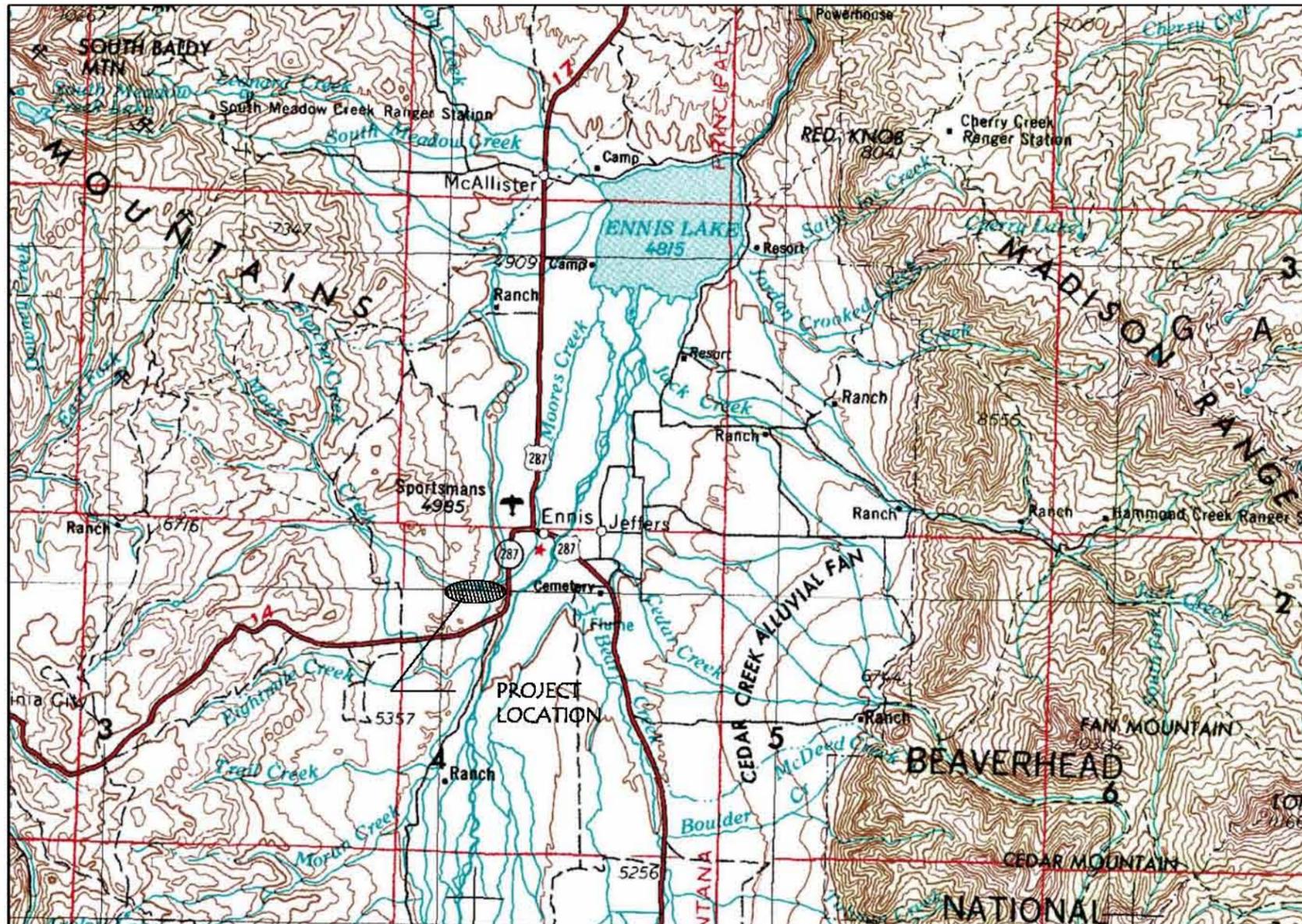


LYONS - MOORES CREEK ENHANCEMENT PROJECT ENNIS, MONTANA -- DRAFT

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SOB, T06S, R01W; C.O.S. 7/2241-BA,
PARCEL 1-B, 28.65 ACRES

LOCATION MAP
Map To Scale



TABLE OF CONTENTS

SHEET	TITLE
1	COVER SHEET
2	GENERAL NOTES
3	SURVEY CONTROL & STAKING
4	PROJECT OVERVIEW - AERIAL
5	PROJECT OVERVIEW - TOPO
6	WETLAND DELINEATION - AERIAL
7	WETLAND DELINEATION - TOPO
8	PROJECT DESIGN OVERVIEW - TOPO
9	DESIGN REACH NO.1
10	DESIGN REACH NO.2
11	DESIGN REACH NO.3
12	CROSS-SECTION "A" (TYP. GLIDE)
12	CROSS-SECTION "B" (TYP. POOL)
13	CROSS-SECTION "C" (TYP. RIPPLE)
13	CROSS-SECTION "D" (IN-STREAM)
14	CROSS-SECTIONS "D" & "E" (REFERENCE REACH)
15	PROJECT PROFILE - EXISTING
16	PROJECT PROFILE - PROPOSED

QUANTITIES

DESCRIPTION	UNIT	QUANTITY
EXISTING CHANNEL WORK	LF	420
NEW CHANNEL CONSTRUCTION	LF	1,380
EXCAVATION - EXIST. CHANNEL	CY	680
EXCAVATION - NEW CHANNEL	CY	2,800
2'-3" COBBLE TOE MATERIAL	CY	800
2" MINUS GRAVEL BEDDING	CY	120
TOP SOIL	CY	800
COIR FABRIC WETLAND SOD MAT	SY	1,000
LIVE SOD REMOVE & RESET	SY	2,800
LIVESTOCK CROSSING	EA	3
EXISTING DRIVEWAY - SHIFT (CUT)	LF	400
(FILL)	CY	180
	CY	320
EXISTING POND - MAINT. DEPTH	CY	500
EXISTING POND - EXPAND	CY	2,000
LANDSCAPE QUANTITIES:		
NATIVE WETLAND SEED MIX	AC	0.5
WILLOW TUBELINGS	EA	2,000
1 GALLON NURSERY STOCK	EA	500
5 GALLON NURSERY STOCK	EA	325
10 GALLON NURSERY STOCK	EA	120

COVER SHEET
LYONS - MOORES CREEK ENHANCEMENT PROJECT
ENNIS, MONTANA

date: 08/18
drawn by: DMS
checked by:



Prepared for:
DAVID LYONS

GENERAL NOTES

PROJECT GOALS & OBJECTIVES

THE GOAL FOR THIS PROJECT IS A DESIGN FOR MOORES CREEK THAT WILL FUNCTION AS A HEALTHIER PERENNIAL STREAM, CARRYING SEDIMENT, WITH AN ACCESSIBLE FLOODPLAIN, SUPPORTING A DIVERSE RIPARIAN PLANT COMMUNITY, AND PROVIDING FISH AND WILDLIFE HABITAT, WITHOUT SIGNIFICANT MECHANICAL MANIPULATION IN THE FUTURE; AND FOR THE CHANNEL, STREAM BANK AND UPLAND CONDITIONS ON THE LYONS PROPERTY NOT TO CONTRIBUTE TO SEDIMENT, NUTRIENT, OR E.COLI CONCERNS WHICH HAVE BEEN IDENTIFIED ON THIS STREAM IN THE PAST BY MT DEQ AND THE MADISON CONSERVATION DISTRICT.

DESIGN SUMMARY

TO MEET THE PROJECT OBJECTIVES, A DESIGN TEAM WAS ASSEMBLED WITH THE DIVERSE SKILLS, TRAINING, AND EXPERIENCE TO COMPLETE THE PROJECT. THE DESIGN TEAM MEMBERS INCLUDED, KARIN BOYD (GEOMORPHOLOGIST), LYNN BACON (PROFESSIONAL WETLANDS SCIENTIST), AND DAVID SIGLER (MS CIVIL ENGINEERING, PE, TSP).

THE FIRST STEP IN THE DESIGN PROCESS WAS TO IDENTIFY A REFERENCE REACH. BETWEEN THE LIMITED SPACE ALLOWED FOR STREAM MOVEMENT DOWNSTREAM AND THE ADDITION OF A RESERVOIR UPSTREAM, IT WAS DETERMINED THAT THIS STREAM SYSTEM WAS IN A STATE OF TRANSITION; THEREFORE, A HISTORIC RESTORATION WAS NOT APPROPRIATE. NONETHELESS THE APPROXIMATELY 800' SECTION OF MOORES CREEK EXTENDING FROM THE WEST MADISON CANAL DOWNSTREAM TO THE CULVERT CROSSING AT MOORES CREEK ROAD UPSTREAM WAS SELECTED TO BE A REFERENCE REACH FOR A MORE STABLE VERSION OF WHAT THIS STREAM WAS TRANSITIONING INTO.

THE REACH OF RIVER TO BE RESTORED EXISTS IN A REGION OF TRANSITION FROM A ROSGEN TYPE "B" IMMEDIATELY DOWNSTREAM OF THE RESERVOIR TO A TYPE "C" STREAM AT THE MOORES CREEK ROAD CROSSING IMMEDIATELY UPSTREAM OF THE CHOSEN REFERENCE REACH FOR THIS PROJECT. THE REFERENCE REACH IS APPROXIMATELY 751 LF OF STREAM OVER 592 LF OF DISTANCE FOR AN EXISTING SINUOSITY OF 1.27. THE AVERAGE BED GRADE ACROSS THIS DISTANCE IS 1.13% (1.43% GROUND SLOPE). TWO REPRESENTATIVE CROSS-SECTIONS WERE TAKEN THROUGH THE REFERENCE REACH (SHEET 15). SECTION "E" AT EXISTING STATION 20+50 HAD SLOPE OF 0.57%, AN ACTIVE CHANNEL WIDTH OF 8.1', AND A FLOODWAY WIDTH OF 37' FOR AN ENTRENCHMENT RATIO OF 4.6 AND A WIDTH TO DEPTH RATIO OF 14. SECTION "F" AT EXISTING STATION 23+50 HAD SLOPE OF 1.42%, AN ACTIVE CHANNEL WIDTH OF 6.8', AND A FLOODWAY WIDTH OF 20' FOR AN ENTRENCHMENT RATIO OF 2.9 AND A WIDTH TO DEPTH RATIO OF 20. OVERALL, THROUGH THIS REACH THE ACTIVE CHANNEL WIDTH VARIED BETWEEN 5'-10', WITH A TYPICAL OF 7' AND THE FLOODWAY VARIES BETWEEN 20'-70'. THESE CHARACTERISTICS ARE CONSISTENT WITH A ROSGEN TYPE "C" STREAM WHICH TYPICALLY HAS A MODERATE TO HIGH SINUOSITY (> 1.2); A MODERATE TO HIGH WIDTH TO DEPTH RATIO (> 12); AND SLIGHTLY ENTRENCHED (> 2.2). THE GENERAL DESCRIPTION OF A ROSGEN TYPE "C" STREAM IS AS FOLLOWS: "A LOW GRADIENT, MEANDERING POINT BAR, RIFFLE-POOL, ALLUVIAL CHANNELS WITH BROAD, WELL-DEFINED FLOOD-PLAINS"

DUE TO THE LACK OF AVAILABLE WETLAND SOD BORROW AREAS ON SITE, THE PROJECT HAS BEEN DESIGNED FOR TOP SOIL AND A WETLAND SEED MIX ALONG WITH NURSERY CONTAINER STOCK PLANTINGS BEHIND PRE-ESTABLISHED COIR FABRIC WETLAND SOD MATS FROM NORTH FORK NATIVE (OR SIMILAR). THESE APPROXIMATELY 3.2' WIDE BY 16' LONG MATS ARE PLACED OVER SATURATED TOP SOILS TEMPORARILY HELD IN PLACE BY A COBBLE STONE TOE COMPRISED OF 2" - 8" COBBLES. THE 2" GRAVELS REPRESENT THE MAXIMUM MATERIAL SIZE TRANSPORTED AT BANKFULL (ALSO THE SIZE OF THE RIFFLE GRAVELS); AND THE 8" MAX COBBLE SIZE REPRESENTS THE EXISTING DMAX IDENTIFIED IN THE REFERENCE REACH.

TO THE BEST OF MY PROFESSIONAL KNOWLEDGE, JUDGMENT, AND BELIEF, THESE PLANS: (1) COMPLY WITH ALL APPLICABLE FEDERAL, STATE, TRIBAL, AND LOCAL LAWS AND REQUIREMENTS, (2) MEET APPLICABLE USDA STANDARDS, SPECIFICATION, AND PROGRAM REQUIREMENTS, AND (3) ARE CONSISTENT WITH AND MEET THE PARTICULAR CONSERVATION PROGRAM GOALS AND OBJECTIVES FOR WHICH THE PROGRAM AGREEMENT OR CONTRACT WAS ENTERED INTO BY THE PROGRAM PARTICIPANT OR USDA.

PROJECT SPECIFICATIONS

STREAM BED GRAVELS:

STREAM BED GRAVELS IN PROPOSED RIFFLE REACHES OF THE NEW MOORES CREEK STREAM ALIGNMENT SHALL BE 2" MINUS ROUNDED GRAVELS.

COBBLE TOE:

COBBLE TOE MATERIAL SHALL BE APPROXIMATELY 800 CY OF 2-8 INCH COBBLE SOURCED AND SCREENED FROM ALDER GULCH TAILINGS. THIS TOE MATERIAL WILL CONTAIN THE TOPSOIL UNDER THE COIR FABRIC WETLAND SOD MATS AND SHALL EXTEND AS FOLLOWS: 2' BELOW THE STREAM BED AT HIGH ENERGY REGIONS (RIFFLES & OUTSIDE BENDS) AND EXTEND 8"-12" IN LOW ENERGY REACHES (GLIDES, INSIDE BENDS, ETC.); AND TO THE BOTTOM OF ALL POOLS.

LIVE SOD COIR FABRIC MATS:

LIVE SOD MATS SHALL BE FROM NORTH FORK NATIVE PLANTS OR APPROVED EQUAL AND SHALL BE WRAPPED IN A BIODEGRADABLE, PROCESSED FIBER PLUGGED WITH A WETLAND PLANT SPECIES MIX THAT INCLUDES NEBRASKA SEDGE, WOOLY SEDGE, AND BALTIC RUSH. THE MATS SHALL BE PLACED OVER LIGHTLY COMPACTED AND DAMP TOP SOILS AT OR JUST ABOVE THE ACTIVE CHANNEL WATER SURFACE ELEVATION. THEY SHALL BE STAKED WITH 8-12 16" WOODEN STAKES PER 3.2'x16' MAT. THE STAKES SHALL BE DRIVEN AT A SLIGHT ANGLE WITH ABOUT 4" OF THE STAKE PROTRUDING ABOVE THE MAT.

RIPARIAN PLANTING:

THE RIPARIAN PLANTS SHALL EXTEND ACROSS BOTH ZONE 1 (OVERBANK FLOODPLAIN BENCHES) AND ZONE 2 (UPLAND FROM THE TOE OF THE ZONE 1 BENCHES TO THE MATCHED EXISTING GRADE). THE ZONE 1 RIPARIAN PLANTINGS SHALL CONSIST OF A MIX OF THE FOLLOWING NATIVE SPECIES: SANDBAR/COYOTE WILLOW (SALIX EXIGUA) @ 50%-60%; GEYER (SALIX GEYER), BOOTH (SALIX BOOTH), AND BEBB (SALIX BEBBIANA) WILLOWS AT 20%; RED-OSIER DOGWOOD (CORNUS SERICEA) @ 10%; GODEN CURRANT (RIBES AUREUM) @ 10%-15%; AND THIN LEAF ALDER (ALNUS INCANA) @ 10%. THE ZONE 2 RIPARIAN PLANTINGS SHALL CONSIST OF A MIX OF THE FOLLOWING NATIVE SPECIES: GOLDEN CURRANT (RIBES AUREUM); NARROWLEAF COTTONWOOD (POPULUS ANGUSTIFOLIA); BLACK COTTONWOOD (POPULUS BLSAMIFERA VAR. TRICHOCARPA); SILVER BUFFALO BERRY (ELEAGUNUS COMMUTATE); CHOKECHERRY (PRUNUS VIRGINIANA); AND ASPEN (POPULUS TREMULOIDES). THE MINIMUM RIPARIAN PLANTING SCHEDULE IS AS FOLLOWS:

- WILLOW STEM TUBELINGS ON A MINIMUM DENSITY OF 1 STEM PER RUNNING BANKLINE FOOT ON OUTSIDE BENDS AND CROSS-OVERS AND ONE STEM PER 2 FEET OF RUNNING BANKLINE ELSEWHERE.
- 1 GALLON POTTED PLANTS AT A DENSITY OF 1 PLANT PER 4 FEET OF RUNNING BANK LINE FOOT ON OUTSIDE BENDS AND CROSS-OVERS AND 1 PLANT PER 8 FEET OF BANKLINE ELSEWHERE.
- 5 GALLON POTTED PLANTS AT A DENSITY OF 1 PLANT PER 6 FEET OF RUNNING BANKLINE FOOT ON OUTSIDE BENDS AND CROSS-OVERS AND 1 PLANT PER 12 FEET OF BANKLINE ELSEWHERE.
- 10 GALLON POTTED PLANTS OR TRANSPLANTED MATURE WILLOW CLUMPS AT A DENSITY OF 1 PLANT PER 24 FEET OF BANKLINE/15 FEET OF BANKLINE, CONCENTRATED ON OUTSIDE BENDS IN STRATEGIC CLUSTERS.

PROJECT PERMITS

PERMITS REQUIRED FOR THIS PROJECT, INCLUDE: A 310 PERMIT FROM THE RUBY VALLEY CONSERVATION DISTRICT; A 404 PERMIT FROM THE ARMY CORE OF ENGINEERS; A 318 AUTHORIZATION FROM THE DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ); AND NOTICE OF INTENT (NOI) FROM DEQ; AND A FLOODPLAIN DEVELOPMENT PERMIT FROM MADISON COUNTY (MAP NO. 3000440003E).

CONSTRUCTION PLAN

THE PROPOSED CONSTRUCTION SEQUENCE FOR THIS PROJECT IS AS FOLLOWS:

1. NEW ALIGNMENT ROUGH EXCAVATION TO AVERAGE BED GRADE, FLOODPLAIN BENCHES AND SLOPES TO MATCH POINTS.
2. TOE INSTALLATION USING KEYED COBBLE STONE TOE TRENCH MATERIAL TO BUILD SUB GRADE FOR OUTSIDE BANK LINES.
3. PLACE GRAVEL BED MATERIAL IN RIFFLE SECTIONS.
4. IN-STREAM EXCAVATION AND REDIRECTION OF STREAM INTO NEW CHANNEL.
5. FINAL BED GRADE-POOL EXCAVATION/CONTROLS/BAR GRADING
6. PLACE AND LIGHTLY COMPACT TOPSOIL ABOVE AND BEHIND COBBLE TOE MATERIAL.
7. SEED NEW TOPSOIL AREAS WITH APPROVED WETLAND SEED MIX AND COVER WITH A MULCH.

THIS CONSTRUCTION SEQUENCE IS A RECOMMENDATION ONLY AND ULTIMATELY THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

PRECONSTRUCTION REQUIREMENTS

1. THE TSP SHALL PERSONALLY CONDUCT A PRE-CONSTRUCTION CONFERENCE WITH THE LANDOWNER AND CONTRACTOR TO ENSURE THAT THEY BOTH UNDERSTAND THE PLANS AND SPECIFICATIONS; THAT ALL THE REQUIRED PERMITS AND PERMISSIONS HAVE BEEN ACQUIRED TO CONSTRUCT THE PROJECT; THAT UTILITY LOCATES HAVE BEEN NOTIFIED; AND THAT TO THE BEST OF THE TSP'S KNOWLEDGE, ALL OTHER RELEVANT RULES AND REGULATIONS ARE BEING ADHERED TO FOR THE CONSTRUCTION OF THIS PROJECT.
2. UTILITY INFORMATION SHOWN ON THE DRAWINGS IS APPROXIMATE AND MAY BE INCOMPLETE. FOR ACCURATE LOCATION CONTACT, PRIOR TO EXCAVATION, THE UTILITIES UNDERGROUND LOCATION CENTER AR: 1-800-424-5555. CONTRACTOR TO BE AWARE OF OVERHEAD LINES IN THE PROJECT VICINITY AND USE THE UTMOST CARE AT ALL TIMES AROUND THE LINES.

CONSTRUCTION INSPECTION

CONSISTENT WITH THE PROJECT DESIGN, THE CONSTRUCTION INSPECTION PLAN FOR THIS PROJECT INCLUDES THE FOLLOWING:

1. CRITICAL INSPECTION AREA AND MATERIALS.
 - a) IMPORTED COBBLE ADEQUATELY APPROXIMATES THE TARGET 2-8" GRADATION.
 - b) INSTALLATION OF COBBLE TOE TO TYPICAL DEPTHS AND WIDTH DESCRIBED IN THE DRAWINGS.
 - c) PLANT MATERIAL IS HEALTHY AS INSTALLED.
 - d) COIR MAT WETLAND SOD MATS ARE SET ON PROPERLY PREPARED SUBGRADE AND STAKED PER THE MANUFACTURER'S RECOMMENDATIONS.
 - e) THE ADJACENT INSET BENCHES ARE LOWERED TO APPROPRIATE ELEVATIONS ALONG THE IN-STREAM EXCAVATION AREA.
2. TOLERANCES FOR LINES AND GRADES
 - a. AVERAGE ROUGH GRADE PASS EXCAVATION WITHIN 0.2' OF THE STAKEOUT GRADE BASED ON 100 FOOT SEGMENTS AS MEASURED AT CONSTRUCTED RIFFLE CREST/TAILOUT LOCATIONS.
 - b. FINAL GRADE - FIT IN FIELD.
 - c. PLAN VIEW/LIMITS OF EXCAVATION PER FIT IN FIELD BASED ON AVERAGE DIMENSIONS STAKED PER TYPICAL SECTIONS IN THE DRAWINGS.
3. COMPACTION
 - a. NO COMPACTION TESTING OF SOILS IS REQUIRED ON THE PROJECT; COMPACTION WILL BE TRACKED BASED UPON APPROPRIATE COMPACTIVE EFFORT.
 - b. BANK TOE COBBLE WILL BE BUCKET PACKED.
 - c. BANK FACE SOD WILL BE BUCKET TAMPED.
4. REQUIRED CONTRACTOR SUBMISSIONS
 - a. GRAVEL AND COBBLE MATERIAL GRADATIONS AND LOAD TICKETS.
 - b. SPECIFICATIONS AND BILL OF MATERIALS FOR COIR FABRIC SOD MATS.
 - c. SEED MIX SPECIFICATIONS AND BILL OF MATERIALS
 - d. NURSERY MATERIAL SOURCE AND BILL OF MATERIALS
5. NAMES & QUALIFICATIONS OF INSPECTORS:
 - a. DAVID M. SIGLER, PE, TSP AND/OR SCOTT GILLILAN, GILLILAN & ASSOCIATES - MATERIAL SPECIFICATIONS CONFIRMATION; LINES AND GRADE CHECKS; COBBLE TOE & STREAM BED GRAVELS INSTALLATION INSPECTION; WETLAND SOD PREP AND INSTALLATION.
 - b. LYNN BACON, TERRAQUATIC - WETLANDS DELINEATION & MONITORING PRE, DURING, AND POST-CONSTRUCTION.
 - c. DAVE MCADOO, RANCH RESOURCES - NATURAL RESOURCE SPECIALIST, LANDSCAPE ARCHITECT, RIPARIAN DESIGN, CULTIVATION, AND INSTALLATION.

OPERATION & MAINTENANCE

6. O&M GENERAL
 - a. A REPRESENTATIVE OF THE DESIGN TEAM AND/OR MILLER FAMILY WILL INSPECT CHANNEL DAILY DURING RUNOFF EVENTS IN YEAR 1 AND AS NEEDED AFTER YEAR 2.
 - b. IF INSPECTIONS WARRANT, TEMPORARY MEASURES MAY BE TAKEN TO MITIGATE ANY UNEXPECTED AS-BUILT CHANNEL BEHAVIOR.
 - c. FOLLOWING RUNOFF AN INSPECTION WILL BE MADE TO DETERMINE IF ANY FURTHER ACTION IS WARRANTED TO PROTECT THE INTEGRITY OF THE CHANNEL FORM AND IF SO, THOSE MEASURES IMPLEMENTED.
2. O&M CHANNEL RE-ALIGNMENT
THE NEW CHANNEL ALIGNMENT WILL NOT BE DIVERTED THROUGH THE USE OF A PLUG OR ANY OTHER IN-STREAM OR WETLAND FILLS, BUT RATHER VIA THE EXCAVATION DOWN OF THE EXISTING CHANNEL AT THE TOP OF THE PROJECT TO RE-DIRECT FLOWS WHICH ARE CURRENTLY SPILLING INTO THE FIELD TO THE SOUTH. ANNUAL INSPECTIONS FOR THE FIRST 3 YEARS AFTER SPRING RIN-OFF ARE RECOMMENDED TO ENSURE THE NEW ALIGNMENT REMAINS ACTIVE
3. NEW RIPARIAN SEEDING MIX SHALL BE COVERED AND MONITORED WEEKLY FOR THE FIRST 3 MONTHS, THEN MONTHLY FOR THE NEXT 12 MONTHS TO ENSURE IT STAYS WET AND COVERED; AND NEW NURSERY STOCK PLANTS SHALL BE MONITORED TO ENSURE THE CAGES ARE EFFECTIVE OR WHETHER SUPPLEMENTAL MEASURES ARE REQUIRED.

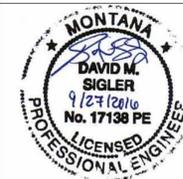
Prepared by:



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GENERAL NOTES
LYONS - MOORES CREEK RESTORATION PROJECT
ENNIS, MONTANA

date: 09/16
drawn by: DMS
checked by:



Prepared for:
DAVID LYONS

SHEET 2 OF 17

STAKING COORDINATES - PROPOSED CHANNEL THALWAG

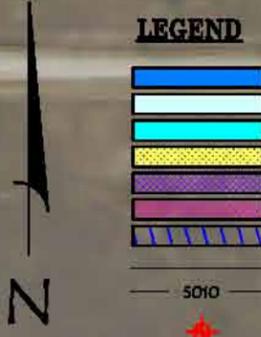
Station	Northing	Easting	TLWG Elev	Bed Elev	TOB			Toe		Match Xstg.		Notes	
					ELEV	BNK HT.	LT	RT	LT	RT	LT		RT
0+00	404585.81	1392425.78	4994.4	4994.4									
0+68	404580.56	1392358.01	4994.8	4994.8	4996.1	1.4'						Begin Project - Upstream HWY 287 Culv.	
0+75	404579.56	1392351.16	4994.0	4995.5	4996.2	0.7'	4.0'	4.3'	18.3'	7.4'	--	9.8'	Bottom of Pool
0+96	404561.91	1392341.96	4994.0	4995.6	4996.4	0.8'	6.1'	2.9'	16.5'	6.6'	--	15.7'	Begin New Alignment
1+00	404557.92	1392342.27	4995.6	4995.6	4996.5	0.9'	5.7'	3.1'	16.1'	7.2'	--	16.3'	Top of Pool # Begin Glide
1+20	404538.06	1392344.62	4995.7	4995.7	4996.7	1.0'	3.3'	3.8'	14.1'	6.8'	--	15.8'	
1+40	404518.09	1392345.34	4995.8	4995.8	4997.0	1.2'	3.1'	4.2'	14.3'	9.5'	--	14.7'	
1+80	404479.23	1392354.51	4995.9	4995.9	4997.5	1.6'	2.8'	4.7'	7.7'	18.7'	--	--	Pool Tail Out # End Glide
1+90	404469.41	1392352.86	4993.4	4994.9	4997.6	2.7'	2.7'	4.7'	--	--	--	--	Bottom of Pool
2+00	404460.59	1392348.23	4996.0	4996.5	4997.7	1.2'	2.7'	4.7'	7.1'	21.2'	9.4'	37.5'	Top of Pool
2+30	404446.61	1392322.53	4996.3	4996.8	4997.9	1.1'	2.7'	4.7'	18.3'	8.2'	--	--	Rifle Crest
2+40	404445.79	1392312.57	4996.5	4997.0	4998.0	1.0'	2.8'	4.7'	10.3'	14.5'	--	30.6'	Pool Tail Out
2+50	404442.13	1392303.37	4994.8	4996.0	4998.1	2.1'	2.8'	4.8'	12.0'	18.1'	--	--	Bottom of Pool
2+60	404434.62	1392296.91	4996.6	4996.8	4998.1	1.3'	2.7'	4.8'	12.4'	23.4'	27.4'	--	Begin Glide
2+85	404414.74	1392282.87	4996.7	4996.9	4998.3	1.4'	3.7'	4.5'	16.4'	24.7'	26.8'	41.1'	
3+10	404402.84	1392261.13	4996.7	4996.9	4998.5	1.6'	3.5'	4.7'	27.2'	21.2'	38.0'	40.4'	
3+40	404395.93	1392232.19	4996.8	4997.0	4998.7	1.7'	4.5'	1.7'	39.8'	4.6'	--	15.5'	Pool Tail Out
3+50	404389.61	1392223.91	4995.4	4997.0	4998.8	1.8'	4.7'	1.5'	--	--	--	--	Bottom of Pool
3+60	404382.08	1392218.07	4996.9	4997.1	4998.9	1.8'	4.7'	2.6'	40.5'	5.9'	50.0'	14.5'	Top of Pool # Begin Glide
3+80	404363.07	1392212.62	4997.0	4997.3	4999.0	1.7'	4.0'	3.2'	37.5'	6.3'	--	21.9'	
4+05	404338.55	1392208.06	4997.7	4998.2	4999.2	1.0'	3.3'	4.2'	28.5'	--	38.3'	--	
4+25	404320.27	1392200.07	4997.7	4998.2	4999.4	1.2'	3.4'	3.6'	19.2'	--	28.0'	--	Pool Tail Out # End Glide
4+45	404310.33	1392183.42	4996.0	4997.5	4999.5	2.0'	4.1'	5.2'	12.4'	36.8'	21.5'	55.9'	Bottom of Pool
4+55	404311.41	1392173.56	4998.4	4998.7	4999.6	0.9'	5.1'	5.0'	9.9'	--	20.2'	--	Top of Pool
4+65	404316.51	1392165.05	4998.6	4998.8	4999.7	0.9'	3.7'	5.1'	9.1'	--	21.1'	--	Rifle Crest
4+85	404332.32	1392152.89	4998.6	4998.9	4999.9	0.9'	5.4'	3.7'	8.7'	26.8'	23.8'	43.7'	
5+05	404350.57	1392144.81	4998.6	4999.0	5000.0	1.0'	4.5'	2.3'	18.2'	--	29.3'	--	Pool Tail Out # End Glide
5+18	404358.72	1392135.70	4996.5	4998.0	5000.1	2.1'	5.3'	1.6'	22.0'	7.2'	41.9'	15.7'	Bottom of Pool
5+25	404357.36	1392128.96	4998.8	4999.2	5000.2	1.0'	4.6'	2.4'	--	7.7'	--	17.2'	Top of Pool
5+35	404349.50	1392123.09	4999.0	4999.3	5000.3	1.0'	3.6'	4.9'	--	13.3'	--	26.4'	Rifle Crest
5+50	404335.44	1392117.91	4998.8	4998.8	5000.4	1.6'	1.7'	5.6'	6.8'	21.1'	--	25.8'	Begin Glide
5+68	404325.75	1392104.84	4998.8	4999.0	5000.5	1.5'	4.2'	2.1'	9.9'	--	19.6'	--	
5+83	404323.55	1392090.29	4998.9	4999.1	5000.6	1.5'	5.0'	1.3'	12.5'	8.7'	23.7'	20.6'	
5+98	404312.71	1392080.34	4999.0	4999.2	5000.8	1.6'	4.0'	2.1'	10.3'	7.9'	21.9'	19.4'	
6+40	404276.38	1392059.42	4999.1	4999.5	5001.1	1.6'	4.7'	3.5'	9.4'	9.1'	15.1'	32.3'	Pool Tail Out # End Glide
6+55	404262.94	1392053.22	4997.0	4998.5	5001.2	2.7'	2.9'	2.1'	6.8'	9.6'	11.4'	19.9'	Bottom of Pool
6+60	404261.01	1392048.68	4999.3	4999.8	5001.2	1.4'	3.8'	3.8'	7.9'	--	14.6'	--	Top of Pool
6+80	404255.05	1392029.65	4999.6	5000.1	5001.4	1.3'	4.9'	1.8'	14.1'	12.3'	21.7'	24.9'	
7+05	404240.70	1392009.34	5000.0	5000.5	5001.6	1.1'	5.6'	2.0'	16.1'	9.7'	21.1'	19.9'	Rifle Crest # Start of Livestock Xing
7+25	404224.71	1391997.43	5000.0	5000.5	5001.7	1.2'	3.4'	4.3'	13.8'	14.0'	18.8'	25.6'	End of Livestock Xing
7+40	404210.90	1391991.63	5000.2	5000.7	5001.8	1.1'	2.2'	4.9'	7.8'	--	13.7'	--	Pool Tail Out
7+50	404202.74	1391986.03	4998.0	4999.5	5001.9	2.4'	2.5'	3.6'	5.6'	20.2'	13.6'	33.1'	Bottom of Pool
7+55	404199.85	1391981.95	5000.4	5000.9	5002.0	1.1'	3.4'	3.1'	6.2'	19.3'	15.2'	32.7'	Top of Pool
7+70	404192.77	1391968.74	5000.8	5001.2	5002.1	0.9'	5.8'	2.6'	9.0'	15.8'	18.7'	29.7'	Rifle Crest
7+80	404187.54	1391960.21	5000.0	5000.3	5002.1	1.8'	6.2'	2.1'	9.5'	14.3'	19.0'	27.8'	Begin Glide
8+00	404176.87	1391943.30	5000.2	5000.5	5002.3	1.8'	5.7'	2.7'	10.7'	12.3'	21.4'	24.5'	

CONTROL POINTS

Control Point	Northing	Easting	Elevation
CP1	404585.81	1392425.78	4994.4
CP2	404580.56	1392358.01	4994.8
CP3	404579.56	1392351.16	4994.0
CP4	404561.91	1392341.96	4994.0
CP5	404557.92	1392342.27	4995.6
CP6	404538.06	1392344.62	4995.7

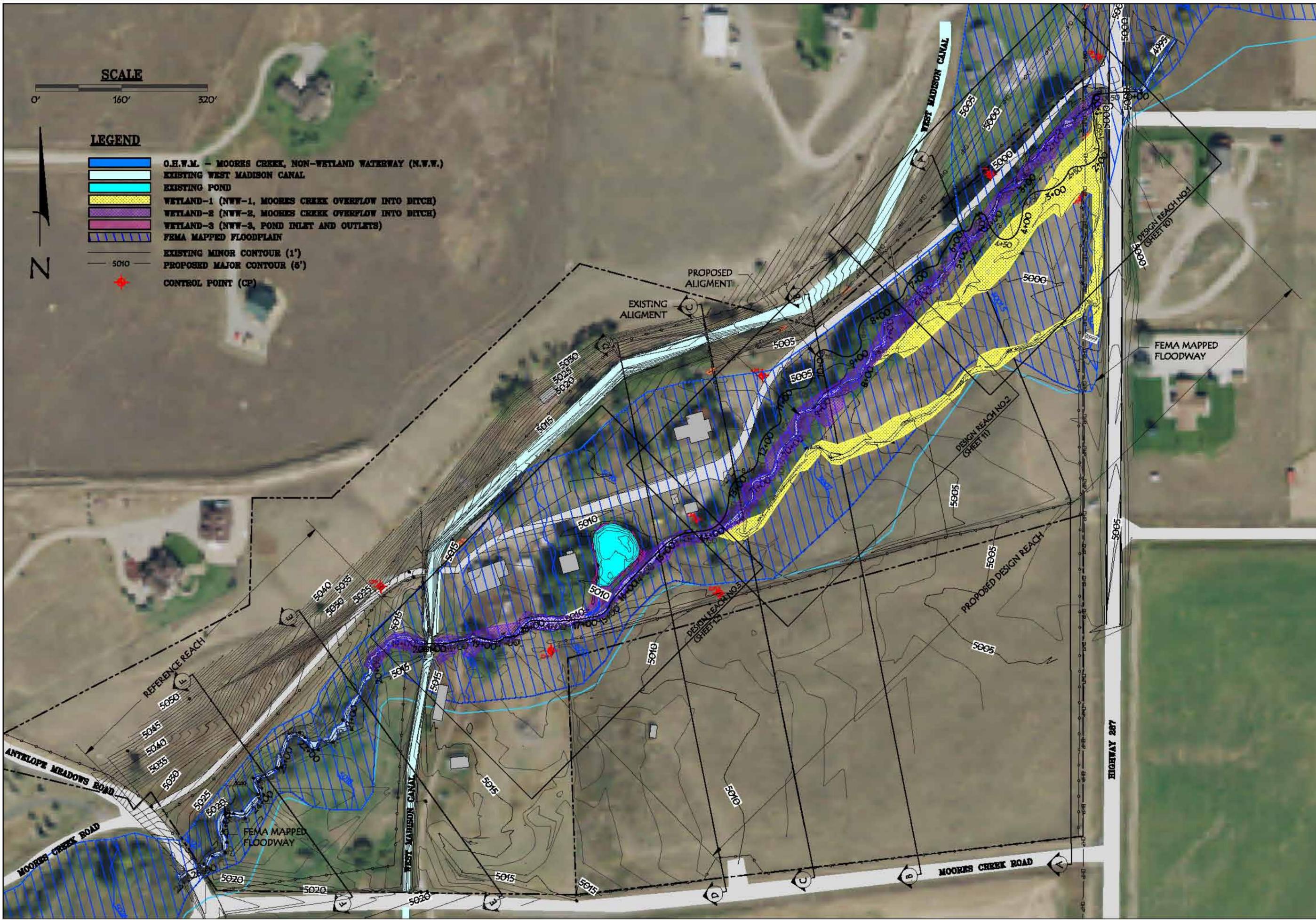
STAKING COORDINATES - PROPOSED CHANNEL THALWAG

Station	Northing	Easting	TLWG Elev	Bed Elev	ELEV	TOB			Toe		Match Xstg.		Notes
						BNK HT.	LT	RT	LT	RT	LT	RT	
8+00	404176.87	1391943.30	5000.2	5000.5	5002.3	1.8'	5.7'	2.7'	10.7'	12.3'	21.4'	24.5'	
8+30	404161.91	1391917.37	5000.5	5000.8	5002.6	1.8'	5.8'	1.9'	22.9'	7.3'	34.0'	18.3'	End Glide
8+45	404149.54	1391909.17	5000.9	5001.4	5002.8	1.4'	4.5'	1.8'	--	10.3'	--	23.9'	
8+65	404129.91	1391909.14	5001.4	5001.9	5003.0	1.1'	3.4'	3.2'	--	--	--	--	
8+80	404115.46	1391912.30	5001.8	5002.2	5003.2	1.0'	2.0'	5.2'	9.2'	--	17.2'	--	Pool Tail out
8+90	404106.10	1391909.02	5000.8	5001.3	5003.3	2.0'	1.6'	6.0'	6.1'	--	13.2'	--	
9+05	404096.04	1391898.12	4999.5	5001.0	5003.5	2.5'	1.5'	5.7'	4.3'	42.2'	12.5'	54.6'	Bottom of Pool
9+15	404092.92	1391888.68	5002.0	5002.5	5003.6	1.1'	2.6'	4.9'	5.4'	--	14.5'	--	Top of Pool
9+35	404096.63	1391869.40	5002.3	5002.7	5003.8	1.1'	4.8'	3.4'	--	--	--	--	Rifle Crest
9+65	404105.23	1391841.08	5002.4	5002.9	5004.1	1.2'	4.8'	1.3'	6.1'	33.2'	16.1'	--	Pool Tail Out
9+80	404097.52	1391828.66	5000.0	5001.5	5004.3	2.8'	4.9'	1.3'	--	6.9'	--	15.5'	Bottom of Pool
9+90	404088.26	1391825.21	5002.7	5003.2	5004.4	1.2'	4.0'	2.7'	--	12.0'	--	--	Top of Pool
10+10	404068.30	1391824.98	5002.9	5003.4	5004.6	1.2'	1.7'	5.9'	16.9'	21.0'	35.0'	--	Rifle Crest
10+20	404058.52	1391822.98	5002.5	5002.9	5004.7	1.8'	2.4'	5.4'	14.0'	24.6'	28.1'	--	Begin Glide
10+48	404036.25	1391807.72	5002.8	5003.2	5005.0	1.8'	2.8'	4.5'	7.8'	27.5'	16.9'	48.7'	
10+90	404024.78	1391767.81	5003.3	5003.7	5005.5	1.8'	4.8'	1.3'	--	11.6'	--	23.2'	Pool Tail Out # End Glide
11+05	404013.66	1391758.26	5001.5	5003.0	5005.6	2.6'	4.1'	3.8'	--	11.6'	--	19.8'	Bottom of Pool
11+10	404008.76	1391757.32	5003.7	5004.2	5005.7	1.5'	3.3'	4.9'	28.7'	13.3'	40.1'	22.3'	Top of Pool
11+30	403989.08	1391760.59	5004.0	5004.5	5005.8	1.3'	3.0'	4.7'	16.0'	--	28.3'	--	Rifle Crest
11+40	403979.40	1391763.07	5004.0	5004.5	5005.9	1.4'	2.2'	5.1'	8.2'	32.5'	19.1'	40.8'	Pool Tail Out
11+50	403969.82	1391760.87	5002.0	5003.5	5006.0	2.5'	3.4'	3.9'	6.4'	--	16.1'	--	Bottom of Pool
11+60	403963.65	1391753.22	5004.3	5004.8	5006.0	1.2'	4.3'	3.0'	7.5'	--	16.6'	--	Top of Pool
11+85	403947.49	1391734.36	5004.5	5005.0	5006.2	1.2'	5.3'	1.7'	8.5'	14.4'	18.9'	22.0'	Rifle Crest
12+10	403925.31	1391723.38	5004.3	5004.6	5006.4	1.8'	4.9'	2.7'	8.0'	11.6'	19.6'	19.0'	Start Glide
12+40	403895.73	1391718.68	5004.7	5005.0	5006.6	1.6'	2.3'	3.5'	5.6'	17.0'	17.6'	27.7'	
12+60	403880.77	1391706.03	5005.0	5005.0	5006.7	1.7'	3.7'	2.9'	6.9'	17.1'	17.3'	26.2'	Pool Tail Out # End Glide
12+70	403876.64	1391696.93	5003.0	5004.5	5006.8	2.3'	5.1'	1.5'	9.1'	13.1'	19.5'	22.4'	Bottom of Pool
12+80	403871.52	1391688.35	5005.2	5005.7	5006.9	1.2'	5.0'	1.7'	10.0'	8.3'	22.		



LEGEND

- O.H.W.M. - MOORES CREEK, NON-WETLAND WATERWAY (N.W.W.)
- EXISTING WEST MADISON CANAL
- EXISTING POND
- WETLAND-1 (NWW-1, MOORES CREEK OVERFLOW INTO DITCH)
- WETLAND-2 (NWW-2, MOORES CREEK OVERFLOW INTO DITCH)
- WETLAND-3 (NWW-3, POND INLET AND OUTLETS)
- FEMA MAPPED FLOODPLAIN
- EXISTING MINOR CONTOUR (1')
- PROPOSED MAJOR CONTOUR (5')
- CONTROL POINT (CP)



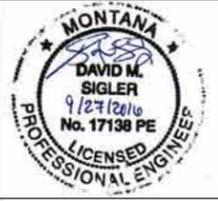
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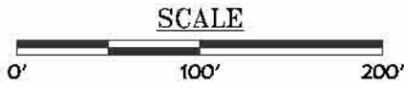
P.O. Box 114 Bozeman, Montana 59771 • 404.587.4051 office • 406.587.4053 fax

PROJECT OVERVIEW - AERIAL
LYONS - MOORES CREEK RESTORATION PROJECT
ENNIS, MONTANA

date: 09/16
 drawn by: DMS
 checked by:

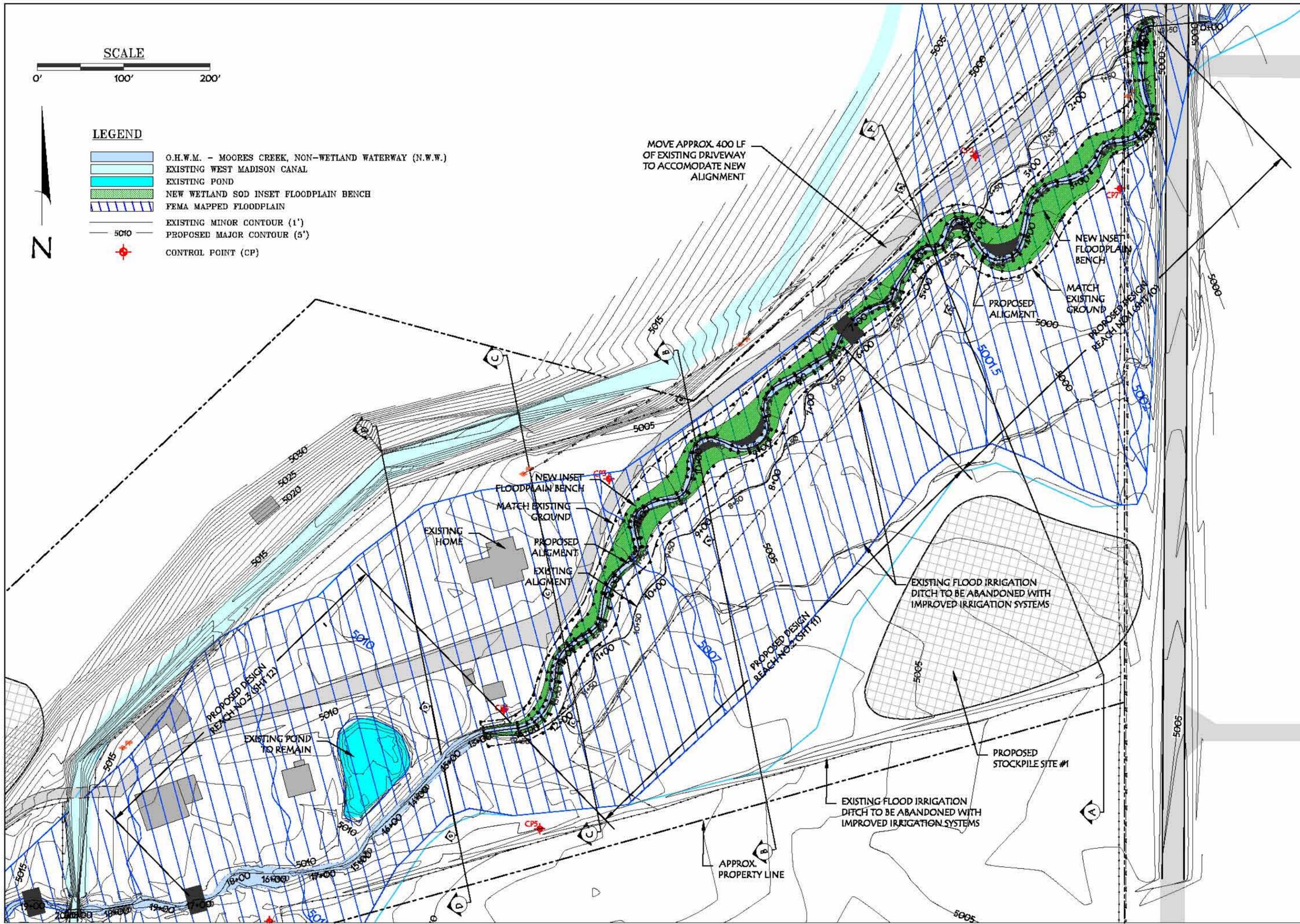


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DAVID LYONS
 SHEET 4 OF 17



LEGEND

- O.H.W.M. - MOORES CREEK, NON-WETLAND WATERWAY (N.W.W.)
- EXISTING WEST MADISON CANAL
- EXISTING POND
- NEW WETLAND SOD INSET FLOODPLAIN BENCH
- FEMA MAPPED FLOODPLAIN
- EXISTING MINOR CONTOUR (1')
- PROPOSED MAJOR CONTOUR (5')
- CONTROL POINT (CP)



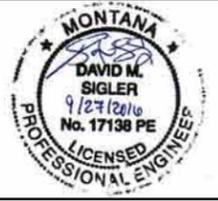
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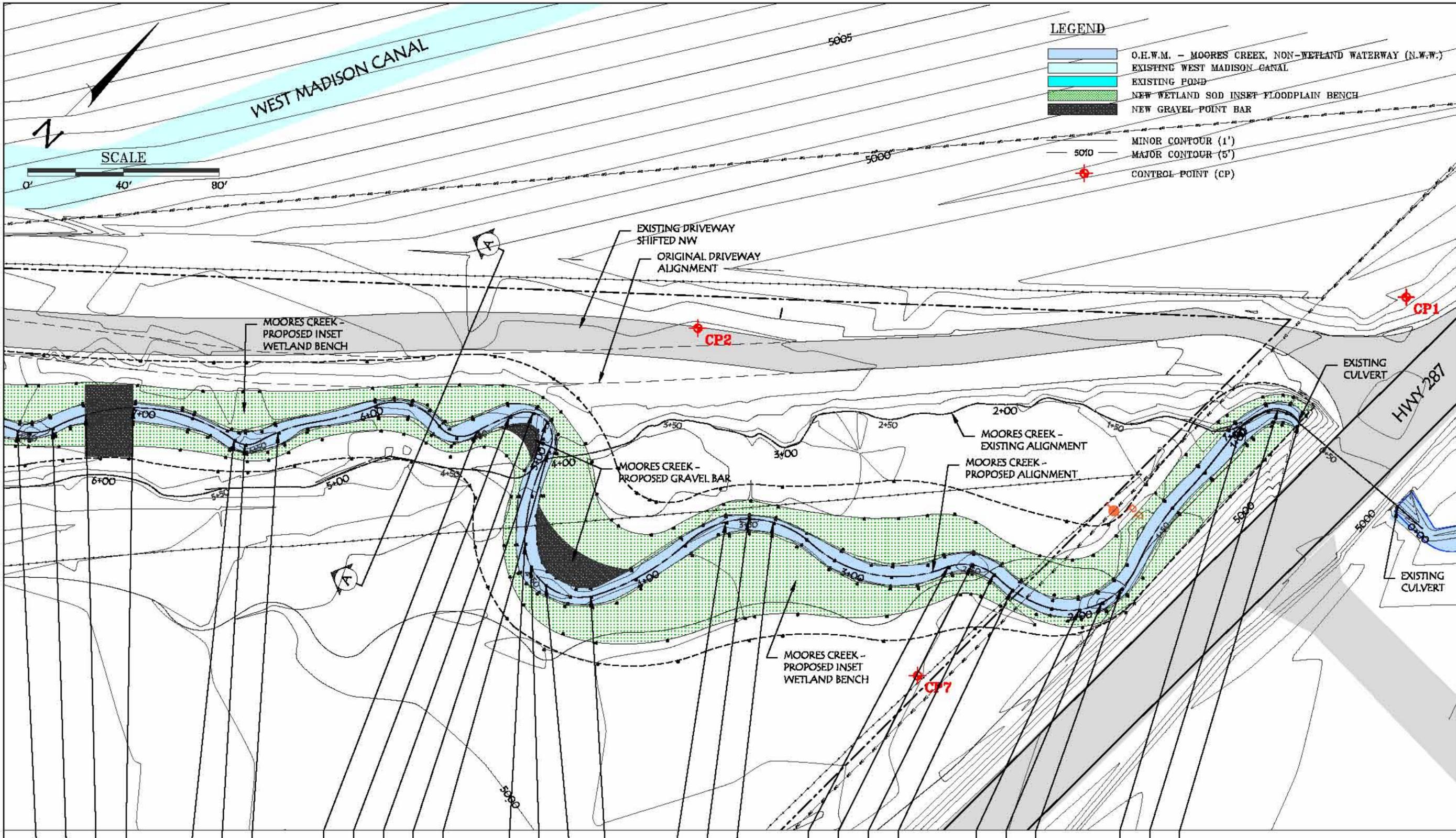
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PROJECT DESIGN OVERVIEW - TOPO
LYONS - MOORES CREEK RESTORATION PROJECT
ENNIS, MONTANA

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SHEET 9 OF 17



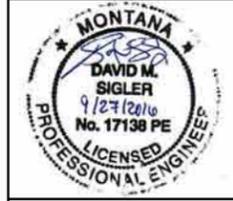
- LEGEND**
- O.H.W.M. - MOORES CREEK, NON-WETLAND WATERWAY (N.W.W.)
 - EXISTING WEST MADISON CANAL
 - EXISTING POND
 - NEW WETLAND SOD INSET FLOODPLAIN BENCH
 - NEW GRAVEL POINT BAR
 - MINOR CONTOUR (1')
 - MAJOR CONTOUR (5')
 - CONTROL POINT (CP)

- BOTTOM OF POOL
STATION 7+50 - ELEV. 4998.0
- POOL TAIL-OUT
STATION 7+40 - ELEV. 5000.2
- END OF LIVESTOCK CROSSING
STATION 7+25 - ELEV. 5000.0
- RIFFLE CREST & START XING
STATION 7+05 - ELEV. 4995.6
- TOP OF POOL
STATION 6+60 - ELEV. 4999.3
- BOTTOM OF POOL
STATION 6+55 - ELEV. 4997.0
- POOL TAIL-OUT & END GLIDE
STATION 6+40 - ELEV. 4999.1
- BEGIN GLIDE
STATION 5+50 - ELEV. 4998.8
- RIFFLE CREST
STATION 5+35 - ELEV. 4999.9
- TOP OF POOL
STATION 5+25 - ELEV. 4998.8
- BOTTOM OF POOL
STATION 5+18 - ELEV. 4996.5
- POOL TAIL-OUT & END GLIDE
STATION 5+05 - ELEV. 4998.6
- RIFFLE CREST
STATION 4+65 - ELEV. 4998.6
- TOP OF POOL
STATION 4+55 - ELEV. 4998.4
- BOTTOM OF POOL
STATION 4+45 - ELEV. 4996.0
- TOP OF POOL & END GLIDE
STATION 4+25 - ELEV. 4997.7
- TOP OF POOL & BEGIN GLIDE
STATION 3+60 - ELEV. 4996.9
- BOTTOM OF POOL
STATION 3+50 - ELEV. 4995.4
- POOL TAIL OUT
STATION 3+40 - ELEV. 4996.8
- BEGIN GLIDE
STATION 2+60 - ELEV. 4996.6
- BOTTOM OF POOL
STATION 2+50 - ELEV. 4994.8
- POOL TAIL OUT
STATION 2+40 - ELEV. 4996.5
- RIFFLE CREST
STATION 2+30 - ELEV. 4996.3
- TOP OF POOL
STATION 2+00 - ELEV. 4996.0
- BOTTOM OF POOL
STATION 1+90 - ELEV. 4995.4
- POOL TAIL OUT & END GLIDE
STATION 1+80 - ELEV. 4995.9
- BEGIN NEW ALIGNMENT
STATION 0+96 - ELEV. 4994.0
- BOTTOM OF POOL
STATION 0+75 - ELEV. 4994.0
- BEGIN PROJECT AT CULVERT
STATION 0+68 - MATCH CULV.

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 Structural Civil Aquatic
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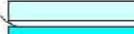
PROJECT DESIGN - REACH NO.1
LYONS - MOORES CREEK RESTORATION PROJECT
ENNIS, MONTANA

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 drawn by: DMS
 checked by:

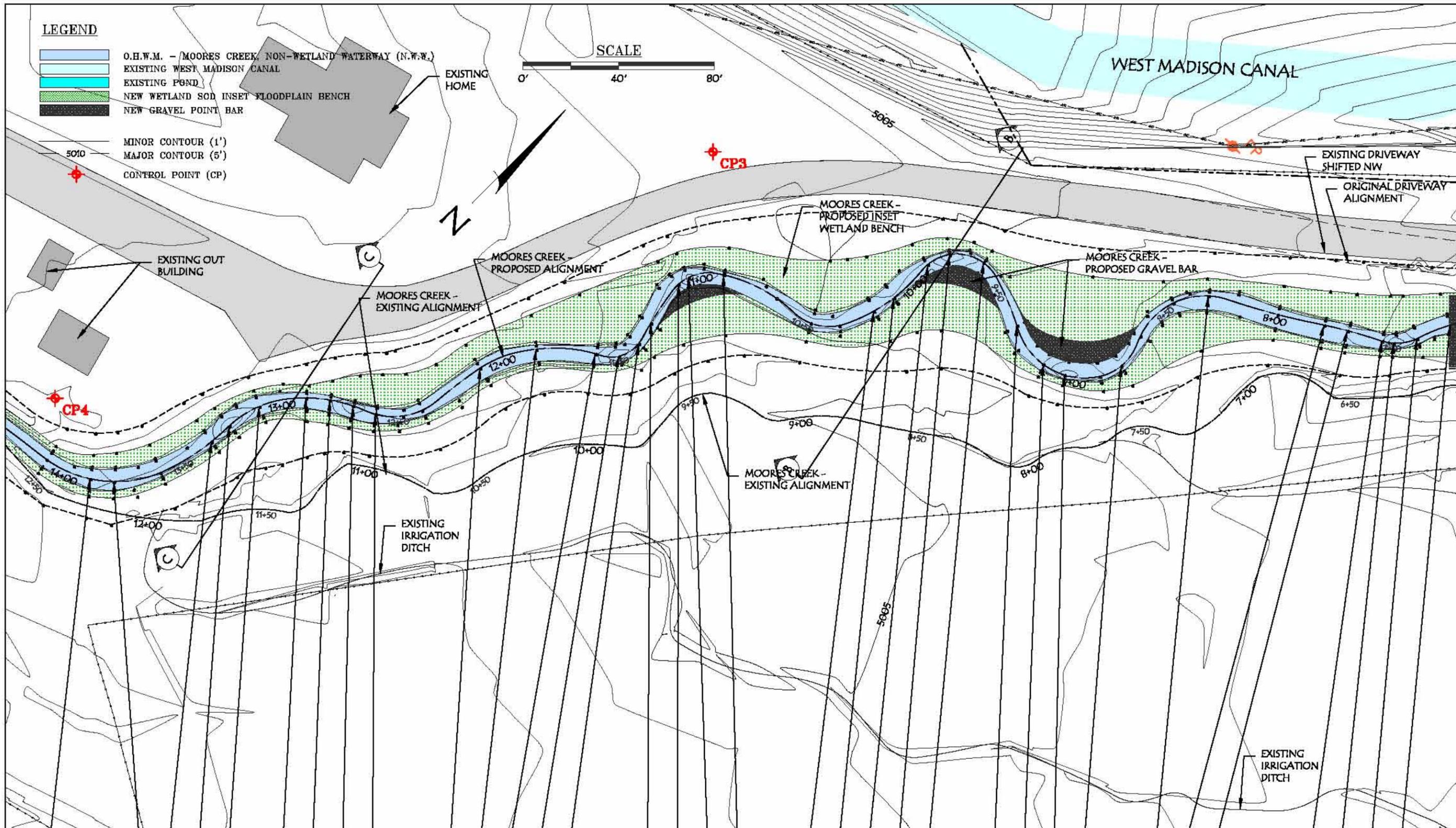
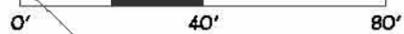


Prepared for:
DAVID LYONS

LEGEND

-  O.H.W.M. - MOORES CREEK, NON-WETLAND WATERWAY (N.W.W.)
-  EXISTING WEST MADISON CANAL
-  EXISTING POND
-  NEW WETLAND SOD INSET FLOODPLAIN BENCH
-  NEW GRAVEL POINT BAR
-  MINOR CONTOUR (1')
-  MAJOR CONTOUR (5')
-  CONTROL POINT (CP)

SCALE

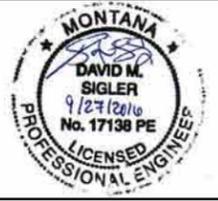


BEGIN GLIDE STATION 13+90 - ELEV. 5005.3	RIFFLE CREST STATION 13+80 - ELEV. 5006.0	TOP OF POOL STATION 13+35 - ELEV. 5005.5	BOTTOM OF POOL STATION 13+25 - ELEV. 5003.0	POOL TAIL-OUT STATION 13+10 - ELEV. 5005.3	RIFFLE CREST STATION 12+90 - ELEV. 5005.3	TOP OF POOL STATION 12+80 - ELEV. 5005.2	BOTTOM OF POOL STATION 12+70 - ELEV. 5003.0	POOL TAIL-OUT & END GLIDE STATION 12+60 - ELEV. 5005.0	START GLIDE STATION 12+10 - ELEV. 5004.3	RIFFLE CREST STATION 11+85 - ELEV. 5004.5	TOP OF POOL STATION 11+60 - ELEV. 5004.3	BOTTOM OF POOL STATION 11+50 - ELEV. 5002.0	POOL TAIL OUT STATION 11+40 - ELEV. 5004.0	RIFFLE CREST STATION 11+30 - ELEV. 5004.0	TOP OF POOL STATION 11+10 - ELEV. 5003.7	BOTTOM OF POOL STATION 11+05 - ELEV. 5001.5	POOL TAIL OUT & END GLIDE STATION 10+90 - ELEV. 5003.3	BEGIN GLIDE STATION 10+20 - ELEV. 5002.5	RIFFLE CREST STATION 10+10 - ELEV. 5002.9	TOP OF POOL STATION 9+90 - ELEV. 5002.7	BOTTOM OF POOL STATION 9+80 - ELEV. 5000.0	POOL TAIL OUT STATION 9+65 - ELEV. 5002.4	RIFFLE CREST STATION 9+35 - ELEV. 5002.3	TOP OF POOL STATION 9+15 - ELEV. 5002.0	BOTTOM OF POOL STATION 9+05 - ELEV. 4995.0	POOL TAIL OUT STATION 8+80 - ELEV. 5001.0	END GLIDE STATION 8+50 - ELEV. 5000.5	BEGIN GLIDE STATION 7+80 - ELEV. 5000.0	RIFFLE CREST STATION 7+70 - ELEV. 5000.8	TOP OF POOL STATION 7+55 - ELEV. 5000.4	BOTTOM OF POOL STATION 7+50 - ELEV. 4998.0	POOL TAIL-OUT STATION 7+40 - ELEV. 5000.2	END OF LIVESTOCK CROSSING STATION 7+25 - ELEV. 5000.0
---	--	---	--	---	--	---	--	---	---	--	---	--	---	--	---	--	---	---	--	--	---	--	---	--	---	--	--	--	---	--	---	--	--

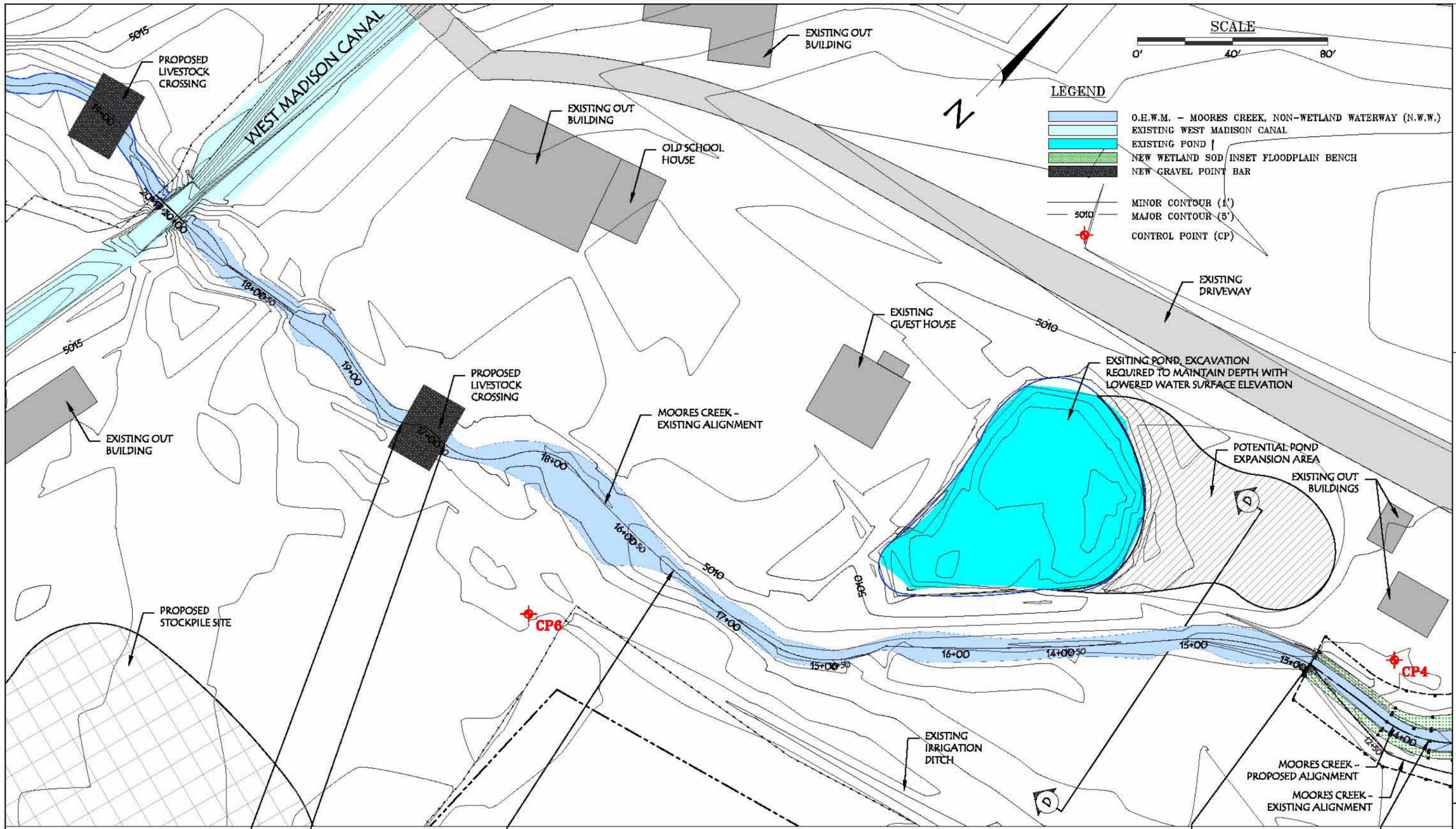
Spanish Peaks Engineering & Consulting, LLC
 Structural Civil Aquatic
 P.O. Box 114 Bozeman, Montana 59711 • 404.587.4051 office • 406.587.4053 fax

PROJECT DESIGN - REACH NO.2
LYONS - MOORES CREEK RESTORATION PROJECT
ENNIS, MONTANA

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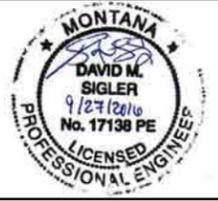
LEGEND

- O.H.W.M. - MOORES CREEK, NON-WETLAND WATERWAY (N.W.W.)
- EXISTING WEST MADISON CANAL
- EXISTING POND
- NEW WETLAND SOD INSET FLOODPLAIN BENCH
- NEW GRAVEL POINT BAR
- MINOR CONTOUR (1')
- MAJOR CONTOUR (5')
- CP CONTROL POINT (CP)

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 Structural Civil Aquatic
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PROJECT DESIGN - REACH NO.3
LYONS - MOORES CREEK RESTORATION PROJECT
ENNIS, MONTANA

date: 09/16
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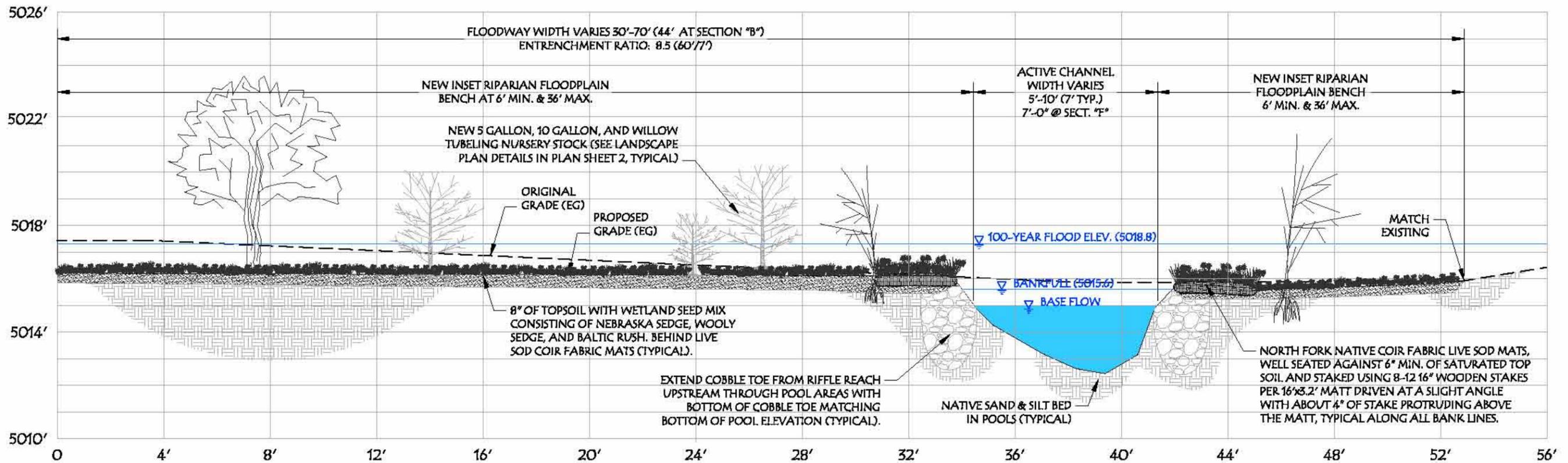
END IN STREAM EXCAVATION &
 END LIVESTOCK CROSSING
 STATION 18+68 - ELEV. 5009.5

BEGIN LIVESTOCK CROSSING
 STATION 18+48 - ELEV. 5009.5

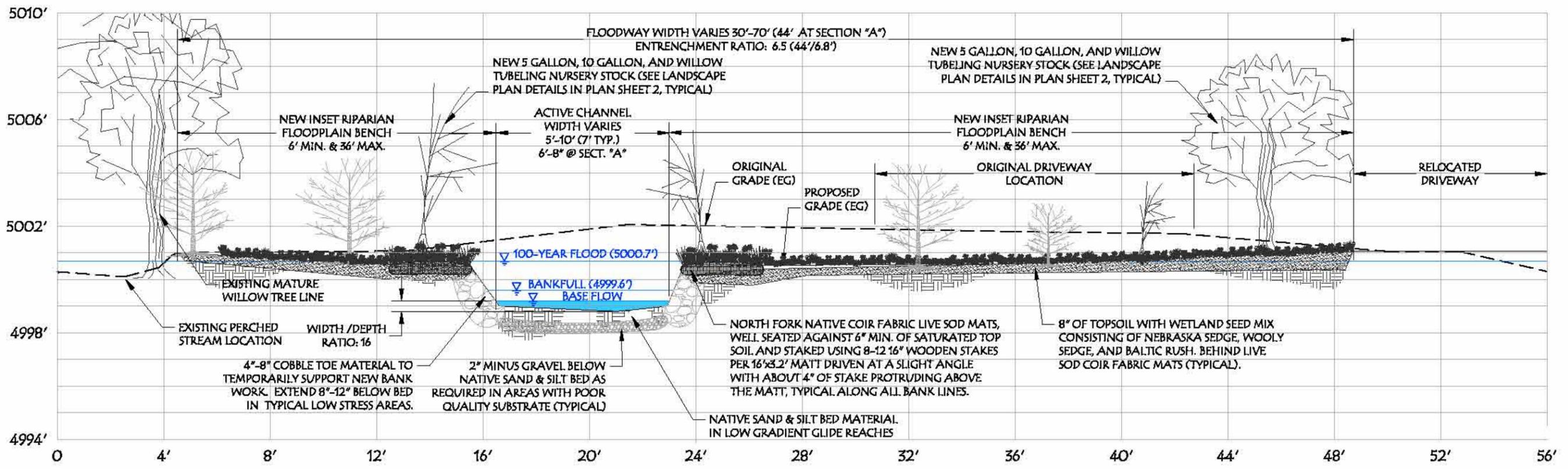
END GLIDE
 STATION 12+10 - ELEV. 5007.5

BEGIN IN STREAM EXCAVATION &
 END GLIDE & NEW ALIGNMENT
 STATION 14+50 - ELEV. 5005.5

BEGIN GLIDE
 STATION 13+90 - ELEV. 5005.3



SECTION "B" - TYPICAL POOL (9+60)
SCALE: 1"=2' FULL SIZED (1"=4' - HALF SIZE 11x17 DRAWINGS) GRADE: 0.57%



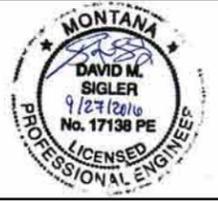
SECTION "A" - TYPICAL GLIDE (5+70)
SCALE: 1"=2' FULL SIZED (1"=4' - HALF SIZE 11x17 DRAWINGS) GRADE: 0.33%

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Structural Civil Aquatic

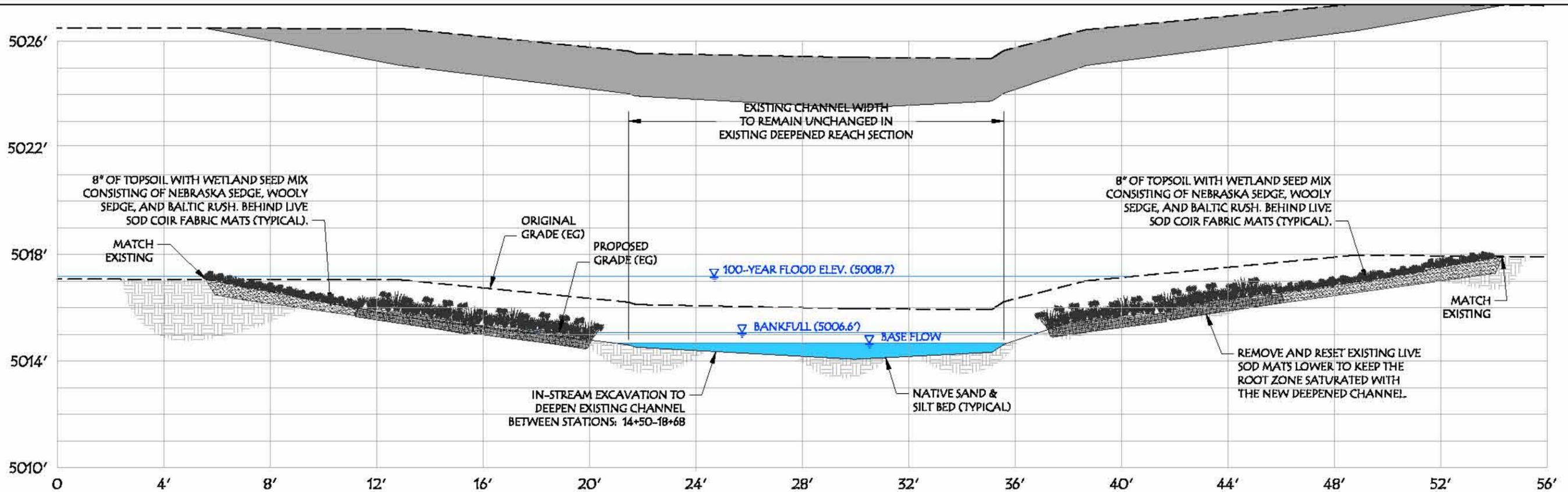
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CROSS-SECTIONS: TYPICAL - DESIGN REACH
LYONS - MOORES CREEK RESTORATION PROJECT
ENNIS, MONTANA

date: 09/16
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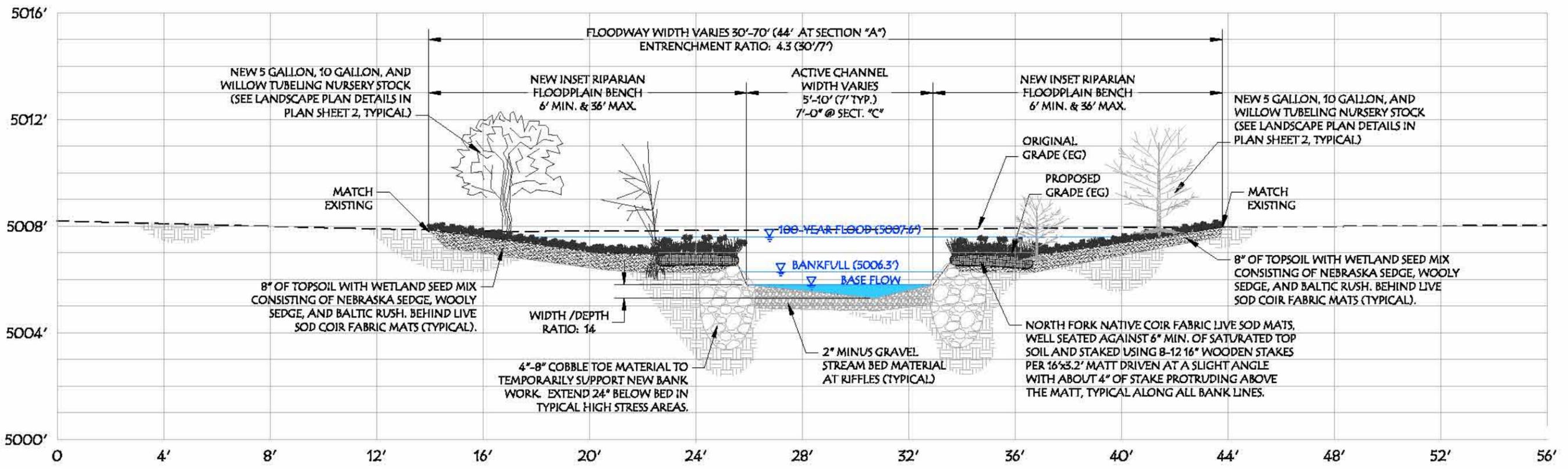


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DAVID LYONS



SECTION "D" - TYPICAL IN-STREAM WORK (15+05)

SCALE: 1"=2' FULL SIZED
(1"=4' - HALF SIZE 11x17 DRAWINGS) GRADE: 0.57%



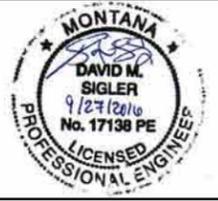
SECTION "C" - TYPICAL RIFFLE (12+90)

SCALE: 1"=2' FULL SIZED
(1"=4' - HALF SIZE 11x17 DRAWINGS) GRADE: 1.11%

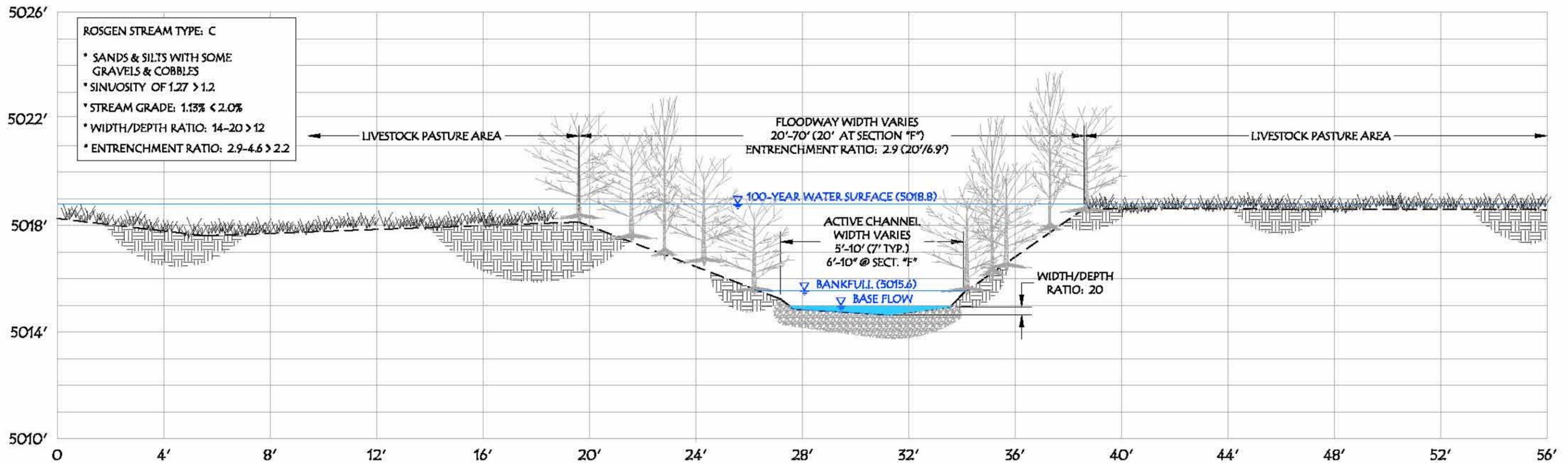
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Structural Civil Aquatic
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CROSS-SECTIONS: TYPICAL - DESIGN REACH
LYONS - MOORES CREEK RESTORATION PROJECT
ENNIS, MONTANA

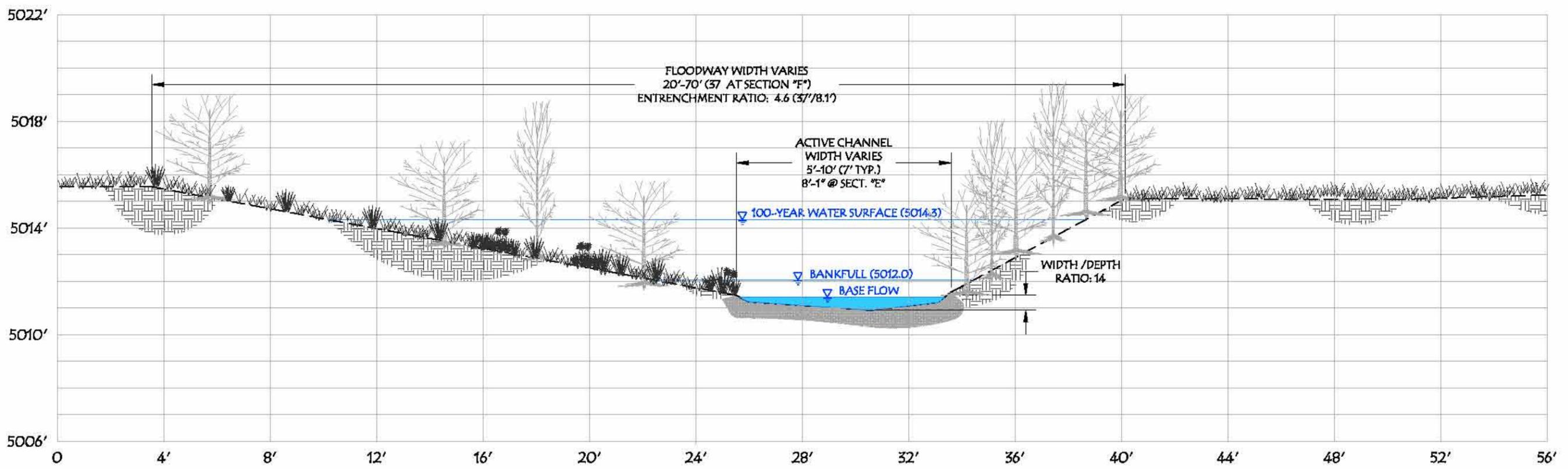
date: 09/16
drawn by: DMS
checked by:



Prepared for:
DAVID LYONS



SECTION "F" - REFERENCE REACH (23+50)
 SCALE: 1"=2' FULL SIZED (1"=4' - HALF SIZE 11x17 DRAWINGS) GRADE: 1.42%

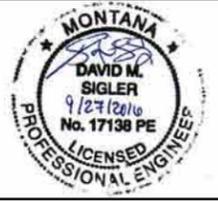


SECTION "E" - REFERENCE REACH (20+50)
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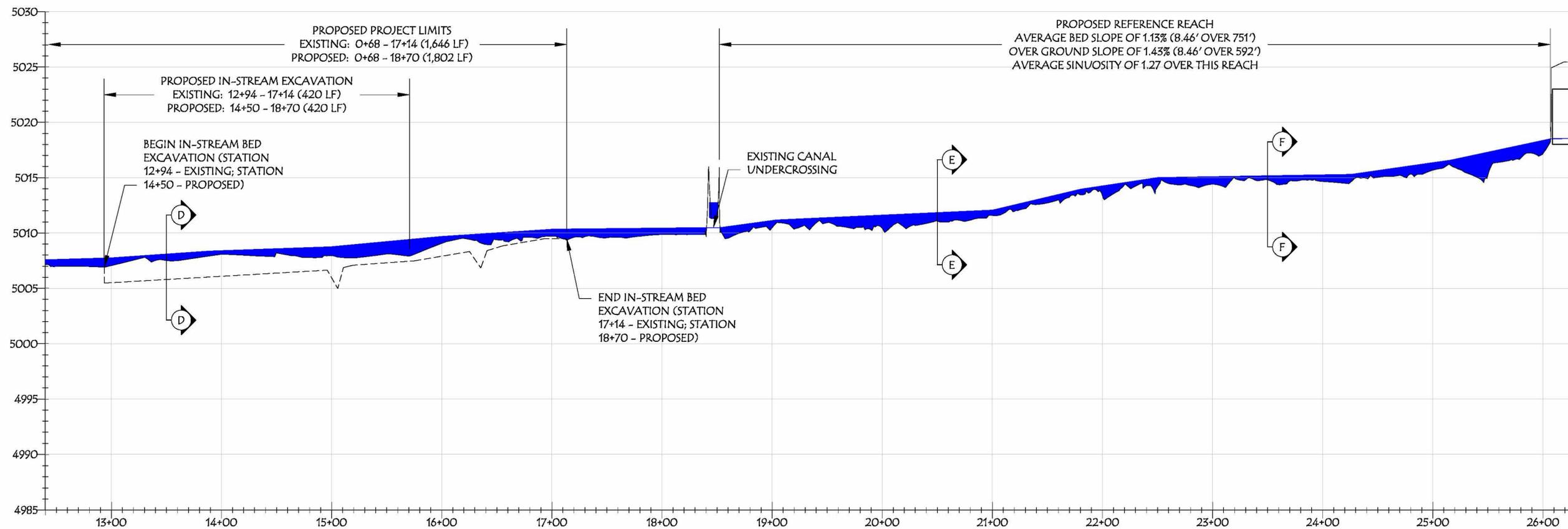
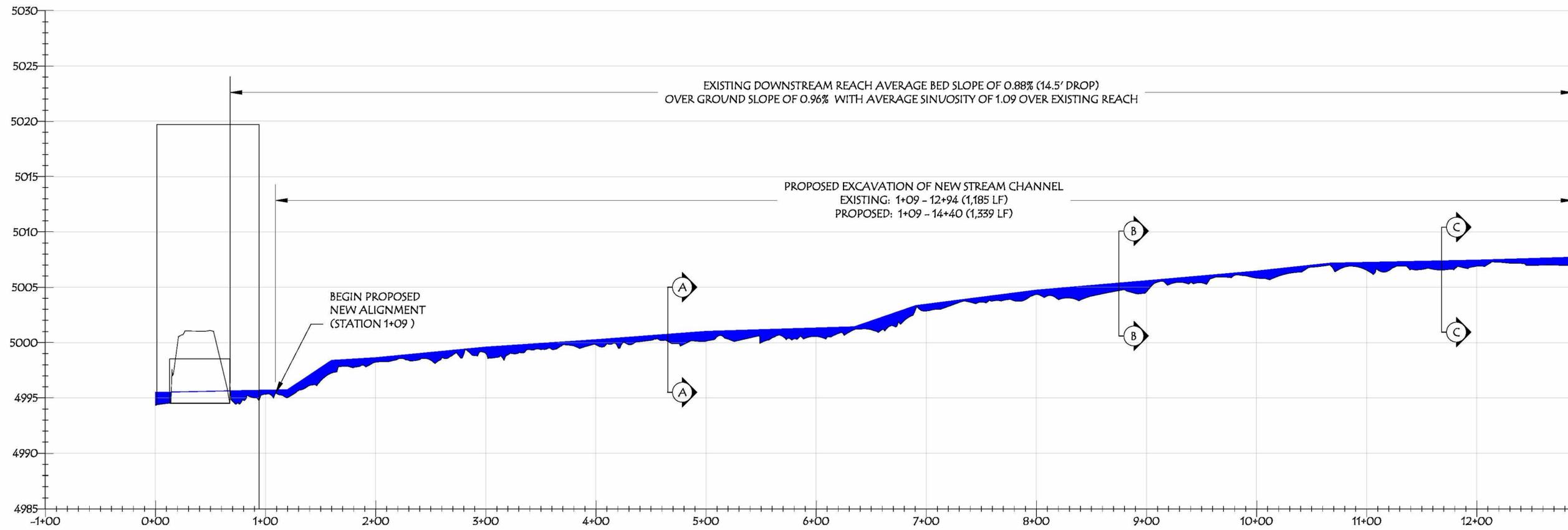
Prepared by:
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 Structural Civil Aquatic
 P.O. Box 114 Bozeman, Montana 59771 • 406.587.4051 office • 406.587.4053 fax

CROSS-SECTIONS: REFERENCE REACH
 LYONS - MOORES CREEK RESTORATION PROJECT
 ENNIS, MONTANA

date: 08/16
 drawn by: DMS
 checked by:



Prepared for:
 DAVID LYONS



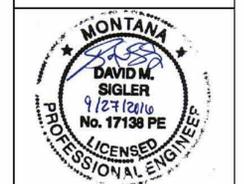
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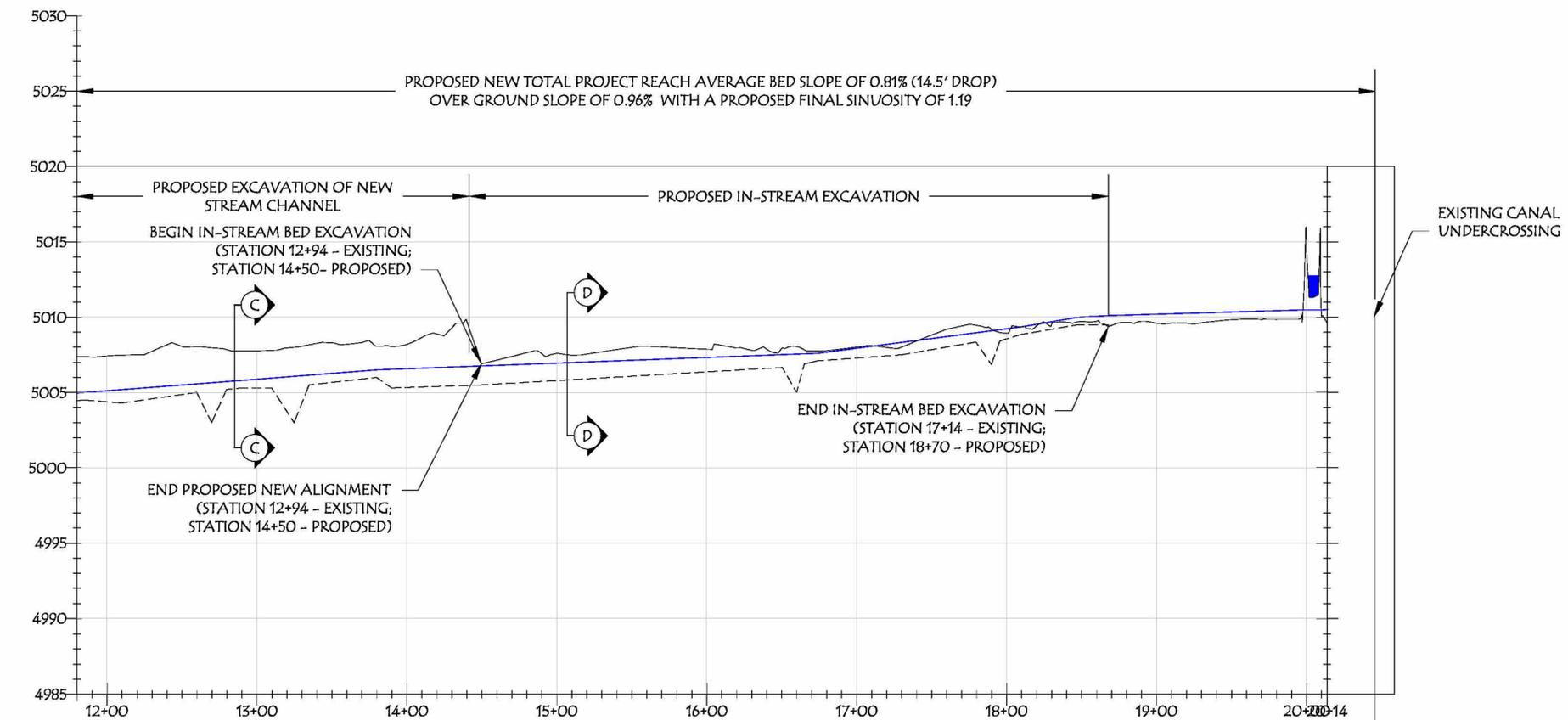
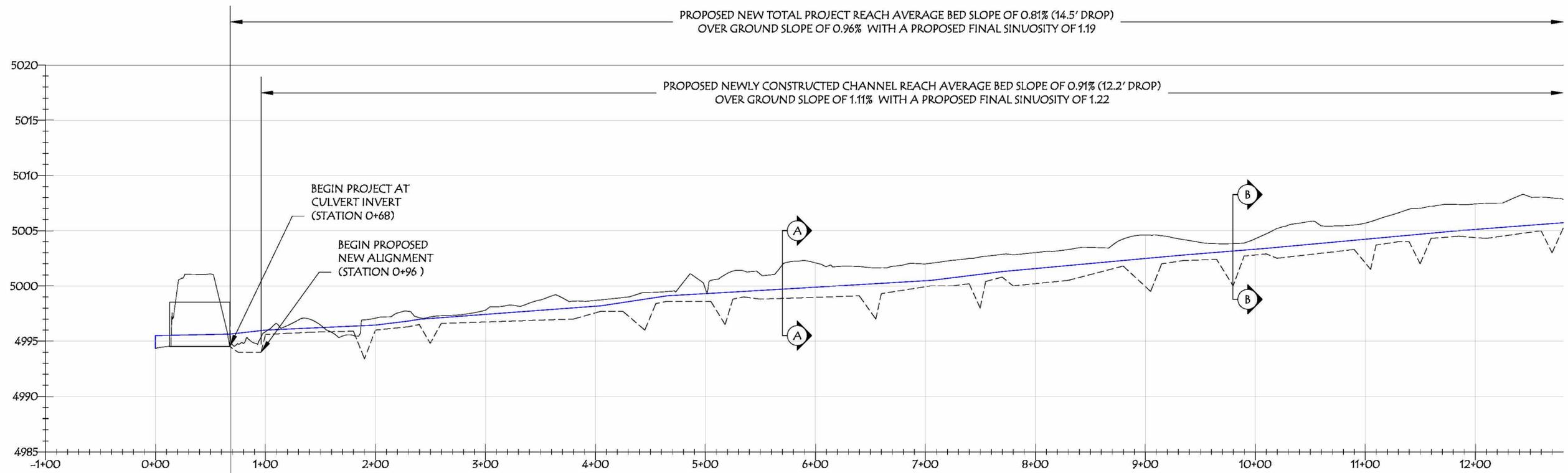
P.O. Box 114 Bozeman, Montana 59771 • 404.587.4051 office • 406.587.4055 fax

PROFILE VIEW - EXISTING ALIGNMENT
 LYONS - MOORES CREEK RESTORATION PROJECT
 ENNIS, MONTANA

date: 09/16
 drawn by: DMS
 checked by:



Prepared for:
 DAVID LYONS



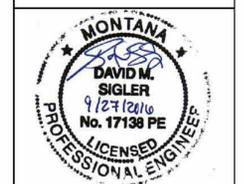
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PROFILE VIEW - PROPOSED ALIGNMENT
 LYONS - MOORES CREEK RESTORATION PROJECT
 ENNIS, MONTANA

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David Lyons EQIP Fence Plan Map

