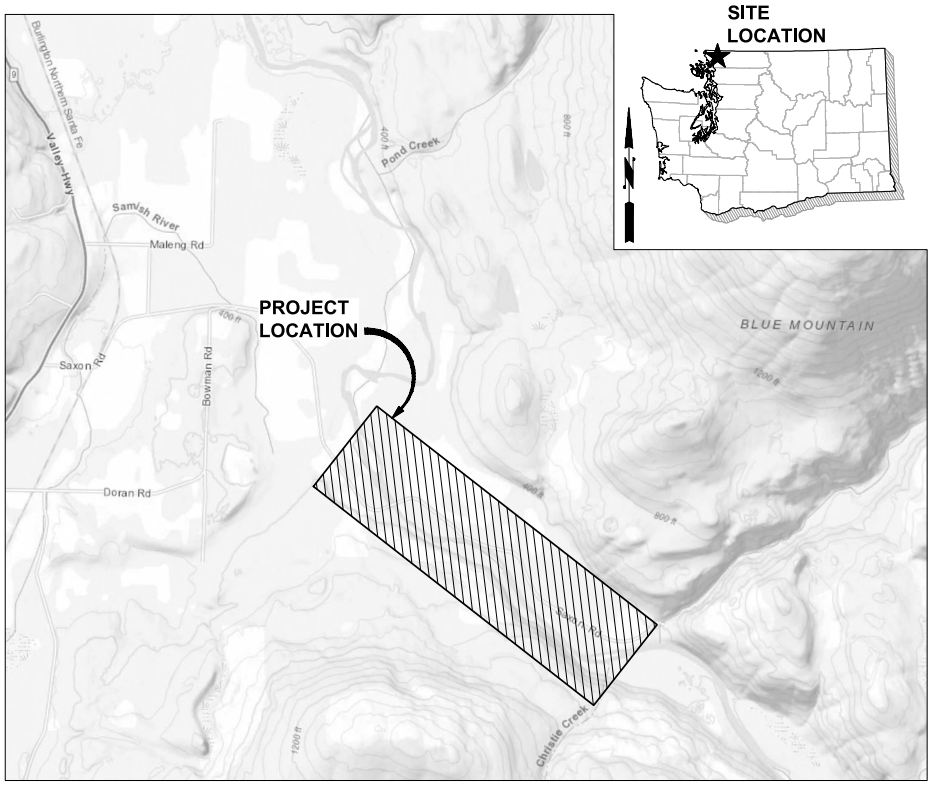
SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO HABITAT RESTORATION PROJECT - PHASE 3

WHATCOM COUNTY, WASHINGTON



VICINITY MAP
SCALE: 1"=1/4 MILE

OWNER:

LUMNI NATION
BELLINGHAM, WA 98226
PHONE: (360) 410-1988
CONTACT: ALEX LEVELL

ENGINEER:

HERRERA ENVIRONMENTAL CONSULTANTS
2200 SIXTH AVENUE, SUITE 1100
SEATTLE, WA 98121
PHONE: (206) 441-9080
CONTACT: IAN MOSTRENKO

SHEET INDEX

PRELIMINARY DESIGN

No.	REVISION	BY	APP'D	DATE

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DESIGNED: B. SCOTT	DRAWN: M. McCARTHY
DESIGNED: T. FOULK	CHECKED: B. SCOTT
SCALE: AS NOTED	APPROVED: B. SCOTT

SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

COVER

DATE: MAY 2025
PROJECT NO: 14-05790-000
DRAWING NO: G0.01
SHEET NO: 1 OF 28

O:\proj\Y2014\14-05790-000\CAD\Sheet\Pln3\Cover.dwg | 5/5/2025 11:25 AM | Eric Marshall

ABBREVIATIONS

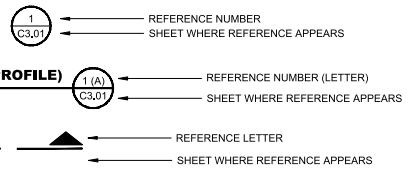
APPROX	APPPROXIMATE
AVG	AVERAGE
BMP	BEST MANAGEMENT PRACTICE
CG	CLEAR AND GRUB
C/L, CL	CENTERLINE
CONC	CONCRETE
CONST	CONSTRUCT, CONSTRUCTION
CP	CONTROL POINT
DIA	DIAMETER
DWG	DRAWING
E	EAST, EASTING
EA	EACH
EG	EXISTING GROUND
EL	ELEVATION
ELS	ENGINEERED LOG STRUCTURE
EX	EXISTING
FG	FINISHED GROUND
FT	FEET/FOOT
HOR	HORIZONTAL
HT	HEIGHT
IN	INCH/INCHES
L	LENGTH
LF	LINEAL FOOT/FEET
LT	LEFT
MAX	MAXIMUM
MIN	MINIMUM
N	NORTH/NORTHING
NA	NOT APPLICABLE
NO	NUMBER
NTS	NOT TO SCALE
OC	ON CENTER
OHW	ORDINARY HIGH WATER
QTY	QUANTITY
REF	REFERENCE
ROW	RIGHT-OF-WAY
RT	RIGHT
S	SOUTH, SLOPE
SPEC	SPECIFICATION
SR	STATE ROUTE
STA	STATION
STD	STANDARD
TESC	TEMPORARY EROSION AND SEDIMENT CONTROL
TYP	TYPICAL
W	WEST, WATER
WSDOT	WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
WSE	WATER SURFACE ELEVATION

LEGEND - EXISTING

- PARCEL LINE
- OHW — ORDINARY HIGH WATER
- WETLAND
- FLOW DIRECTION
- 13.0 — RIVER MILE

LEGEND - PROPOSED

- GRADING LIMITS
- ACCESS ROAD
- CONSTRUCTION STAGING AREA
- SILT BOOM OR TURBIDITY CURTAIN
- SF — SILT FENCE
- HVSF — HI-VIZ SILT FENCE
- STABILIZED CONSTRUCTION ENTRANCE
- ALLUVIUM BACKFILL
- SLASH/ALLUVIUM MATRIX
- SLASH AND RACKING
- SCOUR ROCK
- TYPE 1 SMALL ELS
- TYPE 2 SMALL ELS
- TYPE 3 MEDIUM RIGHT BANK ELS
- TYPE 3 MEDIUM LEFT BANK ELS
- TYPE 4 LARGE MID-CHANNEL ELS
- TYPE 5 LARGE RIGHT BANK ELS
- TYPE 5 LARGE LEFT BANK ELS
- TYPE 6 ELS
- EDGE HABITAT ELS



"-" INDICATES THAT THE DETAIL IS SHOWN ON THE SAME SHEET OR IS A TYPICAL DETAIL.

"VAR" SPECIFIES THAT DETAIL/SECTION WAS TAKEN FROM VARIOUS DRAWINGS

DETAIL/SECTION REFERENCING

PRELIMINARY DESIGN

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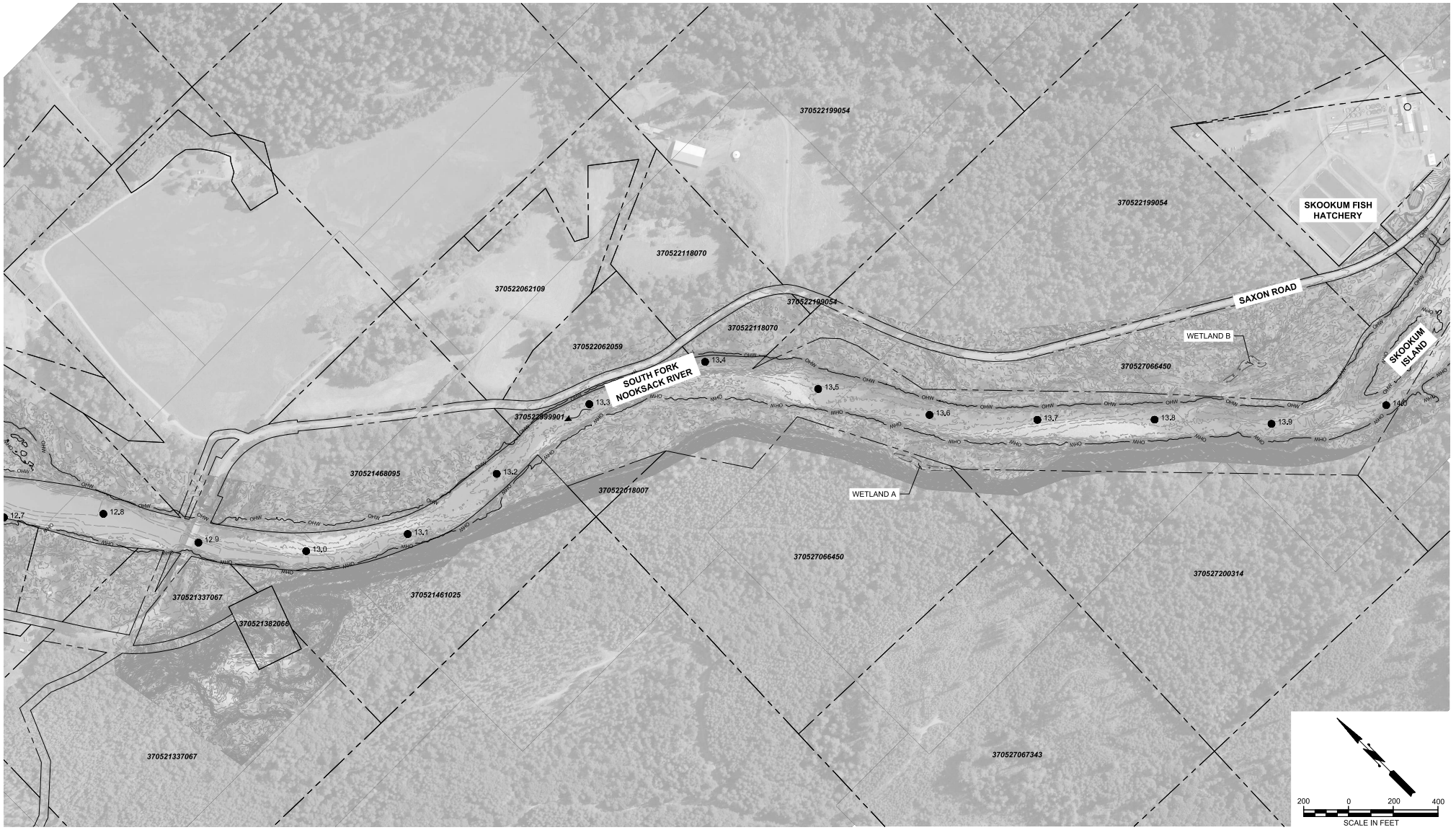
PROJECT - PHASE 3

LEGEND AND ABBREVIATIONS

DATE:	MAY 2025
PROJECT NO:	14-05790-000
DRAWING NO:	G0.02
SHEET NO:	2 OF 28



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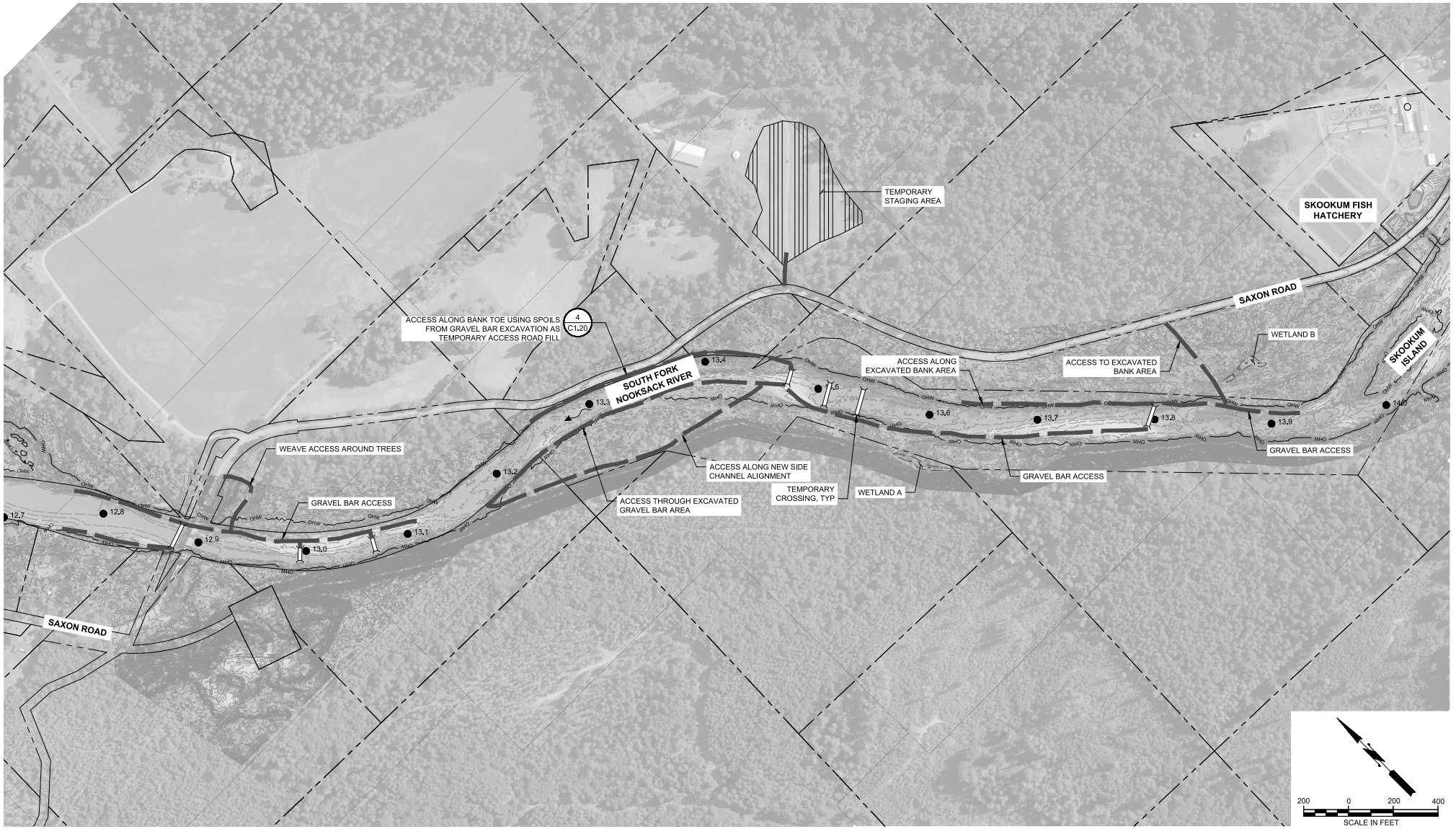
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

EXISTING CONDITIONS

DATE:	MAY 2025
PROJECT NO:	14-05790-000
DRAWING NO:	C0.01
SHEET NO:	3 OF 28



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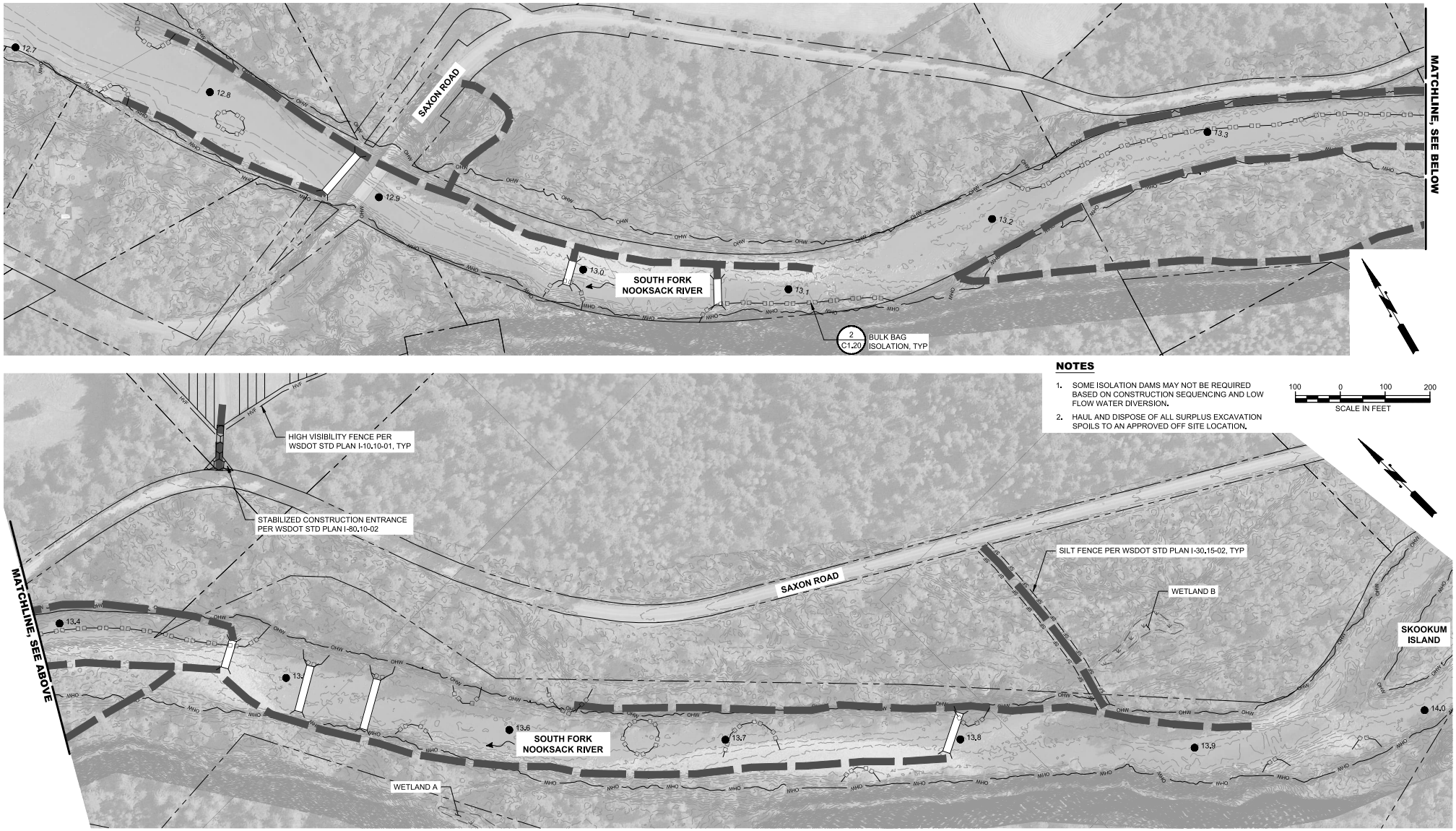
SOUTH FORK NOOKSACK RIVER

SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

SITE PREPARATION, ACCESS ROADS, AND STAGING AREAS

DATE: MAY 2025
PROJECT NO: 14-05790-000
DRAWING NO: C1.01
SHEET NO: 4 OF 28



NOTES

1. SOME ISOLATION DAMS MAY NOT BE REQUIRED BASED ON CONSTRUCTION SEQUENCING AND LOW FLOW WATER DIVERSION.
2. HAUL AND DISPOSE OF ALL SURPLUS EXCAVATION SPOILS TO AN APPROVED OFF SITE LOCATION.

100 0 100 200
SCALE IN FEET

PRELIMINARY DESIGN

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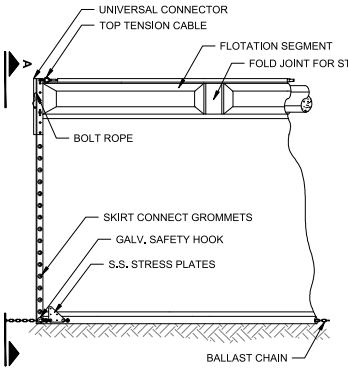
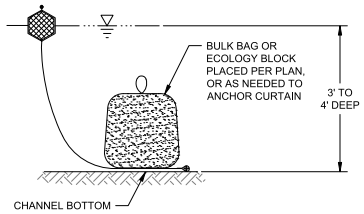
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

TESC AND WATER MANAGEMENT PLAN

DATE:	MAY 2025
PROJECT NO:	14-05790-000
DRAWING NO:	C1.10
SHEET NO:	5 OF 28



ELEVATION



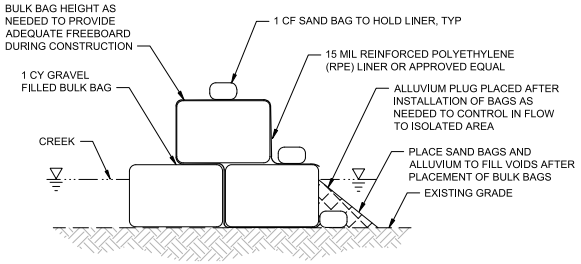
SECTION A

TURBIDITY CURTAIN NOTES:

1. TURBIDITY CURTAIN SHALL BE 12-FOOT-DEEP PERMEATEX SILT CONTAINMENT BOOM-MODEL SCB 12-100 OR APPROVED EQUAL.
2. TURBIDITY CURTAIN TO BE STABILIZED BOTH TRANSVERSELY AND LONGITUDINALLY AS APPROVED BY THE ENGINEER.
3. BULK BAGS SHALL HAVE POLY BAG LINERS.
4. MATERIAL USED TO FILL BULK BAGS SHALL BE PIT RUN.
5. BULK BAGS SHALL HAVE 4 LONG HANDLES AT CORNERS FOR CENTER LIFT.

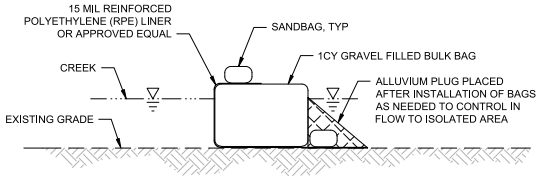
DETAIL - FAST WATER TURBIDITY CURTAIN 1

SCALE: NTS



DETAIL - TYPICAL BULK BAG ISOLATION 2

SCALE: NTS

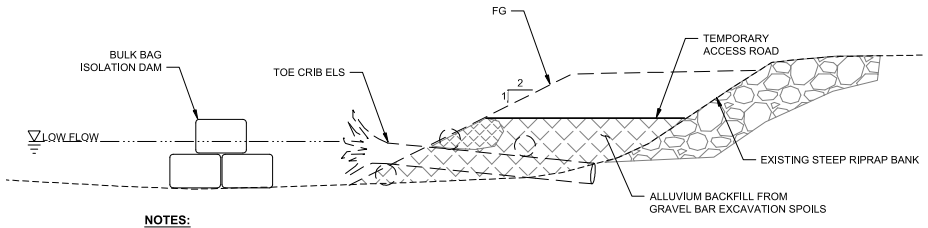


DETAIL - TYPICAL SINGLE BULK BAG ISOLATION 3

SCALE: NTS

BULK BAG NOTES:

1. PLACE/REMOVE ALLUVIUM AS LAST/FIRST STEP OF BULK BAG ISOLATION SYSTEM INSTALLATION/REMOVAL.
2. ONLY INSTALL SINGLE BULK BAG ISOLATION WHERE WATER SURFACE EXPECTED TO BE LESS THAN 2 FT.
3. TRANSITION LINER FROM EXTERIOR (UPSTREAM END) OF ISOLATION TO INTERIOR OF ISOLATION APPROXIMATELY 1/2 THE LENGTH OF THE ISOLATION WHERE RIVER WATER INFILTRATION INTO THE WORK AREA TRANSITIONS TO EXFILTRATION.
4. TRANSITION ISOLATION HEIGHT INTO BANKS USING SAND BAGS.



NOTES:

1. CONSTRUCT ISOLATION DAM AND TEMPORARY ACCESS ROAD USING SPOILS FROM GRAVEL BAR EXCAVATION.
2. DEPTH OF TEMPORARY FILL WILL VARY BASED ON SEQUENCING AND MEANS AND METHODS TO RAMP ACCESS ROAD UP TO SAXON ROAD.
3. CONSTRUCT BANK PROTECTION TOE CRIB ELS WHILE DECOMMISSIONING ACCESS ROAD AND PLACEMENT OF FILL AND FINAL GRADING OF BANK.

DETAIL - ACCESS ALONG BANK TOE 4

SCALE: NTS

NOTE TO REVIEWER:
WSDOT STANDARD DETAILS WILL BE USED WHEREVER FEASIBLE. TYPICALLY STATING ON THE CALLOUT IS PREFERRED, ALTHOUGH ADDING THE PDFs OF THE WSDOT DETAILS IS AN OPTION.

PRELIMINARY DESIGN

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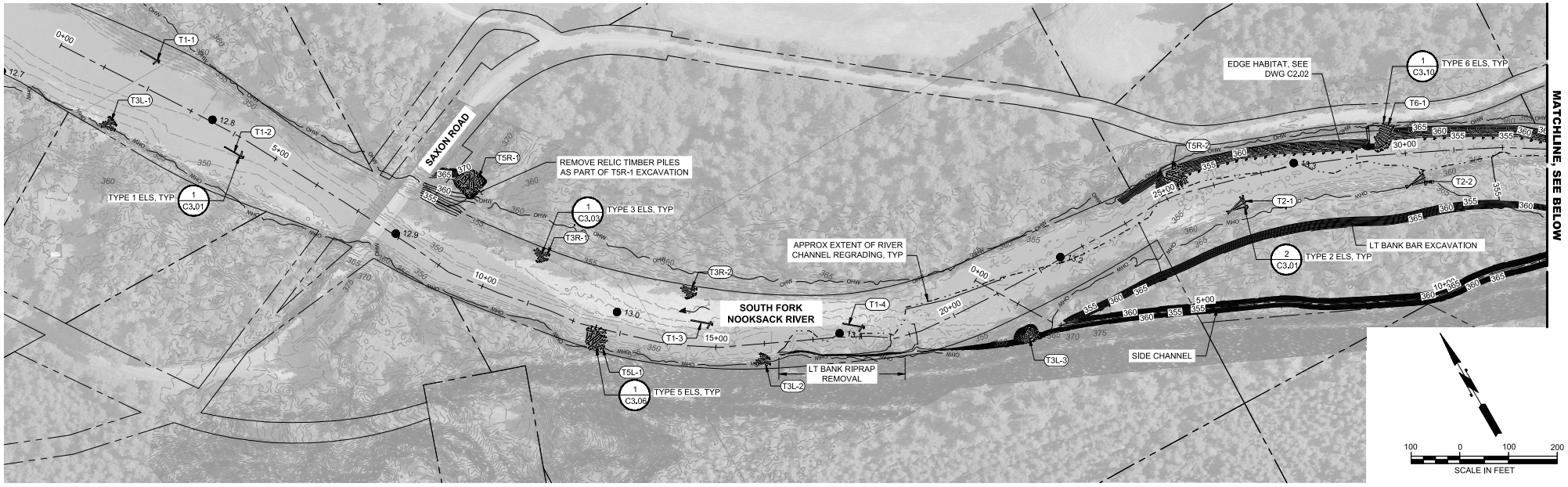
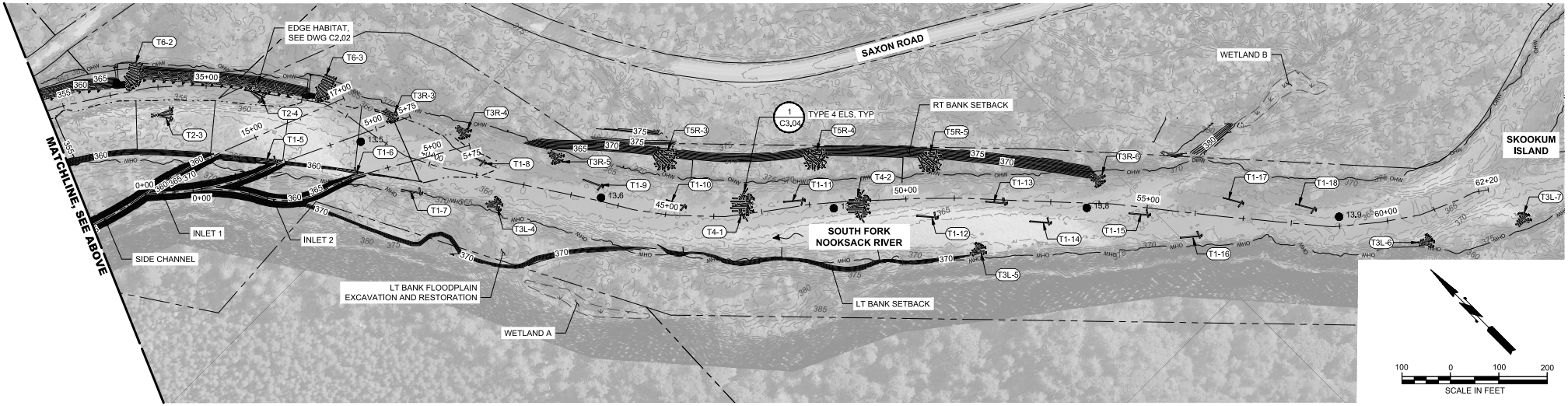
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

TESC AND WATER MANAGEMENT DETAILS

DATE:	MAY 2025
PROJECT NO:	14-05790-000
DRAWING NO:	C1.20
SHEET NO:	6 OF 28





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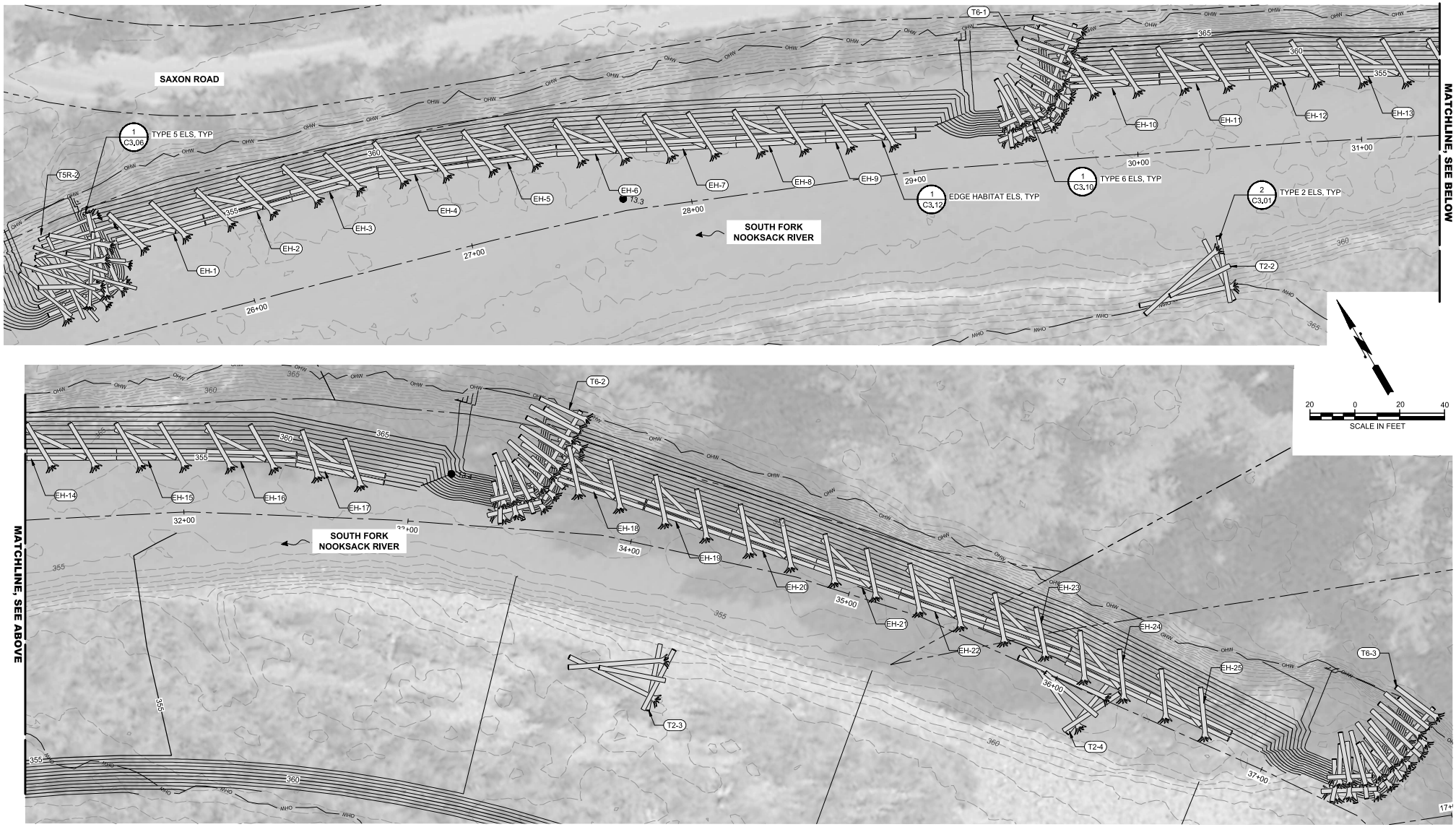
SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

SITE PLAN

DATE: MAY 2025
PROJECT NO: 14-05790-000
DRAWING NO: C2.01
SHEET NO: 7 OF 28



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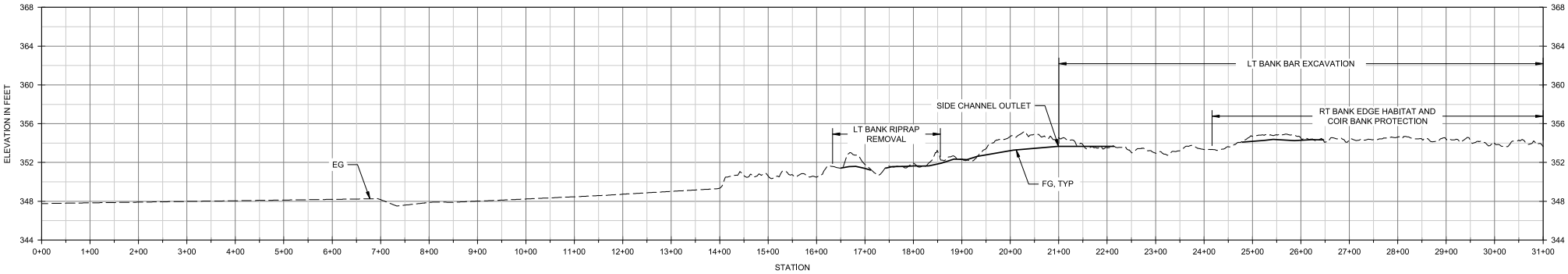
PROJECT - PHASE 3

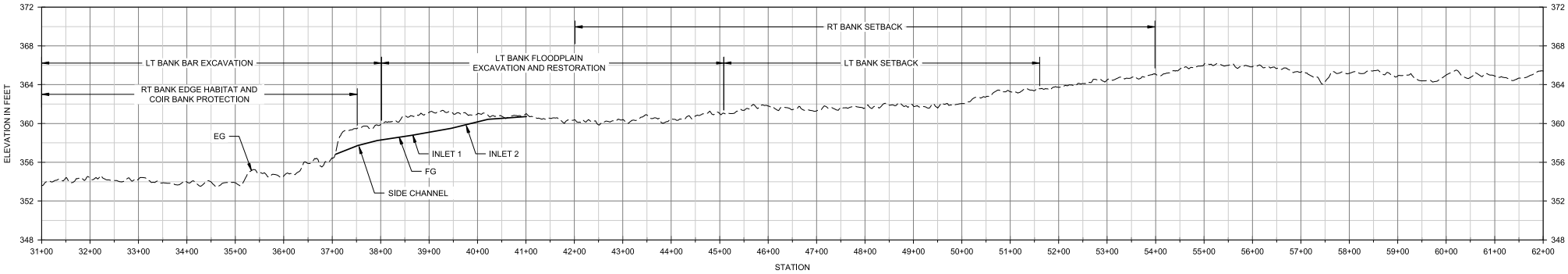
EDGE HABITAT PLAN

DATE:	MAY 2025
PROJECT NO:	14-05790-000
DRAWING NO:	C2.02
SHEET NO:	8 OF 28



SOUTH FORK NOOKSACK RIVER STA 0+00 - 31+00

HORIZ. SCALE: 1"=100'
VERT. SCALE: 1"=20'



SOUTH FORK NOOKSACK RIVER STA 31+00 - 62+00

HORIZ. SCALE: 1"=100'
VERT. SCALE: 1"=20'

HORIZONTAL SCALE IN FEET
100 0 100 200
20 0 20 40
VERTICAL SCALE IN FEET
VERTICAL EXAGGERATION X 5

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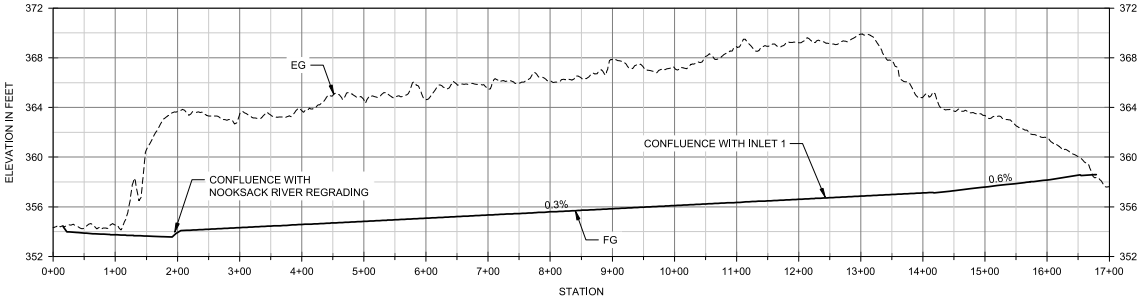
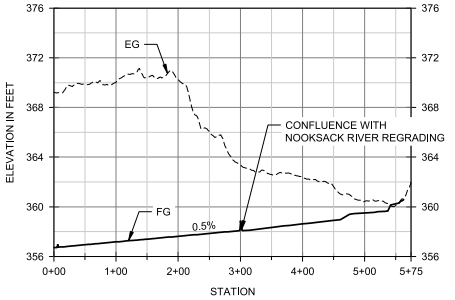
NOOKSACK RIVER PROFILES

DATE: MAY 2025
PROJECT NO: 14-05790-000
DRAWING NO: C2.10
SHEET NO: 9 OF 28



SIDE CHANNEL PROFILE

HORIZ. SCALE: 1"=100'
VERT. SCALE: 1"=20'



INLET 1 PROFILE

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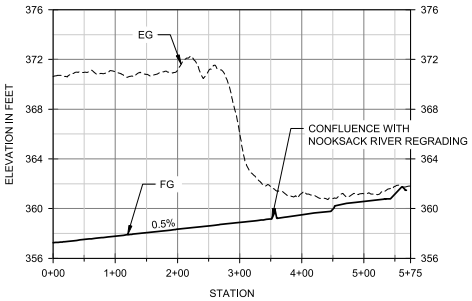
VERT. SCALE: 1"=20'



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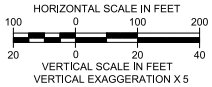

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SIDE CHANNEL AND INLET PROFILES

DATE:	MAY 2025
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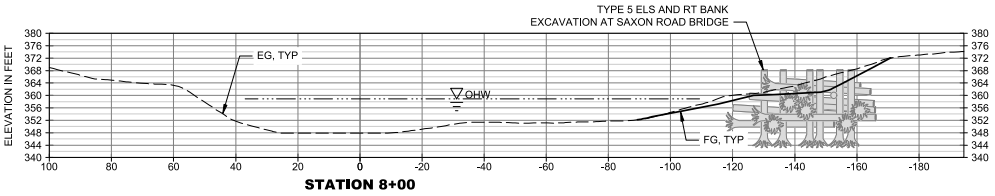
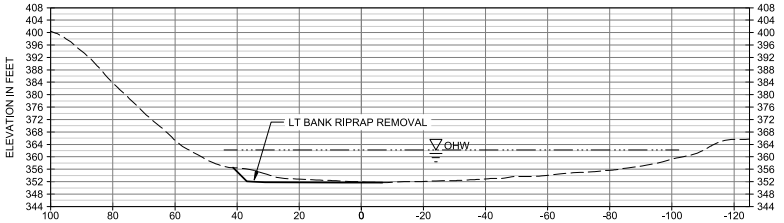
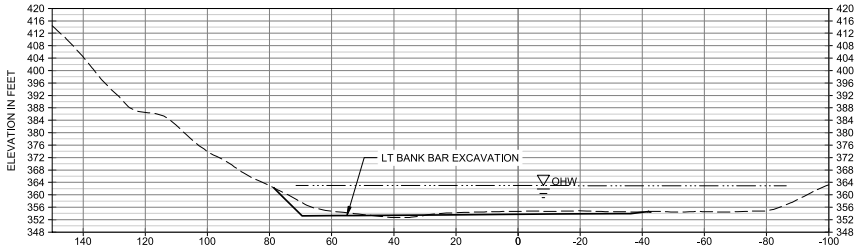
DRAWING NO:	C2.11
SHEET NO:	10 OF 28



STATION 8+00



STATION 18+00



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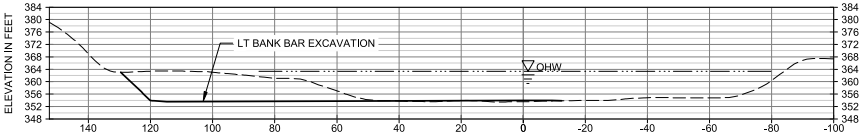
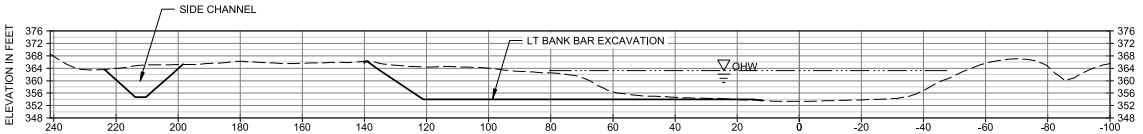


STATION 21+75



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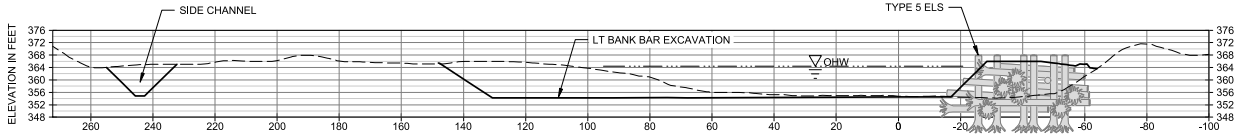

STATION 25+34

HORIZONTAL SCALE IN FEET
20 0 20 40
20 0 20 40
VERTICAL SCALE IN FEET
VERTICAL EXAGGERATION X 1

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SOUTH FORK NOOKSACK RIVER

SKOOKUM/EDFRO RESTORATION
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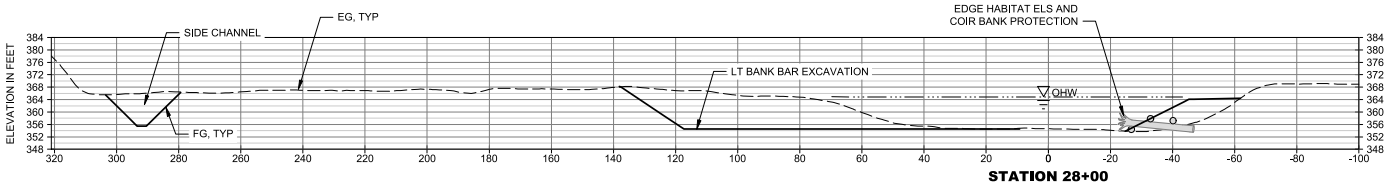
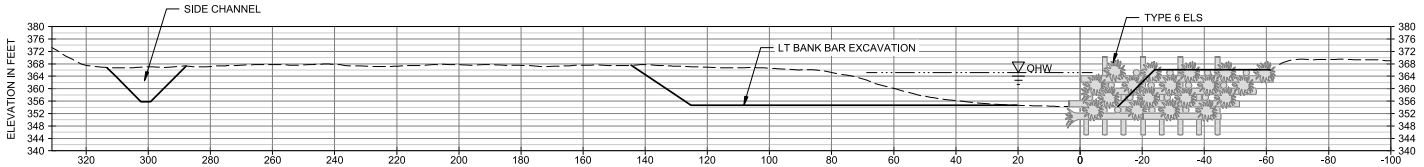
NOOKSACK RIVER SECTIONS 1

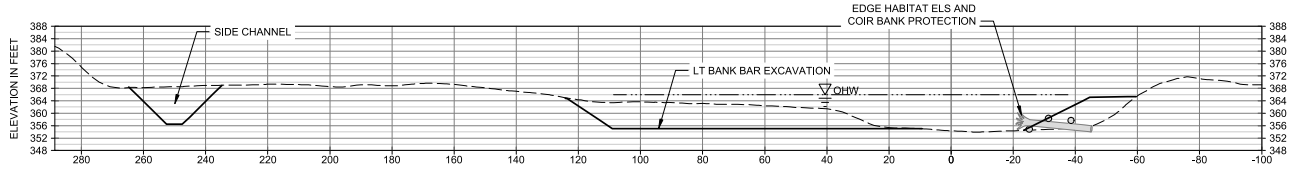
DATE: MAY 2025
PROJECT NO: 14-05790-000
DRAWING NO: C2.20
SHEET NO: 11 OF 28



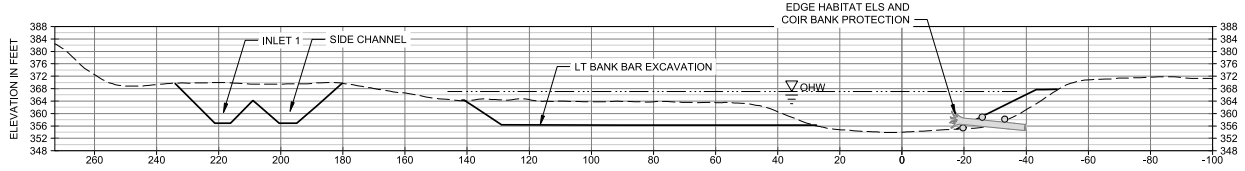
STATION 28+00



STATION 29+50



STATION 32+00



STATION 34+00

HORIZONTAL SCALE IN FEET
20 0 20 40
20 0 20 40
VERTICAL SCALE IN FEET
VERTICAL EXAGGERATION X 1

PRELIMINARY DESIGN

No.	REVISION	BY	APP'D	DATE

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

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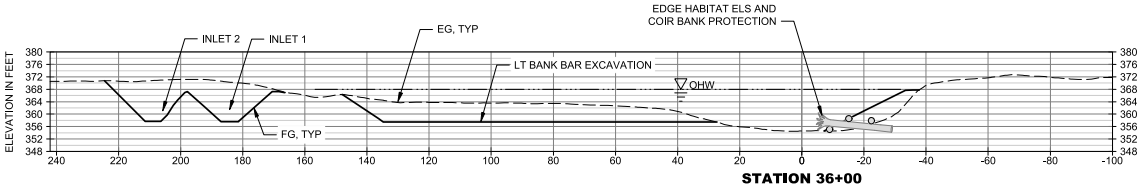
DESIGNED: B. SCOTT	DRAWN: M. McCARTHY
DESIGNED: T. FOULK	CHECKED: B. SCOTT
SCALE: AS NOTED	APPROVED: B. SCOTT

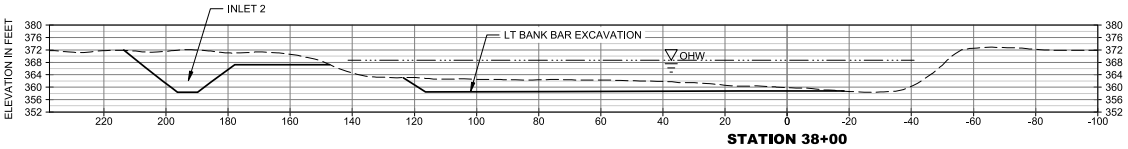
SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

NOOKSACK RIVER SECTIONS 2

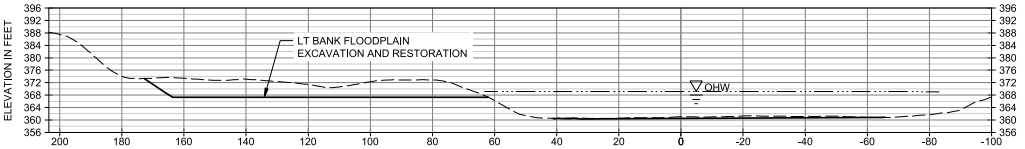
DATE: MAY 2025
PROJECT NO: 14-05790-000
DRAWING NO: C2.21
SHEET NO: 12 OF 28



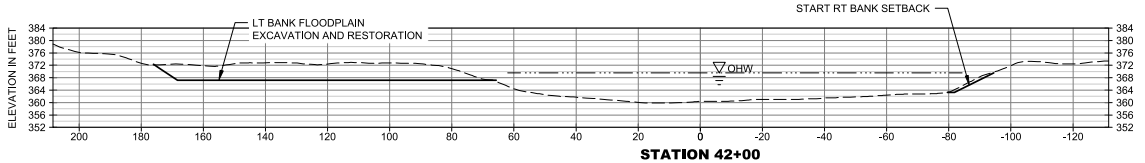
STATION 36+00



STATION 38+00



STATION 40+00



STATION 42+00

HORIZONTAL SCALE IN FEET
20 0 20 40
20 0 20 40
VERTICAL SCALE IN FEET
VERTICAL EXAGGERATION X 1

PRELIMINARY DESIGN

No.	REVISION	BY	APP'D	DATE

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

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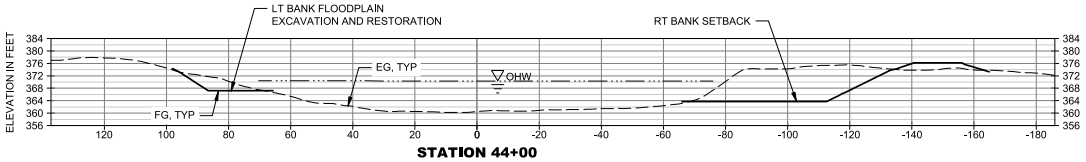
SCALE: AS NOTED	APPROVED: B. SCOTT

SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

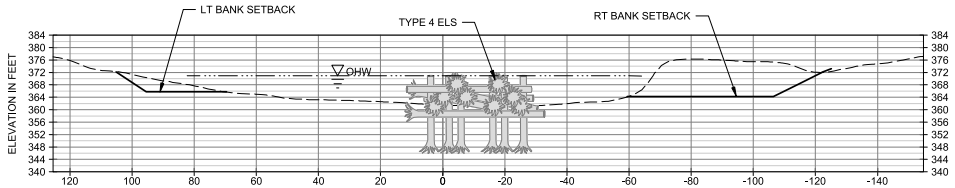
NOOKSACK RIVER SECTIONS 3

DATE: MAY 2025
PROJECT NO: 14-05790-000
DRAWING NO: C2.22
SHEET NO: 13 OF 28

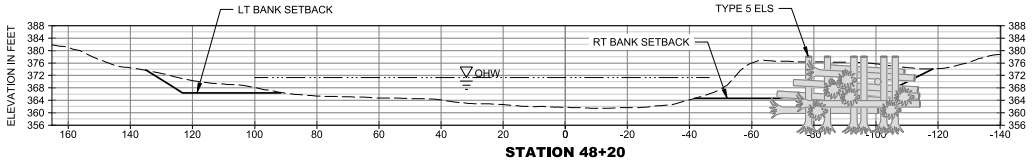
O:\proj\Y2014\14-05790-000\CAD\Sheet\Plt30\Sections.dwg | 5/5/2025 11:29 AM | Eric Marshall



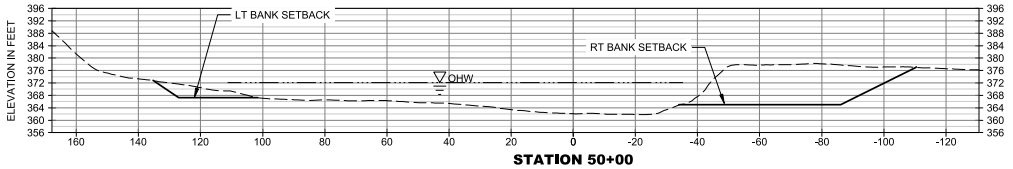
STATION 44+00



STATION 46+75



STATION 48+20



STATION 50+00

HORIZONTAL SCALE IN FEET
20 0 20 40
20 0 20 40
VERTICAL SCALE IN FEET
VERTICAL EXAGGERATION X 1

PRELIMINARY DESIGN

No.	REVISION	BY	APP'D	DATE

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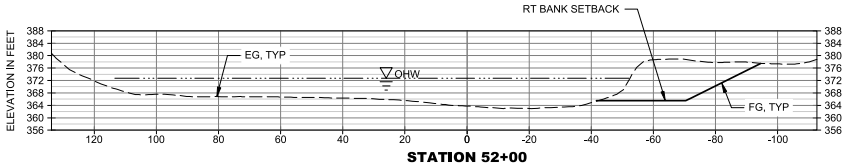
DESIGNED: T. FOULK	CHECKED: B. SCOTT
SCALE: AS NOTED	APPROVED: B. SCOTT

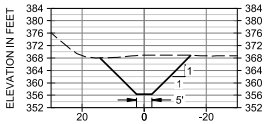
SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

NOOKSACK RIVER SECTIONS 4

DATE: MAY 2025
PROJECT NO: 14-05790-000
DRAWING NO: C2.23
SHEET NO: 14 OF 28



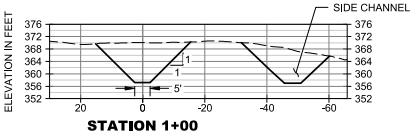
STATION 52+00



STATION 11+00

SECTION - SIDE CHANNEL

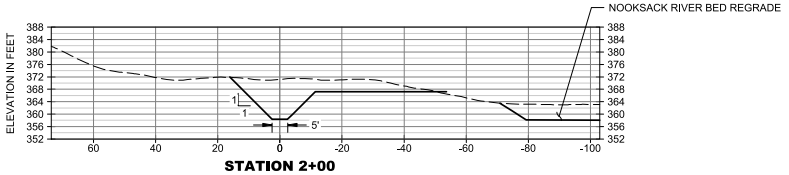
HORIZ. SCALE: 1"=20'
VERT. SCALE: 1"=20'



STATION 1+00

SECTION - INLET 1

HORIZ. SCALE: 1"=20'
VERT. SCALE: 1"=20'



STATION 2+00

SECTION - INLET 2

HORIZ. SCALE: 1"=20'
VERT. SCALE: 1"=20'

HORIZONTAL SCALE IN FEET
20 0 20 40
20 0 20 40
VERTICAL SCALE IN FEET
VERTICAL EXAGGERATION X 1

PRELIMINARY DESIGN

No.	REVISION	BY	APP'D	DATE

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

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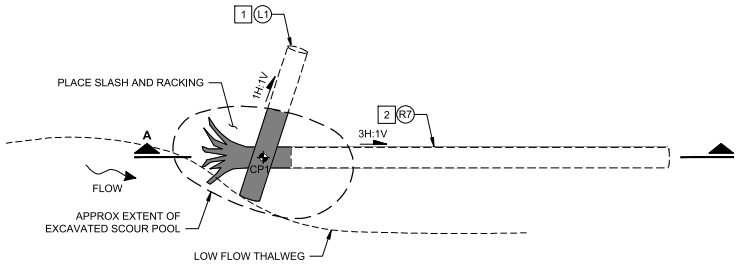
SCALE: AS NOTED	APPROVED: B. SCOTT

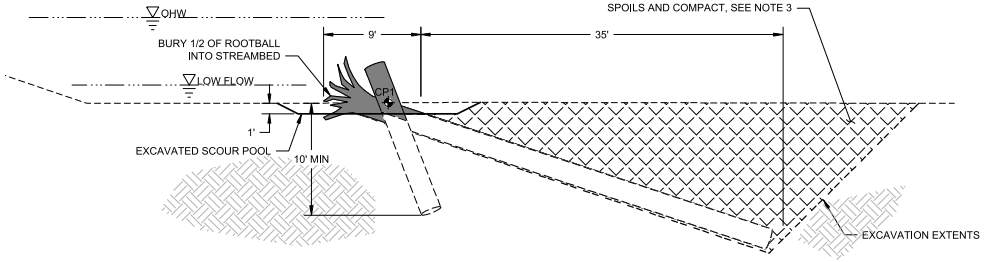
SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

SIDE CHANNEL AND INLETS 1 & 2 SECTIONS

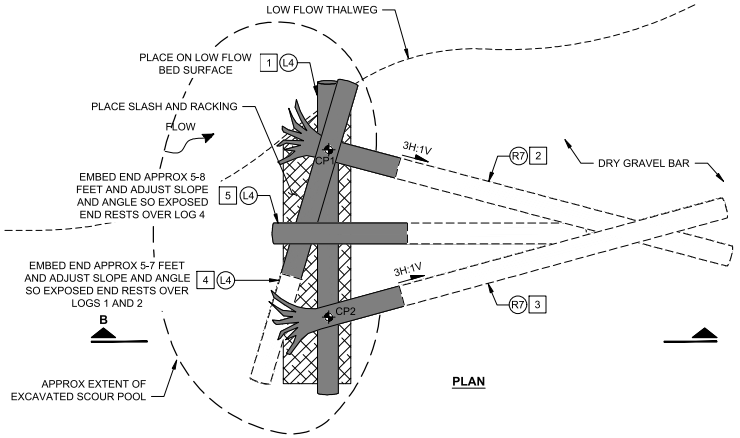
DATE: MAY 2025
PROJECT NO: 14-05790-000
DRAWING NO: C2.24
SHEET NO: 15 OF 28



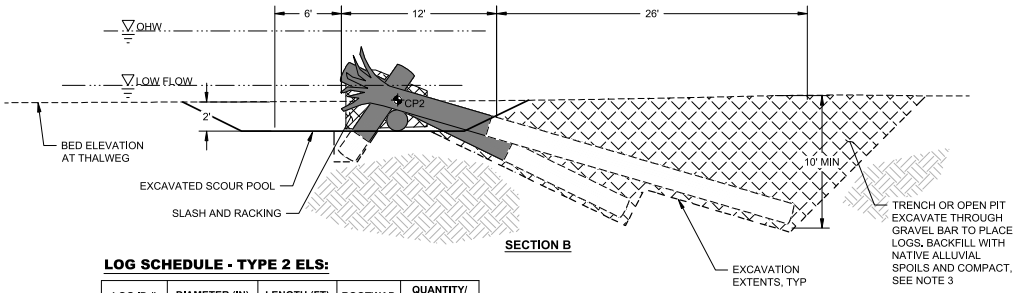
PLAN



SECTION A



PLAN



SECTION B

LOG SCHEDULE - TYPE 1 ELS:

LOG ID #	DIAMETER (IN)	LENGTH (FT)	ROOTWAD	QUANTITY/ STRUCTURE
(L1)	24	15	NO	1
(R7)	24	45	YES	1
RACKING	4-16	15-30	OPTIONAL	2
SLASH	< 4	NA	NA	2 CY

LOG SCHEDULE - TYPE 2 ELS:

LOG ID #	DIAMETER (IN)	LENGTH (FT)	ROOTWAD	QUANTITY/ STRUCTURE
(L4)	24	30	NO	3
(R7)	24	45	YES	2
RACKING	6-12	20	OPTIONAL	30
SLASH	< 4	NA	NA	40 CY

DETAIL - TYPE 1 ELS (1 / VAR)
SCALE: NTS

DETAIL - TYPE 2 ELS (2 / VAR)
SCALE: NTS

LEGEND:

- (X#) LOG TYPE ID
- # LOG PLACEMENT SEQUENCING ORDER
- CP# CONTROL POINT
- BURIED PORTION OF LOG
- EXPOSED PORTION OF LOG

GENERAL NOTES:

1. STRUCTURE LOCATION AND LOG ORIENTATION SHOWN IS APPROXIMATE AND WILL VARY FOR EACH STRUCTURE BASED ON SITE SPECIFIC CONDITIONS AND LOCATION OF STEELHEAD REDDS. PRIOR TO CONSTRUCTION ENGINEER SHALL FLAG APPROXIMATE STRUCTURE CONTROL POINT LOCATION AND MAKE ANY NECESSARY FIELD ADJUSTMENTS TO LOG LOCATIONS AND ORIENTATIONS. CONTRACTOR SHALL VERIFY FINAL STRUCTURE LOCATION AND EXCAVATION EXTENTS WITH ENGINEER PRIOR TO CONSTRUCTION.
2. LOGS SHALL BE PLACED AT THE LOCATIONS, ELEVATIONS AND ORIENTATIONS SPECIFIED ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER.
3. EXCAVATION LIMITS SHOWN ARE APPROXIMATE AND WILL VARY BASED ON CONSTRUCTION MEANS AND METHODS, SUBSURFACE CONDITIONS, AND LOCATION OF STRUCTURE. CONTRACTOR SHALL ADJUST EXCAVATION LIMITS AS NECESSARY TO COMPLETE CONSTRUCTION. CONTRACTOR SHALL BACKFILL ALL EXCAVATIONS USING ONLY DRY NATIVE ALLUVIAL EXCAVATION SPOILS IN 2 FOOT DEEP LAYERS AND COMPACT EACH LAYER WITH BACKSIDE OF EXCAVATOR BUCKET. SATURATED BACKFILL MATERIAL WILL NOT BE ALLOWED.
4. SEE DRAWING XXX FOR STRUCTURE CONTROL POINT COORDINATES (TO BE ADDED AT 90% DESIGN)

PRELIMINARY DESIGN

No.	REVISION	BY	APP'D	DATE

ONE INCH AT FULL SIZE. IF NOT ONE INCH SCALE ACCORDINGLY

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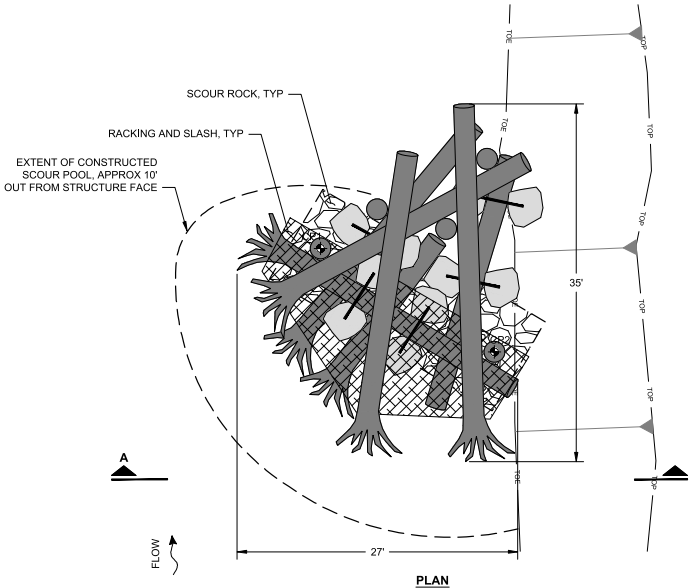
DESIGNED: B. SCOTT	DRAWN: M. McCARTHY
DESIGNED: T. FOULK	CHECKED: B. SCOTT
SCALE: AS NOTED	APPROVED: B. SCOTT

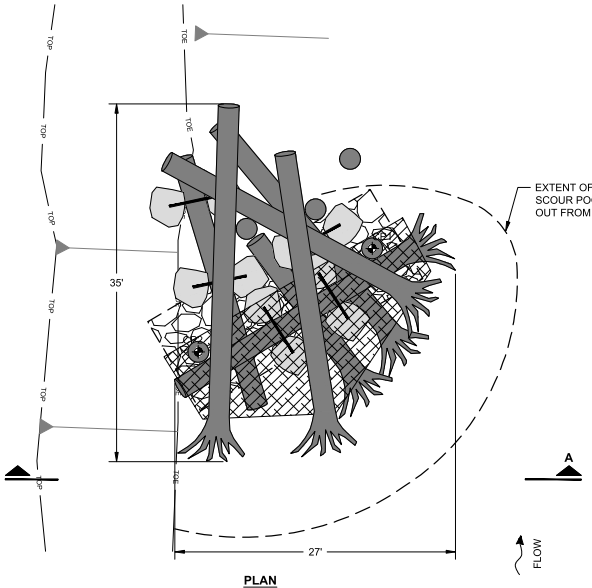
SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

TYPE 1 AND 2 ELS DETAILS

DATE:	MAY 2025
PROJECT NO:	14-05790-000
DRAWING NO:	C3.01
SHEET NO:	16 OF 28



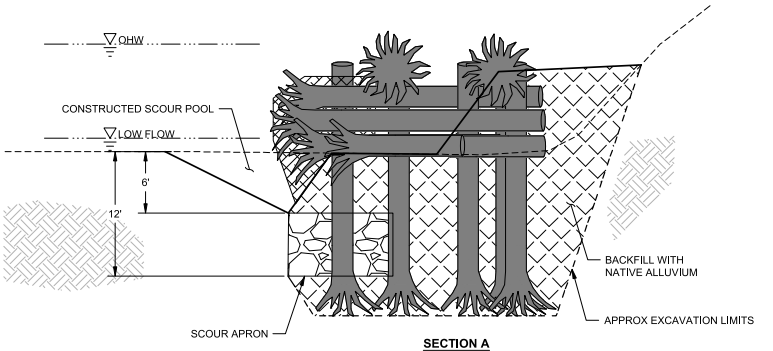
PLAN



PLAN

GENERAL NOTES:

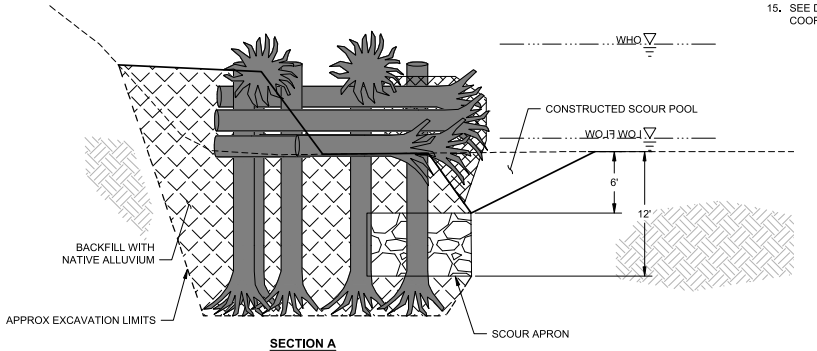
1. UP TO 3 PILE LOCATIONS PER TYPE 3 ELS SHALL BE STAKED BY ENGINEER.
2. EXCAVATION SPOILS SHALL BE STOCKPILED TO ALLOW LOG LAYER PLACEMENT AND CONSTRUCTION ACCESS.
3. LOG MATERIALS SHALL BE PLACED AT THE LOCATIONS AND ELEVATIONS SPECIFIED ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER OR OWNER.
4. TRIM LOGS AS REQUIRED.
5. TOE OF BANK VARIES PER EACH TYPE 3 ELS.
6. SLASH AND RACKING TO FILL VOIDS BETWEEN LOG LAYERS. SEQUENCING OF SLASH PLACEMENT MAY NEED TO BE MODIFIED FOR LASHING. SUBSEQUENT LOG LAYERS SHALL COMPRESS SLASH AND RACKING PLACED IN PREVIOUS LAYERS.
7. RACKING PLACEMENT SHALL BE COORDINATED WITH LOG LAYER PLACEMENT AND SLASH PLACEMENT TO ENSURE LOG MEMBERS EXTEND THROUGH AND BIND RACKING MEMBERS AND RACKING MEMBERS EXTEND THROUGH AND BIND SLASH MATERIAL.
8. PLACE BALLAST ROCKS AS LOW WITHIN THE ELS AS POSSIBLE AND ENSURE CHAIN BETWEEN BALLAST ROCKS HAS NO SLACK.
9. AUGMENT OR DELETE ROCK QUANTITIES AS NEEDED TO MAINTAIN AN ELS ROCK BALLAST OF 20 TONS MINIMUM.
10. ENGINEER SHALL STAKE 2 VERTICAL LOG LOCATIONS FOR TYPE 3 ELS BASED ON APPROX 10' TO THE RELATIVE DEPTH TO THE ADJACENT CHANNEL BOTTOM. DEPTH SHALL NOT EXCEED 15' BELOW BASE FLOW WATER SURFACE. CONTRACTOR SHALL MARK DEPTH OF BURIAL LOCATION ON ALL VERTICAL LOGS PRIOR TO PLACEMENT WITH BLAZE ORANGE MARKING PAINT.
11. CONTRACTOR SHALL EXPECT FIELD FITTING
12. RACKING, SLASH, AND LASHINGS ONLY SHOWN IN LAYERS WHERE PLACEMENT OCCURS FOR CLARITY.
13. ALL LOG TO LOG LASHING SHALL BE 1/2"Ø GRADE 43 NATURAL FINISH CHAIN UNLESS OTHERWISE SPECIFIED IN LAYER PLAN. BOULDER TO LOG LASHING SHALL BE 1/2"Ø GRADE 43 NATURAL FINISH CHAIN. SEE SHEET C3.20 FOR LASHING TYPES AND CONDITIONS.
14. ALL CONNECTING HARDWARE SHALL HAVE A RATED BREAKING LOAD LIMIT OF EQUAL OR GREATER STRENGTH THAN CHAIN. SHACKLES SHALL BE SAFETY SHACKLES AND THREADS SHALL BE MARRED TO PREVENT REMOVAL OF SHACKLES.
15. SEE DRAWING XXX FOR STRUCTURE CONTROL POINT COORDINATES (TO BE ADDED AT 90% DESIGN)



SECTION A

DETAIL - TYPE 3 RIGHT BANK ELS (1 VAR)

SCALE: NTS



SECTION A

DETAIL - TYPE 3 LEFT BANK ELS (1 VAR)

SCALE: NTS

No.	REVISION	BY	APP'D	DATE

PRELIMINARY DESIGN

ONE INCH
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DESIGNED: T. FOULK	CHECKED: B. SCOTT
SCALE: AS NOTED	APPROVED: B. SCOTT

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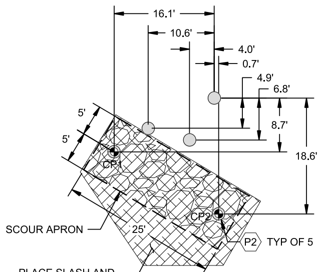
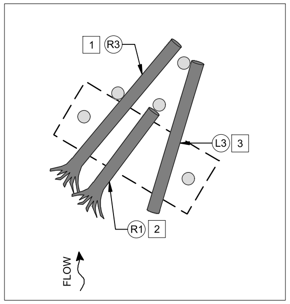
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

TYPE 3 MEDIUM ELS DETAILS

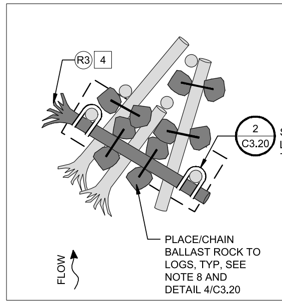
DATE: MAY 2025
PROJECT NO: 14-05790-000
DRAWING NO: C3.02
SHEET NO: 17 OF 28



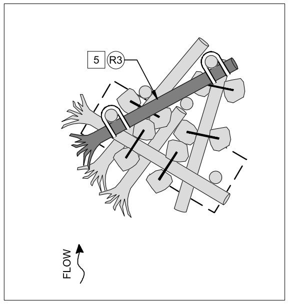
VERTICAL PILES



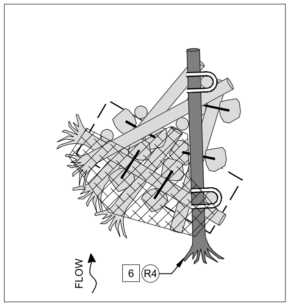
LAYER 1



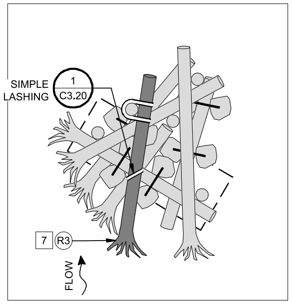
LAYER 2



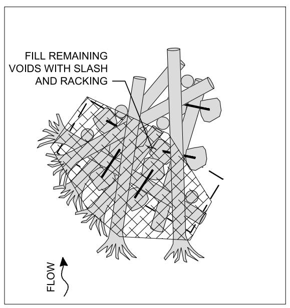
LAYER 3



LAYER 4



LAYER 5



COMPLETE

LOG SCHEDULE - TYPE 3 ELS:

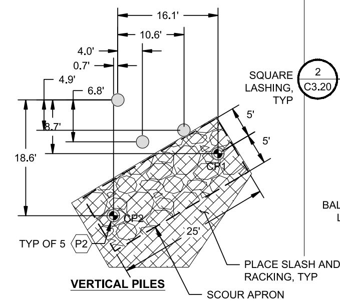
LOG ID #	DIAMETER (IN)	LENGTH (FT)	ROOTWAD	QTY/ STRUCT
P2	24	20	YES	5
L3	24	25	NO	1
R1	24	15	YES	1
R3	24	25	YES	4
R4	24	30	YES	1
RACKING	4-16	15-30		40-50
SLASH	-	-		30 CY

ROCK SCHEDULE - TYPE 3 ELS:

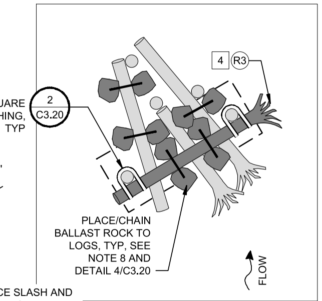
	WEIGHT (TONS)	QTY/ STRUCT
BALLAST ROCKS	2	10

TYPE 3 RIGHT BANK ELS LAYERING PLAN

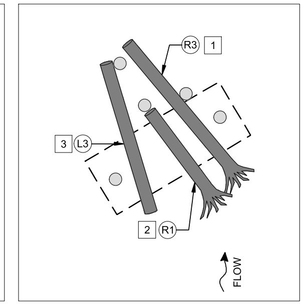
SCALE: NTS



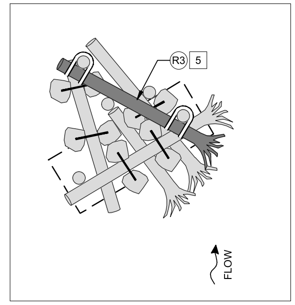
VERTICAL PILES



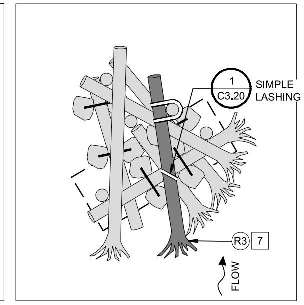
LAYER 2



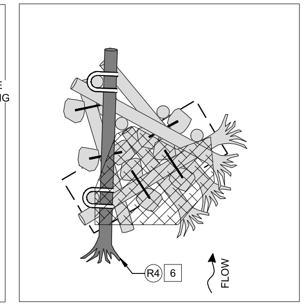
LAYER 1



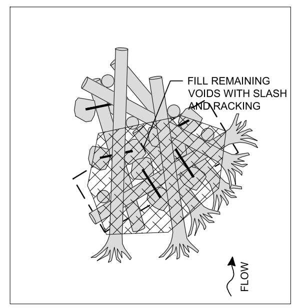
LAYER 3



LAYER 5



LAYER 4



COMPLETE

LOG SCHEDULE - TYPE 3 ELS:

LOG ID #	DIAMETER (IN)	LENGTH (FT)	ROOTWAD	QTY/ STRUCT
P2	24	20	YES	5
L3	24	25	NO	1
R1	24	15	YES	1
R3	24	25	YES	4
R4	24	30	YES	1
RACKING	4-16	15-30		40-50
SLASH	-	-		30 CY

ROCK SCHEDULE - TYPE 3 ELS:

	WEIGHT (TONS)	QTY/ STRUCT
BALLAST ROCKS	2	10

LEGEND:

X#	LOG TYPE ID
#	LOG PLACEMENT SEQUENCING ORDER
CP#	CONTROL POINT

TYPE 3 LEFT BANK ELS LAYERING PLAN

SCALE: NTS

PRELIMINARY DESIGN

No.	REVISION	BY	APP'D	DATE

ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

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DRAFT

DESIGNED: I. MOSTRENKO	DRAWN: E. MARSHALL
DESIGNED: B. SCOTT	DRAWN: M. McCARTHY
DESIGNED: T. FOULK	CHECKED: B. SCOTT
SCALE: AS NOTED	APPROVED: B. SCOTT

SOUTH FORK NOOKSACK RIVER

SKOOKUM/EDFRO RESTORATION PROJECT - PHASE 3

TYPE 3 MEDIUM ELS LAYERING PLAN

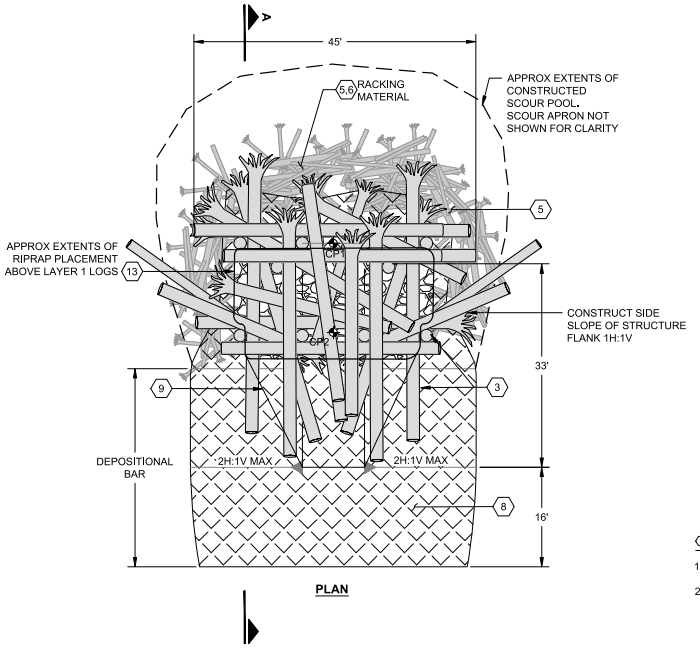
DATE: MAY 2025

PROJECT NO: 14-05790-000

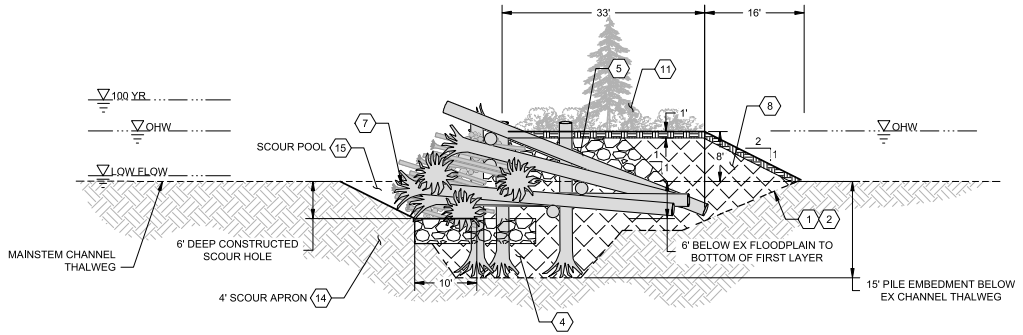
DRAWING NO: C3.03

SHEET NO: 18 OF 28

O:\proj\Y2014\14-05790-000\CAD\Sheet\Ph3\Structures.dwg | 5/5/2025 11:29 AM | Eric Marshall



PLAN



SECTION

KEYNOTES

1. APPROXIMATE STRUCTURE EXCAVATION LIMITS.
2. EXCAVATED SIDE SLOPE AT DOWNSTREAM END OF STRUCTURE VARIES BASED ON CONSTRUCTION ACCESS NEEDS. SALVAGE ALLUVIUM MATERIAL GREATER THAN 12" DIA FOR SCOUR APRON CONSTRUCTION.
3. PLACE PILES AND KEY MEMBERS ACCORDING TO STRUCTURE LAYERING PLAN.
4. LOCALLY EXCAVATE FROM BOTTOM OF STRUCTURE ELEVATION TO ACHIEVE PILE EMBEDMENT SHOWN. PLACE PILE LOG ROOTWAD ON BOTTOM OF HOLE, BACKFILL WITH NATIVE ALLUVIUM WITH SCOUR APRON MATERIAL AS SHOWN, AND COMPACT USING BACKSIDE OF EXCAVATOR BUCKET.
5. SMALL WOODY DEBRIS AND SLASH EMBEDDED INTO FRONT AND SIDES OF STRUCTURES IN AND AROUND INTERFACE OF KEY LOGS AND RACKING LOGS PRIOR TO BACKFILLING.
6. COORDINATE WITH ENGINEER PRIOR TO PLACING RACKING LOGS.
7. LAYERS 1, 2, 3, AND 4 LOGS SHALL EXTEND THROUGH RACKING MATERIAL.
8. CONSTRUCT DEPOSITIONAL BAR WITH ON SITE EXCAVATED ALLUVIUM. DEPOSITIONAL BAR SIZE VARIES AS DIRECTED BY ENGINEER.
9. CONSTRUCT FLANKS OF STRUCTURE USING 35% RACKING, 35% SLASH, AND 30% NATIVE ALLUVIUM BACKFILL MATERIAL ACCORDING TO THE SLOPE SHOWN ON THESE DETAILS. EXTEND RACKING MATERIAL OF STRUCTURE FLANK INTO STRUCTURE CORE BACKFILL. CONSTRUCT FLANK STRUCTURE AS A DENSE MATRIX OF RACKING, SLASH, AND ALLUVIUM BACKFILL AT THE SPECIFIED PROPORTIONS AT A 1H:1V SIDE SLOPE. TRANSITION SIDE SLOPE OF STRUCTURE FLANK FROM 1H:1V TO 2H:1V INTO DEPOSITIONAL BAR SIDE SLOPE AS SHOWN.
10. MAINTAIN A MINIMUM DEPTH OF 3-FEET OF ALLUVIUM BACKFILL MATERIAL OVER TOP OF IMPORTED BALLAST MATERIAL.
11. PLANTING TOP OF ELS TO BE COMPLETED BY OTHERS.
12. DO NOT BACKFILL UPSTREAM OF STRUCTURE. LEAVE AS A POOL.
13. IMPORT RIPRAP LOG BALLAST. PLACE IN LAYERS 5 THROUGH 8 UP TO 1 FOOT BELOW FINAL GRADE. PLACE ALLUVIUM TO FILL VOIDS TO CREATE A DENSELY PACKED MATRIX OF ROCK AND ALLUVIUM.
14. CONSTRUCT A 48-FOOT WIDE SCOUR APRON ALONG UPSTREAM FACE OF ELS TO DIMENSIONS SHOWN USING THE LARGEST EXCAVATED BOULDERS AND COBBLES AS DIRECTED BY ENGINEER. NO IMPORT MATERIALS REQUIRED.
15. DO NOT BACKFILL AT FRONT AND FLANK OF STRUCTURE TO CREATE A 6 FOOT DEEP SCOUR POOL AS DIRECTED BY THE ENGINEER.

CONSTRUCTION QUANTITIES PER ELS:

(TO BE ADDED AT 90% DESIGN)

LARGE SALVAGED ALLUVIUM AND RIPRAP	QTY
IMPORT RIPRAP LOG BALLAST	XX CY
LARGE ALLUVIUM SCOUR APRON	XX CY

DETAIL - TYPE 4 ELS

SCALE: NTS

1 / VAR

PRELIMINARY DESIGN

No.	REVISION	BY	APP'D	DATE

ONE INCH AT FULL SIZE. IF NOT ONE INCH SCALE ACCORDINGLY.

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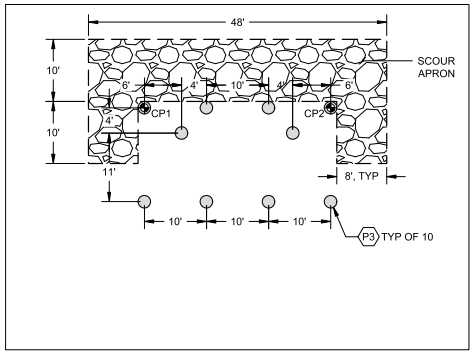
DESIGNED: B. SCOTT	DRAWN: M. McCARTHY
DESIGNED: T. FOULK	CHECKED: B. SCOTT
SCALE: AS NOTED	APPROVED: B. SCOTT

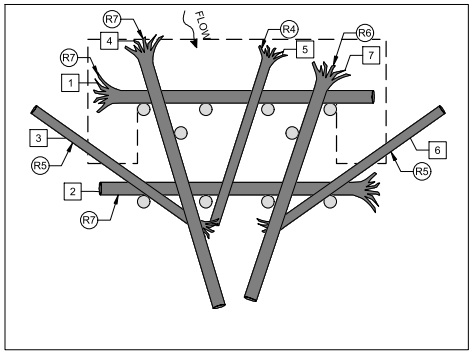
SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

TYPE 4 LARGE MID-CHANNEL ELS DETAILS

DATE: MAY 2025
PROJECT NO: 14-05790-000
DRAWING NO: C3.04
SHEET NO: 19 OF 28



VERTICAL PILE LAYER



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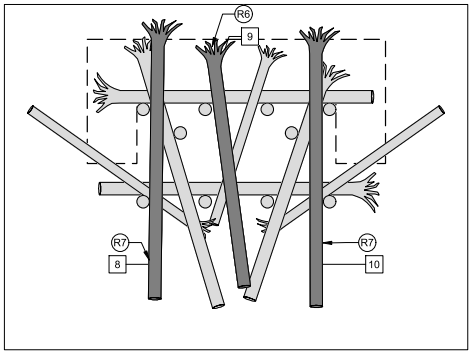

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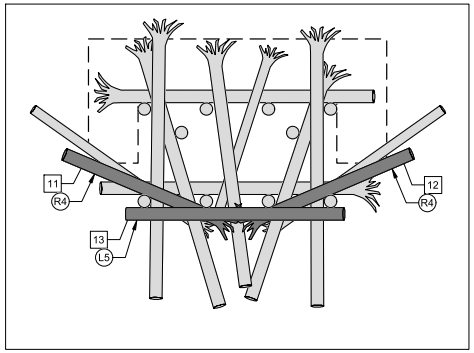

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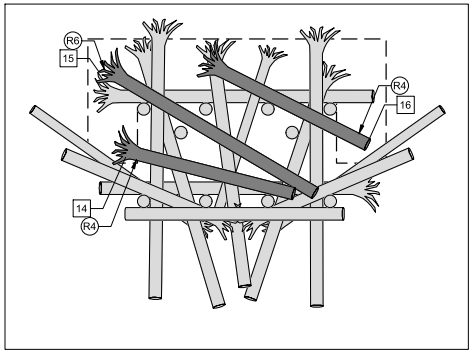

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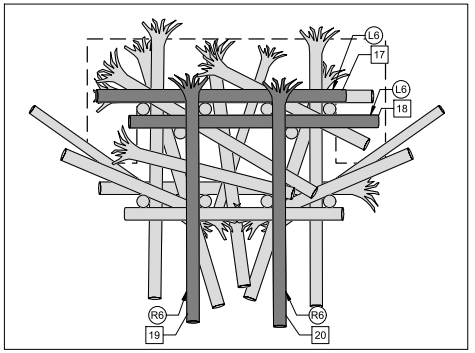

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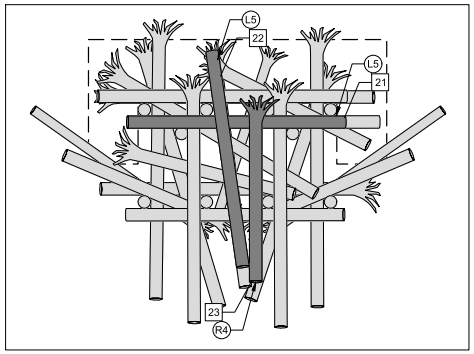

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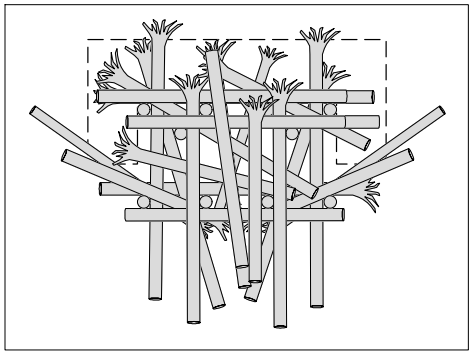

COMPLETE

GENERAL NOTES:

1. FINAL STRUCTURE LOCATION AND ORIENTATION SHALL BE FIELD VERIFIED BY THE ENGINEER PRIOR TO THE CONTRACTOR STAKING PILE LOCATIONS.
2. PILE LOCATIONS SHALL BE STAKED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER PRIOR TO PILE INSTALLATION.
3. PILE LOCATIONS ARE SYMMETRICAL ABOUT THE STRUCTURE CONTROL POINT.
4. PILE LOCATIONS SHALL BE BASED ON THE LOCATION OF THE STRUCTURE CONTROL POINT AND SHALL BE WITHIN 6 INCHES OF THE LOCATION SHOWN ON THE DRAWINGS.
5. LOG MATERIALS SHALL BE PLACED AT THE LOCATIONS, ELEVATIONS AND ORIENTATIONS SPECIFIED ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER.
6. TRIM LOGS TO FIT AS REQUIRED.
7. TRIM PILES A MINIMUM OF 18 INCHES AND A MAXIMUM OF 24 INCHES ABOVE FINAL GRADE.
8. EXCAVATION LIMITS VARY DEPENDING ON THE LOCAL SOIL CONDITIONS AND THE CONSTRUCTION TECHNIQUES EMPLOYED.
9. INSTALL LOGS, RACKING LOGS, SLASH, IMPORT RIPRAP LOG BALLAST, AND NATIVE BACKFILL MATERIAL AS SHOWN ON THE PLANS AND AS DIRECTED BY THE ENGINEER.
10. SEE DRAWING XXX FOR STRUCTURE CONTROL POINT COORDINATES (TO BE ADDED AT 90% DESIGN).
11. RACKING NOT SHOWN FOR CLARITY. PLACE RACKING ALONG UPSTREAM FACE AND ALONG THE SIDES OF THE ELS AS SHOWN ON THE DETAIL SHEET. RACKING SHALL BE PLACED PARALLEL TO AND BETWEEN PILES EXTENDING OUT FROM THE STRUCTURE. ALL RACKING SHALL BE PLACED TO CREATE AN INTERLOCKING MATRIX OF LOGS SECURED BETWEEN PILES AND KEY LOGS. PLACE SLASH AT SAME TIME AS RACKING TO FILL VOIDS BETWEEN RACKING.

ELS CONSTRUCTION SEQUENCE NOTES:

1. INSTALL PILES TO SPECIFIED DEPTH.
2. INSTALL LAYER 1 LOGS, RACKING LOGS, SLASH AND FIRST LIFT OF IMPORT RIPRAP LOG BALLAST MATERIAL.
3. FILL ALL VOIDS IN IMPORT RIPRAP LOG BALLAST MATERIAL WITH NATIVE BACKFILL MATERIAL.
4. INSTALL LAYER 2 AND LAYER 3 LOGS, RACKING LOGS, SLASH AND SECOND LIFT OF IMPORT RIPRAP LOG BALLAST MATERIAL.
5. FILL ALL VOIDS IN IMPORT RIPRAP LOG BALLAST MATERIAL WITH NATIVE BACKFILL MATERIAL.
6. INSTALL LAYER 4 AND LAYER 5 LOGS, RACKING LOGS, SLASH AND THIRD LIFT OF IMPORT RIPRAP LOG BALLAST MATERIAL.
7. FILL ALL VOIDS IN IMPORT RIPRAP LOG BALLAST MATERIAL WITH NATIVE BACKFILL MATERIAL.
8. INSTALL LAYER 6 LOGS RACKING LOGS, SLASH AND FOURTH LIFT OF IMPORT RIPRAP LOG BALLAST MATERIAL.
9. COMPLETELY BACKFILL REMAINDER OF STRUCTURE INTERIOR AND CONSTRUCT DEPOSITIONAL BAR WITH NATIVE BACKFILL MATERIAL TO GRADE AND EXTENTS SHOWN ON STRUCTURE PLAN.

LOG SCHEDULE - TYPE 4 ELS:

LOG ID #	DIAMETER (IN)	LENGTH (FT)	ROOTWAD	QUANTITY/ STRUCTURE
P3	24	25	YES	10
L5	24	35	NO	3
L6	24	40	NO	2
R4	24	30	YES	6
R5	24	35	YES	2
R6	24	40	YES	5
R7	24	45	YES	5
RACKING	4-16	15-30		100
SLASH	-	-		100 CY

LEGEND:

- X# — LOG TYPE ID
- # — LOG PLACEMENT SEQUENCING ORDER
- CP# — CONTROL POINT

PRELIMINARY DESIGN

No.	REVISION	BY	APP'D	DATE

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

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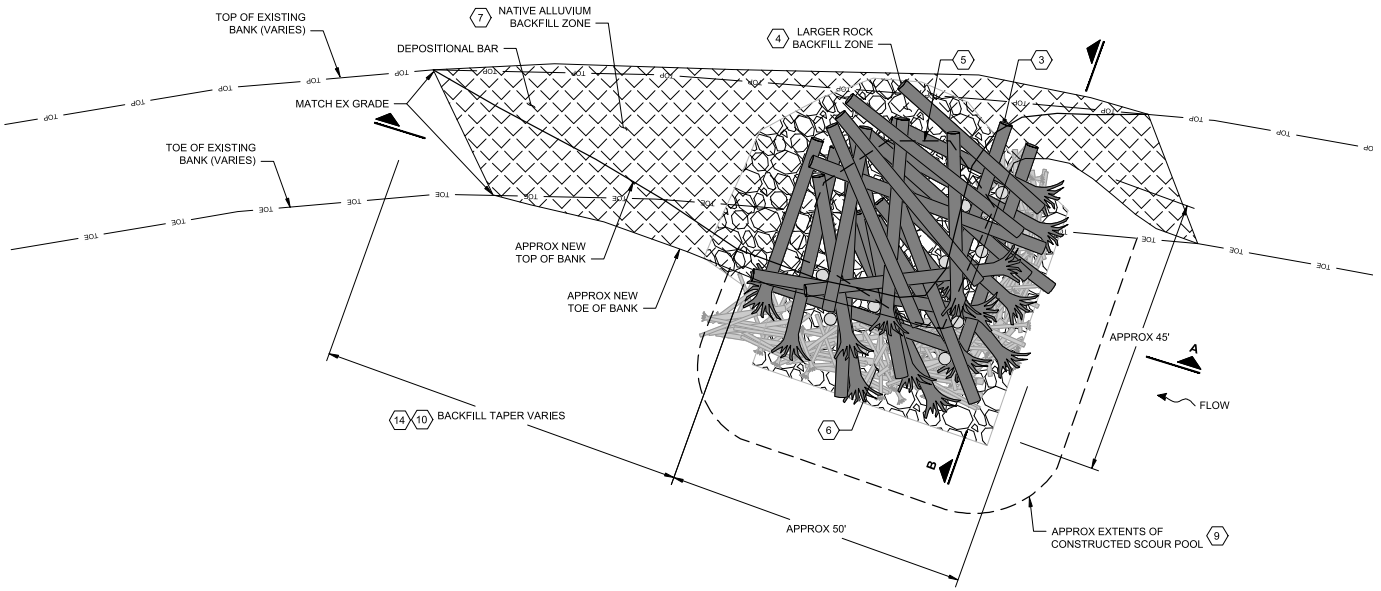
DESIGNED: B. SCOTT	DRAWN: M. McCARTHY
DESIGNED: T. FOULK	CHECKED: B. SCOTT
SCALE: AS NOTED	APPROVED: B. SCOTT

SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

TYPE 4 LARGE MIDI-CHANNEL
ELS LAYERING PLAN

DATE:	MAY 2025
PROJECT NO:	14-05790-000
DRAWING NO:	C3.05
SHEET NO:	20 OF 28



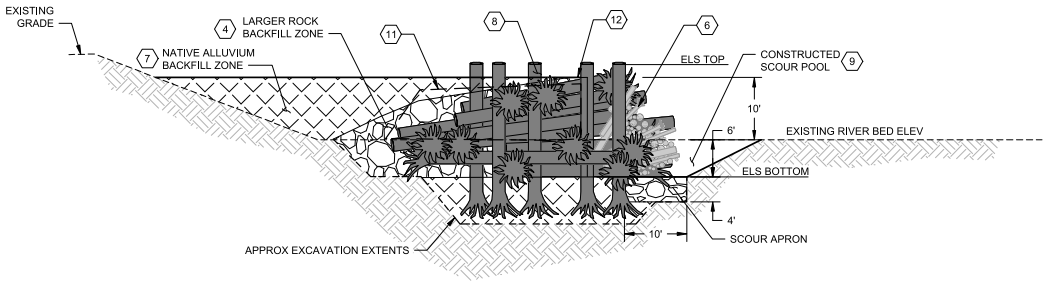
PLAN - RIGHT BANK DEFLECTOR ELS

SCALE: NTS

1 VAR

KEYNOTES

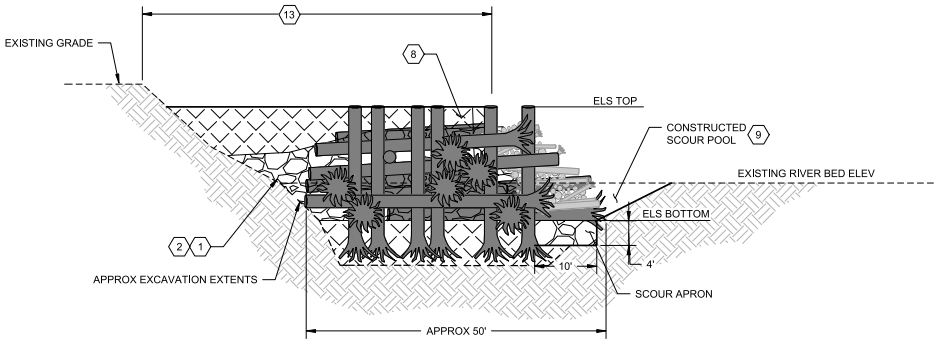
1. APPROXIMATE ELS EXCAVATION LIMITS.
2. EXCAVATION SIDE SLOPES WILL VARY BASED ON CONTRACTORS MEANS AND METHODS.
3. PLACE PILES AND KEY MEMBERS ACCORDING TO ELS LAYERING PLAN.
4. COORDINATE WITH WITH ENGINEER BEFORE PLACING LARGE ROCK AND NATIVE ALLUVIUM BACKFILL MATERIAL.
5. EXTENT OF RIPRAP CORE BACKFILL MATERIAL ABOVE LAYER 3.
6. RACKING LOG SHALL EXTEND THROUGH LOG LAYERS 1, 2, 3, 4 AND 5.
7. CONSTRUCT DEPOSITIONAL BAR WITH NATIVE ALLUVIUM THAT IS EXCAVATED FOR SIDE CHANNEL AND ELS CONSTRUCTION AND WITH ALLUVIUM EXACAVATED FROM SCOUR POOLS AND FROM GRAVEL BARS. CONSTRUCT FLANKS OF ELS AND DEPOSTIONAL BAR WITH NATIVE ALLUVIUM BACKFILL MATERIAL ACCORDING TO THE SLOPE SHOWN ON THESE DETAILS.
8. MAINTAIN A MINIMUM DEPTH OF 3-FEET OF NATIVE ALLUVIUM BACKFILL MATERIAL OVER TOP OF INTERNAL LARGE ROCK BACKFILL MATERIAL.
9. DO NOT BACKFILL UPSTREAM OF ELS. LEAVE AS A POOL.
10. ADJUST FINAL GRADE ON BANK SIDE AND DOWNSTREAM SIDE OF ELS AS NEEDED TO PLACE ALL NATIVE ALLUVIUM BACKFILL MATERIAL.
11. 1-FOOT MIN OF ALLUVIUM FILL OVER RIPRAP CORE BACKFILL MATERIAL.
12. PLACE SLASH MATERIAL AND SALVAGED BRUSH ALONG EDGE OF ELS BETWEEN NATIVE ALLUVIUM BACKFILL MATERIAL AND RACKING LOGS.
13. DIMENSION WILL VARY ALONG ELS TO TRANSITION TO EXISTING GRADE BASED ON TOP OF BANK ELEVATION.



SECTION - RIGHT BANK DEFLECTOR ELS

SCALE: NTS

A -



SECTION - RIGHT BANK DEFLECTOR ELS

SCALE: NTS

B -

PRELIMINARY DESIGN

No.	REVISION	BY	APP'D	DATE

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

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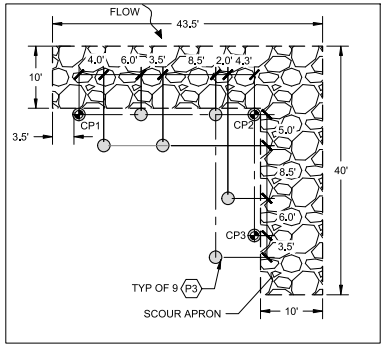
DESIGNED: B. SCOTT	DRAWN: M. McCARTHY
DESIGNED: T. FOULK	CHECKED: B. SCOTT
SCALE: AS NOTED	APPROVED: B. SCOTT

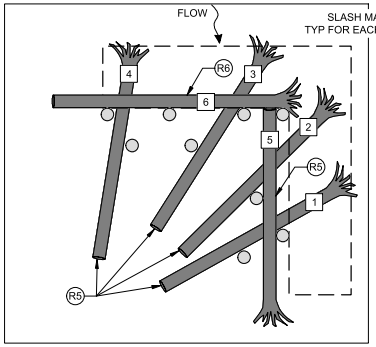
SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

TYPE 5 LARGE RIGHT BANK ELS DETAILS

DATE: MAY 2025
PROJECT NO: 14-05790-000
DRAWING NO: C3.06
SHEET NO: 21 OF 28



PILE LAYOUT



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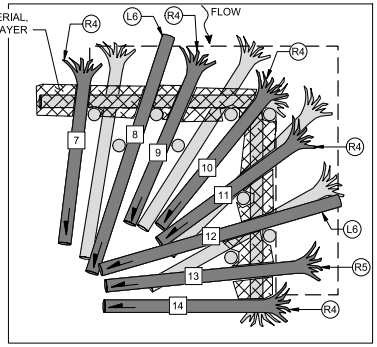

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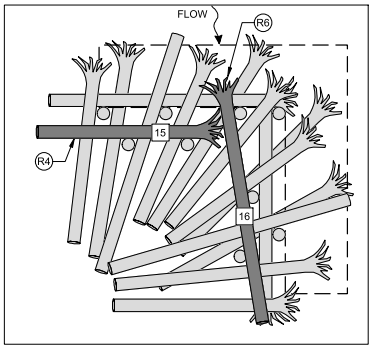

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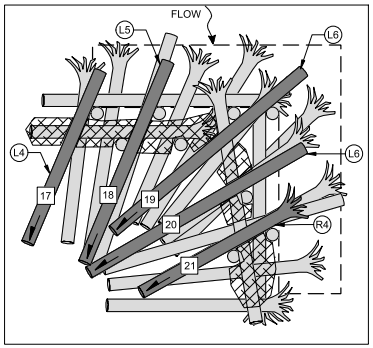

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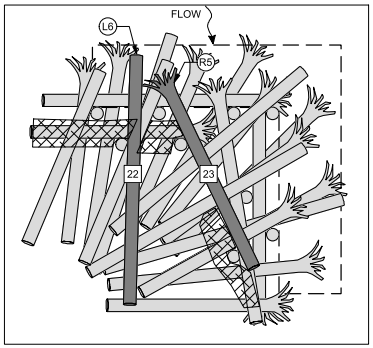

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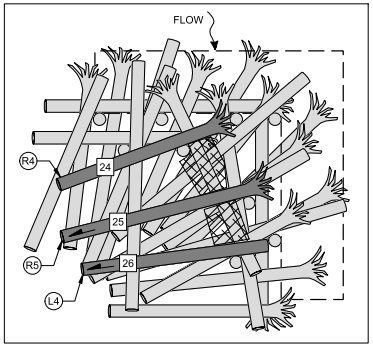

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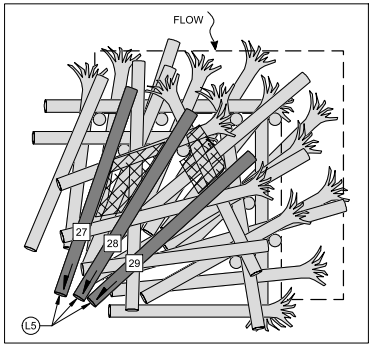

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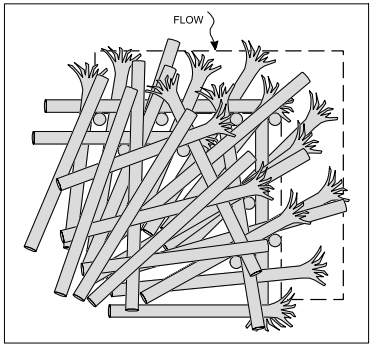

COMPLETE

GENERAL NOTES:

1. PILE LOCATIONS SHALL BE STAKED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER PRIOR TO PILE INSTALLATION.
2. FINAL ELS LOCATION AND ORIENTATION SHALL BE FIELD VERIFIED BY THE ENGINEER AFTER THE CONTRACTOR STAKES THE PILE LOCATIONS.
3. PILE LOCATIONS ARE SYMMETRICAL ABOUT THE ELS CONTROL POINT.
4. PILE LOCATIONS SHALL BE BASED ON THE LOCATION OF THE ELS CONTROL POINT AND SHALL BE WITHIN 6 INCHES OF THE LOCATION SHOWN ON THE DRAWINGS.
5. LOG MATERIALS SHALL BE PLACED AT THE LOCATIONS, ELEVATIONS AND ORIENTATIONS SPECIFIED ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER.
6. TRIM LOGS TO FIT AS REQUIRED.
7. TRIM PILES A MINIMUM OF 18 INCHES AND A MAXIMUM OF 24 INCHES ABOVE FINAL GRADE.
8. EXCAVATION LIMITS VARY DEPENDING ON THE LOCAL SOIL CONDITIONS AND THE CONSTRUCTION TECHNIQUES EMPLOYED.
9. INSTALL LOGS, RACKING LOGS, SLASH, IMPORTED BALLAST MATERIAL AND NATIVE BACKFILL MATERIAL AS SHOWN ON THE PLANS AND AS DIRECTED BY THE ENGINEER.
10. SEE DRAWING XXX FOR STRUCTURE CONTROL POINT COORDINATES (TO BE ADDED AT 90% DESIGN)
11. RACKING LOGS NOT SHOWN FOR CLARITY. PLACE RACKING LOGS ALONG UPSTREAM FACE AND ALONG THE SIDES OF THE ELS AS SHOWN ON DWG C3.06. RACKING LOGS SHALL BE PLACED PARALLEL TO AND BETWEEN PILES EXTENDING OUT FROM THE ELS. ALL RACKING LOGS SHALL BE PLACED TO CREATE AN INTERLOCKING MATRIX OF LOGS SECURED BETWEEN PILES AND KEY LOGS. PLACE SLASH MATERIAL AT SAME TIME AS RACKING LOGS TO FILL VOIDS BETWEEN RACKING LOGS.

ELS CONSTRUCTION SEQUENCE NOTES:

1. INSTALL PILES TO SPECIFIED DEPTH.
2. INSTALL LAYER 1 AND LAYER 2 KEY LOGS, RACKING LOGS, SLASH MATERIAL AND FIRST LIFT OF LARGE ROCK BACKFILL MATERIAL.
4. FILL ALL VOIDS IN LARGE ROCK BACKFILL MATERIAL WITH SMALLER NATIVE ALLUVIUM.
5. INSTALL LAYER 3 AND LAYER 4 KEY LOGS, RACKING LOGS, SLASH MATERIAL AND SECOND LIFT OF LARGE ROCK BACKFILL MATERIAL.
6. FILL ALL VOIDS IN LARGE ROCK BACKFILL MATERIAL WITH SMALLER NATIVE ALLUVIUM.
7. INSTALL LAYER 5 AND LAYER 6 KEY LOGS, RACKING LOGS, SLASH MATERIAL AND THIRD LIFT OF LARGE ROCK BACKFILL MATERIAL.
8. FILL ALL VOIDS IN LARGE ROCK BACKFILL MATERIAL WITH SMALLER NATIVE ALLUVIUM.
9. INSTALL LAYER 7 KEY LOGS, RACKING LOGS, SLASH MATERIAL AND FOURTH LIFT OF LARGE ROCK BACKFILL MATERIAL.
10. COMPLETELY BACKFILL REMAINDER OF ELS INTERIOR AND CONSTRUCT DEPOSITIONAL BAR WITH NATIVE ALLUVIUM TO GRADE AND EXTENTS SHOWN ON ELS PLAN.
11. PLACE TOPSOIL AND MULCH OVER TOP OF ELS AS SHOWN ON ELS PLAN.

LOG SCHEDULE - RIGHT BANK DEFLECTOR ELS

LOG TYPE	DIAMETER (IN)	LENGTH (FT)	ROOTWAD	TOTAL QTY PER STRUCTURE
P3	24	25	YES	9
L4	24	30	NO	2
L5	24	35	NO	4
L6	24	40	NO	5
R4	24	30	YES	8
R5	24	35	YES	8
R6	24	40	YES	2
RACKING	4-16	15-30	OPTIONAL	150
SLASH (LOOSE)	-	-	-	200 CY

LEGEND:

- X# — LOG TYPE ID
- # — LOG PLACEMENT SEQUENCING ORDER
- CP# — CONTROL POINT

PRELIMINARY DESIGN

No.	REVISION	BY	APP'D	DATE

ONE INCH AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

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DESIGNED: B. SCOTT	DRAWN: M. McCARTHY
DESIGNED: T. FOULK	CHECKED: B. SCOTT
SCALE: AS NOTED	APPROVED: B. SCOTT

SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

TYPE 5 LARGE RIGHT BANK ELS LAYERING PLAN

DATE: MAY 2025
PROJECT NO: 14-05790-000
DRAWING NO: C3.07
SHEET NO: 22 OF 28

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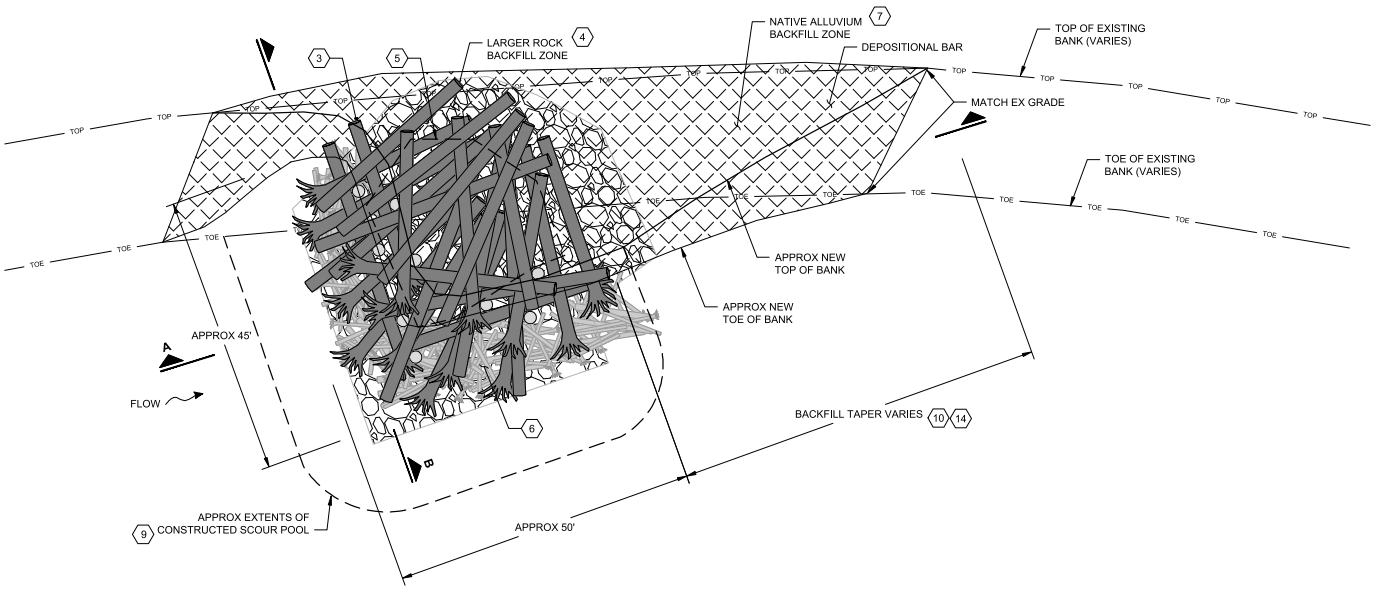
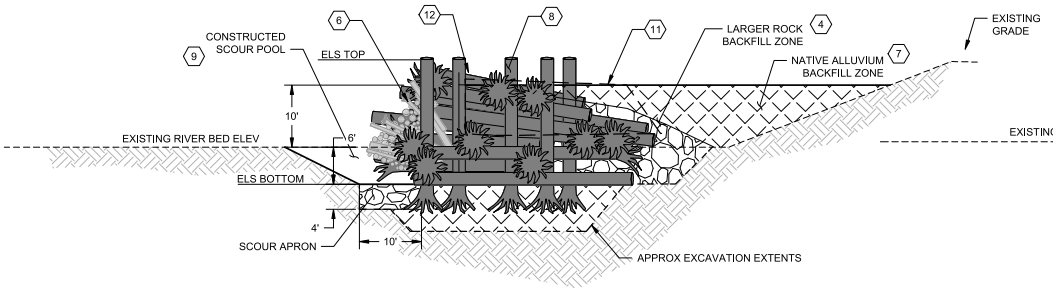


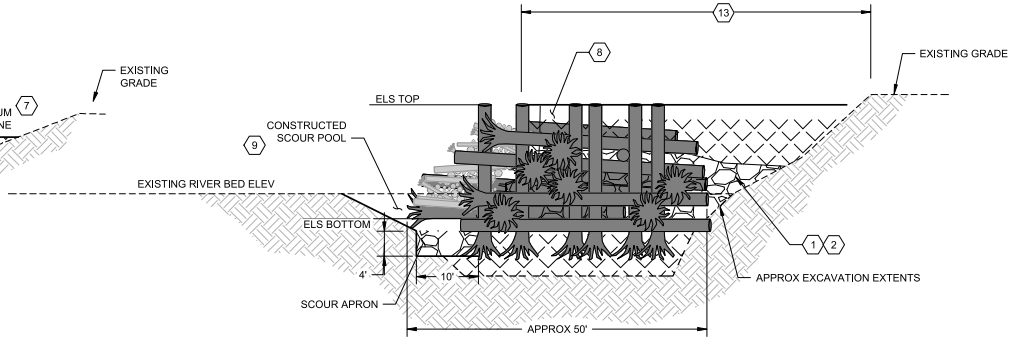
PLAN - LEFT BANK DEFLECTOR ELS
SCALE: NTS
1 VAR

KEYNOTES

1. APPROXIMATE ELS EXCAVATION LIMITS.
2. EXCAVATION SIDE SLOPES WILL VARY BASED ON CONTRACTORS MEANS AND METHODS.
3. PLACE PILES AND KEY MEMBERS ACCORDING TO ELS LAYERING PLAN.
4. COORDINATE WITH WITH ENGINEER BEFORE PLACING LARGE ROCK AND NATIVE ALLUVIUM BACKFILL MATERIAL.
5. EXTENT OF RIPRAP CORE BACKFILL MATERIAL ABOVE LAYER 3.
6. RACKING LOG SHALL EXTEND THROUGH LOG LAYERS 1, 2, 3, 4 AND 5.
7. CONSTRUCT DEPOSITIONAL BAR WITH NATIVE ALLUVIUM THAT IS EXCAVATED FOR SIDE CHANNEL AND ELS CONSTRUCTION AND WITH ALLUVIUM EXACAVATED FROM SCOUR POOLS AND FROM GRAVEL BARS. CONSTRUCT FLANKS OF ELS AND DEPOSTIONAL BAR WITH NATIVE ALLUVIUM BACKFILL MATERIAL ACCORDING TO THE SLOPE SHOWN ON THESE DETAILS.
8. MAINTAIN A MINIMUM DEPTH OF 3-FEET OF NATIVE ALLUVIUM BACKFILL MATERIAL OVER TOP OF INTERNAL LARGE ROCK BACKFILL MATERIAL.
9. DO NOT BACKFILL UPSTREAM OF ELS. LEAVE AS A POOL.
10. ADJUST FINAL GRADE ON BANK SIDE AND DOWNSTREAM SIDE OF ELS AS NEEDED TO PLACE ALL NATIVE ALLUVIUM BACKFILL MATERIAL.
11. 1-FOOT MIN OF ALLUVIUM FILL OVER RIPRAP CORE BACKFILL MATERIAL.
12. PLACE SLASH MATERIAL AND SALVAGED BRUSH ALONG EDGE OF ELS BETWEEN NATIVE ALLUVIUM BACKFILL MATERIAL AND RACKING LOGS.
13. DIMENSION WILL VARY ALONG ELS TO TRANSITION TO EXISTING GRADE BASED ON TOP OF BANK ELEVATION.



SECTION - LEFT BANK DEFLECTOR ELS
SCALE: NTS
A -



SECTION - LEFT BANK DEFLECTOR ELS
SCALE: NTS
B -

PRELIMINARY DESIGN

No.	REVISION	BY	APP'D	DATE

ONE INCH AT FULL SIZE. IF NOT ONE INCH SCALE ACCORDINGLY

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DESIGNED: B. SCOTT	DRAWN: M. McCARTHY
DESIGNED: T. FOULK	CHECKED: B. SCOTT
SCALE: AS NOTED	APPROVED: B. SCOTT

SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

TYPE 5 LARGE LEFT BANK ELS DETAILS

DATE: MAY 2025
PROJECT NO: 14-05790-000
DRAWING NO: C3.08
SHEET NO: 23 OF 28

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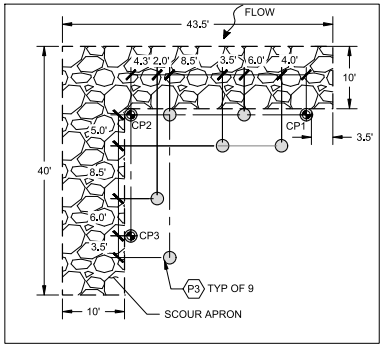
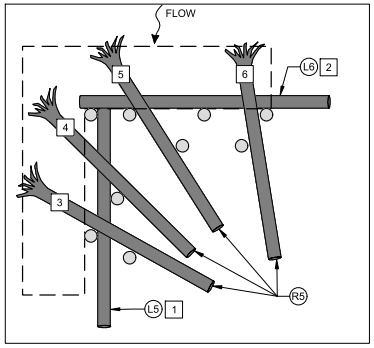


PILE LAYOUT



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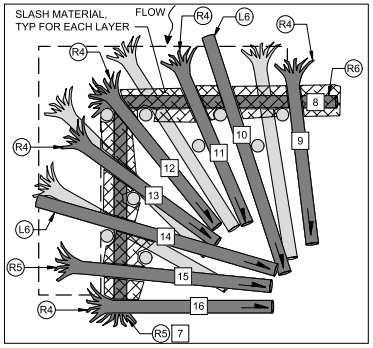

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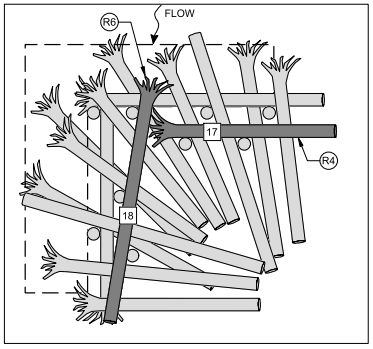

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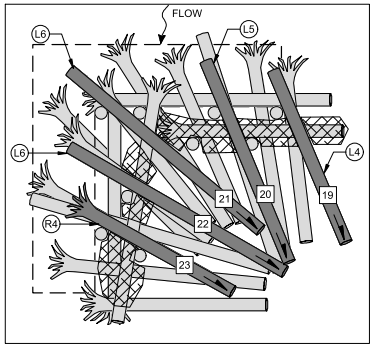

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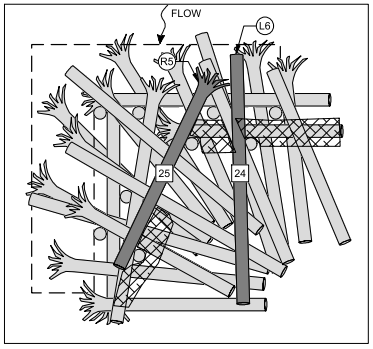

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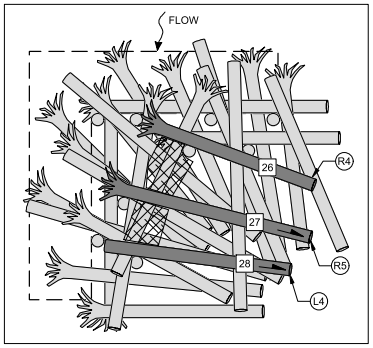

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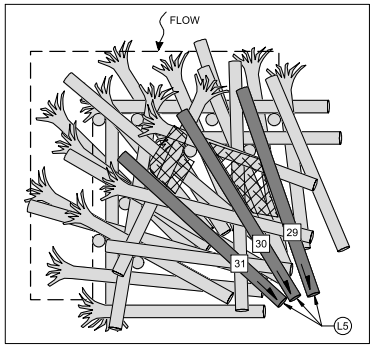

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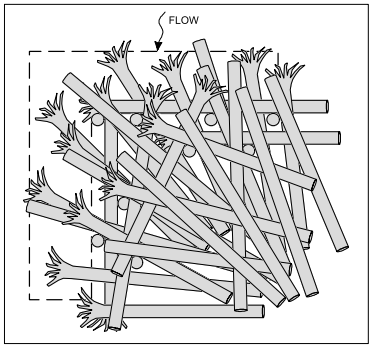

COMPLETE

GENERAL NOTES:

1. PILE LOCATIONS SHALL BE STAKED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER PRIOR TO PILE INSTALLATION.
2. FINAL ELS LOCATION AND ORIENTATION SHALL BE FIELD VERIFIED BY THE ENGINEER AFTER THE CONTRACTOR STAKES THE PILE LOCATIONS.
3. PILE LOCATIONS ARE SYMMETRICAL ABOUT THE ELS CONTROL POINT.
4. PILE LOCATIONS SHALL BE BASED ON THE LOCATION OF THE ELS CONTROL POINT AND SHALL BE WITHIN 6 INCHES OF THE LOCATION SHOWN ON THE DRAWINGS.
5. LOG MATERIALS SHALL BE PLACED AT THE LOCATIONS, ELEVATIONS AND ORIENTATIONS SPECIFIED ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER.
6. TRIM LOGS TO FIT AS REQUIRED.
7. TRIM PILES A MINIMUM OF 18 INCHES AND A MAXIMUM OF 24 INCHES ABOVE FINAL GRADE.
8. EXCAVATION LIMITS VARY DEPENDING ON THE LOCAL SOIL CONDITIONS AND THE CONSTRUCTION TECHNIQUES EMPLOYED.
9. INSTALL LOGS, RACKING LOGS, SLASH, IMPORTED BALLAST MATERIAL AND NATIVE BACKFILL MATERIAL AS SHOWN ON THE PLANS AND AS DIRECTED BY THE ENGINEER.
10. SEE DRAWING XXX FOR STRUCTURE CONTROL POINT COORDINATES (TO BE ADDED AT 90% DESIGN).
11. RACKING LOGS NOT SHOWN FOR CLARITY. PLACE RACKING LOGS ALONG UPSTREAM FACE AND ALONG THE SIDES OF THE ELS AS SHOWN ON DWG C3.08. RACKING LOGS SHALL BE PLACED PARALLEL TO AND BETWEEN PILES EXTENDING OUT FROM THE ELS. ALL RACKING LOGS SHALL BE PLACED TO CREATE AN INTERLOCKING MATRIX OF LOGS SECURED BETWEEN PILES AND KEY LOGS. PLACE SLASH MATERIAL AT SAME TIME AS RACKING LOGS TO FILL VOIDS BETWEEN RACKING LOGS.

ELS CONSTRUCTION SEQUENCE NOTES:

1. INSTALL PILES TO SPECIFIED DEPTH.
2. INSTALL LAYER 1 AND LAYER 2 KEY LOGS, RACKING LOGS, SLASH MATERIAL AND FIRST LIFT OF LARGE ROCK BACKFILL MATERIAL.
4. FILL ALL VOIDS IN LARGE ROCK BACKFILL MATERIAL WITH SMALLER NATIVE ALLUVIUM.
5. INSTALL LAYER 3 AND LAYER 4 KEY LOGS, RACKING LOGS, SLASH MATERIAL AND SECOND LIFT OF LARGE ROCK BACKFILL MATERIAL.
6. FILL ALL VOIDS IN LARGE ROCK BACKFILL MATERIAL WITH SMALLER NATIVE ALLUVIUM.
7. INSTALL LAYER 5 AND LAYER 6 KEY LOGS, RACKING LOGS, SLASH MATERIAL AND THIRD LIFT OF LARGE ROCK BACKFILL MATERIAL.
8. FILL ALL VOIDS IN LARGE ROCK BACKFILL MATERIAL WITH SMALLER NATIVE ALLUVIUM.
9. INSTALL LAYER 7 KEY LOGS, RACKING LOGS, SLASH MATERIAL AND FOURTH LIFT OF LARGE ROCK BACKFILL MATERIAL.
10. COMPLETELY BACKFILL REMAINDER OF ELS INTERIOR AND CONSTRUCT DEPOSITIONAL BAR WITH NATIVE ALLUVIUM TO GRADE AND EXTENTS SHOWN ON ELS PLAN.
11. PLACE TOPSOIL AND MULCH OVER TOP OF ELS AS SHOWN ON ELS PLAN.

LOG SCHEDULE - LEFT BANK DEFLECTOR ELS

LOG TYPE	DIAMETER (IN)	LENGTH (FT)	ROOTWAD	TOTAL QTY PER STRUCTURE
(P3)	24	25	YES	9
(L4)	24	30	NO	2
(L5)	24	35	NO	5
(L6)	24	40	NO	6
(R4)	24	30	YES	8
(R5)	24	35	YES	8
(R6)	24	40	YES	2
RACKING	4-16	15-30	OPTIONAL	150
SLASH (LOOSE)	-	-	-	200 CY

LEGEND:

- (X#) LOG TYPE ID
- [#] LOG PLACEMENT SEQUENCING ORDER
- CP# CONTROL POINT

PRELIMINARY DESIGN

No.	REVISION	BY	APP'D	DATE

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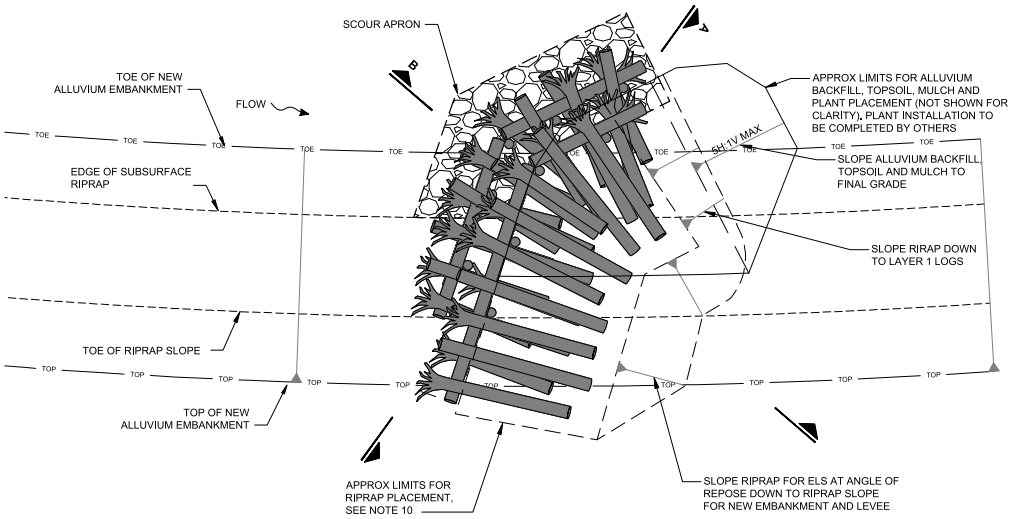
DESIGNED: T. FOULK	CHECKED: B. SCOTT
SCALE: AS NOTED	APPROVED: B. SCOTT

SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

TYPE 5 LARGE LEFT BANK ELS LAYERING PLAN

DATE: MAY 2025
PROJECT NO: 14-05790-000
DRAWING NO: C3.09
SHEET NO: 24 OF 28



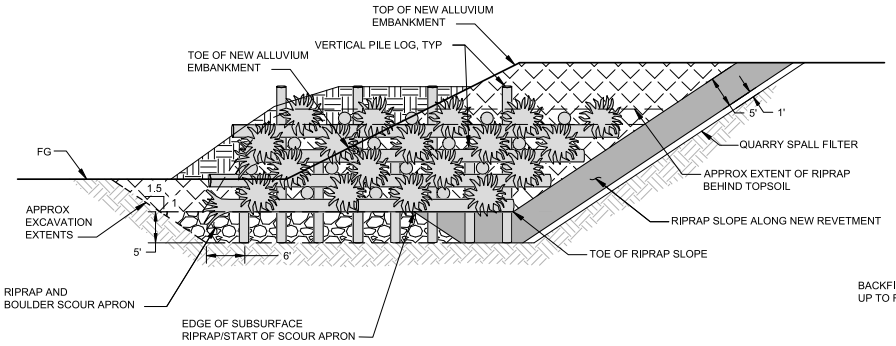
PLAN

CONSTRUCTION QUANTITIES PER TYPE 6 ELS:

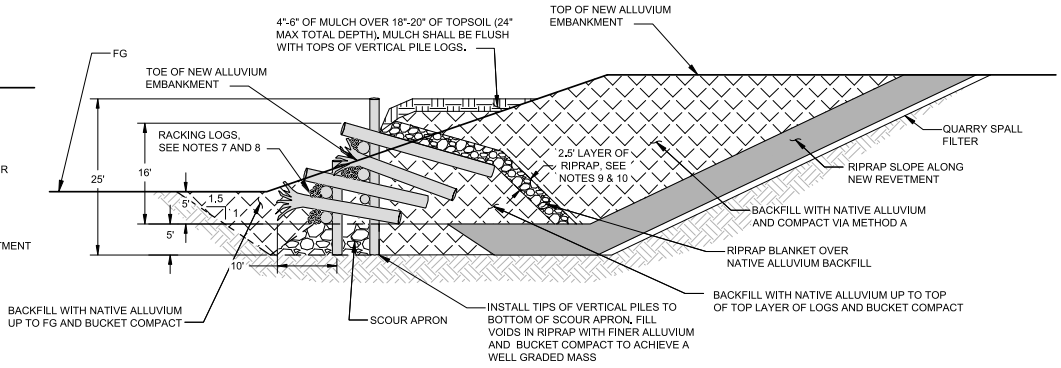
EXCAVATION	800-1,500 CY
HEAVY LOOSE RIPRAP FOR SCOUR APRON	56 CY
NATIVE BOULDERS FOR SCOUR APRON	56 CY
HEAVY LOOSE RIPRAP FOR LOG BALLAST	170 CY
TOPSOIL TYPE C	110 CY
BARK OR WOOD CHIP MULCH	25 CY

NOTES:

1. EXTENTS OF BACKFILL SHOWN ARE APPROXIMATE AND WILL VARY FOR EACH ELS. PLACE ALL EXCESS SPOILS OVER KEY LOGS AS SHOWN AND AS DIRECTED BY THE ENGINEER. ADJUST GRADE OF BACKFILL OVER STRUCTURE AS NECESSARY TO DISPOSE OF ALL EXCESS SPOILS.
2. EXCAVATION LIMITS SHOWN ARE APPROXIMATE AND WILL VARY BASED ON CONSTRUCTION MEANS AND METHODS, SUBSURFACE CONDITIONS AND LOCATION OF STRUCTURE. CONTRACTOR SHALL ADJUST EXCAVATION LIMITS AS NECESSARY TO COMPLETE CONSTRUCTION.
3. PLACE ONLY DRY NATIVE ALLUVIUM BACKFILL MATERIAL WITHIN INTERIOR CORE OF STRUCTURE AND OVER FINAL LAYER OF LOGS IN 2 FOOT LAYERS AND COMPACT WITH BACKSIDE OF EXCAVATOR BUCKET. SATURATED BACKFILL MATERIAL WILL NOT BE ALLOWED.
4. CABLE LASHING NOT SHOWN FOR CLARITY. SEE STRUCTURE LAYERING PLAN ON DWG C3.11 FOR LASHING LOCATIONS AND INFORMATION.
5. CONSTRUCT SCOUR APRON TO THE DIMENSIONS SHOWN USING 50% 24" AND LARGER (MEDIAN DIAMETER) NATIVE BOULDERS AND 50% HEAVY LOOSE RIPRAP. FILL ALL VOIDS BETWEEN BOULDERS AND RIPRAP WITH FINER ALLUVIUM AND BUCKET COMPACT TO ACHIEVE A WELL GRADED AND COMPACTED MASS.
6. SEE LOG SCHEDULE ON DWG C3.11 FOR DIMENSIONS AND NUMBERS OF EACH LOG TYPE IN STRUCTURE.
7. PLACEMENT OF RACKING LOGS SHOWN IS APPROXIMATE. PLACE RACKING LOGS ALONG BOTH UPSTREAM FACES OF STRUCTURE. APPROXIMATELY 1/2 OF RACKING LOGS SHALL BE PLACED ACROSS PILE ROWS (PERPENDICULAR TO FLOW) AND 1/2 OF THE LOGS PARALLEL TO FLOW AND EXTENDING INTO THE CORE OF THE STRUCTURE BETWEEN HORIZONTAL LOGS. RACKING SHALL BE PLACED WITH EACH LAYER OF LOGS, SHALL BE ANGLED UP AND DOWN FROM THE HORIZONTAL, AND SHALL BE PLACED TO CREATE AN INTERLOCKING MATRIX OF LOGS SECURED BETWEEN VERTICAL PILE LOGS AND HORIZONTAL LOGS. COORDINATE WITH ENGINEER PRIOR TO PLACING RACKING LOGS, SLASH AND BACKFILLING.
8. SEE STRUCTURE LAYERING PLAN ON DWG C3.11 FOR SLASH PLACEMENT. SLASH NOT SHOWN HERE FOR CLARITY. PLACE SLASH AT SAME TIME AS RACKING LOGS TO FILL VOIDS BETWEEN RACKING LOGS.
9. ALL HEAVY LOOSE RIPRAP USED IN ELS CONSTRUCTION SHALL CONFORM TO SPECIFICATION SECTION 9-13.1(1) OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT) 2012 STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION.
10. RIPRAP SHALL BE PLACED TO THE EXTENTS SHOWN TO PREVENT EROSION OF NATIVE ALLUVIUM BACKFILL.



SECTION A



SECTION B

DETAIL - TYPE 6 ELS

SCALE: NTS

1 / VAR

PRELIMINARY DESIGN

No.	REVISION	BY	APP'D	DATE

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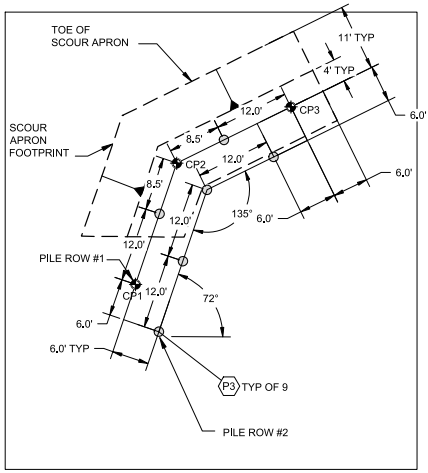
SCALE: AS NOTED	APPROVED: B. SCOTT

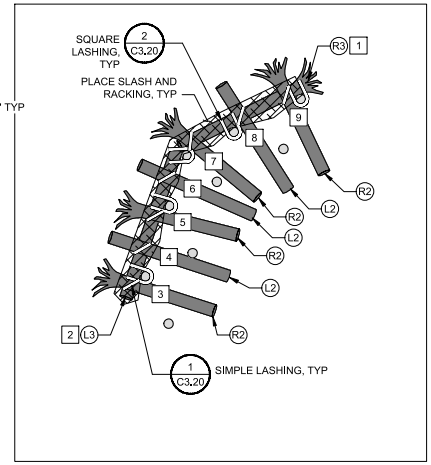
SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

TYPE 6 LARGE RIGHT BANK ELS DETAILS

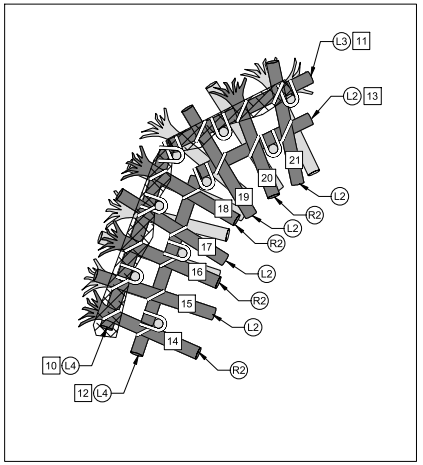
DATE:	MAY 2025
PROJECT NO:	14-05790-000
DRAWING NO:	C3.10
SHEET NO:	25 OF 28



PILES



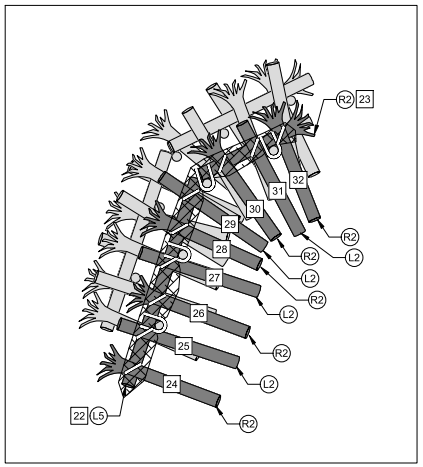
LAYER 1



LAYER 2

GENERAL NOTES:

1. PILES ARE SYMMETRICAL ABOUT THE CONTROL POINTS.
2. STRUCTURE GENERAL LOCATION AND ORIENTATION SHALL BE STAKED BY THE CONTRACTOR. FINAL STRUCTURE LOCATION AND ORIENTATION TO BE FIELD VERIFIED BY ENGINEER FOLLOWING CONTRACTOR STAKING.
3. ALL PILE LOCATIONS SHALL BE STAKED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER PRIOR TO PILE INSTALLATION.
4. ALL PILE LOCATIONS SHALL BE BASED ON THE LOCATION OF THE STRUCTURE CONTROL POINTS AND SHALL BE WITHIN 6 INCHES OF THE LOCATION SHOWN ON THE DRAWINGS.
5. LOG MATERIALS SHALL BE PLACED AT THE LOCATIONS, ELEVATIONS AND ORIENTATIONS SPECIFIED ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER. TRIM CUT ENDS OF HORIZONTAL KEY LOGS TO FIT AS REQUIRED. TRIM TOPS OF PILES IN PILE ROW #1 AS NEEDED TO ALLOW INSTALLATION OF LAYERS 3 AND 4.
6. PLACE SLASH OVER AND BETWEEN KEY LOGS AND PILES AS SHOWN FOR EACH LAYER FOLLOWING PLACEMENT OF KEY LOGS AND RACKING LOGS. PLACE APPROXIMATELY 2 TO 3 FEET OF NATIVE ALLUVIUM OVER 1/2 THE WIDTH OF SLASH TO SECURE IN PLACE SUCH THAT SLASH IS VISIBLE FOLLOWING CONSTRUCTION. COORDINATE WITH ENGINEER PRIOR TO PLACING RACKING AND SLASH.
7. BACKFILL EACH LAYER WITH NATIVE ALLUVIUM FLUSH TO TOP OF CURRENT LAYER PRIOR TO CONSTRUCTING SUBSEQUENT LAYER. COMPACT ALLUVIUM BACKFILL WITH EXCAVATOR BUCKET. FILL ALL VOIDS BETWEEN BOULDERS (ROCKS GREATER THAN 12" DIAMETER) WITH FINER ALLUVIUM TO ACHIEVE A WELL GRADED AND COMPACTED MASS.
8. SEE DRAWING XXX FOR STRUCTURE CONTROL POINT COORDINATES (TO BE ADDED AT 90% DESIGN).



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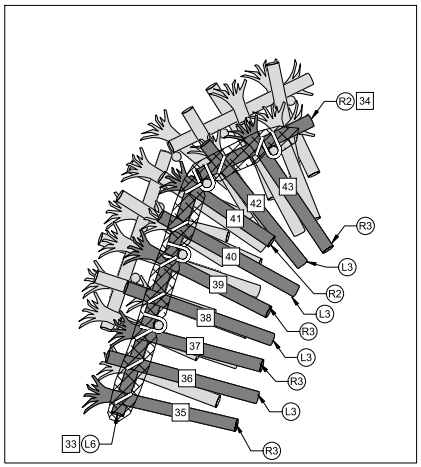

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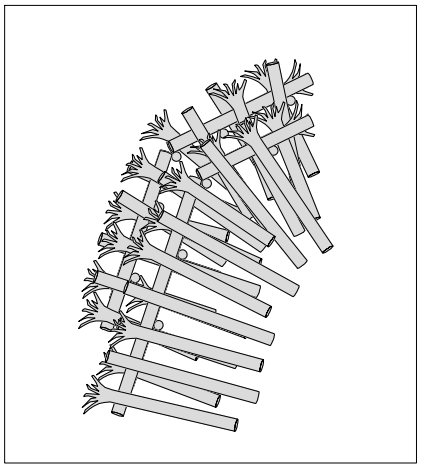

COMPLETE

LOG SCHEDULE - ELS TYPE 6:

LOG TYPE	DIAMETER (IN)	LENGTH (FT)	ROOTWAD	TOTAL QTY PER STRUCTURE
(P3)	24	25	NO	9
(L2)	24	20	NO	12
(L3)	24	25	NO	6
(L4)	24	30	NO	2
(L5)	24	35	NO	1
(L6)	24	40	NO	1
(R2)	24	20	YES	16
(R3)	24	25	YES	5
RACKING	4"-16"	15'-30'	OPTIONAL	120
SLASH				100 CY

LEGEND:

- (X#) LOG TYPE ID
- [#] LOG PLACEMENT SEQUENCING ORDER
- CP# CONTROL POINT

PRELIMINARY DESIGN

No.	REVISION	BY	APP'D	DATE

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

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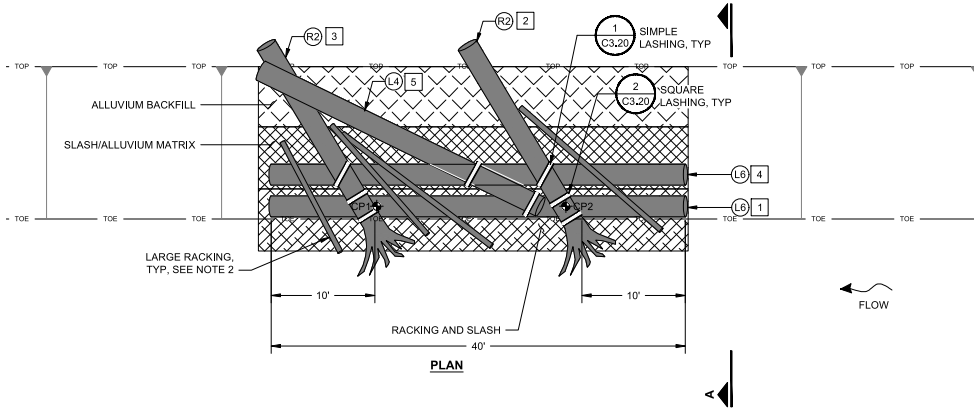
SCALE: AS NOTED	APPROVED: B. SCOTT		

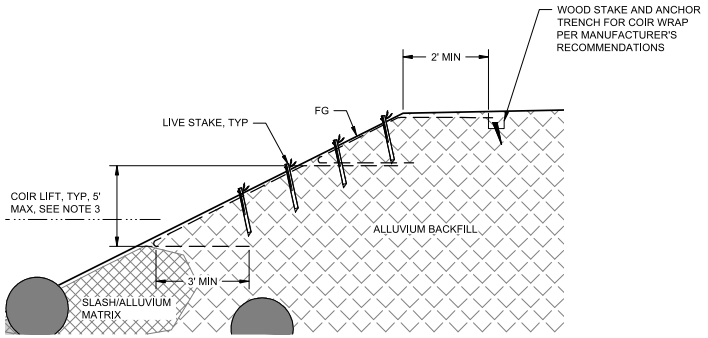
SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

TYPE 6 LARGE RIGHT BANK ELS LAYERING PLAN

DATE: MAY 2025
PROJECT NO: 14-05790-000
DRAWING NO: C3.11
SHEET NO: 26 OF 28

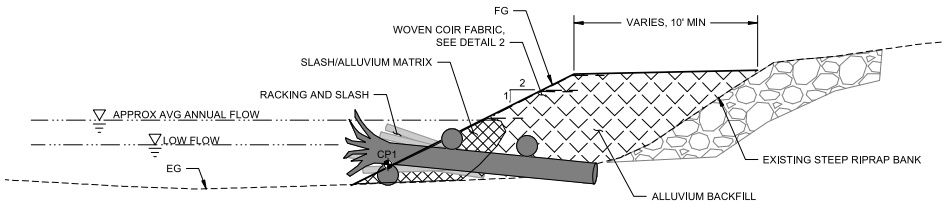


PLAN



DETAIL - WOVEN COIR BANK PROTECTION 2 VAR

SCALE: NTS



SECTION

NOTES

1. SLASH/ALLUVIUM MATRIX SHALL BE A DENSE MATRIX OF 30% SLASH AND 70% ALLUVIUM FILL. MATERIALS SHALL BE PLACED ALTERNATELY, NOT IN LAYERS OR LIFTS, TO CREATE A WELL MIXED AND INTERWOVEN MATRIX. SLASH/ALLUVIUM MATRIX SHALL BE COMPACTED USING METHOD D COMPACTION PER THE APPROVAL OF THE ENGINEER.
2. RACKING "GENERALLY" SHOWN TO SHOW ORIENTATION OF BURIED AND EXPOSED PORTIONS OF THE LARGER RACKING LOGS.
3. PLACE COIR FABRIC PER MANUFACTURER'S RECOMMENDATIONS FOR CHANNEL (MOVING WATER) INSTALLATIONS FOR STAKING AND SHINGLED OVERLAPPING, WITH SHINGLE OVERLAPPING IN A DOWNSTREAM DIRECTION. COIR LIFT VERTICAL HEIGHT WILL VARY WITH A MAXIMUM HEIGHT OF 5 FEET TO PROVIDE 2 TO 3 LIFTS BASED ON TOTAL BANK HEIGHT.

LOG SCHEDULE - EDGE HABITAT ELS:

LOG ID #	DIAMETER (IN)	LENGTH (FT)	ROOTWAD	QUANTITY/ STRUCTURE
(L4)	24	30	NO	1
(L6)	24	40	NO	2
(R2)	24	20	YES	2
RACKING	4-16	15-30	OPTIONAL	2
SLASH	< 4	NA	NA	20 CY

DETAIL - EDGE HABITAT ELS 1 VAR

SCALE: NTS

LEGEND:

(X#)	LOG TYPE ID
[#]	LOG PLACEMENT SEQUENCING ORDER
CP#	CONTROL POINT

PRELIMINARY DESIGN

No.	REVISION	BY	APP'D	DATE

ONE INCH AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

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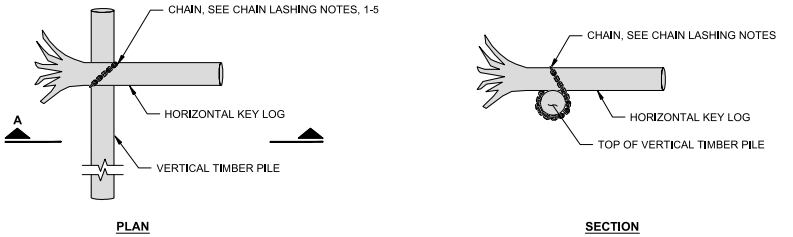
SCALE: AS NOTED	APPROVED: B. SCOTT

SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

EDGE HABITAT ELS DETAILS

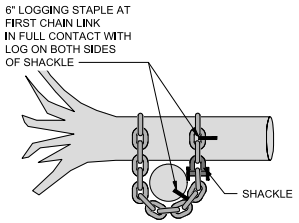
DATE: MAY 2025
PROJECT NO: 14-05790-000
DRAWING NO: C3.12
SHEET NO: 27 OF 28



PLAN SECTION

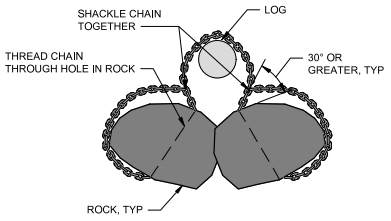
DETAIL - SIMPLE CHAIN LASHING (1)

SCALE: NTS



DETAIL - CHAIN CONNECTION (3)

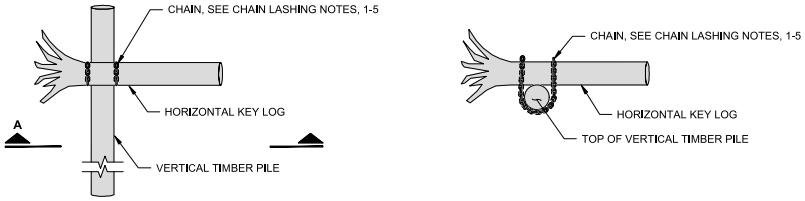
SCALE: NTS



NOTE:
REMOVE SLACK IN CHAIN OVER LOG.

DETAIL - LOG TO ROCK CONNECTION (4)

SCALE: NTS



PLAN SECTION

DETAIL - SQUARE CHAIN LASHING (2)

SCALE: NTS

CHAIN LASHING NOTES:

1. LASH HORIZONTAL LOGS TO VERTICAL TIMBER PILES WITH CHAIN AS SHOWN ON DETAIL AND LAYERING PLAN OR AS DIRECTED BY ENGINEER. CHAIN LASHING SYSTEM SHALL BE PUT IN TENSION TO 1/4 OF THE CHAIN WORKING LOAD LIMIT AND BE MAINTAINED DURING CHAIN SHACKLING.
2. CHAIN LENGTH NEEDED PER LASHING WILL VARY BASED ON DIAMETER OF LOGS AT THE ACTUAL LOCATIONS THEY ARE LASHED TOGETHER.
3. CHAIN FOR LASHING SHALL BE 3/8 INCH DIAMETER CARBON-WELDED GRADE 43 HIGH-TEST CHAIN, WITH A MINIMUM WORKING LOAD LIMIT OF 5400 LBS.
4. ALL HARDWARE USED FOR LASHING SHALL BE STAINLESS STEEL OR NATURAL UNTREATED STEEL, AND CONNECTIONS SHALL BE OF THE QUANTITY AND TYPE SPECIFIED BY THE MANUFACTURER WITH AN EQUAL OR GREATER STRENGTH THAN THE CHAIN BREAKING STRENGTH OR AS APPROVED BY THE ENGINEER.
5. MAR OR ROUND ALL EXPOSED HARDWARE NUTS AND BOLT THREADS AFTER INSTALLATION FOR THEFT PROTECTION. ENGINEER OR OWNER SHALL APPROVE ANY COATING PRIOR TO CONTRACTOR APPLYING IT. SECURE CHAIN TO LOG AND PILE USING 6 INCH LOGGING STAPLE.
6. CONTRACTOR MAY SUBMIT ALTERNATIVE CHAIN CONNECTION SYSTEM FOR APPROVAL.

PRELIMINARY DESIGN

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SOUTH FORK NOOKSACK RIVER
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PROJECT - PHASE 3

LOG CONNECTION DETAILS

DATE:	MAY 2025
PROJECT NO:	14-05790-000
DRAWING NO:	C3.20
SHEET NO:	28 OF 28