Figure 1
COUNTY MAP
Northshore Mining Company
Gilmore Creek Restoration
St. Louis County, MN

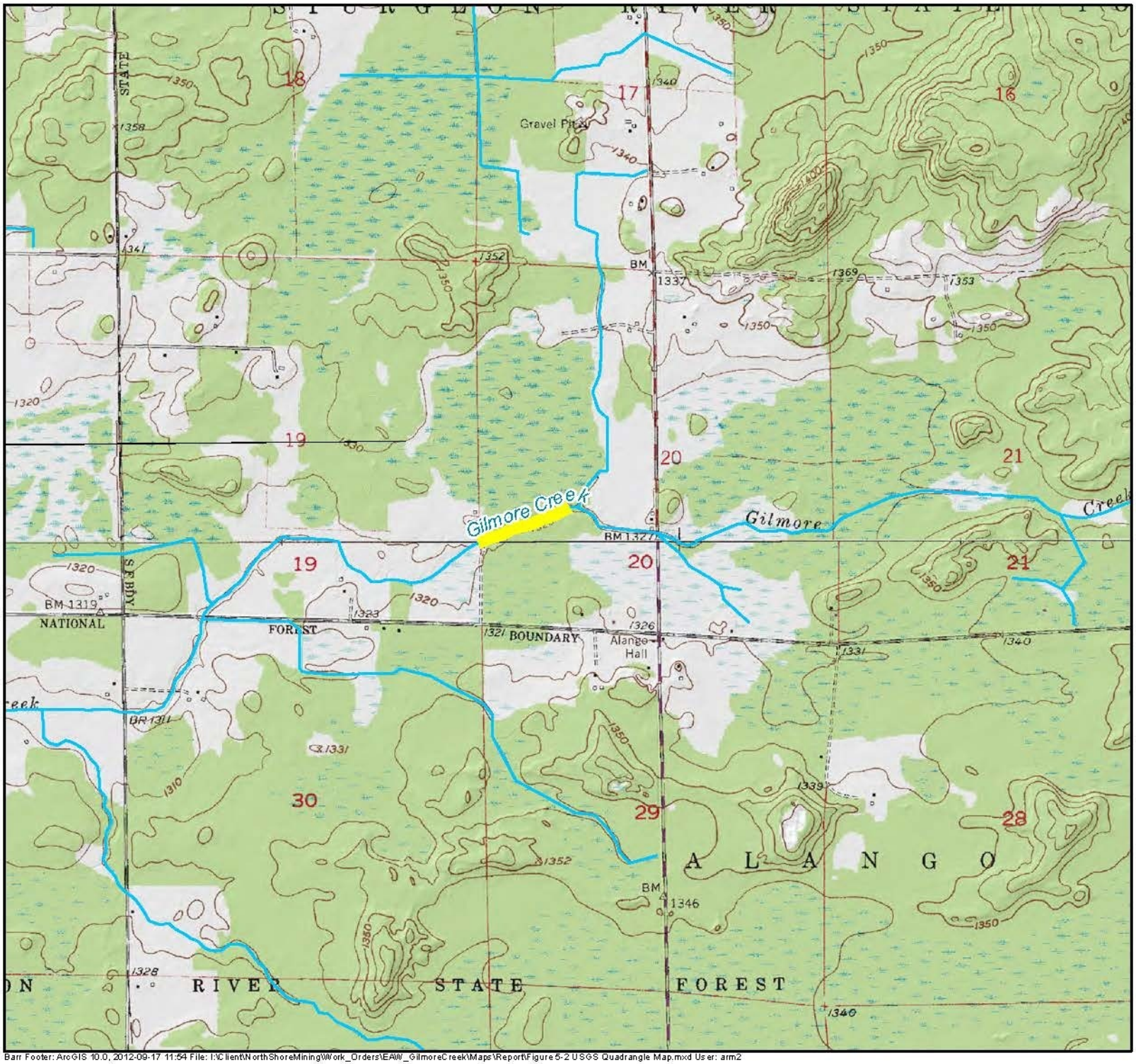


Figure 2
USGS QUADRANGLE MAP
Northshore Mining Company
Gilmore Creek Restoration
St. Louis County, MN

Barr Footer: ArcGIS 10.0, 2012-09-17 11:54 File: I:\Client\NorthShoreMining\Work_Orders\EAW_GilmoreCreek\Maps\Report\Figure 5-2 USGS Quadrangle Map.mxd User: arm2

Figure 3
Gilmore Creek – 1949 Aerial Photo
Northshore Mining Company
St. Louis County, MN

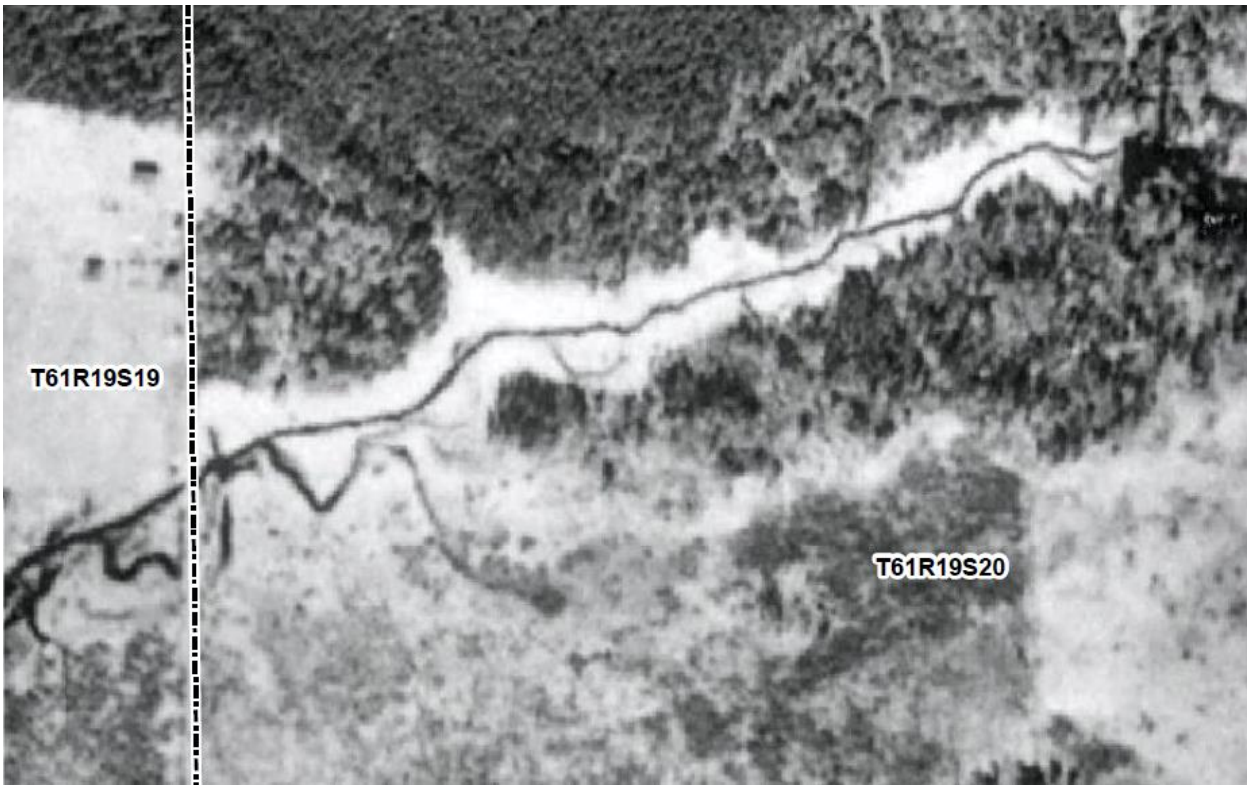


Figure 4
Gilmore Creek – 1992 Aerial Photo*
Northshore Mining Company
St. Louis County, MN

*This aerial photograph was taken during a period of high water in 1992. Note that the historical meander scars have completely or partially filled. Note also that the forested area to the north extends nearly to Gilmore Creek.

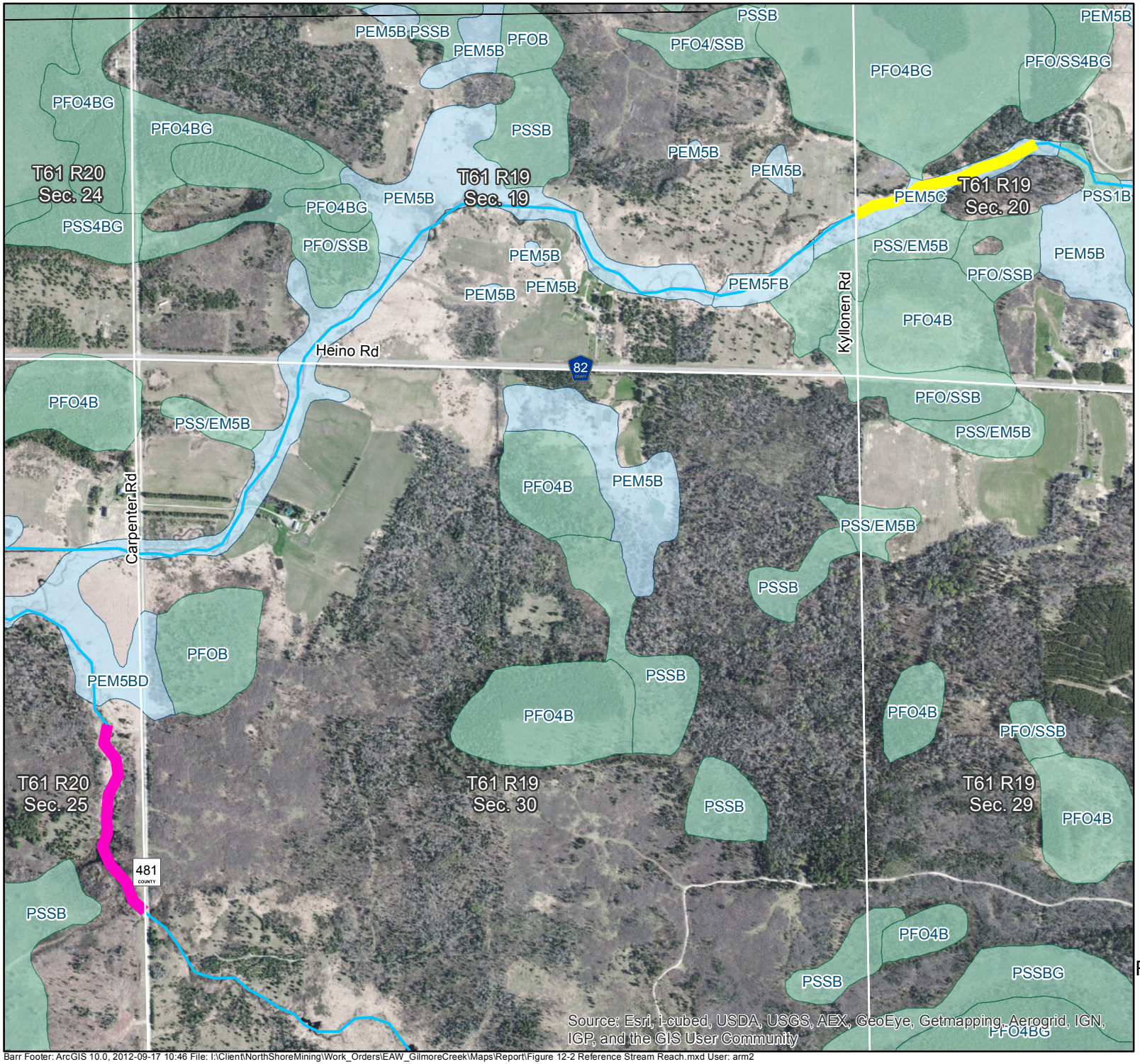


Figure 5
REFERENCE STREAM REACH
Northshore Mining Company
Gilmore Creek Restoration
St. Louis County, MN

Barr Footer: ArcGIS 10.0, 2012-09-17 10:46 File: I:\Client\NorthShoreMining\Work_Orders\EAW_GilmoreCreek\Maps\Report\Figure 12-2 Reference Stream Reach.mxd User: arm2

GILMORE CREEK CHANNEL RESTORATION

PROPOSED CHANNEL DETAILS
CHANNEL TYPE: E
RIFFLE DIMENSIONS:

- WIDTH–13 FT
- MEAN DEPTH–1.5 FT.
- MAX DEPTH–2.7 FT.
- CROSS SECTIONAL AREA–20 SQ. FT.
- W/D RATIO– 8

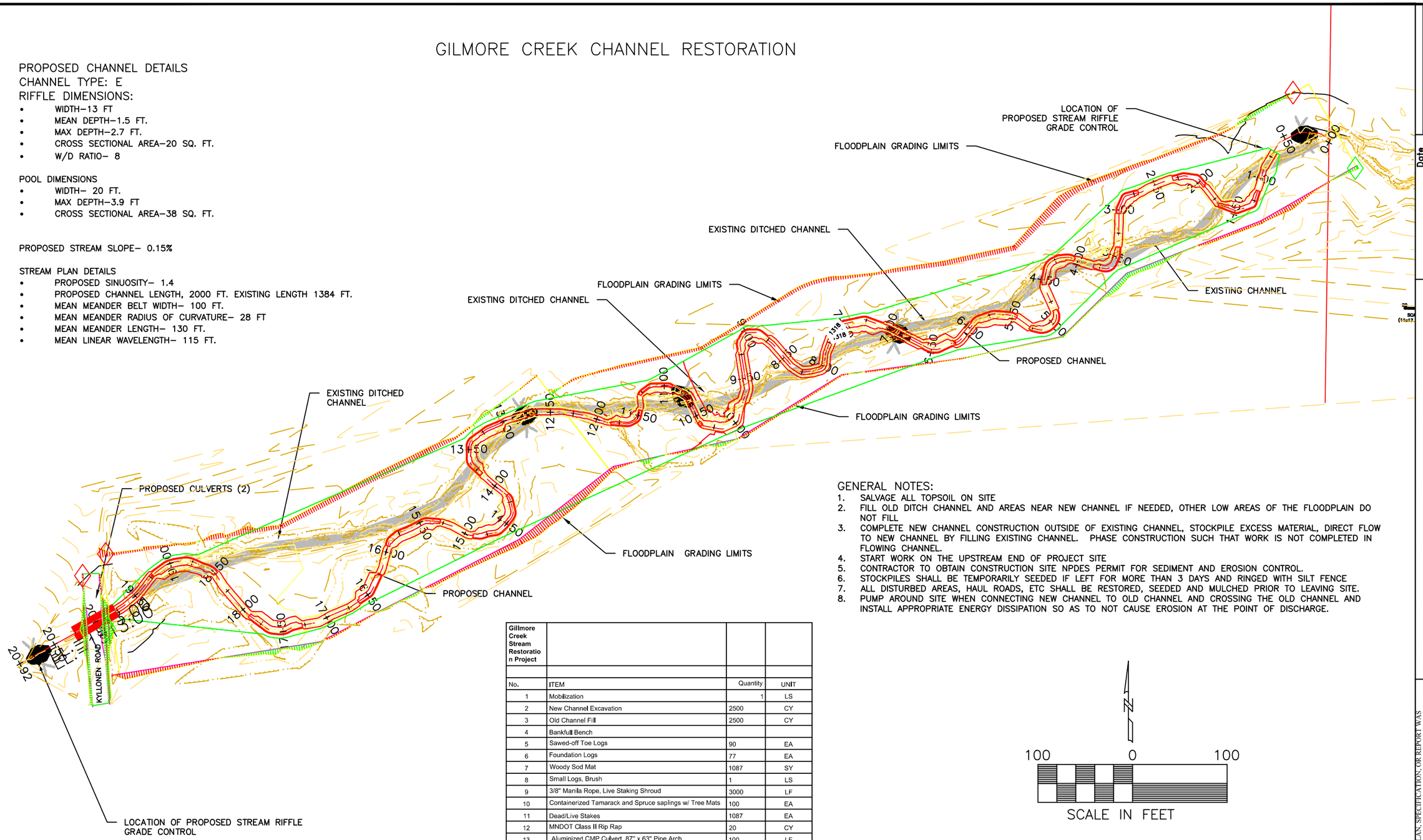
POOL DIMENSIONS

- WIDTH– 20 FT.
- MAX DEPTH–3.9 FT
- CROSS SECTIONAL AREA–38 SQ. FT.

PROPOSED STREAM SLOPE– 0.15%

STREAM PLAN DETAILS

- PROPOSED SINUOSITY– 1.4
- PROPOSED CHANNEL LENGTH, 2000 FT. EXISTING LENGTH 1384 FT.
- MEAN MEANDER BELT WIDTH– 100 FT.
- MEAN MEANDER RADIUS OF CURVATURE– 28 FT
- MEAN MEANDER LENGTH– 130 FT.
- MEAN LINEAR WAVELENGTH– 115 FT.



GENERAL NOTES:

1. SALVAGE ALL TOPSOIL ON SITE
2. FILL OLD DITCH CHANNEL AND AREAS NEAR NEW CHANNEL IF NEEDED, OTHER LOW AREAS OF THE FLOODPLAIN DO NOT FILL
3. COMPLETE NEW CHANNEL CONSTRUCTION OUTSIDE OF EXISTING CHANNEL, STOCKPILE EXCESS MATERIAL, DIRECT FLOW TO NEW CHANNEL BY FILLING EXISTING CHANNEL. PHASE CONSTRUCTION SUCH THAT WORK IS NOT COMPLETED IN FLOWING CHANNEL.
4. START WORK ON THE UPSTREAM END OF PROJECT SITE
5. CONTRACTOR TO OBTAIN CONSTRUCTION SITE NPDES PERMIT FOR SEDIMENT AND EROSION CONTROL.
6. STOCKPILES SHALL BE TEMPORARILY SEEDED IF LEFT FOR MORE THAN 3 DAYS AND RINGED WITH SILT FENCE
7. ALL DISTURBED AREAS, HAUL ROADS, ETC SHALL BE RESTORED, SEEDED AND MULCHED PRIOR TO LEAVING SITE.
8. PUMP AROUND SITE WHEN CONNECTING NEW CHANNEL TO OLD CHANNEL AND CROSSING THE OLD CHANNEL AND INSTALL APPROPRIATE ENERGY DISSIPATION SO AS TO NOT CAUSE EROSION AT THE POINT OF DISCHARGE.

Gillmore Creek Stream Restoration Project			
No.	ITEM	Quantity	UNIT
1	Mobilization	1	LS
2	New Channel Excavation	2500	CY
3	Old Channel Fill	2500	CY
4	Bankfull Bench		
5	Sawed-off Toe Logs	90	EA
6	Foundation Logs	77	EA
7	Woody Sod Mat	1087	SY
8	Small Logs, Brush	1	LS
9	3/8" Manila Rope, Live Staking Shroud	3000	LF
10	Containerized Tamarack and Spruce saplings w/ Tree Mats	100	EA
11	Dead/Live Stakes	1087	EA
12	MNDOT Class II Rip Rap	20	CY
13	Aluminized CMP Culvert, 87" x 63" Pipe Arch	100	LF
14	MNDOT Class III Nonwoven Geotextile	33	SY
15	MNDOT Cat 4 Coir Erosion Control Blanket w/ Natural Net	3549	SY
16	Site Restoration, MN DNR W7 Seed Mixture	20	LBS
17	Site Restoration, Cover Crop Mixture	140	LBS
18	Erosion Control, NPDES Permit	1	LS
19	Channel Pump Around, Temporary	1	LS
20	Gravel for Stream Riffle Grade Controls	62	CY
21	Logs for Stream Riffle Grade Controls	20	EA

NOT FOR CONSTRUCTION
PLANS ARE SUBJECT TO REVIEW AND CHANGE.
NOT TO BE USED FOR CONSTRUCTION.

Soil & Water Conservation Districts
TECHNICAL SERVICE AREA III

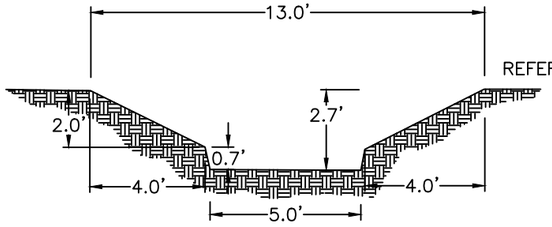
Date	Designed	Drawn	Revised	Checked
10/12	KAA	TB		
10/12				

GILMORE CREEK STREAM RESTORATION
OVERVIEW PLAN
NSL SWCD, CLEVELAND CLIFFS NATURAL RESOURCES
ST LOUIS COUNTY, MINNESOTA

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

PRINTED NAME: KEITH A. ANDERSON
SIGNATURE:
DATE:
REG. NO. 42827

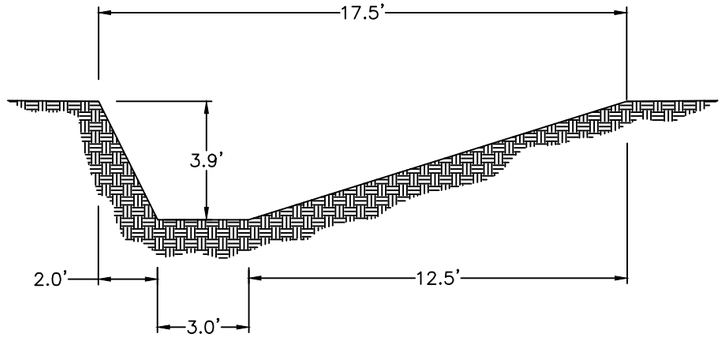
Figure 6



REFER TO CROSS SECTIONS FOR FLOODPLAIN GRADING

NOT FOR CONSTRUCTION
PLANS ARE SUBJECT TO REVIEW AND CHANGE, NOT TO BE USED FOR CONSTRUCTION.

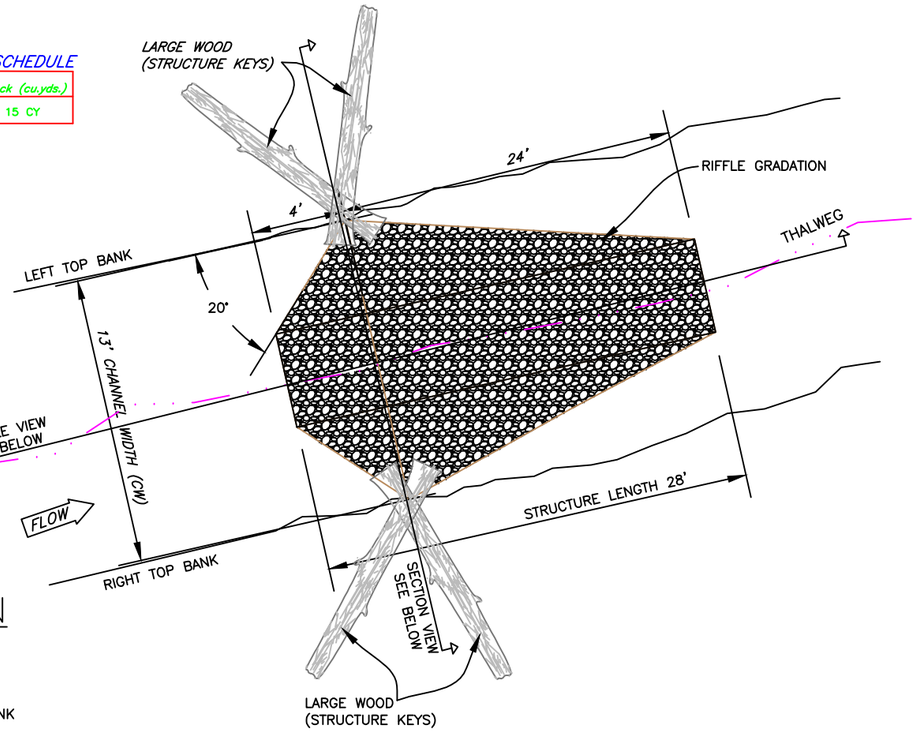
TYPICAL RIFFLE CROSS SECTION
'E' CHANNEL TYPE



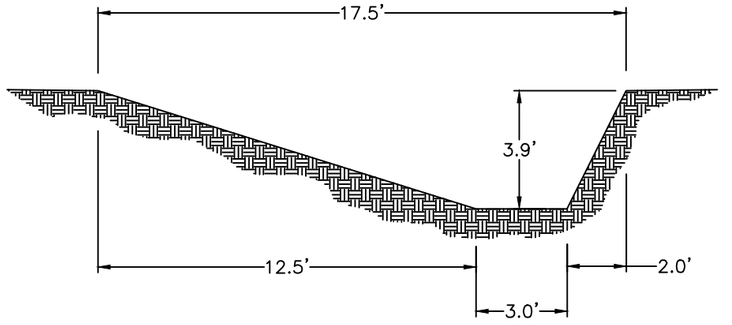
TYPICAL POOL (RIGHT) CROSS SECTION

GEOMORPHIC RIFFLE SCHEDULE

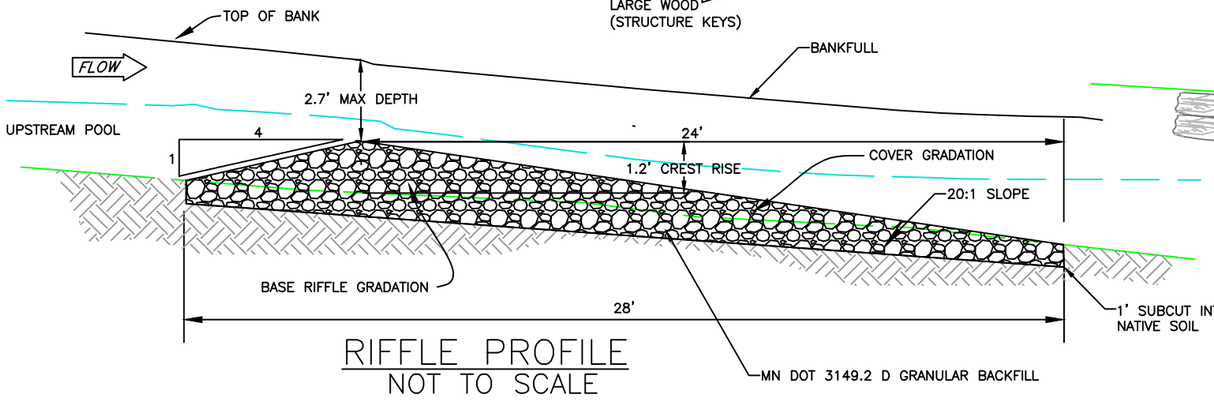
WING ELEV.	CW	L	V Rock (cu.yds.)
XXXX	13'	28'	15 CY



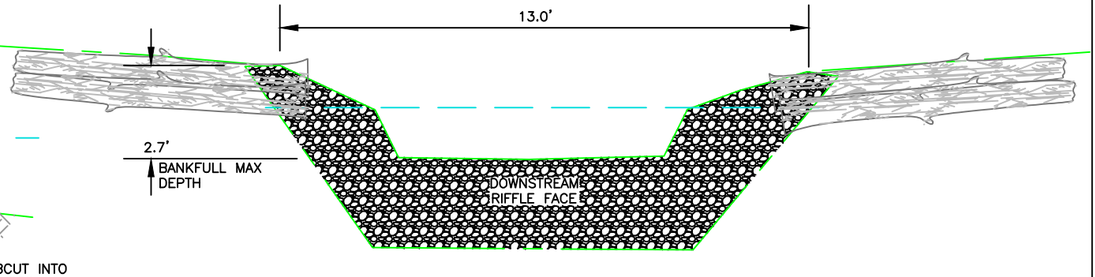
RIFFLE PLAN
NOT TO SCALE



TYPICAL POOL (LEFT) CROSS SECTION



RIFFLE PROFILE
NOT TO SCALE



RIFFLE SECTION
NOT TO SCALE

Soil & Water Conservation Districts
TECHNICAL SERVICE AREA III

Date 1/28/13
Designed KAA, MV
Drawn
Revised
Checked

TYPICAL RIFFLE/POOL DETAIL
GILMORE CREEK
N. ST LOUIS– SOIL & WATER CONSERVATION DIST.
NORTH ST. LOUIS COUNTY, MINNESOTA

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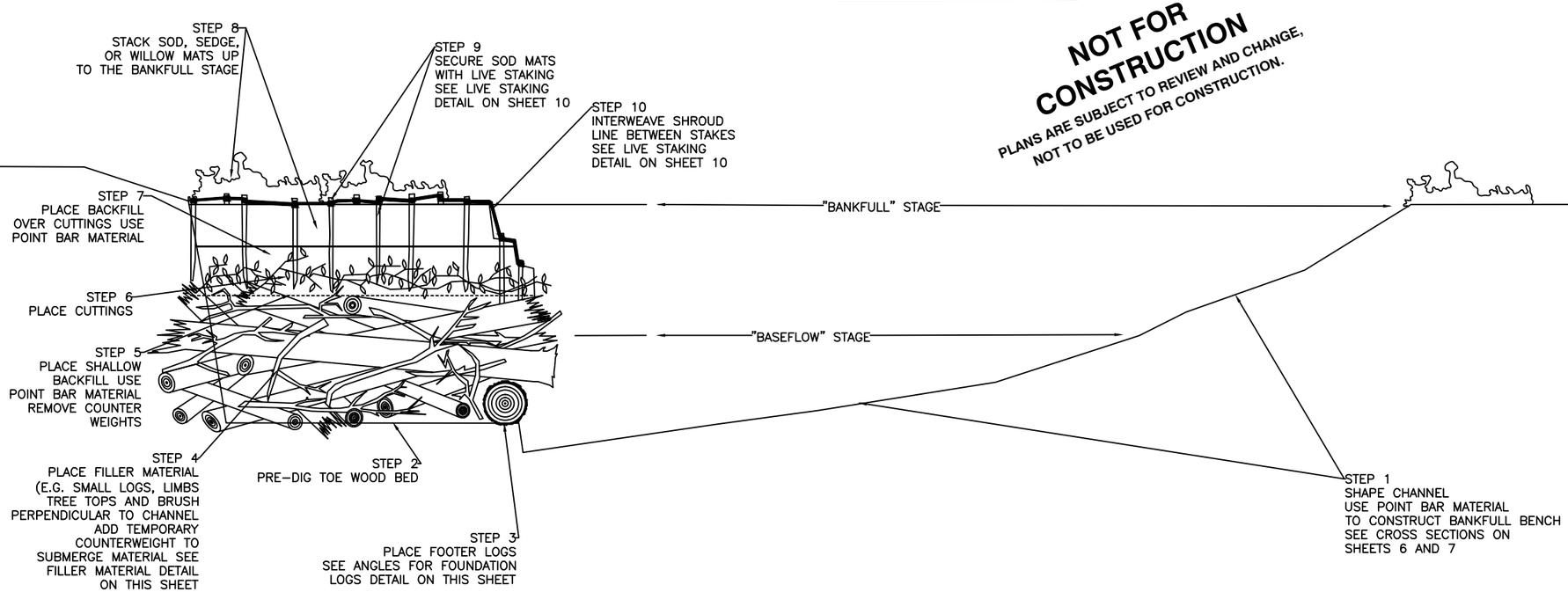
DATE:
REG. NO. 42827

Figure 7

TOE WOOD SEQUENCING

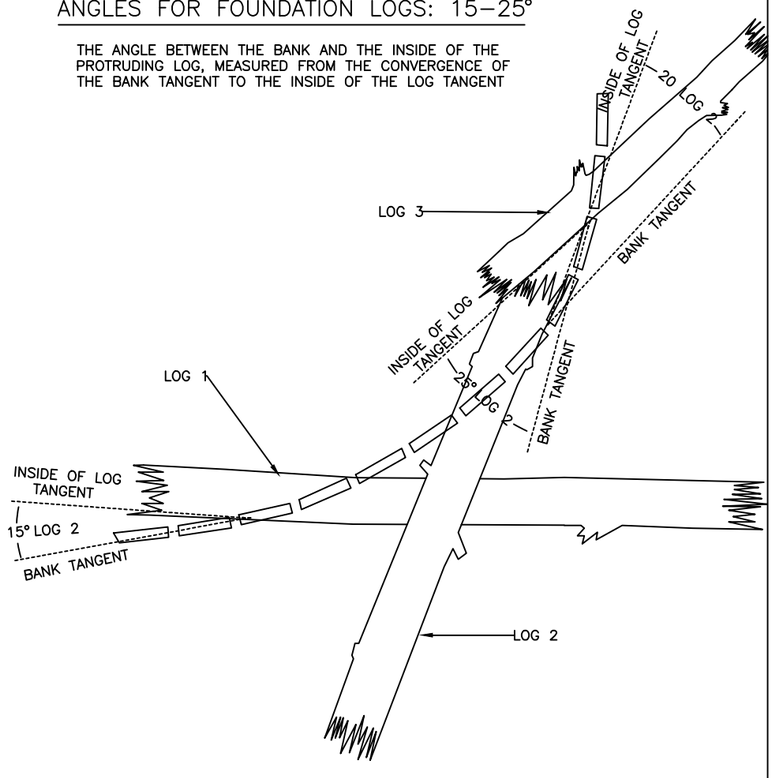


NOT FOR CONSTRUCTION

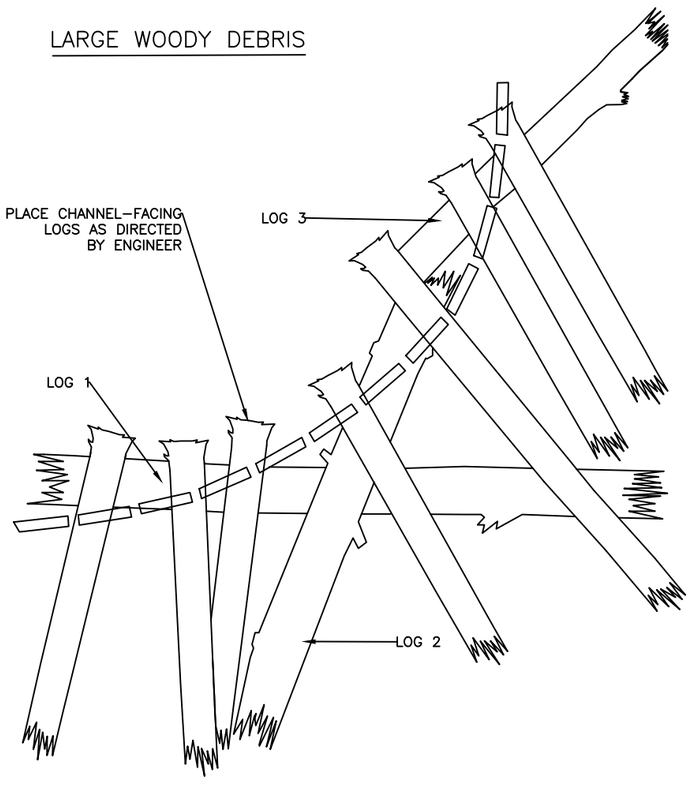
PLANS ARE SUBJECT TO REVIEW AND CHANGE, NOT TO BE USED FOR CONSTRUCTION.

ANGLES FOR FOUNDATION LOGS: 15–25°

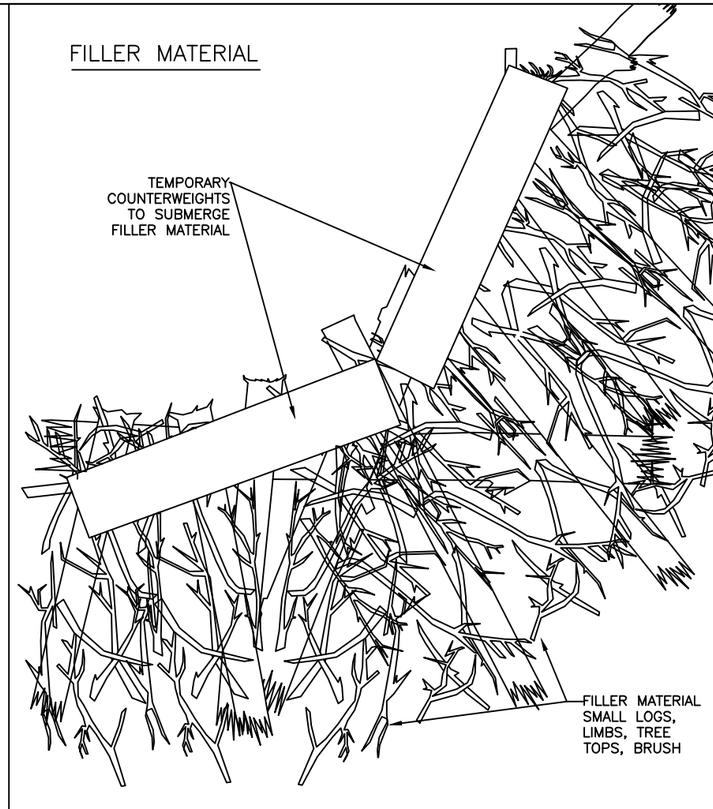
THE ANGLE BETWEEN THE BANK AND THE INSIDE OF THE PROTRUDING LOG, MEASURED FROM THE CONVERGENCE OF THE BANK TANGENT TO THE INSIDE OF THE LOG TANGENT



LARGE WOODY DEBRIS



FILLER MATERIAL



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Date
Designed KAA 1/13
Drawn TB, MV 1/13
Revised
Checked

POOL TOE WOOD PROJECT SEQUENCING
GILMORE CREEK RESTORATION
N. ST. LOUIS – SOIL & WATER CONSERVATION DIST.
NORTH ST. LOUIS COUNTY, MINNESOTA

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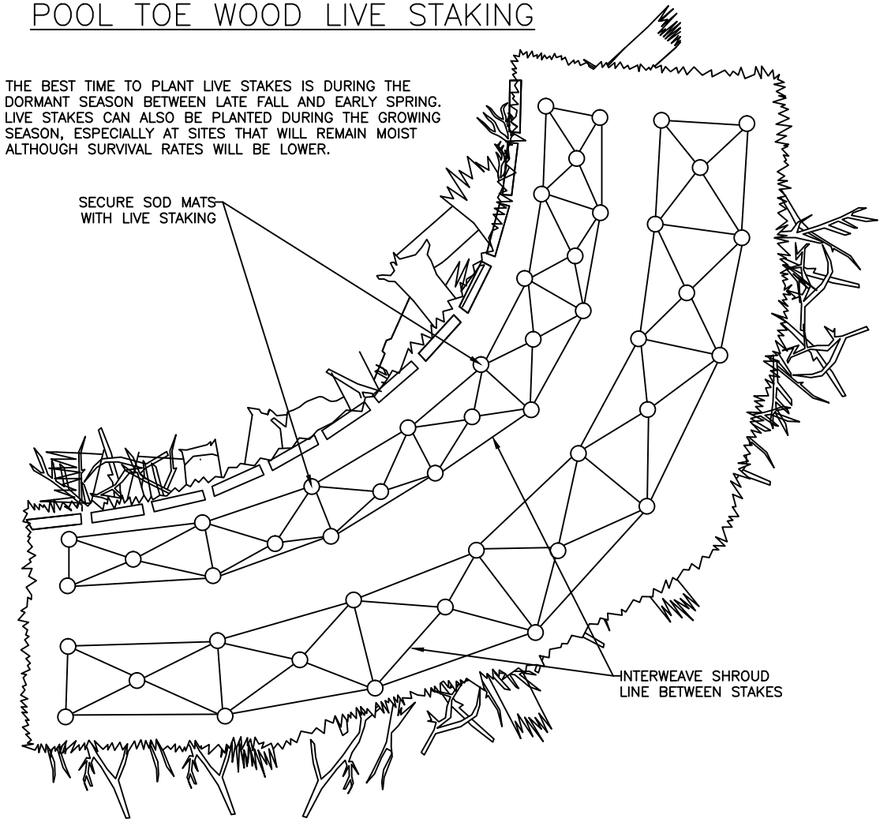
SIGNATURE:
DATE:
REG. NO. 42827

Figure 8

\\MATIAS\SharedDocs\ACTIVE PROJECTS\NorthStLouis\Gillmore Creek\GILMORE TOEWOOD DETAIL.dwg, 5/8/2013 1:46:20 PM, DWG To PDF.pc3

POOL TOE WOOD LIVE STAKING

THE BEST TIME TO PLANT LIVE STAKES IS DURING THE DORMANT SEASON BETWEEN LATE FALL AND EARLY SPRING. LIVE STAKES CAN ALSO BE PLANTED DURING THE GROWING SEASON, ESPECIALLY AT SITES THAT WILL REMAIN MOIST ALTHOUGH SURVIVAL RATES WILL BE LOWER.



LIVE STAKE SEQUENCING

1) CUT STAKES FROM LONG, UPRIGHT BRANCHES TAKEN FROM WILLOWS AND RED OSIER DOGWOOD AT THE PROJECT AREA. THE LIVE STAKES SHOULD BE A MINIMUM OF 24" LONG AND 2" IN DIAMETER.

2) MAKE A STRAIGHT CUT AT THE NARROW END OF THE STAKE (TOWARD THE TIP OF THE BRANCH). AT THE THICKER END (TOWARD THE TRUNK) CUT THE BRANCH AT AN ANGLE SO THAT IT MAKES A POINT. THIS WAY YOU WILL KNOW WHICH WAY IS UP AND IT WILL ALSO BE EASIER TO DRIVE THE STAKES INTO THE GROUND. IT IS IMPORTANT TO PLANT LIVES STAKES WITH THE CORRECT END IN THE GROUND; OTHERWISE THEY WILL DIE.

3) REMOVE THE LEAVES AND SMALL BRANCHES FROM THE STAKES AS SOON AS POSSIBLE AFTER CUTTING THEM TO KEEP THE STAKES FROM DRYING OUT.

4) DIP THE TOP (BLUNT CUT NARROW END) 2–3 INCHES OF THE STAKE IN LATEX PAINT IMMEDIATELY AFTER THEY ARE CUT. THE PAINT MARKS WHICH END IS UP AND ALSO SEALS THE EXPOSED CUT END PREVENTING DRYING/CRACKING

5) PLANT THE STAKES WITHIN 24 HOURS FOR BEST RESULTS. IN THE MEANTIME KEEP THEM MOIST AND WET IN BUCKETS OR WET BURLAP SACKS. ON HOT DAYS KEEP THEM IN THE SHADE UNTIL PLANTING TIME.

6) DRIVE STAKES INTO THE SOD MAT WITH A RUBBER MALLET. PLANT THE STAKES IN AN "X" CONFIGURATION AS INDICATED ON THE "LIVE STAKING" DETAIL ON THIS SHEET. LEAVE 3–6" OF THE STAKES ABOVE GROUND SO THEY CAN SPROUT LEAVES. USE A PLANTING BAR OR LENGTH OF REBAR TO START A HOLE IN HARD AREAS.

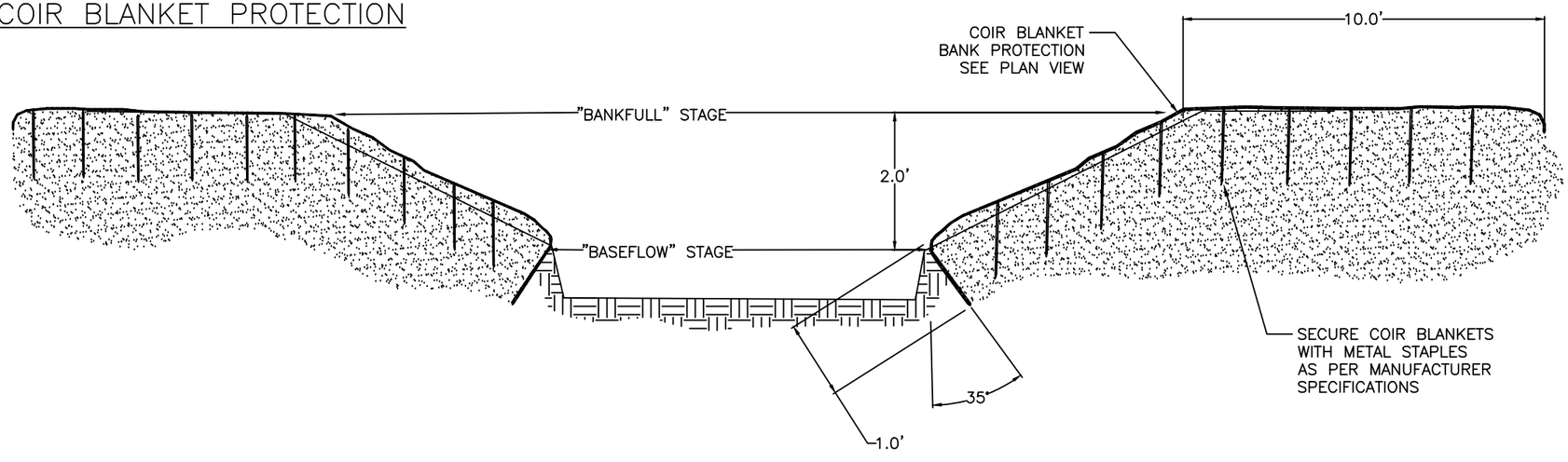
7) USE LONGER STAKES AND LEAVE ONE FOOT STICKING ABOVE THE GROUND IF THE STAKE WILL BE SHADED BY SURROUNDING VEGETATION. IF A STAKE GETS TOO MUCH SHADE IT WILL DROP ITS LEAVES AND DIE.

8) INTERWEAVE SHROUD LINE BETWEEN TOPS OF LIVE STAKES AS INDICATED ON THE "LIVE STAKING" DETAIL ON THIS SHEET.

NOT FOR CONSTRUCTION

PLANS ARE SUBJECT TO REVIEW AND CHANGE, NOT TO BE USED FOR CONSTRUCTION.

STREAM COIR BLANKET PROTECTION



Date
Designed (NAME) (DATE)
Drawn MV, TB 1/30/13
Revised
Checked

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LIVE STAKING, RIFFLE BANK PROTECTION
GILMORE CREEK RESTORATION
N. ST. LOUIS SOIL & WATER CONSERVATION DIST.
NORTH ST. LOUIS COUNTY, MINNESOTA

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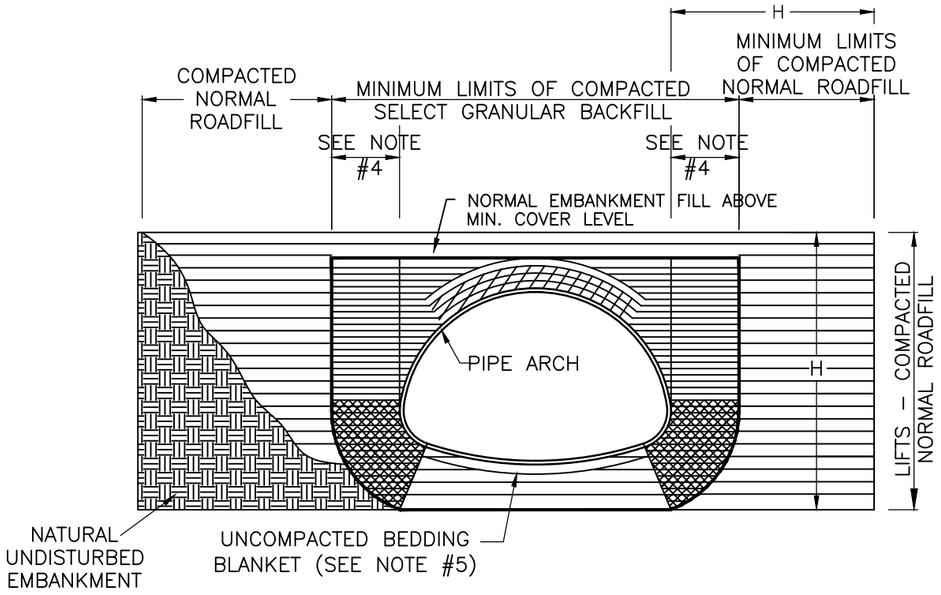
SIGNATURE:
DATE: REG. NO. 42827

Figure 9



SECTION

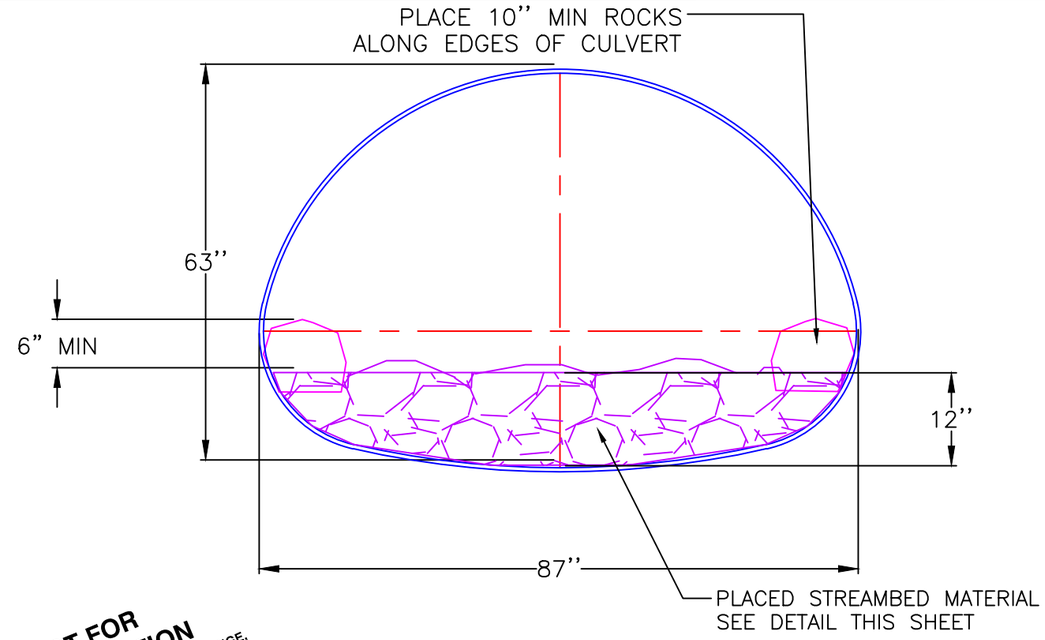
CRITICAL BACKFILL ZONE, PRESSURE ON SOIL GREATEST HERE.

INITIAL LIFTS OVER CROWN OF STRUCTURE AS INDICATED BY SHADED AREA TO BE COMPACTED TO REQUIRED DENSITY WITH HAND OPERATED EQUIPMENT OR WITH SMALL TRACTOR (D–4 OR SMALLER) DRAWN EQUIPMENT.

SELECT GRANULAR BORROW STRUCTURAL BACKFILL LIMITS.

BEDDING NOTES:

1. ALL SELECT GRANULAR BACKFILL TO BE PLACED IN A BALANCED FASHION IN THIN LIFTS (6"–8" LOOSE TYPICALLY) AND COMPACTED TO 90 PERCENT DENSITY PER AASHTO T–180.
2. COMPLETE AND REGULAR MONITORING OF THE CSP ARCH SHAPE IS NECESSARY DURING ALL BACKFILLING OF THE STRUCTURE.
3. PREVENT EXCESSIVE DISTORTION OF SHAPE AS NECESSARY BY VARYING COMPACTION METHODS AND EQUIPMENT.
4. THIS WIDTH SHOULD BE EQUAL TO 1/2 SPAN TO ONE SPAN WIDTH TYPICALLY. GREATER OR LESSER DISTANCE MAY BE REQUIRED. DISTANCE DEPENDS ON BEARING LOAD FOR ANY GIVEN LOADING, STRUCTURE SHAPE AND BACKFILL MATERIAL. THIS MUST BE EVALUATED BY THE PROJECT ENGINEER FOR EACH SPECIFIC SITUATION.
5. SHAPED BED FOR A MINIMUM WIDTH OF SPAN/2. MINIMUM BEDDING THICKNESS IS TWICE THE CORRUGATION DEPTH.
6. EMBANKMENT WIDTH H TO BE SUCH THAT A STABLE EMBANKMENT CAPABLE OF RESISTING SIDE PRESSURES FROM CSP PIPE–ARCH SHAPE WILL BE MAINTAINED THROUGHOUT THE LIFE OF INSTALLATION. THIS WIDTH TO BE DETERMINED BY THE PROJECT ENGINEER.



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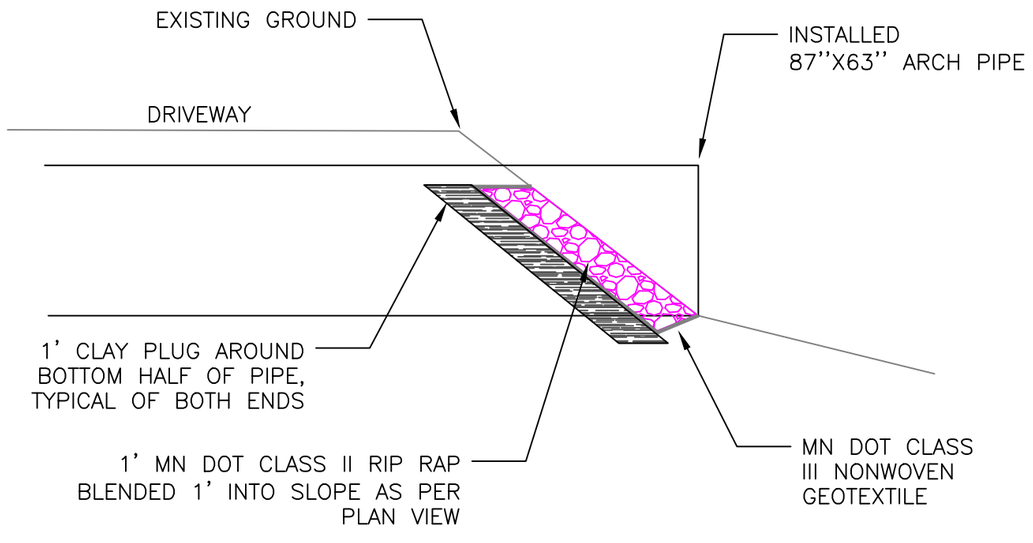
PIPE ARCH DETAIL



CULVERT ROCK AND CLAY PROTECTION - PROFILE VIEW

NOT TO SCALE

Date 1/28/13
Designed KAA, MV
Drawn
Revised
Checked

CULVERT DETAIL
GILMORE CREEK
N. ST LOUIS– SOIL & WATER CONSERVATION DIST.
NORTH ST. LOUIS COUNTY, MINNESOTA

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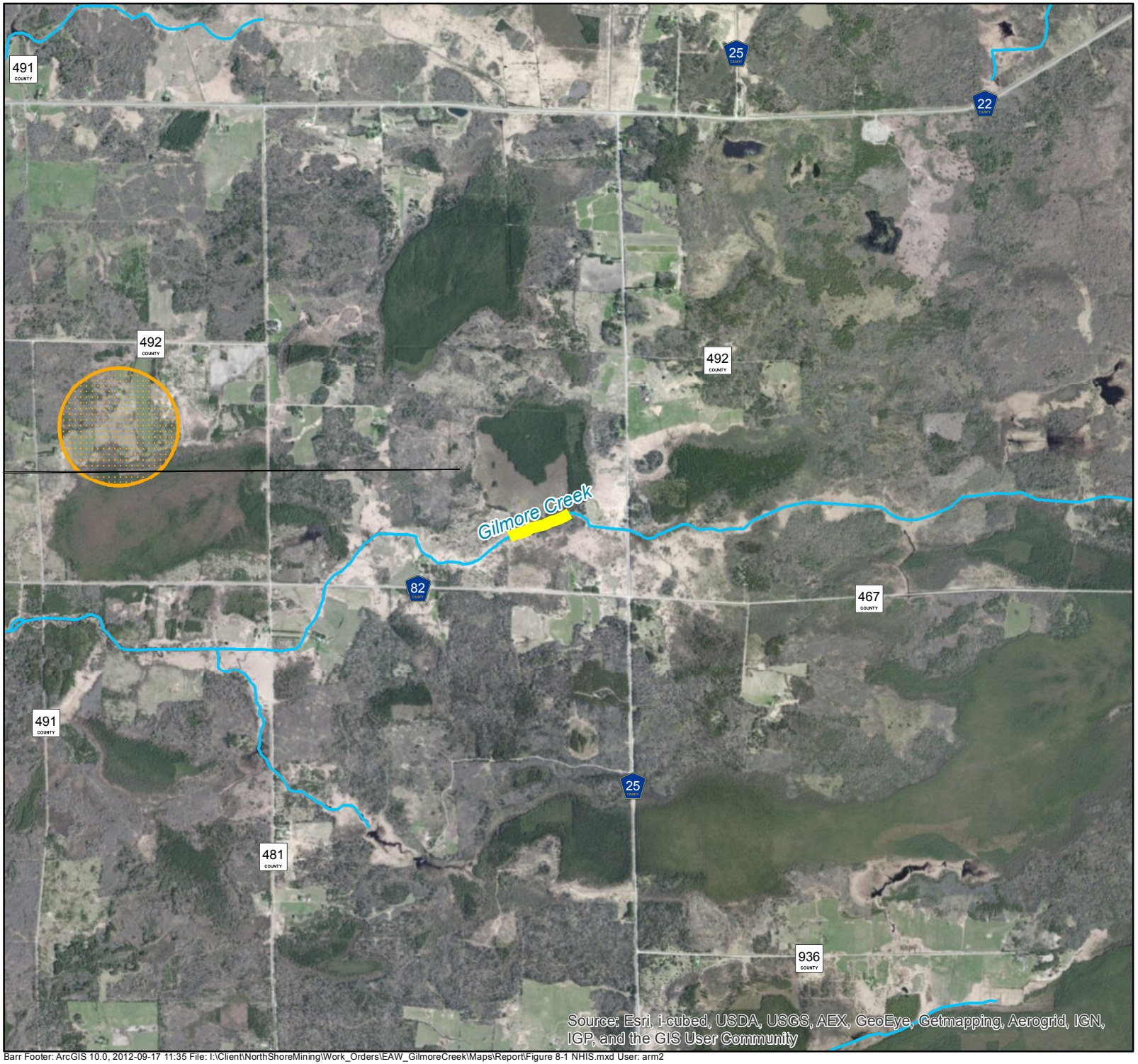
PRINTED NAME: KEITH A. ANDERSON
SIGNATURE:
DATE:
REG. NO. 42827

Figure 10



Gilmore Creek Restoration Reach

Vertebrate Animal

Public Water Inventory (PWI) Watercourses

*Natural Heritage Information System Rare Features Data

1,500 0 1,500

Feet

Figure 11
MnDNR NHIS
Northshore Mining Company
Gilmore Creek Restoration
St. Louis County, MN

Barr Footer: ArcGIS 10.0, 2012-09-17 11:35 File: I:\Client\NorthShoreMining\Work_Orders\EAW_GilmoreCreek\Maps\Report\Figure 8-1 NHIS.mxd User: arm2

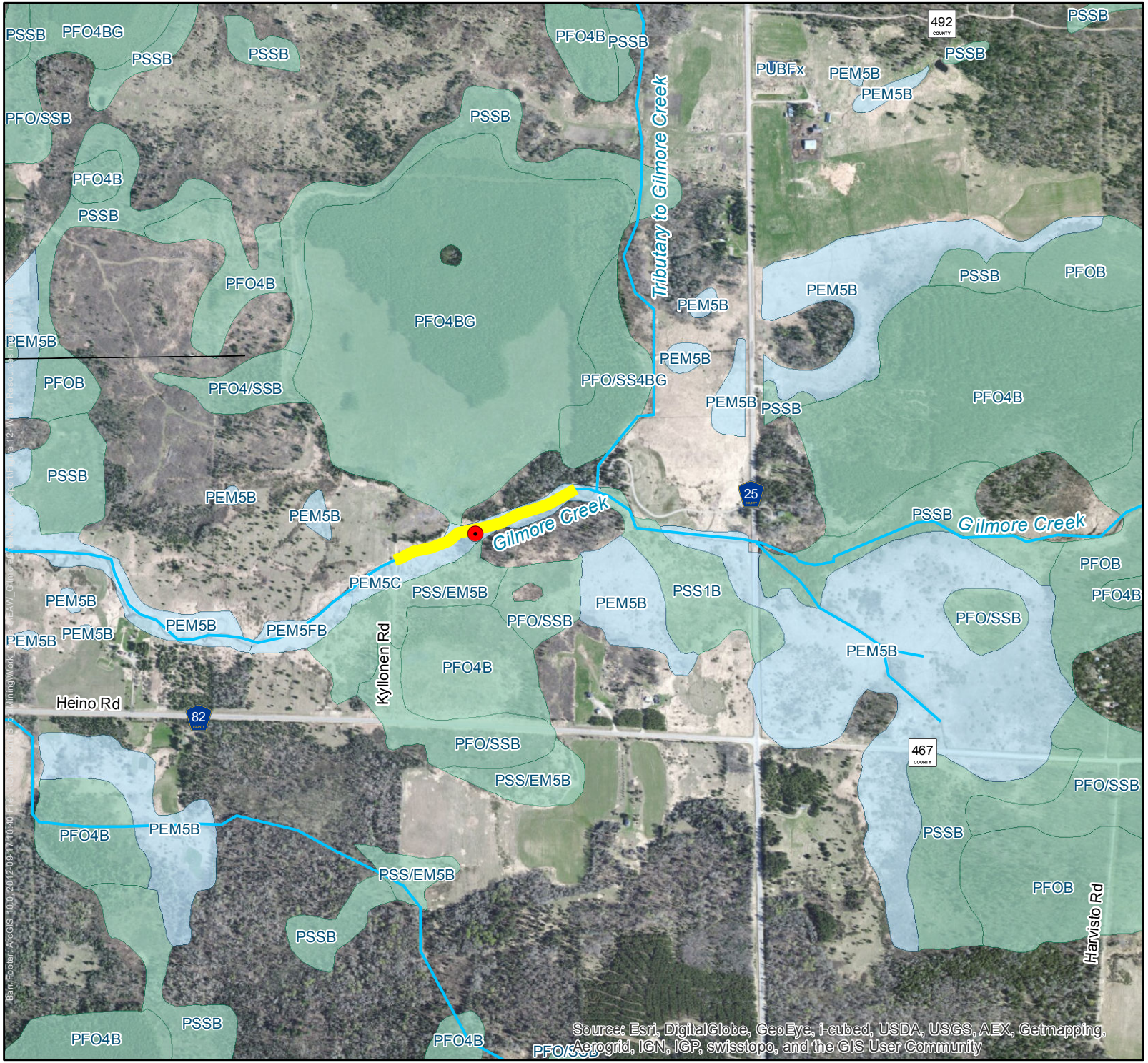


Figure 12
WATER RESOURCES
Northshore Mining Company
Gilmore Creek Restoration
St. Louis County, MN

Gilmore Creek Restoration Reach

Rivers and Streams

Hydric Soils - SSURGO

All Hydric

Partially Hydric

Not Hydric

Unknown Hydric

Map Unit Symbol	Map Unit Name
B10B	Rollins sandy loam, 2 to 8 percent slopes
B10D	Rollins sandy loam, 8 to 18 percent slopes
B11B	Taylor-Taylor, sandy substratum complex, 2 to 6 percent slopes
B26A	Daisybay-Greenwood complex, 0 to 1 percent slopes
B2A	Indus-Woodslake, depressional, complex, 0 to 1 percent slopes
B45A	Dora muck, depressional, Taylor catena, 0 to 1 percent slopes
B4A	Indus-Dora, depressional, complex, 0 to 2 percent slopes
B5B	Alango-Taylor-Woodslake, depressional, complex, 0 to 6 percent slopes
B80A	Rifle soils, Taylor catena, 0 to 1 percent slopes
B9A	Greaney and Dora soils, 0 to 1 percent slopes, frequently flooded
F11B	Eaglesnest stony loam, 2 to 8 percent slopes, bouldery
F2B	Eaglesnest-Wahlsten complex, 2 to 8 percent slopes, bouldery
F37B	Foglake-Babbitt, bouldery, complex, 0 to 4 percent slopes
F38B	Longsiding-Eaglesnest, bouldery, complex, 0 to 8 percent slopes
F5B	Babbitt, bouldery-Wahlsten, bouldery-Aquepts, rubbly, complex, 0 to 8 percent slopes
F7B	Biwabik-Graycalm complex, 1 to 8 percent slopes
F8D	Biwabik-Graycalm-Friendship complex, pitted, 0 to 18 percent slopes
GP	Pits, gravel-Udipsamments complex

500 0 500

Feet

Figure 13
HYDRIC SOILS
Northshore Mining Company
Gilmore Creek Restoration
St. Louis County, MN

Barr Footer: ArcGIS 10.0, 2012-09-17 10:37 File: I:\Client\NorthShoreMining\Work_Orders\EAW_GilmoreCreek\Maps\Report\Figure 19- NRCS Soils.mxd User: arm2