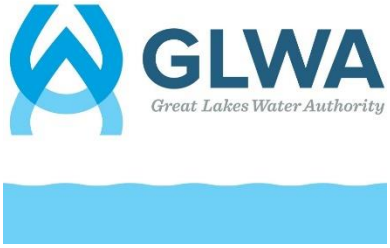
Connors Creek Sewer System Rehabilitation DRAFT

State Revolving Fund (SRF) Project Plan April 2021

Sue F. McCormick
GLWA Chief Executive Officer



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List of Abbreviations

AMP	Asset Management Plan
CCSS	Connors Creek Sewer System
CIPP	Cured-in-Place Pipe Lining
EGLE	Michigan Department of Environment, Great Lakes, and Energy
FSP	Fiscal Sustainability Plan
GLWA	Great Lakes Water Authority
LF	linear feet
MNFI	Michigan Natural Features Inventory
NASSCO	National Association of Sewer Service Companies
O&M	operation and maintenance
PACP	Pipeline Assessment and Certification Program
RCP	reinforced concrete pipe
ROW	right-of-way
SEMCOG	Southeast Michigan Council of Governments
SESC	soil erosion and sedimentation control
SRF	State Revolving Fund

Section 1

Project Background

This document has been prepared in accordance with Clean Water State Revolving Fund (SRF) Project Plan Preparation Guidance adopted by Michigan Department of Environment, Great Lakes, and Energy (EGLE) (Revision 5/2016) for the SRF low interest loan program. It is the intent of Great Lakes Water Authority (GLWA) to seek low interest loan assistance under the SRF program.

The purpose of this document is to describe the Connors Creek Sewer System (CCSS) Rehabilitation project, which GLWA is proposing to undertake with SRF funding to provide rehabilitation of the defective sewers and to prolong the service life of the CCSS. This project plan provides information on the status of the CCSS, a description of the need for rehabilitation, an evaluation of alternatives, a description of the recommended alternative and an assessment of environmental impacts. This project plan also serves as the basis for public review and comment on the proposed work in accordance with the public participation requirements of the SRF program.

The CCSS begins at 8 Mile Road east of Van Dyke Avenue and ends at a gate structure at the Connors Creek Pump Station located at the southwest quadrant of the intersection of Conner Street and Jefferson Avenue in the City of Detroit. The location of this project is shown on Figure 1-1.

Figure 1-1. Location of CCSS

1.1 Delineation of Study Area

The service area of the CCSS is defined using a sewershed where the subcatchments contribute flow to the CCSS during a 10-year, 24-hour storm (Figure 1-2).

The study area for this project includes all areas of potential ground disturbance and above ground features of the CCSS. This area is delineated using a 100 feet wide corridor along the existing horizontal alignment of the CCSS, the maps of which are included in Appendix A Base Maps.

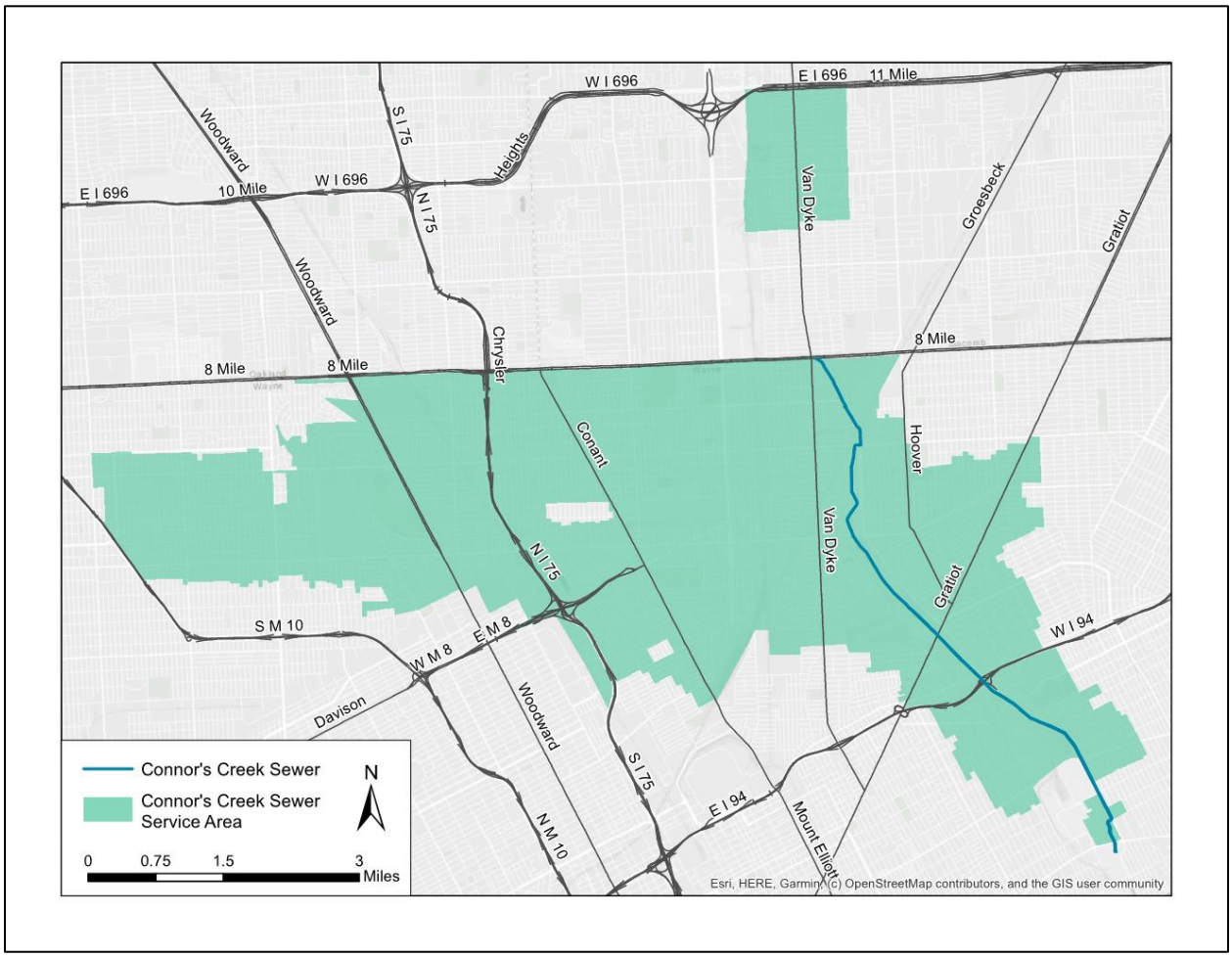


Figure 1-2. Location and Service Area of CCSS

1.2 Environmental Setting

The environmental setting in the study area is discussed in the following sections.

1.2.1 Cultural Resources

The project design team is working with 106 Group, who is a qualified consulting company for archaeology and history, to study the project's impacts on archaeological, historical, and cultural resources. The result of the study, potential impacts and mitigations will be included in the final project plan.

1.2.2 Natural Environment

- Air Quality

The most recent EGLE Air Quality Annual Report (2019) is reviewed to assess the air quality in the study area. Since EGLE began monitoring in the early 1970s, criteria pollutant levels have continually decreased, indicating that the air is much cleaner today than when the federal Clean Air Act began. The entire state of Michigan is in attainment for CO, Pb, NO2, and particulate matter. Although portions of the state including the study area are in nonattainment for SO2 and O3. It is also stated in the report that the levels of these pollutants are still decreasing.

- Wetlands

Wetlands are poorly drained areas generally or intermittently covered with water up to ten feet deep, with emergent vegetation. Included in this habitat type are (1) bogs having acidic water and generally blanketed with a floating mat of specialized mosses, shrubs, and trees; (2) marshes covered with one to three feet of water in which cattails and bulrushes are common; (3) shrub swamps where vegetation grows in soil water covered with up to six inches of water; and (4) wooded swamps where trees dominate in waterlogged soil. Within the City of Detroit, the marshes are generally confined to the edges of waterways. Based on review of the National Wetlands Inventory, there is no mapped wetland in the study area.

- Coastal Zones

According to the definition published by National Oceanic and Atmospheric Administration, Michigan's coastal zone generally extends a minimum of 1,000 feet inland from the ordinary high-water mark, with the boundary extending further inland in some locations to encompass important coastal features. The coastal zone map in the vicinity of the study area published by EGLE is shown in Figure 1-3. The land boundary near the study area coincides roughly with Jefferson Avenue. Therefore, the project should have minimal impacts to the coastal zone.

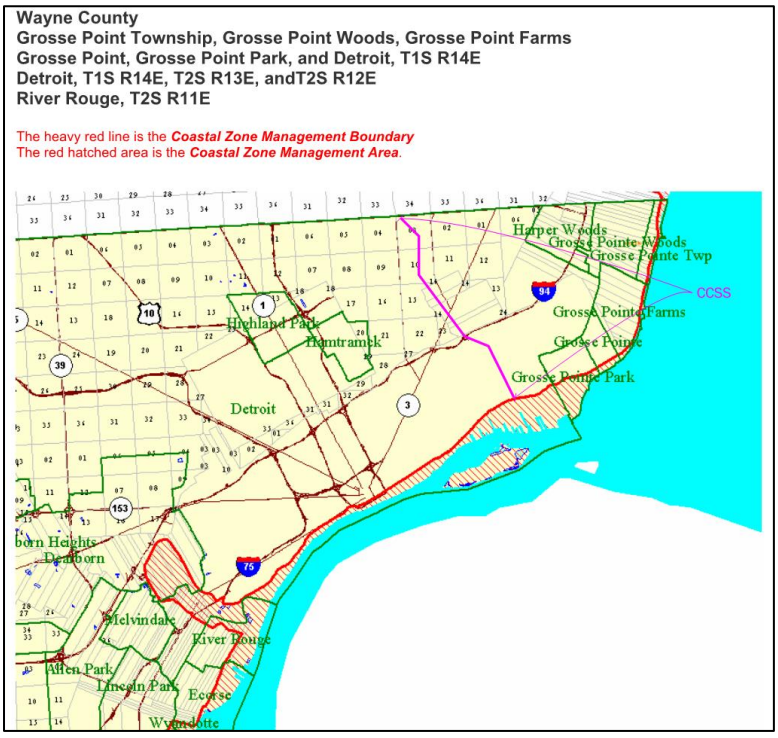


Figure 1-3. Coastal Zone Boundary Map

- Floodplains

Floodplains are relatively flat areas or lowlands adjacent to channels of water courses or water bodies which may be temporarily covered by flood water during periods of high precipitation. In southeast Michigan, floodplains are found along virtually all rivers and lakes, including the Detroit and Rouge Rivers. The Great Lakes Basin Commission has estimated that there will be a continued reduction in flood plain acreage through the year 2020. Industrial, commercial, and residential expansion account for most of the loss of this type of habitat. Based on review of published floodplain maps by Federal Emergency Management Agency, the study area has minimal flood hazard. The nearest flood zones are located to the southeast of the study area as shown in Figure 1-4.

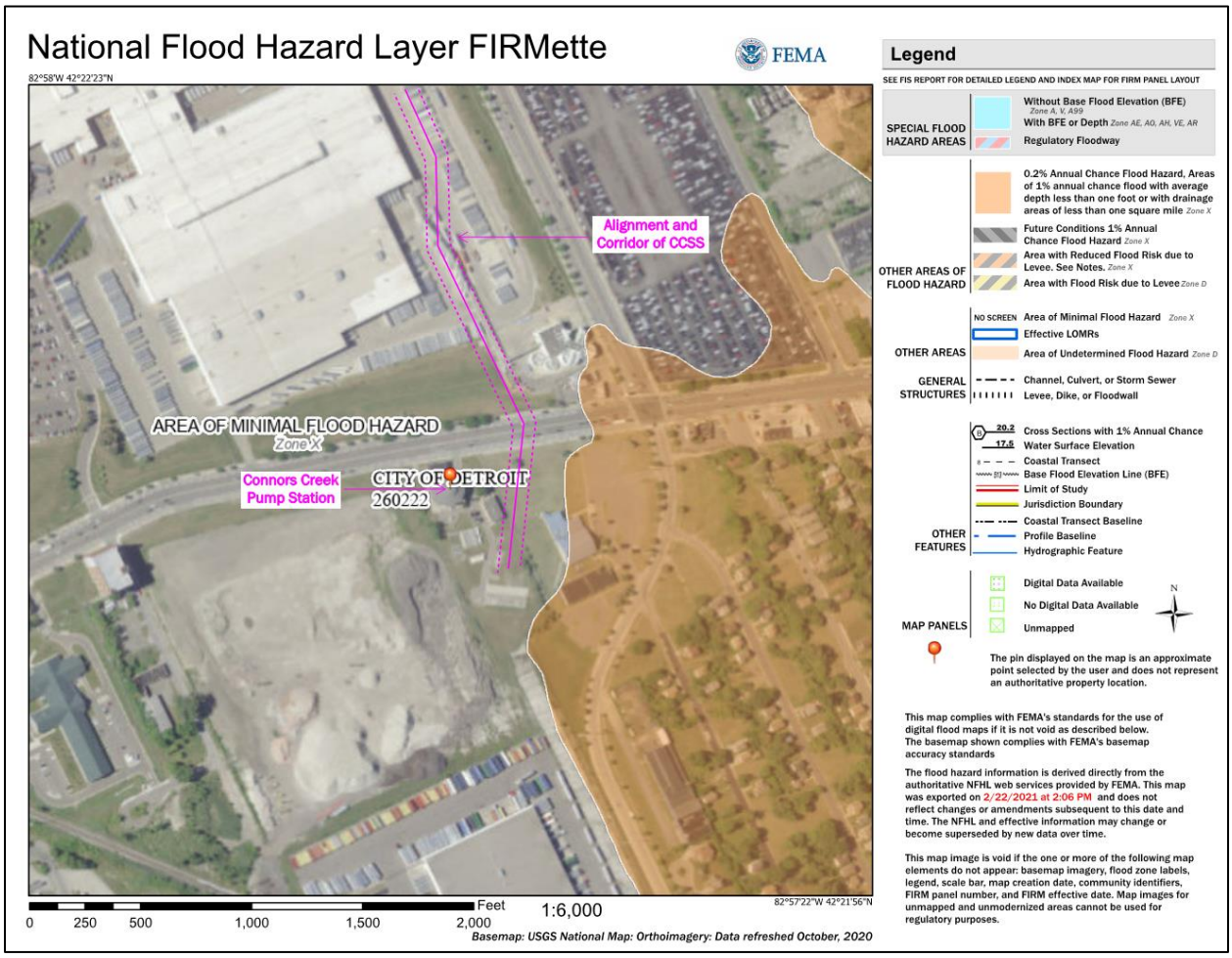


Figure 1-4. Floodplain Map

- Natural or Wild and Scenic Rivers

Based on a watershed map published by Wayne County (Figure 1-5), the study area is located within Detroit River watershed, which is classified as a natural river.

As indicated on the website of National Wild and Scenic Rivers System, Michigan has approximately 51,438 miles of river, of which 656.4 miles are designated as wild and scenic. That is just a bit more than 1 percent of the state's river miles. There is no designated wild or scenic river in the study area.

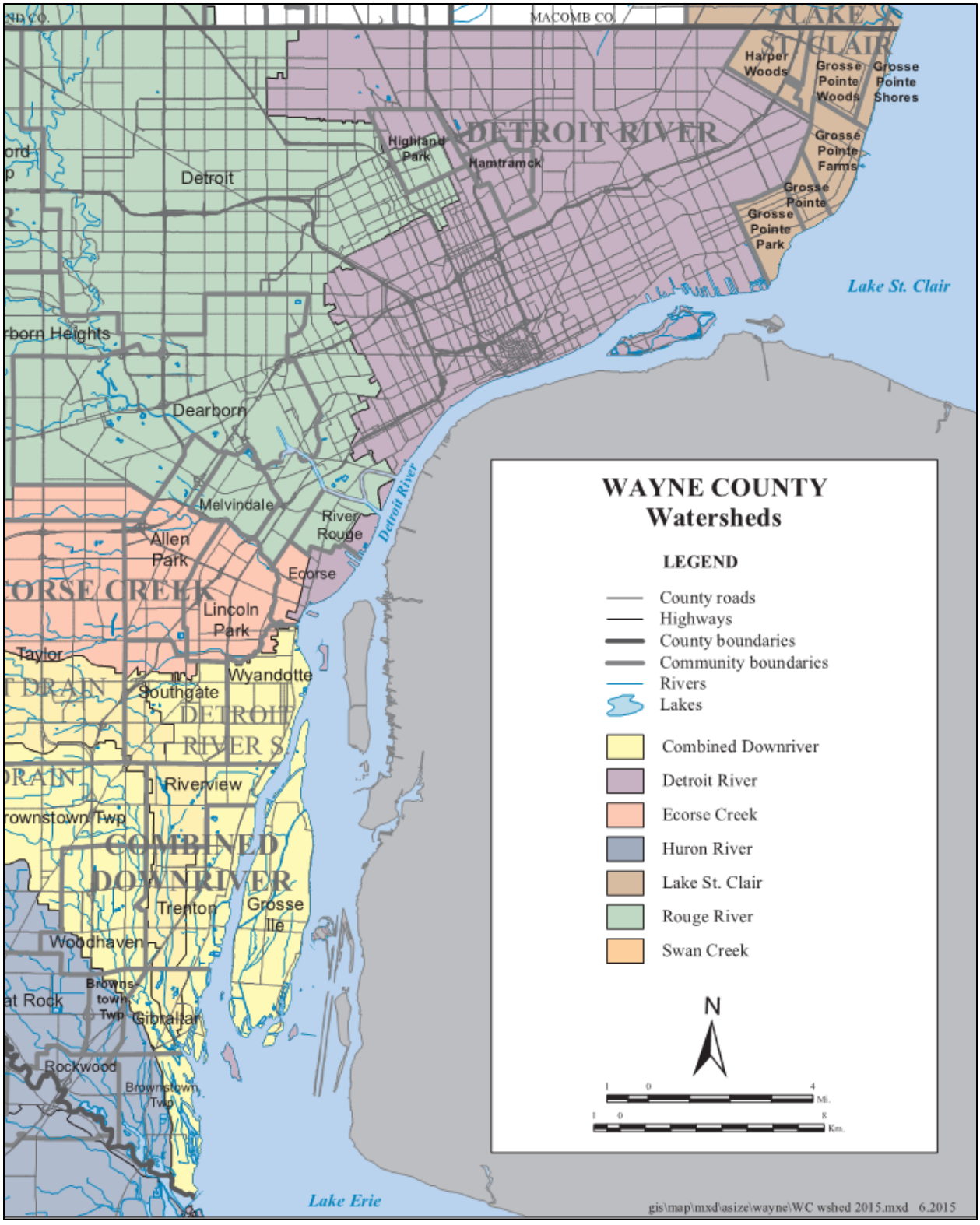


Figure 1-5. Wayne County Watershed Map

- Major Surface Waters

The major surface water in the vicinity of the study area is the Detroit River. The Detroit River is intensively developed, with extensive urban, commercial, and industrial complexes. Over the past several decades significant improvements have been made in controlling conventional pollutant point sources in the Detroit River especially for discharges of oil, grease, and nutrients. Concentrations of other conventional pollutants including chloride, ammonia and phenols have declined substantially.

Bedrock aquifers in the study area are generally considered poor for public use and consumption because of the presence of hydrogen sulfide gas, which leaves the water with a disagreeable quality. For this reason, groundwater utilization is not widely practiced, and the Detroit public water is supplied by the GLWA regional system that uses surface water for its raw water source.

- Recreational Facilities

Based on information published by Detroit Parks and Recreation Department, there are three city parks located in the vicinity of the study area, including Conner Park, Chandler Park and Manz Park. Their relative locations to the project are shown in the following figures. The study area is covered under Detroit City Council Districts 3 and 4; and there are no major improvements or expansions of these recreational facilities in their 2020 to 2021 Park Improvement Plans.

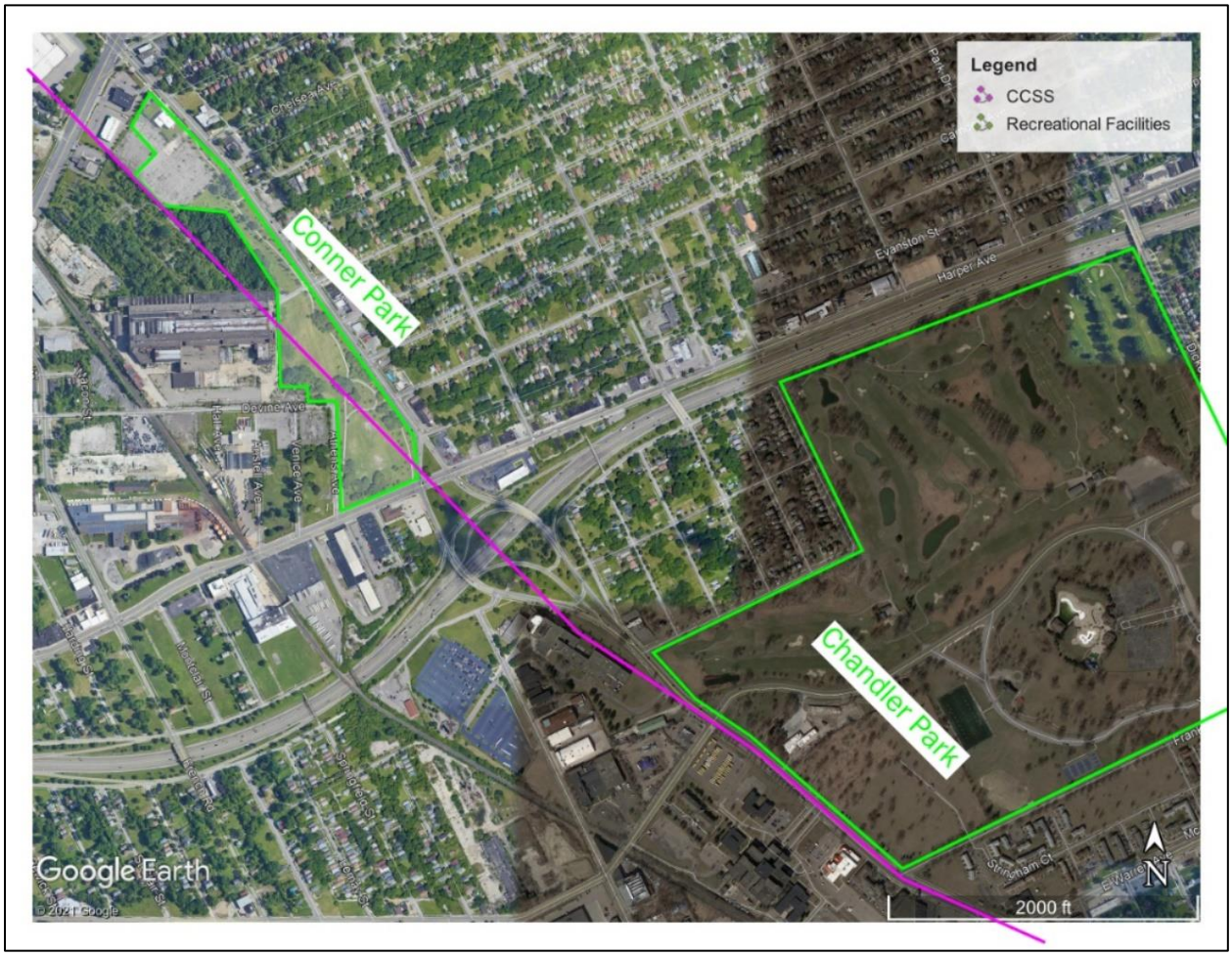


Figure 1-6. Park Location Map – Conner Park and Chandler Park

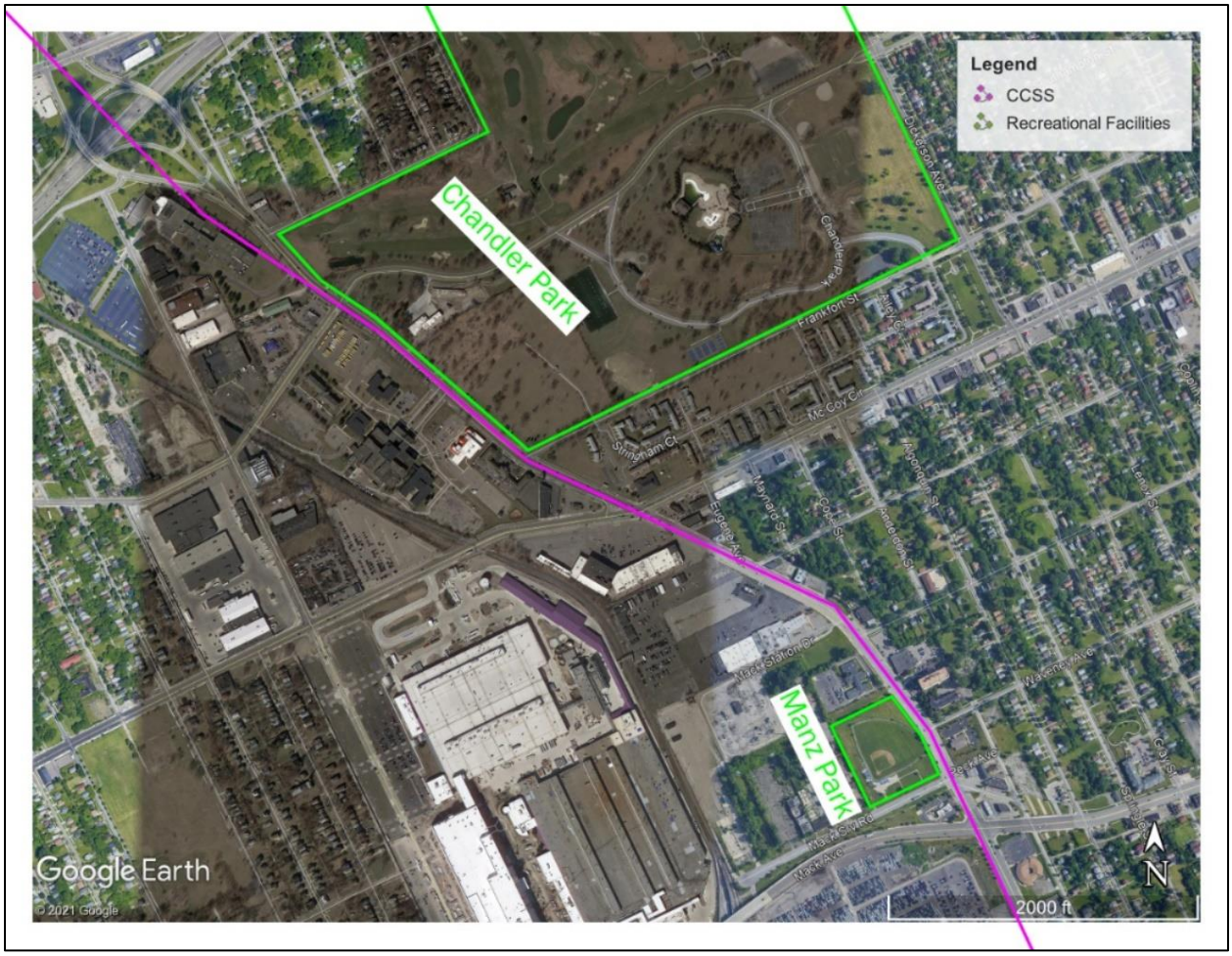


Figure 1-7. Park Location Map – Chandler Park and Manz Park

- Topography

The study area is part of the vast central lowland of North America. The topography consists of plains and low hills, with few extremes of slope or relief. In this region, landforms are the result of the deposition and erosion of loose materials (sand, gravel, silt, and clay particles) in recent geologic time, by either moving water or melting geologic ice.

Local topography is described quantitatively in measures of relative relief and slope. Relative relief is the difference in elevation between the highest and lowest points in a particular area. Relative relief on the lake plains varies from 10 to 50 feet per square mile. Slopes that limit urban development and agricultural land use (steeper than 7 degrees) are rare in the area. The United States Geological Survey Topographic Maps (2019) covering the study area are shown in Figure 1-8 and Figure 1-9.

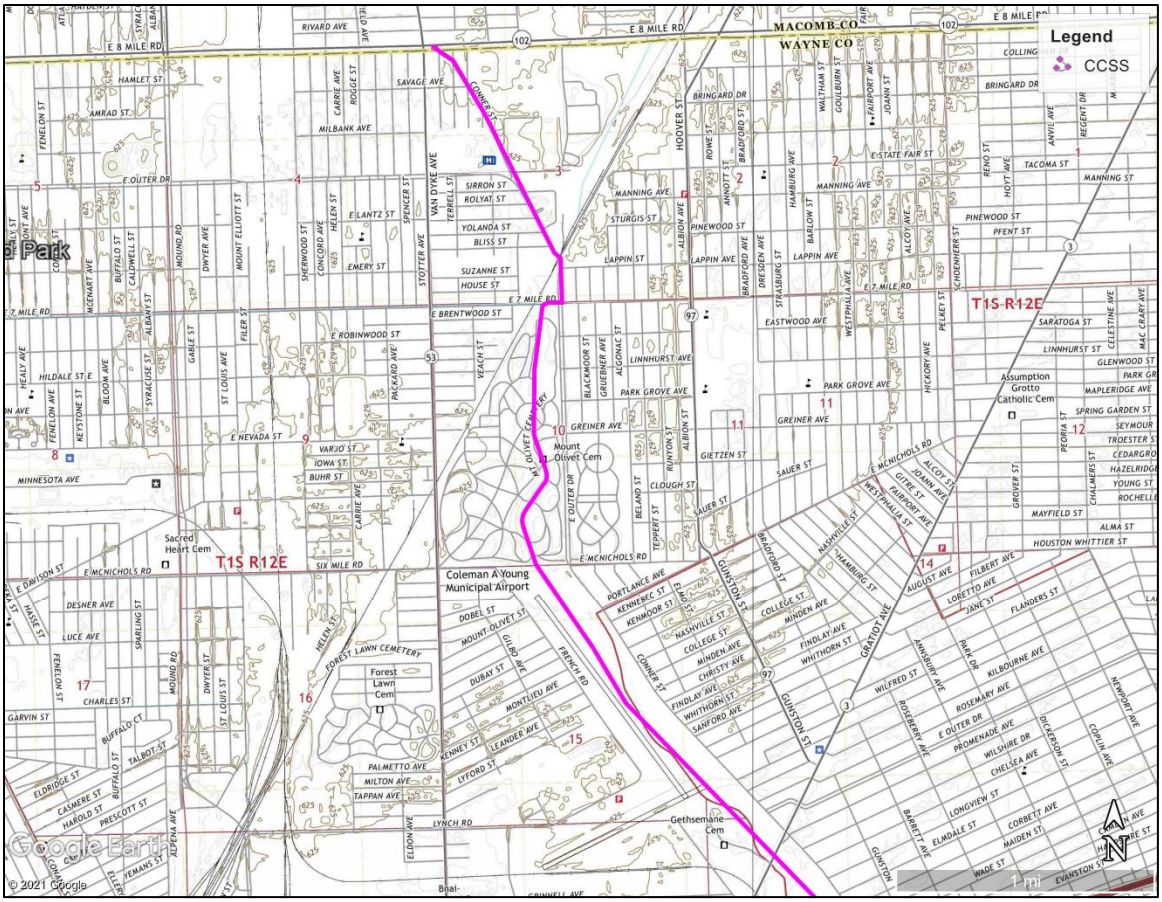


Figure 1-8. Topographic Map 1 of 2

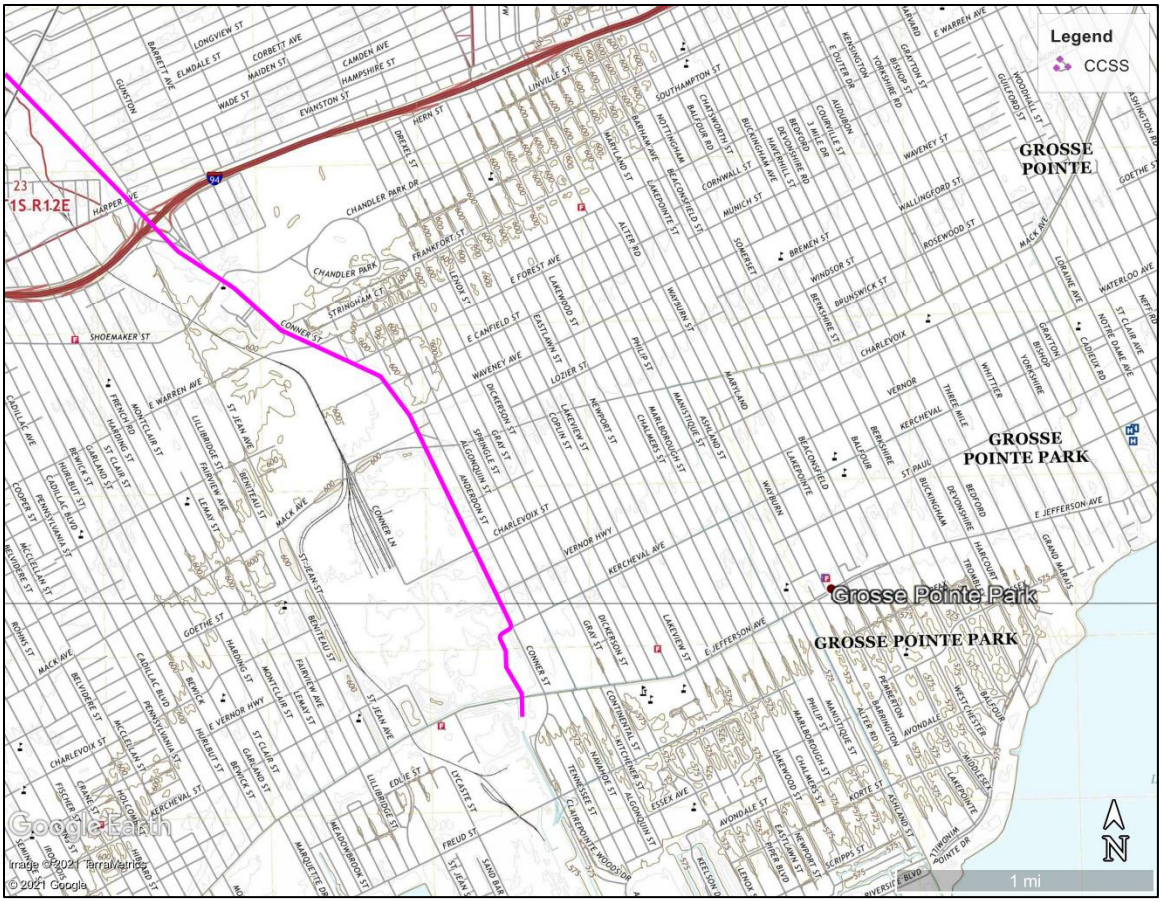


Figure 1-9. Topographic Map 2 of 2

- Soils

The soils in the area are classified as gray-brown podzolic soils and are part of a large area of such soils extending roughly from southern Missouri and Central Wisconsin to Maryland and Quebec. Podzols are acid soils formed under needle-leaf forests in cold climates and are very poor in plant nutrients. Detroit's soil is a typical lowland zone soil which consists of level, poorly drained loam and clay soils developed on former lake bottom sediments. Isolated areas of level, sandy soils are also found as remnants of glacial river-deltas.

- Geology

The surface geology of Detroit is characterized as a lowland zone. This zone is a belt of low, flat lands, varying in width from 20 to 30 miles, located between the Great Lakes shoreline and the edge of the zone of hills and valleys. This lowland is composed mainly of clay and sand deposits laid in the bottom of a large lake which existed during the last glacial period. Interspersed with these lake deposits are small areas of water-laid glacial moraines, raised beach ridges marking former lake shores, and raised deltas formed by rivers fed by the melting glaciers. In certain areas, the geological conditions have constrained subsurface construction operations (particularly tunnel boring projects) due to porous rock strata with high groundwater tables and hydrogen sulfide contamination.

Most of the study area is underlain by Antrim Shale formation. The Antrim is dark gray or brown to largely black, highly carbonaceous, thinly laminated shale with meager fossil content except for profuse algal spores. Large dark brown, bituminous, and pyritic limestone concretions occur in the lower Antrim.

- Agricultural Resources

There are no prime or unique farmlands in the project area.

- Fauna and Flora

The location for the proposed project was checked against known localities for rare species and unique natural features, which are recorded in the Michigan Natural Features Inventory (MNFI) natural heritage database. This continuously updated database is a comprehensive source of existing data on Michigan's endangered, threatened, or otherwise significant plant and animal species, natural plant communities, and other natural features. Although several at-risk species have been documented within 1.5 miles of the project area, the occurrences are historic and/or far away from the location so it is not likely that negative impacts will occur. The response letter from MNFI is included in Appendix B.

In addition, and as required by Section 7 of the Endangered Species Act, the project team is consulting with the U.S. Fish and Wildlife Service, to ensure the proposed activities are not likely to jeopardize the continued existence of listed species or destroy or adversely modify their critical habitat. The results will be included in the final project plan.

1.2.3 Land Use in the Study Area

As shown in Table 1-1, the existing land use within the study area is comprised predominantly of residential, commercial, cemetery, airport, park, and industrial uses. Most of the land in the area has previously been developed. The project will be conducted largely within the existing public right-of-way (ROW), underground, and inside existing sewers. Therefore, has no impact to the land use in the study area.

Table 1-1. Land Use in Study Area

Land Use	Linear Feet along CCSS Corridor	Percentage
Residential	5,200	14
Commercial	1,500	4
Cemetery	5,500	15
Airport	7,700	21
Park	4,600	12
Industrial	13,000	34

1.3 Population

Current and projected populations of Detroit are obtained from the website of Southeast Michigan Council of Governments (SEMCOG) and are summarized in Table 1-2. With the ongoing downtown revitalization and development, population is projected to increase over the next 10 years. The estimated current population in the CCSS service area is 120,000, which is about 18.8 percent of Detroit's total population. The projected population in the service area as shown in the parentheses assumes this percentage will remine the same.

Table 1-2. Current and Projected Population of Detroit and CCSS Service Area			
2020	2025	2030	2040
638,140 (120,000)	631,668 (118,783)	640,533 (120,450)	675,608 (127,046)

1.4 Economic Characteristics

Detroit has an unemployment rate above regional averages. High unemployment rates have been a chronic problem in a ring surrounding the central business district. Compared to regional averages, the City has a relatively low percentage of its population employed in professional occupations and has a higher incidence of unskilled workers. Prime employment categories include civil service, banking, real estate, and insurance. The median household income was estimated by the U.S. Census Bureau as $30,894 in 2019.

1.5 Existing Facilities

The current horizontal alignment of CCSS is roughly 37,500 linear feet (LF) long. Most of the CCSS was constructed in the 1920s, primarily of cast-in-place concrete with upstream portions of the CCSS constructed from hand-laid brick. The size of the sewer varies which is described in detail in the following sections. The CCSS is one of the primary combined sewers in Detroit metropolitan area.

1.6 Fiscal Sustainability Plan

GLWA is compliant with the requirements and intent of the Fiscal Sustainability Plan (FSP) provisions of the Water Resources Reform and Development Act, which was submitted on January 1, 2014, and approved by MDEQ on January 17, 2014. GLWA is in the process of implementing the Asset Management Plant (AMP). Included in the AMP is GLWA's extensive registry and inventory of assets. Preventative, predictive, and corrective equipment maintenance is integral to the AMP, as is the funding mechanisms for repair and eventual equipment replacement.

The existing conditions of the assets related to this project, including location, size, and material, are described in Section 1.7 Need for the Project. The certification form of FSP will be included in the Appendix.

1.7 Need for the Project

The CCSS was inspected in 2018 and 2020. The inspections identified numerous structural and operation and maintenance (O&M) defects throughout the system. These defects are graded from 1 (least severe) to 5 (most severe) based on severity of the defect using the Pipeline Assessment and Certification Program (PACP) (Version 7) developed by National Association of Sewer Service Companies (NASSCO).

The inspection revealed infiltration drippers, runners, and gushers throughout. There were also locations where longitudinal cracking, surface exposure of reinforcement, grit and debris were observed. Every defect was reviewed for potential rehabilitation with a focus on:

- Grade 3 Infiltration Drippers
- Grade 4 Structural and O&M Defects
- Grade 5 Structural and O&M Defects

The most common defect observed in the CCSS is Grade 3 Infiltration Drippers, which may develop into Infiltration Runners and Gushers (Grade 4 and 5), if they are not repaired properly. These kinds of defects will increase the risks of basement backups and combined sewer overflows resulting structural damage to facilities (i.e., pipes and manholes) in the CCSS.

Grade 4 defects in this project typically include visible reinforcement, which is sign of structural failure of reinforced concrete pipe (RCP). Exposed reinforcement will be corroded quickly, resulting cracking or even holes along the sewer. If sediment, subgrade, or overburden soils are allowed to migrate into the sewer from those gaps, sink holes may open up to the ground surface.

Example of Grade 5 defects in this project is open holes on the pipe, which are considered very severe defects and need immediate attention. There are several critical transportation infrastructures and hospitals in the study area of this project, including Interstate I-94, Coleman A. Young International Airport and Conner Creek Health Center. In additional, the Chrysler Jefferson North Assembly Plants, who employs thousands of workers, and the Mt. Olivet Cemetery are of great importance to local and regional residents. The cost of reconstructing a failed sewer would be astronomical; and potential disruption to the residential, commercial, and industrial parties in the project corridor are significant, if no action is taken now.

In evaluating the need for the project, the CCSS is divided into five segments. The observed defects are summarized in tables followed the description of each segment.

1. Circular Sewer

Generally located in the ROW of Conner Street and Outer Drive East, this segment starts at the intersection of the 8 Mile Road and Bramford Street flowing southerly along Conner Street to the intersection of Conner Street and Outer Drive then continues down Outer Drive East terminating at the junction structure 200 feet west of the intersection of Outer Drive East and 7 Mile Road. The pipe material for this segment consists of RCP and brick. A portion of this segment (24 inches in diameter from Manhole ECN015 to ECN012) has previously been repaired using Cured-in-Place Pipe Lining (CIPP) and will not be considered for rehabilitation in this project. The remainder of the circular sewer is being considered for rehabilitation.

Table 1-3. Summary of Observed Defects in Circular Sewer

Pipe Section	Length (LF)	Material	Shape	Size (inch)	Defect Grade	Defect Description
ECN012-ECN010	193	Brick	Circular	42	4	116 feet Continuous Infiltration Runner
ECN010-ECN0A9	472	Brick	Circular	42	3 & 4	6 Infiltration Drippers 2 Infiltration Runners
ECN0A9-ECN009	317	Brick	Circular	42	3	200 feet Continuous Infiltration Dripper
	539	Brick	Circular	102		
ECN009-ECN008	983	Brick	Circular	102	3 to 5	500 feet Continuous Infiltration Dripper Heavy Settled Debris Root Intrusion Encrustation
ECN008-ECN007	288	Brick	Circular	102	3	Full-Length Continuous Infiltration Dripper
ECN007-ECNBT01	618	Brick	Circular	102	3	Full-Length Continuous Infiltration Dripper

Table 1-3. Summary of Observed Defects in Circular Sewer						
Pipe Section	Length (LF)	Material	Shape	Size (inch)	Defect Grade	Defect Description
ECN005-ECN004	630	RCP	Circular	144	3	Longitudinal Cracking Root Intrusion
	264	RCP	Circular	162	3	Longitudinal Cracking 3 Infiltration Drippers
ECN004-ECN003	994	RCP	Circular	162	3	9 Infiltration Drippers
ECN003-ECN002	883	RCP	Circular	162	3 & 4	45 Feet of Settled Debris 4 Longitudinal Cracks 5 Infiltration Drippers 2 Infiltration Runners
ECN002-ECN001	428	RCP	Circular	162	3	2 Longitudinal Cracks
ECN001-CON001	263	Brick	Circular	162	3 & 4	4 Infiltration Drippers 19 feet Surface Reinforcement Visible

2. Arch Sewer

Partially located within the Mount Olivet Catholic Cemetery starting at the junction structure 200 feet west of the intersection of Outer Drive East and 7 Mile Road proceeding south through the cemetery past East McNichols Road. This segment continues under Coleman A. Young International Airport approximately 250 feet west of Conner Street and terminating at the junction structure with the Double Barrel Sewer under the taxiway between Flanders Street and Glenfield Avenue.

Table 1-4. Summary of Observed Defects in Arch Sewer						
Pipe Section	Length (LF)	Material	Shape	Size	Defect Grade	Defect Description
CON001-CON002	240	RCP	Arch	19'-3" X 14'-1"	N/A	No defects observed
CON002-CON003	919	RCP	Arch	19'-3" X 17'-0"	3 & 4	1 Surface Reinforcement Visible with Spalling 4 Surface Reinforcement Visible 29 Infiltration Drippers 1 Infiltration Runner
CON003-CON004	911	RCP	Arch	19'-3" X 17'-0"	3 & 4	6 Surface Reinforcement Visible 1 Intruding Bar 28 Infiltration Drippers
CON004-CON005	972	RCP	Arch	19'-3" X 17'-0"	3 & 4	2 Surface Reinforcement Visible 1 Intruding Bar 21 Infiltration Drippers 1 Infiltration Runner
CON005-CON006	1,006	RCP	Arch	19'-3" X 17'-0"	3	1 Intruding Pipe 6 Infiltration Drippers

Table 1-4. Summary of Observed Defects in Arch Sewer						
Pipe Section	Length (LF)	Material	Shape	Size	Defect Grade	Defect Description
CON006-CON007	1,025	RCP	Arch	19'-3" X 17'-0"	3 & 4	1 Hole 13 Infiltration Drippers
CON007-CON008	561	RCP	Arch	23'-7" X 17'-0"	3 & 4	12 Infiltration Drippers 1 Infiltration Runner
CON008-CON011	1,850	RCP	Arch	24'-0" X 17'-8"	3	60 Infiltration Drippers
CON011-CON014	3,024	RCP	Arch	24'-0" X 17'-8"	3 & 4	39 Infiltration Drippers 1 Infiltration Runner
CON014-CON015	224	RCP	Arch	24'-0" X 17'-8"	3	2 Infiltration Drippers

3. Double Barrel Sewer

Generally located parallel to Conner Street starting under the south runway of Coleman A. Young International Airport and proceeding southeast under the Interstate Highway I-94 and Conner Street interchange. This segment then continues within the Conner Street ROW until approximate 300 feet south of the intersection with Warren Avenue where the Double Barrel Sewer joins with the Triple Barrel Sewer at a junction chamber.

Table 1-5. Summary of Observed Defects in Double Barrel Sewer						
Pipe Section	Length (LF)	Material	Shape	Size	Defect Grade	Defect Description
East Barrel						
CON015-CON015B	794	RCP	Rectangular	12'-0" X 17'-8"	3 & 4	6 Surface Reinforcement Visible with Spalling 10 Infiltration Drippers
CON015B-CON016	1,010	RCP	Rectangular	12'-0" X 17'-8"	3 to 5	24 Surface Reinforcement Visible with Spalling 1 Intruding Pipe 15 Infiltration Drippers 1 Infiltration Runner 1 Infiltration Gusher w/ Hole Void Visible
CON016-CON018	970	RCP	Rectangular	12'-0" X 17'-6"	3 & 4	30 Surface Reinforcement Visible with Spalling 1 Infiltration Dripper
CON018-CON020	884	RCP	Rectangular	12'-0" X 17'-6"	3 & 4	21 Surface Reinforcement Visible with Spalling 5 Infiltration Drippers
CON020-CON022	1,004	RCP	Rectangular	12'-0" X 17'-6"	3 & 4	25 Surface Reinforcement Visible with Spalling 5 Infiltration Drippers 1 Infiltration Runner
CON022-CON024	989	RCP	Rectangular	12'-0" X 17'-6"	3 & 4	19 Surface Reinforcement Visible with Spalling 4 Infiltration Drippers

Table 1-5. Summary of Observed Defects in Double Barrel Sewer						
Pipe Section	Length (LF)	Material	Shape	Size	Defect Grade	Defect Description
CON024-CON026	1,000	RCP	Rectangular	12'-0" X 17'-6"	3 & 4	14 Surface Reinforcement Visible with Spalling 10 Infiltration Drippers
CON026-CON028	992	RCP	Rectangular	12'-0" X 17'-6"	3 & 4	33 Surface Reinforcement Visible with Spalling 17 Infiltration Drippers 2 Infiltration Runners
CON028-CON030	900	RCP	Rectangular	12'-0" X 17'-6"	3 & 4	40 Surface Reinforcement Visible with Spalling 17 Infiltration Drippers
CON030-CON032	870	RCP	Rectangular	12'-0" X 17'-6"	3 & 4	25 Surface Reinforcement Visible with Spalling 16 Infiltration Drippers
CON032-CON034	1,079	RCP	Rectangular	12'-0" X 17'-6"	3 & 4	3 Surface Reinforcement Visible with Spalling 8 Infiltration Drippers
West Barrel						
CON015A-CON017	1,005	RCP	Rectangular	12'-0" X 17'-8"	3 & 4	32 Surface Reinforcement Visible with Spalling 14 Infiltration Drippers 2 Infiltration Runners
CON017-CON019	890	RCP	Rectangular	12'-0" X 17'-6"	3 & 4	22 Surface Reinforcement Visible with Spalling 10 Infiltration Drippers
CON019-CON021	1,117	RCP	Rectangular	12'-0" X 17'-6"	3 & 4	6 Surface Reinforcement Visible with Spalling 7 Infiltration Drippers 1 Infiltration Runner
CON021-CON023	1,017	RCP	Rectangular	12'-0" X 17'-6"	3 & 4	4 Surface Reinforcement Visible with Spalling 10 Infiltration Drippers 2 Infiltration Runners
CON023-CON025	1,040	RCP	Rectangular	12'-0" X 17'-6"	3 & 4	4 Surface Reinforcement Visible with Spalling 30 Feet of Longitudinal Fracture 8 Infiltration Drippers
CON025-CON027	1,045	RCP	Rectangular	12'-0" X 17'-6"	3 & 4	1 Surface Reinforcement Visible with Spalling 7 Infiltration Drippers
CON027-CON029	924	RCP	Rectangular	12'-0" X 17'-6"	3 & 4	34 Surface Reinforcement Visible with Spalling 14 Infiltration Drippers
CON029-CON031	762	RCP	Rectangular	12'-0" X 17'-6"	3 & 4	43 Surface Reinforcement Visible with Spalling 13 Infiltration Drippers 1 Infiltration Runner

Table 1-5. Summary of Observed Defects in Double Barrel Sewer						
Pipe Section	Length (LF)	Material	Shape	Size	Defect Grade	Defect Description
CON031-CON033	902	RCP	Rectangular	12'-0" X 17'-6"	3 & 4	14 Surface Reinforcement Visible with Spalling 13 Infiltration Drippers
CON033-CON034	1,003	RCP	Rectangular	12'-0" X 17'-6"	3 & 4	4 Surface Reinforcement Visible with Spalling 7 Infiltration Drippers 2 Infiltration Runners

4. Triple Barrel Sewer

Located within the Conner Street ROW from approximately 300 feet south of the intersection with Warren Avenue flowing southeast until the sewer diverges with Conner Street at Kercheval Avenue. This segment then flows through the Chrysler Jefferson North Assembly Plant property until the alignment converges into a double barrel sewer, approximately 1,000 feet upstream of the Connors Creek Pump Station.

Table 1-6. Summary of Observed Defects in Triple Barrel Sewer						
Pipe Section	Length (LF)	Material	Shape	Size	Defect Grade	Defect Description
East Barrel						
CON034-TBE01	883	Concrete	Rectangular	15'-9" X 17'-6"	3 & 4	2 Surface Reinforcement Visible 18 Infiltration Drippers
TBE01-TBE02	1001	Concrete	Rectangular	15'-9" X 17'-6"	3 & 4	1 Surface Reinforcement Corroded 11 Infiltration Drippers
TBE02-TBE03	998	Concrete	Rectangular	15'-9" X 17'-6"	3 & 4	1 Surface Reinforcement Visible 17 Infiltration Drippers
TBE03-TBE04	1178	Concrete	Rectangular	15'-9" X 17'-6"	3 to 5	34 Infiltration Drippers 1 Surface Reinforcement Visible Intruding Tap
TBE04-TBE05	1003	Concrete	Rectangular	15'-9" X 17'-6"	3	11 Infiltration Drippers
TBE05-TBE06	893	Concrete	Rectangular	15'-9" X 17'-6"	3	7 Infiltration Drippers
TBE06-TBE07	686	Concrete	Rectangular	15'-9" X 17'-6"	3	8 Infiltration Drippers
TBE07-TBE08	316	Concrete	Rectangular	15'-9" X 17'-6"	3 & 4	4 Infiltration Drippers Hole
TBE08-TBE09	670	Concrete	Rectangular	15'-9" X 17'-6"	3 & 4	12 Infiltration Drippers Hole
TBE09-TBM11	908	Concrete	Rectangular	15'-9" X 17'-6"	3	6 Infiltration Drippers
Middle Barrel						

Table 1-6. Summary of Observed Defects in Triple Barrel Sewer						
Pipe Section	Length (LF)	Material	Shape	Size	Defect Grade	Defect Description
CON034-TBM01	879	Concrete	Rectangular	15'-9" X 17'-6"	3 & 4	2 Surface Reinforcement Visible 18 Infiltration Drippers 100 LF of Debris
TBM01-TBM02	992	Concrete	Rectangular	15'-9" X 17'-6"	3 & 4	17 Infiltration Drippers Hole
TBM02-TBM03	985	Concrete	Rectangular	15'-9" X 17'-6"	3 & 4	1 Surface Reinforcement Visible 13 Infiltration Drippers
TBM03-TBM04	1166	Concrete	Rectangular	15'-9" X 17'-6"	3	23 Infiltration Drippers
TBM04-TBM05	996	Concrete	Rectangular	15'-9" X 17'-6"	3	10 Infiltration Drippers
TBM05-TBM06	898	Concrete	Rectangular	15'-9" X 17'-6"	3	5 Infiltration Drippers
TBM06-TBM07	682	Concrete	Rectangular	15'-9" X 17'-6"	3	9 Infiltration Drippers
TBM07-TBM08	286	Concrete	Rectangular	15'-9" X 17'-6"	3	2 Infiltration Drippers
TBM08-TBM09	191	Concrete	Rectangular	15'-9" X 17'-6"	3	5 Infiltration Drippers
TBM09-TBM10	541	Concrete	Rectangular	15'-9" X 17'-6"	3	10 Infiltration Drippers
West Barrel						
CON034-TBW01	862	Concrete	Rectangular	15'-9" X 17'-6"	3 & 4	2 Surface Reinforcement Visible 9 Infiltration Drippers
TBW01-TBW02	996	Concrete	Rectangular	15'-9" X 17'-6"	3 & 4	1 Surface Reinforcement Visible 1 Intruding Pipe 18 Infiltration Drippers
TBW02-TBW03	981	Concrete	Rectangular	15'-9" X 17'-6"	3 & 4	2 Surface Reinforcement Visible 18 Infiltration Drippers
TBW03-TBW04	1179	Concrete	Rectangular	15'-9" X 17'-6"	3	30 Infiltration Drippers
TBW04-TBW05	1004	Concrete	Rectangular	15'-9" X 17'-6"	3	1 Intruding Tap 14 Infiltration Drippers
TBW05-TBW06	909	Concrete	Rectangular	15'-9" X 17'-6"	3	12 Infiltration Drippers
TBW06-TBW07	683	Concrete	Rectangular	15'-9" X 17'-6"	3 & 4	3 Surface Reinforcement Visible 7 Infiltration Drippers
TBW07-TBW08	286	Concrete	Rectangular	15'-9" X 17'-6"	3 & 4	1 Surface Reinforcement Visible 3 Infiltration Drippers
TBW08-TBW09	746	Concrete	Rectangular	15'-9" X 17'-6"	3 & 4	7 Surface Reinforcement Visible 15 Infiltration Drippers

5. Pump Station Double Barrel Sewer

Located on the southern portion of the Chrysler Jefferson North Assembly Plant property. This double barrel sewer is the final 1,000 feet before reaching the Connors Creek Pump Station. Inspection of this portion of sewer show minor infiltration and limited structural defects. It is recommended that GLWA should continue monitoring this segment for possible future improvement.

Typical and selected defect photos are shown below:

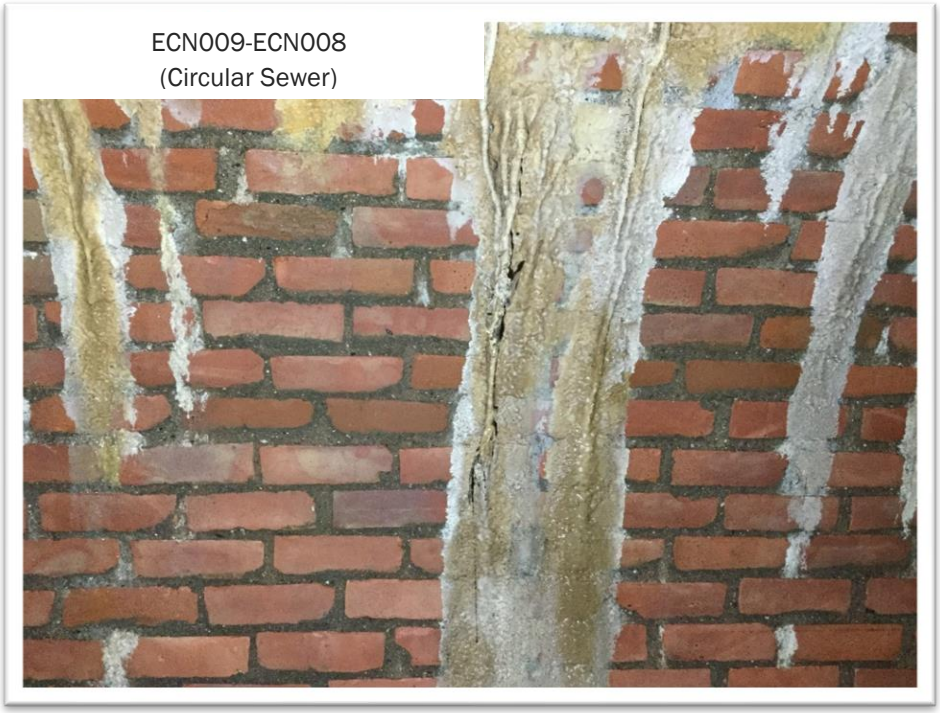


Figure 1-10. Typical Defect - Infiltration Dripper in Brick Sewer

Figure 1-11. Typical Defect - Surface Damage Reinforcement Visible with Spalling

Figure 1-12. Typical Defect - Infiltration Runner

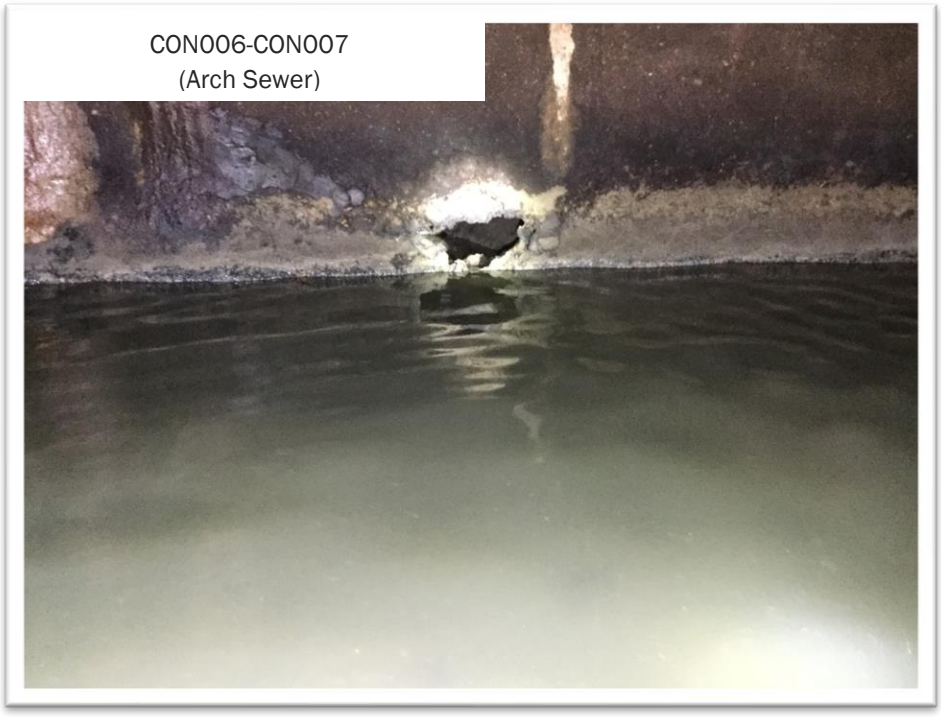


Figure 1-13. Typical Defect - Hole in Sewer Wall

Based on the average age of the CCSS at 100 years and the observed defects, it is recommended that the rehabilitation project needs to be performed to prevent asset failure and extend the useful life of this critical combined sewer system.

1.7.1 Compliance Status

A copy of GLWA's current National Pollutant Discharge Elimination System (NPDES) permit will be included in the final project plan.

1.7.2 Orders

There are no known orders, such as for court, federal or state enforcement, and administrative consent, associated with this project.

1.7.3 Water Quality Problems

There are no known water quality problems associated with this project.

1.7.4 Projected Needs for the Next 20 Years

Considering the age of the CCSS, it is recommended to be monitored and/or inspected in a revolving five-year maintenance program to identify future facility needs.

1.7.5 Future Environment without the Proposed Project

Generally, the defects are expected to worsen if no action is taken, which will increase the risk of failure of this aged sewer system. There are several critical transportation infrastructures and hospitals in the study area of this project, including Interstate I-94, Coleman A. Young International Airport and Conner Creek Health Center. In additional, the Chrysler Jefferson North Assembly Plants, who employs thousands of workers, and the Mt. Olivet Cemetery are of great importance to local and regional residents. The direct consequences of sewer failure include the development of sinkholes and service interruptions. During the service interruptions and emergency repairs, the transportation, medical, and working access of the residents may be limited. Depending on the time required to restore normal services, there may be increasing negative impacts to public health.

Section 2

Analysis of Alternatives

Three alternatives are analyzed in the project plan. The no-action alternative (Alternative 1) is required to be evaluated by the preparation guidance of this project plan. Alternative 2 is to repair the identified defects before they worsen and become more costly to fix. Alternative 3 is a full replacement of the CCSS.

2.1 Alternative 1 – Status Quo (No Action)

As stated in the previous sections, the CCSS was originally constructed about 100 years ago; and defects of varying severity have been identified in recent inspections. The defects are expected to worsen if no action is taken, which will increase the risk of failure of this aged sewer system. The CCSS services an area of approximately 25 square miles with approximately 120,000 residents; and the consequences of its failure are significant, including the development of sinkholes, service interruptions and negative impact to public health. Therefore, the alternative of no-action is not recommended.

2.2 Alternative 2 – Defect Repairs

The second alternative is to repair those defects. This alternative will utilize rehabilitation technologies to repair the defects based on their location and severity. The implementation of the rehabilitation work will require temporary flow bypass, traffic detour and construction of access structures. The selection of the rehabilitation technologies considers their effectiveness of addressing the defects and has a goal to minimize above ground impacts during construction. Alternative 2 is the selected alternative as it is the most economic and effective way to prolong the service life and prevent future failure of the CCSS while limiting risk of combined sewer overflows and basement backups.

Several rehabilitation technologies were evaluated by the project design team. Rehabilitation technologies were chosen for this project to satisfy the following criteria:

- Successful installations in the United States
- Infiltration/Inflow reduction
- Ability to install in dry weather without significant bypass pumping

Other considerations for comparing rehabilitation alternatives include applicability to the pipe material, application on wet, marginally cleaned surfaces, and ability to be completed within the available time windows during dry weather. The recommended rehabilitation technologies include the following:

- Heavy Debris Cleaning
- Cured-in-Place Pipe Lining (CIPP)
- Sliplining
- Chemical Grouting
- Shotcrete Spot Repairs

2.3 Alternative 3 – Full Replacement

The full replacement alternative will not only address all defects but also provide an opportunity to utilize the newest technologies in design, construction, O&M to recreate a more efficient and environment friendly system. Generally, the Full replacement of the CCSS will include the following tasks:

- Creating a bypass system, which may require rerouting current flow to other sewer systems and/or constructing a temporary piping system.
- Shutdown to make connections to the bypass system.
- Removal of the old sewer system and construction of new sewer system.
- Shutdown to make connections to the new sewer system, and removal of the bypass system.

The cost estimation is ongoing for this alternative and it will be included in the final project plan. The cost may be a key reason that this alternative is not favorable. In addition to the cost, the following issues can make this alternative not practical to implement:

- Comparing to a rehabilitation project, the full replacement will require significantly larger area of construction disturbance, staging and a bypass system, the availability of which can be very limited in a well-developed urban area.
- Open excavations for sewer replacement and temporary service interruptions are expected. However, these may not be acceptable to critical infrastructures along the current alignment of the CCSS, including but not limited to Interstate I-94, Coleman A. Young International Airport, Conner Creek Health Center, and the Chrysler Jefferson North Assembly Plants.
- In addition to these impacts, approximately a mile of the CCSS passes through the Mt. Olivet Cemetery. A replacement sewer would require relocating hundreds of graves located over the existing pipeline. The social cost of this eventuality is presumed to be unacceptable, especially compared to relatively minor repairs to the existing sewer conducted from within the pipe (Alternative 2).

Considering the aforementioned reasons, Alternative 3 is ruled out from further considerations.

Section 3

Selected Alternative

3.1 Summary of the Alternative Design

The project design team considered pipe size, pipe shape, construction access, flow control, type, and amount of pipe defects to determine the recommended rehabilitation alternative for different segments within the CCSS.

The recommended rehabilitation work will address all defects in Grade 4 and 5. Grade 3 Infiltration Drippers are also included due to the following reasons:

- The CCSS is about 100 years old. The continued deterioration of defects is expected to accelerate faster than newer systems. As mentioned in Section 1.7, Grade 3 Infiltration Drippers can soon develop into Infiltration Runners and Gushers (Grade 4 and 5).
- Construction of any types, including rehabilitation, emergency repair and replacement, will have adverse impacts to critical infrastructures along the CCSS such as Interstate I-94, Coleman A. Young International Airport, Mt. Olivet Cemetery, and Conner Creek Health Center. Addressing infiltration drippers (Grade 3) at the same time of Grade 4 and 5 defects will reduce the frequency of any adverse impacts.
- The large size limited access points of most of the CCSS will require significant mobilization cost and effort to reach defects that are in the ceiling or high (over 6 feet above the floor) to make repairs. Addressing the Grade 3 defects at the same time as the Grade 4 and 5 defects will add only incremental cost immediately and will defer repeating these high mobilization costs for at least 10 more years.

Table 3-1 summarizes the recommended rehabilitation work for the CCSS. See Appendix A Base Maps for project maps.

Table 3-1. Summary of Recommended Rehabilitation at CCSS

Area	Size	Linear Feet (LF)	Recommendation	Reason
Circular Sewer	42”/102”	1,100	Heavy Cleaning	Heavy debris/grit
	42”	990	CIPP	Excessive infiltration, relatively small diameter brick sewer
	102”/162”	3,300	Slipline	Excessive infiltration, large diameter brick sewer
	144”/162”	1,630	Chemical Grout	Infiltration drippers and runners
Arch Sewer	Varies	11,000	Chemical Grout	Infiltration drippers and runners
		N/A	Remove Obstruction	3 intruding pipes
Double Barrel	12’-0” X 17’-6”	13,317	Chemical Grout	Infiltration drippers and runners
		5,732	Shotcrete Spot Repair	Spalling and surface reinforcement visible

Table 3-1. Summary of Recommended Rehabilitation at CCSS				
Area	Size	Linear Feet (LF)	Recommendation	Reason
		N/A	Remove Obstruction	1 intruding obstruction
Triple Barrel	15'-9" X 17'-6"	100	Heavy Cleaning	Heavy debris
		7,730	Chemical Grout	Infiltration drippers
		4,200	Shotcrete Spot Repair	Surface reinforcement visible, holes
		N/A	Remove Obstruction	4 Intruding taps/obstructions
		15,900	Continue Monitoring	Pipe did not have major defects
Pump Station Double Barrel	15'-9" X 17'-6"	2,000	Continue Monitoring	Pipe did not have major defects

The primary defect within the CCSS is infiltration of varying severity. Based on this finding, the design team started the alternatives analysis by assuming all segments would receive chemical grout as the baseline rehabilitation method. Several reaches in the CCSS have minimal infiltration and other defects. In these reaches, it is most cost effective to forego chemical grouting and continue to monitor for need of repair in the future. For smaller pipes in the system, such as the circular segments at the upstream end of the project, CIPP lining and sliplining were considered as the preferred way to eliminate infiltration plus structurally rehabilitating the sewer to extend its useful life. In larger pipes with structural defects where CIPP is not viable and sliplining would not be cost effective, either continuous or spot repairs using shotcrete is recommended. In addition, the design team recommended removing the obstructions in the double and triple barrel segments and heavy cleaning of the debris the circular sewers.

3.2 Bypass Pumping Considerations

Some of the rehabilitation technologies considered for this project will require bypass pumping of all flow or at least some flow control for proper application. Generally, the dry weather flow in the CCSS is low enough for chemical grouting, sliplining, and shotcrete spot repair applications. However, dry weather flow will still need to be conveyed for the CIPP installation in the 42-inch circular sewer from 8 Mile Road to Savage Avenue. Results of hydraulic analyses will be used during the preliminary design phase to determine anticipated flow levels for both dry and wet weather. Extreme wet weather flow will restrict the ability of construction crews to work within the sewer.

Temporary bypass pumps will need to be set up in the median of 8 Mile Road near Conner Street to convey the flow within the 42-inch circular sewer during rehabilitation. The depth of the sewer may require submersible electrically or hydraulically driven pumps; and the pumps could potentially be installed in the existing meter station in the median. The bypass system would need to be monitored continuously and supplemented by a contingency plan for wet weather and redundancy operating conditions. Any bypass piping will be buried at roadway crossing for protection of the piping and to minimize traffic disturbance. Finally, noise and nighttime lighting abatement measures must be employed to minimize potential impacts to the stakeholders in the area.

3.3 Maintaining Operations during Construction

Most of the rehabilitation work will be accomplished during dry weather without interruption of normal operations of the CCSS. Chemical grouting and spot repairs will be accomplished by manned entry at low flow periods, and work will take place above the water level. Fresh air ventilation may be required to provide a safe atmosphere within the sewer. All materials and equipment will be removed from the sewer unless rehabilitation activities are ongoing. Incomplete work will be secured to prevent damage during wet weather.

Cleaning operations may also be interrupted by wet weather, but to a less extent than the rehabilitation work. It is expected that the equipment utilized for cleaning will be set up on the ground and will remain in place until the completion; and it will not be removed during wet weather events. Depending on the intensity of the event, cleaning equipment within the sewer (if any) may need to be removed.

3.4 Project Schedule

The design of this project is underway and is expected to be finished in October 2021. The current project schedule is as follows.

Table 3-2. Project Schedule

Item	Date
Design Notice to Proceed	06/10/2020
50% Design	05/03/2021
90% Design	08/02/2021
100% Design	10/04/2021
Bid Opening	01/03/2022
Construction Notice to Proceed	03/22/2022
Construction Substantial Completion	03/11/2024
Construction Final Completion	04/05/2024

3.5 Project Cost

Construction cost for the rehabilitation of the CCSS by the recommended rehabilitation methods is estimated to be $34,377,700, which is a Class 3 cost estimate for budgetary purposes as defined by American Association of Cost Engineering International. The cost carries an expected accuracy range of (-) 20 to (+) 30 percent.

In addition to the construction cost, the total project cost also includes:

- Design = $945,463
- Planning = $471,656
- Construction Administration = $1,014,941

The total project cost is $36,809,760.

3.6 Authority to Implement the Selected Alternative

GLWA is a regional utility with broad statutory authority. GLWA has entered contracts with its suburban customers, which establish the terms and conditions for receiving and treating wastewater and overseeing the operation and maintenance of the system. GLWA has substantial experience in the financing of capital improvements under a variety of programs. It has a proven track record for using system revenues to retire its debt on new facilities. GLWA is responsible for the legal, financial, and managerial aspects of the CCSS, and will be the loan applicant for the proposed project.

3.7 User Cost

The costs of capital improvements are spread out over the entire customer base served by GLWA. The user cost for this project is determined using the following equation:

$$A = PW \times \left[\frac{i \times (1+i)^n}{(1+i)^n - 1}\right]$$

Where:

$$A = Equivalent\ Annual\ Cost$$

$$PW = Present\ Worth = Total\ Project\ Cost = \$36{,}809{,}760$$

$$i = SRF\ Interest\ Rate = 2\%$$

$$n = Term\ of\ SRF = 20\ years$$

Therefore, the equivalent annual cost is $2,251,164.

According to the 2020 GLWA Wastewater Master Plan, there is approximately 2.8 million residents between 2018 and 2045 in the GLWA regional service area.

The number of persons per household in Michigan was estimated by the U.S. Census Bureau as 2.47 in 2019. The estimated number of households that will be impacted by this project is estimated to be 1.13 million.

The per household user cost is $1.99 per year.

Section 4

Environmental Impacts

The environmental setting for the proposed project is within the city limits and will be done in local urban neighborhoods. There is minimal environmental impact as the majority of work will occur within the public ROW, where multiple utilities and infrastructure already exists.

The review of cultural resources has not been completed at the time of this draft. They will be evaluated and included in the final project plan.

4.1 Direct Impacts

The proposed improvements will improve GLWA's capability to operate a reliable sewer collection system, reducing sewer backups into the property of end users, avoiding catastrophic sinkholes from sewer collapses and increase efficiency at local and regional wastewater facilities. Implementation of the improvements will also generate construction-related jobs, and local contractors will have an opportunity to bid contract work. Most of the work to be constructed with this project will be underground, minimizing disruption to the existing natural and cultural features, and to the end users. Noise and dust will be generated during construction of the proposed improvements. The contractor will be required to implement efforts to minimize noise, dust, and related temporary construction byproducts. Street congestion and disruption of vehicular movement may occur for short periods of time on the roads where work is actively being done. For work resulting in the need to have open trenches, and spoils from open trenches will be subject to erosion; the contractor will thereby be required to implement a Soil Erosion and Sedimentation Control (SESC) program. Underground utility service inside the project area may be interrupted occasionally for short periods of time. The aesthetics of the area will be temporarily affected until restoration is complete.

The short-term adverse impacts associated with construction activities will be minimal, and will be mitigated, in comparison to the resulting long-term beneficial impacts. Short-term impacts include traffic disruption, dust, noise, and site aesthetics. No adverse long-term impacts are anticipated.

The impact of the proposed project on irreversible and irretrievable commitment of resources includes materials utilized during construction and fossil fuels utilized to implement project construction.

As discussed in Section 3.7, the impact of financing the project through the SRF loan program is expected to increase the user cost. However, the actual rate determination will be based on a variety of factors that encompass the delivery of comprehensive services by GLWA to its customers.

4.2 Indirect Impacts

It is not anticipated that the proposed project will alter the ongoing pattern of growth and development in the study area as these neighborhoods are fully developed. Growth patterns in the service area are subject to local use and zoning plans, thus providing further opportunity to minimize indirect impacts.

4.3 Cumulative Impacts

Improved reliability, efficiency, and the ability to safely convey storm and sanitary flows to the downstream wastewater facilities are the primary cumulative beneficial impacts anticipated from the implementation of the proposed project.

Section 5

Mitigation

The mitigations of unavoidable adverse impacts are discussed in this section. Details of mitigation will be further specified in the construction contact documents used for the project.

5.1 Mitigation of Short-Term Impacts

Short-term impacts due to construction activities such as noise, dust and minor traffic disruption cannot be avoided. However, most of the work will be performed within the sewer underground and that will mitigate most short-term construction impacts to the community and business along the project corridor.

In areas where there will be constriction activities above ground, efforts will be made to minimize the adverse impacts by use of thorough design and well-planned construction sequencing. Noise from equipment cannot be avoided, but hours of work can be controlled. Dust and soil deposits on the streets can be controlled though watering and construction area sweeping. Construction area footprints will be minimized, and traffic control measures can be utilized. Site restoration will minimize the adverse impacts of construction, and the implementation of a SESC program will minimize the impacts due to ground disturbance, when such disturbance is found to be necessary. Specific techniques will be specified in the construction contract documents.

5.2 Mitigation of Long-Term Impacts

Adverse long term impacts due to the proposed project are not anticipated. The aesthetic impacts of construction within the boundaries of the project area will be mitigated by site restoration.

5.3 Mitigation of Indirect Impacts

In general, it is not anticipated that mitigative measures to address indirect impacts will be necessary for the proposed project. The proposed improvements are located within a fully developed urban area, and they are not expected to promote pullulation or economic growth. Therefore, indirect impacts are not likely to be a concern for these improvements.

Section 6

Public Participation

The project design team has identified municipalities, agencies, and government entities that may regulate the work or require permits for the proposed construction. Other stakeholders or interested parties, who may be impacted by the rehabilitation operations, are also identified. Communications will be made continuously through the design and construction of the project.

A key and required component of the public participation will be a public hearing. The public hearing advertisement, transcript and comments will be included in Appendix C of the final project plan.

Appendix A: Base Maps

Bypass pumping from manholes or meter station in median of 8 Mile Road and Conner Street

ECN012

ECN013

ECN011

ECN010

CIPP line out of ECN010 continuously north to ECN013 and south to ECN0A9.

Connor Creek Sewer
Cross Section = Circular
Size = 3'-6"
Material = Brick
Year Built = Unknown

Bypass pumping of lateral flows during installation of CIPP liner.

ECN0A9

CIPP line from ECN0A9 south to transition from 42" to 102" at Savage Avenue.

4 ft Connection

Transition from 42" circular brick to 102" circular brick.

33 in Connection

33 in Connection

Transition from 42" circular brick to 102" circular brick.

Connor Creek Sewer
Cross Section = Circular
Size = 8'-6"
Material = Brick
Year Built = 1930

15 in Connection

Sliplining access pit. Use for slipline termination or pushing both directions to transition or ECN008.

ECN009

Larger lateral connections will require bypass pumping until connection is reestablished in the sliplined pipe.

3.5 ft Connection

12 in Connection

ECN008

24 in Connection

Sliplining access pit. For use as pushing pit north to ECN009 and south to ECNBT01.

ECN007

Stotter
Van Dyke
Savage
8 Mile
Bramford
Terrell
Veach
Conner
Monitor
Outer
Sirron
LEWISDIANA M
LOCAL 17
ROBERT JEMAL T
TARGET CORPORATION
DEVELOPERS DIVERSIFIED
ATU LLC
NDNI ELDERLY LDHA L.P
CONNOR CREEK ELDERLY LDHA LLP
GOOD HANDS TRANSPORTATION
ST JOHN N E COMMUNITY HOSPITAL
HUD
RIO LLC

1 2 3 4 5 6 7 8 9 10 11 12 13

Connor Creek Sewer Base Maps

- Connor Creek Sewer
- Sewers within 100 feet of Connor Sewer Segment
- Sewers 100 feet Outside of Connor Sewer Segment
- Connection to Connor Creek Sewer (drawing available)
- Manhole
- 100 feet Buffer
- Connection to Connor Creek Sewer (drawing not available)

0 250 500 Feet

WADE TRIM

Brown AND Caldwell

NTH

Sliplining access pit. For use as pushing pit north to ECN009 and south to ECNBT01.

ECN007

15 in Connection

6 ft Connection

Larger lateral connections will require bypass pumping until connection is reestablished in the sliplined pipe.

Access for Chemical Grouting of DWSD Sirron Street 144" sewer.

ECN005

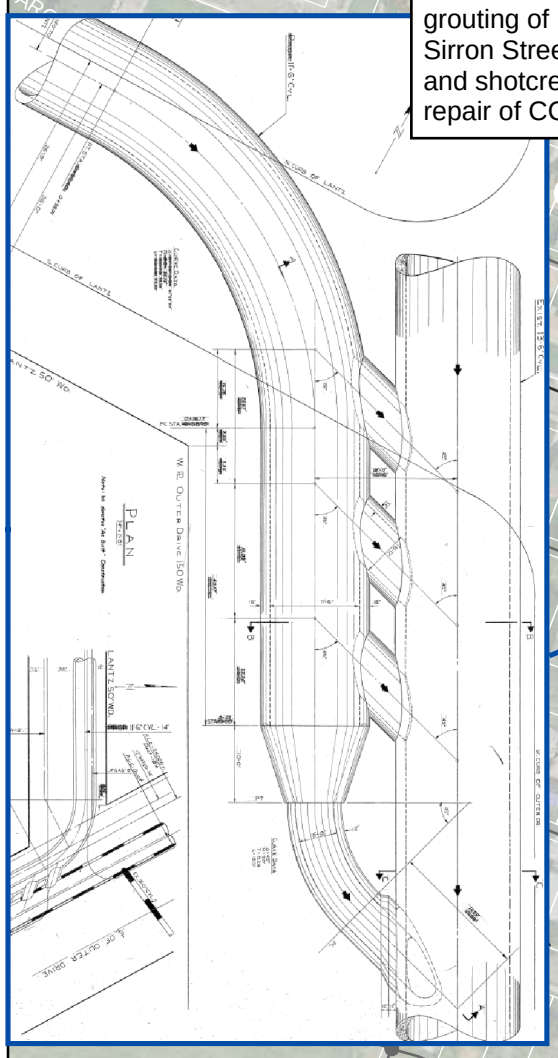
Connor Creek Sewer
Cross Section = Circular
Size = 8'-6"
Material = Brick
Year Built = 1930

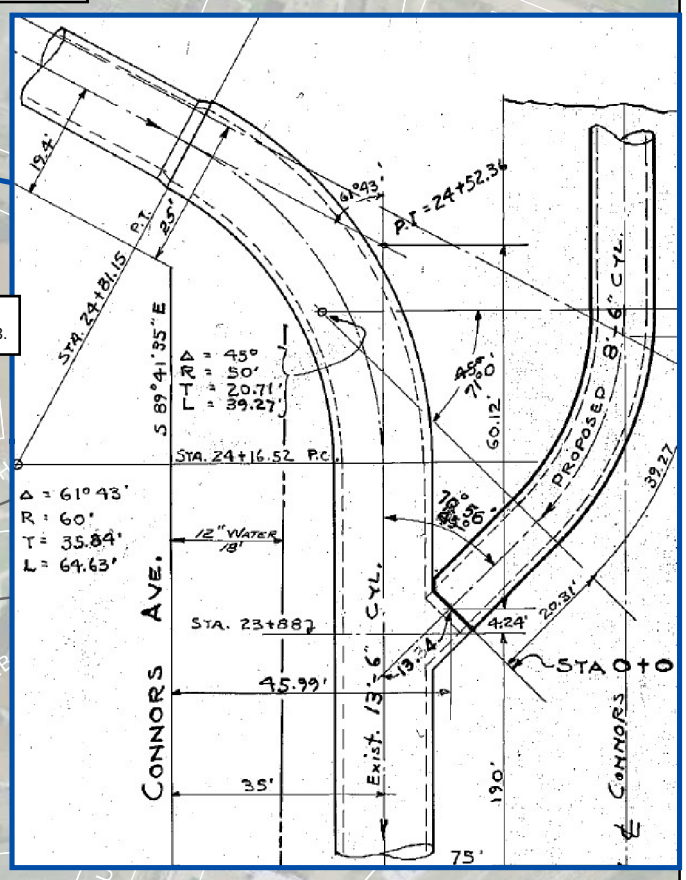
12 ft Connection

Terminate slipline here at start of curved section. Begin shotcrete spot repair of sewer in curved portion of sewer.

Access for chemical grouting of DWSD Sirron Street sewer and shotcrete spot repair of CCSS.

ECNBT01





Connor Creek Sewer
Cross Section = Circular
Size = 13'-6"
Material = Concrete
Year Built = 1928

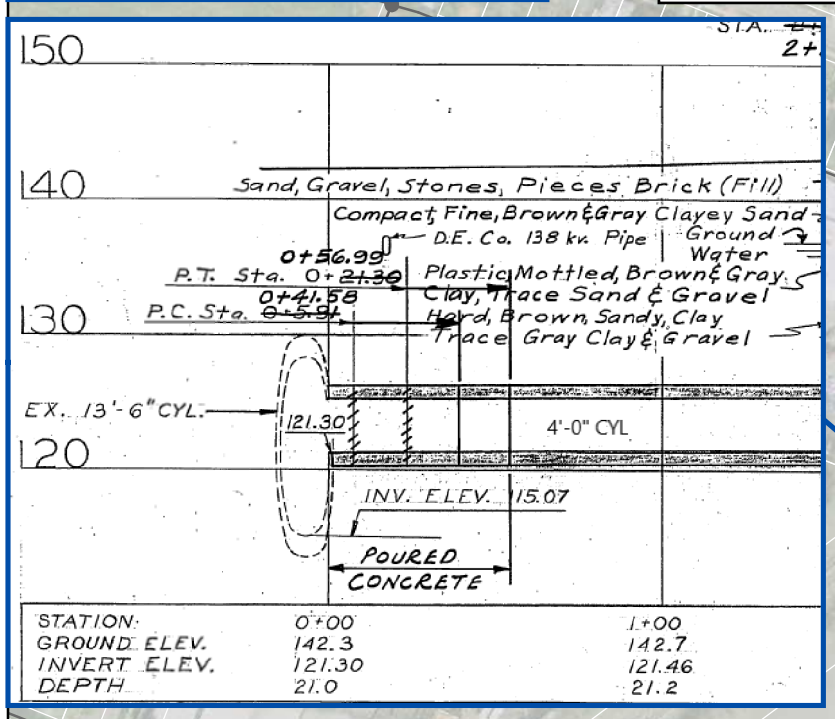
ECN004

Access to CCSS for chemical grouting from ECN004 to ECN003.

11.5 ft Connection

36 in Connection

Additional Access Pit #1. Located in green space west of Outer Drive.



ECN003

Access to CCSS for chemical grouting from ECN004 to ECN003.

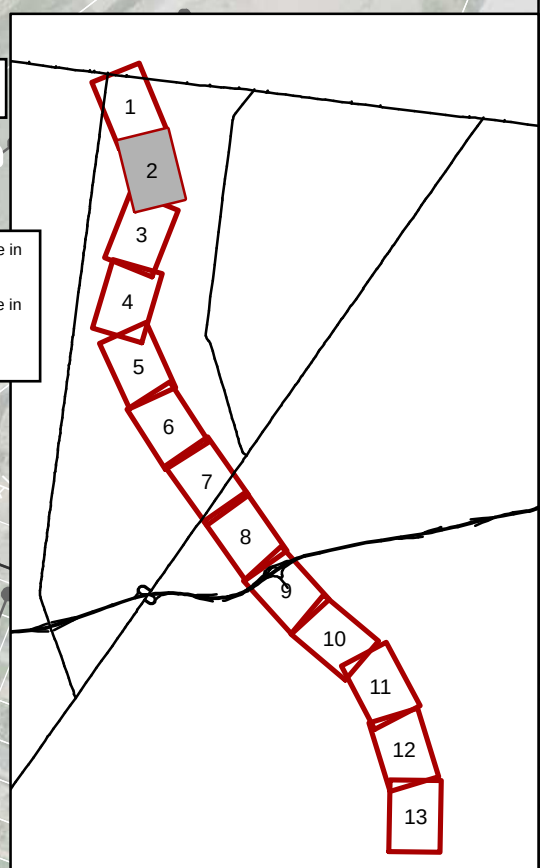
21 in Connection

Start point of sliplined pipe in previous project.

Connor Creek Sewer
Curved section has been sliplined with 11'-0" pipe

Termination point of sliplined pipe in previous project.

Begin of new 132" or 144" slipline in 162". Access Pit - in NB lane of Outer Drive. Use only for slipline termination.



4 ft Connection

Connor Creek Sewer
Cross Section = Circular
Size = 13'-6"
Material = Concrete
Year Built = 1928

ECN002

Maintain access to local businesses during construction.

Connor Creek Sewer Base Maps

- Connor Creek Sewer
- Sewers within 100 feet of Connor Sewer Segment
- Sewers 100 feet Outside of Connor Sewer Segment
- Connection to Connor Creek Sewer (drawing available)
- Manhole
- 100 feet Buffer
- Connection to Connor Creek Sewer (drawing not available)

N

0 250 500 Feet

WADE TRIM

Brown AND Caldwell

NTH

Sliplining Insertion Pit - NB lanes of Outer Drive. Use for insertion and pushing of slipline pipe.

Sewer
Cross Section = Circular
Size = 13'-6"
Material = Concrete
Year Built = 1926

11.5 ft Connection

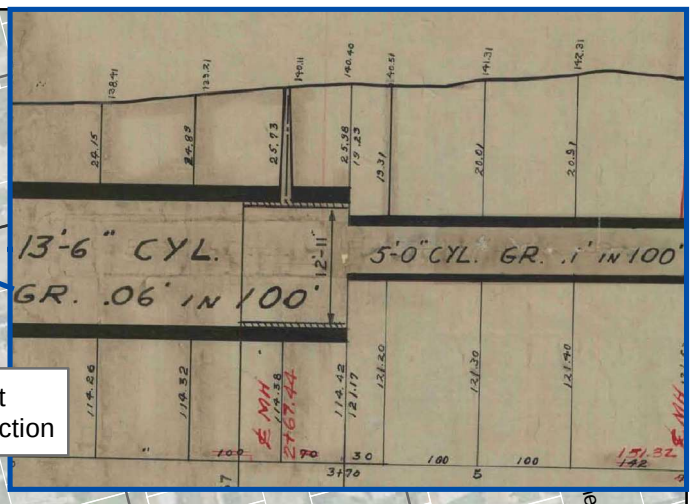
13 ft Connection

ECN001

CON001

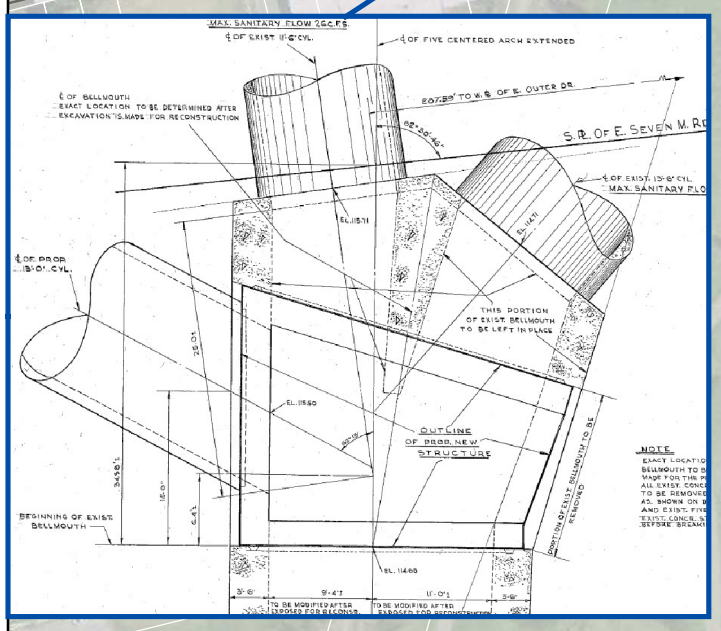
4 ft Connection

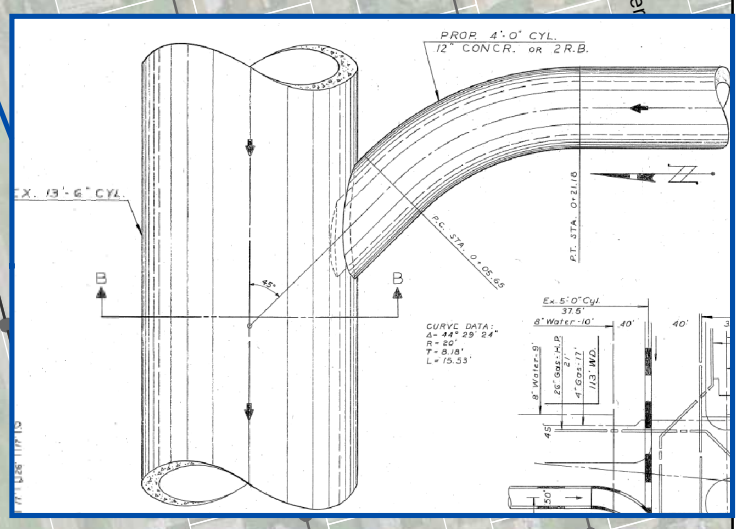
5 ft Connection



Connor Creek Sewer
Cross Section = 5 Centered Arch
Size = 19'-3" x 14'-1"
Material = Concrete
Year Built = 1928

CON002





12 in Connection

12 in Connection

12 in Connection

Access to CCSS for chemical grouting through CON001 through CON015

CON003

12 in Connection

MT OLIVET CEMETERY

24 in Connection

12 in Connection

24 in Connection

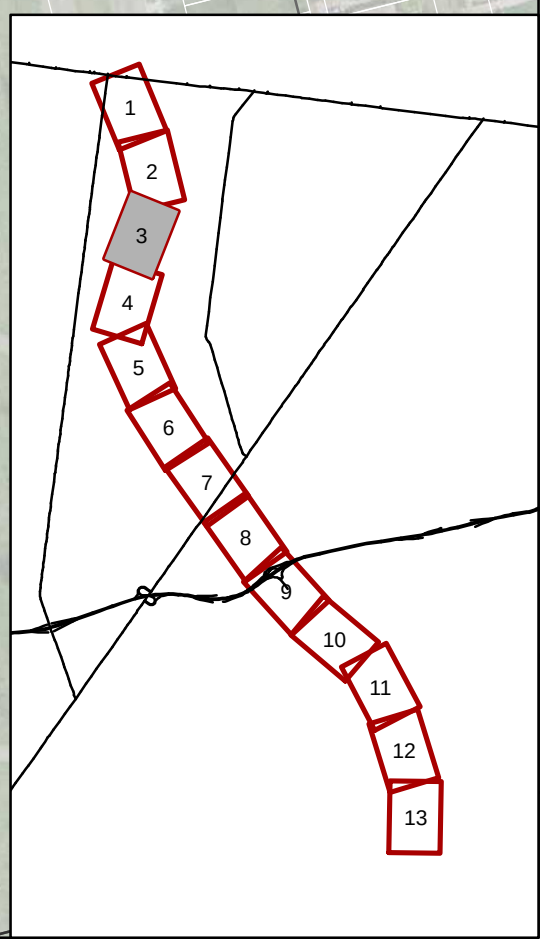
24 in Connection

Connor Creek Sewer
Cross Section = 5 Centered Arch
Size = 19'-3" x 14'-1"
Material = Concrete
Year Built = 1928

CON004

12 in Connection

24 in Connection



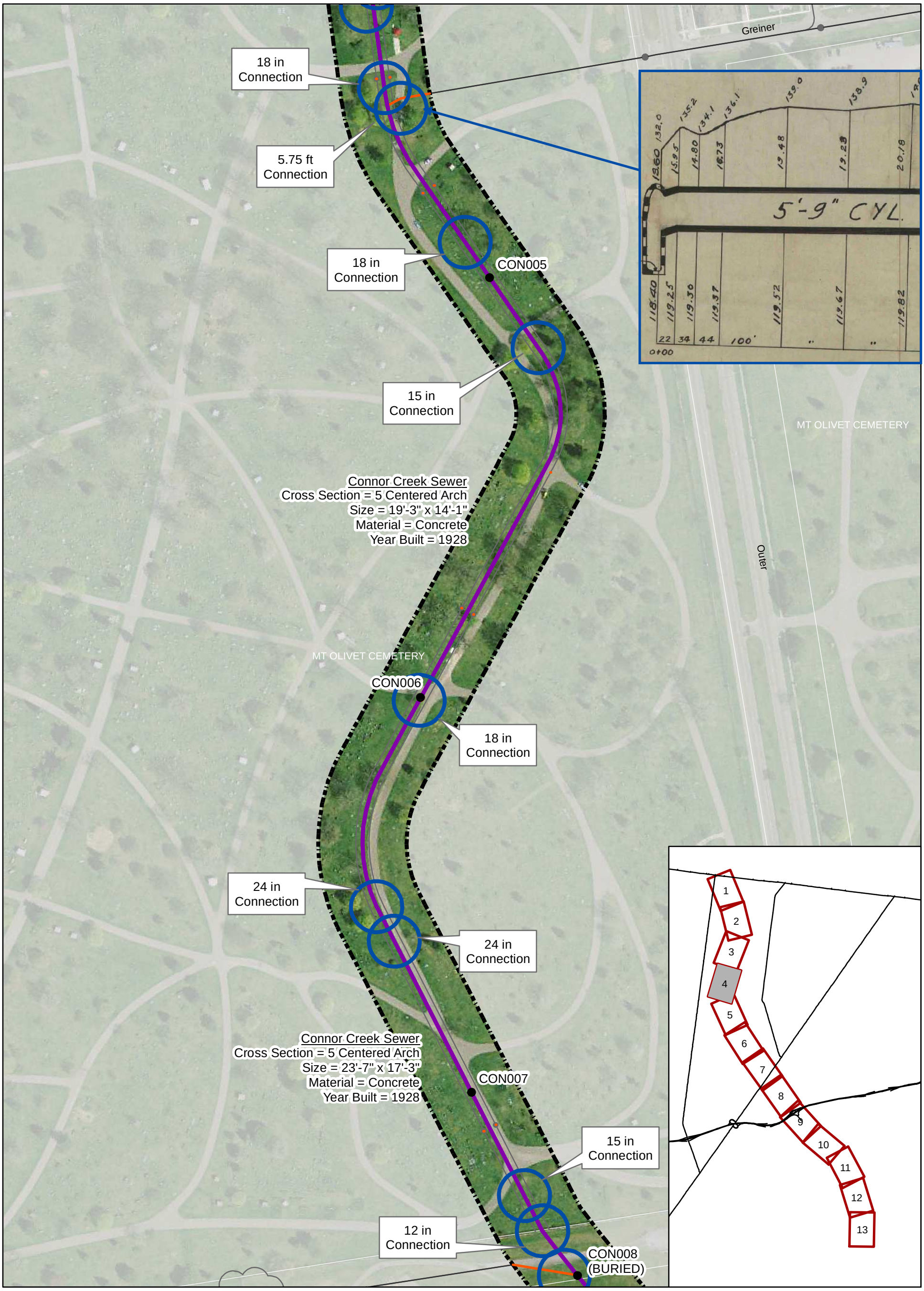
Connor Creek Sewer Base Maps

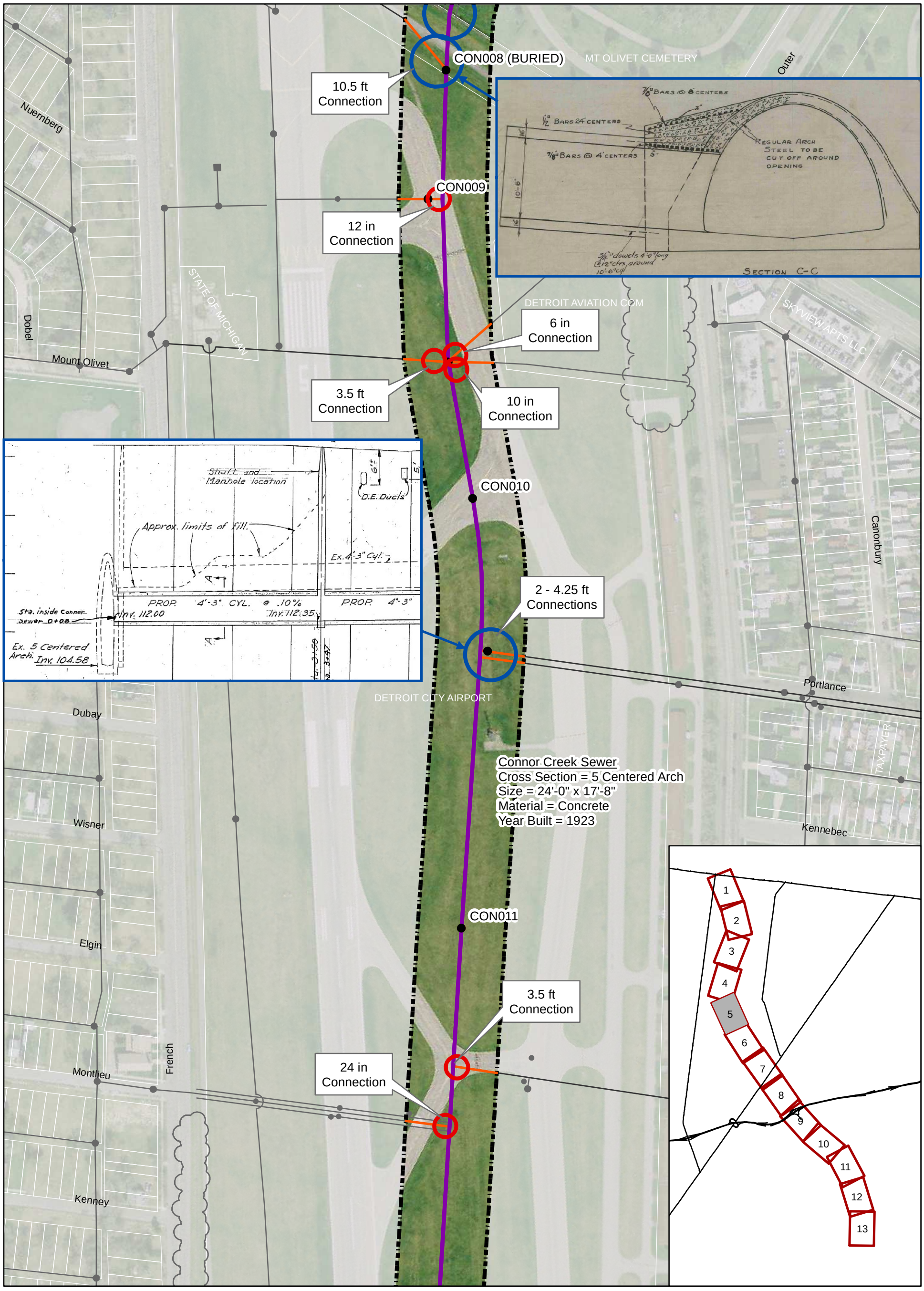
- Connor Creek Sewer
- Sewers within 100 feet of Connor Sewer Segment
- Sewers 100 feet Outside of Connor Sewer Segment
- Connection to Connor Creek Sewer (drawing available)
- Manhole
- 100 feet Buffer
- Connection to Connor Creek Sewer (drawing not available)

N

0 250 500 Feet

WADE TRIM
Brown AND Caldwell
NTH


Greiner
18 in Connection
5.75 ft Connection
18 in Connection
CON005
15 in Connection
MT OLIVET CEMETERY
Connor Creek Sewer
Cross Section = 5 Centered Arch
Size = 19'-3" x 14'-1"
Material = Concrete
Year Built = 1928
5'-9" CYL
Outer
MT OLIVET CEMETERY
CON006
18 in Connection
24 in Connection
24 in Connection
Connor Creek Sewer
Cross Section = 5 Centered Arch
Size = 23'-7" x 17'-3"
Material = Concrete
Year Built = 1928
CON007
15 in Connection
12 in Connection
CON008 (BURIED)
1
2
3
4
5
6
7
8
9
10
11
12
13
Connor Creek Sewer Base Maps
Connor Creek Sewer
Sewers within 100 feet of Connor Sewer Segment
Sewers 100 feet Outside of Connor Sewer Segment
Connection to Connor Creek Sewer (drawing available)
Manhole
100 feet Buffer
Connection to Connor Creek Sewer (drawing not available)
N
WADE TRIM
Brown AND Caldwell
NTH
0
250
500
Feet



Connor Creek Sewer Base Maps

- Connor Creek Sewer
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- Sewers 100 feet Outside of Connor Sewer Segment
- Connection to Connor Creek Sewer (drawing available)
- Manhole
- 100 feet Buffer
- Connection to Connor Creek Sewer (drawing not available)

0 250 500 Feet

CON012 (BURIED)

Connor Creek Sewer
Cross Section = 5 Centered Arch
Size = 24'-0" x 17'-8"
Material = Concrete
Year Built = 1923

24 in Connection

5.25 ft Connection

CON013

24 in Connection

CON014

24 in Connection

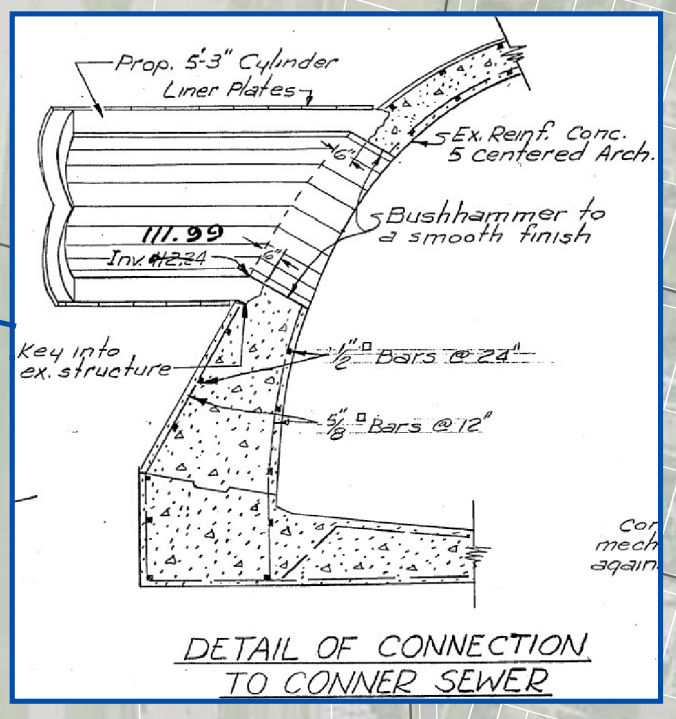
Begin shotcrete spot repair. Access from south.

CON015

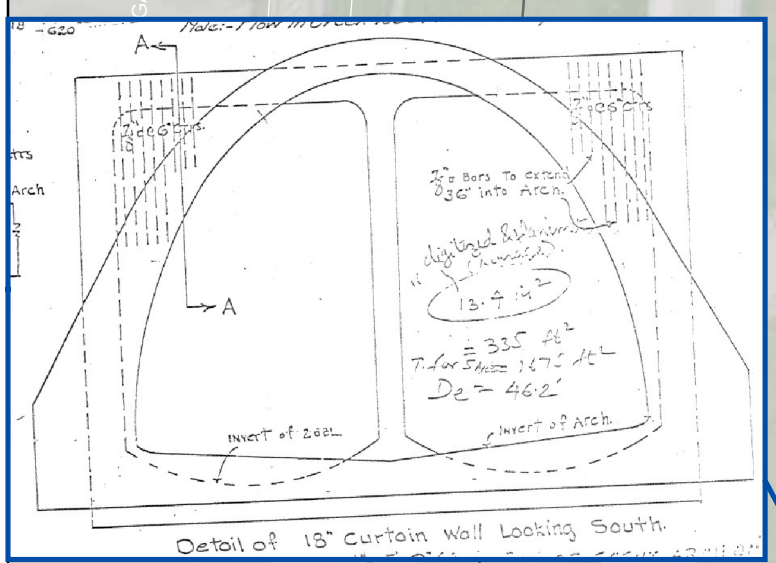
18" Curtain Wall

11.5 ft Connection

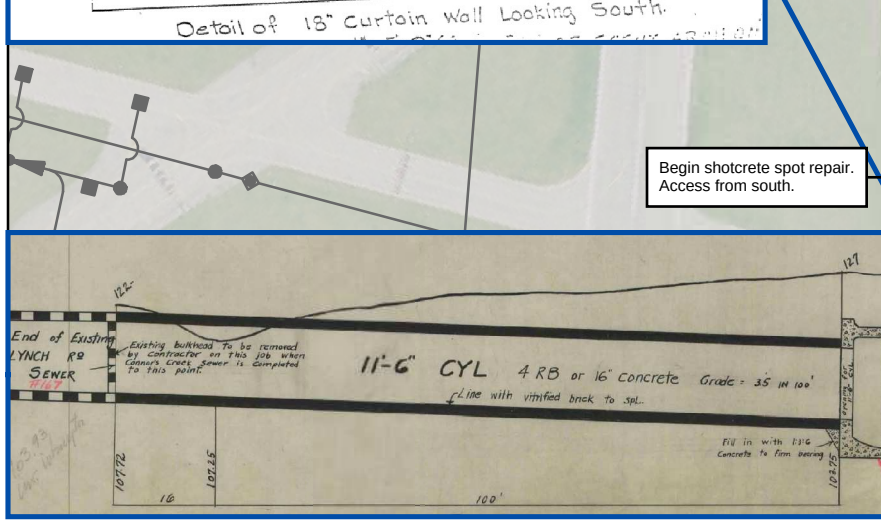
Crossover Between Barrels

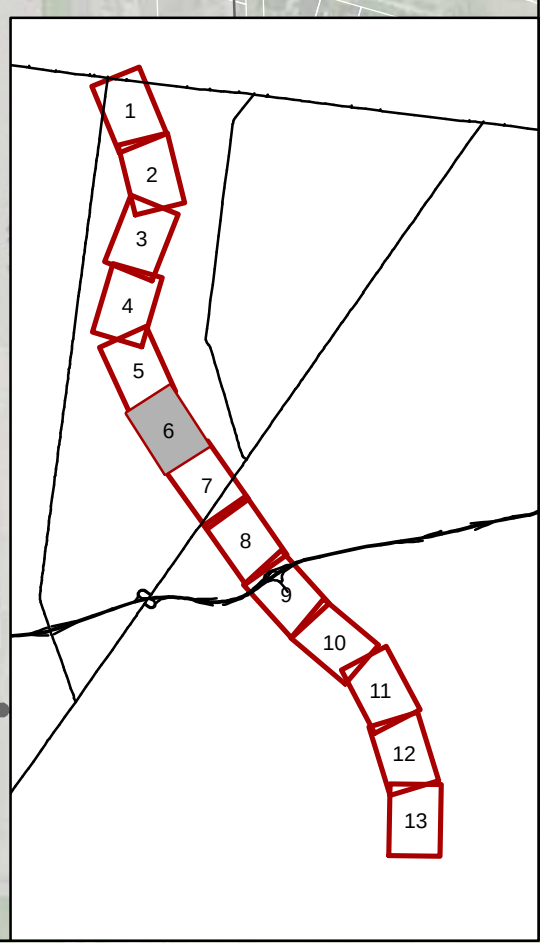


DETAIL OF CONNECTION TO CONNER SEWER



Detail of 13' Curtain Wall Looking South.





Connor Creek Sewer Base Maps

- Connor Creek Sewer
- Sewers within 100 feet of Connor Sewer Segment
- Sewers 100 feet Outside of Connor Sewer Segment
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- Manhole
- 100 feet Buffer
- Connection to Connor Creek Sewer (drawing not available)

WADE TRIM
Brown AND Caldwell
NTH

0 250 500 Feet

Crossover Between Barrels

Connor Creek Sewer
Cross Section = Double Box
Barrel Size = 12'-0" x 17'-6"
Material = Concrete
Year Built = 1922

24 in Connection

CON017 CON016

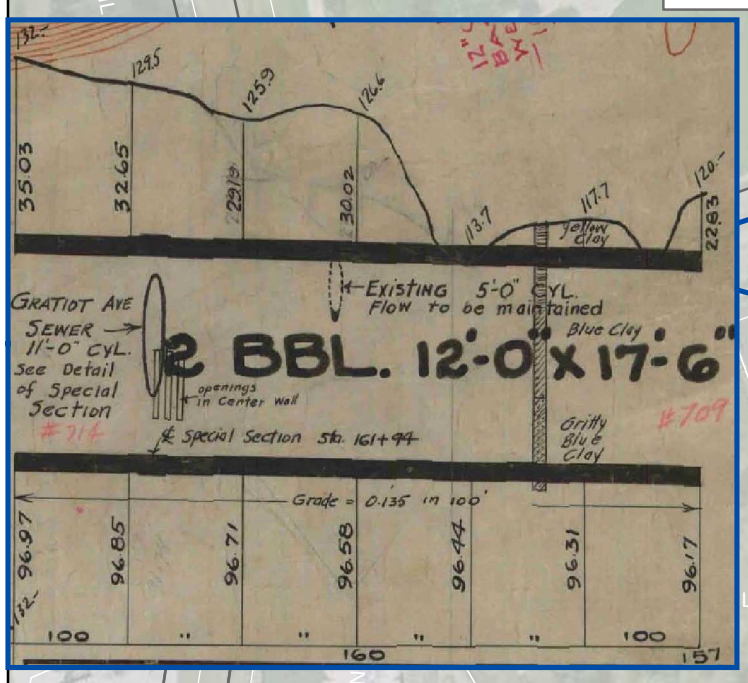
24 in Connection

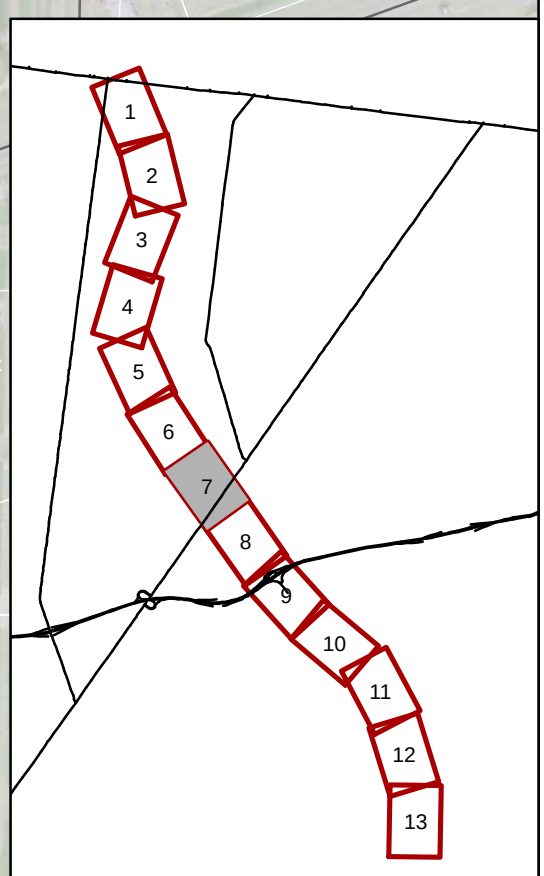
11 ft Connection

5 ft Connection

30 in Connection

CON019 CON018





DETROIT CITY AIRPORT
EV GETHSEMANE CEMETERY
MICCINI, ALUCCIANO & KHALIL
RICHMOND
Flanders
DETROIT BUILDING AUTHORITY
Glenfield
HUD
Charlemagne
DEMERCURIO, F
MR TED'S INC
Rosemary
Gratiot
CVS PHARMACY INC
SHIN, KYUNG
LTD
DEPT OF PARKS & RECREATION
French

Connor Creek Sewer Base Maps

- Connor Creek Sewer
- Sewers within 100 feet of Connor Sewer Segment
- Sewers 100 feet Outside of Connor Sewer Segment
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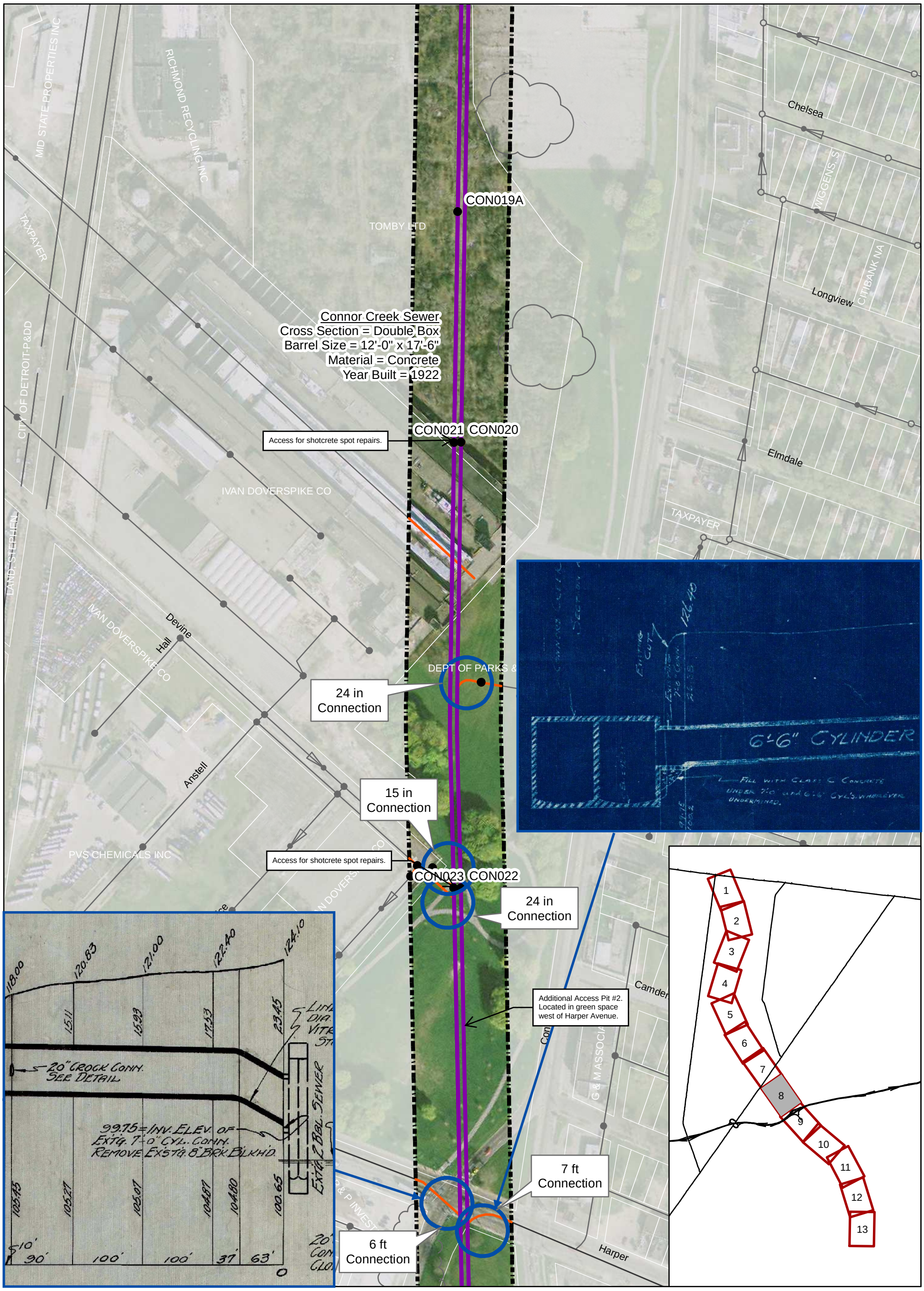
- Manhole
- 100 feet Buffer
- Connection to Connor Creek Sewer (drawing not available)

WADE TRIM
Brown AND Caldwell

0 250 500 Feet



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- Connection to Connor Creek Sewer (drawing available)
- Manhole
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- Connection to Connor Creek Sewer (drawing not available)

WADE TRIM
Brown AND Caldwell
NTH

0 250 500 Feet

Additional Access Pit #3. Located in green space west of Harper Avenue.

CON025 CON024

Access for shotcrete spot repair

15 in Connection

Connor Creek Sewer
Cross Section = Double Box
Barrel Size = 12'-0" x 17'-6"
Material = Concrete
Year Built = 1922

4 ft Connection (Pumped)

CON027 CON026

Access for shotcrete spot repair.

3.5 ft Connection

12 in Connection

15 in Connection

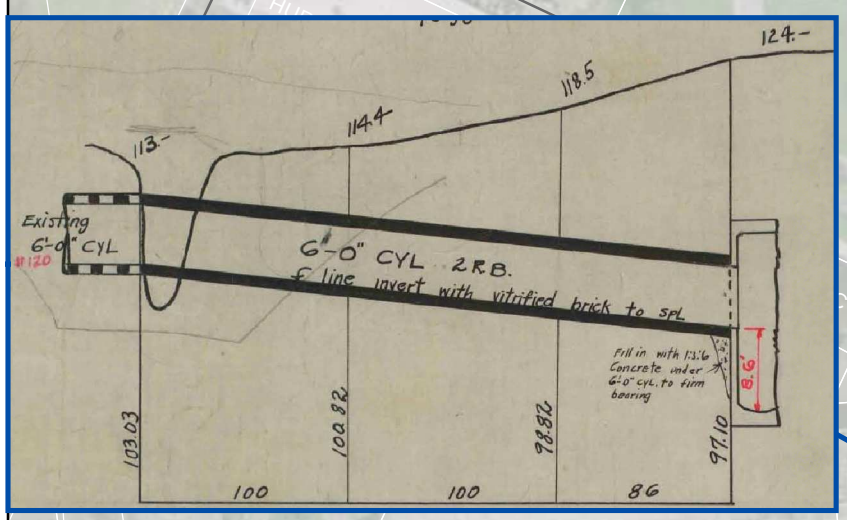
30 in Connection

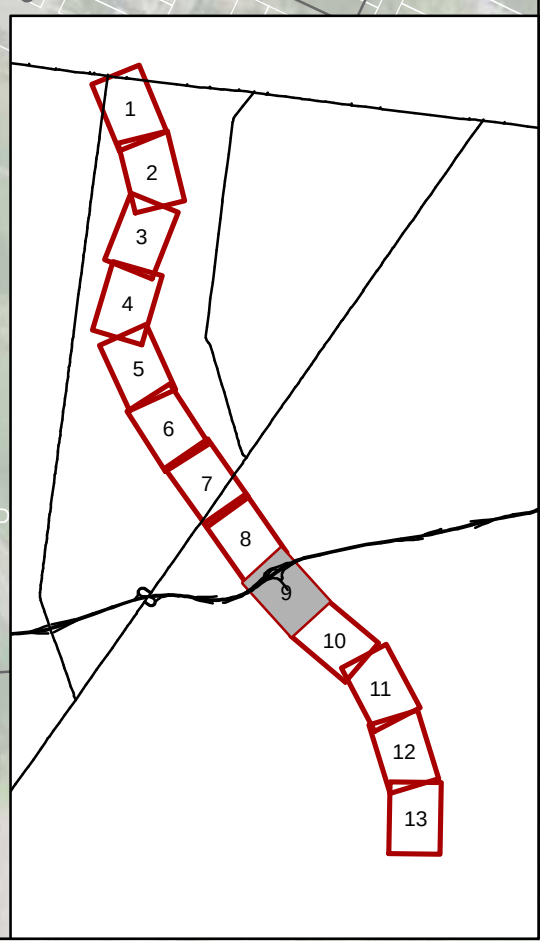
Access for shotcrete spot repair.

CON029 CON028

6 ft Connection

24 in Connection





Connor Creek Sewer Base Maps

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- Sewers 100 feet Outside of Connor Sewer Segment
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- Connection to Connor Creek Sewer (drawing not available)

WADE TRIM
Brown AND Caldwell
NTH

0 250 500 Feet

CON031 CON030

Access for shotcrete spot repair. Traffic control required in Conner Street.

Connor Creek Sewer
Cross Section = Double Box
Barrel Size = 12'-0" x 17'-6"
Material = Concrete
Year Built = 1922

24 in Connection

Access for shotcrete spot repair.

CON033 CON032

18 in Connection

18 in Connection

5.5 ft Connection

4.5 ft Connection

Access for upstream shotcrete spot repair.

CON034

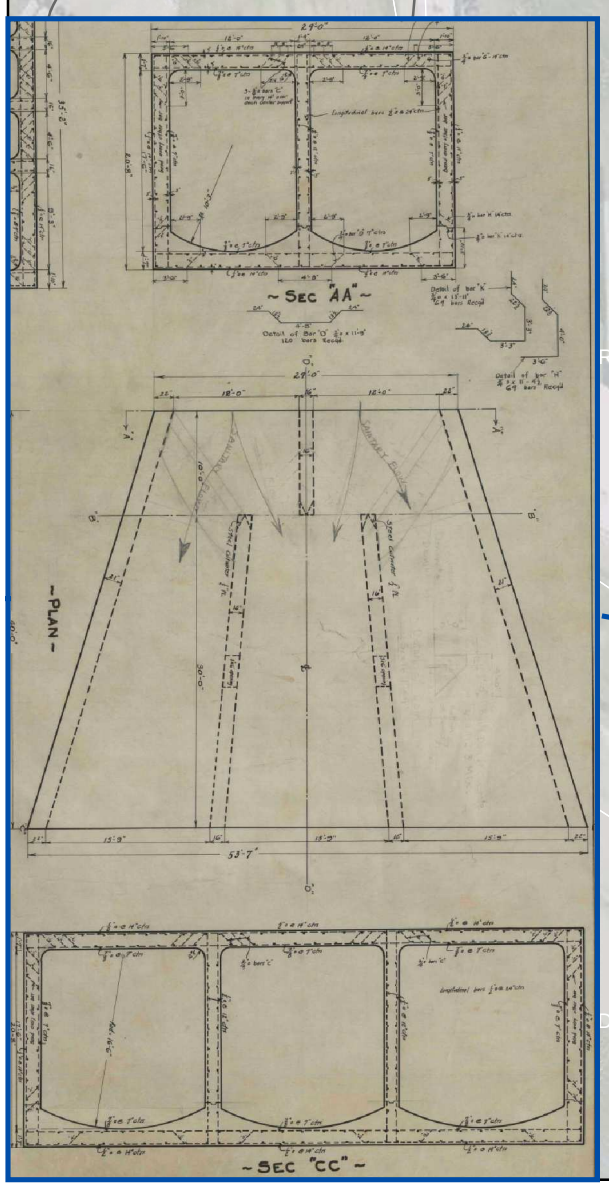
Junction Chamber

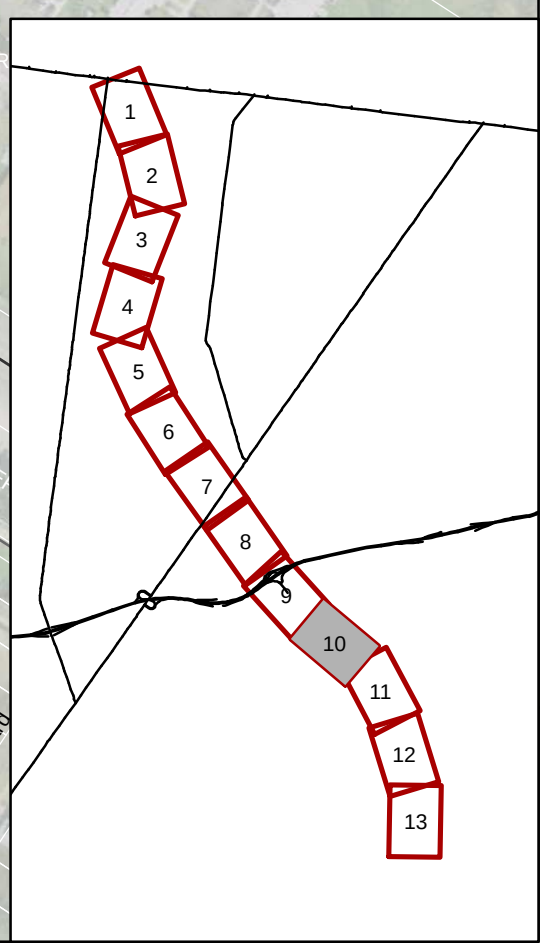
Gates in junction structure to help with flow control in triple barrel sewer.

24 in Connection

15 in Connection

Connor Creek Sewer
Cross Section = Triple Box
Barrel Size = 15'-9" x 17'-6"
Material = Concrete
Year Built = 1921





Connor Creek Sewer Base Maps

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- Manhole
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0 250 500 Feet

15 in Connection

24 in Connection

4.5 ft Connection

18 in Connection

10 in Connection

10 in Connection

6 in Connection

6 in Connection

7 ft Connection

6 ft Connection

TBW01

TBE01

TBW02

TBE02

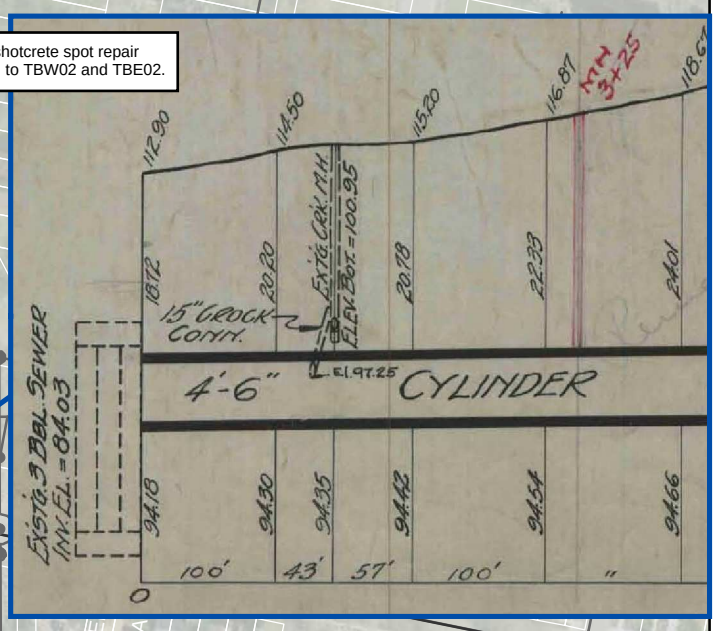
TBW03

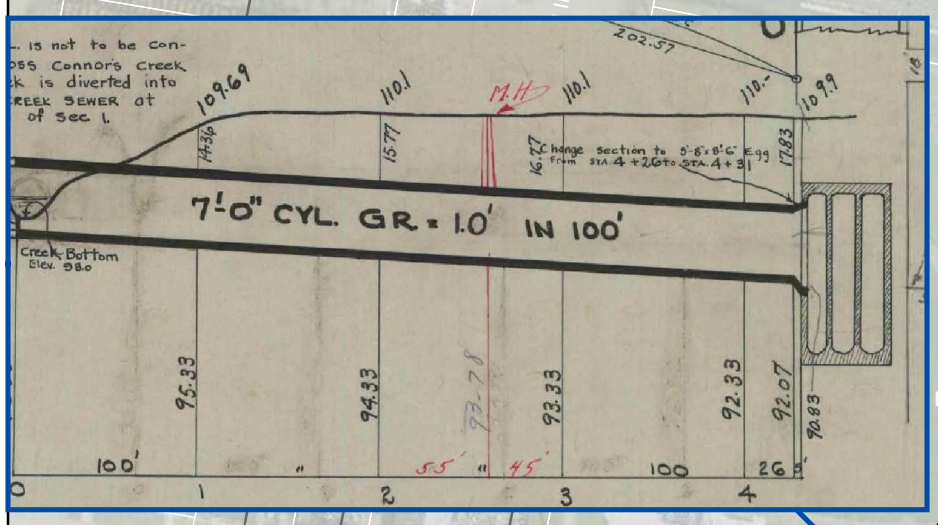
TBE03

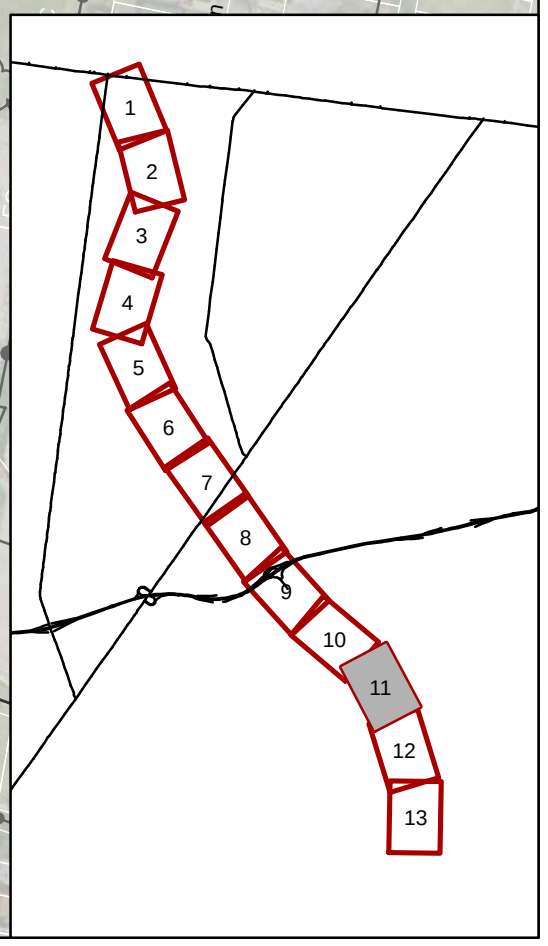
Access for shotcrete spot repair downstream to TBW02 and TBE02.

Access for shotcrete spot repair upstream to TBW01 and TBE01.

Access for shotcrete spot repair downstream to TBW04 and TBE04.







Connor Creek Sewer
Cross Section = Triple Box
Barrel Size = 15'-9" x 17'-6"
Material = Concrete
Year Built = 1921

LEE, JUNRO
PARKSIDE DEVELOPMENT LLC
4737 CONNER CO
DETROIT EDISON COMPANY
HEALTH ALLIANCE PLAN
DEPT 110
TEMPLE OF I AM
CITY OF DETROIT-P&DD
3800 CONNER LLC
PERRY, PAUL
Maynard
Forest
Camille
Waveney
Mack Service Drive
Anderdon
Conner
Mack

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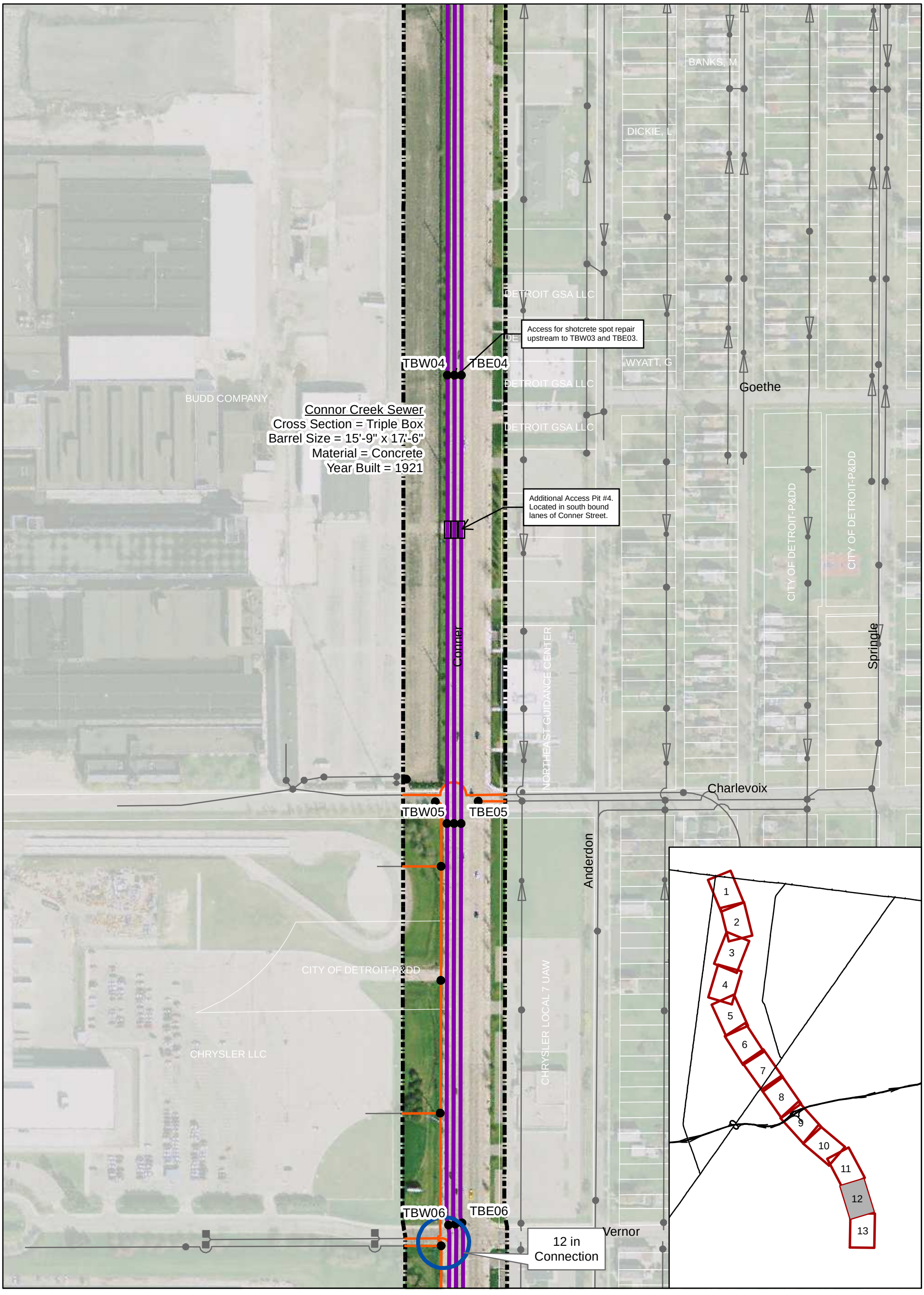
WADE TRIM
Brown AND Caldwell
NTH

0 250 500 Feet



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- Connection to Connor Creek Sewer (drawing not available)

WADE TRIM

Brown AND Caldwell

NTH

0 250 500 Feet

TBE06

12 in Connection

Access for shotcrete spot repair downstream to TBW08 and TBE08.

20 in Connection

TBW07

TBE07

Access for shotcrete spot repair upstream to TBW07 and TBE07 and TBM09.

36 in Connection

TBW08

TBE08

3' In Model

36 in Connection

Access for shotcrete spot repair upstream to TBM08.

Connor Creek Sewer
Cross Section = Triple Box
Barrel Size = 15'-9" x 17'-6"
Material = Concrete
Year Built = 1921

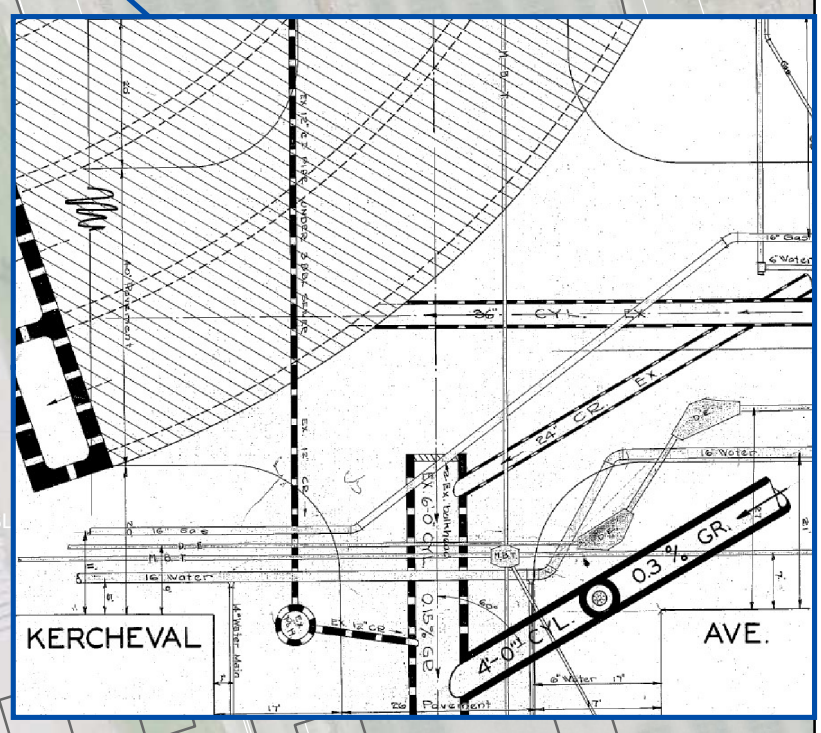
TBM09

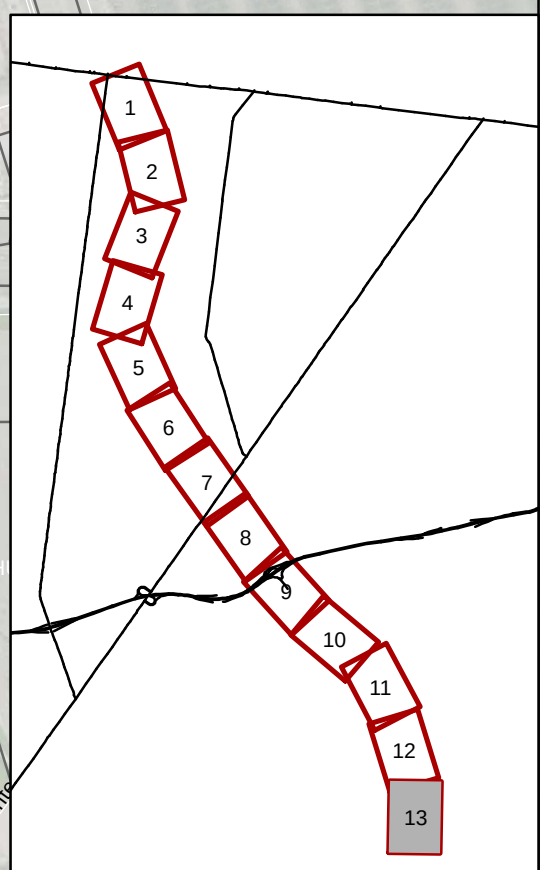
TBE09

Transition from 3 to 2 barrels

TBM011

Connor Creek Sewer
Cross Section = Double Box
Barrel Size = 17'-6" x 22'-11"
Material = Concrete
Year Built = 1925





Springle
Anderdon
Kercheval
Algonquin
CITY OF DETROIT-P&DD
CHRYSL
Jefferson
Clairpointe
EAST JEFFERSON PROPERTIES LLC
CROWN ENTERPRISES INC
EAST JEFFERSON PROPERTIES LLC
DEPT OF PUBLIC WORKS
EASTLAKE BAPTIST CH

Connor Creek Sewer Base Maps

- Connor Creek Sewer
- Sewers within 100 feet of Connor Sewer Segment
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- Manhole
- 100 feet Buffer
- Connection to Connor Creek Sewer (drawing not available)

N

WADE TRIM

Brown AND Caldwell

NTH

0 250 500 Feet

Appendix B: MNFI Response Letter

MICHIGAN STATE UNIVERSITY | Extension

Mr. Xu Zhang, P.E.
Brown and Caldwell, LLC
Detroit, MI
T: 313.662.9183

March 18, 2021

Re: Rare Species Review #2852 – Great Lakes Water Authority – Clean Water State Revolving Fund Project Plan, City of Detroit, Wayne County, MI (T01S R12E).

Mr. Zhang:

The location for the proposed project was checked against known localities for rare species and unique natural features, which are recorded in the Michigan Natural Features Inventory (MNFI) natural heritage database. This continuously updated database is a comprehensive source of existing data on Michigan's endangered, threatened, or otherwise significant plant and animal species, natural plant communities, and other natural features. Records in the database indicate that a qualified observer has documented the presence of special natural features. The absence of records in the database for a particular site may mean that the site has not been surveyed. The only way to obtain a definitive statement on the status of natural features is to have a competent biologist perform a complete field survey.

Under Act 451 of 1994, the Natural Resources and Environmental Protection Act, Part 365, Endangered Species Protection, "a person shall not take, possess, transport, …fish, plants, and wildlife indigenous to the state and determined to be endangered or threatened," unless first receiving an Endangered Species Permit from the Michigan Department of Natural Resources (MDNR), Wildlife Division. Responsibility to protect endangered and threatened species is not limited to the lists below. Other species may be present that have not been recorded in the database.

Although several at-risk species have been documented within 1.5 miles of the project area, the occurrences are Historic and/or far removed from the location **so it is not likely that negative impacts will occur**. Keep in mind that MNFI cannot fully evaluate this project without visiting the project site. MNFI offers several levels of Rare Species Reviews, including field surveys which I would be happy to discuss with you.

Sincerely,

Michael A. Sanders

Michael A. Sanders
Environmental Review Specialist/Zoologist
Michigan Natural Features Inventory

MSU EXTENSION

Michigan Natural Features Inventory

PO Box 13036
Lansing MI 48901

(517) 284-6200
Fax (517) 373-9566

mnfi.anr.msu.edu

Comments for Rare Species Review #2852: It is important to note that it is the applicant's responsibility to comply with both state and federal threatened and endangered species legislation. Therefore, if a state listed species occurs at a project site, and you think you need an endangered species permit please contact: Casey Reitz, Michigan DNR Wildlife Division, 517-284-6210, or ReitzC@michigan.gov. If a federally listed species is involved and, you think a permit is needed, please contact Carrie Tansy, Endangered Species Program, U.S. Fish and Wildlife Service, East Lansing office, 517-351-8375, or Carrie_Tansy@fws.gov.

Special concern species and natural communities are not protected under endangered species legislation, but efforts should be taken to minimize any or all impacts. Species classified as special concern are species whose numbers are getting smaller in the state. If these species continue to decline, they would be recommended for reclassification to threatened or endangered status.

Please consult MNFI's Rare Species Explorer for additional information on Michigan's rare plants and animals.

Table 1: Occurrences of threatened & endangered species within 1.5 miles of RSR #2852

ELCAT	SNAME	SCOMNAME	USESA	SPROT	G_RANK	S_RANK	FIRSTOBS	LASTOBS	EORANK
Animal	*Sterna forsteri*	Forster's tern		T	G5	S2	1985	1985	H
Animal	*Obovaria subrotunda*	Round hickorynut		E	G4	S1		1930	H
Animal	*Noturus stigmosus*	Northern madtom		E	G3	S1	1937-03-21	2016-08-17	E
Animal	*Obovaria subrotunda*	Round hickorynut		E	G4	S1	1920	2000-10-21	H
Animal	*Epioblasma obliquata perobliqua*	White catspaw	LE	E	G1	SH		1930	H
Animal	*Sterna hirundo*	Common tern		T	G5	S2	1985	1985	H
Animal	*Sander canadensis*	Sauger		T	G5	S1	1984	1984	H
Animal	*Villosa fabalis*	Rayed bean	LE	E	G2	S1S2	1920	1998-09-23	E
Animal	*Obovaria olivaria*	Hickorynut		E	G4	S1	1983-07-23	1998-09-23	H
Animal	*Cyclonaias tuberculata*	Purple wartyback		T	G5	S2	1930-pre	1998-09-23	H
Animal	*Epioblasma torulosa rangiana*	Northern riffleshell	LE	E	G1	S1	1920	2007	E
Animal	*Lampsilis fasciola*	Wavyrayed lampmussel		T	G5	S2	1983	1983-08	H
Animal	*Epioblasma triquetra*	Snuffbox	LE	E	G3	S1S2	1920	2000-10-21	H
Animal	*Simpsonaias ambigua*	Salamander mussel		E	G3	S1	1930-pre	1998-09-23	E
Animal	*Percina copelandi*	Channel darter		E	G4	S1	1935-07-16	1935-07-16	H
Animal	*Falco peregrinus*	Peregrine falcon		E	G4	S3	1993	2018	A
Animal	*Ligumia nasuta*	Eastern pondmussel		E	G4	S2	1940-pre	1940-pre	H
Animal	*Ligumia nasuta*	Eastern pondmussel		E	G4	S2			H
Animal	*Obovaria olivaria*	Hickorynut		E	G4	S1	1936-pre	1936-pre	H
Animal	*Obliquaria reflexa*	Threehorn wartyback		E	G5	S1	1936-pre	1998-09-23	E
Animal	*Alasmidonta viridis*	Slippershell		T	G4G5	S2S3			H

Animal	*Pantherophis gloydi*	Eastern fox snake		T	G3	S2	2005-05-27	2014-05-25	C
Animal	*Epioblasma triquetra*	Snuffbox	LE	E	G3	S1S2		1930	H
Animal	*Ligumia recta*	Black sandshell		E	G4G5	S1?	??	1998-09-23	E
Animal	*Ligumia nasuta*	Eastern pondmussel		E	G4	S2	1998-09-23	2007	E
Animal	*Truncilla donaciformis*	Fawnsfoot		T	G5	S1	1998-09-23	1998-09-23	E
Animal	*Notropis anogenus*	Pugnose shiner		E	G3	S1S2	1894	1894-08-22	H
Plant	*Euphorbia commutata*	Tinted spurge		T	G5	S1	1889-08	1889-08	H
Plant	*Galearis spectabilis*	Showy orchis		T	G5	S2	1902	1902-05-18	H
Plant	*Zizania aquatica*	Wild rice		T	G5	S2S3	1892-08-12	1892-08-12	H
Plant	*Endodeca serpentaria*	Virginia snakeroot		T	G4	S2	1900	1900-07-26	H
Plant	*Lactuca floridana*	Woodland lettuce		T	G5	S2	1899	1899-08-03	H
Plant	*Fraxinus profunda*	Pumpkin ash		T	G4	S2	1998-12-09	2001-01-09	BC
Plant	*Asclepias sullivantii*	Sullivant's milkweed		T	G5	S2	1998-12-09	1999-Fall	CD

Comments for Table 1:

No concerns. Occurrences are Historic and/or far removed from the proposed activity.

Table 2: Occurrences of special concern species & natural features within 1.5 miles of RSR #2852

ELCAT	SNAME	SCOMNAME	USESA	SPROT	G_RANK	S_RANK	FIRSTOBS	LASTOBS	EORANK
Animal	*Macrhybopsis storeriana*	Silver chub		SC	G5	S1	1984	1984-11	H
Animal	*Pleurobema sintoxia*	Round pigtoe		SC	G4G5	S3	2000-10-21	2000-10-21	E
Animal	*Villosa iris*	Rainbow		SC	G5	S3	1940	2000-10-21	E
Animal	*Truncilla truncata*	Deertoe		SC	G5	S2S3	??	1998-09-23	E
Animal	*Pisidium simplex*	A fingernail clam		SC	G5	SNR	1998	1998	H
Animal	*Mesodon pennsylvanicus*	Proud globelet		SC	G4	SNR			H
Animal	*Cincinnatia cincinnatiensis*	Campeloma spire snail		SC	G5	S3			H
Animal	*Ptychobranchus fasciolaris*	Kidney shell		SC	G4G5	S2	1936-pre	1998-09-23	E
Animal	*Potamilus alatus*	Pink heelsplitter		SC	G5	SNR	1998-09-23	2007-Summer	E
Animal	*Lasmigona costata*	Flutedshell		SC	G5	SNR	1998-09-23	1998-09-23	E
Animal	*Lasmigona compressa*	Creek heelsplitter		SC	G5	S3	1998-09-23	1998-09-23	E
Plant	*Scleria triglomerata*	Tall nut rush		SC	G5	S3	1860-06-21	1860-06-21	H
Plant	*Sisyrinchium albidum*	Common blue-eyed grass		X	G5?	SX	1896	1896-06-02	H
Plant	*Mimulus alatus*	Winged monkey flower		X	G5	S1	1916	1916-08-27	X
Plant	*Strophostyles helvula*	Trailing wild bean		SC	G5	S3	1895	1899-08-22	H

Plant	*Phaseolus polystachios*	Wild bean		X	G5	SX	1896-08-04	1896-08-04	H
Plant	*Smilax herbacea*	Smooth carrion-flower		SC	G5	S3	1896-06-05	1896-06-15	H
Plant	*Cerastium velutinum*	Field Chickweed		X	G5T4?	SX	1893-06	1903-05-11	H
Plant	*Cerastium velutinum*	Field Chickweed		X	G5T4?	SX	1867-05	1867-05	H

Comments for Table 2:

No concerns. Occurrences are Historic and/or far removed from the proposed activity.

Codes to accompany Tables:

State Protection Status Code Definitions (SPROT)
E: Endangered
T: Threatened
SC: Special concern

Federal Protection Status Code Definitions (USESA)
LE = listed endangered
LT = listed threatened
LELT = partly listed endangered and partly listed threatened
PDL = proposed delist
E(S/A) = endangered based on similarities/appearance
PS = partial status (federally listed in only part of its range)
C = species being considered for federal status

Global Heritage Status Rank Definitions (GRANK)
The priority assigned by NatureServe's national office for data collection and protection based upon the element's status throughout its entire world-wide range. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.
G1 = critically imperiled globally because of extreme rarity (5 or fewer occurrences range-wide or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
G2 = imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
G3: Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g. a single western state, a physiographic region in the East) or because of other factor(s) making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.
G4: Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
G5: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
Q: Taxonomy uncertain

State Heritage Status Rank Definitions (SRANK)
The priority assigned by the Michigan Natural Features Inventory for data collection and protection based upon the element's status within the state. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.
S1: Critically imperiled in the state because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation in the state.
S2: Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.
S3: Rare or uncommon in state (on the order of 21 to 100 occurrences).
S4 = apparently secure in state, with many occurrences.
S5 = demonstrably secure in state and essentially ineradicable under present conditions.
SX = apparently extirpated from state.

Section 7 Comments for Rare Species Review #2852
Brown and Caldwell, LLC
Clean Water State Revolving Fund Project Site
Great Lakes Water Authority
March 18, 2021

For projects involving Federal funding or a Federal agency authorization

The following information is provided to assist you with Section 7 compliance of the Federal Endangered Species Act (ESA). The ESA directs all Federal agencies "to work to conserve endangered and threatened species. Section 7 of the ESA, called "Interagency Cooperation, is the means by which Federal agencies ensure their actions, including those they authorize or fund, do not jeopardize the existence of any listed species."

The proposed project falls within the range of eight (8) federally listed which have been identified by the U.S. Fish and Wildlife Service (USFWS) to occur in Wayne County, Michigan:

Federally Endangered

Indiana bat – there appears to be suitable habitat within the 1.5-mile search buffer. Indiana bats (*Myotis sodalis*) are found only in the eastern United States and are typically confined to the southern three tiers of counties in Michigan. Indiana bats that summer in Michigan winter in caves in Indiana and Kentucky. This species forms colonies and forages in riparian and mature floodplain habitats. Nursery roost sites are usually located under loose bark or in hollows of trees near riparian habitat. Indiana bats typically avoid houses or other artificial structures and typically roost underneath loose bark of dead elm, maple and ash trees. Other dead trees used include oak, hickory and cottonwood.

Foraging typically occurs over slow-moving, wooded streams and rivers as well as in the canopy of mature trees. Movements may also extend into the outer edge of the floodplain and to nearby solitary trees. A summer colony's foraging area usually encompasses a stretch of stream over a half-mile in length. Upland areas isolated from floodplains and non-wooded streams are generally avoided.

Conservation and Management: the suggested seasonal tree cutting range for Indiana bat is between October 1 and March 31 (i.e., no cutting April 1-September 30). This applies throughout the Indiana bat range in Michigan.

Northern riffleshell – there is a known occurrence within 1.5-mile of the project site. The northern riffleshell *(Epioblasma torulosa-angiana)* mussel inhabits medium to large rivers in gravel riffles, where the water is highly oxygenated. This species was formerly widespread in the Midwest, but it has declined in range by more than 95% and now exists in only eight to ten isolated populations, most of which are small and peripheral.

Conservation and Management: members of the genus *Epioblasma* seem to be particularly sensitive to impacts from impoundment, which include population fragmentation and streamflow alteration. Other threats include habitat destruction (e.g. channelization, dredging, bulkheading), exotic species introductions, siltation, pollution, and modified streamflows due to wetland loss, dam operation, and intensive landscape modification. The other two subspecies of *E. torulosa*, *E. torulosa torulosa* and *E. torulosa gubernaculum*, appear to have already gone extinct due to modification and degradation of river systems.

Piping plover – there does not appear to be suitable habitat within 1.5 miles of the project site. In the Great Lakes region, the federal and state endangered piping plover *(Charadrius melodus)* prefers to nest and forage

on sparse or non-vegetated sand-pebble beaches with less than 5% vegetative cover. Nests are simple depressions in the sand are generally placed in level areas between the water's edge and the first dune. Associated bodies of water and interdunal wetlands enhance these areas by increasing food availability. Optimal foraging areas are especially crucial along Lake Superior, where shoreline and benthic invertebrate communities are known to be naturally sparse. While feeding, open shoreline is preferred to vegetated beach areas. Piping plovers begin arriving in mid- to late-April. The nesting season is under way by mid-May and lasts until mid-August.

Conservation and Management - this species is declining throughout the Midwest due to habitat destruction and disturbance. The nests are simple depressions in the sand and are difficult to see. People walking on the beach may inadvertently destroy nests. Dogs on the beach can be especially dangerous for chicks and adults. Piping plovers are protected under the Federal Endangered Species Act and are very sensitive to human disturbance. Please avoid activity along the shoreline in this compartment between May and September.

Rayed bean mussel – there is a known occurrence within 1.5 miles of the project site. The federally and state endangered rayed bean mussel *(Villosa fabalis)* is found in fine mud substrates and riffles among roots of aquatic vegetation. Limits of the breeding season are not known but gravid specimens have been found in May.

Conservation and Management: like other mussels, threats to the rayed bean include: natural flow alterations, siltation, channel disturbance, point and non-point source pollution, and exotic species. Maintenance or establishment of vegetated riparian buffers can help protect mussel habitats from many of their threats. Control of zebra mussels is critical to preserving native mussels. And as with all mussels, protection of their hosts habitat is also crucial.

Federally Threatened

Northern long-eared bat - although no known hibernacula or roost trees have been documented within 1.5 miles of the project area, this activity occurs within the designated WNS zone (i.e., within 150 miles of positive counties/districts impacted by WNS. In addition, suitable habitat does exist in and outside of our 1.5-mile search buffer. The USFWS has prepared a dichotomous key to help determine if this action may cause prohibited take of this bat. Please consult the USFWS Endangered Species Page for more information.

Northern long-eared bat (*M. septentrionalis*) numbers in the northeast US have declined up to 99 percent. Loss or degradation of summer habitat, wind turbines, disturbance to hibernacula, predation, and pesticides have contributed to declines in Northern long-eared bat populations. However, no other threat has been as severe to the decline as White-nose Syndrome (WNS). WNS is a fungus that thrives in the cold, damp conditions in caves and mines where bats hibernate. The disease is believed to disrupt the hibernation cycle by causing bats to repeatedly awake thereby depleting vital energy reserves. This species was federally listed in May 2015 primarily due to the threat from WNS.

Also called northern bat or northern myotis, this bat is distinguished from other *Myotis* species by its long ears. In Michigan, northern long-eared bats hibernate in abandoned mines and caves in the Upper Peninsula; they also commonly hibernate in the Tippy Dam spillway in Manistee County. This species is a regional migrant with migratory distance largely determined by locations of suitable hibernacula sites.

Northern long-eared bats typically roost and forage in forested areas. During the summer, these bats roost singly or in colonies underneath bark, in cavities or in crevices of both living and dead trees. These bats seem to select roost trees based on suitability to retain bark or provide cavities or crevices. Common roost trees in

southern Lower Michigan included species of ash, elm and maple. Foraging occurs primarily in areas along woodland edges, woodland clearings and over small woodland ponds. Moths, beetles and small flies are common food items. Like all temperate bats this species typically produces only 1-2 young per year.

Conservation and Management: when there are no known roost trees or hibernacula in the project area, we encourage you to conduct tree-cutting activities and prescribed burns in forested areas during October 1 through March 31 when possible, but you are not required by the ESA to do so. When that is not possible, we encourage you to remove trees prior to June 1 or after July 31, as that will help to protect young bats that may be in forested areas but are not yet able to fly.

Eastern prairie fringed orchid – there does not appear to be suitable habitat within the 1.5-mile search buffer. The eastern prairie fringed orchid (*Platanthera leucophaea*) occurs in a wide variety of habitats, from mesic prairie to wetlands such as sedge meadows, marsh edges, even bogs. It requires full sun for optimum growth and flowering and a grassy habitat with little or no woody encroachment. The white blossoms produce a heavy fragrance at dusk that attracts many moths, including the primary pollinators of *P. leucophaea*, hawkmoths (Lepidoptera: Sphingidae). Hawkmoths are likely co-adapted pollinators, since their tongues are long enough to reach the nectar that lies deep in the spur of the flower. Capsules mature in September, releasing hundreds of thousands of airborne seeds. Plants may not flower every year but frequently produce only a single leaf above ground, possibly even becoming dormant when conditions are unsuitable, such as the onset of drought.

Conservation and Management: this species requires the maintenance of natural hydrological cycles and open habitat. Activities such as shrub removal are likely to benefit the species, but other management such as prescribed fire is not well understood. Caution and proper monitoring should be employed if using prescribed fire in occupied habitat. Spring fires should be conducted prior to emergence (mid-April). Poaching is also a threat.

Rufa red knot – there does not appear to be suitable habitat within the 1.5-mile search buffer. The rufa red knot (*Calidris canutus rufa*) is one of the longest-distance migrants in the animal kingdom, flying some 18,000 miles annually between its breeding grounds in the Canadian Arctic to the wintering grounds at the southern-most tip of South America. Primarily occurring along the Atlantic and Gulf coasts, small groups of this shorebird regularly use the interior of the United States such as the Great Lakes during the annual migration. The Great Lakes shorelines provide vital stopover habitat for resting and refueling during their long annual journey.

The largest concentration of rufa red knots is found in May in Delaware Bay, where the birds stop to gorge on the eggs of spawning horseshoe crabs; a spectacle attracting thousands of birdwatchers to the area. In just a few days, the birds nearly double their weight to prepare for the final leg of their long journey to the Arctic. This species may be especially vulnerable to climate change which affects coastal habitats due to rising sea levels.

Conservation and Management: applies to actions that occur along coastal areas during the Red Knot migratory window of MAY 1 - SEPTEMBER 30.

Eastern massasauga rattlesnake (EMR) – this project falls outside of Tier 1 and Tier 2 EMR habitat as designated by the US Fish and Wildlife Service. The eastern massasauga rattlesnake *(Sistrurus catenatus)* is Michigan's only venomous snake and is found in a variety of wetland habitats including bogs, fens, shrub swamps, wet meadows, marshes, moist grasslands, wet prairies, and floodplain forests. Eastern massasaugas occur throughout the Lower Peninsula but are not found in the Upper Peninsula. Populations in southern Michigan are typically associated with open wetlands, particularly prairie fens, while those in northern

Michigan are better known from lowland coniferous forests, such as cedar swamps. These snakes normally overwinter in crayfish or small mammal burrows often close to the groundwater level and emerge in spring as water levels rise. During late spring, these snakes move into adjacent uplands they spend the warmer months foraging in shrubby fields and grasslands in search of mice and voles, their favorite food.

Often described as “shy and sluggish”, these snakes avoid human confrontation and are not prone to strike, preferring to leave the area when they are threatened. However, like any wild animal, they will protect themselves from anything they see as a potential predator. Their short fangs can easily puncture skin and they do possess potent venom. Like many snakes, the first human reaction may be to kill the snake, but it is important to remember that all snakes play vital roles in the ecosystem. Some may eat harmful insects. Others like the massasauga consider rodents a delicacy and help control their population. Snakes are also a part of a larger food web and can provide food to eagles, herons, and several mammals.

Conservation and Management: any sightings of these snakes should be reported to the Michigan Department of Natural Resources, Wildlife Division. If possible, a photo of the live snake is also recommended.

USFWS Section 7 Consultation Technical Assistance can be found at:

https://www.fws.gov/midwest/endangered/section7/s7process/index.html

The website offers step-by-step instructions to guide you through the Section 7 consultation process with prepared templates for documenting “no effect.” as well as requesting concurrence on "may affect, but not likely to adversely affect" determinations.

Please let us know if you have questions.

Michael Sanders
Environmental Review Specialist/Zoologist
Sander75@msu.edu
Cell: 517-980-5632

Appendix C: Public Hearing

GREAT LAKES WATER AUTHORITY

PUBLIC HEARING NOTICE FOR CONNORS CREEK SEWER SYSTEM REHABILITATION FY2021 STATE REVOLVING FUND (SRF) PROJECT

The Great Lakes Water Authority (GLWA) announces a Public Hearing regarding its Project Plan for the proposed Connors Creek Sewer System (CCSS) Rehabilitation project. GLWA will be seeking low interest State Revolving Fund (SRF) loan assistance for FY2022. The project is comprised of the rehabilitation of the CCSS, which is one of the primary combined sewers in Detroit metropolitan area. The CCSS was originally constructed in the 1920s. Recent inspections revealed moderate to very severe defects needing to be repaired. Construction will include in-place rehabilitation of sewers and adding new access manhole structures. Right-of-way restoration will be performed on any disrupted areas. The impact of the project will improve customer satisfaction and safe reliable service delivery of sewage sewer conveyance to the Water Resource Recovery Facility. The temporary impact of construction activities will be minimized largely through extensive use of in-place rehabilitation technologies, along with mitigation measures specified in the contract documents. Adverse impacts on historical, archaeological, geographic, or cultural areas are not expected. The total cost of the project is currently estimated at approximately $36,809,760, which is being sought through the SRF low interest loan program. This sewer rehabilitation project is eligible for participation in the State of Michigan low interest SRF loan program.

The Public Hearing will present a description of the project, its evaluation, and estimated costs, as well as the cost per household impact for customer communities. The purpose of the hearing is not only to inform, but to gather feedback from people who will be affected. Comments and viewpoints from the public are requested.

THE MEETING WILL BE HELD ON:

DATE: Wednesday, May 26, 2021

TIME: 2:00 p.m.

PLACE: **Zoom Telephonic Meeting**
Public Call-In Number: 877 853 5247 US Toll-Free
or 888 788 0099 US Toll-Free

Meeting ID: 896 0276 4695

Information on the Project Plan will be available for review online after April 16, 2021 at the **GLWA Website:** https://www.glwater.org/**.**

The Public Hearing on the Connors Creek Sewer System (CCSS) Rehabilitation Project proposed by the Great Lakes Water Authority scheduled for Wednesday, May 26, 2021 at 2:00 p.m. will be held via Zoom and its telephonic capabilities. Members of the public who wish to attend this Public Hearing by telephone can do so in the following manner:

Public Call-In Number: 877 853 5247 US Toll-Free; or
888 788 0099 US Toll-Free
Meeting ID: 896 0276 4695

Members of the public may offer comment in the following manner:

By Telephone: Members of the public who wish to attend the meeting and/or offer public comment by telephone should call in at the number indicated above, press *9 on their keypad to "raise their hand for public comment." During other portions of the meeting, members of the public are asked to mute their line by pressing *6 on their keypad to mute or unmute their line.

By E-Mail: Members of the public may provide written comments to the Board by emailing those comments to CEO@glwater.org on or before 5:00 p.m. EST. on Wednesday, May 26, 2021 and should reference "May 26, 2021 Public Hearing on proposed Connors Creek Sewer System (CCSS) Rehabilitation Project" in the subject line of the e-mail. The opportunity to submit written comments by e-mail may remain open throughout the duration of the Public Hearing.

By U.S. Mail: Members of the public may provide written comments by United States mail addressed to:

Sue F. McCormick, Chief Executive Officer
Great Lakes Water Authority
735 Randolph
Detroit, Michigan, 48226

Written comments by U.S. mail should reference "May 26, 2021 Public Hearing on Connors Creek Sewer System (CCSS) Rehabilitation Project" in the letter. The opportunity to submit written comments by U.S. mail may remain open throughout the duration of the Public Hearing.

If a member of the public requires accommodation due to a disability, please contact CEO@glwater.org or (844) 455-GLWA (4592) not less than 72 hours prior to the date of the meeting.