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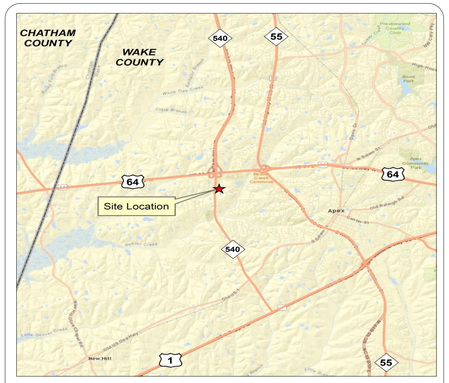
09/08/99

TIP PROJECT: R–2635C

CONTRACT: 700013555

See Sheet 1-A For Index of Sheets



VICINITY MAP

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

WAKE COUNTY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R–2635C	OSM-1	16

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
35520.5.TA.1		P.E.
		CONST.

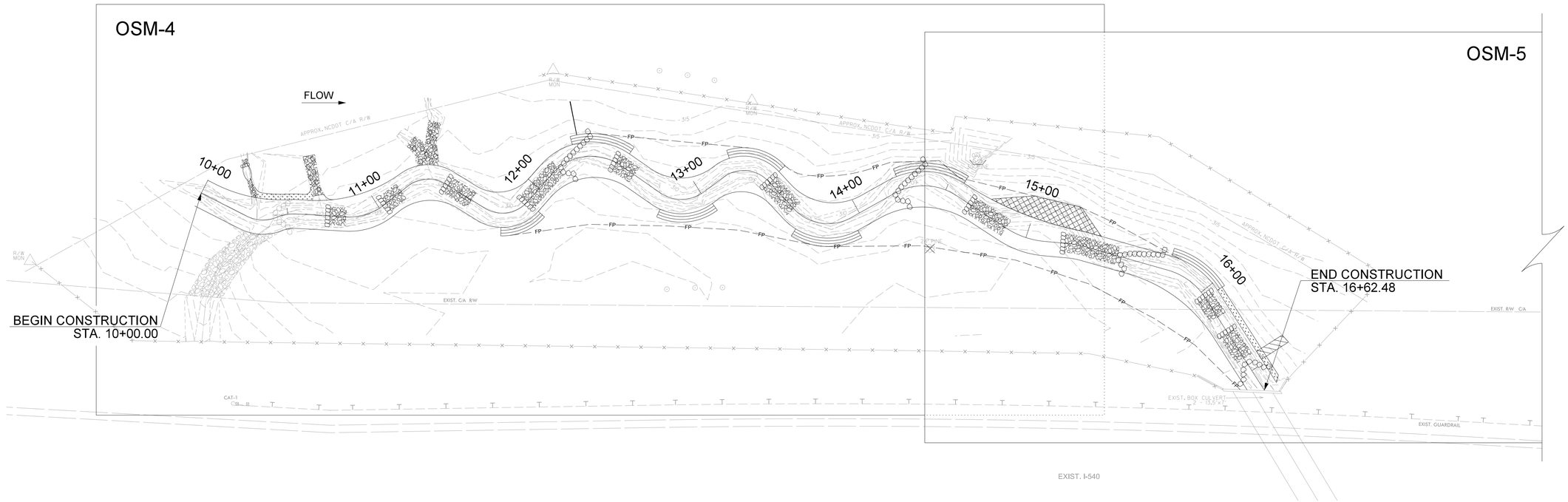
LOCATION: ALONG I–540 – WESTERN WAKE FREEWAY SOUTH OF BEAVER CREEK COMMONS DRIVE IN APEX, NC

TYPE OF WORK: ON–SITE MITIGATION FOR UT TO REEDY BRANCH

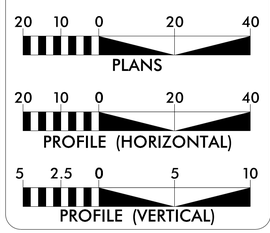
NAD 83

OSM-4

OSM-5



GRAPHIC SCALES



PROJECT LENGTH

EXISTING STREAM LENGTH = 692 FT

PROPOSED DESIGN STREAM LENGTH = 662 FT

Prepared in the Office of:

Michael Baker INTERNATIONAL
Michael Baker Engineering Inc.
8000 Regency Parkway, Suite 600
Cary, NORTH CAROLINA 27518
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2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:

LETTING DATE:

JACOB M. BYERS, PE
PROJECT ENGINEER

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 039201 ENGINEER JACOB M. BYERS

2/11/2016

DocuSigned by: Jacob Byers
SIGNATURE: 207CF47BBE19D462...
P.E.

DIVISION OF HIGHWAYS STATE OF NORTH CAROLINA

STATE OF NORTH CAROLINA · DEPARTMENT OF TRANSPORTATION

P.E.
STATE HIGHWAY DESIGN ENGINEER

2/11/2016
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mcarey

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6/2/99

MORPHOLOGICAL MEASUREMENTS TABLE

UT to Reedy Branch	Existing Stream Values		Composite Reference Data		Design Stream Values	
Parameter	**MIN**	**MAX**	**MIN**	**MAX**	**MIN**	**MAX**
Drainage Area, DA (sq mi)	0.67		---		0.67	
Stream Type (Rosgen)	C4		C4		C4	
Bankfull Discharge, Qbkf (cfs)	95.0		---		95.0	
Bankfull Riffle XSEC Area, Abkf (sq ft)	15.6	19.5	---		17.0	
Bankfull Mean Velocity, Vbkf (ft/s)	3.4	4.3	3.5	5.0	3.8	
Bankfull Riffle Width, Wbkf (ft)	12.8	15.6	---	---	15.4	
Bankfull Riffle Mean Depth, Dbkf (ft)	1.1	1.3	---	---	1.1	
Width to Depth Ratio, W/D (ft/ft)	10.4	13.6	10.0	15.0	14.0	
Width Floodprone Area, Wfpa (ft)	46.9	48.8	---	---	35.0	50.0
Entrenchment Ratio, Wfpa/Wbkf (ft/ft)	3.1	3.7	>2.2		>2.2	
Riffle Max Depth @ bkf, Dmax (ft)	2.2	2.9	---	---	1.4	
Riffle Max Depth Ratio, Dmax/Dbkf	2.0	2.4	1.2	1.5	1.3	
Bank Height Ratio, Dtob/Dmax (ft/ft)	0.8	1.0	1.0	1.1	1.0	
Meander Length, Lm (ft)	55.0	96.0	---	---	---	---
Meander Length Ratio, Lm/Wbkf	4.3	6.1	7.0	14.0	---	---
Radius of Curvature, Rc (ft)	23.0	35.0	---	---	32.0	45.0
Rc Ratio, Rc/Wbkf	1.8	2.2	2.0	3.0	2.0	3.0
Belt Width, Wblt (ft)	25.0	44.0	---	---	54.0	65.0
Meander Width Ratio, Wblt/Wbkf	2.0	2.8	3.5	8.0	3.5	4.2
Sinuosity, K	1.15		1.20	1.40	1.15	
Valley Slope, Sval (ft/ft)	0.0092		0.0050	0.0150	0.0092	
Channel Slope, Schan (ft/ft)	0.0080		---	---	0.0080	
Slope Riffle, Sriff (ft/ft)	0.0060	0.0580	---	---	0.0044	0.0212
Riffle Slope Ratio, Sriff/Schan	0.8	7.3	1.2	1.5	1.2	1.5
Slope Pool, Spool (ft/ft)	0.0000	0.0031	---	---	0.0000	0.0020
Pool Slope Ratio, Spool/Schan	0.0	0.4	0.0	0.2	0.0	0.2
Pool Max Depth, Dmaxpool (ft)	2.9	3.3	---	---	2.6	
Pool Max Depth Ratio, Dmaxpool/Dbkf	2.5	2.6	1.5	3.5	1.5	3.5
Pool Width, Wpool (ft)	10.1	18.7	---	---	19.1	
Pool Width Ratio, Wpool/Wbkf	0.8	1.2	1.2	1.7	1.2	1.4
Pool-Pool Spacing, Lps (ft)	33.0	65.0	---	---	43.0	69.0
Pool-Pool Spacing Ratio, Lps/Wbkf	2.6	4.2	3.5	7.0	3.5	5.0

GENERAL NOTES

1. THE CONTRACTOR IS REQUIRED TO INSTALL IN-STREAM STRUCTURES USING A TRACK HOE WITH A HYDRAULIC THUMB OF SUFFICIENT SIZE TO PLACE IN-STREAM STRUCTURES.
2. THE CONTRACTOR WILL MAKE EVERY EFFORT TO PREVENT SEDIMENT LOSS AND MINIMIZE DISTURBANCE OF THE SITE WHILE PERFORMING THE CONSTRUCTION WORK.
3. CONTRACTOR SHOULD CALL NORTH CAROLINA "ONE-CALL" BEFORE EXCAVATION STARTS. (1-800-632-4949)
4. ENGINEER WILL FLAG TREES TO BE SAVED PRIOR TO CONSTRUCTION.
5. THE CONTRACTOR IS RESPONSIBLE FOR JOB SITE SAFETY.
6. SUBSURFACE PLANS ARE NOT AVAILABLE; THEREFORE, THE CONTRACTOR WILL BE REQUIRED TO LOCATE UTILITIES AND PROTECT FROM DAMAGE.
7. GRADING SHOULD INCLUDE SMOOTH TRANSITIONS.
8. CONTRACTOR WILL BE REQUIRED TO PUMP BASE STREAM FLOW AROUND AREA WHERE CONSTRUCTION WILL OCCUR IN THE ACTIVE STREAM CHANNEL.
9. THE CONTRACTOR SHALL FURNISH AND INSTALL 6 INCHES OF IMPORTED TOP SOIL ON ALL NEWLY EXCAVATED STREAM BANKS, BANKFULL BENCHES, TERRACE SLOPES, AND APPROXIMATELY 5 FEET OF FLOODPLAIN MEASURED PERPENDICULARLY FROM THE TOP OF BANK.
10. ALL NEWLY EXCAVATED STREAM BANKS WILL BE STABILIZED AT THE END OF EACH WORK DAY WITH TEMPORARY AND PERMANENT SEEDING, MULCHING, AND COIR FIBER MATTING PRIOR TO RETURNING FLOW TO THAT SECTION OF CHANNEL.
11. ALL TRANSPLANTABLE VEGETATION THAT IS REMOVED AS PART OF CONSTRUCTION ACTIVITIES SHALL BE TRANSPLANTED BACK INTO THE NEWLY EXCAVATED STREAMBANKS OR FLOOD PLAINS AS DIRECTED BY THE ENGINEER.

PROJECT REFERENCE NO.	SHEET NO.
R-2635C	OSM-1A

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 039201 ENGINEER JACOB M BYERS

2/11/2016

DocuSigned by: Jacob Byers 070F47B9E16D4B...

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INDEX OF SHEETS

STREAM CONVENTIONAL SYMBOLS

SUPERCEDES SHEET 1-B

- ROCK J-HOOK
- ROCK VANE
- OUTLET PROTECTION
- ROCK CROSS VANE
- DOUBLE DROP ROCK CROSS VANE
- ROOT WAD
- LOG J-HOOK
- LOG VANE
- LOG WEIR
- CONSTRUCTED RIFFLE
- BOULDER CLUSTER
- LOG STEP POOL
- SAFETY FENCE
- 435 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- LIMITS OF DISTURBANCE
- PROPERTY LINE
- TEMPORARY STREAM CROSSING
- PERMANENT STREAM CROSSING
- TRANSPLANTED VEGETATION
- TREE REMOVAL
- TREE PROTECTION
- DITCH PLUG
- CHANNEL FILL
- FLOODPLAIN INTERCEPTOR
- GEOLIFT

**NOTE: ALL ITEMS ABOVE MAY NOT BE USED ON THIS PROJECT

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PROJECT REFERENCE NO.	SHEET NO.
R-2635C	OSM-1B

*S.U.E = SUBSURFACE UTILITY ENGINEER

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CONVENTIONAL SYMBOLS

NORTH CAROLINA PROFESSIONAL SEAL 039201 ENGINEER JACOB M. BYERS
2/11/2016
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BOUNDARIES AND PROPERTY:

- State Line
- County Line
- Township Line
- City Line
- Reservation Line
- Property Line
- Existing Iron Pin — EIP
- Property Corner
- Property Monument — ECM
- Parcel/Sequence Number — 123
- Existing Fence Line
- Proposed Woven Wire Fence
- Proposed Chain Link Fence
- Proposed Barbed Wire Fence
- Existing Wetland Boundary — WLB
- Proposed Wetland Boundary — WLB
- Existing Endangered Animal Boundary — EAB
- Existing Endangered Plant Boundary — EPB

BUILDINGS AND OTHER CULTURE:

- Gas Pump Vent or U/G Tank Cap
- Sign — S
- Well — W
- Small Mine
- Foundation
- Area Outline
- Cemetery
- Building
- School
- Church
- Dam

HYDROLOGY:

- Stream or Body of Water
- Hydro, Pool or Reservoir
- Jurisdictional Stream — JS
- Buffer Zone 1 — BZ 1
- Buffer Zone 2 — BZ 2
- Flow Arrow
- Disappearing Stream
- Spring
- Wetland
- Proposed Lateral, Tail, Head Ditch — FLOW
- False Sump

RAILROADS:

- Standard Gauge — CSX TRANSPORTATION
- RR Signal Milepost — MILEPOST 35
- Switch — 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 — RW
- Proposed Right of Way Line with Iron Pin and Cap Marker — RW
- Proposed Right of Way Line with Concrete or Granite Marker — RW
- Existing Control of Access — CA
- Proposed Control of Access — CA
- Existing Easement Line — E
- Proposed Temporary Construction Easement — E
- Proposed Temporary Drainage Easement — TDE
- Proposed Permanent Drainage Easement — PDE
- Proposed Permanent Utility Easement — PUE
- Proposed Temporary Utility Easement — TUE
- Proposed Permanent Easement with Iron Pin and Cap Marker

ROADS AND RELATED FEATURES:

- Existing Edge of Pavement
- Existing Curb
- Proposed Slope Stakes Cut — C
- Proposed Slope Stakes Fill — F
- Proposed Wheel Chair Ramp — WCR
- 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 — Vineyard

EXISTING STRUCTURES:

MAJOR:

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

MINOR:

- Head and End Wall — CONC HW
- Pipe Culvert
- Footbridge
- Drainage Box: Catch Basin, DI or JB — CB
- Paved Ditch Gutter
- Storm Sewer Manhole — S
- Storm Sewer — S

UTILITIES:

POWER:

- Existing Power Pole
- Proposed Power Pole
- Existing Joint Use Pole
- Proposed Joint Use Pole
- Power Manhole — P
- Power Line Tower
- Power Transformer
- U/G Power Cable Hand Hole — HH
- H–Frame Pole
- Recorded U/G Power Line — P
- Designated U/G Power Line (S.U.E.*) — P

TELEPHONE:

- Existing Telephone Pole
- Proposed Telephone Pole
- Telephone Manhole — T
- Telephone Booth
- Telephone Pedestal — T
- Telephone Cell Tower
- U/G Telephone Cable Hand Hole — HH
- Recorded U/G Telephone Cable — T
- Designated U/G Telephone Cable (S.U.E.*) — T
- Recorded U/G Telephone Conduit — TC
- Designated U/G Telephone Conduit (S.U.E.*) — TC
- Recorded U/G Fiber Optics Cable — T FO
- Designated U/G Fiber Optics Cable (S.U.E.*) — T FO

WATER:

- Water Manhole — W
- Water Meter
- Water Valve
- Water Hydrant
- Recorded U/G Water Line — W
- Designated U/G Water Line (S.U.E.*) — W
- Above Ground Water Line — A/G Water

TV:

- TV Satellite Dish
- TV Pedestal — C
- TV Tower
- U/G TV Cable Hand Hole — HH
- Recorded U/G TV Cable — TV
- Designated U/G TV Cable (S.U.E.*) — TV
- Recorded U/G Fiber Optic Cable — TV FO
- Designated U/G Fiber Optic Cable (S.U.E.*) — TV FO

GAS:

- Gas Valve
- Gas Meter
- Recorded U/G Gas Line — G
- Designated U/G Gas Line (S.U.E.*) — G
- Above Ground Gas Line — A/G Gas

SANITARY SEWER:

- Sanitary Sewer Manhole
- Sanitary Sewer Cleanout
- U/G Sanitary Sewer Line — SS
- Above Ground Sanitary Sewer — A/G Sanitary Sewer
- Recorded SS Forced Main Line — FSS
- Designated SS Forced Main Line (S.U.E.*) — FSS

MISCELLANEOUS:

- Utility Pole
- Utility Pole with Base
- Utility Located Object
- Utility Traffic Signal Box — S
- Utility Unknown U/G Line — ?UTL
- 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.

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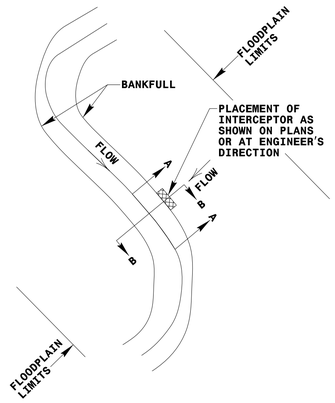
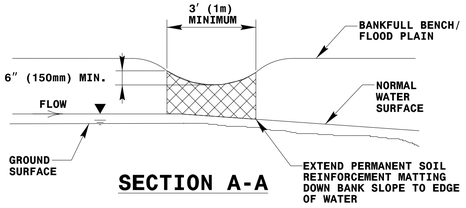
REVISIONS

FLOODPLAIN INTERCEPTOR DETAIL

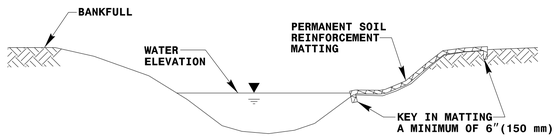
NOT TO SCALE



PLAN VIEW



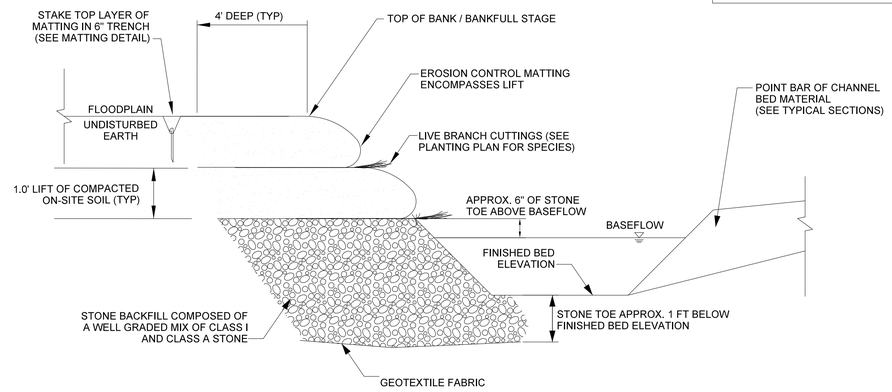
SECTION A-A



SECTION B-B

GEOLIFT DETAIL

NOT TO SCALE



NOTES:

1. IF CONSTRUCTION IS OUTSIDE OF DORMANT SEASON, INSTALL SOIL LIFTS. INSTALL LIVE STAKES DURING THE FOLLOWING DORMANT SEASON ON 2' - 3' CENTERS.
2. IF CONSTRUCTION IS OUTSIDE OF DORMANT SEASON INSTALL JUNCAL PLUGS 1' - 2' CENTERS DURING CONSTRUCTION.

PROJECT REFERENCE NO.	SHEET NO.
R-2635C	OSM-2

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 039201 ENGINEER JACOB M BYERS

2/11/2016

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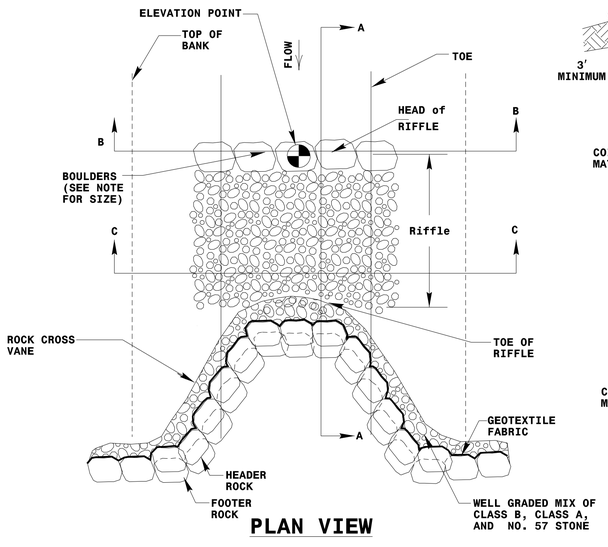
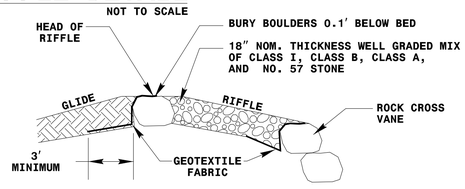
CONSTRUCTED RIFFLE DETAIL

NOT TO SCALE



PLAN VIEW



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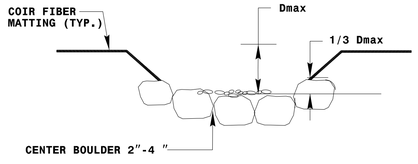

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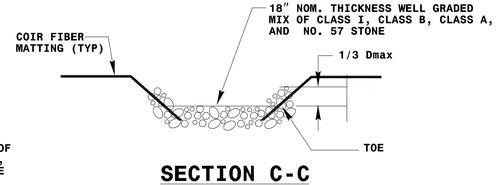


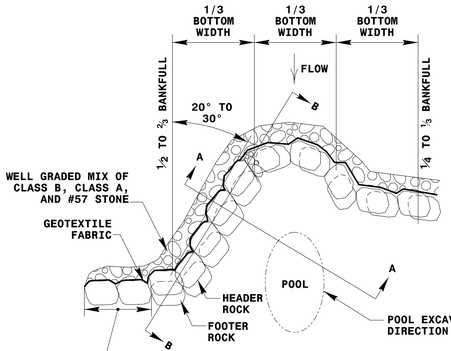
SECTION C-C

NOTE:
1. BOULDERS SHOULD BE NATIVE STONES OR SHOT ROCK, ANGULAR AND OBLONG, WITH AN AXIS APPROXIMATELY 3L x 2W x 1D

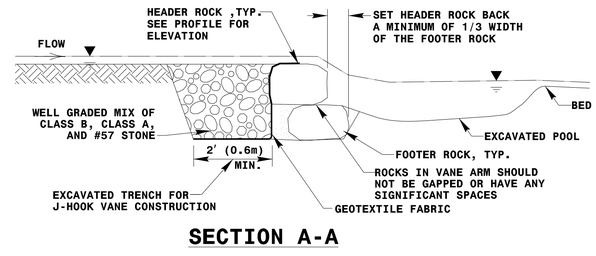
REACH	1
Wbkf (ft)	15.4
Dmax (ft)	1.4

GRADE CONTROL ROCK J-HOOK VANE DETAIL

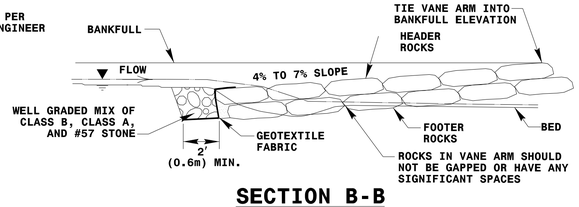
NOT TO SCALE



PLAN VIEW



SECTION A-A



SECTION B-B

	BOULDER DIMENSIONS (FT)		
STATION	HEIGHT	LENGTH	WIDTH
12+15.00	1	3	2
14+21.51	1	3	2
15+50.00	1	3	2

NOTES:
1. DEEPEST PART OF POOL TO BE IN LINE WITH WHERE VANE ARM TIES INTO BANKFULL.
2. DO NOT EXCAVATE POOL TOO CLOSE TO FOOTER BOULDERS.
3. CLASS "A" STONE CAN BE USED TO REDUCE VOIDS BETWEEN HEADERS AND FOOTERS.
4. COMPACT BACKFILL TO EXTENT POSSIBLE OR AT THE DIRECTION OF THE ENGINEER.
5. POOL DEPTH SHOULD BE 2 TO 3 TIMES BANKFULL DEPTH.
6. GEOTEXTILE FABRIC SHALL EXTEND OVER THE HEADER ROCKS TO A DISTANCE EQUAL TO ½ THE ROCK WIDTH.

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PROJECT REFERENCE NO.	SHEET NO.
R-2635C	OSM-2A

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 039201 ENGINEER JACOB M BYERS

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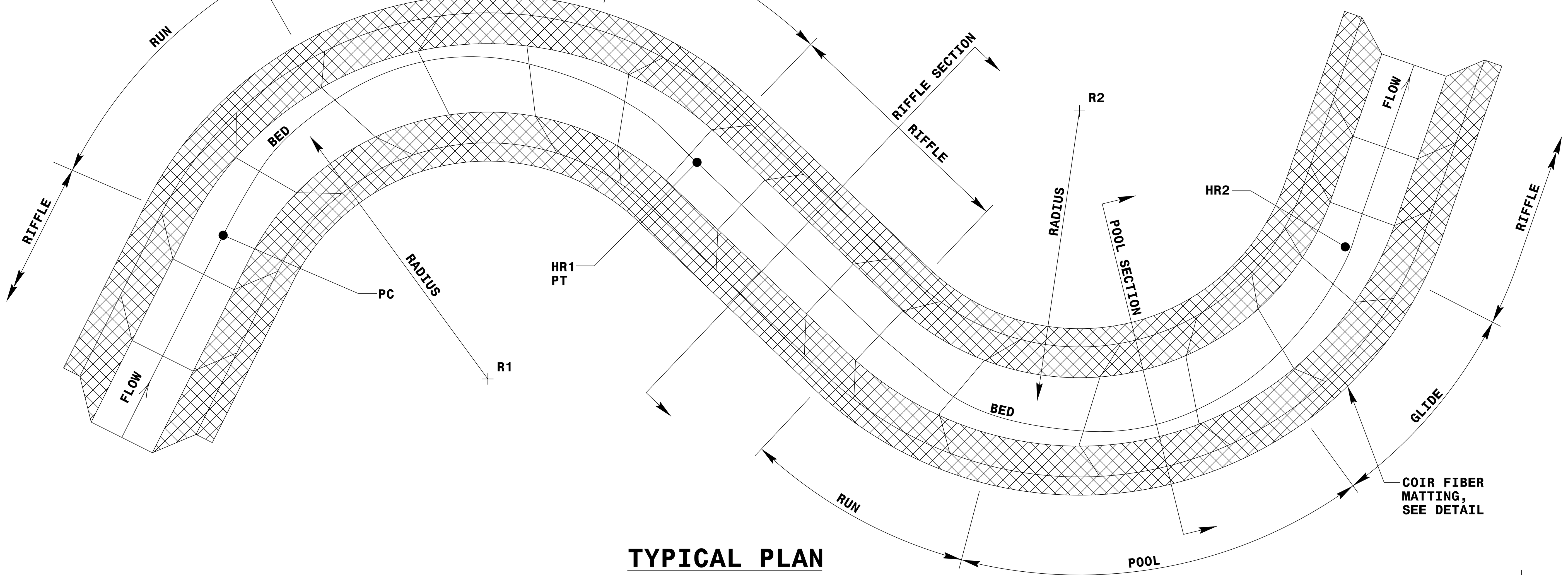
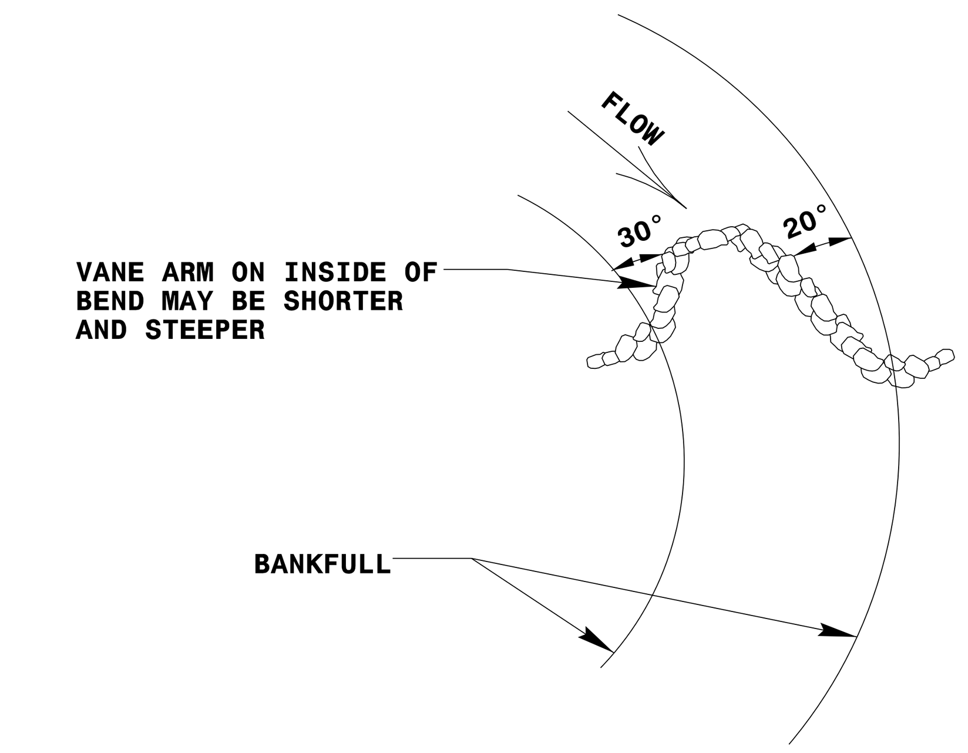
TYPICAL CHANNEL DETAIL

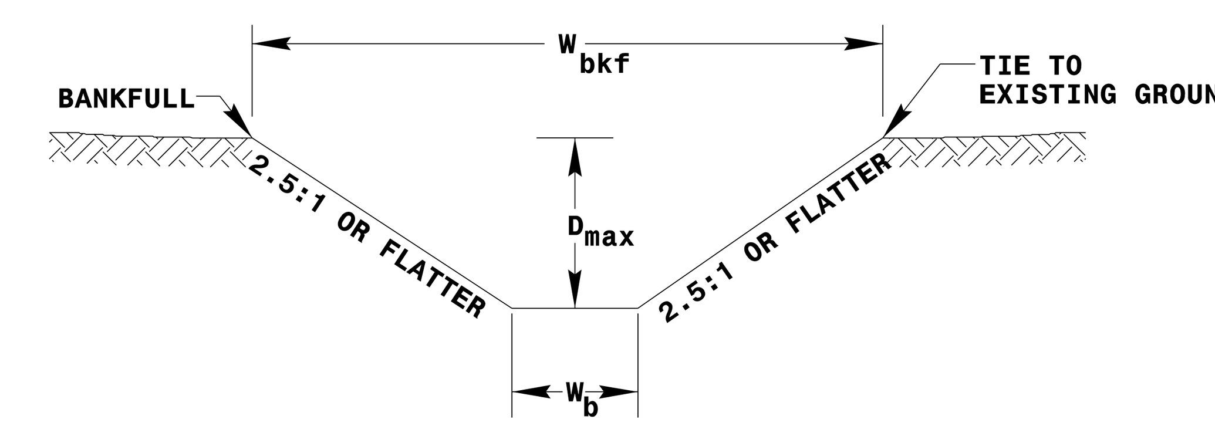
NOT TO SCALE



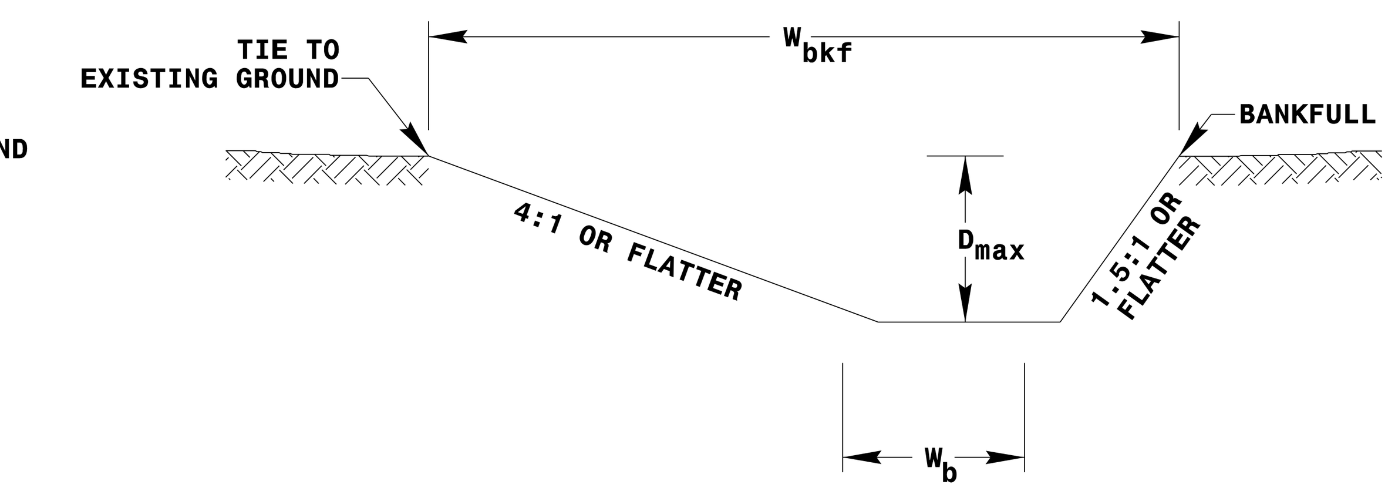
TYPICAL PLAN



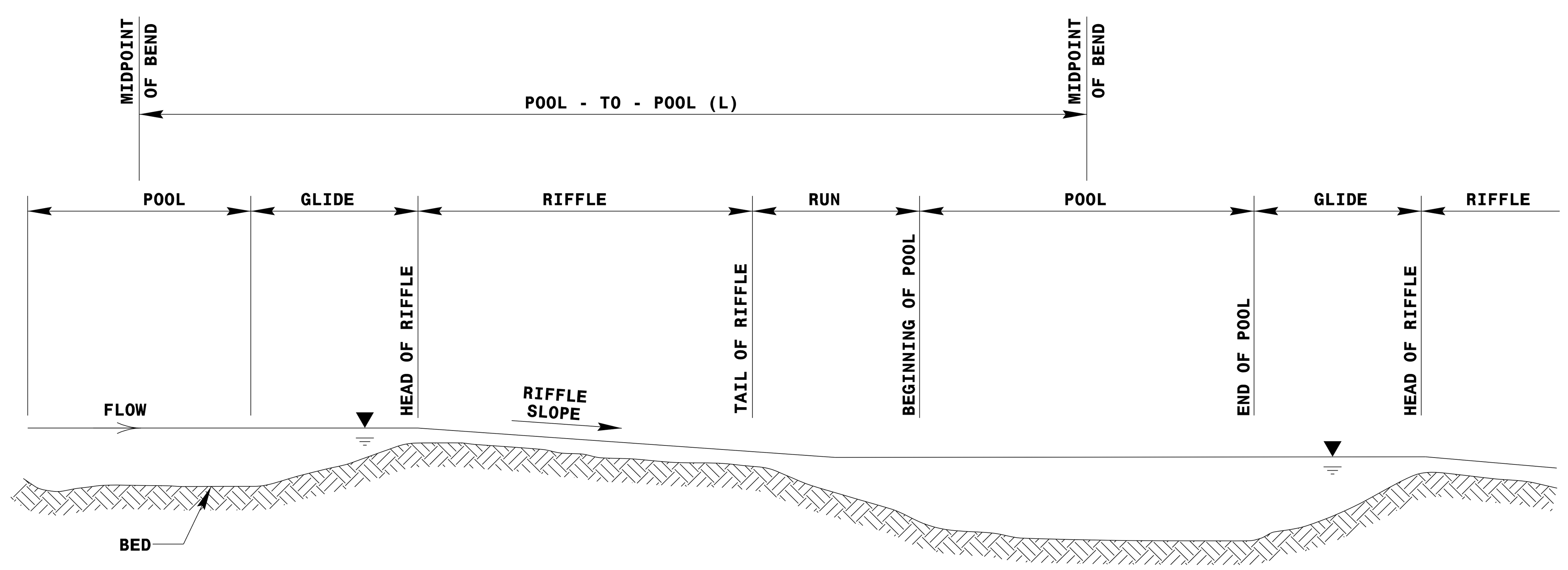
J-HOOK VANE CONSTRUCTION IN MEANDER-BEND PLAN VIEW



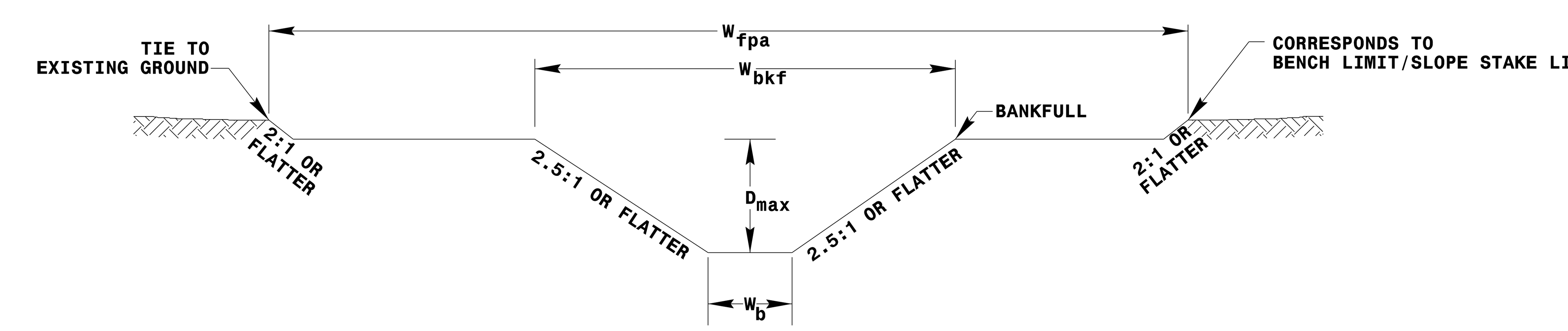
TYPICAL RIFFLE



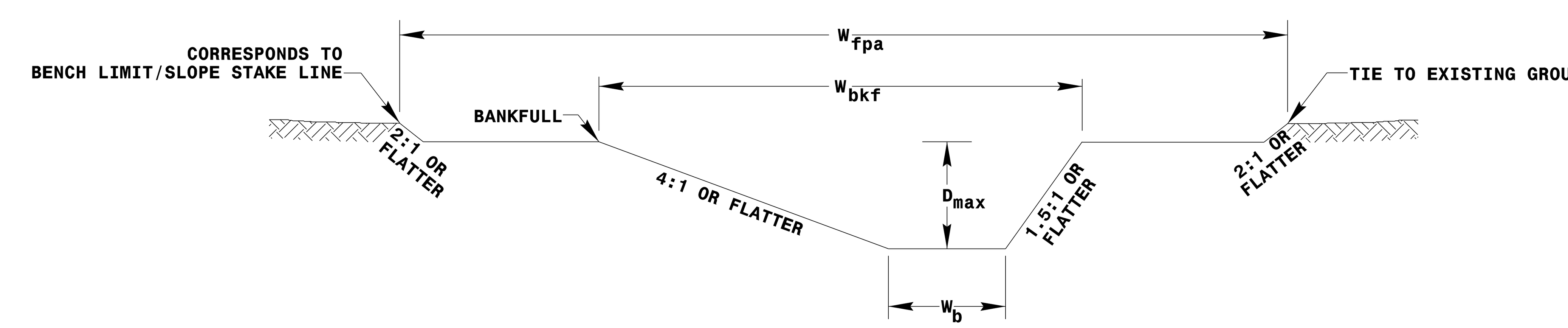
TYPICAL POOL



TYPICAL PROFILE

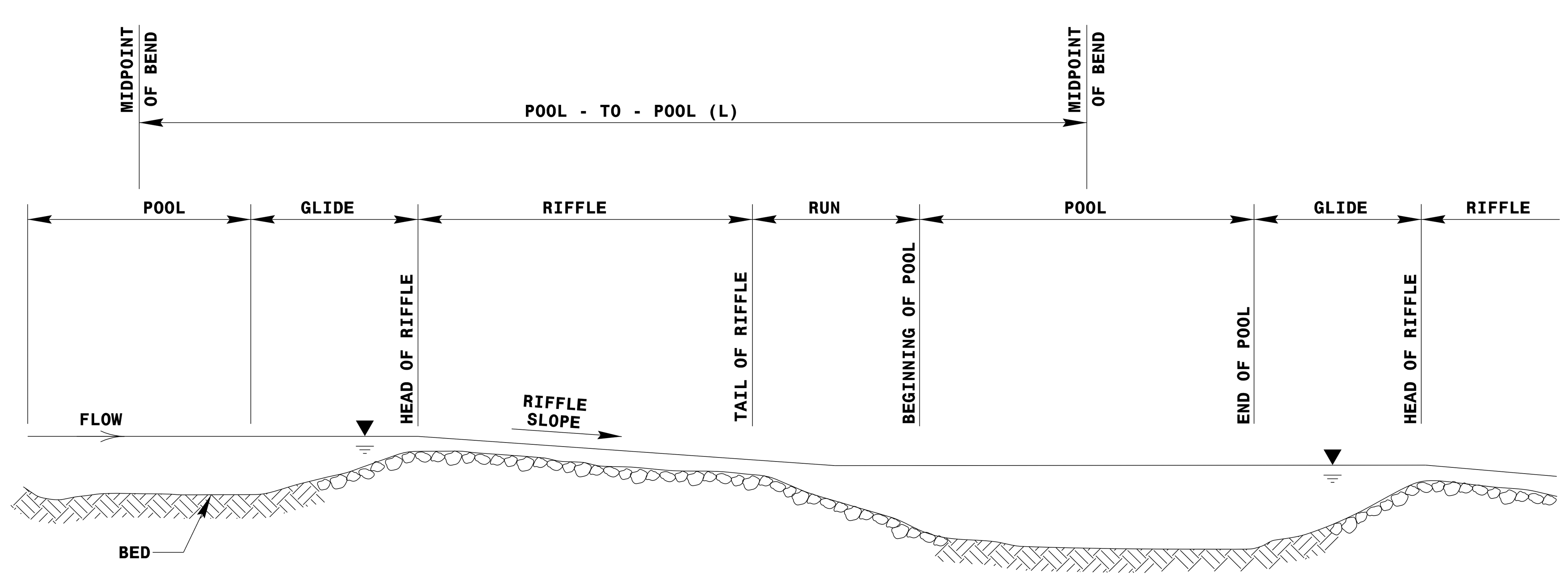


TYPICAL RIFFLE WITH BANKFULL BENCH



TYPICAL POOL WITH BANKFULL BENCH

W_{bkf} = BANKFULL WIDTH
D_{max} = MAXIMUM DEPTH
W_b = BOTTOM WIDTH
W_{fpa} = FLOOD PRONE AREA WIDTH



TYPICAL PROFILE FOR ARMORED RIFFLE SECTION

CROSS-SECTION DIMENSIONS

REACH	RIFFLE				POOL				Width/Depth Ratio
	W_{bkf}	D_{max}	W_b	W_{fpa}	W_{bkf}	D_{max}	W_b	W_{fpa}	
Sta. 10+00.00 - Sta. 16+62.48	15.4	1.4	8.2	35.0	19.1	2.6	4.8	35.0	14.0

NOTES:

1. THE COORDINATES FOR EACH CENTER OF RADIUS (EX. "R1","R2") AND EACH HEAD OF RIFFLE (EX. "HR1", "HR2") ARE INDICATED ON THE PLAN SHEETS.

REVISIONS

6/2/99

2/11/2016
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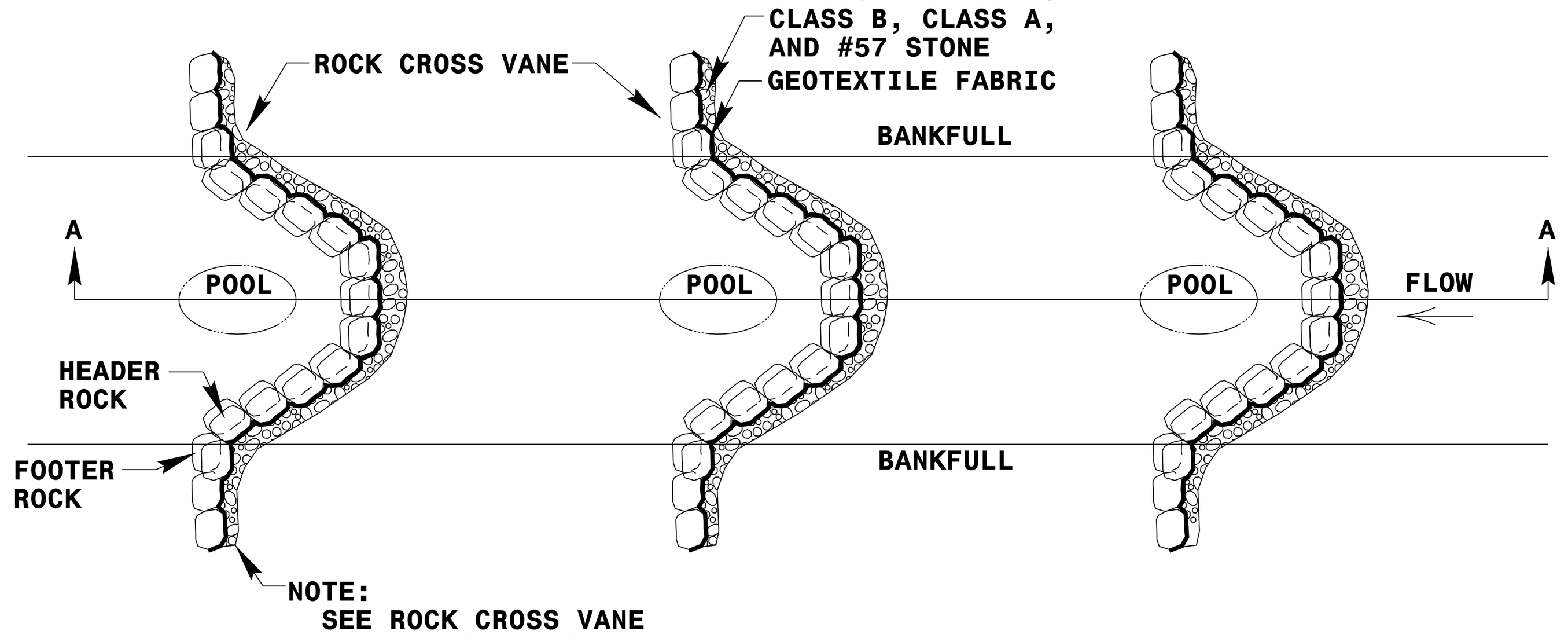
6/2/99

REVISIONS

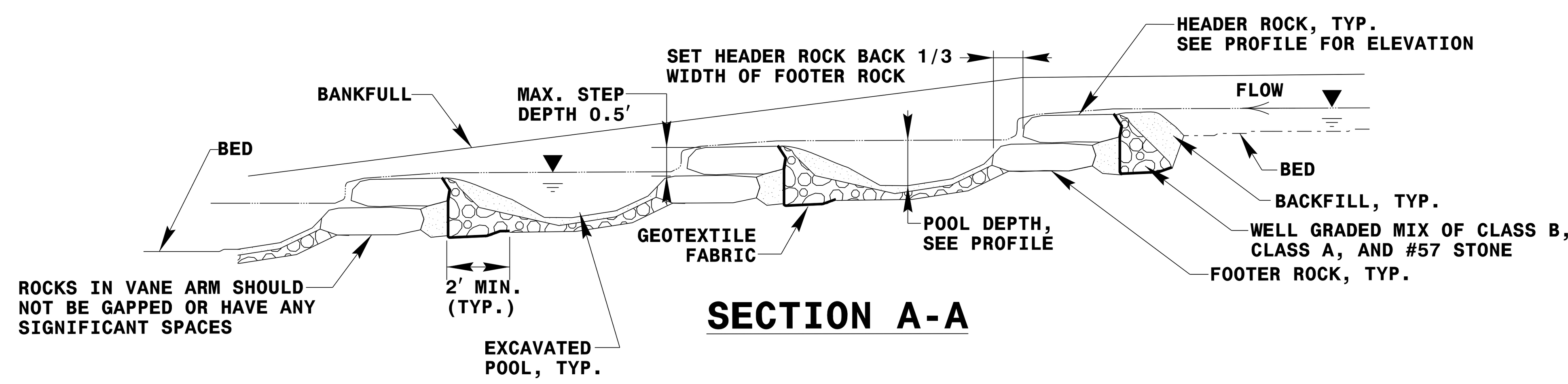
STEP POOL DETAIL

NOT TO SCALE



PLAN VIEW

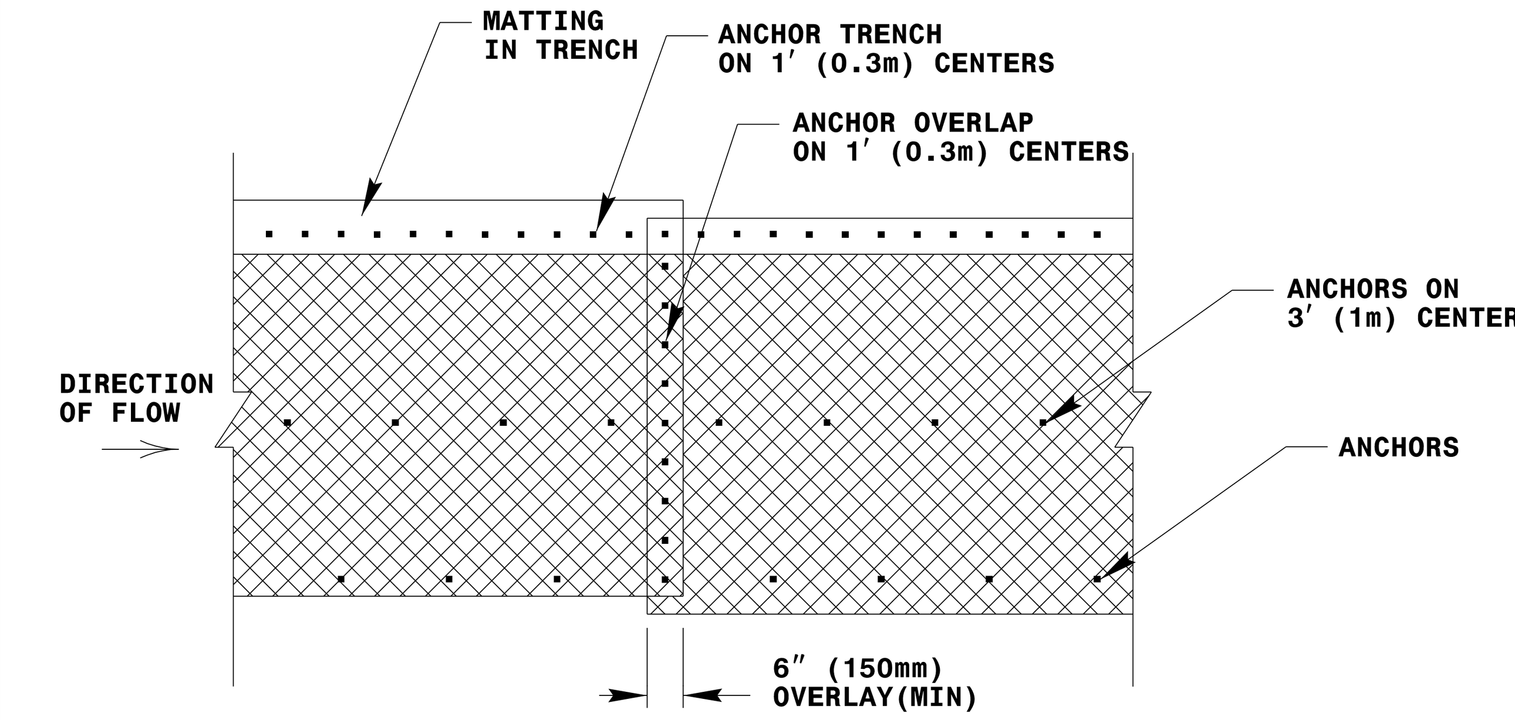
NOTES:
1. STEPS TO BE SHORT, FREQUENT, AND CLOSELY SPACED.
2. POOL SPACING SHALL BE INVERSELY PROPORTIONAL TO STREAM SLOPE, AND DIRECTLY PROPORTIONAL TO BANKFULL WIDTH.
3. POOL DEPTHS AT BANKFULL ELEVATION SHALL BE TYPICALLY 2 TO 3 TIMES DEEPER THAN STEP DEPTHS AT BANKFULL ELEVATION.
4. ADEQUATE NUMBER OF FOOTER BOULDERS TO BE USED IN ORDER TO HOLD UP THE BOULDERS AT HEAD OF STEPS DURING HIGH ENERGY/HIGH FLOW EVENTS.
5. STEP POOL DEPTH SHOULD BE 2 TO 3 TIMES BANKFULL DEPTH.
6. GEOTEXTILE FABRIC SHALL EXTEND OVER THE HEADER ROCKS TO A DISTANCE EQUAL TO 1/2 THE ROCK WIDTH.



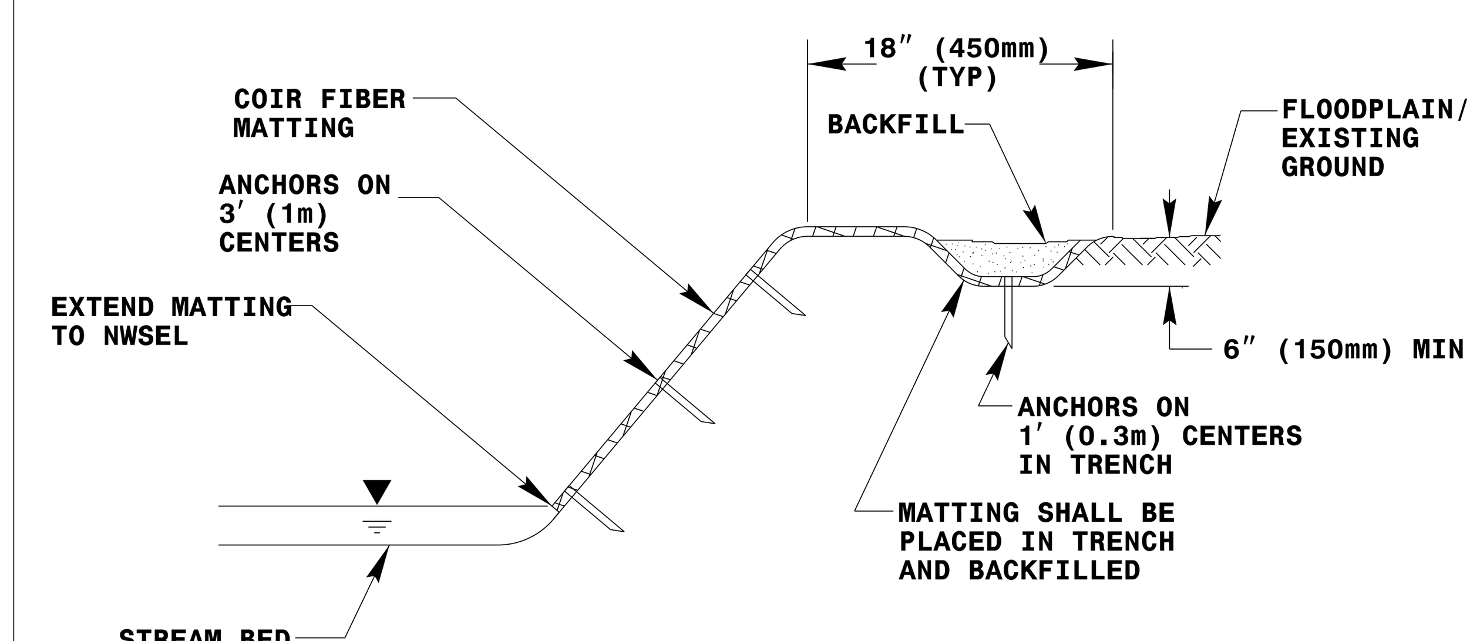
SECTION A-A

COIR FIBER MATTING DETAIL

NOT TO SCALE



PLAN VIEW



TYPICAL CROSS SECTION

PROJECT REFERENCE NO.	SHEET NO.
R-2635C	OSM-2B

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 039201 ENGINEER JACOB M. BYERS

2/11/2016

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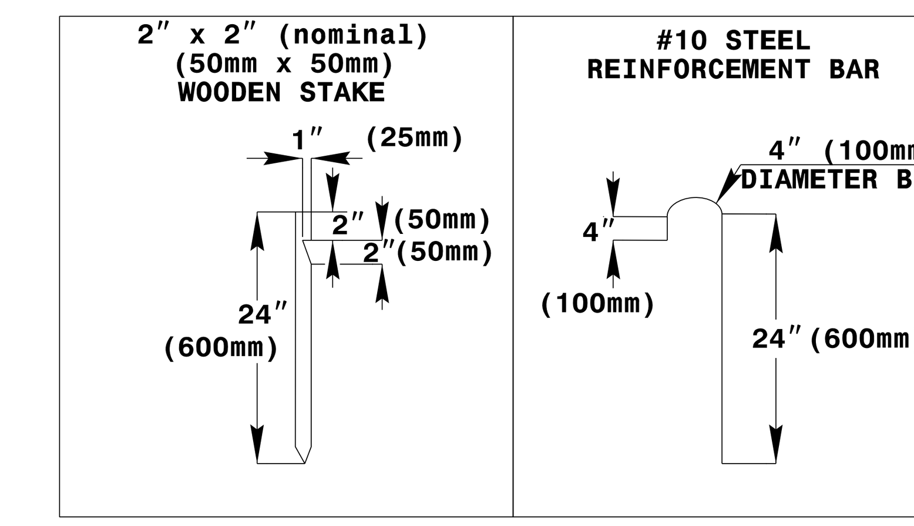
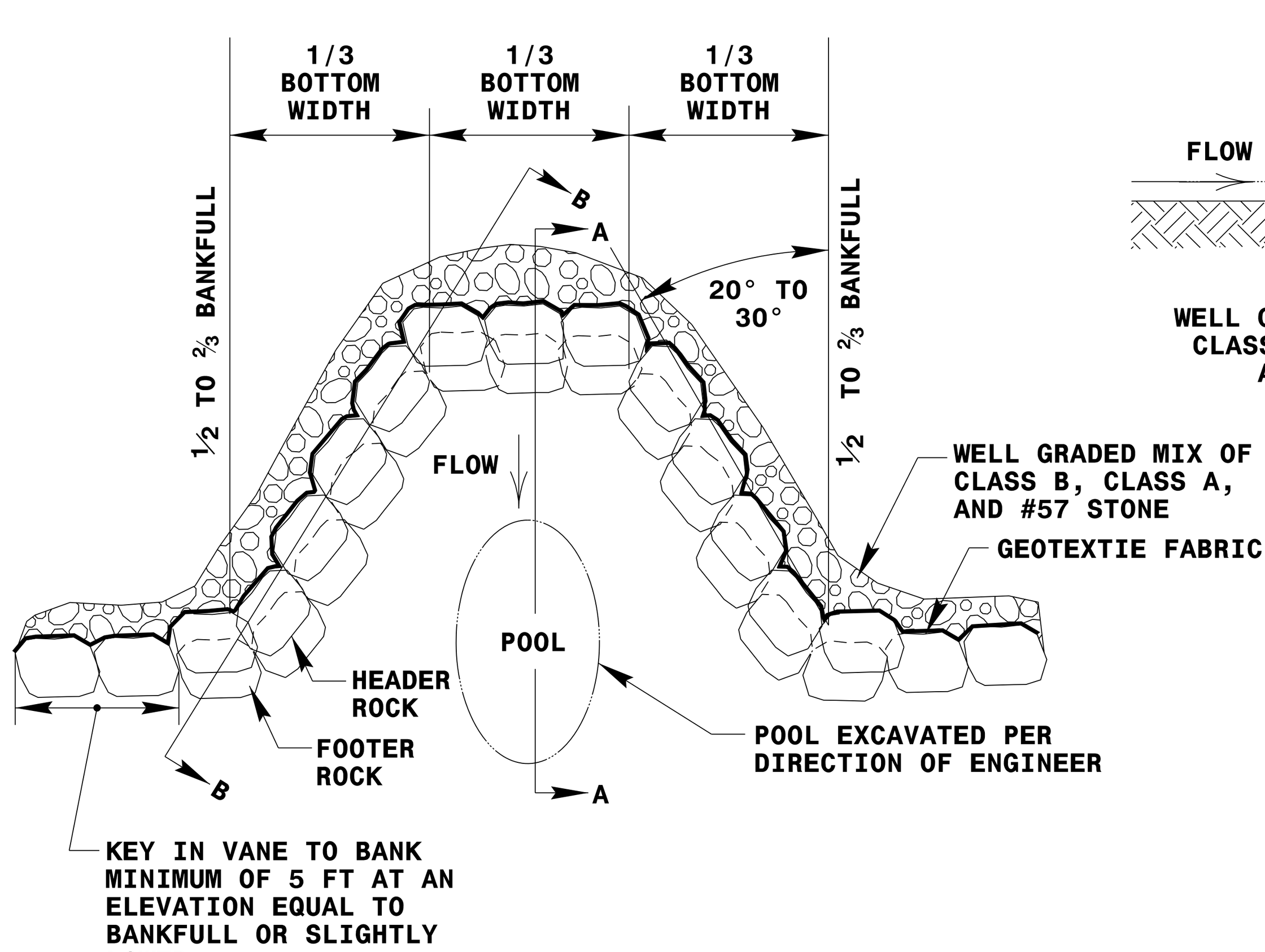


ANCHOR OPTIONS

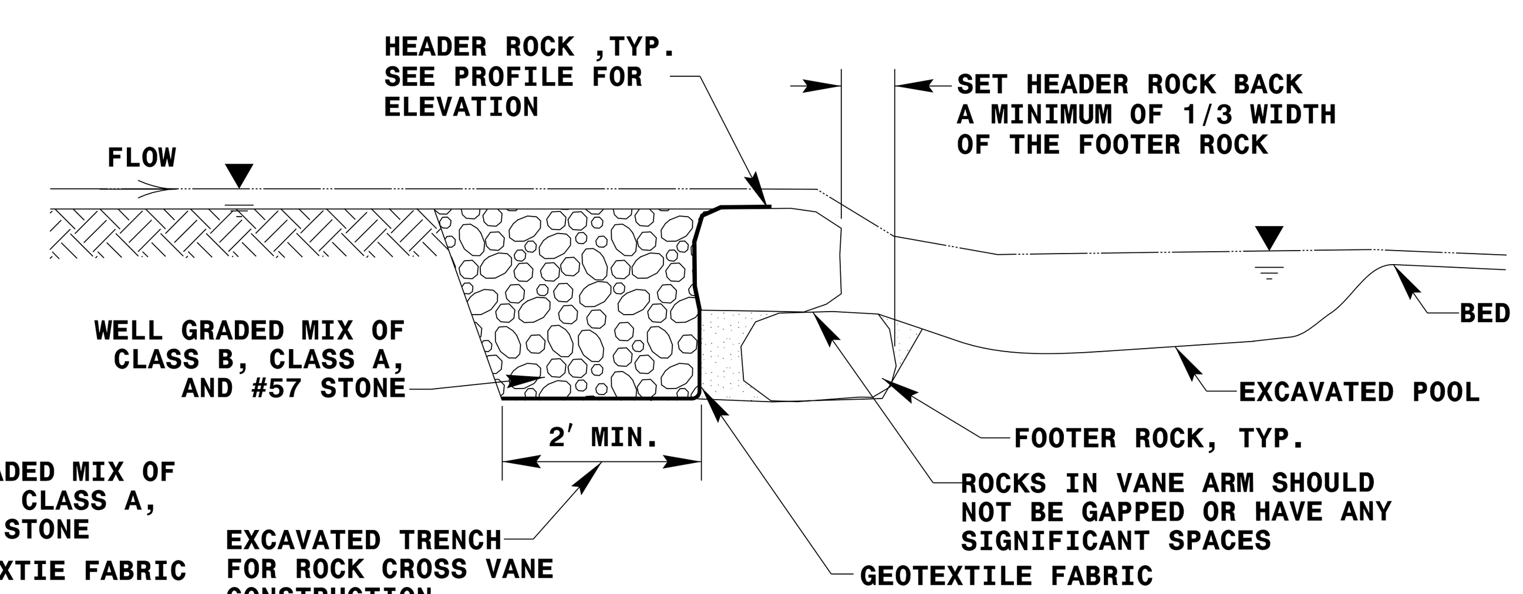
NOTES:
1. IN AREAS TO BE MATTED, ALL SEEDING, SOIL AMENDMENTS, AND SOIL PREPARATION MUST BE COMPLETED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS PRIOR TO PLACEMENT OF COIR FIBER MATTING.
2. REBAR OR STAPLES MAY BE USED IN PLACE OF WOODEN STAKES AS DIRECTED BY THE ENGINEER.

ROCK CROSS VANE DETAIL

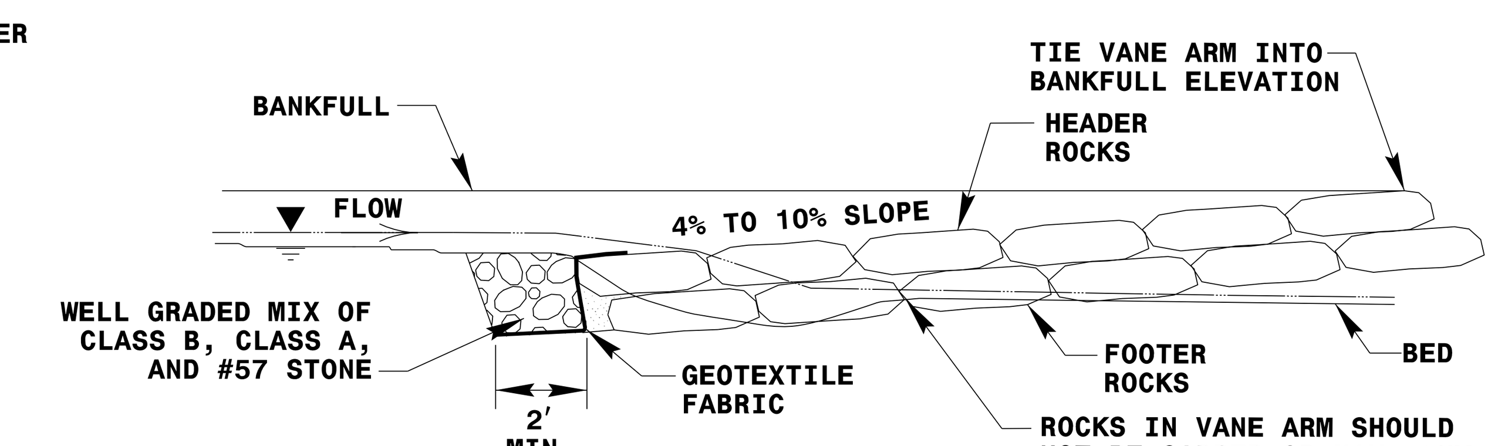
NOT TO SCALE



PLAN VIEW



SECTION A-A



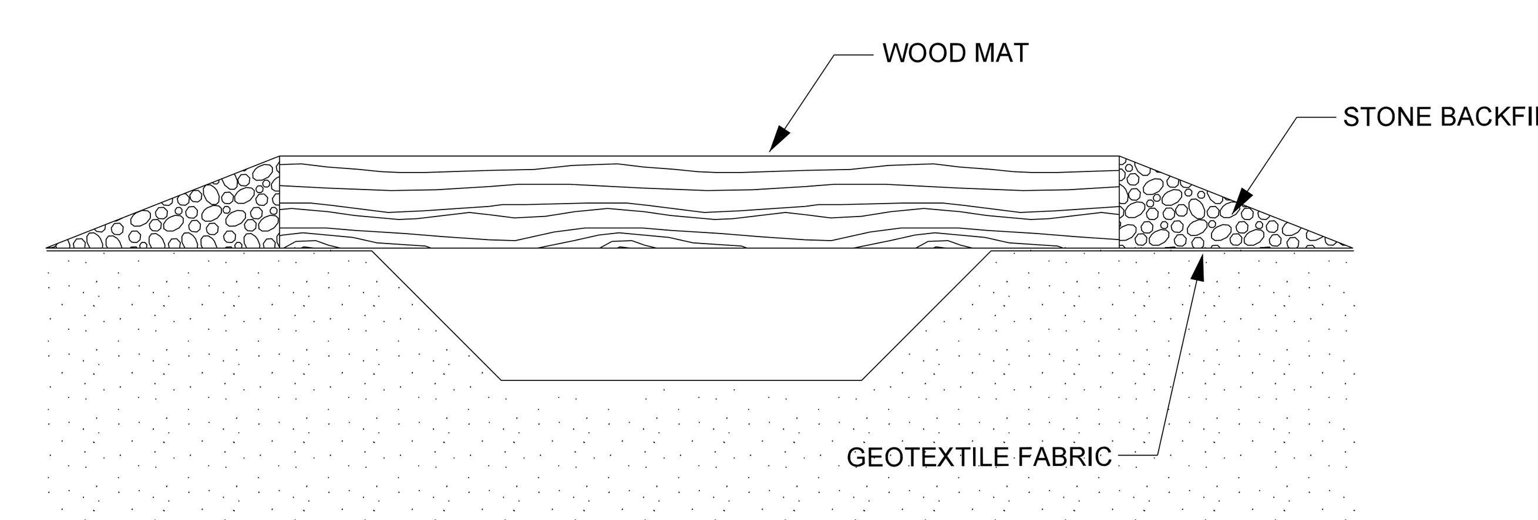
SECTION B-B

	BOULDER DIMENSIONS (FT)		
STATION	HEIGHT	LENGTH	WIDTH
16+45.00	1	3	2

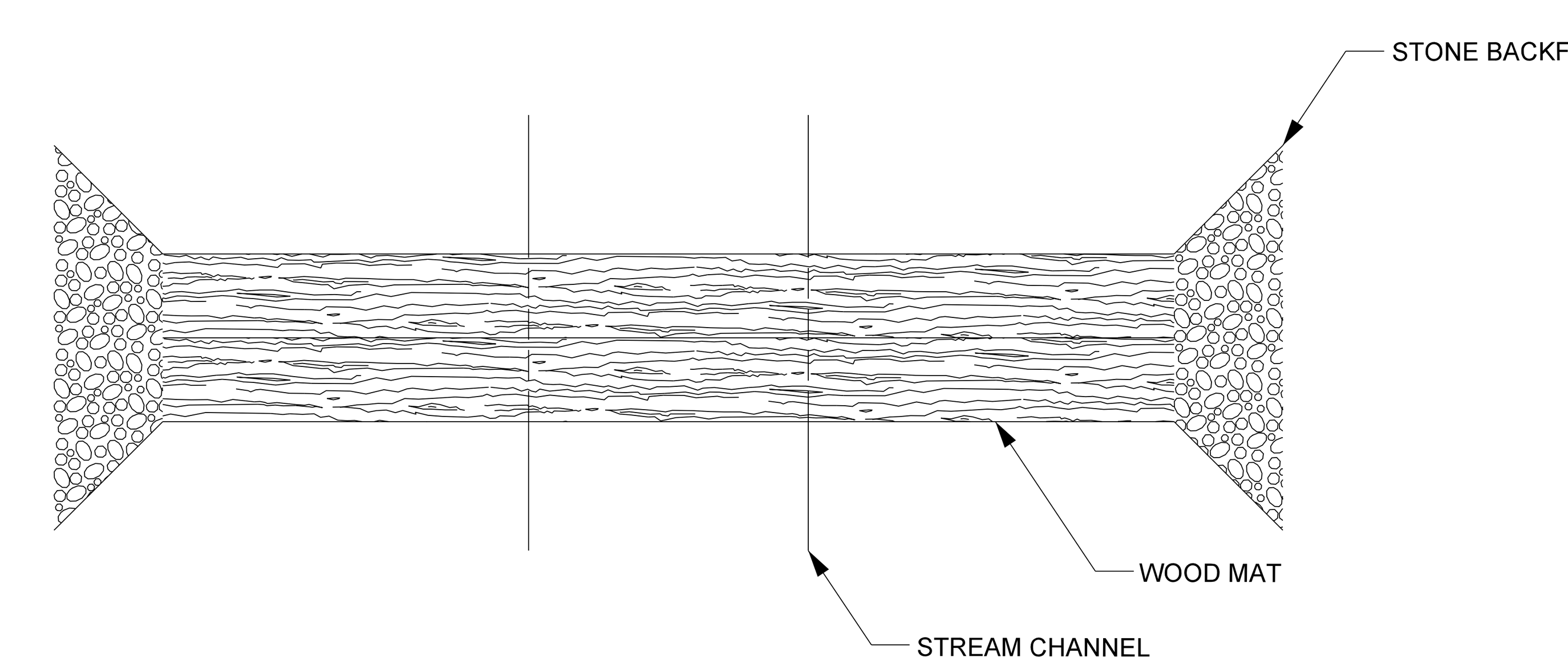
NOTES:
1. DEEPEST PART OF POOL TO BE IN LINE WITH WHERE VANE ARM TIES INTO BANKFULL.
2. DO NOT EXCAVATE POOL TOO CLOSE TO FOOTER BOULDERS.
3. CLASS "A" STONE CAN BE USED TO REDUCE VOIDS BETWEEN HEADERS AND FOOTERS.
4. COMPACT BACKFILL TO EXTENT POSSIBLE OR AT THE DIRECTION OF THE ENGINEER.
5. POOL DEPTH SHOULD BE 2 TO 3 TIMES BANKFULL DEPTH.
6. GEOTEXTILE FABRIC SHALL EXTEND OVER THE HEADER ROCKS TO A DISTANCE EQUAL TO ½ THE ROCK WIDTH.

TEMPORARY STREAM CROSSING - WOOD MAT

NOT TO SCALE



CROSS SECTION



PLAN VIEW

NOTES:

1. CONSTRUCT STREAM CROSSING WHEN FLOW IS LOW.
2. HAVE ALL NECESSARY MATERIALS AND EQUIPMENT ON-SITE BEFORE WORK BEGINS.
3. MINIMIZE CLEARING AND EXCAVATION OF STREAMBANKS. DO NOT EXCAVATE CHANNEL BOTTOM.
4. LINE STREAMBANK AND ACCESS RAMP AREA WITH GEOTEXTILE FABRIC.
5. INSTALL STREAM CROSSING AT RIGHT ANGLE TO THE FLOW.
6. TRANSPLANT SOD FROM ORIGINAL STREAMBANK ONTO SIDE SLOPES FOR LATER USE.
7. MAINTAIN CROSSING SO THAT RUNOFF IN THE CONSTRUCTION ROAD DOES NOT ENTER EXISTING CHANNEL.
8. STABILIZE AN ACCESS RAMP OF CLASS B STONE TO THE EDGE OF THE MUD MAT.
9. THE WOOD MAT SHALL BE OF SUFFICIENT SIZE AND WIDTH TO SUPPORT THE LARGEST VEHICLE CROSSING THE CHANNEL.
10. CONTRACTOR SHALL DETERMINE AN APPROPRIATE RAMP ANGLE ACCORDING TO EQUIPMENT UTILIZED, RECOMMENDED AT A 5:1 SLOPE.
11. CROSSING SHALL SPAN THE CHANNEL.

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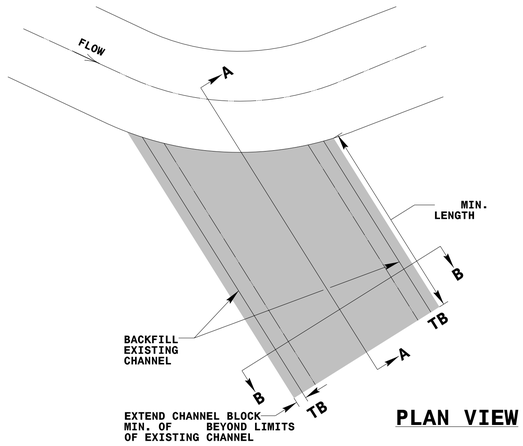
REVISIONS

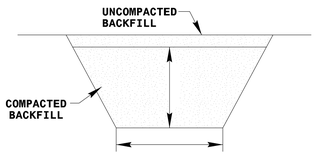
CHANNEL BLOCK DETAIL

NOT TO SCALE

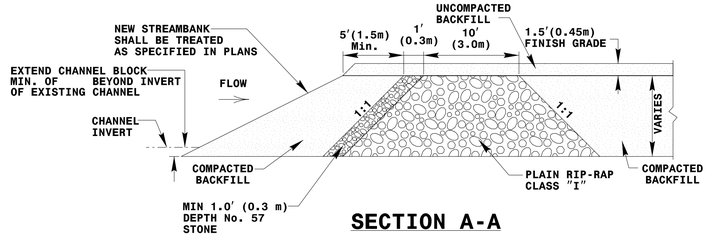


PLAN VIEW

NOTES:
1. CHANNEL BLOCK SHALL BE INSTALLED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.
2. BLOCK SHOULD BE INSTALLED AT THE INTERFACE BETWEEN EXISTING CHANNEL AND PROPOSED CHANNEL.
3. BOTTOM OF BLOCK SHOULD BE A MINIMUM OF BELOW THE INVERT OF THE EXISTING CHANNEL.
4. BLOCK SHOULD EXTEND A MINIMUM OF BEYOND THE LIMITS OF THE EXISTING STREAM CHANNEL.
5. INSTALL EROSION CONTROL MATTING AND SEED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS IMMEDIATELY AFTER GRADING.
6. COMPACT BACKFILL TO EXTENT POSSIBLE OR AT THE DIRECTION OF THE ENGINEER.



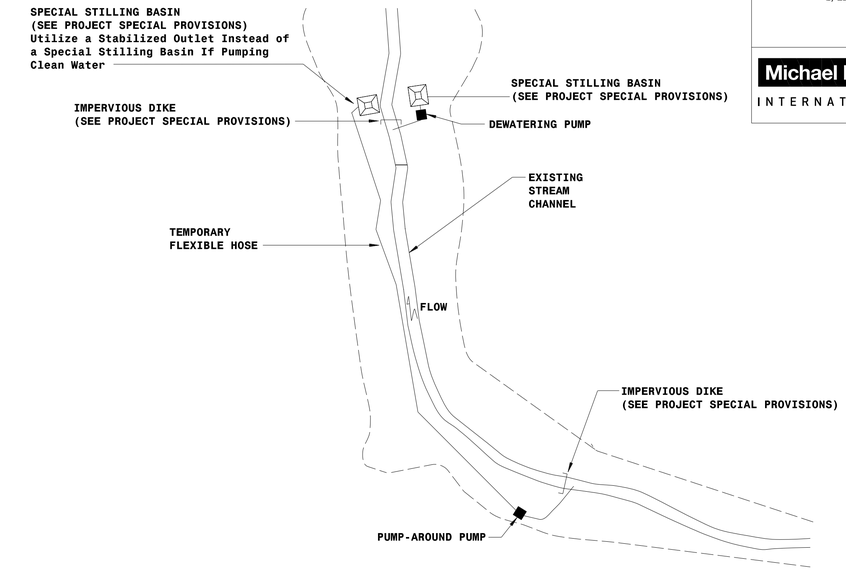
SECTION B-B



SECTION A-A

EXAMPLE OF PUMP-AROUND OPERATION

NOT TO SCALE



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 sufficicient size to dewater the work area.

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.

PROJECT REFERENCE NO.	SHEET NO.
R-2635C	OSM-2C

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 039201 ENGINEER JACOB M BYERS

2/11/2016

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REVISIONS

PROJECT REFERENCE NO.	SHEET NO.
R-2635C	OSM-3

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 039201 ENGINEER JACOB M. BYERS

2/11/2016

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CONSTRUCTION SEQUENCE

The Contractor is responsible for following the construction sequence in accordance with the plans and provisions, as directed by the Engineer. Construction shall proceed in the following manner unless otherwise directed by the Engineer.

1. The Contractor shall contact North Carolina "One Call" Center (1.800.632.4949) before any excavation begins. The Contractor shall notify the Engineer, NC DOT and appropriate utilities provider with any plan discrepancies.
2. All project operations will comply with the provided Sediment and Erosion Control Plan.
3. The Contractor shall mobilize equipment and materials to the site using the construction entrance off of I-540. Install the temporary construction entrance as shown on the plans or as directed by the Engineer.
4. The Contractor will store all equipment and materials in the staging area as shown on the plans or directed by the Engineer.
5. The Contractor shall utilize the haul road as shown on the plans or directed by the Engineer.
6. The Contractor shall layout the location of the new stream channel, construction limits of disturbance, and set grade stakes. The Engineer must inspect and approve all layout work before construction may begin.
7. Clear and grub all necessary vegetation to complete stream work. Clearing and grubbing shall be limited to the amount needed for grading.
8. The Contractor shall work in the dry and utilize a pump-around operation. Setup pump-around operations as shown in the details prior to any land-disturbing activity. The pump-around operation will continue 24 hours a day if for any reason the new section of stream has not been completed by the end of the day.
9. The Contractor shall only begin work on the length of stream that can be constructed and stabilized in one day.
10. The Contractor shall perform all grading and installation of in-stream structures as shown on the plans and details.
11. Immediately following grading activities, the slopes shall be seeded, mulched and matted with NC DOT specified erosion control matting.
12. Upon completion of all grading, disturbed areas, including the staging area(s) and haul road(s), shall be seeded and mulched. All vegetation shall be planted in accordance with the NC DOT vegetation plan. Temporary seeding shall be applied to all areas susceptible to erosion (i.e. disturbed channel banks, terrace slopes and spoil areas) such that ground cover is established within 21 working days following completion of any grading. Permanent ground cover shall be established on all disturbed areas following completion of construction. Plant all vegetation at the designated time of year.
13. All areas should be seeded, mulched and stabilized before leaving the project. Remove all erosion control measures and waste material from the project site.

SUMMARY OF QUANTITIES

SECTION	QUANTITY	UNIT	ITEM DESCRIPTION
800	1	LS	Mobilization/ Demobilization
SP	1	LS	Construction Surveying for Mitigation
SP	1	LS	Site Grading for Mitigation
SP	200	CY	Impervious Select Material
876	550	SY	Geotextile for Drainage
876	55	TON	No. 57 Stone
876	155	TON	Plain Rip Rap, Class A
876	85	TON	Plain Rip Rap, Class B
876	180	TON	Plain Rip Rap, Class I
SP	65	TON	Boulders
1610	30	TON	Stone for Erosion Control Class A
1610	21	TON	Stone for Erosion Control Class B
1610	94	TON	Sediment Control Stone
SP	1	LS	Diversion Pumping
SP	750	SY	Coir Fiber Mat
SP	25	SY	Permanent Soil Reinforcement Matting
1631	50	SY	Matting for Erosion Control
1605	1800	LF	Temporary Silt Fence
1639	5	EACH	Special Stilling Basin
1630	40	CY	Silt Excavation
1615	2	AC	Temporary Mulching
1620	200	LBS	Seed for Temporary Seeding
1620	1	TON	Fertilizer for Temporary Seeding
1622	100	LF	Temporary Slope Drains
SP	200	LF	Safety Fence
1660	3	AC	Seeding and Mulching
1660	3	AC	Mowing
1661	50	LBS	Seed for Repair Seeding
1661	0.25	TON	Fertilizer for Repair Seeding
1662	75	LBS	Seed for Supplemental Seeding
1665	1.75	TON	Fertilize Topdressing
1667	10	MHR	Specialized Hand Mowing
SP	500	CY	Imported Topsoil
SP	1	EACH	Temporary Stream Crossing
SP	1	LS	Live Cuttings
SP	525	EACH	Soft Rush Plug
1632	50	LF	1/4" Hardware Cloth
SP	50	LF	Wattle

STRUCTURE TABLE

R-2635C UT to Reedy Branch
Structure Table

Structure	Type	Station	Thalweg Elevation	Bankfull Elevation
1	Constructed Riffle	10+71.32	310.40	311.80
2	Constructed Riffle	11+03.06	310.23	311.63
3	Constructed Riffle	11+41.10	310.03	311.43
4	Constructed Riffle	11+90.00	309.84	311.24
5	J-Hook Vane	12+15.00	309.73	311.13
6	Constructed Riffle	12+47.00	309.70	311.10
7	Constructed Riffle	13.41.27	309.40	310.80
8	J-Hook Vane	14+21.51	308.74	310.14
9	Constructed Riffle	14+65.00	308.70	310.10
10	Constructed Riffle	15+20.00	308.20	309.60
11	J-Hook Vane	15+50.00	307.63	309.03
12	Constructed Riffle	16+02.00	307.10	308.50
13	Constructed Riffle	16+25.00	307.02	308.42
14	Cross Vane	16+45.00	306.96	308.36

EARTHWORK SUMMARY FOR MITIGATION

IN CUBIC YARDS

Line	Station	Station	Mitigaiton Excavation			Mitigation Embankment		Mitigation Borrow	Mitigation Total Waste
			Undercut	Suitable Unclass.	Total Unclass.	Total Embankment	Embankment + 25%		
UT to Reedy Branch	10+00	16+62	384	839	1223	76	95	0	1128
Total			384	839	1223	76	95	0	1128
Waste in lieu of borrow									
Grand Total					1223	76	95	0	1128
Say					1250		110	0	1140
Imported topsoil not included as part of the earthwork summary for mitigation									

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CURVE DATA

1

PI STA = 10+35.94	N = 724,968.1773	E = 2,032,289.2331
DELTA = 48° 40' 21" (LT)		
DEGREE = 286° 28' 44"		
TANGENT = 9.05		
LENGTH = 16.99		
RADIUS = 20.00		
PC STA = 10+26.90	N = 724,976.1409	E = 2,032,293.5232
PT STA = 10+43.89	N = 724,959.6969	E = 2,032,292.3803
CC	N = 724,966.6554	E = 2,032,311.1308

2

PI STA = 10+49.43	N = 724,954.4956	E = 2,032,294.3106
DELTA = 25° 01' 27" (RT)		
DEGREE = 229° 10' 59"		
TANGENT = 5.55		
LENGTH = 10.92		
RADIUS = 25.00		
PC STA = 10+43.89	N = 724,959.6969	E = 2,032,292.3803
PT STA = 10+54.80	N = 724,948.9661	E = 2,032,293.8595
CC	N = 724,950.9988	E = 2,032,268.9422

3

PI STA = 10+92.69	N = 724,911.2080	E = 2,032,290.7792
DELTA = 41° 31' 09" (LT)		
DEGREE = 190° 59' 09"		
TANGENT = 11.37		
LENGTH = 21.74		
RADIUS = 30.00		
PC STA = 10+81.32	N = 724,922.5421	E = 2,032,291.7039
PT STA = 11+03.06	N = 724,902.1089	E = 2,032,297.6000
CC	N = 724,920.1028	E = 2,032,321.6045

4

PI STA = 11+31.71	N = 724,879.1840	E = 2,032,314.7846
DELTA = 70° 04' 57" (RT)		
DEGREE = 318° 18' 36"		
TANGENT = 12.62		
LENGTH = 22.02		
RADIUS = 18.00		
PC STA = 11+19.08	N = 724,889.2844	E = 2,032,307.2133
PT STA = 11+41.10	N = 724,868.6248	E = 2,032,307.8676
CC	N = 724,878.4880	E = 2,032,292.8106

5

PI STA = 11+80.55	N = 724,835.6211	E = 2,032,286.2483
DELTA = 80° 14' 19" (LT)		
DEGREE = 318° 18' 36"		
TANGENT = 15.17		
LENGTH = 25.21		
RADIUS = 18.00		
PC STA = 11+65.39	N = 724,848.3090	E = 2,032,294.5597
PT STA = 11+90.59	N = 724,825.2789	E = 2,032,297.3435
CC	N = 724,838.4458	E = 2,032,309.6168

6

PI STA = 12+35.48	N = 724,794.6750	E = 2,032,330.1754
DELTA = 83° 16' 25" (RT)		
DEGREE = 204° 37' 40"		
TANGENT = 24.89		
LENGTH = 40.70		
RADIUS = 28.00		
PC STA = 12+10.59	N = 724,811.6475	E = 2,032,311.9673
PT STA = 12+51.28	N = 724,774.6043	E = 2,032,315.4525
CC	N = 724,791.1657	E = 2,032,292.8755

7

PI STA = 12+91.08	N = 724,742.5131	E = 2,032,291.9119
DELTA = 71° 40' 50" (LT)		
DEGREE = 286° 28' 44"		
TANGENT = 14.45		
LENGTH = 25.02		
RADIUS = 20.00		
PC STA = 12+76.63	N = 724,754.1611	E = 2,032,300.4563
PT STA = 13+01.66	N = 724,730.7406	E = 2,032,300.2840
CC	N = 724,742.3315	E = 2,032,316.5828

8

PI STA = 13+31.09	N = 724,706.7537	E = 2,032,317.3424
DELTA = 84° 02' 33" (RT)		
DEGREE = 318° 18' 36"		
TANGENT = 16.22		
LENGTH = 26.40		
RADIUS = 18.00		
PC STA = 13+14.87	N = 724,719.9715	E = 2,032,307.9425
PT STA = 13+41.27	N = 724,696.0327	E = 2,032,305.1716
CC	N = 724,709.5396	E = 2,032,293.2736

9

PI STA = 13+81.03	N = 724,669.7559	E = 2,032,275.3415
DELTA = 76° 25' 10" (LT)		
DEGREE = 229° 10' 59"		
TANGENT = 19.68		
LENGTH = 33.34		
RADIUS = 25.00		
PC STA = 13+61.35	N = 724,682.7643	E = 2,032,290.1090
PT STA = 13+94.69	N = 724,652.3467	E = 2,032,284.5186
CC	N = 724,664.0047	E = 2,032,306.6340

10

PI STA = 14+40.88	N = 724,611.4841	E = 2,032,306.0589
DELTA = 62° 22' 25" (RT)		
DEGREE = 179° 02' 58"		
TANGENT = 19.37		
LENGTH = 34.84		
RADIUS = 32.00		
PC STA = 14+21.51	N = 724,628.6189	E = 2,032,297.0265
PT STA = 14+56.35	N = 724,595.5359	E = 2,032,295.0660
CC	N = 724,613.6968	E = 2,032,268.7187

11

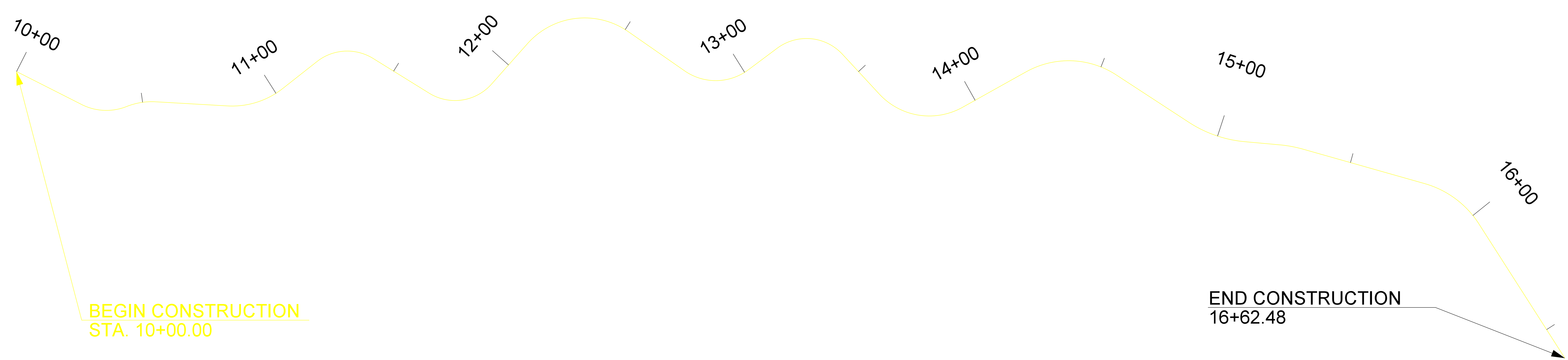
PI STA = 14+99.44	N = 724,560.0537	E = 2,032,270.6086
DELTA = 27° 58' 27" (LT)		
DEGREE = 127° 19' 26"		
TANGENT = 11.21		
LENGTH = 21.97		
RADIUS = 45.00		
PC STA = 14+88.24	N = 724,569.2827	E = 2,032,276.9701
PT STA = 15+10.21	N = 724,548.9191	E = 2,032,269.3196
CC	N = 724,543.7440	E = 2,032,314.0210

12

PI STA = 15+27.54	N = 724,531.7031	E = 2,032,267.3265
DELTA = 10° 38' 06" (RT)		
DEGREE = 127° 19' 26"		
TANGENT = 4.19		
LENGTH = 8.35		
RADIUS = 45.00		
PC STA = 15+23.35	N = 724,535.8637	E = 2,032,267.8082
PT STA = 15+31.70	N = 724,527.7028	E = 2,032,266.0852
CC	N = 724,541.0388	E = 2,032,223.1067

13

PI STA = 15+91.67	N = 724,470.4281	E = 2,032,248.3132
DELTA = 41° 34' 07" (RT)		
DEGREE = 163° 42' 08"		
TANGENT = 13.28		
LENGTH = 25.39		
RADIUS = 35.00		
PC STA = 15+78.39	N = 724,483.1156	E = 2,032,252.2501
PT STA = 16+03.78	N = 724,463.5479	E = 2,032,236.9495
CC	N = 724,493.4880	E = 2,032,218.8224



REVISIONS

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2/11/2016
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PROJECT REFERENCE NO.	SHEET NO.
R-2635C	OSM-4

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 039201 ENGINEER JACOB M EVERS

2/11/2016

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Phone: 919.463.5488
Fax: 919.463.5490
License #: F-1084

NAD 83

INSTALL STEP-POOL/OUTLET PROTECTION

FILL EXISTING HEAD CUT AND ENSURE FLOW THROUGH STEP-POOL ONLY

SLOPE BANK AT 3:1, MAT, AND PLANT

INSTALL 2' THICK LAYER OF A WELL GRADED MIX OF CLASS B AND A RIP RAP UNDERLAIN BY FILTER FABRIC AT OUTFALL

EXIST. GAS LINE DO NOT DIG/DISTURB

EXIST. R/W MONUMENT DO NOT DISTURB

DO NOT DISTURB TREE/ LEFT TOP OF BANK

INSTALL GRADE CONTROL ROCK J-HOOK (TYP)

INSTALL COIR FIBER MATTING ON EXISTING SEEP

APPROX. NCDOT C/A R/W

EXIST. C/A R/W

10+00 11+00 12+00 13+00 14+00 15+00

X-1 X-2 X-3 X-4 X-5

FP

INSTALL CONSTRUCTED RIFFLE (TYP)

INSTALL GEOLIFT (TYP) WITH ROCK TOE

PROPOSED BENCH LIMITS/ SLOPE STAKE LINE

EXISTING CROSS VANE TO REMAIN

EXISTING OUTFALL DO NOT DISTURB

REMOVE TREE

INSTALL CHANNEL BLOCK

MATCH LINE STA. 15+00 SHEET OSM-5

BEGIN CONSTRUCTION STA. 10+00.00

GPS 2
X = 2,032,183.302
Y = 724,638.147
Z = 319.402

CAT-1

REVISIONS

PROPOSED BANKFULL

EXISTING GROUND

DESIGN THALWEG

BEGIN CONSTRUCTION STA. 10+00.00 EL= 310.94

PI=10+26.90 EL=310.74
PI=10+43.89 EL=310.43
PI=10+54.80 EL=309.33
PI=10+71.32 EL=310.40
PI=10+92.19 EL=310.29
PI=11+03.06 EL=310.23
PI=11+15.00 EL=310.06
PI=11+23.00 EL=308.93
PI=11+41.10 EL=310.03
PI=11+65.39 EL=309.86
PI=11+77.99 EL=308.67
PI=11+90.59 EL=309.84
PI=12+15.00 EL=309.73
PI=12+25.00 EL=308.55
PI=12+47.00 EL=309.70
PI=12+76.63 EL=309.63
PI=12+86.00 EL=308.43
PI=13+01.66 EL=309.60
PI=13+14.87 EL=309.43
PI=13+28.07 EL=308.27
PI=13+41.27 EL=309.40
PI=13+61.35 EL=309.13
PI=13+78.02 EL=307.99
PI=13+94.69 EL=309.10
PI=14+21.51 EL=308.74
PI=14+38.93 EL=307.65
PI=14+65.00 EL=308.70
PI=14+88.24 EL=308.23
PI=15+00.00 EL=307.19

320 310 300

10+00 11+00 12+00 13+00 14+00 15+00

2/11/2016
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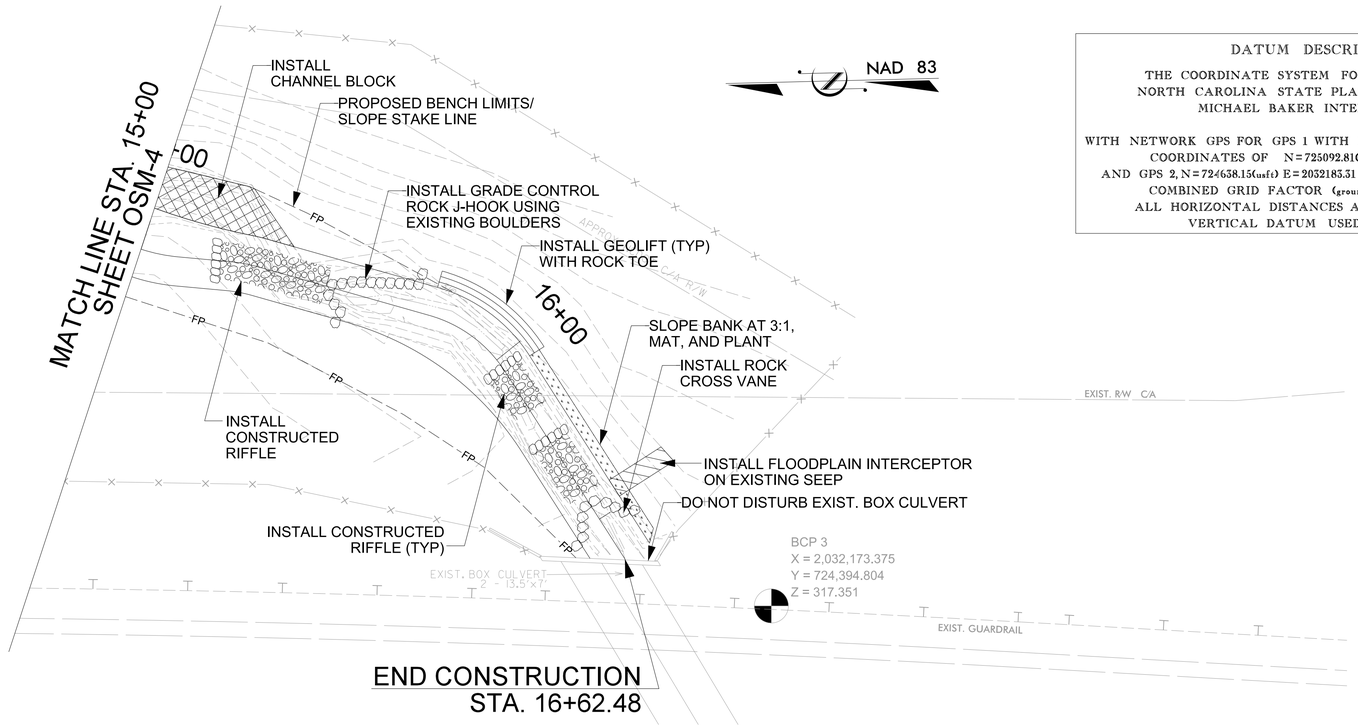

NAD 83

DATUM DESCRIPTION

THE COORDINATE SYSTEM FOR THIS PROJECT IS NORTH CAROLINA STATE PLANE ESTABLISHED BY MICHAEL BAKER INTERNATIONAL

WITH NETWORK GPS FOR GPS 1 WITH NAD 83 STATE PLANE GRID COORDINATES OF N=725092.81(usft), E=2032251.76(usft) AND GPS 2, N=724638.15(usft) E=2032183.51 (usft), WITH AN AVERAGE COMBINED GRID FACTOR (ground to grid) of 0.99998806. ALL HORIZONTAL DISTANCES ARE GRID DISTANCES. VERTICAL DATUM USED IS NAVD 88.

PROJECT REFERENCE NO.	SHEET NO.
R-2635C	OSM-5

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 039201 ENGINEER JACOB M BYERS

2/11/2016

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PROJECT: R-2635C

TIP

EROSION AND SEDIMENT CONTROL MEASURES

Std. #	Description	Symbol
1630.03	Temporary Silt Ditch	TSD
1630.05	Temporary Diversion	TD
1605.01	Temporary Silt Fence	
1606.01	Special Sediment Control Fence	
1622.01	Temporary Berms and Slope Drains	
	Silt Basin Type B	
1633.01	Temporary Rock Silt Check Type-A	
	Temporary Rock Silt Check Type-A with Matting and Polyacrylamide (PAM)	
	Temporary Rock Silt Check Type-B	
	Wattle / Coir Fiber Wattle	
	Wattle / Coir Fiber Wattle with Polyacrylamide (PAM)	
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	
1630.04	Stilling Basin	
1630.06	Special Stilling Basin	
	Rock Inlet Sediment Trap:	
1632.01	Type A	A
1632.02	Type B	B
1632.03	Type C	C
	Skimmer Basin	
	Tiered Skimmer Basin	
	Infiltration Basin	

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

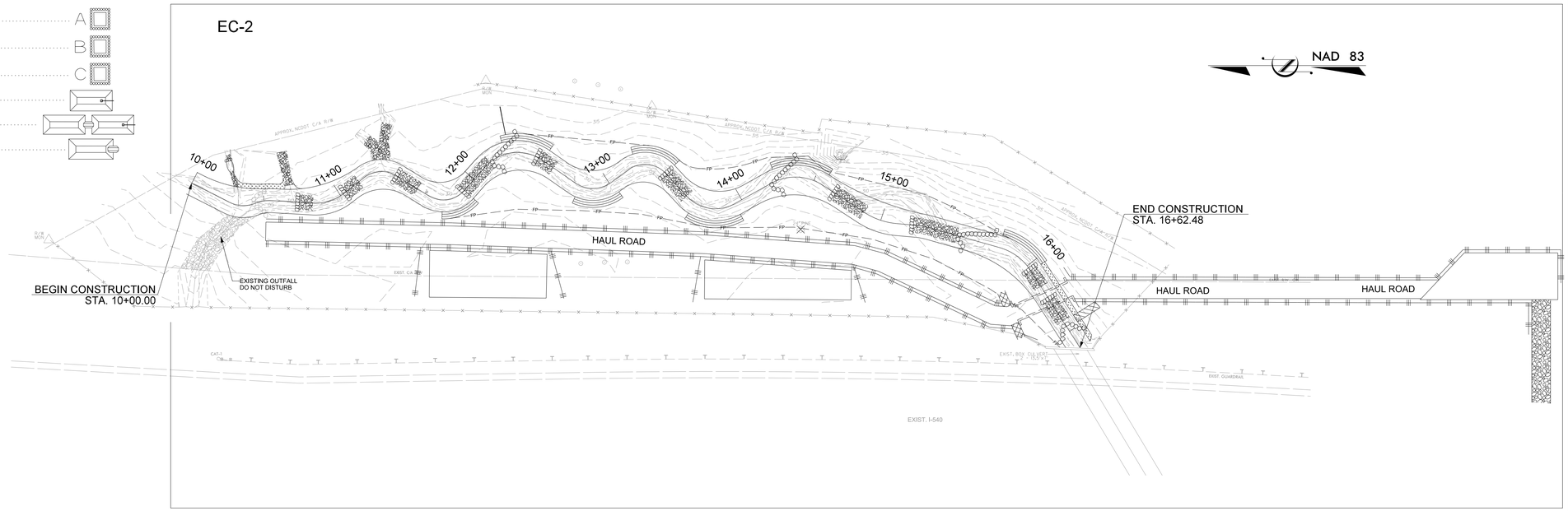
PLAN FOR PROPOSED
EROSION CONTROL

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2635C	EC-1	2

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION

THESE EROSION AND SEDIMENT CONTROL PLANS COMPLY WITH THE REGULATIONS SET FORTH 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 RESOURCES.

EC-2



Jacob M. Byers
LEVEL III NAME

3179
LEVEL III CERTIFICATION NO.

GRAPHIC SCALE

0 15 30

PLANS

PROJECT LENGTH

EXISTING STREAM LENGTH = 692 FT
PROPOSED DESIGN STREAM LENGTH = 662 FT

Prepared in the Office of:

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2012 STANDARD SPECIFICATIONS

RIGHT OF WAY DATE:

LETTING DATE:

NORTH CAROLINA PROFESSIONAL SEAL 039201 ENGINEER JACOB M. BYERS

2/11/2016

DocuSigned by: Jacob Byers

JACOB M. BYERS, PE
PROJECT ENGINEER

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 July 18, 2006 and the latest revison thereto are applicable to this project and by reference hereby are considered a part of these plans.

1605.01 Temporary Silt Fence
1607.01 Gravel Construction Entrance
1630.06 Special Stilling Basin

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GRAPHIC SCALE
30 15 0 30 60
PLANS

PROJECT REFERENCE NO.	SHEET NO.
R-2635C	EC-2

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 039201 ENGINEER JACOB M BYERS

2/11/2016

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NAD 83

REVISIONS

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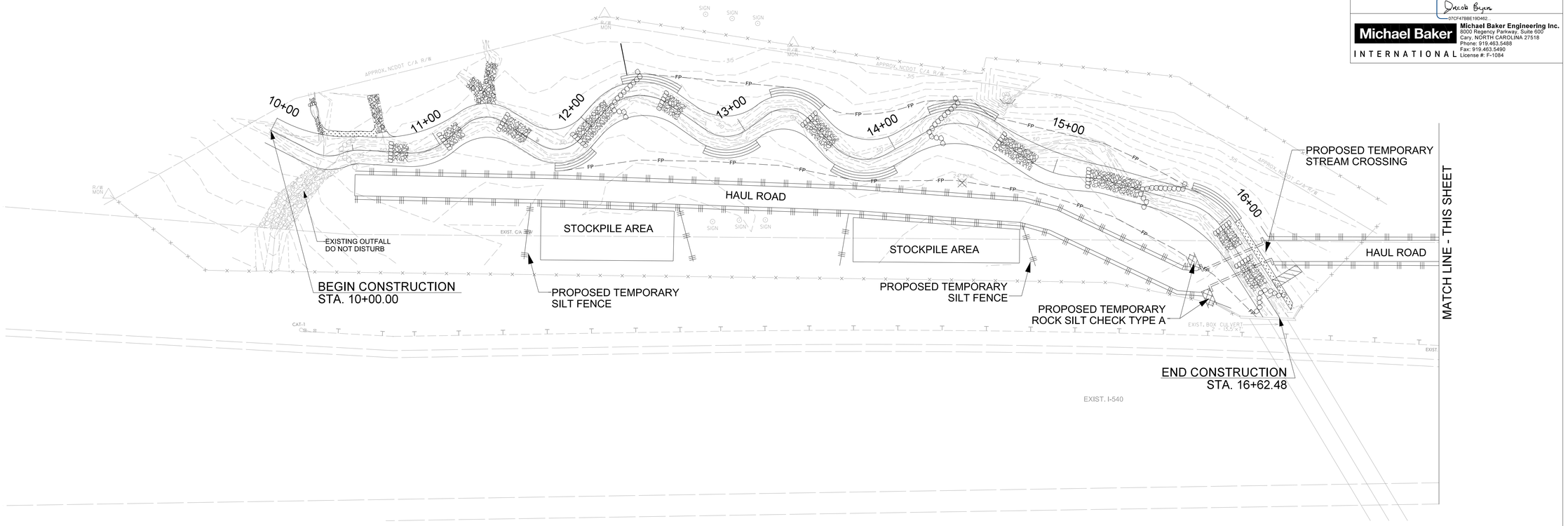

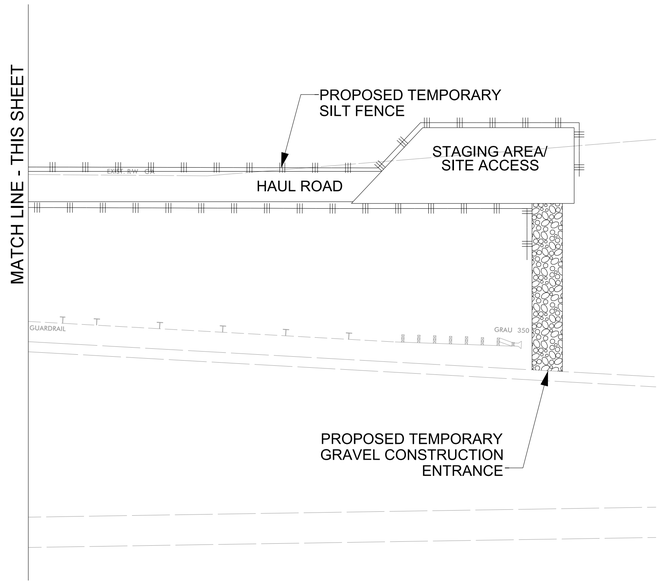

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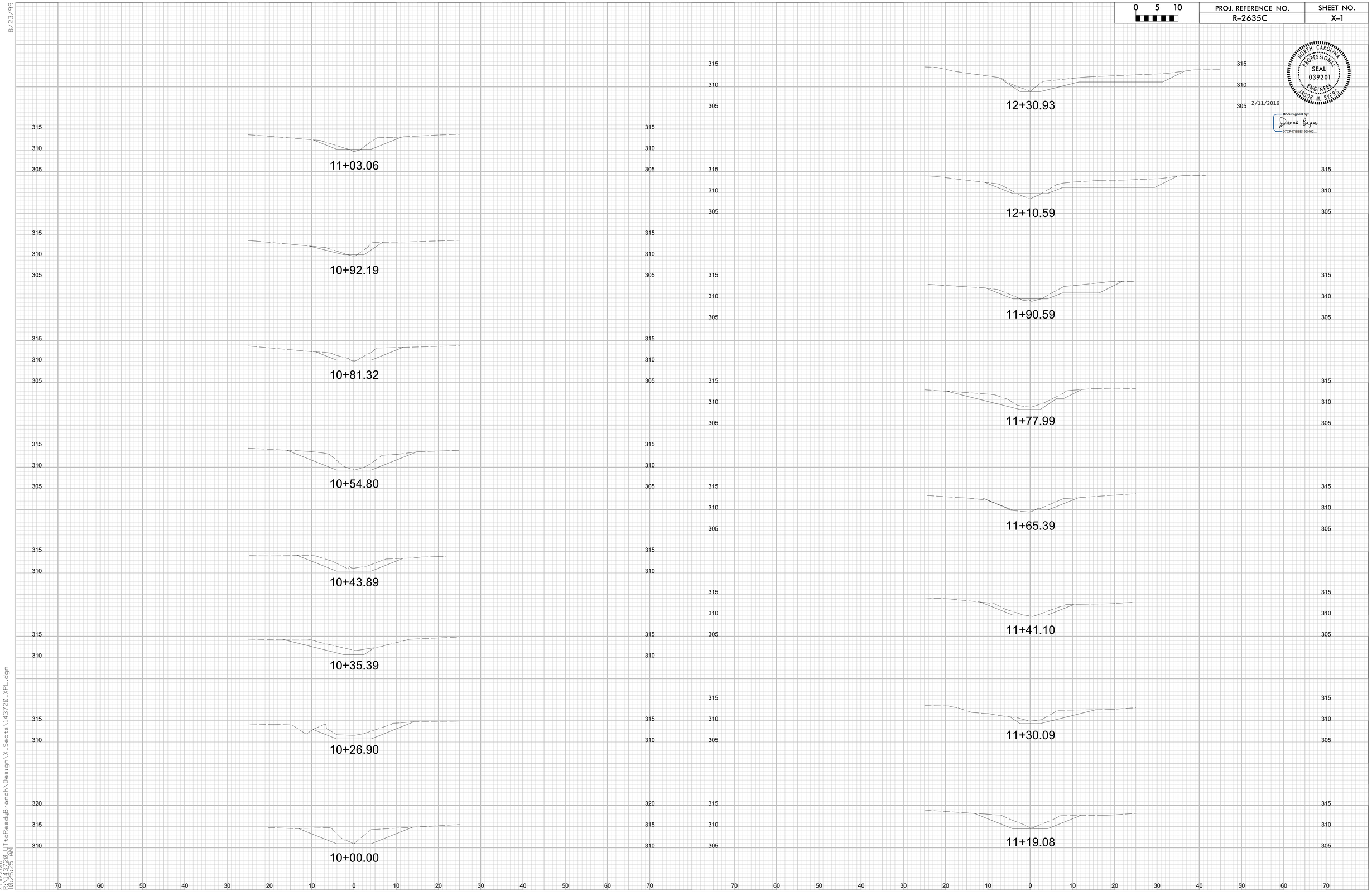

NORTH CAROLINA PROFESSIONAL SEAL 039201 ENGINEER JACOB W BYERS

2/11/2016

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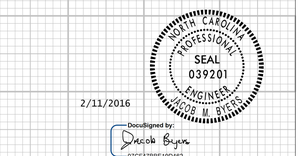

2/11/2016

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Jacob Byers
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13+61.35

13+41.27

13+28.07

13+14.87

13+01.66

12+89.15

12+76.63

12+51.28

14+99.22

14+88.24

14+56.35

14+38.93

14+21.51

13+94.69

13+78.02

2/11/2016
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	R-2635C	X-3

2/11/2016

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