

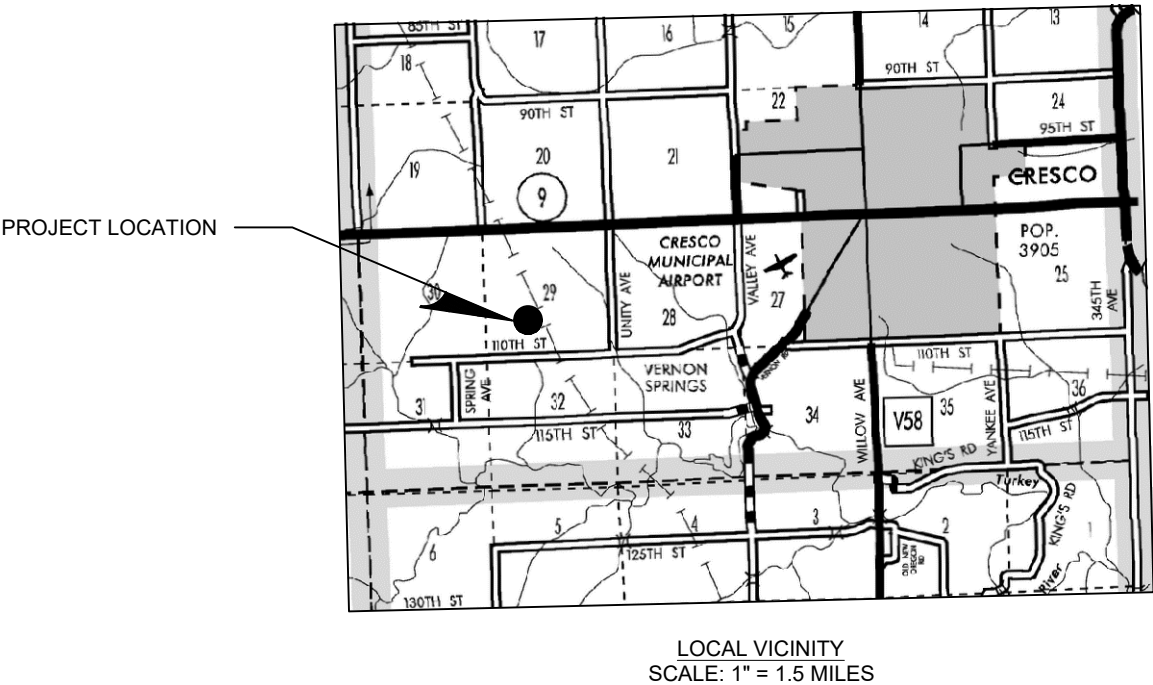
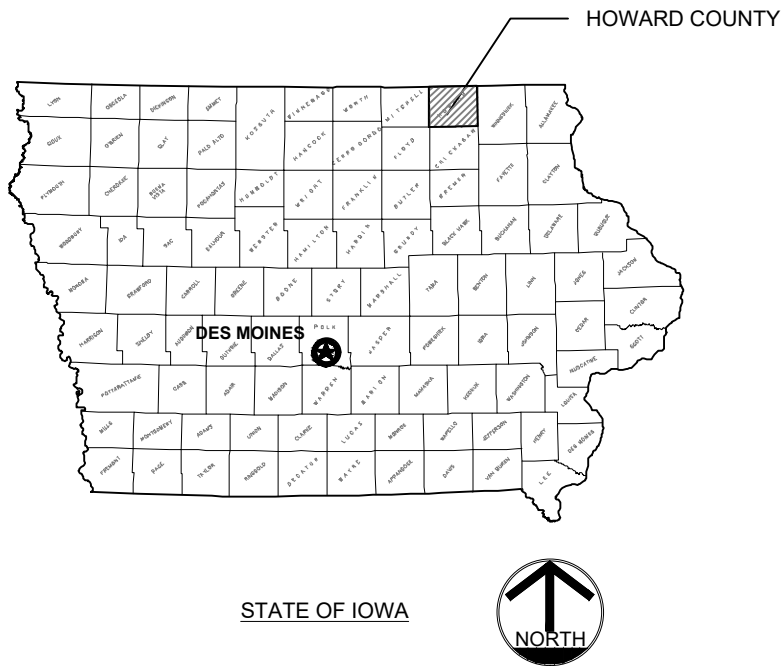
HOW991129B

WATER QUALITY WETLAND PROJECT

SEC 29 TWP 99N RANGE 11W HOWARD COUNTY

IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP

DIVISION OF SOIL CONSERVATION AND WATER QUALITY



LOCAL VICINITY
SCALE: 1" = 1.5 MILES

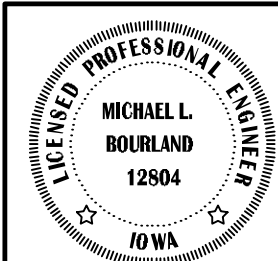
PREPARED FOR:
IOWA DEPARTMENT OF AGRICULTURE & LAND STEWARDSHIP
DIVISION OF SOIL CONSERVATION & WATER QUALITY
HENRY A. WALLACE BUILDING
502 E. 9TH STREET
DES MOINES, IOWA 50319
(515) 281-4246

ENGINEER:
MICHAEL L. BOURLAND, P.E.
MINES & MINERALS BUREAU
TEL: (515)-242-6130
E-MAIL: mike.bourland@iowaagriculture.gov

- INDEX OF SHEETS:
- 1 COVER SHEET
 - 2 GENERAL NOTES AND QUANTITIES
 - 3 SITUATION PLAN WITH SURVEY CONTROL
 - 4 SITE PREPARATION PLAN
 - 5 SITE GRADING PLAN
 - 6 ALUMINUM TOE WALL - OVERVIEW AND QUANTITIES
 - 7 ALUMINUM TOE WALL - PROFILE AND PLAN VIEWS
 - 8 ALUMINUM TOE WALL - NOTES AND FOUNDATION DETAILS
 - 9 WATER CONTROL STRUCTURE DETAILS
 - 10 PLAN AND PROFILE - TILE #1
 - 11 PLAN AND PROFILE - TILE #2
 - 12 TYPICAL DETAILS

These plans are prepared in accordance with NRCS
Job Classification III. The following Conservation
Practice Standards were used:
656 - Constructed Wetlands
410 - Grade Stabilization Structure

To the best of my professional knowledge, judgment,
and belief, these plans meet the applicable NRCS
standards and applicable laws and regulations.



I hereby certify that this engineering document was prepared by me or under
my direct personal supervision and that I am a duly licensed Professional
Engineer under the laws of the State of Iowa

Signature: _____ Date: 08-04-2025

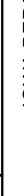
Name (printed or typed): MICHAEL L. BOURLAND

License Number: 12804

My license renewal date is: December 31, 2025

Pages or sheets covered by this seal: ENTIRE DOCUMENT



DESIGN BY: MLB		DRAWN BY: MLB		CHKD. BY: SS		ISSUED: ###/###/##		REVISED: -----		FILE: 01_NAME_AML.DWG		REVISION: DATE:		DESCRIPTION:		
HOW991129C		WATER QUALITY WETLAND PROJECT				IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP DIVISION OF SOIL CONSERVATION AND WATER QUALITY HENRY A. WALLACE BUILDING 502 E. 9th STREET, DES MOINES, IOWA 50319 (515) 281-4246								1		
						2										
						3										
						4										
SHEET		COVER SHEET														
1		OF				12										

GENERAL NOTES:

1. REFERENCES TO "DIVISION" SHALL MEAN "DIVISION OF SOIL CONSERVATION & WATER QUALITY"
2. ALL IMPROVEMENTS SHOWN ON THESE PLANS SHALL COMPLY WITH THE GENERAL CONDITIONS, STANDARDS, AND SPECIFICATIONS SET FORTH IN PROJECT DOCUMENTS. SPECIFICATIONS OR STANDARDS INCORPORATED BY REFERENCE SHALL ALSO BE FOLLOWED.
3. OWNERSHIP: THIS DOCUMENT, AND THE IDEAS AND DESIGN CONTAINED IN THIS DOCUMENT, ARE AN INSTRUMENT OF PROFESSIONAL SERVICE, AND MAY NOT BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN CONSENT OF THE DIVISION.
4. REFERENCES TO PARTICULAR PRODUCTS, TRADENAMES, OR MANUFACTURERS ARE INTENDED FOR CLARITY ONLY AND DO NOT REPRESENT EXCLUSION OR ENDORSEMENT BY THE DIVISION OR THE STATE OF IOWA. EQUIVALENT PRODUCTS OR MATERIALS MAY BE SUITABLE, SUBJECT TO THE APPROVAL OF THE ENGINEER.
5. CONTRACTOR SHALL PROVIDE AT LEAST 48 HOURS NOTICE TO THE ENGINEER AND/OR DIVISION PRIOR TO COMMENCING CONSTRUCTION.
6. IF A CULTURAL RESOURCE IS IDENTIFIED DURING CONSTRUCTION, CONTRACTOR IS TO STOP WORK IMMEDIATELY AND NOTIFY THE ENGINEER OR THE LOCAL NATURAL RESOURCE CONSERVATION SERVICE OFFICE.
7. THERE IS NO GUARANTEE THAT THE WETLAND WILL FILL OR REMAIN FILLED WITH WATER.

UTILITY NOTES:

1. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROTECT ALL EXISTING PUBLIC AND/OR PRIVATE UTILITIES AND PUBLIC ROADWAYS, INCLUDING ANY NOT SHOWN ON THESE DRAWINGS. THE CONTRACTOR SHALL VERIFY ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY THE ENGINEER IF ANY CONFLICTS WITH THE DRAWINGS OCCUR. ANY DAMAGE TO EXISTING UTILITIES AND/OR PUBLIC ROADWAYS CAUSED BY CONTRACTOR TRENCHING SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.
2. UNDERGROUND FACILITIES STRUCTURES AND UTILITIES ARE PLOTTED FROM AVAILABLE SURVEYS, PUBLIC RECORDS, AND FIELD INVESTIGATION WHEN AVAILABLE. THEIR LOCATIONS SHALL BE CONSIDERED TO BE APPROXIMATE ONLY.

TABLE: BID QUANTITIES

Item No.	Work or Material	Specification Number	Unit	Bid Quantity	Installed Quantity
1	Site Preparation	IA-1	Lump Sum	1	
2	Structure Seeding	IA-6	Acre	1.1	
3	Buffer Seeding	IA-6	Acre	1.0	
4	Mobilization/Demobilization	CS-8	Lump Sum	1	
5	Drainage Tile Investigation	IA-9	Lump Sum	1	
6	Aluminum Toe Wall	IA-81	Lump Sum	1	
7	Excavation (General)	IA-21	Cubic Yards	8,672	
8	Earthfill (General Dam)	IA-23	Cubic Yards	7,254	
9	Earthfill (Dam Core)	IA-23	Cubic Yards	1,418	
10	Topsoil Placement	IA-26	Cubic Yards	938	
11	Corrugated Polyethylene Non-perforated Pipe - 6" diameter	IA-46	Linear Feet	450	
12	Dual Wall HDPE Nonperforated - 10" diameter	IA-46	Linear Feet	40	
13	Water Control Structure	IA-46	Each	1	
14	CMP Outlet - 6" x 20'	IA-51	Each	2	
15	CMP Outlet - 10" x 20'	IA-51	Each	1	
16	Riprap	IA-61	Ton	19.4	
17	Erosion Stone	IA-61	Ton	9	

SPECIFICATIONS

IA-01	SITE PREPARATION
IA-05	POLLUTION CONTROL
IA-06	SEEDING
CS-08	MOBILIZATION AND DEMOBILIZATION
IA-09	SURFACE DRAIN INVESTIGATION
IA-11	REMOVAL OF WATER
IA-21	EXCAVATION
IA-23	EARTHWORK
IA-31	CONCRETE
IA-46	TILE DRAINS FOR LAND DRAINAGE
IA-51	CORRUGATED METAL PIPE CONDUITS
IA-61	LOOSE RIPRAP
IA-81	METAL FABRICATION AND INSTALLATION
IA-95	GEOTEXTILE

DESIGN BY: MLB

DRAWN BY: MLB

CHKD. BY: SS

ISSUED: #####

REVISED: ----

FILE: 01_NAME_AML.DWG

REVISION: 1
2
3
4

DATE:

DESCRIPTION:

HOW991129C

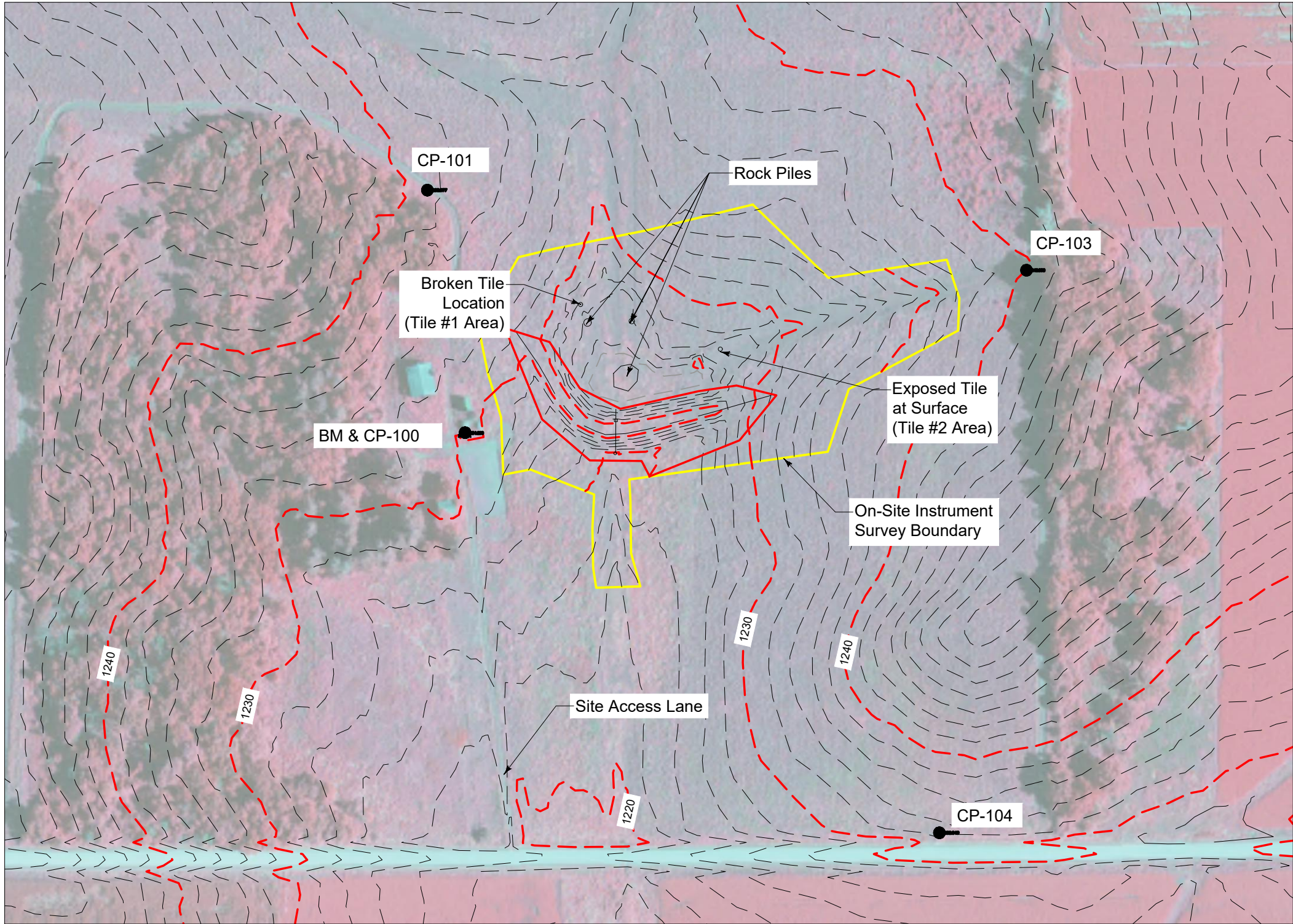
WATER QUALITY WETLAND PROJECT

GENERAL NOTES AND QUANTITIES



IOWA DEPARTMENT OF AGRICULTURE
AND LAND STEWARDSHIP
DIVISION OF SOIL CONSERVATION
AND WATER QUALITY
HENRY A. WALLACE BUILDING
502 E. 9th STREET, DES MOINES, IOWA 50319
(515) 281-4246

SHEET
2 OF 12



HORIZONTAL CONTROL
Coordinates are in NAD84 UTM15
North in International Feet (IF)

VERTICAL CONTROL
Elevations established using Carlson
receiver observed in NAVD 88 using
GEOID18.

Raw data was collected on April 3,
2025 within boundary shown

Topography outside survey area from
LiDAR shape file provided by ISU on
public website that were created in
2022 from 2020 data.

NOTES:

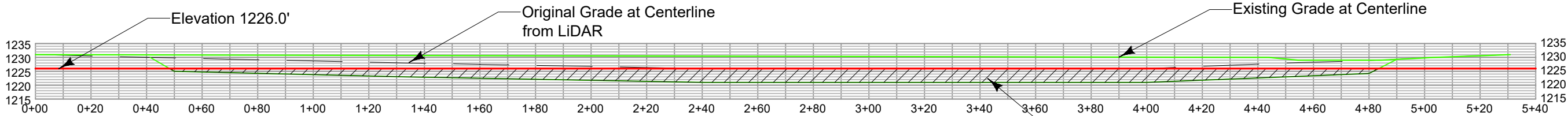
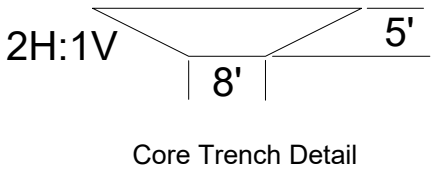
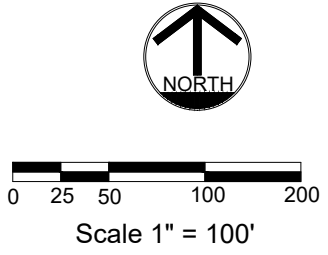
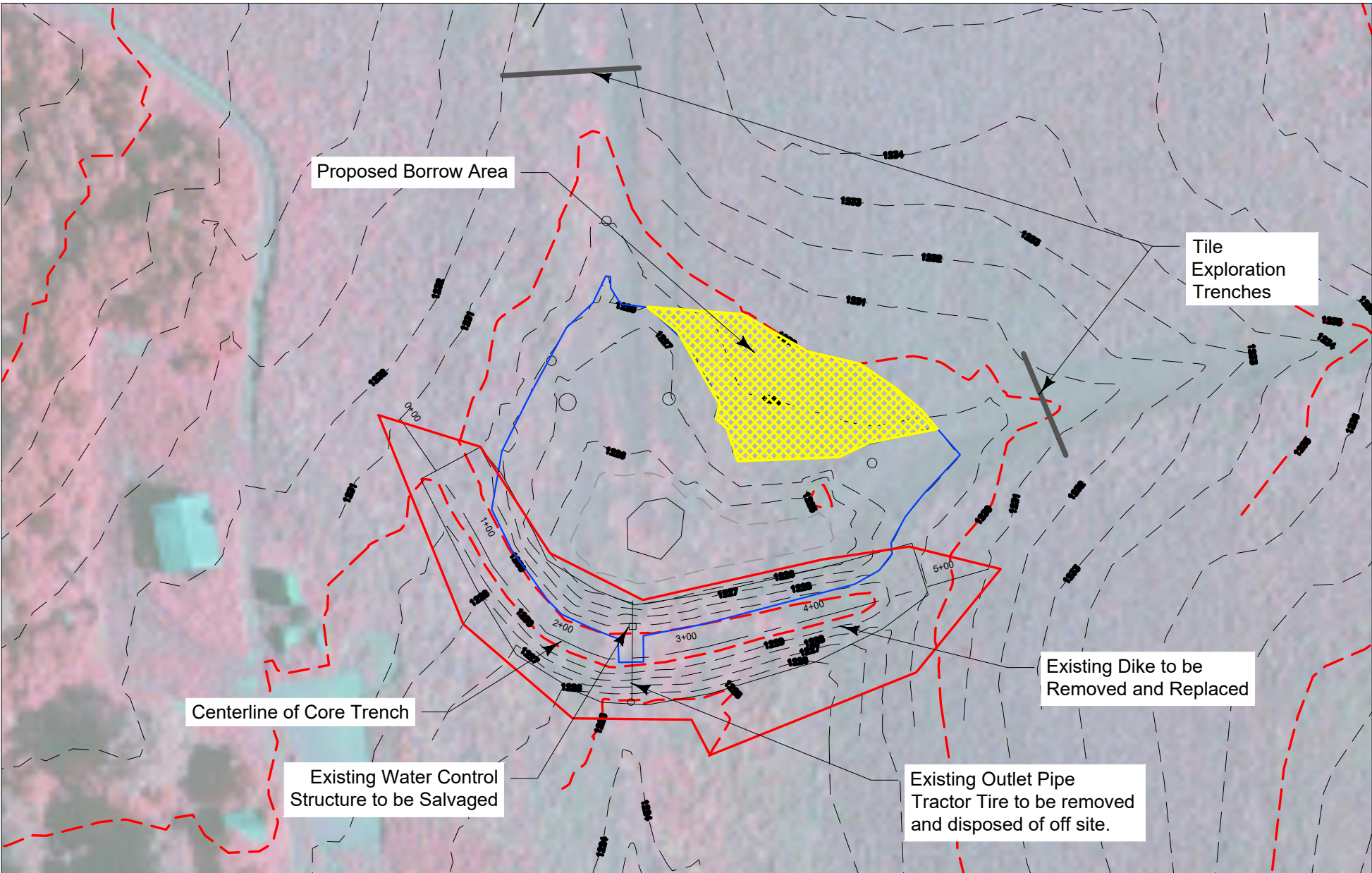
1. SURVEY IN BOUNDARY SHOWN COMPLETED BY DESIGNER ON APRIL 3, 2025 USING UTM84 15N INTERNATIONAL FEET.
2. BENCHMARK AND CONTROL POINT 100 - BLACK X PLACED ON TOP OF FOUNDATION WALL ON SOUTHEAST CORNER OF OLD BUILDING.
3. CONTROL POINTS 101, 103 AND 104 ARE 2' X 2' WOOD STAKES FLAGGED BY LATH.
4. FIELD VERIFY LOCATIONS & ELEVATIONS OF ALL CONTROL POINTS.
5. FIELD ENTRANCE AND ACCESS ROUTE SHALL BE RESTORED AT NO ADDITIONAL COST TO DIVISION..

CONTROL POINT DATA				
POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
CP-100/B.M.	15751131.7967	1860132.6484	1234.0032	Marked X on SE corner of foundation wall
CP-101	15751543.2618	1860069.5214	1238.9767	Wood stake placed by path NE of wetland
CP-103	15751407.6030	1861084.5380	1240.0896	Wood stake placed by path E of wetland
CP-104	15750454.3846	1860936.9723	1232.8489	wood stake placed by path SE of wetland

Scale 1" = 200'



DESIGN BY: MLB	DRAWN BY: MLB	CHKD. BY: SS	ISSUED: ###/##/##	REVISED: -----	FILE: 01_NAME_AML.DWG	DESCRIPTION:
					REVISION: 1	DATE:
HOW991129C WATER QUALITY WETLAND PROJECT SITUATION PLAN WITH SURVEY CONTROL					1	
					2	
					3	
					4	
IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP DIVISION OF SOIL CONSERVATION AND WATER QUALITY HENRY A. WALLACE BUILDING 502 E. 9th STREET, DES MOINES, IOWA 50319 (515) 281-4246						

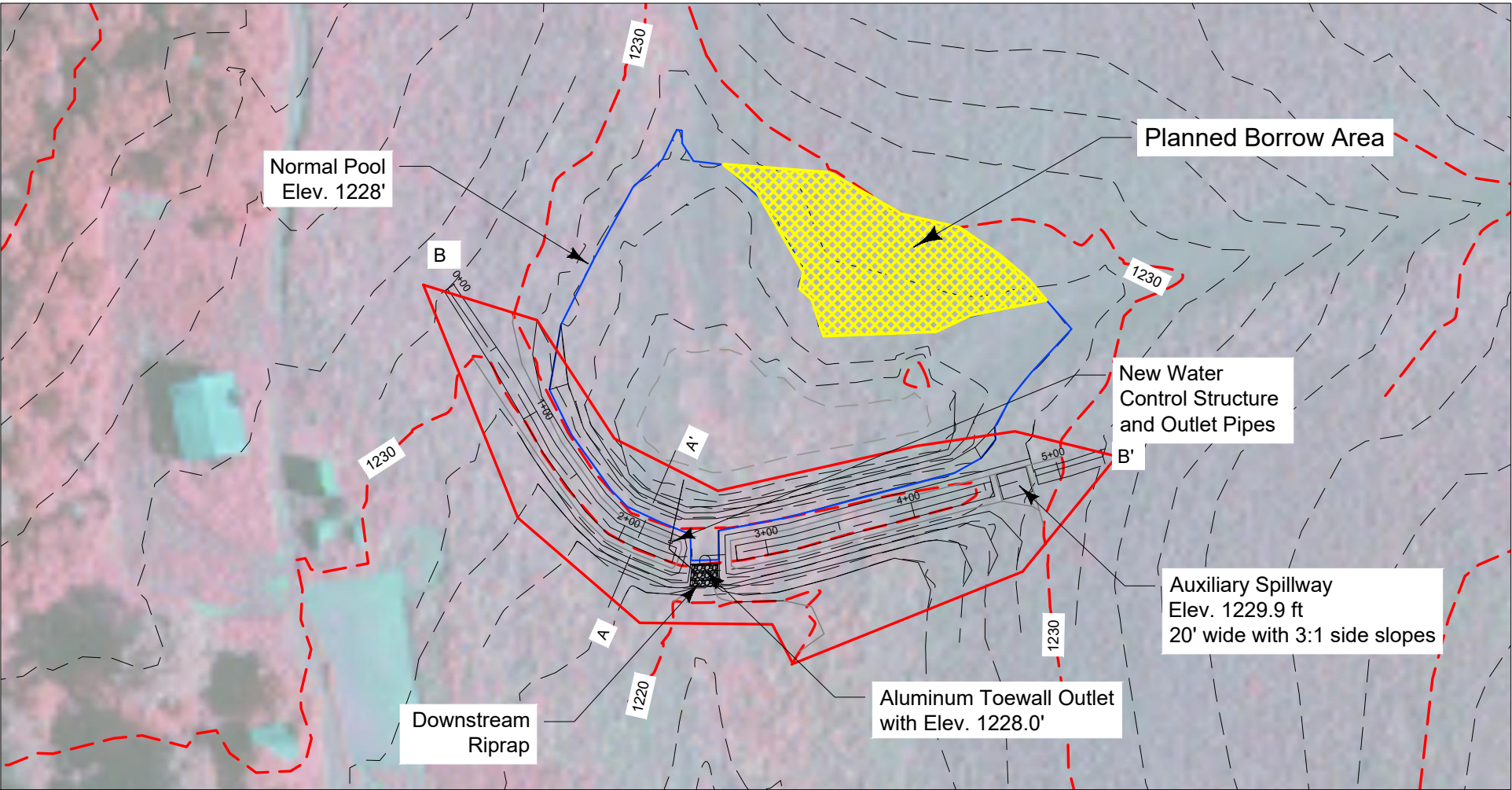


- NOTES:
1. REMOVE TOP 6 INCHES IN OUTLINED AREA AND STOCKPILE FOR FUTURE USE AFTER NEW DIKE IS CONSTRUCTED (530 CY).
 2. REMOVE AND DISCARD OFF WATER CONTROL STRUCTURE. PLASTIC PIPE, AND EXISTING TRACTOR TIRE AT OUTLET.
 3. EXISTING ROCK AT OUTLET CAN BE ADDED TO ROCK PILES IN WETLAND OR BURIED IN NON-STRUCTURAL AREA ON SITE.
 4. EXCAVATE CORE TRENCH TO MINIMUM DIMENSIONS SHOWN (1,182 CY CUT AND 1,420 CY FILL WITH 20% SHRINKAGE).
 5. REMOVE ALL TILE FOUND UNDER THE DIKE TO AT LEAST 15 FEET EACH SIDE OF EMBANKMENT TOE.
 6. EXCAVATE TILE EXPLORATION TRENCHES AT APPROXIMATE LOCATIONS INDICATED AND LEAVE TRENCH OPEN WHERE TILE IS FOUND.

Additional Excavation
for Core Trench
(5' below original grade)

DESIGN BY: MLB		DRAWN BY: MLB	CHKD. BY: SS	ISSUED: ###/##/##	REVISED:	IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP DIVISION OF SOIL CONSERVATION AND WATER QUALITY HENRY A. WALLACE BUILDING 502 E. 9th STREET, DES MOINES, IOWA 50319 (515) 281-4246			
FILE: 00-91-129C-01_NAME_AML.DWG		REVISION: 1		DATE:	DESCRIPTION:		SHEET		
		2					4		
		3					OF		
		4					12		

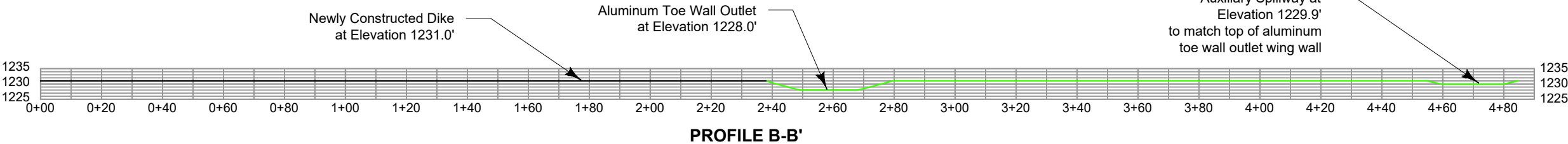
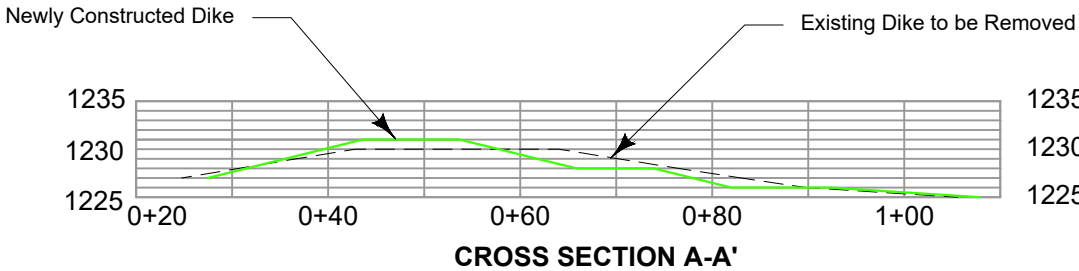
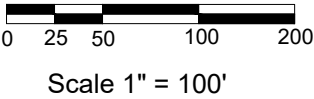
- NOTES:
1. AFTER EXCAVATION AND BACKFILLING OF CORE TRENCH, DIKE SHALL BE CONSTRUCTED USING METHOD 2 PROVIDED IN SPECIFICATION 02600 TO ELEVATION 1131.0 FEET, OVERBUILDING TO ALLOW FOR 5% SETTLEMENT. NEW DIKE SHALL HAVE SIDE SLOPES OF 3H:1V, TOP WIDTH OF 10 FEET AND A WAVE BERM WIDTH OF 8 FEET AT ELEVATION 1228.0 FEET, ALONG WITH A 20' WIDE AUXILIARY SPILLWAY AT ELEVATION 1229.9 FEET.
 2. TOTAL 8,820 CY FILL NEEDED TO CONSTRUCT TO NEAT LINES SHOWN ASSUMING 20% SHRINKAGE AND 6 INCHES OF TOPSOIL PLACED. REMOVAL OF DIKE AND CONSTRUCTION OF AUXILIARY SPILLWAY IS ESTIMATED TO PROVIDE ALL MATERIAL NEEDED TO CONSTRUCT NEW DIKE. IF NEEDED, ADDITIONAL FILL MATERIAL CAN BE OBTAINED FROM ON SITE AS APPROVED BY ENGINEER.
 3. SEE SHEETS 6 THROUGH 8 FOR DETAILS REGARDING ALUMINUM TOE WALL OUTLET AND SHEET 9 FOR DETAILS FOR REPLACED WATER CONTROL STRUCTURE AND OUTLET PIPE.



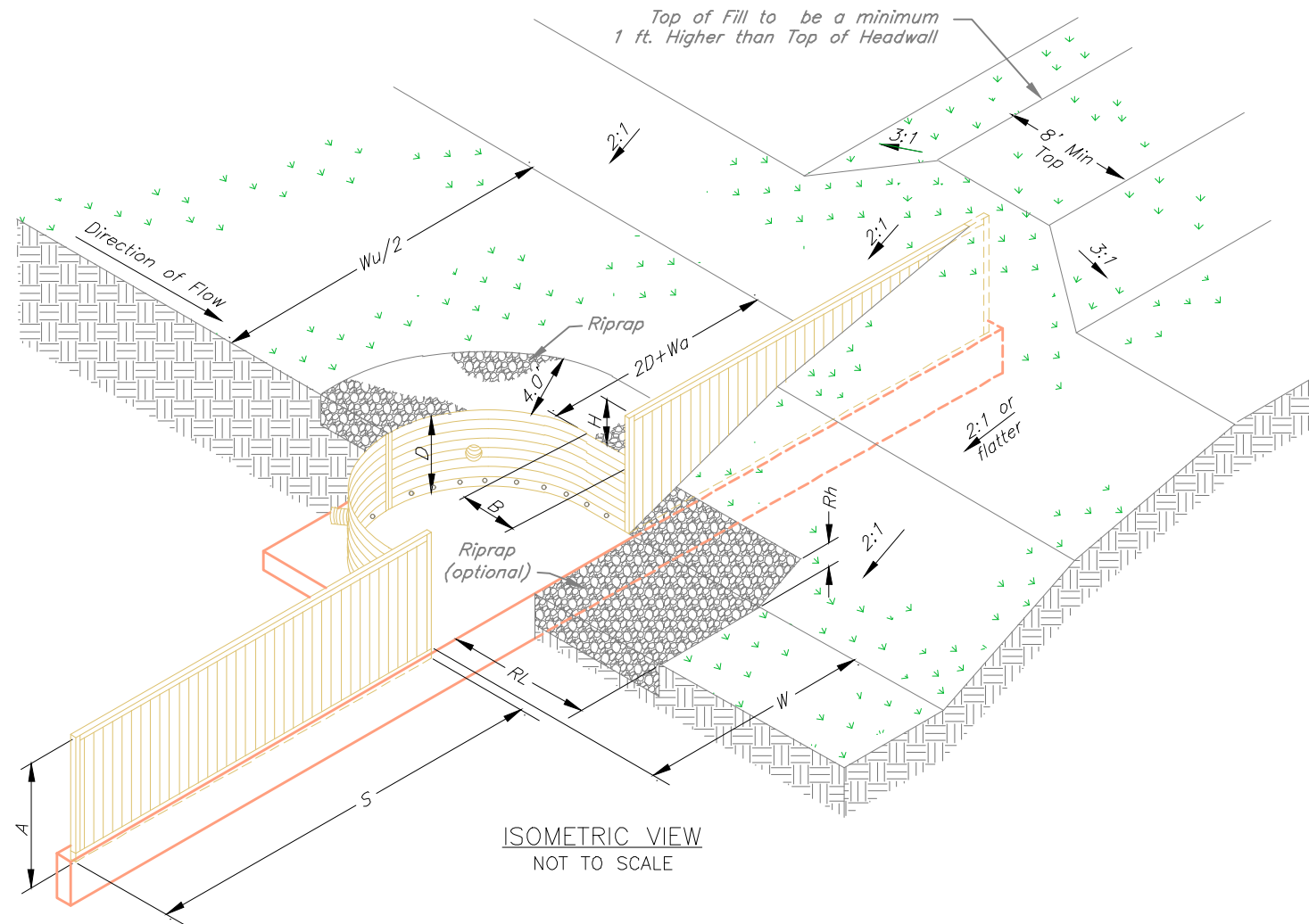
Calculated Grading Quantities

	Out (cy)	Fill (cy)
Topsoil		
Stripping Existing Dike and Auxiliary Spillway	708	0
Stripping Planned Borrow Area	230	0
Replacement of 6 inches		938
Grading		
Existing Dike Removal to Elev. 1226'	2,584	0
Core Trench to 5' below original grade	1182	1418
Grading to Final Design	24	7254
Estimated Borrow Fill	960	0
Total Grading excluding topsoil	4,750	8672

Note: Grading quantities assume 20% shrinkage but does not account for 5% overbuild



DESIGN BY: MLB		DRAWN BY: MLB	 IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP DIVISION OF SOIL CONSERVATION AND WATER QUALITY HENRY A. WALLACE BUILDING 502 E. 9th STREET, DES MOINES, IOWA 50319 (515) 281-4246	CHKD. BY: SS	ISSUED: ##/##/##	REVISED: -----	FILE: 01_NAME_AML.DWG		
						REVISION:	DATE:	DESCRIPTION:	
						1			
						2			
							3		
							4		
HOW991129C									
WATER QUALITY WETLAND PROJECT									
SITE GRADING PLAN									
SHEET									
5		OF		12					



Tile outlet stubs (as required) shall be 2 ft. lengths of corrugated steel pipe, shop-welded to the structure as specified below:

- _____ ft. from the left headwall at the _____ o'clock position (6:00–9:00) _____ inch diameter _____ ft. below the weir at flowline of C.M. Pipe
- _____ ft. from the right headwall at the _____ o'clock position (3:00–6:00) _____ inch diameter _____ ft. below the weir at flowline of C.M. Pipe

STANDARD DWG. IA–1409

March 2013

BILL OF MATERIALS

Item	Quantity	Unit
Galvanized Steel Drop Structure	1	each
Concrete (3500 psi)	4.7	cu.yd.
Reinforcing Steel, Grade 60 – #4 Bars	236.9	lb.
Drainfill	1.0	cu.yd.
Rock Riprap	8.8	cu.yd.
Excavation, Structure	52	cu.yd.
Earthfill	43	cu.yd.
Corrugated Steel Pipe, 16 Gauge	None	
_____ Dia.	N/A	lin.ft.
_____ Dia.	N/A	lin.ft.
Connecting Band, Steel	N/A	each
Animal Guard, Steel	N/A	each
Geotextile, Nonwoven	35	sq.yd.

MATERIAL NOTES

- Concrete shall have a minimum compressive strength at 28 days equal to 3500 psi.
- All reinforcing steel bars shall be Grade 60 – #4 bars.
- The structure shall be fabricated from 12 gauge galvanized steel sheets conforming to ASTM A 929 with 3" by 1" corrugations.
- Angles shall be ASTM A 36 structural steel, galvanized in accordance with ASTM A 123.
- Bolts shall be 3/4" diameter galvanized carbon steel conforming to ASTM A 307.
- Seam sealant shall be knife-grade asphalt mastic or polymer adhesive sealant tape, Manus-Bond 64-A, or equal.
- Drainfill aggregate shall meet the standard gradation of ASTM C 33 size 57 or 67. Do not place geotextile between drainfill and the 1/2" weep holes.
- Riprap shall consist of well-graded rock, minimum size of 4", maximum size of 8". Riprap shall be underlain with nonwoven geotextile bedding.
- Weir length L varies from 14.2' to 49.5' in 1.6' increments. Check with manufacturer or refer to Iowa NRCS hydraulic design spreadsheet, "Semicircular_Drop_Structure.xlsx" for a table of available weir lengths, including straight portion of weir dimension B.

STANDARD STRUCTURE SIZES

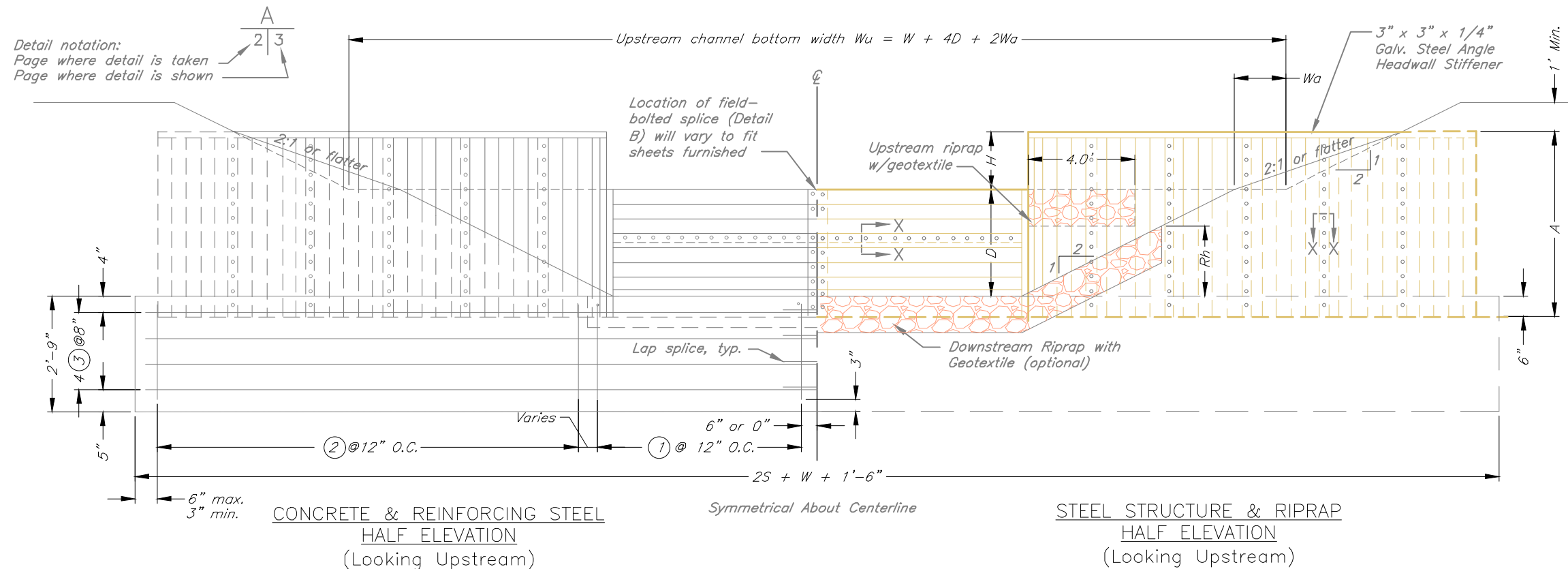
<i>D</i>	<i>1.9'</i>				<i>3.0'</i>				<i>4.0'</i>			
<i>H</i>	<i>1.8'</i>				<i>1.9'</i>				<i>2.1'</i>			
<i>A</i>	<i>4.2'</i>				<i>5.4'</i>				<i>6.6'</i>			
<i>S*</i>	<i>9.2'</i>	<i>11.3'</i>	<i>13.7'</i>	<i>15.8'</i>	<i>11.3'</i>	<i>13.7'</i>	<i>15.8'</i>	<i>18.2'</i>	<i>13.7'</i>	<i>15.8'</i>	<i>18.2'</i>	<i>20.3'</i>
<i>Wa</i>	<i>0.0'</i>	<i>2.0'</i>	<i>4.0'</i>	<i>6.0'</i>	<i>0.0'</i>	<i>2.0'</i>	<i>4.0'</i>	<i>6.0'</i>	<i>0.0'</i>	<i>2.0'</i>	<i>4.0'</i>	<i>6.0'</i>

* Minimum value of S for corresponding value of Wa.

STRUCTURE DIMENSIONS

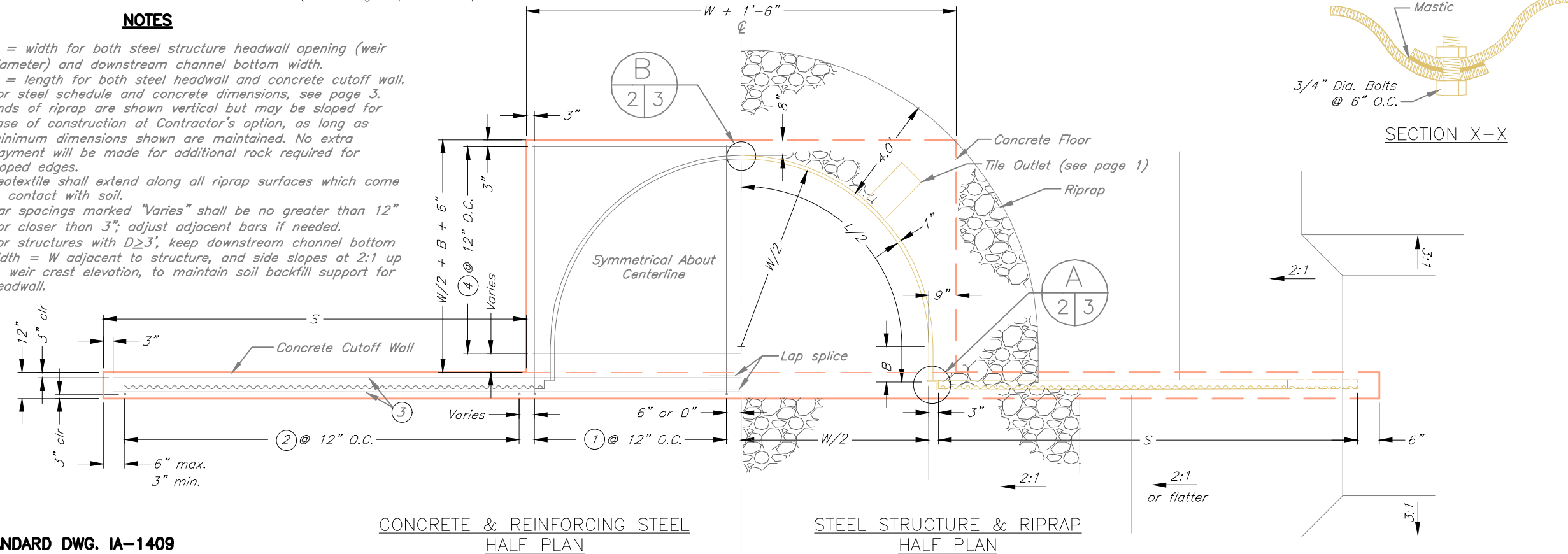
Overfall Height (D)	3.0	ft.
Notch Depth (H)	1.9	ft.
Headwall Height (A)	5.4	ft.
Headwall Length (S)	11.3	ft.
Notch Width (W)	7.0	ft.
Weir Length (L)	15.8	ft.
Straight Portion of Weir (B)	2.3	ft.
Added U/S Channel Width (Wa)	0	ft.
U/S Channel Bottom Width (Wu)	19	ft.
D/S Riprap Length (RL)	10	ft.
D/S Riprap Height (Rh)	2.0	ft.
Concrete Apron Elevation	1225.0	ft.
Weir Crest Elevation	1228.0	ft.
Top of Headwall Elevation	1229.9	ft.
Auxiliary Spillway Elevation	1229.9	ft.
Top of Embankment Elevation	1231.0	ft.

DESIGN BY: MLB	DRAWN BY: MLB	CHKD. BY: SS	ISSUED: #####	REVISED: #####	FILE: 01_NAME_AML.DWG	REVISION: 1	DATE:	DESCRIPTION:
IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP DIVISION OF SOIL CONSERVATION AND WATER QUALITY HENRY A. WALLACE BUILDING 502 E. 9th STREET, DES MOINES, IOWA 50319 (515) 281-4246								
HOW991129C WATER QUALITY WETLAND PROJECT ALUMINUM TOE WALL OVERVIEW AND QUANTITIES								
SHEET 6 OF 12								



NOTES

1. W = width for both steel structure headwall opening (weir diameter) and downstream channel bottom width.
2. S = length for both steel headwall and concrete cutoff wall.
3. For steel schedule and concrete dimensions, see page 3.
4. Ends of riprap are shown vertical but may be sloped for ease of construction at Contractor's option, as long as minimum dimensions shown are maintained. No extra payment will be made for additional rock required for sloped edges.
5. Geotextile shall extend along all riprap surfaces which come in contact with soil.
6. Bar spacings marked "Varies" shall be no greater than 12" nor closer than 3"; adjust adjacent bars if needed.
7. For structures with $D \geq 3'$, keep downstream channel bottom width = W adjacent to structure, and side slopes at 2:1 up to weir crest elevation, to maintain soil backfill support for headwall.

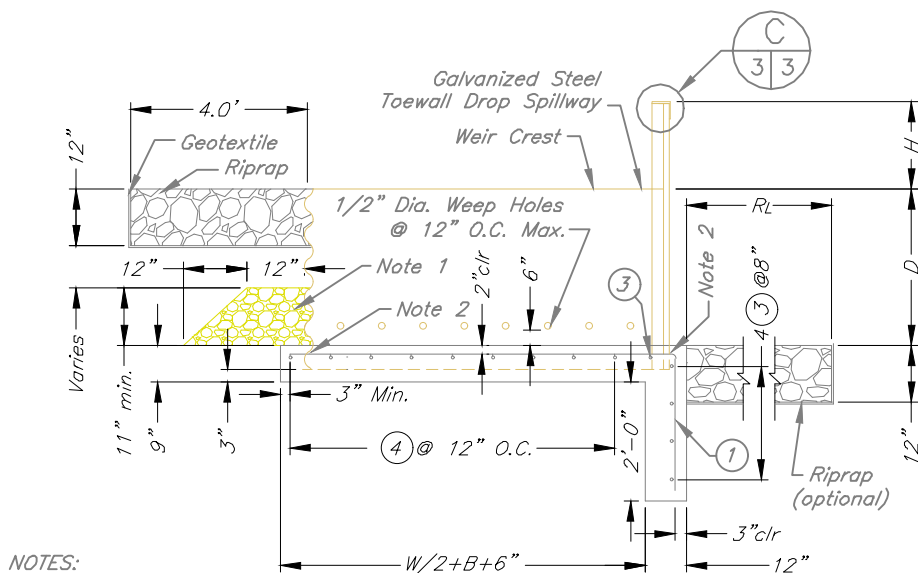


STANDARD DWG. IA-1409

March 2013

NOT TO SCALE

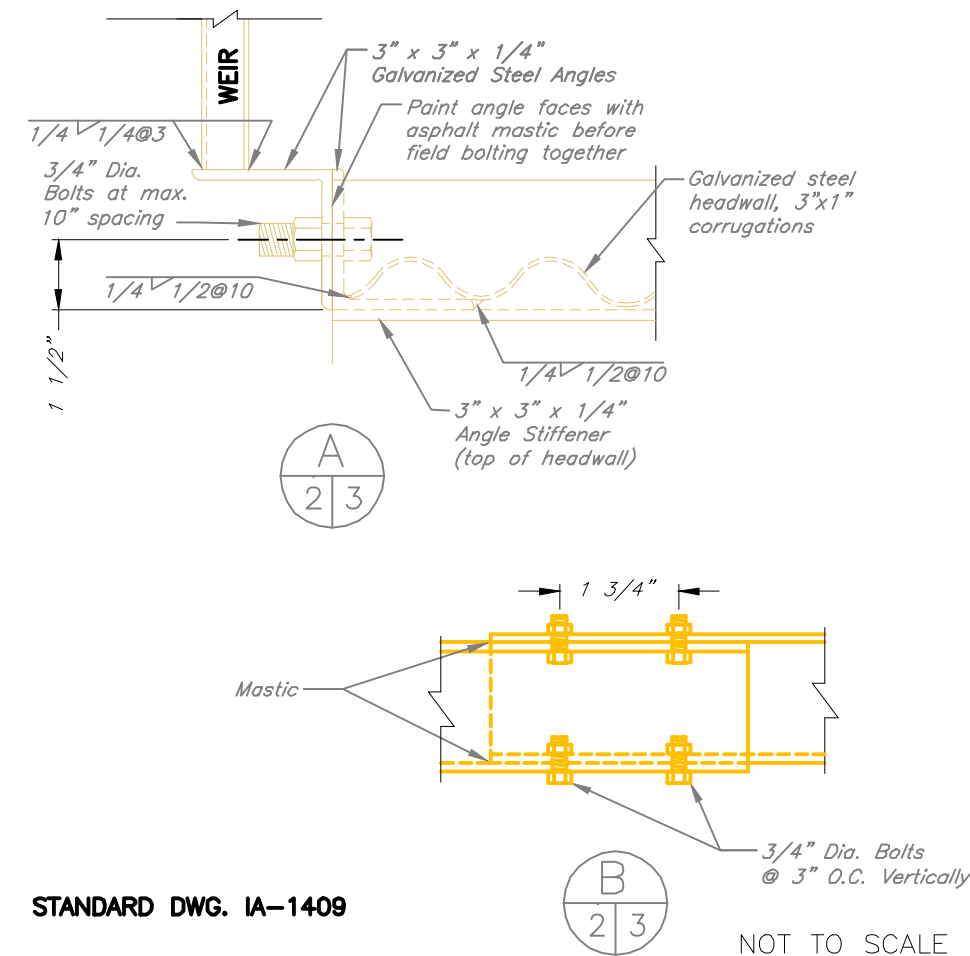
DESIGN BY: MLB		DRAWN BY: MLB	CHKD. BY: SS	ISSUED: ###/###/###	REVISED: -----	FILE: 01_NAME_AML.DWG
HOW991129C WATER QUALITY WETLAND PROJECT ALUMINUM TOE WALL PROFILE AND PLAN VIEWS				IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP DIVISION OF SOIL CONSERVATION AND WATER QUALITY HENRY A. WALLACE BUILDING 502 E. 9th STREET, DES MOINES, IOWA 50319 (515) 281-4246		
				REVISION:	DATE:	DESCRIPTION:
				1		
				2		
				3		
				4		



NOTES:

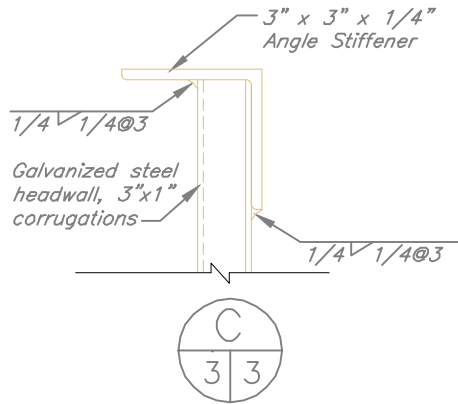
1. Drainfill extends completely around weir.
2. Field drill 7/8" holes as required in the steel structure. Place steel reinforcement through holes. Wrap rebar as described in Construction Note 4.

SECTION ON CENTERLINE



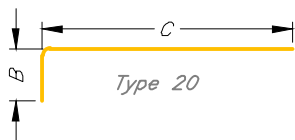
STANDARD DWG. IA-1409

NOT TO SCALE



STEEL REINFORCING NOTES:

1. Radius of bend for Type 20 bar = 2".
2. Alternate splice locations for Mark (3) bars may be used at Contractor's option, with Engineer's approval. Minimum splice length is 1'-9".
3. Minimum splice length for Mark (4) bars is 1'-4".



STEEL SCHEDULE (All #4 bars)

Mark	Type	B	C	Quantity	Length	Total Length	Quantity Formulas	Length Formulas
1	20	2'-4"	6'-10"	9	9'-2"	82.5'	$W + 2$	$C \text{ Leg} = W/2 + B + 1'$
2	Str.	-	-	23	2'-4"	53.6'	$2[\text{RoundUp}(S - .25')]$	Given
3	Str.	-	-	10	16'-3"	162.5	Given	$W/2 + S + 1.42'$
4	Str.	-	-	7	8'-0"	56.0'	$\text{RoundUp}(W/2 + B + 0.5')$	$W + 1.0'$
Total Length						354.6	lin. ft.	
Weight = Total Length x 0.668 lb/lin. ft.						236.9	lb.	

CONSTRUCTION NOTES

1. Forms are not required for concrete apron or cutoff wall if excavated soil will stand vertically. Side slopes above the top of the concrete shall be 1.5:1 or flatter.
2. When necessary, the site shall be dewatered in accordance with Iowa Construction Specification IA-11, Removal of Water. A sump pump and crushed rock may be needed.
3. Set steel structure to grade and place reinforcing bars. Apply asphalt mastic between steel sheets before bolting together. Check elevations of the weir, top of floor and bottom of cutoff trench. Check that the reinforcing steel has the required minimum cover.
4. Wrap reinforcing bars with three layers of electrical tape, or equal, where they pass through the steel structure.
5. Place the concrete floor and cutoff wall in one continuous pour.
6. After a minimum of 24 hours, place drainfill, attach C.M. pipe to tile outlet stubs, and install animal guards. Lay additional drain tile/tubing if needed to connect with existing surface drains.
7. Backfill around structure with moist soil. Place backfill in 6 inch layers and tamp to a density equivalent to the surrounding soil or, in the case of soft surrounding soil, tamp to a density equivalent to adjacent required earthfill. Remove dry soil from sides of excavations as backfill is placed so that moist soil is tamped against moist soil. Keep backfill approximately level around all parts of the structure.
8. Place riprap with geotextile bedding and complete grading and shaping.
9. Seed, fertilize and mulch all disturbed areas in accordance with the seeding plan provided by NRCS.

QUANTITY FORMULAS:

$$\text{CONCRETE: } [(W+1.5)(W/2+B+0.5)(0.75) + (W+2S+1.5)(2.75)]/27 \quad (\text{CuYd})$$

$$\text{DRAINFILL: } \{ \frac{\pi}{2} [(W/2+1.5)^2 - (W/2)^2] + 3B \} / 27 \quad (\text{CuYd})$$

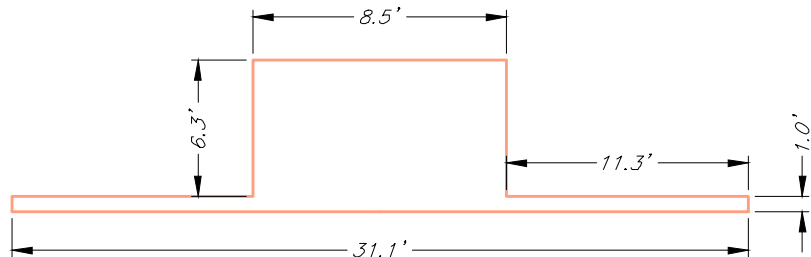
$$\text{UPSTREAM RIPRAP: } \{ \frac{\pi}{2} [(W/2+4)^2 - (W/2)^2] + 8B \} / 27 \quad (\text{CuYd})$$

$$\text{DOWNSTREAM RIPRAP: } (W+4Rh)(RL)/27 \quad (\text{CuYd})$$

$$\text{UPSTREAM GEOTEXTILE: } \{ \frac{\pi}{2} [(W/2+4)^2 - (W/2)^2] + 10B + \pi(W/2+4) \} / 9 \quad (\text{SqYd})^*$$

$$\text{DOWNSTREAM GEOTEXTILE: } (RL+1)(W+4.47Rh+2)/9 \quad (\text{SqYd})^*$$

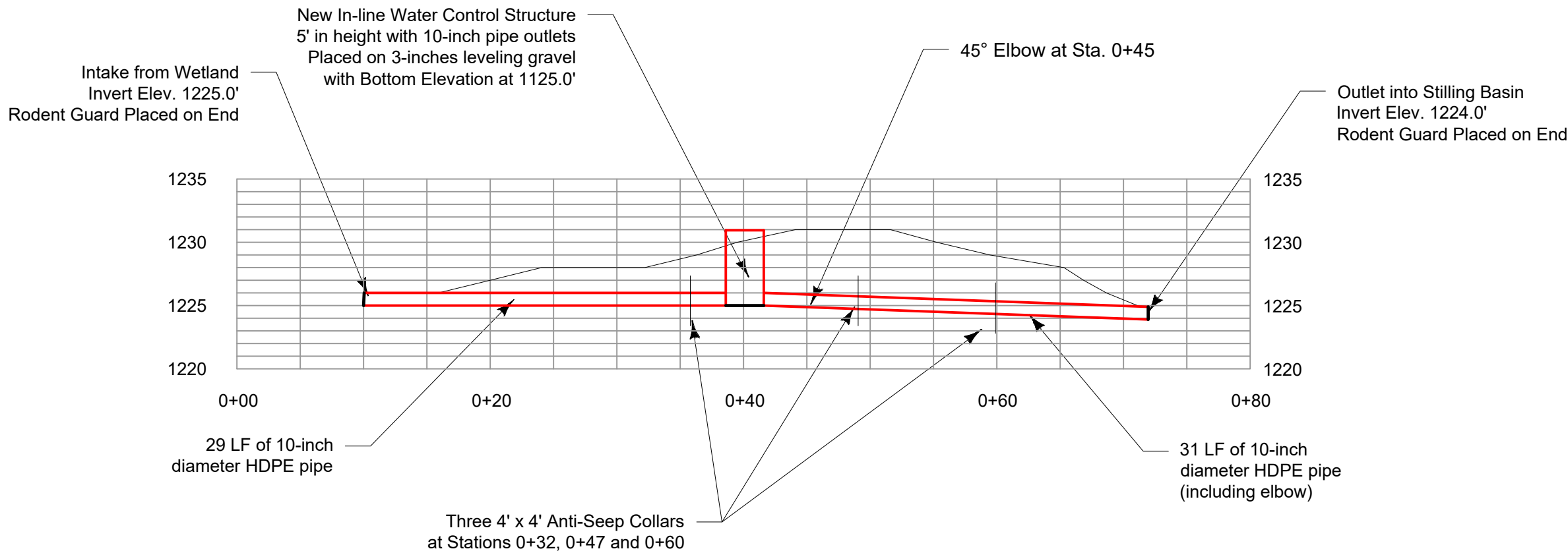
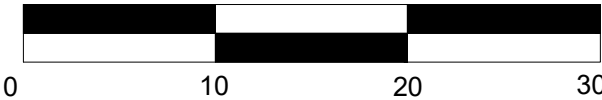
*Geotextile formulas for covered surfaces only

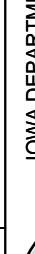


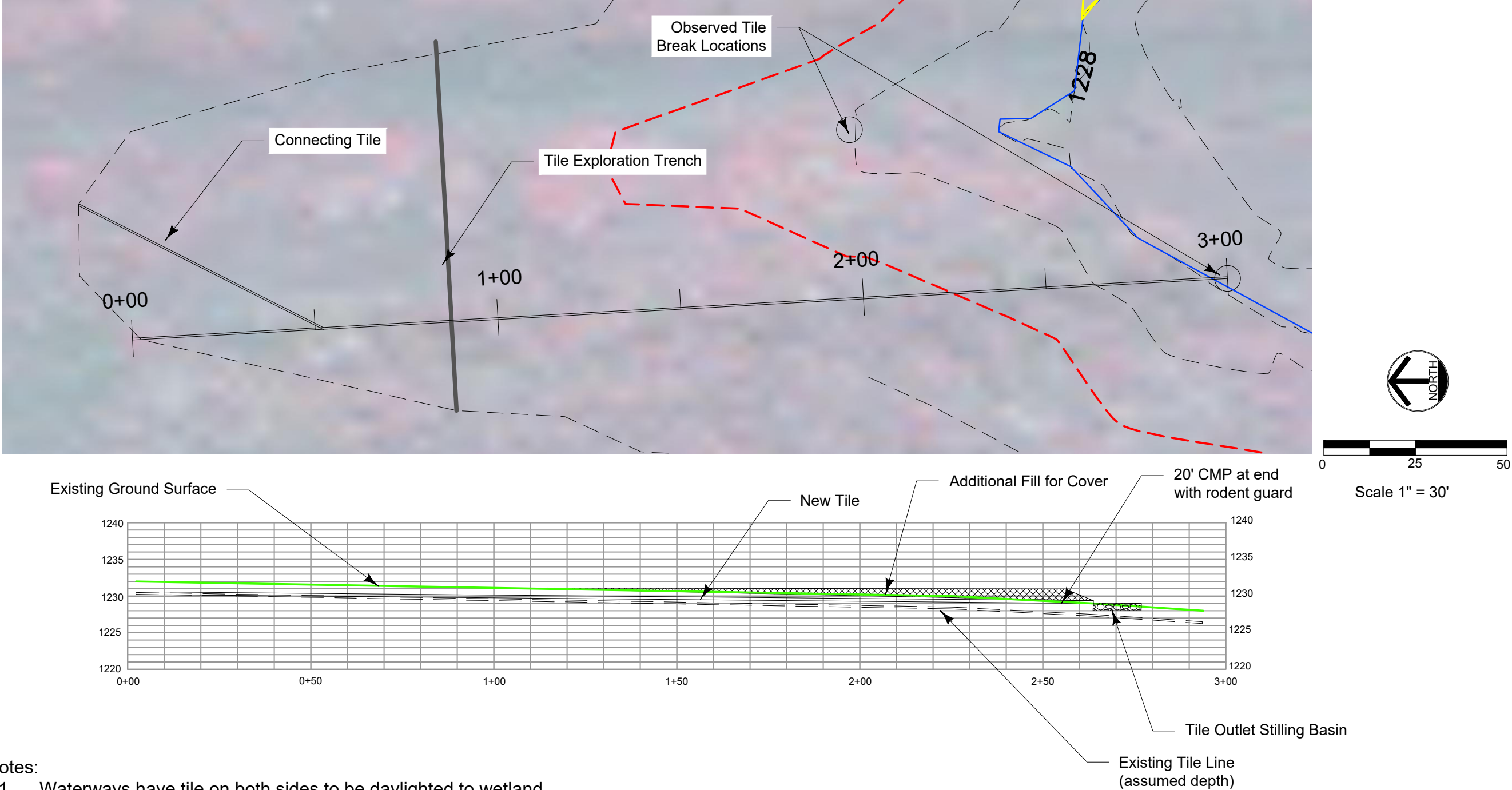
CONCRETE DIMENSIONS SUMMARY



Scale 1" = 10'

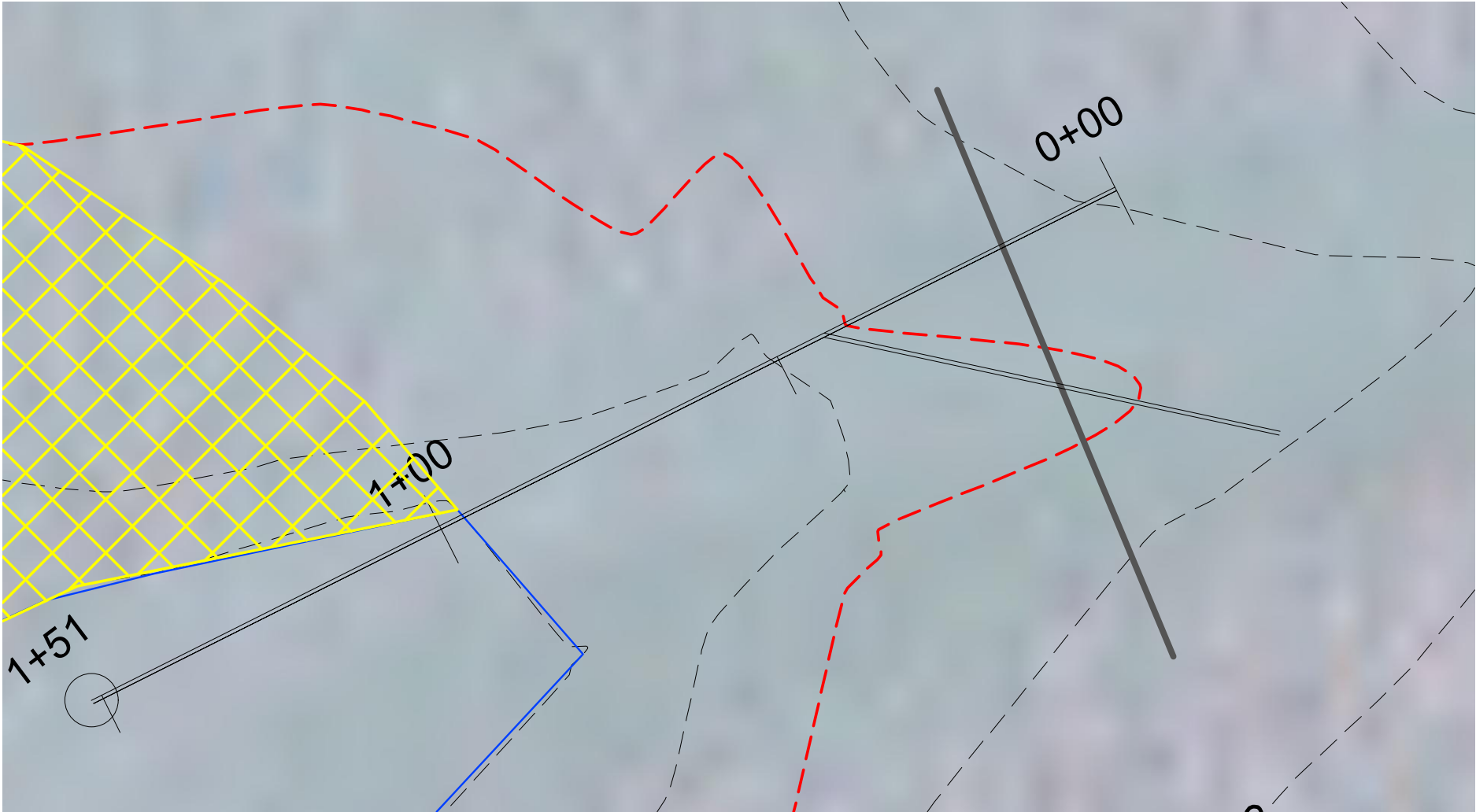


DESIGN BY: MLB		DRAWN BY: MLB	CHKD. BY: SS	ISSUED: ###/###/##	REVISED: 00-00-00	FILE: 01_NAME_AML.DWG				
HOW991129C WATER QUALITY WETLAND PROJECT			IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP DIVISION OF SOIL CONSERVATION AND WATER QUALITY HENRY A. WALLACE BUILDING 502 E. 9th STREET, DES MOINES, IOWA 50319 (515) 281-4246					REVISION:	DATE:	DESCRIPTION:
								1		
								2		
								3		
								4		
WATER CONTROL STRUCTURE DETAILS										

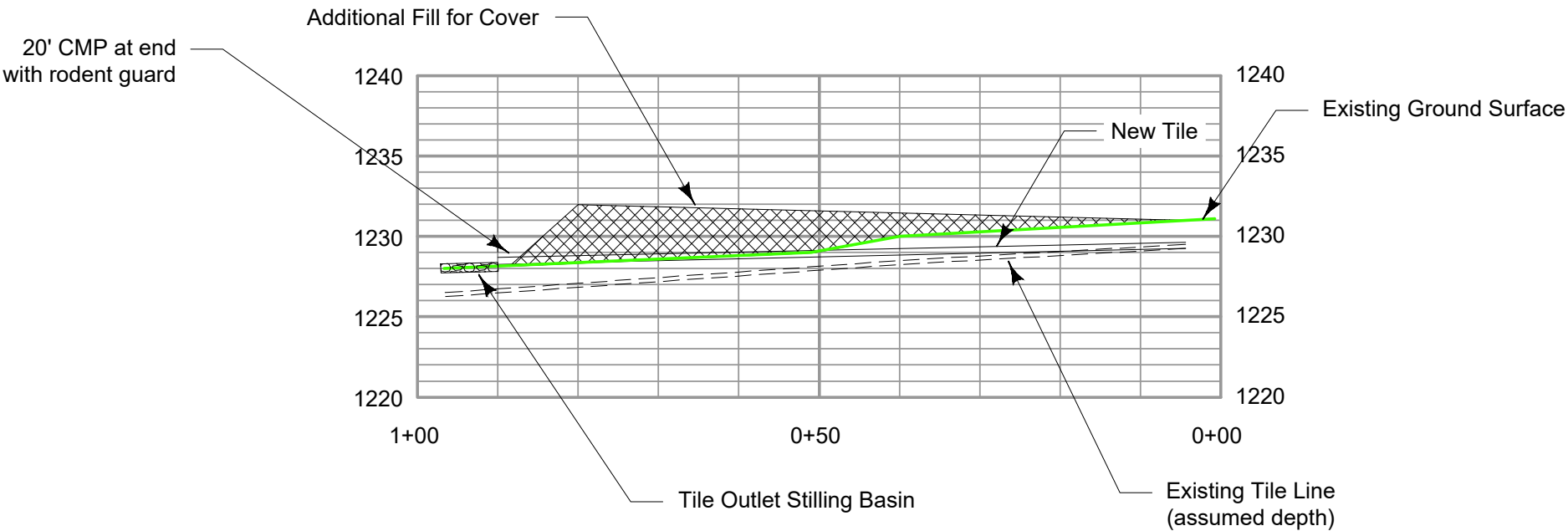


- Notes:
1. Waterways have tile on both sides to be daylighted to wetland.
 2. Exploration trenches are needed to determine location and invert elevations.
 3. New tile to be placed should be non-perforated corrugated plastic with a minimum diameter of 6 inches with slope of 0.1% if possible.
 4. Existing tile on one side should be connected other side at a location that existing elevations allow.
 5. End of new outletted tile should be at elevation 1129.0' with 20' CMP with rodent guard placed at end into stilling basin with erosion stone. (See detail on Sheet 12)
 6. Engineer must be on site during tile investigation to determine tie in location for each tile.

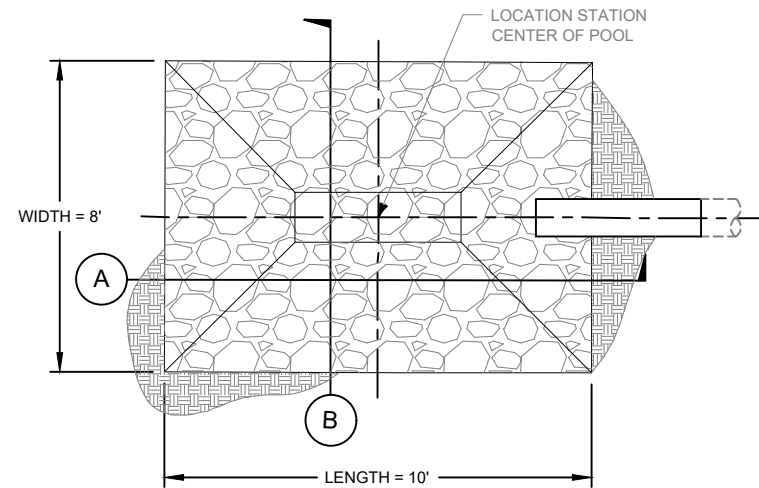
DESIGN BY: MLB		DRAWN BY: MLB	CHKD. BY: SS	ISSUED: ##/##/##	REVISED:	FILE: 01_NAME_AML.DWG
HOW991129C WATER QUALITY WETLAND PROJECT PLAN AND PROFILE - TILE #1				IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP DIVISION OF SOIL CONSERVATION AND WATER QUALITY HENRY A. WALLACE BUILDING 502 E. 9th STREET, DES MOINES, IOWA 50319 (515) 281-4246	REVISION:	DATE:
					1	
					2	
					3	
					4	
SHEET 10 OF 12						



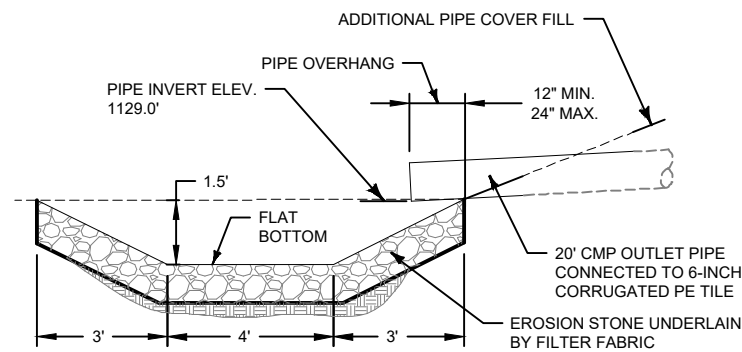
- Notes:
1. Waterways have tile on both sides to be daylighted to wetland.
 2. Exploration trenches are needed to determine location and invert elevations.
 3. New tile to be placed should be non-perforated corrugated plastic with a minimum diameter of 6 inches with slope of 0.1% if possible.
 4. Existing tile on one side should be connected other side at a location that existing elevations allow.
 5. End of new outletted tile should be at elevation 1129.0' with 20' CMP with rodent guard placed at end into stilling basin with erosion stone. (See detail on Sheet 12)
 6. Engineer must be on site during tile investigation to determine tie in location for each tile.



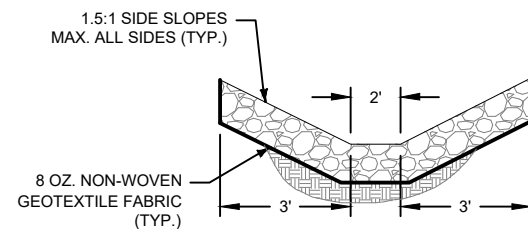
DESIGN BY: MLB		DRAWN BY: MLB	CHKD. BY: SS	ISSUED: ##/##/##	REVISED: -----	FILE: 01_NAME_AML.DWG
HOW991129C WATER QUALITY WETLAND PROJECT				IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP DIVISION OF SOIL CONSERVATION AND WATER QUALITY HENRY A. WALLACE BUILDING 502 E. 9th STREET, DES MOINES, IOWA 50319 (515) 281-4246		
				REVISION:	DATE:	DESCRIPTION:
				1		
				2		
				3		
PLAN AND PROFILE - TILE #2				4		
SHEET 11 OF 12						



PLAN VIEW



SECTION "A"

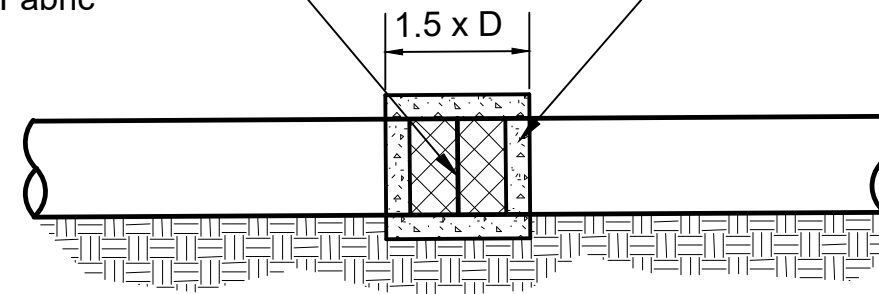


SECTION "B"

1
12 TILE OUTLET STILLING BASIN DETAIL
SCALE: NONE

Pipe Joint
Wrap Tightly with three wraps
of Class 1 Non-Woven
Geotextile Fabric

Encase in at Least
3-inches of Concrete



2
12 TILE JOINT CONNECTION DETAIL
SCALE: NONE

NOTES:

1. COUPLERS CAN BE USED WHEN SIMILAR TILE MATERIALS USED
2. LARGER CMP CAN BE USED TO OUTLET TILE WITHOUT CONCRETE AT JOINT IF PLASTIC TILE EXTENDS 18 INCHES INTO CMP AND TILE TAPE AND FABRIC WRAPS AROUND JOINT ARE UTILIZED.

DESIGN BY:	MLB	DRAWN BY:	MLB	CHKD. BY:	SS	ISSUED:	###/###/###	REVISED:	FILE:	01_NAME_AML.DWG	REVISION:	DATE:	DESCRIPTION:
											1		
											2		
											3		
											4		



HOW991129C
WATER QUALITY WETLAND PROJECT
TYPICAL DETAILS