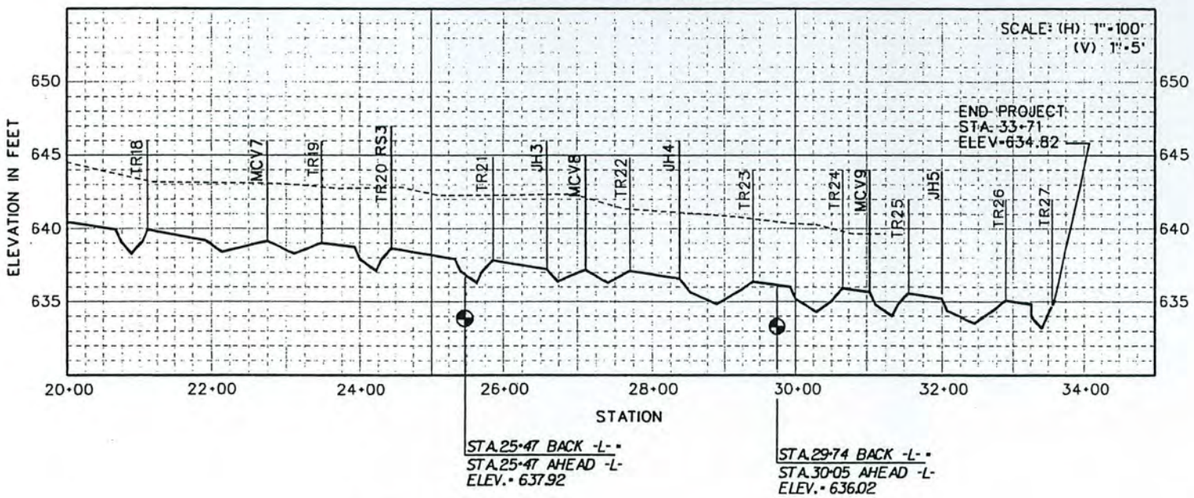
NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DENNIS G. MOOAR, JR.

2/7/04

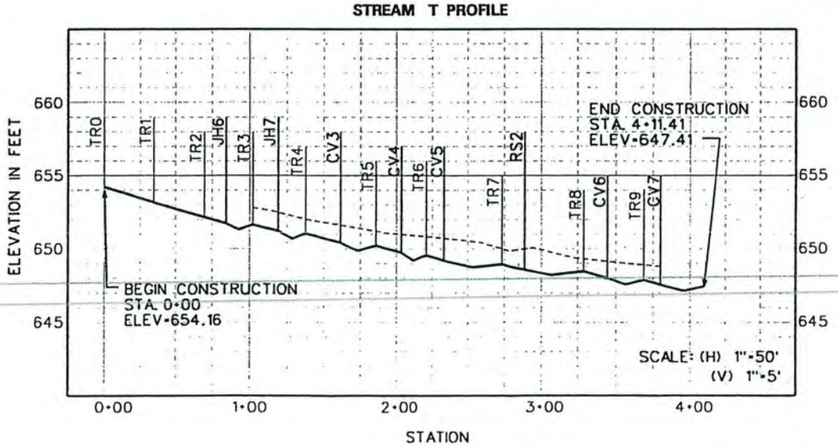
## STREAM L PROFILE



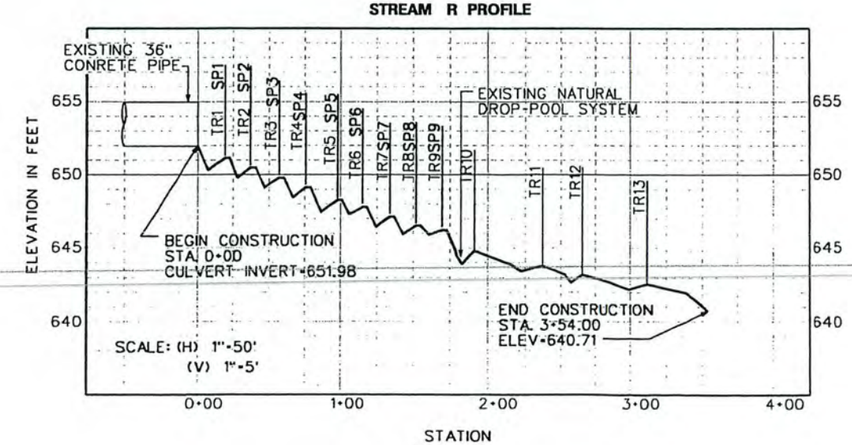

## STREAM L PROFILE (CONT.)




## STREAM T PROFILE




## STREAM R PROFILE




EXISTING FLOODPLAIN ELEVATION

PROPOSED CHANNEL ELEVATION

| | |
|---|---|
| TR0 | TOP OF RIFFLE |
| CV1 | CROSS-VANE |
| JH1 | J-HOOK VANE |
| RS1 | ROCK SILL |
| MCV1 | MODIFIED CROSS-VANE |
| SP5 | STEP-POOL STRUCTURE |
| CF1 | CHANNEL FORD |

# VEGETATION PLOTS AND MONITORING GAUGE LOCATIONS

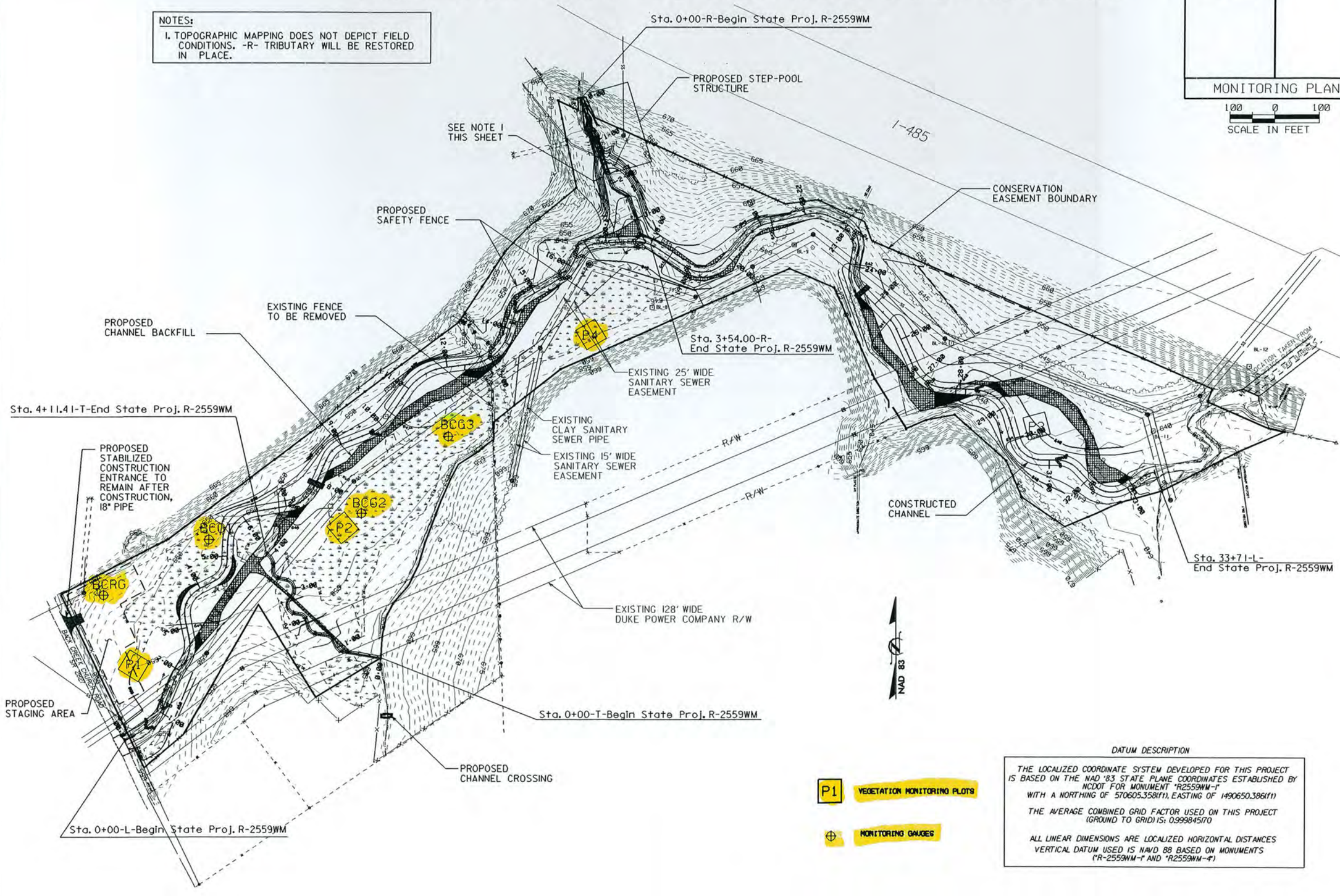
| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | 11 |
| PROJECT DESIGN ENGINEER | |

MONITORING PLAN

100 0 100
SCALE IN FEET

NOTES:

1. TOPOGRAPHIC MAPPING DOES NOT DEPICT FIELD CONDITIONS. -R- TRIBUTARY WILL BE RESTORED IN PLACE.




DATUM DESCRIPTION

THE LOCALIZED COORDINATE SYSTEM DEVELOPED FOR THIS PROJECT IS BASED ON THE NAD '83 STATE PLANE COORDINATES ESTABLISHED BY NCDOT FOR MONUMENT "R2559WM-1" WITH A NORTHING OF 570605.358(ft), EASTING OF 1490650.386(ft)

THE AVERAGE COMBINED GRID FACTOR USED ON THIS PROJECT (GROUND TO GRID) IS: 0.999845170

ALL LINEAR DIMENSIONS ARE LOCALIZED HORIZONTAL DISTANCES
VERTICAL DATUM USED IS NAVD 88 BASED ON MONUMENTS ("R-2559WM-1" AND "R2559WM-4")

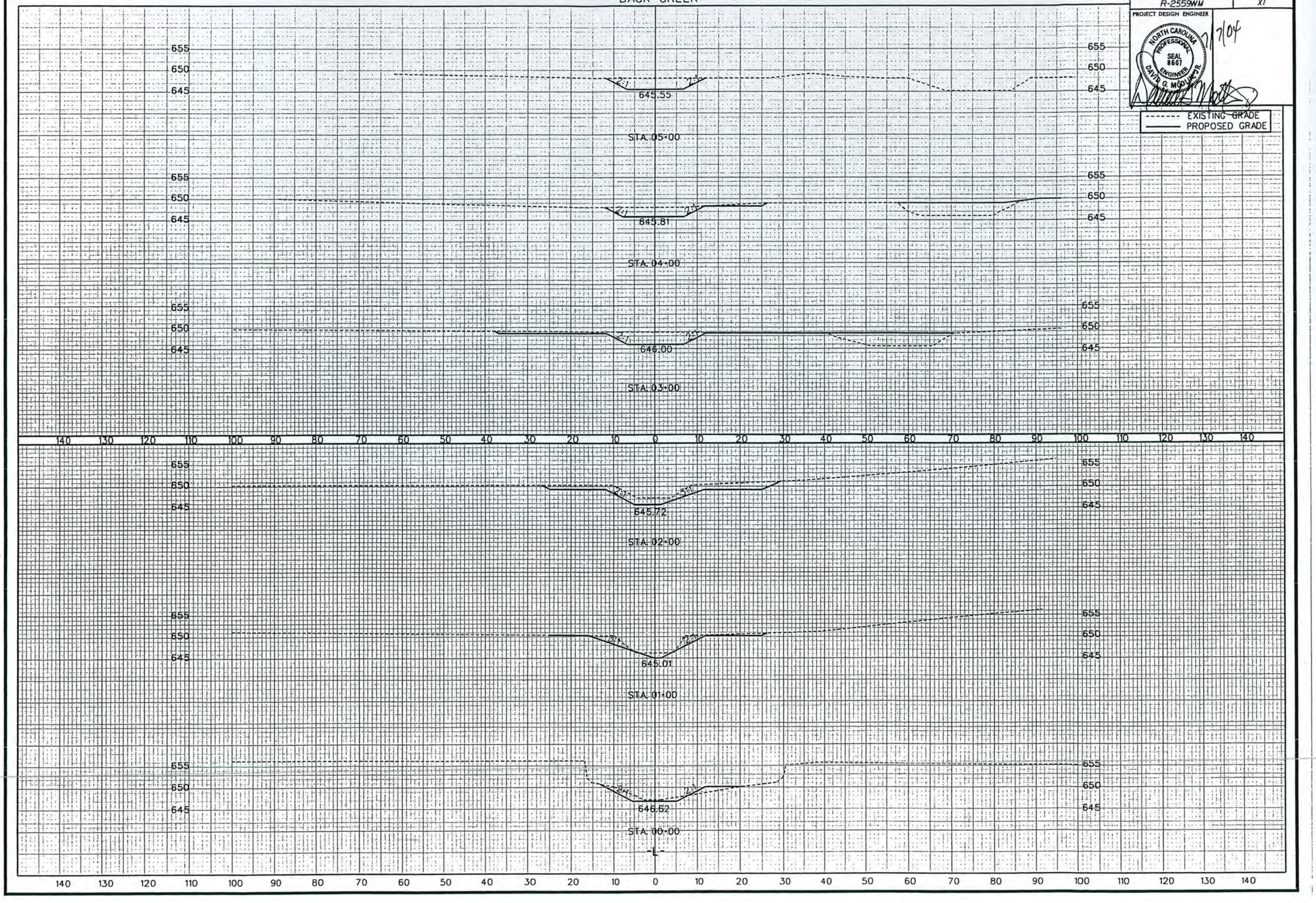
| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | X1 |

PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MOULTON JR.

7/04

EXISTING GRADE
PROPOSED GRADE



BACK CREEK

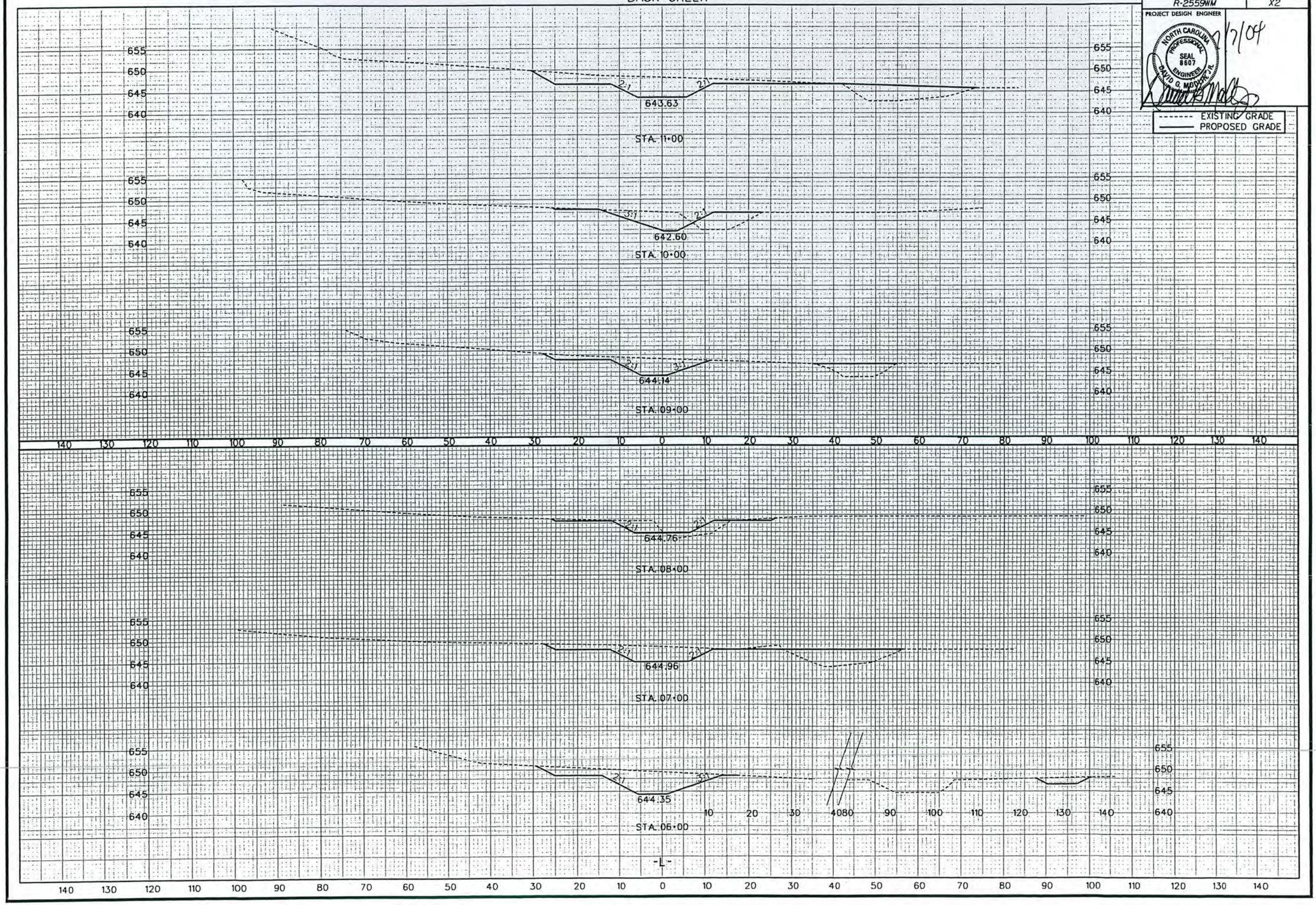
| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | X2 |

PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MOOREFIELD, JR.

1/7/04

EXISTING GRADE
PROPOSED GRADE



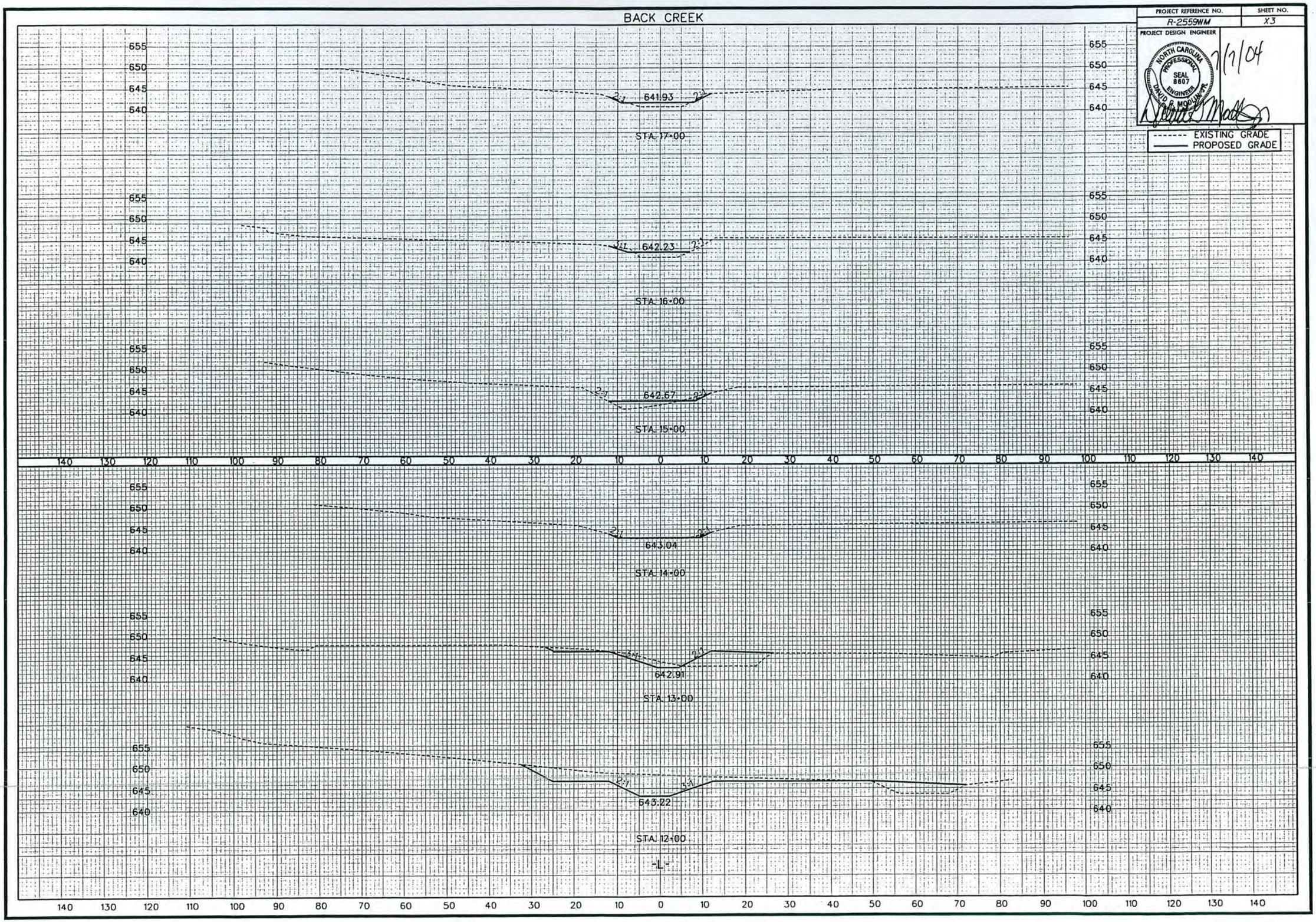
| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | X3 |

PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 8807 ENGINEER DAVID R. MOOLENAAR

7/7/04

EXISTING GRADE
PROPOSED GRADE

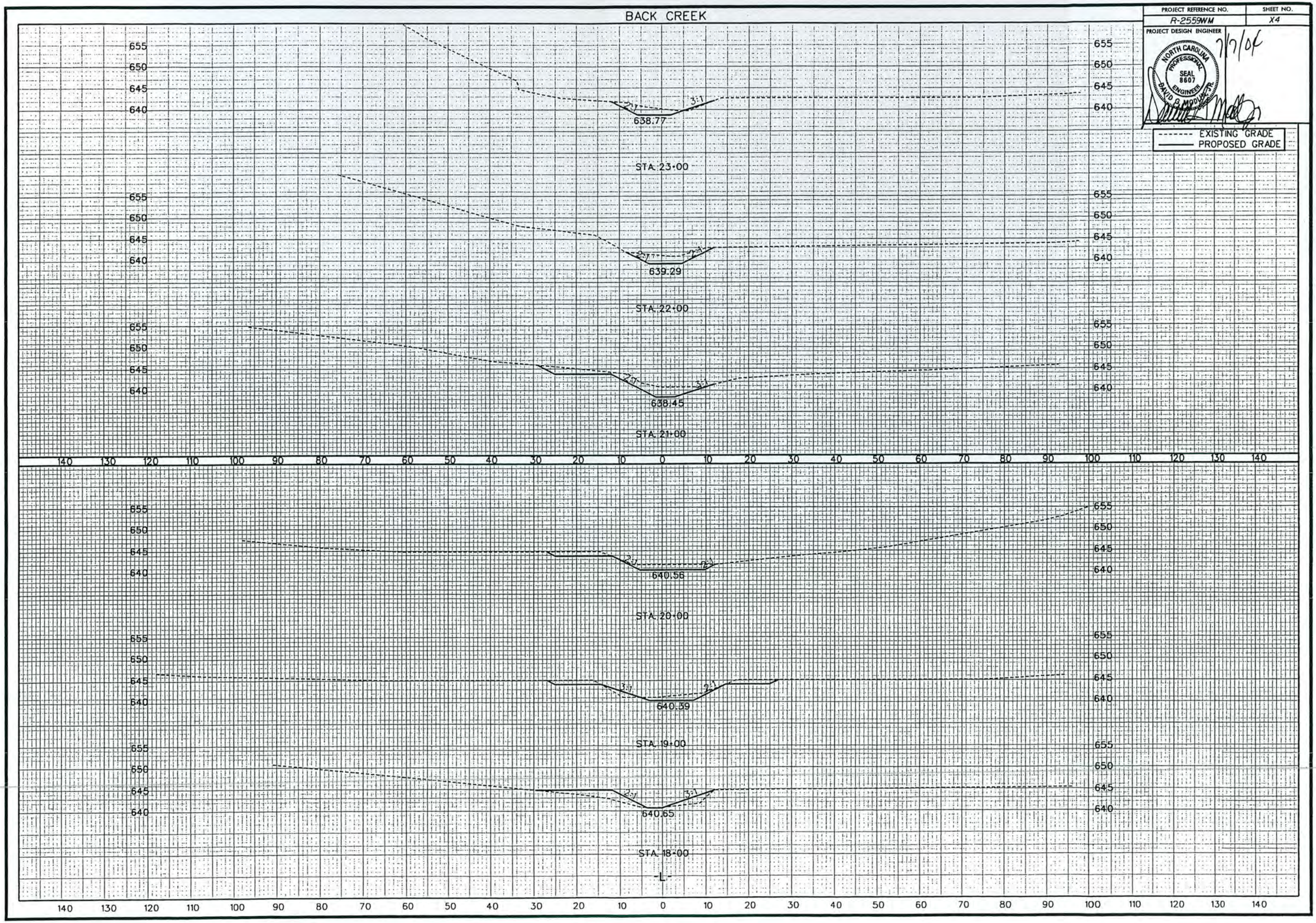


| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | X4 |

PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID B. MOOLAN, JR.

7/7/04

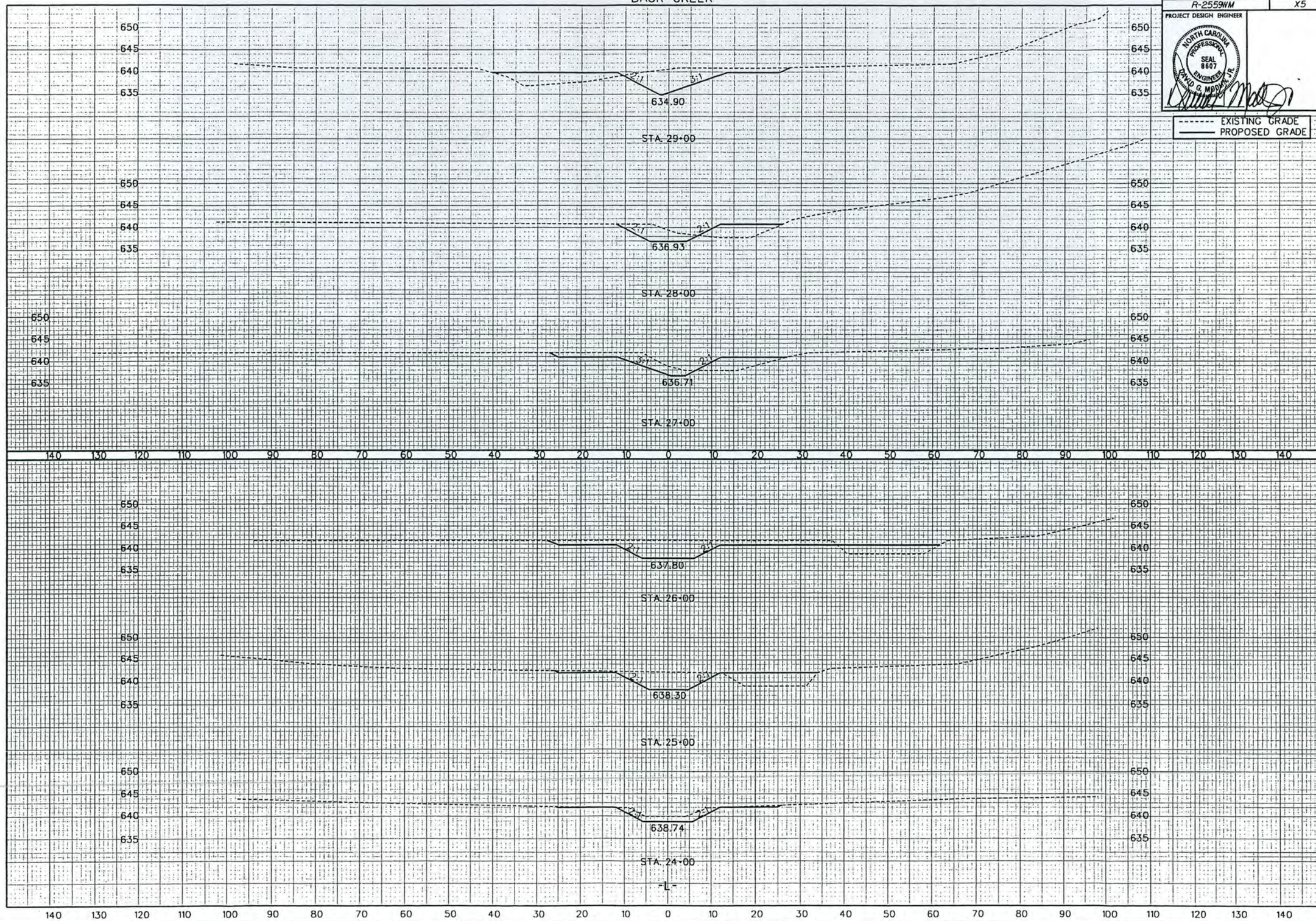


BACK CREEK

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | X5 |

PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MOORE, JR.

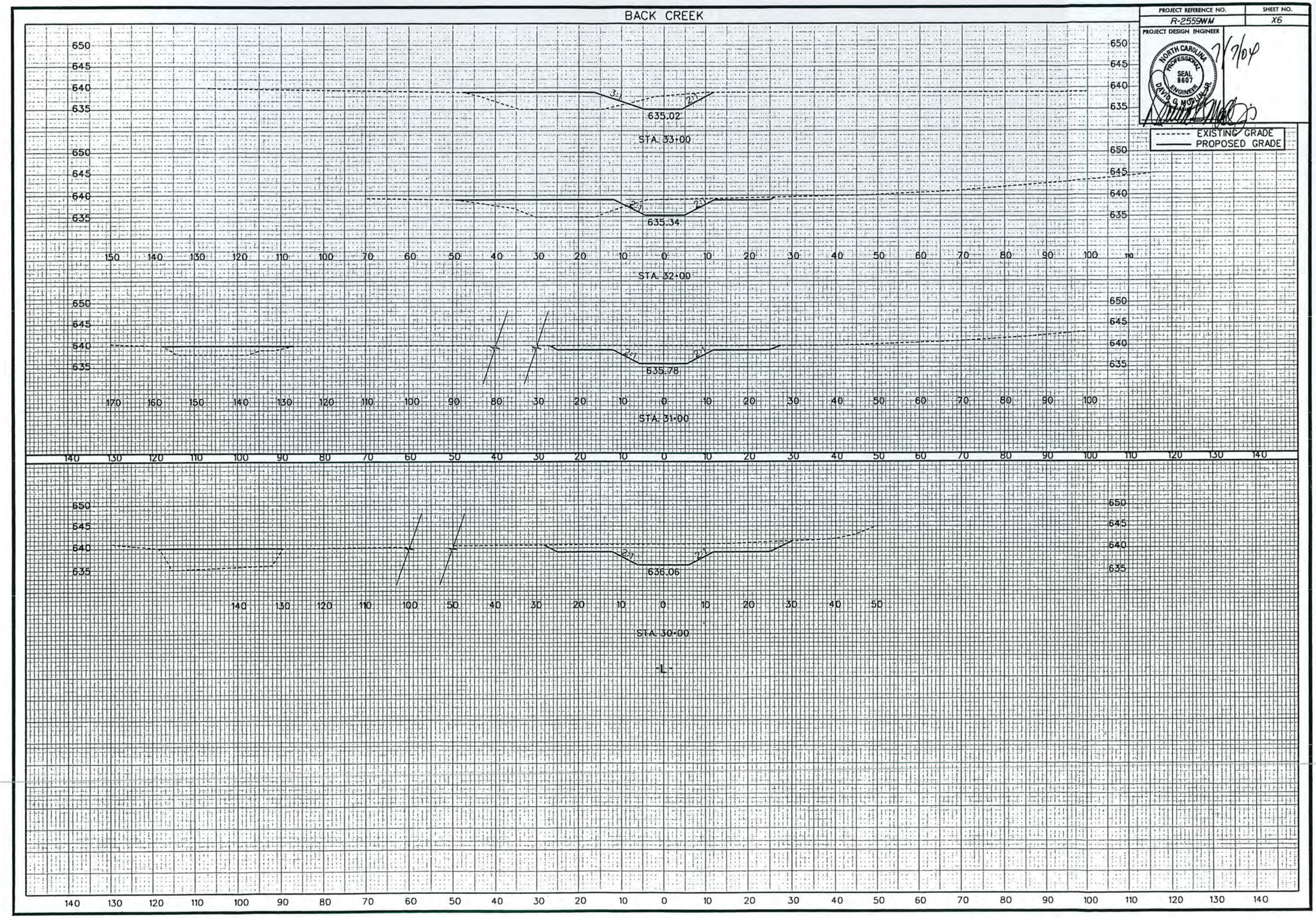


| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | X6 |

PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MOULTON JR.

7/7/04



MORGAN TRIBUTARY

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | X7 |

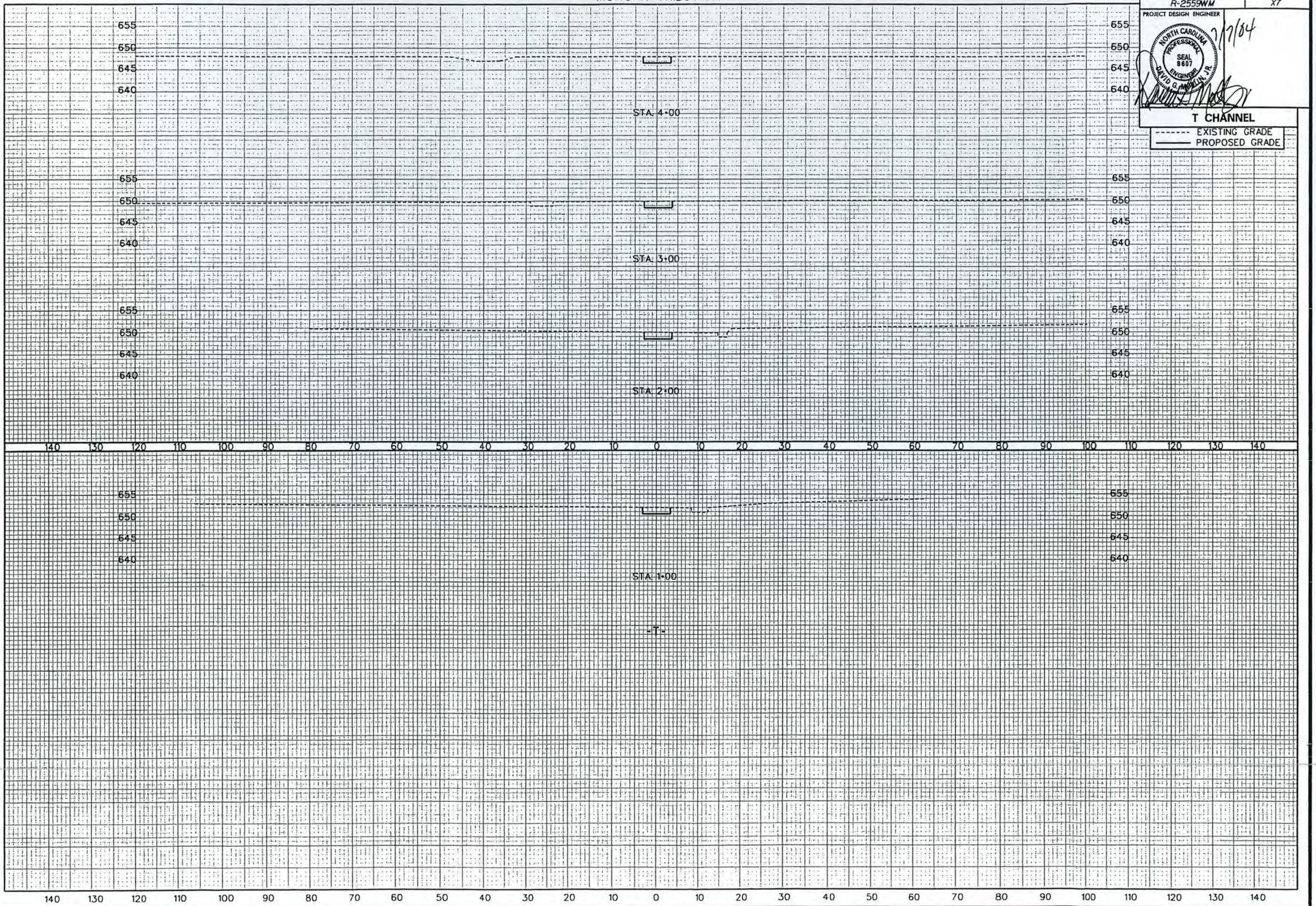
PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. McGILL, JR.

2/7/84

T CHANNEL

------- EXISTING GRADE
——— PROPOSED GRADE



NORTHERN TRIBUTARY

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | X8 |

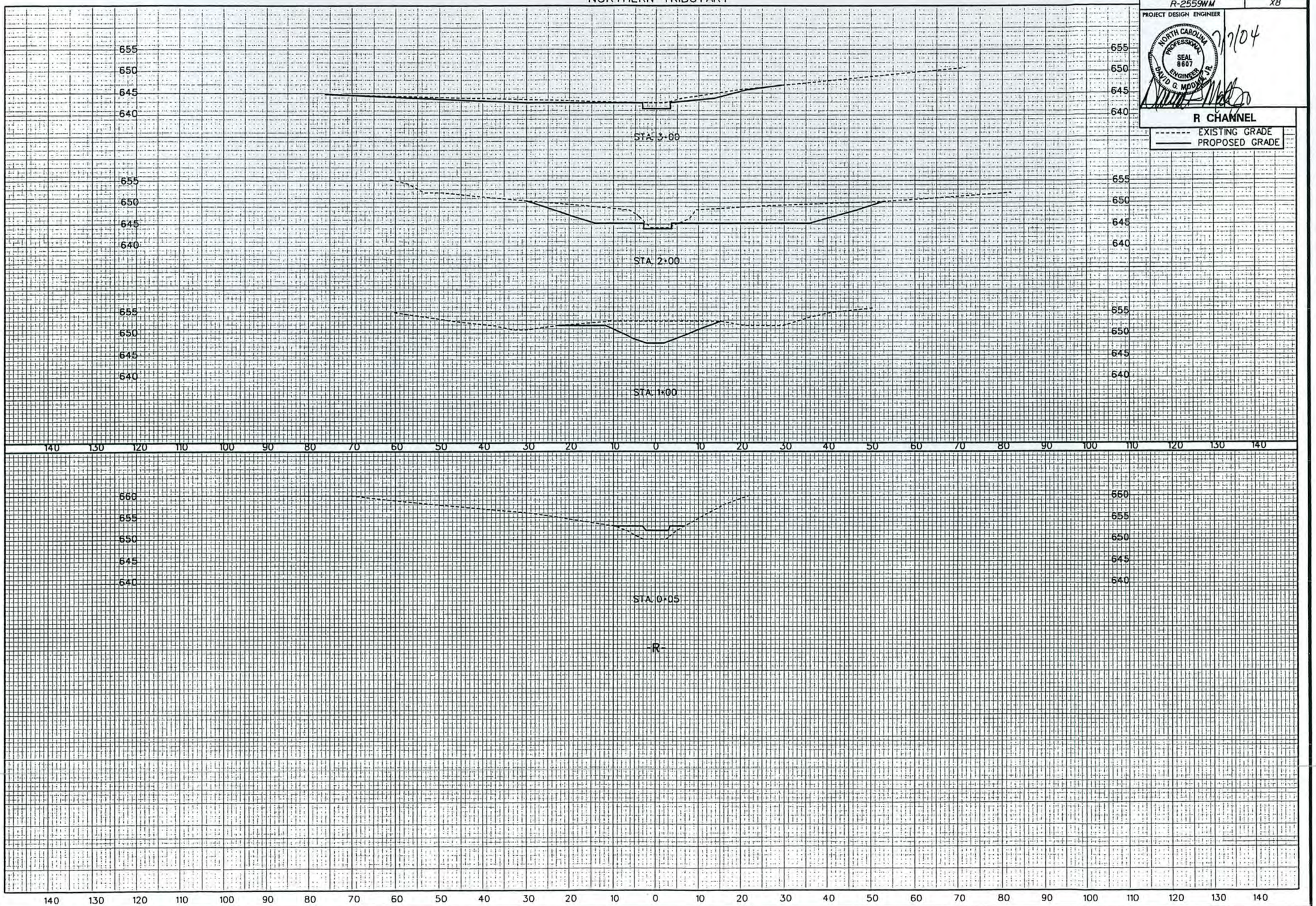
PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 8607 ENGINEER DAVID G. MOOKE, JR.

7/7/04

R CHANNEL

EXISTING GRADE
PROPOSED GRADE



TIP#: R-2559WM

WBS#: 34464.4.3

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | R-2559WM | EC-1 | |

| STATE PROG. NO. | F.A. PROG. NO. | DESCRIPTION |
|---|---|---|
| 34464.4.1 | | P.E. |
| 34464.4.2 | | R/W |
| 34464.4.3 | | CONST. |

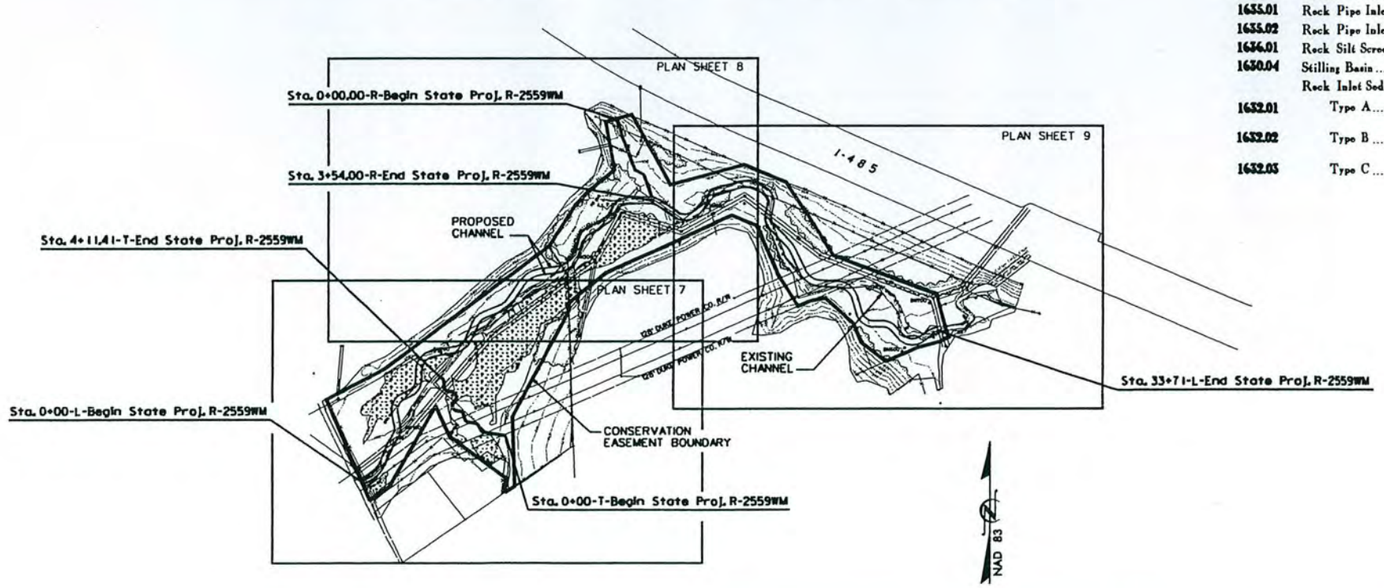
# STATE OF NORTH CAROLINA
# DIVISION OF HIGHWAYS

## PLAN FOR PROPOSED
## HIGHWAY EROSION CONTROL

# *MECKLENBURG COUNTY*

***LOCATION: BACK CREEK STREAM RESTORATION/ENHANCEMENT***

***TYPE OF WORK: IN-STREAM STRUCTURES, FLOODPLAIN GRADING/ SCARIFICATION AND NEW CHANNEL CONSTRUCTION***




## EROSION AND SEDIMENT CONTROL MEASURES

| Std. # | Description | Symbol |
|---|---|---|
| | Reforestation | |
| 1630.03 | Temporary Silt Ditch | |
| 1630.05 | Temporary Diversion | |
| 1605.01 | Temporary Silt Fence | |
| 1606.01 | Special Sediment Control Fence | |
| 1622.01 | Temporary Berms and Slope Drains | |
| 1630.01 | Riser Basin | |
| 1630.02 | Silt Basin Type B | |
| 1633.01 | Temporary Rock Silt Check Type-A | |
| 1633.02 | Temporary Rock Silt Check Type-B | |
| 1634.01 | Temporary Rock Sediment Dam Type-A | |
| 1634.02 | Temporary Rock Sediment Dam Type-B | |
| 1635.01 | Rock Pipe Inlet Sediment Trap Type-A | |
| 1635.02 | Rock Pipe Inlet Sediment Trap Type-B | |
| 1636.01 | Rock Silt Screen | |
| 1630.04 | Stilling Basin | |
| | Rock Inlet Sediment Trap: | |
| 1632.01 | Type A | A OR A |
| 1632.02 | Type B | B OR B |
| 1632.03 | Type C | C OR C |

**GRAPHIC SCALE**

0
PLANS

0
PROFILE (HORIZONTAL)

0
PROFILE (VERTICAL)

*ROADSIDE ENVIRONMENTAL UNIT*
*DIVISION OF HIGHWAYS*
*STATE OF NORTH CAROLINA*

Prepared in the Office of:

***ROADSIDE ENVIRONMENTAL UNIT***

*1 South Wilmington St.*
*Raleigh, NC 27611*

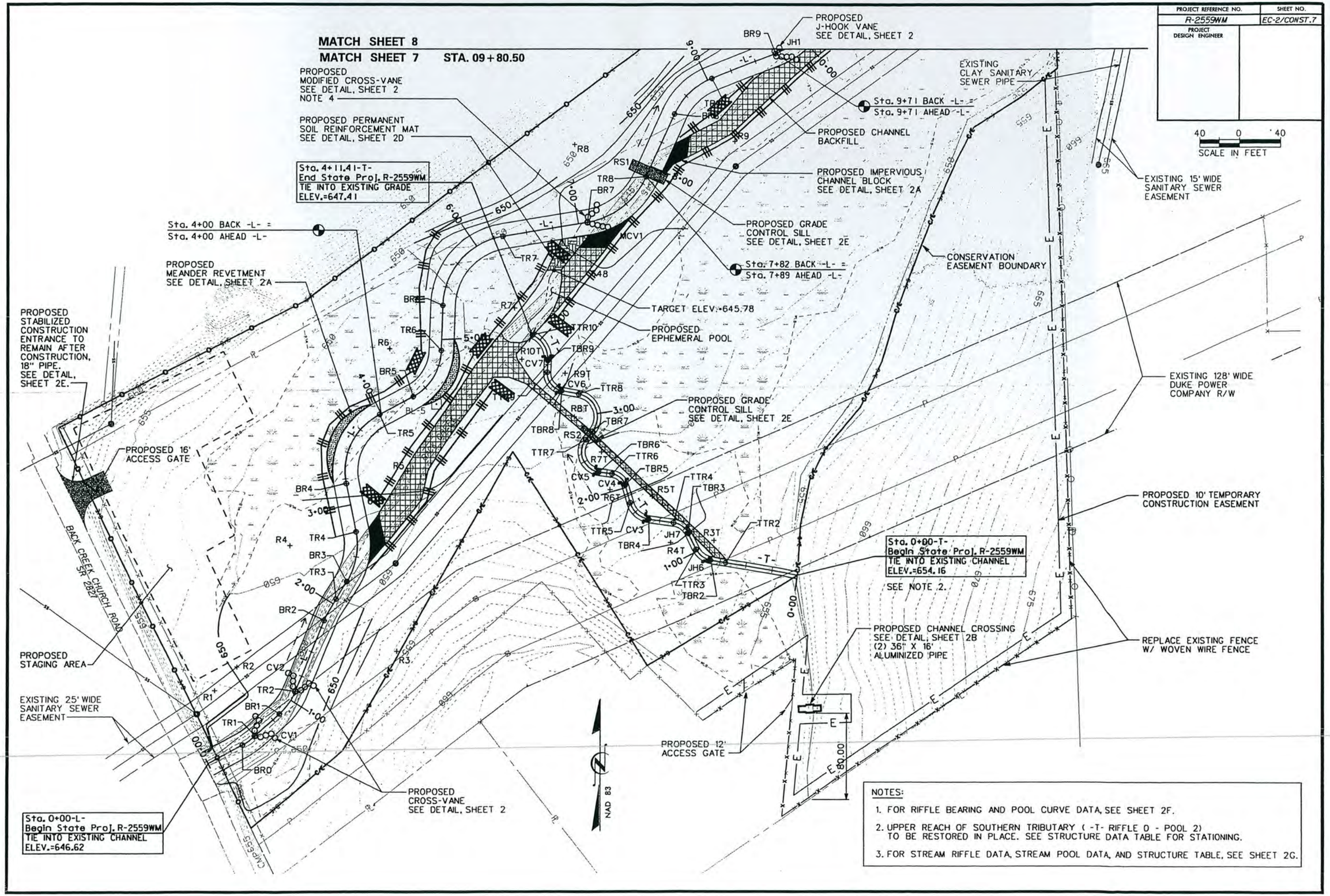
***2002 STANDARD SPECIFICATIONS***

*Roadway Standard Drawings*

*The following roadway english standards as appear in "Roadway Standard Drawings" - Roadway Design Unit - N.C. Department of Transportation - Raleigh, N.C., dated January 20, 2002 and the latest revision thereto are applicable to this project and by reference hereby are considered a part of these plans.*

*1605.01 Temporary Silt Fence*
*1633.01 Temporary Rock Silt Check Type A*
*1636.01 Rock Silt Screen*

| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | EC-2/CONST.7 |
| PROJECT DESIGN ENGINEER | |




NOTES:

1. FOR RIFFLE BEARING AND POOL CURVE DATA, SEE SHEET 2F.
2. UPPER REACH OF SOUTHERN TRIBUTARY ( -T- RIFFLE 0 - POOL 2) TO BE RESTORED IN PLACE. SEE STRUCTURE DATA TABLE FOR STATIONING.
3. FOR STREAM RIFFLE DATA, STREAM POOL DATA, AND STRUCTURE TABLE, SEE SHEET 2G.

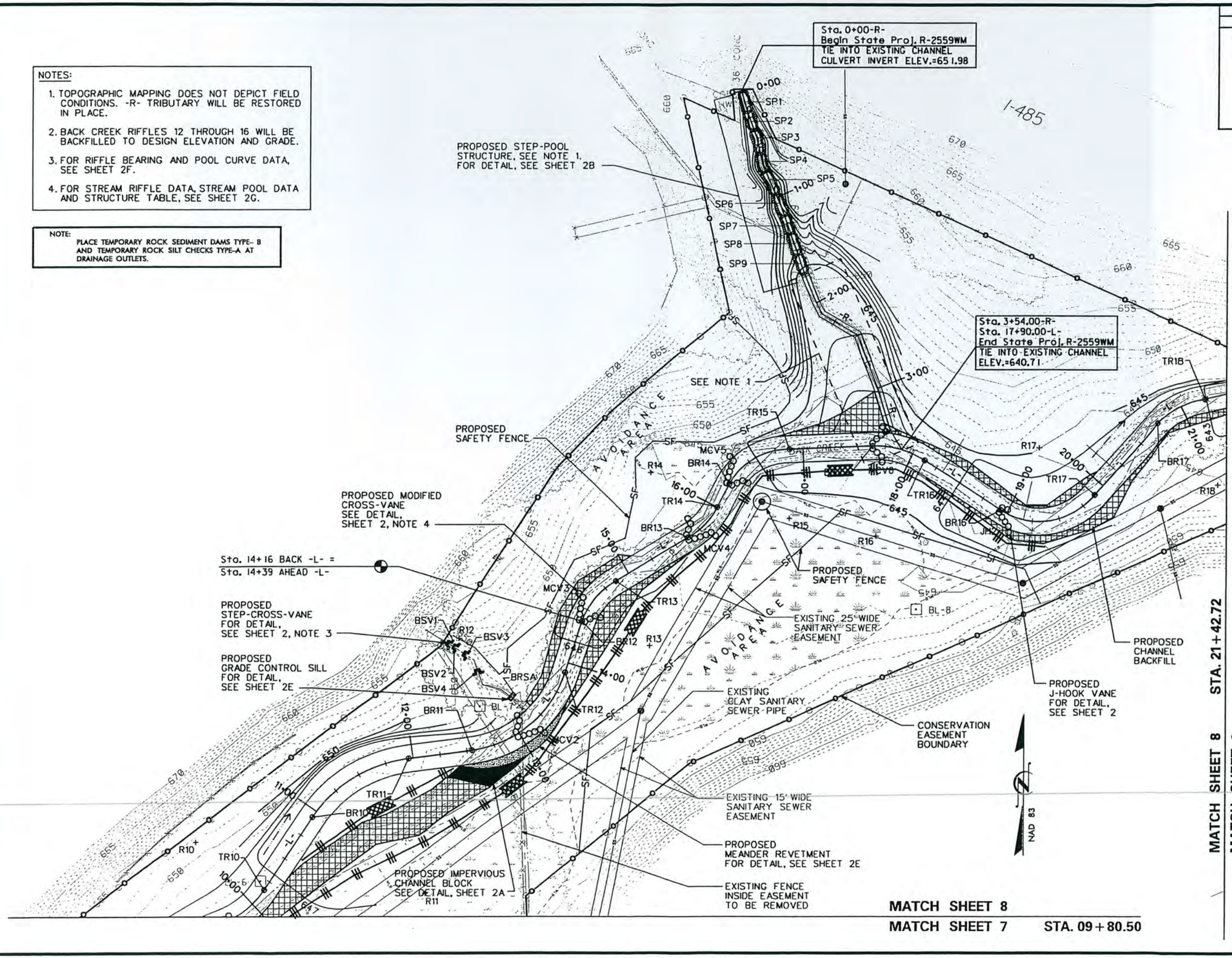
| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | EC-3/CONST.8 |
| PROJECT DESIGN ENGINEER | |

40 0 40
SCALE IN FEET

NOTES:

1. TOPOGRAPHIC MAPPING DOES NOT DEPICT FIELD CONDITIONS. -R- TRIBUTARY WILL BE RESTORED IN PLACE.
2. BACK CREEK RIFFLES 12 THROUGH 16 WILL BE BACKFILLED TO DESIGN ELEVATION AND GRADE.
3. FOR RIFFLE BEARING AND POOL CURVE DATA, SEE SHEET 2F.
4. FOR STREAM RIFFLE DATA, STREAM POOL DATA AND STRUCTURE TABLE, SEE SHEET 2G.

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

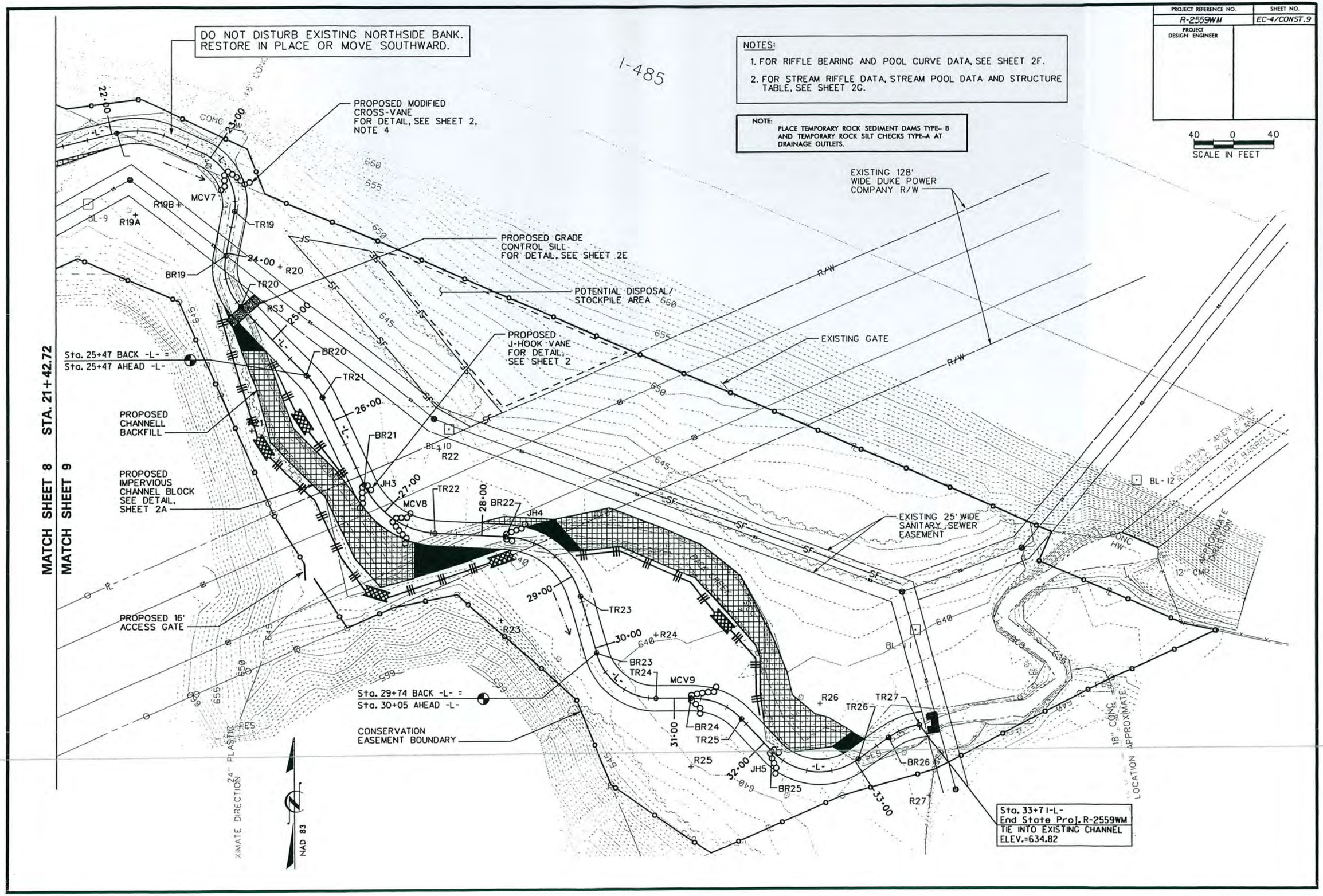


| PROJECT REFERENCE NO. | SHEET NO. |
|---|---|
| R-2559WM | EC-4/CONST.9 |
| PROJECT DESIGN ENGINEER | |

NOTES:

1. FOR RIFFLE BEARING AND POOL CURVE DATA, SEE SHEET 2F.
2. FOR STREAM RIFFLE DATA, STREAM POOL DATA AND STRUCTURE TABLE, SEE SHEET 2G.

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



| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|
| N.C. | R-2559WM | RF-1 | |
| STATE PROJ. NO. | F.A. PROJ. NO. | DESCRIPTION | |

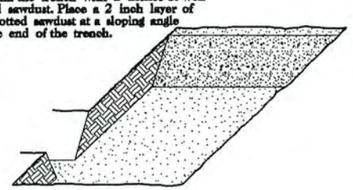
# PLANTING DETAILS

## SEEDLING / LINER BAREROOT PLANTING DETAIL

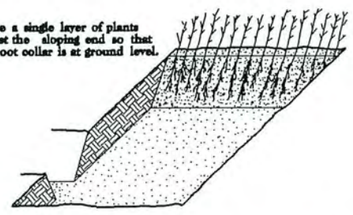
### HEALING IN

1. Locate a healing-in site in a shady, well protected area.
2. Excavate a flat bottom trench 12 inches deep and provide drainage.

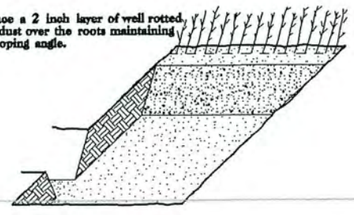
3. Backfill the trench with 2 inches of well rotted sawdust. Place a 2 inch layer of well rotted sawdust at a sloping angle at one end of the trench.



4. Place a single layer of plants against the sloping end so that the root collar is at ground level.



5. Place a 2 inch layer of well rotted sawdust over the roots maintaining a sloping angle.

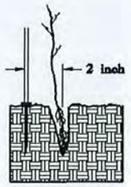


6. Repeat layers of plants and sawdust as necessary and water thoroughly.

### DIBBLE PLANTING METHOD
USING THE KBC PLANTING BAR

1. Insert planting bar as shown and pull handle toward planter.

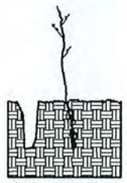
2. Remove planting bar and place seedling at correct depth.




3. Insert planting bar 2 inches toward planter from seedling.

4. Pull handle of bar toward planter, firming soil at bottom.

5. Push handle forward firming soil at top.



6. Leave compaction hole open. Water thoroughly.

### PLANTING NOTES:

PLANTING BAG
During planting, seedlings shall be kept in a moist canvas bag or similar container to prevent the root systems from drying.

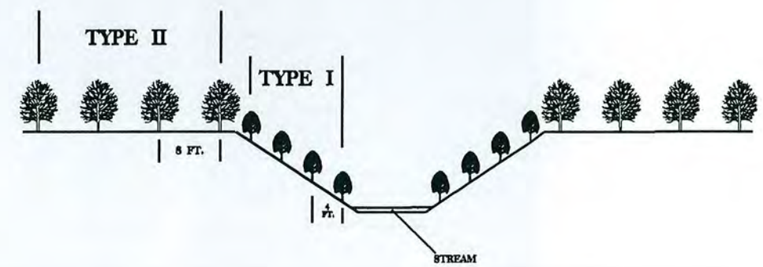
KBC PLANTING BAR
Planting bar shall have a blade with a triangular cross section, and shall be 12 inches long, 4 inches wide and 1 inch thick at center.

ROOT PRUNING
All seedlings shall be root pruned, if necessary, so that no roots extend more than 10 inches below the root collar.

☐ TYPE 1 STREAMBANK REFORESTATION SHALL BE PLANTED 3 FT. TO 5 FT. ON CENTER, RANDOM SPACING, AVERAGING 4 FT. ON CENTER, APPROXIMATELY 2724 PLANTS PER ACRE.

☐ TYPE 2 STREAMBANK REFORESTATION SHALL BE PLANTED 6 FT. TO 10 FT. ON CENTER, RANDOM SPACING, AVERAGING 8 FT. ON CENTER, APPROXIMATELY 680 PLANTS PER ACRE.

## STREAMBANK REFORESTATION TYPICAL




STREAMBANK REFORESTATION

MIXTURE, TYPE, SIZE, AND FURNISH SHALL CONFORM TO THE FOLLOWING:

TYPE 1

| | | |
|---|---|---|
| 50% SALIX NIGRA | BLACK WILLOW | 24 in - 36 in Live stakes |
| 50% CORNUS AMOMUM | SILKY DOGWOOD | 24 in - 36 in Live stakes |

TYPE 2

| | | |
|---|---|---|
| 16.6% PLATANUS OCCIDENTALIS | SYCAMORE | 12 in - 18 in BR |
| 16.6% QUERCUS FALCATA | CHERRYBARK OAK | 12 in - 18 in BR |
| 16.6% FRAXINUS PENNSYLVANICA | GREEN ASH | 12 in - 18 in BR |
| 16.6% BETULA NIGRA | RIVER BIRCH | 12 in - 18 in BR |
| 16.6% QUERCUS MICHAUXII | SWAMP CHESTNUT OAK | 12 in - 18 in BR |
| 16.6% QUERCUS PHELLOS | WILLOW OAK | 12 in - 18 in BR |

# STREAMBANK REFORESTATION DETAIL SHEET

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