

PROJECT NARRATIVE
Fish Creek, Highway 42 Box Culvert
Town of Gibraltar

Project Contacts

Contacts	Name	Address	Phone Number
Landowner	Town of Gibraltar	4097 Highway 42 Fish Creek, WI 54212	(920) 868-1714
Consultant	Miller Engineers & Scientists	5308 S. 12th Street Sheboygan, WI 53081	(920) 458-6164

Project Summary

The Town of Gibraltar is mitigating fish passage obstructions at two locations on Fish Creek in Door County, Wisconsin. The obstructions include the State Highway 42 culvert located within the unincorporated community of Fish Creek and Half Mile Dam, located approximately ½ mile upstream of Highway 42. Removal of these obstructions will allow the movement of fish and other aquatic organisms from the Bay of Green Bay upstream to the headwaters of Fish Creek. These headwaters and associated wetlands provide critical habitat for spawning and young-of-the-year fish. Facilitating migration beyond these barriers will allow for fish passage to historic spawning grounds and nursery areas, making them once again available to migrating fish and other associated biota.

Obstructions at the Highway 42 culvert include a 1½ feet high lip at the downstream edge of the apron that provides a barrier to upstream fish movement, particularly during periods of low flow. Additionally, concrete width restrictions on the interior of the culvert concentrate flow, causing excessive flow velocities in this section of the stream. Remediation of these obstructions will include the construction of terraced fish “steps” within the non-structural portion of the apron and the addition of flow restrictors along both edges of the culvert interior to break flow velocities and provide loafing areas for fish during their upstream passage through the culvert. Construction details of the culvert modifications are shown on the attached plans.

Half Mile Dam consists of a 3 feet high spillway that forms a shallow pool of about 2 acres with a maximum depth of about 6 feet. A dissipation pan approximately 7 feet long spans the width of the dam spillway on the downstream edge of the dam. This dam prevents the movement of fish upstream into the headwaters of the creek. Proposed remediation at this location consists of removal of a section of the dam down to the dissipation pan elevation. This will allow for free passage of fish through the section of removed dam into the historic stream channel and the upstream headwaters and associated wetlands. Details of the dam modification are shown on the attached plan.

Upon completion of construction, the area of the former Redman Pond will be restored with a seeding of native wetland vegetation.

Construction Sequencing

Box Culvert Fish Passage

1. Equipment and Ready-Mix Concrete Trucks are expected to enter and exit the site. A Tracking Pad will be utilized for track-out control in accordance with WDNR Conservation Practice Standard 1057.
2. Establish Erosion Control and Sediment Control BMPs.
3. Saw cut and remove existing concrete. Material shall be disposed of offsite.
4. Construct proposed fish ladder (steps)
5. Place proposed baffles within box culvert.

List of Appendices:

Appendix A: Hydrologic and Hydraulic Study

Appendix B: Construction Plans

Appendix A: Hydrologic and Hydraulic Study

HYDROLOGIC AND HYDRAULIC (H&H) EVALUATION REPORT

Town of Gibraltar

Fish Passage Project – State Highway 42 Box Culvert

Project Contacts

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H & H Evaluation

This report summarizes results of the hydrologic and hydraulic (H&H) analyses that we performed for the State Highway (STH) 42 Bridge Box Culvert on Fish Creek. The Town of Gibraltar is proposing to modify the box culvert in order to minimize the obstacle for spawning fish passage. This can be accomplished by cutting a narrow channel within the non-structural portion of the downstream apron and constructing a stepped channel as detailed in the "HWY 42 Box Culvert – Fish Passage" plan set. This H&H evaluation is required for the Wisconsin Department Natural Resources (WDNR) Chapter 30 Stream Realignment Permit application, as well as the Door County Floodplain Zoning Ordinance. The Chapter 30 Stream Realignment Permit application requires an analysis of the 2-year flow event while the Door county Flood Plain Zoning Ordinance requires an analysis to confirm that the proposed modifications will not raise the water surface elevation (WSEL) during the 100-year flow events.

Project Description

The primary objective of the Town of Gibraltar is to restore fish spawn habitat access to Fish Creek, which flows into Green Bay. One obstacle to fish passage is the approximate two foot rise from the stony bed of the creek up to the downstream apron of the STH 42 Bridge box culvert, through which the creek flows. This obstacle's modifications and analysis are addressed in this report.

The existing box culvert is approximately 11' tall and 10' wide. A nonstructural portion of the box culvert's downstream apron is proposed to be removed and replaced with a concrete step system. Additionally, treated timber baffles 6" Wide x 6" High x 3' Long, would be bolted to the bottom of the interior walls of the culvert in order to provide eddies or resting areas for fish during the spring spawning season. The attached plan set provides details for both of these modifications.

The box culvert is located within the Zone AE flood plain limit (per the pertinent FEMA FIRM) as is shown in Figure 1. In order to verify that the proposed box culvert modification will not raise the WSEL for the 2- and 100-year flow events, we performed detailed hydrologic and hydraulic analyses, which are described as follows.

Door County Flood Insurance Study

Door County's Flood Insurance Study (FIS) dated March 2, 2009, includes hydrologic and hydraulic analyses of Fish Creek. Through Wisconsin Department of Natural Resources' Surface Water Data Viewer, we were able to obtain the Input Data for this FIS of Fish Creek. This data includes calculated estimated peak flows for the 10-, 50-, 100-, and 500-year events (see Table 1). We have utilized the 100-year peak flow (Q_{100}) from the FIS as part of our analysis.

Table 1: Summary of Door County FIS flood flow values at Half Mile Dam

FIS Input Data a short distance downstream of Hwy 42 Bridge Box Culvert		
Event	Flow (cfs)	Water Surface Elevation (NAVD 88)
10-Year Event	475	582.88
50-Year Event	800	584.13
100-Year Event	950	584.63
500-Year Event	1350	585.75

Hydrologic Analysis

For the purposes of this project, the evaluations of both the 2-year and 100-year events are required. The Door County FIS did not include the 2-year event, because of this our evaluation included hydrologic analysis for it. The hydrological analysis for flood studies in Wisconsin must be done in accordance with the NR116.07(3)(a) list of approved techniques. When analyzing the 100-year event, Door County FIS values were used. However, the IP Stream Realignment Chapter 30 Permit's 2-year event analysis does not specify a method for analysis. Therefore, we used the **USGS Flood-Frequency Regression Equation** to establish the 2-year event peak flow estimate (Q_2). This calculation employs the best-fit multi-variable regression equations developed and tabulated in "Flood-Frequency Characteristics of Wisconsin Streams", by J. F. Walker and W.R. Krug in 2003 (Equation 1).

Equation 1: Best-fit regression equation (equation 4-1) for the Q_2 flow; A – contributing drainage area in square miles, ST – storage, in percent of basin area plus 1.0, S – main-channel slope in feet per mile, SP – soil permeability of the least-permeable soil horizon in inches per hour, SN – mean annual snowfall for 1961-1990 in inches.

$$Q_2 = 2.69 A^{0.864} \cdot ST^{-0.296} \cdot S^{0.279} \cdot SP^{-0.250} \cdot SN^{0.490}$$

Figure 2 illustrates the watershed area draining into the flood study project area. Values used for our calculations are summarized in Table 2.

Table 2: Summary of USGS regression equation input variable values; input parameters used in our analysis were sampled by watershed from geospatially referenced (GIS) data freely available at the county, state, and federal levels.

Location	Watershed Area (mi ²)	Watershed Storage (%)	Slope of Main Channel (feet/mile)	Soil Permeability (inches/hour)	Average Annual Snowfall (inches)	Estimated Peak Flow (Q ₂ , cfs)
Project Site	11.13	25	12.15	0.177	52	178

Hydraulic Analysis

The hydraulic analysis was conducted using a “2-Year” (Q)₂ of 178 cfs based on the USGS regression equation and a “100-Year” (Q)₁₀₀ of 950 cfs from the Door County FIS at the 1% Annual Risk.

HEC-RAS was used to model the hydraulic component of the analysis. The edition of HEC-RAS in wide-release, contemporaneous to this study and accepted by Wisconsin DNR, is version 5.0.7. This version exceeds the requirements of NR116.07(4)(c), which requires the use of HEC-2, the predecessor to HEC-RAS.

Cross-sectional data was comprised of a combination of data obtained from site topographic survey and county level contour topography data. The station and elevation data for the existing conditions reflect sampled points overlain onto county topography. The channel topography consists of field cross-section surveys conducted by Miller Engineers & Scientists. The proposed condition elevation data comes from the same topography with modifications to include the proposed alterations to the dam. The locations of these cross sections are shown in Figure 3.

Typically when modeling a culvert or bridge such as this in HEC RAS, an “inline structure” would be used. However, this approach was not appropriate in this case due to the geometrically irregular cross sections within the box culvert for both the existing and proposed condition. Instead, multiple cross sections within the box culvert were used to more accurately evaluate the effects of these details.

Manning's Roughness (“n”) values were chosen appropriate for the local vegetated land cover conditions. Much of the area in the expected floodplain is covered in riparian forest, shrubbery, or grasses. The Manning's “n” values represent an average channel with few obstructions and banks and some vegetation creating an impediment for flow. These values are show in Table 3. The model was sensitivity tested by increasing and decreasing the Manning's “n” values simultaneously for all geometries: existing and proposed while empty and full. No appreciable effect was noted for adjustments made within ±0.005 of the initially selected values.

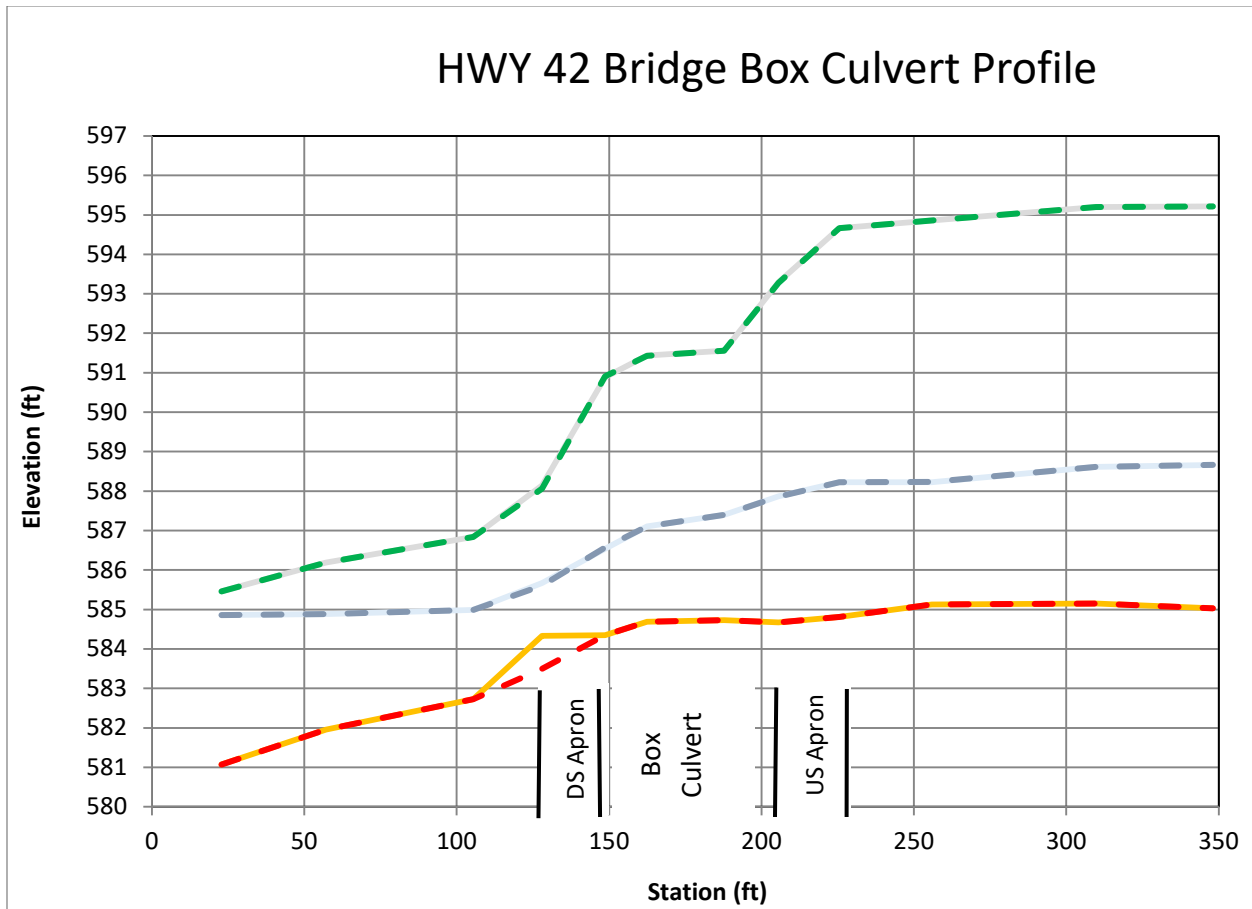
Table 3: HEC-RAS model input values for Manning's “n” roughness at all cross section geometries

Manning's “n”			
Left Bank	Channel Bed	Culvert	Right Bank
0.12	.044	0.015	0.12

The results of the model parameters for the analyzed flow are shown in Exhibit 1 and Tables 4 and 5. These results show that the proposed modifications will raise the “100 Year” (Q_{100}) WSEL up to 0.02 feet, but only within the confines of the culvert box itself. Although the computations indicate that the proposed modifications will raise the Q_2 WSEL up to 0.03 feet within the confines of the box culvert where the first baffle is modeled (STA 1+48.63) it's decreased where the second one is modeled (STA 2+05.62). Regardless, there's no regulatory limitation for increasing the Q_2 WSEL.

Both upstream and downstream of the structure, the 100-year WSEL is computationally not affected (neither raised nor lowered significantly) by the proposed modifications. The 2-year WSEL is raised by 0.01 feet approximately 120 feet upstream of the upstream culvert apron. However, there is no regulation for the effects on the 2-year WSEL. The 2- and 100-year WSEL are only slightly lowered 0.07 feet (less than an inch) near the downstream edge of the downstream apron due to introduction of the stepped channel there.

Exhibit 1: Q_2 and Q_{100} WSEL's Profile through analyzed reach of Fish Creek



- Existing Creek Bed Elevation
- - Proposed Bed Elevation
- - Existing WSEL 2-Yr Event
- - Proposed WSEL 2-Yr Event
- - Existing WSEL 100-Yr Event
- - Proposed WSEL 100-Yr Event

Table 4: Two Year (Q_2) Evaluation

Geometry		Analyzed Q_2 Flow			
River Station	Stream Thalweg Elevation	Q_2	Existing Q_2 WSEL	Proposed Q_2 WSEL	Maximum Change of WSEL
(ft.)	(ft.)	(cfs.)	(ft.)	(ft.)	(ft.)
0+22.84	581.07	178	584.86	584.86	0.00
0+57.16	581.96	178	584.89	584.89	0.00
1+05.39	582.73	178	584.99	584.99	0.00
1+28.02	584.33	178	585.67	585.60	-0.07
1+48.63	584.35	178	586.54	586.57	+0.03
1+62.42	584.69	178	587.11	587.11	0.00
1+87.68	584.73	178	587.40	587.40	0.00
2+05.62	584.67	178	587.87	587.86	-0.01
2+25.52	584.81	178	588.23	588.23	0.00
2+55.86	585.13	178	588.23	588.23	0.00
3+09.69	585.15	178	588.61	588.61	0.00
3+48.09	585.03	178	588.66	588.67	+0.01

Section 1
Section 2
Section 3

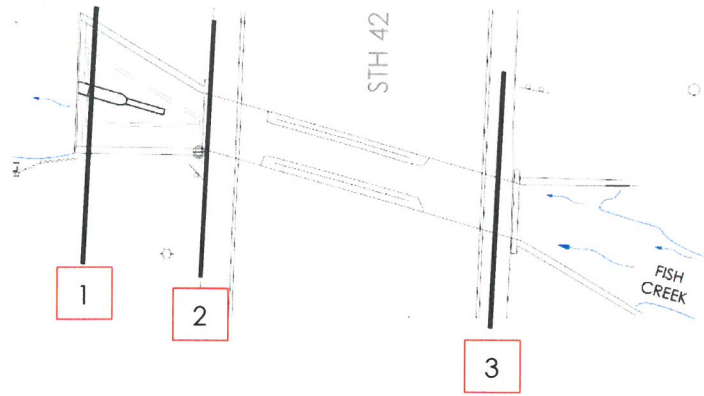
HWY 42 Bridge Box Culvert

Table 5: One Hundred Year (Q_{100}) Evaluation

Geometry		Analyzed Q_{100} Flow			
River Station	Main Channel Elevation	Q_{100}	Existing Q_{100} WSEL	Proposed Q_{100} WSEL	Maximum Change of WSEL
(ft.)	(ft.)	(cfs.)	(ft.)	(ft.)	(ft.)
0+22.84	581.07	950	585.46	585.46	0.00
0+57.16	581.96	950	586.19	586.19	0.00
1+05.39	582.73	950	586.84	586.84	0.00
1+28.02	584.33	950	588.14	588.06	-0.08
1+48.63	584.35	950	590.89	590.91	+0.02
1+62.42	584.69	950	591.43	591.43	0.00
1+87.68	584.73	950	591.56	591.56	0.00
2+05.62	584.67	950	593.29	593.27	-0.02
2+25.52	584.81	950	594.66	594.66	0.00
2+55.86	585.13	950	594.86	594.86	0.00
3+09.69	585.15	950	595.20	595.20	0.00
3+48.09	585.03	950	595.21	595.21	0.00

Section 1
Section 2
Section 3

HWY 42 Bridge Box Culvert



Conclusions

The WSEL's for both the 2- and 100-year events are slightly lowered along the proposed stepped channel in the downstream apron. The WSEL's for both the 2- and 100-year events are increased slightly

Given that these changes are confined within the box culvert and no increase to the 100-year WSEL occurs outside of the culvert we believe that these modifications should be approved.

If the reviewing agency were to reject the proposed modifications to the culvert, we would recommend that the reviewing agency consider approving the concrete step system (without the baffles) because it alone causes no increase to the WSEL's for the 2- and 100-year events.

Sincerely,
MILLER ENGINEERS & SCIENTISTS

Brian Wells
9/17/19
Brian Wells, P.E.
Project Engineer



Roger G. Miller
Roger G. Miller, P.E.
President

Enclosures: Appendix

I:\DATA\20400\20435 - Fish Creek Fish Passage (Town of Gibraltar)\001 - Fish Creek Fish Passage\19-20-01 Fish Passage\Reports\Box Culvert Hydraulic Evaluation\Box Culvert Hydraulic Evaluation Report.docx

APPENDIX

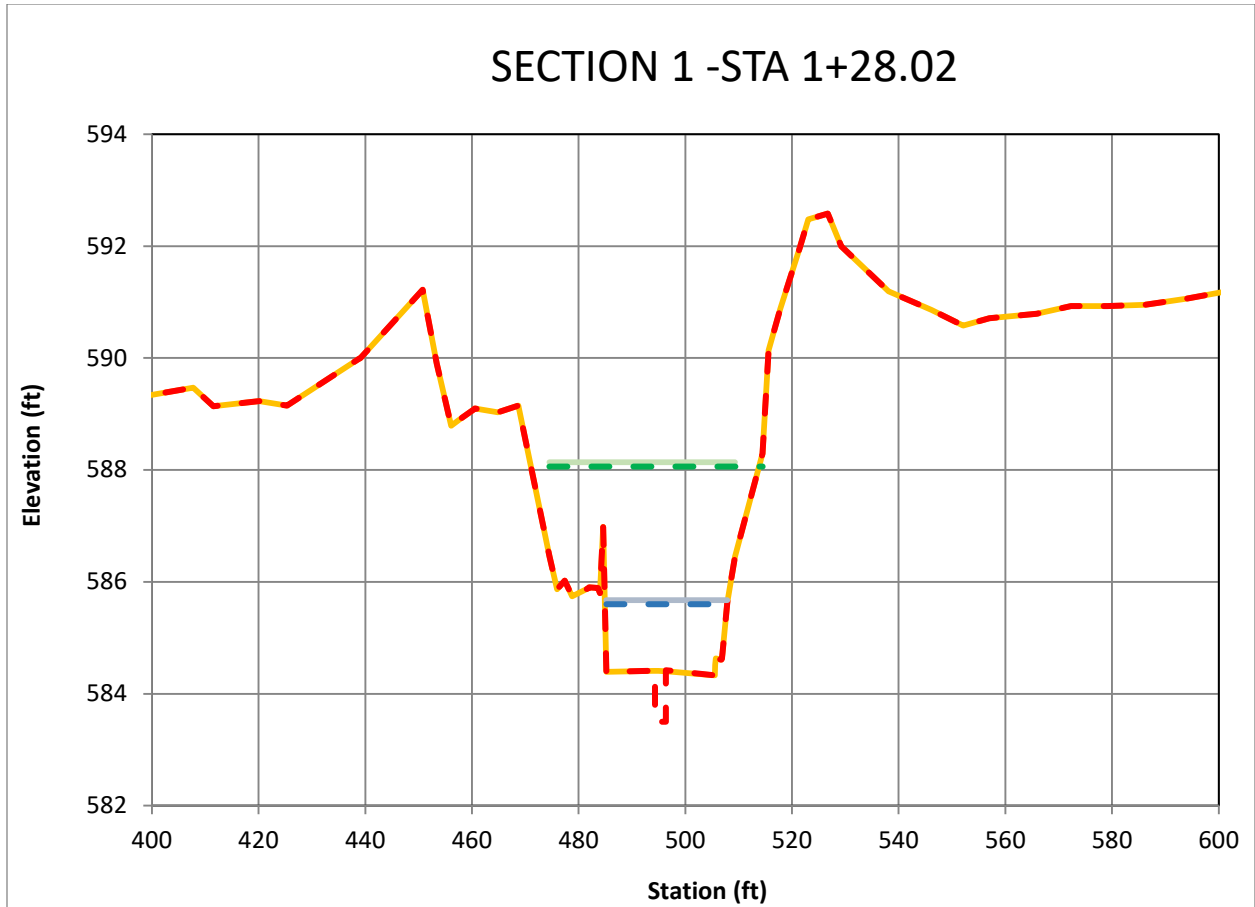
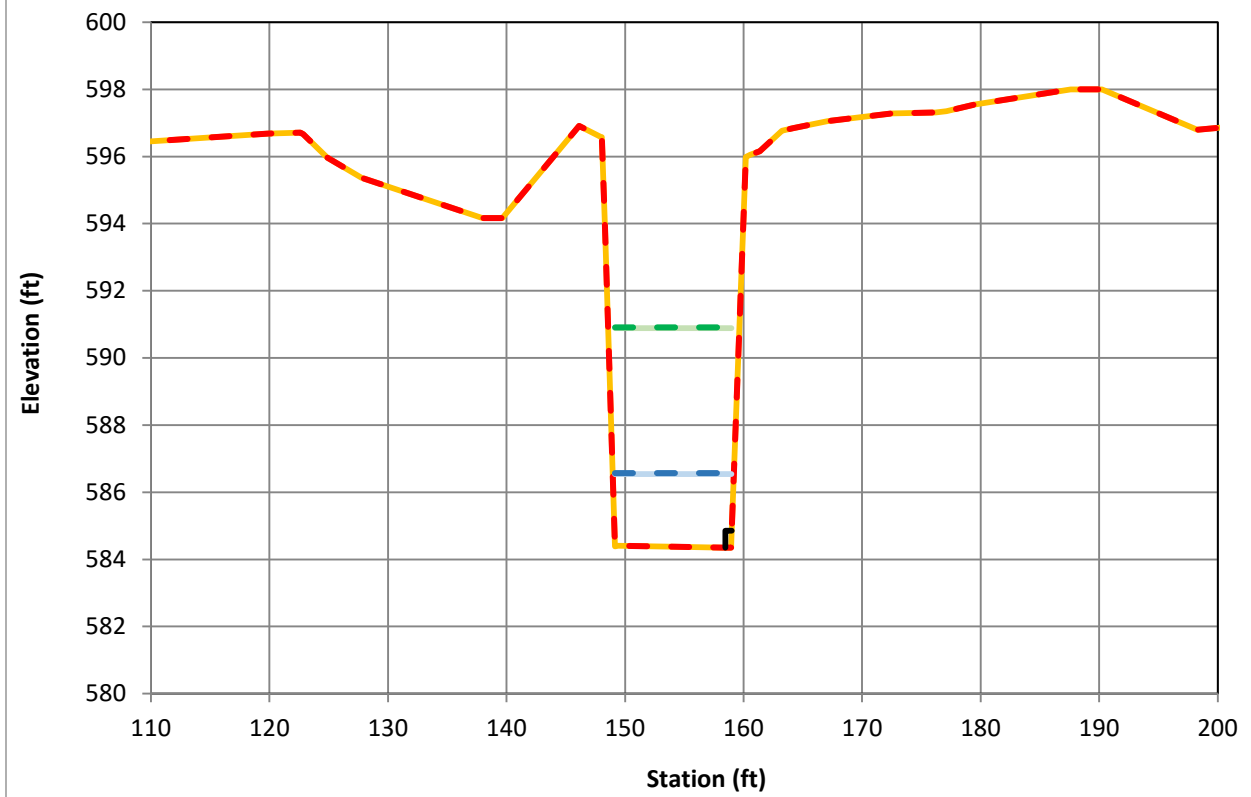


Figure 4: Cross Section 1+28.02 with Dam Overlay

- | | |
|---|--|
| <ul style="list-style-type: none"> — Existing Ground — Existing WSEL 2-Yr Event — Existing WSEL 100-Yr Event | <ul style="list-style-type: none"> - - - Proposed Ground - - - Proposed WSEL 2-Yr Event - - - Proposed WSEL 100-Yr Event |
|---|--|

SECTION 2 - STA 1+48.63



- Existing Ground
 - Existing WSEL 2-Yr Event
 - Existing WSEL 100-Yr Event
 - Baffle
- - - Proposed Ground
 - - - Proposed WSEL 2-Yr Event
 - - - Proposed WSEL 100-Yr Event

SECTION 3 - STA 2+05.62

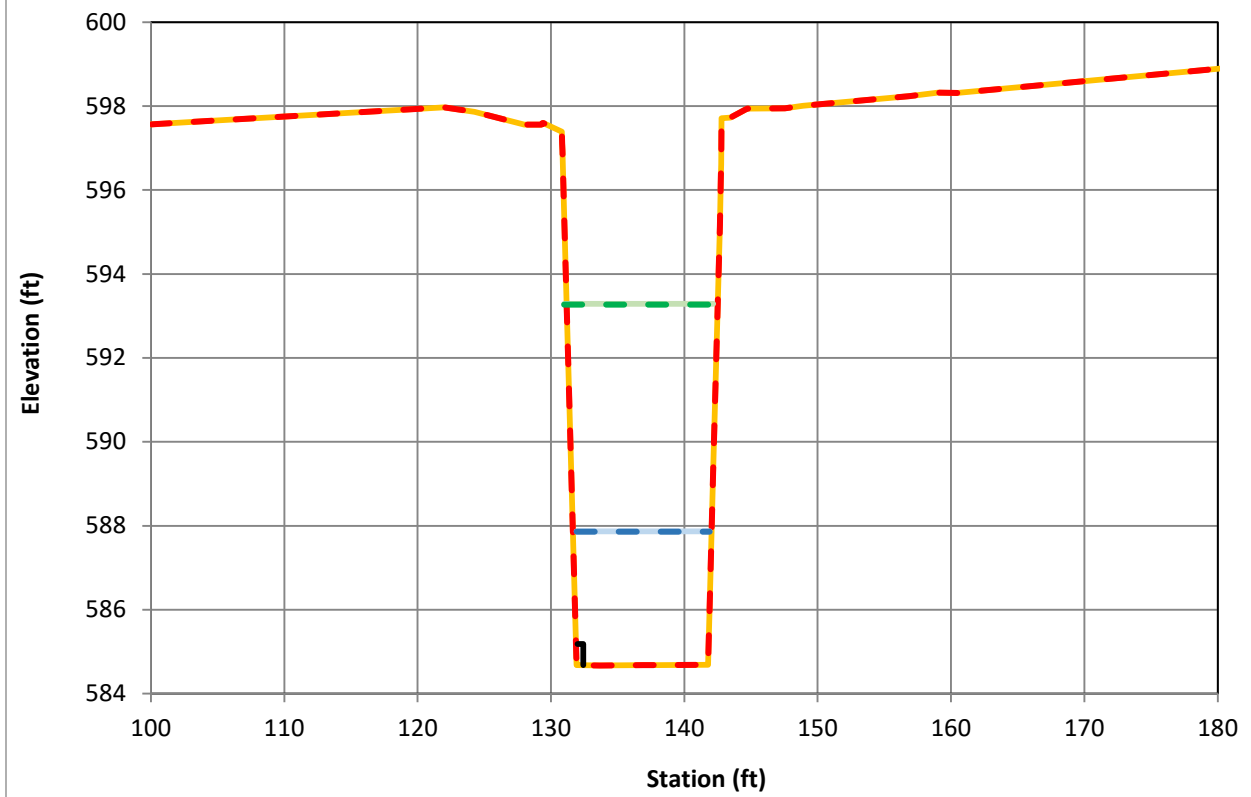


Figure 4: Cross Section 1+48.63

- Existing Ground
- - Proposed Ground
- Existing WSEL 2-Yr Event
- - Proposed WSEL 2-Yr Event
- Existing WSEL 100-Yr Event
- - Proposed WSEL 100-Yr Event
- Baffle

FIGURE 1: FEMA FLOODPLAIN MAP







Highway 42 Bridge - Box Culvert
Town of Gibraltar, Wisconsin

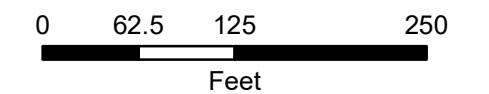
MILLER

ENGINEERS
SCIENTISTS

5308 S. 12th Street
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Phone 920-458-6164
Fax 920-458-0369
www.startwithmiller.com

Legend

-  Fish Creek
-  FEMA Zone A
-  FEMA Zone AE
-  Miller Studied
2-Year Event WSEL
-  Miller Studied
100-Year Event WSEL
-  Approximate Project Area



DATE: 9/16/2019

PROJECT: 20435-001

BY: SMM

CHK: BRW

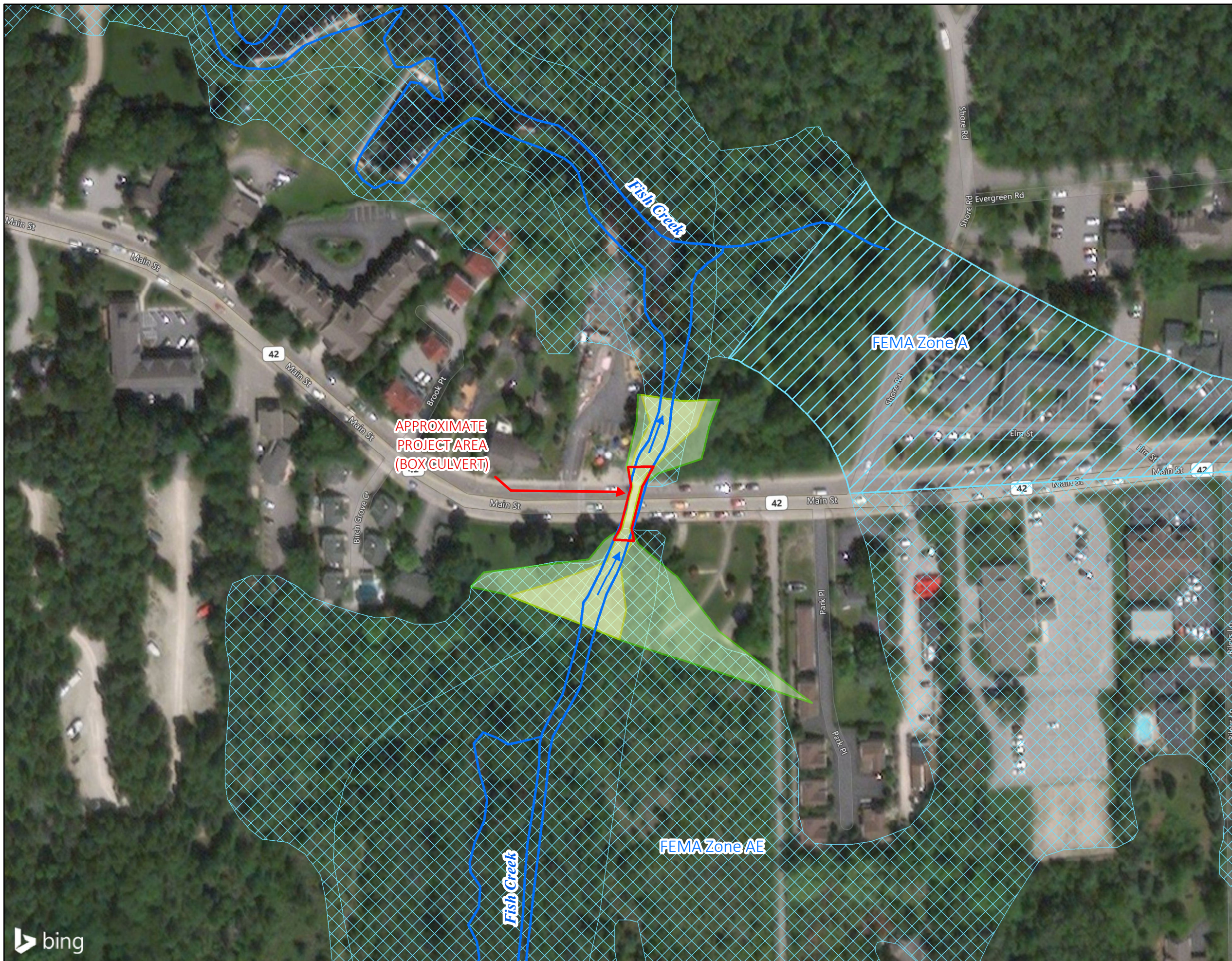





FIGURE 2: WATERSHED MAP

Highway 42 Bridge - Box Culvert
Town of Gibraltar, Wisconsin

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Legend

-  Fish Creek
-  Project Watershed
-  Approximate Project Area



DATE: 9/16/2019

PROJECT: 20435-001

BY: SMM

CHK: BRW



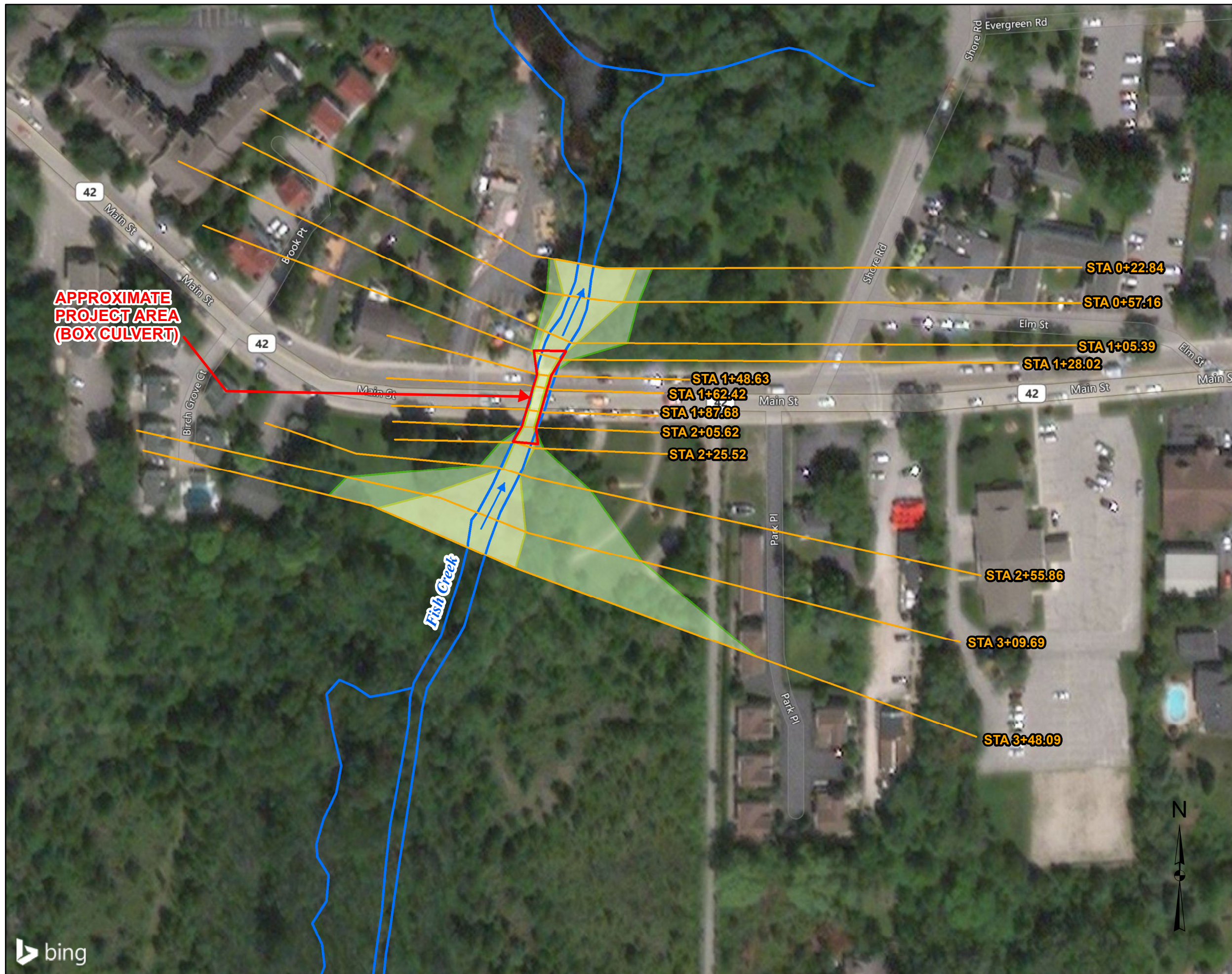


FIGURE 3: CROSS SECTION LOCATIONS

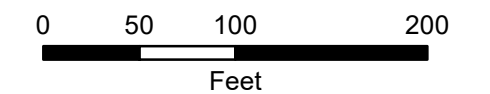
Highway 42 Bridge - Box Culvert
Town of Gibraltar, Wisconsin

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SCIENTISTS

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Sheboygan, WI 53081-8099
Phone 920-458-6164
Fax 920-458-0369
www.startwithmiller.com

Legend

- Fish Creek
- Cross Sections
- Miller Studied 2-Year Event WSEL
- Miller Studied 100-Year Event WSEL
- Approximate Project Area



DATE: 9/16/2019

PROJECT: 20435-001

BY: SMM

CHK: BRW

Appendix B: Construction Plans

HWY 42 BOX CULVERT - FISH PASSAGE

HWY 42, FISH CREEK, DOOR COUNTY, WISCONSIN

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 Sheboygan, WI 53081-8099
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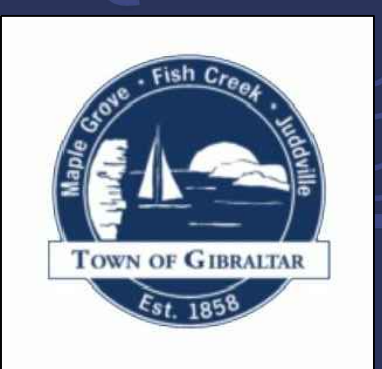
NO.	DATE	DESCRIPTION	BY

HWY 42 BOX CULVERT - FISH PASSAGE
 TOWN OF GIBRALTAR
 HWY 42, FISH CREEK
 DOOR COUNTY, WISCONSIN

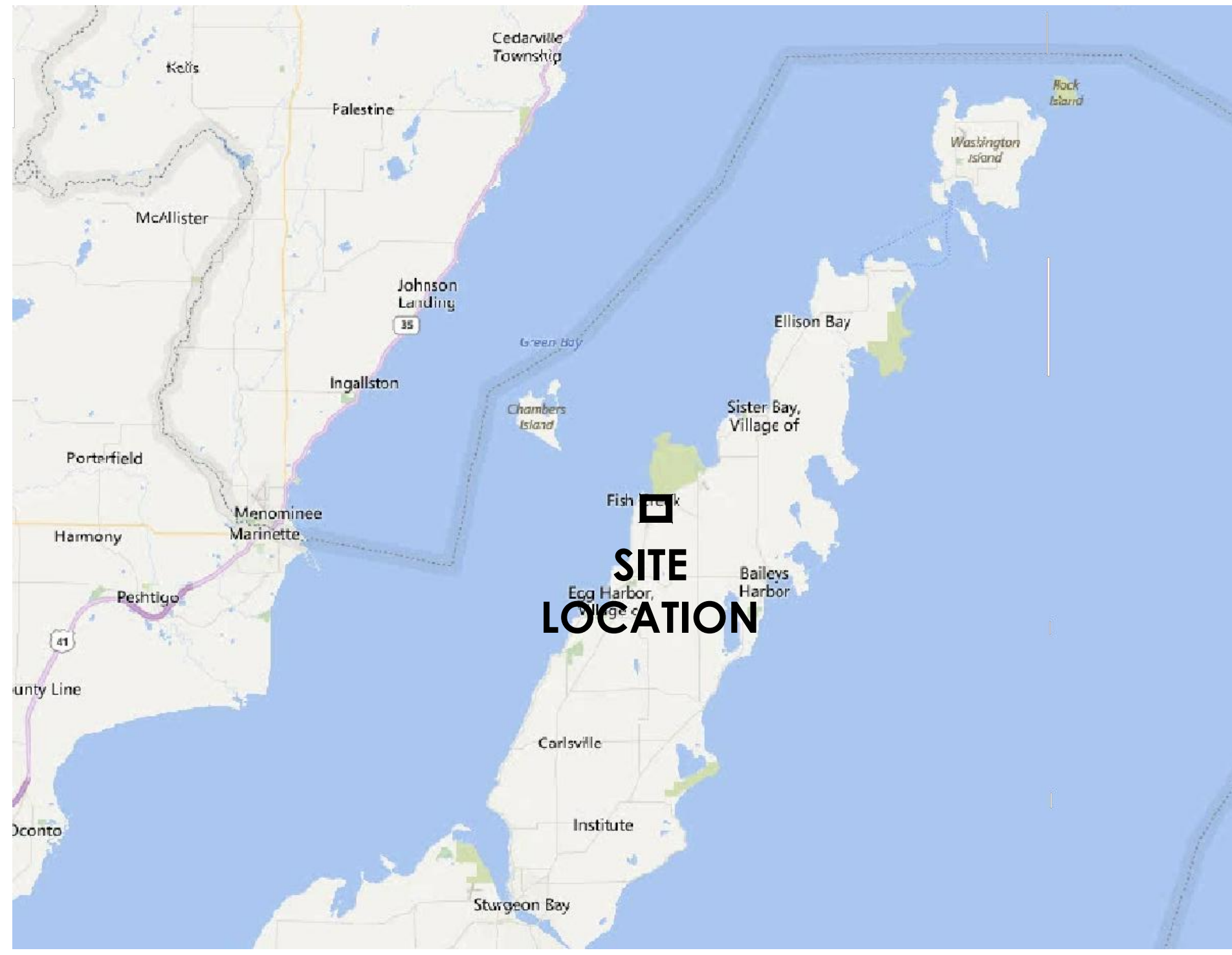
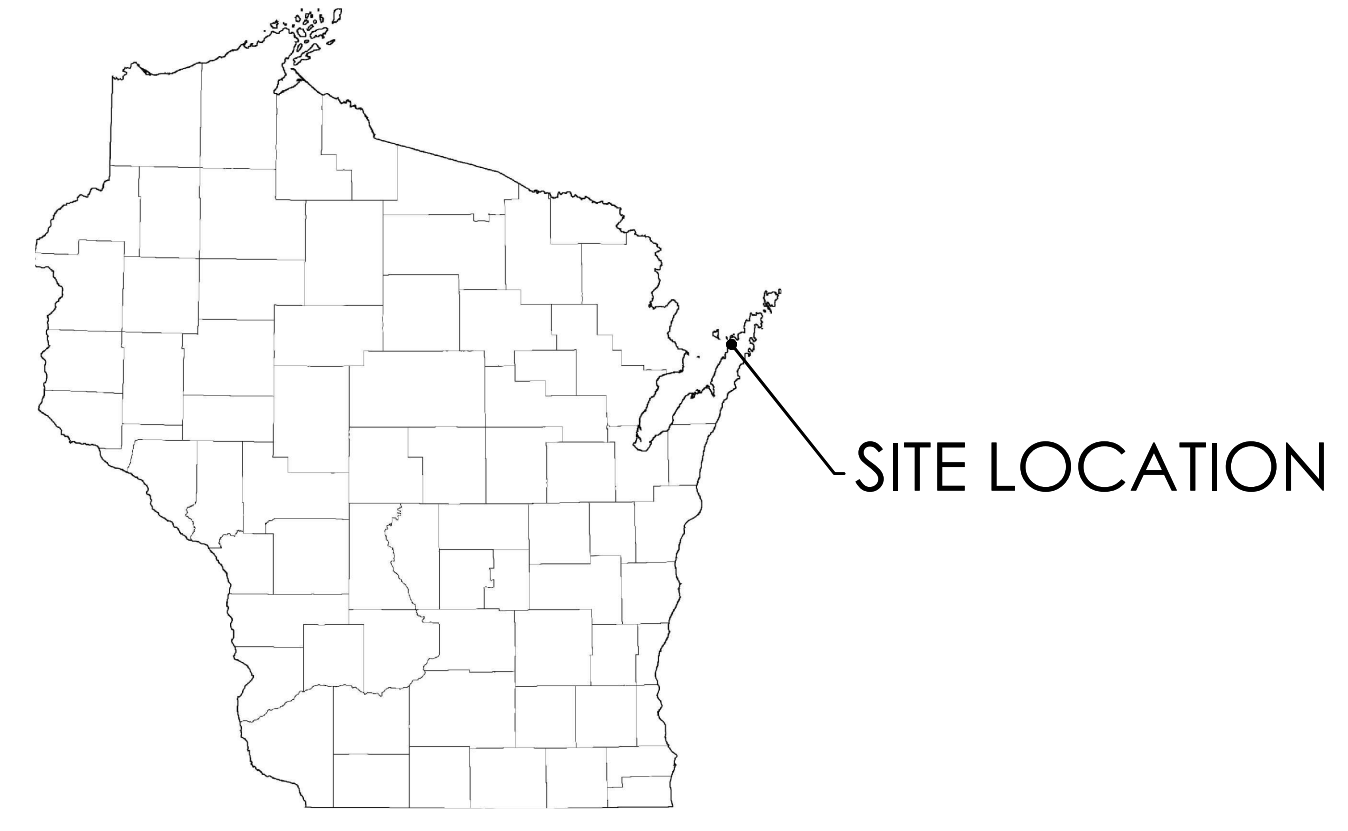
SCALE	HOR. NA
VER.	NA
DATE	08/26/2019
JOB	20435-C
BY	EAS
CK	RGM

SHEET
 1 OF 2

ORIGINAL PLANS
 PREPARED BY
MILLER
 ENGINEERS
 SCIENTISTS
 5308 S 12TH STREET
 SHEBOYGAN, WI 53081
 (920) 458-6164

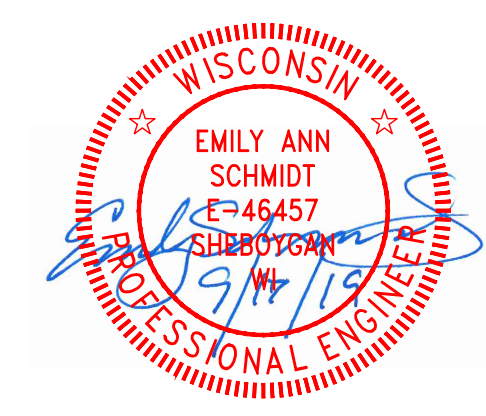


4097 HIGHWAY 42
 PO BOX 850
 FISH CREEK, WI 54212-0850
 PHONE: (920) 868-1714
 FAX: (920) 868-9425



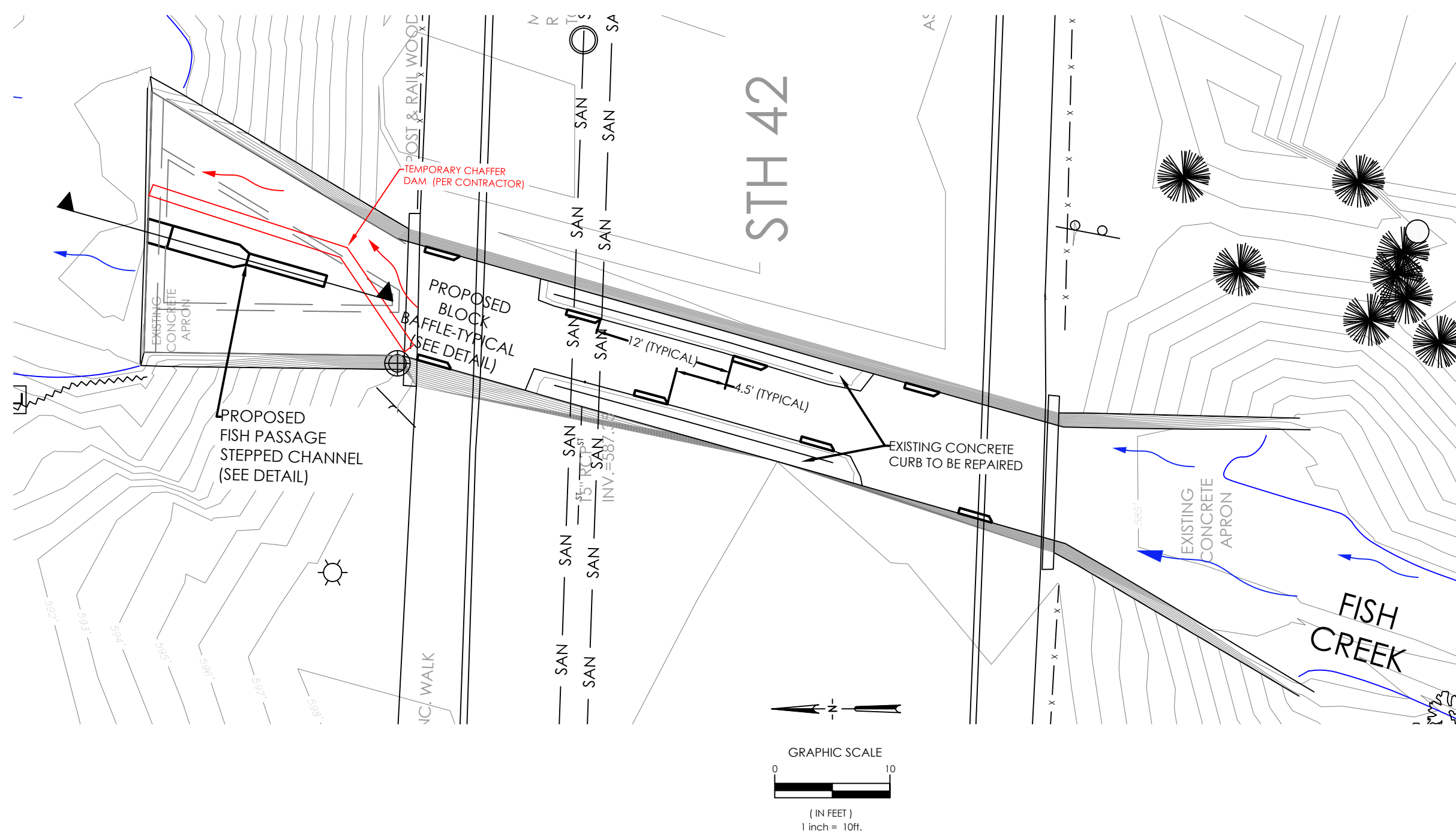
INDEX TO DRAWINGS

SHEET NO.	DESCRIPTION
1	TITLE SHEET, INDEX, AND LOCATION MAP
2	APRON MODIFICATION AND BLOCK BAFFLE - DETAILS AND SPECIFICATIONS

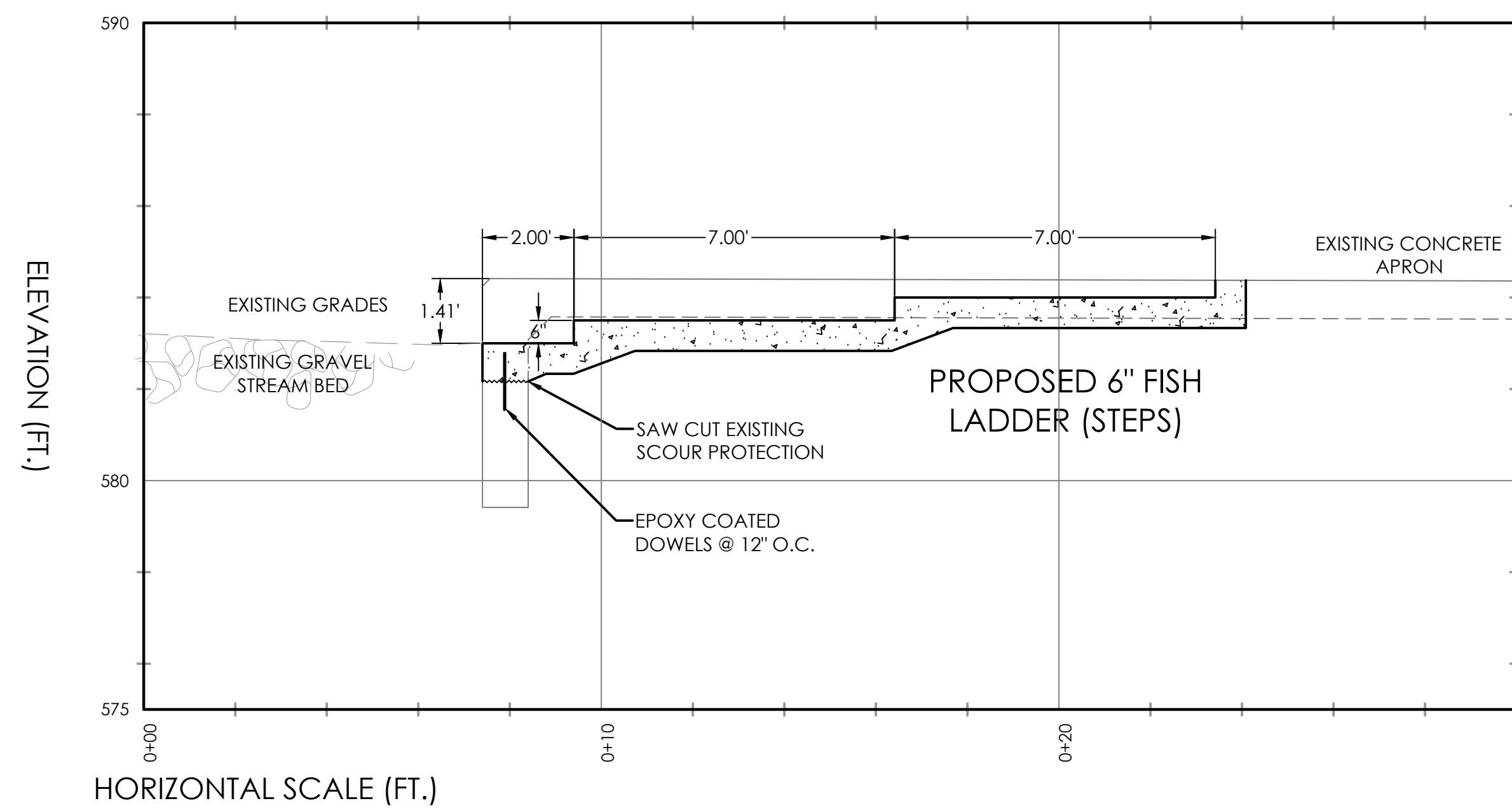


I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF WISCONSIN.

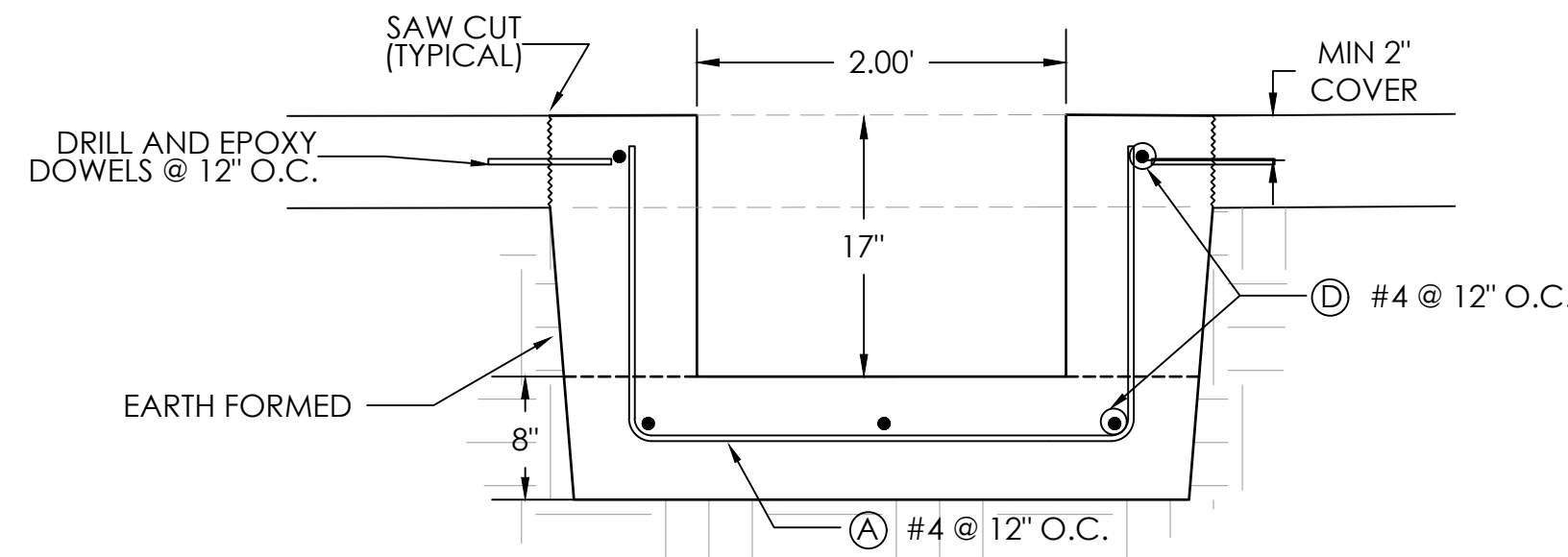
EXISTING BOX CULVERT - PLAN VIEW



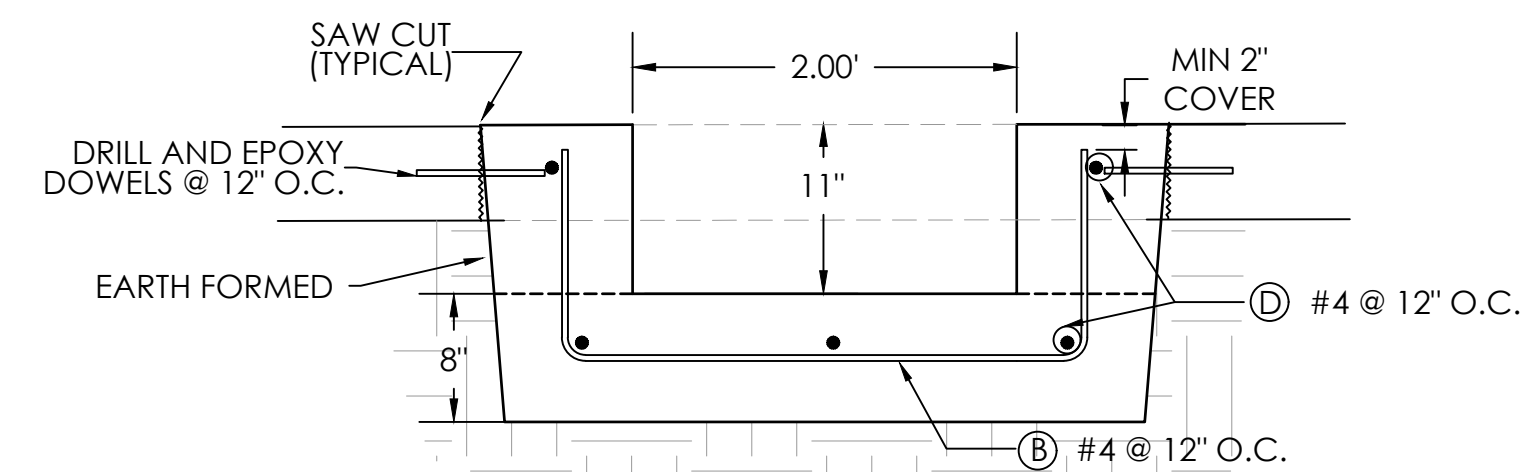
FISH PASSAGE STEPPED CHANNEL - PROFILE



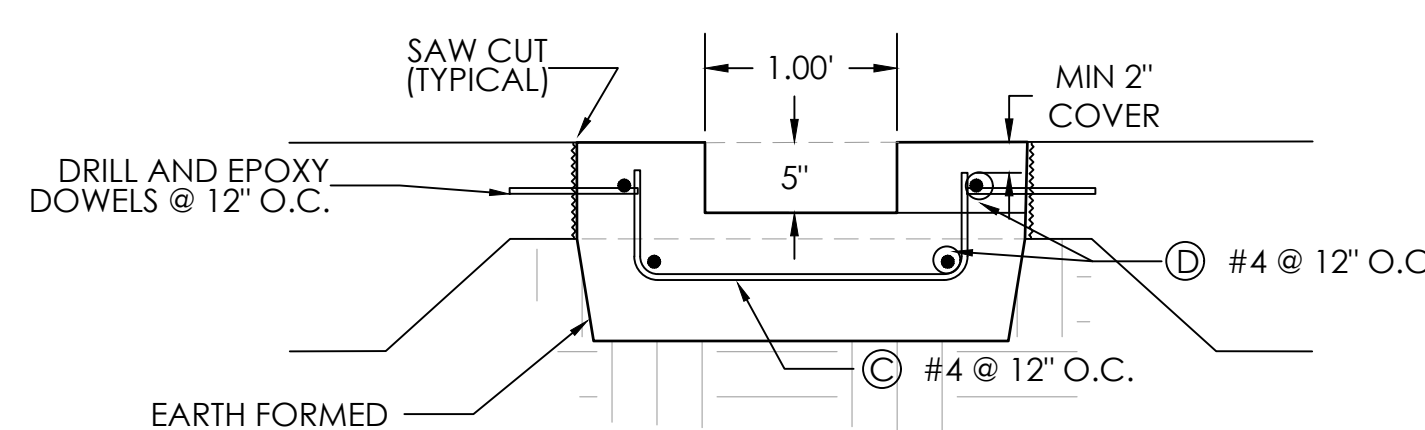
STEP A SECTION DETAIL



STEP B SECTION DETAIL

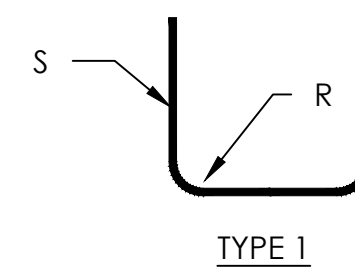


STEP C SECTION DETAIL

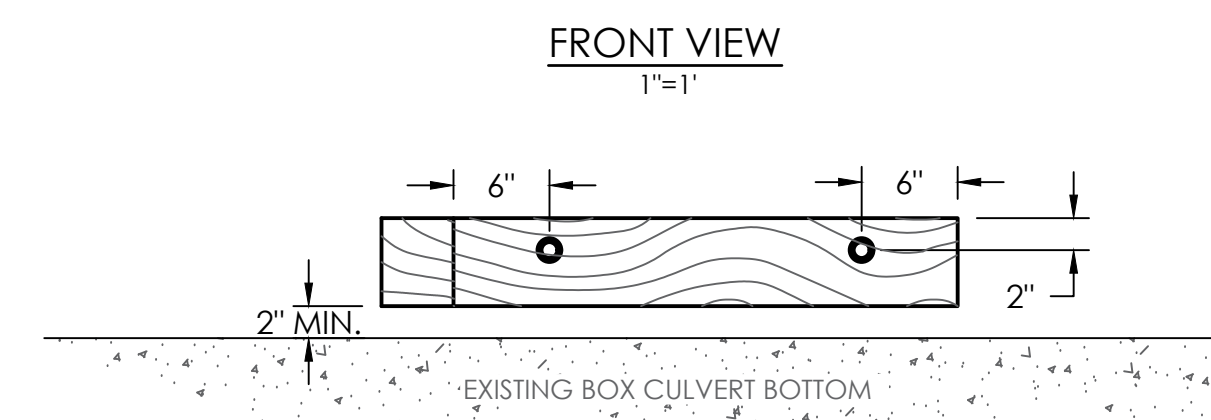
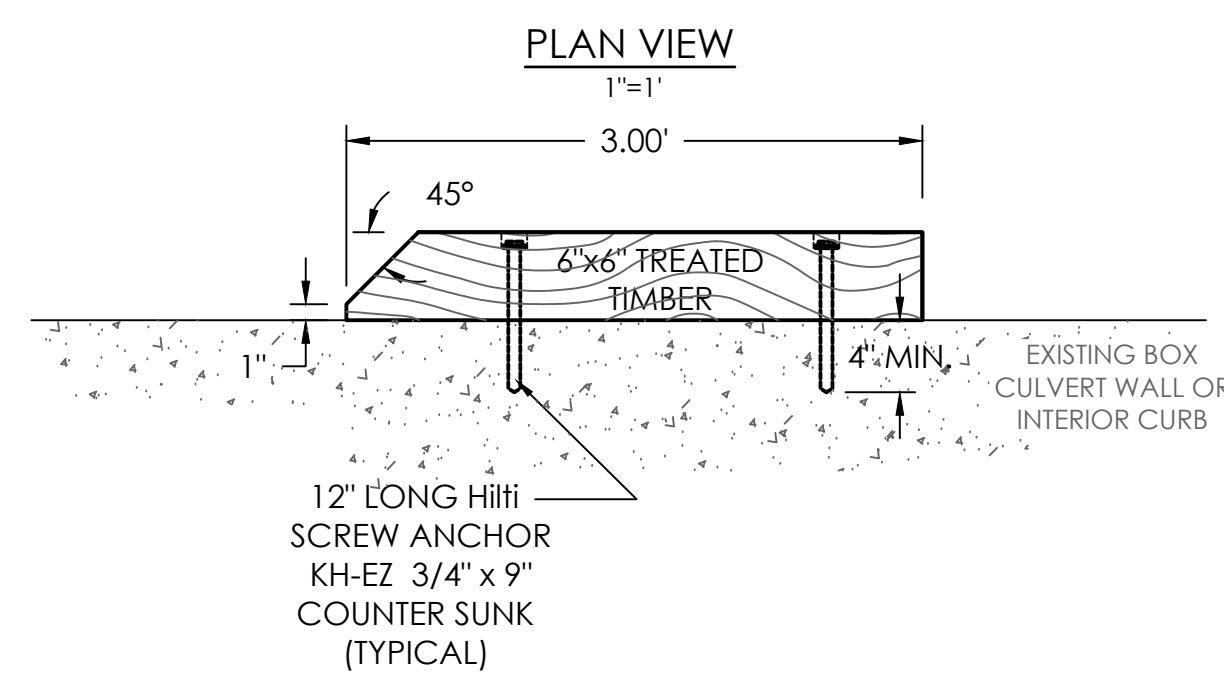


STEEL SCHEDULE - ALL GRADE 60 STEEL
NOTE: ALL STEEL REQUIRES 2" COVER.
ALL STEEL IS EPOXY COATED

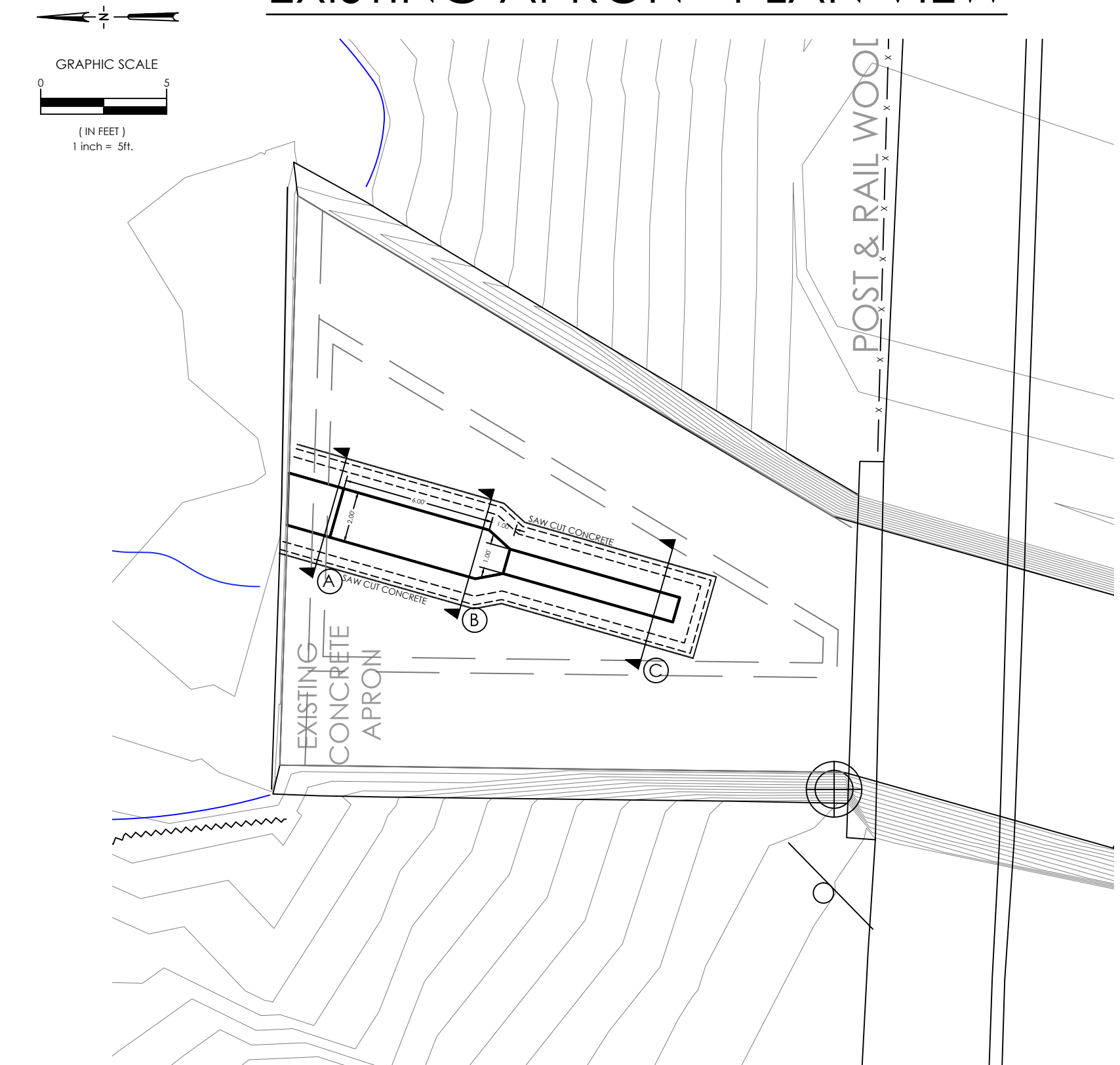
MARK	SIZE	TYPE	R	S	LENGTH
(A)	4	1	2'-8"	1'-6"	5'-8"
(B)	4	1	2'-8"	1'-0"	4'-8"
(C)	4	1	1'-8"	0'-6"	2'-8"
(D)	4	STR	--	--	varies



BLOCK BAFFLE DETAIL



EXISTING APRON - PLAN VIEW



GENERAL NOTES

- DIMENSIONS, WHEN SHOWN, TAKE PRECEDENCE OVER SCALE. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN FIELD.
- THE CONTRACTOR SHALL CALL DIGGERS HOTLINE SERVICE FOR THE LOCATION AND STAGING OF EXISTING UNDERGROUND UTILITIES AT 1-800-242-8511, 3 WORKING DAYS PRIOR TO DIGGING. THE CONTRACTOR IS RESPONSIBLE FOR NOTIFYING ALL OF THE UTILITIES PRIOR TO THE INSTALLATION OF ANY UNDERGROUND IMPROVEMENTS.
- ALL CONSTRUCTION SIGNAGE TO BE IN ACCORDANCE WITH THE TOWN OF GIBLARTAR AND WISCONSIN DEPARTMENT OF TRANSPORTATION REQUIREMENTS.
- THE PROPOSED IMPROVEMENTS SHALL BE CONSTRUCTED ACCORDING TO THE ORDINANCES AND REQUIREMENTS OF THE TOWN OF GIBLARTAR AND THE STATE OF WISCONSIN DOT, DSPS, AND DNR REQUIREMENTS AND PER THE STATE OF WISCONSIN STANDARD SPECIFICATIONS FOR SEWER AND WATER CONSTRUCTION, CURRENT EDITION.
- THE PROPOSED IMPROVEMENTS SHALL BE CONSTRUCTED IN ACCORDANCE WITH PLANS APPROVED BY THE TOWN OF GIBLARTAR, FOLLOWING PROPER CONSTRUCTION TECHNIQUES.
- THE CONTRACTOR IS RESPONSIBLE FOR EXAMINING ALL EXISTING SITE CONDITIONS PRIOR TO BEGINNING CONSTRUCTION AND IS TO COMPARE THE SITE CONDITIONS TO THOSE SHOWN ON THE ENGINEERING PLANS. ANY DISCREPANCIES ARE TO BE RESOLVED PRIOR TO THE START OF CONSTRUCTION.
- IF ANY ERRORS, DISCREPANCIES OR OMISSIONS ON THE PLANS BECOME APPARENT DURING CONSTRUCTION, PROVIDE IMMEDIATE NOTIFICATION TO ENGINEER.
- THE CONTRACTOR SHALL VERIFY THE GRADE AND LOCATION OF EXISTING UTILITIES PRIOR TO BEGINNING CONSTRUCTION. RELATED WORK SHALL NOT COMMENCE UNTIL ANY DISCREPANCY IS RESOLVED.
- THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING THE OWNER WITH AS-BUILT INFORMATION OF THE IMPROVEMENTS.
- THE CONTRACTOR SHALL INSTALL A PEDESTRIAN FENCE AROUND ALL EXCAVATIONS TO BE LEFT OPEN OVERNIGHT. THE CONTRACTOR IS RESPONSIBLE FOR SITE SAFETY DURING CONSTRUCTION OF THE PROPOSED IMPROVEMENTS.
- THE RESTORATION OF EXISTING IMPROVEMENTS WHICH ARE DAMAGED DURING CONSTRUCTION IS CONSIDERED INCIDENTAL AND SHALL BE DONE PER THE REQUIREMENTS OF THE MUNICIPALITY AND SHOULD INCLUDE PAVEMENT, CURB & GUTTER, SIDEWALK, TOPSOIL, FERTILIZER, SEEDING AND MULCHING.
- THE PRIME CONTRACTOR IS RESPONSIBLE FOR COORDINATING THE WORK OF ALL OTHER CONTRACTORS INVOLVED WITH CONSTRUCTION OF THE PROPOSED IMPROVEMENTS AND FOR REPORTING ANY DISCREPANCIES BETWEEN THESE PLANS AND PLANS PREPARED BY OTHERS FOR THE PROJECT.
- THE CONTRACTOR IS RESPONSIBLE FOR SITE SAFETY DURING CONSTRUCTION OF THE PROPOSED IMPROVEMENTS.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS, PERMIT COSTS, TAP FEES, METER DEPOSITS, BONDS, AND ALL OTHER FEES REQUIRED FOR THE PROPOSED WORK TO BE DONE AND IS RESPONSIBLE FOR COORDINATING ALL REQUIRED INSPECTIONS.
- ANY EXISTING SANITARY SEWER, SANITARY SEWER LATERALS, WATER MAIN, WATER SERVICES, STORM SEWER, STORM SEWER LATERALS OR OTHER EXISTING UTILITIES WHICH ARE DAMAGED DURING CONSTRUCTION SHALL BE REPAIRED TO THE UTILITY OWNER'S SATISFACTION AND AT THE CONTRACTOR'S EXPENSE.

CONSTRUCTION NOTES

- GENERAL:
- CONTRACTOR SHALL OBTAIN ANY REQUIRED PERMITS FROM WDNR, COUNTY AND LOCAL MUNICIPALITIES PRIOR TO COMMENCING CONSTRUCTION AND MEET ALL CONDITIONS OF PERMIT.
 - CONSTRUCTION ACCESS AND STAGING SHALL BE LOCATED IN UPLAND AREAS, AVOIDING WETLANDS AND SHALL BE COORDINATED WITH THE TOWN OF GIBLARTAR.
 - CONSTRUCTION SHOULD BE PERFORMED IN WINTER WHEN FLOW IS AT A MINIMUM AND THERE IS LITTLE CHANCE OF FLOODING.
 - CONTRACTOR SHALL PLACE A TEMPORARY CHAFFER DAM (AS SHOWN) TO DIVERT FLOW FROM PROJECT AREA WITHIN THE APRON. CHAFFER DAM SHALL REMAIN IN PLACE UNTIL CONCRETE HAS CURED A MINIMUM OF 7 DAYS.
 - WORK SCHEDULE SHALL CONFORM TO REQUIREMENTS OF THE TOWN OF GIBLARTAR AND WISCONSIN DEPARTMENT OF TRANSPORTATION.
 - ALL EXPOSED REINFORCING STEEL SHALL BE CUT OFF FLUSH WITH FINAL CONCRETE SURFACE.
 - ALL CONCRETE, DEMOLITION MATERIALS, AND EXCAVATED SOIL SHALL BE PROPERLY DISPOSED OF, OFF SITE.
 - ANY DAMAGE TO PAVEMENTS, LANDSCAPING OR EXISTING IMPROVEMENTS SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE.
 - CONTRACTOR SHALL IMPLEMENT APPROPRIATE BEST MANAGEMENT PRACTICES TO PREVENT EROSION AND SEDIMENT FROM LEAVING THE PROJECT AREA.
- CAST-IN-PLACE CONCRETE:
- CAST IN PLACE CONCRETE SHALL USE TYPE I PORTLAND CEMENT TO PROVIDE 28 DAY COMPRESSIVE STRENGTH OF AT LEAST 4000 PSI.
 - USE 3/4" MAXIMUM AGGREGATE SIZE. AGGREGATES SHALL CONFORM TO REQUIREMENTS OF ASTM C-33.
 - AIR CONTENT SHALL BE IN THE RANGE OF 4.5% TO 7.5% AT THE LOCATION AND TIME OF PLACEMENT.
 - THE CONCRETE SHALL HAVE A MAXIMUM SLUMP OF 5" WITH THE USE OF WATER REDUCERS AND A MAXIMUM SLUMP OF 8" WITH THE USE OF SUPERPLASTICIZERS.
 - CONCRETE PLACEMENT AND CURING SHALL BE IN ACCORDANCE WITH ACI-304.
 - REINFORCING STEEL SHALL BE GRADE 60 DEFORMED BARS WITH DETAILING, SUPPORT, AND PLACEMENT IN ACCORDANCE WITH ACI-304 AND ACI-318.
 - FINISH TEXTURE SHALL BE IN ACCORDANCE WITH THE TOWN OF GIBLARTAR AND DEPARTMENT OF TRANSPORTATION.

- CONCRETE TESTING:
- MAKE AND CURE ONE SET OF FOUR TEST CYLINDERS FOR EACH DAY'S POUR.
 - SAMPLE CONCRETE PER ASTM C172 AND CAST TEST CYLINDERS PER ASTM C31. MEASURE CONCRETE SLUMP PER ASTM C143, AIR CONTENT PER ASTM C231 AND TEMPERATURE PER ASTM C1064.
 - PERFORM COMPRESSIVE STRENGTH TESTS ON CYLINDER SETS AS FOLLOWS: (1) AT 7 DAYS, (2) AT 28 DAYS AND KEEP (1) IN RESERVE.

- BLOCK BAFFLES:
- BAFFLES SHALL CONSIST OF 6"x6" TREATED TIMBER, CUT TO DIMENSIONS AS SPECIFIED (SEE BLOCK BAFFLE DETAILS).
 - CONCRETE SHALL BE REPAIRED/PLACED ON EXISTING CONCRETE CURBS LOCATED ON THE INTERIOR OF THE BOX CULVERT PRIOR TO PLACEMENT OF THE BLOCK BAFFLES.
 - FASTENERS SHALL BE PLACED PER MANUFACTURER'S RECOMMENDATIONS.
 - BLOCK BAFFLES SHALL BE PLACED A MINIMUM OF 2" FROM THE BOTTOM OF THE BOX CULVERT TO ALLOW DEBRIS TO CLEAR.

APRON MODIFICATION AND BLOCK BAFFLE - DETAILS AND SPECIFICATIONS

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NO.	DATE	DESCRIPTION

Hwy 42 Box Culvert - Fish Passage
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Hwy 42, Fish Creek
Door County, Wisconsin

SCALE
HOR. 1"=10'
VER. 1"=10'
DATE
08/26/2019
JOB
20435-C
BY
EAS
CK
RGM

SHEET
2
OF
2



CALL 811 OR 1-800-242-8511
TDD (FOR HEARING IMPAIRED) 1-800-542-2289
WIS. STATUTE 182.0175 (1974)
REQUIRES MIN. OF 3 WORK DAYS
NOTICE BEFORE YOU EXCAVATE.

ALL UNDERGROUND UTILITY LOCATIONS SHOWN HEREON ARE BASED UPON FIELD SURVEY OF VISIBLE ABOVE-GROUND STRUCTURES, RECORDED MAPS OR DIGGERS HOTLINE MARKINGS. THE SURVEYOR HAS NOT LOCATED THE ACTUAL UNDERGROUND UTILITY. THE EXACT LOCATION OF ALL UTILITIES MUST BE FIELD LOCATED AND MARKED PRIOR TO BEGINNING ANY CONSTRUCTION.