ATTACHMENT A1

SPIRIT LAKE ESTUARY AND RAILROAD BRIDGES CONSTRUCTION DRAWINGS

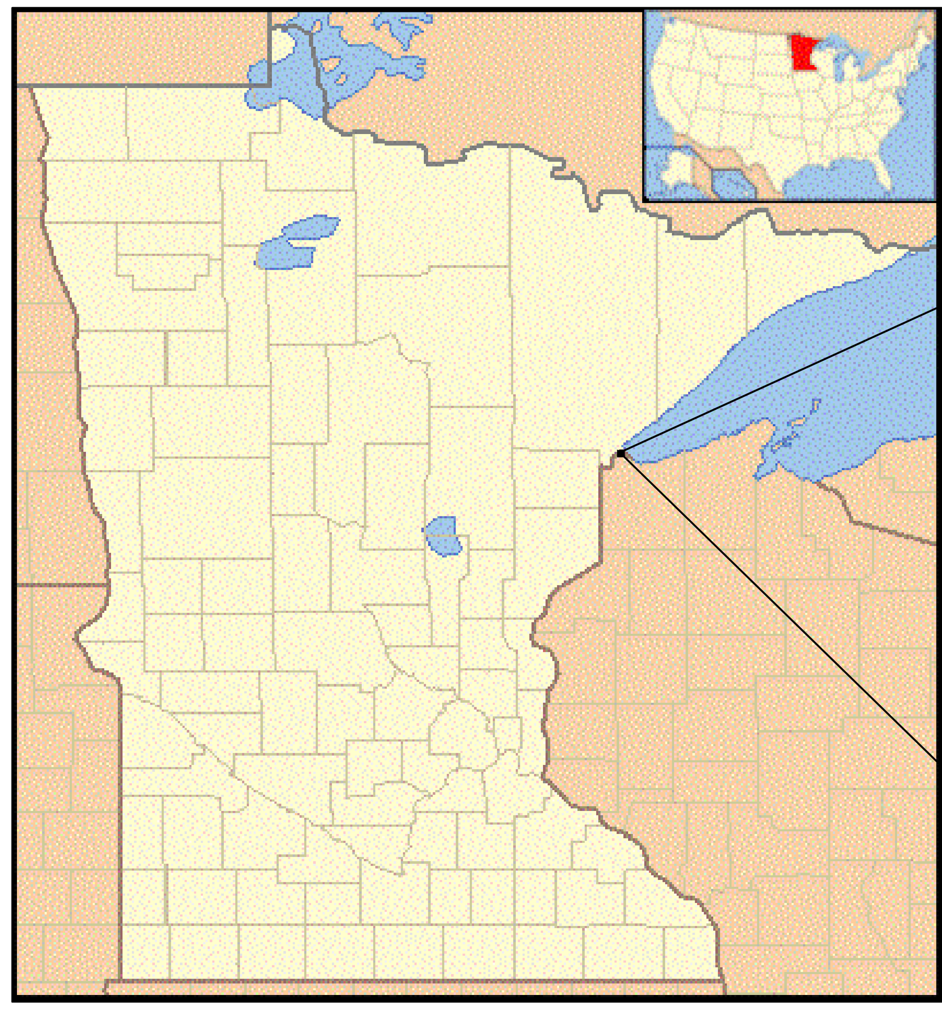

IMAGE SOURCE: MAPSOF.NET

STATE MAP

NOT TO SCALE

IMAGE SOURCE: WWW.MAPQUEST.COM

LOCAL AREA MAP

NOT TO SCALE

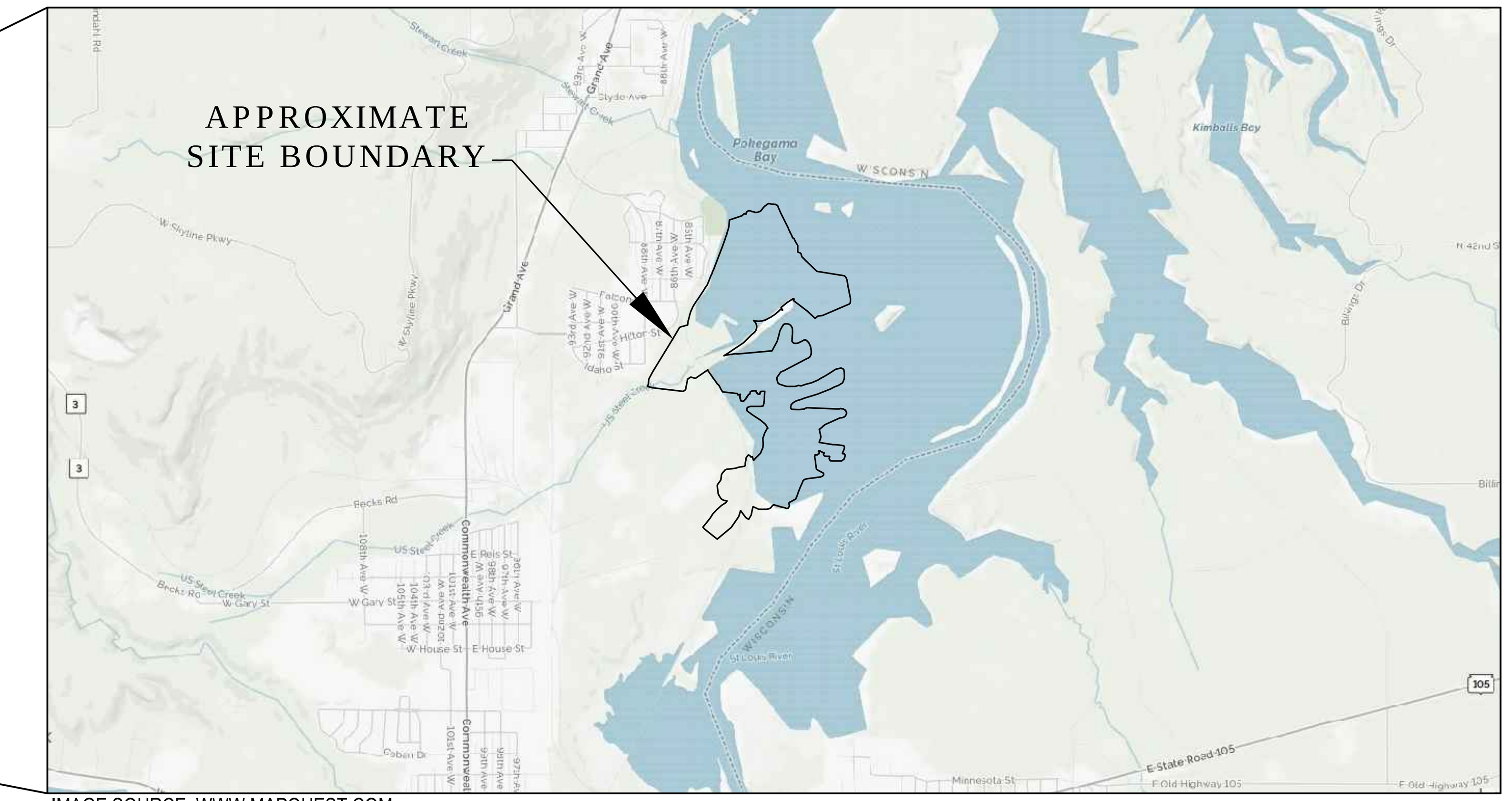

IMAGE SOURCE: WWW.MAPQUEST.COM

VICINITY MAP

NOT TO SCALE

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

PREPARED FOR
EPA REGION 5
CHICAGO, IL

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION	
DESIGNED BY:	LLR
DRAWN BY:	JRM
CHECKED BY:	JMT
PROJECT MANAGER:	JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

TITLE SHEET

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

G-001

SHEET: 1 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\GLAES\PROJECTS\1518924 - SPIRIT LAKE RD\2- DESIGN\1- CADD\4- FIGURES\TITLE SHEET.DWG [TITLE SHEET] OTTO, JUSTIN 5/30/2019 1:02 PM

DRAWING INDEX

SHEET NUMBER	DRAWING NUMBER	SHEET TITLE
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1	G-001	TITLE SHEET
2	G-002	DRAWING INDEX
3	G-003	GENERAL NOTES AND LEGEND
4	G-101	SITE LAYOUT
5	G-102	SITE CONTROL
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7	GE-102	EXISTING CONDITIONS (2 OF 6)
8	GE-103	EXISTING CONDITIONS (3 OF 6)
9	GE-104	EXISTING CONDITIONS (4 OF 6)
10	GE-105	EXISTING CONDITIONS (5 OF 6)
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13	CA-102	SITE ACCESS AND STAGING PLAN - SUBMERGED
14	CA-301	SITE ACCESS DETAILS (1 OF 2)
15	CA-302	SITE ACCESS DETAILS (2 OF 2)
16	CA-103	DEMOLITION PLAN
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17	CU-101	UNNAMED CREEK TEMPORARY DIVERSION PLAN
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19	CU-102	UNNAMED CREEK RELOCATION PLAN (1 OF 2)
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25	CD-301	UPLAND CDF MATERIAL GRADING DETAILS
26	CD-102	UPLAND CDF FINAL GRADING PLAN
27	CD-302	UPLAND CDF DETAILS (1 OF 2)
28	CD-303	UPLAND CDF DETAILS (2 OF 2)
29	CD-501	CDF DETAILS (1 OF 3)
30	CD-103	DELTA CDF MATERIAL GRADING PLAN
31	CD-304	DELTA CDF MATERIAL GRADING DETAILS
32	CD-104	DELTA CDF FINAL GRADING PLAN
33	CD-305	DELTA CDF DETAILS (1 OF 2)
34	CD-306	DELTA CDF DETAILS (2 OF 2)
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37	CD-105	GEOTECHINCAL INSTRUMENTATION PLAN
BORROW AREA		
38	CB-101	BORROW AREA PLAN
39	CB-301	BORROW AREA DETAILS (1 OF 2)
40	CB-302	BORROW AREA DETAILS (2 OF 2)
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42	CR-301	NORTH DREDGE AREA SEDIMENT REMOVAL DETAILS
43	CR-102	UNNAMED POND SEDIMENT REMOVAL PLAN
44	CR-302	UNNAMED POND SEDIMENT REMOVAL DETAILS
45	CR-103	WIRE MILL POND SEDIMENT REMOVAL PLAN
46	CR-303	WIRE MILL POND SEDIMENT REMOVAL DETAILS (1 OF 2)
47	CR-304	WIRE MILL POND SEDIMENT REMOVAL DETAILS (2 OF 2)
48	CR-104	WIRE MILL POND BRIDGE PLAN
49	CR-107	WIRE MILL POND DREDGE MANAGEMENT PLAN **(RESERVED, TO BE COMPLETED FOR FINAL)**
50	CR-108	WIRE MILL DELTA SEDIMENT REMOVAL PLAN
51	CR-305	WIRE MILL DELTA SEDIMENT REMOVAL DETAILS
52	CR-109	WIRE MILL DELTA DREDGE MANAGEMENT PLAN **(RESERVED, TO BE COMPLETED FOR FINAL)**
SEDIMENT REMOVAL AND CAPPING		
53	CS-101	SHALLOW SHELTERED BAY REMOVAL PLAN
54	CS-102	SHALLOW SHELTERED BAY CAPPING PLAN
55	CS-301	SHALLOW SHELTERED BAY REMOVAL AND CAPPING DETAILS (1 OF 2)
56	CS-302	SHALLOW SHELTERED BAY REMOVAL AND CAPPING DETAILS (2 OF 2)
57	CS-501	SHALLOW SHELTERED BAY CAPPING DETAILS
58	CS-103	SHALLOW SHELTERED BAY CAPPING MANAGEMENT PLAN **(RESERVED, TO BE COMPLETED FOR FINAL)**

DRAWING INDEX

SHEET NUMBER	DRAWING NUMBER	SHEET TITLE
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60	CP-501	SEDIMENT PROCESSING FACILITY AND PROCESSING DETAILS
CAPPING		
61	CC-101	UPLAND CAPPING PLAN
62	CC-301	UPLAND CAPPING DETAILS (1 OF 2)
63	CC-302	UPLAND CAPPING DETAILS (2 OF 2)
64	CC-102	UC OFFSHORE SUBAQUEOUS CAPPING PLAN
65	CC-303	UC OFFSHORE SUBAQUEOUS CAPPING DETAILS
66	CC-103	UC OFFSHORE CAPPING MANAGEMENT PLAN **(RESERVED, TO BE COMPLETED FOR FINAL)**
67	CC-104	WIRE MILL OFFSHORE SUBAQUEOUS CAPPING PLAN
68	CC-304	WIRE MILL OFFSHORE SUBAQUEOUS CAP AND COVER DETAILS
69	CC-501	SUBAQUEOUS CAPPING DETAILS
70	CC-105	WIRE MILL OFFSHORE CAPPING MANAGEMENT PLAN **(RESERVED, TO BE COMPLETED FOR FINAL)**
PEDESTRIAN TRAIL		
71	CT-101	PEDESTRIAN TRAIL PLAN AND PROFILE (1 OF 4)
72	CT-102	PEDESTRIAN TRAIL PLAN AND PROFILE (2 OF 4)
73	CT-103	PEDESTRIAN TRAIL PLAN AND PROFILE (3 OF 4)
74	CT-104	PEDESTRIAN TRAIL PLAN AND PROFILE (4 OF 4)
75	CT-301	PEDESTRIAN TRAIL DETAILS
ENHANCED MONITORING NATURAL RECOVERY		
76	CE-101	ENHANCED MONITORED NATURAL RECOVERY PLAN
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77	CH-101	SITE SEEDING AND HABITAT RESTORATION PLAN
78	CH-102	SEDIMENT AND EROSION CONTROL PLAN
79	CH-501	SEDIMENT AND EROSION CONTROL DETAILS
80	CH-103	SHORELINE STABILIZATION PLAN VIEW
81	CH-501	SHORELINE STABILIZATION DETAILS (1 OF 3)
82	CH-502	SHORELINE STABILIZATION DETAILS (2 OF 3)
83	CH-503	SHORELINE STABILIZATION DETAILS (3 OF 3)
WIRE MILL POND CHARACTERISTICALLY HAZARDOUS LEAD AREA		
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85	CL-301	WIRE MILL POND CHARACTERISTICALLY HAZARDOUS LEAD AREA DETAILS (1 OF 1)
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86	BU-001	GENERAL NOTES AND ESTIMATED QUANTITIES
87	BU-101	GENERAL LAYOUT AND TYPICAL SECTIONS
88	BU-102	PILE PLAN AND DETAILS
89	BU-501	PRESTRESSED CONCRETE SLAB BEAM DETAILS (SHEET 1 OF 2)
90	BU-502	PRESTRESSED CONCRETE SLAB BEAM DETAILS (SHEET 2 OF 2)
91	BU-503	WALK AND DECK PLAN AND HANDRAIL DETAILS
WIRE MILL POND RR BRIDGE		
92	BW-001	GENERAL NOTES AND ESTIMATED QUANTITIES
93	BW-101	GENERAL LAYOUT AND TYPICAL SECTIONS
94	BW-102	PILE PLAN AND DETAILS
95	BW-501	PRESTRESSED CONCRETE SLAB BEAM DETAILS (SHEET 1 OF 2)
96	BW-502	PRESTRESSED CONCRETE SLAB BEAM DETAILS (SHEET 2 OF 2)
97	BW-503	WALK AND DECK PLAN AND HANDRAIL DETAILS
POND RR BRIDGE STANDARD DETAILS		
98	BG-501	PRECAST CONCRETE BENT CAP DETAILS AND NOTES
99	BG-502	PRECAST CONCRETE END BENT CAP DETAILS
100	BB-503	WALKWAY AND HANDRAIL DETAILS
101	BG-504	STEEL DETAILS
102	BG-505	MISCELLANEOUS DETAILS
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108	GN-02	GENERAL NOTES
109	GN-03	TYPICAL DETAILS
110	RD-01	PERMANENT CROSSINGS PLAN
111	RD-02	TEMPORARY CROSSINGS PLAN
REFERENCE DRAWINGS		
5 SHEETS	NA	PROPERTY MAP (LHB LAND SURVEYORS)

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

DRAWING INDEX

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

G-002

SHEET: 2 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\CLAIMS\PROJECTS\11800's - SPIRIT LAKE REDI\~DESIGN\~CADD\~FIGURES\DRAWING INDEX\DWG DRAWING INDEX\MITHER, JASON 4/12/2019 9:53 AM

GENERAL CONSTRUCTION NOTES:

1. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. THE CONTRACTOR IS RESPONSIBLE FOR PERFORMING ALL WORK IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS AS REQUIRED.
2. THE CONTRACTOR IS RESPONSIBLE FOR PROTECTING IN PLACE ALL ACTIVE UTILITY STRUCTURES (BOTH BELOW AND ABOVE GROUND), PIPING, AND APPURTENANCES THAT ARE TO REMAIN IN PLACE UNLESS OTHER TREATMENT IS SPECIFIED.
3. ANY AFFECTED ABANDONED UTILITIES THAT INTERSECT WORK AREAS SHALL BE VERIFIED BY THE CONTRACTOR, AND ABANDONMENT MODIFIED AS NECESSARY TO AVOID SPILLS OR OTHER IMPACTS TO SURROUNDING AREAS.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MINIMIZING AND CLEANING UP DUST AND MUD ON ALL ROADS DUE TO VEHICLES ARRIVING AND LEAVING THE JOB SITE AS PART OF THIS WORK.
5. IT SHALL BE UNDERSTOOD THAT FAILURE TO MENTION SPECIFICALLY ANY WORK THAT WOULD NORMALLY BE REQUIRED TO COMPLETE THE PROJECT SHALL NOT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY TO COMPLETE SUCH WORK.
6. SHOULD THE CONTRACTOR DISCOVER DISCREPANCIES BETWEEN THE PLANS AND FIELD CONDITIONS, THE OWNER SHALL BE NOTIFIED IMMEDIATELY TO RESOLVE THE SITUATION. THE CONTRACTOR SHALL ASSUME ALL RESPONSIBILITY FOR ANY FIELD CORRECTIONS OR ADJUSTMENTS MADE WITHOUT NOTIFYING THE OWNER.
7. EXISTING UTILITIES AND STRUCTURES (UNDERGROUND, SURFACE, OR OVERHEAD) ARE INDICATED ONLY TO THE EXTENT THAT SUCH INFORMATION WAS MADE AVAILABLE TO OR DISCOVERED BY THE ENGINEER IN PREPARING THE DRAWINGS. LOCATION, CONFIGURATIONS, AND ELEVATIONS OF EXISTING UNDERGROUND POWER, TELEPHONE, FIBER OPTIC CABLE, DUCT WAYS, SPRINKLER SYSTEMS, SEPTIC SYSTEMS, AND WATER, GAS, AND SEWER SERVICE LINES MAY NOT ALL BE INDICATED. OTHER UTILITIES AND STRUCTURES MAY BE PRESENT. UNDERGROUND LOCATIONS AND ELEVATIONS OF EXISTING UTILITIES AND STRUCTURES, AS FURNISHED BY THE OWNER OF EACH UTILITY OR STRUCTURE, ARE APPROXIMATE. OVERHEAD UTILITIES ARE NOT SHOWN IN PROFILE. CONTRACTOR SHALL PROVIDE PRIVATE UTILITY LOCATE SERVICES TO MAP UTILITIES WITHIN THE LIMITS OF WORK.
8. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE AND INSTALL CONSTRUCTION FENCING FOR SECURITY AND PUBLIC SAFETY. JOB SAFETY SHALL BE SOLELY THE RESPONSIBILITY OF THE CONTRACTOR. HAZARDS SUCH AS OPEN MANHOLES SHOULD BE MARKED AND COVERED WITH STEEL PLATES BY CONTRACTOR.
9. RESTORE ANY EXISTING STRUCTURES THAT ARE DISTURBED, DAMAGED, OR REMOVED BY CONSTRUCTION TO THEIR ORIGINAL LOCATION AND CONDITION, UNLESS OTHERWISE INDICATED.
10. TEMPORARY FACILITIES ARE UP TO CONTRACTOR TO SIZE AND LAYOUT. ALTERNATE BUT EQUIVALENT DESIGNS ARE ALLOWED. SEE TECHNICAL SPECIFICATION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.
11. SLOPES DEPICTED ON DRAWINGS MAY IMPLY MAX VERTICAL CUTS AND STEEP SLOPES IN SOME LOCATIONS, WHICH ARE INTENDED ONLY TO REFLECT THE ANTICIPATED EXTENT OF CONTAMINATED SEDIMENT. THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF ALL CUT AND FILL SLOPES IN THE LIMITS OF WORK, AND TO PROVIDE APPROPRIATE TEMPORARY SHORING OR SUPPORT OF STRUCTURES FOR CUT SLOPES AS NEEDED TO PREVENT SEDIMENT OR SOIL INSTABILITY, SLOUGHING INTO EXCAVATION, OR SETTLEMENT OF ADJACENT STRUCTURES OR GRADES. ADDITIONAL SEDIMENT OR SOIL SLOUGHING INTO EXCAVATION AREAS BEYOND THE LIMITS OF THE APPROVED EXCAVATION PLAN WILL BE THE CONTRACTOR'S RESPONSIBILITY FOR PAYMENT. CONTRACTOR IS RESPONSIBLE FOR PREVENTING SEDIMENT OR SOIL SLOUGHING INTO ADJACENT SURFACES OR WATER RESOURCES AS SUSPENDED SOLIDS.
12. IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY MINNESOTA DIG SYSTEMS AT 1-651-454-8388 REGARDING UTILITIES IN THE CONSTRUCTION SITE.
13. SEE BASIS OF DESIGN REPORT FOR SUGGESTED SEQUENCE OF CONSTRUCTION.

ABBREVIATIONS:

APPROX	APPROXIMATE
AWL	AVERAGE WATER LEVEL
C	CENTERLINE
CDF	CONFINED DISPOSAL FACILITY
CMP	CORRUGATED METAL PIPE
DEM	DIGITAL ELEVATION MODEL
EA	EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. PBC
ELEV	ELEVATION
EMNR	ENHANCED MONITORED NATURAL RECOVERY
EPA	ENVIRONMENTAL PROTECTION AGENCY
FGM	FLEXIBLE GROWTH MEDIUM
FT	FEET
GIS	GEOGRAPHIC INFORMATION SYSTEM
GPS	GLOBAL POSITIONING SYSTEM
HDPE	HIGH-DENSITY POLYETHYLENE PLASTIC PIPE
HORIZ	HORIZONTAL
LB	POUNDS
LOD	LIMITS OF DISTURBANCE
LWL	LOW WATER LEVEL
MAT	MATERIAL
MAX	MAXIMUM
MDEQ	MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
MIL	MILLIMETER
MIN	MINIMUM
MN	MINNESOTA
MTB	MOBILE TURBIDITY BARRIER
MW	MONITORING WELL
N	NORTH
NAD83	NORTH AMERICAN DATUM 1983
NAPL	NON-AQUEOUS PHASE LIQUID
NAVD88	NORTH AMERICAN VERTICAL DATUM 1988
NOAA	NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NPDES	NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
NPRY	NORTHERN PACIFIC RAILWAY
NTS	NOT TO SCALE
OD	OUTSIDE DIAMETER
OHP	OVERHEAD POWER LINE
OHWL	ORDINARY HIGH WATER LEVEL
PRE	PRELIMINARY
RA	REMEDIAL ACTION
RR	RAILROAD
S	SLOPE
SS	SEWER LINE
SC	SILT CURTAIN
SCH.	SCHEDULE
SF	SILT FENCE
TEMP	TEMPORARY
TERMS	TURF AND EARTH REINFORCED MAT SYSTEM
TPH	TOTAL PETROLEUM HYDROCARBONS
TREL	THEORETICAL RAILROAD EMBANKMENT LINE
TRM	TURF REINFORCEMENT MAT
TYP	TYPICAL
UC	UNNAMED CREEK
USACE	UNITED STATES ARMY CORPS OF ENGINEERS
USGS	UNITED STATES GEOLOGICAL SURVEY
VERT	VERTICAL
W	WATER LINE
WMP	WIRE MILL POND
WWT	WASTE WATER TREATMENT BUILDING
YR	YEAR

INFORMATION SOURCE NOTES:

1. LIDAR TOPOGRAPHIC AND LAND BASED SURVEYS COMPLETED BY LHB, DATE OF SURVEY, 27 OCTOBER THROUGH 09 NOVEMBER, 2016. THE LAND BASED SURVEY INCLUDED THE PROPERTY MAP SURVEY AND RAILROAD TRACK TOP OF RAIL SURVEY. AECOM COMPLETED A SURVEY IN DECEMBER 2018 TO SUPPLEMENT THE EXISTING RAILROAD TRACK SURVEY DATA.
2. BATHYMETRIC SURVEY AND SIDE SCAN SURVEY COMPLETED CONCURRENTLY BY EA, DATE OF SURVEY, 03 NOVEMBER THROUGH 05 DECEMBER 2016.
3. HORIZONTAL DATUM IS MINNESOTA NORTH ZONE STATE PLANE NAD83 U.S. SURVEY FEET AND VERTICAL DATUM IS NAVD88.
4. IMAGE SOURCE: MICROSOFT CORP., 2017. SID IMAGE SOURCE: LBH, 27 OCTOBER THROUGH 09 NOVEMBER, 2016.
5. APPROXIMATE DEPOSIT BOUNDARIES, CHARACTERISTICALLY HAZARDOUS FOR LEAD SEDIMENT LOCATIONS ARE ESTIMATED BASED ON AN EXISTING ANALYTICAL DATA.
6. WETLAND LOCATIONS BASED ON WETLAND DELINEATION COMPLETED BY URS/AECOM IN MONTH SEPTEMBER 2013.
7. MINNESOTA DNR ESTABLISHED THE OHWL FOR SPIRIT LAKE IN 2014 AT 602.8 FEET (FT) AND THE OLWL FOR SPIRIT LAKE AT 601.1 FT IGLD 85. THESE ELEVATIONS WERE CONVERTED FOR THESE DRAWINGS TO SHOW THE OHWL AT 603.0 FT NAVD 88 AND THE OLWL AT 601.3 NAVD 88. EA USED WATER LEVEL DATA FROM THE NATIONAL OCEANIC AND ATMOSHEPERIC ADMINISTRATION (NOAA) STATION 9099064 FROM THE LAST 30 YEARS TO ESTABLISH THE AVERAGE WATER LEVEL IN SPIRIT LAKE AT 602.1 FT NAVD 88.
8. CONTRACTOR SHALL FIELD VERIFY ALL MAPPED UTILITIES IN THESE DRAWINGS WITHIN WORK AREAS AND SUPPLEMENT WITH PRIVATE UTILITY LOCATION SUBCONTRACTOR AS INDICATED IN THE CONTRACT DOCUMENTS.
9. NAVIGATION CHANNEL HAS BEEN DIGITIZED FROM NOAA CHART 14975, DATED 9/29/2017. USACE DOES NOT MAINTAIN THIS SEGMENT OF THE ST. LOUIS RIVER, THROUGH SPIRIT LAKE, AND FLOODING IN 2012 MAY HAVE SHOALED AREAS WITHIN THE CHANNEL.

LEGEND:

Symbol	Description
SP — SP	SHEET PILE WALL
—	TURF REINFORCMENT MAT/ FLEX GROWTH MEDIUM
—	FLEX GROWTH MEDIUM
—	WARNING BUOY
—	ACCESS ROADS
—	COURSE AGGREGRATE
—	RIPRAP
—	GEOTEXTILE
—	TIMBER MATS
—	SAND
—	EARTHEN DIKE
—	PORTADAM
—	JERSEY BARRIER
—	EROSION CONTROL BLANKET
—	PROPOSED WALKING GRATE
—	PROPOSED GEOCELL
—	UPLAND CAPPING
—	CAPPING ARMOUR
—	INTERPRETIVE SIGN
—	PROPOSED LOG VANE/ROOT WAD
—	PROPOSED RIFFLE GRADE CONTROL
—	PROPOSED CROSS VANE
—	DECIDUOUS TREE
—	CONIFEROUS TREE
—	GUARD RAIL
—	TREES
—	BRIDGE
—	WATER LEVEL SYMBOL
—	ORDINARY HIGH WATER LEVEL (603.0 FEET)
OHWL — OHWL	ORDINARY HIGH WATER LEVEL
—	ORDINARY LOW WATER LEVEL (601.3 FEET)
—	AVERAGE WATER LEVEL (602.1 FEET)
SA — SA	AVAILABLE STAGING AREA OR EQUIVALENT
SF — SF — SF	SILT FENCE
590	PROPOSED CONTOURS
—	RA BOUNDARY
—	PROPERTY LINE
—	WATER SURFACE
WT — WT	WATER TREATMENT PAD
T — T	TURBIDITY BARRIER
—	CAPPING SURFACE
—	REMOVAL LIMIT
R — R — R — R — R	RAILROAD CROSSING
TE — TE — TE	TERMS
—	WETLAND BOUNDARIES
590	EXISTING CONTOURS
—	APPROXIMATE RAIL ROAD LOCATION
X — X — X — X — X — X — X	APPROXIMATE FENCE LOCATION
BF — BF — BF	APPROXIMATE BUILDING FOUNDATION
—	PROPERTY LINE
—	EXISTING GROUNDWATER
—	CONTROL POINT
—	LIGHT POLE
—	EXISTING WELL
—	STORM CULVERT BOX
—	TRANSMISSION TOWER
—	STORM SEWER INLET
—	EXISTING CULVERT
—	HYDRANT
S	SANITARY SEWER MANHOLE
—	POST
—	POWER POLE
—	SAMPLE LOCATION
DP-10	DRIVE POINT PIEZOMETER
SP-7	SETTLEMENT PLATE
BEC — BEC — BEC	BURIED ELECTRIC CABLE
BEC — BEC — BEC	BURIED ELECTRIC CABLE - VERIFIED
O/H — O/H — O/H	OVERHEAD ELECTRIC
8A — 8A — 8A	8" ACID SEWER
10A — 10A — 10A	10" ACID SEWER
SS	COMBINED SANITARY SEWER
3X4CSO — 3X4CSO	3' X 4' COMBINED SEWER PIPE
4X6CSO — 4X6CSO	4' X 6' COMBINED SEWER PIPE
6CSO — 6CSO	6" COMBINED SEWER PIPE
8CSO — 8CSO	8" COMBINED SEWER PIPE
10CSO — 10CSO	10" COMBINED SEWER PIPE
12CSO — 12CSO	12" COMBINED SEWER PIPE
18CSO — 18CSO	18" COMBINED SEWER PIPE
24CSO — 24CSO	24" COMBINED SEWER PIPE
30CSO — 30CSO	30" COMBINE SEWER PIPE
84CSO — 84CSO	84" COMBINED SEWER PIPE
8SS — 8SS — 8SS	8" SANITARY SEWER PIPE
12SS — 12SS — 12SS	12" SANITARY SEWER PIPE
SP — SP — SP	STEAM SEWER PIPE
1.25SP — 1.25SP — 1.25SP	1.25" STEAM SEWER PIPE
2SP — 2SP — 2SP	2" STEAM SEWER PIPE
2.5SP — 2.5SP	2.5" STEAM SEWER PIPE
3SP — 3SP — 3SP	3" STEAM SEWER PIPE
4SP — 4SP — 4SP	4" STEAM SEWER PIPE
5SP — 5SP — 5SP	5" STEAM SEWER PIPE
6SP — 6SP — 6SP	6" STEAM SEWER PIPE
7SP — 7SP — 7SP	7" STEAM SEWER PIPE
8SP — 8SP — 8SP	8" STEAM SEWER PIPE
10SP — 10SP — 10SP	10" STEAM SEWER PIPE
12SP — 12SP — 12SP	12" STEAM SEWER PIPE
STM — STM — STM	STORM SEWER PIPE
8STM — 8STM	8" STORM SEWER PIPE
10STM — 10STM	10" STORM SEWER PIPE
12STM — 12STM	12" STORM SEWER PIPE
24STM — 24STM	24" STORM SEWER PIPE
30STM — 30STM	30" STORM SEWER PIPE
WS — WS — WS	WATER SERVICE
4 W — 4 W	4" WATER PIPE
6 W — 6 W	6" WATER PIPE
8 W — 8 W	8" WATER PIPE
10 W — 10 W	10" WATER PIPE
12 W — 12 W	12" WATER PIPE
14 W — 14 W	14" WATER PIPE
16 W — 16 W	16" WATER PIPE
18 W — 18 W	18" WATER PIPE
24 W — 24 W	24" WATER PIPE
30 W — 30 W	30" WATER PIPE
42 W — 42 W	42" WATER PIPE
48 W — 48 W	48" WATER PIPE
—	DRAINAGE FEATURE FLOW DIRECTION
—	CONSTRUCTION ENTRANCE

13 / CA-501: SECTION NUMBER; SHEET NUMBER OF SECTION

A / CU-501: DETAIL NUMBER; SHEET NUMBER OF DETAIL

NOTE:

1. IF THE SECTION, DETAIL, SCHEMATIC, OR DIAGRAM IS REFERENCED ON MULTIPLE SHEETS, ALL SHEETS ARE REFERENCED WITHIN THE DETAIL BUBBLE.

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: XX
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN

DULUTH, MINNESOTA

GENERAL NOTES AND LEGEND

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

G-003

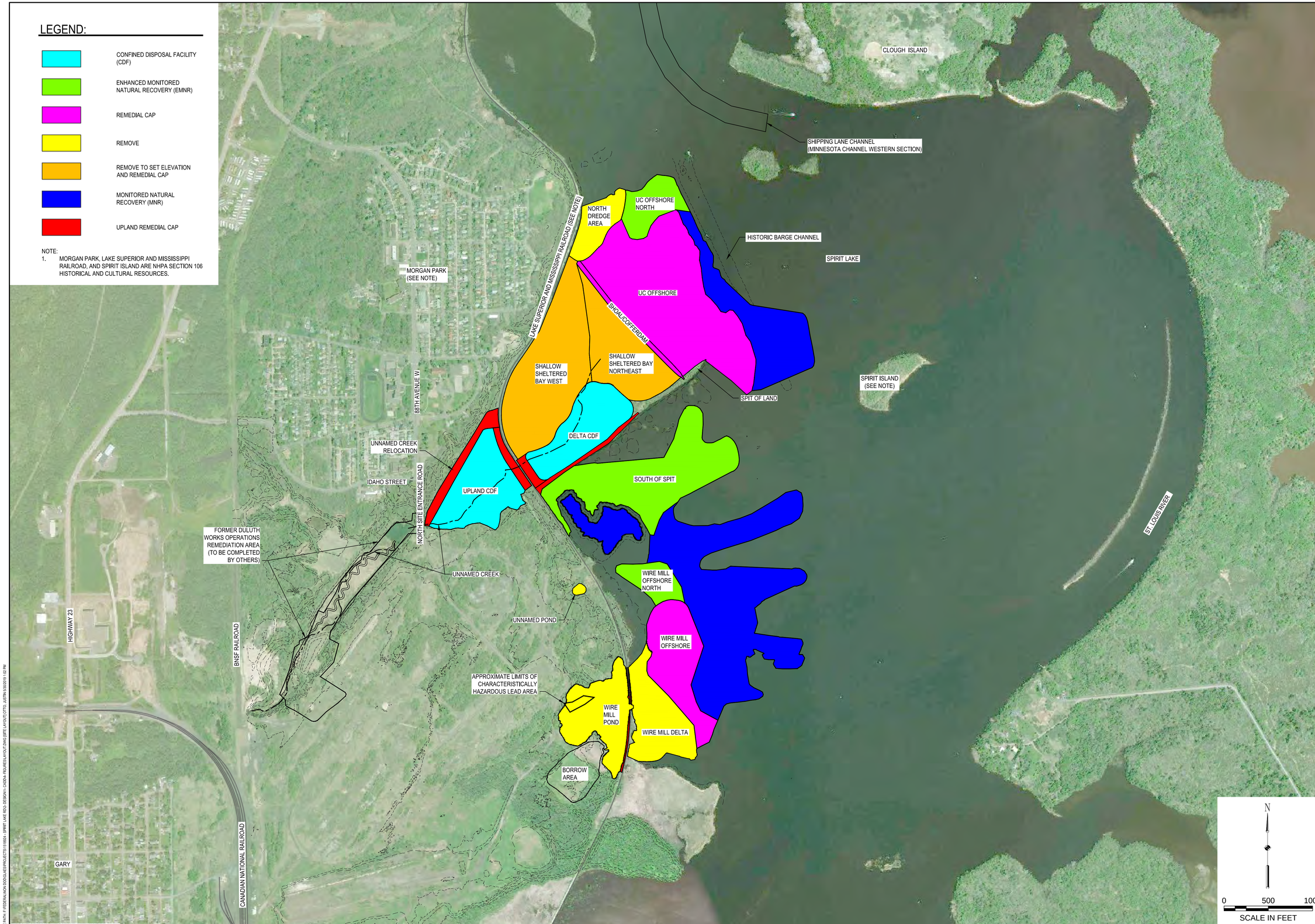
PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\GLAES\PROJECTS\1518924 - SPIRIT LAKE RD\2- DESIGN\1- CADD\4- FIGURES\GENERAL NOTES AND LEGEND.DWG [GENERAL NOTES AND LEGEND] OTTO, JUSTIN 5/30/2019 1:02 PM

LEGEND:

- CONFINED DISPOSAL FACILITY (CDF)
- ENHANCED MONITORED NATURAL RECOVERY (EMNR)
- REMEDIAL CAP
- REMOVE
- REMOVE TO SET ELEVATION AND REMEDIAL CAP
- MONITORED NATURAL RECOVERY (MNR)
- UPLAND REMEDIAL CAP

NOTE:
1. MORGAN PARK, LAKE SUPERIOR AND MISSISSIPPI RAILROAD, AND SPIRIT ISLAND ARE NHPA SECTION 106 HISTORICAL AND CULTURAL RESOURCES.



REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JJB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN

DULUTH, MINNESOTA

SITE LAYOUT

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL
847-915-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

G-101

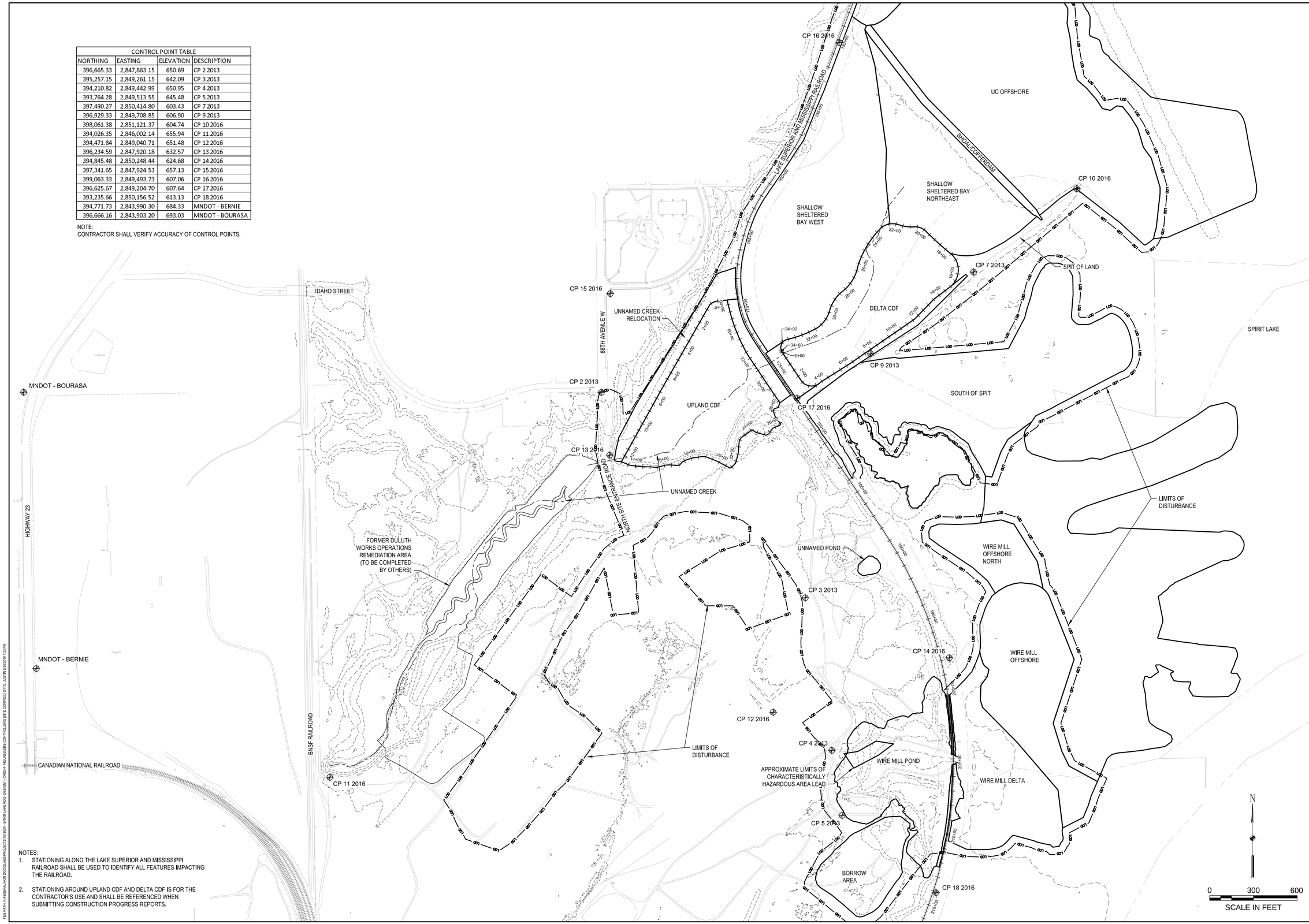
SHEET: 4 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: P:\FEDERAL\NON DOD\CLIENTS\EPA\PROJECTS\1518924 - SPIRIT LAKE REDX - DESIGN\4 - CADD\4.1 FIGURES\LAYOUT\DWG\SITE LAYOUT\DTTD_JJB\TRN-G\2020\19 1:02 PM

CONTROL POINT TABLE			
NORTHING	EASTING	ELEVATION	DESCRIPTION
396,665.33	2,847,863.15	650.69	CP 2 2013
395,257.15	2,849,261.15	642.09	CP 3 2013
394,210.82	2,849,442.99	650.95	CP 4 2013
393,764.28	2,849,513.55	645.48	CP 5 2013
397,490.27	2,850,414.80	603.43	CP 7 2013
396,929.33	2,849,708.85	606.90	CP 9 2013
398,061.38	2,851,121.37	604.74	CP 10 2016
394,026.35	2,846,002.14	655.94	CP 11 2016
394,471.84	2,849,040.71	651.48	CP 12 2016
396,234.59	2,847,920.18	632.57	CP 13 2016
394,845.48	2,850,248.44	624.68	CP 14 2016
397,341.65	2,847,924.53	657.13	CP 15 2016
399,063.33	2,849,493.73	607.06	CP 16 2016
396,625.67	2,849,204.70	607.64	CP 17 2016
393,235.66	2,850,156.52	613.13	CP 18 2016
394,771.73	2,843,990.30	684.33	MNDOT - BERNIE
396,666.16	2,843,903.20	693.03	MNDOT - BOURASA

NOTE:
CONTRACTOR SHALL VERIFY ACCURACY OF CONTROL POINTS.



NOTES:
1. STATIONING ALONG THE LAKE SUPERIOR AND MISSISSIPPI RAILROAD SHALL BE USED TO IDENTIFY ALL FEATURES IMPACTING THE RAILROAD.
2. STATIONING AROUND UPLAND CDF AND DELTA CDF IS FOR THE CONTRACTOR'S USE AND SHALL BE REFERENCED WHEN SUBMITTING CONSTRUCTION PROGRESS REPORTS.

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN

DULUTH, MINNESOTA

SITE CONTROL

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL
847-915-8010

DATE: MAY 2019

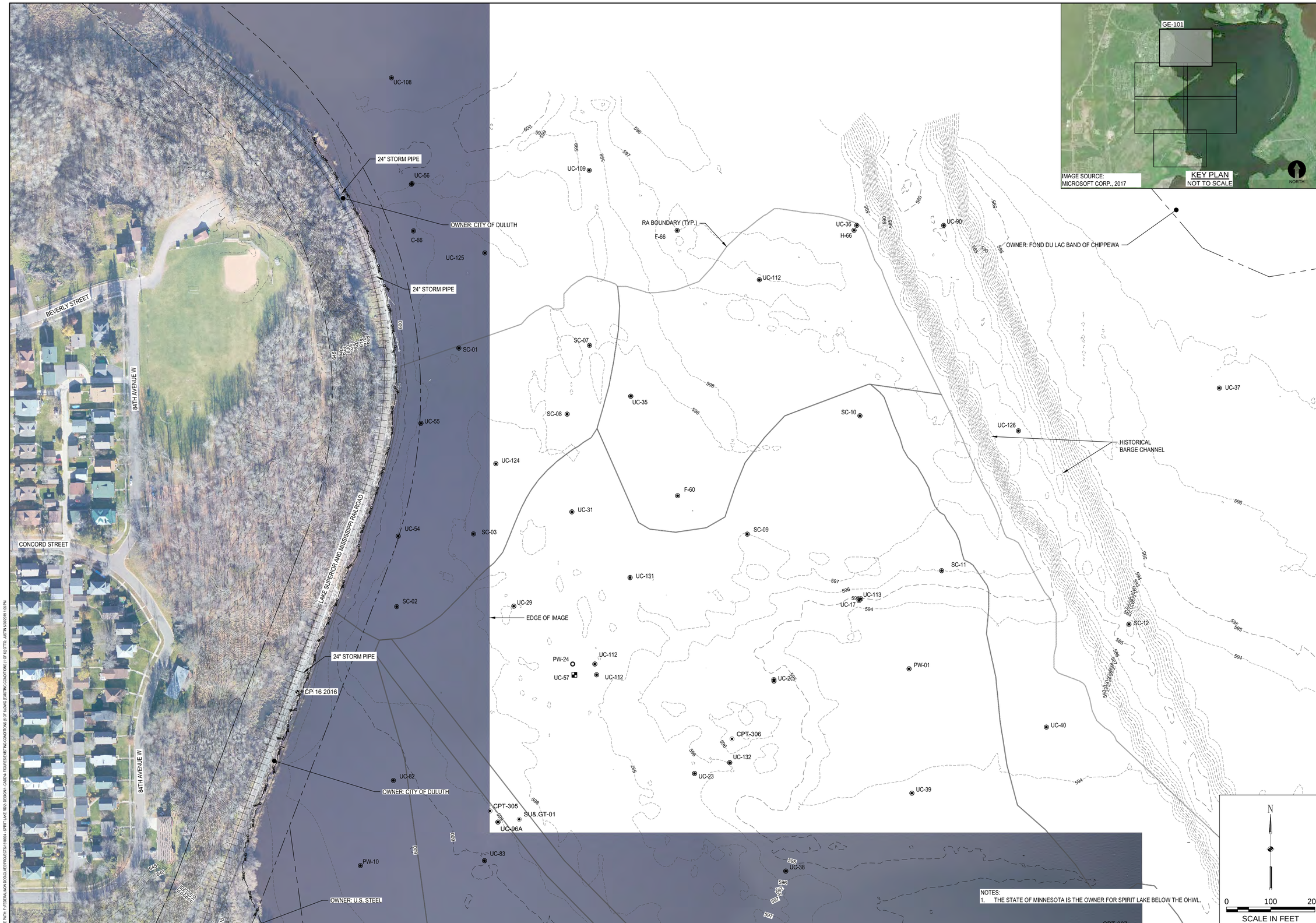
PROJECT NUMBER: 1518924

G-102

SHEET: 5 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\GLAES\PROJECTS\1518924 - SPIRIT LAKE RDO_DESIGN\1-CADD\4-TR\SITE CONTROL\SITE CONTROL.DWG [SITE CONTROL] OTTO, JUSTIN 5/30/2019 1:03 PM



NOTES:
1. THE STATE OF MINNESOTA IS THE OWNER FOR SPIRIT LAKE BELOW THE OHWL.

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

EXISTING CONDITIONS (1 OF 6)

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924
GE-101
SHEET: 6 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: P:\FEDERAL\NON DOD\GLAES\PROJECTS\151924 - SPIRIT LAKE RDA\-DESIGN\+CADD\4-FIGURES\EXISTING CONDITIONS\6 (SP 6).DWG [EXISTING CONDITIONS | (1 OF 6)] LTTD., JUSTIN 5/30/2019 1:05 PM

NOTES:

1. ORDINARY HIGH WATER EXTENDS UPSTREAM FOR EXISTING DRAINAGE FEATURES AT THE UNNAMED CREEK DISCHARGE LOCATION; HOWEVER, THE OHWL FOR DESIGN PURPOSES SEPARATING SPIRIT LAKE FROM UPLAND AREAS IS SHOWN.
2. THE STATE OF MINNESOTA IS THE OWNER FOR SPIRIT LAKE BELOW THE OHWL.

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN

DULUTH, MINNESOTA

EXISTING CONDITIONS (2 OF 6)

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

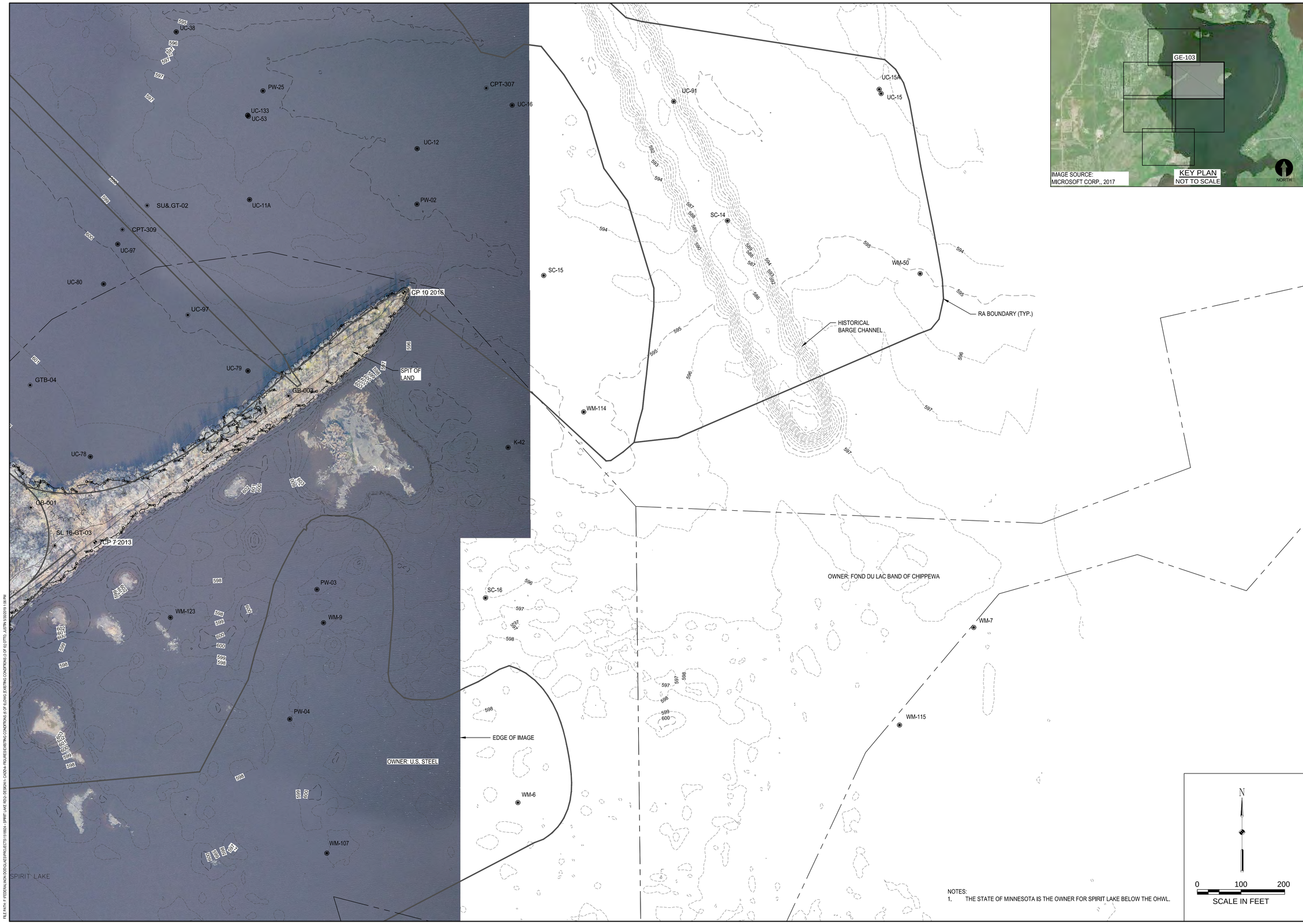
PROJECT NUMBER: 1518924

GE-102

SHEET: 7 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\CLIENTS\EPA\PROJECTS\1518924 - SPIRIT LAKE RDU - DESIGN\1 - CAD\Arc FIGURES\EXISTING CONDITIONS 6 OF 6\GTB\ EXISTING CONDITIONS 6 OF 6\GTB\ JUSTIN 5/30/2019 1:05 PM



NOTES:
1. THE STATE OF MINNESOTA IS THE OWNER FOR SPIRIT LAKE BELOW THE OHWL.

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

EXISTING CONDITIONS (3 OF 6)

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

GE-103

SHEET: 8 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: P:\FEDERAL\MON\DOUGLAS\PROJECTS\151924 - SPIRIT LAKE EDC\-DESIGN\-CADD\-FIGURES\EXISTING CONDITIONS (8 OF 8)\DWG (EXISTING CONDITIONS (3 OF 6) OTTO, JUSTIN 2/26/2019 1:06 PM

NOTES:
1. THE STATE OF MINNESOTA IS THE OWNER FOR SPIRIT LAKE BELOW THE OHWL.

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

EXISTING CONDITIONS (4 OF 6)

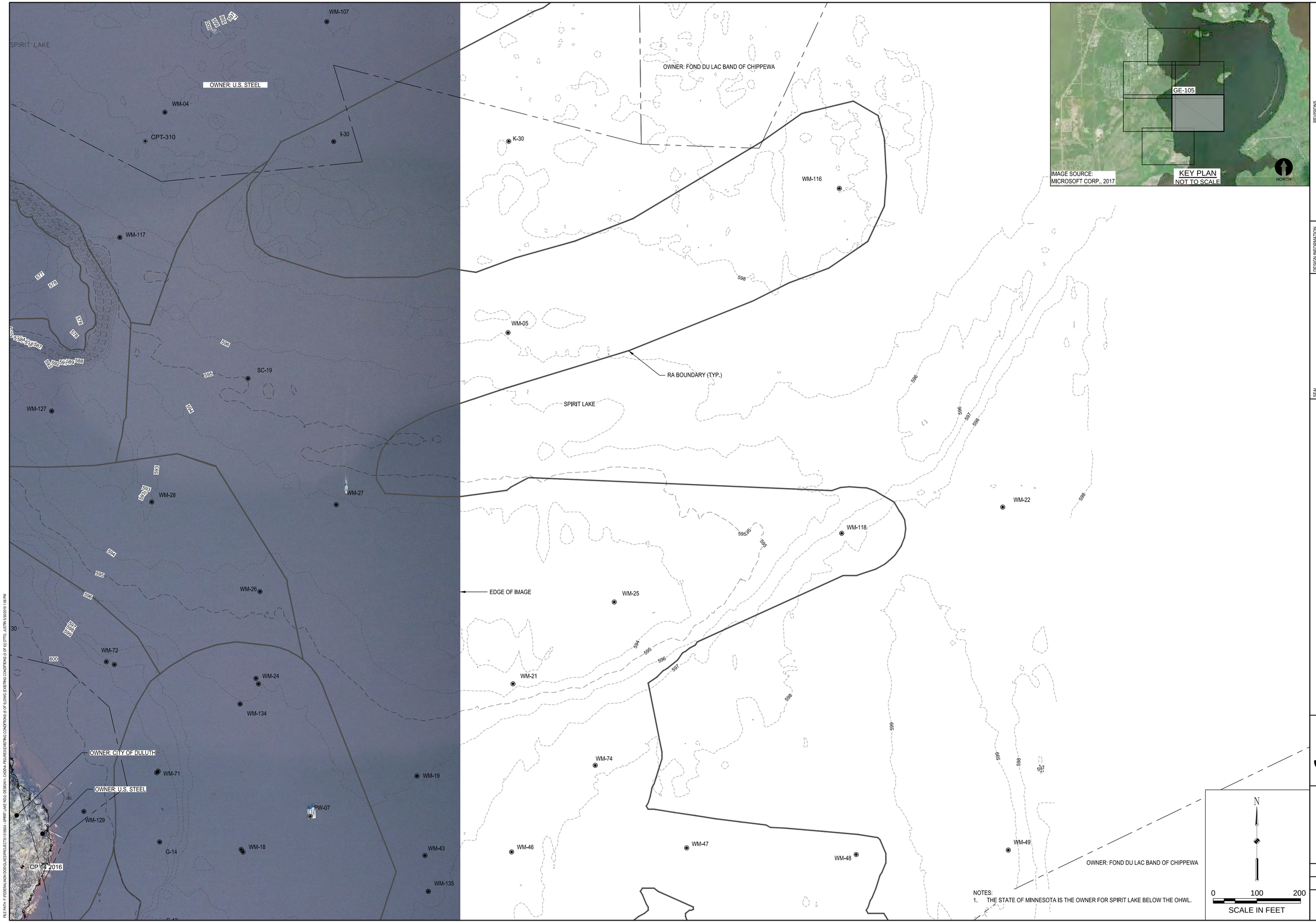
PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924
GE-104
SHEET: 9 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\CLIENTS\EPA\PROJECTS\1518924_SPIRIT LAKE RDCs\DESIGN\1-CADD\4-FIGURES\EXISTING CONDITIONS\4 OF 6\DWG\EXISTING CONDITIONS 4 OF 6\OTTO_JUSTIN 5/20/2019 1:06 PM



NOTES:
1. THE STATE OF MINNESOTA IS THE OWNER FOR SPIRIT LAKE BELOW THE OHWL.

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

EXISTING CONDITIONS (5 OF 6)

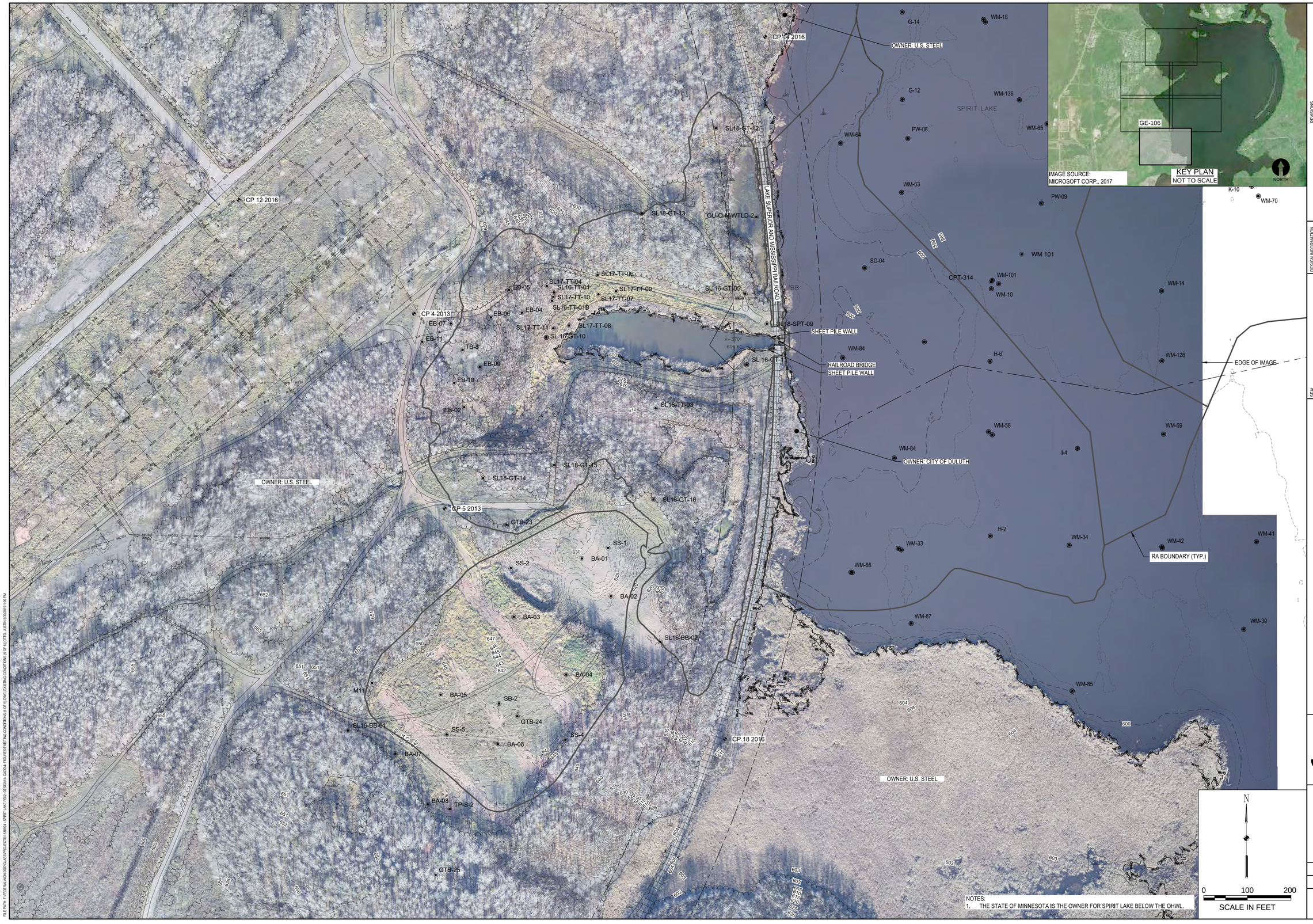
PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924
GE-105
SHEET: 10 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\GLAES\PROJECTS\11180\4 - SPIRIT LAKE RDA\-DESIGN\-CADD\4-FIGURES\EXISTING CONDITIONS\5 OF 6\DWG EXISTING CONDITIONS 5 OF 6.DWG [EXISTING CONDITIONS 5 OF 6] (JTTR) JJSTRN 5/30/2019 1:05 PM



NOTES:
1. THE STATE OF MINNESOTA IS THE OWNER FOR SPIRIT LAKE BELOW THE OHWL.

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN

DULUTH, MINNESOTA

EXISTING CONDITIONS (6 OF 6)

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

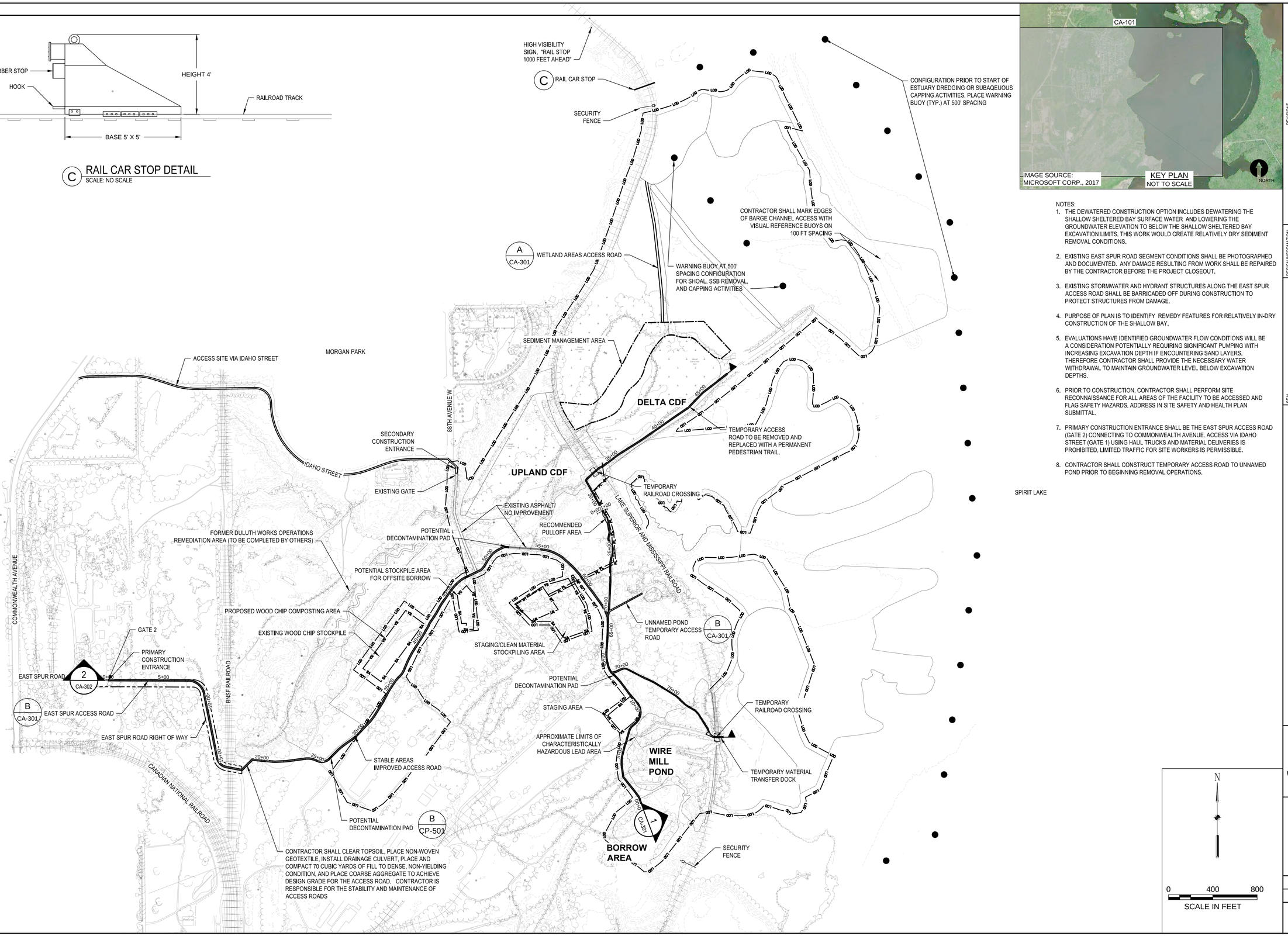
GE-106

SHEET: 11 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\ALLIES\PROJECTS\1518924 - SPIRIT LAKE RDC\-DESIGN\-CADD\4-PROJ\RESE\EXISTING CONDITIONS (6 OF 6)\GTR2_EXISTING CONDITIONS (6 OF 6).DWG, JJSTIN 5/30/2019 1:08 PM

C RAIL CAR STOP DETAIL
SCALE: NO SCALE



NOTES:

1. THE DEWATERED CONSTRUCTION OPTION INCLUDES DEWATERING THE SHALLOW SHELTERED BAY SURFACE WATER AND LOWERING THE GROUNDWATER ELEVATION TO BELOW THE SHALLOW SHELTERED BAY EXCAVATION LIMITS. THIS WORK WOULD CREATE RELATIVELY DRY SEDIMENT REMOVAL CONDITIONS.
2. EXISTING EAST SPUR ROAD SEGMENT CONDITIONS SHALL BE PHOTOGRAPHED AND DOCUMENTED. ANY DAMAGE RESULTING FROM WORK SHALL BE REPAIRED BY THE CONTRACTOR BEFORE THE PROJECT CLOSEOUT.
3. EXISTING STORMWATER AND HYDRANT STRUCTURES ALONG THE EAST SPUR ACCESS ROAD SHALL BE BARRICADED OFF DURING CONSTRUCTION TO PROTECT STRUCTURES FROM DAMAGE.
4. PURPOSE OF PLAN IS TO IDENTIFY REMEDY FEATURES FOR RELATIVELY IN-DRY CONSTRUCTION OF THE SHALLOW BAY.
5. EVALUATIONS HAVE IDENTIFIED GROUNDWATER FLOW CONDITIONS WILL BE A CONSIDERATION POTENTIALLY REQUIRING SIGNIFICANT PUMPING WITH INCREASING EXCAVATION DEPTH IF ENCOUNTERING SAND LAYERS, THEREFORE CONTRACTOR SHALL PROVIDE THE NECESSARY WATER WITHDRAWAL TO MAINTAIN GROUNDWATER LEVEL BELOW EXCAVATION DEPTHS.
6. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PERFORM SITE RECONNAISSANCE FOR ALL AREAS OF THE FACILITY TO BE ACCESSED AND FLAG SAFETY HAZARDS. ADDRESS IN SITE SAFETY AND HEALTH PLAN SUBMITTAL.
7. PRIMARY CONSTRUCTION ENTRANCE SHALL BE THE EAST SPUR ACCESS ROAD (GATE 2) CONNECTING TO COMMONWEALTH AVENUE. ACCESS VIA IDAHO STREET (GATE 1) USING HAUL TRUCKS AND MATERIAL DELIVERIES IS PROHIBITED, LIMITED TRAFFIC FOR SITE WORKERS IS PERMISSIBLE.
8. CONTRACTOR SHALL CONSTRUCT TEMPORARY ACCESS ROAD TO UNNAMED POND PRIOR TO BEGINNING REMOVAL OPERATIONS.

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

SITE ACCESS AND STAGING PLAN - DEWATERED

PREPARED FOR:
EPA

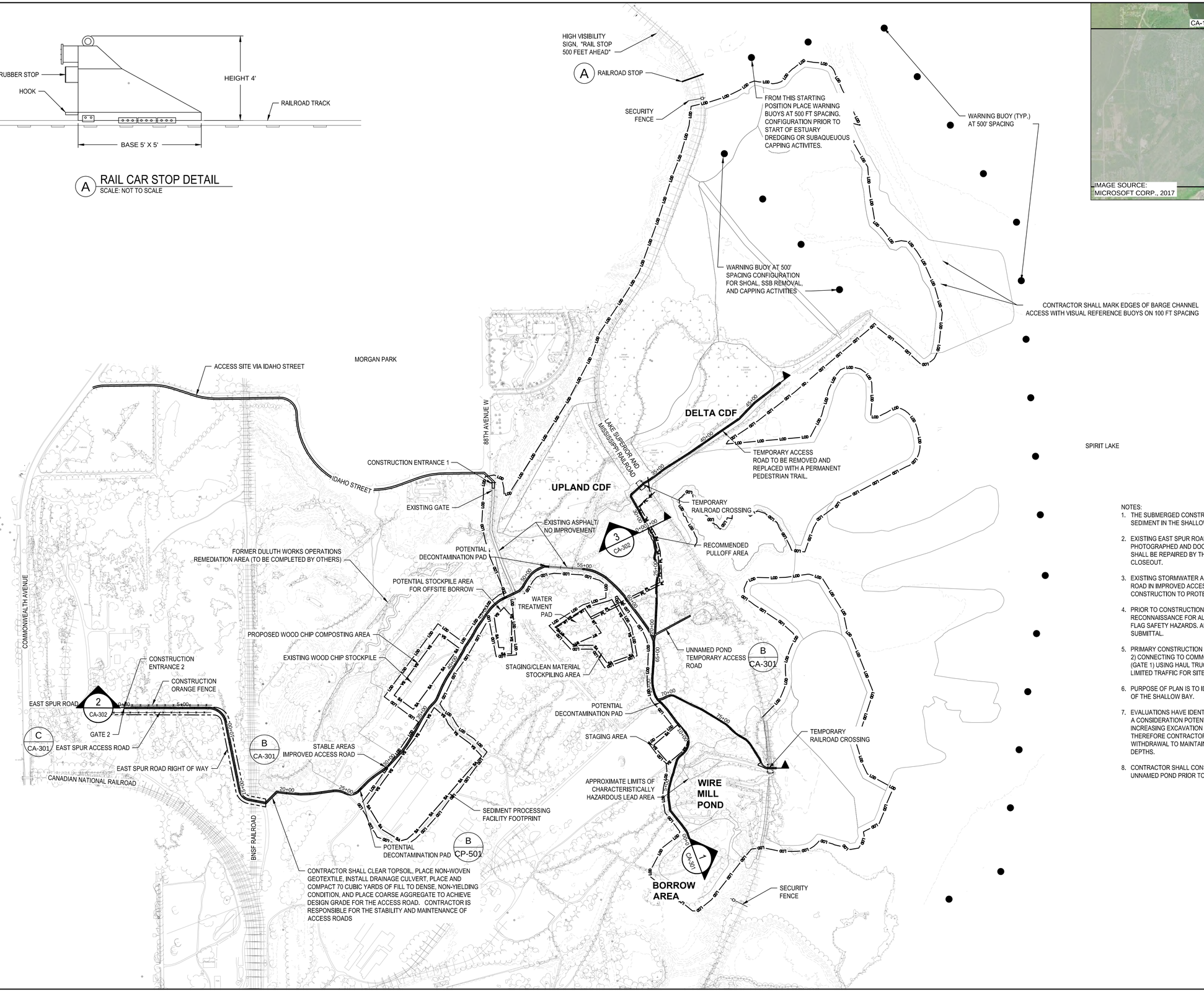
EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924
CA-101
SHEET: 12 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: P:\FEDERAL\NON DOD\GLAES\PROJECTS\151894 - SPIRIT LAKE RD2-RESIGN\1 - CADD\4 - RD\-RES\SITE ACCESS\ENG SITE ACCESS AND STAGING PLAN - DEWATERED SHANNON, CHRISTOPHER 5/30/2019 3:26 PM

A RAIL CAR STOP DETAIL
SCALE: NOT TO SCALE


HIGH VISIBILITY SIGN, "RAIL STOP 500 FEET AHEAD"
A RAILROAD STOP
SECURITY FENCE
FROM THIS STARTING POSITION PLACE WARNING BUOYS AT 500 FT SPACING. CONFIGURATION PRIOR TO START OF ESTUARY DREDGING OR SUBAQUEUOUS CAPPING ACTIVITES.
WARNING BUOY (TYP.) AT 500' SPACING
WARNING BUOY AT 500' SPACING CONFIGURATION FOR SHOAL, SSB REMOVAL, AND CAPPING ACTIVITIES
CONTRACTOR SHALL MARK EDGES OF BARGE CHANNEL ACCESS WITH VISUAL REFERENCE BUOYS ON 100 FT SPACING
MORGAN PARK
ACCESS SITE VIA IDAHO STREET
88TH AVENUE W
LAKE SUPERIOR AND MISSISSIPPI RAILROAD
DELTA CDF
TEMPORARY ACCESS ROAD TO BE REMOVED AND REPLACED WITH A PERMANENT PEDESTRIAN TRAIL.
SPIRIT LAKE
CONSTRUCTION ENTRANCE 1
IDAHO STREET
UPLAND CDF
EXISTING GATE
TEMPORARY RAILROAD CROSSING
EXISTING ASPHALT/ NO IMPROVEMENT
3 CA-302
RECOMMENDED PULLOFF AREA
POTENTIAL DECONTAMINATION PAD
FORMER DULUTH WORKS OPERATIONS REMEDIATION AREA (TO BE COMPLETED BY OTHERS)
POTENTIAL STOCKPILE AREA FOR OFFSITE BORROW
WATER TREATMENT PAD
COMMONWEALTH AVENUE
PROPOSED WOOD CHIP COMPOSTING AREA
EXISTING WOOD CHIP STOCKPILE
STAGING/CLEAN MATERIAL STOCKPILING AREA
UNNAMED POND TEMPORARY ACCESS ROAD
B CA-301
CONSTRUCTION ENTRANCE 2
CONSTRUCTION ORANGE FENCE
EAST SPUR ROAD
2 CA-302
GATE 2
C CA-301
EAST SPUR ACCESS ROAD
POTENTIAL DECONTAMINATION PAD
STAGING AREA
TEMPORARY RAILROAD CROSSING
STABLE AREAS IMPROVED ACCESS ROAD
B CA-301
EAST SPUR ROAD RIGHT OF WAY
CANADIAN NATIONAL RAILROAD
APPROXIMATE LIMITS OF CHARACTERISTICALLY HAZARDOUS LEAD AREA
WIRE MILL POND
SEDIMENT PROCESSING FACILITY FOOTPRINT
POTENTIAL DECONTAMINATION PAD
B CP-501
BNSF RAILROAD
1 CA-301
BORROW AREA
SECURITY FENCE
CONTRACTOR SHALL CLEAR TOPSOIL, PLACE NON-WOVEN GEOTEXTILE, INSTALL DRAINAGE CULVERT, PLACE AND COMPACT 70 CUBIC YARDS OF FILL TO DENSE, NON-YIELDING CONDITION, AND PLACE COARSE AGGREGATE TO ACHIEVE DESIGN GRADE FOR THE ACCESS ROAD. CONTRACTOR IS RESPONSIBLE FOR THE STABILITY AND MAINTENANCE OF ACCESS ROADS
0+00
5+00
10+00
15+00
20+00
25+00
30+00
35+00
40+00
45+00
50+00
55+00
60+00
65+00
70+00
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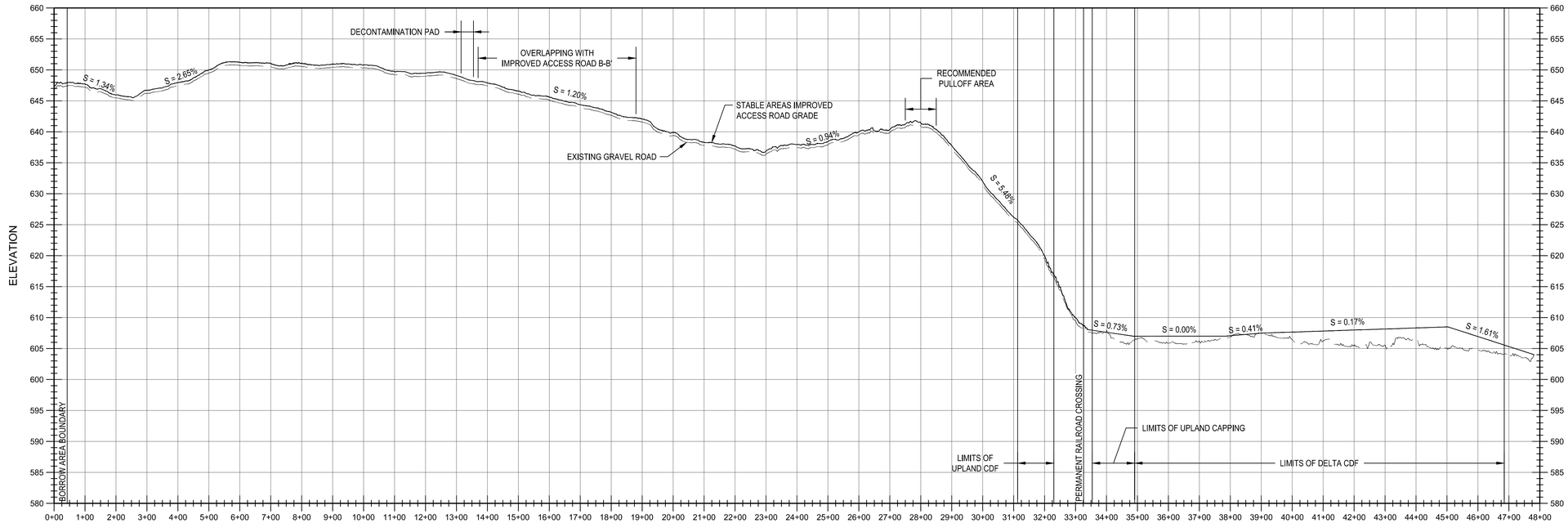
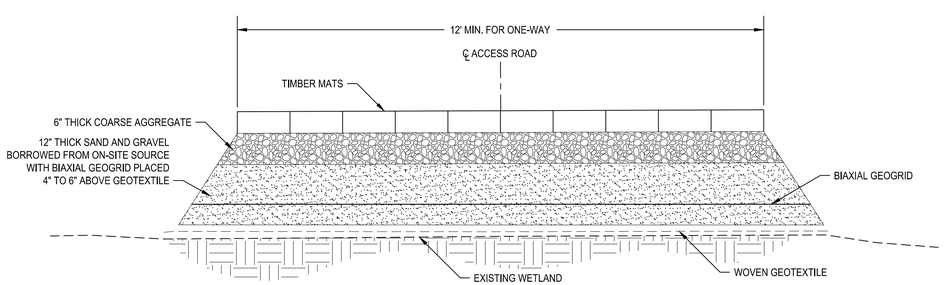
195+00

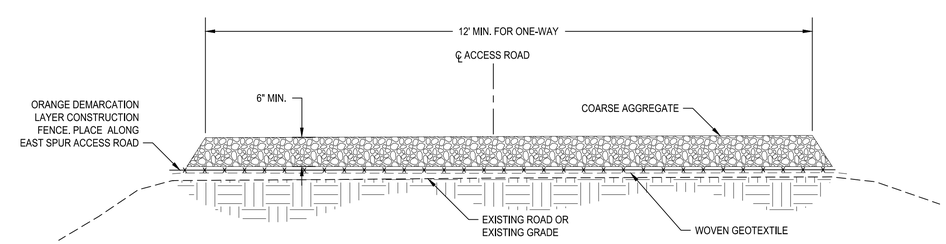


1 CA-101 **PROFILE**
HORIZ. SCALE: 1" = 200'
VERT. SCALE: 1" = 10'

NOTE:
THE RECOMMENDED PULLOFF AREA SHALL BE SIZED BY THE CONTRACTOR TO ALLOW 2 OF THE CONTRACTOR'S SELECTED HAUL TRUCKS TO PASS.



A CA-101 **WETLAND AREAS ACCESS ROAD TYPICAL DETAIL**
SCALE: NO SCALE



B CA-101 CA-102 **STABLE AREAS IMPROVED ACCESS ROAD TYPICAL DETAIL**
SCALE: NO SCALE

NOTES:
1. WETLAND AREAS ACCESS ROADS SHALL BE PLACED IN STABLE AREAS OF WETLANDS. WETLAND ACCESS ROAD TYPICAL DETAIL IS RECOMMENDED ONLY WHERE CONTRACTOR SHALL PROVIDE ACCESS INTO WETLAND FOR CONSTRUCTION ACCESS.
2. WETLAND ACCESS ROADS SHALL BE REMOVED AND DISPOSED IN THE CDF'S UPON COMPLETION OF CONSTRUCTION. TIMBER MATS SHALL BE DECONTAMINATED AND STACKED IN AREA APPROVED BY OWNER.

NOTES:
1. IMPROVED ACCESS ROAD SHALL BE AS SHOWN OR AS APPROVED BY OWNER.
2. WIDTH OF IMPROVED ACCESS ROAD SHALL ALLOW FOR 1-WAY OR 2-WAY TRAFFIC AS NEEDED. PLACE GRANULAR FILL TO WIDEN ROADS TO MEET MINIMUM WIDTH REQUIREMENTS.
3. PULLOFFS SHALL ALLOW FOR HAUL TRAFFIC TO PASS WHEN MEETING ON 1-WAY ROADS.
4. EXISTING ROADS SHALL BE GRADED TO A LEVEL SUBGRADE PRIOR TO INSTALLING IMPROVED ACCESS ROADS. ON SLOPE, LEVEL GRADE TO REMOVE RUTS AND TOPOGRAPHIC VARIATION TO ACHIEVE RELATIVELY UNIFORM SLOPE FOR EFFICIENT VEHICLE TRAVEL, PRIOR TO PLACEMENT OF IMPROVED ROAD DESIGN.
5. STABLE AREAS IMPROVED ACCESS ROAD TYPICAL DETAIL WILL BE USED TO BUILD THE EAST SPUR ROAD ACCESS ROAD.

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

SITE ACCESS DETAILS (1 OF 2)

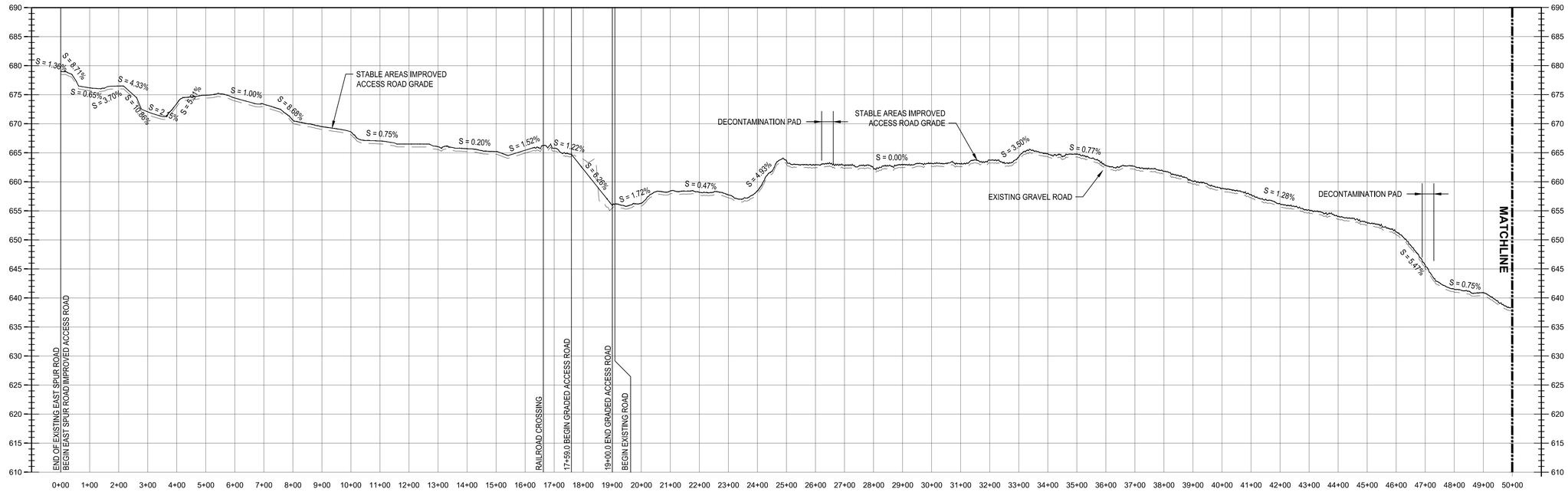
PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924
CA-301
SHEET: 14 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

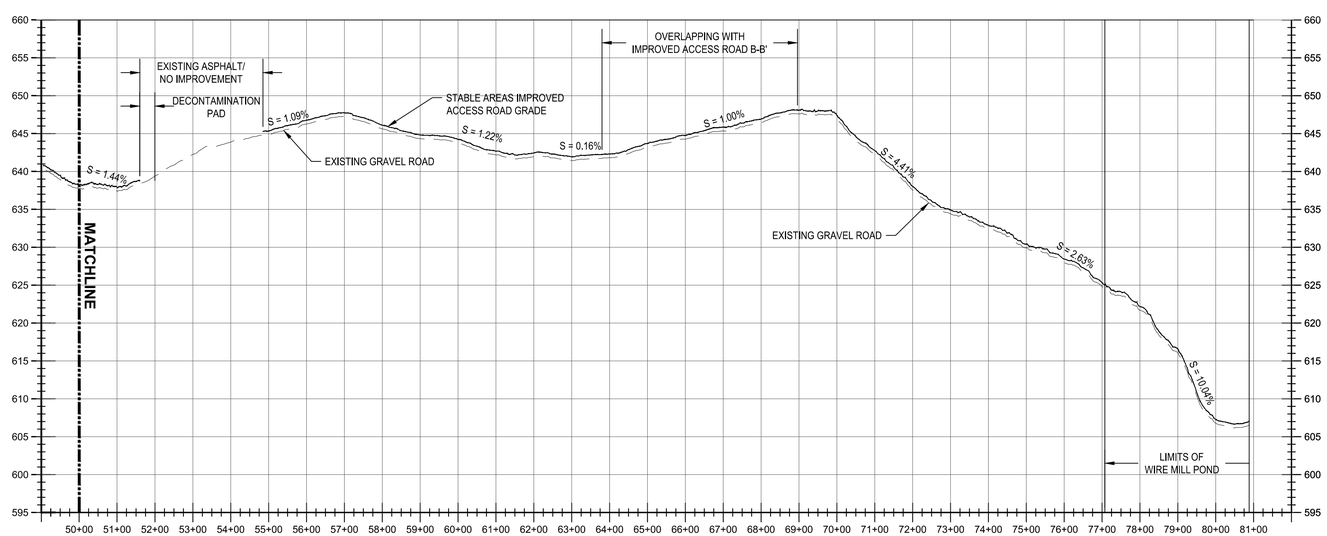
FILE PATH: F:\FEDERAL\NON DOD\LAKES\PROJECTS\1518924 - SPIRIT LAKE RDS\-DESIGN\1-CADD\4- FIGURES\SITE ACCESS\SITE ACCESS DETAILS 1 OF 2\SWANSON, CHRISTOPHER 5/30/2019 3:28 PM



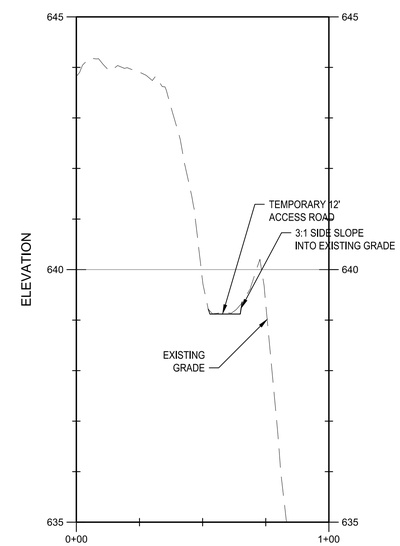
2 CA-101 PROFILE
HORIZ. SCALE: 1" = 200'
VERT. SCALE: 1" = 10'

NOTES:

1. EXISTING STORMWATER AND HYDRANT STRUCTURES ALONG THE EAST SPUR ACCESS ROAD SHALL BE BARRICADED OFF DURING CONSTRUCTION TO PROTECT STRUCTURES FROM DAMAGE.
2. THE CONTRACTOR MAY REGRADE THE EXISTING ACCESS ROAD WITHIN THE EAST SPUR ROAD RIGHT OF WAY TO SMOOTH TRANSITIONS AND ELIMINATE SIGNIFICANT GRADE CHANGES.
3. CONTRACTOR SHALL REGRADE STEEP AREAS INFEASIBLE FOR SAFE TRUCK TRAFFIC USING BALANCE CUT/FILL APPROACH, SUBJECT TO OWNER APPROVAL. SUBMIT GRADING DESIGN TO OWNER.



2 CA-101 PROFILE
HORIZ. SCALE: 1" = 200'
VERT. SCALE: 1" = 10'



3 CA-101 PROFILE
HORIZ. SCALE: 1" = 30'
VERT. SCALE: 1" = 1.5'

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48172, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

SITE ACCESS DETAILS (2 OF 2)

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

CA-302

SHEET: 15 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NCR DOR\GLASS\PROJECTS\11180\A - SPIRIT LAKE REDI\-DESIGN\1-CADD\4-FIGURES\SITE ACCESS\ETA\6.2 OF 2\SITE ACCESS DETAIL 6.2 OF 2\SWANSON, CHRISTOPHER 6/20/2019 3:28 PM

REMOVE TEMPORARY ACCESS ROAD UPON COMPLETION OF REMEDIATION

TREE REMOVAL BOUNDARY

REMOVE DEBRIS FROM AREA WITH ROOT BARRIER

SPIRIT LAKE

TREE REMOVAL BOUNDARY

CP 10 2016

ABANDON 36" RCP WITH FLOWABLE FILL

REMOVE SECTION OF RAILROAD

SPIT OF LAND

ABANDON 12" PIPE WITH FLOWABLE FILL

ABANDON 12" RCP WITH FLOWABLE FILL

ABANDON 12" RCP WITH FLOWABLE FILL

MORGAN PARK

88TH AVENUE W

CP 15 2016

TEMPORARY ACCESS ROAD TO BE REMOVED AND REPLACED WITH A PERMANENT PEDESTRIAN TRAIL.

TREE REMOVAL BOUNDARY

IDAHO STREET

ABANDON 5-48" CULVERTS WITH FLOWABLE FILL

REMOVE SECTION OF RAILROAD FOR CONSTRUCTION ACCESS

NORTH SITE ENTRANCE ROAD

REMOVE AND DISPOSE EXISTING GUARDRAIL

FORMER DULUTH WORKS OPERATIONS REMEDIATION AREA (TO BE COMPLETED BY OTHERS)

LAKE SUPERIOR AND MISSISSIPPI RAILROAD

TREE REMOVAL BOUNDARY

TREE REMOVAL BOUNDARY

UNNAMED POND

SPIRIT LAKE

REMOVE TEMPORARY ACCESS ROAD UPON COMPLETION OF REMEDIATION

REMOVE DEBRIS FROM AREA WITH ROOT BARRIER

TREE REMOVAL BOUNDARY

CP 12 2016

WIRE MILL POND

REMOVE AND REPLACE RAILROAD BRIDGE REMOVE SHEET PILE WALL

TREE REMOVAL BOUNDARY

APPROXIMATE LIMITS OF CHARACTERISTICALLY HAZARDOUS LEAD AREA

REMOVE DEBRIS FROM AREA WITH ROOT BARRIER

CP 11 2016

CANADIAN NATIONAL RAILROAD

BNSF RAILROAD

TREE REMOVAL BOUNDARY

TREE REMOVAL BOUNDARY

CP 18 2016

IMAGE SOURCE: MICROSOFT CORP., 2017

CA-103

KEY PLAN
NOT TO SCALE

NORTH

NOTES:

1. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING VEGETATION, ALL TREES GREATER THAN 2" DIAMETER AND NOT MARKED FOR REMOVAL SHALL BE PRESERVED.
2. SALVAGE TREES FOR UNNAMED CREEK AND SHALLOW SHELTER BAY DESIGN FEATURES, AND REMOVE SOIL FROM ROOT WAD WHERE ROOT WADS ARE PART OF THE REQUIRED FEATURE.
3. TEMPORARY GRAVEL , SAND, AND ROCK USED FOR SITE ACCESS ROADS AND WATER TREATMENT PADS SHALL BE DISPOSED IN THE CDF.
4. EXISTING GEOGRID AND GEOTEXTILE MATERIALS WILL REQUIRE OFF-SITE DISPOSAL.

N

0 300 600

SCALE IN FEET

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR

DRAWN BY: JRM

CHECKED BY: JMT

PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN

DULUTH, MINNESOTA

DEMOLITION PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

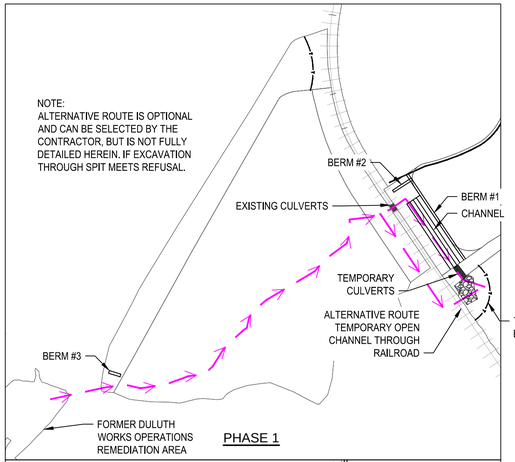
PROJECT NUMBER: 1518924

CA-103

SHEET: 16 OF 116

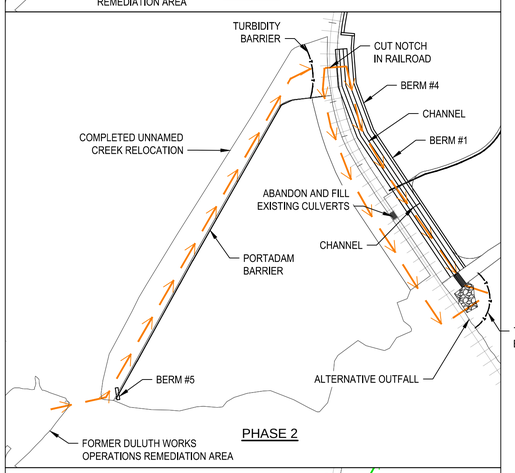
PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\GLAES\PROJECTS\1518924 - SPIRIT LAKE RDS\2- DESIGN\1- CADD\4- FIGURES\DEMOLITION PLAN\DWG [DEMOLITION PLAN] SWANSON, CHRISTOPHER 5/30/2019 3:31 PM



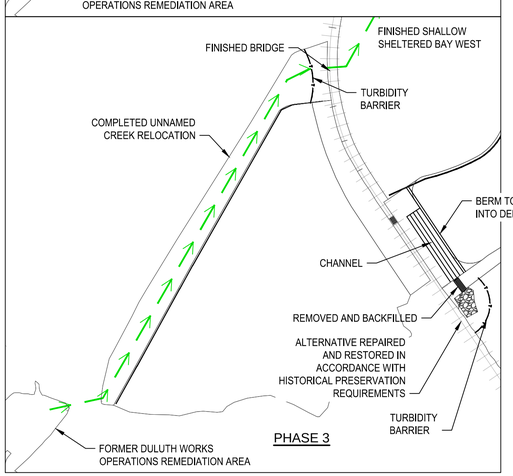
DEWATERED PHASING NOTES:
PHASE 1:
- CONSTRUCT TEMPORARY UC DIVERSION BERM 1, 2, AND 3, TEMPORARY UC DIVERSION CULVERTS, AND COFFERDAM
- DEWATER SHALLOW SHELTERED BAY
- INSTALL TURBIDITY BARRIER

RESULTING AREAS OPEN FOR CONSTRUCTION:
- SHALLOW SHELTERED BAY WEST
- SHALLOW SHELTERED BAY NORTHEAST
- DELTA CDF
- UNNAMED CREEK DIVERSION



DEWATERED PHASING NOTES:
PHASE 2:
- CONSTRUCT UC RELOCATION
- INSTALL TURBIDITY BARRIER
- CUT NOTCH IN RAILROAD
- INSTALL PORTADAM BARRIER
- CONSTRUCT TEMPORARY DIVERSION BERM 4 AND 5
- REMOVE BERM 2 AND 3
- ABANDON AND FILL EXISTING 5-48" CMPS

ADDITIONAL AREAS OPEN FOR CONSTRUCTION:
- UPLAND CDF

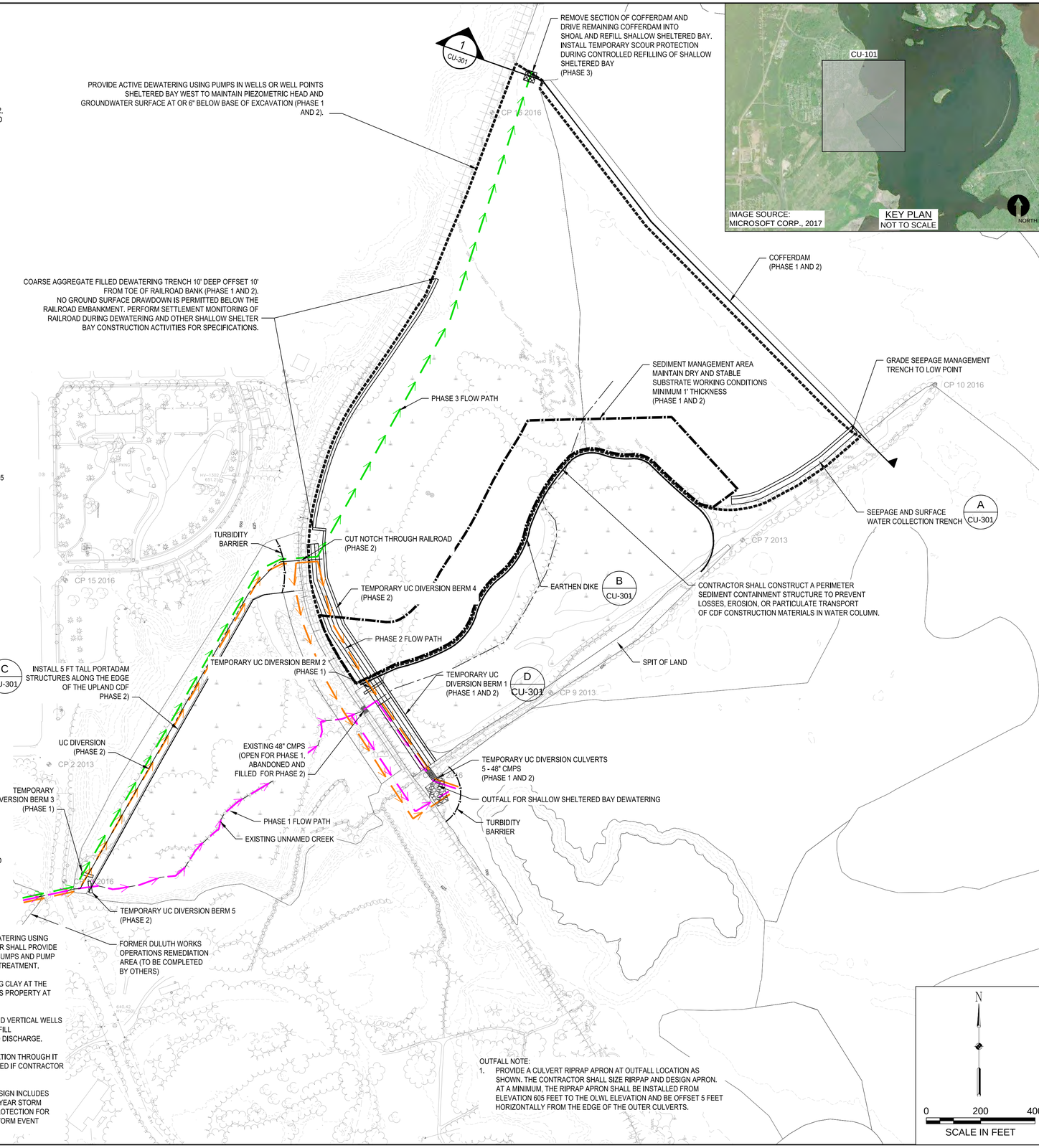


DEWATERED PHASING NOTES:
PHASE 3 (CLOSEOUT TEMPORARY DIVERSION):
- REMOVE BERM 1, 4 AND 5
- REMOVE TEMPORARY UC DIVERSION CULVERTS AND BACKFILL
- END DEWATERING IN SHALLOW SHELTERED BAY
- REMOVE SECTION OF COFFERDAM AND ALLOW SHALLOW SHELTERED BAY TO REFILL. PREVENT SCOURS AS IT REFILLS

NOTES:
1. WHERE NOT OTHERWISE REQUIRING ACTIVE DEWATERING USING PUMPING IN WELLS OR WELL POINTS, CONTRACTOR SHALL PROVIDE CONSTRUCTION DEWATERING THROUGH USE OF SUMPS AND PUMP SYSTEMS TO COLLECT INFILTRATING WATER FOR TREATMENT.
2. ACTIVE PUMPING WITHIN SAND LAYER UNDERLYING CLAY AT THE BASE OF EXCAVATION CAN BE INFILTRATED ON USS PROPERTY AT LOCATION SHOWN.
3. DEWATERING METHODS SUCH AS WELL POINTS AND VERTICAL WELLS EXTRACTING GROUNDWATER WITHIN INDUSTRIAL FILL SOILS/SEDIMENT REQUIRES TREATMENT PRIOR TO DISCHARGE.
4. SPIT OF LAND CONTAINS STEEL SLAG AND EXCAVATION THROUGH IT MAY BE DIFFICULT. ALTERNATE ROUTE CAN BE USED IF CONTRACTOR CANNOT GET THROUGH SPIT.
5. THE TEMPORARY UNNAMED CREEK DIVERSION DESIGN INCLUDES PROTECTION FOR THE UPLAND CDF UP TO THE 10 YEAR STORM EVENT PEAK WATER SURFACE ELEVATION, AND PROTECTION FOR THE SHALLOW SHELTER BAY UP TO THE 2-YEAR STORM EVENT WATER SURFACE ELEVATION.

PHASING DIAGRAM FOR TEMPORARY UNNAMED CREEK DIVERSION

SCALE: NOT TO SCALE



OUTFALL NOTE:
1. PROVIDE A CULVERT RIPRAP APRON AT OUTFALL LOCATION AS SHOWN. THE CONTRACTOR SHALL SIZE RIRPAP AND DESIGN APRON. AT A MINIMUM, THE RIPRAP APRON SHALL BE INSTALLED FROM ELEVATION 605 FEET TO THE OLWL ELEVATION AND BE OFFSET 5 FEET HORIZONTALLY FROM THE EDGE OF THE OUTER CULVERTS.

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UNNAMED CREEK TEMPORARY DIVERSION PLAN

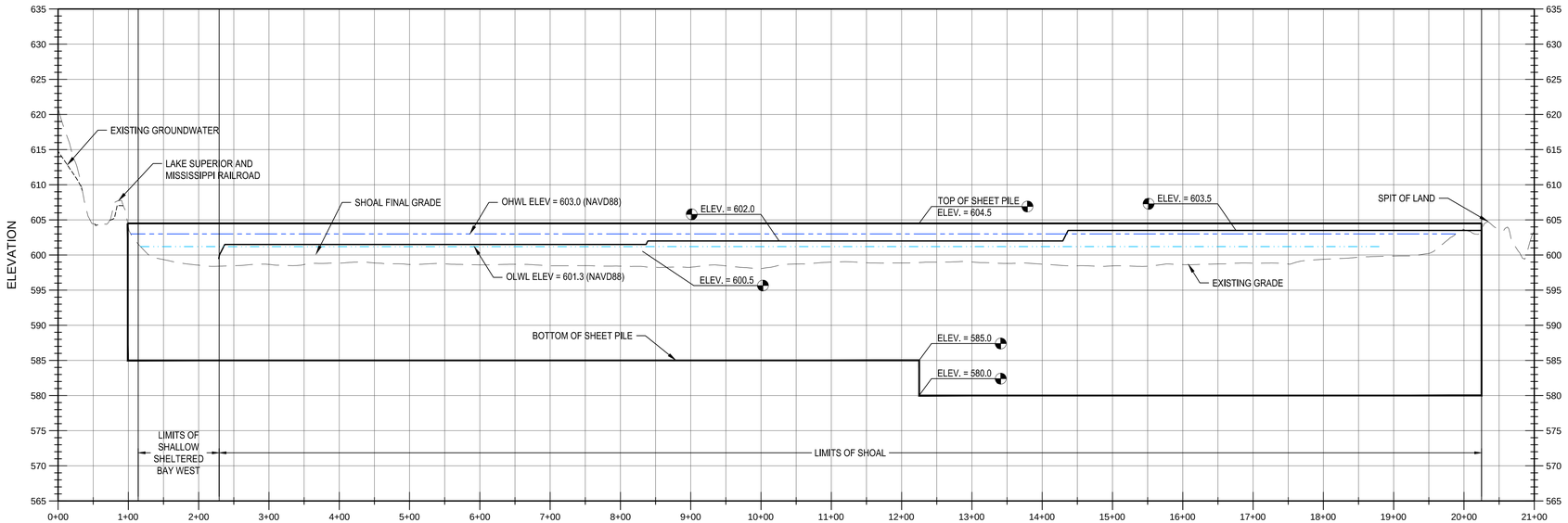
PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924
CU-101
SHEET: 17 OF 116

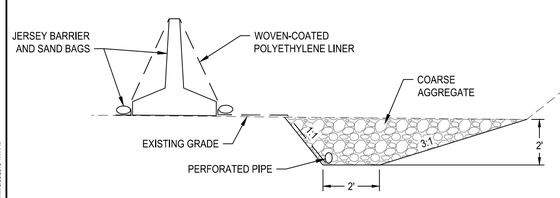
PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: P:\FEDERAL\NON DOD\GLAS\PROJECTS\1518924 - SPIRIT LAKE EECA - DESIGN\1 - CADD\4 - FIGURES\UNNAMED CREEK TEMPORARY DIVERSION DETAILS.DWG [UNNAMED CREEK TEMPORARY DIVERSION PLAN] UTTG, JUSTIN 2/20/2019 1:16 PM



1 CU-101 COFFERDAM SECTION
HORIZ. SCALE: 1" = 100'
VERT. SCALE: 1" = 10'

NOTES:
1. SHEET PILE TO BE DRIVEN INTO CLAY LAYER.
2. SEE SECTION 7 ON SHEET CS-302 FOR FINAL SHOAL DETAILS.
3. SHEETING THROUGH COFFERDAM ONLY REQUIRED FOR DEWATERED SHALLOW SHELTERED BAY CONSTRUCTION APPROACH.
4. GROUNDWATER ELEVATIONS ARE APPROXIMATE BASED ON MODELING, AND MAY VARY FROM WHAT IS DEPICTED.
5. THE TEMPORARY UC DIVERSION IS DESIGNED TO CONVEY THE 2-YEAR STORM EVENT.



A CU-101 SEEPAGE AND SURFACE WATER COLLECTION TRENCH DETAIL
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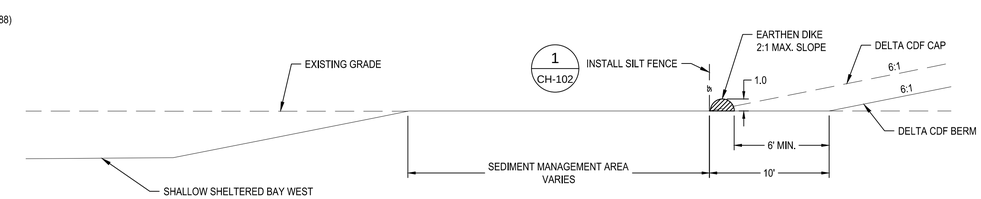
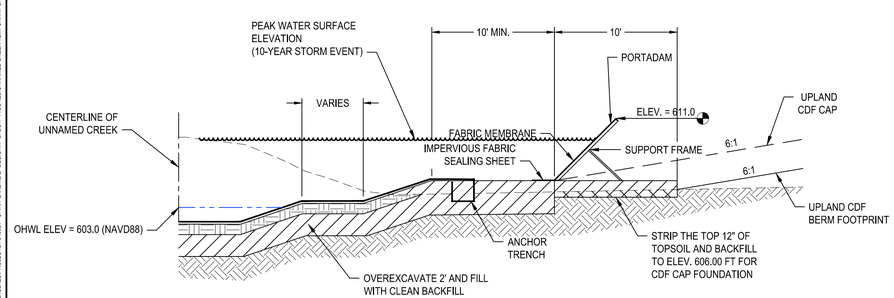


B CU-101 EARTHEN DIKE DETAIL
SCALE: NO SCALE



C CU-101 PORTADAM EXCAVATION PROTECTION DETAIL
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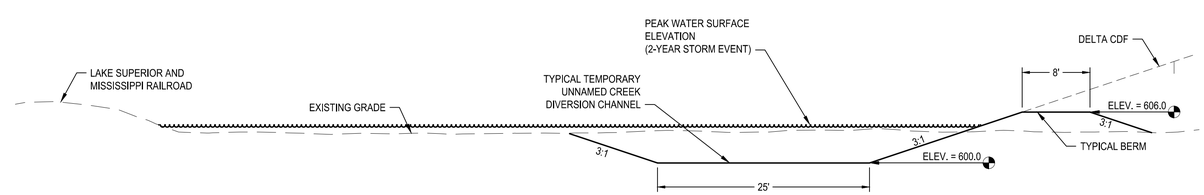


D CU-101 UNNAMED CREEK TEMPORARY DIVERSION TYPICAL SECTION
SCALE: NO SCALE

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UNNAMED CREEK TEMPORARY DIVERSION DETAILS

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924
CU-301
SHEET: 18 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: P:\FEDERAL\NON DOD\GLAES\PROJECTS\151892A - SPIRIT LAKE RDC\-DESIGN\-CADD\4-FIGURES\UNNAMED CREEK TEMPORARY DIV\EROSION\DETAILS\DWG\UNNAMED CREEK TEMPORARY DIV EROSION DETAILS.DWG [UNNAMED CREEK TEMPORARY DIV EROSION DETAILS (LTTD) - JUSTIN] 5/20/2019 1:11 PM

HILTON STREET

E CU-303 ROOT WAD (TYP.)

D CU-303 ROCK CROSS VANE

C CU-303 RIFFLE STRUCTURE #3

POOL #3

POOL #2

C CU-303 RIFFLE STRUCTURE #2

POOL #1

C CU-303 RIFFLE STRUCTURE #1

UNNAMED CREEK PED BRIDGE (DESIGN BY HDR)

UNNAMED CREEK RR BRIDGE (DESIGN BY HDR)

1 CU-302

2 CU-302

SEE SHEET CU-104 FOR UNNAMED CREEK BRIDGE PLAN

S=2.5%

S=.25%

S=.25%

S=.25%

SHALLOW SHELTERED BAY WEST

B CU-302 UNNAMED CREEK RELOCATION

MATCHLINE - SEE DWG CU-103 FOR CONTINUATION

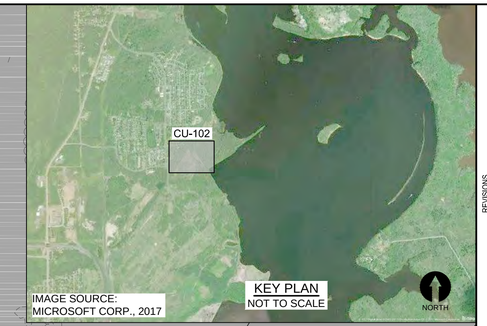
PEDISTRIAN TRAIL

UPLAND CDF

DELTA CDF

LAKE SUPERIOR AND MISSISSIPPI RAILROAD

CP 17 2016



N

0 50 100

SCALE IN FEET

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR

DRAWN BY: JRM

CHECKED BY: JMT

PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN

DULUTH, MINNESOTA

UNNAMED CREEK RELOCATION PLAN (1 OF 2)

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

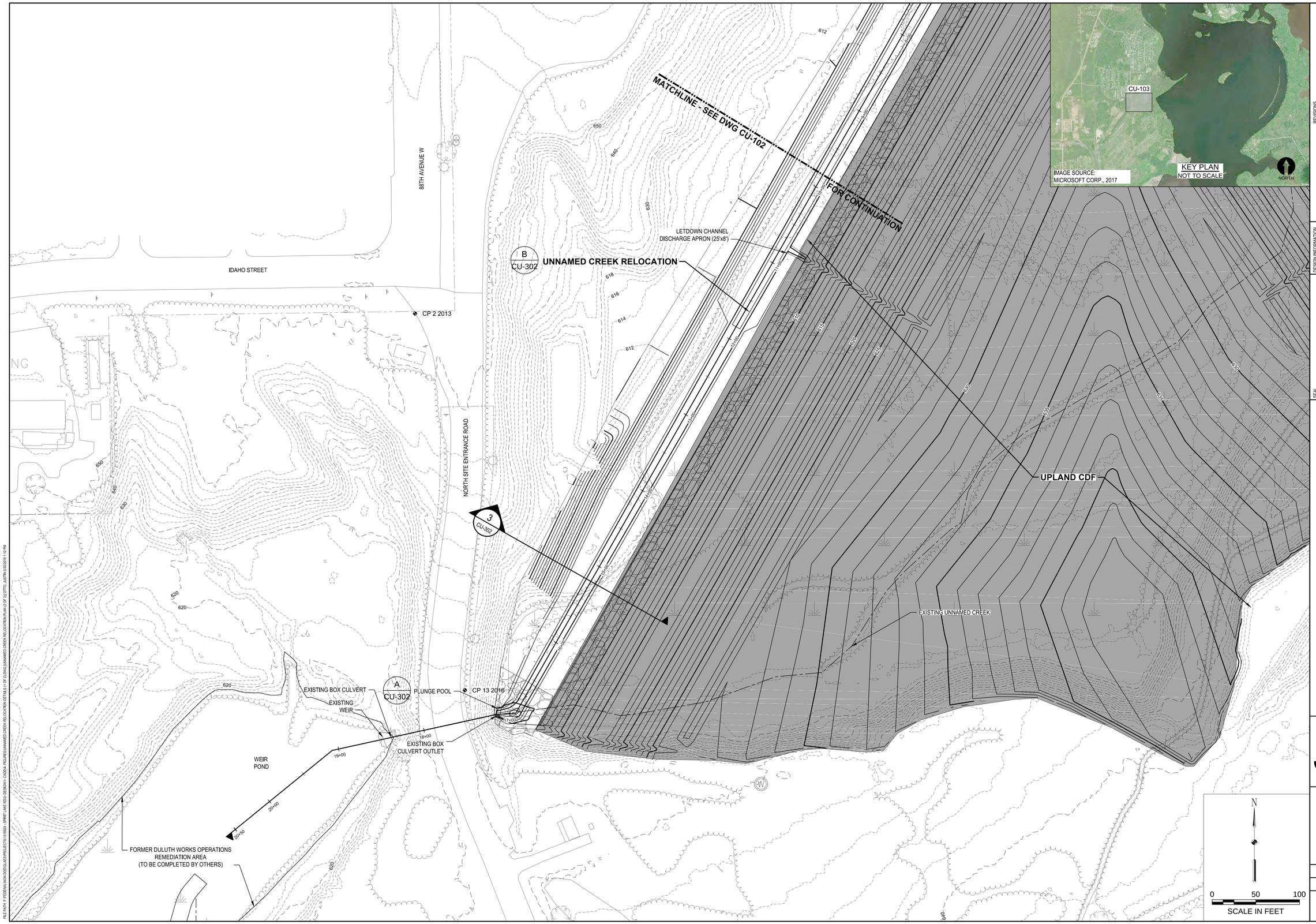
PROJECT NUMBER: 1518924

CU-102

SHEET: 19 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NOR DOD\GLABS\PROJECTS\1518924 - SPIRIT LAKE REVA - DESIGN\+ CADD\+ FIGURES\UNNAMED CREEK RELOCATION DETAILS | OF 2\DWG\UNNAMED CREEK RELOCATION PLAN | 1 OF 2 (UTD). JUSTIN 5/30/2019 1:12 PM



REVISIONS

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DESIGN INFORMATION

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DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UNNAMED CREEK RELOCATION PLAN (2 OF 2)

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

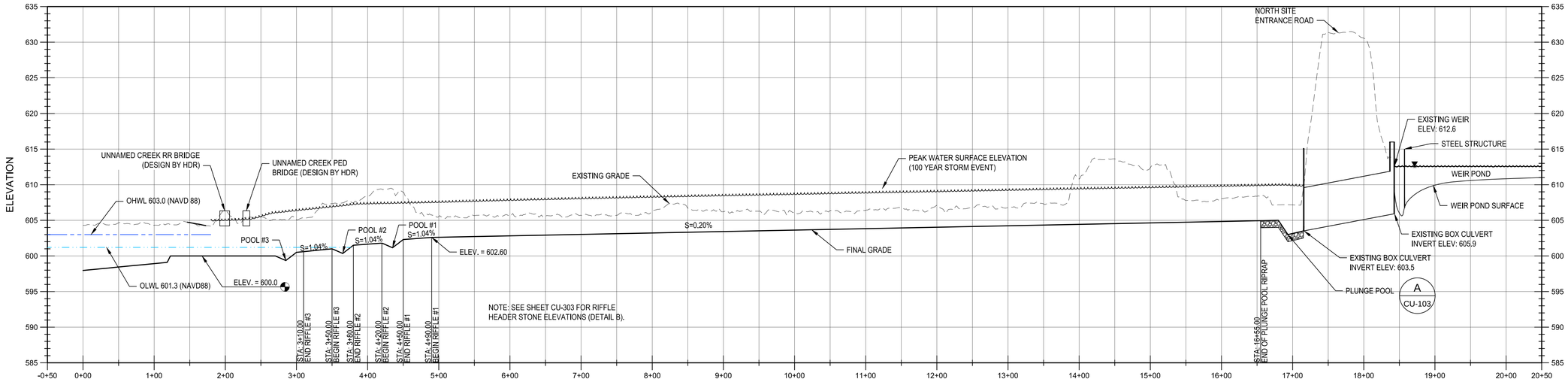
PROJECT NUMBER: 1518924

CU-103

SHEET: 20 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

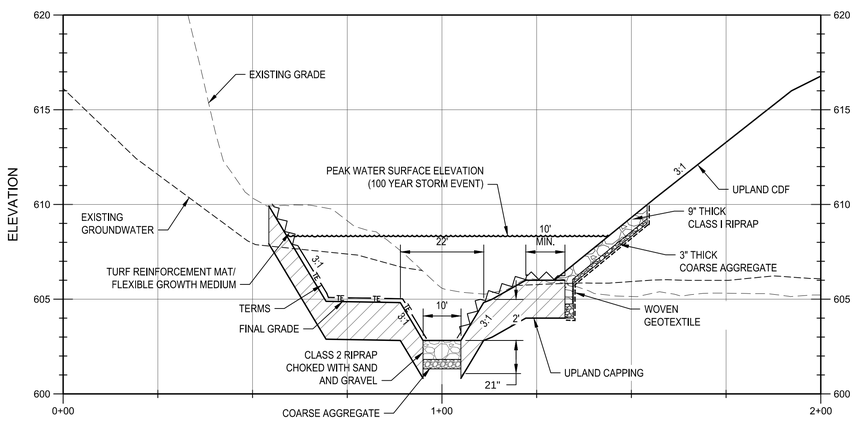
FILE PATH: F:\FEDERAL\NON DOD\CLIENTS\PROJECTS\1518924 - SPIRIT LAKE REVA - BESBOVA - CADD\4-FIG\RESI\UNNAMED CREEK RELOCATION DETAILS (1 OF 2)\DWG\UNNAMED CREEK RELOCATION PLAN (1 OF 2) (OTT). JUSTIN 5/30/2019 1:12 PM



1 CU-102 SECTION
HORIZ. SCALE: 1" = 80'
VERT. SCALE: 1" = 8'

NOTE:

1. GROUNDWATER ELEVATIONS ARE APPROXIMATE BASED ON MODELING, AND MAY VARY FROM WHAT IS DEPICTED.



2 CU-102 STA. 7+00 SECTION
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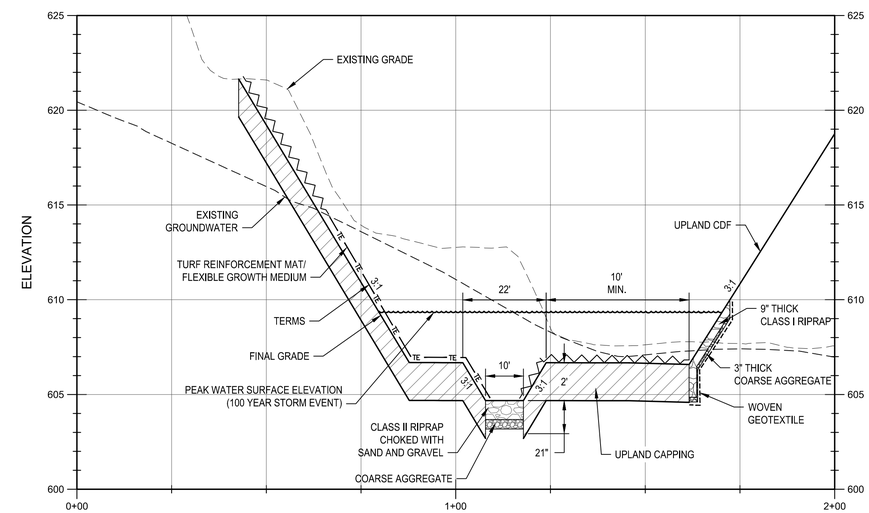
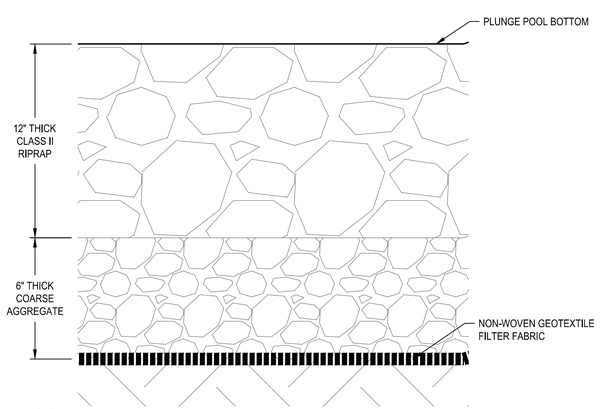
VERT. SCALE: 1" = 4'



3 CU-102 STA. 15+00 SECTION
HORIZ. SCALE: 1" = 20'
VERT. SCALE: 1" = 4'



A CU-103 PLUNGE POOL TYPICAL CROSS SECTION
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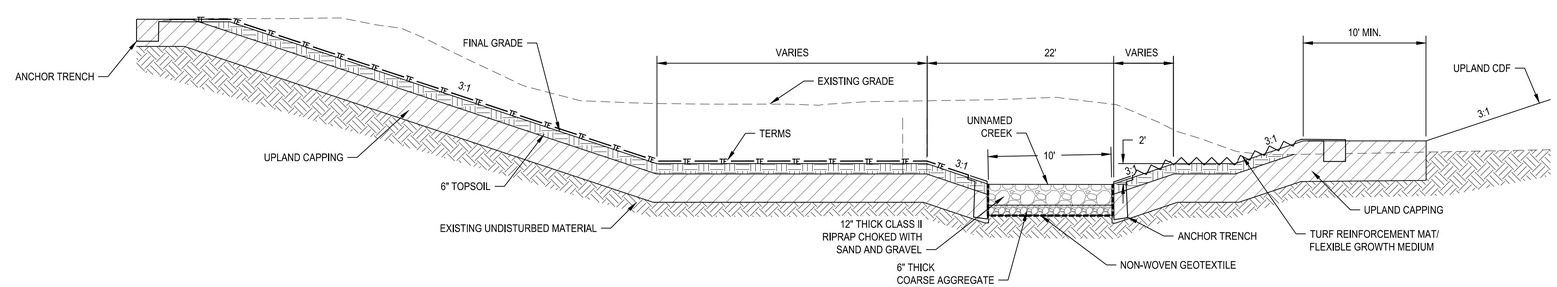

B CU-102 CU-103 UNNAMED CREEK RELOCATION TYPICAL CROSS SECTION
SCALE: NO SCALE

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UNNAMED CREEK RELOCATION DETAILS (1 OF 2)

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924
CU-302
SHEET: 21 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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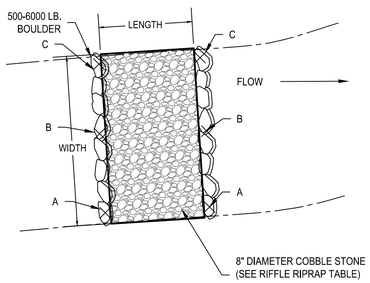
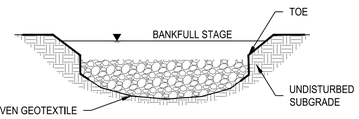
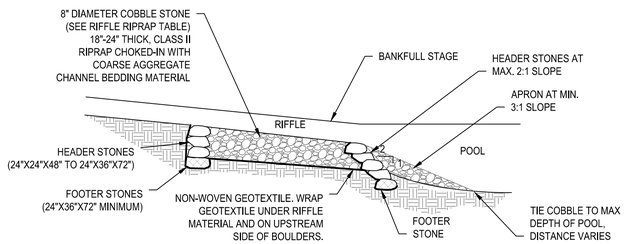
RIFFLE RIPRAP TABLE	
DESCRIPTION	CLASS TYPE
RIFFLE #1	IV
RIFFLE #2	IV
RIFFLE #3	III





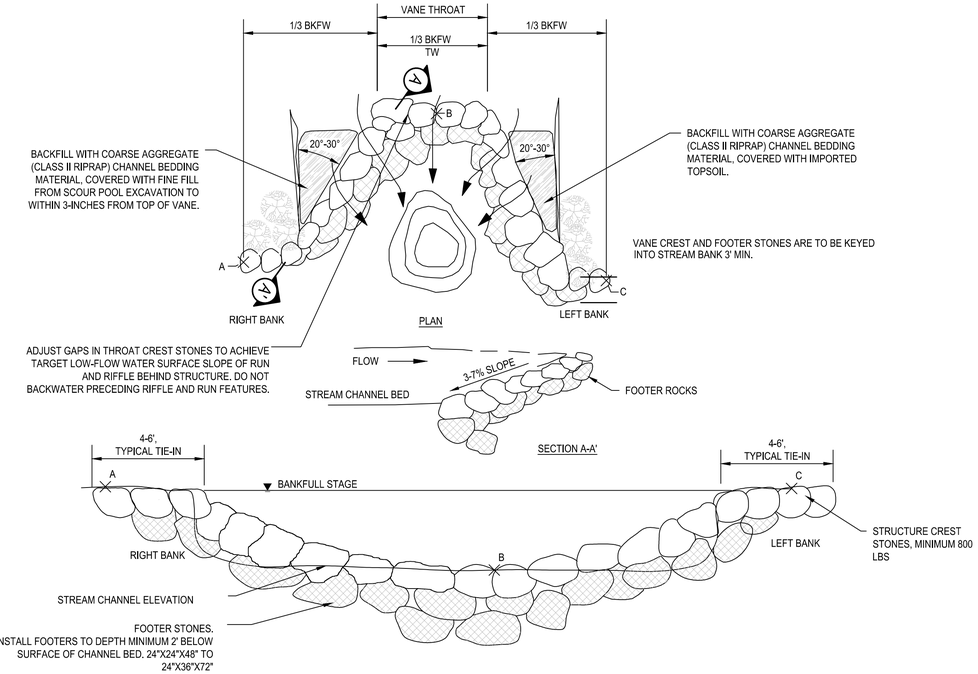
TYPICAL CROSS SECTION B-B'



TYPICAL PROFILE SECTION A-A'

C CU-102 RIFFLE GRADE CONTROL TYPICAL PLAN AND DETAIL

SCALE: NO SCALE

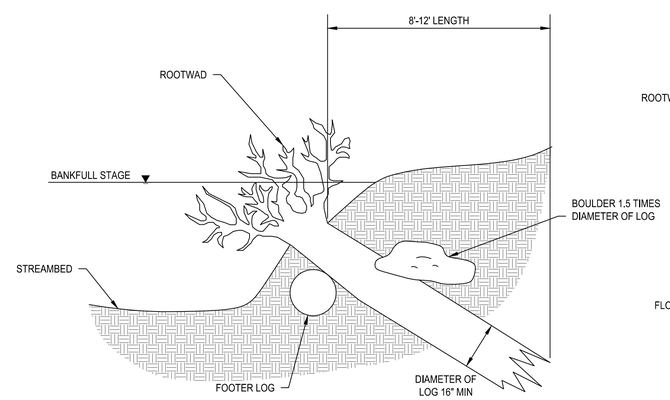


FRONT VIEW OF STRUCTURE

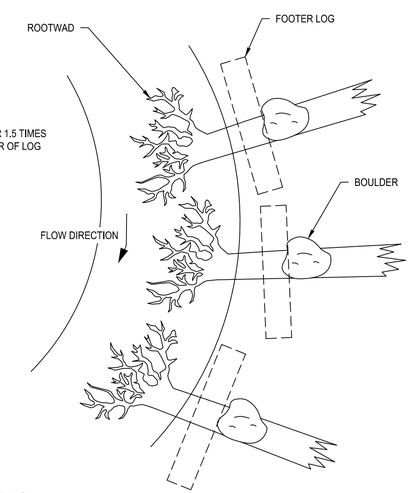
D CU-102 ROCK CROSS VANE DETAIL

SCALE: NO SCALE

RIFFLE HEADER STONE ELEVATIONS				
LABEL	STA	A	B	C
BEGIN RIFFLE #1	4+90.00	604.6	602.6	604.6
END RIFFLE #1	4+50.00	604.3	602.3	604.3
BEGIN RIFFLE #2	4+20.00	603.8	601.8	603.8
END RIFFLE #2	3+80.00	603.5	601.5	603.5
BEGIN RIFFLE #3	3+50.00	603.0	601.0	603.0
END RIFFLE #3	3+10.00	602.5	600.5	602.5



TYPICAL SECTION VIEW



TYPICAL PLAN VIEW

NOTES:

1. ORIENT THE ROOTWAD SO THAT FLOW IS HITTING THE FAN AT A 90° ANGLE, OR CLOSE TO.
2. EMBED THE "BOLE" DEEP INTO THE BANK (3/4 OF THE LENGTH SHOULD BE BURIED).
3. THE MINIMUM LOG DIAMETER FOR THE ROOT WAD STRUCTURE SHOULD BE 16".
4. SUPPORT IT ON A FOOTER LOG.
5. ANCHOR THE FOOTER LOG WITH A BOULDER.
6. ESTABLISH NEW RIPARIAN VEGETATION ALL AROUND THE ROOTWAD.

E CU-102 ROOTWAD DETAIL

SCALE: NO SCALE

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JAO
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UNNAMED CREEK RELOCATION DETAILS (2 OF 2)

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

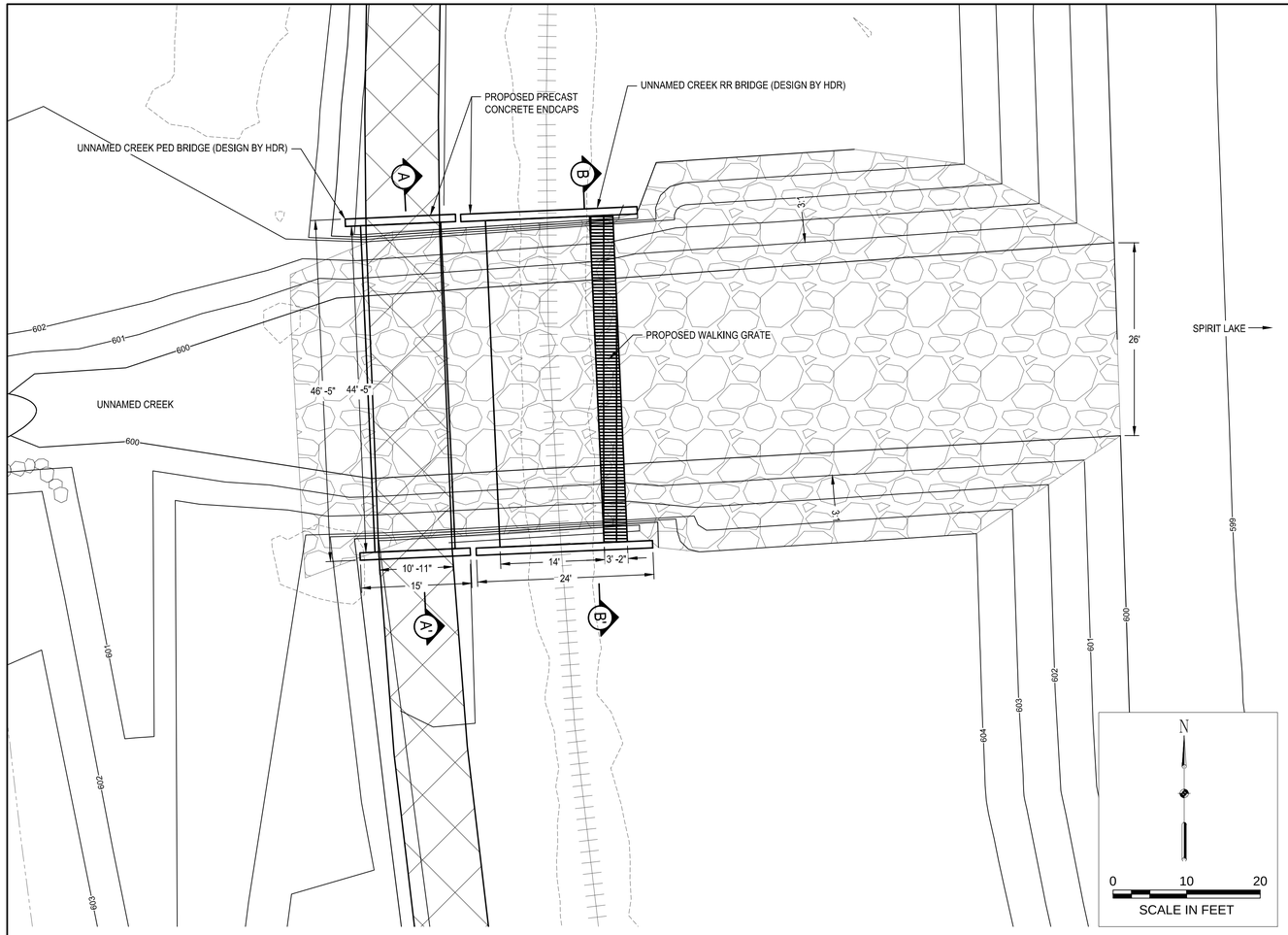
DATE: MAY 2019

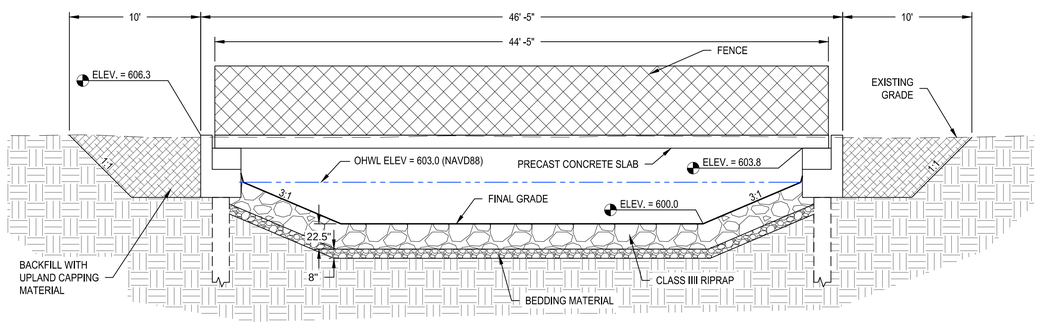
PROJECT NUMBER: 1518924

CU-303

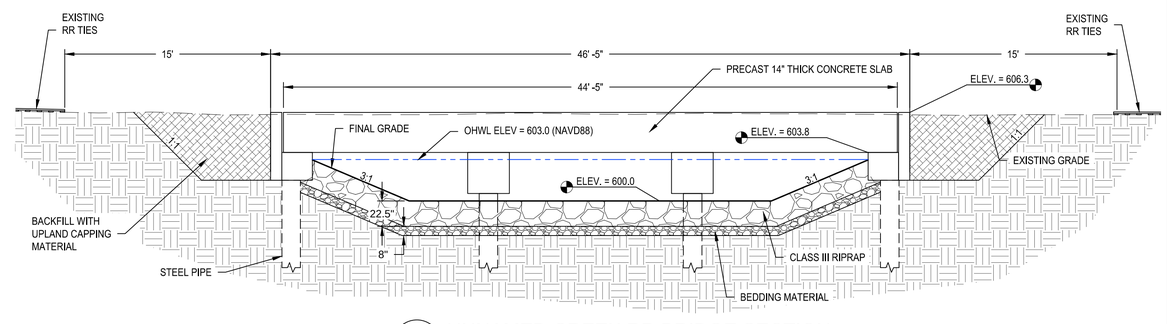
PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\CLIENTS\PROJECTS\1518924 - SPIRIT LAKE RDO - DESIGN\1-CADD\4- FIGURES\UNNAMED CREEK RELOCATION DETAILS 1 OF 2\UNCL\UNNAMED CREEK RELOCATION DETAILS 2 OF 2\UTTD, JUSTIN 9/30/2019 1:13 PM





A CU-104 UNNAMED CREEK PED BRIDGE SECTION
SCALE: NO SCALE



B CU-104 UNNAMED CREEK RR BRIDGE SECTION
SCALE: NO SCALE

NOTE:

1. REMOVE RAILROAD TIES 15' FROM BASE OF THE PROPOSED PRECAST CONCRETE ABUTMENT CAPS ON BOTH SIDE OF BRIDGE.

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UNNAMED CREEK BRIDGE PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

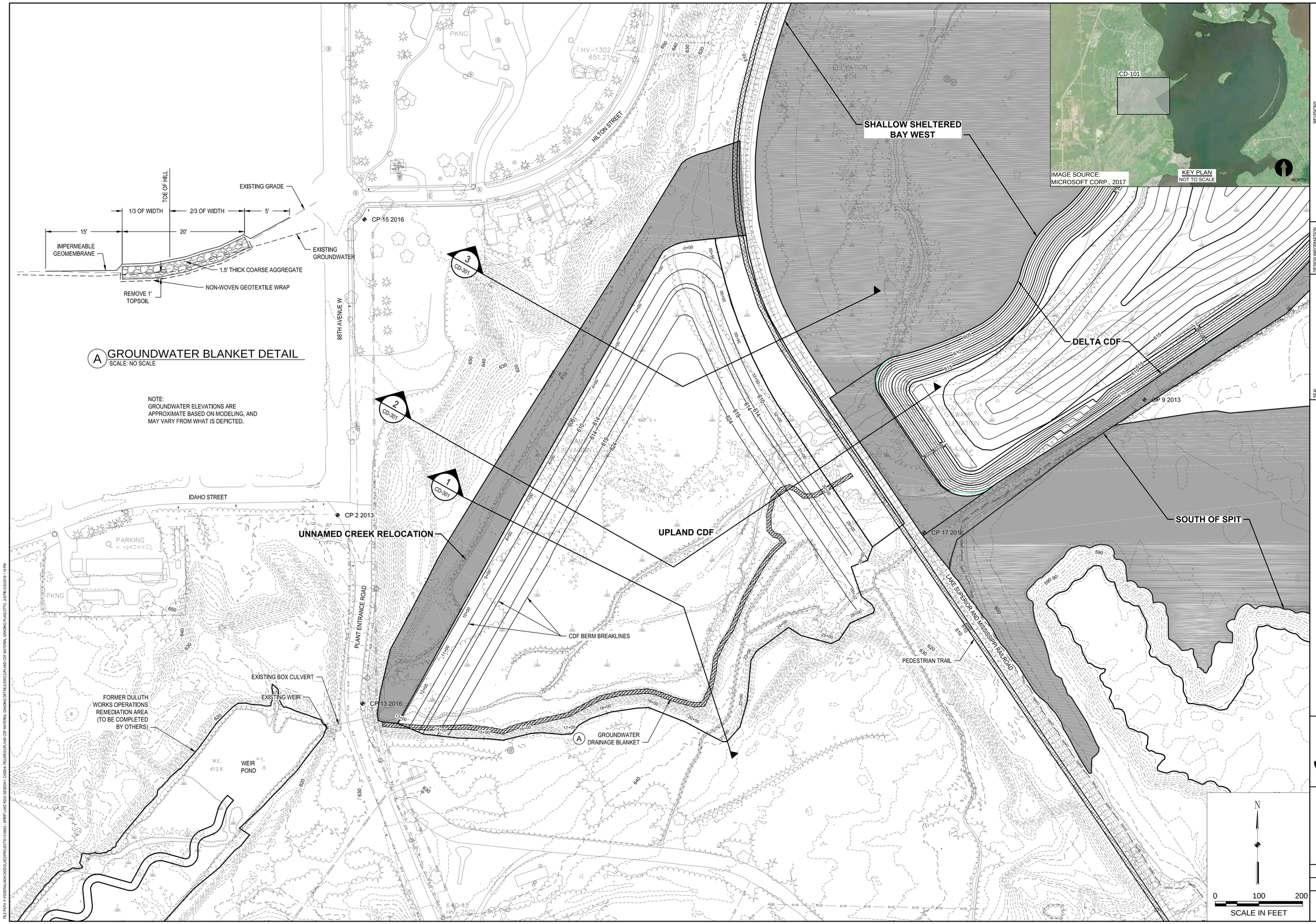
PROJECT NUMBER: 1518924

CU-104

SHEET: 23 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\KCK\DOCLAB\PROJECTS\1518924 - SPIRIT LAKE REX\-DESIGN\ - CADD\4-FIG\RES\UNNAMED CREEK BRIDGE PLAN\ LOP 1 (JD\KG)\UNNAMED CREEK BRIDGE PLAN.LOT10, JUSTIN 5/30/2019 1:14 PM



A GROUNDWATER BLANKET DETAIL
SCALE: NO SCALE

NOTE:
GROUNDWATER ELEVATIONS ARE APPROXIMATE BASED ON MODELING, AND MAY VARY FROM WHAT IS DEPICTED.

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY:	LLR
DRAWN BY:	JRM
CHECKED BY:	JMT
PROJECT MANAGER:	JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVUE UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT INTENDED OR APPROVED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UPLAND CDF MATERIAL GRADING PLAN

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019

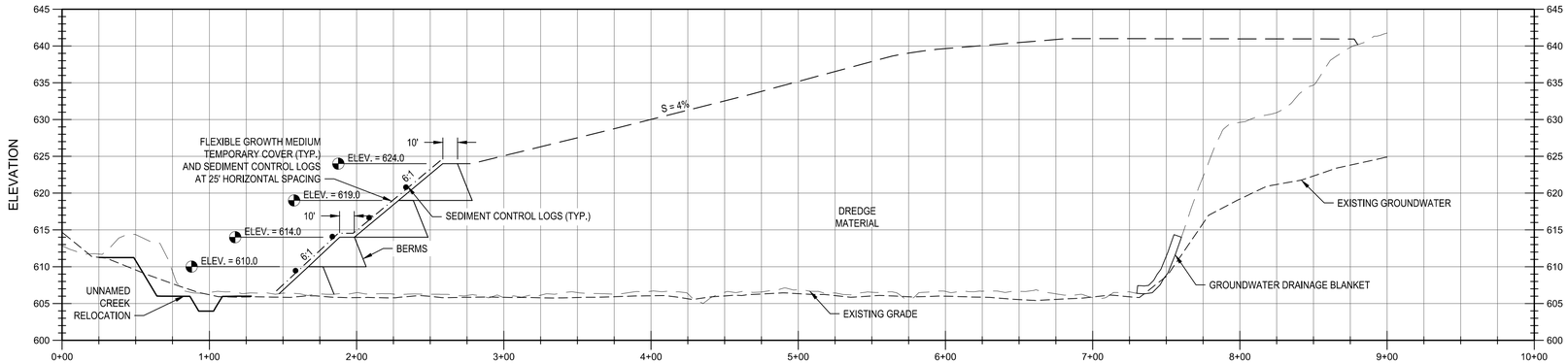
PROJECT NUMBER: 1518924

CD-101

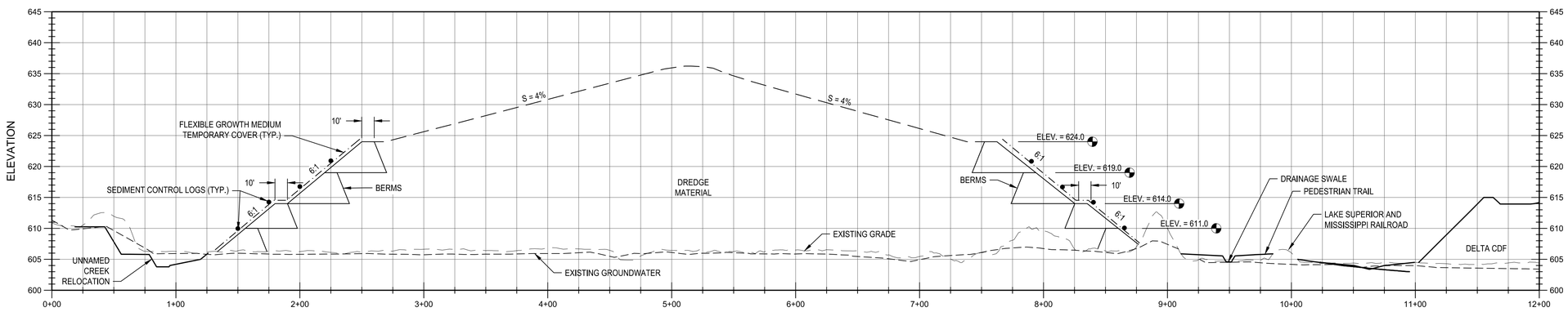
SHEET: 24 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: Y:\FEDERAL\NON DOD\GLAES\PROJECTS\151892A - SPIRIT LAKE RDA\-DESIGN\-CADD\A-FIGURES\UPLAND CDF MATERIAL GRADING\DETAILS\DWG\UPLAND CDF MATERIAL GRADING PLAN LETTO, JUSTIN 5/30/2019 1:18 PM



1 CD-101 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



2 CD-101 SECTION
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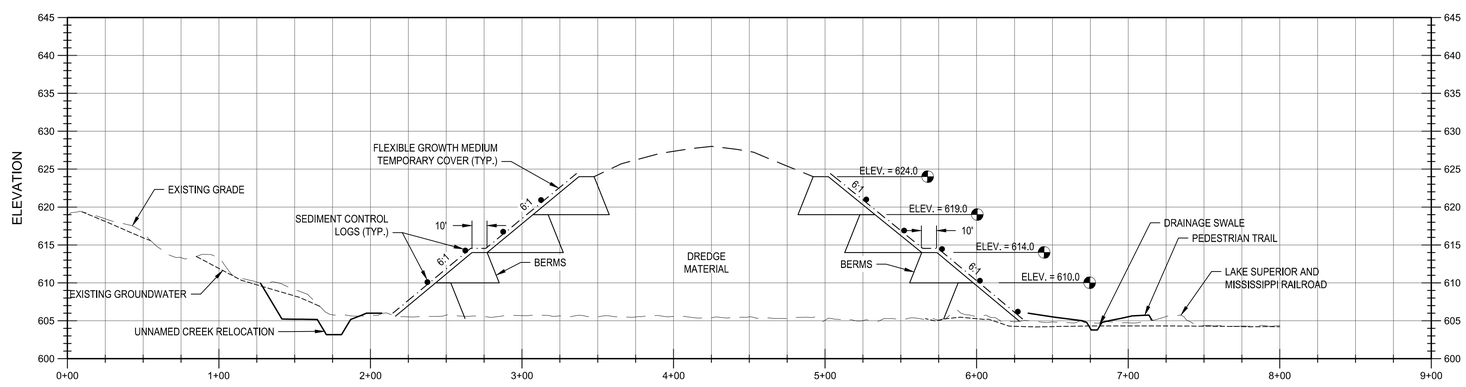
VERT. SCALE: 1" = 10'



3 CD-101 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'

NOTE:
GROUNDWATER ELEVATIONS ARE APPROXIMATE BASED ON MODELING, AND MAY VARY FROM WHAT IS DEPICTED.

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: ###
DRAWN BY: ###
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVUE UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UPLAND CDF MATERIAL GRADING DETAILS

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924
CD-301
SHEET: 25 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

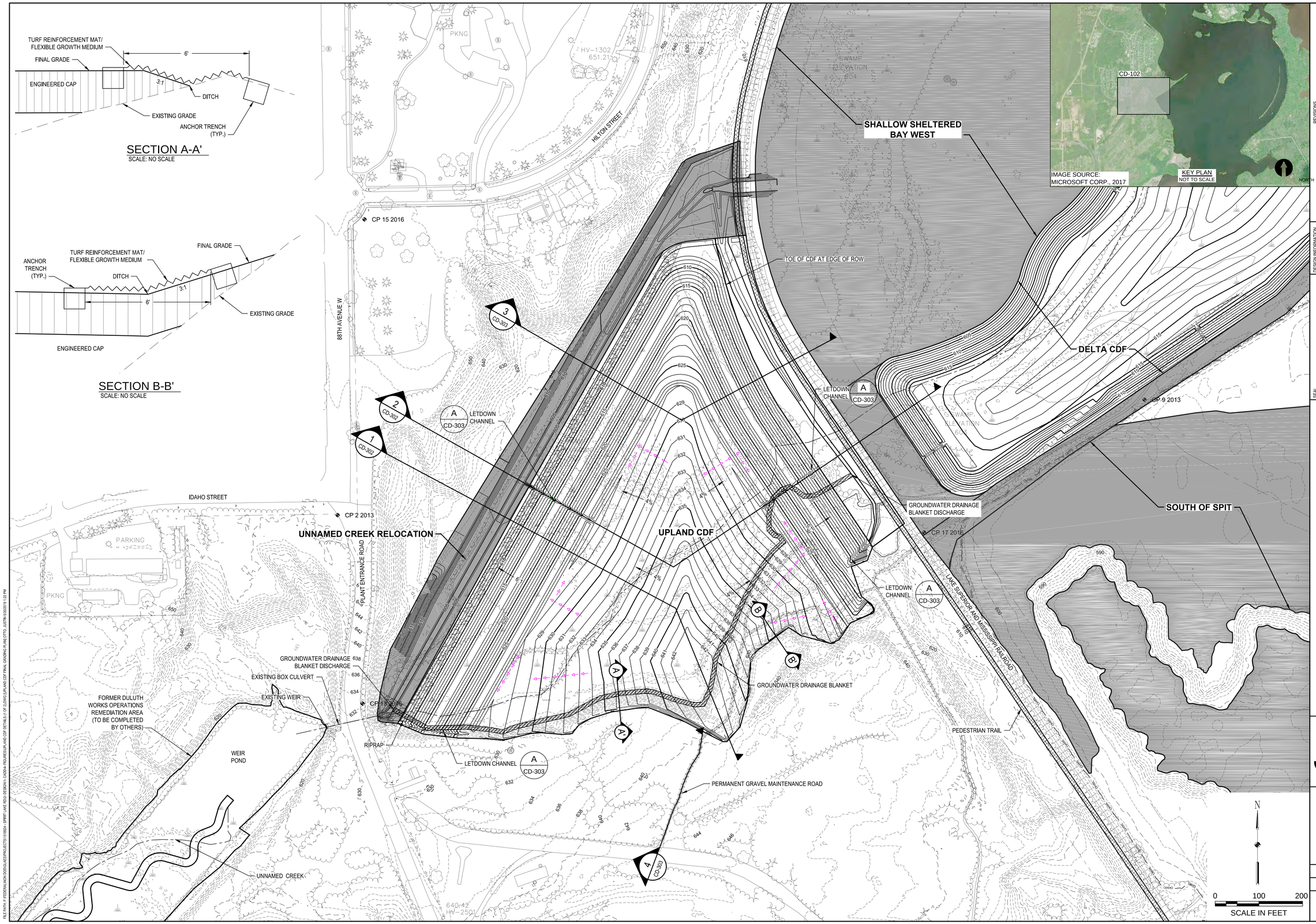
FILE PATH: F:\FEDERAL\NON DOD\CLIAE\PROJECTS\1518924 - SPIRIT LAKE REDI - DESIGN\1 - CADD\4 - FIGURES\UPLAND CDF MATERIAL GRADING DETAILS\UPLAND CDF MATERIAL GRADING DETAILS (OTTO, JUSTIN) 5/30/2019 1:18 PM

SECTION A-A'

SCALE: NO SCALE

SECTION B-B'

SCALE: NO SCALE



NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UPLAND CDF FINAL GRADING PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019

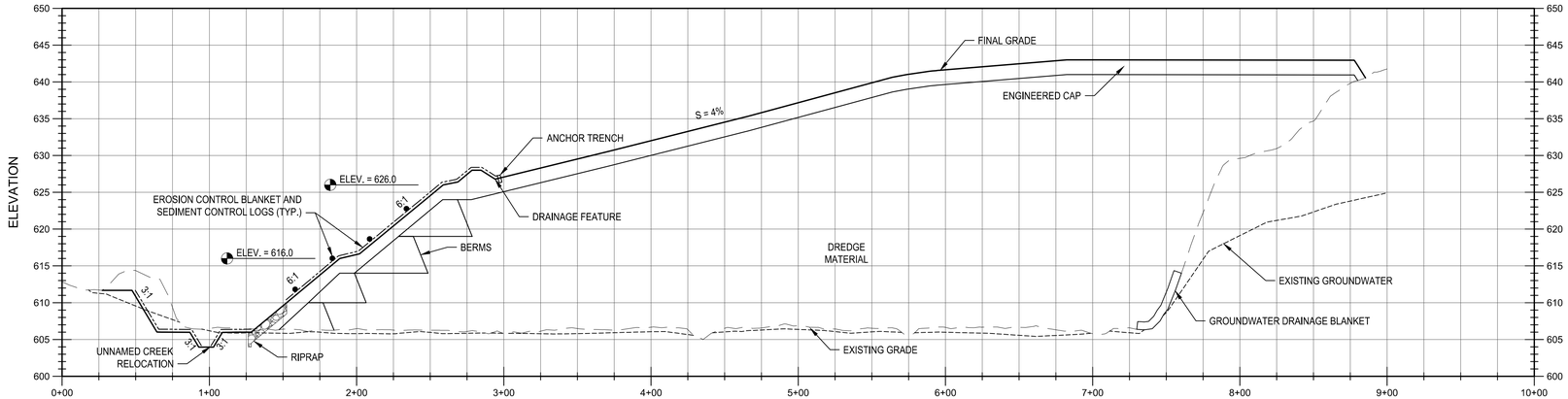
PROJECT NUMBER: 1518924

CD-102

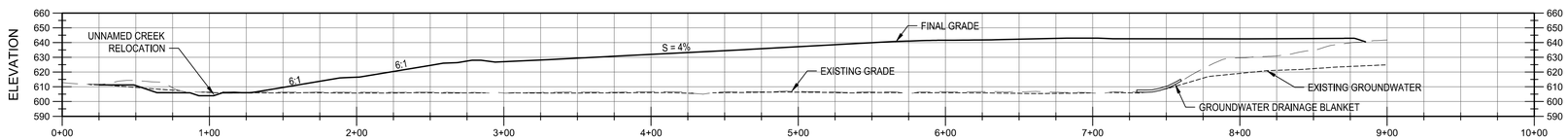
SHEET: 26 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

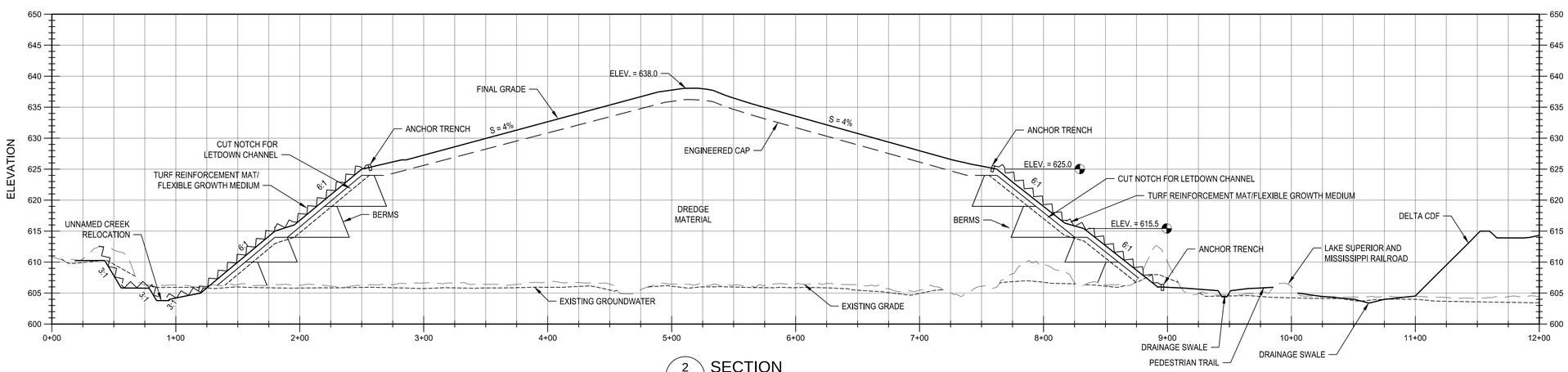
FILE PATH: F:\FEDERAL\NON DOD\CALJEB\PROJECTS\1518924 - SPIRIT LAKE RDG\-DESIGN\-CADD\4-FIGURES\UPLAND CDF DETAIL\11 OF 31\DWG\UPLAND CDF FINAL GRADING PLAN.DTTO, JJETRA 5/30/2019 1:22 PM



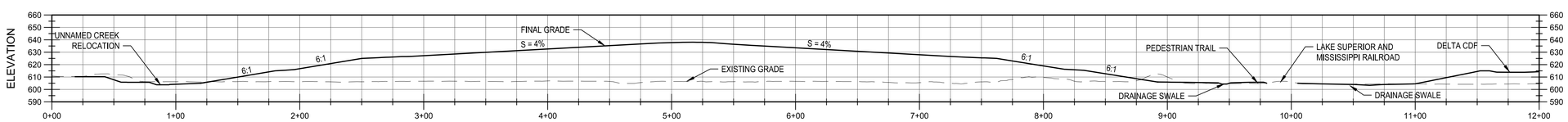
1 CD-102 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



1 CD-102 SECTION (TRUE SCALE)
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 50'



2 CD-102 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



2 CD-102 SECTION (TRUE SCALE)
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 50'

NOTE:
GROUNDWATER ELEVATIONS ARE APPROXIMATE BASED ON MODELING, AND MAY VARY FROM WHAT IS DEPICTED.

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: ###
DRAWN BY: ###
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UPLAND CDF DETAILS (1 OF 2)

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

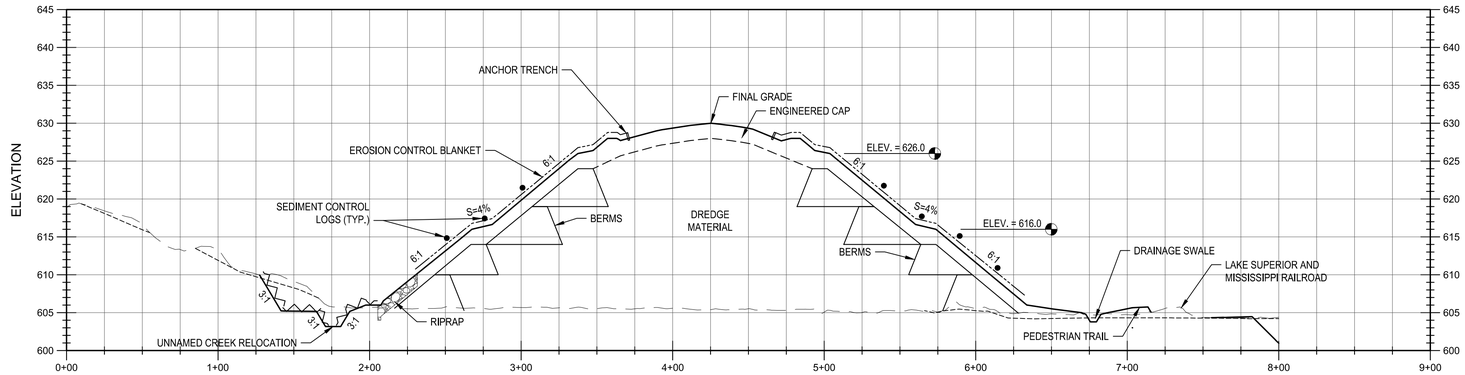
DATE: MAY 2019
PROJECT NUMBER: 1518924

CD-302
SHEET: 27 OF 116

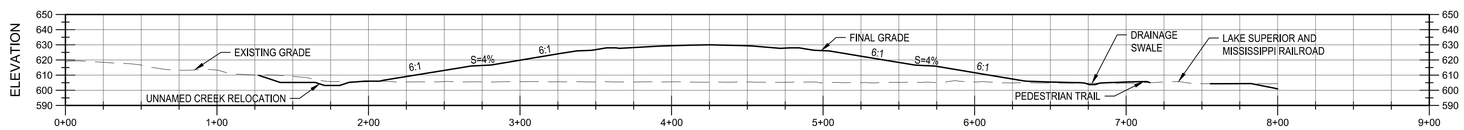
PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\ALJES\PROJECTS\1518924 - SPIRIT LAKE REDI - DESIGN\1 - CADD\4 - FIGURES\UPLAND CDF DETAILS 1 OF 2\UPLAND CDF DETAILS 1 OF 2\UTTU, JUSTIN 2/20/2019 1:52 PM

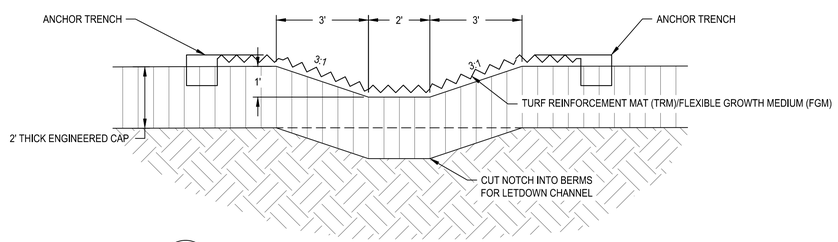
NOTE:
GROUNDWATER ELEVATIONS ARE APPROXIMATE BASED ON MODELING, AND MAY VARY FROM WHAT IS DEPICTED.



3 / CD-102 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'

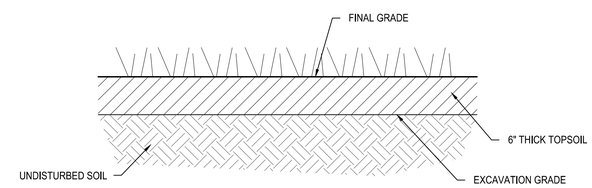


3 / CD-102 SECTION (TRUE SCALE)
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 50'



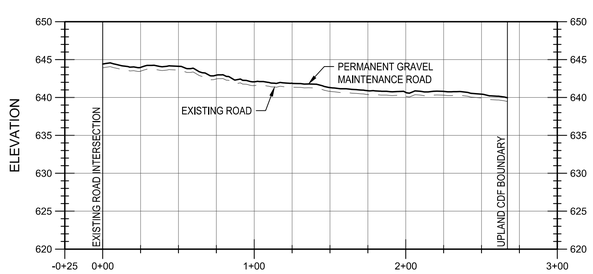
A / CD-102 LET DOWN CHANNEL TYPICAL SECTION
SCALE: NOT TO SCALE

CD-104
CD-305



CONSERVE TOPSOIL DETAIL
SCALE: NO SCALE

NOTES:
1. TOPSOIL SHALL BE CONSERVED BY STRIPPING PRIOR TO EXCAVATION AND STOCKPILED AS DESCRIBED IN THE SPECIFICATIONS.
2. UPON COMPLETION OF EXCAVATION, TOPSOIL SHALL BE PLACED TO THE THICKNESS SHOWN.



4 / CD-102 PERMANENT GRAVEL MAINTENANCE ROAD PROFILE
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UPLAND CDF DETAILS (2 OF 2)

PREPARED FOR:
EPA

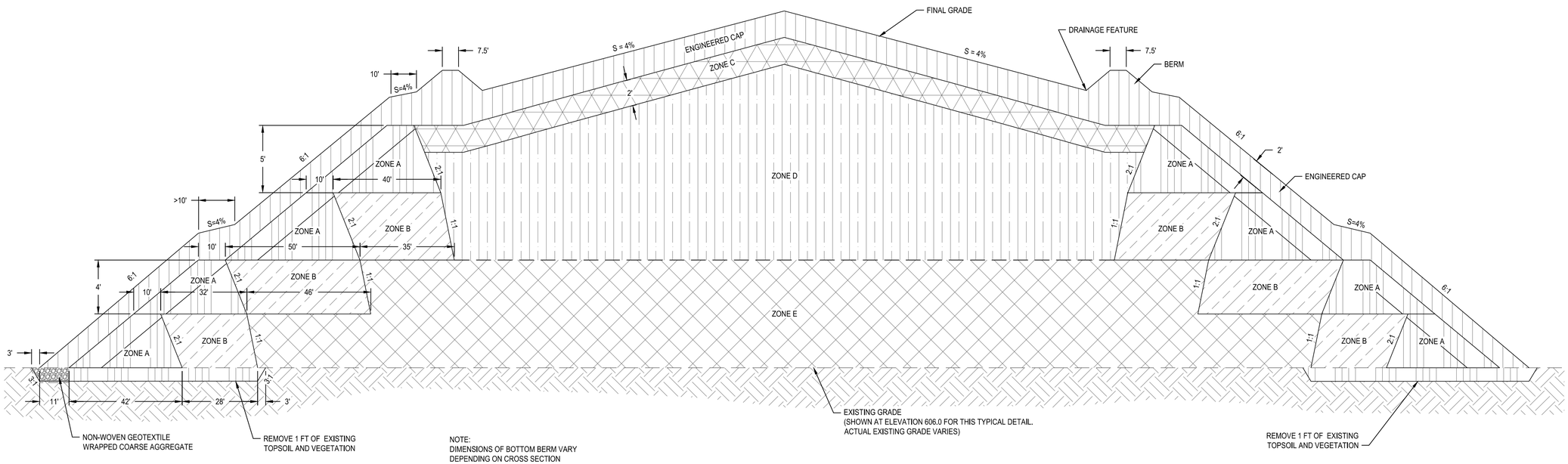
EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924

CD-303
SHEET: 28 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

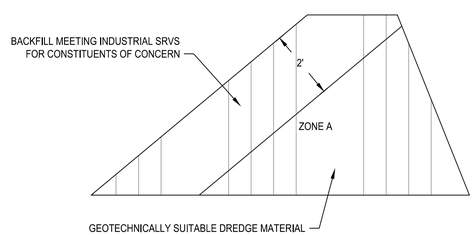
FILE PATH: F:\FEDERAL\NON DOD\ALASKA\PROJECTS\1518924 - SPIRIT LAKE REDL-DESIGN\1 - CADD\4 - FIGURES\UPLAND CDF DETAILS 1 OF 2\DWG\UPLAND CDF DETAILS 2 OF 2\UTTU_JUSTIN 3/20/2019 1:22 PM



NOTE:
DIMENSIONS OF BOTTOM BERM VARY
DEPENDING ON CROSS SECTION

UPLAND CDF TYPICAL DETAIL

SCALE: NO SCALE



BERM MATERIAL DETAIL

SCALE: NO SCALE

NOTES:

1. USE OF IMPACTED SOIL AND SEDIMENT IN UPLAND CDF CONTAINMENT BERMS IS ACCEPTABLE, BELOW INDUSTRIAL SRVS.
2. NO GREATER THAN 50 PERCENT OF DREDGED SEDIMENT EXCLUDING PEAT MAY BE USED I CONTAINMENT BERMS, SUBJECT TO THE APPROVAL OF THE OWNER.
3. GEOTECHNICAL REQUIREMENTS FOR CONTAINMENT BERMS SHALL BE MET FOR ANY USES OF DREDGED SEDIMENT OR IMPACTED SOIL.

LEGEND

ENGINEERED CAP	ENGINEERED CAP - BORROW MATERIAL
ZONE A	BERM - MIX OF BORROW AND DREDGE MATERIAL WITH 3% PORTLAND CEMENT AMENDMENT
ZONE B	BERM STABILIZATION - DREDGE MATERIAL WITH 10% PORTLAND CEMENT AMENDMENT
ZONE C	ENGINEERED CAP STABILIZATION - MIX OF BORROW AND DREDGE MATERIAL
ZONE D	UPPER ZONE - DREDGE MATERIAL
ZONE E	LOWER ZONE - DREDGE MATERIAL

NOTE: SEE TECHNICAL SPECIFICATIONS FOR
DETAILED MATERIAL REQUIREMENTS IN EACH ZONE.

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY:	LLR
DRAWN BY:	CNS
CHECKED BY:	JMT
PROJECT MANAGER:	JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 49712. MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

CDF DETAILS (1 OF 3)

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD; Suite D
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

CD-501

SHEET: 29 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\CLIENTS\PROJECTS\1518924 - SPIRIT LAKE RDC\-RESIGN\+ CADD\Acr FIG\RES\CDF DETAILS (1 OF 3).DWG\CDF DETAILS (1 OF 3).DTTO, JSTTN 5/20/2019 1:22 PM

FALCON STREET

HILTON STREET

LAKE SUPERIOR AND MISSISSIPPI RAILROAD

HV-1302
651.21

SHALLOW SHELTERED BAY WEST

SHALLOW SHELTERED BAY NORTHEAST

DELTA CDF

CDF BERM BREAKLINES

UNNAMED CREEK RELOCATION

UPLAND CDF

SPIT OF LAND

SOUTH OF SPIT

SPIRIT LAKE

CP 7 2013

CP 9 2013

CP 17 2016

1401
603.87

2 CD-304

1 CD-304

3 CD-304

N

0 100 200
SCALE IN FEET

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR

DRAWN BY: JRM

CHECKED BY: JMT

PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMIE BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

DELTA CDF MATERIAL GRADING PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019

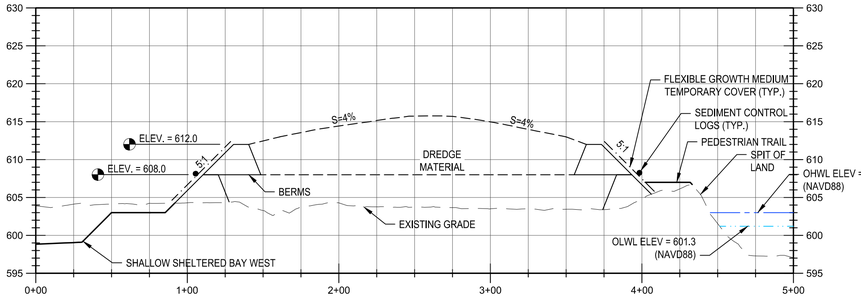
PROJECT NUMBER: 1518924

CD-103

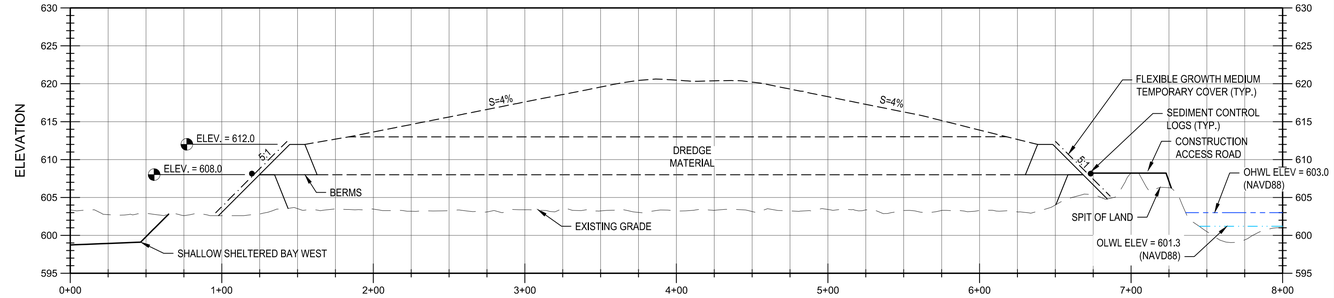
SHEET: 30 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\ALL\EPROJECTS\1518924 - SPIRIT LAKE RDC\-DESIGN\-CADD\4-FIGURES\DELTA CDF MATERIAL GRADING\DELTA CDF MATERIAL GRADING PLAN\DTTO, JUSTIN 5/20/2019 1:24 PM



1 CD-103 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



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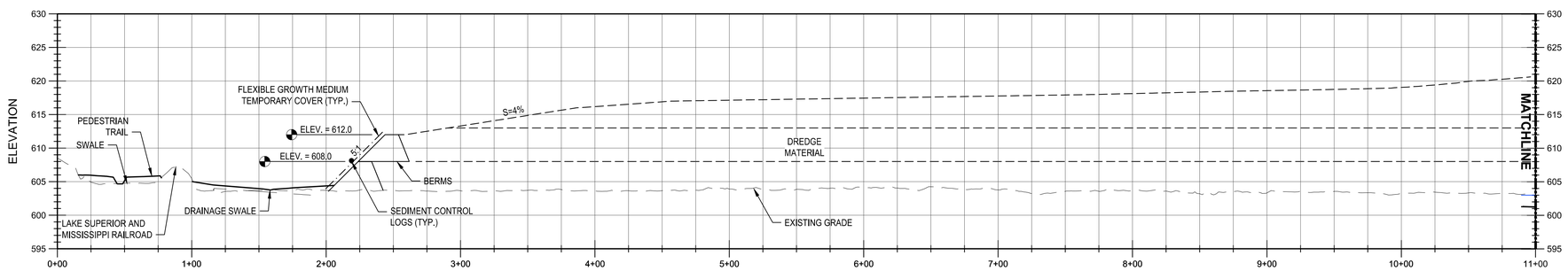
VERT. SCALE: 1" = 10'



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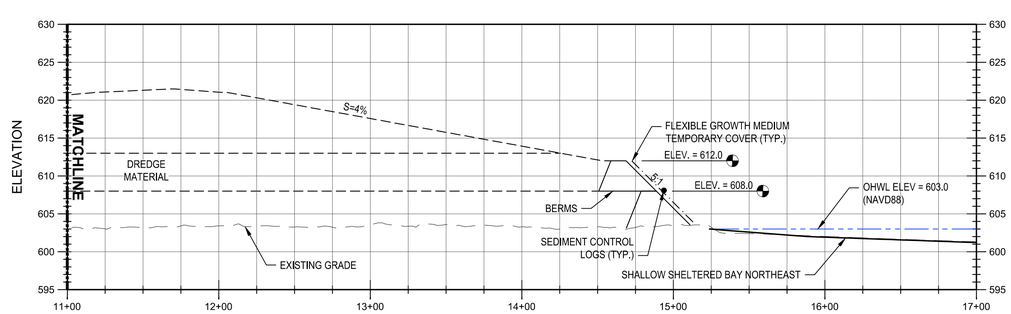
VERT. SCALE: 1" = 10'



3 CD-103 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY:	DRAWN BY:	CHECKED BY:	PROJECT MANAGER:
LLR	JRM	JMT	JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMIE BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

DELTA CDF MATERIAL GRADING DETAILS

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019

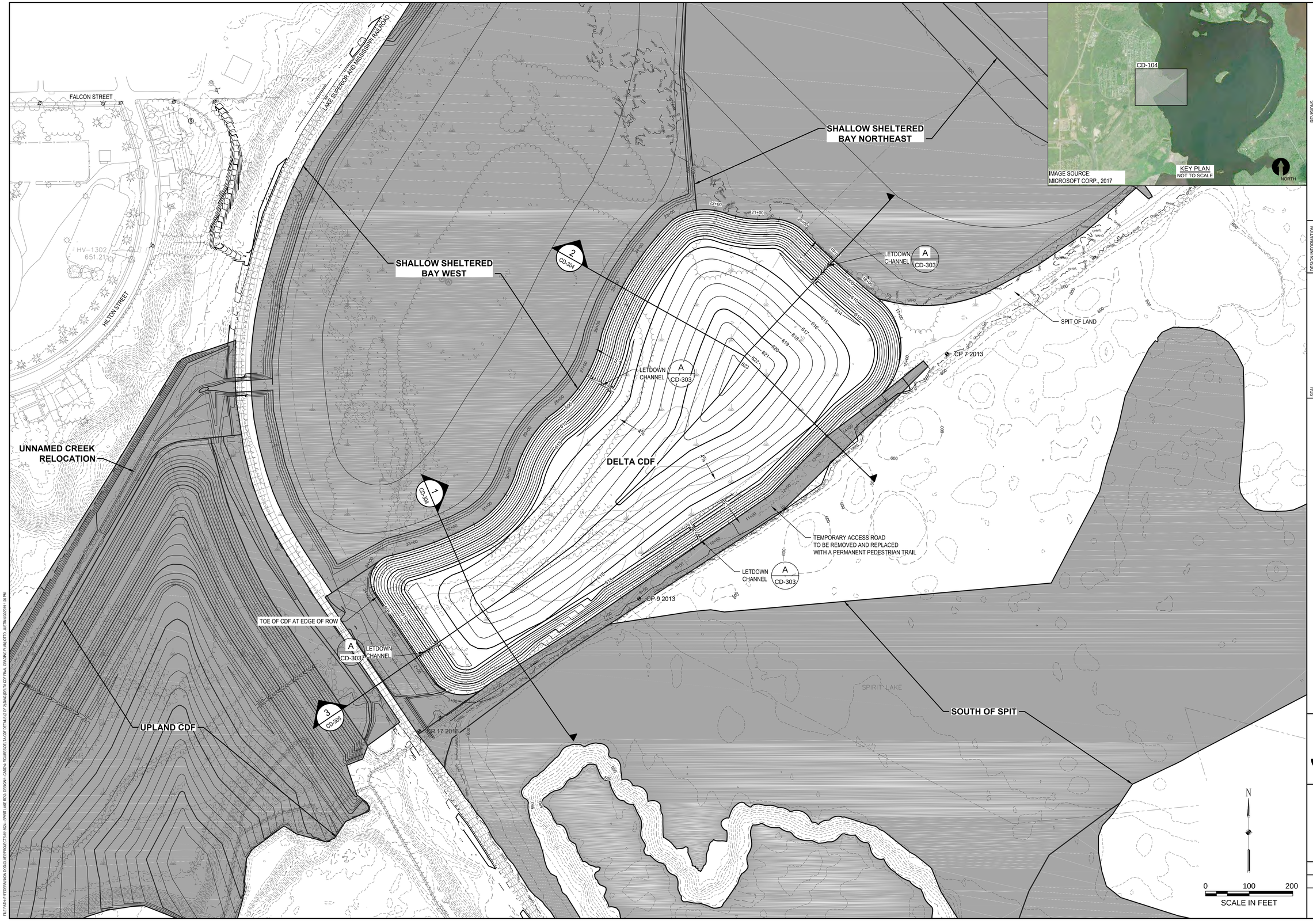
PROJECT NUMBER: 1518924

CD-304

SHEET: 31 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: P:\FEDERAL\NON DOD\GLAES\PROJECTS\1518924 - SPIRIT LAKE RDC\-DESIGN\-CADD\A-FIELD\SELTA CDF MATERIAL GRADING DETAILS\DELTA CDF MATERIAL GRADING DETAILS.DWG; DELTA CDF MATERIAL GRADING DETAILS.DWG; JUSTIN 5/20/2019 1:24 PM



REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

DELTA CDF FINAL GRADING PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019

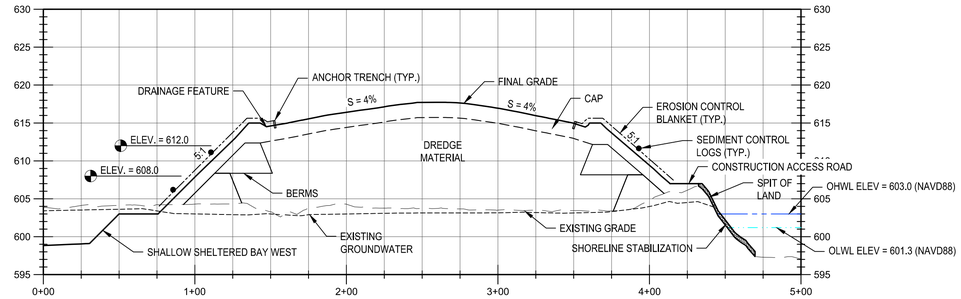
PROJECT NUMBER: 1518924

CD-104

SHEET: 32 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NCH DOCS\JOBS\PROJECTS\1518924 - SPIRIT LAKE REDI, DESIGN\1 - CADD\4 - PROJRESIDELTA CDF DETAILS\2 CDF 2\DWG\DELTA CDF FINAL GRADING PLAN LYTR2, JUSTIN 5/30/2019 1:26 PM



1 CD-104 SECTION
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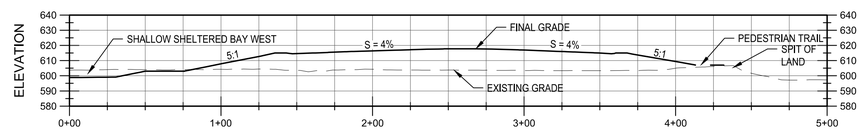
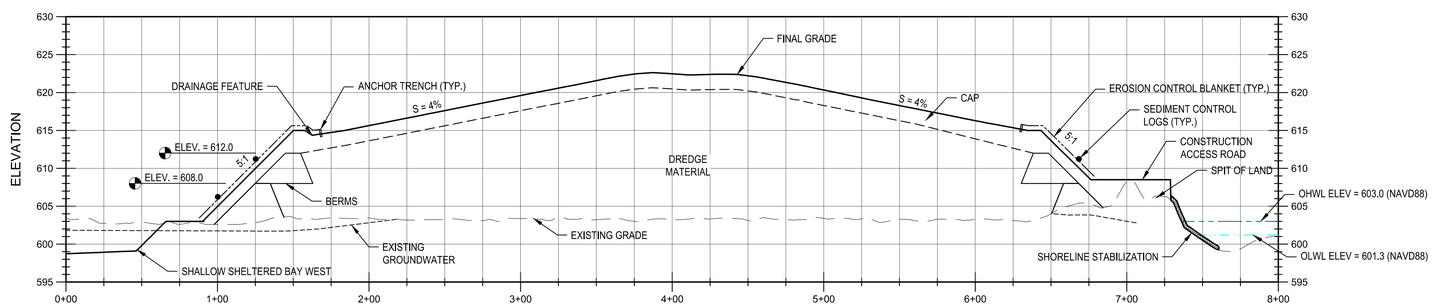
VERT. SCALE: 1" = 10'

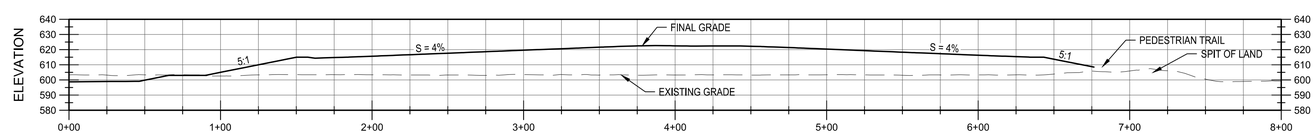


1 CD-104 SECTION (TRUE SCALE)
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 50'

NOTES:
1. GROUNDWATER ELEVATIONS ARE APPROXIMATE BASED ON MODELING, AND MAY VARY FROM WHAT IS DEPICTED.
2. FOR SHORELINE STABILIZATION DETAILS SEE SHEET CH-502.



2 CD-104 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



2 CD-104 SECTION (TRUE SCALE)
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 50'

NO.	DATE	BY	DESCRIPTION

REVISIONS

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

DELTA CDF DETAILS (1 OF 2)

PREPARED FOR:
EPA

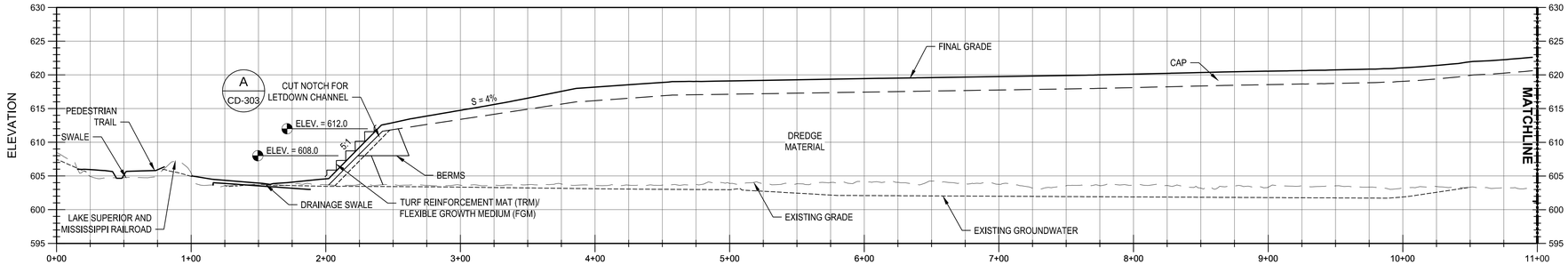
EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924

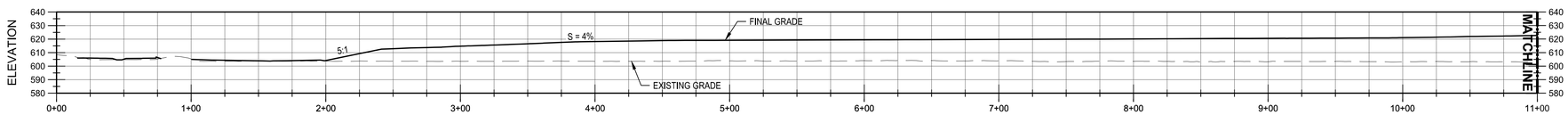
CD-305
SHEET: 33 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NCD\DOCUMENTS\PROJECTS\1518924 - SPIRIT LAKE REDI - DESIGN\1 - CAD\Arc FIGURES\DELTA CDF DETAILS (1 OF 2).DWG [DELTA CDF DETAILS (1 OF 2)] DATE: 5/30/2019 1:26 PM

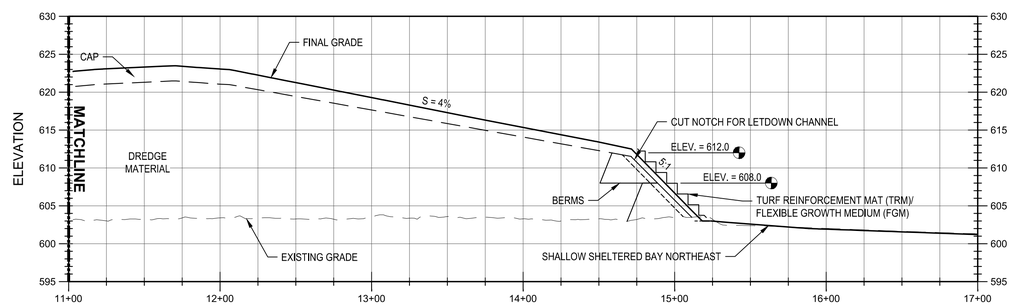


3 CD-104 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'

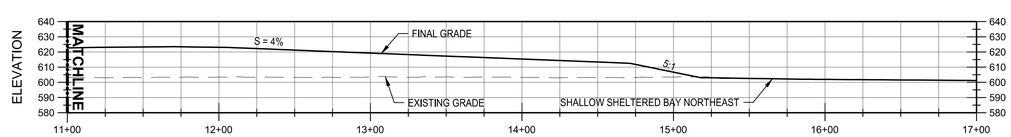


3 CD-104 SECTION (TRUE SCALE)
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 50'

NOTE:
GROUNDWATER ELEVATIONS ARE APPROXIMATE BASED ON MODELING, AND MAY VARY FROM WHAT IS DEPICTED.



3 CD-104 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



3 CD-104 SECTION (TRUE SCALE)
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 50'

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

DELTA CDF DETAILS (2 OF 2)

PREPARED FOR:
EPA

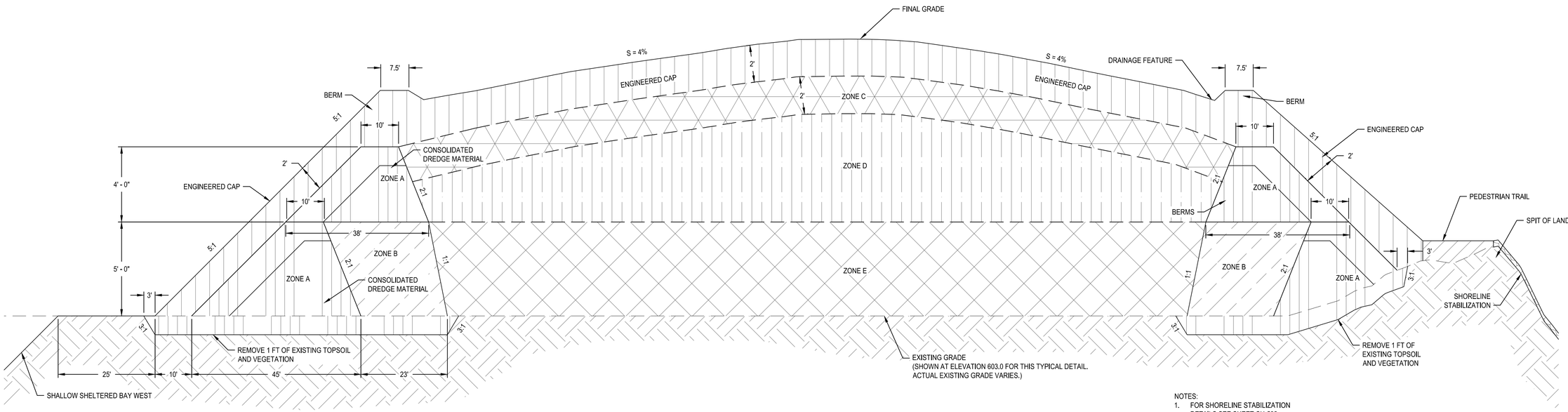
EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924

CD-306
SHEET: 34 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

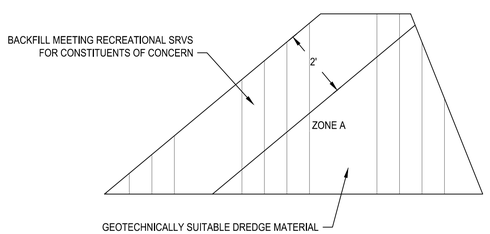
FILE PATH: F:\FEDERAL\NON DOD\ALJES\PROJECTS\1518924 - SPIRIT LAKE REDI - DESIGN\1 - CADD\44 FIGURES\DELTA CDF DETAILS (2 OF 2).DWG [DELTA CDF DETAILS (2 OF 2)] PLOTTED: JUSTIN 5/30/2019 1:27 PM



DELTA CDF TYPICAL DETAIL

SCALE: NO SCALE

NOTES:
1. FOR SHORELINE STABILIZATION DETAILS SEE SHEET CH-502.
2. DIMENSIONS OF BOTTOM BERM VARY DEPENDING ON CROSS SECTION.



BERM MATERIAL DETAIL

SCALE: NO SCALE

NOTES:
1. USE OF IMPACTED SOIL AND SEDIMENT ABOVE INDUSTRIAL SRVS IN DELTA CDF CONTAINMENT BERMS IS NOT PERMITTED.
2. NO GREATER THAN 50 PERCENT OF DREDGED SEDIMENT EXCLUDING PEAT MAY BE USED I CONTAINMENT BERMS, SUBJECT TO THE APPROVAL OF THE OWNER.
3. GEOTECHNICAL REQUIREMENTS FOR CONTAINMENT BERMS SHALL BE MET FOR ANY USES OF DREDGED SEDIMENT OR IMPACTED SOIL.

LEGEND

ENGINEERED CAP	ENGINEERED CAP - BORROW MATERIAL
ZONE A	BERM - MIX OF BORROW AND DREDGE MATERIAL WITH 3% PORTLAND CEMENT AMENDMENT
ZONE B	BERM STABILIZATION - DREDGE MATERIAL WITH 10% PORTLAND CEMENT AMENDMENT
ZONE C	ENGINEERED CAP STABILIZATION - MIX OF BORROW AND DREDGE MATERIAL
ZONE D	UPPER ZONE - DREDGE MATERIAL
ZONE E	LOWER ZONE - DREDGE MATERIAL

NOTE: SEE TECHNICAL SPECIFICATIONS FOR DETAILED MATERIAL REQUIREMENTS IN EACH ZONE.

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: CNS
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 49712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

CDF DETAILS (2 OF 3)

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD; Suite D
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019

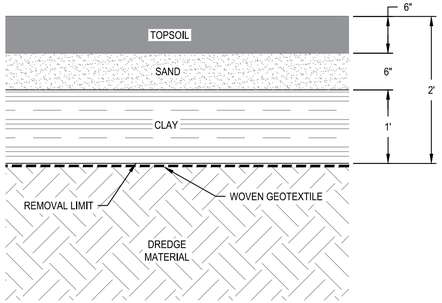
PROJECT NUMBER: 1518924

CD-502

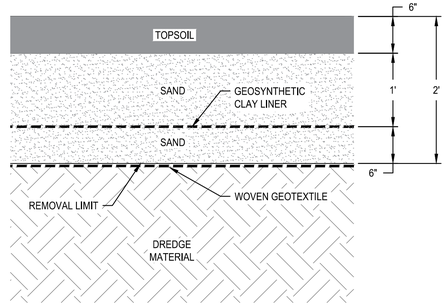
SHEET: 35 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

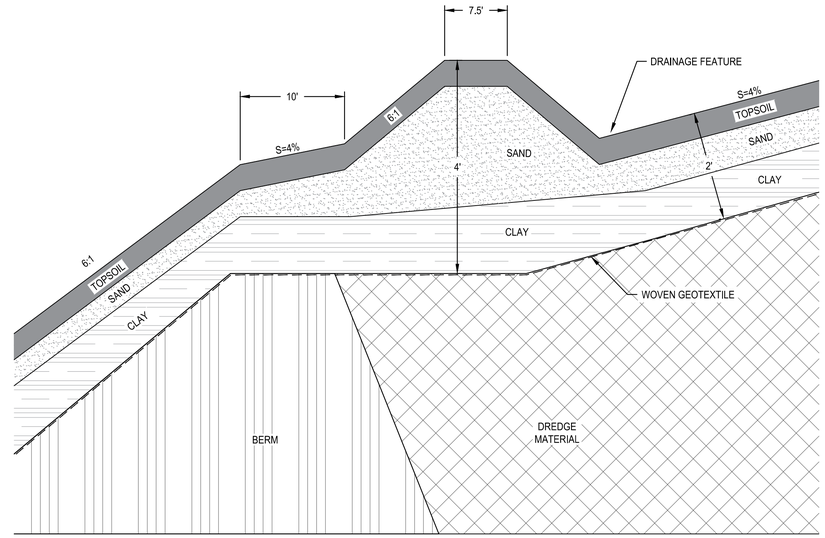
FILE PATH: P:\FEDERAL\NON DOD\GLAES\PROJECTS\118924 - SPIRIT LAKE RDA - DESIGN\+ CADD\4-FIGURES\CDF DETAILS 2 OF 3\DWG\CDF DETAILS 2 OF 3\UTTO, JUSTIN 5/30/2019 12:7 PM



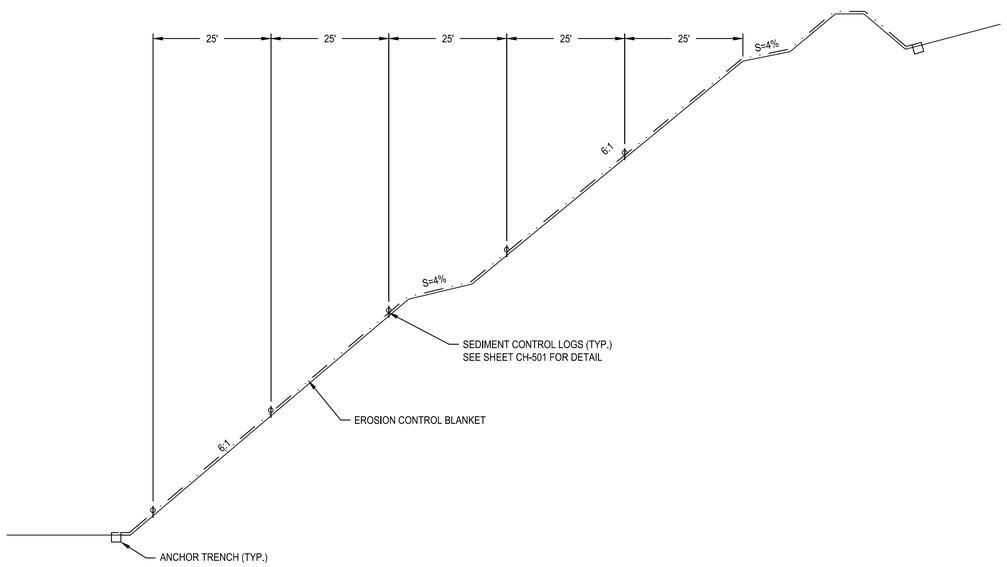
2' CDF ENGINEERED CAP TYPICAL DETAIL
SCALE: NO SCALE



ALTERNATIVE ENGINEERED CAP TYPICAL DETAIL
SCALE: NO SCALE

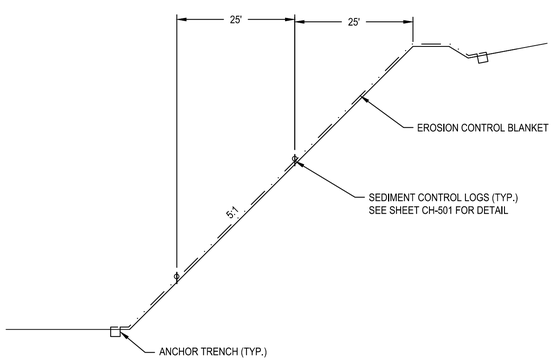


UPLAND CDF DRAINAGE DITCH/BERM TYPICAL DETAIL
SCALE: NO SCALE

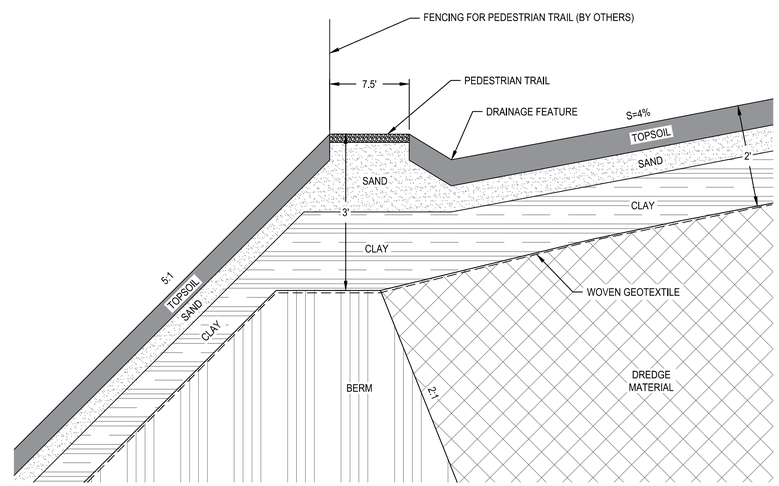


UPLAND CDF SLOPE PROTECTION TYPICAL DETAIL
SCALE: NO SCALE

NOTE:
SEDIMENT CONTROL LOGS SHALL BE INSTALLED ON TEMPORARY BERM, REMOVED PRIOR TO ENGINEERED CAP INSTALLATION, AND SEDIMENT CONTROL LOGS SHALL BE INSTALLED ON ENGINEERED CAP FINAL GRADE.



DELTA CDF SLOPE PROTECTION TYPICAL DETAIL
SCALE: NO SCALE



DELTA CDF DRAINAGE FEATURE/BERM TYPICAL DETAIL
SCALE: NO SCALE

NO.	DATE	BY	DESCRIPTION

REVISIONS

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: CNS
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

CDF DETAILS (3 OF 3)

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD; Suite D
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924
CD-503
SHEET: 36 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\ALLIES\PROJECTS\1518924 - SPIRIT LAKE RDC- DESIGN\1- CADD\4- FIGURES\CDF DETAILS (3 OF 3)\DWG\CDF DETAILS (3 OF 3).DWG, JUSTIN 5/20/2019 1:27 PM

COORDINATE TABLE		
DRIVE POINT	NORTHING	EASTING
DP-1	396,180.79	2,848,139.70
DP-2	396,214.32	2,848,349.46
DP-3	396,272.97	2,848,521.93
DP-4	396,246.16	2,848,676.13
DP-5	396,347.29	2,848,733.17
DP-6	396,468.82	2,848,904.73
DP-7	396,570.74	2,849,022.23
DP-8	396,708.07	2,848,930.02
DP-9	396,877.36	2,848,817.17
DP-10	397,069.43	2,848,725.07
DP-11	397,156.59	2,848,630.99
DP-12	396,980.02	2,848,528.15
DP-13	396,805.81	2,848,428.61
DP-14	396,632.36	2,848,328.77
DP-15	396,460.46	2,848,230.54
DP-16	396,953.41	2,849,168.84
DP-17	396,807.58	2,849,260.79
DP-18	396,900.66	2,849,532.68
DP-19	397,001.47	2,849,690.23
DP-20	397,110.18	2,849,853.51
DP-21	397,220.33	2,850,006.18
DP-22	397,366.06	2,850,148.84
DP-23	397,487.68	2,850,250.82
DP-24	397,599.75	2,850,176.95
DP-25	397,727.34	2,850,037.48
DP-26	397,755.86	2,849,869.86
DP-27	397,682.49	2,849,769.91
DP-28	397,522.93	2,849,685.29
DP-29	397,327.83	2,849,579.23
DP-30	397,198.61	2,849,485.30
DP-31	397,018.22	2,849,311.27
DP-32	397,544.30	2,849,999.32
DP-33	397,382.52	2,849,881.73
DP-34	397,238.77	2,849,742.68
DP-35	396,603.45	2,848,763.57
DP-36	396,556.60	2,848,625.42
DP-37	396,392.71	2,848,464.73
DP-38	396,780.34	2,849,349.82

COORDINATE TABLE		
SETTLEMENT PLATE	NORTHING	EASTING
SP-1	396,269.82	2,848,433.04
SP-2	396,435.30	2,848,387.20
SP-3	396,212.16	2,848,704.86
SP-4	396,504.66	2,848,932.36
SP-5	396,659.64	2,848,747.47
SP-6	396,614.58	2,848,453.25
SP-7	396,867.01	2,848,649.69
SP-8	396,949.30	2,849,421.62
SP-9	397,070.13	2,849,569.73
SP-10	397,460.16	2,849,931.89
SP-11	397,616.02	2,849,891.93
SP-12	397,473.23	2,850,098.09
SP-13	396,668.78	2,848,656.68
SP-14	397,238.77	2,849,742.68

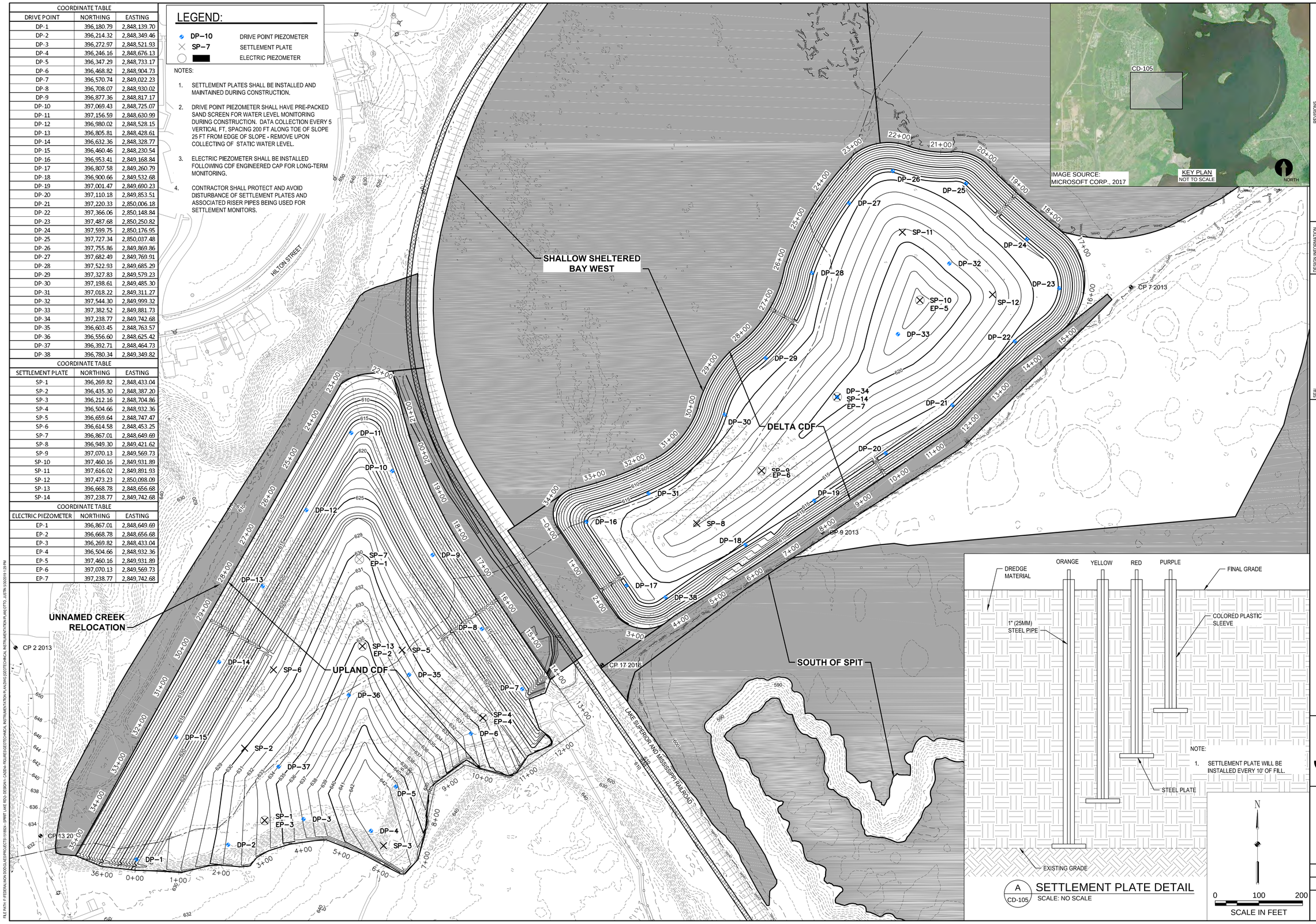
COORDINATE TABLE		
ELECTRIC PIEZOMETER	NORTHING	EASTING
EP-1	396,867.01	2,848,649.69
EP-2	396,668.78	2,848,656.68
EP-3	396,269.82	2,848,433.04
EP-4	396,504.66	2,848,932.36
EP-5	397,460.16	2,849,931.89
EP-6	397,070.13	2,849,569.73
EP-7	397,238.77	2,849,742.68

LEGEND:

- DP-10 — DRIVE POINT PIEZOMETER
- SP-7 — SETTLEMENT PLATE
- ELECTRIC PIEZOMETER

NOTES:

1. SETTLEMENT PLATES SHALL BE INSTALLED AND MAINTAINED DURING CONSTRUCTION.
2. DRIVE POINT PIEZOMETER SHALL HAVE PRE-PACKED SAND SCREEN FOR WATER LEVEL MONITORING DURING CONSTRUCTION. DATA COLLECTION EVERY 5 VERTICAL FT, SPACING 200 FT ALONG TOE OF SLOPE 25 FT FROM EDGE OF SLOPE - REMOVE UPON COLLECTING OF STATIC WATER LEVEL.
3. ELECTRIC PIEZOMETER SHALL BE INSTALLED FOLLOWING CDF ENGINEERED CAP FOR LONG-TERM MONITORING.
4. CONTRACTOR SHALL PROTECT AND AVOID DISTURBANCE OF SETTLEMENT PLATES AND ASSOCIATED RISER PIPES BEING USED FOR SETTLEMENT MONITORS.



A CD-105 SETTLEMENT PLATE DETAIL
SCALE: NO SCALE

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY:	LLR
DRAWN BY:	JRM
CHECKED BY:	JMT
PROJECT MANAGER:	JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT INTENDED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN

DULUTH, MINNESOTA

GEOTECHINCAL INSTRUMENTATION PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

CD-105

SHEET: 37 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: Y:\FEDERAL\NON DOD\SLAE\PROJECTS\1518924 - SPIRIT LAKE REDA DESIGN\1-CADD\4-FIGURES\GEOTECHNICAL INSTRUMENTATION PLAN\GEOTECHNICAL INSTRUMENTATION PLAN (OTD). JUSTIN 5/30/2019 1:29 PM

WIRE MILL POND

WIRE MILL POND DELTA

WIRE MILL POND LETDOWN CHANNEL

A
CR-304

APPROXIMATE BOUNDARY OF BORROW MATERIAL NOT ACCEPTABLE FOR IN-LAKE PLACEMENT

20' MIN OFFSET

100' X 80' APPROXIMATE BOUNDARY OF UNUSABLE INDUSTRIAL FILL

BORROW AREA

S = 1.0%

LAKE SUPERIOR AND MISSISSIPPI RAILROAD

CP 18 2016

CP 3 2012

GTB-23

SS-1

BA-01

SS-2

BA-02

BA-03

BA-04

BA-05

SB-2

GTB-24

SL16-BB-02

M11

SL16-BB-01

SS-5

SS-4

BA-06

BA-07

BA-08

TP-S-2

GTB-25

1
CB-301

2
CB-301

3
CB-301

4
CB-301

IMAGE SOURCE: MICROSOFT CORP., 2017

CB-101

KEY PLAN
NOT TO SCALE

NORTH

LEGEND

BORROW MATERIAL ACCEPTABLE FOR IN-LAKE PLACEMENT

BORROW MATERIAL NOT ACCEPTABLE FOR IN-LAKE PLACEMENT

N

0 50 100
SCALE IN FEET

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR

DRAWN BY: JRM

CHECKED BY: JMT

PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR BIDDING, CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN

DULUTH, MINNESOTA

BORROW AREA PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

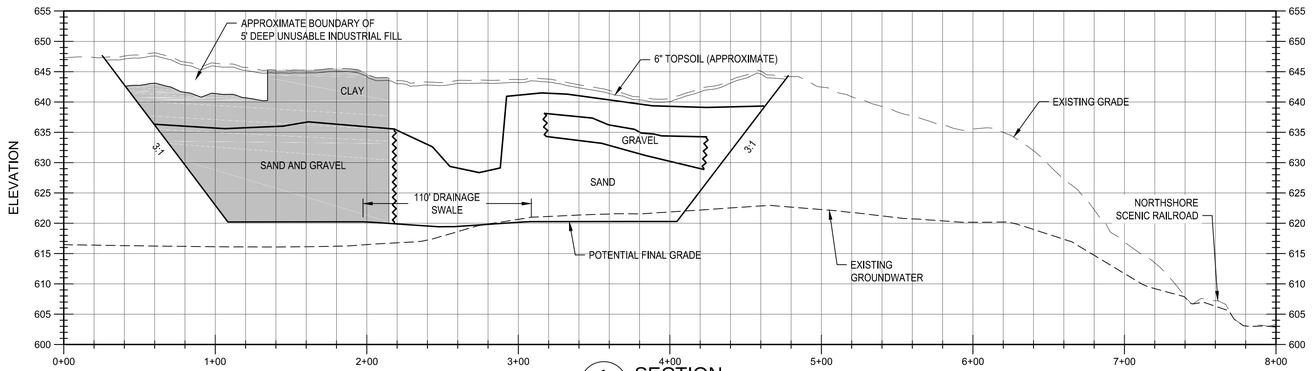
PROJECT NUMBER: 1518924

CB-101

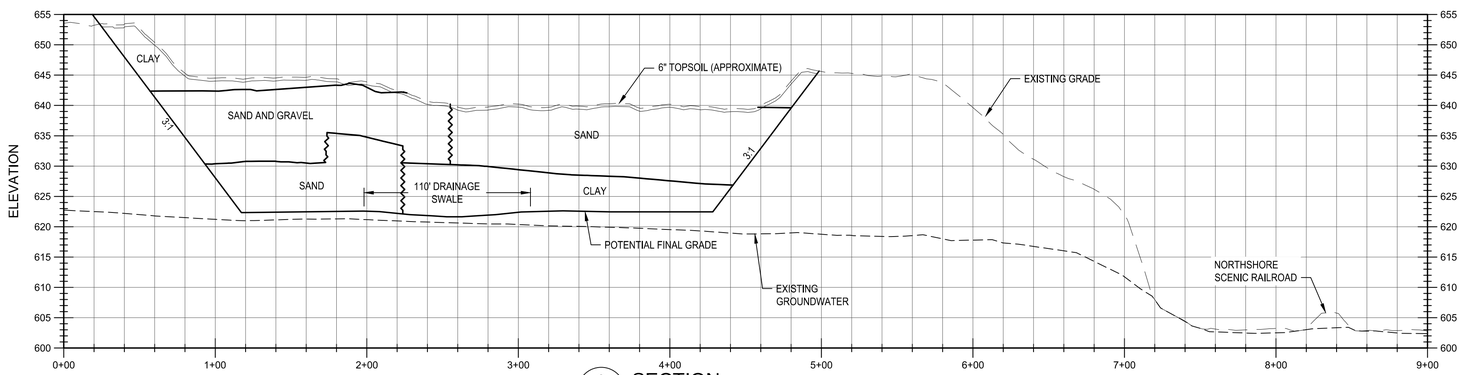
SHEET: 38 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NCR DOD\GLAE\PROJECTS\151892A - SPIRIT LAKE REDI\-DESIGN\-CADD\-FIGURES\BORROW AREA\FIGURE 2-1 OF 3 (BORROW AREA PLAN).DWG, JJUTRN, 5/30/2019 2:38 PM



1 CB-101 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



2 CB-101 SECTION
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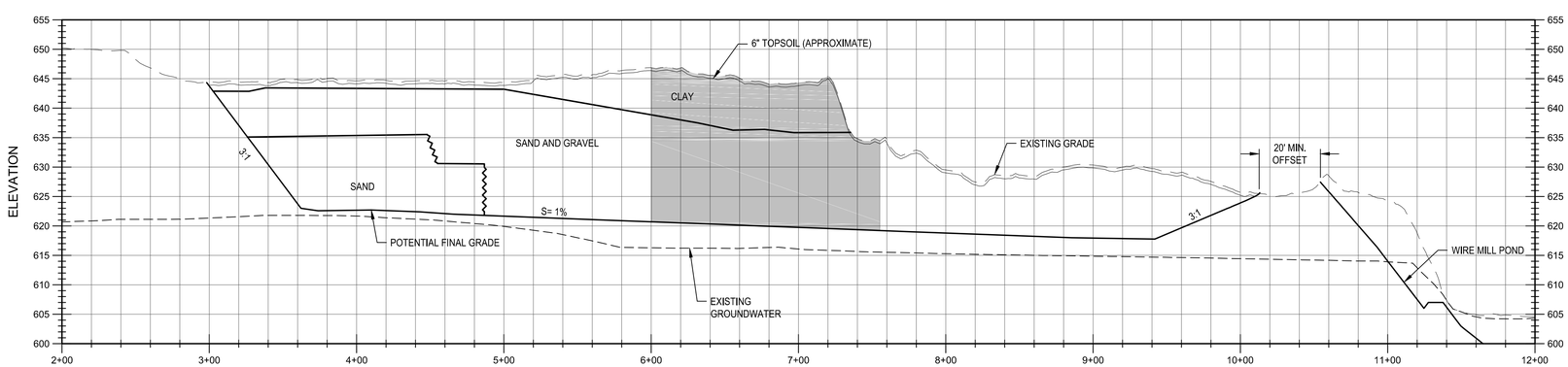
VERT. SCALE: 1" = 10'



3 CB-101 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'

NOTES:

1. THE ESTIMATED AVAILABLE SOIL VOLUME ARE BASED ON TOPOGRAPHIC SURVEY, SOIL BORINGS, AND TRENCHES. THE NATURE AND EXTENT OF VARIATION BETWEEN INVESTIGATED LOCATIONS IS UNPREDICTABLE. THEREFORE, THE VOLUME OF EACH SOIL FOR CONSTRUCTION MAY BE SIGNIFICANTLY DIFFERENT THAN ESTIMATED SOIL VOLUMES.
2. UNUSED SOIL EXCEEDING INDUSTRIAL SRVS EXCAVATED TO OBTAIN USABLE BORROW SHALL BE PLACED IN UPLAND CDF. BORROW SOIL AREAS THAT ARE GEOTECHINCALLY UNSUITABLE BUT ARE LESS THAN INDUSTRIAL SRVS SHALL BE TEMPORARILY STOCKPILED AND COVERED WITH PLASTIC, THEN REPLACED AND COMPACTED TO DENSE, NON-YEILDING CONDITION AS PART OF FINAL BORROW SITE RESTORATION AND COVERED WITH 2 FEET OF SOIL BUFFER FROM THE BORROW SITE RESTORATION. LOCATION OF REPLACED SOIL IS SUBJECT TO APPROVAL BY OWNER.
3. POTENTIAL FINAL GRADE ASSUMES ALL AVAILABLE BORROW SOIL IS EXCAVATED. AS-BUILT FINAL GRADE IS EXPECTED TO BE DIFFERENT BUT SHALL BE GRADED TO DRAIN AS SHOWN.
4. CONTRACTOR IS RESPONSIBLE FOR RESTORATION OF BORROW SITE UPON COMPLETION IN ACCORDANCE WITH CONTRACTOR DOCUMENTS.
5. BORROW SITE FINAL GRADE CONDITION INCLUDES DESIGN SLOPES AND TOPOGRAPHY THAT BLENDS WITH SURROUNDING AREAS, AVOIDING PITS, MOUNDS, JUTTING UNEXCAVATED AREAS AND PROVIDING POSITIVE DRAINAGE.
6. GROUNDWATER ELEVATIONS ARE APPROXIMATE BASED ON MODELING, AND MAY VARY FROM WHAT IS DEPICTED.

ESTIMATED SOIL VOLUMES (ACCEPTABLE FOR IN-LAKE OR UPLAND PLACEMENT)

SOIL	VOLUME	UNITS
SAND AND GRAVEL	40,403	CY
SAND	54,064	CY
CLAY	24,351	CY

ESTIMATED SOIL VOLUMES (ACCEPTABLE FOR UPLAND PLACEMENT)

SOIL	VOLUME	UNITS
SAND AND GRAVEL	11,789	CY
CLAY	6,078	CY
TOPSOIL	4,887	CY

ESTIMATED SOIL VOLUMES (NOT ACCEPTABLE FOR ONSITE PLACEMENT)

SOIL	VOLUME	UNITS
WASTE MATERIAL	1,481	CY

LEGEND

BORROW SOIL ACCEPTABLE FOR IN-LAKE OR UPLAND PLACEMENT

BORROW SOIL ACCEPTABLE FOR UPLAND PLACEMENT

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712 MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

BORROW AREA DETAILS (1 OF 2)

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

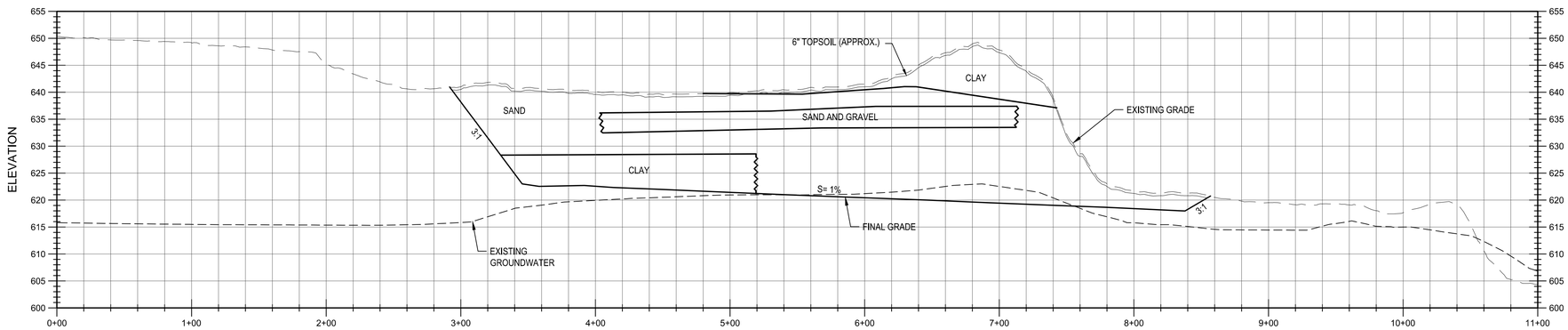
PROJECT NUMBER: 1518924

CB-301

SHEET: 39 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\GLAES\PROJECTS\1518924 - SPIRIT LAKE REDI\-DESIGN\+ CADD\+ FIGURES\BORROW AREA DETAILS 1 OF 2\ DTTD - JUSTIN 5/20/2019 2:29 PM



4 / CB-101 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 12.5'

LEGEND

BORROW SOIL ACCEPTABLE FOR IN-LAKE PLACEMENT

BORROW SOIL ACCEPTABLE FOR IN-LAKE PLACEMENT

NOTE:
1. GROUNDWATER ELEVATIONS ARE APPROXIMATE BASED ON MODELING, AND MAY VARY FROM WHAT IS DEPICTED.

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: CNS
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

BORROW AREA DETAILS (2 OF 2)

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

CB-302

SHEET: 40 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: P:\FEDERAL\MON\DOUGLAS\PROJECTS\181924_SPIRIT LAKE EDZ_DESIGN\1-CADD\4-FIG\ARE2\BORROW AREA DETAILS (2 OF 2)\DWG\BORROW AREA DETAILS (2 OF 2) OTC2, JUSTIN 5/30/2019 2:59 PM

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

NORTH DREDGE AREA SEDIMENT REMOVAL PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

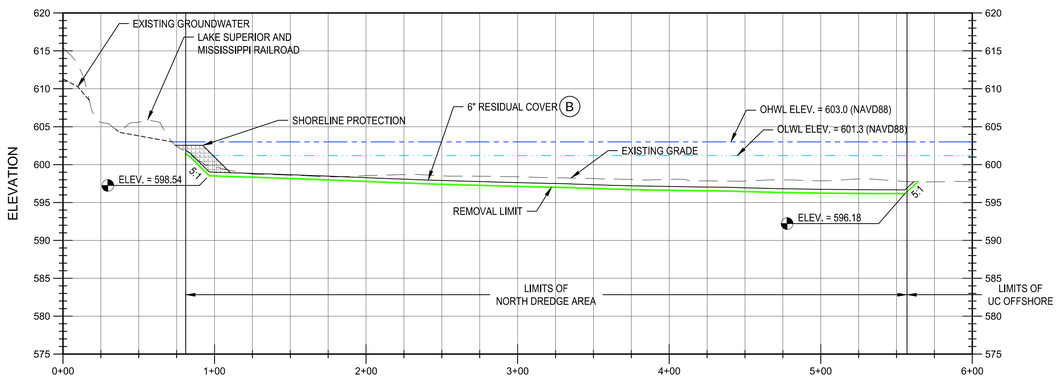
PROJECT NUMBER: 1518924

CR-101

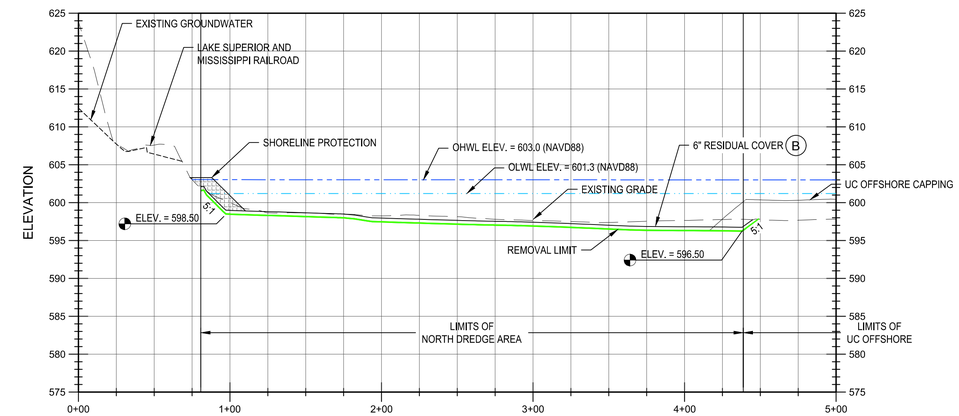
SHEET: 41 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\CLIENTS\PROJECTS\1518924 - SPIRIT LAKE RDC-DESIGN\+ CADD\+ FIGURES\NORTH DREDGE AREA SEDIMENT REMOVAL DETAILS.DWG [NORTH DREDGE AREA SEDIMENT REMOVAL PLAN(UTTO)], JUSTIN 5/30/2019 1:32 PM

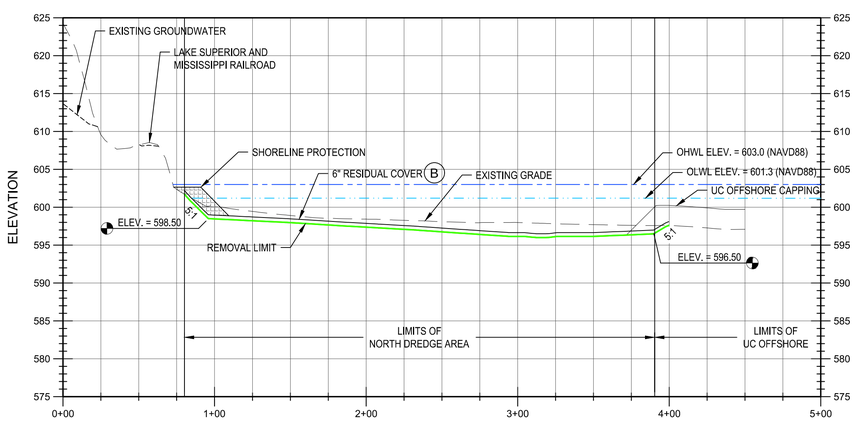


1 CR-101 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'

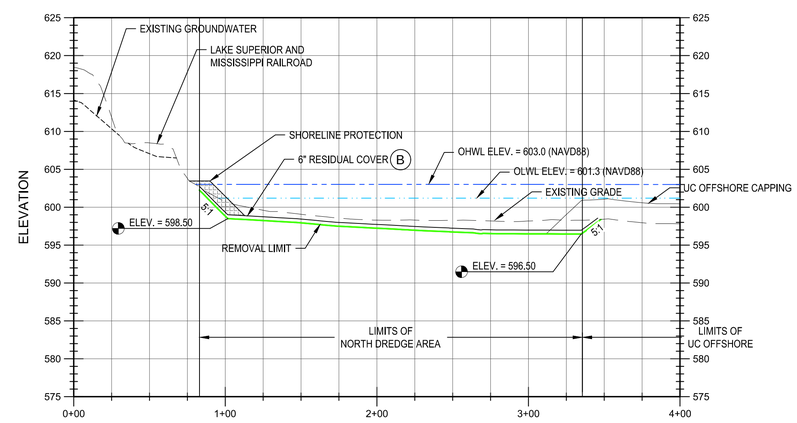


2 CR-101 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'

NOTE:
GROUNDWATER ELEVATIONS ARE APPROXIMATE BASED ON MODELING, AND MAY VARY FROM WHAT IS DEPICTED.



3 CR-101 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



4 CR-101 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 46712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

NORTH DREDGE AREA SEDIMENT REMOVAL DETAILS

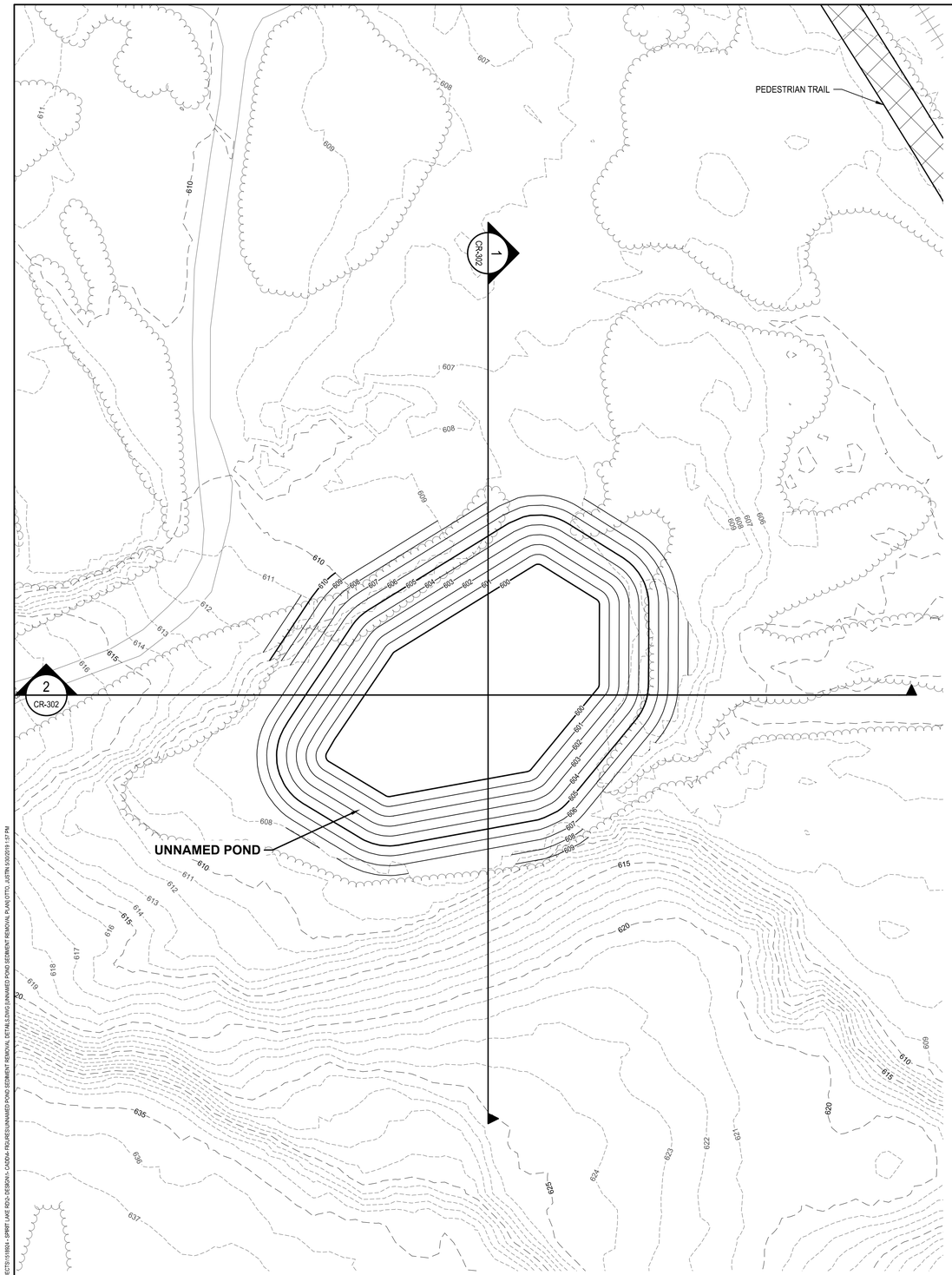
PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

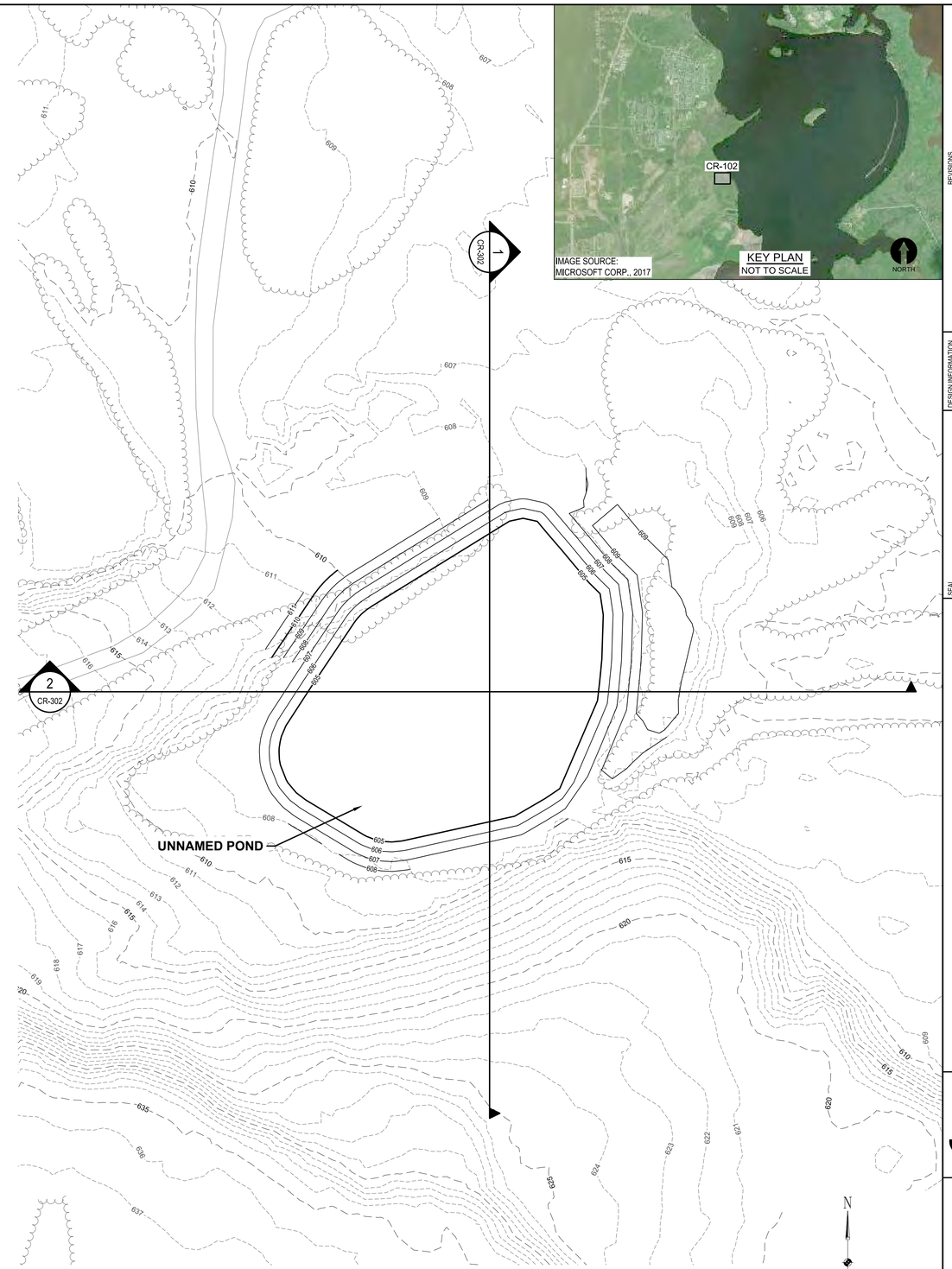
DATE: MAY 2019
PROJECT NUMBER: 1518924
CR-301
SHEET: 42 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\CLIAE\PROJECTS\1518924 - SPIRIT LAKE REDI - DESIGN\+ CADD\+ FIGURES\NORTH DREDGE AREA SEDIMENT REMOVAL DETAILS\CR\NORTH DREDGE AREA SEDIMENT REMOVAL DETAILS (CTTD). JUSTIN 5/30/2019 1:00 PM



UNNAMED POND REMOVAL



UNNAMED POND BACKFILL

N

0 20 40

SCALE IN FEET

NO.	DATE	BY	DESCRIPTION

REVISIONS

DESIGN INFORMATION

DESIGNED BY: LLR

DRAWN BY: JRM

CHECKED BY: JMT

PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN

DULUTH, MINNESOTA

UNNAMED POND SEDIMENT REMOVAL PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

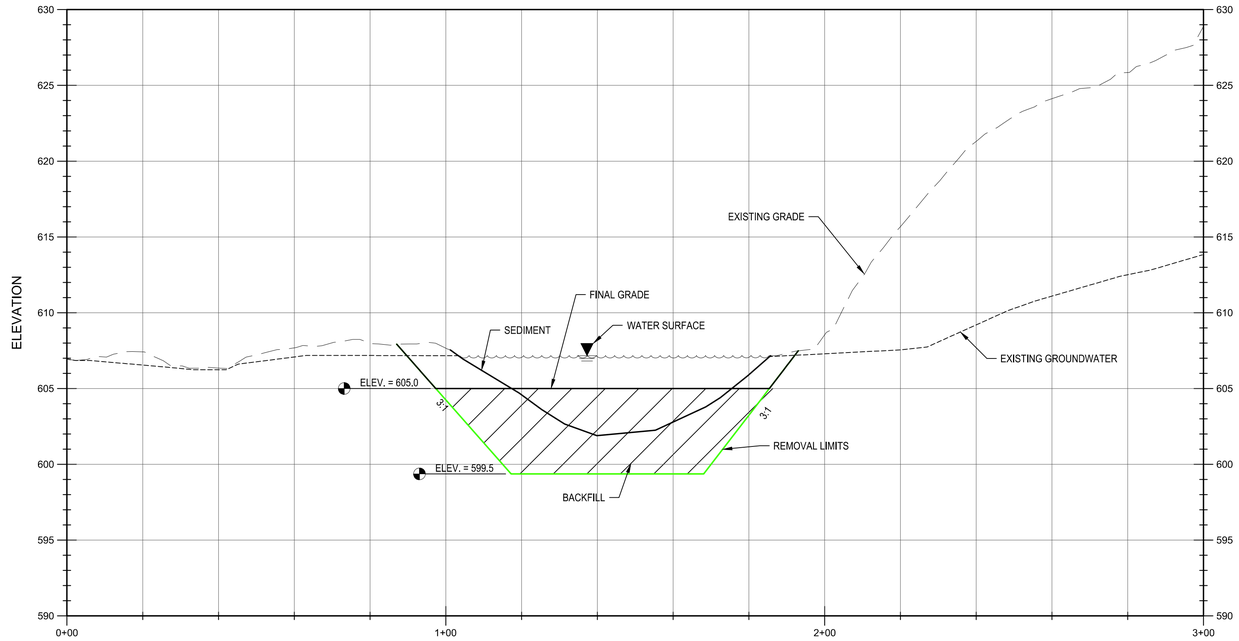
PROJECT NUMBER: 1518924

CR-102

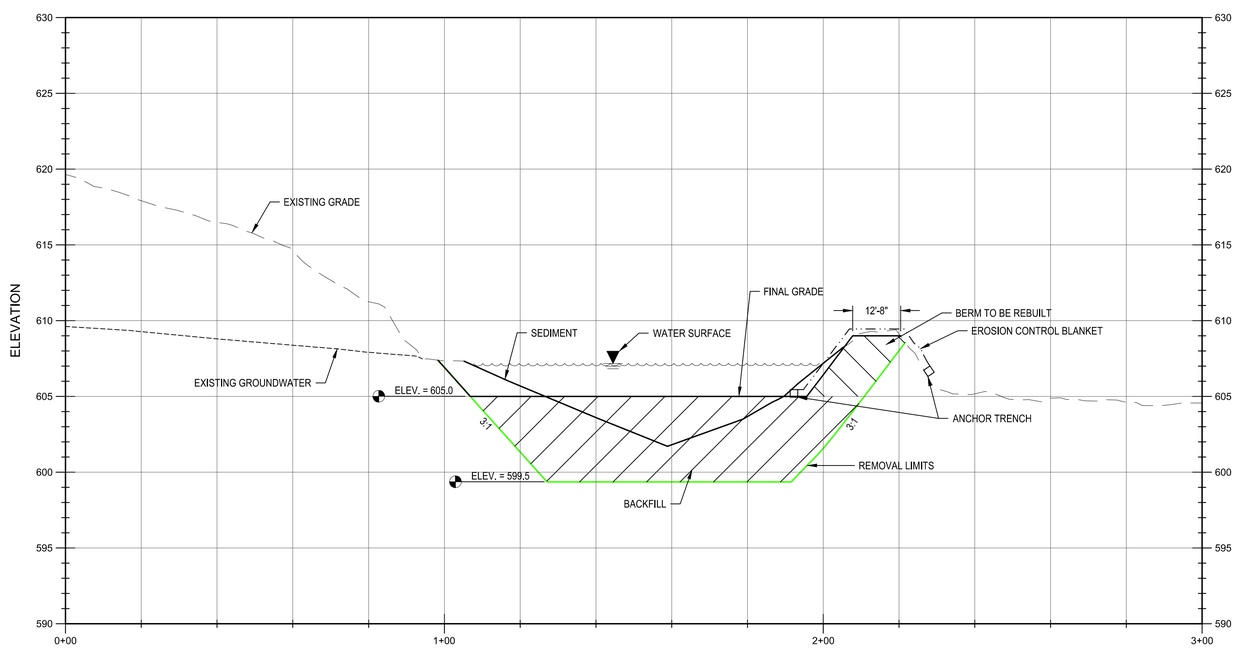
SHEET: 43 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\DOD\ALLIES\PROJECTS\1518924 - SPIRIT LAKE RDC-SEBS\04-1-CADD\4-FIGURES\UNNAMED POND SEDIMENT REMOVAL DETAILS\DWG\UNNAMED POND SEDIMENT REMOVAL PLAN\UTTO_JSTN 5/30/2019 1:8 PM



1 / CR-102 SECTION
HORIZ. SCALE: 1" = 20'
VERT. SCALE: 1" = 5'



2 / CR-102 SECTION
HORIZ. SCALE: 1" = 20'
VERT. SCALE: 1" = 5'

NOTES:
1. UNNAMED POND SEDIMENT SURFACE IS APPROXIMATE, ESTIMATED FROM WATER DEPTH AT SAMPLE LOCATIONS.
2. GROUNDWATER ELEVATIONS ARE APPROXIMATE BASED ON MODELING, AND MAY VARY FROM WHAT IS DEPICTED.

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UNNAMED POND SEDIMENT REMOVAL DETAILS

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924
CR-302
SHEET: 44 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\TEEPALNAS\DOCALLES\PROJECTS\1518924 - SPIRIT LAKE RDC-DESIGN\1 - CADD\4 - FIGURES\UNNAMED POND SEDIMENT REMOVAL DETAILS\DWG\UNNAMED POND SEDIMENT REMOVAL DETAILS.DWG, JUSTIN, 5/20/2019 1:58 PM

LEGEND

ORGANIC RESIDUAL COVER

RESIDUAL COVER

ORGANIC RESIDUAL COVER BOUNDARY SEE DETAILS ON FIGURE CH-501

BORROW AREA

PEDESTRIAN TRAIL

RESIDUAL COVER BOUNDARY

ORGANIC RESIDUAL COVER BOUNDARY

WIRE MILL DELTA

0 200 400

SCALE IN FEET

RESIDUAL COVER PLAN

APPROXIMATE LIMITS OF CHARACTERISTICALLY HAZARDOUS LEAD AREA

LETDOWN CHANNEL

FOOTBRIDGE (TYP)

CR-303 2

CR-303 4

CR-303 3

CR-303 1

BORROW AREA

WIRE MILL POND

SORENT BARRIER SEE SHEET CH-501

LAKE SUPERIOR AND MISSISSIPPI RAILROAD

RIPRAP

TURBIDITY BARRIER SEE SHEET CH-501

WIRE MILL POND RR BRIDGE (DESIGN BY HDR)

WIRE MILL DELTA

0 50 100

SCALE IN FEET

IMAGE SOURCE: MICROSOFT CORP., 2017

CR-103

KEY PLAN NOT TO SCALE

NORTH

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR

DRAWN BY: JRM

CHECKED BY: JMT

PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVUE UNDER THE AUTHORITY OF JAMES BEAVER P.E. 46712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN

DULUTH, MINNESOTA

WIRE MILL POND SEDIMENT REMOVAL PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
221 Sun Valley Boulevard; Suite D
Lincoln, NE 68528
(402) 476-3766

DATE: MAY 2019

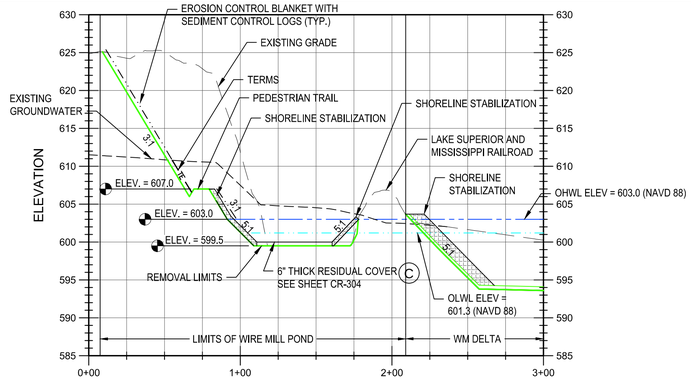
PROJECT NUMBER: 1518924

CR-103

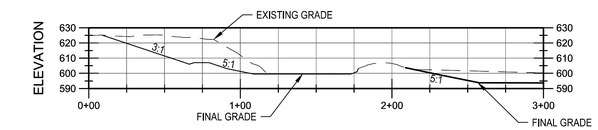
SHEET: 45 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

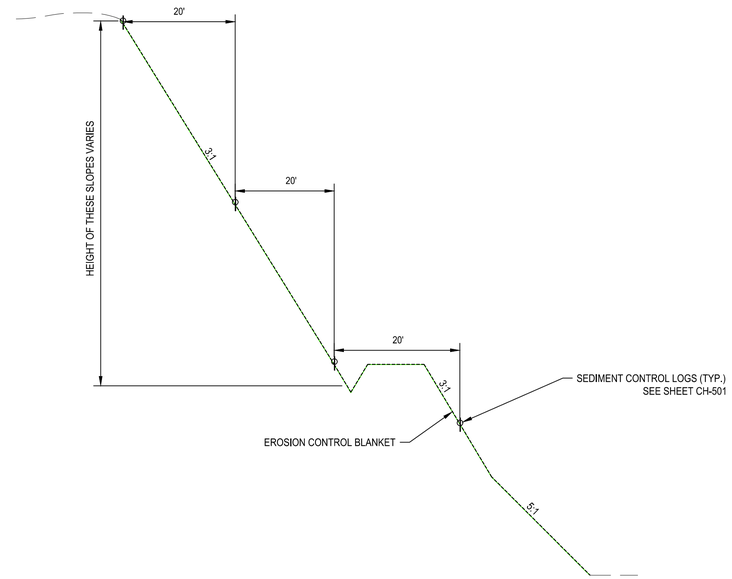
FILE PATH: F:\FEDERAL\DOD\DULUTH\PROJECTS\1518924 - SPIRIT LAKE RDC - DESIGN\CADD\4 FIGURES\WIRE MILL POND REMOVAL SET\FIGURE CH-P2-2.DWG (WIRE MILL POND REMOVAL PLAN UTIL), JUSTIN 5/30/2019 5:31 PM



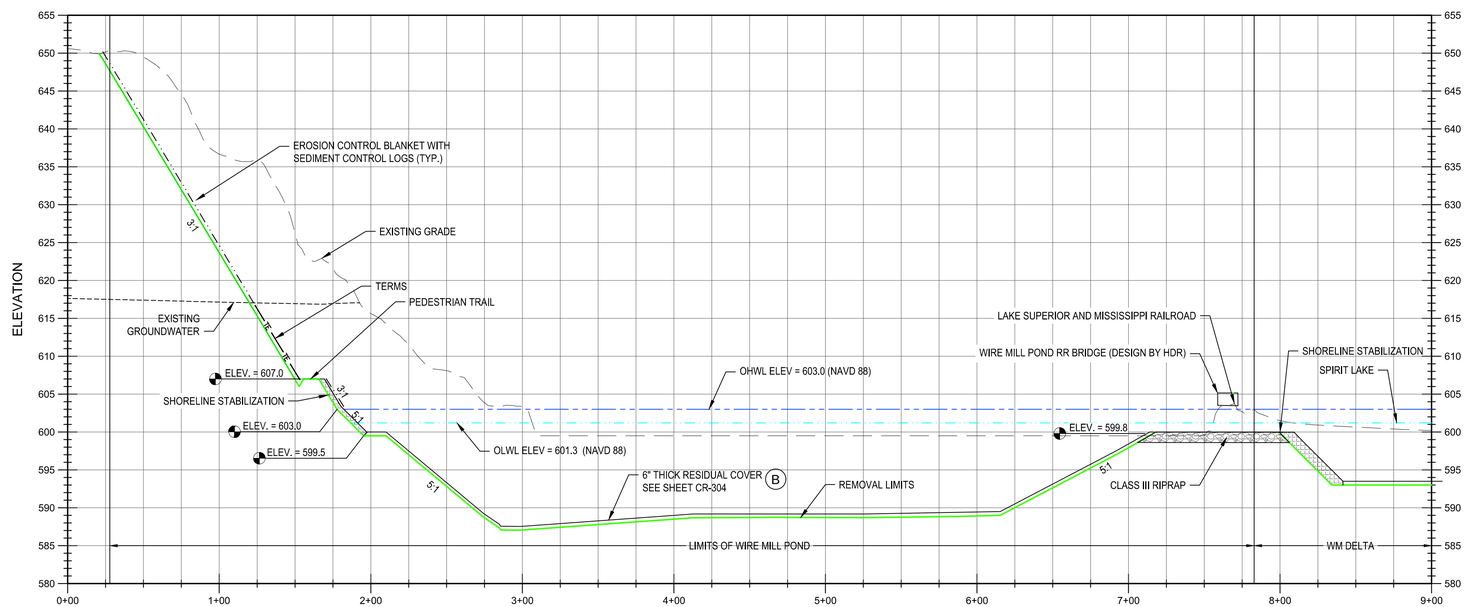
1 CR-103 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



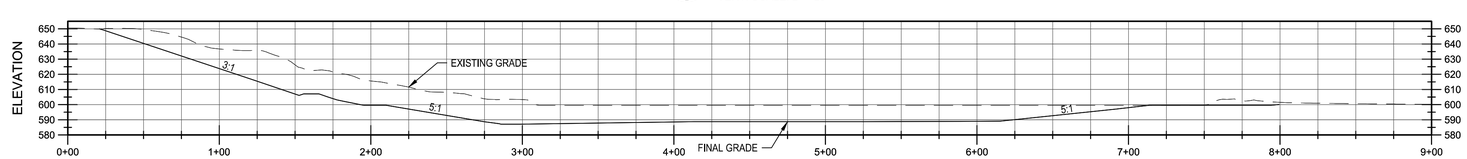
1 CR-103 SECTION (TRUE SCALE)
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 50'



WMP SLOPE STABILIZATION TYPICAL DETAIL
SCALE: NO SCALE



2 CR-103 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



2 CR-103 SECTION (TRUE SCALE)
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 50'

NOTES:

1. GROUNDWATER ELEVATIONS ARE APPROXIMATE BASED ON MODELING, AND MAY VARY FROM WHAT IS DEPICTED.
2. SEE SHEETS CH-501-CH-503 FOR SHORELINE STABILIZATION DETAILS.

NO.	DATE	BY	DESCRIPTION

REVISIONS

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERM REVUE UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

WIRE MILL POND SEDIMENT REMOVAL DETAILS (1 OF 2)

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
221 Sun Valley Boulevard; Suite D
Lincoln, NE 68528
(402) 476-3766

DATE: MAY 2019

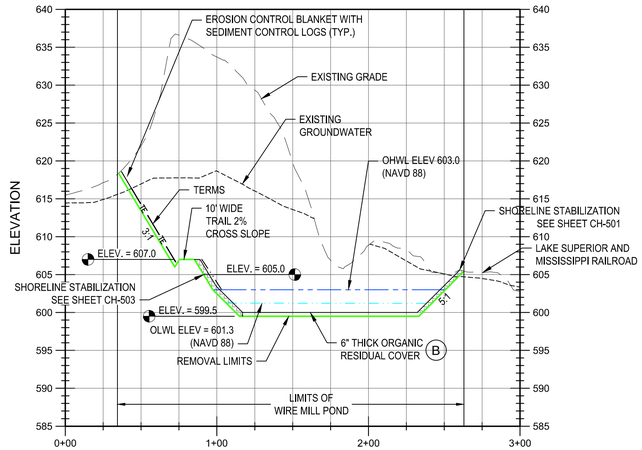
PROJECT NUMBER: 1518924

CR-303

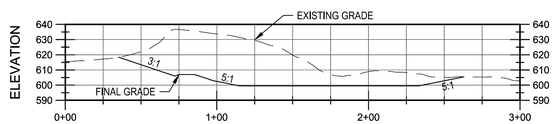
SHEET: 46 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

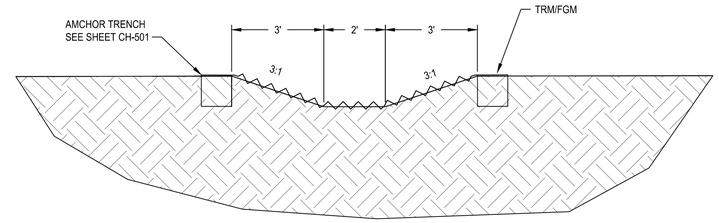
FILE PATH: P:\FEDERAL\MON\DOUGLAS\PROJECTS\1518924_SPIRIT LAKE RDC\-DESIGN\-CADD\A-REL\RESI\WIRE MILL POND REMOVAL DETAILS (1 OF 2).DWG (WIRE MILL POND REMOVAL DETAILS (1 OF 2) (OTTO, JUSTIN 5/30/2019 3:20 PM



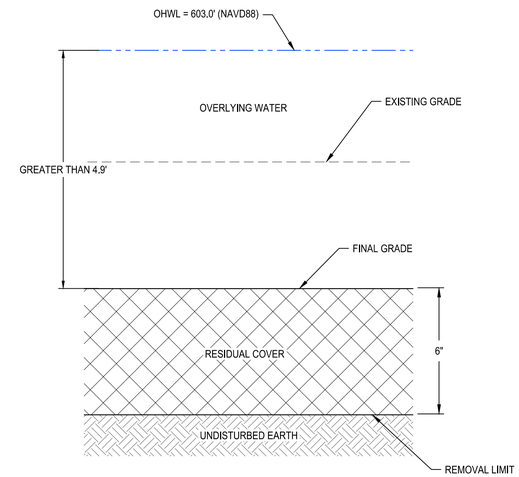
3 CR-103 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



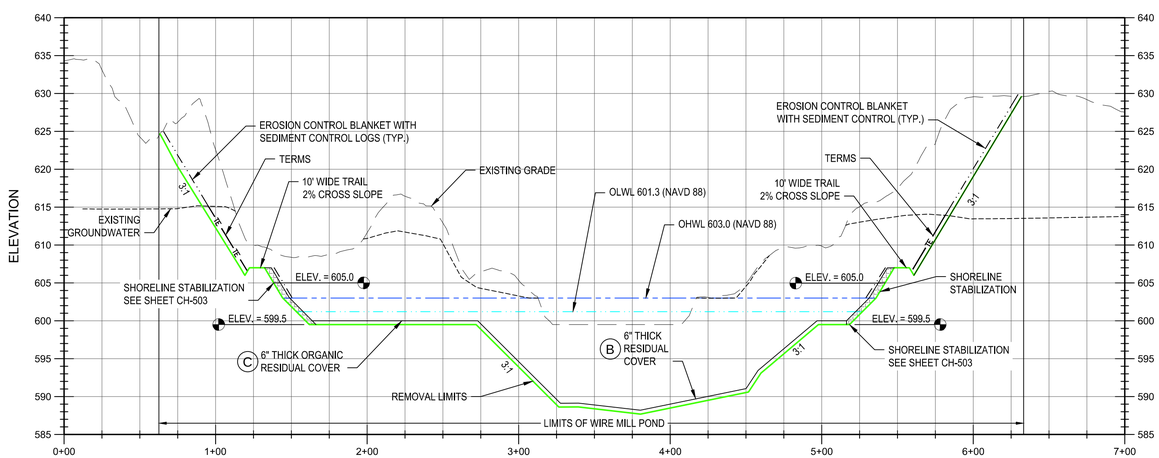
3 CR-103 SECTION (TRUE SCALE)
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 50'



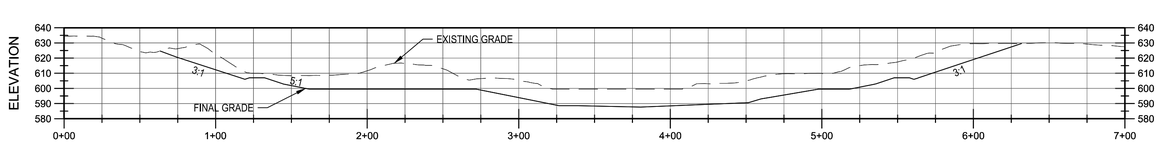
A CH-501 WIRE MILL POND LETDOWN CHANNEL TYPICAL SECTION
SCALE: NO SCALE



B CR-303 REMOVAL WITH RESIDUAL COVER DETAIL
SCALE: NO SCALE



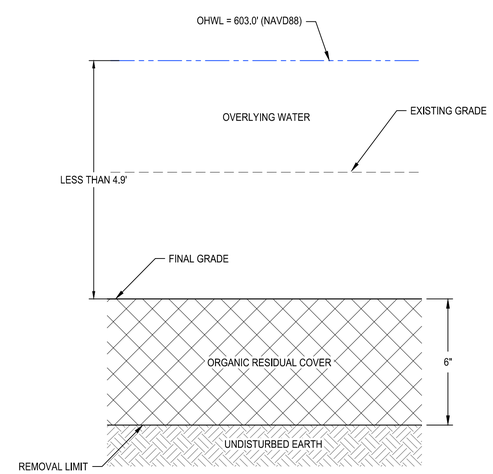
4 CR-103 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



4 CR-103 SECTION (TRUE SCALE)
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 50'

NOTE:

1. GROUNDWATER ELEVATIONS ARE APPROXIMATE BASED ON MODELING, AND MAY VARY FROM WHAT IS DEPICTED.
2. SEE SHEETS CH-501-CH-503 FOR SHORELINE STABILIZATION DETAILS.



C CR-303 REMOVAL WITH ORGANIC RESIDUAL COVER DETAIL
SCALE: NO SCALE

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JAO
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERM REVUE UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

WIRE MILL POND SEDIMENT REMOVAL DETAILS (2 OF 2)

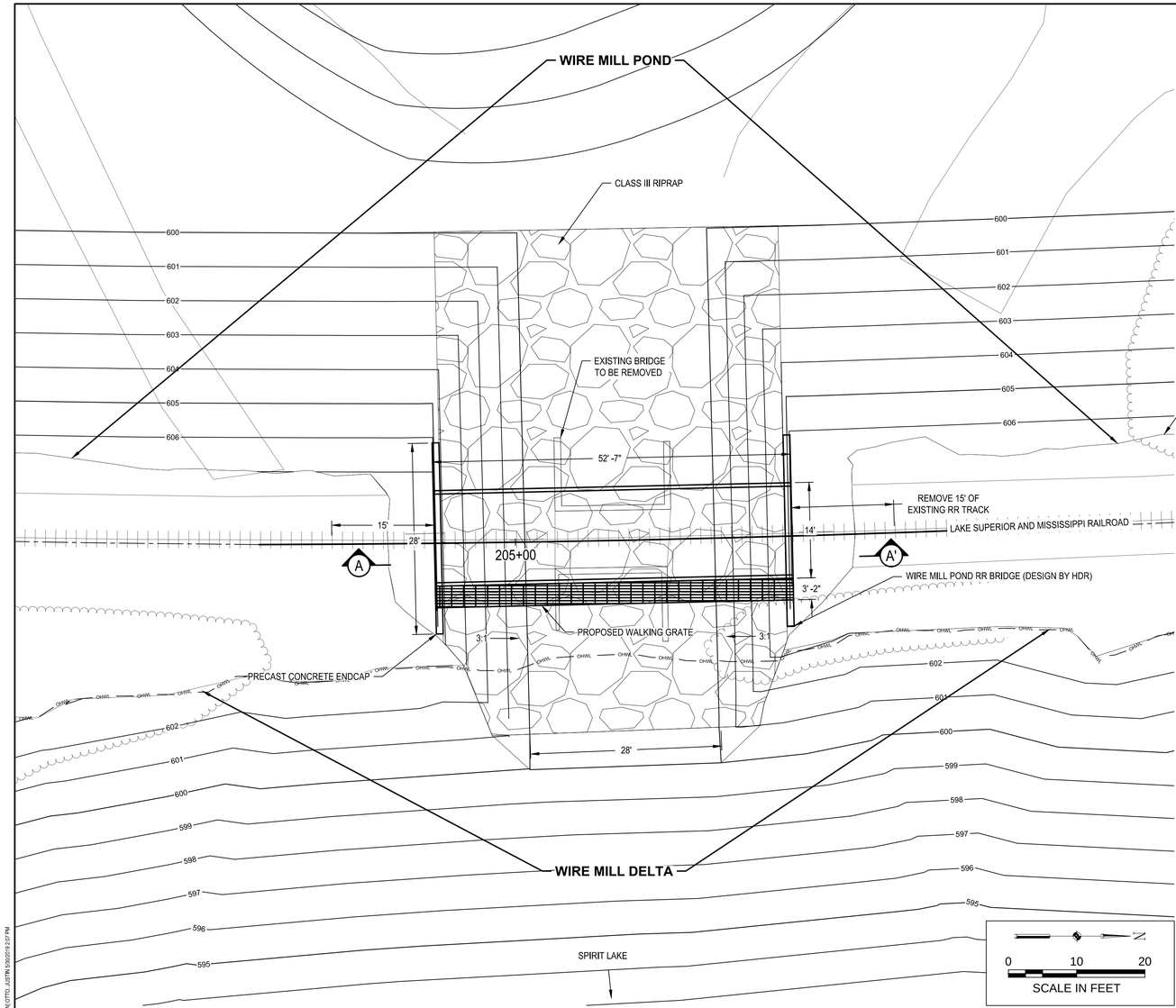
PREPARED FOR:
EPA

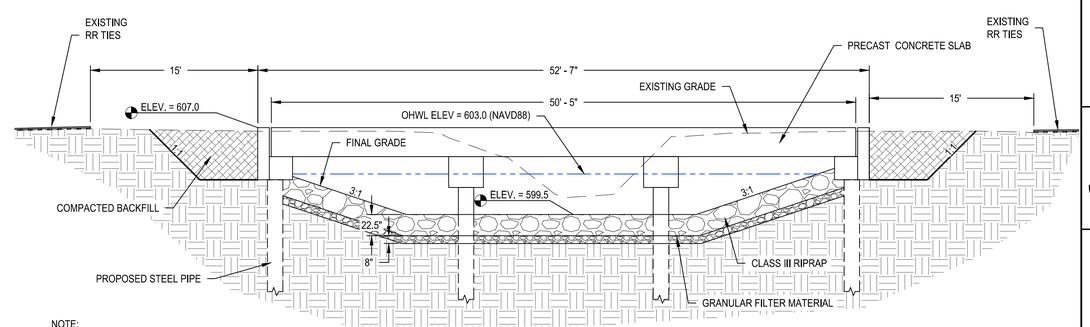
EA Engineering, Science, and Technology, Inc., PBC
221 Sun Valley Boulevard; Suite D
Lincoln, NE 68528
(402) 476-3766

DATE: MAY 2019
PROJECT NUMBER: 1518924
CR-304
SHEET: 47 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\GLAES\PROJECTS\1518924 - SPIRIT LAKE REDI\~DESIGN\+CADD\4+FIGURES\WIRE MILL POND REMOVAL DETAILS (2 OF 2).DWG (WIRE MILL POND REMOVAL DETAILS (2 OF 2)) UTTIG, JUSTIN 5/30/2019 2:33 PM





NOTE:

1. REMOVE RAILROAD TIES 15' FROM BASE OF THE PROPOSED PRECAST CONCRETE ABUTMENT CAPS ON BOTH SIDE OF BRIDGE.
2. STOCKPILE RAILS, SALVAGEABLE TIES, AND BALLAST MATERIAL FOR REUSE IN ACCORDANCE WITH THE NATIONAL HISTORIC PRESERVATION ACT SECTION 106 PERMITTING REQUIREMENTS.

B / CU-104 WMP RR BRIDGE SECTION
SCALE: NO SCALE

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMIE BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

WIRE MILL POND SEDIMENT REMOVAL PLAN

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
221 Sun Valley Boulevard; Suite D
Lincoln, NE 68528
(402) 476-3766

DATE: MAY 2019
PROJECT NUMBER: 1518924
CR-104
SHEET: 48 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\KCK\DGLAS\PROJECTS\1518924 - SPIRIT LAKE RDX\-DESIGN\-CADD\-FIGURES\WIRE MILL POND BRIDGE PLAN.DWG (WIRE MILL POND BRIDGE PLAN.DWG), JUSTIN 5/30/2019 2:07 PM

SAMPLE LOCATION COORDINATE TABLE

PLACEHOLDER

BORROW AREA

CP 3 2013

CP 4 2013

APPROXIMATE LIMITS OF CHARACTERISTICALLY HAZARDOUS LEAD AREA

RESERVED TO BE COMPLETED FOR FINAL

WIRE MILL POND

PEDESTRIAN TRAIL

LAKE SUPERIOR AND MISSISSIPPI RAILROAD

WIRE MILL DELTA

IMAGE SOURCE: MICROSOFT CORP., 2017

0 50 100
SCALE IN FEET

NO.	DATE	BY	DESCRIPTION

REVISIONS

DESIGN INFORMATION

DESIGNED BY: LLR

DRAWN BY: JRM

CHECKED BY: JMT

PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN

DULUTH, MINNESOTA

WIRE MILL POND DREDGE MANAGEMENT PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
221 Sun Valley Boulevard; Suite D
Lincoln, NE 68528
(402) 476-3766

DATE: MAY 2019

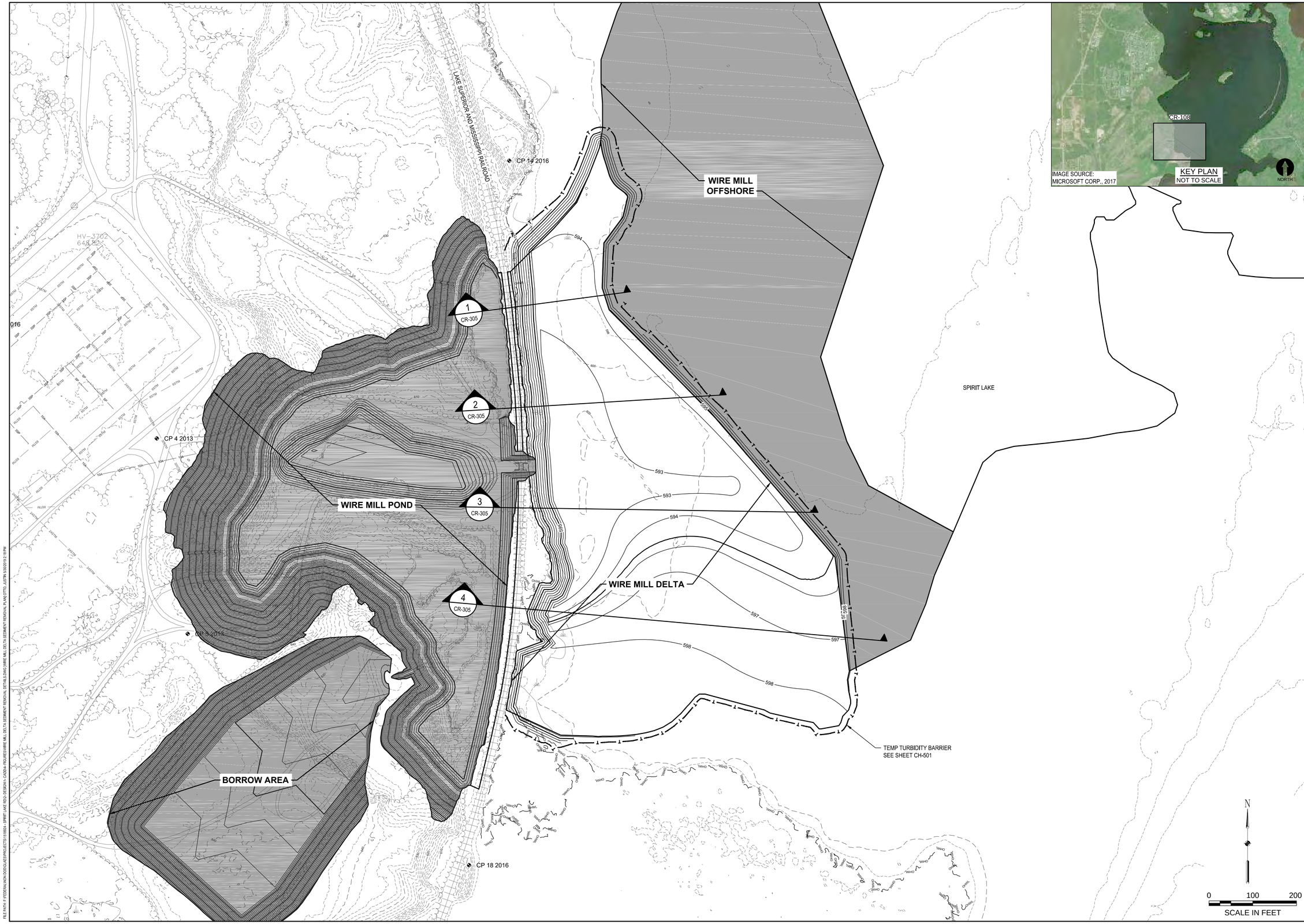
PROJECT NUMBER: 1518924

CR-107

SHEET: 49 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: P:\FEDERAL\NON DOD\CLAIRE\PROJECTS\01890A - SPIRIT LAKE RDs\-DESIGN\-CADD\A-PRC\ARCS\WIRE MILL POND DRALDING\WIRE MILL POND DREDGE MANAGEMENT PLAN OTTIG, JUSTIN 5/30/2019 2:16 PM



REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

WIRE MILL DELTA SEDIMENT REMOVAL PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

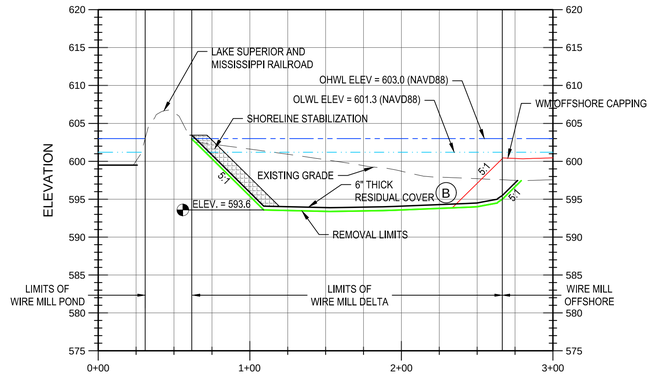
PROJECT NUMBER: 1518924

CR-108

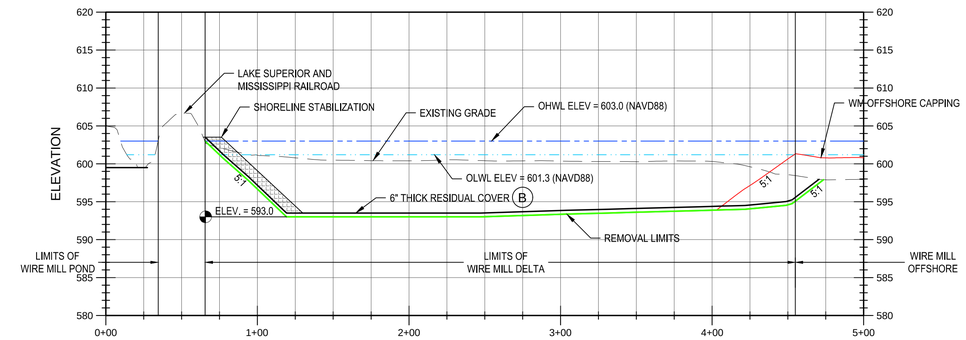
SHEET: 50 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

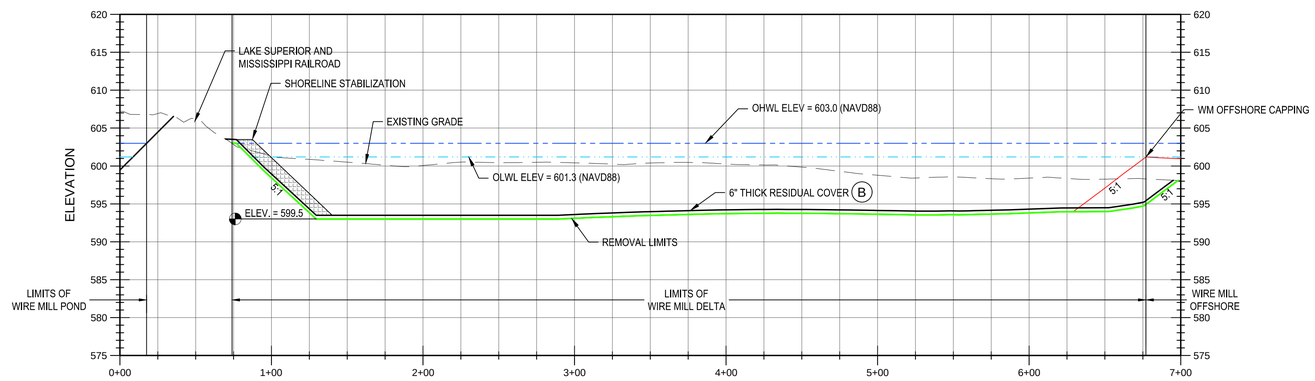
FILE PATH: P:\FEDERAL\NON DOD\GLAS\PROJECTS\1518924_SPIRIT LAKE EE\2-DESIGN\1-CADD\4-FIGURES\WIRE MILL DELTA SEDIMENT REMOVAL DETAILS.DWG (WIRE MILL DELTA SEDIMENT REMOVAL PLAN) (PTTD: JJSTIN 5/20/2019 2:18 PM



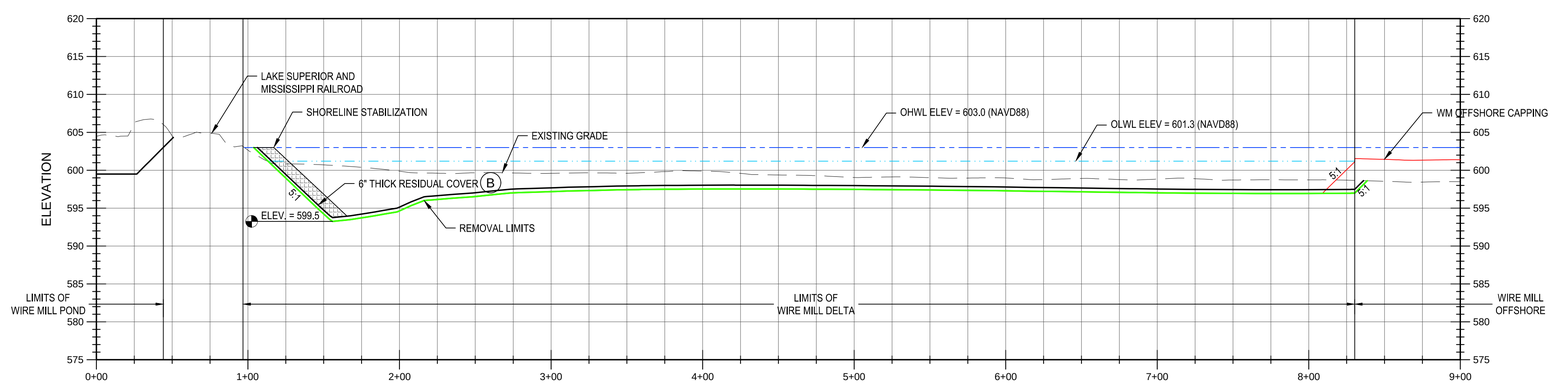
1 CR-108 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



2 CR-108 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



3 CR-108 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



4 CR-108 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'

NOTE:
SEE SHEET CH-501 FOR SHORELINE STABILIZATION DETAILS.

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

WIRE MILL DELTA SEDIMENT REMOVAL DETAILS

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924

CR-305

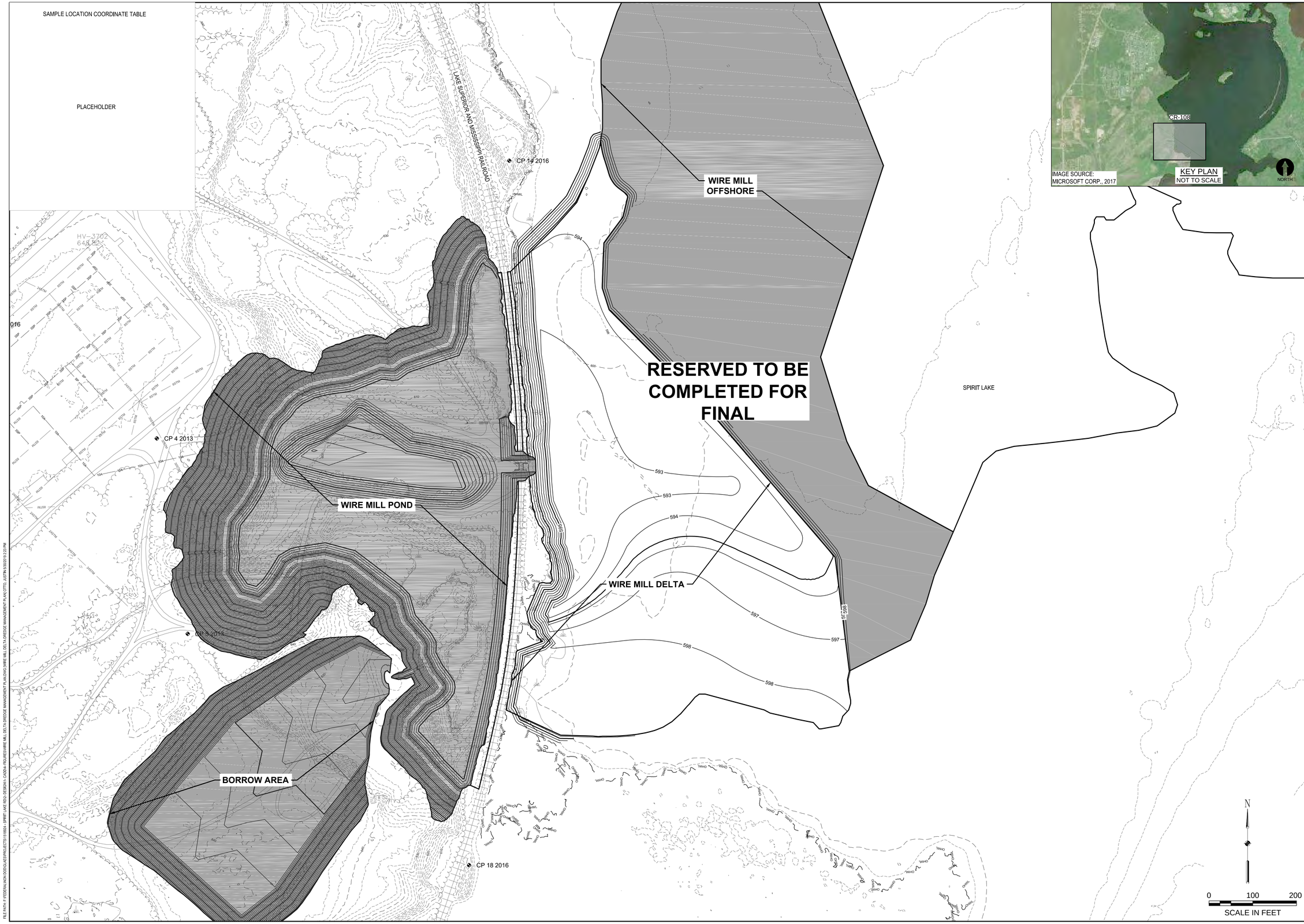
SHEET: 51 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: P:\FEDERAL\NCK DOC\CAD\EES\PROJECTS\1518924 - SPIRIT LAKE RDC\-DESIGN\1 - CADD\4-FIGURES\WIRE MILL DELTA SEDIMENT REMOVAL DETAILS\LDWG\WIRE MILL DELTA SEDIMENT REMOVAL DETAILS\OTTO, JUSTIN 5/30/2019 2:18 PM

SAMPLE LOCATION COORDINATE TABLE

PLACEHOLDER



NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

WIRE MILL DELTA DREDGE MANAGEMENT PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

CR-109

SHEET: 52 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: P:\FEDERAL\NON DOD\CLASS\PROJECTS\1518924 - SPIRIT LAKE EE\2 - DESIGN\1 - CADD\4 - FIGURES\WIRE MILL DELTA DREDGE MANAGEMENT PLAN\DWG\WIRE MILL DELTA DREDGE MANAGEMENT PLAN.DWG, JUSTIN 5/30/2019 2:23 PM

FALCON STREET

HILTON STREET

LAKE SUPERIOR AND MISSISSIPPI RAILROAD

24" CULVERT

NORTH DREDGE AREA

UNNAMED CREEK RELOCATION

UPLAND CDF

SHALLOW SHELTERED BAY WEST

SHALLOW SHELTERED BAY NORTHEAST

DELTA CDF

SOUTH OF SPIT

SPIT OF LAND

SPIRIT LAKE

UC OFFSHORE

CONSTRUCTION OF SHOAL FEATURE IS REQUIRED PRIOR TO START OF SHALLOW SHELTER BAY EXCAVATION, UNLESS OTHERWISE APPROVED BY THE EPA.

TEMPORARY TURBIDITY BARRIER (FOR SUBMERGED OPTION) SEE SHEET CH-501

TEMPORARY SHEET PILE COFFERDAM (FOR DEWATERED OPTION)

1 CS-301

2 CS-304

3 CS-301

4 CS-301

5 CS-302

7 CS-302

IMAGE SOURCE: MICROSOFT CORP., 2017

KEY PLAN
NOT TO SCALE

NORTH

NOTES:

1. SEE DRAWING CS-102 FOR SHALLOW BAY CAPPING PLAN.
2. SUBSURFACE CONDITIONS IN UNNAMED CREEK SHALLOW SHELTER BAY INDUSTRIAL FILL INCLUDES AREAS OF HIGHER DENSITY AND PARTIAL CEMENTING. CONTRACTOR SHALL BE PREPARED TO DREDGE/EXCAVATE WITHIN DIFFICULT CONDITIONS FOR THESE AREAS, REQUIRING BARGE STABILIZATION SPUDS OR JACK-UPS FOR MARINE EXCAVATOR LEVERAGE (SUBMERGED OPTION) AND EQUIPMENT WITH RIPPER ATTACHMENTS AND STRENGTHENED EXCAVATOR TEETH (DEWATERED OPTION, AND SUBMERGED OPTION).
3. SIGNIFICANT AREAS OF PEAT OCCUR THROUGHOUT THE PROJECT WITHIN NATURAL ESTUARY DEPOSITS. CONTRACTOR SHALL BE PREPARED TO MANAGE AND DE-WATER THESE MATERIALS IF INCORPORATED REMOVAL VOLUMES.

0 100 200
SCALE IN FEET

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

SHALLOW SHELTERED BAY REMOVAL PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

CS-101

SHEET: 53 OF 121

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: P:\FEDERAL\NON GOOGLE\PROJECTS\151924 - SPIRIT LAKE RDC\-DESIGN\1-CADD\4-FIGURES\SHALLOW SHELTERED BAY REMOVAL AND CAPPING DETAILS 2 OF 2\STAG SHALLOW SHELTERED BAY REMOVAL AND CAPPING DETAILS 2 OF 2.DWG SHALLOW SHELTERED BAY REMOVAL AND CAPPING DETAILS 1 OF 2 | MATTHEW, JASON 4/18/2019 3:51 PM

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

SHALLOW SHELTERED BAY CAPPING PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

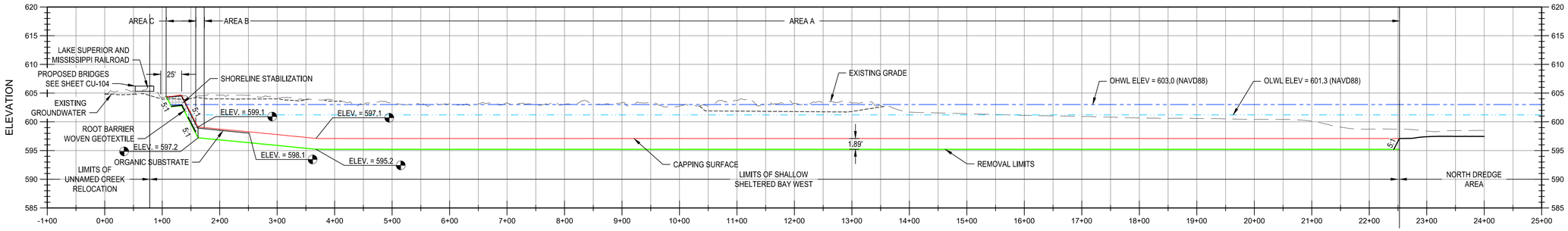
DATE: MAY 2019

PROJECT NUMBER: 1518924

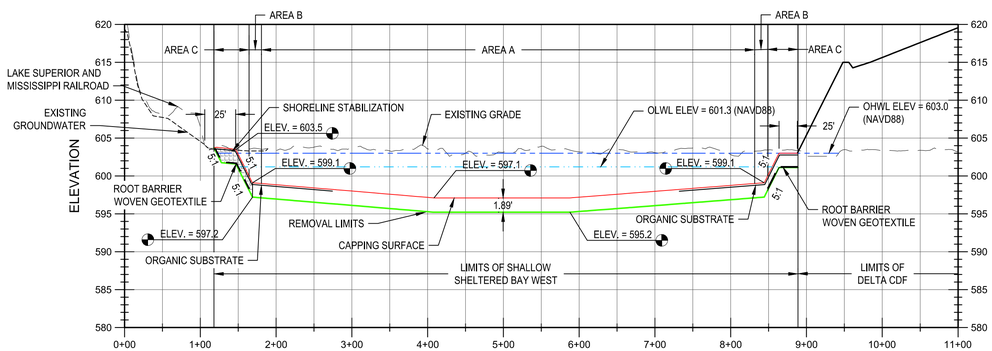
CS-102

SHEET: 54 OF 121

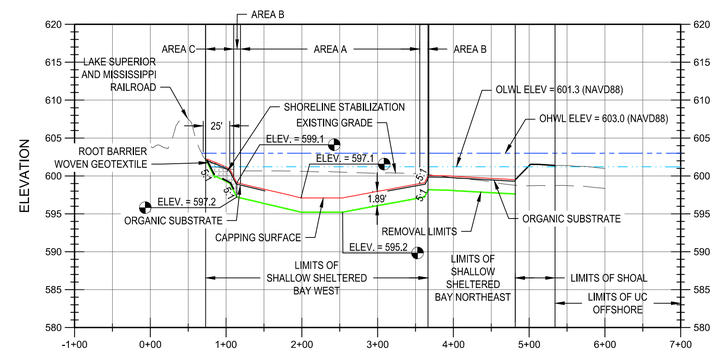
PRE-FINAL DESIGN - NOT FOR CONSTRUCTION



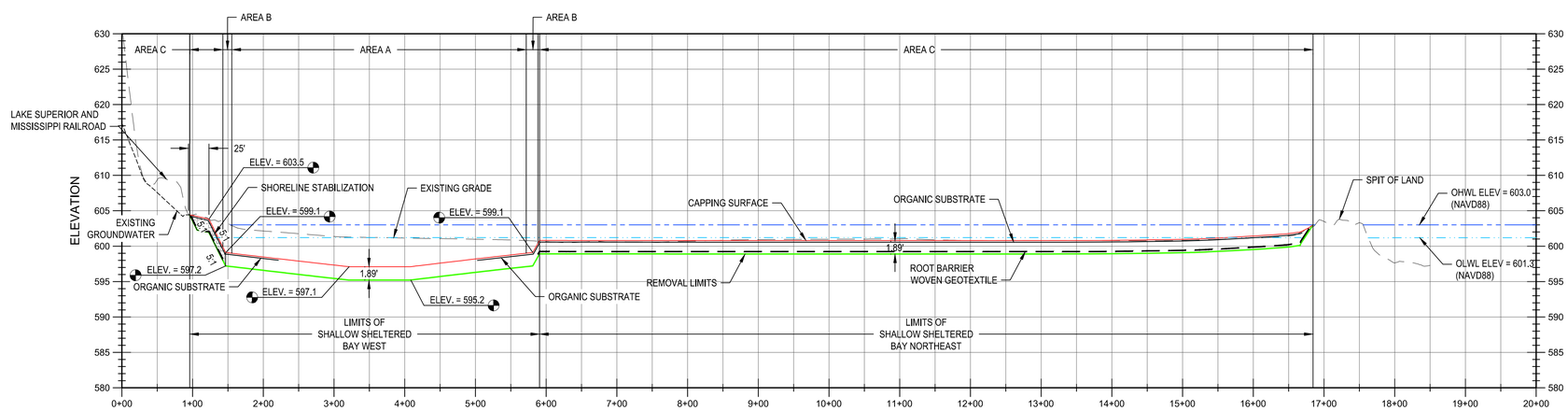
1 CS-101 SECTION
HORIZ. SCALE: 1" = 100'
VERT. SCALE: 1" = 10'



2 CS-101 SECTION
HORIZ. SCALE: 1" = 100'
VERT. SCALE: 1" = 10'



3 CS-101 SECTION
HORIZ. SCALE: 1" = 100'
VERT. SCALE: 1" = 10'



4 CS-101 SECTION
HORIZ. SCALE: 1" = 100'
VERT. SCALE: 1" = 10'

NOTES:
1. CAPPING THICKNESS (1.89') FOR DEWATERED CONSTRUCTION ARE SHOWN. SEE SHEET CS-501 FOR DETAILS.
2. FOR SHORELINE STABILIZATION DETAILS SEE SHEET CH-503.
2. GROUNDWATER ELEVATIONS ARE APPROXIMATE BASED ON MODELING, AND MAY VARY FROM WHAT IS DEPICTED.

NO.	DATE	BY	DESCRIPTION

REVISIONS

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48715 MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

SHALLOW SHELTERED BAY REMOVAL AND CAPPING DETAILS (1 OF 2)

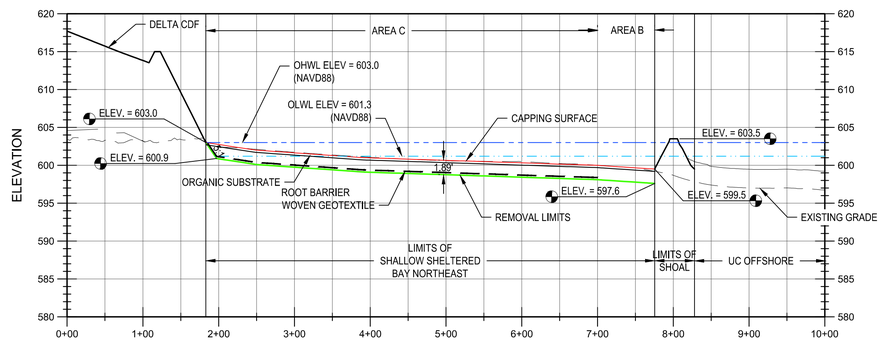
PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

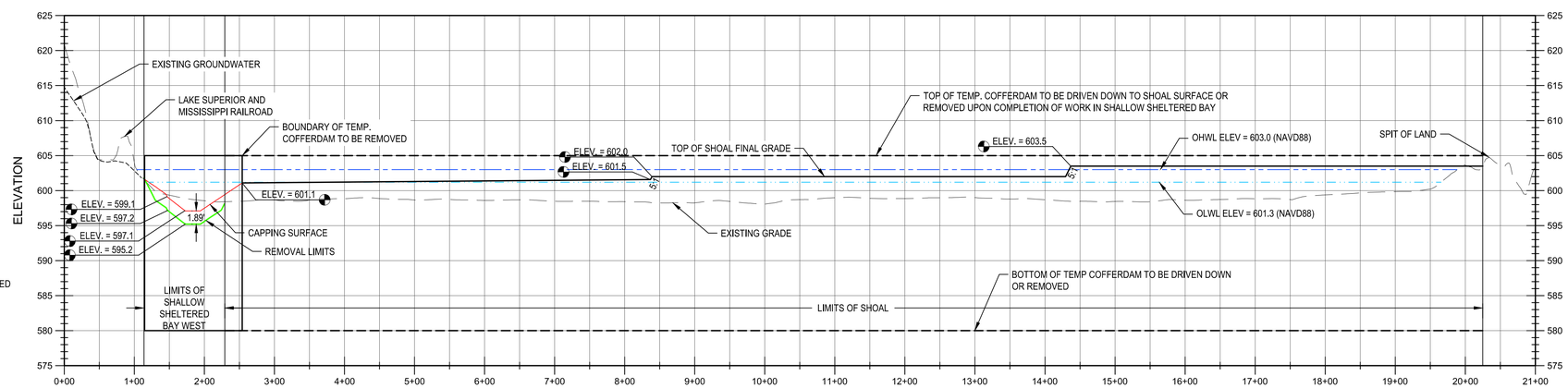
DATE: MAY 2019
PROJECT NUMBER: 1518924
CS-301
SHEET: 55 OF 121

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\CLIAE\PROJECTS\181924 - SPIRIT LAKE RDC-DESIGN\+ CADD\+ FIGURES\SHALLOW SHELTERED BAY REMOVAL AND CAPPING DETAILS 1 OF 2\SHALLOW SHELTERED BAY REMOVAL AND CAPPING DETAILS 1 OF 2\MATHES, JASON\ 6/10/2019 3:31 PM



5 / CS-101 SECTION
HORIZ. SCALE: 1" = 100'
VERT. SCALE: 1" = 10'



7 / CS-101 SECTION
HORIZ. SCALE: 1" = 100'
VERT. SCALE: 1" = 10'

NOTES:
1. CAPPING THICKNESS (1.89') FOR DEWATERED CONSTRUCTION ARE SHOWN. SEE SHEET CS-501 FOR DETAILS.
2. GROUNDWATER ELEVATIONS ARE APPROXIMATE BASED ON MODELING, AND MAY VARY FROM WHAT IS DEPICTED.

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

SHALLOW SHELTERED BAY REMOVAL DETAILS (2 OF 2)

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

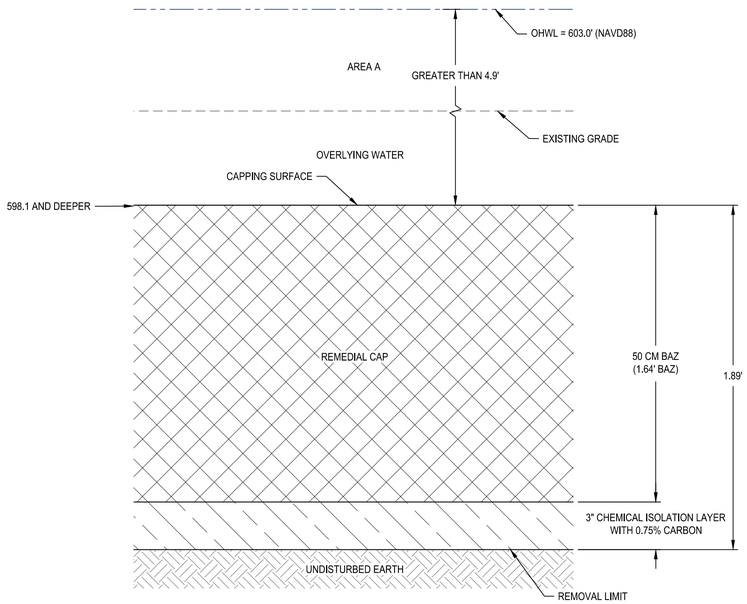
DATE: MAY 2019
PROJECT NUMBER: 1518924
CS-302
SHEET: 56 OF 121

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

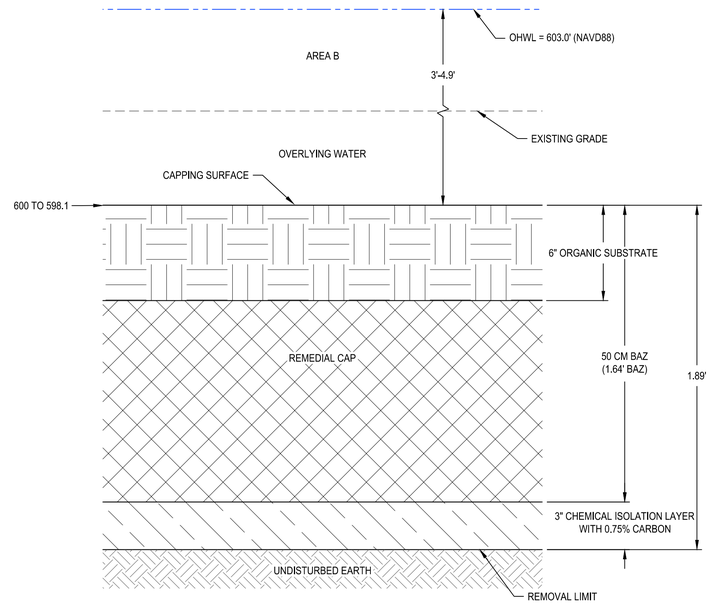
FILE PATH: F:\TEERA\ACKDOCS\JOBS\PROJECTS\1518924 - SPIRIT LAKE RDC-DESIGN\1 - CADD\4 FIGURES\SHALLOW SHELTERED BAY REMOVAL AND CAPPING DETAILS (2 OF 2)\CS-302 SHALLOW SHELTERED BAY REMOVAL AND CAPPING DETAILS (1 OF 2).MATHES, JASON | 6/3/2019 3:31 PM

NOTE:

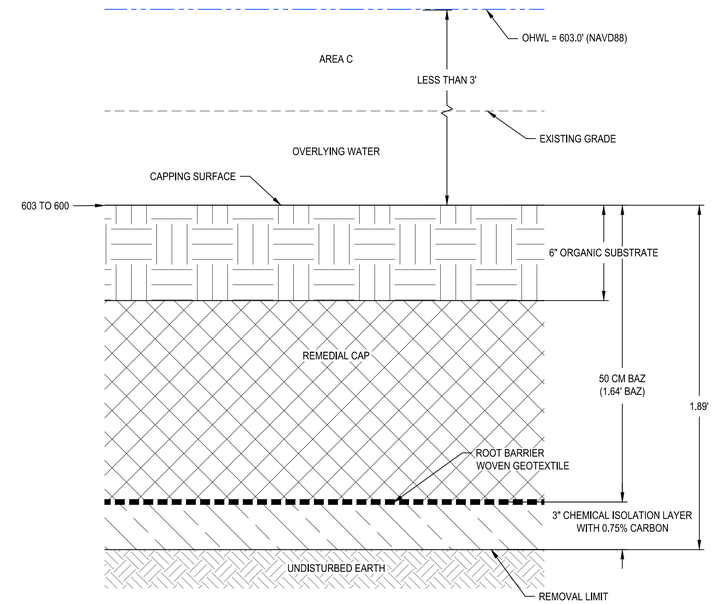
1. WATER DEPTHS SHOWN ARE FOR POST-REMEDY CONDITIONS.



DEWATERED



DEWATERED



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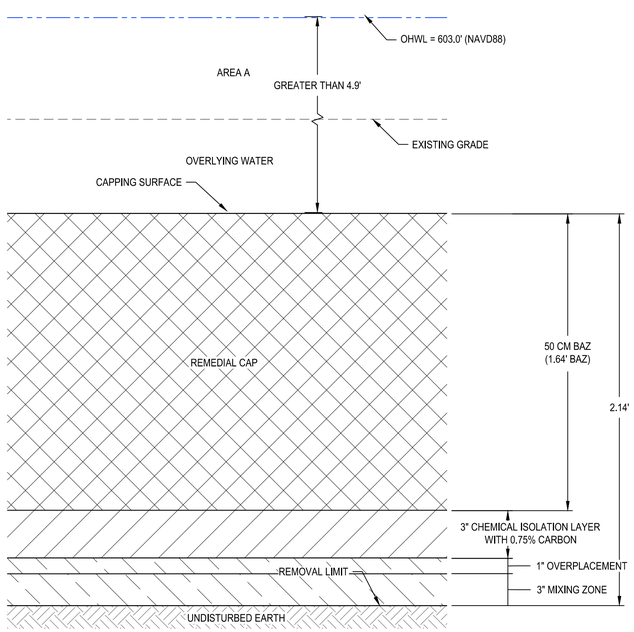
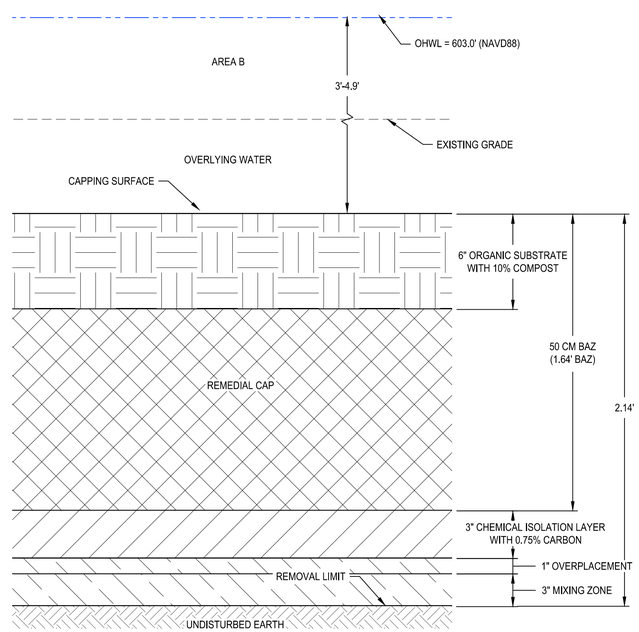


SUBMERGED

A CS-101 SSB AREA A REMOVAL AND CAPPING DETAIL

SCALE: NO SCALE



SUBMERGED

B CS-101 SSB AREA B REMOVAL AND CAPPING DETAIL

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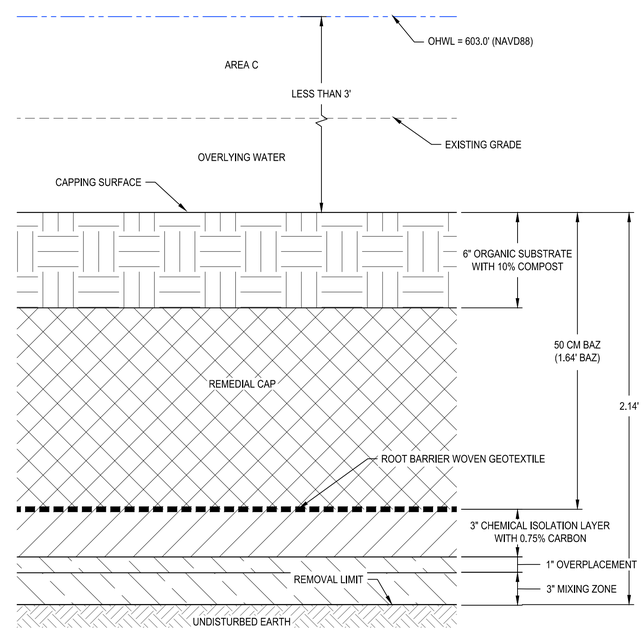


SUBMERGED

C CS-101 SSB AREA C REMOVAL AND CAPPING DETAIL

SCALE: NO SCALE

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JAO
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERM REVUE UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

SHALLOW SHELTERED BAY CAPPING DETAILS

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

CS-501

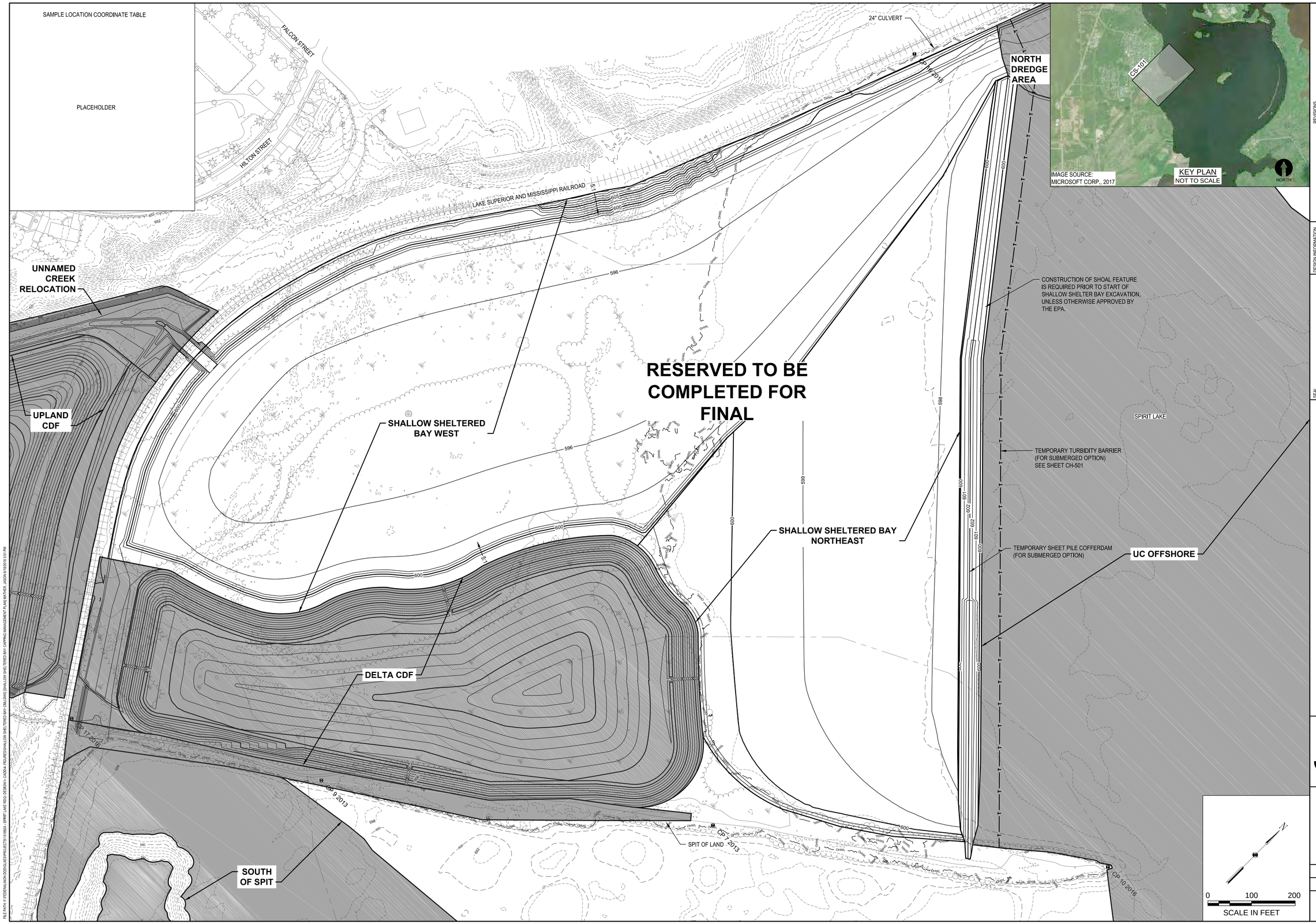
SHEET: 57 OF 121

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\CLIENTS\PROJECTS\1518924 - SPIRIT LAKE REDI - DESIGN\1 - CAD\Arc FIGURES\SHALLOW SHELTERED BAY CAPPING\DETAILS.DWG\SHALLOW SHELTERED BAY CAPPING DETAILS.DWG\SHALLOW SHELTERED BAY CAPPING DETAILS.DWG, JUSTIN, 4/16/2019 3:41 PM

SAMPLE LOCATION COORDINATE TABLE

PLACEHOLDER



REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48715, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

SHALLOW SHELTERED BAY CAPPING MANAGEMENT PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

CS-103

SHEET: 58 OF 121

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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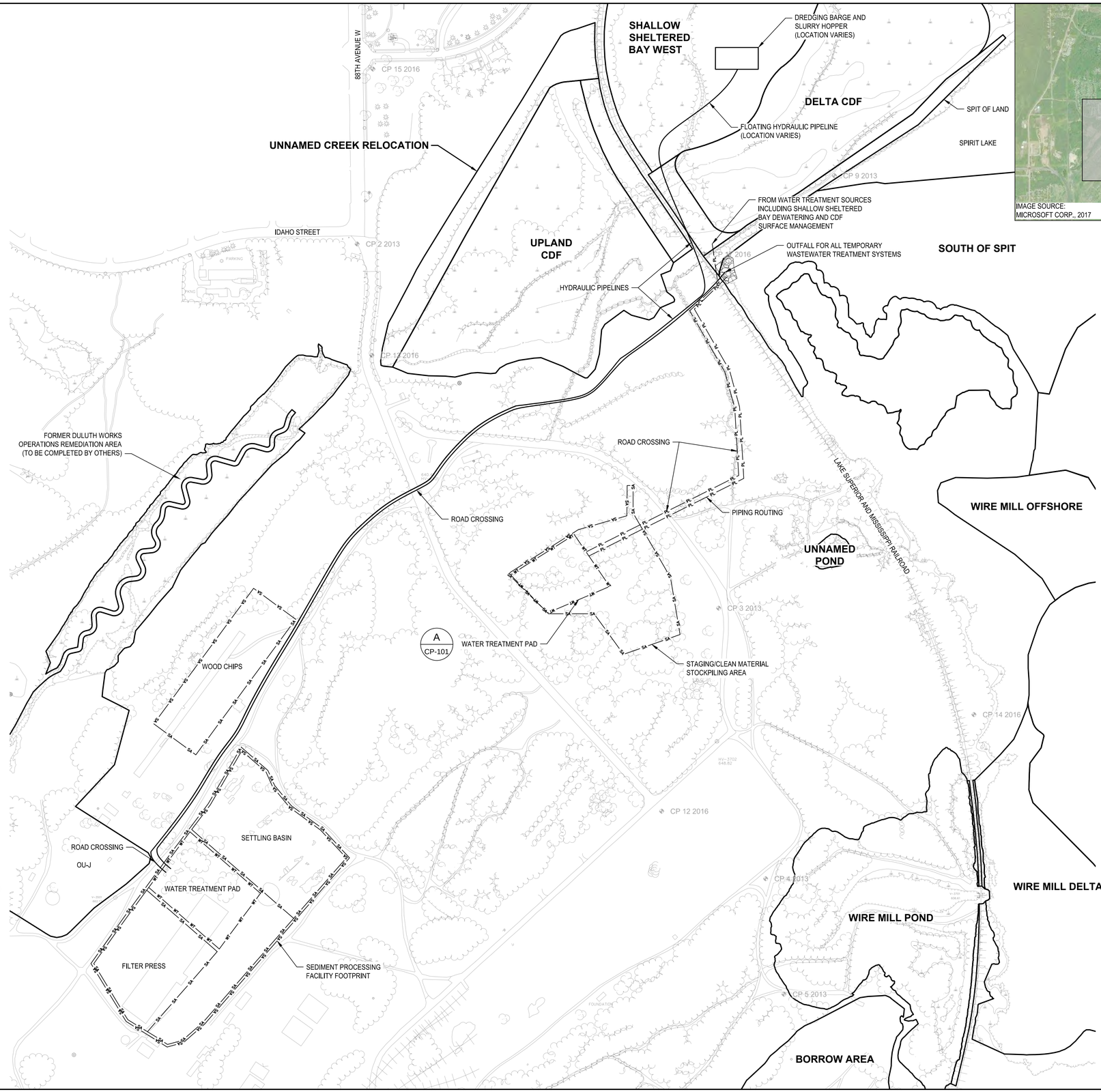

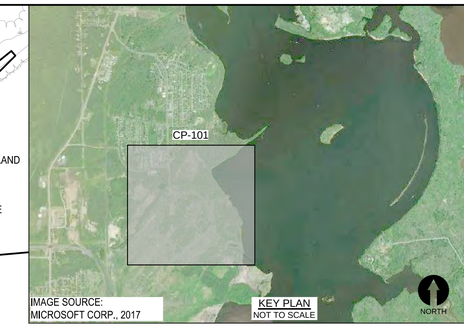

NOTES:

1. FOR HYDRAULIC PIPELINE TRANSPORT, RECIRCULATION/ RECYCLING OF WATER IS REQUIRED. PRIOR TO RECIRCULATION SOLIDS REMOVAL SHALL OCCUR. WATER TREATMENT IS REQUIRED PRIOR TO EFFLUENT DISCHARGE TO THE ESTUARY.
2. INTENT OF DESIGN FOR HYDRAULIC TRANSPORT IS SEPARATION AND BENEFICIAL REUSE OF COARSE-GRAINED FRACTION OF DREDGED MATERIAL. CONTRACTOR SHALL PERFORM NECESSARY BENCH-SCALE TESTING TO DEMONSTRATE PERCENT SOLIDS CHANGE AND VOLUME REDUCTION FROM COMBINED SAND SEPARATION AND FILTER PRESS.

NOTES:

1. PIPE ROUTING IS APPROXIMATE AND SHALL BE DETERMINED BY THE CONTRACTOR WITHIN PERMISSIBLE SITE AREAS. AVOID TRAVERSING UNDISTURBED WETLAND AREAS WHERE POSSIBLE.
2. SEDIMENT PROCESSING FACILITY LAYOUT IS APPROXIMATE AND SHALL BE DETERMINED BY THE CONTRACTOR.

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

SEDIMENT PROCESSING FACILITY PLAN

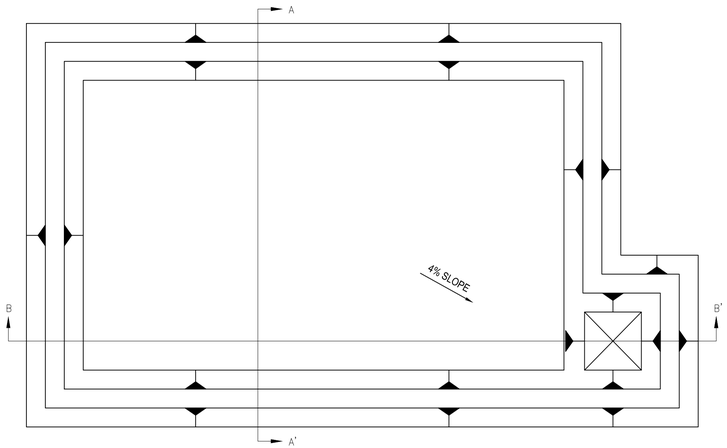
PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL
847-915-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924
CP-101
SHEET: 59 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

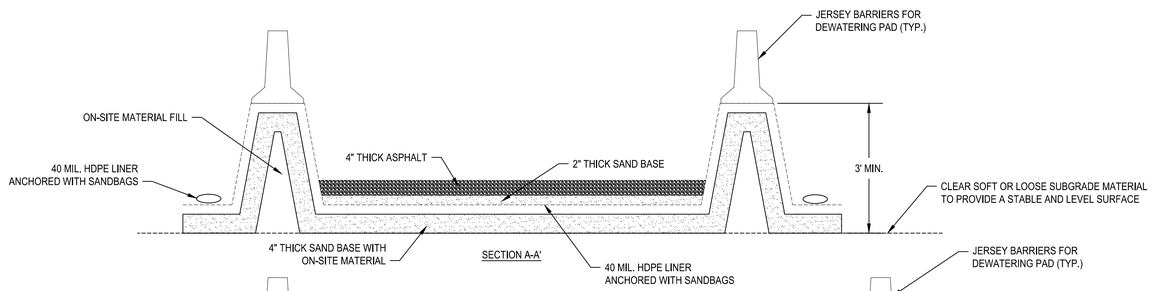
FILE PATH: F:\FEDERAL\NON DOD\GLAS\PROJECTS\1518924 - SPIRIT LAKE RDU DESIGN\ - CAD\04-TM\RES\SEDIMENT PROCESSING FACILITY AND PROCESSING DETAILS.DWG [SEDIMENT PROCESSING FACILITY PLAN] OTTO, JUSTIN 5/30/2019 1:45 PM



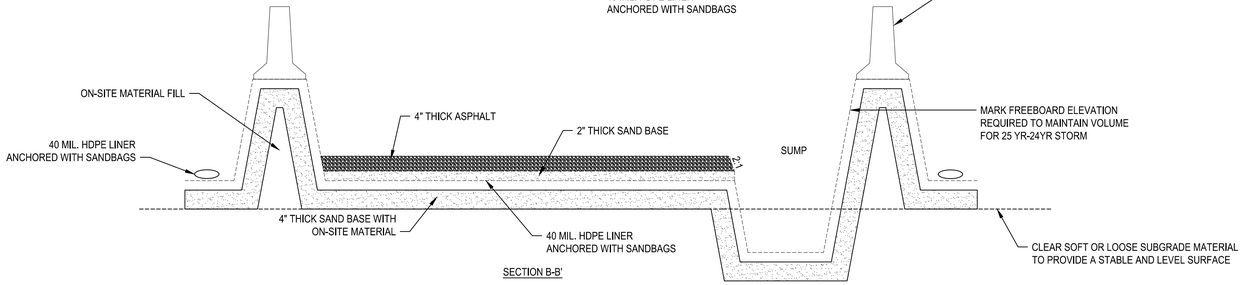
PLAN VIEW

NOTES:

1. PADS SHALL BE AS SHOWN OR AS APPROVED BY OWNER.
2. WASTEWATER TREATMENT AND DISCHARGE SHALL BE IN ACCORDANCE WITH SPECIFICATIONS.
3. 2:1 MAXIMUM SLOPES.
4. 3 FOOT MINIMUM TOP OF BANK WIDTH.
5. ALL PADS MUST CONTAIN ALL WATER PLUS WATER FROM 25YR-24 HOUR STORM.
6. REMOVE UPON COMPLETION OF JOB AND DISPOSE AT APPROVED FACILITY.
7. DEWATERING PAD MUST CONTAIN ALL FILTRATE PLUS STORMWATER FROM 25YR-24 HOUR STORM. FREEBOARD ELEVATION FOR CONTAINING 25YR-24 HOUR STORM SHALL BE MARKED AT SUMP AND SHALL BE MANAGED TO MAINTAIN WATER ELEVATION BELOW FREEBOARD.
8. WASTEWATER TREATMENT PAD MUST CONTAIN ALL SPILLS FROM WASTEWATER TREATMENT SYSTEM.
9. REMOVE GRAVEL AND DEBRIS WITHING SEDIMENT PROCESSING FACILITY FOOTPRINT PRIOR TO INITIAL SAND LAYER PLACEMENT.



SECTION A-A'



SECTION B-B'

A / CH-101 WATER TREATMENT/ DECONTAMINATION PAD - TYPICAL DETAIL

SCALE:NO SCALE

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR

DRAWN BY: JRM

CHECKED BY: JMT

PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

SEDIMENT PROCESSING FACILITY AND PROCESSING DETAILS

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL
847-915-8010

DATE: MAY 2019

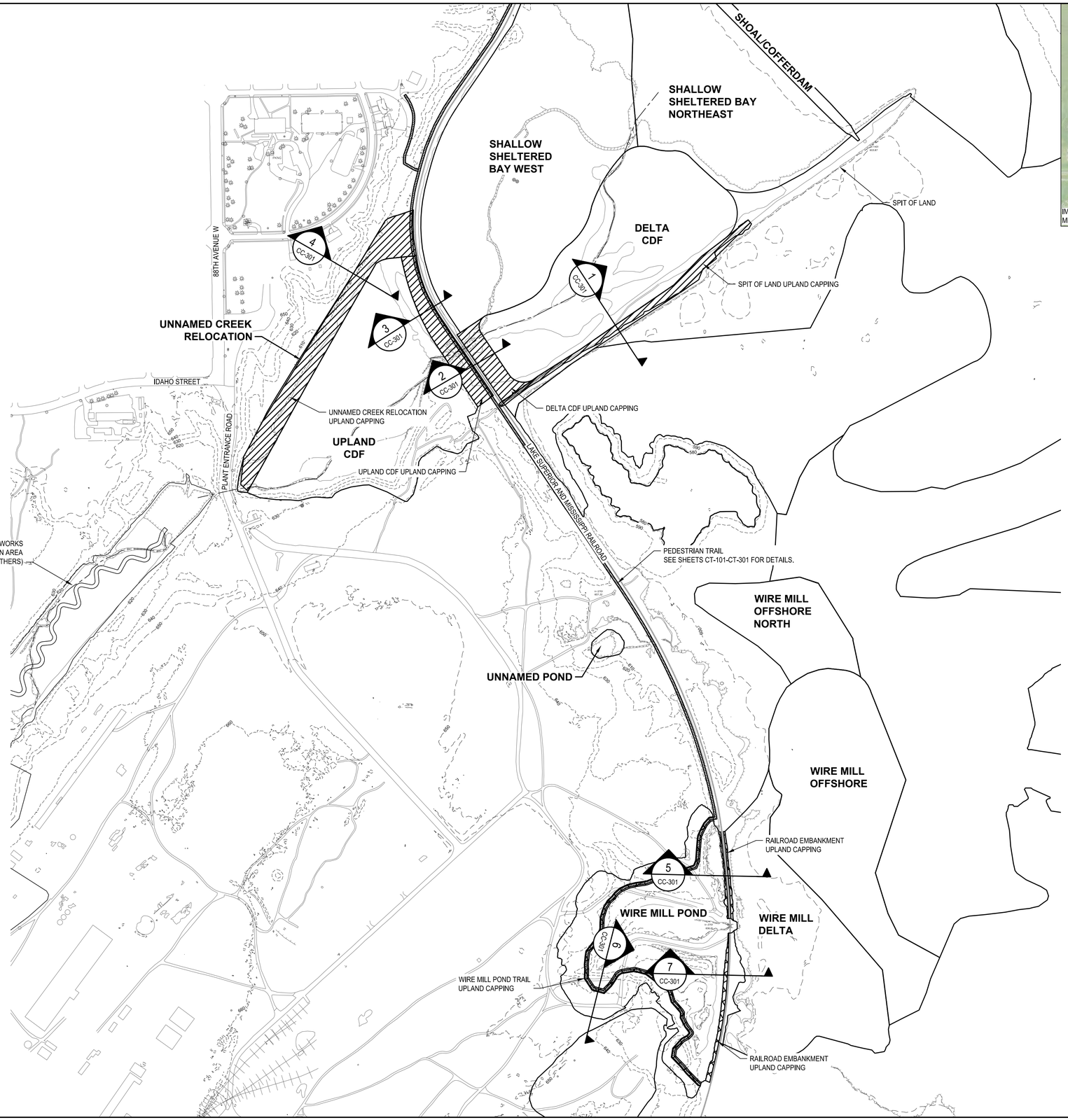
PROJECT NUMBER: 1518924

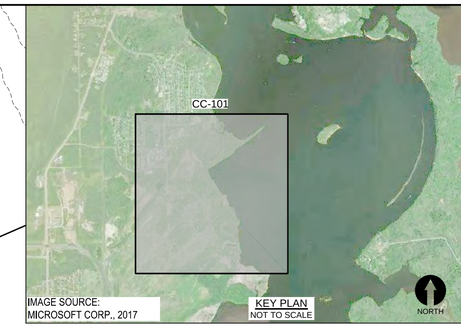
CP-501

SHEET: 60 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\GLAES\PROJECTS\1518924 - SPIRIT LAKE RDO_DESIGN\1-CADD\4-FIGURES\SEDIMENT PROCESSING FACILITY AND PROCESSING DETAILS.DWG SEDIMENT PROCESSING FACILITY AND PROCESSING DETAILS.DWG, JUSTIN 5/30/2019 1:43 PM





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SCALE IN FEET

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UPLAND CAPPING PLAN

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL
847-915-8010

DATE: MAY 2019

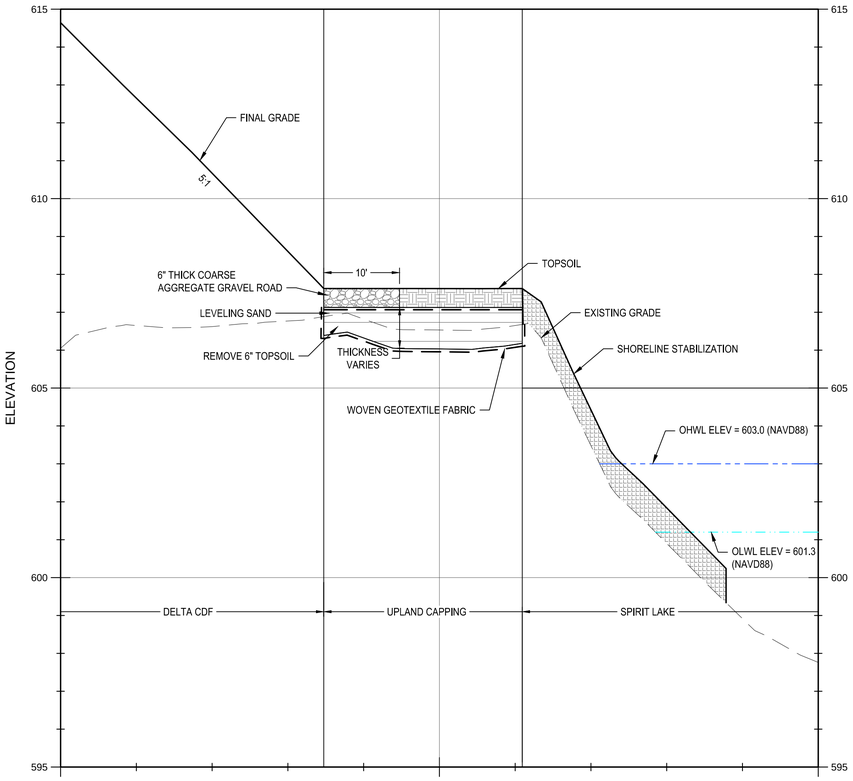
PROJECT NUMBER: 1518924

CC-101

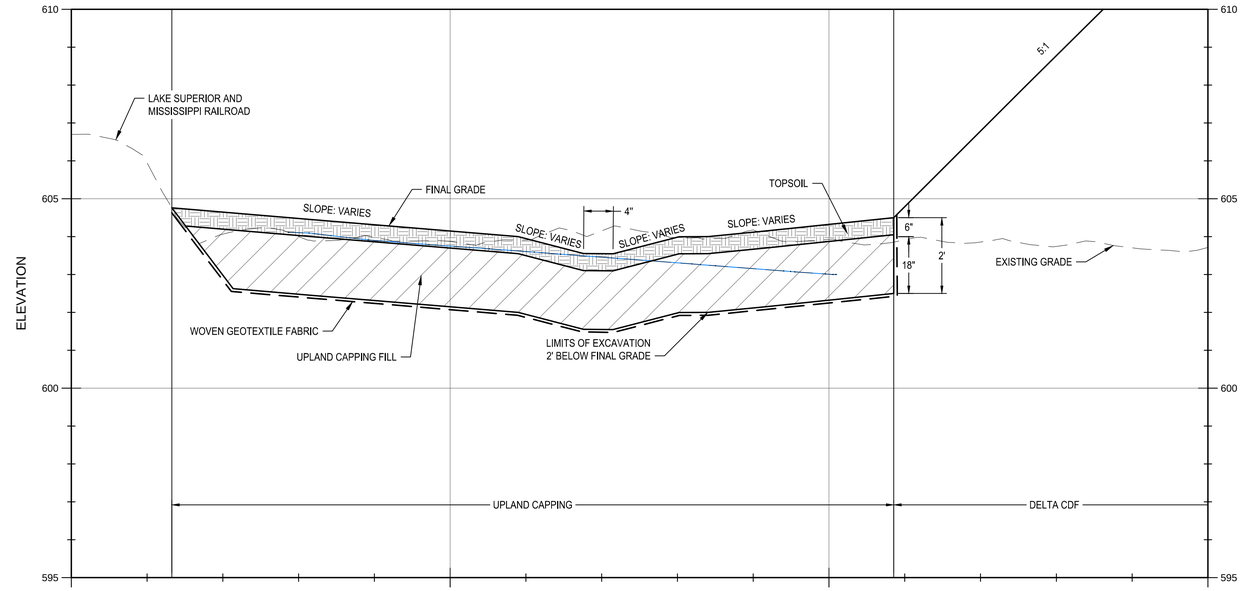
SHEET: 61 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\GLAES\PROJECTS\1518924 - SPIRIT LAKE RDO\DESIGN\4 - CADD\4-PROJRESU\PLAND CAPPING DETAILS OF 5\DWG\PLAND CAPPING PLAN\OTTO, JUSTIN 5/30/2019 3:11 PM



1 CC-101 SPIT OF LAND UPLAND CAP SECTION
HORIZ. SCALE: 1" = 10'
VERT. SCALE: 1" = 2'



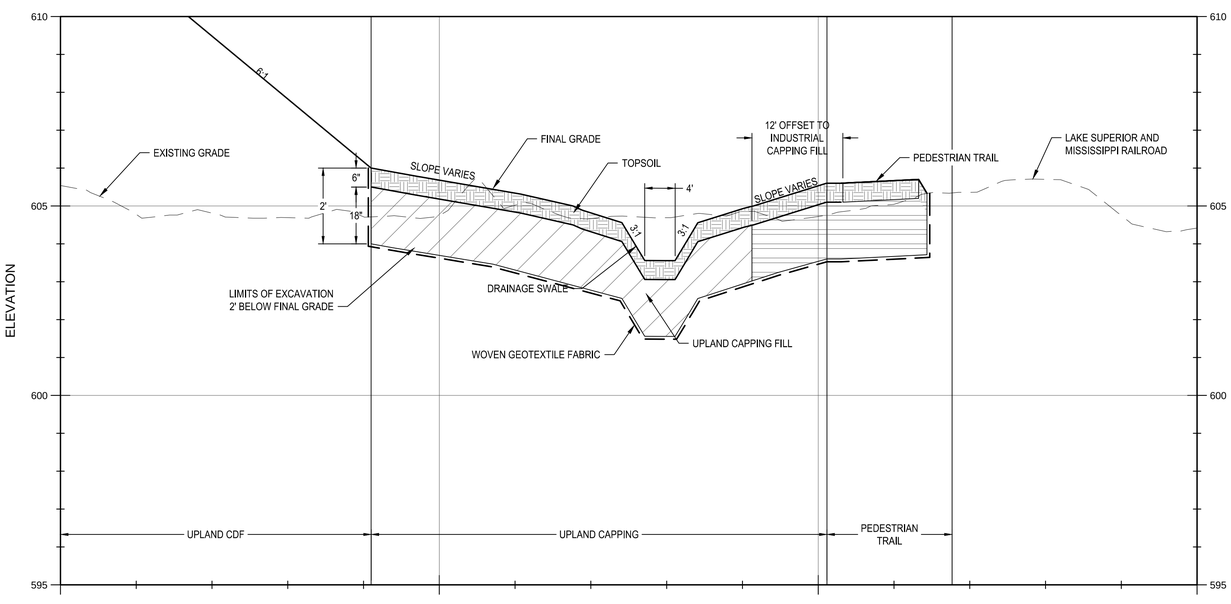
2 CC-101 DELTA CDF UPLAND CAP SECTION
HORIZ. SCALE: 1" = 10'
VERT. SCALE: 1" = 2'

LEGEND

RECREATIONAL CAPPING FILL

INDUSTRIAL CAPPING FILL

NOTE:
FOR SHORELINE STABILIZATION DETAILS SEE SHEETS CH-501-CH-503.



3 CC-101 UPLAND CDF UPLAND CAP SECTION
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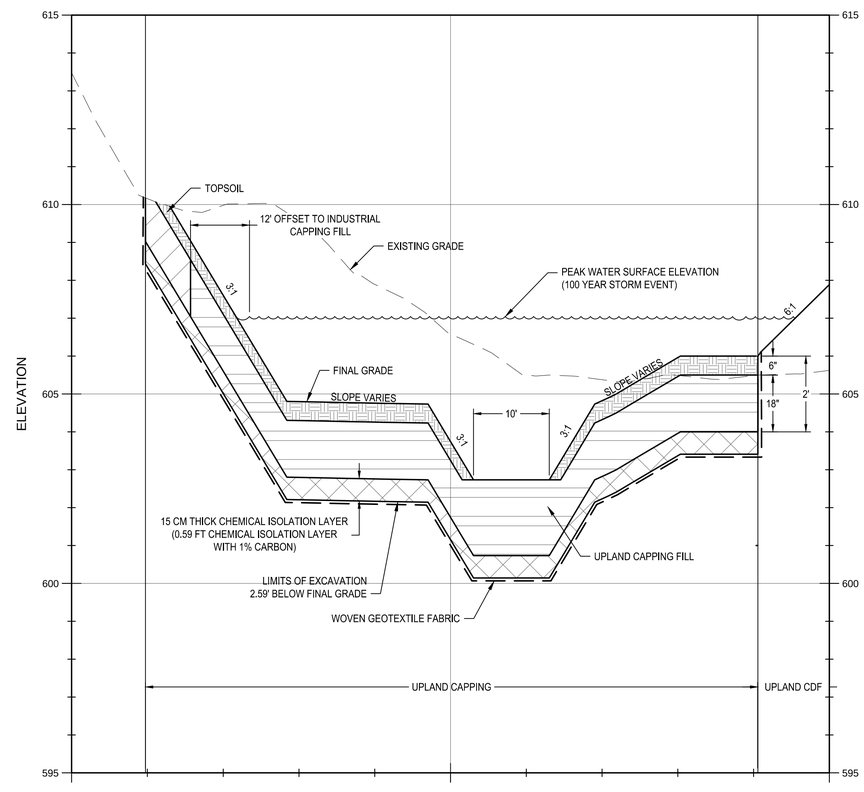

4 CC-101 UNNAMED CREEK RELOCATION UPLAND CAP SECTION
HORIZ. SCALE: 1" = 10'
VERT. SCALE: 1" = 2'

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UPLAND CAPPING DETAILS (1 OF 2)

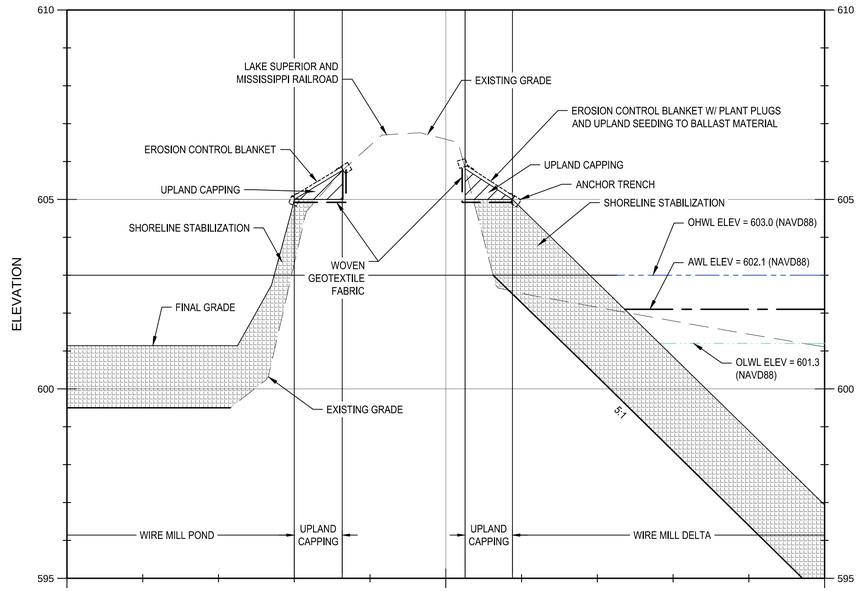
PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL
847-915-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924
CC-301
SHEET: 62 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\GLAES\PROJECTS\1518924 - SPIRIT LAKE RDO_DESIGN\1-CADD\4-FIGURES\UPLAND CAPPING\CC-TM-3.1-01 OF 2\UPLD [UPLAND CAPPING DETAILS 2 OF 2]\UPLD [UPLAND CAPPING DETAILS 2 OF 2]\CC-TM-3.1-01 OF 2\UPLD [UPLAND CAPPING DETAILS 2 OF 2]\CC-301 - UPLAND CAPPING DETAILS 2 OF 2.DWG [UPLAND CAPPING DETAILS 2 OF 2] 5/20/2019 3:12 PM



5 CC-101 WIRE MILL POND UPLAND CAP NORTH SECTION
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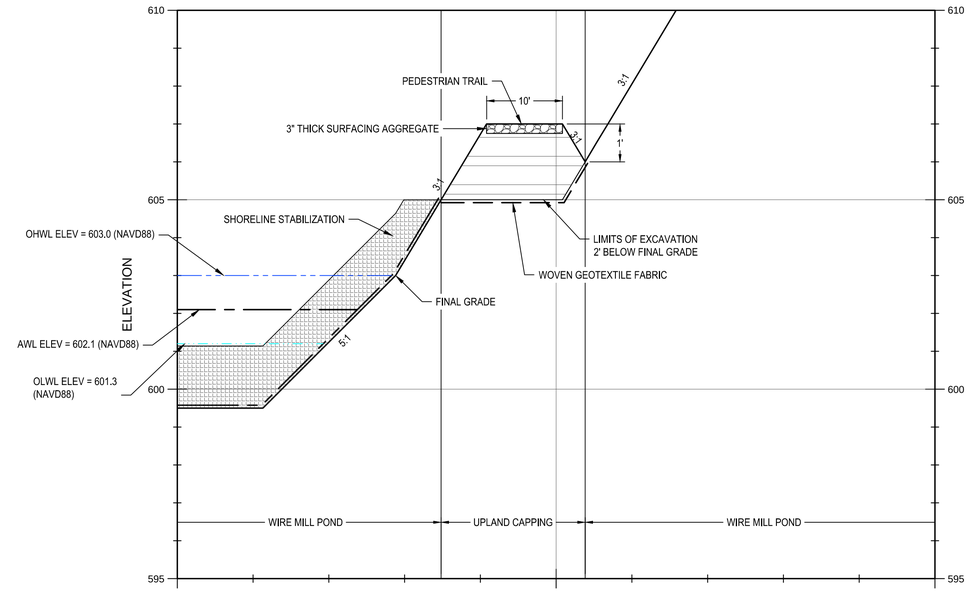
VERT. SCALE: 1" = 2'



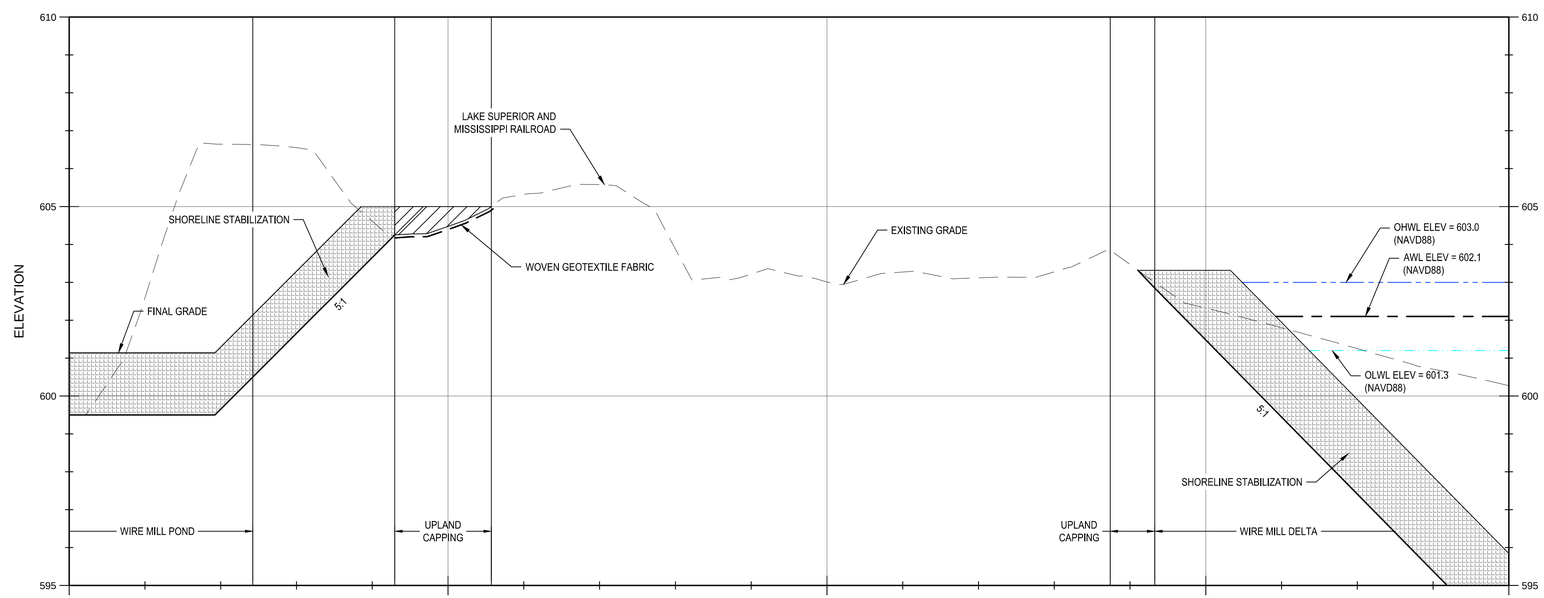
6 CC-101 WIRE MILL POND TRAIL UPLAND CAP SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'

LEGEND

RECREATIONAL CAPPING FILL

INDUSTRIAL CAPPING FILL

NOTE:
FOR SHORELINE STABILIZATION DETAILS SEE SHEETS CH-501-CH-503.



7 CC-101 WIRE MILL POND UPLAND CAP SOUTH SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JAO
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UPLAND CAPPING DETAILS (2 OF 2)

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL
847-915-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924
CC-302
SHEET: 63 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON_DOD\CLIENTS\PROJECTS\1518924 - SPIRIT LAKE ROD_DESIGN\1- CADD\4- FIGURES\UPLAND CAPPING DETAILS (2 OF 2).DWG\UPLAND CAPPING DETAILS (2 OF 2) (CITO, JUSTIN) 5/30/2019 3:12 PM

UC OFFSHORE NORTH

NORTH DREDGE AREA

CAPPING ARMOR

AREA C C CC-501

AREA A A CC-501

AREA B B CC-501

TEMPORARY TURBIDITY BARRIER SEE SHEET CH-501

NOTE:
CAPPING ARMOR (1" OVERPLACEMENT ALLOWANCE) SHALL BE PLACED IN THE TOP 6" OF BAZ WHERE SHOWN.

SPIRIT LAKE

LAKE SUPERIOR AND MISSISSIPPI RAILROAD

CP 10-2016

1 CU-302

2 CU-302

3 CC-302

4 CC-302

SHOAL

UC OFFSHORE

HISTORICAL BARGE CHANNEL

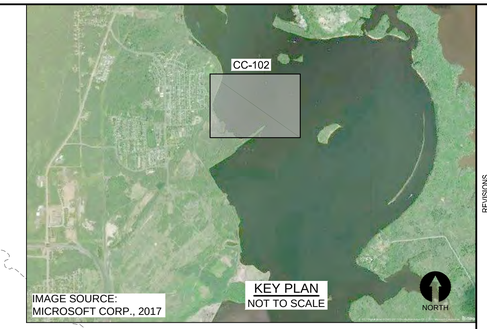
SHALLOW SHELTERED BAY WEST

SHALLOW SHELTERED BAY NORTHWEST

DELTA CDF

SPIT OF LAND

CAPPING ARMOR



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NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UC OFFSHORE SUBAQUEOUS CAPPING PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019

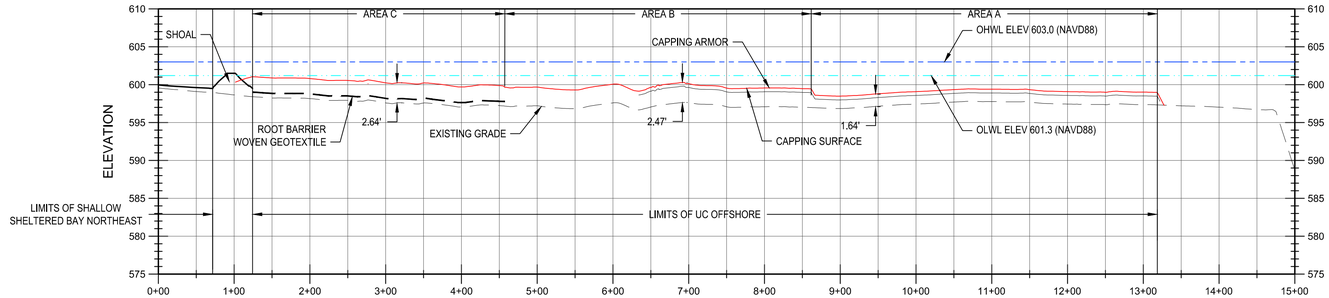
PROJECT NUMBER: 1518924

CC-102

SHEET: 64 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\CLIENTS\PROJECTS\1518924 - SPIRIT LAKE RDA_DESIGN\1-CADD\4-FIGURES\UC OFFSHORE SUBAQUEOUS CAPPING\DETAILS\PNG\UC OFFSHORE SUBAQUEOUS CAPPING PLAN\OTTO JUSTIN 5/30/2019 3:14 PM



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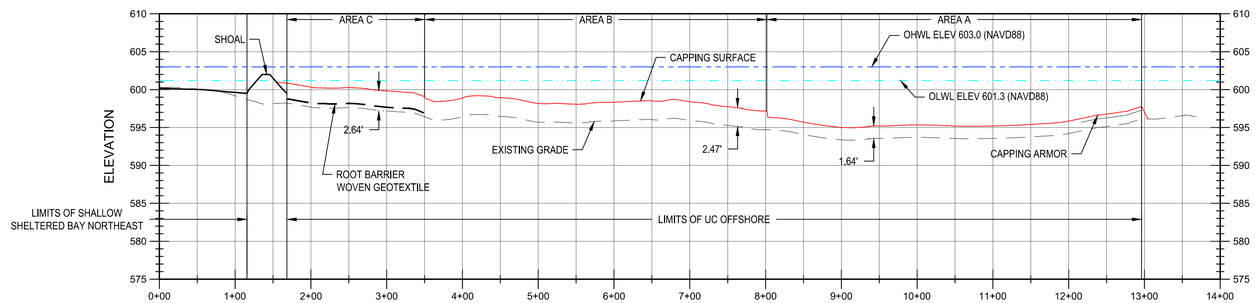
VERT. SCALE: 1" = 10'



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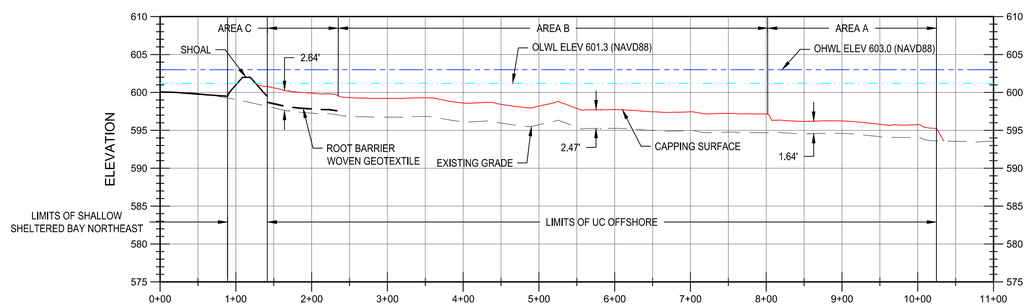
HORIZ. SCALE: 1" = 100'
VERT. SCALE: 1" = 10'



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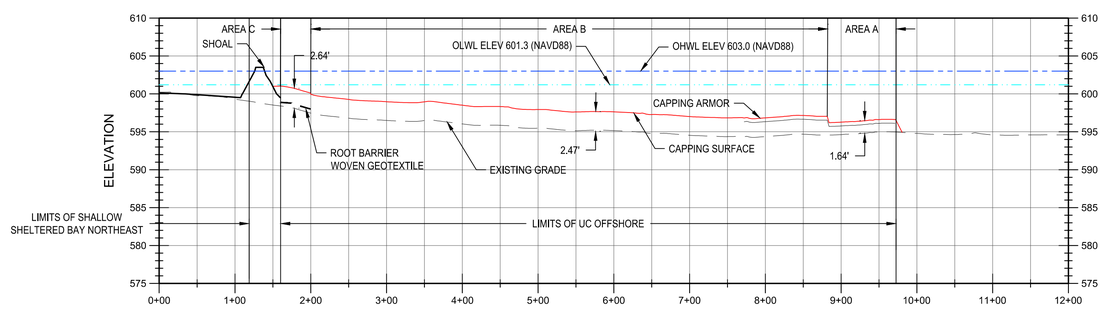
VERT. SCALE: 1" = 10'



4 CC-102 SECTION
HORIZ. SCALE: 1" = 100'
VERT. SCALE: 1" = 10'

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UC OFFSHORE SUBAQUEOUS CAPPING DETAILS

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924

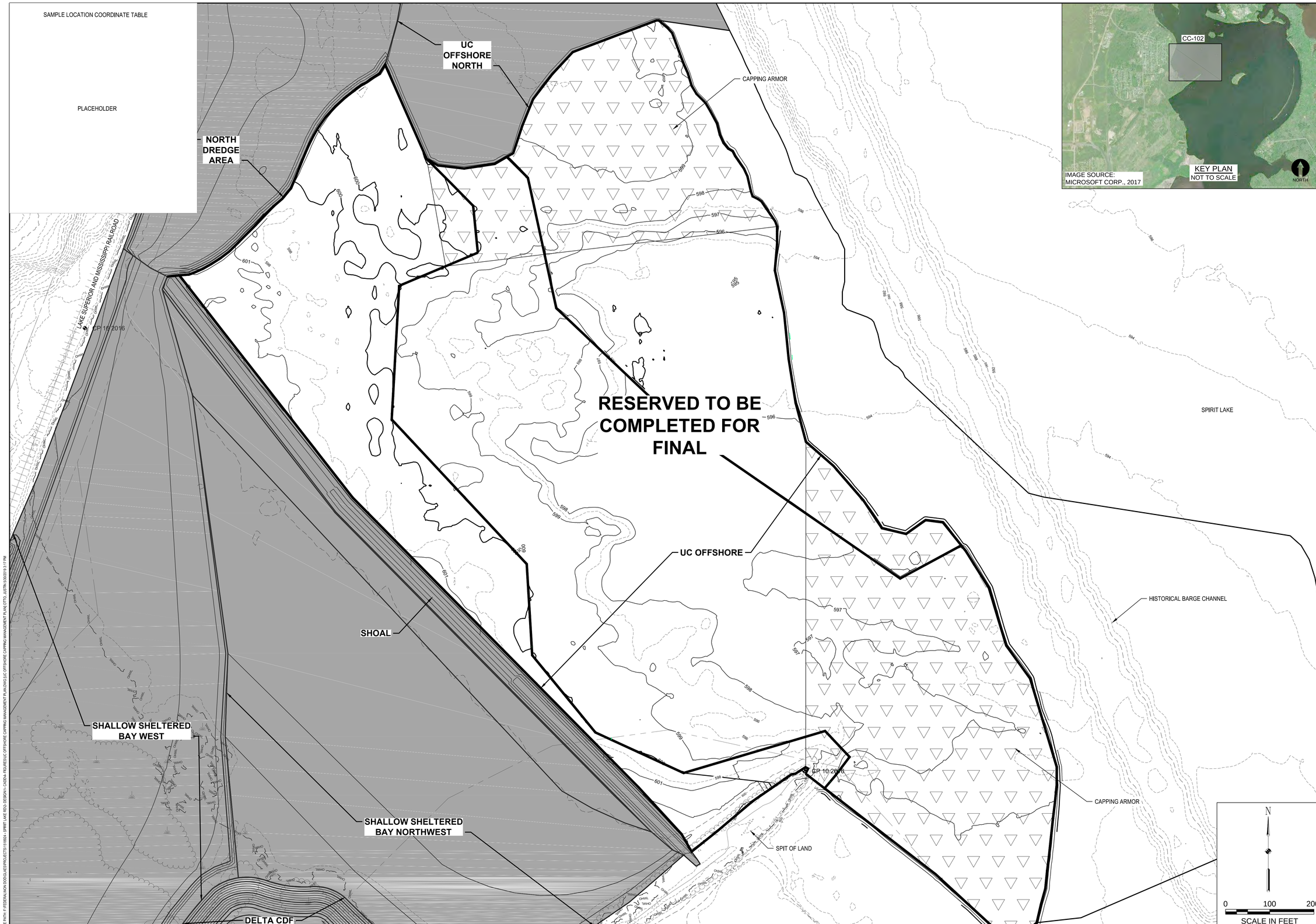
CC-303

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\KA\GIS\CLIENTS\PROJECTS\1518924 - SPIRIT LAKE RDA - DESIGN\1 - CADD\4 - FIGURES\UC OFFSHORE SUBAQUEOUS CAPPING DETAILS\UC OFFSHORE SUBAQUEOUS CAPPING DETAILS.DWG, JUSTIN 5/30/2019 3:15 PM

SAMPLE LOCATION COORDINATE TABLE

PLACEHOLDER



NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UC OFFSHORE CAPPING MANAGEMENT PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

CC-103

SHEET: 66 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\KCK\DOCLAES\PROJECTS\1518924 - SPIRIT LAKE RDA - DESIGN\1 - CAD\04 FIGURES\UC OFFSHORE CAPPING MANAGEMENT PLAN\DWG\UC OFFSHORE CAPPING MANAGEMENT PLAN (CTTO, JUSTIN) 5/30/2019 3:17 PM

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

WIRE MILL OFFSHORE SUBAQUEOUS CAPPING DETAILS

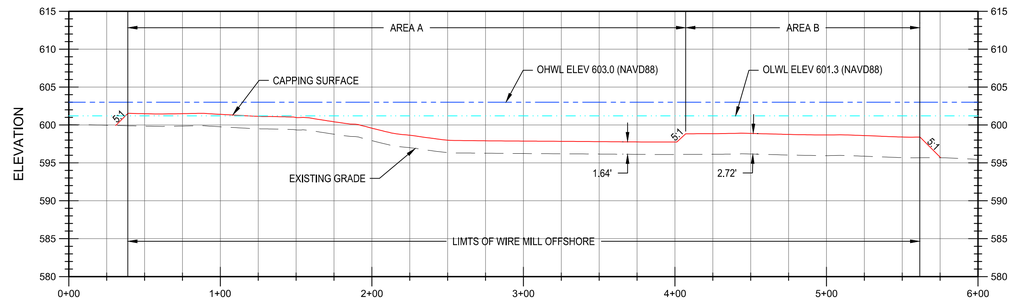
PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924
CC-104
SHEET: 67 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\LAKES\PROJECTS\1518924 - SPIRIT LAKE REDI\-RESEARCH\-CADD\+FIGURES\WIRE MILL OFFSHORE SUBAQUEOUS CAP AND COVER DETAILS.DWG\WIRE MILL OFFSHORE SUBAQUEOUS CAPPING PLAN.OTTO, JJETNA,5/30/2019,1:19 PM



1 CC-104 **SECTION**
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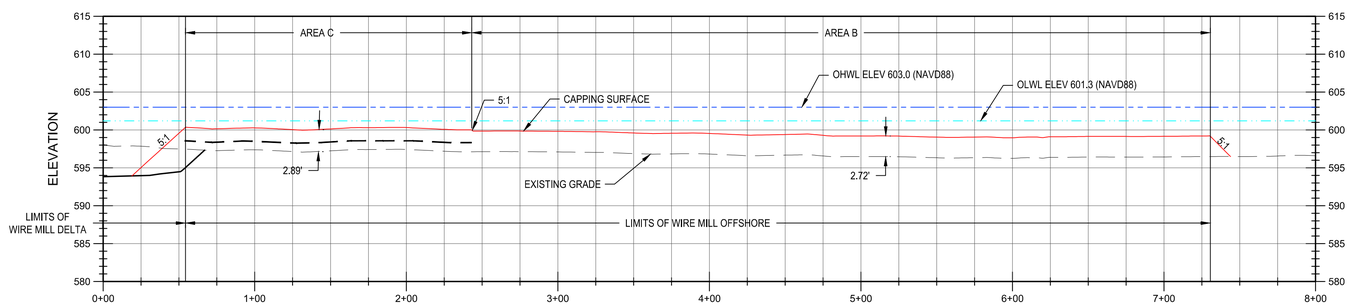
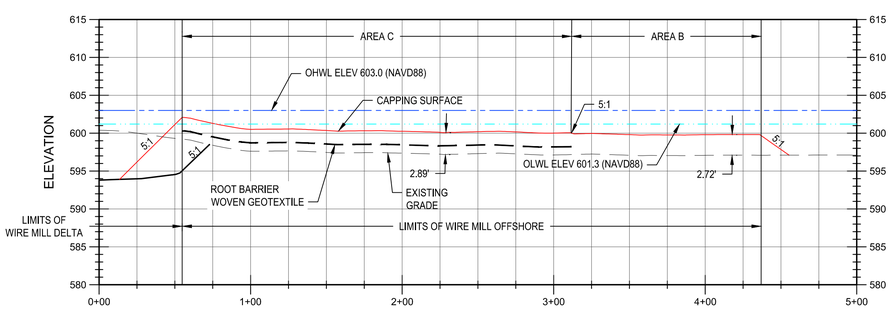
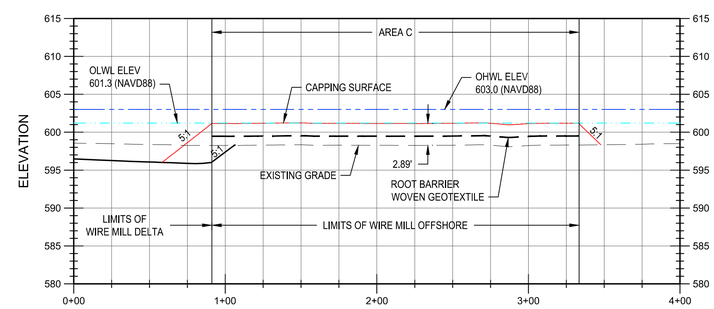
VERT. SCALE: 1" = 10'



2 CC-104 **SECTION**
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



3 CC-104 **SECTION**
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



4 CC-104 **SECTION**
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 46712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

WIRE MILL OFFSHORE SUBAQUEOUS CAPPING DETAILS

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

CC-304

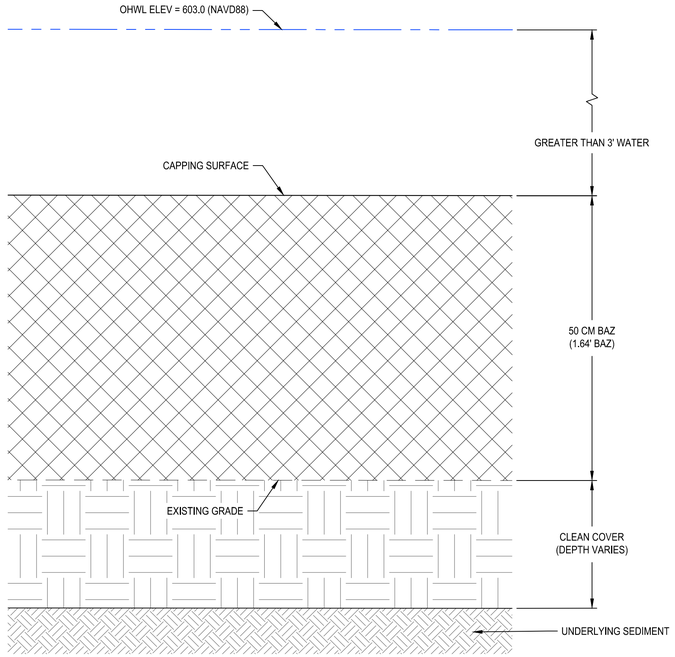
SHEET: 68 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

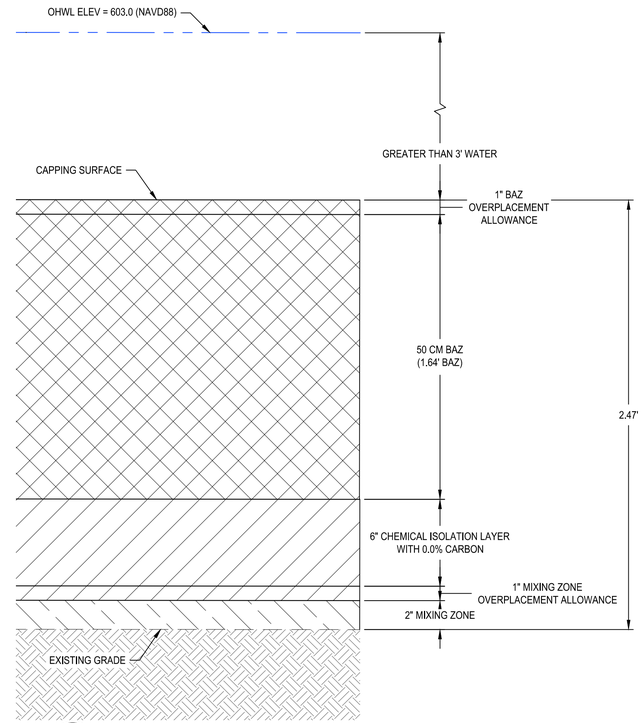
FILE PATH: F:\FEDERAL\NON DOD\CLIENTS\EPA\SITES\1518924 - SPIRIT LAKE RDC-DESIGN\1 - CADD\4 FIGURES\WIRE MILL OFFSHORE SUBAQUEOUS CAP AND COVER DETAILS\WIRE MILL OFFSHORE SUBAQUEOUS CAP AND COVER DETAILS OTTO, JUSTIN 5/30/2019 3:27 PM

NOTES:

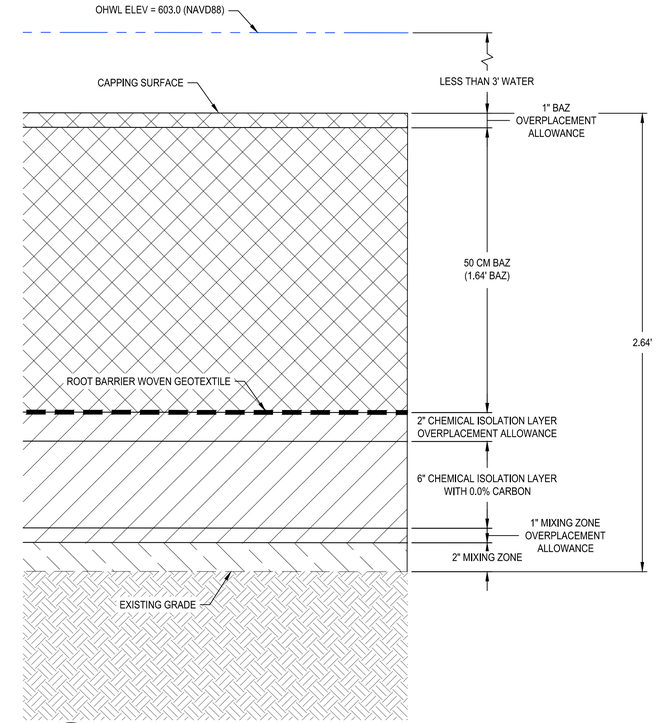
1. DEBRIS SHALL BE REMOVED FROM EXISTING GRADE BEFORE PLACING CAP IN AREA C (AREAS WITH ROOT BARRIER).
2. PLACE MIXING ZONE LAYER UNIFORMLY OVER ENTIRE SUBAQUEOUS CAP (SEPARATELY OVER UC OFFSHORE AND WM OFFSHORE), AND COMPLETE VERIFICATION PRIOR TO PLACING CHEMICAL ISOLATION LAYER.
3. CAPPING ARMOR (1" OVERPLACEMENT ALLOWANCE) SHALL BE PLACED IN THE TOP 6" OF BAZ WHERE SHOWN ON CC-102.



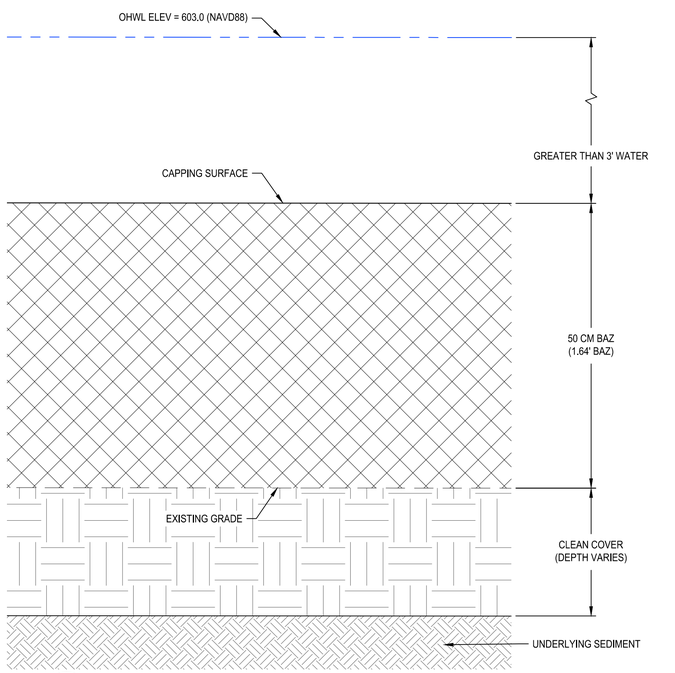
A / CC-102 UC OFFSHORE AREA A CAPPING DETAIL
SCALE: NO SCALE



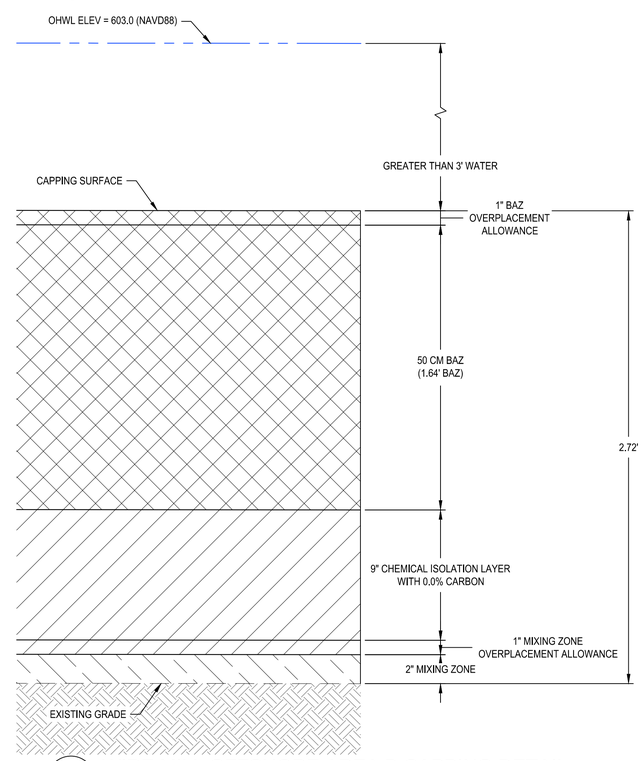
B / CC-102 UC OFFSHORE AREA B CAPPING DETAIL
SCALE: NO SCALE



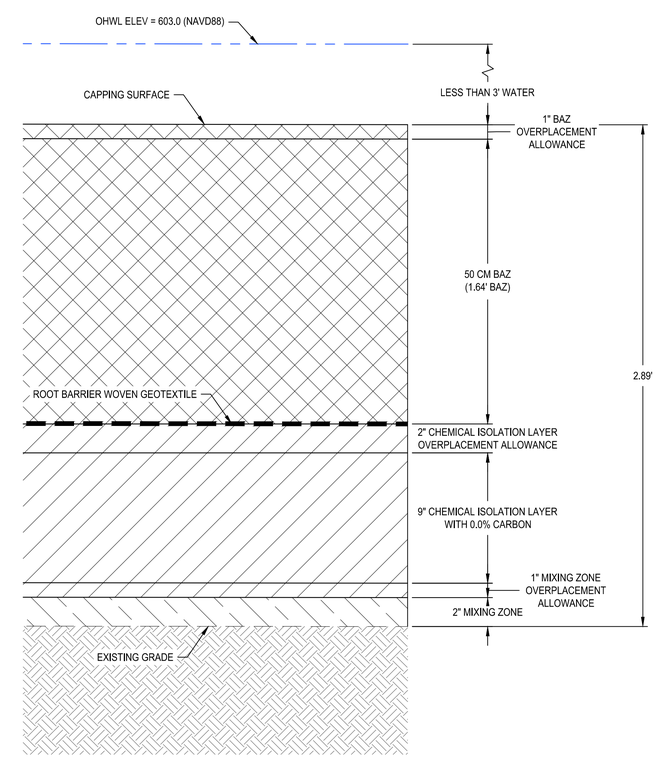
C / CC-102 UC OFFSHORE AREA C CAPPING DETAIL
SCALE: NO SCALE



D / CC-104 WIRE MILL OFFSHORE AREA A CAPPING DETAIL
SCALE: NO SCALE



E / CC-104 WIRE MILL OFFSHORE AREA B CAPPING DETAIL
SCALE: NO SCALE



F / CC-104 WIRE MILL OFFSHORE AREA C CAPPING DETAIL
SCALE: NO SCALE

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

SUBAQUEOUS CAPPING DETAILS

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924

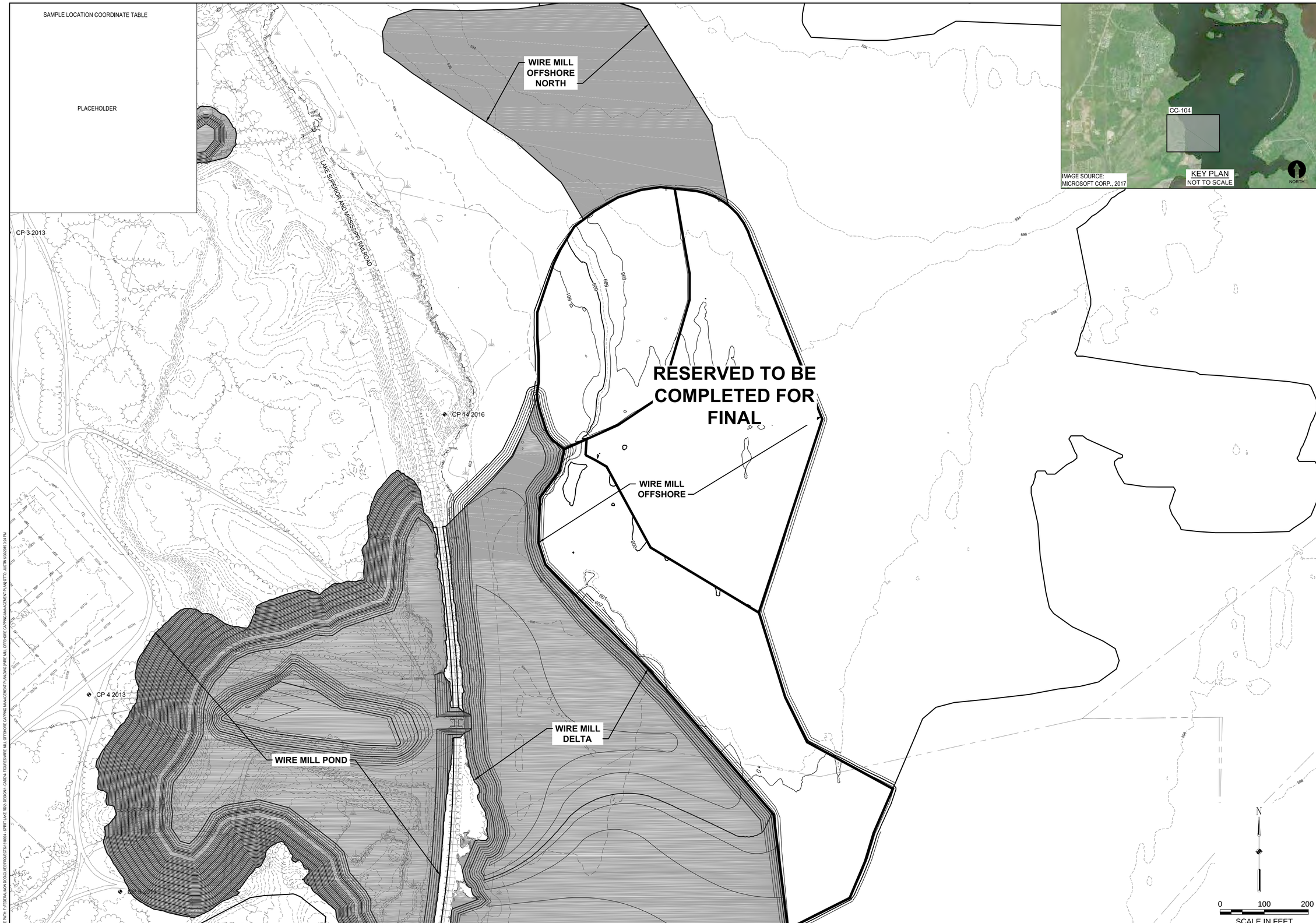
CC-501
SHEET: 69 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\CLIAE\PROJECTS\181924 - SPIRIT LAKE REDI - DESIGN\+ CADD\+ FIGURES\SUBAQUEOUS CAPPING DETAILS\DWG\SUBAQUEOUS CAPPING DETAILS.DTTO, JGTTN JJ/20/2019 3:22 PM

SAMPLE LOCATION COORDINATE TABLE

PLACEHOLDER



REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

WIRE MILL OFFSHORE CAPPING MANAGEMENT PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

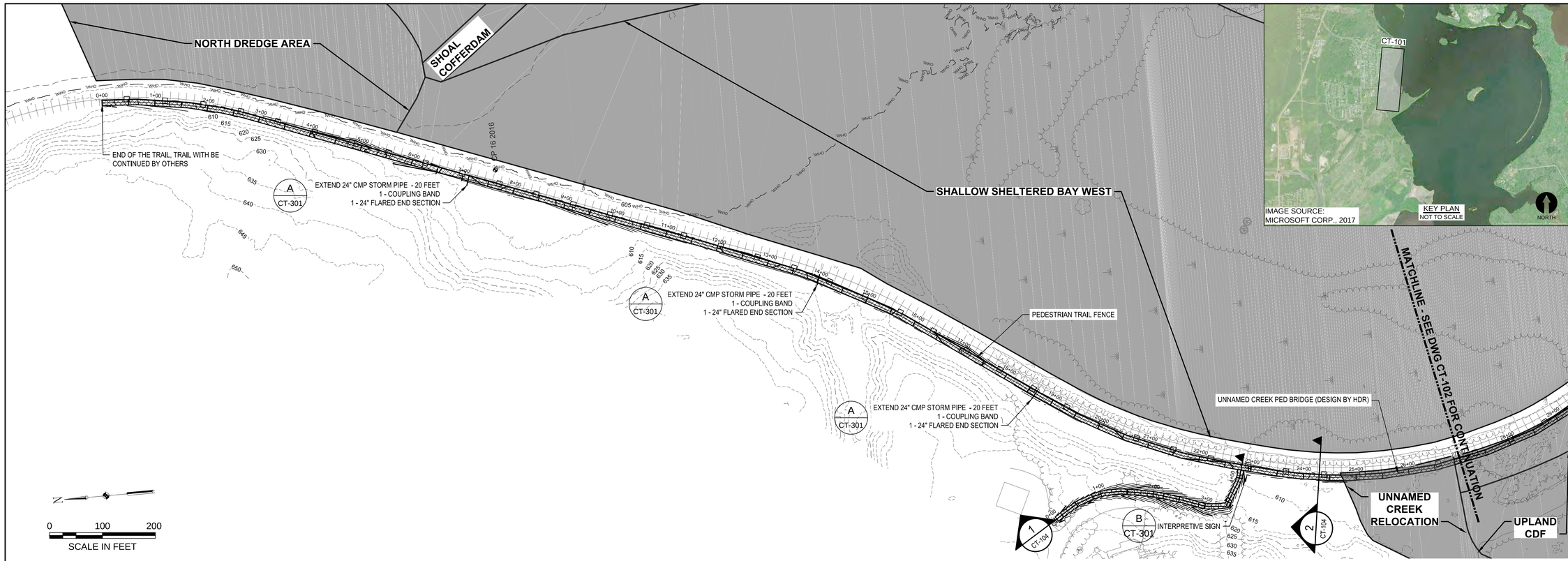
PROJECT NUMBER: 1518924

CC-105

SHEET: 70 OF 116

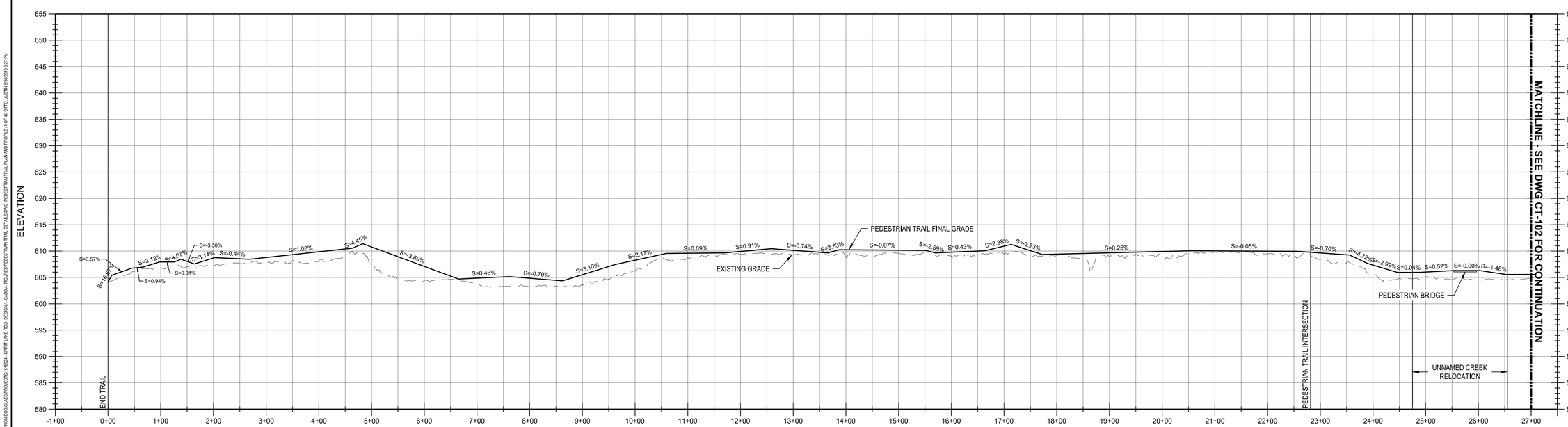
PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: P:\FEDERAL\MCH GOOGLE\ARS\PROJECTS\151924 - SPIRIT LAKE RDO-DESIGN\1-CADD\4-FIGURES\WIRE MILL OFFSHORE CAPPING MANAGEMENT PLAN\WIRE MILL OFFSHORE CAPPING MANAGEMENT PLAN(.DTD), JUSTIN 5/30/2019 3:24 PM



PEDESTRIAN TRAIL PLAN VIEW

SCALE: 1" = 100'



PEDESTRIAN TRAIL PROFILE

HORIZ. SCALE: 1" = 100'

VERT. SCALE: 1" = 10'

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR

DRAWN BY: JRM

CHECKED BY: JMT

PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

PEDESTRIAN TRAIL PLAN AND PROFILE (1 OF 4)

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019

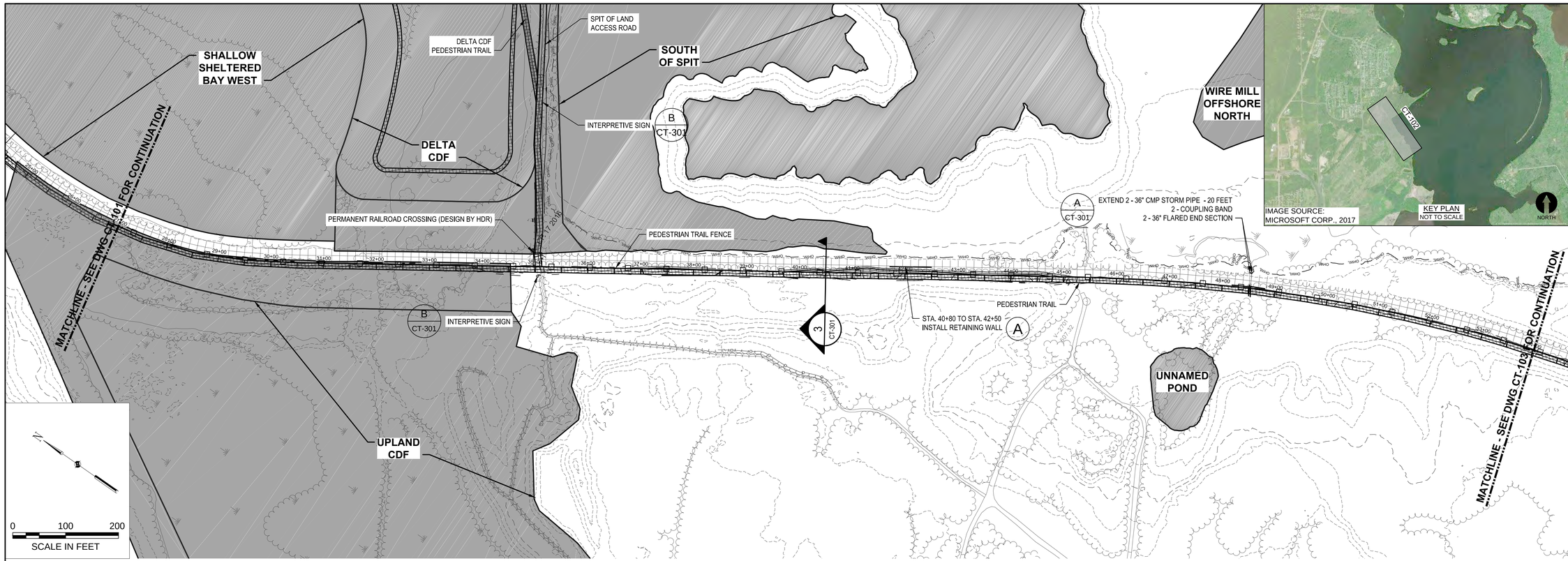
PROJECT NUMBER: 1518924

CT-101

SHEET: 71 OF 116

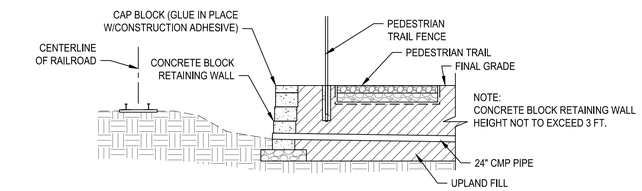
PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\ALJ\SPRLJ\ECT\1518924 - SPIRIT LAKE REDI - DESIGN\1 - CADD\4 - FIG\RES\PEDESTRIAN TRAIL DETAILS.DWG [PEDESTRIAN TRAIL PLAN AND PROFILE 1 OF 4] BY:TTU, JUSTIN 4/30/2019 3:27 PM



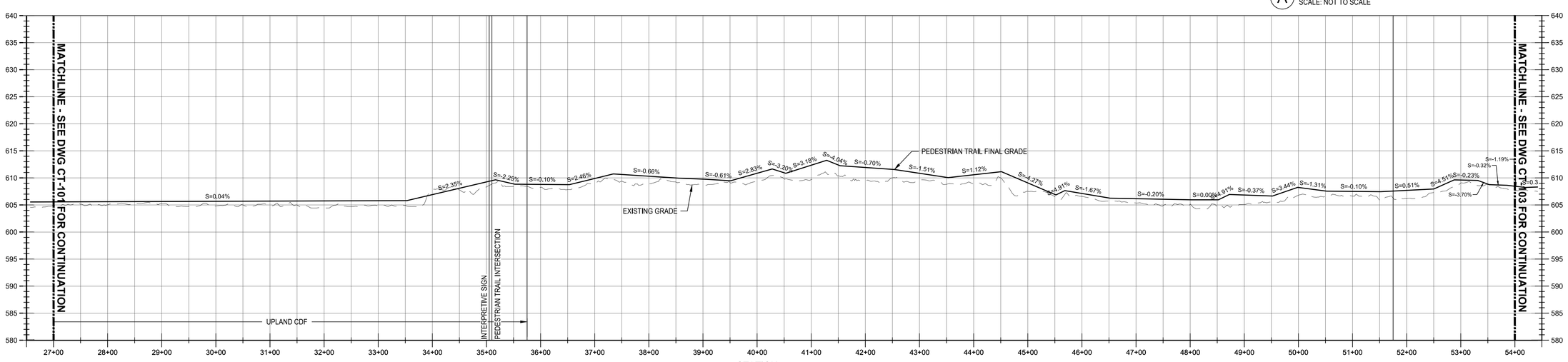
PEDESTRIAN TRAIL PLAN VIEW

SCALE: 1" = 100'



A RETAINING WALL DETAIL

SCALE: NOT TO SCALE



PEDESTRIAN TRAIL PROFILE

HORIZ. SCALE: 1" = 100'
VERT. SCALE: 1" = 10'

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

PEDESTRIAN TRAIL PLAN AND PROFILE (2 OF 4)

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019

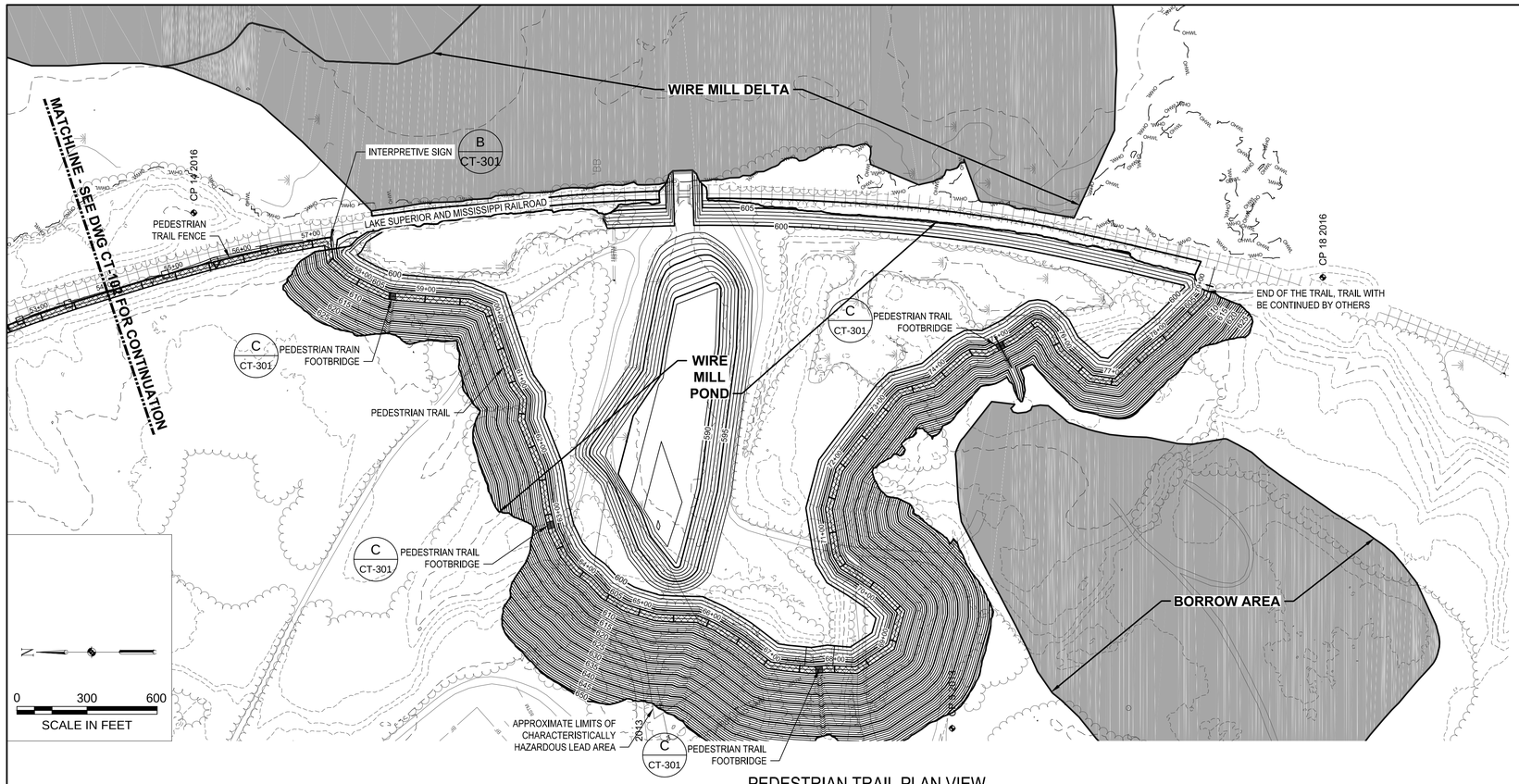
PROJECT NUMBER: 1518924

CT-102

SHEET: 72 OF 116

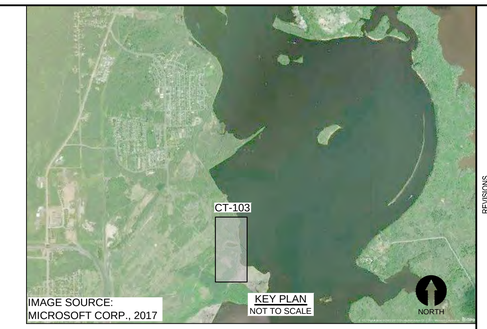
PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

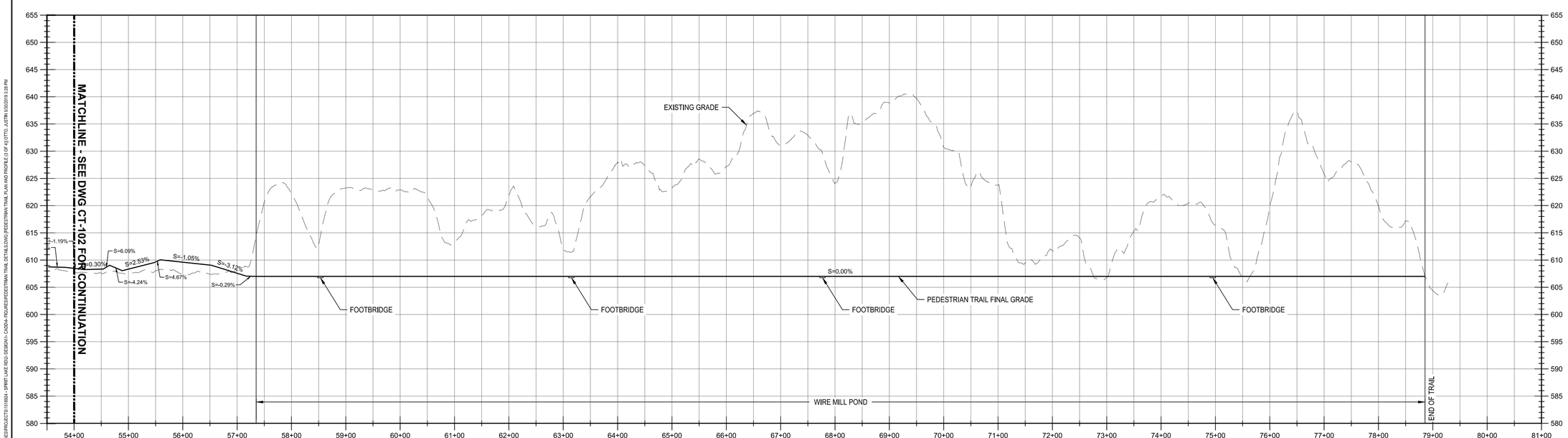
FILE PATH: F:\FEDERAL\NON DOD\ALJ\PROJECTS\1518924 - SPIRIT LAKE REDI - DESIGN\1 - CADD\4 - FIGURES\PEDESTRIAN TRAIL DETAILS.DWG [PEDESTRIAN TRAIL PLAN AND PROFILE 2 OF 4] (CTTU_JJSTIN 4/30/2019 3:27 PM)



PEDESTRIAN TRAIL PLAN VIEW

SCALE: 1" = 100'





PEDESTRIAN TRAIL PROFILE

HORIZ. SCALE: 1" = 100'
VERT. SCALE: 1" = 10'

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

PEDESTRIAN TRAIL PLAN AND PROFILE (3 OF 4)

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019

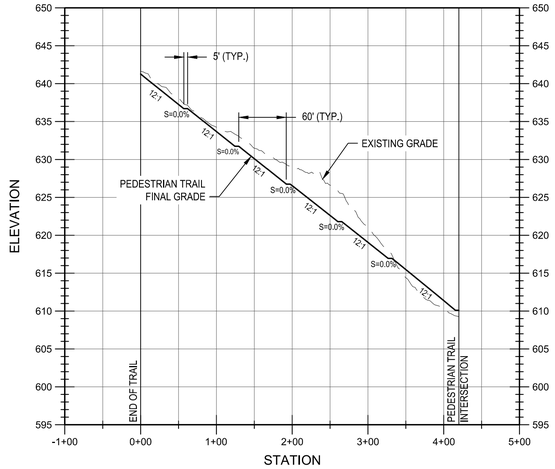
PROJECT NUMBER: 1518924

CT-103

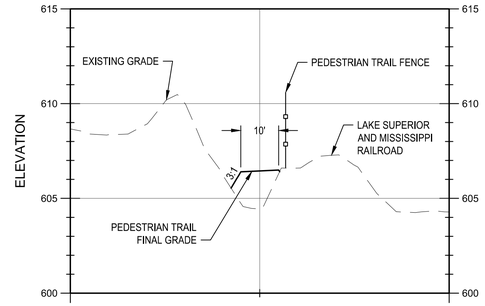
SHEET: 73 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

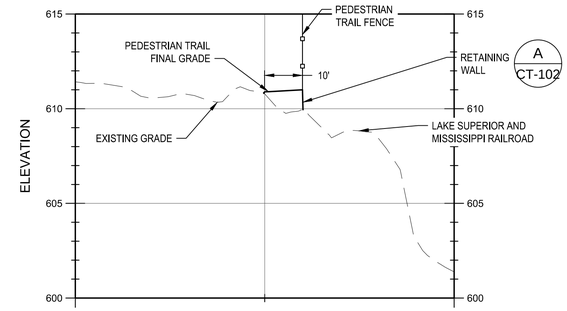
FILE PATH: F:\FEDERAL\NON DOD\CLIENTS\EPA\PROJECTS\1518924 - SPIRIT LAKE RDO - DESIGN\1-CADD\+ FIGURES\PEDESTRIAN TRAIL DETAILS.DWG [PEDESTRIAN TRAIL PLAN AND PROFILE (1 OF 4)] (TTG), JUSTIN 5/30/2019 3:28 PM



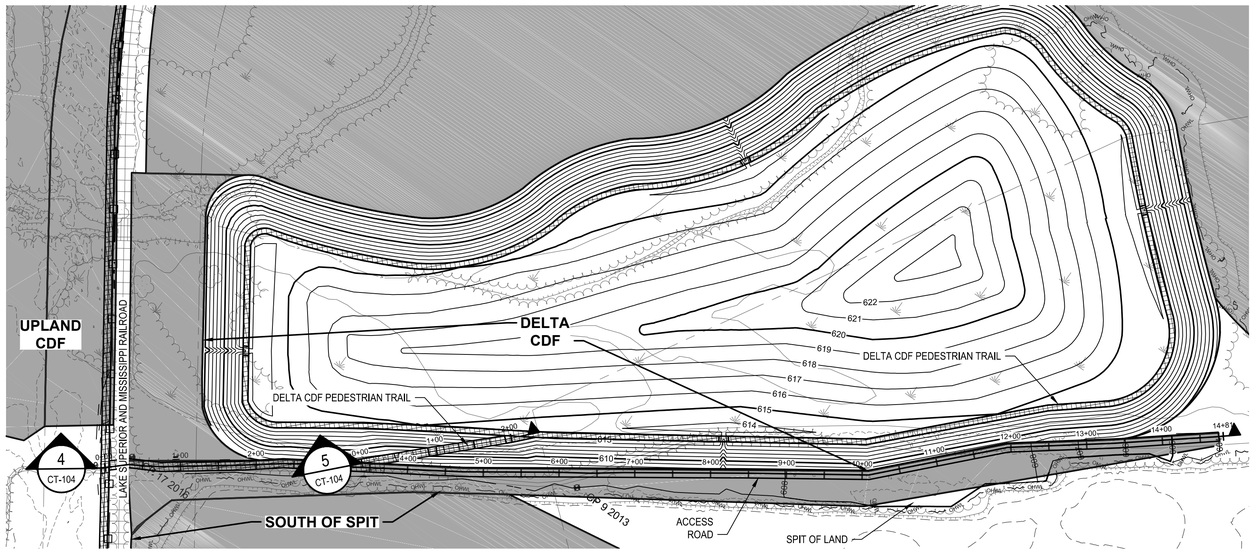
1 CT-101 **PROFILE**
HORIZ. SCALE: 1" = 100'
VERT. SCALE: 1" = 10'



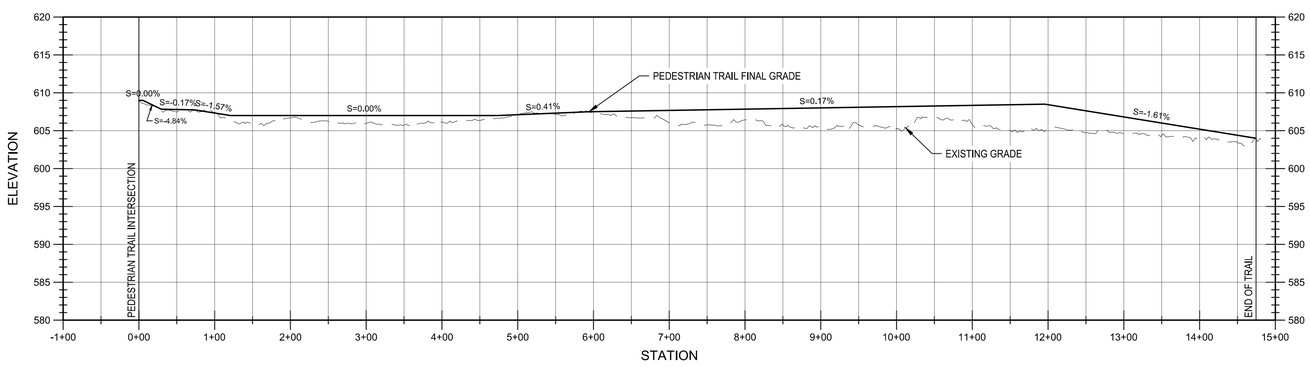
2 CT-101 **SECTION**
HORIZ. SCALE: 1" = 20'
VERT. SCALE: 1" = 4'



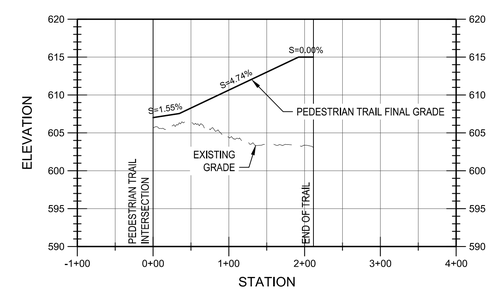
3 CT-102 **SECTION**
HORIZ. SCALE: 1" = 20'
VERT. SCALE: 1" = 4'



SPIT OF LAND PEDESTRIAN TRAIL PLAN VIEW
SCALE: 1" = 100'



4 CT-104 **SPIT OF LAND PEDESTRIAN TRAIL PROFILE**
HORIZ. SCALE: 1" = 100'
VERT. SCALE: 1" = 10'



5 CT-104 **DELTA CDF PEDESTRIAN TRAIL**
HORIZ. SCALE: 1" = 100'
VERT. SCALE: 1" = 10'

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

PEDESTRIAN TRAIL PLAN AND PROFILE (4 OF 4)

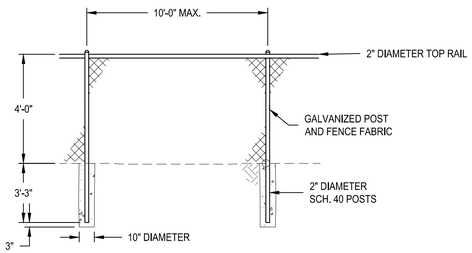
PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924
CT-104
SHEET: 74 OF 116

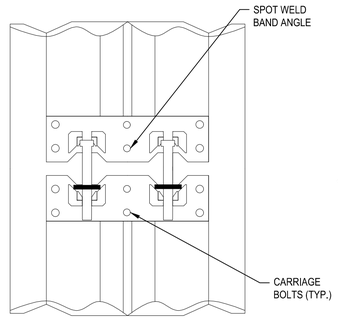
PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

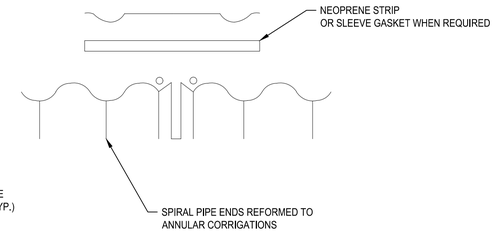
FILE PATH: F:\FEDERAL\NON DOD\CLIENTS\PROJECTS\1518924 - SPIRIT LAKE RDG - DESIGN\1-CADD\4-FIGURES\PEDESTRIAN TRAIL DETAILS.DWG [PEDESTRIAN TRAIL PLAN AND PROFILE (4 OF 4)] (CTTO), JUSTIN 3/20/2019 3:28 PM



TYPICAL PEDESTRIAN TRAIL FENCE DETAIL

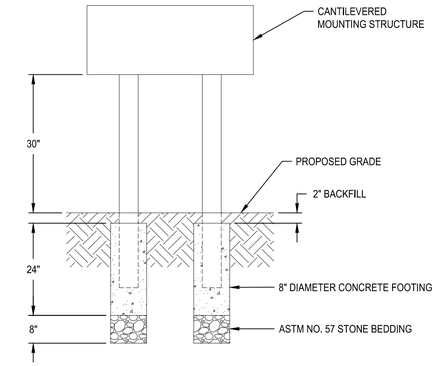
SCALE: NO SCALE





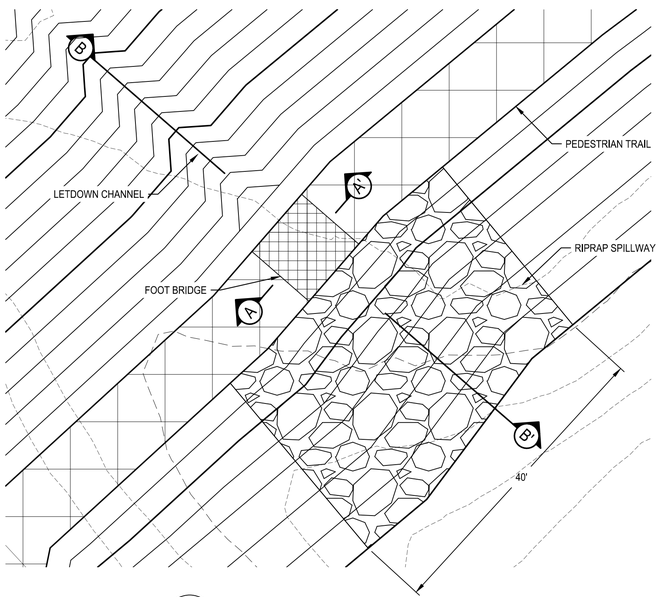
A CT-301 **COUPLING BAND**

SCALE:NO SCALE



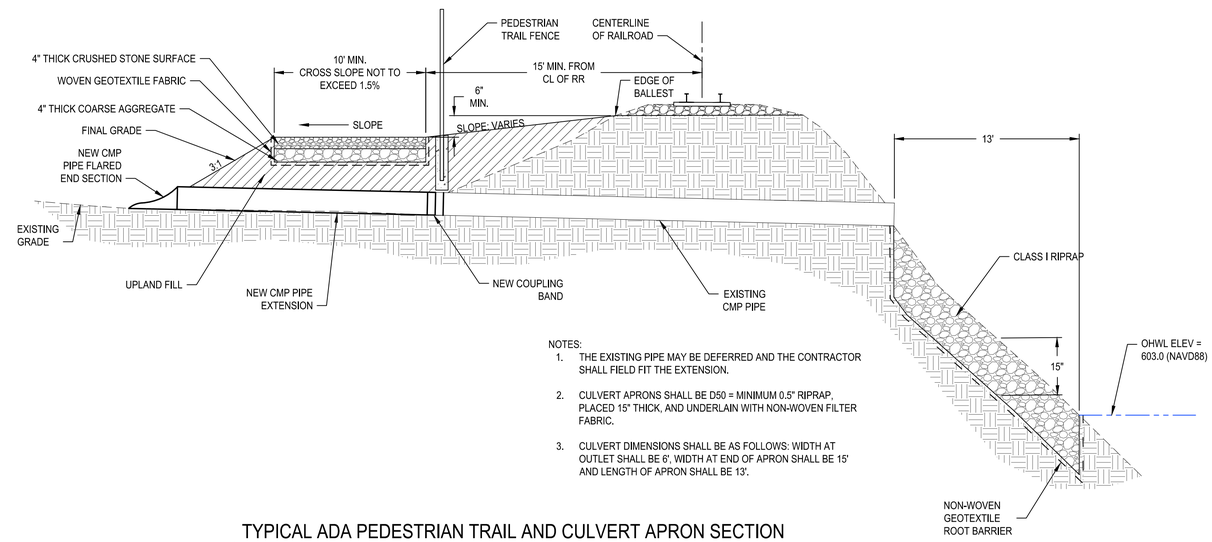
B CT-301 **INTERPRETIVE SIGN**

SCALE:NO SCALE



C CT-103 **PEDESTRIAN TRAIL FOOT BRIDGE**

SCALE:1" = 10'

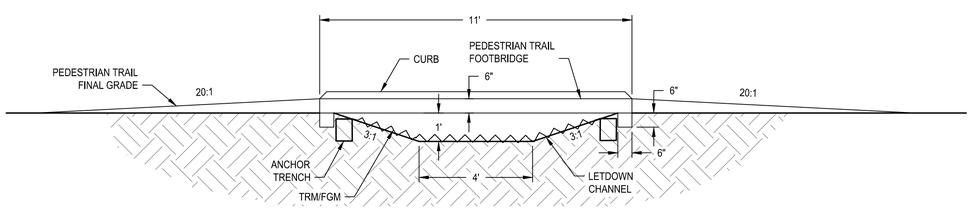


NOTES:

1. THE EXISTING PIPE MAY BE DEFERRED AND THE CONTRACTOR SHALL FIELD FIT THE EXTENSION.
2. CULVERT APRONS SHALL BE D50 = MINIMUM 0.5" RIPRAP. PLACED 15" THICK, AND UNDERLAIN WITH NON-WOVEN FILTER FABRIC.
3. CULVERT DIMENSIONS SHALL BE AS FOLLOWS: WIDTH AT OUTLET SHALL BE 6', WIDTH AT END OF APRON SHALL BE 15' AND LENGTH OF APRON SHALL BE 13'.

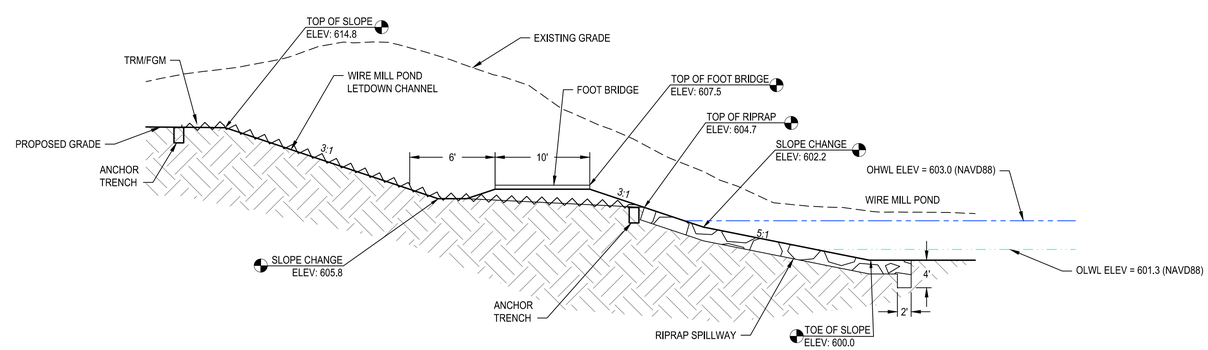
TYPICAL ADA PEDESTRIAN TRAIL AND CULVERT APRON SECTION

SCALE: NO SCALE



SECTION A-A'

SCALE: NO SCALE



SECTION B-B'

SCALE: NO SCALE

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712. MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

PEDESTRIAN TRAIL DETAILS

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

CT-301

SHEET: 75 OF 116

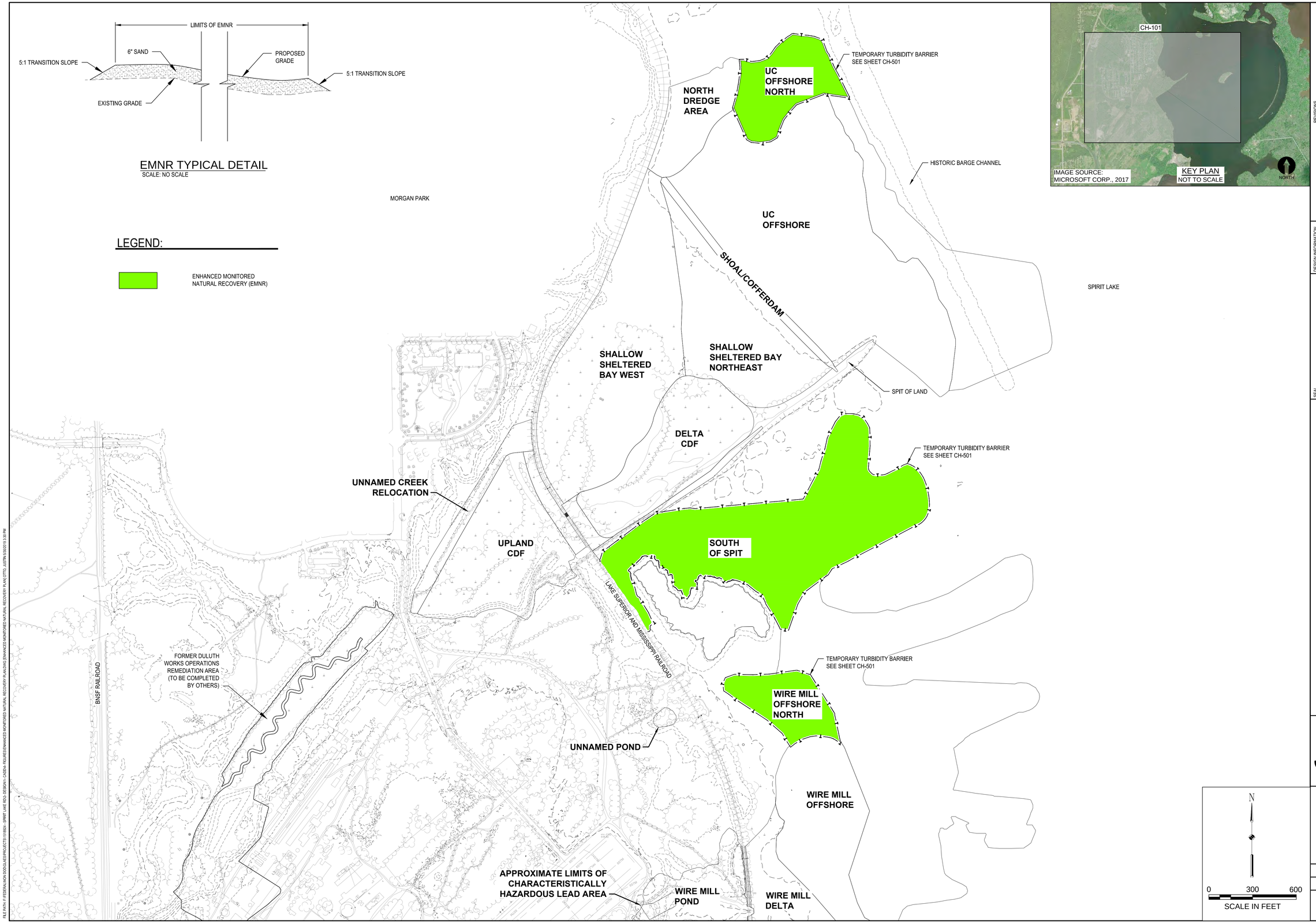
PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: P:\FEDERAL\NON DOD\CLAES\PROJECTS\11180\4 - SPIRIT LAKE REDI\-DESIGN\-CADD\4-FIGURES\PEDESTRIAN TRAIL DETAILS.DWG [PEDESTRIAN TRAIL DETAILS (ATTY). JUSTIN 5/30/2019 3:28 PM

EMNR TYPICAL DETAIL
SCALE: NO SCALE

LEGEND:

ENHANCED MONITORED NATURAL RECOVERY (EMNR)



REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JO
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

ENHANCED MONITORED NATURAL RECOVERY PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019

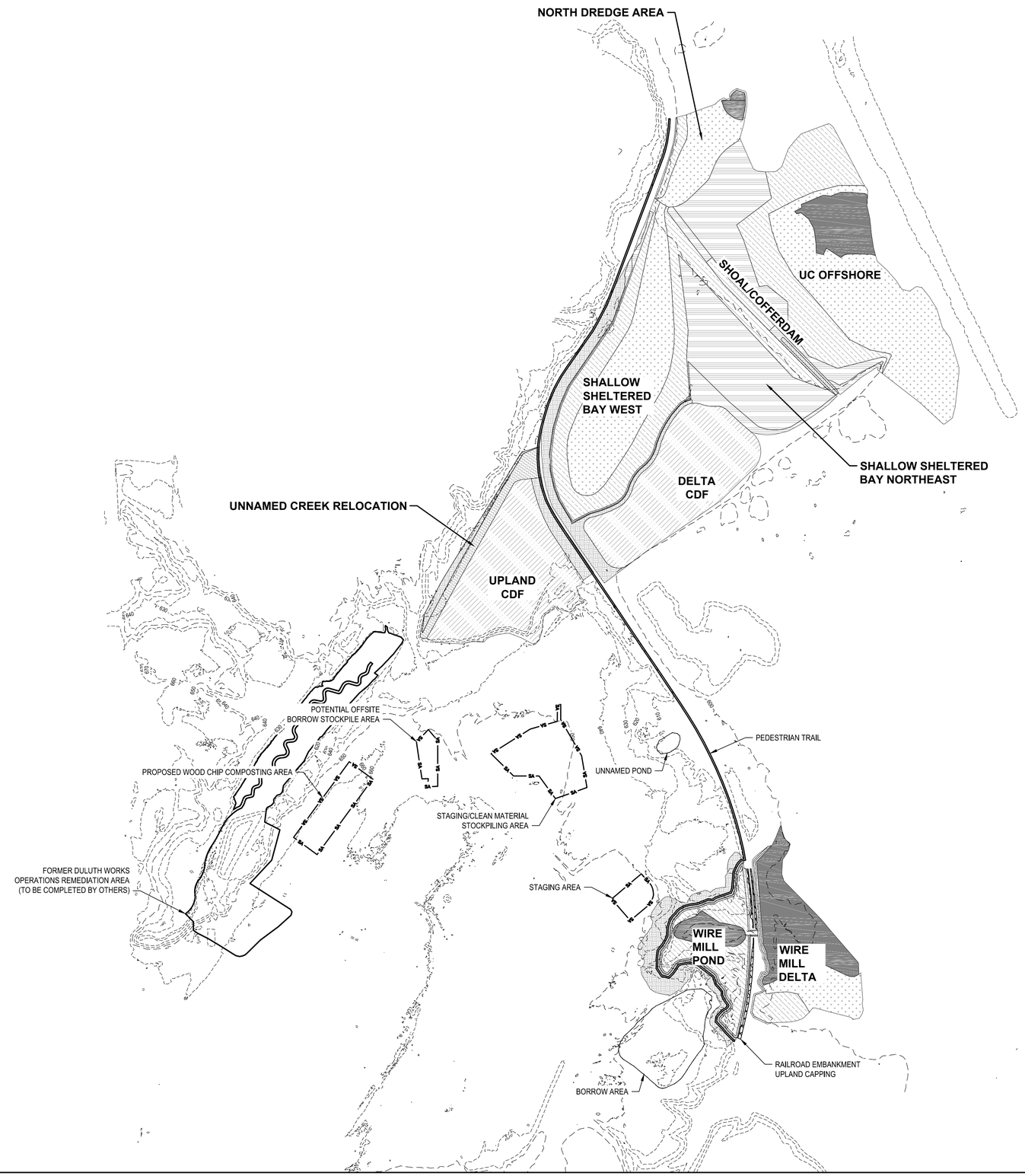
PROJECT NUMBER: 1518924

CE-101

SHEET: 76 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: P:\FEDERAL\NON DOD\GLAS\PROJECTS\151924 - SPIRIT LAKE REDI\2 - DESIGN\1 - CADD\4 - PLANS\ENHANCED MONITORED NATURAL RECOVERY PLAN\ENHANCED MONITORED NATURAL RECOVERY PLAN (JTTS).J43TRN 5/20/2019 3:30 PM



LEGEND:

- ZONE 1 - DEEP WATER - >6' DEPTH
  13.6 ACRES
- ZONE 2 - SUBMERGED AQUATIC VEGETATION - 4'-6' DEPTH
  40.6 ACRES
- ZONE 3 - MIXED VEGETATION - 2'-4' DEPTH
  35.0 ACRES
- ZONE 4 - EMERGENT MARSH - 0'-2' DEPTH
  24.8 ACRES
- ZONE 4A - SHORELINE FRINGE EMERGENT - 0'-0.9' DEPTH
  2.8 ACRES
- ZONE 5 - UPLAND PLANTING FOR CDF
  30.9 ACRES
- ZONE 6 - UPLAND PLANTING
  12.2 ACRES
- ZONE 7 - RIPARIAN ZONE
  2.3 ACRES

NOTE:
DESIGN WATER SURFACE ELEVATION IS 30-YR SUMMER MONTH AVERAGE 602.1 FT NAVD88

N

0 400 800
SCALE IN FEET

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: LAW
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

SITE SEEDING AND HABITAT RESTORATION PLAN

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
(847) 945-8010

DATE: MAY 2019

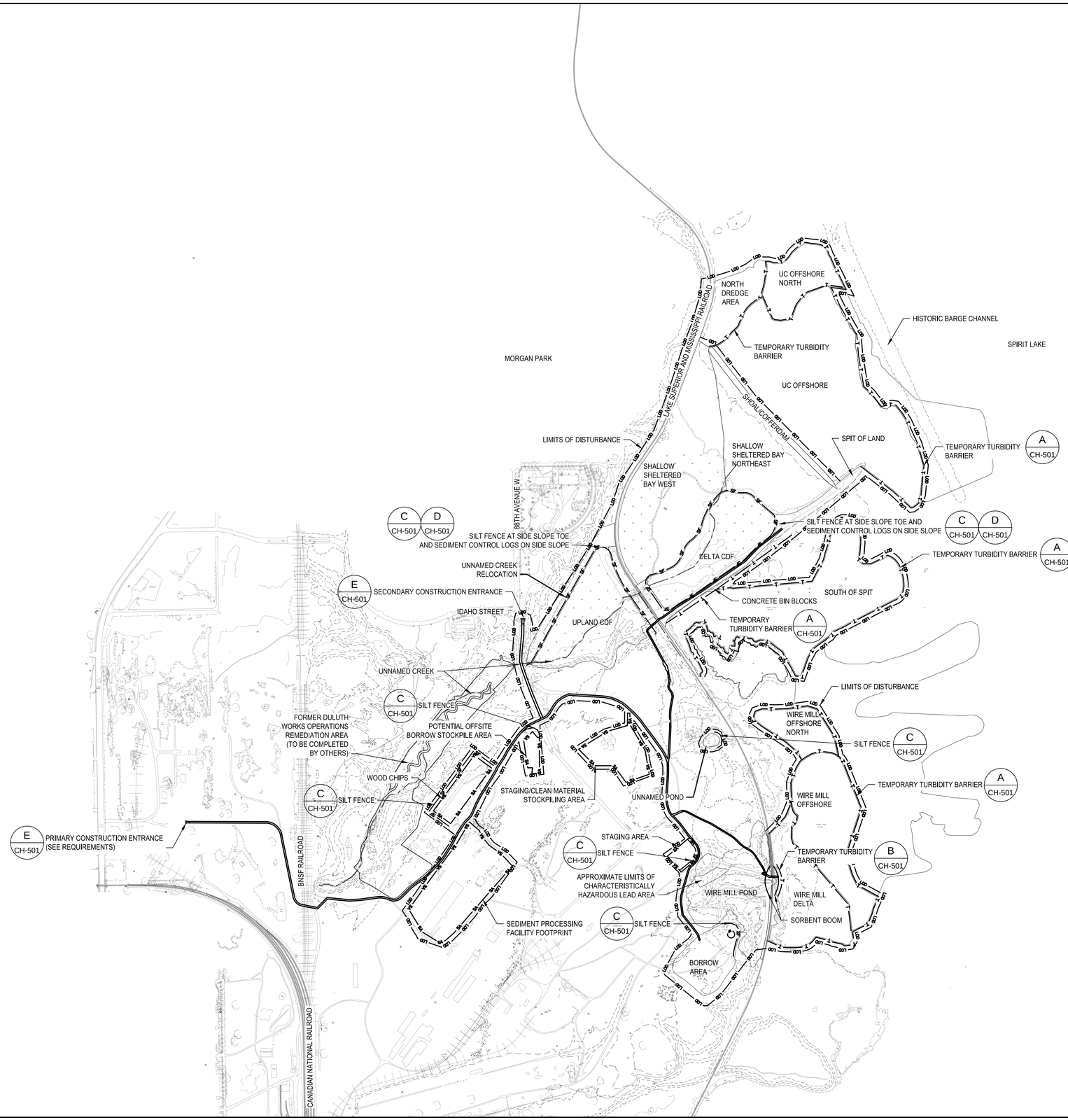
PROJECT NUMBER: 1518924

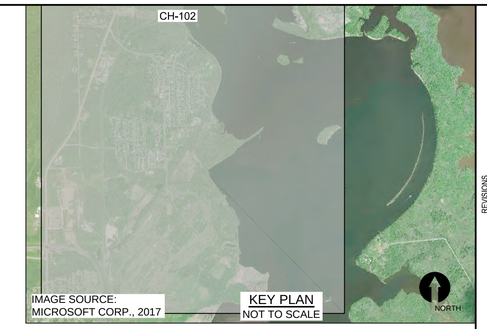
CH-101

SHEET: 77 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DODGOLAE\PROJECTS\1180L4_SPIRIT LAKE RDs\-DESIGN\-CADD\4-PDF\RESTORATION PLAN\DWG\SITE SEEDING AND HABITAT RESTORATION PLAN\CTTO_LASTN 6/20/2019 3:34 PM





NOTES:

1. TURBIDITY BARRIERS SHALL BE PLACED AROUND ALL ACTIVE WORK (DREDGING AND CAPPING AREAS). A TEMPORARY TURBIDITY BARRIER MAY BE USED AT MULTIPLE WORK AREAS.
2. TURBIDITY BARRIER LOCATIONS ON THIS FIGURE ARE APPROXIMATE. SPECIFIC LOCATIONS OF TURBIDITY BARRIERS WILL BE SHOWN ON EARLIER SHEETS.

N

0 500 1000
SCALE IN FEET

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

SEDIMENT AND EROSION CONTROL PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL
847-915-8010

DATE: MAY 2019

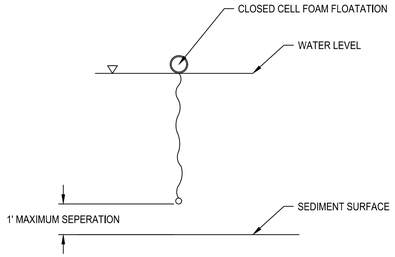
PROJECT NUMBER: 1518924

CH-102

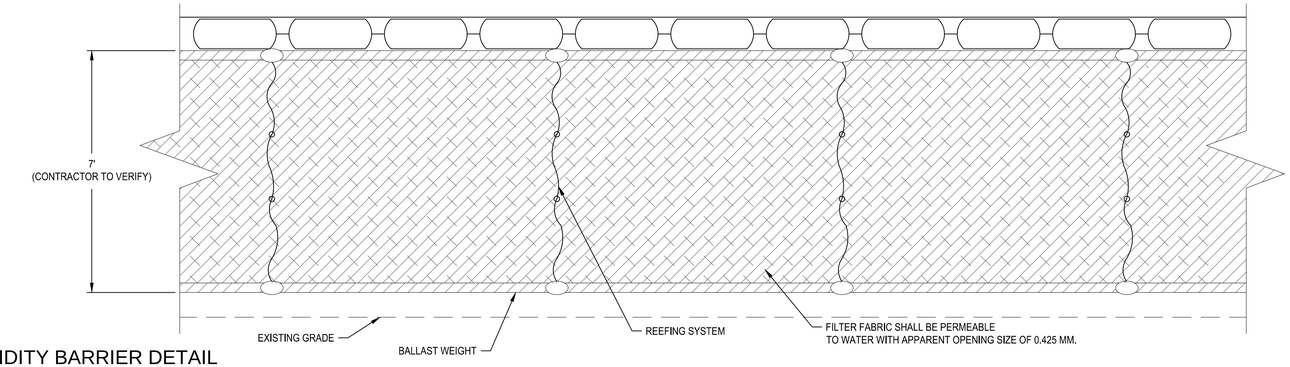
SHEET: 78 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\ALAE\PROJECTS\1518924 - SPIRIT LAKE RDA\-DESIGN\+ CADD\4-PDF\ESDESIGN\SEDIMENT AND EROSION CONTROL PLAN\CH\SEDIMENT AND EROSION CONTROL PLAN (OTTO, JUSTIN) 5/30/2019 3:35 PM

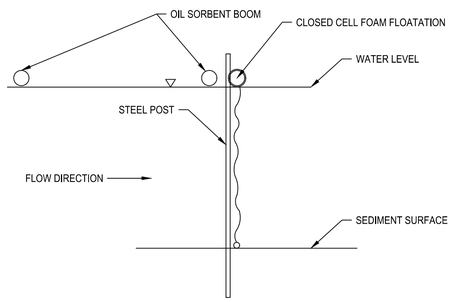


NOTES:
1. THE TOP OF THE TURBIDITY BARRIER SHALL BE A MINIMUM OF 6 INCHES FROM THE WATER SURFACE.
2. THE BOTTOM OF THE TURBIDITY BARRIER SHALL MAINTAIN A MAXIMUM SEPARATION OF 1 FOOT FROM THE SEDIMENT SURFACE AND SHALL NEVER COME IN CONTACT AND CAUSE RE-SUSPENSION.
3. THE FABRIC USED FOR THE FILTER SHALL HAVE A MINIMUM BASE FABRIC WEIGHT OF 7.5 OZ/SQUARE YARD.
4. TURBIDITY BARRIER SHALL HAVE A MINIMUM GROSS BUOYANCY TO WEIGHT RATION OF 4:1.
5. THE MAXIMUM ANCHOR SEPARATION DISTANCE SHALL BE 50 FEET.
6. TURBIDITY BARRIER SHALL BE FULLY ENCLOSED AROUND SEDIMENT TO BE DREDGED UNLESS IT CAN BE ANCHORED TO A SHORELINE.
7. TURBIDITY BARRIER FOR UNNAMED CREEK, SHALLOW SHELTERED BAY, AND WIRE MILL POND SHALL BE FULL-DEPTH BARRIERS UTILIZING PERMEABLE FABRIC AND ANCHORED TO PREVENT BOTTOM DISTURBANCE OF SEDIMENT. CONTRACTOR SHALL SUBMIT A DESIGN FOR THESE AREAS.

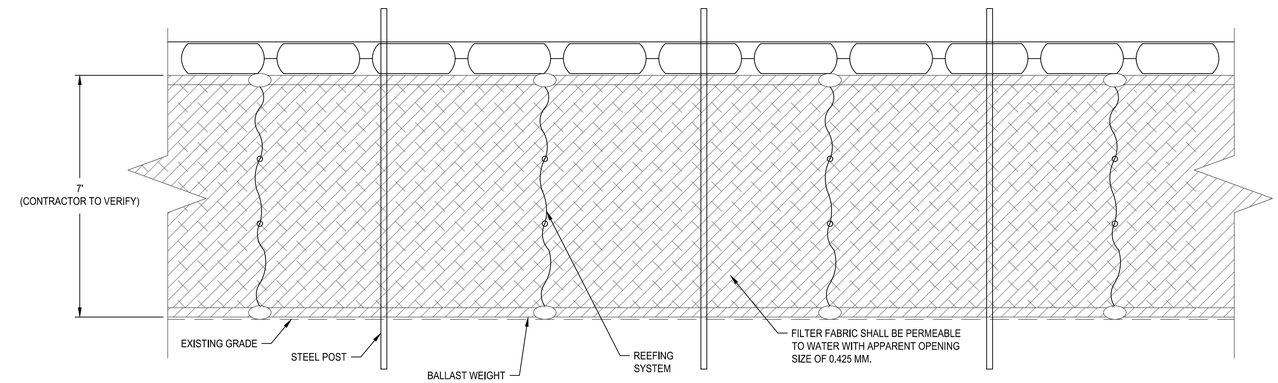


A / CR-101 TUBIDITY BARRIER DETAIL
SCALE: NO SCALE

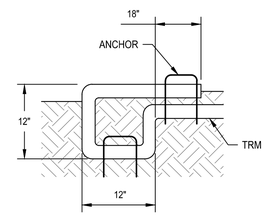
CR-108
CC-102
CC-104
CE-101
CH-102



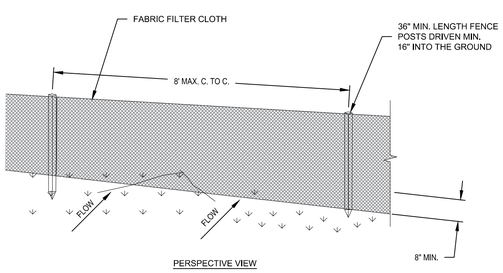
NOTES:
1. THE TOP OF THE TURBIDITY BARRIER SHALL BE A MINIMUM OF 6 INCHES FROM THE WATER SURFACE.
2. THE FABRIC USED FOR THE FILTER SHALL HAVE A MINIMUM BASE FABRIC WEIGHT OF 7.5 OZ/SQUARE YARD.
3. TURBIDITY BARRIER SHALL HAVE A MINIMUM GROSS BUOYANCY TO WEIGHT RATION OF 4:1.
4. THE MAXIMUM ANCHOR SEPARATION DISTANCE SHALL BE 50 FEET.
5. EMBEDDED STEEL POST TO SECURE BARRIER AT WIRE MILL POND.
6. TURBIDITY BARRIER SHALL FULLY CAPTURE ALL WATER MOVING FROM WIRE MILL POND TO SPIRIT LAKE. GENERAL LOCATION OF TURBIDITY BARRIER IS SHOWN ON SHEET 60 FOR INFORMATION PURPOSES ONLY. CONTRACTOR SHALL DESIGN LAYOUT AND ANCHORING OF TURBIDITY BARRIER.

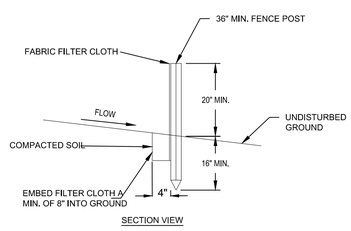


B / CR-103 WIRE MILL POND TURBIDITY BARRIER DETAIL
SCALE: NO SCALE
CH-102



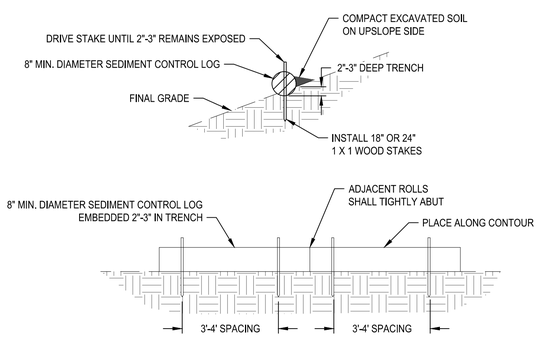
EROSION CONTROL BLANKET/
TURF REINFORCEMENT MAT ANCHOR TYPICAL DETAIL
SCALE: NO SCALE



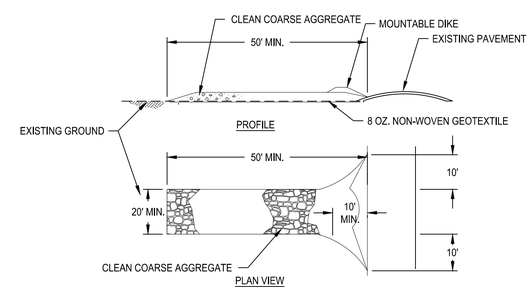


NOTES:
1. FABRIC FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD WITH A MINIMUM CROSS-SECTIONAL AREA OF 3 SQUARE INCHES.
2. FILTER CLOTH TO BE TO BE FASTENED SECURELY WITH SPACED EVERY 24" AT TOP, MID SECTION, AND BOTTOM.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE LAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUIVALENT.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.
6. ANY TORN SILT FENCE CLOTH SECTIONS SHALL BE REPLACED BY THE CONTRACTOR IMMEDIATELY.

C / CH-102 SILT FENCE DETAIL
SCALE: NO SCALE
CU-301



D / CD-503 SEDIMENT CONTROL LOG DETAIL
SCALE: NO SCALE



E / CA-101 STABILIZED CONSTRUCTION ENTRANCE
SCALE: NO SCALE
CA-102

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: CNS
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 49712. MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
ST. LOUIS RIVER AREA OF CONCERN
SPIRIT LAKE ESTUARY SITE
DULUTH, MINNESOTA

SEDIMENT AND EROSION CONTROL DETAILS

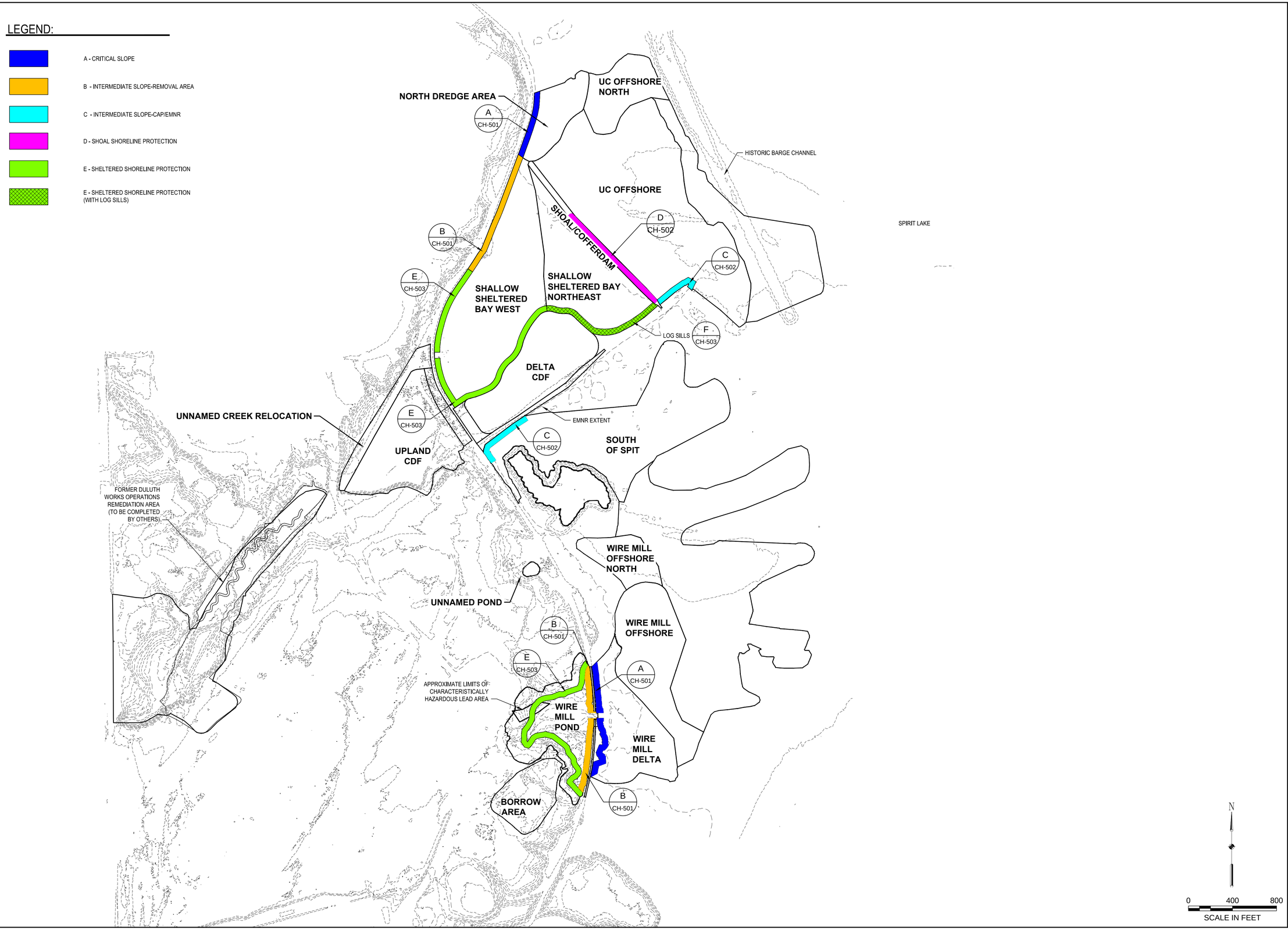
PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
221 Sun Valley Boulevard; Suite D
Lincoln, NE 68528
(402) 476-3766

DATE: MAY 2019
PROJECT NUMBER: 1518924
CH-501
SHEET: 79 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON-DOD\ALJ\EPS\PROJECTS\1518924 - SPIRIT LAKE RDC-DESIGN\1 - CADD\4 FIGURES\SEDIMENT AND EROSION CONTROL DETAILS.DWG [SEDIMENT AND EROSION CONTROL DETAILS] STTD: JJSTIN 5/20/2019 3:30 PM



REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

SHORELINE STABILIZATION DETAILS (1 OF 3)

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

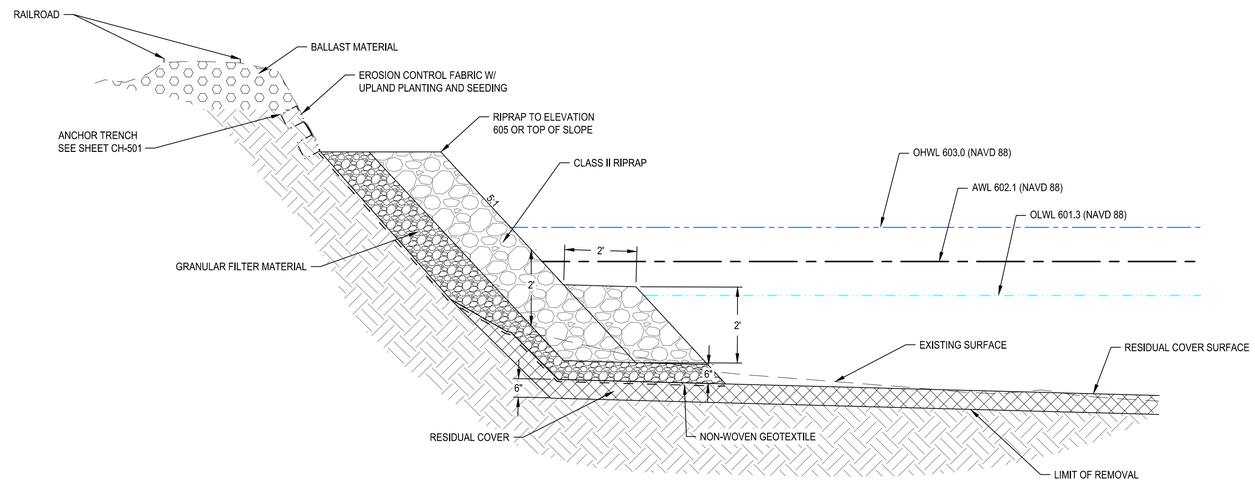
CH-501

SHEET: 80 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

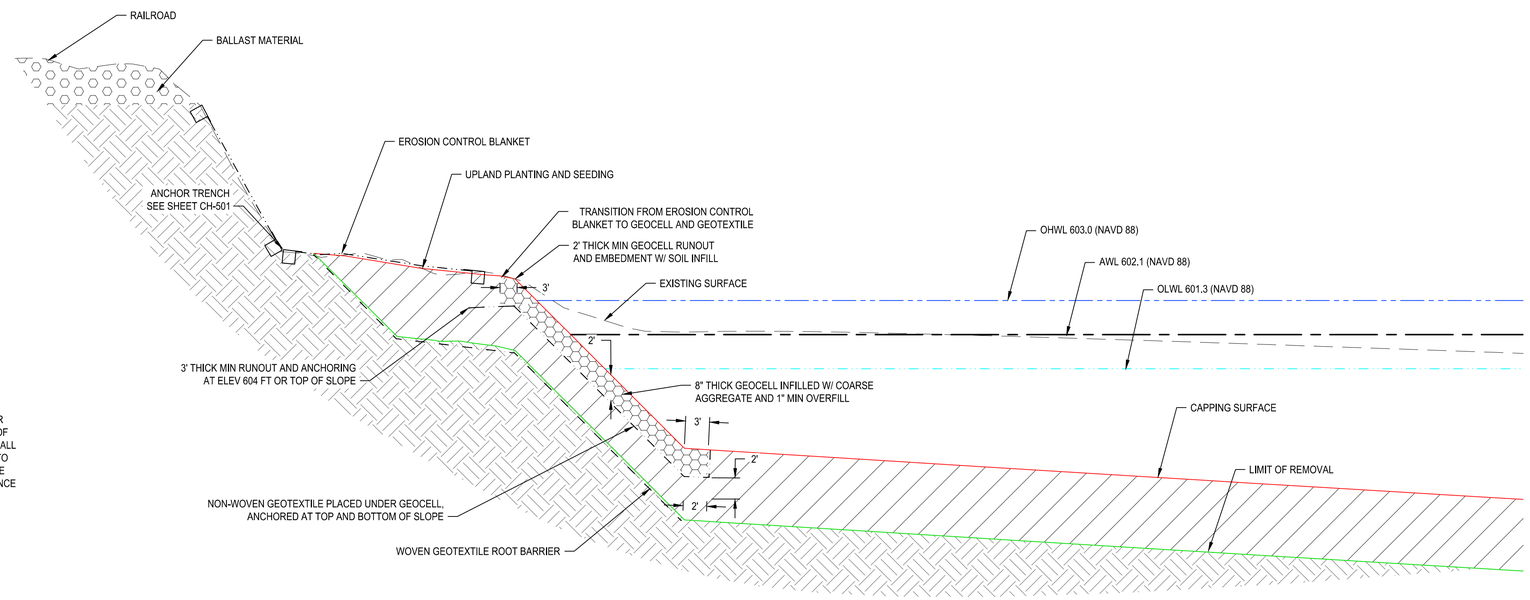
FILE PATH: P:\FEDERAL\NON DOD\CLAIMS\PROJECTS\1518924 - SPIRIT LAKE RDA\-DESIGN\-CADD\4-FIGURES\SHORELINE STABILIZATION\STABILIZATION PLAN VIEW\UTTD_LISTIN 5/30/2019 3:28 PM

NOTES:
1. PLACE RIPRAP FROM THE BASE OF THE SLOPE TO ELEVATION 605FT OR ON TOP OF THE SLOPE.
2. PLACE RESIDUAL COVER PRIOR TO SHORELINE PROTECTION INSTALLATION.
3. CRITICAL SLOPES ARE SUBJECT TO WAVE, WIND, AND ICE EROSION.



A CH-103 CRITICAL SLOPE TYPICAL DETAIL
SCALE:NO SCALE

NOTES:
1. GEOCELL, PRESTO GW30V CELL 8" OR EQUIVALENT, SHALL BE ANCHORED TO MANUFACTURED RECOMMENDATIONS.
2. GEOCELL ANCHORING METHOD SHALL BE APPROVED BY MANUFACTURER PRIOR TO PLACEMENT.
3. GEOCELL SHALL BE INCORPORATED INTO THE TOTAL CAP/COVER THICKNESS.
4. FOR ALL GEOSYNTHETICS PLACED BELLOW WATER, CONTRACTOR SHALL UTILIZE CONSTRUCTION AIDS TO FULLY COVER SURFACE OF SLOPES AND LAKE BED AND REMOVE BILLOWS. CONTRACTOR SHALL INCORPORATE A STITCHED LOOP OR EQUIVALENT ATTACHMENT TO REBAR OR STEEL PIPE TO SPREAD THE GEOSYNTHETICS, AND USE SAND BAGS TO TEMPORARILY WEIGH DOWN GEOSYNTHETICS. ONCE PLACED CONTRACTOR SHALL REMOVE CONSTRUCTION AIDS.



B CH-103 INTERMEDIATE SLOPE STABILIZATION TYPICAL DETAIL - REMOVAL AREA
SCALE:NO SCALE

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JO
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712 MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

SHORELINE STABILIZATION DETAILS (1 OF 3)

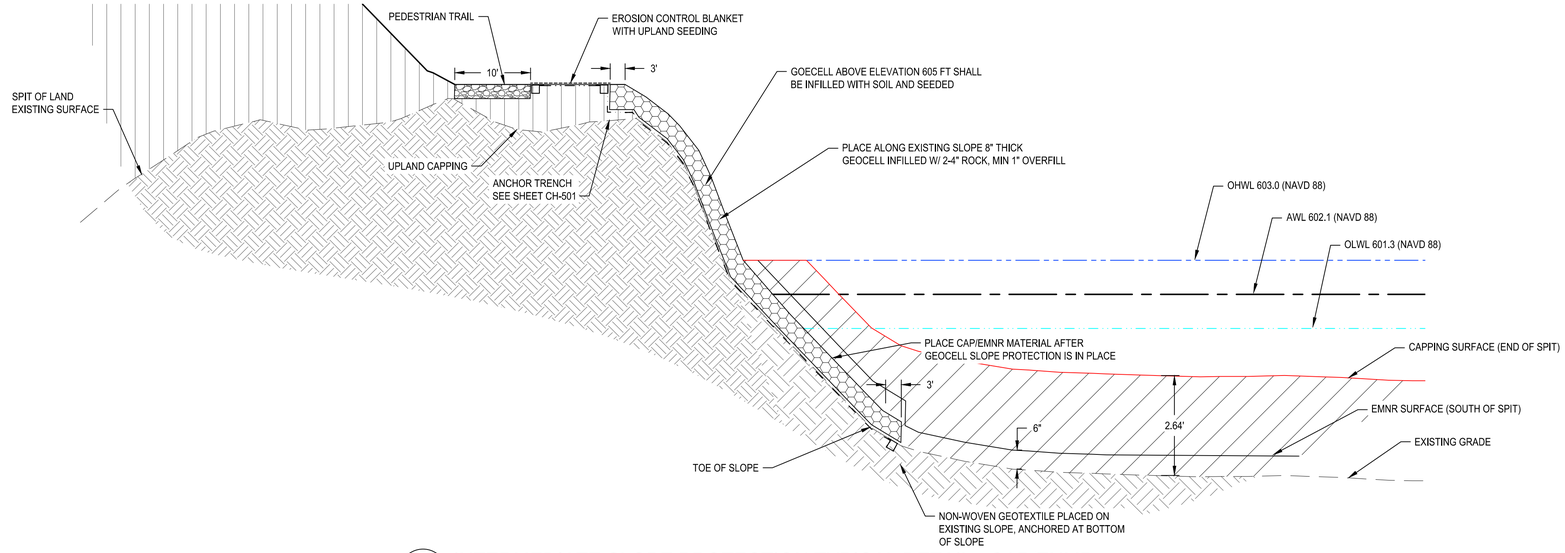
PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924
CH-501
SHEET: 81 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON-DOD\ALJES\PROJECTS\1518924 - SPIRIT LAKE REDI - DESIGN\1 - CADD\4 FIGURES\SHORELINE STABILIZATION\DETAILS (1 OF 3).DWG [SHORELINE STABILIZATION\DETAILS (1 OF 3)] OTTO, JUSTIN 5/30/2019 3:36 PM

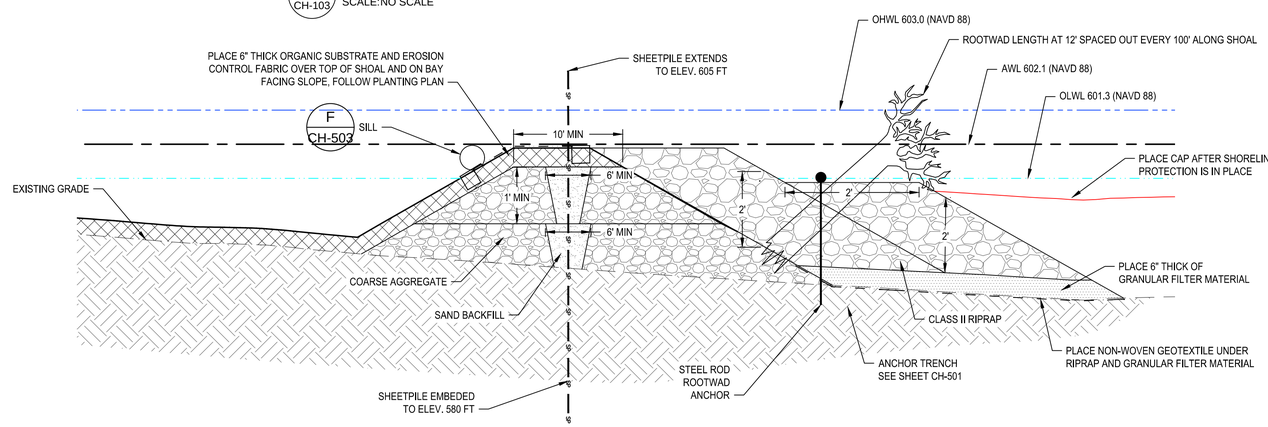


NOTES;

1. PREPARE EXISTING SLOPE AND PLACE NON-WOVEN GEOTEXTILE AND GEOCELL ACCORDING TO MANUFACTURER.
2. ANCHOR ACCORDING TO MANUFACTURER RECOMMENDATIONS.
4. FOR ALL GEOSYNTHETICS PLACED BELLOW WATER, CONTRACTOR SHALL UTILIZE CONSTRUCTION AIDS TO FULLY COVER SURFACE OF SLOPES AND LAKE BED AND REMOVE BILLOWS. CONTRACTOR SHALL INCORPORATE A STITCHED LOOP OR EQUIVALENT ATTACHMENT TO REBAR OR STEEL PIPE TO SPREAD THE GEOSYNTHETICS, AND USE SAND BAGS TO TEMPORARILY WEIGH DOWN GEOSYNTHETICS. ONCE PLACED CONTRACTOR SHALL REMOVE CONSTRUCTION AIDS.

C / CH-103 INTERMEDIATE SLOPE PROTECTION TYPICAL DETAIL - CAP/ENMR

SCALE:NO SCALE



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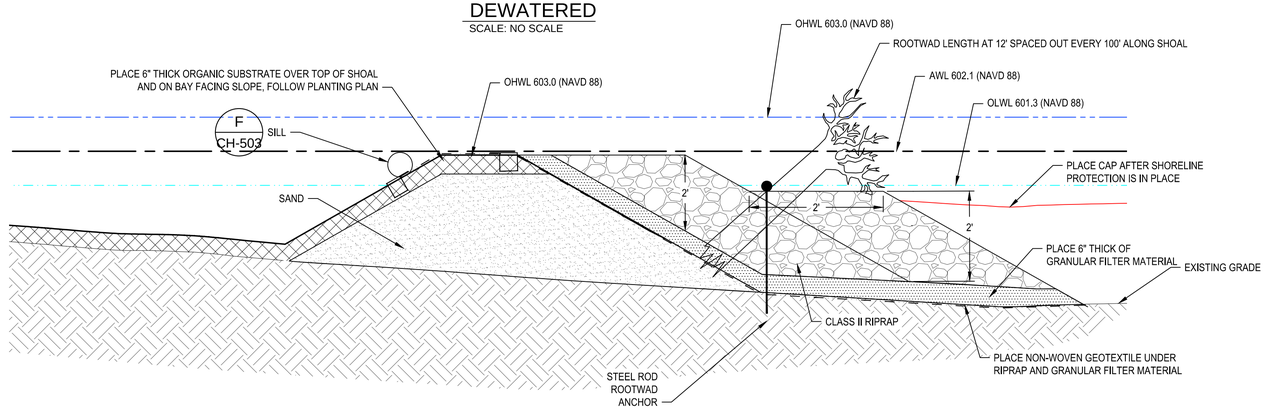


SUBMERGED

SCALE: NO SCALE

NOTES:

1. INSTALL SILL AT AVERAGE WATER DEPTH OR THE EXISTING WATER HEIGHT DURING CONSTRUCTION ACTIVITIES.
2. INSTALL EROSION CONTROL BLANKET AT SILL.
3. SILL OPTION SHALL BE DEPENDENT ON AVAILABLE MATERIALS.

D / CH-103 SHOAL SHORELINE PROTECTION TYPICAL DETAIL

SCALE:NO SCALE

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: LLR
DRAWN BY: JO
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

SHORELINE STABILIZATION DETAILS (2 OF 3)

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

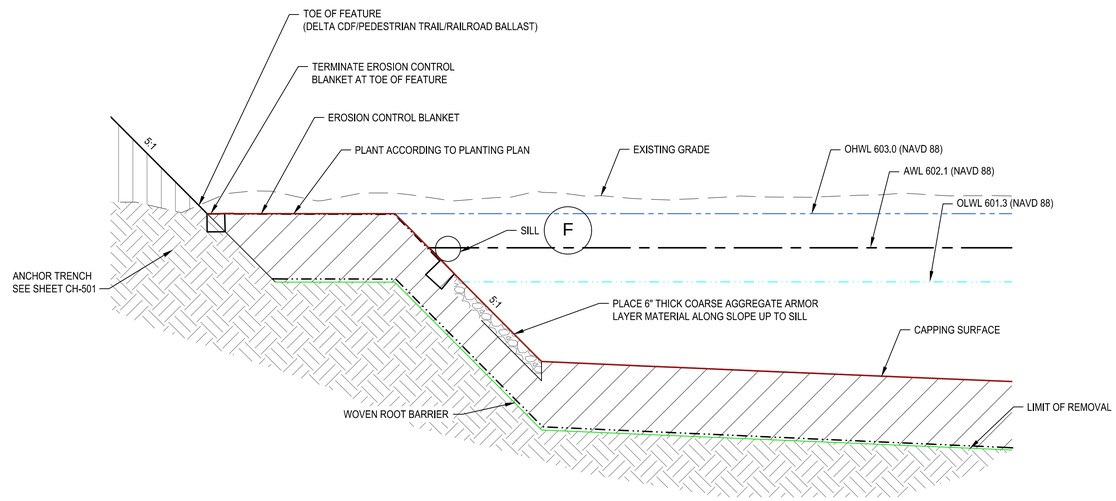
PROJECT NUMBER: 1518924

CH-502

SHEET: 82 OF 116

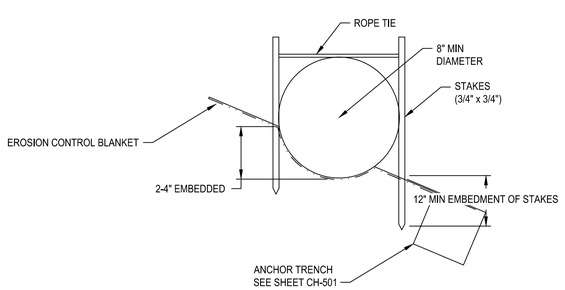
PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: P:\FEDERAL\NON DOD\GLAES\PROJECTS\1518924 - SPIRIT LAKE RDC\- DESIGN\ - CADD\+ FIG\RES\SHORELINE STABILIZATION DETAILS 3 OF 3.DWG [SHORELINE STABILIZATION DETAILS 2 OF 3] OPTS: JJSTIN 05/20/19 3:36 PM



NOTES:
1. INSTALL SILL AT AVERAGE WATER LEVEL OR THE EXISTING WATER HEIGHT DURING CONSTRUCTION ACTIVITIES (IF LOWER).

E / CH-103 SHELTERED SHORELINE PROTECTION TYPICAL DETAIL
SCALE:NO SCALE



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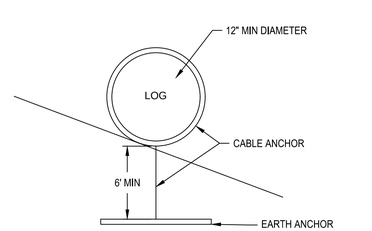

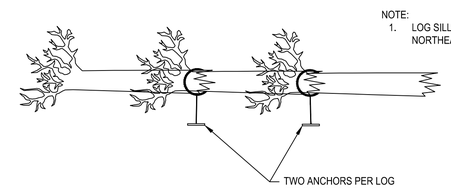

NOTE:
1. LOG SILLS WILL BE USED ALONG SHALLOW SHELTER BAY NORTHEAST SHORELINES ONLY AS SHOWN ON CH-102.

CONNECTED LOGS

F / CH-103 SILL DETAILS
SCALE:NO SCALE

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JAO
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48712, MAY 2019. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

SHORELINE STABILIZATION DETAILS (3 OF 3)

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019
PROJECT NUMBER: 1518924
CH-503
SHEET: 83 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: P:\FEDERAL\AOC\DOUGLAS\PROJECTS\1518924 - SPIRIT LAKE EDA - DESIGN\1 - CADD\4 - FIGURES\SHORELINE STABILIZATION\DETAILS\1 OF 3\DWG [SHORELINE STABILIZATION DETAILS 1 OF 3] (JTTO, JUSTIN) 6/20/2019 3:28 PM

OVERBURDEN ABOVE THE HAZARDOUS LEAD AREA WILL BE REMOVED AND STOCKPILED IN THE STAGING AREA

STAGING AREA

LIMITS OF CHARACTERISTICALLY HAZARDOUS LEAD SEDIMENT AREA. CHARACTERISTICALLY HAZARDOUS LEAD SHALL BE RENDERED NON-HAZARDOUS IN-SITU, LOADED DIRECTLY INTO LINED HAUL TRUCKS, AND DISPOSED OFFSITE BEFORE WIRE MILL POND EXCAVATION AND DREDGING COMMENCES

HAZARDOUS LEAD EXCAVATION SHALL BE COMPLETED USING BEST MANAGEMENT BENCHING TECHNIQUES AND GRADING AS SHOWN

1 CL-301

2 CL-302

3 CL-303

4 CL-304

WIRE MILL POND

BORROW AREA

LAKE SUPERIOR AND MISSISSIPPI RAILROAD

SPIRIT LAKE

WIRE MILL DELTA

IMAGE SOURCE: MICROSOFT CORP., 2017

CL-101

KEY PLAN
NOT TO SCALE

NORTH

N

0 50 100
SCALE IN FEET

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

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REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

WIRE MILL POND CHARACTERISTICALLY HAZARDOUS LEAD AREA PLAN

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

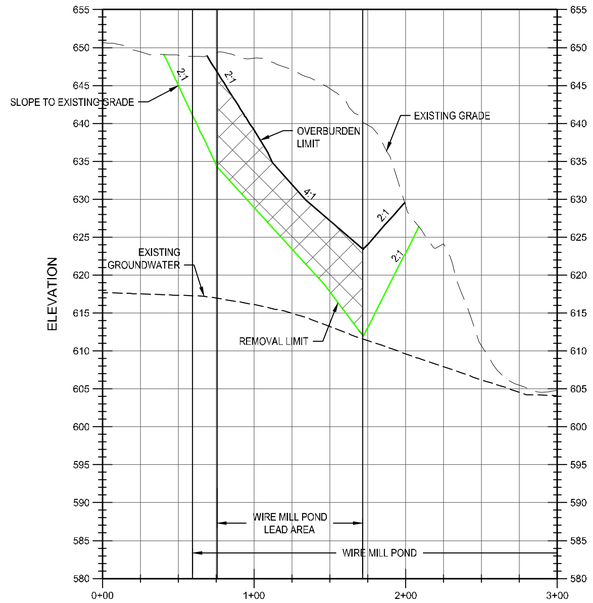
PROJECT NUMBER: 1518924

CL-101

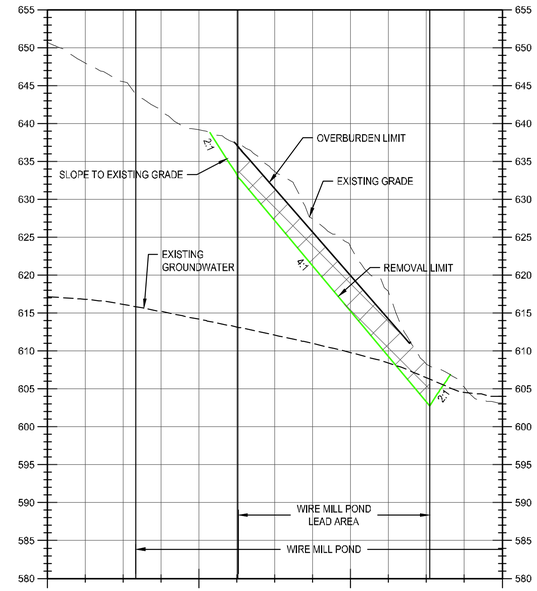
SHEET: 84 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\NON DOD\ALASKA\PROJECTS\151924 - SPIRIT LAKE ISD\2 - DESIGN\1 - CAD\4 FIGURES\IMP CHARACTERISTICALLY HAZARDOUS LEAD AREA LETTA\5 DWG\WIRE MILL POND CHARACTERISTICALLY HAZARDOUS LEAD AREA PLAN\AUTHOR: JASON 5/30/2019 9:33 PM



1 CL-101 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



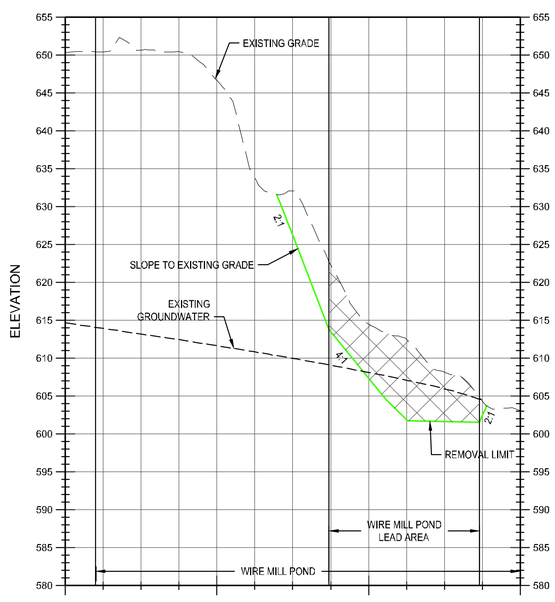
2 CL-101 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'

LEGEND

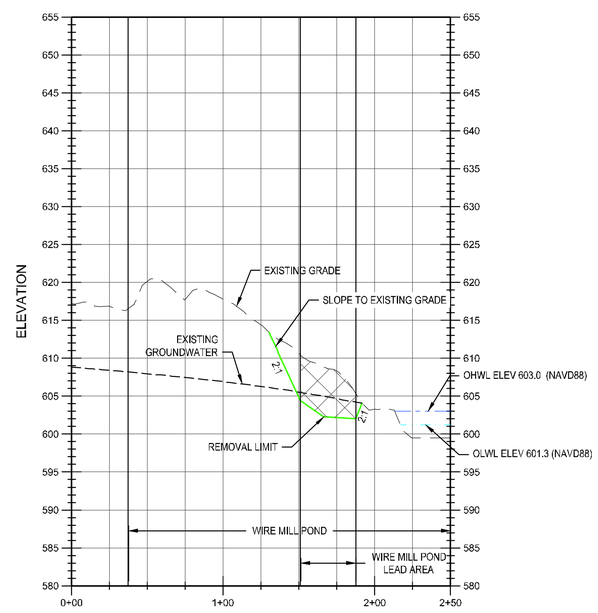
CHARACTERISTICALLY HAZARDOUS LEAD MATERIAL

NOTES:

1. CHARACTERISTICALLY HAZARDOUS LEAD MATERIAL SHALL BE RENDERED NON-HAZARDOUS IN-SITU, LOADED DIRECTLY INTO LINED HAUL TRUCKS, AND DISPOSED OFFSITE. SEE THE TECHNICAL SPECIFICATIONS FOR DETAILS AND REQUIREMENTS.
2. GROUNDWATER ELEVATIONS ARE APPROXIMATE BASED ON MODELING, AND MAY VARY FROM WHAT IS DEPICTED.



3 CL-101 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'



4 CL-101 SECTION
HORIZ. SCALE: 1" = 50'
VERT. SCALE: 1" = 10'

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: LLR
DRAWN BY: JRM
CHECKED BY: JMT
PROJECT MANAGER: JB

SEAL

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JAMES BEAVER P.E. 48772. IT WAS NOT INTENDED OR REPRODUCED FOR CONSTRUCTION OR BIDDING.

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

WMP CHARACTERISTICALLY HAZARDOUS LEAD AREA DETAILS

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

DATE: MAY 2019

PROJECT NUMBER: 1518924

CL-301

SHEET: 85 OF 116

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH: F:\FEDERAL\MN DOT\GALLERY\PROJECTS\1518924 - SPIRIT LAKE EDA - DESIGN\-CADD-4 FIGURES\WMP CHARACTERISTICALLY HAZARDOUS LEAD AREA DETAILS-2D\WMP CHARACTERISTICALLY HAZARDOUS LEAD AREA DETAILS.DWG, JASON.WOODSTRA 3:33 PM

GENERAL NOTES

DESIGN LOADING

ALL COMPONENTS ARE DESIGNED IN ACCORDANCE WITH THE 2017 AREMA MANUAL FOR RAILWAY ENGINEERING, CHAPTER 8-CONCRETE STRUCTURES AND FOUNDATIONS.

LIVE LOAD:	E40 w/ DIESEL IMPACT
DESIGN SPEED:	10 MPH
MINIMUM BALLAST:	15 INCHES
MAXIMUM BALLAST:	24 INCHES
MAXIMUM TRACK ECCENTRICITY:	6 INCHES (FROM ℄ BRIDGE TO ℄ TRACK)

REFERENCE DATA

ALL DETAILS AND DIMENSIONS OF THE EXISTING SITE ARE BASED ON FIELD SURVEY DATA SUPPLIED BY LHB CORPORATION ON JUNE 15, 2016 WITH SUPPLEMENTARY DATA SUPPLIED ON JUNE 12, 2018.

BRIDGE STATIONING IS BASED ON THE INSIDE FACE OF THE NORTH EXISTING BACKWALL OF THE EXISTING WIRE MILL POND BRIDGE AS STATION 204+78.00.

BENCHMARK DATA:	SURVEY CONTROL POINT (HV-1302), STA 165+96.52, OFFSET 276.76' RIGHT, ELEV 651.21'.
VERTICAL DATUM:	NAVD88
HORIZONTAL DATUM:	NAD83/96 MINNESOTA NORTH ZONE

HYDRAULIC INFORMATION IS BASED ON HYDRAULIC MODELING INFORMATION PROVIDED BY EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. DATED JANUARY 24, 2019 AND FEMA FIRM PANEL NO. 2704210045C.

GEOTECHNICAL INFORMATION IS BASED ON HDR ENGINEERING, INC. GEOTECHNICAL REPORT DATED MAY 2019.

BRIDGE STATIONING AND RIGHT-OF-WAY ARE BASED ON HISTORICAL NORTHERN PACIFIC RAILWAY (N.P. RY.) TRACK CHARTS.

GENERAL

IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE ACTUAL FIELD CONDITIONS AND ANY NECESSARY AS-BUILT DIMENSIONS AFFECTING THE SATISFACTORY COMPLETION OF THE WORK REQUIRED FOR THIS PROJECT.

NEW CONSTRUCTION SHOWN AS HEAVY LINES. EXISTING STRUCTURES TO REMAIN SHOWN AS LIGHT LINES. EXISTING STRUCTURES TO BE REMOVED SHOWN AS LIGHT DOTTED LINES.

CONTRACTOR IS RESPONSIBLE FOR DEWATERING TO FACILITATE CONSTRUCTION WHEN REQUIRED TO SATISFACTORILY COMPLETE THE WORK REQUIRED FOR THIS PROJECT.

IN ORDER TO ENSURE THE HYDRAULIC CAPACITY OF THE BRIDGE, THE FINISHED GROUND UNDER THE BRIDGE SHALL BE SHAPED TO MATCH THE UPSTREAM CHANNEL AND FLOODPLAIN AS SHOWN ON DRAWING BU-101.

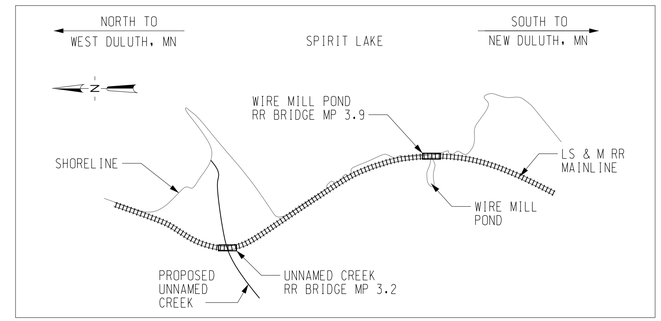
CONTRACTOR SHALL DOCUMENT ALL WORK IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS INCLUDING SUPPLYING: AS-BUILT DRAWINGS, PILE DRIVING RECORDS, AND SHOP DRAWINGS FOR ALL PREFABRICATED COMPONENTS. ALL SHOP DRAWINGS SHALL BE APPROVED BY THE ENGINEER PRIOR TO FABRICATION PER THE PROJECT SPECIFICATIONS.

CONTRACTOR SHALL DISPOSE OF ALL WASTE MATERIALS IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS INCLUDING BUT NOT LIMITED TO EXISTING TIMBER STRUCTURES, SOILS, AND DEFICIENT TRACK MATERIALS.

THE L.S.&M. RAILROAD IS AN HISTORIC RAILROAD. CONTRACTOR SHALL TAKE EXTREME CARE TO PRESERVE THE HISTORIC NATURE OF THE SITE AND RESTORE ANY DISTURBED AREAS TO PRE-CONSTRUCTION CONDITIONS.

TRACK MATERIALS INCLUDING TIES, RAIL, TIE PLATES, SPIKES, ETC. SHALL BE REUSED DURING TRACK RESURFACING TO PRESERVE THE HISTORIC NATURE OF THE RAILROAD. COMPONENTS SHALL BE INSPECTED FOR DEFECTS PRIOR TO PLACING BACK INTO SERVICE TO ENSURE SAFE OPERATION OF TRAINS. DEFECTIVE COMPONENTS MAY BE REPLACED WITH NEW MATERIAL OF A TYPE THAT CLOSELY MATCHES THE EXISTING COMPONENTS.

INFORMATION SHOWN ON THESE PLANS CONCERNING TYPE AND LOCATION OF EXISTING UNDERGROUND AND OVERHEAD UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR SHALL VERIFY THE LOCATION OF UNDERGROUND AND OVERHEAD UTILITIES BEFORE BEGINNING CONSTRUCTION.



VICINITY MAP

0 500 1000 2000 3000

SCALE IN FEET

BID ITEMS ~ UNNAMED CREEK RR BR 3.2

ITEM NO.	ITEM DESCRIPTION	QTY.	UNIT
1	FURNISH AND DRIVE PILE*	924	LF
2	FABRICATE AND INSTALL BRIDGE**	1	LS

*INCLUDES COAL TAR EPOXY COATING AS SPECIFIED ON SHEET BU-102.

**INCLUDES ALL COMPONENTS OF BRIDGE SHOWN ON THESE PLANS EXCEPT PILING.

LIST OF DRAWINGS ~ UNNAMED CREEK RR BR 3.2

DRAWING NUMBER	SHT. NO.	TITLE
BU-001	86	GENERAL NOTES AND ESTIMATED QUANTITIES
BU-101	87	GENERAL LAYOUT AND TYPICAL SECTIONS
BU-102	88	PILE PLAN AND DETAILS
BU-501	89	PRESTRESSED CONCRETE SLAB BEAM DETAILS (SHEET 1 OF 2)
BU-502	90	PRESTRESSED CONCRETE SLAB BEAM DETAILS (SHEET 2 OF 2)
BU-503	91	WALK AND DECK PLAN AND HANDRAIL DETAILS
STANDARD RR BRIDGE COMPONENTS AND DETAILS		
BG-501	98	PRECAST CONCRETE BENT CAP DETAILS AND NOTES
BG-502	99	PRECAST CONCRETE END BENT CAP DETAILS
BG-503	100	WALKWAY AND HANDRAIL DETAILS
BG-504	101	STEEL DETAILS
BG-505	102	MISCELLANEOUS DETAILS

NO.	DATE	BY	REVISIONS DESCRIPTION

SEAL

DESIGN INFORMATION
DESIGNED BY: CLB
DRAWN BY: RLW
CHECKED BY: AGH
PROJECT MANAGER: DLM

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UNNAMED CREEK RR BRIDGE
GENERAL NOTES AND ESTIMATED QUANTITIES

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

HDR ENGINEERING, INC.
700 SW HIGGINS AVE., SUITE 200
MISSOULA, MT 59803-1489

DATE: MAY 2019

PROJECT NUMBER:

BU-001

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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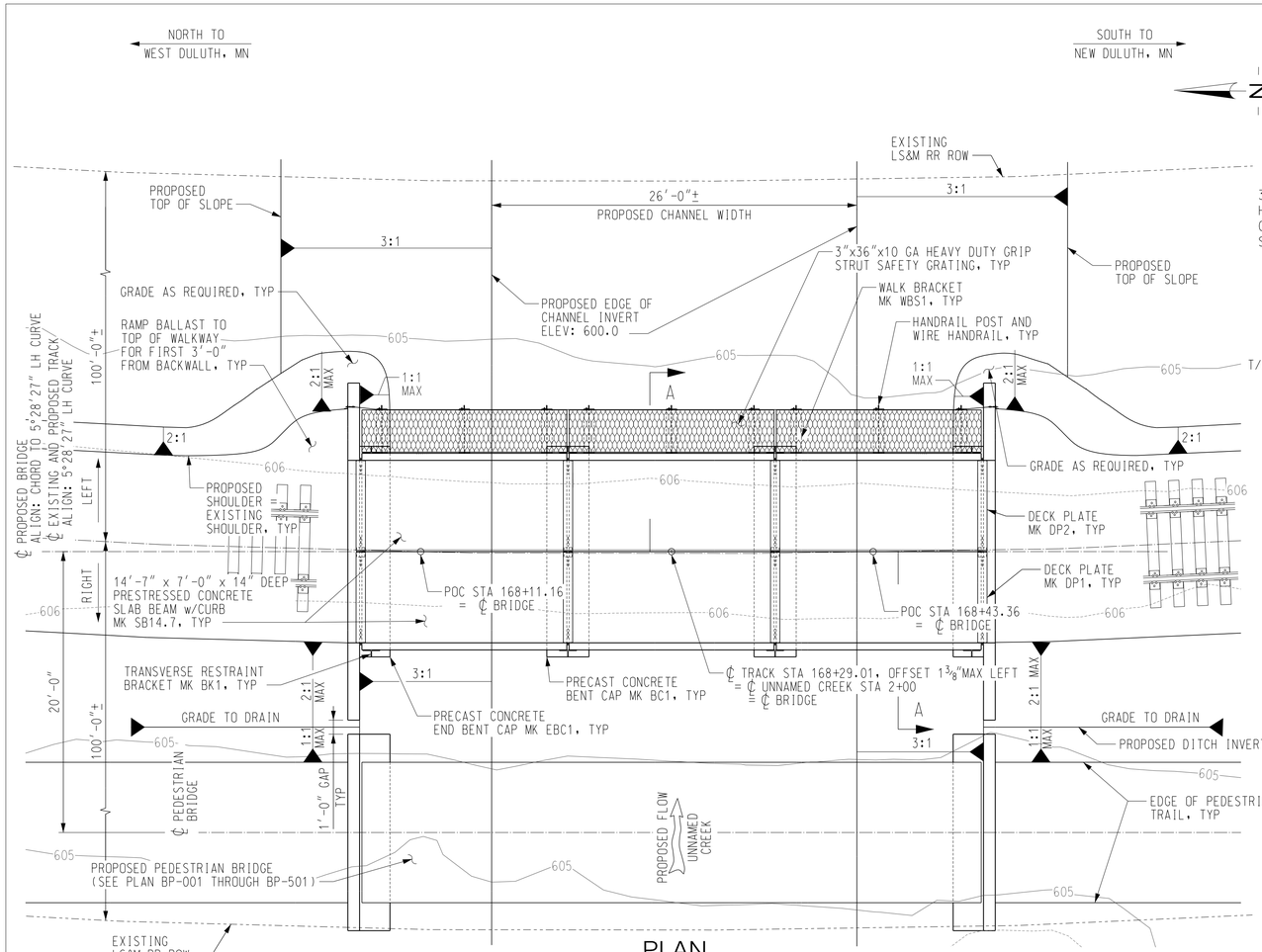
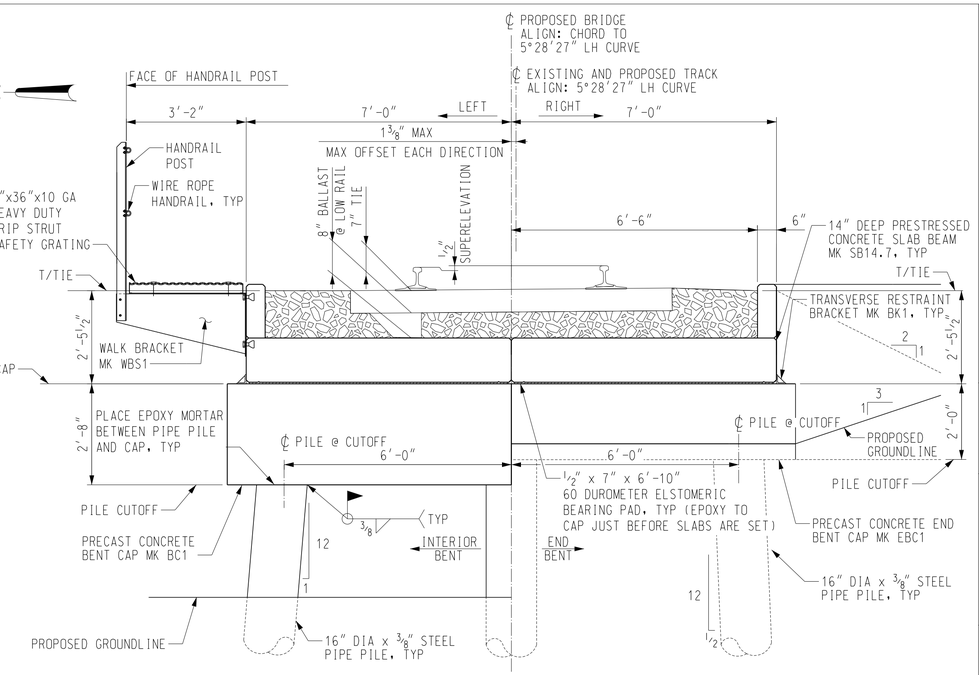


PLAN

SCALE: 3/16" = 1'-0"

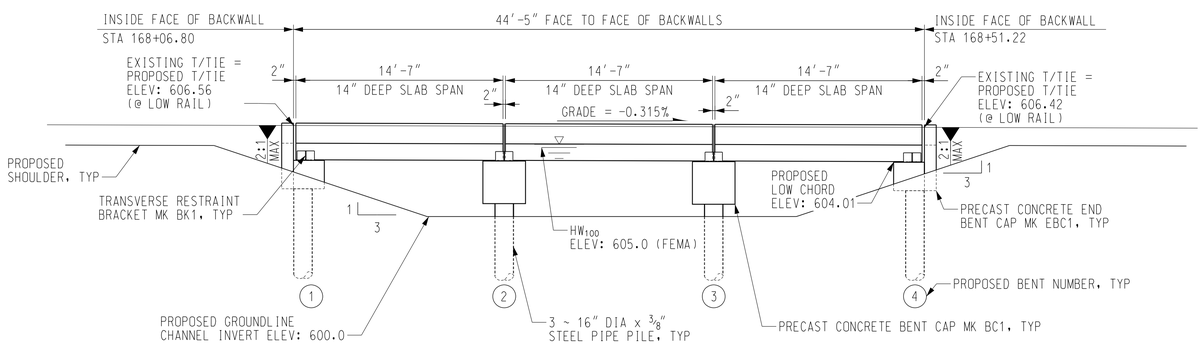


HALF SECTION THRU INTERIOR BENT

SECTION A–A

SCALE: 1/2" = 1'-0"

HALF SECTION THRU END BENT



ELEVATION

SCALE: 3/16" = 1'-0"
WALKWAY AND HANDRAIL NOT SHOWN FOR CLARITY

TABLE OF ELEVATIONS ~ UNNAMED CREEK RR BR 3.2

LOCATION	END BENT 1	BENT 2	BENT 3	END BENT 4
PROPOSED TOP OF TIE (@ LOW RAIL)	606.56	606.51	606.47	606.42
TOP OF CAP	604.10	604.05	604.01	603.97
PILE CUTOFF	602.10	601.39	601.34	601.97
TOP OF TIE TO PILE CUTOFF	4'-5 1/2"	5'-1 1/2"	5'-1 1/2"	4'-5 1/2"

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: CLB
DRAWN BY: RLW
CHECKED BY: AGH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UNNAMED CREEK RR BRIDGE
GENERAL LAYOUT AND TYPICAL SECTIONS

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

HDR ENGINEERING, INC.
700 SW HIGGINS AVE., SUITE 200
MISSOULA, MT 59803-1489

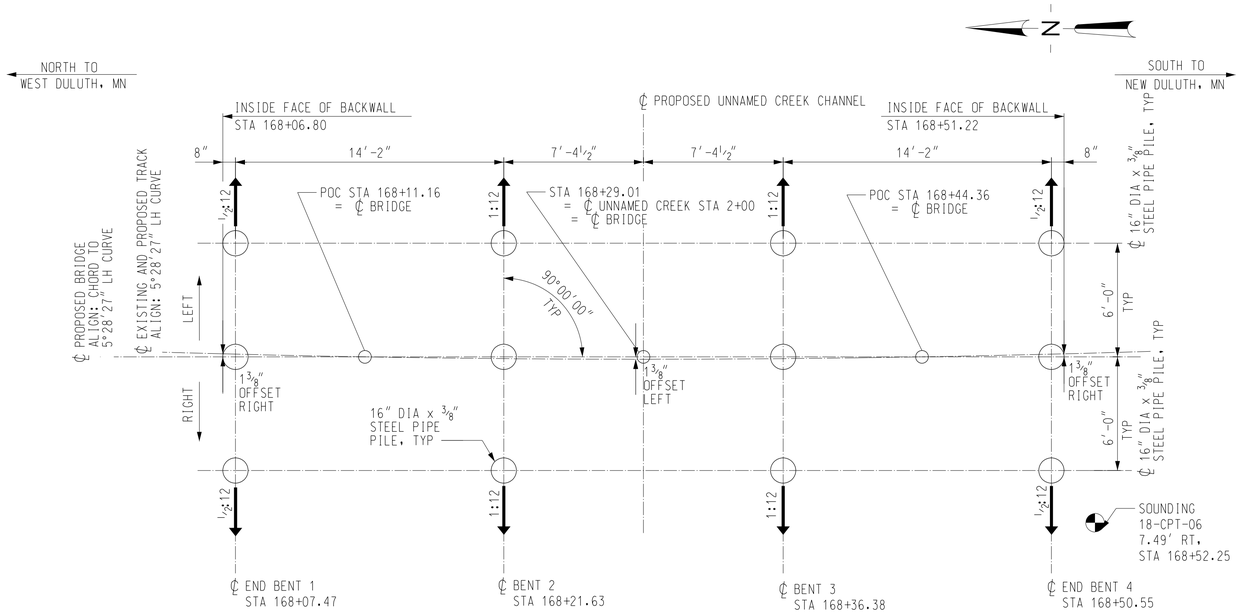
DATE: MAY 2019

PROJECT NUMBER:
BU-101

SHEET: 87 OF 111

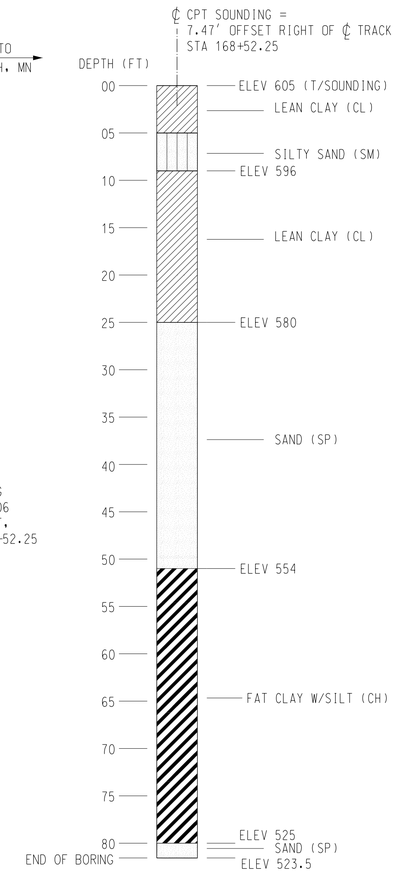
PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH:C:\PWWORKING\EA3\T\H2D05128118\ANN TITLE SHEET.DWG|MODEL|HAMPSON, KAYLAN|7/26/2018 3:52 PM



PILE PLAN

NO SCALE



SOUNDING 18–CPT–06

NO SCALE

PILE NOTES

PIPE PILES SHALL BE 16″ DIA x 3/8″ CONCRETE FILLED STEEL PIPE PILES AND MEET THE REQUIREMENTS OF ASTM A252 GRADE 3, Fy = 45 KSI.

PILE POINTS SHALL BE INSTALLED PER THE MANUFACTURER'S RECOMMENDATIONS ON ALL PIPE PILES PRIOR TO DRIVING.

DEBURR ALL EDGES.

FABRICATION SHALL CONFORM TO CURRENT AREMA GUIDELINES.

BRIDGE PIPE PILES SHALL BE DRIVEN PER THE PROJECT PROJECT SPECIFICATIONS TO THE DEEPER, MORE CONSERVATIVE DEPTH REQUIRED BY EITHER THE MINIMUM TIP ELEVATION OR TO ACHIEVE THE REQUIRED ULTIMATE CAPACITY NOTED IN THE PILE DATA TABLE. CONTACT THE ENGINEER IF PRACTICAL REFUSAL IS REACHED PRIOR TO REACHING THE MINIMUM TIP ELEVATION. ESTIMATED PILE LENGTH BELOW CUTOFF IS SHOWN IN THE PILE DATA TABLE.

CONTRACTOR SHOULD BE PREPARED TO ADJUST PILE LENGTH WITHOUT DELAYING THE PROJECT.

SYMBOL 1:12 → DENOTES DIRECTION AND AMOUNT OF PILE BATTER.

THE CONTRACTOR SHALL HAVE SUFFICIENT PILE SPLICE MATERIAL ON HAND BEFORE PILE DRIVING IS STARTED.

CONTRACTOR TO SUBMIT PROPOSED DRIVING SYSTEM WITH ACCOMPANYING DRIVEABILITY ANALYSIS TO ENGINEER FOR CONFIRMATION OF DRIVEABILITY. MINIMUM RECOMMENDED PILE DRIVING HAMMER ENERGY IS 40 KIP-FT (DELMAG 16-32 OR GREATER). NOTE THE RECOMMENDED HAMMER SIZE IS BASED ON ANTICIPATED ENERGY REQUIRED TO ACHIEVE THE MINIMUM TIP ELEVATION WHICH MAY BE DEEPER THAN THE ELEVATION AT WHICH THE REQUIRED ULTIMATE CAPACITY IS REACHED TO ENSURE PILE TIP REACHES COMPETENT SOIL LAYERS.

THE MAXIMUM HORIZONTAL OUT OF POSITION TOLERANCE AT THE CUTOFF ELEVATION IS 3 INCHES.

PILE COATING NOTES

A COATING OF TWO COMPONENT (SELF-CURING) COAL TAR EPOXY PAINT CONFORMING TO STEEL STRUCTURES PAINTING COUNCIL SPECIFICATION SSPC-PAINT 16, COAL TAR EPOXY BLACK (OR DARK RED PAINT) SHALL BE SHOP APPLIED (AS PER THE MANUFACTURER'S (RECOMMENDATIONS) TO THE ENTIRE OUTER SURFACE OF EACH PILE AND EMBED PLATE PRIOR TO PLACEMENT AS DETAILED BELOW.

STEEL SURFACES WHICH ARE TO RECEIVE THIS COATING SHALL BE PREPARED BY BLAST CLEANING TO NEAR WHITE, GRADE SSPC 10. THE COAL TAR EPOXY PAINT SHALL BE APPLIED BEFORE RUSTING OCCURS AND IN NO CASE LATER THAN 24 HOURS AFTER BLAST CLEANING.

THE COATING MAY BE APPLIED BY SPRAY OR BRUSH. IF THE APPLICATION IS BY BRUSH, APPLY WITH A STIFF BRUSH HEAVILY LOADED WITH PAINT; APPLY QUICKLY AND SMOOTHLY AND AVOID EXCESSIVE BRUSHING.

THE COATING SHALL BE APPLIED IN TWO COATS TO A TOTAL DRY FILM THICKNESS OF 16 MILS AT ITS THINNEST SPOT.

DRYING TIME BETWEEN COATS SHALL BE A MINIMUM OF 12 HOURS AND A MAXIMUM OF 72 HOURS UNDER NORMAL PAINTING CONDITIONS. LONG DRYING TIMES BETWEEN COATS WILL CAUSE POOR INTERCOAT ADHESION AND IT IS ADVISABLE IN WARM WEATHER TO REDUCE THE MAXIMUM INTERVAL BETWEEN COATS. IN VERY HOT WEATHER IT MAY BE NECESSARY TO LIMIT THE INTERCOAT DRYING PERIOD TO 24 HOURS OR LESS.

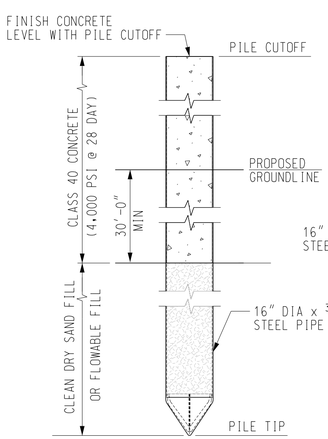
AT NORMAL TEMPERATURES THE COATING DRIES DUST FREE IN ABOUT FOUR HOURS AND BECOMES THOROUGHLY HARDENED AFTER 3 TO 5 DAYS OF CURING. PILE PLACEMENT SHALL NOT BEGIN SOONER THAN 5 DAYS AFTER COATING.

THE COATING SHALL NOT BE APPLIED WHEN THE RECEIVING SURFACES OR AMBIENT TEMPERATURES ARE BELOW 50 DEGREES FAHRENHEIT UNLESS IT CAN REASONABLY BE ANTICIPATED THAT THE AVERAGE AMBIENT TEMPERATURE WILL BE 50 DEGREES FAHRENHEIT OR HIGHER FOR THE 5 DAY PERIOD FOLLOWING THE APPLICATION OF ANY COAT.

STEEL MEMBERS WHICH ARE WELDED AFTER COATING SHALL HAVE THE COATING REMOVED FROM THE WELD AREAS AND SHALL RECEIVE TWO COATS OF THE COATING APPLIED TO THE WELD HEAT AFFECTED AREAS.

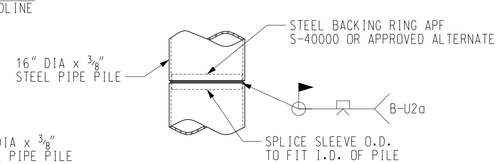
AFTER PLACEMENT, THE AREAS OF THE PILES AND BASE PLATES WHERE THE COATING HAS BEEN DAMAGED SHALL BE TOUCHED UP.

THE COST OF FURNISHING AND APPLYING THE COATING SHALL BE INCLUDED IN THE CONTRACT UNIT PRICE PER FOOT FOR 16″ DIA x 3/8″ THICK STEEL PIPE BEARING PILE, FURNISH AND DRIVE.



PILE FILL DETAIL

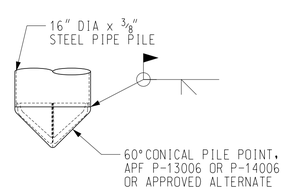
NO SCALE



PIPE PILE SPLICE DETAIL

NO SCALE

PILE SPLICE QUANTITY AND LOCATION TO BE DETERMINED BY CONTRACTOR BASED ON ORDERED LENGTHS



PIPE PILE POINT DETAIL

NO SCALE

PILE DATA TABLE ~ UNNAMED CREEK RR BR 3.2

LOCATION	T/TIE ELEV	PILE CUTOFF ELEV	REQUIRED ULTIMATE CAPACITY (TON) *	MINIMUM TIP ELEV	ESTIMATED PILE LENGTH BELOW CUTOFF (FT)
END BENT 1	606.56	602.10	113	525	77.1
BENT 2	606.51	601.39	113	525	76.4
BENT 3	606.47	601.34	113	525	76.3
END BENT 4	606.42	601.97	113	525	77.0

* BASED ON FACTOR OF SAFETY = 2.0.

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: CLB
DRAWN BY: RLW
CHECKED BY: AGH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UNNAMED CREEK RR BRIDGE
PILE PLAN AND DETAILS

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
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HDR ENGINEERING, INC.
700 SW HIGGINS AVE., SUITE 200
MISSOULA, MT 59803-1489

DATE: MAY 2019

PROJECT NUMBER:

BU-102

SHEET: 88 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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PRESTRESSED CONCRETE NOTES

MATERIALS

CONCRETE

CONCRETE MATERIAL, PLACING AND CURING SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED IN THE PROJECT SPECIFICATIONS FOR PRECAST/PRESTRESSED CONCRETE PRODUCTS AND THE CURRENT EDITION OF CHAPTER 8 OF THE AREMA MANUAL FOR RAILWAY ENGINEERING.

THE COMPRESSIVE STRENGTH OF THE CONCRETE SHALL BE:

PRETENSIONED CONCRETE:
f'ci = 4,500 PSI (AT TRANSFER)
f'c = 7,000 PSI (28-DAY)

CURB CONCRETE:
f'c = 4,500 PSI (28-DAY)

AIR ENTRAINING AGENTS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED IN THE CURRENT EDITION OF ASTM C260. THE TOTAL ENTRAINED AIR CONTENT SHALL BE 6% +/- 1% BY VOLUME OF THE PLASTIC CONCRETE.

CONCRETE AGGREGATE SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED IN THE CURRENT EDITION OF ASTM C33. COARSE AGGREGATE SHALL BE SIZE NO. 67.

CONCRETE SHALL BE DYED TO ACHIEVE A UNIFORM NATURAL WOOD TONE FINISH PER THE PROJECT SPECIFICATIONS. PROPOSED COLOR SAMPLE SHALL BE SUBMITTED AND APPROVED PRIOR TO FABRICATION. PROPOSED COLOR SHALL MATCH THAT OF THE PRECAST CONCRETE BENT CAPS.

PRESTRESSING STRANDS

PRESTRESSING STRAND SHALL BE 0.5-INCH DIAMETER, SEVEN-WIRE, UNCOATED, LOW-RELAXATION STRAND WHICH IS IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED IN ASTM A416. THE STRAND SHALL HAVE AN ULTIMATE TENSILE STRENGTH OF 270 KSI. THE INITIAL PRESTRESS SHALL BE 31,000 LBS. PER STRAND UNLESS NOTED OTHERWISE.

STRAND SHALL BE TESTED IN ACCORDANCE WITH PCI RECOMMENDATIONS (MOUSTAFA METHOD) AND CERTIFIED BY THE FABRICATOR AS HAVING ADEQUATE BOND CHARACTERISTICS TO SATISFY THE PREDICTION EQUATIONS FOR TRANSFER AND DEVELOPMENT LENGTH GIVEN IN THE AREMA MANUAL FOR RAILWAY ENGINEERING.

AN ALTERNATE STRAND PATTERN WHICH HAS THE SAME ECCENTRICITY AS THE PATTERN SHOWN ON THIS PLAN AND IS BETTER SUITED TO THE MANUFACTURER'S FACILITIES WILL BE CONSIDERED. MANUFACTURER MUST SUBMIT PLAN AND COMPUTATIONS TO ENGINEER FOR APPROVAL PRIOR TO CASTING.

REINFORCING STEEL

REINFORCING STEEL SHALL BE DEFORMED, PER CURRENT ASTM A615 SPECIFICATIONS AND MUST MEET GRADE 60 REQUIREMENTS. UNCOATED BLACK BARS SHALL BE USED FOR ALL LOCATIONS EXCEPT FOR CURB REINFORCING.

CURB REINFORCING DENOTED WITH "X" AT THE END OF THE MARK NUMBER (I.E. 3F1X) SHALL BE DEFORMED, CORROSION RESISTANT, HIGH STRENGTH REINFORCEMENT MEETING THE CURRENT ASTM A1035 SPECIFICATIONS AND MUST MEET GRADE 100 REQUIREMENTS.

FABRICATION OF REINFORCING STEEL SHALL BE PER CHAPTER 7 OF THE CRSI MANUAL OF STANDARD PRACTICE. DIMENSIONS OF BENDING DETAILS ARE OUT-TO-OUT OF BAR.

REINFORCING STEEL IS TO BE BLOCKED TO PROPER LOCATION AND SECURELY WIRED AGAINST DISPLACEMENT. USE PLASTIC PROTECTED REINFORCING SUPPORTS MEETING CRSI SPECIFICATIONS CHAPTER 3, CLASS 1. TACK WELDING OF REINFORCING IS PROHIBITED. MINIMUM CONCRETE ON REINFORCEMENT SHALL MEET CURRENT AREMA REQUIREMENTS. MINIMUM CONCRETE COVER IS 1 1/2 INCHES.

GALVANIZING

ALL INSERTS, NUTS, AND WASHERS SHALL BE GALVANIZED ACCORDING TO ASTM A153 (HOT DIP PROCESS) OR ACCORDING TO ASTM B695, CLASS 50, TYPE 1 (MECHANICAL PROCESS).

FABRICATION

CONCRETE

PRODUCTION PROCEDURES AND DIMENSIONAL TOLERANCES FOR THE MANUFACTURE OF PRECAST, PRESTRESSED BEAMS SHALL BE IN ACCORDANCE WITH THE AREMA MANUAL FOR RAILWAY ENGINEERING AND THE PRESTRESSED CONCRETE INSTITUTES CURRENT MANUAL MNL-116 FOR QUALITY CONTROL.

TOLERANCE FOR LOCATION OF LIFTING LOOPS SHALL BE +/- 1/2".

THE ENDS OF THE STRANDS SHALL BE CUT OFF FLUSH WITH THE END OF THE BEAM AND PAINTED. RECESSES AND MINOR SPALLS MUST BE FILLED AND FINISHED TO THE PLAN DIMENSIONS USING AN EPOXY BONDING COMPOUND AND GROUT.

CURB SHALL BE CAST AFTER THE BEAM IS REMOVED FROM THE FORM.

CONCRETE BONDING AGENT: REFER TO SPECIFICATIONS

SURFACES SHALL BE FORMED IN A MANNER WHICH WILL PRODUCE A SMOOTH AND UNIFORM APPEARANCE WITHOUT RUBBING OR PLASTERING. UNLESS OTHERWISE NOTED, EXPOSED EDGES OF 90-DEGREES OR LESS ARE TO BE CHAMFERED 3/4" X 3/4". UNFORMED SURFACES SHALL HAVE A SMOOTH FINISH FREE OF ALL FLOAT AND TROWEL MARKS.

THE FABRICATOR SHALL STENCIL THE FABRICATOR'S NAME, DATE OF FABRICATION, PLACE MARK, AND LIFTING WEIGHT AT LOCATION SHOWN.

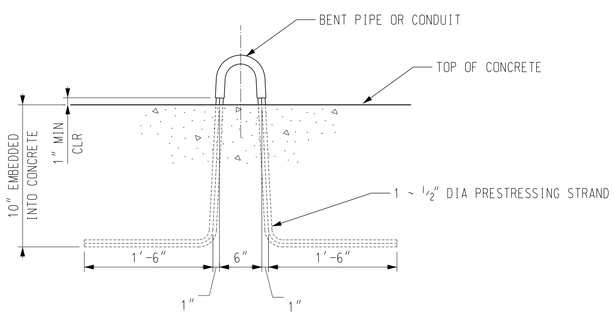
CURB TO BE DIVIDED INTO THREE EQUAL SEGMENTS AS SHOWN. IF CURB JOINTS CANNOT BE EQUALLY SPACED DUE TO CONFLICTS WITH HANDRAIL CONNECTIONS, THEN FABRICATOR SHALL ADJUST CURB SEGMENT LENGTHS SO THAT EACH CURB JOINT IS A MINIMUM OF 12" FROM THE CENTERLINE OF ANY WALKWAY/HANDRAIL CONNECTION.

CONSTRUCTION

MORTAR FOR SETTING BEAMS

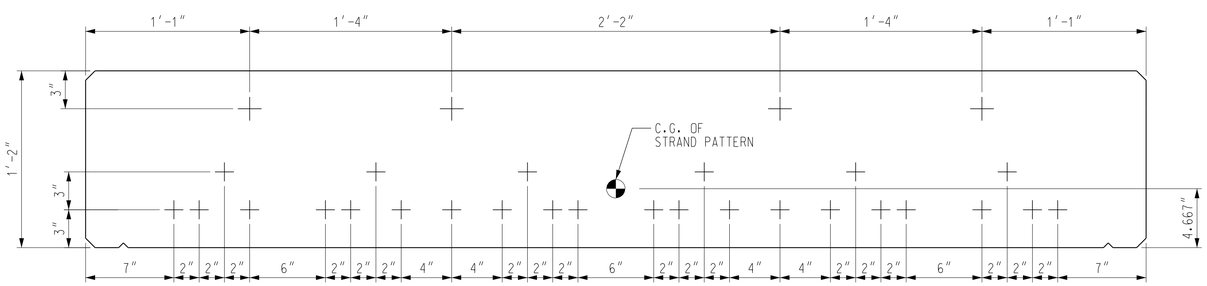
BEAMS SHALL HAVE FULL AND EVEN BEARING UPON THE BRIDGE SEAT AREAS. IF NEEDED, MORTAR CONSISTING OF EQUAL PARTS BY VOLUME OF CLASS B EPOXY AND DRY SILICA SAND, MIXED IN ACCORDANCE WITH THE MANUFACTURER'S DIRECTIONS, SHALL BE SPREAD ON THE TOP OF BEARING PADS TO OBTAIN UNIFORM BEARING. SCRAPE EXCESS MORTAR FROM AROUND BEARING PADS AFTER THE BEAMS ARE SET.

AFTER PRECAST CONCRETE MEMBERS ARE SET, THE ENDS OF THE LIFTING LOOP STRANDS SHALL BE BURNED OFF AND RECESSED TO A DEPTH OF 1 INCH. FILL RECESSES AT LIFT ANCHORS WITH CEMENT GROUT TO TOP OF SURROUNDING CONCRETE.



LIFTING DETAIL

FABRICATOR IS RESPONSIBLE FOR ADEQUACY OF LIFTING LOOPS.



PRESTRESSED STRAND PATTERN FOR MK SB14.7

MILD REINFORCING NOT SHOWN FOR CLARITY
(30 ~ 0.5" 270 KSI STRANDS ALL STRAIGHT STRANDS)
SCALE: 2" = 1' -0"

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: CLB
DRAWN BY: RLW
CHECKED BY: AGH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UNNAMED CREEK RR BRIDGE
PRESTRESSED CONCRETE SLAB BEAM DETAILS (SHEET 1 OF 2)

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

HDR ENGINEERING, INC.
700 SW HIGGINS AVE., SUITE 200
MISSOULA, MT 59803-1489

DATE: MAY 2019

PROJECT NUMBER:

BU-501

SHEET: 89 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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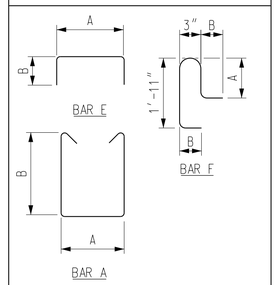
REINFORCING SCHEDULE

MARK	QTY	SIZE	TYPE	A	B	LENGTH
3F1X	27	3	F	1′-10″	5″	4′-10″
4S1	6	4	STR	–	–	4′-7″
4S2	12	4	STR	–	–	4′-6″
5A1	48	5	A	2′-11″	10″	5′-6″
5A2	24	5	A	2′-10″	10″	5′-5″
5E1	10	5	E	9½″	9″	2′-3½″
5E2	12	5	E	8¼″	2′-0″	4′-8¼″
5E3	24	5	E	6′-8″	10″	8′-4″
5S1	18	5	STR	–	–	14′-3″

1075 LBS = WEIGHT OF REINFORCING STEEL PER BEAM (ASTM A615)

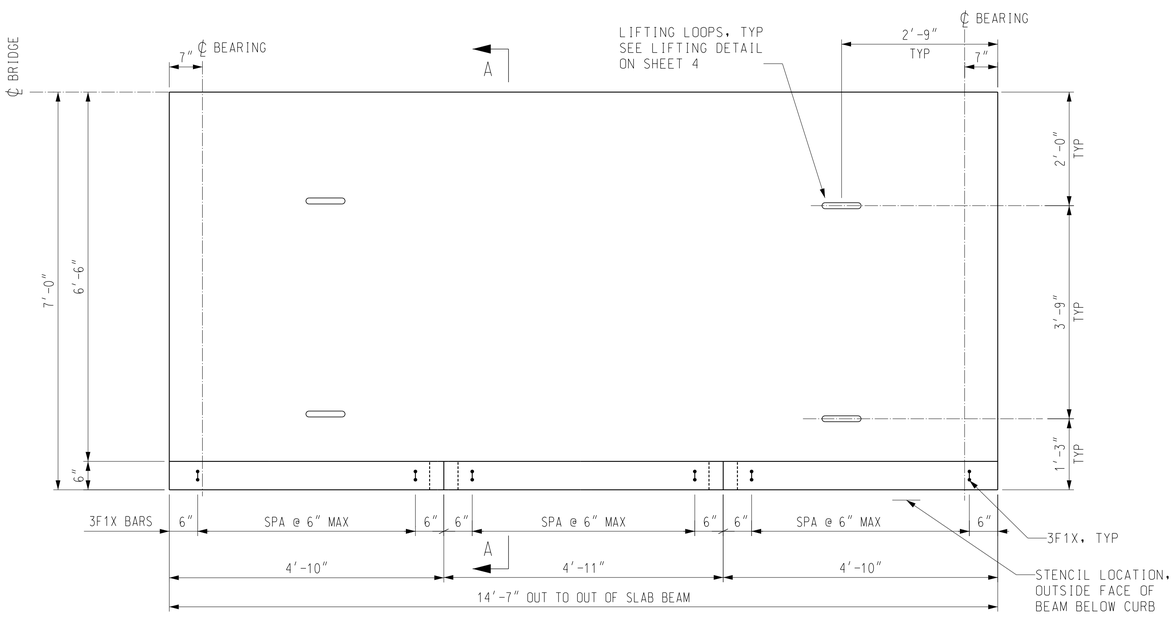
BENDING DETAILS



DIMENSIONS ARE OUT TO OUT

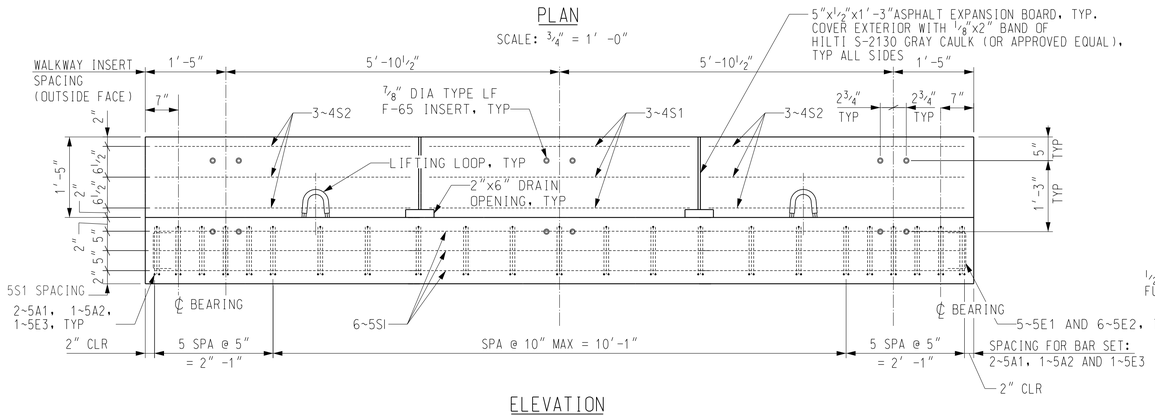
NOTES

SEE SHEET 89 FOR PRESTRESSED CONCRETE NOTES, STRAND PATTERN, AND LIFTING DETAIL.



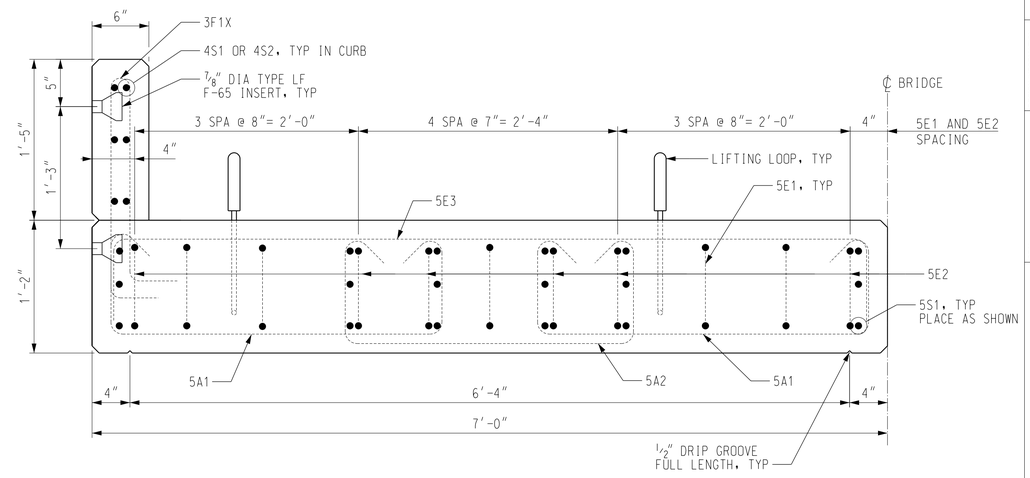
PLAN

SCALE: ¾″ = 1′ -0″



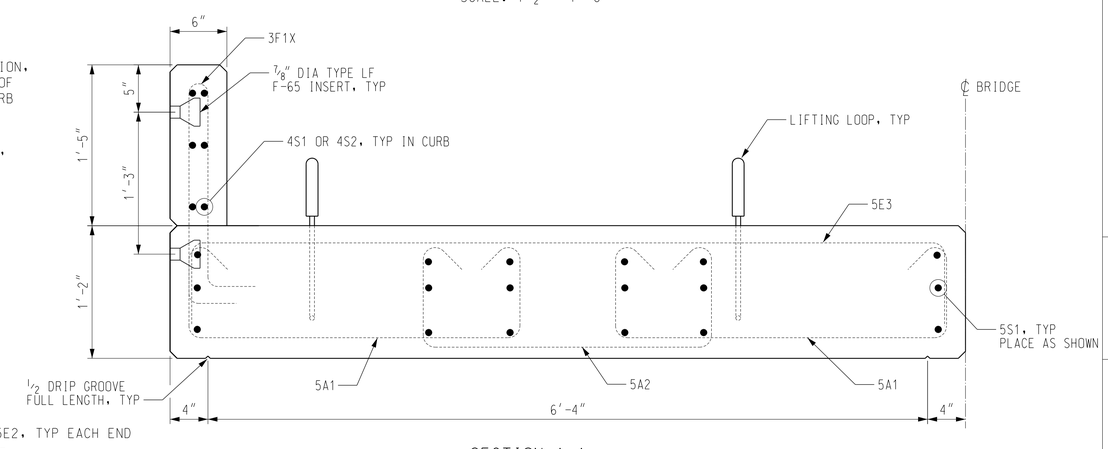
ELEVATION

SCALE: ¾″ = 1′ -0″



END VIEW

SCALE: 1½″ = 1′-0″



SECTION A-A

SCALE: 1½″ = 1′-0″

14” DEEP PRESTRESSED CONCRETE SLAB BEAM MK SB14.7

6 REQUIRED
CONCRETE VOLUME = 4.5 CU.YD (BEAM), 0.4 CU.YD (CURB)
LIFT WEIGHT = 19,500 LBS (19.5 KIPS)

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: CLB
DRAWN BY: RLW
CHECKED BY: AGH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UNNAMED CREEK RR BRIDGE
PRESTRESSED CONCRETE SLAB BEAM DETAILS (SHEET 2 OF 2)

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
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847-915-8010

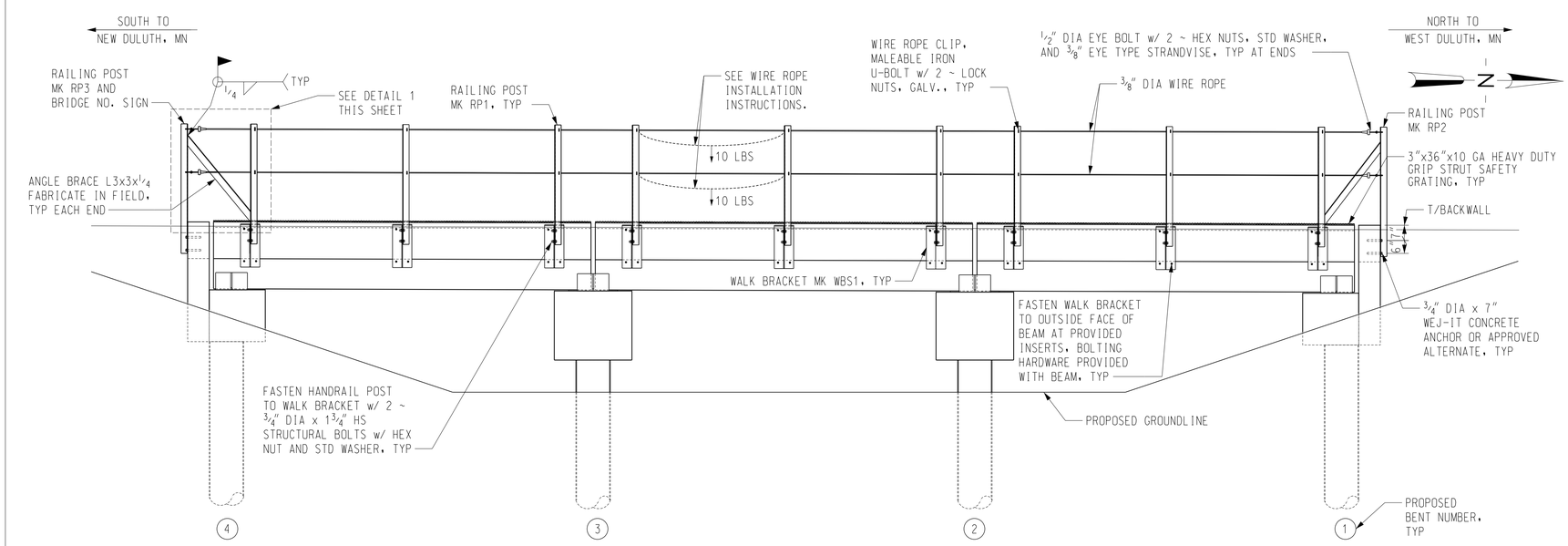
HDR ENGINEERING, INC.
700 SW HIGGINS AVE., SUITE 200
MISSOULA, MT 59803-1489

DATE: MAY 2019

PROJECT NUMBER:
BU-502

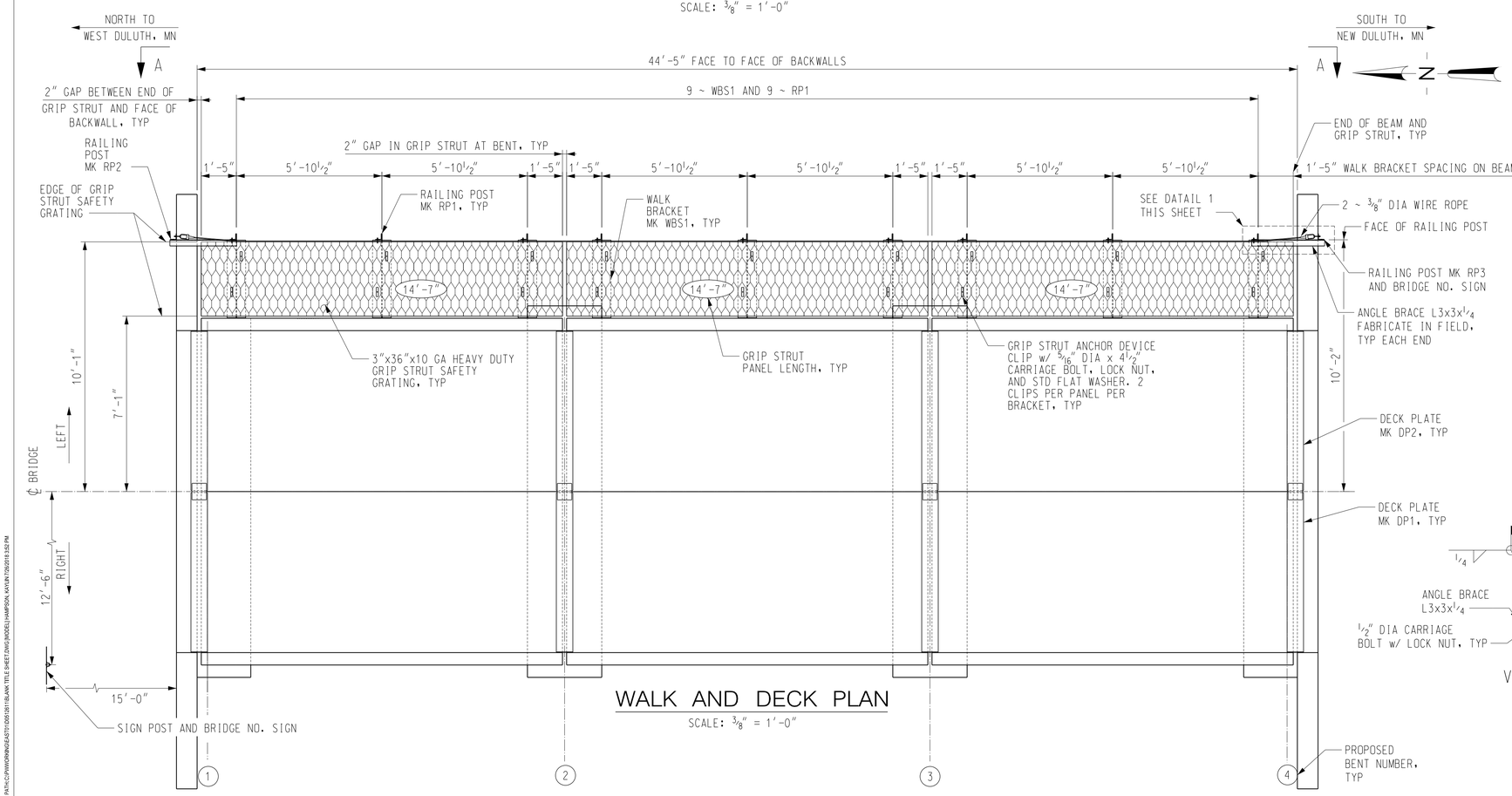
PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH:C:\PWWORK\NAD\EAST\10051811\BLANK TITLE SHEET.DWG\MODEL\ HARPSON, KAYLIN 7/26/2018 3:52 PM



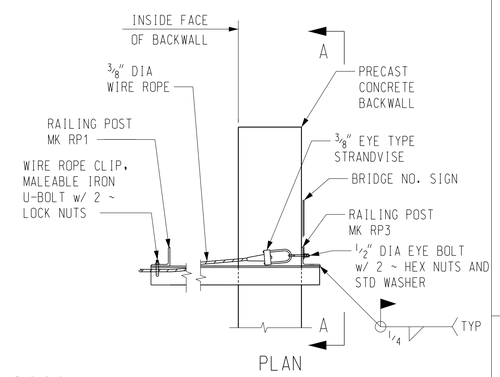
VIEW A–A

SCALE: 3/8" = 1'-0"

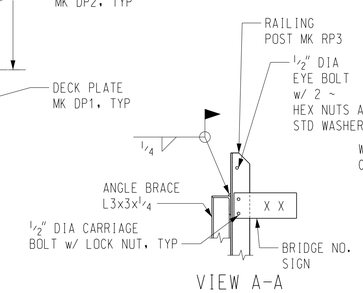


WALK AND DECK PLAN

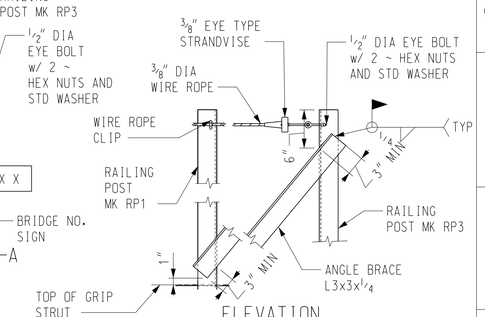
SCALE: 3/8" = 1'-0"



PLAN



VIEW A–A



ELEVATION

DETAIL 1

SCALE: 1" = 1'-0"

WALKWAY GENERAL NOTES

STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH ASTM DESIGNATION A36 OR APPROVED EQUIVALENT. ALL STRUCTURAL STEEL ITEMS AND HARDWARE TO BE GALVANIZED UNLESS OTHERWISE NOTED.

HANDRAIL POSTS ON WALKWAYS SHALL BE ERECTED PLUMB AND IN LINE.

GALVANIZING OF STRUCTURAL STEEL AFTER FABRICATION SHALL BE IN ACCORDANCE WITH THE CURRENT ASTM DESIGNATION A123.

GALVANIZING OF IRON AND STEEL HARDWARE SHALL BE IN ACCORDANCE WITH THE CURRENT ASTM DESIGNATION A153.

FIELD PAINT ANGLE BRACES, WELDED AREAS, AND ABRASIONS OR CUTS ON RAILING POSTS, WALK BRACKETS, AND GRIP STRUT WALKWAY WITH ONE PRIME AND ONE FINISH COAT OF ZINC RICH PAINT.

WIRE ROPE SHALL BE 3/8" DIA, 7-WIRE STRAND, SIEMENS MARTIN GRADE, TYPE A COATING.

EYE BOLTS SHALL BE 1/2" DIAMETER WITH 2" LONG SHANK AND 1" INSIDE DIAMETER EYE.

WIRE ROPE CLIPS SHALL BE MALLEABLE IRON U-BOLTS 1/4" DIAMETER x 1 1/2" LONG WITH A 1" CENTERLINE WIDTH.

GRIP STRUT ANCHOR DEVICE CLIPS SHALL BE MCNICHOLS NO. 12262 DIAMOND ANCHOR DEVICE OR APPROVED EQUAL AND BE COMPATIBLE WITH THE GRIP STRUT PANELS ORDERED.

WIRE ROPE INSTALLATION INSTRUCTIONS

1. THREAD WIRE ROPE THROUGH ALL CLIPS AND BARREL ANCHORS AND SEAT RETAINING WEDGES ON ONE END RAILING POST (DO NOT TIGHTEN).
2. STRETCH WIRE ROPE AND HANG A MINIMUM OF 10 LBS ON ROPE BETWEEN TWO POSTS AS SHOWN. REMOVE ALL SAG IN ROPE TO A MAXIMUM OF 2 INCHES.
3. SEAT RETAINING WEDGES AT REMAINING END POST.
4. REMOVE WEIGHTS.
5. TIGHTEN CLIPS AT INTERMEDIATE POSTS.
6. CUT AND REMOVE EXCESS WIRE ROPE, COAT CUT PORTIONS OF WIRE ROPE WITH COLD GALVANIZING COMPOUND.

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: CLB
DRAWN BY: RLW
CHECKED BY: AGH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UNNAMED CREEK RR BRIDGE
WALK AND DECK PLAN AND HANDRAIL DETAILS

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
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HDR ENGINEERING, INC.
700 SW HIGGINS AVE., SUITE 200
MISSOULA, MT 59803-1489

DATE: MAY 2019

PROJECT NUMBER:

BU-503

SHEET: 91 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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GENERAL NOTES

DESIGN LOADING

ALL COMPONENTS ARE DESIGNED IN ACCORDANCE WITH THE 2017 AREMA MANUAL FOR RAILWAY ENGINEERING, CHAPTER 8-CONCRETE STRUCTURES AND FOUNDATIONS.

LIVE LOAD:	E40 w/ DIESEL IMPACT
DESIGN SPEED:	10 MPH
MINIMUM BALLAST:	15 INCHES
MAXIMUM BALLAST:	24 INCHES
MAXIMUM TRACK ECCENTRICITY:	6 INCHES (FROM ℄ BRIDGE TO ℄ TRACK)

REFERENCE DATA

ALL DETAILS AND DIMENSIONS OF THE EXISTING SITE ARE BASED ON FIELD SURVEY DATA SUPPLIED BY LHB CORPORATION ON JUNE 15, 2016 WITH SUPPLEMENTARY DATA SUPPLIED ON JUNE 12, 2018.

BRIDGE STATIONING IS BASED ON THE INSIDE FACE OF THE NORTH EXISTING BACKWALL OF THE EXISTING WIRE MILL POND BRIDGE AS STATION 204+78.00.

BENCHMARK DATA:	SURVEY CONTROL POINT (HV-3702), STA 195+97.67, OFFSET 923.70' RIGHT, ELEV 648.82'.
VERTICAL DATUM:	NAVD88
HORIZONTAL DATUM:	NAD83/96 MINNESOTA NORTH ZONE

HYDRAULIC INFORMATION IS BASED ON HYDRAULIC MODELING INFORMATION PROVIDED BY EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. DATED MARCH 15, 2018 AND FEMA FIRM PANEL NO. 2704210045C.

GEOTECHNICAL INFORMATION IS BASED ON HDR ENGINEERING, INC. GEOTECHNICAL REPORT DATED MAY 2019.

BRIDGE STATIONING AND RIGHT-OF-WAY ARE BASED ON HISTORICAL NORTHERN PACIFIC RAILWAY (N.P. RY.) TRACK CHARTS.

GENERAL

IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE ACTUAL FIELD CONDITIONS AND ANY NECESSARY AS-BUILT DIMENSIONS AFFECTING THE SATISFACTORY COMPLETION OF THE WORK REQUIRED FOR THIS PROJECT.

NEW CONSTRUCTION SHOWN AS HEAVY LINES. EXISTING STRUCTURES TO REMAIN SHOWN AS LIGHT LINES. EXISTING STRUCTURES TO BE REMOVED SHOWN AS LIGHT DOTTED LINES.

CONTRACTOR IS RESPONSIBLE FOR DEWATERING TO FACILITATE CONSTRUCTION WHEN REQUIRED TO SATISFACTORILY COMPLETE THE WORK REQUIRED FOR THIS PROJECT.

IN ORDER TO ENSURE THE HYDRAULIC CAPACITY OF THE BRIDGE, THE FINISHED GROUND UNDER THE BRIDGE SHALL BE SHAPED TO MATCH THE UPSTREAM CHANNEL AND FLOODPLAIN AS SHOWN ON DRAWING BW-101. THE EXISTING LOW WATER CHANNEL SHALL BE MAINTAINED AS NEAR AS POSSIBLE TO THE EXISTING LOCATION.

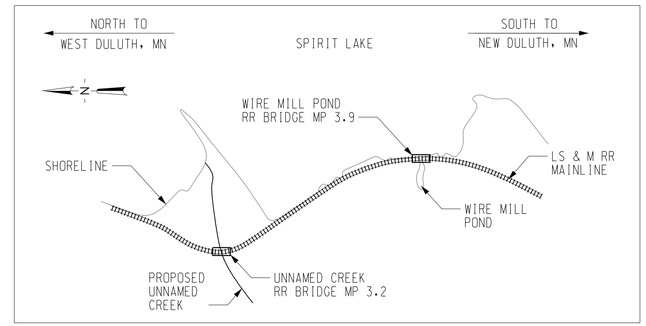
CONTRACTOR SHALL DOCUMENT ALL WORK IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS INCLUDING SUPPLYING: AS-BUILT DRAWINGS, PILE DRIVING RECORDS, AND SHOP DRAWINGS FOR ALL PREFABRICATED COMPONENTS. ALL SHOP DRAWINGS SHALL BE APPROVED BY THE ENGINEER PRIOR TO FABRICATION PER THE PROJECT SPECIFICATIONS.

CONTRACTOR SHALL DISPOSE OF ALL WASTE MATERIALS IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS INCLUDING BUT NOT LIMITED TO EXISTING TIMBER STRUCTURES, SOILS, AND DEFICIENT TRACK MATERIALS.

THE L.S.&M. RAILROAD IS AN HISTORIC RAILROAD. CONTRACTOR SHALL TAKE EXTREME CARE TO PRESERVE THE HISTORIC NATURE OF THE SITE AND RESTORE ANY DISTURBED AREAS TO PRE-CONSTRUCTION CONDITIONS.

TRACK MATERIALS INCLUDING TIES, RAIL, TIE PLATES, SPIKES, ETC. SHALL BE REUSED DURING TRACK RESURFACING TO PRESERVE THE HISTORIC NATURE OF THE RAILROAD. COMPONENTS SHALL BE INSPECTED FOR DEFECTS PRIOR TO PLACING BACK INTO SERVICE TO ENSURE SAFE OPERATION OF TRAINS. DEFECTIVE COMPONENTS MAY BE REPLACED WITH NEW MATERIAL OF A TYPE THAT CLOSELY MATCHES THE EXISTING COMPONENTS.

INFORMATION SHOWN ON THESE PLANS CONCERNING TYPE AND LOCATION OF EXISTING UNDERGROUND AND OVERHEAD UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR SHALL VERIFY THE LOCATION OF UNDERGROUND AND OVERHEAD UTILITIES BEFORE BEGINNING CONSTRUCTION.



VICINITY MAP

0 500 1000 2000 3000

SCALE IN FEET

BID ITEMS ~ WIRE MILL POND RR BR 3.9

ITEM NO.	ITEM DESCRIPTION	QTY.	UNIT
1	FURNISH AND DRIVE PILE*	1080	LF
2	FABRICATE AND INSTALL BRIDGE**	1	LS
3	REMOVE EXISTING TIMBER BRIDGE	1	LS

*INCLUDES COAL TAR EPOXY COATING AS SPECIFIED ON SHEET BW-102.

**INCLUDES ALL COMPONENTS OF BRIDGE SHOWN ON THESE PLANS EXCEPT PILING.

LIST OF DRAWINGS ~ WIRE MILL POND RR BR 3.9

DRAWING NUMBER	SHT. NO.	TITLE
BW-001	92	GENERAL NOTES AND ESTIMATED QUANTITIES
BW-101	93	GENERAL LAYOUT AND TYPICAL SECTIONS
BW-102	94	PILE PLAN AND DETAILS
BW-501	95	PRESTRESSED CONCRETE SLAB BEAM DETAILS (SHEET 1 OF 2)
BW-502	96	PRESTRESSED CONCRETE SLAB BEAM DETAILS (SHEET 2 OF 2)
BW-503	97	WALK AND DECK PLAN AND HANDRAIL DETAILS
STANDARD RR BRIDGE COMPONENTS AND DETAILS		
BG-501	98	PRECAST CONCRETE BENT CAP DETAILS AND NOTES
BG-502	99	PRECAST CONCRETE END BENT CAP DETAILS
BG-503	100	WALKWAY AND HANDRAIL DETAILS
BG-504	101	STEEL DETAILS
BG-505	102	MISCELLANEOUS DETAILS

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: CLB
DRAWN BY: GJT
CHECKED BY: AGH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

WIRE MILL POND RR BRIDGE
GENERAL NOTES AND ESTIMATED QUANTITIES

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
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HDR ENGINEERING, INC.
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MISSOULA, MT 59803-1489

DATE: MAY 2019

PROJECT NUMBER:

BW-001

SHEET: 92 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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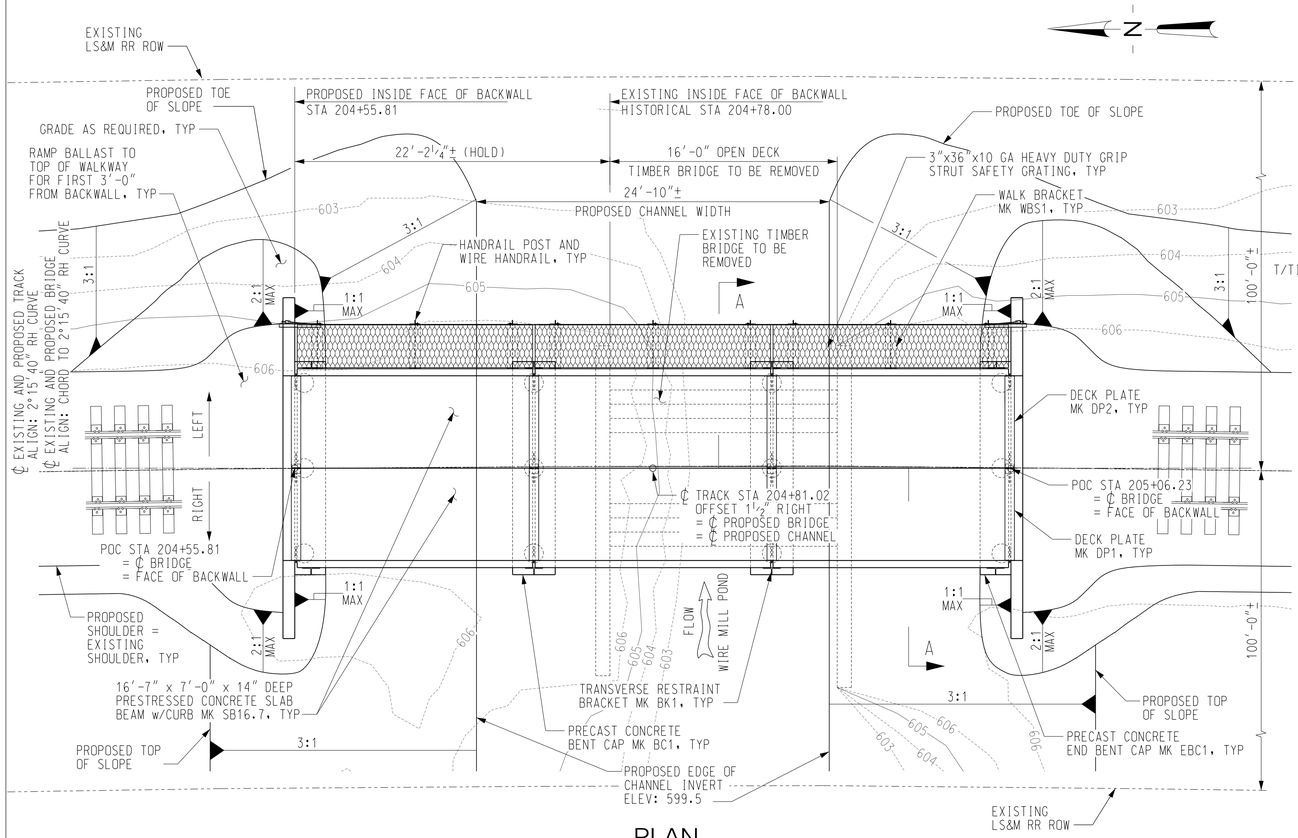
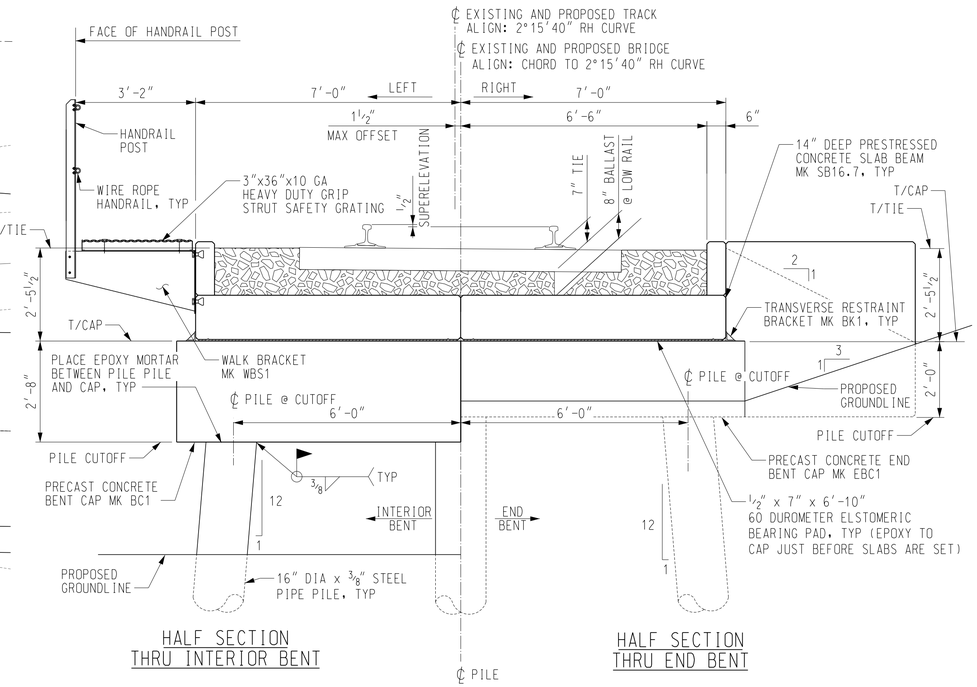


PLAN

SCALE: 3/16" = 1'-0"

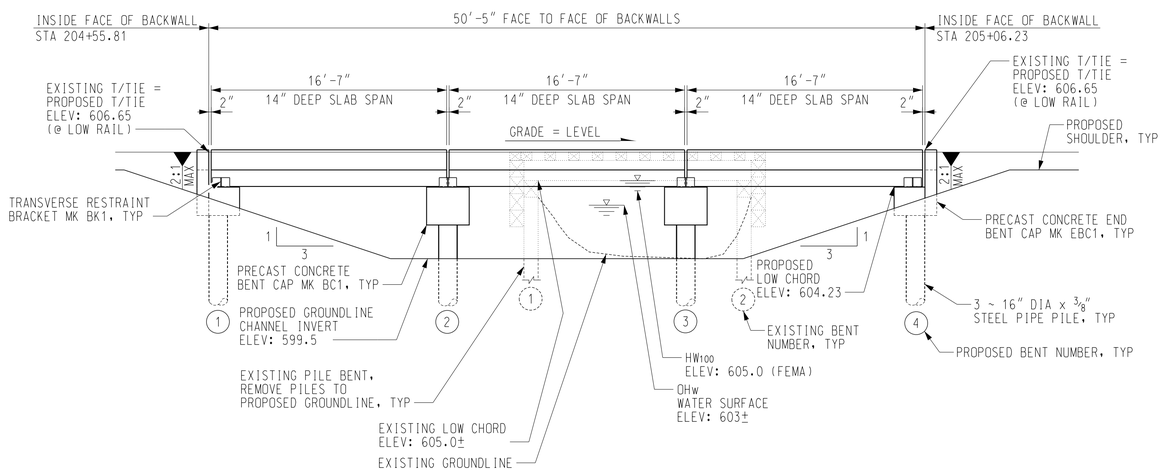


HALF SECTION THRU INTERIOR BENT

HALF SECTION THRU END BENT

SECTION A–A

SCALE: ½" = 1'-0"



ELEVATION

SCALE: 3/16" = 1'-0"
WALKWAY AND HANDRAIL NOT SHOWN FOR CLARITY

TABLE OF ELEVATIONS ~ WIRE MILL POND RR BR 3.9				
LOCATION	END BENT 1	BENT 2	BENT 3	END BENT 4
PROPOSED TOP OF TIE (@ LOW RAIL)	606.65	606.65	606.65	606.65
TOP OF CAP	604.19	604.19	604.19	604.19
PILE CUTOFF	602.19	601.52	601.52	602.19
TOP OF TIE TO PILE CUTOFF	4'-5½"	5'-1½"	5'-1½"	4'-5½"

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: CLB
DRAWN BY: GJT
CHECKED BY: AGH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

WIRE MILL POND RR BRIDGE
GENERAL LAYOUT AND TYPICAL SECTIONS

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DATE: MAY 2019

PROJECT NUMBER:

BW-101

SHEET: 93 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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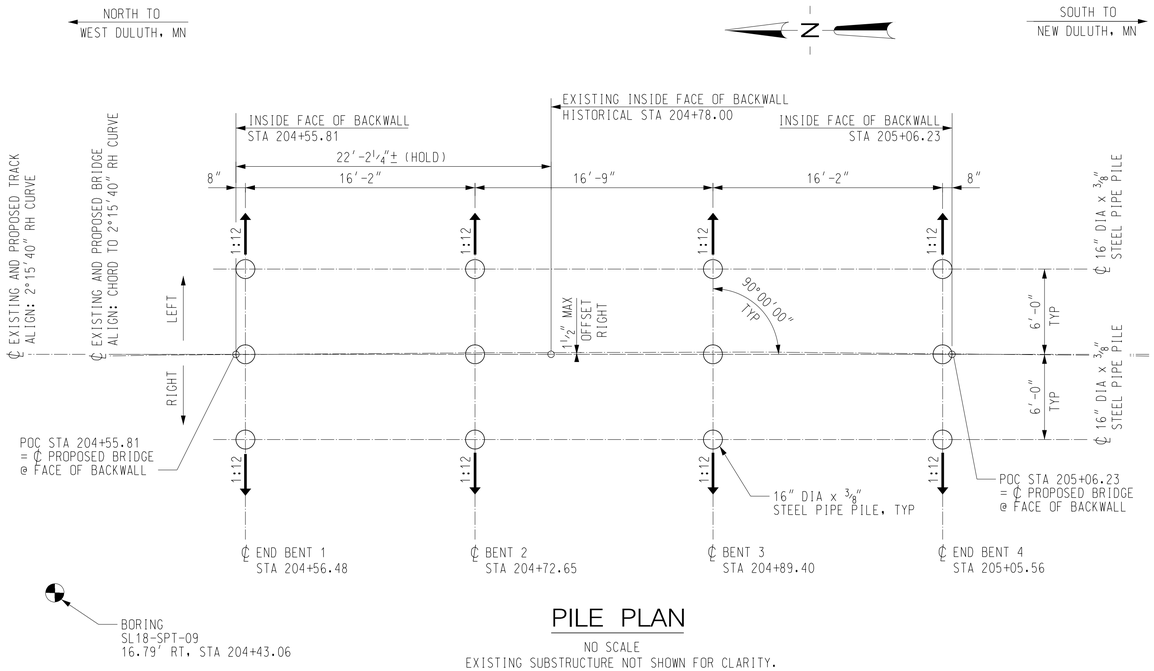
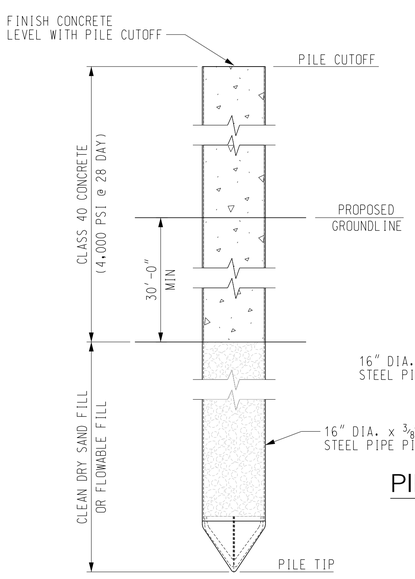


PILE PLAN

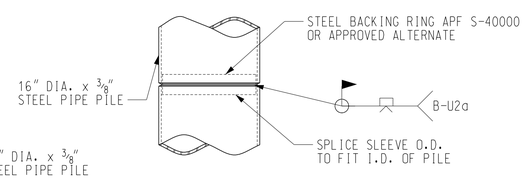
NO SCALE

EXISTING SUBSTRUCTURE NOT SHOWN FOR CLARITY.



PILE FILL DETAIL

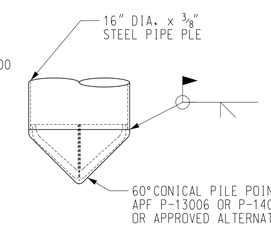
NO SCALE



PIPE PILE SPLICE DETAIL

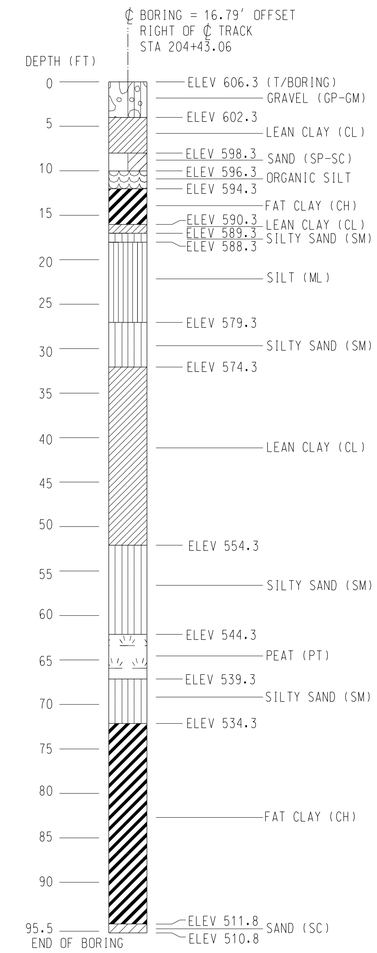
NO SCALE

PILE SPLICE QUANTITY AND LOCATION TO BE DETERMINED BY CONTRACTOR BASED ON ORDERED LENGTHS.



PIPE PILE POINT DETAIL

NO SCALE



BORING SL18-SPT-09

NO SCALE

PILE NOTES

PIPE PILES SHALL BE 16" DIA x ⅜" CONCRETE FILLED STEEL PIPE PILES AND MEET THE REQUIREMENTS OF ASTM A252 GRADE 3, Fy = 45 KSI.

PILE POINTS SHALL BE INSTALLED PER THE MANUFACTURER'S RECOMMENDATIONS ON ALL PIPE PILES PRIOR TO DRIVING.

DEBURR ALL EDGES.

FABRICATION SHALL CONFORM TO CURRENT AREMA GUIDELINES.

BRIDGE PIPE PILES SHALL BE DRIVEN PER THE PROJECT SPECIFICATIONS TO THE DEEPER, MORE CONSERVATIVE DEPTH REQUIRED BY EITHER THE MINIMUM TIP ELEVATION OR TO ACHIEVE THE REQUIRED ULTIMATE CAPACITY NOTED IN THE PILE DATA TABLE. CONTACT THE ENGINEER IF PRACTICAL REFUSAL IS REACHED PRIOR TO REACHING THE MINIMUM TIP ELEVATION. ESTIMATED PILE LENGTH BELOW CUTOFF IS SHOWN IN THE PILE DATA TABLE.

CONTRACTOR SHOULD BE PREPARED TO ADJUST PILE LENGTH WITHOUT DELAYING THE PROJECT.

SYMBOL 1:12 → DENOTES DIRECTION AND AMOUNT OF PILE BATTER.

THE CONTRACTOR SHALL HAVE SUFFICIENT PILE SPLICE MATERIAL ON HAND BEFORE PILE DRIVING IS STARTED.

CONTRACTOR TO SUBMIT PROPOSED DRIVING SYSTEM WITH ACCOMPANYING DRIVEABILITY ANALYSIS TO ENGINEER FOR CONFIRMATION OF DRIVEABILITY. MINIMUM RECOMMENDED PILE DRIVING HAMMER ENERGY IS 40 KIP-FT (DELMAG 16-32 OR GREATER). NOTE THE RECOMMENDED HAMMER SIZE IS BASED ON ANTICIPATED ENERGY REQUIRED TO ACHIEVE THE MINIMUM TIP ELEVATION WHICH MAY BE DEEPER THAN THE ELEVATION AT WHICH THE REQUIRED ULTIMATE CAPACITY IS REACHED TO ENSURE PILE TIP REACHES COMPETENT SOIL LAYERS.

THE MAXIMUM HORIZONTAL OUT OF POSITION TOLERANCE AT THE CUTOFF ELEVATION IS 3 INCHES.

PILE COATING NOTES

A COATING OF TWO COMPONENT (SELF-CURING) COAL TAR EPOXY PAINT CONFORMING TO STEEL STRUCTURES PAINTING COUNCIL SPECIFICATION SSPC-PAINT 16, COAL TAR EPOXY BLACK (OR DARK RED PAINT) SHALL BE SHOP APPLIED (AS PER THE MANUFACTURER'S RECOMMENDATIONS) TO THE ENTIRE OUTER SURFACE OF EACH PILE AND EMBED PLATE PRIOR TO PLACEMENT AS DETAILED BELOW.

STEEL SURFACES WHICH ARE TO RECEIVE THIS COATING SHALL BE PREPARED BY BLAST CLEANING TO NEAR WHITE, GRADE SSPC 10. THE COAL TAR EPOXY PAINT SHALL BE APPLIED BEFORE RUSTING OCCURS AND IN NO CASE LATER THAN 24 HOURS AFTER BLAST CLEANING.

THE COATING MAY BE APPLIED BY SPRAY OR BRUSH. IF THE APPLICATION IS BY BRUSH, APPLY WITH A STIFF BRUSH HEAVILY LOADED WITH PAINT; APPLY QUICKLY AND SMOOTHLY AND AVOID EXCESSIVE BRUSHING.

THE COATING SHALL BE APPLIED IN TWO COATS TO A TOTAL DRY FILM THICKNESS OF 16 MILS AT ITS THINNEST SPOT.

DRYING TIME BETWEEN COATS SHALL BE A MINIMUM OF 12 HOURS AND A MAXIMUM OF 72 HOURS UNDER NORMAL PAINTING CONDITIONS. LONG DRYING TIMES BETWEEN COATS WILL CAUSE POOR INTERCOAT ADHESION AND IT IS ADVISABLE IN WARM WEATHER TO REDUCE THE MAXIMUM INTERVAL BETWEEN COATS. IN VERY HOT WEATHER IT MAY BE NECESSARY TO LIMIT THE INTERCOAT DRYING PERIOD TO 24 HOURS OR LESS.

AT NORMAL TEMPERATURES THE COATING DRIES DUST FREE IN ABOUT FOUR HOURS AND BECOMES THOROUGHLY HARDENED AFTER 3 TO 5 DAYS OF CURING. PILE PLACEMENT SHALL NOT BEGIN SOONER THAN 5 DAYS AFTER COATING.

THE COATING SHALL NOT BE APPLIED WHEN THE RECEIVING SURFACES OR AMBIENT TEMPERATURES ARE BELOW 50 DEGREES FAHRENHEIT UNLESS IT CAN REASONABLY BE ANTICIPATED THAT THE AVERAGE AMBIENT TEMPERATURE WILL BE 50 DEGREES FAHRENHEIT OR HIGHER FOR THE 5 DAY PERIOD FOLLOWING THE APPLICATION OF ANY COAT.

STEEL MEMBERS WHICH ARE WELDED AFTER COATING SHALL HAVE THE COATING REMOVED FROM THE WELD AREAS AND SHALL RECEIVE TWO COATS OF THE COATING APPLIED TO THE WELD HEAT AFFECTED AREAS.

AFTER PLACEMENT, THE AREAS OF THE PILES AND BASE PLATES WHERE THE COATING HAS BEEN DAMAGED SHALL BE TOUCHED UP.

THE COST OF FURNISHING AND APPLYING THE COATING SHALL BE INCLUDED IN THE CONTRACT UNIT PRICE PER FOOT FOR 16" DIA x ⅜" THICK STEEL PIPE BEARING PILE, FURNISH AND DRIVE.

PILE DATA TABLE ~ WIRE MILL POND RR BR 3.9

LOCATION	T/TIE ELEV	PILE CUTOFF ELEV	REQUIRED ULTIMATE CAPACITY (TON) *	MINIMUM TIP ELEV	ESTIMATED PILE LENGTH BELOW CUTOFF (FT)
END BENT 1	606.65	602.19	95	512	90.2
BENT 2	606.65	601.52	95	512	89.5
BENT 3	606.65	601.52	95	512	89.5
END BENT 4	606.65	602.19	95	512	90.2

* BASED ON FACTOR OF SAFETY = 2.0.

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: CLB
DRAWN BY: GJT
CHECKED BY: AGH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

WIRE MILL POND RR BRIDGE
PILE PLAN AND DETAILS

PREPARED FOR:
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DATE: MAY 2019

PROJECT NUMBER:
BW-102

SHEET: 94 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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PRESTRESSED CONCRETE NOTES

MATERIALS

CONCRETE

CONCRETE MATERIAL, PLACING AND CURING SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED IN THE PROJECT SPECIFICATIONS FOR PRECAST/PRESTRESSED CONCRETE PRODUCTS AND THE CURRENT EDITION OF CHAPTER 8 OF THE AREMA MANUAL FOR RAILWAY ENGINEERING.

THE COMPRESSIVE STRENGTH OF THE CONCRETE SHALL BE:

PRETENSIONED CONCRETE:
$f'ci$ = 4,500 PSI (AT TRANSFER)
$f'c$ = 7,000 PSI (28-DAY)

CURB CONCRETE:
$f'c$ = 4,500 PSI (28-DAY)

AIR ENTRAINING AGENTS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED IN THE CURRENT EDITION OF ASTM C260. THE TOTAL ENTRAINED AIR CONTENT SHALL BE 6% +/- 1% BY VOLUME OF THE PLASTIC CONCRETE.

CONCRETE AGGREGATE SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED IN THE CURRENT EDITION OF ASTM C33. COARSE AGGREGATE SHALL BE SIZE NO. 67.

CONCRETE SHALL BE DYED TO ACHIEVE A UNIFORM NATURAL WOOD TONE FINISH PER THE PROJECT SPECIFICATIONS. PROPOSED COLOR SAMPLE SHALL BE SUBMITTED AND APPROVED PRIOR TO FABRICATION. PROPOSED COLOR SHALL MATCH THAT OF THE PRECAST CONCRETE BENT CAPS.

PRESTRESSING STRANDS

PRESTRESSING STRAND SHALL BE 0.5-INCH DIAMETER, SEVEN-WIRE, UNCOATED, LOW-RELAXATION STRAND WHICH IS IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED IN ASTM A416. THE STRAND SHALL HAVE AN ULTIMATE TENSILE STRENGTH OF 270 KSI. THE INITIAL PRESTRESS SHALL BE 31,000 LBS. PER STRAND UNLESS NOTED OTHERWISE.

STRAND SHALL BE TESTED IN ACCORDANCE WITH PCI RECOMMENDATIONS (MOUSTAFA METHOD) AND CERTIFIED BY THE FABRICATOR AS HAVING ADEQUATE BOND CHARACTERISTICS TO SATISFY THE PREDICTION EQUATIONS FOR TRANSFER AND DEVELOPMENT LENGTH GIVEN IN THE AREMA MANUAL FOR RAILWAY ENGINEERING.

AN ALTERNATE STRAND PATTERN WHICH HAS THE SAME ECCENTRICITY AS THE PATTERN SHOWN ON THIS PLAN AND IS BETTER SUITED TO THE MANUFACTURER'S FACILITIES WILL BE CONSIDERED. MANUFACTURER MUST SUBMIT PLAN AND COMPUTATIONS TO ENGINEER FOR APPROVAL PRIOR TO CASTING.

REINFORCING STEEL

REINFORCING STEEL SHALL BE DEFORMED, PER CURRENT ASTM A615 SPECIFICATIONS AND MUST MEET GRADE 60 REQUIREMENTS. UNCOATED BLACK BARS SHALL BE USED FOR ALL LOCATIONS EXCEPT FOR CURB REINFORCING.

CURB REINFORCING DENOTED WITH "X" AT THE END OF THE MARK NUMBER (I.E. 3F1X) SHALL BE DEFORMED, CORROSION RESISTANT, HIGH STRENGTH REINFORCEMENT MEETING THE CURRENT ASTM A1035 SPECIFICATIONS AND MUST MEET GRADE 100 REQUIREMENTS.

FABRICATION OF REINFORCING STEEL SHALL BE PER CHAPTER 7 OF THE CRSI MANUAL OF STANDARD PRACTICE. DIMENSIONS OF BENDING DETAILS ARE OUT-TO-OUT OF BAR.

REINFORCING STEEL IS TO BE BLOCKED TO PROPER LOCATION AND SECURELY WIRED AGAINST DISPLACEMENT. USE PLASTIC PROTECTED REINFORCING SUPPORTS MEETING CRSI SPECIFICATIONS CHAPTER 3, CLASS 1. TACK WELDING OF REINFORCING IS PROHIBITED. MINIMUM CONCRETE ON REINFORCEMENT SHALL MEET CURRENT AREMA REQUIREMENTS. MINIMUM CONCRETE COVER IS 1½ INCHES.

GALVANIZING

ALL INSERTS, NUTS, AND WASHERS SHALL BE GALVANIZED ACCORDING TO ASTM A153 (HOT DIP PROCESS) OR ACCORDING TO ASTM B695, CLASS 50, TYPE 1 (MECHANICAL PROCESS).

FABRICATION

CONCRETE

PRODUCTION PROCEDURES AND DIMENSIONAL TOLERANCES FOR THE MANUFACTURE OF PRECAST, PRESTRESSED BEAMS SHALL BE IN ACCORDANCE WITH THE AREMA MANUAL FOR RAILWAY ENGINEERING AND THE PRESTRESSED CONCRETE INSTITUTES CURRENT MANUAL MNL-116 FOR QUALITY CONTROL.

TOLERANCE FOR LOCATION OF LIFTING LOOPS SHALL BE +/- ½".

THE ENDS OF THE STRANDS SHALL BE CUT OFF FLUSH WITH THE END OF THE BEAM AND PAINTED. RECESSES AND MINOR SPALLS MUST BE FILLED AND FINISHED TO THE PLAN DIMENSIONS USING AN EPOXY BONDING COMPOUND AND GROUT.

CURB SHALL BE CAST AFTER THE BEAM IS REMOVED FROM THE FORM.

CONCRETE BONDING AGENT: REFER TO SPECIFICATIONS

SURFACES SHALL BE FORMED IN A MANNER WHICH WILL PRODUCE A SMOOTH AND UNIFORM APPEARANCE WITHOUT RUBBING OR PLASTERING. UNLESS OTHERWISE NOTED, EXPOSED EDGES OF 90-DEGREES OR LESS ARE TO BE CHAMFERED ¾" X ¾". UNFORMED SURFACES SHALL HAVE A SMOOTH FINISH FREE OF ALL FLOAT AND TROWEL MARKS.

THE FABRICATOR SHALL STENCIL THE FABRICATOR'S NAME, DATE OF FABRICATION, PLACE MARK, AND LIFTING WEIGHT AT LOCATION SHOWN.

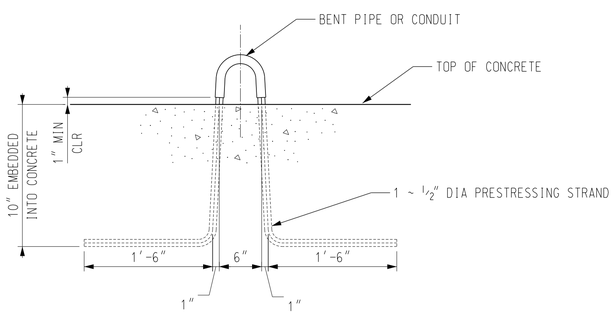
CURB TO BE DIVIDED INTO THREE EQUAL SEGMENTS AS SHOWN. IF CURB JOINTS CANNOT BE EQUALLY SPACED DUE TO CONFLICTS WITH HANDRAIL CONNECTIONS, THEN FABRICATOR SHALL ADJUST CURB SEGMENT LENGTHS SO THAT EACH CURB JOINT IS A MINIMUM OF 12" FROM THE CENTERLINE OF ANY WALKWAY/HANDRAIL CONNECTION.

CONSTRUCTION

MORTAR FOR SETTING BEAMS

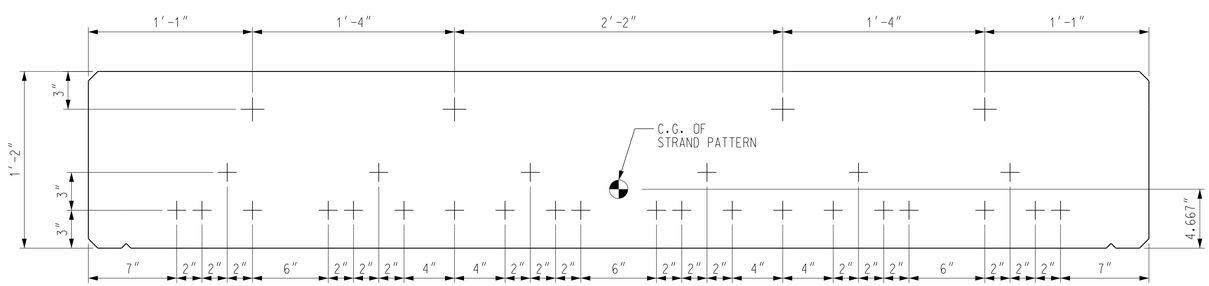
BEAMS SHALL HAVE FULL AND EVEN BEARING UPON THE BRIDGE SEAT AREAS. IF NEEDED, MORTAR CONSISTING OF EQUAL PARTS BY VOLUME OF CLASS B EPOXY AND DRY SILICA SAND, MIXED IN ACCORDANCE WITH THE MANUFACTURER'S DIRECTIONS, SHALL BE SPREAD ON THE TOP OF BEARING PADS TO OBTAIN UNIFORM BEARING. SCRAPE EXCESS MORTAR FROM AROUND BEARING PADS AFTER THE BEAMS ARE SET.

AFTER PRECAST CONCRETE MEMBERS ARE SET, THE ENDS OF THE LIFTING LOOP STRANDS SHALL BE BURNED OFF AND RECESSED TO A DEPTH OF 1 INCH. FILL RECESSES AT LIFT ANCHORS WITH CEMENT GROUT TO TOP OF SURROUNDING CONCRETE.



LIFTING DETAIL

FABRICATOR IS RESPONSIBLE FOR ADEQUACY OF LIFTING LOOPS.



PRESTRESSED STRAND PATTERN FOR MK SB16.7

MILD REINFORCING NOT SHOWN FOR CLARITY
(30 ~ 0.5" 270 KSI STRANDS ALL STRAIGHT STRANDS)
SCALE: 2" = 1' -0"

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: CLB
DRAWN BY: GJT
CHECKED BY: AGH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

WIRE MILL POND RR BRIDGE
PRESTRESSED CONCRETE SLAB BEAM DETAILs (SHEET 1 OF 2)

PREPARED FOR:

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DATE: MAY 2019

PROJECT NUMBER:

BW-501

SHEET: 95 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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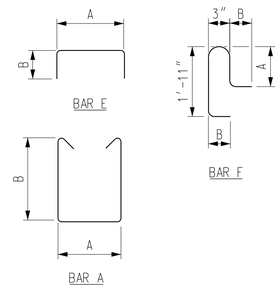
REINFORCING SCHEDULE

MARK	QTY	SIZE	TYPE	A	B	LENGTH
3F1X	31	3	F	1′-10″	5″	4′-10″
4S1	6	4	STR	-	-	5′-3″
4S2	12	4	STR	-	-	5′-2″
5A1	52	5	A	2′-11″	10″	5′-6″
5A2	26	5	A	2′-10″	10″	5′-5″
5E1	10	5	E	9½″	9″	2′-3½″
5E2	12	5	E	8¼″	2′-0″	4′-8¼″
5E3	26	5	E	6′-8″	10″	8′-4″
5S1	18	5	STR	-	-	16′-3″

1180 LBS = WEIGHT OF REINFORCING STEEL PER BEAM (ASTM A615)

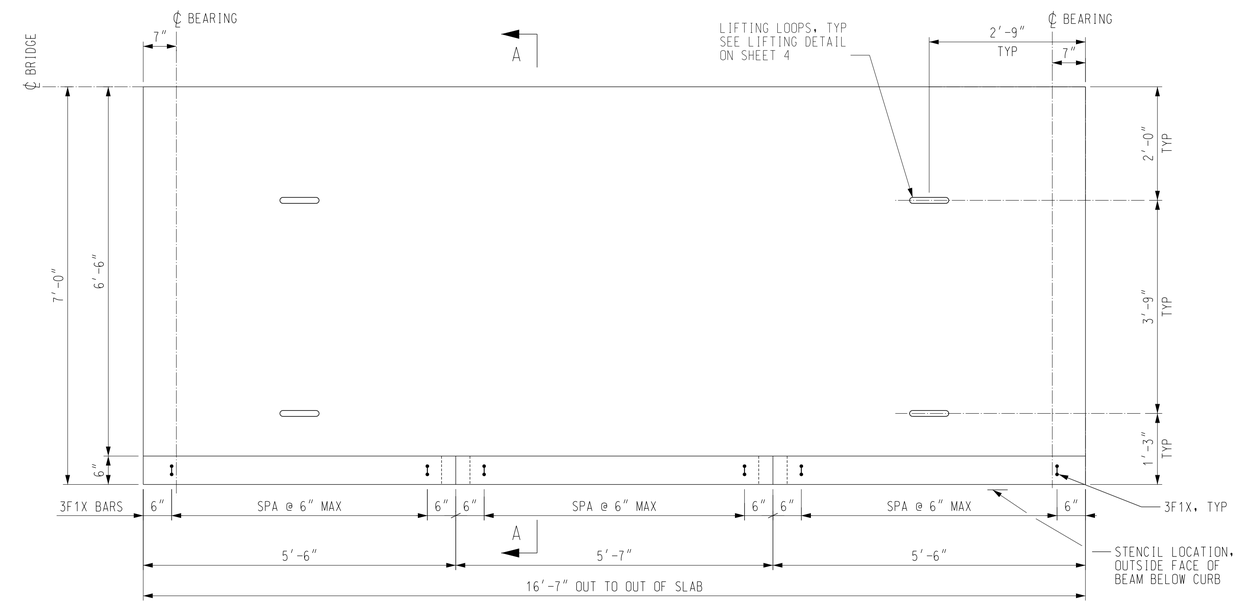
BENDING DETAILS



DIMENSIONS ARE OUT TO OUT

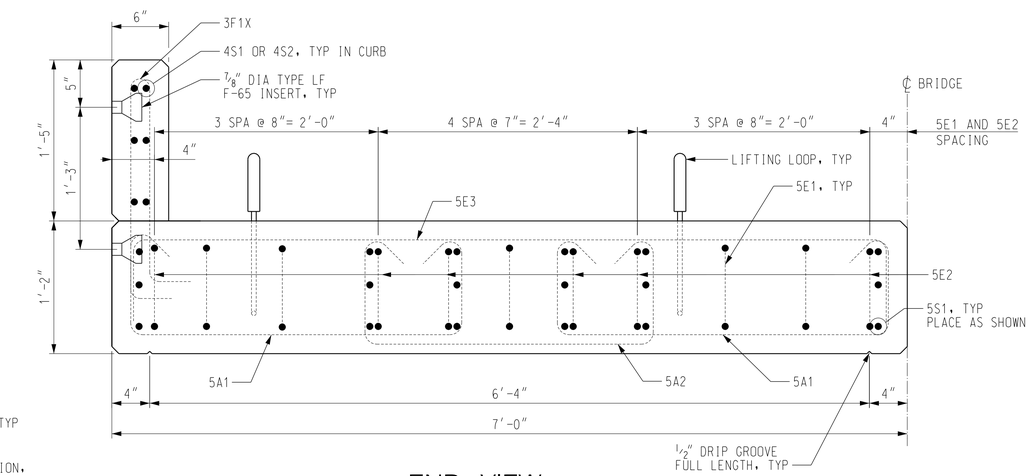
NOTES

SEE SHEET 95 FOR PRESTRESSED CONCRETE NOTES, STRAND PATTERN, AND LIFTING DETAIL.



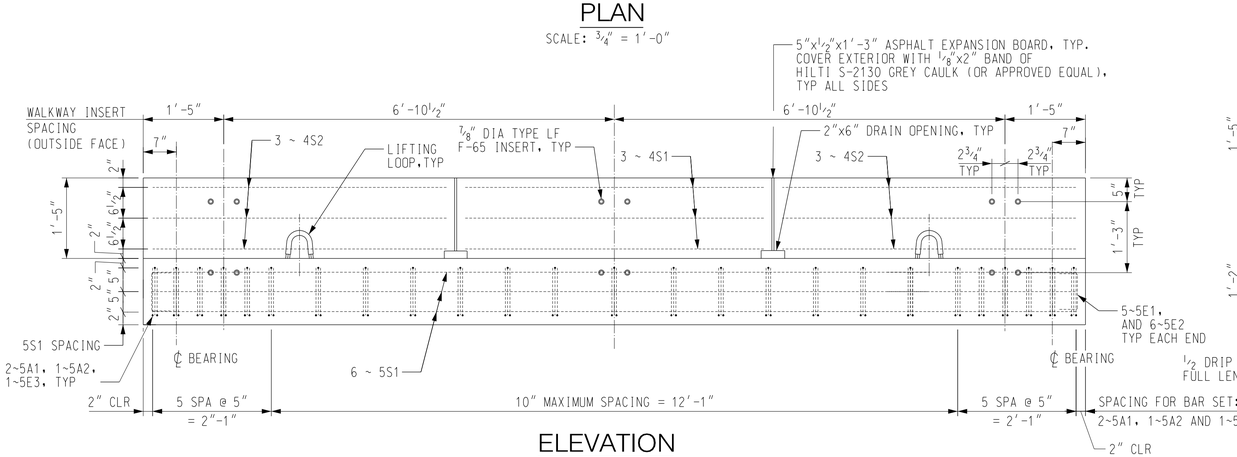
PLAN

SCALE: ¾″ = 1′-0″



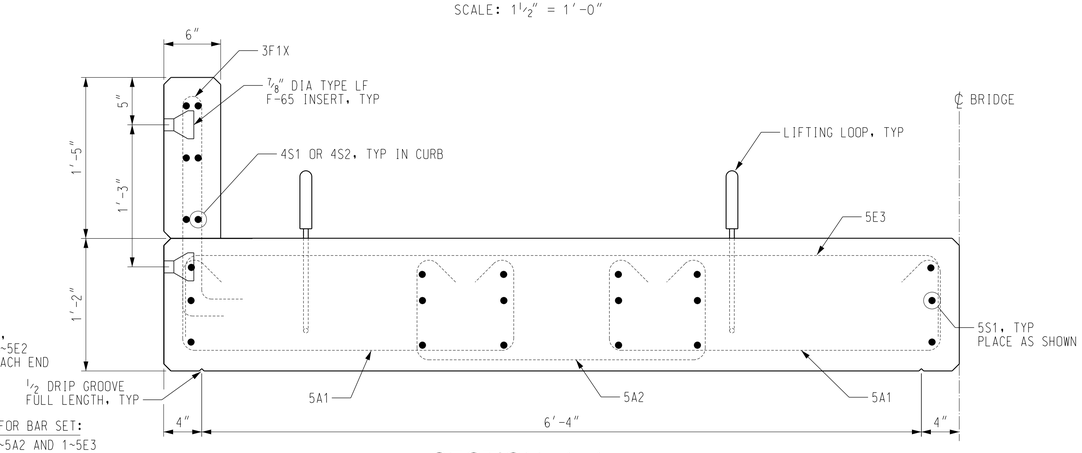
END VIEW

SCALE: 1½″ = 1′-0″



ELEVATION

SCALE: ¾″ = 1′-0″



SECTION A–A

SCALE: 1½″ = 1′-0″

14” DEEP PRESTRESSED CONCRETE SLAB BEAM MK SB16.7

6 REQUIRED

CONCRETE VOLUME = 5.1 CU. YD (BEAM), 0.5 CU.YD (CURB)

LIFT WEIGHT = 22,200 LBS (22.2 KIPS)

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: CLB
DRAWN BY: GJT
CHECKED BY: AGH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

WIRE MILL POND RR BRIDGE
PRESTRESSED CONCRETE SLAB BEAM DETAILS (SHEET 2 OF 2)

PREPARED FOR:

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MISSOULA, MT 59803-1489

DATE: MAY 2019

PROJECT NUMBER:

BW-502

SHEET: 96 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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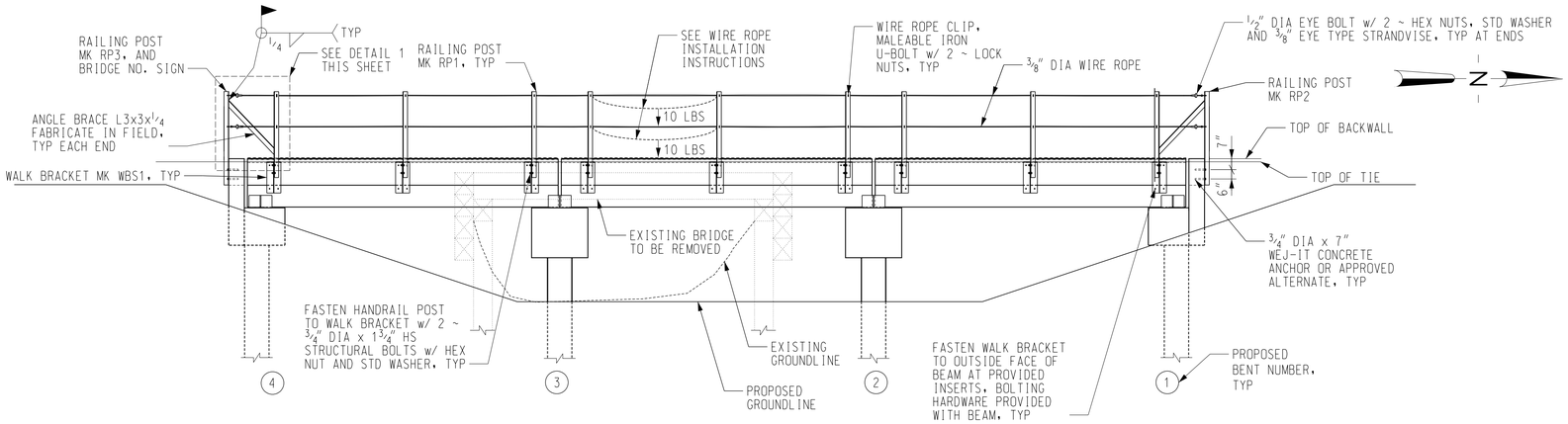


VIEW A–A

SCALE: 1/4" = 1'-0"

WALKWAY GENERAL NOTES

STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH ASTM DESIGNATION A36 OR APPROVED EQUIVALENT. ALL STRUCTURAL STEEL ITEMS AND HARDWARE TO BE GALVANIZED UNLESS OTHERWISE NOTED.

HANDRAIL POSTS ON WALKWAYS SHALL BE ERECTED PLUMB AND IN LINE.

GALVANIZING OF STRUCTURAL STEEL AFTER FABRICATION SHALL BE IN ACCORDANCE WITH THE CURRENT ASTM DESIGNATION A123.

GALVANIZING OF IRON AND STEEL HARDWARE SHALL BE IN ACCORDANCE WITH THE CURRENT ASTM DESIGNATION A153.

FIELD PAINT ANGLE BRACES, WELDED AREAS, AND ABRASIONS OR CUTS ON RAILING POSTS, WALK BRACKETS, AND GRIP STRUT WALKWAY WITH ONE PRIME AND ONE FINISH COAT OF ZINC RICH PAINT.

WIRE ROPE SHALL BE 3/8" DIA, 7-WIRE STRAND, SIEMENS MARTIN GRADE, TYPE A COATING.

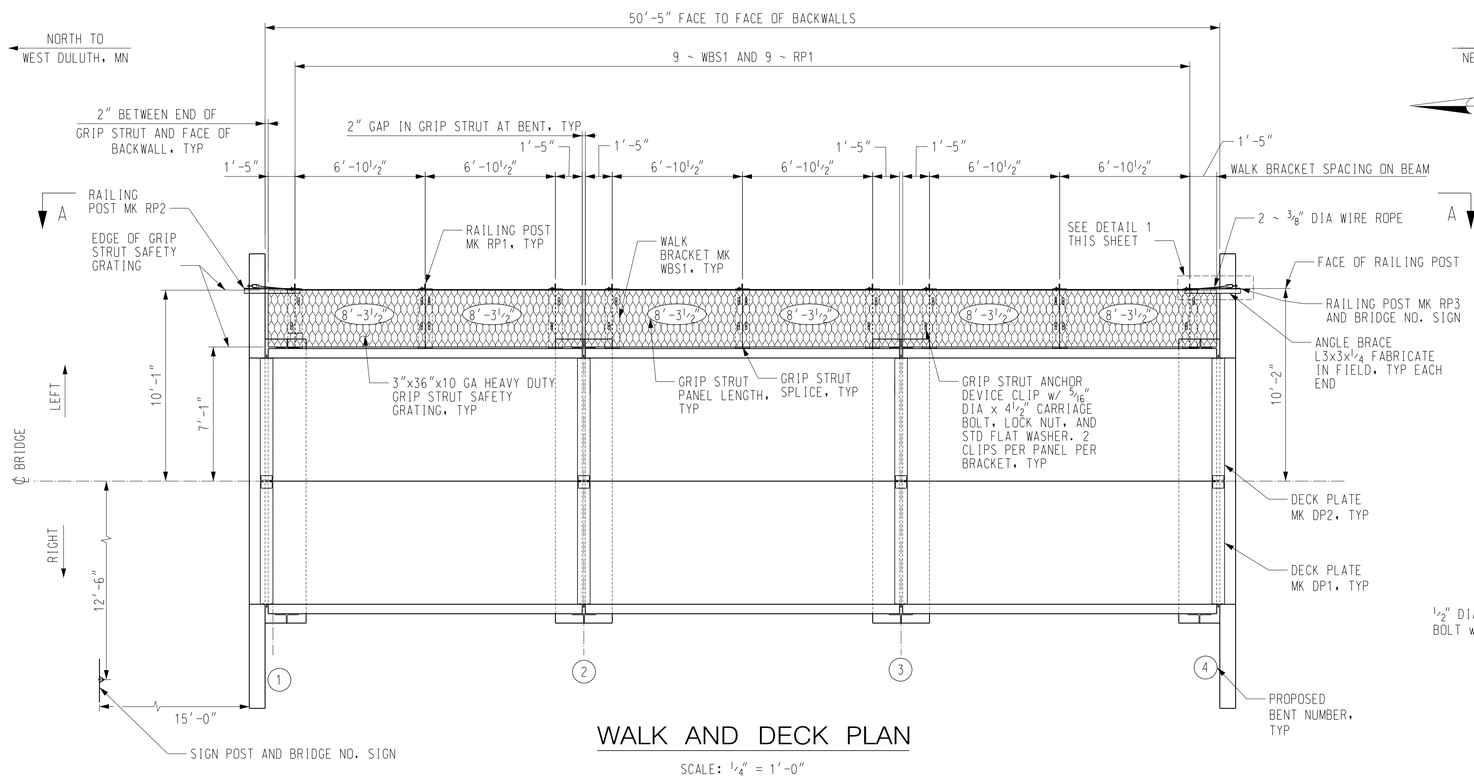
EYE BOLTS SHALL BE 1/2" DIAMETER WITH 2" LONG SHANK AND 1" INSIDE DIAMETER EYE.

WIRE ROPE CLIPS SHALL BE MALLEABLE IRON U-BOLTS 1/4" DIAMETER x 1 1/2" LONG WITH A 1" CENTERLINE WIDTH.

GRIP STRUT ANCHOR DEVICE CLIPS SHALL BE MCNICHOLS NO. 12262 DIAMOND ANCHOR DEVICE OR APPROVED EQUAL AND BE COMPATIBLE WITH THE GRIP STRUT PANELS ORDERED.

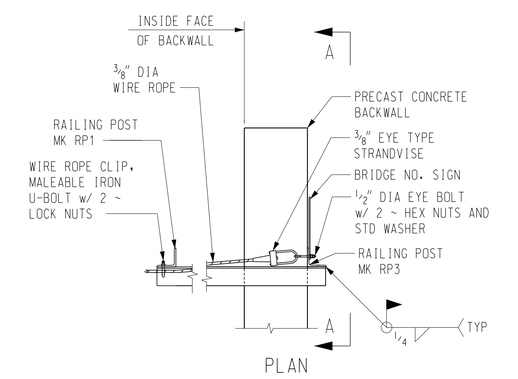
WIRE ROPE INSTALLATION INSTRUCTIONS

1. THREAD WIRE ROPE THROUGH ALL CLIPS AND BARREL ANCHORS AND SEAT RETAINING WEDGES ON ONE END RAILING POST (DO NOT TIGHTEN).
2. STRETCH WIRE ROPE AND HANG A MINIMUM OF 10 LBS ON ROPE BETWEEN TWO POSTS AS SHOWN. REMOVE ALL SAG IN ROPE TO A MAXIMUM OF 2 INCHES.
3. SEAT RETAINING WEDGES AT REMAINING END POST.
4. REMOVE WEIGHTS.
5. TIGHTEN CLIPS AT INTERMEDIATE POSTS.
6. CUT AND REMOVE EXCESS WIRE ROPE, COAT CUT PORTIONS OF WIRE ROPE WITH COLD GALVANIZING COMPOUND.

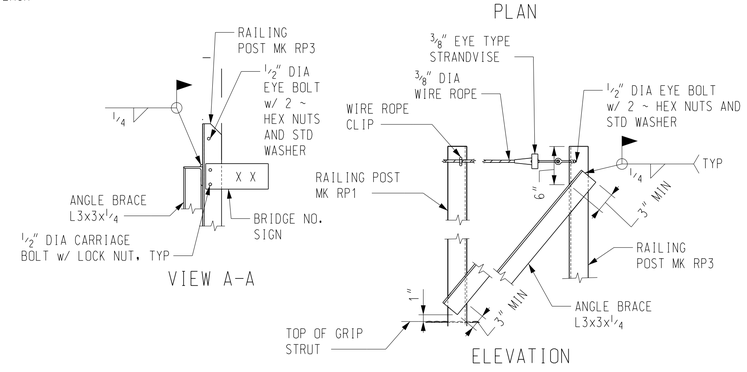


WALK AND DECK PLAN

SCALE: 1/4" = 1'-0"



PLAN



DETAIL 1

SCALE: 1" = 1'-0"

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: CLB
DRAWN BY: GJT
CHECKED BY: AGH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

WIRE MILL POND RR BRIDGE
WALK AND DECK PLAN AND HANDRAIL DETAILS

PREPARED FOR:

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HDR ENGINEERING, INC.
700 SW HIGGINS AVE., SUITE 200
MISSOULA, MT 59803-1489

DATE: MAY 2019

PROJECT NUMBER:

BW-503

SHEET: 97 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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PRECAST CONCRETE NOTES

FABRICATION AND WORKMANSHIP SHALL CONFORM TO CURRENT AREMA MANUAL FOR RAILWAY ENGINEERING, CHAPTER 8, CONCRETE STRUCTURES AND PROJECT SPECIFICATIONS.

PRECAST CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4500 PSI AT 28 DAYS PER SPECIFICATION FOR PRECAST CONCRETE PRODUCTS.

CONCRETE SHALL BE VIBRATED INTERNALLY DURING PLACEMENT TO PROVIDE THROUGH CONSOLIDATION AND COMPACTION. CARE SHALL BE TAKEN TO AVOID DISPLACEMENT OF EMBEDDED ITEMS.

ALL REINFORCING STEEL FOR CAP SHALL CONFORM TO ASTM A615 GR 60.

ALL REINFORCING STEEL SHALL HAVE A MINIMUM OF 2" CLEAR COVER, UNLESS OTHERWISE NOTED.

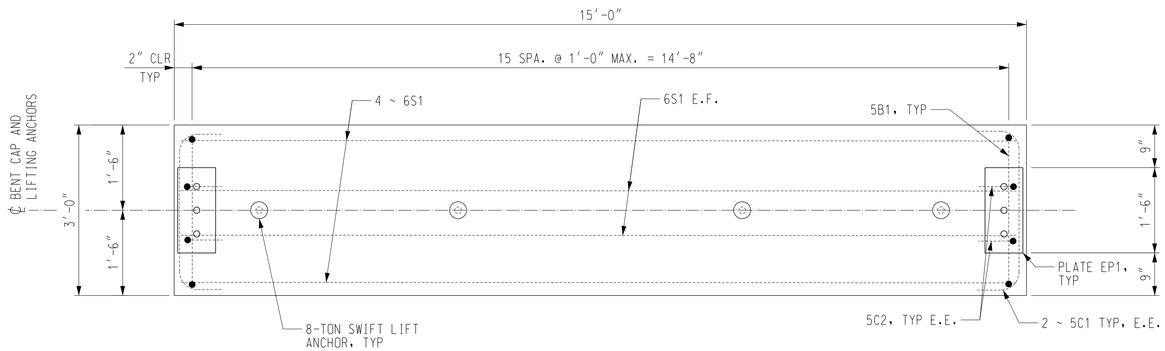
ALL BAR BENDING AND STANDARD HOOK DIMENSIONS SHALL BE IN ACCORDANCE WITH THE "MANUAL OF STANDARD PRACTICE" AS PUBLISHED BY THE CONCRETE REINFORCING STEEL INSTITUTE UNLESS OTHERWISE SHOWN OR NOTED.

CHAMFER ALL EXPOSED CORNERS 3/4", TYPICAL.

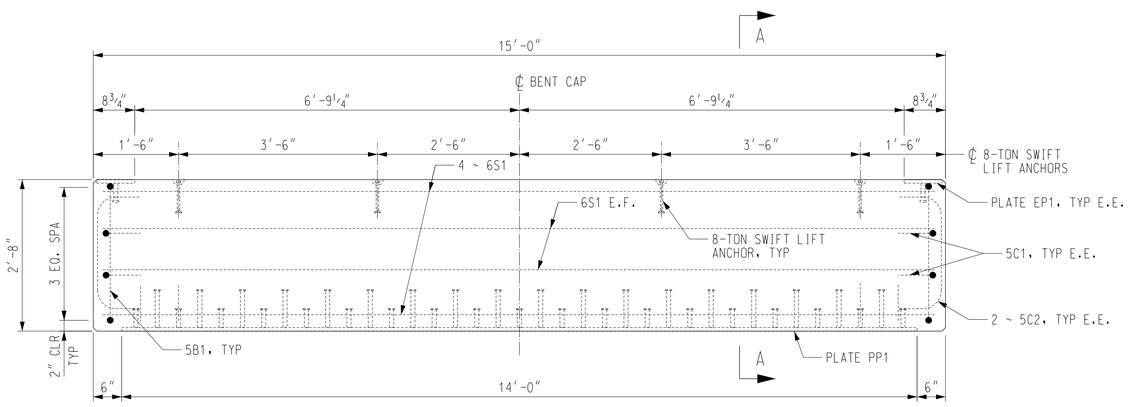
CONCRETE SHALL BE DYED TO ACHIEVE A UNIFORM NATURAL WOOD TONE FINISH PER THE PROJECT SPECIFICATIONS. PROPOSED COLOR SAMPLE SHALL BE SUBMITTED AND APPROVED PRIOR TO FABRICATION. PROPOSED COLOR SHALL MATCH THAT OF THE PRECAST CONCRETE BEAMS.

FABRICATOR TO VERIFY ALL LIFTING DEVICES NECESSARY FOR FABRICATION, TRANSPORTATION, AND PLACEMENT.

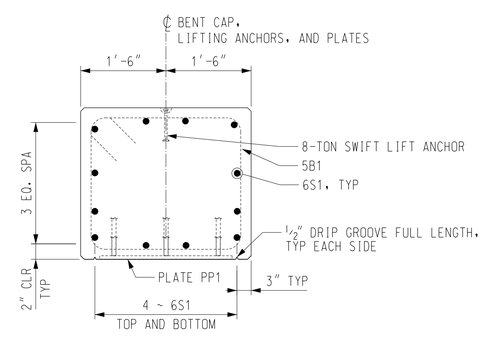
E.F. = EACH FACE
E.E. = EACH END



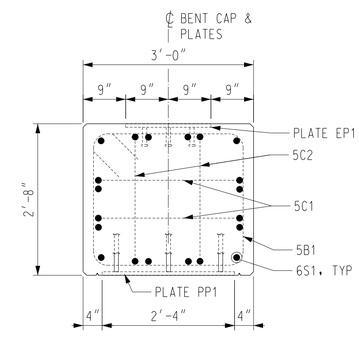
PLAN



ELEVATION



SECTION A–A



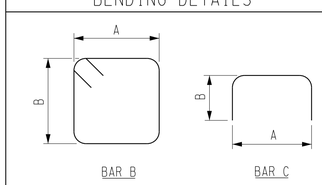
END VIEW

PRECAST CONCRETE BENT CAP MK BC1

SCALE: 3/4" = 1'-0"
ESTIMATED LIFTING WEIGHT = 19,210 LBS. (9.6 TONS)
CONCRETE VOLUME = 4.5 C.Y.

REINFORCING SCHEDULE FOR BENT CAP MK BC1						
QTY	MARK	SIZE	TYPE	A	B	LENGTH
16	5B1	5	B	2'-8"	2'-4"	10'-11"
4	5C1	5	C	2'-7"	10"	4'-3"
4	5C2	5	C	2'-3"	10"	3'-11"
12	6S1	6	STR	-	-	14'-8"
TOTAL REINFORCING WEIGHT (LBS) = 481						

BENDING DETAILS



ALL DIMENSIONS SHOWN ARE OUT TO OUT OF BARS.

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: CLB
DRAWN BY: GJT
CHECKED BY: AGH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

STANDARD RR BRIDGE COMPONENTS AND DETAILS
PRECAST CONCRETE BENT CAP DETAILS AND NOTES

PREPARED FOR:
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HDR ENGINEERING, INC.
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MISSOULA, MT 59803-1489

DATE: MAY 2019
PROJECT NUMBER:
BG-501
SHEET: 98 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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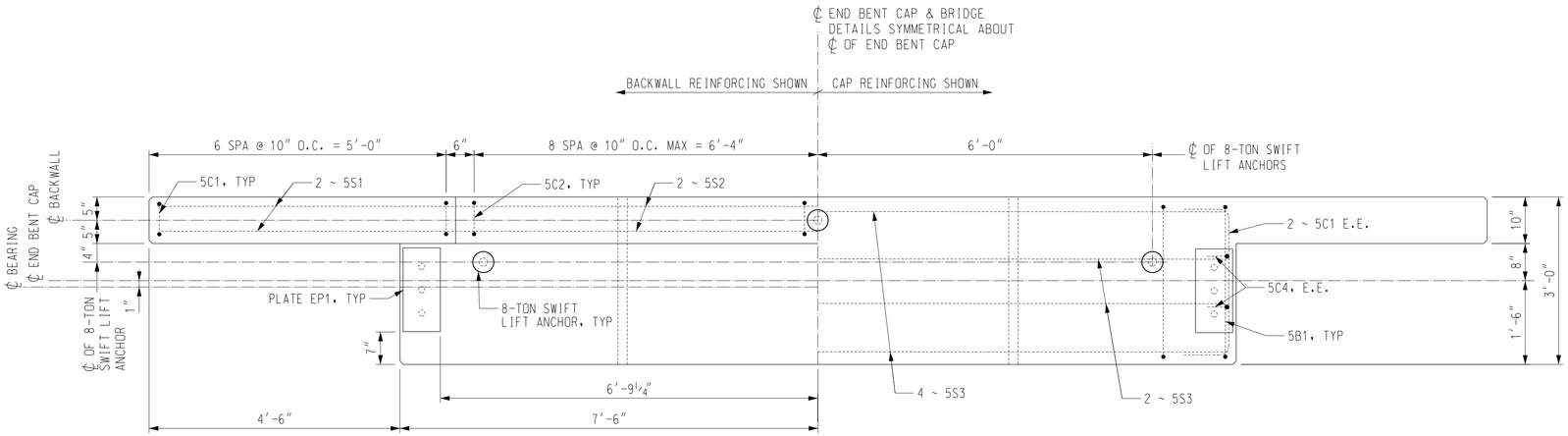
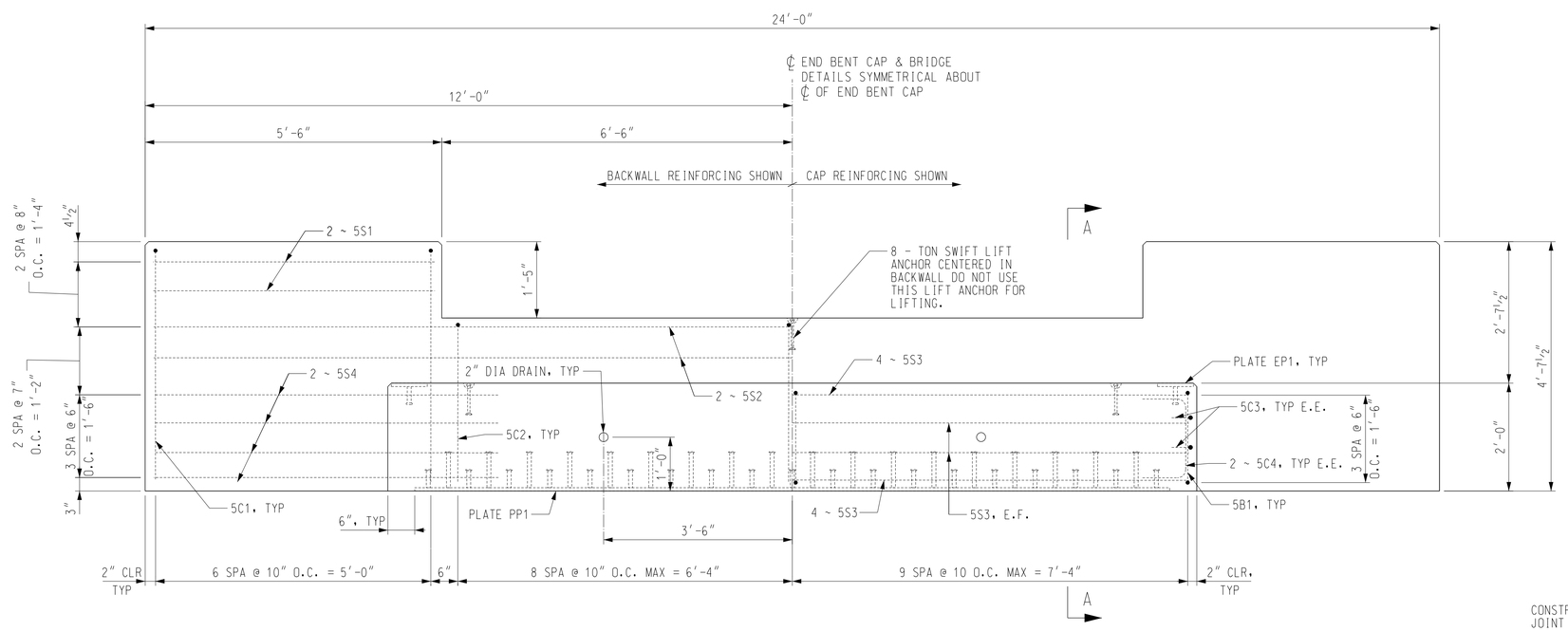


PLAN

BOTTOM AND SIDE LONGITUDINAL MATS OF REINFORCING NOT SHOWN FOR CLARITY



ELEVATION

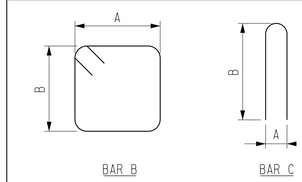
PRECAST CONCRETE END BENT CAP MK EBC1

SCALE: ⅜" = 1'-0"
EST. LIFTING WEIGHT = 22,520 LBS (11.3 TONS)
CONCRETE VOLUME = 5.3 C.Y

REINFORCING SCHEDULE FOR END BENT CAP MK EBC1

QTY	MARK	SIZE	TYPE	A	B	LENGTH
19	5B1	5	B	2'-8"	1'-8"	9'-7"
8	5S1	5	STR	-	-	5'-2"
4	5S2	5	STR	-	-	23'-8"
12	5S3	5	STR	-	-	14'-8"
16	5S4	5	STR	-	-	6'-4"
14	5C1	5	C	6"	4'-3½"	9'-1"
17	5C2	5	C	6"	2'-10½"	6'-3"
4	5C3	5	C	2'-7"	10"	4'-3"
4	5C4	5	C	1'-7"	10"	3'-3"
TOTAL REINFORCING WEIGHT (LBS) = 896						

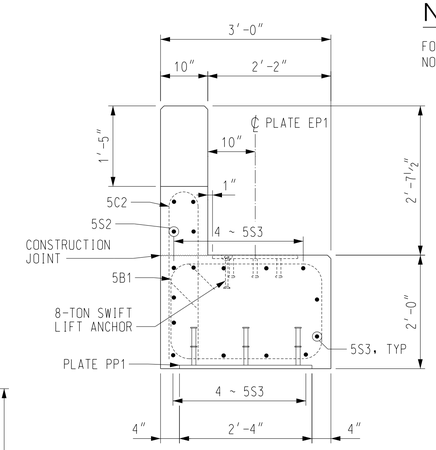
BENDING DETAILS



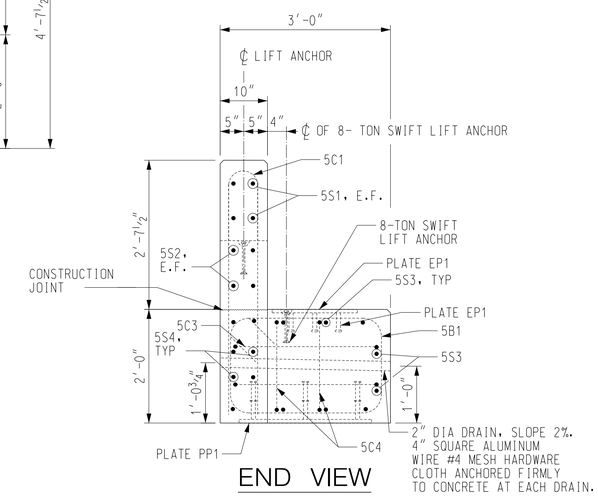
ALL DIMENSIONS SHOWN ARE OUT TO OUT OF BARS.

NOTES

FOR PRECAST CONCRETE NOTES, SEE SHEET 98.



SECTION A–A



END VIEW

NO.	DATE	BY	DESCRIPTION

REVISIONS

DESIGN INFORMATION
DESIGNED BY: CLB
DRAWN BY: GJT
CHECKED BY: AGH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

STANDARD RR BRIDGE COMPONENTS AND DETAILS
PRECAST CONCRETE END BENT CAP DETAILS

PREPARED FOR:

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HDR ENGINEERING, INC.
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MISSOULA, MT 59803-1489

DATE: MAY 2019

PROJECT NUMBER:

BG-502

SHEET: 99 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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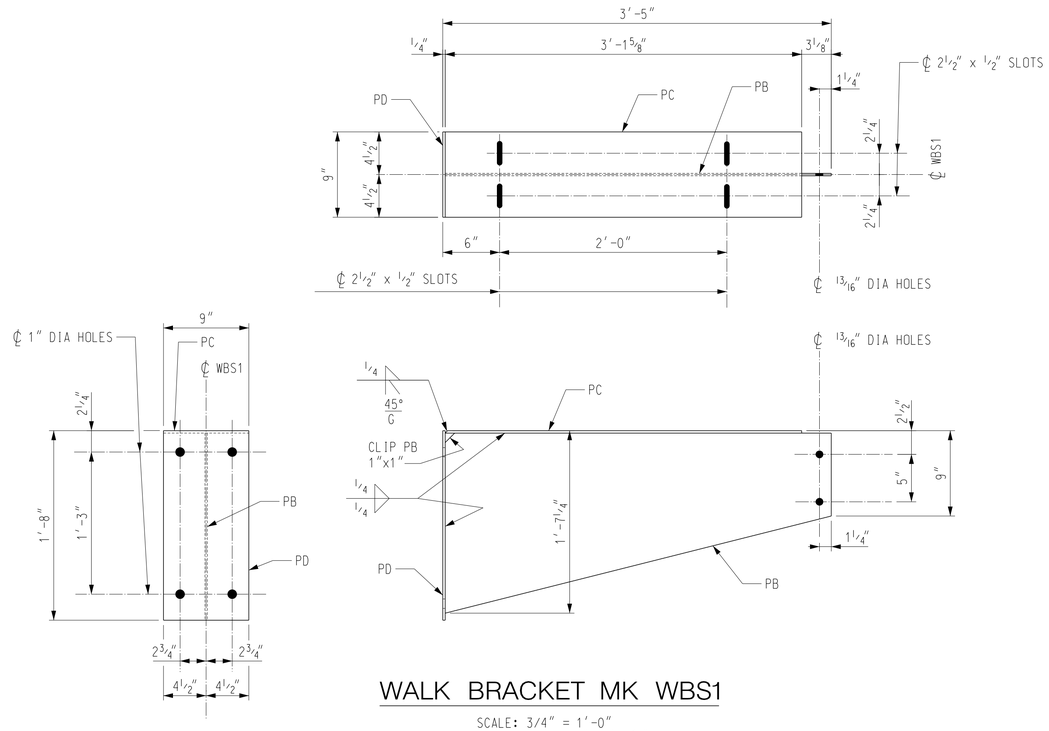
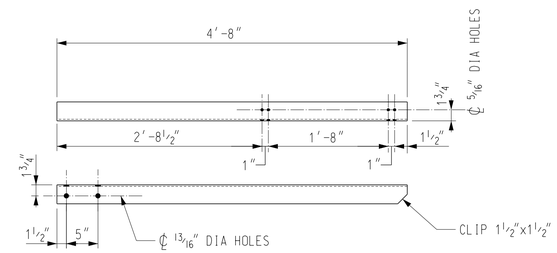


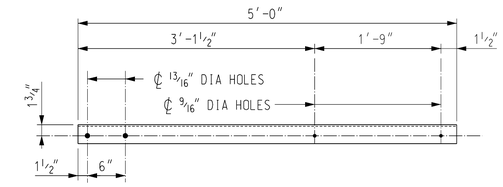
WALK BRACKET MK WBS1

SCALE: 3/4″ = 1′-0″
PB = 1 ~ PL 1/4″ x 19″x 3′-4 3/4″
*PC = 1 ~ PL 1/4″ x 9″x 3′-1 5/8″
*PD = 1 ~ PL 1/4″ x 9″x 1′-8″
WEIGHT = 77 LBS
GALVANIZE AFTER FABRICATION
* ONE (1) BENT PLATE MAY BE SUBSTITUTED FOR THE TWO (2) PLATES PC AND PD SHOWN. MINIMUM INSIDE RADII OF BEND IN PLATE SHALL BE 1.5 TIMES THE THICKNESS OF THE PLATE FOR COLD BENDING.



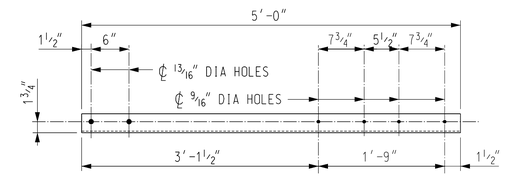
RAILING POST MK RP1

SCALE: 1″ = 1′-0″
1 ~ L3x3x1/4 x 4′-8″
GALVANIZE AFTER FABRICATION.
WEIGHT = 23 LBS



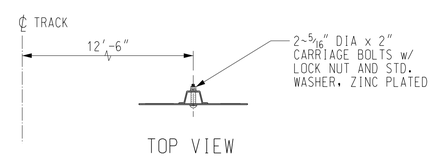
RAILING POST MK RP2

SCALE: 1″ = 1′-0″
1 ~ L3x3x1/4 x 5′-0″
GALVANIZE AFTER FABRICATION.
WEIGHT = 25 LBS

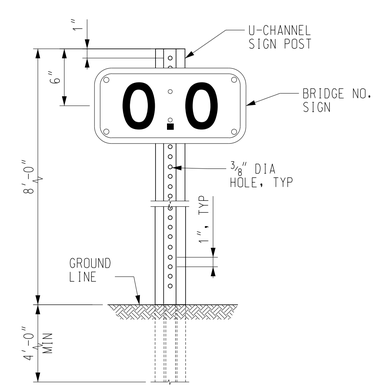


RAILING POST MK RP3

SCALE: 1″ = 1′-0″
1 ~ L3x3x1/4 x 5′-0″
GALVANIZE AFTER FABRICATION.
WEIGHT = 25 LBS



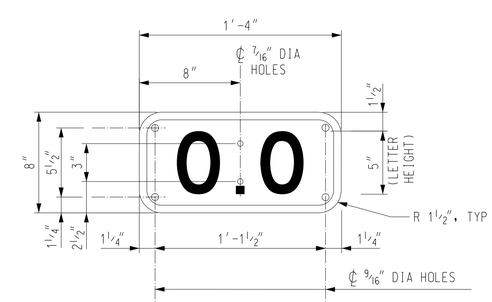
TOP VIEW



FRONT VIEW

SIGN POST MOUNTING DETAIL

SCALE: NTS
SIGN POST WEIGHT = 2.0 LB/FT
1 SIGN POST PER BRIDGE



BRIDGE NO. SIGN DETAIL

SCALE: 2″ = 1′-0″
LETTERING AND BACKGROUND
ON ONE SIDE ONLY
WEIGHT = 10 LBS
2 SIGNS PER BRIDGE,
BRIDGE NO.'S (3.2, 3.9)

GENERAL NOTES

ALL MATERIAL AND WORKMANSHIP SHALL BE PER THE CURRENT PROJECT SPECIFICATIONS.

STRUCTURAL STEEL SHALL MEET THE REQUIREMENTS OF THE CURRENT ASTM DESIGNATION A36 UNLESS OTHERWISE NOTED.

FABRICATION AND ARC WELDING OF STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH CHAPTER 15, PART 3 OF THE CURRENT AREMA MANUAL FOR RAILWAY ENGINEERING.

GALVANIZING SHALL BE IN ACCORDANCE WITH THE CURRENT ASTM DESIGNATION A123.

SIGN NOTES

SIGN POSTS SHALL MEET THE REQUIREMENTS OF ASTM A107, GRADE 1060 AND HAVE A WEIGHT PER LINEAL FOOT OF 2.0 LBS. POSTS SHALL BE MADE FROM NEW BILLET STEEL.

SIGNS TO BE WHITE 3M HIGH INTENSITY BACKGROUND ON 0.80″ 3105 ALUMINUM SHEET.

ALL LETTERS AND NUMERALS TO BE BLACK 3M 3650-12 "SCOTCHCAL PLUS" NON-REFLECTIVE OR 3M PROCESSED INK.

USE GOTHIC SERIES "D" LETTERS OR FIGURES OF THE SIZE SPECIFIED ON THE SIGN DETAIL.

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: CLB
DRAWN BY: GJT
CHECKED BY: AGH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

STANDARD RR BRIDGE COMPONENTS AND DETAILS
WALKWAY AND HANDRAIL DETAILS

PREPARED FOR:

EPA

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HDR ENGINEERING, INC.
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MISSOULA, MT 59803-1489

DATE: MAY 2019

PROJECT NUMBER:

BG-503

SHEET: 100 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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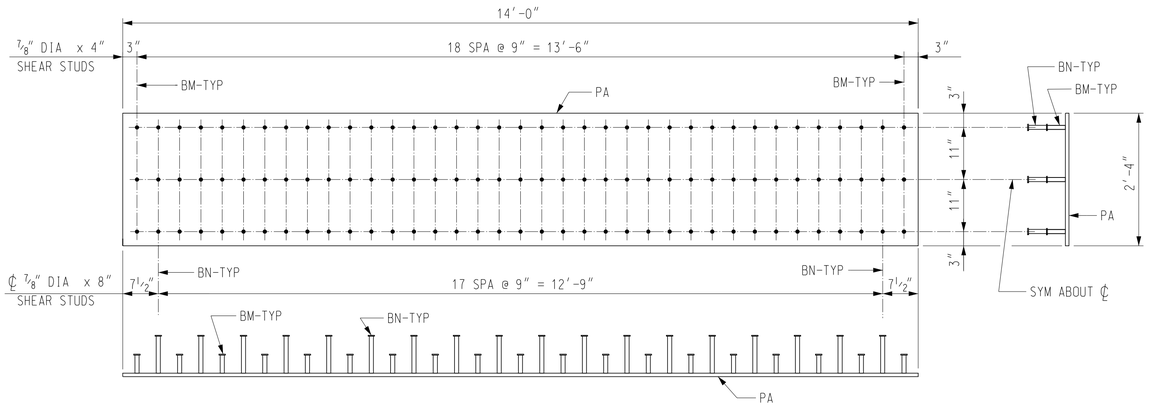


PILE PLATE PP1

SCALE: 3/4" = 1'-0"
1~PL 3/4"x28"x 14'-0" - PA
57~7/8" DIA x 4" SHEAR STUDS - BM
54~7/8" DIA x 8" SHEAR STUDS - BN
WEIGHT = 1,113 LBS

STEEL NOTES

STRUCTURAL STEEL PLATES AND BARS SHALL MEET THE REQUIREMENTS OF THE CURRENT ASTM DESIGNATION A709, GRADE 36.

SHEAR STUD CONNECTORS CONFORMING TO ASTM A108, GRADE 1010 THRU 1020 SHALL BE FASTENED TO THE STEEL PLATE PER CURRENT AWS WELDING CODE D1.1, SECTION 7. CONTACT SURFACES OF PLATE SHALL BE CLEANED PER STEEL STUCTURES PAINTING COUNCIL SPECIFICATION SSPC-SP6 PRIOR TO WELDING STUDS. DO NOT SHOP PAINT.

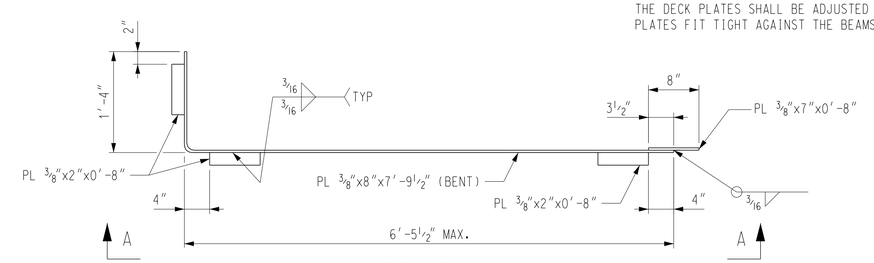
FABRICATION NOTES

FABRICATION AND ARC WELDING OF STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH CHAPTER 15, PART 3 OF THE CURRENT AREMA MANUAL FOR RAILWAY ENGINEERING.

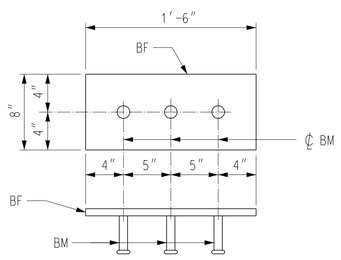
AFTER GALVANIZING ALL ELEMENTS SHALL BE FREE OF FINS, ABRASIONS, ROUGH OR SHARP EDGES AND OTHER SURFACE DEFECTS.

GALVANIZING SHALL BE IN ACCORDANCE WITH THE CURRENT ASTM DESIGNATION A123.

THE DECK PLATES SHALL BE ADJUSTED AS NECESSARY TO ENSURE THE PLATES FIT TIGHT AGAINST THE BEAMS AND CURBS.

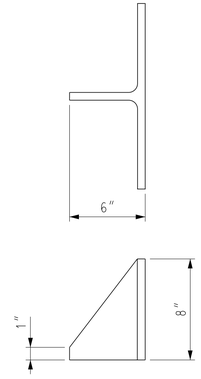


ELEVATION



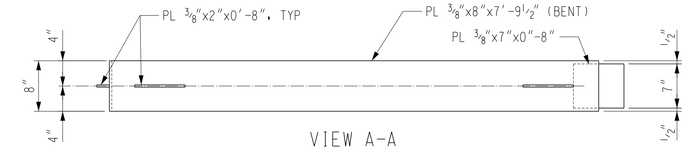
EMBED PLATE EP1

SCALE: 1 1/2" = 1'-0"
1~BAR 8"x3/4" x 1'-6" - BF
3-7/8" DIA x 4" STUDS - BM
WEIGHT = 33 LBS



TRANSVERSE RESTRAINT BRACKET MK BK1

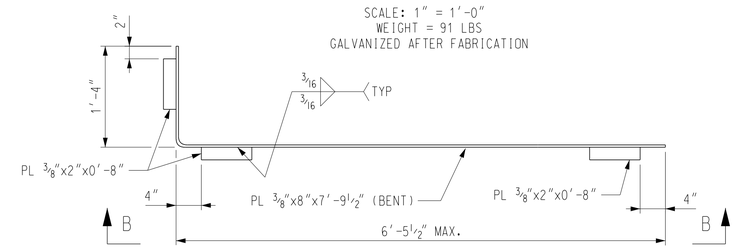
SCALE: 2" = 1'-0"
FABRICATE FROM
HP14x89# PILE CUTOFFS.
WEIGHT = 30 LBS



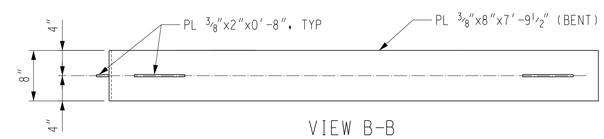
VIEW A-A

DECK PLATE MK DP1

SCALE: 1" = 1'-0"
WEIGHT = 91 LBS
GALVANIZED AFTER FABRICATION



ELEVATION



VIEW B-B

DECK PLATE MK DP2

SCALE: 1" = 1'-0"
WEIGHT = 85 LBS
GALVANIZED AFTER FABRICATION

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: CLB
DRAWN BY: GJT
CHECKED BY: AGH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

STANDARD RR BRIDGE COMPONENTS AND DETAILS
STEEL DETAILS

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HDR ENGINEERING, INC.
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DATE: MAY 2019
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BG-504
SHEET: 101 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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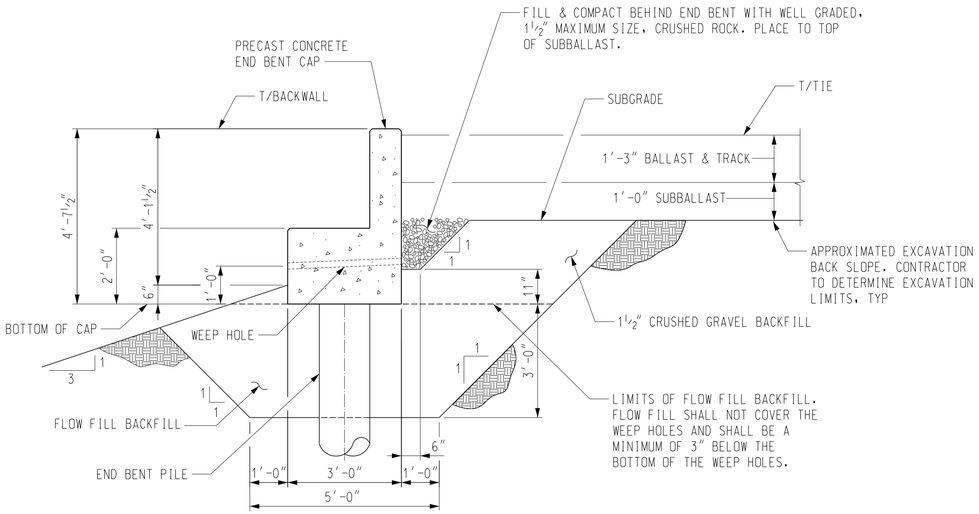


HEAD OF BANK DETAILS

BEFORE BACKFILLING END BENTS, APPLY A COATING OF PETROLATUM TO PILE PLATE PP1, AND TOP ONE FOOT OF PILES.

BEARING PAD SPECIFICATIONS

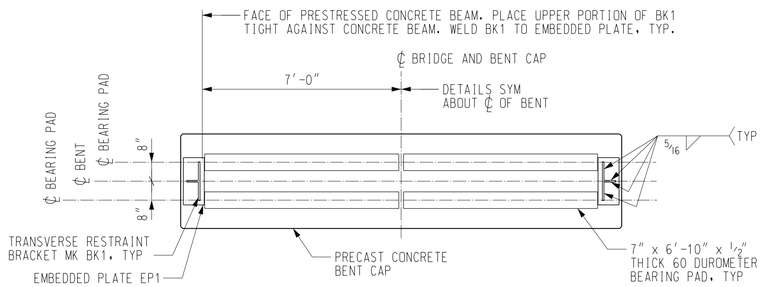
BEARING PADS SHALL BE RANDOM ORIENTED FIBER ELASTOMERIC MATERIAL COMPRISED OF HIGH-QUALITY OZONE-RESISTANT VIRGIN ELASTOMER AND SYNTHETIC FIBERS. PADS SHALL CONFORM TO THE PROJECT SPECIFICATIONS AND THE FOLLOWING MINIMUM MATERIAL PROPERTIES:

HARDNESS (SHORE A, ASTM D2240)	60 ± 5
TENSILE STRENGTH, PSI (ASTM D412, DIE C)	2500 ± 100
ULTIMATE ELONGATION, MINIMUM %	350
HEAT AGING (ASTM D573, 70 HOURS AT NOTED TEMPERATURE)	
DUROMETER, 212 °F, MAXIMUM POINT CHANGE	0 TO +15
TENSILE STRENGTH, 158 °F, MAXIMUM % CHANGE	-15
ULTIMATE ELONGATION, 212 °F, MAXIMUM % CHANGE	-40
COMPRESSION SET, MAXIMUM % (ASTM D395 22 HOURS AT 158 F, METHOD B)	25
APPARENT SHEAR MODULUS (GA), PSI, BASED ON TESTS CONDUCTED AT 70 F TO 80 F UNDER UNIFORM COMPRESSIVE STRESSES OF 500, 1000, AND 1500 PSI AND AT APPLIED HORIZONTAL SHEAR PLUS SLIP STRAIN OF 50%. GA IS CONSTANT IN ALL DIRECTIONS PARALLEL TO THE BEARING PLAN.	230 ± 30

CUTTING OF THE PADS SHALL BE DONE SO THAT THE EDGES HAVE NO TEARS OR OTHER JAGGED AREAS.

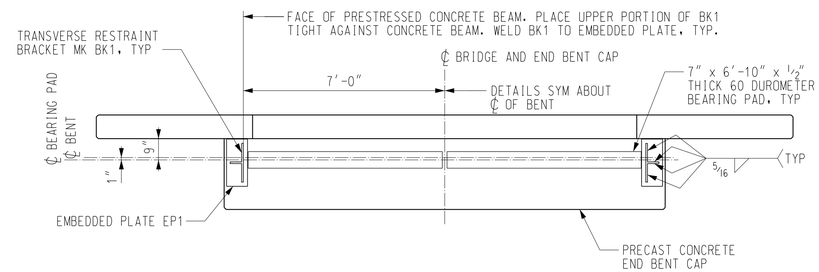
PERMISSIBLE TOLERANCES OF THE PAD SHALL BE AS STATED IN SECTION 5.12.6b, CHAPTER 15 OF THE 2017 AREMA MANUAL AND THE PROJECT SPECIFICATIONS.

THE CAP FABRICATOR SHALL FASTEN THE BEARING PADS TO THE CAP BY USING THE FOLLOWING PROCEDURE: CLEAN PADS ACCORDING TO MANUFACTURER'S RECOMMENDATIONS; PRIME CONTACT SURFACE AND GLUE TO CAP WITH AN APPROVED EPOXY.



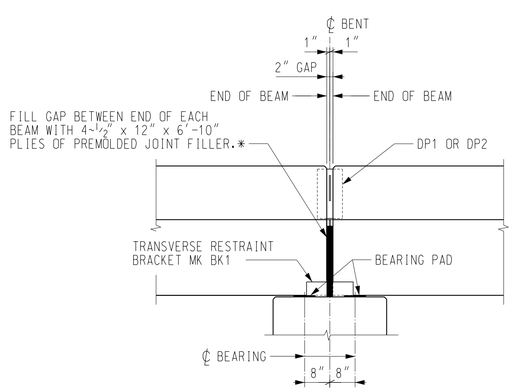
BEARING PAD LAYOUT–INTERIOR BENT

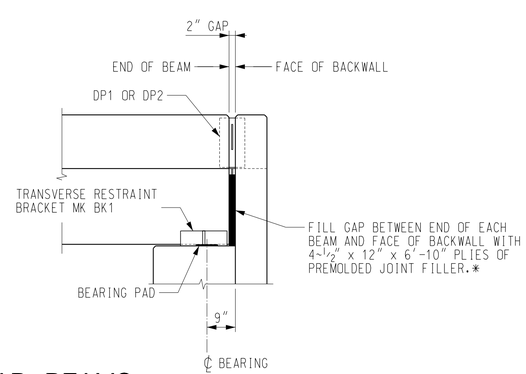
SCALE: 3/8" = 1'-0"



BEARING PAD LAYOUT–END BENT

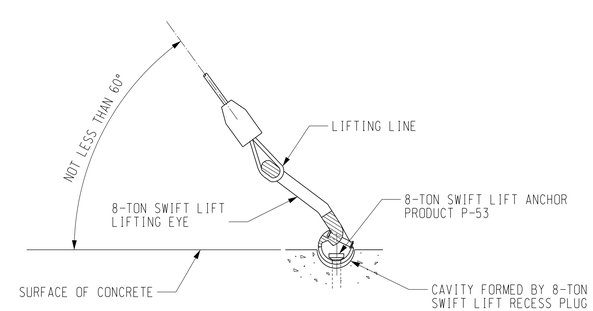
SCALE: 3/8" = 1'-0"





BEARING DETAILS – SLAB BEAMS

* PREMOLDED JOINT FILLER SHALL BE ASPHALT IMPREGNATED



LIFTING DETAIL

NO SCALE

P-53 8-TON SWIFT LIFT RECESS PLUGS, ANCHORS AND LIFTING EYES ARE AVAILABLE FROM DAYTON SUPERIOR CORP. THE MATERIALS FOR THIS LIFTING SYSTEM ARE NOT INCLUDED IN THE BILL OF MATERIAL BUT ARE TO BE ORDERED AS REQUIRED.

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: CLB
DRAWN BY: GJT
CHECKED BY: AGH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

STANDARD RR BRIDGE COMPONENTS AND DETAILS
MISCELLANEOUS DETAILS

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

HDR ENGINEERING, INC.
700 SW HIGGINS AVE., SUITE 200
MISSOULA, MT 59803-1489

DATE: MAY 2019

PROJECT NUMBER:

BG-505

SHEET: 102 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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GENERAL NOTES

DESIGN LOADING

PEDESTRIAN BRIDGE HAS BEEN DESIGNED IN ACCORDANCE WITH THE CURRENT MINNESOTA DOT BRIDGE DESIGN MANUAL, AASHTO LRFD BRIDGE DESIGN SPECIFICATION, AND THE AASHTO LRFD GUIDE SPECIFICATIONS FOR THE DESIGN OF THE PEDESTRIAN BRIDGES.

DESIGN LIVE LOADING IS THE GREATER OF UNIFORM 90 PSF PEDESTRIAN LOAD OR SINGLE H10 DESIGN VEHICLE.

FINAL BEARING LOADS FOR FOUNDATION DESIGN SHALL BE PROVIDED BY TRUSS FABRICATOR FOR VERIFICATION OF THE FOUNDATION DESIGN BY THE ENGINEER.

STEEL TRUSS SUPERSTRUCTURE

THE STEEL SUPERSTRUCTURE DESIGN MUST BE A TRUSS CONFIGURATION SIMILAR TO THAT SHOWN ON THE DRAWINGS. THE BRIDGE CROSS-SECTION SHALL BE DETERMINED BY THE CONTRACTOR BUT SHALL COMPLY WITH THE DETAILS SHOWN ON THE PLANS. THE CONTRACTOR SHALL DETERMINE TRUSS HEIGHT AND THE LOCATION OF THE DECK WITH RESPECT TO THE TOP AND BOTTOM CHORDS IN ACCORDANCE WITH THE PLANS.

THE STEEL BRIDGE SUPERSTRUCTURE, BEARINGS, AND ASSOCIATED DETAILS INCLUDING TIMBER COMPONENTS SHALL BE DESIGNED UNDER THE DIRECTION OF A MINNESOTA PROESSIONAL ENGINEER. THE COMPLETED DESIGN, DRAWINGS AND SPECIFICATION PACKAGE SHALL BE SIGNED AND SEALED BY AN ENGINEER LICENSED IN MINNESOTA AND SUBMITTED FOR REVIEW. SEE PROJECT SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

INCLUDE ALL COSTS ASSOCIATED WITH DESIGN, FABRICATING, FURNISHING, AND ERECTING THE STEEL TRUSS SUPERSTRUCTURE INCLUDING THE HANDRAIL AND TIMBER DECKING IN THE UNIT PRICE BID FOR STEEL TRUSS SUPERSTRUCTURE.

SEE PROJECT SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

REFERENCE DATA

ALL DETAILS AND DIMENSIONS OF THE EXISTING SITE ARE BASED ON FIELD SURVEY DATA SUPPLIED BY AECOM, INC. ON JUNE 15, 2016 WITH SUPPLEMENTARY DATA SUPPLIED ON JUNE 12, 2018.

BRIDGE STATIONING IS BASED ON THE INSIDE FACE OF THE NORTH EXISTING BACKWALL OF THE EXISTING WIRE MILL POND RAILROAD BRIDGE AS STATION 204+78.00.

BENCHMARK DATA: SURVEY CONTROL POINT, STA 165+96.52, OFFSET 276.76′ RIGHT, ELEV 651.21′.
VERTICAL DATUM: NAVD88
HORIZONTAL DATUM: NAD83/96 MINNESOTA NORTH ZONE

HYDRAULIC INFORMATION IS BASED ON HYDRAULIC MODELING INFORMATION PROVIDED BY EA ENGINEERING, SCIENCE, AND TECHNOLOGY, INC. DATED JANUARY 24, 2019 AND FEMA FIRM PANEL NO. 2704210045C.

GEOTECHNICAL INFORMATION IS BASED ON HDR ENGINEERING, INC. GEOTECHNICAL REPORT DATED MAY 2019.

BRIDGE STATIONING AND RIGHT-OF-WAY ARE BASED ON HISTORICAL NORTHERN PACIFIC RAILWAY (N.P. RY.) TRACK CHARTS.

GENERAL

IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE ACTUAL FIELD CONDITIONS AND ANY NECESSARY AS-BUILT DIMENSIONS AFFECTING THE SATISFACTORY COMPLETION OF THE WORK REQUIRED FOR THIS PROJECT.

NEW CONSTRUCTION SHOWN AS HEAVY LINES. EXISTING STRUCTURES TO REMAIN SHOWN AS LIGHT LINES. EXISTING STRUCTURES TO BE REMOVED SHOWN AS LIGHT DOTTED LINES.

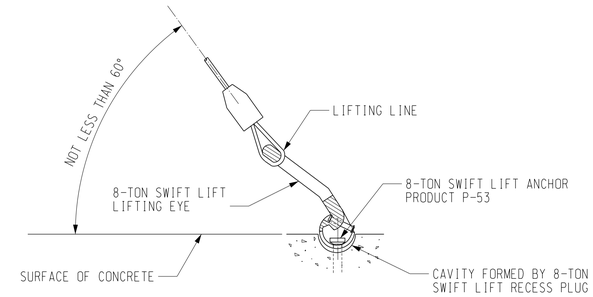
CONTRACTOR IS RESPONSIBLE FOR DEWATERING TO FACILITATE CONSTRUCTION WHEN REQUIRED TO SATISFACTORILY COMPLETE THE WORK REQUIRED FOR THIS PROJECT.

IN ORDER TO ENSURE THE HYDRAULIC CAPACITY OF THE BRIDGE, THE FINISHED GROUND UNDER THE BRIDGE SHALL BE SHAPED TO MATCH THE UPSTREAM CHANNEL AND FLOODPLAIN AS SHOWN ON DRAWING BP-101.

CONTRACTOR SHALL DOCUMENT ALL WORK IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS INCLUDING SUPPLYING: AS-BUILT DRAWINGS, PILE DRIVING RECORDS, AND SHOP DRAWINGS FOR ALL PREFABRICATED COMPONENTS. ALL SHOP DRAWINGS SHALL BE APPROVED BY THE ENGINEER PRIOR TO FABRICATION PER THE PROJECT SPECIFICATIONS.

CONTRACTOR SHALL DISPOSE OF ALL SOIL WASTE MATERIALS IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS INCLUDING, BUT NOT LIMITED TO, EXISTING TIMBER STRUCTURES, SOILS, AND DEFICIENT TRAIL MATERIALS.

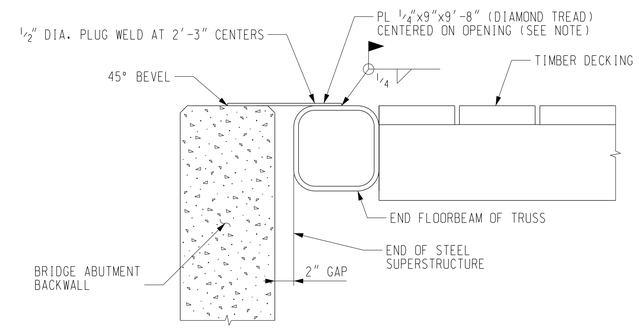
INFORMATION SHOWN ON THESE PLANS CONCERNING TYPE AND LOCATION OF EXISTING UNDERGROUND AND OVERHEAD UTILITES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONCTRACTOR SHALL VERIFY THE LOCATION OF UNDERGROUND AND OVERHEAD UTILITIES BEFORE BEGINNING CONSTRUCTION.



LIFTING DETAIL

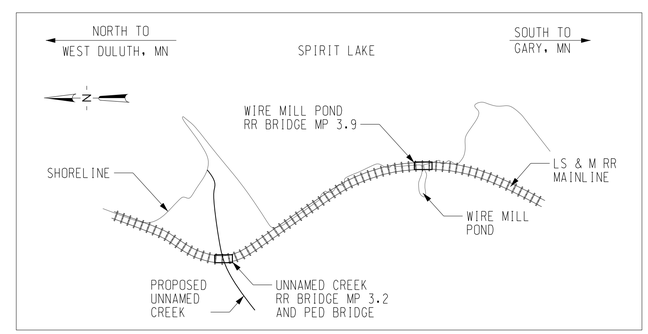
NO SCALE

P-53 8-TON SWIFT LIFT RECESS PLUGS, ANCHORS AND LIFTING EYES ARE AVAILABLE FROM DAYTON SUPERIOR CORP. THE MATERIALS FOR THIS LIFTING SYSTEM ARE NOT INCLUDED IN THE BILL OF MATERIAL BUT ARE TO BE ORDERED AS REQUIRED.



COVER PLATE DETAIL

SCALE: 1 1/2"= 1′-0"
COORDINATE WITH TRUSS SUPPLIER DETAILS OF COVER PLATE.



VICINITY MAP

0 500 1000 2000 3000
SCALE IN FEET

BID ITEMS ~ UNNAMED CREEK PED BRIDGE

ITEM NO.	ITEM DESCRIPTION	QTY.	UNIT
1	FURNISH AND DRIVE PILE*	308	LF
2	PREFABRICATED STEEL TRUSS SUPERSTRUCTURE AND DECK	1	LS
3	FABRICATE AND INSTALL PRECAST CONCRETE SUBSTRUCTURE**	1	LS
4	INSTALL PREFABRICATED STEEL TRUSS SUPERSTRUCTURE	1	LS

* INCLUDES COAL TAR EPOXY COATING AS SPECIFIED ON SHEET BP-102.
** INCLUDES ALL COMPONENTS OF SUBSTRUCTURE SHOWN ON THESE PLANS EXCEPT PILING.

LIST OF DRAWINGS ~ UNNAMED CREEK PED BRIDGE

DRAWING NUMBER	SHT. NO.	TITLE
BP-001	103	GENERAL NOTES AND ESTIMATED QUANTITIES
BP-101	104	GENERAL LAYOUT AND TYPICAL SECTIONS
BP-102	105	PILE PLAN AND DETAILS
BP-501	106	PRECAST CONCRETE END BENT CAP DETAILS

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: MCH
DRAWN BY: GJT
CHECKED BY: MCH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UNNAMED CREEK PED BRIDGE
GENERAL NOTES AND ESTIMATED QUANTITIES

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
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HDR ENGINEERING, INC.
700 SW HIGGINS AVE., SUITE 200
MISSOULA, MT 59803-1489

DATE: MAY 2019

PROJECT NUMBER:

BP-001

SHEET: 103 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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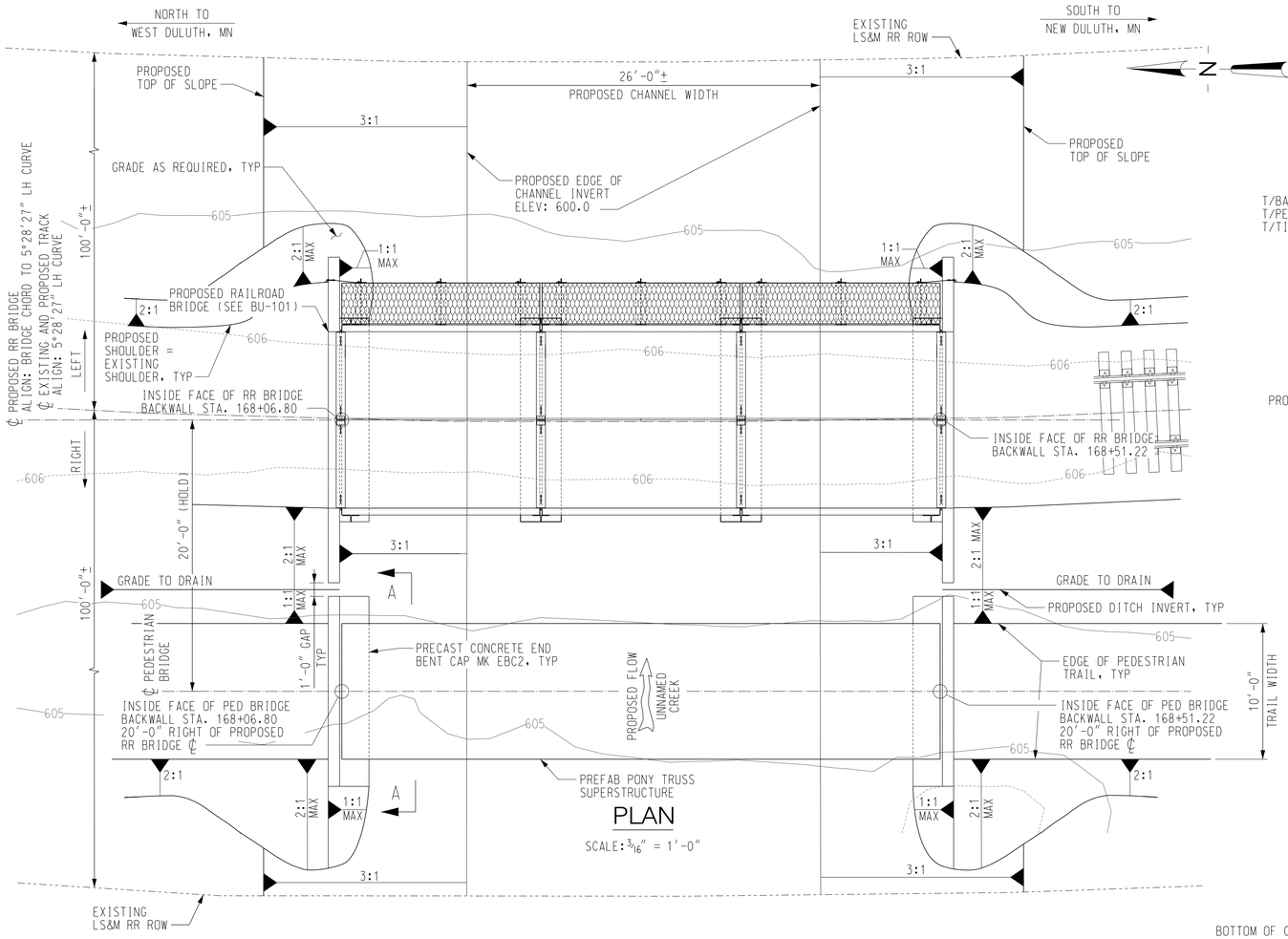
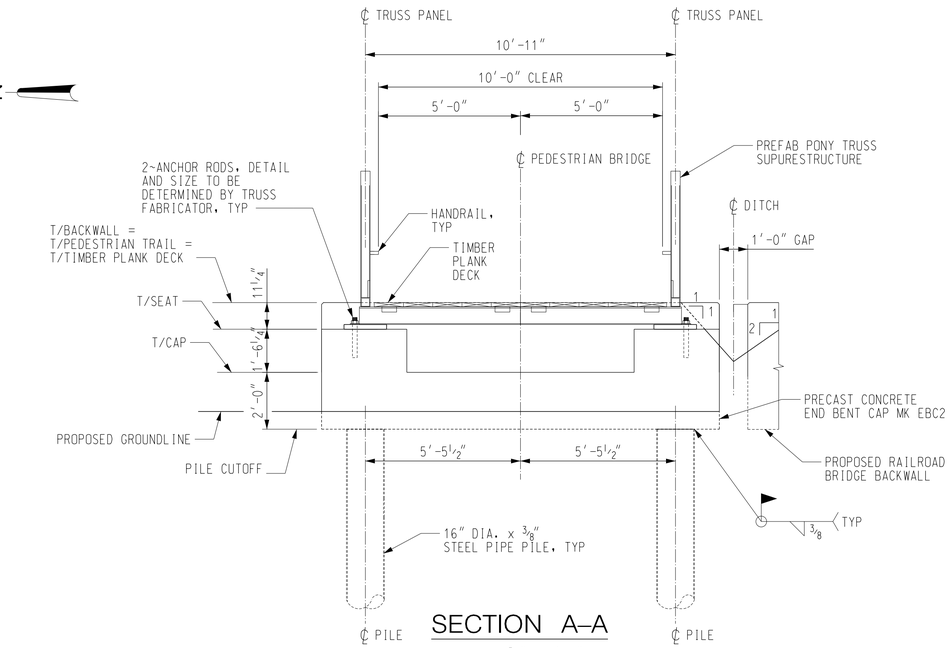


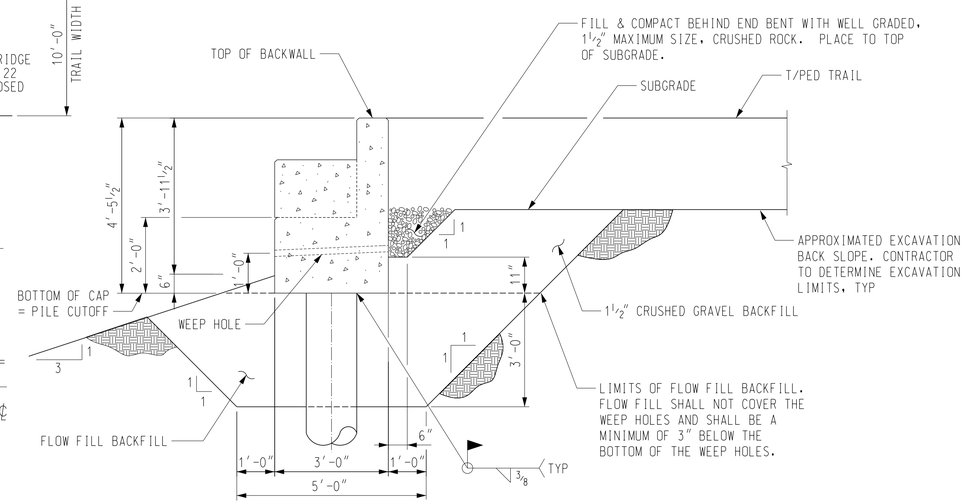
PLAN

SCALE: 3/16" = 1'-0"



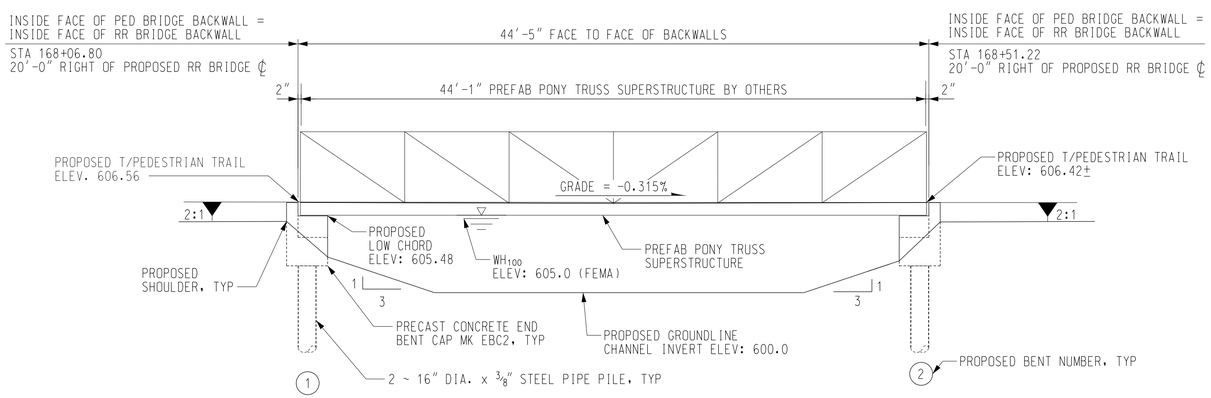
SECTION A–A

SCALE: 3/8" = 1'-0"



HEAD OF BANK DETAILS

BEFORE BACKFILLING END BENTS, APPLY A COATING OF PETROLATUM TO PILE PLATE PP2, AND TOP ONE FOOT OF PILES.



ELEVATION

SCALE: 3/16" = 1'-0"

TABLE OF ELEVATIONS ~ UNNAMED CREEK PED BRIDGE		
LOCATION	END BENT 1	END BENT 2
PROPOSED TOP OF PEDESTRIAN TRAIL	606.56	606.42
TOP OF CAP	604.10	603.97
PILE CUTOFF	602.10	601.97
TOP OF PATH TO PILE CUTOFF	4'-5½"	4'-5½"

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: MCH
DRAWN BY: GJT
CHECKED BY: MCH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UNNAMED CREEK PED BRIDGE
GENERAL LAYOUT AND TYPICAL SECTIONS

PREPARED FOR:
EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

HDR ENGINEERING, INC.
700 SW HIGGINS AVE., SUITE 200
MISSOULA, MT 59803-1489

DATE: MAY 2019

PROJECT NUMBER:
BP-101

SHEET: 104 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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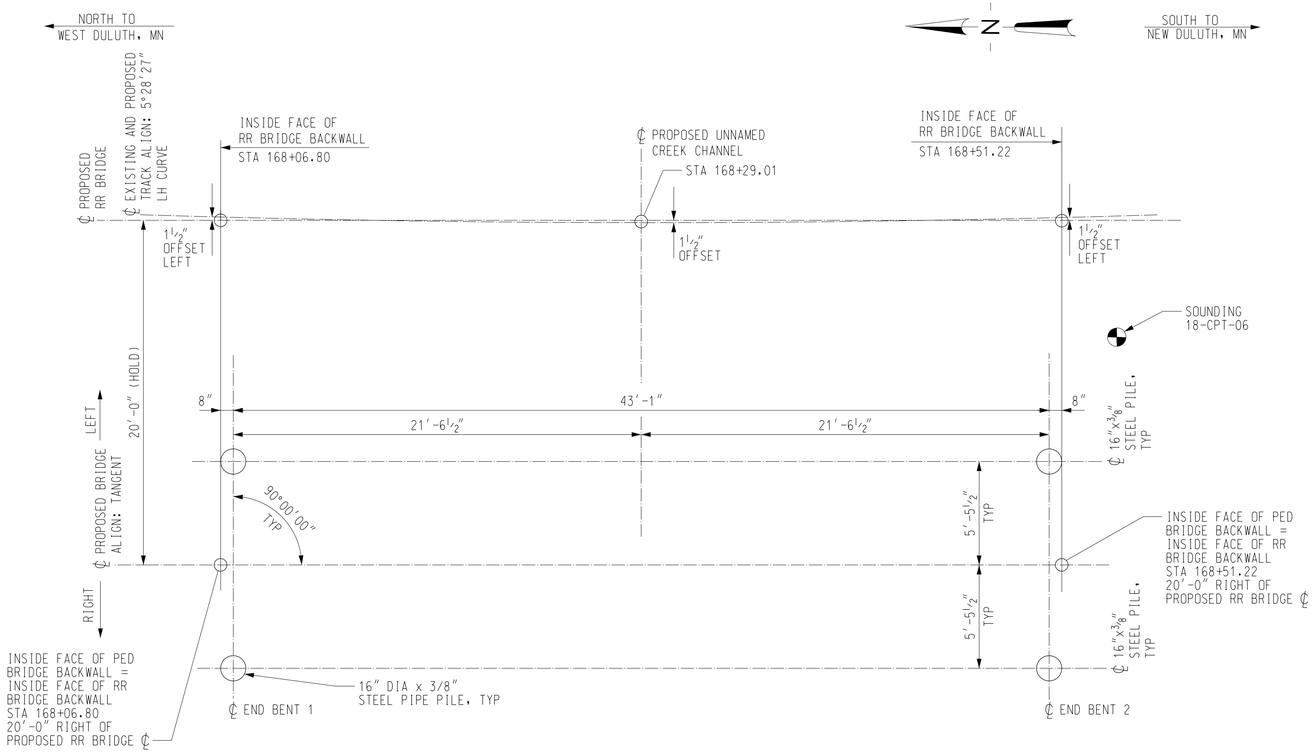
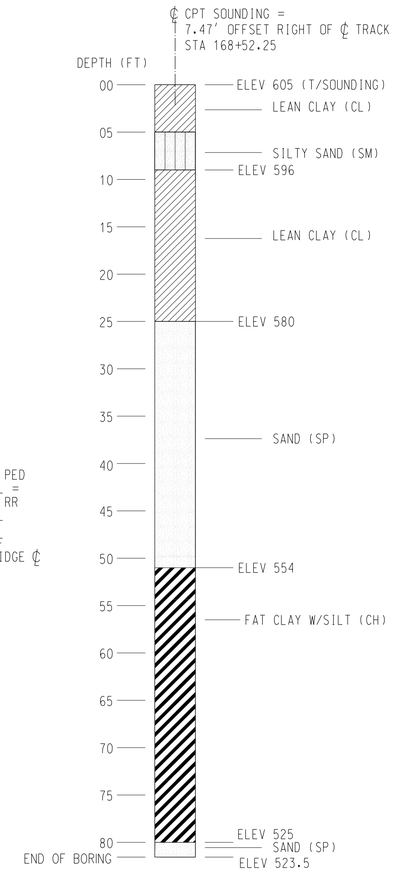


PILE PLAN

NO SCALE



SOUNDING 18-CPT-06

NO SCALE

PILE NOTES

PIPE PILES SHALL BE 16" DIA x ⅜" CONCRETE FILLED STEEL PIPE PILES AND MEET THE REQUIREMENTS OF ASTM A252 GRADE 3, Fy = 45 KSI.

PILE POINTS SHALL BE INSTALLED PER THE MANUFACTURER'S RECOMMENDATIONS ON ALL PIPE PILES PRIOR TO DRIVING.

DEBURR ALL EDGES.

FABRICATION SHALL CONFORM TO CURRENT AREMA GUIDELINES.

BRIDGE PIPE PILES SHALL BE DRIVEN PER THE PROJECT SPECIFICATIONS TO THE DEEPER, MORE CONSERVATIVE DEPTH REQUIRED BY EITHER THE MINIMUM TIP ELEVATION OR TO ACHIEVE THE REQUIRED ULTIMATE CAPACITY NOTED IN THE PILE DATA TABLE. CONTACT THE ENGINEER IF PRACTICAL REFUSAL IS REACHED PRIOR TO REACHING THE MINIMUM TIP ELEVATION.ESTIMATED PILE LENGTH BELOW CUTOFF IS SHOWN IN THE PILE DATA TABLE.

CONTRACTOR SHOULD BE PREPARED TO ADJUST PILE LENGTH WITHOUT DELAYING THE PROJECT.

SYMBOL 1:12 → DENOTES DIRECTION AND AMOUNT OF PILE BATTER.

THE CONTRACTOR SHALL HAVE SUFFICIENT PILE SPLICE MATERIAL ON HAND BEFORE PILE DRIVING IS STARTED.

CONTRACTOR TO SUBMIT PROPOSED DRIVING SYSTEM WITH ACCOMPANYING DRIVEABILITY ANALYSIS TO ENGINEER FOR CONFIRMATION OF DRIVEABILITY. MINIMUM RECOMMENDED PILE DRIVING HAMMER ENERGY IS 40 KIP-FT (DELMAG 16-32 OR GREATER). NOTE THE RECOMMENDED HAMMER SIZE IS BASED ON ANTICIPATED ENERGY REQUIRED TO ACHIEVE THE MINIMUM TIP ELEVATION WHICH MAY BE DEEPER THAN THE ELEVATION AT WHICH THE REQUIRED ULTIMATE CAPACITY IS REACHED TO ENSURE PILE TIP REACHES COMPETENT SOIL LAYERS.

THE MAXIMUM HORIZONTAL OUT OF POSITION TOLERANCE AT THE CUTOFF ELEVATION IS 3 INCHES.

PILE COATING NOTES

A COATING OF TWO COMPONENT (SELF-CURING) COAL TAR EPOXY PAINT CONFORMING TO STEEL STRUCTURES PAINTING COUNCIL SPECIFICATION SSPC-PAINT 16, COAL TAR EPOXY BLACK (OR DARK RED PAINT) SHALL BE SHOP APPLIED (AS PER THE MANUFACTURER'S RECOMMENDATIONS) TO THE ENTIRE OUTER SURFACE OF EACH PILE AND EMBED PLATE PRIOR TO PLACEMENT AS DETAILED BELOW.

STEEL SURFACES WHICH ARE TO RECEIVE THIS COATING SHALL BE PREPARED BY BLAST CLEANING TO NEAR WHITE, GRADE SSPC 10. THE COAL TAR EPOXY PAINT SHALL BE APPLIED BEFORE RUSTING OCCURS AND IN NO CASE LATER THAN 24 HOURS AFTER BLAST CLEANING.

THE COATING MAY BE APPLIED BY SPRAY OR BRUSH. IF THE APPLICATION IS BY BRUSH, APPLY WITH A STIFF BRUSH HEAVILY LOADED WITH PAINT; APPLY QUICKLY AND SMOOTHLY AND AVOID EXCESSIVE BRUSHING.

THE COATING SHALL BE APPLIED IN TWO COATS TO A TOTAL DRY FILM THICKNESS OF 16 MILS AT ITS THINNEST SPOT.

DRYING TIME BETWEEN COATS SHALL BE A MINIMUM OF 12 HOURS AND A MAXIMUM OF 72 HOURS UNDER NORMAL PAINTING CONDITIONS. LONG DRYING TIMES BETWEEN COATS WILL CAUSE POOR INTERCOAT ADHESION AND IT IS ADVISABLE IN WARM WEATHER TO REDUCE THE MAXIMUM INTERVAL BETWEEN COATS. IN VERY HOT WEATHER IT MAY BE NECESSARY TO LIMIT THE INTERCOAT DRYING PERIOD TO 24 HOURS OR LESS.

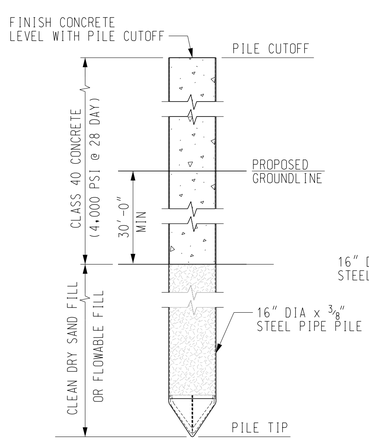
AT NORMAL TEMPERATURES THE COATING DRIES DUST FREE IN ABOUT FOUR HOURS AND BECOMES THOROUGHLY HARDENED AFTER 3 TO 5 DAYS OF CURING. PILE PLACEMENT SHALL NOT BEGIN SOONER THAN 5 DAYS AFTER COATING.

THE COATING SHALL NOT BE APPLIED WHEN THE RECEIVING SURFACES OR AMBIENT TEMPERATURES ARE BELOW 50 DEGREES FAHRENHEIT UNLESS IT CAN REASONABLY BE ANTICIPATED THAT THE AVERAGE AMBIENT TEMPERATURE WILL BE 50 DEGREES FAHRENHEIT OR HIGHER FOR THE 5 DAY PERIOD FOLLOWING THE APPLICATION OF ANY COAT.

STEEL MEMBERS WHICH ARE WELDED AFTER COATING SHALL HAVE THE COATING REMOVED FROM THE WELD AREAS AND SHALL RECEIVE TWO COATS OF THE COATING APPLIED TO THE WELD HEAT AFFECTED AREAS.

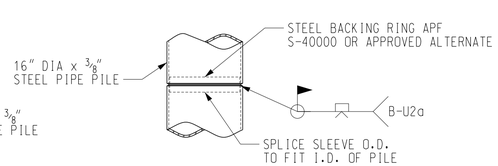
AFTER PLACEMENT, THE AREAS OF THE PILES AND BASE PLATES WHERE THE COATING HAS BEEN DAMAGED SHALL BE TOUCHED UP.

THE COST OF FURNISHING AND APPLYING THE COATING SHALL BE INCLUDED IN THE CONTRACT UNIT PRICE PER FOOT FOR 16" DIA x 3#8" THICK STEEL PIPE BEARING PILE, FURNISH AND DRIVE.



PILE FILL DETAIL

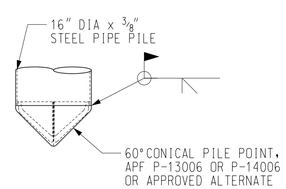
NO SCALE



PIPE PILE SPLICE DETAIL

NO SCALE

PILE SPLICE QUANTITY AND LOCATION TO BE DETERMINED BY CONTRACTOR BASED ON ORDERED LENGTHS



PIPE PILE POINT DETAIL

NO SCALE

PILE DATA TABLE ~ UNNAMED CREEK PED BRIDGE

LOCATION	T/PATH ELEV	PILE CUTOFF ELEV	REQUIRED ULTIMATE CAPACITY (TON) *	MINIMUM TIP ELEV	ESTIMATED PILE LENGTH BELOW CUTOFF (FT)
END BENT 1	606.56	602.10	88	525	77.1
END BENT 2	606.42	601.96	88	525	77.0

* BASED ON FACTOR OF SAFETY = 2.0.

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: MCH
DRAWN BY: GJT
CHECKED BY: MCH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UNNAMED CREEK PED BRIDGE
PILE PLAN AND DETAILS

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

HDR ENGINEERING, INC.
700 SW HIGGINS AVE., SUITE 200
MISSOULA, MT 59803-1489

DATE: MAY 2019

PROJECT NUMBER:

BP-102

SHEET: 105 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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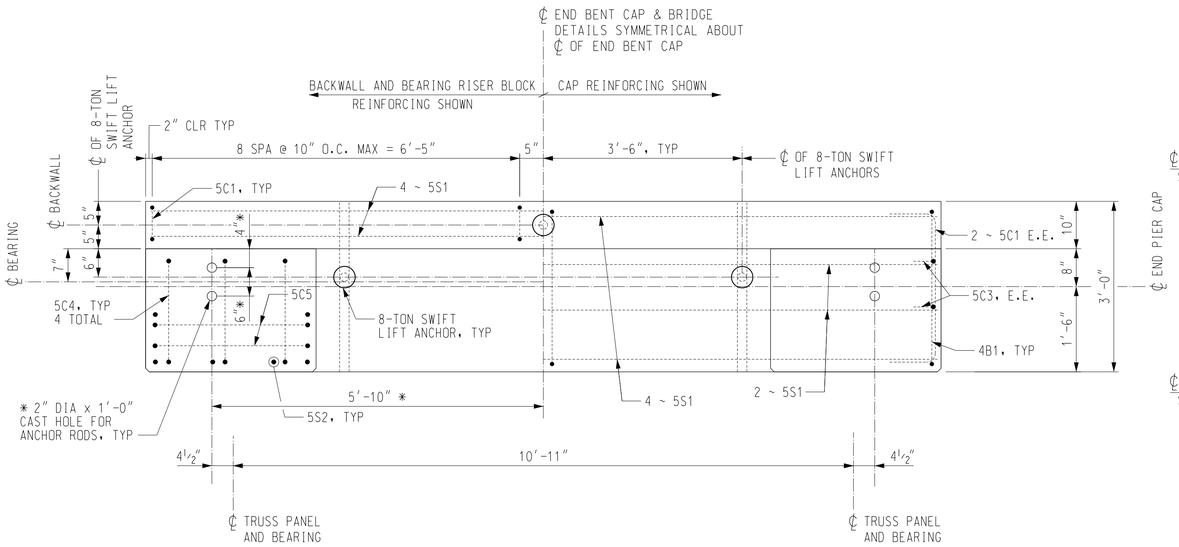
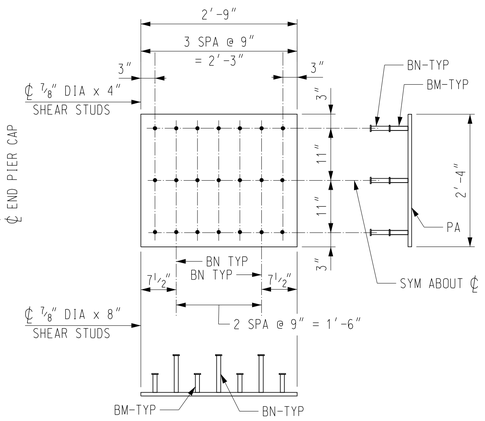


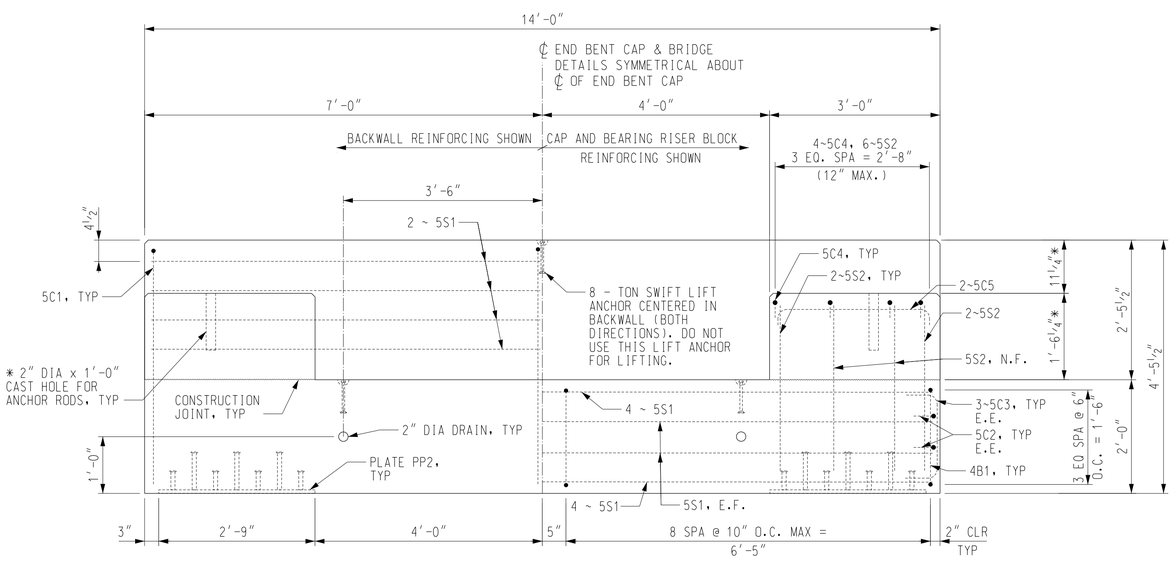
PLAN

BOTTOM AND SIDE LONGITUDINAL MATS OF REINFORCING NOT SHOWN FOR CLARITY

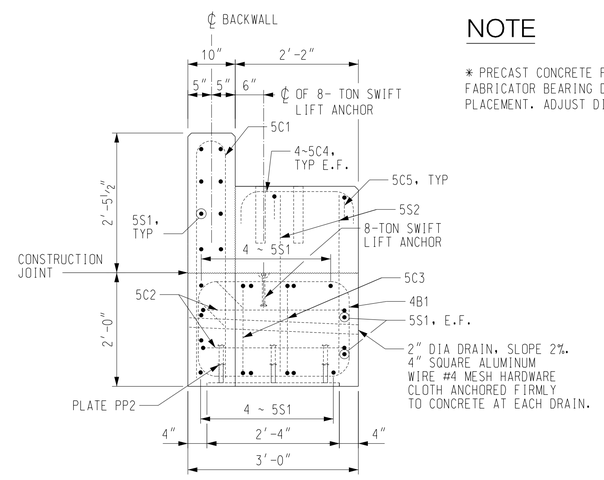


PILE PLATE PP2

SCALE: 3/4" = 1'-0"
1~PL 3/4"x28"x 2'-9" - PA
12~7/8" DIA x 4" SHEAR STUDS - BM
9~7/8" DIA x 8" SHEAR STUDS - BN
WEIGHT = 220 LBS



ELEVATION



END VIEW

STEEL NOTES

STRUCTURAL STEEL PLATES AND BARS SHALL MEET THE REQUIREMENTS OF THE CURRENT ASTM DESIGNATION A709, GRADE 36.

SHEAR STUD CONNECTORS CONFORMING TO ASTM A108, GRADE 1010 THRU 1020 SHALL BE FASTENED TO THE STEEL PLATE PER CURRENT AWS WELDINGCODE D1.1, SECTION 7. CONTACT SURFACES OF PLATE SHALL BE CLEANED PER STEEL STUCTURES PAINTING COUNCIL SPECIFICATION SSPC-SP6 PRIOR TO WELDING STUDS. DO NOT SHOP PAINT.

PRECAST CONCRETE NOTES

FABRICATION AND WORKMANSHIP SHALL CONFORM TO CURRENT AREMA MANUAL FOR RAILWAY ENGINEERING, CHAPTER 8, CONCRETE STRUCTURES AND CPR STANDARD SPECIFICATIONS.

PRECAST CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4500 PSI AT 28 DAYS PER SPECIFICATION FOR PRECAST CONCRETE PRODUCTS.

CONCRETE SHALL BE VIBRATED INTERNALLY DURING PLACEMENT TO PROVIDE THROUGH CONSOLIDATION AND COMPACTION. CARE SHALL BE TAKEN TO AVOID DISPLACEMENT OF EMBEDDED ITEMS.

ALL REINFORCING STEEL FOR CAP SHALL CONFORM TO ASTM A615 GR 60.

ALL REINFORCING STEEL SHALL HAVE A MINIMUM OF 2" CLEAR COVER, UNLESS OTHERWISE NOTED.

ALL BAR BENDING AND STANDARD HOOK DIMENSIONS SHALL BE IN ACCORDANCE WITH THE "MANUAL OF STANDARD PRACTICE" AS PUBLISHED BY THE CONCRETE REINFORCING STEEL INSTITUTE UNLESS OTHERWISE SHOWN OR NOTED.

CHAMFER ALL EXPOSED CORNERS 3/4", TYPICAL.

CONCRETE SHALL BE DYED TO ACHIEVE A UNIFORM NATURAL WOOD TONE FINISH PER THE PROJECT SPECIFICATIONS. PROPOSED COLOR SAMPLE SHALL BE SUBMITTED AND APPROVED PRIOR TO FABRICATION. PROPOSED COLOR SHALL MATCH THAT OF THE PRECAST CONCRETE BEAMS.

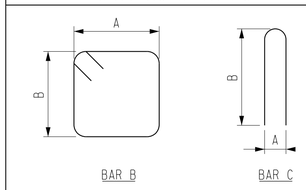
FABRICATOR TO VERIFY ALL LIFTING DEVICES NECESSARY FOR FABRICATION, TRANSPORTATION, AND PLACEMENT.

E.F. = EACH FACE
E.E. = EACH END
N.F. = NEAR FACE

NOTE

* PRECAST CONCRETE FABRICATOR TO VERIFY WITH STEEL SUPERSTRUCTURE FABRICATOR BEARING DEPTH REQUIREMENTS AND BEARING ANCHOR ROD HOLE PLACEMENT. ADJUST DIMENSIONS AS NECESSARY TO ACCOMMODATE.

BENDING DETAILS



ALL DIMENSIONS SHOWN ARE OUT TO OUT OF BARS.

PRECAST CONCRETE END BENT CAP MK EBC2

SCALE: 3/8" = 1'-0"
ESTIMATED LIFTING WEIGHT = 19,900 LB. (10.0 TONS)
CONCRETE VOLUME = 4.9 CY ±

REINFORCING SCHEDULE FOR END BENT CAP MK EBC2

QTY	MARK	SIZE	TYPE	A	B	LENGTH
18	4B1	4	B	2'-8"	1'-8"	9'-5"
18	5C1	5	C	6"	4'-1½"	8'-9"
4	5C2	5	C	2'-7"	10"	4'-3"
4	5C3	5	C	1'-7"	10"	3'-3"
8	5C4	5	C	1'-10"	10"	3'-6"
4	5C5	5	C	2'-8"	10"	4'-4"
20	5S1	5	STR	-	-	13'-8"
12	5S2	5	STR	-	-	3'-2"
TOTAL REINFORCING WEIGHT (LBS) = 696						

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: MCH
DRAWN BY: GJT
CHECKED BY: MCH
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

UNNAMED CREEK PED BRIDGE
PRECAST END BENT CAP DETAILS

PREPARED FOR:
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HDR ENGINEERING, INC.
700 SW HIGGINS AVE., SUITE 200
MISSOULA, MT 59803-1489

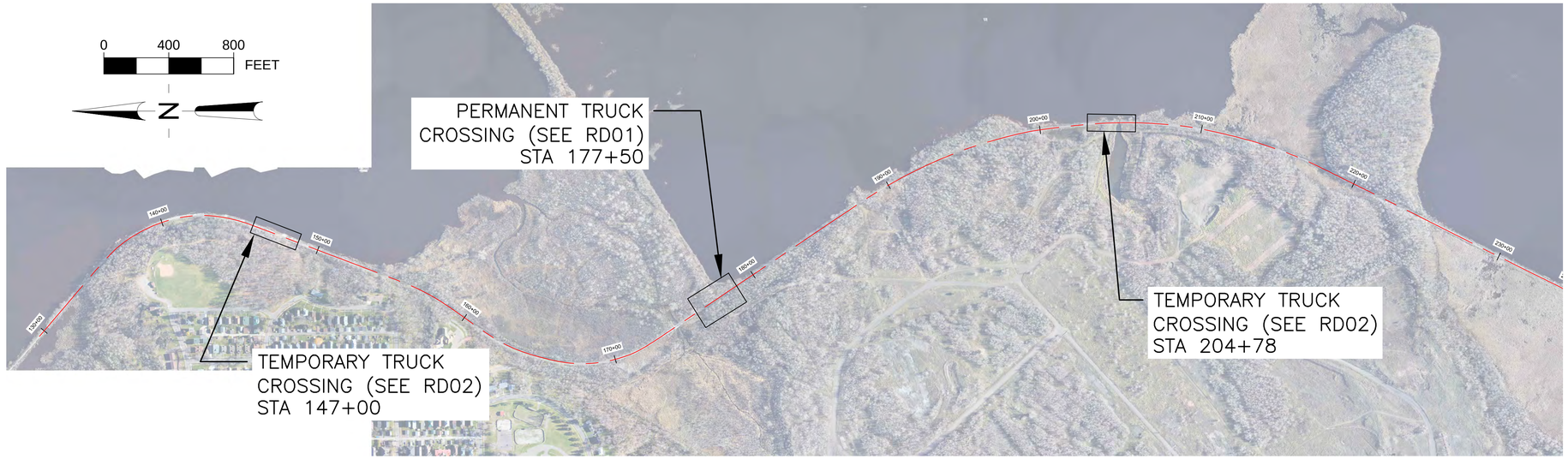
DATE: MAY 2019

PROJECT NUMBER:
BP-501

SHEET: 106 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

FILE PATH:C:\PWWORK\EAST\70051051\BLANK TITLE SHEET.DWG\MODEL\ HARPSON, KATLIN 7/26/2018 3:52 PM



REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN

RAILROAD AT-GRADE CROSSINGS

BID ITEMS ~ RAILROAD AT-GRADE CROSSINGS

ITEM NO.	ITEM DESCRIPTION	QTY.	UNIT
1	PERMANENT AT-GRADE CROSSING	1	LS
2	TEMPORARY AT-GRADE CROSSINGS	2	LS

LIST OF DRAWINGS ~ RAILROAD AT-GRADE CROSSINGS

DRAWING NUMBER	SHT. NO.	TITLE
GN-01	107	COVER SHEET
GN-02	108	GENERAL NOTES
GN-03	109	TYPICAL DETAILS
RD-01	110	PERMANENT CROSSINGS PLANS
RD-02	111	TEMPORARY CROSSINGS PLAN

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: JCM
DRAWN BY: JCM
CHECKED BY: WJJ
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

RAILROAD AT-GRADE CROSSINGS COVER SHEET

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HDR ENGINEERING, INC.
700 SW HIGGINS AVE., SUITE 200
MISSOULA, MT 59803-1489

DATE: MAY, 2019

PROJECT NUMBER: 10085944

GN-01

SHEET: 107 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

SURFACE FEATURES LEGEND

SYMBOLS

- SCRIBED "X"
- PK NAIL
- METAL SIGN POST
- WOOD SIGN POST
- W — WATER MANHOLE
- FIRE HYDRANT
- WATER METER
- EL — ELECTRICAL JUNCTION BOX
- PM — POWER METER
- TC — TELECOMMUNICATION JUNCTION BOX
- JUNCTION BOX
- TELR — TELECOMMUNICATION RISER
- UTILITY POLE
- UG — UTILITY POLE W/ CONDUITS TO UNDERGROUND
- GUY ANCHOR
- GP — GUY POLE
- YARD LIGHT OR LUMINAIRE W/ NO MAST
- FENCE
- TRACK CENTERLINE
- CONTROL POINT
- SANITARY SEWER MANHOLE
- STORM DRAIN MANHOLE
- CO — CATCH BASIN
- WV — WATER VALVE
- STORM DRAIN

ABBREVIATIONS

A	= AREA
AC	= ASPHALT CONCRETE
AP	= ANGLE POINT
ASSY	= ASSEMBLY
BC	= BACK OF CURB
BNSF	= BURLINGTON NORTHERN SANTA FE RAILWAY
CB	= CATCH BASIN
CG	= CURB AND GUTTER
CIPP	= CURED IN PLACE PIPE
C/L, C.L.	= CENTERLINE
CLF	= CHAIN LINK FENCE
CMP	= CORRUGATED METAL PIPE
CO	= CLEANOUT
CONC	= CONCRETE
CPP	= CORRUGATED POLYETHYLENE PIPE
CS	= CONTROL STRUCTURE
CSBC	= CRUSHED SURFACING BASE COURSE
D.I., DIP	= DUCTILE IRON PIPE
EA	= EACH
EAC	= EDGE ASPHALT CURB
ECC	= EDGE CONCRETE CURB
ELEC	= ELECTRICAL
EL	= ELEVATION
EX., EXIST	= EXISTING
EXSC	= EXTRUDED CONCRETE CURB
EOP	= EDGE OF PAVEMENT
ESC	= EROSION AND SEDIMENT CONTROL
F.O.C., FC	= FACE OF CURB
F.G., FIN GR	= FINISHED GRADE
FH	= FIRE HYDRANT
FSC	= FIRE SPRINKLER CONNECTION
FL	= FLANGE OR FLOWLINE
F.L.	= FLOWLINE
GA, GALV	= GALVANIZE
G.V.	= GATE VALVE
H	= HORIZONTAL
HMA	= HOT MIX ASPHALT
I.E., IE	= INVERT ELEVATION
LT	= LEFT
LF	= LINEAR FEET
MH	= MANHOLE
MAX	= MAXIMUM
MDD	= MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-1557 (MODIFIED PROCTOR)
MIL	= 1/1000 OF AN INCH
MIN	= MINIMUM
MN	= MINNESOTA
MNDOT	= MINNESOTA DEPARTMENT OF TRANSPORTATION
MON	= MONUMENT
MTCE	= MAINTENANCE
N, E, W, S	= NORTH, EAST, WEST, SOUTH
OC	= ON CENTER
OD	= OUTSIDE DIAMETER
OPS	= OPERATIONS
PC	= POINT OF CURVATURE
PVC	= POLYVINYLCHLORIDE PIPE
PCC	= PORTLAND CEMENT CONCRETE
PP	= POWER POLE
POC	= POINT OF CONNECTION or POINT ON CURVE
PT	= POINT OF TANGENCY
RCP	= REINFORCED CONCRETE PIPE
REQD	= REQUIRED
RT	= RIGHT
R.O.W.	= RIGHT OF WAY
RD	= ROAD
REQD	= REQUIRED
S	= SLOPE
SDMH	= STORM DRAINAGE MANHOLE
SF	= SQUARE FEET
SHT	= SHEET
SP	= STEEL POLE
SSMH	= SANITARY SEWER MANHOLE
SSSO	= SANITARY SEWER STUB OUT
STA	= STATION
STD	= STANDARD
SY	= SQUARE YARD
T/	= TOP OF HOT DIP
TP	= TOP OF PAVING
UNO	= UNLESS NOTED OTHERWISE
V, VERT	= VERTICAL
TYP	= TYPICAL
W/	= WITH
WP	= WOOD POLE

GENERAL NOTES

SPECIFICATIONS AND STANDARDS

1. MNDOT STANDARD CONSTRUCTION SPECIFICATIONS.
2. WHERE NOTED ON THE PLANS AND IN THE SPECIFICATIONS, METHODS AND MATERIALS SHALL CONFORM TO THE MINNESOTA STANDARD SPECIFICATIONS FOR CONSTRUCTION 2018. THE MINNESOTA STATE DEPARTMENT OF TRANSPORTATION (MNDOT),AND THE AMERICAN PUBLIC WORKS ASSOCIATION (APWA) MINNESOTA STATE CHAPTER.

GENERAL

1. THESE NOTES CONTAIN GENERAL INFORMATION AND ARE NOT COMPLETE FOR CONSTRUCTION PURPOSES. CONTRACTOR SHALL VERIFY INFORMATION GIVEN HERE WITH SPECIFICATIONS AND OTHER DOCUMENTS AND BRING ANY CONFLICTS TO THE ATTENTION OF THE ENGINEER BEFORE BEGINNING AFFECTED WORK. OWNER WILL RESOLVE ANY SUCH CONFLICT.
2. THE EXISTING TRACKS AND ALL PARTS OF THE EXISTING YARD NOT ASSIGNED TO THE CONTRACTOR WILL BE IN OPERATION DURING CONSTRUCTION. EXCEPT WHERE IDENTIFIED ON THE PLANS, THE CONTRACTOR SHALL KEEP THEIR WORKERS, MATERIAL, AND EQUIPMENT A MINIMUM OF 25 FEET CLEAR OF ALL OPERATIONS AND SHALL NOT IN ANY WAY HINDER OR DISRUPT YARD OPERATIONS.
3. ALL DIMENSIONS AND DETAILS SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO FABRICATION AND CONSTRUCTION.
4. ALL SHOP DRAWINGS SHALL BE SUBMITTED TO, REVIEWED, AND APPROVED BY THE ENGINEER PRIOR TO FABRICATION.
5. ARRANGE CONSTRUCTION OPERATIONS TO AVOID CREATION OF HAZARDOUS CONDITIONS. MAINTAIN ADEQUATE CLEARANCE FROM CONSTRUCTION WORK TO PERMIT NORMAL OPERATIONS AND TRAFFIC TO CONTINUE, PROVIDE FLAGGERS, BARRICADES WITH FLASHING LIGHTS, ETC., AS REQUIRED AT NO COST TO THE RAILROAD.
6. PROTECT MATERIALS AND EQUIPMENT TO BE USED IN THE PROJECT FROM WEATHER AND TRAFFIC.
7. REPAIR AND OR REPAINT THE NEW WORK AND ADJACENT SURFACES DAMAGED DURING THE INSTALLATION OF THE NEW WORK, IN ACCORDANCE WITH THE RAILROAD STANDARD PROCEDURES.
8. COMPLY WITH RAILROAD, STATE AND OSHA SHORING REQUIREMENTS.
9. UNDERGROUND UTILITIES AND STRUCTURES, WHERE SHOWN ON THE DRAWINGS, ARE BASED ON FIELD SURVEYS. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES BETWEEN THE EXISTING CONDITIONS AND WHAT IS SHOWN ON THE DRAWINGS.
10. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROTECT ALL UTILITIES WHETHER SHOWN ON THE PLAN OR NOT.
11. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY ALL UTILITY COMPANIES WHEN CONSTRUCTION WORK BEGINS AND TO ARRANGE FOR A REPRESENTATIVE OF THE UTILITY TO BE PRESENT WHEN THE CONTRACTOR'S CONSTRUCTION OPERATIONS ARE IN CLOSE PROXIMITY TO ANY LINES IN THEIR EXISTING OR RELOCATED POSITION . THE CONTRACTOR SHALL COORDINATE ITS ACTIVITIES WITH UTILITY COMPANIES.
12. THE CONTRACTOR SHALL REPAINT EXISTING PAVEMENT MARKINGS REMOVED DURING CONSTRUCTION AT NO ADDITIONAL COST TO THE RAILROAD
13. NO FIELD CHANGES WILL BE PERMITTED WITHOUT DIRECT WRITTEN AUTHORIZATION FROM THE RAILROAD PROJECT ENGINEER.
14. CONTRACTOR SHALL COORDINATE WORK WHICH AFFECTS ADJACENT PROPERTY OWNERS. ANY QUESTIONS OR AGREEMENTS BETWEEN ADJACENT PROPERTY OWNERS AND CONTRACTOR SHALL BE MADE IN WRITING. A COPY OF SUCH AGREEMENT SHALL BE PROVIDED TO THE BNSF RAILWAY.
15. CONTRACTOR SHALL REFER TO THE PROJECT TECHNICAL SPECIFICATIONS AND EROSION AND SEDIMENT CONTROL PLANS FOR ADDITIONAL EROSION CONTROL DETAILS.
16. CONTRACTOR SHALL COORDINATE ALL DAILY ACTIVITIES WITH THE RAILROAD STAFF.
17. CONTRACTOR TO COORDINATE EQUIPMENT STAGING AREA WITH RAILROAD STAFF.

DEMOLITION

1. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO CONTAIN THE DEMOLITION WITHIN THE LIMITS DESIGNATED, TO AVOID DAMAGE TO EXISTING STRUCTURES, UTILITIES, OR FACILITIES.
2. ANY DAMAGE INCURRED TO ANY PART OF THE SITE OR FACILITY NOT SPECIFICALLY DESIGNATED FOR DEMOLITION SHALL BE REPAIRED, REPLACED, AND/OR RECONSTRUCTED BY THE CONTRACTOR AT THEIR EXPENSE, TO ITS ORIGINAL CONDITION AS DIRECTED BY THE ENGINEER.
3. ALL DEMOLISHED MATERIAL, EXCEPT AS NOTED AND/OR SPECIFIED, SHALL BE COMPLETELY REMOVED AND DISPOSED OF BY THE CONTRACTOR.

SURVEY

1. HORIZONTAL DATUM: NAD83/96 MINNESOTA COORDINATE SYSTEM, NORTH ZONE
2. VERTICAL DATUM: NAVD88 (GEIOD 03)
3. THE CONTRACTOR IS RESPONSIBLE FOR THE PRESERVATION OF ALL SURVEY CONTROL MONUMENTS. IN THE EVENT MONUMENTS ARE DAMAGED OR DESTROYED BY THE CONTRACTOR, THE ENGINEER WILL REPLACE THE MONUMENT SOLELY AT THE CONTRACTOR'S EXPENSE.

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: JCM
DRAWN BY: JCM
CHECKED BY: WJJ
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

RAILROAD AT-GRADE CROSSINGS
GENERAL NOTES

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
444 LAKE COOK ROAD, SUITE 18
DEERFIELD, IL 60015
847-915-8010

HDR ENGINEERING, INC.
700 SW HIGGINS AVE., SUITE 200
MISSOULA, MT 59803-1489

DATE: MAY, 2019

PROJECT NUMBER: 10085944

GN–02

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

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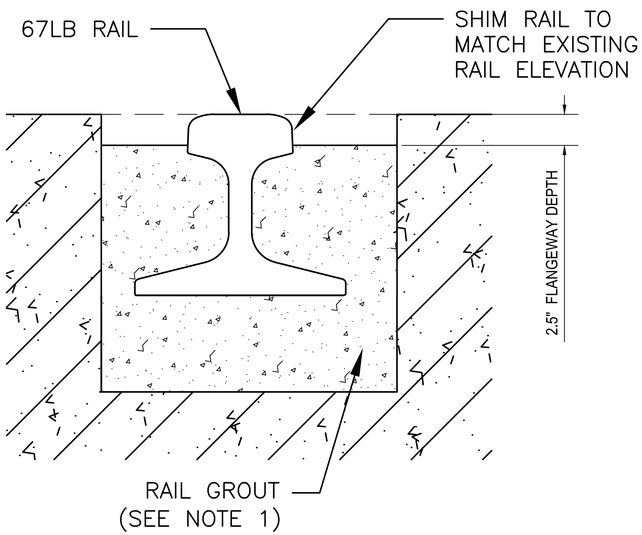
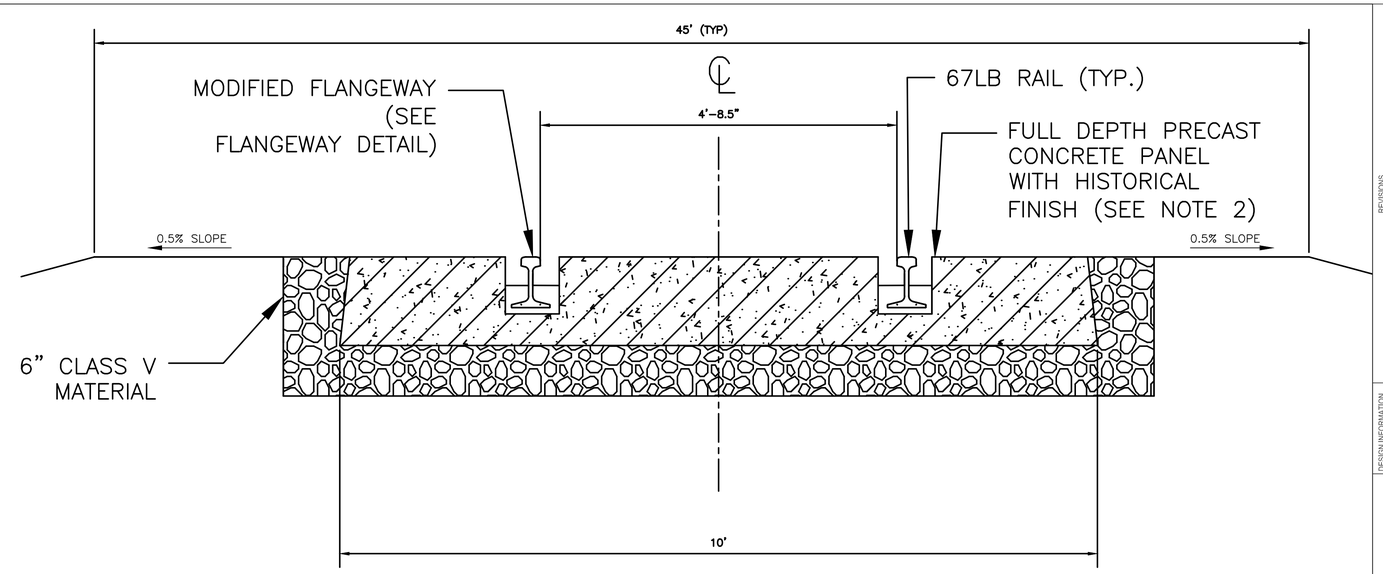


FLANGEWAY DETAIL

(NTS)

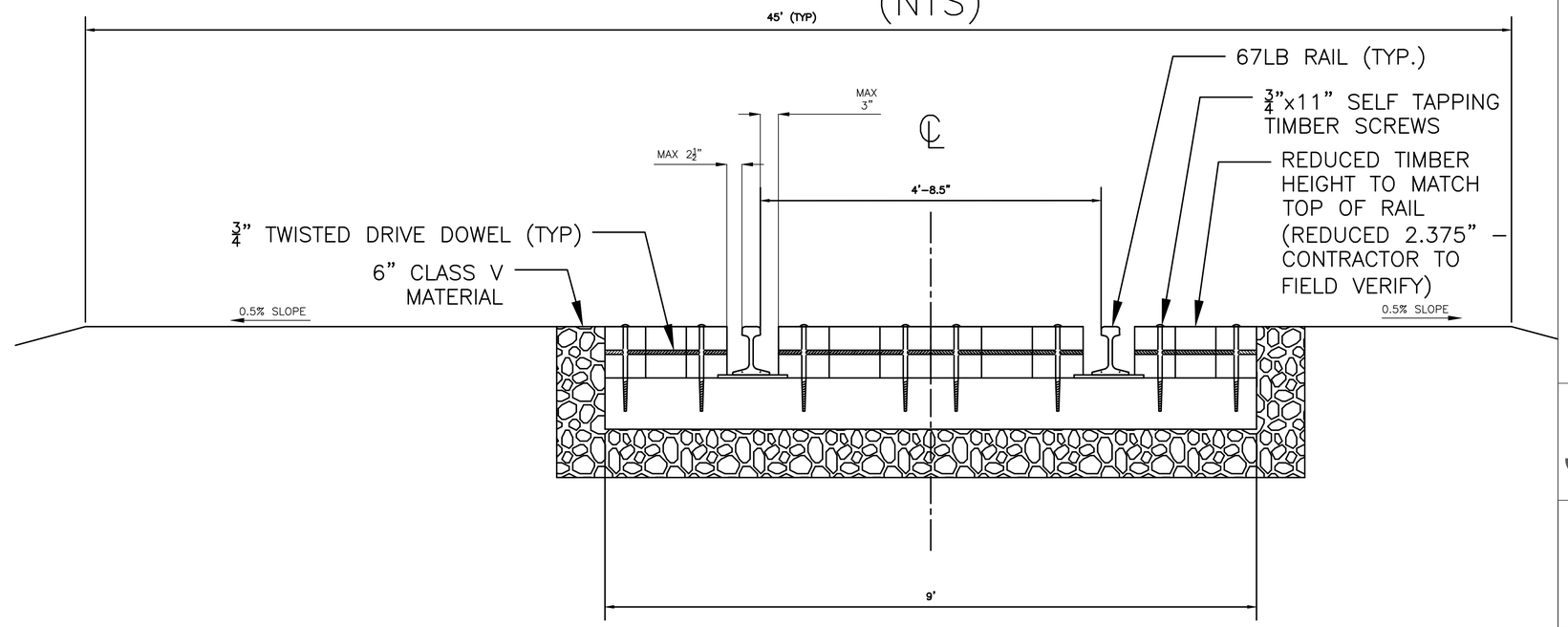


PERMANENT EMBEDDED CONCRETE CROSSING DETAIL

(NTS)

NOTES:

1. SET RAIL IN LOAD-BEARING POLYURETHANE RAIL GROUT. SHIM RAIL TO MATCH TOP OF RAIL TO TOP OF FLANGEWAY CHANNEL. $\frac{1}{8}$" VERTICAL TOLERANCE FOR RAIL ELEVATIONS – SEE AREMA FOR SPECIFICATIONS.
2. APPLY HISTORICAL FINISH TO CONCRETE PANELS TO MATCH CURRENT HISTORICAL CONDITIONS – SEE SPECIFICATIONS.
3. MAINTAIN POSITIVE DRAINAGE AWAY FROM TRACKS (MINIMUM 0.5%)



TEMPORARY TIMBER CROSSING DETAIL

(NTS)

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: JCM
DRAWN BY: JCM
CHECKED BY: WJJ
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

RAILROAD AT-GRADE CROSSINGS CROSSING TYPICAL DETAILS

PREPARED FOR:

EPA

EA Engineering, Science, and Technology, Inc., PBC
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HDR ENGINEERING, INC.
700 SW HIGGINS AVE., SUITE 200
MISSOULA, MT 59803-1489

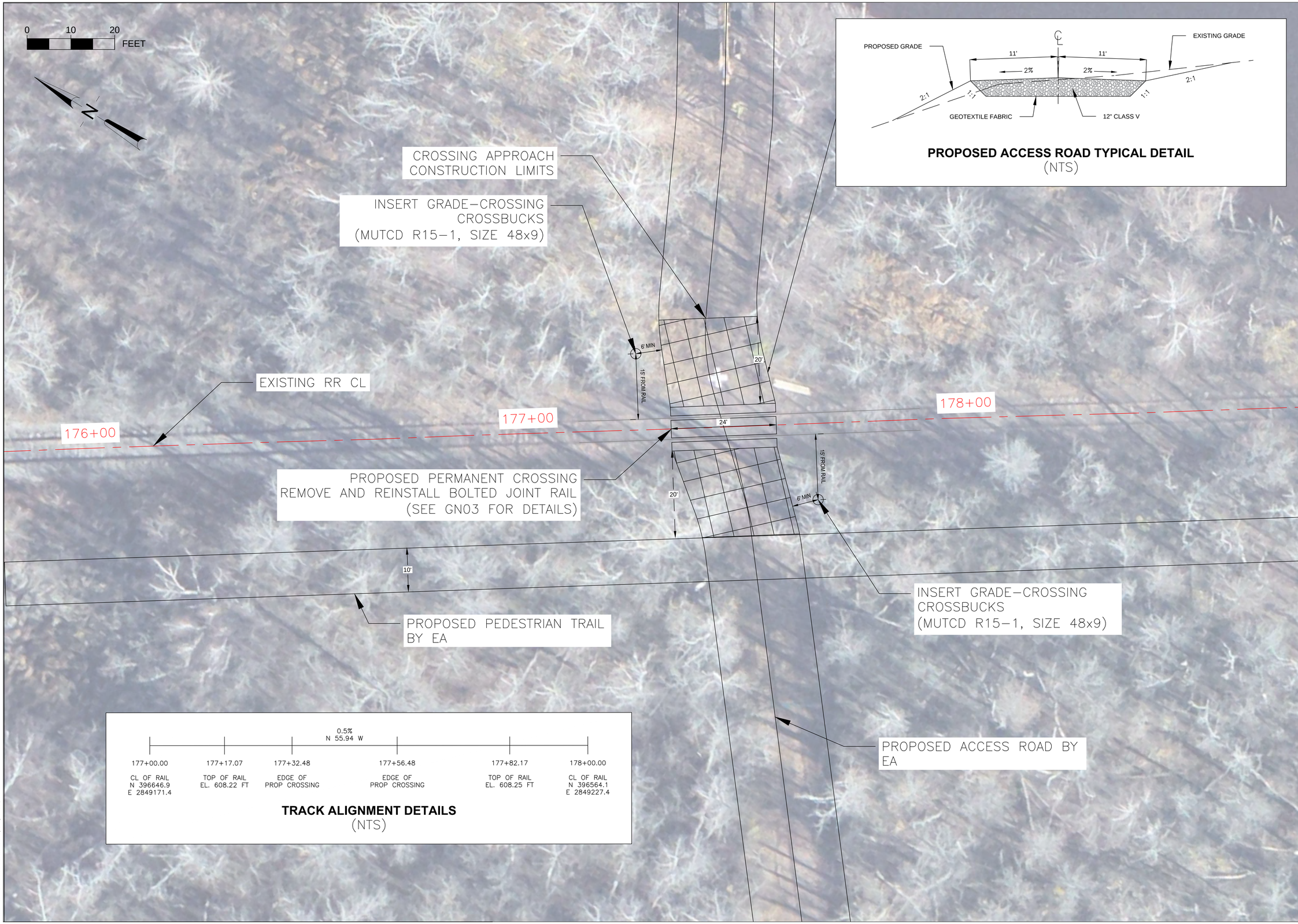
DATE: MAY, 2019

PROJECT NUMBER: 10085944

GN-03

SHEET: 109 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION



NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: JCM
DRAWN BY: JCM
CHECKED BY: WJJ
PROJECT MANAGER: DLM

SEAL

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

RAILROAD AT-GRADE CROSSINGS PERMANENT CROSSING PLAN VIEW

PREPARED FOR:
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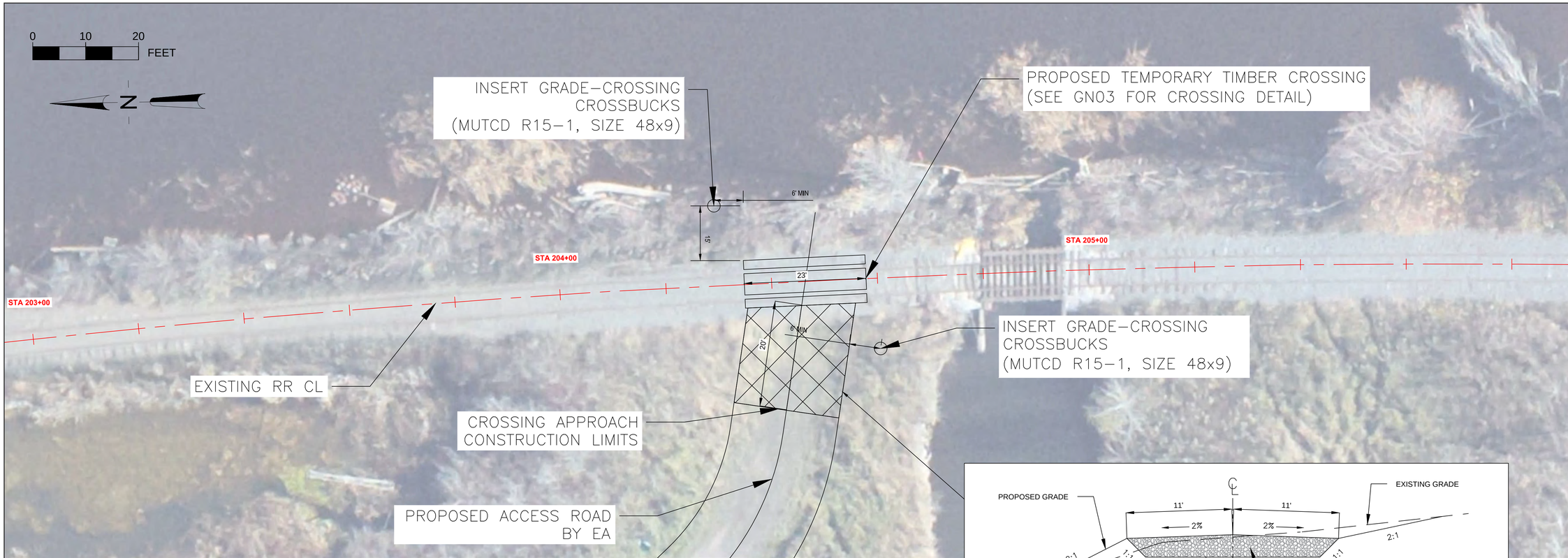
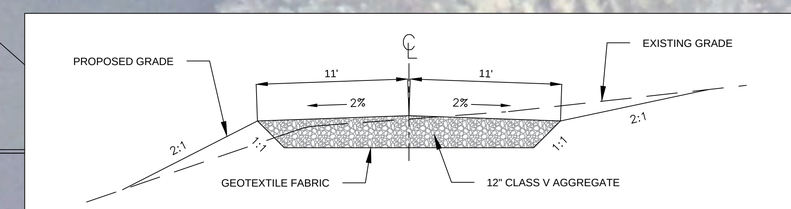
HDR ENGINEERING, INC.
700 SW HIGGINS AVE., SUITE 200
MISSOULA, MT 59803-1489

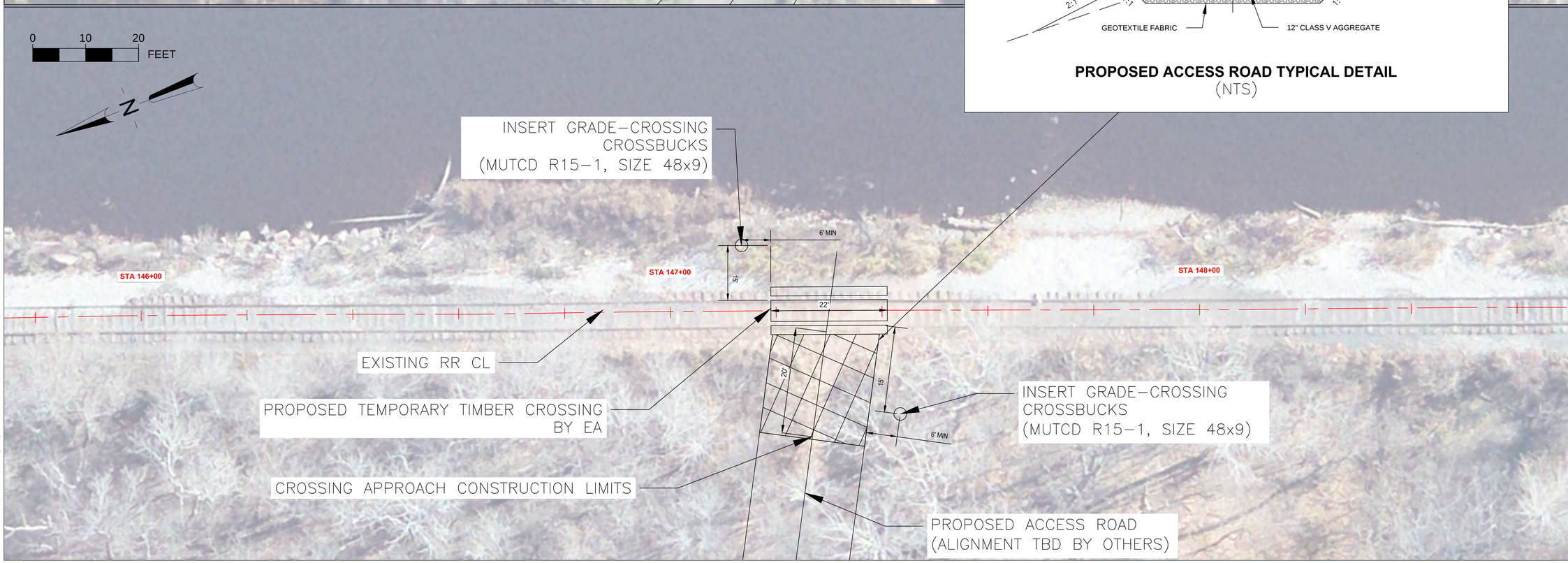
DATE: MAY, 2019
PROJECT NUMBER: 10085944
RD–01
SHEET: 110 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION





PROPOSED ACCESS ROAD TYPICAL DETAIL
(NTS)



REVISIONS

NO.	DATE	BY	DESCRIPTION

SEAL

DESIGN INFORMATION

DESIGNED BY:	JCM
DRAWN BY:	JCM
CHECKED BY:	WJJ
PROJECT MANAGER:	DLM

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY SITE
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

RAILROAD AT-GRADE CROSSINGS
TEMPORARY CROSSING PLAN VIEW

PREPARED FOR:

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HDR ENGINEERING, INC.
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MISSOULA, MT 59803-1489

DATE: MAY, 2019

PROJECT NUMBER: 10085944

RD–02

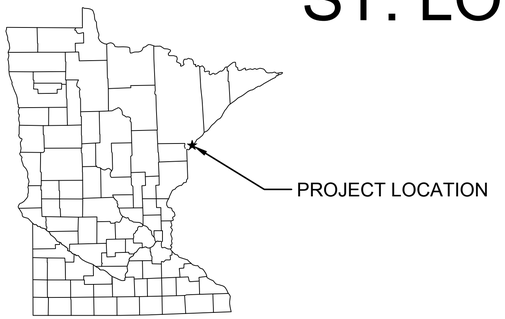
SHEET 111 OF 111

PRE-FINAL DESIGN - NOT FOR CONSTRUCTION

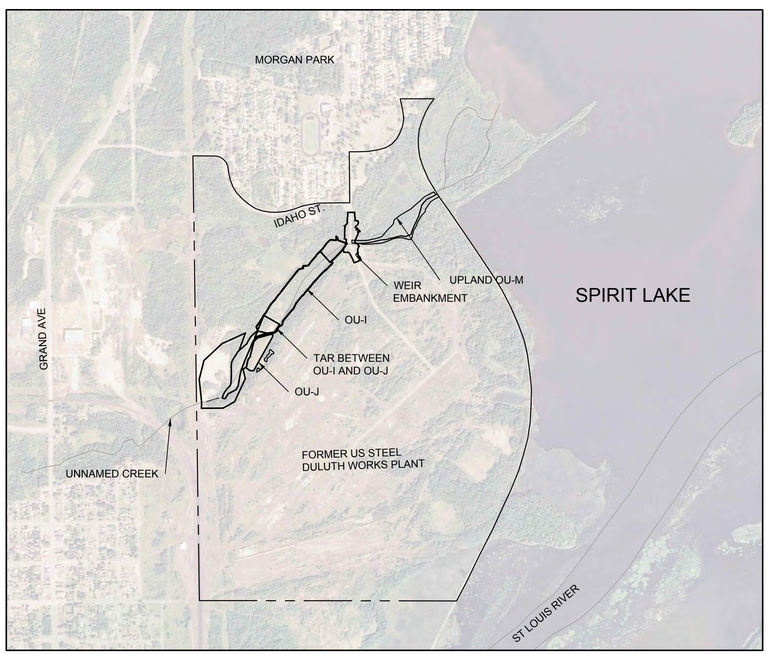
ATTACHMENT A2

OPERABLE UNIT I CONSTRUCTION DRAWINGS

REMEDIAL DESIGN SPIRIT LAKE ESTUARY, OU-I
ST. LOUIS RIVER AREA OF CONCERN
PRE-FINAL DESIGN



LOCATION MAP
NOT TO SCALE



VICINITY MAP
NOT TO SCALE

SHEET INDEX

SHEET NO.	TITLE
G-101	TITLE SHEET
G-102	ESTIMATED QUANTITIES - NOT INCLUDED
G-103	HYDRAULICS AND HYDROLOGY
G-104	OVERALL SITE PLAN
GE-101	OU-I EXISTING CONDITIONS AND SITE ACCESS
CS-101	STORM WATER POLLUTION PREVENTION PLAN - NOT INCLUDED
CS-102	EROSION AND SEDIMENT CONTROL DETAILS - NOT INCLUDED
CS-103	EROSION CONTROL PLAN - NOT INCLUDED
CW-101	OU-I WEIR EMBANKMENT PLAN AND PROFILE
CW-102	OU-I WEIR EMBANKMENT SECTIONS AND DETAILS
CR-101	OU-I REMOVAL PLAN
CR-102	OU-I REMOVAL PLAN -WEIR POND
CC-101	OU-I CAPPING PLAN
CC-102	OUI-CAPPING PLAN -WEIR POND
CC-103	OU-I CROSS SECTIONS
CC-104	OU-I CROSS SECTIONS
CC-105	OU-I CROSS SECTIONS
CC-106	OU-I FINAL CONDITIONS PLAN
CC-107	OU-I DREDGE AND CAP DETAILS
CC-108	OU-I DREDGE AND CAP DETAILS - WEIR POND
CU-101	UNNAMED CREEK TEMPORARY STORMWATER DIVERSION PLAN
CU-102	OU-I UNNAMED CREEK CHANNEL LAYOUT PLAN
CU-103	OU-I UNNAMED CREEK CHANNEL PLAN-PROFILE (STATION 11+00 - 27+50)
CU-104	OU-I UNNAMED CREEK CHANNEL PLAN-PROFILE (STATION 0+00 - 11+00)
CU-105	OU-I UNNAMED CREEK CHANNEL SECTION AND DETAILS
CS-102	SEEDING PLAN - NOT INCLUDED

*SHEETS NOTED AS NOT INCLUDED ARE ANTICIPATED TO BE INCLUDED IN THE FINAL DESIGN PACKAGE

REFERENCE DRAWINGS:

DRAWING NAME	DRAWING TITLE	BY	DATE	REV

NOTES:

1. ALL CONSTRUCTION SHALL COMPLY WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL CODES AND REGULATIONS.
2. TOPOGRAPHIC INFORMATION BASED ON LIDAR DATA COLLECTED BY EA ENGINEERING NOV. 9, 2016.
3. BATHYMETRIC INFORMATION BASED ON SURVEY DATA COLLECTED BY BARR ENGINEERING COMPANY IN SEPTEMBER, OCTOBER, AND NOVEMBER 2017.
4. ALL UTILITIES SHOWN ARE CONSIDRED LEVEL D. UNLESS OTHERWISE NOTED, IN ACCORDANCE WITH ASCE STANDARD CI/ASCE38-02.
5. CONTRACTOR SHALL FIELD-LOCATE ALL SITE UTILITIES PRIVATE AND PUBLIC PRIOR TO STARTING THE WORK. ALL UTILITIES SHOWN ON THE PLANS ARE APPROXIMATE. ANY UTILITIES DAMAGED BY CONTRACTOR SHALL BE REPAIRED BY CONTRACTOR TO THE SATISFACTION OF UTILITY OWNER.

COORDINATE SYSTEM:

HORIZONTAL DATUM - MINNESOTA STATE PLANE NAD83, NORTH ZONE (US SURVEY FEET)
VERTICAL DATUM - NAVD88 (FEET)

ABBREVIATIONS AND SYMBOLS

APPROX.	APPROXIMATE
ASCE	AMERICAN SOCIETY OF CIVIL ENGINEERS
CMP	CORRUGATED METAL PIPE
EL.	ELEVATION
FT	FEET
IN	INCHES
MAX.	MAXIMUM
MIN.	MINIMUM
NOAA	NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
TBD	TO BE DETERMINED
RCP	REINFORCED CONCRETE PIPE
RSU	RESTORATION SITE UNIT
TYP.	TYPICAL
USACE	UNITED STATES ARMY CORPS OF ENGINEERS
VCP	VITRIFIED CLAY PIPE
YR	YEAR
Ø	DIAMETER

SHEET NAMING CONVENTION

G - GENERAL
GE - GENERAL EXISTING CONDITIONS
CS - CONSTRUCTION STORMWATER
CW - WEIR EMBANKMENT
CR - REMOVAL
CC - CAPPING
CU - UNNAMED CREEK

REFERENCING

LIMITS OF SECTION CUT

SECTION IDENTIFIER

SECTION REFERENCES (SHEET SECTION IS LOCATED ON)

1 / C-02

SECTION IDENTIFIER

1 / C-02 SECTION: SECTION TITLE

SECTION REFERENCES (SHEET SECTION IS CALLED OUT)

DETAIL IDENTIFIER

1 / C-02

DETAIL REFERENCES (SHEET DETAIL IS LOCATED ON)

DETAIL IDENTIFIER

1 / C-02 DETAIL: DETAIL TITLE

DETAIL REFERENCES (SHEET DETAIL IS CALLED OUT)

PRELIMINARY
DRAFT
NOT FOR CONSTRUCTION

REVISIONS

NO.	DATE	BY	DESCRIPTION
A	7/30/18	AMS4	PRELIMINARY DESIGN
B	5/31/19	BJM2	PRE - FINAL DESIGN

DESIGN INFORMATION
DESIGNED BY: BJM2
DRAWN BY: SLY
CHECKED BY: ECL
PROJECT MANAGER: ERD

SEAL
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
SIGNATURE
DATE
LICENSE #

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

TITLE SHEET

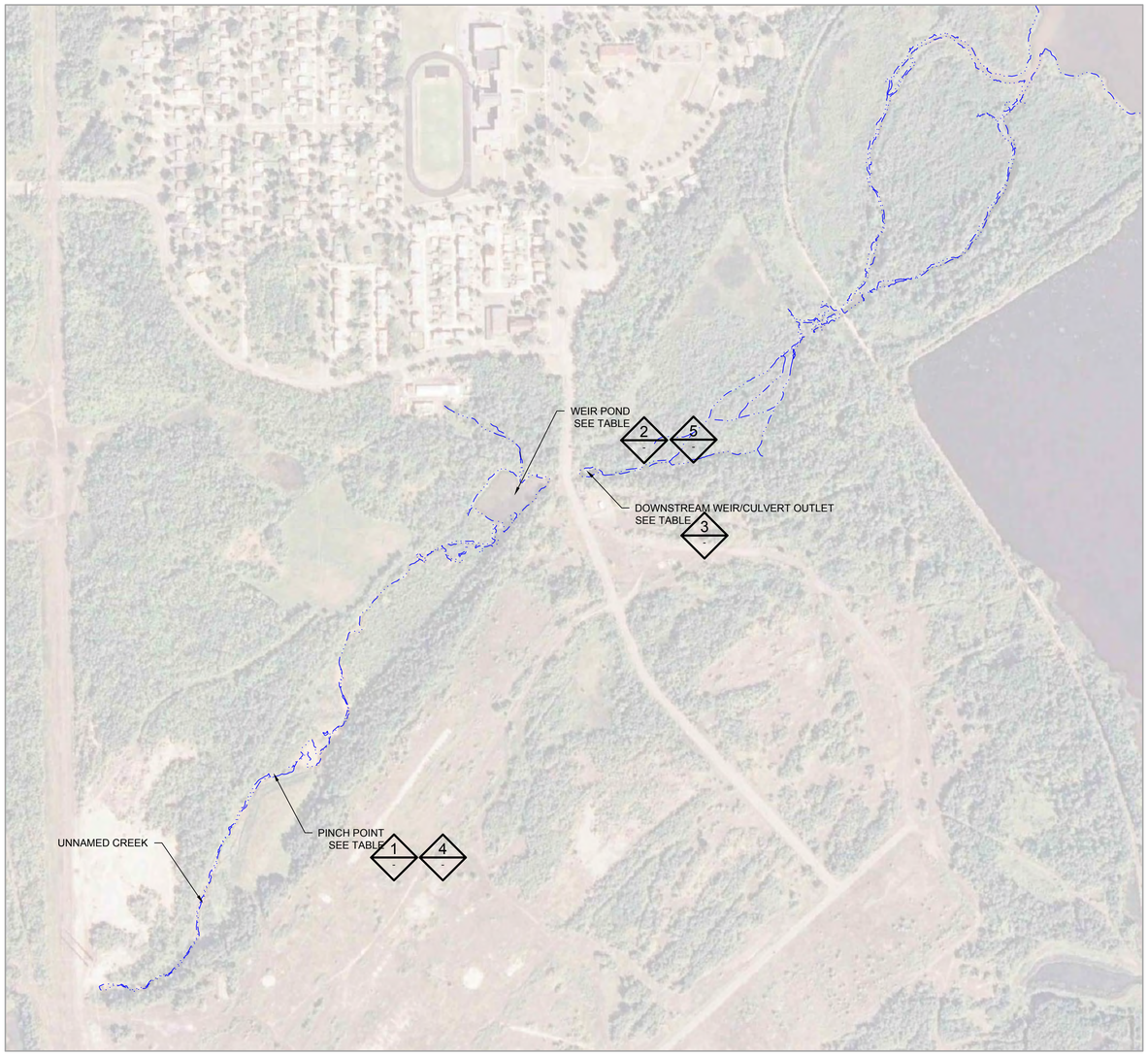
PREPARED FOR:
EPA
USS

BARR
BARR ENGINEERING CO.
325 SOUTH LAKE AVENUE
SUITE 700
DULUTH, MN 55802
Ph: 1-800-786-5830
Fax: (218) 529-8202
www.barr.com

DATE: 5/31/2019
PROJECT NUMBER: 23691125.12
G-101
SHEET: ## OF ####

-

FILE PATH: M:\JOBS\2\23691125.12\2691125_Cu101_COVER SHEET.DWG [BARR D-SIZE PAPER] SHAWE L. VOSS 5/31/2019 2:18 PM



1 - PLAN: HYDRAULIC MONITORING LOCATIONS

0 300 600
SCALE IN FEET

N

NOTES:

1. WATER LEVEL OBSERVATIONS GATHERED BY AECOM.
2. WATER INFORMATION PRESENTED IS BASED ON BEST INFORMATION AVAILABLE. THE INFORMATION DOES NOT NECESSARILY REPRESENT ALL POSSIBLE FUTURE CONDITIONS.

RETURN PERIOD	FLOW (CFS)	WATER SURFACE ELEVATION (FT)	APPROX. CHANNEL DEPTH (FT)	VELOCITY (FT/S)
BANKFULL	70	617.1	1.47	-
Q 2 YR	255	618.0	1.93	6.15
Q 10 YR	460	618.3	2.23	8.32
Q 100 YR	800	619.9	3.89	3.67

1 - TABLE: EXISTING CONDITIONS ESTIMATE PEAK FLOW HYDRAULIC CONDITIONS AT PINCH POINT

NOT TO SCALE

RETURN PERIOD	FLOW (CFS)	WATER SURFACE ELEVATION (FT)	APPROX. CHANNEL DEPTH (FT)	VELOCITY (FT/S)
BANKFULL	70	612.6	2.9	-
Q 2 YR	255	617.3	7.42	.54
Q 10 YR	460	618.2	8.52	.83
Q 100 YR	800	619.88	10.2	1.16

2 - TABLE: EXISTING CONDITIONS ESTIMATE PEAK FLOW HYDRAULIC CONDITIONS WEIR POND

NOT TO SCALE

RETURN PERIOD	FLOW (CFS)	WATER SURFACE ELEVATION (FT)	APPROX. CHANNEL DEPTH (FT)	VELOCITY (FT/S)
BANKFULL	70	-	-	-
Q 2 YR	255	608.4	4.75	3.33
Q 10 YR	460	608.8	5.15	5.44
Q 100 YR	800	609.3	5.67	8.65

3 - TABLE: EXISTING CONDITIONS ESTIMATE PEAK FLOW HYDRAULIC CONDITIONS AT WEIR/CULVERT OUTLET

NOT TO SCALE

RETURN PERIOD	FLOW (CFS)	WATER SURFACE ELEVATION (FT)	APPROX. CHANNEL DEPTH (FT)	VELOCITY (FT/S)
BANKFULL	70	618.2	1.31	3.52
Q 2 YR	255	618.9	2.04	4.52
Q 10 YR	460	619.3	2.42	5.12
Q 100 YR	800	620.3	3.40	3.71

4 - TABLE: PROPOSED CONDITIONS ESTIMATE PEAK FLOW HYDRAULIC CONDITIONS AT PINCH POINT

NOT TO SCALE

RETURN PERIOD	FLOW (CFS)	WATER SURFACE ELEVATION (FT)	APPROX. CHANNEL DEPTH (FT)	VELOCITY (FT/S)
BANKFULL	70	614.1	6.08	0.12
Q 2 YR	255	616.3	8.30	0.29
Q 10 YR	460	617.5	9.51	0.43
Q 100 YR	800	620.0	12.04	0.51

5 - TABLE: PROPOSED CONDITIONS ESTIMATE PEAK FLOW HYDRAULIC CONDITIONS WEIR POND

NOT TO SCALE

PRELIMINARY
DRAFT
NOT FOR CONSTRUCTION

REVISIONS

NO.	DATE	BY	DESCRIPTION
A	7/30/18	AMS4	PRELIMINARY DESIGN
B	5/31/19	BJM2	PRE - FINAL DESIGN

DESIGN INFORMATION

DESIGNED BY: JCO
DRAWN BY: SLY
CHECKED BY: ECL
PROJECT MANAGER: ERD

SEAL

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 _____
SIGNATURE _____
DATE _____ LICENSE # _____

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

HYDRAULICS AND HYDROLOGY

PREPARED FOR:
EPA
USS

BARR
BARR ENGINEERING CO.
325 SOUTH LAKE AVENUE
SUITE 700
DULUTH, MN 55802
Ph: 1-800-786-5830
Fax: (218) 529-8202
www.barr.com

DATE: 5/31/2019

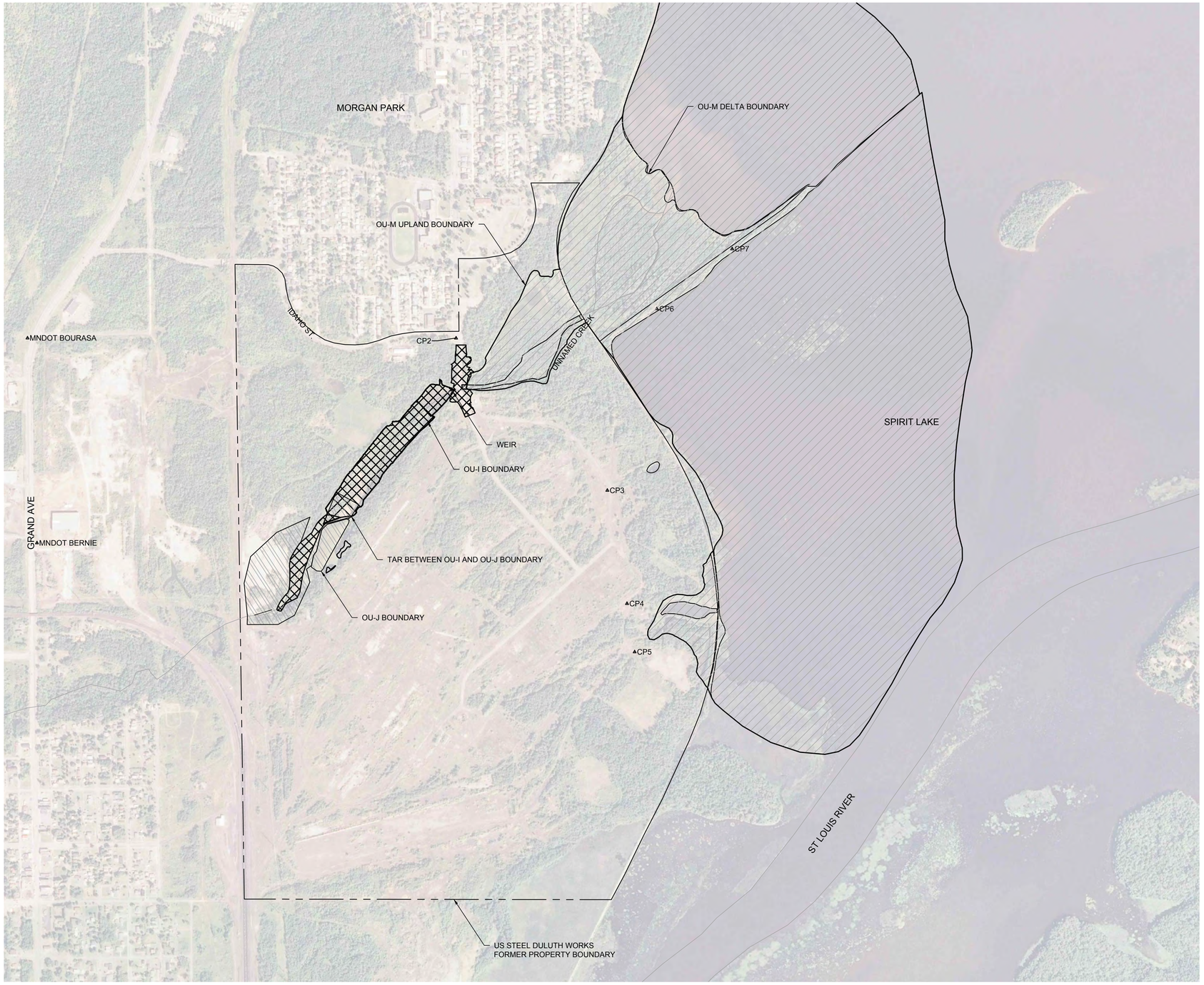
PROJECT NUMBER: 23691125.12

G-103

SHEET: ## OF ####

-

FILE PATH: M:\DESIGN\23691125.12\23691125.12_G-103_HYDRAULICS AND HYDROLOGY.DWG [BARR PLOTTER PAPER] MANEL, YODER 5/31/2019 3:09 PM



BARR DESIGN PACKAGE

EA DESIGN PACKAGE

AECOM DESIGN PACKAGE

1 PLAN: OVERALL SITE PLAN

0 500 1000

SCALE IN FEET

N

CONTROL POINTS				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
2	396665.3387	2847863.1730	650.67	CP2
3	395257.1577	2849261.1910	641.95	CP3
4	394210.8155	2849442.9950	650.88	CP4
5	393764.3053	2849513.5520	645.39	CP5
6	396935.5767	2849719.5320	606.60	CP6
7	397490.2879	2850414.8270	603.33	CP7
8	396666.1600	2843903.2000	693.03	MNDOT BOURASA
9	394771.7300	2843990.3000	684.33	MNDOT BERNIE

NOTES:

1. SURVEY CONTROL POINTS FROM EA (LHB SURVEYS)
2. CONTRACTOR SHALL VERIFY ACCURACY OF SURVEY CONTROL POINTS

PRELIMINARY
DRAFT
NOT FOR CONSTRUCTION

REVISIONS

NO.	DATE	BY	DESCRIPTION
A	7/30/18	DTS	PRELIMINARY DESIGN
B	5/31/19	SLY	PRE - FINAL DESIGN
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

DESIGN INFORMATION

DESIGNED BY: BJM2
DRAWN BY: DTS
CHECKED BY: ECL
PROJECT MANAGER: ERD

SEAL:

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 _____
SIGNATURE _____
DATE _____ LICENSE # _____

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

OVERALL SITE PLAN

PREPARED FOR:

EPA

USS

BARR

BARR ENGINEERING CO.
325 SOUTH LAKE AVENUE
SUITE 700
DULUTH, MN 55802
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Fax: (218) 529-8202
www.barr.com

DATE: 5/31/2019

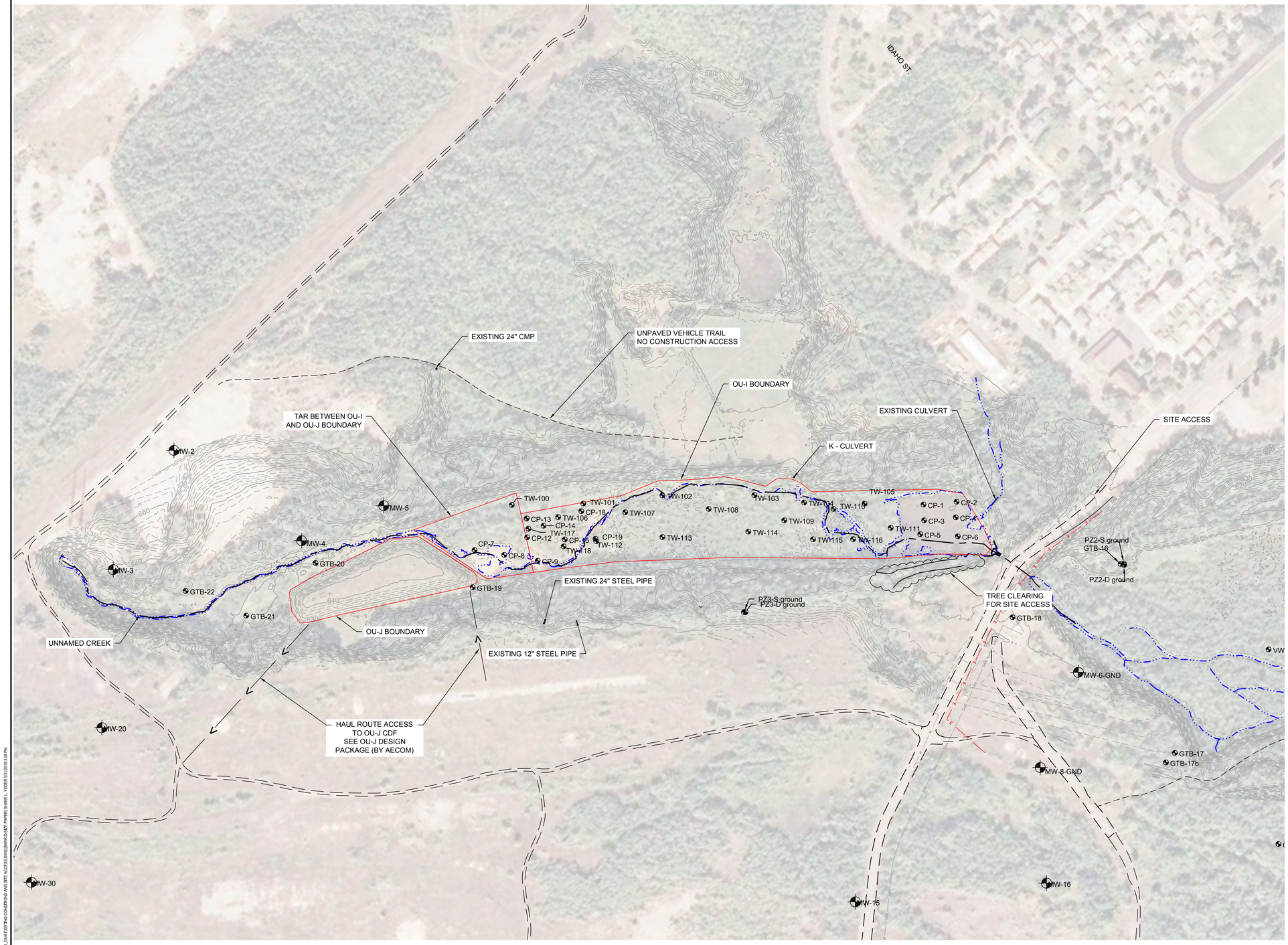
PROJECT NUMBER: 23691125.12

G-104

SHEET: ## OF ####

-

FILE PATH: M:\DESIGN\23691125.12\23691125.12_G-104_OVERALL SITE PLAN.DWG [BARR D-SIZE PAPER] SHAME L. YODER 5/30/2019 12:54 PM



LEGEND

- 800 — EXISTING TEN-FOOT CONTOUR
- EXISTING TWO-FOOT CONTOUR
- PAVED ROADS
- UNPAVED ROADS
- VEHICULAR TRAILS
- RAILROAD TRACKS
- W — WATER MAIN
- SAN — SANITARY SEWER
- OE — OVERHEAD ELECTRIC
- W — ABANDONED WATER LINE
- SAN — ABANDONED SANITARY SEWER
- EDGE OF WATER
- PREVIOUS PROJECT BORING LOCATIONS (BARR AND OTHERS)
- EXISTING MONITORING WELLS (AECOM
- OU BOUNDARY

NOTES:

1. PROTECT ALL MONITORING WELLS, STRUCTURES, UTILITIES AND TREES WHICH ARE NOT BEING REMOVED.

1 PLAN: OU-I EXISTING CONDITIONS AND SITE ACCESS

0 150 300
SCALE IN FEET

PRELIMINARY
DRAFT
NOT FOR CONSTRUCTION

REVISIONS

NO.	DATE	BY	DESCRIPTION
A	7/30/18	DTS	PRELIMINARY DESIGN
B	5/31/19	SLY	PRE - FINAL DESIGN

DESIGN INFORMATION

DESIGNED BY: BJM2
DRAWN BY: DTS
CHECKED BY: ECL
PROJECT MANAGER: ERD

SEAL

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 _____
SIGNATURE _____ LICENSE # _____
DATE _____

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

OU-I EXISTING CONDITIONS AND SITE ACCESS

PREPARED FOR:
EPA
USS

BARR
BARR ENGINEERING CO.
325 SOUTH LAKE AVENUE
SUITE 700
DULUTH, MN 55802
Ph: 1-800-786-5830
Fax: (218) 529-8202
www.barr.com

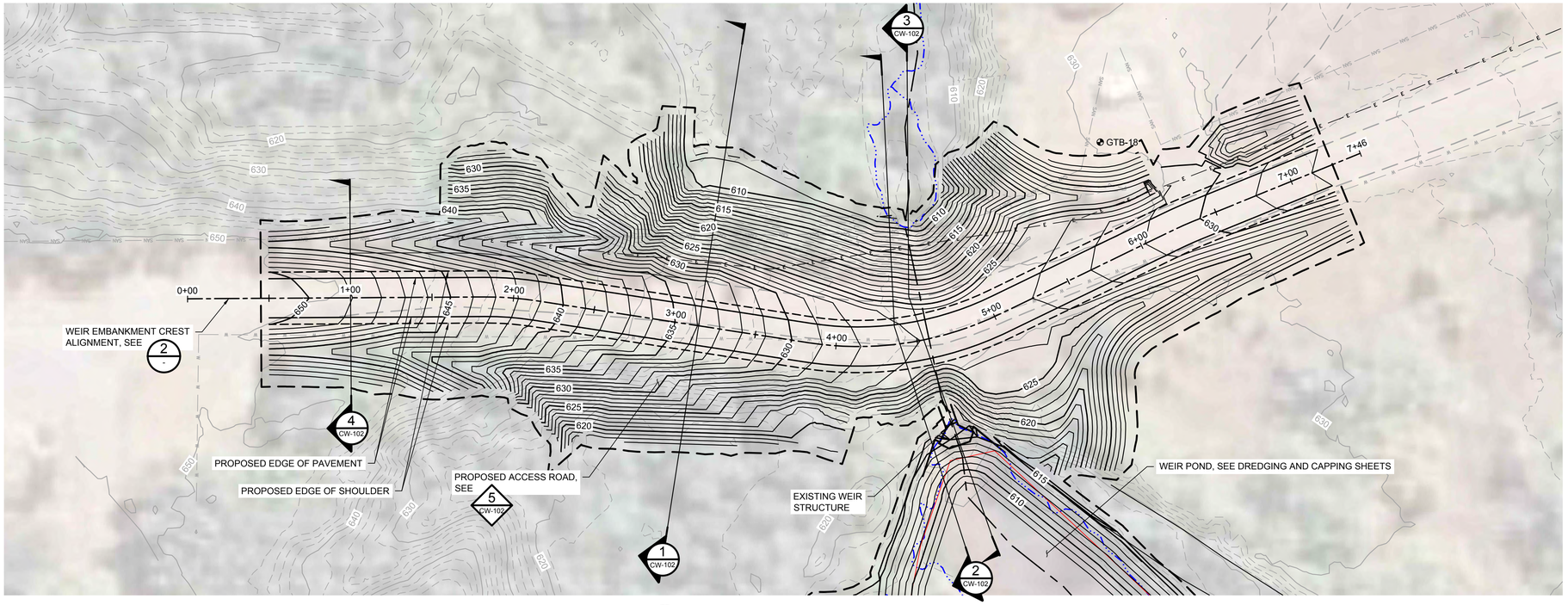
DATE: 5/31/19

PROJECT NUMBER: 23691125.12

GE-101

SHEET: ## OF ####

FILE PATH: M:\DESIGN\23691125.12\23691125.12_GE-101_OU-I EXISTING CONDITIONS AND SITE ACCESS.DWG [BARR 24-SIZE PAPER] BAWE L. FOGER 5/31/2019 3:08 PM



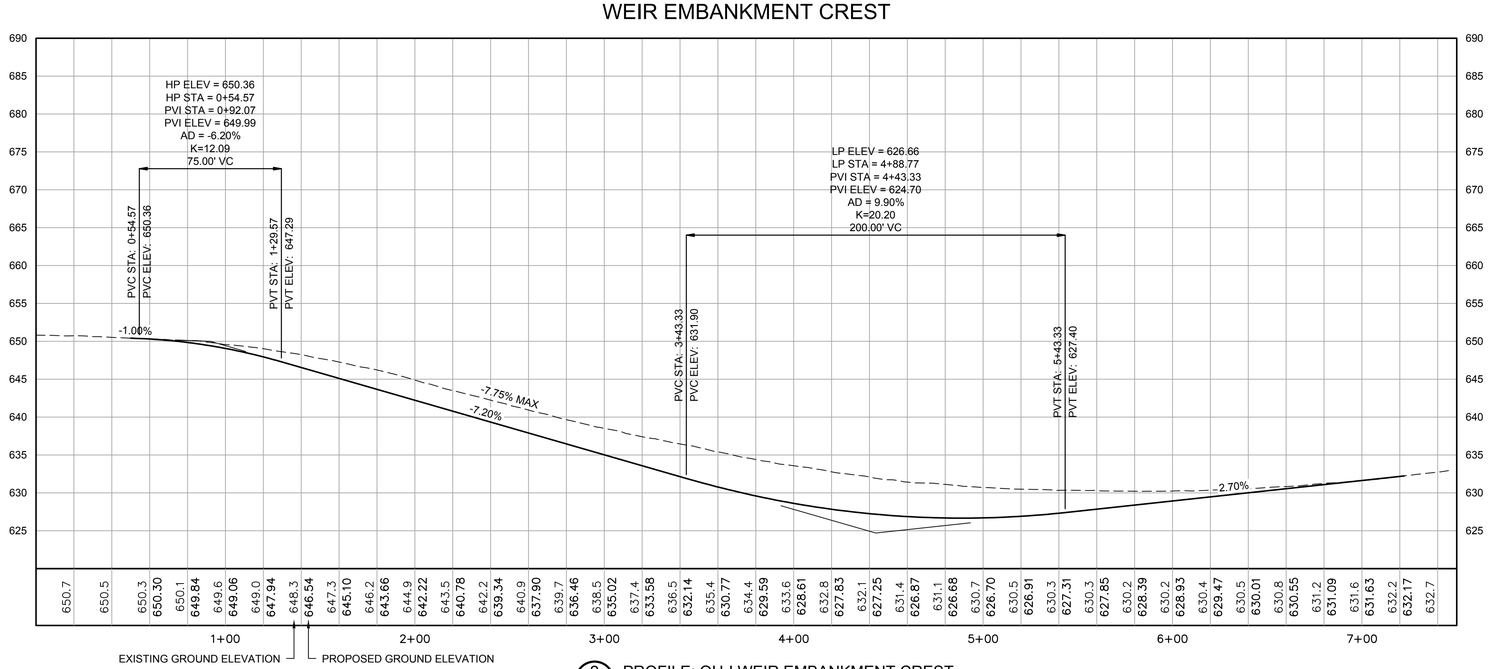
1/- PLAN: OU-I WEIR EMBANKMENT

0 40 80
SCALE IN FEET

PLAN LEGEND

- 800 — EXISTING TEN-FOOT CONTOUR
- EXISTING TWO-FOOT CONTOUR
- PAVED ROADS
- UNPAVED ROADS
- W — WATER MAIN
- SAN — SANITARY SEWER
- E — OVERHEAD ELECTRIC
- ABANDONED WATER LINE
- ABANDONED SANITARY SEWER
- STREAM ALIGNMENT
- EDGE OF WATER
- PREVIOUS PROJECT BORING LOCATIONS (BARR AND OTHERS)
- 800 — PROPOSED FIVE-FOOT CONTOUR
- PROPOSED ONE-FOOT CONTOUR
- WORK AREA LIMITS

WEIR EMBANKMENT CREST



2/- PROFILE: OU-I WEIR EMBANKMENT CREST

0 40 80
HORZ. SCALE IN FEET

0 10 20
VERT. SCALE IN FEET

PROFILE LEGEND

- EXISTING GROUND
- PROPOSED GROUND

PRELIMINARY
DRAFT
NOT FOR CONSTRUCTION

REVISIONS			
NO.	DATE	BY	DESCRIPTION
A	7/30/18	DTS	PRELIMINARY DESIGN
B	5/31/19	SLL	PRE-FINAL DESIGN

DESIGN INFORMATION
DESIGNED BY: PMD
DRAWN BY: DTS
CHECKED BY: SLL
PROJECT MANAGER: ERD

SEAL
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
SIGNATURE
DATE
LICENSE #

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

OU-I WEIR EMBANKMENT PLAN & PROFILE

PREPARED FOR:
EPA
USS

BARR
BARR ENGINEERING CO.
325 SOUTH LAKE AVENUE
SUITE 700
DULUTH, MN 55802
Ph: 1-800-786-5830
Fax: (218) 529-8202
www.barr.com

DATE: 5/31/19
PROJECT NUMBER: 23691125.12
CW-101
SHEET: ## OF ####

FILE PATH: H:\DESIGN\23691125.12\23691125.12_CW-101_OU-I WEIR EMBANKMENT PLAN.DWG [BARR CLASSIC PAPER] ZACH J. NELSON 5/31/2019 2:31 PM

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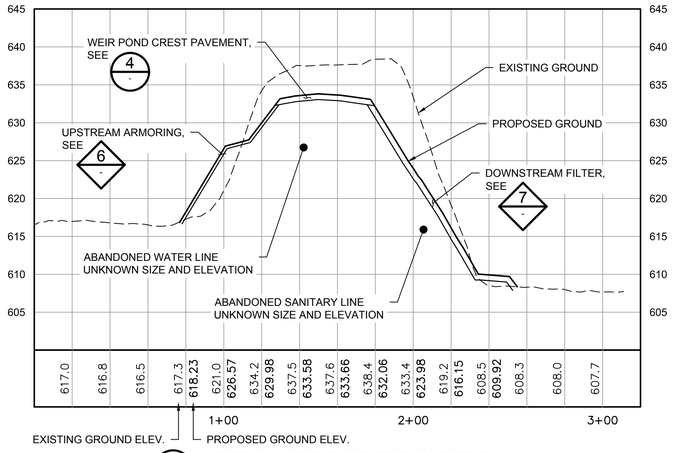
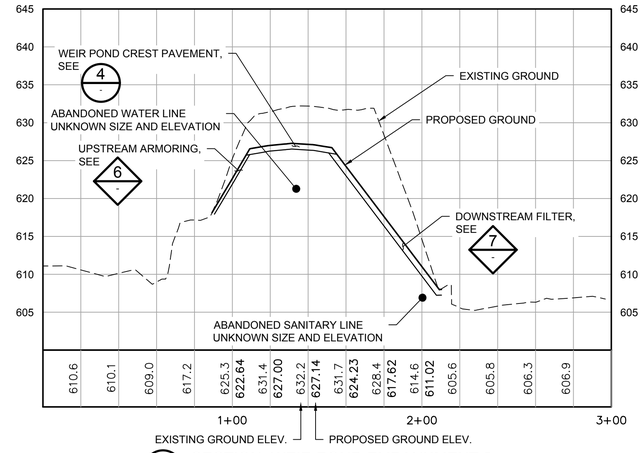


1 CW-101 SECTION: WEIR POND EMBANKMENT 1

0 40 80 HORZ. SCALE IN FEET
0 10 20 VERT. SCALE IN FEET



2 CW-101 SECTION: WEIR POND EMBANKMENT 2

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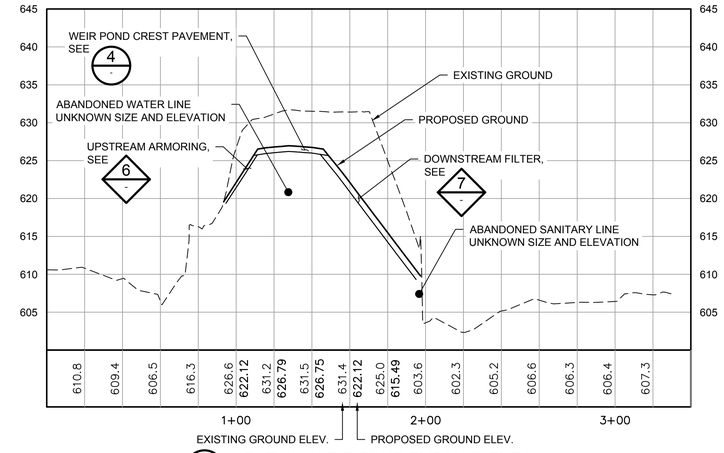
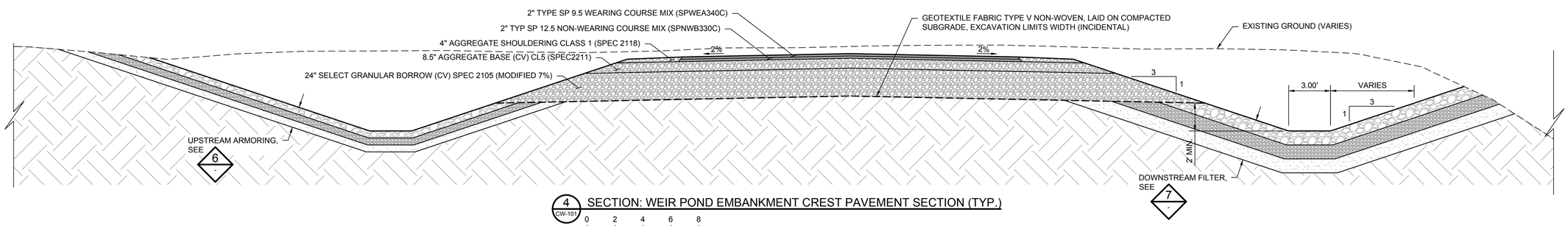
0 10 20 VERT. SCALE IN FEET



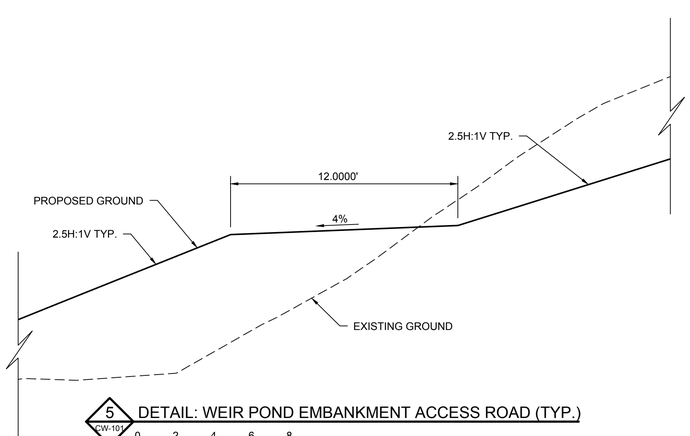
3 CW-101 SECTION: WEIR POND EMBANKMENT 3

0 40 80 HORZ. SCALE IN FEET
0 10 20 VERT. SCALE IN FEET



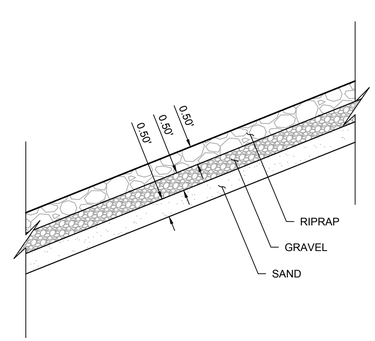
4 CW-101 SECTION: WEIR POND EMBANKMENT CREST PAVEMENT SECTION (TYP.)

0 2 4 6 8 SCALE IN FEET

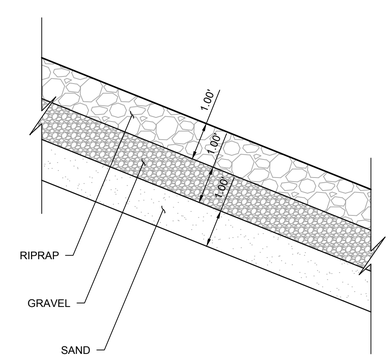


5 CW-101 DETAIL: WEIR POND EMBANKMENT ACCESS ROAD (TYP.)

0 2 4 6 8 SCALE IN FEET



6 DETAIL: WEIR POND EMBANKMENT UPSTREAM ARMORING
N.T.S.



7 DETAIL: WEIR POND EMBANKMENT DOWNSTREAM FILTER
N.T.S.

PRELIMINARY
DRAFT
NOT FOR CONSTRUCTION

REVISIONS			
NO.	DATE	BY	DESCRIPTION
B	5/31/19	SLL	PRE-FINAL DESIGN

DESIGN INFORMATION
DESIGNED BY: PMD
DRAWN BY: ZJN
CHECKED BY: SLL
PROJECT MANAGER: ERD

SEAL
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
SIGNATURE
DATE
LICENSE #

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

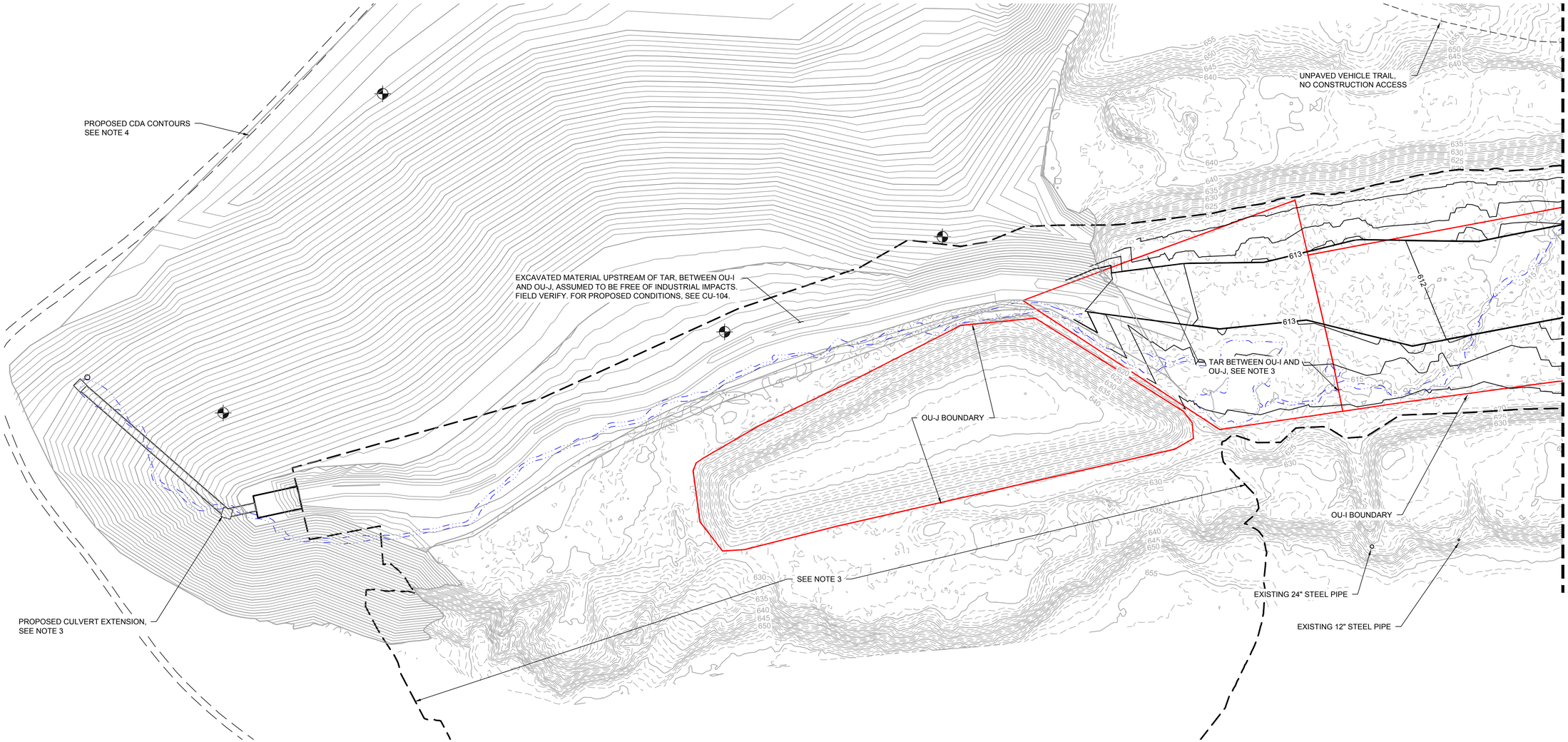
OU-I WEIR EMBANKMENT SECTIONS & DETAILS

PREPARED FOR:
EPA
USS

BARR
BARR ENGINEERING CO.
325 SOUTH LAKE AVENUE
SUITE 700
DULUTH, MN 55802
Ph: 1-800-786-5830
Fax: (218) 529-8202
www.barr.com

DATE: 5/31/19
PROJECT NUMBER: 23691125.12
CW-102
SHEET: ## OF ####

FILE PATH: M:\DESIGN\23691125.12\CAD\02_CW-102_OU-I WEIR EMBANKMENT SECTIONS.DWG [BARR 24x36E PAPER] ZACH J. HELSON 5/31/2019 2:33 PM



1 PLAN: DREDGE PLAN

0 60 120

SCALE IN FEET

NOTES:

1. PROPOSED CONTOURS REPRESENT DREDGED SURFACE.
2. EXISTING CONTOURS REPRESENT EXISTING CONDITIONS AND ASSUMED WORK COMPLETED PRIOR TO DREDGING.
3. SEE OU-J DESIGN PACKAGE (BY AECOM) FOR CULVERT EXTENSION, STABILIZATION AND REMOVAL OF TAR BETWEEN OU-I AND OU-J, AND OU-J CDF CONSTRUCTION. TRANSPORT DREDGED MATERIALS TO OU-J CDF FOLLOWING CDF CONSTRUCTION.
4. SEE CDA DESIGN PKG. (BY AECOM)
5. PROTECT ALL MONITORING WELLS, STRUCTURES, UTILITIES AND TREES WHICH ARE NOT BEING REMOVED.

LEGEND

630	EXISTING FIVE-FOOT CONTOUR
	EXISTING ONE-FOOT CONTOUR
	FUTURE EXISTING FIVE-FOOT CONTOUR PRIOR TO DREDGING
	FUTURE EXISTING ONE-FOOT CONTOUR PRIOR TO DREDGING
630	PROPOSED FIVE-FOOT CONTOUR
630	PROPOSED ONE-FOOT CONTOUR
	WORK AREA LIMITS
	OU BOUNDARY
	EXISTING EDGE OF WATER
	EXISTING MONITORING WELL

PRELIMINARY
DRAFT
NOT FOR CONSTRUCTION

REVISIONS

NO.	DATE	BY	DESCRIPTION
A	7/30/18	ZJN	PRELIMINARY DESIGN
B	5/31/19	BJM	PRE - FINAL DESIGN

DESIGN INFORMATION

DESIGNED BY: BJM2
DRAWN BY: ZJN
CHECKED BY: ECL
PROJECT MANAGER: ERD

SEAL

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 _____
SIGNATURE _____
DATE _____ LICENSE # _____

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

OU-I REMOVAL PLAN

PREPARED FOR:
EPA
USS

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SUITE 700
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Fax: (218) 529-8202
www.barr.com

DATE: 5/31/2019

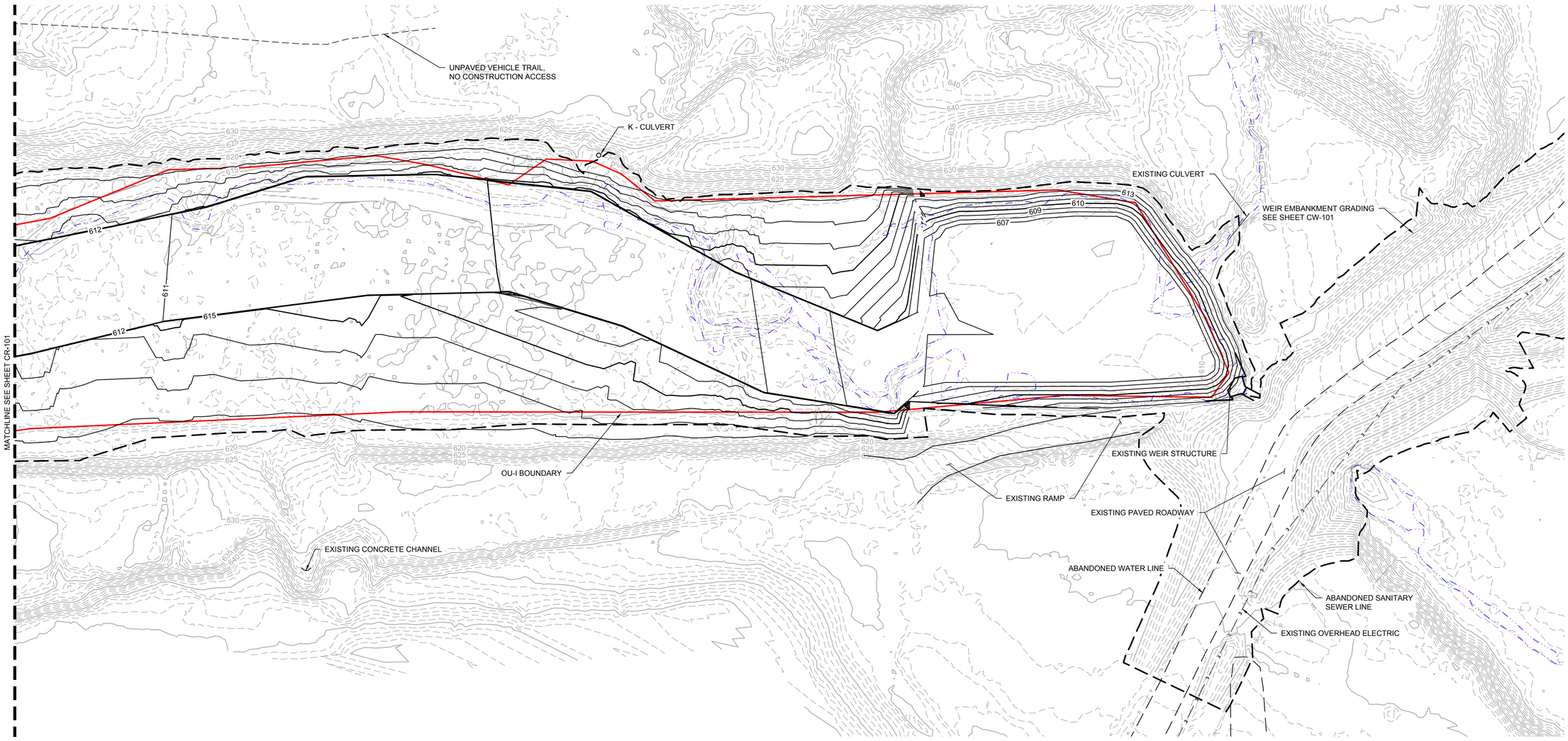
PROJECT NUMBER: 23691125.12

CR-101

SHEET: ## OF ####

PRELIMINARY DRAFT - NOT FOR CONSTRUCTION

FILE PATH: W:\DESIGN\23691125.12\23691125.12_CR-101_OU4 DREDGE PLAN.DWG [BARR-SIZE PAPER-03 BRAME L.] CODES: 5/31/2019 2:33 PM



1 PLAN: DREDGE PLAN - WEIR POND

0 50 100
SCALE IN FEET

LEGEND

630	EXISTING FIVE-FOOT CONTOUR
	EXISTING ONE-FOOT CONTOUR
630	PROPOSED FIVE-FOOT CONTOUR
630	PROPOSED ONE-FOOT CONTOUR
	WORK AREA LIMITS
	OU BOUNDARY
	EXISTING EDGE OF WATER

NOTES:

1. PROPOSED CONTOURS REPRESENT DREDGED SURFACE.
2. TRANSPORT DREDGED MATERIAL TO OU-J CDF FOLLOWING CDF CONSTRUCTION.
3. PROTECT ALL MONITORING WELLS, STRUCTURES, UTILITIES AND TREES WHICH ARE NOT BEING REMOVED.

PRELIMINARY
DRAFT
NOT FOR CONSTRUCTION

REVISIONS

NO.	DATE	BY	DESCRIPTION
A	7/30/18	ZJN	PRELIMINARY DESIGN
B	5/31/19	BJM	PRE - FINAL DESIGN

DESIGN INFORMATION
DESIGNED BY: BJM2
DRAWN BY: ZJN
CHECKED BY: ECL
PROJECT MANAGER: ERD

SEAL:
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
SIGNATURE
DATE
LICENSE #

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

OU-I REMOVAL PLAN - WEIR POND

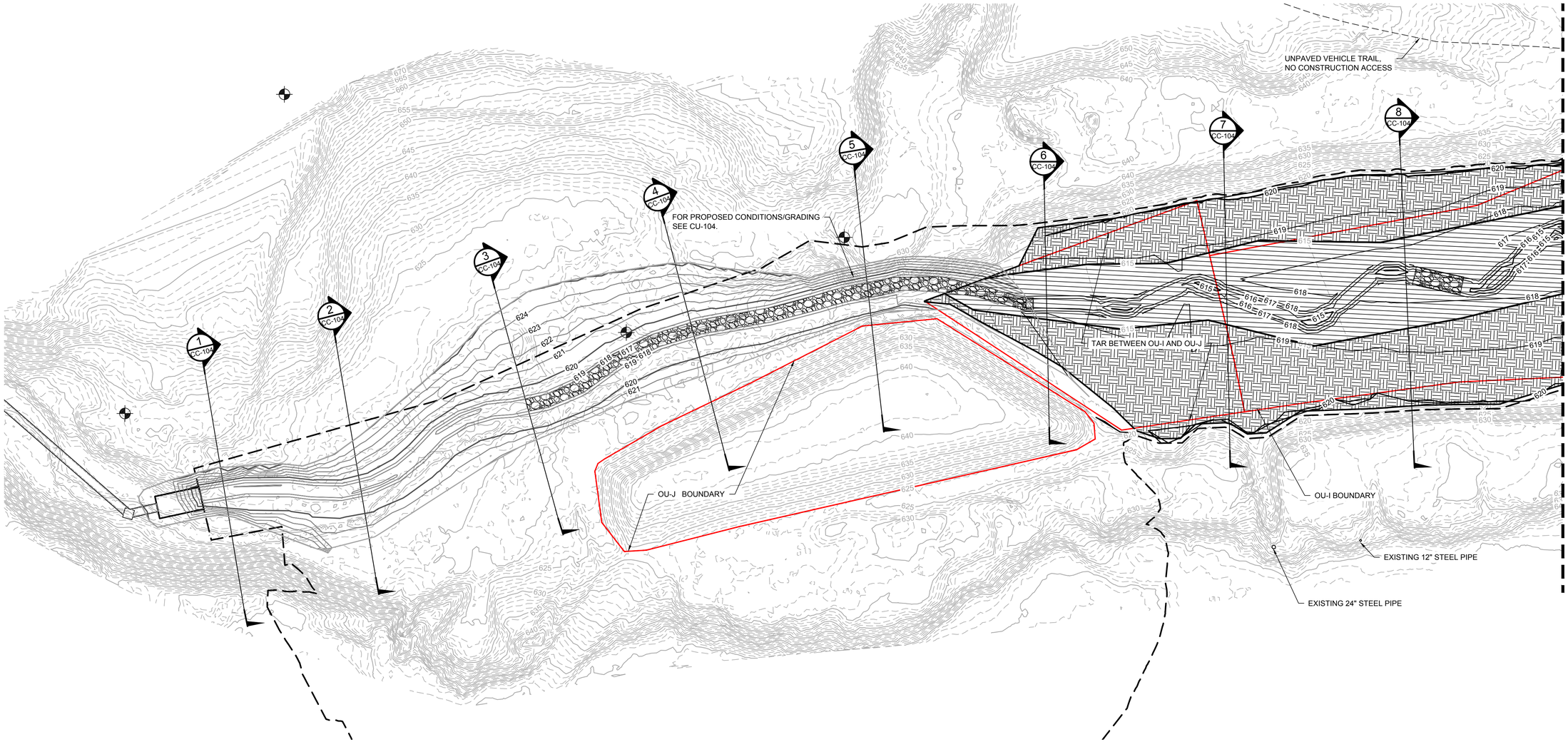
PREPARED FOR:
EPA
USS

BARR
BARR ENGINEERING CO.
325 SOUTH LAKE AVENUE
SUITE 700
DULUTH, MN 55802
Ph: 1-800-786-5830
Fax: (218) 529-8202
www.barr.com

DATE: 5/31/2019
PROJECT NUMBER: 23691125.12
CR-102
SHEET: ## OF ####

PRELIMINARY DRAFT - NOT FOR CONSTRUCTION

FILE PATH: M:\DESIGN\23691125_CR-102_OU-I DREDGE PLAN - WEIR POND.DWG [BARR SHARE L. YODER 5-SIZE PAPER] SHARE L. YODER 5/31/2019 2:42 PM



1 PLAN: CAPPING PLAN

0 60 120
SCALE IN FEET

LEGEND

630	EXISTING FIVE-FOOT CONTOUR
	EXISTING ONE-FOOT CONTOUR
	FUTURE EXISTING FIVE-FOOT CONTOUR PRIOR TO CAPPING
	FUTURE EXISTING ONE-FOOT CONTOUR PRIOR TO CAPPING
630	PROPOSED FIVE-FOOT CONTOUR
630	PROPOSED ONE-FOOT CONTOUR
	WORK AREA LIMITS
	OU BOUNDARY
	EXISTING MONITORING WELL
	REMEDIAL CAP W/ROOT BARRIER, SEE DETAIL 1 ON SHEET CC-107
	UNNAMED CREEK CHANNEL REMEDIAL CAP, SEE DETAIL 2 ON SHEET CC-108
	RIPRAP, SEE DETAILS 8 & 9 ON SHEET CU-105

NOTES:

1. EXISTING CONTOURS REPRESENT CONDITIONS AFTER DREDGING IS COMPLETE. SEE CR-101 & CR-102.
2. PROPOSED CONTOURS REPRESENT CONDITIONS AFTER CAPPING IS COMPLETE.
3. PROTECT ALL MONITORING WELLS, STRUCTURES, UTILITIES AND TREES WHICH ARE NOT BEING REMOVED.

PRELIMINARY DRAFT NOT FOR CONSTRUCTION

REVISIONS

NO.	DATE	BY	DESCRIPTION
A	7/30/18	ZJN	PRELIMINARY DESIGN
B	5/31/19	BJM2	PRE - FINAL DESIGN

DESIGN INFORMATION

DESIGNED BY: BJM2
DRAWN BY: ZJN
CHECKED BY: EJL
PROJECT MANAGER: ERD

SEAL:

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 _____
SIGNATURE _____ LICENSE # _____
DATE _____

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN

DULUTH, MINNESOTA

OU-I CAPPING PLAN

PREPARED FOR:

EPA

USS

BARR

BARR ENGINEERING CO.
325 SOUTH LAKE AVENUE
SUITE 700
DULUTH, MN 55802
Ph: 1-800-786-5830
Fax: (218) 529-8202
www.barr.com

DATE: 05/31/2019

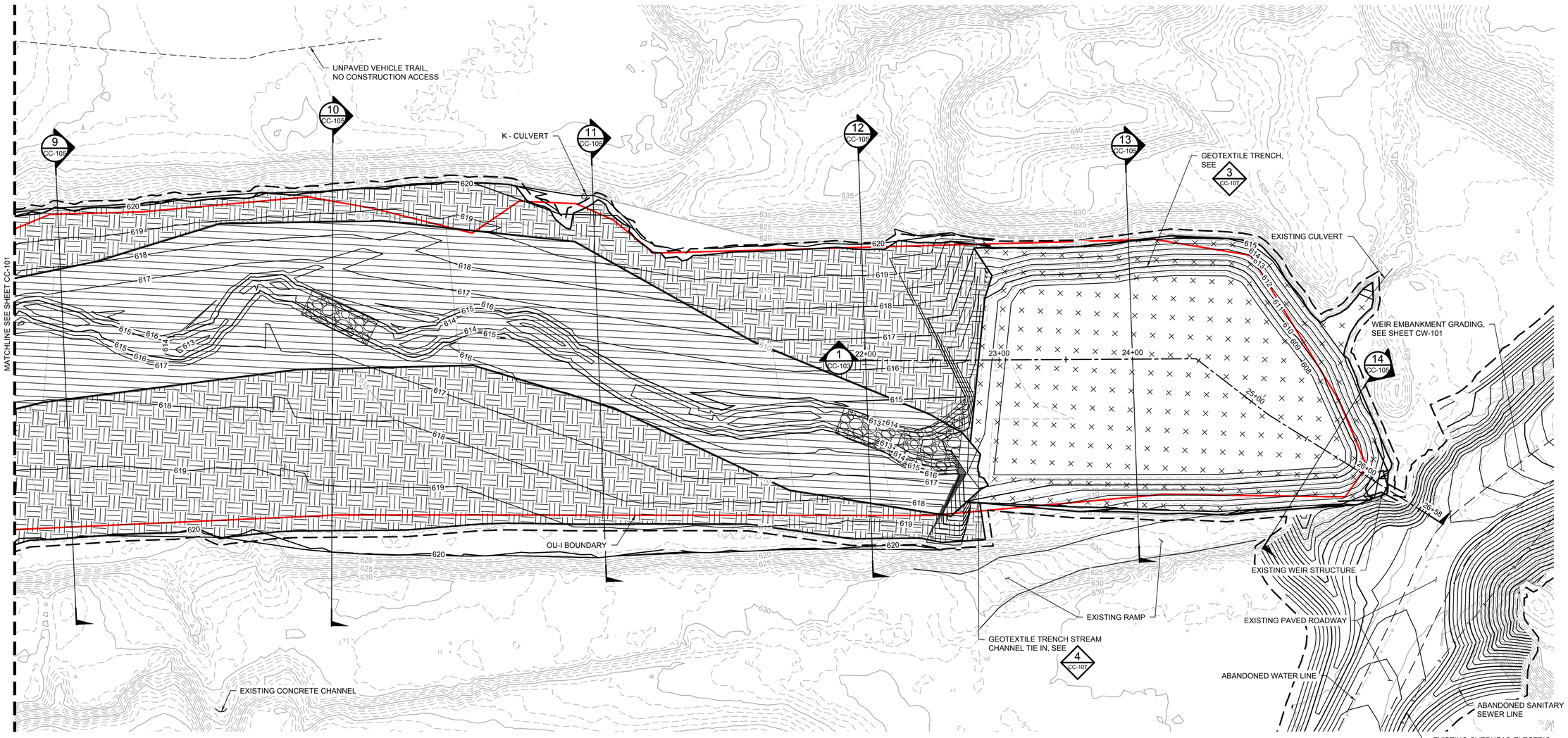
PROJECT NUMBER: 23691125.12

CC-101

SHEET: ## OF ####

PRELIMINARY DRAFT - NOT FOR CONSTRUCTION

FILE PATH: W:\DESIGN\23691125.12\23691125.12_CC-101_OU-I CAPPING PLAN.DWG [BARR B-SIZE PAPER] ZACH J. NELSON 5/31/2019 3:02 PM



1 PLAN: CAPPING PLAN - WEIR POND

0 40 80
SCALE IN FEET

LEGEND

630	EXISTING FIVE-FOOT CONTOUR
	EXISTING ONE-FOOT CONTOUR
630	PROPOSED FIVE-FOOT CONTOUR
630	PROPOSED ONE-FOOT CONTOUR
	WORK AREA LIMITS
	OU BOUNDARY
	REMEDIAL CAP W/ROOT BARRIER, SEE DETAIL 1 ON SHEET CC-107.
	SUBMERGED REMEDIAL CAP, SEE DETAIL 2 ON SHEET CC-107.
	UNNAMED CREEK CHANNEL REMEDIAL CAP, SEE DETAIL 2 ON SHEET CC-108
	RIPRAP, SEE DETAILS 8 & 9 ON SHEET CU-105

NOTES:

1. EXISTING CONTOURS REPRESENT CONDITIONS AFTER DREDGING IS COMPLETE. SEE CR-101 & CR-102.
2. PROPOSED CONTOURS REPRESENT CONDITIONS AFTER CAPPING IS COMPLETE.
3. PROTECT ALL MONITORING WELLS, STRUCTURES, UTILITIES AND TREES WHICH ARE NOT BEING REMOVED.

PRELIMINARY DRAFT NOT FOR CONSTRUCTION

REVISIONS

NO.	DATE	BY	DESCRIPTION
A	7/30/18	ZJN	PRELIMINARY DESIGN
B	5/31/19	BJM2	PRE - FINAL DESIGN

DESIGN INFORMATION

DESIGNED BY: BJM2
DRAWN BY: ZJN
CHECKED BY: ECL
PROJECT MANAGER: ERD

SEAL

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
SIGNATURE
DATE
LICENSE #

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

OU-I CAPPING PLAN - WEIR POND

PREPARED FOR:
EPA
USS

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SUITE 700
DULUTH, MN 55802
Ph: 1-800-786-5830
Fax: (218) 529-8202
www.barr.com

DATE: 05/31/2019

PROJECT NUMBER: 23691125.12

CC-102

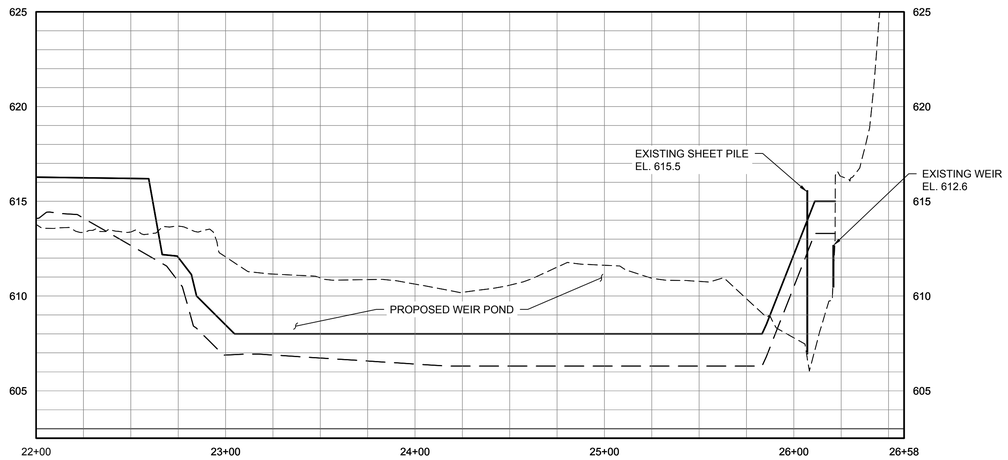
SHEET: ## OF ####

PRELIMINARY DRAFT - NOT FOR CONSTRUCTION

FILE PATH: H:\DESIGN\23691125.12\23691125.12_CC-102_CU-4_CAPPING PLAN - WEIR POND.DWG [BARR-ISO-SIZE P-NPRE] ZACH J HELSON 5/31/2019 3:39 PM

LEGEND

- EXISTING GROUND
- DREDGE SURFACE
- PROPOSED SURFACE



1 SECTION: OU-I OVERALL SECTION

CC-101, CC-102

0 30 60

SCALE IN FEET

VERTICAL SCALE 10X THE HORIZONTAL SCALE

PRELIMINARY
DRAFT
NOT FOR CONSTRUCTION

REVISIONS

NO.	DATE	BY	DESCRIPTION
A	7/30/18	ZJN	PRELIMINARY DESIGN
B	5/31/19	BJM2	PRE - FINAL DESIGN
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

DESIGN INFORMATION

DESIGNED BY: BJM2
DRAWN BY: ZJN
CHECKED BY: ECL
PROJECT MANAGER: ERD

SEAL

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 _____
SIGNATURE _____
DATE _____ LICENSE # _____

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

OU-I OVERALL SECTION

PREPARED FOR:
EPA
USS

BARR
BARR ENGINEERING CO.
325 SOUTH LAKE AVENUE
SUITE 700
DULUTH, MN 55802
Ph: 1-800-786-5830
Fax: (218) 529-8202
www.barr.com

DATE: 05/31/2019

PROJECT NUMBER: 23691125.12

CC-103

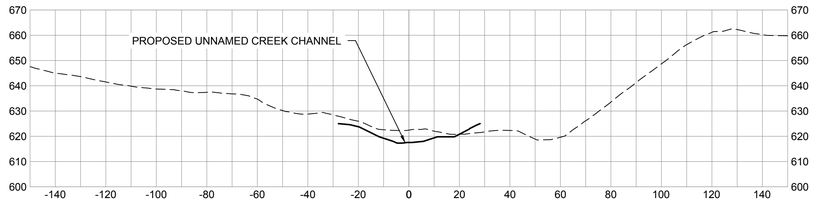
SHEET: ## OF ####

PRELIMINARY DRAFT - NOT FOR CONSTRUCTION

FILE PATH: I:\DL-CAD\CADFES\BRAN\23691125.12\23691125.12_CC-103_CH4 CROSS SECTIONS.DWG [BARR D-SIZE PAPER] CH2-1, ABLESON 5/31/2019 1:31 PM

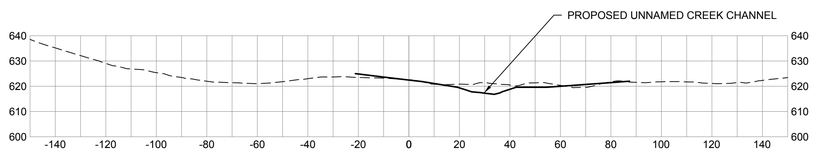
LEGEND

- EXISTING GROUND
- DREDGE SURFACE
- PROPOSED SURFACE



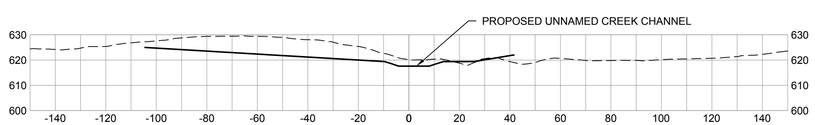
1 CC-101 SECTION: CROSS SECTION 1

0 30 60
SCALE IN FEET



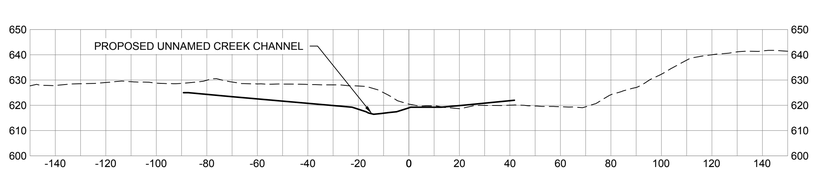
2 CC-101 SECTION: CROSS SECTION 2

0 30 60
SCALE IN FEET



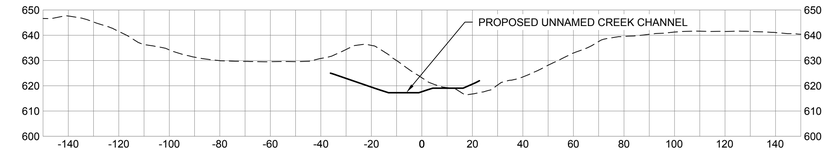
3 CC-101 SECTION: CROSS SECTION 3

0 30 60
SCALE IN FEET



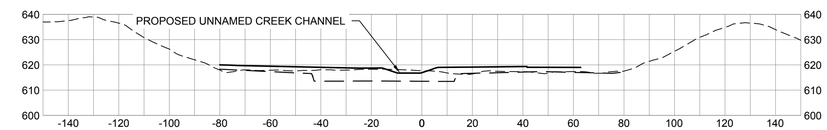
4 CC-101 SECTION: CROSS SECTION 4

0 30 60
SCALE IN FEET



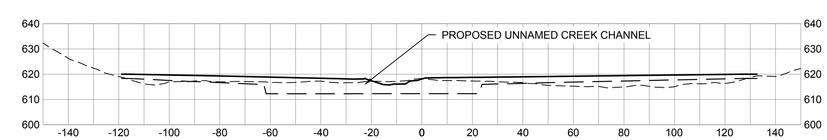
5 CC-101 SECTION: CROSS SECTION 5

0 30 60
SCALE IN FEET



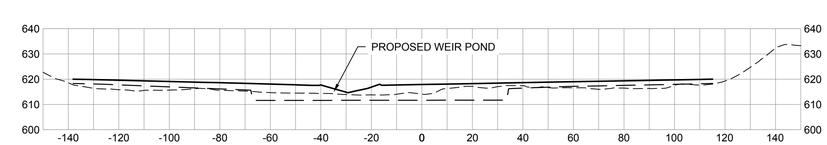
6 CC-101 SECTION: CROSS SECTION 6

0 30 60
SCALE IN FEET



7 CC-101 SECTION: CROSS SECTION 7

0 30 60
SCALE IN FEET



8 CC-101 SECTION: CROSS SECTION 8

0 30 60
SCALE IN FEET

PRELIMINARY
DRAFT
NOT FOR CONSTRUCTION

REVISIONS

NO.	DATE	BY	DESCRIPTION
A	7/30/18	ZJN	PRELIMINARY DESIGN
B	5/31/19	SLY	PRE - FINAL DESIGN
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

DESIGN INFORMATION

DESIGNED BY: BJM2
DRAWN BY: ZJN
CHECKED BY: ECL
PROJECT MANAGER: ERD

SEAL

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 _____
SIGNATURE _____
DATE _____ LICENSE # _____

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

OU-I CROSS SECTIONS

PREPARED FOR:
EPA
USS

BARR
BARR ENGINEERING CO.
325 SOUTH LAKE AVENUE
SUITE 700
DULUTH, MN 55802
Ph: 1-800-786-5830
Fax: (218) 529-8202
www.barr.com

DATE: 05/31/2019

PROJECT NUMBER: 23691125.12

CC-104

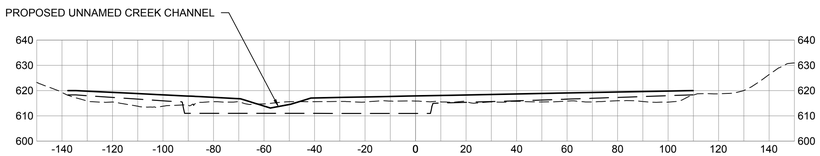
SHEET: ## OF ####

PRELIMINARY DRAFT - NOT FOR CONSTRUCTION

FILE PATH: M:\DESIGN\23691125.12\DWG\BARR-D-SIZE PAPER\ZACH J. MELSON 05/30/19 11:44 AM

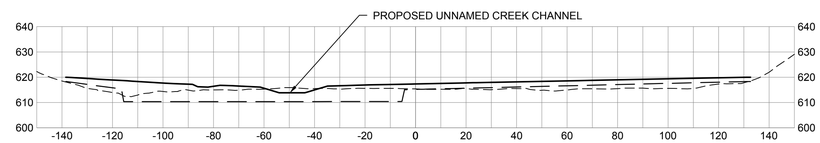
LEGEND

- EXISTING GROUND
- DREDGE SURFACE
- PROPOSED SURFACE



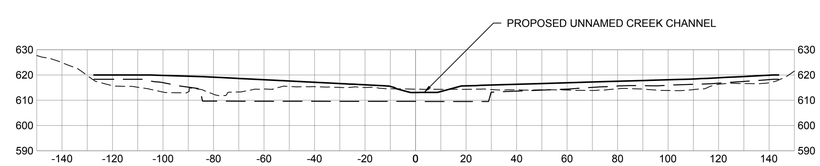
9 CC-102 SECTION: CROSS SECTION 9

0 30 60
SCALE IN FEET



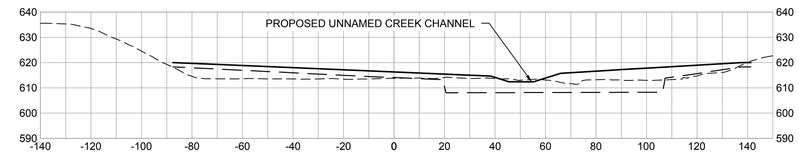
10 CC-102 SECTION: CROSS SECTION 10

0 30 60
SCALE IN FEET



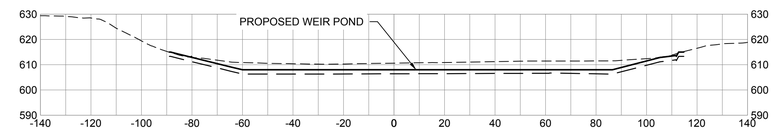
11 CC-102 SECTION: CROSS SECTION 11

0 30 60
SCALE IN FEET



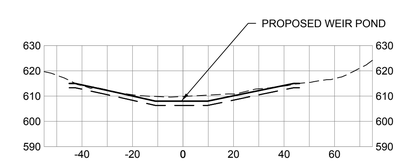
12 CC-102 SECTION: CROSS SECTION 12

0 30 60
SCALE IN FEET



13 CC-102 SECTION: CROSS SECTION 13

0 30 60
SCALE IN FEET



14 CC-102 SECTION: CROSS SECTION 14

0 30 60
SCALE IN FEET

PRELIMINARY
DRAFT
NOT FOR CONSTRUCTION

REVISIONS

NO.	DATE	BY	DESCRIPTION
A	7/30/18	ZJN	PRELIMINARY DESIGN
B	5/31/19	SLY	PRE - FINAL DESIGN
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

DESIGN INFORMATION

DESIGNED BY: BJM2
DRAWN BY: ZJN
CHECKED BY: ECL
PROJECT MANAGER: ERD

SEAL

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 _____
SIGNATURE _____
DATE _____ LICENSE # _____

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

OU-I CROSS SECTIONS

PREPARED FOR:
EPA
USS

BARR
BARR ENGINEERING CO.
325 SOUTH LAKE AVENUE
SUITE 700
DULUTH, MN 55802
Ph: 1-800-786-5830
Fax: (218) 529-8202
www.barr.com

DATE: 05/31/2019

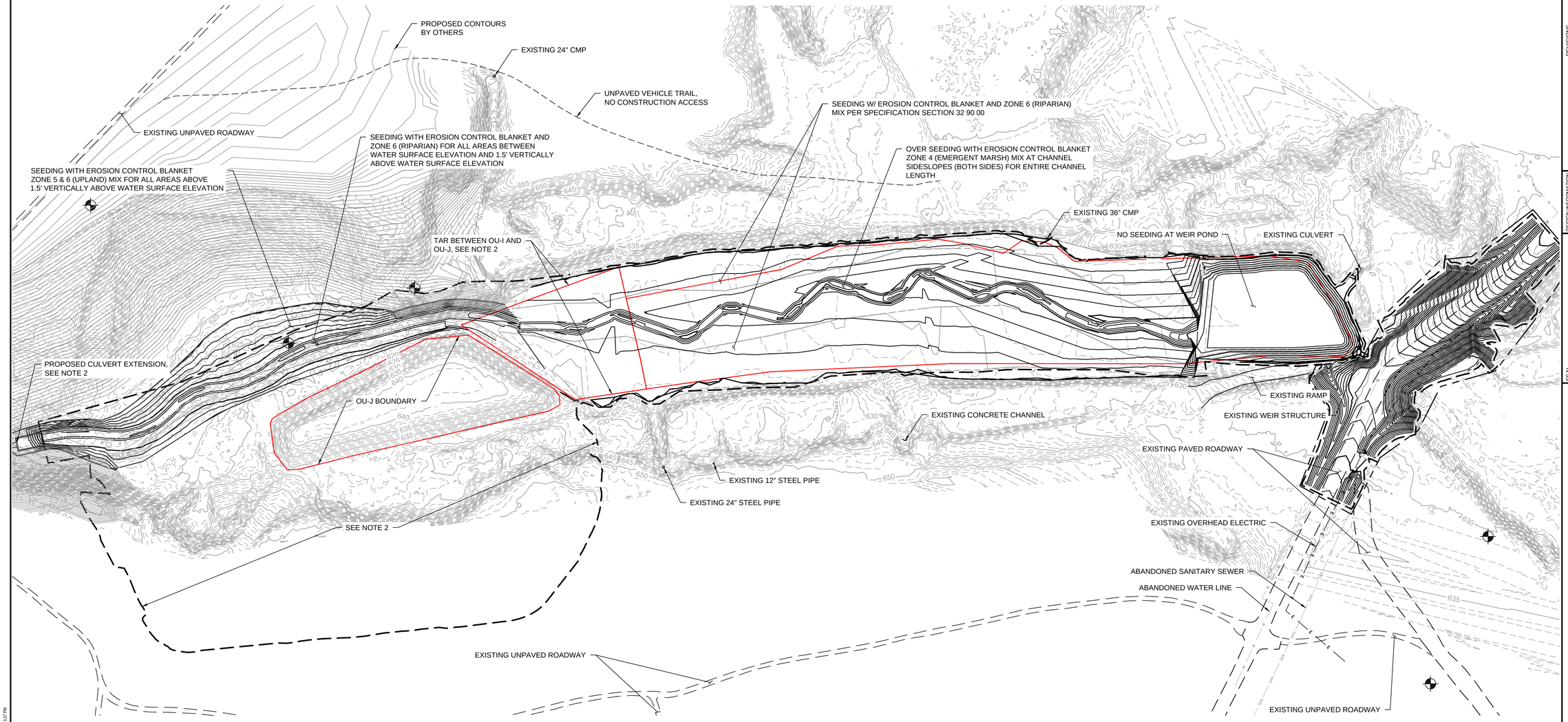
PROJECT NUMBER: 23691125.12

CC-105

SHEET: ## OF ####

PRELIMINARY DRAFT - NOT FOR CONSTRUCTION

FILE PATH: M:\DESIGN\23691125.12\CAD\01-CC-102_CC-105_CAD CROSS SECTIONS-1.DWG [BARR-D-SIZE PAPER] ZACH J. MELSON 5/31/2019 11:45 AM



1 PLAN: FINAL CONDITIONS PLAN

0 100 200
SCALE IN FEET

LEGEND

630	EXISTING FIVE-FOOT CONTOUR
	EXISTING ONE-FOOT CONTOUR
	FUTURE EXISTING FIVE-FOOT CONTOUR PRIOR TO CAPPING COMPLETION
	FUTURE EXISTING ONE-FOOT CONTOUR PRIOR TO CAPPING COMPLETION
630	PROPOSED FIVE-FOOT CONTOUR
630	PROPOSED ONE-FOOT CONTOUR
	WORK AREA LIMITS
	OU BOUNDARY
	EXISTING MONITORING WELL

NOTES:

1. PROPOSED CONTOURS REPRESENT CONDITIONS AFTER CAPPING AND CREEK CONSTRUCTION IS COMPLETE.
2. SEE OU-J DESIGN PACKAGE (BY AECOM) FOR CULVERT EXTENSION AND GRIT CHAMBER, STABILIZATION AND REMOVAL OF TAR BETWEEN OU-I AND OU-J, AND OU-J CDF CONSTRUCTION.

PRELIMINARY DRAFT NOT FOR CONSTRUCTION

REVISIONS

NO.	DATE	BY	DESCRIPTION
A	7/30/18	ZJN	PRELIMINARY DESIGN
B	5/31/19	SLY	PRE - FINAL DESIGN

DESIGN INFORMATION

DESIGNED BY: BJM2
DRAWN BY: ZJN
CHECKED BY: ECL
PROJECT MANAGER: ERD

SEAL

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PRINTED NAME _____
SIGNATURE _____ LICENSE # _____
DATE _____

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

OU-I FINAL CONDITIONS PLAN

PREPARED FOR:
EPA
USS

BARR
BARR ENGINEERING CO.
325 SOUTH LAKE AVENUE
SUITE 700
DULUTH, MN 55802
Ph: 1-800-786-5830
Fax: (218) 529-8202
www.barr.com

DATE: 05/31/2019

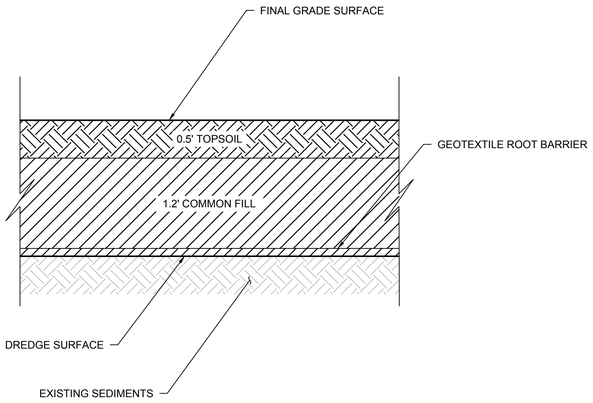
PROJECT NUMBER: 23691125.12

CC-106

SHEET: ## OF ####

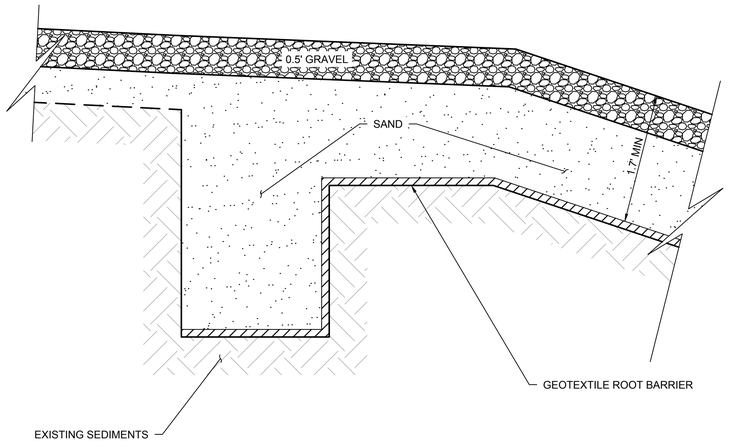
PRELIMINARY DRAFT - NOT FOR CONSTRUCTION

FILE PATH: ISDL-CAD\CADD\23691125\12\23691125.12_CC-06_OU-I FINAL CONDITIONS PLAN.DWG (BARR D-SIZE PAPER) BY: L. MEEMKEN 6/18/2019 2:27 PM



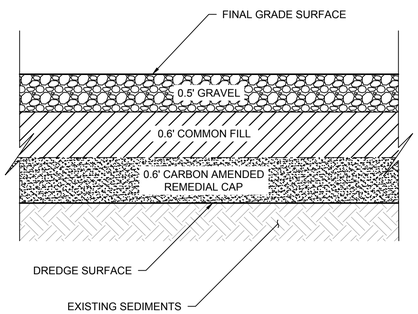
1 DETAIL: REMEDIAL CAP W/ ROOT BARRIER (TYP.)

0 0.5 1 2
SCALE IN FEET



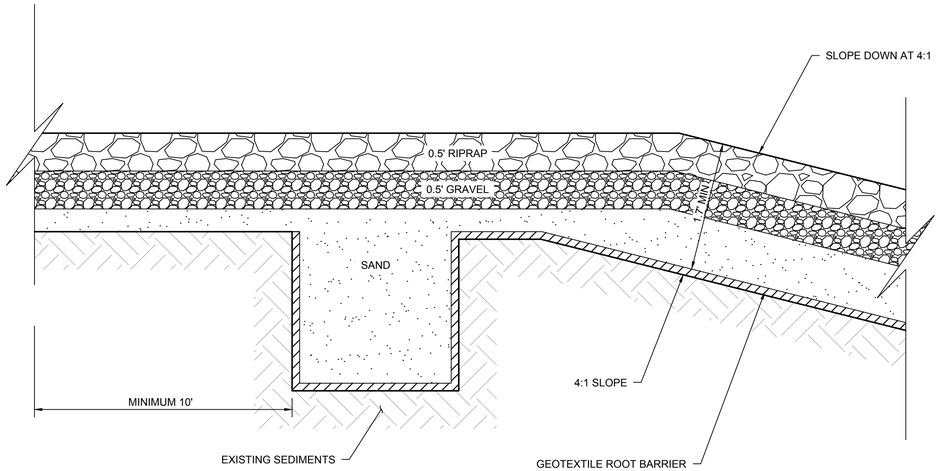
3 DETAIL: GEOTEXTILE TRENCH (TYP.)

0 0.5 1 2
SCALE IN FEET



2 DETAIL: SUBMERGED REMEDIAL CAP (TYP.)

0 0.5 1 2
SCALE IN FEET



4 DETAIL: GEOTEXTILE TRENCH STREAM CHANNEL TIE IN (TYP.)

0 0.5 1 2
SCALE IN FEET

PRELIMINARY
DRAFT
NOT FOR CONSTRUCTION

REVISIONS			
NO.	DATE	BY	DESCRIPTION
A	7/30/18	DTS	PRELIMINARY DESIGN
B	5/31/19	BJM2	PRE - FINAL DESIGN

DESIGN INFORMATION
DESIGNED BY: BJM2
DRAWN BY: DTS
CHECKED BY: ECL
PROJECT MANAGER: ERD

SEAL
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
SIGNATURE
DATE
LICENSE #

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

DREDGE AND CAP DETAILS

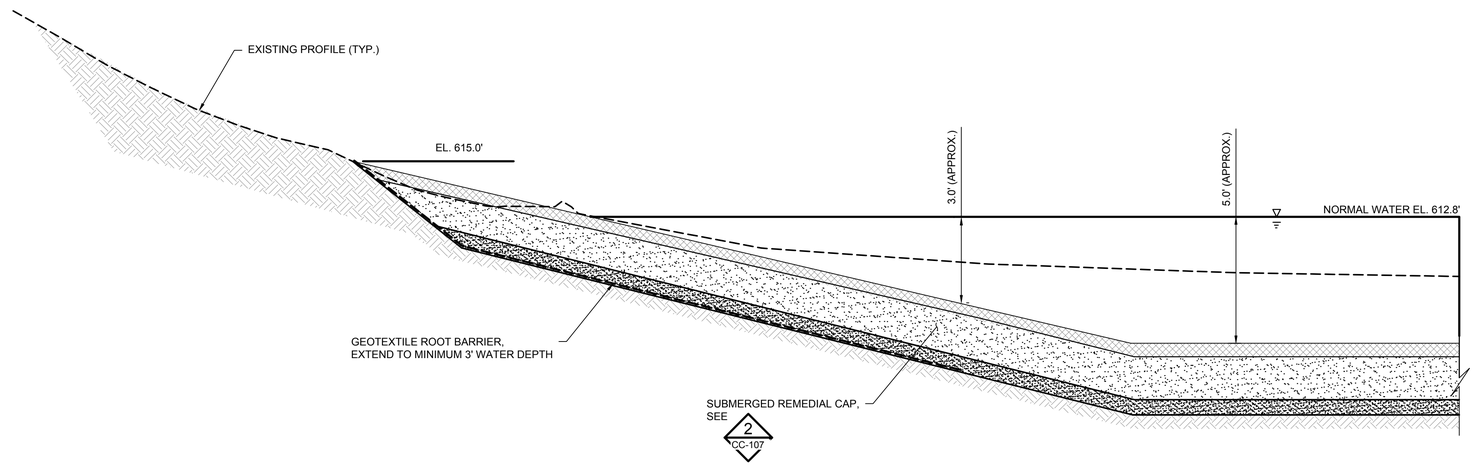
PREPARED FOR:
EPA
USS

BARR
BARR ENGINEERING CO.
325 SOUTH LAKE AVENUE
SUITE 700
DULUTH, MN 55802
Ph: 1-800-786-5830
Fax: (218) 529-8202
www.barr.com

DATE: 07/05/2018
PROJECT NUMBER: 23691125.12
CC-107
SHEET: ## OF ####

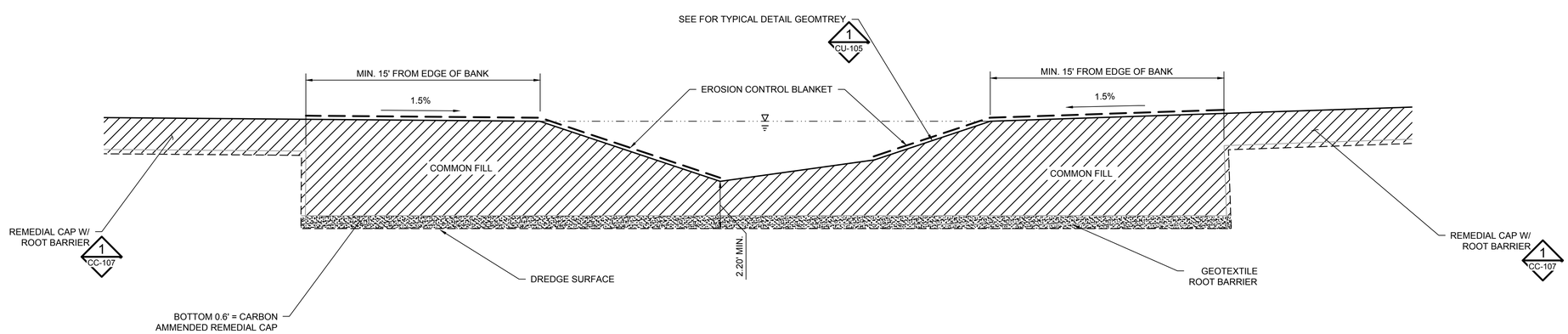
PRELIMINARY DRAFT - NOT FOR CONSTRUCTION

FILE PATH: M:\DESIGN\23691125.12\23691125.12_CC-107_DETAIL_DREDGE_CAP.DWG [BARR FORSE PAPER] ACH J. HELSON 5/31/2019 3:37 PM



1 CC-102 SECTION: WEIR POND REMEDIAL CAP (TYP.)

0 3 6
SCALE IN FEET



2 CC-101, 102 TYPICAL DETAIL: UNNAMED CREEK CHANNEL REMEDIAL CAP

0 3 6
SCALE IN FEET

NOTE: WIDTH OF CARBON AMENDED REMEDIAL CAP VARIES, SEE PLAN

PRELIMINARY
DRAFT
NOT FOR CONSTRUCTION

REVISIONS

NO.	DATE	BY	DESCRIPTION
A	7/30/18	DTS	PRELIMINARY DESIGN
B	5/31/19	BJM2	PRE - FINAL DESIGN
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

DESIGN INFORMATION

DESIGNED BY: BJM2
DRAWN BY: DTS
CHECKED BY: ECL
PROJECT MANAGER: ERD

SEAL

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 _____
SIGNATURE _____
DATE _____ LICENSE # _____

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

DREDGE AND CAPPING SECTIONS AND DETAILS - WEIR POND

PREPARED FOR:
EPA
USS

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BARR ENGINEERING CO.
325 SOUTH LAKE AVENUE
SUITE 700
DULUTH, MN 55802
Ph: 1-800-786-5830
Fax: (218) 529-8202
www.barr.com

DATE: 05/31/2019

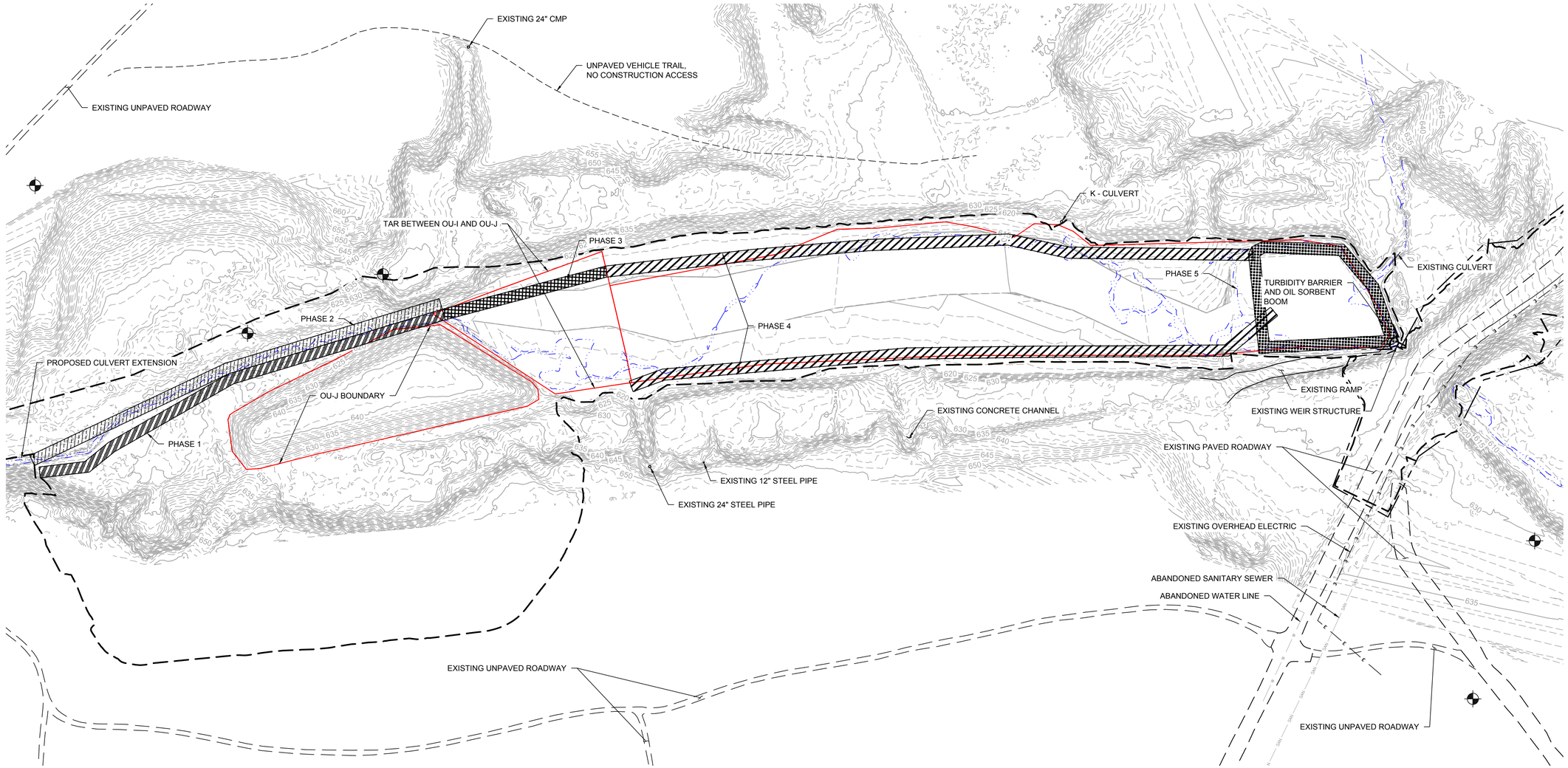
PROJECT NUMBER: 23691125.12

CC-108

SHEET: ## OF ####

PRELIMINARY DRAFT - NOT FOR CONSTRUCTION

FILE PATH: M:\DESIGN\23691125.12\2691125.12_CC-108_DETAIL_DREDGE_CAP_TRANSITIONLOYNG (BARR 24-SIZE) PAPER) BAHMEL, VYODES 5/31/2019 5:11 PM



1 PLAN: TEMPORARY STORMWATER DIVERSION PLAN

0 100 200
SCALE IN FEET

LEGEND

- 630 — EXISTING FIVE-FOOT CONTOUR
- EXISTING ONE-FOOT CONTOUR
- WORK AREA LIMITS
- OU BOUNDARY
- EXISTING EDGE OF WATER
- EXISTING MONITORING WELL

TEMPORARY STORMWATER MANAGEMENT & CONSTRUCTION SEQUENCING PHASES:

1. MAINTAIN UNNAMED CREEK BASE FLOW IN EXISTING CHANNEL WHILE CONSTRUCTING PROPOSED UNNAMED CREEK CHANNEL THROUGH AREA SHOWN.

2. COMPLETE CULVERT EXTENSION AND GRIT CHAMBER PER AECOM DESIGN PACKAGE. ROUTE BASE FLOW INTO NEWLY COMPLETED REACH OF UNNAMED CREEK CHANNEL.

3. STORMWATER DIVERSION AROUND TAR BETWEEN OU-I & OU-J INSTALLED PRIOR TO TAR STABILIZATION PER AECOM DESIGN PACKAGE. MAINTAIN STORMWATER DIVERSION UNTIL REMEDIAL CAP AND UNNAMED CREEK CHANNEL CONSTRUCTION IS COMPLETED THROUGH AREA SHOWN.

4. DIVERT STORMWATER BASE FLOW AND DISCHARGE FROM EXISTING OUTFALLS AROUND WORK AREA TO WEIR POND UNTIL DREDGING, REMEDIAL CAP, AND UNNAMED CREEK CHANNEL CONSTRUCTED THROUGH AREA SHOWN. MAINTAIN POOLED WATER WITHIN EXISTING WEIR POND FOOTPRINT.

5. DREDGE AND CAP WEIR POND. MAINTAIN TURBIDITY CURTAIN AND SORBENT BOOM UNTIL ALL SITE RESTORATION IS COMPLETE.

NOTES:

1. DEWATERING GROUNDWATER TABLE PROHIBITED UNLESS APPROVED BY ENGINEER.
2. IMPLEMENT CONTINGENCY PLAN FOR STORMWATER EVENTS EXCEEDING BASE FLOW.
3. METHODS OF STORMWATER DIVERSION SHALL PREVENT CONTACT WITH IMPACTED OU-I SEDIMENTS AND MAY CONSIST OF CLEAN CAP MATERIAL, LINED DITCHES, GRAVITY OR PUMPED PIPING SYSTEMS.
4. DIVERSION ROUTES SHOWN CONCEPTUALLY. ACTUAL ALIGNMENT TO BE DETERMINED BY CONTRACTOR.

PRELIMINARY
DRAFT
NOT FOR CONSTRUCTION

REVISIONS

NO.	DATE	BY	DESCRIPTION
A	7/30/18	ZJN	PRELIMINARY DESIGN
B	5/31/19	BJM2	PRE - FINAL DESIGN

DESIGN INFORMATION

DESIGNED BY: BJM2
DRAWN BY: ZJN
CHECKED BY: ECL
PROJECT MANAGER: ERD

SEAL:
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 _____
SIGNATURE _____ LICENSE # _____
DATE _____

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN

DULUTH, MINNESOTA

UNNAMED CREEK TEMPORARY STORMWATER DIVERSION PLAN

PREPARED FOR:
EPA
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325 SOUTH LAKE AVENUE
SUITE 700
DULUTH, MN 55802
Ph: 1-800-786-5830
Fax: (218) 529-8202
www.barr.com

DATE: 05/31/2019

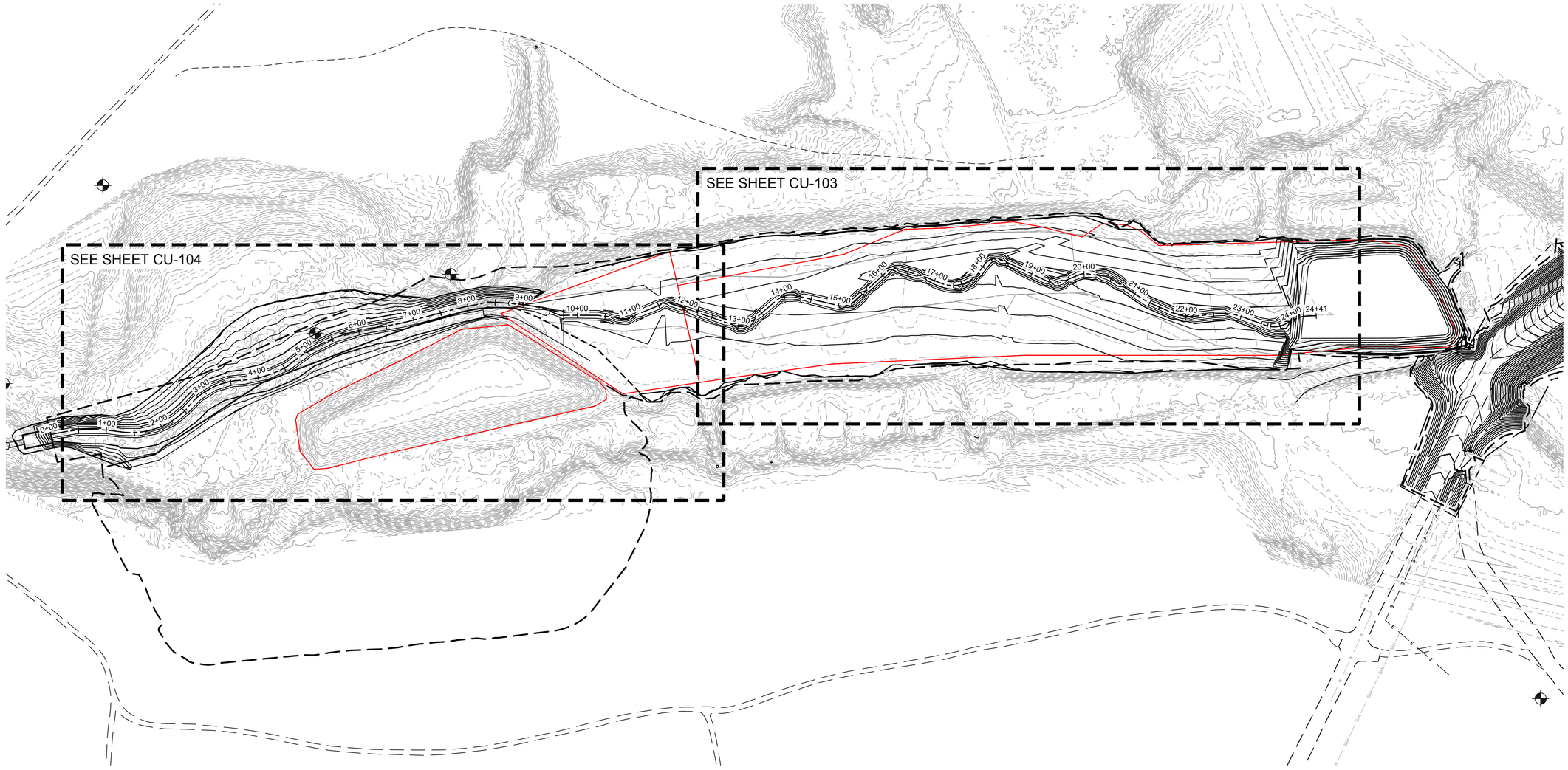
PROJECT NUMBER: 23691125.12

CU-101

SHEET: ## OF ####

PRELIMINARY DRAFT - NOT FOR CONSTRUCTION

FILE PATH: H:\DESIGN\23691125.12\23691125.12_CU-101_UNNAMED_CREEK_TEMPSWMP_STORMWATER_DIVERSION_PLAN.DWG (BARR 8-SIZE PAPER) SHANE L. VOGER 6/3/2019 9:31 AM



1 PLAN: OU-I UNAMED CREEK CHANNEL LAYOUT

0 100 200
SCALE IN FEET

LEGEND

- 630 — EXISTING FIVE-FOOT CONTOUR
- EXISTING ONE-FOOT CONTOUR
- 630 — PROPOSED FIVE-FOOT CONTOUR
- 630 — PROPOSED ONE-FOOT CONTOUR
- PROPOSED CHANNEL CENTERLINE
- WORK AREA LIMITS
- OU BOUNDARY
- EXISTING MONITORING WELL

NOTES:

1. EXISTING CONTOURS REPRESENT CONDITIONS AFTER DREDGING IS COMPLETE SEE CR-101 & CR-102.
2. PROPOSED CONTOURS REPRESENT CONDITIONS AFTER CAPPING IS COMPLETE.

PRELIMINARY
DRAFT
NOT FOR CONSTRUCTION

REVISIONS

NO.	DATE	BY	DESCRIPTION
A	7/30/18	AMS4	PRELIMINARY DESIGN
B	5/31/19	BJM2	PRE - FINAL DESIGN

DESIGN INFORMATION

DESIGNED BY: JCO
DRAWN BY: AMS4
CHECKED BY: ECL
PROJECT MANAGER: ERD

SEAL:

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 _____
SIGNATURE _____
DATE _____ LICENSE # _____

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

OU-I UNNAMED CREEK CHANNEL LAYOUT PLAN

PREPARED FOR:
EPA
USS

BARR
BARR ENGINEERING CO.
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SUITE 700
DULUTH, MN 55802
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Fax: (218) 529-8202
www.barr.com

DATE: 05/31/2019

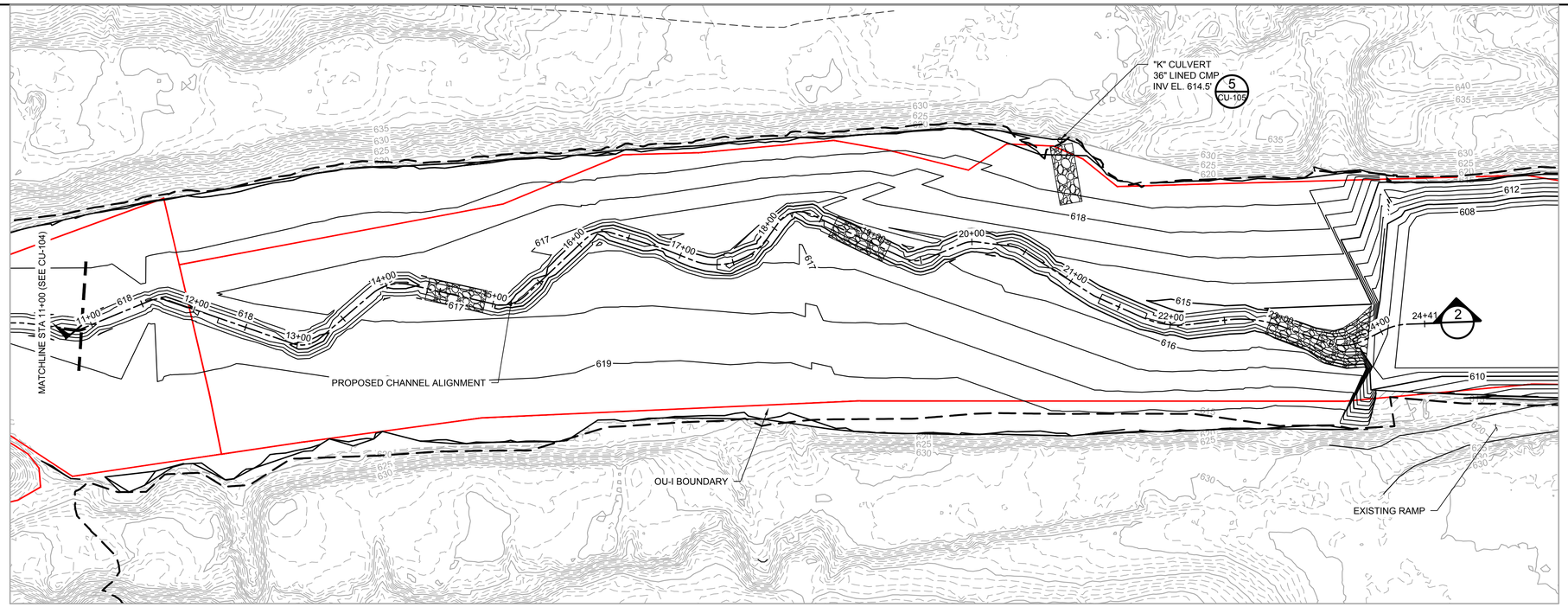
PROJECT NUMBER: 23691125.12

CU-102

SHEET: ## OF ####

PRELIMINARY DRAFT - NOT FOR CONSTRUCTION

FILE PATH: M:\DESIGN\23691125.12\2691125.12_CU-102_OU-I UNNAMED CREEK CHANNEL LAYOUT PLAN.DWG [BARR E-SIZE PAPER] SHANE L. YODER 5/31/2019 9:49 AM



1 PLAN: OU-I UNAMED CREEK CHANNEL LAYOUT

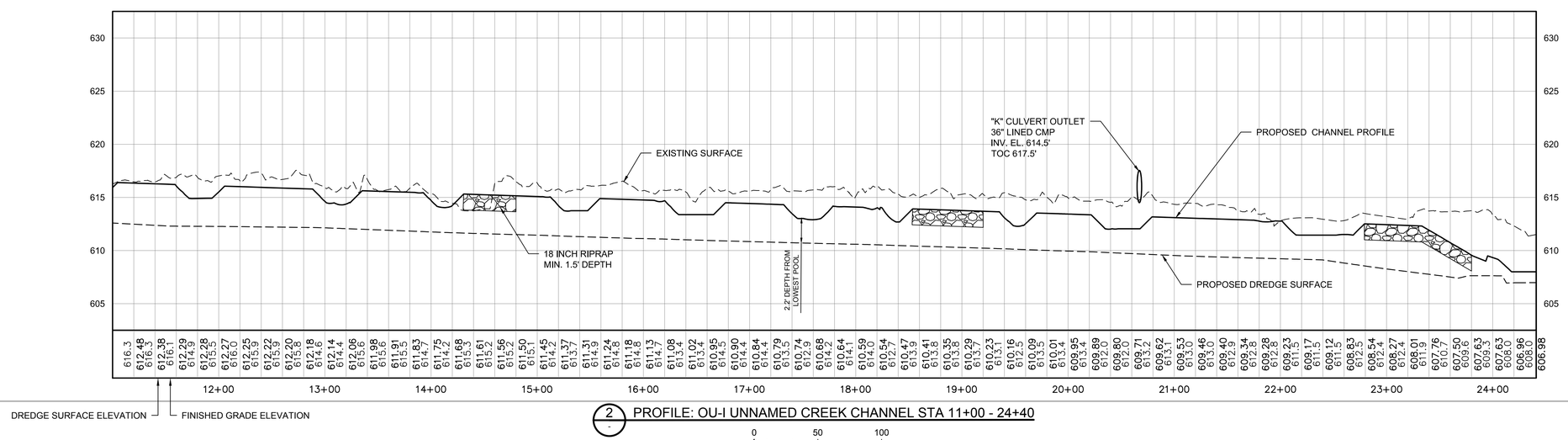
0 50 100
SCALE IN FEET

PLAN VIEW LEGEND

- EXISTING FIVE-FOOT CONTOUR
- EXISTING ONE-FOOT CONTOUR
- PROPOSED FIVE-FOOT CONTOUR
- PROPOSED ONE-FOOT CONTOUR
- PROPOSED CHANNEL CENTERLINE
- WORK AREA LIMITS
- OU BOUNDARY
- RIPRAP, SEE DETAILS 8 & 9 ON SHEET CU-105

NOTES:

1. PROPOSED CONTOURS REPRESENT CONDITIONS AFTER CAPPING IS COMPLETE. SEE SHEETS CC-101 AND CC-102.



2 PROFILE: OU-I UNNAMED CREEK CHANNEL STA 11+00 - 24+40

0 50 100
SCALE IN FEET

PRELIMINARY
DRAFT
NOT FOR CONSTRUCTION

REVISIONS			
NO.	DATE	BY	DESCRIPTION
A	7/30/18	AMS4	PRELIMINARY DESIGN
B	5/31/19	JCO	PRE - FINAL DESIGN

DESIGN INFORMATION
DESIGNED BY: JCO
DRAWN BY: AMS4
CHECKED BY: ECL
PROJECT MANAGER: ERD

SEAL:
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
SIGNATURE
DATE
LICENSE #

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

OU-I UNNAMED CREEK CHANNEL PLAN/PROFILE STA 11+00 - 24+40

PREPARED FOR:
EPA
USS

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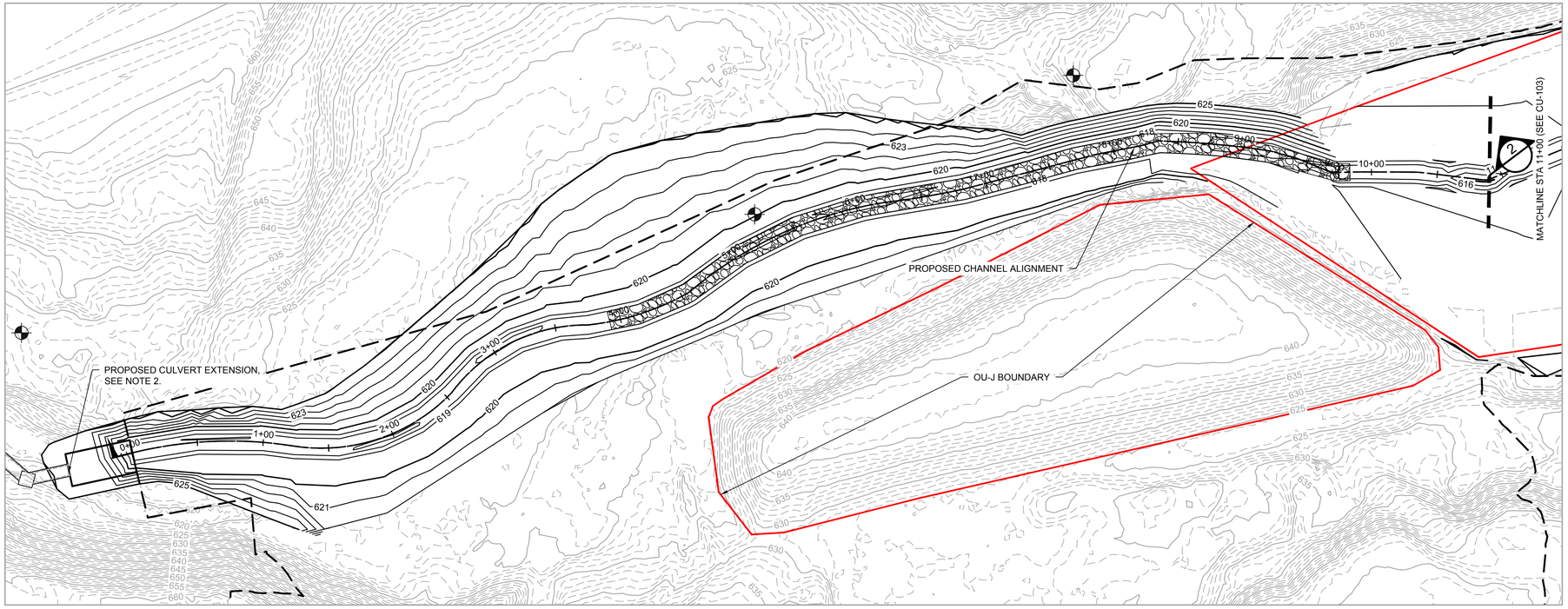
BARR ENGINEERING CO.
325 SOUTH LAKE AVENUE
SUITE 700
DULUTH, MN 55802
Ph: 1-800-786-5830
Fax: (218) 529-8202
www.barr.com

DATE: 05/31/2019
PROJECT NUMBER: 23691125.12
CU-103
SHEET: ## OF ####

PRELIMINARY DRAFT - NOT FOR CONSTRUCTION

FILE PATH: W:\DESIGN\23691125.12\23691125.12_CU-103_OU-I UNNAMED CREEK CHANNEL PLAN-PROFILE.dwg - 12-X3.DWG [BARR 8-SIZE PAPER] SHANE L. VOSER 5/31/2019 4:44 PM



1 PLAN: OU-J UNAMED CREEK CHANNEL STA 0+00 - 11+00

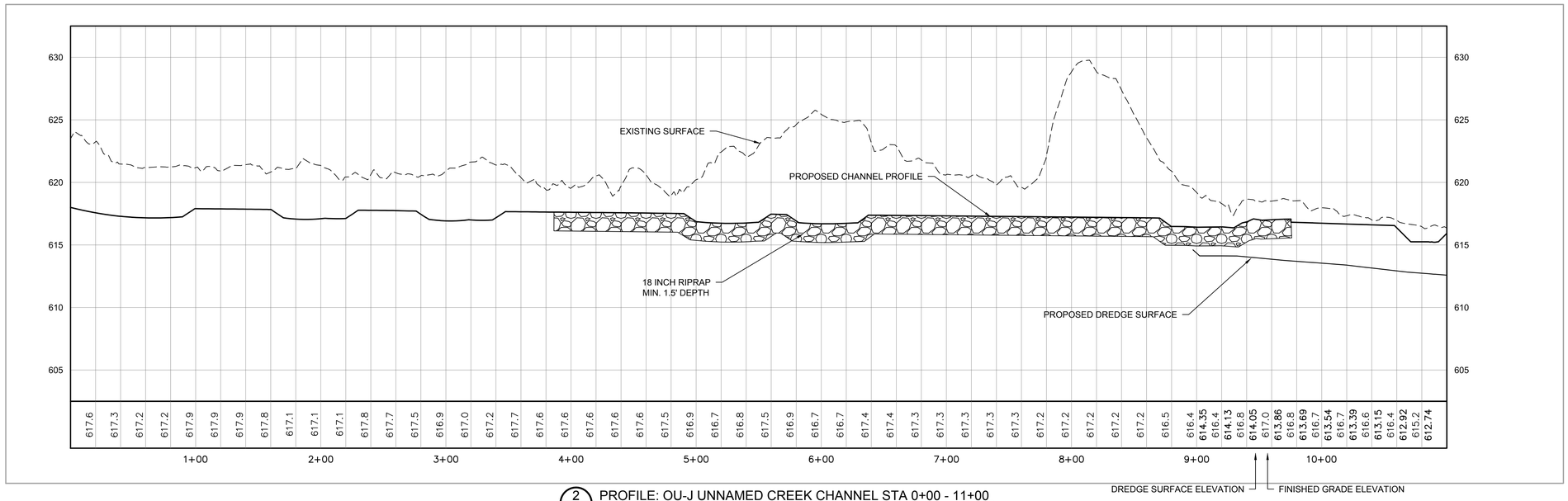
0 50 100
SCALE IN FEET

PLAN VIEW LEGEND

- 630 — EXISTING FIVE-FOOT CONTOUR
- EXISTING ONE-FOOT CONTOUR
- 630 — PROPOSED FIVE-FOOT CONTOUR
- 630 — PROPOSED ONE-FOOT CONTOUR
- PROPOSED CHANNEL CENTERLINE
- OU BOUNDARY
- EXISTING MONITORING WELL
- WORK AREA LIMITS
- RIPRAP, SEE DETAILS 8 & 9 ON SHEET CU-105

NOTES:

1. PROPOSED CONTOURS REPRESENT CONDITIONS AFTER CAPPING IS COMPLETE. SEE SHEETS CC-101 AND CC-102.
2. SEE OU-J DESIGN PACKAGE (BY AECOM) FOR CULVERT EXTENSION.



2 PROFILE: OU-J UNNAMED CREEK CHANNEL STA 0+00 - 11+00

0 50 100
SCALE IN FEET

PRELIMINARY
DRAFT
NOT FOR CONSTRUCTION

REVISIONS

NO.	DATE	BY	DESCRIPTION
A	7/30/18	AMS4	PRELIMINARY DESIGN
B	5/31/19	JCO	PRE - FINAL DESIGN

DESIGN INFORMATION

DESIGNED BY: JCO
DRAWN BY: AMS4
CHECKED BY: ECL
PROJECT MANAGER: ERD

SEAL

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 _____
SIGNATURE _____ LICENSE # _____
DATE _____

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

OU-I UNNAMED CREEK CHANNEL PLAN/PROFILE STA 0+00 - 11+00

PREPARED FOR:
EPA
USS

BARR
BARR ENGINEERING CO.
325 SOUTH LAKE AVENUE
SUITE 700
DULUTH, MN 55802
Ph: 1-800-786-5830
Fax: (218) 529-8202
www.barr.com

DATE: 05/31/2019

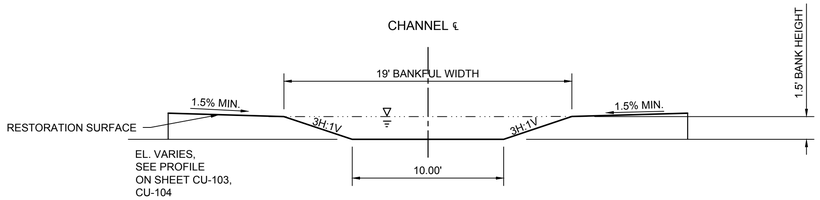
PROJECT NUMBER: 23691125.12

CU-104

SHEET: ## OF ####

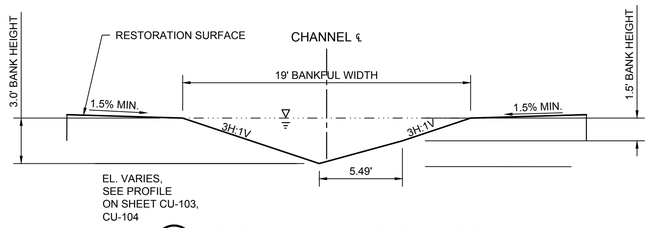
PRELIMINARY DRAFT - NOT FOR CONSTRUCTION

FILE PATH: M:\DES\BRA\23691125.12\23691125.12_CU-104_OU-I UNNAMED CREEK CHANNEL PLAN-PROFILE 24-HR - 24-HR.DWG (BARR 24-SIZE PAPER) BRAME, LYDDER 5/31/2019 4:16 PM



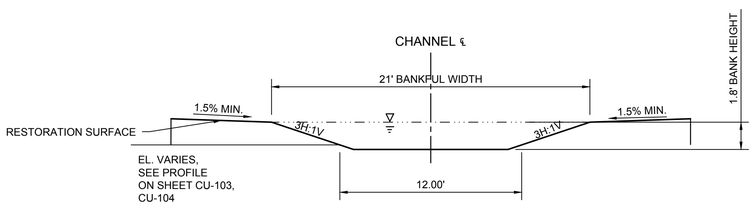
1 SECTION: OU-I CHANNEL RIFFLE (TYP)

0 5 10
SCALE IN FEET



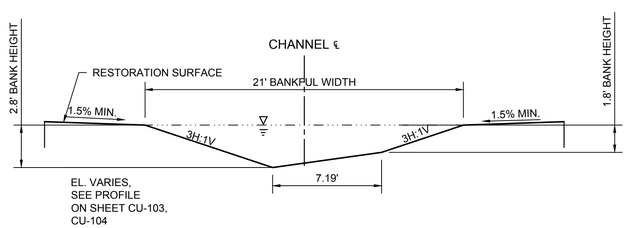
2 SECTION: OU-I CHANNEL POOL (TYP)

0 5 10
SCALE IN FEET



3 SECTION: OU-J CHANNEL RIFFLE (TYP)

0 5 10
SCALE IN FEET

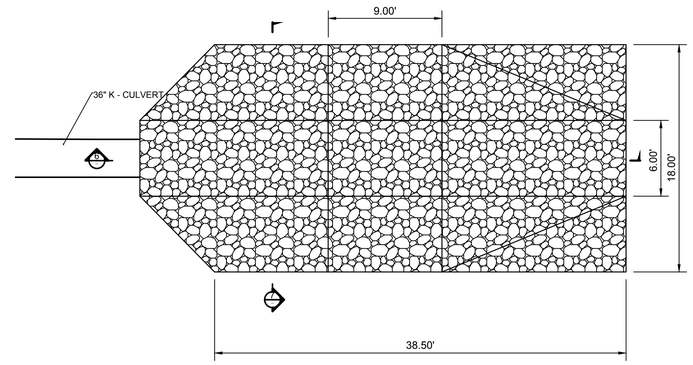


4 SECTION: OU-J CHANNEL POOL (TYP)

0 5 10
SCALE IN FEET

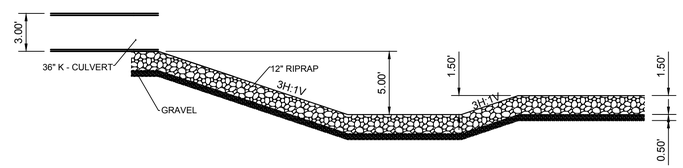
LEGEND

- EXISTING GROUND
- DREDGE SURFACE
- RESTORATION SURFACE
- WATER SURFACE ELEVATION



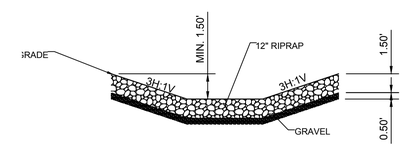
5 DETAIL: K - CULVERT OUTLET

0 6 12
SCALE IN FEET



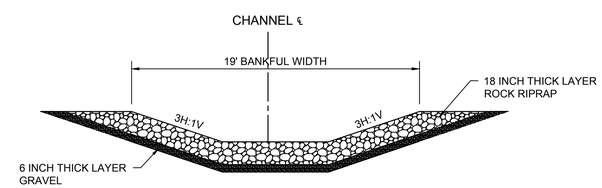
6 SECTION: K - CULVERT OUTLET

0 6 12
SCALE IN FEET



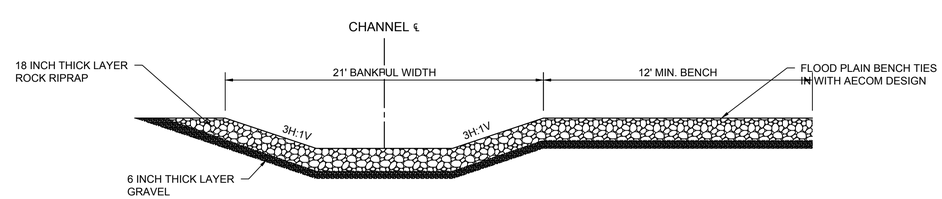
7 SECTION: K - CULVERT OUTLET

0 6 12
SCALE IN FEET



8 SECTION: OU-I GRADE CONTROL RIFFLE (TYP)

0 5 10
SCALE IN FEET



9 SECTION: OU-J GRADE CONTROL RIFFLE (TYP)

0 5 10
SCALE IN FEET

PRELIMINARY
DRAFT
NOT FOR CONSTRUCTION

REVISIONS			
NO.	DATE	BY	DESCRIPTION
A	7/30/18	AMS4	PRELIMINARY DESIGN
B	5/31/19	BJM2	PRE - FINAL DESIGN

DESIGN INFORMATION

DESIGNED BY: JCO
DRAWN BY: AMS4
CHECKED BY: BJM2
PROJECT MANAGER: ERD

SEAL

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 _____
SIGNATURE _____ LICENSE # _____
DATE _____

REMEDIAL DESIGN
SPIRIT LAKE ESTUARY - OU-I
ST. LOUIS RIVER AREA OF CONCERN
DULUTH, MINNESOTA

OU-I UNNAMED CREEK CHANNEL CROSS SECTION DETAILS

PREPARED FOR:
EPA
USS

BARR
BARR ENGINEERING CO.
325 SOUTH LAKE AVENUE
SUITE 700
DULUTH, MN 55802
Ph: 1-800-786-5830
Fax: (218) 529-8202
www.barr.com

DATE: 05/31/2019

PROJECT NUMBER: 23691125.12

CU-105

SHEET: ## OF ####

PRELIMINARY DRAFT - NOT FOR CONSTRUCTION

FILE PATH: M:\DESIGN\23691125_OU-I\05_OU-I UNNAMED CREEK CHANNEL SECTIONS AND DETAILS\ENG\BARR 8x5 SIZE PAPER\BARR\CU-105.DWG 5/31/2019 4:46 PM

ATTACHMENT A3

OPERABLE UNIT J CONFINED DISPOSAL FACILITY CONSTRUCTION DRAWINGS

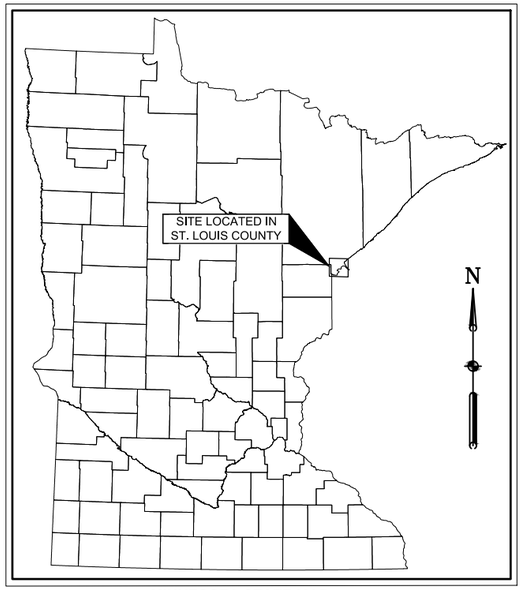
UNITED STATES STEEL
SPIRIT LAKE ESTUARY - OU-J

OU-J CDF 95% PRE-FINAL DESIGN
40K CONFIGURATION

DULUTH, MINNESOTA

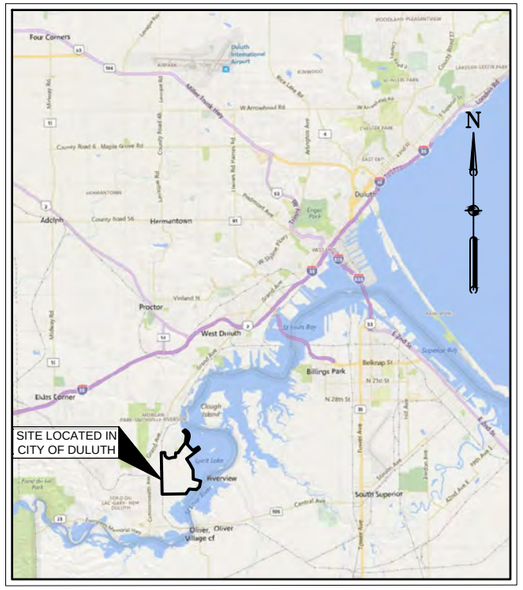
DRAWING LIST

SHEET NO.	DRAWING NO.	DRAWING TITLE
1	G-001	TITLE SHEET
	GE-101	EXISTING CONDITIONS
	GE-102	EXISTING TOE OF SLOPE AND CREEK BANK LOCATION PLAN
	CD-101	OUJ 40K - PROPOSED BERM GRADING PLAN
	CD-102	OUJ 40K - PROPOSED BERM IMPROVEMENTS PLAN
	CC-101	OUJ 40K - PROPOSED COVER SUBGRADE PLAN
	CC-102	OUJ 40K - PROPOSED FINAL COVER PLAN
	CC-103	OUJ 40K - CROSS SECTION LOCATION PLAN
	CC-104	OUJ 40K - BASELINE AND STORMWATER CHANNELS
	CC-105	OUJ 40K - CROSS SECTIONS (STATIONS 0+50 TO 3+50)
	CC-106	OUJ 40K - CROSS SECTIONS (STATIONS 4+50 TO 7+50)
	CC-107	DETAIL SHEET
	CC-108	DETAIL SHEET
	CC-108	PHOTOS OF EXISTING OUJ TOE OF SLOPE
	CT-101	PROPOSED TAR STABILIZATION WORK AREA PLAN
	CT-102	PROPOSED TAR STABILIZATION WORK AREA PLAN AND SECTION



MINNESOTA STATE MAP

NOT TO SCALE



DULUTH CITY MAP

NOT TO SCALE

SITE LOCATION MAP

NOT TO SCALE

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION

DESIGNED BY: MJC
DRAWN BY: ASD
CHECKED BY: JVH
PROJECT MANAGER: MC

SEAL

DRAFT

UNITED STATES STEEL
SPIRIT LAKE ESTUARY - OU-J
OU-J CDF 95% PRE-FINAL DESIGN
DULUTH, MINNESOTA

TITLE SHEET

PREPARED FOR:

UNITED STATES STEEL

EPA

AECOM

DULUTH OFFICE
11 East Superior Street, Suite 150
Duluth, MN 55802
218-625-8766 (phone)
COLLABORATION WITH
ST LOUIS AND CHICAGO OFFICES

DATE: 07/02/2018

PROJECT NUMBER: 60586470

G-001

SHEET: 1 OF 16

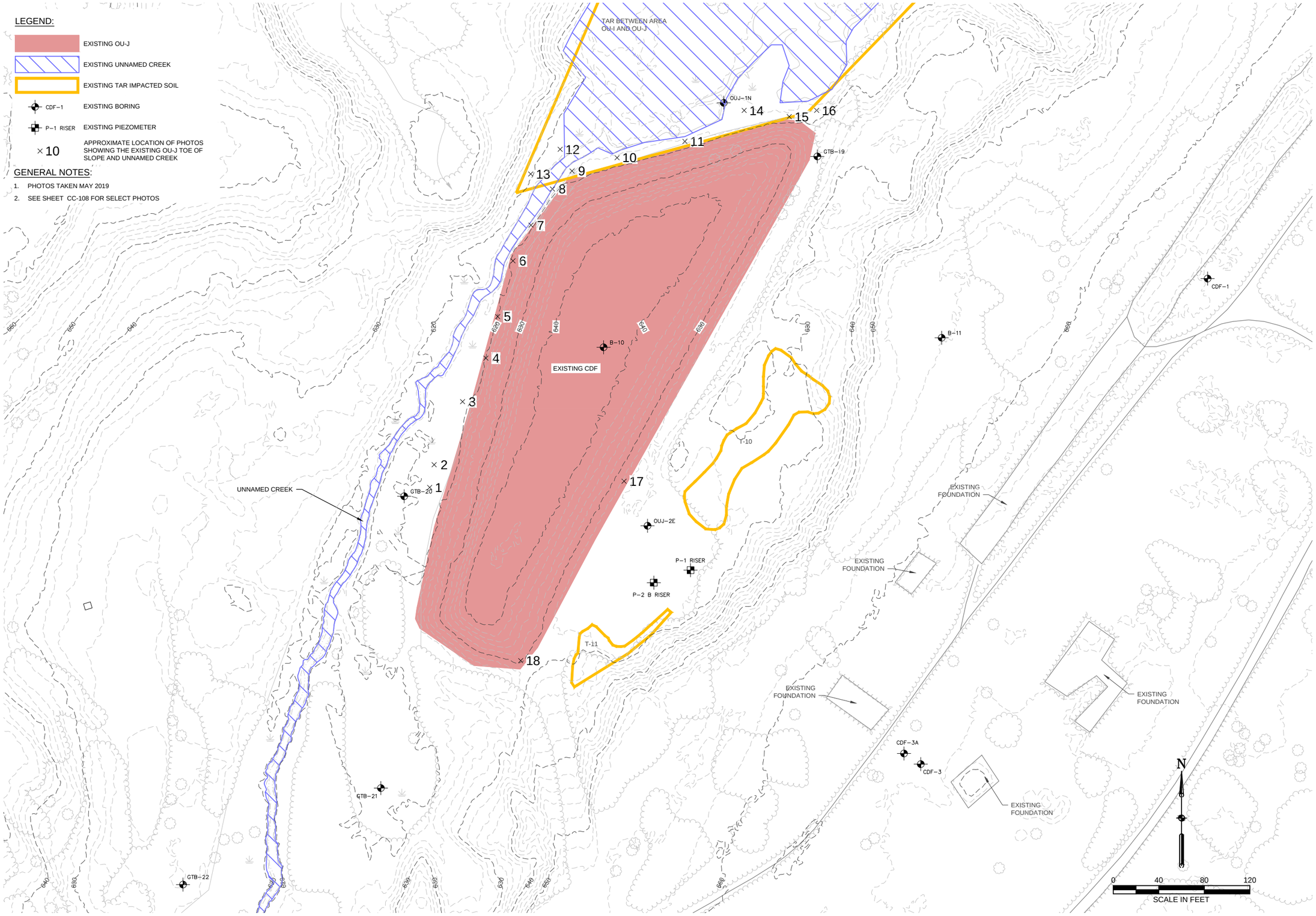
PRELIMINARY DESIGN - NOT FOR CONSTRUCTION

LEGEND:

- EXISTING OU-J
- EXISTING UNNAMED CREEK
- EXISTING TAR IMPACTED SOIL
- CDF-1 — EXISTING BORING
- P-1 RISER — EXISTING PIEZOMETER
- ×10 — APPROXIMATE LOCATION OF PHOTOS SHOWING THE EXISTING OU-J TOE OF SLOPE AND UNNAMED CREEK

GENERAL NOTES:

1. PHOTOS TAKEN MAY 2019
2. SEE SHEET CC-108 FOR SELECT PHOTOS



REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: MJC
DRAWN BY: ASD
CHECKED BY: JVH
PROJECT MANAGER: MC

SEAL

DRAFT

UNITED STATES STEEL
SPIRIT LAKE ESTUARY - OU-J
OU-J CDF 95% PRE-FINAL DESIGN
DULUTH, MINNESOTA

EXISTING CONDITIONS

PREPARED FOR:
UNITED STATES STEEL
EPA

AECOM
DULUTH OFFICE
11 East Superior Street, Suite 150
Duluth, MN 55802
218-625-8766 (phone)
COLLABORATION WITH
ST LOUIS AND CHICAGO OFFICES

DATE: 07/02/2018

PROJECT NUMBER: 60586470

GE-101

SHEET: --- OF 16

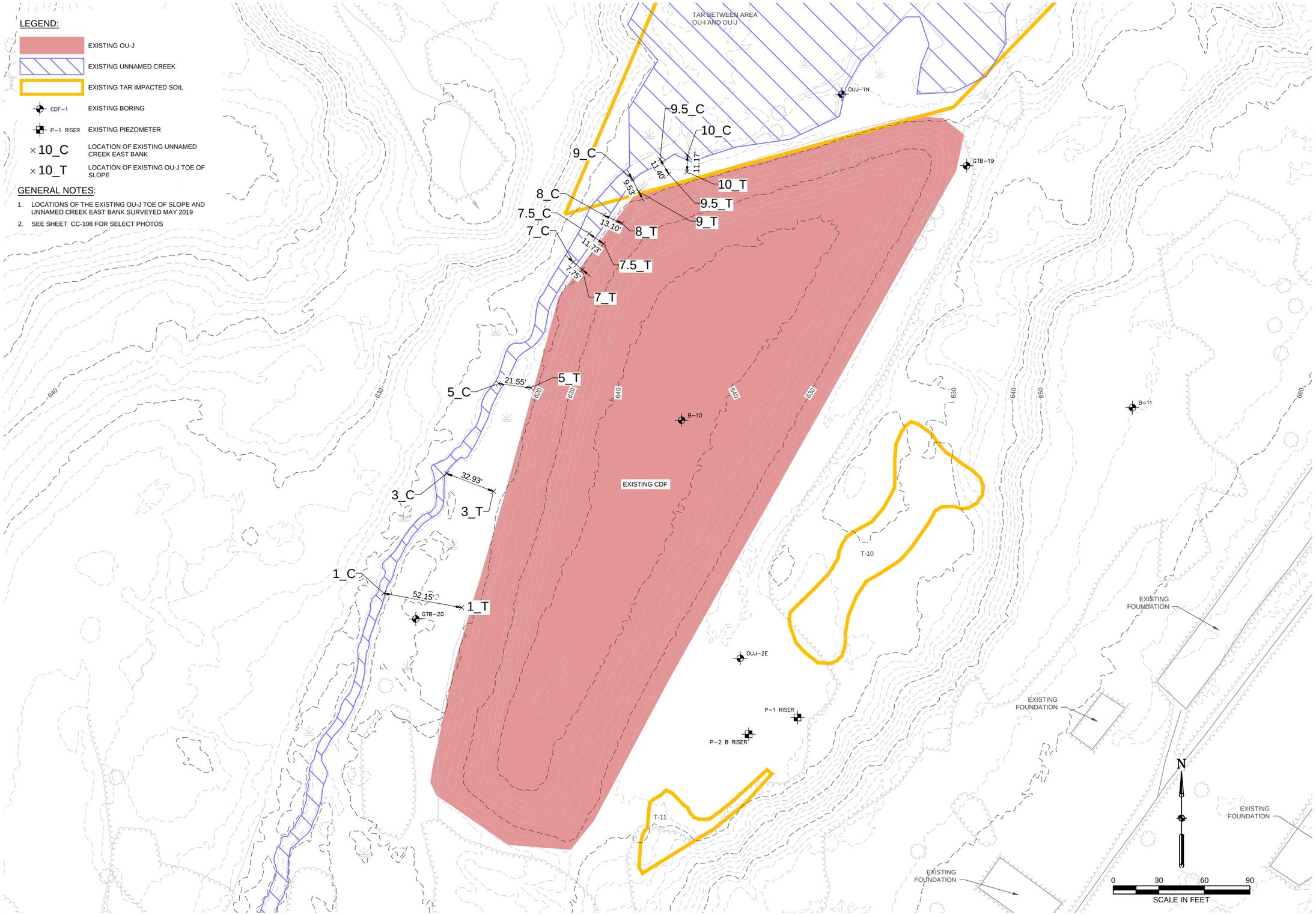
PRELIMINARY DESIGN - NOT FOR CONSTRUCTION

LEGEND:

- EXISTING OU-J
- EXISTING UNNAMED CREEK
- EXISTING TAR IMPACTED SOIL
- CDF-1 — EXISTING BORING
- P-1 RISER — EXISTING PIEZOMETER
- ×10_C — LOCATION OF EXISTING UNNAMED CREEK EAST BANK
- ×10_T — LOCATION OF EXISTING OU-J TOE OF SLOPE

GENERAL NOTES:

1. LOCATIONS OF THE EXISTING OU-J TOE OF SLOPE AND UNNAMED CREEK EAST BANK SURVEYED MAY 2019
2. SEE SHEET CC-108 FOR SELECT PHOTOS



REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: MJC
DRAWN BY: ASD
CHECKED BY: JVH
PROJECT MANAGER: MC

SEAL

DRAFT

UNITED STATES STEEL
SPIRIT LAKE ESTUARY - OU-J
OU-J CDF 50% DESIGN
DULUTH, MINNESOTA

EXISTING TOE OF SLOPE AND CREEK BANK LOCATION PLAN

PREPARED FOR:
UNITED STATES STEEL
EPA

AECOM
DULUTH OFFICE
11 East Superior Street, Suite 150
Duluth, MN 55802
218-625-8766 (phone)
COLLABORATION WITH
ST LOUIS AND CHICAGO OFFICES

DATE: 07/02/2018

PROJECT NUMBER: 60586470

GE-102

SHEET: --- OF 16

PRELIMINARY DESIGN - NOT FOR CONSTRUCTION

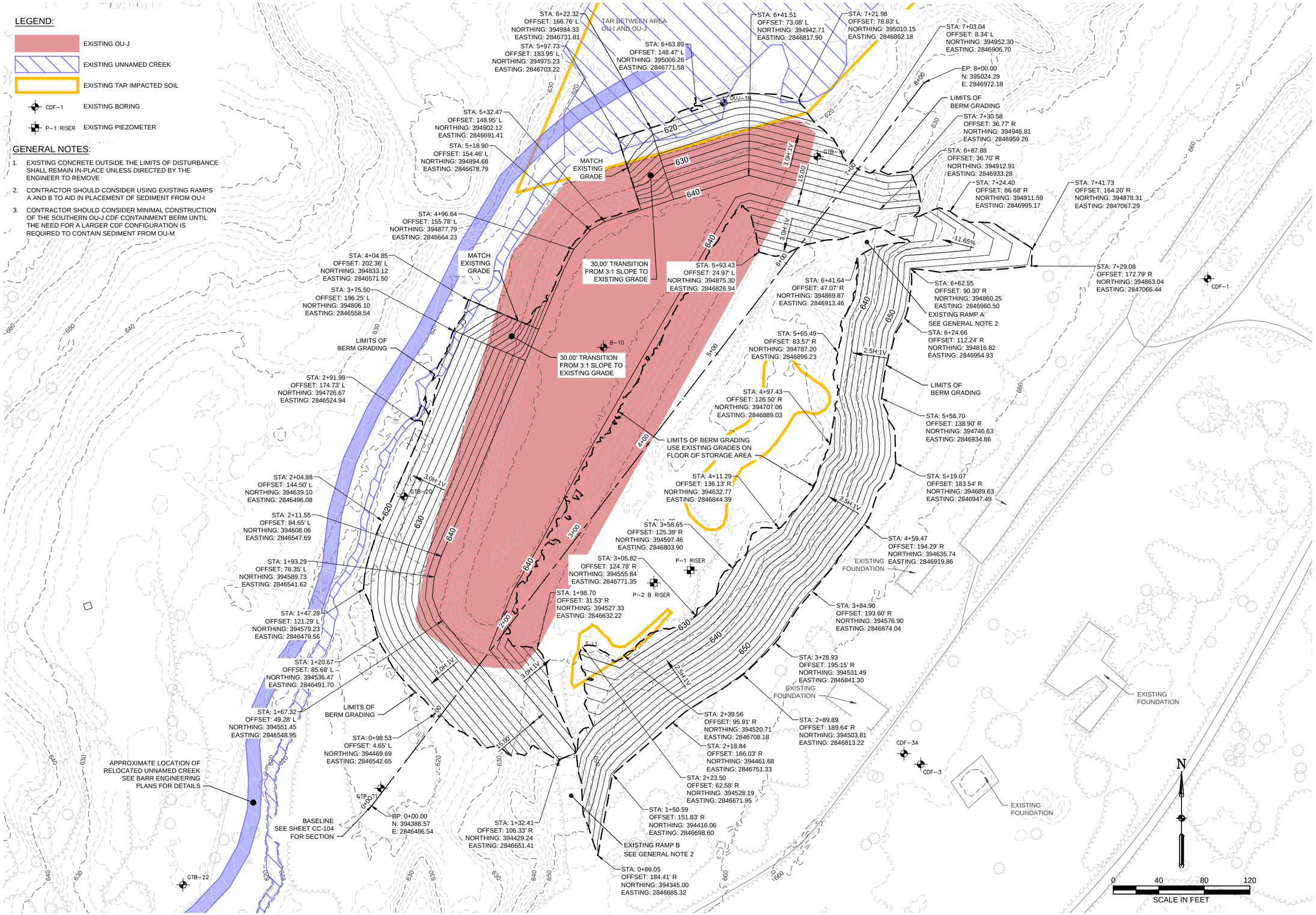
FILE PATH: G:\STLOUIS\DCS\PROJECTS\NW\60586470_USS_DULUTH\ME_CAD_BR\PIC_CADD\SHEETS\OU-J-06 (BERM ONLY - PHOTOS OF EXISTING CONDITIONS).DWG (RE-16) EXISTING TOE OF SLOPE AND CREEK BANK LOCATION PLAN) CAD USE: MICHAEL, 5/30/2019 4:29 PM

LEGEND:

- EXISTING OU-J
- EXISTING UNNAMED CREEK
- EXISTING TAR IMPACTED SOIL
- CDF-1 EXISTING BORING
- P-1 RISER EXISTING PIEZOMETER

GENERAL NOTES:

1. EXISTING CONCRETE OUTSIDE THE LIMITS OF DISTURBANCE SHALL REMAIN IN-PLACE UNLESS DIRECTED BY THE ENGINEER TO REMOVE
2. CONTRACTOR SHOULD CONSIDER USING EXISTING RAMPS A AND B TO AID IN PLACEMENT OF SEDIMENT FROM OU-I
3. CONTRACTOR SHOULD CONSIDER MINIMAL CONSTRUCTION OF THE SOUTHERN OU-J CDF CONTAINMENT BERM UNTIL THE NEED FOR A LARGER CDF CONFIGURATION IS REQUIRED TO CONTAIN SEDIMENT FROM OU-M



REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: MJC
DRAWN BY: ASD
CHECKED BY: JVH
PROJECT MANAGER: MC

SEAL

DRAFT

UNITED STATES STEEL
SPIRIT LAKE ESTUARY - OU-J
OU-J CDF 95% PRE-FINAL DESIGN
DULUTH, MINNESOTA

OUJ 40K - PROPOSED BERM GRADING PLAN

PREPARED FOR:
UNITED STATES STEEL
EPA

AECOM
DULUTH OFFICE
11 East Superior Street, Suite 150
Duluth, MN 55802
218-625-8766 (phone)
COLLABORATION WITH
ST LOUIS AND CHICAGO OFFICES

DATE: 07/02/2018

PROJECT NUMBER: 60586470

CD-101

SHEET: --- OF 16

PRELIMINARY DESIGN - NOT FOR CONSTRUCTION

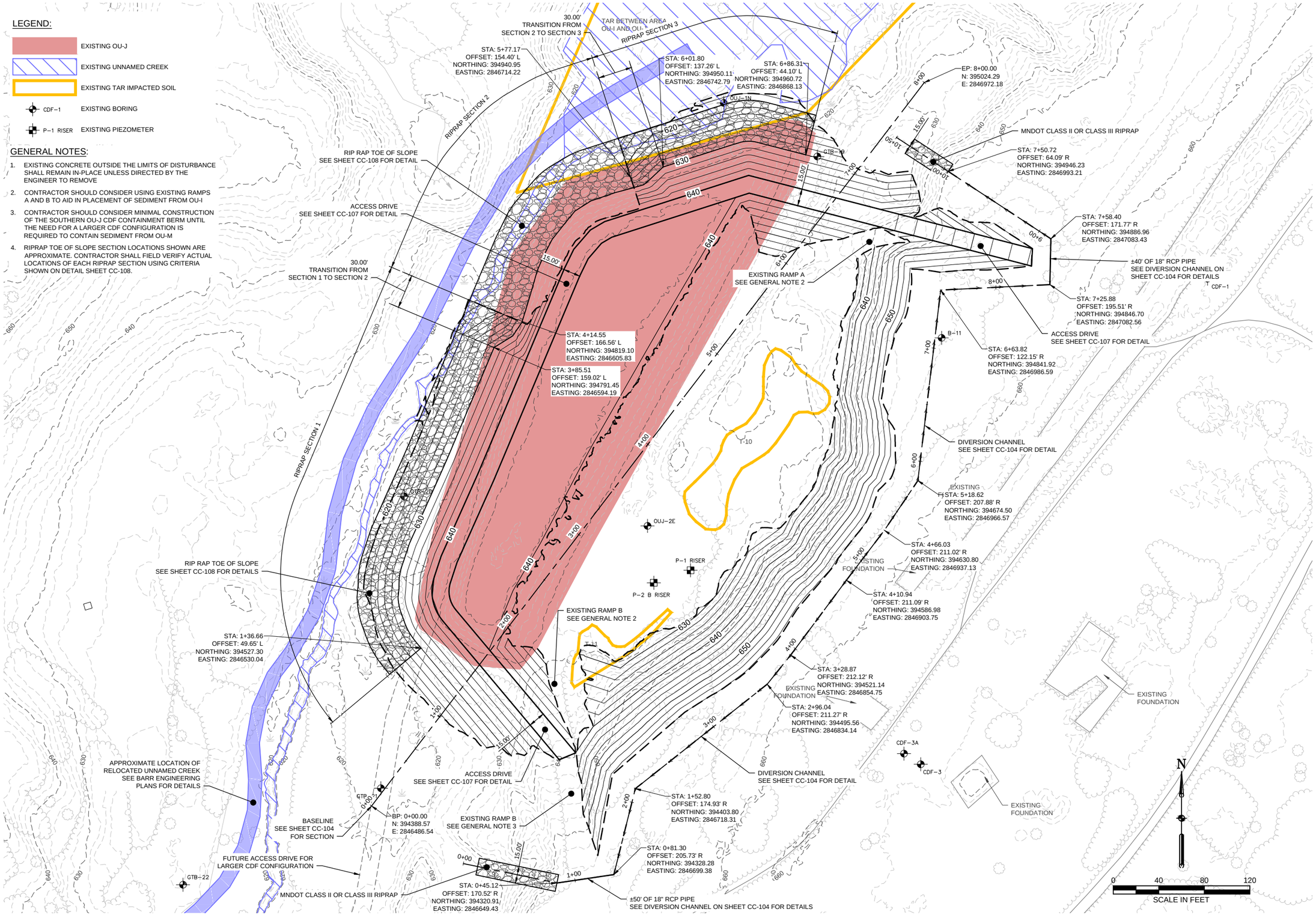
FILE PATH: G:\STLOUIS\CDF\PRELIEST\BRV\60586470_URS_DULUTH\PRE_CAD_BERM_CAD\CD-SHEETS\OU-J\PR-BERM\CD-101 OU-J PR - PROPOSED BERM GRADING PLAN.DWG, MICHAEL, 6/20/2018 2:07 PM

LEGEND:

- EXISTING OU-J
- EXISTING UNNAMED CREEK
- EXISTING TAR IMPACTED SOIL
- CDF-1 EXISTING BORING
- P-1 RISER EXISTING PIEZOMETER

GENERAL NOTES:

1. EXISTING CONCRETE OUTSIDE THE LIMITS OF DISTURBANCE SHALL REMAIN IN-PLACE UNLESS DIRECTED BY THE ENGINEER TO REMOVE
2. CONTRACTOR SHOULD CONSIDER USING EXISTING RAMPS A AND B TO AID IN PLACEMENT OF SEDIMENT FROM OU-I
3. CONTRACTOR SHOULD CONSIDER MINIMAL CONSTRUCTION OF THE SOUTHERN OU-J CDF CONTAINMENT BERM UNTIL THE NEED FOR A LARGER CDF CONFIGURATION IS REQUIRED TO CONTAIN SEDIMENT FROM OU-M
4. RIPRAP TOE OF SLOPE SECTION LOCATIONS SHOWN ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY ACTUAL LOCATIONS OF EACH RIPRAP SECTION USING CRITERIA SHOWN ON DETAIL SHEET CC-108.



REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: MJC
DRAWN BY: ASD
CHECKED BY: JVH
PROJECT MANAGER: MC

SEAL

DRAFT

UNITED STATES STEEL
SPIRIT LAKE ESTUARY - OU-J
OU-J CDF 95% PRE-FINAL DESIGN
DULUTH, MINNESOTA

OUJ 40K - PROPOSED BERM IMPROVEMENTS PLAN

PREPARED FOR:
UNITED STATES STEEL
EPA

AECOM
DULUTH OFFICE
11 East Superior Street, Suite 150
Duluth, MN 55802
218-625-8766 (phone)
COLLABORATION WITH
ST LOUIS AND CHICAGO OFFICES

DATE: 07/02/2018

PROJECT NUMBER: 60586470

CD-102

SHEET: --- OF 16

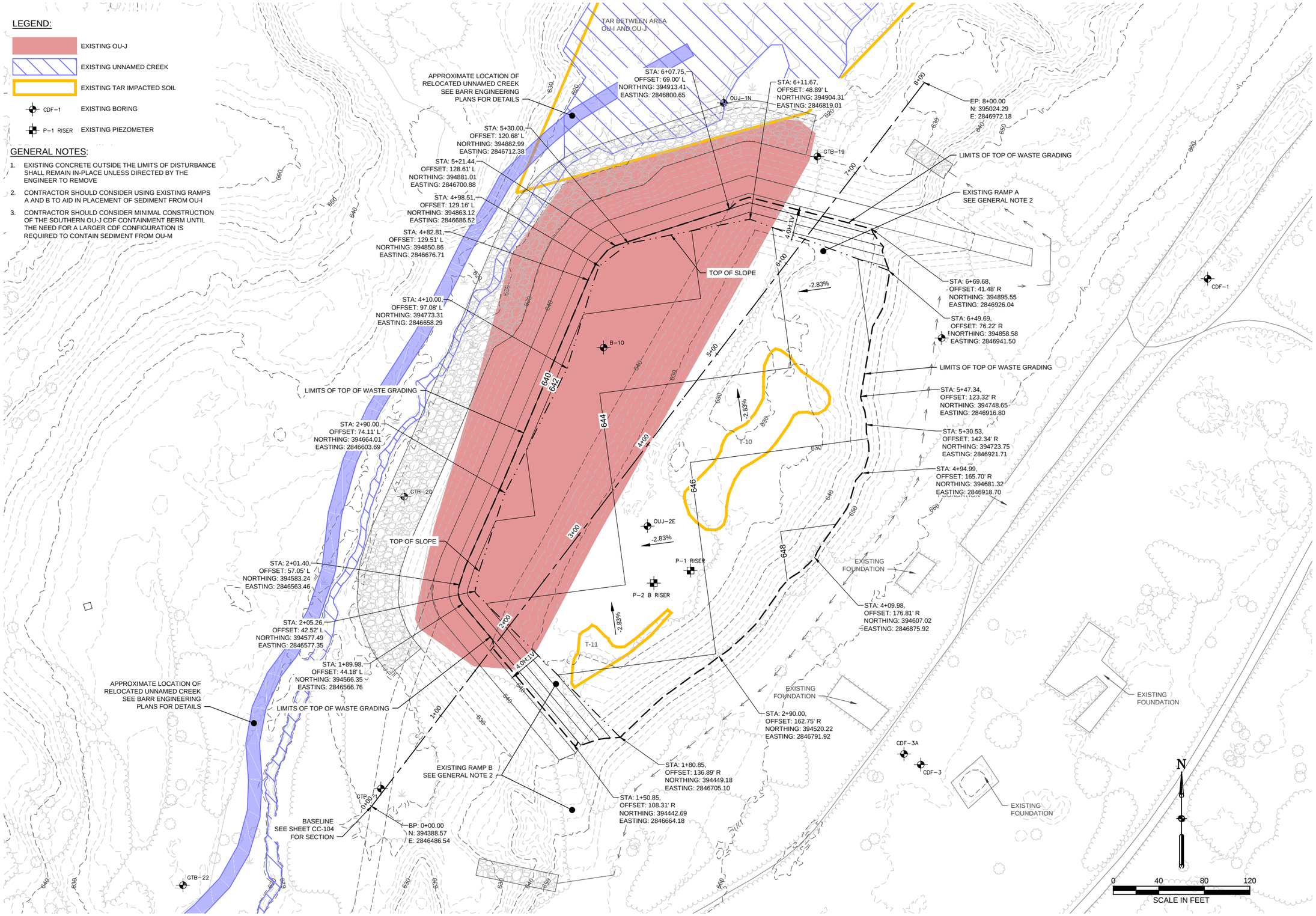
PRELIMINARY DESIGN - NOT FOR CONSTRUCTION

LEGEND:

- EXISTING OU-J
- EXISTING UNNAMED CREEK
- EXISTING TAR IMPACTED SOIL
- CDF-1 EXISTING BORING
- P-1 RISER EXISTING PIEZOMETER

GENERAL NOTES:

1. EXISTING CONCRETE OUTSIDE THE LIMITS OF DISTURBANCE SHALL REMAIN IN-PLACE UNLESS DIRECTED BY THE ENGINEER TO REMOVE
2. CONTRACTOR SHOULD CONSIDER USING EXISTING RAMPS A AND B TO AID IN PLACEMENT OF SEDIMENT FROM OU-I
3. CONTRACTOR SHOULD CONSIDER MINIMAL CONSTRUCTION OF THE SOUTHERN OU-J CDF CONTAINMENT BERM UNTIL THE NEED FOR A LARGER CDF CONFIGURATION IS REQUIRED TO CONTAIN SEDIMENT FROM OU-M



REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION	
DESIGNED BY:	MJC
DRAWN BY:	ASD
CHECKED BY:	JVH
PROJECT MANAGER:	MC

SEAL

DRAFT

UNITED STATES STEEL
SPIRIT LAKE ESTUARY - OU-J
OU-J CDF 95% PRE-FINAL DESIGN
DULUTH, MINNESOTA

OUJ 40K - PROPOSED COVER SUBGRADE PLAN

PREPARED FOR:

UNITED STATES STEEL

EPA

AECOM

DULUTH OFFICE
11 East Superior Street, Suite 150
Duluth, MN 55802
218-625-8766 (phone)
COLLABORATION WITH
ST LOUIS AND CHICAGO OFFICES

DATE: 07/02/2018

PROJECT NUMBER: 60586470

CC-101

SHEET: --- OF 16

PRELIMINARY DESIGN - NOT FOR CONSTRUCTION

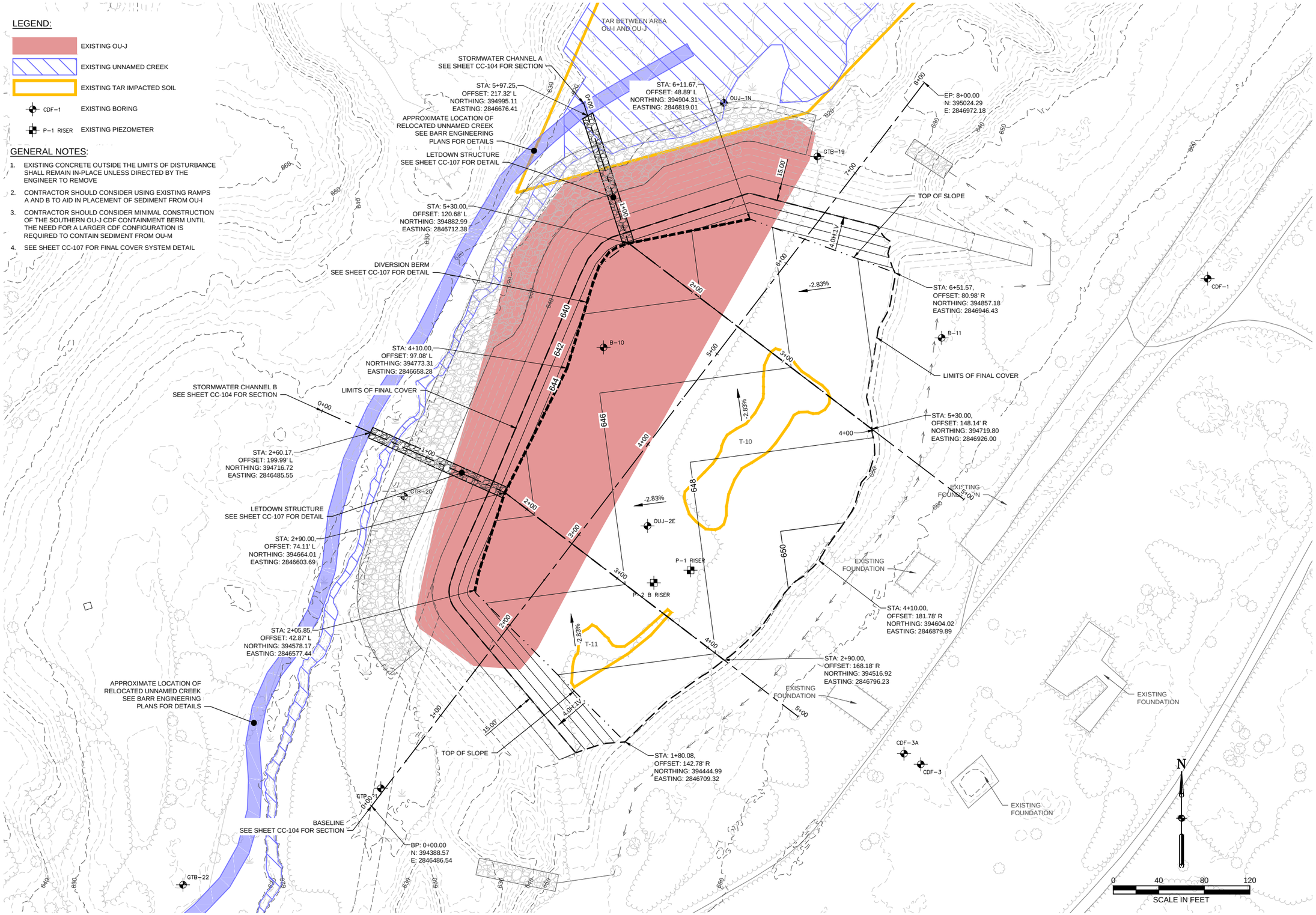
FILE PATH: G:\STUDIES\PROJECTS\NV0000\60_US_DULUTH\60_CAD_DATA_CADD-SHEETS\OU-J\40K\BEFM ONLY -TOP OF WASTE P-A\95\95\(CC-01 OUJ 40K - PROPOSED COVER SUBGRADE P-A\95\CAD\JVO, MICHAEL 5/30/2018 4:29 PM

LEGEND:

- EXISTING OU-J
- EXISTING UNNAMED CREEK
- EXISTING TAR IMPACTED SOIL
- CDF-1 EXISTING BORING
- P-1 RISER EXISTING PIEZOMETER

GENERAL NOTES:

1. EXISTING CONCRETE OUTSIDE THE LIMITS OF DISTURBANCE SHALL REMAIN IN-PLACE UNLESS DIRECTED BY THE ENGINEER TO REMOVE
2. CONTRACTOR SHOULD CONSIDER USING EXISTING RAMPS A AND B TO AID IN PLACEMENT OF SEDIMENT FROM OU-I
3. CONTRACTOR SHOULD CONSIDER MINIMAL CONSTRUCTION OF THE SOUTHERN OU-J CDF CONTAINMENT BERM UNTIL THE NEED FOR A LARGER CDF CONFIGURATION IS REQUIRED TO CONTAIN SEDIMENT FROM OU-M
4. SEE SHEET CC-107 FOR FINAL COVER SYSTEM DETAIL



REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: MJC
DRAWN BY: ASD
CHECKED BY: JVH
PROJECT MANAGER: MC

SEAL

DRAFT

UNITED STATES STEEL
SPIRIT LAKE ESTUARY - OU-J
OU-J CDF 95% PRE-FINAL DESIGN
DULUTH, MINNESOTA

OUJ 40K - PROPOSED FINAL COVER PLAN

PREPARED FOR:
UNITED STATES STEEL
EPA

AECOM
DULUTH OFFICE
11 East Superior Street, Suite 150
Duluth, MN 55802
218-625-8766 (phone)
COLLABORATION WITH
ST LOUIS AND CHICAGO OFFICES

DATE: 07/02/2018

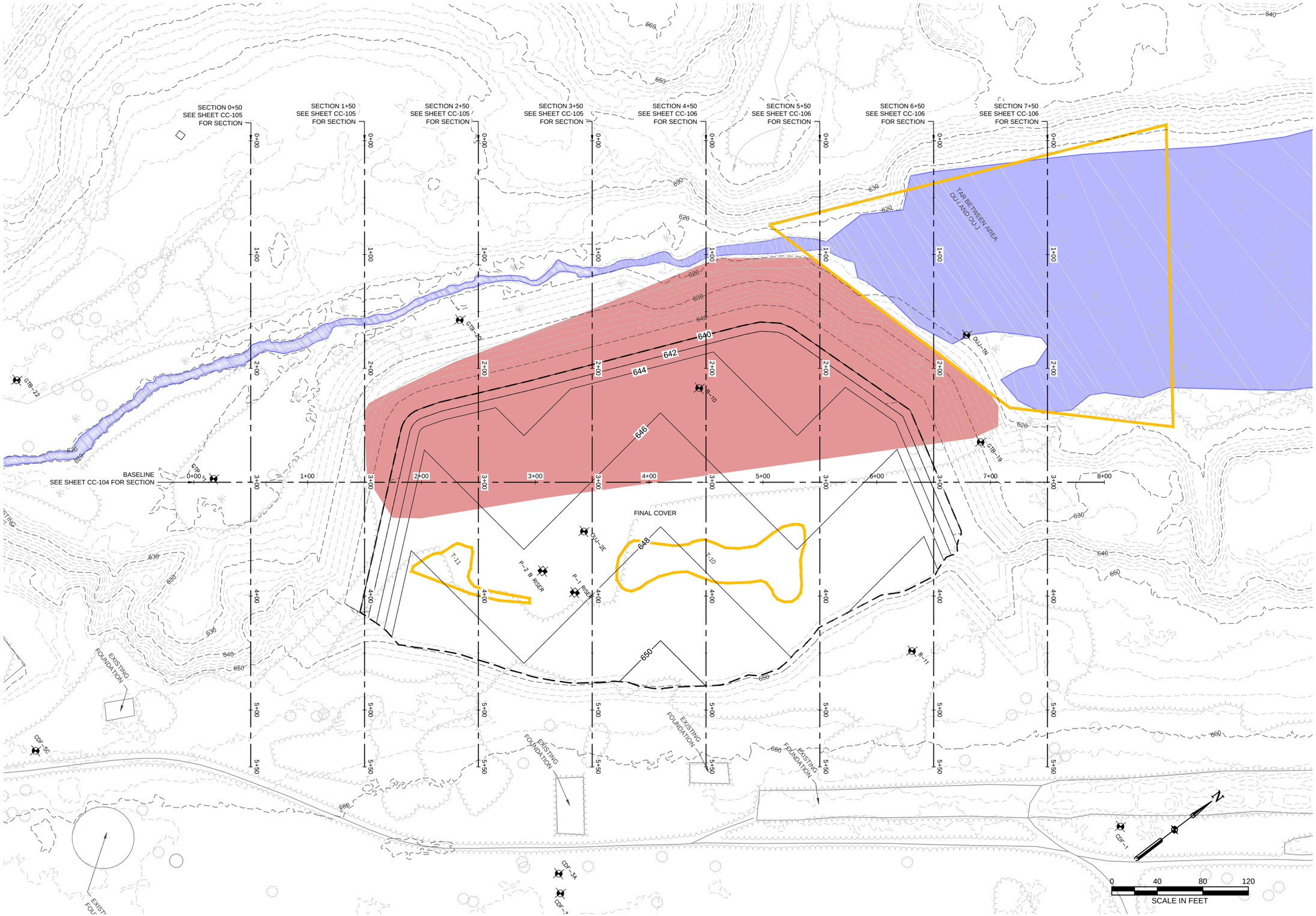
PROJECT NUMBER: 60586470

CC-102

SHEET: --- OF 16

PRELIMINARY DESIGN - NOT FOR CONSTRUCTION

FILE PATH: G:\STLOUIS\DCS\PROJECTS\NV\0000\60586470_USS_DULUTH\WIL_CAD_DRWG_CAD\CD-SHEETS\OU-J\95 BERM ONLY - FINAL COVER PLAN\CAD\EC-102 OU-J 40K - PROPOSED FINAL COVER PLAN.DWG; MICHAEL.SIMSON 7:42 PM



REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: MJC
DRAWN BY: ASD
CHECKED BY: JVH
PROJECT MANAGER: MC

SEAL

DRAFT

UNITED STATES STEEL
SPIRIT LAKE ESTUARY - OU-J
OU-J CDF 95% PRE-FINAL DESIGN
DULUTH, MINNESOTA

OU4 40K - CROSS SECTION LOCATION PLAN

PREPARED FOR:
UNITED STATES STEEL
EPA

AECOM
DULUTH OFFICE
11 East Superior Street, Suite 150
Duluth, MN 55802
218-625-8766 (phone)
COLLABORATION WITH
ST LOUIS AND CHICAGO OFFICES

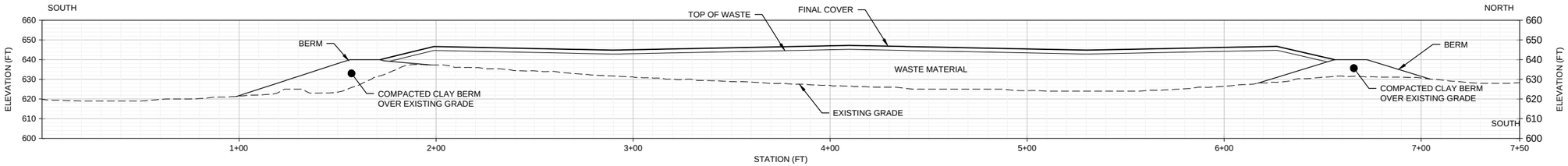
DATE: 07/02/2018

PROJECT NUMBER: 60586470

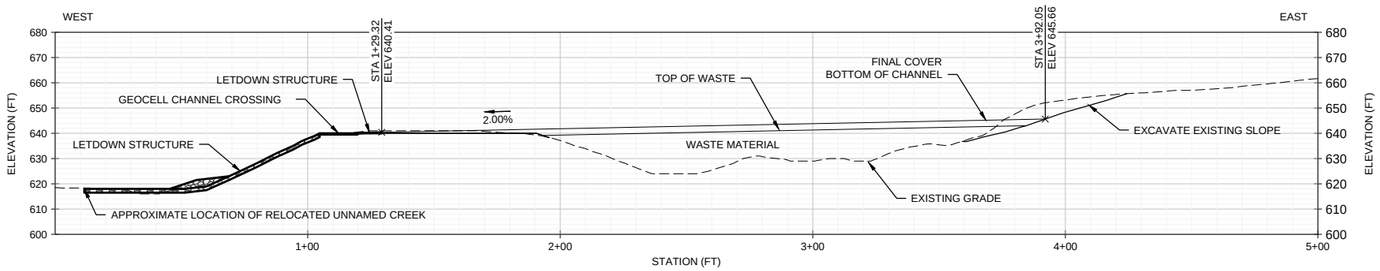
CC-103

SHEET: --- OF 16

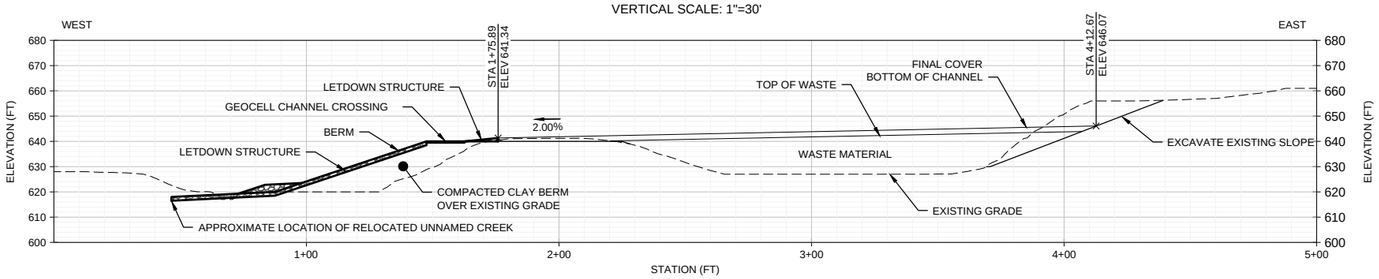
PRELIMINARY DESIGN - NOT FOR CONSTRUCTION



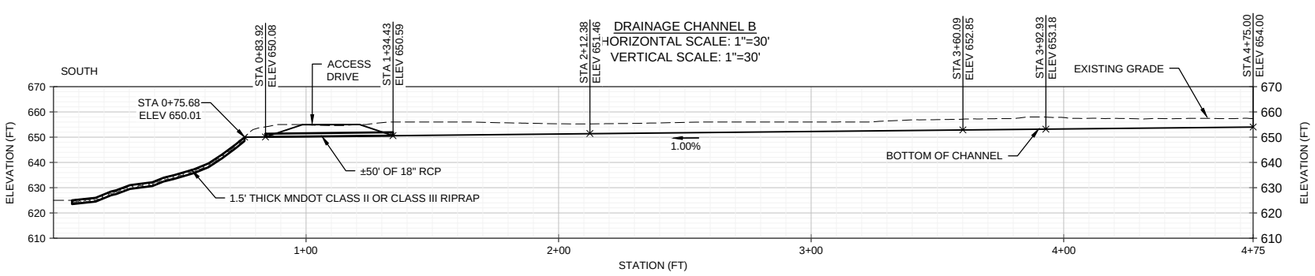
BASELINE
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=30'



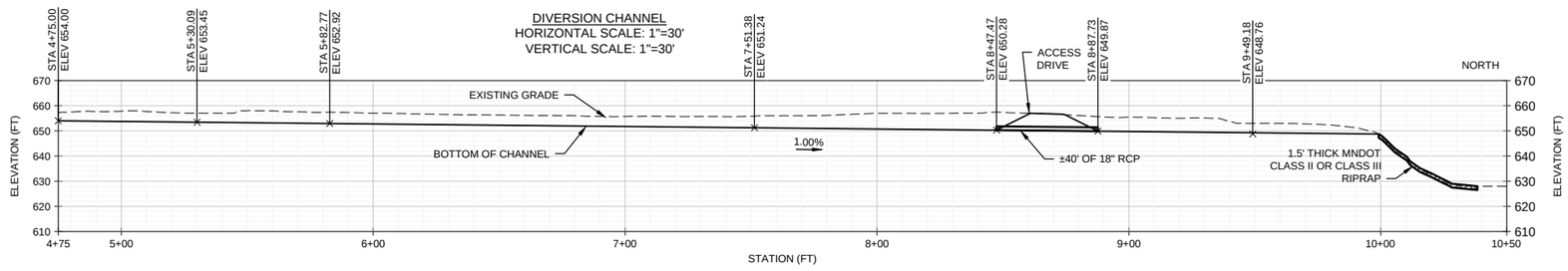
DRAINAGE CHANNEL A
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=30'



DRAINAGE CHANNEL B
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=30'



DIVERSION CHANNEL
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=30'



DIVERSION CHANNEL
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=30'

GENERAL NOTES:

1. SEE SHEET CC-107 FOR LETDOWN STRUCTURE DETAILS
2. SEE SHEET CC-107 FOR DRAINAGE CHANNEL ON COVER DETAILS
3. SEE SHEET CC-107 FOR GEOCELL CHANNEL CROSSING DETAILS

0 30 60 90
SCALE IN FEET

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: MJC
DRAWN BY: ASD
CHECKED BY: JVH
PROJECT MANAGER: MC

SEAL

DRAFT

UNITED STATES STEEL
SPIRIT LAKE ESTUARY - OU-J
OU-J CDF 95% PRE-FINAL DESIGN
DULUTH, MINNESOTA

OUJ 40K - BASELINE AND STORMWATER CHANNELS

PREPARED FOR:
UNITED STATES STEEL
EPA

AECOM
DULUTH OFFICE
11 East Superior Street, Suite 150
Duluth, MN 55802
218-625-8766 (phone)
COLLABORATION WITH
ST LOUIS AND CHICAGO OFFICES

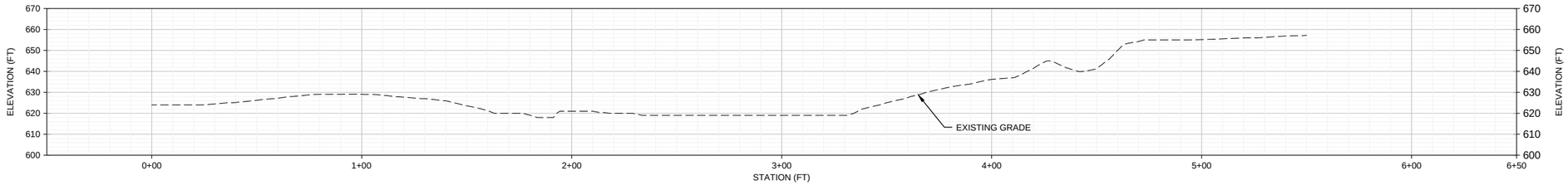
DATE: 07/02/2018

PROJECT NUMBER: 60586470

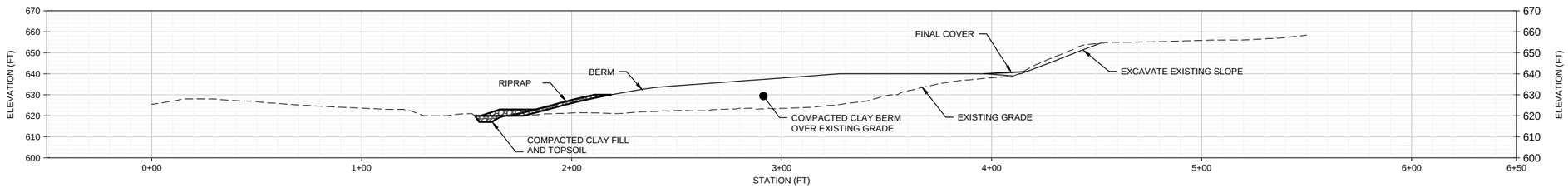
CC-104

SHEET: --- OF 16

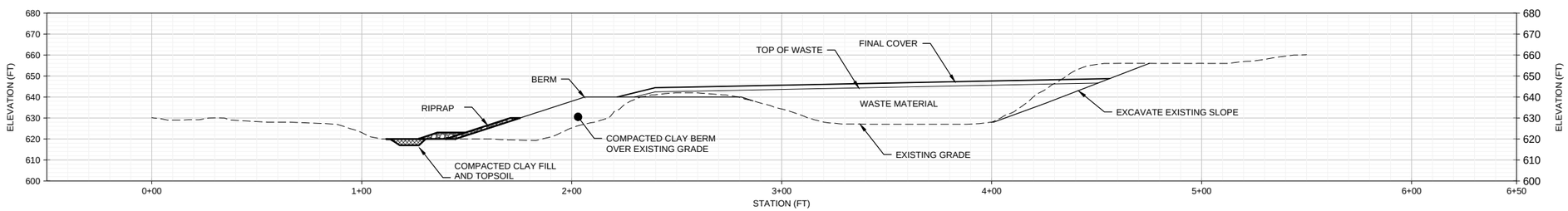
PRELIMINARY DESIGN - NOT FOR CONSTRUCTION



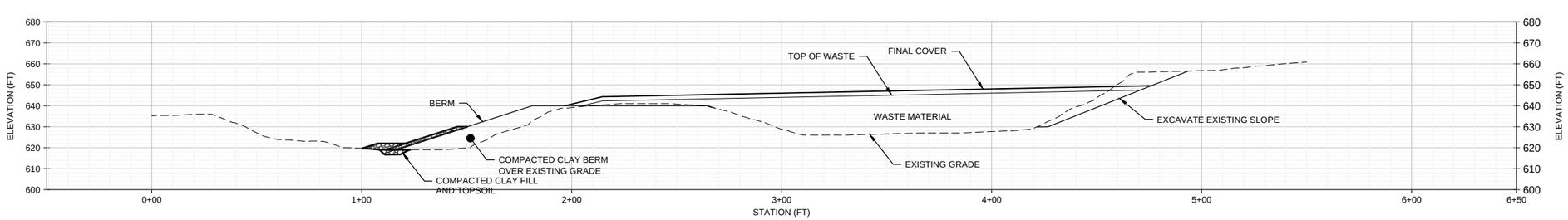
STATION 0+50
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=30'



STATION 1+50
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=30'



STATION 2+50
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=30'



STATION 3+50
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=30'

0 30 60 90
SCALE IN FEET

REVISIONS

NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: MJC
DRAWN BY: ASD
CHECKED BY: JVH
PROJECT MANAGER: MC

SEAL

UNITED STATES STEEL
SPIRIT LAKE ESTUARY - OU-J
OU-J CDF 95% PRE-FINAL DESIGN
DULUTH, MINNESOTA

OUJ 40K - CROSS SECTIONS (STATIONS 0+50 TO 3+50)

PREPARED FOR:
UNITED STATES STEEL
EPA

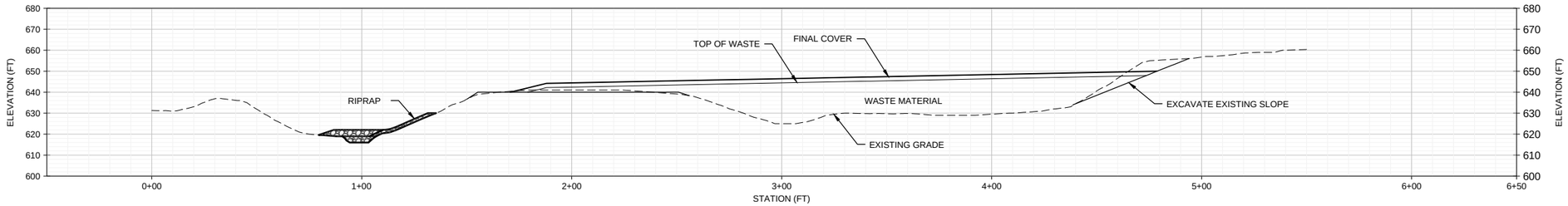
AECOM
DULUTH OFFICE
11 East Superior Street, Suite 150
Duluth, MN 55802
218-625-8766 (phone)
COLLABORATION WITH
ST LOUIS AND CHICAGO OFFICES

DATE: 07/02/2018
PROJECT NUMBER: 60586470

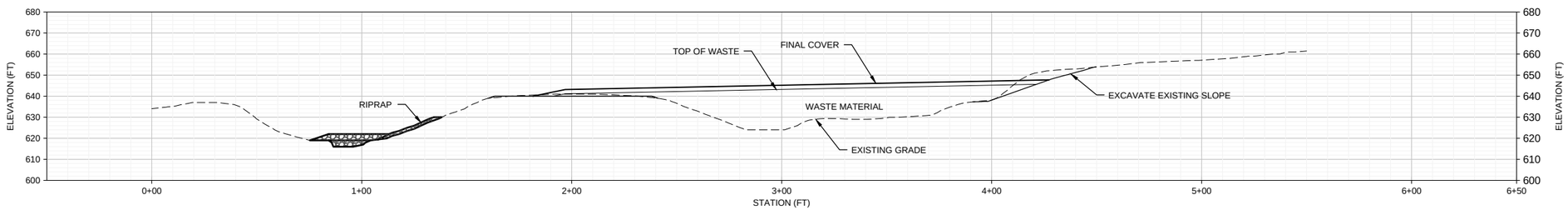
CC-105

SHEET: ---- OF 16

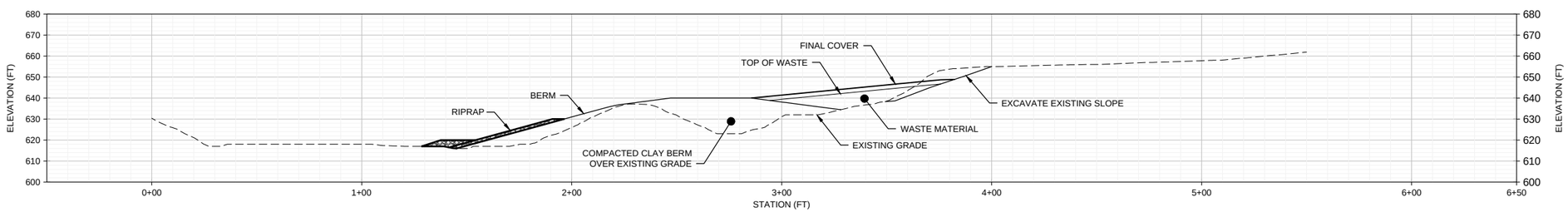
PRELIMINARY DESIGN - NOT FOR CONSTRUCTION



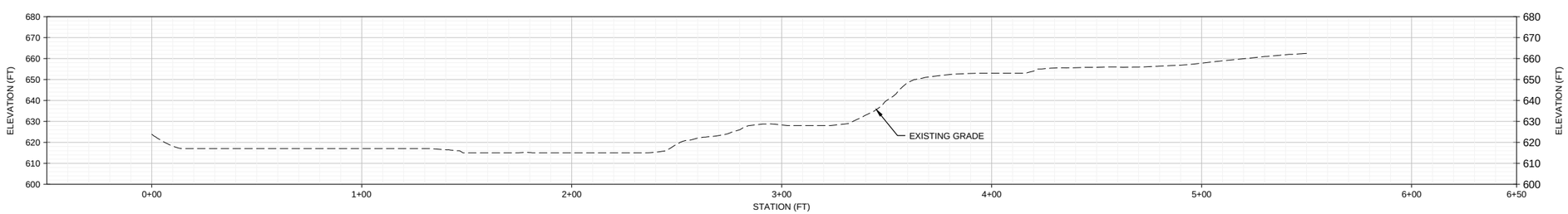
STATION 4+50
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=30'



STATION 5+50
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=30'



STATION 6+50
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=30'



STATION 7+50
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=30'

0 30 60 90
SCALE IN FEET

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: MJC
DRAWN BY: ASD
CHECKED BY: JVH
PROJECT MANAGER: MC

SEAL

DRAFT

UNITED STATES STEEL
SPIRIT LAKE ESTUARY - OU-J
OU-J CDF 95% PRE-FINAL DESIGN
DULUTH, MINNESOTA

OUJ 40K - CROSS SECTIONS (STATIONS 4+50 TO 7+50)

PREPARED FOR:
UNITED STATES STEEL
EPA

AECOM
DULUTH OFFICE
11 East Superior Street, Suite 150
Duluth, MN 55802
218-625-8766 (phone)
COLLABORATION WITH
ST LOUIS AND CHICAGO OFFICES

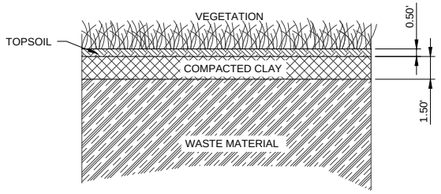
DATE: 07/02/2018

PROJECT NUMBER: 60586470

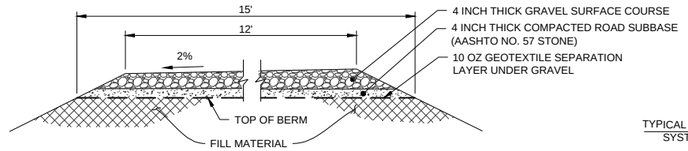
CC-106

SHEET: --- OF 16

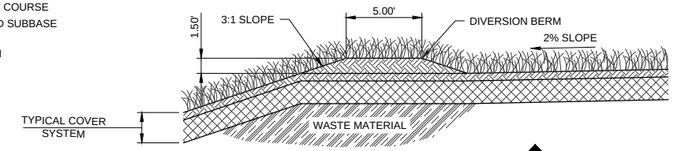
PRELIMINARY DESIGN - NOT FOR CONSTRUCTION



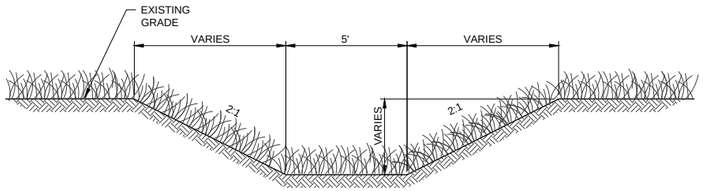
TYPICAL COVER SYSTEM (1)
SCALE:NTS



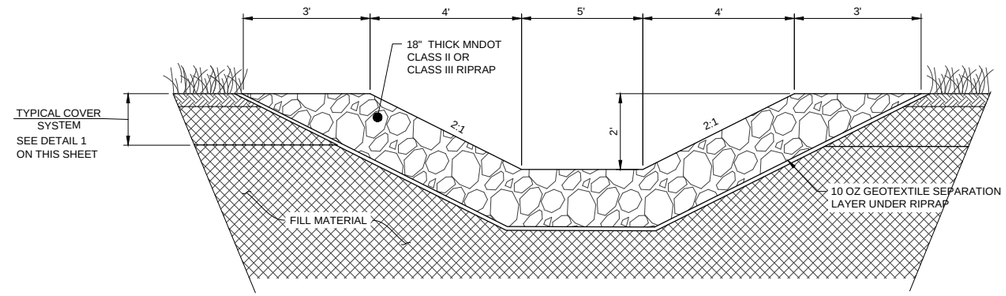
ACCESS DRIVE (2)
SCALE:NTS



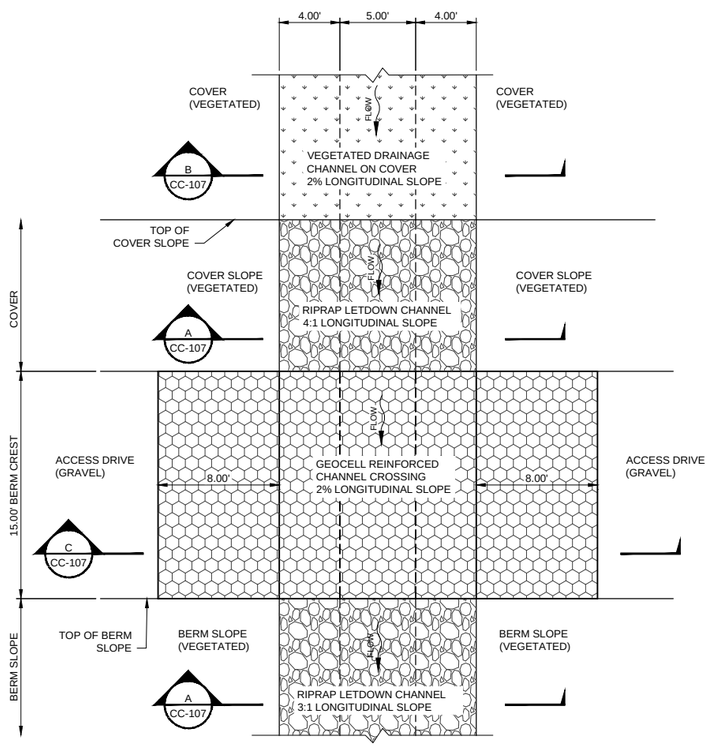
DIVERSION BERM (3)
SCALE:NTS



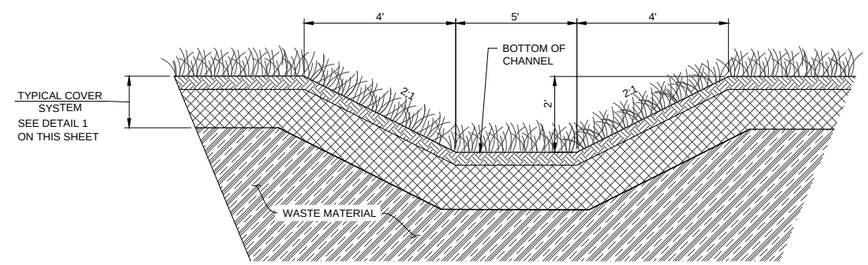
DIVERSION CHANNEL (4)
SCALE:NTS



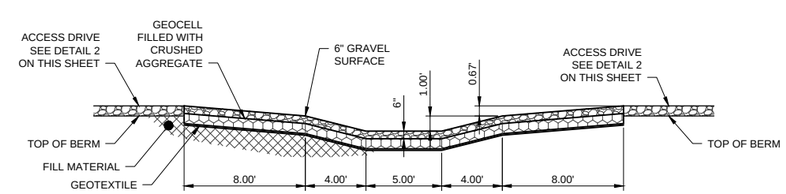
RIPRAP LETDOWN CHANNEL (A)
SCALE:NTS



RIPRAP LETDOWN STRUCTURE (5)
SCALE: NTS



DRAINAGE CHANNEL ON COVER (B)
SCALE:NTS



GEOCELL REINFORCED CHANNEL CROSSING (C)
SCALE:NTS

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: MJC
DRAWN BY: ASD
CHECKED BY: JVH
PROJECT MANAGER: MC

SEAL

DRAFT

UNITED STATES STEEL
SPIRIT LAKE ESTUARY - OU-J
OU-J CDF 95% PRE-FINAL DESIGN
DULUTH, MINNESOTA

DETAIL SHEET

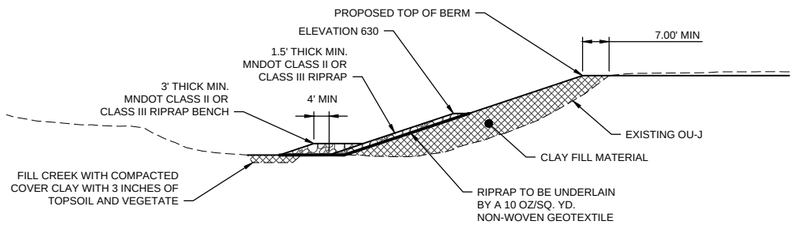
PREPARED FOR:
UNITED STATES STEEL
EPA

AECOM
DULUTH OFFICE
11 East Superior Street, Suite 150
Duluth, MN 55802
218-625-8766 (phone)
COLLABORATION WITH
ST LOUIS AND CHICAGO OFFICES

DATE: 07/02/2018
PROJECT NUMBER: 60586470

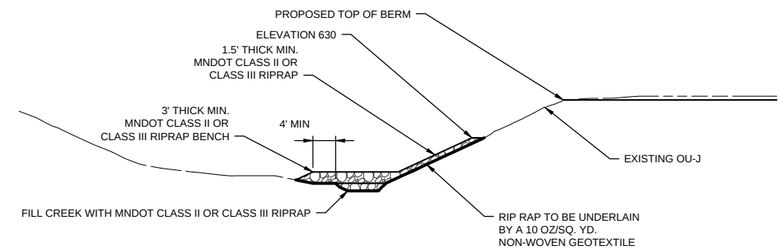
CC-107
SHEET: --- OF 16

PRELIMINARY DESIGN - NOT FOR CONSTRUCTION



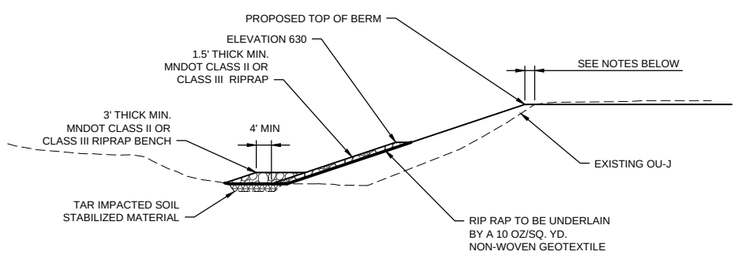
RIPRAP TOE OF SLOPE - SECTION 1 (1)
SCALE: NTS

SECTION 1 NOTES:
- APPROXIMATE LOCATION OF SECTION 1 IS SHOWN ON SHEET CD-102
- LOCATED WHERE GABIONS ARE NOT EXPOSED ALONG CREEK BANK
- TOP OF PROPOSED BERM MUST EXTEND GREATER THAN 7 FT BEYOND EXISTING OU-J TOP OF SLOPE
- GABIONS EMBEDDED IN AND ON SIDE SLOPES OF BERM SHALL BE COVERED WITH A 10 OZ GEOTEXTILE BEFORE PLACING SOIL ON SLOPE
- INSTALL 3' THICK RIPRAP BENCH AT TOE OF RIPRAP SLOPE, BENCH SHALL EXTEND 4' MINIMUM BEYOND PROPOSED TOE OF RIPRAP SLOPE



RIPRAP TOE OF SLOPE - SECTION 2 (2)
SCALE: NTS

SECTION 2 NOTES:
- APPROXIMATE LOCATION OF SECTION 2 IS SHOWN ON SHEET CD-102
- LOCATED WHERE GABIONS ARE EXPOSED ALONG CREEK BANK
- INSTALL RIPRAP FROM BOTTOM OF CREEK TO TOP OF GABIONS
- INSTALL 1.5' THICK RIPRAP ON TOE OF SLOPE
- INSTALL 3' THICK RIPRAP BENCH AT TOE OF RIPRAP SLOPE, BENCH SHALL EXTEND 4' MINIMUM BEYOND WEST CREEK BANK



RIPRAP TOE OF SLOPE - SECTION 3 (3)
SCALE: NTS

SECTION 3 NOTES:
- APPROXIMATE LOCATION OF SECTION 3 IS SHOWN ON SHEET CD-102
- LOCATED WHERE TAR IMPACTED SOIL STABILIZATION HAS OCCURRED
- WHEN PROPOSED TOP OF BERM IS LESS THAN 7 FT BEYOND EXISTING OU-J TOP OF SLOPE, ADD 1.5' (MIN.) THICKNESS OF RIPRAP ALONG EXISTING TOE OF SLOPE. WHEN PROPOSED TOP OF BERM IS GREATER THAN 7 FT BEYOND EXISTING OU-J TOP OF SLOPE, PLACE AND COMPACT CLAY FILL AT 3H:1V SLOPE, ADD 1.5' (MIN.) THICKNESS OF RIPRAP ALONG PROPOSED TOE OF SLOPE
- INSTALL 3' THICK RIPRAP BENCH AT TOE OF RIPRAP SLOPE, BENCH SHALL EXTEND 4' MINIMUM BEYOND PROPOSED TOE OF RIPRAP SLOPE

GENERAL NOTES:

1. RIPRAP TOE OF SLOPE SECTION LOCATIONS SHOWN ON SHEET CD-102 ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY ACTUAL SITE CONDITION TO DETERMINE LOCATION TO USE EACH RIPRAP SECTION USING CRITERIA ON THIS SHEET.
2. CONTRACTOR, WITH ENGINEER'S APPROVAL, CAN ALTER RIPRAP TOE OF SLOPE SECTIONS PENDING LOCATION OF EXISTING CREEK, EXISTING GABIONS, EXISTING TOE OF SLOPE AND/OR PROPOSED TOE OF SLOPE

REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: MJC
DRAWN BY: ASD
CHECKED BY: JVH
PROJECT MANAGER: MC

SEAL

DRAFT

UNITED STATES STEEL
SPIRIT LAKE ESTUARY - OU-J
OU-J CDF 95% PRE-FINAL DESIGN
DULUTH, MINNESOTA

DETAIL SHEET

PREPARED FOR:
UNITED STATES STEEL
EPA

AECOM
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11 East Superior Street, Suite 150
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COLLABORATION WITH
ST LOUIS AND CHICAGO OFFICES

DATE: 07/02/2018
PROJECT NUMBER: 60586470

CC-108

SHEET: --- OF 16

PRELIMINARY DESIGN - NOT FOR CONSTRUCTION

FILE PATH: G:\STLOUIS\SOPRO\ECTS\INV\60586470_UNE_DULUTH\60_CAD_DRWG_CAD\CD-SHEETS\OU-J\IP-DRW-CN_1_DETAILS.DWG ECS-DETAIL SHEET1.DWG, MICHAEL S 5/30/2019 4:39 PM

PHOTO 6
STANDING ON EAST BANK OF UNNAMED CREEK LOOKING NORTH

PHOTO 7
STANDING ON EAST BANK OF UNNAMED CREEK LOOKING NORTH

PHOTO 9
STANDING ON WEST BANK OF UNNAMED CREEK LOOKING SOUTH

PHOTO 13
STANDING ON WEST BANK OF UNNAMED CREEK LOOKING EAST

GENERAL NOTES:

1. APPROXIMATE LOCATIONS OF PHOTOGRAPHS ARE SHOWN ON SHEET GE-101

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: MJC
DRAWN BY: ASD
CHECKED BY: JVH
PROJECT MANAGER: MC

SEAL

DRAFT

UNITED STATES STEEL
SPIRIT LAKE ESTUARY - OU-J
OU-J CDF 50% DESIGN
DULUTH, MINNESOTA

PHOTOS OF EXISTING OUJ TOE OF SLOPE

PREPARED FOR:
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COLLABORATION WITH
ST LOUIS AND CHICAGO OFFICES

DATE: 07/02/2018

PROJECT NUMBER: 60586470

CC-108

SHEET: --- OF 16

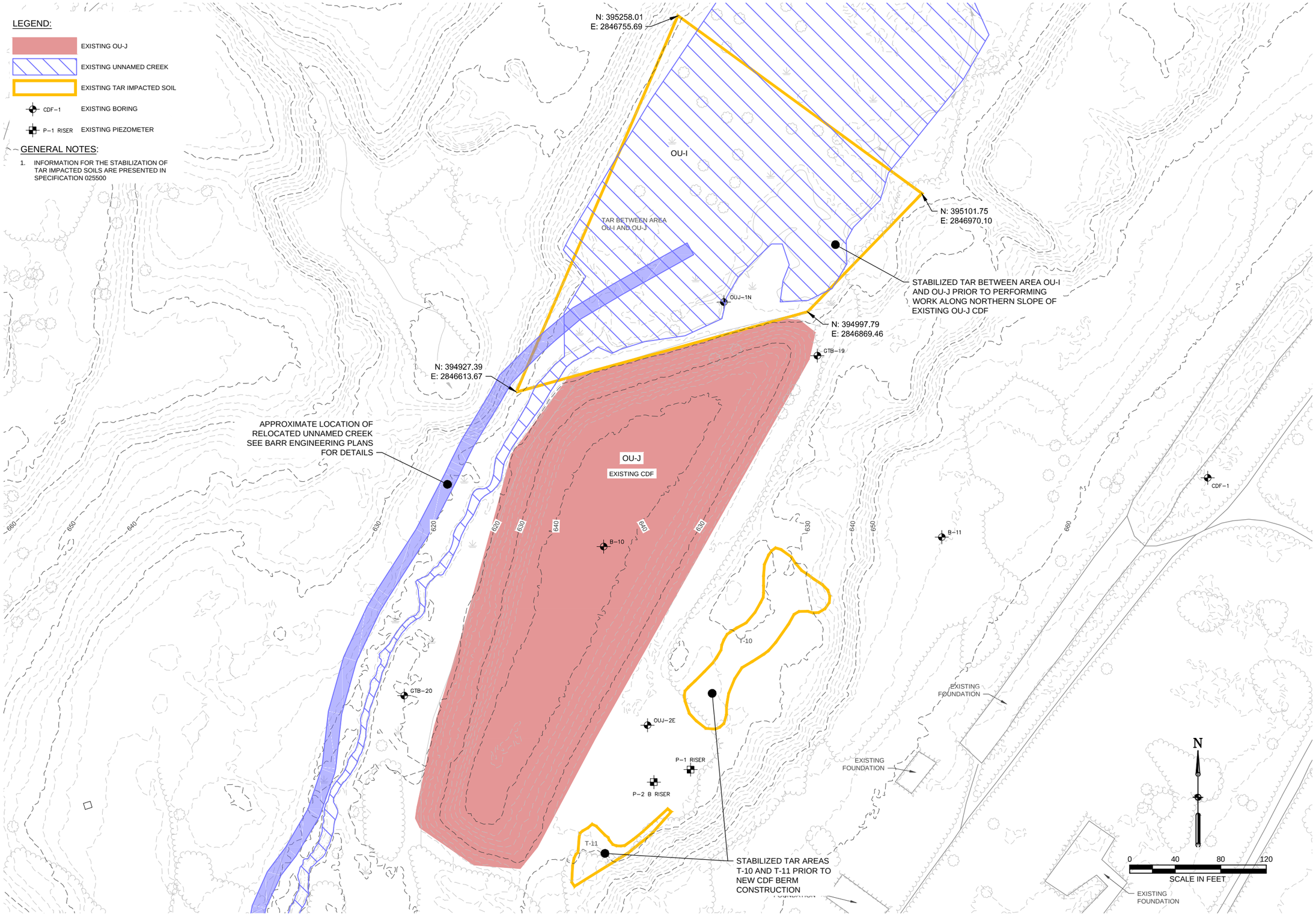
PRELIMINARY DESIGN - NOT FOR CONSTRUCTION

LEGEND:

- EXISTING OU-J
- EXISTING UNNAMED CREEK
- EXISTING TAR IMPACTED SOIL
- CDF-1 EXISTING BORING
- P-1 RISER EXISTING PIEZOMETER

GENERAL NOTES:

1. INFORMATION FOR THE STABILIZATION OF TAR IMPACTED SOILS ARE PRESENTED IN SPECIFICATION 025500



REVISIONS			
NO.	DATE	BY	DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: MJC
DRAWN BY: ASD
CHECKED BY: JVH
PROJECT MANAGER: MC

SEAL

DRAFT

UNITED STATES STEEL
SPIRIT LAKE ESTUARY - OU-J
OU-J CDF 95% PRE-FINAL DESIGN
DULUTH, MINNESOTA

PROPOSED TAR STABILIZATION WORK AREA PLAN

PREPARED FOR:
USS
UNITED STATES STEEL
EPA

AECOM
DULUTH OFFICE
11 East Superior Street, Suite 150
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218-625-8766 (phone)
COLLABORATION WITH
ST LOUIS AND CHICAGO OFFICES

DATE: 07/02/2018

PROJECT NUMBER: 60586470

CT-101

SHEET: --- OF 16

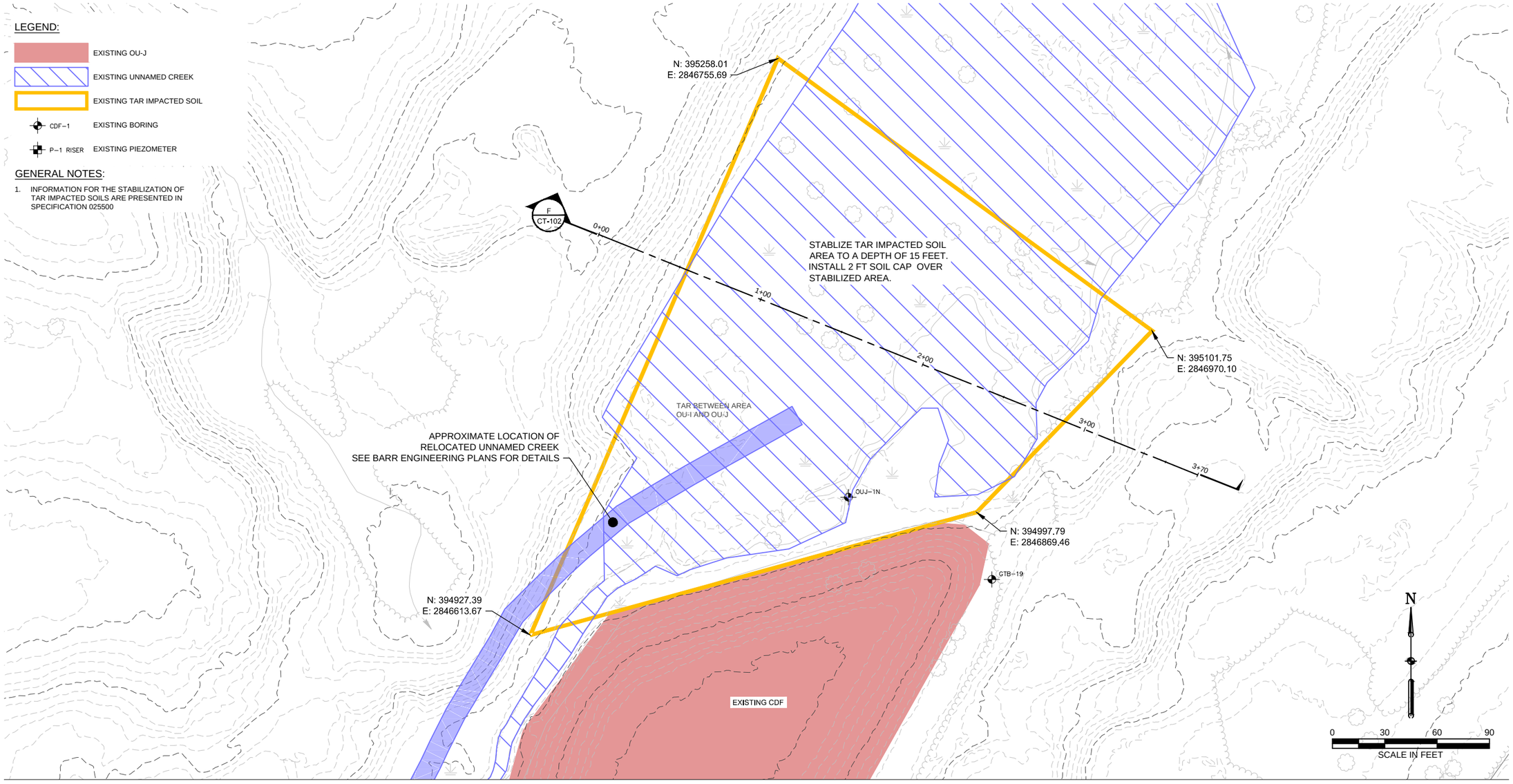
PRELIMINARY DESIGN - NOT FOR CONSTRUCTION

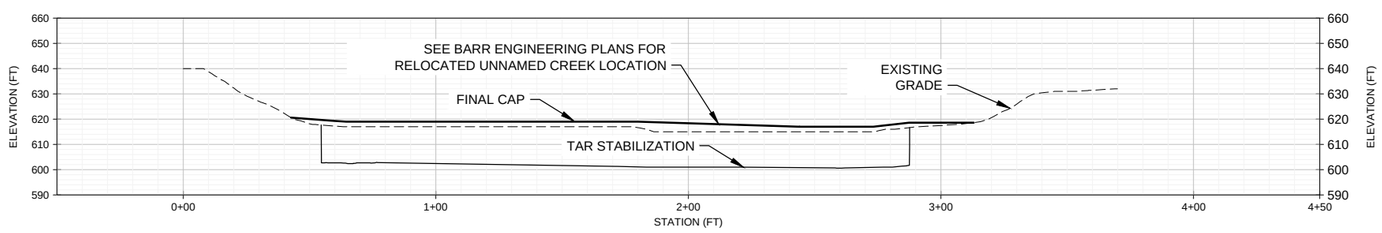
LEGEND:

- EXISTING OU-J
- EXISTING UNNAMED CREEK
- EXISTING TAR IMPACTED SOIL
- CDF-1 EXISTING BORING
- P-1 RISER EXISTING PIEZOMETER

GENERAL NOTES:

1. INFORMATION FOR THE STABILIZATION OF TAR IMPACTED SOILS ARE PRESENTED IN SPECIFICATION 025500





SECTION F
HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=30'

0 30 60 90
SCALE IN FEET

NO.	DATE	BY	REVISIONS DESCRIPTION

DESIGN INFORMATION
DESIGNED BY: MJC
DRAWN BY: ASD
CHECKED BY: JVH
PROJECT MANAGER: MC

SEAL

DRAFT

UNITED STATES STEEL
SPIRIT LAKE ESTUARY - OU-J
OU-J CDF 95% PRE-FINAL DESIGN
DULUTH, MINNESOTA

PROPOSED TAR STABILIZATION WORK AREA PLAN AND SECTION

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218-625-8766 (phone)
COLLABORATION WITH
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DATE: 07/02/2018

PROJECT NUMBER: 60586470

CT-102

SHEET: --- OF 16

PRELIMINARY DESIGN - NOT FOR CONSTRUCTION