ADDENDUM No. 2

RFP No. 22-82

S. Main Street Water Main Replacement and Resurfacing Project

Due: December 20, 2022 at 10:00 A.M (local time)

The information contained herein shall take precedence over the original documents and all previous addenda (if any), and is appended thereto. **This Addendum includes 113 pages.**

The Proposer is to acknowledge receipt of this Addendum No. 2, including all attachments in its Proposal by so indicating in the proposal that the addendum has been received. Proposals submitted without acknowledgement of receipt of this addendum may be considered non-conforming.

The following forms provided within the RFP Document should be included in submitted proposal:

- **Attachment D - Prevailing Wage Declaration of Compliance**
- **Attachment E - Living Wage Declaration of Compliance**
- **Attachment G - Vendor Conflict of Interest Disclosure Form**
- **Attachment H - Non-Discrimination Declaration of Compliance**

Proposals that fail to provide these completed forms listed above upon proposal opening may be rejected as non-responsive and may not be considered for award.

I. CORRECTIONS/ADDITIONS/DELETIONS

Changes to the RFP documents which are outlined below are referenced to a page or Section in which they appear conspicuously. Offerors are to take note in its review of the documents and include these changes as they may affect work or details in other areas not specifically referenced here.

Section/Page(s)	Change
All mentions	- As provided in RFP No. 22-82, Plan Sheets 22-38: *"Contractor shall expose water service and take utmost care in areas adjacent to underground vault. Work to be paid for under exploratory excavation"*
	- As updated herein: *"Contractor shall take caution in excavating and installing service leads in proximity to existing underground vaults. Protect existing vault. Connect to existing water service outside existing vault wall. This shall be included in the cost of the water main pay items."*
	- As updated herein: *"Contractor shall take caution in excavating and installing service leads in proximity to existing underground vaults. Protect existing vault. Connect to existing water service outside existing vault wall. This shall*

be included in the cost of the water main pay items."

All mentions

- As provided in RFP No. 22-82, Plan Sheets 22-38:

"Two weeks prior to the start of construction on S Main St the contractor shall perform exploratory excavation at the intersection of Huron and S Main St and the east & west connection point or as directed by the engineer to verify the location of the existing watermain. All costs associated with this work shall not be paid for separately, but shall be included in the item of work: Exploratory Excavation (0-10' Deep) (Trench Detail 1)"

- As updated herein:

Replace "Huron" with applicable intersection located on plan sheet (William, Washington, Liberty).

Plan Sheet 14

Revised aggregate base and subbase notes to include correct pay item.

Plan Sheet 27

- Connection to existing watermain on west side of Liberty was corrected to reflect existing 6-inch watermain.
- Watermain lowering between STA 0+82 and STA 0+98 was eliminated
- Restrained joint length was changed to reflect the elimination of the lowering

Plan Sheet 28

- Elevation of existing watermain crossing was corrected at STA 0+85 and 1+17. Note that the exact elevation of the existing water main crossing must be verified by the contractor. Existing water main will remain live throughout installation of new watermain.

Plan Sheet 32

- S1 lowering from STA 0+16 to STA 0+34 was eliminated.
- S3 lowering from STA 0+00 to STA 0+09 was eliminated

Plan Sheet 33

- S5 lowering from STA 0+00 to STA 0+09 was eliminated

Plan Sheet 34

- S7 alignment was horizontally shifted for ease of constructability
- S7 lowering from STA 0+00 to STA 0+07 was eliminated
- S8 vertical alignment was shifted to avoid existing watermain crossing. Note that the exact elevation of the existing water main crossing must be verified by the contractor. Existing water main will remain live throughout installation of new watermain.

Plan Sheet 35

- Utility crossings corrected at S10. Note that the exact elevation of the existing utility crossings must be verified by the contractor. Existing water main will remain live throughout installation of new watermain.

Plan Sheet 36

- S14 and S15 were shifted horizontally for ease of constructability
- S14: Elevation of existing watermain crossing was corrected. Note that the exact elevation of the existing water main crossing must be verified by the contractor. Existing water main will remain live throughout installation of new watermain.

Plan Sheet 38

- S21: Elevation of existing watermain crossing was corrected. Note that the exact elevation of the existing water main crossing must be verified by the contractor. Existing water main will remain live throughout installation of new watermain.

Plan Sheet 29-30

- Finish grade elevations on hydrants were corrected
- H6, H10 and H13 were shifted horizontally for ease of constructability
- Elevation of existing watermain crossing was corrected. Note that the exact elevation of the existing water main crossing must be verified by the contractor. Existing water main will remain live throughout installation of new watermain.
- Utility crossings corrected at H13. Note that the exact elevation of the existing utility crossings must be verified by the contractor.

Plan Sheets 22-38

- Add note: If water services of unknown size are found to be 4" or larger, they shall be replaced from the watermain to behind the curb, where a new water shut-off will be installed and the new service connected into the existing service, per the approval of the engineer."
- All 4" and 6" private water services shall have shut-off gate valves of matching size to proposed service. Plan view callout of 12-inch Gate Valve in Box is incorrect.

Plan Sheets 57-60

- Note added *"For Use in MDOT Right-of-Way Only"*

Page DS-216 to DS-255

- Updated to include the following pay items:

  Sewer Bulkhead, 10 inch
  Video Taping Sewer and Culv Pipe
  Dr Structure, Tap, _ inch

Page 15-21

The bid form has been amended to reflect the modifications of this Addendum No. 2 and other quantity corrections from original contract documents.

Addendum Attachments The following supplemental documents have been included as attachments for additional information:

- Soil Borings
- Historical Trolley Track drawings
- Maintaining Traffic Presentation

II. QUESTIONS AND ANSWERS

The following Questions have been received by the City. Responses are being provided in accordance with the terms of the RFP. Respondents are directed to take note in its review of the documents of the following questions and City responses as they affect work or details in other areas not specifically referenced here.

Question 1: The first phase of construction will be taking place during seasonal restrictions. Will there be any compensation for that?

Answer 1: Incentives are provided for timely completion of each phase. Work during seasonal restrictions will be paid for at contracted values. No additional compensation will be provided.

Question 2: What happens if ductile iron isn't available?

Answer 2: Contractor may provide alternate schedule addressing material delivery dates as a supplement to the bid. Refer to Progress Clause for additional details.

Question 3: Will there be enough crews available from the City to perform the water service transfers?

Answer 3: The City understands the importance of timely completion of the project and is committed to working with the contractor for the installation of the services. It should be noted that services 4-inch and larger are included in the watermain installation by the contractor. All smaller services are installed by the City.

Question 4: Please provide the engineer's estimate.
Answer 4: $5 Million

Question 5: Do you have more information on the historical trolley track foundation?
Answer 5: See Attachments.

Question 6: Is trash and delivery service through the alley system?
Answer 6: The majority of these services are from the alleys. The contractor should anticipate some coordination with businesses on this item.

Question 7: Is mail service provided on foot?
Answer 7: To our knowledge, mail service is provided on foot.

Question 8: Is provision for emergency vehicles required?
Answer 8: Yes. See bid documents.

Question 9: Is there any concern about contamination of soil in the area?
Answer 9: Refer to Detailed Specifications for Existing In Situ Soils and Non-Hazardous Contaminated Material.

Question 10: Have valves in the area been exercised?
Answer 10: The City has exercised several of the valves in the system. Project documents

include provisions for line stops if needed. Additional information on the valves in the area will be provided to the selected contractor.

Offerors are responsible for any conclusions that they may draw from the information contained in the Addendum.

E. Schedule of Pricing/Cost – 20 Points

Company: _____
Acknowledgement of Addendum No. 2 (initial): _____
Date: _____

Unit Price Bid –

Item Code	Item Description	Unit	Est Qty	Addendum 2 Qty	Change in Qty	Unit Price	Total Price
101	Allowance for Incentives for Timely Completion of Work Phase 1	LSum	1				
102	Allowance for Incentives for Timely Completion of Work Phase 2	LSum	1				
103	Allowance for Incentives for Timely Completion of Work Phase 3	LSum	1				
201	General Conditions, Max $400,000	LSum	1				
202	Certified Payroll Compliance and Reporting	LSum	1				
204	Minor Traffic Devices, Max $160,000	LSum	1				
205	Audio-visual Recording	LSum	1				
206	Exploratory Excavation, (0-10 ft. deep) (Trench Det 1, Modified)	Ea	17				
207	Erosion Control, Inlet Filter	Ea	28				
208	Sewer, Any Size or Depth, Rem	Ft	208				
209	Dr Structure, Any Size or Depth, Rem	Ea	17				
210	Curb and Gutter, Any Type or Size, Rem	Ft	1308				
211	Sidewalk and Ramps, Rem	Sft	6833				
212	Pav't, Rem	Syd	4078				
213	Pav't, Rem, Special	Syd	2721				
214	Machine Grading, Modified, S Main St	Sta	13.2				
215	Non-Hazardous Contam'd Mat'l Handling and Disposal (LM)	Cyd	200				
216	Subgrade Undercutting, Type II	Cyd	150				
217	Subgrade Undercutting, Type IV	Cyd	150				
218	Dr Structure Cover, Type Q, Special	Ea	35				
219	Dr Structure Cover, Type K, Special	Ea	16				
220	6 inch, Wrapped Underdrain	Ft	300				
221	Aggregate Base Course, 21AA, Modified	Ton	4500	4700	200		
222	Subbase, Cl II CIP	Cyd	1600				
223	Curb and Gutter, Conc, Match Existing, Special	Ft	1456				
224	Mountable Curb and Gutter	Ft	84				
225	Maintenance Gravel, 21AA, Modified	Ton	400				
226	Sidewalk, Concrete, 4 inch, Special	Sft	2627	3200	573		

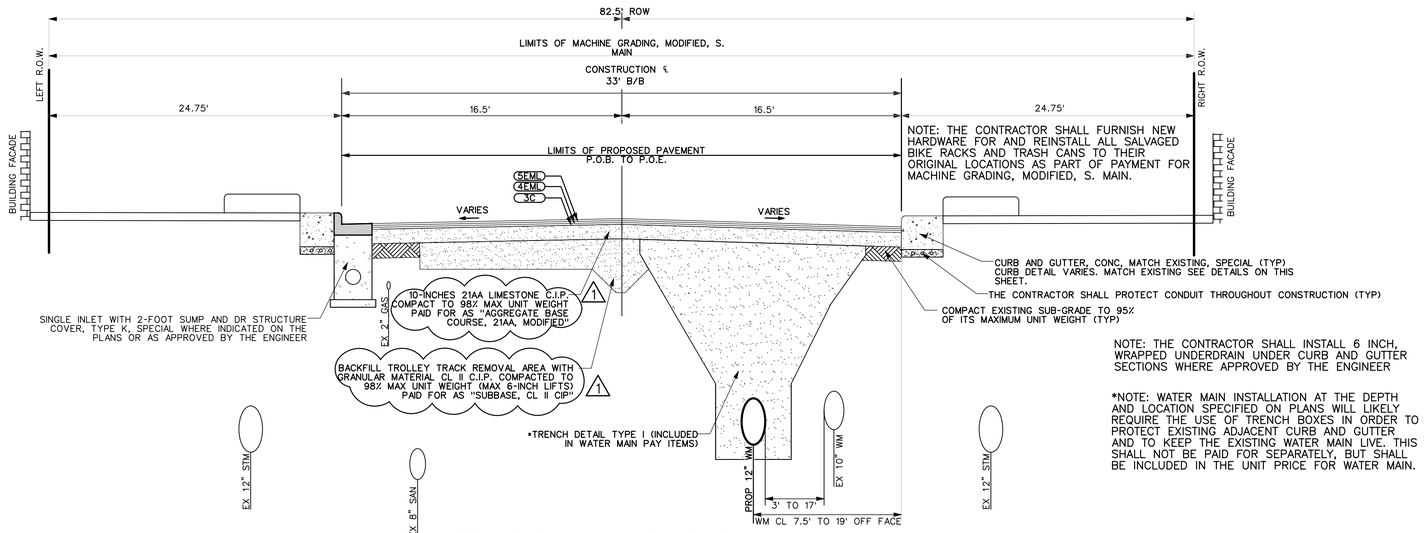
227	Sidewalk Ramp, Concrete, 6 inch, Special	Sft	1823				
228	Sidewalk, Concrete, 8 inch, Special	Sft	358				
229	Detectable Warning Surface, Modified	Ft	150				
230	Conc Base, 4 inch, Perforated	Sft	1857				
231	Brick Pavers, Rem, Sort and Salv	Sft	1956				
232	Brick Pavers, Install Salvaged	Sft	1857				
233	Trench Drain	LSum	1				
234	Hand Patching, Modified	Ton	100				
235	HMA, 3C (Base)	Ton	1231				
236	HMA, 4EML (Leveling)	Ton	828				
237	HMA, 5EML (Top)	Ton	828				
238	Band, Sign	Ea	32				
239	Fdn, Perforated Steel Square Tube Breakaway System, Rem	Ea	5				
240	Sign, Type III, Rem	Ea	36				
241	Sign, Type IIIA, Modified	Sft	28.5				
242	Sign, Type IIIB, Modified	Sft	69.5				
243	Reflective Panel for Permanent Sign Support, 3 foot, Modified	Ea	4				
244	Perforated Steel Square Tube Breakaway System, Modified	Ea	8	19	11		
247	Parking Meter, Rem	Ea	1				
248	Parking Meter, Install	Ea	1				
250	Rem Spec Mrkg	Sft	412				
251	Pavt Mrkg, Polyurea, 4 inch, White	Ft	358				
252	Pavt Mrkg, Polyurea, 4 inch, Yellow	Ft	3797				
253	Pavt Mrkg, Polyurea, 18 inch, White	Ft	78				
254	Pavt Mrkg, Polyurea, 12 inch, Crosswalk	Ft	1650				
255	Pavt Mrkg, Polyurea, 24 inch, Stop Bar	Ft	172				
256	Pavt Mrkg, Polyurea, Sharrow Sym	Ea	6				
257	Pavt Mrkg, Polyurea, Lt Turn Arrow Sym	Ea	5				
258	Recess Pavt Mrkg, Longit	Ft	6609				
258A	Recess Pavt Mrkg, Spec Mrkg	Sft	2350				
259	Scarification, for Polyurea Spec Mrkg	Sft	200				
260	Pavt Mrkg, Polyurea, 12 inch, Cross Hatching, Yellow	Ft	71				
261	Pavt Mrkg, Polyurea, Bike, Lt Turn Arrow Sym	Ea	2				
262	Pavt Mrkg, Polyurea, Bike, Rt Turn Arrow Sym	Ea	1				
263	Pavt Mrkg, Bike Lane, Green	Sft	572				
263A	Pavt Mrkg, Polyurea, Bike Sym	Ea	1				

263B	Pavt Mrkg, Polyurea, Bike, Stop Bar	Ft	18				
264	Pedestrian Path, Temp	Ft	500				
265	Pedestrian Ramp, Temp	Ea	15				
266	Pedestrian Type II Barricade, Temp	Ea	500				
267	Pedestrian Type II Chanellizer, Temp	Ft	3600				
268	Barricade, Type III, High Intensity, Double Sided, Lighted, Furn	Ea	24				
269	Barricade, Type III, High Intensity, Double Sided, Lighted, Oper	Ea	24				
270	Plastic Drum, Fluorescent, Furn	Ea	30				
271	Plastic Drum, Fluorescent, Oper	Ea	30				
272	Sign, Type B, Temp, Prismatic, Furn	Sft	860				
273	Sign, Type B, Temp, Prismatic, Oper	Sft	860				
274	Sign, Type B, Temp, Prismatic, Spec, Furn	Sft	625				
275	Sign, Type B, Temp, Prismatic, Spec, Oper	Sft	625				
276	Sign, Portable, Changeable Message, NTCIP Compliant, Furn & Oper	Ea	2				
277	Lighted Arrow, Type C, Furn & Oper	Ea	4				
278	Sign Cover	Ea	20				
279	Traffic Regulator Control	LSum	1				
280	Project Supervision, Max $100,000	LSum	1				
281	Pedestrian Barrier with Fence, Temp	Ft	200				
282	Flowable Fill (Backfill)	Cyd	10				
283	No Parking Sign	Ea	10				
284	Temporary Audible Message Device	Ea	36				
901	Line Stop, Ductile/Cast Iron Pipe, 8 inch	Ea	3				
902	Line Stop, Ductile/Cast Iron Pipe, 6 inch	Ea	6				
903	Line Stop, Ductile/Cast Iron Pipe, 10 inch	Ea	2				
904	Line Stop, Ductile/Cast Iron Pipe, 12 inch	Ea	2				
905	Line Stop, Additional Rental Day	Each	10				
906	CL 50, D.I. Water Main, w/Poly Wrap, 12 inch, Tr Det I, Mod	Ft	1464				
907	CL 50, D.I. Water Main, w/Poly Wrap, 8 inch, Tr Det I, Mod	Ft	101				
908	CL 50, D.I. Water Main, w/Poly Wrap, 6 inch, Tr Det I, Mod	Ft	264				
909	CL 50, D.I. Water Main, w/Poly Wrap, 4 inch, Tr Det I, Mod	Ft	342				
910	90 deg Bend, 12 inch	Ea	11	3	-8		
911	90 deg Bend, 8 inch	Ea	3				
912	45 deg Bend, 12 inch	Ea	43	39	-4		
913	45 deg Bend, 8 inch	Ea	4				
914	45 deg Bend, 6 inch	Ea	22	14	-8		
915	45 deg Bend, 4 inch	Ea	30	24	-6		

915A	22.5 deg Bend, 4 inch	Ea	0	1	1		
915B	22.5 deg Bend, 8 inch	Ea	0	1	1		
916	Reducer, 8 inch x 6 inch	Ea	7				
916A	Reducer, 12 inch x 6 inch	Ea	0	1	1		
917	Reducer, 12 inch x 8 inch	Ea	1				
918	Cross, 12 inch x 12 inch	Ea	2				
919	Tee, 12 inch x 12 inch x 4 inch	Ea	13				
920	Tee, 12 inch x 12 inch x 6 inch	Ea	9				
921	Tee, 12 inch x 12 inch x 8 inch	Ea	9				
922	Tee, 12 inch x 12 inch x 12 inch	Ea	1				
923	Fire Hydrant Assembly, w/Extensions, Complete	Ea	8				
924	Gate Valve-in-Well, 12 inch	Ea	15				
925	Gate Valve-in-Box, 6 inch	Ea	16				
926	Gate Valve-in-Box, 4 inch	Ea	13				
927	Sacrificial Anode, 17 LB	Ea	1				
928	Sacrificial Anode, 32 LB	Ea	10				
929	Water Main, Abandon w/Flowable Fill	Ft	1542				
929A	Water Main Pipe Abandonement	Ft	300				
929B	Gate Valve-in-Well, Rem	Ea	5				
930	Gate Valve-in-Box, Abandon	Ea	10				
931	Gate Valve-in-Well, Abandon	Ea	5				
932	Fire Hydrant, Remove	Ea	6	7	1		
933	Meter Pit, Complete	Ea	14				
934	Water Fountain, Salv, Rem	Ea	6				
935	Water Fountain, Salv, Install	Ea	6				
936	Water Fountain, Winterization Box, Complete	Ea	6				
937	RCP, Sewer, C76, CL-IV, 12 inch, Tr Det I	Ft	213				
938	RCP, Sewer, C76, CL-IV, 18 inch, Tr Det I	Ft	55	110	55		
939	Sewer, SDR 35 PVC Pipe, 6 inch, Tr Det I	Ft	46				
940	Sewer, SDR 35 PVC Pipe, 10 inch, Tr Det I	Ft	38				
941	SDR 35, PVC Service Lead	Ft	50				
942	SDR 35, PVC Tee	Ea	5				
943	SDR 35, PVC Riser	VFt	10				
944	Type I Manhole (4 ft dia) (0-10 ft. Deep)	Ft	4	8	4		
945	Single Inlet with 2 Foot Sump	Ea	15	16	1		
946	Excavate & Backfill for Water Service Tap and Lead	Ft	493				
947	Adjust Structure Cover	Ea	21				

948	Adjust Monument Box or Gate Valve Box	Ea	4				
949	Hh, Adj	Ea	12				
950	TS Face, Bag	Ea	4				
951	TS Face Bag, Rem	Ea	4				
954	TS, Pedestrian, Bracket Arm Mtd, Rem	Ea	4				
955	TS, Pedestrian, Pedestal Mtd, Rem	Ea	1				
956	Pedestal, Rem	Ea	1				
957	Pedestal Fdn, Rem	Ea	1				
958	Sign, Type III, Rem	Ea	1				
959	Conduit, Rem	Ft	8				
960	TS, Pedestrian, One Way Bracket Arm Mtd (LED) Countdown	Ea	1				
961	TS, Pedestrian, One Way Pedestal Mtd (LED) Countdown	Ea	9				
962	Pedestal, Alum	Ea	9				
963	Pedestal, Fdn	Ea	9				
964	Sign, Type III, Erect, Salv	Ea	1				
966	Wireless Vehicle Sensor Node, Rem	Ea	4				
967	Wireless Vehicle Sensor Node, Salv	Ea	4				
968	Hand Hole Assembly, Remove and Replace, All Sizes	Ea	10				
969	Hand Hole Assembly, 12 inch x 18 inch	Ea	4	8	4		
969A	Hand Hole Assembly, 17 inch x 30 inch	Ea	4				
969B	Hand Hole Assembly, 24 inch x 36 inch	Ea	10				
970	Light Fdn, Post, Electrical, Rem, Salv, Reinstall	LSum	1				
971	2 inch Schedule 80 PVC Electrical Conduit	Ft	95				
972	3 inch Schedule 80 PVC Electrical Conduit	Ft	60				
973	Recable, TS	Ft	200				
974	Reconstruct Structure	Ea	6				
975	Additional Depth Structure Adjust/Repair	Ft	10				
976	Protective Fence, Orange, Plastic, 4 foot Ht	Lft	1200				
977	Video Taping Sewer and Culv Pipe (6")	Lft	0	25	25		
978	Dr Structure, Tap, 10 inch	Ea	0	1	1		
979	Dr Structure, Tap, 12 inch	Ea	0	9	9		
980	Dr Structure, Tap, 18 inch	Ea	0	4	4		
981	Sewer Bulkhead, 10 inch	Ea	0	1	1		

TOTAL CONTRACT PRICE **$_____**

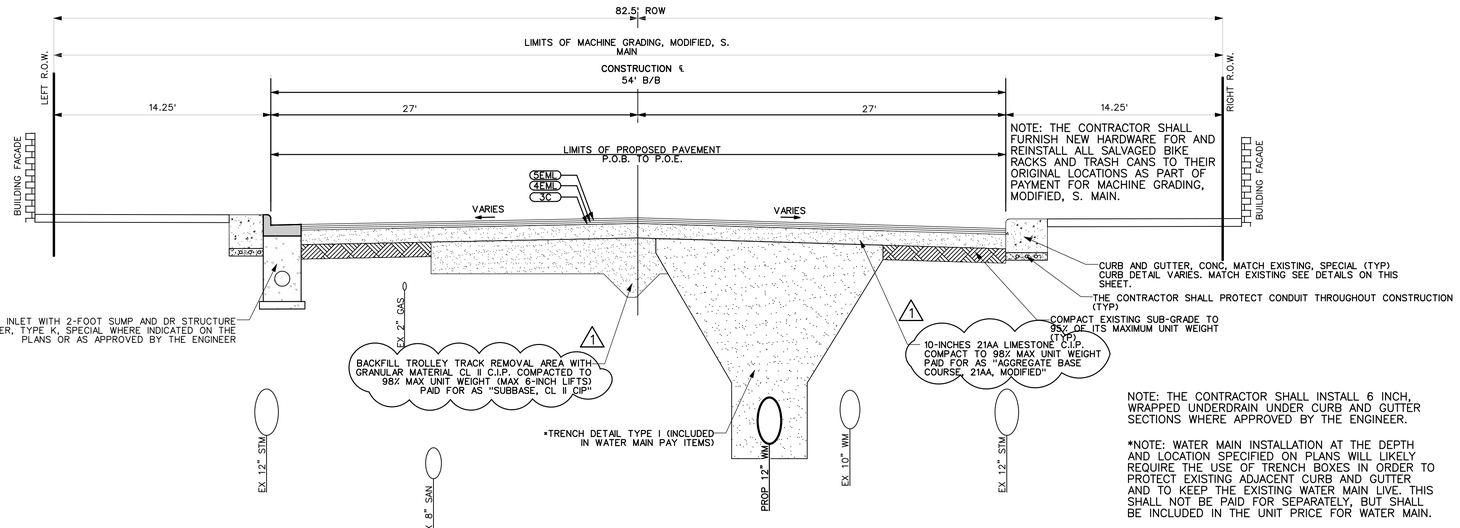


PROPOSED TYPICAL CROSS SECTION
S MAIN STREET

STA 2+90.85 TO STA 3+66.89
STA 4+99.64 TO STA 6+06.76
STA 7+38.86 TO STA 9+56.68
STA 10+67.58 TO STA 12+89.72
STA 13+99.85 TO STA 14+75.95
NOT TO SCALE

NOTE: THE CONTRACTOR SHALL INSTALL 6 INCH, WRAPPED UNDERDRAIN UNDER CURB AND GUTTER SECTIONS WHERE APPROVED BY THE ENGINEER

*NOTE: WATER MAIN INSTALLATION AT THE DEPTH AND LOCATION SPECIFIED ON PLANS WILL LIKELY REQUIRE THE USE OF TRENCH BOXES IN ORDER TO PROTECT EXISTING ADJACENT CURB AND GUTTER AND TO KEEP THE EXISTING WATER MAIN LIVE. THIS SHALL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE UNIT PRICE FOR WATER MAIN.

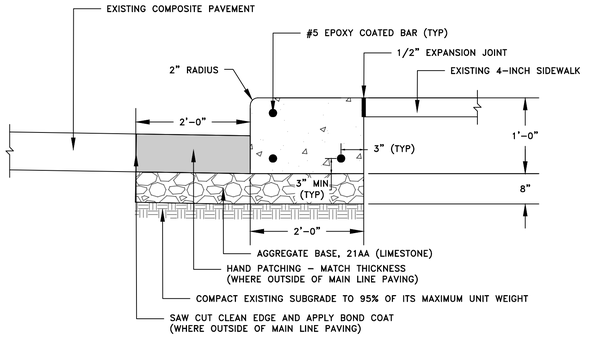


PROPOSED TYPICAL CROSS SECTION
S MAIN STREET

STA 3+84.68 TO STA 4+77.51
STA 6+24.46 TO STA 7+18.97
STA 9+75.23 TO STA 10+49.98
STA 13+10.40 TO STA 13+77.09
NOT TO SCALE

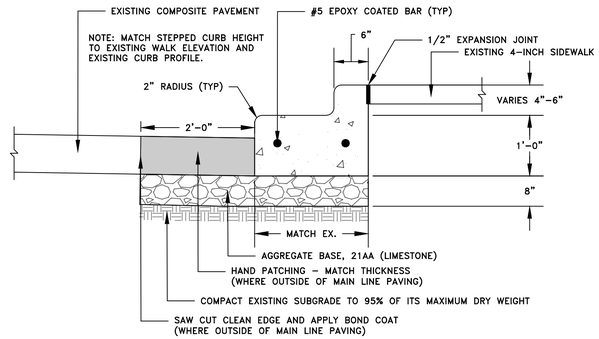
NOTE: THE CONTRACTOR SHALL INSTALL 6 INCH, WRAPPED UNDERDRAIN UNDER CURB AND GUTTER SECTIONS WHERE APPROVED BY THE ENGINEER.

*NOTE: WATER MAIN INSTALLATION AT THE DEPTH AND LOCATION SPECIFIED ON PLANS WILL LIKELY REQUIRE THE USE OF TRENCH BOXES IN ORDER TO PROTECT EXISTING ADJACENT CURB AND GUTTER AND TO KEEP THE EXISTING WATER MAIN LIVE. THIS SHALL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE UNIT PRICE FOR WATER MAIN.



CURB DETAIL 1
NOT TO SCALE

NOTE: CURB DETAIL 1 REPRESENTS THE EXISTING CURB BASED ON THE BEST INFORMATION AVAILABLE FROM RECORD DRAWINGS.



CURB DETAIL 2
NOT TO SCALE

NOTE: CURB DETAIL 2 REPRESENTS THE EXISTING CURB AND GUTTER BASED ON THE BEST INFORMATION AVAILABLE FROM RECORD DRAWINGS.

WIDTH TRANSITIONS			
WIDTH 1	WIDTH 2	BEGINNING STATION	ENDING STATION
33 FEET	54 FEET	3+66.89	3+84.68
54 FEET	33 FEET	4+77.51	4+99.64
33 FEET	54 FEET	6+6.76	6+24.46
54 FEET	33 FEET	7+18.97	7+38.86
33 FEET	54 FEET	9+56.68	9+75.23
54 FEET	33 FEET	10+49.98	10+67.58
33 FEET	54 FEET	12+89.72	13+10.40
54 FEET	33 FEET	13+77.09	13+99.85

STREET NAME	PAY ITEM	HMA MIX	APPLICATION RATE	EST. THICKNESS	PERF. GRADE	AWI (MIN)
S. MAIN ST	HMA, 5EML	5EML (TOP)	220 LB/SYD	2"	PG 70-28P	260
S. MAIN ST	HMA, 4EML	4EML (LEVELING)	220 LB/SYD	2"	PG 70-28P	-
S. MAIN ST	HMA, 3C	3C (BASE)	330 LB/SYD	3"	PG 70-28P	-
S. MAIN ST	HAND PATCHING	5EML	110 LB/IN/SYD	VARIES	PG 70-28P	-

HMA APPLICATION ESTIMATE

Start Station	End Station	Left Lane	Right Lane	Notes
POB	3+75	2.5%	1.5%	
3+75	4+75	2.5% - 4.0%	1.5% - 2.5%	Transition lane slope to match catch basins
4+75	5+00	4.0% - 2.5%	2.5% - 2.0%	Transition lane slopes
5+00	6+25	2.5%	2.0%	
6+25	7+25	2.5% - 3.0%	2.0% - 2.5%	Trasition lane slope to match catch basins
7+25	7+50	3.0% -2.5%	2.5% - 2.0%	Transition lane slopes
7+25	14+75	2.5%	2.0%	

PROPOSED CROSS SLOPE TABLE

Know what's below. Call before you dig.

REV.	DESCRIPTION	DATE	DRAWN	CHECKED
1	REVISION #1	12/9/2022	AK/RB/MF	CT/VCM

CITY OF ANN ARBOR
PUBLIC SERVICES
301 E HURON STREET
P.O. BOX 8647
ANN ARBOR, MI 48107-8647
734.794.6410
www.a2gov.org

CITY OF ANN ARBOR - PUBLIC SERVICES - ENGINEERING

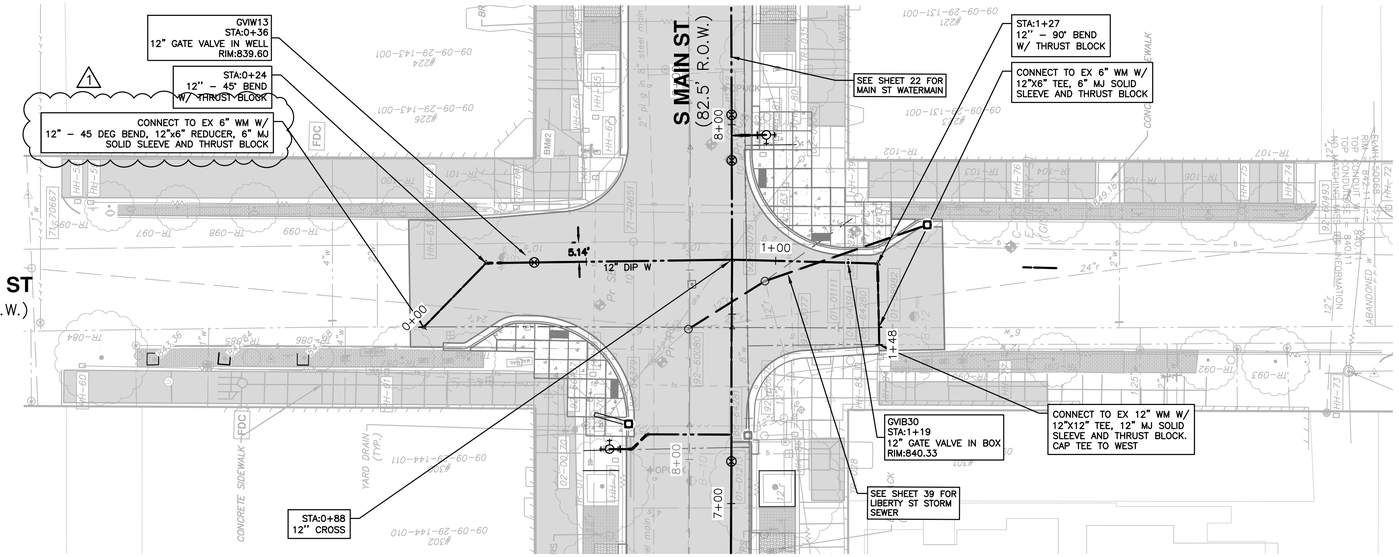
S. MAIN STREET WATER MAIN
REPLACEMENT & RESURFACE PROJECT
PROPOSED TYPICALS

SCALE PLAN: NOT TO SCALE

DRAWING No.
2020-038-14

SHEET No.
14 OF 80

C:\pw_work\d1092459\GTP-PLTS-Typicals.dwg Dwg Created: 8-Dec-22 - _a2 standard bw.stb - Plot Date: 9-Dec-22



LEGEND

- EXISTING BUILDING VAULTS
- EXISTING TROLLEY TRACK FOUNDATION AREA
- EXISTING BRICK PAVER AREA

NOTES

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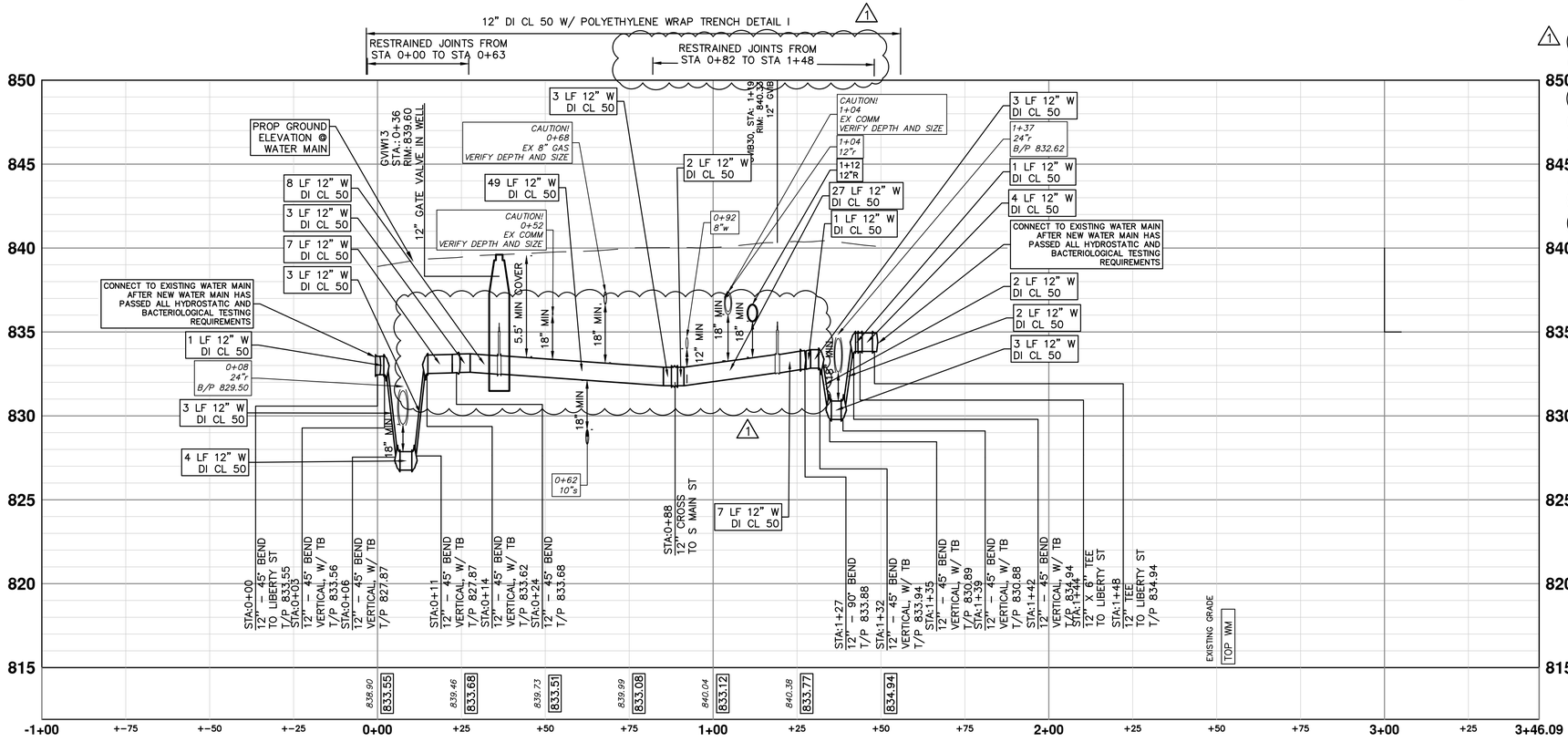
2: THE CONTRACTOR SHALL BE AWARE THAT THE FOUNDATION/SUPPORTS FOR THE FORMER TROLLEY TRACKS EXTEND TO A VARIABLE DEPTH OF ABOUT 3'. THE LOCATIONS ARE REPRESENTED ON THE PLANS FROM THE BEST AVAILABLE INFORMATION. IF THESE FOUNDATIONS/SUPPORTS OR OLD TROLLEY TRACKS ARE ENCOUNTERED IN ANY LOCATION DURING THE PERFORMANCE OF THE WORK OF THE PROJECT, THE TRACKS, FOUNDATIONS/SUPPORTS, AND ANCILLARY MATERIALS MUST BE REMOVED FULL DEPTH IF THEY ARE CROSSED TRANSVERSELY AS PART OF THE PROJECT'S WORK. THIS WORK WILL BE PAID FOR AS "PAV'T REM, SPECIAL."

3: IF WATER SERVICES OF UNKNOWN SIZE ARE FOUND TO BE 4" OR LARGER, THEY SHALL BE REPLACED FROM THE WATERMAIN TO BEHIND THE CURB, WHERE A NEW WATER SHUT-OFF WILL BE INSTALLED AND THE NEW SERVICE CONNECTED INTO THE EXISTING SERVICE, PER THE APPROVAL OF THE ENGINEER.

1

12" DI CL 50 W/ POLYETHYLENE WRAP TRENCH DETAIL I



1

CONTRACTOR SHALL TAKE CAUTION IN EXCAVATING AND INSTALLING LEADS IN PROXIMITY TO EXISTING UNDERGROUND BUILDING VAULTS. PROTECT EXISTING VAULT. CONNECT TO EXISTING WATER SERVICE OUTSIDE EXISTING VAULT WALL. THIS SHALL BE INCLUDED IN THE COST OF THE WATER MAIN PAY ITEMS.

TWO WEEKS PRIOR TO THE START OF CONSTRUCTION ON S MAIN ST THE CONTRACTOR SHALL PERFORM EXPLORATORY EXCAVATION AT THE INTERSECTION OF LIBERTY AND S MAIN ST CONNECTION POINT OR AS DIRECTED BY THE ENGINEER TO VERIFY THE LOCATION OF THE EXISTING WATERMAIN. ALL COSTS ASSOCIATED WITH THIS WORK SHALL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE ITEM OF WORK :EXPLORATORY EXCAVATION (0-10; DEEP)"(TRENCH DETAIL 1)

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THE DEPTH AND SIZE OF ELECTRICAL, TELEPHONE AND FIBER OPTIC CONDUITS/DUCTS AND THE DEPTH OF GAS MAINS ARE APPROXIMATE. CONTRACTOR SHALL VERIFY, SUPPORT AND PROTECT DURING CONSTRUCTION AND ADJUST WATER MAIN WHERE NECESSARY TO MAINTAIN 12-INCHES VERTICAL CLEARANCE FROM ALL UTILITIES (EXCEPT SANITARY AND STORM SEWER WHERE 18-INCHES IS REQUIRED). THIS WORK IS PAID FOR UNDER GENERAL CONDITIONS, MAX.

WATER MAIN STRUCTURE TABLE

STRUCTURE	TYPE	STATION	RIM	WELL DEPTH	COVER TYPE
GVIW13	12" GVIW	0+36	839.60	7.62	Q

WATER MAIN STRUCTURE TABLE

STRUCTURE	TYPE	STATION	RIM	DEPTH
GVIB30	12" GVIB	1+19	840.33	6.67

811 Know what's below. Call before you dig.

REV.	DESCRIPTION	DATE	DRAWN	CHECKED
1	REVISION #1	12/9/2022	AK/RB/MF	CT/VCM

CITY OF ANN ARBOR
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ANN ARBOR, MI 48107-8647
734.794.6410
www.a2gov.org

CITY OF ANN ARBOR - PUBLIC SERVICES - ENGINEERING

S. MAIN STREET WATER MAIN REPLACEMENT & RESURFACE PROJECT

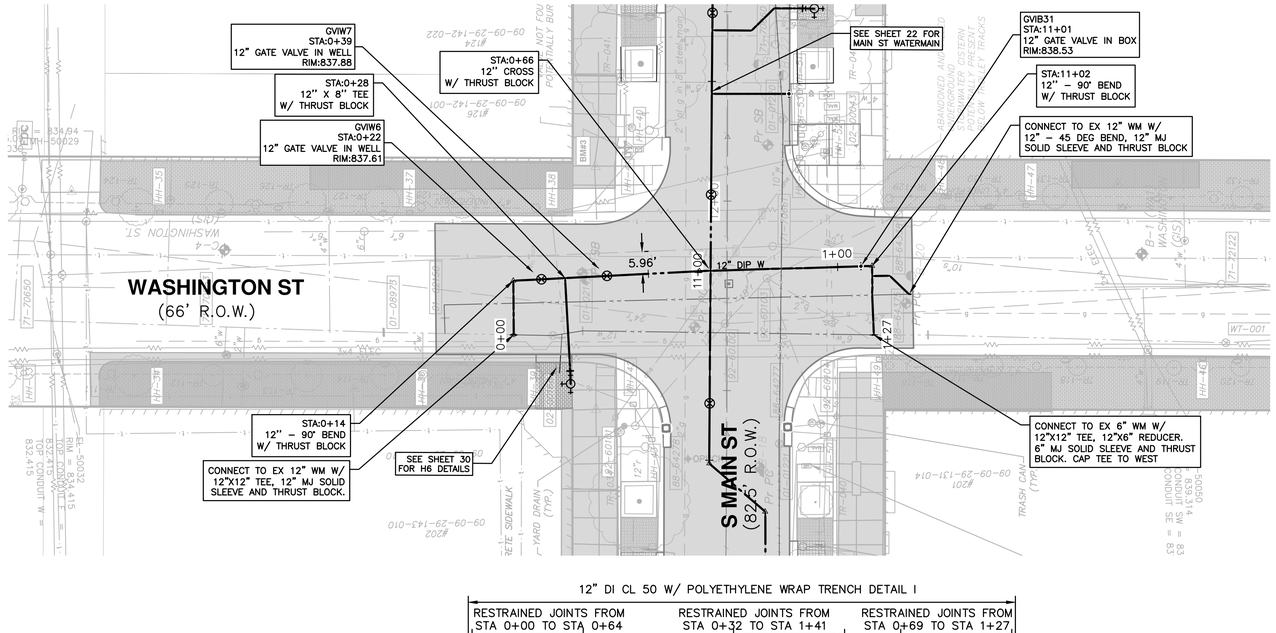
PROPOSED WATER MAIN PLAN AND PROFILE - LIBERTY STREET

SCALE PLAN: 1"=20' PROFILE: 1"=5'

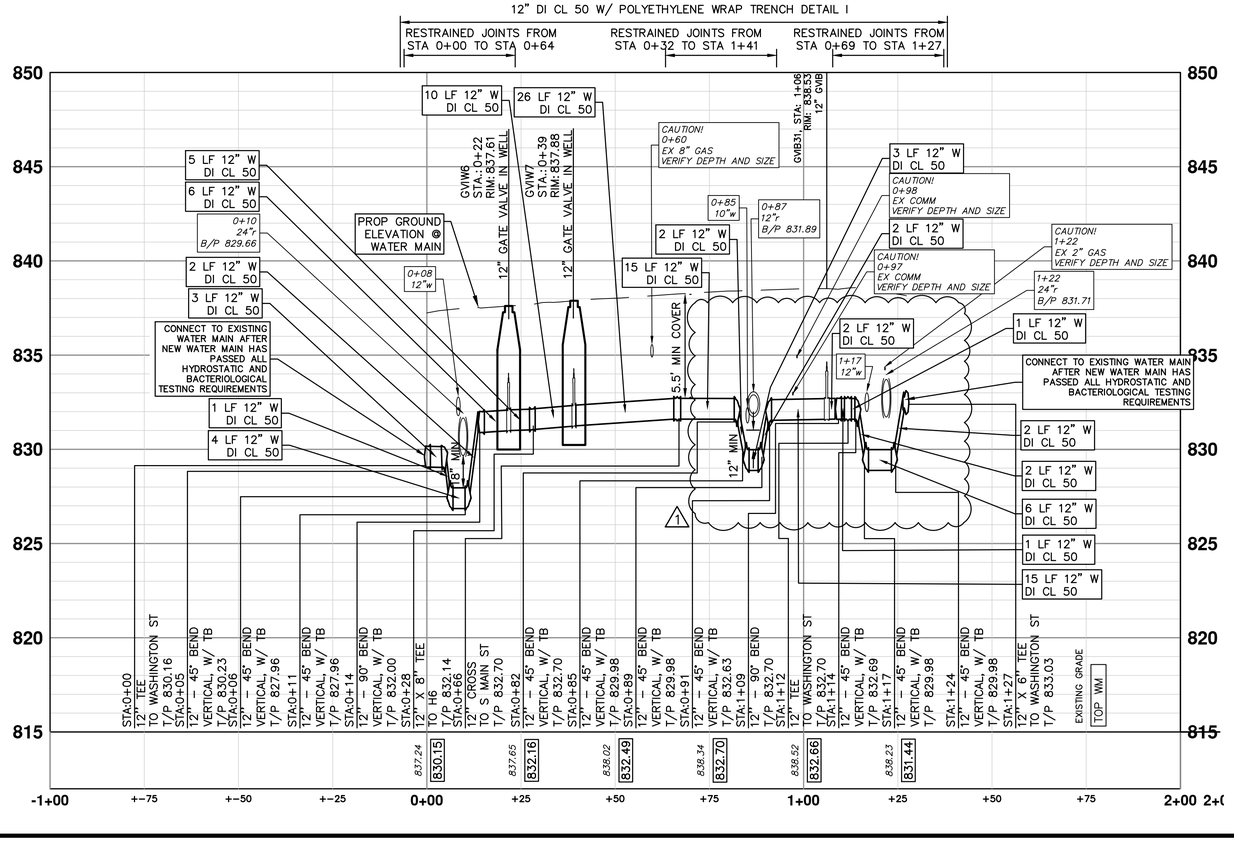
DRAWING No. 2020-038-27

SHEET No. 27 OF 80

c:\pw_work\wade-trim_rbrown\d1092459\CWM-PLTS-Cross WM.dwg Dwg Created: 9-Dec-22 - _a2 standard bw.stb - Plot Date: 9-Dec-22



12" DI CL 50 W/ POLYETHYLENE WRAP TRENCH DETAIL I



LEGEND

- EXISTING BUILDING VAULTS
- EXISTING TROLLEY TRACK FOUNDATION AREA
- EXISTING BRICK PAVER AREA

NOTES

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WATER MAIN STRUCTURE TABLE

STRUCTURE	TYPE	STATION	RIM	WELL DEPTH	COVER TYPE
GVIW6	12" GVIW	0+22	837.61	7.12	Q
GVIW7	12" GVIW	0+39	837.88	7.15	Q

WATER MAIN STRUCTURE TABLE

STRUCTURE	TYPE	STATION	RIM	DEPTH
GVIB31	GVIB	11+01	838.53	5.84

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CITY OF ANN ARBOR - PUBLIC SERVICES - ENGINEERING

S. MAIN STREET WATER MAIN REPLACEMENT & RESURFACE PROJECT

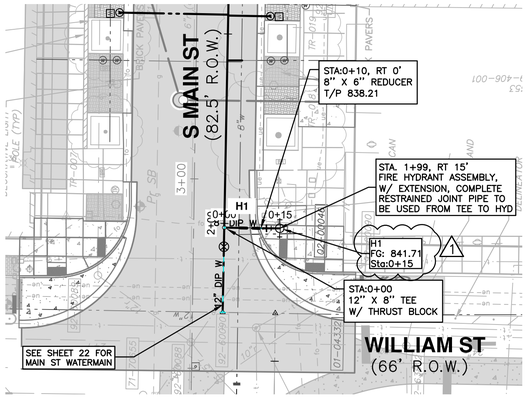
PROPOSED WATER MAIN PLAN AND PROFILE - WASHINGTON STREET

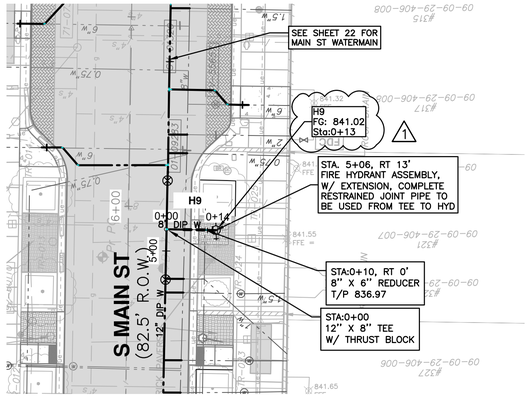
SCALE PLAN: 1"=20' PROFILE: 1" = 5'

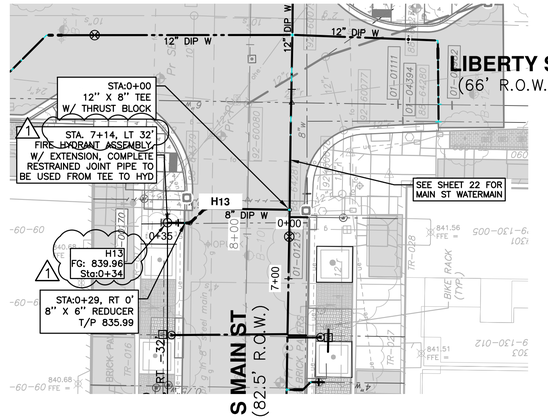
DRAWING No. 2020-038-28

SHEET No. 28 OF 80

c:\pw_work\wade-trim_rbrown\d1092459\CWM-PLTS-Cross WM.dwg Dwg Created: 9-Dec-22 — _a2 standard bw.stb — Plot Date: 9-Dec-22







LEGEND

- EXISTING BUILDING VAULTS
- EXISTING TROLLEY TRACK FOUNDATION AREA
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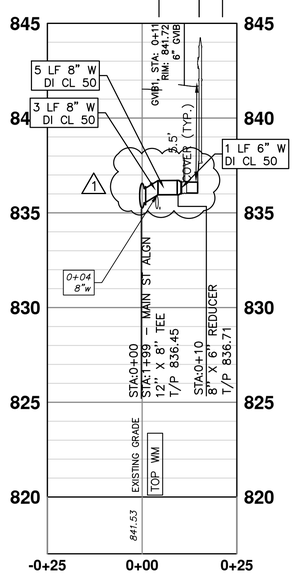
WATER MAIN STRUCTURE TABLE

STRUCTURE	TYPE	STATION	FG	T/P
H1	HYD	0+15	841.71	5.50
H9	HYD	0+13	841.02	5.50
H13	HYD	0+34	839.96	5.50

8" DI CL 50 W/ POLYETHYLENE WRAP TRENCH DETAIL I

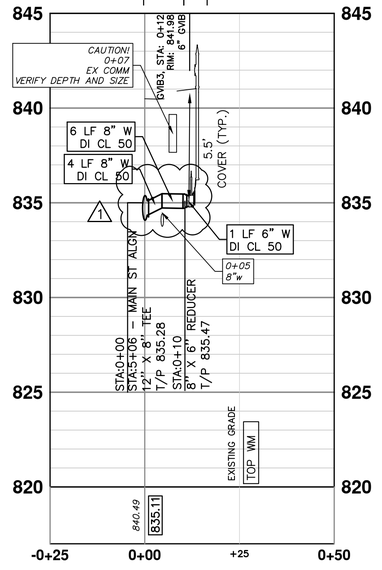
6" DI CL 50 W/ POLYETHYLENE WRAP TRENCH DETAIL I



H1

8" DI CL 50 W/ POLYETHYLENE WRAP TRENCH DETAIL I

6" DI CL 50 W/ POLYETHYLENE WRAP TRENCH DETAIL I



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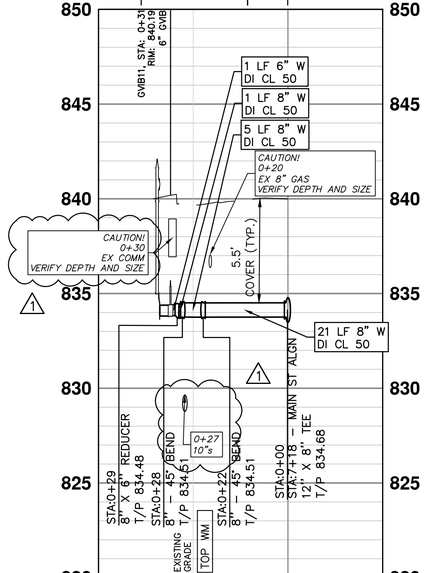
6" DI CL 50 W/ POLYETHYLENE WRAP TRENCH DETAIL I

8" DI CL 50 W/ POLYETHYLENE WRAP TRENCH DETAIL I



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CITY OF ANN ARBOR - PUBLIC SERVICES - ENGINEERING

S. MAIN STREET WATER MAIN REPLACEMENT & RESURFACE PROJECT

HYDRANTS 1

SCALE PLAN: 1"=20' PROFILE: 1"=5'

DRAWING No. 2020-038-29

SHEET No. 29 OF 80

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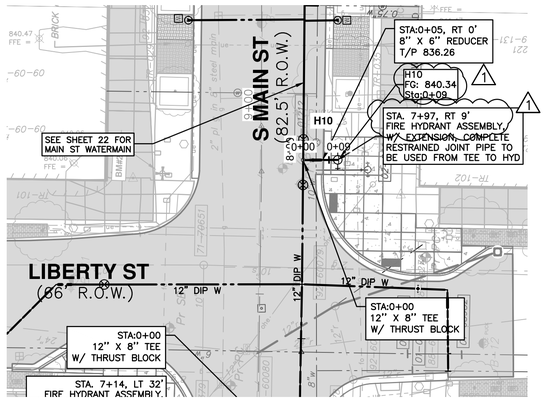

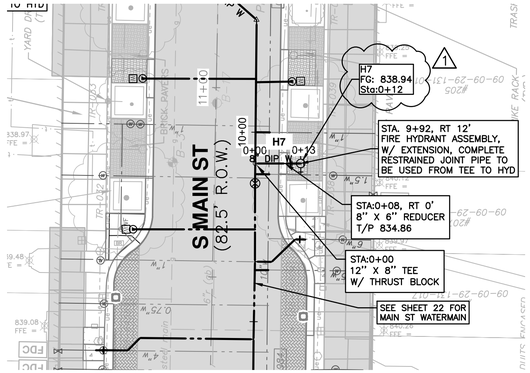

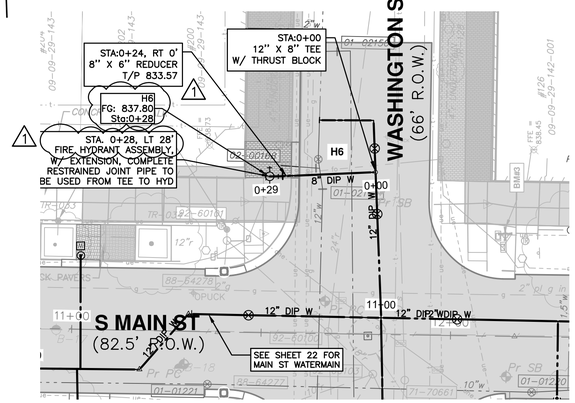

LEGEND

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- EXISTING TROLLEY TRACK FOUNDATION AREA
- EXISTING BRICK PAVER AREA

NOTES

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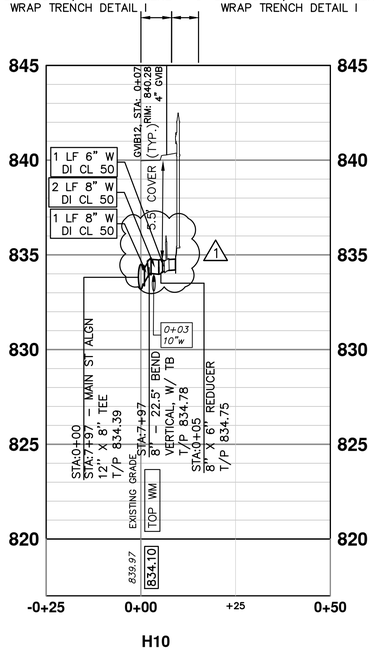
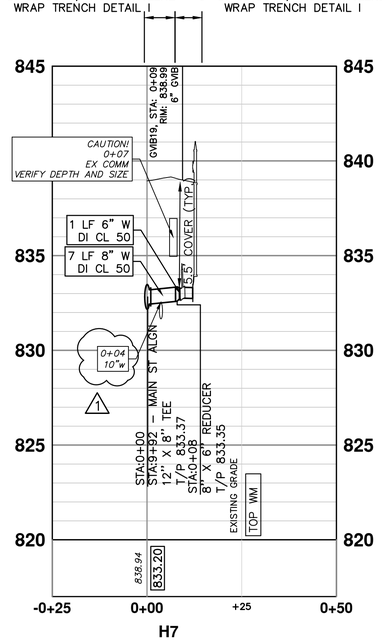
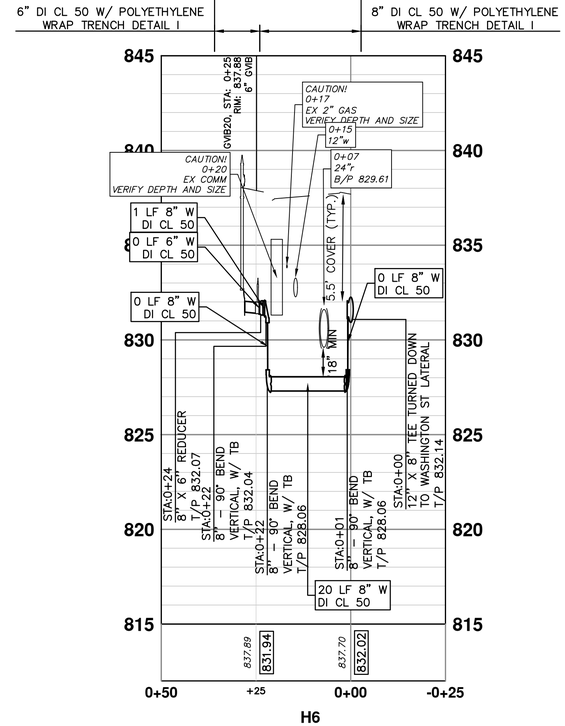
WATER MAIN STRUCTURE TABLE

STRUCTURE	TYPE	STATION	FG	T/P
H6	HYD	0+28	837.80	5.50
H7	HYD	0+12	838.94	5.50
H10	HYD	0+09	840.34	5.50







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1	REVISION #1	12/9/2022	AK/RB/MF	CT/VCM

CITY OF ANN ARBOR - PUBLIC SERVICES - ENGINEERING

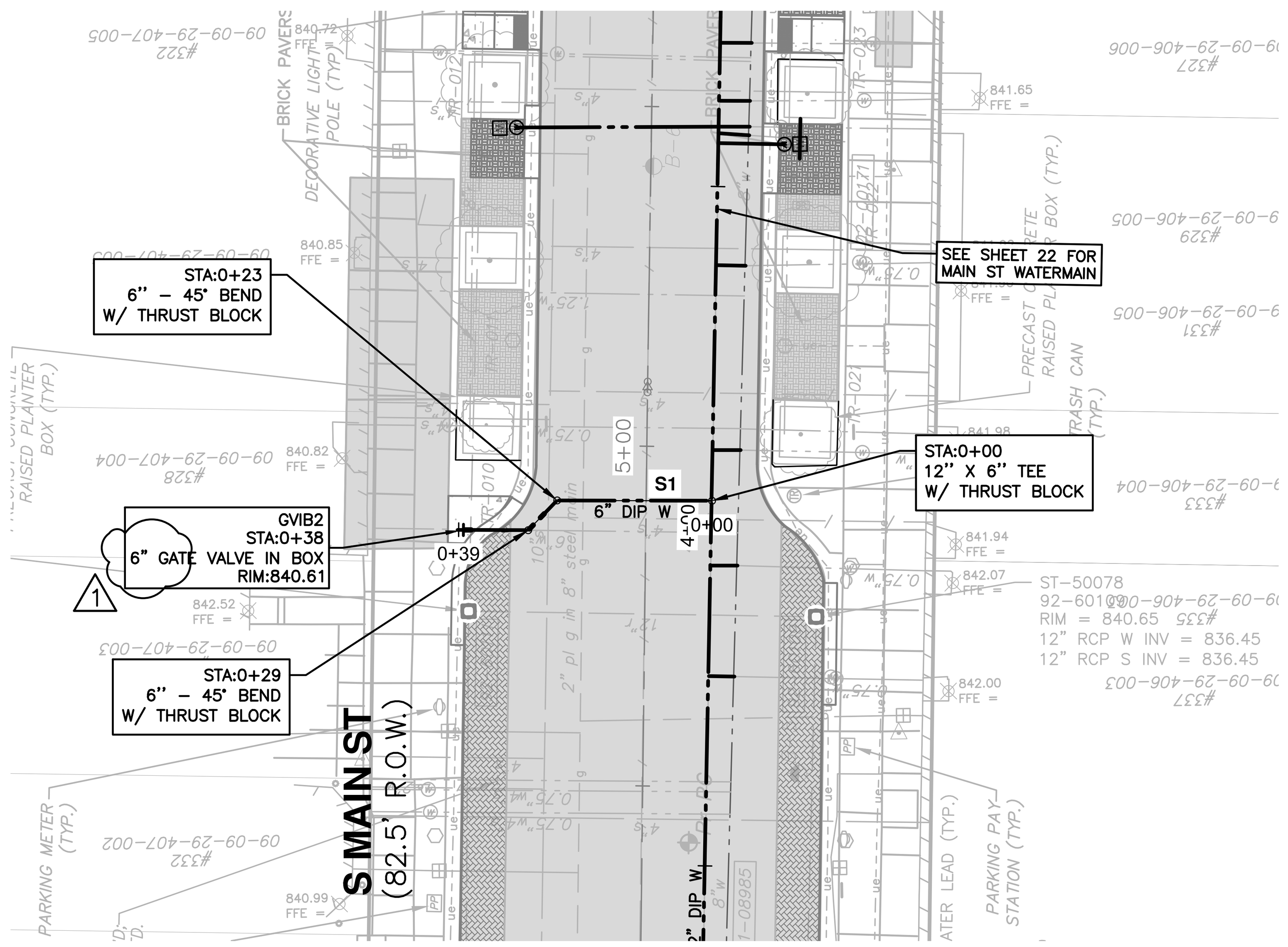
S. MAIN STREET WATER MAIN REPLACEMENT & RESURFACE PROJECT
HYDRANTS 2

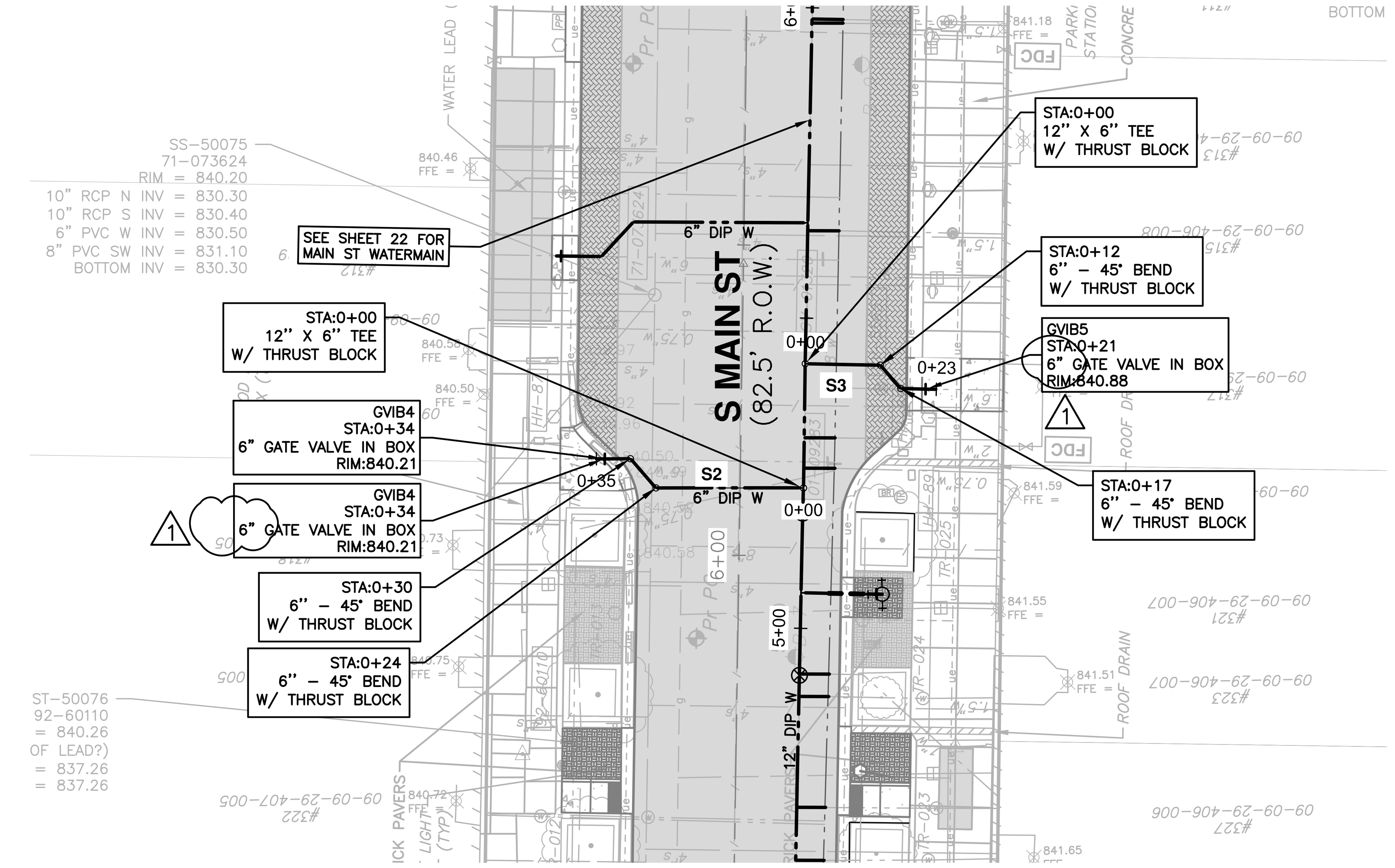
SCALE PLAN: 1"=20' PROFILE: 1" = 5'

DRAWING No. 2020-038-30

SHEET No. 30 OF 80

c:\pw_work\wade-trim_rbrown\d1092459\CWM-PLTS-WM Hydrants.dwg Dwg Created: 9-Dec-22 - _a2 standard bw.stb - Plot Date: 9-Dec-22





LEGEND

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3: IF WATER SERVICES OF UNKNOWN SIZE ARE FOUND TO BE 4" OR LARGER, THEY SHALL BE REPLACED FROM THE WATERMAIN TO BEHIND THE CURB, WHERE A NEW WATER SHUT-OFF WILL BE INSTALLED AND THE NEW SERVICE CONNECTED INTO THE EXISTING SERVICE, PER THE APPROVAL OF THE ENGINEER.

CONTRACTOR SHALL TAKE CAUTION IN EXCAVATING AND INSTALLING LEADS IN PROXIMITY TO EXISTING UNDERGROUND BUILDING VAULTS. PROTECT EXISTING VAULT. CONNECT TO EXISTING WATER SERVICE OUTSIDE EXISTING VAULT WALL. THIS SHALL BE INCLUDED IN THE COST OF THE WATER MAIN PAY ITEM.

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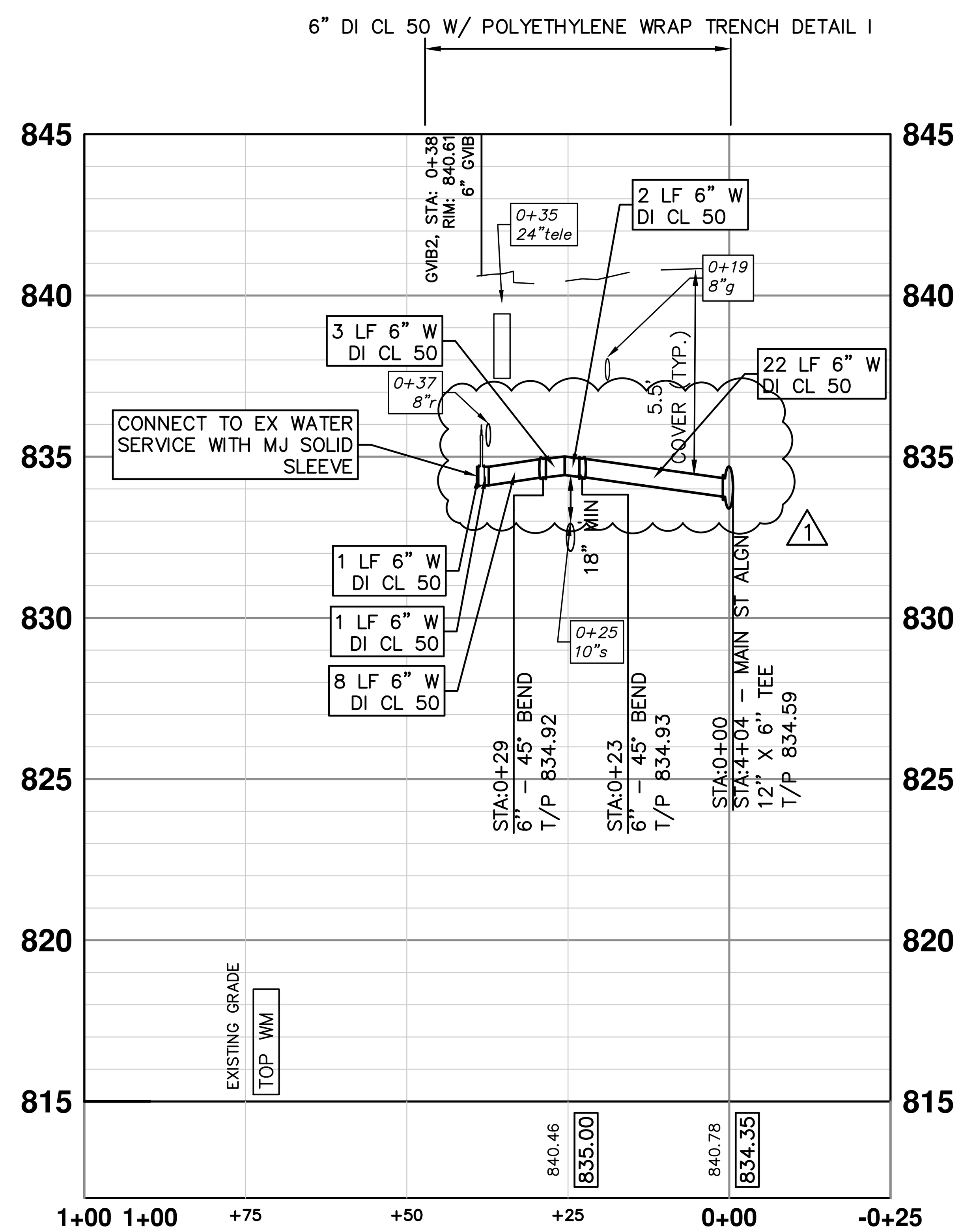
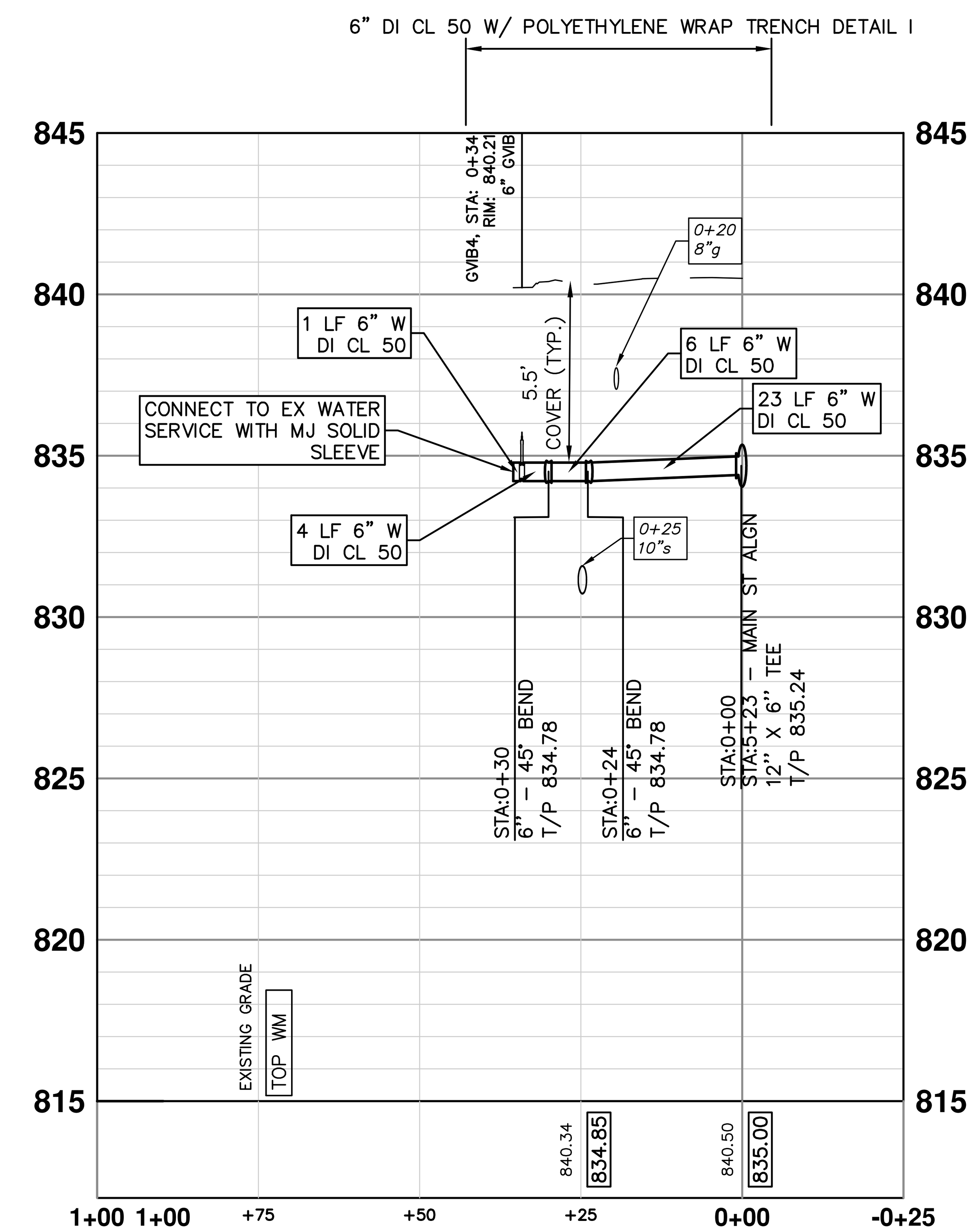
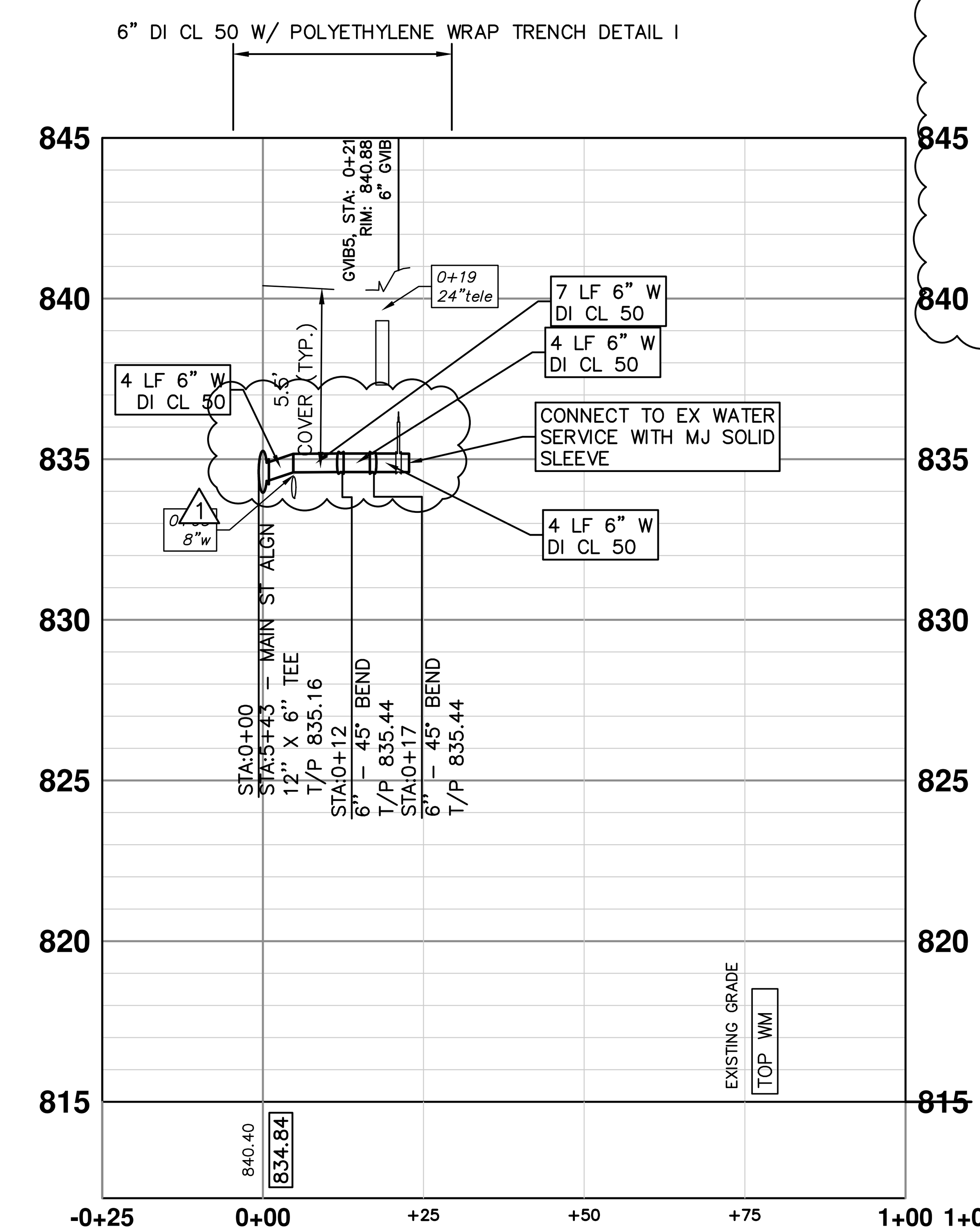


S1: 328 MAIN ST



S2: 316 MAIN ST



S3: 317 MAIN ST

WATER MAIN STRUCTURE TABLE				
STRUCTURE	TYPE	STATION	RIM	DEPTH
GVIB5	6" GVIB	0+21	840.88	5.70
GVIB4	6" GVIB	0+34	840.21	5.42
GVIB2	6" GVIB	0+38	840.61	5.93

REV.	DESCRIPTION	DATE	DRAWN	CHECKED
1	REVISION #1	12/9/2022	AK/RB/MF	CT/VCM

811 Know what's below. Call before you dig.

CITY OF ANN ARBOR
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301 EAST HURON STREET
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ANN ARBOR, MI 48107-8647
734-794-6410
www.a2gov.org

CITY OF ANN ARBOR - PUBLIC SERVICES - ENGINEERING

S. MAIN STREET WATER MAIN REPLACEMENT & RESURFACE PROJECT

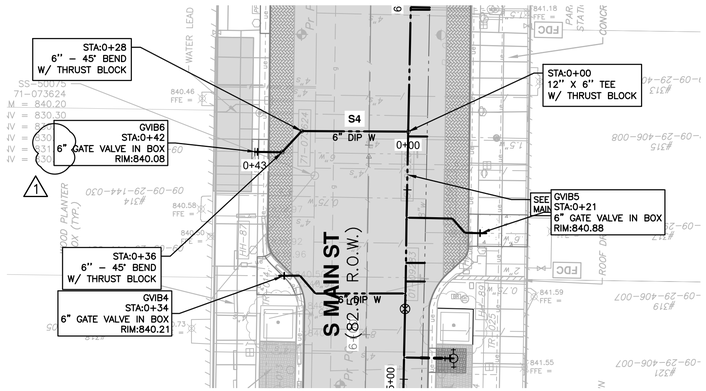
LATERALS 1

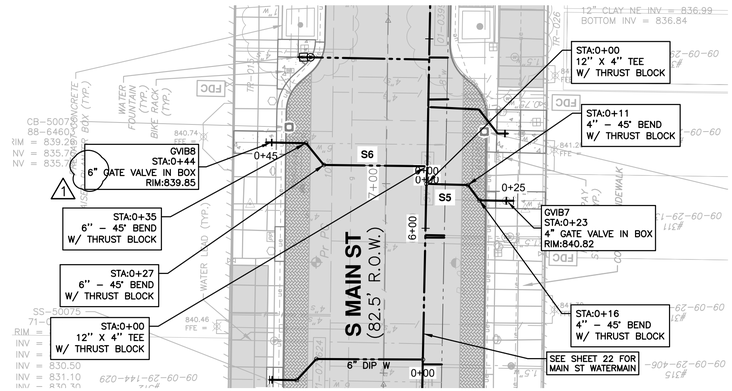
SCALE PLAN: 1"=20' PROFILE: 1"= 5'

DRAWING No. 2020-038-32

SHEET No. 32 OF 80

c:\pw_work\wade-trim_rbrown\d1092459\CWM-PLTS-WM Laterals1.dwg Dwg Created: 9-Dec-22 — _a2 standard bw.stb — Plot Date: 9-Dec-22





LEGEND

- EXISTING BUILDING VAULTS
- EXISTING TROLLEY TRACK FOUNDATION AREA
- EXISTING BRICK PAVER AREA

NOTES

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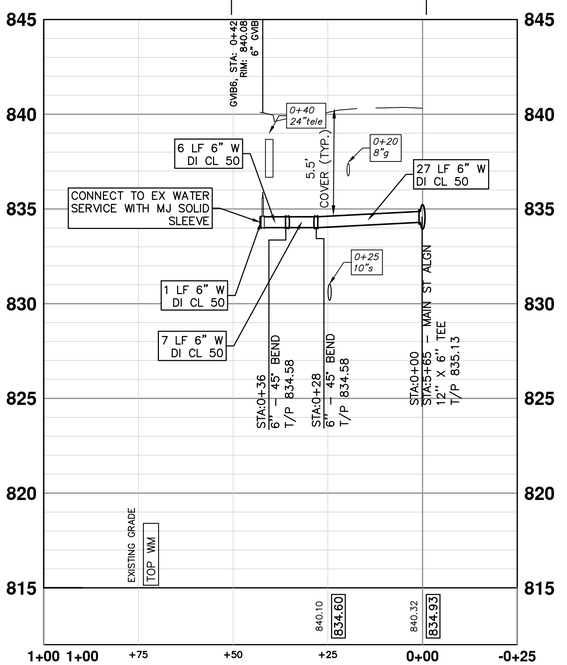
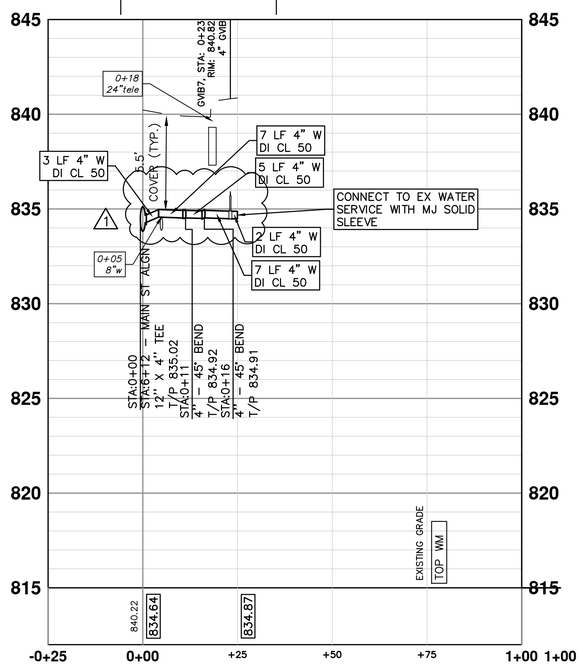
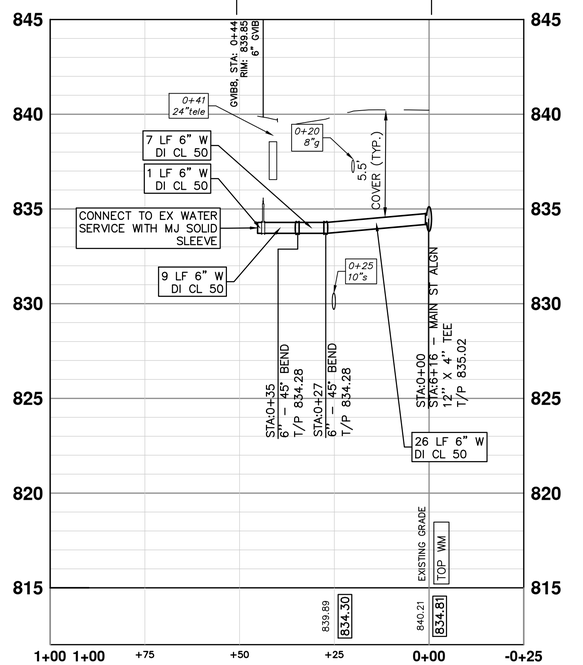


S4: 312 MAIN ST



S5: 311 MAIN ST



S6: 306 MAIN ST

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WATER MAIN STRUCTURE TABLE

STRUCTURE	TYPE	STATION	RIM	DEPTH
GVIB7	4" GVIB	0+23	840.82	5.94
GVIB6	6" GVIB	0+42	840.08	5.49
GVIB8	6" GVIB	0+44	839.85	5.56

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REV.	DESCRIPTION	DATE	DRAWN	CHECKED
1	REVISION #1	12/9/2022	AK/RB/MF	CT/VCM

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301 E. HURON STREET
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ANN ARBOR, MI 48107-8647
734.794.6410
www.a2gov.org

CITY OF ANN ARBOR - PUBLIC SERVICES - ENGINEERING

S. MAIN STREET WATER MAIN REPLACEMENT & RESURFACE PROJECT

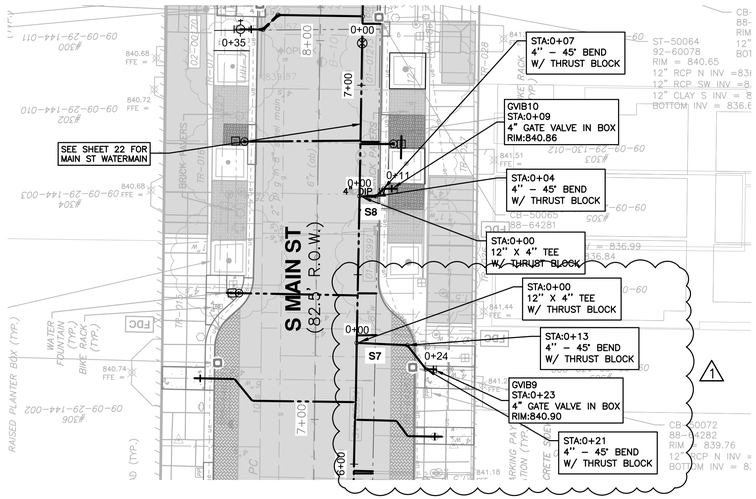
LATERALS 2

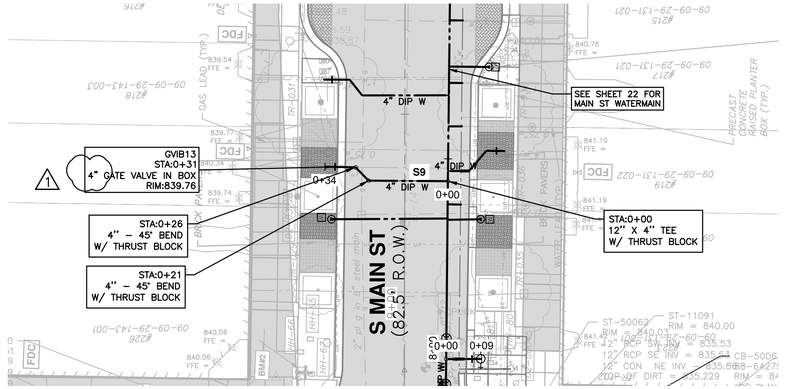
SCALE PLAN: 1"=20' PROFILE: 1" = 5'

DRAWING No. 2020-038-33

SHEET No. 33 OF 80

c:\pw_work\wade-trim_rbrown\d1092459\CWM-PLTS-WM Laterals1.dwg Dwg Created: 9-Dec-22 -- _a2 standard bw.stb - Plot Date: 9-Dec-22





LEGEND

- EXISTING BUILDING VAULTS
- EXISTING TROLLEY TRACK FOUNDATION AREA
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NOTES

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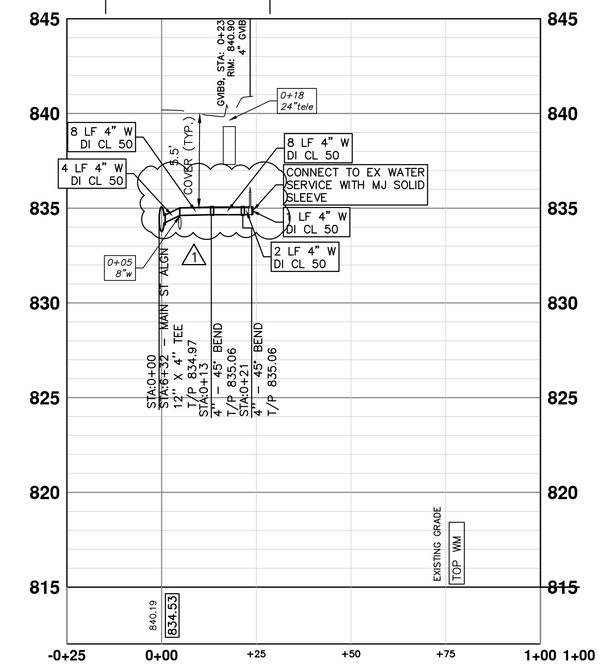
WATER MAIN STRUCTURE TABLE

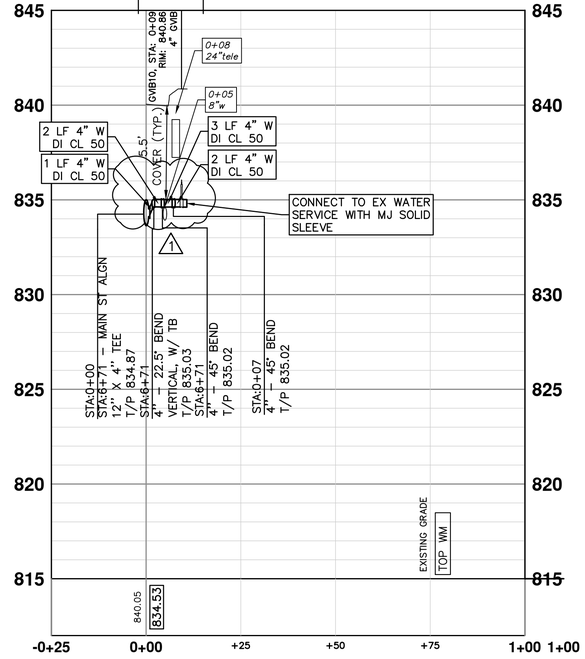
STRUCTURE	TYPE	STATION	RIM	DEPTH
GVIB10	4" GVIB	0+09	840.86	5.84
GVIB9	4" GVIB	0+23	840.90	5.83
GVIB13	4" GVIB	0+31	839.76	5.86

4" DI CL 50 W/ POLYETHYLENE WRAP TRENCH DETAIL I



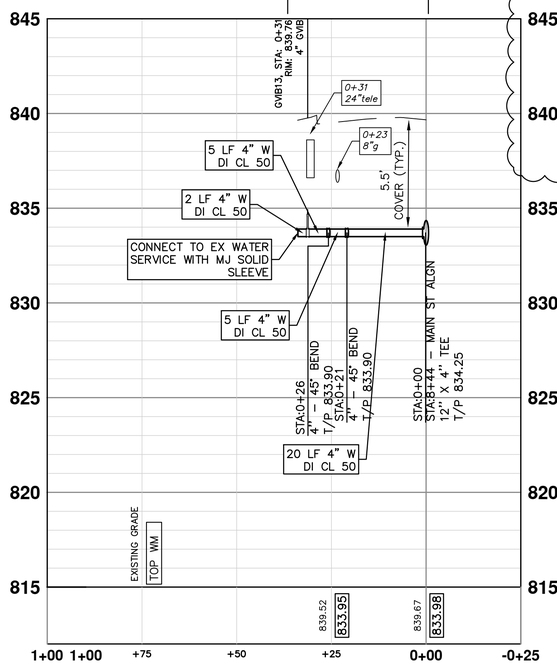
S7: 309 MAIN ST

4" DI CL 50 W/ POLYETHYLENE WRAP TRENCH DETAIL I



S8: 305 MAIN ST

4" DI CL 50 W/ POLYETHYLENE WRAP TRENCH DETAIL I



S9: 220 MAIN ST

CITY OF ANN ARBOR - PUBLIC SERVICES - ENGINEERING

S. MAIN STREET WATER MAIN REPLACEMENT & RESURFACE PROJECT
LATERALS 3

CITY OF ANN ARBOR
PUBLIC SERVICES
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ANN ARBOR, MI 48107-8647
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REV.	DESCRIPTION	DATE	DRAWN	CHECKED
1	REVISION #1	12/9/2022	AK/RB/MF	CT/VCM

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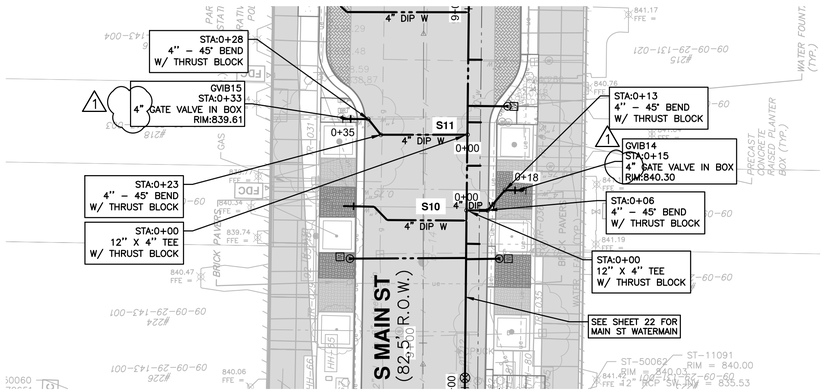
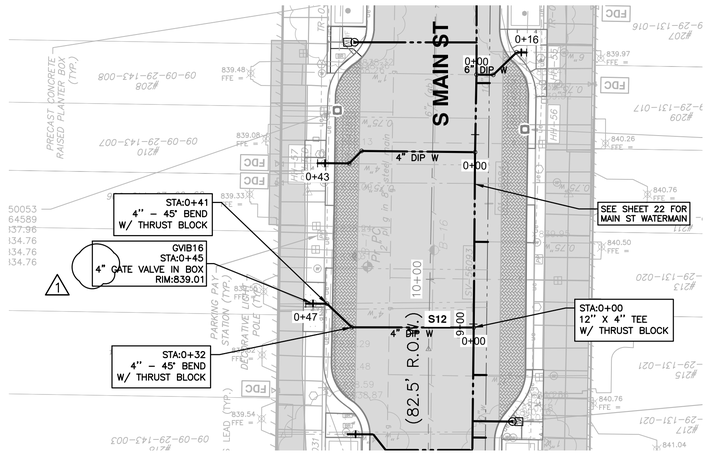
SCALE PLAN: 1"=20' PROFILE: 1" = 5'

DRAWING No. 2020-038-34

SHEET No. 34 OF 80

c:\pw_work\wade-trim_rbrown\d1092459\CWM-PLTS-WM Laterals1.dwg Dwg Created: 9-Dec-22 — o2 standard bw.stb — Plot Date: 9-Dec-22





LEGEND

- EXISTING BUILDING VAULTS
- EXISTING TROLLEY TRACK FOUNDATION AREA
- EXISTING BRICK PAVER AREA

NOTES

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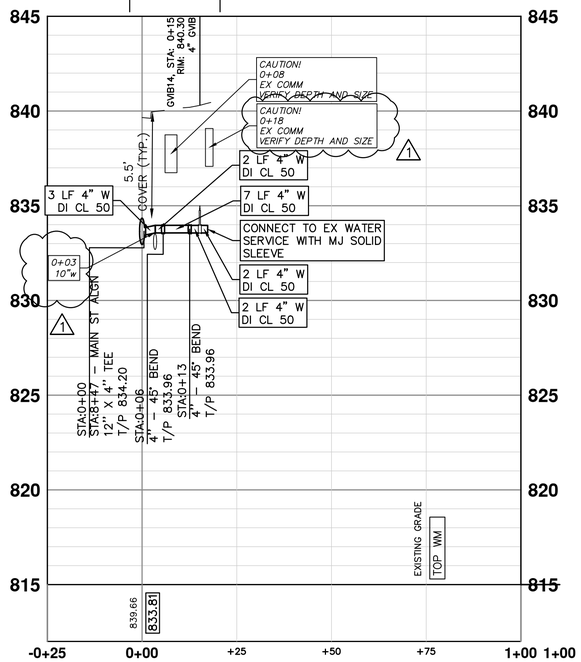
WATER MAIN STRUCTURE TABLE

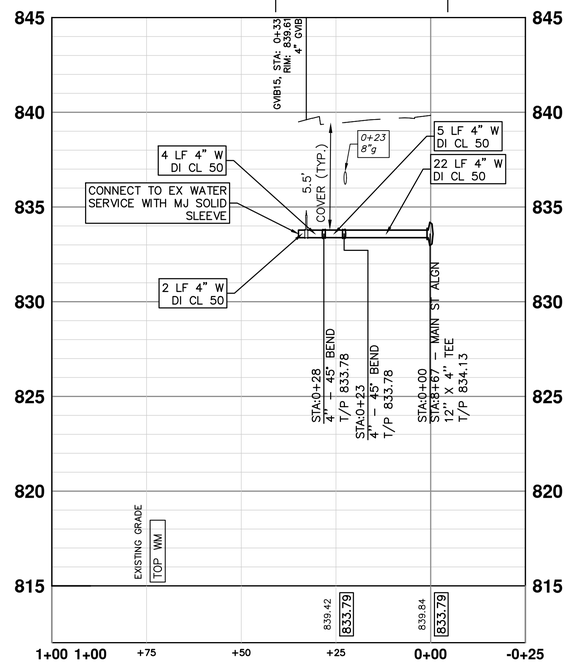
STRUCTURE	TYPE	STATION	RIM	DEPTH
GVIB14	4" GVIB	0+15	840.30	6.34
GVIB15	4" GVIB	0+33	839.61	5.83
GVIB16	4" GVIB	0+45	839.01	5.46

4" DI CL 50 W/ POLYETHYLENE WRAP TRENCH DETAIL I



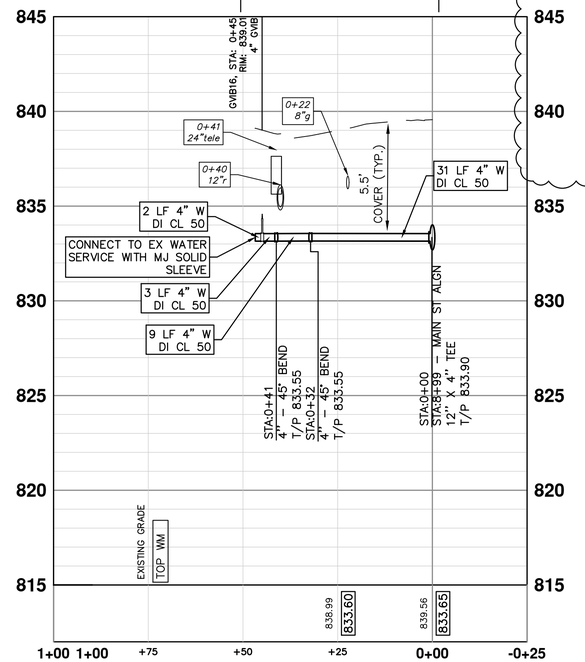
S10: 219 MAIN ST

4" DI CL 50 W/ POLYETHYLENE WRAP TRENCH DETAIL I



S11: 218 MAIN ST

4" DI CL 50 W/ POLYETHYLENE WRAP TRENCH DETAIL I



S12: 214 MAIN ST

811 Know what's below. Call before you dig.

REV.	DESCRIPTION	DATE	DRAWN	CHECKED
1	REVISION #1	12/9/2022	AK/RB/MF	CT/VCM

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PUBLIC SERVICES
301 E. HURON STREET
P.O. BOX 8647
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CITY OF ANN ARBOR - PUBLIC SERVICES - ENGINEERING

S. MAIN STREET WATER MAIN REPLACEMENT & RESURFACE PROJECT

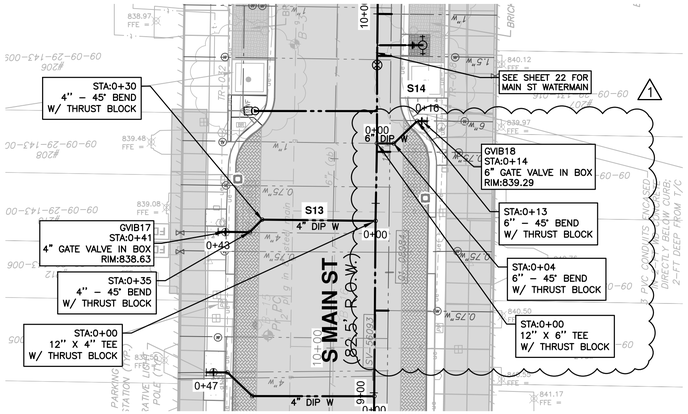
LATERALS 4

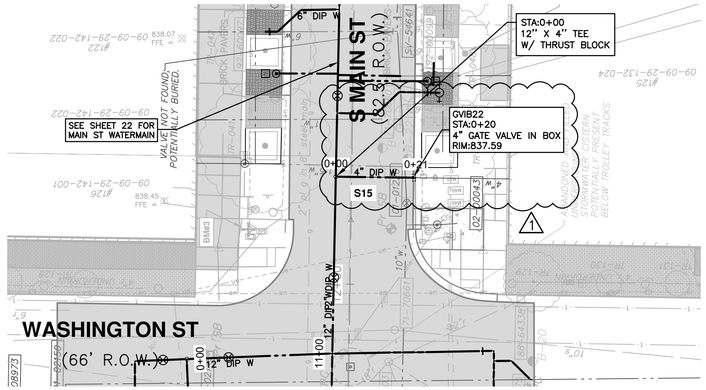
SCALE PLAN: 1"=20' PROFILE: 1"=5'

DRAWING No. 2020-038-35

SHEET No. 35 OF 80

c:\pw_work\wade-trim_rbrown\d1092459\CWM-PLTS-WM Laterals1.dwg Dwg Created: 9-Dec-22 - _a2 standard bw.stb - Plot Date: 9-Dec-22





LEGEND

- EXISTING BUILDING VAULTS
- EXISTING TROLLEY TRACK FOUNDATION AREA
- EXISTING BRICK PAVER AREA

NOTES

1: DURING THE PROJECT'S CONSTRUCTION, IF THE CONTRACTOR ENCOUNTERS A GALVANIZED STEEL OR LEAD WATER SERVICE DURING THE PERFORMANCE OF THE WORK, THAT WATER SERVICE MUST BE IMMEDIATELY REPLACED IF IT IS DETERMINED TO HAVE, OR HAVE HAD, LEAD COMPONENTS WITHIN IT. THE CONTRACTOR UPON DISCOVERING A WATER SERVICE THAT APPEARS TO BE CONSTRUCTED OF A GALVANIZED STEEL OR LEAD MATERIAL, MUST IMMEDIATELY REPORT THEIR OBSERVATION TO THE ENGINEER AND/OR CITY OF ANN ARBOR PUBLIC WORKS STAFF FOR AUTHENTICATION. IF THE LEAD IS CONFIRMED TO BE CONSTRUCTED OF A MATERIAL THAT CONTAINS LEAD OR COULD HAVE CONTAINED LEAD MATERIALS, THEN THE CONTRACTOR MUST IMMEDIATELY COORDINATE THE REMOVAL OF THE MATERIAL WITH THE ENGINEER, PROPERTY OWNER, AND PUBLIC WORKS STAFF TO REMOVE FROM SERVICE AND REPLACE THE WATER SERVICE TO THE LIMITS AS DIRECTED BY THE ENGINEER. THIS WORK SHALL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE ITEM OF WORK "EXCAVATE AND BACKFILL FOR WATER SERVICE TAP AND LEAD."

2: THE CONTRACTOR SHALL BE AWARE THAT THE FOUNDATION/SUPPORTS FOR THE FORMER TROLLEY TRACKS EXTEND TO A VARIABLE DEPTH OF ABOUT 3'. THE LOCATIONS ARE REPRESENTED ON THE PLANS FROM THE BEST AVAILABLE INFORMATION. IF THESE FOUNDATIONS/SUPPORTS OR OLD TROLLEY TRACKS ARE ENCOUNTERED IN ANY LOCATION DURING THE PERFORMANCE OF THE WORK OF THE PROJECT, THE TRACKS, FOUNDATIONS/SUPPORTS, AND ANCILLARY MATERIALS MUST BE REMOVED FULL DEPTH IF THEY ARE CROSSED TRANSVERSELY AS PART OF THE PROJECT'S WORK. THIS WORK WILL BE PAID FOR AS "PAV'T REM, SPECIAL."

1 3: IF WATER SERVICES OF UNKNOWN SIZE ARE FOUND TO BE 4" OR LARGER, THEY SHALL BE REPLACED FROM THE WATERMAIN TO BEHIND THE CURB, WHERE A NEW WATER SHUT–OFF WILL BE INSTALLED AND THE NEW SERVICE CONNECTED INTO THE EXISTING SERVICE, PER THE APPROVAL OF THE ENGINEER.

CONTRACTOR SHALL TAKE CAUTION IN EXCAVATING AND INSTALLING LEADS IN PROXIMITY TO EXISTING UNDERGROUND BUILDING VAULTS. PROTECT EXISTING VAULT. CONNECT TO EXISTING WATER SERVICE OUTSIDE EXISTING VAULT WALL. THIS SHALL BE INCLUDED IN THE COST OF THE WATER MAIN PAY ITEMS.

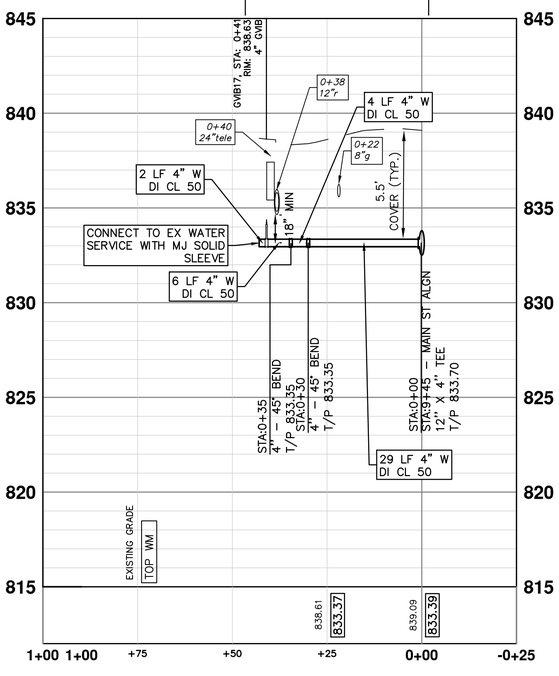
WHERE EXISTING WATER MAIN IS EXPOSED FOR A CONNECTION OR APPURTENANCE INSTALLATION, THE CONTRACTOR SHALL INSTALL ONE SACRIFICIAL ANODE ON THE EXISTING PIPE. IF THE NEW FITTING IS INSTALLED IN–LINE WITH THE EXISTING MAIN, SUCH AS AT A CUT–IN TEE OR VALVE INSERTION, ONE ANODE SHALL BE INSTALLED ON THE EXISTING PIPE TO EACH SIDE OF THE NEW FITTING. EACH ANODE INSTALLED ON EXISTING WATER MAIN WILL BE PAID FOR AS "SACRIFICIAL ANODE, XX LB"

THE DEPTH AND SIZE OF ELECTRICAL, TELEPHONE AND FIBER OPTIC CONDUITS/DUCTS AND THE DEPTH OF GAS MAINS ARE APPROXIMATE. CONTRACTOR SHALL VERIFY, SUPPORT AND PROTECT DURING CONSTRUCTION AND ADJUST WATER MAIN WHERE NECESSARY TO MAINTAIN 12–INCHES VERTICAL CLEARANCE FROM ALL UTILITIES (EXCEPT SANITARY AND STORM SEWER WHERE 18–INCHES IS REQUIRED). THIS WORK IS PAID FOR UNDER GENERAL CONDITIONS, MAX.

WATER MAIN STRUCTURE TABLE

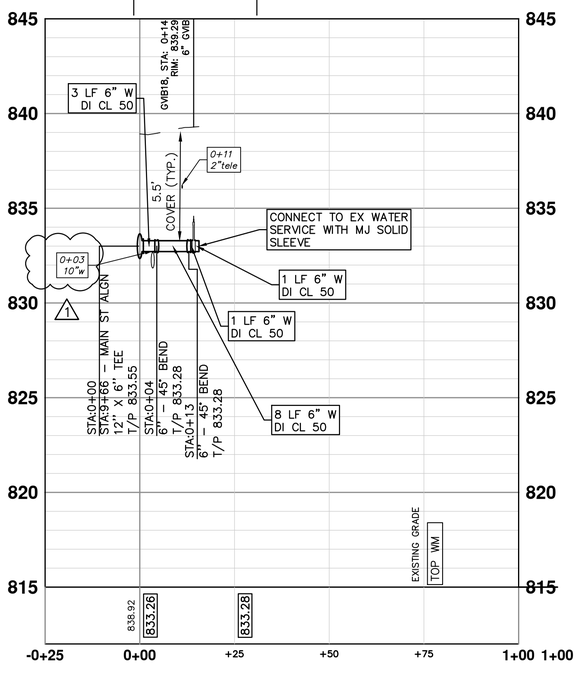
STRUCTURE	TYPE	STATION	RIM	DEPTH
GVIB18	6" GVIB	0+14	839.29	6.00
GVIB22	4" GVIB	0+20	837.59	5.58
GVIB17	4" GVIB	0+41	838.63	5.28

4" DI CL 50 W/ POLYETHYLENE WRAP TRENCH DETAIL I



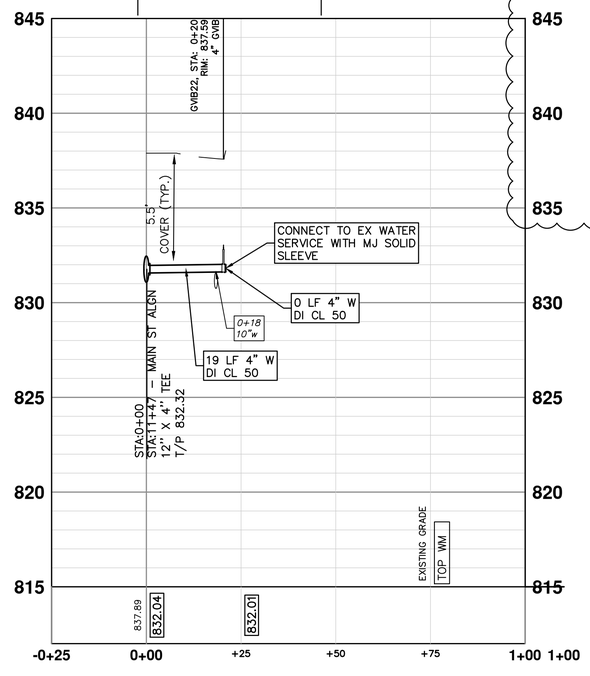
S13: 210 MAIN ST

6" DI CL 50 W/ POLYETHYLENE WRAP TRENCH DETAIL I



S14: 207 MAIN ST

4" DI CL 50 W/ POLYETHYLENE WRAP TRENCH DETAIL I



S15: 125 MAIN ST

811 Know what's **below.** **Call** before you dig.

REV.	DESCRIPTION	DATE	DRAWN	CHECKED
1	REVISION #1	12/9/2022	AK/RB/MF	CT/VCM

CITY OF ANN ARBOR
PUBLIC SERVICES
301 E. HURON STREET
P.O. BOX 8647
ANN ARBOR, MI 48107-8647
(734) 794-6410
www.a2gov.org

CITY OF ANN ARBOR - PUBLIC SERVICES - ENGINEERING

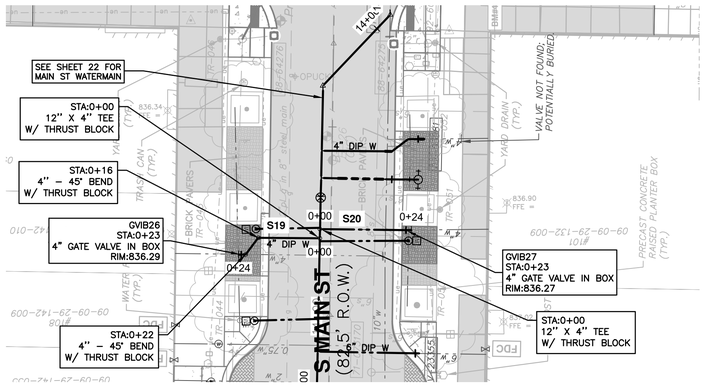
S. MAIN STREET WATER MAIN REPLACEMENT & RESURFACE PROJECT
LATERALS 5

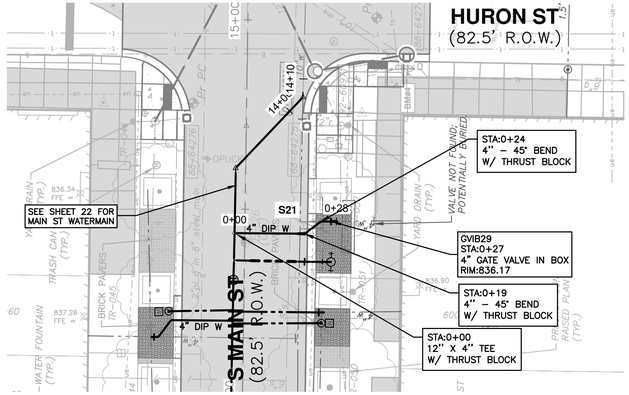
SCALE PLAN: 1"=20' PROFILE: 1"= 5'

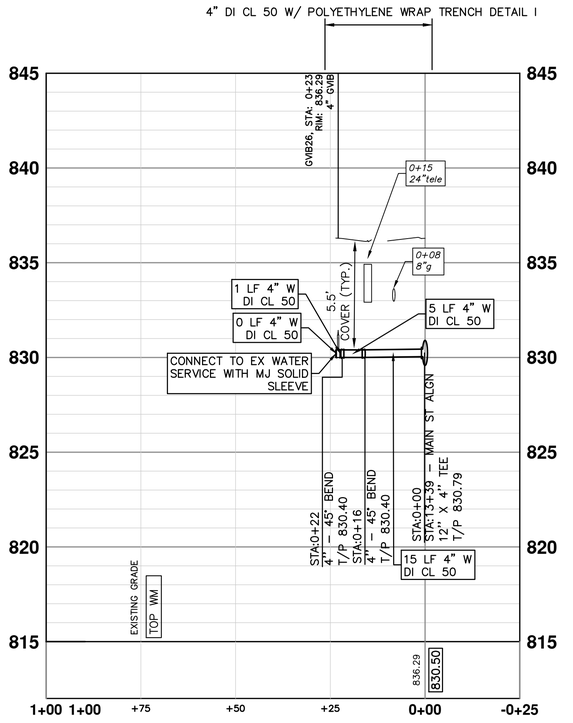
DRAWING No. 2020-038-36

SHEET No. 36 OF 80

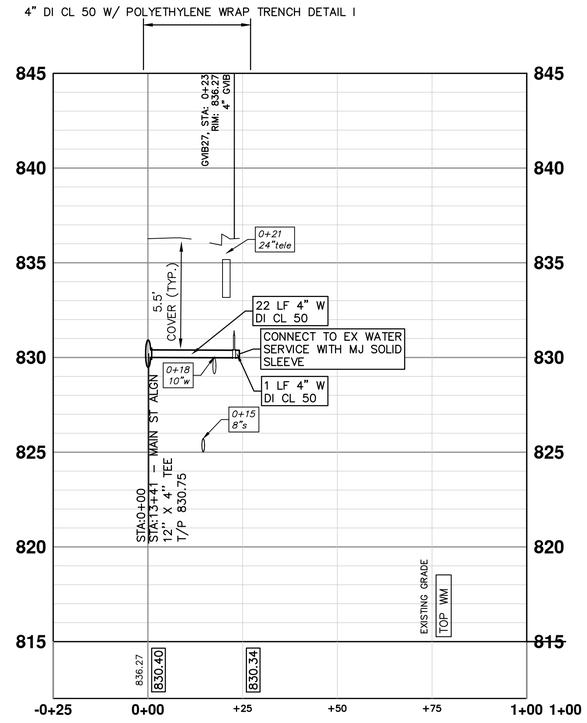
c:\pw_work\wade-trim_rbrown\d10924591\CWM-PLTS-WM Laterals2.dwg Dwg Created: 9-Dec-22 — _o2 standard bw.stb — Plot Date: 9-Dec-22



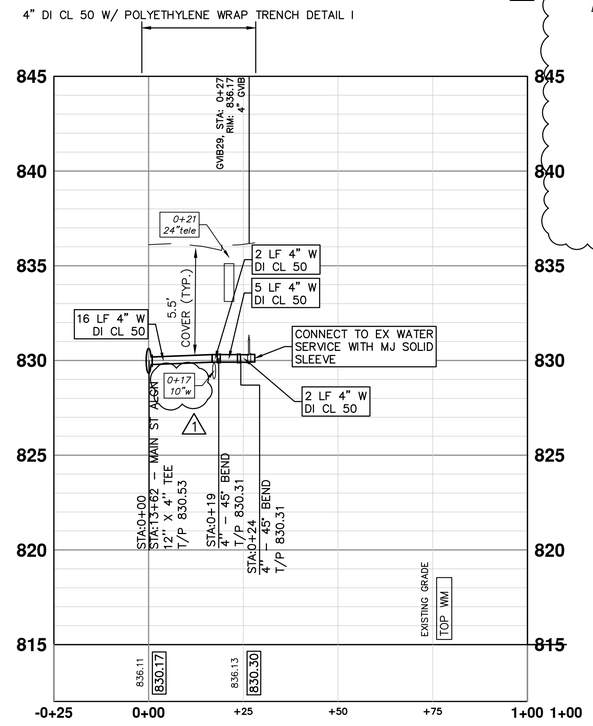




S19: 106 MAIN ST



S20: 101 MAIN ST



S21: 101 (NORTH) MAIN ST

LEGEND

- EXISTING BUILDING VAULTS
- EXISTING TROLLEY TRACK FOUNDATION AREA
- EXISTING BRICK PAVER AREA

N

NOTES

1: DURING THE PROJECT'S CONSTRUCTION, IF THE CONTRACTOR ENCOUNTERS A GALVANIZED STEEL OR LEAD WATER SERVICE DURING THE PERFORMANCE OF THE WORK, THAT WATER SERVICE MUST BE IMMEDIATELY REPLACED IF IT IS DETERMINED TO HAVE, OR HAVE HAD, LEAD COMPONENTS WITHIN IT. THE CONTRACTOR UPON DISCOVERING A WATER SERVICE THAT APPEARS TO BE CONSTRUCTED OF A GALVANIZED STEEL OR LEAD MATERIAL, MUST IMMEDIATELY REPORT THEIR OBSERVATION TO THE ENGINEER AND/OR CITY OF ANN ARBOR PUBLIC WORKS STAFF FOR AUTHENTICATION. IF THE LEAD IS CONFIRMED TO BE CONSTRUCTED OF A MATERIAL THAT CONTAINS LEAD OR COULD HAVE CONTAINED LEAD MATERIALS, THEN THE CONTRACTOR MUST IMMEDIATELY COORDINATE THE REMOVAL OF THE MATERIAL WITH THE ENGINEER, PROPERTY OWNER, AND PUBLIC WORKS STAFF TO REMOVE FROM SERVICE AND REPLACE THE WATER SERVICE TO THE LIMITS AS DIRECTED BY THE ENGINEER. THIS WORK SHALL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE ITEM OF WORK "EXCAVATE AND BACKFILL FOR WATER SERVICE TAP AND LEAD."

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WATER MAIN STRUCTURE TABLE

STRUCTURE	TYPE	STATION	RIM	DEPTH
GVIB26	4" GVIB	0+23	836.29	5.89
GVIB27	4" GVIB	0+23	836.27	5.89
GVIB29	4" GVIB	0+27	836.17	5.85

811 Know what's below. Call before you dig.

REV.	DESCRIPTION	DATE	DRAWN	CHECKED
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CITY OF ANN ARBOR
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CITY OF ANN ARBOR - PUBLIC SERVICES - ENGINEERING

S. MAIN STREET WATER MAIN REPLACEMENT & RESURFACE PROJECT

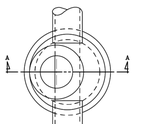
LATERALS 7

SCALE PLAN: 1"=20' PROFILE: 1" = 5'

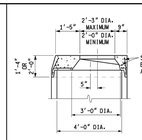
DRAWING No. 2020-038-38

SHEET No. 38 OF 80

c:\pw_work\wade-trim_rbrown\d1092459\CWM-PLTS-WM Laterals2.dwg Dwg Created: 9-Dec-22 — _a2 standard bw.stb — Plot Date: 9-Dec-22

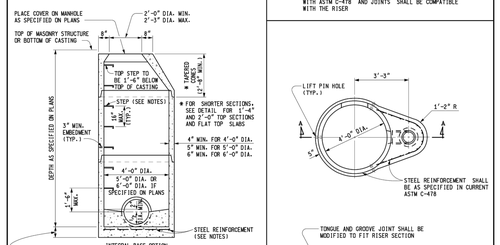


PLAN VIEW



DETAIL FOR 1'-4" & 2'-0" TOP SECTIONS

SHAPE MAY VARY FROM DETAIL SHOWN BUT MUST COMPLY WITH ASTM C-478 AND JOINTS SHALL BE COMPATIBLE WITH THE RISER

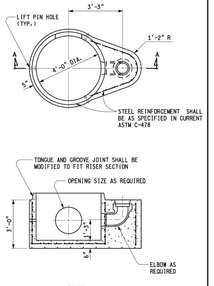


SECTION A - A

TYPICAL MANHOLE

PRECAST REINFORCED CONCRETE SHOWN

OTHER OPTIONS INCLUDE CONCRETE BLOCK, BRICK, OR CAST-IN-PLACE WALL SECTIONS. SEE TYPICAL WALL SECTIONS FOR WALL THICKNESS



SECTION A - A

TYPICAL PRECAST REINFORCED BOTTOM SECTION FOR DROP MANHOLE

MDOT Michigan Department of Transportation

DEPARTMENT DIRECTOR: Paul C. Ajegba

PREPARED BY: DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: K.L.P.

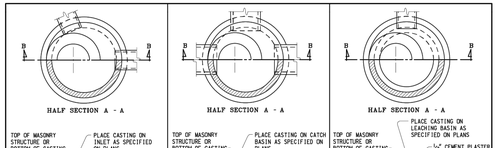
APPROVED BY: Gregg Brunner, P.E. — Gregg Brunner Sep 19 2019 2:27 PM — DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: Bradley C. Wieferich — Bradley C. Wieferich Sep 19 2019 11:22 AM — DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

DRAINAGE STRUCTURES

5-18-2020 F.H.W.A. APPROVAL	9-19-2019 PLAN DATE	R-1-G	SHEET 1 OF 9



SEE MANHOLE DETAILS FOR SIZE AND BASE OPTIONS

SECTION B - B

INLET

SEE MANHOLE DETAILS FOR SIZE AND BASE OPTIONS

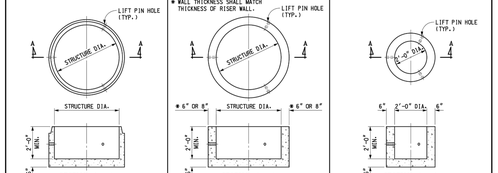
SECTION B - B

CATCH BASIN

SEE MANHOLE DETAILS FOR BASE OPTIONS

SECTION B - B

LEACHING BASIN



SEE MANHOLE DETAILS FOR SIZE AND BASE OPTIONS

PRECAST SUMP FOR PRECAST RISERS

SEE TYPICAL BRICK AND BLOCK SECTION FOR SIZE AND BASE OPTIONS

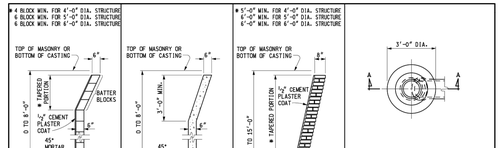
PRECAST SUMP FOR BRICK OR BLOCK CONSTRUCTION

PRECAST SUMP FOR 2'-0" DIA. STRUCTURES

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

DRAINAGE STRUCTURES

5-18-2020 F.H.W.A. APPROVAL	9-19-2019 PLAN DATE	R-1-G	SHEET 2 OF 9



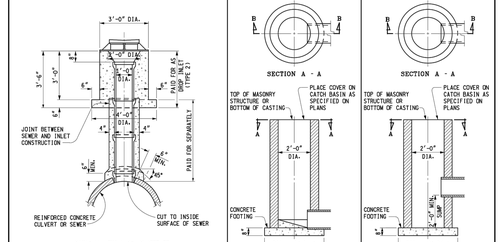
SECTION A - A

TYPICAL CONCRETE BLOCK WALL SECTION

TYPICAL CAST-IN-PLACE CONCRETE WALL SECTION

TYPICAL BRICK WALL SECTION

DROP INLET (TYPE 1)



DROP INLET (TYPE 2)

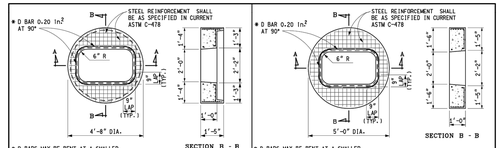
INLET

CATCH BASIN

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

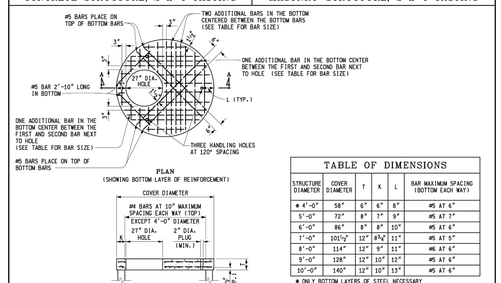
DRAINAGE STRUCTURES

5-18-2020 F.H.W.A. APPROVAL	9-19-2019 PLAN DATE	R-1-G	SHEET 3 OF 9



PRECAST FLAT SLAB TOP FOR PRECAST CONCRETE STRUCTURE, 2' x 4' CASTING

PRECAST FLAT SLAB TOP FOR MASONRY STRUCTURE, 2' x 4' CASTING



PRECAST REINFORCED CONCRETE FLAT SLAB TOP

TABLE OF DIMENSIONS

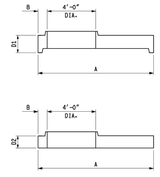
STRUCTURE DIAMETER	COVER DIAMETER	T	K	L	BAR MAXIMUM SPACING (BOTTOM EACH WAY)
* 4'-0"	58"	6"	6"	8"	#5 AT 6"
5'-0"	72"	8"	7"	9"	#5 AT 7"
6'-0"	86"	8"	8"	10"	#5 AT 6"
7'-0"	101½"	12"	8¾"	11"	#5 AT 5"
8'-0"	114"	12"	9"	11"	#6 AT 6"
9'-0"	128"	12"	10"	12"	#5 AT 6"
10'-0"	140"	12"	10"	13"	#5 AT 6"

* ONLY BOTTOM LAYERS OF STEEL NECESSARY

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

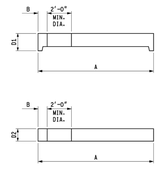
DRAINAGE STRUCTURES

5-18-2020 F.H.W.A. APPROVAL	9-19-2019 PLAN DATE	R-1-G	SHEET 4 OF 9



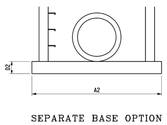
PRECAST REDUCER CAP

REDUCER CAP DIMENSIONS				
STRUCTURE DIAMETER	CAP DIAMETER "A"	B	CAP DEPTH "D1"	CAP DEPTH "D2"
7'-0"	101½"	8¾"	1'-5"	12"
8'-0"	114"	9"	1'-5"	12"
9'-0"	128"	10"	1'-5"	12"
10'-0"	140"	10"	1'-6"	12"



PRECAST FLAT SLAB TOP

FLAT SLAB TOP DIMENSIONS				
STRUCTURE DIAMETER	COVER DIAMETER "A"	B	COVER DEPTH "D1"	COVER DEPTH "D2"
7'-0"	101½"	8¾"	1'-5"	12"
8'-0"	114"	9"	1'-5"	12"
9'-0"	128"	10"	1'-5"	12"
10'-0"	140"	10"	1'-6"	12"



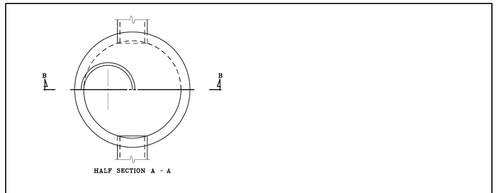
SEPARATE BASE OPTION

BASE AND RISER DIMENSIONS					
STRUCTURE DIAMETER	BASE DIAMETER "A1"	BASE DIAMETER "A2"	MIN. WALL THICKNESS "T"	BASE DEPTH "D1"	BASE DEPTH "D2"
7'-0"	101½"	108"	7"	8"	12"
8'-0"	114"	128"	8"	8"	12"
9'-0"	128"	140"	9"	8"	12"
10'-0"	140"	154"	10"	8"	12"

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

DRAINAGE STRUCTURES

5-18-2020 F.H.W.A. APPROVAL	9-19-2019 PLAN DATE	R-1-G	SHEET 5 OF 9

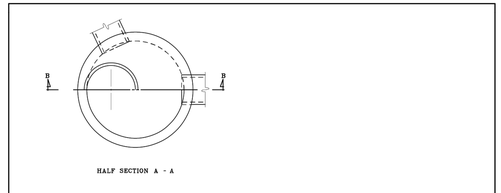


PRECAST MANHOLE

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

DRAINAGE STRUCTURES

5-18-2020 F.H.W.A. APPROVAL	9-19-2019 PLAN DATE	R-1-G	SHEET 6 OF 9

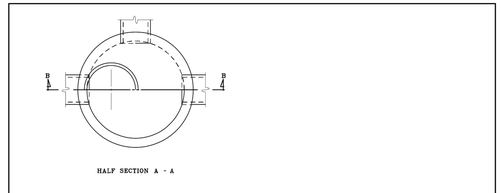


PRECAST INLET

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

DRAINAGE STRUCTURES

5-18-2020 F.H.W.A. APPROVAL	9-19-2019 PLAN DATE	R-1-G	SHEET 7 OF 9



PRECAST CATCH BASIN

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

DRAINAGE STRUCTURES

5-18-2020 F.H.W.A. APPROVAL	9-19-2019 PLAN DATE	R-1-G	SHEET 8 OF 9

Know what's below. Call before you dig. 811

REV.	DESCRIPTION	DATE	DRAWN	CHECKED
1	REVISION #1	12/9/2022	AK/RB/MF	CT/VCM

CITY OF ANN ARBOR
PUBLIC SERVICES
301 EAST HURON STREET
P.O. BOX 8647
ANN ARBOR, MI 48107-8647
734.794.6410
www.a2gov.org

CITY OF ANN ARBOR - PUBLIC SERVICES - ENGINEERING

S. MAIN STREET WATER MAIN
REPLACEMENT & RESURFACE PROJECT
MDOT DETAILS 1

SCALE PLAN: ########

DRAWING No. 2020-038-57

SHEET No. 57 OF 80

1 FOR USE IN MDOT ROW ONLY

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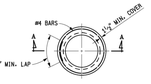
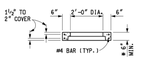




SECTION A - A

* WHEN RISER TONGUE LENGTH IS GREATER THAN 3", USE 2 TIMES THE TONGUE LENGTH.

NOTE: PRECAST RISER SHALL FULLY ENGAGE THE TONGUE OF THE RISER PIPE.

PRECAST RISER RING

(FOR 2'-0" DIAMETER STRUCTURE)

NOTES:

THE DRAINAGE STRUCTURE COVERS ALLOWED FOR USE ON THESE DRAINAGE STRUCTURES ARE SPECIFIED IN SUBSEQUENT STANDARD PLANS AND ARE INTERCHANGEABLE ON ANY STRUCTURE.

THE TOPS OF MASONRY STRUCTURES SHALL BE SUFFICIENTLY LOW TO PERMIT PROPER ADJUSTMENT OF COVER TO GRADE USING MORTAR OR BRICK AS DIRECTED BY THE ENGINEER.

PREMIUM JOINTS ARE REQUIRED ON ALL SANITARY MANHOLES. SEE ASTM DESIGNATION C-923.

GRANULAR MATERIAL CLASS II SHALL BE USED IN BACKFILLING AROUND ALL STRUCTURES THAT FALL WITHIN THE 1:1 INFLUENCE LINES FROM THE EDGE OF PAVEMENT OR BACK OF CURB.

STEPS FOR DRAINAGE STRUCTURES SHALL BE OF AN APPROVED DESIGN AND MADE FROM CAST IRON, ALUMINUM, OR PLASTIC COATED STEEL. RUNGS SHALL BE A MINIMUM OF 12" IN CLEAR LENGTH, DESIGNED TO PREVENT THE FOOT FROM SLIPPING OFF THE END. THE MINIMUM HORIZONTAL PULL OUT LOAD SHALL BE 400 LBS. THE MINIMUM VERTICAL LOAD SHALL BE 800 LBS.

THE BELL SHALL BE REMOVED FOR THE FIRST LENGTH OF OUTLET PIPE PROJECTING THROUGH THE WALL OF THE MANHOLE.

PRECAST CONCRETE SECTIONS, SUMPS, BASE SECTIONS, AND FLAT TOP SLABS SHALL BE BUILT ACCORDING TO CURRENT ASTM C-478 AND ACCORDING TO DETAILS SPECIFIED ON THIS PLAN. PRECAST REINFORCED CONCRETE FLAT TOP SLAB SHALL BE MARKED TO SHOW LOCATION OF REINFORCEMENT. THE WALLS OF THE PRECAST UNITS MAY HAVE A SLIGHT TAPER TO ALLOW FOR FORM REMOVAL. PRECAST CONCRETE 2'-0" DIAMETER DRAINAGE STRUCTURES SHALL HAVE A MINIMUM 3" WALL THICKNESS WITH A 5" MINIMUM BEARING SURFACE ON TOP. SEE PRECAST RISER RING FOR 2'-0" DIAMETER STRUCTURE.

THE MAXIMUM INSIDE DIAMETER OF PIPES ENTERING OR LEAVING PRECAST DRAINAGE STRUCTURES SHALL BE 2'-0" LESS THAN THE INSIDE DIAMETER OF THE DRAINAGE STRUCTURE. A PIPE LEAVING A 2'-0" DIAMETER DRAINAGE STRUCTURE IS ALLOWED TO HAVE 1'-0" INSIDE DIAMETER OR LESS.

THE NUMBER OF PIPE OPENINGS IN A RISER SHALL BE DETERMINED BY THE DESIGNER. SPACING BETWEEN OPENINGS SHALL BE 1'-0" MINIMUM. OPENINGS MAY BE CONSTRUCTED BY CASTING OR SCRIBING IN PRECAST STRUCTURES DURING FABRICATION OR BY CORING THE CURED CONCRETE.

PRECAST CONCRETE FOOTINGS OR BASES SHALL BE REINFORCED WITH #4 BARS SPACED AT 1'-0" BOTH WAYS OR WITH TWO LAYERS OF WELDED WIRE FABRIC OF EQUIVALENT CROSS SECTIONAL AREA LAID AT RIGHT ANGLES AND WIRED TOGETHER. REINFORCEMENT SHALL BE PLACED IN TOP OF FOOTING AND SHALL BE MARKED.

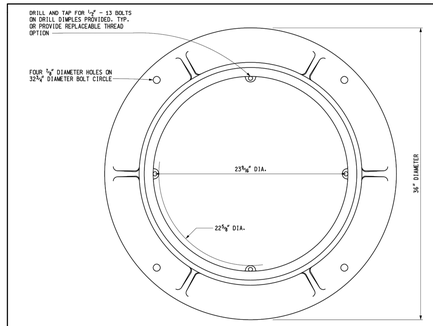
PRECAST CONCRETE FOOTINGS SHALL BE SUPPORTED BY A COMPACTED 6" GRANULAR SUBBASE.

THE MINIMUM WALL THICKNESS FOR ALL 2'-0", 4'-0", 5'-0", AND 6'-0" DRAINAGE STRUCTURES USING CONCRETE BLOCK, BRICK, OR CAST-IN-PLACE CONCRETE SHALL BE AS SPECIFIED IN TYPICAL WALL SECTIONS.

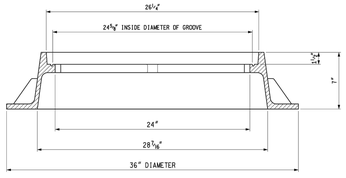
THE CONICAL SECTION OF MANHOLES OR CATCH BASINS CONSTRUCTED OF BLOCK OR BRICK SHALL BE SHROUDED WITH GEOTEXTILE FABRIC TO A MINIMUM DEPTH OF 4'-0" OR THROUGH THE FROST ZONE. ENOUGH GEOTEXTILE MATERIAL SHALL BE LEFT ON THE TOP (8" OR MORE) TO ROLL OVER THE TOP OF THE CONE.

PREFORMED HIGH DENSITY POLYSTYRENE FILLER PIECES MAY BE USED TO CHANNEL FLOW IN THE BOTTOM OF MANHOLES PROVIDED THEY HAVE AT LEAST 2" OF CONCRETE COVER. THE USE OF THIS MATERIAL FOR CHANNEL FLOW IS RESTRICTED TO MANHOLES WHERE THE BOTTOM SECTION IS NOT SUBJECT TO FREEZING. THE USE OF THIS MATERIAL MUST BE APPROVED BY THE ENGINEER.

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR DRAINAGE STRUCTURES			
5-18-2020 F.H.W.A. APPROVAL	9-19-2019 PLAN DATE	R-1-G	SHEET 9 OF 9

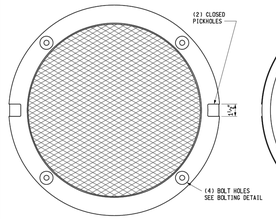


TOP VIEW OF FRAME

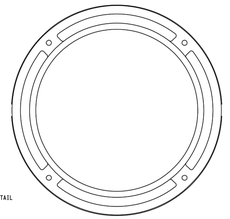


FRAME SECTION

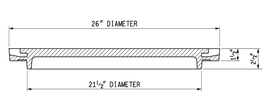
DEPARTMENT DIRECTOR Kirk T. Steudle	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR COVER Q FOR USE ON MANHOLES OR SANITARY SEWERS WHERE VENT HOLES ARE NOT DESIRED			
PREPARED BY DESIGN DIVISION DRAWN BY: R.L.T. CHECKED BY: R.K.P.	APPROVED BY: Randy V. Byrd DIRECTOR, BUREAU OF FIELD SERVICES APPROVED BY: Paul a Van Poolen DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT	9-30-2014 F.H.W.A. APPROVAL	3-12-2014 PLAN DATE	R-18-F	SHEET 1 OF 2



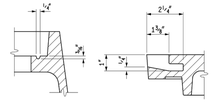
TOP VIEW OF COVER



BOTTOM VIEW OF COVER



COVER SECTION



GROOVE DETAIL
¼" DIA. NEOPRENE GASKET PLACED IN GROOVE

PICKHOLE DETAIL
ALTERNATE CLOSED PICKHOLES ALLOWED

BOLTING DETAIL

NOTES:

THE CASTINGS SHALL MEET THE REQUIREMENTS OF THE CURRENT STANDARD SPECIFICATION FOR GRAY IRON CASTINGS.

ALL CASTINGS SHALL BE CLEANED BY CURRENT APPROVED BLASTING METHODS.

THE SEATING FACE OF THE LID AND THE SEAT FOR THE SAME ON THE FRAME SHALL BE GROUND OR MACHINED SO THAT THE LID WILL HAVE AN EVEN BEARING ON ITS SEAT TO PREVENT ROCKING OR TILTING.

THE CASTINGS SHALL BE FREE OF POURING FAULTS, BLOW HOLES, CRACKS AND OTHER IMPERFECTIONS. THEY SHALL BE SOUND, TRUE TO FORM AND THICKNESS, CLEAN AND NEATLY FINISHED, AND SHALL BE COATED WITH COAL TAR PITCH VARNISH.

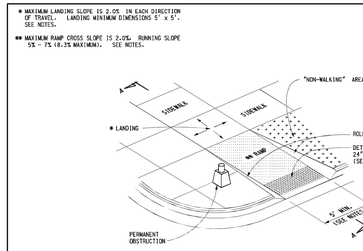
THIS COVER IS DESIGNED TO FIT ON ANY MANHOLE OR ON ANY EXISTING SIMILAR STRUCTURE WHEN SO DESIGNATED ON THE PLANS.

A NON-LOCKING COVER MAY BE USED WHEN APPROVED BY THE ENGINEER

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR COVER Q FOR USE ON MANHOLES OR SANITARY SEWERS WHERE VENT HOLES ARE NOT DESIRED			
9-30-2014 F.H.W.A. APPROVAL	3-12-2014 PLAN DATE	R-18-F	SHEET 2 OF 2

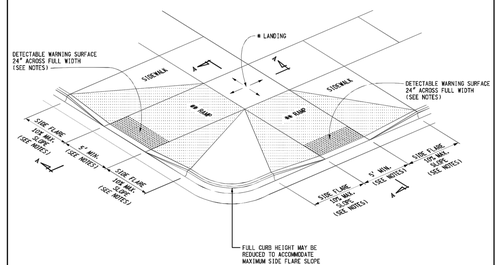
* MAXIMUM LANDING SLOPE IS 2.0% IN EACH DIRECTION OF TRAVEL. LANDING MINIMUM DIMENSIONS 5' x 5'. SEE NOTES.

** MAXIMUM RAMP CROSS SLOPE IS 2.0%. RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



CURB RAMP TYPE R

(ROLLED SIDES)



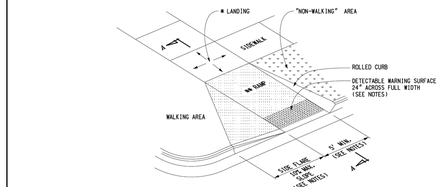
CURB RAMP TYPE F

(FLARED SIDES, TWO RAMPS SHOWN)

DEPARTMENT DIRECTION Paul C. Ajegba	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR CURB RAMP AND DETECTABLE WARNING DETAILS			
PREPARED BY DESIGN DIVISION DRAWN BY: R.L.T. CHECKED BY: R.K.P.	APPROVED BY: Gregg Brunnap DIRECTOR, BUREAU OF FIELD SERVICES APPROVED BY: Bradley C. Wieferich DIRECTOR, BUREAU OF DEVELOPMENT	4-7-2022 F.H.W.A. APPROVAL	5-8-2020 PLAN DATE	R-28-J	SHEET 1 OF 7

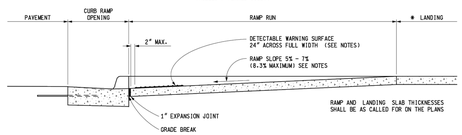
* MAXIMUM LANDING SLOPE IS 2.0% IN EACH DIRECTION OF TRAVEL. LANDING MINIMUM DIMENSIONS 5' x 5'. SEE NOTES.

** MAXIMUM RAMP CROSS SLOPE IS 2.0%. RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



CURB RAMP TYPE RF

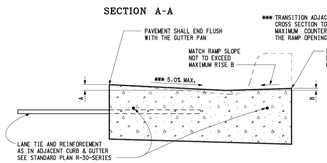
(ROLLED / FLARED SIDES)



SECTION A-A

CURB TYPE	MAXIMUM RISE (INCHES) A	B
B1	¼	1
B2	½	1
B3	¾	1
D1	¼	1
D2	½	1
D3	¾	1
C1	½	½
C2	½	½
C3	¾	½
C4	¾	½
C5	1	½
C6	1	½
F1	½	½
F2	½	½
F3	¾	½
F4	¾	½
F5	1	½
F6	1	½

FOR CURB TYPES SEE STANDARD PLAN R-30-SERIES



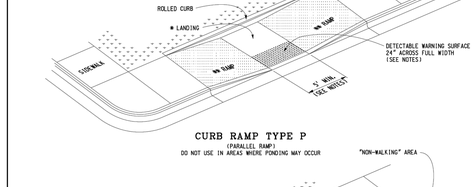
SECTION THROUGH CURB RAMP OPENING

(TYPICAL ALL RAMP TYPES)

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR CURB RAMP AND DETECTABLE WARNING DETAILS			
4-7-2022 F.H.W.A. APPROVAL	5-8-2020 PLAN DATE	R-28-J	SHEET 2 OF 7

* MAXIMUM LANDING SLOPE IS 2.0% IN EACH DIRECTION OF TRAVEL. LANDING MINIMUM DIMENSIONS 5' x 5'. SEE NOTES.

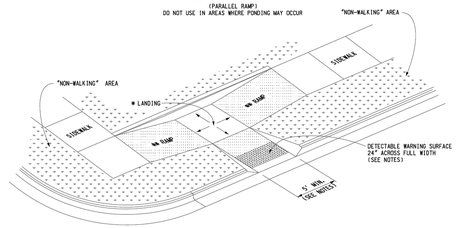
** MAXIMUM RAMP CROSS SLOPE IS 2.0%. RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



CURB RAMP TYPE P

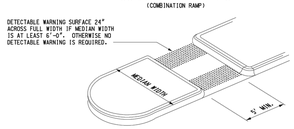
(PARALLEL RAMP)

DO NOT USE IN AREAS WHERE PONDING MAY OCCUR



CURB RAMP TYPE C

(COMBINATION RAMP)



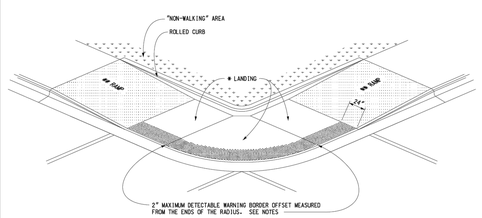
CURB RAMP TYPE M

(MEDIAN ISLAND)

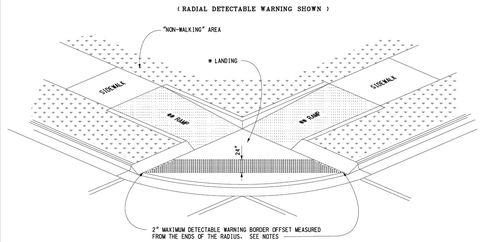
MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR CURB RAMP AND DETECTABLE WARNING DETAILS			
4-7-2022 F.H.W.A. APPROVAL	5-8-2020 PLAN DATE	R-28-J	SHEET 3 OF 7

* MAXIMUM LANDING SLOPE IS 2.0% IN EACH DIRECTION OF TRAVEL. LANDING MINIMUM DIMENSIONS 5' x 5'. SEE NOTES.

** MAXIMUM RAMP CROSS SLOPE IS 2.0%. RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



(RADIAL DETECTABLE WARNING SHOWN)



(TANGENT DETECTABLE WARNING SHOWN)

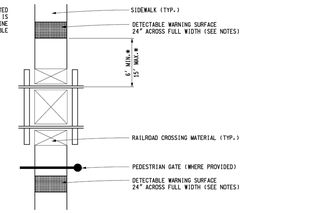
CURB RAMP TYPE D

(DEPRESSED CORNER)

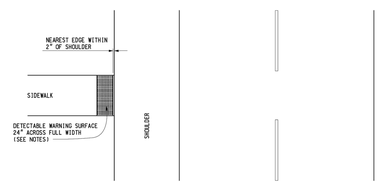
USE ONLY WHEN INDEPENDENT DIRECTIONAL RAMPS CAN NOT BE CONSTRUCTED FOR EACH CROSSING DIRECTION

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR CURB RAMP AND DETECTABLE WARNING DETAILS			
4-7-2022 F.H.W.A. APPROVAL	5-8-2020 PLAN DATE	R-28-J	SHEET 4 OF 7

* THE DETECTABLE WARNING SURFACE SHALL BE LOCATED SO THAT THE EDGE NEAREST THE RAIL CROSSING IS 6' MINIMUM AND 15' MAXIMUM FROM THE CENTERLINE OF THE NEAREST RAIL. DO NOT PLACE DETECTABLE WARNING ON RAILROAD CROSSING MATERIAL.



DETECTABLE WARNING AT RAILROAD CROSSING



DETECTABLE WARNING AT FLUSH SHOULDER OR ROADWAY

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR CURB RAMP AND DETECTABLE WARNING DETAILS			
4-7-2022 F.H.W.A. APPROVAL	5-8-2020 PLAN DATE	R-28-J	SHEET 5 OF 7

1 FOR USE IN MDOT ROW ONLY

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CITY OF ANN ARBOR - PUBLIC SERVICES - ENGINEERING

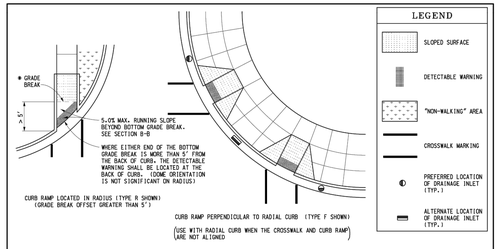
SCALE PLAN: ########

S. MAIN STREET WATER MAIN
REPLACEMENT & RESURFACE PROJECT
MDOT DETAILS 2

DRAWING No.
2020-038-58

SHEET No.
58 OF 80

C:\pw_work\d1092459\CDT-PLTS-MDOT Details.dwg Dwg Created: 8-Dec-22 — _a2 standard bw.stb — Plot Date: 9-Dec-22



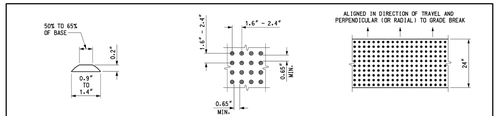
SECTION B-B

CURB RAMP ORIENTATION

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

CURB RAMP AND DETECTABLE WARNING DETAILS

4-7-2022	5-8-2020	R-28-J	SHEET
F.H.W.A. APPROVAL	PLAN DATE		6 OF 7



DOME SECTION | DOME SPACING | DOME ALIGNMENT

DETECTABLE WARNING DETAILS

NOTES:

DETAILS SPECIFIED ON THIS PLAN APPLY TO ALL CONSTRUCTION, RECONSTRUCTION, OR ALTERATION OF STREETS, CURBS, OR SIDEWALKS IN THE PUBLIC RIGHT OF WAY.

CURB RAMPS ARE TO BE LOCATED AS SPECIFIED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

RAMPS SHALL BE PROVIDED AT ALL CORNERS OF AN INTERSECTION WHERE THERE IS EXISTING OR PROPOSED SIDEWALK AND CURB. RAMPS SHALL ALSO BE PROVIDED AT MARKED AND/OR SIGNALIZED MID-BLOCK CROSSINGS.

SURFACE TEXTURE OF THE RAMP SHALL BE THAT OBTAINED BY A COARSE BROOMING, TRANSVERSE TO THE RUNNING SLOPE.

SIDEWALK SHALL BE RAMPED WHERE THE DRIVEWAY CURB IS EXTENDED ACROSS THE WALK.

CARE SHALL BE TAKEN TO ASSURE A UNIFORM GRADE ON THE RAMP, WHERE CONDITIONS PERMIT. IT IS DESIRABLE THAT THE SLOPE OF THE RAMP BE IN ONLY ONE DIRECTION. PARALLEL TO THE DIRECTION OF TRAVEL.

RAMP WIDTH SHALL BE INCREASED, IF NECESSARY, TO ACCOMMODATE SIDEWALK SNOW REMOVAL EQUIPMENT NORMALLY USED BY THE MUNICIPALITY.

WHEN 5' MINIMUM WIDTHS ARE NOT PRACTICABLE, RAMP WIDTH MAY BE REDUCED TO NOT LESS THAN 4' AND LANDINGS TO NOT LESS THAN 4' x 4'.

CURB RAMPS WITH A RUNNING SLOPE ≤5% DO NOT REQUIRE A TOP LANDING. HOWEVER, ANY CONTINUOUS SIDEWALK OR PEDESTRIAN ROUTE CROSSING THROUGH OR INTERSECTING THE CURB RAMP MUST INDEPENDENTLY MAINTAIN A CROSS SLOPE NOT GREATER THAN 2% PERPENDICULAR TO ITS OWN DIRECTION(S) OF TRAVEL.

DETECTABLE WARNING SURFACE COVERAGE IS 24" MINIMUM IN THE DIRECTION OF RAMP/PATH TRAVEL AND THE FULL WIDTH OF THE RAMP/PATH OPENING EXCLUDING CURBED OR FLARED CURB TRANSITION AREAS. A BORDER OFFSET NOT GREATER THAN 2" MEASURED ALONG THE EDGES OF THE DETECTABLE WARNING IS ALLOWABLE. FOR RADIAL CURB THE OFFSET IS MEASURED FROM THE ENDS OF THE RADIUS.

FOR NEW ROADWAY CONSTRUCTION, THE RAMP CROSS SLOPE MAY NOT EXCEED 2.0%. FOR ALTERATIONS TO EXISTING ROADWAYS, THE CROSS SLOPE MAY BE TRANSITIONED TO MEET AN EXISTING ROADWAY GRADE. THE CROSS SLOPE TRANSITION SHALL BE APPLIED UNIFORMLY OVER THE FULL LENGTH OF THE RAMP.

THE MAXIMUM RUNNING SLOPE OF 8.3% IS RELATIVE TO A FLAT (0%) REFERENCE. HOWEVER, IT SHALL NOT REQUIRE ANY RAMP OR SERIES OF RAMPS TO EXCEED 15 FEET IN LENGTH NOT INCLUDING LANDINGS OR TRANSITIONS.

DRAINAGE STRUCTURES SHOULD NOT BE PLACED IN LINE WITH RAMPS. THE LOCATION OF THE RAMP SHOULD TAKE PRECEDENCE OVER THE LOCATION OF THE DRAINAGE STRUCTURE. WHERE EXISTING DRAINAGE STRUCTURES ARE LOCATED IN THE RAMP PATH OF TRAVEL, USE A MANUFACTURER'S ADA COMPLIANT GRATE. OPENINGS SHALL NOT BE GREATER THAN ½". ELONGATED OPENINGS SHALL BE PLACED SO THAT THE LONG DIMENSION IS PERPENDICULAR TO THE DOMINANT DIRECTION OF TRAVEL.

THE TOP OF THE JOINT FILLER FOR ALL RAMP TYPES SHALL BE FLUSH WITH THE ADJACENT CONCRETE.

CROSSWALK AND STOP LINE MARKINGS, IF USED, SHALL BE SO LOCATED AS TO STOP TRAFFIC SHORT OF RAMP CROSSINGS. SPECIFIC DETAILS FOR MARKING APPLICATIONS ARE GIVEN IN THE "MICHIGAN MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

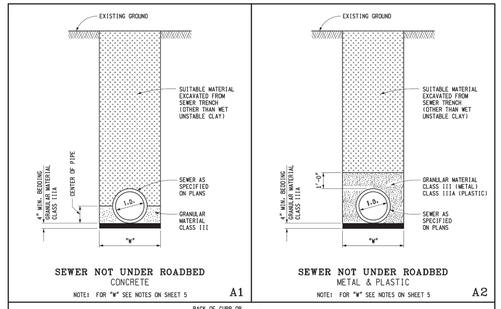
FLARED SIDES WITH A SLOPE OF 10% MAXIMUM, MEASURED ALONG THE ROADSIDE CURB LINE, SHALL BE PROVIDED WHERE AN UNOBSTRUCTED CIRCULATION PATH LATERALLY CROSSES THE CURB RAMP. FLARED SIDES ARE NOT REQUIRED WHERE THE RAMP IS BORDERED BY LANDSCAPING, UNPAVED SURFACE OR PERMANENT FIXED OBJECTS. WHERE THEY ARE NOT REQUIRED, FLARED SIDES CAN BE CONSIDERED IN ORDER TO AVOID SHARP CURB RETURNS AT RAMP OPENINGS.

DETECTABLE WARNING PLATES MUST BE INSTALLED USING FABRICATED OR FIELD CUT UNITS CAST AND/OR ANCHORED IN THE PAVEMENT TO RESIST SHIFTING OR HEAVING.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

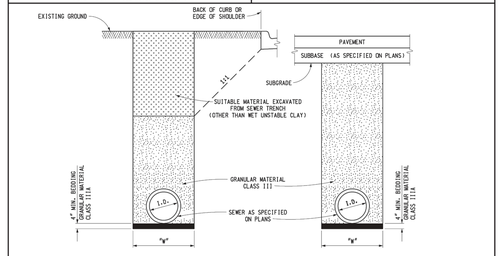
CURB RAMP AND DETECTABLE WARNING DETAILS

4-7-2022	5-8-2020	R-28-J	SHEET
F.H.W.A. APPROVAL	PLAN DATE		7 OF 7

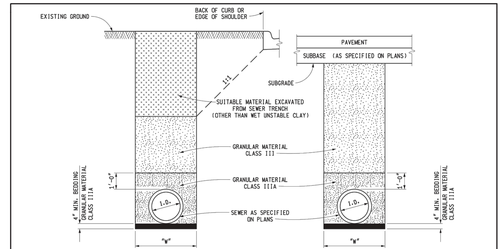


SEWER NOT UNDER ROADBED
CONCRETE
NOTE: FOR "W" SEE NOTES ON SHEET 5 — A1

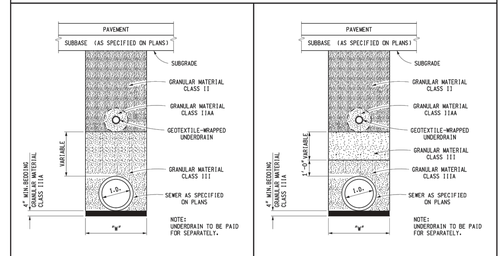
SEWER NOT UNDER ROADBED
METAL & PLASTIC
NOTE: FOR "W" SEE NOTES ON SHEET 5 — A2



SEWER UNDER ROADBED OR WITHIN INFLUENCE OF ROADBED
CONCRETE & METAL PIPE — B1



SEWER UNDER ROADBED OR WITHIN INFLUENCE OF ROADBED
PLASTIC PIPE — B2



SEWER WITH UNDERDRAIN UNDER ROADBED
CONCRETE & METAL PIPE — C1

SEWER WITH UNDERDRAIN UNDER ROADBED
PLASTIC PIPE — C2

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

UTILITY TRENCHES

7-25-2017	2-8-2016	R-83-C	SHEET
F.H.W.A. APPROVAL	PLAN DATE		1 OF 5

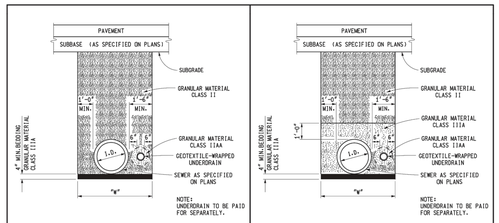
MDOT — Michigan Department of Transportation
PREPARED BY: DESIGN DIVISION
DRAWN BY: B.L.T.
CHECKED BY: K.A.F.

DEPARTMENT DIRECTOR: Kirk T. Steudle
APPROVED BY: Kimberly Avery — DIRECTOR, BUREAU OF FIELD SERVICES
APPROVED BY: Bradley C. Wieferich — DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

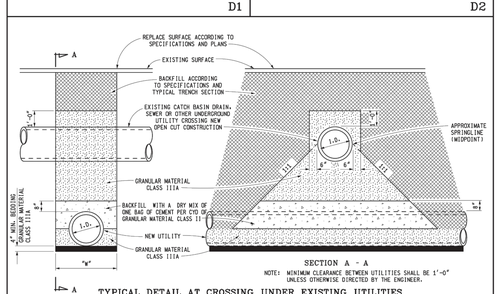
UTILITY TRENCHES

7-25-2017	2-8-2016	R-83-C	SHEET
F.H.W.A. APPROVAL	PLAN DATE		2 OF 5



SEWER WITH UNDERDRAIN UNDER ROADBED
CONCRETE & METAL PIPE
(FOR SHALLOW SEWERS) — D1

SEWER WITH UNDERDRAIN UNDER ROADBED
PLASTIC PIPE
(FOR SHALLOW SEWERS) — D2



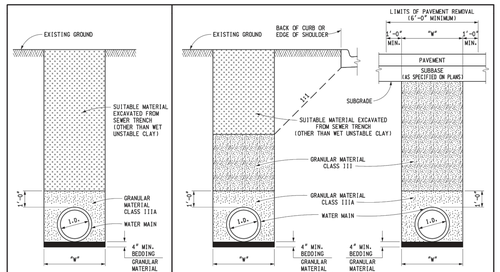
SECTION A - A
NOTE: MINIMUM CLEARANCE BETWEEN UTILITIES SHALL BE 1'-0" UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

TYPICAL DETAIL AT CROSSING UNDER EXISTING UTILITIES
PAYMENT FOR THIS TRENCH DETAIL WILL BE INCLUDED WITH THE ADJACENT TRENCH DETAILS — E

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

UTILITY TRENCHES

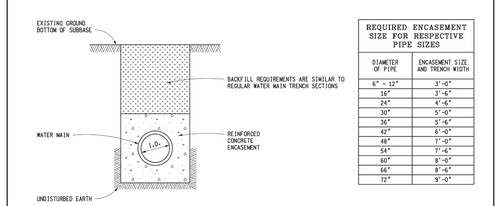
7-25-2017	2-8-2016	R-83-C	SHEET
F.H.W.A. APPROVAL	PLAN DATE		3 OF 5



WATER MAINS NOT UNDER ROADBED — F

NOTE: WHEN WATER MAIN IS PLACED IN PROPOSED ROADBED AREA, IT SHALL BE BACKFILLED WITH SELECTED EXCAVATION MATERIAL ABOVE FUTURE SUBGRADE TO EXISTING GROUND LINE.

WATER MAINS UNDER ROADBED OR WITHIN INFLUENCE OF ROADBED — G



REQUIRED ENCASEMENT SIZE FOR RESPECTIVE PIPE SIZES

DIAMETER OF PIPE	ENCASEMENT SIZE AND TRENCH WIDTH
6" - 12"	3'-0"
16"	3'-6"
24"	4'-6"
30"	5'-0"
36"	5'-6"
42"	6'-0"
48"	7'-0"
54"	7'-6"
60"	8'-0"
66"	8'-6"
72"	9'-0"

NOTE: REINFORCEMENT SHALL BE AS SPECIFIED ON PLANS.

WATER MAINS IN REINFORCED CONCRETE ENCASEMENT — H

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

UTILITY TRENCHES

7-25-2017	2-8-2016	R-83-C	SHEET
F.H.W.A. APPROVAL	PLAN DATE		4 OF 5

NOTES:

BACKFILLING SHALL BE ACCORDING TO THE STANDARD SPECIFICATION.

SUFFICIENT TRENCH WIDTH SHALL BE PROVIDED TO ALLOW FREE WORKING SPACE AND TO PERMIT COMPACTING THE BACKFILL AROUND THE PIPE.

THE FOLLOWING ARE MINIMUM TRENCH WIDTHS:

I.D. PIPE SIZE (INCHES)	LESS THAN 18	21	24	30	36
"W" TRENCH WIDTH (FEET)	3.0	3.5	4.0	5.0	6.0

I.D. PIPE SIZE (INCHES)	42	48	54	60	66	72
"W" TRENCH WIDTH (FEET)	7.0	8.0	9.5	10.0	10.5	11.0

I.D. PIPE SIZE (INCHES)	78	84	90	96	102	108
"W" TRENCH WIDTH (FEET)	11.5	12.0	12.5	13.0	13.5	14.0

ESTIMATED PAVEMENT REMOVAL WIDTH IS TO BE TRENCH WIDTH "W" PLUS 1'-0" EACH SIDE OF THE TRENCH (6"-0" MINIMUM).

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

UTILITY TRENCHES

7-25-2017	2-8-2016	R-83-C	SHEET
F.H.W.A. APPROVAL	PLAN DATE		5 OF 5

811 Know what's below. Call before you dig.

REV.	DESCRIPTION	DATE	DRAWN	CHECKED
1	REVISION #1	12/9/2022	AK/RB/MF	CT/VCM

CITY OF ANN ARBOR
PUBLIC SERVICES
301 EAST HURON STREET
P.O. BOX 8647
ANN ARBOR, MI 48107-8647
734.794.6410
www.a2gov.org

CITY OF ANN ARBOR - PUBLIC SERVICES - ENGINEERING

S. MAIN STREET WATER MAIN
REPLACEMENT & RESURFACE PROJECT
MDOT DETAILS 3

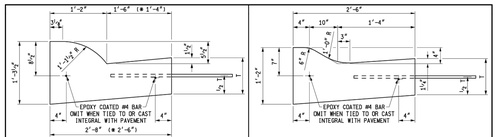
SCALE PLAN: ########

DRAWING No.
2020-038-59

SHEET No.
59 OF 80

1 FOR USE IN MDOT ROW ONLY

C:\pw_work\d1092459\CDT-PLTS-MDOT Details.dwg Dwg Created: 8-Dec-22 — _a2 standard bw.stb — Plot Date: 9-Dec-22



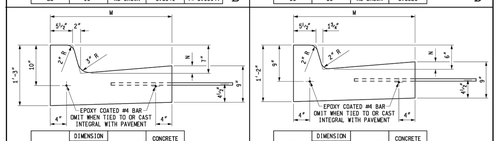
(★ GUTTER PAN WIDTH MAY BE REDUCED WHEN APPROVED BY THE ENGINEER)

DETAIL	DIMENSION T	LANE TIES	CONCRETE CYD / LFT	CONCRETE CYD / LFT
B1	9"	AS SHOWN	0.0900	(★ 0.0855)
B2	9"	OMITTED	0.0900	(★ 0.0855)
B3	10"	AS SHOWN	0.0941	(★ 0.0894)

B

DETAIL	DIMENSION T	LANE TIES	CONCRETE CYD / LFT
D1	9"	AS SHOWN	0.0788
D2	9"	OMITTED	0.0788
D3	10"	AS SHOWN	0.0826

D

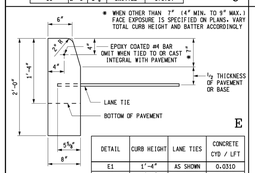


DETAIL	DIMENSION W	DIMENSION N	LANE TIES	CONCRETE CYD / LFT
C1	1'-4"	7/8"	AS SHOWN	0.0506
C2	1'-4"	1/4"	OMITTED	0.0506
C3	2'-0"	1 3/8"	AS SHOWN	0.0632
C4	2'-0"	1 3/8"	OMITTED	0.0632
C5	2'-6"	1 7/8"	AS SHOWN	0.0757
C6	2'-6"	1 7/8"	OMITTED	0.0757

C

DETAIL	DIMENSION W	DIMENSION N	LANE TIES	CONCRETE CYD / LFT
F1	1'-4"	7/8"	AS SHOWN	0.0484
F2	1'-4"	1/4"	OMITTED	0.0484
F3	2'-0"	1 3/8"	AS SHOWN	0.0610
F4	2'-0"	1 3/8"	OMITTED	0.0610
F5	2'-6"	1 7/8"	AS SHOWN	0.0737
F6	2'-6"	1 7/8"	OMITTED	0.0737

F



DETAIL	CURB HEIGHT	LANE TIES	CONCRETE CYD / LFT
E1	1'-4"	AS SHOWN	0.0310
E2	1'-4"	OMITTED	0.0310
E4	2'-0"	OMITTED	0.0477

E

MDOT

PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: K.K.T.

DEPARTMENT DIRECTOR
Kirk T. Steudle

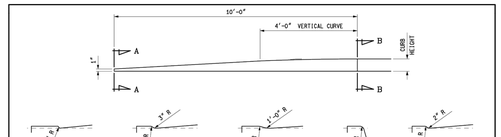
APPROVED BY: _____ DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____ DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT

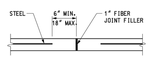
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

CONCRETE CURB AND CONCRETE CURB & GUTTER

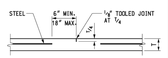
9-30-2014 F.H.W.A. APPROVAL	2-6-2014 PLAN DATE	R-30-G	SHEET 1 OF 2



CONCRETE CURB, CURB AND GUTTER ENDINGS



1" FIBER JOINT FILLER



CONTRACTION JOINT

NOTES:

CURB AND GUTTER RADII SHALL BE DIMENSIONED TO THE FRONT EDGE OF THE GUTTER PAN OR EDGE OF PAVEMENT.

CONCRETE CURB AND GUTTER ENDINGS WILL BE PAID FOR IN LINEAR FEET OF THE ADJACENT CURB DETAIL.

JOINTS SHALL BE PLACED AT RIGHT ANGLES TO THE EDGE OF CONCRETE CURB AND GUTTER.

JOINTS DETAILED ON THE PLANS SHALL SUPERSEDE THOSE SPECIFIED ON THIS STANDARD PLAN.

BOTTOM SLOPE OF CURB AND GUTTER STRUCTURE MAY BE THE SAME SLOPE AS BOTTOM OF PAVEMENT. BACK OF CURB AND VERTICAL EDGE OF GUTTER PAN MAY HAVE A MAXIMUM 1/2" BATTER TO FACILITATE FORMING.

WHEN CURB AND GUTTER IS CAST INTEGRALLY, SEE CURRENT STANDARD PLAN R-31-SERIES.

ALL JOINTS FOR CURB OR CURB AND GUTTER ARE INCLUDED IN THE PAY ITEM FOR THE CURB OR CURB AND GUTTER.

JOINTS IN CURB OR CURB AND GUTTER NOT TIED TO CONCRETE PAVEMENT; ADJACENT TO CONCRETE BASE COURSE; OR ADJACENT TO HMA PAVEMENT:

A. PLACE 1" FIBER JOINT FILLER AT 400' MAXIMUM INTERVALS.
B. PLACE 1" FIBER JOINT FILLER AT SPRING POINTS OF INTERSECTING STREETS.
C. PLACE 1/2" ISOLATION JOINT AT CATCH BASINS PER STANDARD PLAN R-37-SERIES.
D. PLACE CONTRACTION JOINTS AT 40' MAXIMUM INTERVALS.

JOINTS IN CURB OR CURB AND GUTTER TIED TO JOINTED PAVEMENT

A. PLACE 1" FIBER JOINT FILLER OPPOSITE ALL TRANSVERSE EXPANSION JOINTS IN PAVEMENT.
B. PLACE 1/2" ISOLATION JOINT AT CATCH BASINS PER STANDARD PLAN R-37-SERIES.
C. PLACE CONTRACTION JOINTS OPPOSITE ALL TRANSVERSE CONTRACTION JOINTS IN PAVEMENT.
D. A SYMBOL (B) JOINT SHALL BE PLACED BETWEEN CURB OR CURB AND GUTTER AND ADJACENT CONCRETE PAVEMENT AS SPECIFIED ON STANDARD PLAN R-41-SERIES.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

CONCRETE CURB AND CONCRETE CURB & GUTTER

9-30-2014 F.H.W.A. APPROVAL	2-6-2014 PLAN DATE	R-30-G	SHEET 2 OF 2

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REV.	DESCRIPTION	DATE	DRAWN	CHECKED
1	REVISION #1	12/9/2022	AK/RB/MF	CT/VCM

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301 E. HURON STREET
P.O. BOX 8647
ANN ARBOR, MI 48107-8647
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CITY OF ANN ARBOR - PUBLIC SERVICES - ENGINEERING

S. MAIN STREET WATER MAIN
REPLACEMENT & RESURFACE PROJECT

MDOT DETAILS 4

SCALE PLAN: ########

DRAWING No.
2020-038-60

SHEET No.
60 OF 80

1 FOR USE IN MDOT ROW ONLY

C:\pw_work\d1092459\CDT-PLTS-MDOT Details.dwg Dwg Created: 8-Dec-22 — _a2 standard bw.stb — Plot Date: 9-Dec-22

DETAILED SPECIFICATION
FOR
STORM SEWER, MODIFIED

AA:MGN 1 of 9 02/13/14
WT:VCM:CGT:AJK 11/21/22

a. Description.- This work shall consist of installing storm sewer and bulkheads in accordance with Section 402 of the Michigan Department of Transportation 2020 Standard Specifications for Construction and as specified herein. All newly constructed storm sewer shall be tested and video inspected in accordance with the requirements of this Detailed Specification.

b. Materials.- The materials used for this work shall be in accordance with Section 402.02 except as modified herein.

Bedding and backfill for Trench Detail I, Modified shall be Granular Material, Class II, meeting the requirements of Section 902. Bedding and backfill for Trench Detail V, Modified shall be Granular Material, Class II and Engineer-approved material for the backfill that is placed at an elevation greater than 1-foot above the top-of-pipe and/or outside the 1:1 influence line of paved areas.

All pipe shall be concrete, contain steel reinforcement, and shall be of the type, class, and size as shown on the plans.

Reinforced concrete pipe shall conform to the requirements for reinforced concrete pipe of ASTM Designation C 76, Class IV, unless otherwise designated on the Plans. For diameters larger than listed in ASTM Specifications, wall thickness and reinforcing steel shall be as shown in Section 909 Table 909-3 or 909-4 as applicable.

Reinforced elliptical concrete pipe shall conform to the requirements for reinforced concrete elliptical pipe of ASTM Designation C 507, Class as designated on the Plans. For diameters larger than listed in ASTM Specifications, wall thickness and reinforced steel shall be as shown in Section 909 Table 909-5.

Joints for reinforced concrete pipe shall meet ASTM C 443 and shall be rubber gasket for tongue and groove, full bell and spigot rubber O-ring gasket, or modified grooved tongue with rubber gasket. Joints for sewers over 36 inches in diameter shall have inside joints cement mortar pointed to their full depth and shall have the outside joints provided with a cement mortar collar.

Joints for reinforced concrete elliptical pipe shall be mastic compound with inside cement mortar pointing to full depth and outside cement mortar collar.

Lubricants used in making up joints shall be supplied by the pipe manufacturer and the joints shall be coupled in accordance with the manufacturer's requirements.

Class X concrete as described in this Detailed Specification shall consist of Portland Cement, coarse and fine aggregates, and water, proportioned with 282 lbs. cement (3 sacks) per cubic yard to produce a minimum 28 day compressive strength of 1000 psi.

c. Pipe Inspection and Delivery.- The following information shall be clearly marked on each length of pipe:

a) The pipe designation and class (e.g., C 76, Class IV).
b) The name or trademark of the manufacturer.
c) Identification of the manufacturing plant.
d) The date of manufacture.
e) Testing lot number or testing lab stamp.
f) Reinforced concrete pipe with elliptical reinforcement shall be clearly marked on the inside and the outside opposite walls along the minor axes of the elliptical reinforcing.
g) Beveled pipe shall be marked with the amount of bevel and the point of maximum length shall be marked on the beveled end.

All pipe furnished shall be subject to inspection on arrival at the job site by the Engineer. The purpose of the inspection shall be to cull and reject pipe or fittings that, independent of physical tests specified under the standard specifications designated herein, fail to conform to the requirements of these Specifications.

The Contractor shall notify the Engineer sufficiently in advance so that an Inspector may be on the job during the unloading of materials. A minimum notice of 24 hours is required for such unloading and inspection.

Concrete pipe of any type shall be subject to rejection on account of any of the following:

a) Variation in any dimension exceeding the permissible variations given in the material specifications.
b) Fractures or cracks passing through the wall.
c) Defects that indicate imperfect proportioning, mixing, or molding.
d) Surface defects indicating honeycombed or open texture.
e) Variation of more than 1/16 inch per lineal foot in alignment of pipe intended to be straight.
f) Insecure attachment of branches or spurs.

g) Damaged ends, where in the judgment of the Engineer such damage would prevent making a satisfactory joint.

Rejected pipe shall be plainly marked by the Inspector and immediately removed from the site of the work by the Contractor without cost to the project.

All pipe furnished shall be accompanied by the manufacturer's certificate of test showing conformity with the Specifications. Each certificate shall identify a specific lot number, quantity of pipe, and show actual test results for the lot furnished. These certificates shall be submitted to the Inspector at the time of unloading.

d. Methods of Construction.- All construction shall be performed in accordance with Section 402.03 except as modified herein.

The bedding and backfill for Trench Detail I, Modified shall be MDOT Class II sand compacted to 95% of its maximum dry density. Compaction shall be performed as specified elsewhere in this Detailed Specification.

The bedding and backfill for Trench Detail V, Modified to a point 12 inches above the top of pipe, shall be MDOT Class II granular material compacted to 95% of its maximum dry density. The backfill above a point 12 inches above the top of pipe shall be Engineer-approved material, compacted to 90% of its maximum dry density. Compaction shall be performed as specified elsewhere in this Detailed Specification.

The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures, both known and unknown, may be determined, and the Contractor shall be held responsible for the repair of such structures when broken or otherwise damaged. The Contractor shall not intentionally remove existing storm sewer, storm sewer leads, or sanitary sewer leads in lieu of protecting and preserving them in order to expedite the proposed construction.

Excavation normally shall be by open cut from the surface, except as otherwise specified, or in special cases where crossing under trees, pavements, or structures. The Contractor may use tunnel methods if permitted in writing by the Engineer, provided his method of backfill is such, in the judgment of the Engineer, as to avoid any present or future injury to the tree, pavement, or structure. All excavation shall be in such manner as will provide adequate room for the construction and installation of the work to the lines, grades and dimensions shown on the Plans.

The trench shall be excavated to a minimum of four inches below the final location of the pipe. For reinforced concrete pipe 66" in diameter or larger, the trench will be excavated to a minimum of six inches below the pipe. This cut shall be filled to the level of the bottom quadrant of the pipe with Class II granular material as specified herein, shaped and compacted to the pipe barrel.

Bell holes shall be provided in the trench bottom at each joint to permit the joints to be made properly.

The Contractor shall dig-up and expose all utility crossings prior to laying any storm sewer pipe. This will allow the Engineer to adjust the grade of the storm sewer, if possible, to avoid the existing utilities. The costs of the exploratory excavation, and all related costs, shall be included in the unit price of the storm sewer. The Engineer may require that some dig-ups be performed out of the current construction stage or phase where the sewer work is taking place in order to aid in alignment decisions. Any required traffic control measures required to comply with this requirement shall be included in the costs of “Minor Traf Devices” and “Traffic Regulator Control.”

During the construction it may be necessary to cross under or over certain sewers, drains, culverts, water lines, gas lines, electric lines, and other underground structures or facilities, known or unknown. The Contractor shall make every effort to prevent damage to such underground structures and facilities. Wherever such structures or facilities are disturbed or broken, they shall be restored to a condition that is as good, or better than, that which existed prior to the disturbance and shall be acceptable to the owner and the City, at the Contractor's expense. These crossings shall be made with a minimum of twelve inches of vertical clearance between facilities.

Should the storm sewer conflict with abandoned sewers or water mains, the conflicting section of abandoned sewer or water main shall be removed and the remaining sections shall be (re)abandoned in accordance the Detailed Specification for “Water Main and Appurtenances, Abandon” and the Detailed Specification for “Sewer, Any Size or Depth, Abandon,” except that flow filling the sewer will not be required. All the abandonment work shall be included in the cost of the storm sewer and will not be paid for separately.

Not more than 50 feet of trench shall be open at one time in advance of the pipe laying operation. At no time shall more than 200 feet of trench be opened and incompletely backfilled. At the end of each day, no more than 25 feet of trench may be left open, and access to all drives shall be restored. This opening shall be surrounded

by fencing and barricades, or plated. The remainder of the trenching operation shall be available for safe vehicular and pedestrian traffic at all times.

All excavated material approved by the Engineer as backfill material and imported backfill material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. All excavated material which is unsuitable for backfill shall be immediately removed from the site by the Contractor unless otherwise provided in the contract documents. Hydrants under pressure, manholes of any kind, valve boxes, curb stop boxes, fire and police call boxes, and other utility controls shall be left unobstructed and accessible until the work is completed. Gutters shall be kept clear, or other satisfactory provisions made, for street drainage, and natural water courses shall not be obstructed.

Each pipe shall be inspected for defects prior to being lowered into the trench. Inside of pipe and outside of spigot shall be cleaned of any earth or foreign matter.

Proper implements, tools, and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe, manhole bases, manhole sections, and other similar items shall be carefully lowered into the trench piece by piece by means of suitable tools or equipment as recommended by the manufacturer, in such a manner as to prevent damage to them and their protective coatings and linings. Under no circumstances shall materials be dropped or dumped into the trench.

Construction of sewers shall begin at the outlet end and proceed upgrade. Pipe shall be laid on the prepared subgrade with the bell ends facing the direction of laying, unless otherwise directed by the Engineer.

The Contractor shall take every precaution to prevent foreign material from entering the pipe while it is being placed in the line. During laying operations, no debris, tools, clothing or other materials shall be placed in the pipe. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug. This provision shall apply during the noon hours as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

Pipe shall be jointed as specified elsewhere herein.

No pipe shall be laid until a cut sheet for that pipe has been approved by the Engineer. All pipe shall be laid at the correct line and grade as indicated by the grade stakes and offset line. The correct line and grade shall be maintained by the use of a

laser alignment system. Each pipe, as laid, shall be checked by the Contractor to insure that this result is obtained. The grade as shown on the Plans is that of the pipe invert for sewers and the work must conform to this profile. A variation of 1/4 inch from this profile grade will be deemed sufficient reason to cause the work to be rejected and relaid. Sewer pipe alignment shall be maintained so as to not vary more than one-half inch from the correct line on pipes up to 36 inches in diameter nor more than one inch on pipes 42 inches in diameter and larger. Any pipe found out of line shall be relaid properly by the Contractor.

Mechanical means shall be used for pulling home all rubber-gasketed pipe regardless of trench condition where manual means will not result in pushing and holding the pipe home. When a trench box or liner is used, a cable shall be used to pull the joints home and hold them in position.

Where work is performed in wet trenches or trenches with running sand, the Contractor shall provide and use mechanical means for pulling the pipe home in making up the joint and for holding the pipe joints tight until completion of the line. Mechanical means shall consist of a cable placed inside or outside of the pipe with a suitable winch, jack, or come-along for pulling the pipe home and holding the pipe in position.

Where not required by these Specifications, manual means will be acceptable only if the joints can be pushed home and hold themselves securely in place.

All pipes shall be bed on a four inch or thicker layer of compacted Class II granular material (unless noted otherwise on the applicable trench details) unless pipe undercutting is required. Perform any required pipe undercutting as directed by the Engineer and in accordance with the Section 402.03.A.

Where Class II granular material used as pipe bedding is required by the plans, from the bedding to the pipe centerline backfill shall be carefully placed Class II granular material, placed in maximum lift thicknesses of six inches, loose measure. Each lift shall be thoroughly compacted by hand tamps, pneumatic "pogo-sticks", or other approved methods, to at least 95% of the material’s maximum dry density at optimum moisture content. Each lift shall extend the full width of the space between the pipe and trench wall, and the fill shall be brought up evenly on both sides of the pipe. The backfill under the haunches of the pipe shall be consolidated by the use of a tee-bar.

When the pipe is greater than 48 inch diameter, or when permitted in writing by the Engineer, the Class II granular fill from the bedding to the centerline may be replaced by 6A, 17A, or 34R aggregate meeting the requirements of Section 902. A suitable

geotextile separator, approved by the Engineer, shall be provided around and above the coarse aggregate to prevent intrusion of succeeding backfill materials.

Where Class II granular material used as pipe bedding is required by the plans, from the pipe centerline to the top of the pipe, backfill shall be Class II granular material placed in maximum lift thicknesses of six inches, loose measure. Each lift shall be thoroughly compacted by hand tamps, pneumatic "pogo-sticks", or other approved methods, to at least 95% of the material's maximum dry density.

From the top of the pipe to two feet above the top of the pipe backfill shall be Class II granular material uniformly spread and machine tamped. Machine tamping shall include manually operated vibrating plate compactors. The backfill material shall be compacted in lifts of twelve inches, loose measure.

From two feet above the top of the pipe to the grade shown on the Plans or to the subgrade of surface materials, or to the subgrade of surface structures, backfill shall be Class II granular material (Trench Detail I installations) uniformly spread and machine tamped. If machine tamping includes manually operated vibrating plate compactors or self propelled vibrating rollers the backfill material shall be compacted in lifts not exceeding twelve inches, loose measure. If a backhoe mounted compactor is employed, the backfill material shall be compacted in lifts of thirty-six inches, loose measure. Approval to use a particular machine tamping method will be withdrawn by the Engineer if the method causes injury to the pipe or adjacent structures or movement of the pipe. Each lift shall be thoroughly compacted to at least 95% of material's maximum dry density. The Engineer may give consideration to giving written permission to increase the thickness of the lifts specified in this paragraph if satisfactory compaction is achieved and no undesirable side effects occur.

From one foot above the top of the pipe to the grade shown on the Plans or to the subgrade of surface materials, or to the subgrade of surface structures, backfill shall be Engineer-approved material (Trench Detail V installations) uniformly spread and machine tamped. If machine tamping includes manually operated vibrating plate compactors or self propelled vibrating rollers the backfill material shall be compacted in lifts not exceeding twelve inches, loose measure. If a backhoe mounted compactor is employed, the backfill material shall be compacted in lifts of thirty-six inches, loose measure. Approval to use a particular machine tamping method will be withdrawn by the Engineer if the method causes injury to the pipe or adjacent structures or movement of the pipe. Each lift shall be thoroughly compacted to at least 90% of the material's maximum dry density.

All storm sewer shall be television inspected by the Contractor. The Contractor shall furnish all labor, equipment and materials necessary for the television inspection. The Engineer shall be given 24 hours notice so that an Inspector may witness the television inspection. All storm sewer lines are to be thoroughly cleaned prior to television inspection, by jetting of the lines or other approved methods. Television inspection shall consist of wetting the invert of the section by pouring clean water in the upstream manhole until it appears in the downstream manhole, and then, after the water has stopped flowing, passing a television camera through the section. The television camera shall be passed through the section of pipe from the downstream to upstream end. Any runs of sewer not televised in this manner shall be re-televised at the Contractor's expense. The camera shall be connected to a monitor and a digital video recorder capable of generating DVD format disks. The video inspection record shall indicate the date, the section tested, and the actual distance from the beginning manhole to the ending manhole and shall note each visible defect. The DVD shall be furnished to the Engineer for review.

The television inspection will be deemed satisfactory if no visible defects, including, but not limited to, dips or low spots, high spots, errors in horizontal or vertical alignment, joint offsets, leaks, cracks, standing water greater than ¼", or debris, are present. Only after all tests have been successfully completed, and acknowledged by the Engineer in writing, may the storm sewer be placed into service.

If a sewer repair is required as a result of damage during construction operations or television inspection failure, the Contractor shall expose the sewer pipe and perform the required correction(s), as specified herein and as directed by the Engineer.

If the repair is required due to the pipe being out of alignment or off grade, the pipe shall be adjusted so as to be placed in proper alignment and grade. Coarse-graded aggregate material shall be carefully placed under the haunches of the realigned pipe and compacted by the use of a tee-bar. From the haunches of the pipe, backfilling shall be performed in accordance with the requirements for backfilling as outlined elsewhere in this Detailed Specification.

If the pipe cannot be satisfactorily realigned or an open joint reset; or if the pipe is cracked, broken, or permanently deflected, the affected pipe shall be removed and replaced with the same pipe material. The pipe to be removed is to be sawed on each side of the damaged section in a neat and workmanlike manner without damage to the adjacent pipe. The replacement pipe section shall fit flush to the remaining pipe at each end. These sawed joints shall be coupled using a flexible pipe coupling and stainless steel shear ring. These joints shall be encased to the pipe centerline with Class X

concrete one foot on either side of the flexible coupling. The remaining pipe backfill shall be performed in accordance with the applicable requirements for backfilling as outlined elsewhere in this Detailed Specification.

The Contractor shall install bulkheads on abandoned sewer pipe or drainage structure connections in accordance with section 402.03.E where indicated on the plans or otherwise approved by the Engineer.

e. Measurement and Payment.- The completed work as measured will be paid for at the contract unit prices for the following contract items (pay items):

Contract Item (Pay Item)	**Pay Unit**
RCP, Sewer, C76, CL-IV, __inch, Tr Det I	Foot
Sewer Bulkhead, 10 inch	Each

The items of work listed above shall be paid for by the length of pipe actually installed. The unit price for this item of work shall include all labor, material, and equipment costs, including video inspection, and all needed items to properly complete the work as shown on the plans, as detailed in the Specifications, and as directed by the Engineer.

The herein specified dig-ups shall be included in the cost of the pipe and not paid for separately.

Payment for Sewer Bulkhead, 10 inch shall include furnishing all materials, labor, and equipment necessary to complete the work.

DETAILED SPECIFICATION
FOR
SANITARY SEWER

AA:MGN 1 of 26 04/08/14
WT:VCM:CGT:AJK 11/21/22

a. Description. This work includes installing sanitary sewer, manholes, video inspection of pipe, and related items. The Contractor shall furnish all materials, equipment, tools, and labor necessary to perform the work required by this Detailed Specification and shall unload, haul, distribute, store, and install all pipe, fittings, castings, manholes, and accessories.

The Contractor shall excavate all trenches and pits to the required dimensions; excavate the bell holes; sheet, brace, and properly support the adjoining ground or structures where necessary to comply with MIOSHA and other relevant safety standards; properly handle and remove all drainage or ground water so that the work can be completed in accordance with the specifications; install and test the pipe, fittings, castings, manholes, and accessories; backfill and compact all fill materials within trenches and pits; and remove and properly dispose of surplus or unsuitable excavated material off-site.

Materials. Materials shall conform to the Michigan Department of Transportation 2020 Standard Specifications for Construction, Sections:

Concrete, Grade 3500 1004
Mortar, Type R-1 1005
Granular Material, Class II 902
Coarse Aggregate, 6A 902
Steel Reinforcement 905
Castings 908
Miscellaneous Metal Products 908
Geosynthetics 910
Masonry Units 913

Coarse Aggregate, 6A shall be crushed limestone. Concrete, Grade X shall consist of Portland cement, coarse and fine aggregates, and water, proportioned with 282 lbs. cement (3 sacks) per cubic yard to produce a minimum 28 day compressive strength of 1000 psi.

Vitrified Clay Pipe and Fittings:

Vitrified clay sewer pipe shall be the bell and spigot type, glazed or non-glazed, and shall be of full internal diameter from 4 through 18 inches inclusive. Clay pipe shall conform to the material and testing requirements of ASTM C 700, extra strength.

Joints:

Joints for vitrified clay sewer pipe shall be compression type joints conforming to the material and testing requirements of ASTM C 425. Lubricant used in making up joints shall be supplied by the pipe manufacturer and the joints shall be coupled in accordance with the manufacturer's requirements.

Pipe Marking:

The following information shall be clearly marked on each length of pipe:

a) The pipe designation and class (e.g., C 700, ES).
b) The name or trademark of the manufacturer.
c) Identification of the manufacturing plant.
d) Testing lot number or testing lab stamp.

Manufacturer's Certification:

All pipe furnished shall be accompanied by the manufacturer's certificate of test showing conformity with the Specifications. Each certificate shall identify a specific lot number, quantity of pipe, and show actual test results for the lot furnished. These certificates shall be submitted to the Inspector at the time of unloading.

Inspection:

All pipe furnished shall be subject to inspection on arrival at the job site by the Engineer. The purpose of the inspection shall be to cull and reject pipe or fittings that, independent of physical tests specified under the standard specifications designated herein, fail to conform to the requirements of these Specifications.

The Contractor shall notify the Engineer sufficiently in advance so that an Inspector may be on the job during the unloading of materials. A minimum notice of 24 hours is required for such unloading and inspection.

Vitrified clay pipe shall be subject to rejection on account of any of the following:

a) Variation in any dimension exceeding the permissible variations given in the material specifications. Pipe in all cases shall be full diameter.
b) Fractures or cracks passing through the barrel or socket.
c) Chips or fractures on the interior of the pipe exceeding two inches in length, one inch in width, or depth more than 1/4 of the thickness of the wall.
d) Blisters that are either broken, exceed three inches in diameter, or project more

than 1/8-inch above the surrounding surface of the pipe.

e) Variation of more than 1/16-inch per lineal foot in alignment of pipe intended to be straight.
f) Insecure attachment of branches or spurs.

Rejected pipe shall be plainly marked by the Inspector and immediately removed from the site of the work by the Contractor, without cost to the City.

Polyvinyl Chloride Pipe and Fittings:

Polyvinyl chloride (PVC) pipe shall have an integral wall bell and spigot. PVC pipe shall conform to the material and testing requirements of ASTM D 3034-83. Minimum wall thickness shall be SDR 35.

Joints:

Joints for PVC pipe shall be elastomeric gasketed push-on joints conforming to the requirements of ASTM D 3212-81. Lubricant used in making up joints shall be supplied by the pipe manufacturer and the joints shall be coupled in accordance with the manufacturer's requirements.

Pipe Marking:

The following information shall be clearly marked on each length of pipe at intervals of five feet or less:

a) Manufacturer's name or trademark and code.
b) Nominal pipe size.
c) The PVC cell classification (e.g. "12454-B").
d) The legend "Type PSM SDR-35 PVC Sewer Pipe".
e) The designation "Specification D 3034".

The following information shall be clearly marked on each fitting:

a) Manufacturer's name or trademark and code.
b) Manufacturer's name or trademark.
c) Nominal size.
d) The material designation "PVC".
e) "PSM"
f) The designation "Specification D 3034".

Manufacturer's Certification:

All pipe furnished shall be accompanied by the manufacturer's certificate of test showing conformity with the Specifications. Each certificate shall identify a specific lot number, quantity of pipe, and show actual test results for the lot furnished. These certificates shall be submitted to the Inspector at the time of unloading.

Inspection:

All pipe furnished shall be subject to inspection on arrival at the job site by the Engineer. The purpose of the inspection shall be to cull and reject pipe or fittings that, independent of physical tests specified under the standard specifications designated herein, fail to conform to the requirements of these Specifications.

The Contractor shall notify the Engineer sufficiently in advance so that an Inspector may be on the job during the unloading of materials. A minimum notice of 24 hours is required for such unloading and inspection.

Pipe shall be subject to rejection on account of any of the following:

a) Variation in any dimension exceeding the permissible variations given in the material specifications. Pipe in all cases shall be full diameter.
b) Fractures or cracks passing through the barrel or socket.
c) Chips or fractures on the interior of the pipe exceeding two inches in length, one inch in width, or depth more than 1/4 of the thickness of the wall.
d) Blisters that are either broken, exceed three inches in diameter, or project more than 1/8-inch above the surrounding surface of the pipe.
e) Variation of more than 1/16-inch per lineal foot in alignment of pipe intended to be straight.

Rejected pipe shall be plainly marked by the Inspector and immediately removed from the site of the work by the Contractor, without cost to the City.

Sewer Service Leads, Risers and Fittings:

Allowable pipe materials are; SDR 35 polyvinyl chloride (PVC) plastic conforming to the material and testing requirements of ASTM D 3034; and vitrified clay pipe conforming to the material and testing requirements of ASTM C 700.

Whenever adapters are required to properly connect the pipe with pipe of other material or manufacturer, the nominal I.D. of adapters shall be manufactured for that specific purpose and shall be the same size as the nominal diameter of pipe connected thereto. Adapters shall also be furnished and used as required by the manufacturer. The adaptor at this

tapped connection shall be made using either a gasketed sewer saddle, a flexible neoprene rubber boot, or approved equal. Gasketed sewer saddles shall meet the following requirements:

a) The castings shall be ductile iron per ASTM 536, Grade 65-45-12, protected with a yellow shopcoat.
b) The adjustable strap shall be 3.5” wide, stainless steel per ASTM A 240, type 304.
c) The bolts shall be 0.5” UNC rolled thread, lubricant coated, stainless steel per ASTM A 1943, type 304.
d) The nuts shall be per ASTM A 194, type 304.
e) The washers shall be stainless steel per ASTM A 240, type 304 and plastic lubricating washers.
f) The gaskets shall be SBR per ASTM D 2000 MBA 710, compounded for water and sewer service.

Joints:

Joints for SDR 35 PVC pipe shall be bell and spigot rubber o-ring gasket joints conforming to the requirements of ASTM D-3212. Lubricant supplied by the pipe manufacturer shall be used, and the joints shall be coupled in accordance with the manufacturer's requirements.

Joints for vitrified clay pipe shall be compression type joints conforming to the material and testing requirements of ASTM C 425. Lubricant used in making up joints shall be supplied by the pipe manufacturer and the joints shall be coupled in accordance with the manufacturer's requirements.

Joints for cast iron pipe shall be mechanical compression joints conforming to the material and testing requirements of ASTM C 564.

Pipe Marking:

The following information shall be clearly marked on each length of pipe:

a) The pipe designation and class (e.g., SDR 35, ASTM D 3034).
b) The name or trademark of the manufacturer.
c) Identification of the manufacturing plant.
d) Testing lot number.

Manufacturer's Certification:

All pipe furnished shall be accompanied by the manufacturer's certificate of test showing

conformity with the Specifications. Each certificate shall identify a specific lot number, quantity of pipe, and show actual test results for the lot furnished. These certificates shall be submitted to the Inspector at the time of unloading.

Inspection:

All pipe furnished shall be subject to inspection on arrival at the job site by the Engineer. The purpose of the inspection shall be to cull and reject pipe or fittings that, independent of physical tests specified under the standard specifications designated herein, fail to conform to the requirements of these Specifications.

The Contractor shall notify the Engineer sufficiently in advance so that an Inspector may be on the job during the unloading of materials. A minimum notice of 24 hours is required for such unloading and inspection.

Pipe for sewer service leads and risers shall be subject to rejection on account of any of the following:

a) Variation in any dimension exceeding the permissible variations given in the material specifications. Pipe in all cases shall be full diameter.
b) Fractures or cracks passing through the barrel or socket.
c) Chips or fractures on the interior of the pipe exceeding two inches in length, one inch in width, or depth more than 1/4 of the thickness of the wall.
d) Blisters that are either broken, exceed three inches in diameter, or project more than 1/8-inch above the surrounding surface of the pipe.
e) Variation of more than 1/16-inch per lineal foot in alignment of pipe intended to be straight.

Rejected pipe shall be plainly marked by the Inspector and immediately removed from the site of the work by the Contractor, without cost to the City.

Manholes:

All sanitary sewer manholes shall be constructed of precast reinforced concrete sections. Precast drainage structures shall be designed to accommodate HL-93 Modified Live Load requirements as determined by a Professional Engineer licensed by the State of Michigan, regardless of where they are to be installed. For the purposes of design, a HL-93 Modified Live Load shall consist of 1.2 times the design truck or 1.2 times a single 60 kip load, whichever produces the greater stresses.

Precast reinforced concrete bases, bottom sections, manhole risers, grade adjustment rings, concentric cones, eccentric cones, and flat top slabs shall conform to the

requirements of ASTM C 478. Joints on precast manholes used on all sanitary sewers shall meet ASTM C 443, rubber O-ring gasket.

Concrete brick shall conform to the requirements for concrete building brick, ASTM C 55, Grade N-1.

Cast iron frames and covers for manholes shall conform to the requirements for grey iron castings, ASTM A 48, Class No. 30. Specific, approved castings are listed in the Detailed Specification for “Dr Structure Covers.”

Plastic coated manhole steps shall be injection molded of copolymer, polypropylene, encapsulating a 1/2 inch grade 60 steel reinforcing bar. Plastic-coated manhole steps shall meet the performance test described in ASTM C-478, Paragraph ll, and shall have an impact resistance of 300 ft.-lbs., with only minor deflection and no cracking or breaking.

The steps shall resist pull out forces of 1500 lbs.

Manhole Connections:

Sewer pipe to precast manhole connections shall be through: 1) a flexible neoprene rubber boot which shall be securely clamped into a core-drilled pipe port. Pipe ports shall be core-drilled at the point of manhole manufacture and shall be accurately located within 1/2-inch of proposed sewer centerline; or, 2) a self-adjusting mechanical pipe to manhole seal which provides a resilient, flexible, and infiltration-proof joint; or, 3) a flexible rubber wedge firmly rammed into a rubber gasket which is cast into the manhole as approved in writing by the Engineer.

Neoprene rubber for manhole boots shall meet the requirements of ASTM C 443 and shall have a minimum thickness of 3/8-inch. Pipe clamp bands shall be of corrosion-resistant steel.

b. Construction.

Material Handling:

Pipe, fittings and accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such material be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground.

In distributing the material at the site of the work, each piece shall be stored off of the ground surface by means of skids or bunks, and stacked neatly. Pipe may be "strung-out"

for only the length which, in the opinion of the Engineer, will be installed within 24 hours, if maintained such that the pipe interior will remain free of dirt, mud, and debris.

Excavation:

The Contractor shall dig-up and expose all utility crossings prior to laying any sanitary sewer pipe or lead. This will allow the Engineer to adjust the grade of the sanitary sewer or lead, if possible, to avoid the existing utilities. The costs of the dig-ups, and related costs, shall be included in the unit price of the sanitary sewer or lead. The Engineer may require that some dig-ups be performed out-of the staging area where the sewer work is taking place in order to aid in alignment decisions. Any required traffic control measures shall be included in the costs of “Minor Traffic Devices” and “Traffic Regulator Control.”

Excavation shall include the removal and disposal of all materials of every kind, including rock, boulders, or buried obstructions necessary to be removed in the construction work.

The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures, both known and unknown, may be determined, and the Contractor shall be held responsible for the repair of such structures when broken or otherwise damaged.

Excavation normally shall be by open cut from the surface, except as otherwise specified, or in special cases where crossing under trees, pavements, or structures. The Contractor may use tunnel methods if permitted in writing by the Engineer, provided his method of backfill is such, in the judgment of the Engineer, as to avoid any present or future injury to the tree, pavement, or structure. All excavation shall be performed in such a manner as to provide adequate room for the construction and installation of the work to the lines, grades and dimensions shown on the Plans.

The trench shall be excavated to a minimum of four inches below the final location of the pipe. This cut shall be filled to the level of the bottom quadrant of the pipe with Coarse Aggregate, 6A as specified herein, shaped and compacted to the pipe barrel.

Bell holes shall be provided in the trench bottom at each joint to permit the joints to be made properly.

Whenever, in the opinion of the Engineer, it is necessary to explore and excavate to determine the location of existing underground structures, the Contractor shall make explorations and excavations for such purposes. These excavations will not be paid for separately, but shall be included in the cost of the item of work being performed. Any backfilling that may be required to be performed as a result of an exploratory excavation

that is not part of the backfill associated with the work being undertaken, shall be included in the item of work being performed, with the exception of final trench restoration, which shall be paid for separately using appropriate items of work contained within the contract documents.

All excavated material approved by the Engineer as backfill material and imported backfill material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways or clear vision areas along roadways, driveways, or parking areas. All excavated material which is unsuitable for backfill shall be immediately removed from the site by the Contractor. Hydrants under pressure, manholes of any kind, valve boxes, curb stop boxes, fire and police call boxes, and other utility controls shall be left unobstructed and accessible until the work is completed. Gutters shall be kept clear, or other satisfactory provisions made, for proper drainage. Natural and man-made water courses shall not be obstructed. Disposal of excavated material, if required, shall be the Contractor's responsibility.

Hand methods for excavation shall be employed in locations shown on the Plans. In other locations the Contractor may use trench-digging machinery or employ hand methods.

Pipe Undercut:

In locations where in the opinion of the Engineer, the soil at the bottom of the trench is unstable, the Contractor shall excavate below the trench bottom to such depth as directed by the Engineer and refill with compacted Aggregate, 6A (limestone), or compacted Granular Material, Class II, as directed by the Engineer, to the level of the bottom quadrant of the pipe. If refill with compacted Aggregate, 6A (limestone) is required during sewer construction, it shall be placed for the entire sewer run, from manhole to manhole.

Trench Opening:

The width of the trench shall be ample to permit the pipe to be laid and jointed properly, and the backfill to be placed and compacted as specified. Trenches shall be of such extra width, when required, to permit the convenient placing of timber supports, sheeting and bracing, and handling of special fittings. For each size of pipe, the minimum trench width shall provide clearance of four inches on each side of the bell of the pipe or fitting or six inches on each side of the pipe barrel, whichever is greater. The maximum trench width shall be in keeping with good construction practice, such that existing structures are not undermined.

In excavating for pipe lines, the excavation shall at all times be finished to the required grade in advance of the pipe line, but unless otherwise permitted in writing by the

Engineer, not more than 50 feet of trench shall be open at one time in advance of the pipe. At no time shall more than 200 feet of trench be opened and incompletely backfilled. At the end of each day, no more than 25 feet of trench may be left open, and access to all drives shall be restored. This opening shall be surrounded by fencing and lighted barricades, or plated. The remainder of the trenching operation shall be available for safe vehicular and pedestrian traffic at all times.

The trench shall be so braced and drained that the workers may work therein safely and efficiently. It is essential that the discharge of the trench dewatering pumps be conducted to natural drainage channels, drains, or storm sewers. If trench water is pumped to natural drainage channels or drains, approved soil erosion and sedimentation controls shall be installed and maintained at the point of discharge. If trench water is pumped into storm sewers, filters shall be provided to prevent the flow of rocks, mud and other debris into the storm sewer line.

The length of street which may be occupied by the construction work at any one time shall be subject to the approval of the Engineer and will be based on the requirements of use of the street by the public.

The Contractor shall fully comply with all laws and regulations governing construction methods and the furnishing and use of all safeguards, safety devices, protective equipment, and pollution controls. Particular care shall be taken to conform to all applicable rules of the Michigan Department of Labor, Construction Safety Standards Commission, "Safety Standards". Part 9 of the above document should be particularly noted.

Where required to support the surfaces of adjacent throughfares, structures, or excavations, or to protect the construction work, adjacent work, or workmen; sheeting, bracing, and shoring shall be provided. The placing of such supports shall not release the Contractor of the responsibility for the sufficiency and integrity of the trench opening. In the removing of sheeting and bracing after the construction has been completed, special care shall be taken to prevent any caving of the sides of the excavation and injury to the completed work or to adjacent property.

Sheeting, bracing, and shoring shall not be left in place after completion of the work except as required by the Engineer. Where the Engineer requires the sheeting, bracing, or shoring to be left in place it shall be cut off below the established surface grade as required by the Engineer.

Disposal of Water and Sewage:

The Contractor shall remove by well points, pumping, bailing, or other acceptable method

any water which may accumulate or be found in the trenches or other excavations to be made. The Contractor shall take all necessary precautions to keep the trenches and other excavations entirely clear of water and sewage during construction of pipe lines and structures. Newly placed concrete shall be adequately protected from injury resulting from ground water or sewage. No drainage ditches shall be placed within the area to be occupied by any structure except as permitted in writing by the Engineer.

The Contractor shall at all times have upon the work sufficient pumping equipment ready for immediate use to carry out the intent of this section.

Where existing sewers, drains, or ditches are encountered in this work, adequate provisions shall be made for diverting their flow, so that the excavation will be kept dry. Upon completion of the construction work, the existing sewers, drains, or ditches shall be restored as directed by the Engineer.

Crossing Existing Structures & Facilities:

During the construction it may be necessary to cross under or over certain sewers, service leads, drains, culverts, water lines, gas lines, electric lines, and other underground structures or facilities, known or unknown. The Contractor shall make every effort to prevent damage to such underground structures and facilities. The Contractor shall not intentionally “dig through” existing facilities with the intention of replacing or repairing them after the proposed work is completed. Wherever such structures or facilities are disturbed or broken, they shall be restored to a condition equal to, or better than, the condition that existed prior the work being performed. All repairs shall acceptable to the owner and the City and shall be at the Contractor's sole expense. These crossings shall be made with a minimum of twelve inches of vertical clearance between facilities.

Laying Pipe:

Each pipe shall be inspected for defects prior to being lowered into the trench. The inside of each pipe and outside of each spigot shall be cleaned of any earth or foreign matter.

Proper implements, tools, and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe and fittings shall be carefully lowered into the trench piece by piece by means of a derrick, ropes, or other suitable tools or equipment as recommended by the manufacturer, in such a manner as to prevent damage to them and their protective coatings and linings. Under no circumstances shall materials be dropped or dumped into the trench.

New sewer construction shall be plugged at the outlet, so as to not be connected into the existing system until it has been tested and accepted. Construction of sewers shall begin

at the outlet end and proceed upgrade, unless otherwise directed by the plans or the Engineer. Pipe shall be laid on the prepared subgrade with the bell ends facing the direction of laying, unless otherwise directed by the Engineer.

The Contractor shall take every precaution to prevent foreign material from entering the pipe while it is being placed in the line. During laying operations, no debris, tools, clothing or other materials shall be placed in the pipe. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug. This provision shall apply during the break period as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

Pipe shall be jointed as specified elsewhere herein. The pipe shall be secured in place with approved backfill material tamped under it except at the bells. Pipe and fittings which do not allow a sufficient and uniform space for joints shall be removed and replaced with pipe and fittings of proper dimensions to insure such uniform space. Precautions shall be taken to prevent dirt from entering the joint space.

All pipe shall be laid at the correct line and grade as indicated by the grade stakes and offset line. The correct line and grade shall be maintained by the use of a laser alignment system. The staking shall be provided by the Engineer. No pipe shall be laid until a cut sheet for that pipe has been approved by the Engineer. Each pipe, as laid, shall be checked by the Contractor to insure that this result is obtained. The grade as shown on the Plans is that of the pipe invert for sewers; the work must conform to this profile. A variation of 1/4 inch from this profile grade will be deemed sufficient reason to cause the work to be rejected and re-laid. Sewer pipe alignment shall be maintained so as to not vary more than one-half inch from the correct line on pipes up to 36 inches in diameter nor more than one inch on pipes 42 inches in diameter and larger. Any pipe found out of line shall be re-laid properly by the Contractor.

Due to conditions in the field, changes to the proposed vertical and horizontal alignment of the proposed sanitary sewer may become necessary. The Contractor shall, where directed by the Engineer, excavate up to 60 feet in advance of the pipe laying operation to expose existing underground facilities thereby enabling the Engineer to make alignment decisions. The Contractor is required to realign (re-lay) the sanitary sewer up to 2 feet vertically and/or horizontally as directed by the Engineer at no extra cost to the project. The excavation in advance of the pipe laying is intended to help eliminate the need for re-laying pipe.

<u>Making Joints</u>

General:

Mechanical means shall be used for pulling home all rubber-gasket pipe regardless of trench condition where manual means will not result in pushing and holding the pipe home. When a trench box or liner is used, a cable shall be used to pull the joints home and hold them in position.

Where work is performed in wet trenches or trenches with running sand, the Contractor shall provide and use mechanical means for pulling the pipe home in making up the joint and for holding the pipe joints tight until completion of the line. Mechanical means shall consist of a cable placed inside or outside of the pipe with a suitable winch, jack, or come-along for pulling the pipe home and holding the pipe in position.

Where not required by these Specifications, manual means will be acceptable only if the joints can be pushed home and held.

Sewer pipe may not be cut when the cut end will be used in making a pipe joint. Cut ends may only occur in situations such as a manhole or headwall. Cut ends shall be carefully and neatly made with a saw, pipe cutter, or other approved means.

Vitrified Clay Pipe:

Compression-type joints shall be made in accordance with manufacturer's standards and ASTM C 425. The jointing surfaces of the pipe shall be wiped clean, and lubricated using lubricants supplied by the pipe manufacturer. The socket and spigot shall be lined up and joined together with a steady, uniformly applied force.

Polyvinyl Chloride (PVC) Pipe:

Elastomeric gasket, push-on joints, shall be made in accordance with manufacturer's standards, and ASTM D2321 and D3212. The jointing surfaces of the pipe shall be wiped clean, and lubricated using lubricant supplied by the pipe manufacturer. The spigot end is to be inserted into the bell so that it is in contact with the gasket. The bell is to be braced while the spigot end is pushed in under the gasket, so that previously completed joints will not be altered. The spigot shall be pushed into the bell until the reference mark on the pipe barrel is flush with the end of the bell.

<u>Backfilling</u>

Vitrified Clay Pipe:

All pipe shall be bed on a four inch or thicker layer of compacted Granular Material, Class II or compacted Aggregate, 6A (limestone) as specified herein.

From the bedding to the pipe centerline backfill shall be carefully placed Granular Material, Class II, placed in maximum lift thicknesses of six inches, loose measure. Each lift shall be thoroughly compacted by hand tamps, pneumatic "pogo-sticks", or other approved methods, to at least 95% of the material's maximum dry density at optimum moisture content as determined by ASTM D 1557, Method C, or AASHTO T-180. Each lift shall extend the full width of the space between the pipe and trench, and the fill shall be brought up evenly on both sides of the pipe. The backfill under the haunches of the pipe shall be consolidated by the use of a tee-bar.

When the pipe is greater than 48 inch diameter, or when permitted in writing by the Engineer, the Granular Material, Class II from the bedding to the centerline may be replaced by Aggregate, 6A (limestone) as specified. A suitable granular filter, designed by the Contractor and approved by the Engineer, shall be provided above the coarse aggregate to prevent intrusion of succeeding backfill materials.

From the pipe centerline to the top of the pipe, backfill shall be Granular Material, Class II placed in maximum lift thicknesses of six inches, loose measure. Each lift shall be thoroughly compacted by hand tamps, pneumatic "pogo-sticks", or other approved methods, to at least 95% of the material's maximum dry density at optimum moisture content as determined by ASTM D 1557 Method C, or AASHTO T-180.

From the top of the pipe to two feet above the top of the pipe backfill shall be Granular Material, Class II uniformly spread and machine tamped. Machine tamping shall include manually operated vibrating plate compactors. The backfill material shall be compacted in lifts of twelve inches, loose measure.

From two feet above the top of the pipe to the grade shown on the Plans and Details, or to the subgrade of roadway materials, or to the subgrade of surface structures, backfill shall be Granular Material, Class II uniformly spread and machine tamped. If machine tamping includes manually operated vibrating plate compactors or self propelled vibrating rollers the backfill material shall be compacted in lifts not exceeding twelve inches, loose measure. If a backhoe mounted compactor is employed, the backfill material shall be compacted in lifts of thirty-six inches, loose measure. Approval to use a particular machine tamping method will be withdrawn by the Engineer if the method causes injury to the pipe or adjacent structures or movement of the pipe. Each lift shall be thoroughly compacted to at least 95% of the material's maximum dry density at optimum moisture content as determined by ASTM D 1557, Method C, or AASHTO T-180. The Engineer may give consideration to giving written permission to increase the thickness of the lifts specified in this paragraph if satisfactory compaction is achieved and no undesirable side effects occur.

PVC Pipe:

All pipe shall be bed on a four inch or thicker layer of compacted Coarse Aggregate, 6A (limestone) as specified herein.

From the bedding to the pipe centerline backfill shall be carefully placed Coarse Aggregate, 6A (limestone), placed in maximum lift thicknesses of six inches, loose measure. Each lift shall be thoroughly compacted by hand tamps, pneumatic "pogo-sticks", or other approved methods. Each lift shall extend the full width of the space between the pipe and trench, and the fill shall be brought up evenly on both sides of the pipe. The backfill under the haunches of the pipe shall be consolidated by the use of a tee-bar.

From the pipe centerline to the top of the pipe, backfill shall be Aggregate, 6A (limestone) placed in maximum lift thicknesses of six inches, loose measure. Each lift shall be thoroughly compacted by hand tamps, pneumatic "pogo-sticks", or other approved methods. A layer of geotextile separator, meeting the requirements of Section 910, extending the full width of the trench, shall be provided above the coarse aggregate to prevent intrusion of succeeding backfill materials.

From the top of the pipe to two feet above the top of the pipe, unless otherwise specified, backfill shall be Granular Material, Class II placed in a maximum lift thickness of twelve inches, loose measure. These lifts shall be thoroughly compacted by manually operated vibrating plate compactors, to at least 95% of the material’s maximum dry density at optimum moisture content, as determined by ASTM D 1557, Method C, or AASHTO T-180.

From two feet above the top of PVC pipe to the grade shown on the Plans and Details, or to the subgrade of roadway materials, or to the subgrade of surface structures, backfill shall be Class II granular material uniformly spread and machine tamped. If machine tamping includes manually operated vibrating plate compactors or self propelled vibrating rollers the backfill material shall be compacted in lifts not exceeding twelve inches, loose measure. If a backhoe mounted compactor is employed, the backfill material shall be compacted in lifts of thirty-six inches, loose measure. Approval to use a particular machine tamping method will be withdrawn by the Engineer if the method causes injury to the pipe or adjacent structures or movement of the pipe. Each lift shall be thoroughly compacted to at least 95% of the material’s maximum dry density at optimum moisture content as determined by ASTM D 1557, Method C, or AASHTO T-180. The Engineer may give consideration to giving written permission to increase the thickness of the lifts specified in this paragraph if satisfactory compaction is achieved and no undesirable side effects occur.

<u>General</u>

Backfilling shall not be performed in freezing weather except by written permission of the Engineer, and it shall not be composed of frozen material. No fill shall be placed where the material already in the trench is frozen.

Concrete Cradle and Encasement for Sewers:

Where shown on the Plans, pipe shall be installed with a concrete cradle or encasement of Concrete, Grade X as shown on the Standard Details or plan sheets. Cradle or encasement shall be for the full run of the sewer, from manhole to manhole. Each pipe shall rest on a bed of Concrete, Grade X, shaped to fit the bottom of the pipe. After setting the pipe, the space between the outside of the pipe and the undisturbed trench bank shall be completely filled with Concrete, Grade X. Concrete, Grade X used for this purpose shall have a slump not exceeding two inches.

Riser Pipe for Service Leads:

Where shown on the Plans or directed by the Engineer, the Contractor shall furnish and place risers extending from the branch opening of the sewer up to within eight to ten feet of the proposed finished grade. These pipes shall be laid with joints as specified above. These risers shall be laid up and held in place as required by the Standard Details. The connection fitting when a riser is to be used shall be a tee fitting. Openings in the top of the riser pipe shall be closed, marked, and staked as specified above.

Service Lead Connections and Fittings:

Service lead connections shall be provided at such points as shown on the Plans or as directed by the Engineer. These shall be of the size and character indicated on the Plans. House service leads shall be a minimum of four inches in diameter. Service lead connections shall be formed by the use of standard wye or tee fittings of the same material called for use on the main sewer being constructed. Wye fittings are not to be used for connections with riser pipes. All wye and tee fittings shall be encased in Concrete, Grade X. All leads which will not have pipe connected to them immediately shall be closed by the use of a watertight plug manufactured specifically for that purpose and approved by the Engineer.

Branch connections to existing sewers shall be made by the City of Ann Arbor – Field Operations Personnel. Scheduling of these taps shall be made with Field Operations by the Contractor. All applicable tap fees must be paid in full prior to this scheduling.

Connections for sewer service leads connecting to existing sewer mains or sewer mains of a different pipe material shall be at a core-drilled tap into the sewer pipe. The joint at this tapped connection shall be made using either a gasketed sewer saddle, a flexible

neoprene rubber boot securely clamped into the core-drilled tap, or approved equal. The end of the sewer service lead pipe shall be flush with the inside wall of the sewer main. Gasketed sewer saddles shall meet the following requirements:

g) The castings shall be ductile iron per ASTM 536, Grade 65-45-12, protected with a yellow shopcoat.
h) The adjustable strap shall be 3.5” wide, stainless steel per ASTM A 240, type 304.
i) The bolts shall be 0.5” UNC rolled thread, lubricant coated, stainless steel per ASTM A 1943, type 304.
j) The nuts shall be per ASTM A 194, type 304.
k) The washers shall be stainless steel per ASTM A 240, type 304 and plastic lubricating washers.
l) The gaskets shall be SBR per ASTM D 2000 MBA 710, compounded for water and sewer service.

In order to properly mark the location of every branch connection, the Contractor shall take accurate measurement of all branches before the sewer trench is backfilled. The measurements shall indicate the distance from each branch to the center of the nearest downstream and upstream manhole. When leads are run to the property line, they shall be perpendicular to the main sewer. The Contractor shall also report the location of the point where the lead ends, relative to the nearest property corners. The Contractor shall furnish the Engineer with a copy of these measurements immediately upon the completion of each section of sewer.

In addition to measurements, the Contractor shall furnish and place a minimum two inch by two inch cedar or treated lumber marking stick at the end of each lateral extension or service lead connection of such length that it will reach from the end of the pipe vertically up to a minimum of two inches above the proposed finished grade. Each marker shall be set in a vertical position. Markers will not be required on the main run of sewer at fittings. The visible end of each marker stake must be plainly painted red if sanitary or white if storm.

The service lead pipes shall also be marked for identification in order to prevent cross connection of the leads: sanitary leads - red, storm leads - white. The last two lengths of pipe shall be marked by wrapping the appropriate colored tape twice around the barrel. This wrapping shall take place at any point in the lead whenever the lead is terminated. This taping (wrapping) must be performed under the inspection of the Inspector.

Manholes:

Excavation shall be carried to the depth and width required to permit the construction of the required base. The excavation width shall be greater than the base. The bottom of

the excavation shall be trimmed to a uniform horizontal bed and be completely dewatered before any concrete is placed therein. Concrete shall be Grade S2. Precast manhole bases and precast bottom sections are allowed.

Precast concrete manholes shall be constructed of Concrete, Grade S2.

Circular precast manhole sections shall be constructed in accordance with the Standard Detail Drawings. Manhole stack units shall be constructed on level poured-in-place bases, precast concrete bases, or precast concrete bottom sections.

Precast cone sections shall be constructed in accordance with the Standard Details. These units shall be eccentric for all manholes. All structures shall be topped with a minimum of one and a maximum of three brick or precast adjustment ring courses.

Manholes shall be constructed within 2-1/2 inches of plumb.

Frames and cover castings shall be set in full mortar beds and pointed on the structure interior to a smooth, brushed finish. The covers shall be set flush with sidewalk, roadway pavement, or ground surfaces. City of Ann Arbor Project Management Personnel shall be notified prior to the final paving of all private roads and parking lots so as to allow inspection of the final casting adjustments for all City utility structures. In gravel streets, covers shall be set six to eight inches below finished gravel surface.

Sewer pipes shall extend into structures a minimum of 1/2 inch and a maximum of 3 inches.

Flow channels for sewer structures shall be finished in accordance with the Standard Details. All flow channels shall be screeded and floated to a smooth, uniform surface and troweled to a hard surface finish. In vitrified clay sewers, the manhole may be constructed around the pipe, then the top half of the pipe broken out with concrete fillets provided to fill in between the pipe and manhole.

Stubs for future sewer connections shall be furnished and placed by the Contractor as shown on the Plans and as directed by the Engineer. Connections shall be properly supported and braced when not resting on original ground so that any settlement will not disturb the connection. Stubs shall consist of one length of sewer pipe, of the size indicated on the Plans, with a watertight plug.

See Sewer Testing section for the requirement of the installation of a pipe nipple through the sewer manhole wall.

Drop Connections:

Where shown on the Plans or directed by the Engineer where a branch sanitary sewer is brought into a manhole more than 24 inches above the invert elevation in the manhole, a drop connection shall be provided in accordance with the Standard Detail Drawings.

Backfilling Around Manholes:

As soon as practicable after a precast structure has been set, forms and debris have been removed from the structure, and the structure has been inspected and approved, the excavated area around the structure shall be backfilled up to the specified grade with Granular Material, Class II. No boulders, rocks, stones, masonry, lumber, or debris shall be allowed within the backfill.

Sewer Testing:

All sanitary sewers, including leads, 36 inches and smaller shall be air tested by the Contractor. All sanitary sewers greater than 36 inches shall be infiltration or exfiltration tested by the Contractor. The Engineer will decide whether inflitration or exfiltration testing is performed based upon ground water conditions. All sewers, except 4-inch and 6-inch leads, shall be television inspected by the Contractor. All PVC sanitary sewer mains shall be mandrel tested. All sewer must meet each test, in order (mandrel testing, air or infiltration/exfiltration, television inspection), before the next test is performed. The Contractor shall furnish all labor, equipment and materials necessary for testing. Only after all tests have been successfully completed, and acknowledged by the Engineer in writing, may the sewer be placed in service.

Mandrel Testing:

All PVC sanitary sewer mains shall be mandrel tested for deflection by the Contractor. The mandrel shall be a commercially produced, nine-fin mandrel, with the pipe diameter, percent deflection and applicable ASTM or AASHTO standard stamped on the fins. The testing is to take place after the sewers have been in place for a minimum of 30 days. The mandrel shall be pulled from structure to structure. Any portion of the pipe through which the mandrel passes freely shall be deemed to have passed the mandrel test. Sections of pipe through which the mandrel does not pass freely shall be exposed and examined. Based on this examination either the pipe zone bedding and backfill shall be improved or the pipe replaced. The pipe shall then be re-tested before approval is granted.

The Contractor shall not be granted an extension of contract time for the period in which a portion(s) of PVC sanitary sewer is awaiting mandrel and other acceptance tests. This waiting period is understood to be an integral element of the construction of the utility and cannot be eliminated. Further, if a sewer is installed and requires remedial action in order

to comply with the requirements of the project specifications, the waiting period associated with the remedial repairs shall also not be considered as a basis for an extension of contract time. The Contractor shall take these requirements into account when preparing their Critical Path Schedule, and any required updates, and shall account for them during the performance of the project.

The mandrel is to be constructed in accordance with the following table:

SDR 35 PVC, Pipe I.D.	Mandrel O.D.
8"	7.28"
10"	9.08"
12"	10.79"
15"	13.20"
18"	N/A
24"	N/A

Air Test:

The air test can be dangerous. Lack of understanding, carelessness, or an improperly prepared line must be avoided. It is extremely important that the plugs be installed in such a way as to prevent blowouts. Sudden expulsion of a poorly installed or partially deflated plug can cause serious injury or damage. As a safety precaution, pressurizing equipment must include a relief valve set at not more than 10 psig. No one will be allowed in the manholes during testing.

In areas where ground water is known to exist and the sewer is to be air tested, the Contractor shall install a 1/2-inch diameter by approximately 10 inch long pipe nipple, through the manhole wall above one of the sewer lines entering the manhole. The pipe nipple shall be capped on the inside of the manhole at the time the sewer line is installed. Immediately prior to the performance of the air test, the ground water level shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the pipe nipple. The tube shall be held vertically and a measurement of the height in feet of water above pipe centerline shall be taken after the water stops rising in this plastic tube. The height in feet shall be divided by 2.31 to establish the pressure (in psig) that will be considered to be the average ground water back pressure.

The normal sequence and time requirements for air testing are:

1. After a manhole-to-manhole section of line has been backfilled and cleaned, it shall be plugged at each manhole with pneumatic plugs. The design of the pneumatic

plugs shall be such that they will hold against the line test pressure without requiring external blocking or bracing. There shall be three hose connections to the pneumatic plug. One hose shall be used only for inflation of the pneumatic plug. The second hose shall be used for continuously reading the air pressure rise in the sealed line. The third hose shall be used only for introducing low pressure air into the sealed line.

2. Low pressure air shall be introduced into the sealed line until the internal air pressure reaches 4.0 psig greater than the average back pressure of any ground water pressure that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize. After the stabilization period, the pressurization hose shall be disconnected to prevent air from entering or escaping from the line.

   There shall be a pressure gauge for reading the internal pressure of the line being tested. The gauge shall be capable of showing pressure as low as 0 psig up to no greater than 20 psig. In the 0-10 psig range the gauge shall be both calibrated and accurate to one-tenth of one pound and the gauge dial shall cover at least one-half of the complete dial range. This gauge shall have a tee fitting to allow simultaneous pressure reading by a City gauge.

3. The time requirement for the pressure to decrease from 3.5 to 2.5 psig (greater than the average back pressure of any ground water that may be over the pipe) shall not be less than the time given in the following table:

	VCP SEWERS	PVC SEWERS	
Pipe Size	Minimum Holding Time Seconds/100 ft. Pipe	Holding Time (Seconds)	Minimum Holding Time (Min:Sec)
4-inch	18	0.380 x Length	3:46
6-inch	42	0.854 x L	5:40
8-inch	72	1.520 x L	7:34
10-inch	90	2.374 x L	9:26
12-inch	108	3.418 x L	11:20
15-inch	126	5.342 x L	14:10
18-inch	144	7.692 x L	17:00
21-inch	180	10.470 x L	19:50
24-inch	216	13.674 x L	22:40
30-inch	288	21.366 x L	28:20
36-inch	360	30.768 x L	34:00

Infiltration Test:

The Contractor shall place temporary weirs for testing purposes in such manholes as necessary to measure the amount of infiltration. Test sections shall be no longer than 1,200 feet.

The allowable amount of infiltration shall not be more than 200 gallons per inch of pipe diameter per mile of sewer per 24 hours, including manholes. The Contractor shall repair all visible leaks regardless of the results of the infiltration test.

If the allowable limit of infiltration is exceeded on any test section, the Contractor shall reconstruct or repair the defective portion of the sewer, and re-test.

Exfiltration Test:

The standpipe method will be used from manhole to manhole for the length of pipe to be tested. A hydrostatic head of 10 ft. to the sewer's average centerline elevation will be required, with adjustments for external submergence due to water in the trench. The Engineer will establish time durations and procedures for each test. The maximum allowable exfiltration rate will be 200 gallons per inch of pipe diameter per mile of sewer per 24 hours including manholes. Upon completion of this test on a sanitary sewer, the Contractor shall pump all water out of the downstream manhole to a storm sewer.

Television Inspection:

A video inspection must be approved prior to the acceptance of the sewers, and prior to any building connections being made. The Engineer shall be given 24 hours notice so that an Inspector may witness the video inspection. All sewer lines are to be thoroughly cleaned prior to video inspection, by jetting of the lines or other approved methods. Video inspection shall consist of wetting the invert of the section by pouring clean water in the upstream manhole until it appears in the downstream manhole, and then, after the water has stopped flowing, passing a video camera through the section. The camera shall be connected to a monitor and the results recorded in DVD format. The inspection record (DVD) shall indicate the date, the section tested, and the actual distance from the beginning manhole to each tee or wye, and each visible defect. The DVD shall be furnished to the Engineer for further review and final approval.

The video inspection will be deemed satisfactory if there are no visible defects, including, but not limited to: dips or low spots, high spots, deviations in horizontal or vertical alignment, joint offsets, leaks or cracks and there is no debris or other foreign material in the sewer system.

Sewer Repairs:

If a sewer repair is required as a result of damage during construction operations, air test failure, or video inspection failure, the Contractor shall expose the sewer pipe and perform the required correction(s), as specified herein and as directed by the Engineer. The Contractor shall be fully responsible to provide a written plan of all proposed activities associated with any repair(s) for the review and approval of the Engineer. All repairs proposed shall be effective. The Engineer's acceptance of a proposed repair plan shall not be construed as acceptance of any associated result. The Contractor is, and shall remain responsible, for all work until such time as it is formally accepted in writing by the Engineer.

If the repair is required due to the pipe being out of alignment or off grade, the pipe shall be adjusted so as to be placed in proper alignment and grade. Aggregate, 6A (limestone) shall be carefully placed under the haunches of the realigned pipe and compacted by the use of a tee-bar. From the haunches of the pipe, backfilling shall be performed as specified elsewhere herein.

If the pipe cannot be satisfactorily realigned or an open joint reset; or if the pipe is cracked, broken, or permanently deflected, the affected pipe shall be removed and replaced with the same pipe material. The pipe to be removed is to be sawed on each side of the damaged section in a neat and workmanlike manner without damage to the adjacent pipe. The replacement pipe section shall fit flush to the remaining pipe at each end. These sawed joints shall be coupled using a flexible pipe coupling and stainless steel shear ring. These joints shall be encased to the pipe centerline with Concrete, Grade X one foot on either side of the flexible coupling. The remaining pipe backfill shall be performed as specified elsewhere herein.

The Contractor shall use closed circuit television to inspect sewer pipe in accordance with section 402.03.J where indicated on the plans or otherwise approved by the Engineer.

c. Measurement and Payment. The completed work as described will be measured and paid for at the contract unit price using the following contract items (pay items):

Contract Item (Pay Item)	**Pay Unit**
Sewer, SDR 35 PVC Pipe, ___ inch, Tr Det ___	Foot
Type I Manhole (4 ft dia) (0-10 ft. Deep)	Each
SDR 35, PVC Tee	Each
SDR 35, PVC Riser	Vft
SDR 35, PVC Service Lead	Foot
Video Taping Sewer and Culv Pipe	Foot

Sewer Pipe

Sewer pipe as specified shall be measured in place by length in lineal feet (LF) from center of manhole to center of manhole.

Payment will include, but not be limited to; excavation; removal and proper disposal off-site of all excess or unsuitable excavated material; any needed sheeting, shoring and bracing; the installation of water-tight plugs; protection of all existing utilities and service connections; connections into existing structures; bulkheading existing connections that are no longer needed in existing manholes; pipe bedding; by-pass pumping; furnishing an approved geotextile separator; backfilling per the trench details and the requirements specified herein; cleaning; video inspection; and testing.

Service Tees

Service tees shall be paid for based on each tee installed. The payment for the service tee will include the material, equipment and labor costs for the connection of the riser or lead to the tee. Also, the payment for the service tee will include the material, equipment and labor costs for the excavation; removal and proper disposal off-site of all excess or unsuitable excavated material; any needed sheeting, shoring and bracing; the installation of water-tight plugs; protection of all existing utilities and service connections; pipe bedding; by-pass pumping; furnishing an approved geotextile separator; backfilling per the trench details and the requirements specified herein; cleaning; testing; placing the plug or cap placed on the tee, riser or lead; and, the required wooden stake to locate the riser or lead in the future.

Risers & Leads

Service risers shall be paid for based on vertical feet (VF) measured as installed, from invert of the sewer main to invert of the bend at the top of the riser.

Service leads shall be paid for based on lineal feet (LF) measured as installed, from the center of the main to the capped end of the lead. If a service riser is installed, this measurement shall be from the center of the bend at the top of the riser to the capped end of the lead. The payment for service leads will include, but not be limited to; excavation; removal and proper disposal off-site of all excess or unsuitable excavated material; any needed sheeting, shoring and bracing; the installation of water-tight plugs; protection of all existing utilities and service connections; connections into existing structures; pipe bedding; by-pass pumping; furnishing an approved geotextile separator; backfilling and compacting per the trench details and the requirements specified herein; cleaning; video inspection; testing; and, the necessary fittings, labor and equipment to connect the lead to a riser.

Manholes

Manholes of the detail and depth specified will be paid for at the Contract unit price for each unit installed. Payment includes, but shall not be limited to; furnishing the labor, equipment and materials for all necessary excavation; any needed sheeting, shoring and bracing; properly disposing of surplus or unsuitable excavated material; backfilling and compaction; and, constructing the structure complete, including pipe connections and structure cleaning, up to 10 feet of drainage structure depth.

Payment for additional depth for drainage structures includes, but shall not be limited to; furnishing the labor, equipment, and materials for all necessary excavation; any needed sheeting, shoring and bracing; disposing of surplus excavated material; backfilling and compaction; and constructing the structure complete, including pipe connections and structure cleaning, for the portion of the structure which is deeper than 10 feet.

Payment for adjusting of manhole frames and covers shall be included in payment for the manhole. The manhole frames and covers will be paid for separately.

Drop Connections

Payment for drop connections shall be based on vertical feet (VF) installed. Payment includes, but shall not be limited to; furnishing all labor, equipment and materials for all necessary excavation; any needed sheeting, shoring and bracing; proper removal and disposal off-site of surplus and unsuitable excavated material; pipe, fittings, and concrete; backfilling and compaction; and, connections to complete this item of work. Vertical footage will be measured from the bottom invert of the drop connection to the top invert of the drop connection.

Pipe Undercut & Refill
The Contractor shall note that undercut quantities shown on the Bid Form are estimates only. The quantities of undercut may vary significantly more or less depending on field conditions at the time of construction. Any variation from the bid amount shall not be a basis of claim for additional compensation pursuant to Sections 103.02.B or 104.10 .

Measurement for refill width will be the outside diameter of the pipe barrel plus two feet. Measurement for depth will be from the bottom of the excavation to the bottom of the pipe barrel.

Payment will be based on cubic yards (CY) as measured compacted in place, as described above. Payment will include the additional excavation, placement of refill material compacted in place, and all related work.

Payment for Video Taping Sewer and Culv pipe shall include furnishing all materials, labor, and equipment necessary to complete the work.

DETAILED SPECIFICATION
FOR
DRAINAGE STRUCTURES

AA:MGN 1 of 6 11/17/15
WT:VCM:CGT:AJK 11/21/22

a. Description.- This work shall consist of constructing drainage structures and making drainage structure taps in accordance with Section 403 of the Michigan Department of Transportation 2020 Standard Specifications for Construction, as shown on the plans, and as specified herein.

b. Materials.- The materials used for this work shall conform to Subsection 403.02 of the Michigan Department of Transportation 2020 Standard Specifications for Construction, except as specified herein.

Storm sewer drainage structures shall be constructed of precast or cast-in-place reinforced concrete sections, or concrete masonry units. All sanitary sewer manholes and gate wells (water main valve manholes) shall be constructed of precast reinforced concrete sections.

Precast reinforced concrete bases, bottom sections, manhole risers, grade adjustment rings, concentric cones, eccentric cones, and flat slab tops shall conform to the requirements of ASTM C-478. Joints on precast manholes used on all sanitary sewers shall meet ASTM C-443, rubber O-ring gasket.

Precast manhole tees and radius pipe sections shall conform to requirements for reinforced concrete pipe, ASTM C-76, Class IV. Joints shall conform to adjacent pipe. Tees and radius pipe shall conform to details indicated on drawings offered by the Concrete Pipe Association of Michigan, Inc., or Engineer approved equal.

If precast drainage structures are used, they shall be designed to accommodate HL-93 Modified Live Load requirements as determined by a Professional Engineer licensed by the State of Michigan, regardless of where they are to be installed. For the purposes of design, a HL-93 Modified Live Load shall consist of 1.2 times the design truck or 1.2 times a single 60 kip load, whichever produces the greater stresses.

If precast structures are used, the Contractor shall field verify inverts prior to fabricating precast units. No additional payment will be made to the Contractor for precast units that cannot be used due to existing inverts being different than shown on the plans, changes in vertical or horizontal alignment due to conditions found in the field, or similar unforeseen circumstances.

If the Contractor elects to use pre-cast drainage structures, or if portions of the drainage structures are constructed with pre-cast concrete elements, the Contractor shall submit to the Engineer for review and approval shop drawings in accordance with Section

104.02 of the Michigan Department of Transportation 2020 Standard Specifications for Construction.

For each submittal or resubmittal, the Contractor shall allow at least 14 calendar days from the date of the submittal to receive the Engineer's acceptance or request for revisions. The Engineer's comments shall be incorporated into the submitted plans, calculations and descriptions. The Engineer's acceptance is required before beginning the work. Resubmittals shall be reviewed and returned to the General Contractor within 14 calendar days. Required revisions will not be a basis of payment for additional compensation, extra work, or an extension of contract time. The Contractor shall include time for this entire review process in his/her CPM network schedule.

Concrete masonry units shall conform to the requirements for concrete masonry units for catch basins and manholes, ASTM C-139.

Concrete brick shall conform to the requirements for concrete building brick, ASTM C-55, Grade N-1.

Slide gate assemblies for use on structures with weirs shall be designed to meet or exceed the current AWWA Standard C513. The slide plate, guide frame, and yoke pedestal shall be fabricated from minimum ¼" thickness 6061-T6 aluminum plate and shapes, and shall be designed to deflect no more than 1/360 of the span width under full design head. Slide gate upper seals shall be fabricated Ultra High Molecular Weight Polyethylene. Weir gate invert seals shall be fabricated from neoprene. All seals shall prevent leakage without requiring adjustments. Gate operators shall be non-rising stem type with a bronze operating nut supported by roller thrust bearings top and bottom secured in an accurately machined cast aluminum housing bolted to the pedestal. Stems shall be 1½" diameter stainless steel rod.

Where specified on the plans, use a PVC liner that is 30 mils thick. The PVC liner shall be seamless for its entire length and width in its installed position. Use resins to manufacture the PVC liner that are 100 percent first quality virgin polyvinyl chloride. The PVC liner must be resistant to ultraviolet degradation, construction damage and all forms of biological and chemical degradation normally encountered in highway construction applications. Satisfy the physical properties contained in the following table.

PVC Liner Physical Requirements

Property	Test Method	Requirement
Thickness Tolerance	ASTM D 1593	5+/- percent
100 Percent Modulus	ASTM D 882	1000 psi (minimum)
Elongation @ Break	ASTM D 882	300 percent (minimum)
Dimensional Stability	ASTM D 1204 (212 degrees F, 15 minutes)	5 percent change (maximum)

With each material shipment, provide test data certification from the manufacturer which includes a certified report of quality control test results obtained from the lot(s) of material in the shipment. Label each unit of material to provide product identification sufficient for field identification and correlation to certified test results. Certify the specified physical properties as minimum average roll values (MARV).

Plastic coated manhole steps shall be injection molded of copolymer, polypropylene, encapsulating a 1/2 inch grade 60 steel reinforcing bar. Plastic-coated manhole steps shall meet the performance test described in ASTM C-478, Paragraph ll, and shall have an impact resistance of 300 ft.-lbs. with only minor deflection and no cracking or breaking. The steps shall resist pull out forces of l500 lbs.

c. Methods of Construction.- The construction methods used shall conform to Section 403.03 of the Michigan Department of Transportation 2020 Standard Specifications for Construction except as specified herein.

Where a structure currently exists and a new structure is required to be constructed in the same location, the Contractor shall excavate, remove, and dispose of the existing drainage structure included in the unit price for the structure to be constructed.

Excavation shall be carried to the depth and width required to permit the construction of the required base. The excavation width shall be greater than the base. The bottom of the excavation shall be trimmed to a uniform horizontal bed and be completely dewatered before any concrete is placed therein. Precast manhole bases and precast bottom sections are allowed.

Concrete block construction shall only be allowed for storm sewer manholes and inlets and shall be built of the size and dimensions shown on the Plans. The block shall be clean, laid in a full bed of mortar, and thoroughly bonded by completely filling the vertical end grooves with mortar so as to interlock with the adjacent block. The mortar beds and joints shall not exceed 3/4 inch thickness. The vertical joints are to be completely filled with the joints on the inside face rubbed full of mortar and struck smooth as the manhole, inlet or structure is built up. The entire outside face of the structure shall receive a 1/2" thick mortar coat and struck smooth. All masonry materials, sand, and water shall be heated to over 50^{o} F during freezing weather, and the completed work shall be covered and protected from damage by freezing.

Circular precast manhole sections shall be constructed in accordance with the details as shown on the plans. Manhole stack units shall be constructed on level poured-in-place bases, precast concrete bases, or precast concrete bottom sections.

Precast cone sections shall be constructed in accordance with the details as shown on the plans. These units shall be eccentric for all manholes, precast or block. All structures shall be topped with a minimum of one, and a maximum of three, 2” tall, brick or precast adjustment courses.

Manholes, inlets, gate wells and structures shall be constructed within 2-1/2 inches of plumb.

Frames and cover castings shall be set in full mortar beds and pointed on the structure interior to a smooth, brushed finish. The covers shall be set flush with sidewalk, roadway pavement, or ground surfaces. The Engineer shall be notified prior to the final paving so as to allow inspection of the final casting adjustments for all utility structures. In gravel streets, covers shall be set six to eight inches below finished gravel surface.

Sewer pipes shall extend into structures a minimum of 1/2 inch and a maximum of 3 inches.

Flow channels for sewer structures shall be finished in accordance with the details as shown on the plans. All flow channels shall be screeded and floated to a smooth, uniform surface and troweled to a hard surface finish.

Stubs for future sewer connections shall be furnished and placed by the Contractor as shown on the Plans and as directed by the Engineer. Connections shall be properly

supported and braced when not resting on original ground so that any settlement will not disturb the connection. Stubs shall consist of one length of sewer pipe, of the size indicated on the Plans, with a watertight plug.

The excavation shall be kept in a dry condition. All necessary dewatering shall be paid for separately in accordance with the Special Provision entitled “Dewatering”.

All necessary adjustments for new structures shall be included in the cost of the structure.

Temporary drainage structures shall be constructed as specified in the plans and consist of a typical manhole riser with no manhole base. The excavation for temporary drainage structures shall be performed such that the bottom portion of the manhole penetrates into the existing granular soil layer and water is permitted to infiltrate through the granular base. If the sand layer is not reached at the depth indicated in the plans, the Contractor shall excavate to a depth a minimum of 6 inches into said sand layer. The bottom of the excavation shall be trimmed to a uniform horizontal bed and be completely dewatered. The manhole riser section shall be placed on existing granular material and supplemented with coarse aggregate (MDOT 6A or other Engineer approved material) such that the manhole is stable and will remain plumb during the entire construction process.

Removal and/or abandonment of the temporary drainage structures shall be performed as shown on the plans and as directed by the Engineer.

Where making sewer connections to existing drainage structures, the Contractor shall tap drainage structures in accordance with section 403.03.E where indicated on the plans or otherwise approved by the Engineer.

d. Measurement and Payment.- The completed work as measured shall be paid at the contract unit price for the following contract items (pay items):

(Contract Item) Pay Item	**Pay Unit**
Single Inlet with 2 Foot Sump	Each
Dr Structure, Tap, 10 inch	Each
Dr Structure, Tap, 12 inch	Each
Dr Structure, Tap, 18 inch	Each

DETAILED SPECIFICATION
FOR
DRAINAGE STRUCTURES

AA:MGN 6 of 6 11/17/15
WT:VCM:CGT:AJK 11/21/22

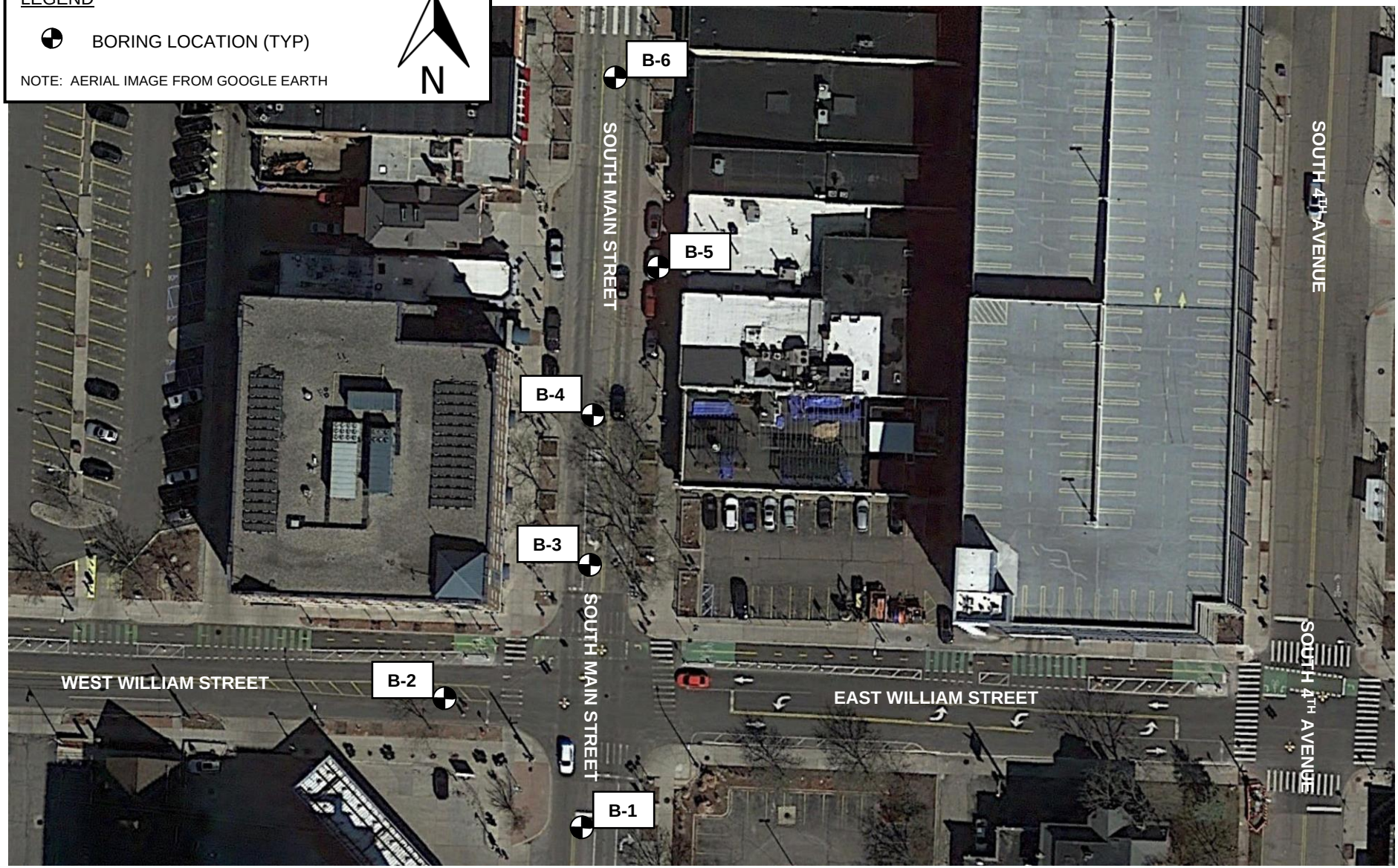
Payment for drainage structures includes furnishing the labor, equipment and materials for all necessary excavation, disposing of surplus excavated material, backfilling, and constructing the structure complete, including pipe connections and structure cleaning. A standard depth manhole shall be considered to be 8 feet or less in depth (including sump).

Payment for temporary drainage structures includes constructing the structure as show on the plans and as detailed in the specifications; removing and disposing off-site of the drainage structure when no longer needed; all materials associated with the construction of the structure; backfilling and compacting the resulting excavation with Class II Granular Material and MDOT Open-Graded Aggregate 34R as shown in the plans; and, making the area ready for subsequent construction activities. Required castings for temporary drainage structures will be provided as directed by the Engineer and paid for separately.

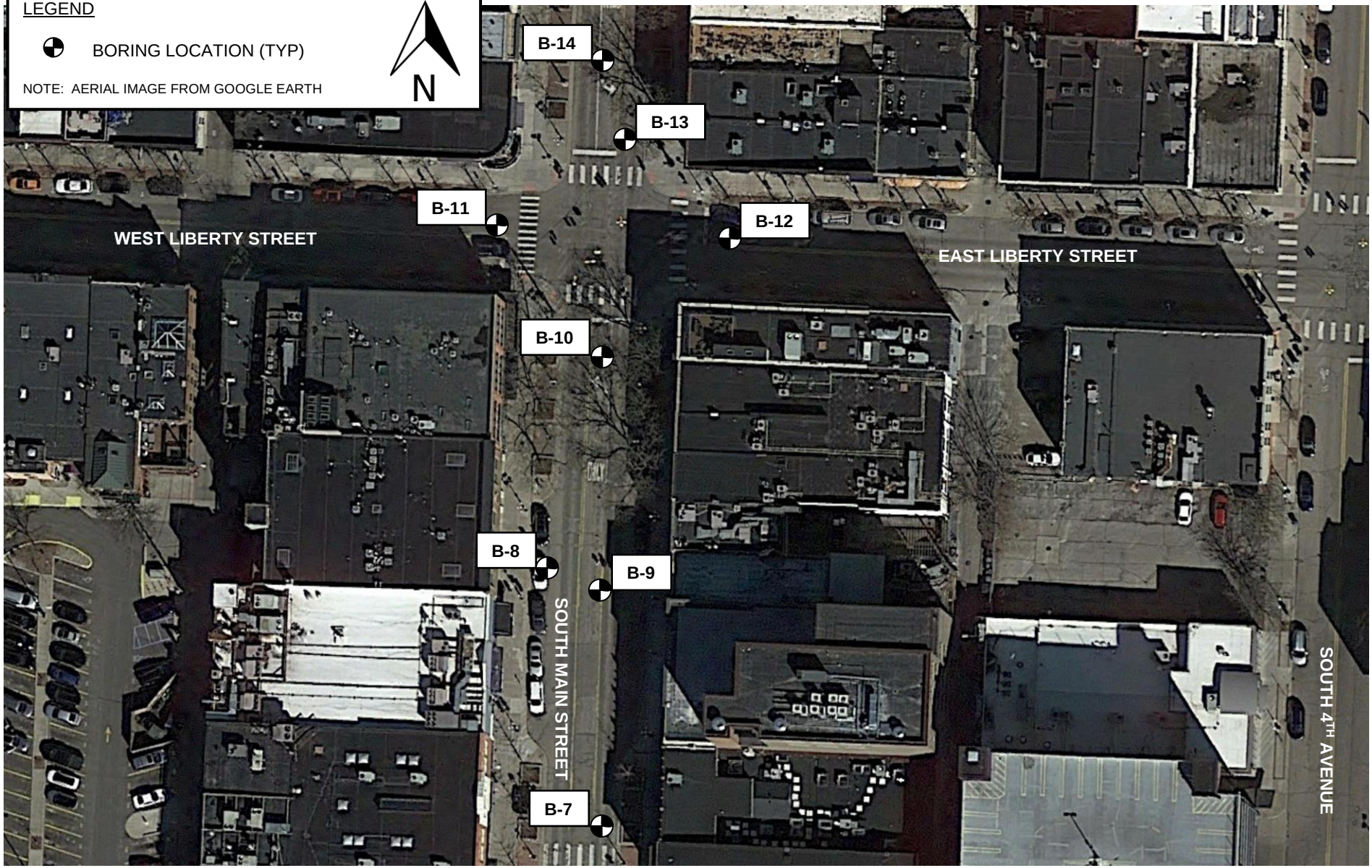
Payment for additional depth for drainage structures includes furnishing the labor, equipment, and materials for all necessary excavation, disposing of surplus excavated material, backfilling, and constructing the structure complete, including pipe connections and structure cleaning, for the portion of the structure which is deeper than 8 feet (including sump).

Payment for adjusting of drainage structure covers shall be included in payment for the structure. Drainage structure covers will be paid for separately.

Payment for Dr Structure, Tap, _ inch shall include furnishing all materials, labor, and equipment necessary to complete the work.

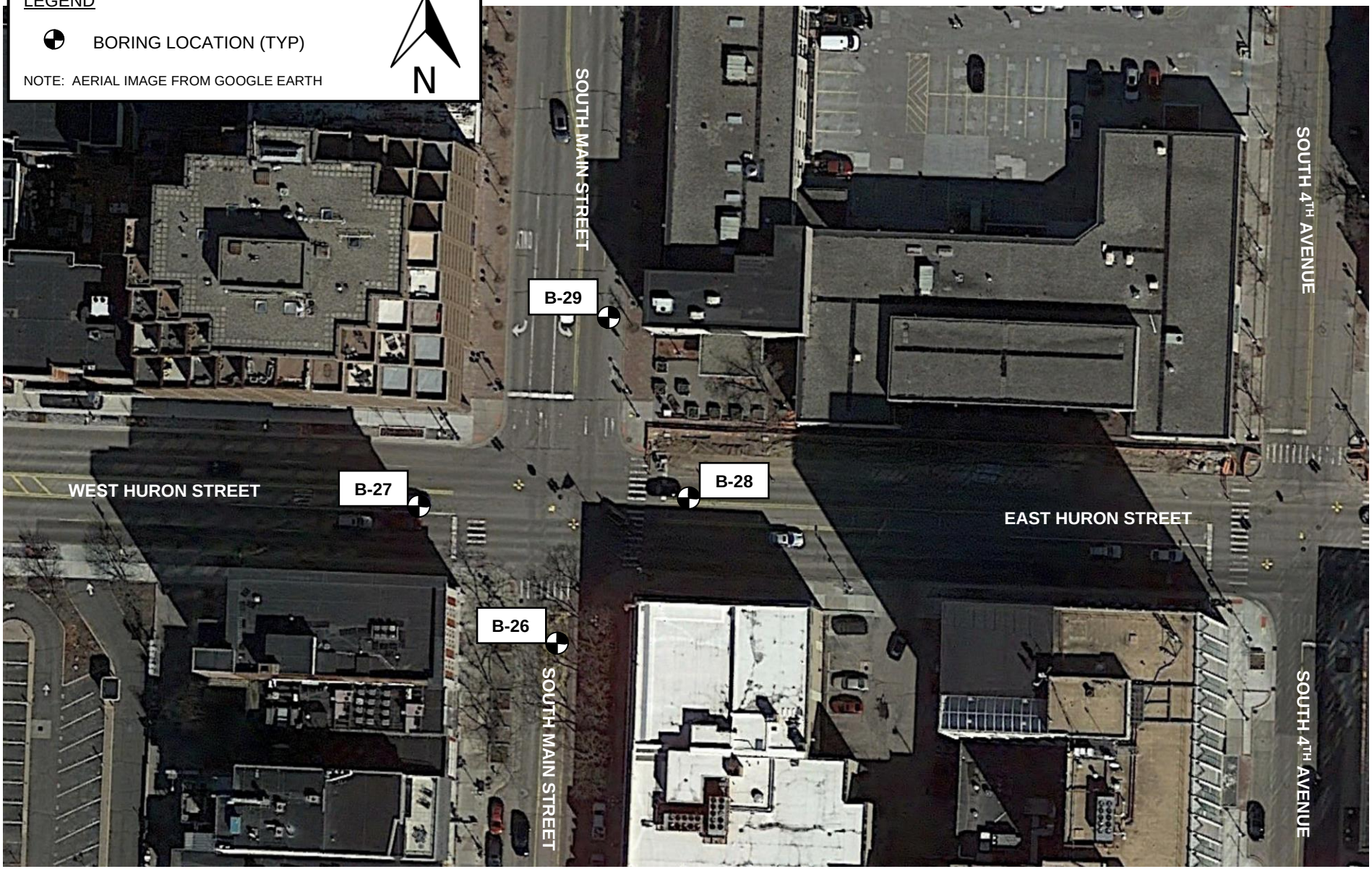


TITLE: BORING LOCATION PLAN		PROJECT: ANN ARBOR S. MAIN STREET WATER MAIN REPLACEMENT AND RESURFACING	
SCALE: NS	DATE: 07/14/2021	PROJECT NO.: 211132	MTC MATERIALS TESTING CONSULTANTS
FIG. NO.: 1	DR. BY: KLV	REV. BY: RW	



TITLE: BORING LOCATION PLAN		PROJECT: ANN ARBOR S. MAIN STREET WATER MAIN REPLACEMENT AND RESURFACING	
SCALE: NS	DATE: 07/14/2021	PROJECT NO.: 211132	MTC MATERIALS TESTING CONSULTANTS
FIG. NO.: 2	DR. BY: KLV	REV. BY: RW	

TITLE: BORING LOCATION PLAN		PROJECT: ANN ARBOR S. MAIN STREET WATER MAIN REPLACEMENT AND RESURFACING	
SCALE: NS	DATE: 07/14/2021	PROJECT NO.: 211132	MTC MATERIALS TESTING CONSULTANTS
FIG. NO.: 3	DR. BY: KLV	REV. BY: RW	



TITLE: BORING LOCATION PLAN		PROJECT: ANN ARBOR S. MAIN STREET WATER MAIN REPLACEMENT AND RESURFACING	
SCALE: NS	DATE: 07/14/2021	PROJECT NO.: 211132	MTC MATERIALS TESTING CONSULTANTS
FIG. NO.: 4	DR. BY: KLV	REV. BY: RW	

Table 1 - Summary of Investigation Results

Street Name	Limits	Borings	Asphalt Thickness (inches)	Base Thickness and Description	Subgrade Soils	Estimated Resilient Modulus, psi	Laboratory Results - Moisture, %
Intersection of South Main and William St	-	B-1 to B-3	4 1/2 to 8	B-1: 10" Gravel with wood in upper 7" B-2: 10" Natural Agg. B-3: 16" Concrete	B-1: Poorly graded sand with gravel (SP) to 5.5 ft, clayey sand with gravel (SC) to 8 ft, poorly graded sand with gravel to 10 ft B-2, B-3: Clayey sand (SC) to 2 to 5.5 ft, poorly graded sand with gravel (SP) to 5 to 10 ft	SP: 5,500 - 7,500 SC: 3,700 - 5,100	SC: 13.3 to 25.6
South Main	Liberty St to William St	B-4 to B-9	6 1/2 to 12 except for B-8: 1 1/2	B-4, B-6, B-9: 13 to 17 1/4" Concrete B-5, B-7: N/A B-8: 4" Red Brick, 3" Sand/Gravel	B-4: Clayey sand with gravel (SC) to 3.2 ft, poorly graded gravel with sand (GP) to 5 ft B-5: Poorly graded sand with gravel (SP) to 5 ft B-6: Poorly graded sand with silt (SP-SM) to 2.8 ft, clayey sand (SC) to 5 ft B-7, B-8: Clayey sand with gravel (SC) to 5 ft B-9: Poorly graded sand with clay (SP-SC) to 3 ft, poorly graded sand with silt (SP-SM) to 5 ft	SC: 3,700 - 5,100 GP: 5,500 - 7,500 SP: 5,500 - 7,500 SP-SM: 5,900 - 8,100 SP-SC: 3,700 - 5,100	SC: 12.3 to 19.5
Intersection of South Main and Liberty St	-	B-10 to B-13	3 to 6 1/2	B-10: 16" Concrete B-11: N/A B-12: 15" Crushed Agg. B-13: 6" Natural Agg.	B-10, B-13: Clayey sand (SC) to 2.7 to 3 ft, poorly graded sand with gravel (SP) to 5 ft B-11: Poorly graded sand with silt (SP-SM) to 3 ft, poorly graded sand with gravel (SP) to 10 ft B-12: Poorly graded sand with clay (SP-SC) to 2.2 ft, clayey sand (SC) to 3.2 ft, poorly graded sand (SP) to 5 ft	SC: 3,700 - 5,100 SP: 5,500 - 7,500 SP-SM: 5,900 - 8,100 SP-SC: 3,700 - 5,100	SC: 12.4
South Main	Washington St to Liberty St	B-14 to B-17	5 3/4 to 7 1/2	B-14, B-17: 17 1/2 to 18" Concrete with Wood Tie B-15: 4" Natural Agg. B-16: 7" Concrete	B-14: Clayey sand (SC) to 3.9 ft, poorly graded sand with clay and gravel (SP-SC) to 4.5 ft, poorly graded sand with gravel (SP) to 5 ft B-15: Clayey sand (SC) to 3.5 ft, poorly graded sand (SP) to 5 ft B-16: Poorly graded sand with silt (SP-SM) to 2.9 ft, clayey sand (SC) to 4.5 ft, poorly graded sand with gravel (SP) to 5 ft B-17: Poorly graded sand with clay (SP-SC) to 4.5 ft, brown poorly graded sand with gravel (SP) to 5 ft	SC: 3,700 - 5,100 SP-SC: 3,700 - 5,100 SP: 5,500 - 7,500 SP-SM: 5,900 - 8,100	SC: 7.2

Table 1 - Summary of Investigation Results, Continued

Street Name	Limits	Borings	Asphalt Thickness (inches)	Base Thickness and Description	Subgrade Soils	Estimated Resilient Modulus, psi	Laboratory Results - Moisture, %
Intersection of South Main and Washington St	-	B-18 to B-22	6 to 10	B-18, B-20, B-22: 4 to 8" Natural Agg. B-19: N/A B-21: 16 3/4" Concrete	B-18: Sandy lean clay (CL) to 2.8 ft, poorly graded sand with gravel (SP) to 5 ft B-19, B-22: Clayey sand (SC) to 4.7 to 5.5 ft, poorly graded sand with gravel (SP) to 10 ft B-20: Poorly graded sand with clay (SP-SC) to 2.5 ft, clayey sand (SC) to 4.5 ft, poorly graded gravel with sand (GP) to 5 ft B-21: Poorly graded sand with clay (SP-SC) to 3.2 ft, poorly graded sand with silt (SP-SM) to 4.8 ft, poorly graded sand with gravel (SP) to 5 ft	CL: 3,700 - 5,100 SP: 5,500 - 7,500 SC: 3,700 - 5,100 SP-SC: 3,700 - 5,100 GP: 5,500 - 7,500 SP-SM: 5,900 - 8,100	CL: 19.1 SC: 10.1 to 17.9
South Main	Huron St to Washington St	B-23 to B-25	8 1/4 except for B-24: 1	B-23: 5" Natural Agg. B-24: 4" Red Brick, 7" Natural Agg. B-25: 12" Concrete	B-23: Clayey sand (SC) to 4 ft, poorly graded sand (SP) to 5 ft B-24: Clayey sand (SC) to 5 ft B-25: Poorly graded sand with clay and gravel (SP-SC) to 3 ft, clayey sand (SC) to 3.4 ft, poorly graded sand with silt (SP-SM) to 5 ft	SC: 3,700 - 5,100 SP: 5,500 - 7,500 SP-SC: 3,700 - 5,100 SP-SM: 5,900 - 8,100	SC: 11.7 to 18.5
Intersection of South Main and Huron St	-	B-26 to B-29	6 to 8 1/4	B-26: 15 1/2" Concrete B-27, B-28, B-29: 3 1/2 to 12" Natural Agg.	B-26: Clayey sand (SC) to 2.3 ft, poorly graded sand with silt and gravel (SP) to 4 ft, clayey sand (SC) to 4.4 ft, poorly graded sand with gravel (SP) to 5 ft B-27: Clayey sand (SC) to 5 ft B-28: Clayey sand (SC) to 3 ft, sandy lean clay (CL) to 4.9 ft, poorly graded sand (SP) to 5 ft B-29: Clayey sand (SC) to 4.2 ft, poorly graded sand with gravel (SP) to 8 ft, poorly graded sand with clay and gravel (SP-SC) to 9.4 ft	SC: 3,700 - 5,100 SP: 5,500 - 7,500 CL: 3,700 - 5,100 SP-SC: 3,700 - 5,100	CL: 16.0 SC: 9.3 to 16.0

BORING LOG TERMINOLOGY AND ASTM D 2488 CLASSIFICATION OUTLINE

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE-GRAINED SOILS (major portions retained on No. 200 sieve): includes (1) clean gravel and sands and (2) silty or clayey gravels and sands. Condition is rated according to relative density as determined by laboratory tests or standard penetration resistance tests.

Descriptive Terms	Relative Density	SPT Blow Count
Very loose	0 to 15 %	< 5
Loose	15 to 35 %	5 to 10
Medium dense	35 to 65 %	10 to 30
Dense	65 to 85 %	30 to 50
Very dense	85 to 100 %	> 50

Per ASTM D2487, the following conditions must be met based on laboratory testing to justify the label 'well graded' in a soil description.

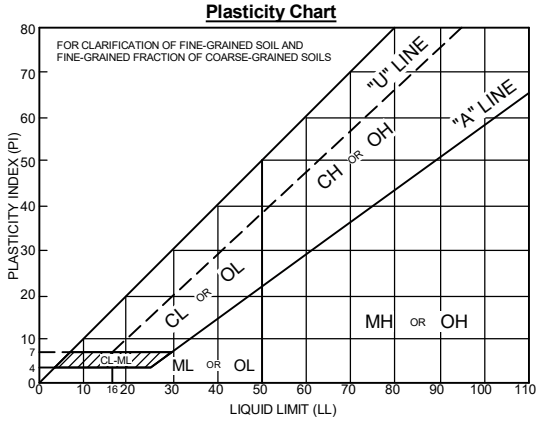
Gravel: $C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3

Sand: $C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3

FINE-GRAINED SOILS (major portions passing on No. 200 sieve): includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings, SPT blow count, or unconfined compression tests.

Descriptive Terms	Unconfined Compressive Strength TSF	SPT Blow Count
Very soft	< 0.25	< 2
Soft	0.25 to 0.5	2 to 4
Medium stiff	0.5 to 1.0	4 to 8
Stiff	1.0 to 2.0	8 to 15
Very stiff	2.0 to 4.0	15 to 30
Hard	> 4.0	> 30

Plasticity Chart



MAJOR DIVISIONS					TYPICAL NAMES
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS WITH LESS THAN 15% FINES	GW		WELL-GRADED GRAVELS WITH OR WITHOUT SAND
			GP		POORLY-GRADED GRAVELS WITH OR WITHOUT SAND
		GRAVELS WITH 15% OR MORE FINES	GM		SILTY GRAVELS WITH OR WITHOUT SAND
			GC		CLAYEY GRAVELS WITH OR WITHOUT SAND
	SANDS MORE THAN HALF COARSE FRACTION IS FINER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 15% FINES	SW		WELL-GRADED SANDS WITH OR WITHOUT GRAVEL
			SP		POORLY-GRADED SANDS WITH OR WITHOUT GRAVEL
			SP-SM		POORLY-GRADED SANDS WITH SILT WITH OR WITHOUT GRAVEL
		SANDS WITH 15% OR MORE FINES	SM		SILTY SANDS WITH OR WITHOUT GRAVEL
			SC		CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML		INORGANIC SILTS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL
			CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL
			OL		ORGANIC SILTS OR CLAYS OF LOW TO MEDIUM PLASTICITY WITH OR WITHOUT SAND OR GRAVEL
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH		INORGANIC SILTS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL
			CH		INORGANIC CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL
			OH		ORGANIC SILTS OR CLAYS OF HIGH PLASTICITY WITH OR WITHOUT SAND OR GRAVEL
HIGHLY ORGANIC SOILS			PT/OL		PEAT AND OTHER HIGHLY ORGANIC SOILS

GENERAL NOTES

1. Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.

2. "Grades with" or "Grades without" may be used to describe soil when characteristics vary within a stratum.

3. Preserved soil samples will be discarded after 60 days unless alternate arrangements have been made.

GROUNDWATER OBSERVATIONS:

During - indicates water level encountered during the boring
End- indicates water level immediately after drilling
Date and Depth - Measurements at indicated date

SAMPLE TYPES AND NUMBERING

	S	SPT, split barrel sample, ASTM D1586
	U	Shelby tube sample, ASTM D1587
	R	Rock core run
	*S	Other than 2" split barrel sample
	L	SPT with liner, ASTM D1586
	A	Auger cuttings
	G	Geoprobe liner

MINOR COMPONENT QUANTIFYING TERMS

Less than 5%	TRACE
5 to 10%	FEW
15 to 25%	LITTLE
30 to 40%	SOME
50 to 100%	MOSTLY

GRAIN SIZE

BOULDER	>12"
COBBLE	12" to 3"
COARSE GRAVEL	3" to 0.75"
FINE GRAVEL	0.75" to No. 4
COARSE SAND	No. 4 to No. 10
MEDIUM SAND	No. 10 to No.40
FINE SAND	No. 40 to No. 200

LOG OF BORING

Project No.: 211132
Boring No.: B-1
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: JS Rev. By: RW
Coordinates: N=284057.1 E=13290595.8 (MI South ift)
Elevation: 841.2 ft Datum: NAVD 88 (GPS Observation)
Notes: 28'S, 24'E of Traffic Signal Pole on Southwest Corner of South Main and William
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 6.5 ft.

Date Begin: 06/16/2021 Date End: 06/16/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 10.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
840.7	0.5					7" HMA 0.6				Wood sample retreived from auger cuttings
840.2	1.0					7" Gravel and Wood, 3" Gravel / COBBLE 1.4				
839.7	1.5									
839.2	2.0					Brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, moist				
838.7	2.5	S-1	1.5	9-12-4 N=16	SP					
838.2	3.0									
837.7	3.5									
837.2	4.0									
836.7	4.5	S-2	1.5	4-4-4 N=8						
836.2	5.0									
835.7	5.5					5.5				
835.2	6.0					Brown clayey SAND with gravel; mostly coarse to fine sand, little clayey fines, little coarse to fine gravel, moist				
834.7	6.5									
834.2	7.0	S-3	0.4	2-2-3 N=5	SC			25.6		S-3: Poor recovery; possible coarse gravel / COBBLE
833.7	7.5									
833.2	8.0					8.0				
832.7	8.5					Brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, moist				
832.2	9.0									
831.7	9.5	S-4	1.5	9-11-9 N=20	SP					
831.2	10.0					10.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-2
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: JS Rev. By: RW
Coordinates: N=284118.8 E=13290530.1 (MI South ift)
Elevation: 839.5 ft Datum: NAVD 88 (GPS Observation)
Notes: 28'S, 26'W of Stop Walk Signal on Northwest Corner of South Main and William
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/22/2021 Date End: 06/22/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 4.2 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
839.0	0.5					4 1/2" HMA 0.4				Fill: 0' to 2.0'
838.5	1.0	A-1				10" Natural Aggregate Base 1.2				
838.0	1.5	A-2		12	SC	Brown clayey SAND; mostly coarse to fine sand, little clayey fines, few coarse to fine gravel, moist, Fill 2.0				
837.5	2.0									
837.0	2.5	A-3				Brown poorly graded SAND with gravel; mostly coarse to fine sand, some coarse to fine gravel, moist				
836.5	3.0				SP					
836.0	3.5									
835.5	4.0			20+		4.2				
						End of Boring				Auger refusal at 4.2' due to collapsing soil

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-3
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: JS Rev. By: RW
Coordinates: N=284181.8 E=13290597.8 (MI South ift)
Elevation: 841.3 ft Datum: NAVD 88 (GPS Observation)
Notes: 18'N, 30'W of Traffic Signal Pole on Northeast Corner of South Main and William
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 6.8 ft.

Date Begin: 6/17/2021 Date End: 6/17/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 10.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%
QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
840.8	0.5					8" HMA 0.7				Fill: 0' to 5.5'
840.3	1.0					16" Concrete 2.0				
839.8	1.5									
839.3	2.0									
838.8	2.5					Dark brown clayey SAND; mostly medium to fine sand, some clayey fines, moist, Fill with clay seams				
838.3	3.0	S-1	1.5	3-2-2 N=4				16.3		
837.8	3.5									
837.3	4.0				SC					
836.8	4.5	S-2	1.5	3-4-2 N=6		Grades brown		13.3		
836.3	5.0					Grades with little clayey fines				
835.8	5.5					5.5				
835.3	6.0					Brown poorly graded SAND with gravel; mostly coarse to fine sand, few coarse to fine gravel, moist				
834.8	6.5									
834.3	7.0	S-3	1.0	4-5-4 N=9						
833.8	7.5									Driller noted possible COBBLE at 8.0'
833.3	8.0				SP					
832.8	8.5									S-3 and S-4: Poor recovery; possible coarse gravel / COBBLE
832.3	9.0									
831.8	9.5	S-4	1.1	3-3-3 N=6						
831.3	10.0					10.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-4
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: JS Rev. By: RW
Coordinates: N=284250.0 E=13290601.3 (MI South ift)
Elevation: 841.2 ft Datum: NAVD 88 (GPS Observation)
Notes: 8'N, 25'W of Drinking Fountain in front of 347 South Main

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 6/17/2021 Date End: 06/17/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
840.7	0.5					8 1/4" HMA 0.7				Possible Fill: 0' to 3.2'
840.2	1.0					15 1/2" Concrete 2.0				
839.7	1.5									
839.2	2.0									
838.7	2.5									
838.2	3.0	A-1		11	SC	Brown clayey SAND with gravel; mostly coarse to fine sand, some coarse to fine gravel, little clayey fines, moist, Possible Fill 3.2				A-1 and A-2: Samples saturated due to core drill water
837.7	3.5									
837.2	4.0									
836.7	4.5	A-2		20	GP	Brown poorly graded GRAVEL with sand; mostly coarse to fine gravel, some coarse to fine sand, moist 5.0				
836.2	5.0									
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-5
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: JS Rev. By: RW
Coordinates: N=284320.4 E=13290628.7 (MI South ift)
Elevation: 840.7 ft Datum: NAVD 88 (GPS Observation)
Notes: 4'S, 7.5'W of Pay Station in front of 337 South Main

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/14/2021 Date End: 06/14/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
840.2	0.5					12" HMA				Possible Fill: 0' to 5.0'
839.7	1.0					1.0				HMA core consisted of a 4" upper layer in fair condition and an 8" lower layer which was highly deteriorated
839.2	1.5					Brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, trace silty fines, moist, Possible Fill				
838.7	2.0	S-1	1.4	2-5-6-7 N=11	SP					
838.2	2.5									
837.7	3.0									
837.2	3.5									S-1 and S-2: Poor recovery; possible coarse gravel / COBBLE
836.7	4.0	S-2	1.4	9-8-8-6 N=16						
836.2	4.5									
835.7	5.0					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-6
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: JS Rev. By: RW
Coordinates: N=284409.3 E=13290609.6 (MI South ift)
Elevation: 840.6 ft Datum: NAVD 88 (GPS Observation)
Notes: 24'S, 20'W of Light Pole on East Side of Cross Walk in front of 327 South Main
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/21/2021 Date End: 06/21/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
840.1	0.5					6 1/2" HMA 0.5				Fill: 0' to 5.0'
839.6	1.0					13" Concrete 1.6				Concrete core split horizontally at 7" below top of concrete
839.1	1.5									
838.6	2.0	A-1		9	SP-SM	Brown poorly graded SAND with silt; mostly coarse to fine sand, few coarse to fine gravel, few silty fines, moist, Fill 2.8				A-1: Sample saturated due to core drill water
838.1	2.5									
837.6	3.0									
837.1	3.5	A-2			SC	Brown clayey SAND; mostly coarse to fine sand, some clayey fines, few coarse to fine gravel, moist, Fill 5.0				
836.6	4.0									
836.1	4.5			7						
835.6	5.0									
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-7
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: JS Rev. By: RW
Coordinates: N=284452.5 E=13290619.0 (MI South ift)
Elevation: 840.4 ft Datum: NAVD 88 (GPS Observation)
Notes: 19'N, 12'W of Street Light on Eastern Edge of Crosswalk at 327 South Main
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/14/2021 Date End: 06/14/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
839.9	0.5					9 1/2" HMA				Possible Fill: 0' to 5.0'
839.4	1.0					0.8				
838.9	1.5					Brown clayey SAND with gravel; mostly coarse to fine sand, some clayey fines, little coarse to fine gravel, moist, Possible Fill		12.4		
838.4	2.0	S-1	1.8	4-5-4-3 N=9						
837.9	2.5									
837.4	3.0				SC					
836.9	3.5							13.2		S-2: Poor recovery; possible coarse gravel / COBBLE
836.4	4.0	S-2	0.8	7-10-14-13 N=24		Grades with little clayey fines				
835.9	4.5									
835.4	5.0					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-8
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: JS Rev. By: RW
Coordinates: N=284568.0 E=13290592.3 (MI South ift)
Elevation: 839.6 ft Datum: NAVD 88 (GPS Observation)
Notes: 12.5'N, 9'E of Parking Meter in front of 306 South Main

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/14/2021 Date End: 06/14/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
839.1	0.5					1 1/2" HMA 0.1				Possible Fill: 0' to 3.0'
838.6	1.0					4" Red Brick 0.4				
838.1	1.5					3" Sand / Gravel Base 0.7				
837.6	2.0	S-1	2.0	5-4-4-3 N=8	SC	Brown clayey SAND; mostly coarse to fine sand, some clayey fines, moist, Possible Fill with sandy clay lenses		12.3		
837.1	2.5									
836.6	3.0					3.0				
836.1	3.5					Dark brown clayey SAND; mostly coarse to fine sand, some clayey fines, moist with possible organics and clay lenses		19.5		
835.6	4.0	S-2	2.0	3-3-2-3 N=5	SC					
835.1	4.5									
834.6	5.0					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-9
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: JS Rev. By: RW
Coordinates: N=284559.6 E=13290616.8 (MI South ift)
Elevation: 840.1 ft Datum: NAVD 88 (GPS Observation)
Notes: 4.5'N, 34'E of Parking Pay Station in front of 306 South Main

Plugging Record: Backfilled borehole with compacted cuttings.

Date Begin: 06/22/2021 Date End: 06/22/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
839.6	0.5					6 3/4" HMA 0.6				Fill: 0' to 5.0'
839.1	1.0					17 1/4" Concrete				
838.6	1.5									Concrete core split horizontally at 9 1/4" below top of concrete
838.1	2.0					2.0				
837.6	2.5	A-1		20+	SP-SC	Brown poorly graded SAND with clay; mostly medium to fine sand, few clayey fines, moist, Fill with clayey sand lenses				
837.1	3.0					3.0				
836.6	3.5	A-2				Brown poorly graded SAND with silt; mostly medium to fine sand, few silty fines, moist, Fill with clayey sand lenses				
836.1	4.0									
835.6	4.5			20+	SP-SM					
835.1	5.0					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-10
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: JS Rev. By: RW
Coordinates: N=284663.5 E=13290617.2 (MI South ift)
Elevation: 839.9 ft Datum: NAVD 88 (GPS Observation)
Notes: 16'S, 21.5'E of Traffic Signal Pole on Southwest Corner of South Main and Liberty
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/22/2021 Date End: 06/22/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
839.4	0.5					3" HMA 0.3				Fill: 0' to 2.7'
838.9	1.0					16" Concrete 1.8				
838.4	1.5									
837.9	2.0	A-1		14	SC	Brown clayey SAND; mostly coarse to fine sand, little clayey fines, moist, Fill 2.7				A-1: Sample saturated due to core drill water
837.4	2.5									
836.9	3.0	A-2		20+	SP	Brown poorly graded SAND with gravel; mostly coarse to fine sand, some coarse to fine gravel, moist 5.0				
836.4	3.5									
835.9	4.0									
835.4	4.5									
834.9	5.0									
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-11
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: JS Rev. By: RW
Coordinates: N=284723.7 E=13290569.4 (MI South ift)
Elevation: 839.6 ft Datum: NAVD 88 (GPS Observation)
Notes: 29'S, 24'W of Stop Walk signal on Northwest Corner of Intersection
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 5.3 ft.

Date Begin: 06/14/2021 Date End: 06/14/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 10.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
839.1	0.5					7" HMA 0.6				Fill: 0' to 3.0'
838.6	1.0				SP-SM	Brown poorly graded SAND with silt; mostly coarse to fine sand, few silty fines, moist, Fill with clayey sand lenses				
838.1	1.5	S-1	1.5	4-3-3 N=6						
837.6	2.0									
837.1	2.5									
836.6	3.0					3.0				
836.1	3.5				SP	Brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, moist				
835.6	4.0	S-2	1.5	4-8-11 N=19						
835.1	4.5									
834.6	5.0									
834.1	5.5									
833.6	6.0									
833.1	6.5	S-3	1.5	8-12-11 N=23		Grades with some coarse to fine gravel				Driller noted possible coarse gravel / COBBLE at 6.0'
832.6	7.0									
832.1	7.5									
831.6	8.0									
831.1	8.5									
830.6	9.0	S-4	1.5	10-12-11 N=23						
830.1	9.5									
829.6	10.0					10.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-12
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: JS Rev. By: RW
Coordinates: N=284717.7 E=13290675.2 (MI South ift)
Elevation: 840.3 ft Datum: NAVD 88 (GPS Observation)
Notes: 30.5'S, 27'E of Traffic Signal Pole on Northeast Corner of South Main and Liberty
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/23/2021 Date End: 06/23/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
839.8	0.5					5" HMA 0.4				Fill: 0' to 3.3'
839.3	1.0	A-1				15" Crushed Aggregate Base 1.7				
838.8	1.5									
838.3	2.0	A-2		9	SP-SC	Brown poorly graded SAND with clay; mostly coarse to fine sand, few coarse to fine gravel, few clayey fines, moist, Fill 2.2				
837.8	2.5									
837.3	3.0	A-3			SC	Brown clayey SAND; mostly coarse to fine sand, some clayey fines, moist, Fill 3.3				
836.8	3.5									
836.3	4.0	A-4			SP	Brown poorly graded SAND; mostly coarse to fine sand, few coarse to fine gravel, trace clayey fines, moist 5.0				
835.8	4.5			19						
835.3	5.0									
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-13
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: JS Rev. By: RW
Coordinates:
Elevation: 840 ft Datum: Appx from Washtenaw County GIS contours
Notes: 6'N, 18.5'W of Fire Hydrant on Northeast Corner of South Main and Liberty
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/15/2021 Date End: 06/15/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
839.5	0.5					6 1/2" HMA 0.5				Fill: 0' to 3.0'
839.0	1.0					6" Natural Aggregate Base 1.0				
838.5	1.5				SC	Brown clayey SAND; mostly coarse to fine sand, some clayey fines, moist with sandy clay lenses		12.4		
838.0	2.0	S-1	2.0	3-2-2-3 N=4						
837.5	2.5									
837.0	3.0					3.0				
836.5	3.5				SP	Brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, trace silty fines, moist				
836.0	4.0	S-2	1.0	8-12-13-14 N=25						S-2: Poor recovery; rock stuck in tip of sampler
835.5	4.5									
835.0	5.0					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-14
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: JS Rev. By: RW
Coordinates: N=284798.2 E=13290617.3 (MI South ift)
Elevation: 839.8 ft Datum: NAVD 88 (GPS Observation)
Notes: 47'N, 22'E of Stop Walk Signal on Northwest Corner of South Main and Liberty
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/23/2021 Date End: 06/23/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
839.3	0.5					5 3/4" HMA (0.5)				Fill: 0' to 4.5'
838.8	1.0					17 1/2" Concrete with Wood Tie (1.9)				Wood tie encountered in concrete core between 1 3/4" and 7 3/4" below top of concrete. Wood tie was encountered in north side of core hole with the tie oriented east-west. Core sample of wood retrieved. Concrete core split horizontally at 9 1/4" below top of concrete
838.3	1.5									
837.8	2.0									
837.3	2.5	A-1		12	SC	Brown clayey SAND; mostly coarse to fine sand, little clayey fines, moist (3.9)				
836.8	3.0									
836.3	3.5									
835.8	4.0									
835.3	4.5	A-2			SP-SC	Brown poorly graded SAND with clay and gravel; mostly coarse to fine sand, little coarse to fine gravel, few clayey fines, moist, Fill (4.5)				A-1: Sample saturated due to core drill water
834.8	5.0	A-3		15	SP	Brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, moist (5.0)				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-15
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: JS Rev. By: RW
Coordinates: N=284890.4 E=13290603.1 (MI South ift)
Elevation: 838.5 ft Datum: NAVD 88 (GPS Observation)
Notes: 9'N, 9'E of Pay Station in front of 214 South Main

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/16/2021 Date End: 06/16/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
838.0	0.5					7 1/2" HMA 0.6				Fill: 0' to 3.5'
837.5	1.0					4" Natural Aggregate Base 1.0				
837.0	1.5	S-1	1.0	2-2-2-2 N=4	SC	Brown clayey SAND; mostly coarse to fine sand, some clayey fines, moist with clay lenses		7.2		
836.5	2.0									
836.0	2.5									
835.5	3.0									
835.0	3.5					3.5				S-1 and S-3: Poor recovery; possible coarse gravel / COBBLE
834.5	4.0	S-2	1.2	3-3-4-3 N=7	SP	Brown poorly graded SAND; mostly coarse to fine sand, trace clayey fines, moist				
834.0	4.5									
833.5	5.0					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-16
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: JS Rev. By: RW
Coordinates: N=284876.5 E=13290623.5 (MI South ift)
Elevation: 839.3 ft Datum: NAVD 88 (GPS Observation)
Notes: 3'S, 3'E of Parking Pay Station in front of 214 South Main

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/23/2021 Date End: 06/23/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
838.8	0.5					6 1/2" HMA 0.5				Fill: 0' to 4.5'
838.3	1.0					7" Concrete 1.1				
837.8	1.5	A-1		6	SP-SM	Brown poorly graded SAND with silt; mostly coarse to fine sand, few coarse to fine sand, few silty fines, moist, Fill 2.9				
837.3	2.0									
836.8	2.5									
836.3	3.0									
835.8	3.5	A-2			SC	Brown clayey SAND; mostly coarse to fine sand, some clayey fines, moist, Fill 4.5				
835.3	4.0			12						
834.8	4.5									
834.3	5.0	A-3			SP	Brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, moist 5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-17
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: JS Rev. By: RW
Coordinates: N=284965.0 E=13290629.5 (MI South ift)
Elevation: 838.5 ft Datum: NAVD 88 (GPS Observation)
Notes: 46'S, 25.5'W of Stop Walk Signal on Southeast Corner of South Main and Washington
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/21/2021 Date End: 06/21/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
838.0	0.5					6" HMA 0.5				Fill: 0' to 4.6'
837.5	1.0					18" Concrete with Wood Tie and gravel				
837.0	1.5									Wood tie encountered in concrete core between 3" and 7 1/2" below top of concrete. Gravel encountered below wood tie between 7 1/2" and 9 1/2" below top of concrete. Wood tie was encountered in south side of core hole with the tie oriented east-west. Core sample of wood retrieved.
836.5	2.0					2.0				
836.0	2.5	A-1		9		Brown poorly graded SAND with clay; mostly coarse to fine sand, few coarse to fine gravel, few clayey fines, moist, Fill with clayey sand lenses				
835.5	3.0									
835.0	3.5				SP-SC					
834.5	4.0									
834.0	4.5			9		4.6				
833.5	5.0	A-2			SP	Brown poorly graded SAND with gravel; mostly coarse to fine sand, some coarse to fine gravel, moist 5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-18
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: JS Rev. By: RW
Coordinates: N=284996.8 E=13290636.5 (MI South ift)
Elevation: 838.0 ft Datum: NAVD 88 (GPS Observation)
Notes: 15'S, 19'W of Stop Walk signal on Southeast Corner of South Main and Washington
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/15/2021 Date End: 06/15/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
837.5	0.5					8" HMA (0.7)				Fill: 0' to 2.8'
837.0	1.0					4" Natural Aggregate Base (1.0)				
836.5	1.5	S-1	2.0	3-2-2-4 N=4	CL	Brown sandy lean CLAY; mostly clayey fines, some coarse to fine sand, moist, Fill	2.0	19.1		
836.0	2.0									
835.5	2.5									
835.0	3.0					(2.8)				
834.5	3.5	S-2	2.0	6-8-7-6 N=15	SP	Brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, few silty fines, moist				
834.0	4.0									
833.5	4.5									
833.0	5.0					(5.0)				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-19
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: JS Rev. By: RW
Coordinates: N=285049.1 E=13290590.8 (MI South ift)
Elevation: 837.7 ft Datum: NAVD 88 (GPS Observation)
Notes: 35'S, 12'W of Stop Walk on Northwest Corner of South Main and Washington
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 6.0 ft.

Date Begin: 06/15/2021 Date End: 06/15/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 10.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%
QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
837.2	0.5					10" HMA				Fill: 0' to 4.7'
836.7	1.0					0.8				
836.2	1.5				SC	Dark brown clayey SAND; mostly coarse to fine sand, little clayey fines, moist, Fill		17.9		
835.7	2.0	S-1	2.0	3-5-3-2 N=8						
835.2	2.5					Grades brown				
834.7	3.0									
834.2	3.5							10.1		
833.7	4.0					Grades with some clayey fines				
833.2	4.5	S-2	1.5	2-3-3 N=6						
832.7	5.0					4.7				
832.2	5.5				SP	Brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, trace silty fines, moist				
831.7	6.0									
831.2	6.5									
830.7	7.0	S-3	0.4	12-23-26 N=49						S-3: Poor recovery; rock stuck in tip of sampler
830.2	7.5									
829.7	8.0									
829.2	8.5									
828.7	9.0									
828.2	9.5	S-4	1.5	10-15-15 N=30						
827.7	10.0					10.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-20
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: JS Rev. By: RW
Coordinates: N=285047.2 E=13290677.0 (MI South ift)
Elevation: 838.5 ft Datum: NAVD 88 (GPS Observation)
Notes: 38'S, 23'E of Traffic Signal of Northeast Corner of South Main and Washington
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/23/2021 Date End: 06/23/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%
QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
838.0	0.5					10" HMA (0.8)				Fill: 0' to 4.5'
837.5	1.0									
837.0	1.5	A-1				8" Natural Aggregate Base (1.5)				
836.5	2.0	A-2		14	SP-SC	Brown poorly graded SAND with clay; mostly medium to fine sand, few clayey fines, moist, Fill (2.5)				
836.0	2.5									
835.5	3.0	A-3				Brown clayey SAND; mostly coarse to fine sand, little clayey fines, moist, Fill				
835.0	3.5				SC					
834.5	4.0			13						
834.0	4.5					(4.5)				
833.5	5.0	A-4			GP	Brown poorly graded GRAVEL with sand; mostly coarse to fine gravel, some coarse to fine sand, moist (5.0)				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-21
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: JS Rev. By: RW
Coordinates:
Elevation: 838 ft Datum: Appx from Washtenaw County GIS contours
Notes: 22'N, 23'E of Stop Walk Signal on Northwest Corner of South Main and Washington
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/22/2021 Date End: 06/22/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
837.5	0.5					6 3/4" HMA (0.6)				Fill: 0' to 4.8'
837.0	1.0					16 3/4" Concrete (2.0)				Concrete core split horizontally at 10 1/4" below top of concrete
836.5	1.5									
836.0	2.0									
835.5	2.5	A-1		20+	SP-SC	Dark brown poorly graded SAND with clay; mostly medium to fine sand, few clayey fines, moist, Fill (3.2)				
835.0	3.0									
834.5	3.5	A-2		13	SP-SM	Brown poorly graded SAND with silt; mostly medium to fine sand, few silty fines, moist, Fill (4.8)				A-1 and A-2: Samples saturated due to core drill water
834.0	4.0									
833.5	4.5									
833.0	5.0	A-3			SP	Brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, moist (5.0)				

End of Boring

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-22
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: JS Rev. By: RW
Coordinates:
Elevation: 838 ft Datum: Appx from Washtenaw County GIS contours
Notes: 17.5'N, 15.5'W of Traffic Signal Pole on Northeast Corner of South Main and Washington
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 6.2 ft.

Date Begin: 06/15/2021 Date End: 06/15/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 10.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
837.5	0.5					6" HMA 0.5				Fill: 0' to 5.5'
837.0	1.0					8" Natural Aggregate Base 1.2				
836.5	1.5									
836.0	2.0					Dark brown clayey SAND; mostly coarse to fine sand, little clayey fines, moist, Fill		13.3		Encountered wires within asphalt approximately 3/4" below road surface.
835.5	2.5	S-1	2.0	3-4-2-3 N=6						
835.0	3.0					Grades brown				
834.5	3.5				SC					Possible edge of concrete slab encountered beneath asphalt at west side of borehole within aggregate base layer.
834.0	4.0							15.6		
833.5	4.5	S-2	1.8	3-3-5 N=8						
833.0	5.0									
832.5	5.5					5.5				Driller noted coarse gravel at 5.0'
832.0	6.0					Brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, moist				
831.5	6.5									
831.0	7.0	S-3	0.2	17-10-9 N=19						S-3: Poor recovery; possible coarse gravel / COBBLE, 2 attempts were made
830.5	7.5									
830.0	8.0				SP					
829.5	8.5									
829.0	9.0					Grades with some coarse to fine gravel				
828.5	9.5	S-4	1.5	6-16-18 N=34						
828.0	10.0					10.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-23
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: JS Rev. By: RW
Coordinates: N=285180.7 E=13290642.4 (MI South ift)
Elevation: 836.8 ft Datum: NAVD 88 (GPS Observation)
Notes: 36'S, 20'W of Pay Station in front of 109 South Main

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/16/2021 Date End: 06/16/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
836.3	0.5					8 1/4" HMA 0.7				Fill: 0' to 4.0'
835.8	1.0					5" Natural Aggregate Base 1.1				
835.3	1.5					Brown clayey SAND; mostly coarse to fine sand, some clayey fines, moist, Fill with brick fragments		11.7		
834.8	2.0	S-1	2.0		SC					
834.3	2.5									
833.8	3.0									
833.3	3.5									
832.8	4.0					4.0				
832.3	4.5	S-2	2.0		SP	Brown poorly graded SAND; mostly coarse to fine sand, few coarse to fine gravel, moist				
831.8	5.0					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-24
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: JS Rev. By: RW
Coordinates: N=285205.5 E=13290613.6 (MI South ift)
Elevation: 836.6 ft Datum: NAVD 88 (GPS Observation)
Notes: 10.5'E of Pay Station in front of 116 South Main

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/15/2021 Date End: 06/15/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
836.1	0.5					1" HMA (0.1)				Possible Fill: 0' to 5.0'
835.6	1.0					4" Red Brick (0.4)				
835.1	1.5					7" Natural Aggregate Base (1.0)				
834.6	2.0	S-1	0.8	2-4-2-2 N=6	SC	Brown clayey SAND; mostly coarse to fine sand, some clayey fines, moist, Possible Fill		15.6		
834.1	2.5									
833.6	3.0									
833.1	3.5							18.5		S-1 and S-2: Poor recovery; possible coarse gravel / COBBLE
832.6	4.0	S-2	0.7	2-2-3-3 N=5		Grades with few coarse to fine gravel				
832.1	4.5									
831.6	5.0					(5.0)				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-25
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: JS Rev. By: RW
Coordinates: N=285202.5 E=13290633.6 (MI South ift)
Elevation: 836.9 ft Datum: NAVD 88 (GPS Observation)
Notes: 1'S, 31'E of Pay Station in front of 116 South Main

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/21/2021 Date End: 06/21/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
836.4	0.5					8 1/4" HMA				Fill: 0' to 5.0'
835.9	1.0					0.7				Concrete core split horizontally at 8 3/4" below top of concrete
835.4	1.5					12" Concrete				5/8" sqaure rebar in concrete core at 5" below top of concrete
834.9	2.0	A-1		6		1.7				
834.4	2.5				SP-SC	Dark brown poorly graded SAND with clay and gravel; mostly coarse to fine sand, little coarse to fine gravel, few clayey fines, moist, Fill				
833.9	3.0					3.0				
833.4	3.5	A-2			SC	3.4				
832.9	4.0	A-3		10		Dark brown clayey SAND; mostly coarse to fine sand, some clayey fines, moist, Fill with Topsoil				
832.4	4.5				SP-SM	Brown poorly graded SAND with silt; mostly coarse to fine sand, few coarse to fine gravel, few silty fines, moist, Fill with clayey sand lenses				
831.9	5.0					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-26
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: Hand Auger
Crew Chief: Field Eng.: JS Rev. By: RW
Coordinates:
Elevation: 836 ft Datum: Appx from Washtenaw County GIS contours
Notes: 4'N, 20'W of Fire Hydrant in front of 101 South Main

Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/21/2021 Date End: 06/21/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing			During	None
Sampler	Hand Auger	3 1/4"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer				

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Dyn. Cone Eq. "N": ASTM STP 399	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
835.5	0.5					7 1/2" HMA (0.6)				Fill: 0' to 4.4'
835.0	1.0					15 1/2" Concrete (1.9)				Concrete core split horizontally at 8" below top of concrete
834.5	1.5									
834.0	2.0									
833.5	2.5	A-1			SC	Dark brown clayey SAND; mostly coarse to fine sand, little clayey fines, moist, Fill (2.3)				A-1 and A-2: Sample saturated due to core drill water
833.0	3.0	A-2		19						
832.5	3.5				SP-SM	Brown poorly graded SAND with silt and gravel; mostly coarse to fine sand, little coarse to fine gravel, few silty fines, moist, Fill (4.0)				
832.0	4.0									
831.5	4.5	A-3			SC	Brown clayey SAND; mostly coarse to fine sand, some clayey fines, few coarse to fine gravel, moist, Fill (4.4)				
831.0	5.0	A-4		20	SP	Brown poorly graded SAND with gravel; mostly coarse to fine sand, some coarse to fine gravel, moist (5.0)				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-27
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: JS Rev. By: RW
Coordinates:
Elevation: 835 ft Datum: Appx from Washtenaw County GIS contours
Notes: 29'S, 14'W of Traffic Signal Pole on Northwest Corner of South Main and Huron
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/17/2021 Date End: 06/17/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%
QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
834.5	0.5					6" HMA 0.5				Fill: 0' to 5.0'
834.0	1.0					12" Natural Aggregate Base 1.5				
833.5	1.5							9.3		
833.0	2.0	S-1	1.0	6-5-5-4 N=10		Brown clayey SAND; mostly coarse to fien sand, little clayey fines, few coarse to fine gravel, moist, Fill				S-1: Poor recovery; possible coarse gravel / COBBLE
832.5	2.5									
832.0	3.0									
831.5	3.5				SC					
831.0	4.0							11.8		
830.5	4.5	S-2	2.0	4-4-4-4 N=8						
830.0	5.0					5.0				
						End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-28
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: JS Rev. By: RW
Coordinates: N=285392.3 E=13290696.7 (MI South ift)
Elevation: 836.3 ft Datum: NAVD 88 (GPS Observation)
Notes: 34'S, 20'E of Stop Walk Signal on Northeast Corner of South Main and Huron
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch.

Date Begin: 06/16/2021 Date End: 06/16/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 5.0 ft.

Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%

QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
835.8	0.5					8 1/2" HMA				Fill: 0' to 4.9'
835.3	1.0					0.7 3 1/2" Natural Aggregate Base 1.0				
834.8	1.5	S-1	2.0	7-5-6-6 N=11	SC	Brown clayey SAND; mostly coarse to fine sand, little clayey fines, moist, Fill with brick fragments		10.4		
834.3	2.0									
833.8	2.5									
833.3	3.0					3.0				
832.8	3.5	S-2	2.0	3-3-4-5 N=7	CL	Brown sandy lean CLAY; mostly clayey fines, some coarse to fine sand, moist, Fill	3.25	16.0		
832.3	4.0									
831.8	4.5									
831.3	5.0					4.9				
					SP	Brown poorly graded SAND; mostly coarse to fine sand, few coarse to fine gravel, moist 5.0 End of Boring				

* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

LOG OF BORING

Project No.: 211132
Boring No.: B-29
Sheet: 1 of 1

Project: Ann Arbor S. Main Street Water Main Replacement and Resurfacing
Client: City of Ann Arbor
Location: Ann Arbor, Michigan
Drill Type: CME 45
Crew Chief: ZM Field Eng.: JS Rev. By: RW
Coordinates:
Elevation: 835 ft Datum: Appx from Washtenaw County GIS contours
Notes: 47'N, 12'W of Stop Walk Signal on Northeast Corner of South Main and Huron
Plugging Record: Backfilled borehole with compacted cuttings, patched pavement with cold patch. Cave in at 5.5 ft.

Date Begin: 06/16/2021 Date End: 06/16/2021

Tooling	Type	Dia.	Groundwater, ft.	
Casing	HSA	4 1/4"	During	None
Sampler	SPT	2"	End	NA
Core			Seepage	
Tube			Date	Depth, ft.
SPT Hammer	Auto			

Depth Drilled: 9.4 ft.

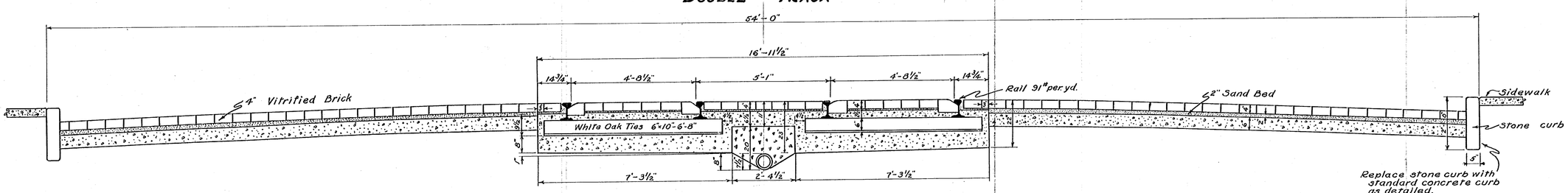
Component Percentages: Trace < 5%, Few 5-10%, Little 15-25%, Some 30-45%, Mostly 50-100%
QP = Calibrated Penetrometer (tons/sq. ft.)

Elev. FT.	Depth FT.	Sample Number	Recov. FT.	Penetration (Blows Per 6") ASTM D 1586	*USCS Group Symbol	*DESCRIPTION	QP tsf	MST %	DD pcf	REMARKS
834.5	0.5					6 1/2" HMA 0.5				Fill: 0' to 4.2'
834.0	1.0					6" Natrual Aggregate Base 1.0				
833.5	1.5				SC	Brown clayey SAND; mostly coarse to fine sand, some clayey fines, moist with brick fragments		13.8		
833.0	2.0	S-1	1.5	3-7-3 N=10						
832.5	2.5									
832.0	3.0									
831.5	3.5									
831.0	4.0					4.2				
830.5	4.5	S-2	1.5	2-4-4 N=8	SP	Brown poorly graded SAND with gravel; mostly coarse to fine sand, little coarse to fine gravel, moist				
830.0	5.0									
829.5	5.5									
829.0	6.0									
828.5	6.5									
828.0	7.0	S-3	1.5	11-17-15 N=32						
827.5	7.5									
827.0	8.0					8.0				Driller noted possible coarse gravel / COBBLE at 7.5'
826.5	8.5				SP-SC	Brown poorly graded SAND with clay and gravel; mostly coarse to fine sand, some coarse to fine gravel, few clayey fines, moist				
826.0	9.0	S-4	0.9	17-50/5"		9.4				S-4: SPT refusal; possible coarse gravel / COBBLE
						End of Boring				

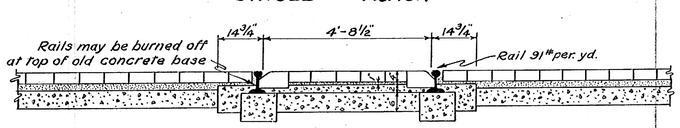
* Visual estimate following ASTM D 2488 unless laboratory testing has been performed. Stratification changes are approximated between samples.

Cross Sections of Existing Pavement

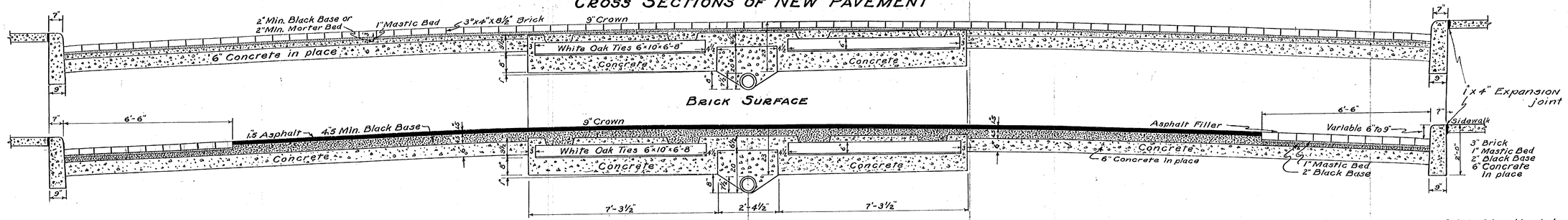
Double Track



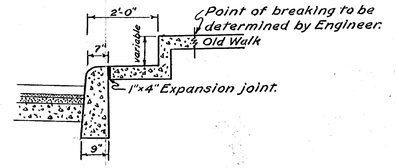
Single Track



Cross Sections of New Pavement

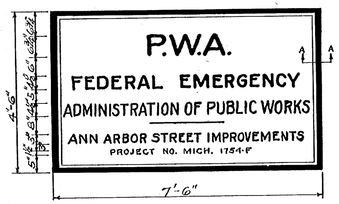


Asphalt Surface with Brick Parking Area



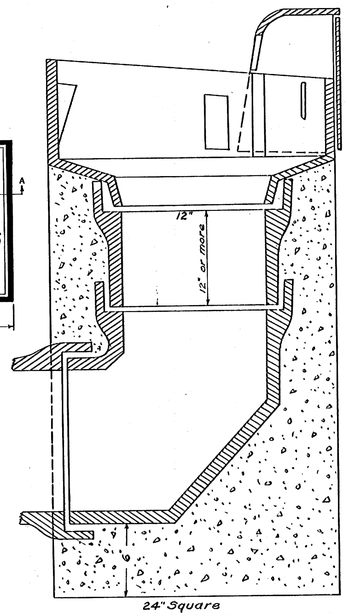
Detail of Step in Walk

Measurement for walk where new step is built will be the area of the horizontal surface and the area of the riser.



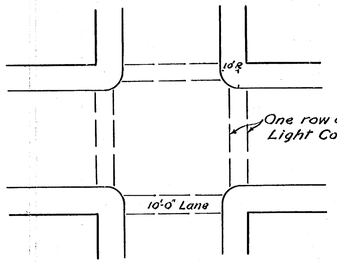
Detail of Sign

Sign shall be made of wood and given a lead and oil priming coat and two coats of lead and oil paint. The field shall be white and the lettering black.



Detail For Resetting Inlet

Scale 1"=6"



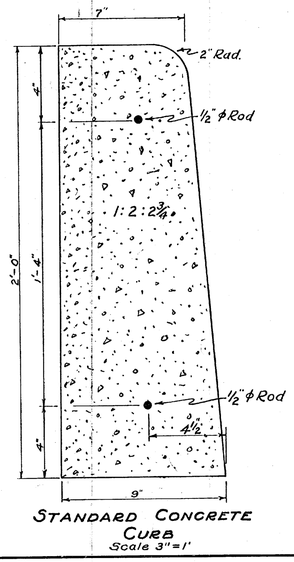
Detail of Typical Street Intersection

Showing Pedestrian Traffic Lane formed by light colored brick if pavement is all brick.

Scale 1"=40'

NOTE:

One course concrete curb to be 1-2-2¾ mix as specified. All aggregate to be washed and separated. Blocks to be marked at 6'-0" intervals. ½" Expansion joints placed every 30 feet. Place ½" Rods as shown.



Standard Concrete Curb

Scale 3"=1'

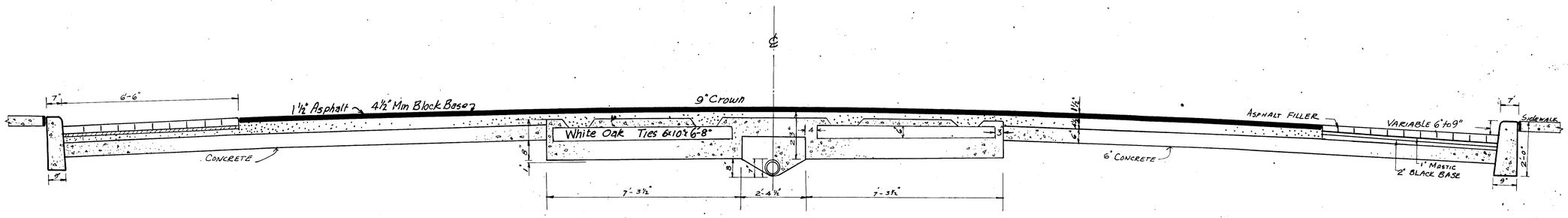
Digital Status
Scanned On: 12/1/06
By: JMG

GRAPHIC SCALE
TWO INCHES
0 1 2

NOTE:
Data contained on this page was drawn from City records. No guarantee is made as to its accuracy or completeness.

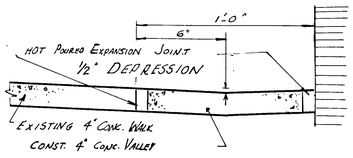
SHEET No. 3
INDEX No. 225Z
SHELF No. 5 C
SUB No. 443
GMB DRAWN BY
GMB TRACED BY
HHR CHECKED BY

DEPARTMENT OF PUBLIC WORKS
ANN ARBOR, MICH.
PAVEMENT
CROSS SECTION
MAIN ST.
WILLIAM ST. TO CATHERINE ST.
P.W.A. DOCKET No. MICH. 1754-F
Geo. H. Sandenburgh City Engineer
1938-8-23
SCALE ½"-1'-0"



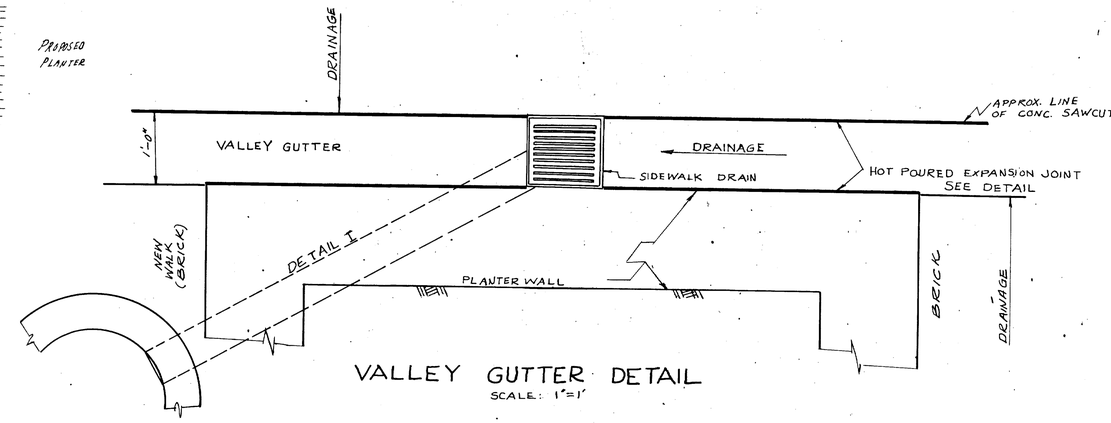
ORIGINAL CROSS-SECTION

Scale: ½" = 1'-0"



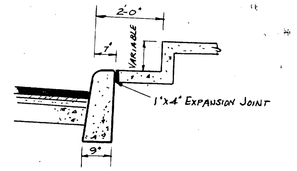
VALLEY GUTTER DETAIL III

SCALE 1"=0.4'



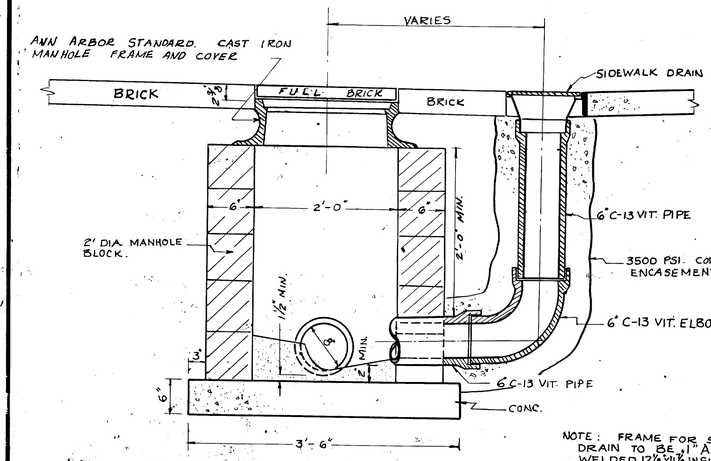
VALLEY GUTTER DETAIL

SCALE: 1"=1'



EXISTING STEP DETAIL

Scale: ½"=1'-0"

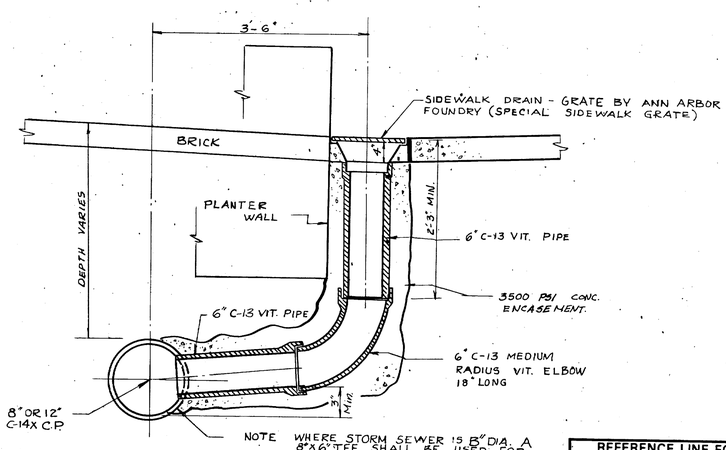


STANDARD 2' DIA. MANHOLE

SCALE: 1"=1'-0"

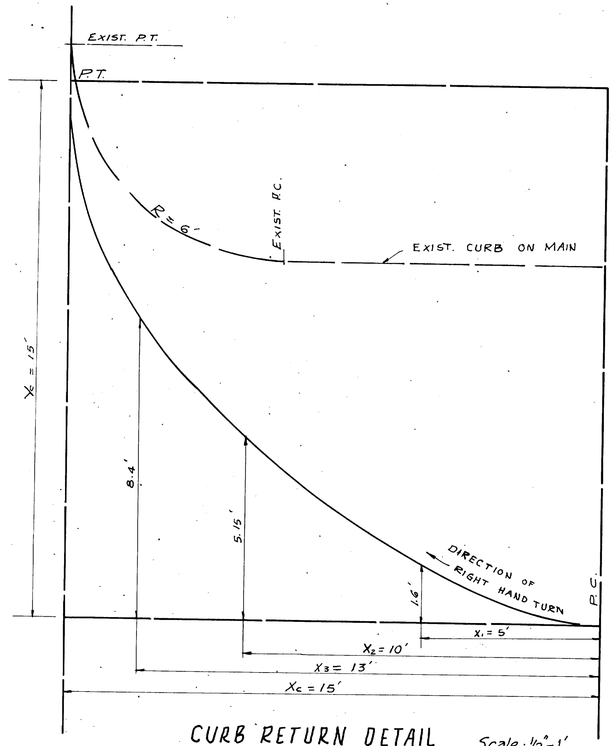
NOTE: FRAME FOR SIDE WALK DRAIN TO BE 2" ANGLE IRON WELDED 12⅛"x11⅛" INSIDE DIA. TO BE SET IN CONC. AS SPECFD.

DRAIN CONNECTION DETAIL I



DRAIN CONNECTION DETAIL II

SCALE: 1"=1'



CURB RETURN DETAIL Scale: ½"=1'

Ref. See-5-C-443 Job No. 510-3184

REFERENCE LINE FOR TWO INCHES
0 1 2
PHOTOGRAPHED DRAWINGS

	DATE	SHEET NO.
DR. BY R.L.	1/65	INDEX NO. 5508
TR. BY M.A.	7/66	SHELF NO. 6-C-3399
CH. BY H.F.R.	9/68	
REVISIONS		

DETAILS

MAIN STREET

WILLIAM TO HURON

FREDRICK A. MAMMEL SUPERINTENDENT OF PUBLIC WORKS

PUBLIC WORKS DEPARTMENT — ANN ARBOR, MICHIGAN

Digital Status
Scanned On: 4-16-04
By: DGK
Inspected: YES
Vectorst:
C.C.R.:

B4SR3E B3SR3E B2SR3E B1SR3E

B4SR4E B3SR4E B2SR4E B1SR4E

MAIN ST.

WILLIAM ST.

LIBERTY ST.

WASHINGTON ST.

Pavement of Concrete

Beginning of Pavement Station 3+78

Present curb to remain

Pavement—Bithulithic on Concrete.

Pavement—Asphalt Block on Sand.

Pavement—Brick on Concrete Bituminous Resurfacing.

Storm Sewer

Gas Station

Cistern to be filled.

Detroit Edison M.H.

Power Pole

Mon. Box

6'-6" Brick

Parking Area

24° Step

16° Step

Signal Poles

5" Elm

10" Elm

18" Elm

12" Elm

333.73

331.45

Present Grades

Established Grades

West Curb. East Curb

East Gutter, West Gutter

4+44 E Curb 841.80 W " 841.52

5+06 E Curb 841.62

7+00 E Curb 840.90 W " 840.59

8+50 W Curb 840.18

9+68 E Curb 840.21 W " 840.12

10+39.59 E Curb 840.34 W " 840.00

11+50 E Curb 839.80

12+00 W Curb 839.04

13+00 E Curb 838.56 W " 838.25

4+44 E Gutter 841.30 W " 841.02

5+06 E Gutter 841.11

7+00 E Gutter 840.40 W " 840.09

9+68 E Gutter 839.71 W " 839.37

10+39.59 E Gutter 839.73 W " 839.50

11+50 E Gutter 839.20

12+00 W Gutter 838.54

13+00 E Gutter 838.06 W " 837.73

NOTE:- Water and gas curb boxes to be raised to new grade of street without extra compensation.

NOTE:- Inequalities formed in the concrete by the removal of the street car tracks are to be filled in with bituminous binder if sheet asphalt is used and concrete if brick is used.

NOTE:- All street car track rails, brick wearing surface and Two inch sand cushion are to be removed.

NOTE:- All manhole, inlet and monument castings to be raised to new grade of street without extra compensation.

NOTE:- Existing concrete base is to remain.

NOTE:- All Car Track Drains to be rebuilt into Manholes.

LEGEND:- Ornamental Street Lights, Fire Hydrants, Inlets, Car Track Drain Grate, Manholes, Monument Boxes

LEGEND: ℄, E Gutter, W ", E Curb, W "

NOTE: Data contained on this page was drawn from City records. No guarantee is made as to its accuracy or completeness.

Digital Status Scanned On: 12/06 By: JMG

GRAPHIC SCALE TWO INCHES 0 1 2

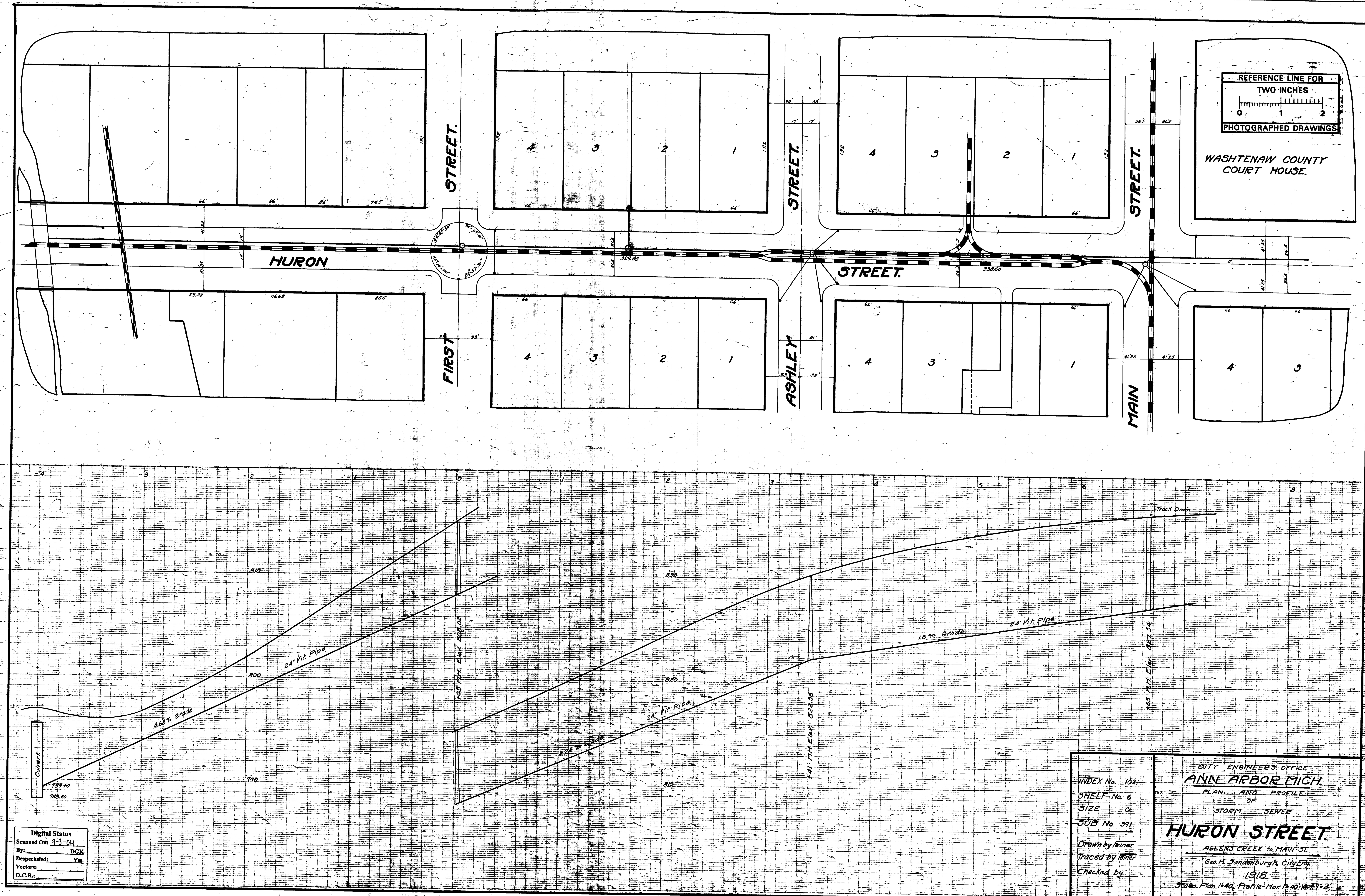
SHEET No. 1
INDEX No. 2255
SHELF No. 5
SIZE C
SUB No. 441
DRAWN By GMB
TRACED By GMB
CHECKED By H.H.A.
Bk. 422 p 17

DEPARTMENT OF PUBLIC WORKS
ANN ARBOR, MICH.
PAVEMENT
PLAN AND PROFILE
MAIN ST.
WILLIAM ST. TO CATHERINE ST.
P.W.A. DOCKET No. MICH. 1754-F.
Geo. H. Sandenburgh City Engineer
1938 - 8 - 23
Scales: Plan Hor. 1"=40' Vert. 1"=4'


B1SR3E
B1NR3E
B2NR3E
B1SR4E
B2NR4E
COURT HOUSE SQUARE
B1NR4E
MAIN ST.
WASHINGTON ST.
HURON ST.
ANN ST.
MILLER AVE.
CATHERINE
Pavement - Brick on Conc. Bituminous Resurfacing.
Pavement - Asphalt Block on Sand
Pavement - Concrete
Pavement - Vituminous Brick on Sand
Pavement - Vituminous Brick on Conc.
Storm Sewer
Cistern to be filled.
Whitney Theatre Canopy
Gas Station
U.S. Post Office
Drive to be removed and repaved with brick pavement.
Detroit Edison M.H.
6'-6" Brick Parking Area
Mon. Box
Signal Poles
Power Pole
End of Pavement Station 23+79
All curb returns to have a radius of 6'-0" at the intersections except Huron, Ann and Catherine Streets which have 10'-0".
Under the direction of the Engineer relay old pavement back of this point at all intersections to provide a smooth connection between old and new pavement included in contract without extra compensation.
Street car rails to be removed 35' from edge of new pavement and surface to be reshaped to conform to regular Crown of Street.
Present Grades
Established Grades
West Curb
East Curb
East Gutter
West Gutter
NOTE:- The Detroit Edison Company will reset all of their own Manholes and any cable which may become exposed.
NOTE:- Replace old manhole rings and covers, old inlet structures with new Ann Arbor Standard castings.
Construct new curb returns at present driveways as shown on plans. Remove stone curb and replace with conc. curb as detailed.
NOTE:- Old cisterns to be filled up and abandoned.
NOTE:- All old car track drains to be replaced with manholes.
NOTE:- All Flag Pole holders to be replaced without extra compensation.
GRAPHIC SCALE
LEGEND:- Ornamental Street Lights, Fire Hydrants, Inlets, Car Track Drain Grate, Manholes, Monument Boxes
LEGEND:- ℄, E Gutter, W, E Curb, W
NOTE: Data contained on this page was drawn from City records. No guarantee is made as to its accuracy or completeness.
Digital Status Scanned On: 12/06 By: JMG
SHEET No 2
INDEX No 2256
SHELF No 5
SIZE C
SUB No 442
DRAWN BY G.H.B.
TRACED BY G.H.B.
CHECKED BY
DEPARTMENT OF PUBLIC WORKS
ANN ARBOR, MICH.
PAVEMENT PLAN AND PROFILE
MAIN ST.
WILLIAM ST. TO CATHERINE ST.
P.W.A. DOCKET No. MICH. 1734-F
Geo. H. Sandenburgh City Engineer
1938 - 8 - 23
Scales: Plan Hor. 1"=40' Vert. 1"=4'

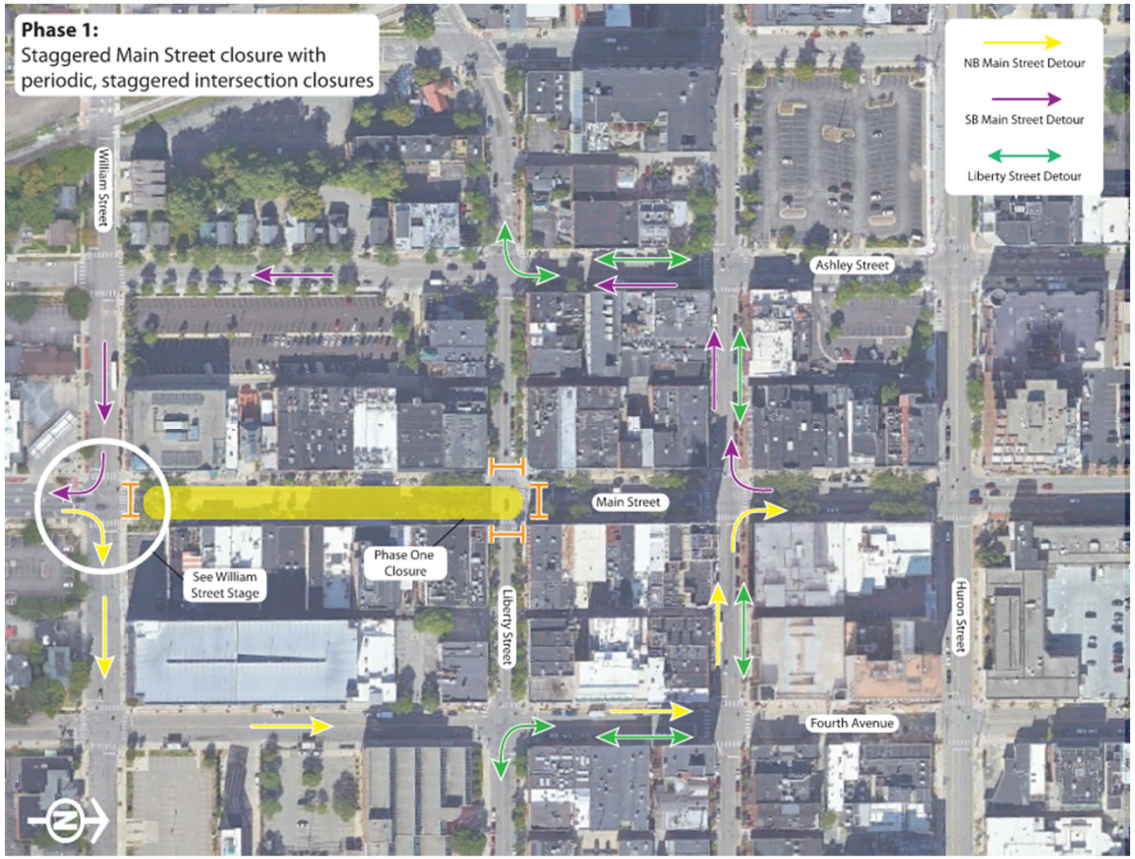
HURON ST.
WASHINGTON ST.
LIBERTY ST.
MAIN ST.
B.1 S. R.4 E.
B.2 S. R.4 E.
B.3 S. R.4 E.
B.1 S. R.3 E.
B.2 S. R.3 E.
B.3 S. R.3 E.
REFERENCE LINE FOR TWO INCHES
PHOTOGRAPHED DRAWINGS
1.2% Grade 8" Vit. pipe
1.0% Grade 8" Vit. pipe
1.0% Grade 8" Vit. pipe
824.36
828.28
+.05 M.H. El. 823.86
+75.41 F.T. El. 828.50
+59.21 M.H. El. 827.42
+12.21 L.H.
+61.21 F.T. El. 833.25
MEASUREMENTS TO HOUSE CONNECTIONS
0=M.H. at Huron St.
East West
63.2 112.6
85.6 131.2
98.6 153.4
120.6
141.8
161.4
182.6
203.5
224.2
248.4
254.4
269.3 F.T.
0=M.H. at Liberty St.
71.0 219.0
109.0 228.0
130.0 262.0
134.0 284.5
173.0 307.5
194.5 331.0
213.0 352.0
234.5 232.0 L.H. 371.0
257.5 408.0
282.8 488.5
305.5
324.0
330.0
369.0
412.5
444.0
461.5
482.0 502.0 F.T.
Digital Status:
Scanned On: 8-3-04
By: DGK
Despeckeled: Yes
Vectors:
O.C.R.:
SHEET No. 208
INDEX No. 877
SHELF No. 6
SIZE C
SUB. No. 261
Drawn by. H.H.P.
Traced by "
Checked by
CITY ENGINEER'S OFFICE.
ANN ARBOR, MICH.
PLAN AND PROFILE
OF
SANITARY SEWER
MAIN ST.
HURON ST. TO WILLIAM ST.
Manley Osgood, City Engineer.
1916.
Scales- Plan 1"=40'. Profile- Hor. 1"=40' Ver. 1"=4'.


ORIGINAL TOWNSITE
ANN ARBOR LAND CO'S. ADDITION
WILLIAM ST.
PACKARD ST.
D. J. & C. R. R.
S. MAIN ST.
JEFFERSON ST.
ANN ARBOR R. R.
B.4S. R.4E.
B.5S. R.4E.
B.4S. R.3E.
REFERENCE LINE FOR
TWO INCHES
PHOTOGRAPHED DRAWINGS
N
1.2 % Grade
8" Vit. Pipe.
4.25 % Grade
10" Vit. Pipe
2.5 % Grade
8" Vit. Pipe
1% Grade
MH. Sta. 0+08
El. 831.17
F.T. Sta. 0+98.5
El. 833.36
MH. Sta. 4+69.35
El. 828.91
+94 M.H.
El. 807.84
+55 M.H.
El. 805.94
807.24
MEASUREMENTS
TO
HOUSE CONNECTIONS
0 = MH. at Packard St.
East.
111.50
155.70
195.50
241.00
282.50
306.00
362.40
182.5 L.H.
369.4 F.T.
West.
27.00
70.00
113.50
180.50
210.00
272.50
337.00
MEASUREMENTS
TO
HOUSE CONNECTIONS
From Main Sewer to Jefferson
Sta. 0 = ⊼ M.H. in Main St.
East
81.5
102.0
167.5
226.5
266.0
295.0
339.0
West.
195.5
262.0
280.0
392.5
405.0 - in L.H.
410.0 = F.T.
SHEET No. 209
INDEX No. 878
SHELF No. 6
SIZE C
SUB No. 262
Drawn by H.Person.
Traced by H.Person.
CITY ENGINEER'S OFFICE.
ANN ARBOR, MICH.
PLAN AND PROFILE
OF
SANITARY SEWER
SOUTH MAIN ST.
WILLIAM ST. TO MAIN SEWER
Manley Osgood, City Engineer.
1917.
Scales - Plan 1" = 40' Profile - Hor. 1" = 40' Ver. 1" = 4'
Digital Status
Scanned On: 8-31-04
By: DGK
Despeckeled: Yes
Vectors:
O.C.R.:



REFERENCE LINE FOR
TWO INCHES
0 1 2
PHOTOGRAPHED DRAWINGS
WASHTENAW COUNTY
COURT HOUSE.
FIRST STREET.
ASHLEY STREET.
MAIN STREET.
HURON
STREET.
Track Drain
24" Vit. Pipe
4.68% Grade
1.6% Grade
4.24% Grade
Culvert
789.40
788.20
810
800
790
830
820
810
M.H. Elev. 806.08
M.H. Elev. 822.36
M.H. Elev. 827.34
CITY ENGINEER'S OFFICE
ANN ARBOR MICH.
PLAN AND PROFILE
OF
STORM SEWER
HURON STREET.
ALLENS CREEK to MAIN ST.
Geo. H. Sandenburgh, City Eng.
1918
Scales. Plan 1"=40', Profile-Hor. 1"=40'-Vert. 1"=4'
INDEX No. 1021
SHELF No. 6
SIZE C
SUB No 391
Drawn by Feiner
Traced by Feiner
Checked by
Digital Status
Scanned On: 9-3-04
By: DGK
Despeckeled: Yes
Vectors:
O.C.R.:

Construction Phase 1 - William to Liberty



Duration: Feb/March – May

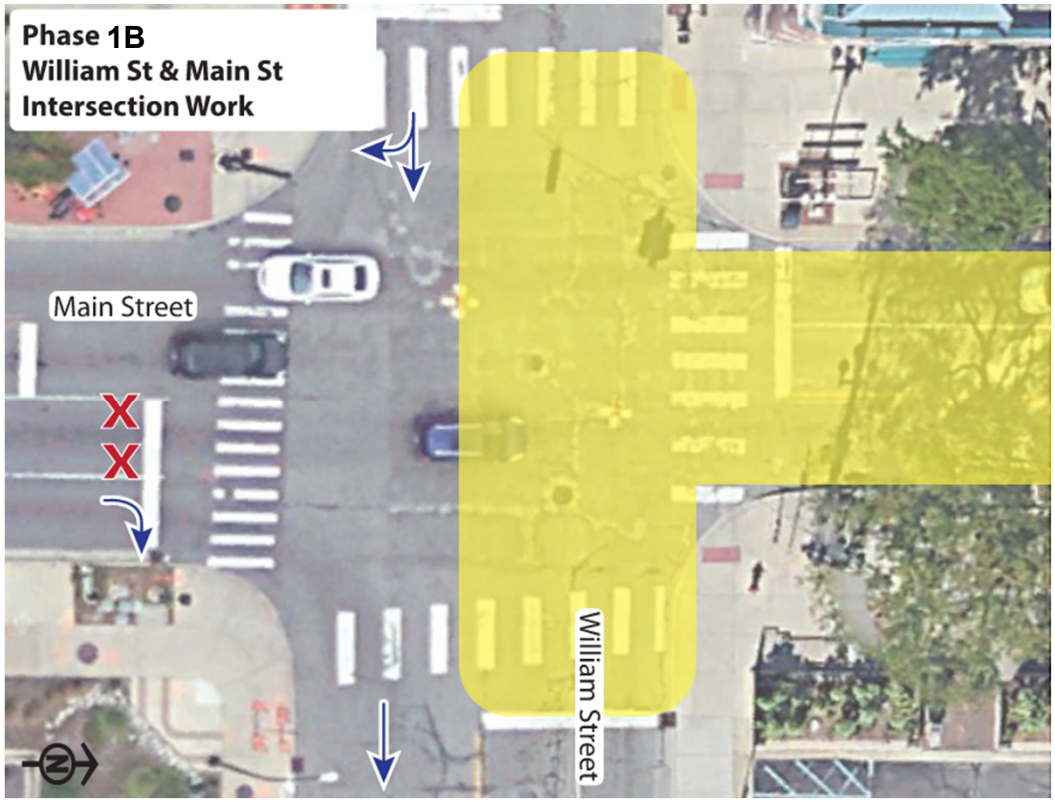
Major Tasks	Duration
• Removals =	1 Weeks
• Water Main Installation =	2 Weeks
• Water Main Testing =	2 Weeks
• Service Connections & Tie-ins =	1 Weeks
• Road Construction, Concrete Work, Sidewalk Repairs, misc. =	3 Weeks
• Paving/Striping/Re-opening =	1 Weeks

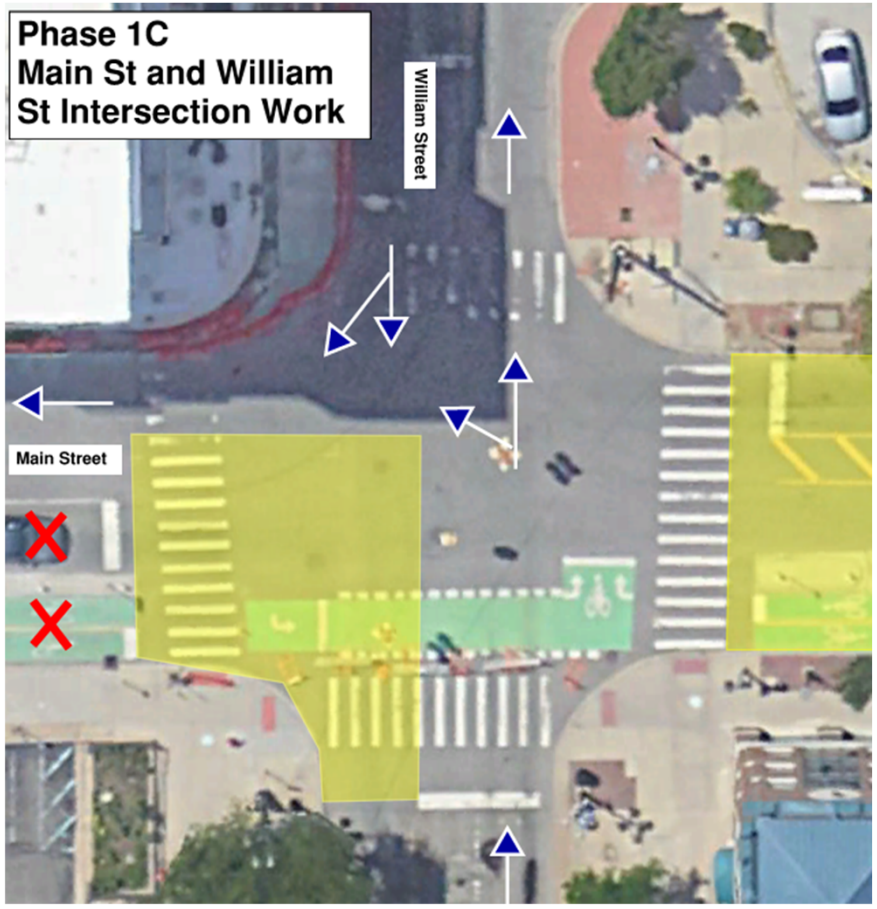
(A work week equals 5 working days per week)

Total **Estimated** Duration = 10 Weeks

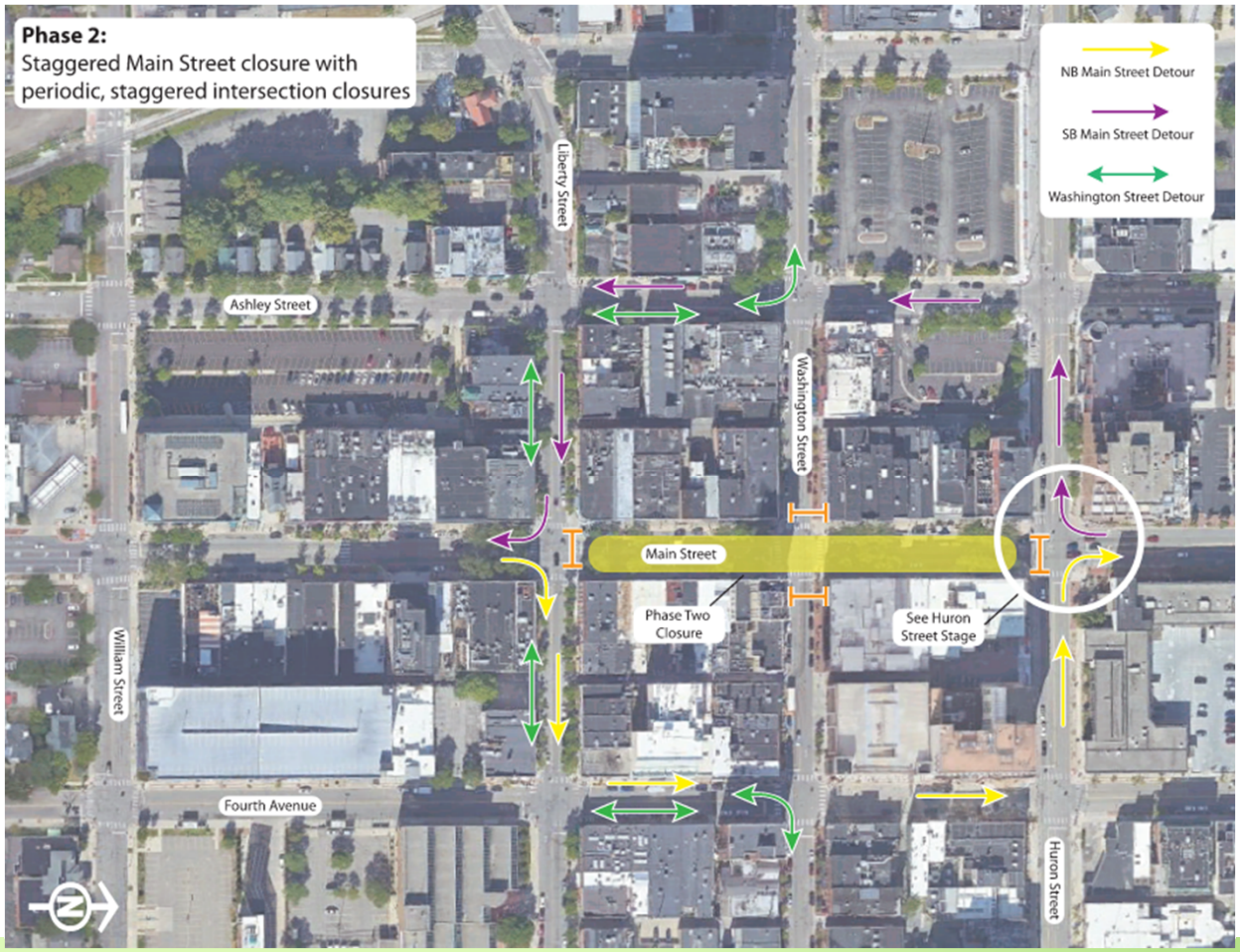
(February thru April, with provisions to stockpile onsite/work during frost laws)

Construction Phase 1 - William to Liberty





Construction Phase 2 - Liberty to Huron



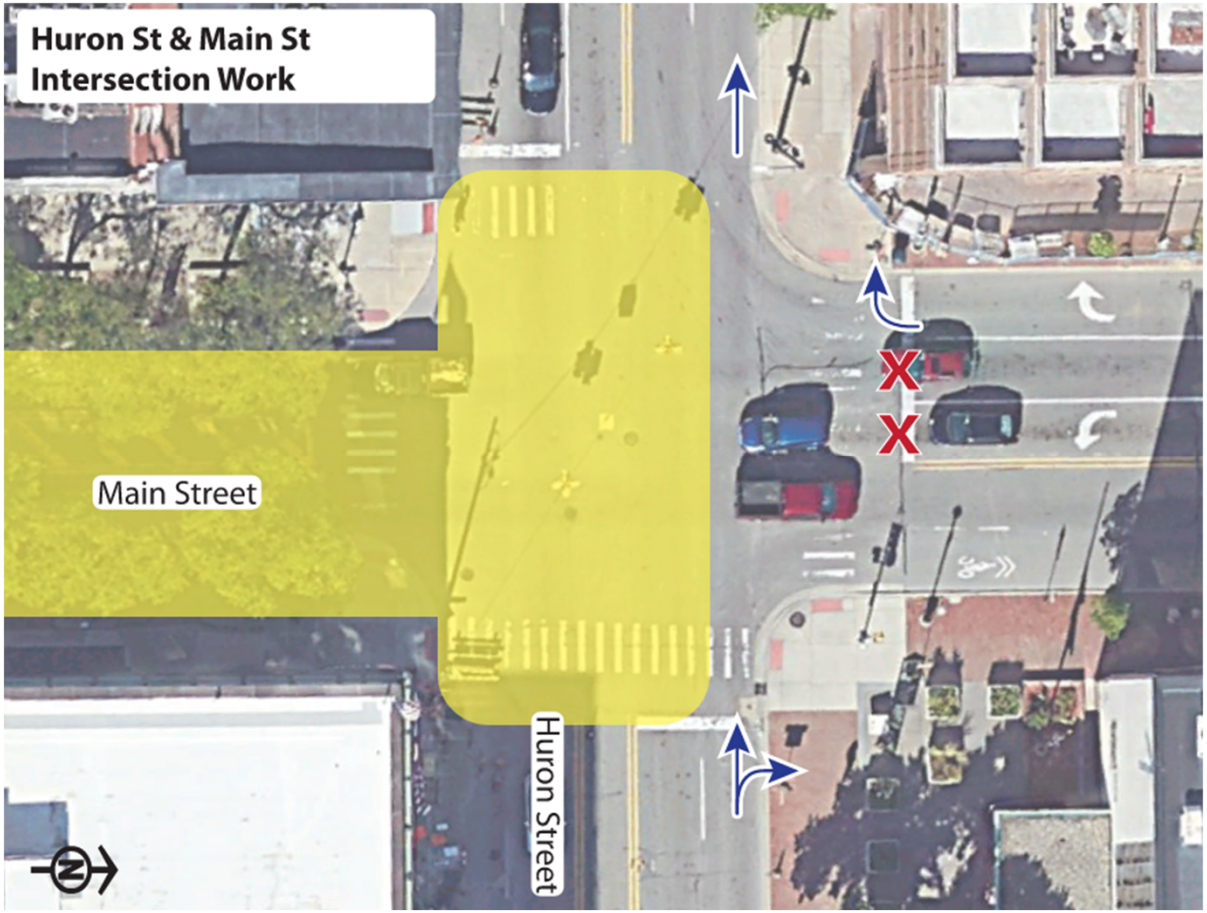
Duration: May - July/August*

Major Tasks	Duration
• Removals =	1 Weeks
• Water Main Installation =	2 Weeks
• Water Main Testing =	2 Weeks
• Service Connections & Tie-ins =	1 Weeks
• Road Construction, Concrete Work, Sidewalk Repairs, misc. =	3 Weeks
• Paving/Striping/Re-opening =	1 Weeks

(A work week equals 5 working days per week)

Total **Estimated** Duration = 10 Weeks

Construction Phase 3 - S. Main & Huron



Duration: August/September

Major Tasks		Duration
• Storm sewer work	=	1 Weeks
• Road Construction, Concrete Work, Sidewalk Repairs, misc.	=	2 Weeks
• Paving/Striping/Re-opening	=	1 Weeks

(A work week equals 5 working days per week)

Total **Estimated** Duration = 4 Weeks