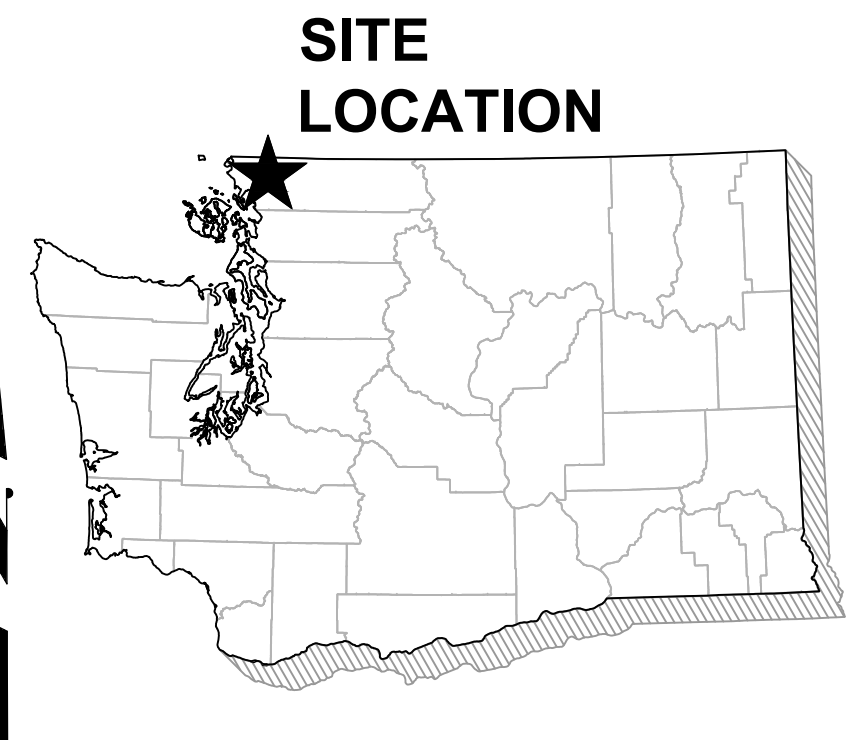
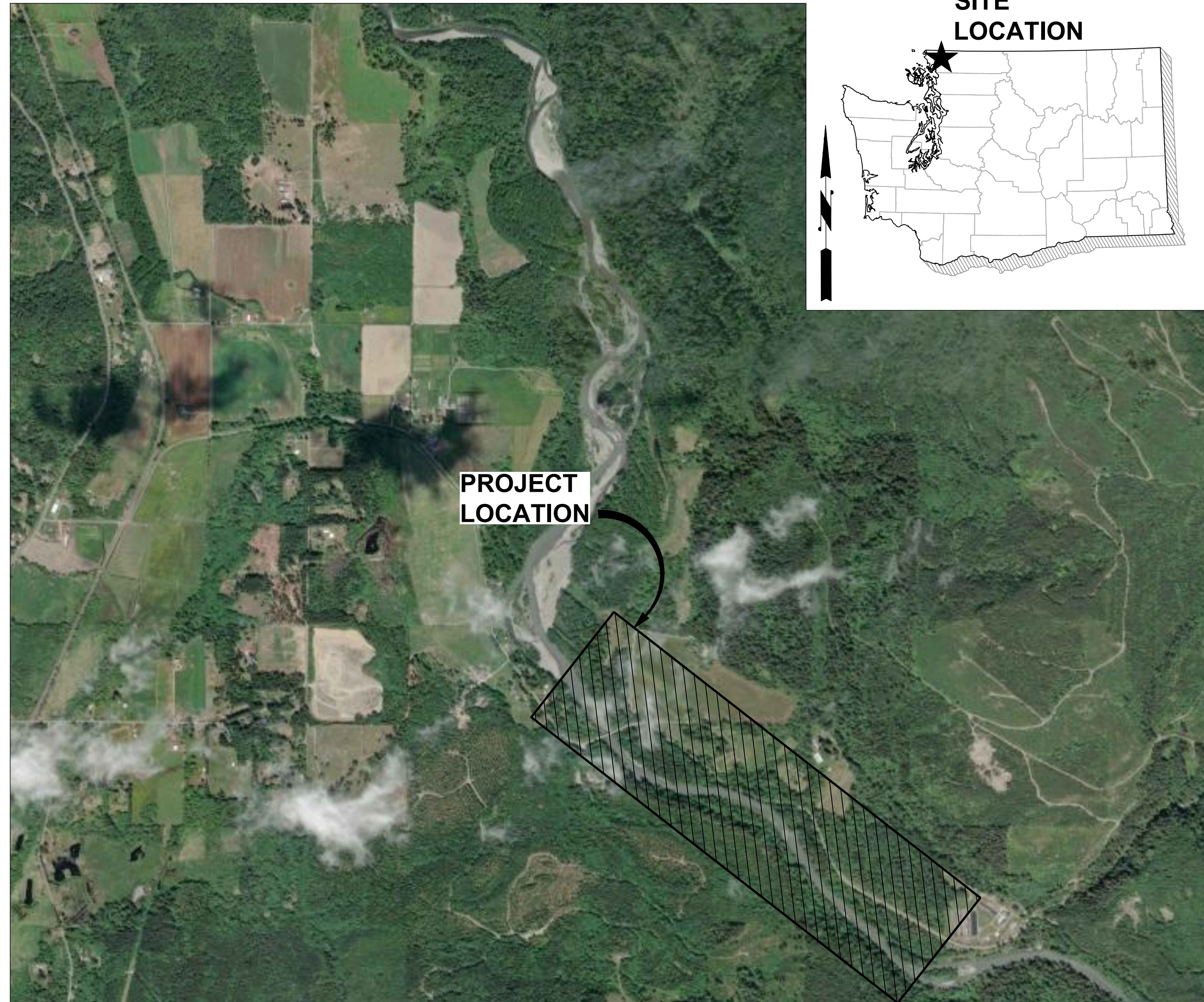


SOUTH FORK NOOKSACK RIVER SKOOKUM/EDFRO HABITAT RESTORATION PROJECT - PHASE 3

WHATCOM COUNTY, WASHINGTON



INDEX OF DRAWINGS		
SHEET NO.	SHEET TITLE	SHEET DESCRIPTION
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4	C1.01	TYPE 1 AND 2 ELS DETAILS
5	C1.02	TYPE 3 MEDIUM RIGHT BANK ELS
6	C1.03	TYPE 3 MEDIUM LEFT BANK ELS
7	C1.04	TYPE 4 LARGE MID-CHANNEL ELS
8	C1.05	TYPE 4 LARGE MID-CHANNEL ELS LAYERING PLAN
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11	C1.08	TYPE 5 LARGE LEFT BANK ELS
12	C1.09	TYPE 5 LARGE LEFT BANK ELS LAYERING PLAN

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

**PROJECT
LOCATION**

VICINITY MAP
SCALE: 1"=1/4 MILE

CONCEPTUAL DESIGN

No.	REVISION	BY	APP'D	DATE

ONE INCH
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INCH SCALE ACCORDINGLY
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SCALE: AS NOTED	APPROVED: -

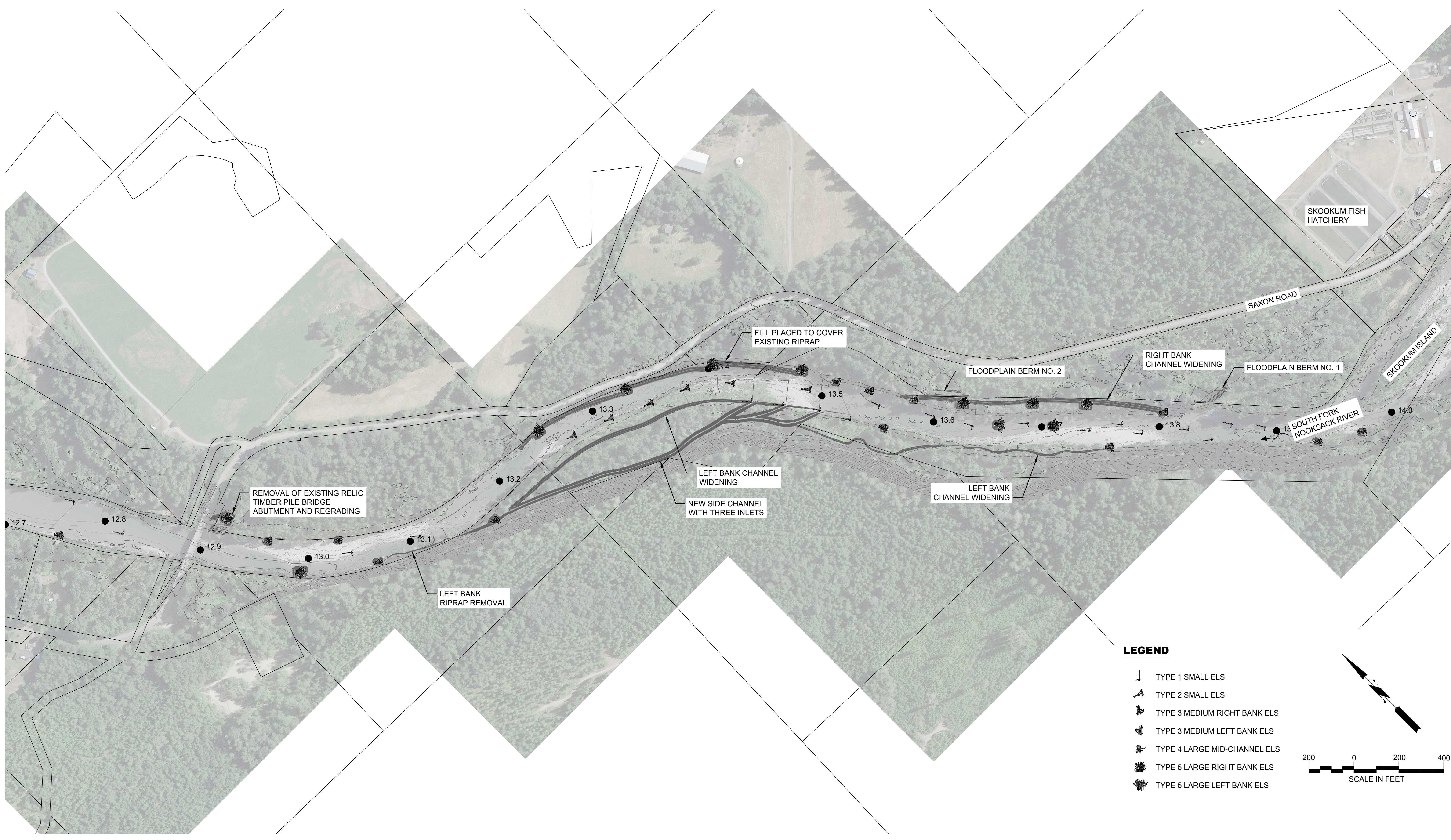
**SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3**

COVER

DATE: APRIL 2024
PROJECT NO: 14-05790-000
DRAWING NO: G0.01
SHEET NO: 1 OF 12

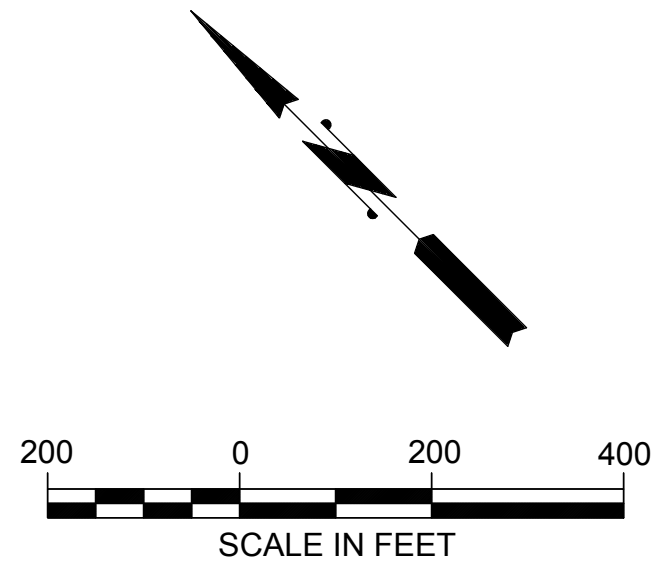
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LEGEND

- ↓ 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



CONCEPTUAL DESIGN				
No.	REVISION	BY	APP'D	DATE

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 INCH SCALE ACCORDINGLY



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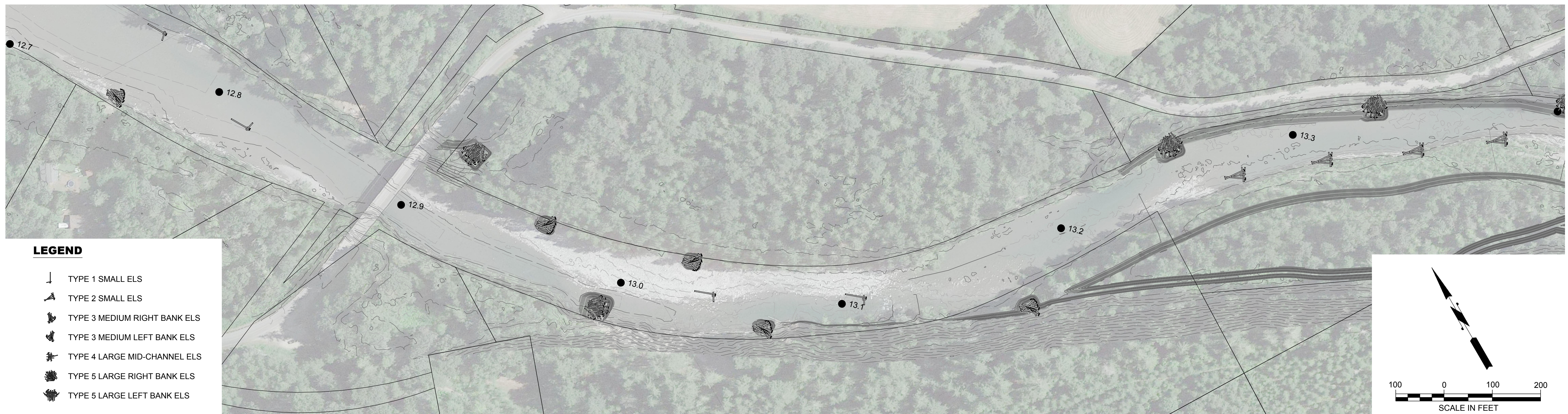
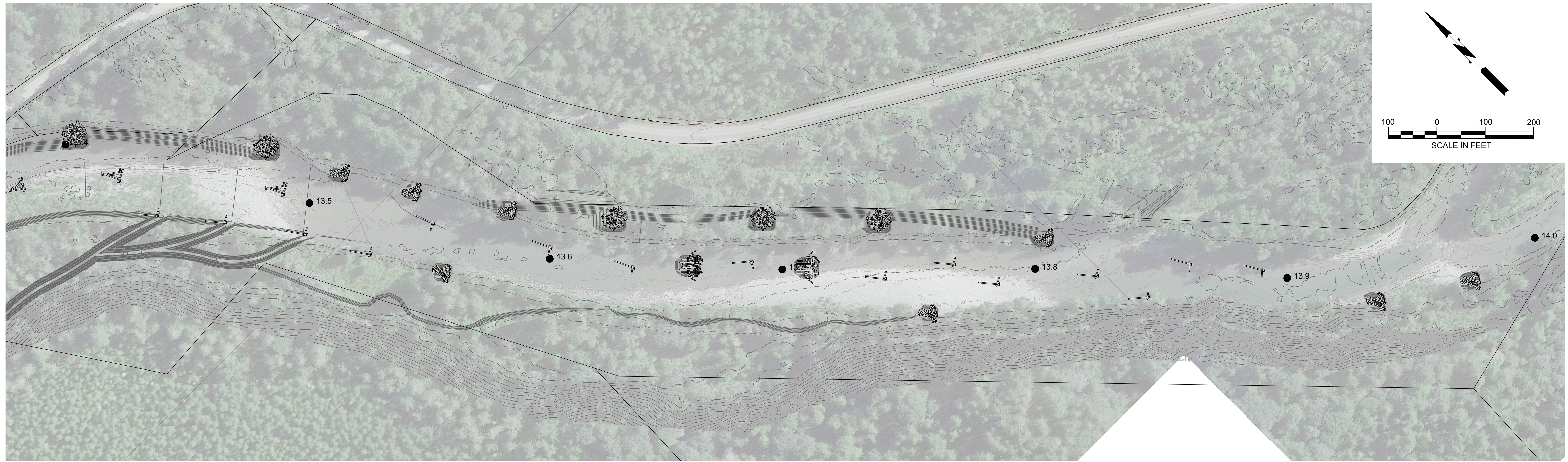
SOUTH FORK NOOKSACK RIVER
 SKOOKUM/EDFRO RESTORATION
 PROJECT - PHASE 3

 CONCEPTUAL DESIGN SITE PLAN

DATE:	APRIL 2024
PROJECT NO:	14-05790-000
DRAWING NO:	C0.01
SHEET NO:	2 OF 12

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LEGEND

- ↓ 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

CONCEPTUAL DESIGN

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INCH SCALE ACCORDINGLY
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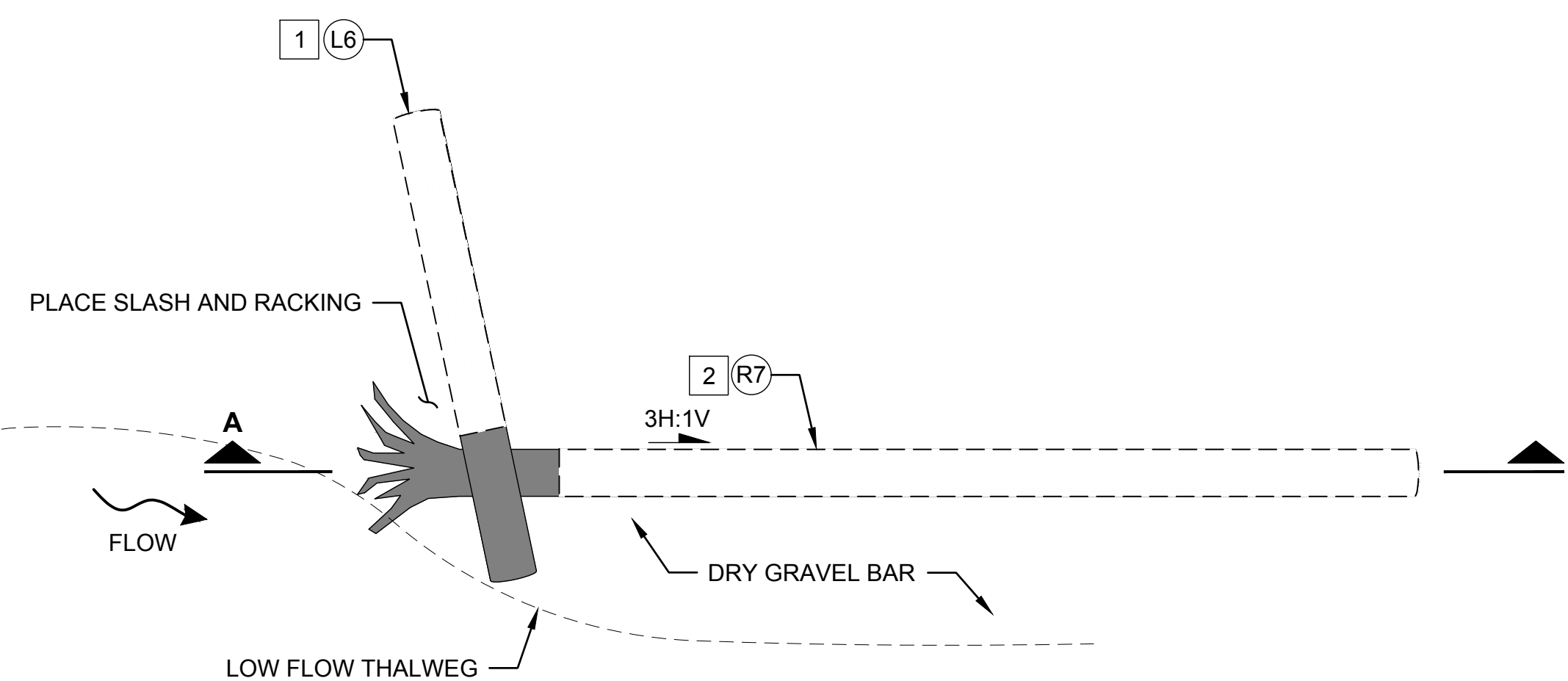
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AS NOTED	-

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

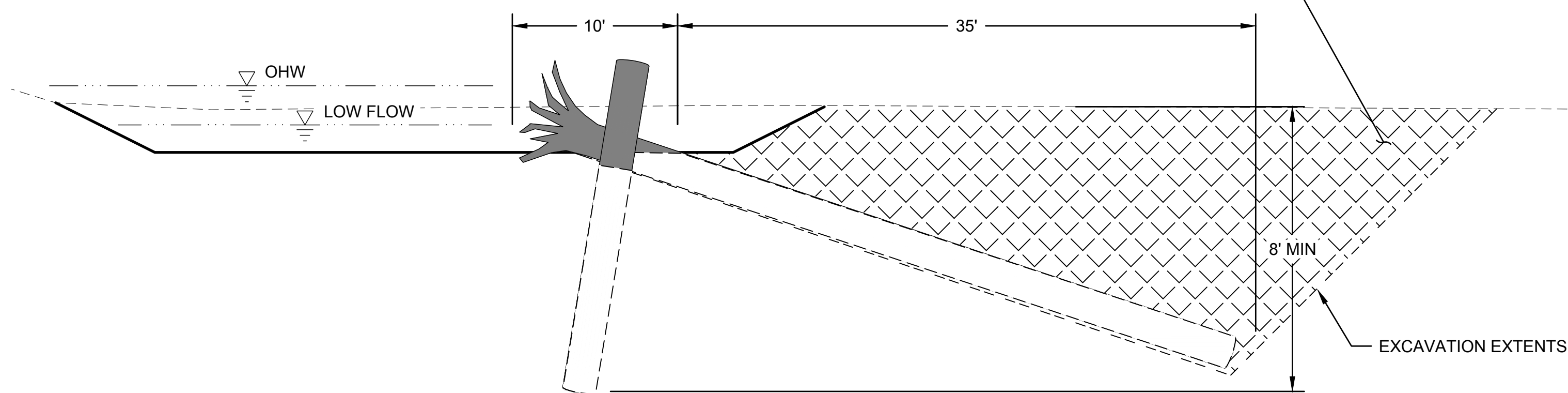
CONCEPTUAL DESIGN SITE PLAN II

DATE:	APRIL 2024
PROJECT NO:	14-05790-000
DRAWING NO:	C0.02
SHEET NO:	3 OF 12



PLAN

TRENCH EXCAVATE THROUGH GRAVEL BAR TO PLACE LOG. BACKFILL WITH NATIVE ALLUVIAL SPOILS AND COMPACT, SEE NOTE 3



SECTION A LOG SCHEDULE - TYPE 1 ELS:

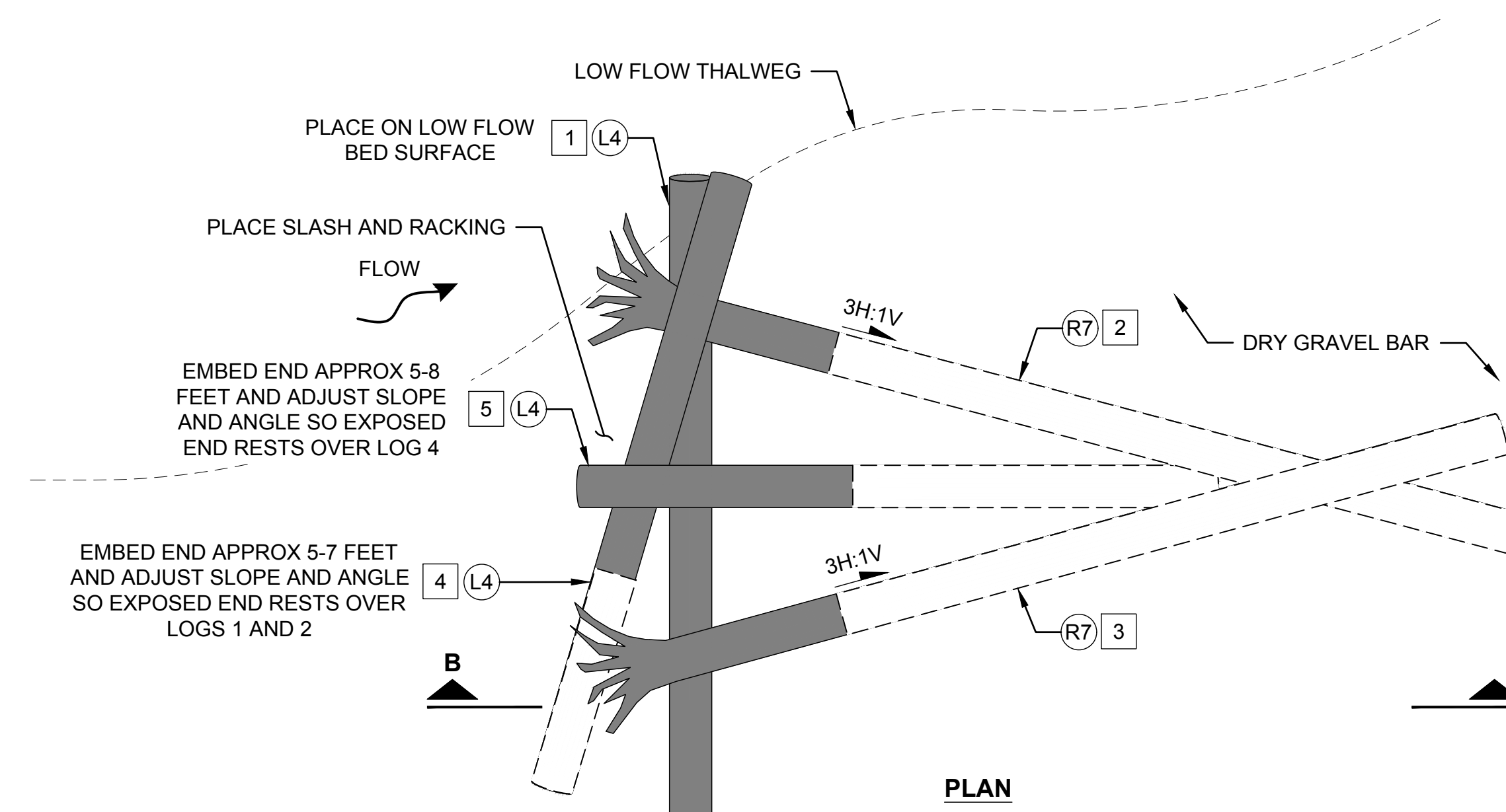
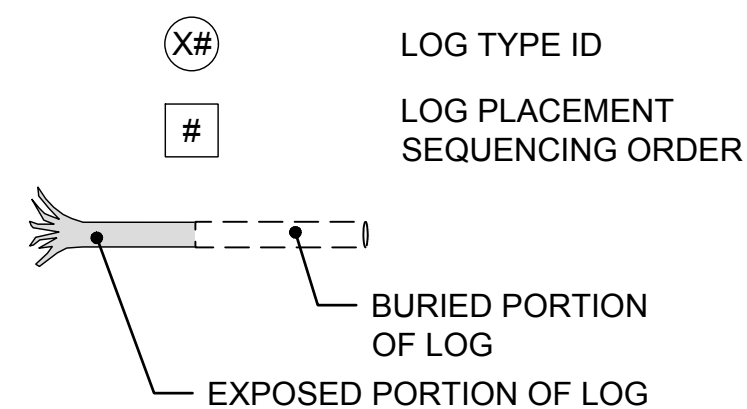
LOG ID #	DIAMETER (IN)	LENGTH (FT)	ROOTWAD	QUANTITY/STRUCTURE
(L6)	24	40	NO	1
(R7)	24	45	YES	1
RACKING	4-16	15-30	OPTIONAL	2
SLASH	< 4	NA	NA	2 CY

DETAIL - TYPE 1 ELS

SCALE: NTS

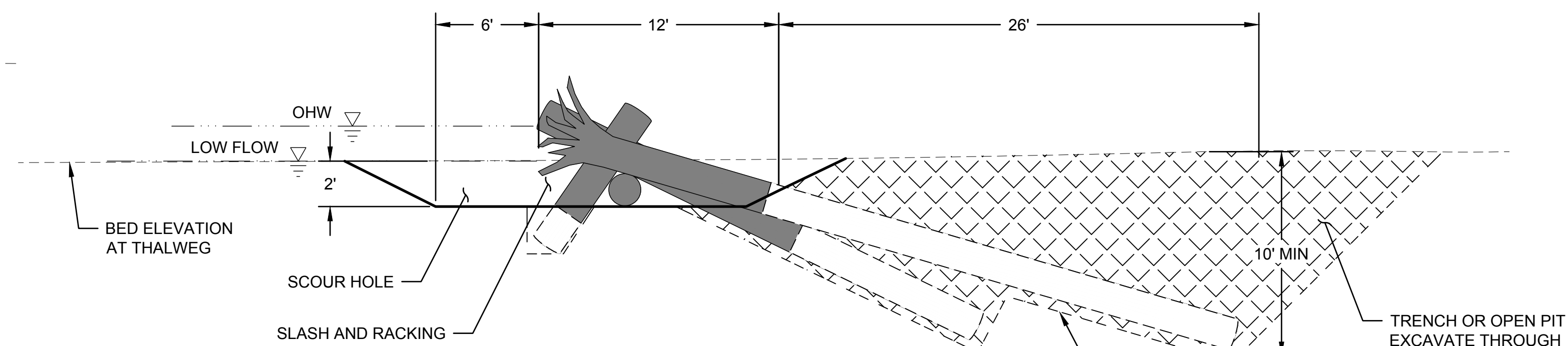
1
VAR

LEGEND:



PLAN

EMBED END APPROX 5-7 FEET AND ADJUST SLOPE AND ANGLE SO EXPOSED END RESTS OVER LOGS 1 AND 2



SECTION B

TRENCH OR OPEN PIT EXCAVATE THROUGH GRAVEL BAR TO PLACE LOGS. BACKFILL WITH NATIVE ALLUVIAL SPOILS AND COMPACT, SEE NOTE 3

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 2 ELS

SCALE: NTS

2
VAR

GENERAL NOTES:

- 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.
- LOGS SHALL BE PLACED AT THE LOCATIONS, ELEVATIONS AND ORIENTATIONS SPECIFIED ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER.
- 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.

CONCEPTUAL DESIGN

No.	REVISION	BY	APP'D	DATE

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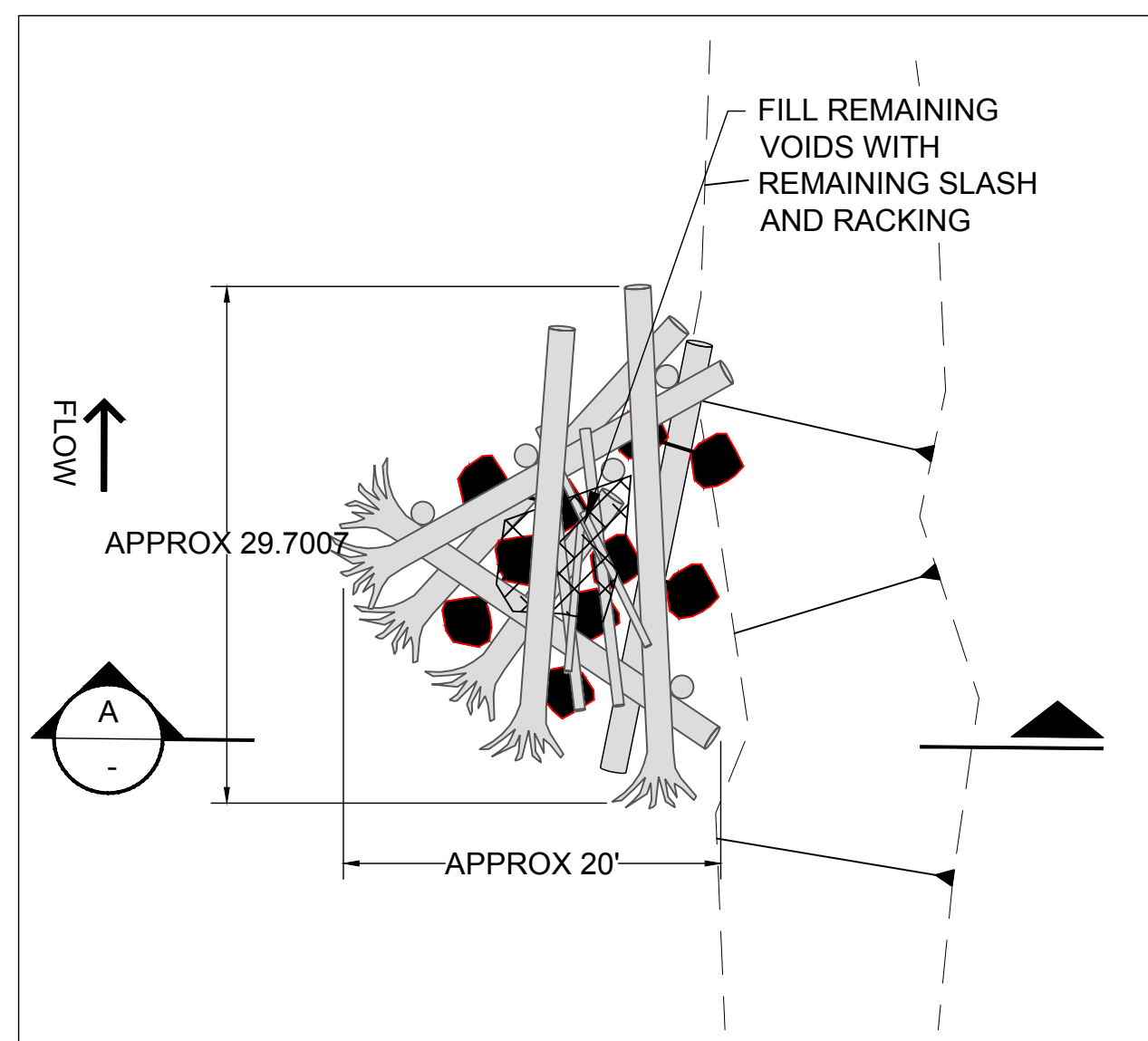
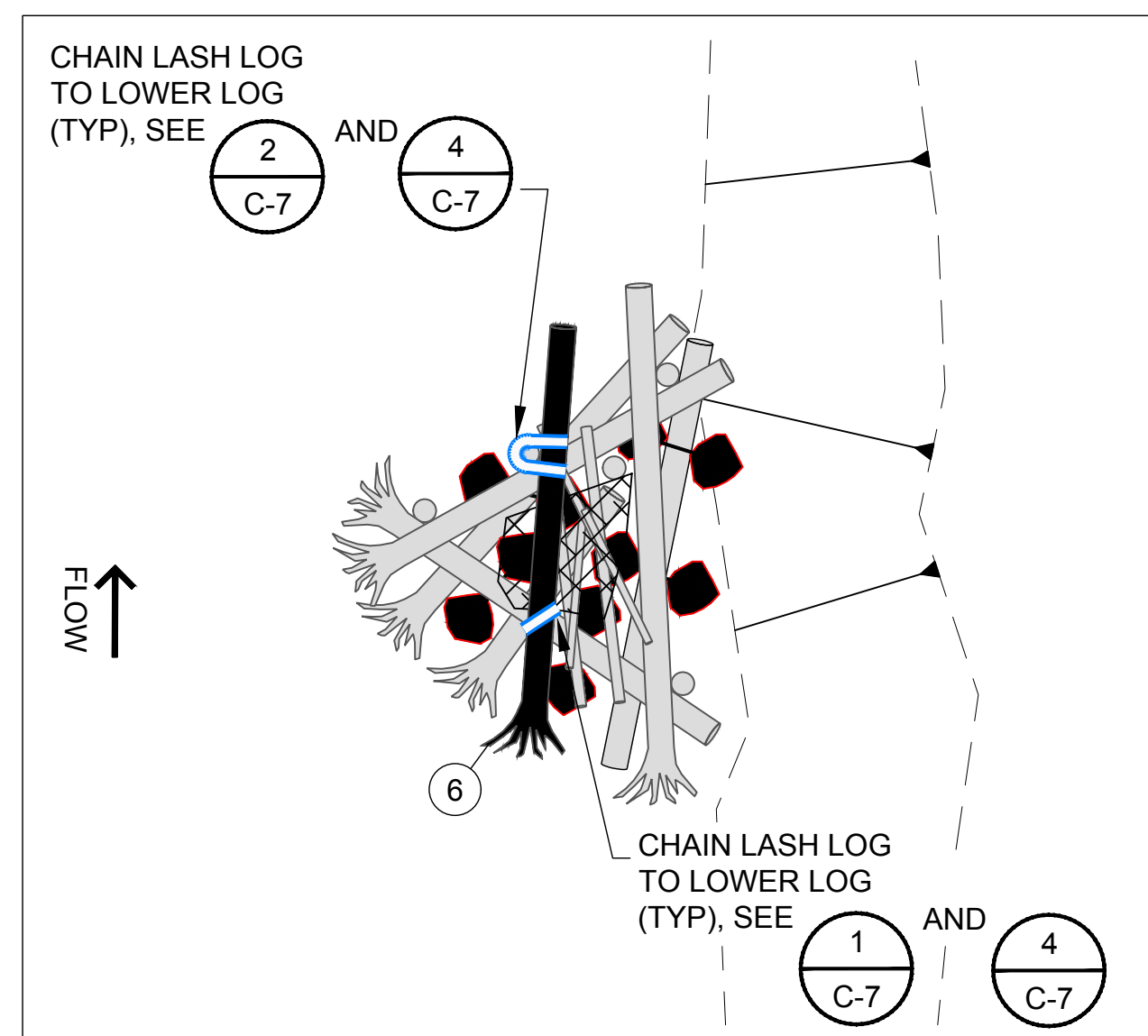
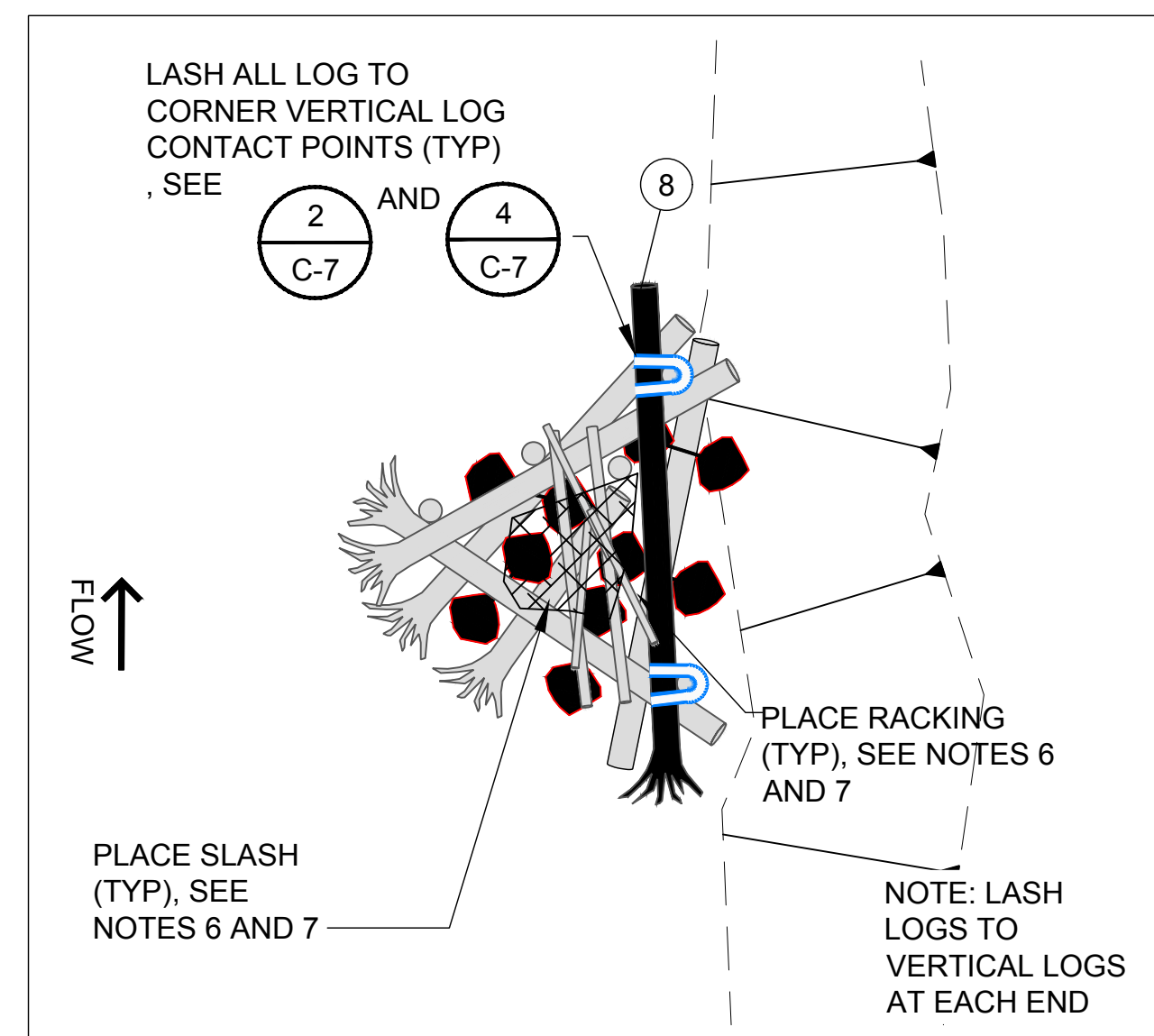
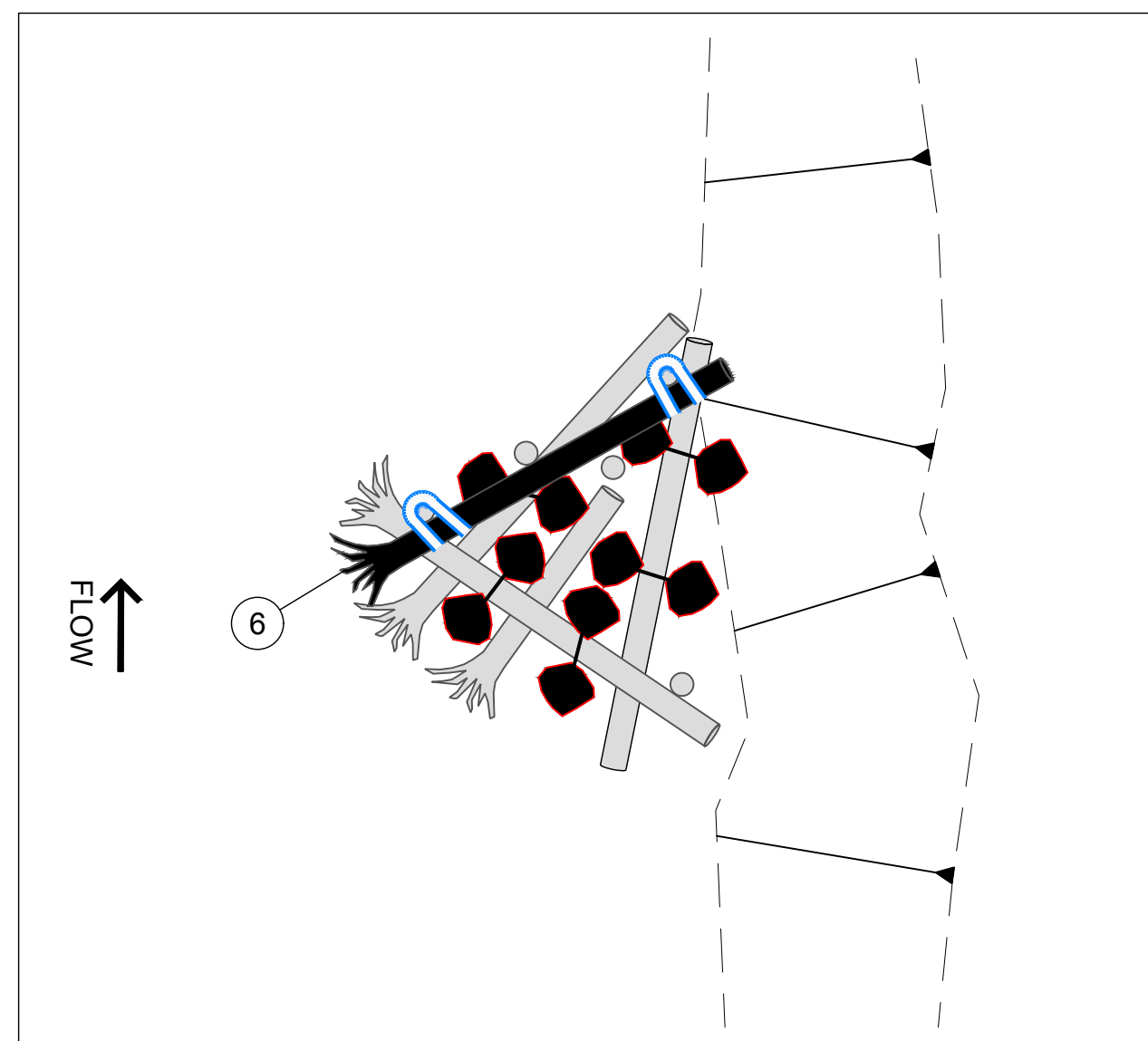
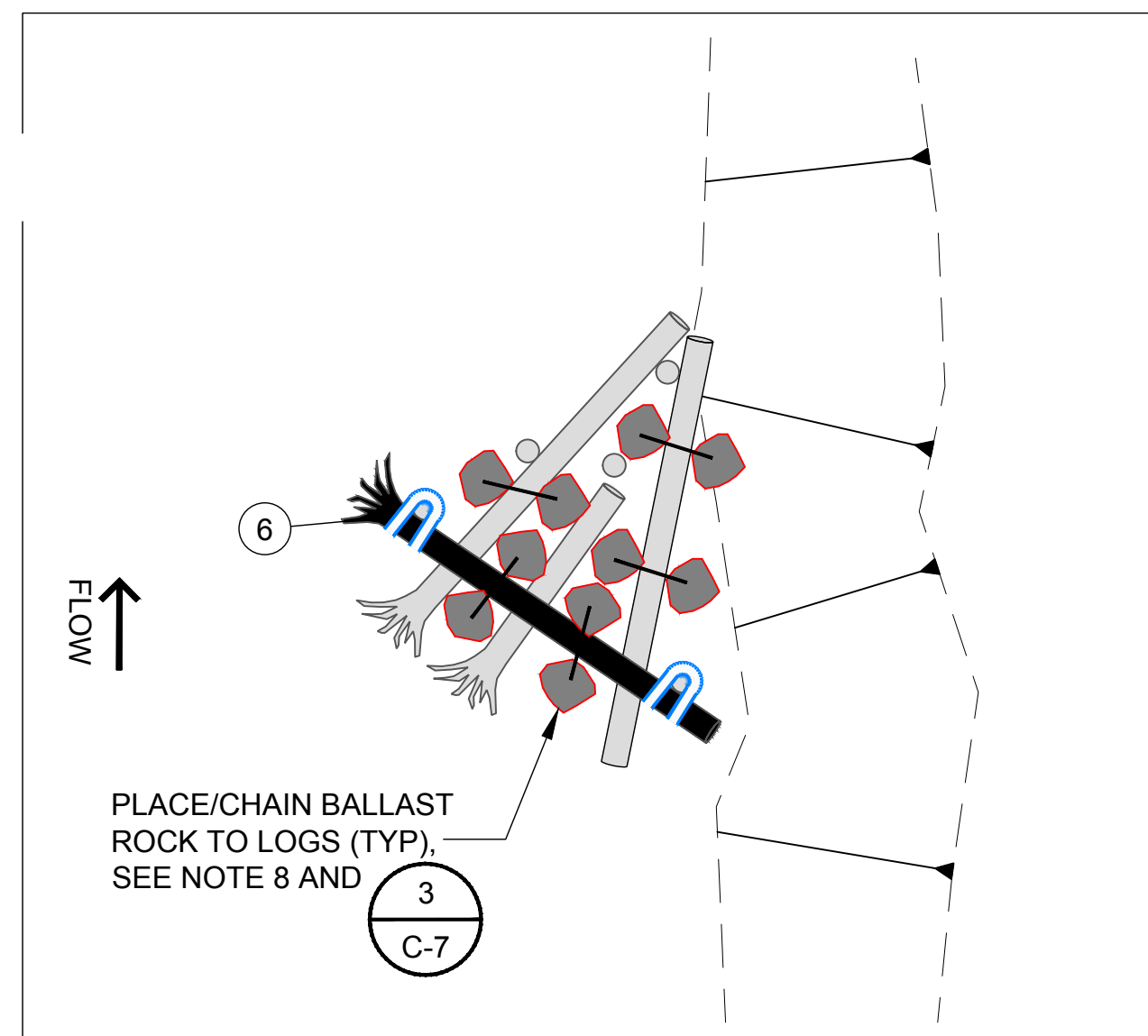
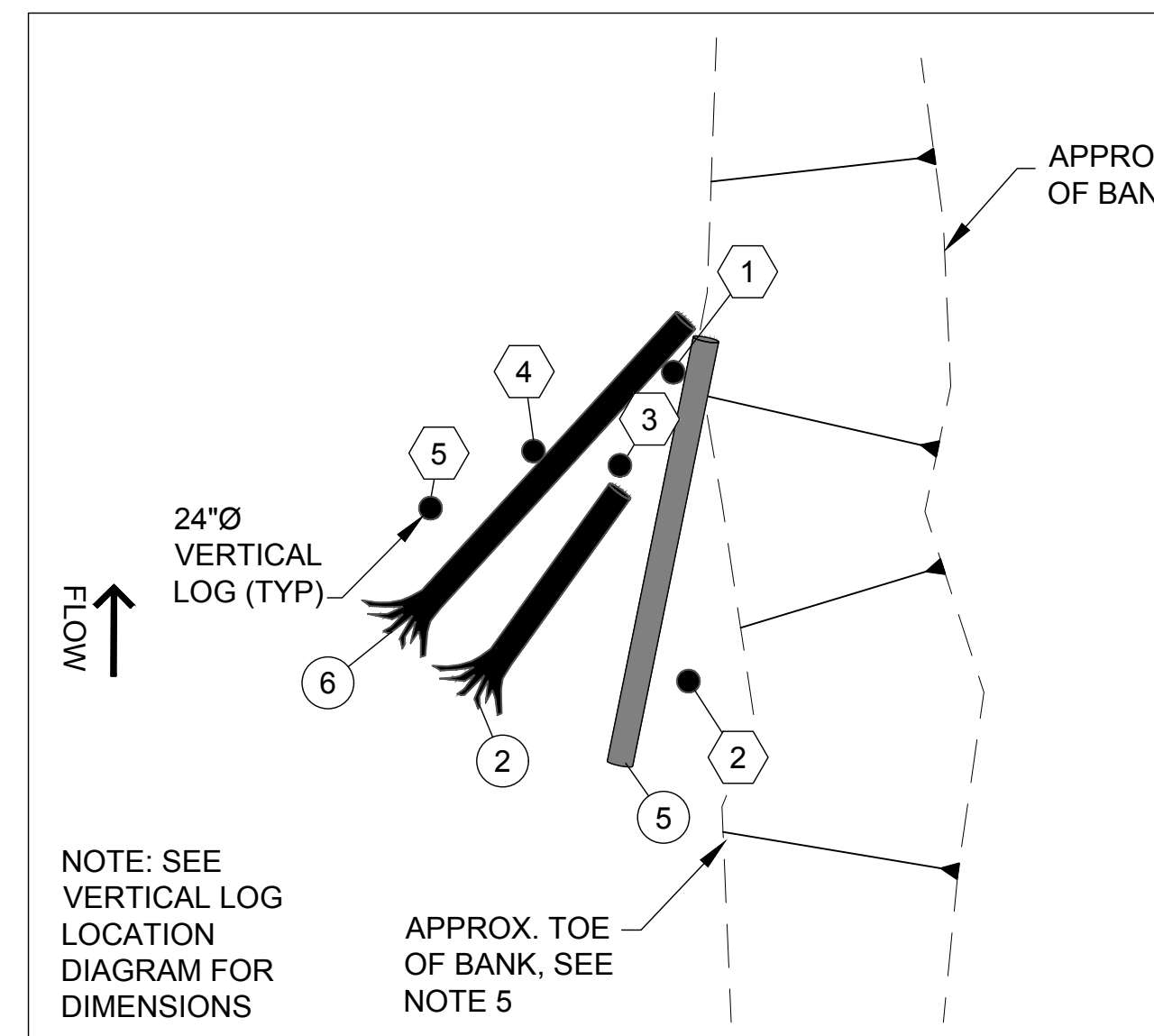
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SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

TYPE 1 AND 2 ELS DETAILS

DATE:	APRIL 2024
PROJECT NO:	14-05790-000
DRAWING NO:	C1.01
SHEET NO:	4 OF 12



LEGEND:

- SLOPE LINE
- ▨ PROPOSED SLASH
- PROPOSED RACKING MATERIAL (PLAN VIEW)
- BALLAST ROCK
- PROPOSED RACKING MATERIAL (SECTION VIEW)
- LOG
- ① LOG ID
- SQUARE LOG AND CHAIN LASHING
- SIMPLE LOG AND CHAIN LASHING
- - - EXISTING GRADE

TABLE - RACKSTER SLASH SCHEDULE

SLASH	QUANTITY/STRUCTURE (CY)
SLASH	30

TABLE - RACKSTER RACKING SCHEDULE

RACKING LOGS	QUANTITY/STRUCTURE
RACKING LOGS	40-50

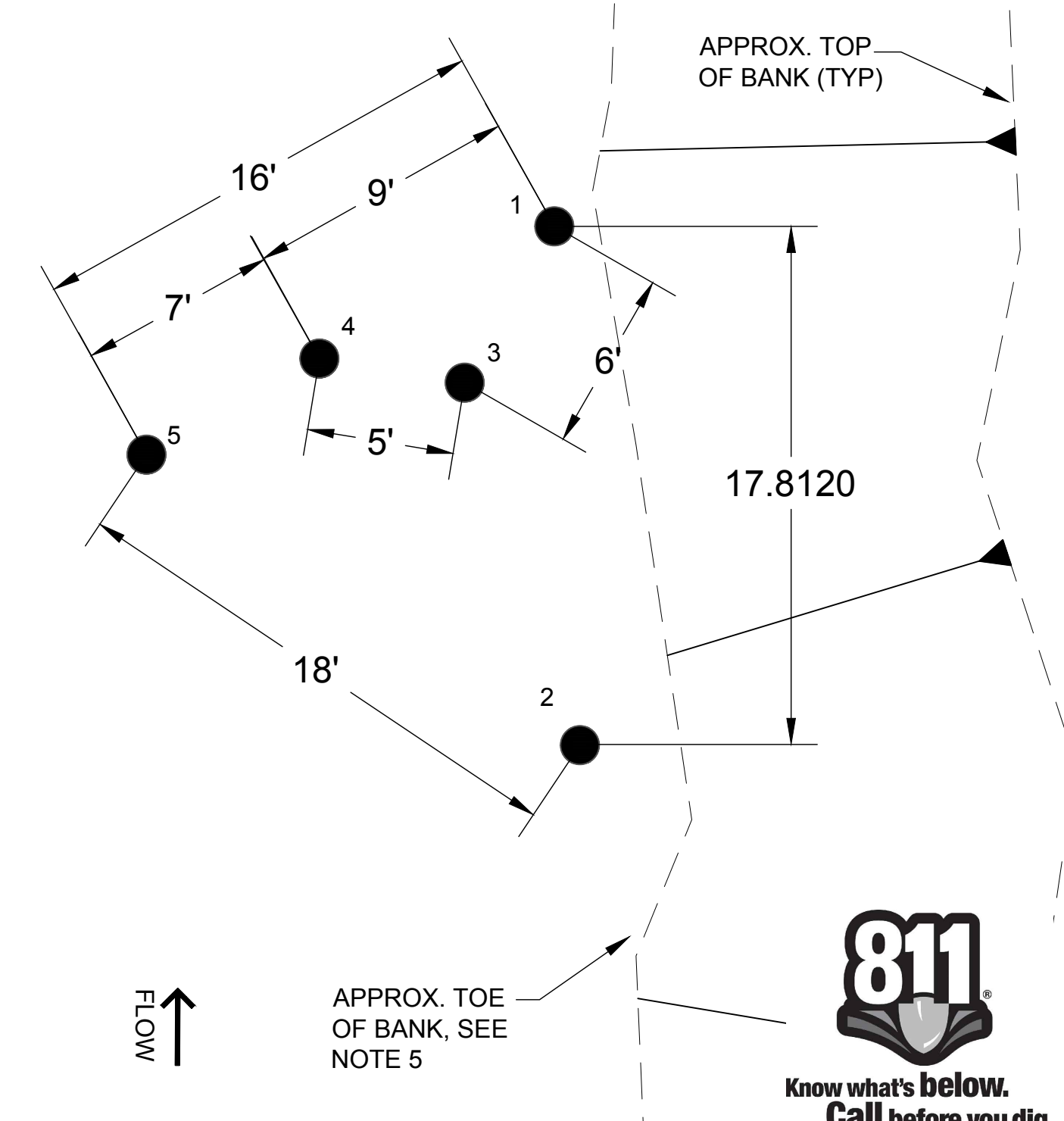
TABLE - RACKSTER ROCK SCHEDULE

BALLAST ROCKS	WEIGHT (TONS)	QUANTITY/STRUCTURE
BALLAST ROCKS	2	10

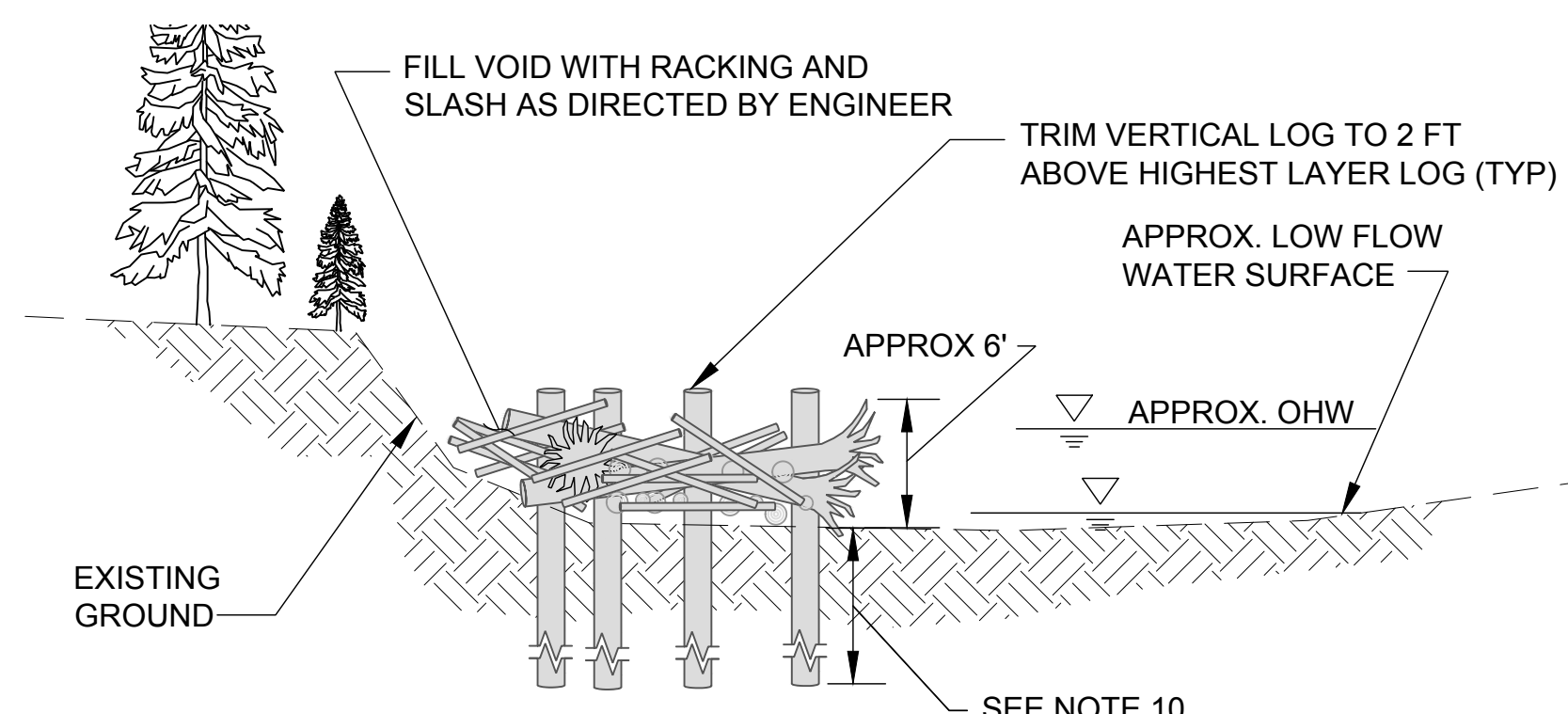
TABLE - RACKSTER LOG SCHEDULE:

LOG TYPE ID#	DIAMETER (IN)	LENGTH (FT)	ROOTWAD	QUANTITY/STRUCTURE
②	24	15	YES	1
⑤	24	25	NO	1
⑥	24	25	YES	4
⑧	18-24	30	YES	1
TOTAL:				7 TOTAL
VERTICAL LOG #	24	20	NO	5
TOTAL:				12 PER STRUCTURE

VERTICAL LOG LOCATION DIAGRAM:



- NOTES:**
- UP TO 3 PILE LOCATIONS PER RACKSTER SHALL BE STAKED BY ENGINEER.
 - EXCAVATION SPOILS SHALL BE STOCKPILED TO ALLOW LOG LAYER PLACEMENT AND CONSTRUCTION ACCESS.
 - LOG MATERIALS SHALL BE PLACED AT THE LOCATIONS AND ELEVATIONS SPECIFIED ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER OR OWNER.
 - TRIM LOGS AS REQUIRED.
 - TOE OF BANK VARIES PER EACH RACKSTER.
 - 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.
 - 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.
 - PLACE BALLAST ROCKS AS LOW WITHIN THE ELJ AS POSSIBLE AND ENSURE CHAIN BETWEEN BALLAST ROCKS HAS NO SLACK.
 - AUGMENT OR DELETE ROCK QUANTITIES AS NEEDED TO MAINTAIN AN ELJ ROCK BALLAST OF 20 TONS MINIMUM.
 - ENGINEER SHALL STAKE 2 VERTICAL LOG LOCATIONS FOR RACKSTER 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.
 - CONTRACTOR SHALL EXPECT FIELD FITTING
 - RACKING, SLASH, AND LASHINGS ONLY SHOWN IN LAYERS WHERE PLACEMENT OCCURS FOR CLARITY.
 - 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 C-7 FOR LASHING TYPES AND CONDITIONS.
 - 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.



CONCEPTUAL DESIGN

No.	REVISION	BY	APP'D	DATE

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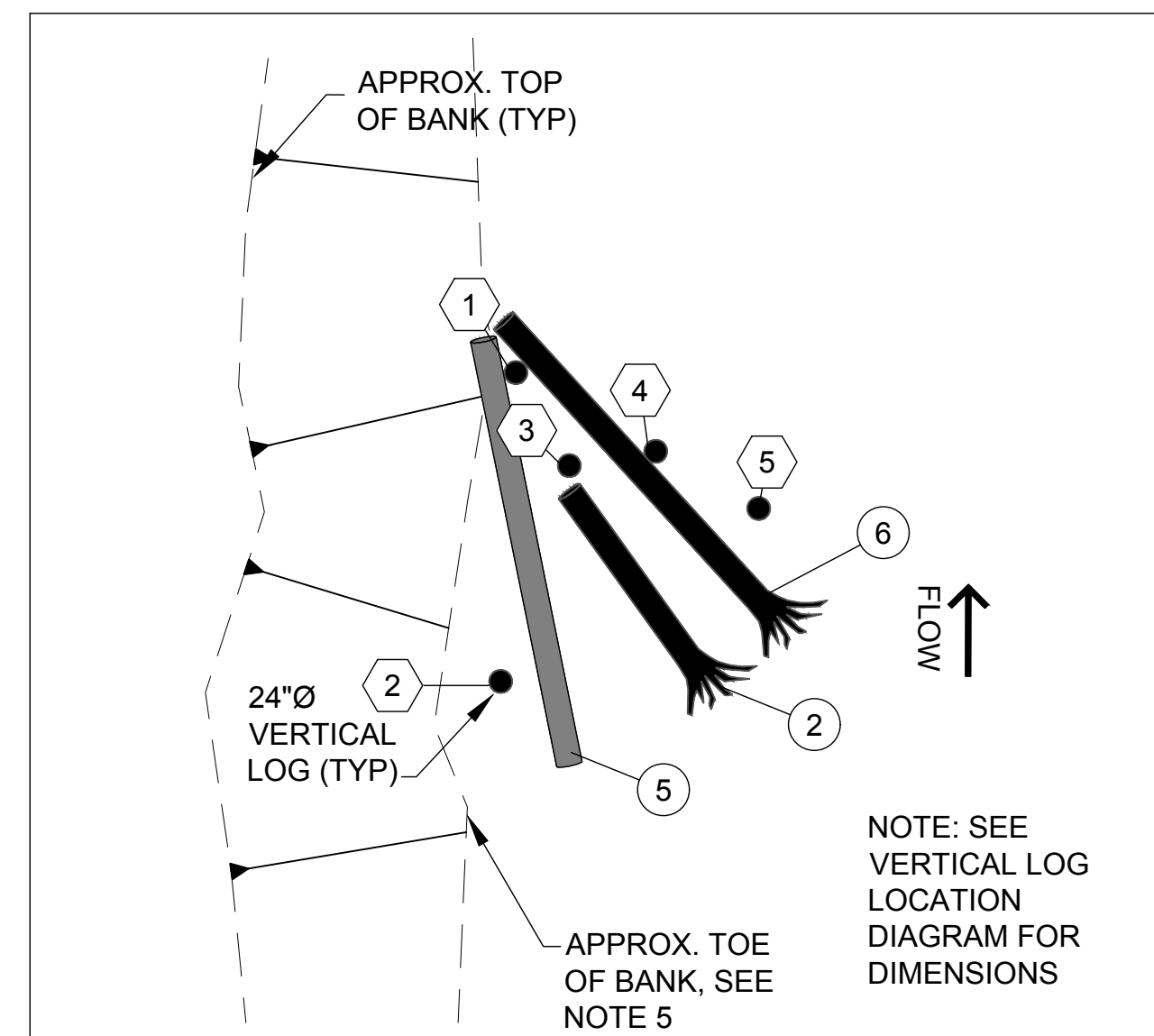
SOUTH FORK NOOKSACK RIVER SKOOKUM/EDFRO RESTORATION PROJECT - PHASE 3

TYPE 3 MEDIUM RIGHT BANK ELS



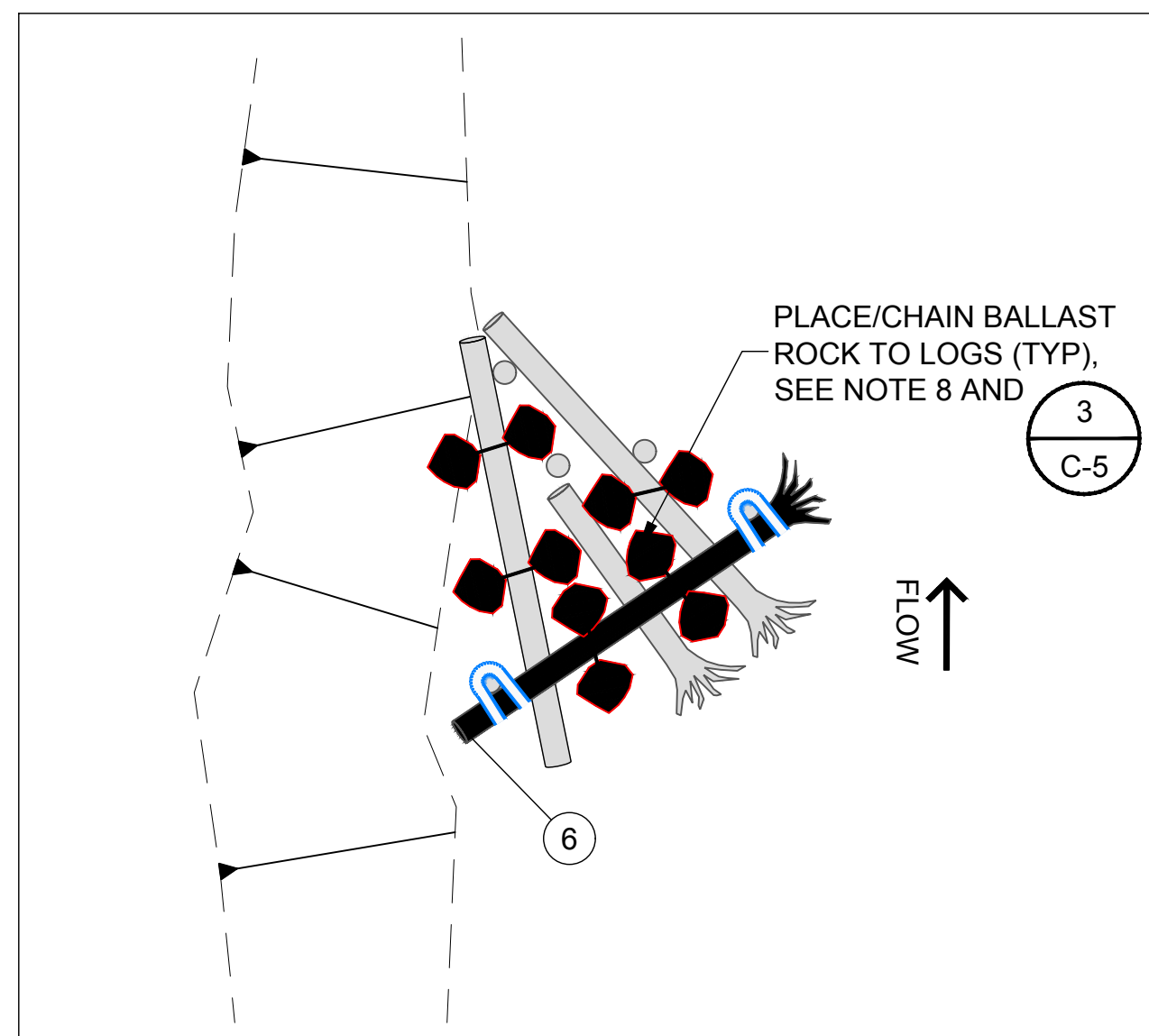
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PROJECT NO:	14-05790-000
DRAWING NO:	C1.02
SHEET NO:	5 OF 12

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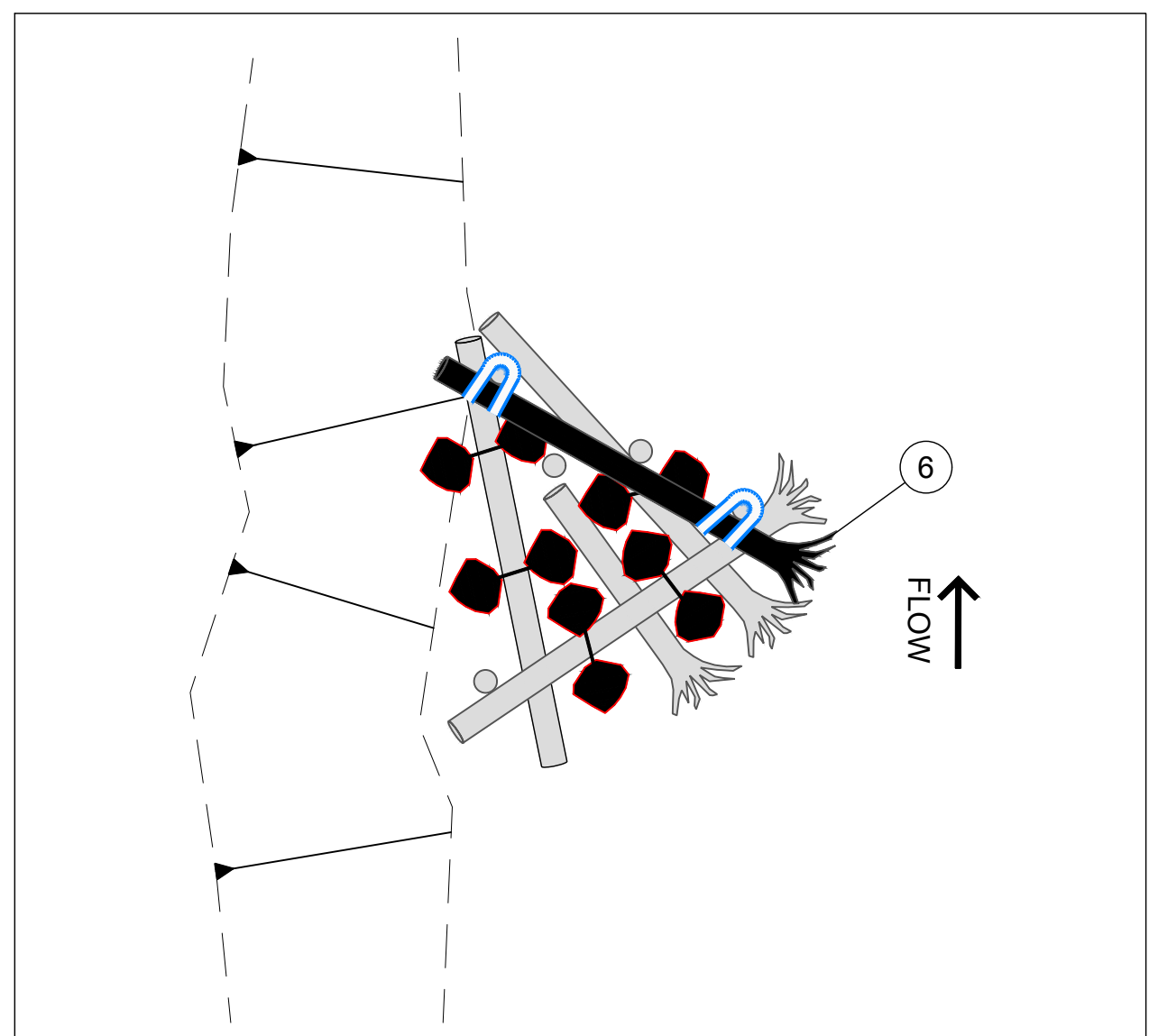


LAYER 1

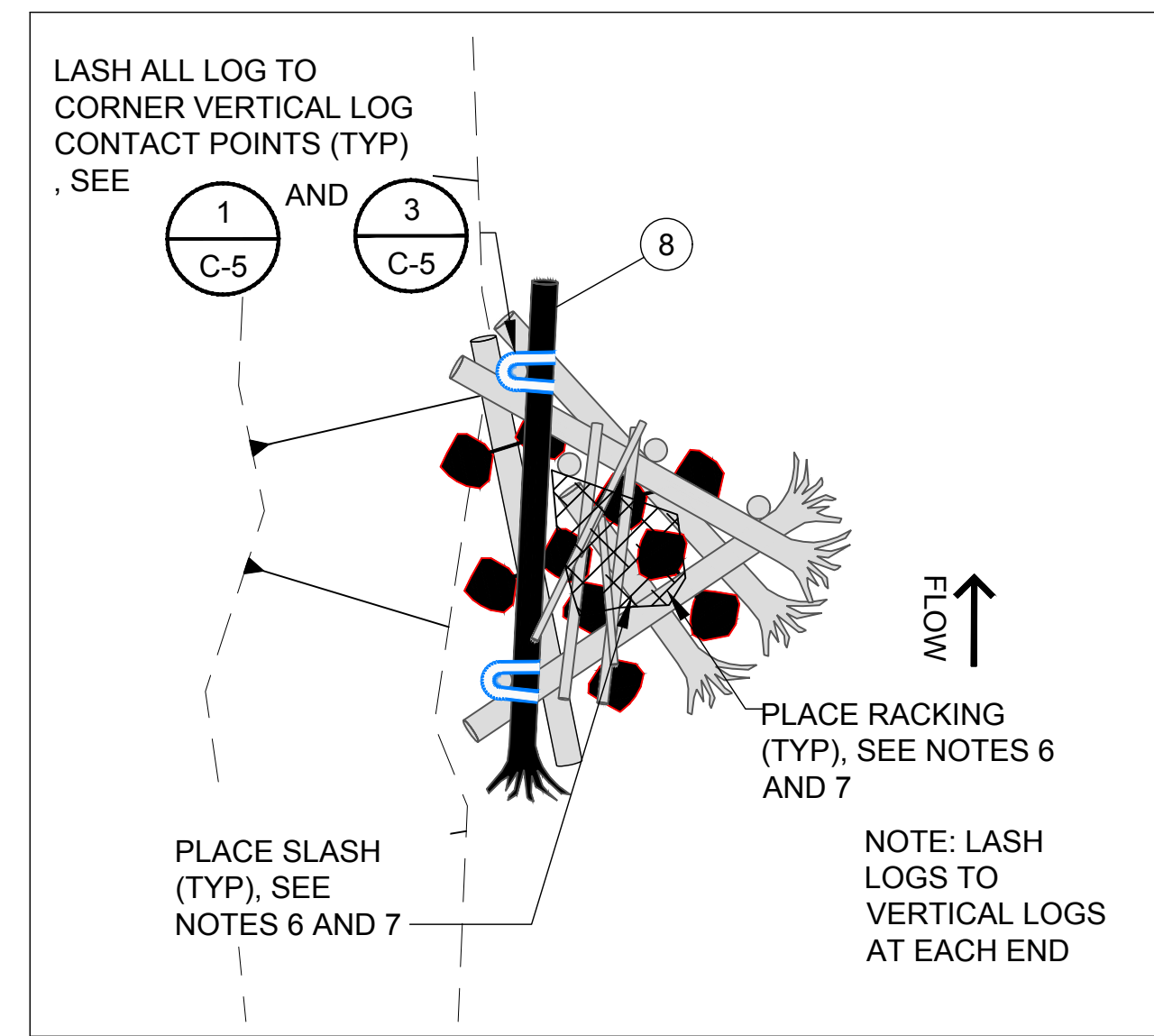
NOTE: SEE VERTICAL LOG LOCATION DIAGRAM FOR DIMENSIONS



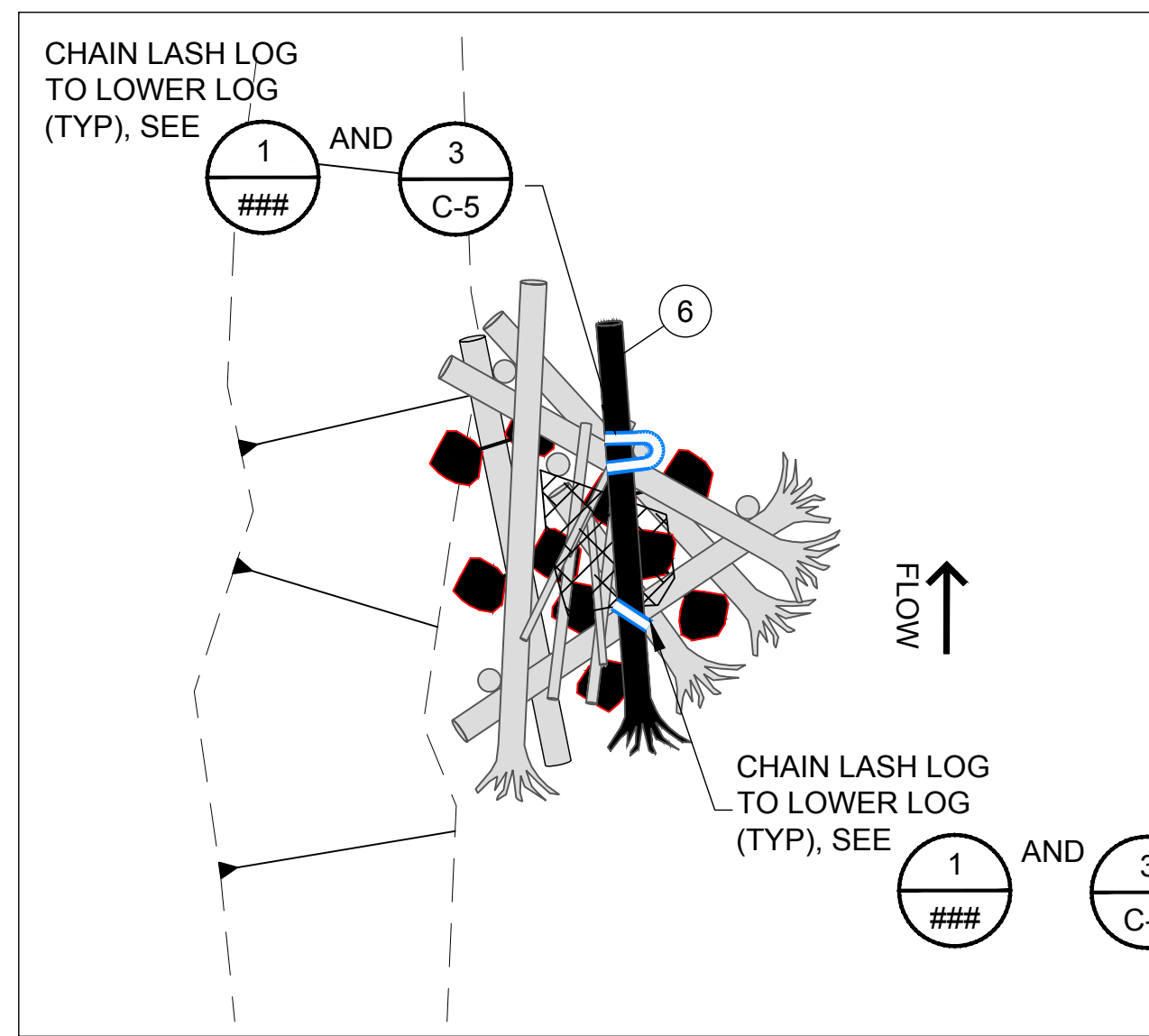
LAYER 2



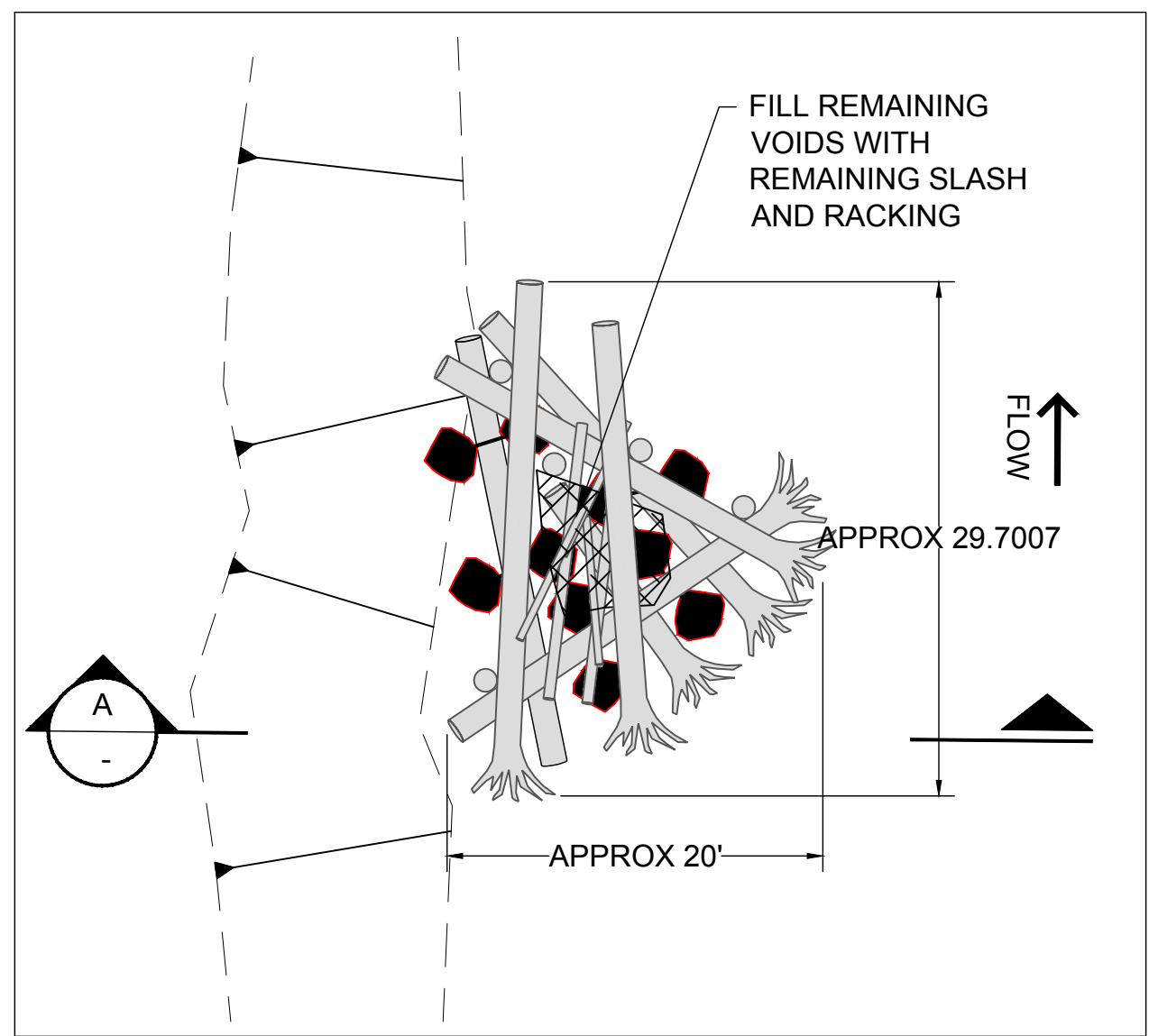
LAYER 3



LAYER 4



LAYER 5



COMPLETE

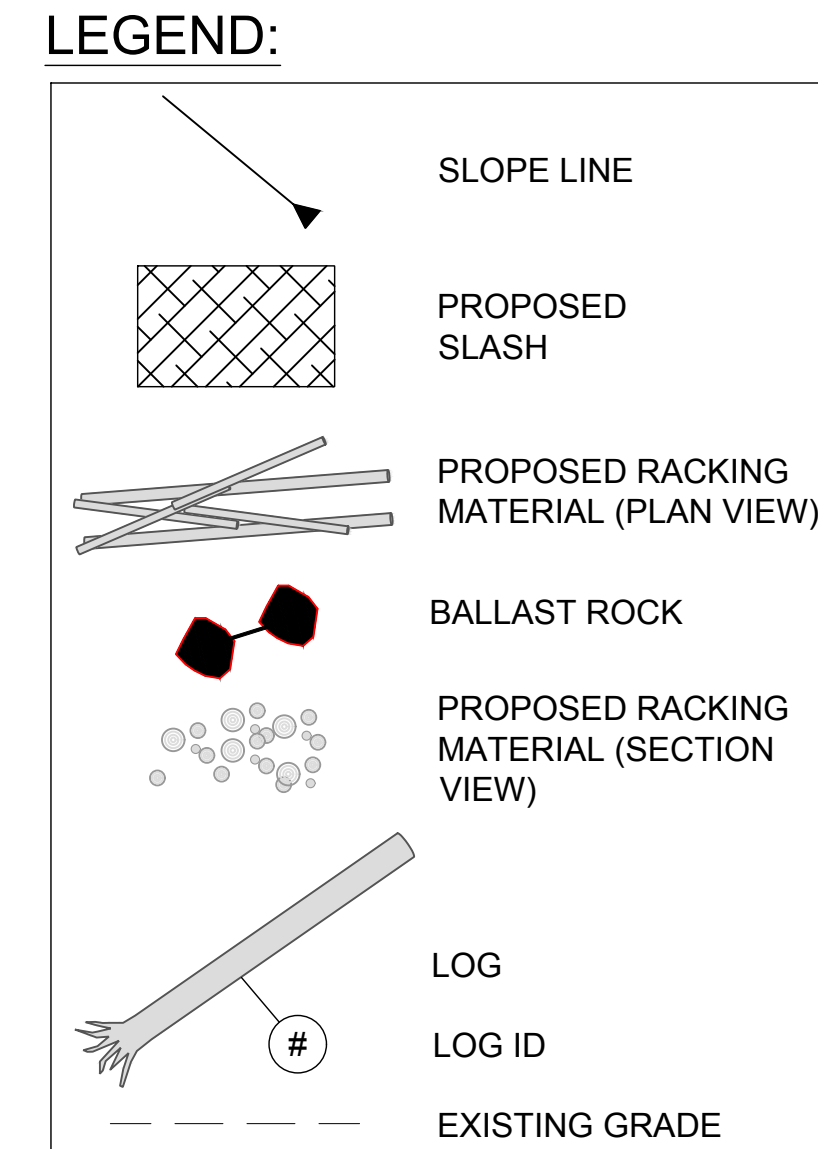


TABLE - RACKSTER SLASH SCHEDULE

	QUANTITY/STRUCTURE (CY)
SLASH	30

TABLE - RACKSTER RACKING SCHEDULE

	QUANTITY/STRUCTURE
RACKING LOGS	40-50

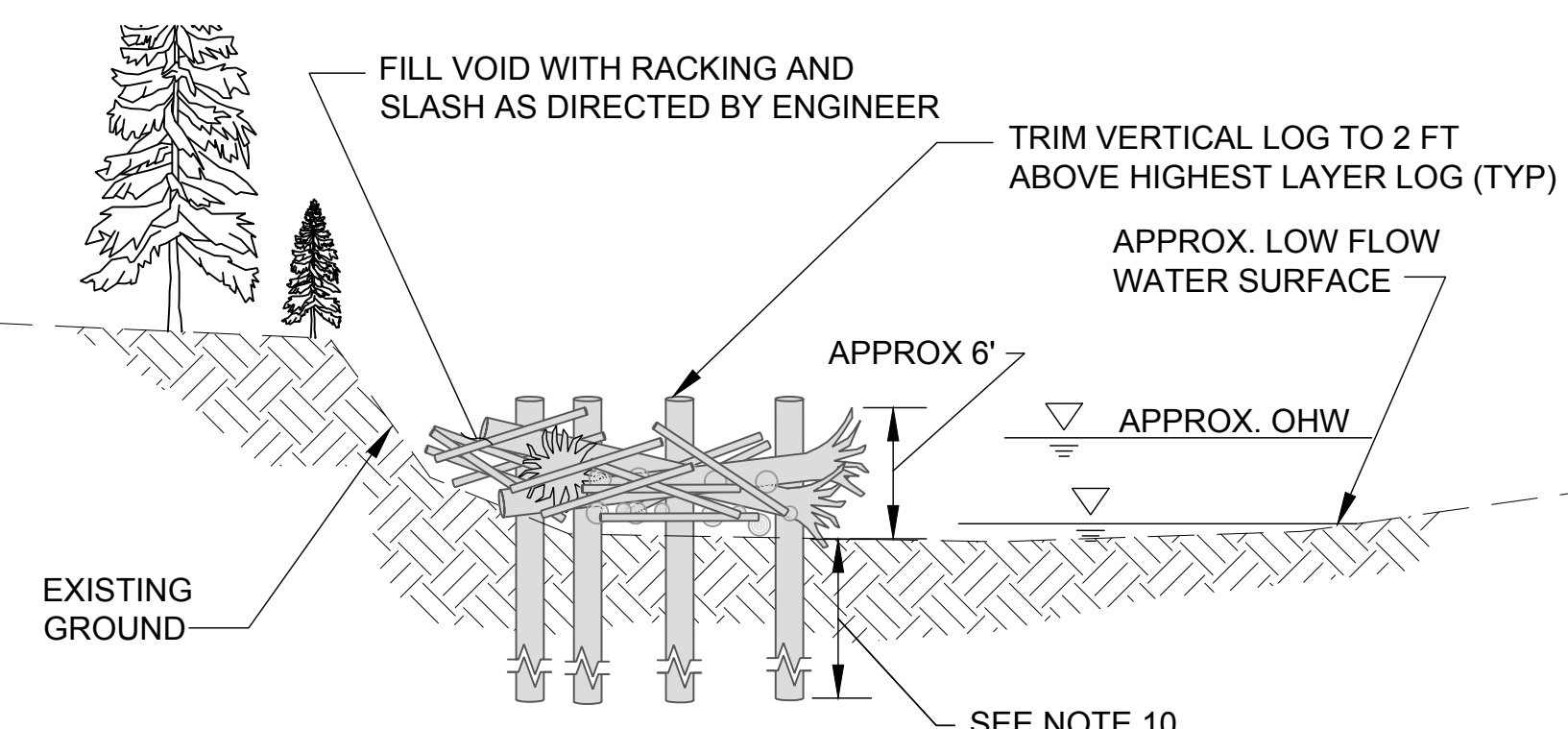
TABLE - RACKSTER ROCK SCHEDULE

	WEIGHT (TONS)	QUANTITY/STRUCTURE
BALLAST ROCKS	2	10

TABLE - RACKSTER LOG SCHEDULE:

LOG ID	DIAMETER (IN)	LENGTH (FT)	ROOTWAD	QUANTITY/STRUCTURE
2	24	15	YES	1
5	24	25	NO	1
6	24	25	YES	4
8	18-24	30	YES	1
TOTAL:				7 TOTAL
VERTICAL LOG #	24	20	NO	5
TOTAL:				12 PER STRUCTURE

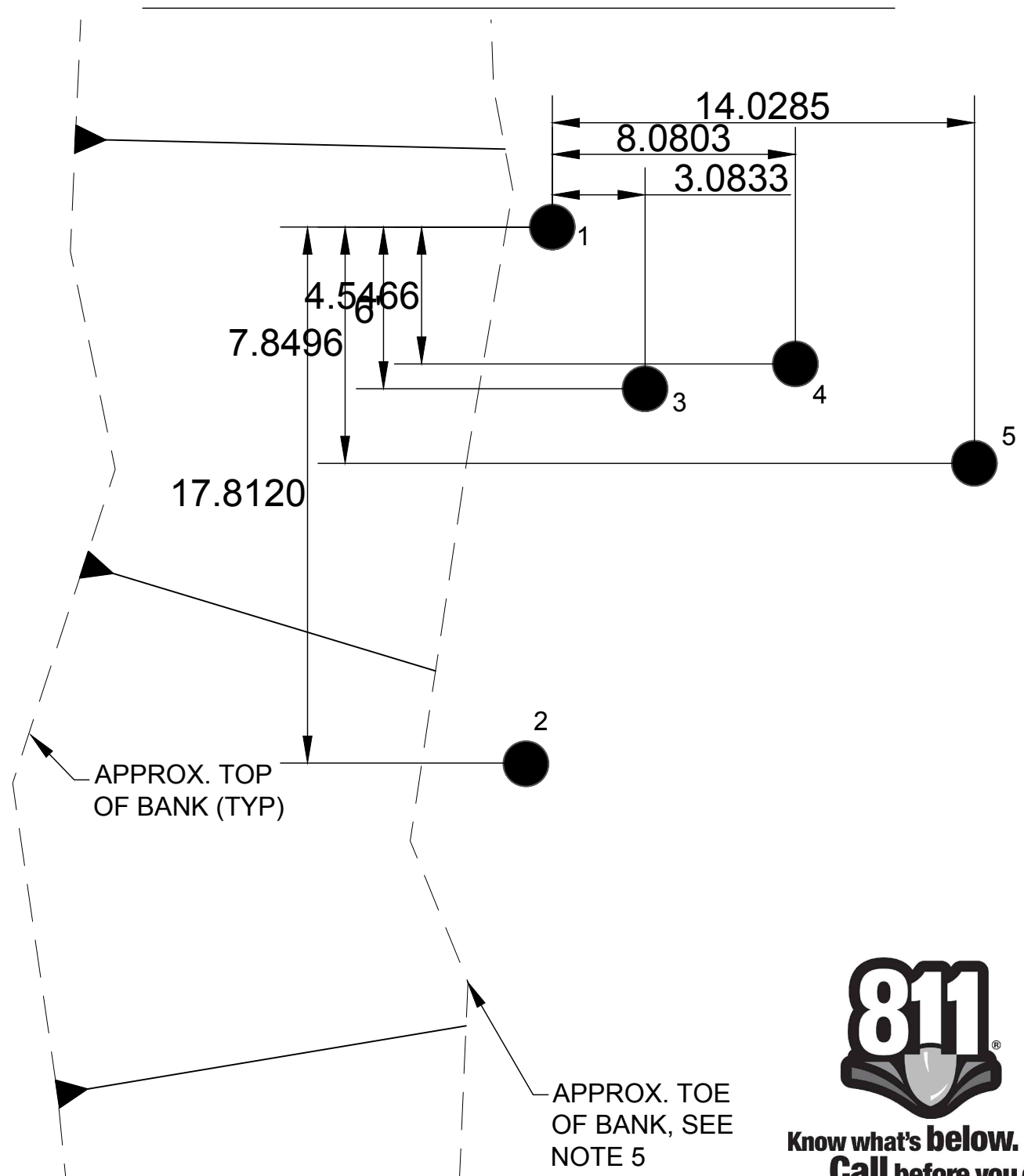
- NOTES:**
- 2 PILE LOCATIONS PER RACKSTER SHALL BE STAKED BY ENGINEER.
 - EXCAVATION SPOILS SHALL BE STOCKPILED TO ALLOW LOG LAYER PLACEMENT AND CONSTRUCTION ACCESS.
 - LOG MATERIALS SHALL BE PLACED AT THE LOCATIONS AND ELEVATIONS SPECIFIED ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER OR OWNER.
 - TRIM LOGS AS REQUIRED.
 - TOE OF BANK VARIES PER EACH RACKSTER.
 - 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.
 - 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.
 - PLACE BALLAST ROCKS AS LOW WITHIN THE ELJ AS POSSIBLE AND ENSURE CHAIN BETWEEN BALLAST ROCKS HAS NO SLACK.
 - AUGMENT OR DELETE ROCK QUANTITIES AS NEEDED TO MAINTAIN AN ELJ ROCK BALLAST OF 20 TONS MINIMUM.
 - ENGINEER SHALL STAKE 2 VERTICAL LOG LOCATIONS FOR RACKSTER 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.
 - CONTRACTOR SHALL EXPECT FIELD FITTING
 - RACKING, SLASH, AND LASHINGS ONLY SHOWN IN LAYERS WHERE PLACEMENT OCCURS FOR CLARITY.
 - 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 ### AND C-5 FOR LASHING TYPES AND CONDITIONS.
 - 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.



RACKSTER SECTION

SCALE: 1:10

VERTICAL LOG LOCATION DIAGRAM:



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No.	REVISION	BY	APP'D	DATE



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DESIGNED:	CHECKED:
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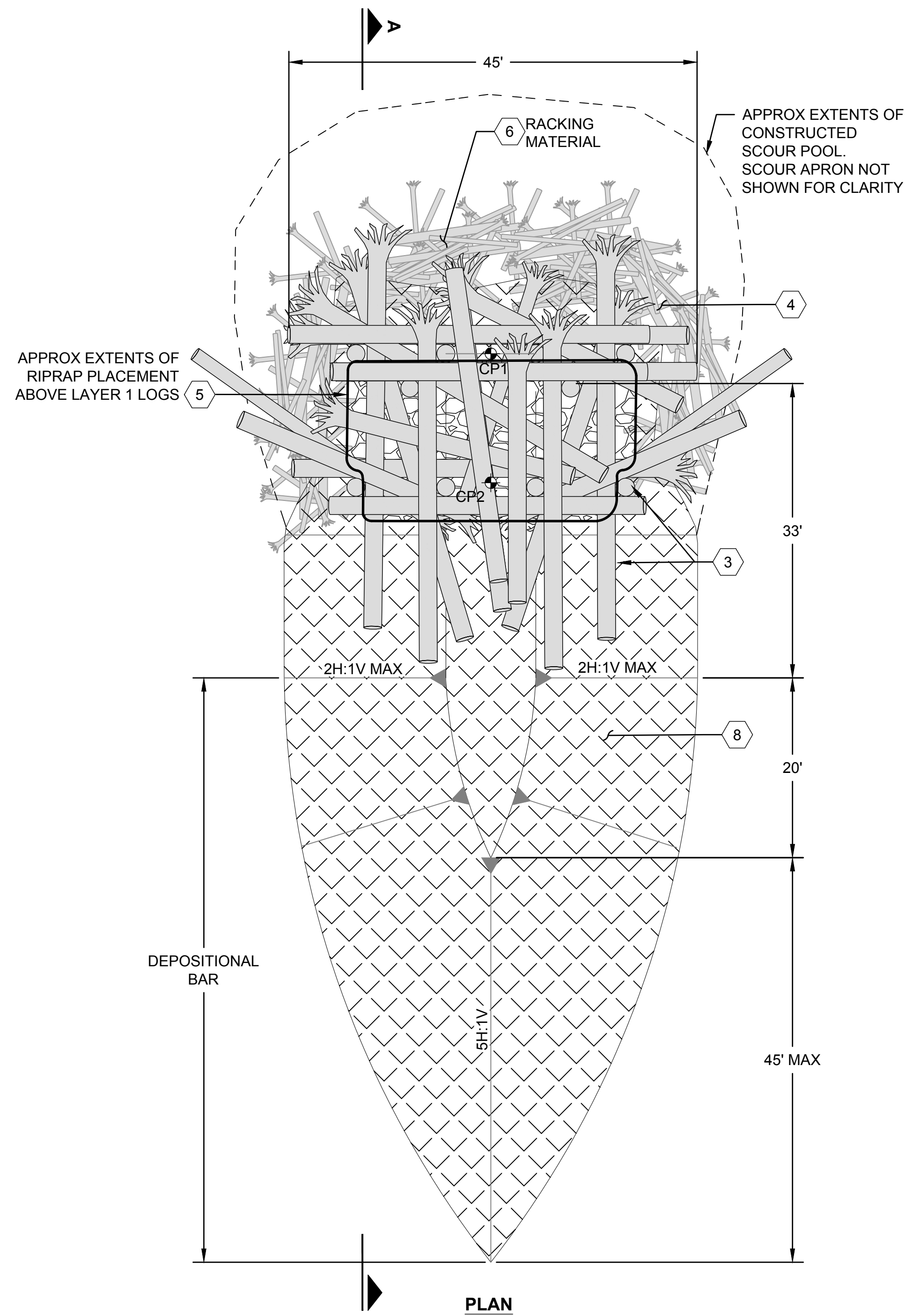
SOUTH FORK NOOKSACK RIVER
 SKOOKUM/EDFRO RESTORATION
 PROJECT - PHASE 3
 TYPE 3 MEDIUM LEFT BANK ELS

DATE:	APRIL 2024
PROJECT NO:	14-05790-000
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SHEET NO:	6 OF 12



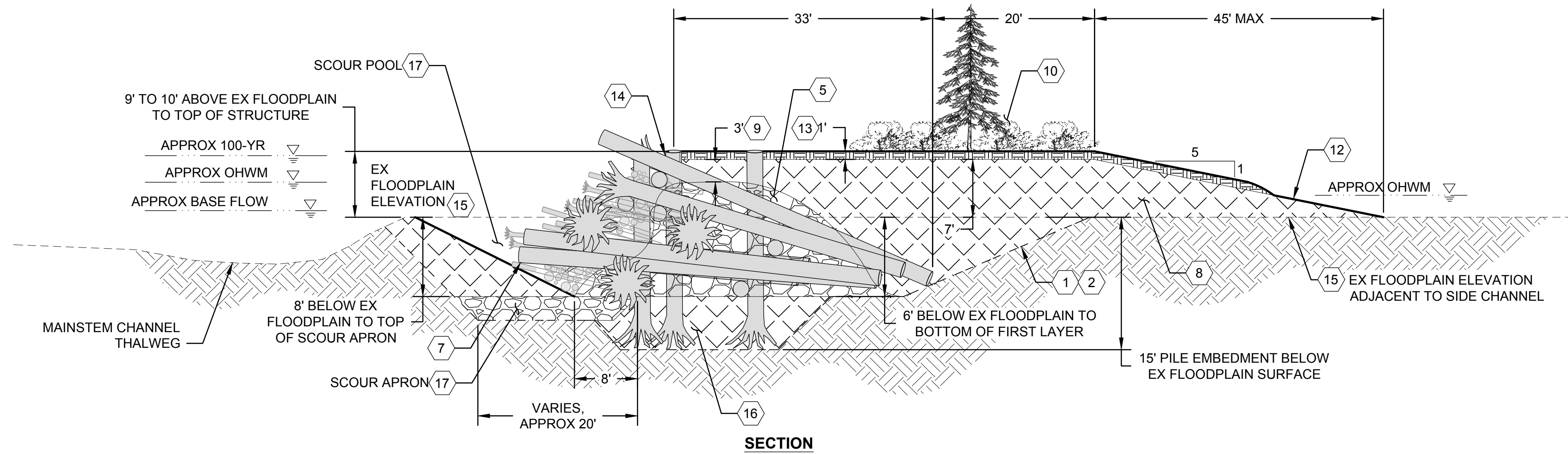
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DETAIL - TYPE 4 ELS

SCALE: NTS



SECTION

KEYNOTES

1. APPROXIMATE STRUCTURE EXCAVATION LIMITS.
2. EXCAVATED SIDE SLOPE AT DOWNSTREAM END OF STRUCTURE VARIES BASED ON CONSTRUCTION ACCESS NEEDS.
3. PLACE PILES AND KEY MEMBERS ACCORDING TO STRUCTURE LAYERING PLAN.
4. SMALL WOODY DEBRIS AND SLASH EMBEDDED INTO FLANKS OF STRUCTURES IN AND AROUND INTERFACE OF KEY LOGS AND RACKING LOGS PRIOR TO BACKFILLING, EXTENDING FROM BASE OF STRUCTURE TO 3- FEET ABOVE EXISTING GRADE.
5. COORDINATE WITH ENGINEER PRIOR TO PLACING IMPORTED HEAVY LOOSE RIPRAP AND SIDE CHANNEL EXCAVATION SPOILS FOR LOG BALLAST.
6. COORDINATE WITH ENGINEER PRIOR TO PLACING RACKING LOGS.
7. LAYERS 1, 2, 3, AND 4 SHALL EXTEND THROUGH RACKING MATERIAL.
8. CONSTRUCT DEPOSITIONAL BAR WITH ON SITE EXCAVATED ALLUVIUM. DEPOSITIONAL BAR SIZE VARIES AS DIRECTED BY ENGINEER. CONSTRUCT FLANKS OF STRUCTURE AND DEPOSITIONAL BAR WITH NATIVE ALLUVIUM BACKFILL MATERIAL ACCORDING TO THE SLOPE SHOWN ON THESE DETAILS.
9. MAINTAIN A MINIMUM DEPTH OF 3- FEET OF ALLUVIUM BACKFILL MATERIAL OVER TOP OF IMPORTED BALLAST MATERIAL.
10. PLANTING TOP OF ELS TO BE COMPLETED BY OTHERS.
11. DO NOT BACKFILL UPSTREAM OF STRUCTURE. LEAVE AS A POOL.
12. ADJUST FINAL GRADE OF DEPOSITIONAL BAR ON DOWNSTREAM SIDE OF STRUCTURE AS NEEDED TO PLACE ALL EXCESS ALLUVIUM.
13. PLACE 12- INCHES OF TOPSOIL AND 2- INCHES OF MULCH ABOVE OHWM AS DIRECTED BY ENGINEER.
14. PLACE SALVAGED BRUSH ALONG EDGE OF STRUCTURE BETWEEN SOIL AND RACKING LOGS TO PREVENT BLEEDING SOIL FROM THE STRUCTURE. PLACE ADDITIONAL RACKING LOGS AND SLASH ABOVE FINAL LAYER PER DIRECTION OF ENGINEER.
15. CONTRACTOR SHALL DETERMINE EXCAVATION DEPTH AND STRUCTURE HEIGHT BASED ON EXISTING RIVER BED AND FLOODPLAIN ELEVATION.
16. LOCALLY EXCAVATE FROM BOTTOM OF STRUCTURE EXCAVATION TO ACHIEVE PILE EMBEDMENT SHOWN. PLACE PILE LOG ROOTWAD ON BOTTOM OF HOLE. BACKFILL WITH NATIVE ALLUVIUM AND COMPACT USING BACKSIDE OF EXCAVATOR BUCKET.
17. CONSTRUCT A 45- 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.
18. CONNECT ELS SCOUR POOL TO EXCAVATION OF BOULDER AND COBBLE BAR AT INLET TO SIDE CHANNEL. EXTENTS OF BAR EXCAVATION SHOWN IS APPROXIMATE. COORDINATE WITH ENGINEER PRIOR TO EXCAVATING BAR AND ELS CONSTRUCTION. EXTENTS AND DEPTH OF BAR EXCAVATION SHALL BE VERIFIED BY THE ENGINEER. USE BAR SPOILS AS LOG BALLAST MATERIAL AND DEPOSITIONAL BAR CONSTRUCTION AS DIRECTED BY THE ENGINEER.
19. PROTECT EXISTING TREES FROM DAMAGE ALONG RIGHT BANK OF SIDE CHANNEL DURING CONSTRUCTION ACTIVITIES.

CONSTRUCTION QUANTITIES PER ELS:

HEAVY LOOSE RIPRAP, EXISTING RIPRAP, CONCRETE DEBRIS, AND CHANNEL ARMOR MATERIAL	QTY
LOG BALLAST	156 CY
SCOUR APRON	100 CY

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VAR

CONCEPTUAL DESIGN

No.	REVISION	BY	APP'D	DATE

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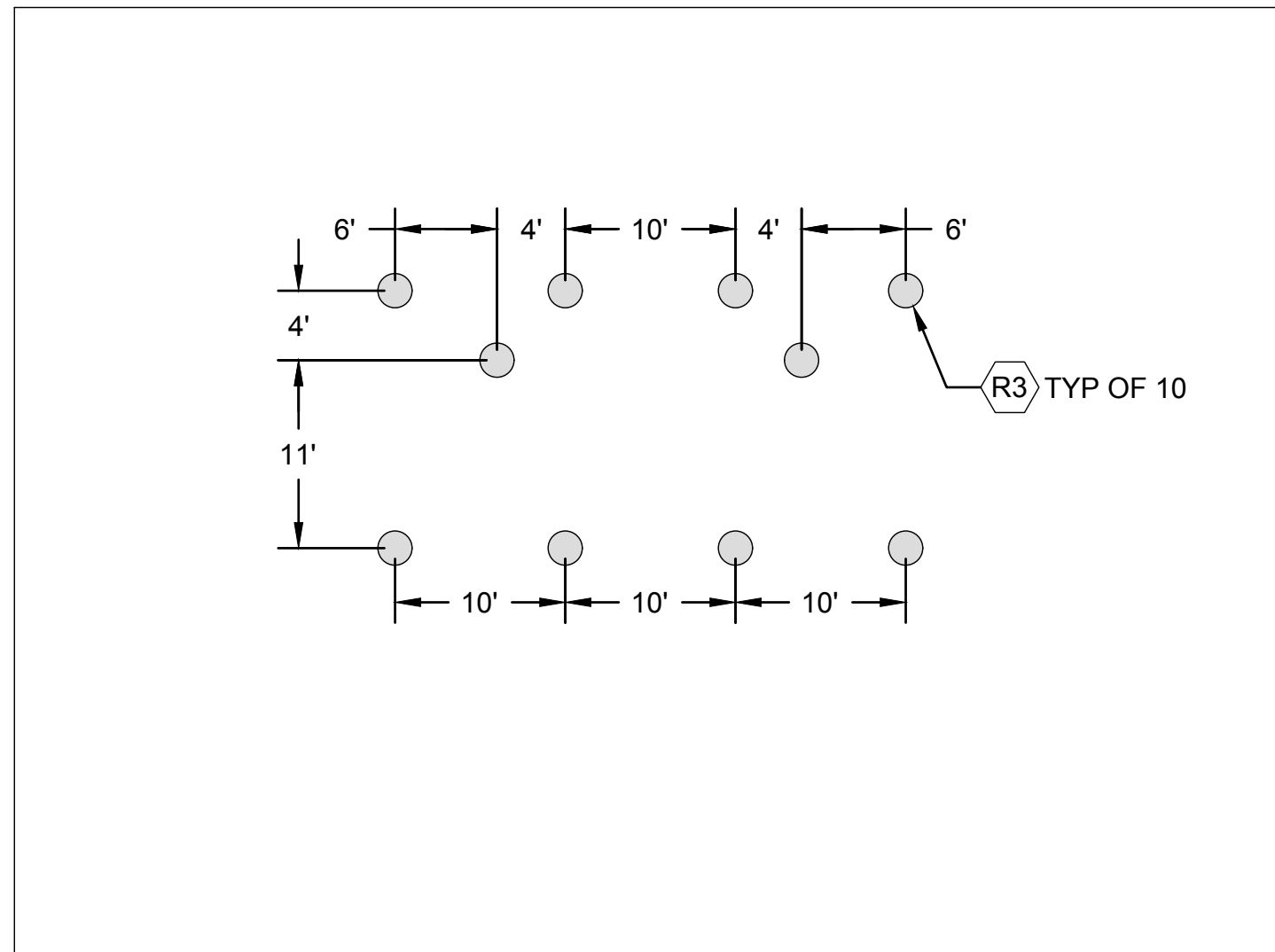
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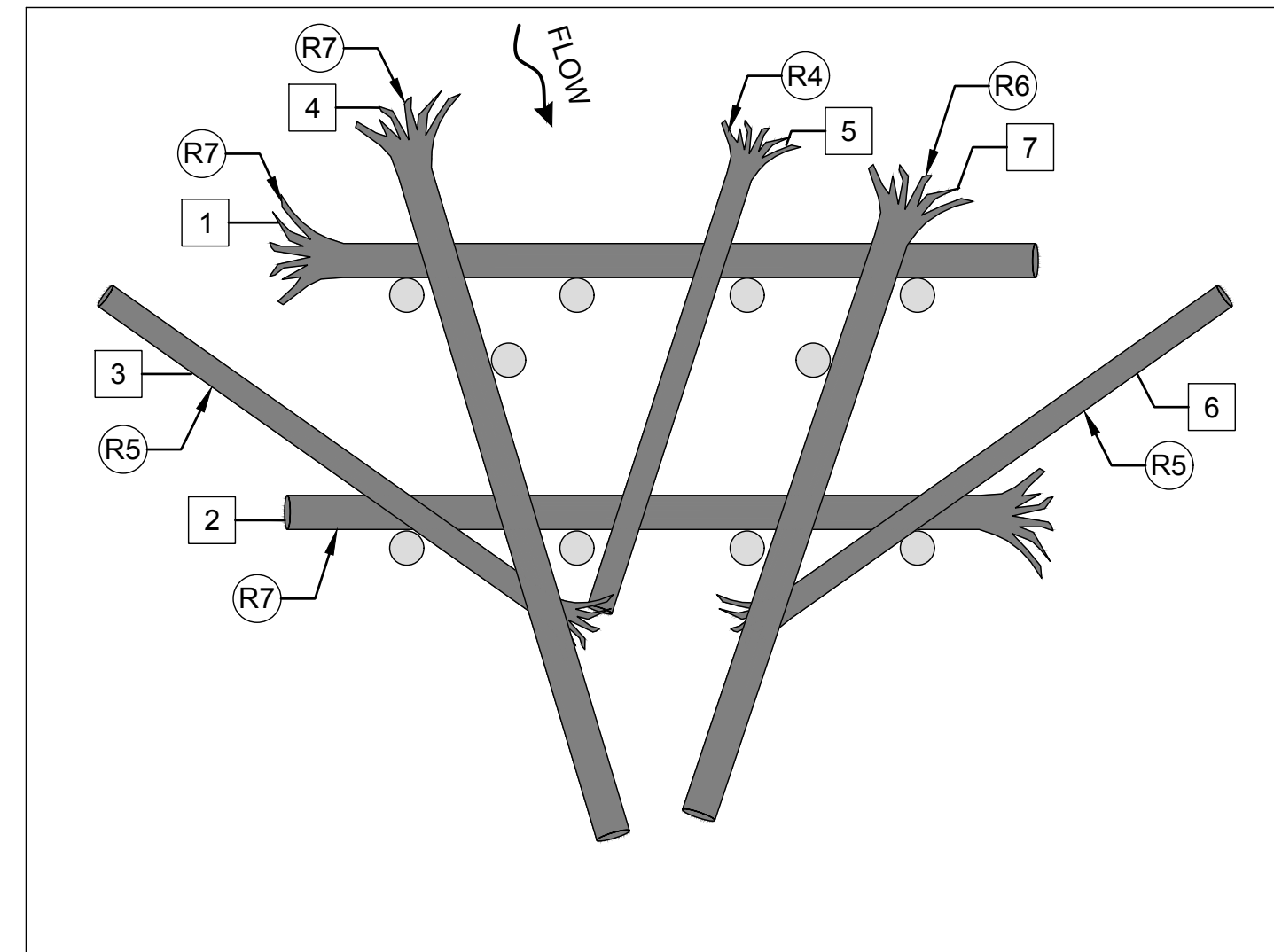
**SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3**

TYPE 4 LARGE MID-CHANNEL ELS

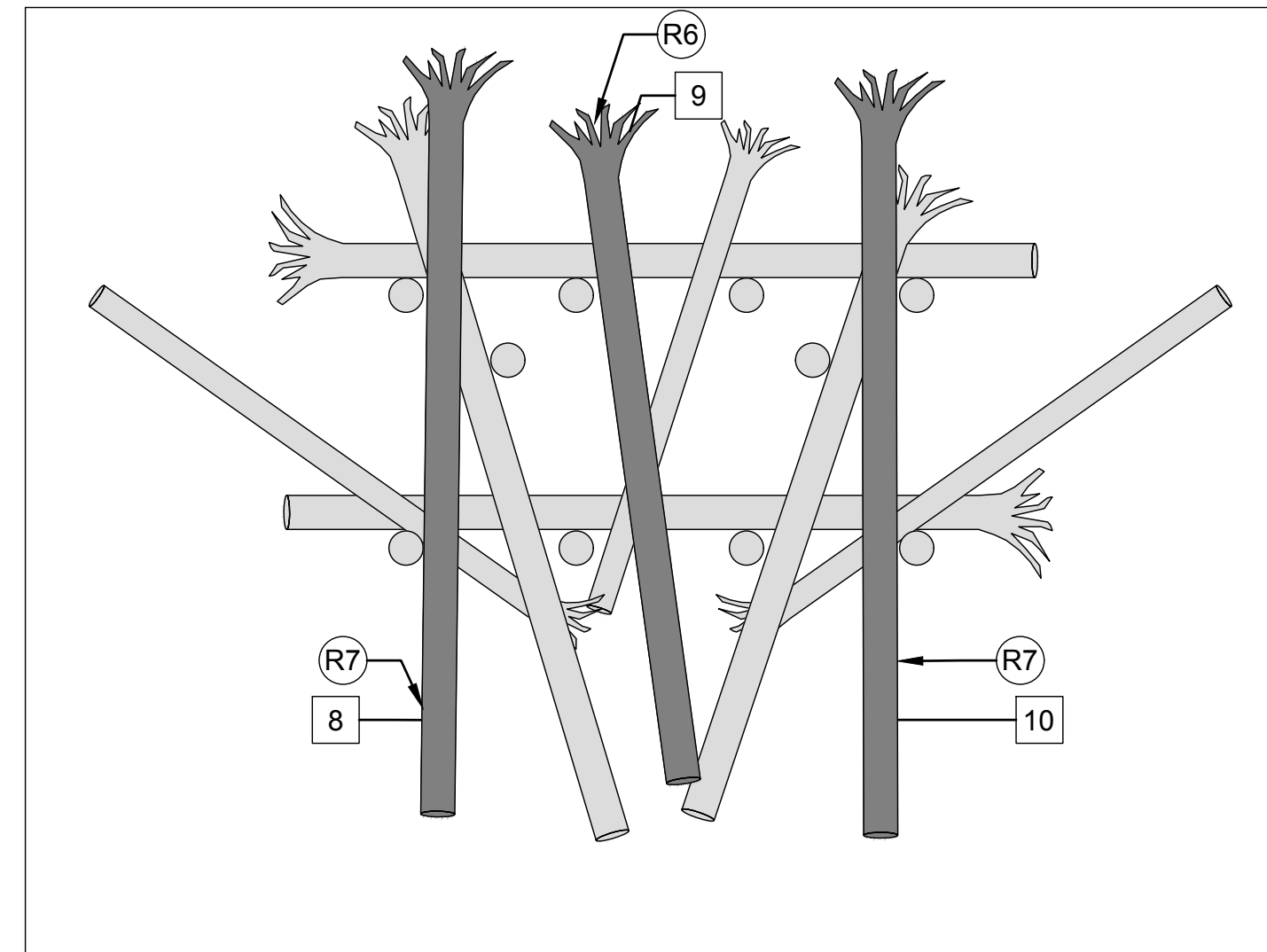
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PROJECT NO:	14-05790-000
DRAWING NO:	C1.04
SHEET NO:	7 OF 12



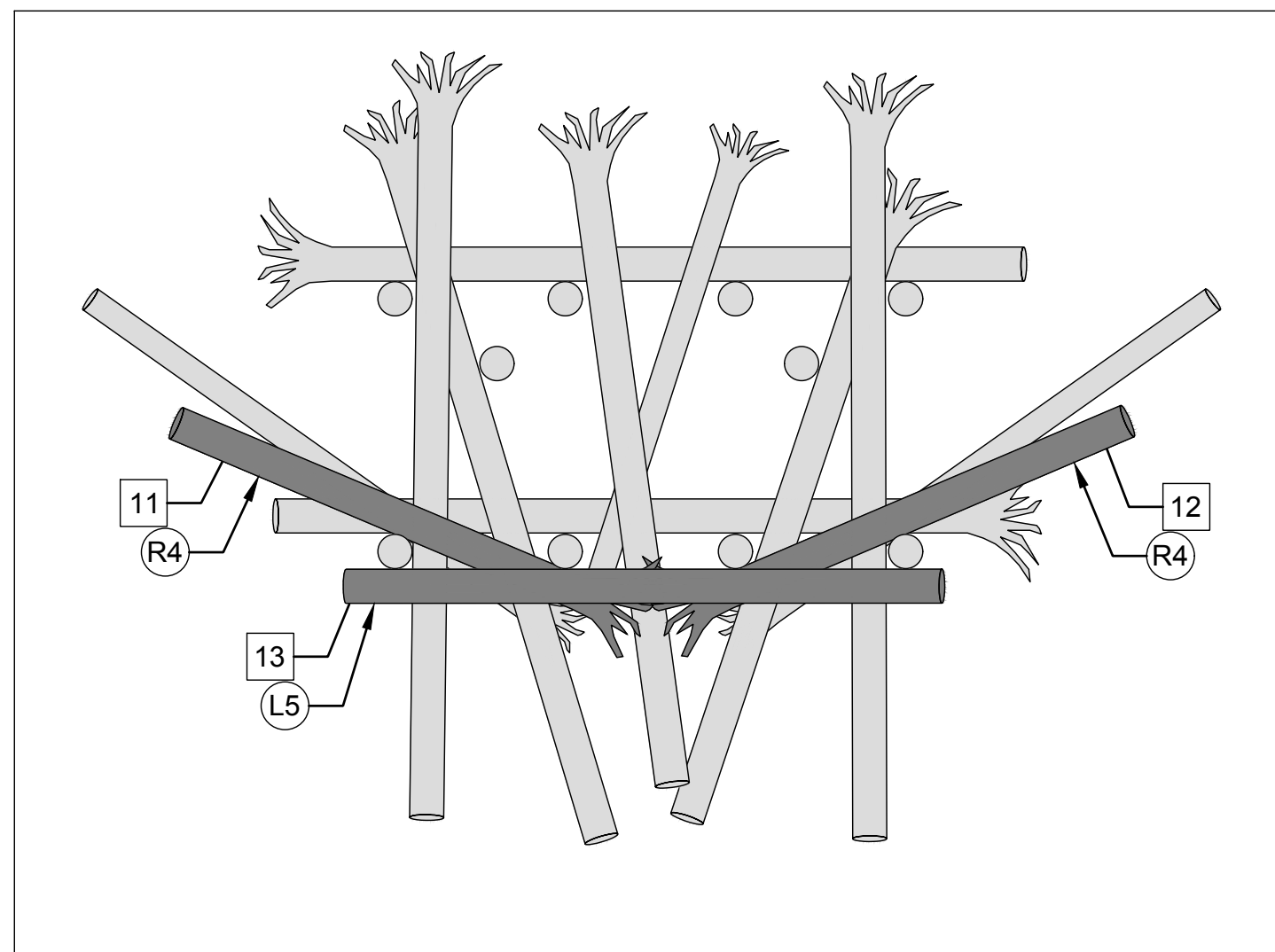
PILE LAYER



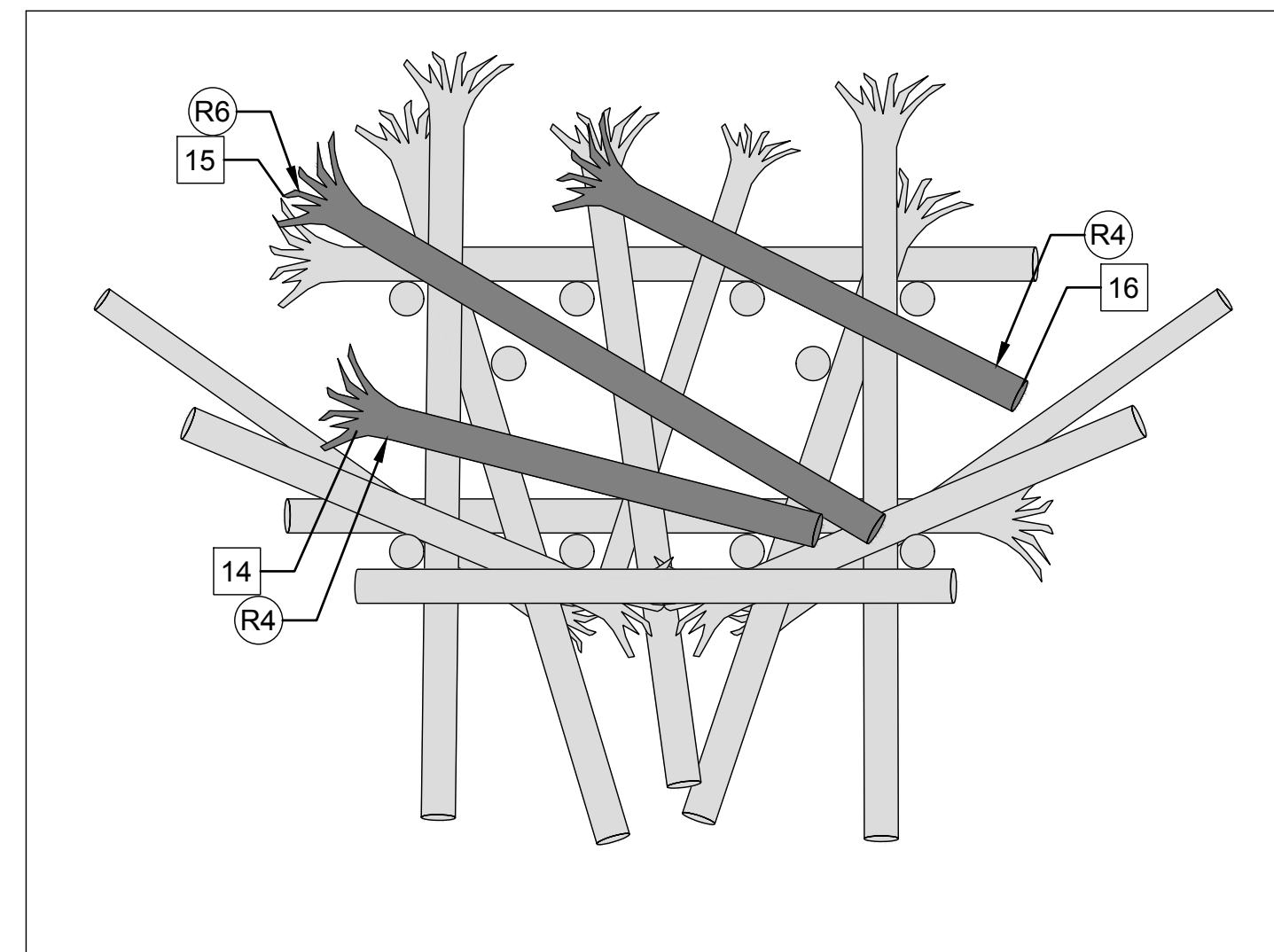
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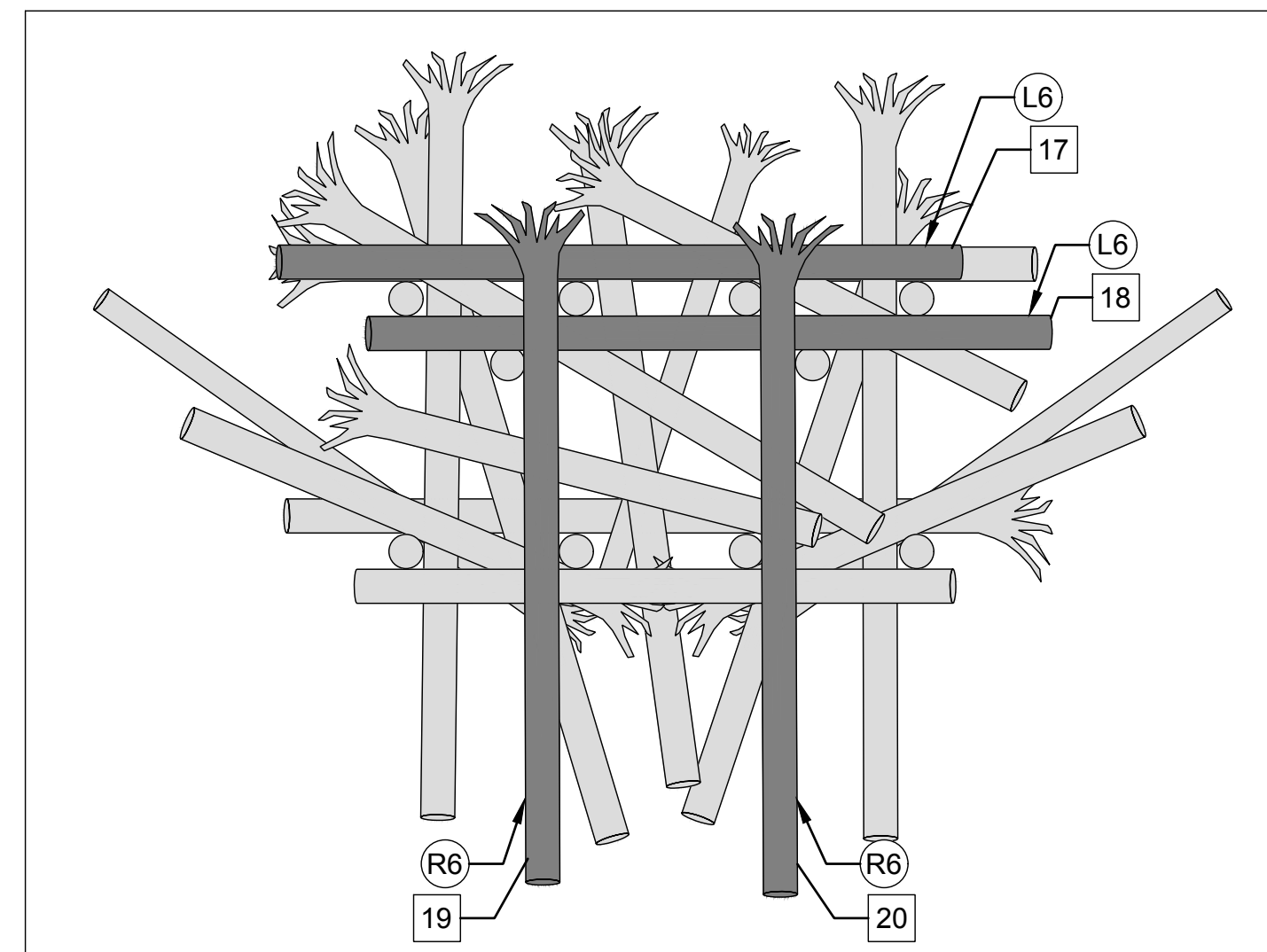
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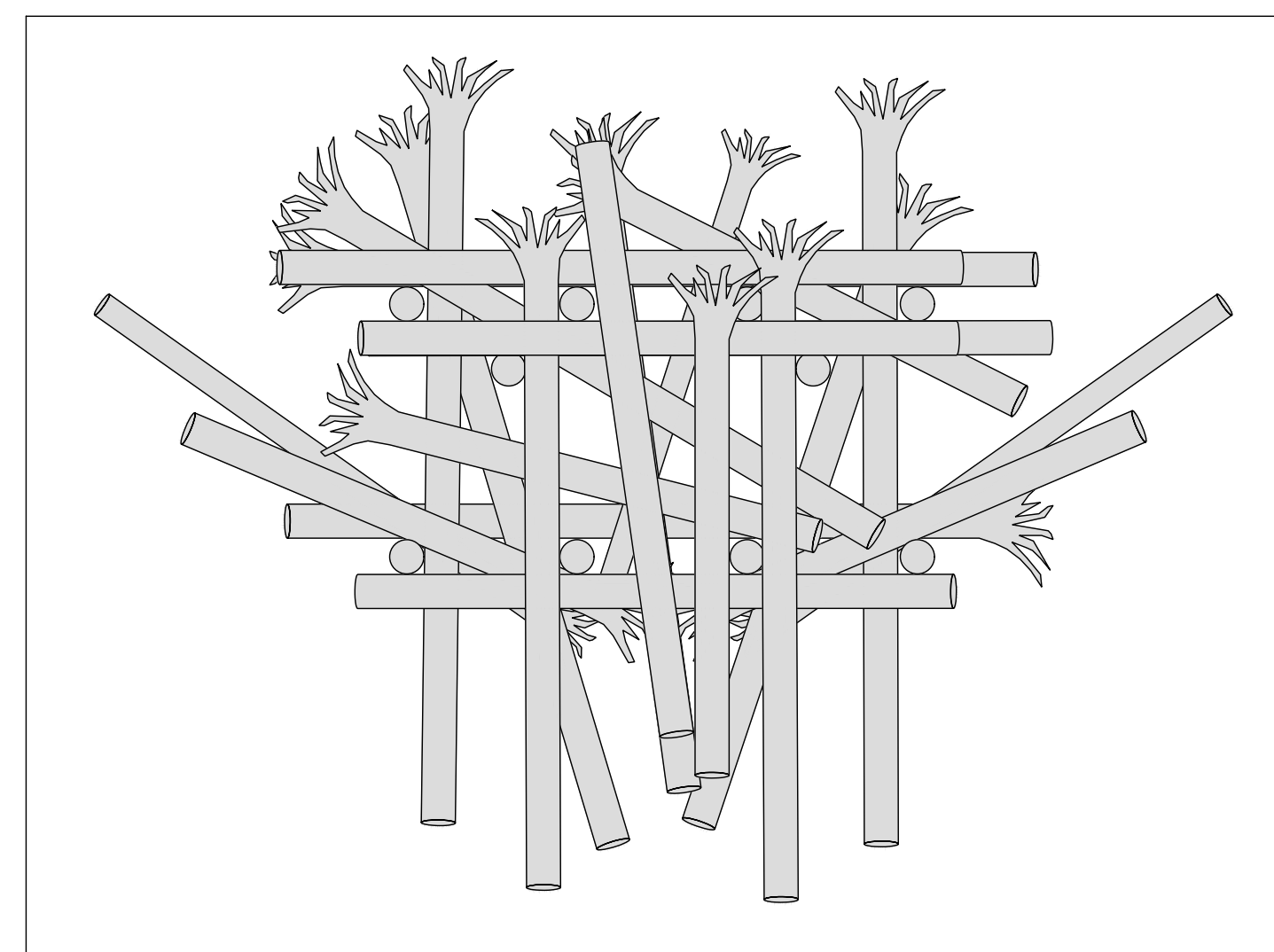
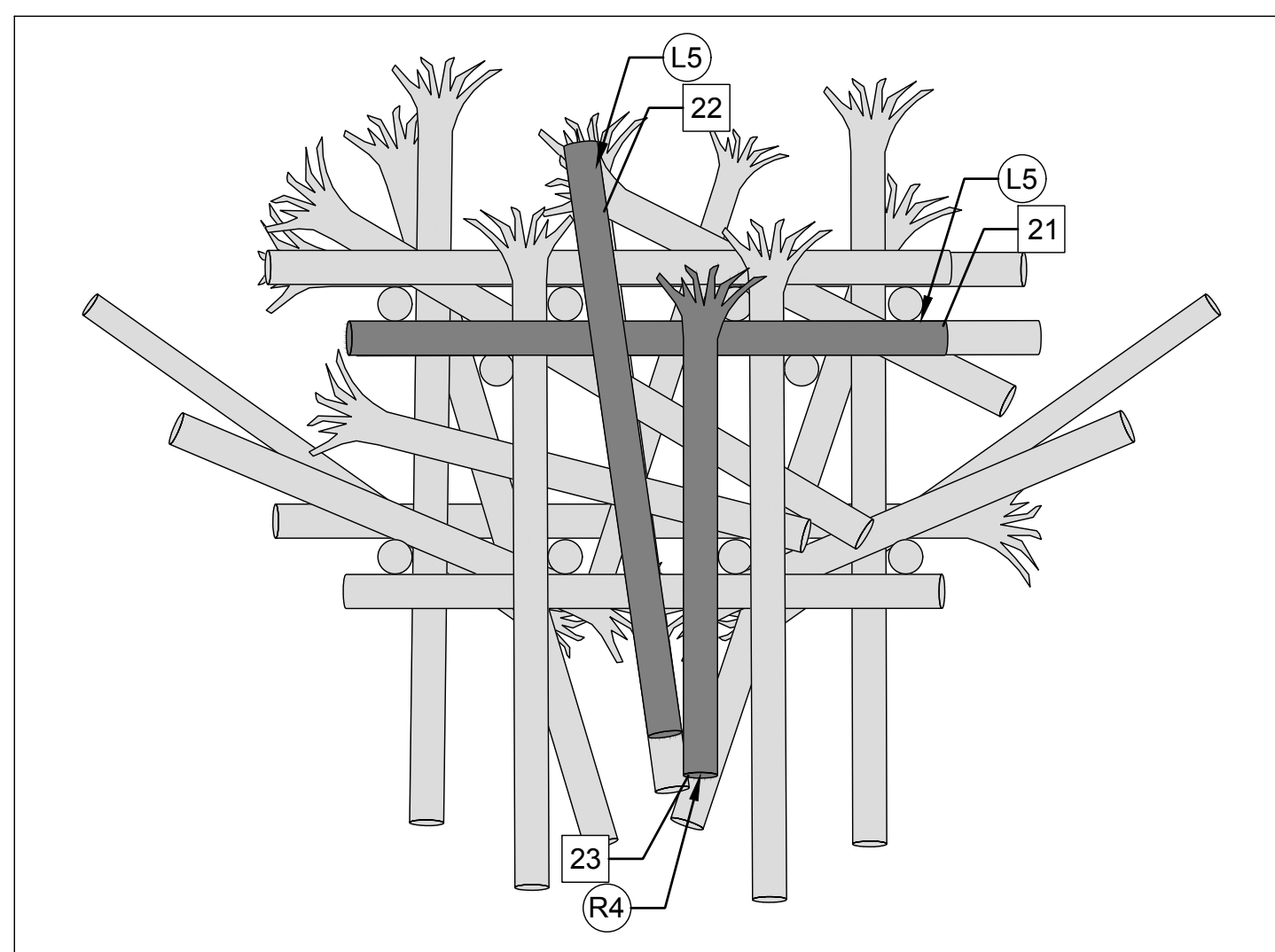
LAYER 3



LAYER 4



LAYER 5



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, IMPORTED BALLAST MATERIAL AND NATIVE BACKFILL MATERIAL AS SHOWN ON THE PLANS AND AS DIRECTED BY THE ENGINEER.
10. SEE DRAWING C-5 FOR STRUCTURE CONTROL POINT COORDINATES.
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 IMPORTED BALLAST MATERIAL.
3. FILL ALL VOIDS IN BALLAST MATERIAL WITH NATIVE BACKFILL MATERIAL.
4. INSTALL LAYER 2 AND LAYER 3 LOGS, RACKING LOGS, SLASH AND SECOND LIFT OF IMPORTED BALLAST MATERIAL.
5. FILL ALL VOIDS IN BALLAST MATERIAL WITH NATIVE BACKFILL MATERIAL.
6. INSTALL LAYER 4 AND LAYER 5 LOGS, RACKING LOGS, SLASH AND THIRD LIFT OF IMPORTED BALLAST MATERIAL.
7. FILL ALL VOIDS IN BALLAST MATERIAL WITH NATIVE BACKFILL MATERIAL.
8. INSTALL LAYER 6 LOGS RACKING LOGS, SLASH AND FOURTH LIFT OF IMPORTED 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.
10. PLACE TOPSOIL AND MULCH OVER TOP OF STRUCTURE AS SHOWN ON STRUCTURE PLAN.

LOG SCHEDULE - TYPE 4 ELS:

LOG ID #	DIAMETER (IN)	LENGTH (FT)	ROOTWAD	QUANTITY/ STRUCTURE
R3	24	25	YES	10
R4	24	30	YES	6
L5	24	35	NO	3
R5	24	35	YES	2
L6	24	40	NO	2
R6	24	40	YES	5
R7	24	45	YES	5
RACKING	4-16	15-30		100
SLASH	-	-		100 CY

CONCEPTUAL DESIGN

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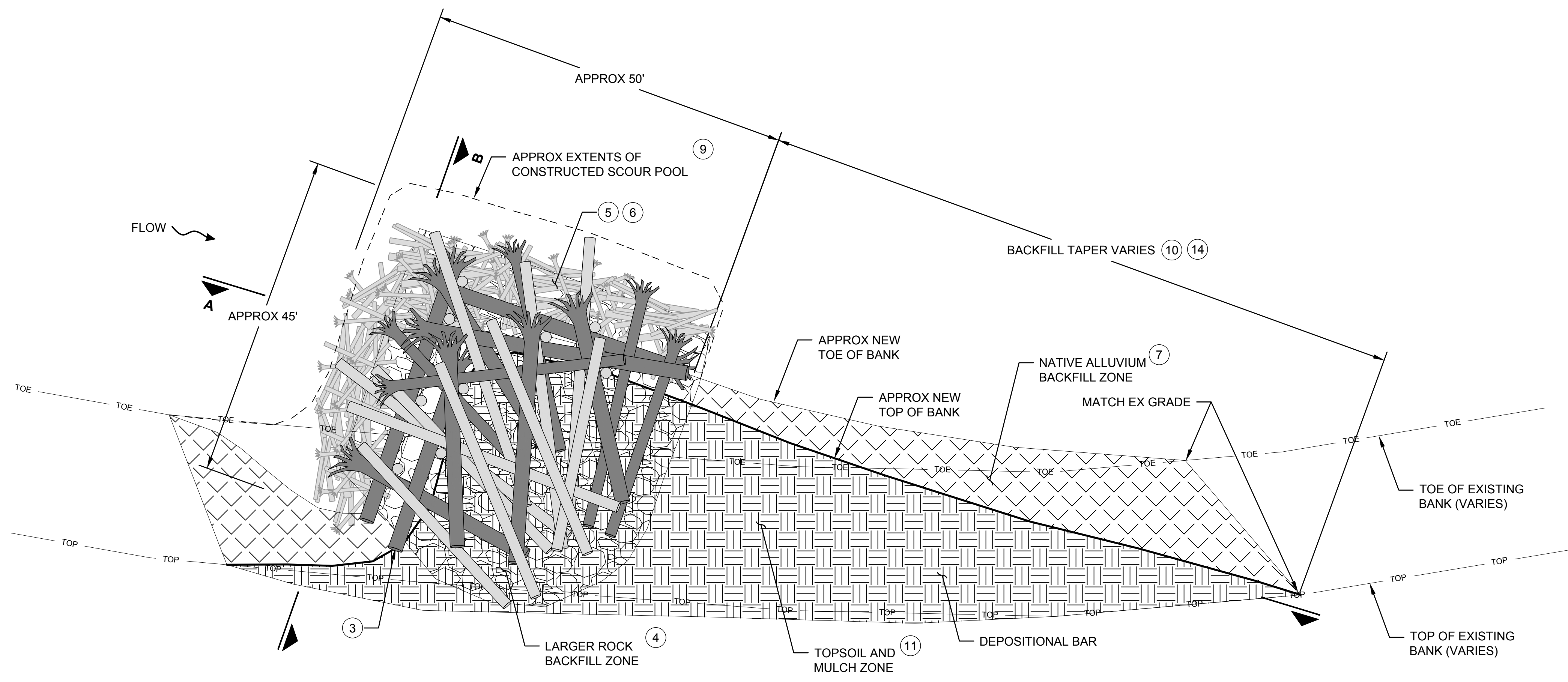
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SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

TYPE 4 LARGE MID-CHANNEL
ELS LAYERING PLAN

DATE:	APRIL 2024
PROJECT NO:	14-05790-000
DRAWING NO:	C1.05
SHEET NO:	8 OF 12



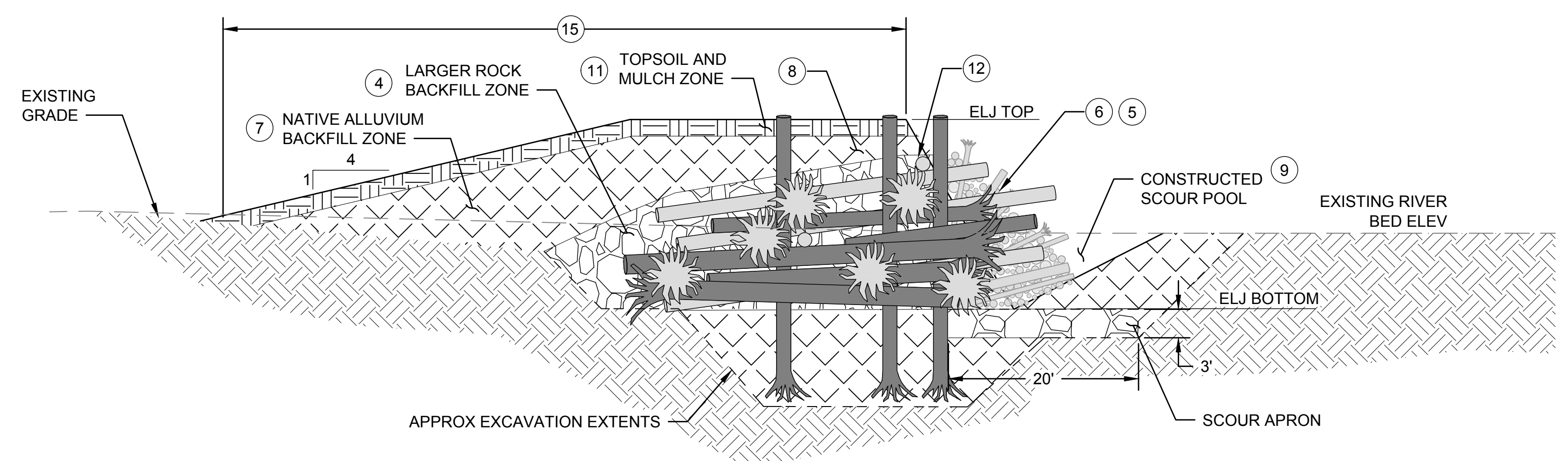
PLAN - RIGHT BANK DEFLECTOR ELS

SCALE: NTS

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VAR

CONSTRUCTION KEY NOTES:

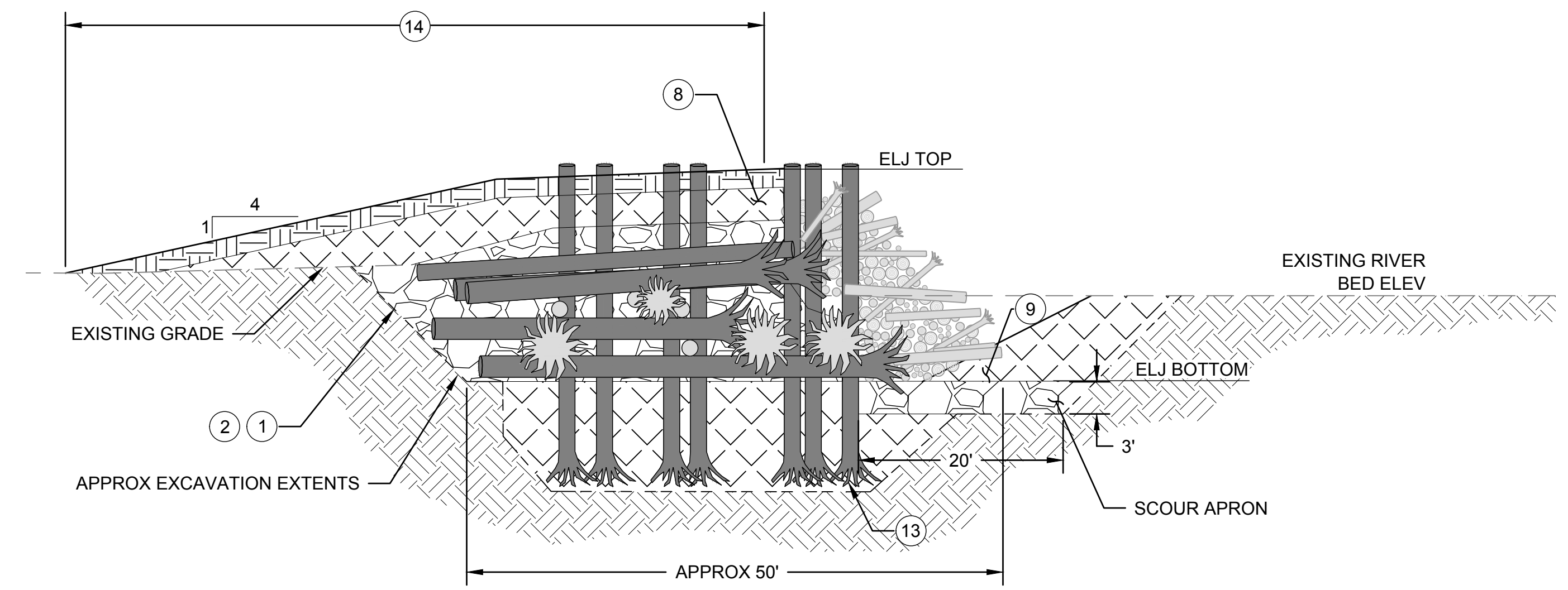
- ① APPROXIMATE ELJ EXCAVATION LIMITS.
- ② EXCAVATION SIDE SLOPES WILL VARY BASED ON CONTRACTORS MEANS AND METHODS.
- ③ PLACE PILES AND KEY MEMBERS ACCORDING TO ELJ LAYERING PLAN.
- ④ COORDINATE WITH WITH ENGINEER BEFORE PLACING LARGE ROCK AND NATIVE ALLUVIUM BACKFILL MATERIAL.
- ⑤ COORDINATE WITH ENGINEER BEFORE PLACING RACKING LOGS AND SLASH MATERIAL.
- 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 ELJ CONSTRUCTION AND WITH ALLUVIUM EXCAVATED FROM SCOUR POOLS AND FROM GRAVEL BARS. CONSTRUCT FLANKS OF ELJ AND DEPOSITIONAL 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 ELJ. LEAVE AS A POOL.
- ⑩ ADJUST FINAL GRADE ON BANK SIDE AND DOWNSTREAM SIDE OF ELJ AS NEEDED TO PLACE ALL NATIVE ALLUVIUM BACKFILL MATERIAL.
- ⑪ 3-INCHES OF BARK OR WOOD CHIP MULCH OVER 12 TO 18-INCHES OF TOPSOIL TYPE A TO BE PLACED AS DIRECTED BY ENGINEER.
- ⑫ PLACE SLASH MATERIAL AND SALVAGED BRUSH ALONG EDGE OF ELJ BETWEEN NATIVE ALLUVIUM BACKFILL MATERIAL AND RACKING LOGS.
- ⑬ TIMBER PILES SHALL BE DRIVEN OR PLACED INTO VERTICAL DRILLED ROCK SHAFTS THROUGH SEDIMENTARY BEDROCK AND EXISTING ALLUVIUM PER SPECIFICATION SECTION 6-05.
- ⑭ DIMENSION WILL VARY ALONG ELJ TO TRANSITION TO EXISTING GRADE BASED ON TOP OF BANK ELEVATION.



SECTION - RIGHT BANK DEFLECTOR ELS

SCALE: NTS

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SECTION - RIGHT BANK DEFLECTOR ELS

SCALE: NTS

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CONCEPTUAL DESIGN				
No.	REVISION	BY	APP'D	DATE

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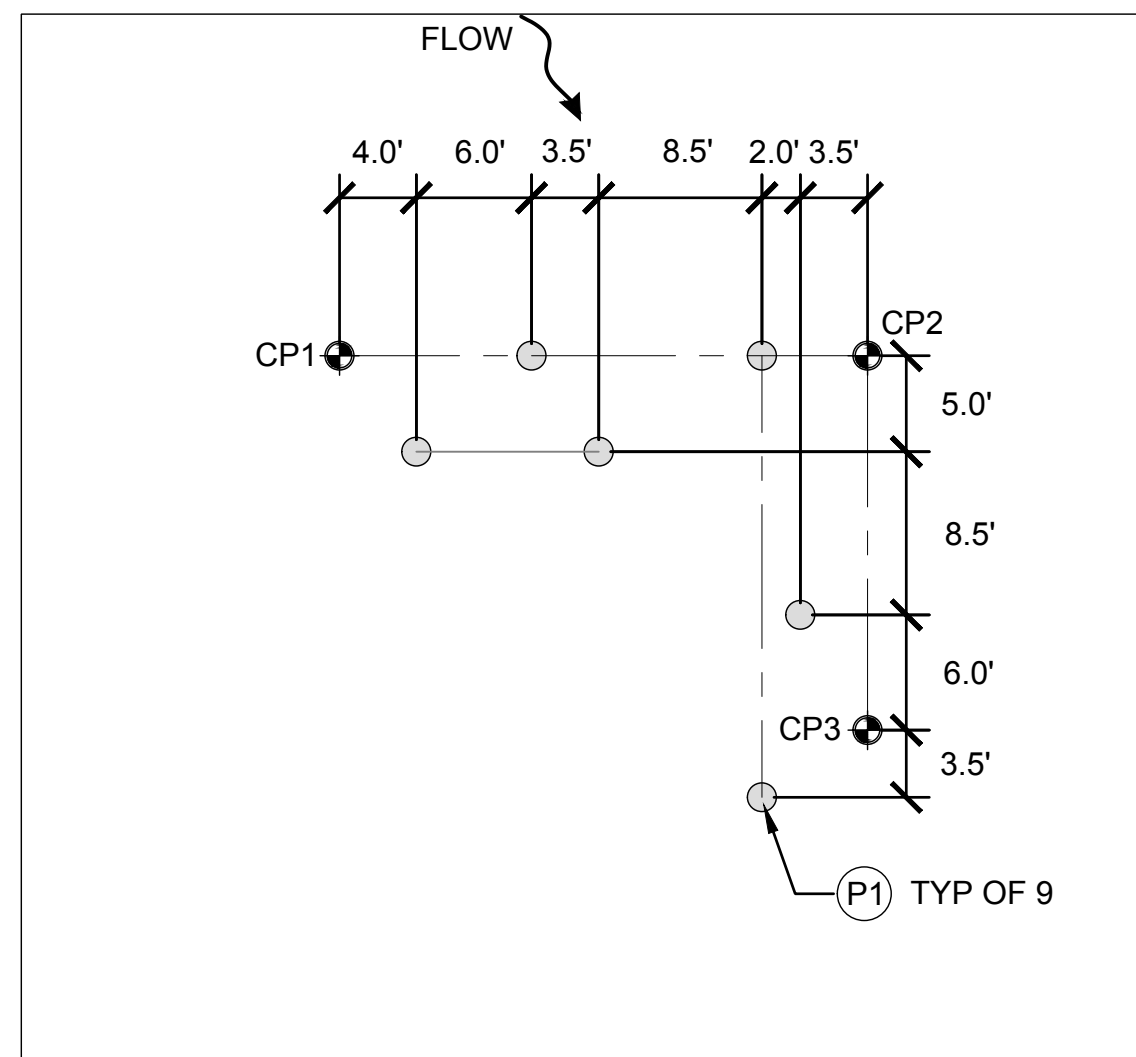
SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3

TYPE 5 LARGE RIGHT BANK ELS

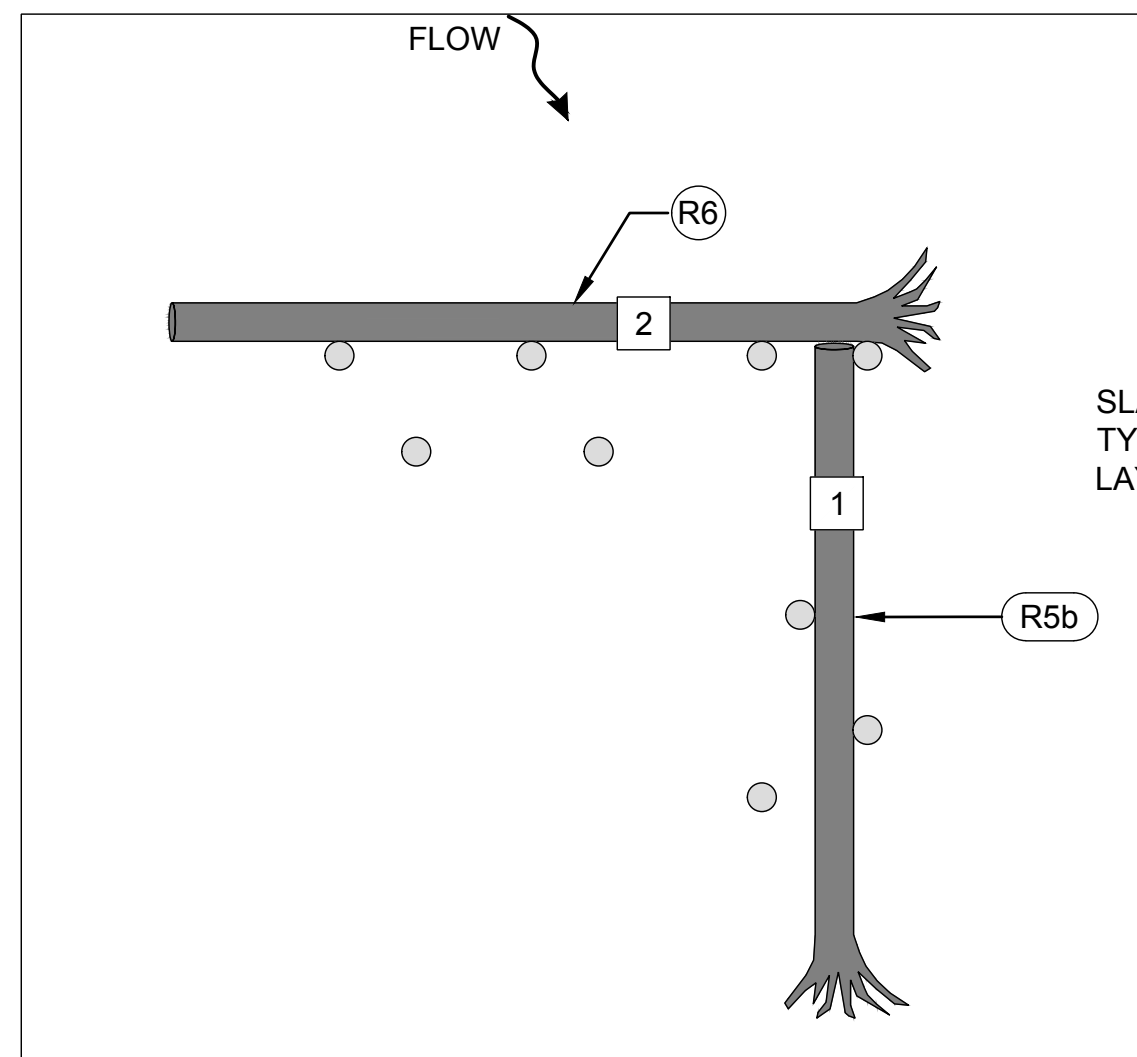
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PROJECT NO:	14-05790-000
DRAWING NO:	C1.06
SHEET NO:	9 OF 12

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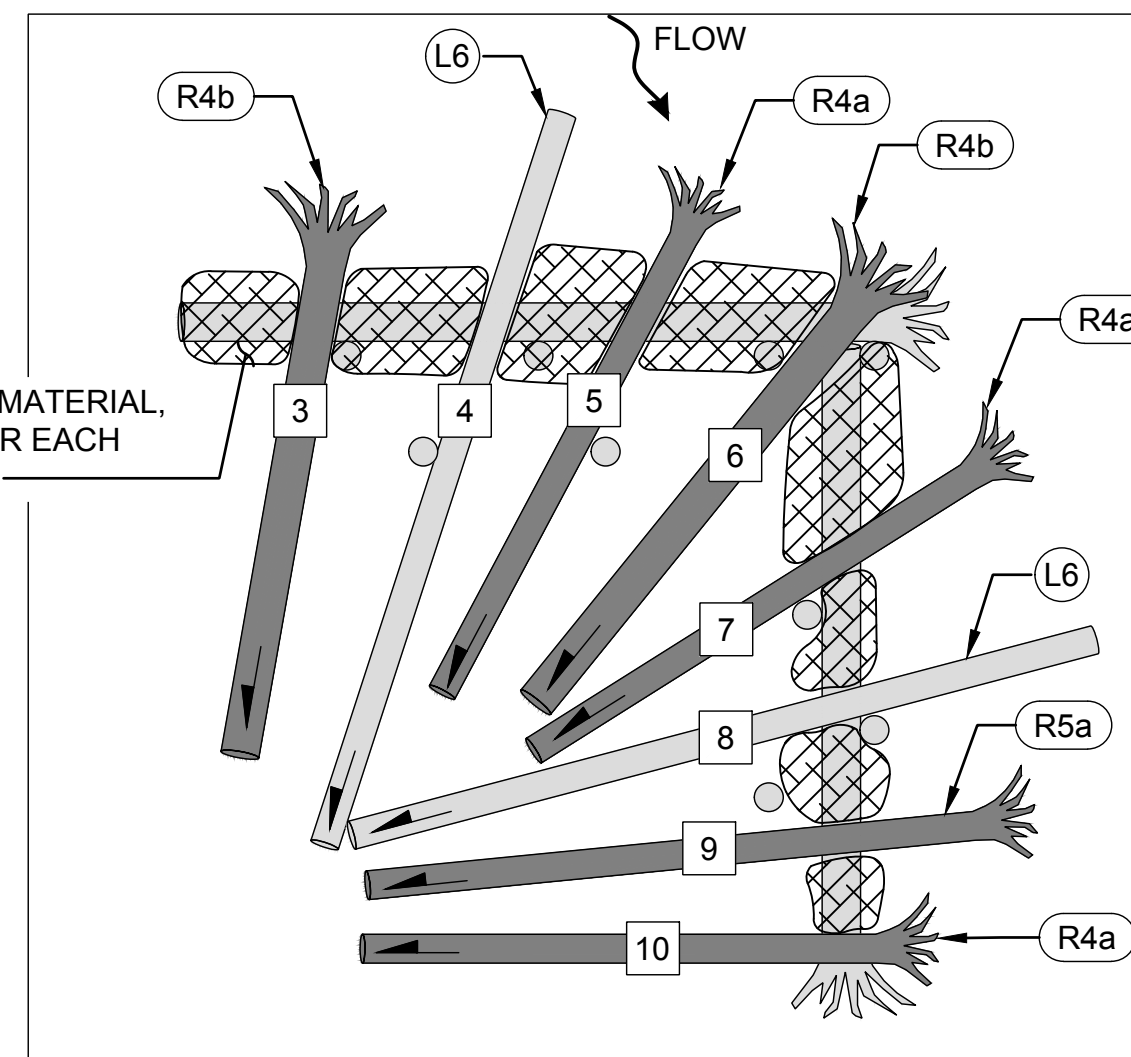
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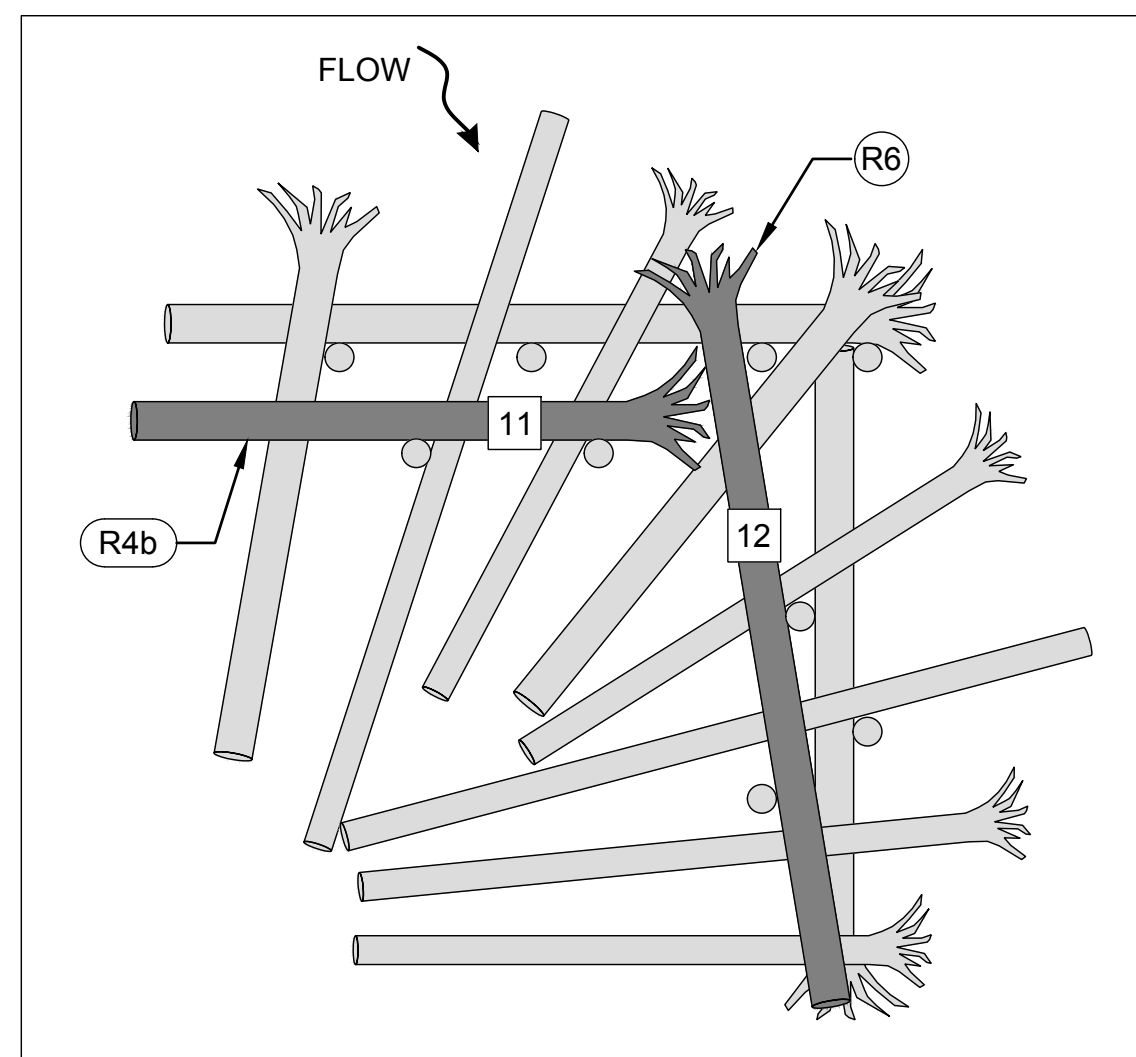
PILE LAYOUT



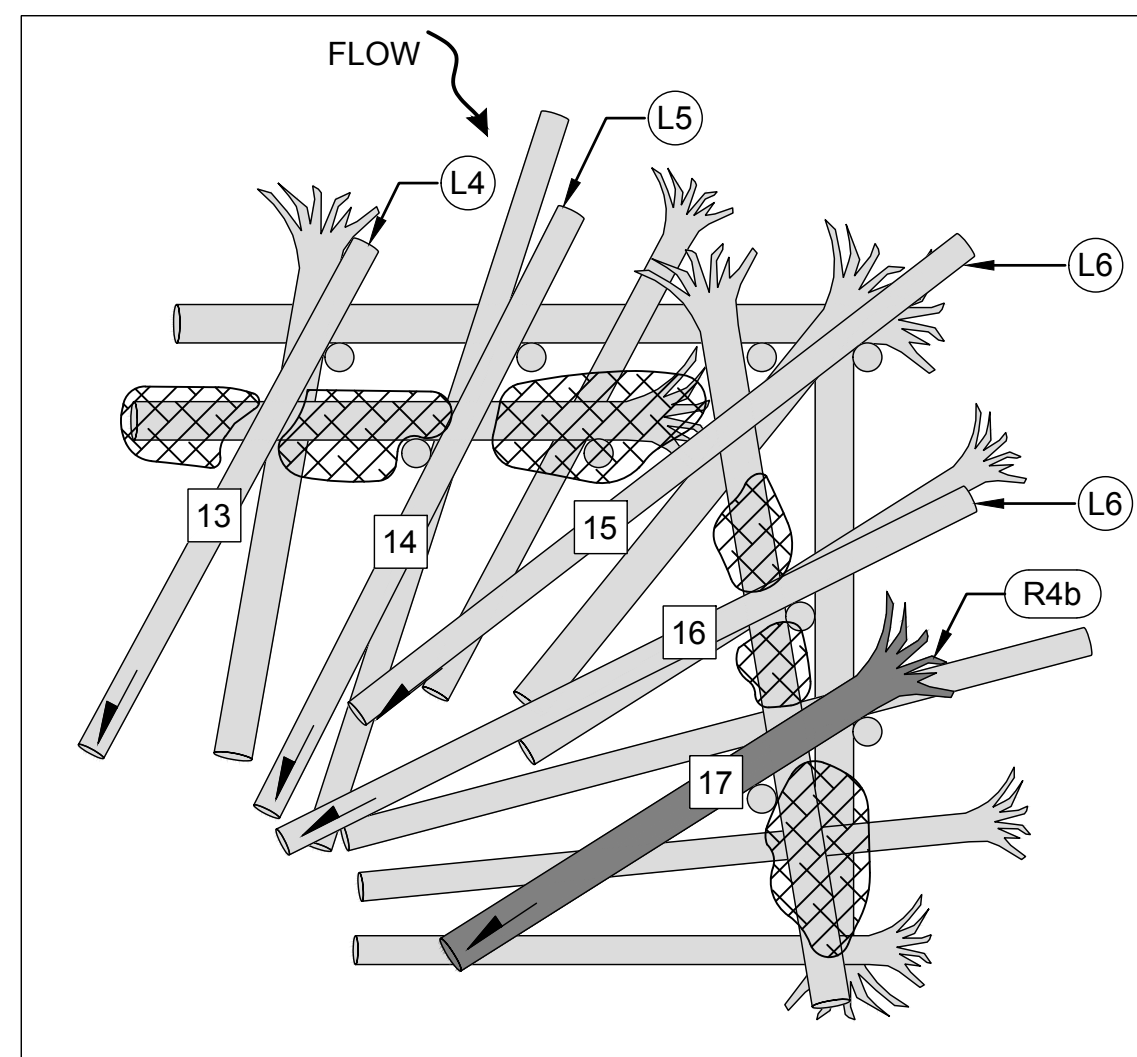
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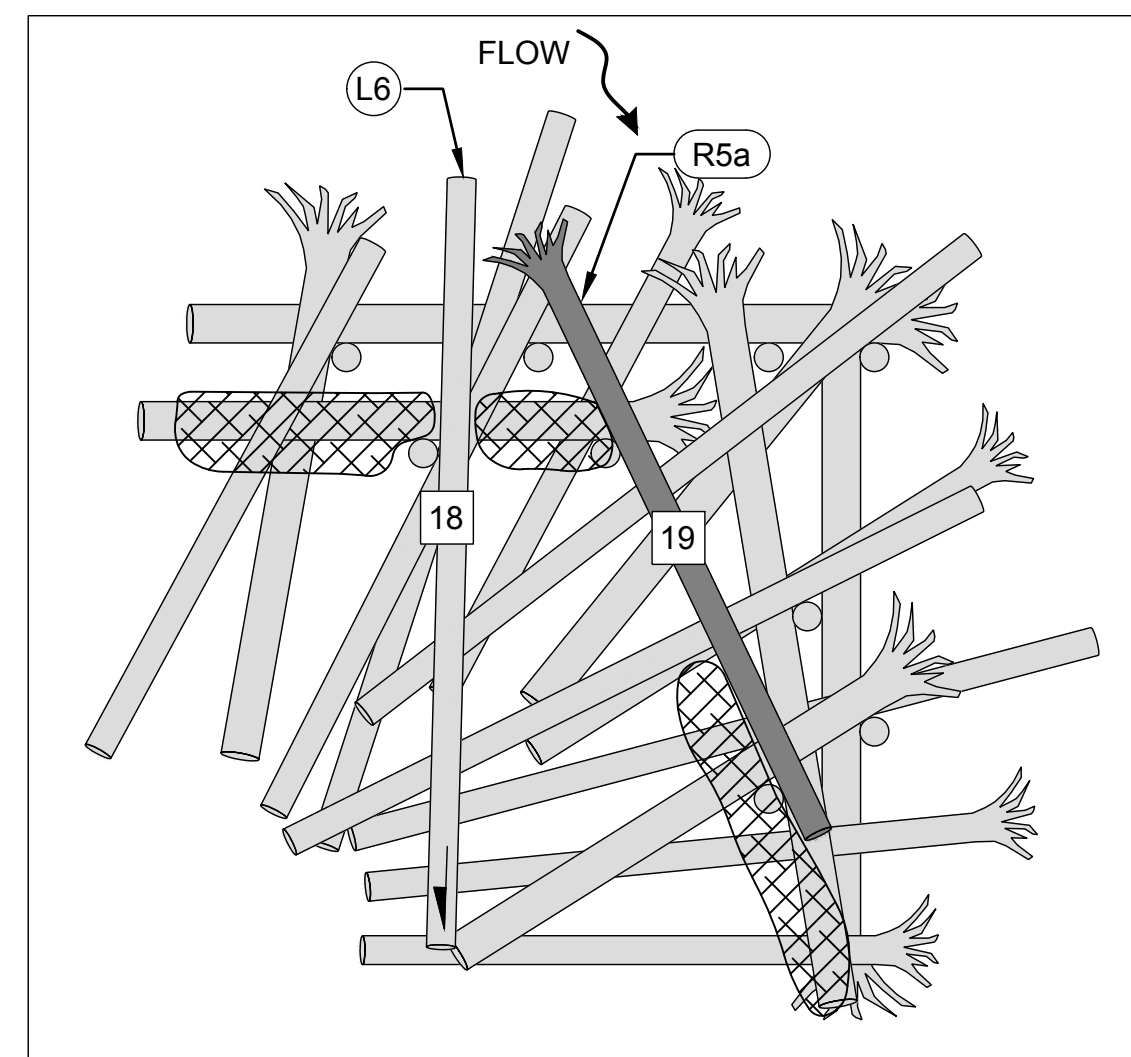
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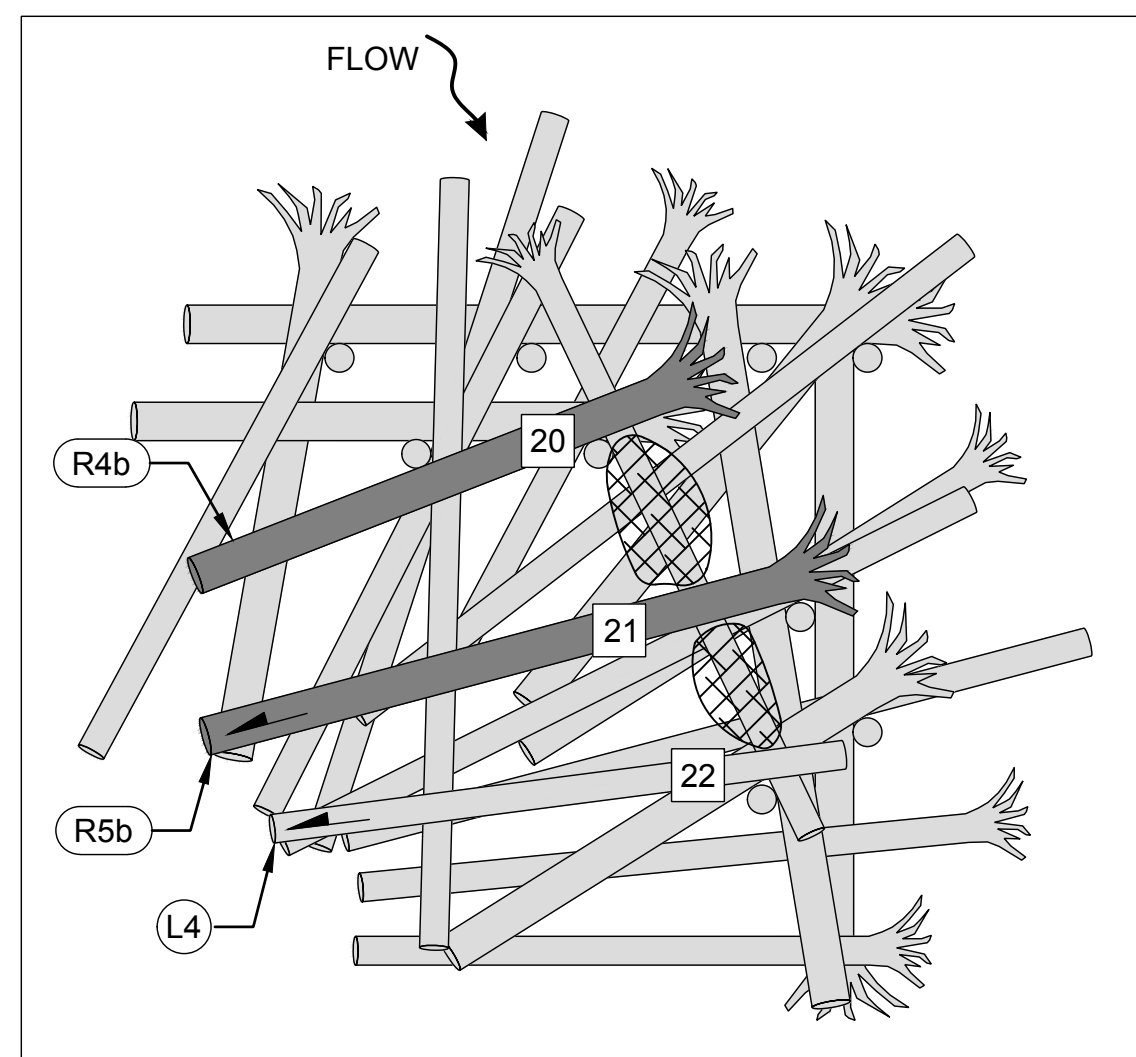
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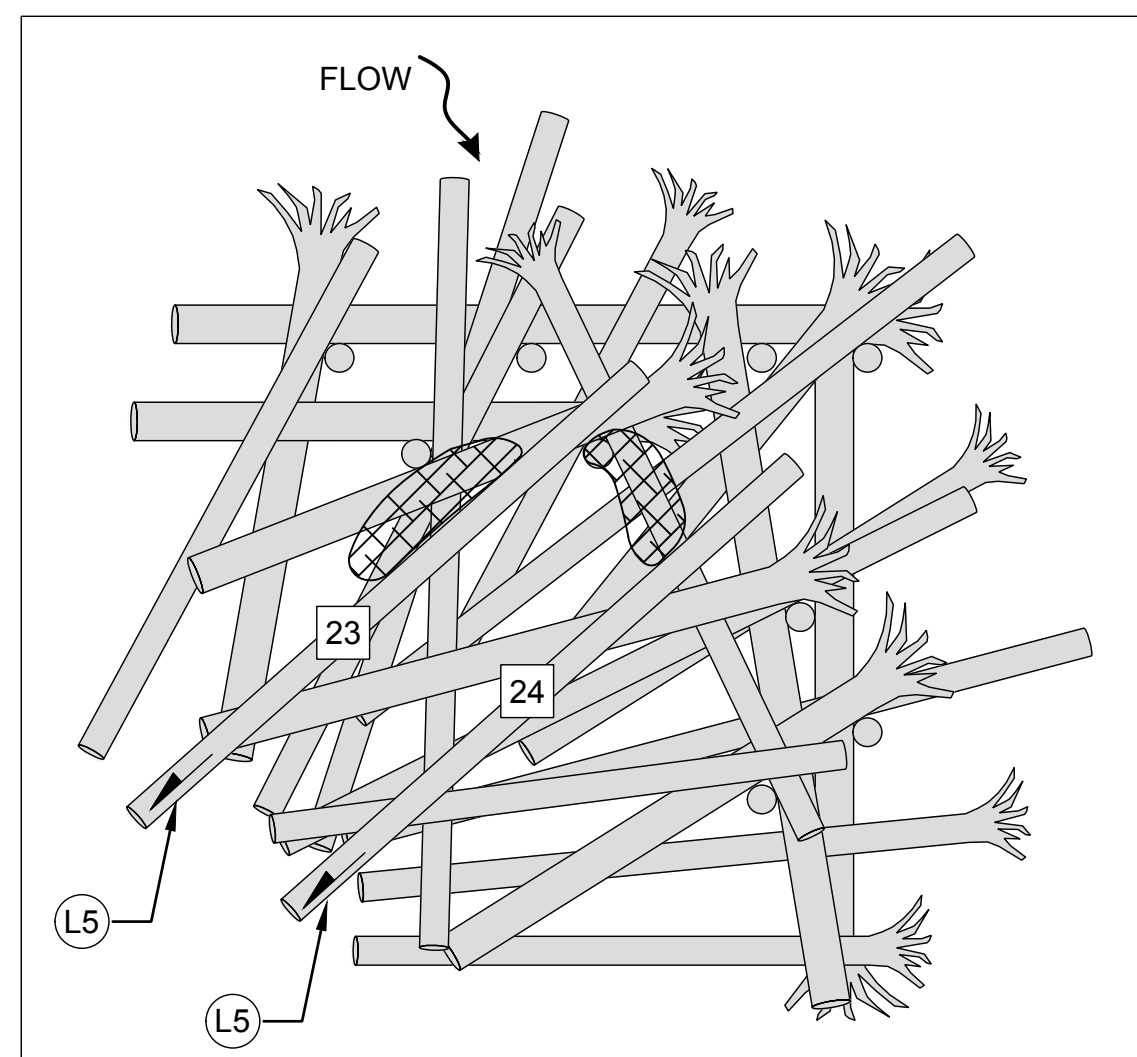
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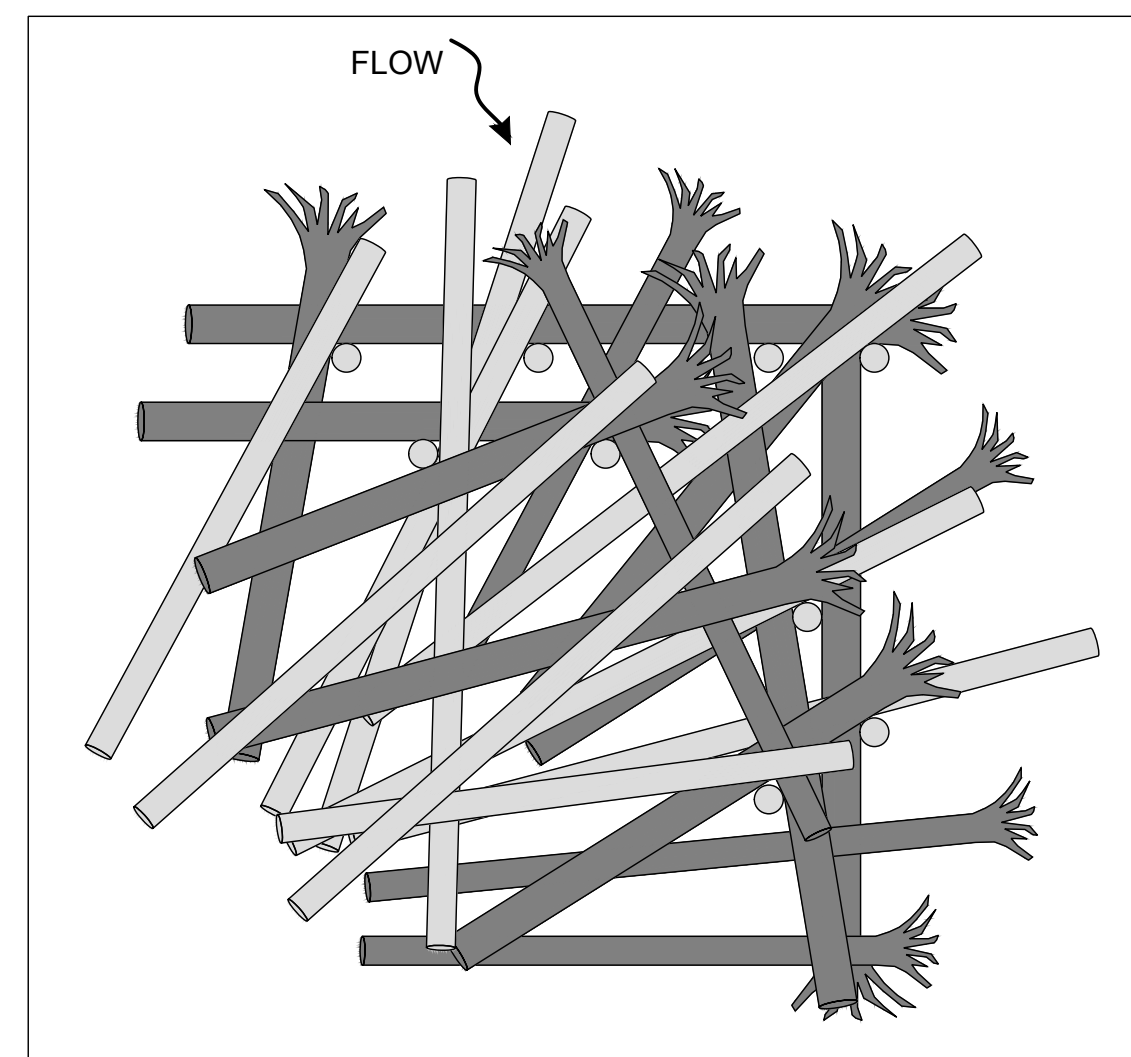
LAYER 5



LAYER 6



LAYER 7



COMPLETE

GENERAL NOTES:

- PILE LOCATIONS SHALL BE STAKED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER PRIOR TO PILE INSTALLATION.
- FINAL ELJ LOCATION AND ORIENTATION SHALL BE FIELD VERIFIED BY THE ENGINEER AFTER THE CONTRACTOR STAKES THE PILE LOCATIONS.
- PILE LOCATIONS ARE SYMMETRICAL ABOUT THE ELJ CONTROL POINT.
- PILE LOCATIONS SHALL BE BASED ON THE LOCATION OF THE ELJ CONTROL POINT AND SHALL BE WITHIN 6 INCHES OF THE LOCATION SHOWN ON THE DRAWINGS.
- LOG MATERIALS SHALL BE PLACED AT THE LOCATIONS, ELEVATIONS AND ORIENTATIONS SPECIFIED ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER.
- TRIM LOGS TO FIT AS REQUIRED.
- TRIM PILES A MINIMUM OF 18 INCHES AND A MAXIMUM OF 24 INCHES ABOVE FINAL GRADE.
- EXCAVATION LIMITS VARY DEPENDING ON THE LOCAL SOIL CONDITIONS AND THE CONSTRUCTION TECHNIQUES EMPLOYED.
- INSTALL LOGS, RACKING LOGS, SLASH, IMPORTED BALLAST MATERIAL AND NATIVE BACKFILL MATERIAL AS SHOWN ON THE PLANS AND AS DIRECTED BY THE ENGINEER.
- SEE DRAWING XX FOR ELJ CONTROL POINT COORDINATES.
- RACKING LOGS NOT SHOWN FOR CLARITY. PLACE RACKING LOGS ALONG UPSTREAM FACE AND ALONG THE SIDES OF THE ELJ AS SHOWN ON DWG XX. RACKING LOGS SHALL BE PLACED PARALLEL TO AND BETWEEN PILES EXTENDING OUT FROM THE ELJ. 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.

ELJ CONSTRUCTION SEQUENCE NOTES:

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

LOG SCHEDULE - LEFT BANK DEFLECTOR ELS

LOG TYPE	MINIMUM DIAMETER (IN)	LENGTH (FT)	ROOTWAD	TOTAL QTY PER ELJ
(P1)	22-26	25	YES	9
(R4a)	18-22	30	YES	3
(R4b)	24-28	30	YES	5
(R5a)	18-22	35	YES	2
(R5b)	24-28	35	YES	2
(R6)	24-28	40	YES	2
(L4)	18-22	30	NO	2
(L5)	18-22	35	NO	3
(L6)	18-22	40	NO	5
RACKING	4-16	15-30	OPTIONAL	150
SLASH (LOOSE)	-	-	-	200 CY

LEGEND:

- (X#) LOG IDENTIFIER
- # LOG PLACEMENT SEQUENCING ORDER
- CONTROL POINT

CONCEPTUAL DESIGN

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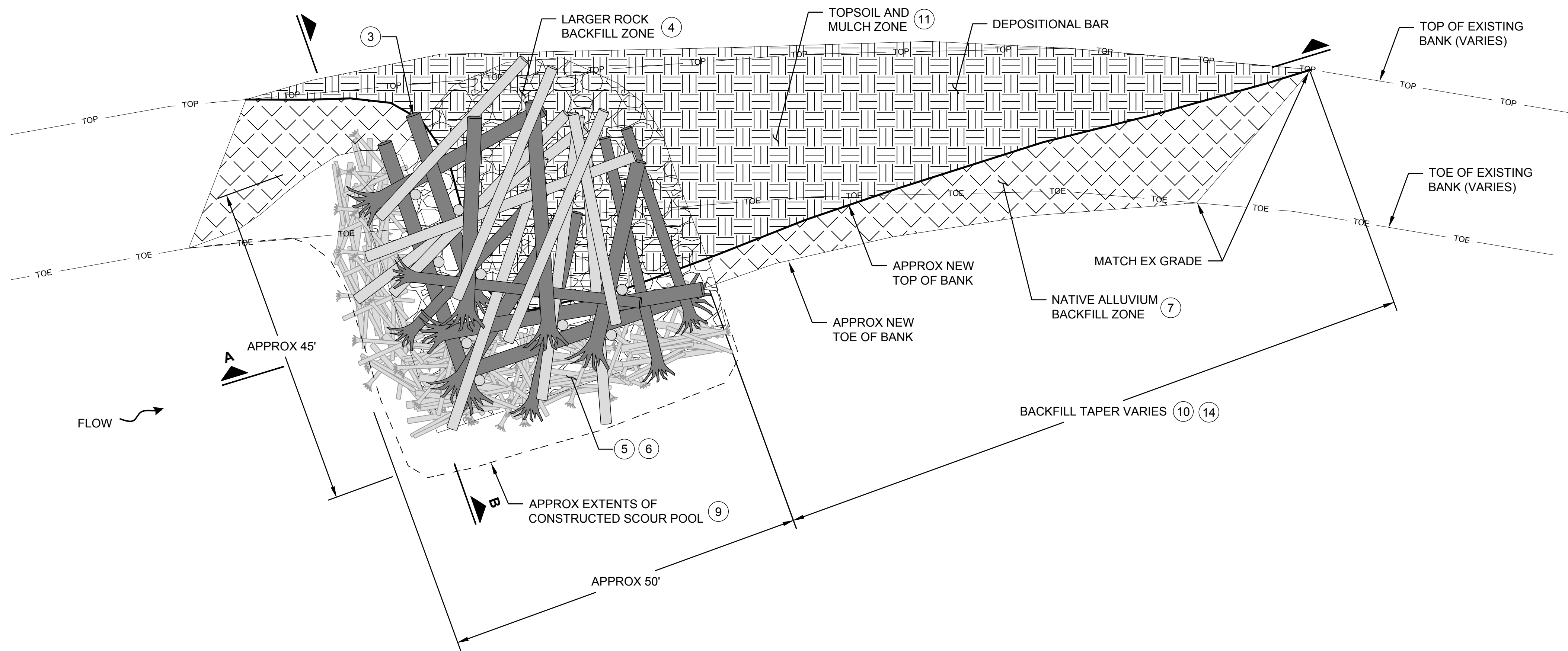
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**SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3**

TYPE 5 LARGE RIGHT BANK ELS LAYERING PLAN

DATE:	APRIL 2024
PROJECT NO:	14-05790-000
DRAWING NO:	C1.07
SHEET NO:	10 OF 12



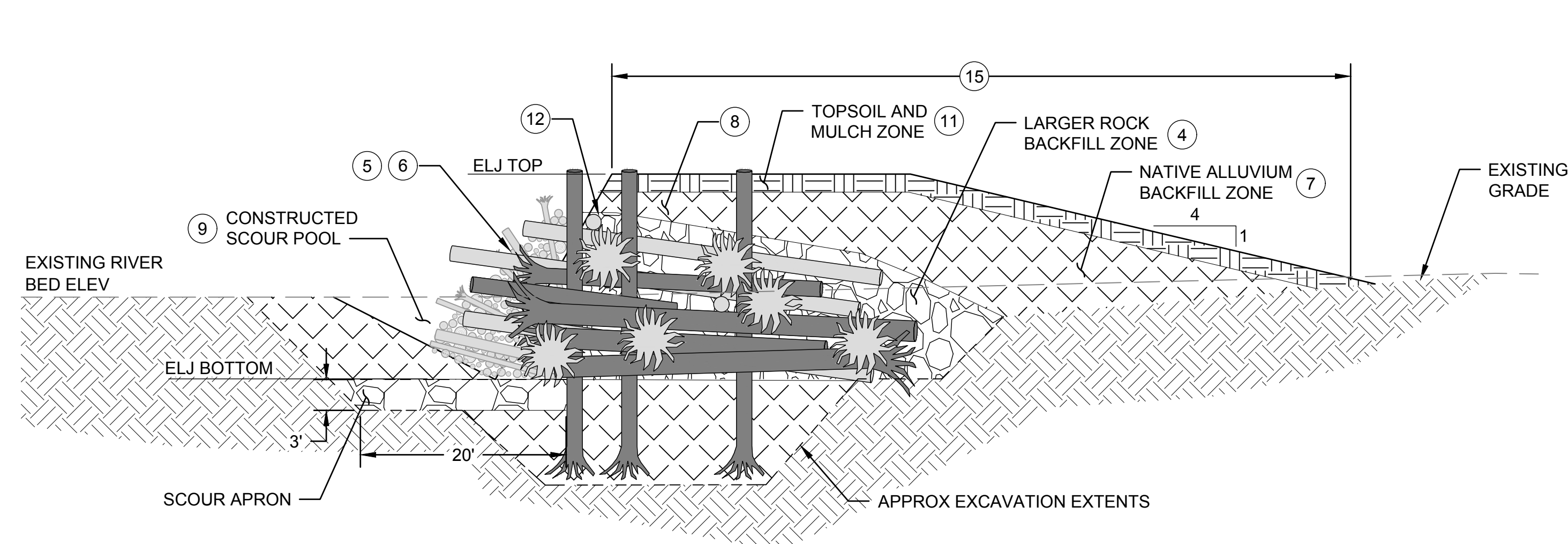
PLAN - LEFT BANK DEFLECTOR ELS

SCALE: NTS

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VAR

CONSTRUCTION KEY NOTES:

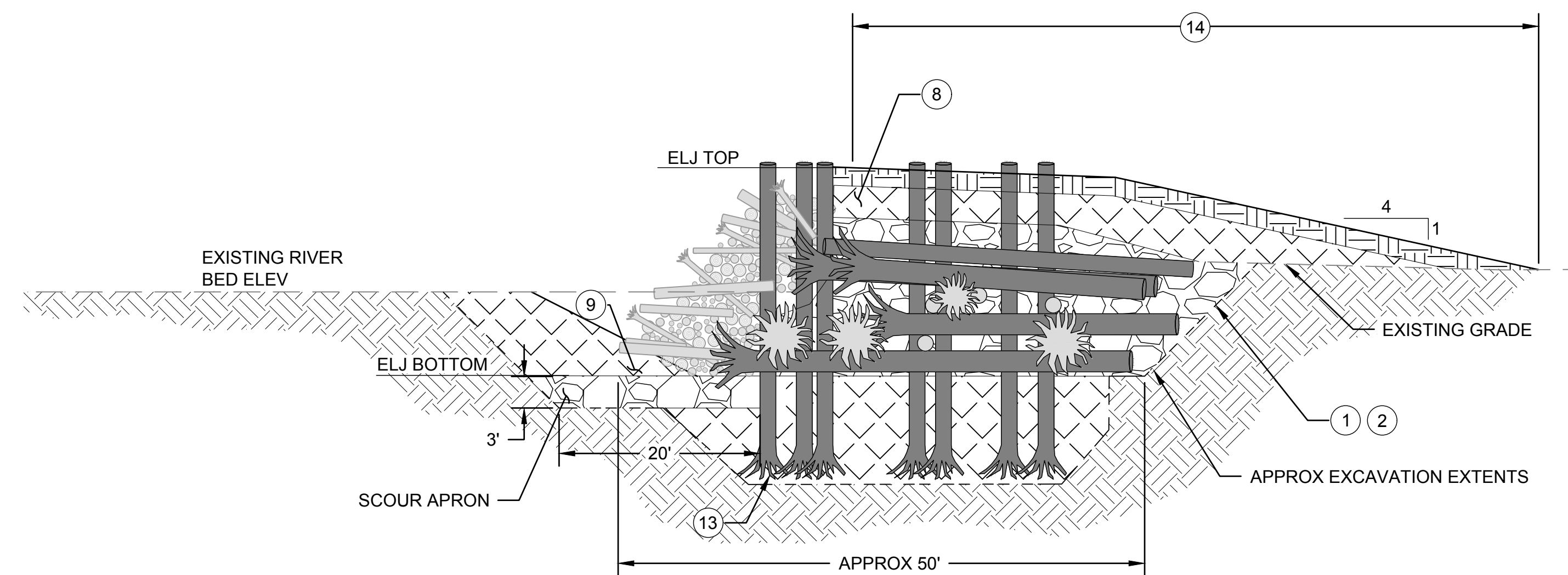
- 1 APPROXIMATE ELJ EXCAVATION LIMITS.
- 2 EXCAVATION SIDE SLOPES WILL VARY BASED ON CONTRACTORS MEANS AND METHODS.
- 3 PLACE PILES AND KEY MEMBERS ACCORDING TO ELJ LAYERING PLAN.
- 4 COORDINATE WITH WITH ENGINEER BEFORE PLACING LARGE ROCK AND NATIVE ALLUVIUM BACKFILL MATERIAL.
- 5 COORDINATE WITH ENGINEER BEFORE PLACING RACKING LOGS AND SLASH MATERIAL.
- 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 ELJ CONSTRUCTION AND WITH ALLUVIUM EXCAVATED FROM SCOUR POOLS AND FROM GRAVEL BARS. CONSTRUCT FLANKS OF ELJ AND DEPOSITIONAL 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 ELJ. LEAVE AS A POOL.
- 10 ADJUST FINAL GRADE ON BANK SIDE AND DOWNSTREAM SIDE OF ELJ AS NEEDED TO PLACE ALL NATIVE ALLUVIUM BACKFILL MATERIAL.
- 11 3-INCHES OF BARK OR WOOD CHIP MULCH OVER 12 TO 18-INCHES OF TOPSOIL TYPE A TO BE PLACED AS DIRECTED BY ENGINEER.
- 12 PLACE SLASH MATERIAL AND SALVAGED BRUSH ALONG EDGE OF ELJ BETWEEN NATIVE ALLUVIUM BACKFILL MATERIAL AND RACKING LOGS.
- 13 TIMBER PILES SHALL BE DRIVEN OR PLACED INTO VERTICAL DRILLED ROCK SHAFTS THROUGH SEDIMENTARY BEDROCK AND EXISTING ALLUVIUM PER SPECIFICATION SECTION 6-05.
- 14 DIMENSION WILL VARY ALONG ELJ TO TRANSITION TO EXISTING GRADE BASED ON TOP OF BANK ELEVATION.



SECTION - LEFT BANK DEFLECTOR ELS

SCALE: NTS

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SECTION - LEFT BANK DEFLECTOR ELS

SCALE: NTS

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CONCEPTUAL DESIGN

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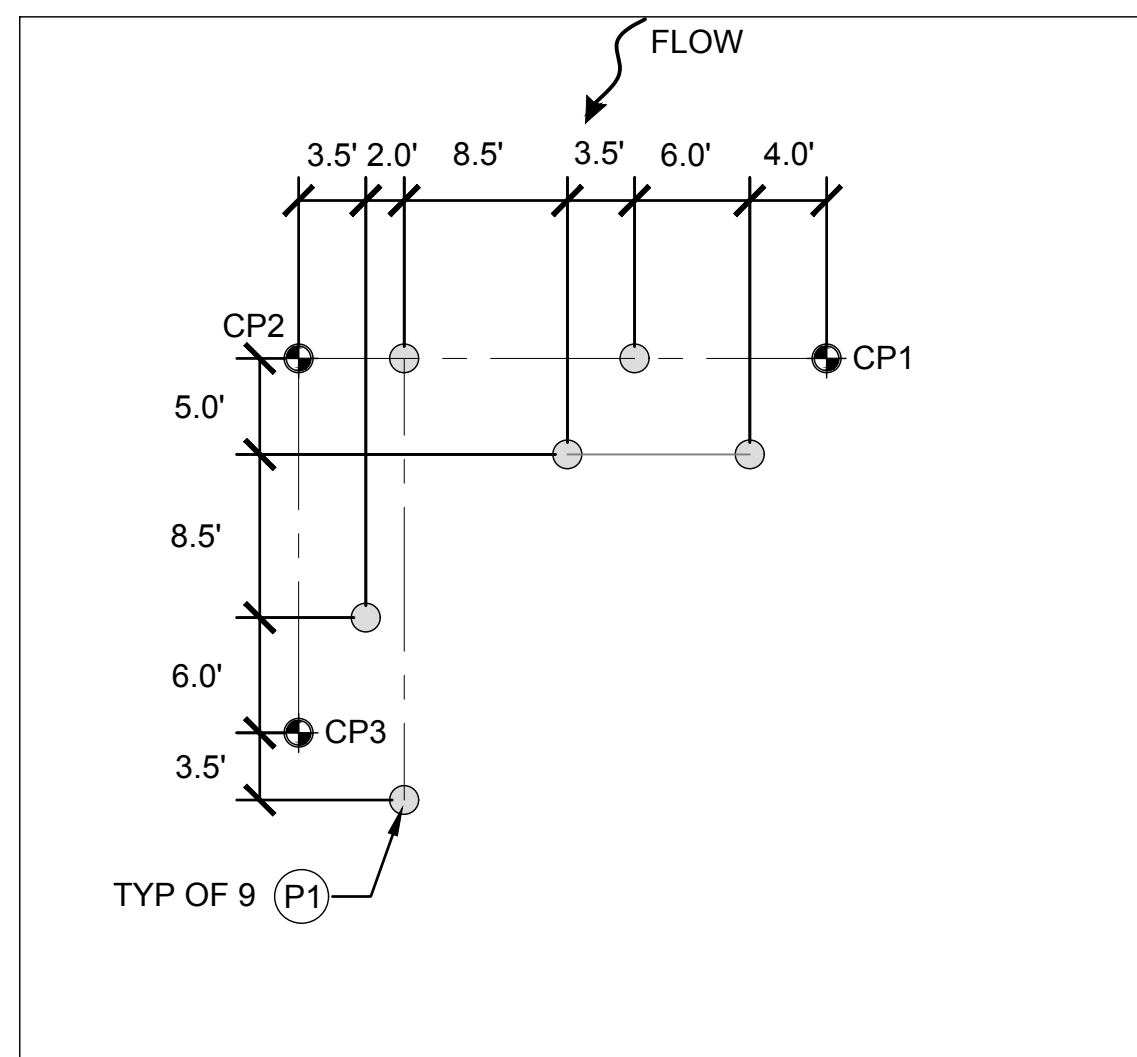
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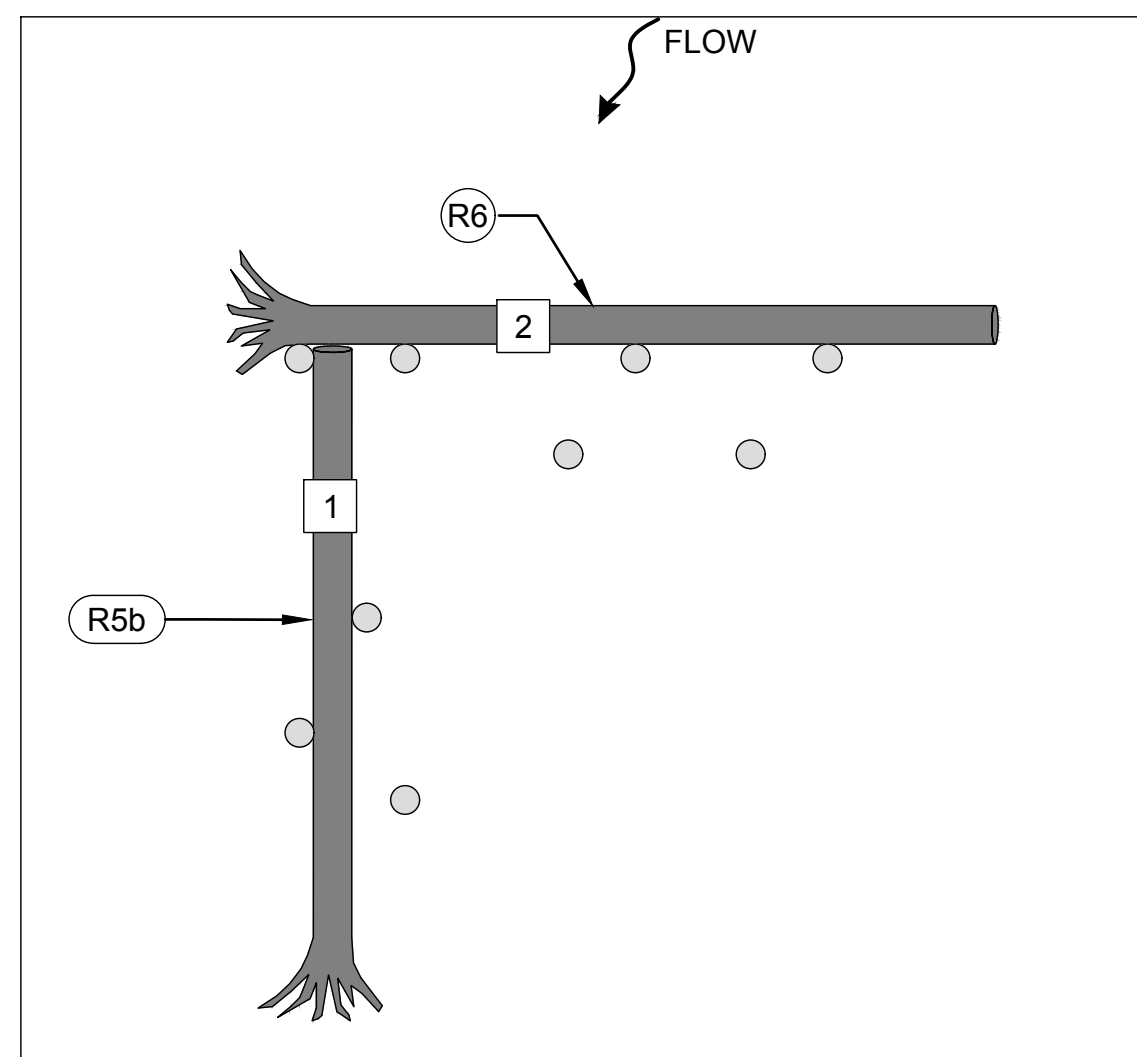
**SOUTH FORK NOOKSACK RIVER
SKOOKUM/EDFRO RESTORATION
PROJECT - PHASE 3**

TYPE 5 LARGE LEFT BANK ELS

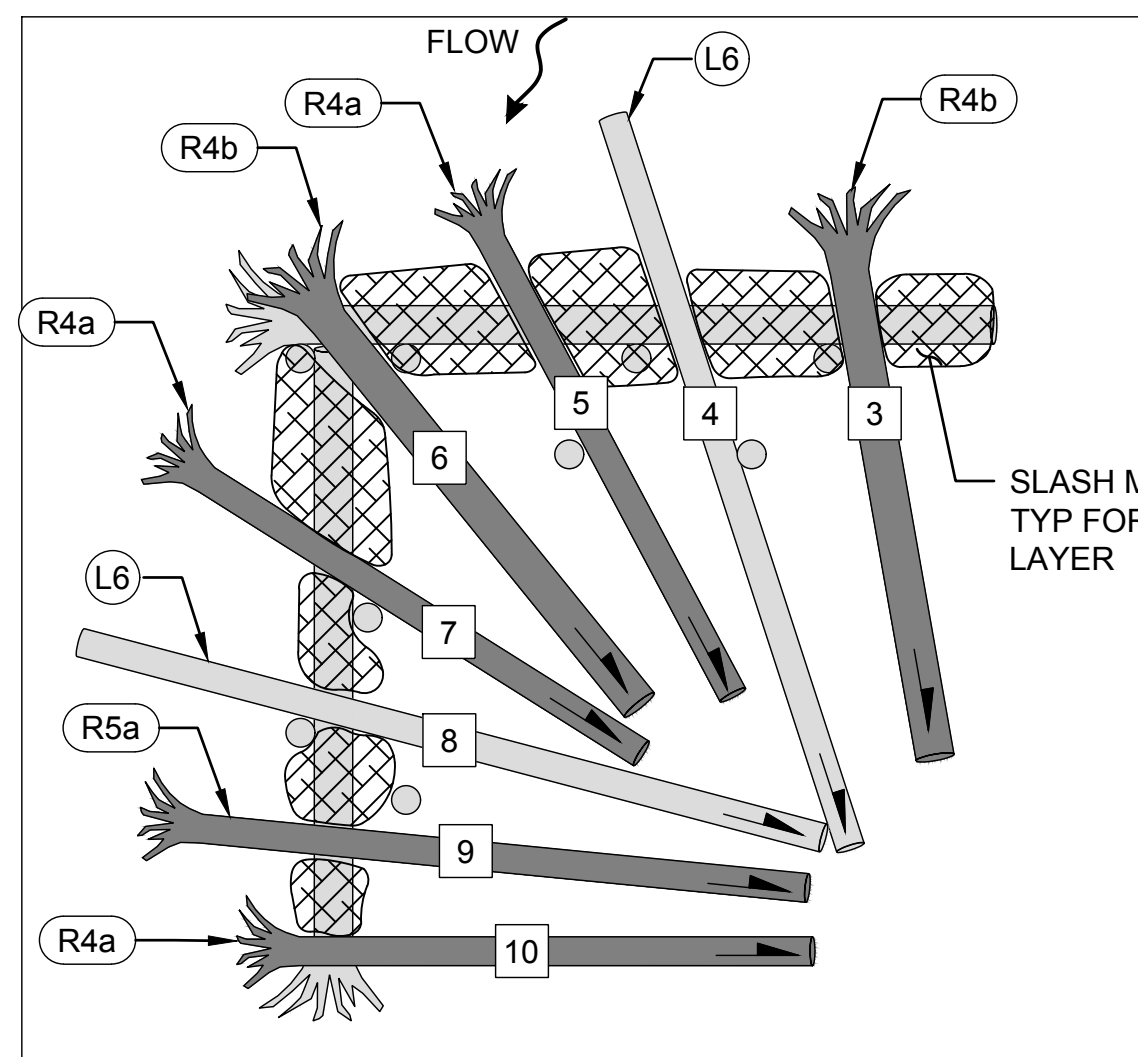
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SHEET NO:	11 OF 12



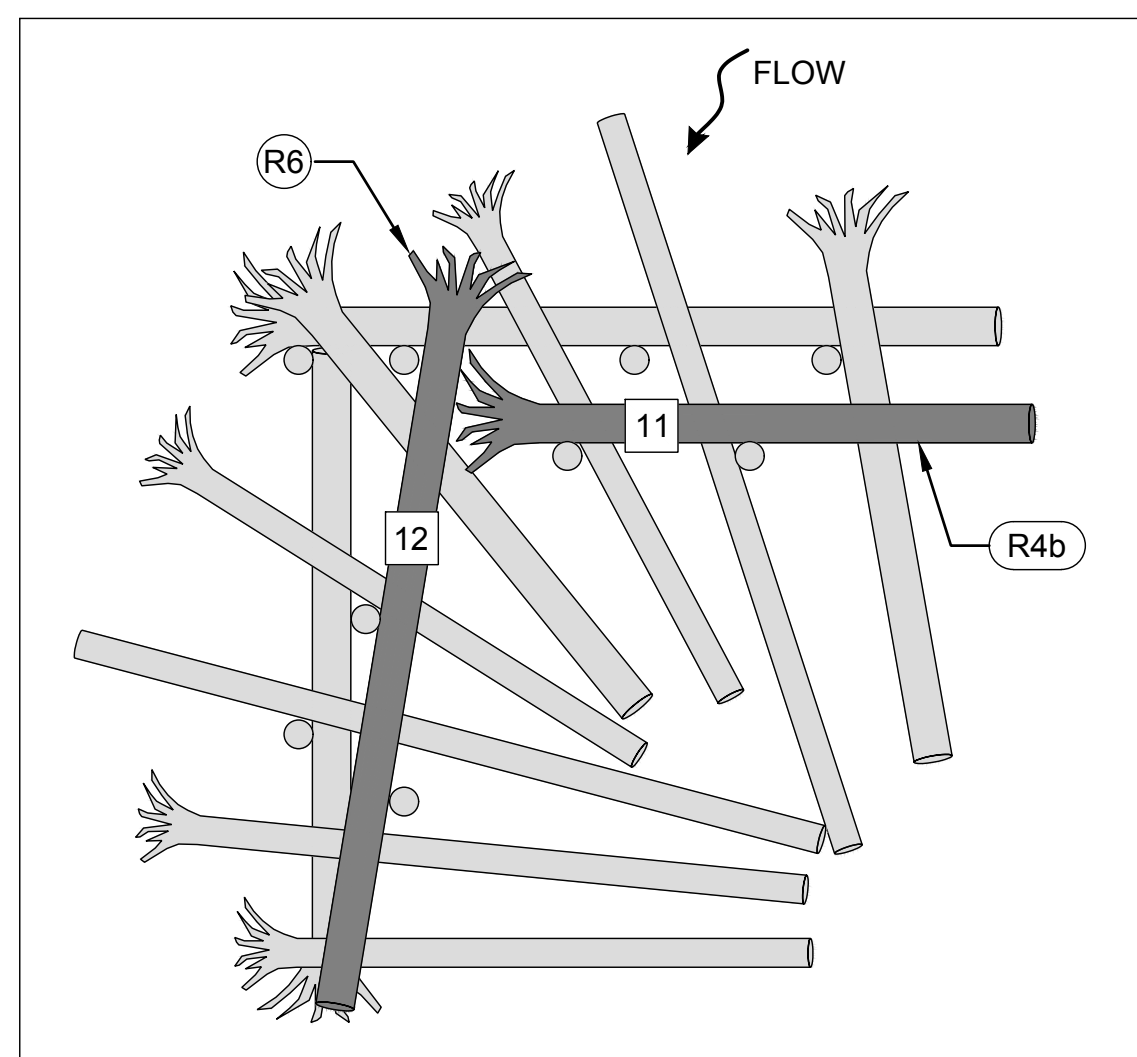
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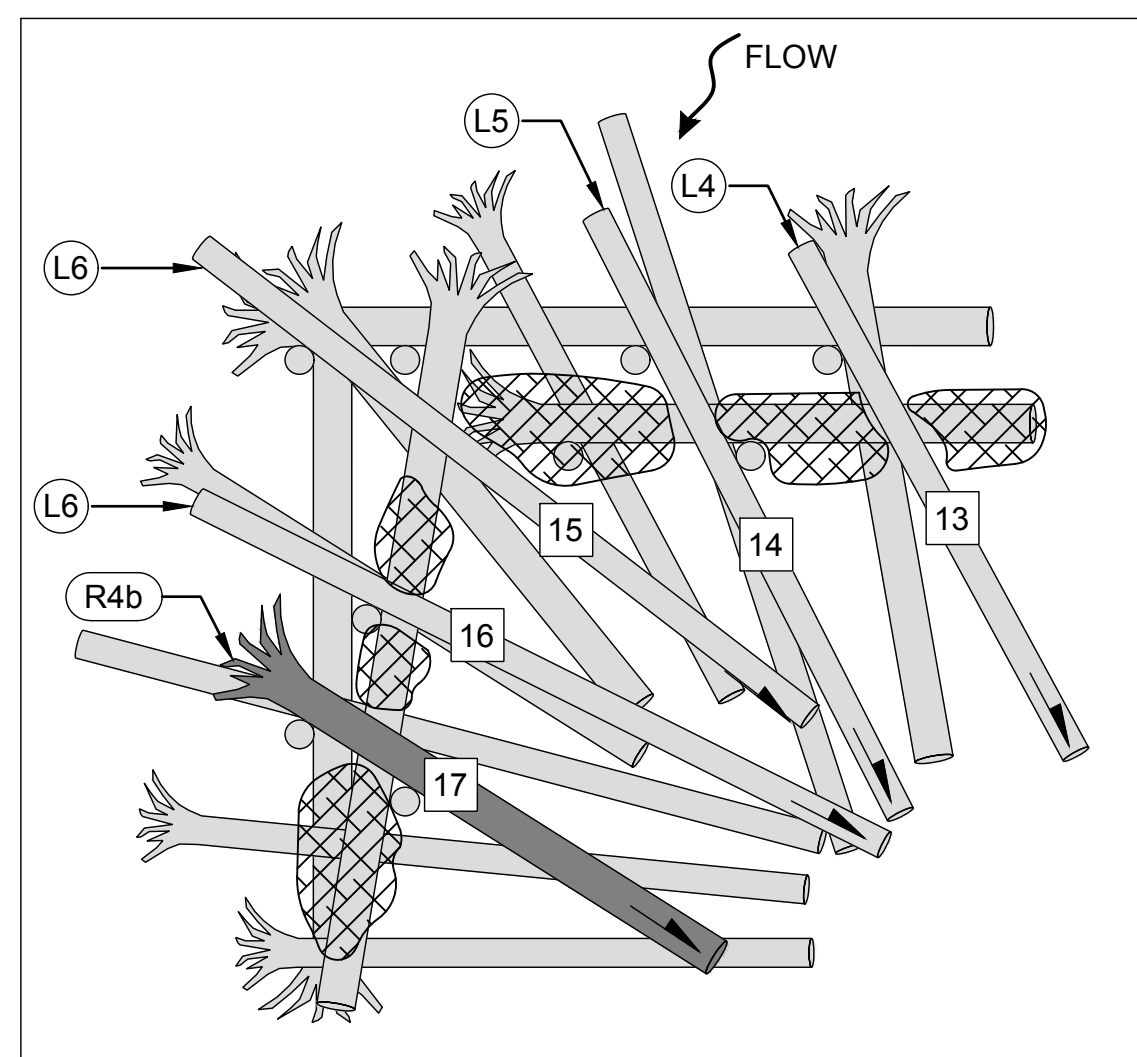
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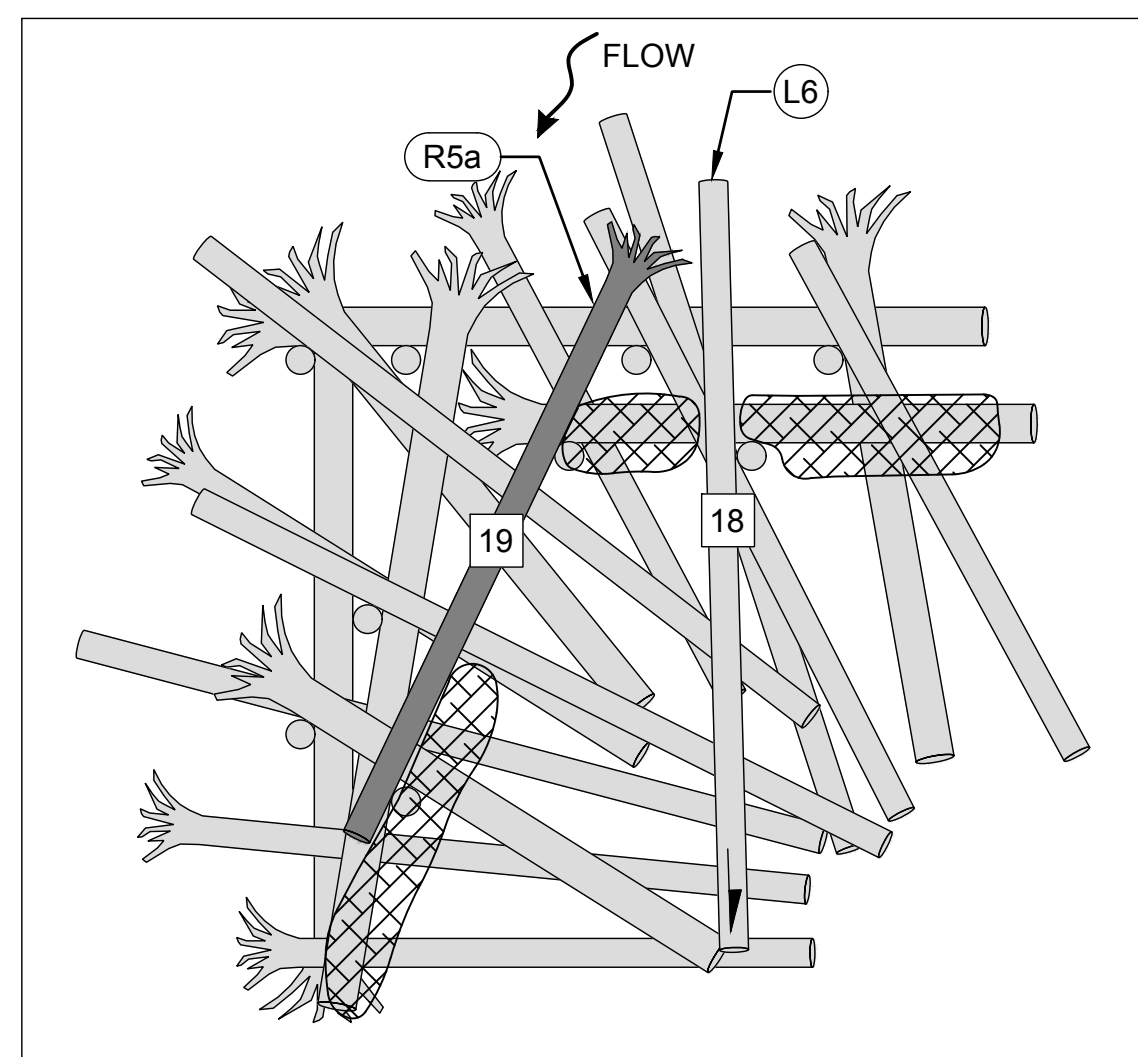
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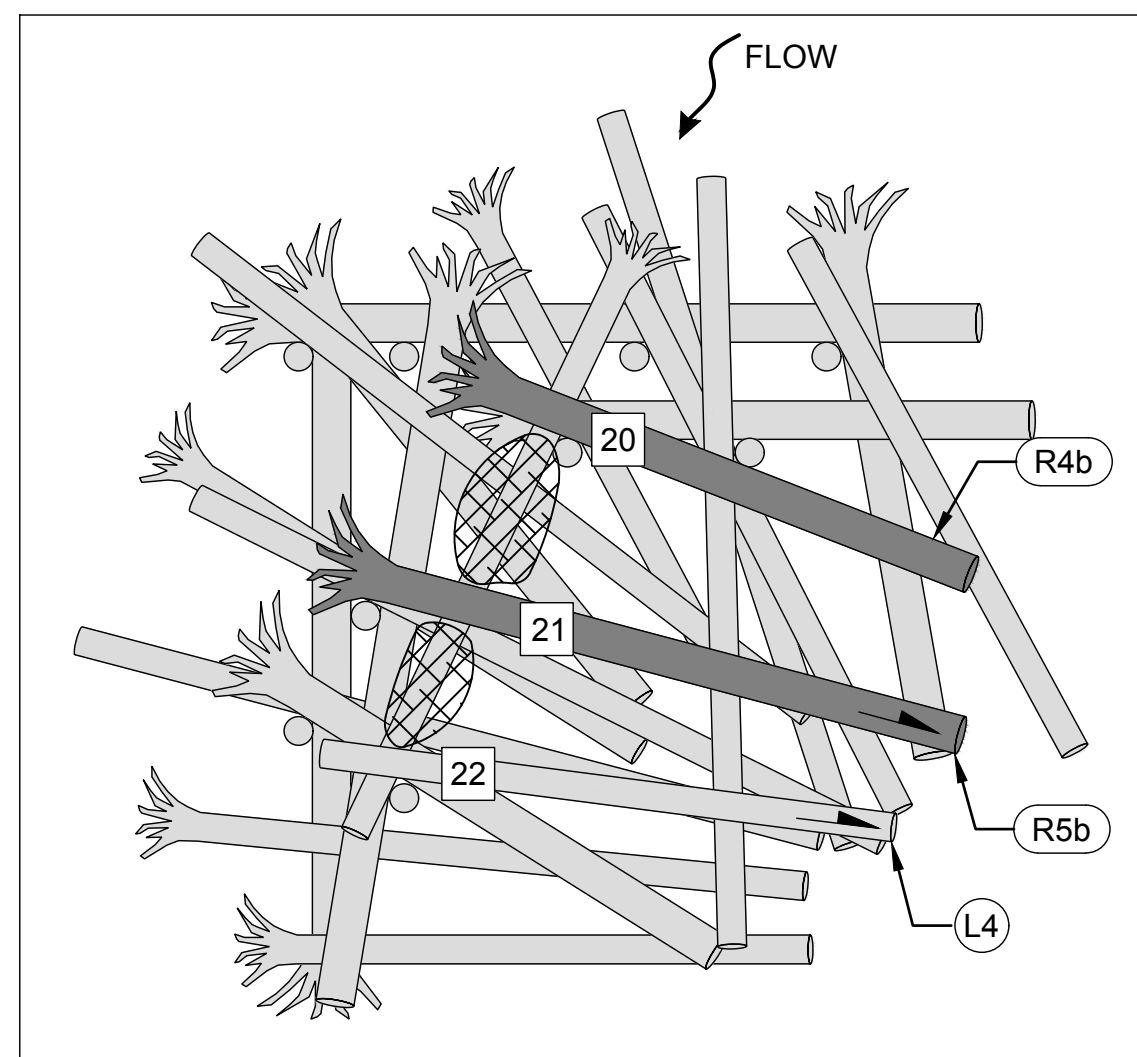
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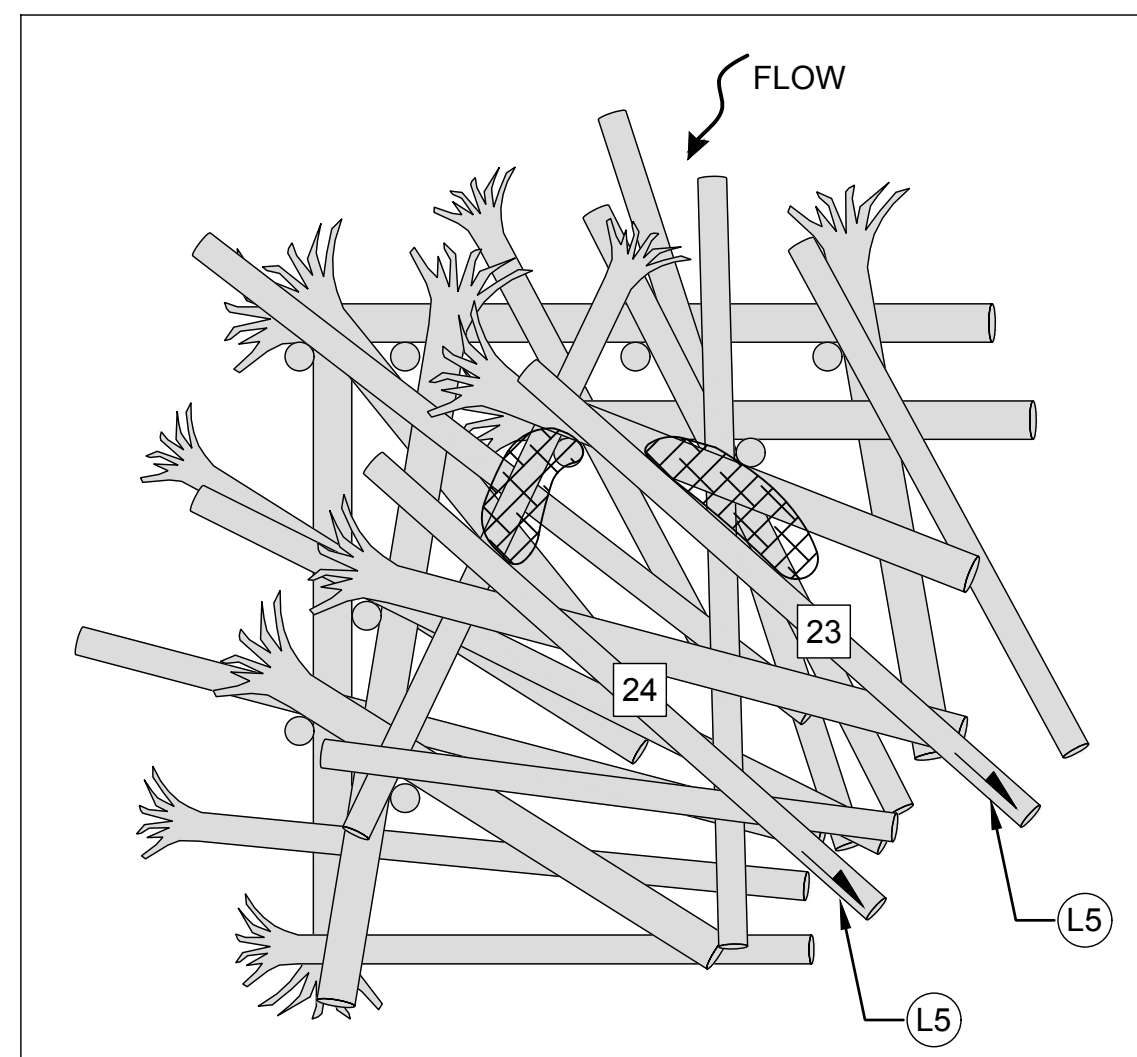
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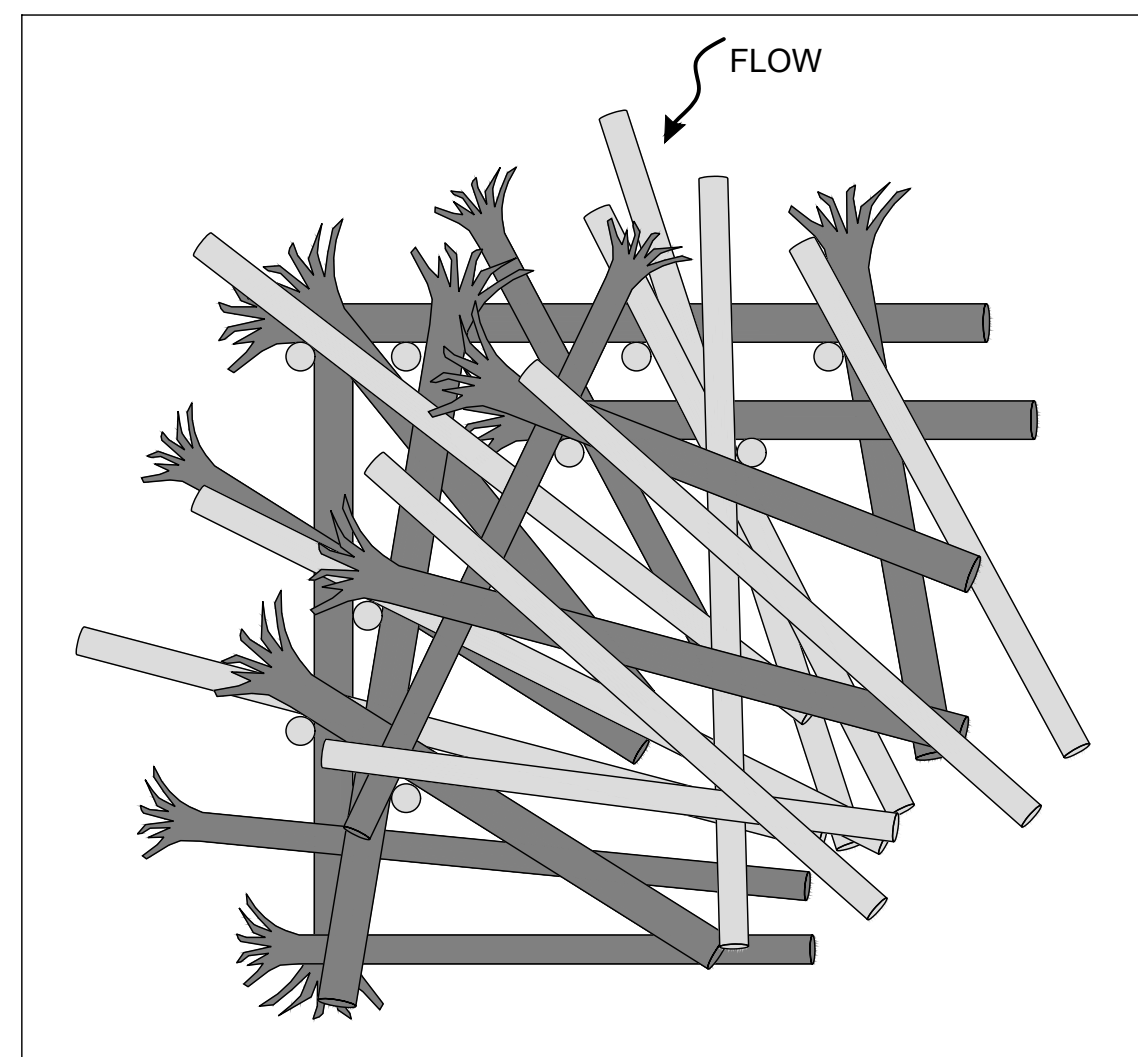
LAYER 5



LAYER 6



LAYER 7



COMPLETE

GENERAL NOTES:

- PILE LOCATIONS SHALL BE STAKED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER PRIOR TO PILE INSTALLATION.
- FINAL ELJ LOCATION AND ORIENTATION SHALL BE FIELD VERIFIED BY THE ENGINEER AFTER THE CONTRACTOR STAKES THE PILE LOCATIONS.
- PILE LOCATIONS ARE SYMMETRICAL ABOUT THE ELJ CONTROL POINT.
- PILE LOCATIONS SHALL BE BASED ON THE LOCATION OF THE ELJ CONTROL POINT AND SHALL BE WITHIN 6 INCHES OF THE LOCATION SHOWN ON THE DRAWINGS.
- LOG MATERIALS SHALL BE PLACED AT THE LOCATIONS, ELEVATIONS AND ORIENTATIONS SPECIFIED ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER.
- TRIM LOGS TO FIT AS REQUIRED.
- TRIM PILES A MINIMUM OF 18 INCHES AND A MAXIMUM OF 24 INCHES ABOVE FINAL GRADE.
- EXCAVATION LIMITS VARY DEPENDING ON THE LOCAL SOIL CONDITIONS AND THE CONSTRUCTION TECHNIQUES EMPLOYED.
- INSTALL LOGS, RACKING LOGS, SLASH, IMPORTED BALLAST MATERIAL AND NATIVE BACKFILL MATERIAL AS SHOWN ON THE PLANS AND AS DIRECTED BY THE ENGINEER.
- SEE DRAWING XX FOR ELJ CONTROL POINT COORDINATES.
- RACKING LOGS NOT SHOWN FOR CLARITY. PLACE RACKING LOGS ALONG UPSTREAM FACE AND ALONG THE SIDES OF THE ELJ AS SHOWN ON DWG XX. RACKING LOGS SHALL BE PLACED PARALLEL TO AND BETWEEN PILES EXTENDING OUT FROM THE ELJ. 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.

ELJ CONSTRUCTION SEQUENCE NOTES:

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

LOG SCHEDULE - LEFT BANK DEFLECTOR ELS

LOG TYPE	MINIMUM DIAMETER (IN)	LENGTH (FT)	ROOTWAD	TOTAL QTY PER ELJ
(P1)	22-26	25	YES	9
(R4a)	18-22	30	YES	3
(R4b)	24-28	30	YES	5
(R5a)	18-22	35	YES	2
(R5b)	24-28	35	YES	2
(R6)	24-28	40	YES	2
(L4)	18-22	30	NO	2
(L5)	18-22	35	NO	3
(L6)	18-22	40	NO	5
RACKING	4-16	15-30	OPTIONAL	150
SLASH (LOOSE)	-	-	-	200 CY

LEGEND:

- (X#) LOG IDENTIFIER
- # LOG PLACEMENT SEQUENCING ORDER
- CONTROL POINT

CONCEPTUAL DESIGN

No.	REVISION	BY	APP'D	DATE

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



DRAFT

DESIGNED:	DRAWN:
-	-
DESIGNED:	DRAWN:
-	-
DESIGNED:	CHECKED:
-	-
SCALE:	APPROVED:
AS NOTED	-

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

TYPE 5 LARGE LEFT BANK ELS LAYERING PLAN

DATE:	APRIL 2024
PROJECT NO:	14-05790-000
DRAWING NO:	C1.09
SHEET NO:	12 OF 12