



UPPER TRINITY REGIONAL WATER DISTRICT

CONSTRUCTION PLANS FOR

LAKE RALPH HALL MITIGATION PROJECT VOLUME 3

MITIGATION STREAMS - ZONE C

OWNER

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Ramiro Lopez _____ Vice President
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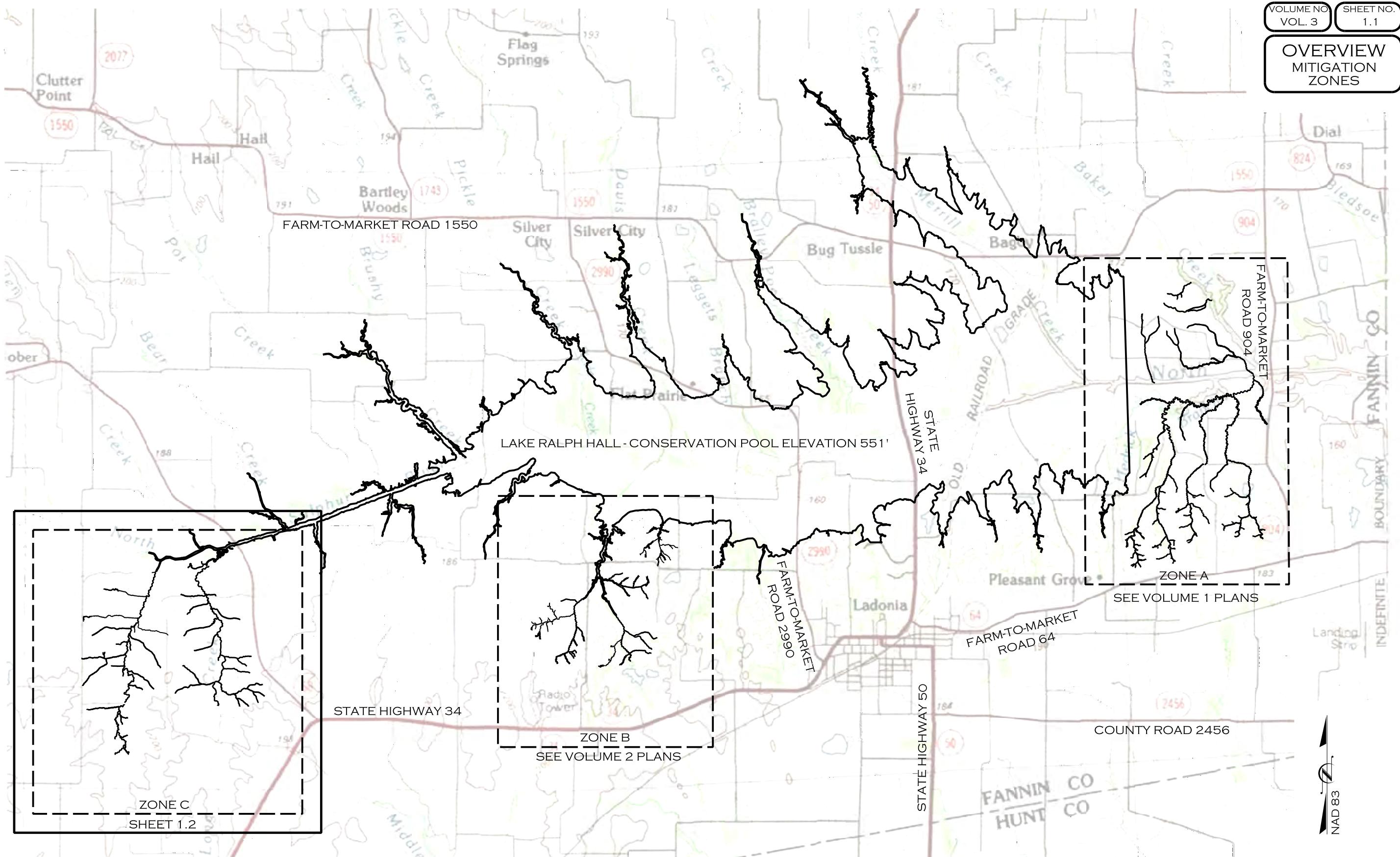
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KEVIN L. TWEEDY, P.E., VICE PRESIDENT
ECOSYSTEM PLANNING AND RESTORATION

TIMOTHY J. NOACK, P.E., PROJECT MANAGER
Alan Plummer Associates, Inc.

JULY 2019

VOLUME NO.
VOL. 3
SHEET NO.
1.1
**OVERVIEW
MITIGATION
ZONES**



7/15/2019 DAL0001_LAKE_RALPH_HALL\ADD\MIT AREA C\CADD\PLANS\LRH_PSH_1.1.DGN

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NO.	DESCRIPTION	ENGR.	APPROV.	DATE	
1	DRAFT DESIGN PLANS	EMP	KLT	7/01/19	



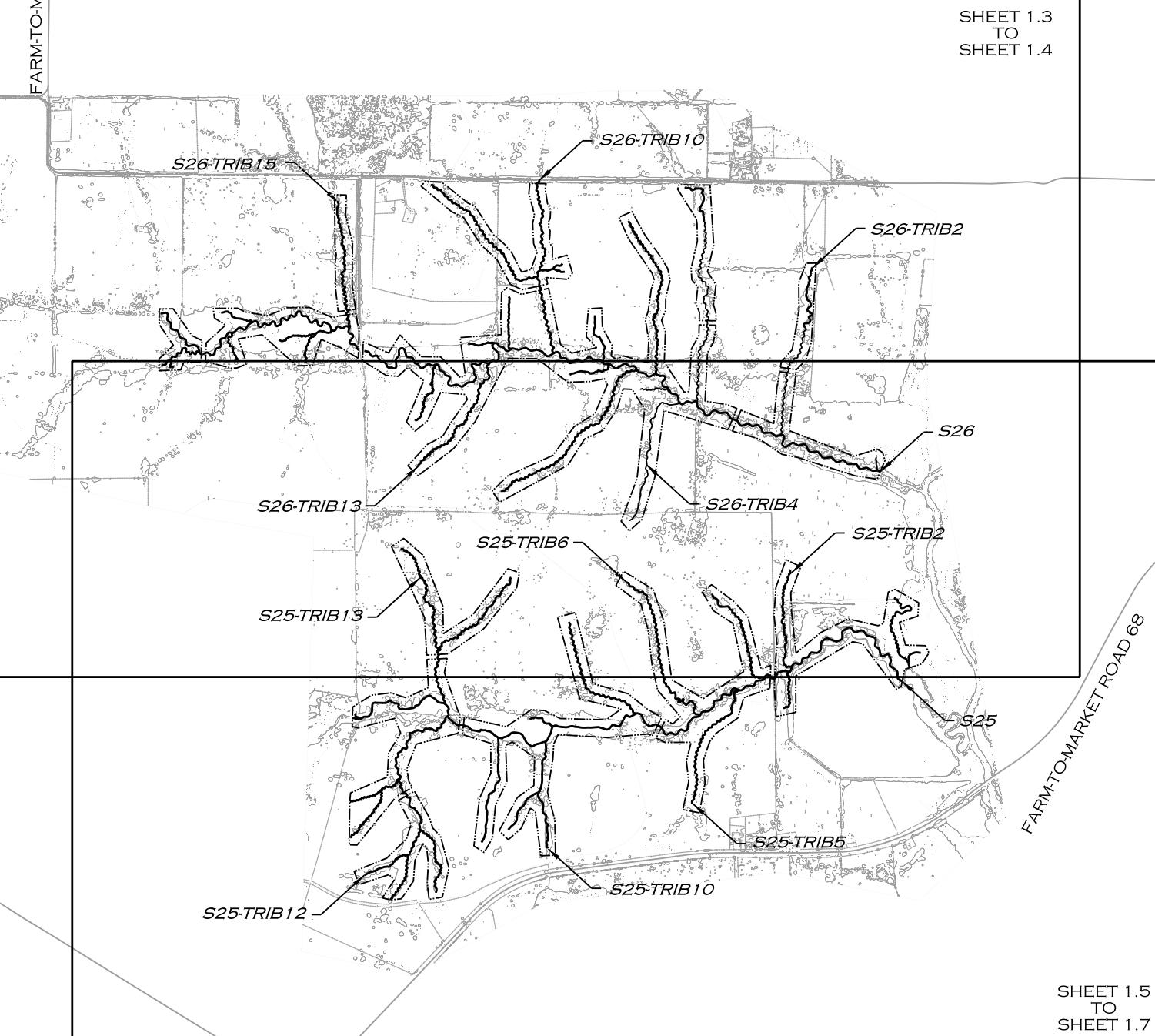
LAKE RALPH HALL MITIGATION
MITIGATION ZONE C
FANNIN COUNTY, TEXAS



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NAD 83

FARM-TO-MARKET ROAD 3740



1000 0 1000 2000
SCALE (FT)

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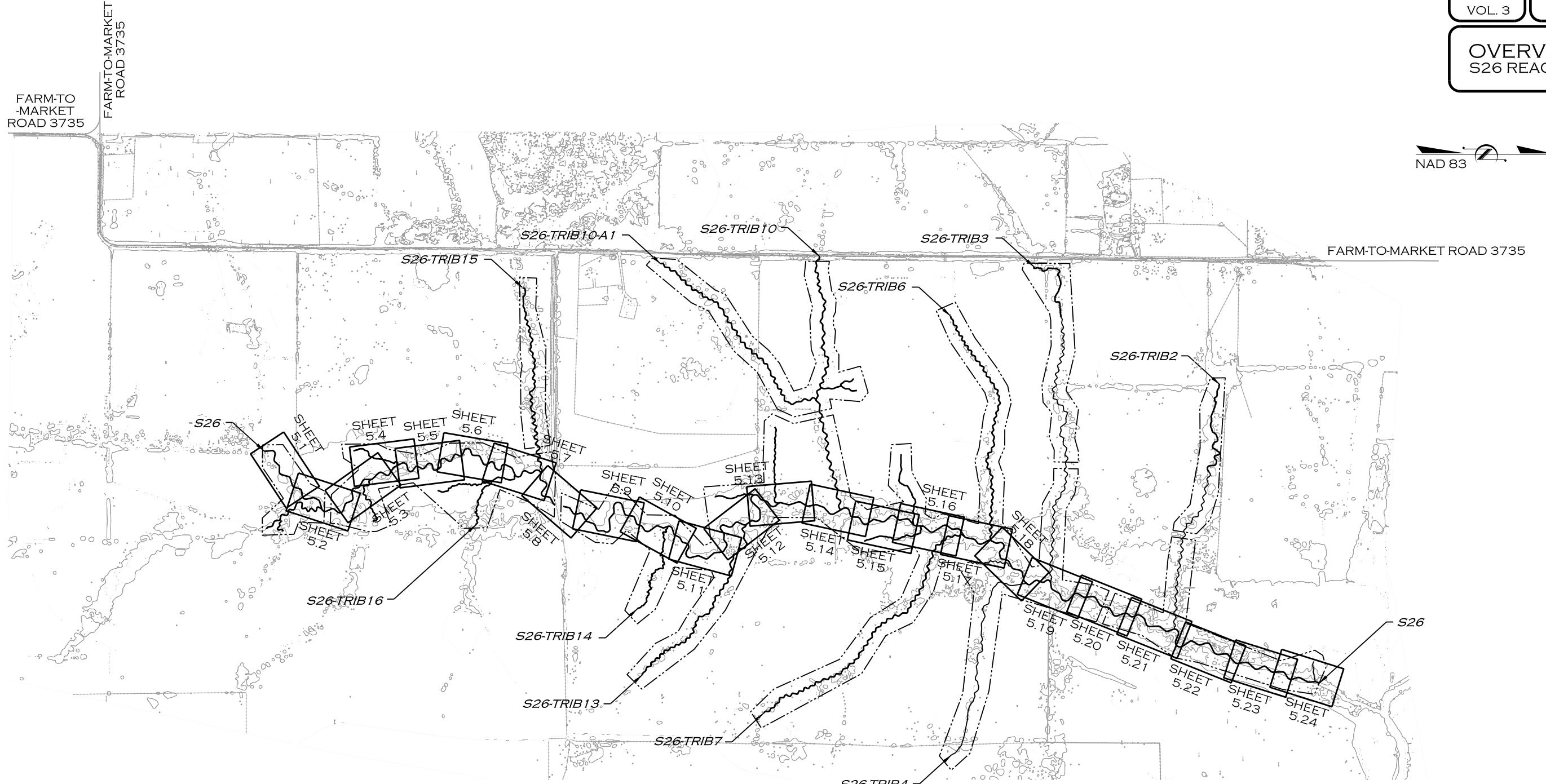
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OVERVIEW
S26 REACHES

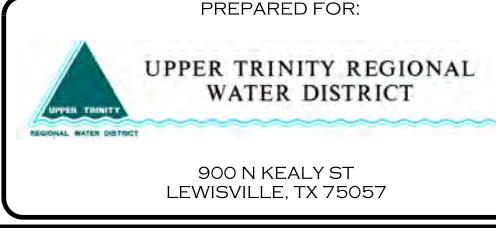


1000 0 500 1000
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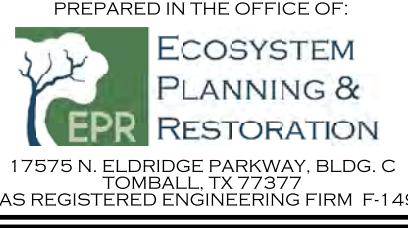
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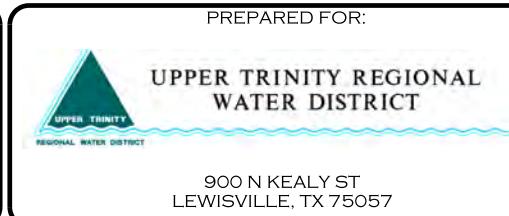
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OVERVIEW

S26 REACHES

A scale bar diagram with a horizontal axis. At the left end is a vertical tick mark labeled "1000". To its right is another vertical tick mark labeled "0". To the right of "0" is a shaded triangular area. To the right of the shaded area is a vertical tick mark labeled "500". To the right of "500" is another vertical tick mark labeled "1000". Below the axis, the word "SCALE (FT)" is written in parentheses.



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UPPER TRINITY REGIONAL
WATER DISTRICT

900 N KEALY ST
LEWISVILLE, TX 75057

LAKE RALPH HALL MITIGATION
MITIGATION ZONE C
FANNIN COUNTY, TEXAS



IN THE OFFICE OF:
**ECOSYSTEM
PLANNING &
RESTORATION**

17575 N. ELDRIDGE PARKWAY, BLDG. C
TOMBALL, TX 77377
TEXAS REGISTERED ENGINEERING FIRM E-14997

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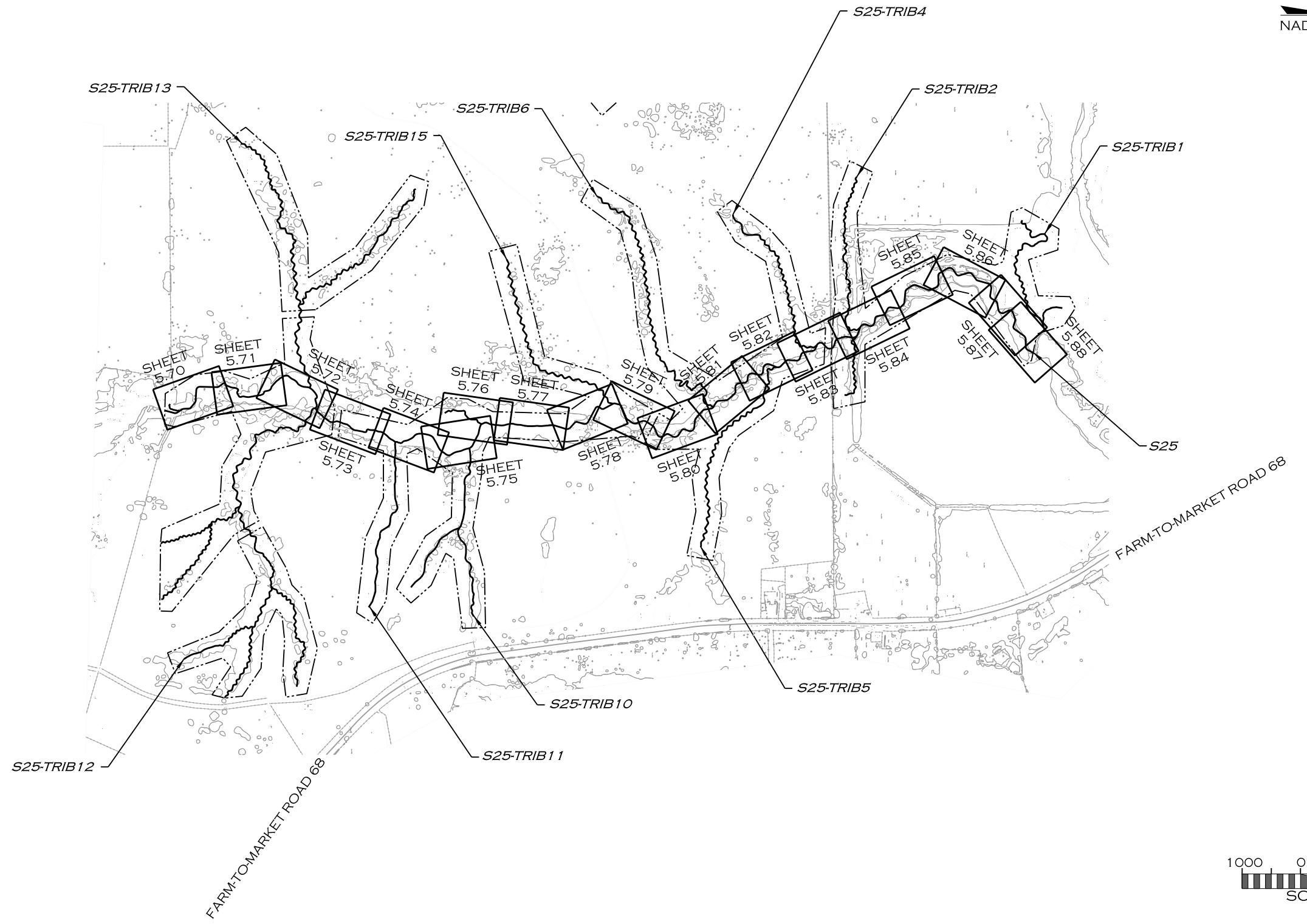
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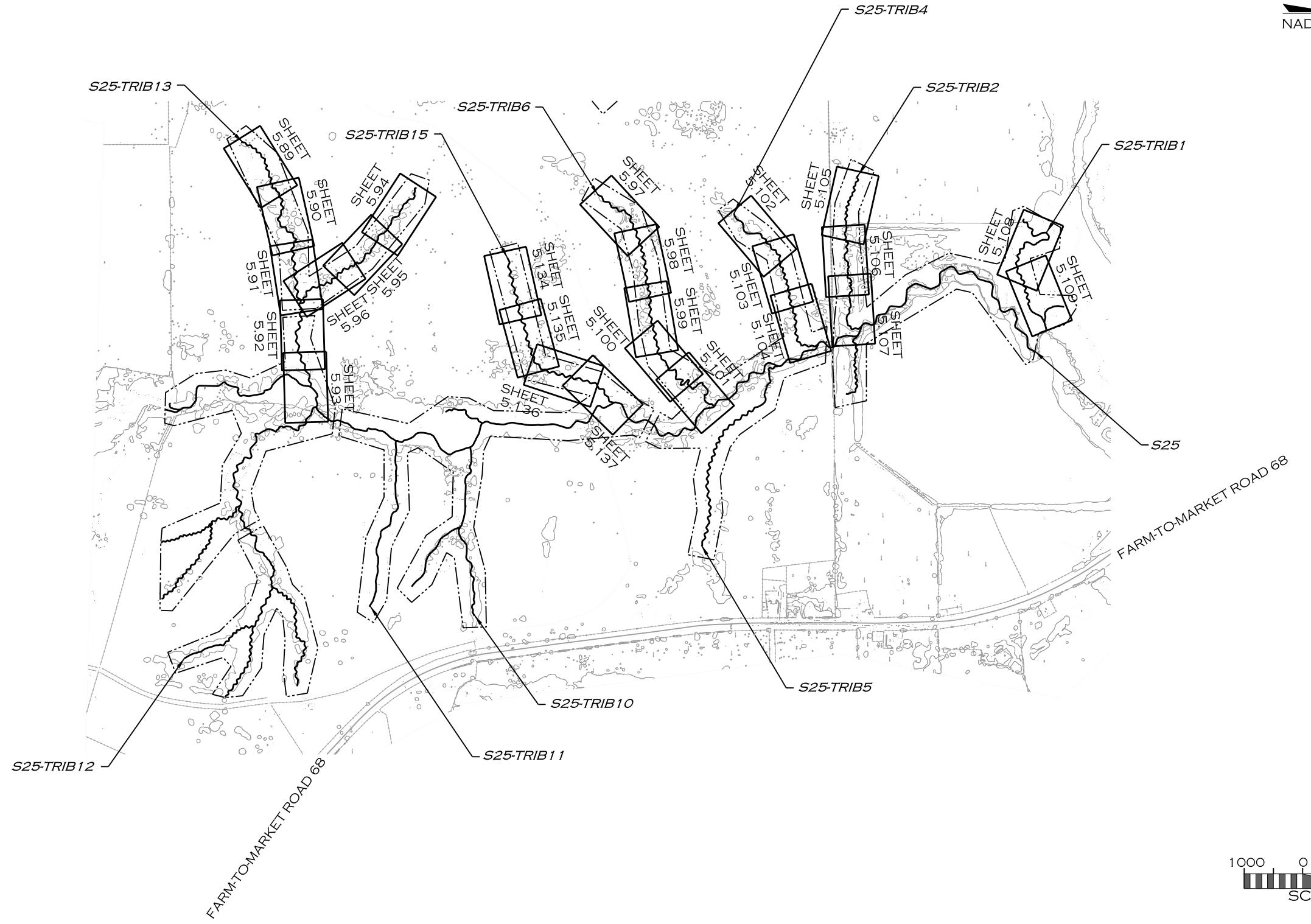
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1000 0 500 1000
SCALE (FT)

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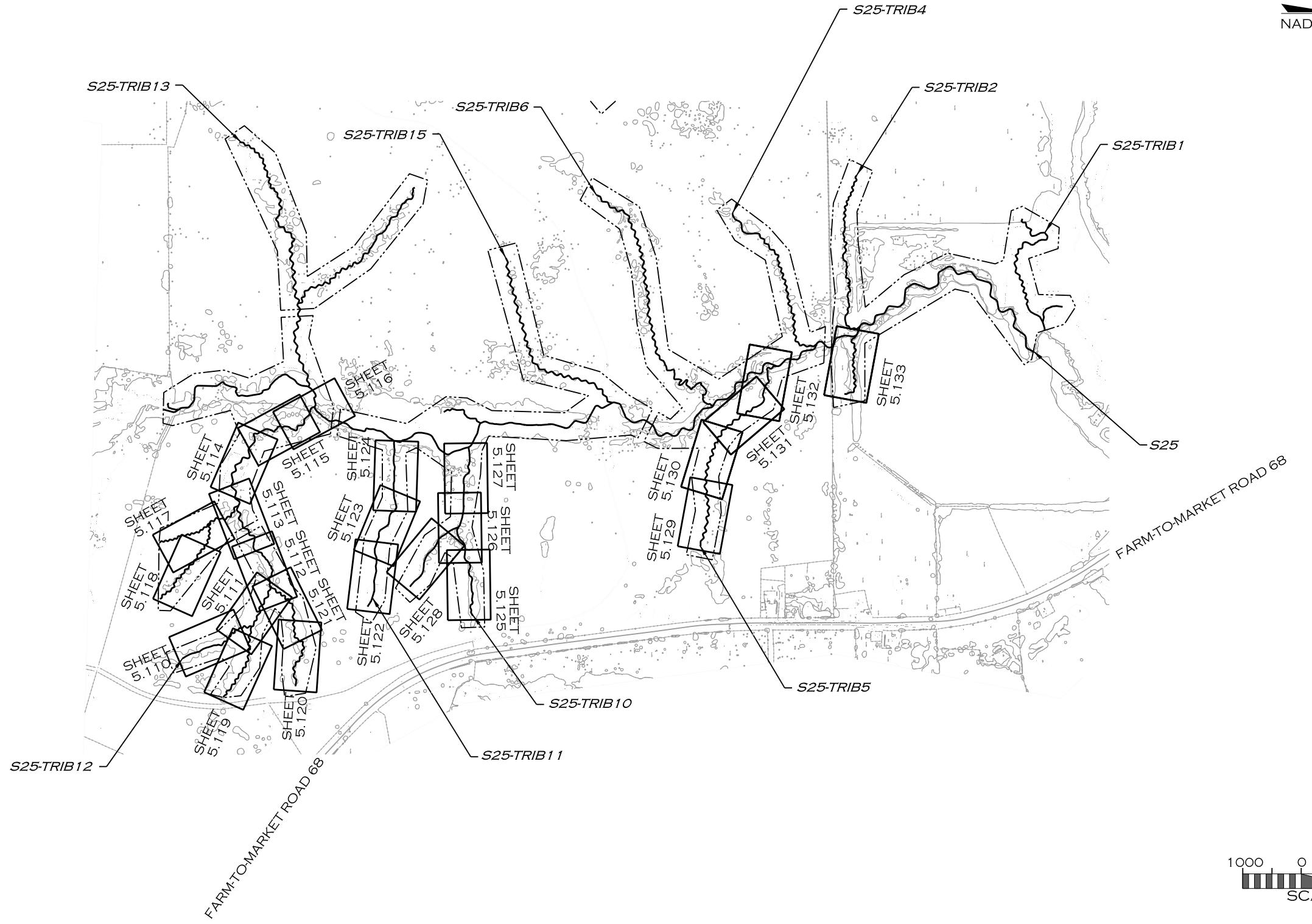
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OVERVIEW
S25 REACHES

NAD 83



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CONVENTIONAL SYMBOLS



- EXISTING TREE
- EXISTING TREE LINE
- EXISTING FENCE LINE
- EXISTING WATERS
- SF — SAFETY FENCE
- TP — TAPE FENCE
- SILT FENCE
- CONSERVATION EASEMENT (PRELIMINARY)
- 20 — EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- 20 — PROPOSED MAJOR CONTOUR
- 21 — PROPOSED MINOR CONTOUR
- LIMITS OF DISTURBANCE
- FLOODPLAIN BENCH
- PROPERTY LINE
- ACCESS ROAD
- STREAM THALWEG
- STREAM TOP OF BANKS
- FOOT BRIDGE
- TEMPORARY STREAM CROSSING
- PERMANENT FORD STREAM CROSSING
- TRANSPLANTED VEGETATION
- TREE REMOVAL
- TREE PROTECTION
- GEOLIFT
- CHANNEL FILL
- COMPACTED CHANNEL PLUG
- GRADE BANK 2:1 OR FLATTER
- EXISTING WETLANDS

INDEX OF SHEETS

VOLUME NO.
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SHEET NO.
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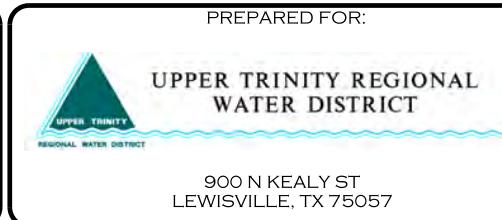
SYMBOLS /
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- 1.2 OVERVIEW MITIGATION ZONE C
- 1.3 - 1.4 OVERVIEW S25 REACHES
- 1.5 - 1.7 OVERVIEW S26 REACHES
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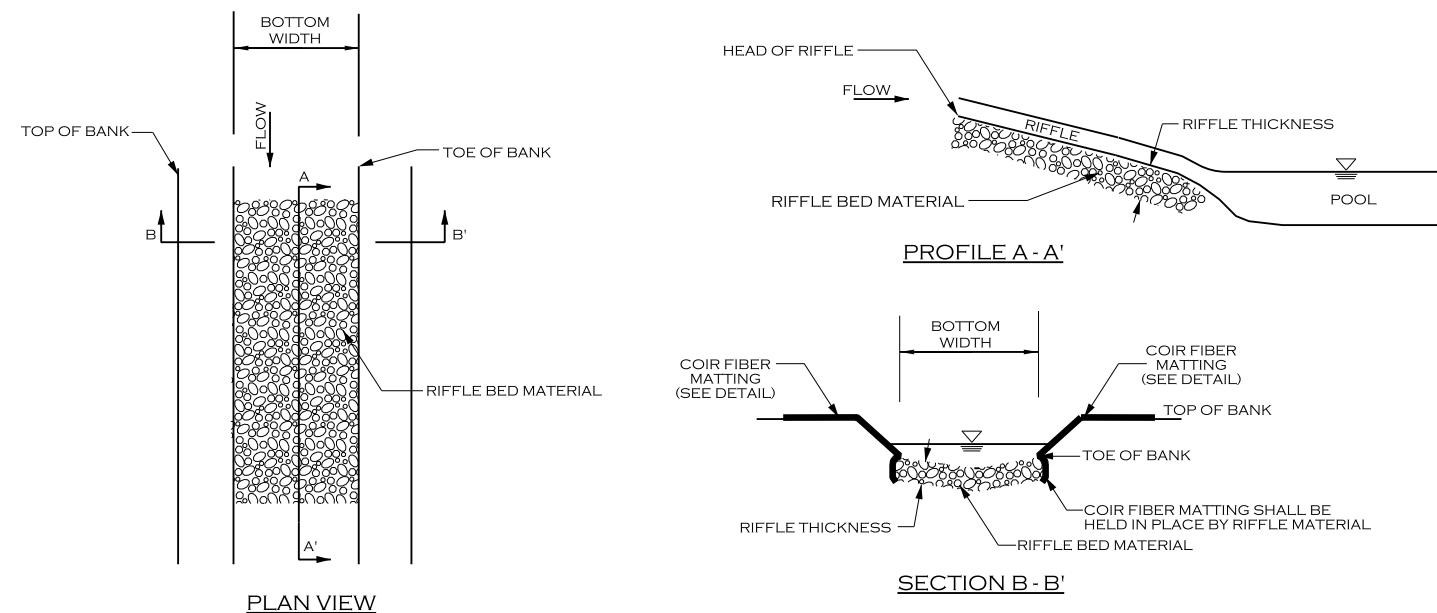
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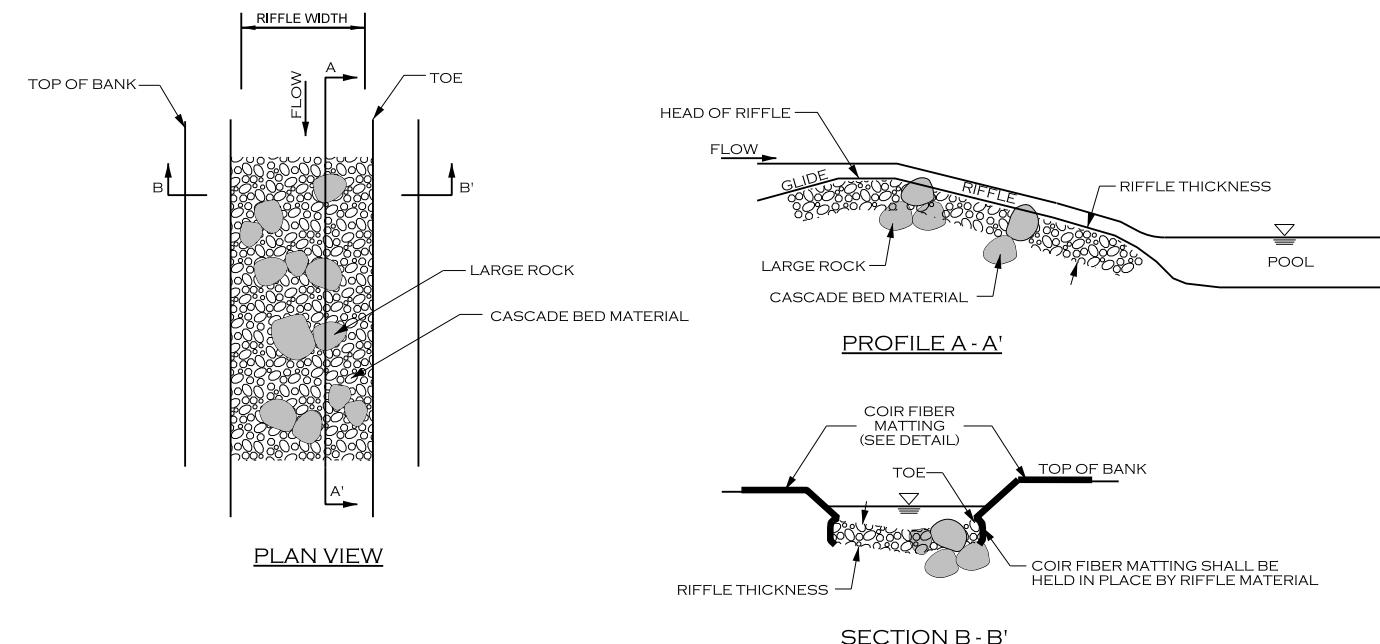
CONSTRUCTED RIFFLE

CONSTRUCTED RIFFLE SPECIFICATIONS	
MATERIALS:	SPECIFICATIONS:
RIFFLE BED MATERIAL	TYPE: GRANITE OR COMPARABLE SIZE: WELL GRADED MIX OF TXDOT/AASHTO MIX 1 AND WASHED #57 STONE THICKNESS: 16 INCHES MIN.
COIR FIBER MATTING	SEE MATTING DETAIL
NOTES FOR CONSTRUCTED RIFFLE STRUCTURES:	
1. GRADE STREAMBED AND BANKS TO PROPOSED DIMENSIONS PER TYPICAL CROSS-SECTION AND PROFILE. 2. EXCAVATE TRENCH BELOW PROPOSED STREAMBED ELEVATION EQUAL TO OR GREATER THAN RIFFLE THICKNESS. 3. PLACE COIR FIBER MATTING ON BANKS AND LAY DOWN INTO TRENCH EXCAVATED FOR RIFFLE BED MATERIAL. 4. FILL TRENCH WITH RIFFLE BED MATERIAL TO FINAL DESIGN STREAM GRADE.	



CONSTRUCTED CASCADE

CONSTRUCTED CASCADE SPECIFICATIONS	
MATERIALS:	SPECIFICATIONS:
LARGE ROCKS	TYPE: GRANITE OR COMPARABLE SIZE: CLASS A1 THICKNESS: 24 INCHES MIN.
CASCADE BED MATERIAL	TYPE: GRANITE OR COMPARABLE SIZE: WELL GRADED MIX OF TXDOT/AASHTO MIX 1 AND MIX 2 THICKNESS: 16 INCHES MIN.
COIR FIBER MATTING	SEE MATTING DETAIL
NOTES FOR CONSTRUCTED CASCADE STRUCTURES:	
1. GRADE STREAMBED AND BANKS TO PROPOSED DIMENSIONS PER TYPICAL CROSS-SECTION AND PROFILE. 2. EXCAVATE TRENCH BELOW PROPOSED STREAMBED ELEVATION EQUAL TO OR GREATER THAN RIFFLE THICKNESS. 3. PLACE COIR FIBER MATTING ON BANKS AND LAY DOWN INTO TRENCH EXCAVATED FOR RIFFLE BED MATERIAL. 4. FILL TRENCH WITH STONE TO FINAL DESIGN STREAM GRADE.	



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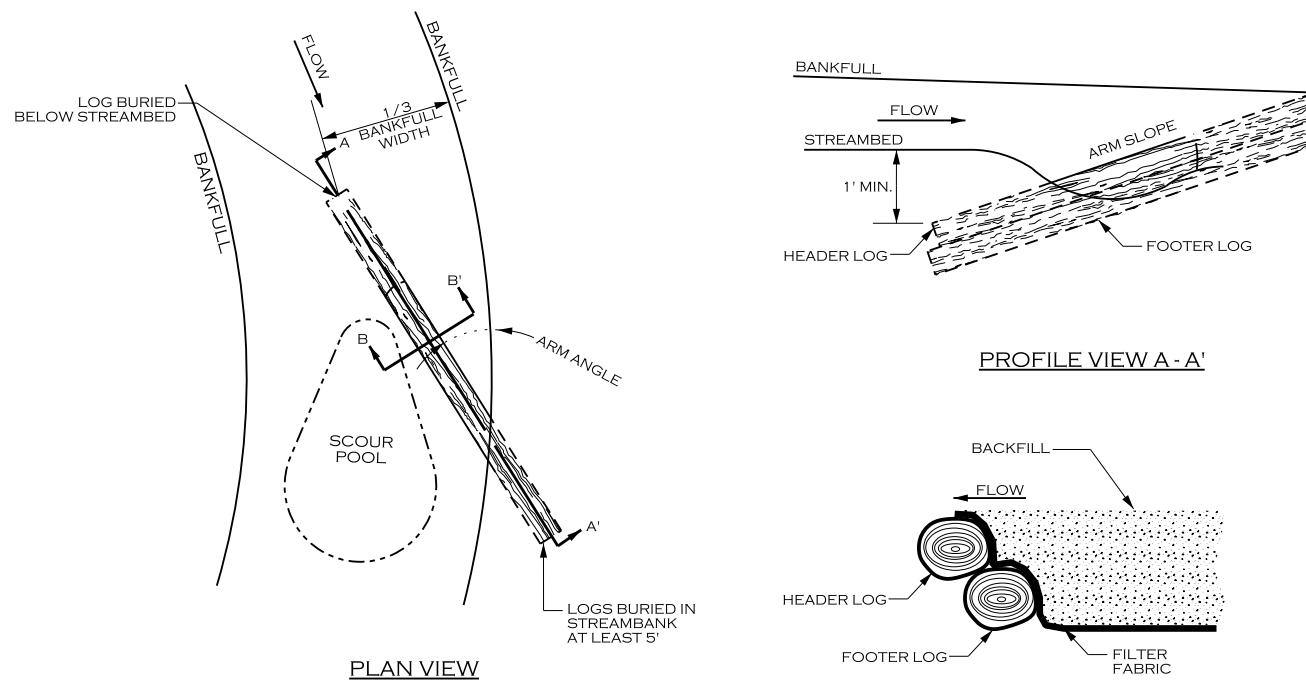
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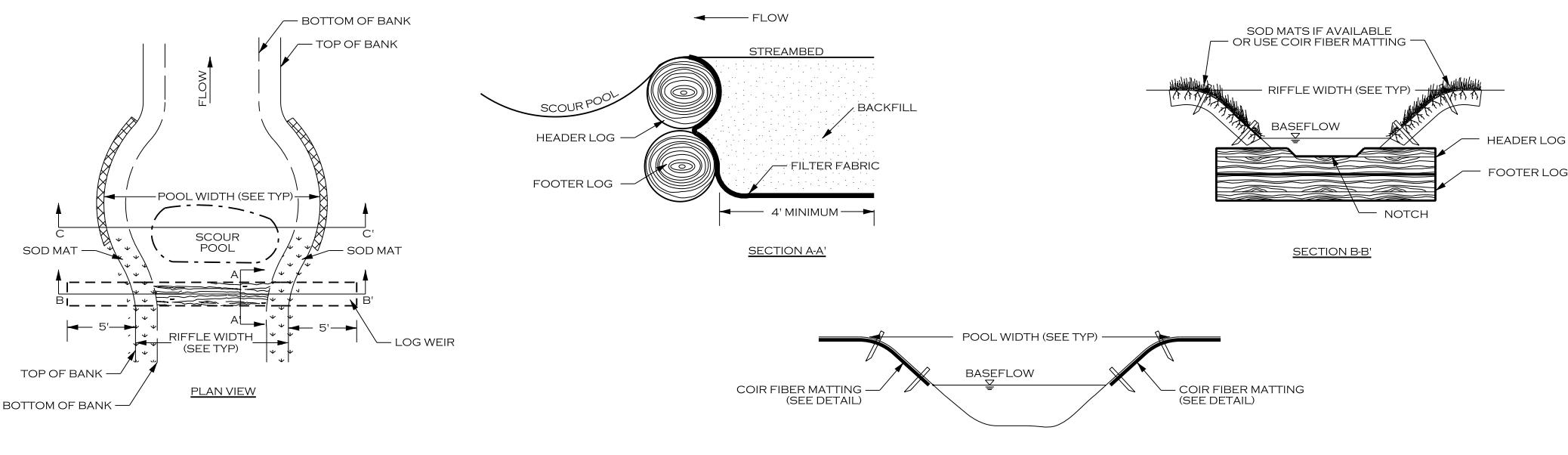
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LOG VANE



LOG VANE SPECIFICATIONS	
MATERIALS:	SPECIFICATIONS:
LOGS	TYPE: HARDWOOD SIZE: 10 INCH Ø MIN. NUMBER OF HEADER LOGS: 1 NUMBER OF FOOTER LOGS: 1
FILTER FABRIC	TYPE: TYPE 2 NON-WOVEN WIDTH UPSTREAM: 4 FT MINIMUM
BACKFILL	ON-SITE ALLUVIUM
NOTES FOR LOG VANE STRUCTURES:	
1. LOGS SHALL BE STRAIGHT, HARDWOOD, AND NOT ROTTEN. 2. SOIL SHALL BE COMPACTED WELL AROUND BURIED PORTIONS OF LOGS. 3. FILTER FABRIC SHALL BE NAILED TO THE LOG PRIOR TO PLACEMENT OF BACKFILL.	

LOG STEP

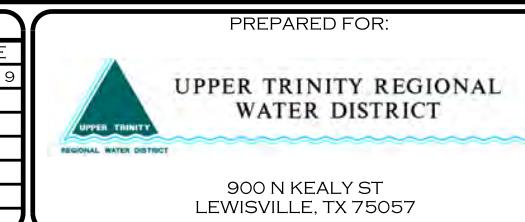


LOG STEP SPECIFICATIONS	
MATERIALS:	SPECIFICATIONS:
LOGS	TYPE: HARDWOOD SIZE: LENGTH - 2 x WBF, 12 INCH Ø MIN. NUMBER OF HEADER LOGS: 1 NUMBER OF FOOTER LOGS: 1
FILTER FABRIC	TYPE: TYPE 2 NON-WOVEN WIDTH UPSTREAM: 4 FT MINIMUM
BACKFILL	ON-SITE ALLUVIUM
NOTES FOR LOG STEP STRUCTURES:	
1. LOGS SHALL BE RELATIVELY STRAIGHT, HARDWOOD, AND RECENTLY HARVESTED. 2. LOGS >24 INCHES IN DIAMETER MAY BE USED ALONE WITHOUT AN ADDITIONAL FOOTER LOG. FILTER FABRIC SHALL STILL BE USED TO SEAL AROUND LOG. 3. PLACE FOOTER LOGS FIRST AND THEN HEADER (TOP) LOG. SET HEADER LOG APPROXIMATELY 1 TO 2 INCHES ABOVE THE INVERT ELEVATION. 4. CUT A NOTCH IN THE HEADER LOG APPROXIMATELY 50 PERCENT OF THE CHANNEL BOTTOM WIDTH AND EXTENDING DOWN TO THE INVERT ELEVATION. 5. USE FILTER FABRIC TO SEAL GAPS BETWEEN LOGS. 6. PLACE TRANSPLANTS OR COIR FIBER MATTING FROM TOE OF STREAMBANK TO TOP OF STREAMBANK.	

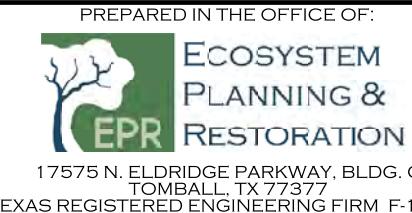
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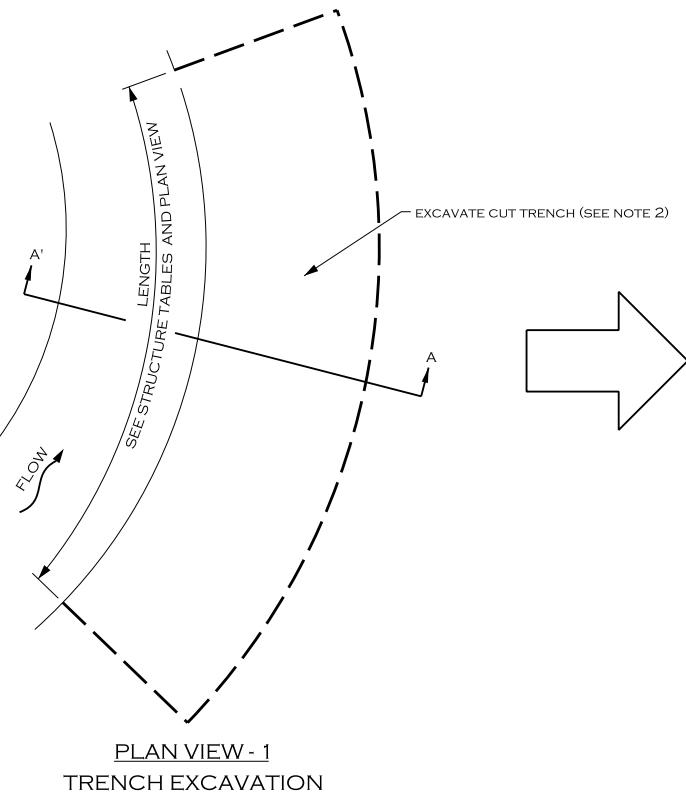


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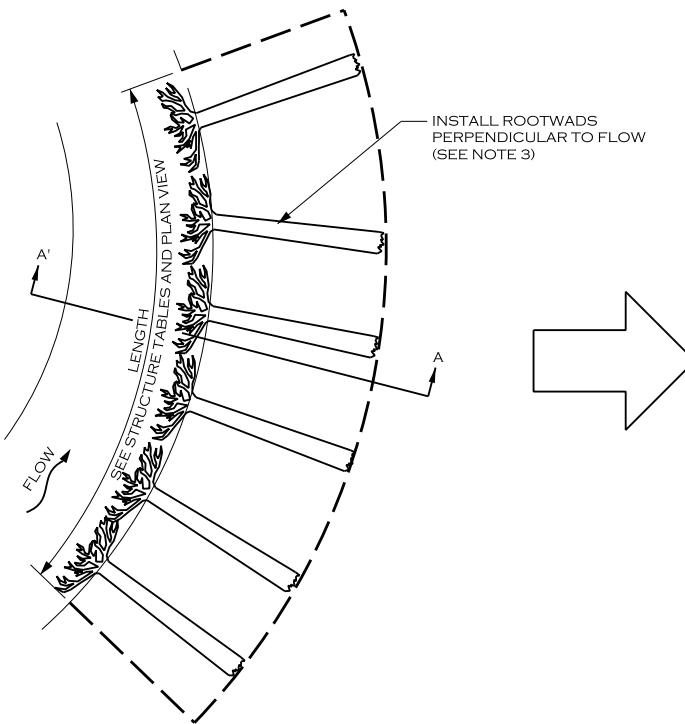
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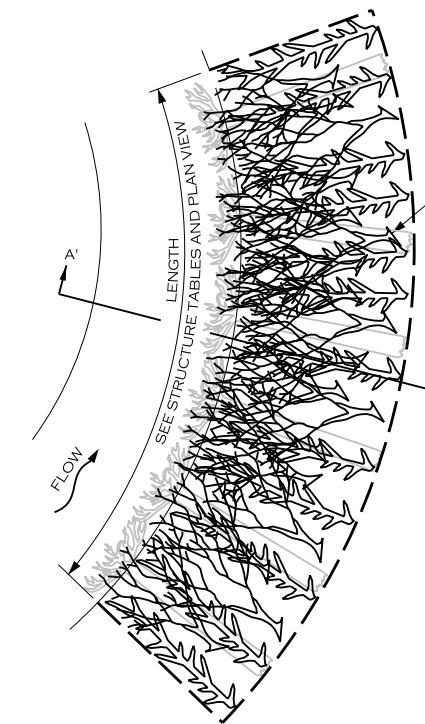
TOE WOOD WITH GEOLIFT



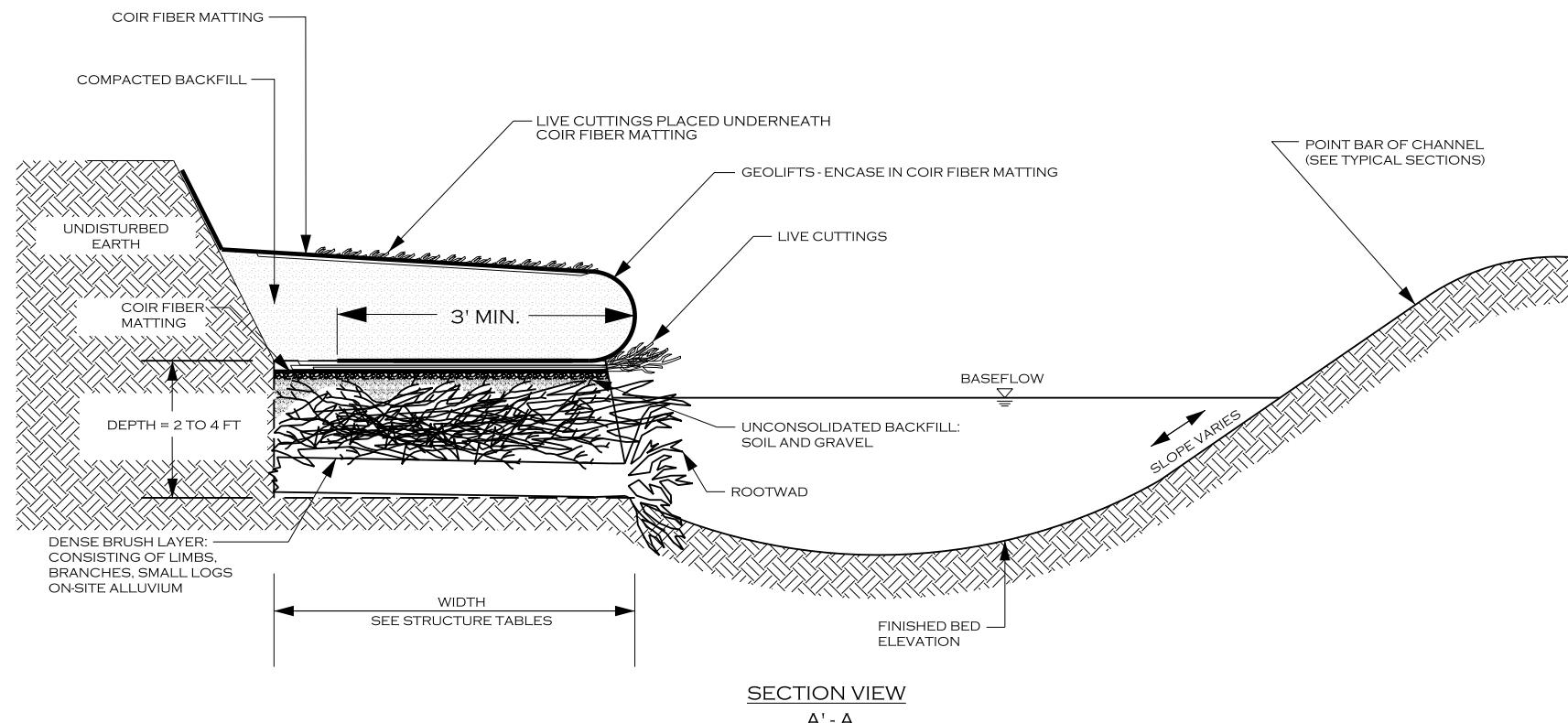
PLAN VIEW - 1
TRENCH EXCAVATION



PLAN VIEW - 2
ROOTWAD INSTALLATION



PLAN VIEW - 3
BRUSH LAYER INSTALLATION



TOE WOOD SPECIFICATIONS	
MATERIALS:	SPECIFICATIONS:
BRUSH MATERIAL	TYPE: HARDWOOD LIMBS AND SHRUBS SIZE: MIN. 5 FT LONG. 1 INCH DIAMETER
ROOTWAD MATERIAL	TYPE: HARDWOOD SIZE: MIN. 6 FT LONG MIN. 10 INCH DIAMETER
COIR FIBER MATTING	SEE MATTING DETAIL

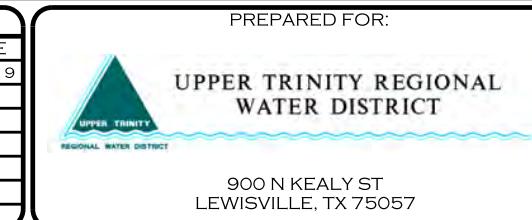
NOTES FOR TOE WOOD STRUCTURES:

- DIG A TRENCH ALONG BANK WHERE TOE WOOD IS TO BE INSTALLED. IF TOE WOOD IS BEING PLACED IN A LOCATION WHERE THERE IS NOT EXISTING GROUND, PLACE FILL MATERIAL AND COMPACT TO FORM THE TRENCH FOR THE TOE WOOD MATERIALS.
- EXCAVATE TRENCH BELOW TOEWOOD GRADE (PLAN VIEW 1).
- INSTALL ROOTWADS PERPENDICULAR TO THE FLOW AS SHOWN IN PLAN VIEW 2.
- INSTALL BRUSH MATERIAL INCLUDING BRANCHES, LOGS, AND BRUSH, AND AT LEAST 1" IN DIAMETER. LARGE MATERIALS AND SMALL MATERIALS SHALL BE MIXED, PLACED IN LAYERS NO MORE THAN 1 FOOT DEEP, COVERED IN A THIN LAYER OF ON SITE ALLUVIUM, AND COMPACTED BEFORE PLACING THE NEXT LAYER OF TOE WOOD MATERIAL. CONTINUE PLACING MATERIALS TO FORM A DENSE LAYER OF WOODY MATERIALS AND ON SITE ALLUVIUM TO THE DEPTH AND ELEVATIONS SPECIFIED.
- PLACE AN UNCONSOLIDATED LAYER OF SOIL AND GRAVEL ON TOP OF BRUSH LAYER.
- COVER SOIL AND GRAVEL LAYER IN COIR FIBER MATTING.
- INSTALL LIVE CUTTINGS, INCLUDING BRANCHES AND BRUSH, AT LEAST 5 FEET IN LENGTH, AND AT LEAST 1 INCH IN DIAMETER.
- CONSTRUCT GEOLIFTS OR PLACE TRANSPLANTS AS SPECIFIED OR DIRECTED BY THE ENGINEER TO REBUILD THE STREAMBANK ABOVE THE TOE WOOD LAYER.
- IF CONSTRUCTION OCCURS IN THE GROWING SEASON, DO NOT INSTALL LIVE CUTTINGS. INSTEAD INSTALL LIVE STAKES IN GEOLIFTS DURING VEGETATION DORMANT SEASON.

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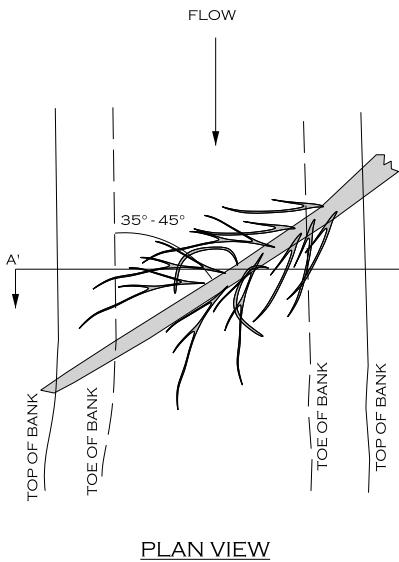


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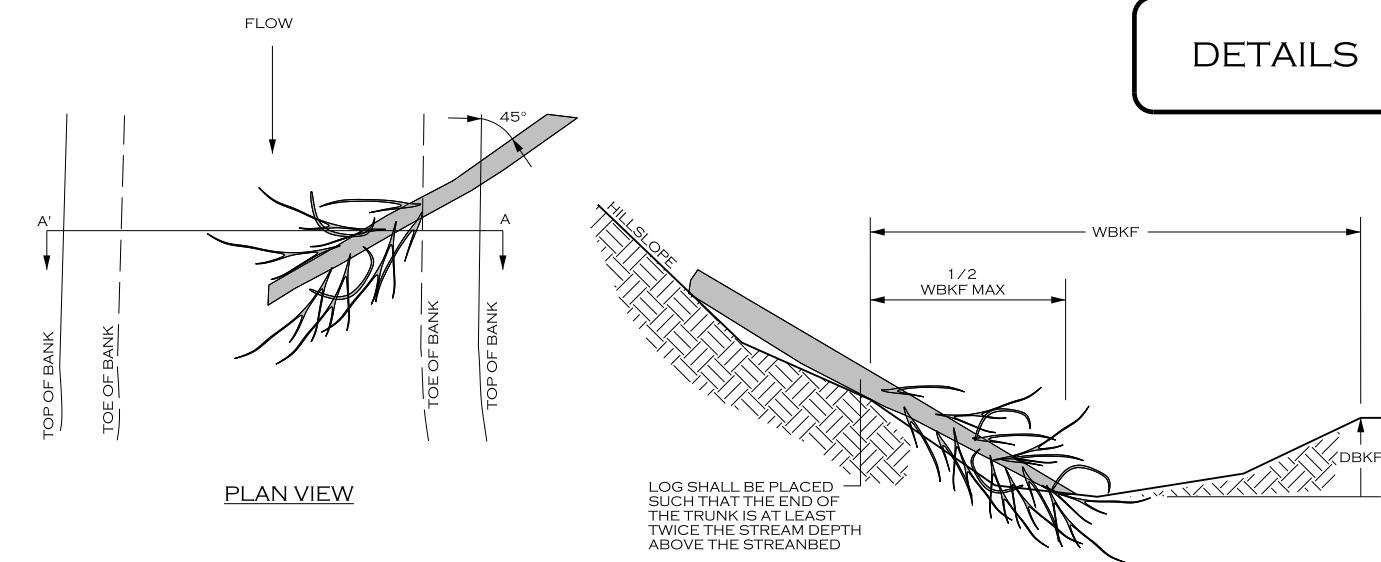
DEBRIS JAM
TYPE 1



PLAN VIEW

- DEBRIS JAM TYPE 1**
1. DEBRIS JAM TYPE 1 INSTALLATIONS SHALL BE PLACED WITHIN STREAM RIFFLES TO TRAP DETRITUS AND ORGANIC MATTER AND KEEP IT IN CONTACT WITH FLOWING, AERATED WATER.
 2. TREE SHALL BE ANY NON-EVERGREEN TREE WITH BRANCHES, AT LEAST 8 INCHES DIAMETER, AND NOT ROTTEN.
 3. TREE SHALL HAVE CONSIDERABLE NUMBER OF BRANCHES THAT REMAIN EXPOSED AFTER INSTALLATION AND IN CONTACT WITH THE STREAM FLOW TO TRAP LEAVES AND DETRITUS FROM STREAM FLOW.
 4. TREE SHALL BE INSTALLED SO THAT THE TRUNK IS LEVEL WITH THE BED ELEVATION OF THE STREAM, SUCH THAT THE TRUNK DOES NOT POOL WATER IN FRONT OF THE STRUCTURE, BACKFULL AND COMPACT AROUND THE TRUNK AND INSTALLED TREE TO MINIMIZE Voids.

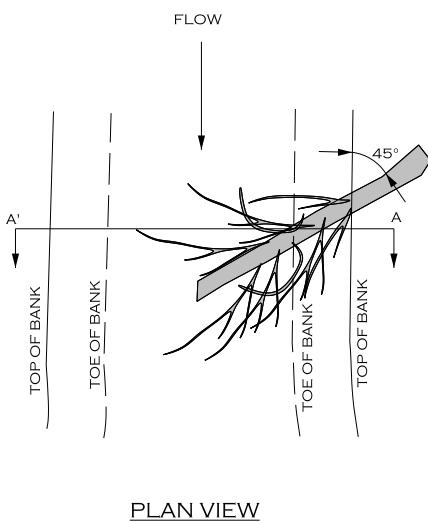
DEBRIS JAM
TYPE 2



SECTION A-A'

- DEBRIS JAM TYPE 2**
1. DEBRIS JAM TYPE 2 INSTALLATIONS SHALL BE PLACED AREAS WHERE THE STREAM FLOWS AGAINST A STEEP SLOPE. A TREE IS INSTALLED AS SHOWN TO CATCH DETRITUS AND ORGANIC MATTER AND KEEP IT IN CONTACT WITH STREAM FLOWS. THIS DEBRIS JAM MAY BE INSTALLED IN RIFFLE OR POOL CONDITIONS.
 2. TREE SHALL BE ANY NON-EVERGREEN TREE WITH BRANCHES, AT LEAST 8 INCHES DIAMETER, AND NOT ROTTEN.
 3. TREE SHALL HAVE CONSIDERABLE NUMBER OF BRANCHES THAT REMAIN EXPOSED AND IN CONTACT WITH THE STREAM FLOW AFTER INSTALLATION TO TRAP LEAVES AND DETRITUS FROM STREAM FLOW.
 4. TREE SHALL BE INSTALLED SO THAT THE TRUNK LIES UPON THE HILLSLOPE, AND IS ANCHORED TO THE HILLSLOPE TO PREVENT MOVEMENT DURING LARGE STREAM FLOWS. TREE SHALL BE CABLED TO A FRESHLY CUT STUMP OR ANOTHER LIVE TREE OF AT LEAST THE SAME SIZE.

DEBRIS JAM
TYPE 3

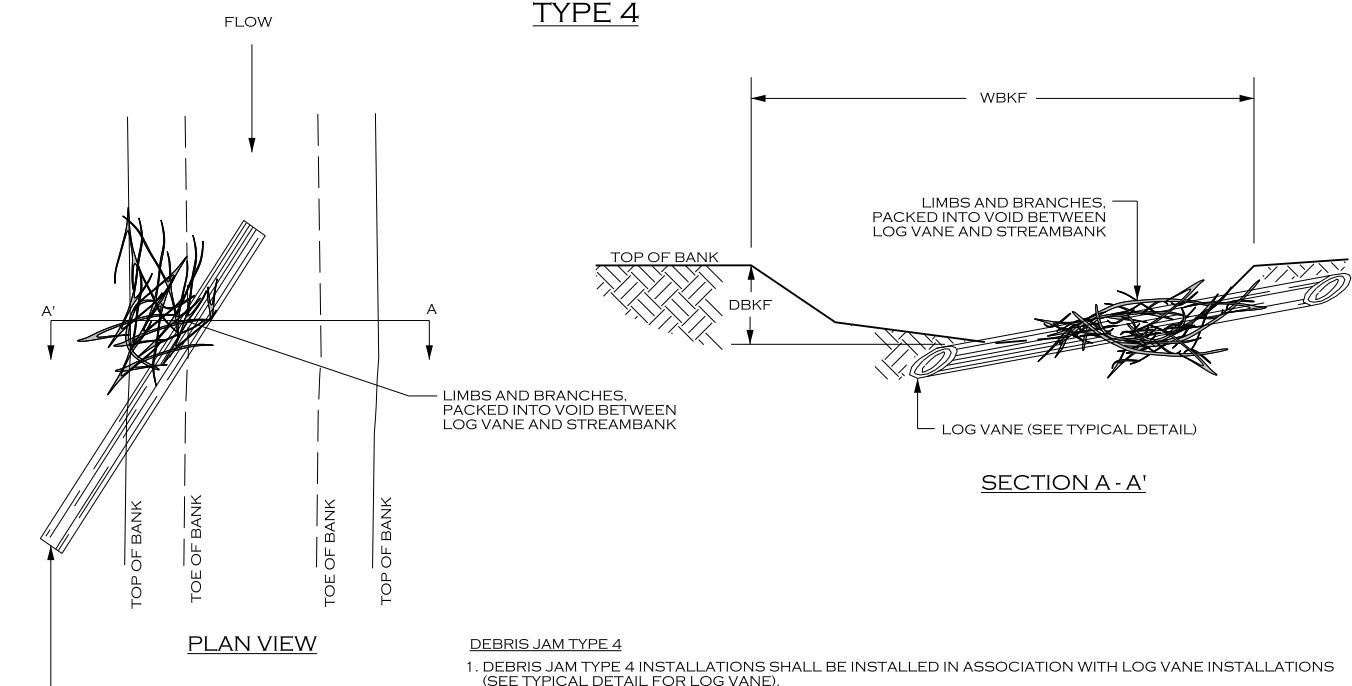


PLAN VIEW

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- DEBRIS JAM TYPE 3**
1. DEBRIS JAM TYPE 3 INSTALLATIONS SHALL BE PLACED WITHIN STREAM RIFFLES OR POOLS TO TRAP DETRITUS AND ORGANIC MATTER AND KEEP IT IN CONTACT WITH FLOWING WATER.
 2. TREE SHALL BE ANY NON-EVERGREEN TREE WITH BRANCHES, AT LEAST 8 INCHES DIAMETER, AND NOT ROTTEN.
 3. TREE SHALL HAVE CONSIDERABLE NUMBER OF BRANCHES THAT REMAIN EXPOSED AFTER INSTALLATION AND IN CONTACT WITH THE STREAM FLOW TO TRAP LEAVES AND DETRITUS FROM STREAM FLOW.
 4. TREE SHALL BE INSTALLED SO THAT THE TRUNK IS IN CONTACT WITH THE STREAM BED, BACKFULL AND COMPACT AROUND THE TRUNK AND INSTALLED TREE TO MINIMIZE Voids.

DEBRIS JAM
TYPE 4



SECTION A-A'

DEBRIS JAM TYPE 4

1. DEBRIS JAM TYPE 4 INSTALLATIONS SHALL BE INSTALLED IN ASSOCIATION WITH LOG VANE INSTALLATIONS (SEE TYPICAL DETAIL FOR LOG VANE).
2. LIMBS AND BRANCHES THAT FORM THE DEBRIS JAM SHALL VARY IN DIAMETER, BUT SHALL BE AT LEAST 3 FEET LONG WITH MULTIPLE BRANCHES TO PROMOTE ENTANGLING WHEN PACKED TOGETHER. LIMBS AND BRANCHES SHOULD BE A MIXTURE (APPROX. 50/50) OF RECENTLY CUT BRANCHES AND DEAD/DECAYING BRANCHES.
3. PREPARE THE EXCAVATION FOR THE LOG VANE, THEN PLACE THE DEBRIS JAM PRIOR TO PLACING AND INSTALLING THE LOG VANE.
4. WHEN INSTALLED, THE LOG VANE SHOULD PIN THE DEBRIS JAM TO THE STREAM BED AND BANK AND PREVENT EASY MOVEMENT DURING HIGH FLOW EVENTS.
5. AFTER INSTALLATION, STREAM FLOW SHOULD BE IN CONTACT WITH THE DEBRIS JAM, IN ORDER TO TRAP ADDITIONAL DEBRIS AND ORGANIC MATTER.

REVISIONS

NO.	DESCRIPTION	ENGR.	APPROV.	DATE
1	DRAFT DESIGN PLANS	EMP	KLT	7/01/19

PREPARED FOR:



900 N KEALY ST
LEWISVILLE, TX 75057

LAKE RALPH HALL MITIGATION
MITIGATION ZONE C
FANNIN COUNTY, TEXAS



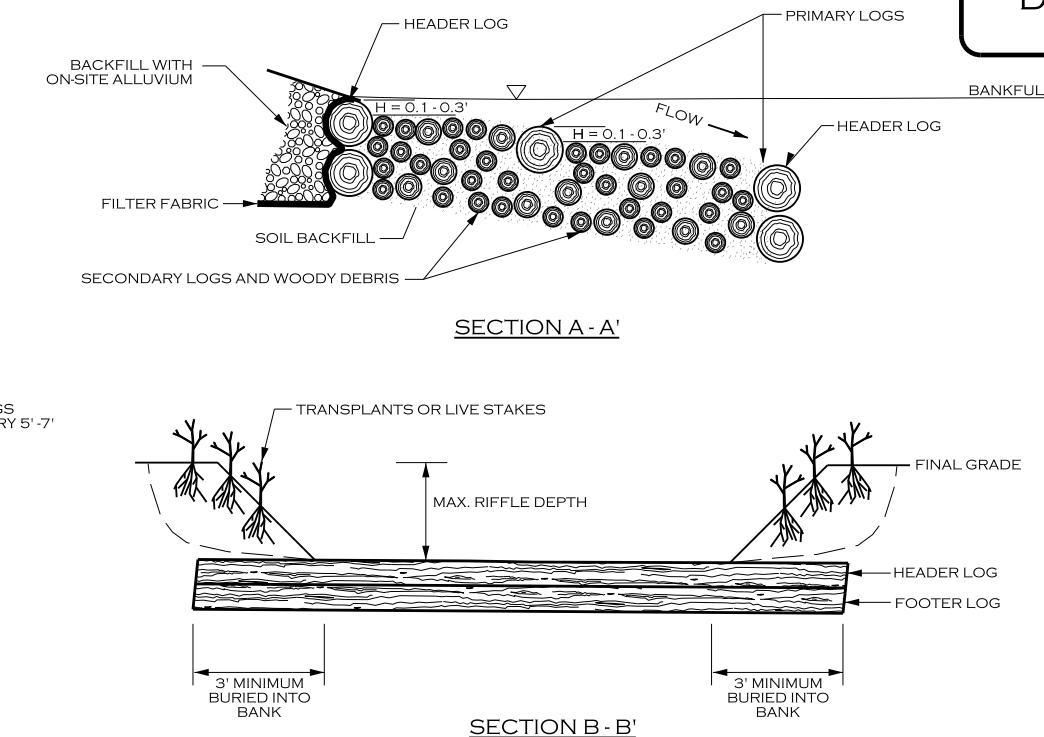
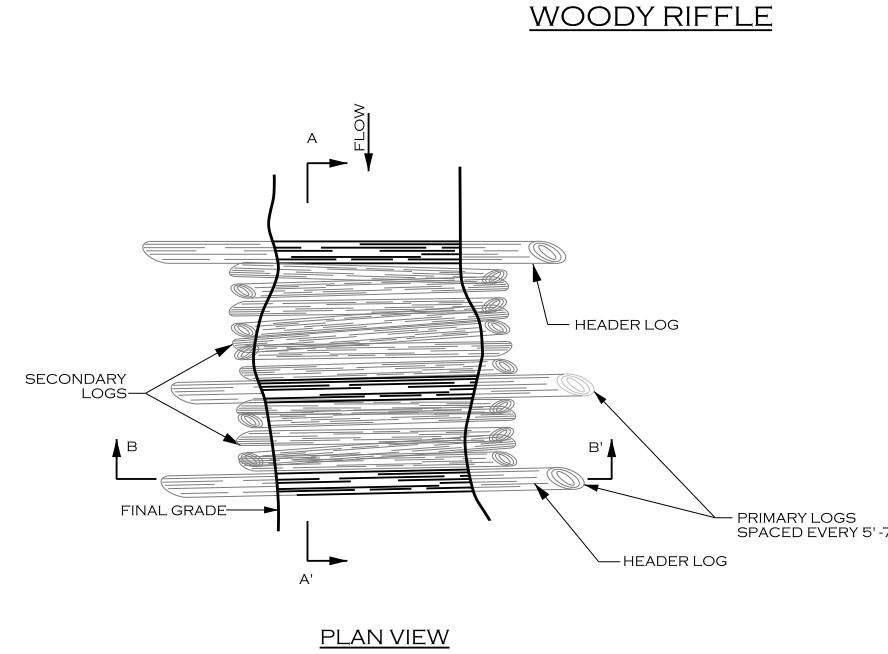
17575 N. ELDRIDGE PARKWAY, BLDG. C
TOMBALL, TX 77377
TEXAS REGISTERED ENGINEERING FIRM F-14997

PROJECT ENGINEER

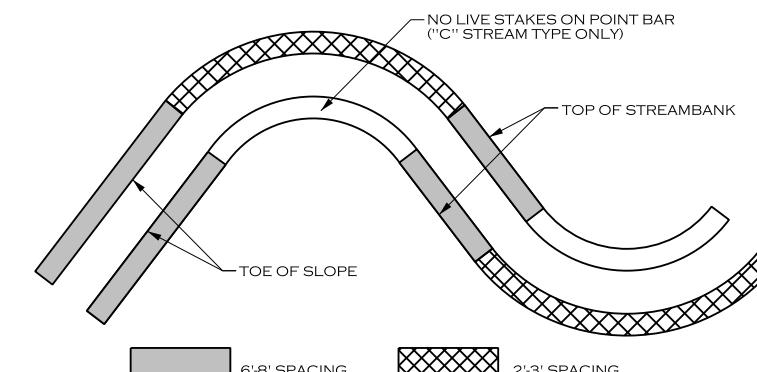
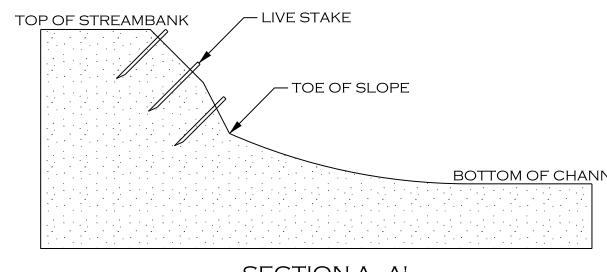
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PURPOSES ONLY

DETAILS

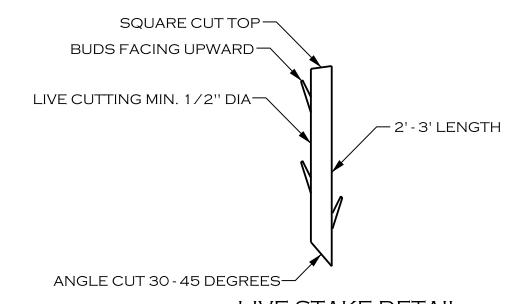
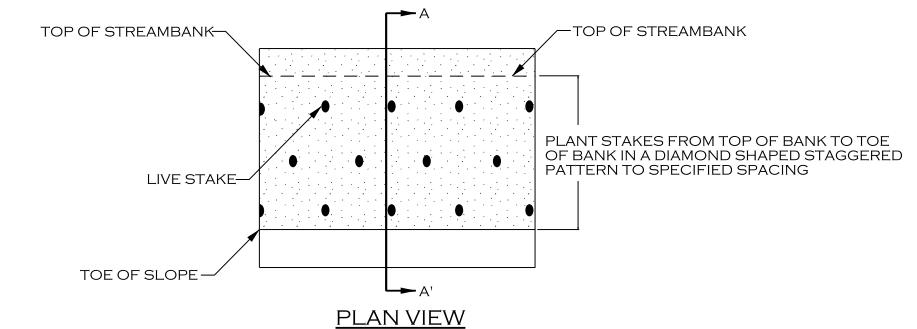
WOODY RIFFLE	
MATERIALS:	SPECIFICATIONS:
LOGS	SEE NOTES BELOW
FILTER FABRIC	TYPE: UPSTREAM: TYPE 2 NON-WOVEN WIDTH: 6 FT MINIMUM
BACKFILL	ON-SITE ALLUVIUM AND SOIL
NOTES FOR WOODY RIFFLE STRUCTURES:	
1. PRIMARY LOGS SHALL BE AT LEAST 8" OR MORE IN DIAMETER, RELATIVELY STRAIGHT, AND RECENTLY HARVESTED AND EXTENDING INTO THE BANK 3' ON EACH SIDE. 2. SECONDARY LOGS SHALL BE AT LEAST 1" IN DIAMETER AND NO LARGER THAN 8", AND EXTEND INTO THE BANK 2 FEET ON EACH SIDE. WOOD MATERIAL SHALL BE VARYING DIAMETER TO ALLOW MATERIAL TO BE COMPACTED. 3. COIR FIBER MATTING CAN BE USED INSTEAD OF TRANSPLANTS OR LIVE STAKES, PER DIRECTION OF ENGINEER. 4. AFTER TRENCH HAS BEEN EXCAVATED A LAYER OF SECONDARY LOGS AND WOODY DEBRIS SHALL BE PLACED WITH MINIMAL GAPS. A LAYER OF ON-SITE ALLUVIUM SHALL BE APPLIED TO FILL VOIDS BETWEEN SECONDARY LOGS BEFORE ADDITIONAL LAYERS ARE PLACED.	



LIVE STAKING



LIVE STAKE SPACING PLAN VIEW



NOTES:

1. STAKES SHALL BE CUT AND INSTALLED ON THE SAME DAY.
2. DO NOT INSTALL STAKES THAT HAVE BEEN SPLIT.
3. STAKES MUST BE INSTALLED WITH BUDS POINTING UPWARDS.
4. STAKES SHALL BE INSTALLED PERPENDICULAR TO BANK.
5. STAKES SHALL BE 1/2 TO 2 INCHES IN DIAMETER AND 2 TO 3 FT LONG.
6. STAKES SHALL BE INSTALLED LEAVING 1/5 OF STAKE ABOVE GROUND.

REVISIONS

NO.	DESCRIPTION	ENGR.	APPROV.	DATE
1	DRAFT DESIGN PLANS	EMP	KLT	7/01/19

PREPARED FOR:



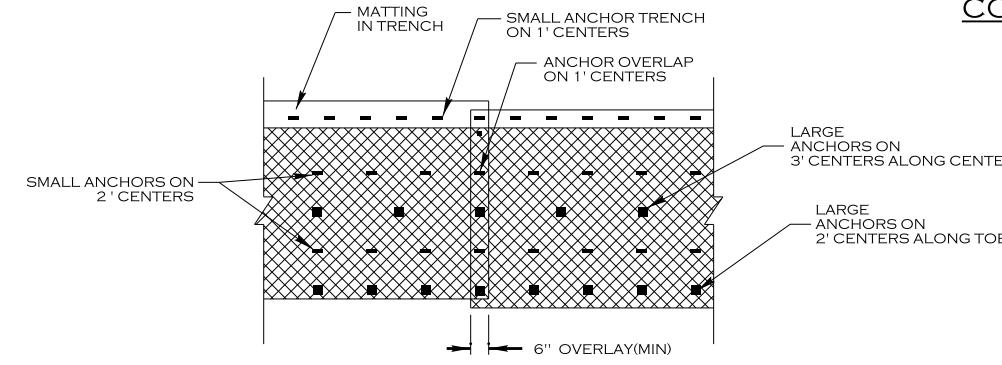
LAKE RALPH HALL MITIGATION
MITIGATION ZONE C
FANNIN COUNTY, TEXAS

PREPARED IN THE OFFICE OF:

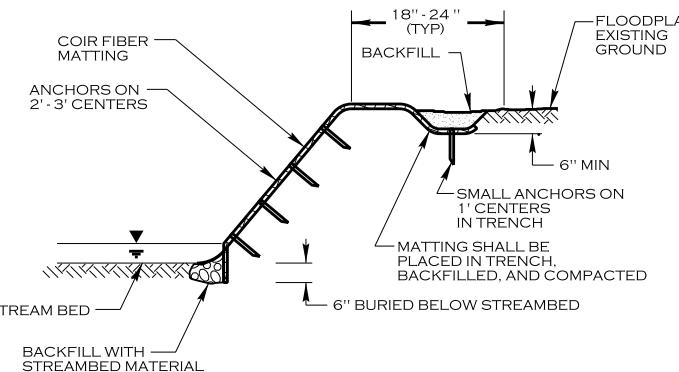


PROJECT ENGINEER

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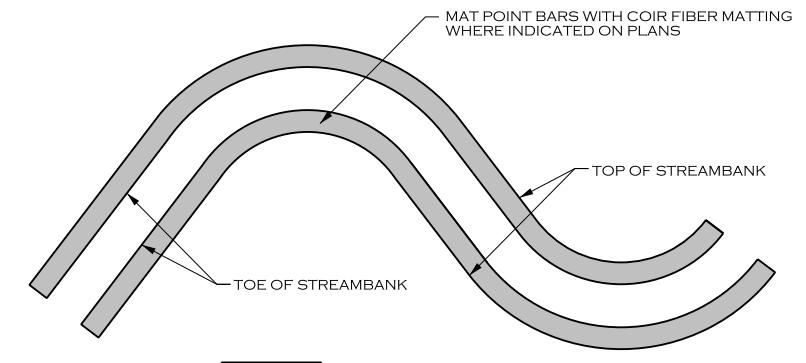
PLAN VIEW



NOTES:
1. IN AREAS TO BE MATTED, ALL SEEDING, SOIL AMENDMENTS, AND SOIL PREPARATION MUST BE COMPLETED PRIOR TO PLACEMENT OF COIR FIBER MATTING.

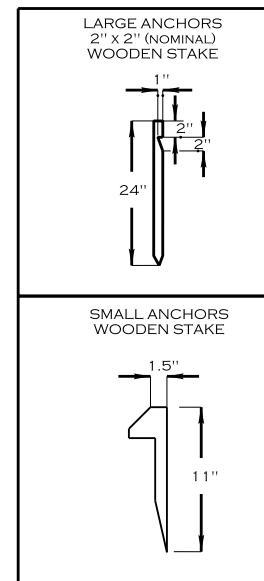
CROSS SECTION

COIR FIBER MATTING



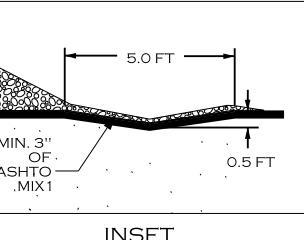
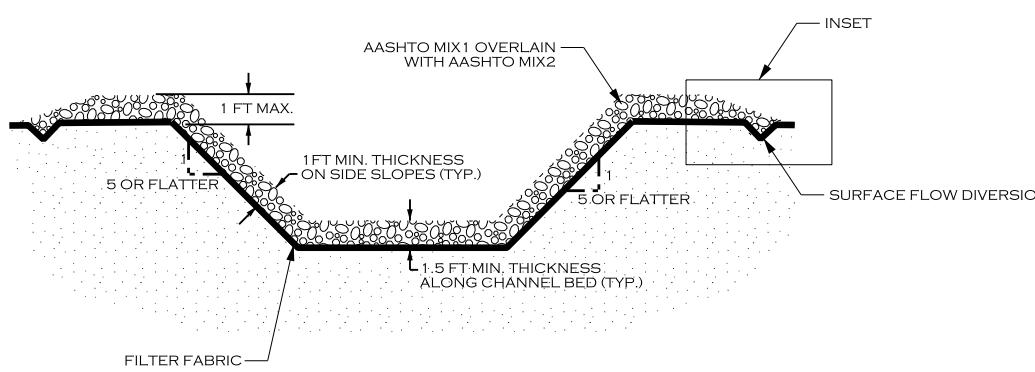
SEE PLAN VIEW SHEET FOR MATTING LOCATIONS

MATTING PLAN VIEW



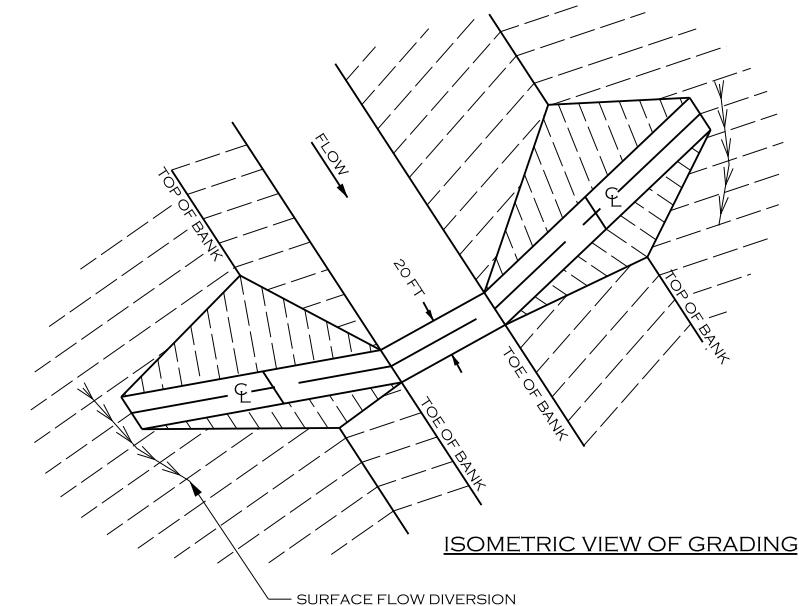
ANCHOR OPTIONS

PERMANENT FORD STREAM CROSSING



CROSS SECTION

NOTES:
1. HAVE ALL NECESSARY MATERIALS AND EQUIPMENT ON-SITE BEFORE WORK BEGINS.
2. MINIMIZE CLEARING AND EXCAVATION OF STREAMBANKS. COMPLETE ONE SIDE BEFORE STARTING ON THE OTHER SIDE.
3. INSTALL STREAM CROSSING AT RIGHT ANGLE TO THE FLOW.
4. DIVERT ALL SURFACE RUNOFF FROM CONSTRUCTION SITE ONTO UNDISTURBED AREAS ADJOINING THE STREAM.
5. ALIGN ROAD APPROACHES WITH THE CENTERLINE OF THE CROSSING FOR A MINIMUM DISTANCE OF 30 FEET.
6. GRADE SLOPES TO A 5:1 SLOPE OR FLATTER. TRANSPLANT SOD FROM ORIGINAL STREAMBANK ONTO SIDE SLOPES IF POSSIBLE.
7. MAINTAIN CROSSING SO THAT RUNOFF IN THE CONSTRUCTION ROAD DOES NOT ENTER EXISTING CHANNEL.
8. A STABILIZED PAD OF STONE BACKFILL, LINED WITH GEOTEXTILE FABRIC SHALL BE USED OVER ACCESS SLOPES.
9. WIDTH OF THE CROSSING SHALL BE 20FEET.
10. INSPECT STREAM CROSSING AFTER RUNOFF - PRODUCING RAINS TO CHECK FOR BLOCKAGE IN CHANNEL, EROSION OF BANKS, CHANNEL SCOUR, STONE DISPLACEMENT, OR PIPING. MAKE ALL REPAIRS IMMEDIATELY TO PREVENT FURTHER DAMAGE TO INSTALLATION.



ISOMETRIC VIEW OF GRADING

REVISIONS

NO.	DESCRIPTION	ENGR.	APPROV.	DATE
1	DRAFT DESIGN PLANS	EMP	KLT	7/01/19

PREPARED FOR:



LAKE RALPH HALL MITIGATION
MITIGATION ZONE C
FANNIN COUNTY, TEXAS

PREPARED IN THE OFFICE OF:



PROJECT ENGINEER

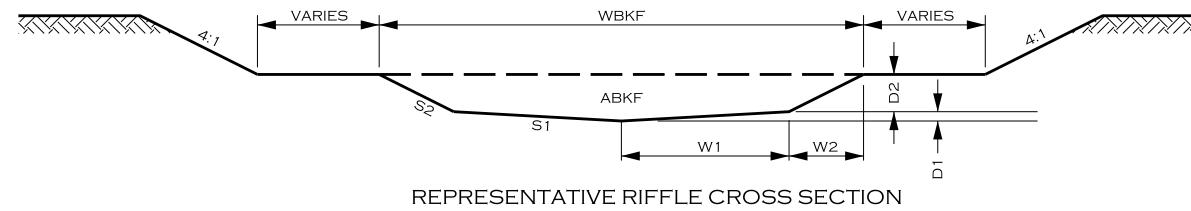
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REPRESENTATIVE SECTIONS

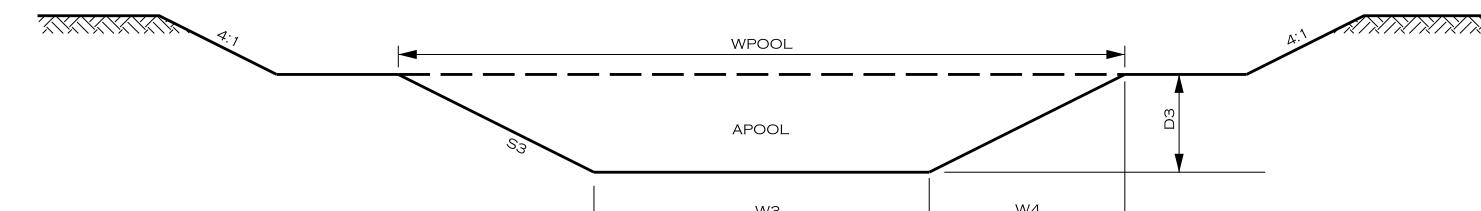
"B" TYPE CHANNELS

VOLUME NO. SHEET NO.
VOL. 3 4.1

REPRESENTATIVE SECTIONS



REPRESENTATIVE RIFFLE CROSS SECTION



REPRESENTATIVE POOL CROSS SECTION

B STREAM TYPE REPRESENTATIVE CROSS SECTION DIMENSIONS																
			RIFLES								POOLS					
Stream	Sheet Range	Station Range	ABKF	WBKF	W1	W2	D1	D2	S1	S2	APool	WPool	W3	W4	D3	S3
S25-TRIB1-(2b)	5.109	22+86 to 25+57	2.7	5.7	1.0	1.8	0.06	0.60	16:1	3:1	4.3	6.3	2.3	2.0	1.00	2:1
S25-TRIB10-(1)	5.125 - 5.126	10+00 to 18+37	1.9	4.8	0.9	1.5	0.06	0.50	16:1	3:1	3.0	5.3	1.9	1.7	0.84	2:1
S25-TRIB10-(2)	5.126 - 5.127	18+37 to 21+59	2.9	6.4	1.5	1.7	0.07	0.57	22:1	3:1	4.9	7.0	3.2	1.9	0.96	2:1
S25-TRIB10-(3)	5.127, 5.75	21+59 to 25+54	3.0	7.3	2.1	1.5	0.06	0.51	35:1	3:1	5.5	8.1	4.7	1.7	0.86	2:1
S25-TRIB10-A1-(1)	5.128, 5.126	10+00 to 16+92	2.0	4.9	0.9	1.5	0.06	0.51	15:1	3:1	3.2	5.4	2.0	1.7	0.86	2:1
S25-TRIB11-(1)	5.122 - 5.124	10+00 to 21+47	2.0	4.9	0.9	1.5	0.06	0.51	15:1	3:1	3.2	5.4	2.0	1.7	0.86	2:1
S25-TRIB11-(2)	5.124, 5.74	21+47 to 25+16	2.2	5.1	0.9	1.6	0.06	0.54	16:1	3:1	3.5	5.7	2.1	1.8	0.90	2:1
S25-TRIB12-(1)	5.110	10+00 to 13+34	1.7	4.5	0.8	1.4	0.06	0.47	15:1	3:1	2.7	5.0	1.8	1.6	0.79	2:1
S25-TRIB12-A1-(1)	5.117 - 5.118	10+00 to 19+53	1.9	5.8	1.7	1.2	0.04	0.41	38:1	3:1	3.4	6.4	3.6	1.4	0.68	2:1
S25-TRIB12-A1-TRIBA-(1)	5.117	10+00 to 15+50	1.2	3.8	0.7	1.2	0.04	0.40	16:1	3:1	1.9	4.2	1.6	1.3	0.66	2:1
S25-TRIB1-A1-(1)	5.109	10+00 to 12+67	0.5	3.0	0.9	0.6	0.02	0.21	37:1	3:1	0.9	3.3	1.9	0.7	0.35	2:1
S25-TRIB2-(3)	5.107	22+50 to 26+56	2.4	5.4	1.0	1.7	0.07	0.56	15:1	3:1	3.8	5.9	2.1	1.9	0.94	2:1
S25-TRIB4-(1)	5.102	10+00 to 13+17	2.0	6.0	1.7	1.3	0.05	0.42	37:1	3:1	3.6	6.6	3.8	1.4	0.70	2:1
S25-TRIB5-(1)	5.131 - 5.132	26+54 to 30+97	3.4	6.4	1.2	2.0	0.08	0.67	16:1	3:1	5.3	7.0	2.6	2.2	1.12	2:1
S25-TRIB9-(1)	5.76	10+00 to 13+91	1.8	4.6	0.9	1.5	0.05	0.49	16:1	3:1	2.8	5.1	1.9	1.6	0.81	2:1
S26-TRIB1-(1)	5.24	10+00 to 12+00	1.0	4.2	1.22	0.90	0.03	0.30	41:1	3:1	1.8	4.7	2.7	1.0	0.49	2:1
S26-TRIB10-A2-(1)	5.36	10+00 to 13+49	1.1	4.4	1.3	0.9	0.04	0.31	36:1	3:1	2.0	4.9	2.9	1.0	0.52	2:1
S26-TRIB10-A2-TRIBA-(1)	5.36	10+00 to 11+65	0.5	3.0	0.9	0.6	0.02	0.21	37:1	3:1	0.9	3.3	1.9	0.7	0.35	2:1
S26-TRIB11-(2)	5.26, 5.13	14+59 to 17+67	1.6	5.4	1.5	1.1	0.04	0.38	41:1	3:1	2.9	5.9	3.3	1.3	0.63	2:1
S26-TRIB12-(1)	5.25	10+00 to 13+78	1.6	5.4	1.5	1.1	0.04	0.38	41:1	3:1	2.9	5.9	3.3	1.3	0.63	2:1
S26-TRIB13-(2)	5.59 - 5.60	22+02 to 25+43	3.6	8.0	2.3	1.7	0.07	0.56	35:1	3:1	6.6	8.9	5.1	1.9	0.94	2:1
S26-TRIB14-(1)	5.55 - 5.56, 5.10	10+00 to 20+76	1.6	5.4	1.5	1.1	0.04	0.38	41:1	3:1	2.9	5.9	3.3	1.3	0.63	2:1
S26-TRIB4-(0)	5.66, 5.67	10+00 to 15+88	1.8	4.6	0.9	1.5	0.05	0.49	16:1	3:1	2.8	5.1	1.9	1.6	0.81	2:1
S26-TRIB4-(1)	5.18, 5.67 - 5.69	15+88 to 13+80	3.1	6.6	1.5	1.8	0.07	0.59	22:1	3:1	5.2	7.2	3.2	2.0	0.99	2:1
S26-TRIB5-(1)	5.18, 5.145	10+00 to 14+87	1.4	4.4	1.0	1.2	0.04	0.40	24:1	3:1	2.4	4.9	2.3	1.3	0.66	2:1
S26-TRIB8-(1)	5.15 - 5.16	10+00 to 16+42	1.6	4.4	0.8	1.4	0.05	0.46	16:1	3:1	2.5	4.8	1.8	1.5	0.77	2:1
S26-TRIB9-(1)	5.37, 5.16	10+00 to 17+42	2.0	6.0	1.7	1.3	0.05	0.42	37:1	3:1	3.6	6.6	3.8	1.4	0.70	2:1

7/8/2019 R:\\PROJECTS\\DAL0001_LAKE_RALPH_HALL\\CADD\\MIT AREA C\\PLANS\\LRH_PSH_4.1.DGN
MISSION



PREPARED FOR:

UPPER TRINITY REGIONAL WATER DISTRICT

900 N KEALY ST
LEWISVILLE, TX 7505

LAKE RALPH HALL MITIGATION
MITIGATION ZONE C
FANNIN COUNTY, TEXAS



IN THE OFFICE OF:
**ECOSYSTEM
PLANNING &
RESTORATION**

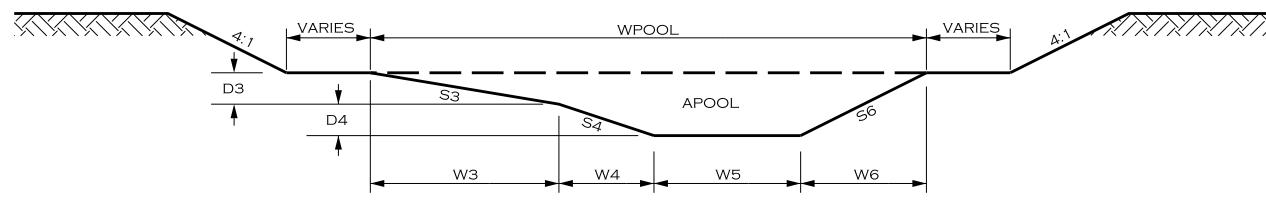
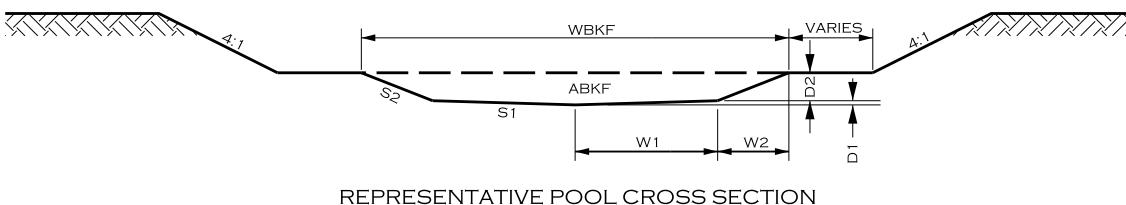
17575 N. ELDRIDGE PARKWAY, BLDG. C
TOMBALL, TX 77377
TEXAS REGISTERED ENGINEERING FIRM F-1499

PROJECT ENGINEER

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KEVIN TWEEDY PE#113620
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REPRESENTATIVE SECTIONS

'C' TYPE CHANNELS

VOLUME NO.
VOL. 3SHEET NO.
4.2REPRESENTATIVE
SECTIONS

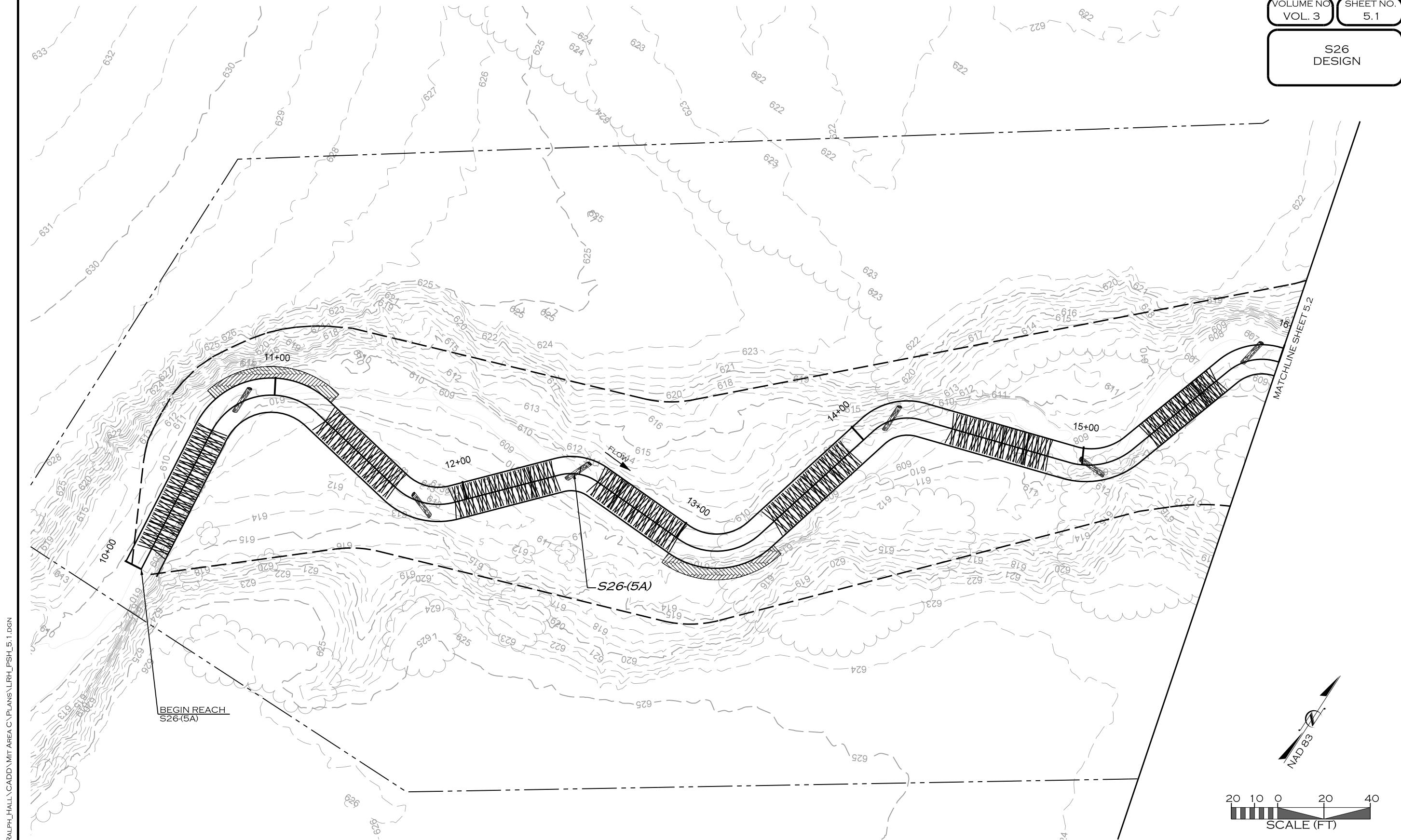
C STREAM TYPE REPRESENTATIVE CROSS SECTION DIMENSIONS

Stream	Sheet Range	Station Range	RIFLES							POOLS											
			ABKF	WBKF	W1	W2	D1	D2	S1	S2	APool	WPool	W3	W4	W5	W6	D3	D4	S3	S4	S6
S25-(7)	5.70 - 5.71	10+00 to 16+41	18.5	18.2	5.7	3.4	0.28	1.14	20:1	3:1	29.0	21.9	8.2	4.1	1.4	8.2	1.37	1.37	6:1	3:1	3:1
S25-(9a)	5.78 - 5.85	53+23 to 96+64	22.3	16.4	5.1	3.1	0.37	1.53	14:1	2:1	34.4	19.6	6.3	3.1	3.9	6.3	1.57	1.57	4:1	2:1	2:1
S25-(9b)	5.85 - 5.88	96+64 to 111+44	22.6	16.5	5.1	3.1	0.38	1.54	14:1	2:1	35.1	19.8	6.3	3.2	4.0	6.3	1.58	1.58	4:1	2:1	2:1
S25-TRIB1-(2a)	5.108 - 5.109	16+03 to 22+86	2.6	6.8	2.1	1.3	0.10	0.43	20:1	3:1	4.1	8.2	3.1	1.5	0.5	3.1	0.52	0.51	6:1	3:1	3:1
S25-TRIB12-(2)	5.110 - 5.111	13+34 to 17+17	1.9	5.8	1.8	1.1	0.09	0.37	20:1	3:1	3.0	7.0	2.6	1.3	0.4	2.6	0.44	0.44	6:1	3:1	3:1
S25-TRIB12-(3)	5.111 - 5.112	17+17 to 21+61	3.4	7.8	2.4	1.5	0.12	0.49	20:1	3:1	5.3	9.4	3.5	1.7	0.6	3.5	0.59	0.58	6:1	3:1	3:1
S25-TRIB12-(5a)	5.113	26+38 to 30+18	4.9	9.4	2.9	1.8	0.14	0.59	20:1	3:1	7.7	11.3	4.3	2.1	0.7	4.2	0.71	0.70	6:1	3:1	3:1
S25-TRIB12-(5b)	5.113 - 5.114	30+18 to 36+45	5.5	9.9	3.1	1.9	0.15	0.62	20:1	3:1	8.6	11.9	4.5	2.2	0.7	4.5	0.75	0.74	6:1	3:1	3:1
S25-TRIB12-(7)	5.115 - 5.116	42+36 to 45+45	5.7	10.1	3.2	1.9	0.15	0.63	20:1	3:1	9.0	12.2	4.6	2.3	0.8	4.6	0.76	0.76	6:1	3:1	3:1
S25-TRIB12-A1-(2)	5.117, 5.113	19+53 to 23+04	2.4	5.4	1.7	1.0	0.12	0.50	14:1	2:1	3.7	6.4	2.1	1.0	1.2	2.1	0.52	0.51	4:1	2:1	2:1
S25-TRIB12-A2-(1)	5.112, 5.120 - 5.121	10+00 to 21+66	2.7	7.0	2.2	1.3	0.11	0.44	20:1	3:1	4.3	8.4	3.2	1.6	0.5	3.2	0.53	0.52	6:1	3:1	3:1
S25-TRIB12-A3-(1)	5.119, 5.111	10+00 to 17+80	2.7	7.0	2.2	1.3	0.11	0.44	20:1	3:1	4.3	8.4	3.2	1.6	0.5	3.2	0.53	0.52	6:1	3:1	3:1
S25-TRIB13-(1)	5.89	10+00 to 16+16	2.7	5.2	1.2	1.4	0.02	0.71	63:1	2:1	3.5	6.2	2.4	1.2	0.2	2.4	0.60	0.60	4:1	2:1	2:1
S25-TRIB13-(2)	5.89 - 5.91	16+16 to 23+28	3.9	8.4	2.6	1.6	0.13	0.52	20:1	3:1	6.2	10.1	3.8	1.9	0.6	3.8	0.63	0.63	6:1	3:1	3:1
S25-TRIB13-(3)	5.91 - 5.93	23+28 to 37+19	5.3	8.6	3.1	1.2	0.25	0.62	13:1	2:1	9.1	10.3	2.8	1.4	3.2	2.8	0.71	0.71	4:1	2:1	2:1
S25-TRIB13-A1-(2)	5.91, 5.95 - 5.96	19+53 to 26+76	3.0	7.3	2.3	1.4	0.11	0.46	20:1	3:1	4.7	8.8	3.3	1.7	0.6	3.3	0.55	0.55	6:1	3:1	3:1
S25-TRIB15-(1)	5.134 - 5.137	10+00 to 29+76	3.1	7.5	2.3	1.4	0.11	0.47	20:1	3:1	4.9	9.0	3.4	1.7	0.6	3.4	0.56	0.56	6:1	3:1	3:1
S25-TRIB2-(1)	5.105	10+00 to 15+35	2.1	6.1	1.9	1.2	0.09	0.38	20:1	3:1	3.3	7.4	2.8	1.4	0.5	2.8	0.46	0.46	6:1	3:1	3:1
S25-TRIB3-(1)	5.133	10+00 to 16+81	6.2	9.3	3.3	1.3	0.27	0.67	13:1	2:1	10.7	11.2	3.1	1.5	3.5	3.1	0.77	0.76	4:1	2:1	2:1
S25-TRIB4-(2)	5.102 - 5.104	13+17 to 27+23	3.1	7.5	2.3	1.4	0.11	0.47	20:1	3:1	4.9	9.0	3.4	1.7	0.6	3.4	0.56	0.56	6:1	3:1	3:1
S25-TRIB5-(0)	5.129 - 5.131	10+00 to 26+54	2.8	7.1	2.2	1.3	0.11	0.44	20:1	3:1	4.4	8.5	3.2	1.6	0.6	3.2	0.53	0.53	6:1	3:1	3:1
S25-TRIB6-(1)	5.97 - 5.100	10+00 to 29+08	3.9	8.4	2.6	1.6	0.13	0.52	20:1	3:1	6.2	10.1	3.8	1.9	0.6	3.8	0.63	0.63	6:1	3:1	3:1
S26-(5a)	5.1 - 5.2	10+00 to 19+65	13.1	15.4	4.8	2.9	0.23	0.96	20:1	3:1	20.5	18.4	6.9	3.5	1.2	6.9	1.15	1.15	6:1	3:1	3:1
S26-(5b)	5.2 - 5.3	19+65 to 24+60	13.8	12.9	4.0	2.4	0.29	1.21	14:1	2:1	21.2	15.4	5.0	2.5	3.0	4.9	1.24	1.23	4:1	2:1	2:1
S26-(5c)	5.3 - 5.8	24+60 to 52+50	16.4	17.2	5.4	3.2	0.26	1.07	20:1	3:1	25.7	20.6	7.7	3.9	1.3	7.7	1.29	1.29	6:1	3:1	3:1
S26-(6a)	5.8 - 5.12	53+25 to 78+65	17.4	17.7	5.5	3.3	0.27	1.11	20:1	3:1	27.2	21.2	8.0	4.0	1.3	8.0	1.33	1.32	6:1	3:1	3:1
S26-(6b)	5.12 - 5.14	78+65 to 94+46	18.8	18.4	5.7	3.4	0.28	1.15	20:1	3:1	29.6	22.1	8.3	4.1	1.4	8.3	1.38	1.38	6:1	3:1	3:1
S26-(6c)	5.14 - 5.19	94+46 to 116+88	20.2	19.1	6.0	3.6	0.29	1.19	20:1	3:1	31.8	22.9	8.6	4.3	1.5	8.6	1.43	1.43	6:1	3:1	3:1
S26-(6d)	5.18 - 5.19	116+88 to 119+36	20.9	18.3	4.8	4.3	0.16	1.44	31:1	3:1	29.0	21.9	7.9	3.9	2.2	7.9	1.32	1.31	6:1	3:1	3:1
S26-(6e)	5.19 - 5.24	119.36 to 151.72	22.1	19.9	6.2	3.7	0.30	1.25	20:1	3:1	34.6	23.9	9.0	4.5	1.5	9.0	1.50	1.49	6:1	3:1	3:1
S26-TRIB10-(1a)	5.27 - 5.29	10+00 to 25+83	4.3	6.6	1.5	1.8	0.02	0.89	63:1	2:1	5.7	7.9	3.0	1.5	0.3	3.0	0.76	0.75	4:1	2:1	2:1
S26-TRIB10-(1b)	5.14, 5.29 - 5.31	25+83 to 38+19	6.4	10.7	3.4	2.0	0.16	0.67</													

VOLUME NO. SHEET NO.
VOL. 3 51

SHEET NO.
5-1

S26
DESIGN



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**UPPER TRINITY REGIONAL
WATER DISTRICT**

900 N KEALY ST
LEWISVILLE, TX 75057

LAKE RALPH HALL MITIGATION
MITIGATION ZONE C
FANNIN COUNTY, TEXAS



ED IN THE OFFICE OF:
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RESTORATION**

17575 N. ELDRIIDGE PARKWAY, BLDG. C
TOMBALL, TX 77377
TEXAS REGISTERED ENGINEERING FIRM F-14997

PROJECT ENGINEER

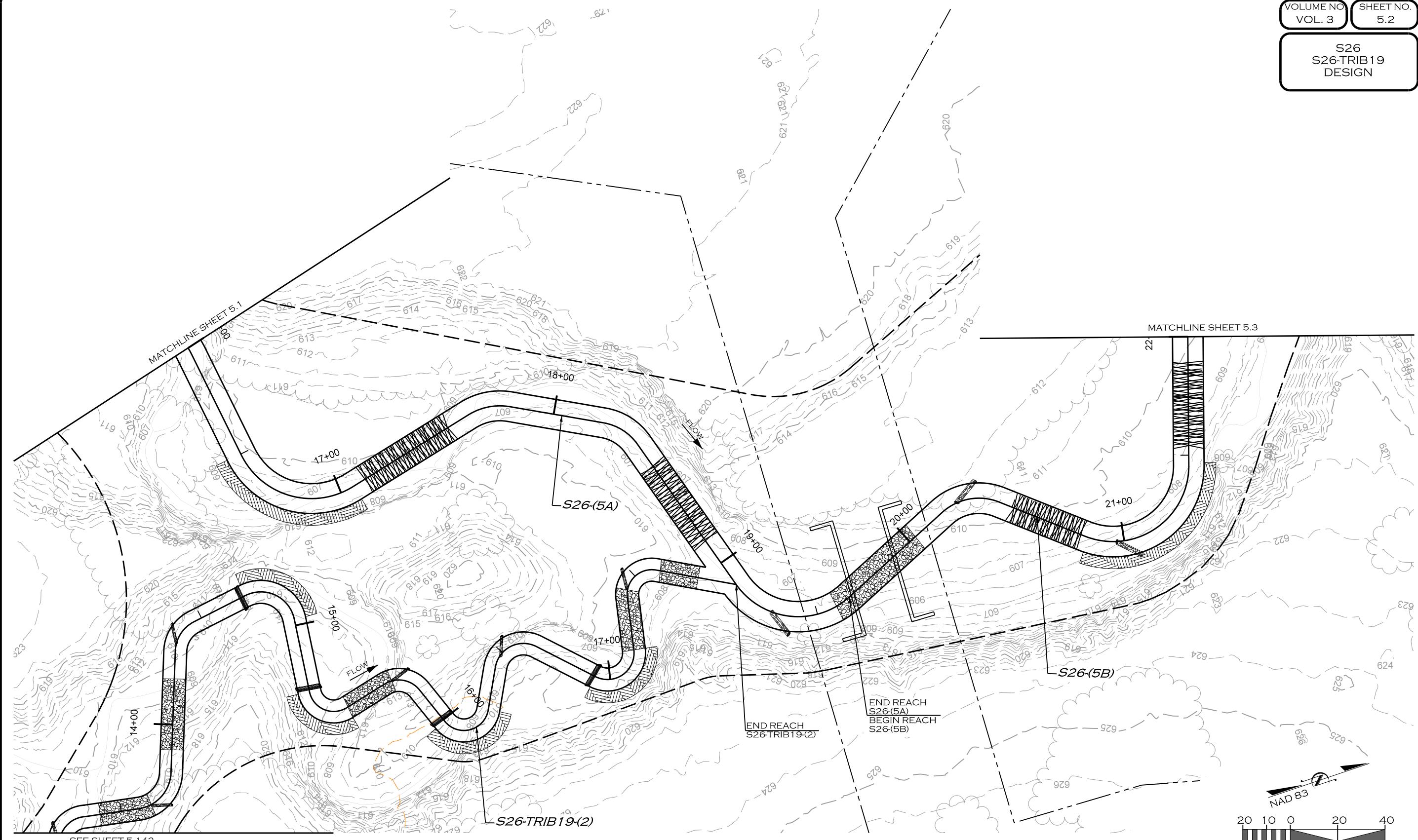
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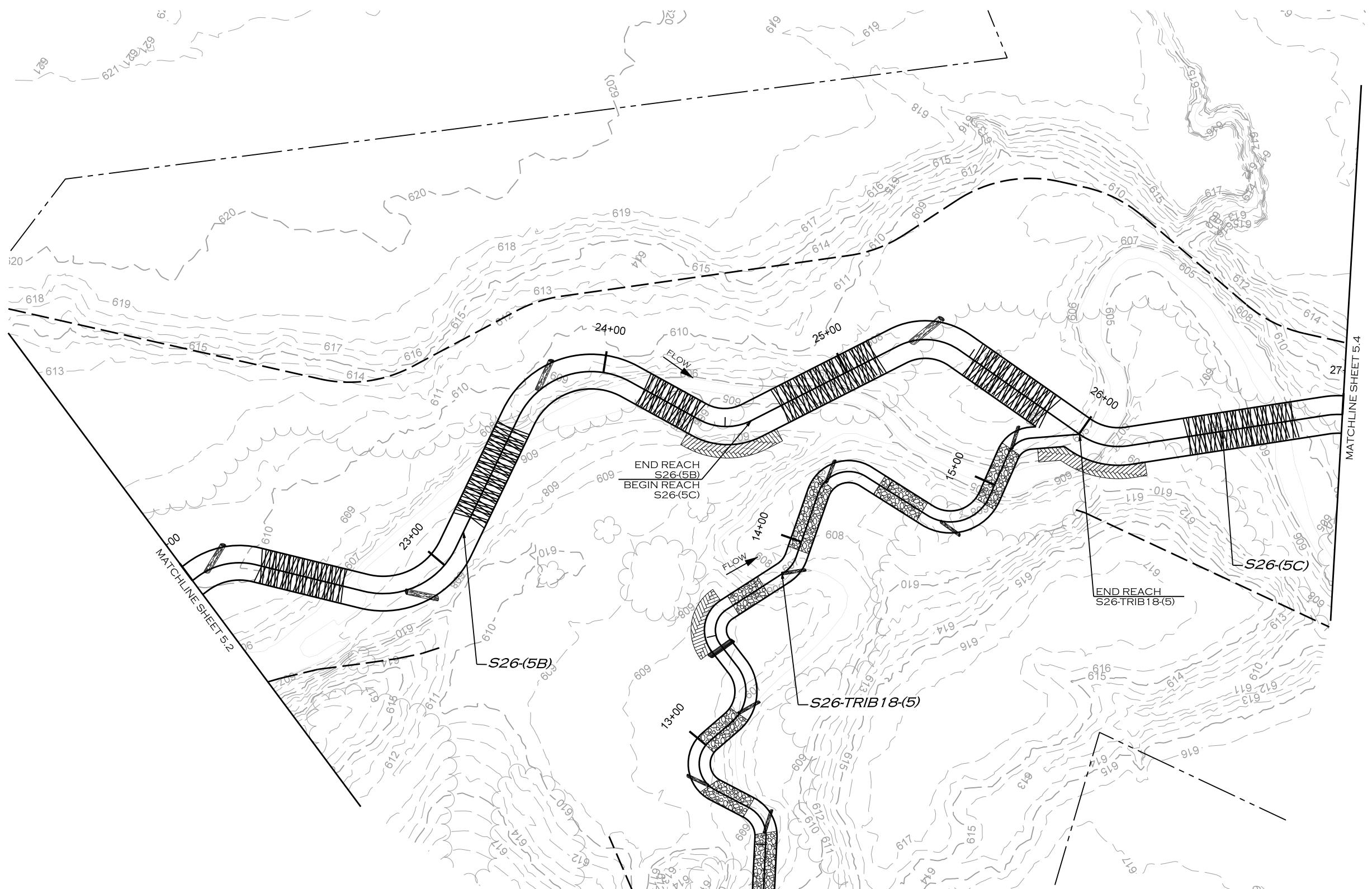
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VOL. 3

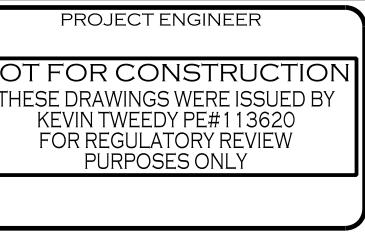
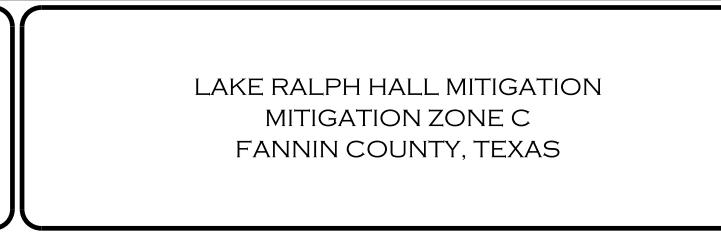
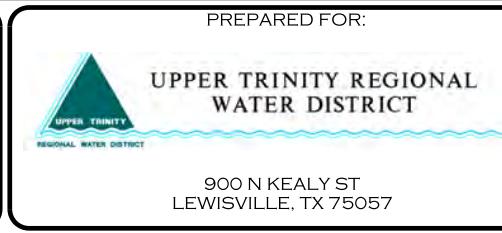
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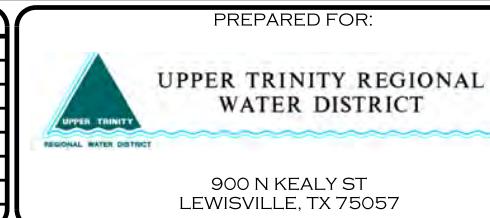
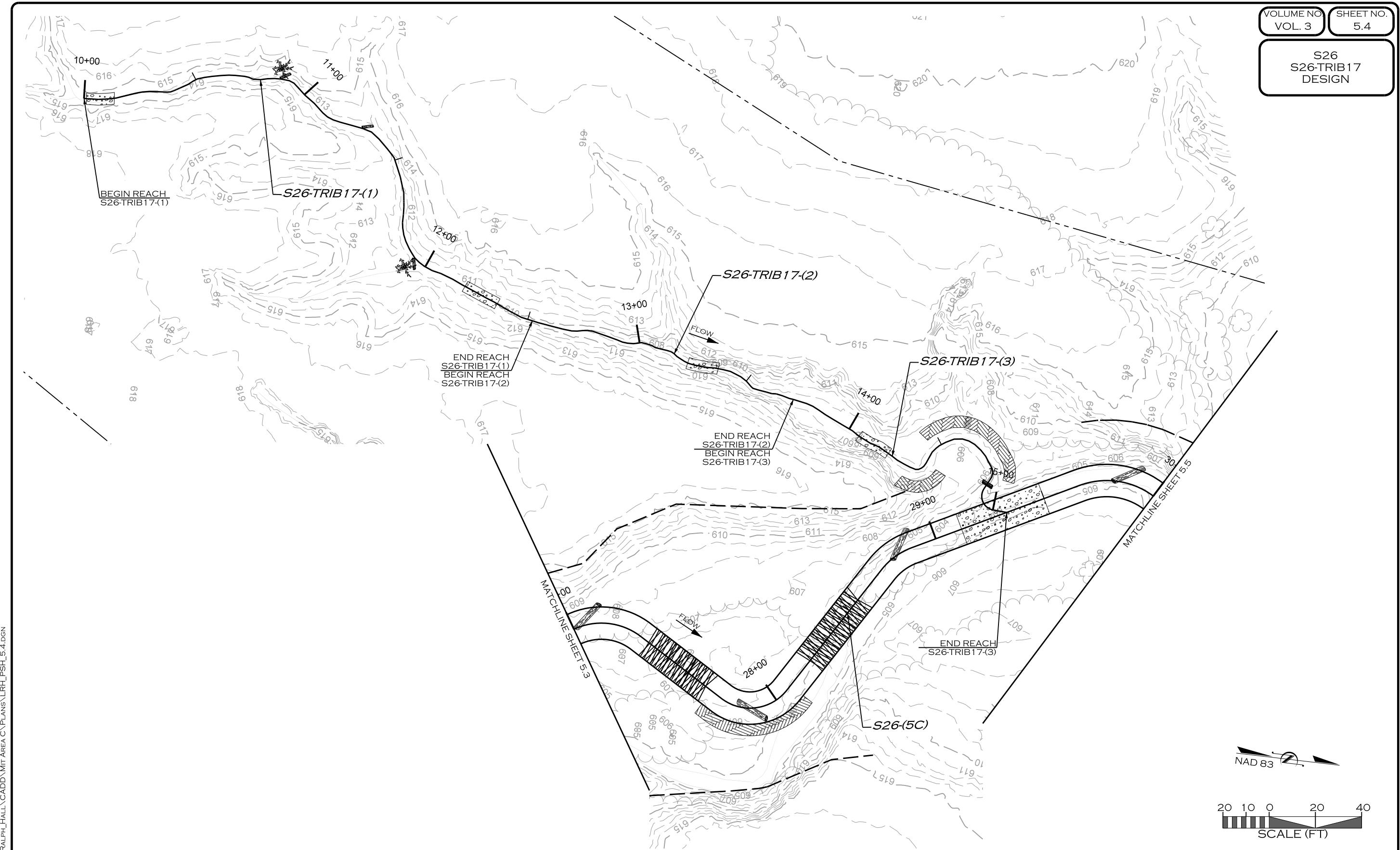
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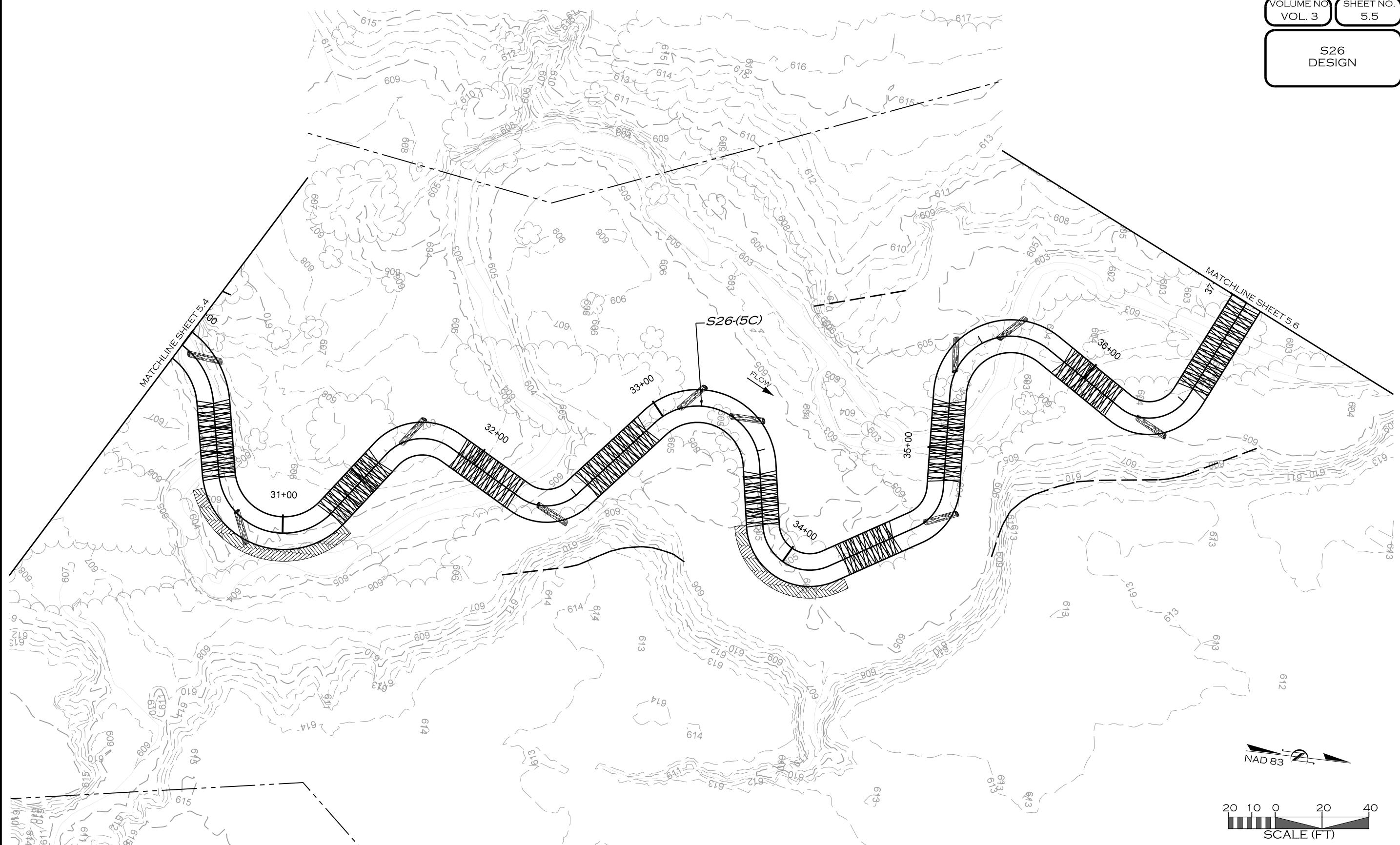


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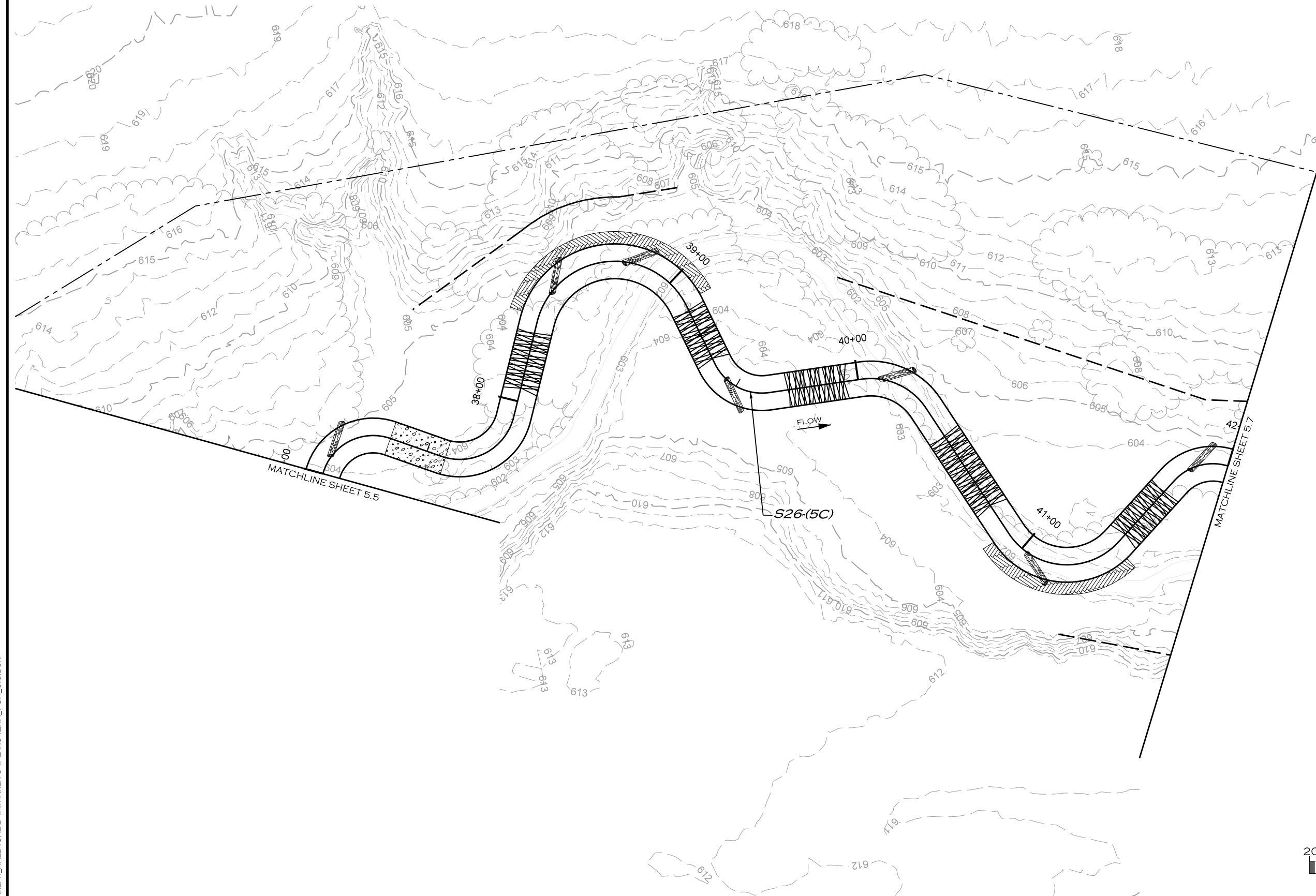


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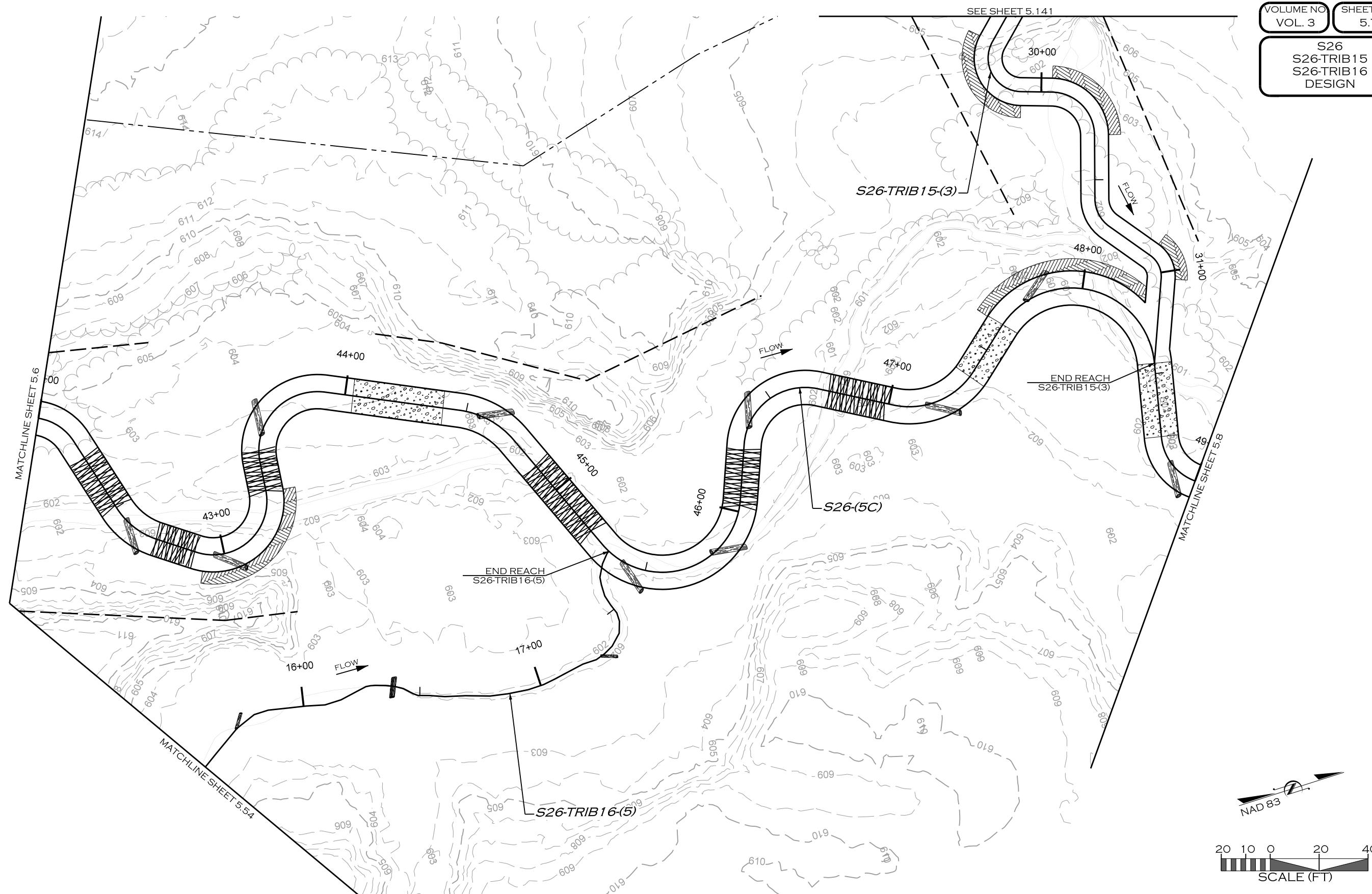
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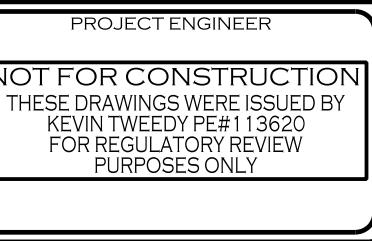
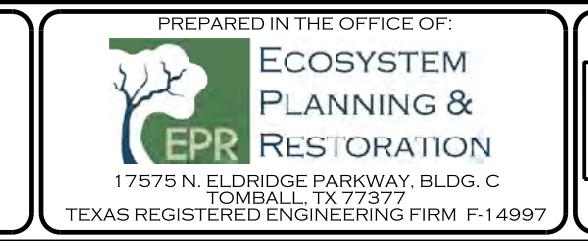
VOLUME NO.
VOL. 3
SHEET NO.
5.7

S26
S26-TRIB15
S26-TRIB16
DESIGN

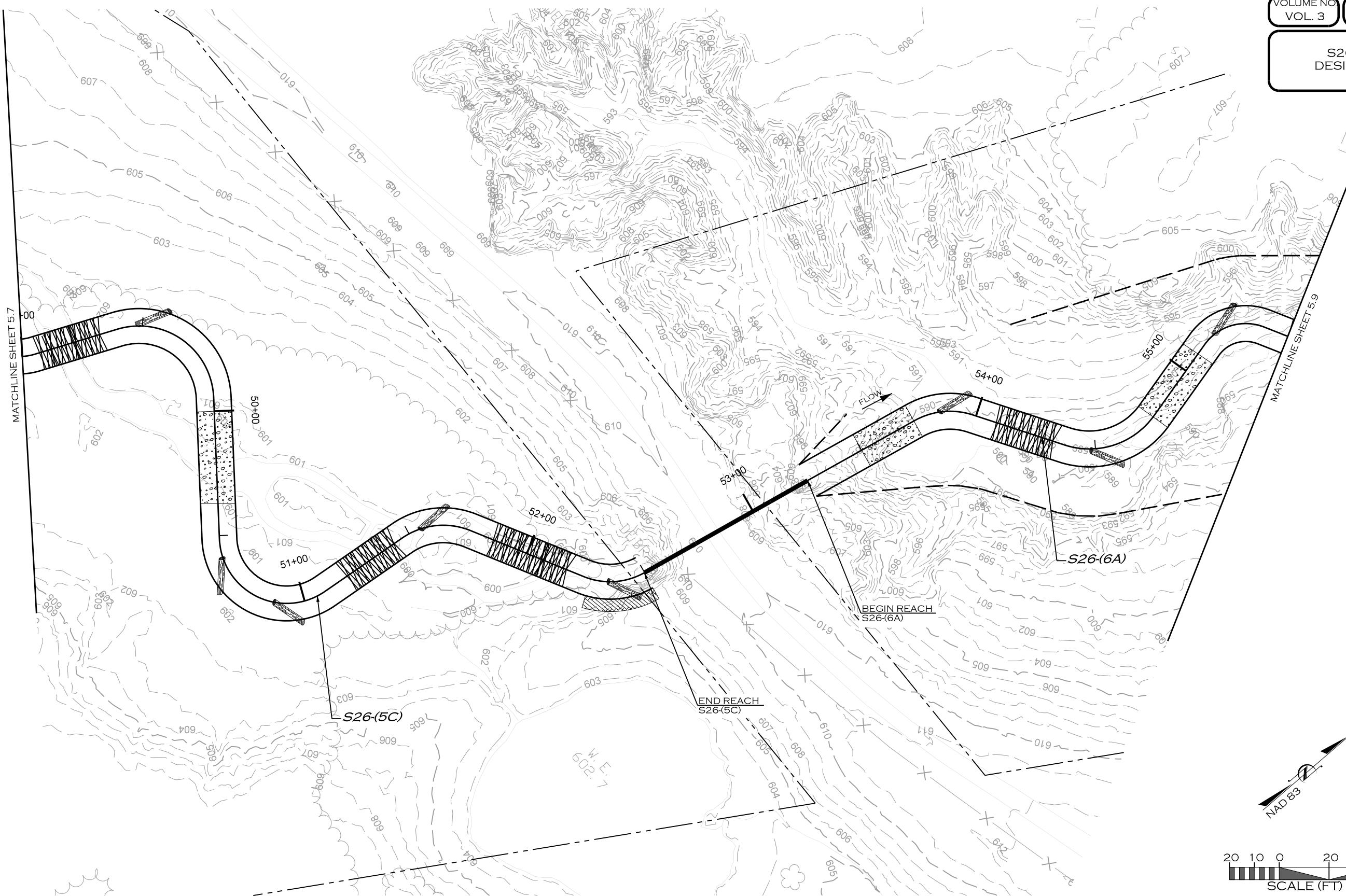


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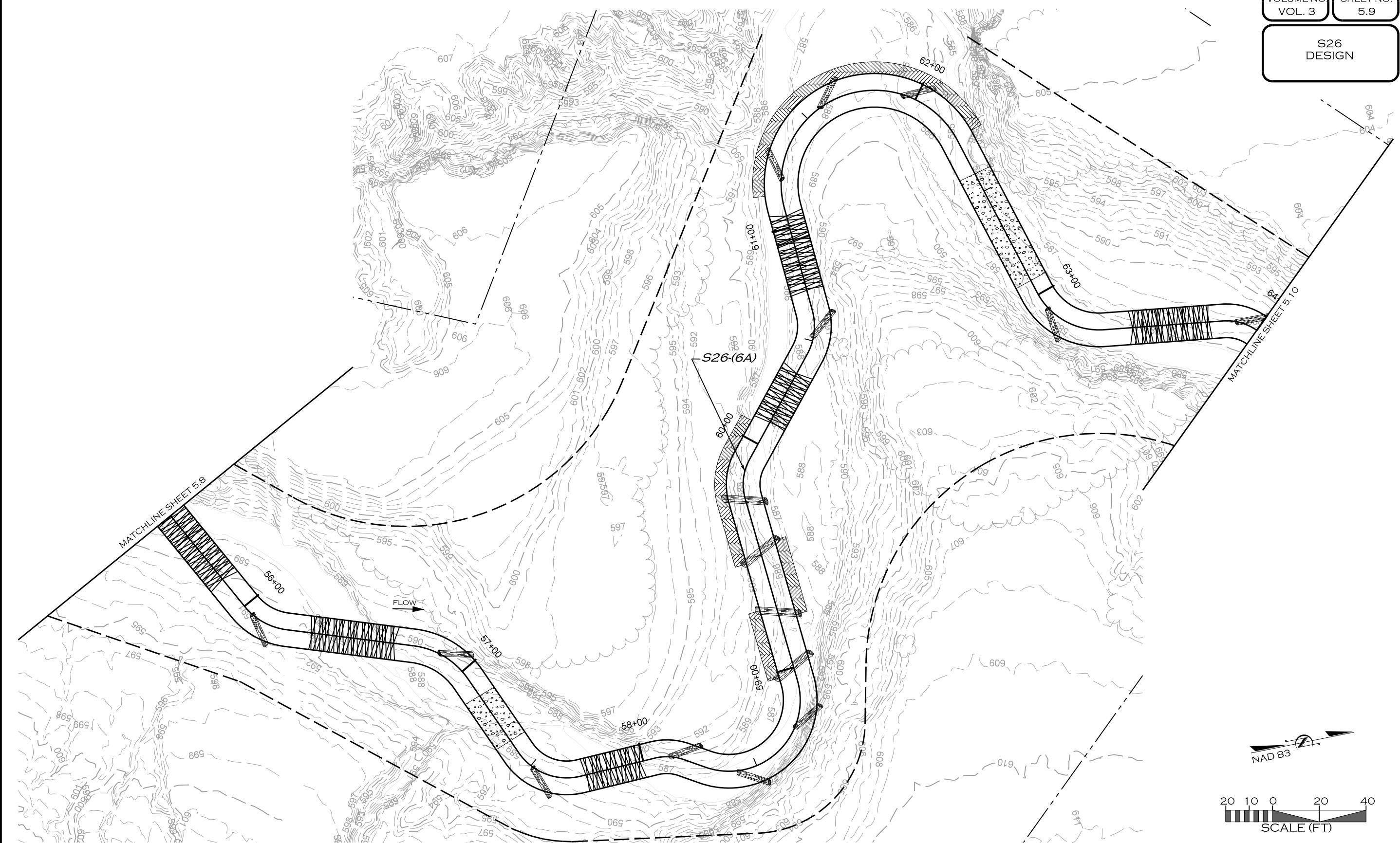


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SHEET NO.
5.9

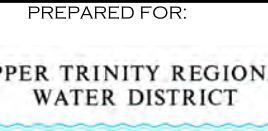
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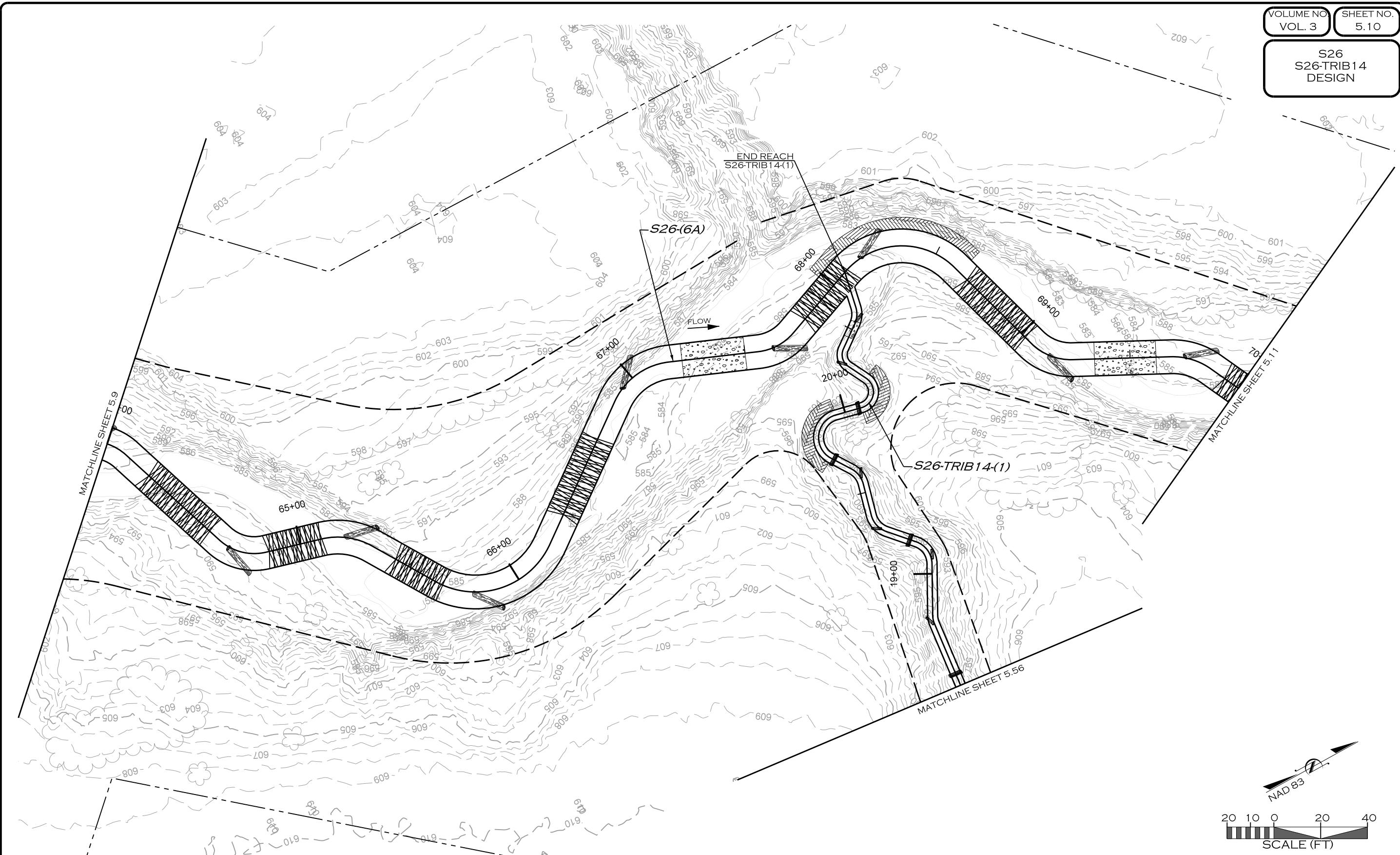
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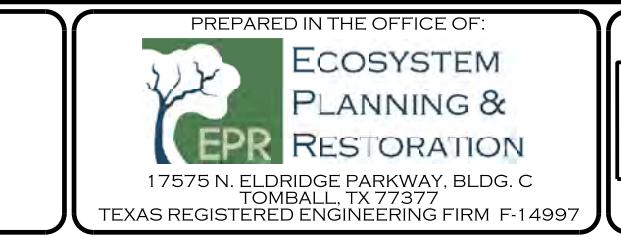


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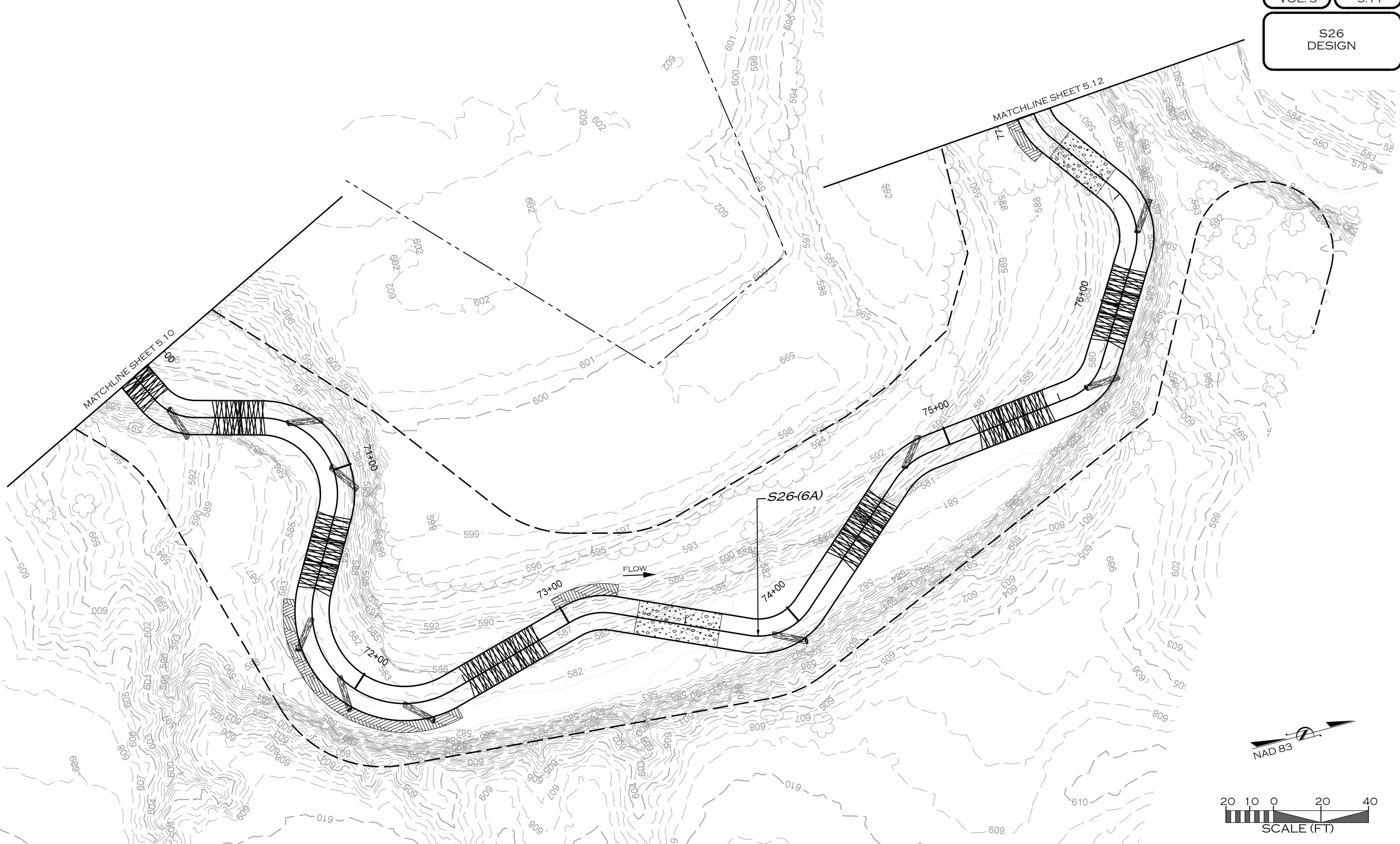
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5.11

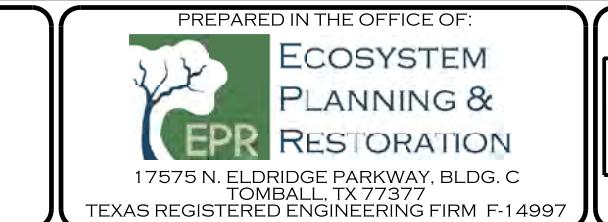
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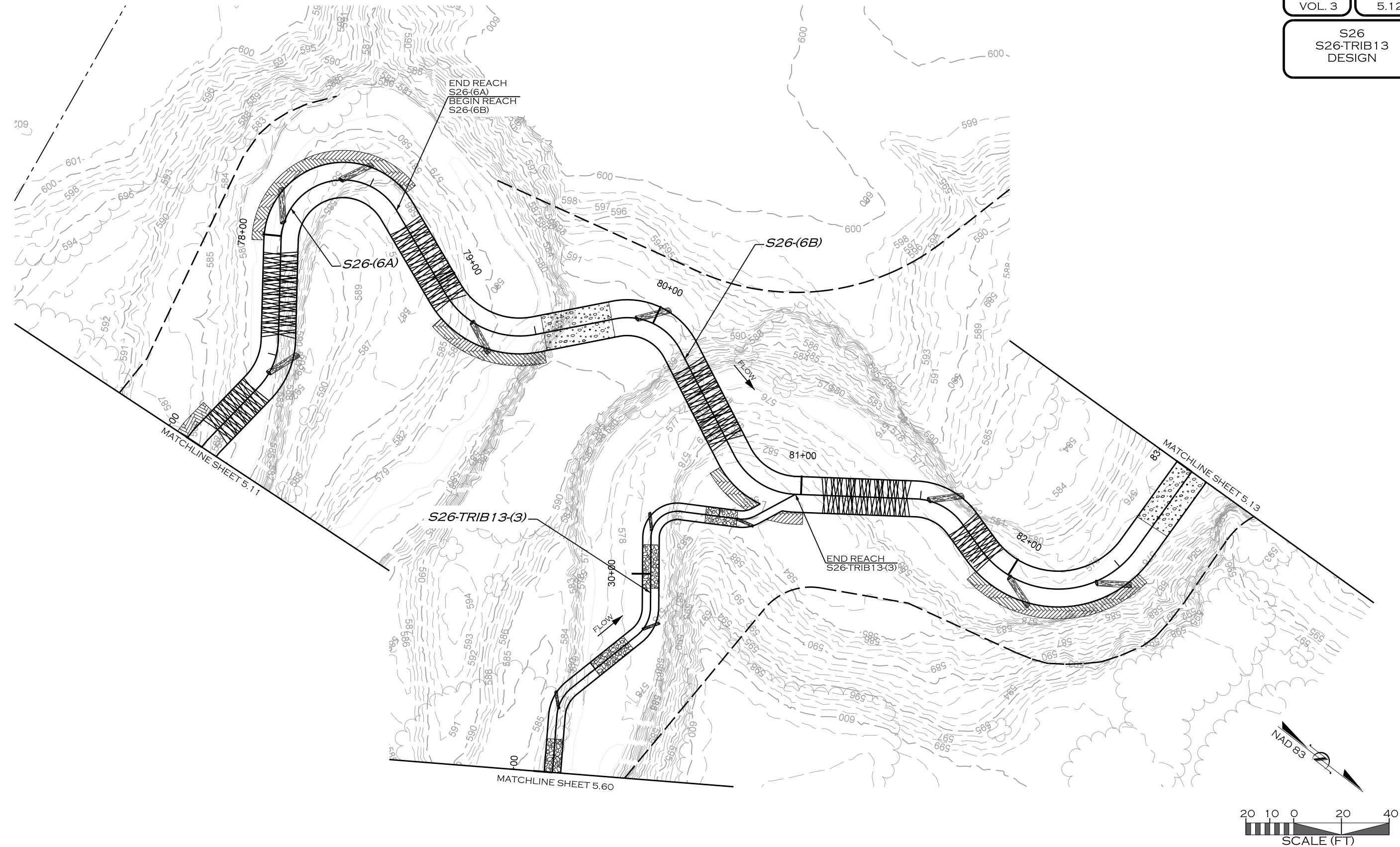


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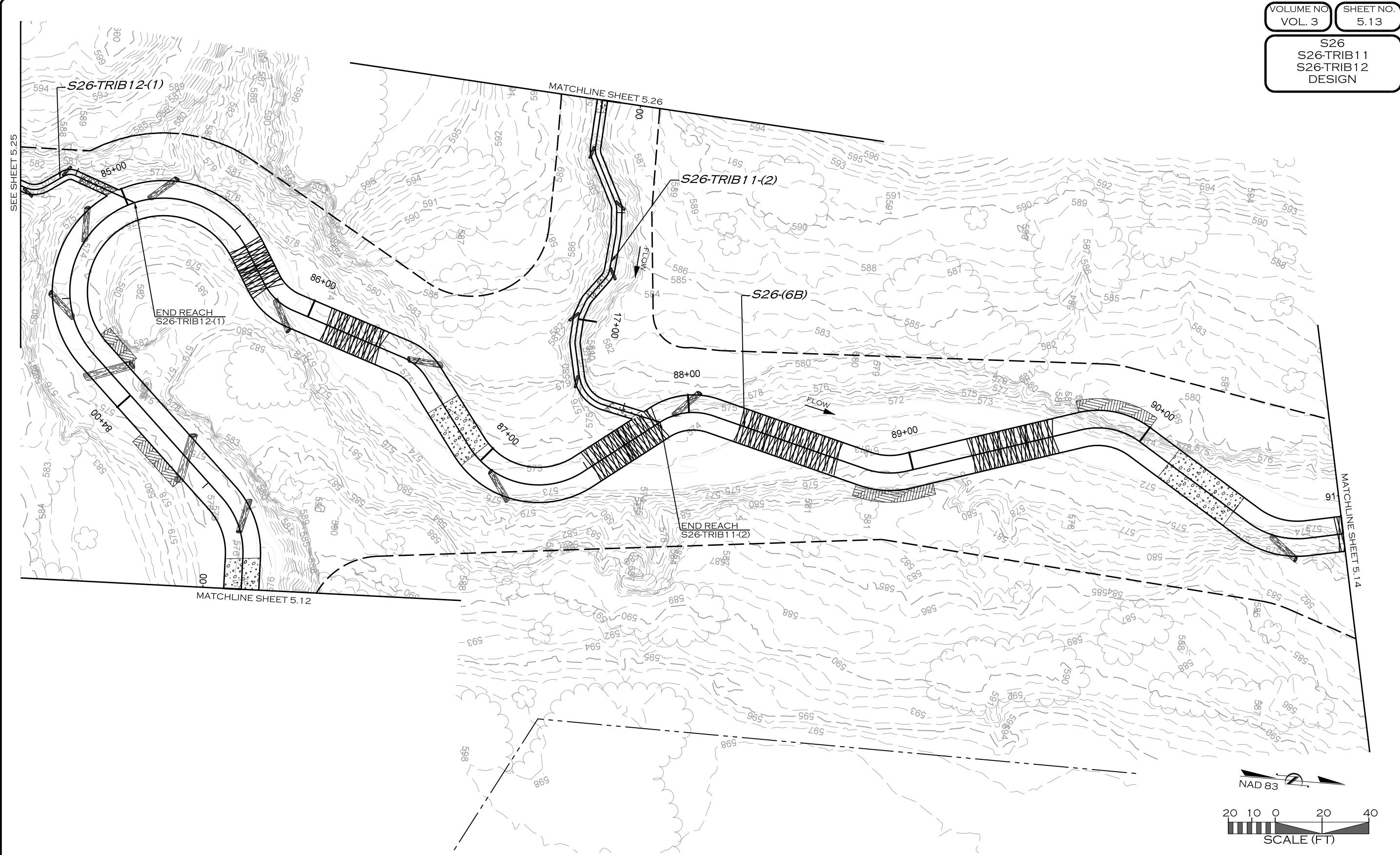
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S26-TRIB12
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