

SUBJECT

Buick City Outfall 011 Storm Sewer PFAS Infiltration
Mitigation Option Analysis

TO

Jeremy Pepin, EGLE - MMD

DATE

March 22, 2024

PROJECT NUMBER

30193649

COPIES TO

Grant Tigger, RACER Trust
Brendan Mullen, RACER Trust
Chris Peters, Arcadis
Brian Zuber – EGLE - WRD

NAME

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This Outfall 011 storm sewer PFAS infiltration Mitigation Option Analysis memo (Memo) has been prepared by Arcadis on behalf of Revitalized Auto Communities Environmental Response Trust (RACER) for the Buick City Site (Site) located in Flint, Michigan (**Figure 1**).

Although the Site encompasses over 400 acres, this Memo applies only to the Outfall 011 storm sewer section located on Hamilton Avenue between Industrial Avenue and the former railroad crossing to the east (**Figure 2**). The following sections summarize the data collected as well as details of the options evaluated to address per and polyfluorinated alkyl substances (PFAS) groundwater infiltration to the storm sewer.

Hamilton Avenue Previous Activities

Efforts have been ongoing to address environmental concerns with Outfall 011 and conveyance of PFAS for almost 10 years. The following provides a timeline of the activities completed:

- September 2014 – Disconnected Outfall 009 on Site
- June 2020- Installed plugs in Outfall 011 laterals MH 6-A6 and 6-A8
- July 2021 - Installed temporary plug in Outfall 009 at MH 11-6, leak still present
- August 2021 – Video survey of Outfall 011
- September 2021 – Temporary plugs installed in Outfall 011 laterals MH 11-6-A2 and MH-6-A3
- November 2021 – Temporary plugs removed
- December 2021 MH 11-6-A2 and MH-6-A3 northern laterals permanently plugged
- January 2022– Outfall 009 bulkheaded at MH 11-6
- April 2022 – Video survey of Outfall 011
- July 2022 – Lateral flow isolation test in Outfall 011 sewer to determine source of impacts
- 2023 - Installed soil berm and gravel trench on Division Street to redirect surface runoff to RACER property.

Outfall 011 Data Summary

Recent sampling of Outfall 011 has been used to identify where PFAS has been detected in storm sewer samples within the storm sewer system and where to target the mitigation activities. The results of recent storm sewer sampling events along Hamilton Avenue and downgradient of manhole MH 11-6 are shown on **Figure 3** and **Figure 4**, respectively. PFAS concentrations at the furthest downgradient manhole exceed Michigan Part 31 Rule 57 surface water quality criteria.

PFAS impacts are present throughout much of the storm sewer along Hamilton Avenue, from approximately Manhole MH 11-6-3 to MH 11-6 (**Figure 2**). Based on previous investigations, the primary sources of PFAS impacts are due to infiltration of impacted groundwater into the existing manholes along the storm sewer and into two street drains, which are believed to be damaged resulting in subsequent discharge of contaminated groundwater into the Outfall 011 storm sewer main.

Outfall 011 Option Evaluation

Multiple options for addressing groundwater infiltration were considered as part of this effort. The following two options were identified to be the most effective and cost efficient. Both options include traffic control, bypass pumping of pipe flow, replacement of the existing street drains and associated piping, disposal of PFAS impacted soils, road repairs, and the installation of new pre-cast concrete manholes. Groundwater that is recovered from dewatering to achieve the at depth work is anticipated to be run through a treatment system and discharged to the City Sanitary sewer as permitted by the City of Flint.

Option 1 – Reroute of Outfall 011 Stormwater into Outfall 013

This option would include reroute the drainage from upstream of manhole MH-6-3 into a separate storm sewer at the intersection of Hamilton and Industrial, eliminating the section of sewer where the infiltration is occurring, as indicated in **Figure 5**. A new precast concrete structure will be installed at the intersection to redirect discharge from the 011 storm sewer into 013 storm sewer. The existing street drainage along Hamilton Avenue that services the abandoned section of storm sewer would be replaced and conveyed to the new structure.

Bulkheads would be installed on the existing Outfall 011 storm sewer directly after the reroute connection, at manhole 11-6, and another downgradient manhole to prevent a pathway for groundwater currently infiltrating the storm sewer from discharging to the Flint River.

Preliminary estimates indicate that outfall 013 has more than adequate capacity to transport the added flow, however, stormwater flow information is being collected to confirm that the receiving storm sewer (013) has the expected adequate capacity for the added volume. A rough order of magnitude (ROM) cost is included in **Table 1**. The ROM for Option 1 is approximately \$640,000.

Option 2 – Existing Outfall 011 Storm Sewer Line Improvements

This option would include improving the existing 011 storm sewer along Hamilton Avenue immediately south of the Buick City property to prevent infiltration through the affected area. Existing manholes would be removed and replaced with new precast concrete structures as indicated in **Figure 2**. The existing sewer main would be reconnected to these manholes. Lateral pipe connections not associated with the street drains would be plugged and not connected following installation of the new manholes. Existing street drains will be replaced, and new

Jeremy Pepin
EGLE
March 22, 2024

pipe would be installed to connect them to the new manholes. A ROM cost is included in **Table 2**. The ROM for Option 2 is approximately \$2,400,000.

Next Steps

Arcadis is currently in the process of designing and gathering flow data as part of the reroute options. As these options are better defined meetings with the City of Flint will be arranged to incorporate the City's comments and input into the final strategy. Once the remedial analyses are completed a further meeting with the City of Flint will be arranged for their final review and project planning purposes. The flow monitoring data would be provided once complete, and the overall approval be contingent upon that information being agreeable. If Option 1 is selected, additional soil sampling to characterize the soils removed will also need to be performed to determine whether the soil can be placed back into the excavation or needs to be disposed off-site.

After obtaining input from the City, a formal work plan with design would be submitted to Michigan Environment, Great Lakes, and Energy (EGLE) for review and approval.

Enclosures:

Figure 1 – Site Location Map

Figure 2 – Overall Key Plan

Figure 3 – Outfall 011 PFOS Results – September and November 2023

Figure 4 – Outfall 011 PFOS Results – Downgradient of Hamilton Avenue -

Figure 5 – Outfall 011/013 Reroute

Table 1 - Rough Order of Magnitude Cost Option 1

Table 2 - Rough Order of Magnitude Cost Option 2

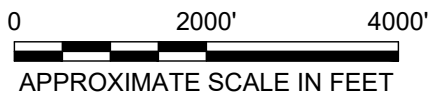
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SOURCE: USGS 7.5 MIN., FLINT NORTH QUADRANGLE, FLINT NORTH 2017

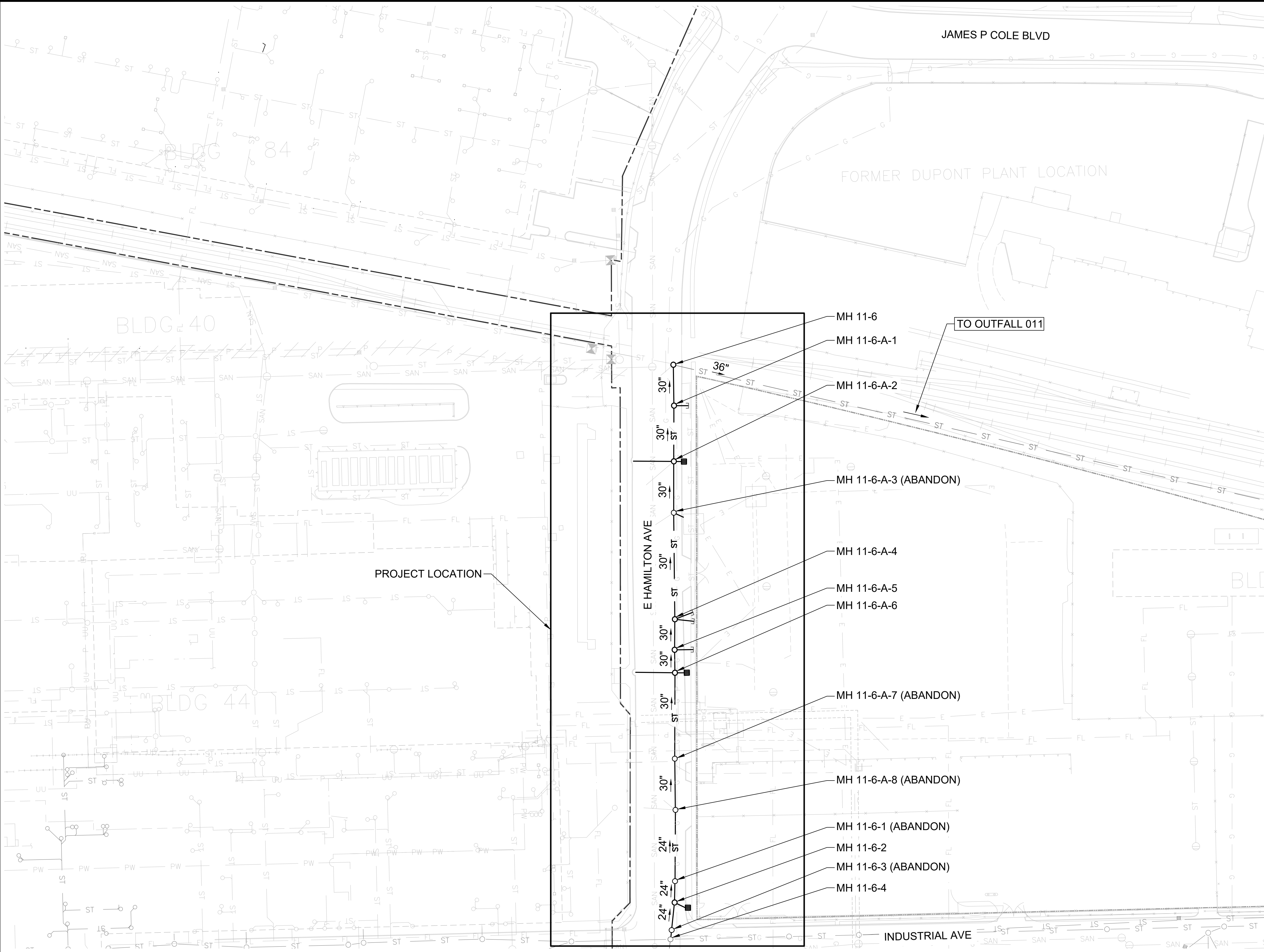


AREA LOCATION
MICHIGAN



<p>RACER TRUST BUICK CITY FLINT, MICHIGAN</p>	
<p>SITE LOCATION MAP</p>	
	<p>Design & Consultancy for national and built assets</p>
<p>FIGURE 1</p>	

CITY OF BUICK CITY, MI, DIVISION OF PUBLIC WORKS, PROJECT NO. 2022-011, RACER TRUST, 28550 CABOT DRIVE, SUITE 500, NOVI, MI 48377, TEL: 248.994.2240, FAX: 248.994.2241, WWW.ARCADIS.COM, DATE: 02/20/2024, BY: KASPEREK, KATIE, PLOTTED: 1/24/2024 8:18 AM, ACADVER: 24.1S (LMS TECH), PAGES: 1 OF 1, PLOT SETUP: 1/24/2024 8:05 AM, SAV: 1/24/2024 8:05 AM, LAYOUT: C-1, SHEET: 01, MARSHALL PROMEDIATION/CADD/SheetG01.dwg



- LEGEND:**
- PROPERTY BOUNDARY
 - - - CONTOUR LINE
 - ▭ BUILDING OUTLINE
 - - - FORMER BUILDING OUTLINE
 - - - BASEMENT/TUNNEL AREA
 - FENCE
 - RAILROAD
 - UNSURVEYED EXISTING UTILITIES (FROM HISTORICAL MAPPING)
 - BULKHEAD
 - PLUG
 - CATCH BASIN
 - MANHOLE
 - ST — STORM LINE
 - SAN — SANITARY LINE
 - E — ELECTRIC LINE
 - FL — FIRE WATER LINE
 - G — GAS LINE
 - W — POTABLE WATER LINE
 - P — PROCESS LINE
 - PW — PROCESS WASTE LINE
 - UU — UNKNOWN UTILITY LINE
 - SURVEYED EXISTING UTILITIES
 - CATCH BASIN
 - MANHOLE
 - ST — STORM LINE
 - SAN — SANITARY LINE
 - X — FENCE
 - PROPOSED UTILITIES/MODIFICATIONS
 - 1+00 — EXISTING SEWER PIPE TO BE TREATED WITH CURE-IN-PLACE PIPE
 - /// EXISTING SEWER TO BE ABANDONED IN PLACE
 - - - EXISTING SEWER MAIN TO REMAIN
 - EXISTING SEWER MAIN TO BE LINED (TO BE IMPLEMENTED FOLLOWING SEWER REROUTE)
 - PROPOSED BULKHEAD AND ID — 1 D-3
 - PROPOSED MANHOLE LOCATION AND ID — 2 D-2, 3 D-2

- NOTES:**
1. REFER TO DRAWING G-3 FOR ADDITIONAL BASEMAP NOTES AND INFORMATION.
 2. THE SURVEYED EXISTING AND UNSURVEYED (HISTORICAL) EXISTING UTILITIES MAY NOT CORRESPOND PRECISELY IN ALL LOCATIONS. THE UNSURVEYED UTILITIES ARE MEANT TO BE USED AS A GUIDE AND MAY NOT ACCURATELY DEPICT FIELD CONDITIONS. PROPOSED UTILITIES/MODIFICATIONS ARE BASED ON SURVEYED LOCATIONS OF EXISTING UTILITIES.
 3. PROPOSED BULKHEADS AND EXISTING MANHOLES, CATCH BASINS, AND BULKHEADS ARE SHOWN AT AN EXAGGERATED SIZE FOR CLARITY. PROPOSED MANHOLES ARE DRAWN TO SCALE.

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING.

USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REUSED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.				

Professional Engineer's Name
BRAD A. SAUNDERS

Professional Engineer's No.
6201050540

State
MI

Date Signed
ALS

Project Mgr.
TM

Designed by
GG/KG/OH

Drawn by
ALS

Checked by
BMS



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OUTFALL 011 STORM SEWER REHABILITATION

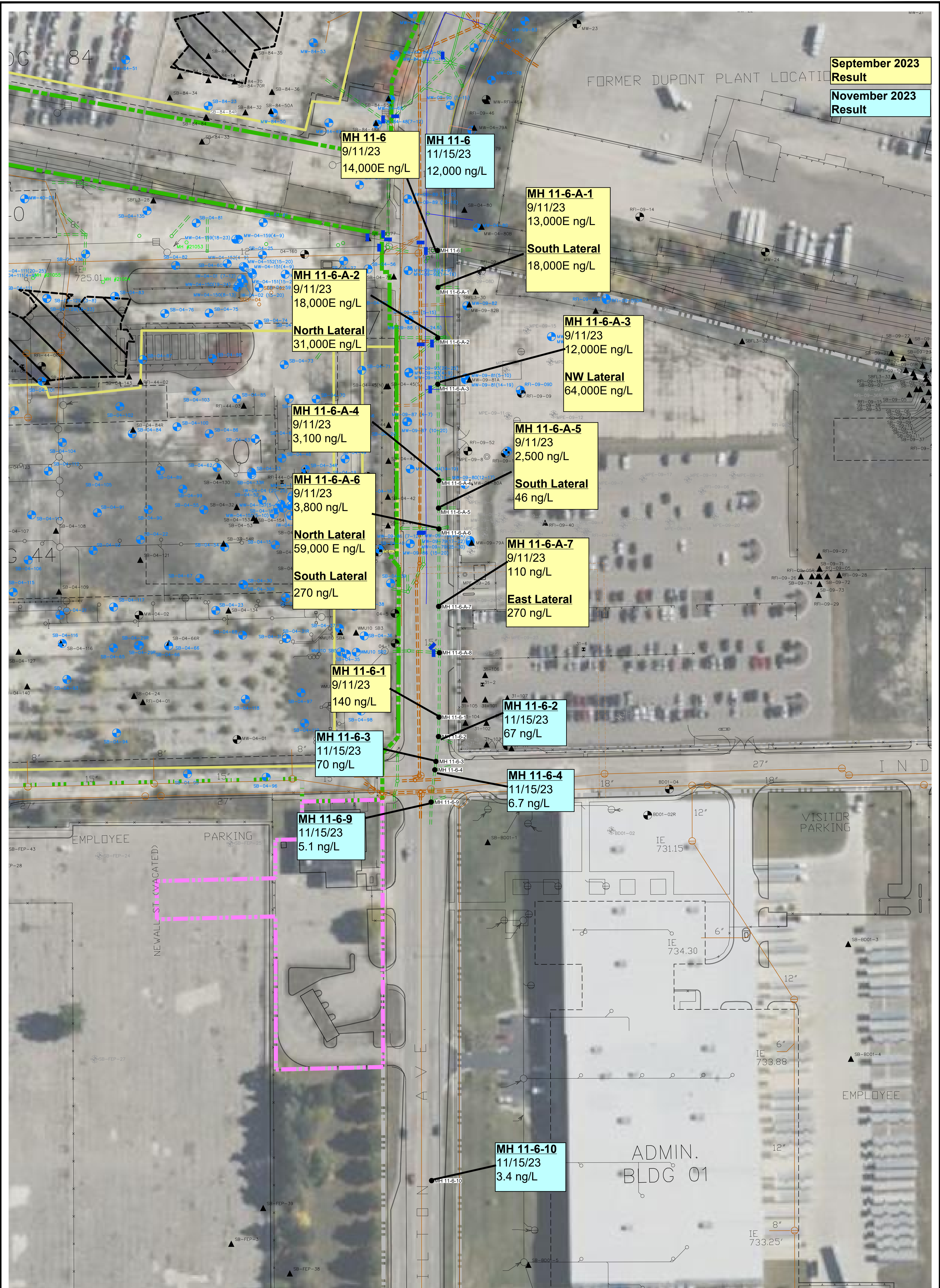
OVERALL KEY PLAN

GENERAL

ARCADIS Project No.
30174223

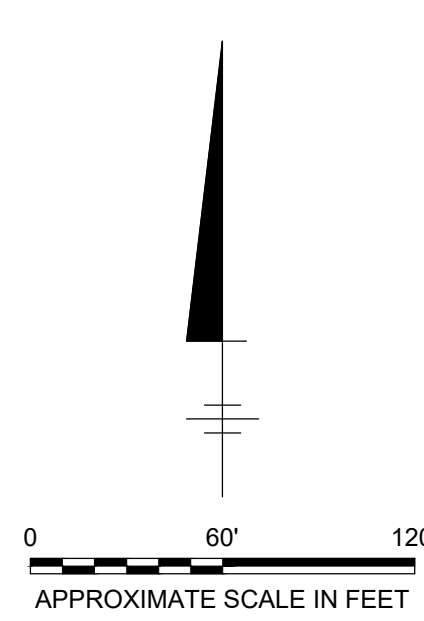
Date
FEBRUARY 2024

ARCADIS OF MICHIGAN, LLC
28550 CABOT DRIVE
SUITE 500
NOVI, MICHIGAN 48377
TELEPHONE: 248.994.2240



LEGEND:

- | | |
|-----------------------------|---------------------------------|
| ▲ SOIL BORING | ⊗ RIVER GAUGE |
| ⊕ MONITORING WELL (ACTIVE) | ⊗ UNABLE TO LOCATE |
| ⊞ PIEZOMETER | — HISTORICAL STORM SEWER LINE |
| ⊙ RECOVERY WELL | — STORM SEWER LINE (2018) |
| ⊠ SOIL GAS POINT | — SANITARY SEWER LINE |
| ■ SUB-SLAB MONITORING POINT | --- RACER TRUST PROPERTY |
| ● TRANSECT POINT | --- FORMER RACER TRUST PROPERTY |
| ⊕ SURFACE WATER | ■ APPROXIMATE BULKHEAD LOCATION |



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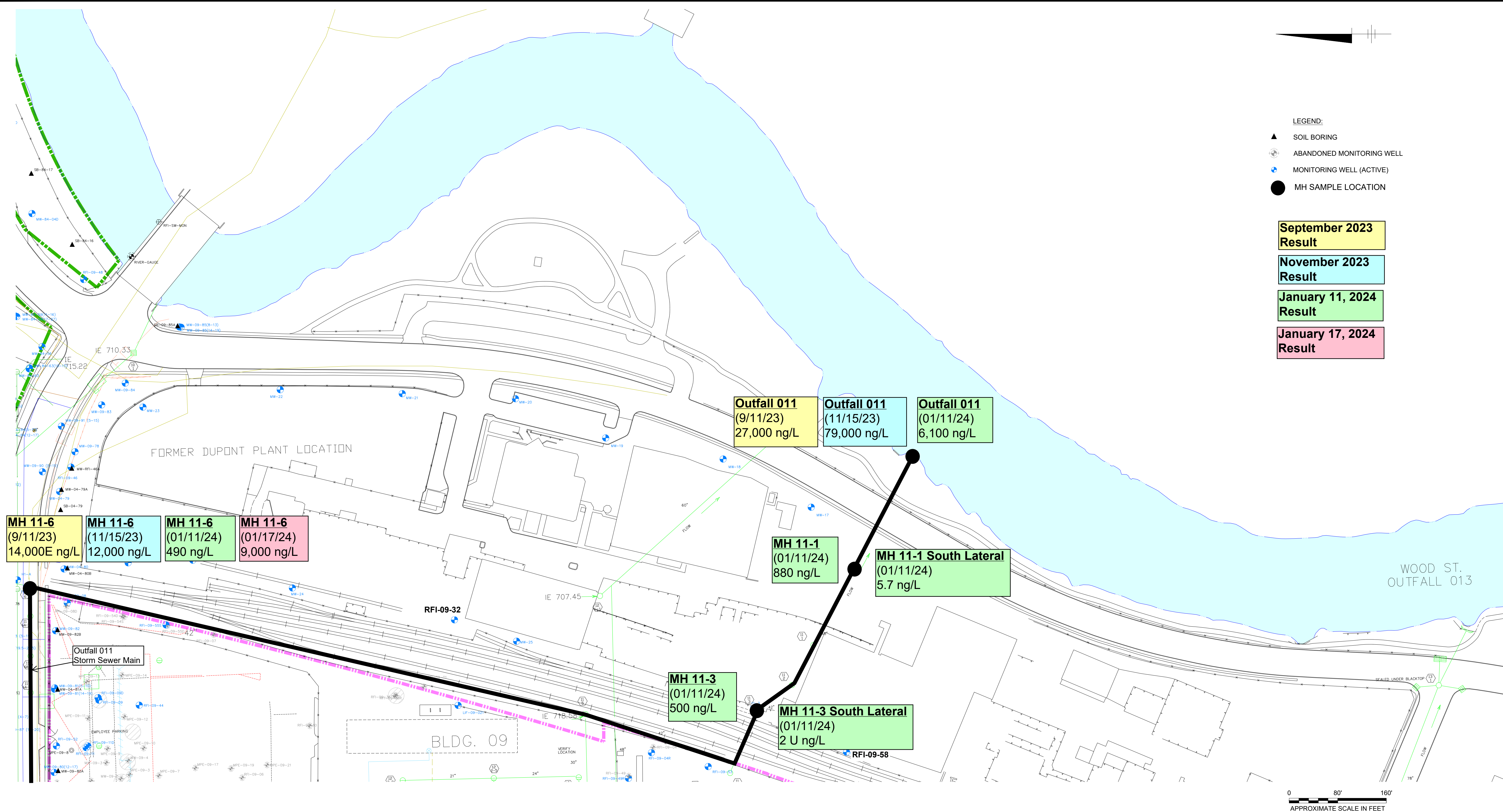
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BUICK CITY
FLINT, MICHIGAN

**OUTFALL 011 PFOS RESULTS -
SEPTEMBER AND NOVEMBER 2023**

ARCADIS Design & Consultancy
for natural and built assets

FIGURE
3

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BUICK CITY
FLINT, MICHIGAN

**OUTFALL 011 PFOS RESULTS
DOWNGRADIENT OF HAMILTON AVE**

ARCADIS Design & Consultancy
for natural and built assets

FIGURE
4

Client: Racer Buick City - Table 1 Rough Order of Magnitude Cost Estimate

Estimate: Project Cost Estimate

Project: Hamilton Ave Sewer - Reroute OPTION 1

Date: March 20, 2024

Item No.	Description	Qty	Units	Unit Cost	Total Item Cost
1. Civil				\$ -	\$ 344,000
	Manhole Demolition	25	VF	\$ 250.00	\$ 6,250
	Asphalt Removal	431	SY	\$ 4.50	\$ 1,940
	Asphalt Paving	431	SY	\$ 34.00	\$ 14,658
	Excavation and Disposal	652	CY	\$ 207.00	\$ 134,933
	Select Fill (non-piping)	27	CY	\$ 38.00	\$ 1,014
	Backfill	652	CY	\$ 38.00	\$ 24,770
	Frame and Cover	4	EA	\$ 1,700.00	\$ 6,800
	Precast Manhole (4-ft diameter)	27	VF	\$ 300.00	\$ 8,100
	Precast Manhole (Structure)	30	VF	\$ 700.00	\$ 21,000
	Exterior Coating	57	VF	\$ 200.00	\$ 11,400
	Pipe Reconnection to Manhole (Main)	4	EA	\$ 5,000.00	\$ 20,000
	Pipe Reconnection to Manhole (Laterals)	5	EA	\$ 2,000.00	\$ 10,000
	Dewatering	1	LS	\$ 38,300.00	\$ 38,300
	Bypass Pumping	1	LS	\$ 15,000.00	\$ 15,000
	Maintenance and Protection of Traffic	25	Day	\$ 1,200.00	\$ 30,000
	18" New Pipe for removed manholes	760	LF	\$ 100.00	\$ 76,000
	Bulkheads	3	each	\$ 1,500.00	\$ 4,500
	Street Drains	5	EA	\$ 4,125.00	\$ 20,625
				Subtotal	\$ 445,291
GENERAL REQUIREMENTS				\$	166,984
	Mobilization / Demobilization	10%	%	\$	44,529
	Bonds	2%	%	\$	8,906
	Insurance	3%	%	\$	13,359
	General Conditions	10%	%	\$	44,529
	Profit	10%	%	\$	55,661
				Total (Rounded)	\$ 612,275
	Arcadis Oversight			\$	51,900
				Total	\$ 639,275

VF = Vertical Feet

Client: Racer Buick City

Estimate: Project Cost Estimate

Project: Hamilton Ave Sewer - Manhole Replacement and Pipe Lining

Date: January 26, 2024

Item No.	Description	Qty	Units	Unit Cost	Total Item Cost
1. Civil				\$ -	\$ 1,651,000
	Manhole Demolition	68	VF	\$ 250.00	\$ 17,000
	Asphalt Removal	533	SY	\$ 4.50	\$ 2,400
	Asphalt Paving	533	SY	\$ 34.00	\$ 18,133
	Excavation and Disposal	1156	CY	\$ 220.00	\$ 254,222
	Select Fill (non-piping)	27	CY	\$ 38.00	\$ 1,014
	Backfill	800	CY	\$ 38.00	\$ 30,400
	Frame and Cover	7	EA	\$ 1,700.00	\$ 11,900
	Precast Manhole (4-ft diameter)	8	VF	\$ 300.00	\$ 2,400
	Precast Manhole (5-ft diameter)	36	VF	\$ 450.00	\$ 16,200
	Precast Manhole (6-ft diameter)	10	VF	\$ 600.00	\$ 6,000
	Exterior Coating	54	VF	\$ 200.00	\$ 10,800
	Pipe Reconnection to Manhole (Main)	14	EA	\$ 5,000.00	\$ 70,000
	Pipe Reconnection to Manhole (Laterals)	5	EA	\$ 3,000.00	\$ 15,000
	Dewatering	1	LS	\$ 229,800.00	\$ 229,800
	Bypass Pumping	1	LS	\$ 150,000.00	\$ 150,000
	Sewer Cleaning	863	LF	\$ 15.00	\$ 12,945
	Smaller CIPP Pipe Lining	150	LF	\$ 200.00	\$ 30,000
	36" CIPP Pipe Lining	713	LF	\$ 1,000.00	\$ 713,000
	Maintenance and Protection of Traffic	40	Day	\$ 1,500.00	\$ 60,000
	30" New Pipe for removed manholes	50	LF	\$ 200.00	\$ 10,000
	Street Drains	5	EA	\$ 4,125.00	\$ 20,625
				Subtotal	\$ 1,681,840
GENERAL REQUIREMENTS				\$	630,690
	Mobilization / Demobilization	10%	%	\$	168,184
	Bonds	2%	%	\$	33,637
	Insurance	3%	%	\$	50,455
	General Conditions	10%	%	\$	168,184
	Profit	10%	%	\$	210,230
				Total (Rounded)	\$ 2,312,530
Arcadis Oversight				\$	83,000.00
				Total	\$ 2,395,530

VF = Vertical Feet