

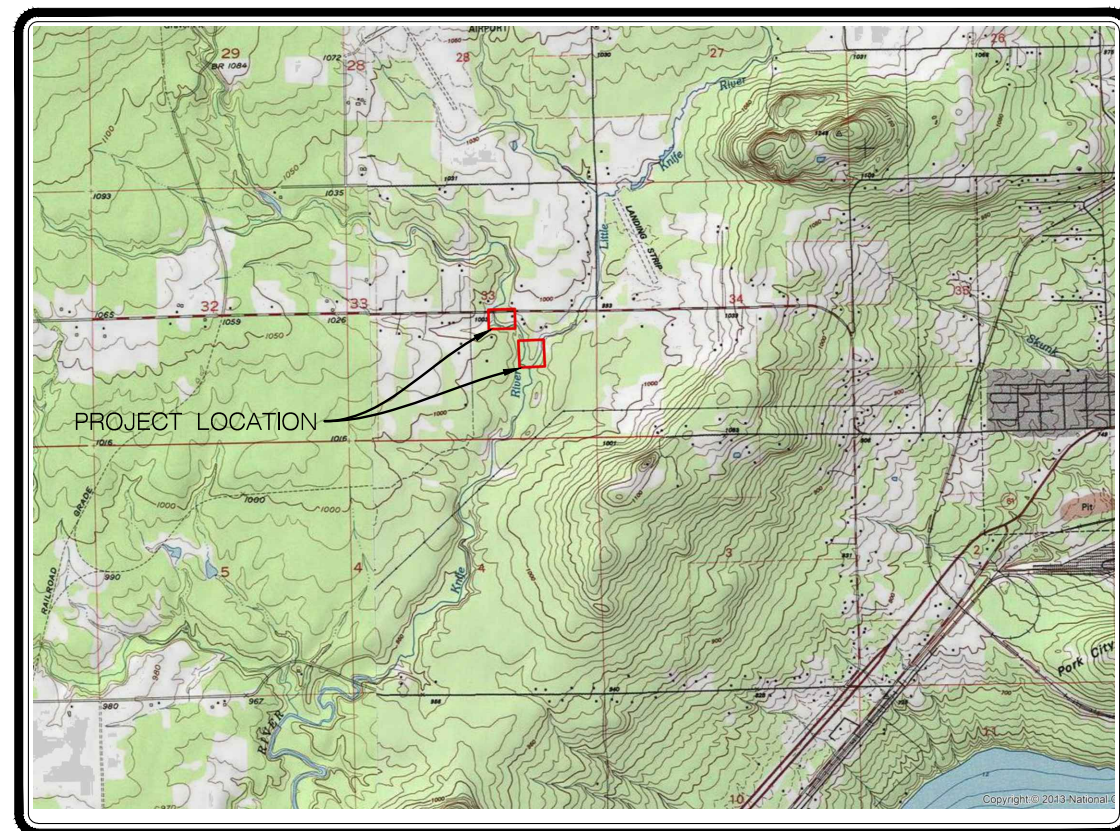


KNIFE RIVER Reach 13

ENVIRONMENTAL TROUBLE SHOOTERS
LAKE COUNTY, MINNESOTA
MARCH 2022

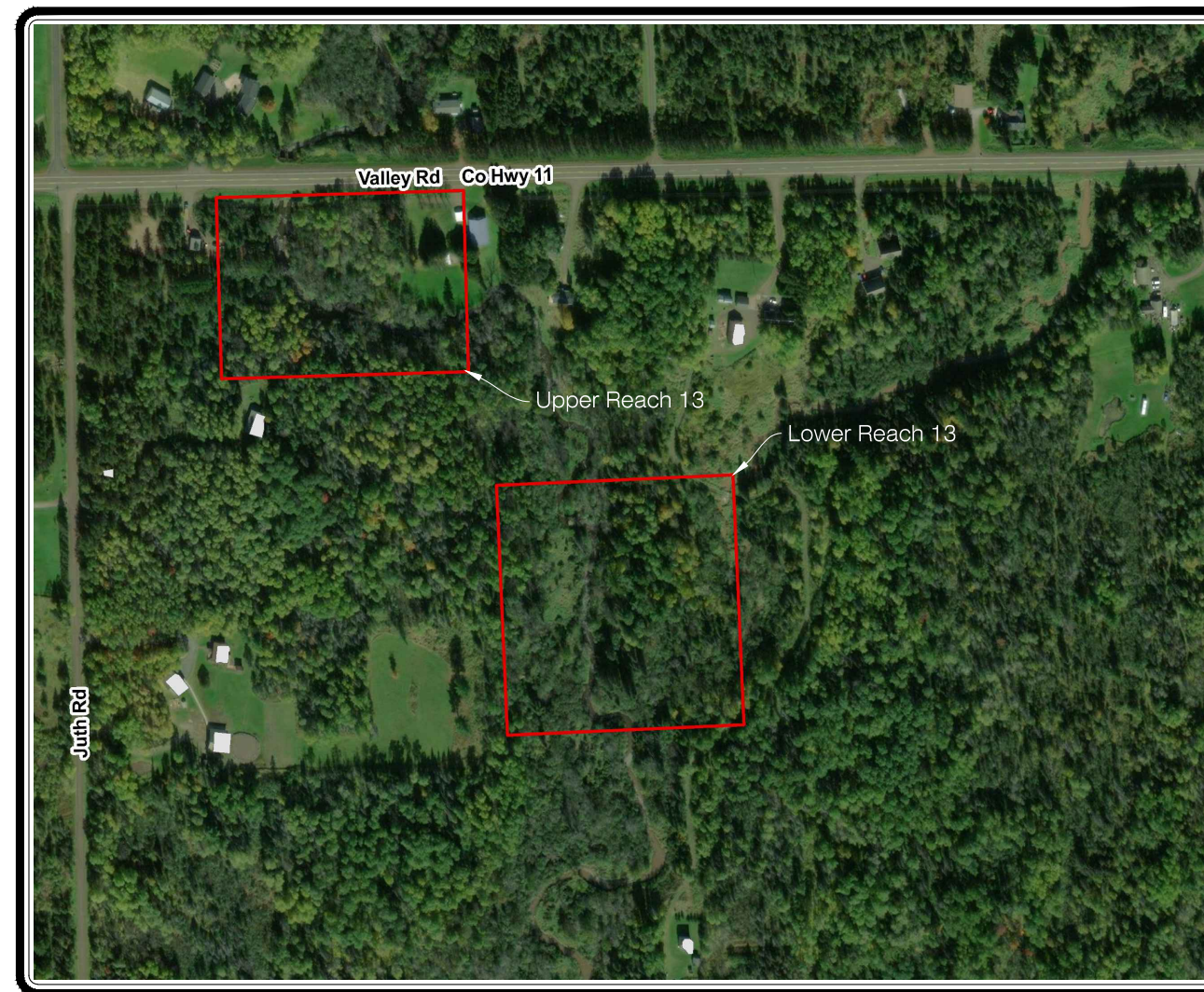
Sheet List Table

Sheet Number	Sheet Title
1	COVER SHEET
2	ACCESS PLAN
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11	REVEGETATION PLAN



GRAPHIC SCALE VERIFICATION
This bar measures 1" on 22"x34"
or 1/2" on 11"x17" original.
Adjust scale accordingly.

VICINITY MAP
SCALE: 1" = 2000'



GRAPHIC SCALE VERIFICATION
This bar measures 1" on 22"x34"
or 1/2" on 11"x17" original.
Adjust scale accordingly.

SITE MAP
SCALE: 1" = 200'



COVER SHEET
KNIFE RIVER Reach 13
ENVIRONMENTAL TROUBLE SHOOTERS
LAKE COUNTY, MINNESOTA

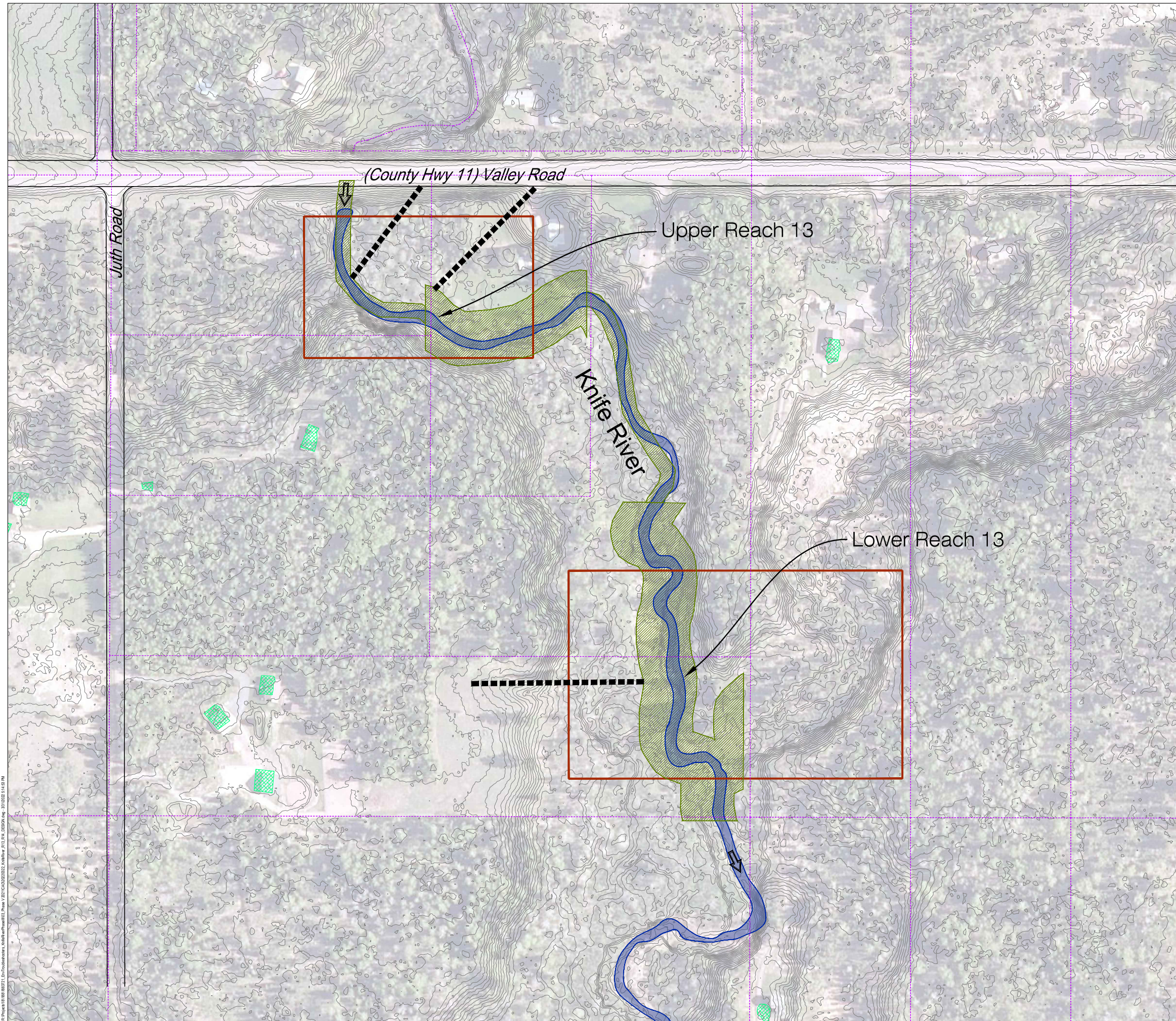
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DATE	MARCH 2022
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PROJECT #	J188372103

SHEET TITLE
COVER

SHEET NUMBER
1

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PLAN VIEW
 SCALE: 1" = 100'
 GRAPHIC SCALE IN FEET
 GRAPHIC SCALE VERIFICATION
 This bar measures 1" on 22"x34"
 or 1/2" on 11"x17" original.
 Adjust scale accordingly.

- LEGEND
- EDGE OF WATER
 - EXISTING GRADE
 - DRAINAGE FLOW
 - PARCEL LINE
 - EASEMENT
 - EXISTING STRUCTURES
 - TEMPORARY ACCESS PATHS

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ACCESS PLAN
 KNIFE RIVER Reach 13
 ENVIRONMENTAL TROUBLE SHOOTERS
 LAKE COUNTY, MINNESOTA

#	DATE	DESCRIPTION	BY

DATE	MARCH 2022
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PROJECT #	J188372103
SHEET TITLE	
ACCESS PLAN	
SHEET NUMBER	
2	
LAND USE #	

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Construction Notes here

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DATE | MARCH 2022
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PROJECT # | J188372103

SHEET TITLE
NOTES
SHEET NUMBER

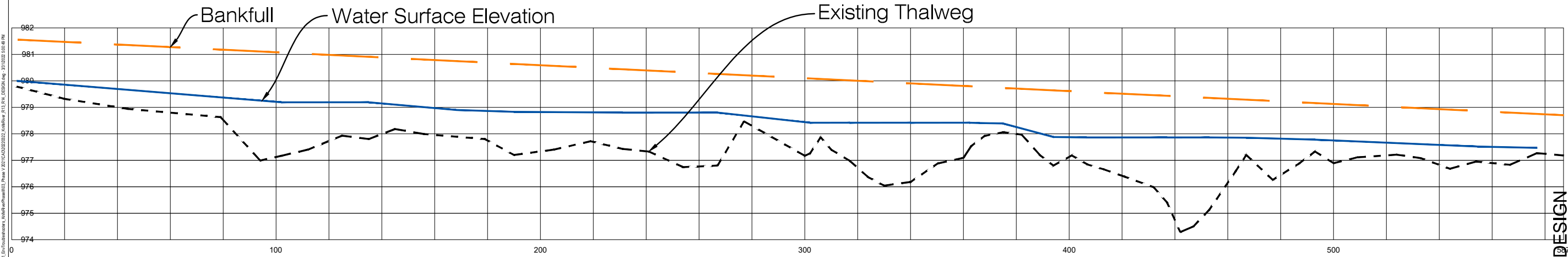
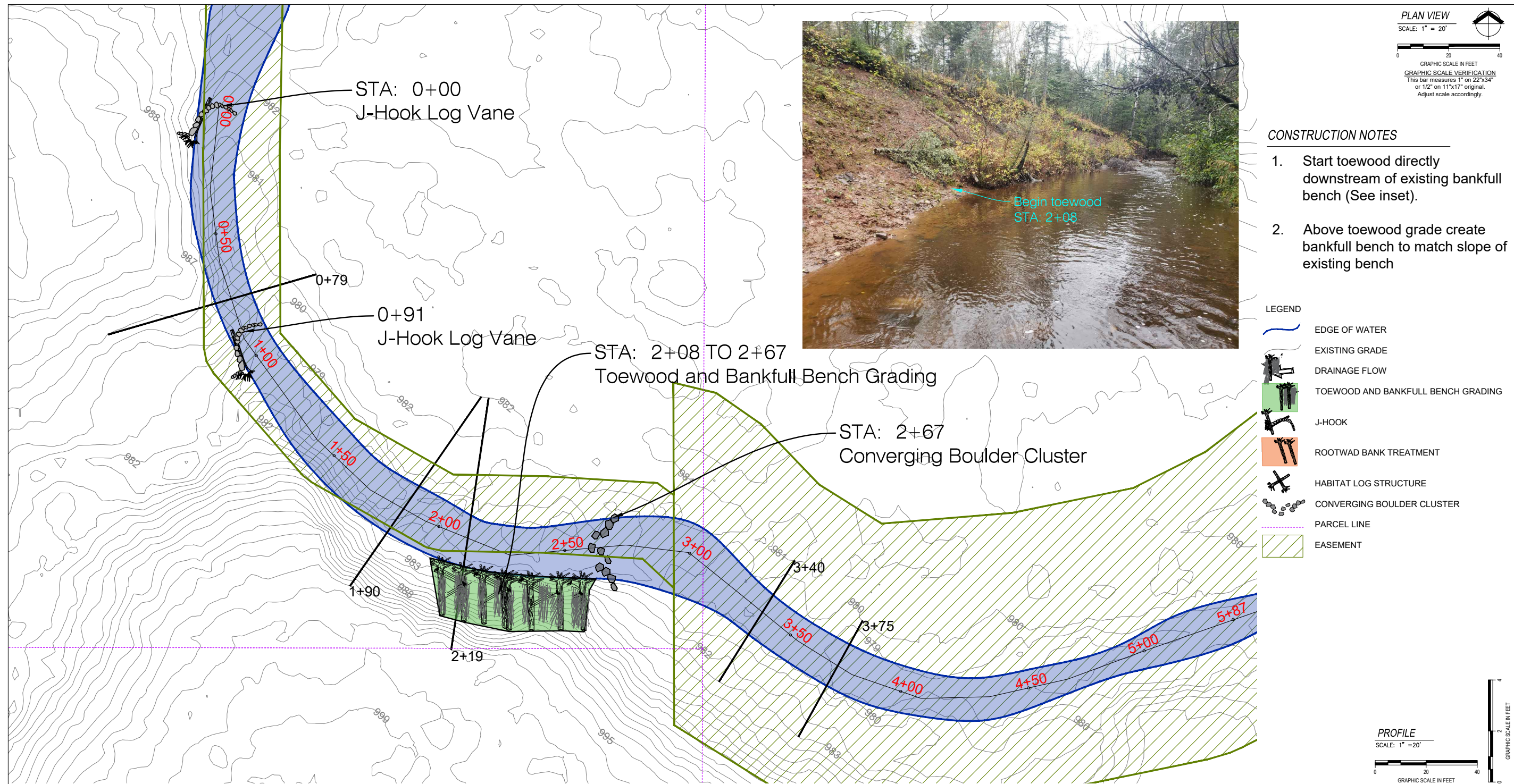
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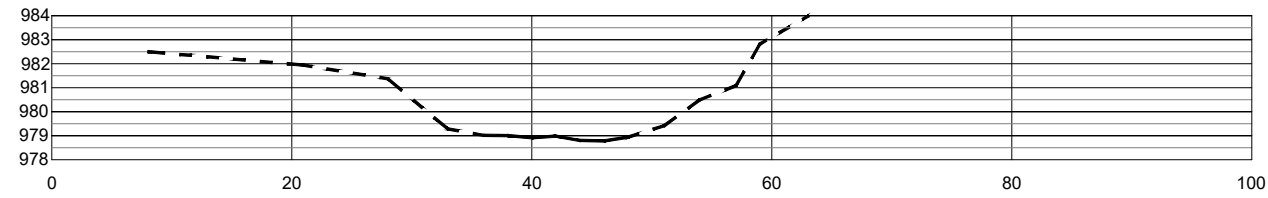
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CONSTRUCTION NOTES
KNIFE RIVER Reach 13
ENVIRONMENTAL TROUBLE SHOOTERS
LAKE COUNTY, MINNESOTA

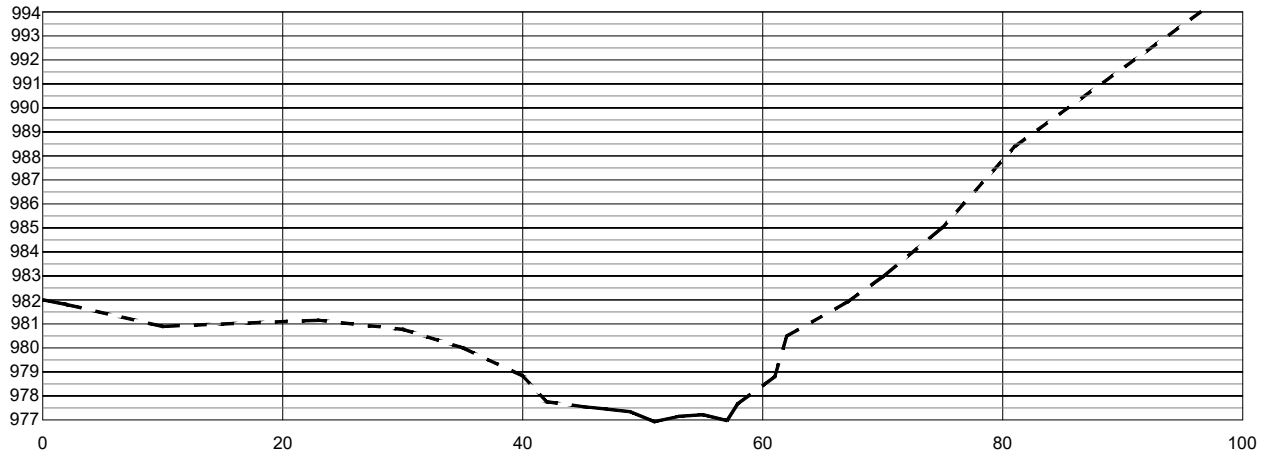




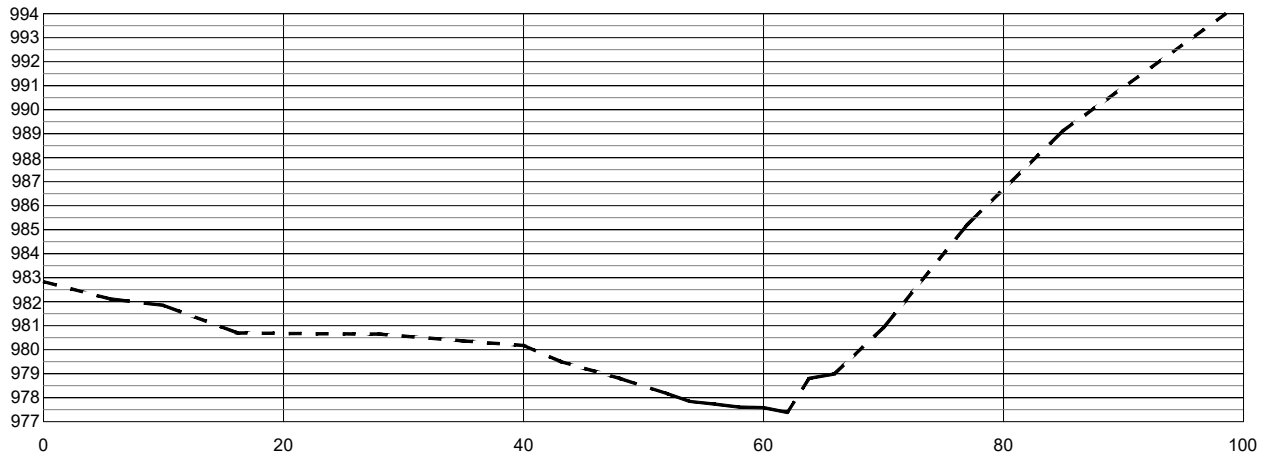
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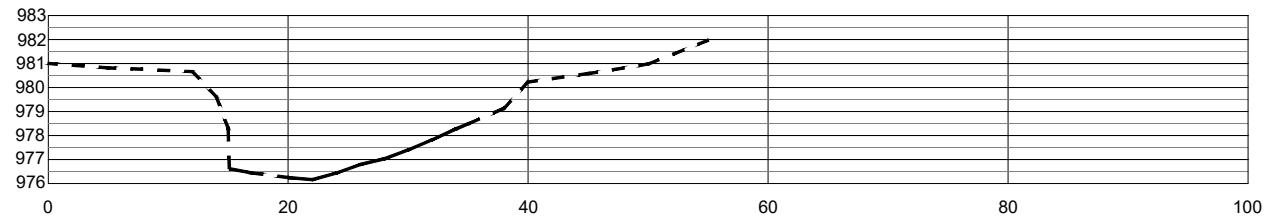
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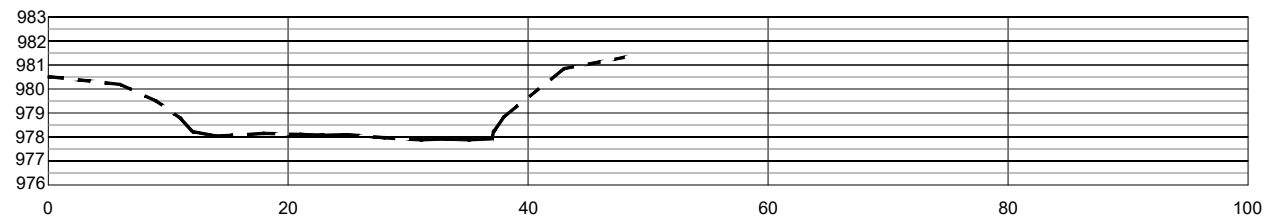
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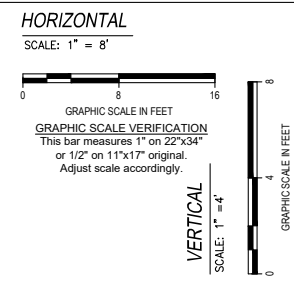
Cross Section 2+19



Cross Section 3+40



Cross Section 3+75



UPPER REACH 13 CROSS SECTIONS
 KNIFE RIVER Reach 13
 ENVIRONMENTAL TROUBLE SHOOTERS
 LAKE COUNTY, MINNESOTA

DATE	DESCRIPTION

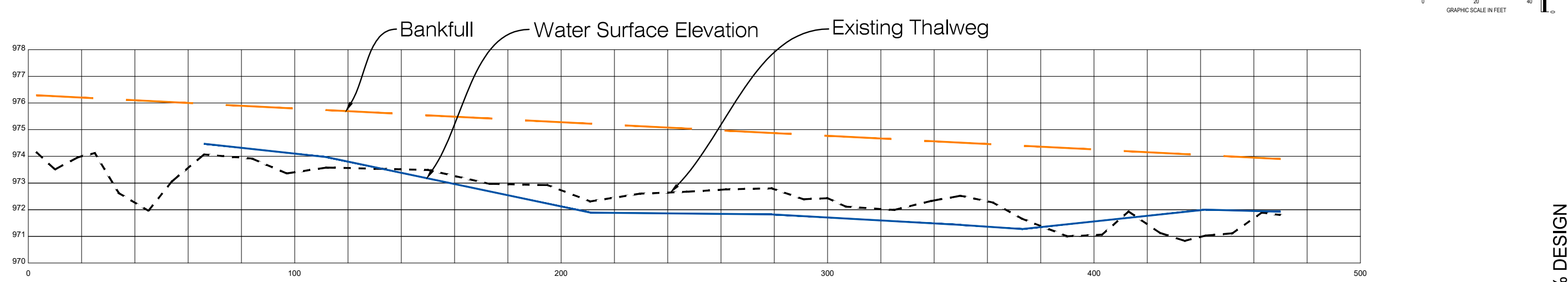
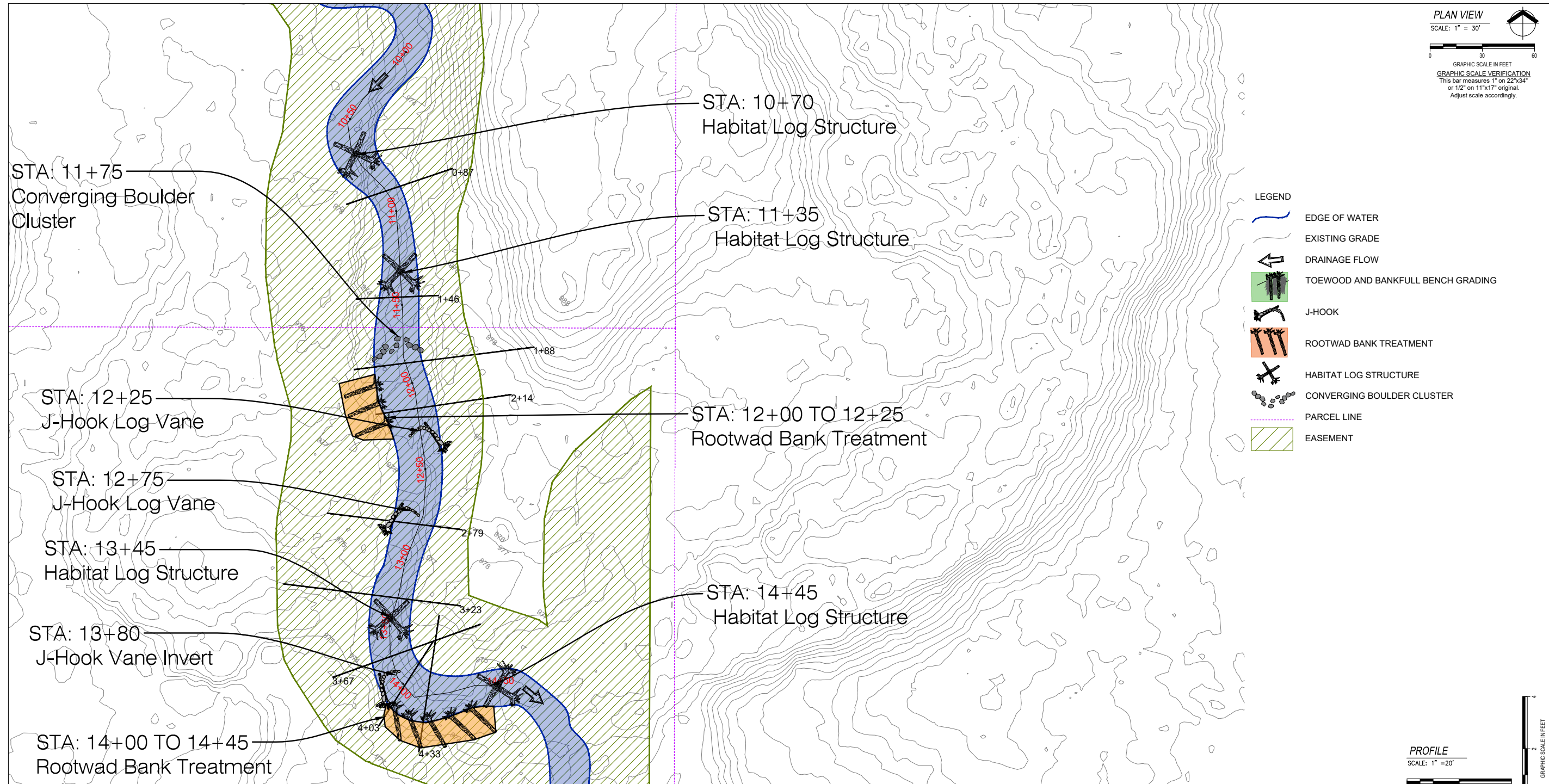
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PROJECT #	J188372103

SHEET TITLE
 UPPER R13 SECTIONS

SHEET NUMBER
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30% DESIGN

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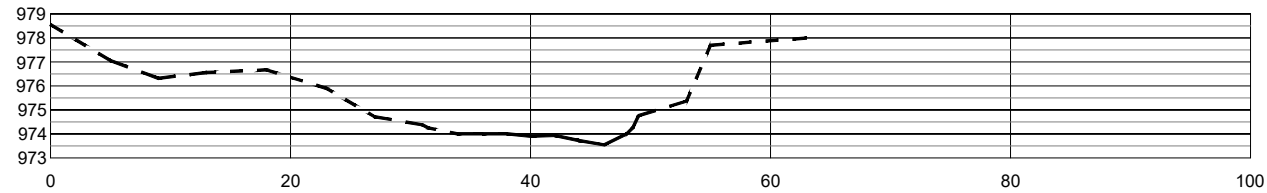
LOWER REACH 13 PLAN AND PROFILE
KNIFE RIVER Reach 13
ENVIRONMENTAL TROUBLE SHOOTERS
LAKE COUNTY, MINNESOTA

#	DATE	DESCRIPTION

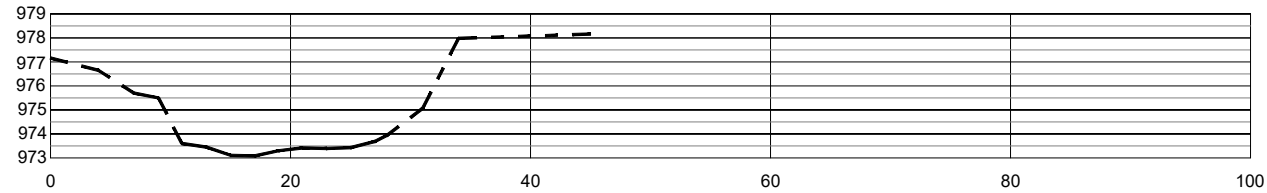
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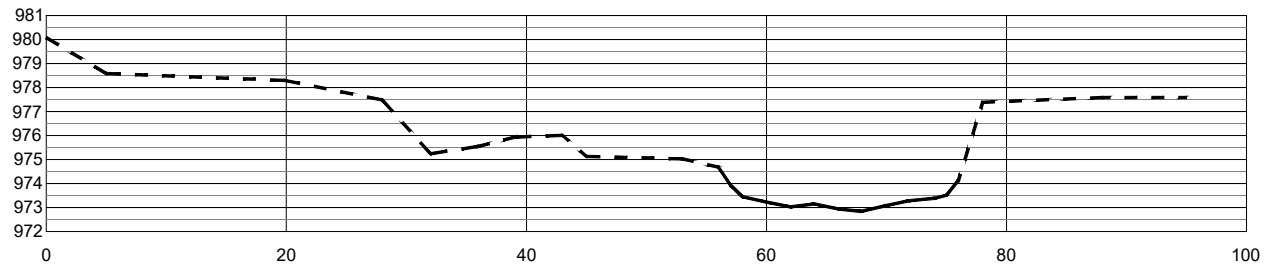
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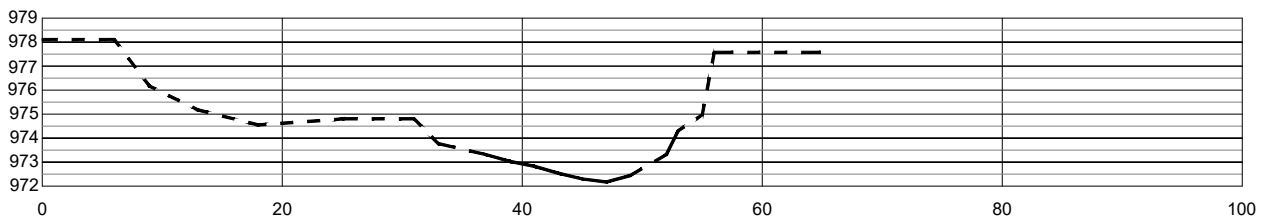
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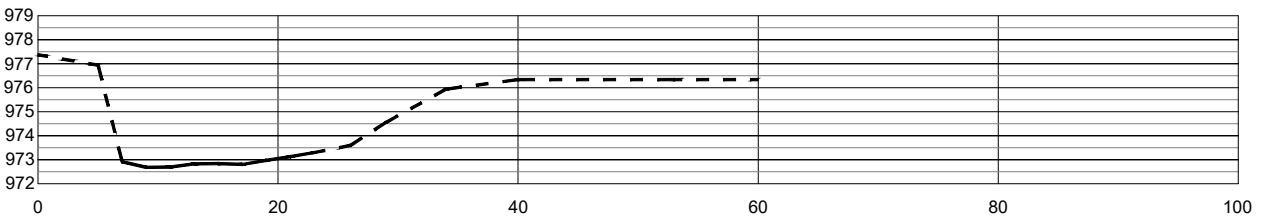
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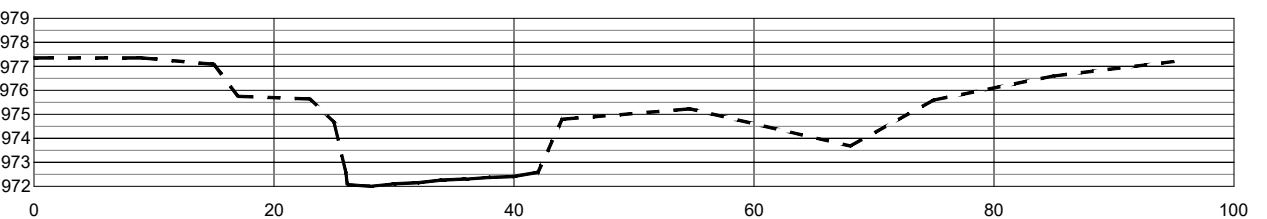
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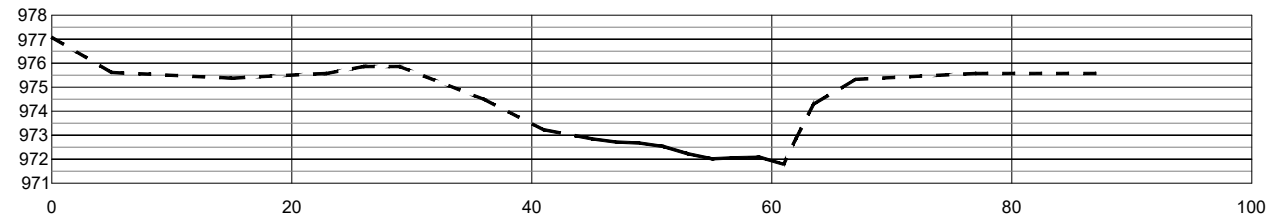
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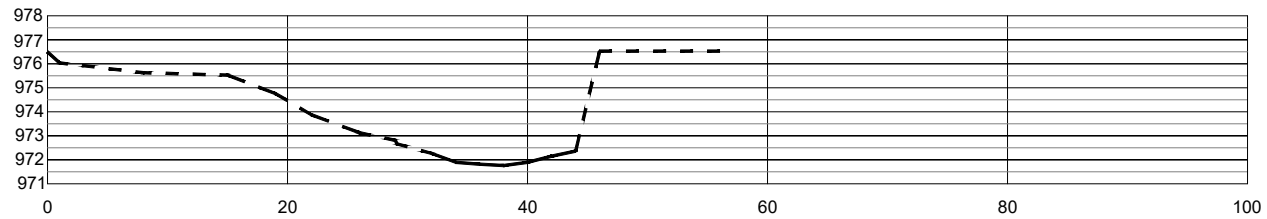
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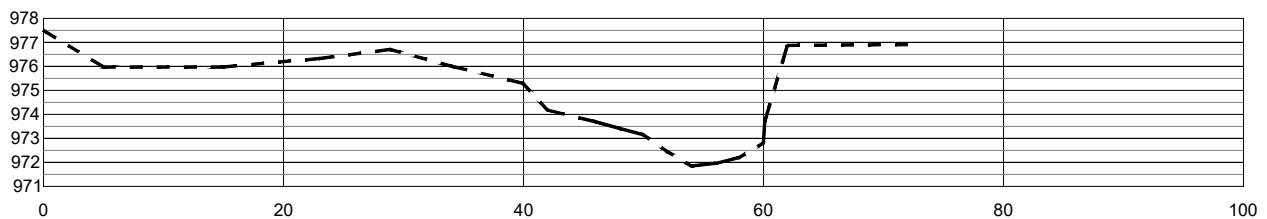
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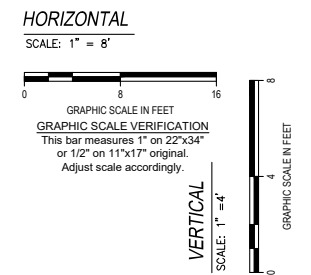
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Cross Section 4+03



Cross Section 4+33



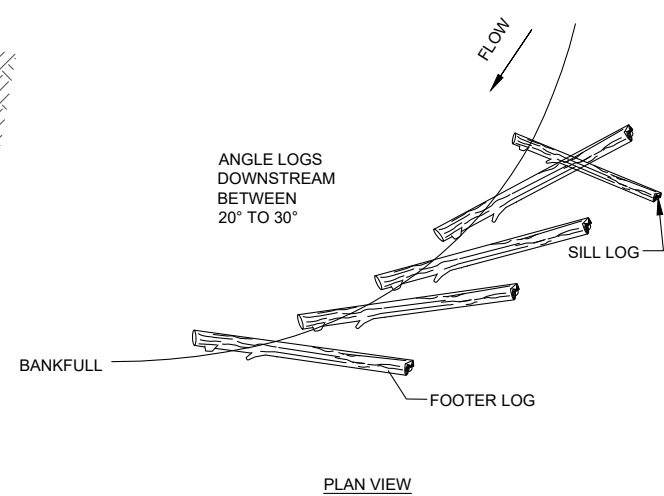
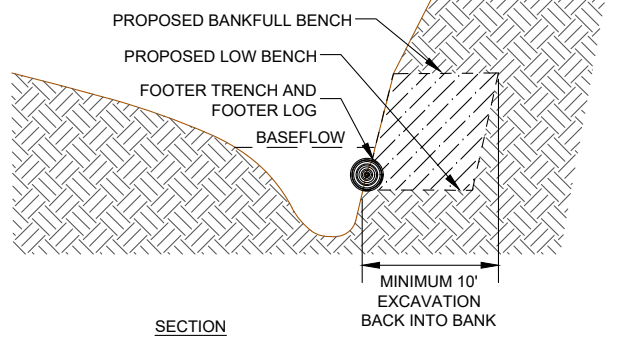
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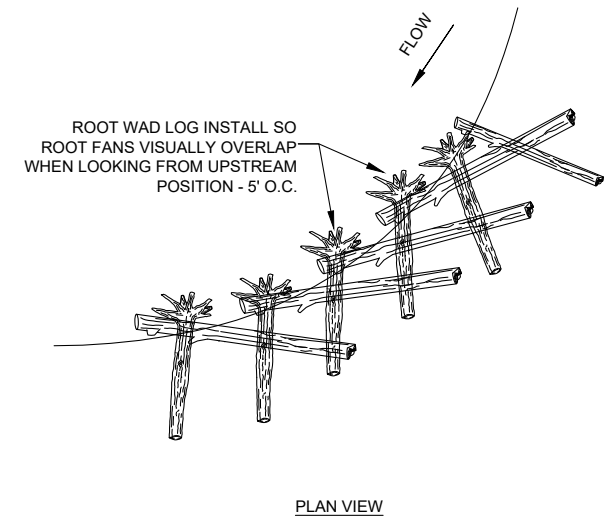
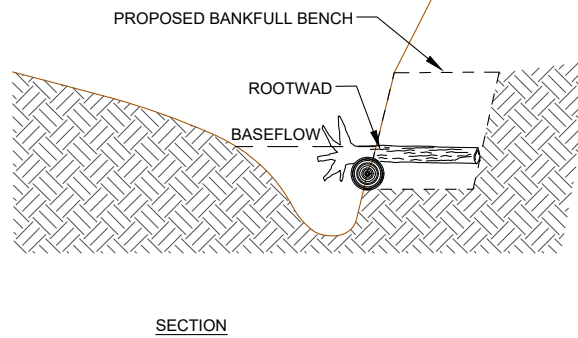
STEP 1:

EXCAVATE LOW BENCH FOR TOEWOOD MATERIAL. EXCAVATE FOOTER TRENCH IN LOWER BENCH AND PLACE FOOTER LOGS



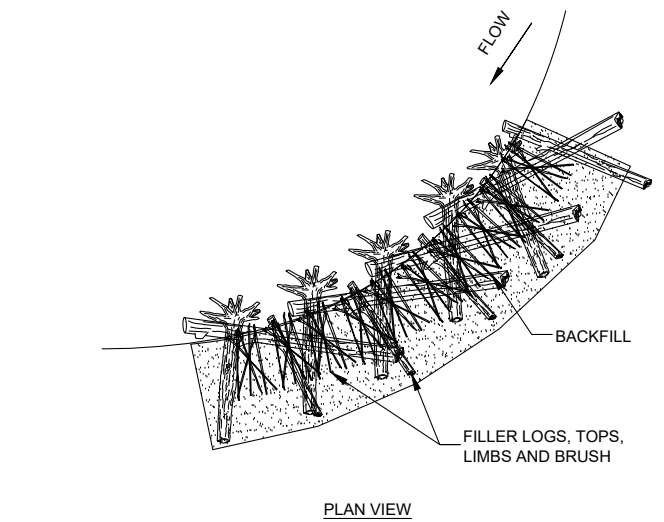
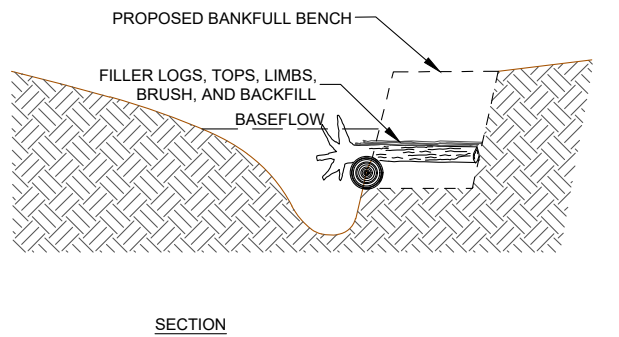
STEP 2:

PLACE ROOT WAD LOGS CANTILEVERED OVER FOOTING LOGS.



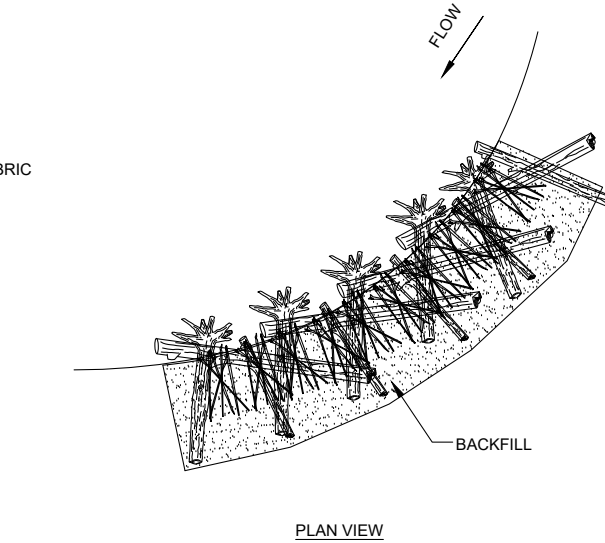
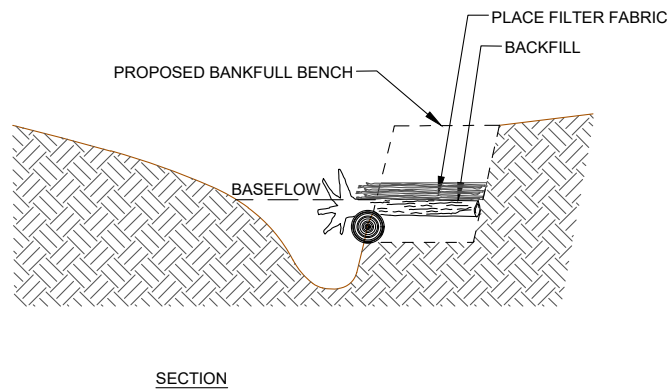
STEP 3:

PLACE FILLER MATERIAL (SMALL LOGS, LIMBS, TREE TOPS AND BRUSH) BETWEEN AND ON TOP OF THE ROOT WADS. THEN PLACE BACKFILL BETWEEN FILLER MATERIAL AND ROOTWADS IN LIFTS



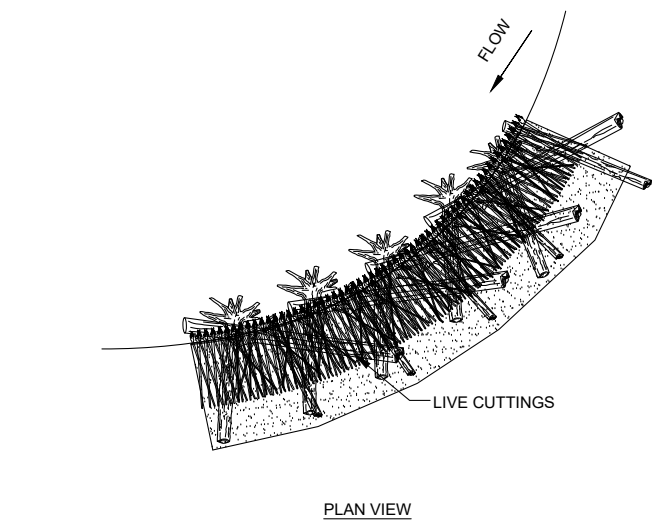
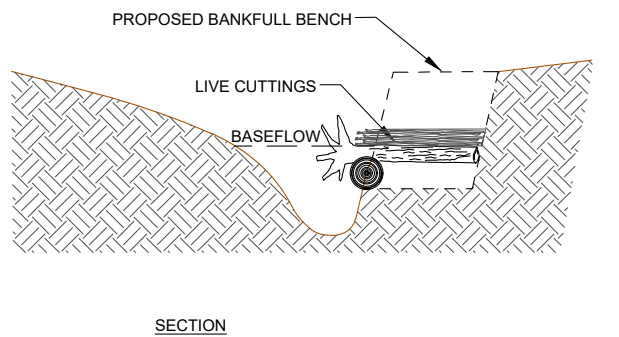
STEP 4:

CONTINUE TO BACKFILL WITH LOGS, LIMBS, TREE TOPS, AND FILLER MATERIAL TO 0.5' ABOVE BASEFLOW ELEVATION. COMPACT WITH EXCAVATOR BUCKET, BUT DO NOT REMOVE ALL VOIDS, ESPECIALLY ALONG TOE.



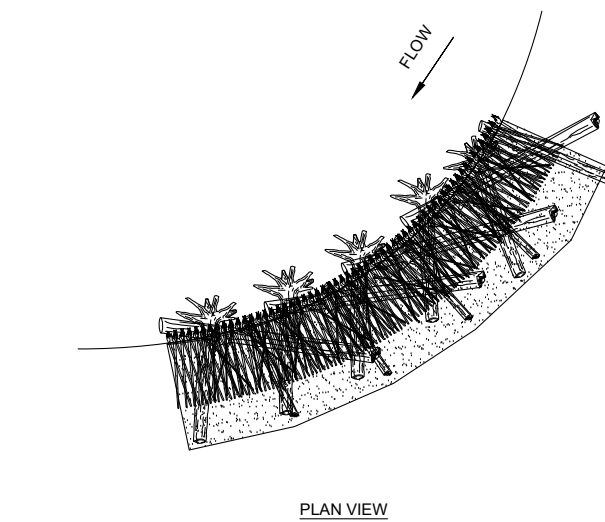
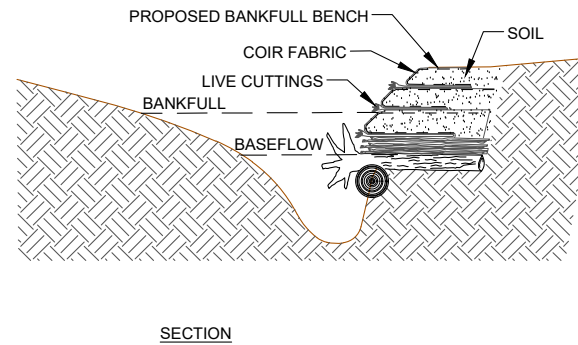
STEP 5:

PLACE LIVE BRUSH CUTTINGS AT LEAST 3' IN LENGTH AND 1/4" DIAMETER, 6 CUTTINGS/FOOT



STEP 6:

INSTALL COIR WRAPPED SOIL LIFTS AND LAYERS OF CUTTING BETWEEN SOIL LIFTS UP TO BANKFULL STAGE. WRAP ENDS OF FABRIC AND BURY WITH SILL LOGS AT TOP SOIL LIFT ELEVATION. COVER WITH SOIL. SEE TOEWOOD WITH SOIL LIFT DETAIL.



NOTES:

1. THE TOP OF THE ROOTWAD SHOULD BE INSTALLED AT AN ELEVATION SUCH THAT IT REMAINS INUNDATED DURING LOW FLOW EVENTS. THE ELEVATION SHOULD BE APPROXIMATELY 0.5' ABOVE THE DOWNSTREAM RIFFLE INVERT ELEVATION
2. THE WOOD SHOULD BE BURIED A MINIMUM OF 10 FEET INTO THE BANK.
3. LAYERS OF LIVE BRANCH CUTTINGS SHALL BE PLACED BETWEEN SOIL LIFTS.

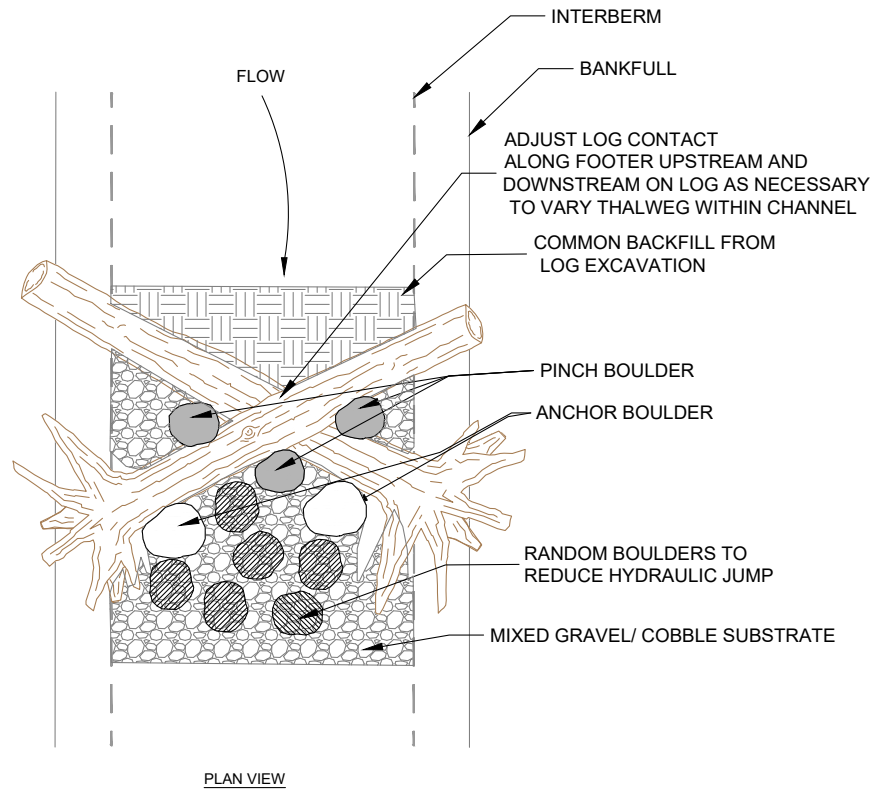
1 TOEWOOD WITH SOIL LIFT
NOT TO SCALE

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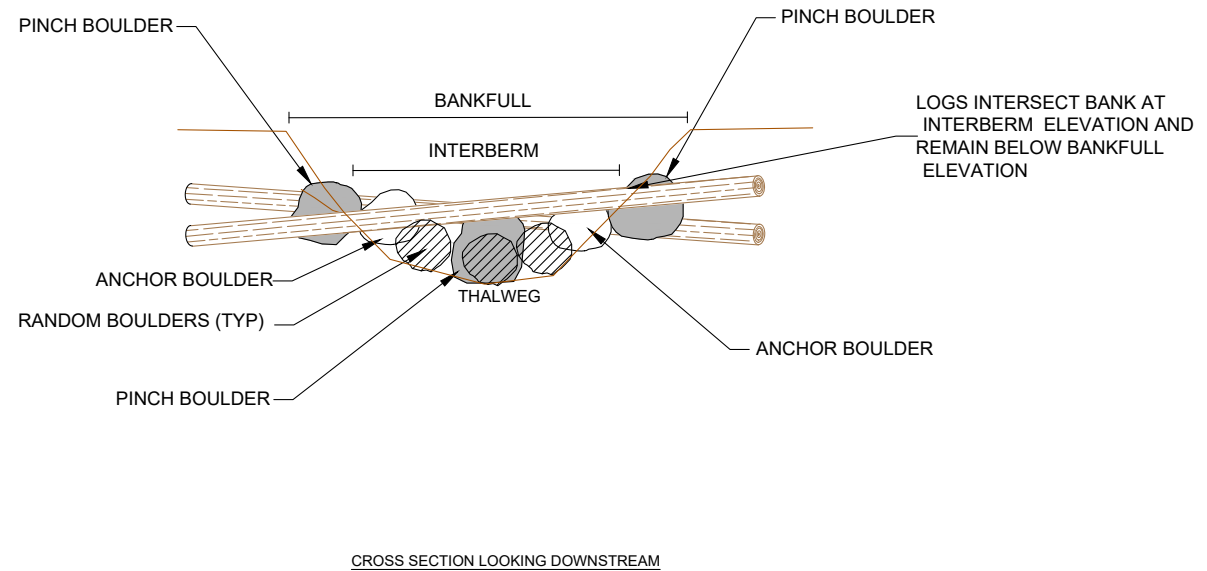
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DATE	MARCH 2022
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PROJECT #	J188372103
SHEET TITLE	DETAILS
SHEET NUMBER	8
LAND USE #	

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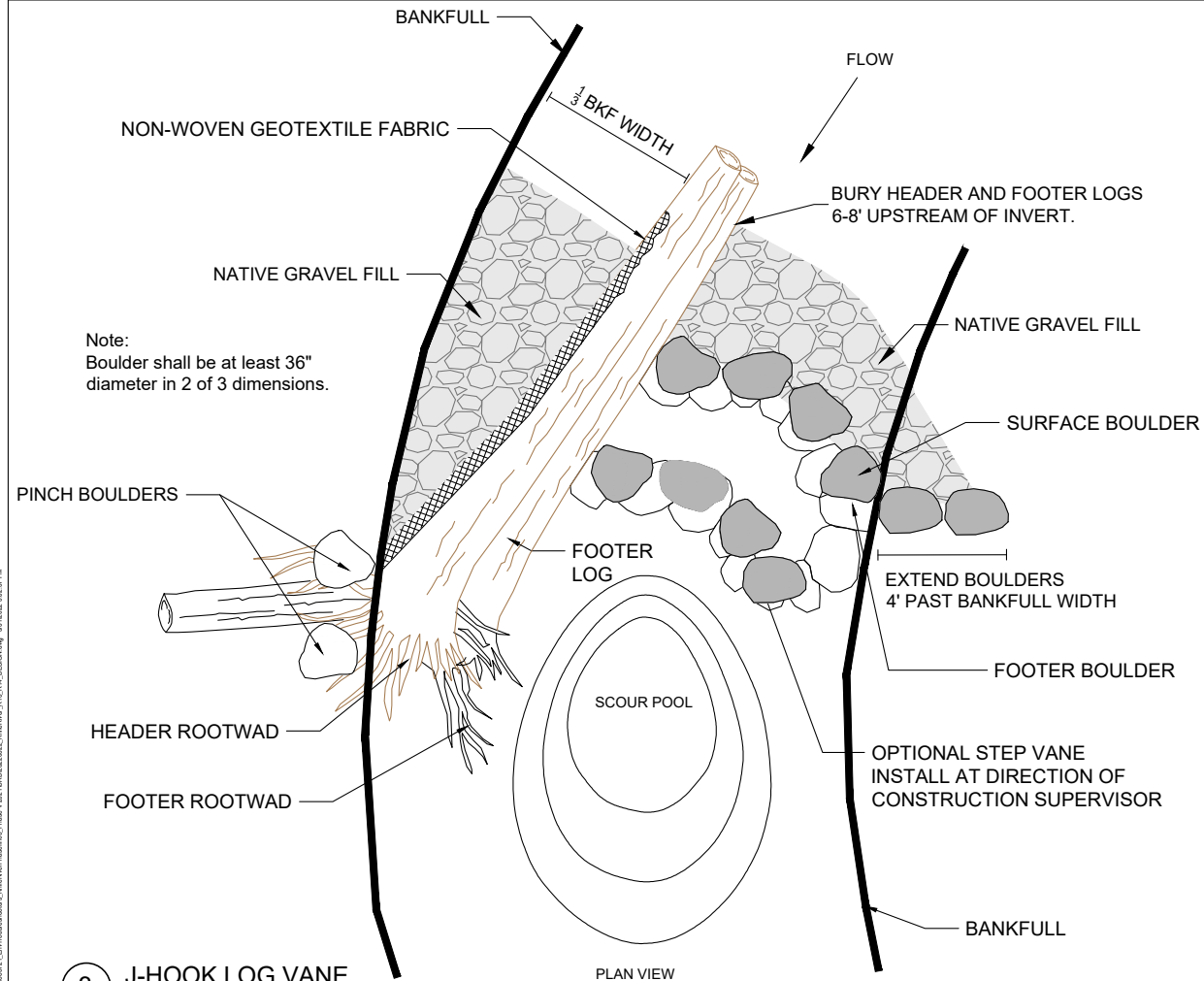


PLAN VIEW

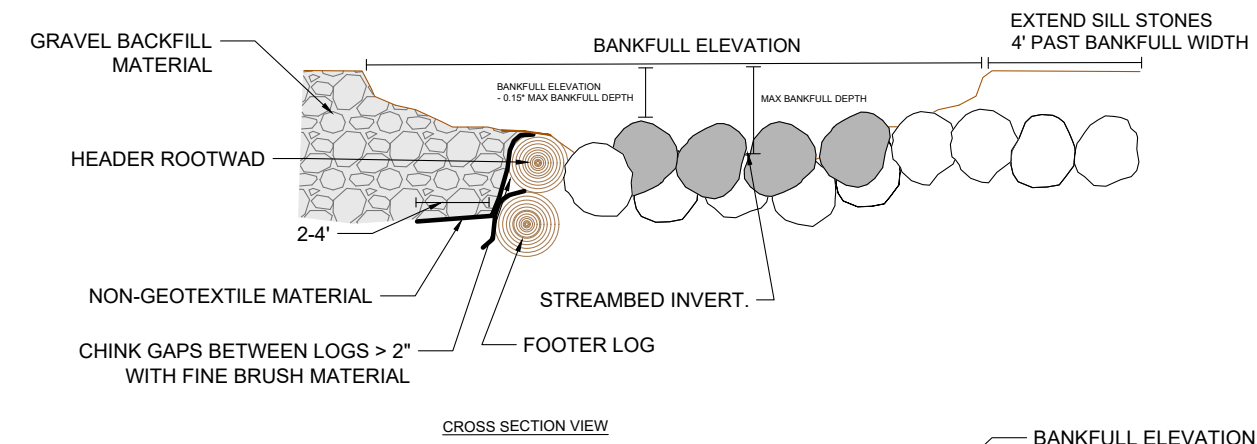


CROSS SECTION LOOKING DOWNSTREAM

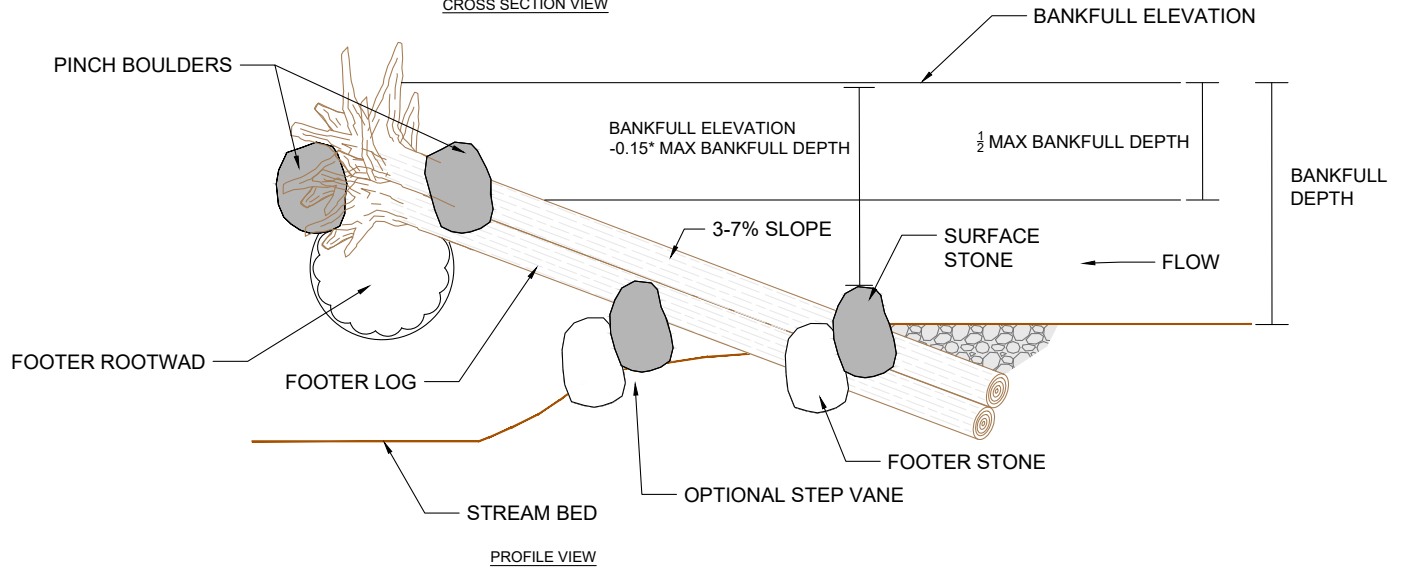
2 HABITAT LOG STRUCTURE
NOT TO SCALE



PLAN VIEW



CROSS SECTION VIEW



PROFILE VIEW

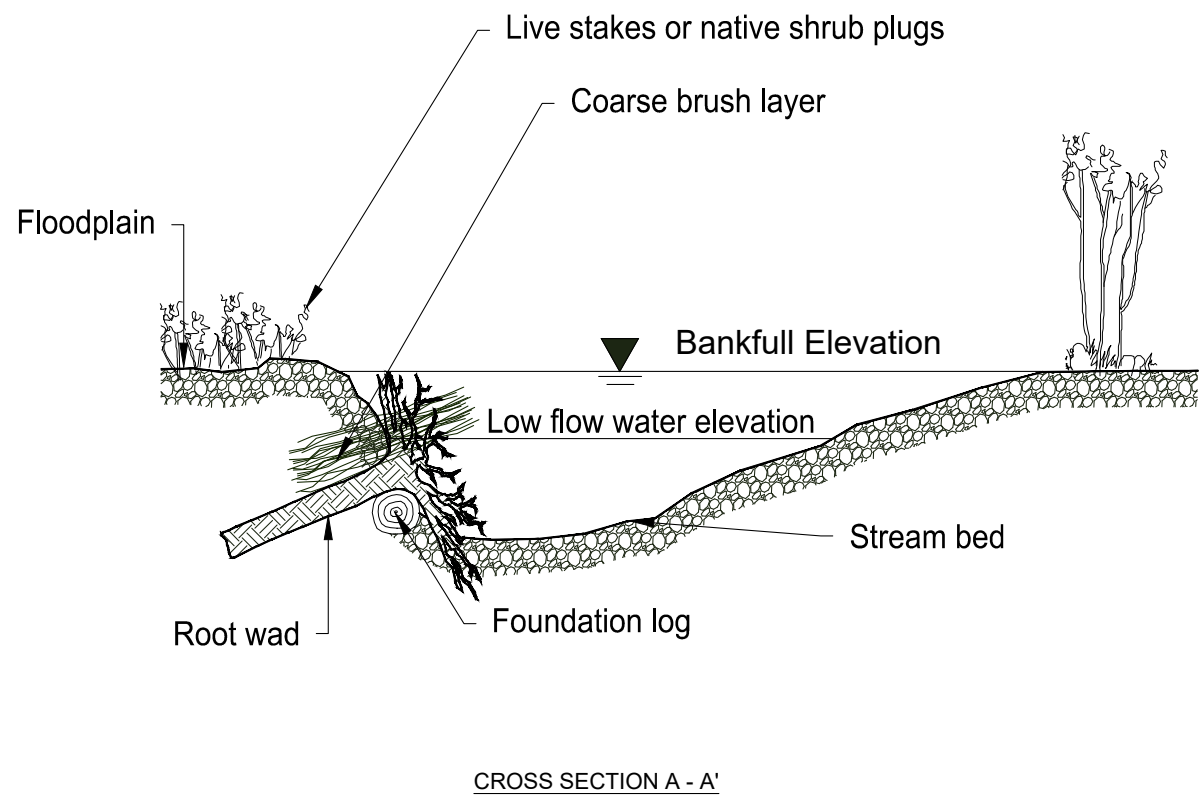
3 J-HOOK LOG VANE
NOT TO SCALE

#	DATE	DESCRIPTION

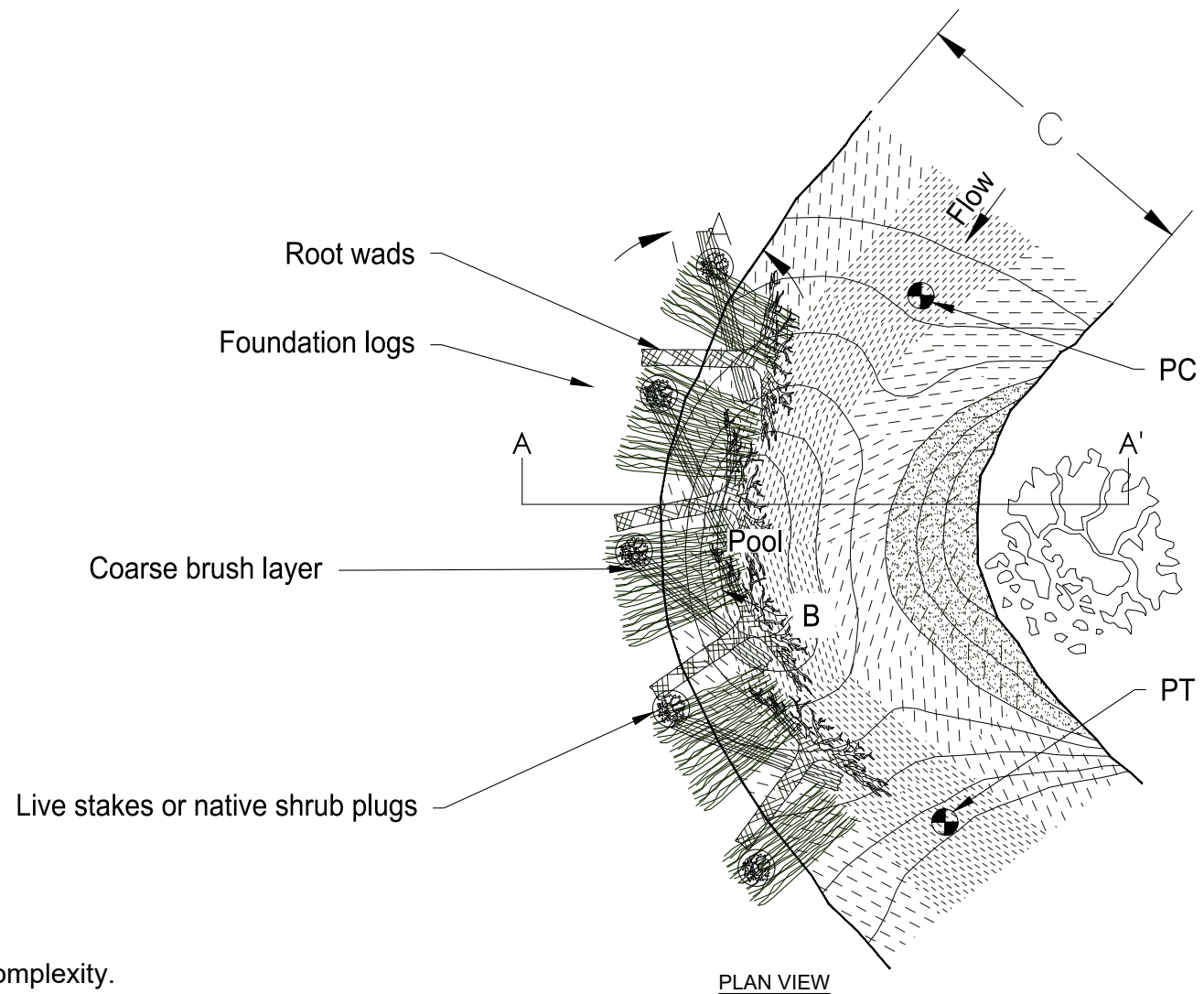
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SHEET TITLE	DETAILS
SHEET NUMBER	9
LAND USE #	

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CROSS SECTION A - A'

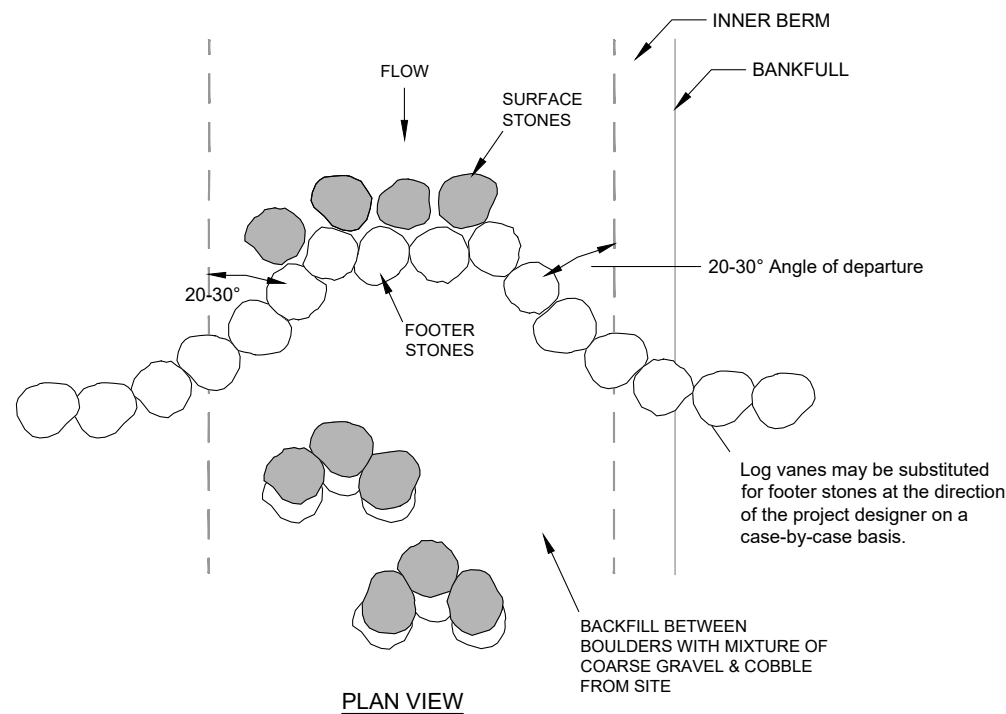


PLAN VIEW

NOTES:

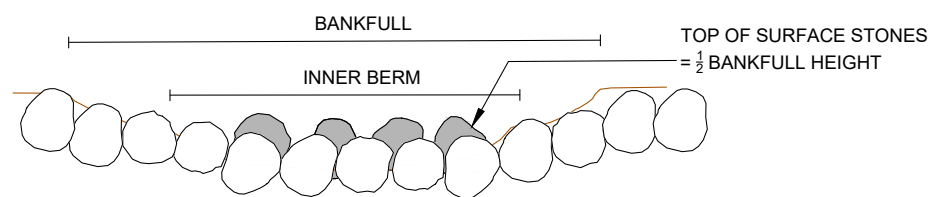
1. Vary and off set distance that root wad extends into the channel to create varied flow.
2. Using longer foundational logs for root wads that stick into the channel.
3. Do not extend root wad greater than 1/5 bankfull width into the channel.
4. Set root wads at elevation below low flow water surface elevation to keep submerged.
5. Vary root wad elevation below low flow water surface elevation to increase habitat structure complexity.

4 ROOTWAD BANK TREATMENT DETAIL
NOT TO SCALE

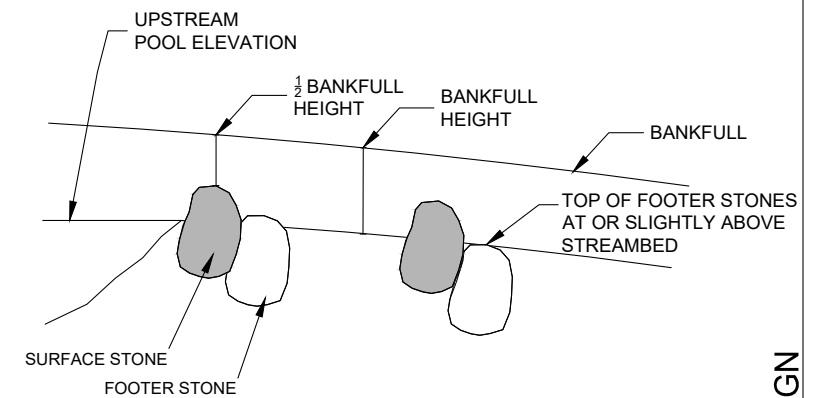


PLAN VIEW

Note:
Boulder shall be at least 36"
diameter in 2 of 3 dimensions.



CROSS SECTION



PROFILE

5 CONVERGING BOULDER CLUSTER DETAIL
NOT TO SCALE

BY	DATE	DESCRIPTION

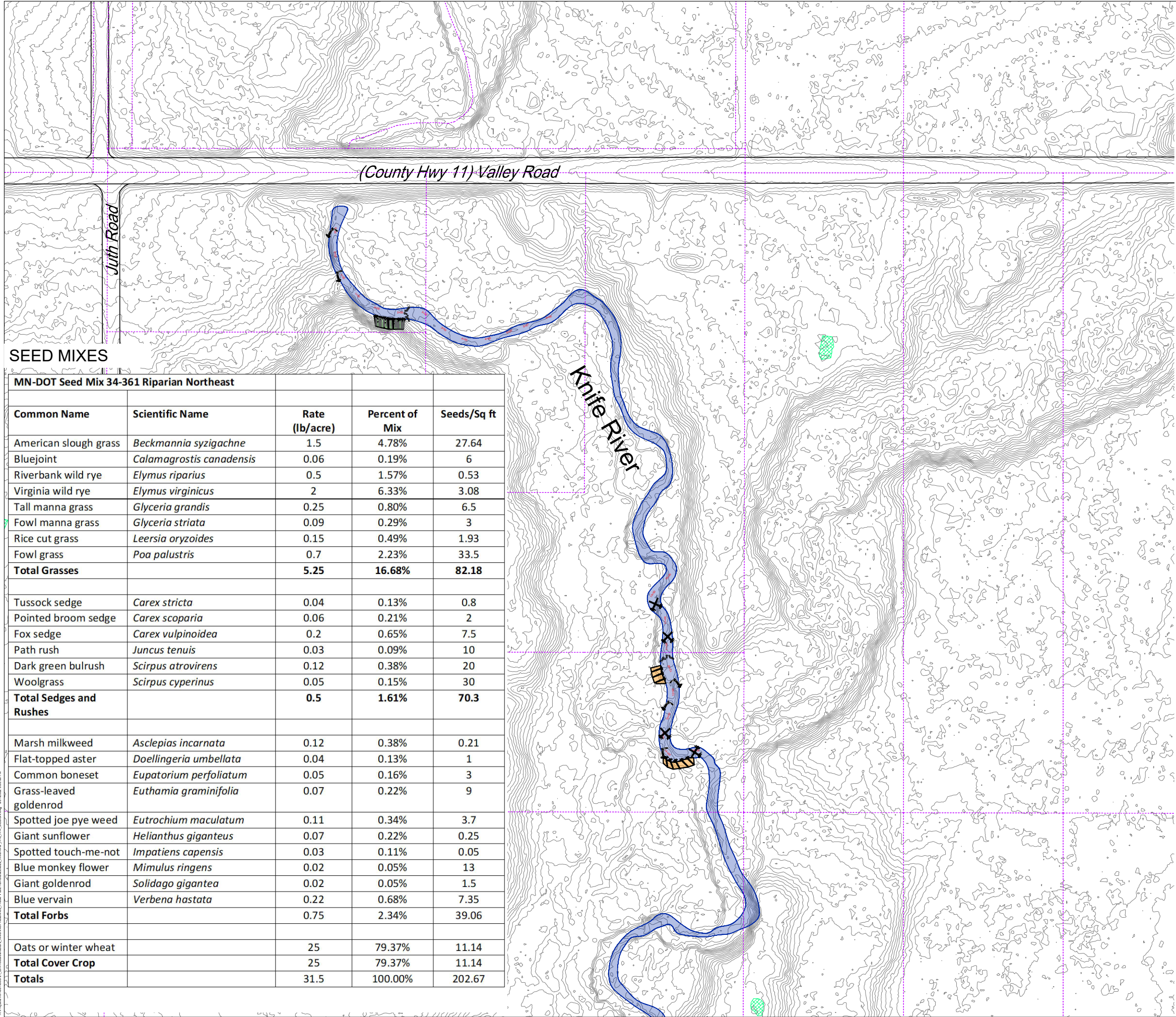
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DESIGNED	MTP
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PROJECT #	J188372103

SHEET TITLE	DETAILS
SHEET NUMBER	10

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PLAN VIEW
 SCALE: 1" = 100'
 GRAPHIC SCALE IN FEET
 GRAPHIC SCALE VERIFICATION
 This bar measures 1" on 22"x34"
 or 1/2" on 11"x17" original.
 Adjust scale accordingly.



NOTE:
 1. All disturbed areas seeded with MN-dot 64-361 Seed Mix.

SEED MIXES

MN-DOT Seed Mix 34-361 Riparian Northeast				
Common Name	Scientific Name	Rate (lb/acre)	Percent of Mix	Seeds/Sq ft
American slough grass	<i>Beckmannia syzigachne</i>	1.5	4.78%	27.64
Bluejoint	<i>Calamagrostis canadensis</i>	0.06	0.19%	6
Riverbank wild rye	<i>Elymus riparius</i>	0.5	1.57%	0.53
Virginia wild rye	<i>Elymus virginicus</i>	2	6.33%	3.08
Tall manna grass	<i>Glyceria grandis</i>	0.25	0.80%	6.5
Fowl manna grass	<i>Glyceria striata</i>	0.09	0.29%	3
Rice cut grass	<i>Leersia oryzoides</i>	0.15	0.49%	1.93
Fowl grass	<i>Poa palustris</i>	0.7	2.23%	33.5
Total Grasses		5.25	16.68%	82.18
Tussock sedge	<i>Carex stricta</i>	0.04	0.13%	0.8
Pointed broom sedge	<i>Carex scoparia</i>	0.06	0.21%	2
Fox sedge	<i>Carex vulpinoidea</i>	0.2	0.65%	7.5
Path rush	<i>Juncus tenuis</i>	0.03	0.09%	10
Dark green bulrush	<i>Scirpus atrovirens</i>	0.12	0.38%	20
Woolgrass	<i>Scirpus cyperinus</i>	0.05	0.15%	30
Total Sedges and Rushes		0.5	1.61%	70.3
Marsh milkweed	<i>Asclepias incarnata</i>	0.12	0.38%	0.21
Flat-topped aster	<i>Doellingeria umbellata</i>	0.04	0.13%	1
Common boneset	<i>Eupatorium perfoliatum</i>	0.05	0.16%	3
Grass-leaved goldenrod	<i>Euthamia graminifolia</i>	0.07	0.22%	9
Spotted joe pye weed	<i>Eutrochium maculatum</i>	0.11	0.34%	3.7
Giant sunflower	<i>Helianthus giganteus</i>	0.07	0.22%	0.25
Spotted touch-me-not	<i>Impatiens capensis</i>	0.03	0.11%	0.05
Blue monkey flower	<i>Mimulus ringens</i>	0.02	0.05%	13
Giant goldenrod	<i>Solidago gigantea</i>	0.02	0.05%	1.5
Blue vervain	<i>Verbena hastata</i>	0.22	0.68%	7.35
Total Forbs		0.75	2.34%	39.06
Oats or winter wheat		25	79.37%	11.14
Total Cover Crop		25	79.37%	11.14
Totals		31.5	100.00%	202.67

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REVEGETATION PLAN
 KNIFE RIVER Reach 13
 ENVIRONMENTAL TROUBLE SHOOTERS
 LAKE COUNTY, MINNESOTA

DATE	DESCRIPTION

DATE | MARCH 2022
 DRAWN | COD
 DESIGNED | MTP
 CHECKED |
 PROJECT # | J188372103
 SHEET TITLE
 REVEGETATION PLAN
 SHEET NUMBER
11
 LAND USE # |

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