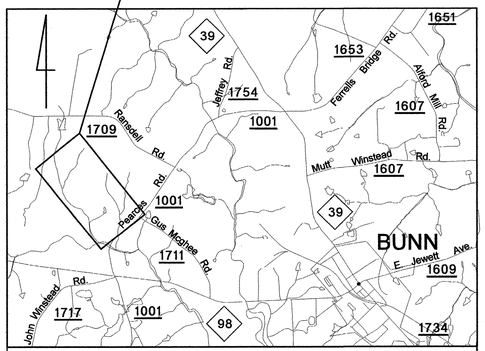
STATE	WRP PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	040614801	1	4A

STATE OF NORTH CAROLINA
ECOSYSTEM ENHANCEMENT PROGRAM

STREAM RESTORATION PLANS FOR UT-CROOKED CREEK SPEAS PROPERTY
HUC 03020101
SUBBASIN 03-03-01
TAR-PAMLICO RIVER BASIN

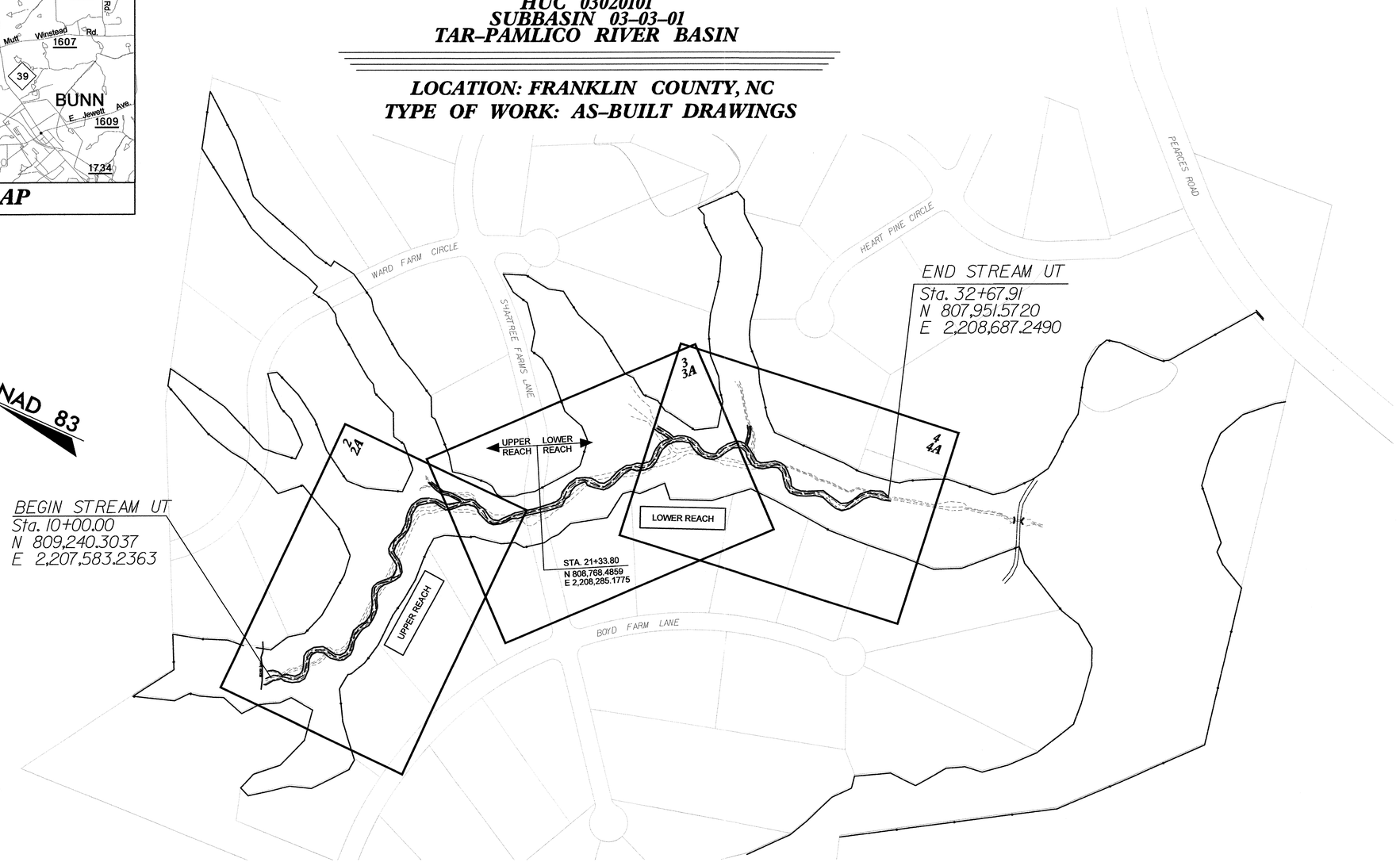
LOCATION: FRANKLIN COUNTY, NC
TYPE OF WORK: AS-BUILT DRAWINGS

PROJECT LOCATION



VICINITY MAP

NC GRID NAD 83



INDEX OF SHEETS

GRAPHIC SCALES

25 12.5 0 25 50
PLANS

DESIGN DATA

	UPPER REACH	*LOWER REACH*
DESIGN STREAM TYPE =	*C5*	*C5*
BANKFULL AREA (FT2)=	*12*	*17*
BANKFULL WIDTH (FT)=	*13*	*15*
BANKFULL DEPTH (FT)=	*0.93*	*1.15*
W/D RATIO=	*14*	*13*

OWNER CONTACT: *JEFF SCHAFFER /TRACY MORRIS*
EEP PROJECT MANAGER

Prepared In the Office of:

KO & ASSOCIATES, P.C.
Consulting Engineers

1011 Schaub Dr.
Suite 202
Raleigh N.C. 27606

AS BUILT
This record drawing has been prepared in part, based upon information furnished by others. While this information is believed to be reliable, the Engineer cannot assure its accuracy, and thus is not responsible for the accuracy of this record drawing or for any errors or omissions which may have been incorporated into it as a result. Those relying on this record document are advised to obtain independent verification of its accuracy before applying for any purpose.

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS 2-20-07

SIGNATURE

PROJECT: 04061480l

8/8/06
W:\ 17030928\dgn\to client\crooked_creek_asbuilt1.dgn

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE *202 RALEIGH, N.C. 27606
(919) 851-6066

SCALE: 25 0 50

PROJECT REFERENCE NO.	SHEET NO.
040614801	2

PROJECT ENGINEER

AS BUILT

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NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS 2-20-07

SIGNATURE

LEGEND

- ROCK CROSS VANE
- LOG VANE
- ROOTWAD
- ROOTBALL
- RIP-RAP
- TRANSPLANTS
- BOULDER
- METAL CONDUIT
- IRON REBAR SET W/CAP
- LOG VANE w/ LOG SILL
- THALWEG
- EASEMENT BOUNDARY
- TOE SLOPE
- BANKFULL

NOTE:
ALL CROSS-VANES ARE GRADE CONTROL STRUCTURES.

LOCATION:	AS-BUILT PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY: RKW	
CHECKED BY:	DATE: 9/11/06

AS-BUILT

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	2A

PROJECT ENGINEER

AS BUILT
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SIGNATURE — NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER ROBERT KEVIN WILLIAMS — 2-20-07

-BL-1013 PINC 34+53.53

BEAVER DAM

BEGIN
10+00.00
N 809,240.3037
E 2,207,583.2363

ORIGINAL CHANNEL TOP OF BANK AND THALWEG

CROSS-SECTION 1

PHOTO SITE 1

IRS

10+43.66

10+68.24

11+57.52

11+84.30

10+82.33

11+44.51

12+03.74

IRS

PHOTO SITE 2

13+38.33

IRS

12+36.16

12+51.19

12+86.89

IRS

12+70.67

CROSS-SECTION 2

VEG PLOT 1

14+58.15

14+76.00

14+29.74

15+45.03

16+10.54

16+75.70

16+88.47

IRS

WOODS

18+13.35

IRS

IRS

WOODS

CROSS-SECTION 3

PHOTO SITE 3

IRS

PHOTO SITE 4

17+67.85

10+19.84

10+65.89

18+54.67

BOULDER STEP STRUCTURE

CROSS-SECTION 4

E

WOODS

-BL-1011 PINC 31+40.07

UPPER REACH

-BL-1009 PINC 28+21.77

-MATCHLINE- SEE SHEET 3A

LEGEND

ROCK CROSS VANE	METAL CONDUIT
LOG VANE	IRON REBAR SET W/CAP
ROOTWAD	LOG VANE w/ LOG SILL
ROOTBALL	THALWEG
RIP-RAP	EASEMENT BOUNDARY
TRANSPLANTS	TOE SLOPE
BOULDER	BANKFULL

NOTE:
ALL CROSS-VANES ARE GRADE CONTROL STRUCTURES.

LOCATION:	AS-BUILT PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 9/11/06

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KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	3

PROJECT ENGINEER

AS BUILT

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SIGNATURE — R.K. WILLIAMS — PROFESSIONAL ENGINEER — SEAL 20263 — 2-20-07

AS–BUILT

-MATCHLINE– SEE SHEET 2

NC GRID NAD 83

WOODS

19+42.23

20+55.26

UPPER REACH | LOWER REACH

22+02.97

21+85.35

21+33.80
N 808,768.4859
E 2,208,285.1775

21+69.63

22+83.53

23+24.51

IRS

PHOTO SITE 5

IRS 23+37.63

CROSS-SECTION 5

24+27.64

24+92.66

24+93.17

25+07.20

25+45.61

10+07.04

26+24.61

VEG PLOT 2

-MATCHLINE– SEE SHEET 4

UPPER REACH

LOWER REACH

-BL-1005 PINC 22+51.64

-BL-1007 PINC 26+08.05

NOTE:
ALL CROSS-VANES ARE GRADE CONTROL STRUCTURES.

LEGEND

- ROCK CROSS VANE
- LOG VANE
- ROOTWAD
- ROOTBALL
- RIP-RAP
- TRANSPLANTS
- BOULDER
- METAL CONDUIT
- IRON REBAR SET W/CAP
- LOG VANE w/ LOG SILL
- THALWEG
- EASEMENT BOUNDARY
- TOE SLOPE
- BANKFULL

LOCATION:	STREAM RESTORATION PLANS UT–CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 9/1/06

2/19/2007
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AS–BUILT

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	3A

PROJECT ENGINEER

AS BUILT

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NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KELVIN WILLIAMS

SIGNATURE 2-28-07

-MATCHLINE- SEE SHEET 2A

NC GRID NAD 83

WOODS

19+42.23

20+55.26

UPPER REACH | LOWER REACH

22+02.97

21+85.35

21+33.80
N 808,768.4859
E 2,208,285.1775

21+69.63

22+83.53

23+24.51

IRS

24+27.64

24+92.66

25+07.20

25+45.61

10+07.04

26+24.61

CROSS-SECTION 5

24+93.17

VEG PLOT 2

-MATCHLINE- SEE SHEET 4A

PHOTO SITE 5

IRS 23+37.63

UPPER REACH

LOWER REACH

ORIGINAL CHANNEL TOP OF BANK AND THALWEG

-BL-1005 PINC 22+51.64

-BL-1007 PINC 26+08.05

NOTE:
ALL CROSS-VANES ARE GRADE CONTROL STRUCTURES.

LEGEND

- ROCK CROSS VANE
- LOG VANE
- ROOTWAD
- ROOTBALL
- RIP-RAP
- TRANSPLANTS
- BOULDER
- METAL CONDUIT
- IRON REBAR SET W/CAP
- LOG VANE w/ LOG SILL
- THALWEG
- E — EASEMENT BOUNDARY
- TOE SLOPE
- BANKFULL

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 9/1/06

2/19/2007
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AS–BUILT

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-5066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	4

PROJECT ENGINEER

AS BUILT

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PROFESSIONAL SEAL 20253 ENGINEER RICHARD K. WILLIAMS
2-26-07
SIGNATURE

NC GRID NAD 83

WOODS

EXISTING BEDROCK ENCOUNTERED DURING CONSTRUCTION. CHANNEL SHIFTED APPROXIMATELY 16 FEET TO AVOID BEDROCK

10+00.49

CROSS-SECTION 6

28+03.99

29+04.19

29+38.80

PHOTO SITE 8

30+89.20

32+31.37

END
32+67.91
N 807,951.5720
E 2,208,687.7490

IRS

IRS

IRS

VEG PLOT 3

30+57.61

27+04.00

IRS

PHOTO SITE 7

CROSS-SECTION 7

CROSS-SECTION 8

IRS

HEADER BOULDER

31+03.98

30+90.01

PHOTO SITE 6

MATCHLINE– SEE SHEET 3

LOWER REACH

WOODS

WOODS

WOODS

WOODS

-BL-1003 PINC 19+16.50

-BL-1001 PINC 15+81.12

LEGEND

ROCK CROSS VANE	METAL CONDUIT
LOG VANE	IRON REBAR SET W/CAP
ROOTWAD	LOG VANE w/ LOG SILL
ROOTBALL	THALWEG
RIP-RAP	EASEMENT BOUNDARY
TRANSPLANTS	TOE SLOPE
BOULDER	BANKFULL

NOTE:
ALL CROSS-VANES ARE GRADE CONTROL STRUCTURES.

LOCATION:	AS BUILT PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 9/1/06

2/9/2007
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AS–BUILT

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	4A

PROJECT ENGINEER

AS BUILT
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NORTH CAROLINA PROFESSIONAL SEAL 30253 ENGINEER RYAN WILLIAMS
2-20-07
SIGNATURE

NC GRID NAD 83

WOODS

EXISTING BEDROCK ENCOUNTERED DURING CONSTRUCTION. CHANNEL SHIFTED APPROXIMATELY 16 FEET TO AVOID BEDROCK

10+00.49

CROSS-SECTION 6

28+03.99

29+04.19

29+38.80

PHOTO SITE 8

30+89.20

32+31.37

END
32+67.91
N 807,951.5720
E 2,208,687.7490

IRS

IRS

IRS

IRS

IRS

VEG PLOT 3

30+57.61

27+04.00

-MATCHLINE- SEE SHEET 3A

PHOTO SITE 7

CROSS-SECTION 7

CROSS-SECTION 8

HEADER BOULDER

31+03.98

30+90.01

PHOTO SITE 6

LOWER REACH

ORIGINAL CHANNEL TOP OF BANK AND THALWEG

-BL-1003 PINC 19+16.50

-BL-1001 PINC 15+81.12

NOTE:
ALL CROSS-VANES ARE GRADE CONTROL STRUCTURES.

LEGEND

- ROCK CROSS VANE
- LOG VANE
- ROOTWAD
- ROOTBALL
- RIP-RAP
- TRANSPLANTS
- BOULDER
- METAL CONDUIT
- IRON REBAR SET W/CAP
- LOG VANE w/ LOG SILL
- THALWEG
- EASEMENT BOUNDARY (E)
- TOE SLOPE
- BANKFULL

LOCATION:	AS BUILT PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 9/11/06

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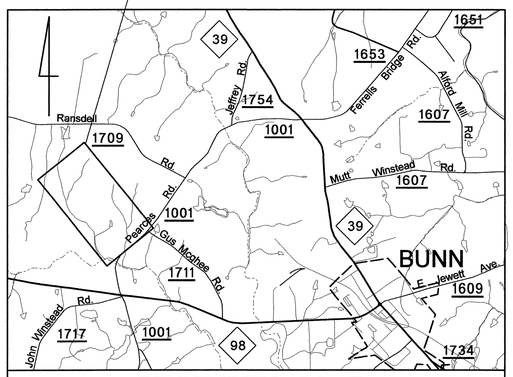
STATE	WRP PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	040614801	1	

PROJECT LOCATION



VICINITY MAP

STATE OF NORTH CAROLINA
WETLANDS RESTORATION PROGRAM

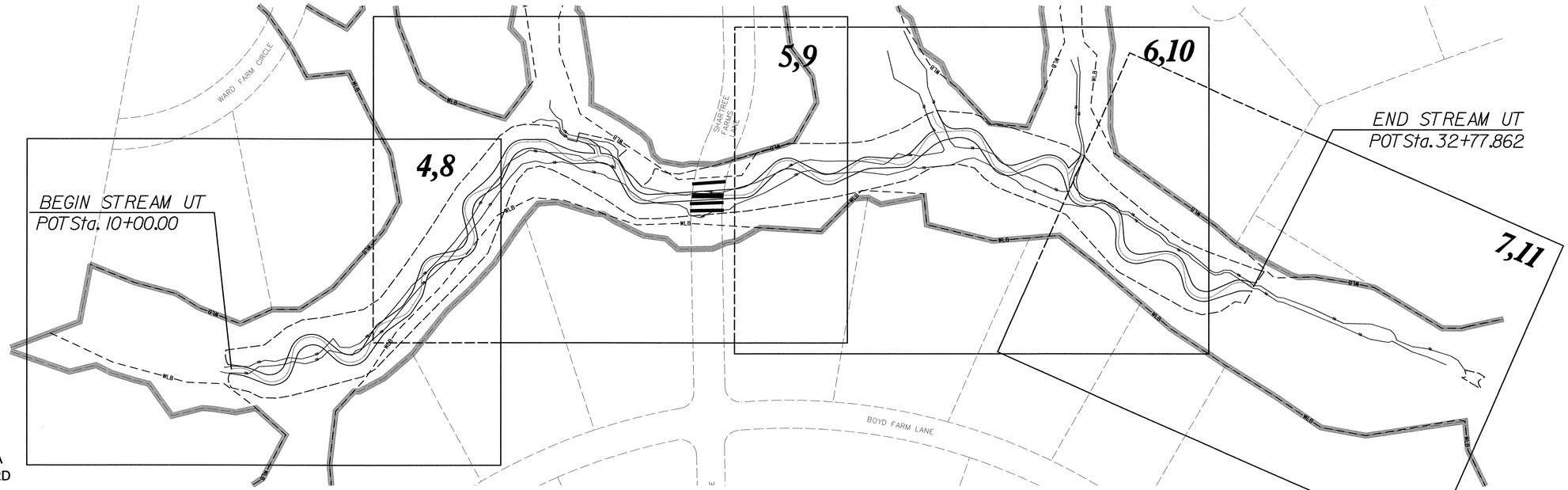
STREAM RESTORATION PLANS
UT-CROOKED CREEK
SPEAS PROPERTY

LOCATION: FRANKLIN COUNTY, NORTH CAROLINA

TYPE OF WORK: STREAM MITIGATION
(CLEARING, GRUBBING, GRADING, EROSION CONTROL AND PLANTING)

CONVENTIONAL SYMBOLS

- Prop. Slope Stakes Cut
- Prop. Slope Stakes Fill
- Prop. Right of Way Line with Proposed
- R/W Marker (Iron Pin & Cap)
- Prop. Temp. Construction Easement Line
- Stream or Body of Water
- Prop Lateral, Tail, Head Ditches
- Pipe Culvert
- Drainage Boxes
- Exist. Pole
- Hydrant
- Exist. Water Valve
- Power Manhole
- Sanitary Sewer Manhole
- Storm Sewer Manhole
- Recorded Water Line
- Sanitary Sewer
- Storm Sewer
- Property Line
- Property Line Symbol
- Exist. Iron Pin
- Fence Line
- Bridge
- Box Culvert or Tunnel
- Single Tree
- Hedge
- Woods Line



INDEX OF SHEETS

PROJECT: 040614801

9/9/2005
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GRAPHIC SCALES

PLANS: 50 25 0 50 100
PROFILE (HORIZONTAL): 20 10 0 20 40
PROFILE (VERTICAL): 4 2 0 4 8

DESIGN DATA

DESIGN STREAM TYPE	=	C5
BANKFULL AREA (FT^2)	=	17.3
BANKFULL WIDTH (FT)	=	15.0
BANKFULL DEPTH (FT)	=	1.15
W/D RATIO	=	13

PROJECT LENGTH

EXISITING STREAM LENGTH = 1920 FEET
PROPOSED DESIGN STREAM LENGTH = 2295 FEET

OWNER CONTACT: JEFF SCHAFFER
WRP PROJECT MANAGER

Prepared In the Office of:
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202
RALEIGH, N.C. 27606
(919) 851-6066
FAX: (919) 851-6846

LETTING DATE: DEC 2, 2005

DESIGNER
R. KEVIN WILLIAMS, PE
PROJECT MANAGER

R. KEVIN WILLIAMS, PE
PROJECT DESIGN ENGINEER

PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 22601 ENGINEER KEVIN WILLIAMS

RECORD DOCUMENT

SIGNATURE: P.E.

REVISIONS

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

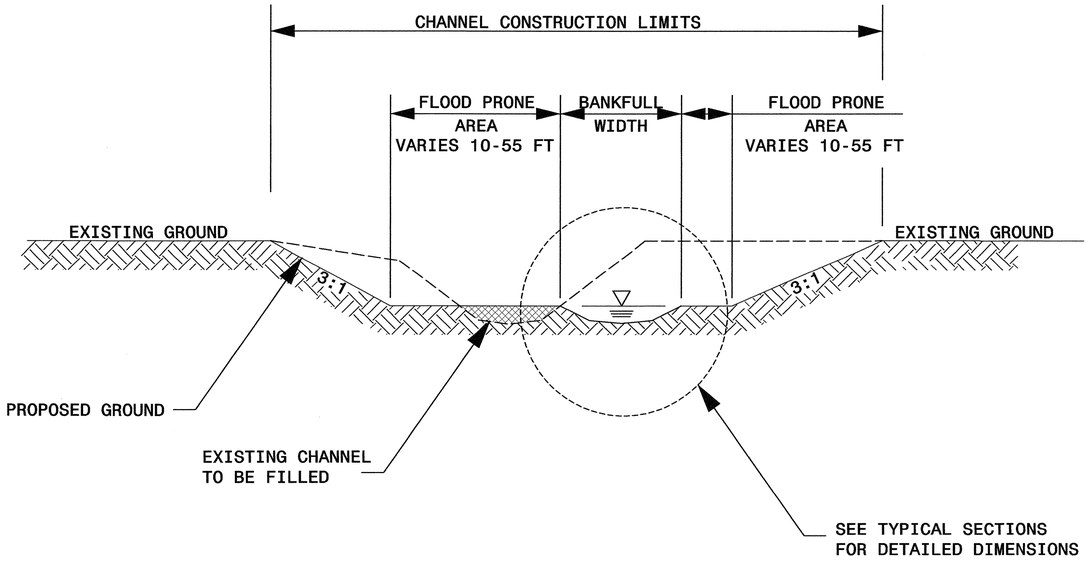
PROJECT REFERENCE NO.	SHEET NO.
040614801	2

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER KEVIN WILLIAMS

TYPICAL CHANNEL SECTION

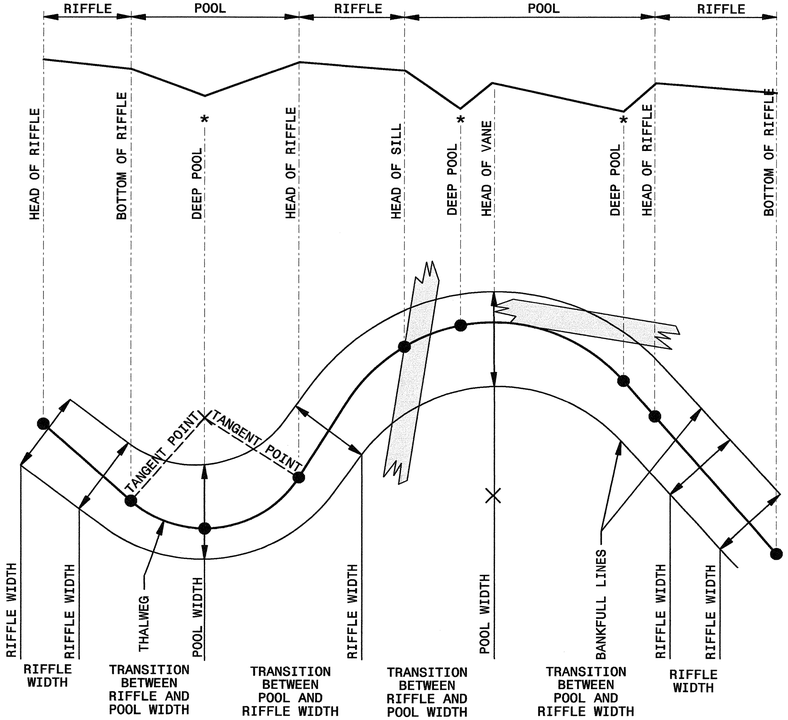
VARIABLE	STATION - STATION
UPPER	10+00 - 21+00
LOWER	21+00 - 32+77.86



FEATURE LOCATION

SCALE: NTS

THALWEG PROFILE



PATTERN\ STRUCTURES

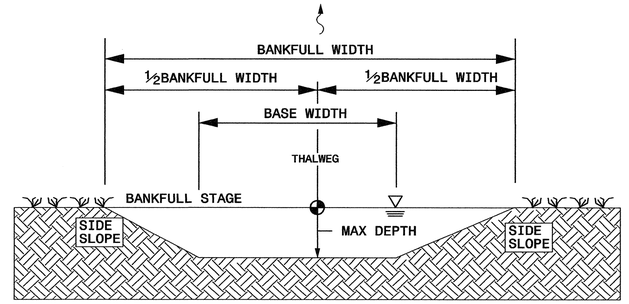
WIDTHS

* NOTE: REFER TO PROFILE, SHEETS -- AND -- FOR DEEP POOL LOCATIONS

TYPICAL SECTION - RIFFLE

VARIABLE	UPPER	LOWER
BANKFULL WIDTH	13	15
BASE WIDTH	5.8	6
MAXIMUM DEPTH	1.21	1.5
SIDE SLOPE	3:1	3:1

ALL UNITS ARE IN FEET



THALWEG (DEEPEST POINT IN CROSS SECTION) IS LOCATED IN CENTER OF CHANNEL IN A RIFFLE.

NOTES: - ALL CROSS SECTIONS ARE SHOWN LOOKING IN THE DOWNSTREAM DIRECTION.
- ⊕ - GRADE POINT IS THE ELEVATION SHOWN ON PROFILE.
- ALL SHARP CORNERS SHOULD BE ROUNDED

SCALE: NTS

RECORD DOCUMENT

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/30/05

9/6/2005
8:30:34 AM
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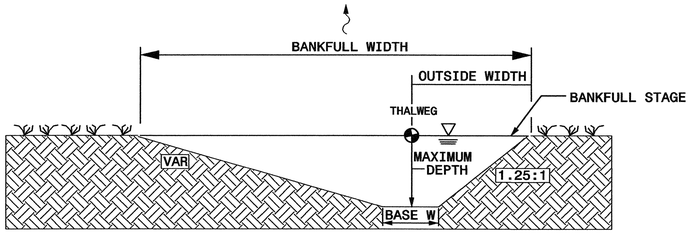
REVISIONS

TYPICAL SECTION - POOL RIGHT

VARIABLE	UPPER	LOWER
BANKFULL WIDTH	14.95	19.50
BASE WIDTH	2.54	3.90
MAX DEPTH	2.32	2.88
OUTSIDE WIDTH	4.17	5.55
BAR SIDE SLOPE	4.10:1	4.16:1
RIGHT BANK SIDE SLOPE	1.25:1	1.25:1

ALL UNITS ARE IN FEET



THALWEG (DEEPEST POINT IN A CROSS SECTION)
IS LOCATED IN THE MIDDLE OF THE BASE WIDTH.

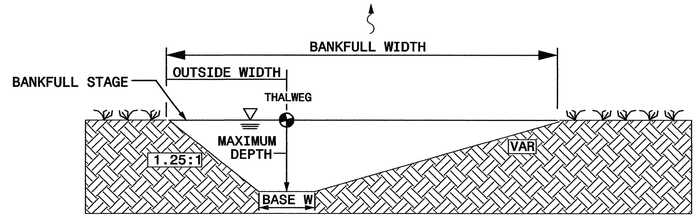
NOTES: - ALL CROSS SECTIONS ARE SHOWN LOOKING IN THE DOWNSTREAM DIRECTION.
- ⊕ - GRADE POINT IS THE ELEVATION SHOWN ON THE PROFILE
- ALL SHARP CORNERS SHOULD BE ROUNDED

SCALE: NTS

TYPICAL SECTION - POOL LEFT

VARIABLE	UPPER	LOWER
BANKFULL WIDTH	14.95	19.50
BASE WIDTH	2.54	3.90
MAX DEPTH	2.32	2.88
OUTSIDE WIDTH	4.17	5.55
BAR SIDE SLOPE	4.10:1	4.16:1
LEFT BANK SIDE SLOPE	1.25:1	1.25:1

ALL UNITS ARE IN FEET



THALWEG (DEEPEST POINT IN A CROSS SECTION)
IS LOCATED IN THE MIDDLE OF THE BASE WIDTH.

NOTES: - ALL CROSS SECTIONS ARE SHOWN LOOKING IN THE DOWNSTREAM DIRECTION.
- ⊕ - GRADE POINT IS THE ELEVATION SHOWN ON THE PROFILE
- ALL SHARP CORNERS SHOULD BE ROUNDED

SCALE: NTS

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

PROJECT REFERENCE NO.	SHEET NO.
040614801	2A

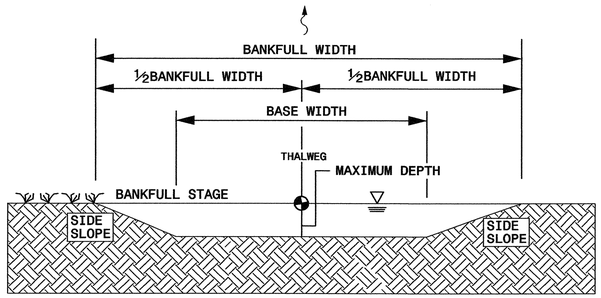
PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 202539 ENGINEER R. KEVIN WILLIAMS

TYPICAL SECTION - HEAD OF LOG VANE

VARIABLE	UPPER	LOWER
BANKFULL WIDTH	VARIES*	VARIES*
BASE WIDTH	VARIES*	VARIES*
MAX DEPTH	1.21	1.50
SIDE SLOPE	VARIES*	VARIES*

ALL UNITS ARE IN FEET



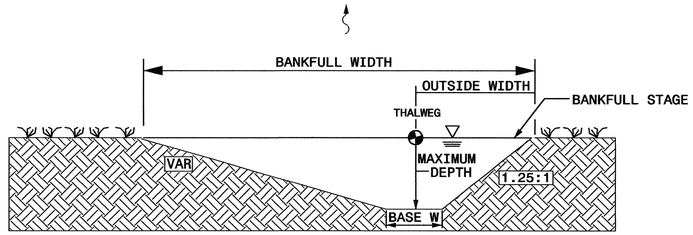
NOTES: - ALL CROSS SECTIONS ARE SHOWN LOOKING IN THE DOWNSTREAM DIRECTION.
- ⊕ - GRADE POINT IS THE ELEVATION SHOWN ON PROFILE.
- ALL SHARP CORNERS SHOULD BE ROUNDED
*- BANKFULL WIDTH VARIES DEPENDING ON LOCATION OF THE STRUCTURE IN RELATION TO TRANSITIONAL SECTIONS IN THE STREAM (SEE FEATURE LOCATION DETAIL IN PLANS)

SCALE: NTS

TYPICAL SECTION - LOG VANE (POOL RIGHT) (MIRROR IMAGE POOL LEFT)

VARIABLE	UPPER	LOWER
BANKFULL WIDTH	VARIES*	VARIES*
OUTSIDE WIDTH	VARIES*	VARIES*
MAXIMUM DEPTH	2.32	2.88

ALL UNITS ARE IN FEET



THALWEG (DEEPEST POINT IN A CROSS SECTION)
IS LOCATED IN THE MIDDLE OF THE BASE WIDTH.

NOTES: - ALL CROSS SECTIONS ARE SHOWN LOOKING IN THE DOWNSTREAM DIRECTION.
- ⊕ - GRADE POINT IS THE ELEVATION SHOWN ON PROFILE.
- ALL SHARP CORNERS SHOULD BE ROUNDED
*- BANKFULL WIDTH VARIES DEPENDING ON LOCATION OF THE STRUCTURE IN RELATION TO TRANSITIONAL SECTIONS IN THE STREAM (SEE FEATURE LOCATION DETAIL IN PLANS)

SCALE: NTS

RECORD DOCUMENT

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/3005

9/6/2005
8:30:00 AM
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REVISIONS

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

PROJECT REFERENCE NO.	SHEET NO.
040614801	2B

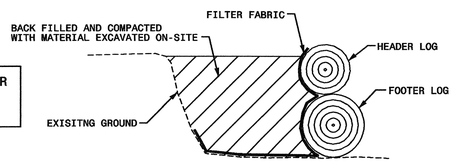
PROJECT ENGINEER

1. FILTER FABRIC SHALL BE PLACED ON THE UPSTREAM SIDE OF THE STRUCTURE ¼ DIAMETER FROM THE TOP OF THE LOG.
2. FILTER FBARIC SHALL BE NAILED ON 12 INCH CENTERS.
3. FILTER FABRIC SHALL BE BACK FILLED AND COMPACTED WITH MATERIAL EXCAVATED ON-SITE.
4. FILTER FABRIC SHALL BE BURIED IN THE BOTTOM OF THE CHANNEL AND SHALL BE PLACED THE ENTIRE LENGTH OF THE STRUCTURE.
5. STAINLESS STEEL TIE STRAPS SHALL BE WRAPPED AROUND THE HEADER AND FOOTER LOG AT 2' INTERVALS FOR THE ENTIRE LENGTH OF THE LOGS.
6. TIE STRAPS SHALL BE STAINLESS STEEL WITH A MINIMUM ⅜" WIDTH, AND .015" THICK. STRAPPING SHALL BE TENSIONED WITH A PUSH BAR TENSIONER (OR COMPARABLE) TAUT WITH THE LOGS. STRAPS SHALL BE SEALED WITH OVERLAPS SEAL AND A REGULAR DUTY STRAP SEALER (OR COMPARABLE).

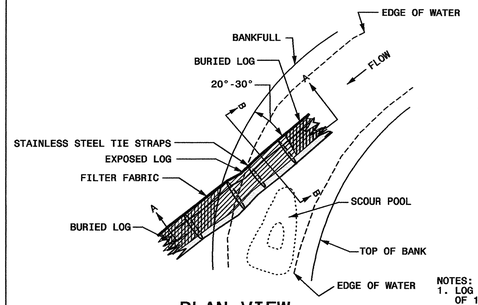
LOG VANE

SCALE: NTS

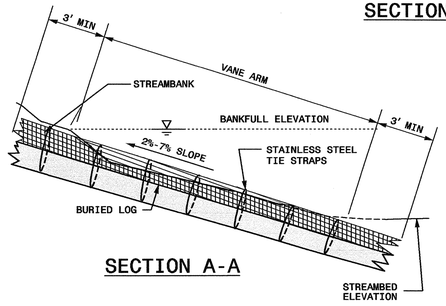
	UPPER	LOWER
VANE ARM LENGTH	12	15



SECTION B-B



PLAN VIEW



SECTION A-A

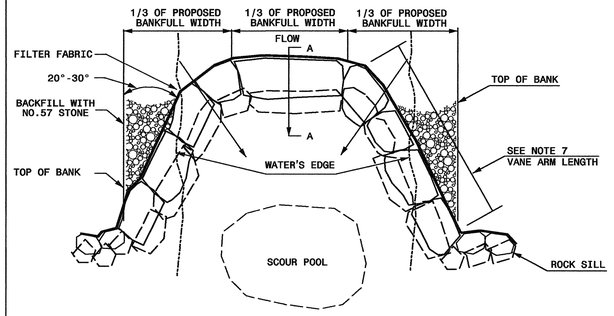
NOTES:
1. LOG IS HARDWOOD MINIMUM DIAMETER OF 18", LOG IS BURIED MINIMUM OF 3 FT. ON BOTH ENDS.
2. VANE ARM LENGTH IS THE LENGTH OF THE EXPOSED LOG BETWEEN BANKFUL AND THALWEG INVERT.

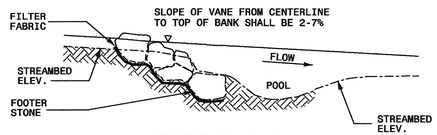
ROCK CROSS-VANE

SCALE:NTS

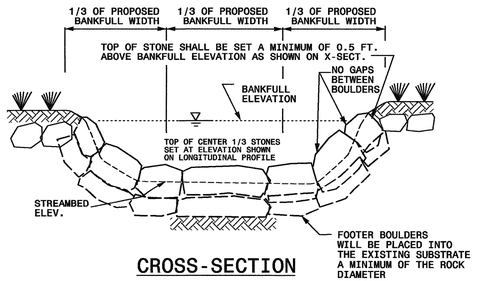
NOTES:
1. ALL STONES ARE TO BE STRUCTURE STONE.
2. GAPS BETWEEN BOULDERS SHALL BE MINIMIZED BY FITTING BOULDERS TOGETHER, PLUGGING WITH STRUCTURE STONE CLASS A AND NO.57 AND LINING WITH FILTER FABRIC.
3. DIMENSIONS AND SLOPES MAYBE ADJUSTED TO FIT BY THE ENGINEER.
4. A DOUBLE FOOTER BOULDER SHALL BE UTILIZED IN SAND BED MATERIAL.
5. CONTRACTOR WILL BE REQUIRED TO FIT BOULDERS TIGHTLY.
6. FOOTER BOULDERS AND VANE BOULDERS SHALL BE NATIVE STONE OR SHOT ROCK, CUBICAL OR RECTANGULAR IN NATURE.
7. SLOPE OF VANE FROM CENTERLINE TO TOP OF BANK SHALL BE 2-7%.

FILTER FABRIC SHALL BE PLACED ON THE UPSTREAM SIDE OF THE STRUCTURE TO PREVENT WASHOUT OF SEDIMENT THROUGH BOULDER GAPS. FILTER FABRIC SHALL EXTEND FROM THE BOTTOM OF THE FOOTER BOULDER TO THE FINISHED GRADE ELEVATION AND SHALL BE PLACED THE ENTIRE LENGTH OF STRUCTURE.





SECTION A-A



CROSS-SECTION

	UPPER	LOWER
VANE ARM LENGTH	12	15

RECORD DOCUMENT

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 63005

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REVISIONS

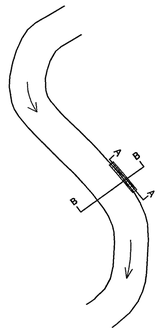
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

PROJECT REFERENCE NO.	SHEET NO.
040614801	2C

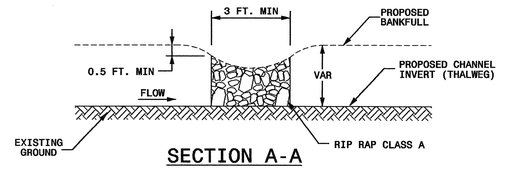
PROJECT ENGINEER

FLOODPLAIN INTERCEPTOR

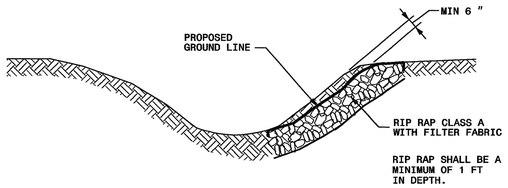
SCALE: NTS



PLAN VIEW



SECTION A-A



SECTION B-B

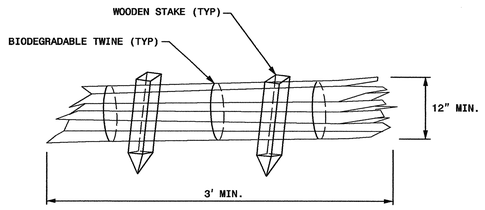
NOTE:
FLOODPLAIN INTERCEPTORS SHALL BE PLACED ON-SITE AT AREAS SPECIFIED BY DESIGNER.

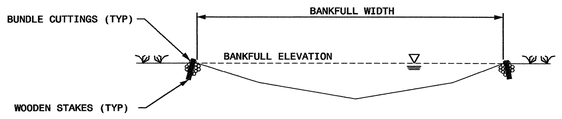
BUNDLE CUTTINGS

SCALE: NTS

NOTES:

1. BUNDLE CUTTINGS SHALL BE COMPOSED OF CUTTINGS FROM VEGETATION USED FOR LIVE STAKING.
2. THE BUNDLE SHALL BE A MINIMUM OF 12" IN DIAMETER AND A MINIMUM OF 3' LONG.
3. TWO WOODEN STAKES SHALL BE DRIVEN THROUGH THE BUNDLE TO ANCHOR THE BUNDLES TO THE GROUND.
4. APPROXIMATELY 2" OF TOP SOIL SHALL BE FILLED ON TOP OF THE BUNDLE CUTTINGS AFTER INSTALLATION.





TYPICAL SECTION

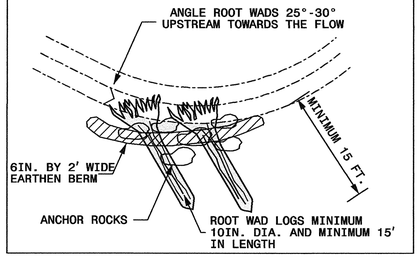
ROOT WAD

SCALE:NTS

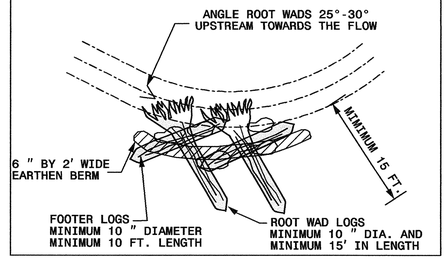
NOTE: 1. ALL STONES ARE TO BE STRUCTURE STONE.
2. SIDE SLOPES SHALL BE MATTED.
3. 6IN. BY 2' WIDE EARTHEN BERM LOCATED BEHIND ROOT WADS EXTENDING A MINIMUM OF 5' BEYOND UPSTREAM AND DOWNSTREAM ENDS OF ROOT WADS TO DIRECT SHEET FLOW AWAY FROM ROOTWADS.

WHEN BACKFILLING OVER AND AROUND ROOT WAD LOGS PACK STONE BETWEEN ALL WADS TO FIRMLY SECURE ALL CONNECTIONS AND GAPS. ROOT WADS SHALL OVERLAP. STRUCTURE STONE PLACED BETWEEN ROOT WADS. NO GAP BETWEEN BOTTOM OF ROOT WAD & STREAMBED. ROOT WADS SHALL BE HARDWOOD SPECIES. ROOT WAD SHALL NOT BE DETERIORATED AT THE TIME OF INSTALLATION. SEE SPECIAL PROVISIONS FOR STONE SIZE.

INSTALLATION BY DRIVING ROOT WAD INTO STREAMBANK

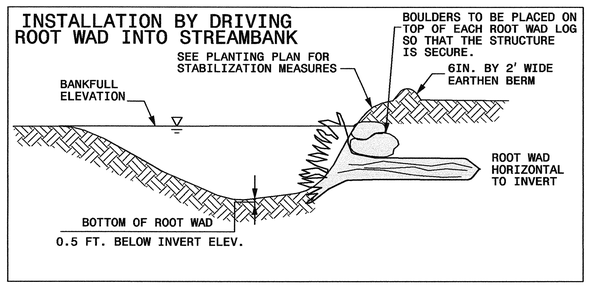


INSTALLATION BY TRENCHING

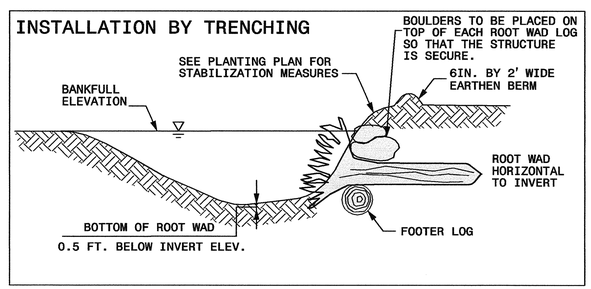


PLAN VIEW

INSTALLATION BY DRIVING ROOT WAD INTO STREAMBANK



INSTALLATION BY TRENCHING



ROOT WADS - CROSS-SECTION (CUT)

RECORD DOCUMENT

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY: RKW	
CHECKED BY:	DATE: 6/30/05

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REVISIONS

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

PROJECT REFERENCE NO.	SHEET NO.
040614801	2D

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

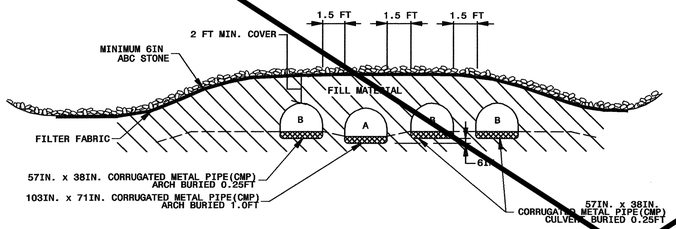
PERMANENT STREAM CROSSING

SCALE: N.T.S.

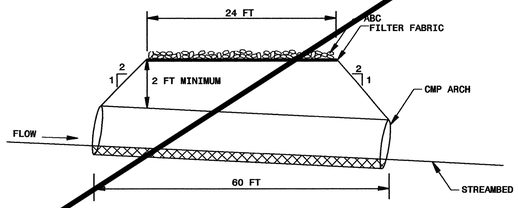
	UPSTREAM	DOWNSTREAM
DAILY FLOW PIPE (A)		
BED ELEVATION	227.97	227.75
INVERT ELEVATION	226.97	226.75
BANKFULL FLOW (B)		
BED ELEVATION	229.25	229.24
INVERT ELEVATION	229.00	228.99

NOTES:

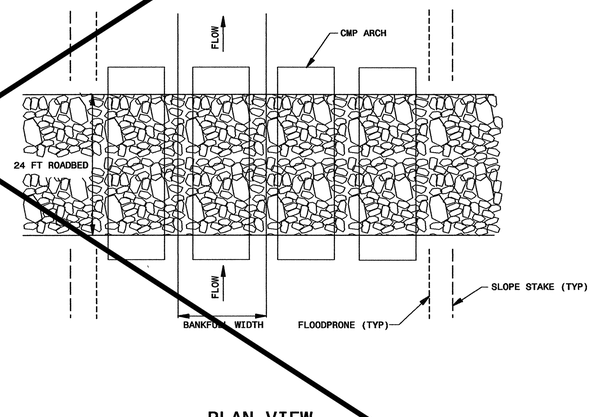
1. CORRUGATED PIPE MATERIAL WILL BE PROVIDED BY OTHERS, NOT IN CONTRACT.
2. PIPES MUST BE INSTALLED IN ACCORDANCE WITH NCDOT STANDARD SPECIFICATIONS SECTION 300.



CROSS-SECTION



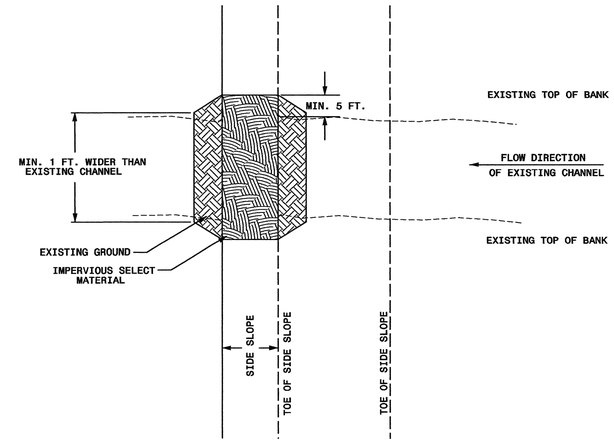
LONGITUDINAL PROFILE



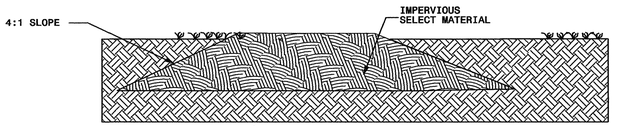
PLAN VIEW

IMPERVIOUS DITCH PLUG

SCALE: NTS



PLAN VIEW



CROSS-SECTION

RECORD DOCUMENT

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
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DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/30/05

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REVISIONS

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

NOT TO SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	3

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

LOCATION MAP

FOR STREAM DETAILS SEE SHEETS 2 THRU 2D
FOR STREAM STRUCTURE LOCATIONS SEE SHEETS 3 THRU 7
FOR STREAM ALIGNMENT PLANS SEE SHEETS 8 THRU 11
FOR STREAM PROFILE SEE SHEETS 14 AND 15

RECORD DOCUMENT

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/30/05

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REVISIONS

PROPOSED CHANNEL ALIGNMENT AND STRUCTURE LOCATIONS

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	4

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

ROCK CROSS VANE 10+00

PROP THALWEG

LIMITS OF CONSTRUCTION

ROOTWAD (TYP)

LOG VANE (TYP)

LOG VANE 11+39.13

LOG VANE 11+86.07

LOG VANE 12+38.14

LOG VANE 12+75.45

(2) ROOTWADS 13+47

LOG VANE 14+61.19

BEGIN STREAM UT
POT Sta. 10+00.00

ROCK CROSS VANE (TYP)

-MATCHLINE- STA. 15+00.00 SEE SHEET NO. 5

N 27° 13' 31.6" W

N 46° 32' 35.6" W

-BL-5001 PINC 35+63.45

-BL-1013 PINC 34+53.53

-BL-1011 PINC 31+40.07

PROP. BANKFULL

LOG VANE 10+57.41

CHANNEL PLUG (TYP)

LIMITS OF CONSTRUCTION

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

LEGEND
- WLB — WETLAND
- ROCK CROSS-VANE
- LOG VANE
- ROOTWAD
- CHANNEL PLUG

RECORD DOCUMENT

FOR STREAM ALIGNMENT SEE SHEET 8
FOR STREAM DETAILS SEE SHEETS 2 THRU 2D
FOR STREAM PROFILE SEE SHEET 14

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/2005

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REVISIONS

PROPOSED CHANNEL ALIGNMENT AND STRUCTURE LOCATION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	5

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

LIMITS OF CONSTRUCTION

LOG VANE (TYP)

PROP BANKFULL

ROCK CROSS VANE (TYP)

PERMANENT STREAM CROSSING SEE DETAIL SHEET 2D

ROOTWAD (TYP)

CHANNEL PLUG (TYP)

PROP THALWEG

LIMITS OF CONSTRUCTION

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

ROCK CROSS VANE 17+75

ROCK CROSS VANE 18+23.50

ROOTWAD 18+66.59

ROCK CROSS VANE 10+19.73 TIE-1

ROCK CROSS VANE 19+47.50

ROCK CROSS VANE 20+62

SHARTREE FARMS LANE

ROCK CROSS VANE 22+10.50

ROCK CROSS VANE 22+92

LOG VANE 15+31.38

LOG VANE 16+12.29

LOG VANE 16+76.68

N 74° 31' 42.6" W

N 7° 11' 32.7" W

-BL-1009 PINC 28+21.77

-BL-1007 PINC 26+08.05

-MATCHLINE- STA. 15+00.00
SEE SHEET NO. 4

-MATCHLINE- STA. 23+00.00
SEE SHEET NO. 6

WLB

E

TB

15

20

LEGEND

- WLB — WETLAND
- ROCK CROSS-VANE
- LOG VANE
- ROOTWAD
- CHANNEL PLUG

RECORD DOCUMENT

FOR STREAM ALIGNMENT SEE SHEET 9
FOR STREAM DETAILS SEE SHEETS 2 THRU 2D
FOR STREAM PROFILE SEE SHEETS 14 & 15

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/2005

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REVISIONS

PROPOSED CHANNEL ALIGNMENT AND STRUCTURE LOCATION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	6

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

ROCK CROSS VANE 24+36.50

LOG VANE 25+39.78

ROCK CROSS VANE 10+01.04 TIE-2

ROCK CROSS VANE 26+39.50

ROCK CROSS VANE (TYP)

LOG VANE (TYP)

PROP BANKFULL

ROCK CROSS VANE 28+22

ROCK CROSS VANE 10+11.59 TIE-3

ROOTWAD 29+26.45

LIMITS OF CONSTRUCTION

-MATCHLINE- STA. 23+00.00
SEE SHEET NO. 5

LOG VANE 23+32.85

CHANNEL PLUG (TYP)

ROCK CROSS VANE 25+05

ROCK CROSS VANE 27+22.50

ROCK CROSS VANE 29+60

PROP THALWEG

LIMITS OF CONSTRUCTION

N 61° 00' 06.6" W

N 18° 09' 23.6" W

ROOTWAD (TYP)

-MATCHLINE- STA. 30+00.00
SEE SHEET NO. 7

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

-BL-1005 PINC 22+51.64

LEGEND
- WLB — WETLAND
- ROCK CROSS-VANE
- LOG VANE
- ROOTWAD
- CHANNEL PLUG

RECORD DOCUMENT

FOR STREAM ALIGNMENT SEE SHEET 10
FOR STREAM DETAILS SEE SHEETS 2 THRU 2D
FOR STREAM PROFILE SEE SHEETS 14 & 15

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/30/05

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REVISIONS

PROPOSED CHANNEL ALIGNMENT AND STRUCTURE LOCATION

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	7

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL 20253 ENGINEER KEVIN WILLIAMS

ROCK CROSS VANE
31+26.50

ROCK CROSS VANE
32+77.86

END STREAM UT
POT Sta. 32+77.862

REMOVE EXISTING 36" CMP AND HEADWALLS GRADE TO MATCH EXISTING CHANNEL GEOMETRY UP AND DOWNSTREAM

LIMITS OF CONSTRUCTION

PROP BANKFULL

MATCHLINE- STA. 30+00.00
SEE SHEET NO. 6

PROP THALWEG

LIMITS OF CONSTRUCTION

LIMITS OF CONSTRUCTION

N 3° 32' 52.6" W

N 24° 43' 38.7" W

-BL-1003 PINC 19+16.50

-BL-1001 PINC 15+81.12

-BL-2 PINC 12+46.19

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

LEGEND
- WLB — WETLAND
- ROCK CROSS-VANE
- LOG VANE
- ROOTWAD
- CHANNEL PLUG

RECORD DOCUMENT

FOR STREAM ALIGNMENT SEE SHEET 11
FOR STREAM DETAILS SEE SHEETS 2 THRU 2D
FOR STREAM PROFILE SEE SHEETS 14

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 63005

9/8/2005
8:25:59 AM
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REVISIONS

PROPOSED ALIGNMENT

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	8

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

10

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

PCSta.10+11.129

POT Sta.10+00.000

PROP THALWEG

PT Sta.10+32.244

PCSta.10+52.684

PT Sta.11+11.312

PCSta.12+29.961

PT Sta.12+02.025

PT Sta.12+90.678

PT Sta.13+45.078

PCSta.13+73.123

PT Sta.13+92.265

PCSta.14+16.303

PT Sta.14+31.481

PCSta.14+53.060

PT Sta.14+97.658

R–1 X

R–2 X

R–3 X

R–4 X

R–5 X

R–6 X

R–7 X

R–8 X

N 27° 13' 31.6" W

N 46° 32' 35.6" W

PCSta.11+36.265

PCSta.13+20.448

-BL-5001 PINC 35+63.45

-BL-1013 PINC 34+53.53

-BL-1011 PINC 31+40.07

-MATCHLINE- STA. 15+00.00 SEE SHEET NO. 9

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

FOR STREAM DETAILS SEE SHEETS 2 THRU 2D
FOR ALIGNMENT DATA SEE SHEETS 12 & 13
FOR STREAM PROFILE SEE SHEET 14

RECORD DOCUMENT

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/30/05

9/6/2005
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REVISIONS

PROPOSED ALIGNMENT

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	9

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

PERMANENT STREAM CROSSING SEE DETAIL SHEET 2D

SHARTREE FARMS LANE

PCSta.19+83.169
PTSta.20+28.157
PCSta.20+51.153
PTSta.20+62.220
PCSta.21+73.341
PTSta.22+10.542
PCSta.22+45.273
PTSta.22+92.167
PTSta.19+04.653
POTSta.10+48.48 TIE-1
PCSta.18+48.634
POTSta.10+00.00 TIE-1
PTSta.18+23.613
PTSta.18+476.546
PCSta.18+01.972
PTSta.17+75.049
PCSta.17+36.820
PTSta.17+03.609
PCSta.16+76.676
PTSta.16+53.053

R-9
R-10
R-11
R-12
R-13
R-14
R-15
R-16
R-17
R-18
R-19
R-100
R-101

PTSta.19+47.931
PCSta.16+03.971
PTSta.15+83.355
PCSta.15+23.412
PROP THALWEG

N 74° 31' 42.6" W
N 7° 11' 32.7" W

-BL-1009 PINC 28+21.77
-BL-1007 PINC 26+08.05

-MATCHLINE- STA. 15+00.00
SEE SHEET NO. 8

-MATCHLINE- STA. 23+00.00
SEE SHEET NO. 10

FOR STREAM DETAILS SEE SHEETS 2 THRU 2D
FOR ALIGNMENT DATA SEE SHEETS 12 & 13
FOR STREAM PROFILE SEE SHEETS 14 & 15

RECORD DOCUMENT

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/2005

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REVISIONS

PROPOSED ALIGNMENT

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

POT Sta. 10+00.00 TIE-2

PT Sta. 25+63.111

POT Sta. 10+42.99 TIE-2

PC Sta. 25+35.176

PC Sta. 27+65.635

PC Sta. 28+45.196

PT Sta. 23+70.126

PC Sta. 23+99.498

PT Sta. 24+36.695

PC Sta. 24+68.761

PT Sta. 25+05.265

PT Sta. 28+22.062

POT Sta. 10+00.00 TIE-3

PT Sta. 28+89.249

PC Sta. 29+09.621

PT Sta. 29+60.387

R-20

R-21

R-22

R-23

R-24

R-25

R-26

R-27

R-28

R-29

R-300

PC Sta. 26+03.198

PT Sta. 26+39.663

PC Sta. 26+74.744

PT Sta. 27+22.500

POT Sta. 10+41.52 TIE-3

PROP. THALWEG

PC Sta. 23+29.964

N 61° 00' 06.6" W

N 18° 09' 23.6" W

PC Sta. 29+86.738

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

-BL-1005 PINC 22+51.64

-MATCHLINE- STA. 23+00.00 SEE SHEET NO. 9

-MATCHLINE- STA. 30+00.00 SEE SHEET NO. 11

FOR STREAM DETAILS SEE SHEETS 2 THRU 2D
FOR ALIGNMENT DATA SEE SHEETS 12 & 13
FOR STREAM PROFILE SEE SHEETS 14 & 15

RECORD DOCUMENT

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

PROJECT REFERENCE NO.	SHEET NO.
040614801	10

PROJECT ENGINEER

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/30/05

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REVISIONS

PROPOSED ALIGNMENT

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	11

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER KEVIN WILLIAMS

PT Sta. 32+07.876
PC Sta. 32+37.799
END STREAM UT
POT Sta. 32+77.862
PT Sta. 31+26.864
30
-MATCHLINE- STA. 30+00.00
SEE SHEET NO. 10
R-29
R-30
R-31
R-32
PROP THALWEG
PC Sta. 30+75.214
PC Sta. 31+47.716
PT Sta. 32+68.959
PT Sta. 30+45.506
N 3° 32' 52.6" W
N 24° 43' 38.7" W
-BL-2 PINC 12+46.19
SHARTREE SUBDIVISION WETLAND EASEMENT LINE
-BL-1001 PINC 15+81.12
-BL-1003 PINC 19+16.50
INV 215.34
INV 215.16
SATELLITE
ROCK

FOR STREAM DETAILS SEE SHEETS 2 THRU 2D
FOR ALIGNMENT DATA SEE SHEETS 12 & 13
FOR STREAM PROFILE SEE SHEET 14

RECORD DOCUMENT

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/2005

9/8/2006
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REVISIONS

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

NOT TO SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	12

PROJECT ENGINEER

PROPOSED ALIGNMENT DATA TABLES

STREAM ALIGNMENT DATA

STATION	CURVE/ TANGENT NUMBER		NORTHING	EASTING	CURVE LENGTH/ TANGENT LENGTH (FT)	CURVE/TANGENT BEARING	CHORD LENGTH (FT)	DELTA ANGLE	RADIUS (FT)
10+11.13		PC	809,219.8291	2,207,598.6035					
	THAL-1	CC	809,199.3837	2,207,576.6494	21.12'	S 22° 47' 55" E	20.68'	40° 19' 37" RT	30.00'
10+32.24		PT	809,200.7630	2,207,606.6176					
						S 2° 38' 07" E			
10+52.68		PC	809,180.3446	2,207,607.5574					
	THAL-2	CC	809,181.7239	2,207,637.5257	58.63'	S 58° 37' 16" E	49.73'	111° 58' 19" LT	30.00'
11+11.31		PT	809,154.4484	2,207,650.0175					
						N 65° 23' 34" E			
11+36.26		PC	809,164.8385	2,207,672.7038					
	THAL-3	CC	809,137.5629	2,207,685.1957	65.76'	S 51° 48' 40" E	53.36'	125° 35' 31" RT	30.00'
12+02.02		PT	809,131.8465	2,207,714.6460					
						S 10° 59' 06" W			
12+29.96		PC	809,104.4220	2,207,709.3227					
	THAL-4	CC	809,098.7055	2,207,738.7731	60.72'	S 46° 59' 44" E	50.87'	115° 57' 40" LT	30.00'
12+90.68		PT	809,069.7245	2,207,746.5256					
						N 75° 01' 26" E			
13+20.45		PC	809,077.4176	2,207,775.2845					
	THAL-5	CC	809,048.4366	2,207,783.0370	24.63'	S 81° 27' 21" E	23.94'	47° 02' 26" RT	30.00'
13+45.08		PT	809,073.8602	2,207,798.9631					
						S 57° 56' 09" E			
13+73.12		PC	809,058.9720	2,207,822.7299					
	THAL-6	CC	809,084.3956	2,207,838.6560	19.14'	S 76° 12' 53" E	18.82'	36° 33' 28" LT	30.00'
13+92.26		PT	809,054.4878	2,207,841.0064					
						N 85° 30' 23" E			
14+16.30		PC	809,056.3711	2,207,864.9706					
	THAL-7	CC	809,086.2789	2,207,862.6202	15.18'	N 71° 00' 44" E	15.02'	28° 59' 20" LT	30.00'
14+31.48		PT	809,061.2572	2,207,879.1706					
						N 56° 31' 04" E			
14+53.06		PC	809,073.1619	2,207,897.1687					
	THAL-8	CC	809,048.1402	2,207,913.7190	44.60'	S 80° 53' 40" E	40.60'	85° 10' 33" RT	30.00'
14+97.66		PT	809,066.7362	2,207,937.2603					
						S 38° 18' 23" E			
15+23.41		PC	809,046.5270	2,207,953.2241					
	THAL-9	CC	809,065.1230	2,207,976.7653	59.94'	N 84° 27' 09" E	50.46'	114° 28' 56" LT	30.00'
15+83.35		PT	809,051.4048	2,208,003.4451					
						N 27° 12' 41" E			
16+03.97		PC	809,069.7389	2,208,012.8722					
	THAL-10	CC	809,056.0207	2,208,039.5520	49.08'	N 74° 04' 55" E	43.79'	93° 44' 28" RT	30.00'
16+53.05		PT	809,081.7485	2,208,054.9818					
						S 59° 02' 51" E			
16+76.68		PC	809,069.5986	2,208,075.2407					
	THAL-11	CC	809,095.3264	2,208,090.6705	26.93'	S 84° 45' 59" E	26.04'	51° 26' 16" LT	30.00'
17+03.61		PT	809,067.2235	2,208,101.1695					
						N 69° 30' 53" E			
17+36.82		PC	809,078.8461	2,208,132.2800					
	THAL-12	CC	809,050.7432	2,208,142.7790	38.23'	S 73° 58' 44" E	35.69'	73° 00' 45" RT	30.00'
17+75.05		PT	809,068.9948	2,208,166.5883					
						S 37° 28' 22" E			
18+01.97		PC	809,047.6279	2,208,182.9675					
	THAL-13	CC	809,029.3764	2,208,159.1582	21.64'	S 16° 48' 23" E	21.18'	41° 19' 58" RT	30.00'
18+23.61		PT	809,027.3568	2,208,189.0902					
						S 3° 51' 36" W			
18+48.63		PC	809,002.3931	2,208,187.4059					
	THAL-14	CC	809,000.3736	2,208,217.3378	27.91'	S 22° 47' 38" E	26.92'	53° 18' 27" LT	30.00'
18+76.55		PT	808,977.5792	2,208,197.8335					
						S 49° 26' 51" E			
19+04.65		PC	808,959.3055	2,208,219.1897					
	THAL-15	CC	808,936.5111	2,208,199.6854	43.28'	S 8° 07' 13" E	39.62'	82° 39' 17" RT	30.00'
19+47.93		PT	808,920.0811	2,208,224.7863					
						S 33° 12' 26" W			
19+83.17		PC	808,890.5978	2,208,205.4877					
	THAL-16	CC	808,874.1678	2,208,230.5886	44.99'	S 9° 45' 12" E	40.89'	85° 55' 15" LT	30.00'
20+28.16		PT	808,850.2992	2,208,212.4146					
						S 52° 42' 49" E			
20+51.15		PC	808,836.3681	2,208,230.7110					
	THAL-17	CC	808,804.5433	2,208,206.4790	11.07'	S 44° 47' 15" E	11.03'	15° 51' 09" RT	40.00'
20+62.22		PT	808,828.5385	2,208,238.4827					
						S 36° 51' 40" E			
21+73.34		PC	808,739.6315	2,208,305.1419					
	THAL-18	CC	808,763.6266	2,208,337.1455	37.20'	S 63° 30' 17" E	35.87'	53° 17' 12" LT	40.00'
22+10.54		PT	808,723.6268	2,208,337.2488					
						N 89° 51' 07" E			
22+45.27		PC	808,723.7164	2,208,371.9794					
	THAL-19	CC	808,693.7165	2,208,372.0568	46.89'	S 45° 22' 04" E	42.26'	89° 33' 38" RT	30.00'
22+92.17		PT	808,694.0241	2,208,402.0553					
						S 0° 35' 15" E			

STREAM ALIGNMENT DATA

STATION	CURVE/ TANGENT NUMBER		NORTHING	EASTING	CURVE LENGTH/ TANGENT LENGTH (FT)	CURVE/TANGENT BEARING	CHORD LENGTH (FT)	DELTA ANGLE	RADIUS (FT)
23+29.96		PC	808,656.2289	2,208,402.4428					
	THAL-20	CC	808,656.5365	2,208,432.4412	40.16'	S 38° 56' 23" E	37.23'	76° 42' 17" LT	30.00'
23+70.13		PT	808,627.2714	2,208,425.8417					
						S 77° 17' 31" E			
23+99.50		PC	808,620.8102	2,208,454.4935					
	THAL-21	CC	808,581.7901	2,208,445.6943	37.20'	S 50° 39' 04" E	35.87'	53° 16' 54" RT	40.00'
24+36.70		PT	808,598.0662	2,208,482.2331					
						S 24° 00' 38" E			
24+68.76		PC	808,568.7752	2,208,495.2807					
	THAL-22	CC	808,580.9823	2,208,522.6849	36.50'	S 58° 52' 10" E	34.29'	69° 43' 05" LT	30.00'
25+05.27		PT	808,551.0458	2,208,524.6357					
						N 86° 16' 18" E			
25+35.18		PC	808,552.9909	2,208,554.4834					
	THAL-23	CC	808,523.0544	2,208,556.4343	27.94'	S 67° 03' 09" E	26.94'	53° 21' 07" RT	30.00'
25+63.11		PT	808,542.4885	2,208,579.2884					
						S 40° 22' 35" E			
26+03.20		PC	808,511.9504	2,208,605.2567					
	THAL-24	CC	808,492.5162	2,208,582.4025	36.47'	S 5° 33' 16" E	34.26'	69° 38' 39" RT	30.00'
26+39.66		PT	808,477.8495	2,208,608.5729					
						S 29° 16' 04" W			
26+74.74		PC	808,447.2470	2,208,591.4222					
	THAL-25	CC	808,432.5803	2,208,617.5926	47.76'	S 16° 20' 08" E	42.87'	91° 12' 25" LT	30.00'
27+22.50		PT	808,406.1068	2,208,603.4803					
						S 61° 56' 21" E			
27+65.64		PC	808,385.8156	2,208,641.5449					
	THAL-26	CC	808,359.3422	2,208,627.4326	56.43'	S 8° 03' 20" E	48.47'	107° 46' 02" RT	30.00'
28+22.06		PT	808,337.8246	2,208,648.3370					
						S 45° 49' 41" W			
28+45.20		PC	808,321.7046	2,208,631.7442					
	THAL-27	CC	808,300.1870	2,208,652.6486	44.05'	S 3° 45' 38" W	40.20'	84° 08' 06" LT	30.00'
28+89.25		PT	808,281.5908	2,208,629.1075					
						S 38° 18' 25" E			
29+09.62		PC	808,265.6047	2,208,641.7357					
	THAL-28	CC	808,247.0085	2,208,618.1947	50.77'	S 10° 10' 15" W	44.92'	96° 57' 19" RT	30.00'
29+60.39		PT	808,221.3887	2,208,633.8034					
						S 58° 38' 54" W			
29+86.74		PC	808,207.6783	2,208,611.2994					
	THAL-29	CC	808,182.0586	2,208,626.9080	58.77'	S 2° 31' 46" W	49.81'	112° 14' 16" LT	30.00'
30+45.51		PT	808,157.9151	2,208,609.1010					
						S 53° 35' 22" E			
30+75.21		PC	808,140.2812	2,208,633.0098					
	THAL-30	CC	808,116.1376	2,208,615.2027	51.65'	S 4° 16' 04" E	45.50'	98° 38' 37" RT	30.00'
31+26.86		PT	808,094.9044	2,208,636.3959					
						S 45° 03' 15" W			
31+47.72		PC	808,080.1737	2,208,621.6373					
	THAL-31	CC	808,058.9405	2,208,642.8305	60.16'	S 12° 23' 42" E	50.57'	114° 53' 53" LT	30.00'
32+07.88		PT	808,030.7777	2,208,632.4932					
						S 69° 50' 38" E			
32+37.80		PC	808,020.4671	2,208,660.5832					
	THAL-32	CC	807,992.3043	2,208,650.2459	31.16'	S 40° 05' 19" E	29.78'	59° 30' 39" RT	30.00'
32+68.96		PT	807,997.6854	2,208,679.7593					
						S 10° 19' 59" E			

BASELINE POINT TABLE

BASELINE POINT TABLE

POINT (#)	NORTHING	EASTING	ELEV (FT)
BL1	807,588.2480	2,209,415.5293	224.50
BL2	807,578.2902	2,208,669.4018	220.43
BL1001	807,882.5063	2,208,529.3017	224.42
BL1003	808,217.2397	2,208,508.5473	227.88
BL1005	808,535.6978	2,208,404.1111	230.57
BL1007	808,708.4801	2,208,092.3800	248.80
BL1009	808,920.5109	2,208,065.6228	239.25
BL1011	809,005.4223	2,207,758.8495	241.59
BL1013	809,221.0213	2,207,531.3120	245.20
BL5001	809,326.0109	2,207,498.7612	243.75

RECORD DOCUMENT

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 63005

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REVISIONS

PROPOSED ALIGNMENT TIE DATA TABLE

STREAM ALIGNMENT DATA									
STATION	CURVE/ TANGENT NUMBER		NORTHING	EASTING	CURVE LENGTH/ TANGENT LENGTH (FT)	CURVE/TANGENT BEARING	CHORD LENGTH (FT)	DELTA ANGLE	RADIUS (FT)
10+14.98		PC	808,989.5630	2,208,228.5950					
	TIE1-1	CC	808,985.9781	2,208,219.2596	4.29'	S 8° 42' 55" E	4.26'	24° 35' 00" RT	10.00'
10+19.27		PT	808,985.3543	2,208,229.2401					
						S 3° 34' 35" W			
10+31.39		PC	808,973.2612	2,208,228.4843					
	TIE1-2	CC	808,973.8850	2,208,218.5038	6.45'	S 22° 03' 52" W	6.34'	36° 58' 34" RT	10.00'
10+37.84		PT	808,967.3836	2,208,226.1019					
						S 40° 33' 09" W			
10+16.15		PC	808,557.6636	2,208,588.5556					
	TIE2-1	CC	808,547.8308	2,208,605.9716	13.91'	S 9° 31' 43" W	13.63'	39° 50' 22" LT	20.00'
10+30.06		PT	808,544.2235	2,208,586.2996					
						S 10° 23' 28" E			
10+00.00		PC	808,337.9625	2,208,687.5533					
	TIE3-1	CC	808,354.7862	2,208,676.7384	12.39'	S 75° 00' 53" W	12.19'	35° 29' 52" RT	20.00'
10+12.39		PT	808,334.8095	2,208,675.7741					
						N 87° 14' 11" W			

PROPOSED CURVE DATA TABLE

CURVE DATA			
RADIUS (#)	NORTHING	EASTING	RADIUS (FT)
R-1	809,199.3837	2,207,576.6494	30.00'
R-2	809,181.7239	2,207,637.5257	30.00'
R-3	809,137.5629	2,207,685.1957	30.00'
R-4	809,098.7055	2,207,738.7731	30.00'
R-5	809,048.4366	2,207,783.0370	30.00'
R-6	809,084.3956	2,207,838.6560	30.00'
R-7	809,086.2789	2,207,862.6202	30.00'
R-8	809,048.1402	2,207,913.7190	30.00'
R-9	809,065.1230	2,207,976.7653	30.00'
R-10	809,056.0207	2,208,039.5520	30.00'
R-11	809,095.3264	2,208,090.6705	30.00'
R-12	809,050.7432	2,208,142.7790	30.00'
R-13	809,029.3764	2,208,159.1582	30.00'
R-14	809,000.3736	2,208,217.3378	30.00'
R-15	808,936.5111	2,208,199.6854	30.00'
R-16	808,874.1678	2,208,230.5886	30.00'
R-17	808,804.5433	2,208,206.4790	40.00'
R-18	808,763.6266	2,208,337.1455	40.00'
R-19	808,693.7165	2,208,372.0568	30.00'
R-20	808,656.5365	2,208,432.4412	30.00'
R-21	808,581.7901	2,208,445.6943	40.00'
R-22	808,580.9823	2,208,522.6849	30.00'
R-23	808,523.0544	2,208,556.4343	30.00'
R-24	808,492.5162	2,208,582.4025	30.00'
R-25	808,432.5803	2,208,617.5926	30.00'
R-26	808,359.3422	2,208,627.4326	30.00'
R-27	808,300.1870	2,208,652.6486	30.00'
R-28	808,247.0085	2,208,618.1947	30.00'
R-29	808,182.0586	2,208,626.9080	30.00'
R-30	808,116.1376	2,208,615.2027	30.00'
R-31	808,058.9405	2,208,642.8305	30.00'
R-32	807,992.3043	2,208,650.2459	30.00'
R-100	808,985.9781	2,208,219.2596	10.00'
R-101	808,973.8850	2,208,218.5038	10.00'
R-200	808,547.8308	2,208,605.9716	20.00'
R-300	808,354.7862	2,208,676.7384	20.00'

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE *202 RALEIGH, N.C. 27606
(919) 851-6066

NOT TO SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	13

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

STRUCTURE LOCATION TABLE

STREAM STRUCTURE LOCATIONS				
STR. TYPE	STATION	NORTHING	EASTING	ELEV (FT) *
ROCK CROSS VANE	10+00.00	809,228.7969	2,207,590.6298	234.602
LOG VANE	10+57.41	809,175.6575	2,207,608.1455	233.894
LOG VANE	11+39.13	809,165.9064	2,207,675.3647	233.658
LOG VANE	11+86.07	809,147.5690	2,207,713.4778	233.029
LOG VANE	12+38.14	809,096.2834	2,207,708.8710	233.067
LOG VANE	12+75.45	809,069.6094	2,207,731.4643	232.649
ROOTWAD	13+47.00	809,072.8388	2,207,800.5936	232.922
LOG VANE	14+61.19	809,076.6801	2,207,904.4739	232.072
LOG VANE	15+31.38	809,041.0028	2,207,958.9268	231.912
LOG VANE	16+12.29	809,076.5209	2,208,017.6489	231.511
LOG VANE	16+76.68	809,069.5986	2,208,075.2407	231.620
ROCK CROSS VANE	17+75.00	809,069.0337	2,208,166.5584	230.730
ROCK CROSS VANE	18+23.50	809,027.4699	2,208,189.0976	230.040
ROOTWAD	18+66.59	808,985.1796	2,208,191.4700	229.076
ROCK CROSS VANE	19+47.50	808,920.4432	2,208,225.0196	229.050
ROCK CROSS VANE	20+62.00	808,828.7142	2,208,238.3502	228.1000
ROCK CROSS VANE	22+10.50	808,723.6267	2,208,337.2064	227.010
ROCK CROSS VANE	22+92.00	808,694.1909	2,208,402.0531	226.190
LOG VANE	23+32.85	808,653.3533	2,208,402.6106	225.842
ROCK CROSS VANE	24+36.50	808,598.2444	2,208,482.1532	225.120
ROCK CROSS VANE	25+05.00	808,551.0298	2,208,524.3711	224.350
LOG VANE	25+39.78	808,552.9373	2,208,559.0816	223.762
ROCK CROSS VANE	26+39.50	808,477.9922	2,208,608.6523	223.320
ROCK CROSS VANE	27+22.50	808,406.1068	2,208,603.4803	222.500
ROCK CROSS VANE	28+22.00	808,337.8677	2,208,648.3813	221.600
ROOTWAD	29+26.15	808,250.5262	2,208,647.9878	220.310
ROCK CROSS VANE	29+60.00	808,221.5920	2,208,634.1323	220.560
ROCK CROSS VANE	31+26.50	808,095.1630	2,208,636.6518	219.400
ROCK CROSS VANE	32+77.86	807,988.9286	2,208,681.3559	218.811
ROCK CROSS VANE	10+19.73	808,984.9016	2,208,229.1895	229.72
ROCK CROSS VANE	10+01.04	808,570.8250	2,208,595.9864	224.06
ROCK CROSS VANE	10+11.59	808,334.7618	2,208,676.5716	221.86

* ELEVATION IS THALWEG INVERT

RECORD DOCUMENT

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY: RKW	
CHECKED BY:	DATE: 63005

9/18/2006
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5/28/99

PROJECT REFERENCE NO.	SHEET NO.
040614801	14
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

FOR STREAM PLANS SEE SHEETS 4,5,8 & 9

BEGIN STREAM UT
POT Sta 10+00.000
ELEV = 235.20

EXISTING GROUND ALONG THAWEG

PROPOSED BANKFULL GRADELINE

PROPOSED THAWEG INVERT

PROPOSED STEP STRUCTURE (TYP)

PI = 17+75.00 EL = 232.44
PI = 17+75.10 EL = 231.94
PI = 18+23.50 EL = 231.75
PI = 18+23.60 EL = 231.25
PI = 19+47.50 EL = 230.76
PI = 19+47.60 EL = 230.26
PI = 20+62.00 EL = 229.81
PI = 20+62.10 EL = 229.31

240 230 220 210

10 11 12 13 14 15 16 17 18 19 20 21 22

FOR STREAM PLANS SEE SHEETS 5,6,7,9,10 & 11

PROPOSED BANKFULL GRADELINE

EXISTING GROUND ALONG THAWEG

END STREAM UT
POT Sta 32+77.862
ELEV = 220.31

PI = 22+10.50 EL = 229.01
PI = 22+10.60 EL = 228.51
PI = 22+92.00 EL = 228.19
PI = 22+92.10 EL = 227.69
PI = 24+36.50 EL = 227.12
PI = 24+36.60 EL = 226.62
PI = 25+05.00 EL = 226.35
PI = 25+05.10 EL = 225.85
PI = 26+39.50 EL = 225.32
PI = 26+39.60 EL = 224.82
PI = 27+22.50 EL = 224.50
PI = 27+22.60 EL = 224.00
PI = 28+22.00 EL = 223.60
PI = 28+22.10 EL = 223.10
PI = 29+60.00 EL = 222.56
PI = 29+60.10 EL = 222.06
PI = 31+26.50 EL = 221.40
PI = 31+26.60 EL = 220.90
220.31

PROPOSED STEP STRUCTURE (TYP)

PROPOSED THAWEG INVERT

RECORD DOCUMENT

240 230 220 210 200

22 23 24 25 26 27 28 29 30 31 32 33

9/8/2005
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Ken Alexander

5/28/99

PROJECT REFERENCE NO.	SHEET NO.
040614801	15
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMSON

FOR STREAM PLANS SEE SHEETS 5,6,9 & 10

TIE–1

BEGIN TIE–1
Sta 10+00.000
ELEV = 229.72

EXISTING GROUND

END TIE–1
Sta 10+48.47 =
Sta 19+04.65 – STREAM UT
ELEV = 229.72

GRADE REPRESENTS
THALWEG INVERT

TIE–2

BEGIN TIE–2
Sta 10+00.000
ELEV = 224.06

EXISTING GROUND

END TIE–2
Sta 10+42.99 =
Sta 25+77.53 – STREAM UT
ELEV = 224.06

GRADE REPRESENTS
THALWEG INVERT

TIE–3

BEGIN TIE–3
Sta 10+00.000
ELEV = 221.96

EXISTING GROUND

END TIE 3
Sta 10+41.52 =
Sta 28+24.37 – STREAM UT
ELEV = 221.59

GRADE REPRESENTS
THALWEG INVERT

240
230
220
210
200

10 11 10 11 10 11

RECORD DOCUMENT

9/8/2005
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8/23/99

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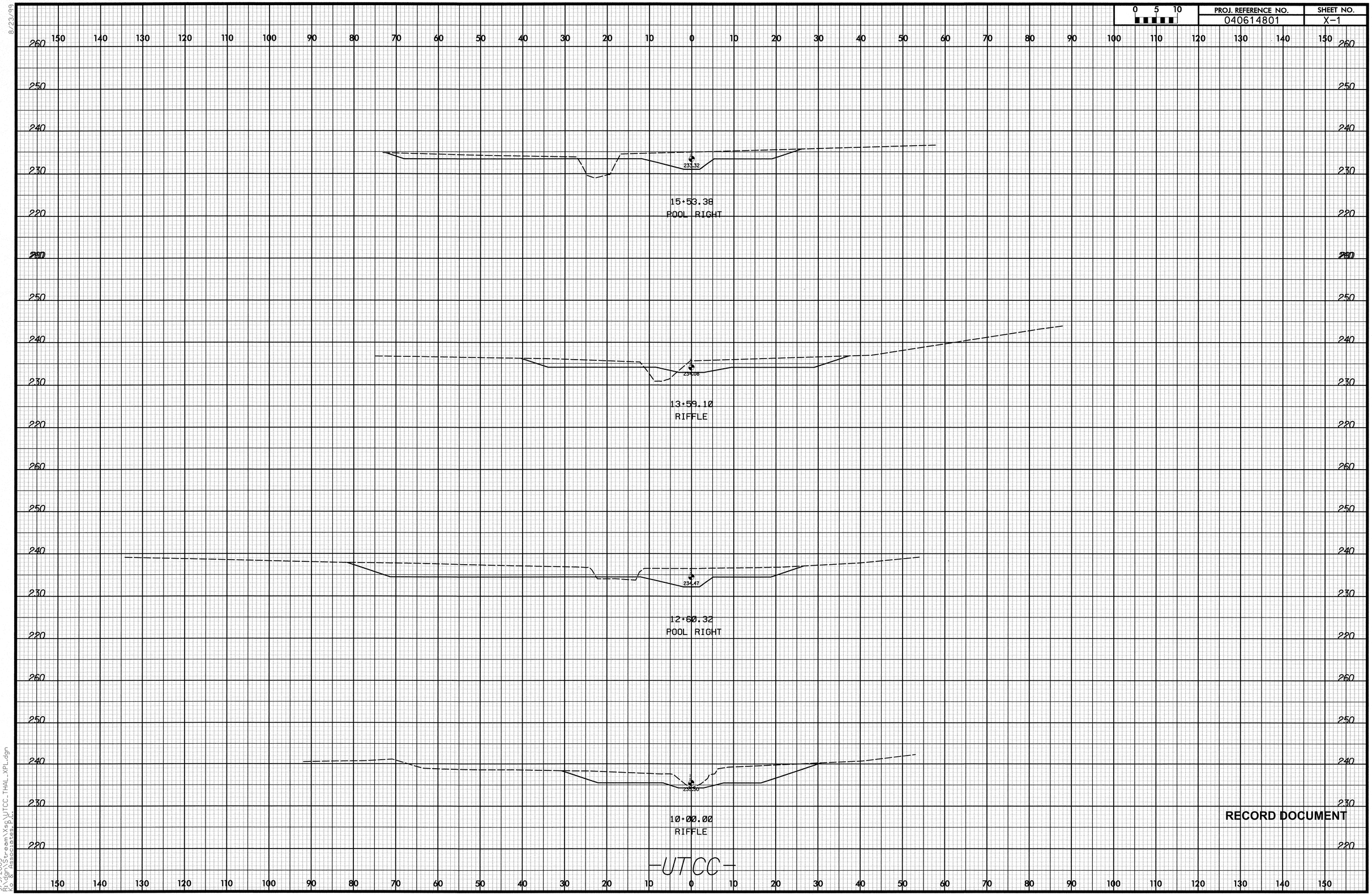

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-UTCC-

9/9/2005
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Ko & Associates, P.C.

8/23/99

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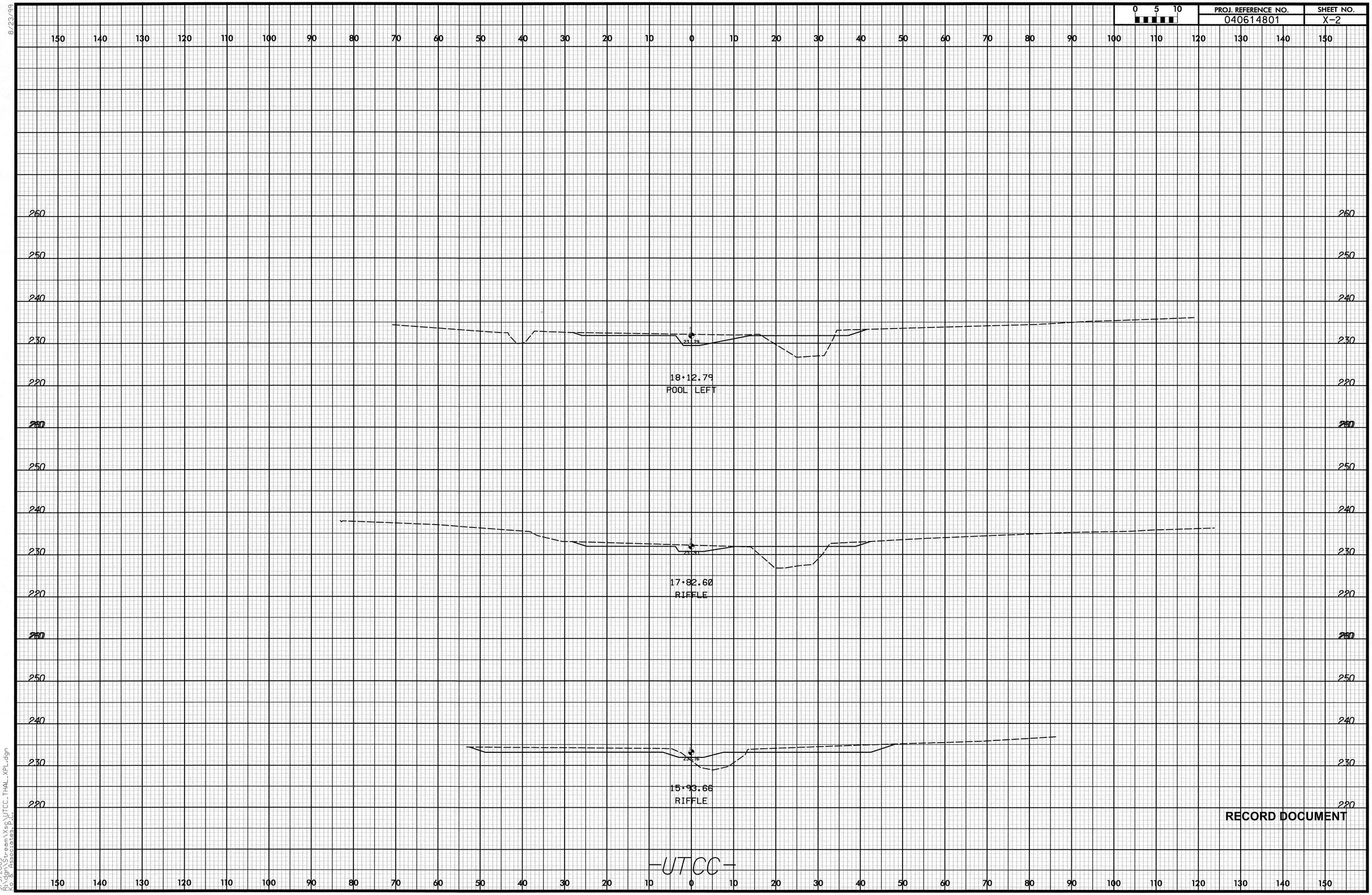

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-UTCC-

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Ko & Associates, P.C.

8/23/99

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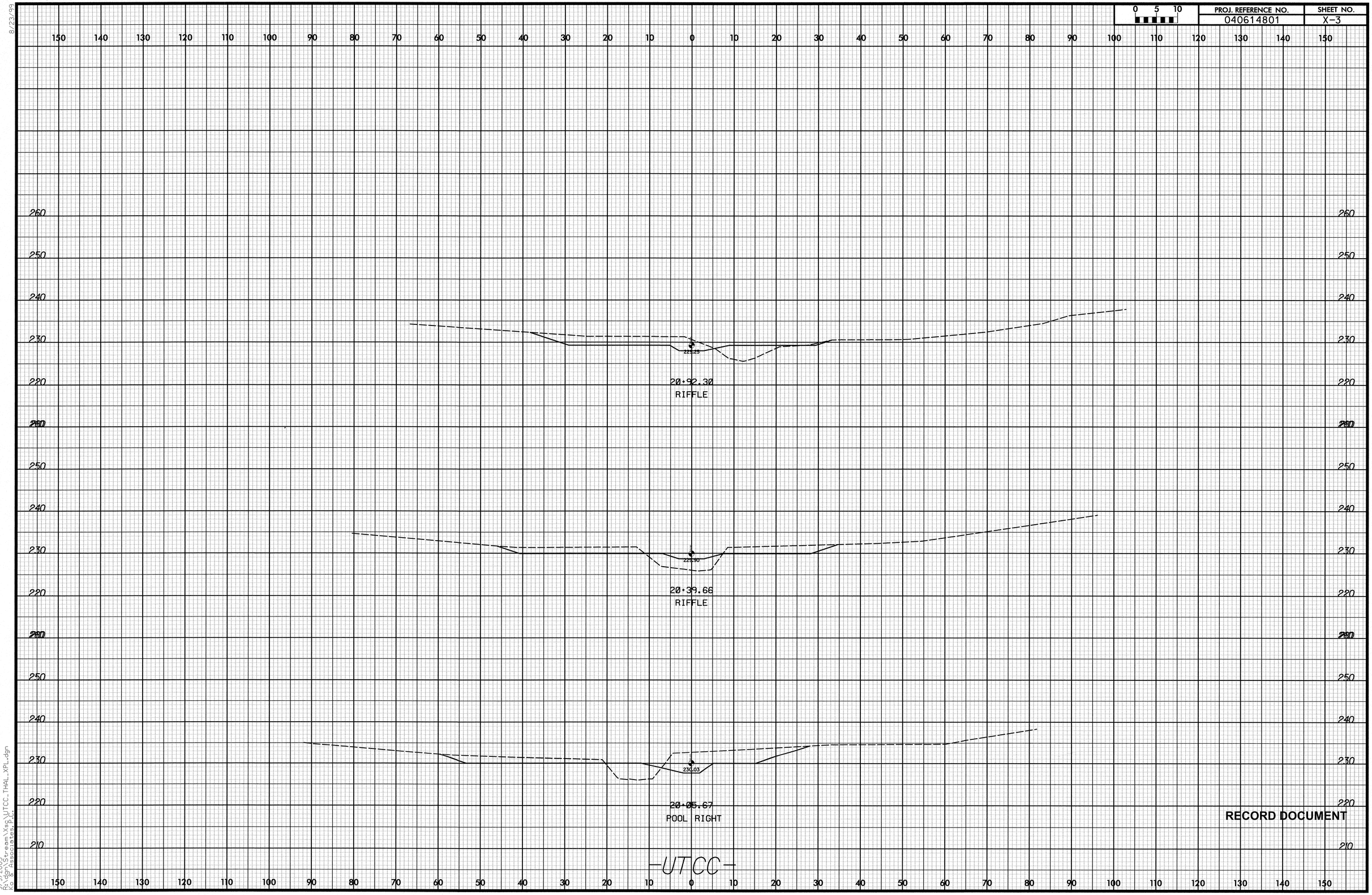

RECORD DOCUMENT

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K & Associates, P.C.

8/23/99

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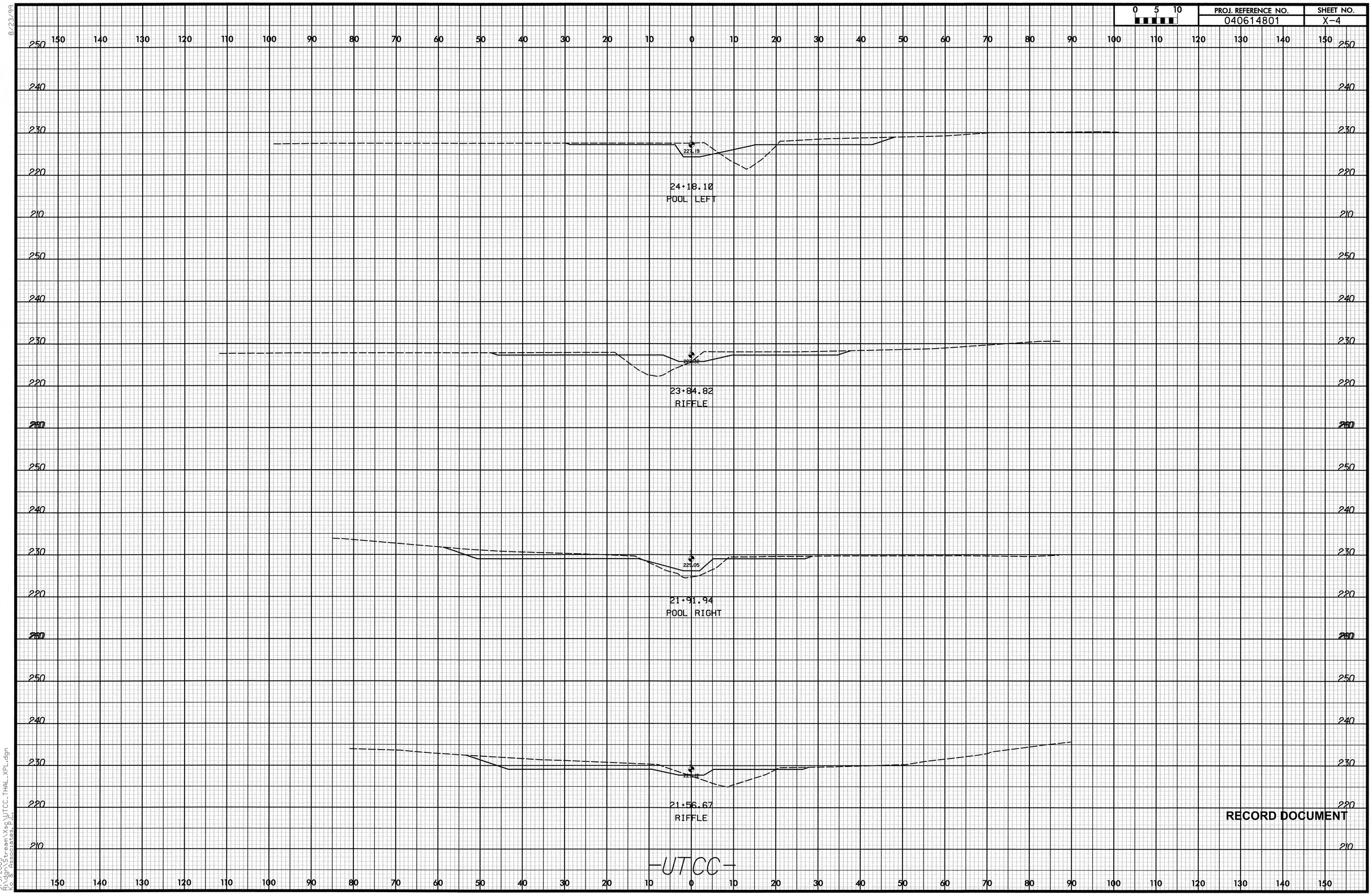

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Ko & Associates, P.C.

8/23/99

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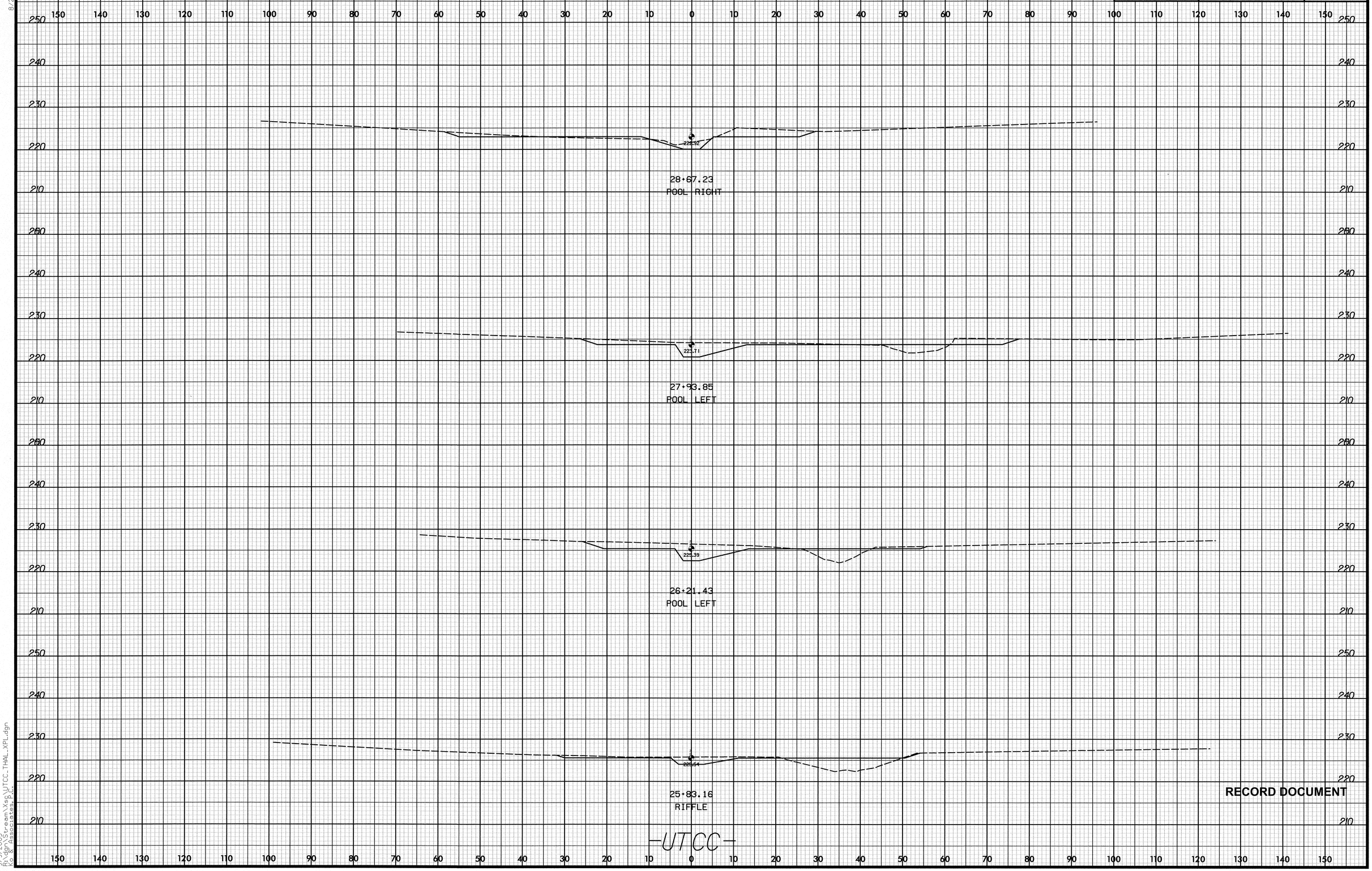

RECORD DOCUMENT

-UTCC-

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ko & Associates, P.C.

8/23/99

0 5 10

PROJ. REFERENCE NO.	SHEET NO.
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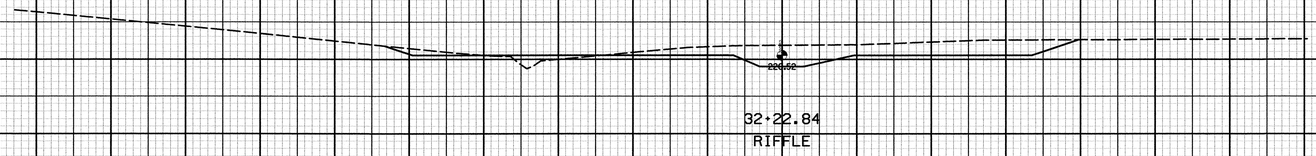
250 240 230 220 210 260 240 230 220 210 260 240 230 220 210 200



32+22.84
RIFFLE

30+60.36
RIFFLE

30+16.13
POOL RIGHT

RECORD DOCUMENT

-UTCC-

9/9/2005
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K-O & Associates, P.C.

8/23/99

0 5 10

PROJ. REFERENCE NO.	SHEET NO.
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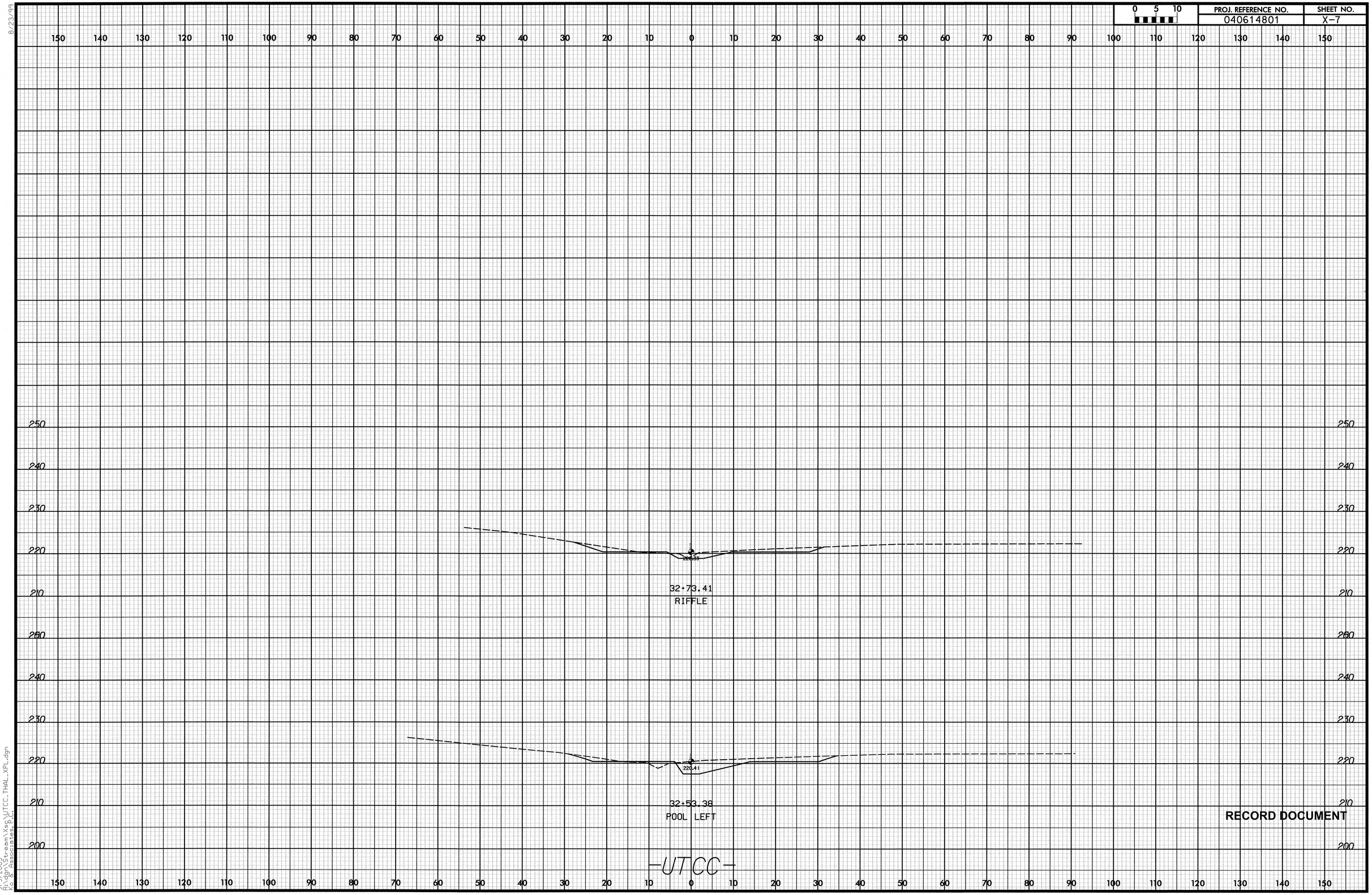

RECORD DOCUMENT

-UTCC-

9/9/2005
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Ko & Associates, P.C.

STATE	WRP PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	040614801	PL-1	

PROJECT: 040614801

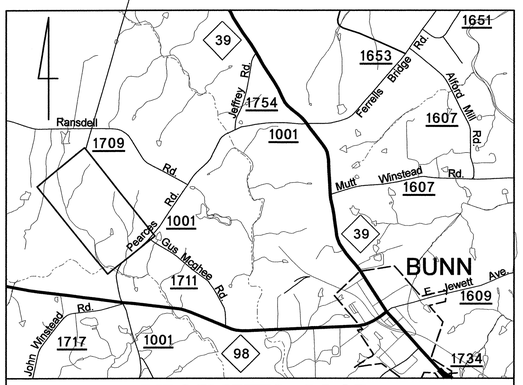
STATE OF NORTH CAROLINA
WETLANDS RESTORATION PROGRAM

PLANTING PLANS
UT-CROOKED CREEK
SPEAS PROPERTY

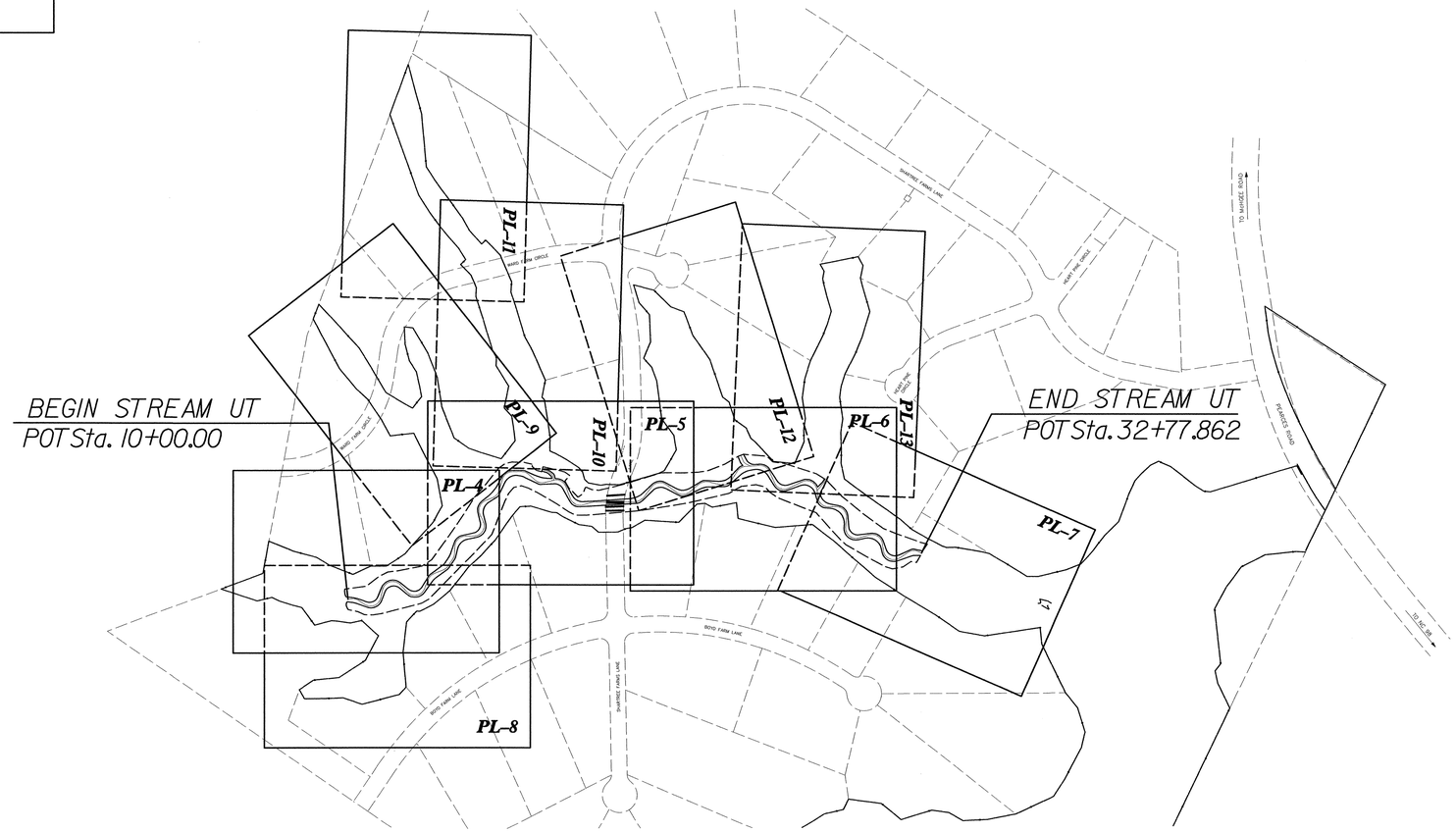
LOCATION: FRANKLIN COUNTY, NORTH CAROLINA

TYPE OF WORK: PLANTING

PROJECT LOCATION



VICINITY MAP



INDEX OF SHEETS

GRAPHIC SCALES

50 25 0 50 100
PLANS

20 10 0 20 40
PROFILE (HORIZONTAL)

4 2 0 4 8
PROFILE (VERTICAL)

DESIGN DATA

DESIGN STREAM TYPE	=	C5
BANKFULL AREA (FT^2)	=	17.3
BANKFULL WIDTH (FT)	=	15.0
BANKFULL DEPTH (FT)	=	1.15
W/D RATIO	=	13

PROJECT LENGTH

EXISITING STREAM LENGTH = 1920 FEET
PROPOSED DESIGN STREAM LENGTH = 2295 FEET

OWNER CONTACT: JEFF SCHAFFER
WRP PROJECT MANAGER

Prepared In the Office of:
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202
RALEIGH, N.C. 27606
(919) 851-6066
FAX: (919) 851-6846

LETTING DATE: DEC 2, 2005

DESIGNER
R. KEVIN WILLIAMS, PE
PROJECT MANAGER

R. KEVIN WILLIAMS, PE
PROJECT DESIGN ENGINEER

PROJECT DESIGN ENGINEER

RECORD DOCUMENT

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

SIGNATURE: P.E.

10/28/2005
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REVISIONS

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

PROJECT REFERENCE NO.	SHEET NO.
040614801	PL-2

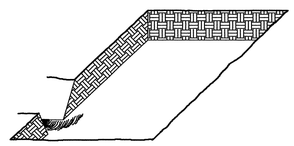
PROJECT ENGINEER

PLANTING DETAILS

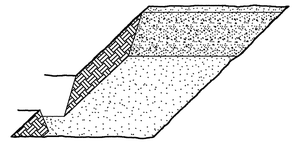
SEEDLING / LINER BAREROOT PLANTING DETAIL

HEALING IN

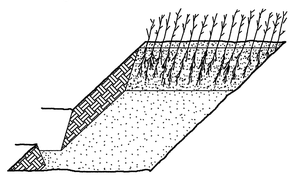
1. Locate a healing-in site in a shady, well protected area.
2. Excavate a flat bottom trench 12IN. deep and provide drainage.



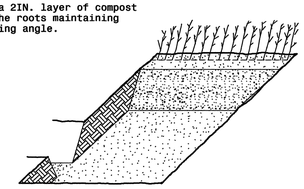
3. Backfill the trench with 2IN. of compost. Place a 2IN. layer of compost at a sloping angle at one end of the trench.



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

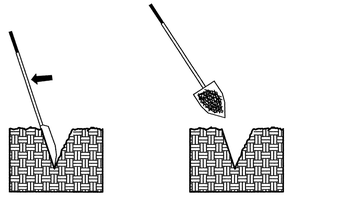


5. Place a 2IN. layer of compost over the roots maintaining a sloping angle.

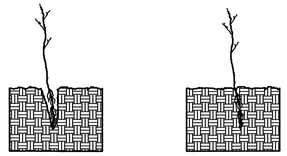


6. Repeat layers of plants and compost as necessary and water thoroughly.

PLANTING METHOD USING A SHOVEL



1. Dig hole with shovel to appropriate depth and width for seedling.
2. Remove soil from hole with shovel. Hole shall not be made by compacting soil away from the hole.



3. Remove shovel and place seedling at correct depth.
4. Fill hole with soil. Tamp soil to remove air pockets. Water Thoroughly.

PLANTING NOTES:

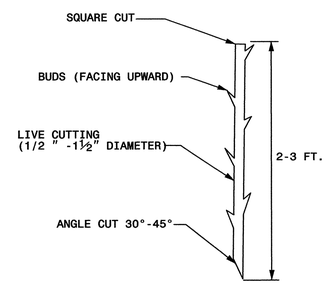
PLANTING BAG
During planting, seedlings shall be kept in a moist canvas bag or similar container to prevent the root systems from drying.

ROOT PRUNING
All seedlings shall be root pruned, if necessary, so that no roots extend more than 24inches (24IN.) below the root collar.

TREE REFORESTATION SHALL BE PLANTED 13' ON CENTER, RANDOM SPACING, AVERAGING 8' ON CENTER, APPROXIMATELY 260 PLANTS PER ACRE.

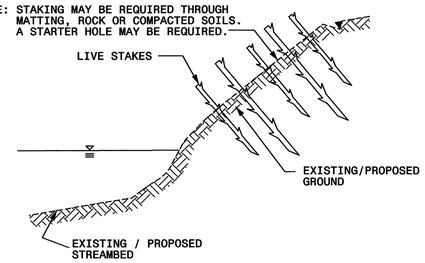
LIVE STAKE DETAIL

SCALE:NTS



LIVE STAKE

NOTE: STAKING MAY BE REQUIRED THROUGH MATTING, ROCK OR COMPACTED SOILS. A STARTER HOLE MAY BE REQUIRED.



NOTE:
1. LIVE STAKES SHALL BE EVENLY SPACED 4 FT. APART.
2. LIVE STAKES SHALL BE DRIVEN UNTIL APPROXIMATELY ¾ OF LIVE STAKE IS WITHIN GROUND.
3. IF STARTER HOLE IS NEEDED, MINIMIZE AIR POCKET.
4. UTILIZE ALL ON SITE TRANSPLANT MATERIALS MADE AVAILABLE BY THE OWNER. ONCE SOURCE OF TRANSPLANT MATERIAL HAS BEEN HARVESTED, THEN UTILIZE LIVE STAKING.

BANK STABILIZATION WITH LIVE STAKES

RECORD DOCUMENT

LOCATION:	PLANTING PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/3005

10/28/2005
9:43:40 AM
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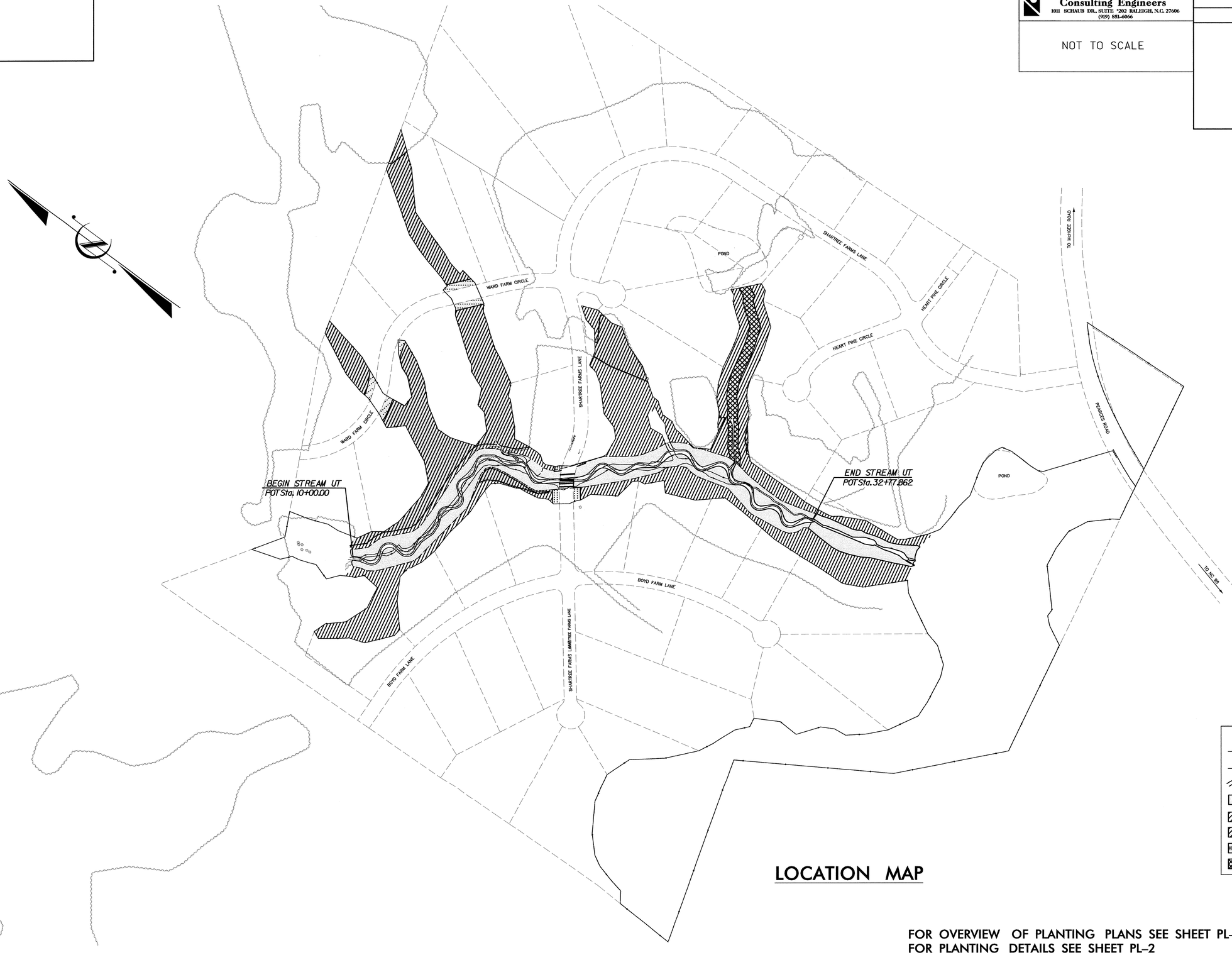
REVISIONS

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

NOT TO SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	PL-3
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER KEVIN WILLIAMS



LEGEND

- CONSERVATION EASEMENT PLANTING LIMITS
- SLOPE STAKE LINE
- STREAMBANK ZONE A
- FLOODPLAIN ZONE B
- RIPARIAN BUFFER ZONE C
- RIPARIAN BUFFER ZONE D (NO PLANTING, MATURE FOREST)
- RIPARIAN BUFFER ZONE E
- RIPARIAN BUFFER ZONE F (WET)

RECORD DOCUMENT

LOCATION MAP

FOR OVERVIEW OF PLANTING PLANS SEE SHEET PL-1
FOR PLANTING DETAILS SEE SHEET PL-2

LOCATION: STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY	
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY: RKW	
CHECKED BY:	DATE: 63005

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REVISIONS

PLANTING PLAN

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	PL-4

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER KEVIN WILLIAMS

10

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

LIMITS OF CONSTRUCTION

PROP THALWEG

BEGIN STREAM UT
POT Sta. 10+00.00

12"OAK
12"OAK TRIPLE
12"OAK
15"OAK
12"OAK
12"OAK DOUBLE

DAM

CREEK BED ROCK IN THIS AREA

TB

E

PROP. BANKFULL

–MATCHLINE– STA. 15+00.00 SEE SHEET NO. PL–5

–MATCHLINE– SEE SHEET NO. PL–8

LEGEND

- E — CONSERVATION EASEMENT PLANTING LIMITS
- SLOPE STAKE LINE
- STREAMBANK ZONE A
- FLOODPLAIN ZONE B
- RIPARIAN BUFFER ZONE C
- RIPARIAN BUFFER ZONE D (NO PLANTING, MATURE FOREST)
- H H H RIPARIAN BUFFER ZONE E (HEAVY)
- RIPARIAN BUFFER ZONE F (WET)

RECORD DOCUMENT

FOR OVERVIEW OF PLANTING PLANS SEE SHEET PL–1
FOR PLANTING DETAILS SEE SHEET PL–2

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/30/05

10/28/2005
9:33:20 AM
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REVISIONS

PLANTING PLAN

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	PL-5
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER KEVIN WILLIAMS

–MATCHLINE– SEE SHEET NO. PL–10

–MATCHLINE– SEE SHEET NO. PL–9

–MATCHLINE– STA. 15+00.00
SEE SHEET NO. PL–4

–MATCHLINE– STA. 23+00.00
SEE SHEET NO. PL–6

PROP BANKFULL

PERMANENT STREAM CROSSING SEE DETAIL SHEET 2D

SHARTREE FARMS LANE

LIMITS OF CONSTRUCTION

15

20

48" OAK

24" OAK

ROCK

TB

E

H H H

LEGEND

- E — CONSERVATION EASEMENT PLANTING LIMITS
- SLOPE STAKE LINE
- STREAMBANK ZONE A
- FLOODPLAIN ZONE B
- RIPARIAN BUFFER ZONE C
- RIPARIAN BUFFER ZONE D (NO PLANTING, MATURE FOREST)
- H H H RIPARIAN BUFFER ZONE E (HEAVY)
- RIPARIAN BUFFER ZONE F (WET)

RECORD DOCUMENT

FOR OVERVIEW OF PLANTING PLANS SEE SHEET PL–1
FOR PLANTING DETAILS SEE SHEET PL–2

LOCATION:	STREAM RESTORATION PLANS UT–CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/30/05

10/28/2005
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REVISIONS

PLANTING PLAN

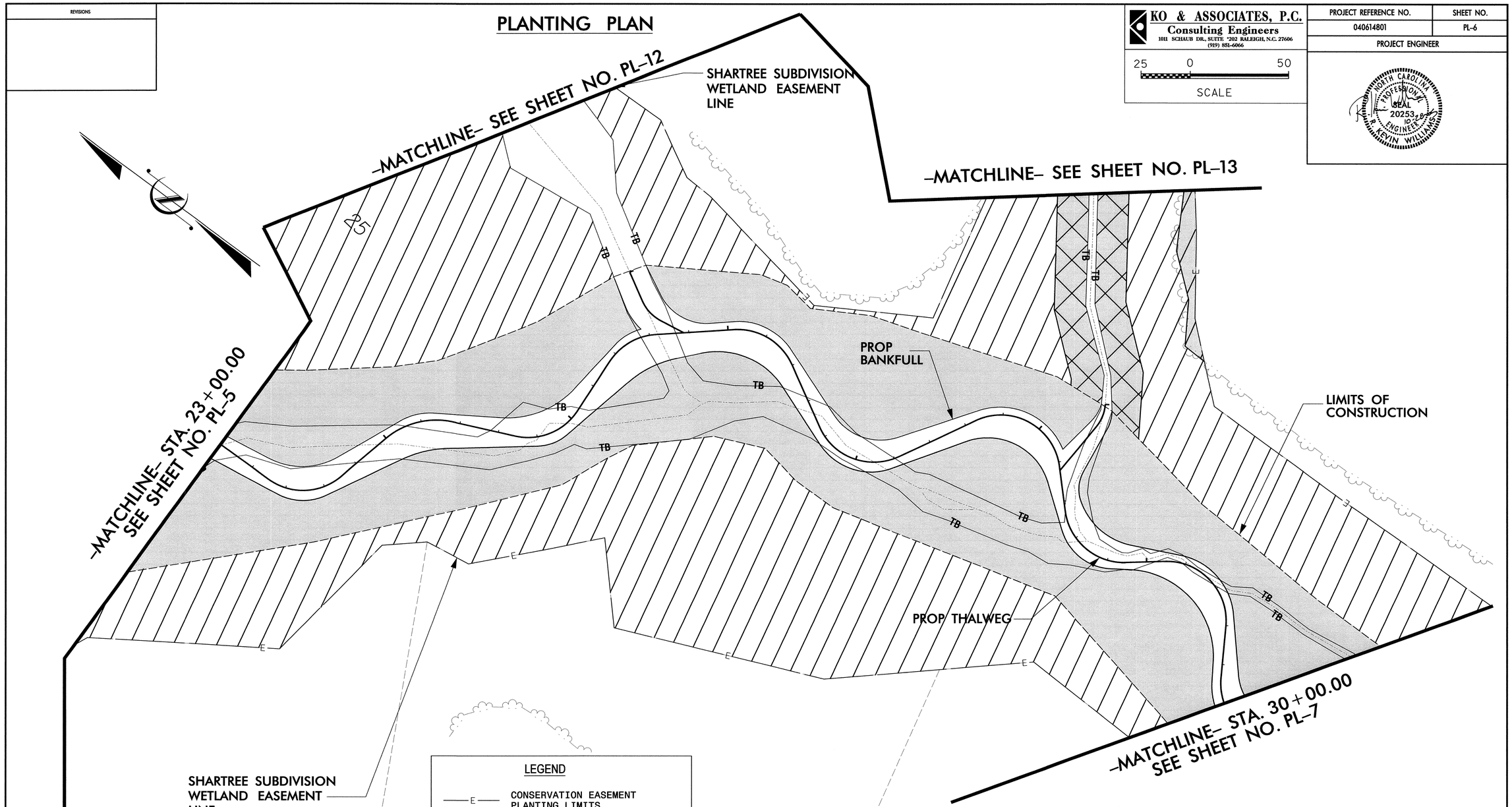
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	PL-6

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER KEVIN WILLIAMS



LEGEND

- E — CONSERVATION EASEMENT PLANTING LIMITS
- SLOPE STAKE LINE
- STREAMBANK ZONE A
- FLOODPLAIN ZONE B
- RIPARIAN BUFFER ZONE C
- RIPARIAN BUFFER ZONE D (NO PLANTING, MATURE FOREST)
- H H H RIPARIAN BUFFER ZONE E (HEAVY)
- RIPARIAN BUFFER ZONE F (WET)

FOR OVERVIEW OF PLANTING PLAN SEE SHEET PL-1
FOR PLANTING DETAILS SEE SHEET PL-2

RECORD DOCUMENT

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
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DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/30/05

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REVISIONS

PLANTING PLAN

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	PL-7
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS
10-28-05

30

END STREAM UT
POT Sta. 32+77.862

SATELITE

-MATCHLINE- STA. 30+00.00
SEE SHEET NO. PL-6

PROP THALWEG

TB

E

ROCK

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

LEGEND

- E — CONSERVATION EASEMENT PLANTING LIMITS
- SLOPE STAKE LINE
- STREAMBANK ZONE A
- FLOODPLAIN ZONE B
- RIPARIAN BUFFER ZONE C
- RIPARIAN BUFFER ZONE D (NO PLANTING, MATURE FOREST)
- H H H — RIPARIAN BUFFER ZONE E (HEAVY)
- RIPARIAN BUFFER ZONE F (WET)

RECORD DOCUMENT

FOR OVERVIEW OF PLANTING PLANS SEE SHEET PL-1
FOR PLANTING DETAILS SEE SHEET PL-2

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/30/05

10/28/2005
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REVISIONS

PLANTING PLAN

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

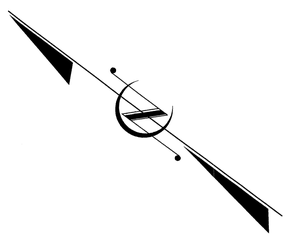
PROJECT REFERENCE NO.	SHEET NO.
040614801	PL-8

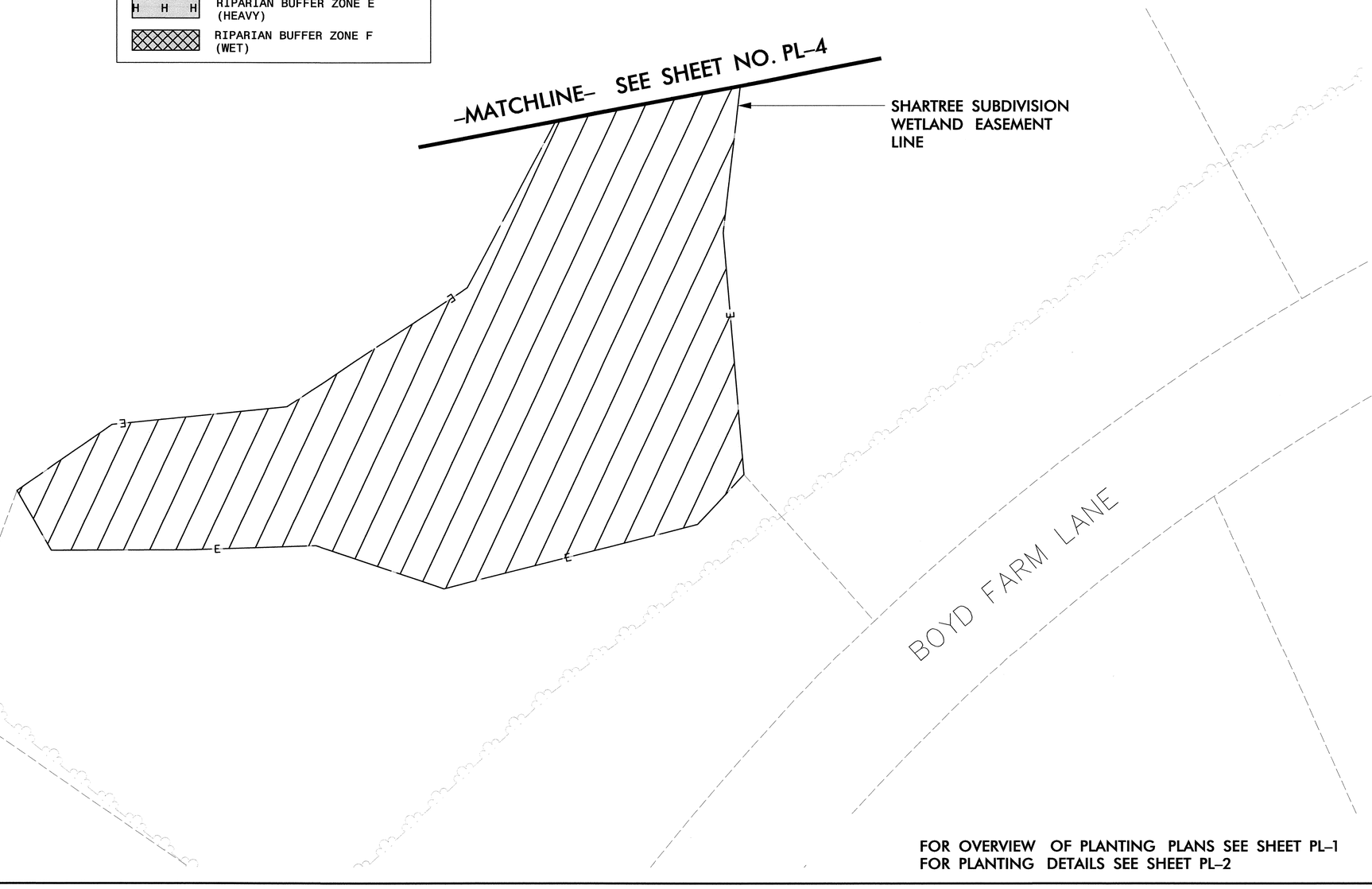
PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER KEVIN WILLIAMS

LEGEND

- E — CONSERVATION EASEMENT PLANTING LIMITS
- SLOPE STAKE LINE
- STREAMBANK ZONE A
- FLOODPLAIN ZONE B
- RIPARIAN BUFFER ZONE C
- RIPARIAN BUFFER ZONE D (NO PLANTING, MATURE FOREST)
- H H H RIPARIAN BUFFER ZONE E (HEAVY)
- RIPARIAN BUFFER ZONE F (WET)





RECORD DOCUMENT

FOR OVERVIEW OF PLANTING PLANS SEE SHEET PL-1
FOR PLANTING DETAILS SEE SHEET PL-2

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
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DESIGNED BY: RKW	
CHECKED BY:	DATE: 6/30/05

10/28/2005
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REVISIONS

PLANTING PLAN

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	PL-9

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

WARD FARM CIRCLE

LEGEND

- CONSERVATION EASEMENT PLANTING LIMITS
- SLOPE STAKE LINE
- STREAMBANK ZONE A
- FLOODPLAIN ZONE B
- RIPARIAN BUFFER ZONE C
- RIPARIAN BUFFER ZONE D (NO PLANTING, MATURE FOREST)
- RIPARIAN BUFFER ZONE E (HEAVY)
- RIPARIAN BUFFER ZONE F (WET)

SHARTREE SUBDIVISION
WETLAND EASEMENT LINE

–MATCHLINE– SEE SHEET NO. PL–5

RECORD DOCUMENT

FOR OVERVIEW OF PLANTING PLANS SEE SHEET PL–1
FOR PLANTING DETAILS SEE SHEET PL–2

LOCATION:	STREAM RESTORATION PLANS UT–CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/30/05

10/28/2005
8:05:04 AM
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REVISIONS

PLANTING PLAN

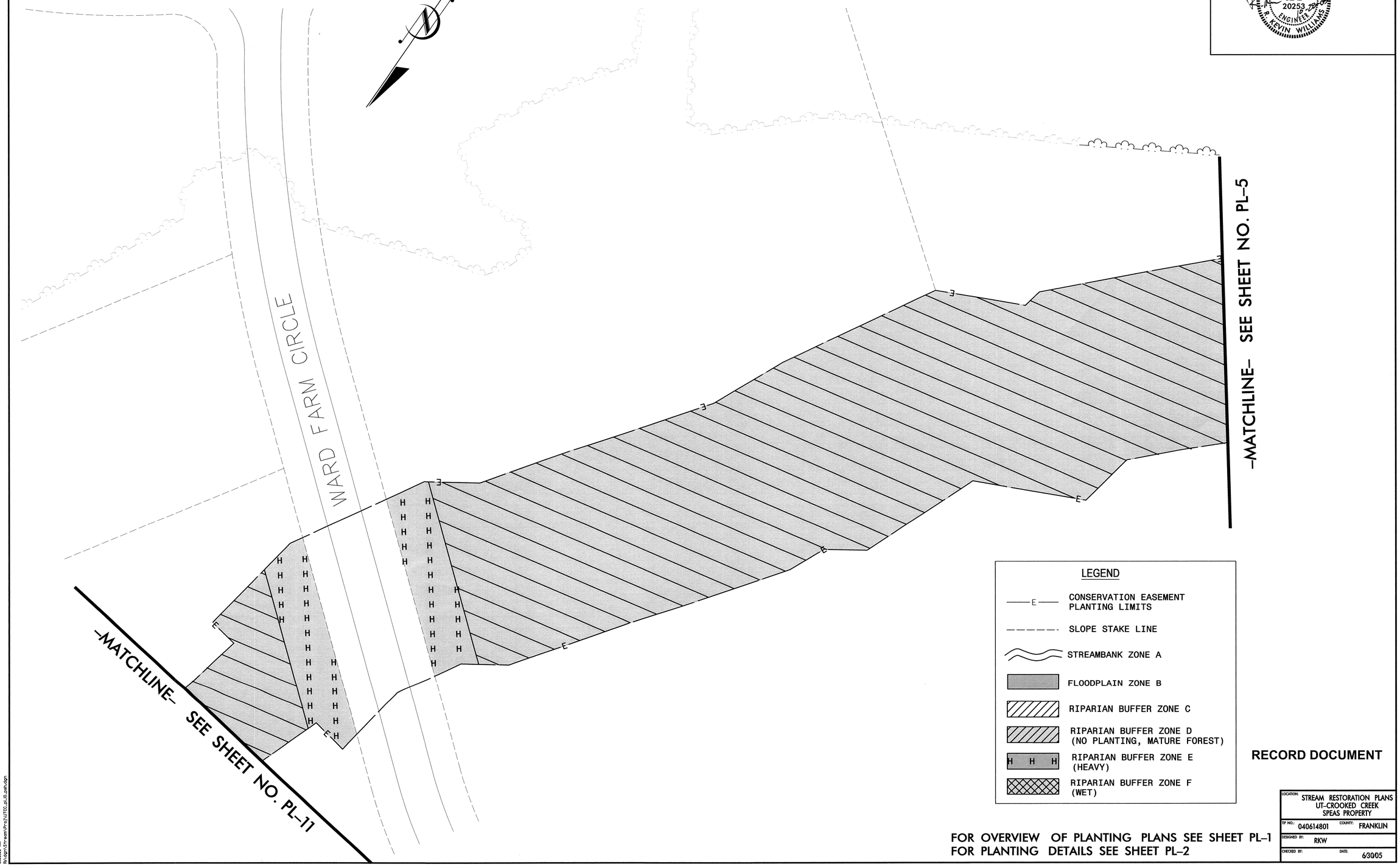
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	PL-10

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS



LEGEND

- E — CONSERVATION EASEMENT PLANTING LIMITS
- SLOPE STAKE LINE
- STREAMBANK ZONE A
- FLOODPLAIN ZONE B
- RIPARIAN BUFFER ZONE C
- RIPARIAN BUFFER ZONE D (NO PLANTING, MATURE FOREST)
- H H H RIPARIAN BUFFER ZONE E (HEAVY)
- RIPARIAN BUFFER ZONE F (WET)

RECORD DOCUMENT

FOR OVERVIEW OF PLANTING PLANS SEE SHEET PL–1
FOR PLANTING DETAILS SEE SHEET PL–2

LOCATION:	STREAM RESTORATION PLANS UT–CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/30/05

10/28/2005
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REVISIONS

PLANTING PLAN

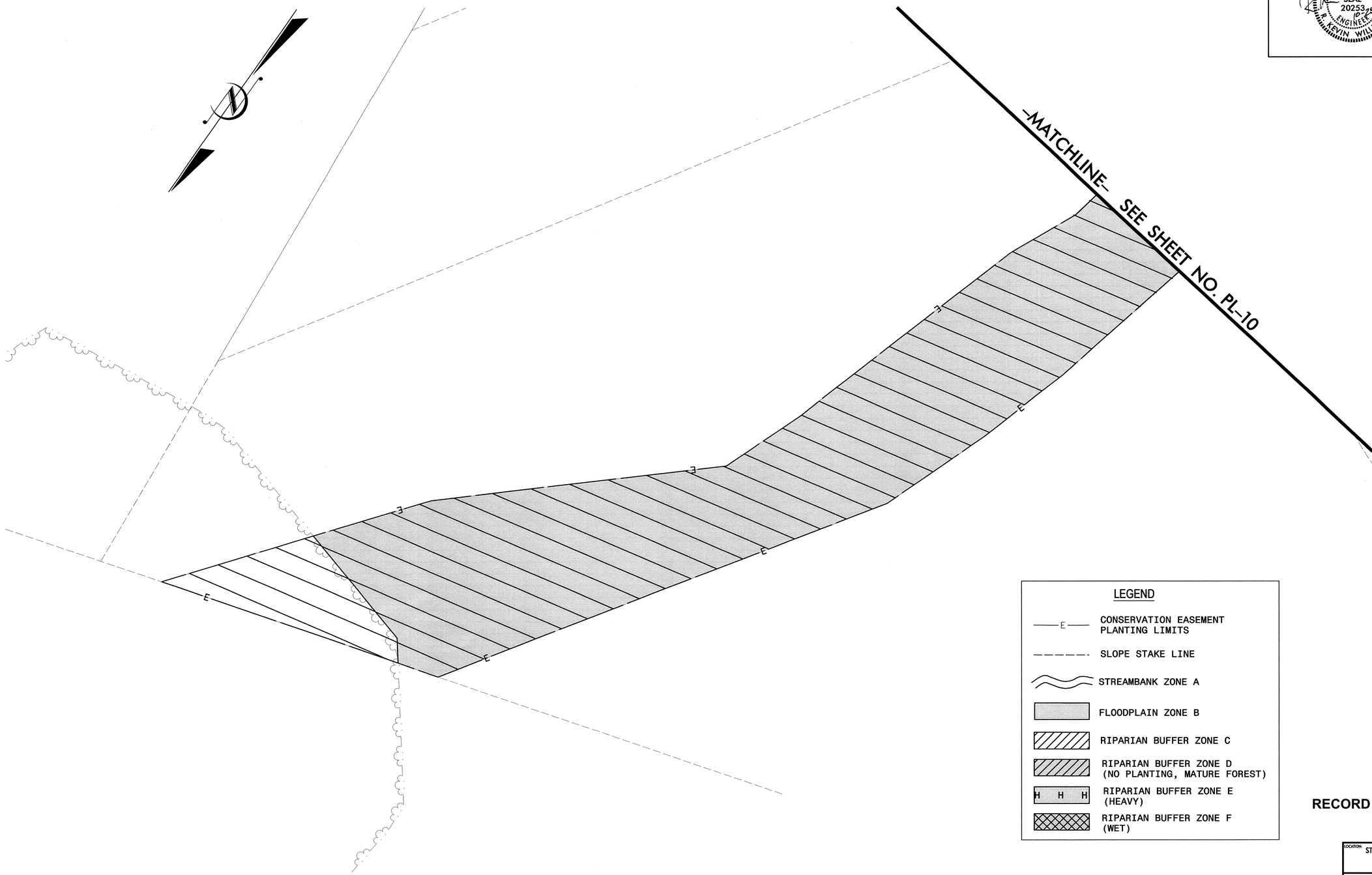
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	PL-11

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER KEVIN WILLIAMS



LEGEND

- E — CONSERVATION EASEMENT PLANTING LIMITS
- SLOPE STAKE LINE
- STREAMBANK ZONE A
- FLOODPLAIN ZONE B
- RIPARIAN BUFFER ZONE C
- RIPARIAN BUFFER ZONE D (NO PLANTING, MATURE FOREST)
- H H H RIPARIAN BUFFER ZONE E (HEAVY)
- RIPARIAN BUFFER ZONE F (WET)

RECORD DOCUMENT

FOR OVERVIEW OF PLANTING PLANS SEE SHEET PL-1
FOR PLANTING DETAILS SEE SHEET PL-2

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
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DESIGNED BY:	RKW
CHECKED BY:	DATE: 63005

10/29/2005
8:06:03 AM
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REVISIONS

PLANTING PLAN

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE *202 RALEIGH, N.C. 27606
(919) 851-6066

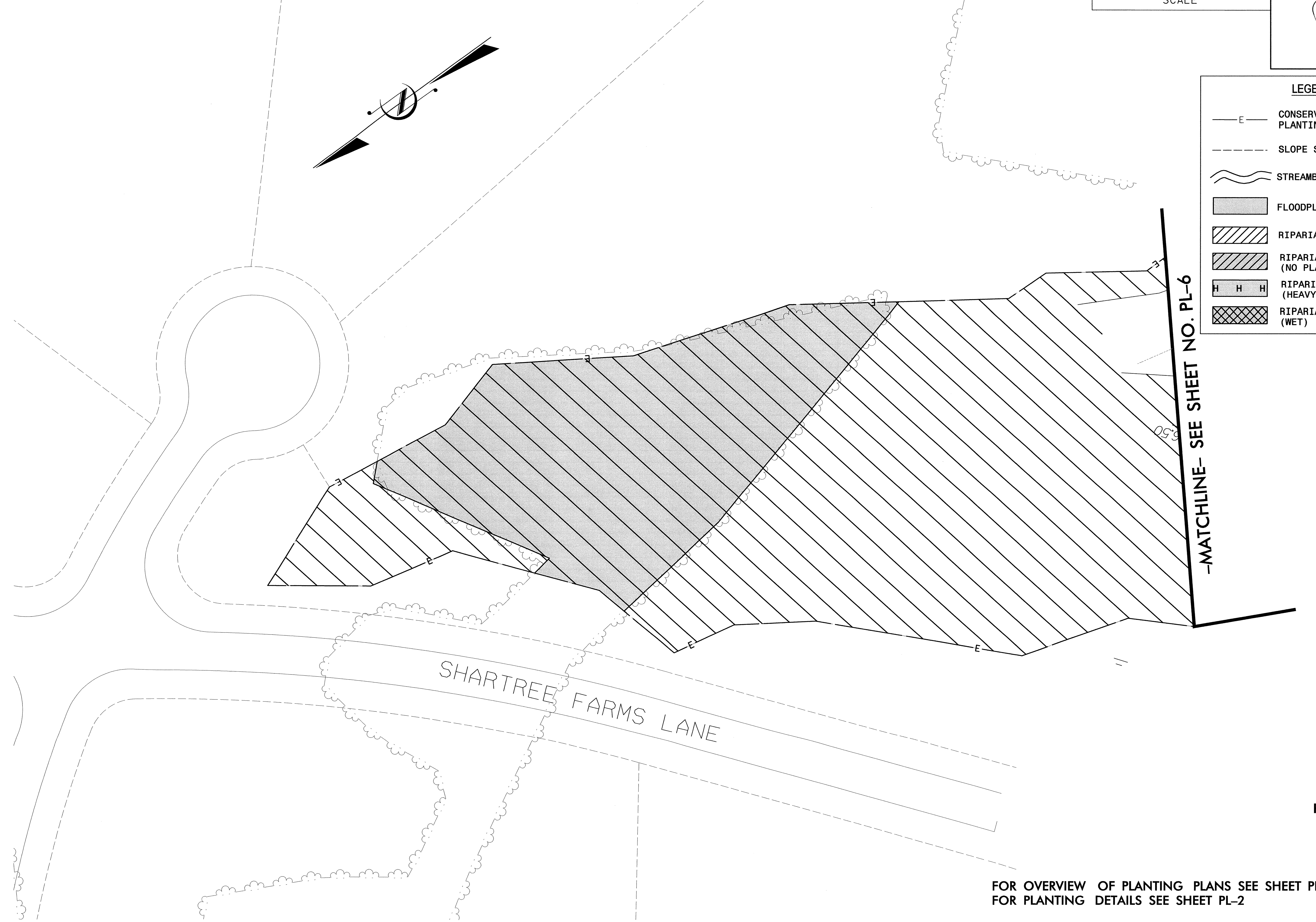
25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	PL-12
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS 10-28-05

LEGEND

——E——	CONSERVATION EASEMENT PLANTING LIMITS
– – – – – –	SLOPE STAKE LINE
(wavy lines)	STREAMBANK ZONE A
(shaded)	FLOODPLAIN ZONE B
(hatched)	RIPARIAN BUFFER ZONE C
(shaded, hatched)	RIPARIAN BUFFER ZONE D (NO PLANTING, MATURE FOREST)
H H H	RIPARIAN BUFFER ZONE E (HEAVY)
(cross-hatched)	RIPARIAN BUFFER ZONE F (WET)



RECORD DOCUMENT

FOR OVERVIEW OF PLANTING PLANS SEE SHEET PL-1
FOR PLANTING DETAILS SEE SHEET PL-2

LOCATION: STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY	
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY: RKW	
CHECKED BY:	DATE: 6/30/05

10/28/2005
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REVISIONS

PLANTING PLAN

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	PL-13

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

HEART PINE CIRCLE

POND

E

TIE-3

–MATCHLINE– SEE SHEET NO. PL-6

LEGEND

- E — CONSERVATION EASEMENT PLANTING LIMITS
- SLOPE STAKE LINE
- STREAMBANK ZONE A
- FLOODPLAIN ZONE B
- RIPARIAN BUFFER ZONE C
- RIPARIAN BUFFER ZONE D (NO PLANTING, MATURE FOREST)
- H H H RIPARIAN BUFFER ZONE E (HEAVY)
- RIPARIAN BUFFER ZONE F (WET)

RECORD DOCUMENT

FOR OVERVIEW OF PLANTING PLANS SEE SHEET PL–1
FOR PLANTING DETAILS SEE SHEET PL–2

LOCATION:	STREAM RESTORATION PLANS UT–CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/30/05

10/28/2005
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STATE	WRP PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	040614801	EC-1	

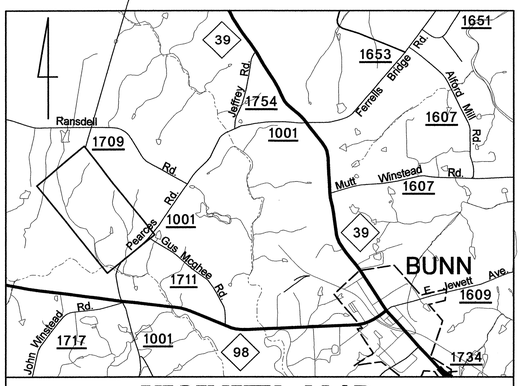
STATE OF NORTH CAROLINA
WETLANDS RESTORATION PROGRAM

EROSION CONTROL PLANS
UT-CROOKED CREEK
SPEAS PROPERTY

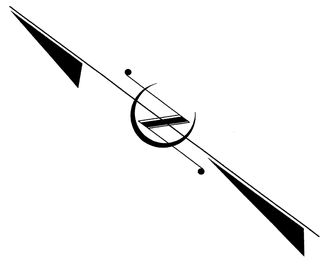
LOCATION: FRANKLIN COUNTY, NORTH CAROLINA

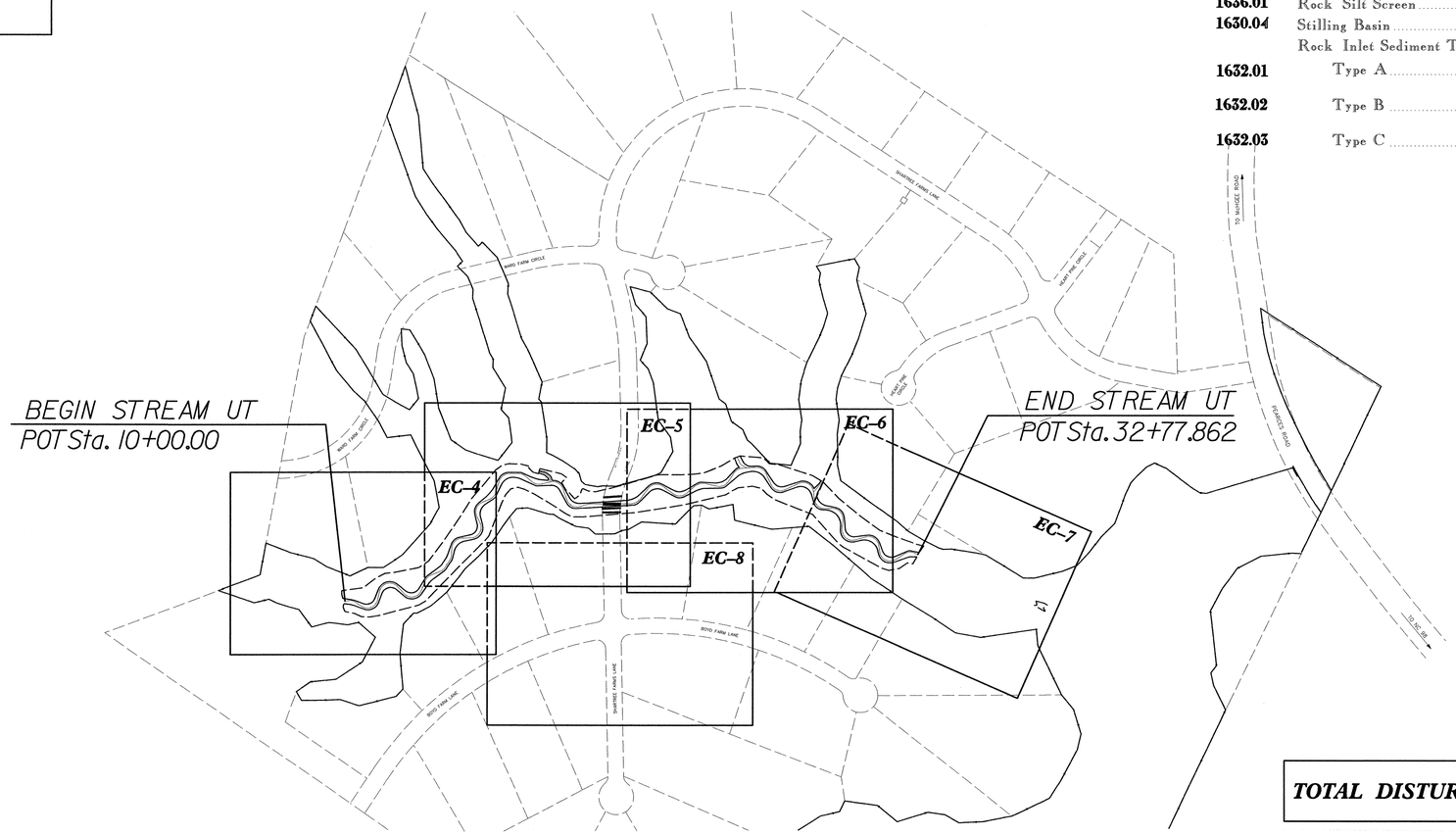
TYPE OF WORK: EROSION CONTROL

PROJECT LOCATION



VICINITY MAP





INDEX OF SHEETS

EROSION AND SEDIMENT CONTROL MEASURES

Std. #	Description	Symbol
	Streambank Reforestation	
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	
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

TOTAL DISTURBED AREA = 8.95 AC

PROJECT: 04061480

GRAPHIC SCALES

50 25 0 50 100
PLANS

20 10 0 20 40
PROFILE (HORIZONTAL)

4 2 0 4 8
PROFILE (VERTICAL)

DESIGN DATA

DESIGN STREAM TYPE	=	*C5*
BANKFULL AREA (FT^2)	=	*17.3*
BANKFULL WIDTH (FT)	=	*15.0*
BANKFULL DEPTH (FT)	=	*1.15*
W/D RATIO	=	*13*

PROJECT LENGTH

EXISITING STREAM LENGTH = 1920 FEET
PROPOSED DESIGN STREAM LENGTH = 2295 FEET

OWNER CONTACT: *JEFF SCHAFFER*
WRP PROJECT MANAGER

Prepared In the Office of:
KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202
RALEIGH, N.C. 27606
(919) 851-6066
FAX: (919) 851-6846

LETTING DATE:
DEC 2, 2005

DESIGNER
R. KEVIN WILLIAMS, PE, CPESC
PROJECT MANAGER

R. KEVIN WILLIAMS, PE, CPESC
PROJECT DESIGN ENGINEER

PROJECT DESIGN ENGINEER

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 20255 R. KEVIN WILLIAMS

RECORD DOCUMENT

SIGNATURE: P.E.

9/9/2005
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REVISIONS

NOTES:
1.) CONTRACTOR SHALL PROVIDE GROUND COVER ON EXPOSED SLOPES AT THE END OF EACH WORKING DAY.

2.) CONTRACTOR SHALL NOT DISTURB ANY MORE AREA THAN WHAT CAN BE STABILIZED (MATTING OR SEED AND STRAW) AT THE END OF EACH WORKING DAY.

3.) CONTRACTOR SHALL PROVIDE A RAIN GUAGE AND LOG BOOK AT THE PROJECT SITE AND SHALL READ AND RECORD RAIN AMOUNTS AT THE SAME TIME EACH DAY.

TEMPORARY SEEDING SCHEDULE

DATE	TYPE	PLANTING RATE (LBS/ACRE)
JAN 1 - MAY 1	RYE GRAIN	120
	ANNUAL KOBE LESPEDEZA	50
	GROUND AGRICULTURAL LIMESTONE	2,000
	10-10-10 FERTILIZER	750
	STRAW MULCH	4,000
MAY 1 - AUG 15	GERMAN MILLET	40
	GROUND AGRICULTURAL LIMESTONE	2,000
	10-10-10 FERTILIZER	750
	STRAW MULCH	4,000
AUG 15 - DEC 30	RYE GRAIN	120
	GROUND AGRICULTURAL LIMESTONE	2,000
	10-10-10 FERTILIZER	1,000
	STRAW MULCH	4,000

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE 202 RALEIGH, N.C. 27606
(919) 851-6066

PERMANENT SEEDING SCHEDULE

DATE	TYPE	PLANTING RATE (LBS/ACRE)
FEB 15 - MAR 21 or AUG 25 - SEPT 15	TALL FESCUE	80
	SERICEA LESPEDEZA	20
	KOBE LESPEDEZA	10
	GROUND AGRICULTURAL LIMESTONE	4,000
	10-10-10 FERTILIZER	1,000
	STRAW WULCH	4,000

PROJECT REFERENCE NO.	SHEET NO.
040614801	EC-2
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER KEVIN WILLIAMS

CONSTRUCTION SEQUENCE

CONSTRUCTION SEQUENCE
The Contractor is responsible for the following sequence of construction in accordance with the construction plans and the Special Provisions.

I. Initial Site Preparation

1. Install construction entrances.
2. Prepare staging and stockpiling areas in areas located on the construction plans.
3. Stake and mark sensitive areas with boundary marking material to the limits as indicated on the construction plans.
4. Stake construction and limits of construction as shown on the construction plans.
5. Install sediment and erosion control devices.
6. Install temporary stream crossings.

II. Channel Construction - Upper Reach

1. Project will be constructed from the upstream end, working in the downstream direction.
2. Install sediment and erosion control devices.
3. Install temporary diversion channels around area of proposed channel that will be constructed.
4. Construct the proposed stream channel. Open up only that portion of the channel that can be completed and stabilized within the same day.
5. Construct the proposed stream channel to the grade specified in the cross-sections and profile. Stockpile and separate all soil suitable for fill or topsoil in the area indicated on the construction plans. Any soil unsuitable for fill shall be disposed of appropriately offsite.
6. Install structures (root wads, rock cross-vanes, culverts, floodplain interceptors, etc.).
7. Place impervious channel plugs where new channel crosses the existing channel.
8. Seed areas where matting is to be installed with appropriate seed mix.
9. Install coir fiber matting.
10. Fill in the abandoned channel with suitable material approved by the Designer.
11. Divert water into constructed channel, remove diversion channel, temporary impervious channel plug, and complete all stabilization activities.
12. Seed and mulch all disturbed areas at the end of each work day.
13. The upper reach channel, floodplain and banks shall be completed and stabilized prior to further construction.

III. Channel Construction - Lower Reach

1. Project will be constructed from the upstream working in the downstream direction.
2. Install sediment and erosion control devices.
3. Install temporary diversion channels around area of proposed channel that will be constructed.
4. Construct the proposed stream channel. Open up only that portion of the channel that can be completed and stabilized within the same day.
5. Construct the proposed stream channel to the grade specified in the cross-sections and profile. Stockpile and separate all soil suitable for fill or topsoil in the area indicated on the construction plans. Any soil unsuitable for fill shall be disposed of appropriately offsite.
6. Install structures (root wads, rock cross-vanes, culverts, floodplain interceptors, etc.).
7. Place impervious channel plugs where the new channel crosses the existing channel.
8. Seed areas where matting is to be installed with appropriate seed mix.
9. Install coir fiber matting.
10. Fill in the abandoned channel with suitable material approved by the Designer.
11. Divert water into constructed channel, remove diversion channel and temporary impervious channel plug, and complete all stabilization activities.
12. Seed and mulch all disturbed areas at the end of each work day.
13. The lower reach channel, floodplain and banks shall be completed prior to further construction.

IV. Repair all disturbed areas.

V. Remove sediment and erosion control devices, any temporary fencing, staking, sensitive area marking material, trash, etc. from the site.

VII. Seed and mulch staging, stockpiling, and any bare areas with permanent seed mixture.

RECORD DOCUMENT

LOCATION:	EROSION CONTROL PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/30/05

9/6/2005
8:35:52 AM
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REVISIONS

KO & ASSOCIATES, P.C.
Consulting Engineers
1011 SCHAUB DR., SUITE #202 RALEIGH, N.C. 27606
(919) 851-6066

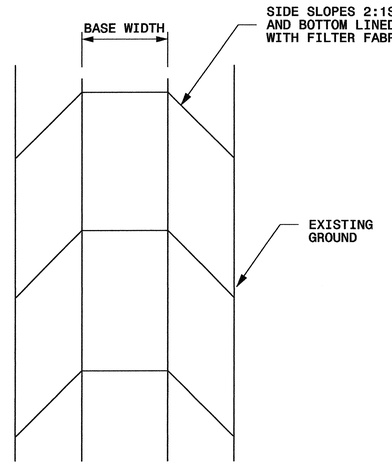
PROJECT REFERENCE NO.	SHEET NO.
040614801	EC-2A

PROJECT ENGINEER

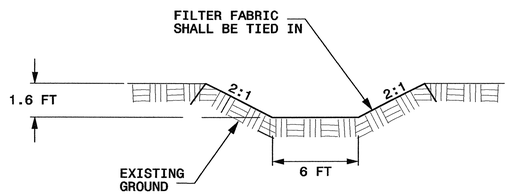
NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER KEVIN WILLIAMS

MAIN CHANNEL DIVERSION

SCALE: N.T.S.



PLAN VIEW

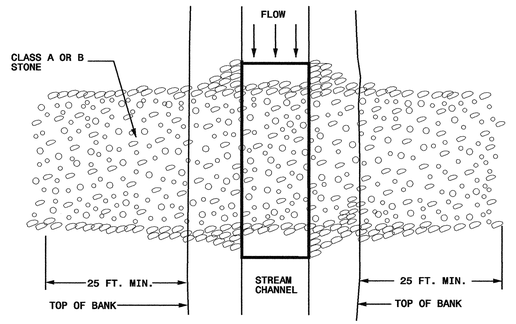


PROFILE VIEW

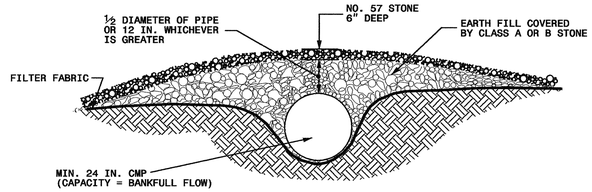
TEMPORARY STREAM CROSSING

SCALE:NTS

NOTE:FOR USE IN EXISTING CHANNEL ONLY.
NOT FOR USE IN RESTORED CHANNEL.



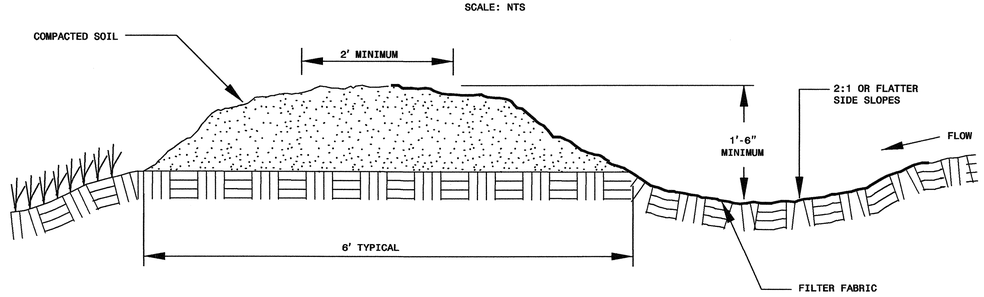
PLAN VIEW



PROFILE VIEW

TEMPORARY DIVERISON

SCALE: NTS



CROSS SECTIONAL VIEW

RECORD DOCUMENT

LOCATION:	EROSION CONTROL PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 63005

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REVISIONS

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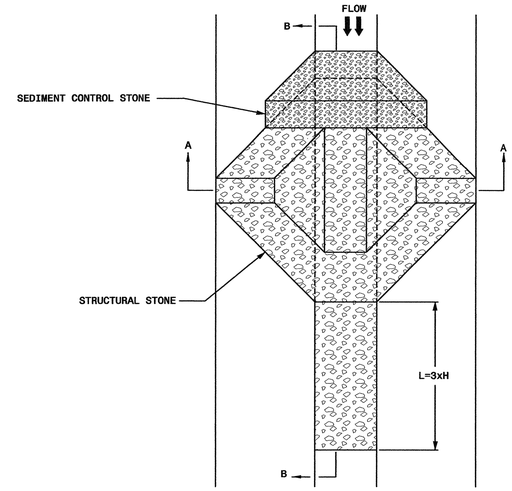
PROJECT REFERENCE NO.	SHEET NO.
040614801	EC-2B

PROJECT ENGINEER

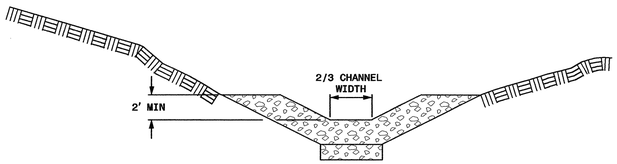
NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

TEMPORARY ROCK SILT CHECK, TYPE A

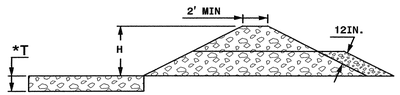
SCALE: N.T.S.



PLAN



SECTION A-A



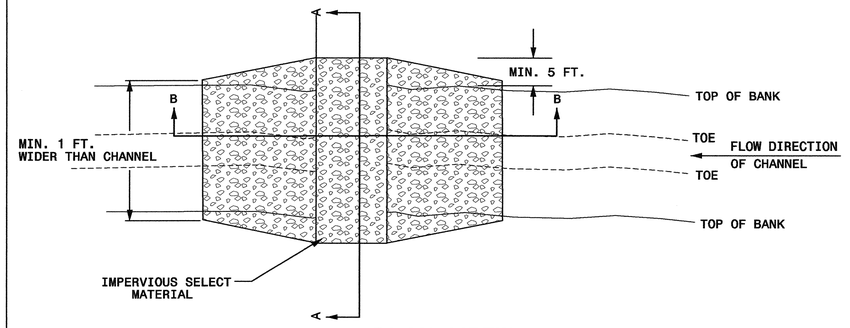
SECTION B-B

*T = 12IN. MIN., 18IN. MAX.

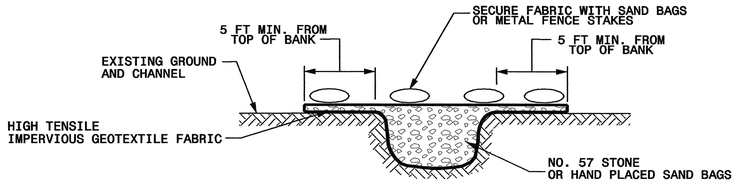
NOTE
STRUCTURAL STONE SHALL BE STONE FOR EROSION CONTROL (CLASS IN.BIN.) AND SHALL BE PAID FOR AT THE CONTRACT UNIT PRICE PER TON IN.STONE FOR EROSION (CLASS IN.BIN.).IN. SEDIMENT CONTROL STONE SHALL BE NO. 5 OR NO. 57 STONE AND SHALL BE PAID FOR AT THE CONTRACT UNIT PRICE PER TON IN.SEDIMENT CONTROL STONE.IN.

TEMPORARY IMPERVIOUS STREAM CHANNEL PLUG

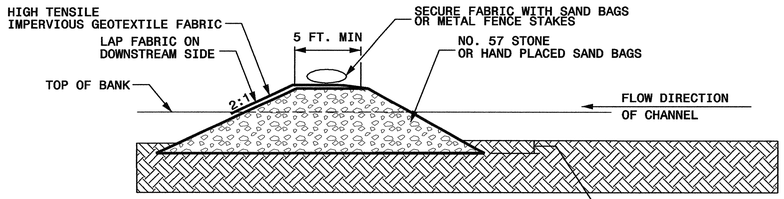
SCALE: NTS



PLAN VIEW



SECTION A-A



SECTION B-B

RECORD DOCUMENT

EROSION CONTROL PLANS
UT-CROOKED CREEK
SPEAS PROPERTY

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DESIGNED BY: RKW	
CHECKED BY:	DATE: 6/2005

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PROJECT REFERENCE NO.	SHEET NO.
040614801	EC-2C

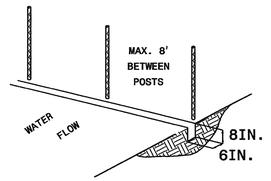
PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

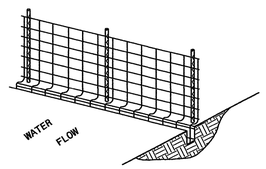
STANDARD TEMPORARY SILT FENCE

SCALE: N.T.S.

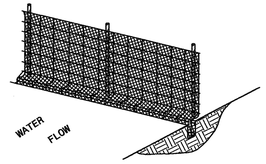
STEP 1:
DRIVE STEEL POSTS 18IN. INTO GROUND AND EXCAVATE A 6IN.x 6IN. TRENCH UPHILL ALONG THE LINE OF POSTS. WOOD POSTS 4IN. IN DIAMETER MAY BE USED.



STEP 2:
ATTACH WIRE FENCE TO POSTS AND EXTEND THE BOTTOM OF THE FENCE 8IN. INTO THE EXCAVATED TRENCH.



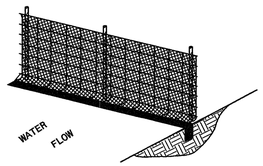
STEP 3:
ATTACH THE FILTER FABRIC TO THE WIRE FENCE AND EXTEND THE BOTTOM OF THE FABRIC 8IN. INTO THE TRENCH.

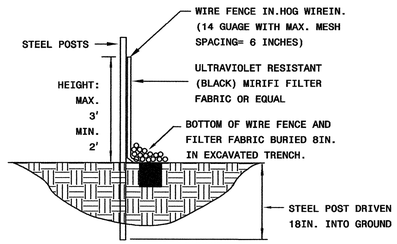


SECTION

NOTE:
BOTTOM OF FILTER MUST BE PLACED IN TRENCH AND SECURED BY EITHER BACK-FILLING WITH SOIL MATERIAL AND TAMPING OR BY PLACING WASHED STONE TO A HEIGHT OF 6IN. ABOVE GROUND LEVEL.

STEP 4:
BACKFILL THE TRENCH AND COMPACT THE SOIL FIRMLY TO ANCHOR THE BOTTOM OF THE SILT FENCE SO THAT RUNOFF IS FORCED TO GO THROUGH THE FENCE AND CANNOT GO UNDER IT.





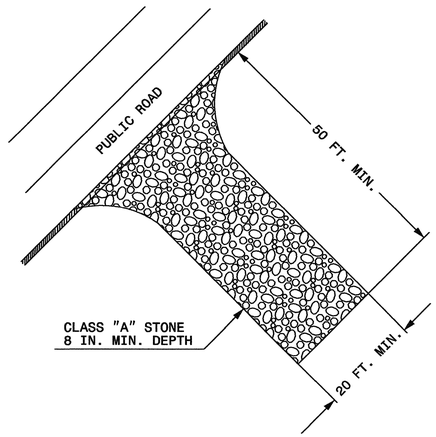
CONSTRUCTION SPECIFICATIONS

1. CONSTRUCT SEDIMENT FENCE ON LOW SIDE OF TOPSOIL STOCKPILE TO PREVENT SEDIMENT FROM BEING WASHED INTO THE DRAINAGE SYSTEM. FENCE TO EXTEND AROUND APPROXIMATELY 70% OF THE PERIMETER OF THE STOCKPILE.
2. LOCATE POSTS DOWNSLOPE OF FABRIC TO HELP SUPPORT FENCING.
3. BURY TOE OF FENCE APPROXIMATELY 8" DEEP TO PREVENT UNDERCUTTING.
4. WHEN JOINTS ARE NECESSARY, SECURELY FASTEN THE FABRIC AT A SUPPORT POST WITH OVERLAP TO THE NEXT POST.
5. FILTER FABRIC TO BE ON NYLON, PLOYESTER, PROPYLENE OR ETHYLENE YARN WITH EXTRA STRENGTH-50LB/ LIN. IN. (MINIMUM) AND WITH A FLOW RATE OF AT LEAST 0.3 GAL./FT^2/ MINUTE. FABRIC SHOULD CONTAIN ULTRAVIOLET RAY INHIBITORS AND STABLIZERS.
6. POST TO BE 4" DIAMETER PINE WITH A MINIMUM LENGTH OF 4'.

TEMPORARY GRAVEL CONSTRUCTION ENTRANCE

SCALE:NTS

NOTES:
1. TURNING RADIUS SUFFICIENT TO ACCOMMODATE 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 TOP DRESSING 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.FILTER FABRIC TO BE PLACED BENEATH STONE.



LEGEND

TEMPORARY ROCK SILT CHECK, TYPE A	TEMPORARY SILT FENCE
TEMPORARY STREAM CROSSING	TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
TICP — TEMPORARY IMPERVIOUS CHANNEL PLUG	—TD— TEMPORARY DIVERSION
DO NOT DISTURB AREA	— X — LIMITS OF DISTURBANCE
	—MD— MAIN CHANNEL DIVERSION

RECORD DOCUMENT

LOCATION:	EROSION CONTROL PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY: RKW	
CHECKED BY:	DATE: 63005

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REVISIONS

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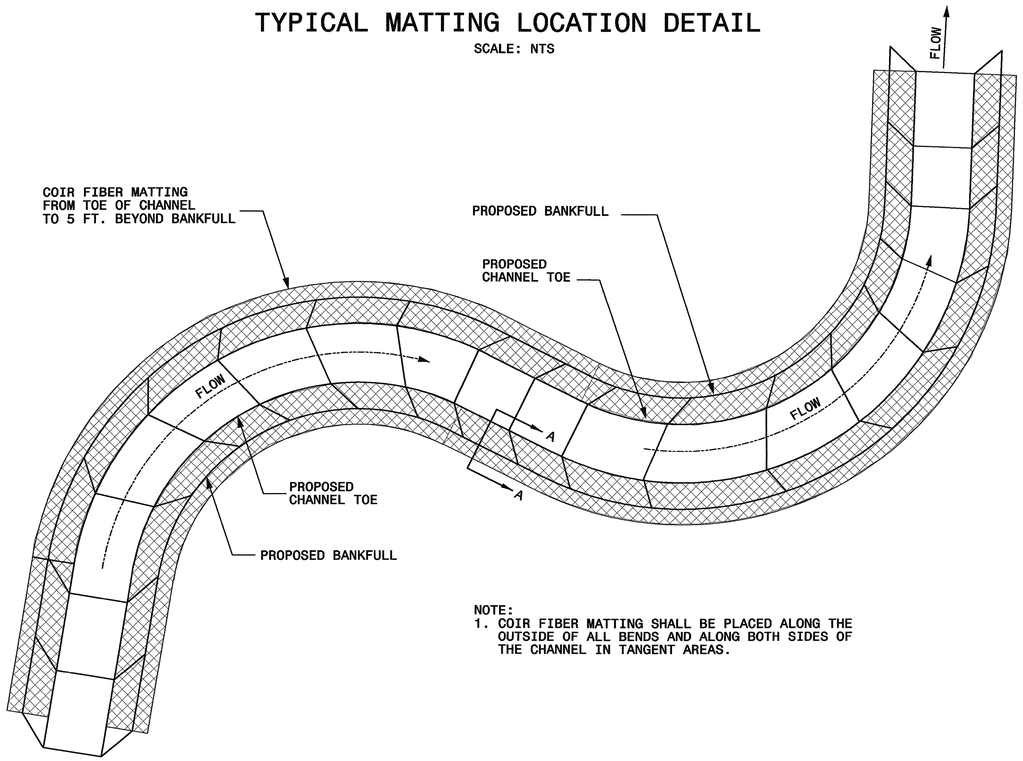
PROJECT REFERENCE NO.	SHEET NO.
040614801	EC-2D
PROJECT ENGINEER	

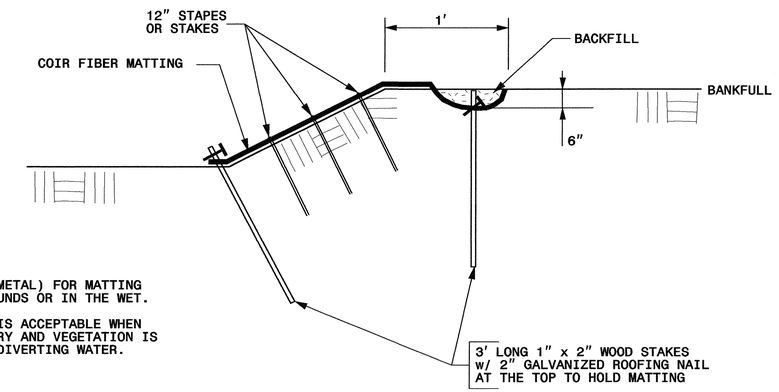
NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

TYPICAL MATTING LOCATION DETAIL

SCALE: NTS



NOTE:
1. COIR FIBER MATTING SHALL BE PLACED ALONG THE OUTSIDE OF ALL BENDS AND ALONG BOTH SIDES OF THE CHANNEL IN TANGENT AREAS.

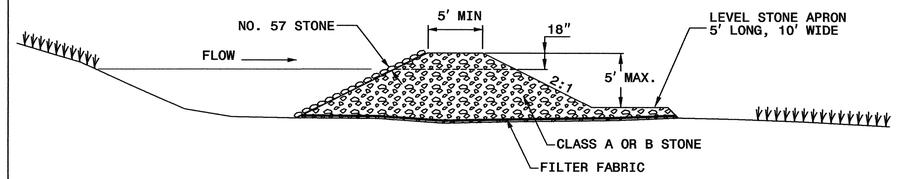


NOTES:
1. USE WOOD STAKES (NOT METAL) FOR MATTING INSTALLED IN PUMP AROUNDS OR IN THE WET.
2. USE OF METAL STAPLES IS ACCEPTABLE WHEN CONSTRUCTING IN THE DRY AND VEGETATION IS ESTABLISHED PRIOR TO DIVERTING WATER.

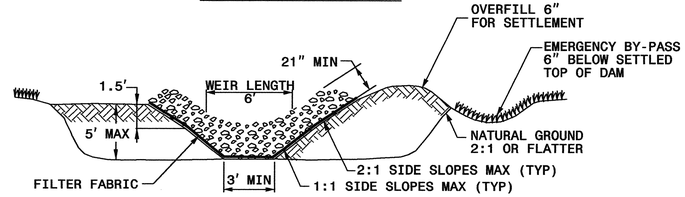
SECTION A-A

TEMPORARY SEDIMENT TRAP

SCALE: N.T.S.



PROFILE SECTION



CROSS SECTION

RECORD DOCUMENT

LOCATION:	EROSION CONTROL PLANS UT-CROOKED CREEK SPEAS PROPERTY
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DESIGNED BY:	RKW
CHECKED BY:	DATE: 63005

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REVISIONS

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(919) 851-6066

NOT TO SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	EC-3

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER KEVIN WILLIAMS

LOCATION MAP

FOR EROSION CONTROL DETAILS SEE SHEETS EC–2 THRU EC–2D

RECORD DOCUMENT

LOCATION: STREAM RESTORATION PLANS UT–CROOKED CREEK SPEAS PROPERTY	
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY: RKW	
CHECKED BY:	DATE: 6/30/05

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REVISIONS

EROSION CONTROL

LEGEND

- TEMPORARY ROCK SILT CHECK, TYPE A
- TEMPORARY STREAM CROSSING
- TICP — TEMPORARY IMPERVIOUS CHANNEL PLUG
- DO NOT DISTURB AREA
- TEMPORARY SILT FENCE
- TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
- TD — TEMPORARY DIVERSION
- X — LIMITS OF DISTURBANCE
- MD — MAIN CHANNEL DIVERSION

KO & ASSOCIATES, P.C.
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25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	EC-4

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 20253 KEVIN WILLIAMS

MAIN CHANNEL DIVERSION

TEMPORARY ROCK SILT CHECK, TYPE A

LIMITS OF CONSTRUCTION

PROP THALWEG

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

BEGIN STREAM UT

POT Sta. 10+00.00

PROP. BANKFULL

TEMPORARY DIVERSION

TEMPORARY DIVERSION

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

CREEK BED ROCK IN THIS AREA

DAM

12"OAK
12"OAK TRIPLE
15"OAK

–MATCHLINE– STA. 15+00.00 SEE SHEET NO. EC-5

FOR EROSION CONTROL DETAILS SEE SHEETS 2 THRU 2D

RECORD DOCUMENT

LOCATION:	STREAM RESTORATION PLANS UT–CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/30/05

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Modified by:
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REVISIONS

EROSION CONTROL

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25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	EC-5
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER KEVIN WILLIAMS

LEGEND

- TEMPORARY ROCK SILT CHECK, TYPE A
- TEMPORARY STREAM CROSSING
- TICP — TEMPORARY IMPERVIOUS CHANNEL PLUG
- DO NOT DISTURB AREA
- TEMPORARY SILT FENCE
- TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
- TD — TEMPORARY DIVERSION
- X — LIMITS OF DISTURBANCE
- MD — MAIN CHANNEL DIVERSION

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

END OF PAVEMENT PROPOSED SHARTREE SUBDIVISION

TEMPORARY GRAVEL CONSTRUCTION ENTRANCE

STAGING AREA 0.75 ACRES

MAIN CHANNEL DIVERSION

DO NOT DISTURB 48" OAK

SHARTREE FARMS LANE

TEMPORARY STREAM CROSSING, SEE DETAIL EC-2A

PROP BANKFULL

TEMPORARY ROCK SILT CHECK, TYPE A

TEMPORARY ROCK SILT CHECK, TYPE A

PROP THALWEG

PERMANENT STREAM CROSSING SEE DETAIL 2D

LIMITS OF CONSTRUCTION

TEMPORARY ROCK SILT CHECK, TYPE A

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

–MATCHLINE– STA. 15+00.00 SEE SHEET NO. EC–4

–MATCHLINE– STA. 23+00.00 SEE SHEET NO. EC–6

–MATCHLINE– SEE SHEET NO. EC–8

FOR EROSIN CONTROL DETAILS SEE SHEETS 2 THRU 2D

RECORD DOCUMENT

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
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DESIGNED BY:	RKW
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REVISIONS

EROSION CONTROL

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25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	EC-6
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

STAGING AREA
0.75 ACRES

TEMPORARY SEDIMENT
TRAP (52'L x 26"W x 2'D)
5' WEIR

SHARTREE SUBDIVISION
WETLAND EASEMENT
LINE

MAIN CHANNEL
DIVERSION

PROP
BANKFULL

LIMITS OF
CONSTRUCTION

TEMPORARY ROCK
SILT CHECK, TYPE A

TEMPORARY ROCK
SILT CHECK, TYPE A

TEMPORARY ROCK
SILT CHECK, TYPE A

PROP THALWEG

TEMPORARY ROCK
SILT CHECK, TYPE A

SHARTREE SUBDIVISION
WETLAND EASEMENT
LINE

TEMPORARY SEDIMENT TRAP
70'L x 35'W x 2'D
5' WEIR

-MATCHLINE- STA. 23+00.00
SEE SHEET NO. EC-5

-MATCHLINE- STA. 30+00.00
SEE SHEET NO. EC-7

SEE SHEET NO. EC-8

LEGEND

- TEMPORARY ROCK SILT CHECK, TYPE A
- TEMPORARY STREAM CROSSING
- TICP — TEMPORARY IMPERVIOUS CHANNEL PLUG
- DO NOT DISTURB AREA
- TEMPORARY SILT FENCE
- TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
- TD — TEMPORARY DIVERSION
- X — LIMITS OF DISTURBANCE
- MD — MAIN CHANNEL DIVERSION

RECORD DOCUMENT

FOR EROSION CONTROL DETAILS SEE SHEETS 2 THRU 2D

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
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DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/30/05

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REVISIONS

EROSION CONTROL

LEGEND

- TEMPORARY ROCK SILT CHECK, TYPE A
- TEMPORARY STREAM CROSSING
- TICP — TEMPORARY IMPERVIOUS CHANNEL PLUG
- DO NOT DISTURB AREA
- TEMPORARY SILT FENCE
- TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
- TD — TEMPORARY DIVERSION
- X — LIMITS OF DISTURBANCE
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25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	EC-7

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

MAIN CHANNEL DIVERSION

END STREAM UT
POT Sta. 32+77.862

PROP BANKFULL

PROP THALWEG

TEMPORARY ROCK SILT CHECK, TYPE A

TEMPORARY ROCK SILT CHECK, TYPE A

36" CMP TO BE REMOVED

LIMITS OF CONSTRUCTION

LIMITS OF CONSTRUCTION

SHARTREE SUBDIVISION WETLAND EASEMENT LINE

MATCHLINE- STA. 30+00.00
SEE SHEET NO. EC-6

RECORD DOCUMENT

FOR EROSION CONTROL DETAILS SEE SHEETS 2 THRU 2D

LOCATION:	STREAM RESTORATION PLANS UT-CROOKED CREEK SPEAS PROPERTY
TIP NO.: 040614801	COUNTY: FRANKLIN
DESIGNED BY:	RKW
CHECKED BY:	DATE: 6/30/05

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REVISIONS

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25 0 50
SCALE

PROJECT REFERENCE NO.	SHEET NO.
040614801	EC-8
PROJECT ENGINEER	

NORTH CAROLINA PROFESSIONAL SEAL 20253 ENGINEER R. KEVIN WILLIAMS

EROSION CONTROL

–MATCHLINE– SEE SHEET NO. EC–5

SEE SHEET NO. EC–6

BOYD FARM LANE

SHARTREE FARMS LANE

STOCKPILE AREA 0.5 AC

LEGEND

- TEMPORARY ROCK SILT CHECK, TYPE A
- TEMPORARY STREAM CROSSING
- TICP — TEMPORARY IMPERVIOUS CHANNEL PLUG
- DO NOT DISTURB AREA
- TEMPORARY SILT FENCE
- TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
- TD — TEMPORARY DIVERSION
- X — LIMITS OF DISTURBANCE
- MD — MAIN CHANNEL DIVERSION

RECORD DOCUMENT

FOR EROSION CONTROL DETAILS SEE SHEETS 2 THRU 2D

LOCATION:	STREAM RESTORATION PLANS UT–CROOKED CREEK SPEAS PROPERTY
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DESIGNED BY:	RKW
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