

CITY of NOVI CITY COUNCIL

Agenda Item K February 25, 2019

SUBJECT: Approval to advance purchase a 14' x 7' Precast Box Culvert for the Flint/Bond Street Culvert Replacement project from Northern Concrete Pipe, Inc., in the amount of \$60,588.

SUBMITTING DEPARTMENT: Department of Public Works, Engineering Division

CITY MANAGER APPROVAL: *[Signature]*

EXPENDITURE REQUIRED	\$ 60,588.00
AMOUNT BUDGETED	\$ 662,724
APPROPRIATION REQUIRED	\$ 0
LINE ITEM NUMBER	210-211.00-865.129

BACKGROUND INFORMATION:

The realignment and reconstruction of Flint Street is part of the Capital Improvement Program for FY 2019-20. To facilitate the construction of the Flint/Bond Street road project, a culvert replacement is required where the Middle Branch of the Rouge River crosses Flint/Bond Street. Advance purchasing the box culvert will save the City at least three months' worth of lead time on the product ensuring the project begins when funds become available in FY2019-2020. Having the box culvert on hand prior to bid letting will allow the City to complete the road reconstruction and culvert replacement beneath Flint/Bond Street, before the end the 2019 construction season.

City Engineering Consultant AECOM reached out to the only two concrete pipe manufacturers in southeast Michigan and received a quote from both for a 14' x 7' Precast Box Culvert on February 1, 2019. Prior to obtaining a quote from the two concrete pipe manufacturers, AECOM verified through multiple sources that the two companies are the only fabricators that can produce a concrete box culvert of this size within Southeast Michigan. Engineering staff reviewed the quotes and determined the length and weight of each of the culvert sections from Northern Concrete Pipe (11 sections of 6' long Box Culvert @ 20 to 25 Tons per each section) when compared to the length and weight of Mack Industries heavier culvert sections (7 sections of 9'5" long Box Culvert @ 35 Tons per each section) is a key factor in the City's decision as to which manufacturer to recommend. By choosing Northern Concrete Pipe Company, Inc. to fabricate this culvert, the price difference of \$3,168 is minimal when compared to what it would cost for our future contractor on this project to bring in a larger crane to install the longer and heavier culvert sections from Mack Industries, Inc.

Therefore, Northern Concrete Pipe, Inc., is recommended as being in the best interest of the City. Attached in the packet is the award recommendation letter from City Engineering Consultant AECOM. The summary of the quotes are as follows:

Contractor	Price	Weight of Culvert	Sections
Northern Concrete Pipe, Inc.	\$ 60,588.00	20-25 Tons per Section	11 sections @ 6' Long
Mack Industries, Inc.	\$ 57,420.00	34 Tons per Section	7 sections @ 9'5" Long

The quotes from both manufacturers include the storage of the culvert (once manufactured) on their site/grounds as well as the delivery of the culvert to Flint Street. The installation of the box culvert is expected to begin after July 1, 2019.

RECOMMENDED ACTION: Approval to advance purchase a 14' x 7' Precast Box Culvert for the Flint/Bond Street Culvert Replacement project from Northern Concrete Pipe, Inc., in the amount of \$60,588.

Flint Street Streambank Stabilization and Culvert Replacement

Location Map



Map Author: Joseph Akers
 Date: June 4, 2018
 Project: Flint Street Streambank
 Stabilization and Culvert Replacement

Amended By:
 Date:
 Department:

MAP INTERPRETATION NOTICE

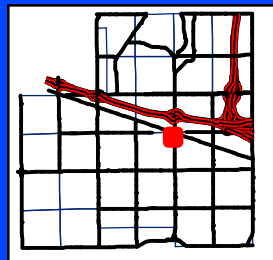
Map information depicted is not intended to replace or substitute for any official or primary source. This map was intended to meet National Map Accuracy Standards and use the most recent, accurate sources available to the people of the City of Novi. Boundary measurements and area calculations are approximate and should not be construed as survey measurements performed by a licensed Michigan Surveyor as defined in Michigan Public Act 132 of 1970 as amended. Please contact the City GIS Manager to confirm source and accuracy information related to this map.



Streambank
 Stabilization Site



Culvert
 Replacement



City of Novi

Engineering Division
 Department of Public Services
 26300 Lee BeGole Drive
 Novi, MI 48375
cityofnovi.org



1 inch = 167 feet





February 13, 2019

Mr. Joseph Akers
City of Novi
Engineering Department
26300 Lee BeGole Dr
Novi, MI 48375

Reference: Quote Analysis and PO Recommendation
Flint Street Culvert
AECOM Project Number 60580125

Dear Mr. Akers:

Attached are the two quotes we received for the referenced project from Mack Industries and Northern Concrete Pipe. AECOM has verified through multiple sources that the two companies in the previous sentence are the only two fabricators that could produce a box culvert of this size within southeast Michigan.

Northern Concrete Pipe's bid was \$3168 more than Mack Industries quote, however, the Mack sections weigh 34 tons each and the Northern Concrete Pipe sections weigh between 20 and 25 tons each.

We recommend issuing a PO to purchase the culvert to Northern Concrete Pipe in the amount of \$60,588. Although the Mack quote is lower, the additional cost when soliciting the installation bid from the contractor is expected to be greater than the \$3,168 difference included in prices submitted.

Please feel free to contact me if you need anything else or wish to discuss the project.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Mark Koskinen', with a long horizontal flourish extending to the right.

Mark Koskinen, P.E.
Project Manager

cc: George Melistas, City of Novi
Sean Kelsch, AECOM



QUOTE

Quote: 11594

Bid Date: 2/1/2019

Project Quote

Flint Street Culvert
Flint St. W of Novi Road
Oakland County (MI)
Novi, MI

Quantity UOM Description Unit Price UOM Total

Boxes / Bridges

14x7

66.00	LF	14' x 7' Precast Box Culvert	918.00	LF	60,588.00
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Proposed- 14' x 7' Precast Box Culvert will be manufactured to ASTM C-1577 Specifications w/ HS-25 Loading.

All MDOT Standard Joint Materials (butyl rope w/primer, filter fabric and mastic) are included.

A stamped design along w/ Load Ratings for "As Designed" conditions are included.

All threaded anchors for CIP Headwalls, Wingwalls and Aprons are included as noted on the plans, but all required threaded Rods for the CIP items are Not included and must be furnished by others.

Our design engineers could not provide a workable design to provide precast Headwalls and Wingwalls, they must remain as designed, CIP.

The bid pricing includes delivery to the job site, but MI sales tax (if applicable) is Not included.

The heaviest lift will weigh between 20 to 25 Tons/section. Lifting cables of the proper length and capacity must be furnished by others.

If awarded the project, we will provide our proposed shop drawings along with a stamped design from our design engineer within approx- 1 month after award. Provided that we receive the award as well as final approval of our proposed drawings and design by April 1st, we will manufacture the sections and have them ready for an early July delivery.

PRICES ARE FIRM THIRTY DAYS FROM DATE OF QUOTE ONLY
ALL PRICES QUOTED AS NET 30th AND SUBJECT TO NCPI's STANDARD TERMS AND CONDITIONS

Accepted By: _____

Date: _____

Jim Washabaugh

Print Name: _____

Engineering / Sales



401 Kelton St
Bay City, MI 48706
989-892-3545
989-892-3533 Fax

5281 Lansing Rd
Charlotte, MI 48813
517-645-2777
517-645-7774 Fax

2701 Chicago Dr SW
Wyoming, MI 49519
616-608-6025
616-608-7807 Fax

4950 White Lake Rd
Clarkston, MI 48346
248-795-2431
248-795-2463 Fax

3756 Centennial Rd
Sylvania, OH 43560
419-841-3361
419-841-3321 Fax

QUOTE

Quote: 11594

Bid Date: 2/1/2019

**NORTHERN CONCRETE PIPE, INC.
STANDARD TERMS AND CONDITIONS**

This Quotation is Seller's method of acceptance of an order. Seller's acceptance is limited to the terms of this Quotation, and even if Buyer does not sign and return this document, Buyer's acceptance of delivery of materials hereunder shall serve as Buyer's confirmation that this document constitutes the parties entire agreement. If Buyer issues a document and/or Purchase Order of its own, this Quotation shall supersede the terms of Buyer's document.

All Quotations are open for acceptance by the Buyer for 30 days from the bid date, and if not accepted in its entirety and all submittals approved within that time, will be deemed to be withdrawn, unless otherwise agreed to in writing by the Seller. The Quantity, Size And Description of the materials in this Quotation are generally that of others, should not be relied on for bidding purposes and must be verified by Buyer at time of acceptance.

This Quotation may not be changed or modified except in writing and signed by Seller, and waiver by Seller of one provision herein, or one provision on one occasion, does not constitute waiver as to any other provision or waiver for other occasions.

Seller's prices do not include sales or use tax, any and all responsibility for which is assumed by Buyer.

Acceptance of Quotation shall be conditioned upon the Buyer establishing appropriate credit.

Payment terms are cash - due net in the month following the month of delivery and will be referred to in billing as Net 30th. If payment has not been received by the end of the second month following the month of delivery the account will be considered past due and shall be subject to a SERVICE CHARGE of one and one-half percent (1½%) per month thereafter on the unpaid balance representing a TIME-PRICE DIFFERENTIAL pursuant to MSA§19.15 (1). This amounts to an ANNUAL PERCENTAGE RATE of 18% per year.

Unless this Quotation otherwise specifies in writing, it is made on the condition that full delivery will be taken within six (6) months from acceptance of order. Any product delivered after this period may be subject to an increase in price for each six (6) month period from acceptance of order up to the list price as shown on Manufacturers then current price list. Seller will invoice in full and charge one percent (1%) per month of the selling price for all boxes, bridges and 48" and larger (equivalent) diameter pipe not delivered within 30 days of the originally scheduled delivery date.

Materials are quoted F.O.B. tailgate of truck in truckload lots, during Seller's normal working hours, as near to jobsite as is accessible to trucks under own power, without risk of accident, vehicle damage, injury or undue delay. The purchaser shall provide and maintain suitable access roads to the project site for delivery of product. ONE (1) HOUR is the time allowed for unloading of truck - after that a delay on site fee of \$200.00 per hour will be assessed. Buyer may be assessed a delay in release fee, up to \$500.00 per load, for material that is released for shipment, loaded on trucks and then the release is delayed or cancelled. Less than truckload lots delivered at \$3.00/mile each way.

Seller shall not be liable for nonperformance or delay in delivery due to acts of God, labor disputes, local labor shortages, fire, war, terrorism, flood or other casualty, governmental regulations or requirements, shortages or failure of raw materials, supplies, fuel, power or transportation, breakdown of equipment, or any other causes beyond Seller's control, whether of similar or dissimilar nature than those enumerated. In no event shall Seller be liable for any consequential damages or claims resulting from failure or delay in delivery.

The products sold hereunder shall be subject to Seller's standard manufacturing variations, tolerances and classifications.

The Buyer will inspect Seller's products at the time of delivery and any claims in respect thereto (damage, shortage or other alleged cause) shall be made at that time by entering the full details thereof on the delivery receipt. Seller's liability for defective or shortage of product is limited to replacement of same at the Seller's cost, and Seller shall not be liable for consequential, indirect or incidental damages, including without limitation any liquidated damages or penalties of any kind which Buyer may incur. Seller assumes no obligations for expenses of any kind, whether arising from delays during replacement of materials for cause or otherwise.

Installation is under Buyer's supervision and is solely Buyer's responsibility. Seller vacuum tests sanitary sewer concrete pipe and will not assume any responsibility regarding Buyer's installation techniques and/or final air test results. Unless expressly agreed in writing and signed by Seller, Seller shall not be responsible for the results of any instructions or technical advice in connection with the design, installation or use of the products sold hereunder. A field representative of Seller may from time to time be present on the jobsite and will work with and be of assistance to Buyer but has no authority to modify this or other provisions hereof or otherwise bind Seller.

Special precast concrete products are not subject to cancellation or return and any special product not taken will be charged to Buyer at the quoted price plus a disposal fee. Other materials when returned for credit will be subject to freight charges and the acceptance of Seller with a minimum of 25% handling charge deducted from the saleable returns.

There are no warranties, representations, conditions or agreements between Seller and Buyer other than as set out in this Quotation. Quotation is subject to availability of materials from vendors and/or third party suppliers. There is no implied warranty or condition except an implied warranty of title to and freedom from encumbrance of, the products sold hereunder and in respect of products bought by description that they are of merchantable quality. SELLER EXPRESSLY DISCLAIMS ALL RESPONSIBILITY FOR DESIGN OF THE PROJECT BY OTHERS AS WELL AS HANDLING AND INSTALLATION OF THE MATERIALS BY BUYER AND DAMAGES ATTRIBUTABLE THERETO VOID ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED.

In the event the payment terms set forth in Paragraph 6 are not timely honored and Seller files a lien or asserts a claim against the bond, whichever is applicable, Buyer shall be responsible for and shall pay all of Seller's reasonable costs, including but not limited to, filing and recording fees, attorney fees, litigation expenses, court costs and expert fees.

Should any part or provision of this agreement be declared invalid, unenforceable, illegal or in conflict with any law, the validity and enforceability of the remaining portions or provisions or portions of provisions shall not be affected.

Returns: No special items may be cancelled or returned for credit without paying full price plus a disposal fee of \$15.00 per ton. If customer returns standard stock items to our yard in good, saleable, truck ready condition credit will be 100% on standard, non-special items only. If NCP picks up and returns standard product that is in good condition the credit will be 75% plus freight. If lightly damaged, but patchable standard products get picked up by NCP, the credit will be 25% plus freight, since we will have to sell them as seconds. If NCP is forced to pick up product that is already in seconds condition, no credit will be issued for the material, and you will be invoiced for the cost to return the material, plus a \$15.00 per ton disposal fee. NCP will not pick up junk product for return, please dispose of it on the jobsite.

**PRICES ARE FIRM THIRTY DAYS FROM DATE OF QUOTE ONLY
ALL PRICES QUOTED AS NET 30th AND SUBJECT TO NCPI's STANDARD TERMS AND CONDITIONS**

Accepted By: _____

Date: _____

Jim Washabaugh

Print Name: _____

Engineering / Sales



MACK INDUSTRIES, INC.

8265 WHITE LAKE ROAD • WHITE LAKE, MI 48386
PHONE: 248-620-7400 • FAX: 248-327-1905



DATE: January 31, 2019

TO: City of Novi
c/o AECOM
27777 Franklin Road, Suite 2000
Southfield, MI 48034
ATTN.: Mark Koshinen, P.E.

PROJECT
Flint Street Culvert
Novi, MI

QM 13749

P R O P O S A L

ITEM NO.	QTY	DESCRIPTION	UNIT PRICE	TOTAL
66		L.F. - 14'-0" x 7'-0" Precast Concrete Box Culvert to include:	\$ 870.00	\$ 57,420.00
		7 - Sections, each 9'-5", weight 34 tons		
		1 - Lot Joint Primer & Sealant		
		1 - Lot Top & Side Joint Membrane Waterproofing		
		1 - Lot Cast-in Inserts for Headwalls & Wingwalls		
		1 - Lot Structural Design Calculations for MDOT HL-93 modified loading		
		1 - Lot Submittals		
		Freight to project site		
		<u>Optional</u>		
2		Precast Concrete Detachable Headwalls w/installation hardware & structural design calculations, freight	\$ 3,131.00	\$ 6,262.00
4		Precast Concrete Freestanding Wingwalls with integral footer to include:	\$ 14,576.00	\$ 58,304.00
		1 - Lot Cast-in Inserts for CIP Apron		
		1 - Lot Cast-in Inserts with Galvanized Joint Straps & Anchor Bolts		
		1 - Lot Structural Design Calculations		
		Freight to project site		

BID TOTAL: \$ 121,986.00
(PLUS APPLICABLE MI SALES TAXES)

NOTES:

- Price includes freight to the project site in truck-load quantities; partial loads will result in additional freight charges.
- Below signature of acceptance or issuance of purchase order is considered an acceptance of Mack Industries' standard terms and conditions which are available upon request.
- Above pricing is based upon complete order of above items, if purchaser deletes items, Mack reserves the right to re-price the project.

TERMS: NET 30 DAYS

P.O. NO.: _____

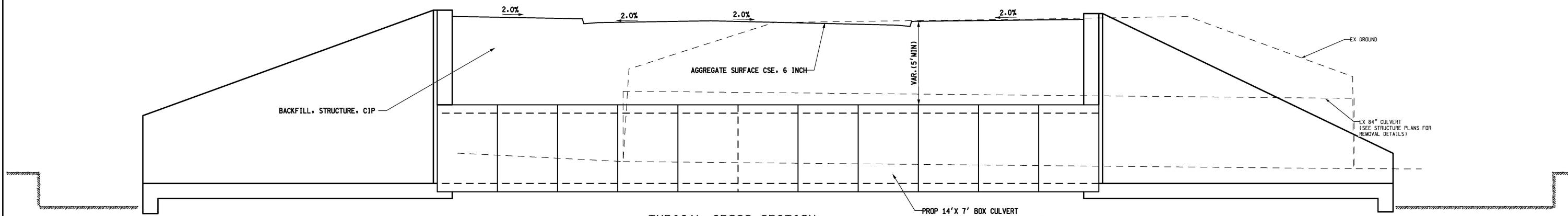
ACCEPTED BY: _____
(SIGNATURE)

DATE: _____

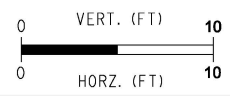
Regards,
Mark Hilty
248-361-2238 • 724-968-9283
mhilty@mackconcrete.com

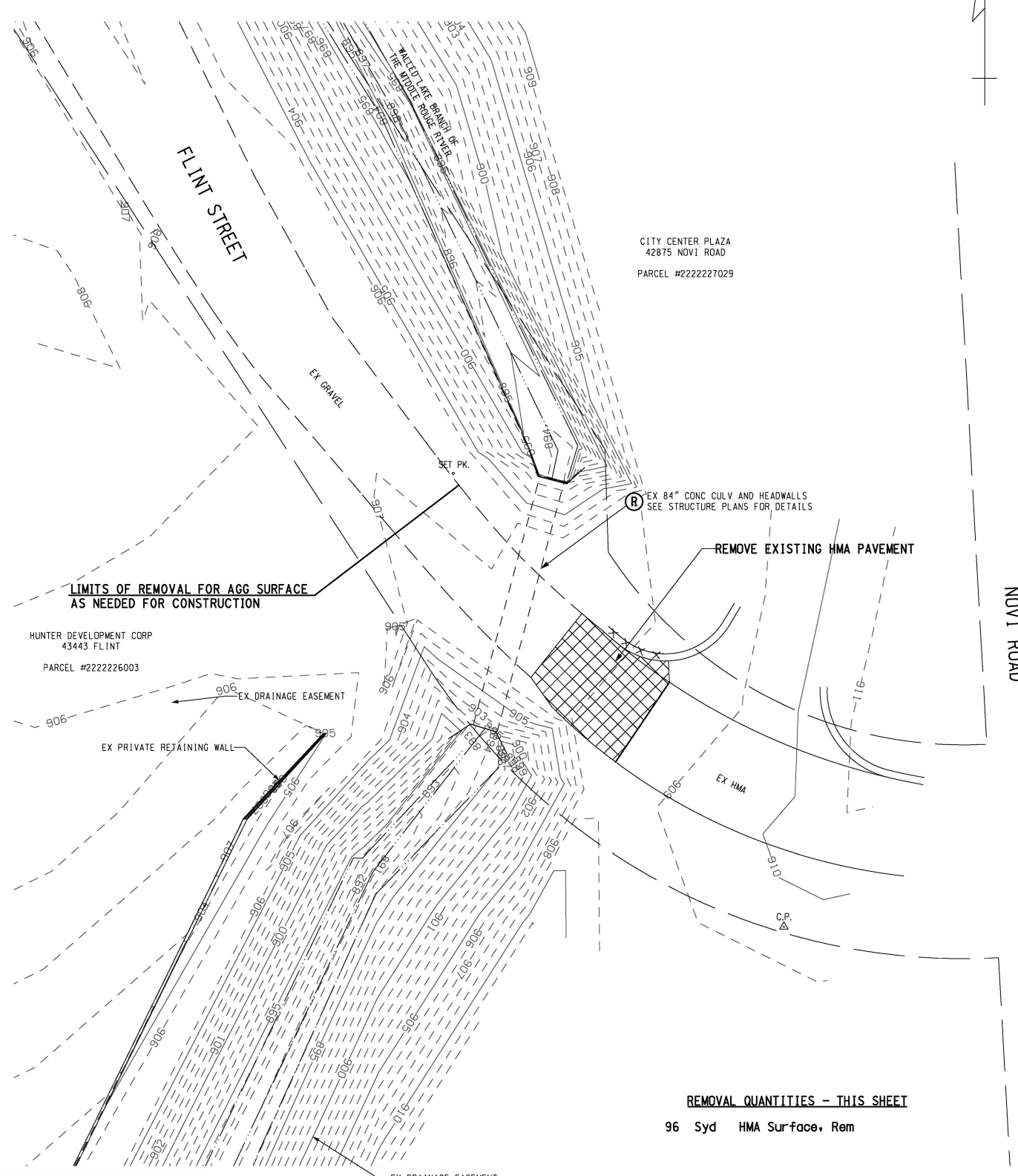


CITY OF NOVI - FLINT ST CULVERT
 TYPICAL CROSS SECTION



TYPICAL CROSS SECTION
 SCALE: 1"=8'
 TO APPLY:
 FLINT STREET
 OVER BOX CULVERT

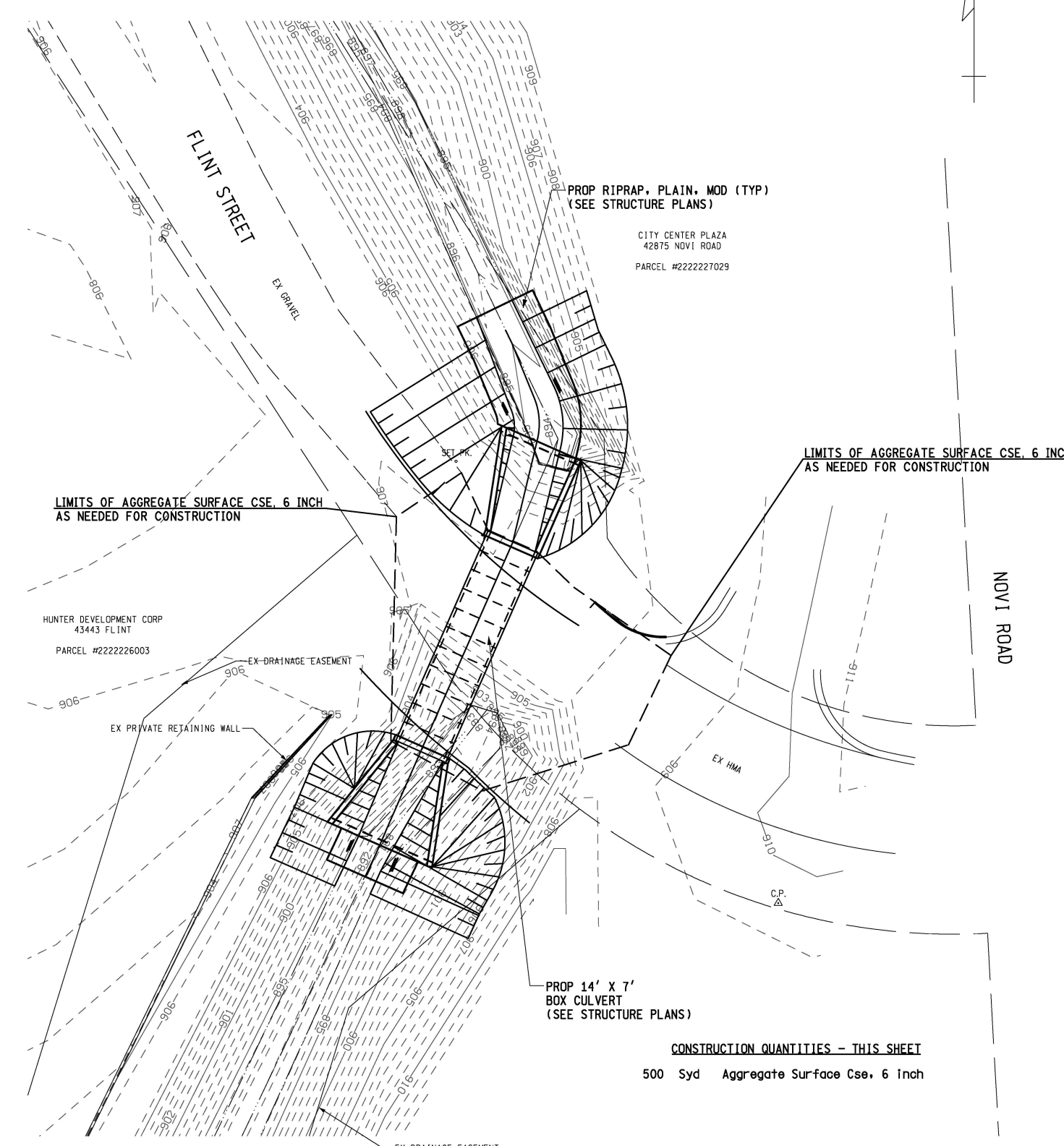




REMOVAL LEGEND	
REMOVING SIDEWALK	
REMOVING PAVEMENT	
REMOVING CURB, GUTTER AND CURB & GUTTER	
REMOVING	(R)
CLEARING	(C)

REMOVAL QUANTITIES - THIS SHEET
 96 Syd HMA Surface, Rem

REMOVAL PLAN



CONSTRUCTION QUANTITIES - THIS SHEET
 500 Syd Aggregate Surface Cse, 6 inch

CITY OF NOVI BENCHMARK 2312
 X ON NORTH RIM OF GATEWELL, LOCATED IN THE SOUTH EAST QUAD
 OF INTERSECTION MAIN STREET AND NOVI ROAD, 10 FEET SOUTH
 OF BACK OF CURB AND 5 FEET SOUTHEAST OF TRAFFIC POLE
 NORTH: 357828.62
 EAST: 13363850.08
 ELEV: 914.50

CONSTRUCTION PLAN

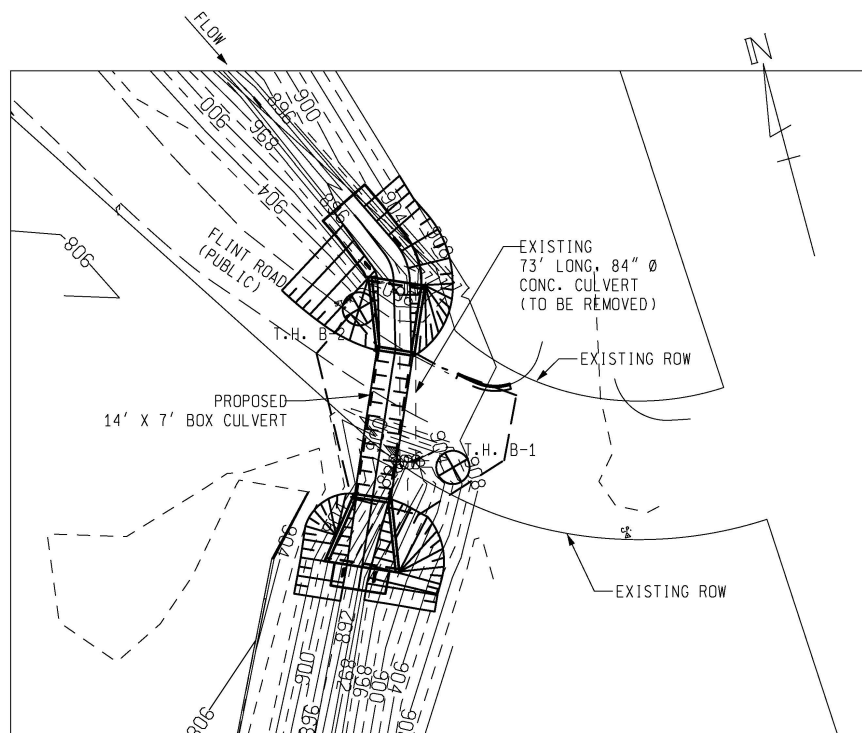


FILE: 80125-FLINTSTCULV-PLAN.DGN		
AUTH	DATE	REVISION

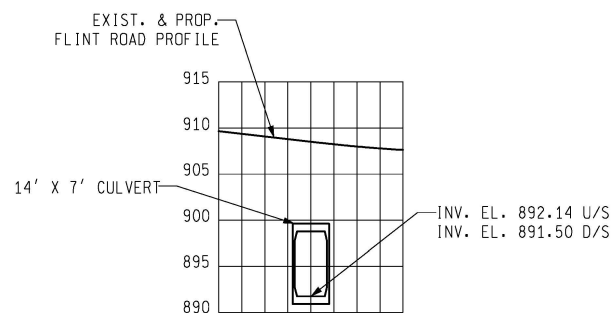


CITY OF NOVI - FLINT ST CULVERT
 REMOVAL AND CONSTRUCTION PLAN

JOB	60580125
DATE	09/27/18
SHEET	12



SITUATION PLAN
SCALE 1" = 40'

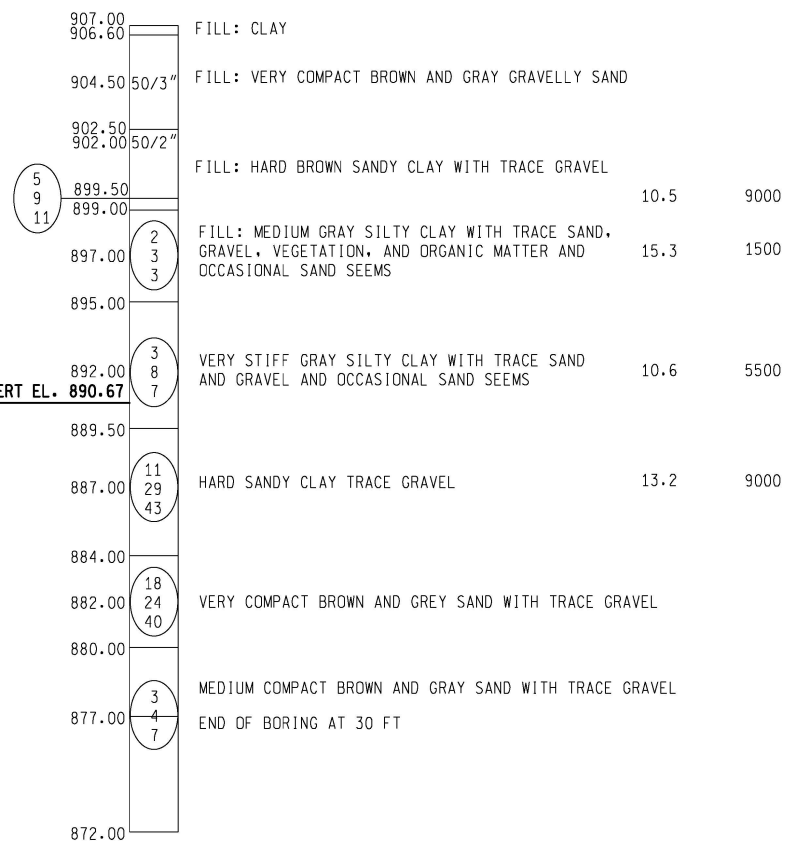


FLINT STREET PROFILE

SUMMARY OF HYDRAULIC ANALYSIS							
EXISTING				PROPOSED			
FLOOD DATA	DIS-CHARGE (CFS)	WATER SURFACE ELEV. AT U/S FACE OF STRUCTURE	VELOCITY IN D/S CHANNEL (FPS)	WATER SURFACE ELEV. AT U/S FACE OF STRUCTURE	VELOCITY IN D/S CHANNEL (FPS)	WATERWAY AREA (SFT) AT D/S FACE	CHANGE IN WS EL U/S OF PROPOSED STRUCTURE
50 YEAR	700	907.76	11.06	900.70	7.94	84	-7.06
100 YEAR	800	908.09	11.49	901.80	8.13	84	-6.29
MAXIMUM BRIDGE AREA BELOW LOW CHORD IS 96 SQUARE FEET							

THE WATER SURFACE AND/OR ENERGY GRADE ELEVATIONS SHOWN ON THE ABOVE HYDRAULIC TABLE ARE TO BE USED FOR COMPARISON PURPOSES ONLY AND ARE NOT TO BE USED FOR ESTABLISHING A REGULATORY FLOODPLAIN. THE ELEVATIONS MAY BE USED PROVIDED THEY ARE VERIFIED WITH THE LAND AND WATER MANAGEMENT DIVISION, MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY.

TEST HOLE B-1
GROUND SURFACE ELEVATION: 907.0 ft BORING DATE: 10/21/09 MC HP



NOTES: GROUND WATER SEEPAGE AT 12 FEET DURING DRILLING; GROUND WATER ENCOUNTERED AT 23 FEET DURING DRILLING; 24 FEET UPON COMPLETION. BORE HOLE COLLAPSED AT 24 FEET AFTER AUGER REMOVAL.

NOTES:

THE DESIGN OF THIS STRUCTURE IS BASED ON CURRENT AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES HS25 LOADING. LIVE LOAD PLUS IMPACT DEFLECTION DOES NOT EXCEED 1/600 OF SPAN LENGTH. THE LOAD FACTOR METHOD OF DESIGN WAS USED FOR THIS STRUCTURE.

THE DRAINAGE AREA CONTRIBUTORY TO THIS CROSSING IS 8.6 SQUARE MILES.

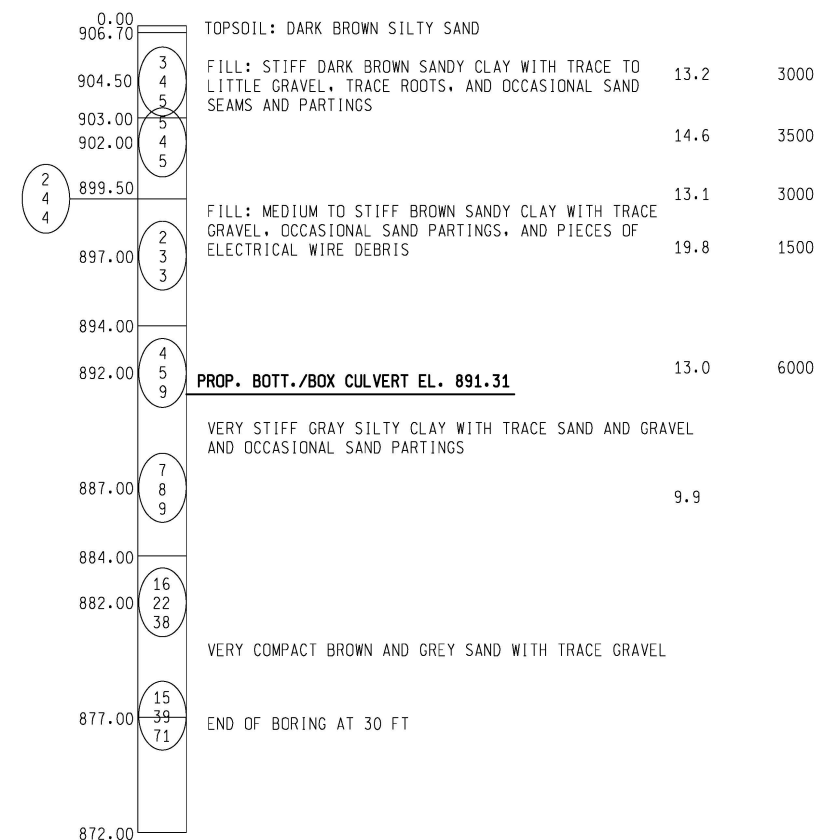
THE WATER SURFACE AND/OR ENERGY GRADE ELEVATIONS SHOWN ON THE ABOVE HYDRAULIC TABLE ARE TO BE USED FOR COMPARISON PURPOSES ONLY AND ARE NOT TO BE USED FOR ESTABLISHING A REGULATORY FLOODPLAIN.

WITHOUT THE PREVENTIVE MEASURE SHOWN ON THESE PLANS, THERE IS A POSSIBILITY THAT STREAM BED SCOUR MAY OCCUR.

GEOTEXTILE LINER SHALL BE PLACED ON ALL SLOPES PRIOR TO PLACING RIPRAP. PAYMENT FOR GEOTEXTILE LINER SHALL BE INCLUDED IN PAYMENT FOR RIPRAP.

THE RIPRAP QUANTITY IS BASED ON THE LATERAL DIMENSIONS OF THE AREA TO BE PROTECTED, REGARDLESS OF THE NUMBER OF LAYERS.

TEST HOLE B-2
GROUND SURFACE ELEVATION: 907.0 ft BORING DATE: 10/21/09 MC HP



NOTES: GROUND WATER SEEPAGE AT 15 FEET DURING DRILLING; GROUND WATER ENCOUNTERED AT 28 FEET DURING DRILLING; DRY UPON COMPLETION. BORE HOLE COLLAPSED AT 12 1/2 FEET AFTER AUGER REMOVAL.

NOTES:

NUMBERS IN ELIPSE DENOTE NUMBER OF BLOWS REQUIRED TO DRIVE A 2" O.D. (1 1/2" I.D.) SPLIT SPOON SAMPLER 3 SUCCESSIVE 6" INCREMENTS USING A 140 LBS. HAMMER FALLING 30".

(WHERE THE SAMPLER IS DRIVEN DISTANCES OTHER THAN 18", THE DISTANCE IS SHOWN WITH THE NUMBER OF BLOWS IN THE FORM OF A FRACTION.)

31/4" NUMBER OF BLOWS/DISTANCE DRIVEN

CONSISTENCY WAS DETERMINED BY INSPECTION OF SAMPLES AND SUBSTANTIATED BY SOILS RESISTANCE TO DRILLING TOOLS.

WATER LEVELS MAY BE INFLUENCED BY RESIDUAL BORING WATER.

THE SOIL BORING LOGS REPRESENT POINT INFORMATION. PRESENTATION OF THIS INFORMATION IN NO WAY IMPLIES THAT SUBSURFACE CONDITIONS ARE THE SAME AT LOCATIONS OTHER THAN THE EXACT LOCATION OF THE BORING.

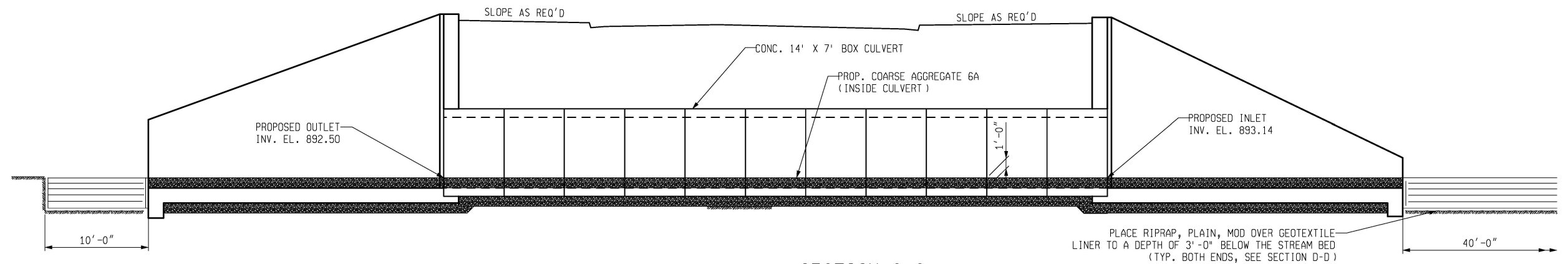
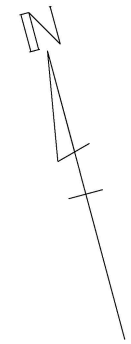
MC = PERCENT MOISTURE CONTENT
HP = HAND PENETROMETER TEST, SHEAR STRENGTH - KIPS/SQ.FT (KSF)

FILE: 80125-FLINTSTCULV-DET1.DGN

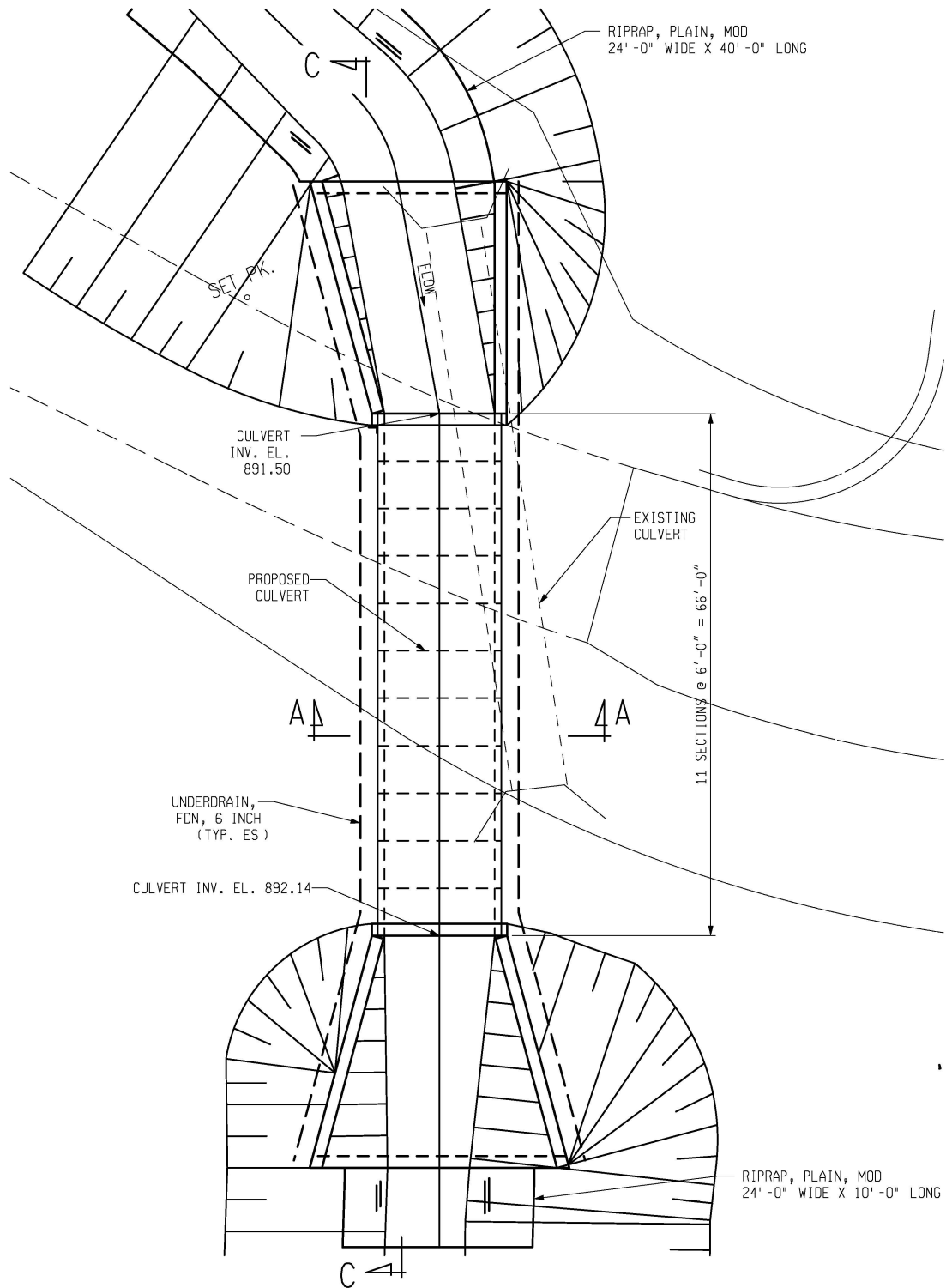


CITY OF NOVI - FLINT ST CULVERT

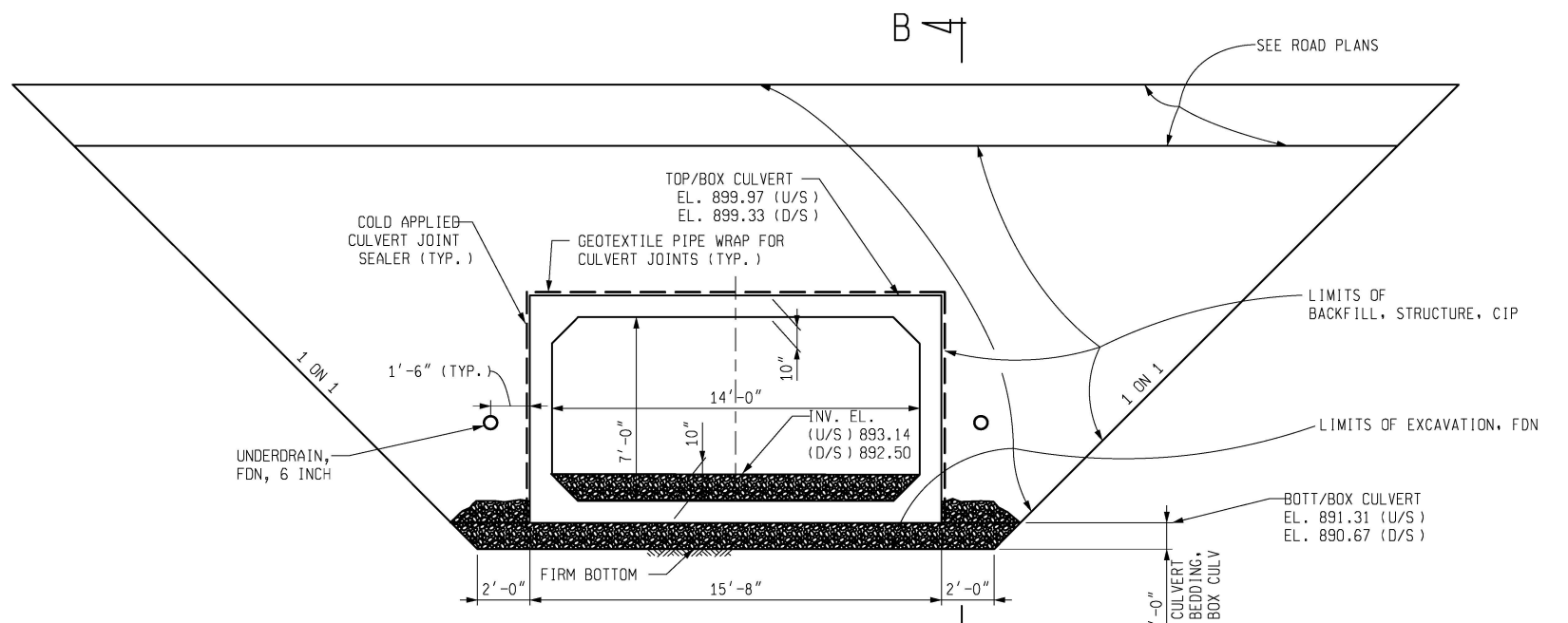
CULVERT DETAILS



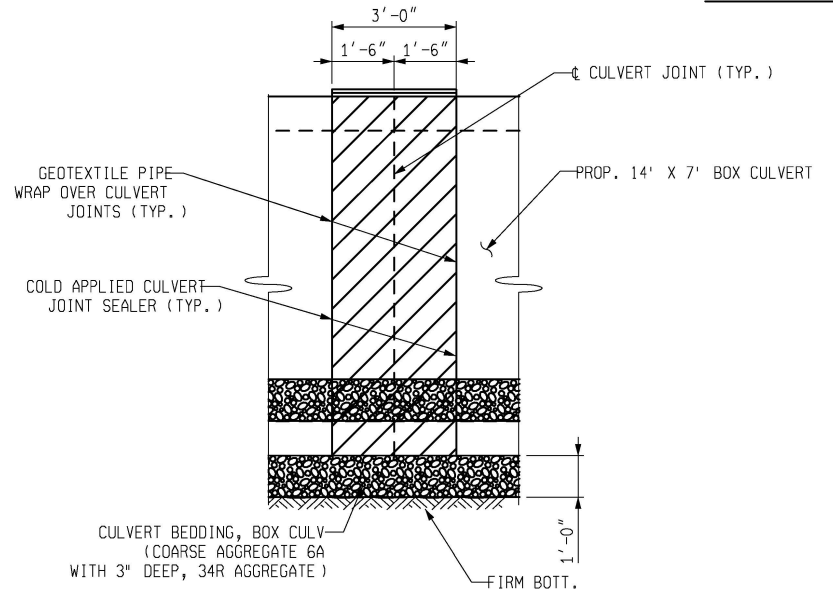
SECTION C-C



PLAN



SECTION A-A



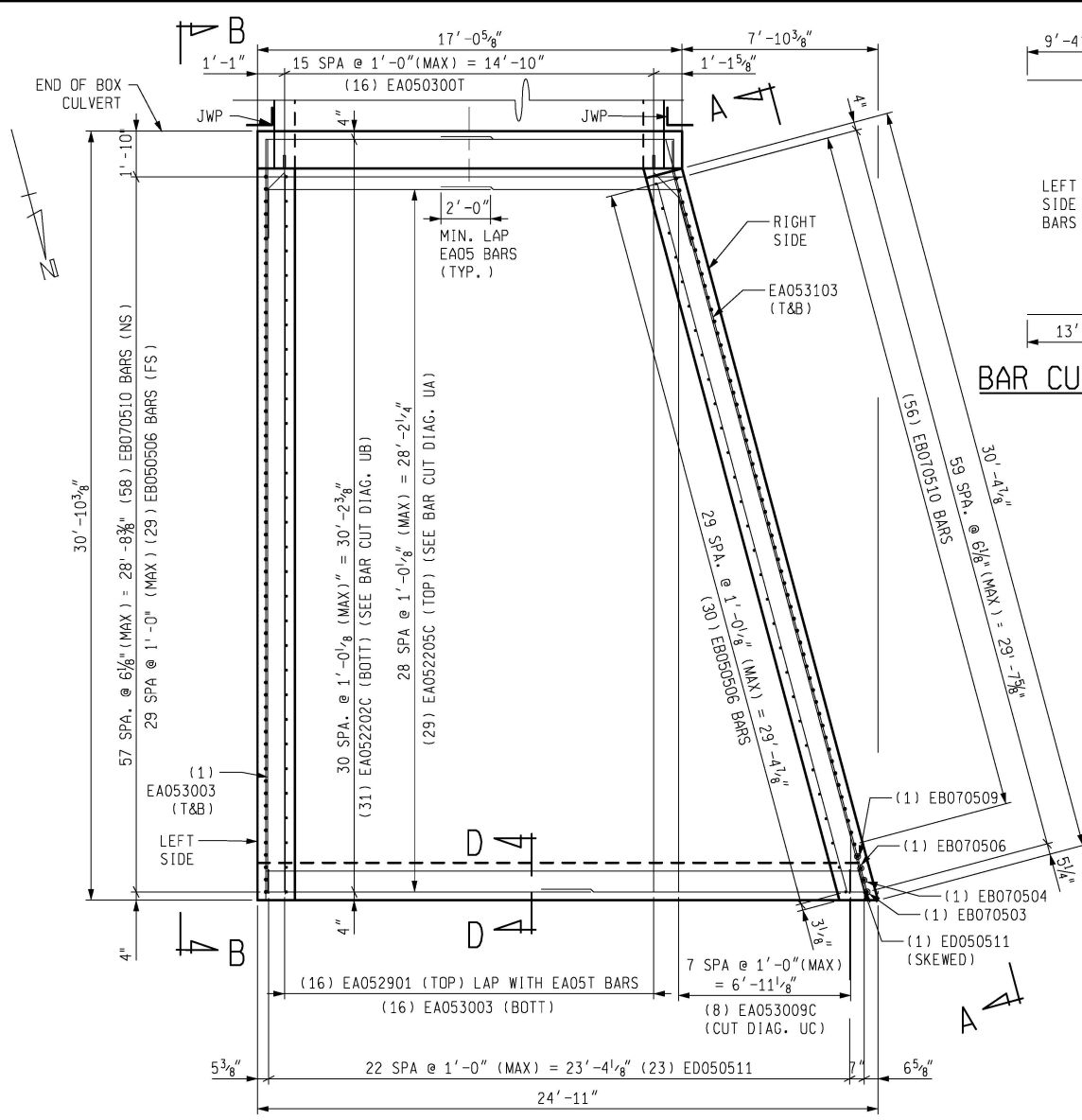
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FILE: 80125-FLINTSTCULV_DET2.DGN
AUTH DATE REVISION

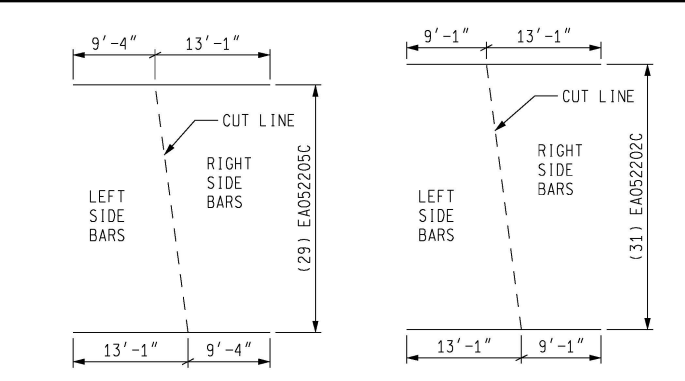


CITY OF NOVI - FLINT ST CULVERT
CULVERT DETAILS

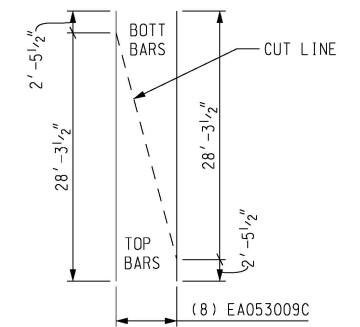
JOB 60580125
DATE 09/27/18
SHEET 14



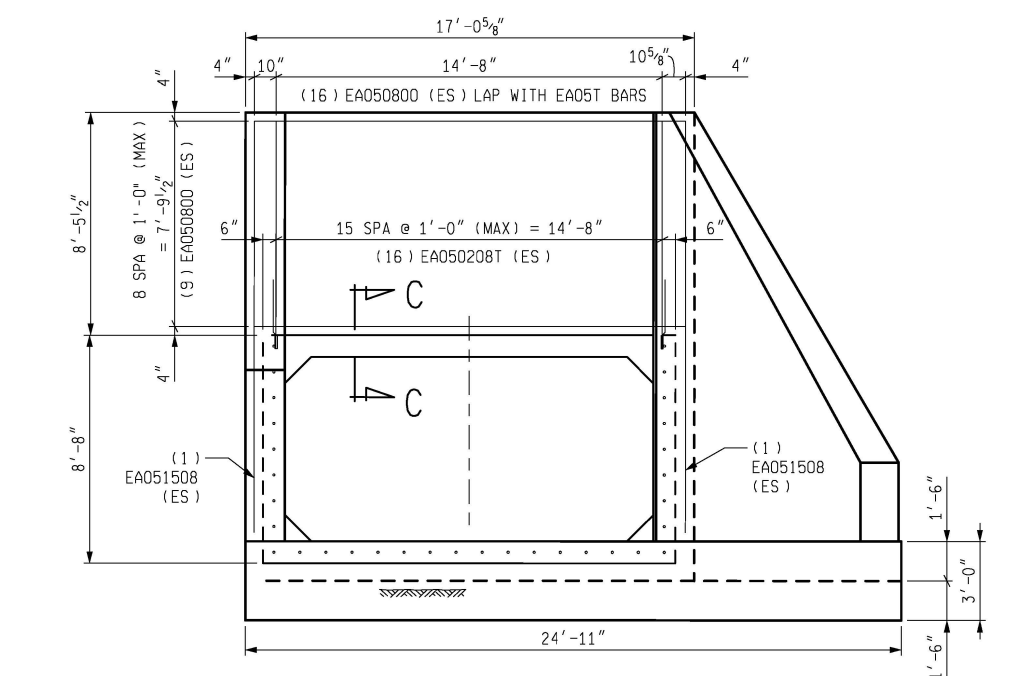
UPSTREAM PLAN



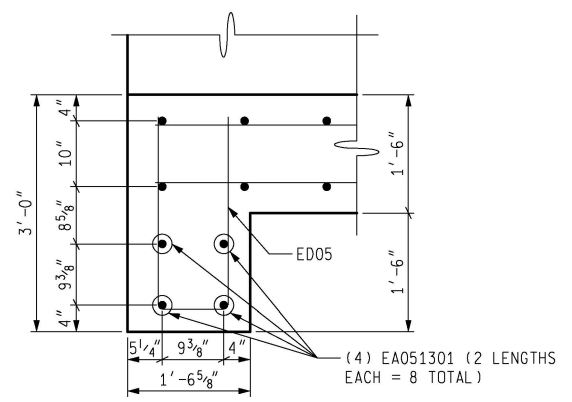
BAR CUT DIAGRAM UA BAR CUT DIAGRAM UB



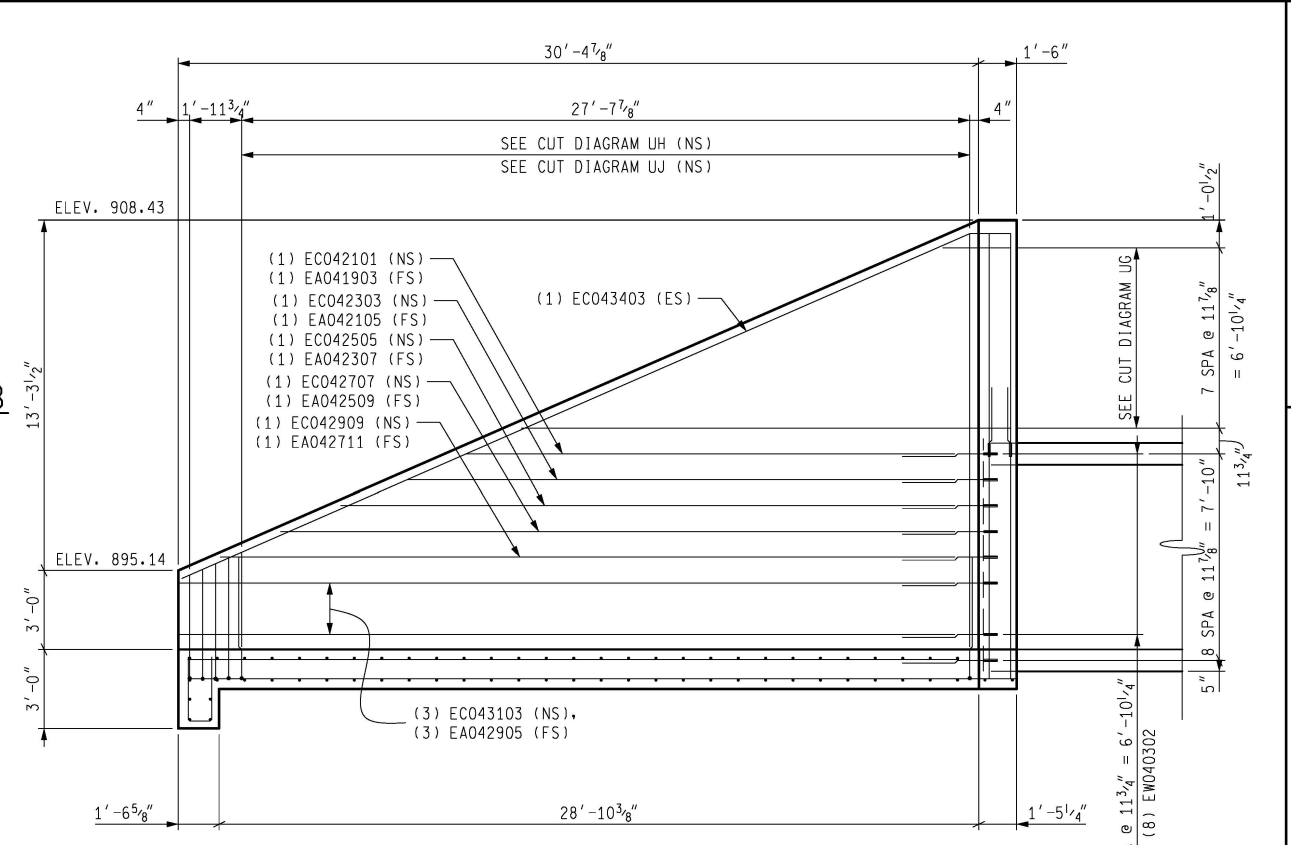
BAR CUT DIAGRAM UC



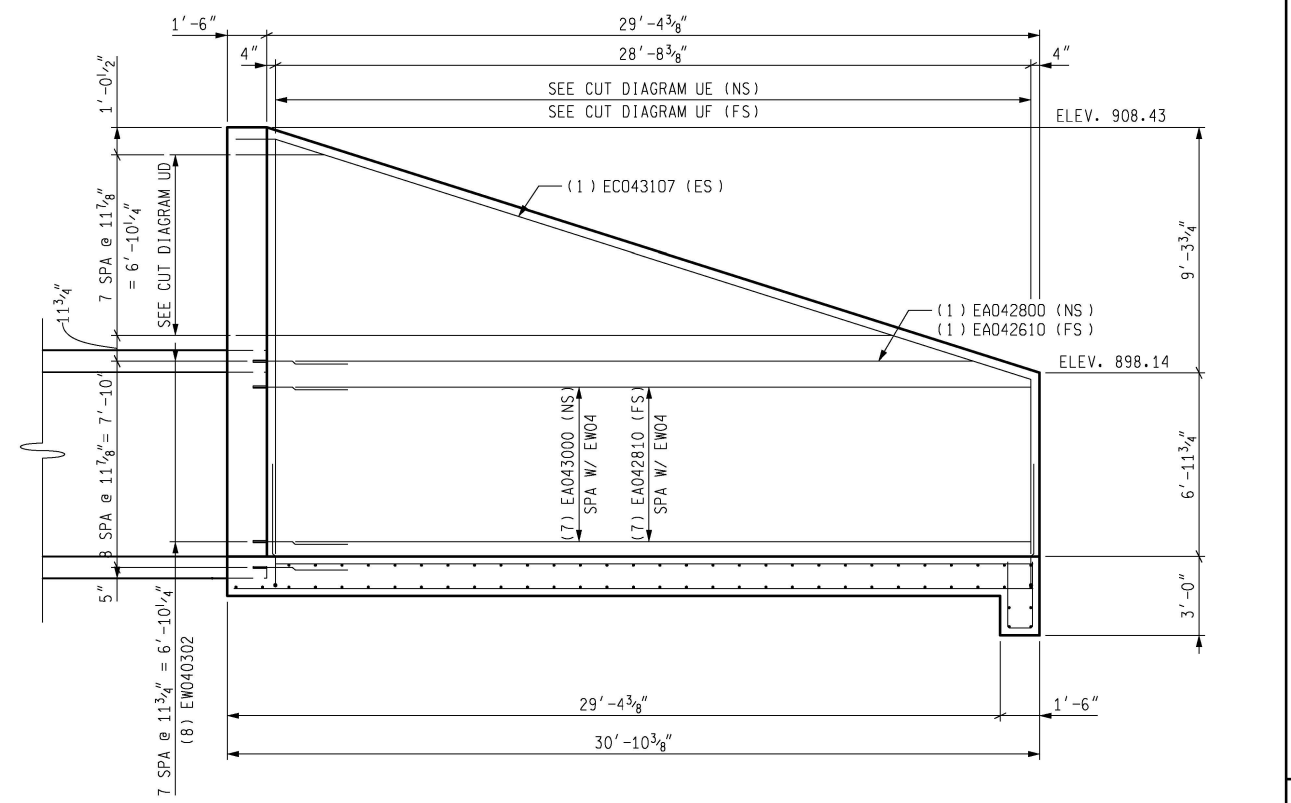
UPSTREAM ELEVATION



SECTION D-D



SECTION A-A
RIGHT SIDE



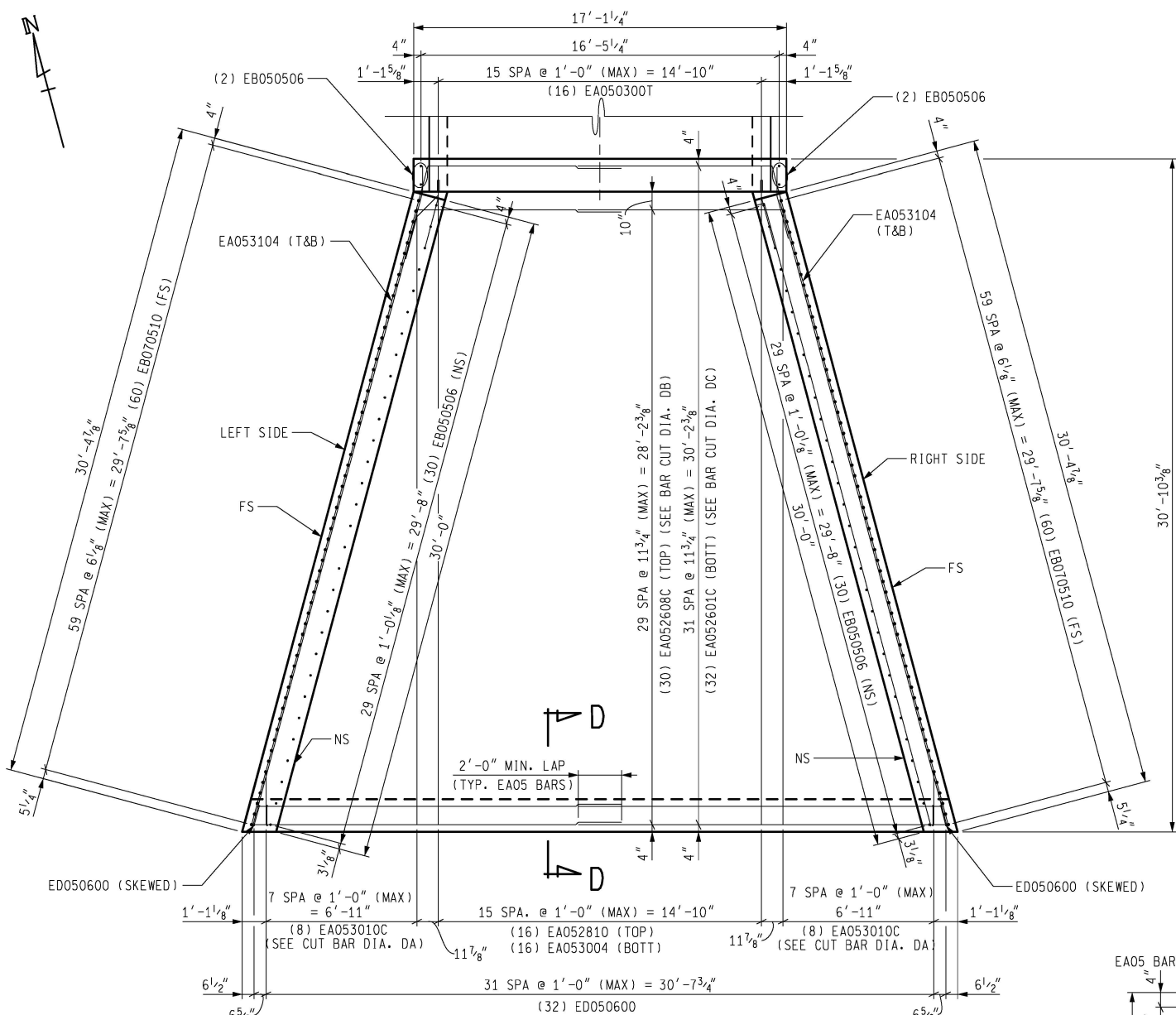
SECTION B-B
LEFT SIDE

FILE: 80125-FLINTSTCULV-DET3.DGN
AUTH DATE REVISION

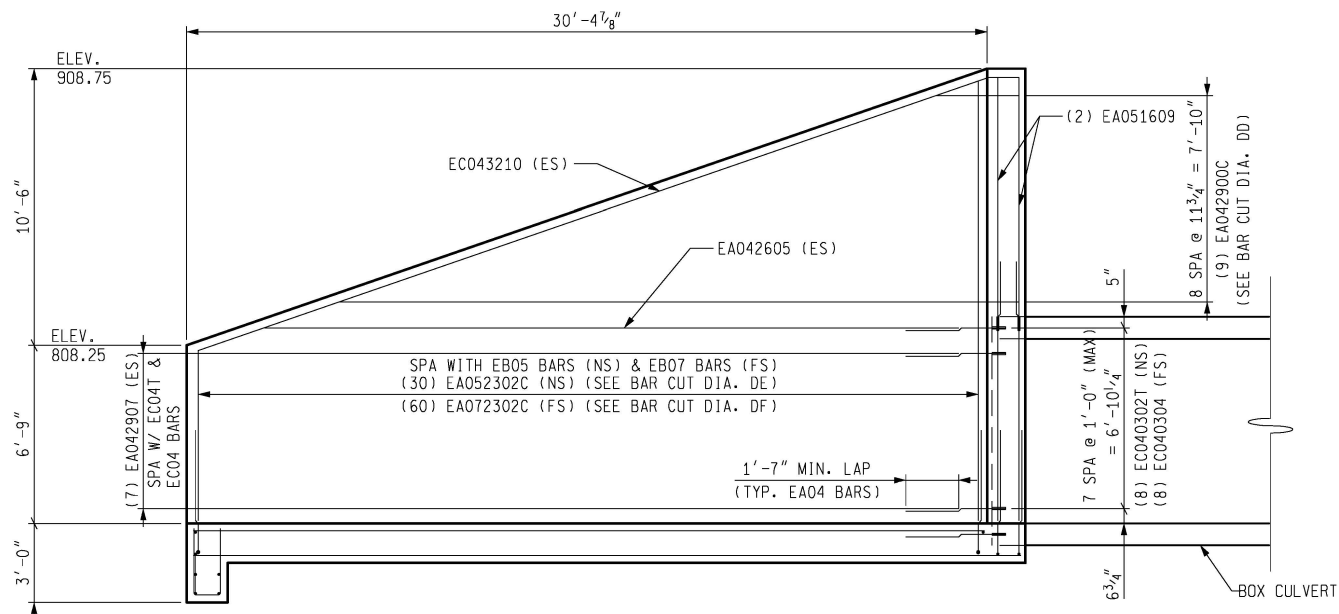


CITY OF NOVI - FLINT ST CULVERT
CULVERT DETAILS

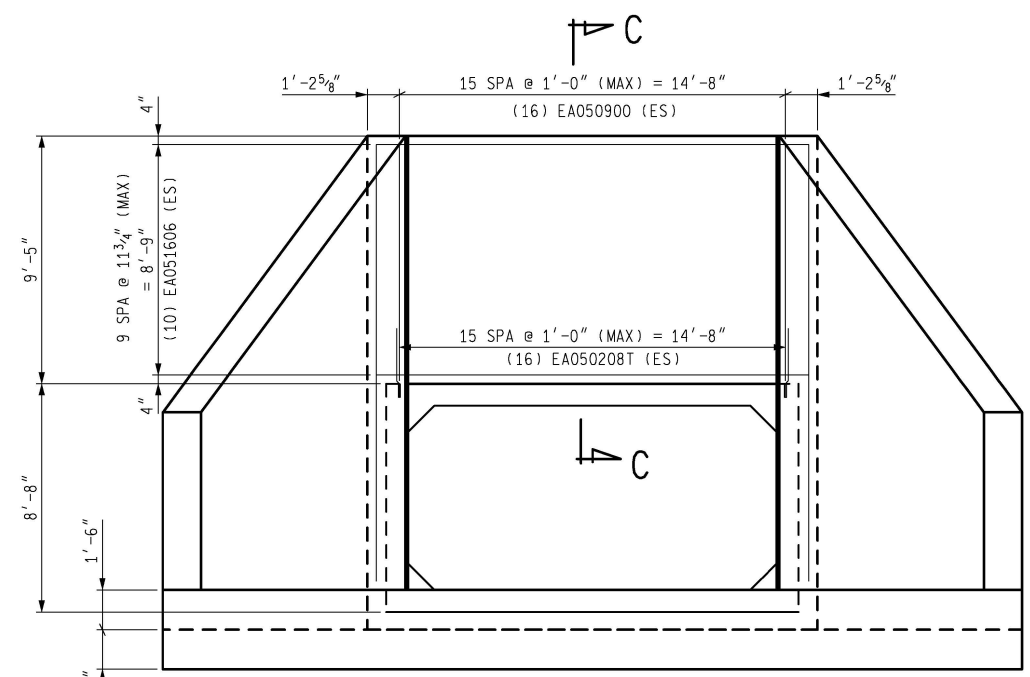
JOB 60580125
DATE 09/27/18
SHEET 15



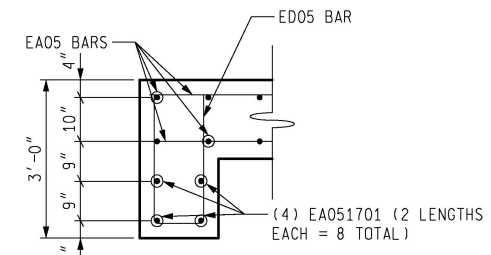
DOWNSTREAM PLAN



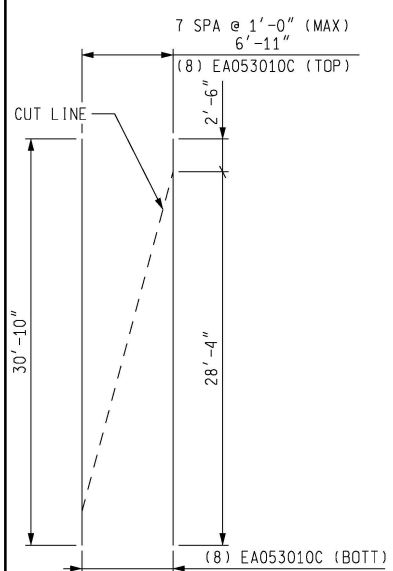
TYPICAL WINGWALL ELEVATION
(2 PLACES)



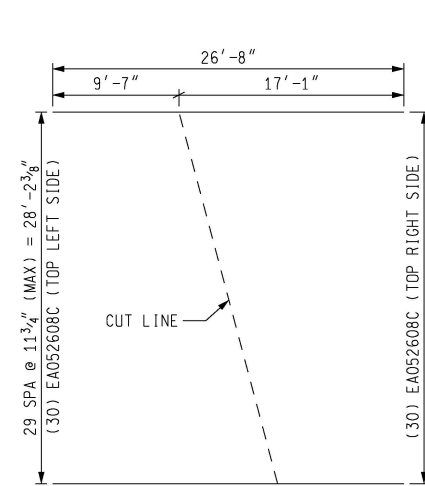
DOWNSTREAM ELEVATION



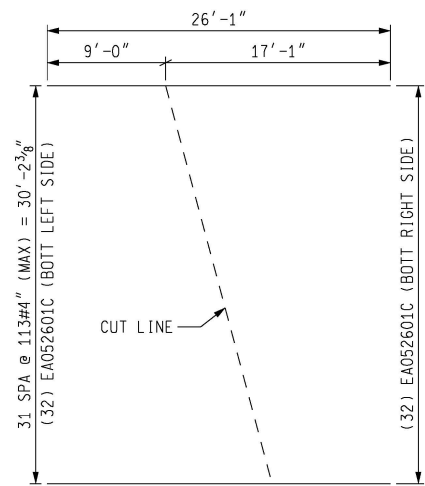
SECTION D-D



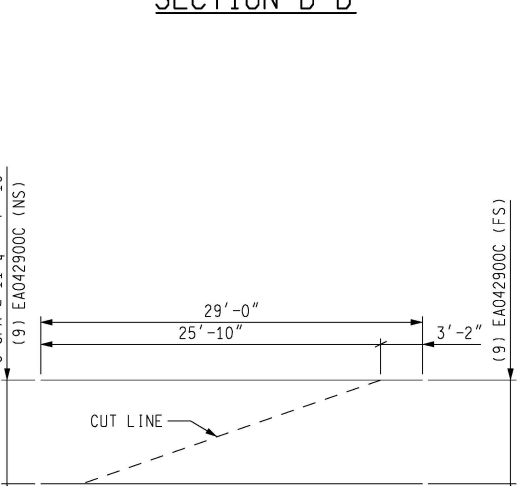
BAR CUT DIA. DA
(2 SETS)



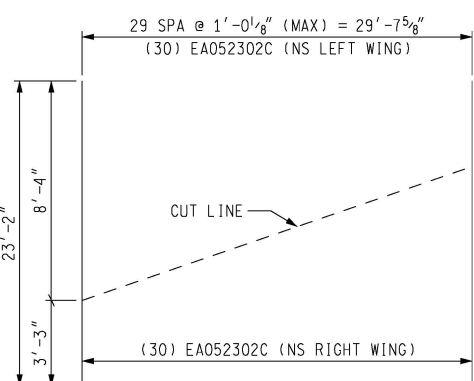
BAR CUT DIA. DB
(1 SET)



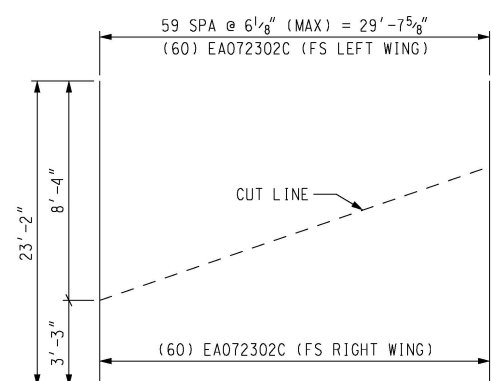
BAR CUT DIA. DC
(1 SET)



BAR CUT DIA. DD
(2 SETS)

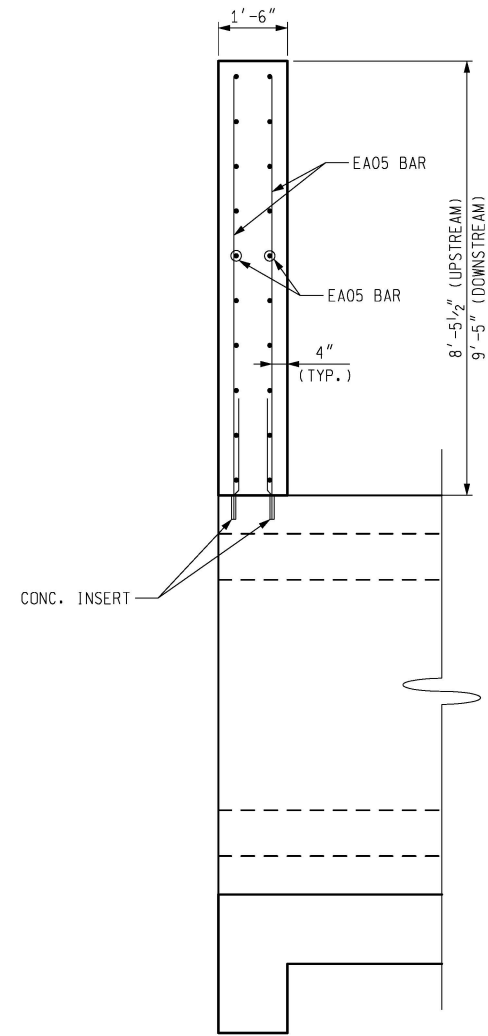


BAR CUT DIA. DE
(1 SET)

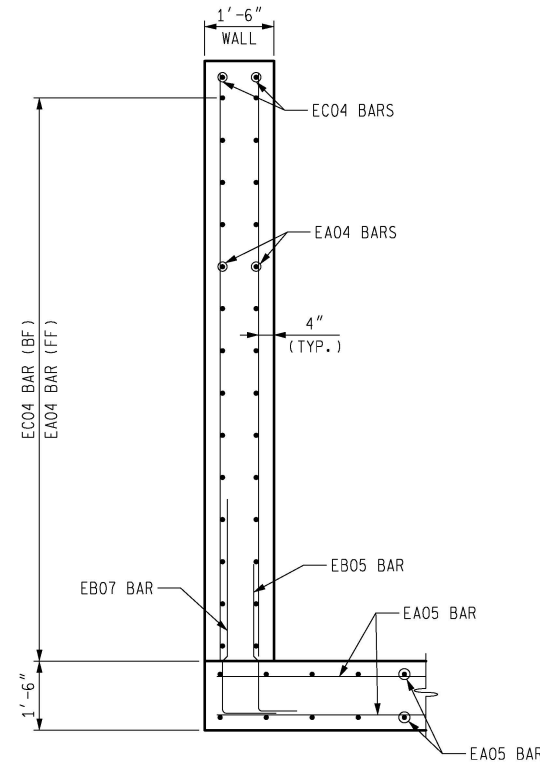


BAR CUT DIA. DF
(1 SET)

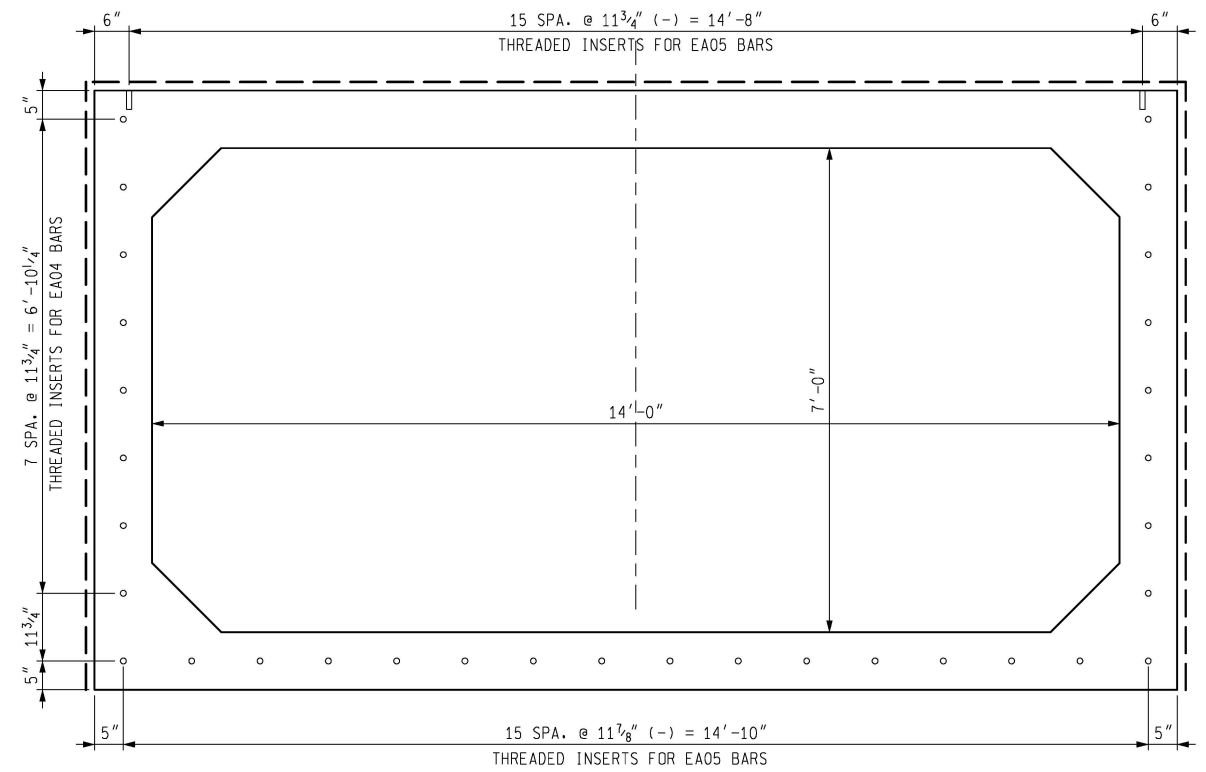
FILE: 80125_FLINTSTCULV_DET4.DGN	AUTH	DATE	REVISION
AECOM			
CITY OF NOVI			
CITY OF NOVI - FLINT ST CULVERT			
CULVERT DETAILS			
JOB	60580125	DATE	09/27/18
SHEET	16		



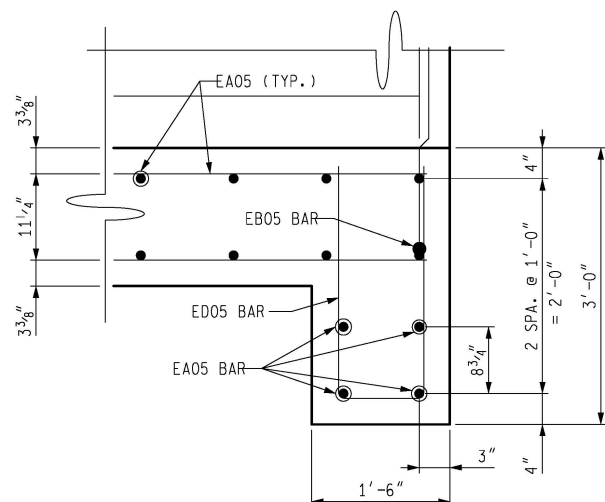
SECTION C-C



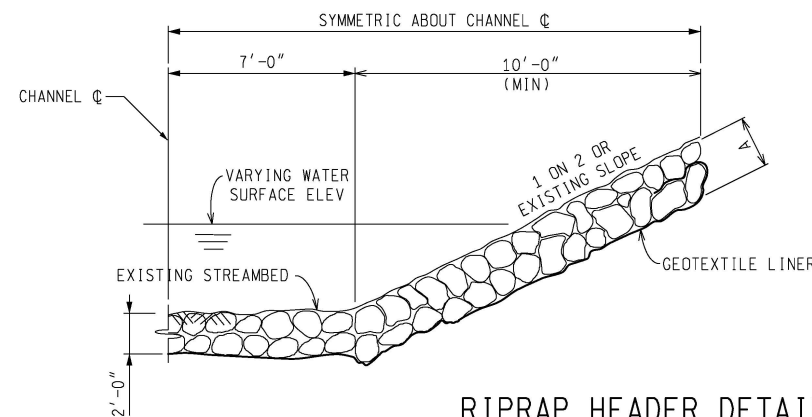
TYPICAL WINGWALL SECTION



CULVERT END SECTION VIEW



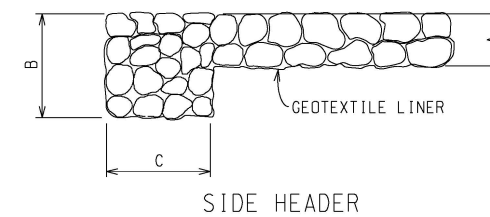
SECTION D-D



RIPRAP HEADER DETAILS

TOP OF RIPRAP MUST BE AT OR BELOW EXISTING STREAMBED/SLOPE ELEVATION.
 AN APPROPRIATE METHOD OF WATER DIVERSION FOR PLACING RIPRAP SHALL BE PROPOSED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER. IF WATER IS SHALLOW (LESS THAN TWO FEET), TEMPORARY CONCRETE BARRIERS OR SANDBAGS MAY BE USED TO DIVERT FLOW.
 THE RIPRAP SCHEME SHOWN IS A MINIMUM REQUIREMENT FOR SCOUR.

MINIMUM DIMENSIONS	
DIM.	PLAIN
A	1'-6"
B	3'
C	3'



SIDE HEADER

UPSTREAM FLOOR

BAR	BAR										NO. REQ'D	TOTAL WEIGHT
	a	b	c	d	e	f	g	h	j			
EA050300C	3'-0"										16	50
EA051301C	13'-1"										8	109
EA052202C	22'-2"										31	717
EA052205T	22'-5"										29	678
EA052901	29'-1"										16	485
EA053003	30'-3"										18	568
EA053009	30'-9"										8	257
EB050506	4'-8"	0'-10"									59	338
EB070510	4'-8"	1'-2"									114	1359
EB070509	4'-7"	1'-2"									1	12
EB070506	4'-4"	1'-2"									1	11
EB070504	4'-2"	1'-2"									1	11
EB070503	4'-1"	1'-2"									1	11
ED050511	2'-6"	0'-11"	2'-6"								24	148

UPSTREAM WINGWALLS

EA041903	19'-3"										1	13
EA042103C	21'-3"										8	114
EA042105	21'-5"										1	14
EA042307	23'-7"										1	16
EA042509	25'-9"										1	17
EA042610	26'-10"										1	18
EA042711	27'-11"										1	19
EA042800	28'-0"										1	19
EA042804C	28'-4"										8	151
EA042810	28'-10"										7	135
EA042905	29'-5"										3	59
EA043000	30'-0"										7	140
EA051509C	15'-9"										30	493
EA051509C	19'-5"										30	493
EA071905C	19'-5"										114	3670
EC042101	1'-2 1/8"	19'-10"	0'-0"	0'-0"	0'-0"	0'-3 3/4"	1'-2 5/8"				1	14
EC042303	1'-2 1/8"	22'-0"	0'-0"	0'-0"	0'-0"	0'-3 3/4"	1'-2 5/8"				1	16
EC042505	1'-2 1/8"	24'-2"	0'-0"	0'-0"	0'-0"	0'-3 3/4"	1'-2 5/8"				1	17
EC042707	1'-2 1/8"	26'-4"	0'-0"	0'-0"	0'-0"	0'-3 3/4"	1'-2 5/8"				1	18
EC042909	1'-2 1/8"	28'-6"	0'-0"	0'-0"	0'-0"	0'-3 3/4"	1'-2 5/8"				1	20
EC043103	1'-2 1/8"	30'-0"	0'-0"	0'-0"	0'-0"	0'-3 3/4"	1'-2 5/8"				3	63
EC043107	1'-5 1/8"	30'-1"	0'-0"	0'-0"	0'-0"	0'-5 1/2"	1'-6"				2	42
EC043403	1'-5"	32'-8"	0'-0"	0'-0"	0'-0"	0'-7 3/8"	1'-6 5/8"				2	46
EW040302T	0'-8 1/4"	0'-7 5/8"	1'-7"	0'-0"	0'-0"	0'-7 5/8"	0'-10 3/4"	0'-0"	0'-0"		16	34

UPSTREAM HEADWALL

EA050208T	2'-8"										32	89
EA050800	8'-0"										50	417
EA051508	15'-8"										20	327

DOWNSTREAM FLOOR

BAR	BAR										NO. REQ'D	TOTAL WEIGHT
	a	b	c	d	e	f	g	h	j			
EA050300T	3'-0"										16	50
EA051701	17'-1"										8	143
EA052601C	26'-1"										32	871
EA052608C	26'-8"										30	834
EA052810	28'-10"										16	481
EA053004	30'-4"										16	506
EA053010C	30'-10"										16	515
EA053104	31'-4"										4	131
EB050506	4'-8"	0'-10"									64	367
EB070510	4'-8"	1'-2"									120	1431
ED040600	2'-6"	1'-0"	2'-6"								34	136

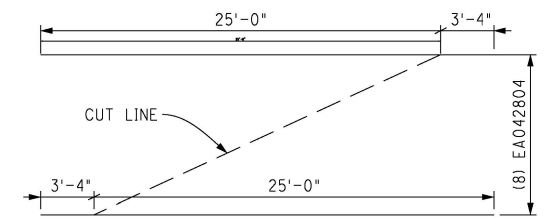
DOWNSTREAM WINGWALLS

EA042605	26'-5"										4	71
EA042900C	29'-0"										18	349
EA042907	29'-7"										28	553
EA051609	16'-9"										4	70
EA052302C	23'-2"										60	1450
EA072302C	23'-2"										120	5682
EC040106	1'-11 1/8"	1'-4"	0'-0"	0'-0"	0'-0"	0'-6 1/4"	0'-2"				16	16
EC040302T	2'-3 7/8"	0'-9 1/2"	0'-0"	0'-0"	0'-0"	0'-7 1/2"	2'-4 3/4"				16	34
EC043210	30'-0 1/4"	1'-1"	0'-0"	0'-0"	0'-0"	10'-4 3/8"	31'-9 1/8"				4	88

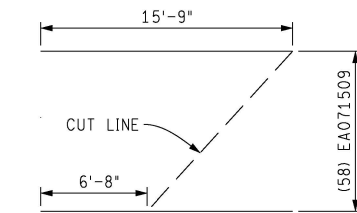
DOWNSTREAM HEADWALL

EA050208T	2'-8"										32	89
EA050900	9'-0"										32	300
EA051606	16'-6"										20	344

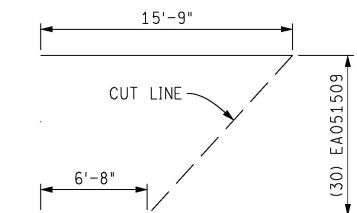
BAR CUT DIAGRAM UD



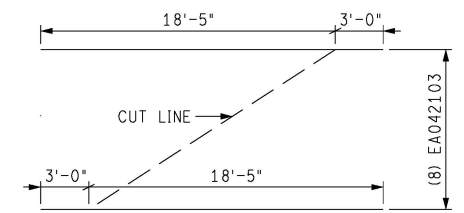
BAR CUT DIAGRAM UE



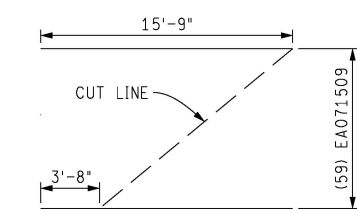
BAR CUT DIAGRAM UF



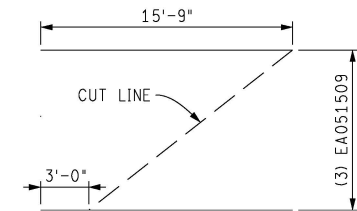
BAR CUT DIAGRAM UG



BAR CUT DIAGRAM UH

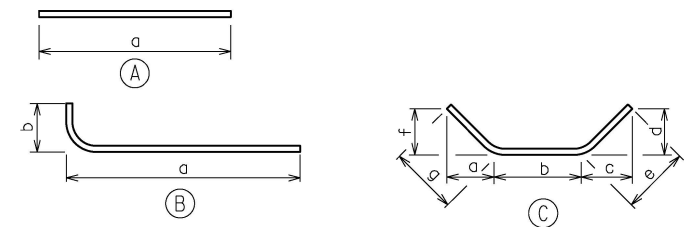


BAR CUT DIAGRAM UJ



EPOXY COATED
BAR SIZE
BAR LENGTH (FT.)
BAR LENGTH (IN.)
T = THREADED
C = CUT (SEE CUT DIAGRAMS)

EA064700x
BAR SHAPE
BAR LEGEND



NOTES:
REINFORCEMENT SHALL BE BUNDLED AND TAGGED AS TO THE LOCATION AS SHOWN ON THIS SHEET.
REINFORCEMENT IS TO BE SHOP CUT AS SHOWN. THE EPOXY COATING SHALL BE REPAIRED ACCORDING TO THE STANDARD SPECIFICATIONS.