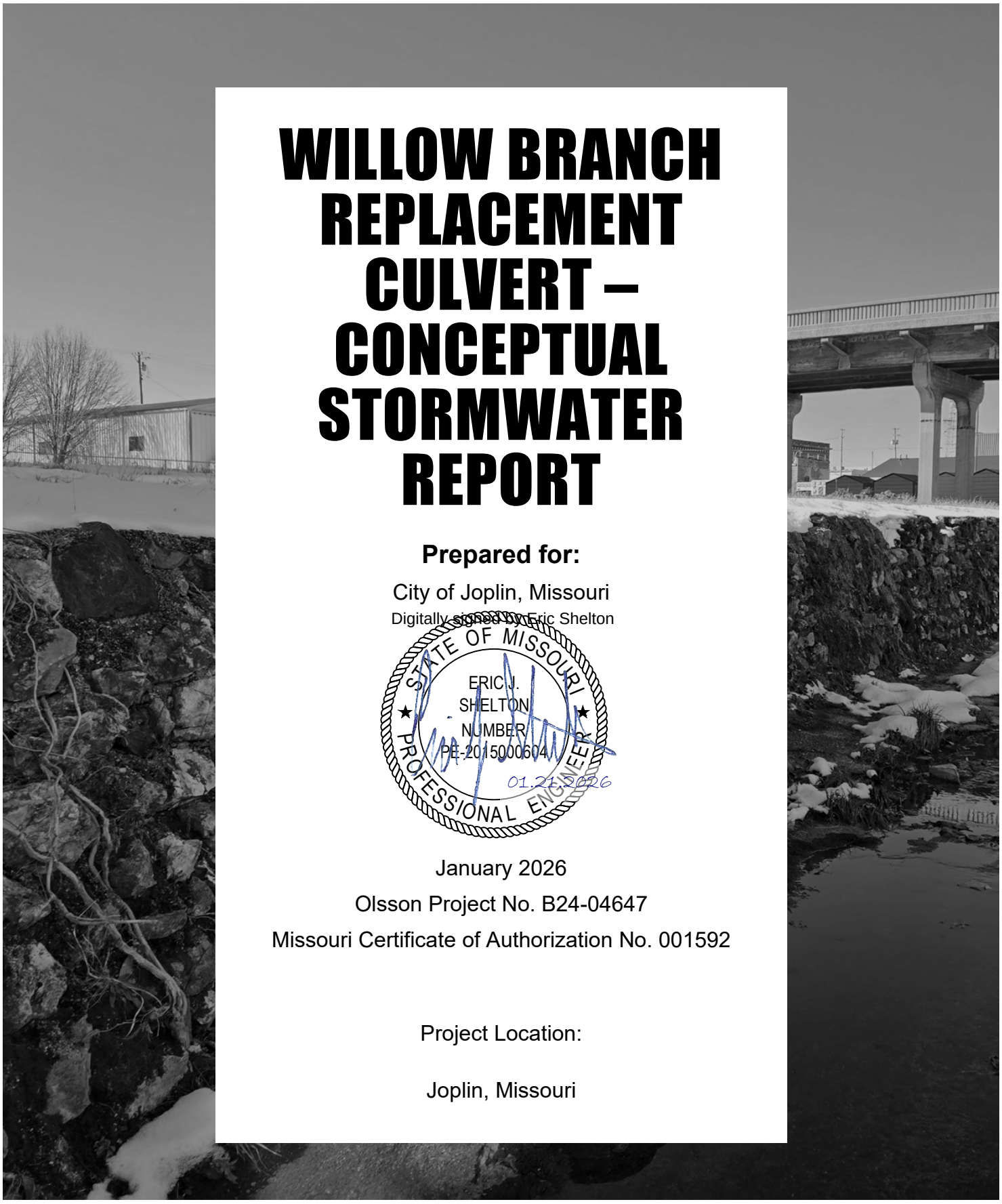


WILLOW BRANCH REPLACEMENT CULVERT – CONCEPTUAL STORMWATER REPORT

Prepared for:

City of Joplin, Missouri

Digitally signed by Eric Shelton

STATE OF MISSOURI
ERIC J. SHELTON
NUMBER PE-2015000604
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PROFESSIONAL ENGINEER

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Project Location:

Joplin, Missouri

olsson®

ACRONYMS AND ABBREVIATIONS

1D… ..... One-dimensional
2D ..... Two-dimensional
ADA ..... Americans with Disabilities Act
CFS ..... Cubic Feet per Second
CHI ..... Computational Hydraulics Inc.
DEM ..... Digital Elevation Model
FEMA ..... Federal Emergency Management Agency
FIRM ..... Flood Insurance Rate Map
GIS ..... Geographic Information System
GPRS ..... Ground Penetrating Radar Systems LLC
HEC-22 ..... Hydraulic Engineering Circular No. 22
HGL ..... Hydraulic Grade Line
MoDOT ..... Missouri Department of Transportation
NOAA ..... National Oceanic and Atmospheric Administration
NWB ..... New Willow Branch
OWB ..... Old Willow Branch
PCSWMM ..... Personal Computer Stormwater Management Model
PVC ..... Polyvinyl Chloride
RCB ..... Reinforced Concrete Box
ROW ..... Right-of-way
NRCS ..... Natural Resources Conservation Service
SFHA ..... Special Flood Hazard Areas
TR-55 ..... Technical Release 55
USDA ..... U.S. Department of Agriculture
WPA ..... Works Progress Administration

TABLE OF CONTENTS

Summary S-1
1. Project Background 1
1.1 Project Purpose 1
1.2 Project Location 1
1.3 Terminology 3
1.4 History of Old Willow Branch Box Culvert 6
1.5 Video Inspection of Existing Infrastructure 7
1.6 Project Goals 7
1.7 Related Projects 9
2. Alignment Evaluation 10
2.1 Alignment Alternative No. 1 – Seventh Street and Pennsylvania Avenue 10
2.2 Alignment Alternative No. 2 – Seventh Street and Virginia Avenue Through Parking Lots 12
2.3 Alignment Alternative No. 3 – Byers Avenue North to Fifth Street, then South on Virginia Avenue 13
2.4 Alignment Alternative No. 4 – Byers Avenue North to Sixth Street – Parallel New Willow Branch to the Outlet Location at Sixth Street and Virginia Avenue 14
2.5 Alignment Alternative No. 5 – Seventh Street East to Wall Avenue, then North to Fifth Street, then South on Virginia Avenue to Connection with New Willow Branch 15
2.6 Summary of Alignment Alternative Evaluation 16
3. PCSWMM – Hydraulics And Hydrology 20
3.1 Hydrology 20
3.2 Hydraulics 22
3.3 PCSWMM – Evaluation of Alternatives 23
3.4 Final PCSWMM Update for Nearby Storm Sewer Improvements 27
4. Public Storm Sewer Relocations 32
4.1 Summary of Scope for Storm Relocations 33
4.2 Hydrology and Hydraulics 35
5. Utility Relocations 36

5.1 Storm Sewer....36
5.2 Sanitary Sewer Relocation....39
5.3 Domestic Water Relocation....40
5.4 Gas Main Relocation....41
5.5 Communications Relocation....41
5.6 Additional Conflicts/Relocations....42
6. Construction Phasing....43
6.1 Willow Branch Replacement Culvert – Phase 1....45
6.2 Willow Branch Replacement Culvert – Phase 2....46
6.3 Hydraulic Considerations for Construction Phasing....47
7. References....49

LIST OF FIGURES

Figure 1. Old Willow Branch Location in Joplin, Missouri 2
Figure 2. Effective Federal Emergency Management Agency Floodplain Mapping for Joplin in Project Vicinity (Flood Insurance Rate Map) 3
Figure 3. Willow Branch Location Map 5
Figure 4. Alignment Evaluation Exhibit 19
Figure 5. Scenario 9 Minus Scenario 3 (Difference) 26
Figure 6. Phase 2C Minus Scenario 11 (Difference) 28
Figure 7. Existing Conditions 25 Year Depth 29
Figure 8. Phase 1D 25 Year Depth 30
Figure 9. Phase 2C (Ultimate) 25 Year Depth 31
Figure 10. Willow Branch Utilities Map 34
Figure 11. Construction and Abandonment Phasing Plan 44

LIST OF TABLES

Table 1. Alignment Alternative No. 1 – Pennsylvania Avenue and Seventh Street 11
Table 2. Alignment Alternative No. 2 – Virginia Avenue and Cut Through Parking Lots to Seventh Street 12
Table 3. Alignment Alternative No. 3 – Virginia Avenue to Fifth Street, then Down Byers Avenue 13
Table 4. Alignment Alternative No. 4 – Sixth Street to Byers Avenue 14
Table 5. Alignment Alternative No. 5 – Virginia Avenue to Fifth Street, then Down Byers Avenue 16
Table 6. Alignment Comparison Summary. 17
Table 7. Critical Storm Analysis. 22
Table 8. Green-Ampt Infiltration Parameters. 23
Table 9. PCSWMM Simulation Options 32
Table 10. Summary of Culvert Sizing Scenarios Modeled in PCSWMM 32
Table 11. Summary of Culvert Sizing Scenarios Modeled in PCSWMM 48

APPENDICES

Appendix A – Figures
Appendix B – Hydraulic Inputs
Appendix C – PCSWMM Modeling Results
Appendix D – StormCAD Results
Appendix E – Storm Relocations
Appendix F – Geotechnical Reports and Logs
Appendix G – Ground Penetrating Radar Systems LLC
Appendix H – New Willow Branch Construction Plans
Appendix I – Opinion of Probable Construction Costs

SUMMARY

The City of Joplin, Missouri, hired Olsson to evaluate alternatives for replacing the aging Old Willow Branch (OWB) box culvert, which is located beneath downtown buildings and has reached the end of its service life. This report presents a comprehensive assessment of alignment options, hydrologic and hydraulic modeling, and conceptual plans for stormwater system relocation north of Seventh Street. Five alignment alternatives were analyzed, considering factors such as constructability, utility conflicts, traffic impacts, and comparative cost. Alignment Alternative No. 5 was selected for its flexibility, reduced excavation depth, minimal utility relocations, and limited traffic disruption. Advanced Personal Computer Stormwater Management Model (PCSWMM) modeling was performed to assure the proposed culvert maintains or improves existing drainage capacity, with a focus on meeting City design standards and mitigating surface flooding. This report also outlines phased construction and utility relocation strategies to coordinate with related infrastructure projects, assuring continued stormwater management and protection for downtown Joplin, Missouri. This report precedes final design and construction phases for the Willow Branch Replacement Culvert Project (Project), associated storm sewer relocations and the OWB decommissioning.

1. PROJECT BACKGROUND

1.1 Project Purpose

The City of Joplin, Missouri, hired Olsson to evaluate alignments and hydrology/hydraulics for the potential replacement of the Old Willow Branch (OWB) box culvert. The existing OWB box culvert is near the end of its service life and in need of replacement. The existing culvert is located in downtown Joplin, Missouri, beneath several existing buildings. The scope of this study is to evaluate alternatives for replacement of the existing culvert along a new alignment, evaluate the appropriate size for the proposed culvert to maintain adequate drainage within the constraints of the Willow Branch Replacement Culvert Project (Project), and develop conceptual-level plans for the relocation of drainage systems north of Seventh Street that connect to the existing OWB box culvert. Development of construction plans and specifications for the new culvert will be included in a separate future contract.

1.2 Project Location

The Project is located within the City of Joplin, Missouri as shown in Figure 1 below. The OWB culvert entrance is located on the southern side of 10th Street at Chestnut Avenue, just north of the railroad tracks. The culvert follows the low spot and presumably the historical channel location to the northeast and then discharges to an open channel again at Sixth Street and Virginia Avenue. In the early 2000s, a second parallel culvert system was constructed to help reduce severe flooding in this region. The parallel system, referred to as the New Willow Branch (NWB), follows major roadway corridors and crosses the OWB culvert at six locations including the upstream entrance and downstream discharge location. Refer to Figure 3 for the locations of the existing OWB and NWB culvert systems.

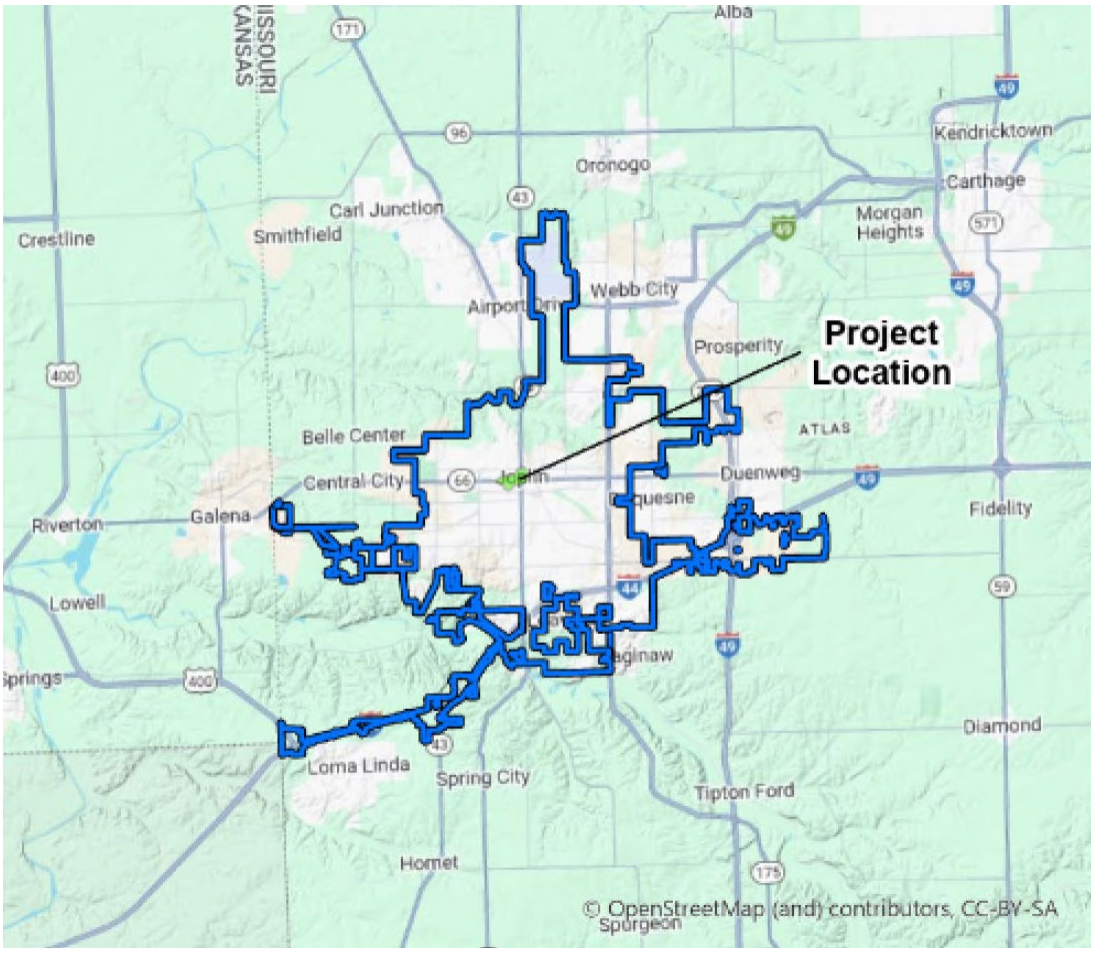


Figure 1. Old Willow Branch Location in Joplin, Missouri.

The scope of this study is to evaluate a replacement alignment for the portion of the culvert from Seventh Street to the north, and to evaluate alignments for redirection of public storm sewer draining into this portion of the OWB culvert. To accurately quantify surface flow captured by inlets, the scope of the storm sewer modeling starts farther upstream, stretching from 10th Street and Chestnut Avenue to Fourth Street and Virginia Avenue. Just beyond Virginia Avenue, the Willow Branch waterway merges with Joplin Creek, south of Fourth Street and Murphy Boulevard.

In Figure 2 below, Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) 29097C0259E Panel 259 of 400 shows the Jasper County Floodway and Special Flood Hazard Areas (SFHA) located within Joplin, Missouri. The Project is situated outside the limits of any flood hazard area.



Figure 2. Effective Federal Emergency Management Agency Floodplain Mapping for Joplin in Project Vicinity (Flood Insurance Rate Map).

1.3 Terminology

1.3.1 Old Willow Branch (OWB)

OWB refers to the box culvert constructed in the 1930s between 10th Street and Chestnut Avenue and Sixth Street and Virginia Avenue. The size and geometry of this box culvert is varied along its length. Some sections are constructed with concrete while other sections are constructed of stone or masonry walls with a concrete lid. The box is located directly below many buildings, specifically in the downtown area north of Seventh Street. This drainage system was historically undersized, causing the downtown area to deal with frequent flooding for more than 50 years until improvements were constructed.

1.3.2 New Willow Branch (NWB)

Design and construction of the NWB culvert started in 2002 and ended in 2008 in five separate phases. This culvert system was designed to address the flooding issues with the OWB by providing additional capacity in a parallel storm system. This system follows major roadway corridors and crosses the OWB at six locations, including the upstream entrance and the downstream discharge location. The NWB culvert is a rectangular concrete box culvert, and the size varies along the length of the culvert.

1.3.3 Willow Branch Replacement Culvert (Proposed Box Culvert)

The Willow Branch Replacement Culvert is the focus of this design report. This culvert will follow a new alignment altogether, starting at the existing OWB culvert near Seventh Street and Byers Avenue. The replacement culvert will be constructed to replace the stormwater conveyance capacity that is provided by the OWB. At the completion of construction on the Project and after public storm sewers draining to the OWB have been relocated, the OWB culvert may be decommissioned. Additional details for decommissioning and phasing for this effort are included in this report.

FIGURE 3

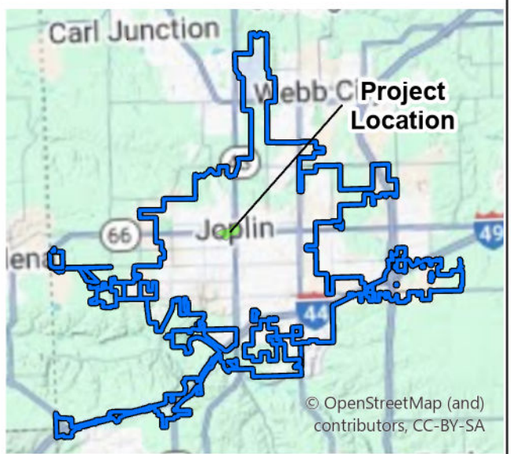
Willow Branch Location Map

City of Joplin, Mo

Old Willow Branch

New Willow Branch

Willow Branch Replacement Culvert



0 150 300 600 Feet

1 inch equals 300 feet

N

olsson

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1.4 History of Old Willow Branch Box Culvert

As the City's business district expanded in the late 19th and early 20th centuries, the area between Fifth Street and Sixth Street became notorious for water problems centered around Willow Branch. The stream meandered through the heart of downtown, often overflowing during storms and causing significant damage. Early efforts to control it included meetings among property owners and City engineers that proposed channelization and underground routing. Despite some improvements, such as stone retaining walls and bridges, the stream continued to wreak havoc, especially during heavy rains (Caldwell 2018).

Throughout the 20th century, Willow Branch remained a persistent challenge. Major floods in 1911 and 1943 highlighted the inadequacy of the City's stormwater infrastructure. The 1943 flood was particularly devastating, with more than 12 inches of rain falling in 48 hours, submerging downtown streets under 3 feet of water and shutting down businesses. The flood overwhelmed the Willow Branch storm sewer and led to widespread infrastructure failures, including power outages and water shortages. Despite various proposals to reroute or upgrade the Willow Branch waterway, including a 1921 plan to divert it toward Turkey Creek, financial constraints and political opposition delayed meaningful action for decades (Caldwell 2018).

A significant milestone occurred in 1936, when the City undertook the construction of a new concrete box culvert for Willow Branch. This project was part of a broader Works Progress Administration (WPA) initiative during the Great Depression, aimed at both flood control and local employment. The box was designed to be 9 feet wide and 6 feet high, channeling the stream west of Virginia Avenue and helping to mitigate the chronic flooding issues downtown. Funding for the project came primarily from federal WPA resources, supplemented by local contributions. Though the construction improved drainage and reduced the frequency of catastrophic floods, repairs and upgrades were still required in subsequent decades as storms continued to test the limits of the infrastructure (Caldwell 2018).

The history of the NWB in Joplin, Missouri, began in earnest in the early 2000s, when the City took decisive action to address chronic downtown flooding. In 2001, voters approved a quarter-cent sales tax dedicated to parks and stormwater projects. One of the most significant outcomes of this initiative was the construction of a large storm drain system under Sixth Street specifically designed to manage overflow from Willow Branch during heavy rains. This infrastructure was engineered to handle a 10-year storm event through most of the system, while the system downstream of Seventh Street and Byers Avenue was designed to contain the 25-year storm event. Early tests (including a major storm in June 2007) proved its effectiveness (Wilson Hydro LLC 2003; Woodin 2008).

1.5 Video Inspection of Existing Infrastructure

Video inspection was performed within the OWB box culvert primarily to identify locations where private and public storm sewers discharge into the OWB box culvert. Any drain connecting to the OWB must be relocated to connect to the Willow Branch Replacement Culvert or the NWB prior to blocking or demolishing the box culvert at that location. Additionally, the video inspection of the OWB provided additional information on the condition, geometry, and construction methods of the OWB culvert. More than 95 percent of the culvert was accessible with video inspection equipment; however, some portions were not accessible, and some portions had limited GPS signal. This left only 150 feet of the 2,700-foot-long OWB reinforced concrete box (RCB) unaccounted for. A GPS signal was used to provide geographic information system (GIS) shapefiles of the approximate location of the culvert walls.

The video inspection found the OWB RCB box culvert system within the Project area exhibits widespread signs of deterioration and obstruction. Throughout the inspection of the culvert length, a consistent presence of sediment, rocks, ceiling cave-ins, and homeless belongings were discovered, all contributing to reduced flow capacity and potential structural concerns. Several segments showed the settlement and debris deposits occupying as much as 10 percent to 20 percent of the culvert's cross-sectional area. Infiltration stains, cracks, encrustation, and visible or protruding reinforcement were observed. The findings indicate ongoing water intrusion and concrete degradation to the RCB structure. Utilities were found sporadically within the culvert, typically just beneath the ceiling.

Photographs were taken at every point where the pipe was observed connecting to the OWB box culvert. Figure A1 in Appendix A summarizes the location of storm sewer tap locations and access points. Figure A2 in Appendix A includes a map showing the areas of the inspection that were inaccessible or that had limited GPS signal to provide location data. Photos for each storm sewer tap can be found in Figures A3-A5 in Appendix A. These figures and the phasing plan in Section 6 of this report should be referenced to assure that public and private storm drains are relocated prior to abandonment and decommissioning of the OWB culvert. A full report from the video inspection is included in Appendix G.

1.6 Project Goals

This existing OWB box culvert is located directly below 14 buildings in downtown Joplin, Missouri, between Seventh Street and Byers Avenue and the outlet location at Sixth Street and Virginia Avenue. For this reason, the age and observed deterioration of the OWB culvert are concerning. Failure of the OWB box culvert could cause structural damage to buildings and more likely would cause increased flooding damage for the surrounding area. The first goal for this Project is to replace an aging, structurally deficient piece of stormwater infrastructure. The replacement

system should be located within City right-of-way (ROW) and away from existing buildings to provide access for maintenance and repair in the future. Construction of a replacement system within City ROW and relocation of public drainage systems will ultimately allow for the decommissioning and abandonment of the OWB system by private property owners.

1.6.1 Hydraulic Design Goals

The combined conveyance capacity of the OWB and NWB is sufficient to convey the 25-year peak flow below ground elevation according to the 2003 stormwater report (Wilson Hydro LLC 2003). These systems have functioned well, and the City has been pleased with their capacity. The primary hydraulic goal for this Project will be to maintain the existing capacity of the combined storm sewer system through two specific hydraulic goals.

The first goal is that the proposed Project create no adverse impact to surface conditions, including inlet ponding elevations and gutter flow depths where water is conveyed in the streets. An interconnected one-dimensional/two-dimensional (1D/2D) model was used to fully understand the impacts of the conveyance system on surface ponding. Ponding depths were compared at a range of manholes and inlets to assure the flooding conditions are equal to or less than pre-Project conditions. Surface depth rasters were also generated and compared to existing conditions to identify the net decrease in ponding and any areas that may have increased flow depth. Because of the complexity of the parallel conveyance system and because the alignment of the proposed culvert is substantially different than the OWB, this modeling approach is critically important to understanding and addressing any pinch points or unintended effects of the proposed Project.

The second hydraulic goal for the Project is to provide the combined pipe conveyance capacity equal to or greater than the existing system. Based on the previous hydraulic report, the existing system was believed to have conveyance capacity equivalent to the 25-year storm event, so the 25-year design capacity was targeted until an existing condition model could be created and used for comparison. This assures the new system capacity is equivalent to the existing system from the standpoint of underground conveyance capacity. These criteria will be primarily evaluated by comparing the hydraulic grade line (HGL) of the proposed culvert and the NWB conveyance systems to the ground elevation. The combined hydraulic model will also be used to assure the peak flow rates in the NWB culvert are not being increased because of the Project. In a parallel system, increased flow rates would indicate a reduction in capacity of the parallel system or other losses in efficiency such as junction or friction losses.

Lastly, surface ponding depth rasters were evaluated for the existing and proposed conditions. Areas with substantial ponding near the Project were evaluated to understand whether simple improvements could be added to the proposed Project to address these issues together. For

example, old inefficient storm inlets may be easily replaced with new, more efficient inlets when directly adjacent to the construction of the proposed box culvert.

1.7 Related Projects

1.7.1 U.S. Route 66 – Seventh Street Improvements

The U.S. Route 66–Seventh Street Improvements Project in Joplin, Missouri, is a comprehensive infrastructure initiative led by the Missouri Department of Transportation (MoDOT) under Job Number J7S2185C. Spanning approximately 1 mile from Maiden Lane to Route 43 (Main Street), the project focuses on revitalizing a key stretch of historic U.S. Route 66. The improvements include full-depth pavement reconstruction to enhance road durability and ride quality, along with upgrades to traffic signals and intersections to improve traffic flow and safety. A major component of the project is the modernization of pedestrian infrastructure, assuring compliance with the Americans with Disabilities Act (ADA) through the installation of accessible sidewalks, ramps, and crossings. This project overlaps with the proposed Project between Byers Avenue and Wall Avenue on Seventh Street. Coordination of these projects is critical to assure that the proposed conveyance system on Seventh Street functions as required to meet the conveyance goals for the Project. The U.S. Route 66-Seventh Street Improvements Project bid opening occurred in November 2025. Construction is set to occur in multiple phases, with the portion that overlaps with the Project not planned to start construction until January 2028. Prior to construction of this phase of Seventh Street, some downstream portion of the Project must first be constructed to allow for drainage of the storm sewer system within Seventh Street to connect to the parallel Willow Branch conveyance systems. Refer to Section 6 of this report for additional information.

1.7.2 Pennsylvania Bridge Demolition

The Pennsylvania Avenue Viaduct Demolition Project in Joplin, Missouri, involves the removal of an aging concrete beam bridge that spans from Fifth Street to Seventh Street, originally built in 1929 to cross over railroad tracks and open a channel section of Willow Branch. The bridge was closed in 2019 after inspections revealed serious structural deterioration, with its substructure condition declining from "fair" in 2013 to "serious" by 2017. Because of the high cost of repairs, City officials opted for demolition.

Community discussions are ongoing about the costs and benefits of reconstructing a channel crossing along Pennsylvania Avenue. Demolition plans are moving forward at this time and plans for reconstruction of Pennsylvania Avenue will occur in the future when the community decides how to proceed. If the Pennsylvania Avenue crossing of Willow Branch is reconstructed, some channel stabilization and drainage improvements will be required to transition the channel to the new bridge crossing and to address aging retaining walls and channel lining between Virginia Avenue and Kentucky Avenue. The bridge demolition is scheduled to begin in 2026.

2. ALIGNMENT EVALUATION

With knowledge of the upcoming Seventh Street reconstruction project and the potential for overlap with the construction of the Willow Branch Replacement Culvert Project, a study was necessary to fully understand the best alignment for the Project. Portions of the Project within Seventh Street need to be designed ahead of the U.S. Route 66-Seventh Street Improvements Project so the construction can be coordinated with that project. The alignment study would identify and recommend the best alignment for the replacement culvert, which would then lead into the development of construction drawings for the culvert.

The study evaluated multiple alignments considering costs, risks, and benefits from a comparative standpoint. Factors considered include overall Project length, added pavement replacement, traffic impacts, potential bedrock excavation, depth of excavations, construction impacts to nearby buildings, utility impacts, and ROW impacts. Detailed opinions of probable construction cost and detailed conceptual plans for each alternative were not included in the scope of work. The evaluation was intended to provide a high-level understanding of relative costs and levels of risk associated with each alternative.

Utilities also abound throughout the downtown corridor, which makes locating a new box culvert a challenge. Utilities include domestic water, natural gas, communication, fiber optic, and sanitary sewer. Sanitary sewer mains generally run north-south within most alleys downtown and flow to the trunkline that flows eastward on Sixth Street. Figure A6 in Appendix A shows existing utilities and contours.

2.1 Alignment Alternative No. 1 – Seventh Street and Pennsylvania Avenue

Alignment Alternative No. 1 would include following Seventh Street from the connection point with the OWB just west of Seventh Street and Byers Avenue east to Pennsylvania Avenue, then turn north and follow Pennsylvania Avenue to the discharge location at the open channel portion of Willow Branch. This alternative was very attractive because of the overlap with both the Seventh Street project and the Pennsylvania Avenue Bridge demolition project. This overlap would allow shared cost of pavement replacement and demolition costs. Also, there are very few utilities within the Pennsylvania Avenue corridor because of the presence of the viaduct.

The total length of this alignment would be approximately 2,625 linear feet. It would require approximately 500 linear feet of surface repair beyond Seventh Street ROW; most of the surface repair would already be included in the Seventh Street project. The profile depth would reach up to 22 feet, with 1,100 feet of the culvert length deeper than 17 feet, indicating substantial excavation. Rock excavation through this section is also anticipated to be significant with the

bedrock depth on geotechnical borings ranging from 10-15 feet. The volume and location of rock excavation increases risk for construction damage to nearby historic buildings and increases the risk of substantial traffic impacts and closures at the intersection of Seventh Street and Main Street, a critical intersection in Joplin, Missouri.

Demolition of adjacent buildings to Pennsylvania Avenue may be necessary to facilitate construction of this alignment. Sanitary sewer relocation would largely be avoidable, though junctions might present minor conflicts. There would be one conflict junction, a crossing of sanitary sewer pipe through the middle of the box culvert opening, just east of Wall Avenue. ROW acquisition would be minimal because the alignment follows existing ROW. Table 1 lists out the pros and cons for Alignment Alternative No. 1.

Table 1. Alignment Alternative No. 1 – Pennsylvania Avenue and Seventh Street.

Pros	Cons
Total length of RCB= 2,625 LF	1,100 feet greater than 17 feet deep to flowline Maximum depth = 22 feet at Main Avenue (higher cost and slower construction)
Nearly 2,000 LF within Seventh Street ROW and pavement costs would be covered by the Seventh Street project. Only 500 LF of surface repair is located outside the Seventh Street project.	Requires removal of Pennsylvania Avenue Bridge and nearby buildings.
Minimal conflict with Sanitary Sewer. Minor adjustments and encasement required in some locations.	Traffic Impacts to Seventh Street
	Significant impacts because of the bedrock
	Limited ability to redirect storm drainage from north of Fifth Street after OWB alignment is decommissioned

RCB – reinforced concrete box
LF – linear feet
ROW – right-of-way
OWB – Old Willow Branch

2.2 Alignment Alternative No. 2 – Seventh Street and Virginia Avenue Through Parking Lots

Alignment Alternative No. 2 would include following Seventh Street from the connection point with the OWB just west of Seventh Street and Byers Avenue, east past Wall Avenue. Just east of Wall Avenue, the alignment would shift north through a series of parking lots. At Virginia Avenue, the culvert would turn north and then connect to the existing culverts near the discharge location at Sixth Street and Virginia Avenue. Moving the culvert outside of the Seventh Street ROW would reduce the traffic impacts of the Project, and because many of the parking lots are owned by the City, the additional ROW needed would be modest. Easements will be needed through the Liberty parking lot and at 629 S. Main Street, and partial reconstruction of a parking garage at Virginia Avenue will be required. This alternative would require the acquisition and demolition of the building at 622–632 Main Street. Total length of this alternative is 2,140 feet, with 1,550 feet of surface repair outside the ROW. The maximum depth would be 18 feet; only 385 feet in length would be deeper than 15 feet. Although less than Alignment Alternative No. 1, this is still a significant depth of volume of excavation and significant bedrock excavation would be required. Sanitary sewer conflicts would be similar to Alignment Alternative No. 1. Traffic impacts would be moderate, with deep crossings at Main Street and limited intrusion into the Seventh Street ROW, except for the first 750 feet. Table 2 lists out the pros and cons of Alignment Alternative No. 2.

Table 2. Alignment Alternative No. 2 – Virginia Avenue and Cut Through Parking Lots to Seventh Street.

Pros	Cons
Total length of RCB= 2,140 LF	Maximum depth of 18 feet at Main Avenue Crossing
Limited ROW acquisition	Requires purchase and removal of building at 622-632 Main Street
Limited impacts to traffic (crossings only at major north-south streets, then 750 LF along Seventh Street)	1,550 LF of surface repair along box culvert outside of Seventh Street
Minimal conflict with sanitary sewer. Minor adjustments and encasement required in some locations.	Significant impacts because of the bedrock
	Limited ability to redirect storm drainage from north of Fifth Street after OWB alignment is decommissioned
	Sanitary conflict junction east of Wall Avenue

RCB – reinforced concrete box
LF – linear feet
ROW – right-of-way
OWB – Old Willow Branch

2.3 Alignment Alternative No. 3 – Byers Avenue North to Fifth Street, then South on Virginia Avenue

Alignment Alternative No. 3 would cut across the parking lot at the northwestern corner of Fifth Street and Byers Avenue, and then follow Byers Avenue north to Fifth Street before turning down Virginia Avenue, covering 3,080 feet. This alternative would require full surface repair along its entire length that mostly occurs outside the limits of the U.S. Route 66-Seventh Street Improvements Project. The overall length and surface repair length are more than other alternatives. The depth profile is shallow compared to other alternatives, with a maximum depth of 14 feet near Fifth Street and Virginia Avenue; most of the alignment is less than 10 feet deep. The location of deeper excavation near Fifth Street and Virginia Avenue is a narrow corridor and will require careful consideration during design; however, the depths are more manageable than alignment alternatives No. 1 and No. 2. No additional demolition requirements are known at this time. There are five sanitary sewer crossings along Fifth Street. Two of these crossings may require lowering, while one of these crossings may be unavoidable and may require a conflict junction in the box culvert. Conflict junctions are not preferred because of the negative impacts associated with conveyance capacity and debris capture. Traffic impacts would be low compared to other alternatives because Fifth Street is a one-way road, which could simplify construction logistics. Table 3 lists out the pros and cons of Alignment Alternative No. 3.

Table 3. Alignment Alternative No. 3 – Virginia Avenue to Fifth Street, then Down Byers Avenue.

Pros	Cons
Maximum depth is only 14 feet. Most is less than 10 feet deep.	Total length of RCB= 3,080 LF
Limited impacts to traffic. Fifth Street has lower traffic.	3,080 LF of surface repair along box culvert outside of Seventh Street
Moderate bedrock at Fifth Street and Virginia Avenue. Low for most of Project.	Requires relocation of sewer on western side of Byers Avenue to allow for parallel section of OWB and NWB.
Increased flexibility for storm sewer relocation north of Fifth Street	Three potential sanitary sewer crossing conflicts, one requiring conflict junction.
	Only 0.35 percent slope

RCB – reinforced concrete box
LF – linear feet
OWB – Old Willow Branch
NWB – New Willow Branch

2.4 Alignment Alternative No. 4 – Byers Avenue North to Sixth Street – Parallel New Willow Branch to the Outlet Location at Sixth and Virginia Avenue

Alignment Alternative No. 4 would begin at Byers Avenue and proceed to Sixth Street until the discharge location at Sixth Street and Virginia Avenue. The total length of this alignment is 2,200 feet. Like Alignment Alternative No. 3, this alignment would require full surface repair along its entire length, mostly outside of the limits of the Seventh Street project. The depth profile would be similar, with a maximum of 14 feet and most under 10 feet. This alignment is notably parallel to the NWB box culvert alignment, and the primary challenge will be insufficient space for both systems within the ROW and additional utilities that already exist within the space. The NWB culvert takes up approximately half of the ROW width, and there is also a parallel sanitary sewer line in Sixth Street. Demolition would include sanitary sewer relocation and portions of the NWB where crossings and junctions would be required. Traffic impacts would be moderate. One additional risk involved the section of work beneath the parking garage at Sixth Street and Virginia Avenue, which would require special consideration. After review, the conclusion was this alignment is not feasible because of the limited ROW in Sixth Street for both culverts and the costs associated with relocating sanitary sewer. Table 4 lists out the pros and cons of Alignment Alternative No. 4.

Table 4. Alignment Alternative No. 4 – Sixth Street to Byers Avenue.

Pros	Cons
Total length of RCB= 2,200 LF	Relocation of sanitary sewer for approximately 2,200 LF of 18-inch sewer. Relocation site and feasibility is not certain.
Maximum depth is only 14 feet. Most is less than 10 feet deep.	2,200 LF of surface repair along box culvert outside of Seventh Street
Moderate bedrock at Fifth Street and Virginia Avenue. Low for most of Project.	Inadequate space within the ROW for the size of box needed

RCB – reinforced concrete box
LF – linear feet
ROW – right-of-way

2.5 Alignment Alternative No. 5 – Seventh Street East to Wall Avenue, then North to Fifth Street, then South on Virginia Avenue to Connection with New Willow Branch

After presenting the first four alignment alternatives to the City and comparing the relative costs and risks, it was decided to evaluate a fifth alignment alternative that would build on the benefits of Alignment Alternative No. 3 and Alignment Alternative No. 1. A portion of the box culvert could be constructed within the Seventh Street ROW to Wall Street, taking advantage of the opportunity to combine this scope with the U.S. Route 66-Seventh Street Improvements Project and save on pavement replacement and traffic impacts. East of Wall Avenue, however, the depth starts to increase along Alignment No. 1. Instead, turning north along Wall Avenue and then east along Fifth Street allows the proposed box culvert to maintain a more modest depth. The historical low point is generally where the OWB box culvert is located. This Alignment Alternative No. 5 does not exactly match the historical low point, but it is closer to it, enabling the proposed and new Willow Branch box culverts to surround the historical low point, which can improve storm sewer connection opportunities and reduce the length of storm sewer connections from both the north and south. Sanitary sewer relocations are limited because this alignment avoids the most challenging crossing location on Alignment Alternative No. 3, which is west of Wall Avenue.

The overall length of this alignment would be 3,169 feet, with approximately 2,348 linear feet of pavement replacement outside of the Seventh Street project. Traffic impacts are expected to be low because Wall Avenue and Fifth Street are one-way streets with multiple lanes. The maximum depth will be 14 feet, and most of the Project length will have a depth of less than 10 feet. The location with the deepest excavation just west of Fifth Street and Virginia Avenue will be the most challenging segment of the Project because of the limited street width and the depth of the excavation. Full temporary closure of Fifth Street at this location will likely be required to accommodate this construction. Table 5 lists out the pros and cons of Alignment Alternative No. 5.

Table 5. Alignment Alternative No. 5 – Virginia Avenue to Fifth Street, then Down Byers Avenue.

Pros	Cons
Maximum depth is only 14 feet. Most is less than 10 feet deep	Total length of RCB= 3,169 LF
Limited impacts to traffic. Fifth Street has less traffic. Wall Avenue and Fifth Street are both one-way.	2,348 LF of surface repair along box culvert outside of Seventh Street
Moderate bedrock at Fifth and Virginia. Low for most of Project.	Two potential sanitary sewer conflicts require relocation
Increased flexibility for storm sewer relocation north of Fifth Street.	Only 0.35 percent slope

RCB – reinforced concrete box
LF – linear feet

2.6 Summary of Alignment Evaluation

Multiple alignment alternatives were evaluated with respect to Project costs, risks, constructability, and impacts to traffic, utilities, and the community. Though Alignment Alternative No. 1 was considered the most likely alternative before the study, the depth of bedrock identified in the geotechnical investigation and the depth of the proposed culvert raised significant concerns about the risks of this alternative in terms of Project costs, schedule, traffic impacts, and impacts to nearby private properties. Alignment Alternative No. 5 creates multiple options and greater flexibility for storm sewer relocations and future drainage improvements in this area because this alignment would alternate with the NWB alignment to always surround the historical alignment. This shortens the length of storm sewer relocations and reduces the costs of those items. Additionally, this alignment had limited traffic impacts, limited sanitary sewer and utility relocations, and reduced excavation depths compared to the other alternatives. Based on the evaluation of Project risks and high-level comparison of costs among each of the alternatives, Olsson and the City selected Alignment Alternative No. 5 as the alignment for the proposed Willow Branch Replacement Culvert. Additional summary comparison information is included in Table 6 below. Alignment Alternative No. 5 is the selected alignment and all evaluations of storm sewer relocations in the scope of work were performed assuming the Willow Branch Replacement Culvert would follow Alignment Alternative No. 5. Figure 4 shown the location of the alignments that were evaluated.

Table 6. Alignment Comparison Summary.

Description	1 Pennsylvania Avenue and Seventh Street	2 Virginia Avenue and Cut Through Parking Lots to Seventh Street	3 Virginia Avenue to Fifth Street then Down Byers Avenue	4 Sixth Street to Byers Avenue	5 Virginia Avenue to Fifth Street then Wall Avenue to Seventh Street
Total Length of new RCB	2,625 LF	2,140 LF	3,080 LF	2,200 LF	3,169 LF
Approximate length of surface repair outside of Seventh Street ROW	500 LF	1,550 LF	3,080 LF	2,200 LF	2,348 LF
Profile Depth	Map depth = 22 feet. 1,100 LF greater than 17 LF deep.	Maximum depth 18 feet. Only 385 feet greater than 15 feet deep.	Maximum depth is only 14 feet. Most is less than 10 feet deep.	Maximum 14 feet. Most is less than 10 feet.	Maximum depth is only 14 feet. Most is less than 10 feet deep.
Demolition	Pennsylvania Avenue Bridge and Adjacent Buildings	Building at 622-632 Main Street	None identified	Sanitary sewer and portions of NWB box culvert	None identified
Traffic Impacts	Significant. Deep cuts along Seventh Street will affect traffic, especially 22 feet deep at Seventh Street and Main Street.	Moderate. Deep crossing at Main Street, then outside of ROW other than 750 LF in Seventh Street.	Low. Fifth Street is a one-way street.	Moderate	Low. Fifth Street and Wall Avenue are one-way streets.
Bedrock Impacts	Significant	Significant	Moderate at Fifth Street and Virginia Avenue. Low for most of Project.	Low	Moderate at Fifth Street and Virginia Avenue. Low for most of Project.

RCB – reinforced concrete box
LF – linear feet
ROW – right-of-way
NWB – New Willow Branch

Table 6. Alignment Comparison Summary Continued.

Description	1 Pennsylvania Avenue and Seventh Street	2 Virginia Avenue and Cut Through Parking Lots to Seventh Street	3 Virginia Avenue to Fifth Street then Down Byers Avenue	4 Sixth Street to Byers Avenue	5 Virginia Avenue to Fifth Street then Wall Avenue to Seventh Street
Sanitary Sewer Relocation	Minimal conflicts. One conflict junction may be required east of Wall Avenue.	Similar to Alternate 1	Two relocations and one conflict junction. Also relocation parallel sewer on Byers Avenue.	Significant relocations	Two relocations
ROW	Minimal	Moderate. Building acquisition at 622 Main Street, easement through Liberty Parking Lot, easement at 629 S. Main Street. Reconstruction of parking garage at Virginia Avenue.	Minimal	Minimal	Minimal

ROW – right-of-way



olsson

550 East St. Louis Street
Springfield, MO 65806

olsson.com
TEL 417.890.8802
FAX 417.890.8805

Olsson - Engineering
Missouri COA #001592

EXHIBIT:
NOT FOR
CONSTRUCTION

REVISIONS

REV. NO.	DATE	DESCRIPTION

FIGURE 4
ALIGNMENT EVALUATION EXHIBIT

OLD WILLOW BRANCH CULVERT REPLACEMENT

JOPLIN, MO

2025

drawn by: EJS
designed by: EJS
project no.: 024-04647
date: 02/04/2025

FIGURE
4

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DATE: Jan 05, 2026 5:38am USER: lmcdonald

3. PCSWMM – HYDRAULICS AND HYDROLOGY

The existing drainage system within the Project area in downtown Joplin, Missouri, is complex because of the parallel conveyance systems with multiple crossing junctions. These junctions allow flow to balance between the parallel culverts, adding an extra layer of complexity. As changes are made to the model to evaluate proposed conditions, flow changes in both systems must be properly evaluated to determine the impact on the overall drainage system. Evaluating surface runoff and collection in urban areas is also very complex because of the spatial and temporal variation of flow direction and the large number of inlets that may be modeled to understand the collection capacity of the system. Modeling both the underground conveyance system and the aboveground collection system accurately and as interconnected is critical to understanding what is limiting the system and how changes to the system will affect its overall performance.

To best model this environment, Olsson used Computational Hydraulics Inc. (CHI) PCSWMM modeling software to study the watershed in the existing, proposed, and ultimate conditions for the Project. Ultimate condition refers to completion of all phases of the proposed box culvert construction and demolition/abandonment of the OWB box culvert and is not referring to land use conditions in the watershed. PCSWMM allows modelers to consider the hydrology and hydraulics of the watershed, infiltration, and various forms of runoff conveyance overland and underground. The model allows for modeling surface overflow with a 2D mesh, which more accurately calculates overflow paths that change with time and depth. The 2D mesh can be connected via inlets directly to the pipes and box culverts, so pipe surcharges are accurately reflected as flooding at the surface level. The pipe calculations use dynamic wave routing to evaluate the runoff hydrograph. At junction locations, the model will automatically balance energy grade lines and calculate discharges to each parallel culvert at each time step in the model. This modeling software was critical to understanding all potential hydraulic impacts as changes are made to this complex system.

3.1 Hydrology

The study looked at 496.2 acres of the Willow Branch watershed with an outfall downstream of Kentucky Avenue between Fifth Street and Seventh Street. The watershed stretches as far south and west as the intersection of Maiden Lane and 23rd Street. To begin the hydrologic analysis, Olsson obtained the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Point Precipitation Frequency Estimates for the Joplin, Missouri, downtown area. The tabular data was used for PCSWMM time series and rain gage inputs. Olsson used the PCSWMM 5 hydrology method for the watershed. Atlas 14 data can be found in Appendix B.

Because the watershed was smaller than 10 square miles, Olsson used the Huff rainfall distribution for watersheds 0-10 square miles. A critical storm analysis was conducted for the existing and proposed conditions by analyzing the downstream peak outflow for the 100-year storm event at various storm durations. The critical storm was determined by the total maximum flowrate (peak flowrates) at all outfall nodes in the model. The one-hour storm duration was the critical storm. Table 7 contains results for the critical storm analysis.

Table 7. Critical Storm Analysis.

Storm Duration	National Oceanic and Atmospheric Administration Atlas 14 Depth-Duration-Frequency (inches)	Peak flow for 100-year Recurrence Interval in Existing Conditions (cubic feet per second)
30-minute Duration	2.45	1,259
1-hour Duration	3.43	1,309
2-hour Duration	4.40	1,276

The one-hour duration hydrology was applied to the watershed via subcatchments that connect to the 2D mesh to model overflow. Olsson evaluated three techniques for hydrology in the area of the 2D cells and ultimately selected the 2D modeling approach with distributed subcatchments, where individual 2D cells are modeled as subcatchments with runoff draining to 2D junctions.

A 2D mesh was created via PCSWMM, incorporating a Digital Elevation Model (DEM) from survey and LiDAR data. At the time of modeling, the U.S. 66-Seventh Street project was in design. The portion of survey used from this project was completed by Powell CWM Inc. Olsson also completed additional survey along portions of Virginia Avenue, Fourth Street, Fifth Street, and Sixth Street. Additional topography was obtained via public source LiDAR data.

Downstream of Seventh Street and east of Byers Avenue along the main NWB and OWB corridors, 2D cell sizes are at the minimum recommended to be 5 feet wide. The remaining cells outside this area were modeled at 30 feet. Areas within the stream corridor east of the OWB outfall were modeled as directional 2D mesh. The smaller cell size allows for more detailed and possibly more accurate results at the cost of longer model run times. In line with the PCSWMM's 2D distributed subcatchment method, the 2D mesh and cells were converted to 2D subcatchments and 2D junctions to apply rainfall onto the study area.

At the upstream end of the OWB, there is a clear division of the watershed south of 10th Street because stormwater is conveyed under an existing railroad track. Approximately 80 feet north of the tracks, the NWB and OWB storm lines begin. Because of this distinction, all models used a

single upstream subcatchment to model inflow from the approximately 282 acres located upstream of the railroad tracks. This approach improved modeling time.

3.2 Hydraulics

Analyzing the latest 2022 aerial imagery in ARCGIS Pro (Esri, 2022), Olsson used the Classification Wizard to differentiate pervious surfaces and impervious surfaces within the watershed. This raster was imported into PCSWMM to calculate impervious surface percentages for each subcatchment. A Manning's "n" value of 0.012 for impervious surfaces and 0.035 for pervious surfaces was used from the February 2024 U.S. Department of Transportation Federal Highway Administration's Hydraulic Engineering Circular No. 22 (HEC-22) manual (Federal Highway Administration, 2009).

Each subcatchment contains information pertaining to the slope, percent impervious, and infiltration. Olsson obtained soil data via the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey (U.S. Department of Agriculture, Natural Resources Conservation Service, n.d.). The entire watershed consists of variations of silt loam soil texture class. The Web Soil Survey for the watershed is located in Appendix B. The model incorporated PCSWMM guidance for the Green-Ampt Infiltration Method for subcatchment infiltration data. Table 8 contains Green-Ampt parameters used for infiltration. General reference values for soil characteristics followed PCSWMM recommendations.

Table 8. Green-Ampt Infiltration Parameters.

Parameter	Value
Soil Texture Class	Silt Loam
Hydraulic Conductivity (inches/hour)	0.260
Suction Head (inches)	6.690
Initial Deficit (fraction)	0.366

The distributed subcatchment method for the 1D/2D combined model used 2D stormwater runoff conveyed via 2D conduits and 2D junctions. The analysis also included 1D elements to model stormwater capture and pipe conveyance. At existing and proposed inlets, inlet rating curves were created based on HEC-22 equations with City and MoDOT-type inlets. Inlets on grade were rounded to the nearest whole percent slope for longitudinal slope to develop a standard catalog of inlet rating curves. These rating curves were applied to the outlet connections between 2D junctions and 1D junctions to accurately balance flow between the 2D surface and the underground 1D elements. Each junction rim elevation was adjusted down to the low opening elevation to account for the throat height to capture runoff.

Once the stormwater enters the storm sewer system, additional losses were accounted for such as entrance, exit, bend, and friction losses. The model uses the eastern edge of the study area as the outfall location. Olsson set the outfall as a free boundary condition at the downstream study area. Along with these inputs, the PCSWMM model used the following simulation options listed in Table 9.

Table 9. PCSWMM Simulation Options.

Simulation Option	Description
Process Models	Rainfall/Runoff & Flow Routing
Routing Method	Dynamic Wave
Infiltration Model	Green-Ampt
Ponding	Allowed
Duration	3 hours
Time Step	0.25 second

After Alignment Alternative No. 5 was selected, scenarios were run with varying RCB culvert sizes and compared to Project design goals to size each segment of the proposed Willow Branch Replacement Culvert. Modelers also considered construction phasing requirements and evaluated impacts that will occur if upstream portions of the Project are constructed without the downstream portions, or if portions of the OWB are abandoned prior to the construction of the entire Project. The model was used to inform construction phasing decisions concerning when old segments can be decommissioned without causing any adverse impact on drainage.

3.3 PCSWMM – Evaluation of Alternatives

Nine scenarios were evaluated on two main criteria to determine the most efficient option of replacement for the OWB RCB. The scenarios were created to evaluate the ultimate condition with the OWB RCB decommissioned and all storm sewer connections relocated to flow into the NWB and Willow Branch Replacement RCBs. The scenarios created would start at a baseline RCB size for the proposed alignment and increase in volumetric size to compare results. To start, the sizes were increased incrementally in three sections of the alignment where flow or capacity changes were likely to occur. The three sections of the RCB were: (1) Upstream Segment – Seventh Street including Wall Avenue from Seventh to Sixth streets, (2) Downstream Segment – Wall Avenue from Sixth to Fifth streets and to the downstream outlet, and (3) Main Street crossing that required a different size on some alternatives because of limited cover. Each of these sections had limitations to the RCB size and could not be identical in their size increase because the

scenarios progressed. The scenario results were analyzed by incrementally increasing the downstream section and then the upstream section. Results for each alternative were observed to understand how the system functions and results were compared to Project goals.

3.3.1 Analysis for Criteria 1

No increase in surface depths was based on the depths of ponding water occurring throughout the study area compared to current conditions. At junctions and 2D nodes aligned with the NWB, OWB, and Willow Branch Replacement Culverts, Olsson compared the maximum HGL, hours flooded, hours surcharged, and maximum height above crown pulled from each PCSWMM model to assure no adverse ponding impacts from the existing to proposed condition. A flooding depth raster was also created for the existing condition and compared to a depth raster from each scenario. The existing ponding raster was subtracted from the proposed scenario rasters to more clearly identify increases and decreases in ponding depth throughout the entire 2D area. The 25-year and 100-year storm events were evaluated.

3.3.2 Analysis for Criteria 2

The 25-year conveyance capacity and combined system conveyance capacity greater than the existing condition was based on evaluating the 25-year HGL and peak flow rates at different points in the system. Profiles showing the HGL of the NWB and Willow Branch Replacement Culvert were created for each scenario for comparison. Peak flows within the culvert were shown throughout the culvert lengths and compared to existing maximum flows. The proposed RCB throughout the scenarios was evaluated to assure it could handle the flows from the existing OWB RCB. The NWB RCB peak flows were checked throughout all scenarios to assure its flows were not increased from the existing condition, which would indicate the new parallel system was not functioning at the same level as the OWB. Exhibits for the analysis of Criteria 2 can be found in Appendix C. The evaluation of the 25-year HGL was performed under the assumption that the existing condition system could meet this criteria; however, the existing conditions PCSWMM model also revealed surcharge at Byers Avenue. Though 25-year capacity is the preferred result, meeting or exceeding the results of the existing system capacity and the City's design criteria would serve as the primary criteria for choosing the final culvert size.

Results of the analysis for the nine scenarios indicated all the scenarios met Criteria 1, no adverse impact in surface depths. Comparison exhibits and summary tables for Criteria 1 can be found in Appendix C. However, only scenarios 7 through 9 were able to fully meet Criteria 2, 25-year HGL below grade; the problem location for scenarios 1 through 6 was the low point on Byers Avenue. The models show substantial flooding (2-3 feet in depth) at Byers Avenue regardless of the pipe condition between the existing and the proposed scenarios. The depth raster comparison for the scenarios revealed a significant ponding reduction throughout the study area for all scenarios compared to the existing condition, except for at the low point on Byers Avenue.

Scenario 9 used the largest sizes of RCB feasible through the proposed RCB alignment; however, there was concern about the amount of ROW that would be used by these boxes and finding space for the remaining utilities within Seventh Street and Wall Avenue. The difference in the maximum ponding between Scenario 3 and Scenario 9 was about 3 inches at Byers Avenue, while Scenario 3 would be much less challenging for utility relocations, ROW, and construction. Figure 5 shows the improvement in ponding depth between Scenario 3 and Scenario 9. Olsson's evaluation found that Scenario 3 had 25-year conveyance capacity with the exception of the HGL rising above the surface at Byers Avenue. This alternative had no adverse impact on surface ponding or conduit conveyance capacity compared to the existing condition and provides capacity in excess of the City design standard, which is the 10-year storm event. Inlet ponding maximum surcharge reported at the node on Byers Avenue would reduce from existing ponding of 2.2 feet to 1.0 foot in Scenario 3, based on the surcharge depth from the 1D hydraulics alone. This shows the potential the system has to reduce ponding if the necessary inlets are provided for surface capture. The ponding depth at Byers Avenue is primarily caused by an inlet capacity issue that will be further reduced by the Seventh Street inlet improvements that were included in the ultimate condition PCSWMM model in this study. Further increase in culvert size from Scenario 3 would provide diminishing returns and increasing concerns for constructability.

Legend

- Existing Storm Pipe Inventory
- Existing Storm Structure Inventory
- Old Willow Branch
- 2-ft Contours
- Parcels
- Willow Branch Replacement Culvert

Scenario 9 - Scenario 3

Value

- -0.986 - -0.796
- -0.795 - -0.605
- -0.604 - -0.47
- -0.469 - -0.376
- -0.375 - -0.359
- -0.358 - -0.338
- -0.337 - -0.317
- -0.316 - -0.287
- -0.286 - -0.262
- -0.261 - -0.241
- -0.24 - -0.224
- -0.223 - -0.211
- -0.21 - -0.185
- -0.184 - -0.16
- -0.159 - -0.135
- -0.134 - -0.105

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N 0 50 100 200 ft

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Scenario 9 Minus Scenario 3 (Difference)

Old Willow Branch
Culvert Replacement Study
Joplin, MO
Figure 5

WGS 1984 Web Mercator Auxiliary Sphere

Basemap: ESRI World Imagery

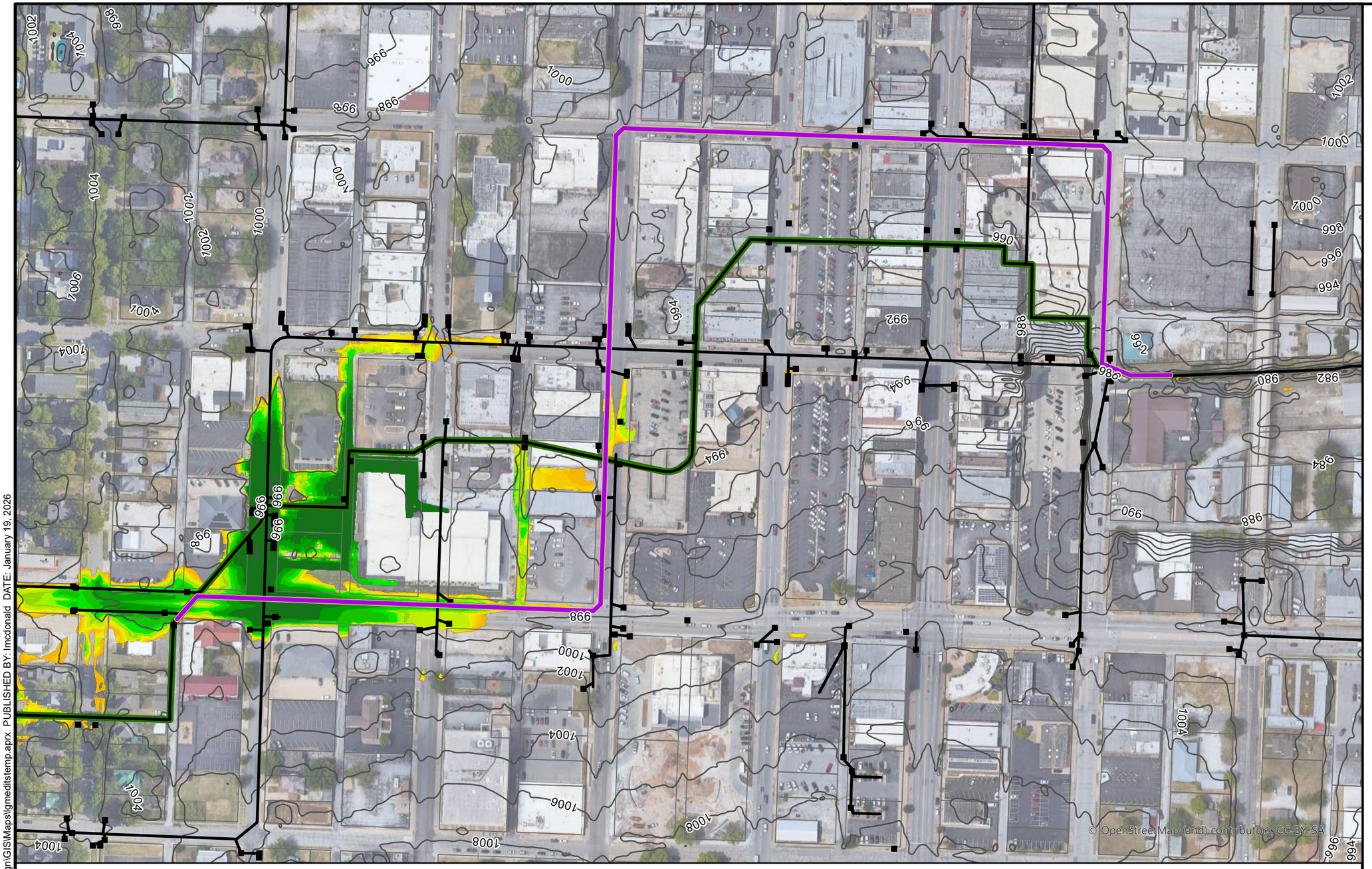
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After discussing results with City staff, Scenario 3 was selected and advanced for further refinement. Scenario 10 was the same as Scenario 3 with a few minor changes to the inverts of the RCBs along Seventh Street to avoid utilities. Scenario 11 improved on Scenario 10 by removing a drop in flowline from the NWB culvert connection to the proposed culvert flowline and adding an inflection point over the sanitary sewer crossing along Seventh Street. Scenario 11 was the selected scenario and was used for all analyses moving forward, including evaluation of construction phasing impacts on short-term hydraulic capacity discussed in Section 6 of this report.

3.4 Final PCSWMM Update for Nearby Storm Sewer Improvements

After completion of the proposed culvert alternative evaluation, finalization of storm sewer design for the U.S. Route 66-Seventh Street Improvements Project, and finalization of storm sewer relocation design for phases 1C and 2B of construction (refer to Section 6 of this report), the final deliverable model for the proposed system was developed by updating the PCSWMM model with the proposed storm sewer improvements associated with U.S. Route 66 and phases 1C and 2B storm sewer relocations. The addition of these related storm sewer projects to the model will more accurately show the surface collection and ponding depth that is expected to improve.

After incorporating Seventh Street improvements and phases 1C and 2B storm sewer improvements, the model results were once again compared. The final deliverable model, Phase 2C, was compared to Scenario 11 to evaluate the improvement in surface drainage specifically related to these two scenarios caused by finalizing storm sewer relocation designs and importing into the PCSWMM model. The results can be seen in the Figures 6-9 below. The U.S. 66-Seventh Street Improvements Project and the relocation of the local storm drainage system significantly reduced the ponding on Byers Avenue by approximately 2.5 feet from Scenario 11 to Phase 2C, in addition to reducing the ponding on Seventh Street by approximately 1 foot. A comparison of the Phase 2C to the existing model can be found in Appendix A. The depth raster maps of existing, Phase 1B, and the overall final deliverable model Phase 2C are located within Appendix C. Refer to Table 10 for a summary of the different scenarios modeled in PCSWMM.



N 0 50 100 200 ft

Legend

- Willow Branch Replacement Culvert
- Existing Storm Pipe Inventory
- Existing Storm Structure Inventory
- Old Willow Branch
- 2-ft Contours
- Parcels

Phase 2C - Scenario 11

Value

- -0.986 - -0.796
- -0.795 - -0.605
- -0.604 - -0.47
- -0.469 - -0.376
- -0.375 - -0.359
- -0.358 - -0.338
- -0.337 - -0.317
- -0.316 - -0.287
- -0.286 - -0.262
- -0.261 - -0.241
- -0.24 - -0.224
- -0.223 - -0.211
- -0.21 - -0.185
- -0.184 - -0.16
- -0.159 - -0.135
- -0.134 - -0.105

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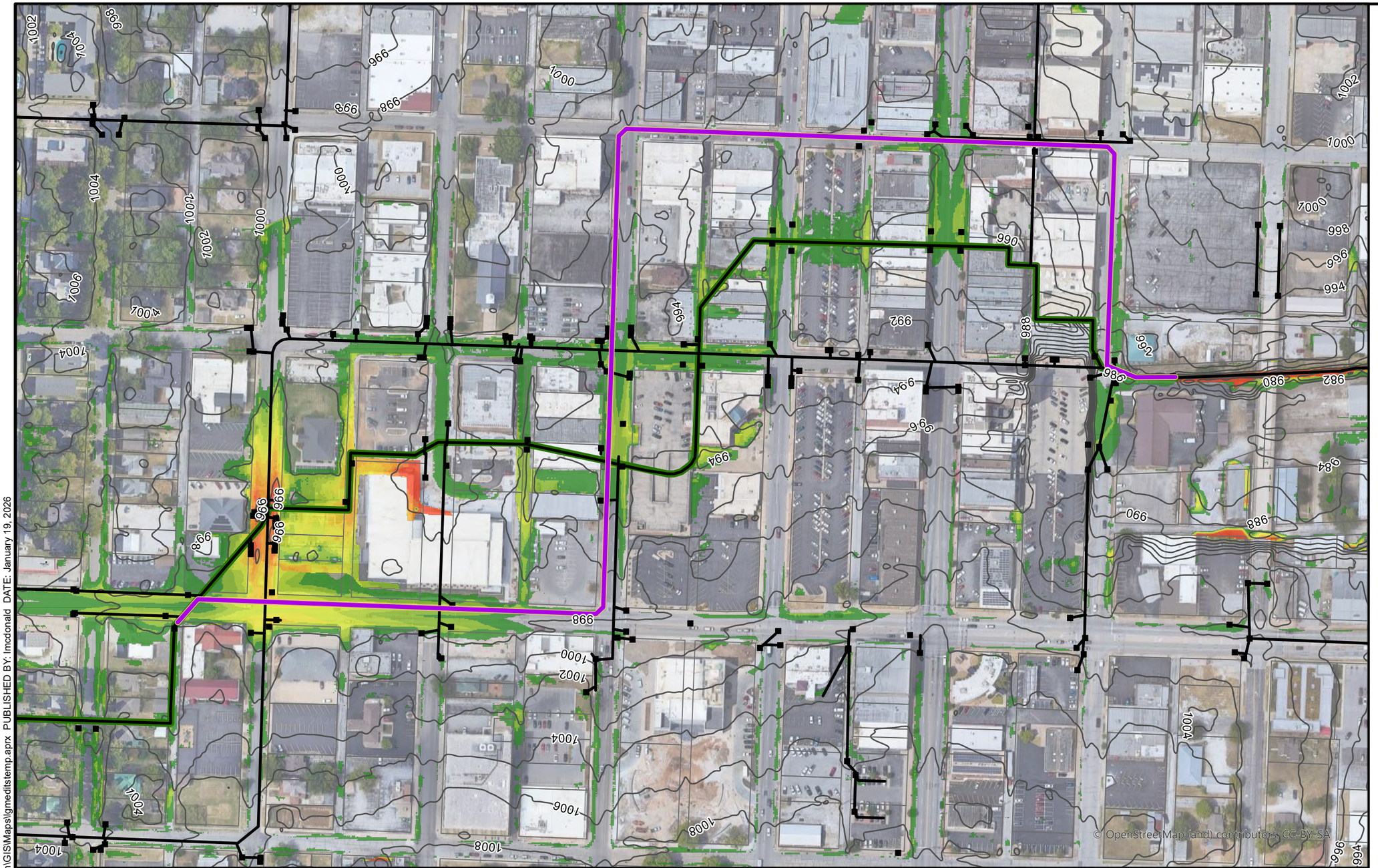
Phase 2C Minus Scenario 11 (Difference)

Old Willow Branch
Culvert Replacement Study
Joplin, MO
Figure 6

WGS 1984 Web Mercator Auxiliary Sphere

Basemap: ESRI World Imagery

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Legend

- Willow Branch Replacement Culvert
- Existing Storm Pipe Inventory
- Existing Storm Structure Inventory
- Old Willow Branch
- 2-ft Contours
- Parcels

Value

- 0.330001 - 0.75
- 0.750001 - 1
- 1.000001 - 1.25
- 1.250001 - 1.5
- 1.500001 - 1.75
- 1.750001 - 2
- 2.000001 - 2.25
- 2.250001 - 2.5
- 2.500001 - 2.75
- 2.750001 - 3

N 0 50 100 200 ft

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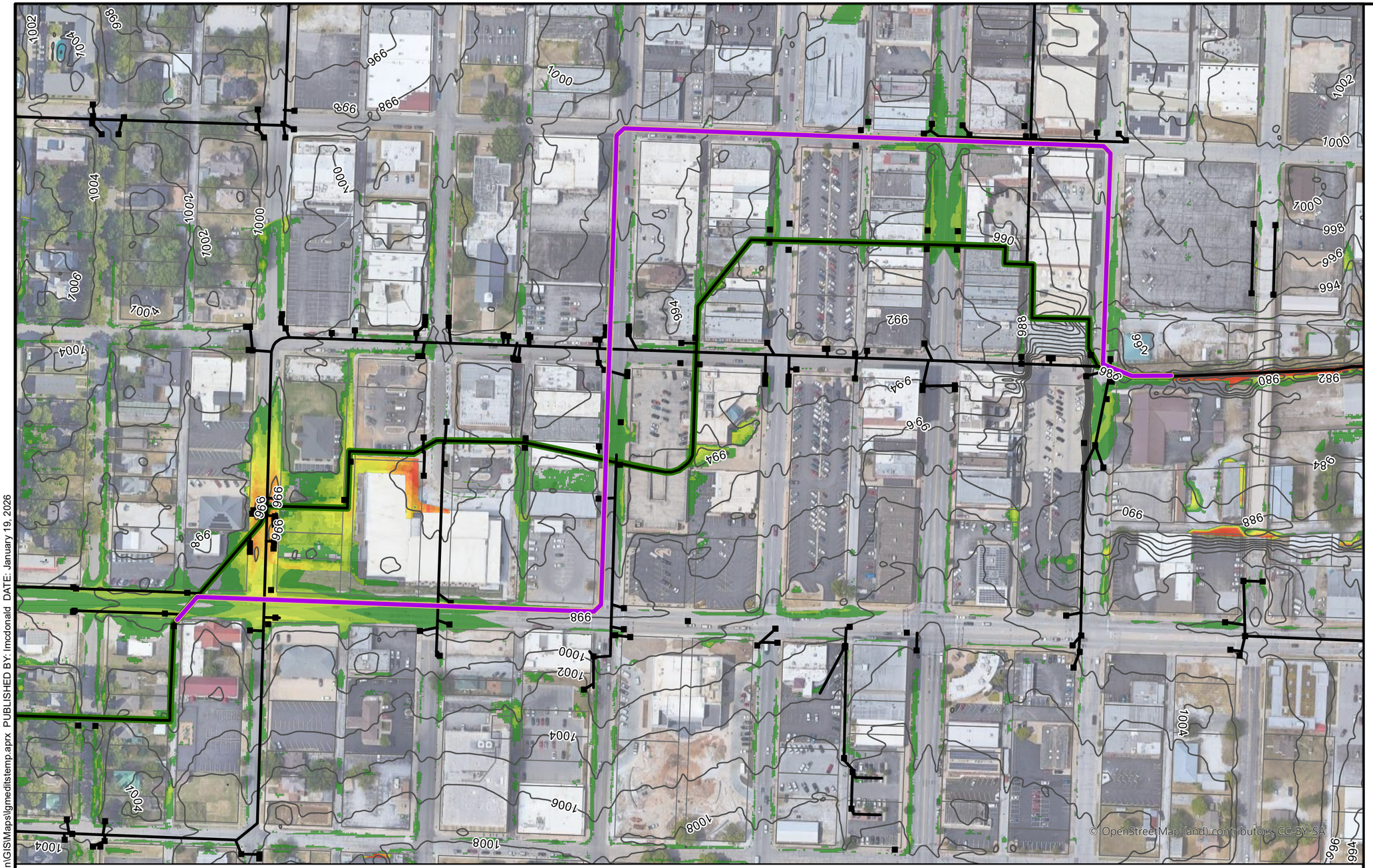
Existing Conditions 25-Year Depth

Old Willow Branch
Culvert Replacement Study
Joplin, MO
Figure 7

WGS 1984 Web Mercator Auxiliary Sphere

Basemap: ESRI World Imagery

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Legend

- Willow Branch Replacement Culvert
- Existing Storm Pipe Inventory
- Existing Storm Structure Inventory
- Old Willow Branch
- 2-ft Contours
- Parcels

Value

- 0.330001 - 0.75
- 0.750001 - 1
- 1.000001 - 1.25
- 1.250001 - 1.5
- 1.500001 - 1.75
- 1.750001 - 2
- 2.000001 - 2.25
- 2.250001 - 2.5
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- 2.750001 - 3

N 0 50 100 200 ft

olsson

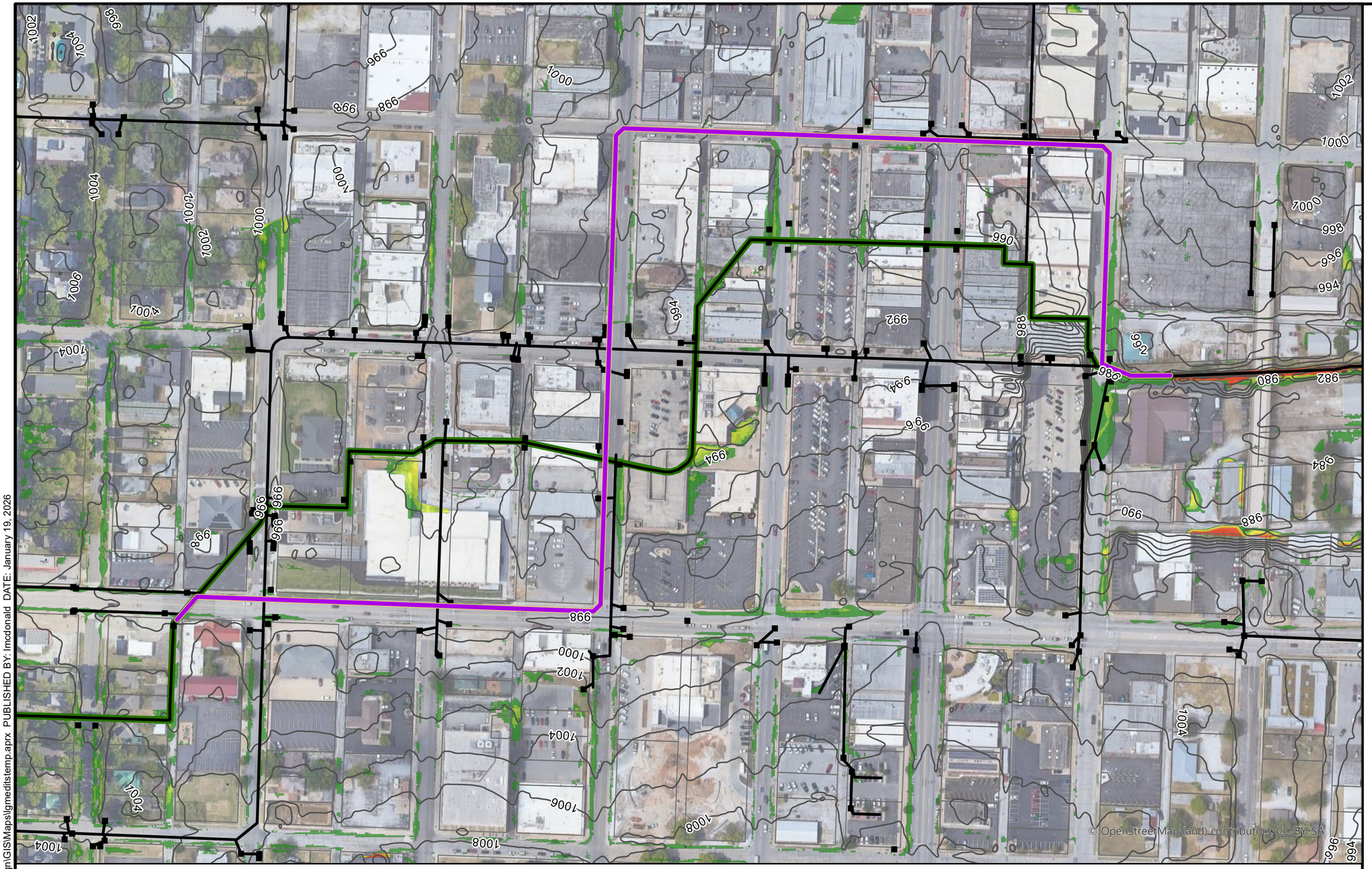
Phase 1D 25-Year Depth

Old Willow Branch
Culvert Replacement Study
Joplin, MO
Figure 8

WGS 1984 Web Mercator Auxiliary Sphere

Basemap: ESRI World Imagery

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Legend

- Willow Branch Replacement Culvert
- Existing Storm Pipe Inventory
- Existing Storm Structure Inventory
- Old Willow Branch
- 2-ft Contours
- Parcels

Phase 2C

Value

- 0.330001 - 0.75
- 0.750001 - 1
- 1.000001 - 1.25
- 1.250001 - 1.5
- 1.500001 - 1.75
- 1.750001 - 2
- 2.000001 - 2.25
- 2.250001 - 2.5
- 2.500001 - 2.75
- 2.750001 - 3

N 0 50 100 200 ft

olsson

Phase 2C (Ultimate) 25-Year Depth

Old Willow Branch
Culvert Replacement Study
Joplin, MO
Figure 9

WGS 1984 Web Mercator Auxiliary Sphere

Basemap: ESRI World Imagery

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Table 10. Summary of Culvert Sizing Scenarios Modeled in PCSWMM.

Scenario Name	Wall Avenue from Sixth to Fifth Streets, along Fifth Street, excluding Main Street, After Main Street to Outfall (6 feet maximum height)	Reinforced Concrete Box Along Seventh Street including Wall Avenue from Seventh Street to Sixth Street (4 feet maximum height)	Main Street (5 feet maximum height)	Notes
Scenario 1	10 x 4 (40 sf)	10 x 4 (40sf)	10 x 4 (40 sf)	
Scenario 2	10 x 5 (50 sf)	10 x 4 (40 sf)	10 x 5 (50 sf)	
Scenario 3	10 x 5 (50 sf)	12 x 4 (48 sf)	10 x 5 (50 sf)	
Scenario 4	9 x 6 (54 sf)	12 x 4 (48 sf)	10 x 5 (50 sf)	
Scenario 5	9 x 6 (54 sf)	Twin 7 x 4 (56 sf)	10 x 5 (50 sf)	
Scenario 6	11 x 6 (66 sf)	Twin 7 x 4 (56 sf)	12 x 5 (60 sf)	
Scenario 7	11 x 6 (66 sf)	Twin 8 x 4 (56 sf)	12 x 5 (60 sf)	Meets criteria 1 and 2
Scenario 8	12 x 6 (72 sf)	Twin 8 x 4 (56 sf)	Twin 7 x 5 (70 sf)	Meets criteria 1 and 2
Scenario 9	9 x 6 (54 sf)	Twin 8 x 4 (56 sf)	12 x 5 (60 sf)	Meets criteria 1 and 2
Scenario 10	10 x 5 (50 sf)	12 x 4 (48 sf)	10 x 5 (50 sf)	Scenario 3 with change to inverts at Seventh Street culvert for SSWR crossing
Scenario 11	10 x 5 (50 sf)	12 x 4 (48 sf)	10 x 5 (50 sf)	Scenario 10 with changes to inverts of culverts for SSWR.

sf – square feet
SSWR – sanitary sewer

4. PUBLIC STORM SEWER RELOCATIONS

4.1 Summary of Scope for Storm Relocations

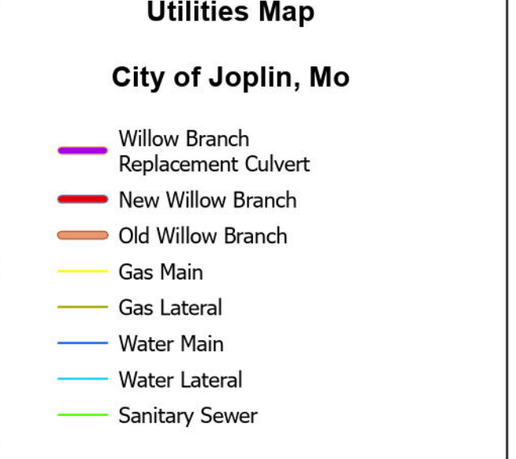
Olsson was tasked with developing conceptual plans for storm sewer relocations for systems that currently connect to the existing OWB box culvert. These systems must be rerouted to drain into the NWB or the proposed culvert to allow for the future abandonment of the OWB. Olsson evaluated the alignment and profile for each system relocation and then developed a hydraulic model for each system to size the pipes. Inlet design calculations were not performed because the primary goal was to reroute existing drainage; however, inlet infrastructure was marked to be replaced if it was visibly damaged, inefficient, or outdated with respect to current standards. Conceptual plan and profile sheets and opinions of probable construction cost can be found in Appendix E. Figure 10 shows these storm sewer relocations.

Figure 10

Willow Branch Utilities Map

City of Joplin, Mo

- Willow Branch Replacement Culvert
- New Willow Branch
- Old Willow Branch
- Gas Main
- Gas Lateral
- Water Main
- Water Lateral
- Sanitary Sewer



0 100 200 400 Feet

1 inch equals 200 feet

N

olsson

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4.2 Hydrology and Hydraulics

Storm sewer hydrology and hydraulics were modeled using Bentley StormCAD Version 10.03.04.53 to size the proposed enclosed storm sewer system. The study area was divided into subdrainage areas for each existing inlet. Most of the drainage area land use is single-family residential. The Rational Method was used to develop peak flow rates for each subdrainage area. In StormCAD, a frequency factor of 1.25 was applied to the 100-year storm event. Runoff coefficients for each subdrainage area followed guidance from the City‘s Stormwater Management Criteria manual (City of Joplin, n.d.). Times of concentration were calculated using the Technical Release 55 (TR-55) method. Rainfall data was obtained from the NOAA Atlas 14 database. Appendix D shows the drainage area locations for each subdrainage area.

Inlets were not designed during the conceptual analysis and calculations assumed 100 percent capture at inlets that should result in conservative pipe design. Storm pipes were designed to convey the 10-year design storm according to the City’s design criteria. In cases where the system surcharging would not have an adequate overflow path and potentially cause flooding, the storm sewer system was designed to convey the 100-year design storm. Tabular modeling results and HGL plots for each storm system are included in Appendix D.

An effort was made to follow the City’s design criteria for geometric layout; however, limited cover and surface slope were present in certain locations, requiring some deviations from the design standard. Storm sewer system relocations were designed within StormCAD to reduce modeling time and facilitate sizing iterations. This simple approach reduced modeling time and avoided overcomplication; the final design storm sewer relocations were imported into the final PCSWMM model for a comprehensive view of the proposed drainage improvements.

5. UTILITY RELOCATIONS

5.1 Storm Sewer

Existing storm drainage systems that drain to the OWB box culvert must be redirected to the NWB or the proposed box culvert prior to decommissioning the OWB culvert. GIS information is available for most of the public storm sewer within the study area; however, because of the age of the OWB system, an investigation was performed to identify any additional public or private connections to the OWB culvert. Ground Penetrating Radar Systems LLC (GPRS) was contracted to provide video inspection services for the existing OWB storm sewer from Eighth Street west of Sergeant Avenue to the outfall of OWB east of Virginia Avenue along with a secondary system east of Main Street flowing from north to south. GPRS's aim was to identify public and private storm sewer currently connected to the existing OWB culvert.

The following section will detail known connections within the decommissioning area, starting upstream and moving downstream. Because some areas could not be inspected and there is potential that conditions may change with time, it is recommended that the City or Contractor confirm private drainage systems are not present or have been relocated prior to abandonment of the OWB box culvert. Conceptual relocation plans of public storm sewer systems are included in Appendix E.

5.1.1 Old Willow Branch – Seventh Street to Byers Avenue

The OWB intersects Seventh Street diagonally from southwest to northeast. The proposed RCB culvert will connect to the OWB and divert flow to the east. At this junction on Seventh Street, western upstream stormwater from Seventh Street connects to the OWB. The U.S. 66-Seventh Street Improvement Project will connect this storm system to the proposed junction. Where the OWB outfalls to the northeast, a headwall will block flow, diverting upstream OWB flow easterly in the Willow Branch Replacement Culvert.

5.1.2 Old Willow Branch – Byers Avenue to Wall Avenue

The segment of the OWB between Byers Avenue and the alley west of Pearl Avenue may remain in place for the foreseeable future or until its physical condition requires replacement because it is located on public property and not beneath existing buildings.

There appears to be four underground stormwater connections to the OWB on the Jasper County courthouse property and two within the alley directly east. These connections can be united and conveyed with a new storm pipe to the north, connecting into the NWB at Sixth Street.

No storm connections were identified between the alley west of Wall Avenue and Wall Avenue.

5.1.3 Old Willow Branch – Wall Avenue to Sixth Street

At Wall Avenue, the OWB travels east and bends north under a parking garage until it intersects the NWB on Sixth Street.

Construction phasing requires constructing the new box culvert from the upstream end to its connection with the NWB at Sixth Street and Wall Avenue. Modeling results showed that the downstream portion of the OWB east of Wall Avenue and south of Sixth Street will need to remain at least 50 percent open until the downstream phase of the proposed culvert construction to Virginia Avenue is completed. This is necessary to avoid an adverse effect on the storm system.

East of Wall Avenue under the parking garage, there appears to be at least seven connections of various sizes to the OWB. These connections can be directed downstream to connect to the NWB. Once the second phase of the Willow Branch Replacement Culvert is constructed, the full cutoff wall can be constructed on the eastern side of Wall Avenue. After this is completed, no public drainage will flow through this segment of the OWB between Wall Avenue and Sixth Street. The OWB can continue to function for private drainage in this location until the private property owner chooses to replace it. A cutoff wall with an access grate could be constructed at the downstream end of the building to prevent access; however, this is not necessary from a stormwater standpoint.

5.1.4 Old Willow Branch – Alley North of Sixth Street West of Joplin Avenue

A small portion of the OWB travels north under an alley before bending under existing buildings. At least two connections are made and will need to be directed south to the NWB on Sixth Street. At that juncture, the OWB can be cut off before going under the existing buildings to the north. Removal of the OWB box culvert in this alley just north of Sixth Street may incur unnecessary risk. Instead, portions of the box culvert may remain in place and the culvert may be filled with aggregate material or otherwise abandoned in place. Final design plans should consider demolition options with respect to the nearby buildings. After the culvert is filled, a storm sewer can be trenched into the fill to provide conveyance for the grate inlets in the alley.

Under the buildings west of Joplin Avenue, at least four drain connections are made to the OWB. A cutoff wall should be constructed upstream of these buildings so that no public drainage will be flowing through this section of the OWB. The OWB can continue to function for private drainage in this location until the private property owner chooses to replace it. A cutoff wall with an access grate could be constructed at the downstream end of the building to prevent access; however, this is not necessary from a stormwater standpoint.

5.1.5 Old Willow Branch – Joplin Avenue to Main Street

Joplin Avenue contains four sets of combination curb-and-grate inlets that currently flow into the OWB. It is anticipated that these four inlets will be conveyed to the south toward the NWB on Sixth Street. They could also possibly be conveyed east into the public parking lot to the cluster of inlets there, or north along Joplin Avenue.

The public parking lot and alley east of Joplin Avenue contains grate inlets and curb inlets. These can be linked together and conveyed north through the parking lot to the proposed RCB culvert on Fifth Street. After Phase 2 is completed, a cutoff wall can be installed before the OWB goes below buildings.

Main Street contains four sets of triple combination curb-and-grate inlets that flow into the OWB It is anticipated that these four inlets will be conveyed to the north toward the proposed RCB culvert on Fifth Street. Depending on flow lines and utilities, it may also be possible to convey stormwater south to the NWB.

No storm connections were identified under the buildings on the western side of Main Street. Once the cutoff wall is constructed upstream of these buildings, no public drainage will be flowing through this section of the OWB. The OWB can remain in place in this location until the private property owner chooses to replace it. A cutoff wall with an access grate could be constructed at the downstream end of the building to prevent access; however, this is not necessary from a stormwater standpoint.

5.1.6 Old Willow Branch – East of Main Street to Connection to New Willow Branch

The segment of the OWB from the eastern side of Main Street traveling east was not accessible for video inspection. This segment is believed to extend approximately 130 feet to the east with several bends before turning south on the eastern side of the alley and continuing another 100 feet to the south. At that location, the culvert daylights to a concrete open channel located between two buildings and oriented east-west. Once the relocation discussed in Section 5.1.7 is completed and once the cutoff wall is constructed upstream of these buildings on the eastern side of Main Street, no public drainage will flow through this section of the OWB. It is unknown whether private drainage flows to this section of the culvert; however, the OWB can remain in place in this location until the private property owner chooses to replace it. A cutoff wall with an access grate could be constructed at the downstream end of the building to prevent access; however, this is not necessary from a stormwater standpoint.

A storm sewer system can be constructed in the east-west ditch to facilitate filling the ditch and installing two grate inlets. This system can be conveyed to the east and connected to the proposed RCB along Virginia Avenue via a small culvert. The upstream OWB culvert that would not, at this

point, convey any public drainage could connect to this storm system with a small pipe to convey any private drainage that was not identified.

Alternatively, the City could elect to keep the channel open and only install pipe between the open channel and the proposed RCB culvert. Cutoff walls could then be installed to: (1) disconnect the downstream (southern) portion of the OWB from public drainage, and (2) prevent access to the upstream portion of the OWB located beneath existing buildings.

5.1.7 North-South Pipe in Alley Between Main Street and Virginia Avenue South of Fourth Street to Old Willow Branch

An existing storm pipe in the alley between Main Street and Virginia Avenue drains from Fourth Street south to its connection with the OWB in the alley. This pipe varies in material and size and is surprisingly smaller than upstream storm sewers that are shown to drain into this system on the City's GIS database. Similar to other systems located below buildings, it is recommended that public storm sewer on Fifth Street and Fourth Street be redirected to drain to new systems on Main Avenue and Virginia Avenue. After these systems are constructed, no public stormwater will drain through the existing north-south pipe. The pipe can remain in place in this location until the private property owner chooses to remove or replace it.

5.2 Sanitary Sewer Relocation

5.2.1 Seventh Street Alley Between Byers Avenue and Pearl Avenue

An existing 8-inch sanitary sewer crosses Seventh Street in an alley between Byers Avenue and Pearl Avenue. As part of the U.S. 66-Seventh Street Improvements Project and proposed culvert installation, the manhole in the middle of Seventh Street is being filled with gravel after the pipe is extended through the manhole. Where the proposed RCB culvert crosses the existing sanitary main, the main will be encased within the bottom of the culvert floor and the RCB culvert will be cast-in-place construction.

5.2.2 Seventh Street Alley Between Pearl Avenue and Wall Avenue

An existing 8-inch sanitary sewer crosses Seventh Street in an alley between Pearl Avenue and Wall Avenue. As part of the U.S. 66-Seventh Street Improvements Project and proposed culvert installation, the manhole in the middle of Seventh Street is being filled with gravel after the pipe is extended through the manhole. Where the proposed RCB culvert crosses the existing sanitary main, the main will be encased within the bottom of the culvert floor and the RCB culvert.

5.2.3 Fifth Street Alley Between Wall Avenue and Joplin Avenue

An existing 8-inch sanitary sewer crosses Fifth Street in an alley between Wall Avenue and Joplin Avenue. This crossing conflicts with the Phase 2 proposed RCB culvert. The upstream sanitary sewer will need to be rerouted along the northern side of the proposed RCB culvert and conveyed east.

5.2.4 Fifth Street Alley Between Joplin Avenue and Main Street

An existing 8-inch sanitary sewer crosses Fifth Street in an alley between Joplin Avenue and Main Street. This crossing conflicts with the Phase 2 proposed RCB culvert. The upstream sanitary sewer will need to be picked up by the previously mentioned reroute along the northern side of the proposed RCB culvert and conveyed east.

5.2.5 Fifth Street Alley Between Main Street and Virginia Avenue

An existing 8-inch sanitary sewer crosses Fifth Street in an alley between Main Street and Virginia Avenue. This crossing should be below the Phase 2 proposed RCB culvert. A manhole on the northern side should be placed to pick up the previous two rerouted sanitary sewers. The sanitary sewer manhole in the middle of Fifth Street will need to be removed and another manhole installed directly downstream.

5.3 Domestic Water Relocation

5.3.1 Wall Avenue – Seventh Street to Fifth Street

A 12-inch water main runs down the centerline of Wall Avenue between Seventh Street and Fifth Street. This waterline will need to be either protected in place or relocated east of the proposed RCB culvert. Any service lines along this stretch will need to be adjusted.

5.3.2 Fifth Street Between Wall Avenue and Virginia Avenue

An existing water main runs along the northern pavement section of Fifth Street between Wall Avenue and Virginia Avenue that will be in conflict the proposed RCB culvert in Phase 2. This waterline will need to be adjusted. Because the sanitary sewer will need to be rerouted along the northern edge and because of the tight restrictions between ROW lines and existing buildings, the water will need to be relocated to the south of the proposed RCB. Any service lines along this stretch will need to be adjusted.

5.3.3 Virginia Avenue Between Fifth Street and Sixth Street

An existing water main appears to run down the center of Virginia Avenue between Fifth Street and Sixth Street. This water main will conflict with the proposed RCB culvert alignment and will need to be relocated within the street corridor. Any service lines along this stretch will need to be adjusted.

5.3.4 Additional Storm Sewer Relocations

Additional conflicts may be present at the additional storm sewer relocations and more detailed utility locations will be provided by utility providers during final design of each system.

5.4 Gas Main Relocation

5.4.1 Wall Avenue – Fifth Street to Seventh Street

An existing 4-inch gas main is located within the western drive lane of Wall Avenue between Sixth Street and Seventh Street. It jogs east at Sixth Street and continues north in the center of Wall Avenue to Fifth Street. It is unclear whether this main extends farther north up Wall Avenue. This main is within the alignment of the proposed RCB culvert and will need to be relocated either to the west in the sidewalk or to the east. Any service lines along this stretch will need to be adjusted.

5.4.2 Fifth Street – Wall Avenue to Virginia Avenue

An existing 6-inch gas main appears to be within the southern portion of the pavement section on Fifth Street between Wall Avenue and Main Street and then continues east as an 8-inch main from Main Avenue to Virginia Avenue. This gas main most likely will need to be shifted south to accommodate the proposed RCB culvert. However, further design of the box culvert will be required to determine a final location for the gas main. Gas mains cross Fifth Street at Joplin Avenue, Main Avenue, and the alleys between Joplin Avenue and Main Street and between Main Street and Virginia Avenue. Any service lines along this stretch will need to be adjusted. Lastly, there is a 4-inch gas main on the western side of Virginia Avenue running north-south.

5.4.3 Additional Storm Sewer Relocations

Additional conflicts may be present at the additional storm sewer relocations, and more detailed utility locations will be provided by utility providers during final design of each system.

5.5 Communications Relocation

5.5.1 Seventh Street – West of Byers Avenue to Wall Avenue

An AT&T transmission line crosses Seventh Street going north-south on the eastern side of Byers Avenue and on the eastern side of Pearl Avenue. The location at Byers Avenue is believed to be below the OWB box culvert, while the location at Pearl Avenue should be evaluated for a potential

conflict. An additional AT&T distribution line travels north-south in the alley between Joplin Avenue and Main Street. This line crosses the proposed culvert alignment at Fifth Street.

5.5.2 Fifth Street – Joplin Avenue to Virginia Avenue

Additional communications (other provider) line runs east-west behind the curb on both sides of Fifth Street east of Joplin Avenue. Additional coordination will be required during final design of the Project to identify potential relocation requirements.

5.5.3 Additional Storm Sewer Relocations

Additional conflicts may be present at the additional storm sewer relocations, and more detailed utility locations will be provided by AT&T during the final design of each system.

5.6 Additional Conflicts/Relocations

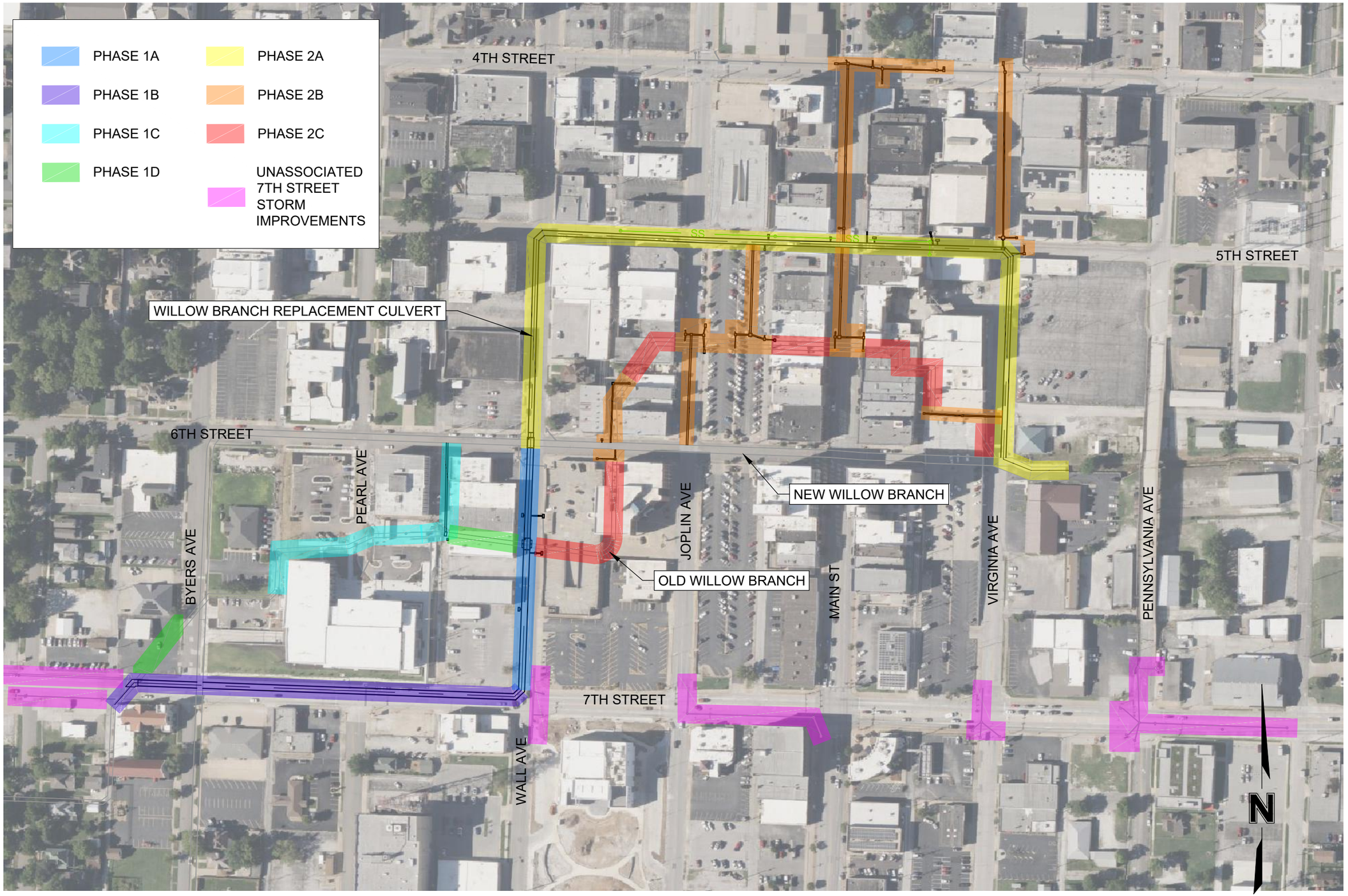
Additional utility relocations are likely, and more information will be available as the proposed projects progress to final design. Preliminary plans for each storm sewer system design should be delivered to utility companies at preliminary and final plan submittals to identify potential issues quickly after drafting storm sewer design.

6. CONSTRUCTION PHASING

The Project involves a multiphase approach to culvert construction and storm sewer relocation, with coordination required between public infrastructure teams and private property owners. The phasing assures that critical components are built in a logical sequence to maintain functionality and minimize disruption.

Storm sewer improvements included in the U.S. Route 66-Seventh Street Improvements Project were coordinated with the Project and designed to discharge to the proposed Willow Branch Replacement Culvert within Seventh Street before the culvert turns north on Wall Avenue. To avoid delays, the Willow Branch Replacement Culvert construction must be completed prior to the overlapping portion of the U.S. Route 66-Seventh Street Improvements Project.

MoDOT has agreed to delay construction of this phase of Seventh Street until January of 2028 at the latest to allow for construction of the Project that Seventh Street will drain to. With respect to these time constraints, the minimum amount of the proposed culvert that must be constructed to accommodate Seventh Street drainage is the portion from Seventh Street to Sixth Street on Wall Avenue. Constructing this segment as a first phase will allow Seventh Street to drain to the NWB culvert on Sixth Street and also connect to the OWB just south of Sixth Street on Wall Avenue. Hydraulics were evaluated for this phasing scenario and modeling results are discussed in this report. Additional hydraulic modeling was also performed to evaluate which segments of OWB may be blocked prior to construction of the full length of the Project. Design will continue in Phase 2 of the Project with the goal of constructing that phase immediately following Phase 1. Refer to Figure 11 on construction phasing.



0' 100' 200' 400'

SCALE IN FEET

FIGURE 11

CONSTRUCTION AND ABANDONMENT PHASING PLAN

OLD WILLOW BRANCH CULVERT REPLACEMENT

JOPLIN, MO

2025

REVISIONS

REV. NO.	DATE	DESCRIPTION

drawn by: EJS
designed by: EJS
project no.: 024-04647
date: 02/04/2025

550 East St. Louis Street
Springfield, MO 65806

olsson.com
TEL 417.890.8802
FAX 417.890.8805

Olsson - Engineering
Missouri COA #001592

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DATE: Jan 18, 2026 6:20pm USER: lmcdonald

6.1 Willow Branch Replacement Culvert – Phase 1

Phase 1 focuses on the western portion of the Project area, primarily between Sixth Street and Seventh Street, and includes preparatory work for future phases.

6.1.1 1a – Culvert Construction from Sixth Street to Seventh Street

This segment initiates the culvert installation, establishing the primary drainage route between Sixth Street and Seventh Street. It sets the foundation for downstream connectivity and must be completed before any upstream work begins, including the Route 66-Seventh Street Improvements Project overlapping this area. The OWB culvert connection on the western side of Wall Avenue must remain connected and not blocked until Phase 1C is completed. Also, any private drains should be extended to the replacement culvert prior to abandonment. No private drains are known on the western side of Wall Avenue, while there are multiple connections on the eastern side of Wall Avenue under the parking garage. The OWB culvert east of Wall Avenue will continue to flow northeast and into the OWB and NWB according to the phasing plan.

6.1.2 1b – Culvert Construction on Seventh Street (U.S. Route 66)

Following the Sixth Street to Seventh Street segment, the culvert continues upstream along Seventh Street. This assures continuity of the drainage system and prepares the area for integration with existing infrastructure and proposed stormwater improvements on Seventh Street. At the western end, just past Byers Avenue, the new culvert will connect to the OWB box culvert as part of the U.S. Route 66-Seventh Street Improvements Project. The conduit to the north will be blocked at that junction location as part of the decommissioning plan for the OWB in the U.S. Route 66-Seventh Street Improvements Project.

6.1.3 1c – Relocation of Existing Storm Sewer (West of Wall Avenue)

To accommodate the new culvert system and to allow for abandonment and decommissioning of the OWB on private property, existing storm sewer lines west of Wall Avenue must be relocated. Conceptual plans for storm sewer relocations are included in Appendix E.

6.1.4 1d – Demolition/Abandonment of Existing Old Willow Branch Box Culvert (by Private Property Owners)

Prior to Phase 1D, all public storm drainage systems will be relocated and no longer flow through the OWB. Private property owners are responsible for removing or abandoning the existing OWB infrastructure after the City reroutes all public drainage through other systems. Refer to the

hydraulic considerations of construction phasing in Section 6 for more detailed information on hydraulic impacts of decommissioning certain sections; however, the segment of the OWB east of Wall Avenue and south of Sixth Street should not be demolished prior to completion of Phase 2A.

6.2 Willow Branch Replacement Culvert – Phase 2

Phase 2 expands the culvert system eastward to the discharge location in the open channel and finalizes the storm sewer relocations and the OWB abandonment, completing the full drainage corridor.

6.2.1 2a – Culvert Construction from Sixth Street and Wall Avenue to Sixth Street and Virginia Avenue via Fifth Street

This segment extends the culvert eastward, connecting Wall Avenue to Virginia Avenue through Fifth Street. It completes the main drainage route and links all previously constructed segments. After completion of this phase, the Willow Branch Replacement Culvert will be completed, although some public drainage is still being conveyed through the OWB system.

6.2.2 2b – Relocation of Existing Storm Sewer (East of Sixth Street and Wall Avenue)

Similar to Phase 1, existing storm sewer infrastructure east of Sixth Street and Wall Avenue must be relocated to connect to the new culvert system prior to decommissioning the OWB culvert. The storm sewer on Joplin Avenue, in the parking lot east of Joplin Avenue, and on Main Street will each be relocated to either the OWB or NWB. With these relocations, the OWB culvert within public ROW can be demolished and abandoned. The downstream side of the culvert can be blocked with a concrete wall. The upstream side of the culvert at each location should not be blocked until all private drains are confirmed to be extended to the public system. This effort can be deferred to Phase 2C. No private drains are known in these locations; however, segments of the systems were not traversable, and the existence of private drains could neither be confirmed nor denied. If private drains are discovered, they can be extended with an equivalent size polyvinyl chloride (PVC) pipe because the culvert is either removed or filled with flowable fill. Alternatively, the upstream side of the junction with the proposed culvert and the OWB can remain partially or fully open until the private property owner chooses to decommission the culvert.

6.2.3 2C – Demolition/Abandonment of Existing Old Willow Branch Box Culvert (by Private Property Owners)

Prior to this Phase 2C, all public storm drainage will have been rerouted to the NWB and the proposed culvert, while the OWB will only convey private drainage. Private drainage must be relocated by private property owners. Final removal or abandonment of remaining OWB boxes will be performed by private property owners at their schedule and discretion.

6.3 Hydraulic Considerations for Construction Phasing

Because the first phase of construction is expected to be the upstream half of the Willow Branch Replacement Culvert, hydraulic evaluation was necessary to understand (1) how the temporary condition of having only the upstream portion of the Project constructed would affect the overall system, (2) how blocking the OWB segment north of Seventh Street and west of Wall Avenue would affect the overall system hydraulics, and (3) how blocking the OWB segments on the eastern and western side of the junction with the OWB at Wall Avenue would affect the hydraulics of the overall system. Of particular concern was whether the OWB segment east of Wall Avenue could be blocked during the construction of the culvert on Wall Avenue. This determination was important because of structural design challenges associated with a four-way cross structure at that location.

To model Phase 1, the proposed culvert needed to be built up to the Sixth Street connection to the NWB, and the OWB west of Wall Avenue would need to be removed from the model to reflect the proposed drainage. The Phase 1 model retained the NWB and the OWB downstream of Sixth Street from the existing conditions and modeled the proposed upstream drainage changes. Additional phasing scenarios are further described below in Table 11.

Table 11. Summary of Culvert Sizing Scenarios Modeled in PCSWMM.

Alternatives	Description	Results
Phase 1-1	Consists of adding the Phase 1 proposed culvert (from Seventh Street and Byers Avenue to Sixth Street and Wall Avenue) to the existing model without abandoning/removal any portion of OWB.	Does not cause any rise compared to existing conditions
Phase 1-2	Consists of Phase 1-1 model, with a wall to block flow from going east under the parking garage at the junction of OWB and proposed culvert on Wall Avenue south of Sixth Street.	Causes a rise of 2.1 feet compared to existing conditions at the OWB and Willow Branch Replacement Culvert connection on Wall Street. Causes flooding of 1.2 feet. Junction: J11
Phase 1-3	Consists of Phase 1-1 model, with a wall to block only one side of the twin 3.5 feet by 7.4 feet RCB east of Wall Avenue.	Causes an increase compared to existing conditions at the same location as 1B; however, the HGL stays below the surface in the 100-year scenario. Junction: J11. No increases in surface ponding occur.

OWB – Old Willow Branch
RCB – reinforced concrete box
HGL – hydraulic grade line

After reviewing the alternatives for Phase 1, it was determined that the proposed construction phasing for Phase 1 will not cause any adverse effect on hydraulics in the temporary condition prior to construction of Phase 2. Additionally, the OWB running east of Wall Avenue cannot be completely blocked without causing the hydraulic grade to jump above ground, potentially flooding streets and buildings. However, scenarios 1-3 show that up to half of that culvert segment can be blocked without causing flooding on Wall Avenue. A partial blockage was considered because it would allow for stub walls or a shorter span that eases constructability concerns with the proposed concrete junction structure. Additional detailed modeling results are included in Appendix C.

7. REFERENCES

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APPENDIX A
Figures



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olsson

OLD WILLOW BRANCH – VIDEO INSPECTION
DRAINAGE CONNECTIONS: ACCESS LOCATIONS

Old Willow Branch
024-04647-B
Joplin, Missouri

Date of Inspection: February 2025

Figure A-1

NAD 1983 StatePlane Missouri West FIPS 2403 Feet

Figure A-2

GPRS Information Guide

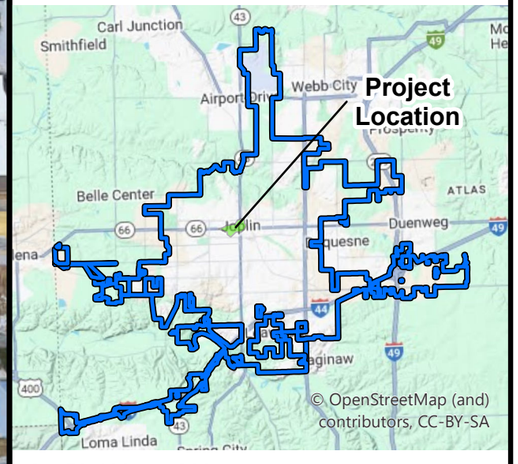
City of Joplin, Mo

Outer Wall Locations- Tap and Video Provided

No wall locations - Tap and Video Provided

Could Not Access

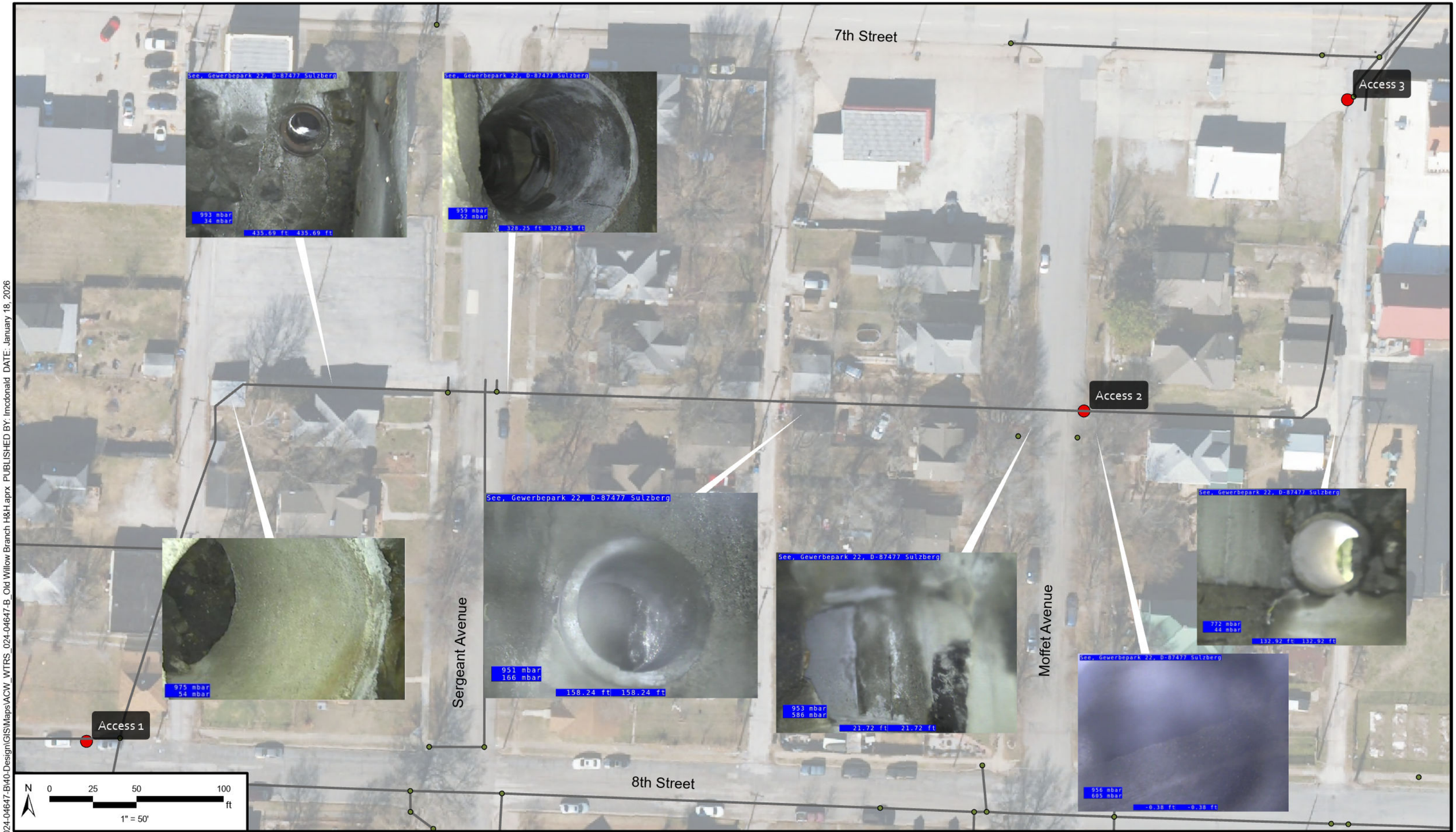
*Note: Drawn as an estimate based on upstream and downstream access locations



0 50 100 200 ft

N

olsson



OLD WILLOW BRANCH – VIDEO INSPECTION
DRAINAGE CONNECTIONS: ACCESS 1-3

olsson

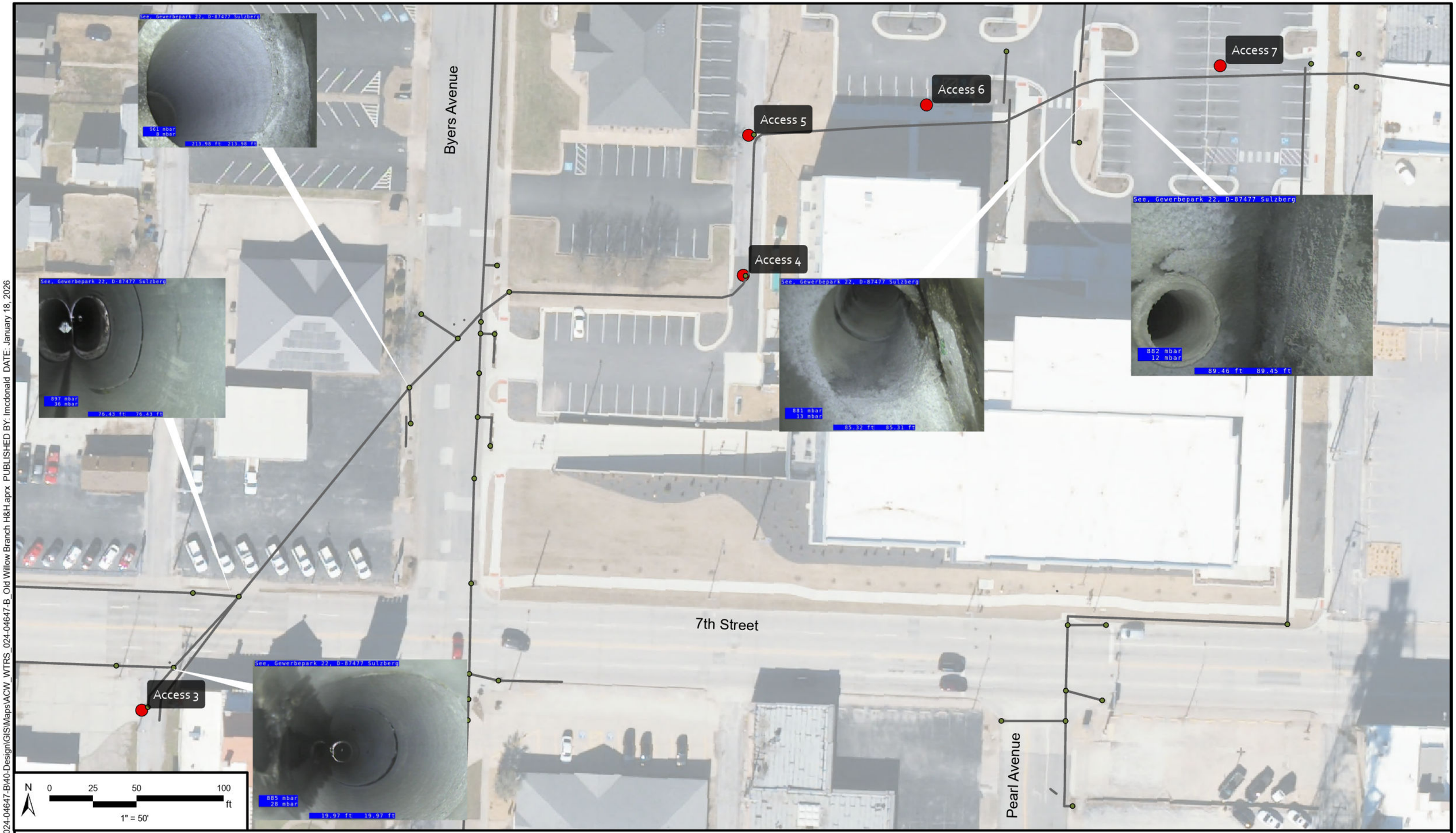
Old Willow Branch
024-04647-B
Joplin, Missouri

Date of Inspection: February 2025

Figure A-3

NAD 1983 StatePlane Missouri West FIPS 2403 Feet

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OLD WILLOW BRANCH – VIDEO INSPECTION
DRAINAGE CONNECTIONS: ACCESS 3-7

olsson

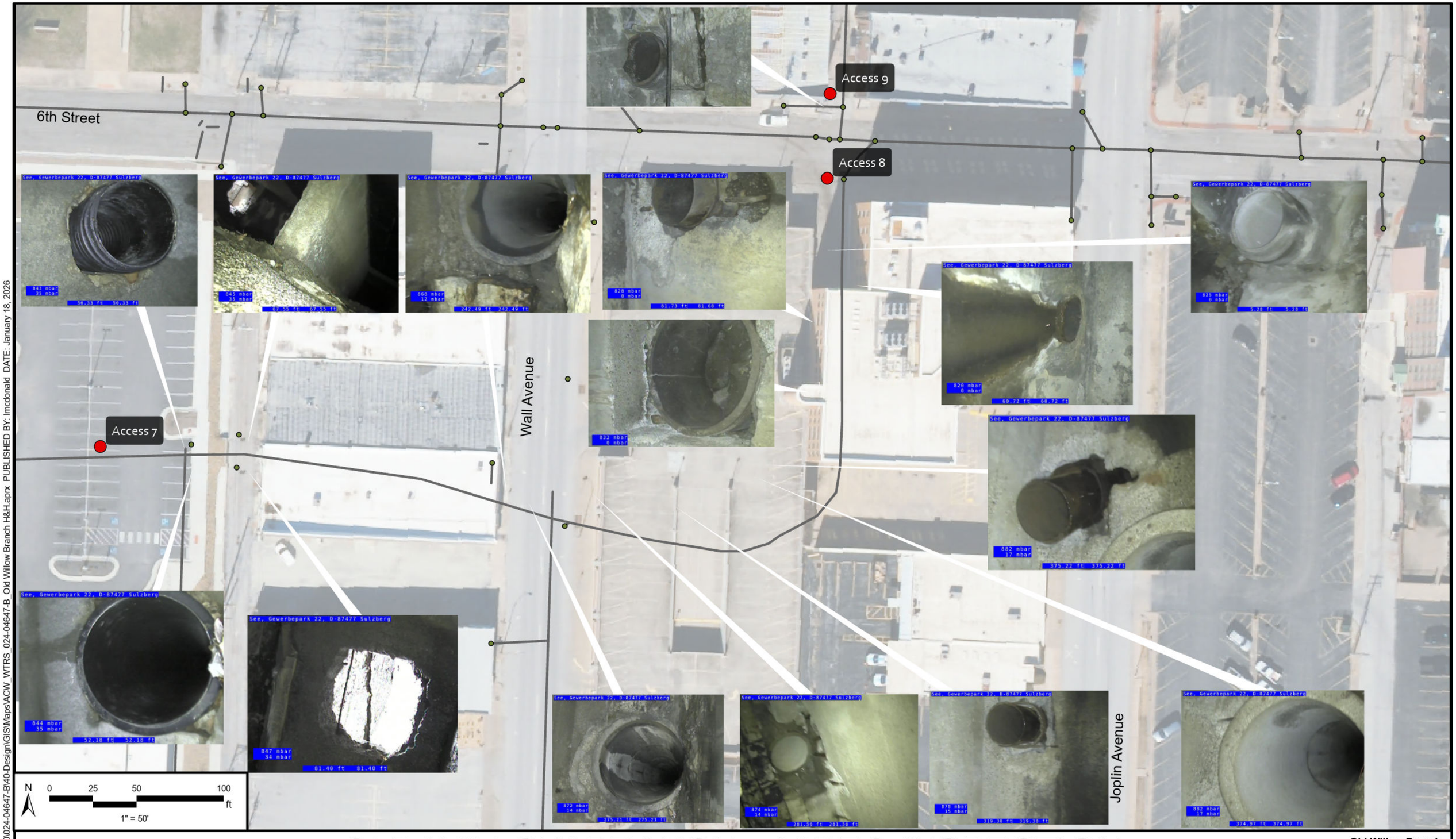
Old Willow Branch
024-04647-B
Joplin, Missouri

Date of Inspection: February 2025

Figure A-4

NAD 1983 StatePlane Missouri West FIPS 2403 Feet

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OLD WILLOW BRANCH – VIDEO INSPECTION
DRAINAGE CONNECTIONS: ACCESS 7-9

olsson

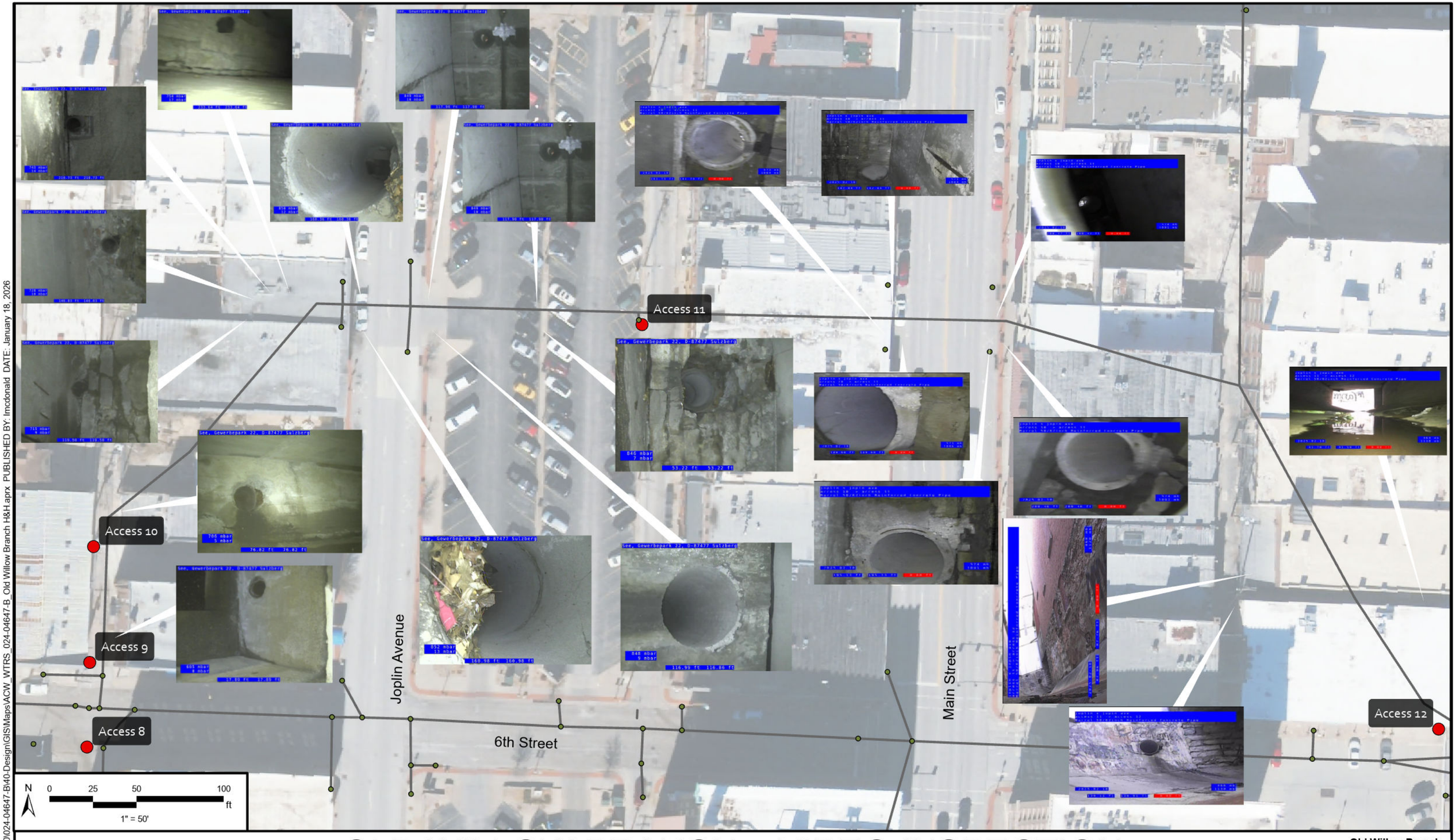
Old Willow Branch
024-04647-B
Joplin, Missouri

Date of Inspection: February 2025

Figure A-5

NAD 1983 StatePlane Missouri West FIPS 2403 Feet

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OLD WILLOW BRANCH – VIDEO INSPECTION
DRAINAGE CONNECTIONS: ACCESS 9-12

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Old Willow Branch
024-04647-B
Joplin, Missouri

Date of Inspection: February 2025

Figure A-6

NAD 1983 StatePlane Missouri West FIPS 2403 Feet

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Access 14

4th Street

Main Street

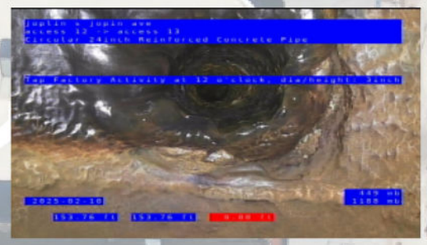
5th Street

Access 13

Virginia Avenue











N

0 25 50 100 ft

1" = 50'

OLD WILLOW BRANCH – VIDEO INSPECTION
DRAINAGE CONNECTIONS: ACCESS 13-14

olsson

Old Willow Branch
024-04647-B
Joplin, Missouri

Date of Inspection: February 2025

Figure A-7

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NAD 1983 StatePlane Missouri West FIPS 2403 Feet

APPENDIX B
Hydraulic Inputs

NOAA Atlas 14, Volume 8, Version 2
Location name: Joplin, Missouri, USA*
Latitude: 37.084°, Longitude: -94.518°
Elevation: 998 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	5.10 (4.14-6.24)	5.82 (4.72-7.13)	6.98 (5.65-8.57)	7.94 (6.40-9.76)	9.24 (7.27-11.5)	10.2 (7.93-12.8)	11.2 (8.50-14.2)	12.2 (8.99-15.6)	13.5 (9.68-17.5)	14.4 (10.2-18.9)
10-min	3.73 (3.03-4.57)	4.26 (3.46-5.22)	5.12 (4.13-6.28)	5.81 (4.69-7.15)	6.77 (5.32-8.42)	7.49 (5.81-9.38)	8.20 (6.22-10.4)	8.92 (6.58-11.5)	9.85 (7.09-12.8)	10.5 (7.46-13.9)
15-min	3.04 (2.46-3.72)	3.46 (2.81-4.24)	4.16 (3.36-5.10)	4.73 (3.81-5.81)	5.50 (4.33-6.84)	6.09 (4.72-7.63)	6.67 (5.06-8.46)	7.25 (5.35-9.32)	8.01 (5.76-10.4)	8.57 (6.07-11.3)
30-min	2.19 (1.78-2.68)	2.52 (2.04-3.08)	3.04 (2.46-3.73)	3.47 (2.79-4.26)	4.04 (3.18-5.03)	4.48 (3.47-5.60)	4.90 (3.71-6.21)	5.32 (3.93-6.83)	5.87 (4.22-7.64)	6.27 (4.44-8.25)
60-min	1.45 (1.18-1.78)	1.66 (1.35-2.04)	2.02 (1.63-2.47)	2.32 (1.87-2.85)	2.74 (2.17-3.44)	3.08 (2.40-3.88)	3.43 (2.61-4.36)	3.78 (2.80-4.88)	4.27 (3.08-5.58)	4.64 (3.29-6.11)
2-hr	0.901 (0.738-1.09)	1.03 (0.845-1.25)	1.26 (1.03-1.53)	1.45 (1.18-1.77)	1.74 (1.39-2.16)	1.96 (1.54-2.46)	2.20 (1.69-2.79)	2.45 (1.83-3.15)	2.80 (2.04-3.65)	3.08 (2.19-4.02)
3-hr	0.675 (0.556-0.815)	0.772 (0.636-0.932)	0.943 (0.774-1.14)	1.10 (0.896-1.33)	1.32 (1.07-1.65)	1.51 (1.20-1.89)	1.71 (1.32-2.17)	1.93 (1.45-2.47)	2.23 (1.63-2.90)	2.47 (1.77-3.22)
6-hr	0.406 (0.338-0.485)	0.465 (0.386-0.556)	0.570 (0.473-0.683)	0.667 (0.551-0.800)	0.813 (0.664-1.01)	0.937 (0.750-1.16)	1.07 (0.836-1.35)	1.21 (0.921-1.55)	1.42 (1.05-1.84)	1.59 (1.14-2.05)
12-hr	0.237 (0.199-0.281)	0.273 (0.229-0.324)	0.337 (0.282-0.400)	0.395 (0.329-0.469)	0.481 (0.396-0.590)	0.554 (0.447-0.682)	0.631 (0.497-0.787)	0.715 (0.546-0.904)	0.833 (0.618-1.07)	0.928 (0.673-1.19)
24-hr	0.139 (0.118-0.163)	0.161 (0.136-0.189)	0.199 (0.168-0.233)	0.232 (0.196-0.274)	0.282 (0.233-0.341)	0.322 (0.262-0.392)	0.365 (0.289-0.451)	0.411 (0.316-0.515)	0.475 (0.354-0.604)	0.525 (0.383-0.671)
2-day	0.081 (0.069-0.094)	0.093 (0.080-0.108)	0.115 (0.098-0.134)	0.134 (0.114-0.157)	0.162 (0.135-0.194)	0.184 (0.151-0.222)	0.208 (0.166-0.254)	0.232 (0.180-0.289)	0.267 (0.200-0.336)	0.294 (0.216-0.373)
3-day	0.058 (0.050-0.068)	0.068 (0.058-0.078)	0.084 (0.072-0.097)	0.097 (0.083-0.113)	0.117 (0.098-0.140)	0.133 (0.110-0.160)	0.150 (0.120-0.183)	0.168 (0.130-0.207)	0.192 (0.145-0.241)	0.211 (0.156-0.267)
4-day	0.047 (0.041-0.054)	0.054 (0.047-0.062)	0.067 (0.058-0.077)	0.078 (0.067-0.090)	0.093 (0.079-0.111)	0.106 (0.088-0.127)	0.119 (0.096-0.145)	0.133 (0.104-0.164)	0.153 (0.115-0.191)	0.168 (0.124-0.211)
7-day	0.031 (0.027-0.036)	0.036 (0.031-0.041)	0.044 (0.038-0.050)	0.051 (0.044-0.058)	0.061 (0.052-0.072)	0.069 (0.057-0.081)	0.077 (0.062-0.093)	0.086 (0.067-0.105)	0.097 (0.074-0.121)	0.107 (0.079-0.134)
10-day	0.025 (0.022-0.028)	0.028 (0.025-0.032)	0.034 (0.030-0.039)	0.040 (0.034-0.045)	0.047 (0.040-0.055)	0.053 (0.044-0.062)	0.059 (0.048-0.070)	0.065 (0.051-0.079)	0.073 (0.056-0.091)	0.080 (0.059-0.100)
20-day	0.017 (0.015-0.019)	0.019 (0.017-0.021)	0.022 (0.020-0.025)	0.025 (0.022-0.029)	0.029 (0.025-0.034)	0.032 (0.027-0.038)	0.036 (0.029-0.042)	0.039 (0.031-0.047)	0.043 (0.033-0.053)	0.046 (0.035-0.057)
30-day	0.013 (0.012-0.015)	0.015 (0.013-0.017)	0.018 (0.016-0.020)	0.020 (0.018-0.022)	0.023 (0.020-0.026)	0.025 (0.021-0.029)	0.027 (0.022-0.032)	0.029 (0.023-0.035)	0.032 (0.025-0.039)	0.034 (0.026-0.042)
45-day	0.011 (0.010-0.012)	0.012 (0.011-0.014)	0.014 (0.013-0.016)	0.016 (0.014-0.018)	0.018 (0.016-0.021)	0.020 (0.017-0.023)	0.021 (0.018-0.025)	0.023 (0.018-0.027)	0.025 (0.019-0.030)	0.026 (0.020-0.032)
60-day	0.009 (0.008-0.010)	0.010 (0.009-0.012)	0.012 (0.011-0.014)	0.014 (0.012-0.015)	0.016 (0.013-0.018)	0.017 (0.014-0.019)	0.018 (0.015-0.021)	0.019 (0.015-0.023)	0.021 (0.016-0.025)	0.022 (0.016-0.027)

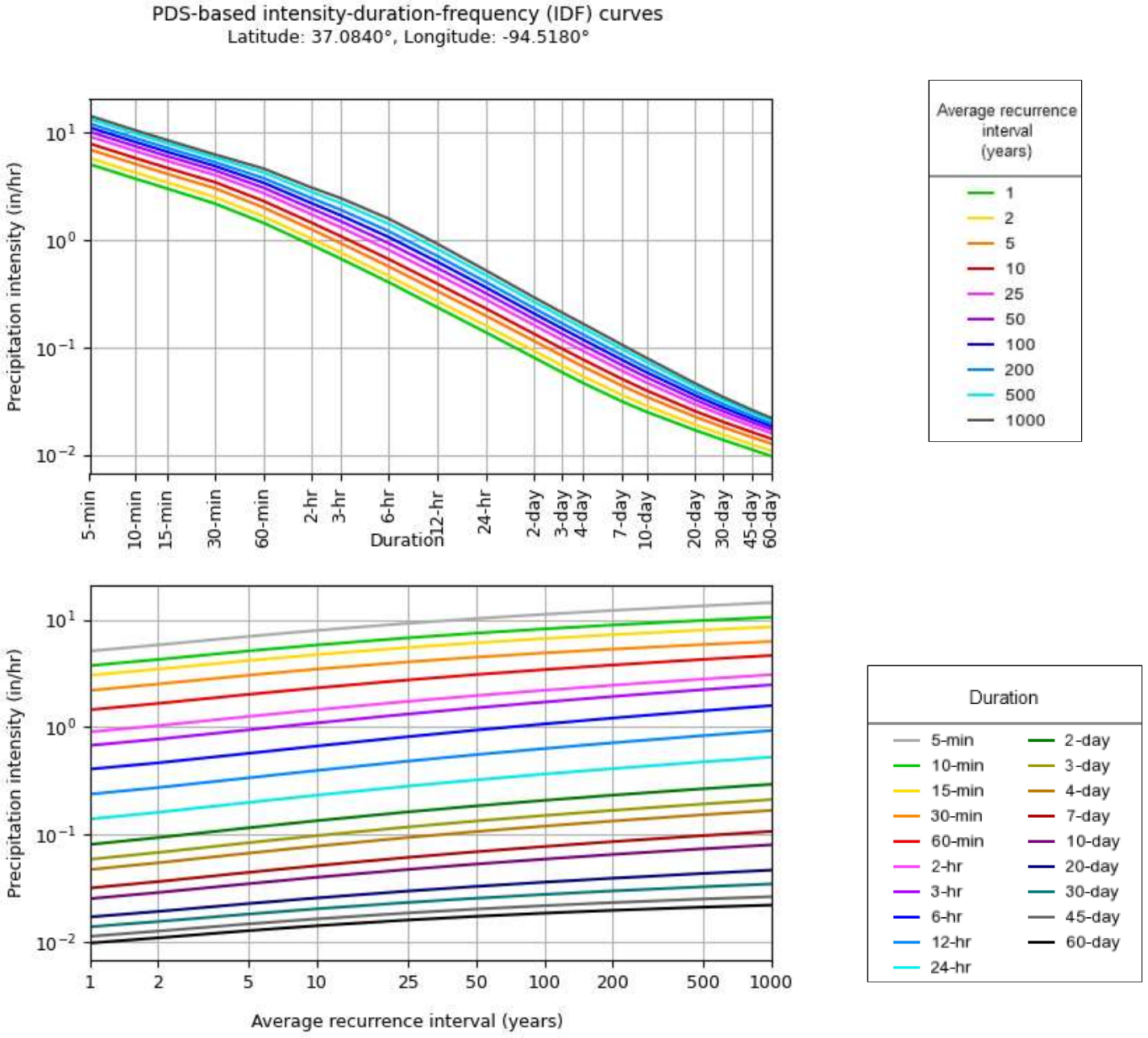
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Wed Dec 18 21:25:51 2024

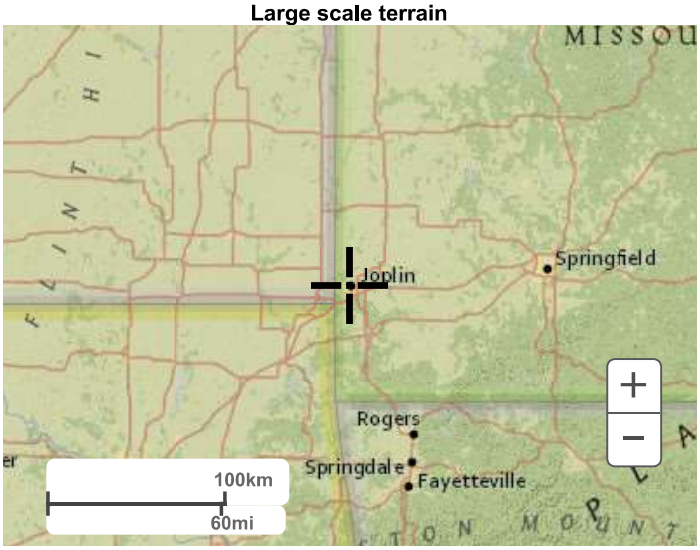
Back to Top

Maps & aerials

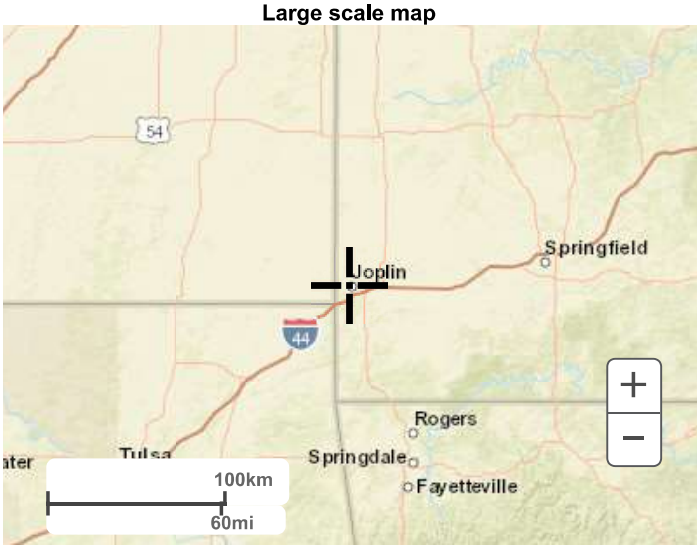
Small scale terrain



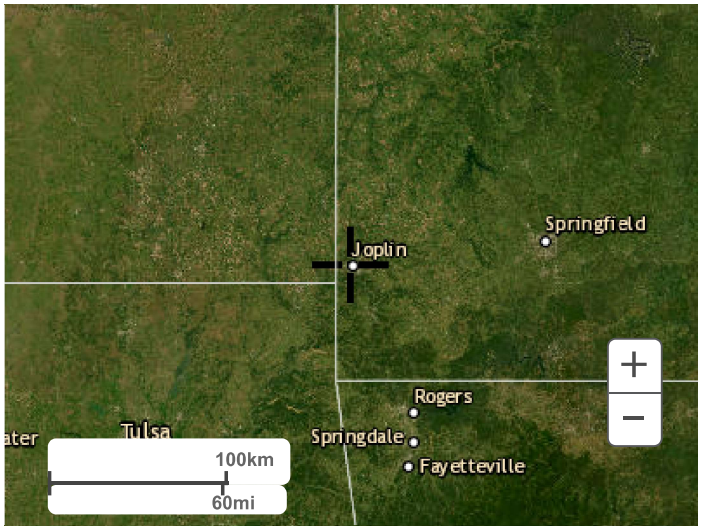
Large scale terrain



Large scale map



Large scale aerial



Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

NOAA Atlas 14, Volume 8, Version 2
Location name: Joplin, Missouri, USA*
Latitude: 37.084°, Longitude: -94.518°
Elevation: 998 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.425** (0.345-0.520)	**0.485** (0.393-0.594)	**0.582** (0.471-0.714)	**0.662** (0.533-0.813)	**0.770** (0.606-0.958)	**0.852** (0.661-1.07)	**0.934** (0.708-1.18)	**1.02** (0.749-1.30)	**1.12** (0.807-1.46)	**1.20** (0.850-1.58)
10-min	**0.622** (0.505-0.762)	**0.710** (0.576-0.870)	**0.853** (0.689-1.05)	**0.969** (0.781-1.19)	**1.13** (0.887-1.40)	**1.25** (0.968-1.56)	**1.37** (1.04-1.73)	**1.49** (1.10-1.91)	**1.64** (1.18-2.14)	**1.76** (1.24-2.31)
15-min	**0.759** (0.616-0.929)	**0.866** (0.702-1.06)	**1.04** (0.841-1.28)	**1.18** (0.952-1.45)	**1.38** (1.08-1.71)	**1.52** (1.18-1.91)	**1.67** (1.26-2.11)	**1.81** (1.34-2.33)	**2.00** (1.44-2.61)	**2.14** (1.52-2.82)
30-min	**1.10** (0.889-1.34)	**1.26** (1.02-1.54)	**1.52** (1.23-1.86)	**1.73** (1.40-2.13)	**2.02** (1.59-2.51)	**2.24** (1.73-2.80)	**2.45** (1.86-3.10)	**2.66** (1.96-3.42)	**2.93** (2.11-3.82)	**3.14** (2.22-4.12)
60-min	**1.45** (1.18-1.78)	**1.66** (1.35-2.04)	**2.02** (1.63-2.47)	**2.32** (1.87-2.85)	**2.74** (2.17-3.44)	**3.08** (2.40-3.88)	**3.43** (2.61-4.36)	**3.78** (2.80-4.88)	**4.27** (3.08-5.58)	**4.64** (3.29-6.11)
2-hr	**1.80** (1.48-2.19)	**2.06** (1.69-2.51)	**2.51** (2.05-3.06)	**2.90** (2.36-3.54)	**3.47** (2.78-4.32)	**3.93** (3.09-4.92)	**4.40** (3.38-5.58)	**4.91** (3.67-6.30)	**5.60** (4.08-7.29)	**6.15** (4.39-8.04)
3-hr	**2.03** (1.67-2.45)	**2.32** (1.91-2.80)	**2.83** (2.33-3.42)	**3.29** (2.69-3.98)	**3.97** (3.21-4.95)	**4.54** (3.60-5.68)	**5.14** (3.98-6.51)	**5.79** (4.35-7.42)	**6.70** (4.90-8.71)	**7.43** (5.32-9.68)
6-hr	**2.44** (2.03-2.91)	**2.79** (2.32-3.33)	**3.42** (2.83-4.09)	**4.00** (3.30-4.80)	**4.87** (3.98-6.04)	**5.61** (4.49-6.98)	**6.41** (5.01-8.06)	**7.28** (5.52-9.28)	**8.51** (6.28-11.0)	**9.50** (6.84-12.3)
12-hr	**2.87** (2.41-3.39)	**3.30** (2.77-3.91)	**4.07** (3.41-4.82)	**4.76** (3.97-5.66)	**5.81** (4.78-7.12)	**6.68** (5.39-8.22)	**7.61** (5.99-9.49)	**8.62** (6.58-10.9)	**10.0** (7.46-12.9)	**11.2** (8.11-14.4)
24-hr	**3.35** (2.84-3.92)	**3.87** (3.28-4.54)	**4.78** (4.04-5.62)	**5.59** (4.71-6.58)	**6.77** (5.61-8.20)	**7.75** (6.30-9.43)	**8.77** (6.95-10.8)	**9.87** (7.59-12.4)	**11.4** (8.51-14.5)	**12.6** (9.21-16.1)
2-day	**3.89** (3.34-4.52)	**4.50** (3.86-5.23)	**5.55** (4.75-6.46)	**6.47** (5.51-7.55)	**7.80** (6.51-9.34)	**8.88** (7.27-10.7)	**10.0** (7.98-12.2)	**11.2** (8.66-13.9)	**12.8** (9.63-16.2)	**14.1** (10.4-17.9)
3-day	**4.24** (3.66-4.90)	**4.91** (4.23-5.67)	**6.05** (5.20-7.00)	**7.04** (6.03-8.16)	**8.48** (7.11-10.1)	**9.63** (7.93-11.5)	**10.8** (8.70-13.2)	**12.1** (9.41-15.0)	**13.9** (10.5-17.4)	**15.3** (11.2-19.3)
4-day	**4.54** (3.94-5.22)	**5.25** (4.55-6.04)	**6.46** (5.58-7.44)	**7.50** (6.45-8.67)	**9.02** (7.60-10.7)	**10.2** (8.46-12.2)	**11.5** (9.26-13.9)	**12.8** (10.0-15.8)	**14.7** (11.1-18.4)	**16.1** (11.9-20.3)
7-day	**5.34** (4.67-6.10)	**6.14** (5.36-7.00)	**7.48** (6.52-8.55)	**8.64** (7.50-9.91)	**10.3** (8.74-12.1)	**11.6** (9.68-13.8)	**13.0** (10.5-15.6)	**14.5** (11.3-17.7)	**16.4** (12.5-20.4)	**18.0** (13.4-22.5)
10-day	**6.08** (5.35-6.90)	**6.94** (6.10-7.88)	**8.39** (7.35-9.54)	**9.62** (8.39-11.0)	**11.4** (9.69-13.3)	**12.8** (10.7-15.0)	**14.2** (11.5-17.0)	**15.7** (12.3-19.1)	**17.7** (13.5-21.9)	**19.3** (14.4-24.1)
20-day	**8.22** (7.31-9.24)	**9.26** (8.22-10.4)	**11.0** (9.70-12.3)	**12.4** (10.9-14.0)	**14.3** (12.3-16.5)	**15.8** (13.3-18.4)	**17.3** (14.2-20.5)	**18.9** (14.9-22.7)	**20.9** (16.0-25.6)	**22.4** (16.9-27.8)
30-day	**9.99** (8.94-11.2)	**11.2** (10.0-12.5)	**13.1** (11.7-14.7)	**14.7** (13.0-16.5)	**16.8** (14.5-19.2)	**18.4** (15.6-21.3)	**20.0** (16.4-23.5)	**21.6** (17.1-25.8)	**23.6** (18.1-28.7)	**25.1** (18.9-31.0)
45-day	**12.2** (11.0-13.6)	**13.7** (12.3-15.2)	**16.0** (14.3-17.7)	**17.8** (15.9-19.8)	**20.2** (17.4-22.8)	**21.9** (18.6-25.1)	**23.6** (19.5-27.4)	**25.2** (20.1-29.9)	**27.2** (21.0-32.9)	**28.6** (21.7-35.2)
60-day	**14.1** (12.8-15.6)	**15.8** (14.3-17.5)	**18.4** (16.6-20.4)	**20.5** (18.3-22.7)	**23.1** (20.0-26.0)	**25.0** (21.3-28.4)	**26.8** (22.2-31.0)	**28.4** (22.7-33.6)	**30.5** (23.6-36.7)	**31.8** (24.2-39.1)

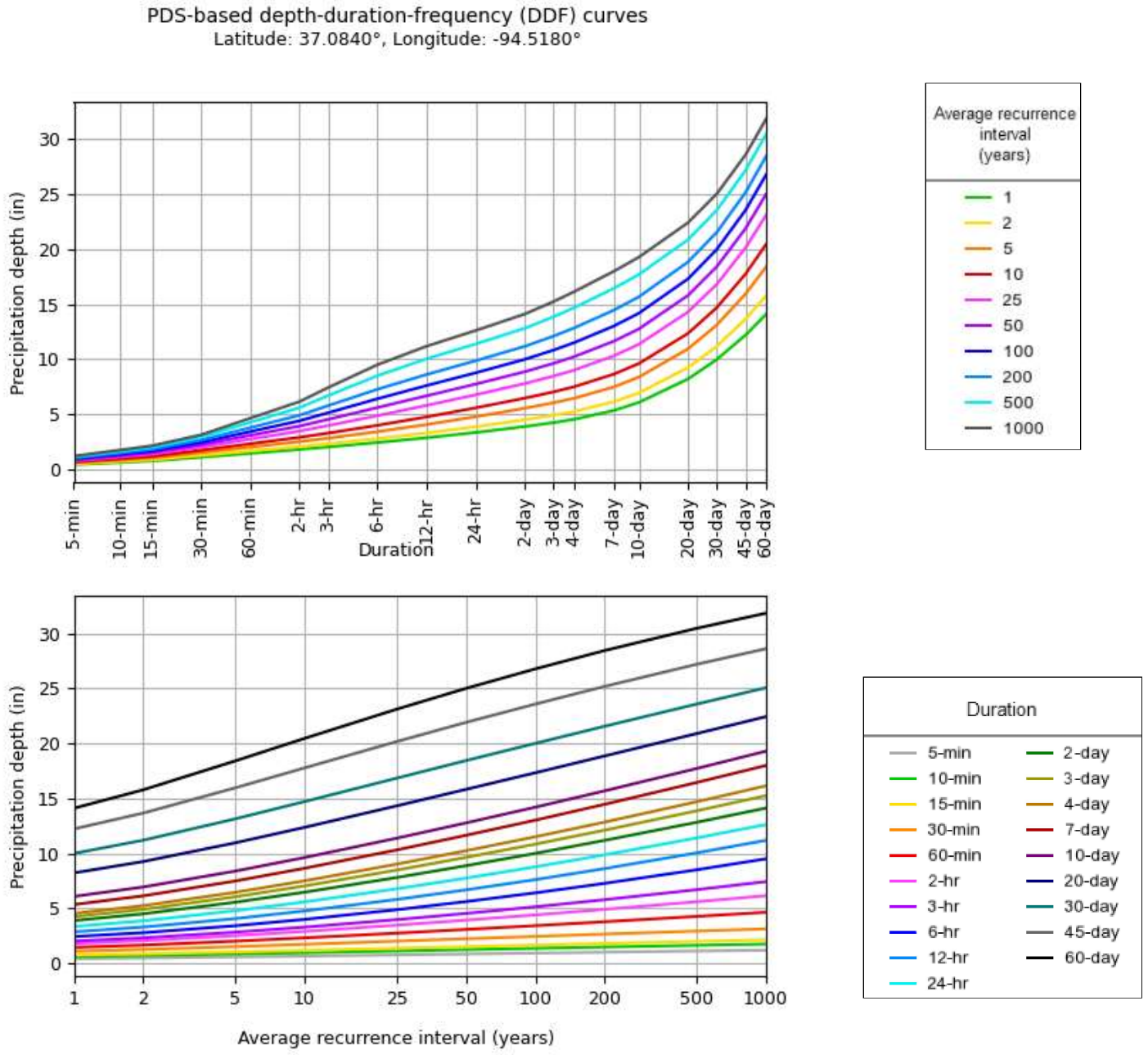
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Wed Dec 18 21:24:59 2024

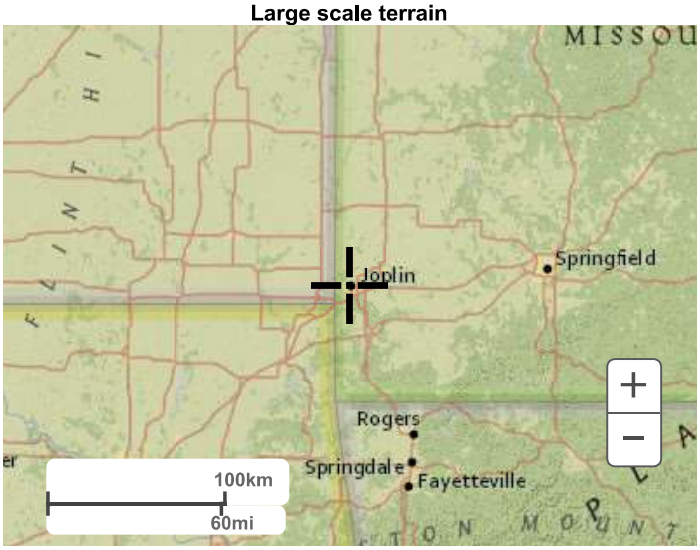
Back to Top

Maps & aerials

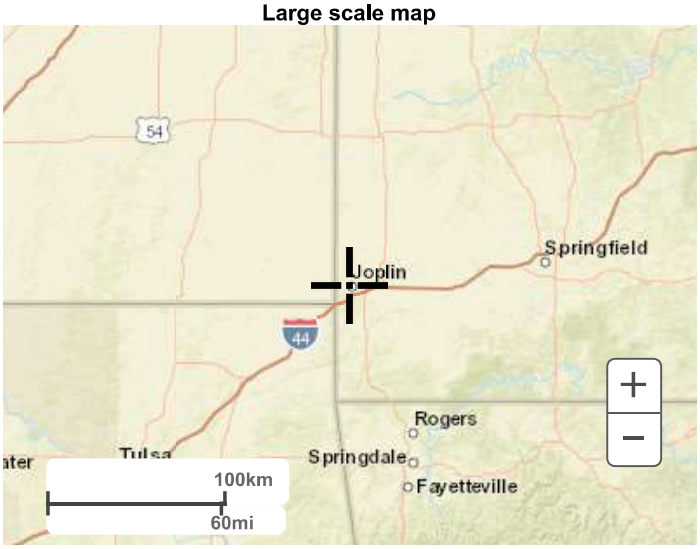
Small scale terrain



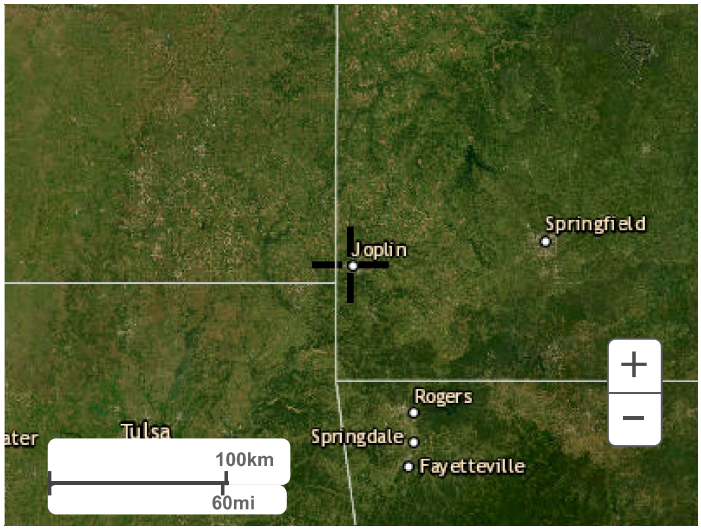
Large scale terrain



Large scale map



Large scale aerial

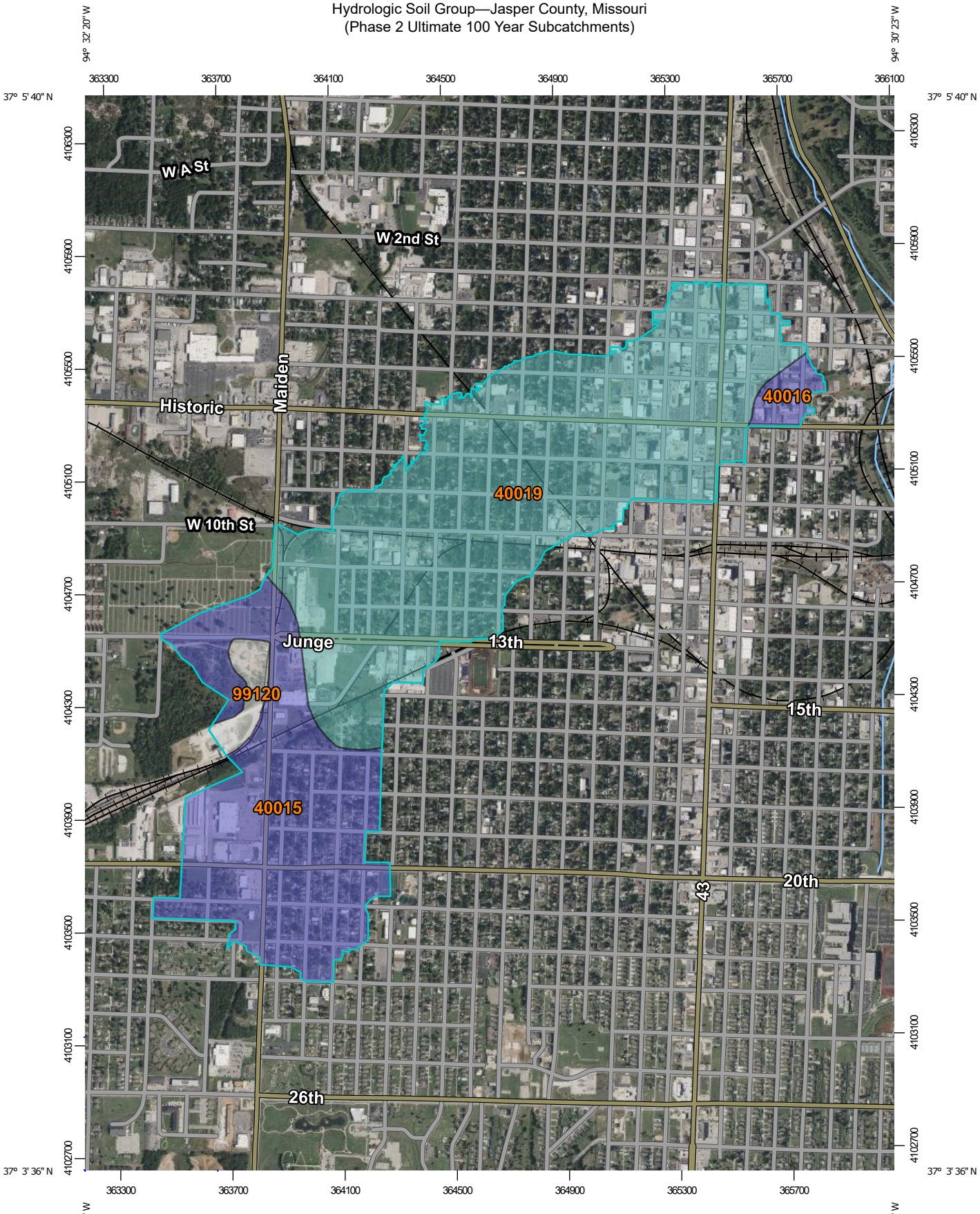


Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Hydrologic Soil Group—Jasper County, Missouri
(Phase 2 Ultimate 100 Year Subcatchments)



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Jasper County, Missouri
Survey Area Data: Version 29, Sep 2, 2025

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 20, 2022—Sep 1, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
40015	Eldorado silt loam, 1 to 3 percent slopes, very stony	B	159.2	32.1%
40016	Eldorado very gravelly silt loam, 3 to 8 percent slopes, very stony	B	10.2	2.1%
40019	Newtonia-Eldorado silt loams, 1 to 3 percent slopes	C	315.7	63.7%
99120	Dumps, mine		10.8	2.2%
Totals for Area of Interest			**495.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

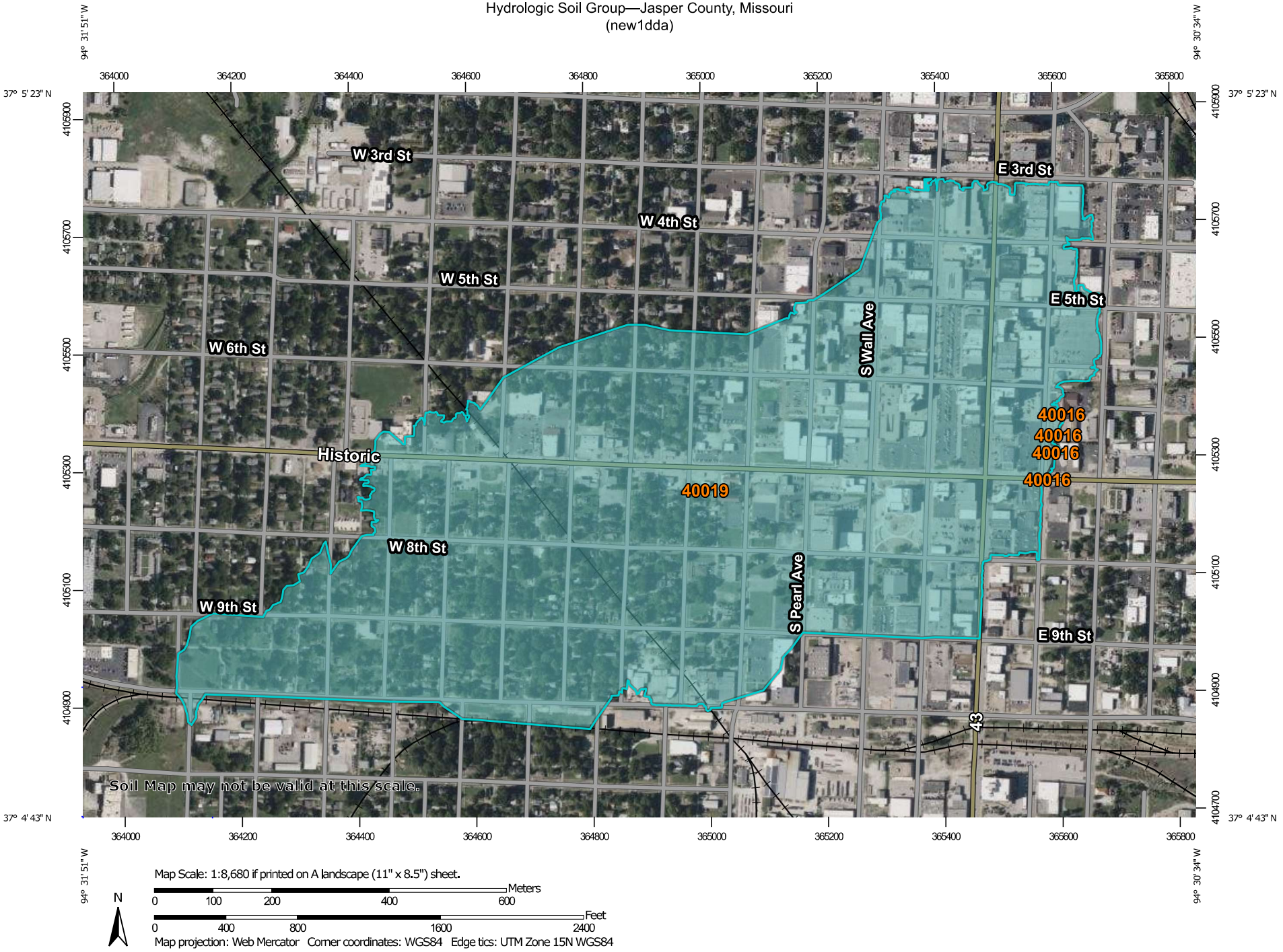
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Hydrologic Soil Group—Jasper County, Missouri
(new1dda)



Map Scale: 1:8,680 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 100 200 400 600

Feet
0 400 800 1600 2400

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Lines

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Jasper County, Missouri
Survey Area Data: Version 29, Sep 2, 2025

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 20, 2022—Sep 1, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
40016	Eldorado very gravelly silt loam, 3 to 8 percent slopes, very stony	B	0.1	0.0%
40019	Newtonia-Eldorado silt loams, 1 to 3 percent slopes	C	198.1	100.0%
Totals for Area of Interest			**198.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

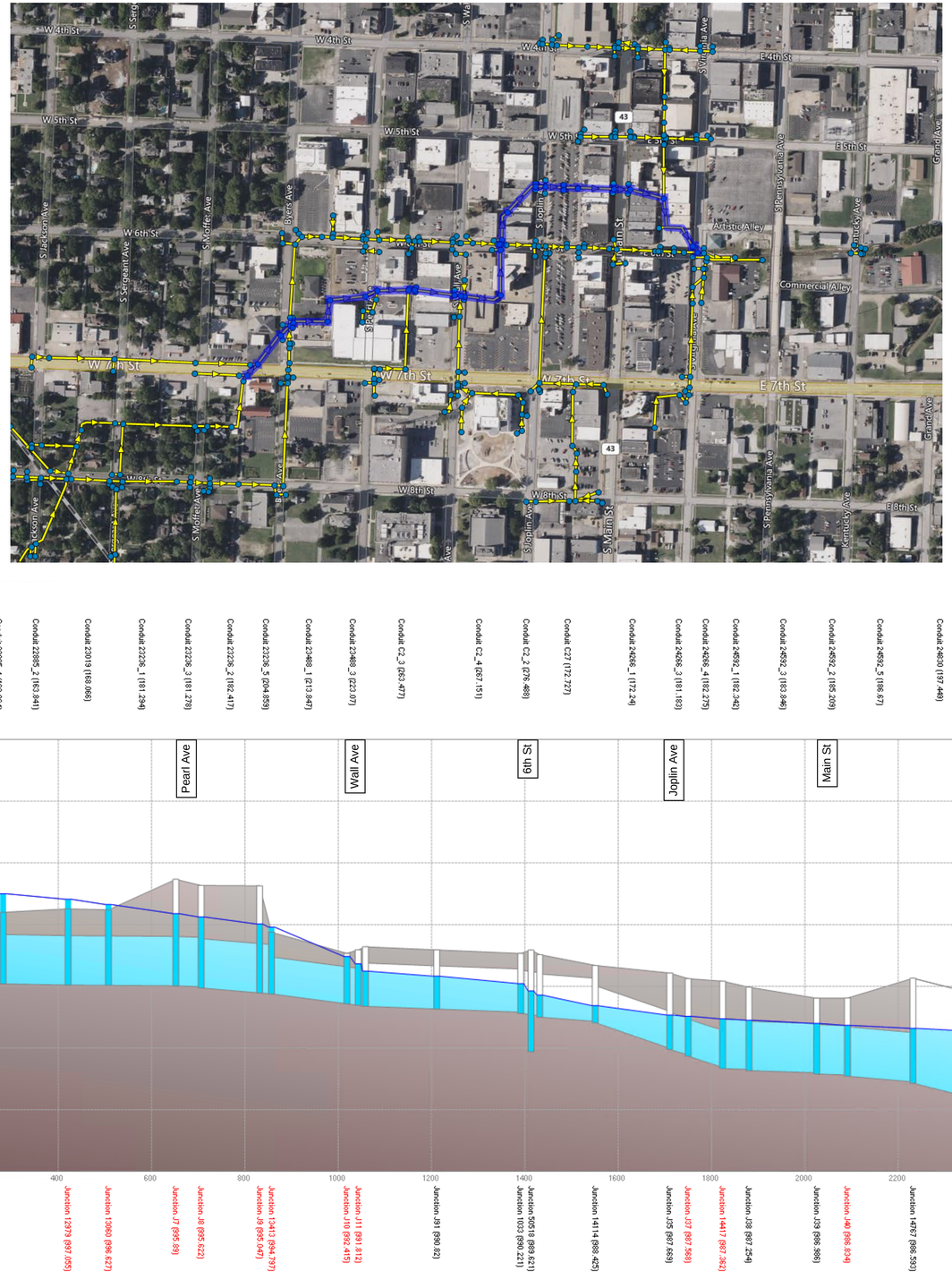
Component Percent Cutoff: None Specified

Tie-break Rule: Higher

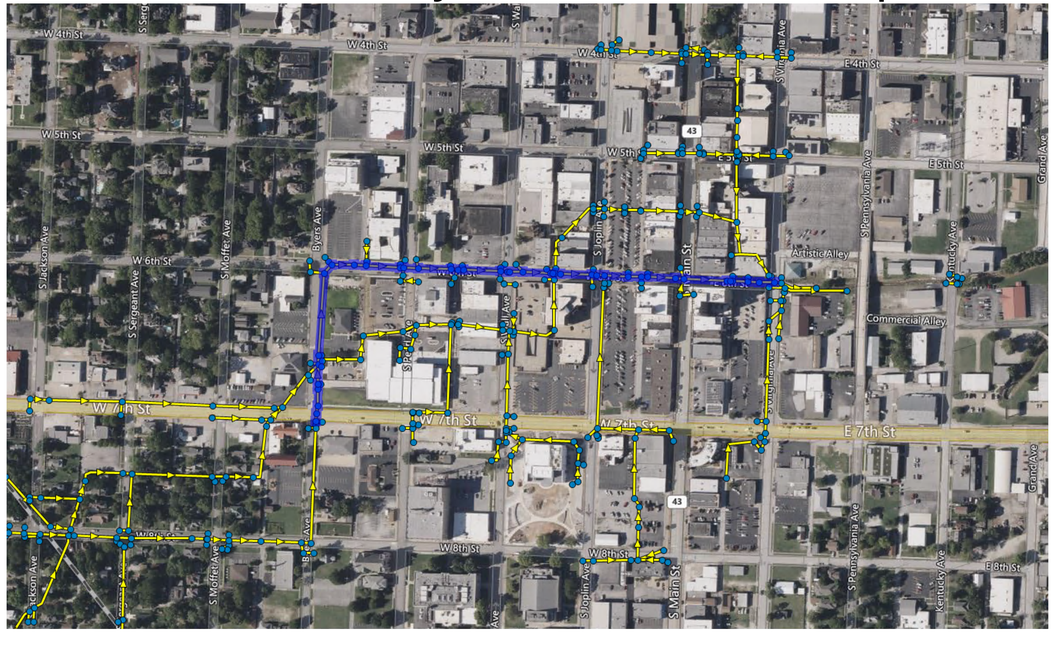
APPENDIX C
PCSWMM Modeling Results

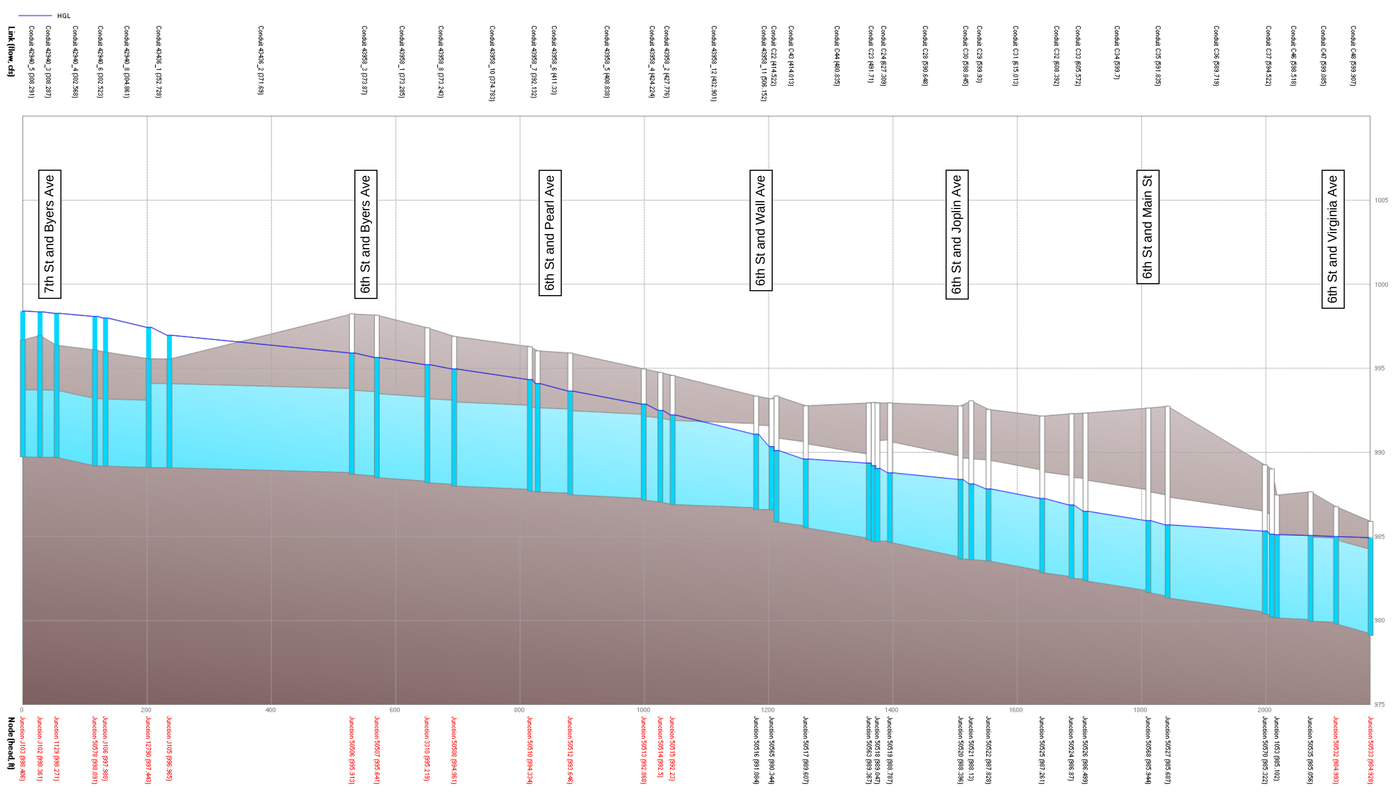
PCSWMM Existing Condition Model Profiles

Old Willow Branch – Existing Condition 10-year Peak Time Step

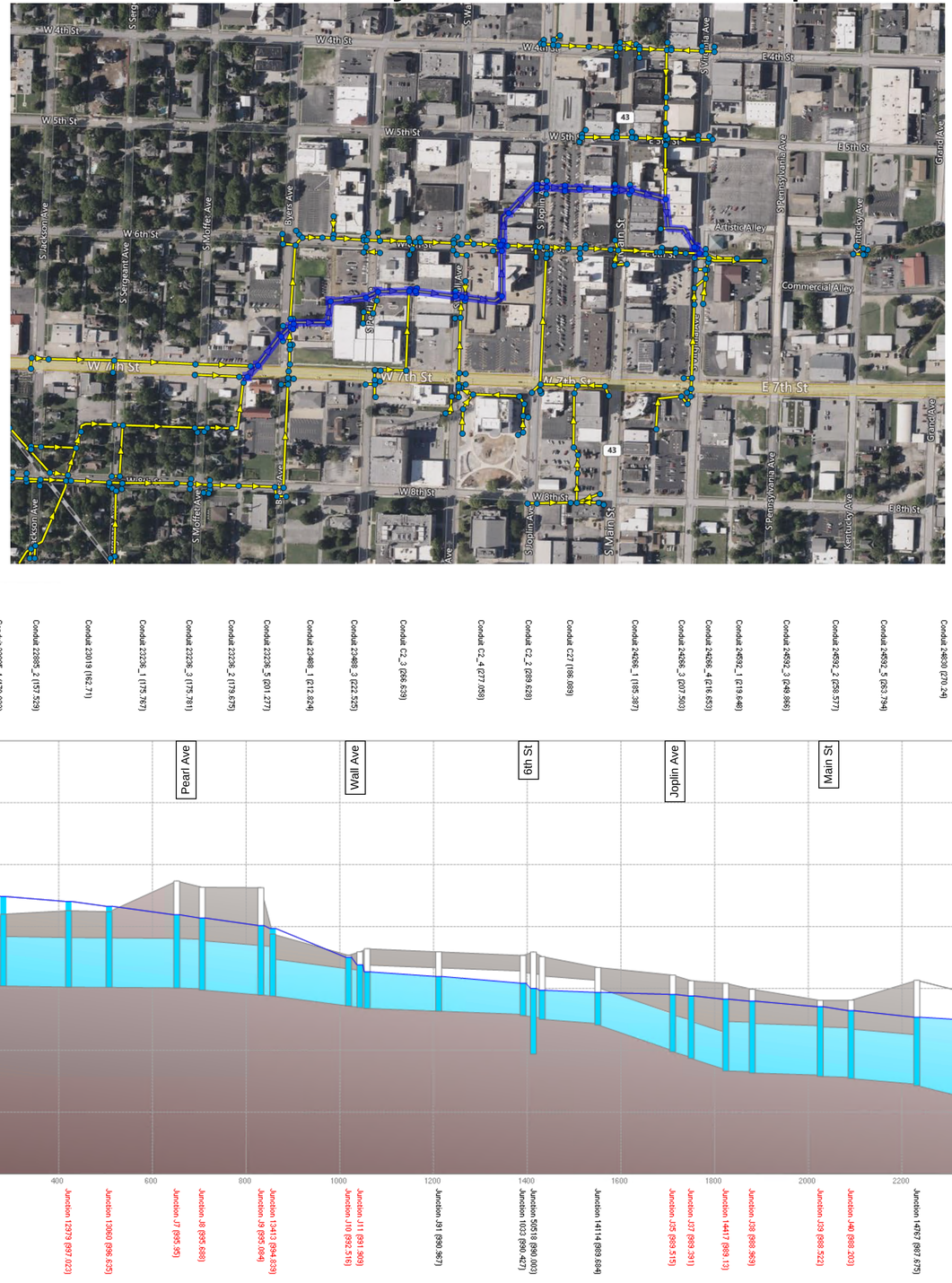


New Willow Branch – Existing Condition 10-year Peak Time Step

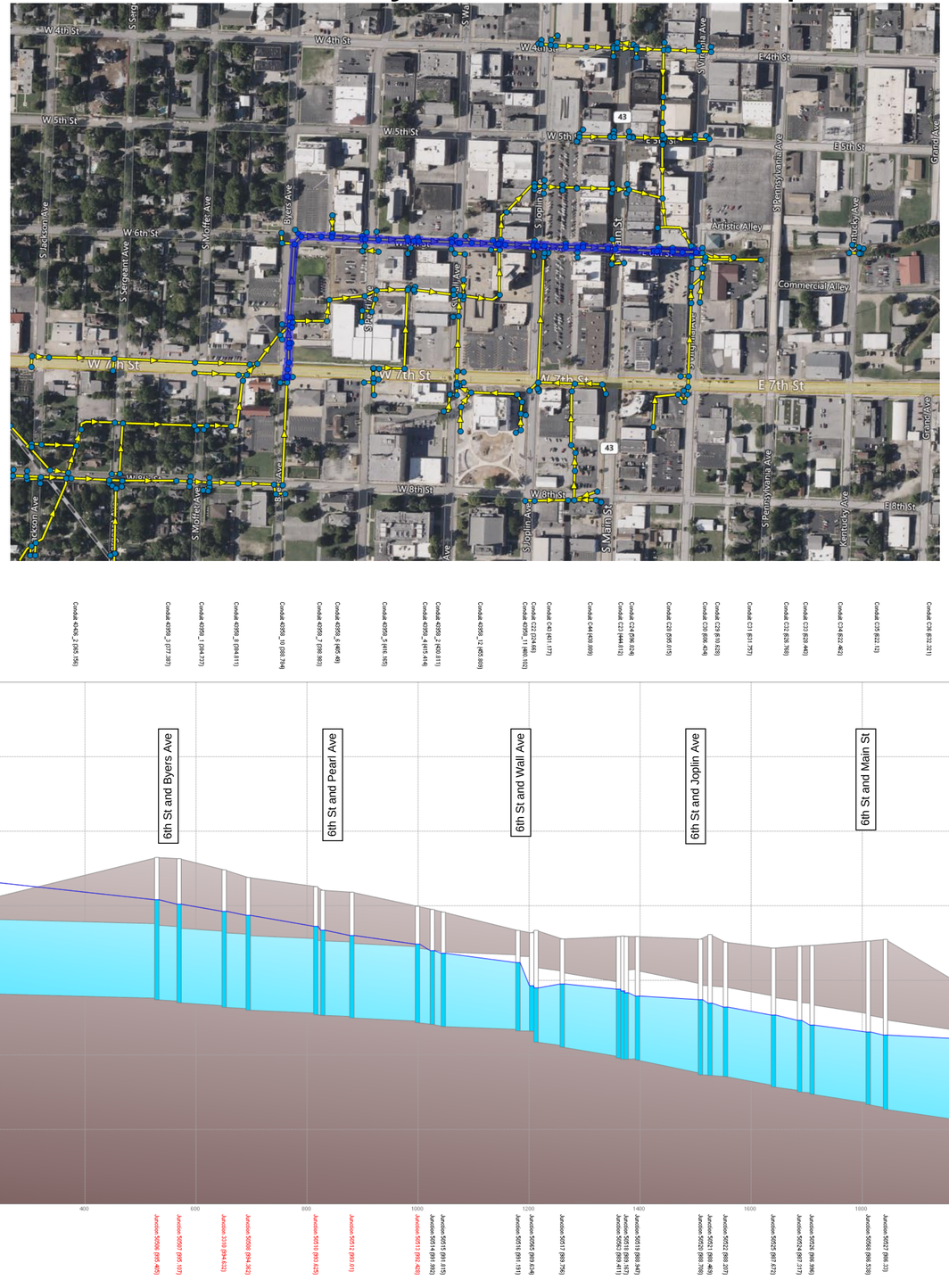




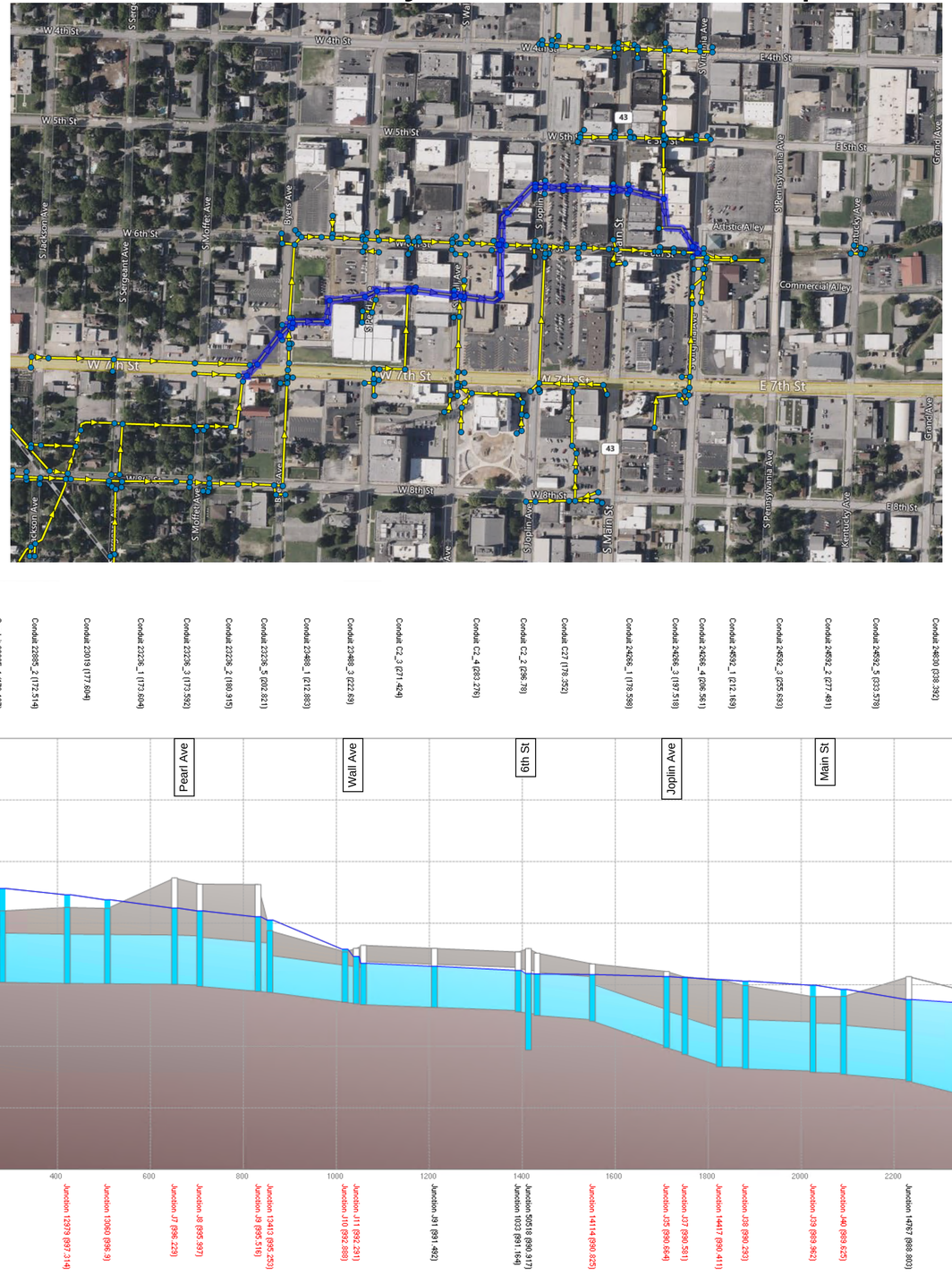
Old Willow Branch – Existing Condition 25-year Peak Time Step



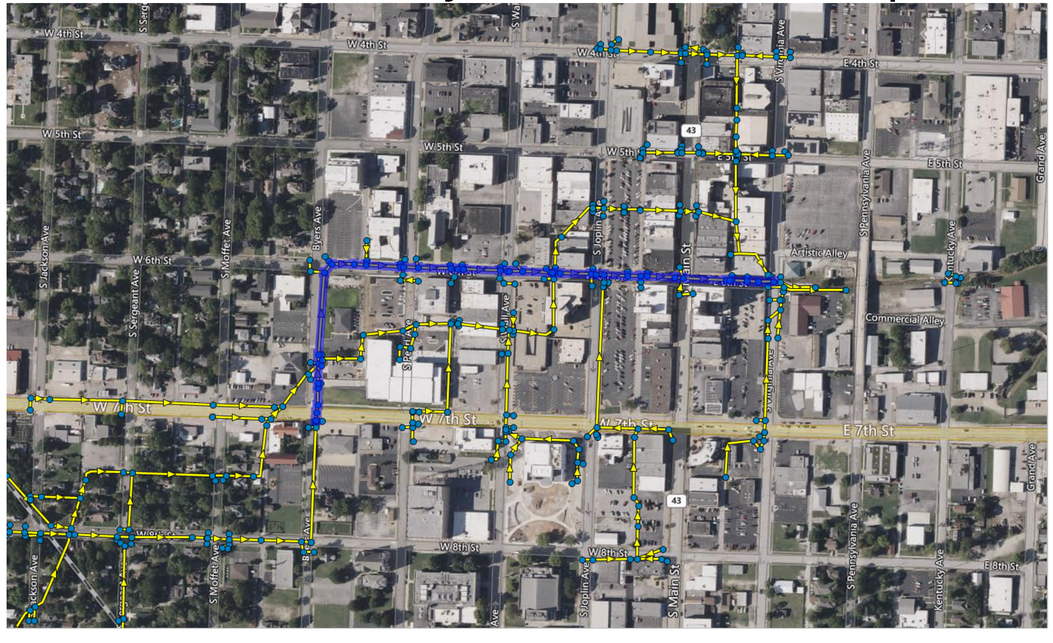
New Willow Branch – Existing Condition 25-year Peak Time Step

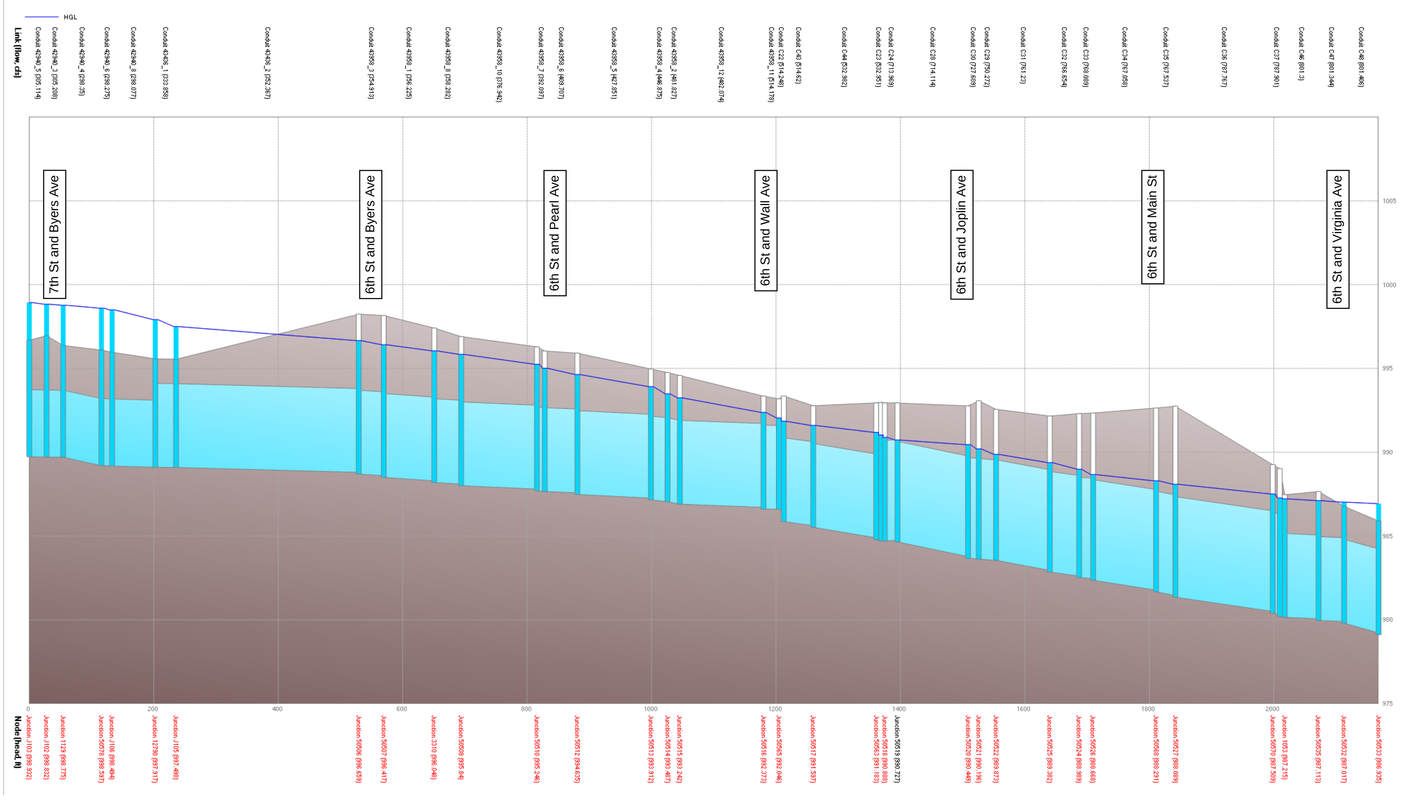


Old Willow Branch – Existing Condition 100-year Peak Time Step



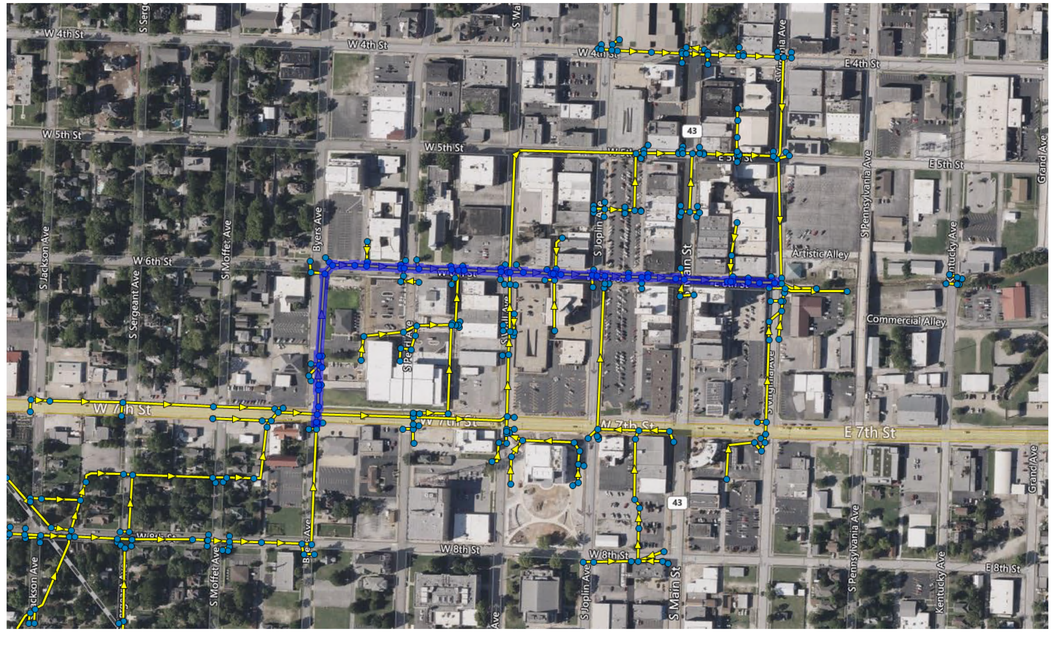
New Willow Branch – Existing Condition 100-year Peak Time Step

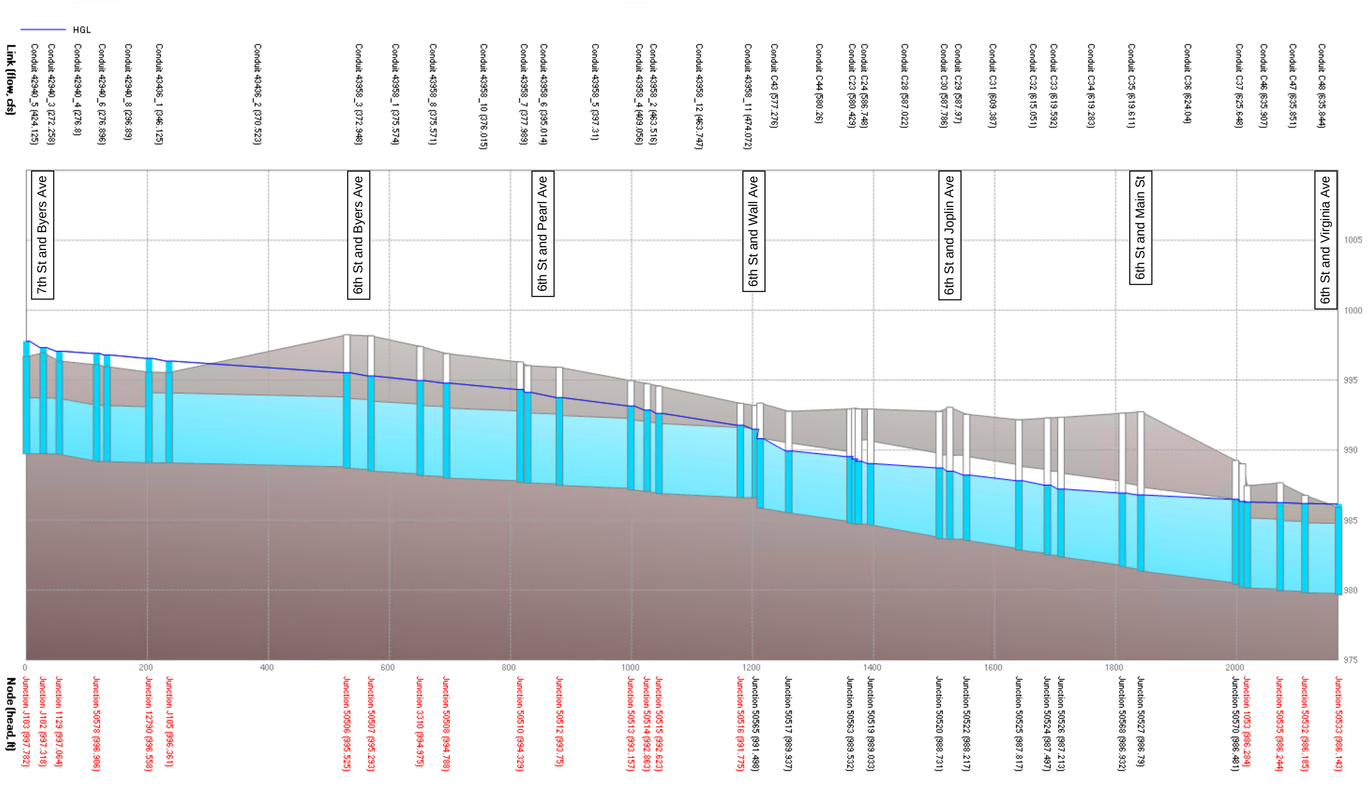




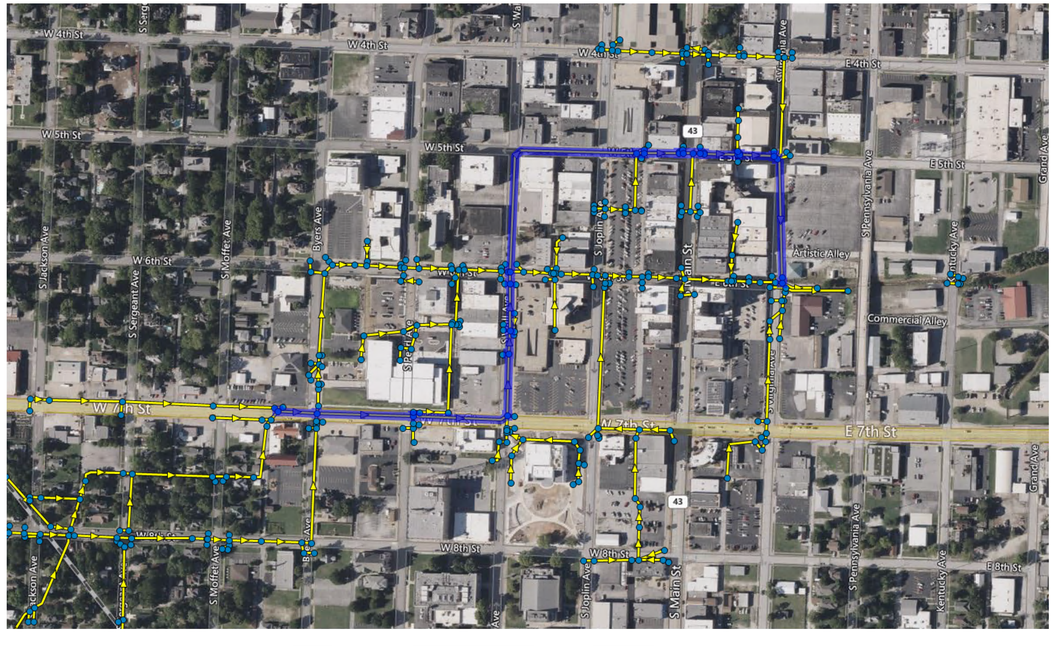
PCSWMM Proposed Condition Model Profiles

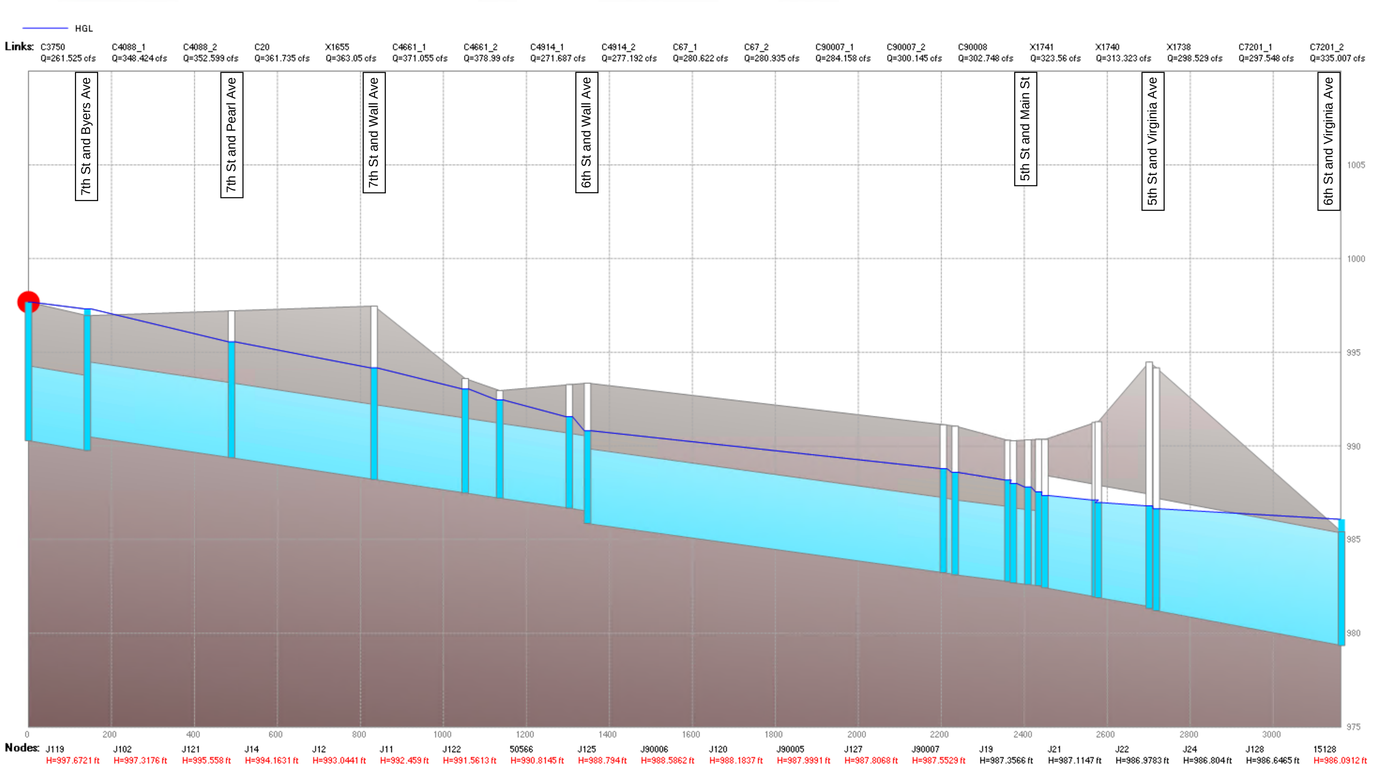
New Willow Branch – 25-year Peak Time Step Scenario 1



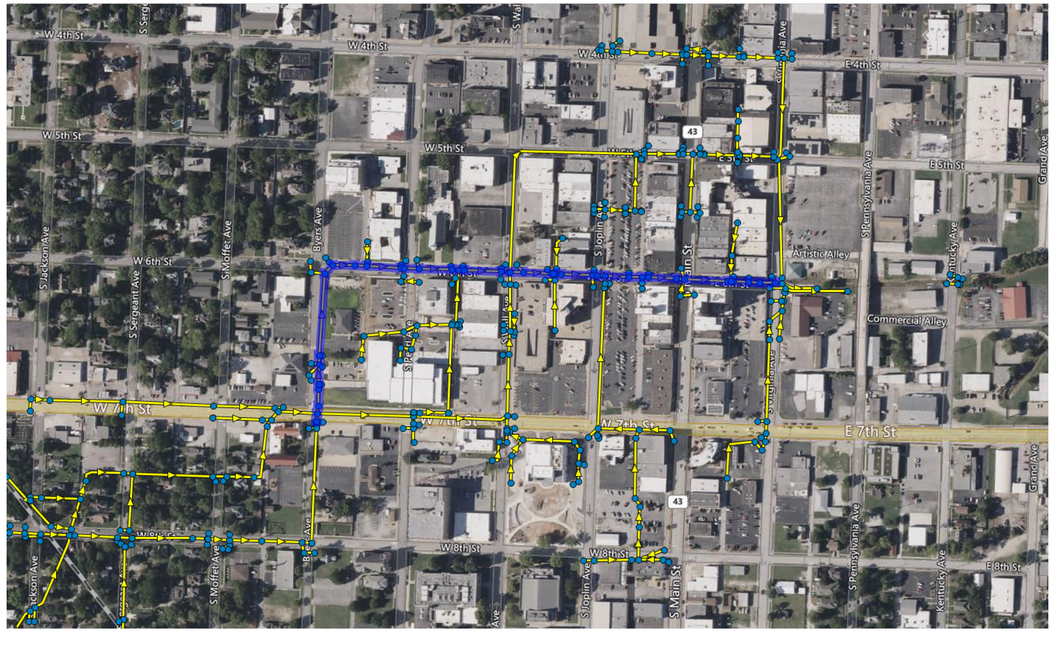


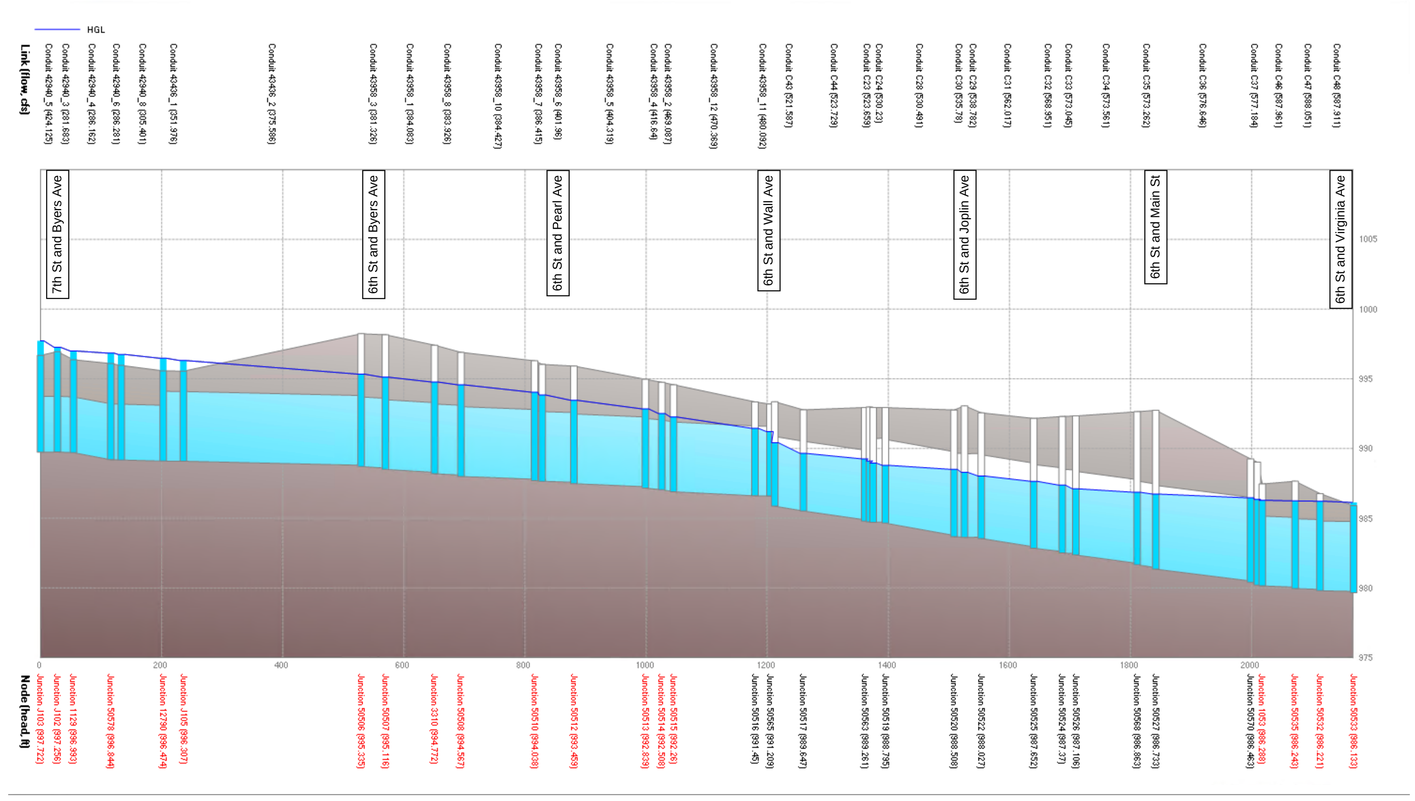
Willow Branch Replacement – 25-year
Peak Time Step Scenario 1



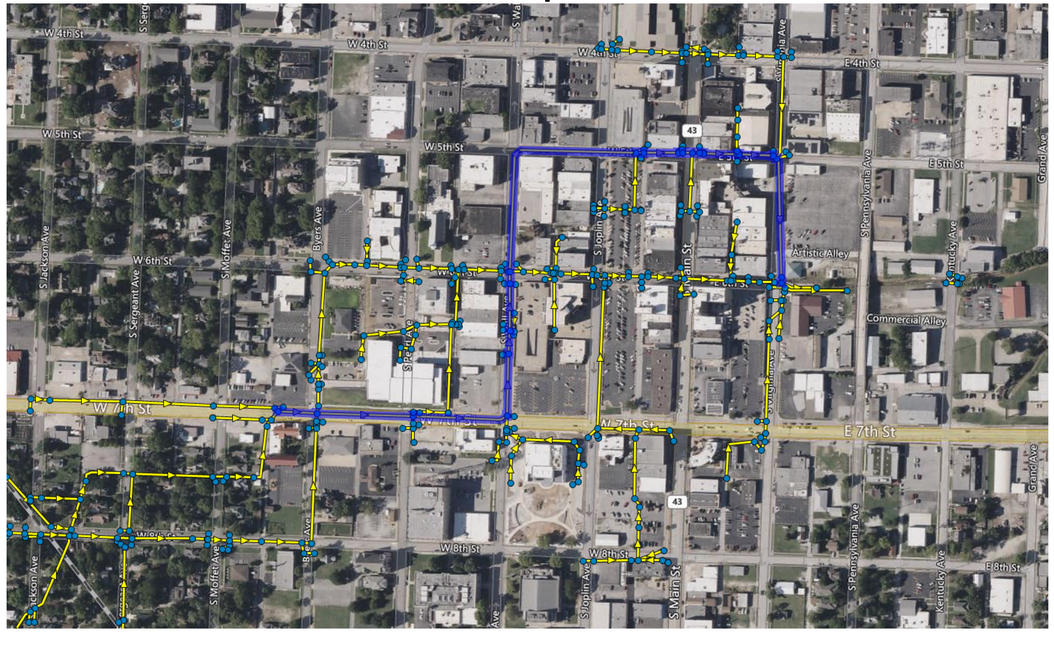


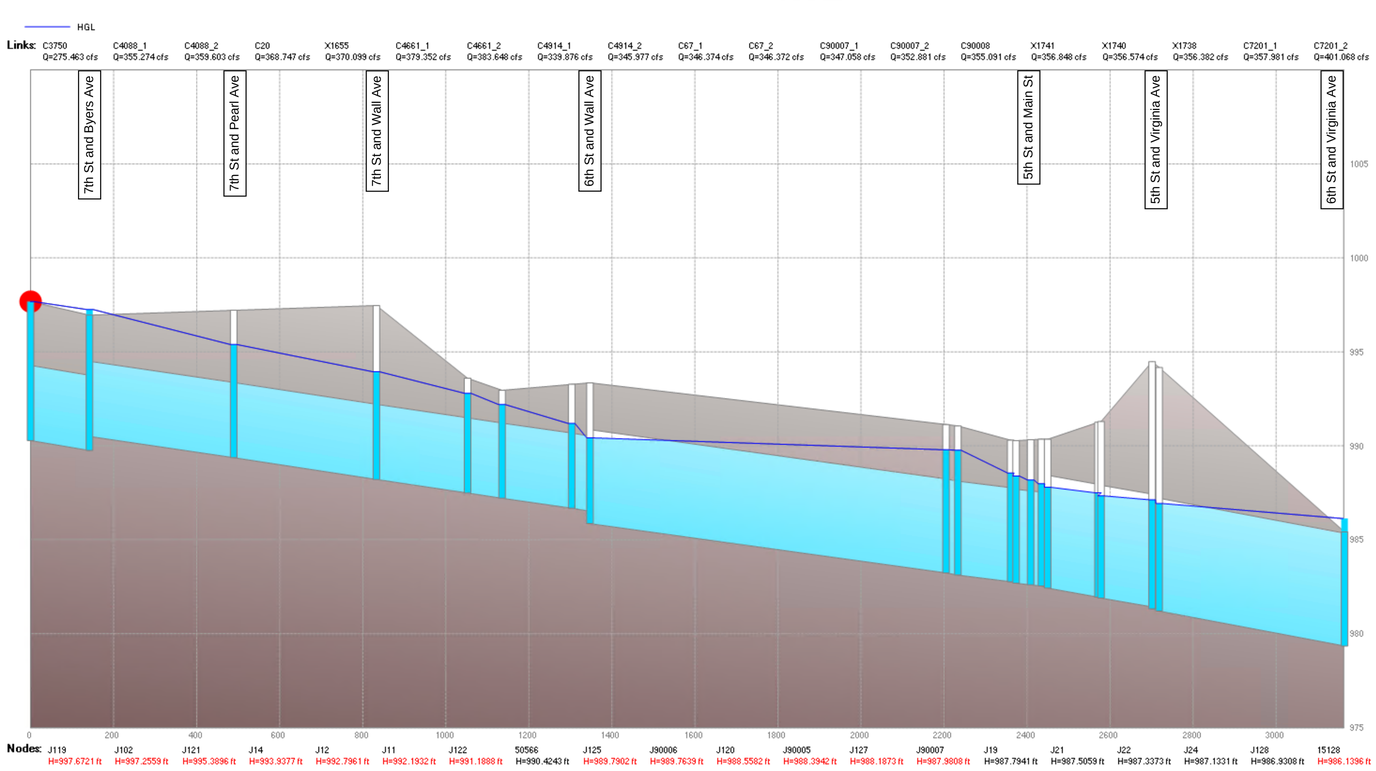
New Willow Branch – 25-year Peak Time Step Scenario 2



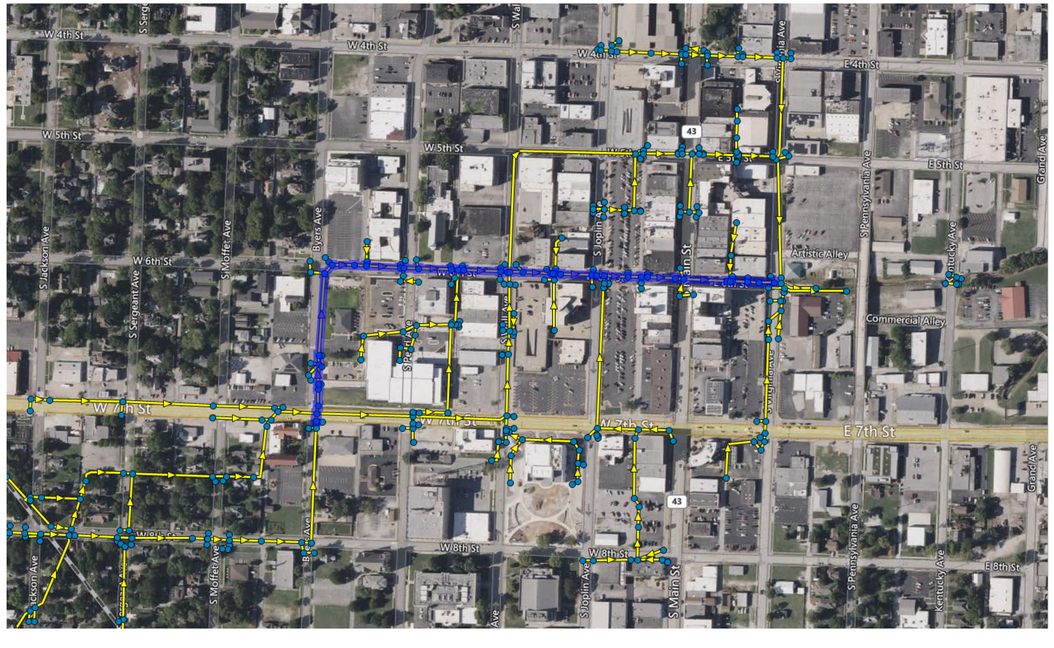


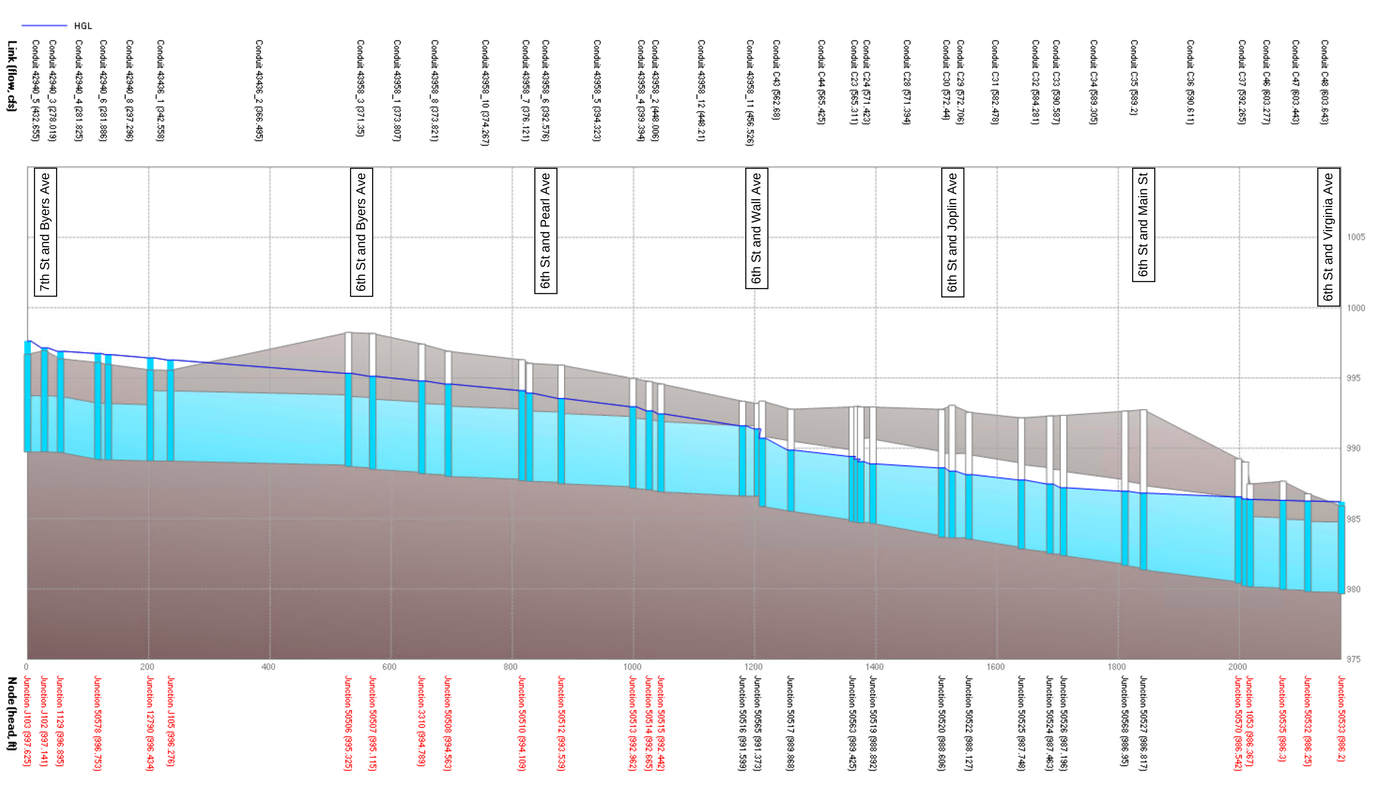
Willow Branch Replacement – 25-year
Peak Time Step Scenario 2



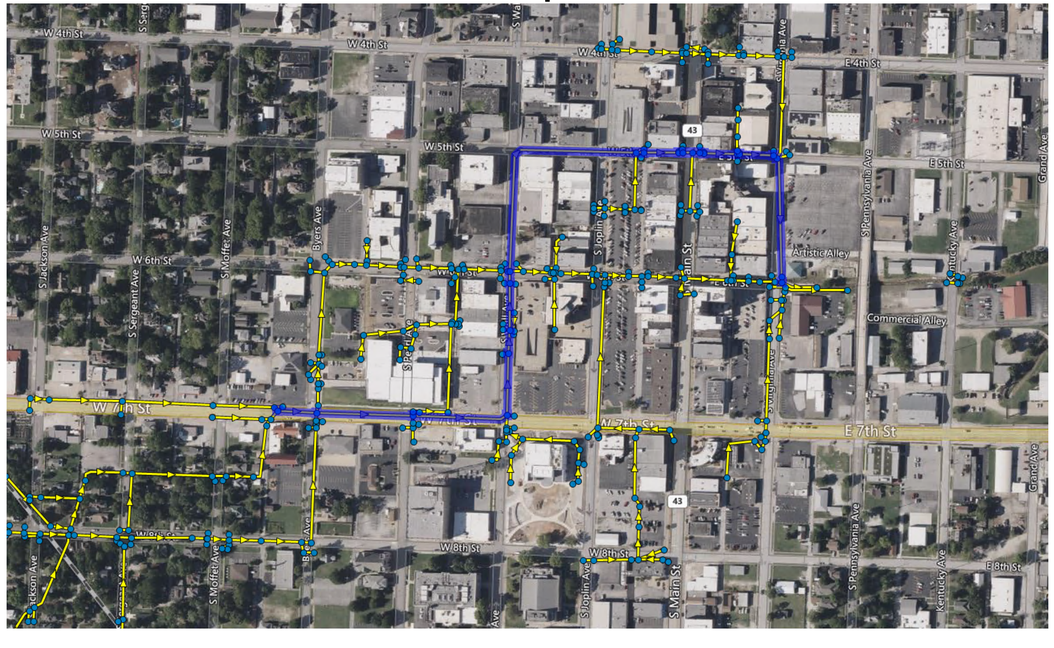


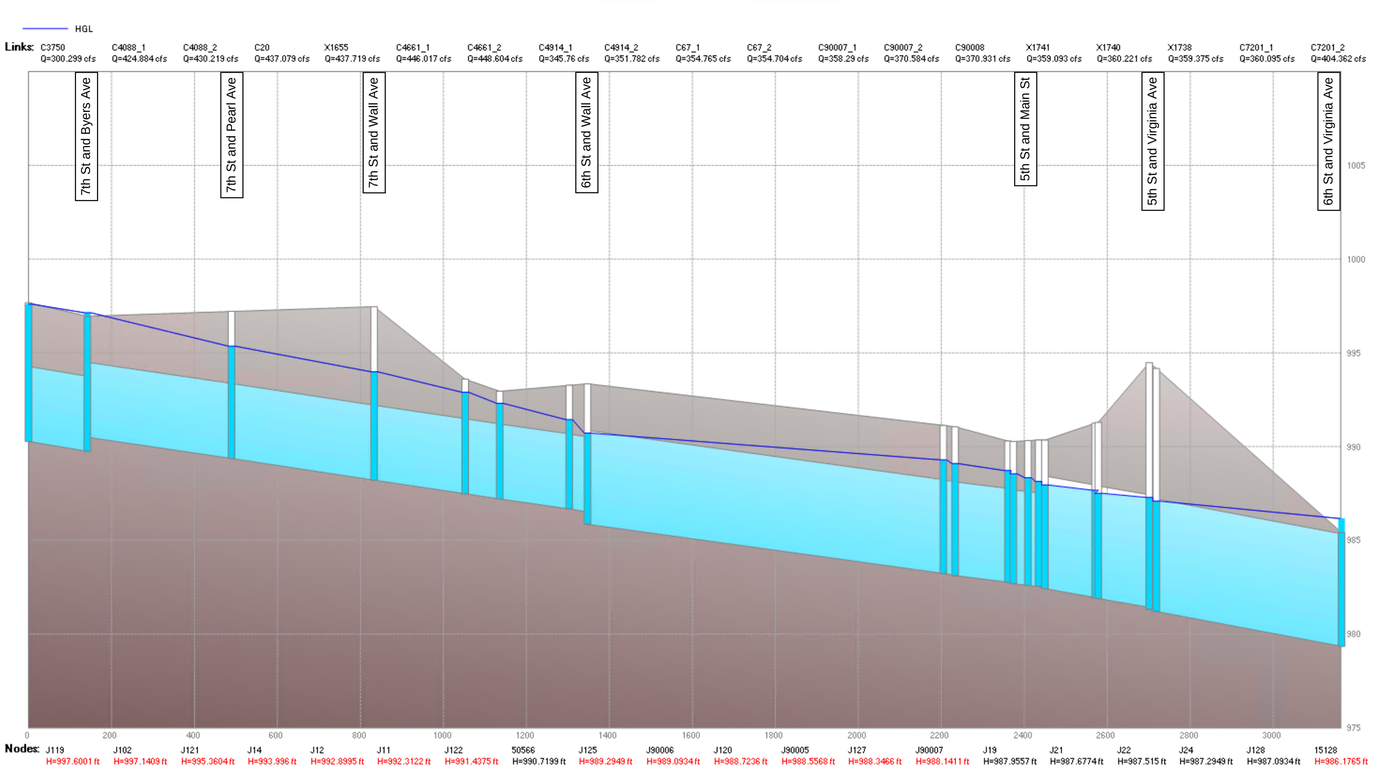
New Willow Branch – 25-year Peak Time Step Scenario 3





Willow Branch Replacement – 25-year
Peak Time Step Scenario 3

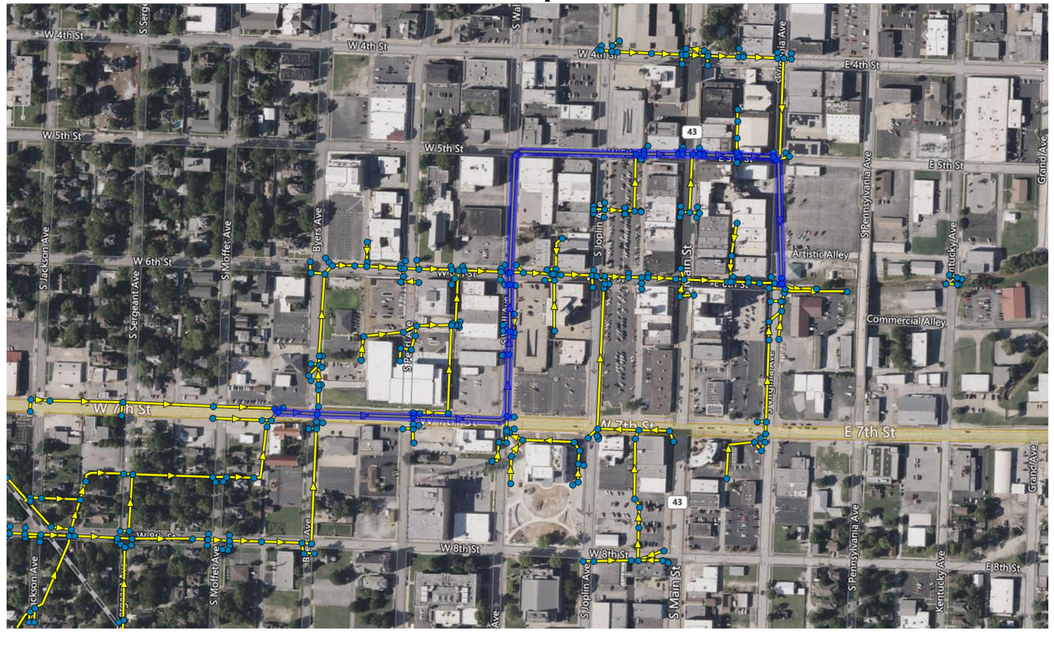


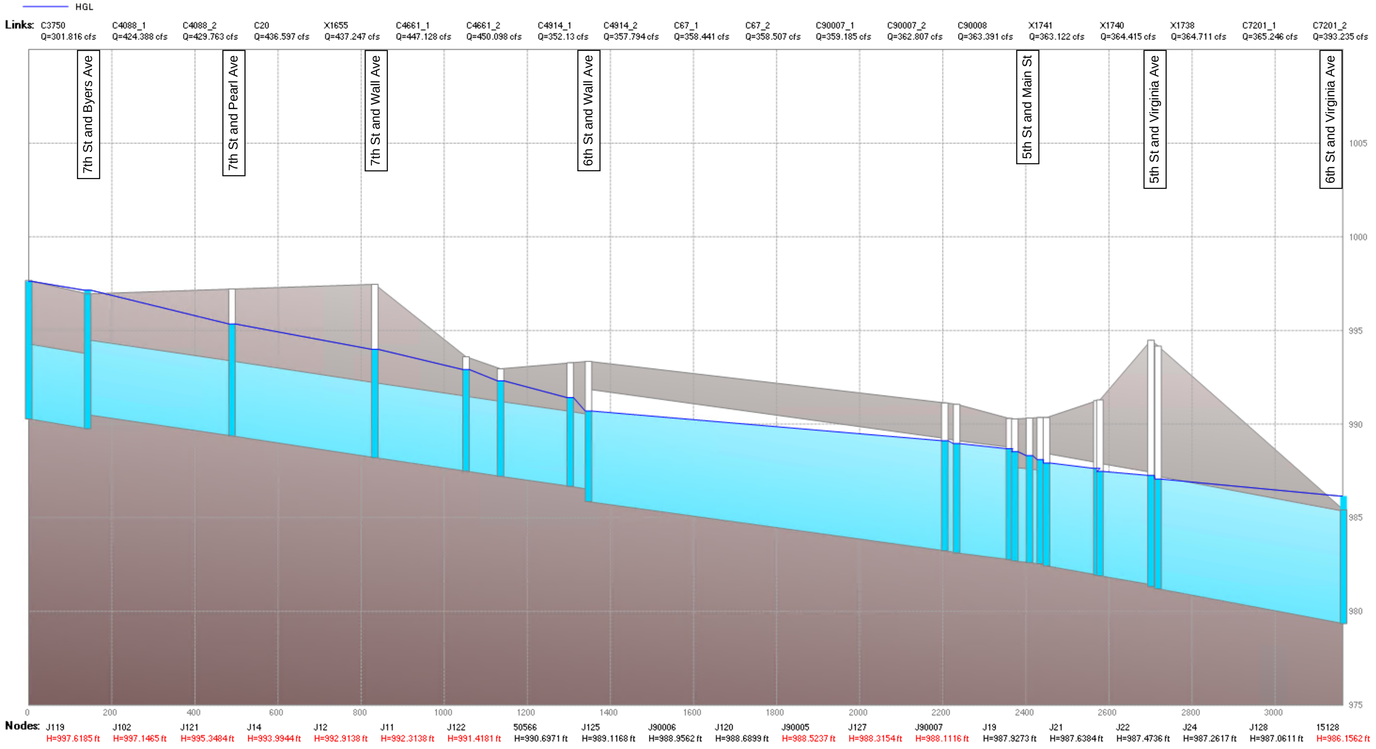


New Willow Branch – 25-year Peak Time Step Scenario 4



Willow Branch Replacement – 25-year
Peak Time Step Scenario 4

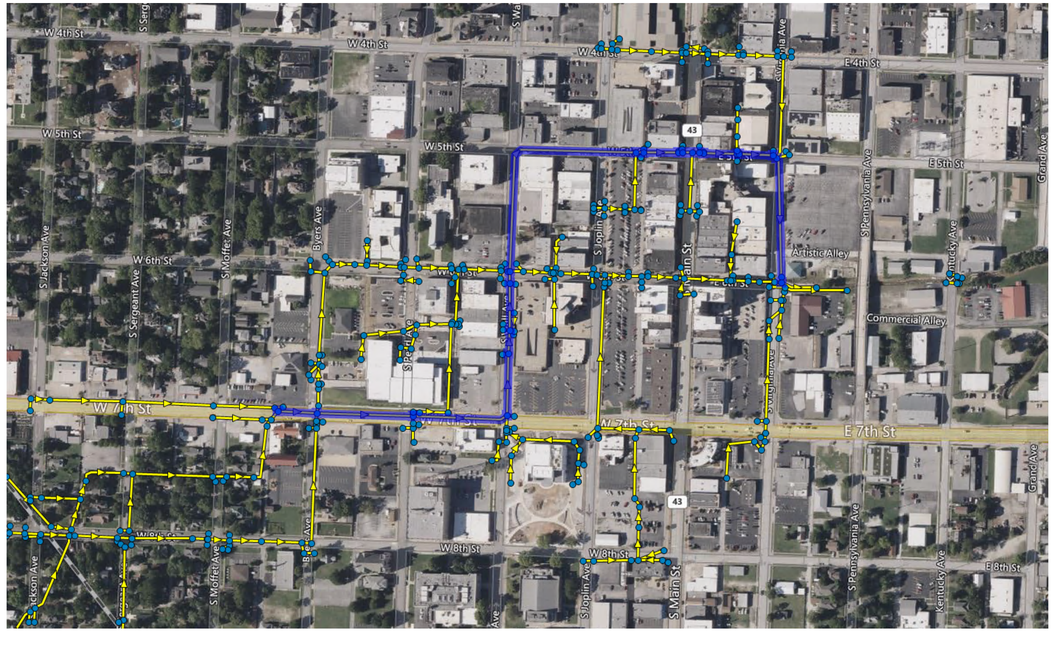


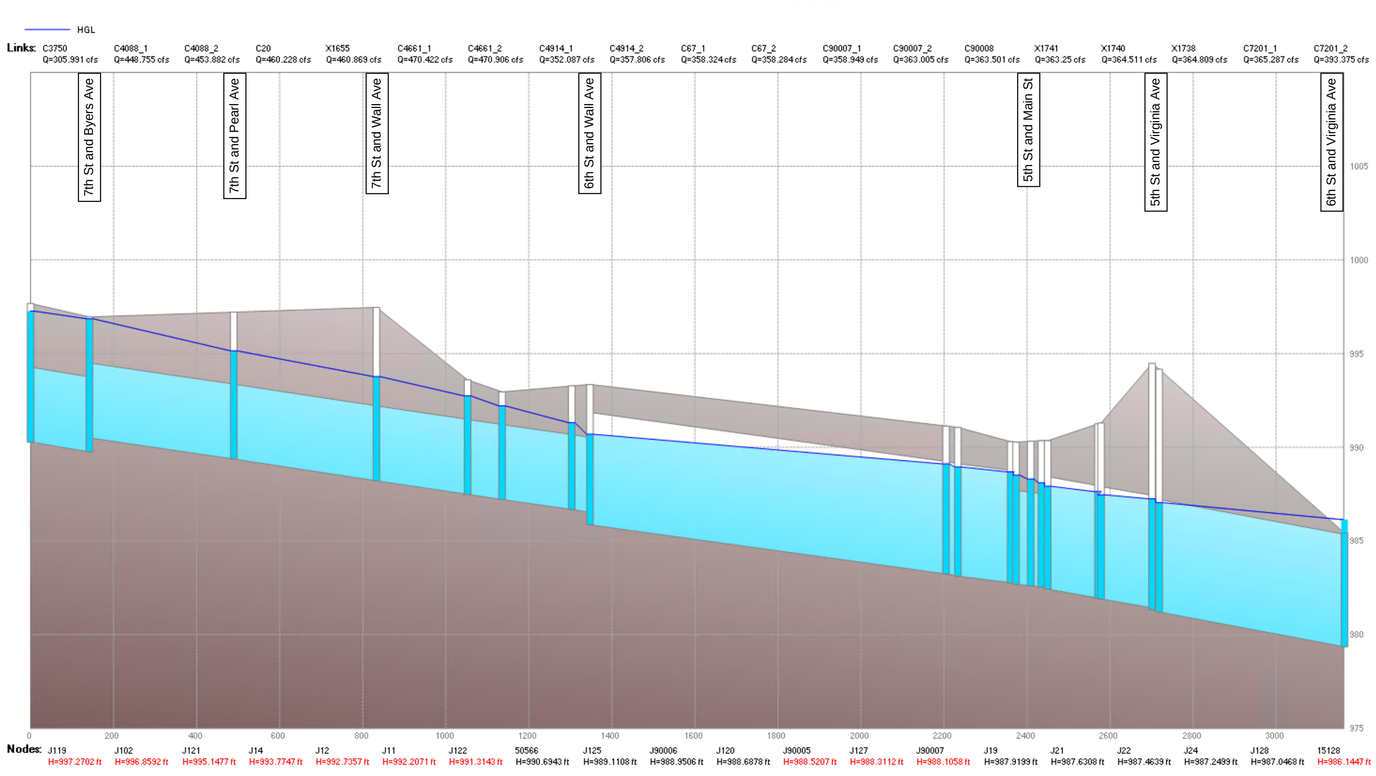


New Willow Branch – 25-year Peak Time Step Scenario 5



Willow Branch Replacement – 25-year Peak Time Step
Scenario 5

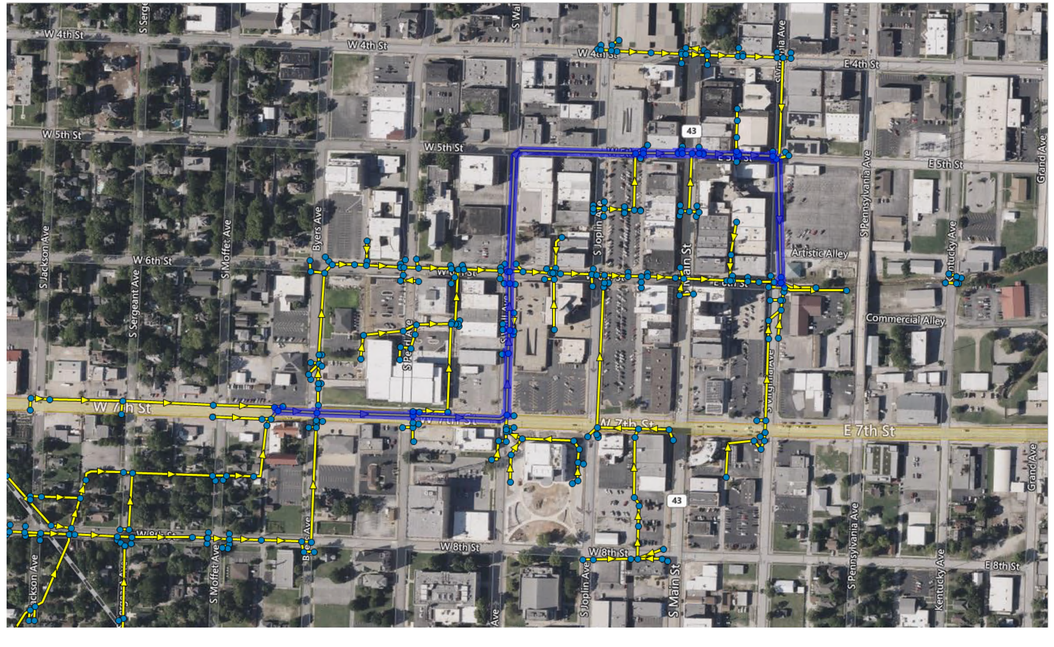


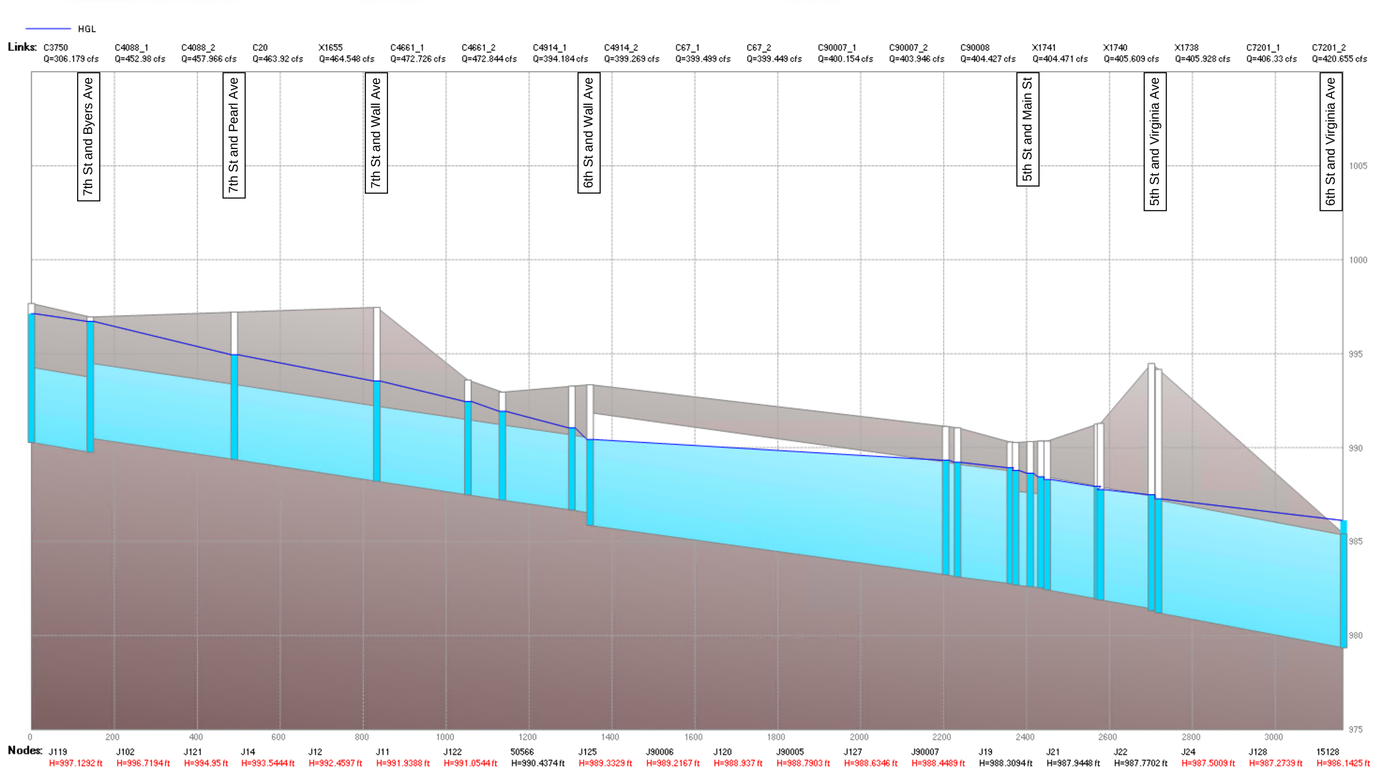


New Willow Branch – 25-year Peak Time Step Scenario 6



Willow Branch Replacement – 25-year Peak Time Step
Scenario 6

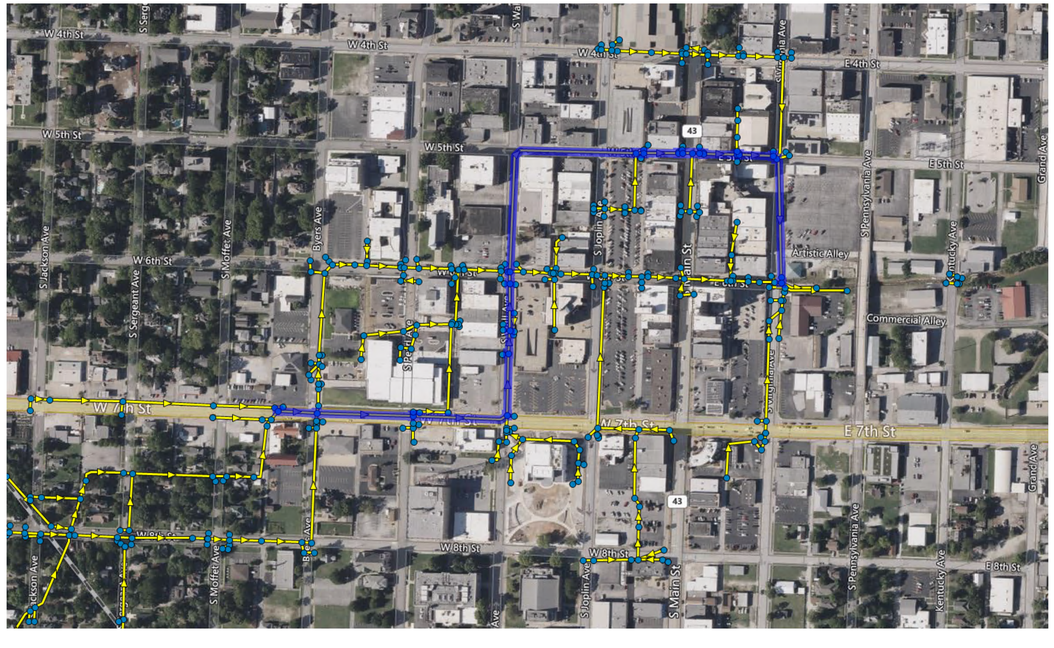


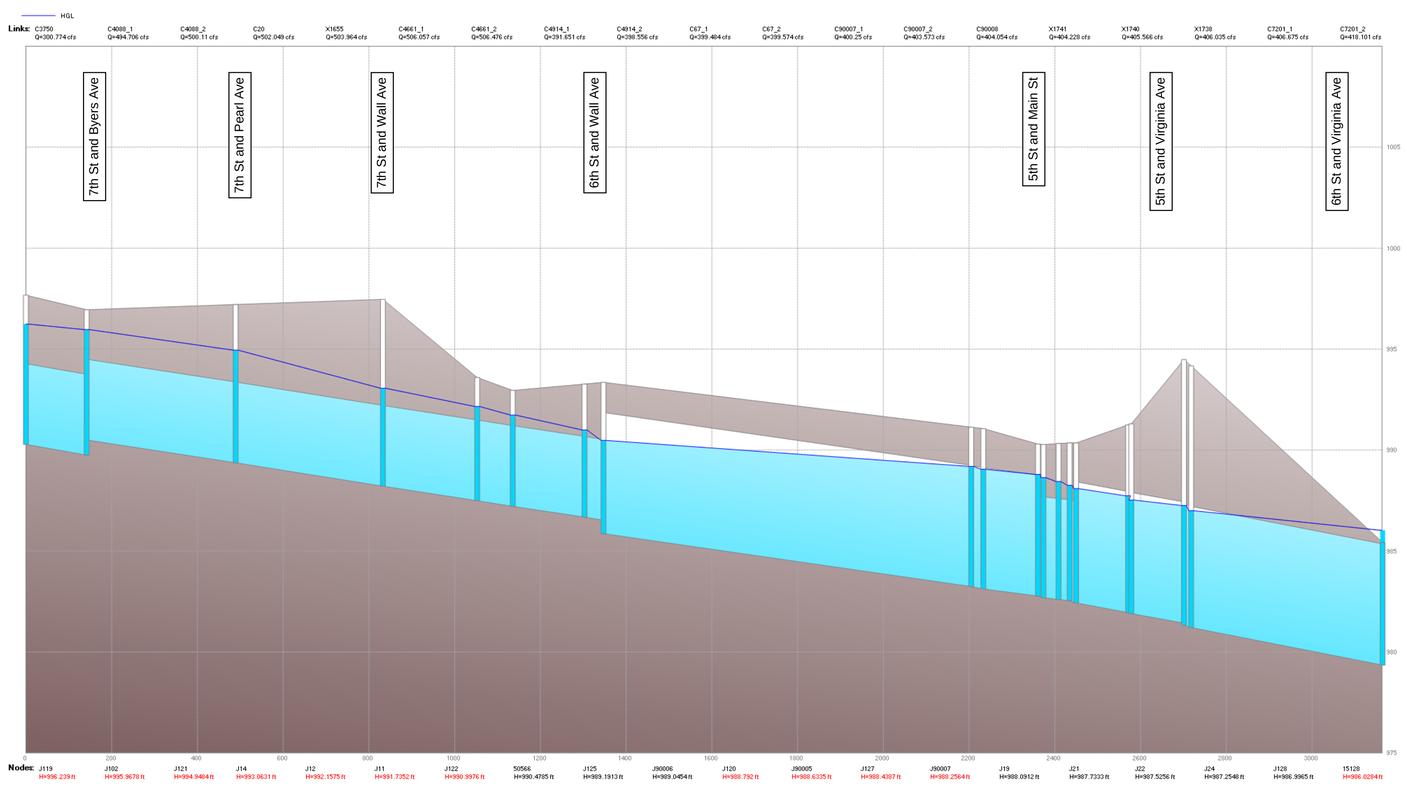


New Willow Branch – 25-year Peak Time Step Scenario 7

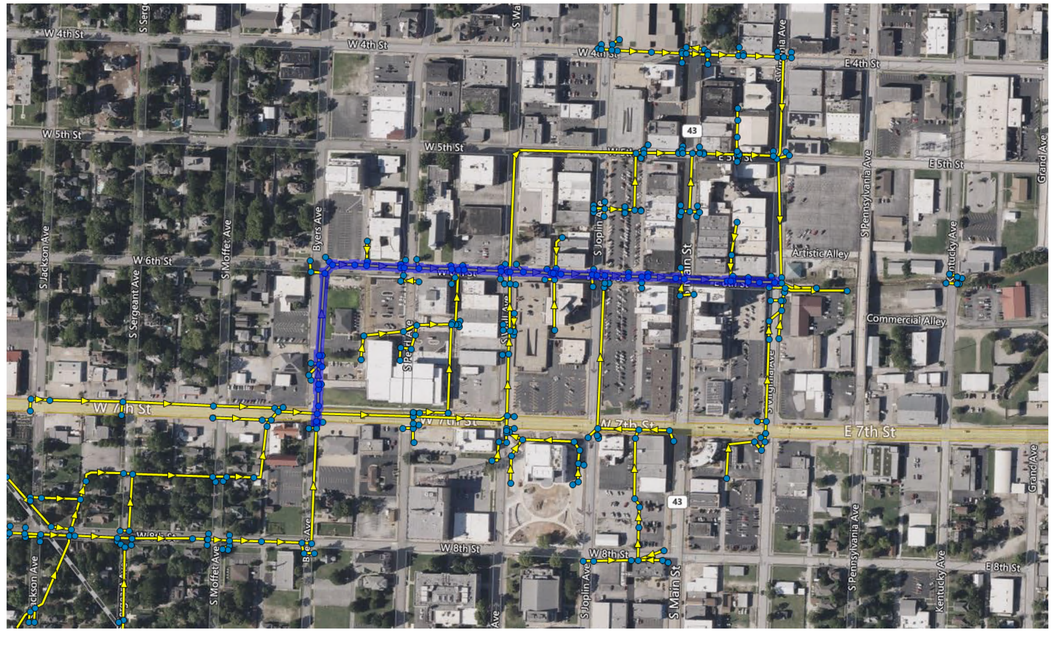


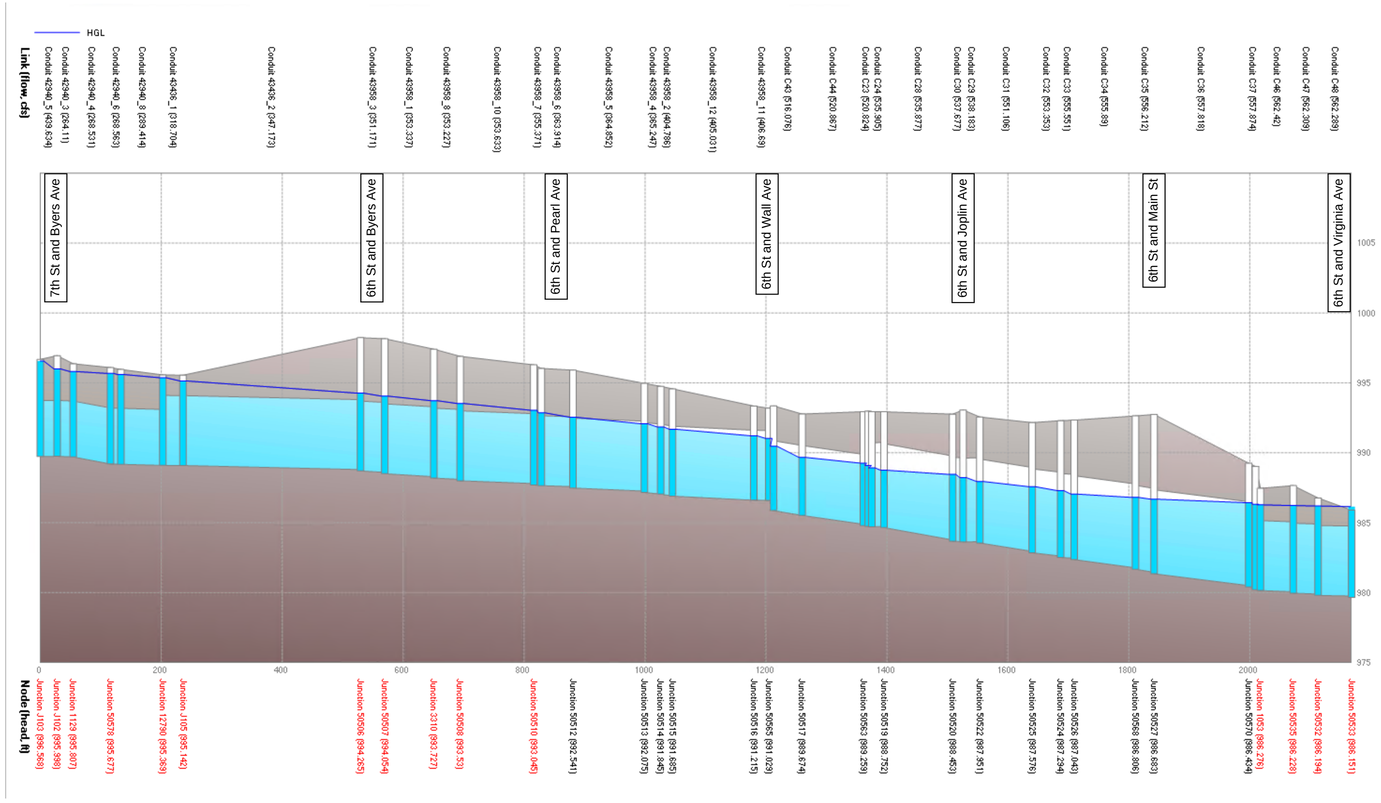
Willow Branch Replacement – 25-year Peak Time Step
Scenario 7



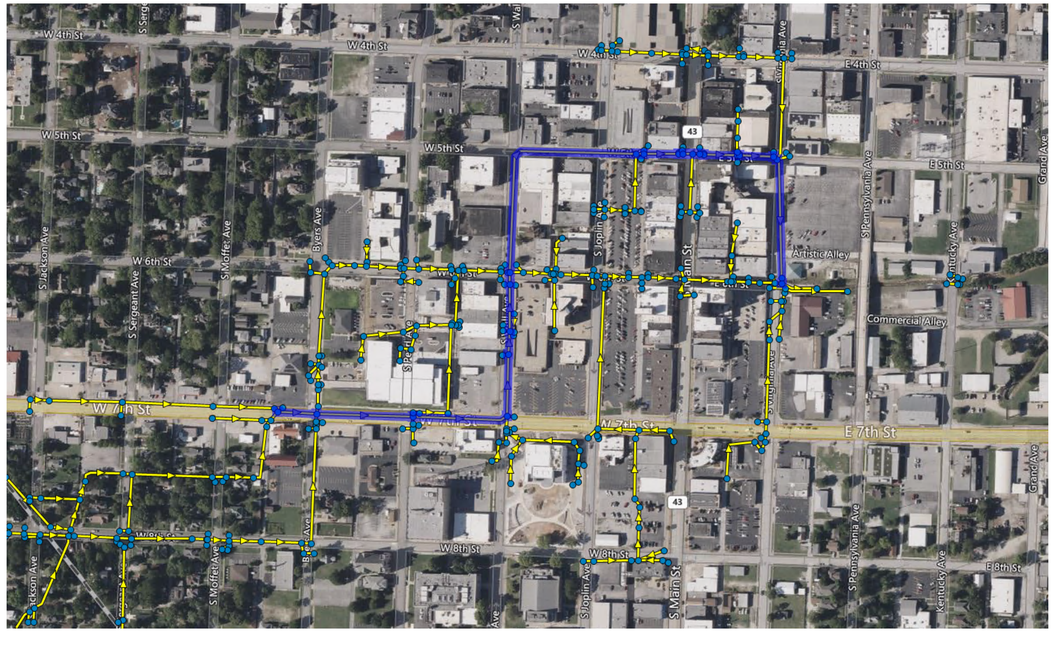


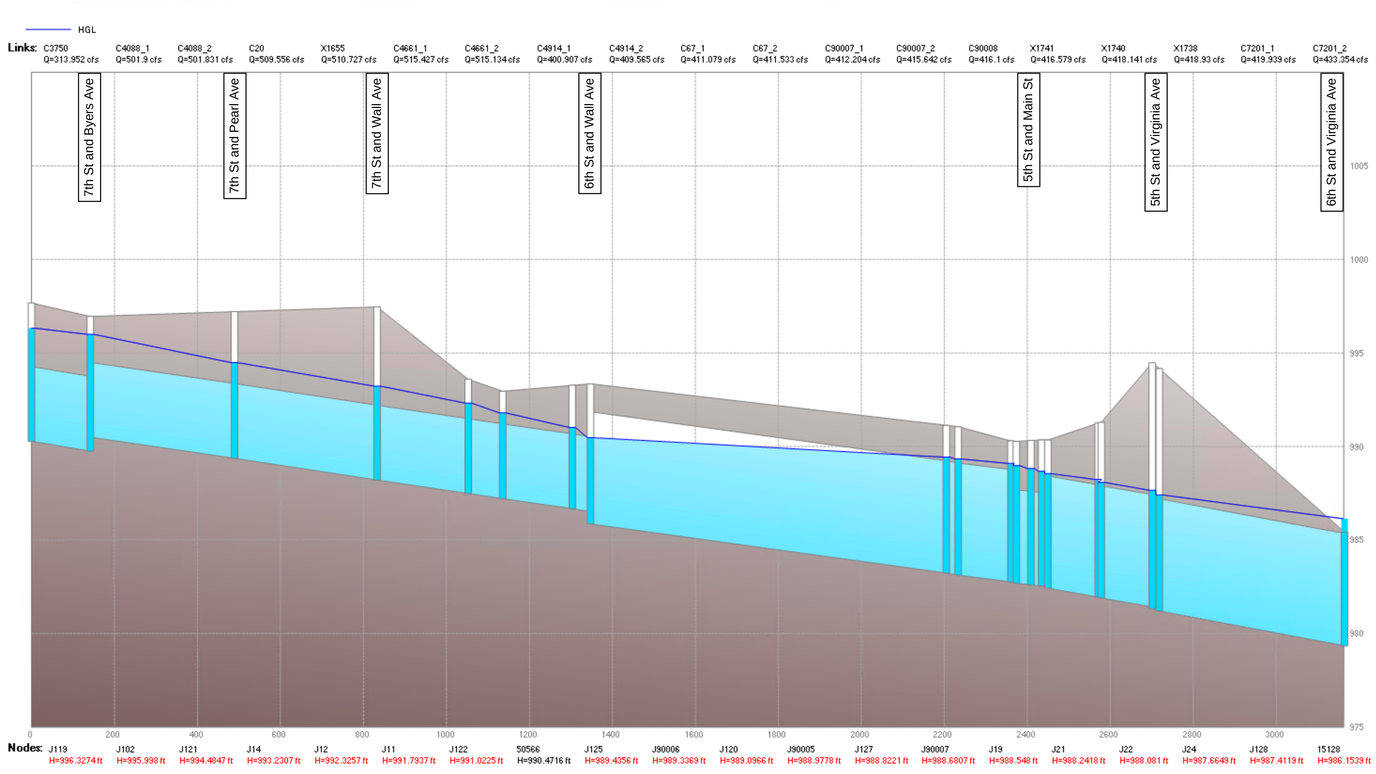
New Willow Branch – 25-year Peak Time Step Scenario 8





Willow Branch Replacement – 25-year Peak Time Step
Scenario 8

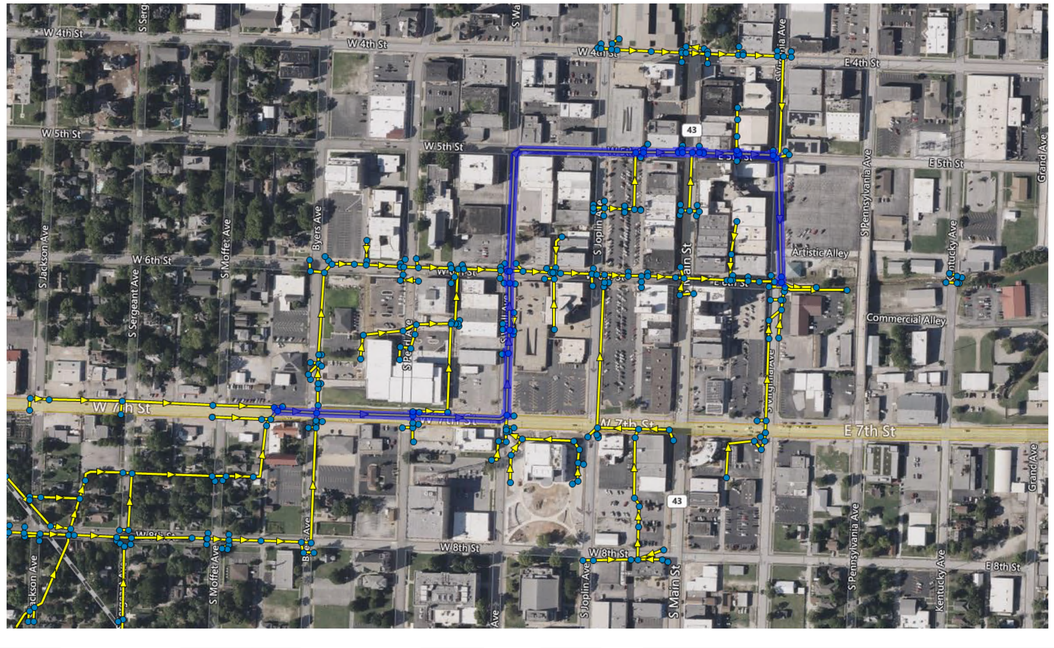


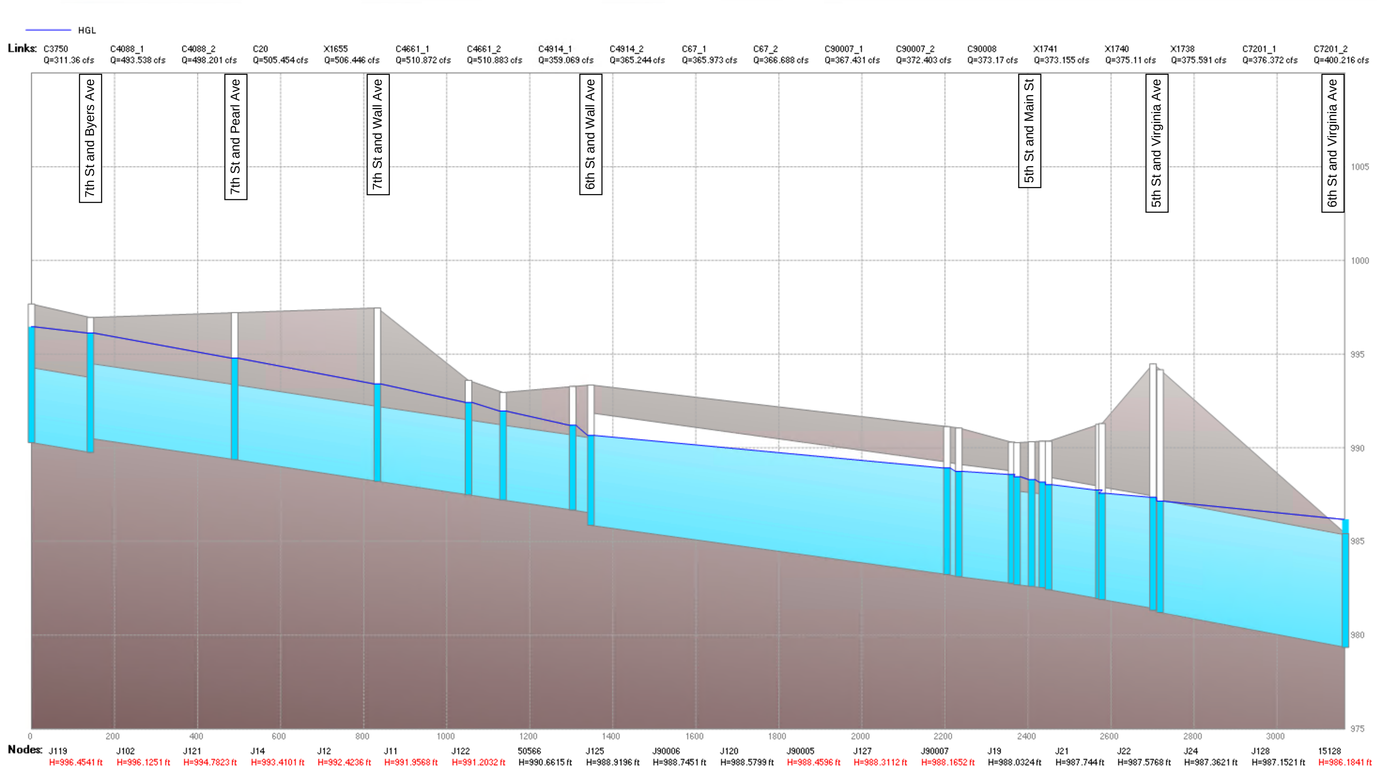


New Willow Branch – 25-year Peak Time Step Scenario 9



Willow Branch Replacement – 25-year Peak Time Step
Scenario 9

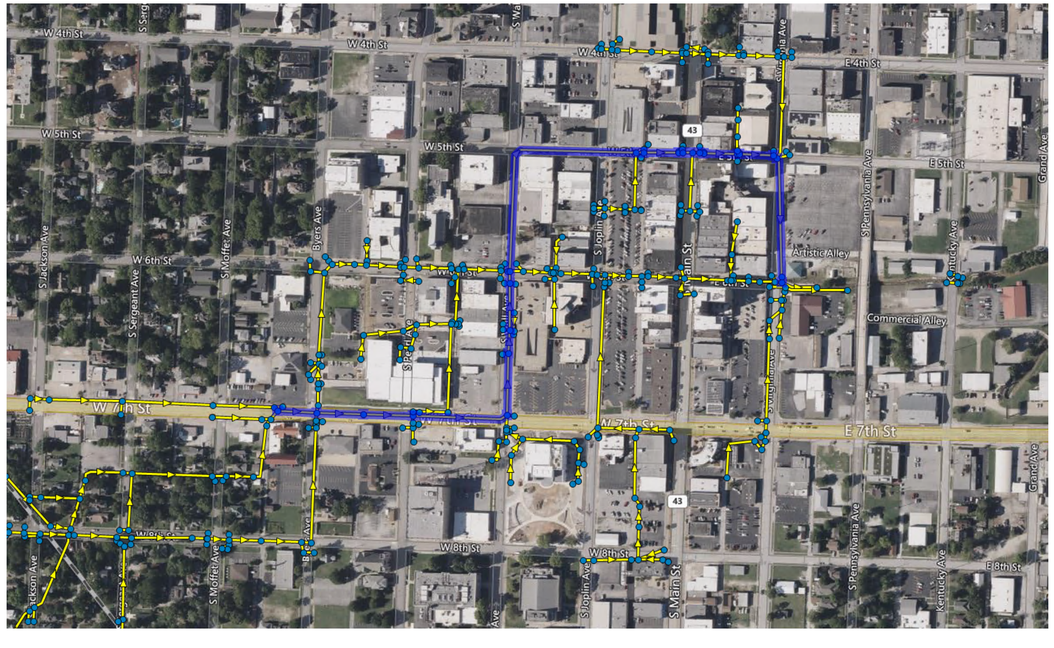


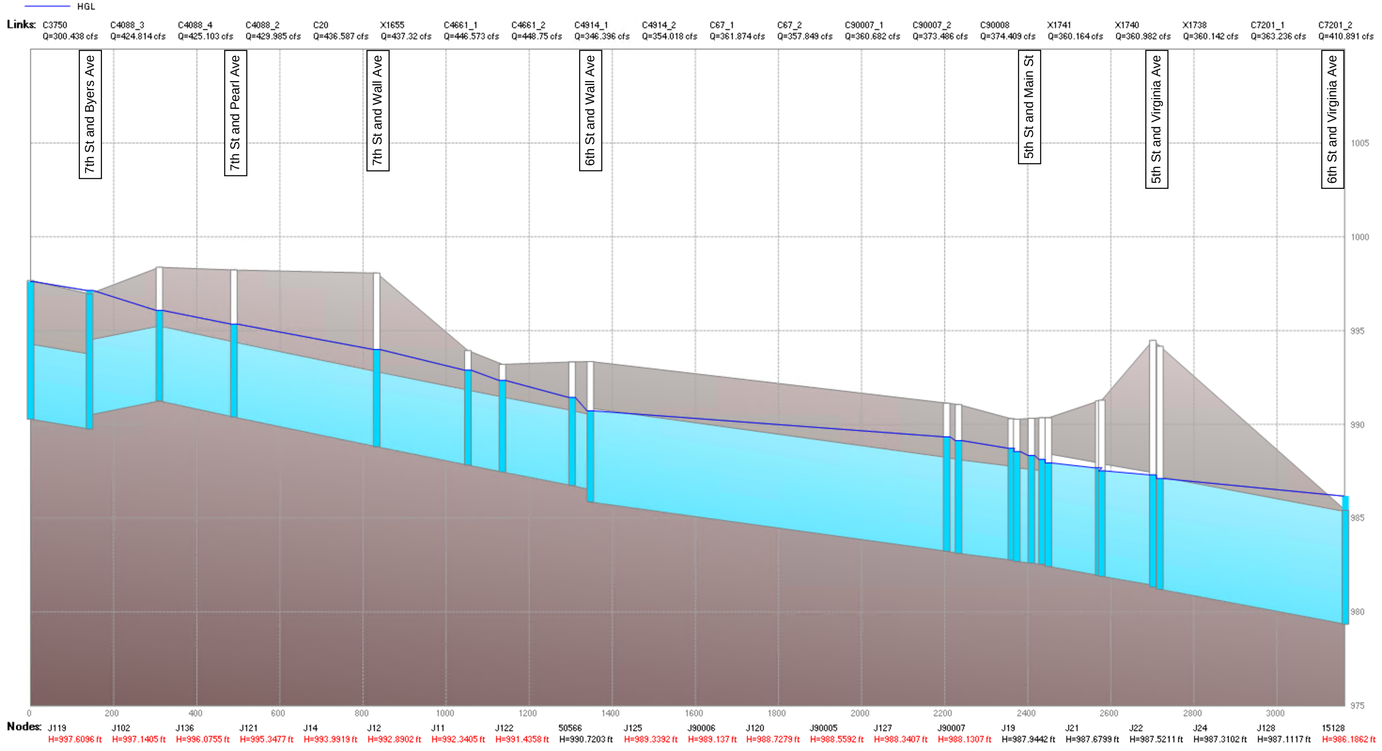


New Willow Branch – 25-year Peak Time Step Scenario 10

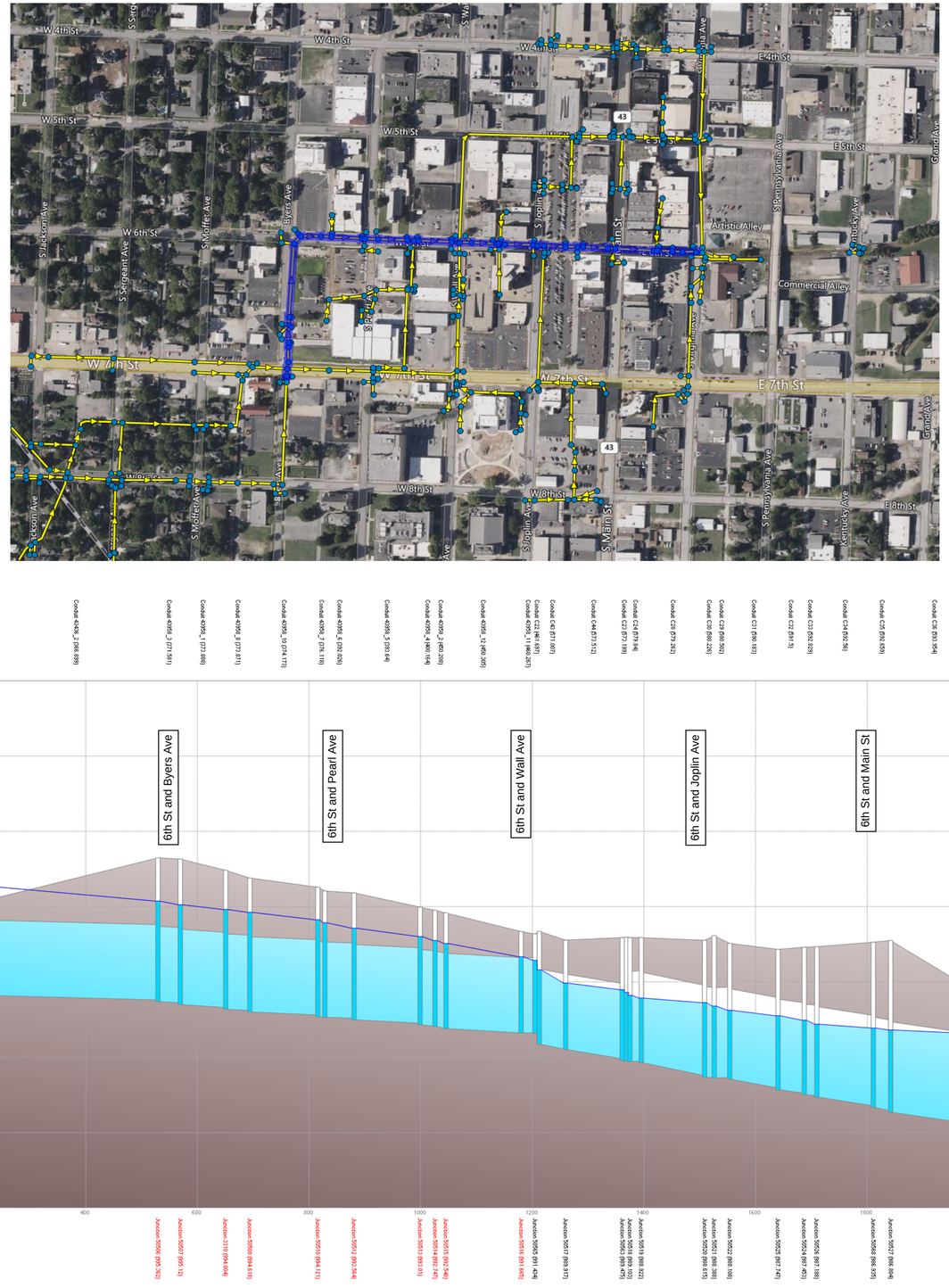


Willow Branch Replacement – 25-year Peak Time Step
Scenario 10

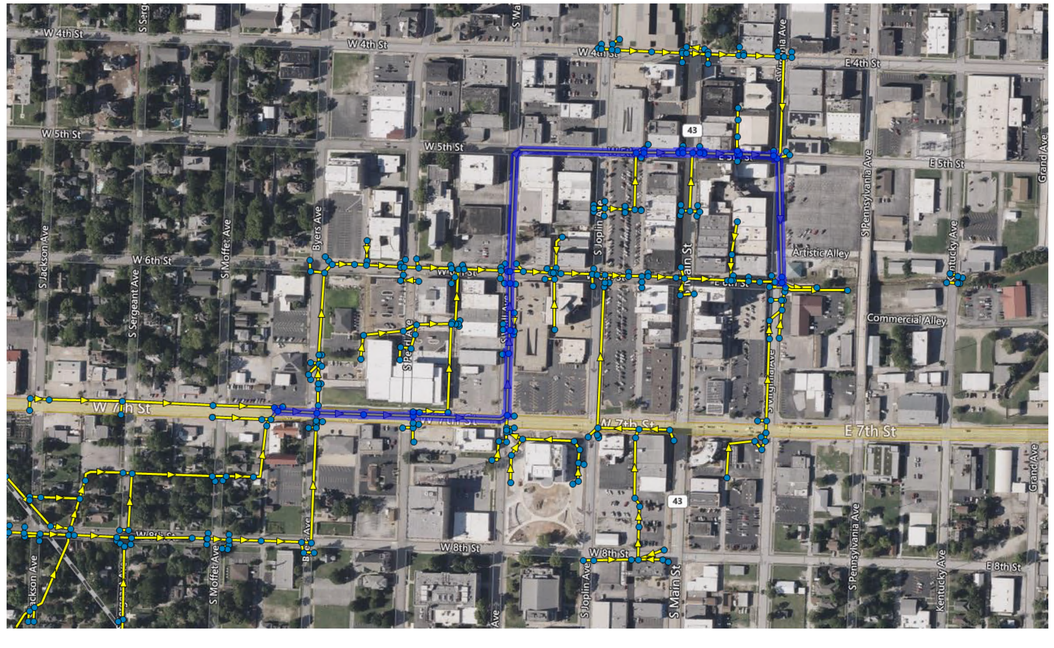


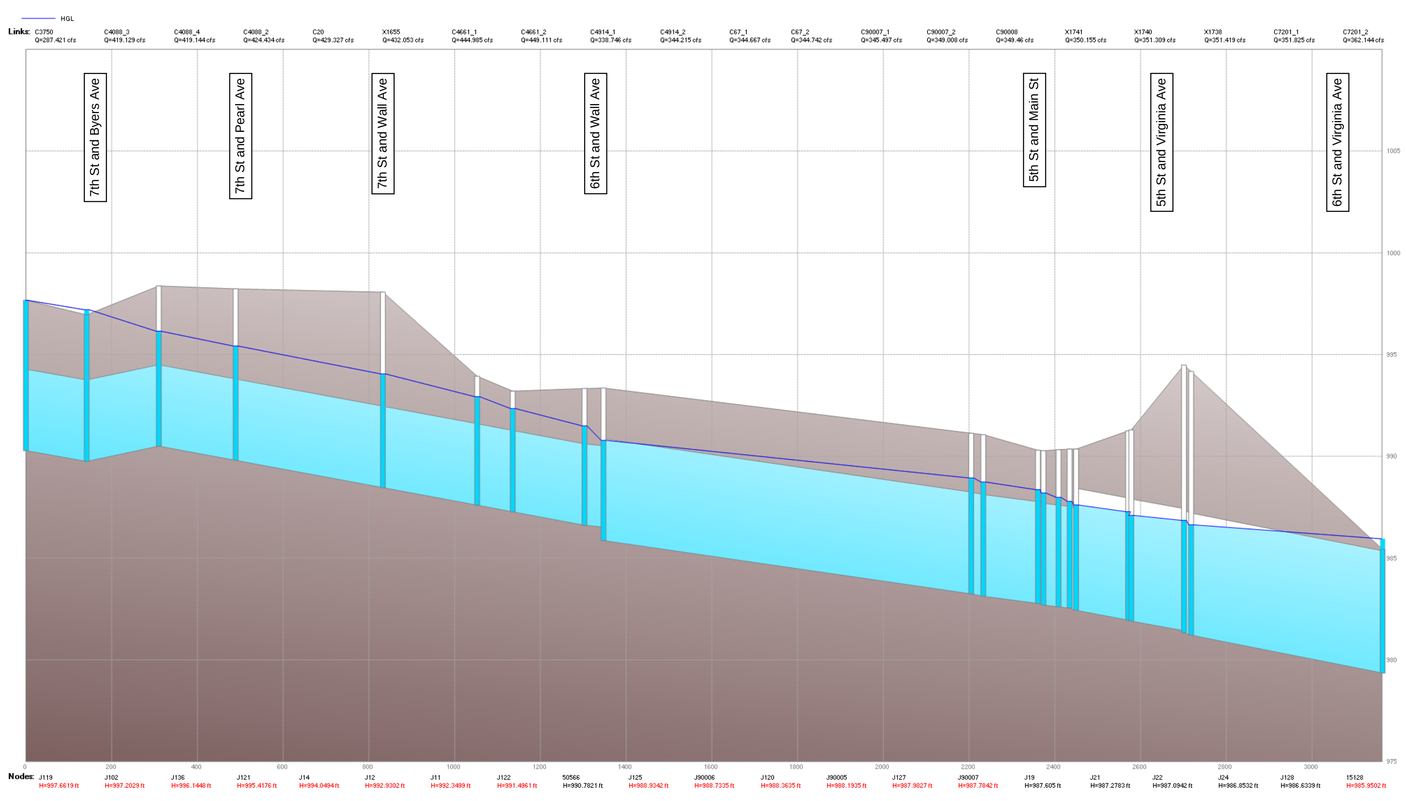


New Willow Branch – 25-year Peak Time Step Scenario 11

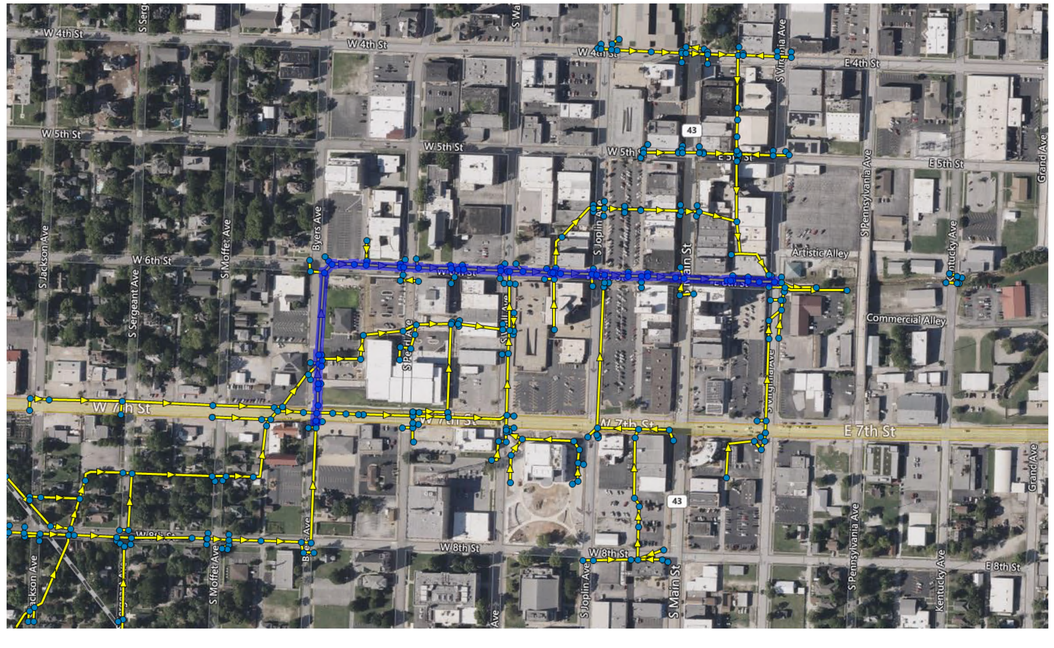


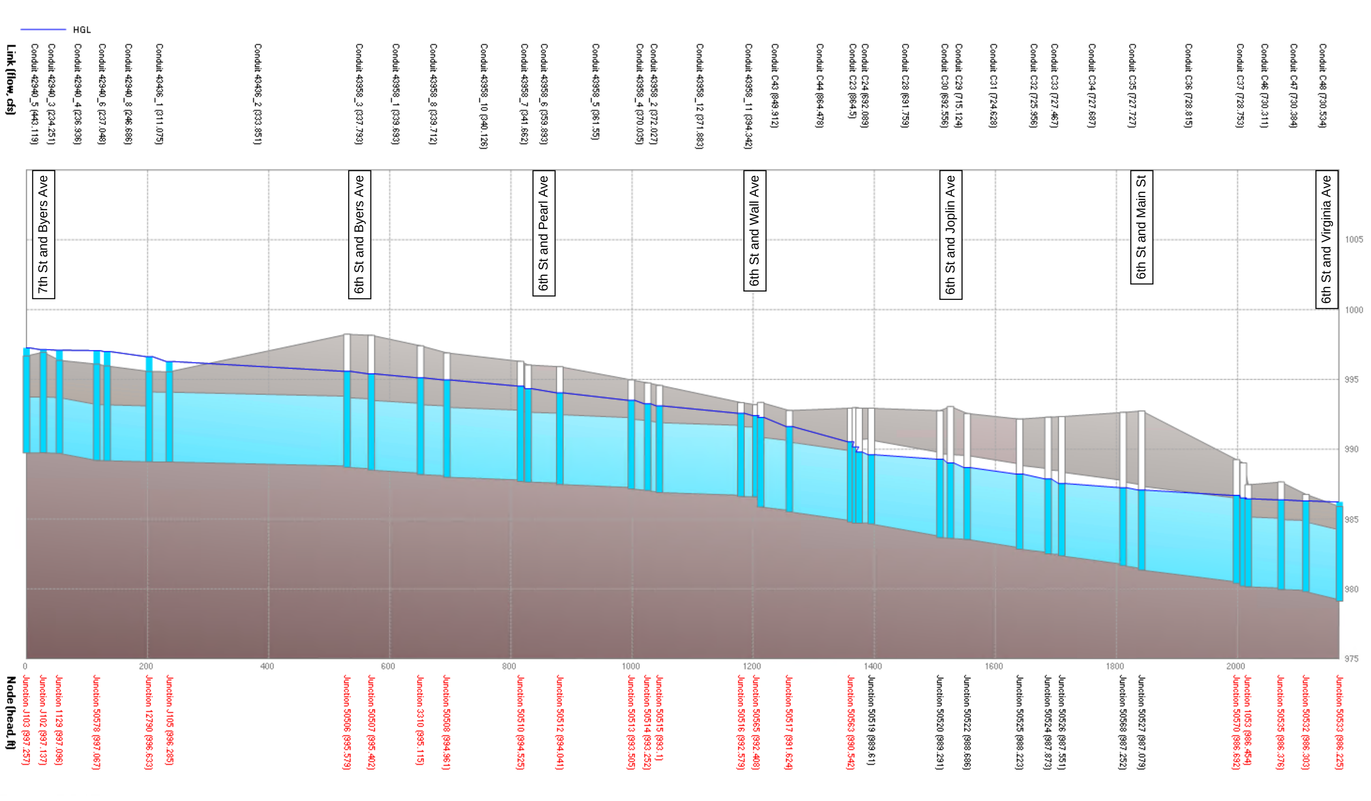
Willow Branch Replacement – 25-year Peak Time Step
Scenario 11



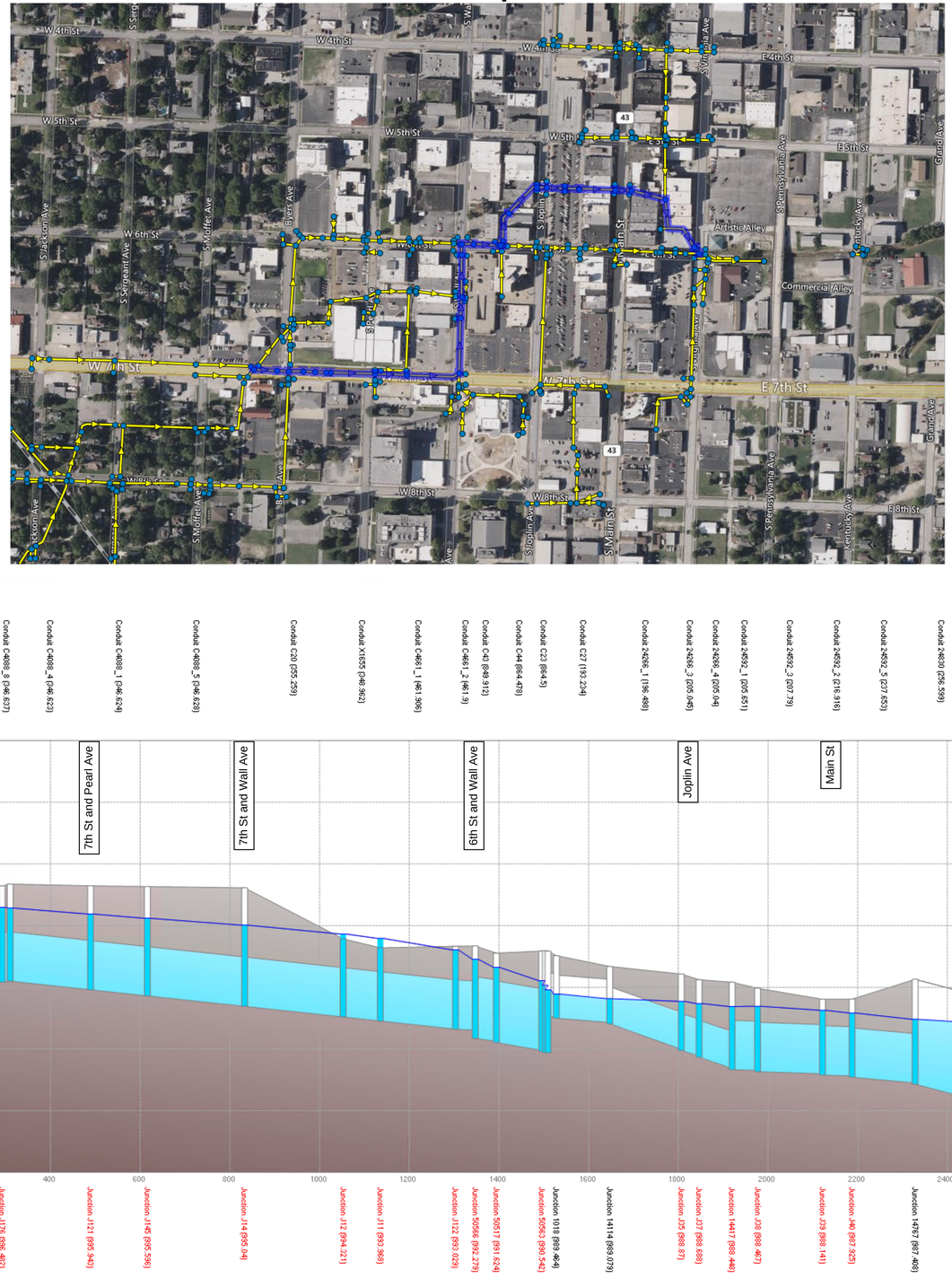


New Willow Branch – Phase 1B 25-year Peak Time Step

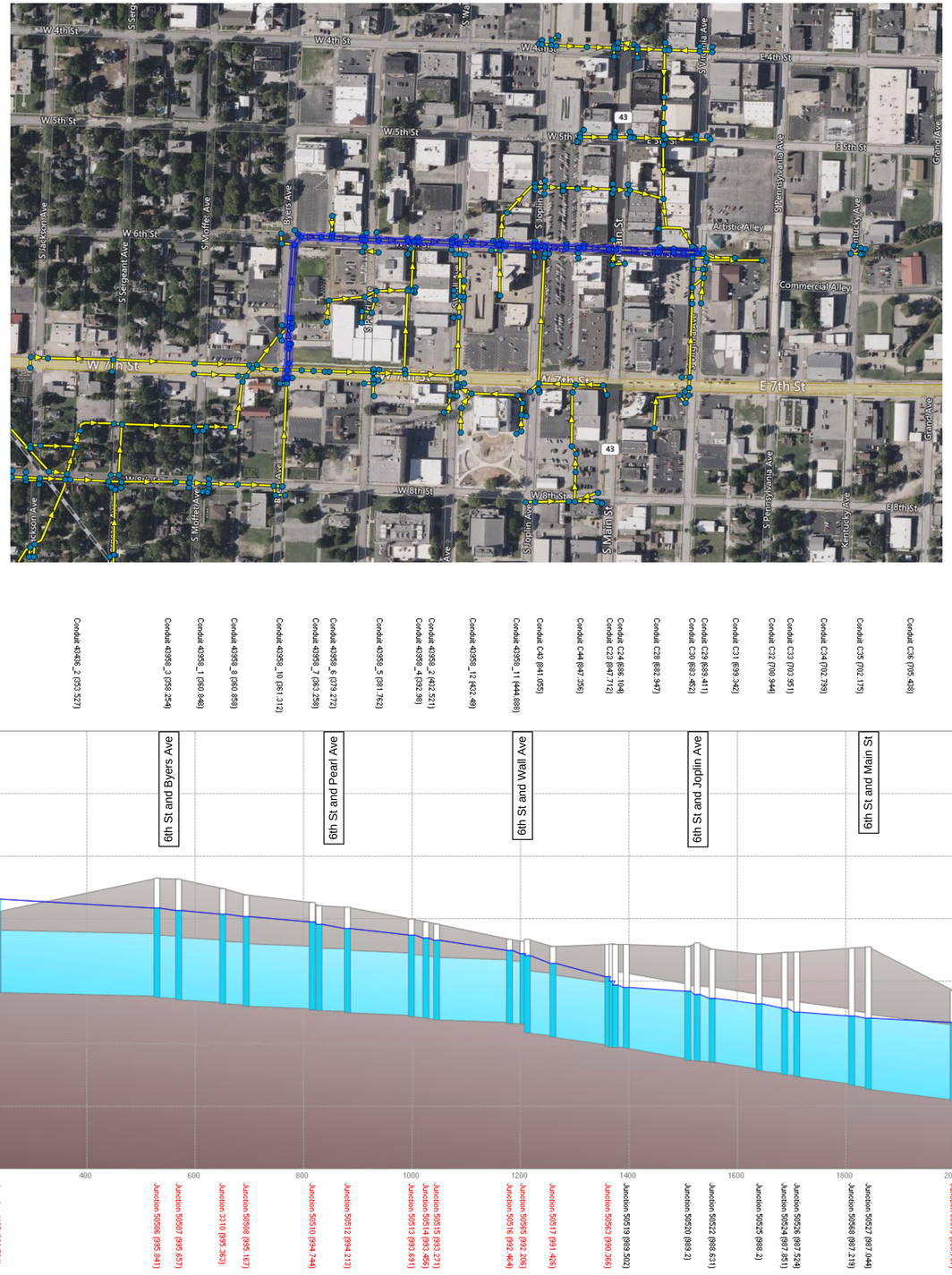




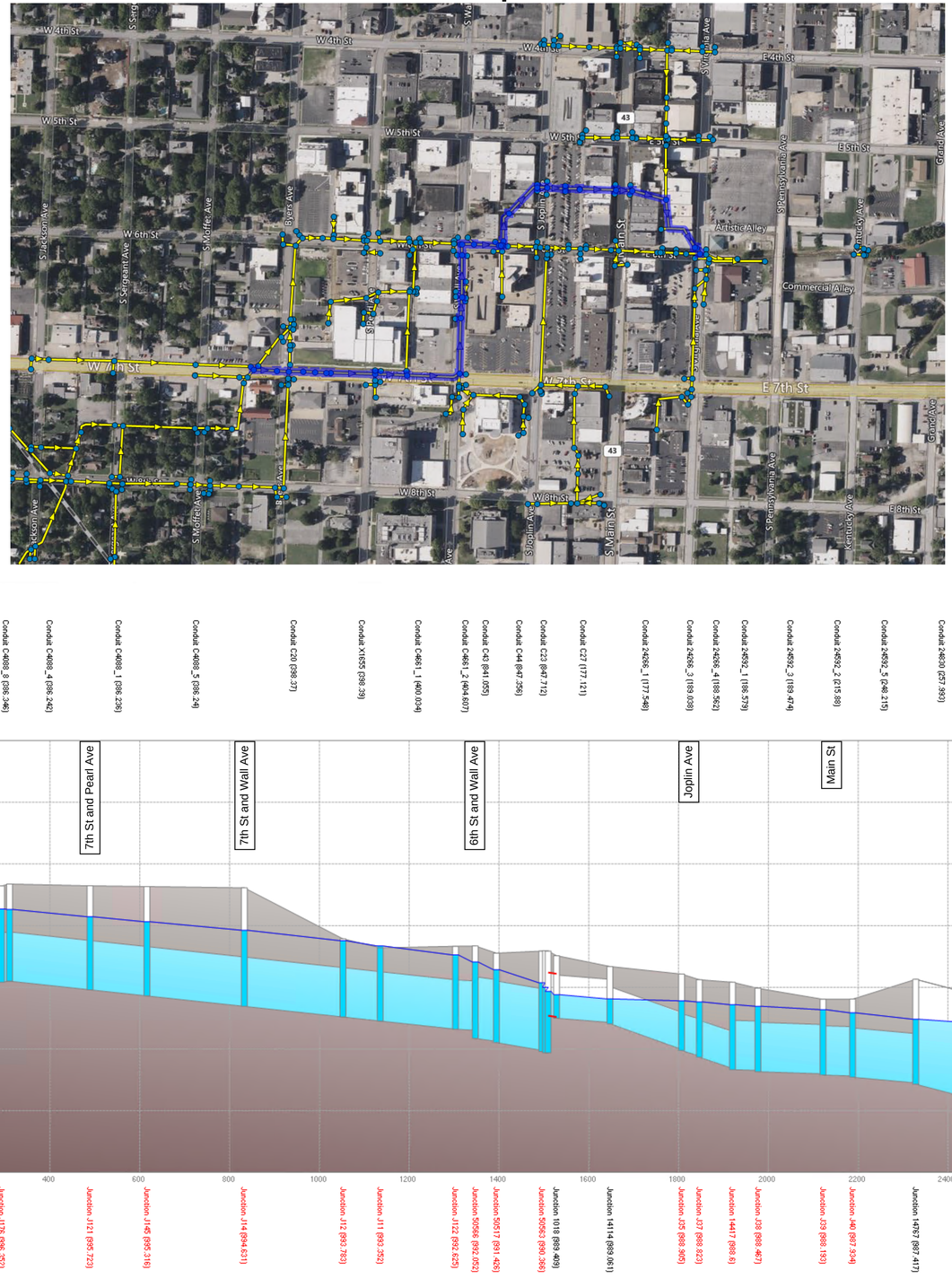
Willow Branch Replacement – Phase 1B 25-year Peak Time Step



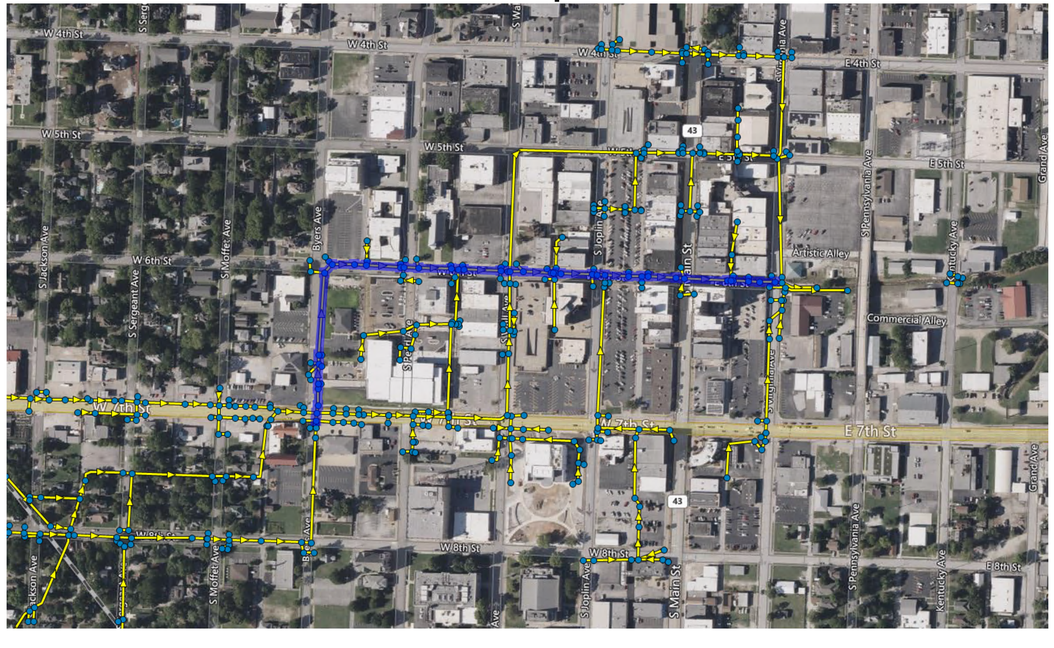
New Willow Branch – Phase 1D 25-year Peak Time Step

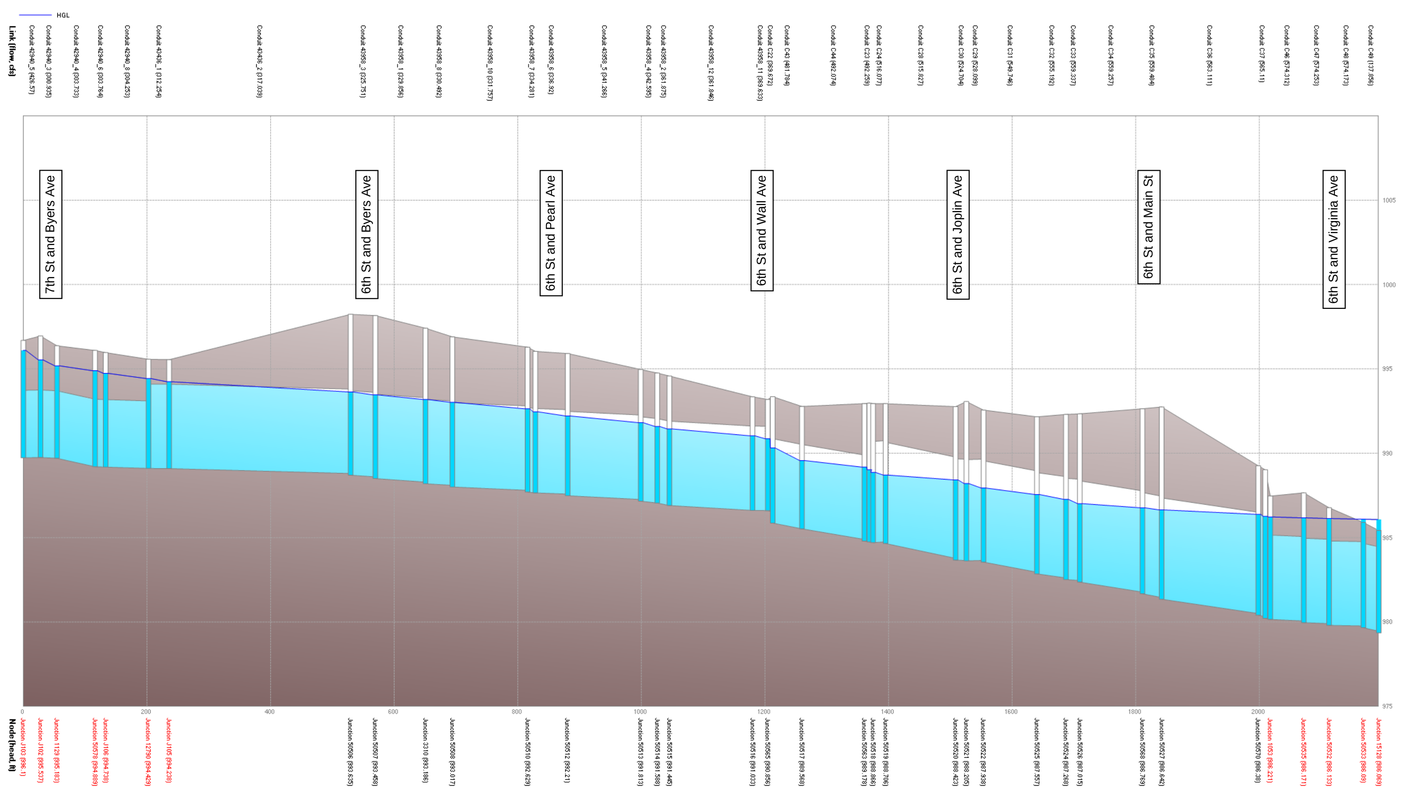


Willow Branch Replacement – Phase 1D 25-year Peak Time Step

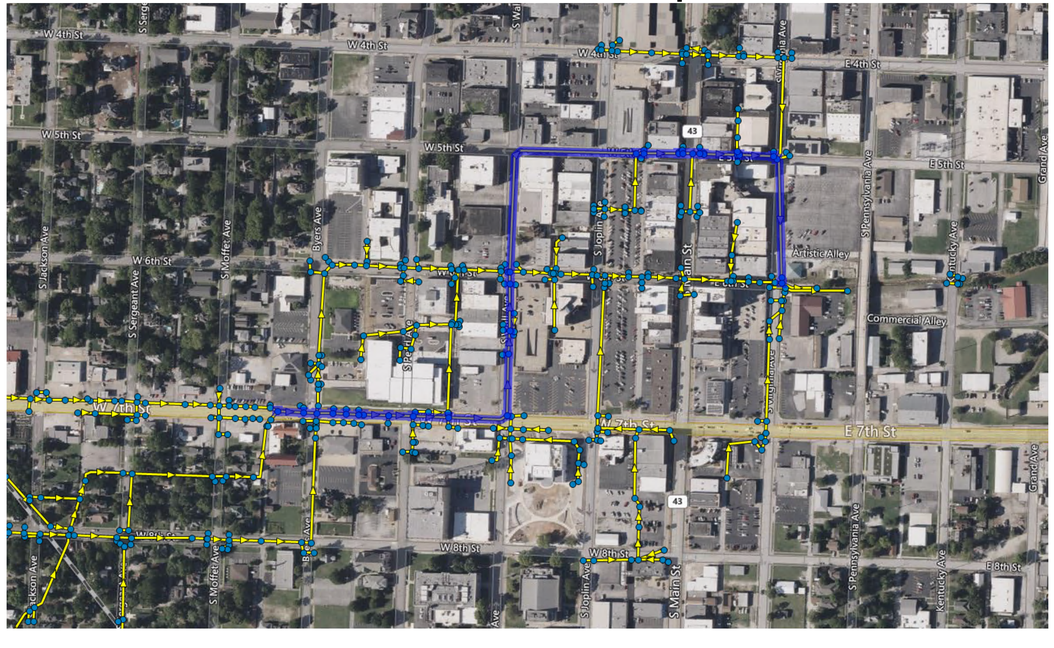


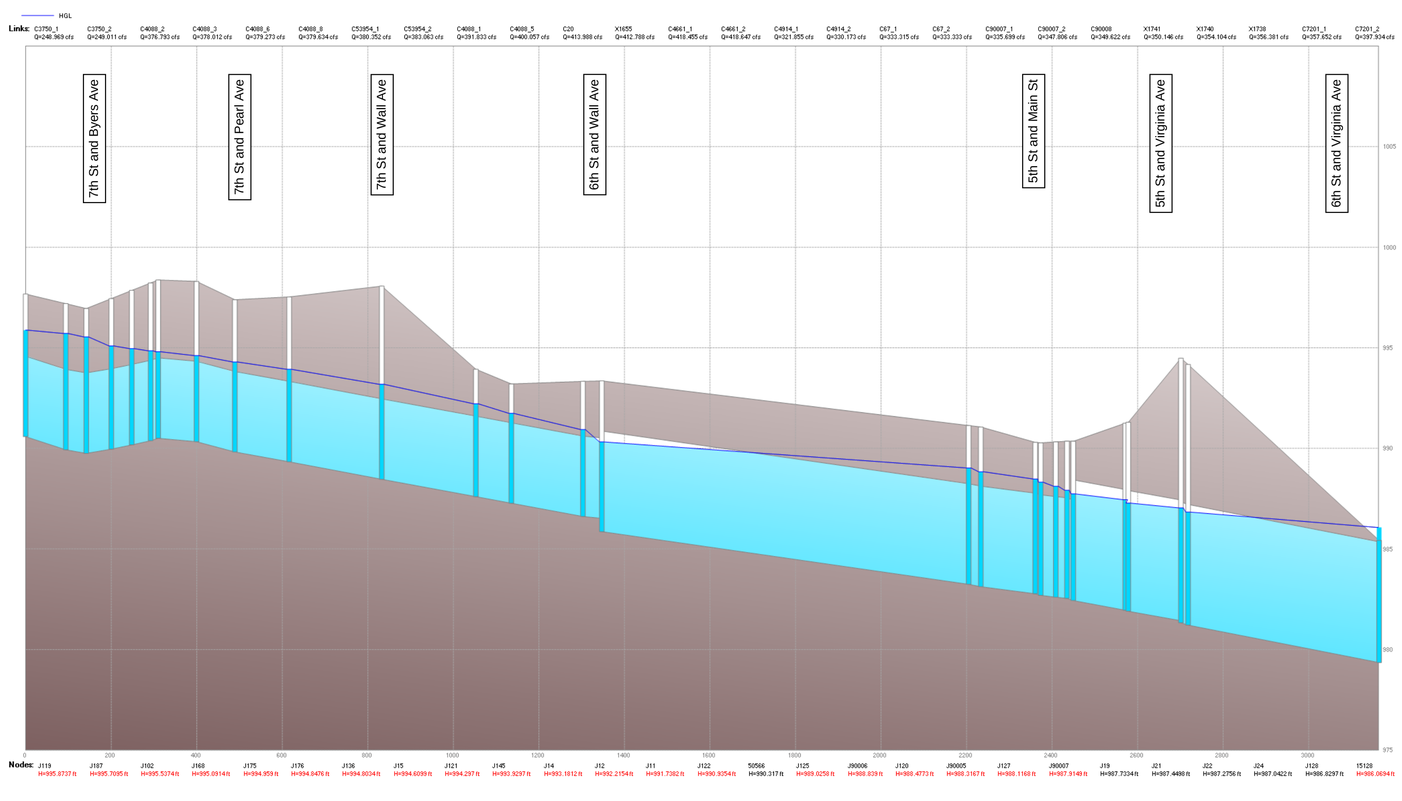
New Willow Branch – Phase 2C Ultimate 25-year Peak Time Step

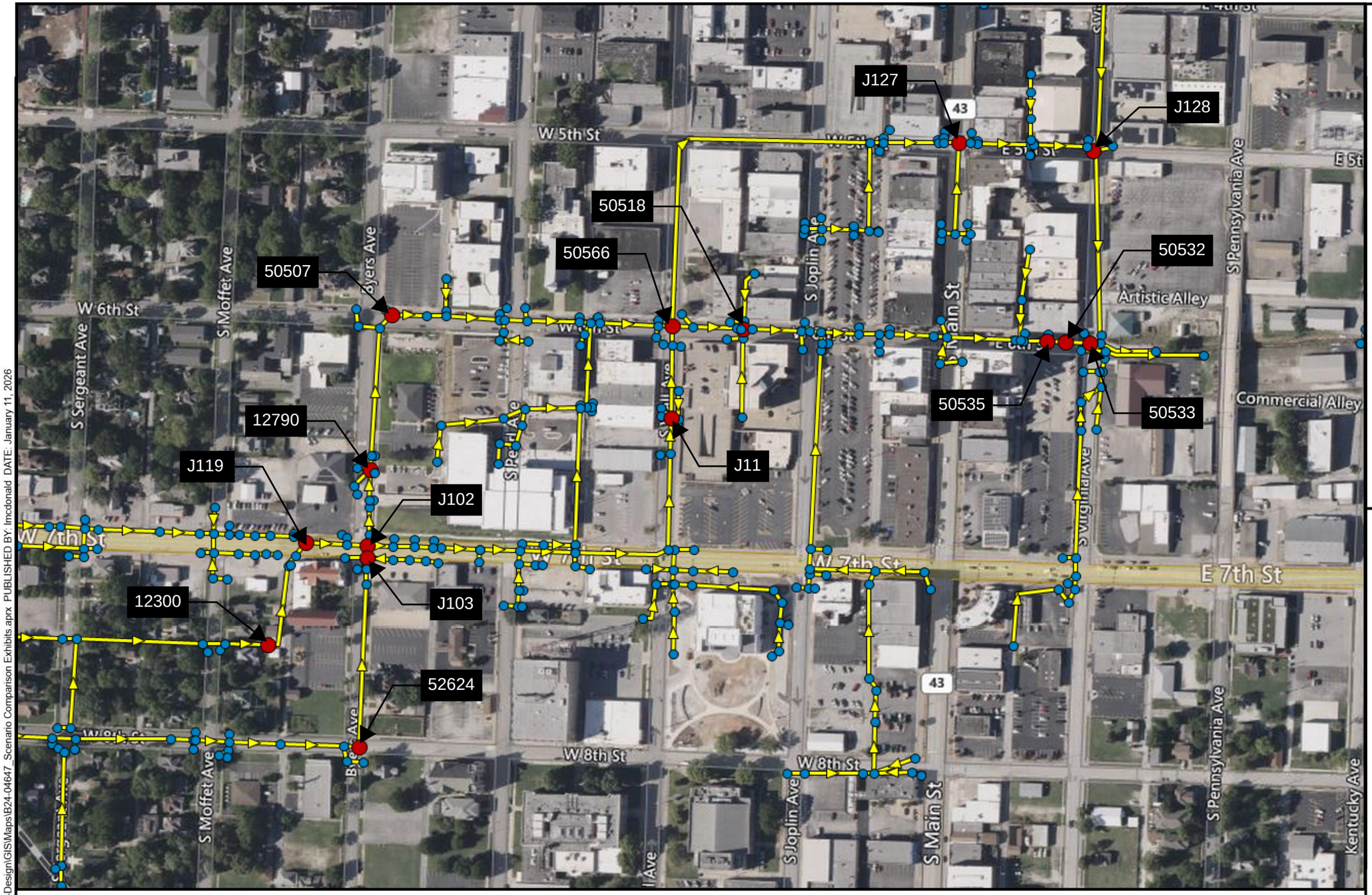




Willow Branch Replacement – Phase 2C Ultimate 25-year Peak Time Step







Legend

- Conduit
- Junction
- Node Summary Junction

N 0 50 100 200 ft

NODE ANALYSIS MAP

Old Willow Branch
Culvert Replacement Study
Joplin, MO

WGS 1984 Web Mercator Auxiliary Sphere

Basemap: ESRI World Imagery

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SUMMARY OF PONDING DEPTH IN KEY PCSWMM NODES ACROSS ALL SCENARIOS

	HGL_difference_Feet [Max HGL - Rim Elevation]											
Scenario	**Existing**	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Scenario 4**	**Scenario 5**	**Scenario 6**	**Scenario 7**	**Scenario 8**	**Scenario 9**	**Scenario 10**	**Scenario 11**
Node												
12300	0.653	0.233	-0.237	-0.747	-0.807	-1.177	-1.317	-2.337	-2.367	-2.277	-0.837	-0.787
12790	2.33	1.18	1.06	1	1.01	0.65	0.49	-0.02	-0.1	0.19	1	1.03
50507	-0.239	-2.799	-2.989	-3.009	-2.979	-3.279	-3.499	-4.019	-4.099	-3.879	-2.999	-2.889
50518	-2.931	-3.741	-3.981	-3.881	-3.891	-3.891	-4.101	-3.961	-4.021	-3.861	-3.861	-3.831
50532	-0.269	-0.529	-0.529	-0.469	-0.479	-0.489	-0.539	-0.539	-0.539	-0.489	-0.459	-0.459
50533	0.514	0.274	0.274	0.334	0.334	0.314	0.294	0.284	0.284	0.324	0.344	0.334
50535	-1.066	-1.406	-1.396	-1.326	-1.326	-1.346	-1.396	-1.396	-1.396	-1.336	-1.306	-1.316
50566	-1.964	-2.534	-2.934	-2.634	-2.654	-2.654	-2.914	-2.814	-2.884	-2.694	-2.634	-2.554
52624	1.25	5.14	5.14	-1.03	-2.14	-2.48	-2.06	-3.31	-4.39	-3.49	-2.98	1.04
J102	1.708	0.378	0.318	0.208	0.218	-0.062	-0.222	-0.622	-0.612	-0.662	0.208	0.278
J103	2.055	1.125	1.065	0.955	0.975	0.705	0.565	0.095	0.075	0.055	0.955	1.025
J11	-1.013	-0.723	-0.973	-0.853	-0.763	-0.863	-1.303	-0.403	-1.453	-1.253	-0.903	-0.803
J119		-0.002	-0.002	-0.062	-0.042	-0.392	-0.542	-1.232	-1.302	-1.212	-0.062	-0.002
J127		-0.001	-1.981	-0.821	-1.991	-2.001	-1.641	-1.631	-1.331	-2.011	-1.101	-0.871
J128		-7.52	-7.24	-7.07	-7.11	-7.12	-6.82	-6.85	-6.54	-7.01	-7.05	-7.07

: Ponding Above Rim Elev.
: HGL Below Rim Elev.

	Delta to Existing											
Scenario	**Existing**	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Scenario 4**	**Scenario 5**	**Scenario 6**	**Scenario 7**	**Scenario 8**	**Scenario 9**	**Scenario 10**	**Scenario 11**
Node												
12300	0	-0.42	-0.89	-1.4	-1.46	-1.83	-1.97	-2.99	-3.02	-2.93	-1.49	-1.44
12790	0	-1.15	-1.27	-1.33	-1.32	-1.68	-1.84	-2.35	-2.43	-2.14	-1.33	-1.3
50507	0	-2.56	-2.75	-2.77	-2.74	-3.04	-3.26	-3.78	-3.86	-3.64	-2.76	-2.65
50518	0	-0.81	-1.05	-0.95	-0.96	-0.96	-1.17	-1.03	-1.09	-0.93	-0.93	-0.9
50532	0	-0.26	-0.26	-0.2	-0.21	-0.22	-0.27	-0.27	-0.27	-0.22	-0.19	-0.19
50533	0	-0.24	-0.24	-0.18	-0.18	-0.2	-0.22	-0.23	-0.23	-0.19	-0.17	-0.18
50535	0	-0.34	-0.33	-0.26	-0.26	-0.28	-0.33	-0.33	-0.33	-0.27	-0.24	-0.25
50566	0	-0.57	-0.97	-0.67	-0.69	-0.69	-0.95	-0.85	-0.92	-0.73	-0.67	-0.59
52624	0	3.89	3.89	-2.28	-3.39	-3.73	-3.31	-4.56	-5.64	-4.74	-4.23	-0.21
J102	0	-1.33	-1.39	-1.5	-1.49	-1.77	-1.93	-2.33	-2.32	-2.37	-1.5	-1.43
J103	0	-0.93	-0.99	-1.1	-1.08	-1.35	-1.49	-1.96	-1.98	-2	-1.1	-1.03
J11	0	0.29	0.04	0.16	0.25	0.15	-0.29	0.61	-0.44	-0.24	0.11	0.21
J119	0	-0.002	-0.002	-0.062	-0.042	-0.392	-0.542	-1.232	-1.302	-1.212	-0.062	-0.002
J127	0	-0.001	-1.981	-0.821	-1.991	-2.001	-1.641	-1.631	-1.331	-2.011	-1.101	-0.871
J128	0	-7.52	-7.24	-7.07	-7.11	-7.12	-6.82	-6.85	-6.54	-7.01	-7.05	-7.07

: HGL Higher than Existing
: HGL Lower than Existing

SUMMARY OF PONDING DEPTH IN KEY PCSWMM NODES FOR CONSTRUCTION PHASING SCENARIOS

	HGL_difference_Feet [Max HGL - Rim Elevation]				
Scenario	**Existing**	**Phase 1-1**	**Phase 1-2**	**Phase 1-3**	**Phase 2 Ultimate**
Node					
12300	0.653	-2.427	-1.147	-3.517	-3.157
12790	2.33	0.06	1.17	-1.69	-0.13
50507	-0.239	-3.899	-2.719	-5.099	-4.699
50518	-2.931	-2.931	-3.141	-3.121	-4.071
50532	-0.269	-0.239	-0.409	-0.339	-0.599
50533	0.514	0.534	0.364	0.444	0.244
50535	-1.066	-1.046	-1.236	-1.146	-1.456
50566	-1.964	-1.974	-1.054	-2.364	-3.034
52624	1.25	-4.28	-4.7	-6.2	-2.05
J102	1.708	-0.802	0.208	-2.552	-1.372
J103	2.055	-0.395	0.595	-2.115	-0.525
J11	-1.013	-1.133	1.117	-1.623	-1.423
J119		-1.372	-0.352	-3.192	-1.792
J127					-1.421
J128					-7.31

: Ponding Above Rim Elev.
: HGL Below Rim Elev.

Delta to Existing					
12300	0	-3.08	-1.8	-4.17	-3.81
12790	0	-2.27	-1.16	-4.02	-2.46
50507	0	-3.66	-2.48	-4.86	-4.46
50518	0	0	-0.21	-0.19	-1.14
50532	0	0.03	-0.14	-0.07	-0.33
50533	0	0.02	-0.15	-0.07	-0.27
50535	0	0.02	-0.17	-0.08	-0.39
50566	0	-0.01	0.91	-0.4	-1.07
52624	0	-5.53	-5.95	-7.45	-3.3
J102	0	-2.51	-1.5	-4.26	-3.08
J103	0	-2.45	-1.46	-4.17	-2.58
J11	0	-0.12	2.13	-0.61	-0.41
J119	0	-1.372	-0.352	-3.192	-1.792
J127	0	0	0	0	-1.421
J128	0	0	0	0	-7.31

: HGL Higher than Existing
: HGL Lower than Existing

Proposed Scenario Depth Ponding Results

Legend

- Willow Branch Replacement Culvert
- Existing Storm Pipe Inventory
- Existing Storm Structure Inventory
- Old Willow Branch
- 2-ft Contours
- Parcels

Phase 2C - Existing Model

Value

- -0.986 - -0.796
- -0.795 - -0.605
- -0.604 - -0.47
- -0.469 - -0.376
- -0.375 - -0.359
- -0.358 - -0.338
- -0.337 - -0.317
- -0.316 - -0.287
- -0.286 - -0.262
- -0.261 - -0.241
- -0.24 - -0.224
- -0.223 - -0.211
- -0.21 - -0.185
- -0.184 - -0.16
- -0.159 - -0.135
- -0.134 - -0.105

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N 0 50 100 200 ft

olsson

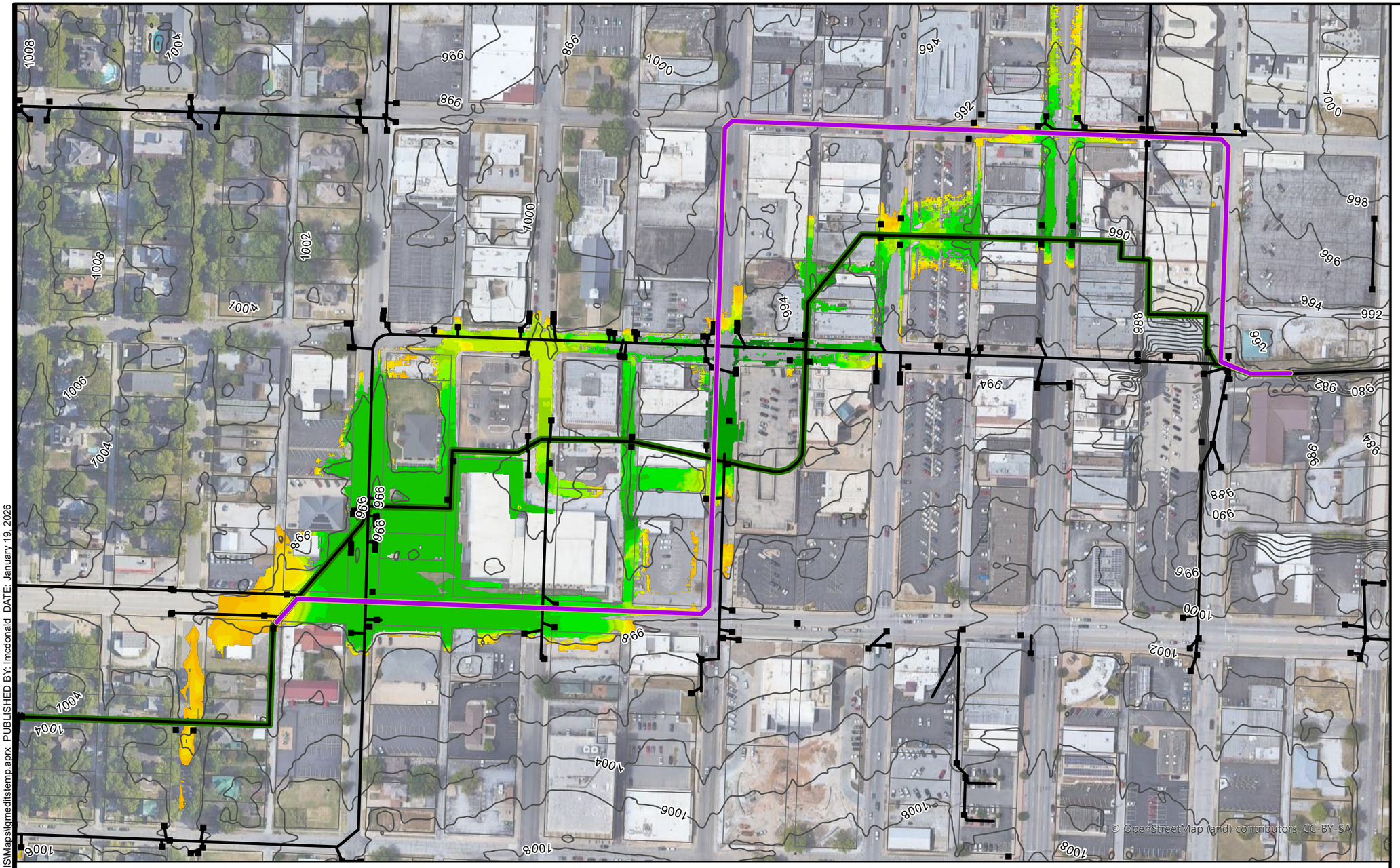
Phase 2C Minus Existing Model (Difference)

Old Willow Branch
Culvert Replacement Study
Joplin, MO

WGS 1984 Web Mercator Auxiliary Sphere

Basemap: ESRI World Imagery

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Legend

- Existing Storm Pipe Inventory
- Existing Storm Structure Inventory
- Old Willow Branch
- 2-ft Contours
- Parcels
- Willow Branch Replacement Culvert

Scenario 3 - Existing Model

Value

- -0.986 - -0.796
- -0.795 - -0.605
- -0.604 - -0.47
- -0.469 - -0.376
- -0.375 - -0.359
- -0.358 - -0.338
- -0.337 - -0.317
- -0.316 - -0.287
- -0.286 - -0.262
- -0.261 - -0.241
- -0.24 - -0.224
- -0.223 - -0.211
- -0.21 - -0.185
- -0.184 - -0.16
- -0.159 - -0.135
- -0.134 - -0.105

N

0 12.5 25 50 ft

1:600

olsson

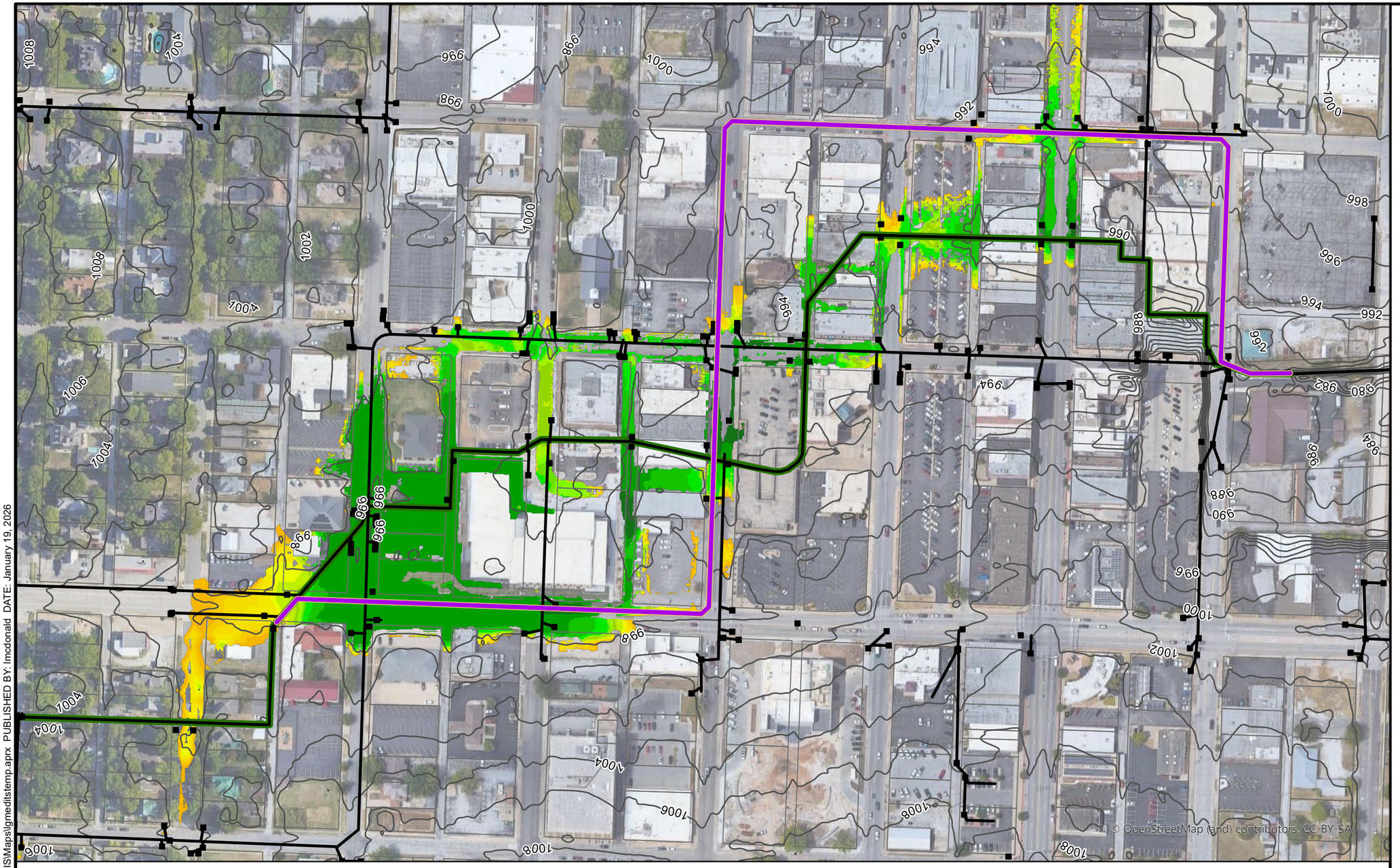
Scenario 3 Minus Existing Model (Difference)

Old Willow Branch
Culvert Replacement Study
Joplin, MO

WGS 1984 Web Mercator Auxiliary Sphere

Basemap: ESRI World Imagery

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Legend

- Existing Storm Pipe Inventory
- Existing Storm Structure Inventory
- Old Willow Branch
- 2-ft Contours
- Parcels
- Willow Branch Replacement Culvert

Scenario 9 - Existing Model

Value

- -0.986 - -0.796
- -0.795 - -0.605
- -0.604 - -0.47
- -0.469 - -0.376
- -0.375 - -0.359
- -0.358 - -0.338
- -0.337 - -0.317
- -0.316 - -0.287
- -0.286 - -0.262
- -0.261 - -0.241
- -0.24 - -0.224
- -0.223 - -0.211
- -0.21 - -0.185
- -0.184 - -0.16
- -0.159 - -0.135
- -0.134 - -0.105

N

0 12.5 25 50 ft

1:600

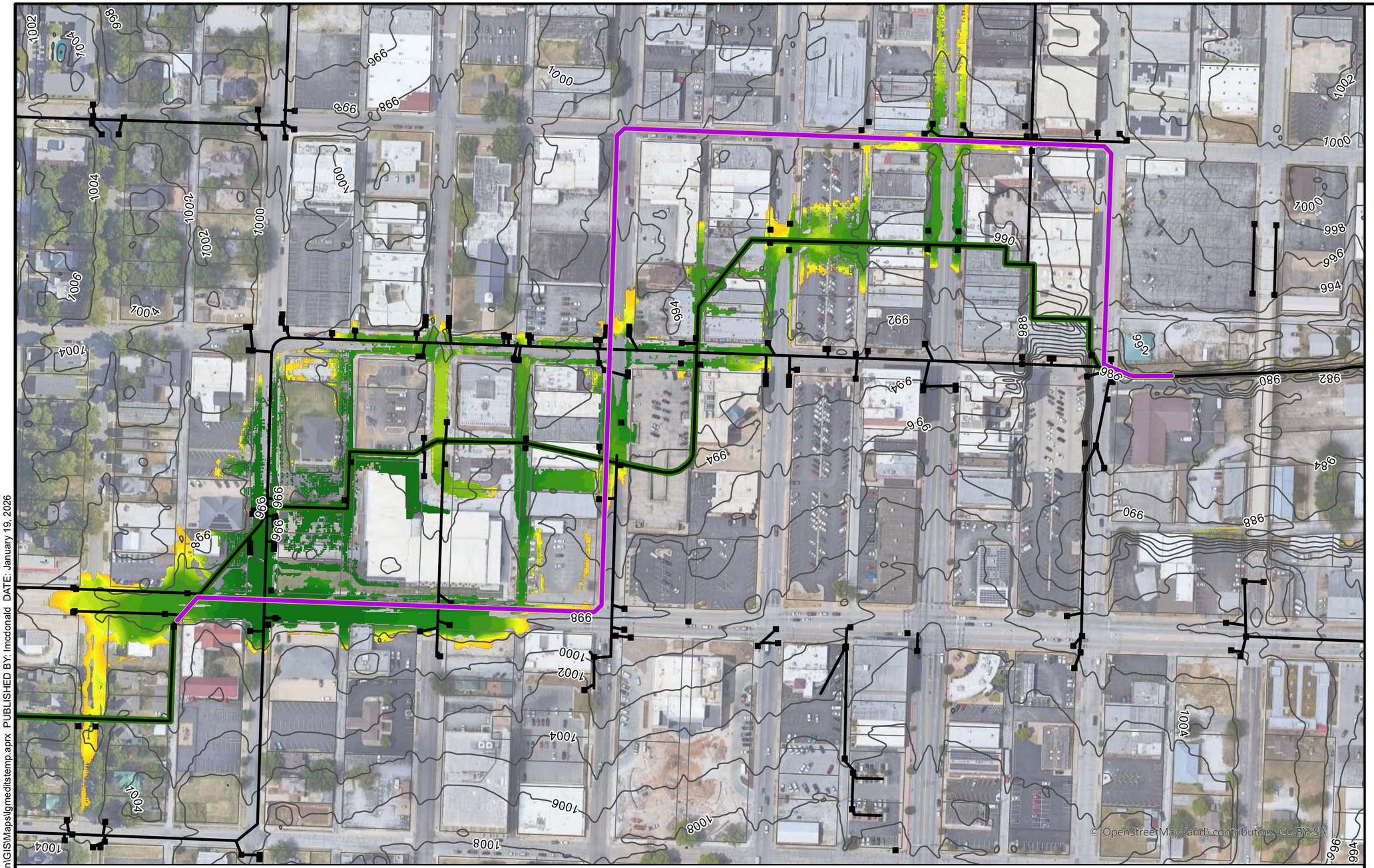
Scenario 9 Minus Existing Model (Difference)

Old Willow Branch
Culvert Replacement Study
Joplin, MO

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WGS 1984 Web Mercator Auxiliary Sphere

Basemap: ESRI World Imagery



N 0 50 100 200 ft

Legend

- Willow Branch Replacement Culvert
- Existing Storm Pipe Inventory
- Existing Storm Structure Inventory
- Old Willow Branch
- 2-ft Contours
- Parcels

Scenario 11 - Existing Model

Value

- -3.428 - -0.987
- -0.986 - -0.796
- -0.795 - -0.605
- -0.604 - -0.47
- -0.469 - -0.376
- -0.375 - -0.359
- -0.358 - -0.338
- -0.337 - -0.317
- -0.316 - -0.287
- -0.286 - -0.262
- -0.261 - -0.241
- -0.24 - -0.224
- -0.223 - -0.211
- -0.21 - -0.185
- -0.184 - -0.16
- -0.159 - -0.135
- -0.059 - -0.105

Scenario 11 Minus Existing Model (Difference)

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Old Willow Branch
Culvert Replacement Study
Joplin, MO

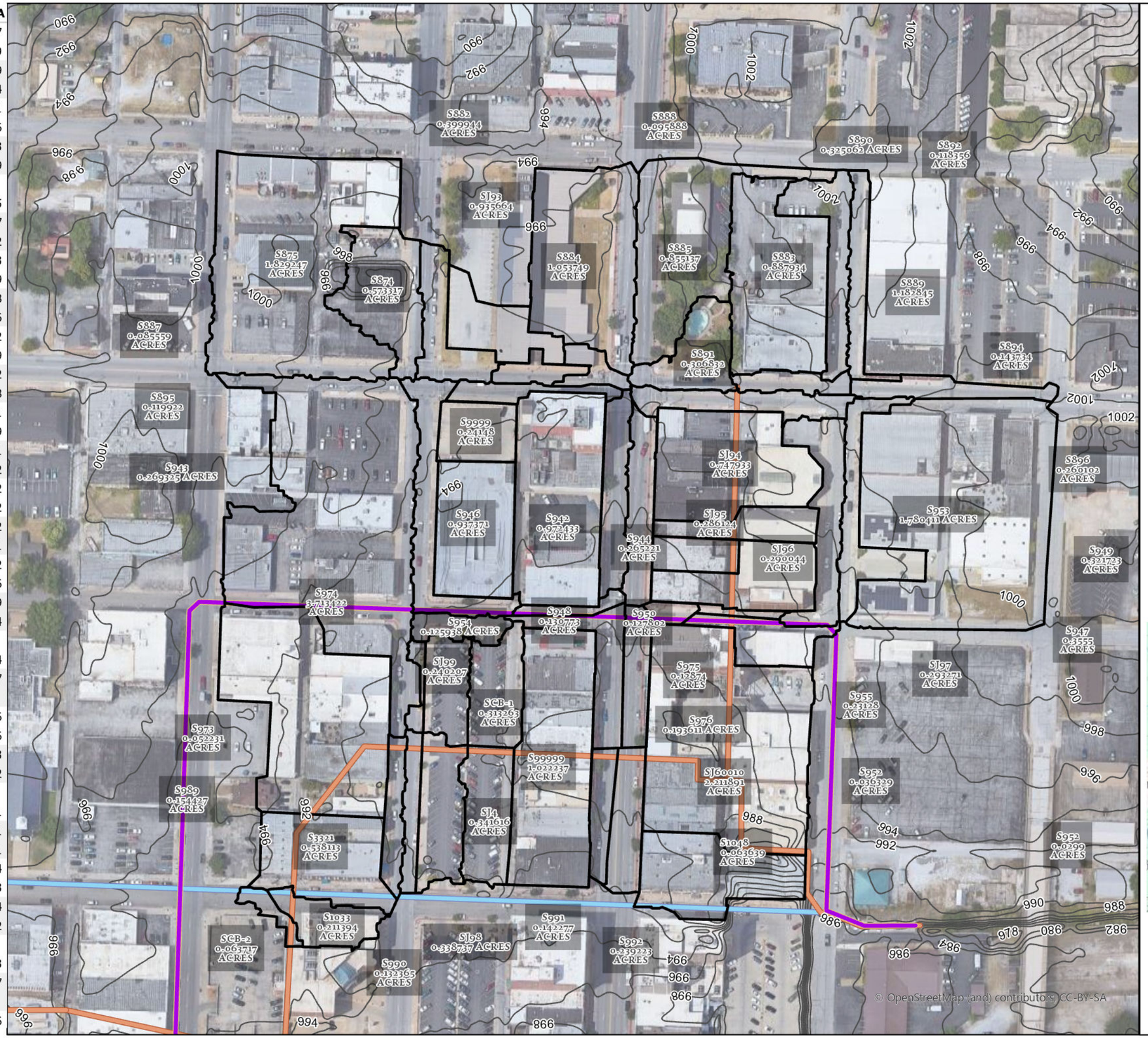
WGS 1984 Web Mercator Auxiliary Sphere

Basemap: ESRI World Imagery

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APPENDIX D
StormCAD Results

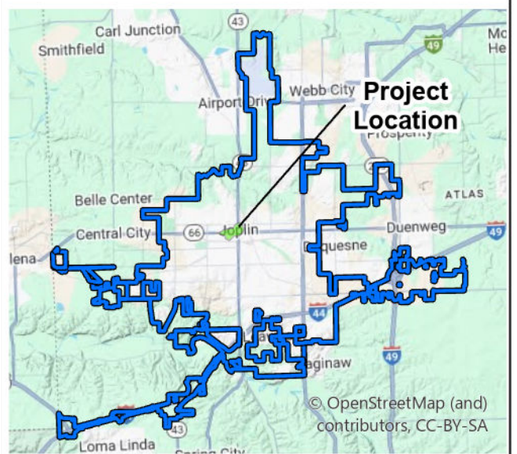
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2	S944	0.269
3	S976	0.194
4	S950	0.051
5	S954	0.126
6	SCB-1	0.313
7	SJ98	0.339
8	SJ99	0.24
9	S890	0.325
11	S891	0.307
12	S974	2.302
13	S882	0.273
14	S943	0.269
15	S892	0.118
16	S947	0.356
17	S874	0.492
18	S875	1.829
19	S894	0.172
20	S949	0.338
21	S953	2.181
22	S992	0.239
23	S955	0.231
24	S990	0.132
25	S973	0.052
26	SJ4	0.342
27	S99999	1.022
28	S991	0.151
29	S942	0.972
30	S952	0.036
31	SJ97	0.429
32	SJ94	0.814
33	SJ95	0.22
34	SJ96	0.154
35	S10001	0.557
36	S895	0.12
37	S887	0.096
38	S888	0.096
39	S884	0.993
40	S885	0.842
41	S896	0.26
42	S883	0.901
43	S9999	0.241
44	S1033	0.211
45	SCB-2	0.064
46	S3321	0.563
47	S989	0.154
48	S14114	1.412
49	S946	0.38
50	S948	0.063
51	S889	0.207
52	S975	0.27
0	SJ93	0.306



Old Willow Branch

6th Street Relocations Drainage Area Map

- 2-ft Contours
- Drainage Areas
- Willow Branch Replacement Culvert
- Old Willow Branch
- New Willow Branch



0 75 150 300 Feet

1 inch equals 150 feet

N

olsson

100-Year Storm Event

Scenario Summary

ID	2224
Label	100 year
Notes	
Active Topology	Base Active Topology
User Data Extensions	Base User Data Extensions
Physical	Base Physical
Boundary Condition	Base Boundary Condition
Initial Settings	Base Initial Settings
Hydrology	Base Hydrology
Output	Base Output
Infiltration and Inflow	Base Infiltration and Inflow
Rainfall Runoff	100 year
Water Quality	Base Water Quality
Sanitary Loading	Base Sanitary Loading
Headloss	Base Headloss
Operational	Base Operational
Design	Base Design
System Flows	Base System Flows
Energy Cost	Base Energy Cost
Surface Definition	Base Surface Definition
SCADA	Base SCADA
Solver Calculation Options	Base Calculation Options

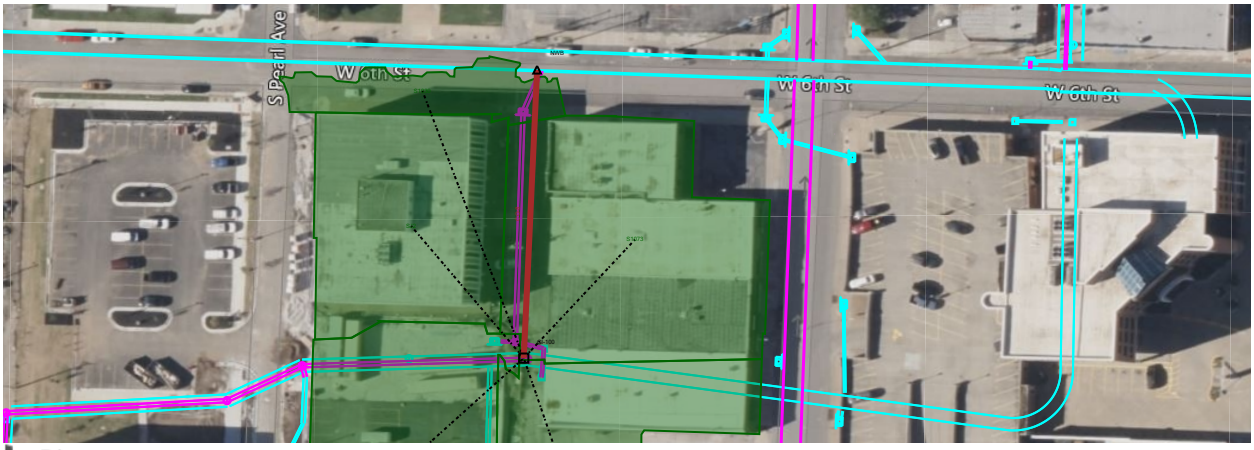
Hydraulic Summary

Active Numerical Solver	GVF-Rational (StormCAD)	Minimum Time of Concentration	0.083
Calculation Type	Analysis		

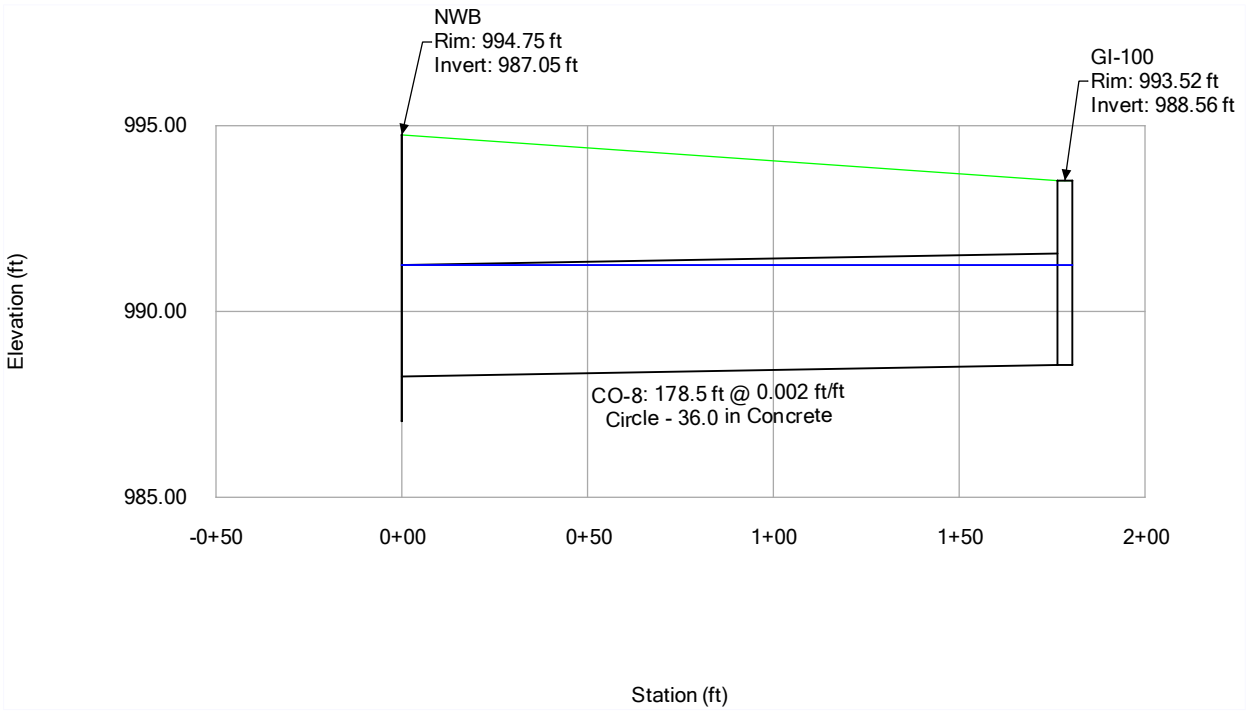
100-Year Storm Event

Stormline 100

Stormline 100



100-Year Storm Event
Stormline 100



100-Year Storm Event

Catchment Table - Time: 0.00 hours

ID	Label	Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (hours)	Flow (Total Out) (cfs)
2348	S1030	GI-100	0.115	0.000	0.950	0.00
2350	S1073	GI-100	0.559	0.000	0.950	0.00
2351	S1083	GI-100	0.978	0.000	0.950	0.00
2361	SJ2	GI-100	0.394	0.000	0.950	0.00
2362	SJ3	GI-100	0.402	0.000	0.950	0.00

100-Year Storm Event

Catch Basin Table - Time: 0.00 hours

ID	Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Capture Efficiency (Calculated) (%)	Flow (Captured) (cfs)	Hydraulic Grade Line (In) (ft)	Spread / Top Width (ft)
116	GI-100	993.52	988.56	100.0	0.00	991.25	0.0

100-Year Storm Event

Conduit Table - Time: 0.00 hours

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)
2388	CO-8	GI-100	988.56	NWB	988.25	178.5	0.002	36.0

Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Out) (ft)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Depth (Normal) / Rise (%)
0.013	0.00	0.00	3.00	27.80	0.0	(N/A)

100-Year Storm Event

Scenario Summary

ID	2247
Label	100 year
Notes	
Active Topology	Base Active Topology
User Data Extensions	Base User Data Extensions
Physical	Base Physical
Boundary Condition	Base Boundary Condition
Initial Settings	Base Initial Settings
Hydrology	Base Hydrology
Output	Base Output
Infiltration and Inflow	Base Infiltration and Inflow
Rainfall Runoff	100 yr
Water Quality	Base Water Quality
Sanitary Loading	Base Sanitary Loading
Headloss	Base Headloss
Operational	Base Operational
Design	Base Design
System Flows	Base System Flows
Energy Cost	Base Energy Cost
Surface Definition	Base Surface Definition
SCADA	Base SCADA
Solver Calculation Options	Base Calculation Options

Hydraulic Summary

Active Numerical Solver	GVF-Rational (StormCAD)	Minimum Time of Concentration	0.083
Calculation Type	Analysis		

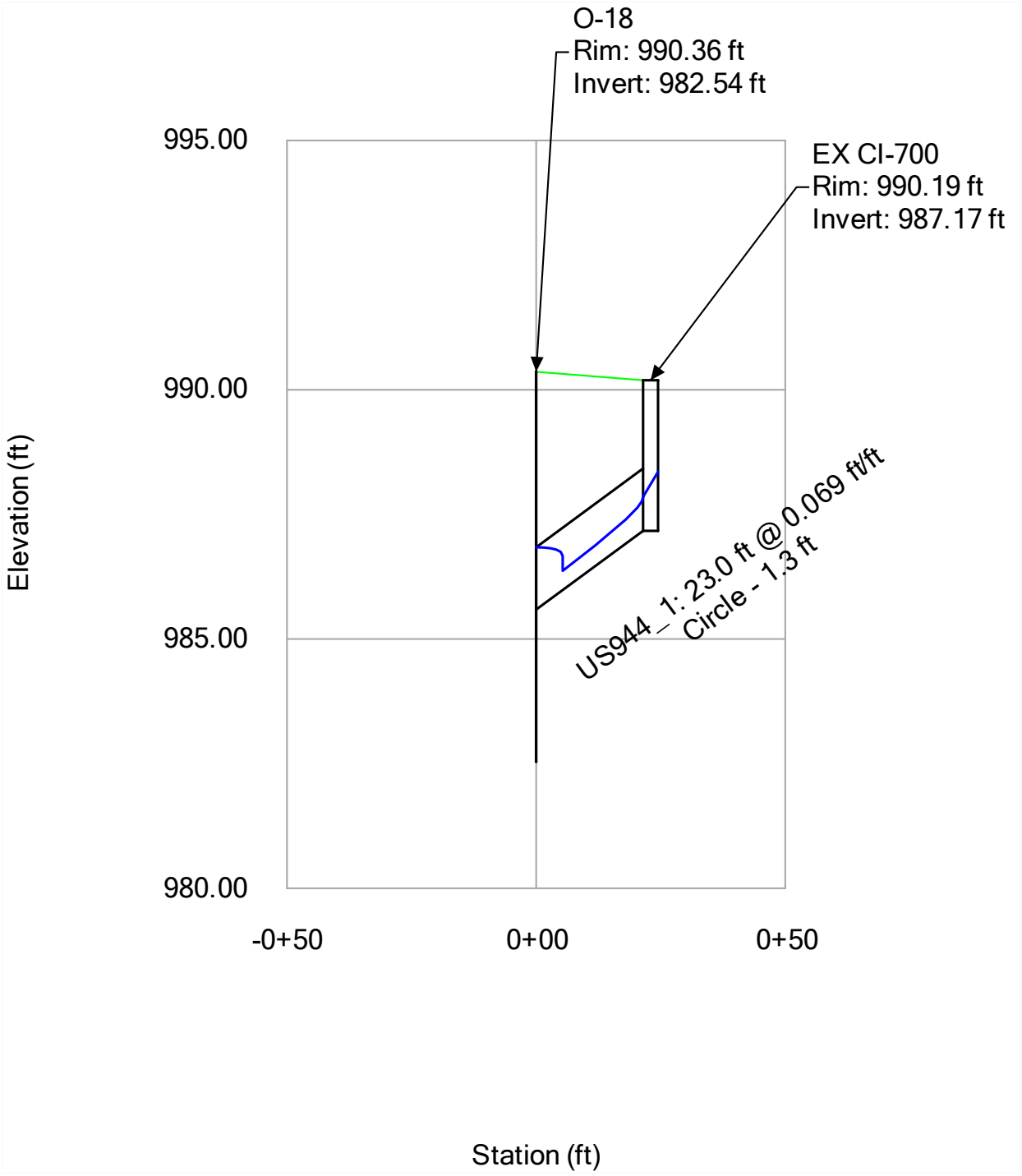
100-Year Storm Event

Stormline 700

Stormlines 700, 800, 900, 1100



100-Year Storm Event
Stormline 700



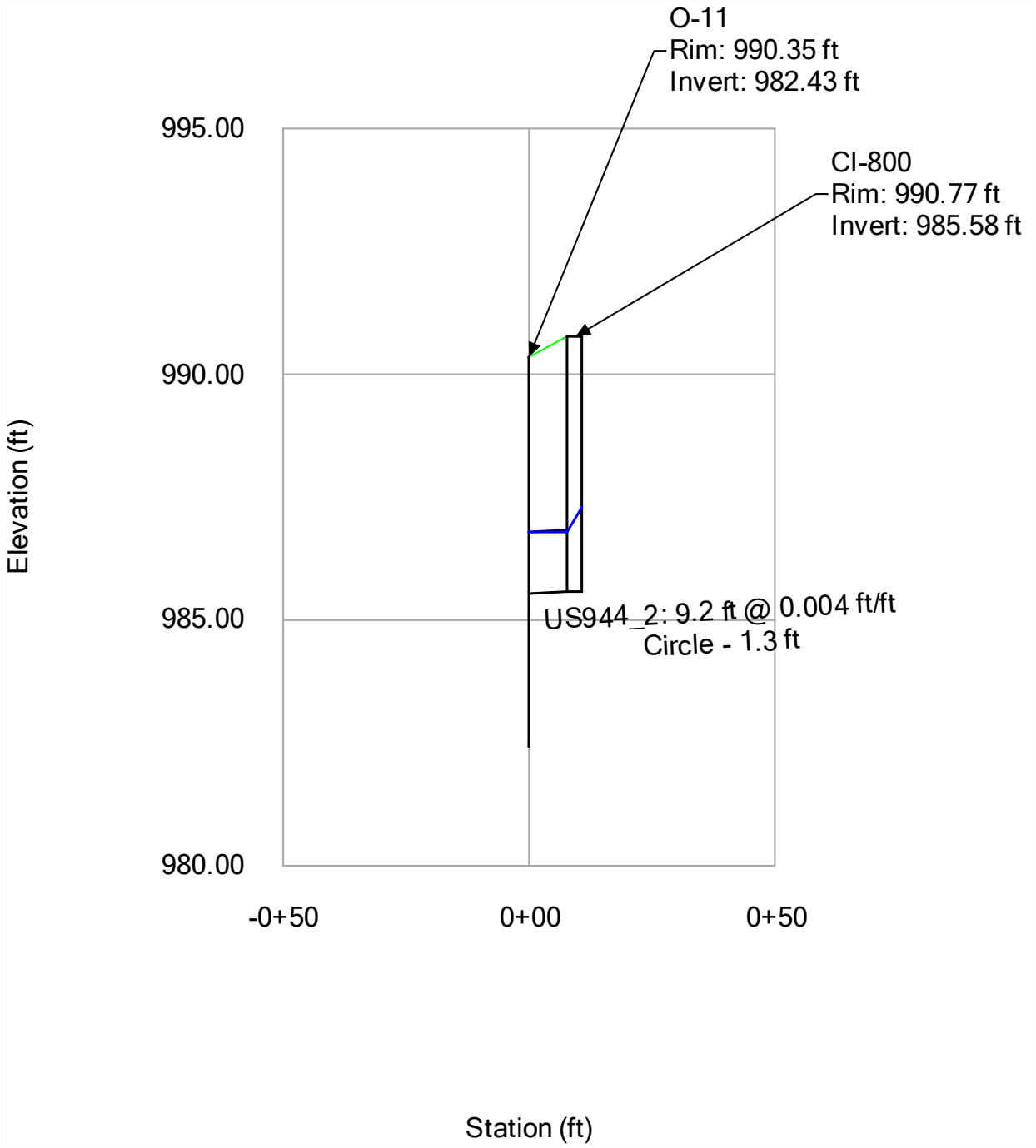
100-Year Storm Event

Stormline 800

Stormlines 700, 800, 900, 1100



100-Year Storm Event
Stormline 800



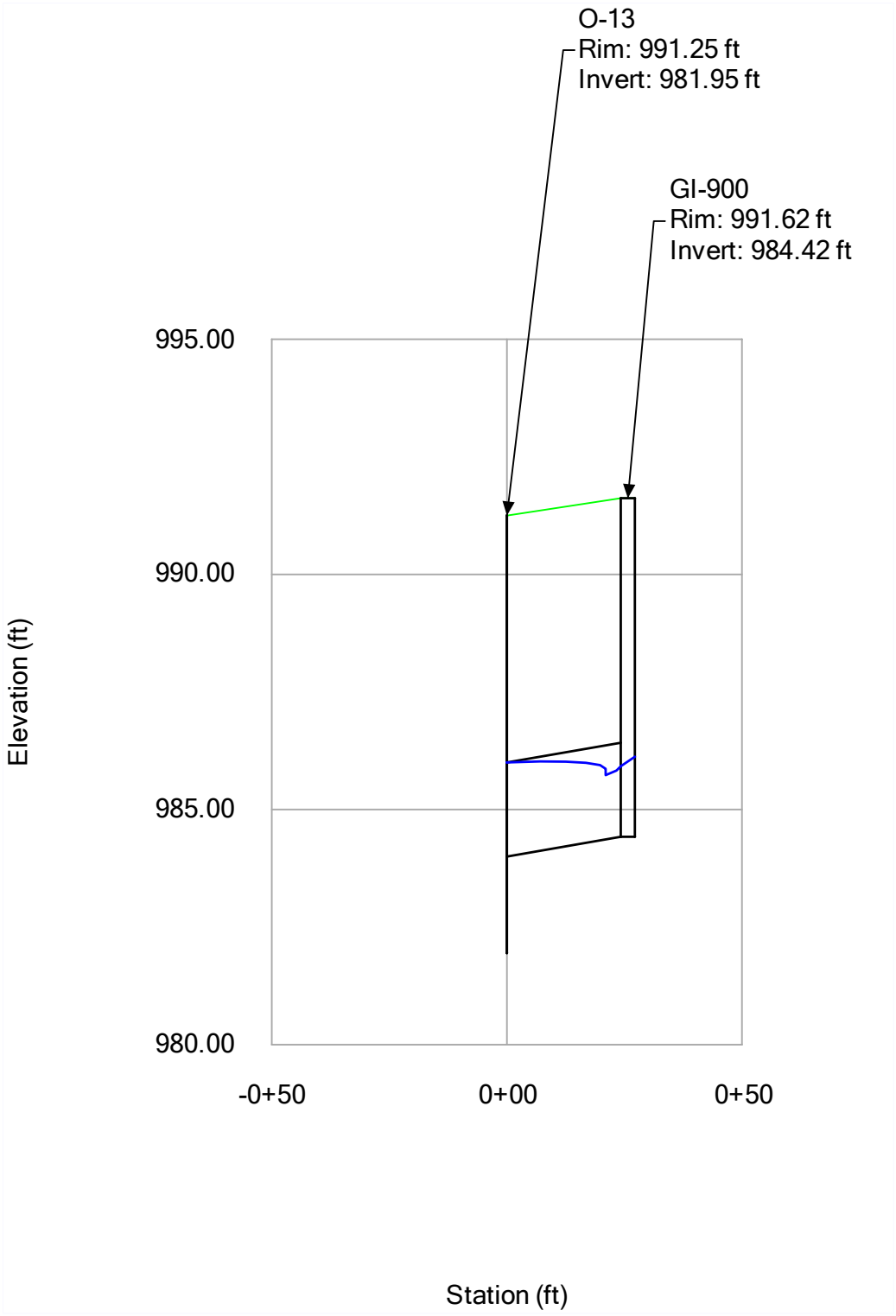
100-Year Storm Event

Stormline 900

Stormlines 700, 800, 900, 1100



100-Year Storm Event
Stormline 900



100-Year Storm Event

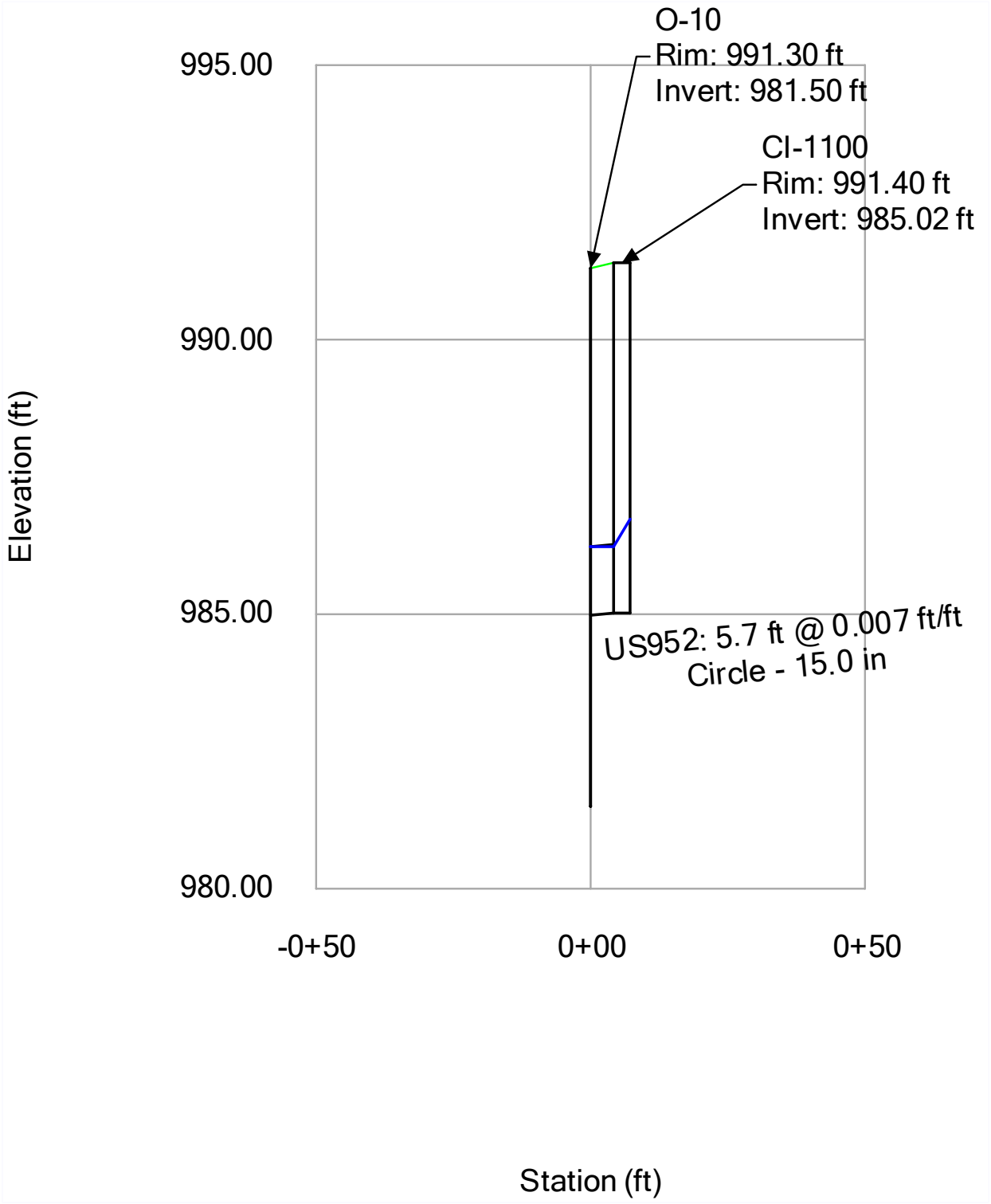
Stormline 1100

Stormlines 700, 800, 900, 1100



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100-Year Storm Event
Stormline 1100



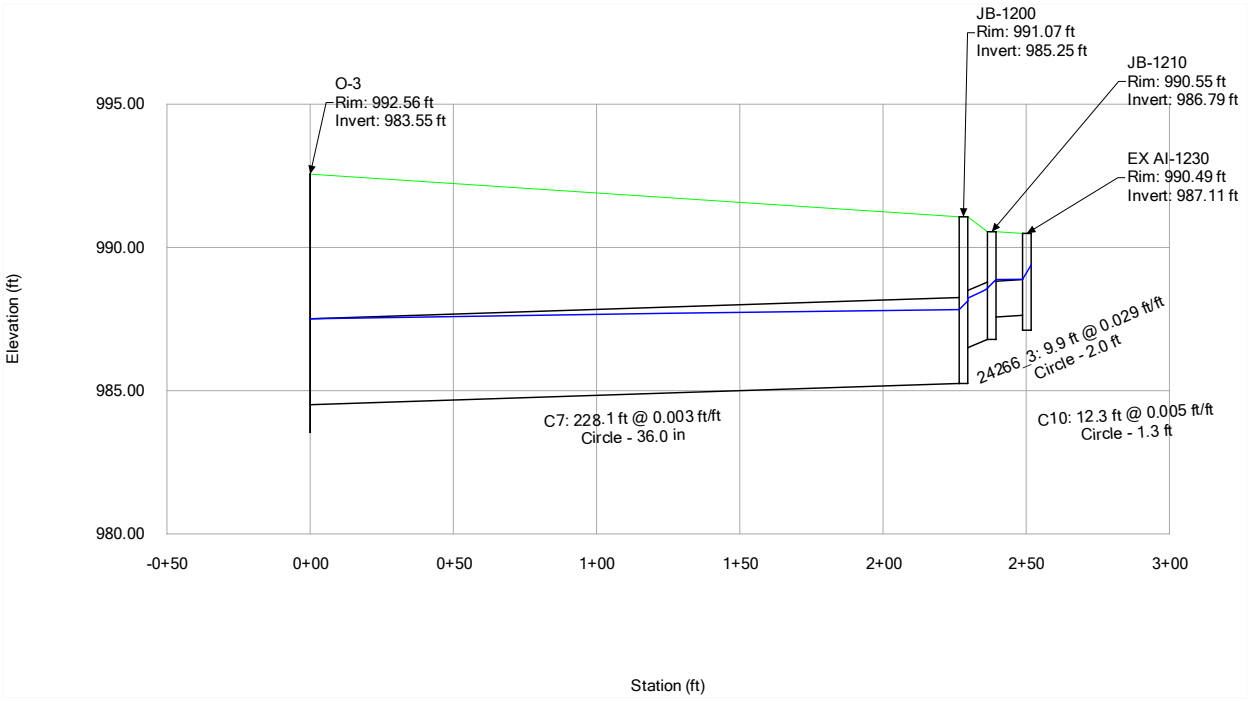
100-Year Storm Event

Stormline 1200

Stormline 1200, 1210, 1230, 1250



100-Year Storm Event
Stormline 1200



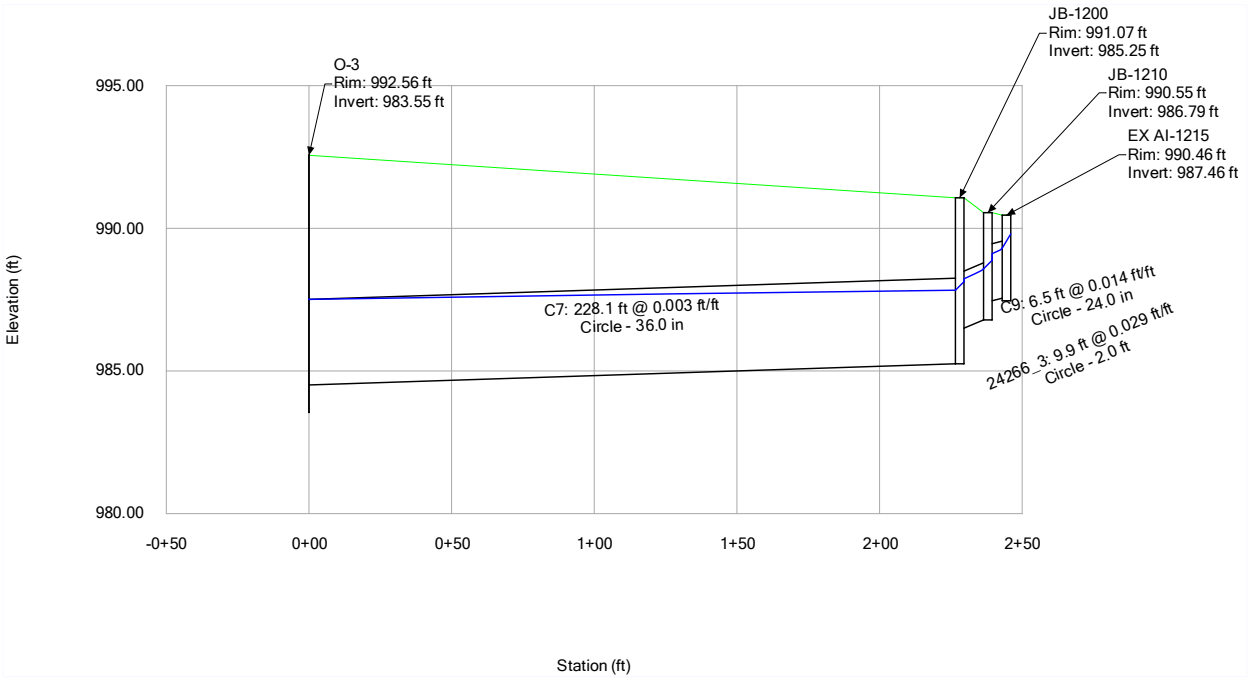
100-Year Storm Event

Stormline 1210

Stormline 1200, 1210, 1230, 1250



100-Year Storm Event
Stormline 1210



100-Year Storm Event

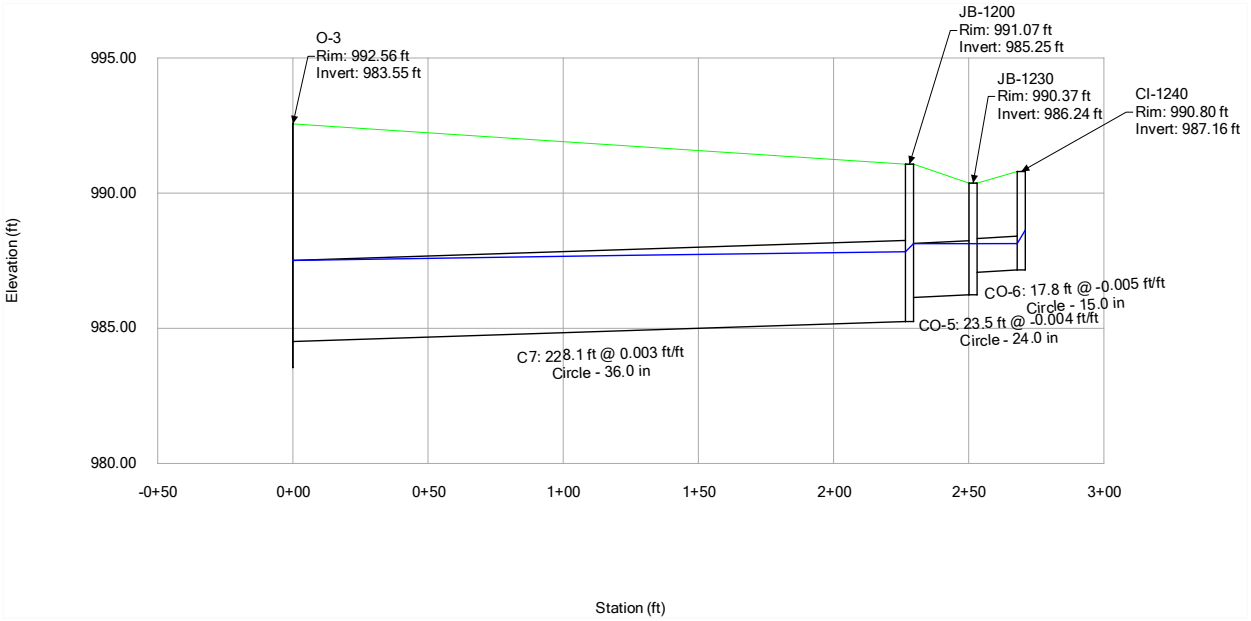
Stormline 1230

Stormline 1200, 1210, 1230, 1250



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100-Year Storm Event
Stormline 1230



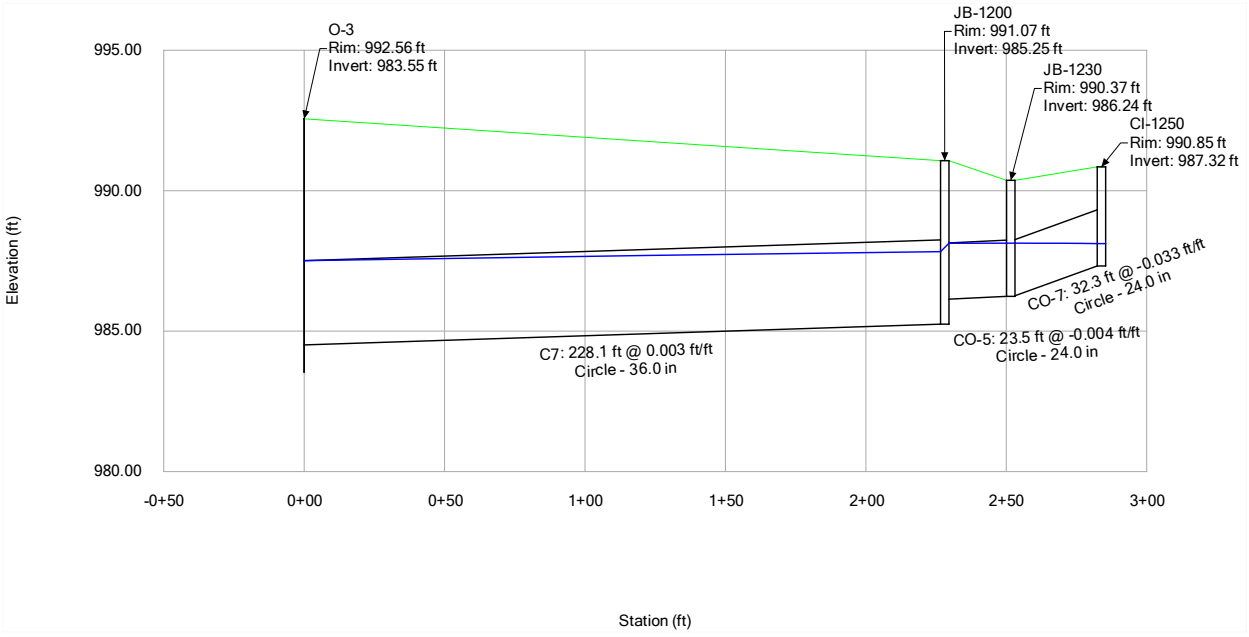
100-Year Storm Event

Stormline 1250

Stormline 1200, 1210, 1230, 1250



100-Year Storm Event
Stormline 1250

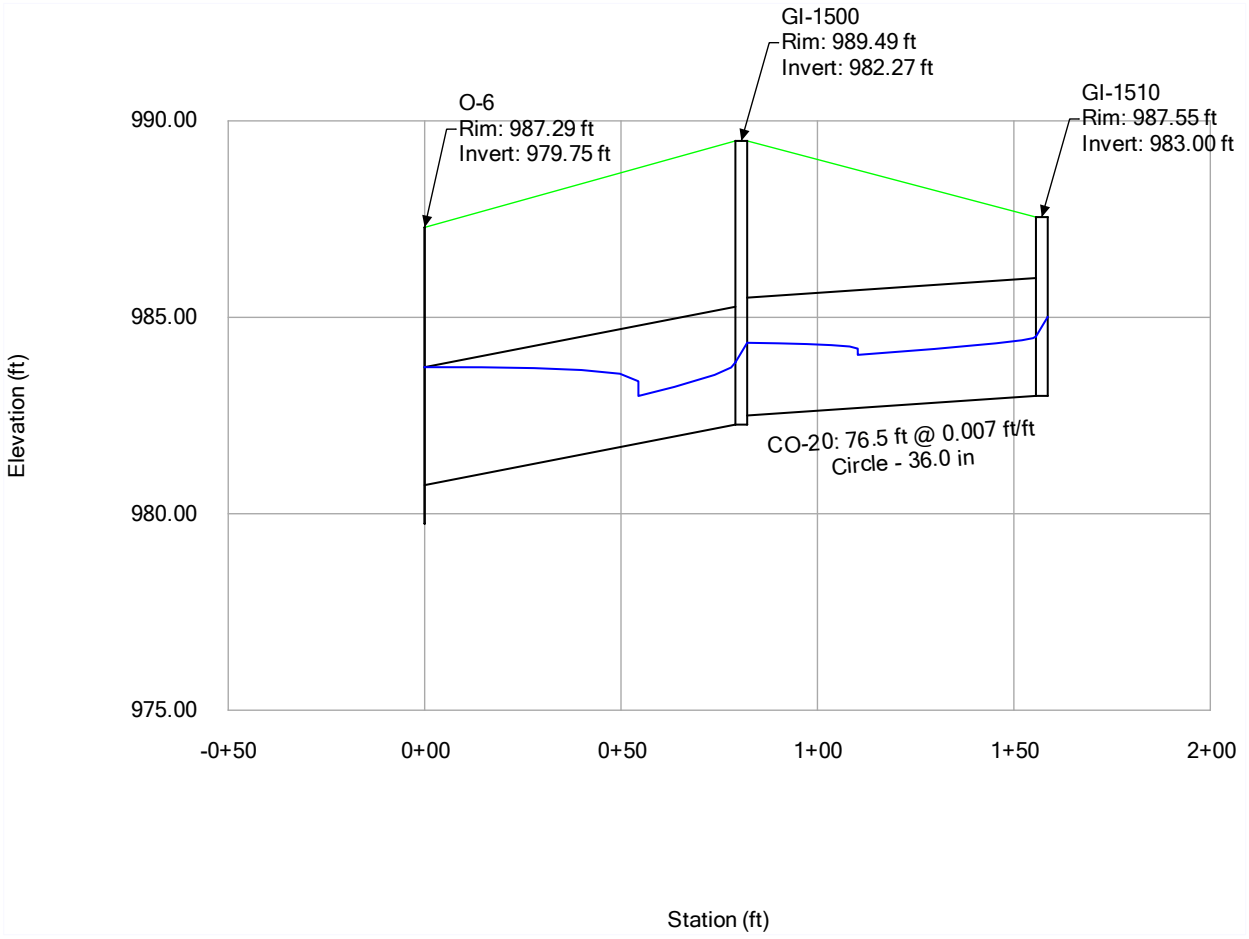


100-Year Storm Event
Stormline 1500
Stormline 1500



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100-Year Storm Event
Stormline 1500



100-Year Storm Event

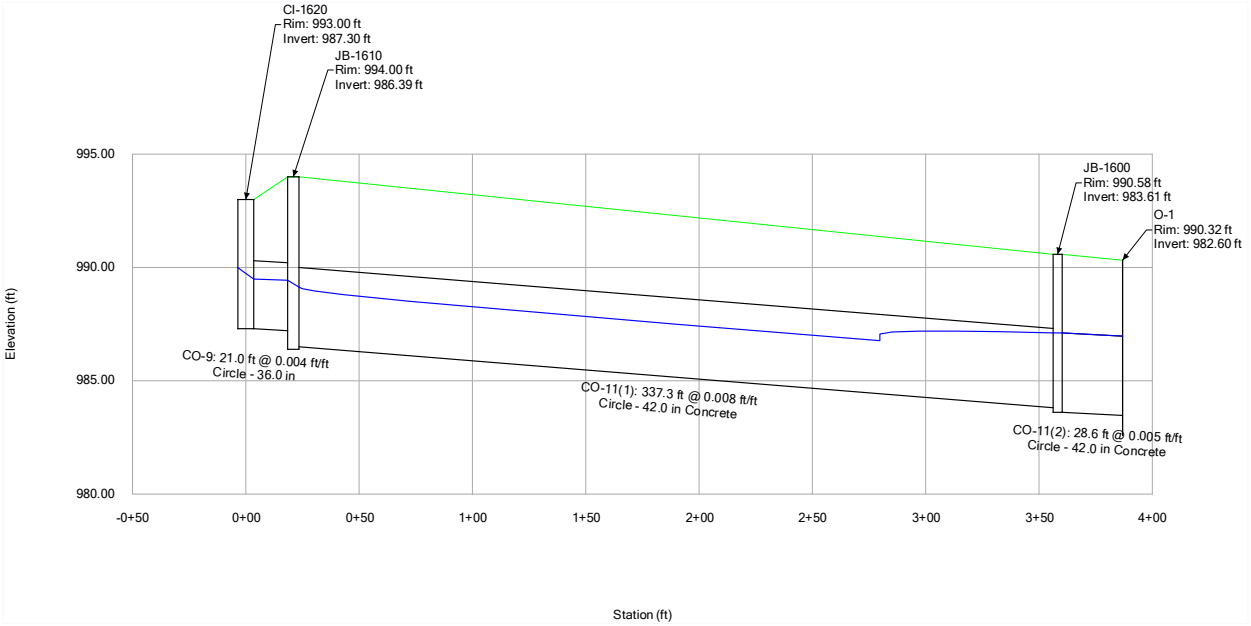
Stormline 1600

Stormline 1600, 1610, 1620, 1630, 1640



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100-Year Storm Event
Stormline 1600



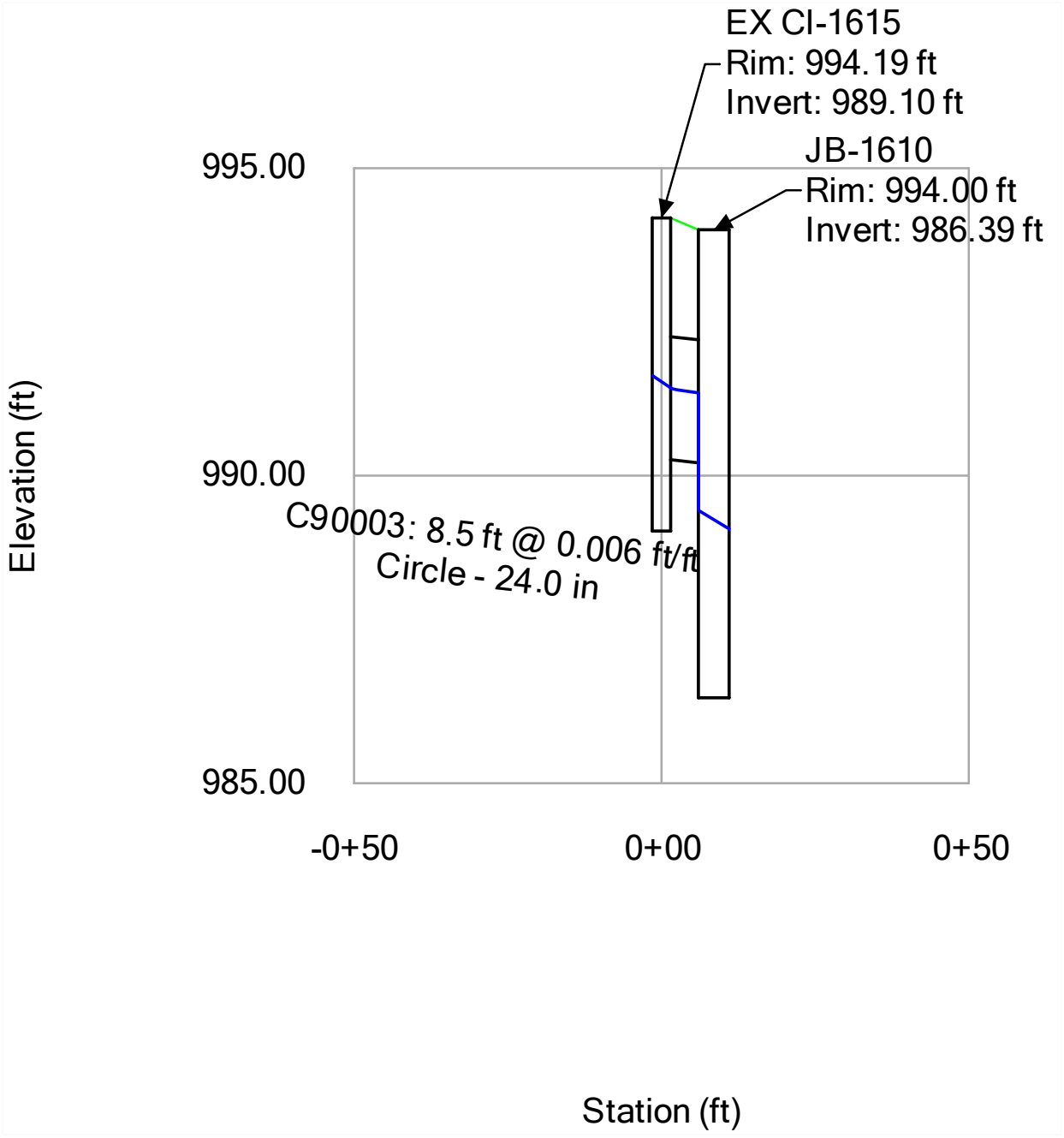
100-Year Storm Event

Stormline 1610

Stormline 1600, 1610, 1620, 1630, 1640



100-Year Storm Event
Stormline 1610



100-Year Storm Event

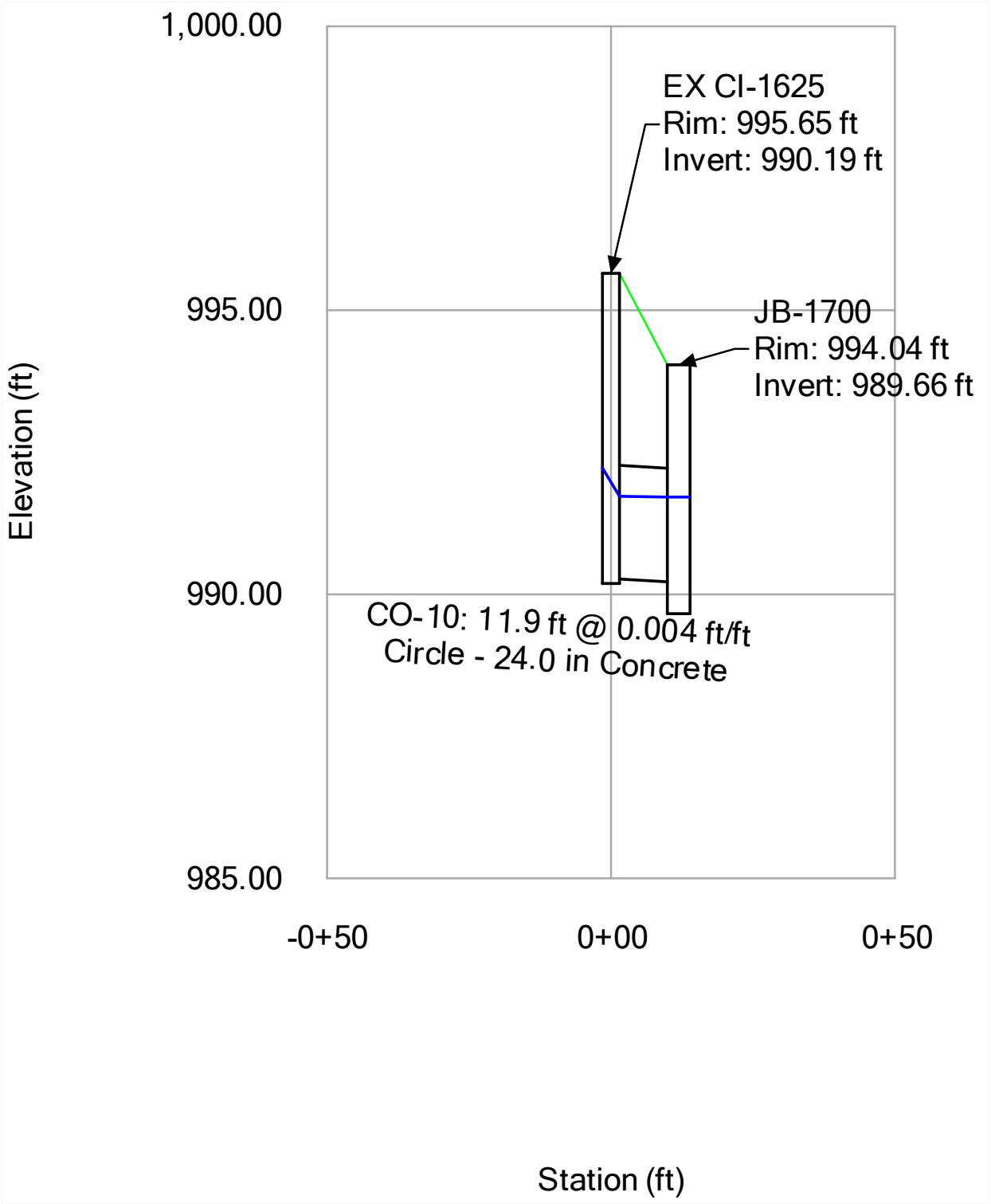
Stormline 1620

Stormline 1600, 1610, 1620, 1630, 1640



100-Year Storm Event

Stormline 1620



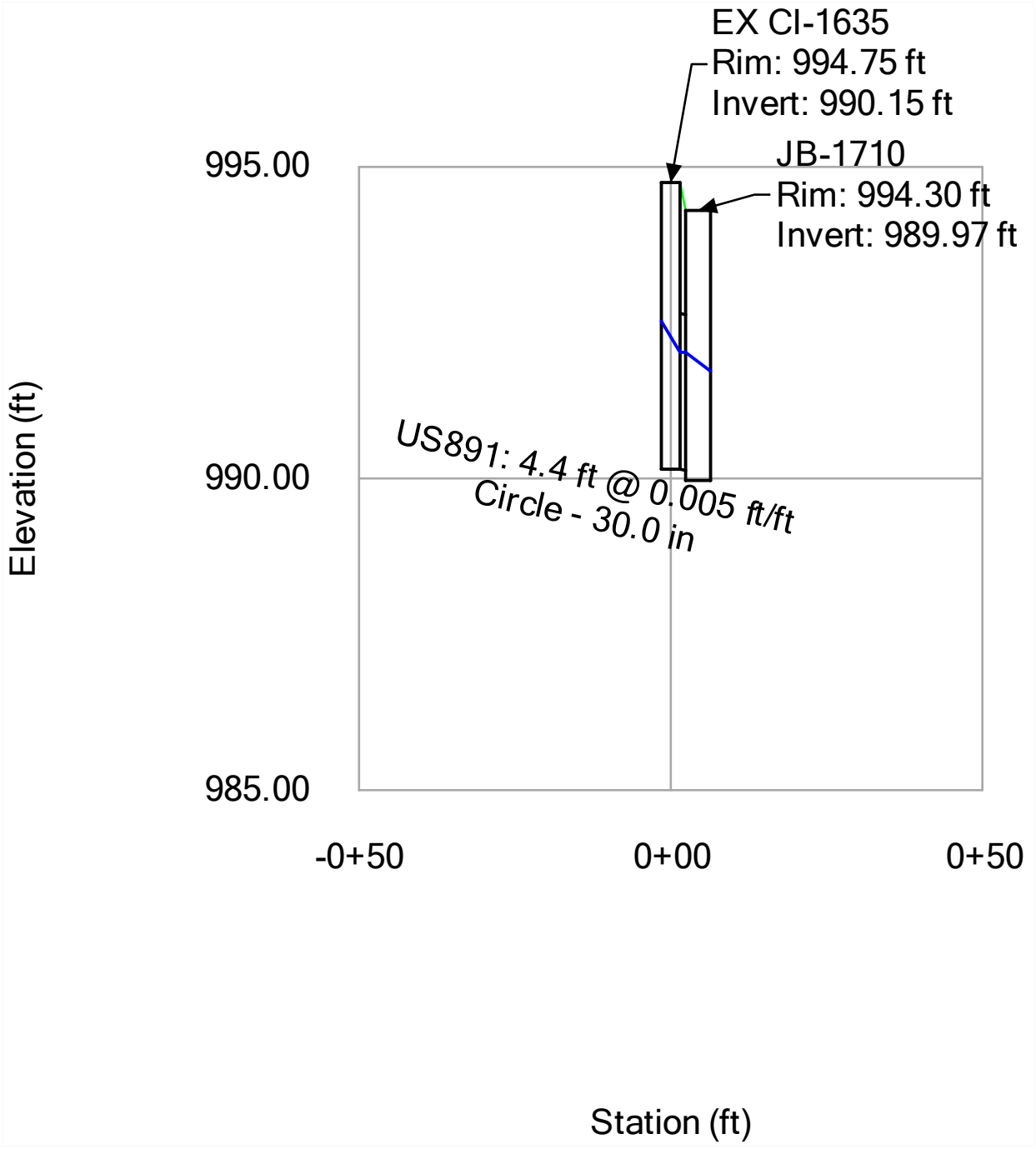
100-Year Storm Event

Stormline 1630

Stormline 1600, 1610, 1620, 1630, 1640



100-Year Storm Event
Stormline 1630



100-Year Storm Event

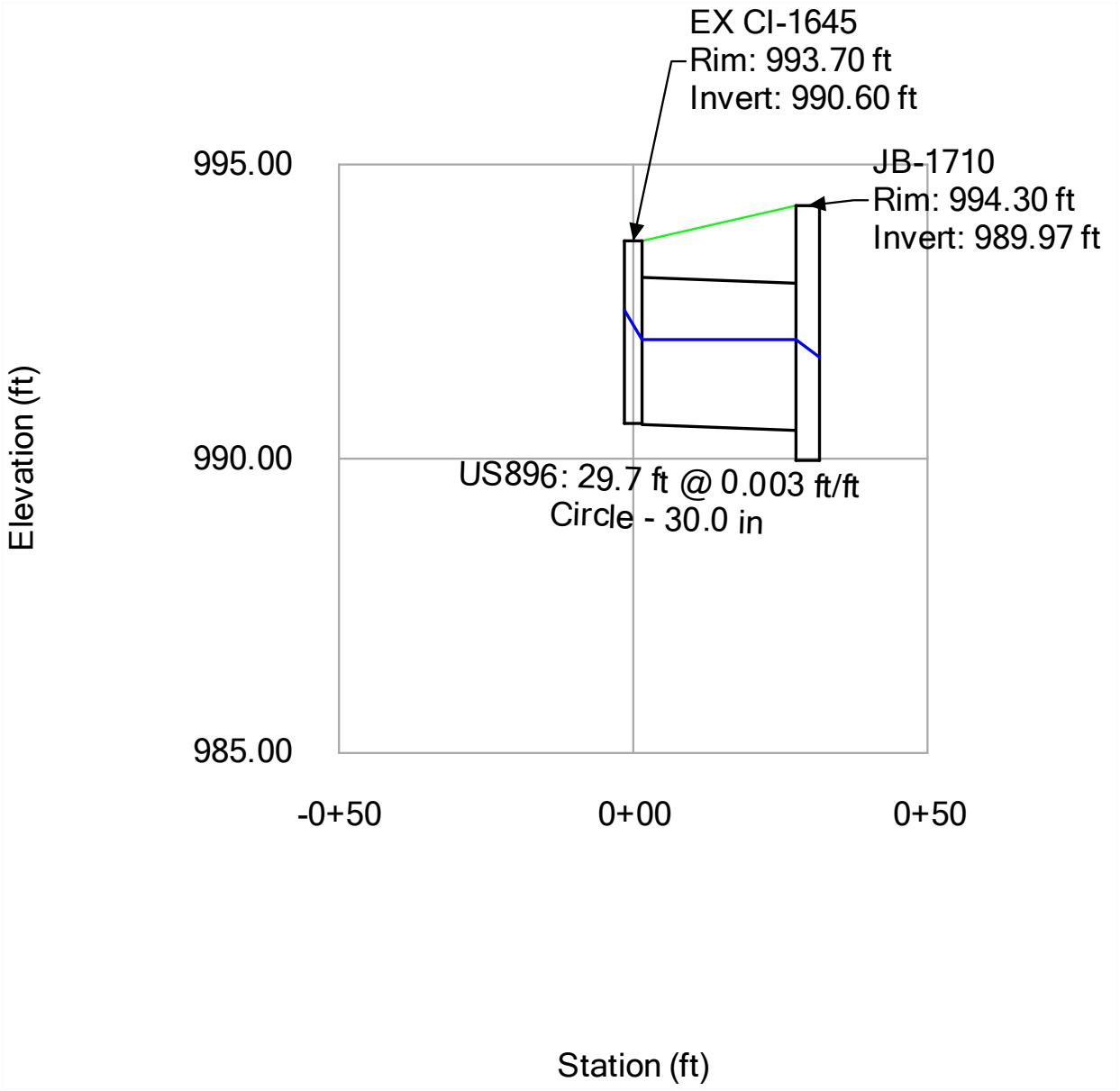
Stormline 1640

Stormline 1600, 1610, 1620, 1630, 1640



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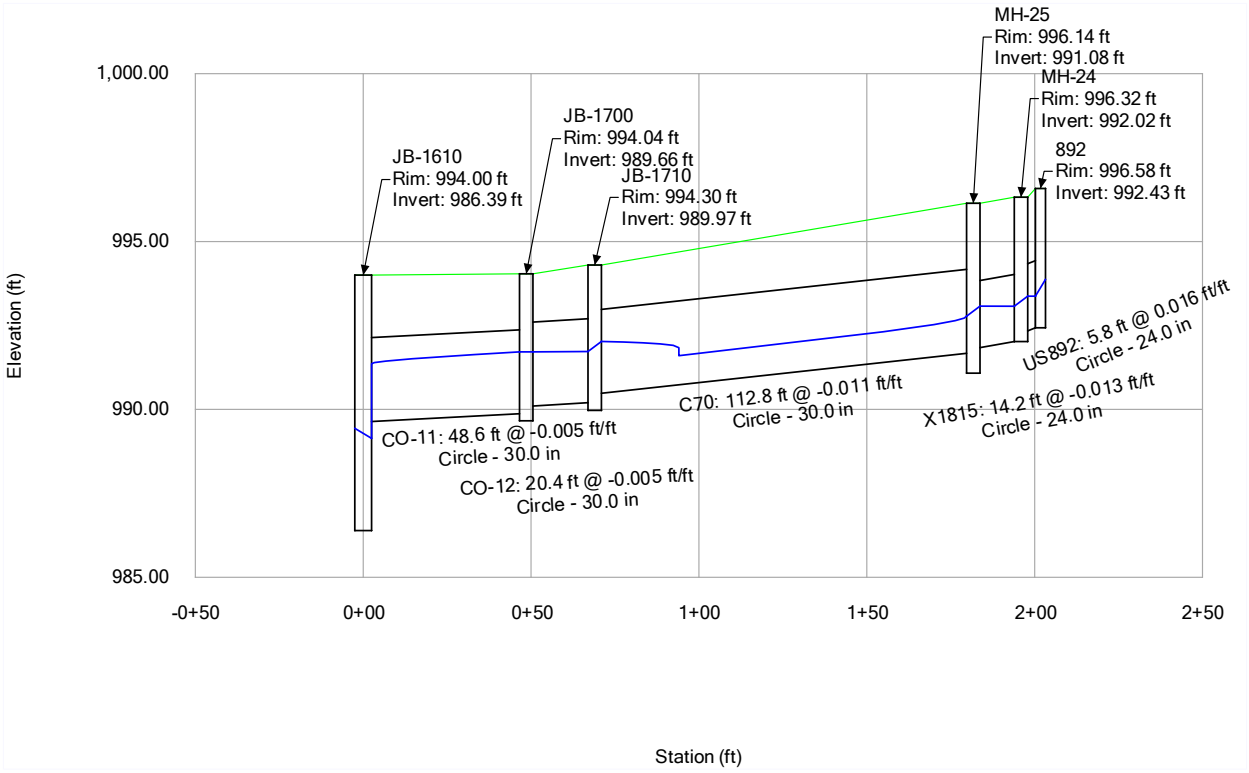
100-Year Storm Event
Stormline 1640



100-Year Storm Event
Stormline 1700
Stormline 1700



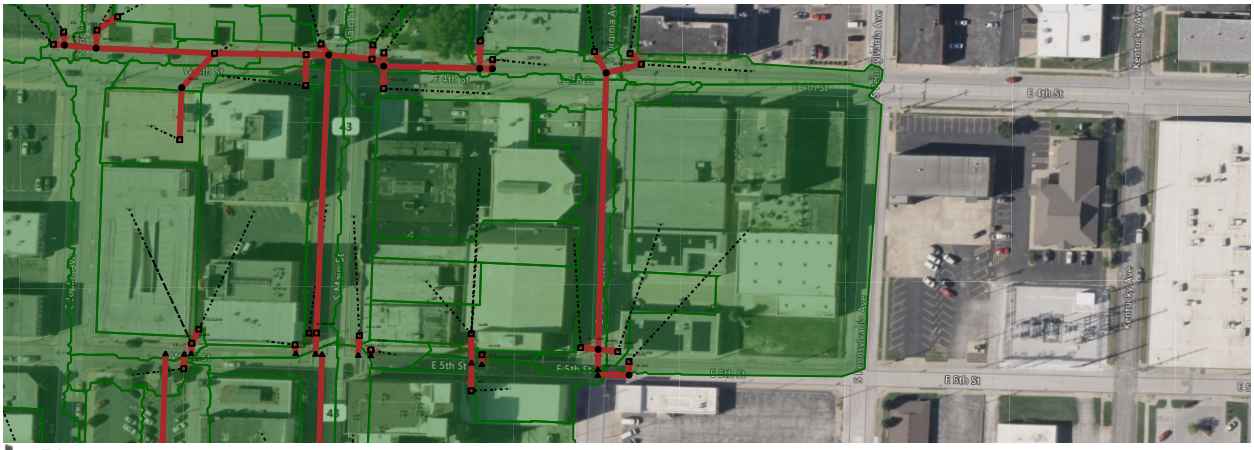
100-Year Storm Event
Stormline 1700



100-Year Storm Event

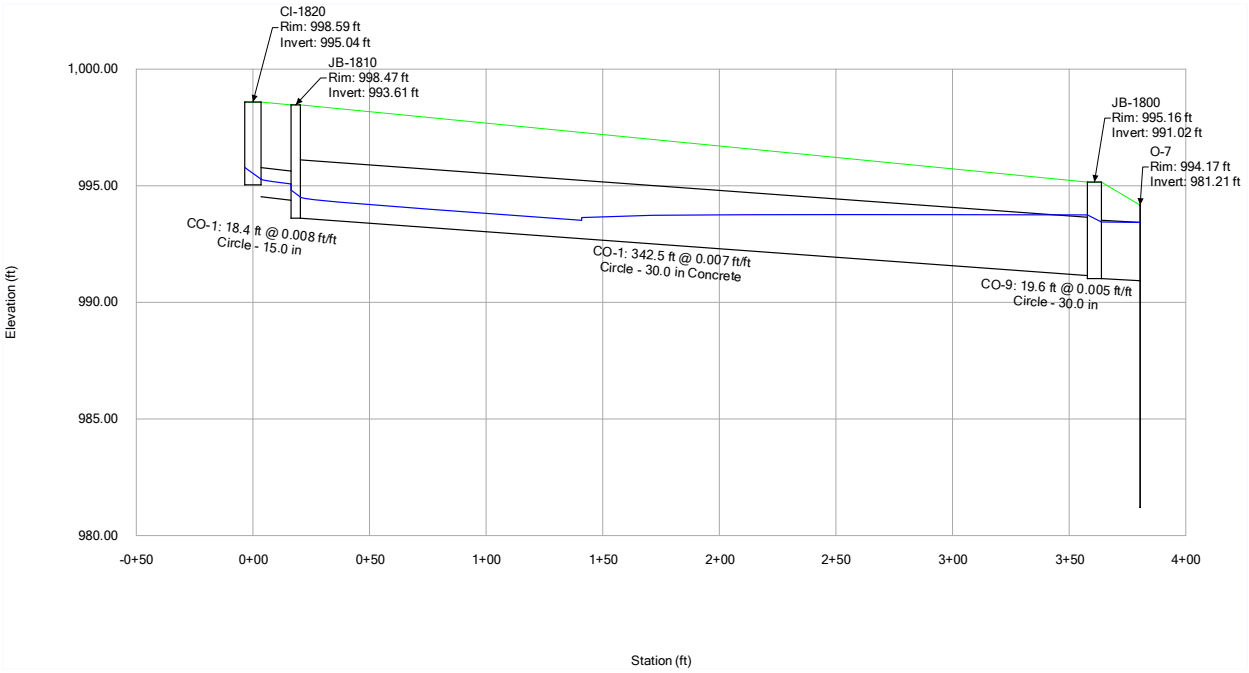
Stormline 1800

Stormline 1800



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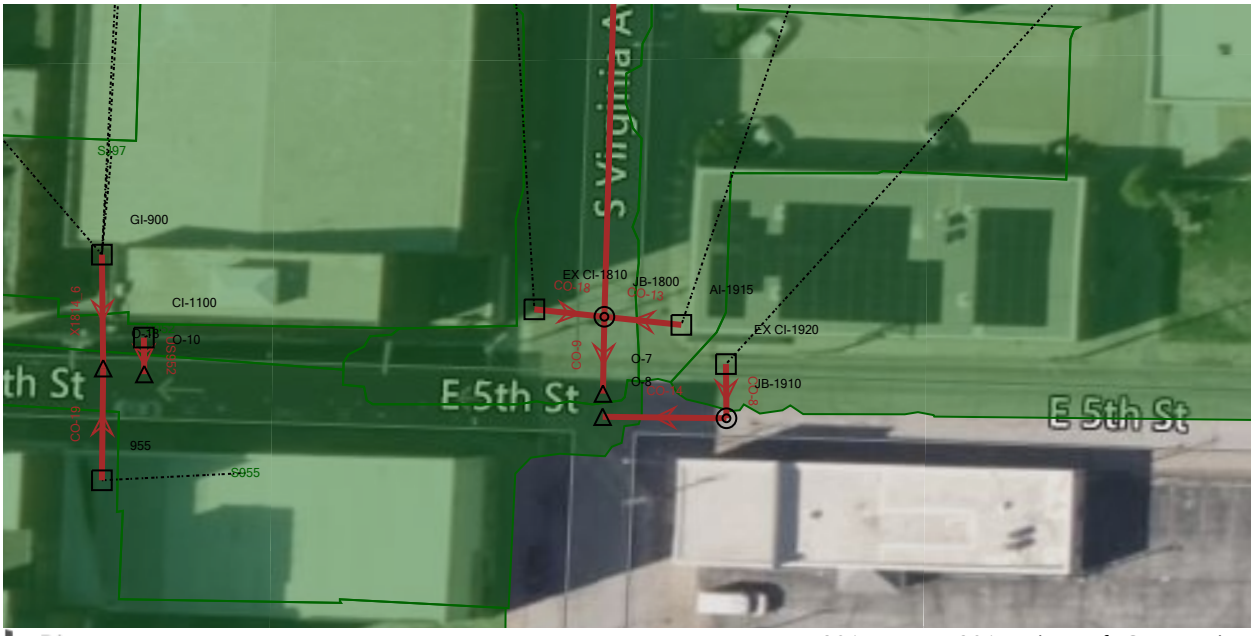
100-Year Storm Event
Stormline 1800



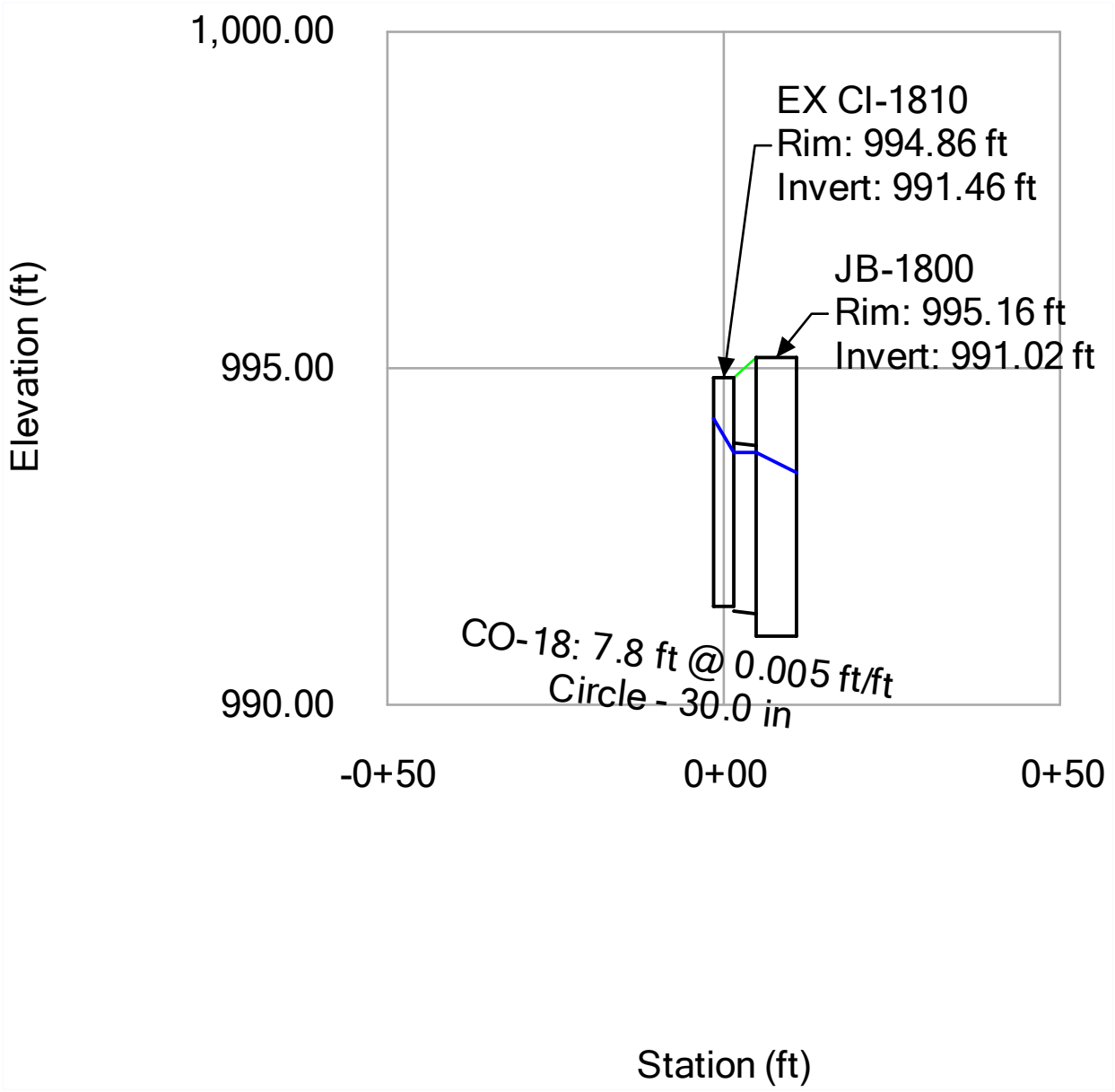
100-Year Storm Event

Stormline 1810

Stormline 1810, 1900, 1910



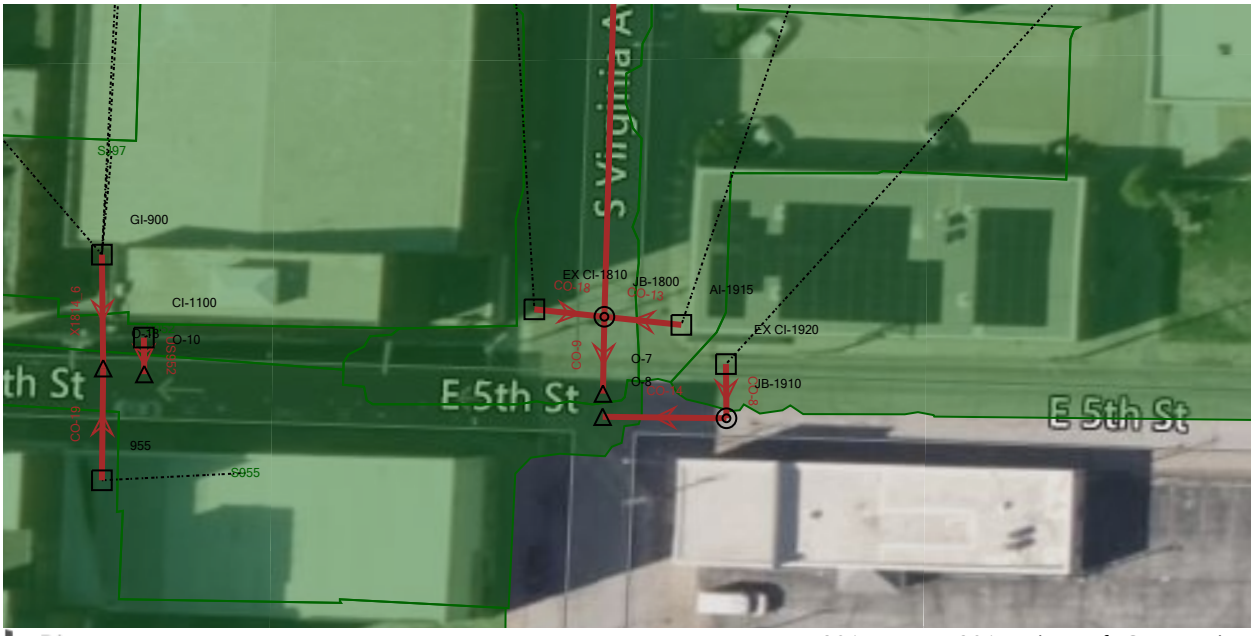
100-Year Storm Event
Stormline 1810



100-Year Storm Event

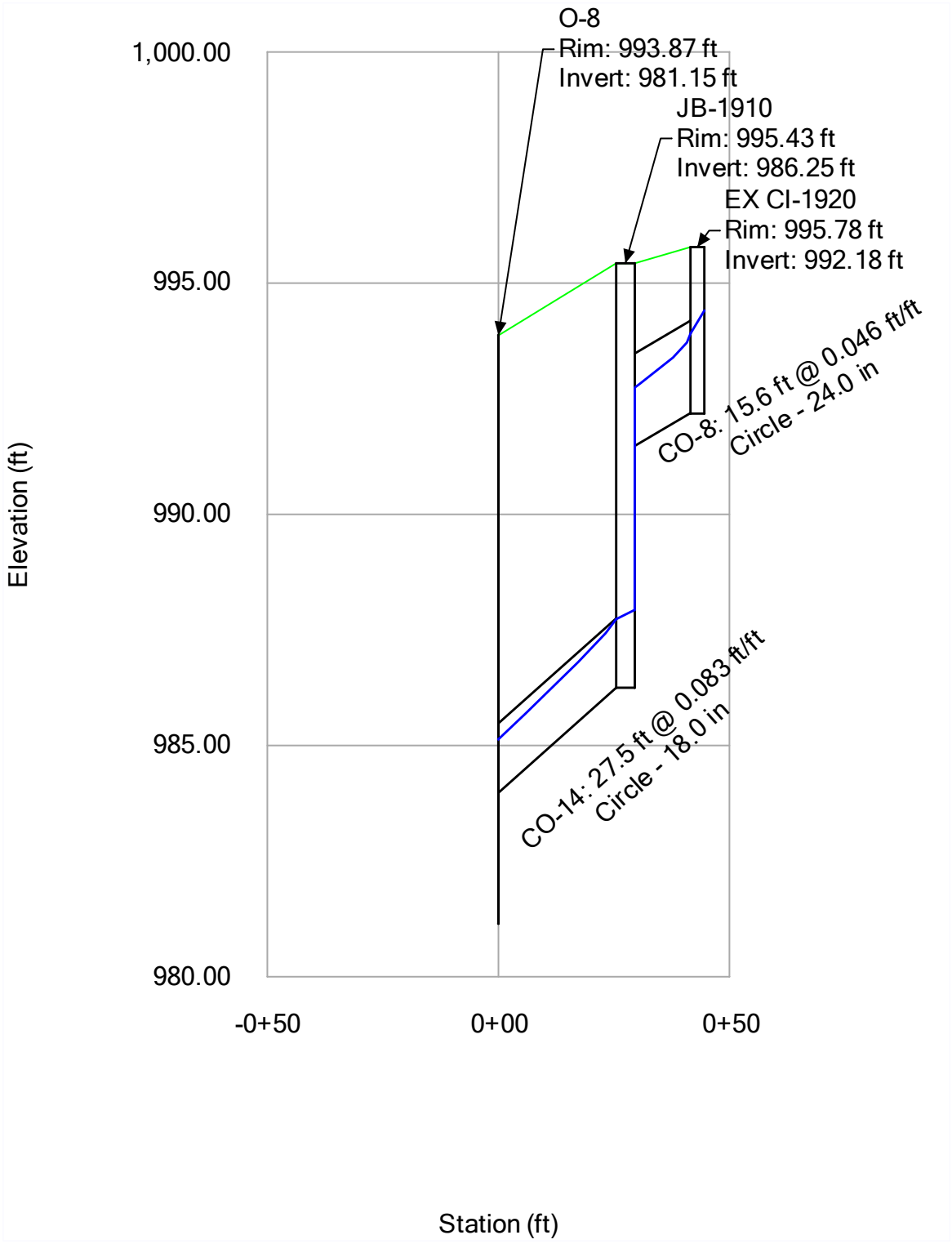
Stormline 1900

Stormline 1810, 1900, 1910



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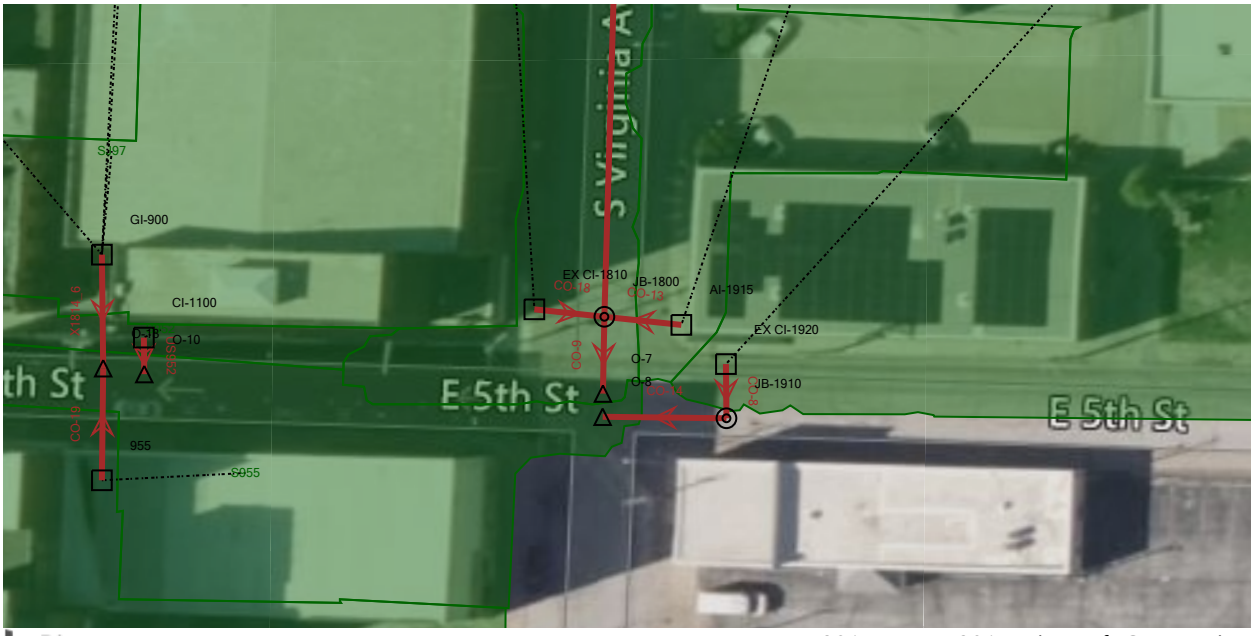
100-Year Storm Event
Stormline 1900



100-Year Storm Event

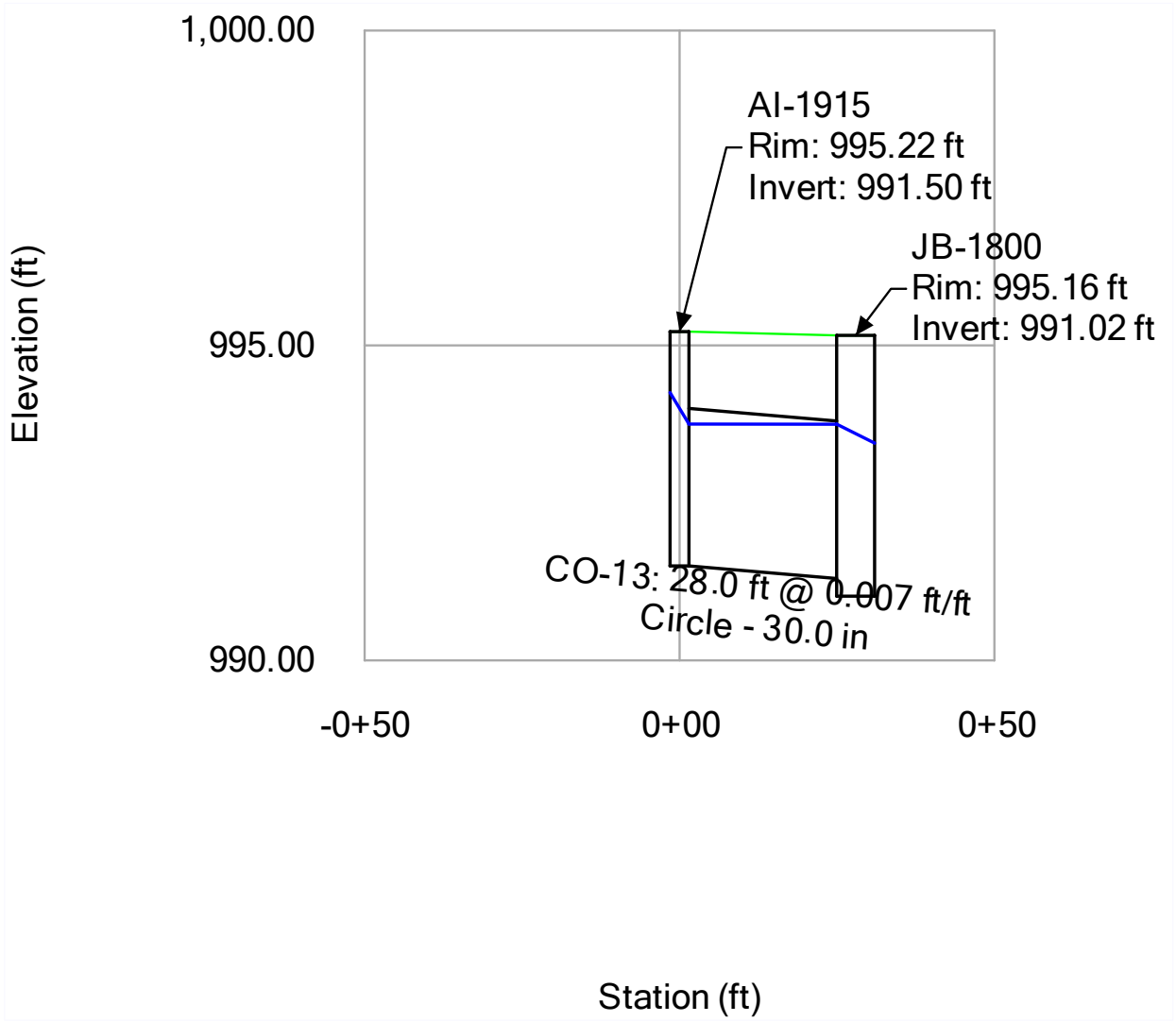
Stormline 1910

Stormline 1810, 1900, 1910



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100-Year Storm Event
Stormline 1910



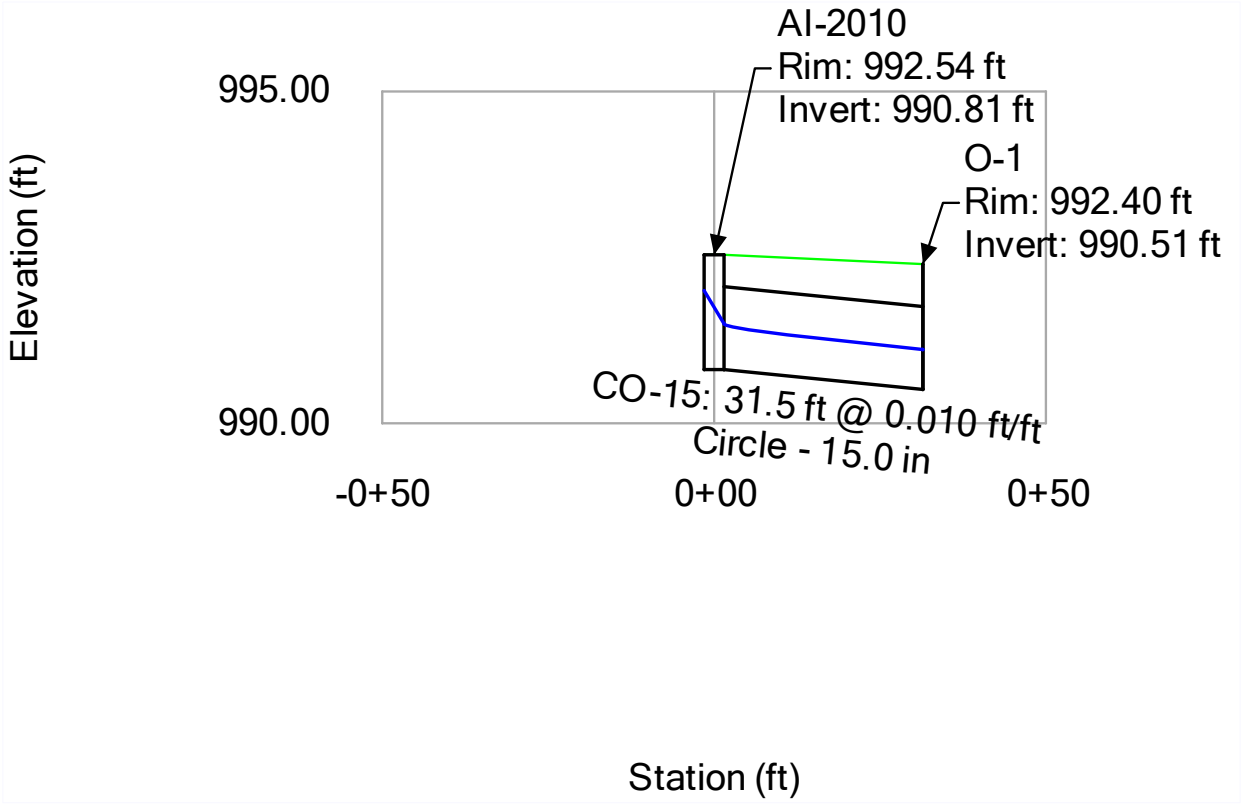
100-Year Storm Event

Stormline 2000

Stormline 2000, 2100, 2200



100-Year Storm Event
Stormline 2000



100-Year Storm Event

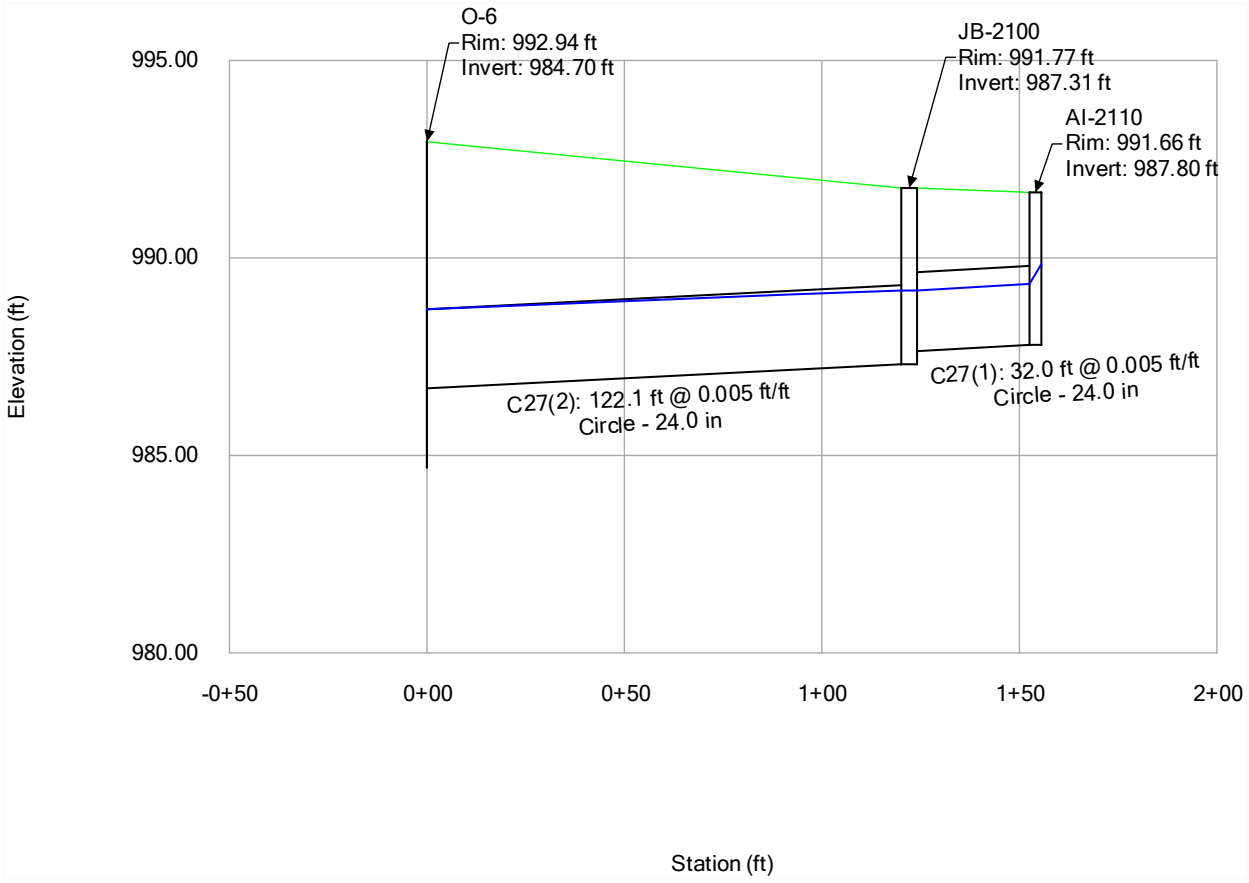
Stormline 2100

Stormline 2000, 2100, 2200



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100-Year Storm Event
Stormline 2100



100-Year Storm Event

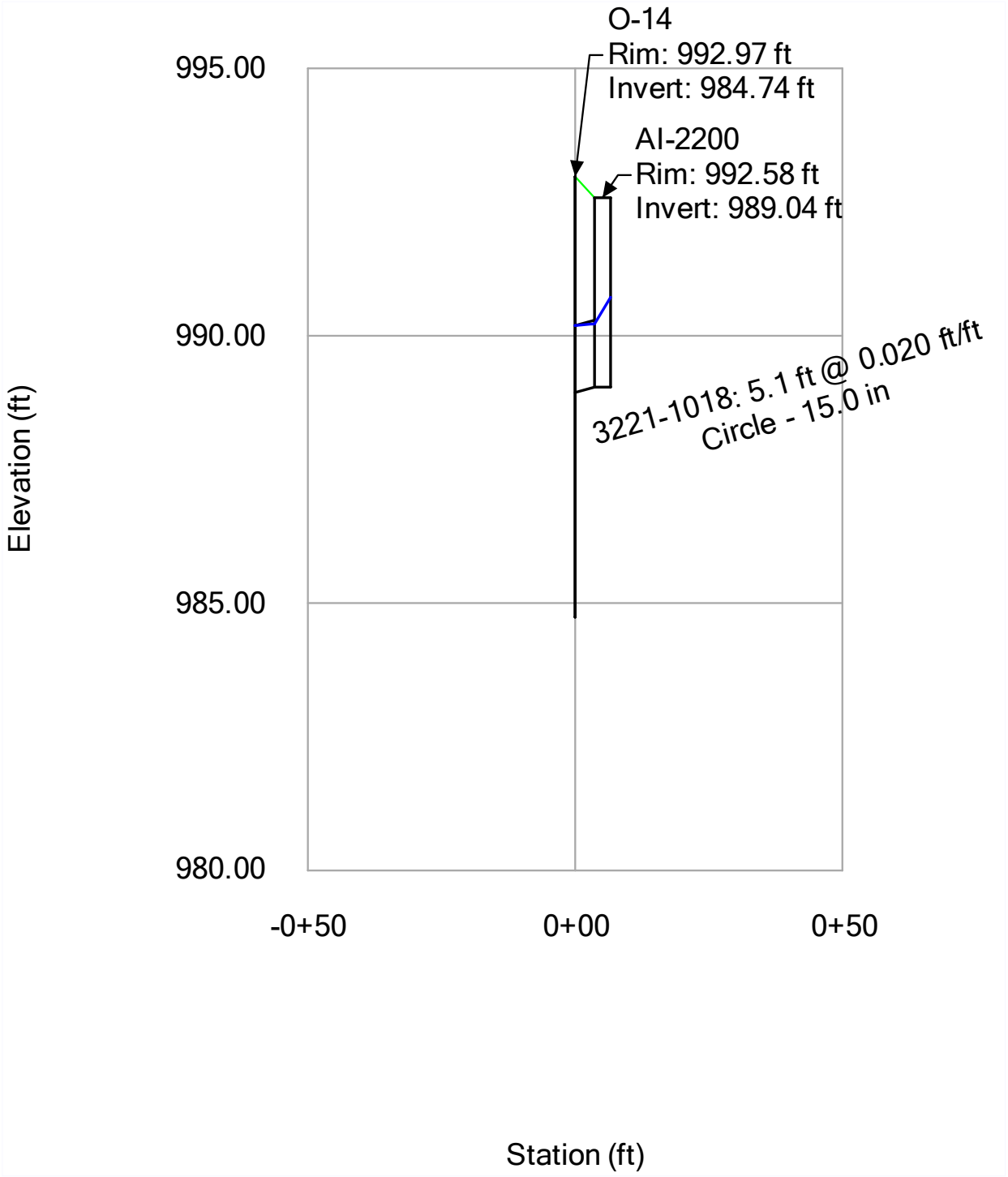
Stormline 2200

Stormline 2000, 2100, 2200



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100-Year Storm Event
Stormline 2200



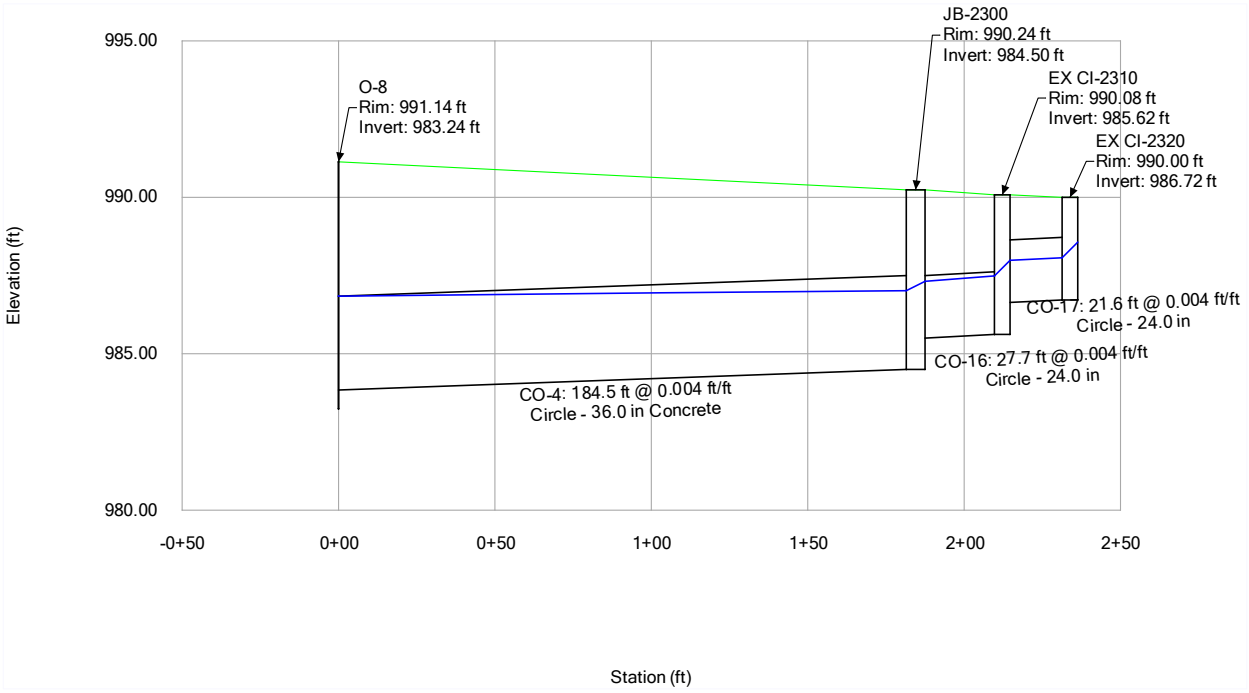
100-Year Storm Event

Stormline 2300

Stormline 2300, 2310, 2320, 2330



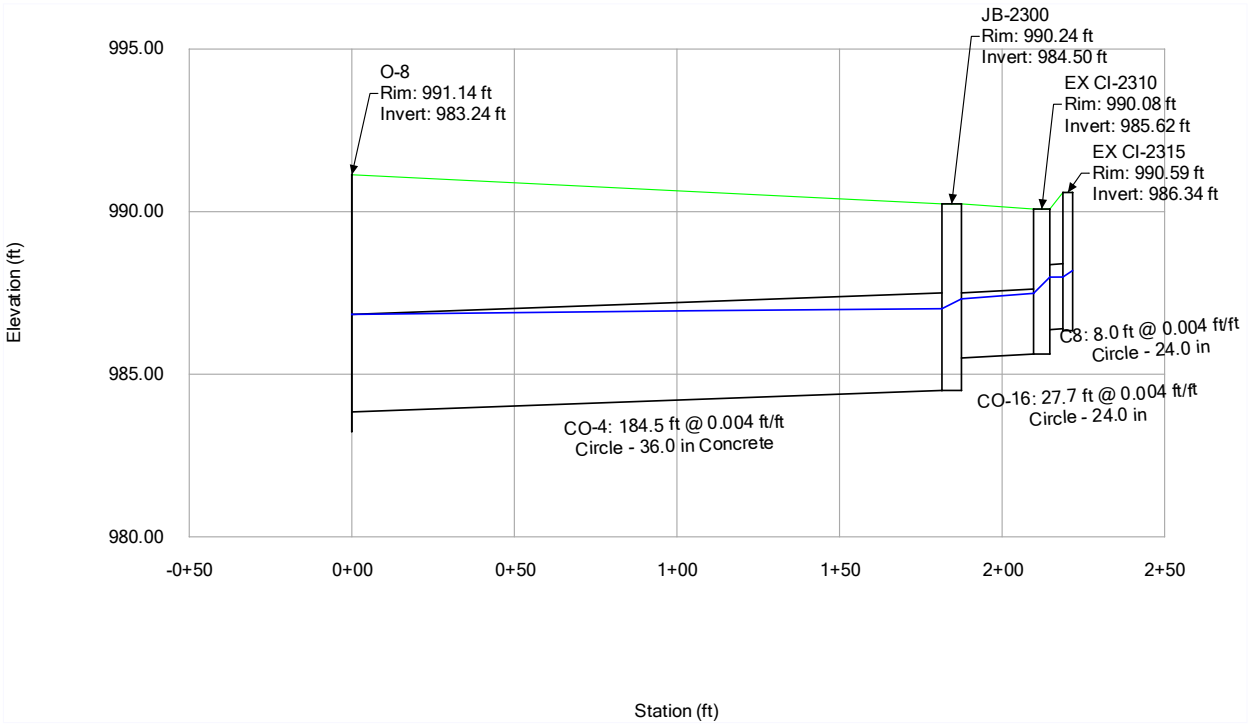
100-Year Storm Event
Stormline 2300



100-Year Storm Event
Stormline 2310
Stormline 2300, 2310, 2320, 2330



100-Year Storm Event
Stormline 2310



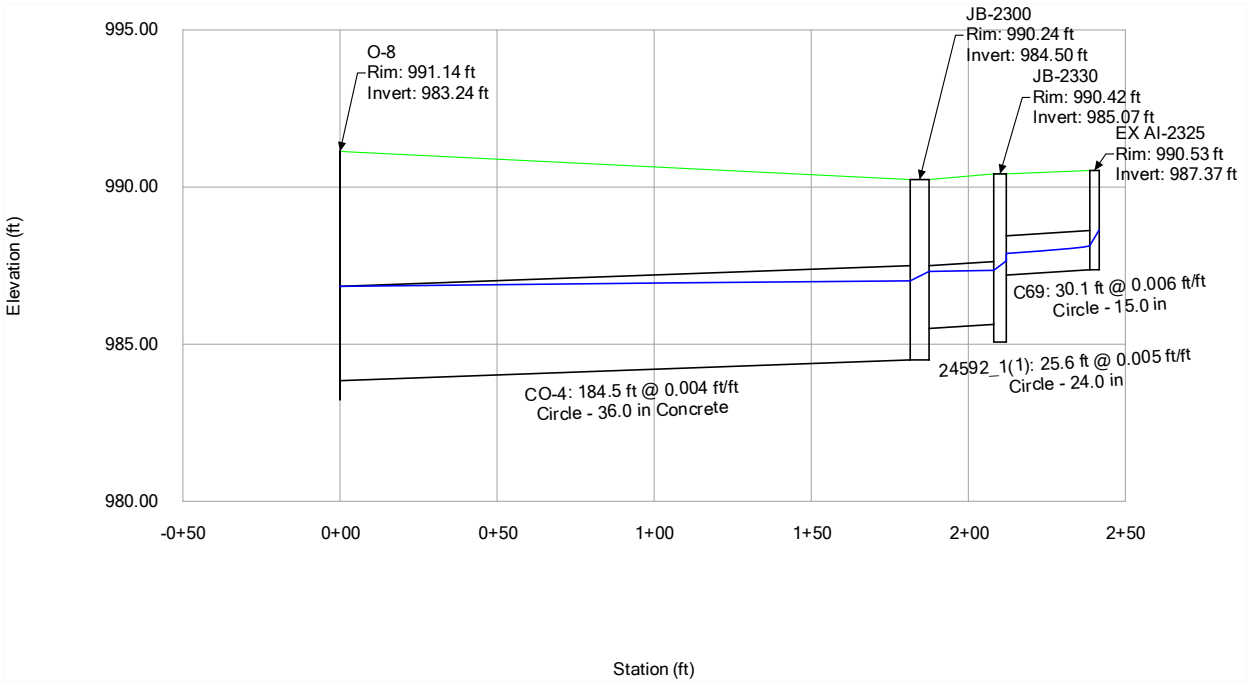
100-Year Storm Event

Stormline 2320

Stormline 2300, 2310, 2320, 2330



100-Year Storm Event
Stormline 2320



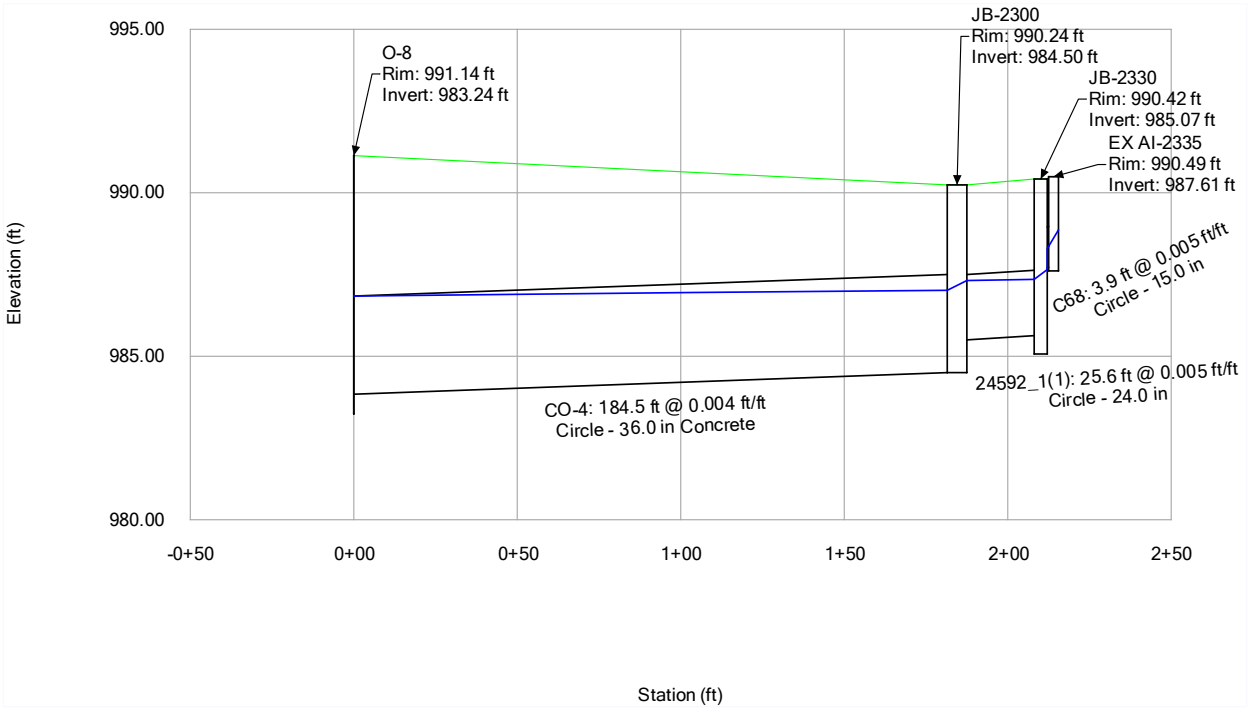
100-Year Storm Event

Stormline 2330

Stormline 2300, 2310, 2320, 2330



100-Year Storm Event
Stormline 2330



100-Year Storm Event

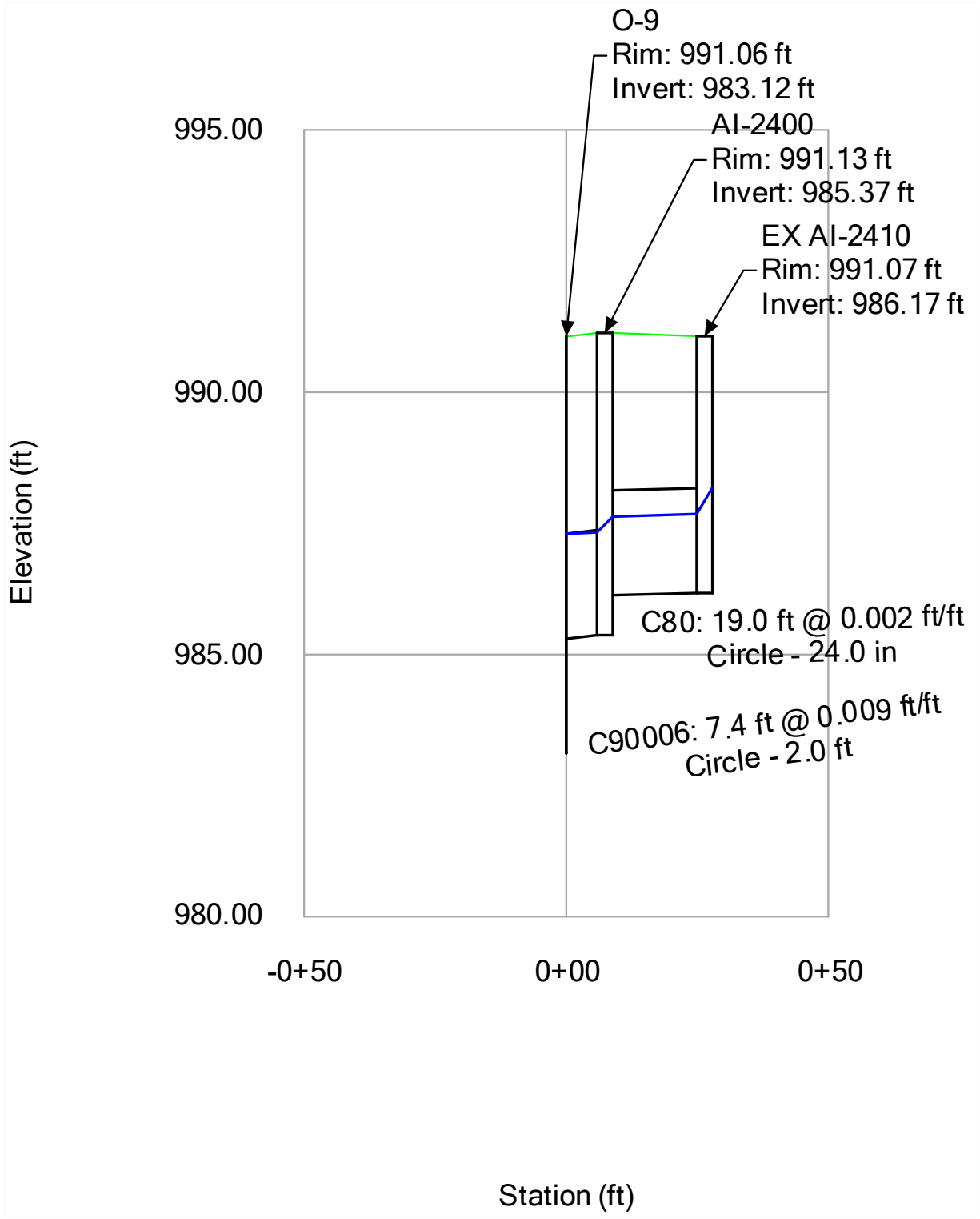
Stormline 2400

Stormline 2400, 2410



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100-Year Storm Event
Stormline 2400



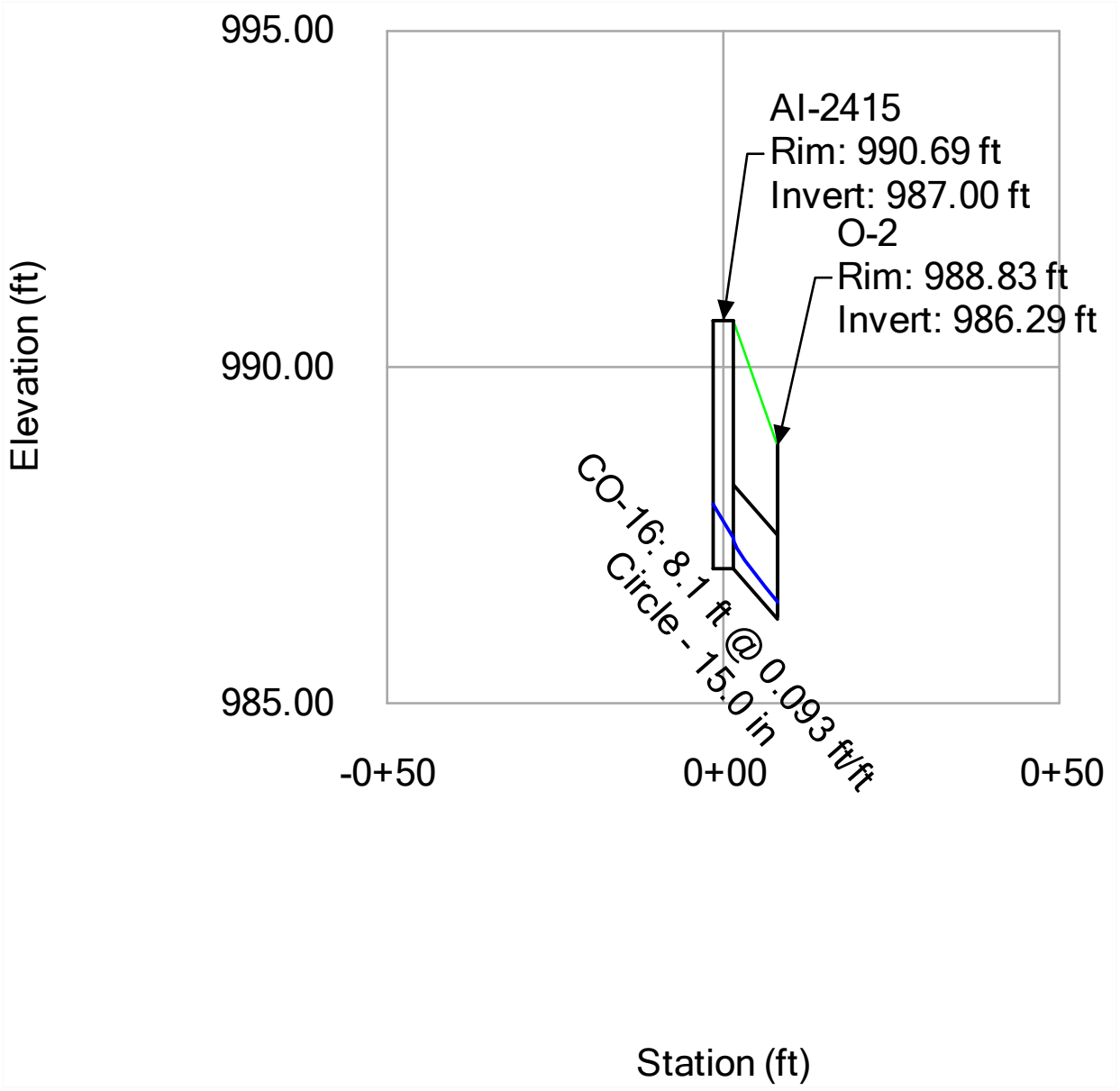
100-Year Storm Event

Stormline 2410

Stormline 2400, 2410



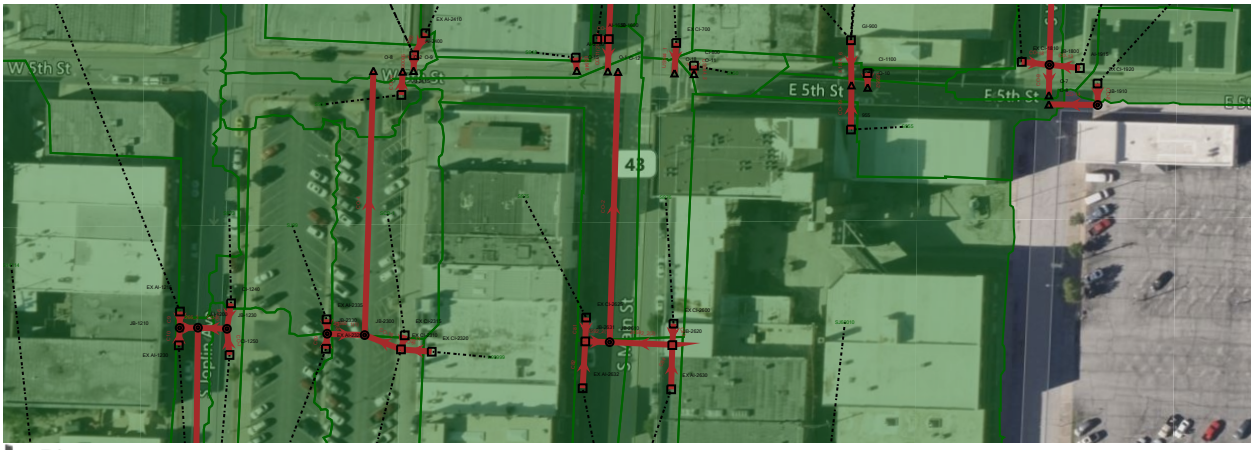
100-Year Storm Event
Stormline 2410



100-Year Storm Event

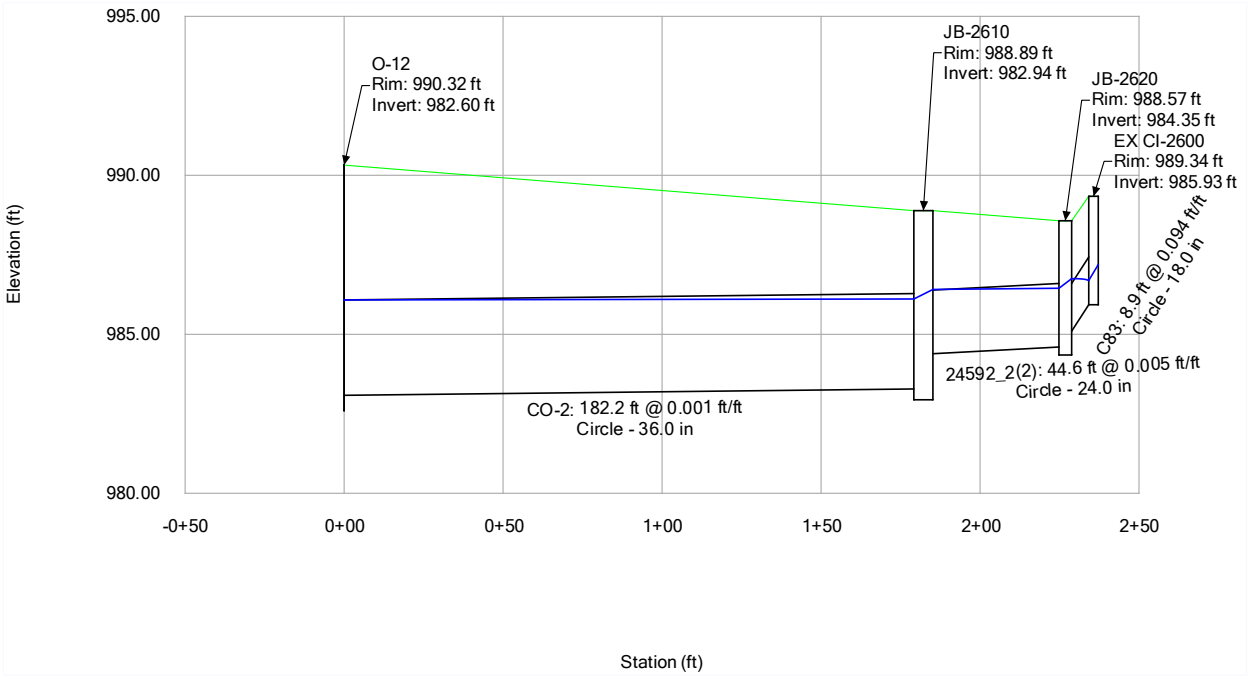
Stormline 2600

Stormline 2600, 2610, 2620, 2630, 2700



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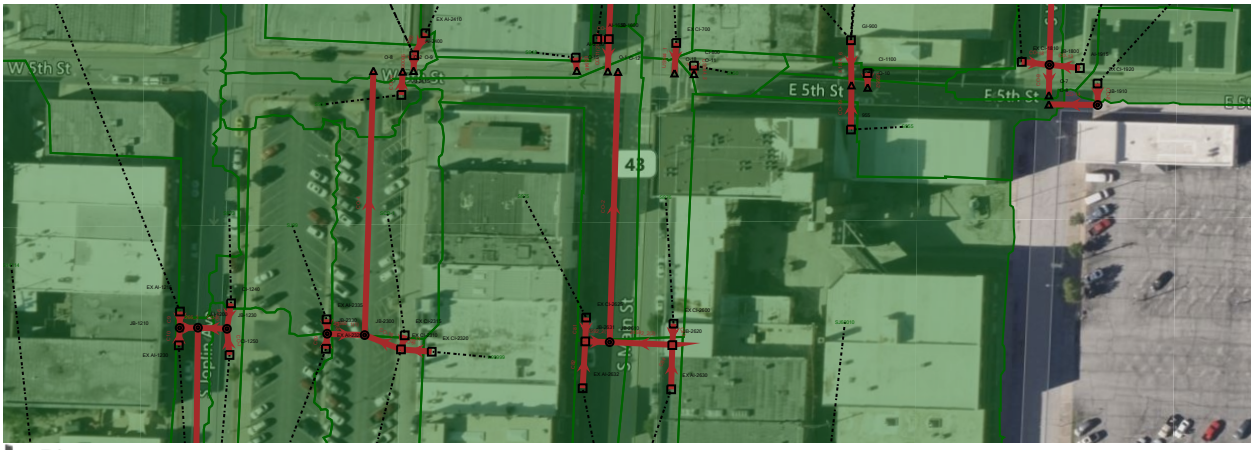
100-Year Storm Event
Stormline 2600



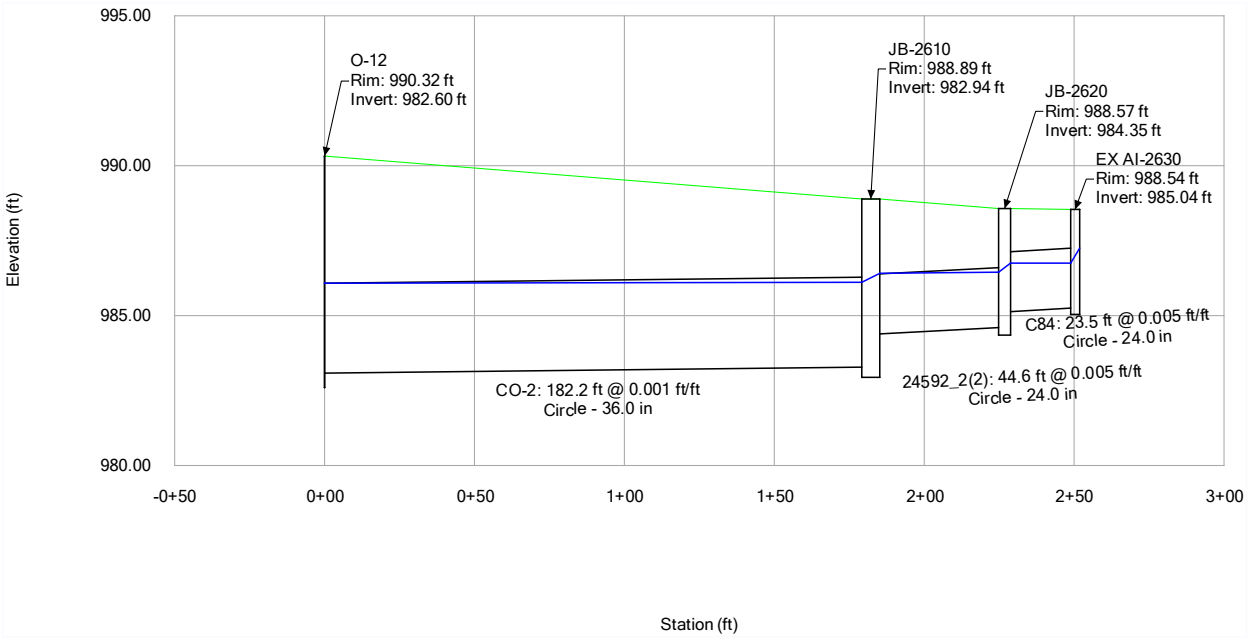
100-Year Storm Event

Stormline 2610

Stormline 2600, 2610, 2620, 2630, 2700



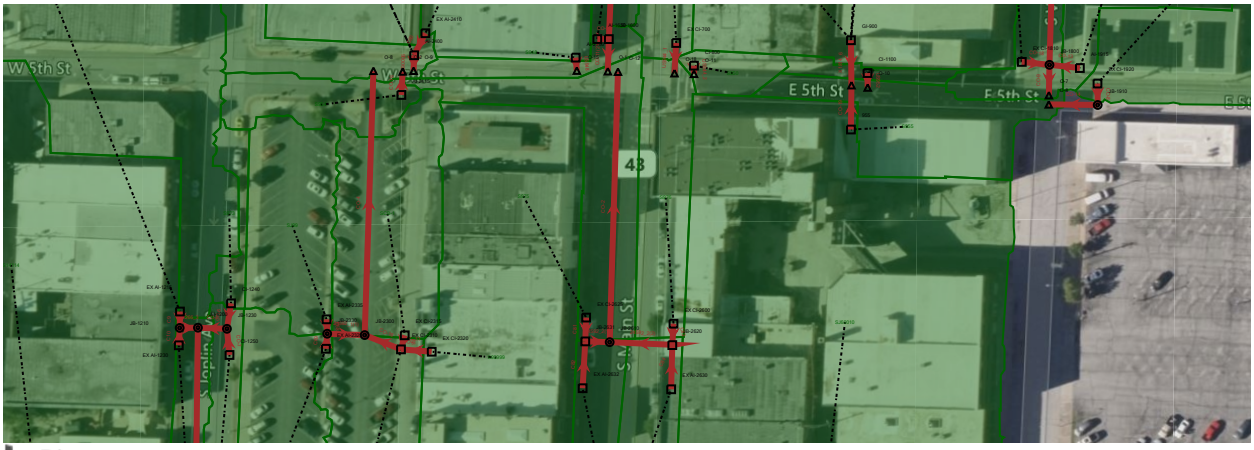
100-Year Storm Event
Stormline 2610



100-Year Storm Event

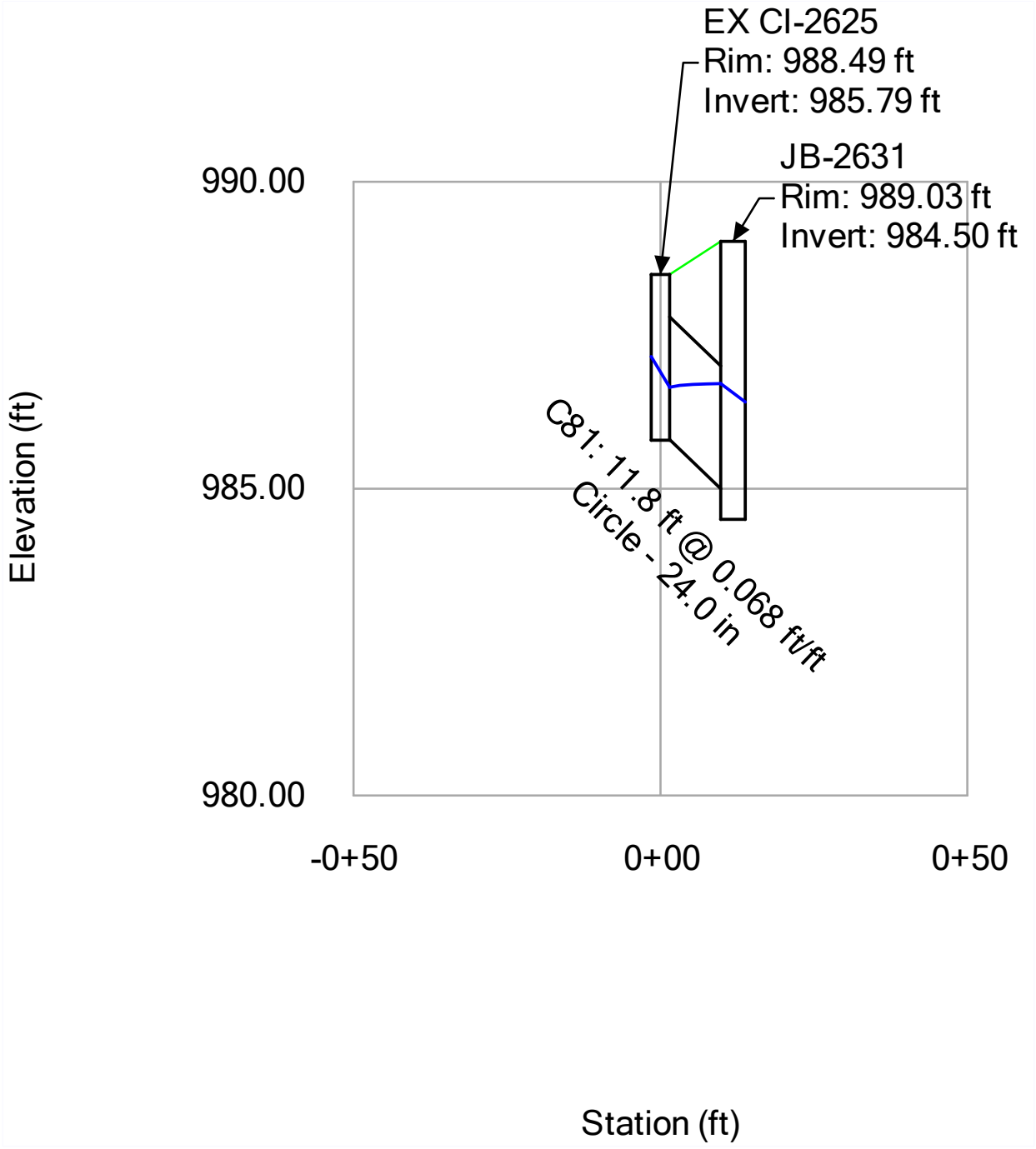
Stormline 2620

Stormline 2600, 2610, 2620, 2630, 2700



"2017 HERE " 2017 Microsoft Corporation

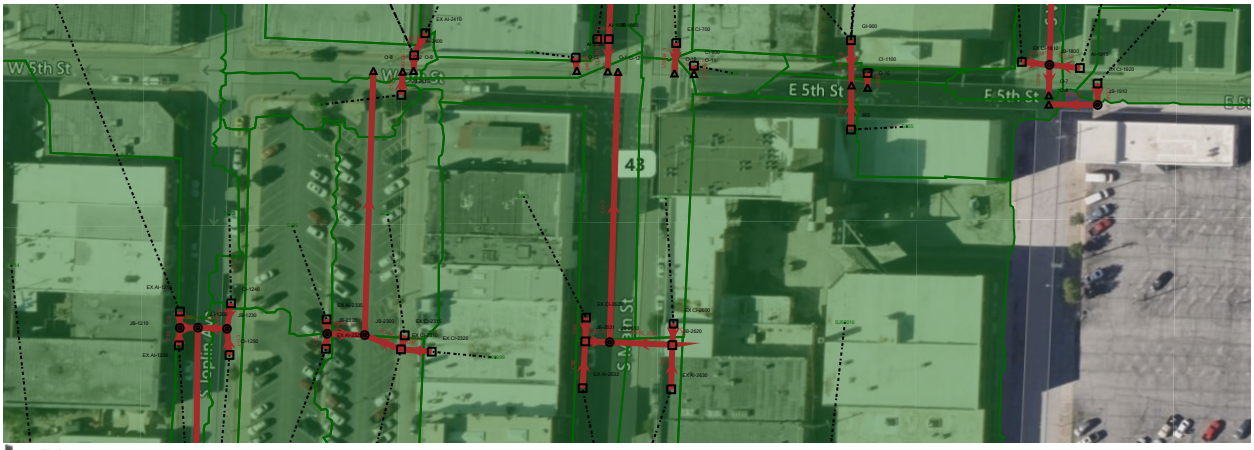
100-Year Storm Event
Stormline 2620



100-Year Storm Event

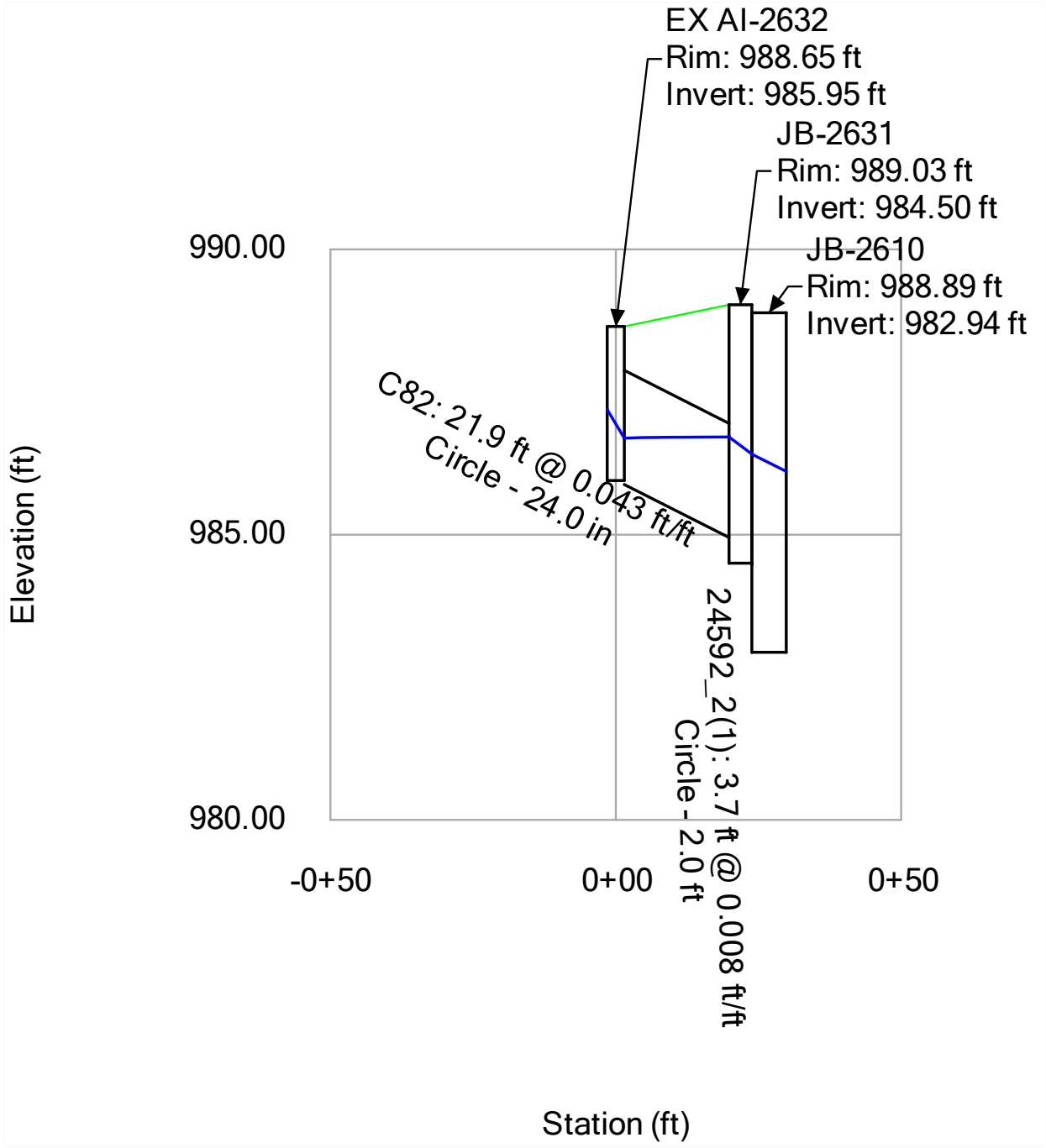
Stormline 2630

Stormline 2600, 2610, 2620, 2630, 2700



"2017 HERE " 2017 Microsoft Corporation

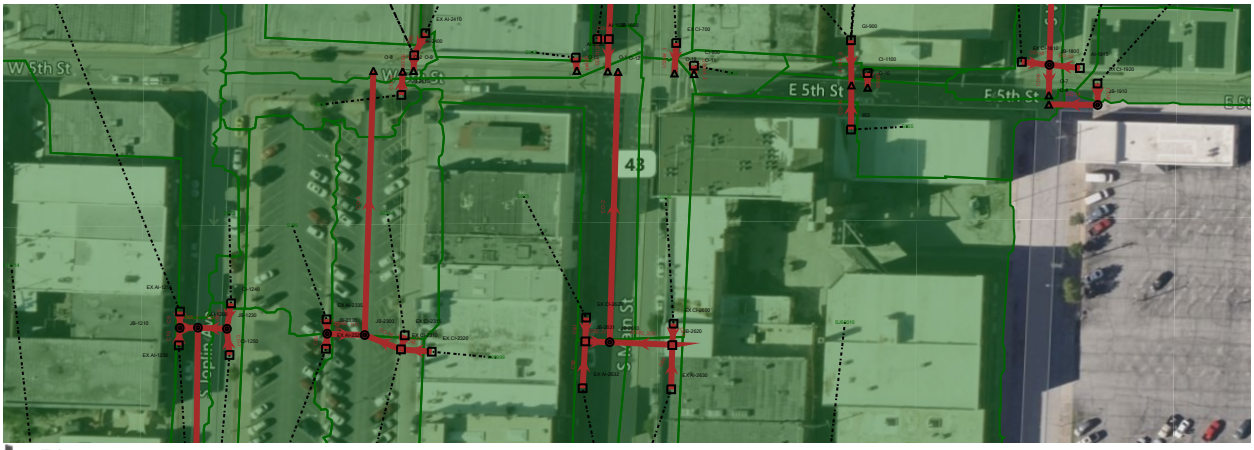
100-Year Storm Event
Stormline 2630



100-Year Storm Event

Stormline 2700

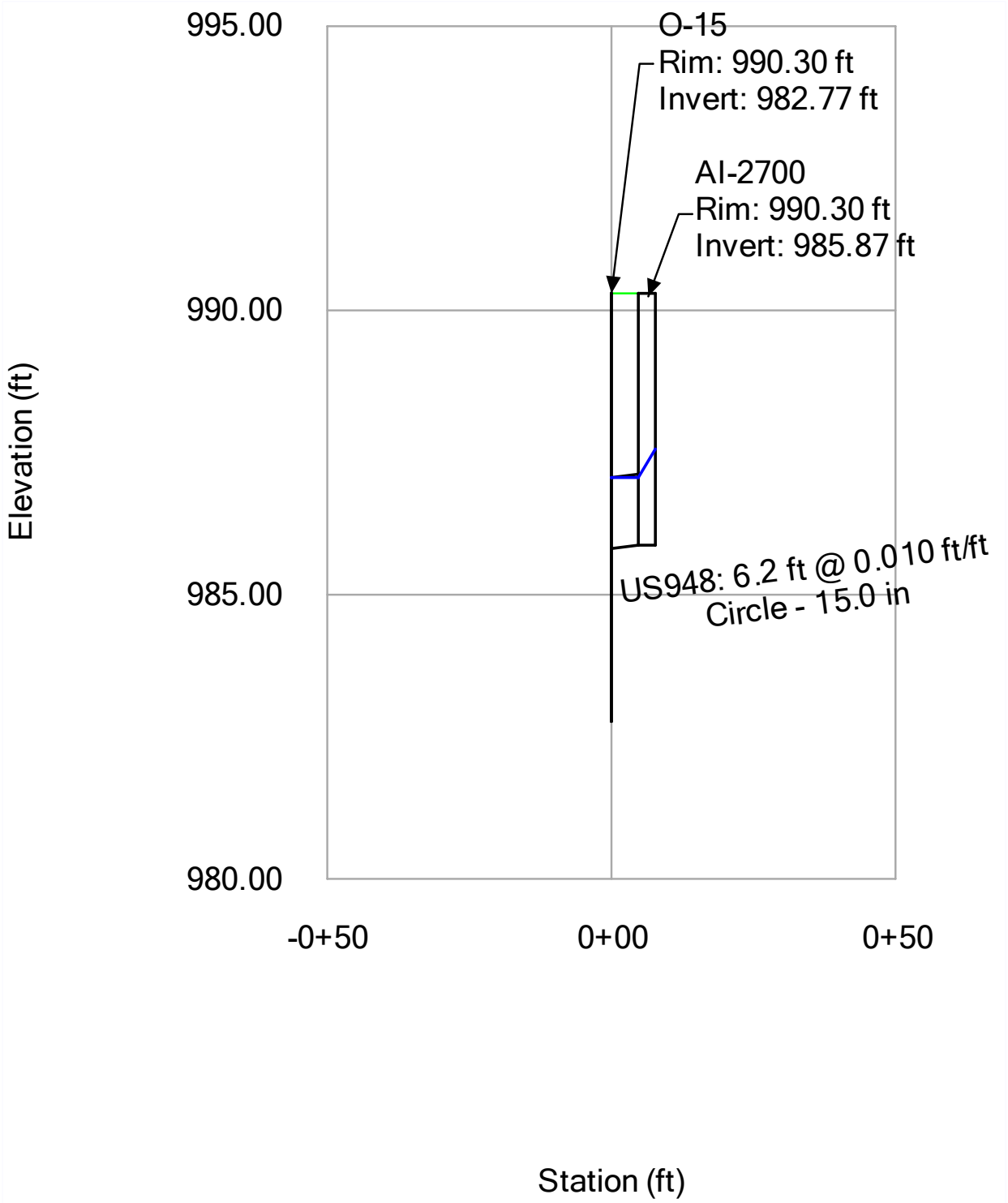
Stormline 2600, 2610, 2620, 2630, 2700



"2017 HERE " 2017 Microsoft Corporation

100-Year Storm Event

Stormline 2700



100-Year Storm Event

Catchment Table - Time: 0.00 hours

ID	Label	Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (hours)	Flow (Total Out) (cfs)
2492	S10001	AI-2400	0.557	0.950	0.083	5.97
2493	S1033	AI-2010	0.211	0.950	0.083	2.27
2494	S1048	GI-1510	0.372	0.950	0.083	3.99
2495	S14114	AI-2110	1.412	0.950	0.083	15.14
2496	S3321	AI-2200	0.563	0.950	0.083	6.04
2497	S874	874	0.492	0.950	0.083	5.28
2498	S875	875	1.829	0.950	0.083	19.62
2499	S882	882	0.273	0.950	0.083	2.93
2500	S883	883	0.901	0.950	0.083	9.67
2501	S884	EX CI-1615	0.993	0.950	0.083	10.65
2502	S885	EX CI-1625	0.842	0.950	0.083	9.03
2503	S887	887	0.096	0.950	0.083	1.03
2504	S888	CI-1620	0.096	0.950	0.083	1.03
2505	S889	889	0.207	0.950	0.083	2.22
2506	S890	CI-1820	0.325	0.950	0.083	3.49
2507	S891	EX CI-1635	0.307	0.950	0.083	3.29
2508	S892	892	0.118	0.950	0.083	1.27
2509	S894	894	0.172	0.950	0.083	1.84
2510	S895	895	0.120	0.950	0.083	1.29
2511	S896	EX CI-1645	0.260	0.950	0.083	2.79
2512	S942	EX AI-2410	0.972	0.950	0.083	10.43
2513	S943	AI-1650	0.269	0.950	0.083	2.89
2514	S944	EX CI-700	0.269	0.950	0.083	2.88
2515	S946	AI-2400	0.380	0.950	0.083	4.08
2516	S947	EX CI-1810	0.356	0.950	0.083	3.81
2517	S948	AI-2700	0.063	0.950	0.083	0.67
2518	S949	AI-1915	0.338	0.950	0.083	3.62
2519	S950	CI-800	0.051	0.950	0.083	0.54
2520	S952	CI-1100	0.036	0.950	0.083	0.39
2521	S953	EX CI-1920	2.181	0.950	0.083	23.39
2522	S954	AI-2415	0.126	0.950	0.083	1.35
2523	S955	955	0.231	0.950	0.083	2.48
2524	S973	CI-1240	0.052	0.950	0.083	0.56
2525	S974	EX AI-1215	2.302	0.950	0.083	24.69
2526	S975	EX CI-2625	0.270	0.950	0.083	2.90
2527	S976	EX CI-2600	0.194	0.950	0.083	2.08
2528	S989	EX AI-1230	0.154	0.950	0.083	1.66
2529	S990	CI-1250	0.132	0.950	0.083	1.42
2530	S991	EX AI-2632	0.151	0.950	0.083	1.62
2531	S992	EX AI-2630	0.239	0.950	0.083	2.57
2532	S9999	CB-18	0.241	0.950	0.083	2.59
2533	S99999	EX CI-2320	1.022	0.950	0.083	10.96
2534	SCB-1	EX CI-2315	0.313	0.950	0.083	3.36
2535	SCB-2	AI-2010	0.064	0.950	0.083	0.68
2536	SJ4	EX CI-2310	0.342	0.950	0.083	3.66

100-Year Storm Event

Catchment Table - Time: 0.00 hours

ID	Label	Outflow Element	Area (User Defined) (acres)	Runoff Coefficient (Rational)	Time of Concentration (hours)	Flow (Total Out) (cfs)
2537	SJ60010	GI-1510	1.686	0.950	0.083	18.08
2538	SJ94	GI-900	0.814	0.950	0.083	8.73
2539	SJ95	GI-900	0.220	0.950	0.083	2.36
2540	SJ96	GI-900	0.154	0.950	0.083	1.65
2541	SJ97	GI-900	0.429	0.950	0.083	4.60
2542	SJ98	EX AI-2325	0.339	0.950	0.083	3.63
2543	SJ99	EX AI-2335	0.240	0.950	0.083	2.58
2545	SJ93	J93	0.306	0.950	0.083	3.29
2579	CM-1	GI-1500	0.208	0.950	0.083	2.23

100-Year Storm Event

Catch Basin Table - Time: 0.00 hours

ID	Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Capture Efficiency (Calculated) (%)	Flow (Captured) (cfs)	Hydraulic Grade Line (In) (ft)	Spread / Top Width (ft)
306	AI-2110	991.66	987.80	100.0	15.14	989.84	17.1
322	AI-2200	992.58	989.04	100.0	6.04	990.72	12.1
552	874	994.82	991.20	100.0	5.28	995.16	11.5
554	875	994.90	991.50	100.0	19.62	995.40	18.9
556	882	995.54	990.49	100.0	2.93	994.14	9.2
558	883	996.18	992.73	100.0	9.67	996.14	14.5
560	EX CI-1615	994.19	989.10	100.0	10.65	991.63	15.0
562	EX CI-1625	995.65	990.19	100.0	9.03	992.23	14.1
566	887	994.92	988.16	100.0	1.03	990.92	6.3
568	CI-1620	993.00	987.30	100.0	1.03	989.99	6.2
570	889	998.99	996.35	100.0	2.22	997.49	8.3
572	CI-1820	998.59	995.04	100.0	3.49	995.78	9.9
574	EX CI-1635	994.75	990.15	100.0	3.29	992.52	9.7
576	892	996.58	992.43	100.0	1.27	993.87	6.8
580	894	998.90	995.45	100.0	1.84	996.72	7.8
582	895	993.41	990.20	100.0	1.29	991.20	6.8
584	EX CI-1645	993.70	990.60	100.0	2.79	992.52	9.1
586	EX AI-2410	991.07	986.17	100.0	10.43	988.18	14.9
588	AI-1650	990.23	987.51	100.0	2.89	988.69	9.2
590	EX CI-700	990.19	987.17	100.0	2.88	988.35	9.2
592	AI-2400	991.13	985.37	100.0	10.05	987.63	14.7
594	EX CI-1810	994.86	991.46	100.0	3.81	994.25	10.2
596	AI-2700	990.30	985.87	100.0	0.67	987.56	5.3
598	AI-1915	995.22	991.50	100.0	3.62	994.25	10.0
600	CI-800	990.77	985.58	100.0	0.54	987.29	4.9
602	CI-1100	991.40	985.02	100.0	0.39	986.73	4.3
604	EX CI-1920	995.78	992.18	100.0	23.39	994.41	20.2
606	AI-2415	990.69	987.00	100.0	1.35	987.96	6.9
608	955	992.05	987.10	100.0	2.48	988.69	8.7
610	CI-1240	990.80	987.16	100.0	0.56	988.63	5.0
612	EX AI-1215	990.46	987.46	100.0	24.69	989.80	20.6
614	EX CI-2625	988.49	985.79	100.0	2.90	987.15	9.2
616	EX CI-2600	989.34	985.93	100.0	2.08	987.19	8.1
618	EX AI-1230	990.49	987.11	100.0	1.66	989.39	7.5
622	EX AI-2632	988.65	985.95	100.0	1.62	987.19	7.4
624	EX AI-2630	988.54	985.04	100.0	2.57	987.25	8.8
716	JB-2631	989.03	984.50	100.0	0.00	986.71	0.0
718	EX CI-2310	990.08	985.62	100.0	3.66	987.99	10.1
720	JB-2620	988.57	984.35	100.0	0.00	986.75	0.0
770	GI-1510	987.55	983.00	100.0	22.07	985.01	19.7
864	J93	994.71	991.20	100.0	3.29	994.72	9.7
872	GI-900	991.62	984.42	100.0	17.35	986.12	18.0
874	EX AI-2325	990.53	987.37	100.0	3.63	988.64	10.0
876	EX AI-2335	990.49	987.61	100.0	2.58	988.86	8.8

100-Year Storm Event

Catch Basin Table - Time: 0.00 hours

ID	Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Capture Efficiency (Calculated) (%)	Flow (Captured) (cfs)	Hydraulic Grade Line (In) (ft)	Spread / Top Width (ft)
2238	EX CI-2315	990.59	986.34	100.0	3.36	988.19	9.7
2259	AI-2010	992.54	990.81	100.0	2.95	992.00	9.3
2375	EX CI-2320	990.00	986.72	100.0	10.96	988.57	38.8
2380	CB-18	993.31	990.74	100.0	2.59	992.03	(N/A)
2445	GI-1500	989.49	982.27	100.0	2.23	984.35	(N/A)
2627	CI-1250	990.85	987.32	100.0	1.42	988.12	(N/A)
2630	JB-1600	990.58	983.61	100.0	0.00	987.11	0.0
2636	JB-1700	994.04	989.66	100.0	0.00	991.71	0.0

100-Year Storm Event

Conduit Table - Time: 0.00 hours

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)
1562	C8	EX CI-2315	986.40	EX CI-2310	986.37	8.0	0.004	24.0
1565	US948	AI-2700	985.87	O-15	985.81	6.2	0.010	15.0
1567	US944_2	CI-800	985.58	O-11	985.54	9.2	0.004	15.0
1568	US952	CI-1100	985.02	O-10	984.98	5.7	0.007	15.0
1584	US892	892	992.43	MH-24	992.34	5.8	0.016	24.0
1588	US891	EX CI-1635	990.15	JB-1710	990.13	4.4	0.005	30.0
1593	C68	EX AI-2335	987.72	JB-2330	987.70	3.9	0.005	15.0
1599	C69	EX AI-2325	987.37	JB-2330	987.20	30.1	0.006	15.0
1608	X1814_6	GI-900	984.42	O-13	984.00	25.7	0.016	24.0
1610	C9	EX AI-1215	987.55	JB-1210	987.46	6.5	0.014	24.0
1613	C10	EX AI-1230	987.63	JB-1210	987.57	12.3	0.005	15.0
1616	C90006	AI-2400	985.37	O-9	985.30	7.4	0.009	24.0
1617	C72_1	875	991.50	MH-32	991.45	9.0	0.006	15.0
1628	C82	EX AI-2632	985.88	JB-2631	984.95	21.9	0.043	24.0
1631	C71	874	991.20	MH-32	991.15	10.6	0.005	18.0
1643	C84	EX AI-2630	985.25	JB-2620	985.13	23.5	0.005	24.0
1654	889-894	889	996.35	894	996.20	18.7	0.008	12.0
1660	X1815	MH-25	991.84	MH-24	992.02	14.2	-0.013	24.0
1687	C90003	EX CI-1615	990.26	JB-1610	990.21	8.5	0.006	24.0
1691	C81	EX CI-2625	985.80	JB-2631	985.00	11.8	0.068	24.0
1692	C73	882	990.49	MH-31	990.36	13.8	0.009	18.0
1694	C80	EX AI-2410	986.17	AI-2400	986.13	22.0	0.002	24.0
1709	US944_1	EX CI-700	987.17	O-18	985.59	23.0	0.069	15.0
1716	C83	EX CI-2600	985.93	JB-2620	985.10	8.9	0.094	18.0
1735	C7	JB-1200	985.25	O-3	984.51	228.1	0.003	36.0
1753	C127	J93	991.20	882	991.00	24.7	0.008	15.0
1766	US883	883	992.73	MH-25	992.50	29.1	0.008	12.0
1770	3221-1018	AI-2200	989.04	O-14	988.94	5.1	0.020	15.0
1773	US896	EX CI-1645	990.58	JB-1710	990.48	29.7	0.003	30.0
1784	US895	895	990.20	CI-1620	990.10	18.8	0.005	12.0
1803	C72_2	MH-32	990.65	MH-31	990.40	36.2	0.007	24.0
1809	24266_3	JB-1210	986.79	JB-1200	986.50	9.9	0.029	24.0
1842	US894	894	995.45	JB-1810	995.00	50.2	0.009	18.0
1911	C70	JB-1710	990.48	MH-25	991.67	112.8	-0.011	30.0
2190	CO-1	JB-1810	993.61	JB-1800	991.15	342.5	0.007	30.0
2192	24592_2 (1)	JB-2631	984.50	JB-2610	984.47	3.7	0.008	24.0
2193	24592_2 (2)	JB-2620	984.60	JB-2610	984.39	44.6	0.005	24.0
2197	CO-2	JB-2610	983.28	O-12	983.08	182.2	0.001	36.0
2200	24592_1 (1)	JB-2330	985.63	JB-2300	985.50	25.6	0.005	24.0
2203	CO-4	JB-2300	984.50	O-8	983.84	184.5	0.004	36.0
2255	CO-9	JB-1800	991.02	O-7	990.93	19.6	0.005	30.0

100-Year Storm Event

Conduit Table - Time: 0.00 hours

ID	Label	Start Node	Invert (Start) (ft)	Stop Node	Invert (Stop) (ft)	Length (User Defined) (ft)	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Out) (ft)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Depth (Normal) / Rise (%)
2382	CO-16	CB-18	990.74	MH-36	990.39	0.0	0.006	12.0	0.013	3.36	3.63	1.62	13.84	24.3	33.6
2383	CO-17	MH-36	990.00	887	989.66	0.0	0.006	15.0	0.013	0.67	3.36	1.25	6.34	10.6	22.0
2446	CO-5	GI-1500	982.27	O-6	980.73	80.6	0.019	36.0	0.013	0.54	2.38	1.25	4.25	12.8	24.2
2460	CO-8	EX CI-1920	992.19	JB-1910	991.48	15.6	0.046	24.0	0.013	0.39	2.56	1.25	5.41	7.2	18.2
2548	C27(1)	AI-2110	987.80	JB-2100	987.64	32.0	0.005	24.0	0.013	1.27	4.53	1.03	28.20	4.5	14.5
2549	C27(2)	JB-2100	987.31	O-6	986.70	122.1	0.005	24.0	0.012	3.29	4.01	1.89	29.99	11.0	22.4
2573	CO-16	EX CI-2310	985.62	JB-2300	985.50	27.7	0.004	24.0	0.010	2.58	4.70	0.61	6.00	43.0	45.8
2574	CO-17	EX CI-2320	986.72	EX CI-2310	986.64	21.6	0.004	24.0	0.010	3.63	5.33	0.69	6.31	57.5	54.4
2577	CO-18	EX CI-1810	991.39	JB-1800	991.35	7.8	0.005	30.0	0.013	17.35	9.62	2.00	28.90	60.0	55.8
2580	CO-19	955	987.10	O-13	986.90	0.0	0.006	15.0	0.013	24.69	9.59	1.66	26.54	93.0	76.3
2583	CO-20	GI-1510	983.00	GI-1500	982.50	76.5	0.007	36.0	0.013	1.66	1.35	1.31	4.52	36.6	41.9
2610	CO-1	CI-1820	994.53	JB-1810	994.38	18.4	0.008	15.0	0.010	20.41	9.91	2.00	28.66	71.2	62.4
2614	CO-2	887	988.16	CI-1620	987.50	100.9	0.007	30.0							
2620	CO-4	MH-31	989.90	887	989.00	142.6	0.006	24.0							
2625	CO-5	JB-1200	986.14	JB-1230	986.24	23.5	-0.004	24.0							
2626	CO-6	JB-1230	987.07	CI-1240	987.16	17.8	-0.005	15.0							
2628	CO-7	JB-1230	986.26	CI-1250	987.32	32.3	-0.033	24.0							
2631	CO-11(1)	JB-1610	986.50	JB-1600	983.81	337.3	0.008	42.0							
2632	CO-11(2)	JB-1600	983.61	O-1	983.47	28.6	0.005	42.0							
2633	CO-8	AI-1650	987.51	JB-1600	987.16	9.9	0.035	15.0							
2634	CO-9	CI-1620	987.30	JB-1610	987.21	21.0	0.004	36.0							
2637	CO-10	EX CI-1625	990.27	JB-1700	990.22	11.9	0.004	24.0							
2638	CO-11	JB-1610	989.64	JB-1700	989.87	48.6	-0.005	30.0							
2639	CO-12	JB-1700	990.10	JB-1710	990.20	20.4	-0.005	30.0							
2641	CO-13	AI-1915	991.50	JB-1800	991.30	28.0	0.007	30.0							
2643	CO-14	JB-1910	986.25	O-8	983.98	27.5	0.083	18.0							
2645	CO-15	AI-2010	990.81	O-1	990.51	31.5	0.010	15.0							
2648	CO-16	AI-2415	987.00	O-2	986.25	8.1	0.093	15.0							

100-Year Storm Event

Conduit Table - Time: 0.00 hours

Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Out) (ft)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Depth (Normal) / Rise (%)
0.013	19.62	15.99	3.18	4.81	407.5	(N/A)
0.013	1.62	6.95	1.76	46.67	3.5	12.7
0.013	5.28	2.99	3.48	7.21	73.2	63.5
0.013	2.57	3.76	1.62	16.15	15.9	26.9
0.013	2.22	4.39	0.61	3.19	69.6	61.4
0.013	1.27	4.22	1.24	25.44	5.0	15.2
0.013	10.65	5.80	1.14	17.33	61.5	56.7
0.013	2.90	9.72	1.71	58.83	4.9	15.1
0.013	6.17	3.49	3.54	10.19	60.5	56.1
0.013	10.43	3.76	1.50	10.38	100.5	82.4
0.013	2.88	10.30	1.25	16.94	17.0	27.9
0.013	2.08	10.23	1.65	32.13	6.5	17.2
0.013	27.99	5.88	3.00	37.99	73.7	63.8
0.014	3.29	2.68	3.14	5.40	60.8	56.3
0.013	9.67	12.31	0.99	3.17	305.3	(N/A)
0.014	6.04	7.43	1.25	8.38	72.0	62.9
0.012	2.79	3.44	1.54	25.80	10.8	22.2
0.013	1.29	3.30	0.48	2.60	49.5	49.7
0.013	24.84	7.91	3.50	18.80	132.2	(N/A)
0.020	26.16	9.11	1.73	25.19	103.8	85.9
0.013	4.05	5.34	0.67	9.95	40.8	44.5
0.013	10.90	7.20	1.54	42.13	25.9	34.7
0.013	7.47	5.64	2.60	34.76	21.5	31.5
0.020	4.51	3.83	1.94	13.31	33.9	40.1
0.020	4.62	3.14	2.02	10.09	45.8	47.5
0.013	9.00	2.97	3.00	22.10	40.7	44.4
0.020	6.18	3.47	1.82	10.48	59.0	55.3
0.013	23.94	5.90	3.00	39.89	60.0	55.8
0.013	14.01	5.67	2.50	27.79	50.4	50.2
0.013	2.59	3.87	0.79	2.67	97.1	79.5
0.013	2.56	4.08	1.26	4.98	51.3	50.8
0.013	24.10	10.98	3.00	92.18	26.1	34.9
0.013	23.39	15.26	1.26	48.34	48.4	49.1
0.013	15.14	5.79	1.54	16.00	94.6	77.5
0.013	15.08	5.79	2.00	15.99	94.3	77.3
0.013	17.94	5.71	1.82	14.89	120.4	(N/A)
0.013	10.96	4.86	1.35	13.75	79.7	67.5
0.013	3.81	4.13	2.40	29.35	13.0	24.3
0.013	2.48	4.04	1.25	4.95	50.1	50.1
0.013	22.07	7.25	1.85	53.92	40.9	44.6
0.013	3.49	4.97	0.70	5.84	59.7	55.7
0.013	33.83	7.70	2.49	33.17	102.0	83.9
0.013	30.78	9.80	1.92	17.97	171.3	(N/A)
0.013	1.97	3.27	1.99	14.75	13.4	24.7

100-Year Storm Event

Conduit Table - Time: 0.00 hours

Manning's n	Flow (cfs)	Velocity (ft/s)	Depth (Out) (ft)	Capacity (Full Flow) (cfs)	Flow / Capacity (Design) (%)	Depth (Normal) / Rise (%)
0.013	0.56	2.54	1.06	4.59	12.2	23.6
0.013	1.42	6.10	1.87	41.00	3.5	12.7
0.013	70.77	10.35	3.30	89.85	78.8	66.9
0.013	71.32	8.33	3.50	70.34	101.4	83.3
0.013	2.89	8.11	0.48	12.12	23.8	33.2
0.013	35.66	6.89	2.23	43.70	81.6	68.6
0.013	9.03	4.90	1.49	14.65	61.6	56.8
0.013	25.52	6.51	1.72	28.23	90.4	74.5
0.013	16.72	6.07	1.61	28.72	58.2	54.8
0.013	3.62	4.58	2.45	34.69	10.4	21.8
0.013	23.39	18.86	1.16	30.18	77.5	66.1
0.013	2.95	5.06	0.60	6.31	46.8	48.1
0.013	1.35	9.18	0.26	19.68	6.9	17.7

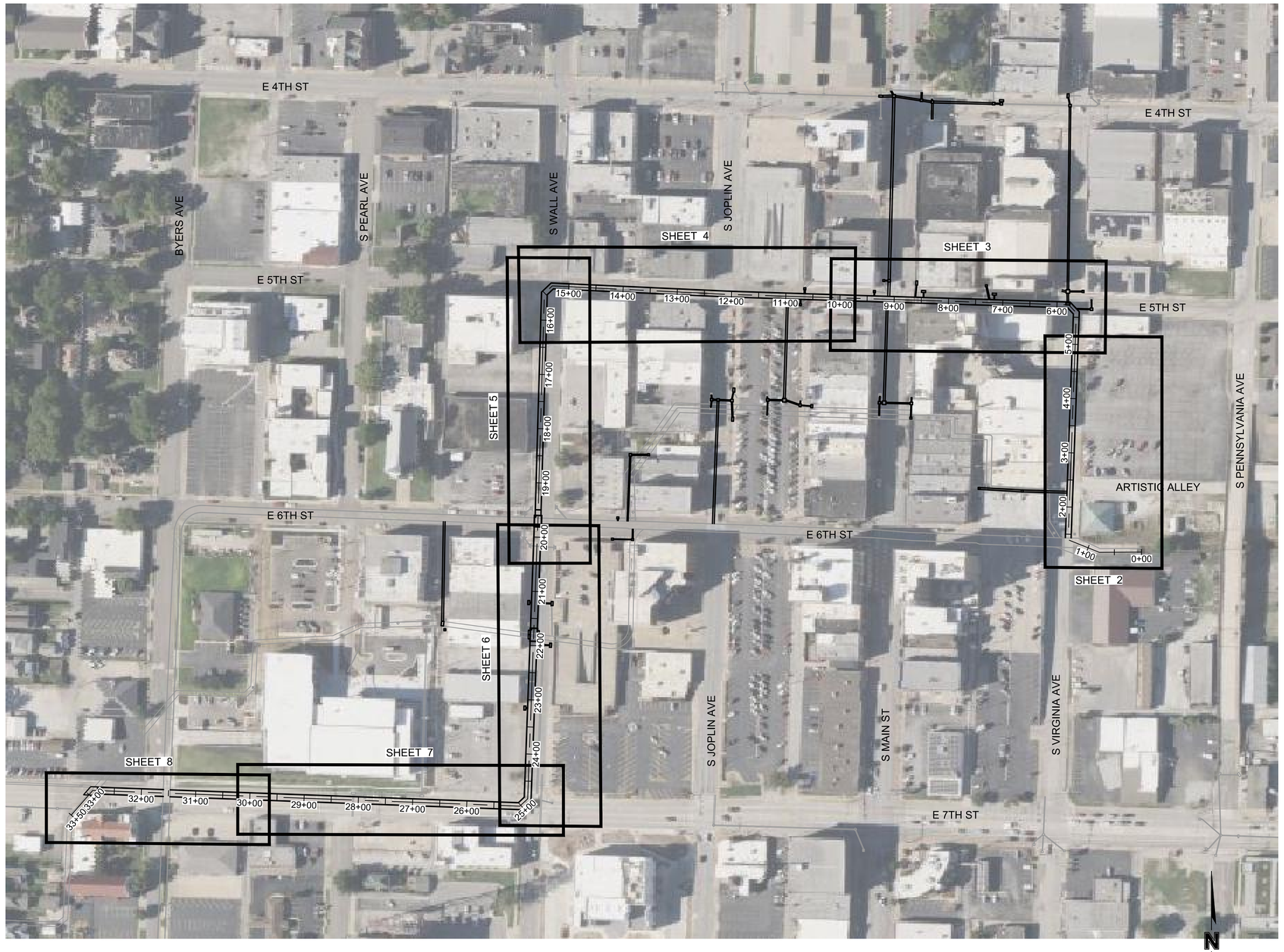
APPENDIX E
Storm Relocations

WILLOW BRANCH REPLACEMENT CULVERT
GENERAL LAYOUT SHEET

LEGEND

SURVEY CONTROL POINT	TRAFFIC SIGNAL BOX
SURVEY BENCHMARK	TRAFFIC SIGNAL MANHOLE
SURVEY TEMPORARY BENCHMARK	TRAFFIC SIGNAL POLE W/ ARM
GAS METER	TRAFFIC SIGNAL POLE
GAS RISER	TRAFFIC SIGNAL CONTROL BOX
GAS MANHOLE	TRAFFIC SIGNAL PEDESTAL
GAS REGULATOR	ELECTRIC MANHOLE
TELEVISION PEDESTAL	ELECTRIC METER
FIBER BOX	ELECTRIC RISER
FIBER PEDESTAL	ELECTRIC BOX
CABLE BOX	ELECTRIC CABINET
CABLE VAULT	ELECTRIC JUNCTION BOX
TELEPHONE PEDESTAL	SPRINKLER HEAD
STORM MANHOLE	SPRINKLER CONTROL VALVE
STORM GRATE	WATER METER PIT
SANITARY MANHOLE	FIRE HYDRANT
YARD LIGHT	WATER METER
LIGHT POLE	WATER VALVE
POWER POLE	FLAG POLE
POWER POLE W/ LIGHT	SIGN
GUY WIRE	BOLLARD
STUMP	WOOD POST
BUSH	STEEL POST
EVERGREEN TREE	COLUMN
DECIDUOUS TREE	BORE HOLE

LOT LINE	
PROPERTY LINE	
CENTER LINE	
ROW LINE	
CF	CONSTRUCTION FENCE
LOG	LIMITS OF GRADING
	EXISTING EASEMENT
	PROPOSED EASEMENT
1371	EXISTING MINOR CONTOUR
1370	EXISTING MAJOR CONTOUR
1371	FUTURE MINOR CONTOUR
1370	FUTURE MAJOR CONTOUR
T	EXISTING TELEPHONE RISER
TEL	EXISTING TELEPHONE LINE
FO	EXISTING FIBER OPTICS LINE
SS	EXISTING SANITARY LINE
SD	EXISTING STORM LINE
G	EXISTING GAS LINE
W	EXISTING WATER LINE
	EXISTING BOARD FENCE
	EXISTING BARB WIRE FENCE
P-OH	EXISTING OVERHEAD ELECTRIC
UGE	EXISTING UNDERGROUND ELECTRIC
LOC	LIMITS OF CONSTRUCTION
	REMOVE UPRIGHT CURB AND GUTTER
	CURB FACE
	BACK OF CURB
	PROPOSED STORM SEWER



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WILLOW BRANCH REPLACEMENT CULVERT GENERAL LAYOUT

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

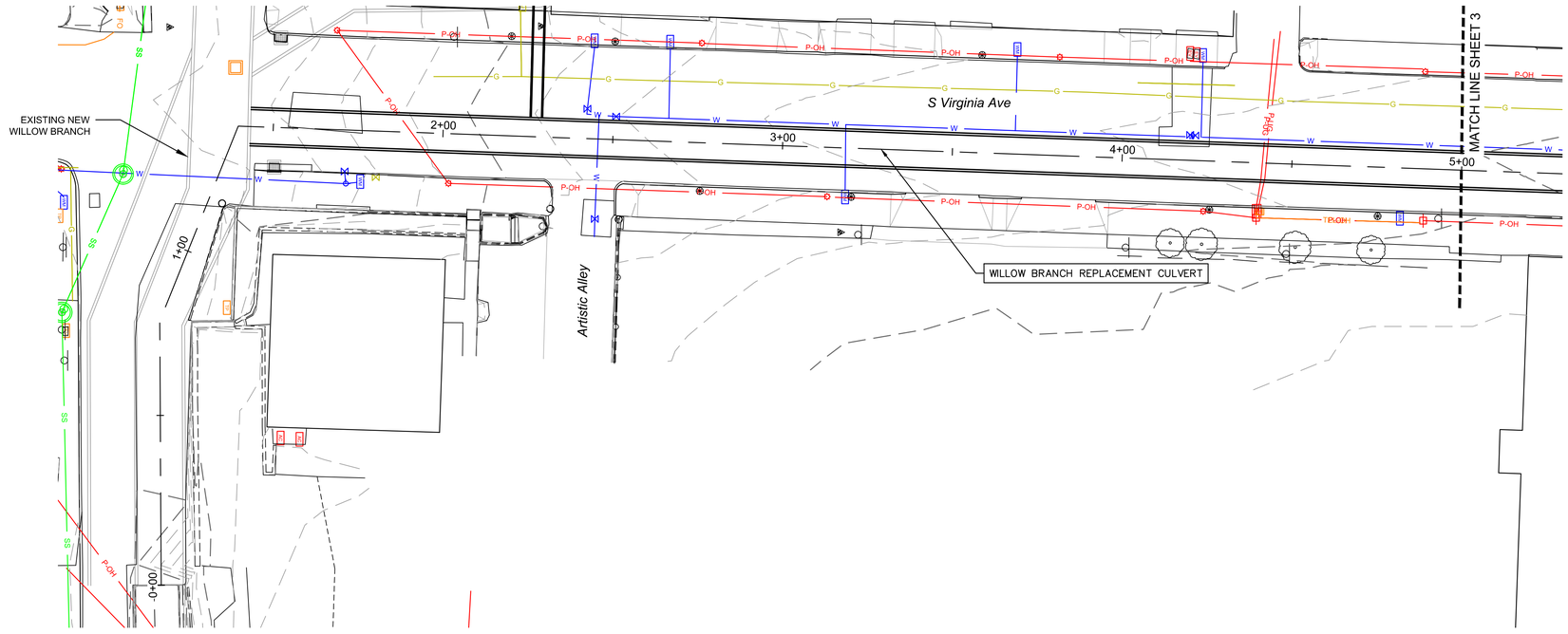
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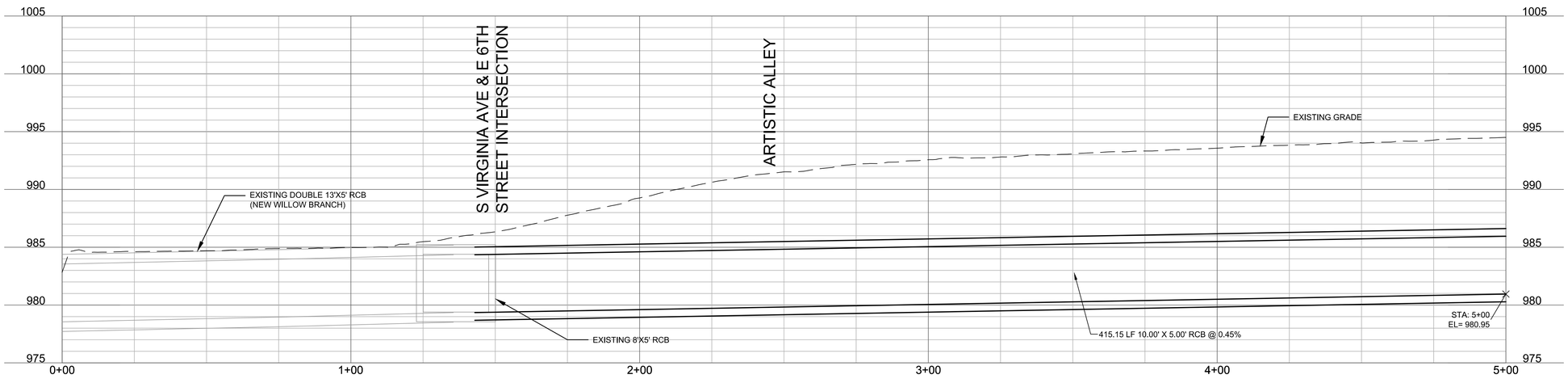
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project no.: B24-04647
date: 01.09.2026

SHEET
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WILLOW BRANCH REPLACEMENT CULVERT PLAN AND PROFILE

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

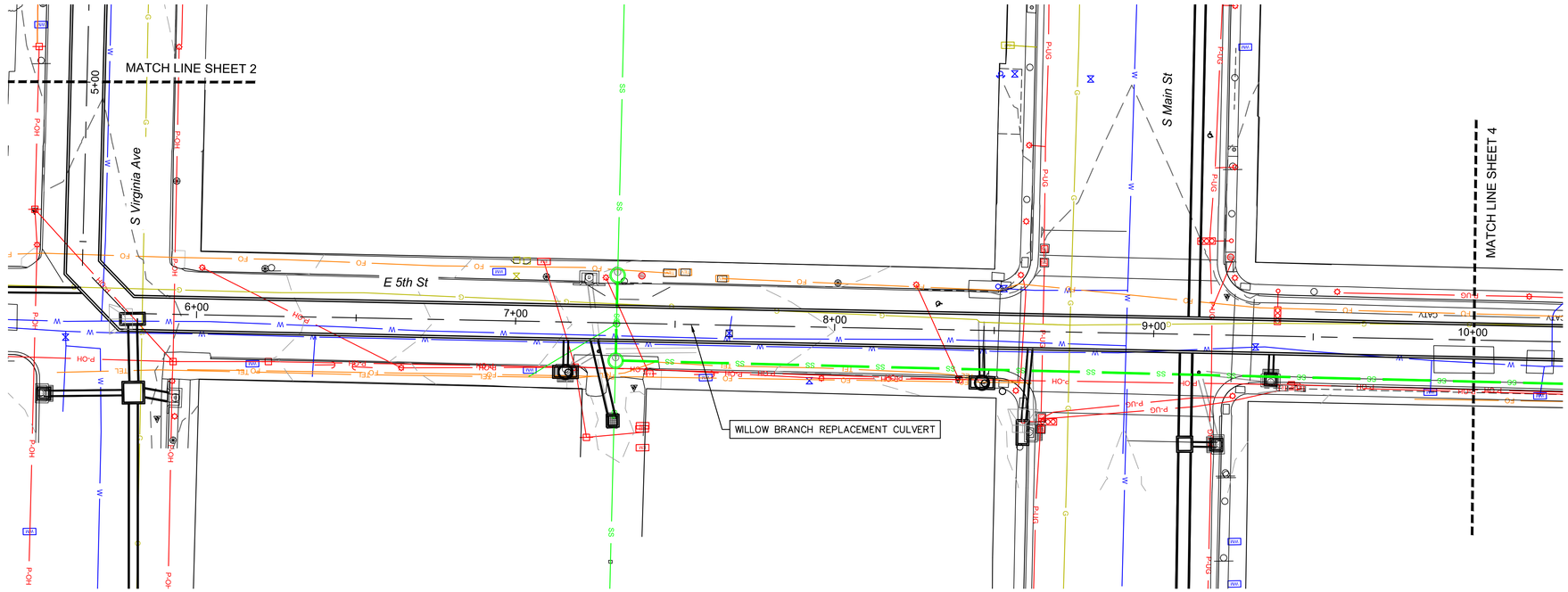
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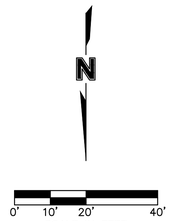
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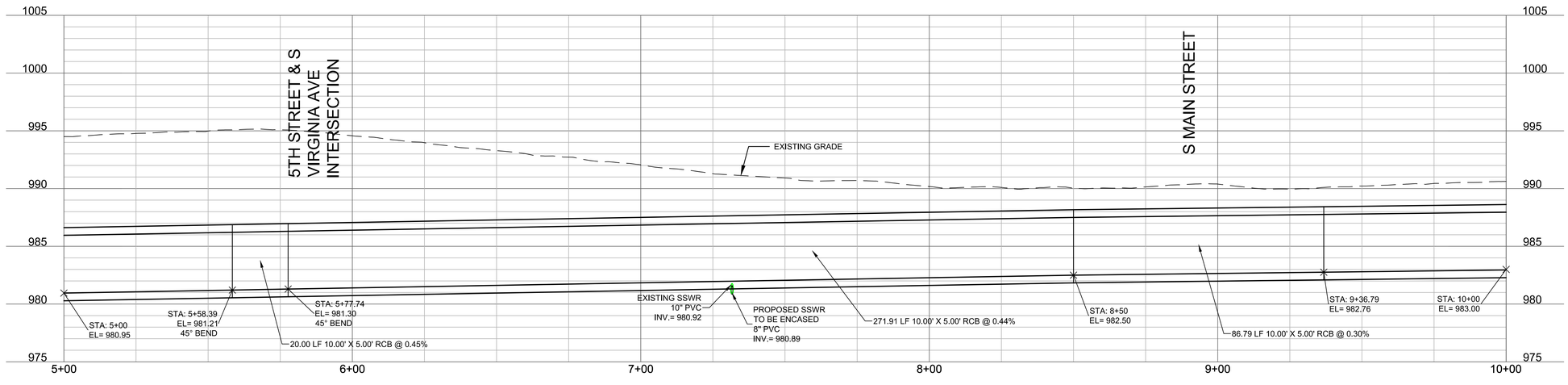
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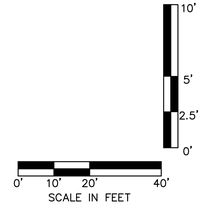
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WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

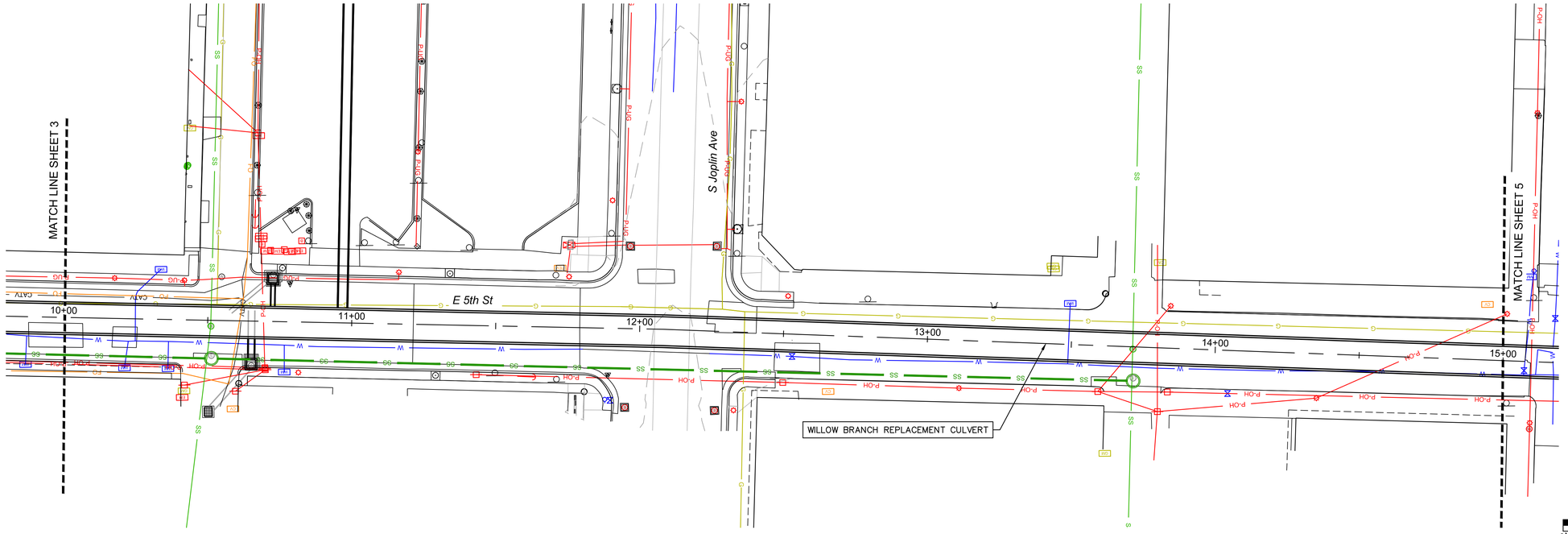
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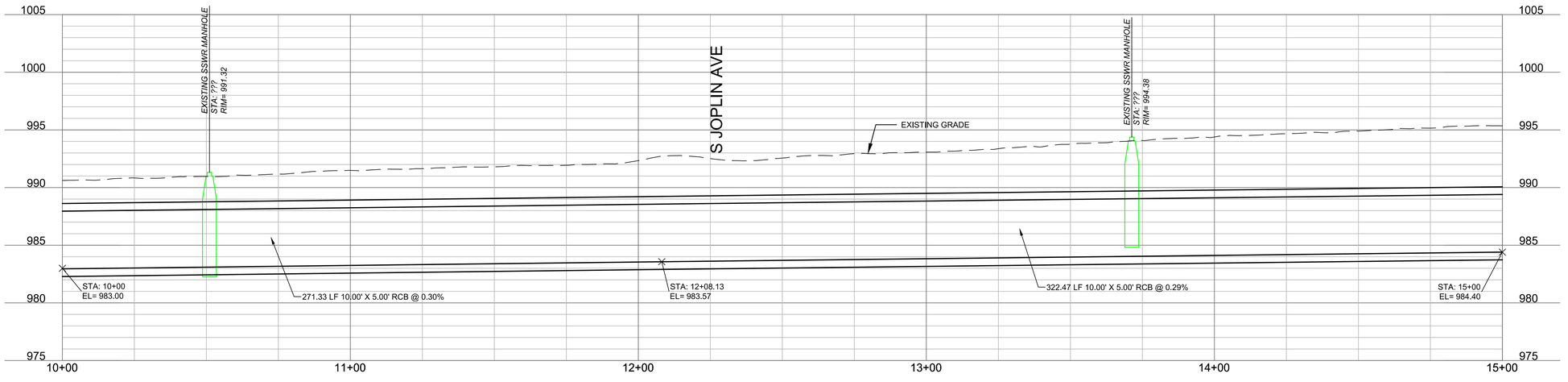
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WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

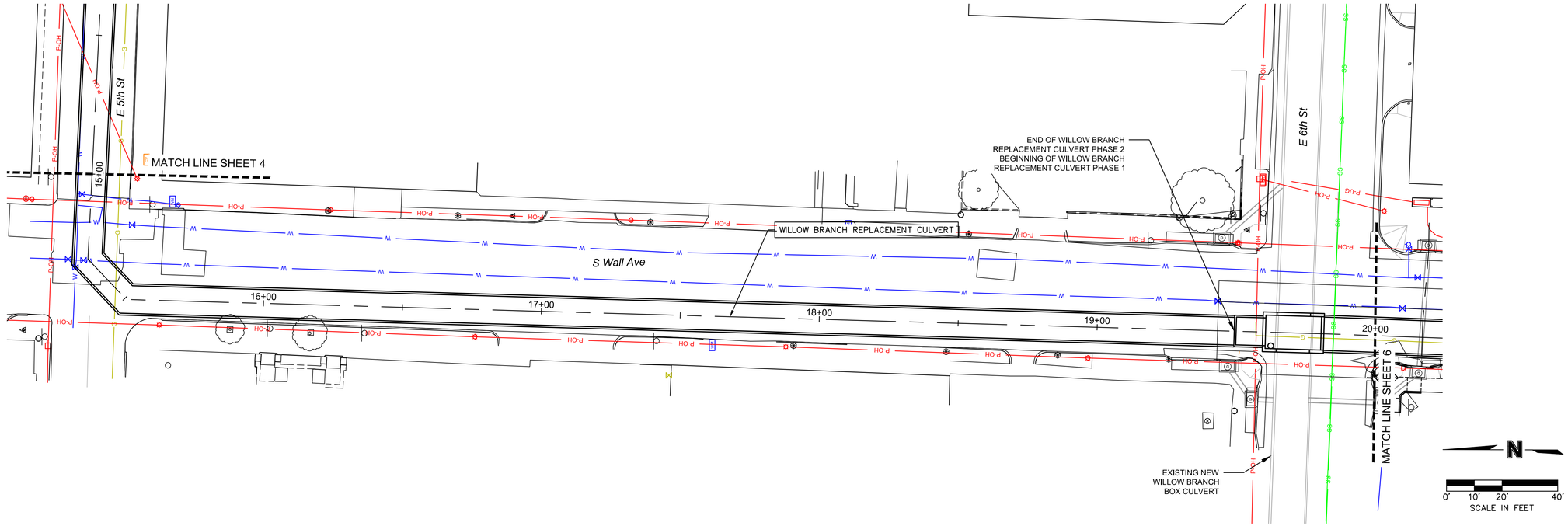
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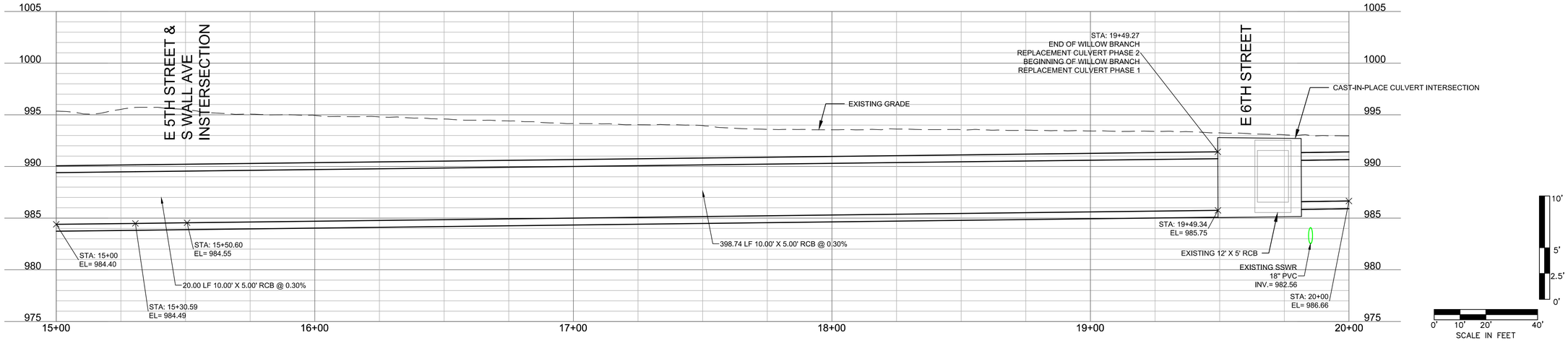
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STORMWATER IMPROVEMENT PLANS

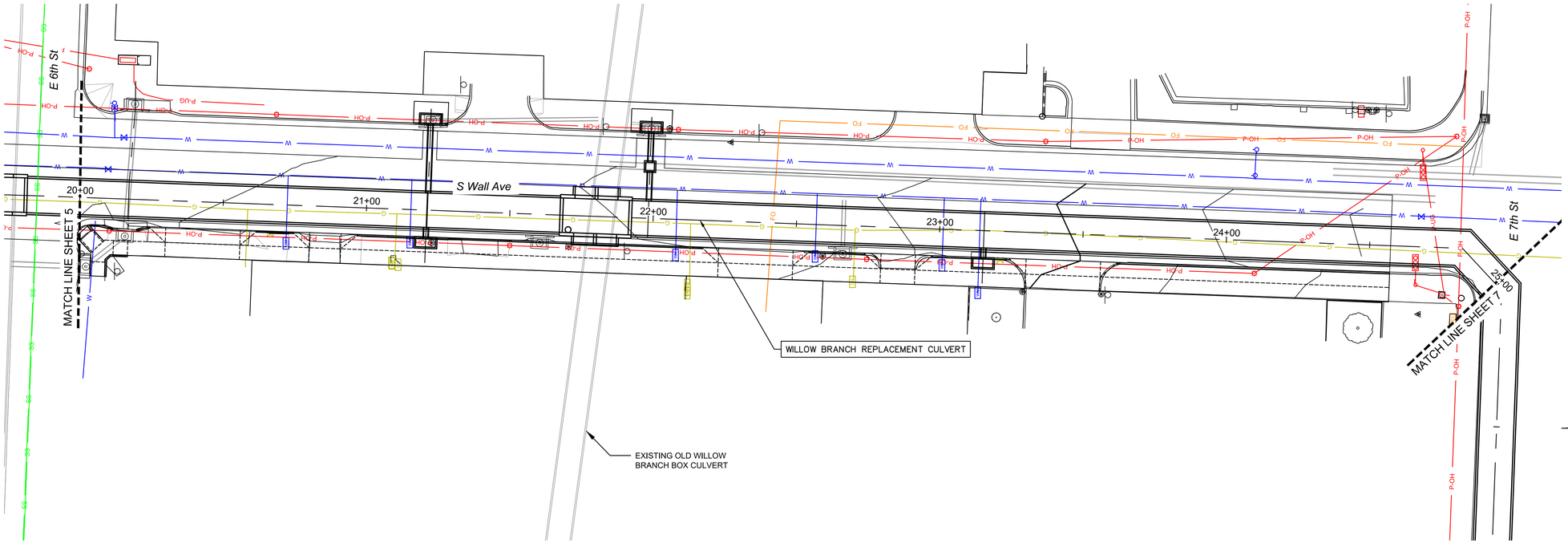
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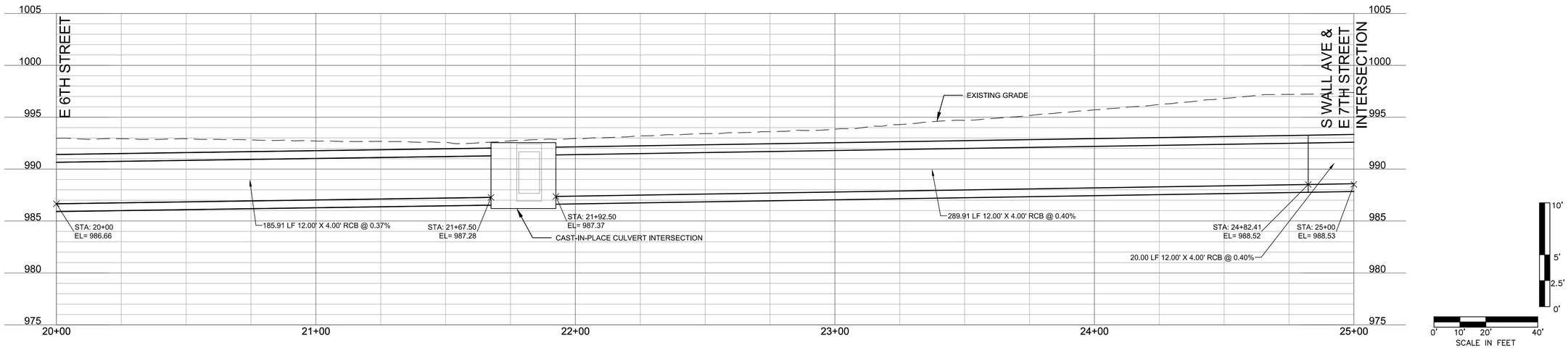
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STORMWATER IMPROVEMENT PLANS

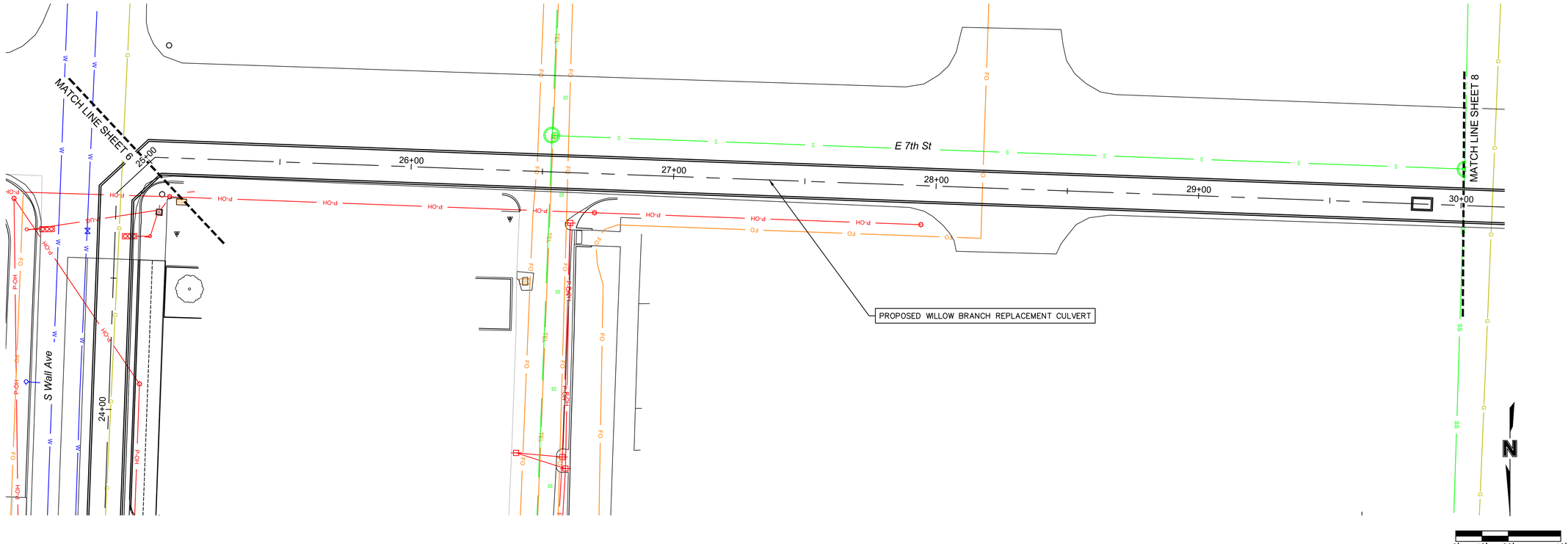
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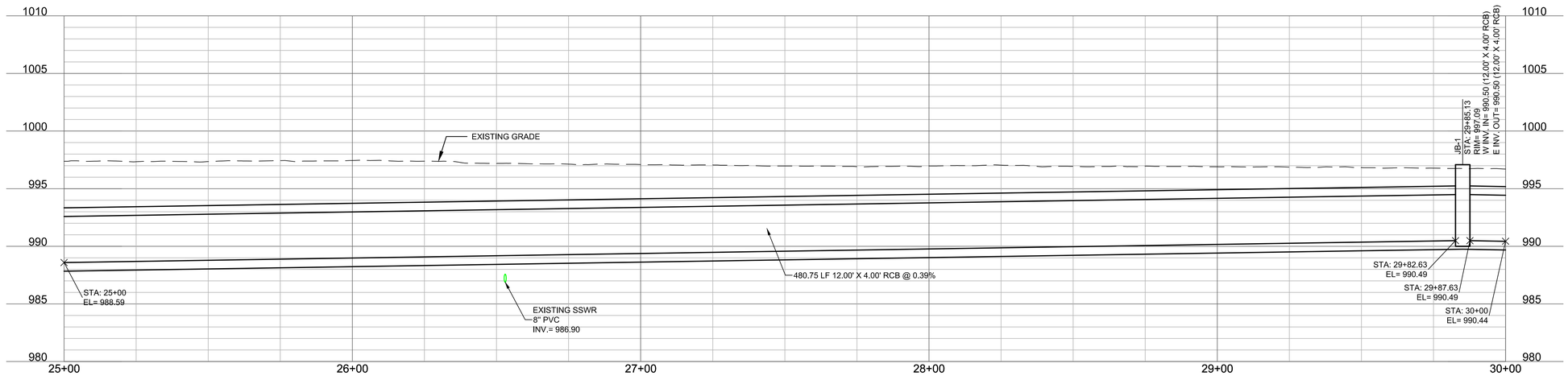
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WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

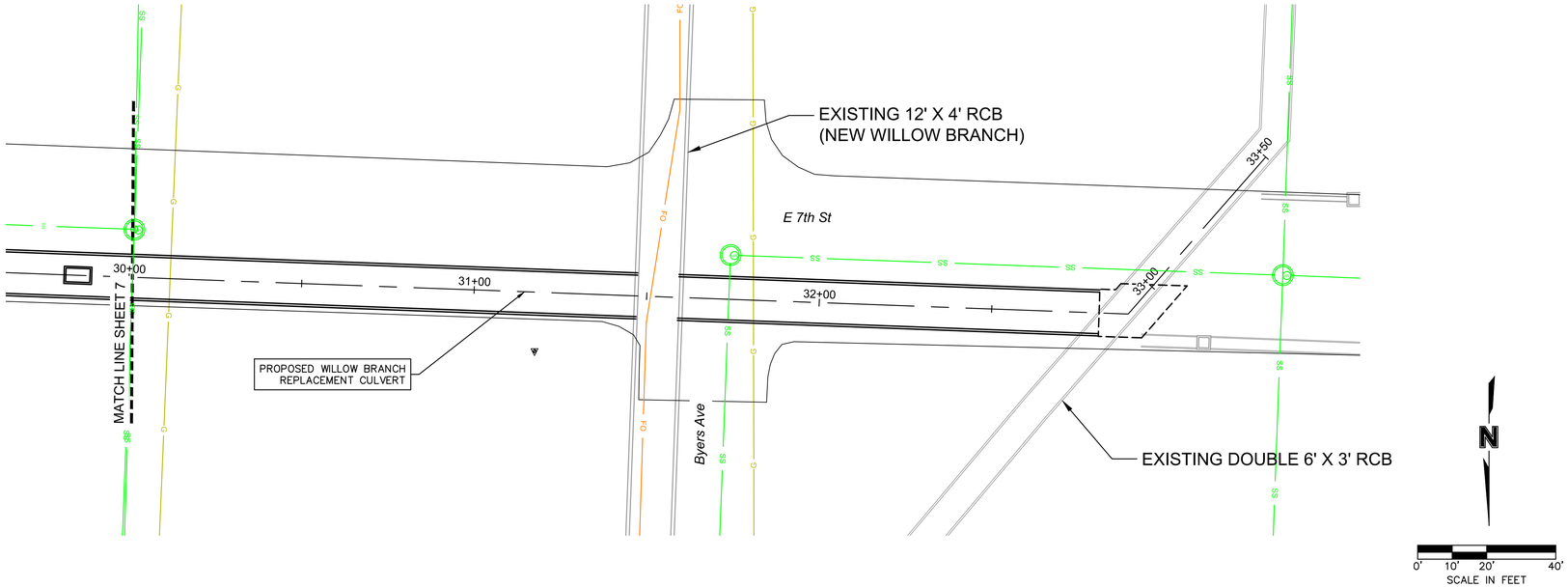
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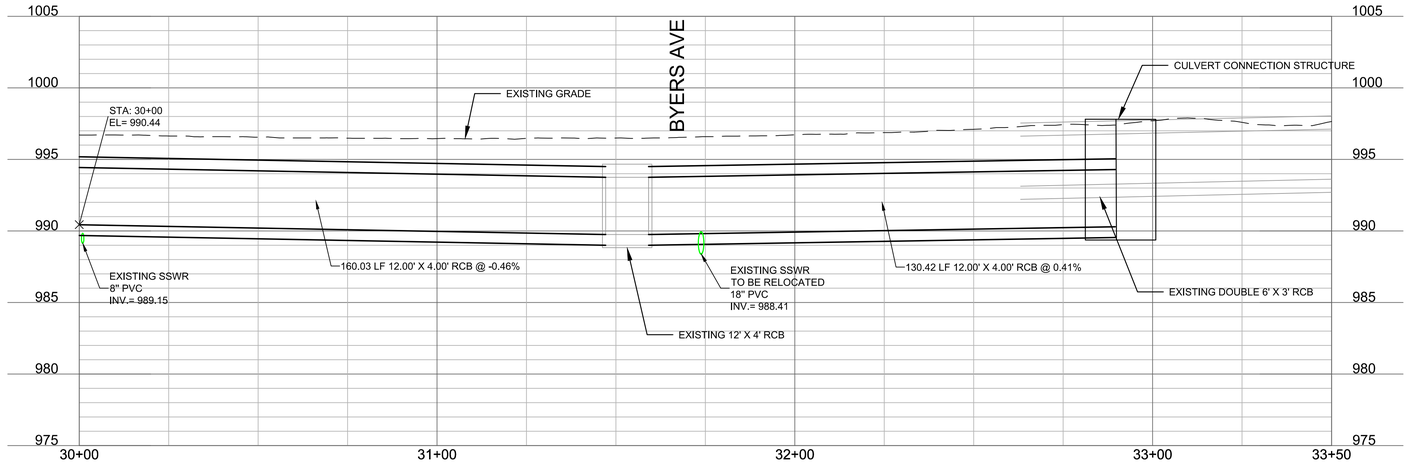
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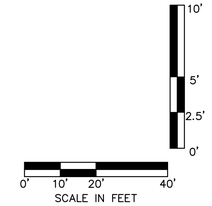
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WILLOW BRANCH REPLACEMENT CULVERT PLAN AND PROFILE

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

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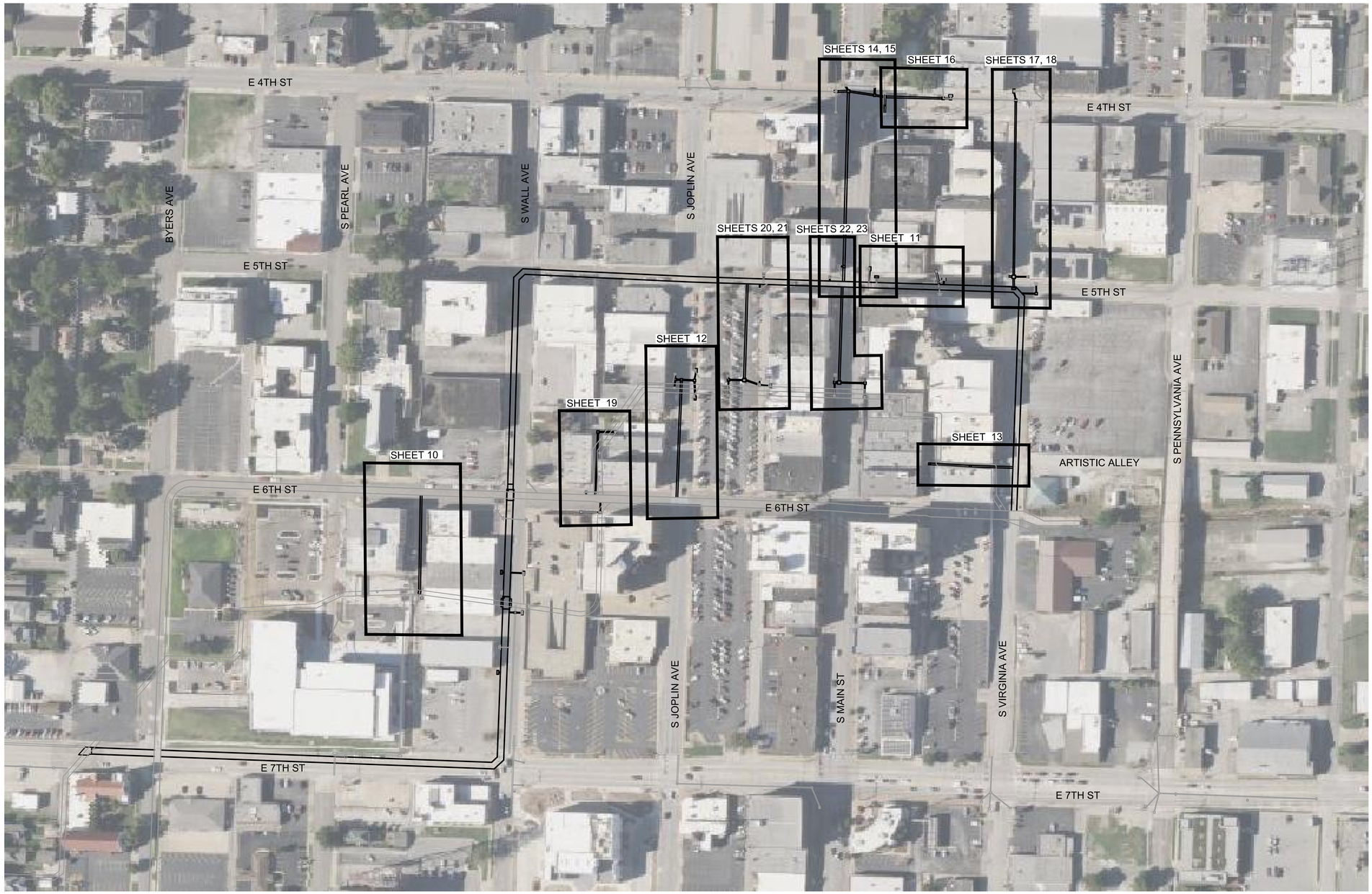
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STORM SEWER RELOCATION
GENERAL LAYOUT SHEET



N

0' 50' 100' 200'
SCALE IN FEET

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STORM SEWER GENERAL LAYOUT

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

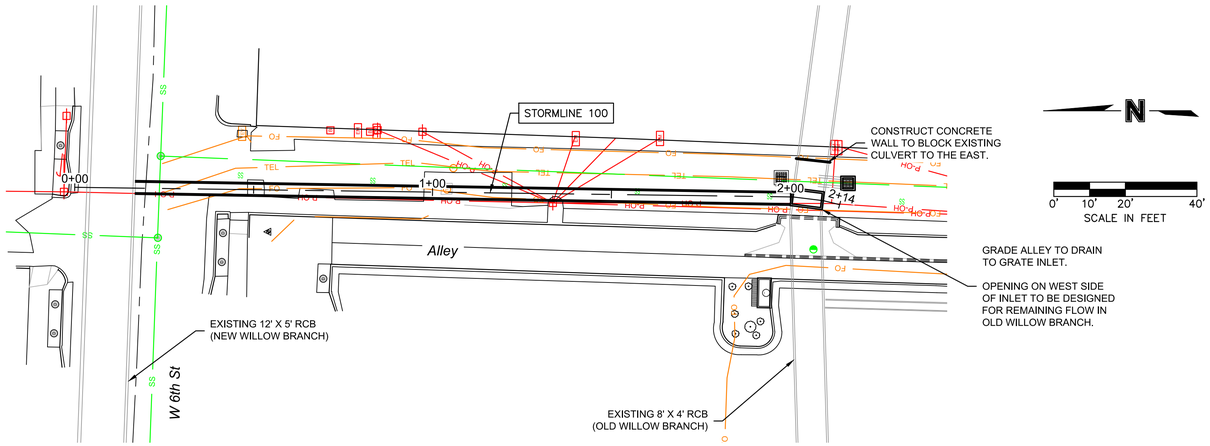
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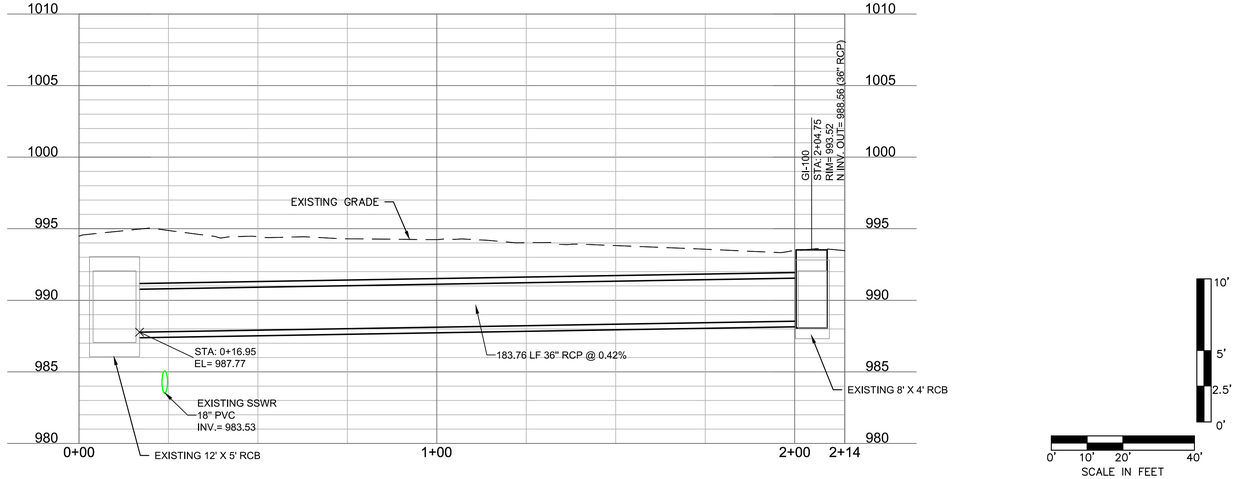
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STORMLINE 100 (0+00 - 2+14)



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REV. NO.	DATE	DESCRIPTION	BY

STORMLINE 100 PLAN & PROFILE

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

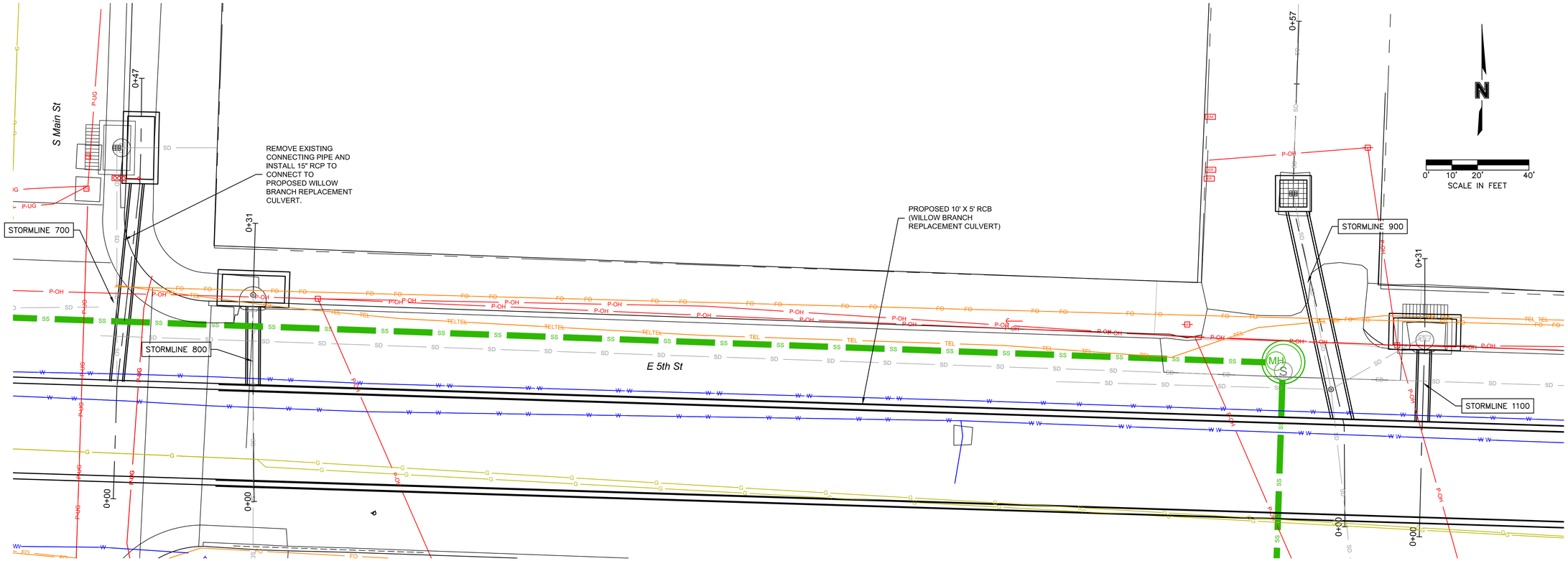
JOPLIN, MISSOURI

2026

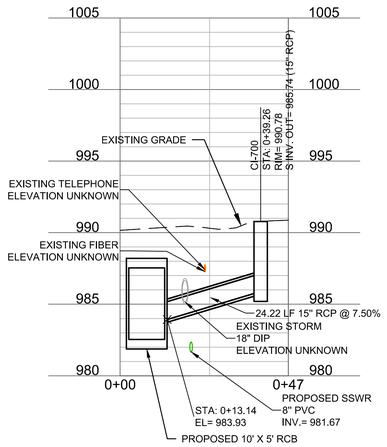
drawn by: ACW
designed by: EJS
project no.: B24-04647
date: 01.09.2026

SHEET
10 of 25

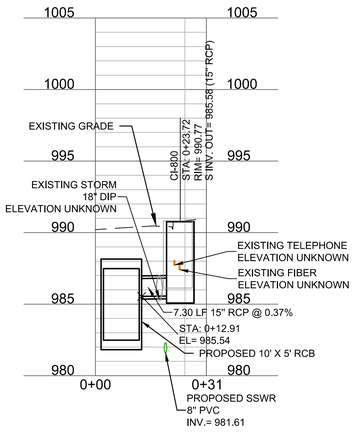
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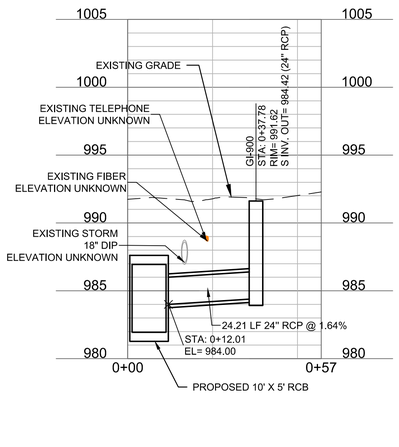
STORMLINE 700 (0+00 - 0+47)



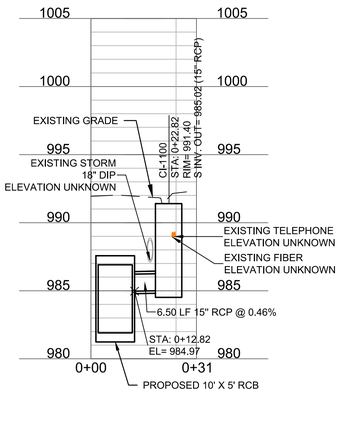
STORMLINE 800 (0+00 - 0+31)



STORMLINE 900 (0+00 - 0+57)

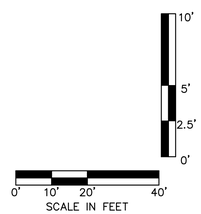


STORMLINE 1100 (0+00 - 0+31)



STRUCTURES	
ID	DESCRIPTION
CI-700	7'X3' JBOX 0+39.26, -0.03' L STORMLINE 700 RIM= 990.78 INV OUT = 985.74 (15" RCP) N: 335006.648; E: 2785129.066
CI-800	7'X3' JBOX 0+23.72, 0.00' STORMLINE 800 RIM= 990.77 INV OUT = 985.58 (15" RCP) N: 334990.944; E: 2785141.628
CI-1100	7'X3' JBOX 0+22.82, 0.00' STORMLINE 1100 RIM= 991.40 INV OUT = 985.02 (15" RCP) N: 334986.119; E: 2785272.106
GI-900	3' X 3' GRATE INLET 0+37.78, 0.00' STORMLINE 900 RIM= 991.62 INV OUT = 984.42 (24" RCP) N: 335001.549; E: 2785257.465

GENERAL NOTE: STRUCTURE COORDINATES ARE TO CENTER OF STRUCTURE.



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REV. NO.	DATE	DESCRIPTION	BY

STORMLINE 700, 800, 900, 1100 PLAN & PROFILE

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

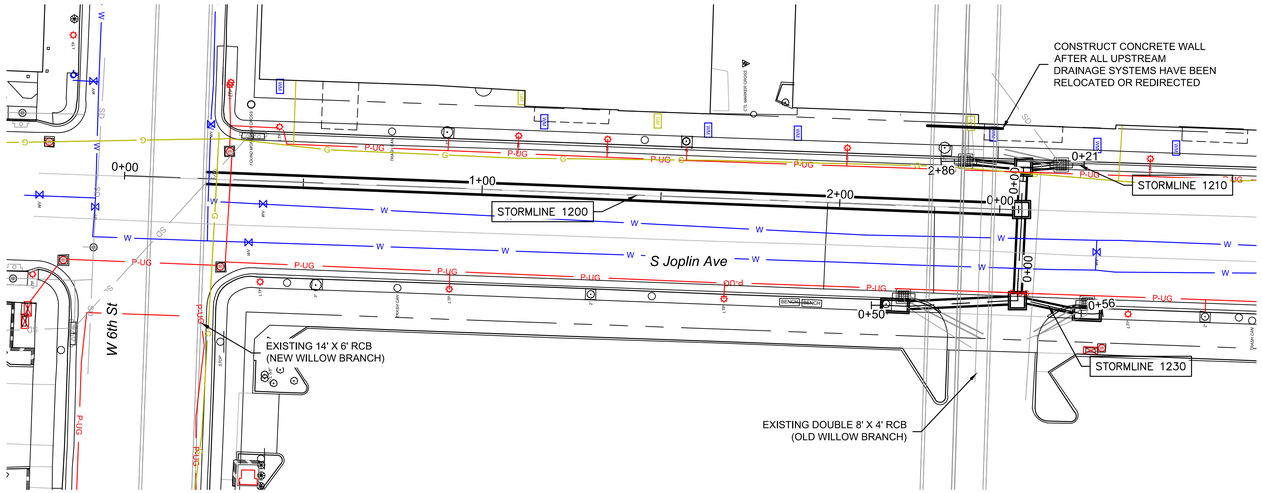
JOPLIN, MISSOURI

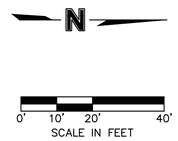
2026

drawn by: ACW
designed by: EJS
project no.: B24.04647
date: 01.09.2026

SHEET
11 of 25

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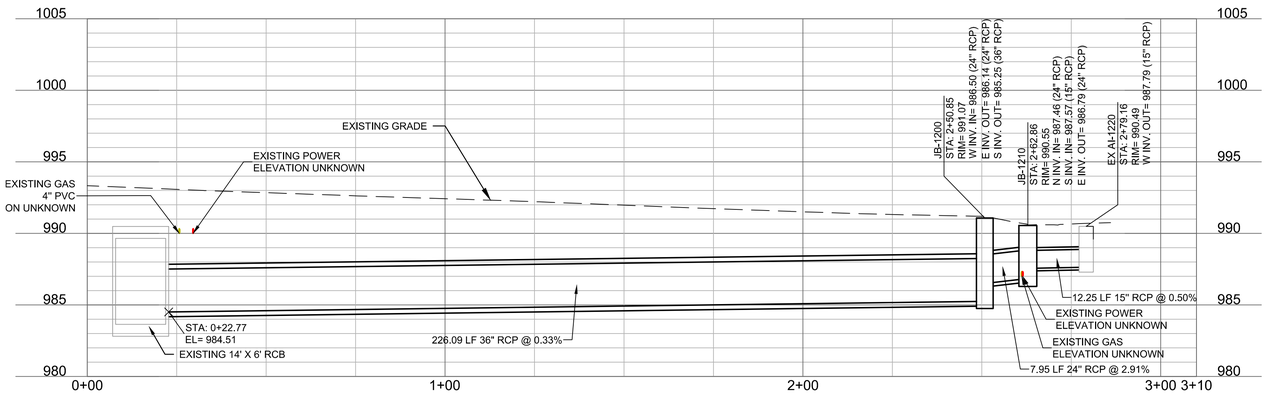




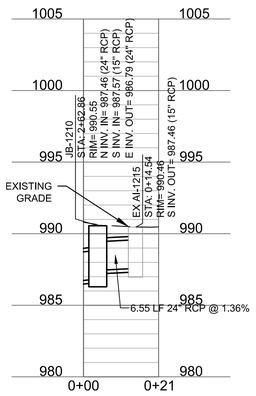
STRUCTURES	
ID	DESCRIPTION
CI-1240	7' X 3' CURB INLET 0+51.60, 0.00' STORMLINE 1230 RIM= 990.80 INV OUT = 987.16 (15" RCP) N: 334809.440; E: 2784792.167
CI-1250	7' X 3' CURB INLET 0+43.44, 0.00' STORMLINE 1250 RIM= 990.85 INV IN = 987.32 (24" RCP) N: 334755.766; E: 2784789.945
JB-1210	4' X 4' JUNCTION BOX 2+62.86, 0.00' STORMLINE 1200 RIM= 990.55 INV IN = 987.46 (24" RCP) INV IN = 987.57 (15" RCP) INV OUT = 986.79 (24" RCP) N: 334791.709; E: 2784751.178
JB-1230	4' X 4' JUNCTION BOX 0+31.75, 0.00' STORMLINE 1230 RIM= 990.37 INV IN = 986.24 (24" RCP) INV IN = 987.07 (15" RCP) INV OUT = 986.26 (24" RCP) N: 334789.999; E: 2784788.535

GENERAL NOTE: STRUCTURE COORDINATES ARE TO CENTER OF STRUCTURE.

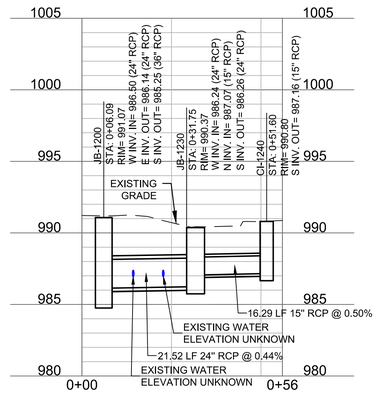
STORMLINE 1200 (0+00 - 3+10)

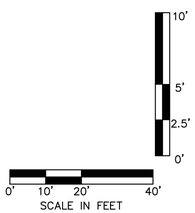


STORMLINE 1210 (0+00 - 0+21)



STORMLINE 1230 (0+00 - 0+56)





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STORMLINE 1200, 1210, 1230 PLAN & PROFILE

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

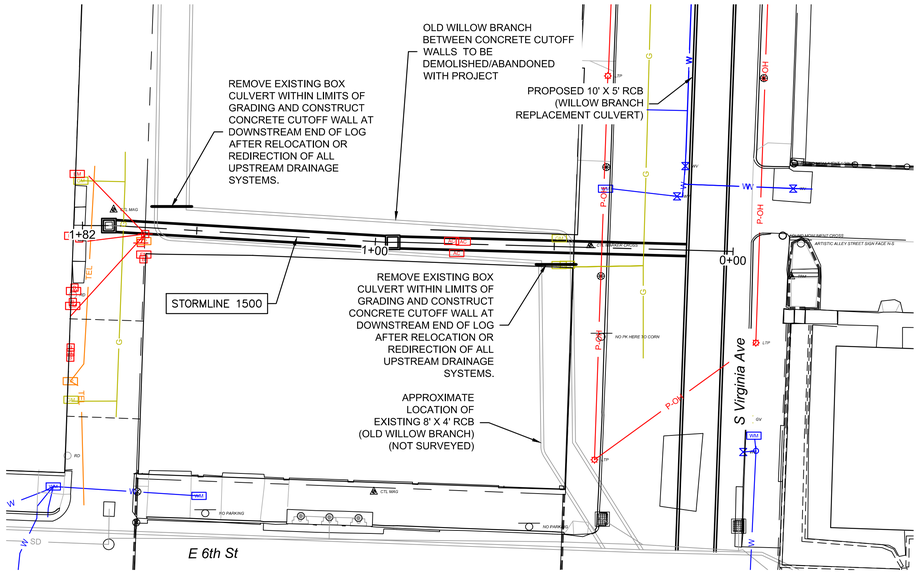
JOPLIN, MISSOURI

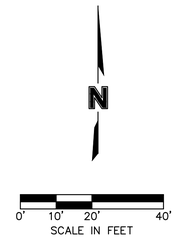
2026

drawn by: ACW
designed by: EJS
project no.: B24.04647
date: 01.09.2026

SHEET
12 of 25

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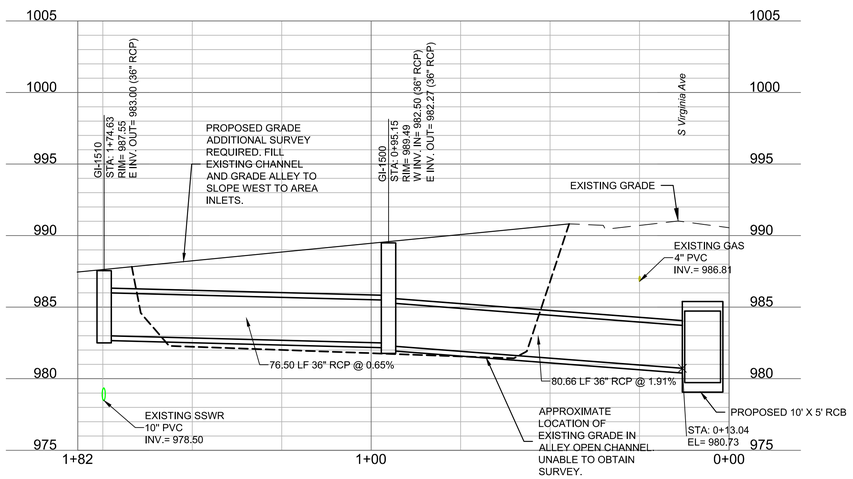




NOTE: ABANDONMENT, REMOVAL, AND FILLING OF EXISTING CONDUITS ON PRIVATE PROPERTY WILL BE THE RESPONSIBILITY OF PRIVATE PROPERTY OWNERS.

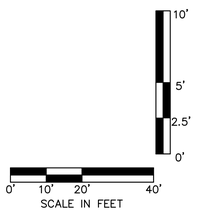
PUBLIC PROJECT WILL BLOCK OPENINGS ON UPSTREAM AND DOWNSTREAM ENDS OF PRIVATE BUILDINGS AFTER ALL UPSTREAM DRAINAGE SYSTEMS HAVE BEEN RELOCATED OR REDIRECTED.

STORMLINE 1500 (0+00 - 1+82)



STRUCTURES	
ID	DESCRIPTION
GI-1500	3' X 3' GRATE INLET 0+95.15, 0.00' L STORMLINE 1500 RIM= 989.49 INV IN = 982.50 (36" RCP) INV OUT = 982.27 (36" RCP) N: 334623.399; E: 2785323.435
GI-1510	3' X 3' GRATE INLET 1+74.63, 0.00' STORMLINE 1500 RIM= 987.55 INV OUT = 983.00 (36" RCP) N: 334628.075; E: 2785244.094

GENERAL NOTE: STRUCTURE COORDINATES ARE TO CENTER OF STRUCTURE.



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Springfield, MO 65806

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REVISIONS

STORMLINE 1500 PLAN & PROFILE

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

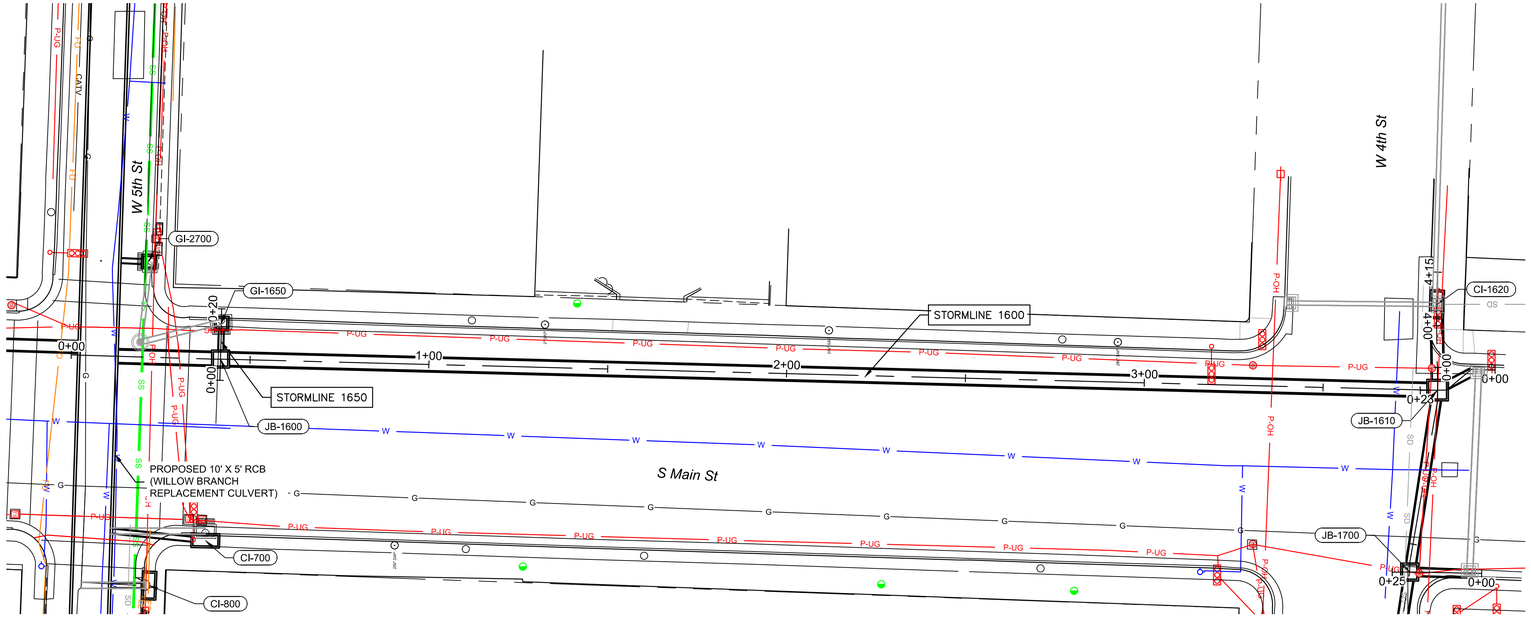
JOPLIN, MISSOURI

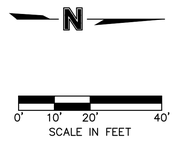
2026

drawn by: ACW
designed by: EJS
project no.: B24.04647
date: 01.09.2026

SHEET
13 of 25

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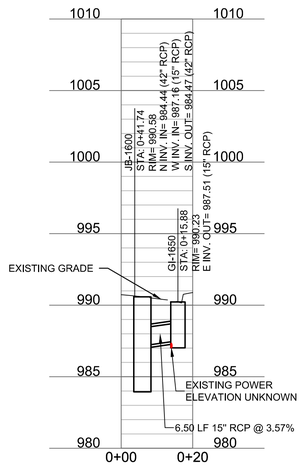




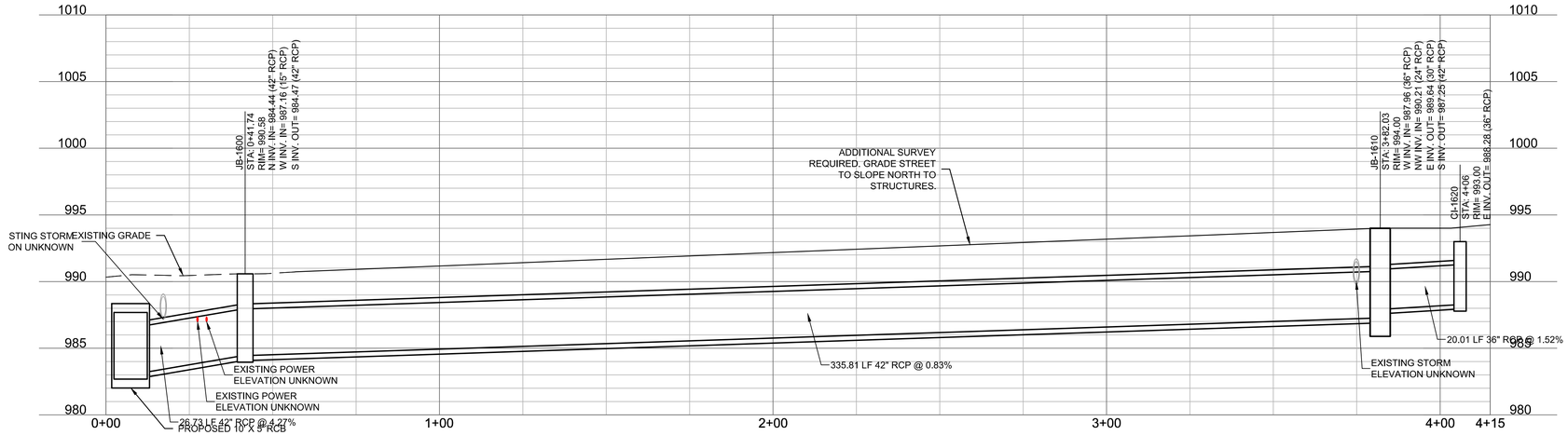
STRUCTURES	
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CI-1620	7' X 3' CURB INLET 4+06 STORMLINE 1600 RIM= 993.00 INV OUT = 988.28 (36" RCP) N: 335350.845; E: 2785063.040
GI-1650	3' X 3' GRATE INLET 0+15.88 STORMLINE 1650 RIM= 990.23 INV OUT = 987.51 (15" RCP) N: 335011.140; E: 2785068.388
JB-1600	4' X 4' JUNCTION BOX 0+41.74 STORMLINE 1600 RIM= 990.58 INV IN = 984.44 (42" RCP) INV IN = 987.16 (15" RCP) INV OUT = 984.47 (42" RCP) N: 335010.892; E: 2785078.328
JB-1610	5' X 5' JUNCTION BOX 3+82.03 STORMLINE 1600 RIM= 994.00 INV IN = 987.96 (36" RCP) INV IN = 990.21 (24" RCP) INV OUT = 989.64 (30" RCP) INV OUT = 987.25 (42" RCP) N: 335351.055; E: 2785086.996

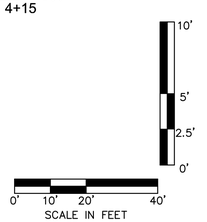
GENERAL NOTE: STRUCTURE COORDINATES ARE TO CENTER OF STRUCTURE.

STORMLINE 1650 (0+00 - 0+20)



STORMLINE 1600 (0+00 - 4+15)





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Springfield, MO 65806

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TEL 417.890.8802
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REV. NO.	DATE	DESCRIPTION	BY

STORMLINE 1600, 1650 PLAN & PROFILE

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

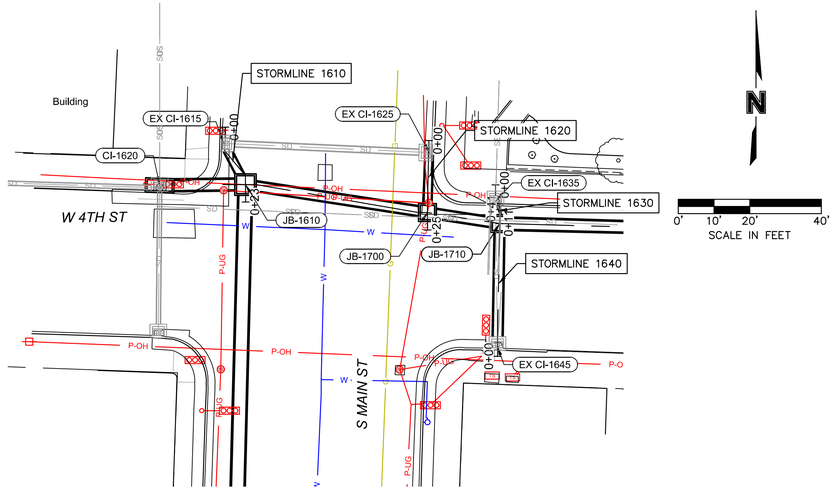
JOPLIN, MISSOURI

2026

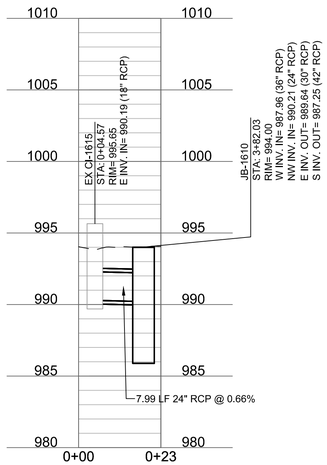
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designed by: EJS
project no.: B24.04647
date: 01.09.2026

SHEET
14 of 25

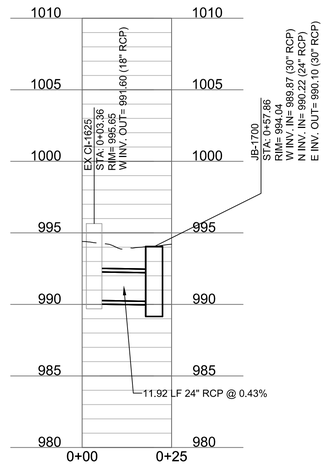
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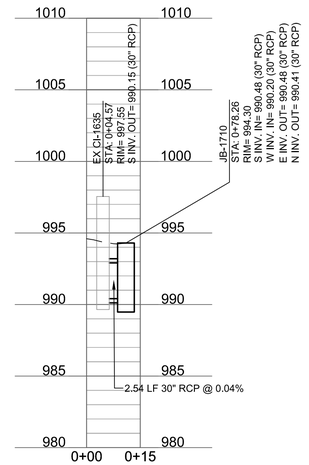
STORMLINE 1610 (0+00 - 0+23)



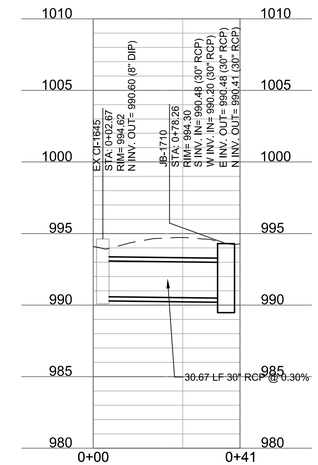
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STORMLINE 1630 (0+00 - 0+15)

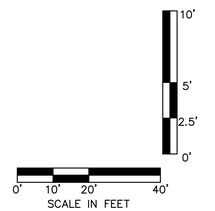


STORMLINE 1640 (0+00 - 0+41)



STRUCTURES	
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JB-1710	4' X 4' JUNCTION BOX 0+78.26 STORMLINE 1700 RIM= 994.30 INV IN = 990.48 (30" RCP) INV IN = 990.20 (30" RCP) INV OUT = 990.48 (30" RCP) INV OUT = 990.41 (30" RCP) N: 335340.172; E: 2785158.027

GENERAL NOTE: STRUCTURE COORDINATES ARE TO CENTER OF STRUCTURE.



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STORMLINE 1610, 1620, 1660, 1670 PLAN & PROFILE

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

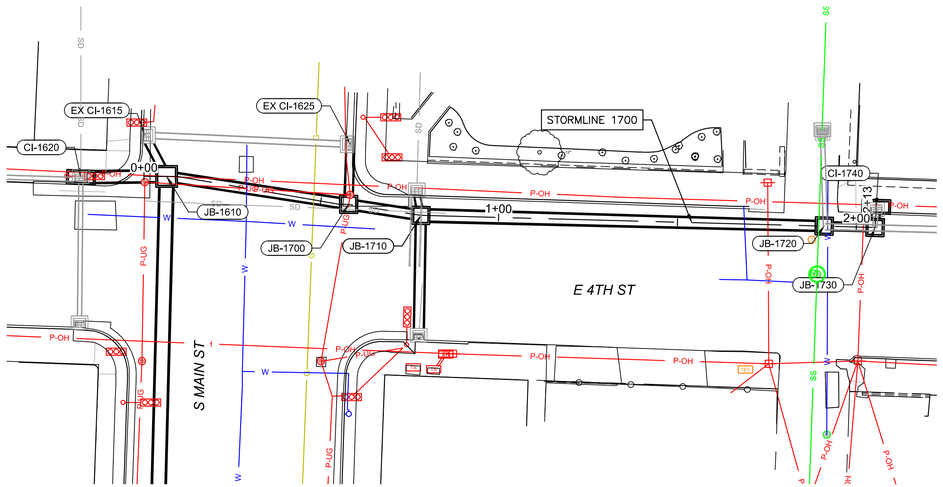
JOPLIN, MISSOURI

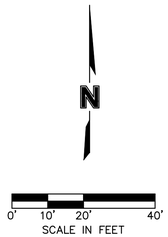
2026

drawn by: ACW
designed by: EJS
project no.: B24-04647
date: 01.09.2026

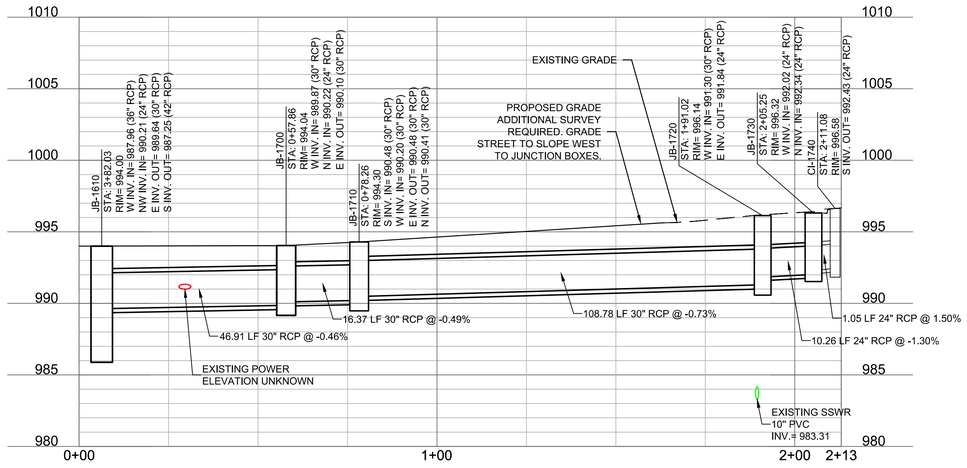
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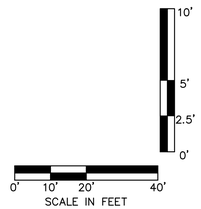


STORMLINE 1700 (0+00 - 2+13)



STRUCTURES	
ID	DESCRIPTION
CI-1740	7' X 3' CURB INLET 2+11.08 STORMLINE 1700 RIM= 996.58 INV OUT = 992.43 (24" RCP) N: 335342.611; E: 2785285.289
JB-1700	4' X 4' JUNCTION BOX 0+57.86 STORMLINE 1700 RIM= 994.04 INV IN = 989.87 (30" RCP) INV IN = 990.22 (24" RCP) INV OUT = 990.10 (30" RCP) N: 335343.262; E: 2785137.859
JB-1720	4' X 4'JUNCTION BOX 1+91.02 STORMLINE 1700 RIM= 996.14 INV IN = 991.30 (30" RCP) INV OUT = 991.84 (24" RCP) N: 335337.171; E: 2785270.748
JB-1730	4' X 4' JUNCTION BOX 2+05.25 STORMLINE 1700 RIM= 996.32 INV IN = 992.02 (24" RCP) INV IN = 992.34 (24" RCP) N: 335336.792; E: 2785284.969

GENERAL NOTE: STRUCTURE COORDINATES ARE TO CENTER OF STRUCTURE.



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REV. NO.	DATE	DESCRIPTION	BY

STORMLINE 1700 PLAN & PROFILE

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

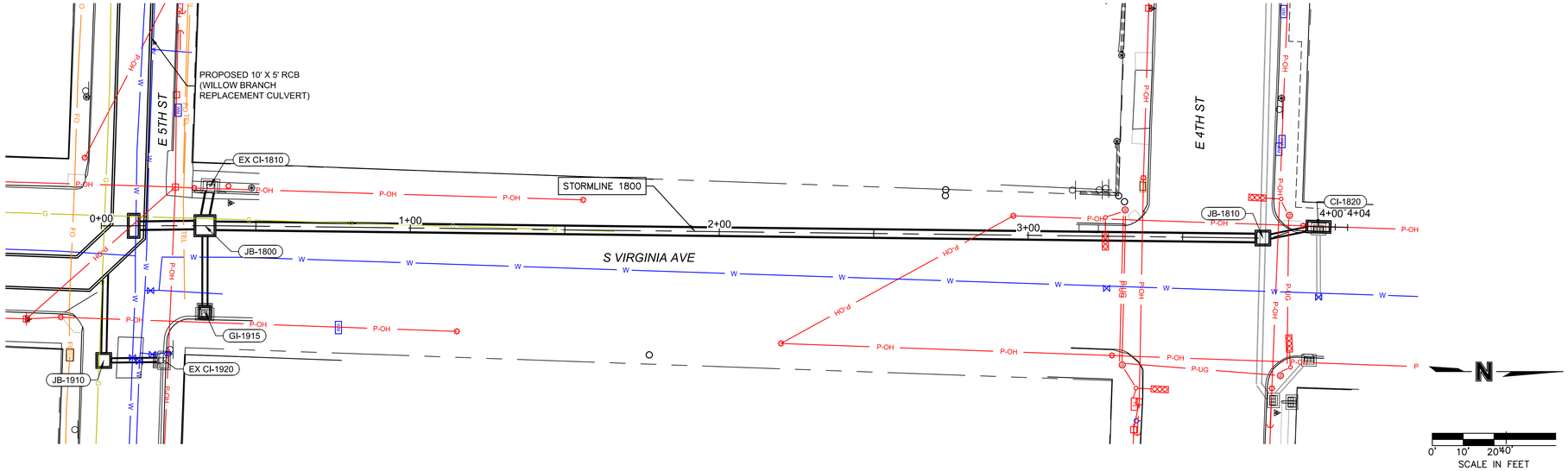
JOPLIN, MISSOURI

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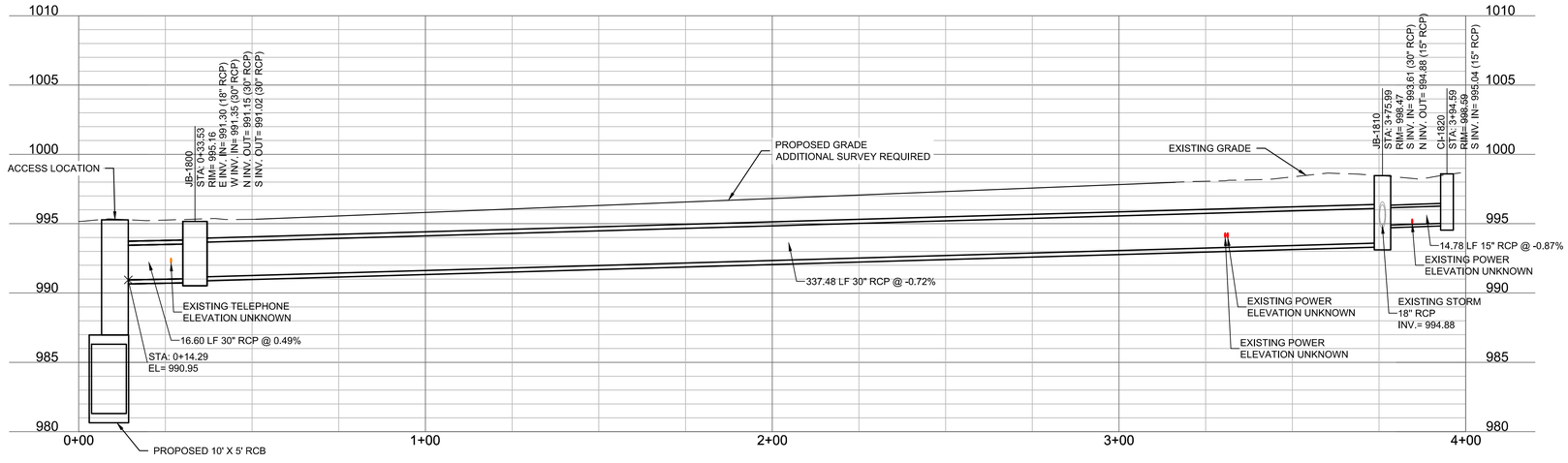
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designed by: EJS
project no.: B24.04647
date: 01.09.2026

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16 of 25

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STORMLINE 1800 (0+00 - 4+00)



STRUCTURES	
ID	DESCRIPTION
CI-1820	7' X 3' CURB INLET 3+94.59, 0.00' STORMLINE 1800 RIM= 998.59 INV IN = 995.04 (15" RCP) N: 335351.471; E: 2785407.895
JB-1800	6' X 6' JUNCTION BOX 0+33.53, 0.00' STORMLINE 1800 RIM= 995.16 INV IN = 991.30 (18" RCP) INV IN = 991.35 (30" RCP) INV OUT = 991.15 (30" RCP) INV OUT = 991.02 (30" RCP) N: 334991.044; E: 2785407.553
JB-1810	4' X 4' JUNCTION BOX 3+75.99, 0.00' R STORMLINE 1800 RIM= 998.47 INV IN = 993.61 (30" RCP) INV OUT = 994.88 (15" RCP) N: 335333.480; E: 2785411.571

GENERAL NOTE: STRUCTURE COORDINATES ARE TO CENTER OF STRUCTURE.

10'
5'
2.5'
0'
0' 10' 20' 40'
SCALE IN FEET

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STORMLINE 1800 PLAN & PROFILE

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

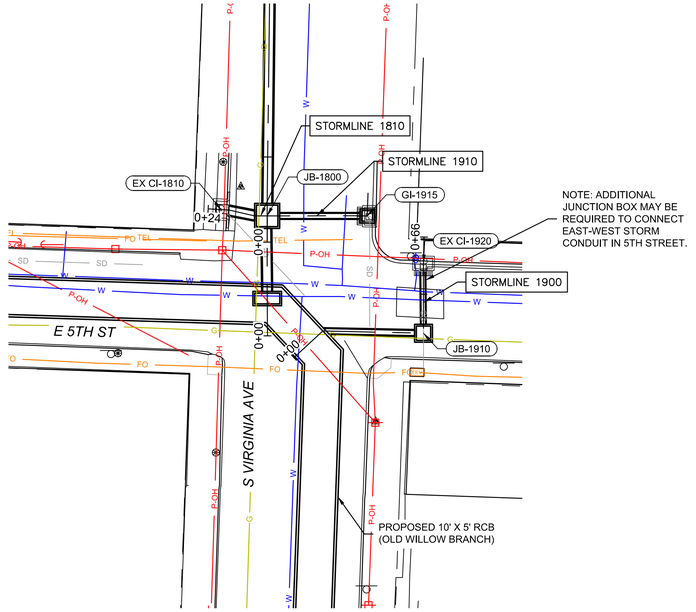
JOPLIN, MISSOURI

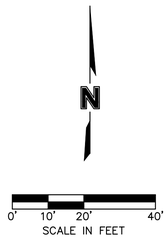
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designed by: EJS
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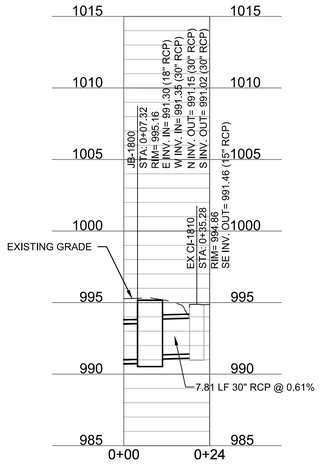
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17 of 25

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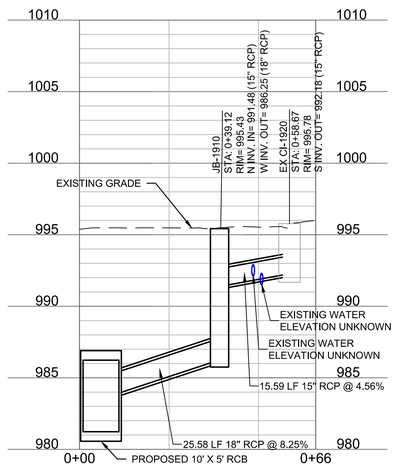




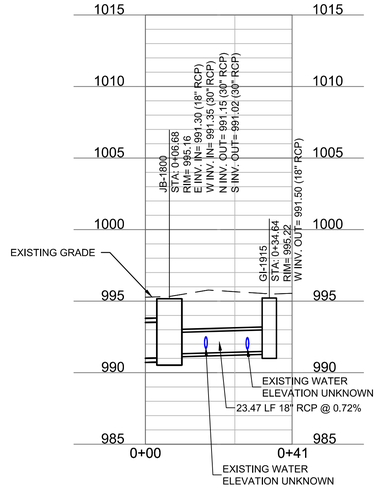
STORMLINE 1810 (0+00 - 0+24)



STORMLINE 1900 (0+00 - 0+66)

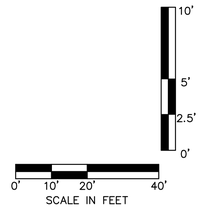


STORMLINE 1910 (0+00 - 0+41)



STRUCTURES	
ID	DESCRIPTION
GI-1915	3' X 3' GRATE INLET 0+34.64, 0.00' STORMLINE 1910 RIM= 995.22 INV OUT = 991.50 (18" RCP) N: 334991.027; E: 2785435.512
JB-1800	6' X 6' JUNCTION BOX 0+33.53, 0.00' STORMLINE 1800 RIM= 995.16 INV IN = 991.30 (18" RCP) INV IN = 991.35 (30" RCP) INV OUT = 991.15 (30" RCP) INV OUT = 991.02 (30" RCP) N: 334991.044; E: 2785407.553
JB-1910	4' X 4' JUNCTION BOX 0+39.12, 0.00' STORMLINE 1900 RIM= 995.43 INV IN = 991.48 (15" RCP) INV OUT = 986.25 (18" RCP) N: 334958.271; E: 2785451.228

GENERAL NOTE: STRUCTURE COORDINATES ARE TO CENTER OF STRUCTURE.



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STORMLINE 1900, 1910 PLAN & PROFILE

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

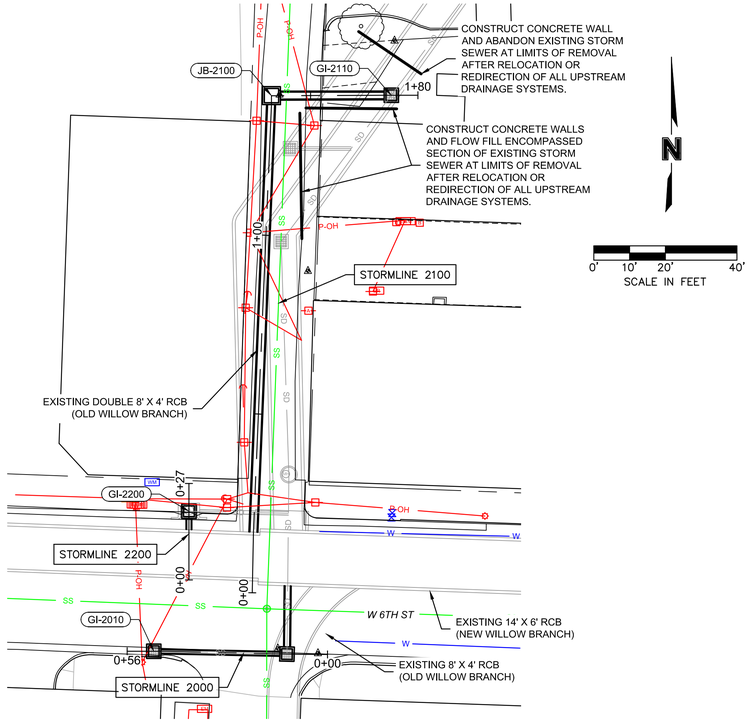
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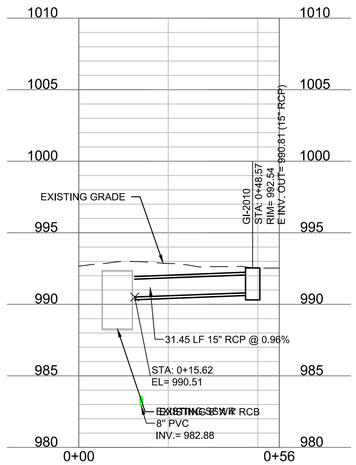
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project no.: B24-04647
date: 01.09.2026

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18 of 25

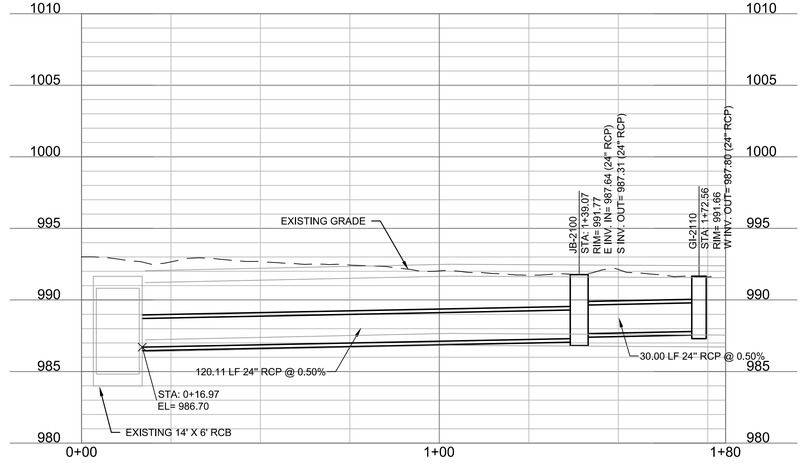
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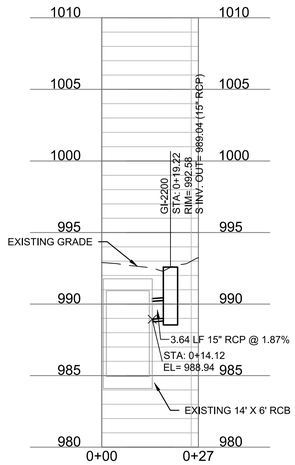
STORMLINE 2000 (0+00 - 0+56)



STORMLINE 2100 (0+00 - 1+80)



STORMLINE 2200 (0+00 - 0+27)



STRUCTURES	
ID	DESCRIPTION
GI-2010	3' X 3' GRATE INLET 0+48.57, 0.00' STORMLINE 2000 RIM= 992.54 INV OUT = 990.81 (15" RCP) N: 334534.652; E: 2784568.500
GI-2110	3' X 3' GRATE INLET 1+72.56, 0.00' STORMLINE 2100 RIM= 991.66 INV OUT = 987.80 (24" RCP) N: 334690.098; E: 2784634.870
GI-2200	3' X 3' GRATE INLET 0+19.22, 0.00' STORMLINE 2200 RIM= 992.58 INV OUT = 989.04 (15" RCP) N: 334573.800; E: 2784578.333
JB-2100	4' X 4' JUNCTION BOX 1+39.07, 0.00' STORMLINE 2100 RIM= 991.77 INV IN = 987.64 (24" RCP) INV OUT = 987.31 (24" RCP) N: 334689.981; E: 2784601.386

GENERAL NOTE: STRUCTURE COORDINATES ARE TO CENTER OF STRUCTURE.

10' 5' 2.5' 0'
0' 10' 20' 40'
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STORMLINE 2000, 2100, 2200 PLAN & PROFILE

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

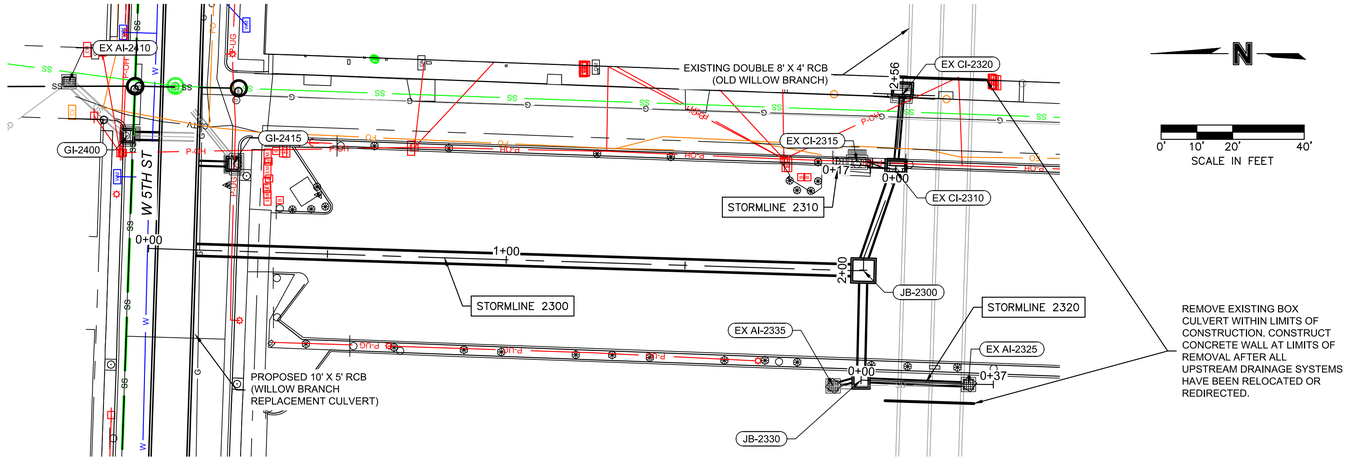
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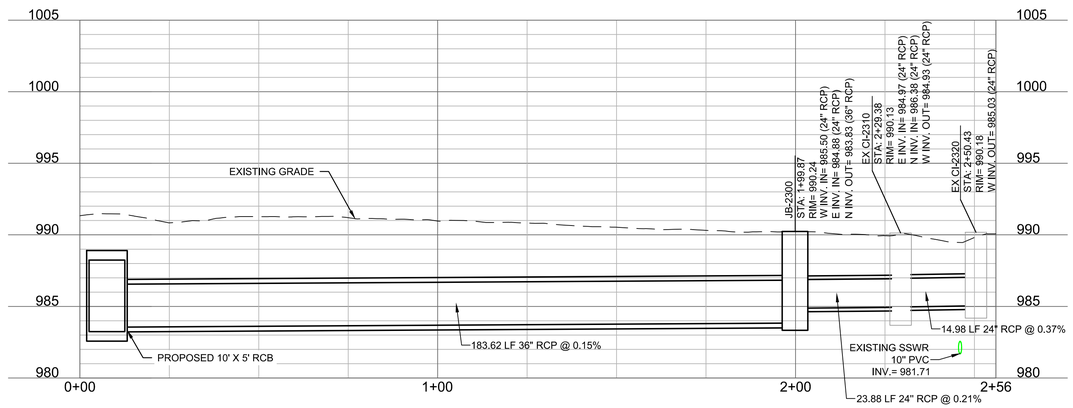
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designed by: EJS
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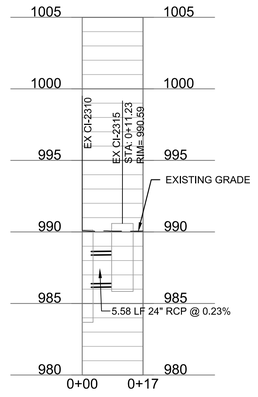
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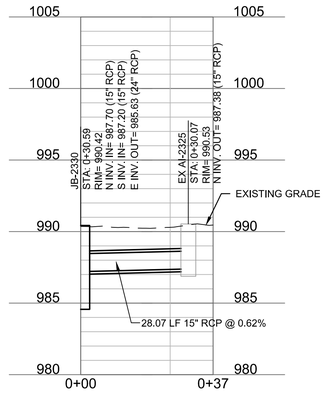
STORMLINE 2300 (0+00 - 2+56)



STORMLINE 2310 (0+00 - 0+17)

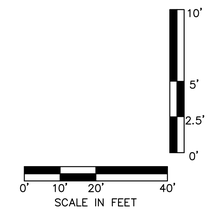


STORMLINE 2320 (0+00 - 0+37)



STRUCTURES	
ID	DESCRIPTION
JB-2300	6' X 6' JUNCTION BOX 1+99.87, 0.00' STORMLINE 2300 RIM= 990.24 INV IN = 985.50 (24" RCP) INV IN = 984.88 (24" RCP) INV OUT = 983.83 (36" RCP) N: 334790.501; E: 2784885.100
JB-2330	4' X 4' JUNCTION BOX 0+30.59, 0.00' STORMLINE 2330 RIM= 990.42 INV IN = 987.70 (15" RCP) INV IN = 987.20 (15" RCP) INV OUT = 985.63 (24" RCP) N: 334791.175; E: 2784854.518

GENERAL NOTE: STRUCTURE COORDINATES ARE TO CENTER OF STRUCTURE.



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STORMLINE 2300, 2310, 2320 PLAN & PROFILE

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

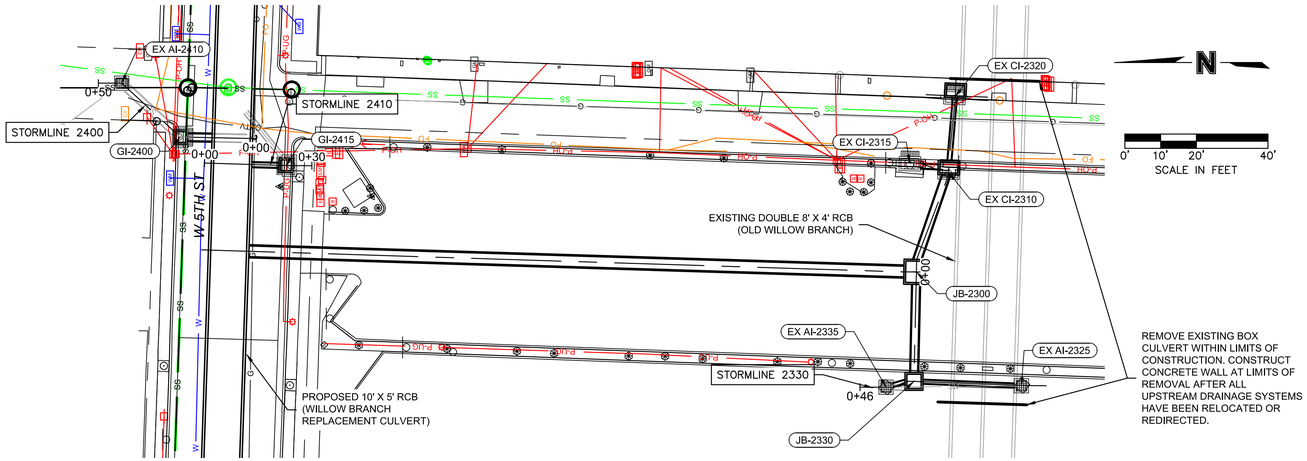
JOPLIN, MISSOURI

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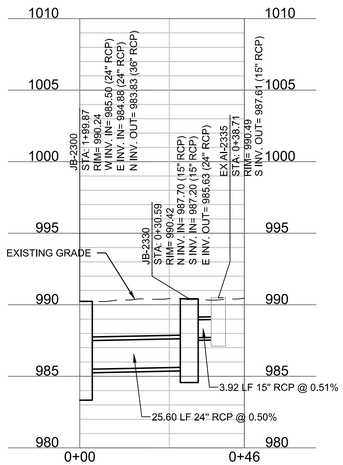
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designed by: EJS
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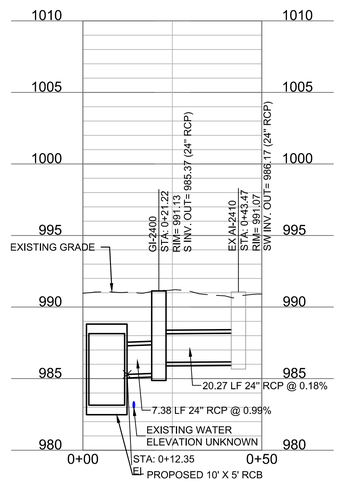
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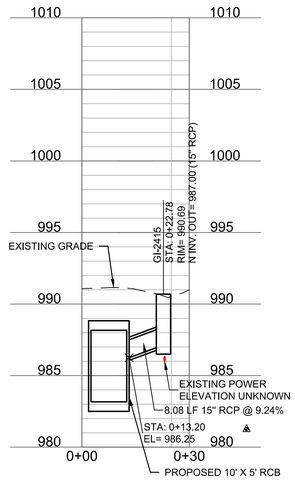
STORMLINE 2330 (0+00 - 0+46)



STORMLINE 2400 (0+00 - 0+50)

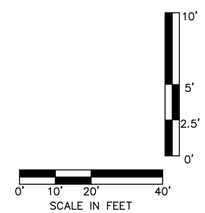


STORMLINE 2410 (0+00 - 0+30)



STRUCTURES	
ID	DESCRIPTION
GI-2400	3' X 3' GRATE INLET 0+21.22, 0.00' STORMLINE 2400 RIM= 991.13 INV OUT = 985.37 (24" RCP) N: 334996.200; E: 2784922.811
GI-2415	3' X 3' GRATE INLET 0+22.78, -0.05' L STORMLINE 2410 RIM= 990.69 INV OUT = 987.00 (15" RCP) N: 334966.650; E: 2784914.888

GENERAL NOTE: STRUCTURE COORDINATES ARE TO CENTER OF STRUCTURE.



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STORMLINE 2330, 2400, 2410 PLAN & PROFILE

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

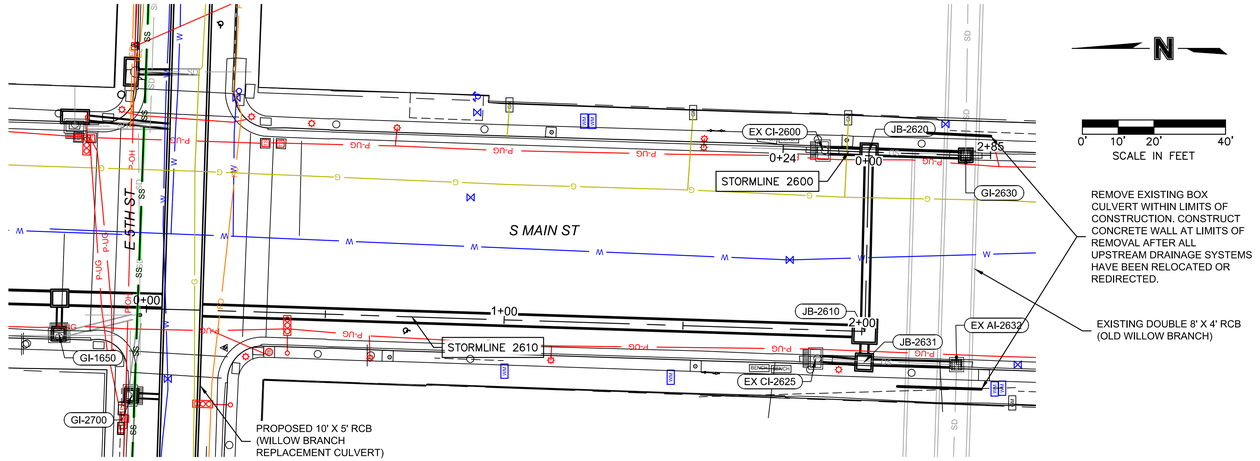
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2026

drawn by: ACW
designed by: EJS
project no.: B24-04647
date: 01.09.2026

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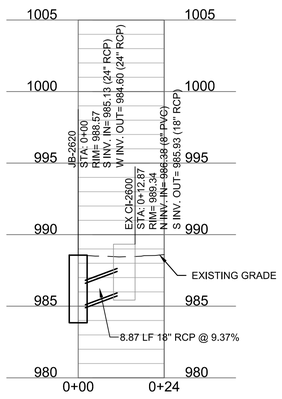
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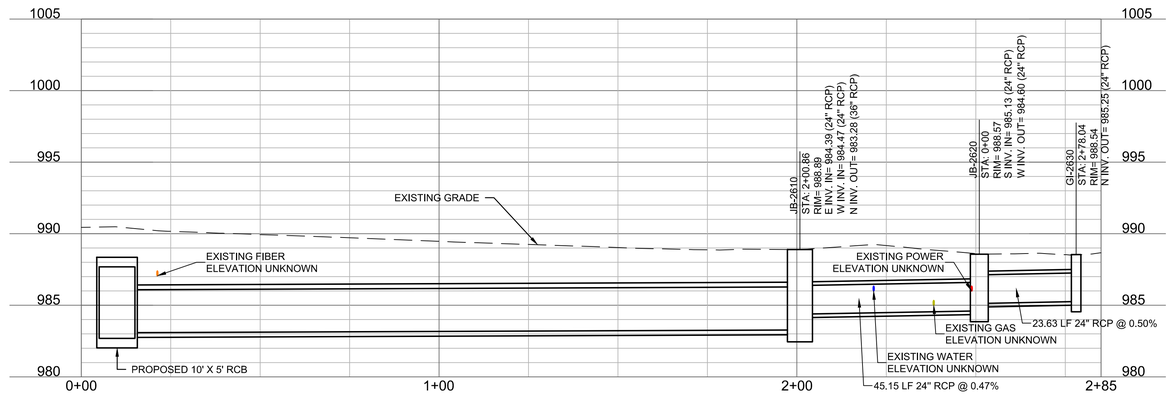
N

0' 10' 20' 40'
SCALE IN FEET

STORMLINE 2600 (0+00 - 0+24)



STORMLINE 2610 (0+00 - 2+85)



STRUCTURES	
ID	DESCRIPTION
GI-2630	3' X 3' GRATE INLET 2+78.04, +0.02' L STORMLINE 2610 RIM= 988.54 INV OUT = 985.25 (24" RCP) N: 334757.710; E: 2785118.251
JB-2610	6' X 6' JUNCTION BOX 2+00.86, 0.00' STORMLINE 2610 RIM= 988.89 INV IN = 984.39 (24" RCP) INV IN = 984.47 (24" RCP) INV OUT = 983.28 (36" RCP) N: 334785.899; E: 2785069.047
JB-2620	4' X 4' JUNCTION BOX 0+00, 0.00' L STORMLINE 2600 RIM= 988.57 INV IN = 985.13 (24" RCP) INV OUT = 984.60 (24" RCP) N: 334784.739; E: 2785119.170
JB-2631	4' X 4' JUNCTION BOX 0+08.66, 0.00' STORMLINE 2630 RIM= 989.03 INV IN = 984.95 (24" RCP) INV IN = 985.00 (24" RCP) INV OUT = 984.50 (24" RCP) N: 334786.110; E: 2785060.389

GENERAL NOTE: STRUCTURE COORDINATES ARE TO CENTER OF STRUCTURE.

10'
5'
2.5'
0'
0' 10' 20' 40'
SCALE IN FEET

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REV. NO.	DATE	DESCRIPTION	BY

STORMLINE 2500, 2600, 2610 PLAN & PROFILE

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

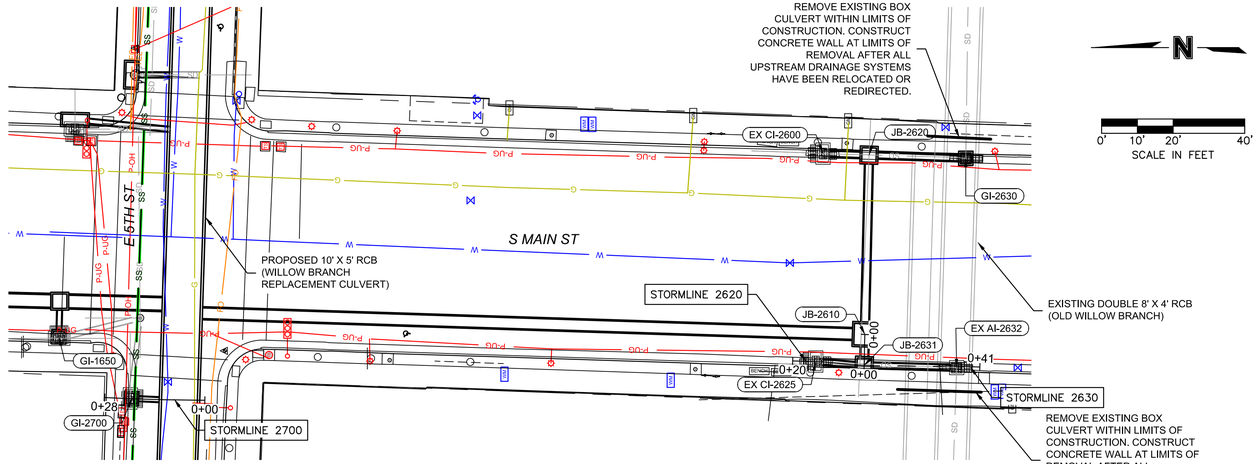
JOPLIN, MISSOURI

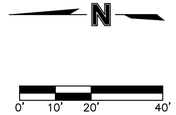
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designed by: EJS
project no.: B24-04647
date: 01.09.2026

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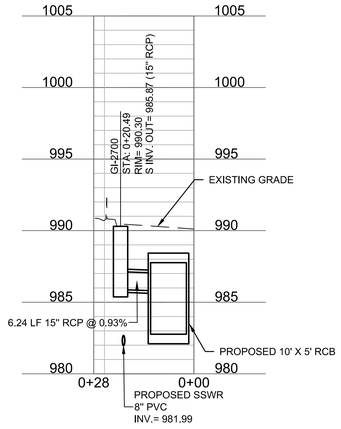




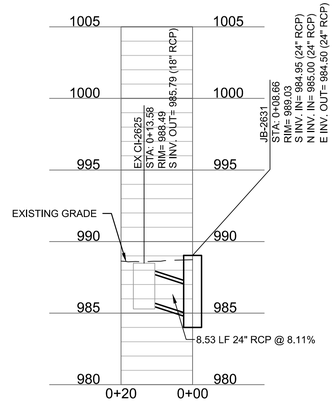
NOTE: ABANDONMENT, REMOVAL, AND FILLING OF EXISTING CONDUITS ON PRIVATE PROPERTY WILL BE RESPONSIBILITY OF PRIVATE PROPERTY OWNERS.

PUBLIC PROJECT WILL BLOCK OPENINGS ON UPSTREAM AND DOWNSTREAM ENDS OF PRIVATE BUILDINGS AFTER ALL UPSTREAM DRAINAGE SYSTEMS HAVE BEEN RELOCATED OR REDIRECTED.

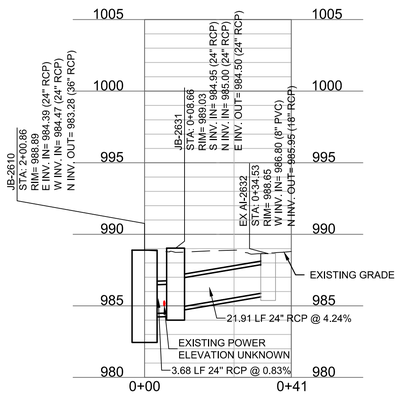
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STORMLINE 2620 (0+00 - 0+20)

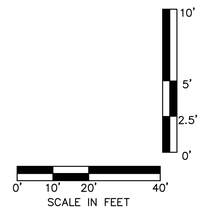


STORMLINE 2630 (0+00 - 0+41)



STRUCTURES	
ID	DESCRIPTION
GI-2700	3' X 3' GRATE INLET 0+20.49, 0.03' R STORMLINE 2700 RIM= 990.30 INV OUT = 985.87 (15" RCP) N: 334990.837; E: 2785051.116
JB-2631	4' X 4' JUNCTION BOX 0+08.66, 0.00' STORMLINE 2630 RIM= 989.03 INV IN = 984.95 (24" RCP) INV IN = 985.00 (24" RCP) INV OUT = 984.50 (24" RCP) N: 334786.110; E: 2785060.389

GENERAL NOTE: STRUCTURE COORDINATES ARE TO CENTER OF STRUCTURE.



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Springfield, MO 65806

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FAX 417.890.8805

Olsson - Engineering
Missouri COA #001592

NOT FOR CONSTRUCTION

REVISIONS

REV. NO.	DATE	DESCRIPTION	BY

STORMLINE 2620, 2630, 2700 PLAN & PROFILE

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

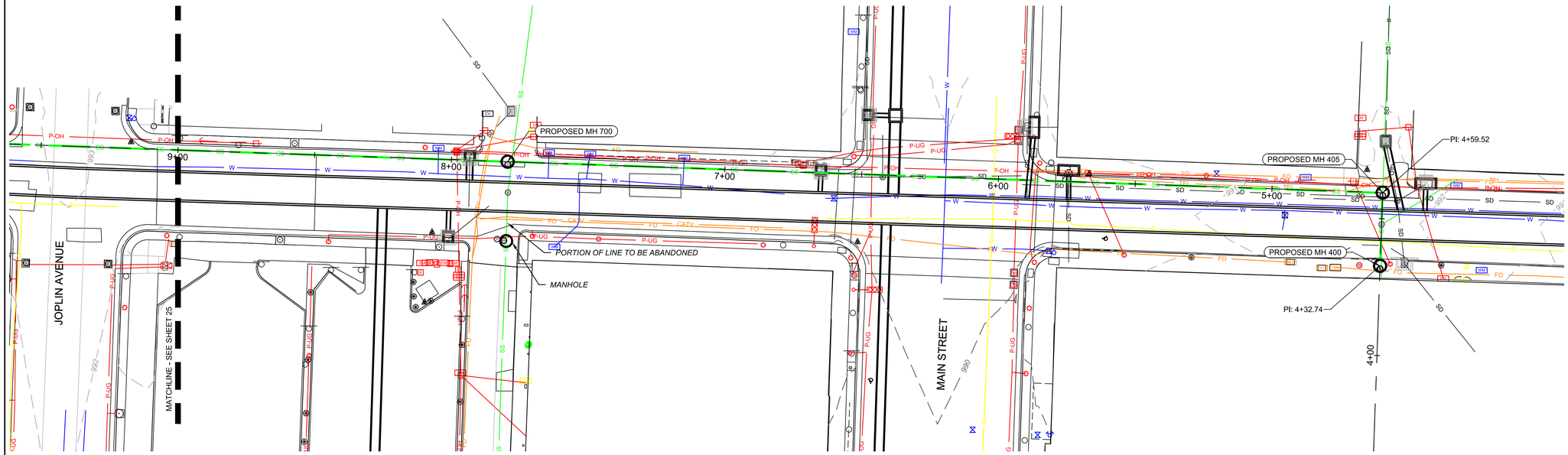
JOPLIN, MISSOURI

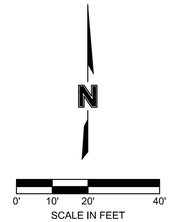
2026

drawn by: ACW
designed by: EJS
project no.: B24.04647
date: 01.09.2026

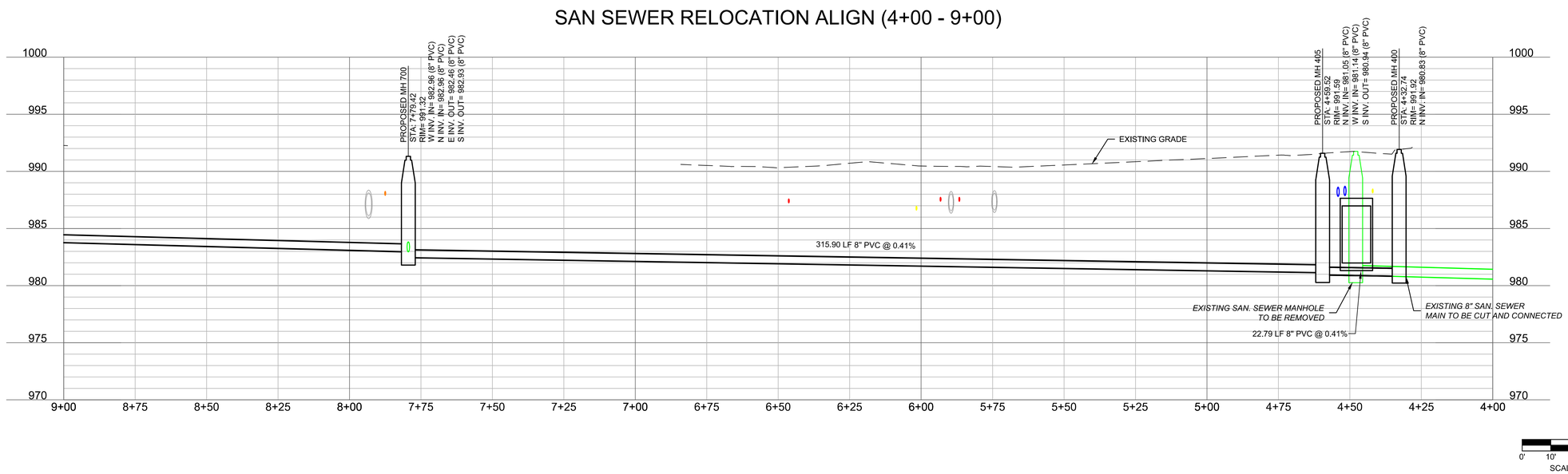
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23 of 25

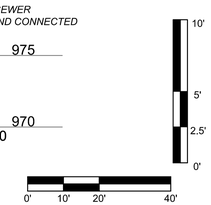
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SAN SEWER RELOCATION ALIGN (4+00 - 9+00)







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Missouri COA #001592

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REVISIONS

REV. NO.	DATE	DESCRIPTION	BY

SANITARY SEWER RELOCATION 4+00 - 9+00

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

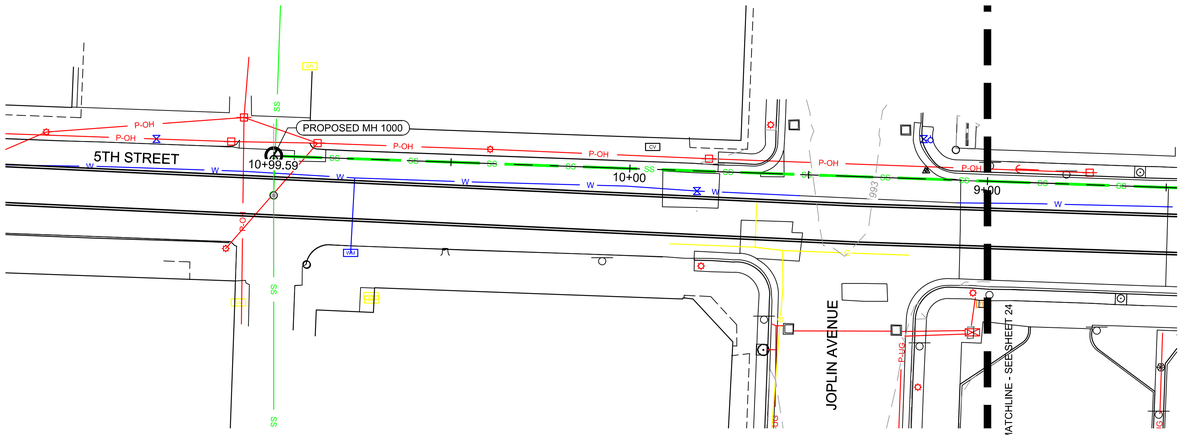
JOPLIN, MISSOURI

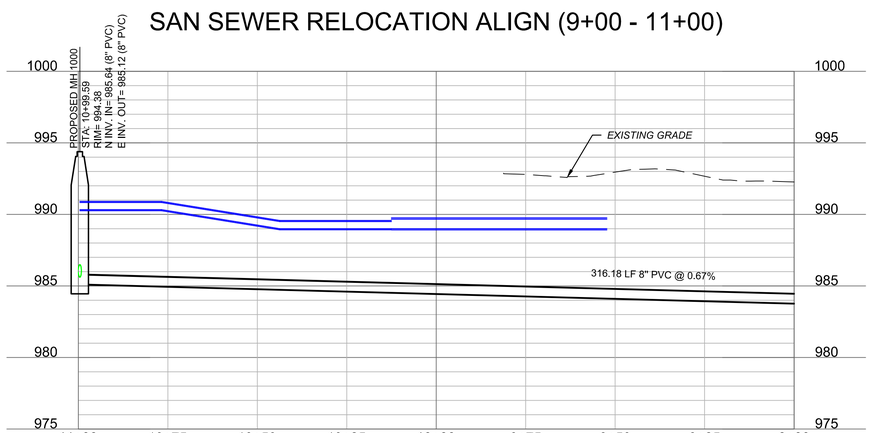
2026

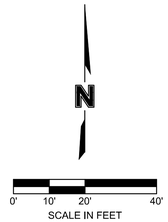
drawn by: ACW
designed by: EJS
project no.: B24.04647
date: 01.09.2026

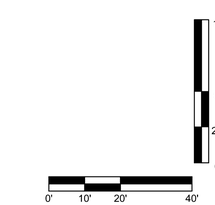
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DATE: Jan 19, 2026 12:41pm USER: lmcdonald









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550 East St. Louis Street
Springfield, MO 65806

olsson.com
TEL 417.890.8802
FAX 417.890.8805

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Missouri COA #001592

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REVISIONS

REV. NO.	DATE	DESCRIPTION	BY

SANITARY SEWER RELOCATION 9+00 - 11+00

WILLOW BRANCH CULVERT REPLACEMENT
STORMWATER IMPROVEMENT PLANS

JOPLIN, MISSOURI

2026

drawn by: ACW
designed by: EJS
project no.: B24.04647
date: 01.09.2026

SHEET
25 of 25

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APPENDIX F

Geotechnical Reports and Logs

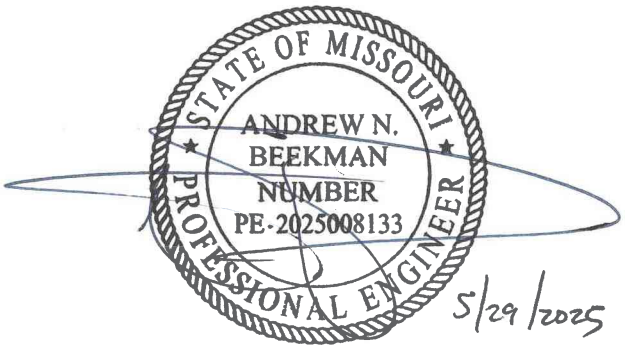
GEOTECHNICAL ENGINEERING REPORT

Old Willow Branch Culvert Replacement – Phase 200
Joplin, Missouri

Prepared for:

City of Joplin MO

Joplin, Missouri



May 2025

Olsson Project No. B24-04647

Missouri Certificate
of Authorization #: 001592

olsson®

May 29, 2025

City of Joplin MO
Attn: Daniel Johnson, P.E.
602 S. Main St.
Joplin, MO 64801

RE: Geotechnical Engineering Report
Old Willow Branch Culvert Replacement – Phase 200
Joplin, Missouri
Olsson Project No. B24-04647

Dear Mr. Johnson:

In general accordance with Work Authorization Number OLS-WIL-02 revised October 4, 2024, Olsson, Inc. has completed the authorized geotechnical exploration for the above-referenced project. The geotechnical exploration was conducted to evaluate the subsurface conditions with respect to design and construction of the project. The enclosed report summarizes the project characteristics as we understand them, presents the findings of the exploration and laboratory testing, and discusses the observed subsurface conditions.

We appreciate the opportunity to provide our geotechnical engineering services for this project. If you have any questions or need further assistance, please contact us at your convenience.

Respectfully submitted,
Olsson, Inc.
Missouri Certificate of Authority No. *001592*

Delaney Keith
Assistant Engineer
dkeith@olsson.com

Andrew N. Beekman, PE
Senior Geotechnical Engineer
abeekman@olsson.com

TABLE OF CONTENTS

1. Project Understanding 1
1.1 Project Information 1
1.2 Site Description 2
2. Subsurface Conditions 3
2.1 Subsurface Profile 3
2.2 Water Level Observations 4
3. Report Limitations 6

LIST OF FIGURES

Figure 1. Proposed Box Culvert New Alignment. 1
Figure 2. 2023 Aerial Photograph/Site Location Plan. 2

LIST OF TABLES

Table 1. Existing Pavement Thickness 3
Table 2. Approximate Depth and Elevation to Limestone Bedrock and Refusal 4
Table 3. Water Level Observations. 5

APPENDICES

Appendix A Exploration Maps, Logs, and Information
Appendix B Laboratory Test Results

1. PROJECT UNDERSTANDING

1.1 Project Information

This overall project comprises the replacement of the existing Old Willow Branch box culvert located in downtown Joplin, Missouri. The overall project site extends east to west from Kentucky Avenue to S. Connor Avenue and extends north to south from 4th Street to 7th Street. The proposed box culvert alignment is shown in red in **Figure 1**.



Figure 1. Proposed Box Culvert New Alignment.

This project has been split into three phases identified as phase 100, phase 200 and phase 300. This report covers phase 200 (purple phase) which includes the subsurface evaluation in areas of potential alternative alignments for replacement of the existing box culvert between the intersections of 7th Avenue (Route 66) & Moffett Avenue and 6th Avenue & Pennsylvania Avenue. This report also includes the subsurface evaluation in areas of planned relocation of drainage systems north of 7th Avenue that connect to the existing box culvert.

Maximum excavation depths of about 10 feet and maximum fill depths of about 6 feet are anticipated to be required to achieve final grades.

1.2 Site Description

The proposed culvert for phase 200 will extend from S Virginia Avenue along W 5th Street to S Wall Avenue and from W 5th Street along S Wall Avenue to 7th Street. The approximate project boundary and site location are provided in **Figure 2**.

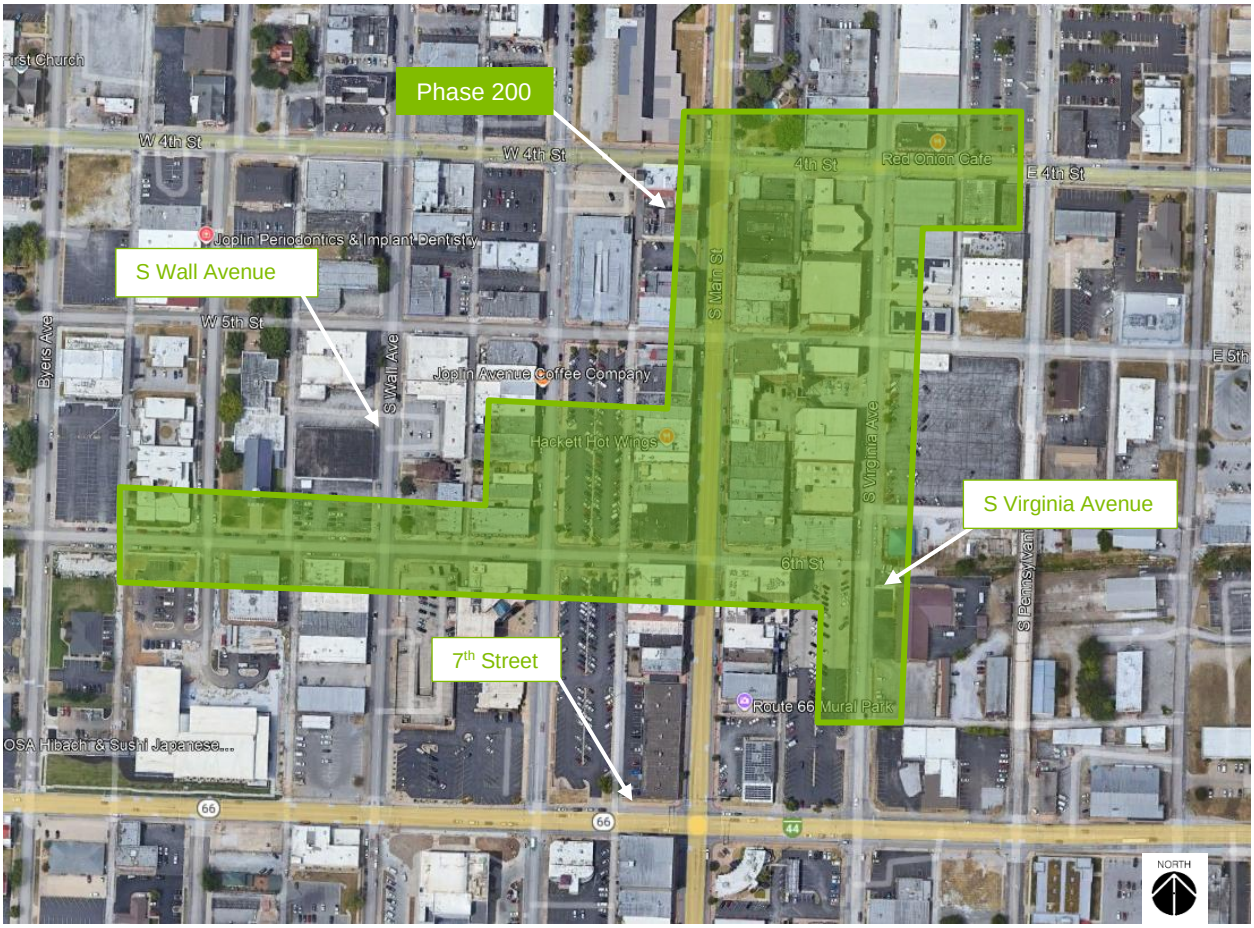


Figure 2. 2023 Aerial Photograph/Site Location Plan.

The site surface at the performed boring locations consisted of existing pavement. The site surface was accessible to a truck-mounted drilling rig.

Based on the topographic survey performed by the Olsson Survey team, existing site grades range from a low elevation of approximately 987 feet to a high elevation of 1000 feet.

2. SUBSURFACE CONDITIONS

2.1 Subsurface Profile

A boring location map, boring logs, and a description of our exploration program, are provided in **Appendix A**. The appended borehole reports represent subsurface conditions at the specific boring locations at the time of our field exploration; variations may occur between or beyond the borings. The stratification lines shown on the logs represent the approximate boundary between material types. However, the transition between layers may be gradual. The depths referenced in the following paragraphs are relative to the site grade at the time of our exploration. Laboratory test results are presented in **Appendix B**.

The subsurface soils at this site generally consist of lean-to fat clay with varying gravel content, poorly graded gravel, and clayey gravel overlying limestone bedrock. The general characteristics of each soil stratum are summarized below, with more detailed descriptions provided on the borehole reports in **Appendix A**.

Surfacing

We encountered existing asphalt pavement, approximately 4-5 inches thick at all of the boring locations for phase 200. Surfacing material and thickness for the boring locations where asphalt pavement was encountered at the ground surface are shown in **Table 1**.

Table 1. Existing Pavement Thickness

Boring No.	Surfacing Material	Thickness (inches)
B-201	Asphalt	5
	Aggregate Base	3
B-202	Asphalt	5
	Concrete	2
B-203	Asphalt	5
	Aggregate Base	3
B-204	Asphalt	5
	Aggregate Base	3
B-205	Asphalt	4
	Aggregate Base	3
B-206	Asphalt	5
	Aggregate Base	3
B-207	Asphalt	5

Boring No.	Surfacing Material	Thickness (inches)
	Aggregate Base	3
B-208	Asphalt	5
	Aggregate Base	3
B-209	Asphalt	5
	Aggregate Base	2

Native Clays and Gravel

We encountered apparent native soils underlying the surfacing materials in the borings extending to depths of 7.0 to 13.3 feet. These soils are comprised of a combination of apparent native lean-to fat clays (CH, CL) with various amounts of gravel, poorly graded gravel (GP), and clayey gravel (GC). Encountered clay soils were described as medium stiff to hard and encountered gravel soils were described as dense to very dense. A layer of soft, highly weathered shale was encountered beginning at a depth of 5.1 feet within the native soils at boring B-208.

Limestone

We encountered apparent limestone bedrock in two of the performed boring locations beginning at approximate depths of 7.0 to 13.3 feet and extending to termination depths. The limestone bedrock was described as gray and hard.

Table 2 provides the approximate depth and elevation to apparent top-of-bedrock and the approximate depth and elevation to auger refusal.

Table 2. Approximate Depth and Elevation to Limestone Bedrock and Refusal

Boring Number	Depth to Bedrock (feet)	Top of Bedrock Elevation (feet)	Depth to Auger Refusal (feet)	Refusal Elevation (feet)
B-208	7.0	994	7.1	993.9
B-209	13.3	972.7	13.6	972.5

2.2 Water Level Observations

We observed water in two of our soil borings as summarized in **Table 2**Error! Reference source not found. and as indicated on the boring logs presented in **Appendix A**.

Table 3. Water Level Observations.

Boring No.	Water Level Depth While Drilling (feet)	Water Level Elevation While Drilling (feet)	Water Level Depth Immediately After Drilling (feet)	Water Level Elevation Immediately After Drilling (feet)
B-204	5.3	986.7	NE	NE
B-302	11.4	974.6	NE	NE
**NE – Not Encountered*				

The above observations provide an indication of the on-site water levels at the time the borings were drilled but should not be construed to represent a permanent or absolute condition. Variations and uncertainties exist with relatively short-term water level observations in boreholes.

Subsurface water levels will fluctuate over time with variations in precipitation, site grading, drainage, and adjacent land use. Perched water conditions can also develop in seams of loose or granular soil. Any foundation design or global stability analysis must take into consideration changing subsurface water conditions.

Long-term monitoring with piezometers generally provides a more representative indication of the potential range of subsurface water conditions. Such monitoring was not completed as part of this exploration. Olsson can provide additional monitoring upon written request of the Owner and/or Olsson's client.

3. REPORT LIMITATIONS

The conclusions and recommendations presented in this report are based on the information available regarding the proposed construction, geotechnical information obtained from our field exploration and laboratory testing, as well as our experience with similar projects. Our borings and testing represent a limited statistical sampling of the subsurface. Conditions may be encountered during construction that are substantially different from those encountered in this exploration and adjustments to design and construction may be necessary.

In the event of any changes in the nature of the proposed project as outlined in this report, the opinions in this report cannot be considered valid unless Olsson reviews the changes, and the opinions of this report are modified or affirmed by Olsson.

The scope of this exploration did not include any environmental assessment for the presence of wetlands and/or hazardous or toxic materials in the soil or groundwater on or near the site. Any statements in this report regarding odors, discoloration, or suspicious conditions are strictly for the information of our client.

This report is based on generally accepted professional geotechnical engineering practice at the time of this report, within this geographic area. No warranty, express or implied, is intended or made. This report has been prepared for the exclusive use of our client and their authorized representatives for specific application to the discussed project.

APPENDIX A

Exploration Maps, Logs, and Information

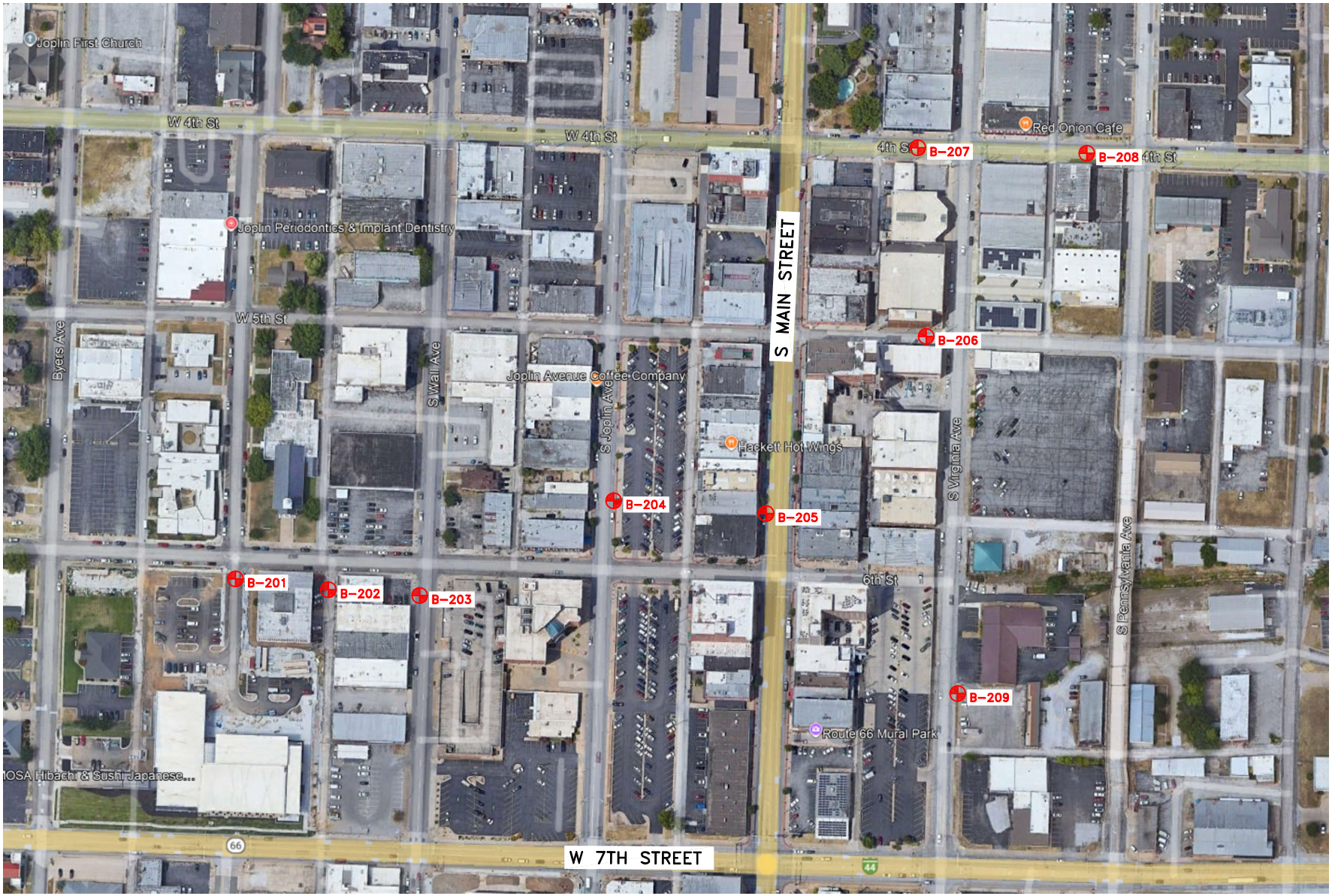
Field Exploration

Our drill crew advanced 9 borings for this exploration with a truck-mounted drill rig using hollow-stem augers. Boring locations were located in the field by the drill crew using a hand-held GPS unit. The approximate locations of the borings are shown on the Boring Location Map.

Samples were obtained using the methods and at the depths shown on the logs. Recovered samples were sealed in containers, labeled, and protected for transportation to the laboratory for testing.

We interpolated the ground surface elevation at the boring locations using a topographic map provided by Olsson. The surface elevations at the boring locations, rounded to the nearest foot, are presented on the boring logs.

The drill crew prepared field boring logs during drilling operations. The field logs include drilling and sampling methods, sampling intervals, groundwater measurements, and general descriptions of the observed soil conditions. The final boring logs represent our engineering interpretation of the field logs based on visual classification and laboratory testing of the collected samples.



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DATE: 4/3/2025 USER: dkeith

LEGEND

SOIL BORING LOCATION

PROJECT: B24–04647

DATE: 04/03/2025 | DRAWN BY: DEK

BORING LOCATION MAP

JOPLIN, MISSOURI

olsson

1027 S. Main Street, STE 503
Joplin, MO 64801

TEL 417.781.0643
www.olsson.com

BORING LOG NO. B-201

PROJECT NAME	CLIENT
Old Willow Branch Culvert Replacement - Phase 200	City of Joplin MO
PROJECT NUMBER	**LOCATION**
B24-04647	Joplin, Missouri

LAT: 37.085417 LONG: -94.516852
APPROX. SURFACE ELEV. (ft): 997

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" (N-VALUE)	UNC STR (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
	ASPHALT, 5-inches thick (0.5')										
	CRUSHED STONE, 3-inches thick (0.7')										
	CLAYEY GRAVEL (GC), dense, brown, moist		1								
			2	SPT-1		26-26-20 (46)		8.5			
	(3.0')		3								
	FAT CLAY (CH), medium stiff to stiff, dark gray		4	SPT-2	CH	1-3-5 (8)		27.3		61/42	P-200 = 90.1%
992.0			5								
			6								
			7								
			8								
			9	SPT-3		11-8-4 (12)					
	(9.5')										
	BASE OF BORING AT 9.5 FEET										
987.0			10								
			11								
			12								
			13								
			14								
982.0			15								
			16								
			17								
			18								
			19								

WATER LEVEL OBSERVATIONS		
WD	▽	Not Encountered
IAD	▼	Not Encountered
AD	▼	Not Performed

olsson

STARTED:	Feb 26 2025	FINISHED:	Feb 26 2025
DRILL CO.:	AIMRIGHT	EQUIPMENT:	CME 75
DRILLER:	JD	LOGGED BY:	EC
METHOD:	Continuous Flight Auger		

BORING LOG NO. B-202

Sheet 1 of 1

PROJECT NAME	CLIENT
Old Willow Branch Culvert Replacement - Phase 200	City of Joplin MO
PROJECT NUMBER	**LOCATION**
B24-04647	Joplin, Missouri

LAT: 37.085396 LONG: -94.516379
APPROX. SURFACE ELEV. (ft): 996

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" (N-VALUE)	UNC STR (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
	ASPHALT, 5-inches thick 0.5'										
	CONCRETE, 2-inches thick 0.6'										
	GRAVELLY FAT CLAY (CH), stiff to hard, reddish brown, moist		1	SPT-1		4-7-5 (12)		15.6			
			2								
			3	SPT-2		5-10-6 (16)					
991.0			4								
			5								
			6	SPT-3		12-12-20 (32)		17.4			
			7								
			8	SPT-4		12-14-5 (19)					
	9.5'		9								
	BASE OF BORING AT 9.5 FEET										
986.0			10								
			11								
			12								
			13								
			14								
981.0			15								
			16								
			17								
			18								
			19								

WATER LEVEL OBSERVATIONS		
WD	▽	Not Encountered
IAD	▼	Not Encountered
AD	▼	Not Performed

olsson

STARTED:	Feb 26 2025	FINISHED:	Feb 26 2025
DRILL CO.:	AIMRIGHT	EQUIPMENT:	CME 75
DRILLER:	JD	LOGGED BY:	EC
METHOD:	Continuous Flight Auger		

BORING LOG NO. B-203

PROJECT NAME	CLIENT
Old Willow Branch Culvert Replacement - Phase 200	City of Joplin MO
PROJECT NUMBER	**LOCATION**
B24-04647	Joplin, Missouri

LAT: 37.085388 LONG: -94.515694
APPROX. SURFACE ELEV. (ft): 995

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" (N-VALUE)	UNC STR (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
	ASPHALT, 5-inches thick 0.5'										
	CRUSHED STONE, 3-inches thick 0.7'										
	GRAVELLY FAT CLAY (CH), medium stiff to hard, black, moist		1	SPT-1		10-4-2 (6)		20.6			
			2								
			3	SPT-2		10-20-31 (51)					
	3.5'		4								
	POORLY GRADED GRAVEL very dense, dark gray 4.5'										
990.0	GRAVELLY FAT CLAY (CH), very stiff, dark gray, moist		5								
			6								
			7								
			8	SPT-3		3-12-6 (18)		24.5			
	9.5'		9								
	BASE OF BORING AT 9.5 FEET										
985.0			10								
			11								
			12								
			13								
			14								
980.0			15								
			16								
			17								
			18								
			19								

WATER LEVEL OBSERVATIONS		
WD	▽	Not Encountered
IAD	▼	Not Encountered
AD	▼	Not Performed

olsson

STARTED:	Feb 26 2025	FINISHED:	Feb 26 2025
DRILL CO.:	AIMRIGHT	EQUIPMENT:	CME 75
DRILLER:	JD	LOGGED BY:	EC
METHOD:	Continuous Flight Auger		

BORING LOG NO. B-204

PROJECT NAME	CLIENT
Old Willow Branch Culvert Replacement - Phase 200	City of Joplin MO
PROJECT NUMBER	**LOCATION**
B24-04647	Joplin, Missouri

LAT: 37.085843 LONG: -94.514477
APPROX. SURFACE ELEV. (ft): 992

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" (N-VALUE)	UNC STR (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
	ASPHALT, 5-inches thick (0.5')										
	CRUSHED STONE, 3-inches thick (0.7')										
	GRAVELLY FAT CLAY (CH), stiff to hard, brown, moist		1	SPT-1		9-6-5 (11)					
			2								
			3	SPT-2		4-30-41 (71)		10.6			
987.0			4								
			5								
			6								
			7								
			8	SPT-3		12-10-7 (17)					
	(9.5')		9								
	BASE OF BORING AT 9.5 FEET										
982.0			10								
			11								
			12								
			13								
			14								
977.0			15								
			16								
			17								
			18								
			19								

WATER LEVEL OBSERVATIONS		
WD	▽	5.3 ft
IAD	▼	Not Encountered
AD	▼	Not Performed

olsson

STARTED:	Feb 26 2025	FINISHED:	Feb 26 2025
DRILL CO.:	AIMRIGHT	EQUIPMENT:	CME 75
DRILLER:	JD	LOGGED BY:	EC
METHOD:	Continuous Flight Auger		

BORING LOG NO. B-205

PROJECT NAME	CLIENT
Old Willow Branch Culvert Replacement - Phase 200	City of Joplin MO
PROJECT NUMBER	**LOCATION**
B24-04647	Joplin, Missouri

LAT: 37.085804 LONG: -94.513517
APPROX. SURFACE ELEV. (ft): 991

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" (N-VALUE)	UNC STR (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
	ASPHALT, 4-inches thick 0.3'										
	CRUSHED STONE, 3-inches thick 0.6'										
	GRAVELLY FAT CLAY (CH), medium stiff to very stiff, dark gray, moist		1	SPT-1		9-11-8 (19)		11.6			
			2								
			3	SPT-2		3-5-12 (17)					
986.0			4								
			5								
			6								
			7								
			8	SPT-3		4-3-4 (7)				49/30	
	9.5'		9								
	BASE OF BORING AT 9.5 FEET										
981.0			10								
			11								
			12								
			13								
			14								
976.0			15								
			16								
			17								
			18								
			19								

WATER LEVEL OBSERVATIONS		
WD	▽	Not Encountered
IAD	▼	Not Encountered
AD	▼	Not Performed

olsson

STARTED:	Feb 26 2025	FINISHED:	Feb 26 2025
DRILL CO.:	AIMRIGHT	EQUIPMENT:	CME 75
DRILLER:	JD	LOGGED BY:	EC
METHOD:	Continuous Flight Auger		

BORING LOG NO. B-206

Sheet 1 of 1

PROJECT NAME	CLIENT
Old Willow Branch Culvert Replacement - Phase 200	City of Joplin MO
PROJECT NUMBER	**LOCATION**
B24-04647	Joplin, Missouri

LAT: 37.086680 LONG: -94.512935
APPROX. SURFACE ELEV. (ft): 995

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" (N-VALUE)	UNC STR (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
	ASPHALT, 5-inches thick (0.5')										
	CRUSHED STONE, 3-inches thick (0.7')										
	GRAVELLY FAT CLAY (CH), very stiff to hard, reddish brown, moist		1	SPT-1		9-17-17 (34)		10.1			
			2								
			3	SPT-2		17-9-32 (41)					
990.0			4								
			5								
			6								
			7								
			8	SPT-3		7-10-12 (22)		28.6			
	(9.5')		9								
	BASE OF BORING AT 9.5 FEET										
985.0			10								
			11								
			12								
			13								
			14								
980.0			15								
			16								
			17								
			18								
			19								

WATER LEVEL OBSERVATIONS		
WD	▽	Not Encountered
IAD	▼	Not Encountered
AD	▼	Not Performed

olsson

STARTED:	Feb 26 2025	FINISHED:	Feb 26 2025
DRILL CO.:		EQUIPMENT:	CME 75
DRILLER:	JD	LOGGED BY:	EC
METHOD:	Continuous Flight Auger		

BORING LOG NO. B-207

Sheet 1 of 1

PROJECT NAME	CLIENT
Old Willow Branch Culvert Replacement - Phase 200	City of Joplin MO
PROJECT NUMBER	**LOCATION**
B24-04647	Joplin, Missouri

LAT: 37.087612 LONG: -94.512572
APPROX. SURFACE ELEV. (ft): 998

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" (N-VALUE)	UNC STR (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
	ASPHALT, 5-inches thick (0.5')										
	CRUSHED STONE, 3-inches thick (0.7')										
	GRAVELLY FAT CLAY (CH), stiff to hard, dark gray, moist		1	SPT-1		9-8-7 (15)					
			2								
			3	SPT-2		15-30-25 (55)		13.9			
993.0			4								
			5								
	GRAVELLY FAT CLAY (CH), hard, reddish brown, moist (6.0')		6								
			7								
			8	SPT-3		7-20-25 (45)					
	(9.5')		9								
988.0	**BASE OF BORING AT 9.5 FEET**		10								
			11								
			12								
			13								
			14								
983.0			15								
			16								
			17								
			18								
			19								

WATER LEVEL OBSERVATIONS		
WD	▽	Not Encountered
IAD	▼	Not Encountered
AD	▼	Not Performed

olsson

STARTED:	Feb 26 2025	FINISHED:	Feb 26 2025
DRILL CO.:		EQUIPMENT:	CME 75
DRILLER:	JD	LOGGED BY:	EC
METHOD:	Continuous Flight Auger		

BORING LOG NO. B-208

Sheet 1 of 1

PROJECT NAME	CLIENT
Old Willow Branch Culvert Replacement - Phase 200	City of Joplin MO
PROJECT NUMBER	**LOCATION**
B24-04647	Joplin, Missouri

LAT: 37.087582 LONG: -94.511495
APPROX. SURFACE ELEV. (ft): 1001

ELEVATION (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	DEPTH (ft)	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" (N-VALUE)	UNC STR (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
	ASPHALT, 5-inches thick (0.5')										
	CRUSHED STONE, 3-inches thick (0.7')										
	GRAVELLY FAT CLAY (CH), very stiff to hard, reddish brown, moist		1	SPT-1		19-13-19 (32)		10.3			
			2								
			3	SPT-2		6-9-19 (28)					
			4								
996.0	(5.1')		5								
	SHALE, highly weathered, reddish brown, soft (5.7')			SPT-3		27-10-10 (20)		32.5			
	GRAVELLY FAT CLAY (CH), very stiff, reddish brown, moist (7.0')		6								
	LIMESTONE, gray, hard (7.1')		7	SPT-4		50/1"					
	REFUSAL AT 7.1 FEET		8								
			9								
991.0			10								
			11								
			12								
			13								
			14								
986.0			15								
			16								
			17								
			18								
			19								

WATER LEVEL OBSERVATIONS		
WD	▽	Not Encountered
IAD	▼	Not Encountered
AD	▼	Not Performed

olsson

STARTED:	Feb 26 2025	FINISHED:	Feb 26 2025
DRILL CO.:		EQUIPMENT:	CME 75
DRILLER:	JD	LOGGED BY:	EC
METHOD:	Continuous Flight Auger		

BORING LOG NO. B-209

Sheet 1 of 1

PROJECT NAME: Old Willow Branch Culvert Replacement - Phase 200	CLIENT: City of Joplin MO
PROJECT NUMBER: B24-04647	LOCATION: Joplin, Missouri

LAT: 37.084725 LONG: -94.512342
APPROX. SURFACE ELEV. (ft): 986

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	GRAPHIC LOG	SAMPLE TYPE NUMBER	CLASSIFICATION (USCS)	BLOWS/6" (N-VALUE)	UNC STR (tsf)	MOISTURE (%)	DRY DENSITY (pcf)	LL/PI (%)	ADDITIONAL DATA/ REMARKS
		ASPHALT, 5-inches thick (0.5')									
		CRUSHED STONE, 2-inches thick (0.7')									
	1	GRAVELLY LEAN CLAY (CL), soft to stiff, reddish brown, moist		SPT-1		11-9-4 (13)		25.7			
	2										
	3			SPT-2		4-5-6 (11)					
981.0	4										
	5										
	6										
	7										
	8			SPT-3	CL	1-2-1 (3)		54.1		47/12	P-200 = 86.6%
976.0	9										
	10										
	11										
	12										
	13	(13.3') LIMESTONE, gray, hard (13.5')		SPT-4		50/0"					
	14	REFUSAL AT 13.5 FEET									
971.0	15										
	16										
	17										
	18										
	19										

WATER LEVEL OBSERVATIONS		
WD	▽	11.4 ft
IAD	▼	Not Encountered
AD	▼	Not Performed

olsson

STARTED:	Feb 26 2025	FINISHED:	Feb 26 2025
DRILL CO.:		EQUIPMENT:	CME 75
DRILLER:	JD	LOGGED BY:	EC
METHOD:	Continuous Flight Auger		

APPENDIX B

Laboratory Test Results

OLSSON, INC.
BOULEVARD SUITE 310
FAYETTEVILLE, AR 72703

SUMMARY OF LABORATORY RESULTS

PROJECT NAME: Old Willow Branch Culvert Replacement - Phase 200
PROJECT NUMBER: B24-04647
CLIENT: City of Joplin MO
PROJECT LOCATION: Joplin, Missouri

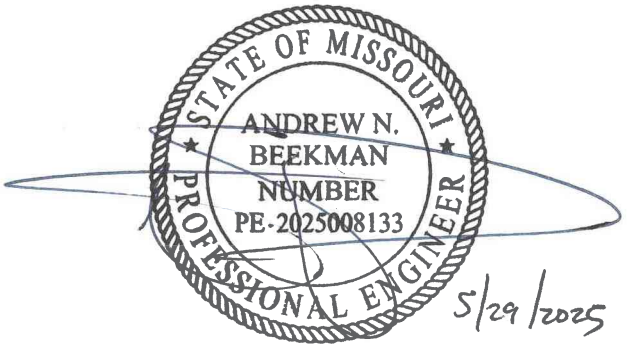
BORING NUMBER	SAMPLE ID	SAMPLE DEPTH (FT)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	VOID RATIO	SATURATION (%)	UNCONFINED STRENGTH (tsf)	STRAIN (%)	ATTERBERG LIMITS			P-200	USCS CLASS
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
B-201	1	1 - 2.5	8.5										
B-201	2	3 - 4.5	27.3						61	19	42	90.1	CH
B-202	1	1 - 2.5	15.6										
B-202	3	6 - 7.5	17.4										
B-203	1	1 - 2.5	20.6										
B-203	3	8 - 9.5	24.5										
B-204	2	3 - 4.5	10.6										
B-205	1	1 - 2.5	11.6										
B-205	3	8 - 9.5							49	19	30		CL
B-206	1	1 - 2.5	10.1										
B-206	3	8 - 9.5	28.6										
B-207	2	3 - 4.5	13.9										
B-208	1	1 - 2.5	10.3										
B-208	3	5 - 6.5	32.5										
B-209	1	1 - 2.5	25.7										
B-209	3	8 - 9.5	54.1						47	35	12	86.6	CL

OLD WILLOW BRANCH CULVERT REPLACEMENT – PHASE 200

Joplin, Missouri

May 2025

Olsson Project No. B24-04647



APPENDIX G

Ground Penetrating Radar Systems LLC

JOB SUMMARY REPORT

Order Number:	Work Order #747582	**Job Date:**	Feb 11, 2025 12:10:00 PM
Customer:	65955 OLSSON ASSOCIATES : OLSSON	**Billing Address:**	OLSSON 1717 INGERSOLL AVE STE 111 DES MOINES IA 50309 United States

JOB DETAILS

Jobsite Location	701 South Main Street, Joplin, Missouri, 64801
Work Order Number	Work Order #747582
Job Number	
PO Number	

GPRS Project Manager: Brendan Koziol

Thank you for using GPRS on your project. We appreciate the opportunity to work with you. If you have questions regarding the results of this scanning, please contact the lead GPRS project manager on this project.

EQUIPMENT USED

The following equipment was used on this project:

- **GPS:** This handheld unit offers accuracy down to 4 inches; however, the accuracy achieved will depend on the satellite environment at the time of collection and is not considered survey-grade. Features can be collected as points, lines, or areas and then exported as a KML/KMZ or overlaid on a CAD drawing. For more information, please visit: Link
- **Video Push Camera:** This push camera is designed for video pipe inspection and pipe locating. It has a 1”-2” diameter, self-leveling camera head that provides high-quality images in pipes with a diameter between 2”-8”. Behind the camera is a 512 Hz sonde that can be located from above ground to provide the approximate depth of the pipe up to 10’ deep. The locatable signal from the sonde will not pass through solid metal barriers or metal pipes other than cast iron. Access through a structure such as a cleanout, drain, etc., or an open pipe within arm’s reach is required for inspection service and locating. An operator can push the camera through the pipe to a maximum of 325’ depending on the model used. If the project requires entry into confined spaces to gain access to the subject piping, GPRS will need the client to coordinate all confined space entry and obtain any required permits. Video and photos of the interior of pipes can be provided, along with inspection reports. The client must request inspection reports before fieldwork begins. For more information, please visit: Link

JOB SUMMARY REPORT

WORK PERFORMED

VIDEO PIPE INSPECTION	
Client Provided Drawings	Yes
Scope of Work	The scope of work is to run the storm gallery's under down town Joplin. We are tasked with marking both sides of the wall throughout the project. We are also taking pictures of the interior tap and putting them onto site map along with a surface picture.
NASSCO Report Performed	Yes
Inclination Report Performed	No
Manhole Inspection Level 1 Performed	No
Manhole Inspection Level 2 Performed	No
Pipe Infrastructure Located	No
Lateral Locating Performed	No
Entry point obstructions blocking access?	No
Pipe segments unable to be inspected?	No
Unable to determine depths at any location?	No
Unable to locate entirety of pipe segments?	No
Any segments require cleaning?	No
Marking Medium	- Spray Paint - Flags
Results Notes	Through out the whole project there is an abundance of sediment, rocks, homeless belongings, and fallen concrete off the concrete pipe ceiling. All pictures of taps are going to show up on the map. There were only some utilities found inside of the pipes. They are in various areas of the pipe line. They're all just under the pipe ceiling. I have found 5 roof drains north of liberty utilities. There is a 24 inch line running north and south between Virginia and Joplin street. That line was unable to be located on the ground due to the line being under buildings. There is a section without buildings over the line but, there is an abundance of power running underground which makes it impossible to read the sonde from the surface. There was an area I could not run with the robot due to a traitorous path to drive through as well as too many turns from the other access. I was able to run 95% of this job. We are only missing about 150' of footage. Other than this the job went well despite the equipment issues we were up against. The finalized report and map will be coming in before the end of the week.

JOB SUMMARY REPORT

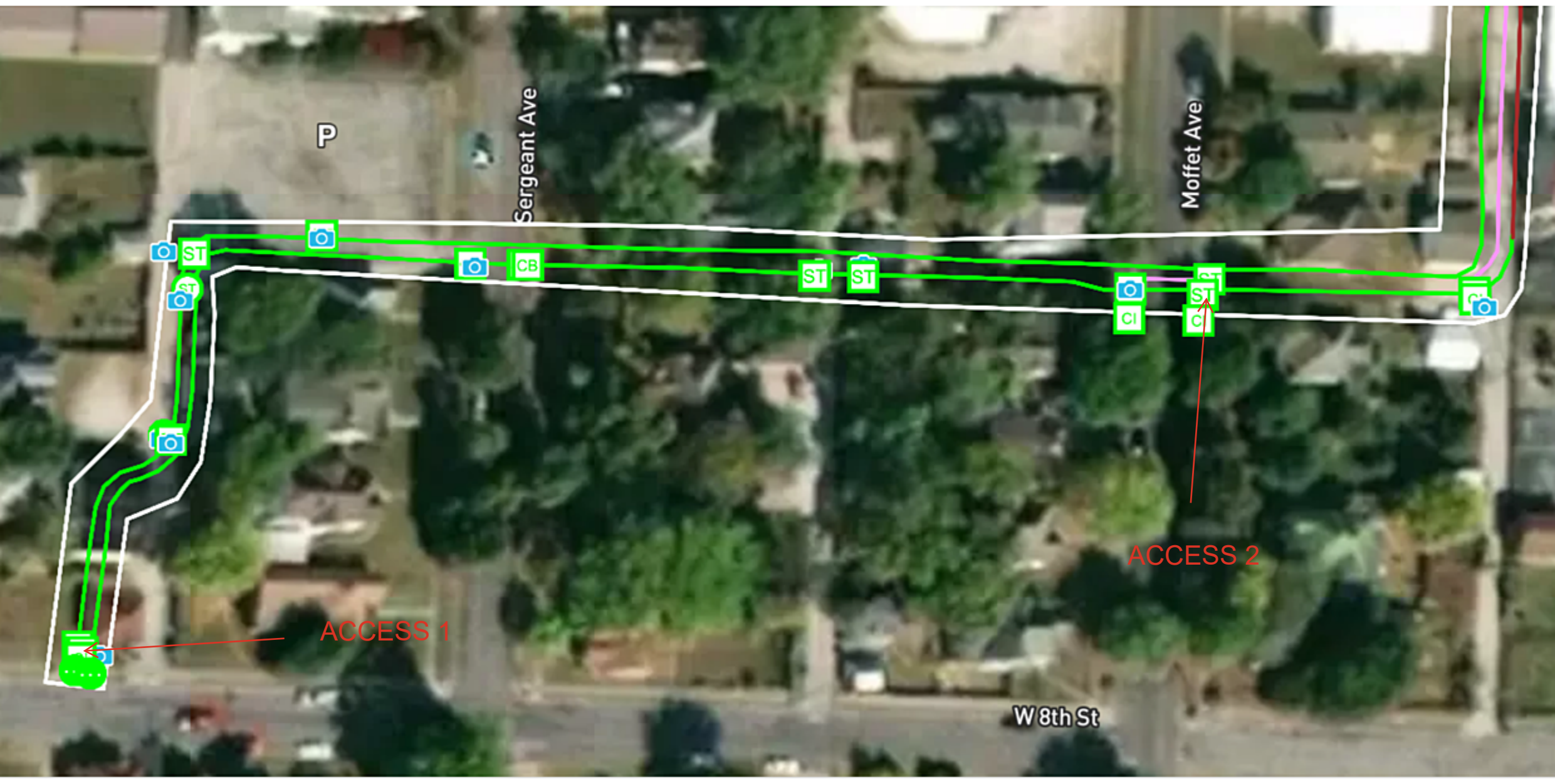
CONTACT / SIGNATURE INFORMATION

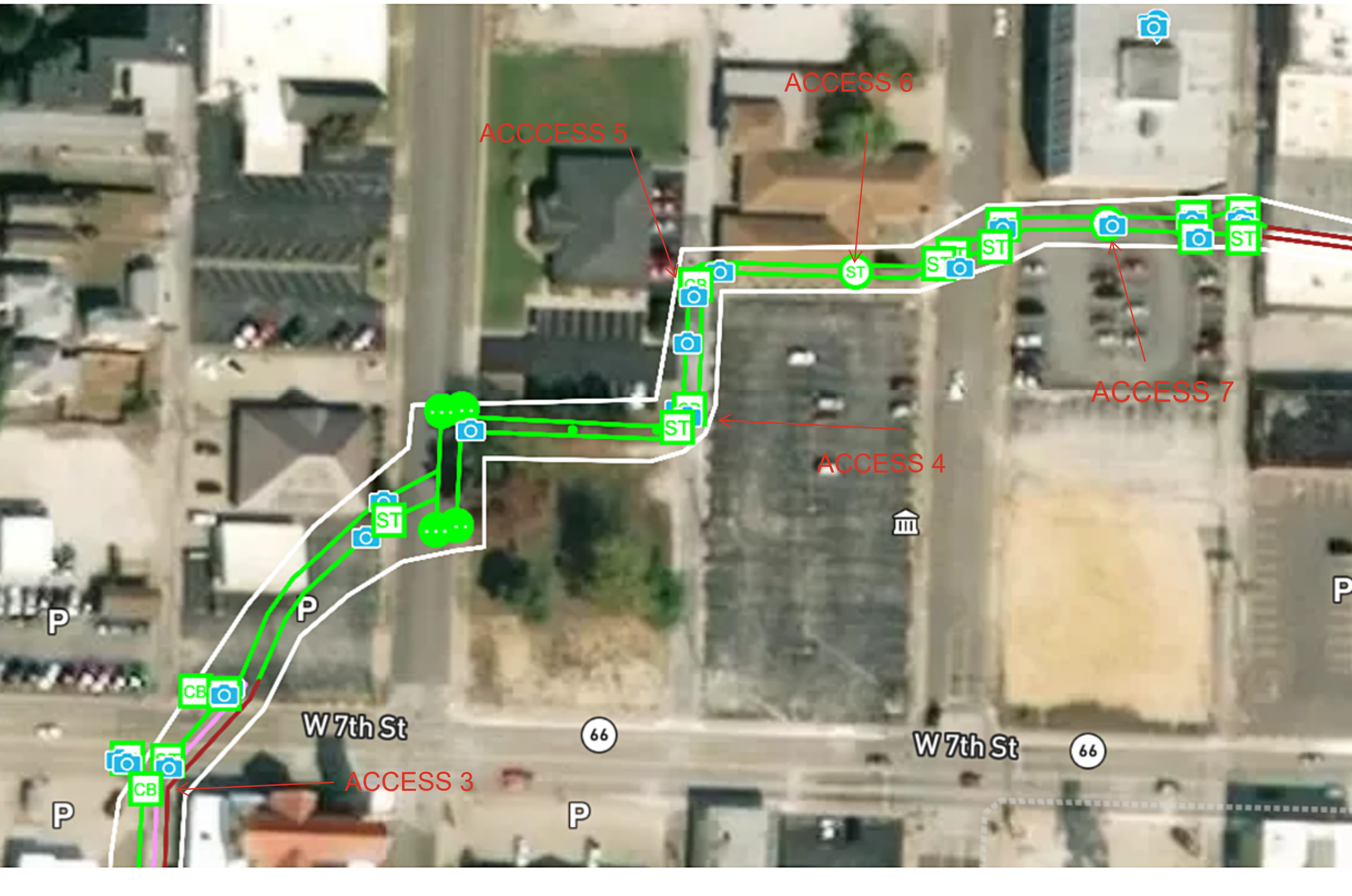
Contact Information

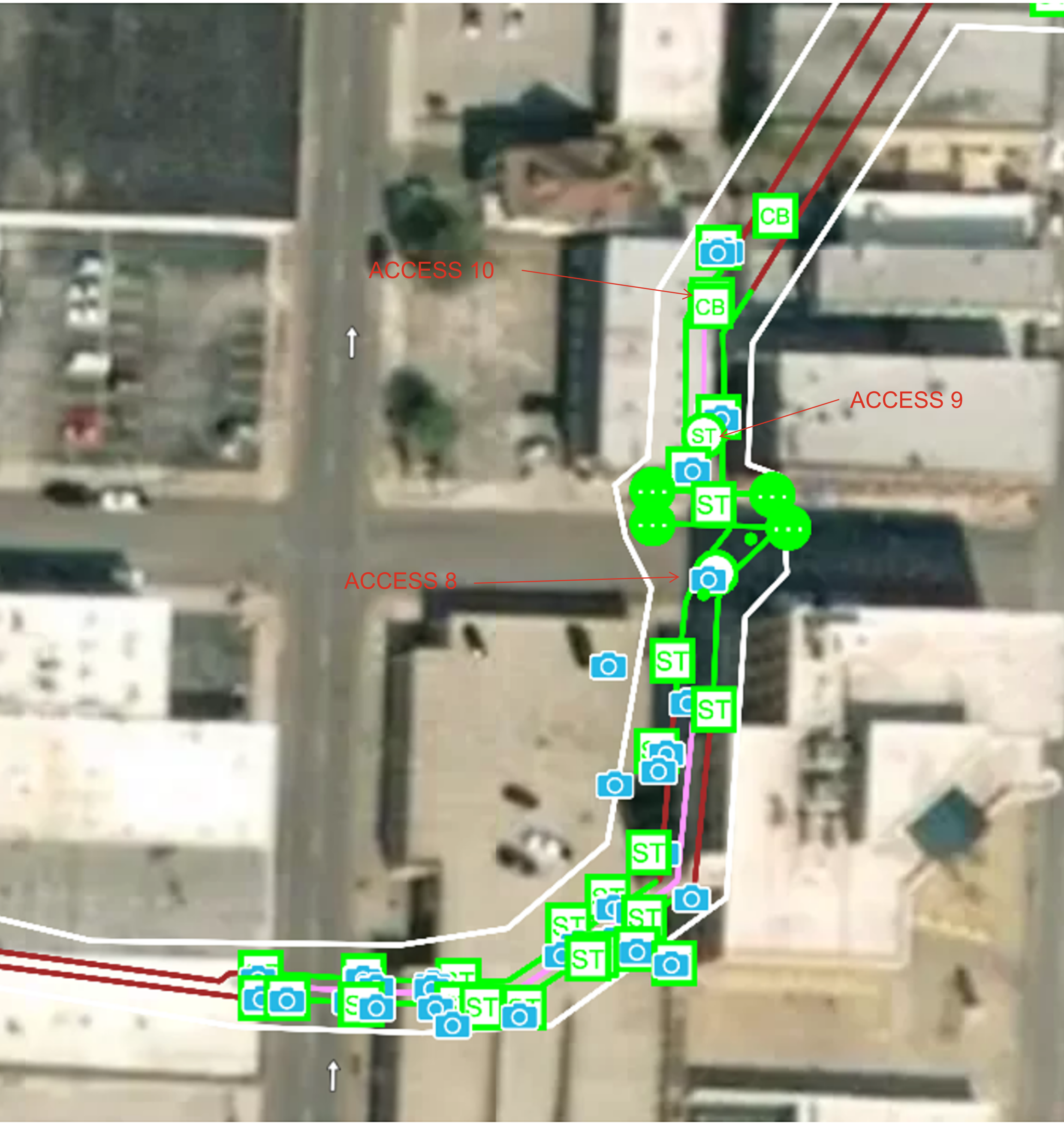
Contact Name	Eric Shelton	**Email**	eshelton@olsson.com

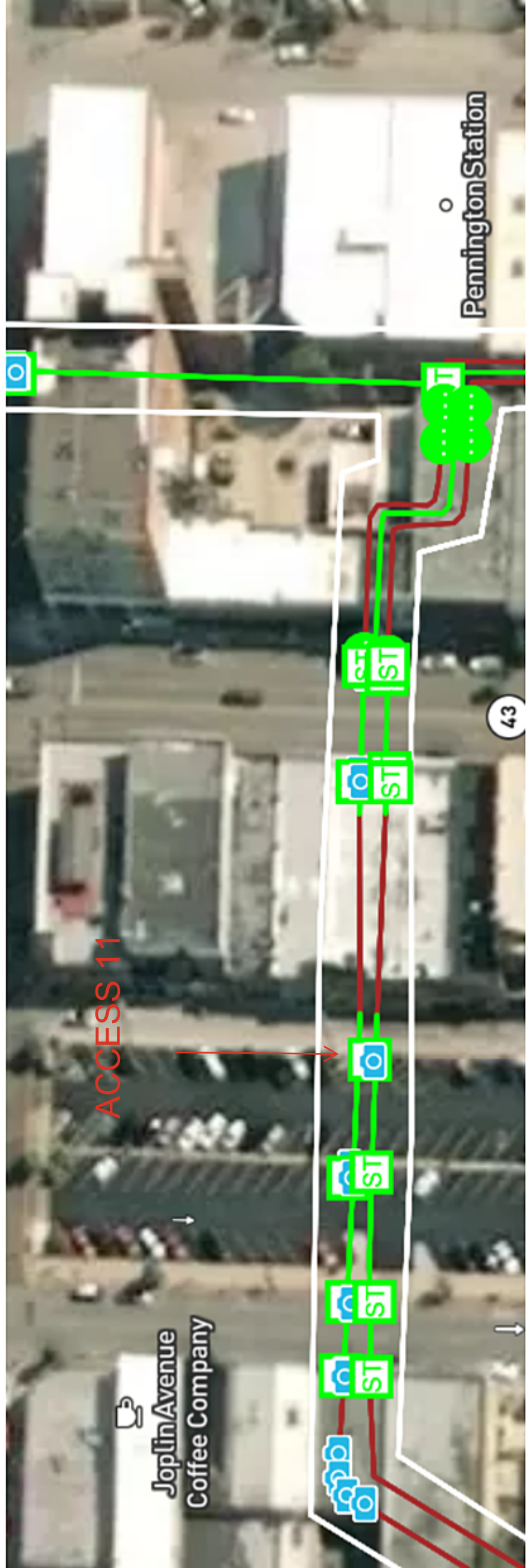
TERMS & CONDITIONS

http://www.gprsinc.com/termsandconditions.html

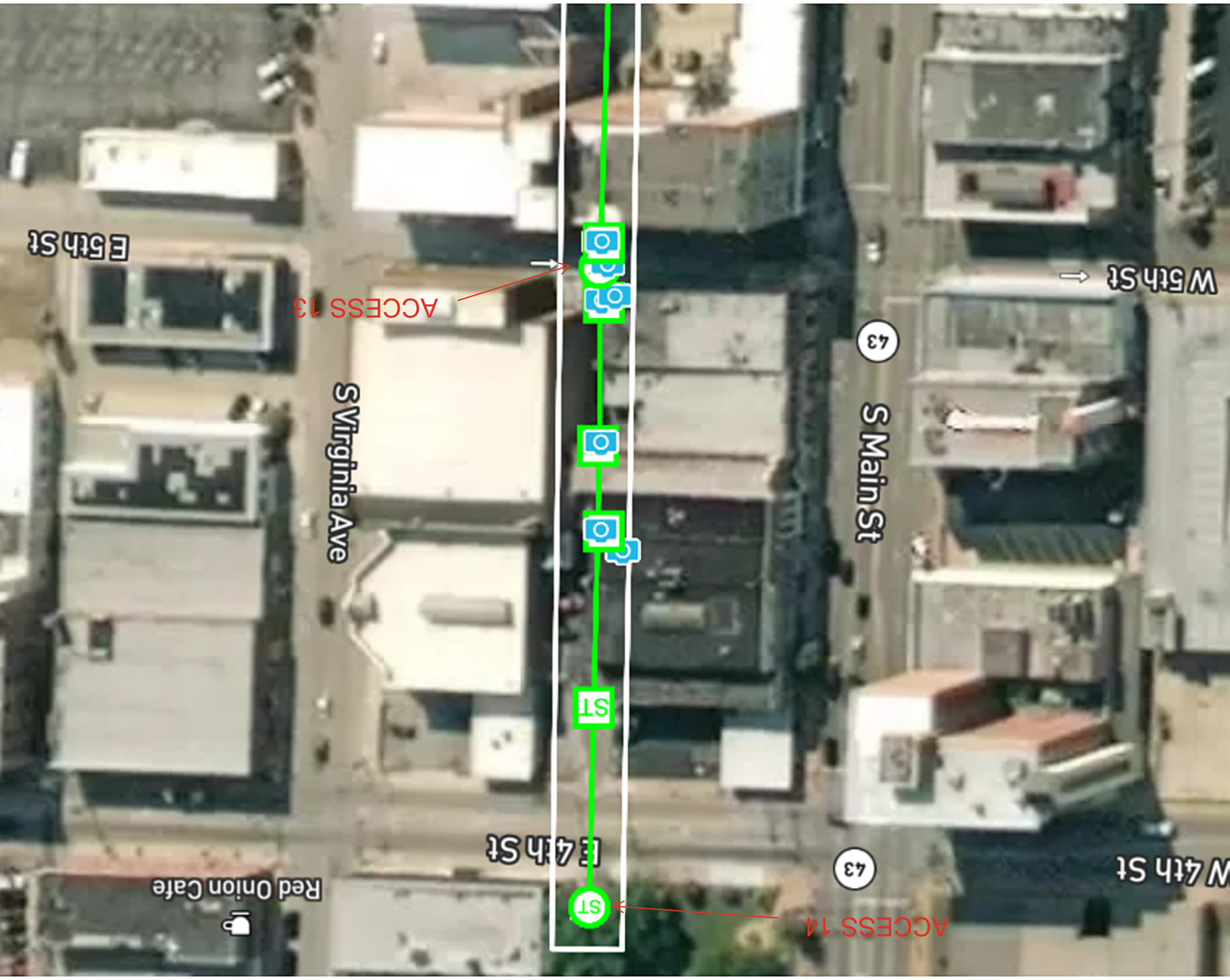

P
Sergeant Ave
Moffet Ave
ST
CB
CI
ACCESS 1
ACCESS 2
W 8th St


ACCCESS 5
ACCESS 6
ACCESS 7
ACCESS 4
ACCESS 3
ST
CB
P
W 7th St
66


CB
ACCESS 10
CB
ACCESS 9
ST
ST
ACCESS 8
ST
ST
ST
ST
ST
ST


Pennington Station
ACCESS 11
Joplin Avenue
Coffee Company
43


Artistic Alley
ST
ST
Telomark LLC
E 6th St
ACCESS 12
ed Ventures


E 5th St
ACCESS 13
S Virginia Ave
S Main St
W 5th St
43
ST
E 4th St
Red Onion Cafe
43
ACCESS 14
N 4th St

WINCAN

WEB PROJECT
CLICK TO OPEN

Project

Project	Olsen Downtown Joplin
	2/13/2025

WINCAN

Table of Contents

Project		
Olsen Downtown Joplin		**2/5/2025**

Project Information P-1

Section: 1; access 10 - access 12 1

Section: 1; access 2 - access 1 5

Section: 2; access 2 - access 1 7

Section: 2; access 11 - outlet 10

Section: 3; access 3 - access 2 12

Section: 3; access 11 - access 12 16

Section: 4; access 3 - access 2 20

Section: 4; access 12 - acces 10 - 12 line 23

Section: 5; access 2 - west end of moffet st 26

Section: 5; access 12 - access 13 28

Section: 6; access 2 - access 3 31

Section: 7; access 1 - access 4 35

Section: 8; access 4 - access 6 39

Section: 9; access 4 - access 5 42

Section: 10; access 6 - access 1 44

Section: 11; access 5 - access 7 46

Section: 12; access 7 - access 8 50

Section: 13; access 10 - access 9 57

Section: 14; access 11 - gallery 2 63

Section: 15; access 8 - access 7 65

Section: 16; access 8 west wall - access 7 67

Section: 17; access 11 - access 10 70

WINCAN

Project Information

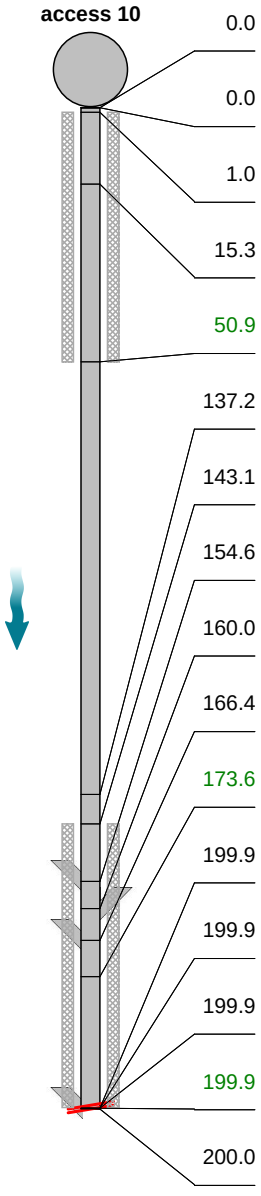
Project		
Olsen Downtown Joplin		**2/5/2025**

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/10/2025			**Brendan koziol**	**P0044090-09223**	**2/10/2025 9:35:57 AM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Downstream**	Pipe Joint Length:	Total Length: **200.0 '**	Length Surveyed: **200.0 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 10**
Street:	**s jopin ave**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**access 12**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Barrel**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**50 x 62 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					



1:1510 Distance		Code	Observation	Counter	Photo	Grade
0.0		AMH	Manhole / access 10	00:00:00		
0.0		MWL	Water Level, 5% of the vertical dimension	00:00:27		
1.0	S01	DSC	Deposits Settled Compacted, 15% of cross sectional area from 5 o'clock to 7 o'clock, Start / soil, rocks, debries	00:05:14	2_10_2025 9_35_57 AM_27b4f	
15.3		MGO	Miscellaneous General Observation / curb inlet	00:05:47	2_10_2025 9_35_57 AM_7789c	
50.9	F01	DSC	Deposits Settled Compacted, 15% of cross sectional area from 5 o'clock to 7 o'clock, Finish / soil, rocks, debries	00:06:15		M3
137.2		MGO	Miscellaneous General Observation / utilities	00:08:02	2_10_2025 9_35_57 AM_6eaaf	
143.1	S02	DSC	Deposits Settled Compacted, 5% of cross sectional area from 5 o'clock to 7 o'clock, Start / soil, rocks	00:08:26		
154.6		TFA	Tap Factory Activity at 3 o'clock, dia/height: 14inch / tap 51	00:08:54	2_10_2025 9_35_57 AM_2665b	
160.0		TFA	Tap Factory Activity at 10 o'clock, dia/height: 12inch / tap 50	00:09:07	2_10_2025 9_35_57 AM_46ef6f	
166.4		TFA	Tap Factory Activity at 2 o'clock, dia/height: 14inch / tap 52	00:09:26	2_10_2025 9_35_57 AM_d0c26	
173.6		IS	Infiltration Stain at 2 o'clock	00:09:51	2_10_2025 9_35_57 AM_38944	M1
199.9		TFA	Tap Factory Activity at 3 o'clock, dia/height: 14inch / tap 48	00:11:27	2_10_2025 9_35_57 AM_60026	
199.9		TFA	Tap Factory Activity at 3 o'clock, dia/height: 14inch / tap 47	00:11:57	2_10_2025 9_35_57 AM_17aa0	
199.9		TFA	Tap Factory Activity at 3 o'clock, dia/height: 14inch / tap 49	00:12:02	2_10_2025 9_35_57 AM_d41f0	
199.9	F02	DSC	Deposits Settled Compacted, 5% of cross sectional area from 5 o'clock to 7 o'clock, Finish / soil, rocks	00:12:19		M2
200.0		MSA	Miscellaneous Survey Abandoned / crawler cannot proceed due to hole	00:12:27		

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	3A2A	3A2A	0.0	53.0	53.0	0.0	2.4	2.4

WINCAN

Section Pictures - 2/10/2025 - 2/10/2025 9:35:57 AM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**s jopin ave**	**2/10/2025**	**2/10/2025 9:35:57 AM**	**1**



2_10_2025 9_35_57
AM_27b4f9b8-6289-4503-a634-f8da6fb52ec3_20250213_115924_840.jpg, 00:05:14, 1.00ft
Deposits Settled Compacted, 15% of cross sectional area from 5 o'clock to 7 o'clock, Start / soil, rocks, debries



2_10_2025 9_35_57
AM_7789c62c-ff2d-4a80-bb39-dd19c416f3ab_20250213_120041_311.jpg, 00:05:47, 15.26ft
Miscellaneous General Observation / curb inlet



2_10_2025 9_35_57
AM_6eaaf61e-de39-4953-a5f2-5d60911f8a1e_20250213_120322_718.jpg, 00:08:02, 137.18ft
Miscellaneous General Observation / utilities



2_10_2025 9_35_57
AM_2665b175-d4c1-49d8-82c3-27c9dd86ef61_20250213_120746_019.jpg, 00:08:54, 154.56ft
Tap Factory Activity at 3 o'clock, dia/height: 14inch / tap 51

WINCAN

Section Pictures - 2/10/2025 - 2/10/2025 9:35:57 AM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**s jopin ave**	**2/10/2025**	**2/10/2025 9:35:57 AM**	**1**



2_10_2025 9_35_57
AM_46ef6f8c-c3f6-4e6b-bdae-5e5b3bd85b7e_20250213_121128_951.jpg, 00:09:07, 160.00ft
Tap Factory Activity at 10 o'clock, dia/height: 12inch / tap 50



2_10_2025 9_35_57
AM_d0c26d45-9150-4d29-a595-04b0cc964347_20250213_120902_665.jpg, 00:09:26, 166.35ft
Tap Factory Activity at 2 o'clock, dia/height: 14inch / tap 52



2_10_2025 9_35_57
AM_3894419d-de48-4cfd-9194-f35d1531761d_20250213_121315_089.jpg, 00:09:51, 173.59ft
Infiltration Stain at 2 o'clock



2_10_2025 9_35_57
AM_60026da7-be22-4e4b-bafb-9dff17d08954_20250213_122351_345.jpg, 00:11:27, 199.88ft
Tap Factory Activity at 3 o'clock, dia/height: 14inch / tap 48

WINCAN

Section Pictures - 2/10/2025 - 2/10/2025 9:35:57 AM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**s jopin ave**	**2/10/2025**	**2/10/2025 9:35:57 AM**	**1**



2_10_2025 9_35_57
AM_17aa001d-f373-4d82-99f0-7937d05688df_20250213_122349_125.jpg, 00:11:57, 199.88ft
Tap Factory Activity at 3 o'clock, dia/height: 14inch / tap 47



2_10_2025 9_35_57
AM_d41f0d59-a1e4-4262-97b3-830d4958d704_20250213_122453_732.jpg, 00:12:02, 199.88ft
Tap Factory Activity at 3 o'clock, dia/height: 14inch / tap 49

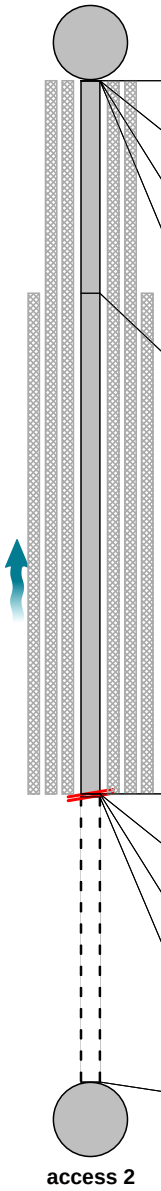
WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/5/2025			**Brendan Koziol**	**P0044090-092023**	**2/5/2025 8:39:05 PM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Upstream**	Pipe Joint Length:	Total Length: **160.0 '**	Length Surveyed: **114.5 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 2**
Street:	**7th st**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**access 1**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Rectangular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**48 x 60 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			

Additional Info:



1:1208 Distance		Code	Observation	Counter	Photo	Grade
0.0		AMH	Manhole / access 1	00:00:00		
0.0		MWL	Water Level, 0% of the vertical dimension	00:00:03		
0.0	S01	DSC	Deposits Settled Compacted, 10% of cross sectional area at 6 o'clock, Start	00:00:06	2_5_2025 8_39_05 PM_bc65f	
0.0	S02	DSZ	Deposits Settled Other, 10% of cross sectional area at 6 o'clock, Start / rock/concrete	00:00:07		
34.0	S03	SRV	Surface Damage Reinforcement Visible at 12 o'clock, Start	00:02:20	2_5_2025 8_39_05 PM_839f8	
114.0	F01	DSC	Deposits Settled Compacted, 10% of cross sectional area at 6 o'clock, Finish	01:03:23		M2
114.0	F02	DSZ	Deposits Settled Other, 10% of cross sectional area at 6 o'clock, Finish / rock/concrete	01:03:23		M2
114.0	F03	SRV	Surface Damage Reinforcement Visible at 12 o'clock, Finish	01:03:23		S4
114.5		MSA	Miscellaneous Survey Abandoned / cannot proceed	01:04:30		
160.0			End of pipe			

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
4B00	2H00	4B2H	64.0	92.0	156.0	4.0	2.0	2.5

WINCAN

Section Pictures - 2/5/2025 - 2/5/2025 8:39:05 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/5/2025**	**2/5/2025 8:39:05 PM**	**1**



2_5_2025 8_39_05 PM_bc65f797-3783-48a9-ad5b-35d387e5795e_20250205_204527_558.jpg, 00:00:06, 0.00ft
Deposits Settled Compacted, 10% of cross sectional area at 6 o'clock, Start



2_5_2025 8_39_05 PM_839f80c9-7304-456d-9f30-c8cc280c542b_20250205_204844_272.jpg, 00:02:20, 34.00ft
Surface Damage Reinforcement Visible at 12 o'clock, Start



2_5_2025 8_39_05 PM_87d98958-d3b3-422e-bea7-0cb740d804c2_20250205_205138_447.jpg, 00:02:20, 34.00ft
Surface Damage Reinforcement Visible at 12 o'clock, Start

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/5/2025			**Brendan Koziol**	**P0044090-092023**	**2/5/2025 9:03:15 PM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Downstream**	Pipe Joint Length:	Total Length: **158.0 '**	Length Surveyed: **158.0 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 2**
Street:	**7th st**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**access 1**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Rectangular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**48 x 60 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			

Additional Info:



1:1193	Distance		Code	Observation	Counter	Photo	Grade
	0.0		AMH	Manhole / access 2	00:00:00		
	0.0		MWL	Water Level, 0% of the vertical dimension	00:33:40		
	5.0	S01	DSC	Deposits Settled Compacted, 10% of cross sectional area at 6 o'clock, Start	00:34:14	2_5_2025 9_03_15 PM_e1659	
	23.0	F01	DSC	Deposits Settled Compacted, 10% of cross sectional area at 6 o'clock, Finish	00:34:52		M2
	122.0		MGO	Miscellaneous General Observation / supporting wall	00:46:38	2_5_2025 9_03_15 PM_b1382	
	145.0		MGO	Miscellaneous General Observation / meeting corner of first run	00:50:52	2_5_2025 9_03_15 PM_fb490	
	149.0		SRP	Surface Damage Reinforcement Projecting from 10 o'clock to 2 o'clock	00:51:26	2_5_2025 9_03_15 PM_f1412	S5
	149.5		TFA	Tap Factory Activity at 1 o'clock, dia/height: 12inch / tap 1 132 ft	00:59:35	2_5_2025 9_03_15 PM_35b5b	
	157.0		MGO	Miscellaneous General Observation / a look down the east line south of 7th st	01:11:33		
	158.0		MSA	Miscellaneous Survey Abandoned / cannot proceed due to friction	01:11:33		

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
5100	2400	5124	5.0	8.0	13.0	5.0	2.0	2.6

WINCAN

Section Pictures - 2/5/2025 - 2/5/2025 9:03:15 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/5/2025**	**2/5/2025 9:03:15 PM**	**2**



2_5_2025 9_03_15 PM_e16599cf-42ff-463a-8581-6f5224678090_20250209_131931_737.jpg, 00:34:14, 5.00ft
Deposits Settled Compacted, 10% of cross sectional area at 6 o'clock, Start



2_5_2025 9_03_15 PM_b1382bfa-9591-4e9c-98a7-0e3617c8bf41_20250209_133346_518.jpg, 00:46:38, 122.00ft
Miscellaneous General Observation / supporting wall



2_5_2025 9_03_15 PM_fb4906cd-9cbc-44fa-b734-068501b290e9_20250209_133527_500.jpg, 00:50:52, 145.00ft
Miscellaneous General Observation / meeting corner of first run



2_5_2025 9_03_15 PM_f1412005-c611-4b22-83c4-07a60644c841_20250209_133659_491.jpg, 00:51:26, 149.00ft
Surface Damage Reinforcement Projecting from 10 o'clock to 2 o'clock

WINCAN

Section Pictures - 2/5/2025 - 2/5/2025 9:03:15 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/5/2025**	**2/5/2025 9:03:15 PM**	**2**



2_5_2025 9_03_15 PM_35b5be0c-070b-4639-85fe-4b55aa4b9bbc_20250213_142054_026.jpg, 00:59:35, 149.50ft
Tap Factory Activity at 1 o'clock, dia/height: 12inch / tap 1 132 ft

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/10/2025			**Brendan koziol**	**P0044090-09223**	**2/10/2025 11:16:53 AM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Downstream**	Pipe Joint Length:	Total Length: **156.0 '**	Length Surveyed: **156.0 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 11**
Street:	**s jopin ave**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**outlet**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Barrel**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**50 x 62 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					



1:1178 Distance	Code	Observation	Counter	Photo	Grade
0.0	AMH	Manhole / access 11	00:00:00		
0.0	MWL	Water Level, 2% of the vertical dimension	00:00:07		
0.0	MGO	Miscellaneous General Observation / homeless belongings	00:00:16		
8.1	MGO	Miscellaneous General Observation / new storm system	00:01:00	2_10_2025 11_16_53 AM_07a12	
45.0	TFA	Tap Factory Activity at 11 o'clock, dia/height: 12inch / tap 45	00:01:43	2_10_2025 11_16_53 AM_19dcb	
129.6	MGO	Miscellaneous General Observation / belongings	00:03:02	2_10_2025 11_16_53 AM_4876e	
156.0	AMH	Manhole / outlet	00:03:35		

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	0000	0000	0.0	0.0	0.0	0.0	0.0	0.0

WINCAN

Section Pictures - 2/10/2025 - 2/10/2025 11:16:53 AM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**s jopin ave**	**2/10/2025**	**2/10/2025 11:16:53 AM**	**2**



2_10_2025 11_16_53
AM_07a1282a-484d-4ead-9268-8c441bb4675c_20250210_111927_576.jpg, 00:01:00, 8.07ft
Miscellaneous General Observation / new storm system



2_10_2025 11_16_53
AM_19dcbd6a-1538-4a0c-b993-07f090a58613_20250213_130125_627.jpg, 00:01:43, 45.00ft
Tap Factory Activity at 11 o'clock, dia/height: 12inch / tap 45



2_10_2025 11_16_53
AM_4876e4e0-157b-4461-96d6-90bf0e2fce22_20250210_112146_244.jpg, 00:03:02, 129.63ft
Miscellaneous General Observation / belongings



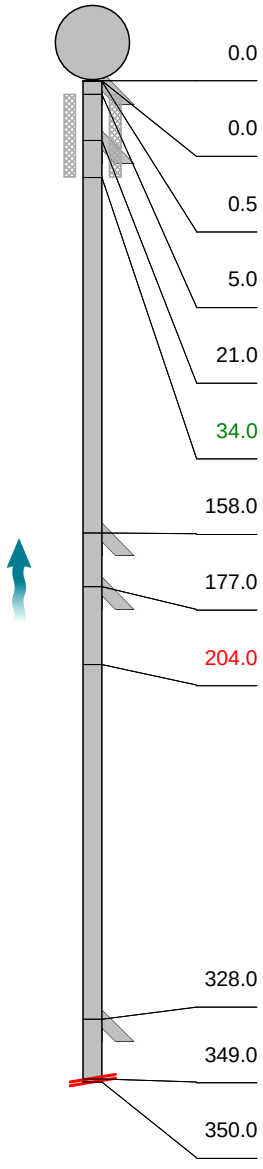
2_10_2025 11_16_53
AM_497b61c9-332e-44e3-b12e-cef6ee1e3ced_20250213_130253_747.jpg, 00:03:02, 129.63ft
Miscellaneous General Observation / belongings

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/5/2025			**Brendan Koziol**	**P0044090-092023**	**2/9/2025 1:54:06 PM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Upstream**	Pipe Joint Length:	Total Length: **350.0 '**	Length Surveyed: **350.0 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 3**
Street:	**7th st**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**access 2**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Rectangular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**48 x 60 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					



1:2642 Distance		Code	Observation	Counter	Photo	Grade
0.0		AMH	Manhole / access 2	00:00:00		
0.0		MWL	Water Level, 0% of the vertical dimension	00:00:01		
0.5		TFA	Tap Factory Activity at 11 o'clock, dia/height: 12inch / tap 2	00:00:08	2_9_2025 1_54_06 PM_3b9be	
5.0	S01	DSC	Deposits Settled Compacted, 10% of cross sectional area from 5 o'clock to 7 o'clock, Start / sediment, rocks, leafs	00:01:17	2_9_2025 1_54_06 PM_6f163	
21.0		TFA	Tap Factory Activity at 10 o'clock, dia/height: 12inch / tap 5	00:01:46	2_9_2025 1_54_06 PM_43639	
34.0	F01	DSC	Deposits Settled Compacted, 10% of cross sectional area from 5 o'clock to 7 o'clock, Finish / sediment, rocks, leafs	00:02:34		M2
158.0		TFA	Tap Factory Activity at 8 o'clock, dia/height: 12inch / tap 3	00:05:11	2_9_2025 1_54_06 PM_994c0	
177.0		TFA	Tap Factory Activity at 7 o'clock, dia/height: 18inch / tap 4	00:05:44	2_9_2025 1_54_06 PM_11d85	
204.0		SRV	Surface Damage Reinforcement Visible at 12 o'clock	00:06:24	2_9_2025 1_54_06 PM_a2270	S4
328.0		TFA	Tap Factory Activity at 7 o'clock, dia/height: 14inch / tap A	00:10:36	2_9_2025 1_54_06 PM_19990	
349.0		MGO	Miscellaneous General Observation / storm grate 1	00:13:35	2_9_2025 1_54_06 PM_66d4c	
350.0		MSA	Miscellaneous Survey Abandoned / survey abandoned	00:14:40		

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
4100	2600	4126	4.0	12.0	16.0	4.0	2.0	2.3

WINCAN

Section Pictures - 2/5/2025 - 2/9/2025 1:54:06 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/5/2025**	**2/9/2025 1:54:06 PM**	**3**



2_9_2025 1_54_06
PM_3b9bee17-89e5-4f0b-856c-5ae6f01df232_20250209_140636_555.jpg, 00:00:08, 0.50ft
Tap Factory Activity at 11 o'clock, dia/height: 12inch / tap 2



2_9_2025 1_54_06
PM_a9b3c89a-fe69-4136-ac1f-3c6482ebe0f4_20250209_140648_680.jpg, 00:00:08, 0.50ft
Tap Factory Activity at 11 o'clock, dia/height: 12inch / tap 2



2_9_2025 1_54_06
PM_6f1636b0-58a8-40d3-bee4-3d2a4e0498d3_20250212_095007_556.jpg, 00:01:17, 5.00ft
Deposits Settled Compacted, 10% of cross sectional area from 5 o'clock to 7 o'clock, Start / sediment, rocks, leafs



2_9_2025 1_54_06
PM_43639dae-1a90-4779-8ed0-1b30f9267272_20250209_141227_844.jpg, 00:01:46, 21.00ft
Tap Factory Activity at 10 o'clock, dia/height: 12inch / tap 5

WINCAN

Section Pictures - 2/5/2025 - 2/9/2025 1:54:06 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/5/2025**	**2/9/2025 1:54:06 PM**	**3**



2_9_2025 1_54_06
PM_994c0b8b-6fc5-4a0d-8a15-0fc3f0cc69da_20250209_140908_841.jpg, 00:05:11, 158.00ft
Tap Factory Activity at 8 o'clock, dia/height: 12inch / tap 3



2_9_2025 1_54_06
PM_11d853aa-8cf7-4d2d-83e8-ffd3712265ee_20250213_145548_417.jpg, 00:05:44, 177.00ft
Tap Factory Activity at 7 o'clock, dia/height: 18inch / tap 4



2_9_2025 1_54_06
PM_a22700ae-7b91-4812-a4c2-6c7ac8e92d28_20250209_141731_779.jpg, 00:06:24, 204.00ft
Surface Damage Reinforcement Visible at 12 o'clock



2_9_2025 1_54_06
PM_199907fb-e107-4d0f-ad7c-55523f66cd89_20250209_142012_956.jpg, 00:10:36, 328.00ft
Tap Factory Activity at 7 o'clock, dia/height: 14inch / tap A

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Section Pictures - 2/5/2025 - 2/9/2025 1:54:06 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/5/2025**	**2/9/2025 1:54:06 PM**	**3**



2_9_2025 1_54_06
PM_66d4c4f6-debf-48ac-91cc-65dc410e8360_20250209_142
132_293.jpg, 00:13:35, 349.00ft
Miscellaneous General Observation / storm grate 1

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/10/2025			**Brendan koziol**	**P0044090-09223**	**2/10/2025 11:35:28 AM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Downstream**	Pipe Joint Length:	Total Length: **165.3 '**	Length Surveyed: **165.3 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 11**
Street:	**s jopin ave**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**access 12**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Barrel**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**50 x 62 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					



1:1248	Distance	Code	Observation	Counter	Photo	Grade
access 11						
	0.0	AMH	Manhole / access 11	00:00:00		
	0.0	MWL	Water Level, 2% of the vertical dimension	00:00:02		
	32.3	HSV	Hole Soil Visible from 6 o'clock to 7 o'clock, length: 40inch, intruding: 8inch	00:00:59	2_10_2025 11_35_28 AM_a1778	S5
	34.7	HSV	Hole Soil Visible from 5 o'clock to 6 o'clock, length: 60inch, intruding: 12inch	00:01:10	2_10_2025 11_35_28 AM_9eddc	S5
	56.3	DSZ	Deposits Settled Other, 5% of cross sectional area at 6 o'clock / house hold debries	00:01:28	2_10_2025 11_35_28 AM_534b5	M2
	92.8	H	Hole from 6 o'clock to 7 o'clock, length: 40inch, intruding: 10inch	00:02:15	2_10_2025 11_35_28 AM_266a7	S4
	98.1	MGO	Miscellaneous General Observation / drain gully between buildings	00:02:24	2_10_2025 11_35_28 AM_a0b23	
	140.0	TFA	Tap Factory Activity at 9 o'clock, dia/height: 18inch / tap 46	00:03:27	2_10_2025 11_35_28 AM_ded1f	
	165.3	MGO	Miscellaneous General Observation / gallery turns again to the west ahead. linking up with the previous run	00:04:59	2_10_2025 11_35_28 AM_06992	
	165.3	MSA	Miscellaneous Survey Abandoned / too many turns cannot proceed	00:04:48		

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
5241	2100	5241	14.0	2.0	16.0	4.7	2.0	4.0

WINCAN

Section Pictures - 2/10/2025 - 2/10/2025 11:35:28 AM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**s jopin ave**	**2/10/2025**	**2/10/2025 11:35:28 AM**	**3**



2_10_2025 11_35_28
AM_a1778c74-6c59-4dc9-8714-52c213941a5e_20250213_130857_800.jpg, 00:00:59, 32.30ft
Hole Soil Visible from 6 o'clock to 7 o'clock, length: 40inch, intruding: 8inch



2_10_2025 11_35_28
AM_9eddc77f-cdfb-4b8d-b73f-48677174c481_20250213_130937_999.jpg, 00:01:10, 34.65ft
Hole Soil Visible from 5 o'clock to 6 o'clock, length: 60inch, intruding: 12inch



2_10_2025 11_35_28
AM_38abb125-aed9-4863-98fe-786ef64a1e16_20250213_130942_967.jpg, 00:01:10, 34.65ft
Hole Soil Visible from 5 o'clock to 6 o'clock, length: 60inch, intruding: 12inch



2_10_2025 11_35_28
AM_534b5338-29be-4e42-beab-18007b7374c8_20250213_131032_981.jpg, 00:01:28, 56.25ft
Deposits Settled Other, 5% of cross sectional area at 6 o'clock / house hold debries

WINCAN

Section Pictures - 2/10/2025 - 2/10/2025 11:35:28 AM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**s jopin ave**	**2/10/2025**	**2/10/2025 11:35:28 AM**	**3**



2_10_2025 11_35_28
AM_266a73a2-492b-4f53-9569-d0323644f5d3_20250213_131145_379.jpg, 00:02:15, 92.81ft
Hole from 6 o'clock to 7 o'clock, length: 40inch, intruding: 10inch



2_10_2025 11_35_28
AM_4d200cb1-4a7f-42fb-aaec-02700410909f_20250213_131202_076.jpg, 00:02:15, 92.81ft
Hole from 6 o'clock to 7 o'clock, length: 40inch, intruding: 10inch



2_10_2025 11_35_28
AM_a0b23d46-0bab-4ed8-b5ed-d886247d0411_20250213_131229_724.jpg, 00:02:24, 98.09ft
Miscellaneous General Observation / drain gully between buildings



2_10_2025 11_35_28
AM_696eb16d-9601-4e99-8715-d598ba2ec73a_20250213_131257_048.jpg, 00:02:24, 98.09ft
Miscellaneous General Observation / drain gully between buildings

WINCAN

Section Pictures - 2/10/2025 - 2/10/2025 11:35:28 AM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**s jopin ave**	**2/10/2025**	**2/10/2025 11:35:28 AM**	**3**



2_10_2025 11_35_28 AM_ded1f80c-b15e-4016-89c2-428f34f7a370_20250213_131419_055.jpg, 00:03:27, 140.00ft
Tap Factory Activity at 9 o'clock, dia/height: 18inch / tap 46



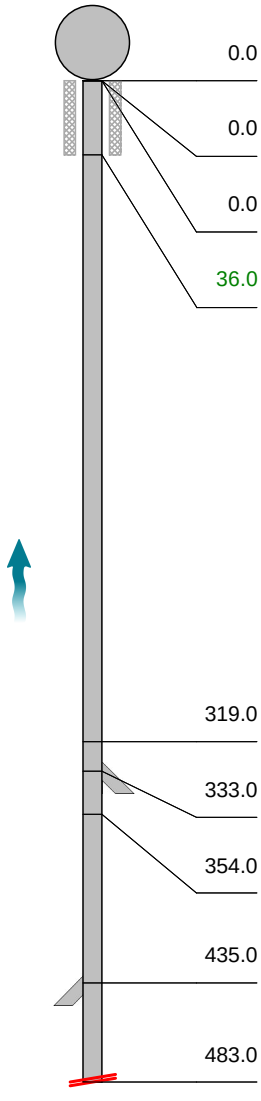
2_10_2025 11_35_28 AM_06992e6c-705e-4e37-b8c5-8edf5f5afffc_20250213_131616_815.jpg, 00:04:59, 165.30ft
Miscellaneous General Observation / gallery turns again to the west ahead. linking up with the previous run

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/5/2025			**Brendan Koziol**	**P0044090-092023**	**2/9/2025 2:22:53 PM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Upstream**	Pipe Joint Length:	Total Length: **483.0 '**	Length Surveyed: **483.0 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 3**
Street:	**7th st**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**access 2**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Rectangular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**48 x 60 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					



1:3646	Distance		Code	Observation	Counter	Photo	Grade
	0.0		AMH	Manhole / access 2	00:00:00		
	0.0		MWL	Water Level, 0% of the vertical dimension	00:00:05		
	0.0	S01	DSC	Deposits Settled Compacted, 20% of cross sectional area from 5 o'clock to 7 o'clock, Start	00:00:24	2_9_2025 2_22_53 PM_18736	
	36.0	F01	DSC	Deposits Settled Compacted, 20% of cross sectional area from 5 o'clock to 7 o'clock, Finish	00:02:38		M3
	319.0		MGO	Miscellaneous General Observation / grate 1	00:09:38	2_9_2025 2_22_53 PM_24bc2	
	333.0		TFA	Tap Factory Activity at 7 o'clock, dia/height: 14inch / tap A	00:10:01	2_9_2025 2_22_53 PM_9c1f8	
	354.0		MGO	Miscellaneous General Observation / grate 2	00:10:56	2_9_2025 2_22_53 PM_03745	
	435.0		TFA	Tap Factory Activity at 5 o'clock, dia/height: 4inch / tap B	00:12:36	2_9_2025 2_22_53 PM_f77d2	
	483.0		MSA	Miscellaneous Survey Abandoned / cannot make it around corner	00:14:51		

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	3700	3700	0.0	21.0	21.0	0.0	3.0	3.0

WINCAN

Section Pictures - 2/5/2025 - 2/9/2025 2:22:53 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/5/2025**	**2/9/2025 2:22:53 PM**	**4**



2_9_2025 2_22_53
PM_18736a63-f97a-4abf-a2ef-0ffe0621751f_20250212_093231_420.jpg, 00:00:24, 0.00ft
Deposits Settled Compacted, 20% of cross sectional area from 5 o'clock to 7 o'clock, Start



2_9_2025 2_22_53
PM_24bc2363-ffdd-41da-9ae6-77b9a74853d9_20250209_143122_913.jpg, 00:09:38, 319.00ft
Miscellaneous General Observation / grate 1



2_9_2025 2_22_53
PM_9c1f89e4-62f7-444f-96b1-2a2234f5f946_20250209_143210_328.jpg, 00:10:01, 333.00ft
Tap Factory Activity at 7 o'clock, dia/height: 14inch / tap A



2_9_2025 2_22_53
PM_03745b61-f79b-4ba6-9eaf-d30976a857cc_20250209_143525_150.jpg, 00:10:56, 354.00ft
Miscellaneous General Observation / grate 2

WINCAN

Section Pictures - 2/5/2025 - 2/9/2025 2:22:53 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/5/2025**	**2/9/2025 2:22:53 PM**	**4**



2_9_2025 2_22_53
PM_f77d266a-2100-4399-a768-f5075070f1a9_20250209_143523_203.jpg, 00:12:36, 435.00ft
Tap Factory Activity at 5 o'clock, dia/height: 4inch / tap B

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/10/2025			**Brendan koziol**	**P0044090-09223**	**2/10/2025 12:15:40 PM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Downstream**	Pipe Joint Length:	Total Length: **222.7 '**	Length Surveyed: **222.7 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 12**
Street:	**s jopin ave**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**acces 10 - 12 line**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Circular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**24 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					



1:1682	Distance		Code	Observation	Counter	Photo	Grade
access 12							
	0.0		AMH	Manhole / access 12	00:00:00		
	0.0		MWL	Water Level, 10% of the vertical dimension	00:00:04		
	16.2		TFA	Tap Factory Activity at 11 o'clock, dia/height: 8inch / tap 44	00:00:34	2_10_2025 12_15_40 PM_a5f7e	
	27.9		HSV	Hole Soil Visible at 12 o'clock, length: 1inch, intruding: 1inch	00:00:58	2_10_2025 12_15_40 PM_0ce33	S5
	53.2		CL	Crack Longitudinal at 8 o'clock, length: 4inch, intruding: 0inch	00:01:44	2_10_2025 12_15_40 PM_b1d5f	S2
	54.6	S01	CM	Crack Multiple from 8 o'clock to 5 o'clock, Start, length: 45inch, intruding: 0inch	00:01:56	2_10_2025 12_15_40 PM_05795	
	62.2	F01	CM	Crack Multiple from 8 o'clock to 5 o'clock, Finish, length: 45inch, intruding: 0inch	00:02:16		S3
	65.3		CL	Crack Longitudinal at 12 o'clock, length: 4inch, intruding: 0inch	00:02:31	2_10_2025 12_15_40 PM_f55a7	S2
	135.0	S02	CM	Crack Multiple from 12 o'clock to 12 o'clock, Start, length: 99inch, intruding: 0inch	00:04:10	2_10_2025 12_15_40 PM_e0b5d	
	155.6		MGO	Miscellaneous General Observation / repair	00:05:11	2_10_2025 12_15_40 PM_9801c	
	222.7		AMH	Manhole / acces 10 - 12 line	00:07:43		
	222.7	F02	CM	Crack Multiple from 12 o'clock to 12 o'clock, Finish, length: 99inch, intruding: 0inch	00:07:41		S3
acces 10 - 12 line							

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
513C	0000	513C	69.0	0.0	69.0	3.0	0.0	3.0

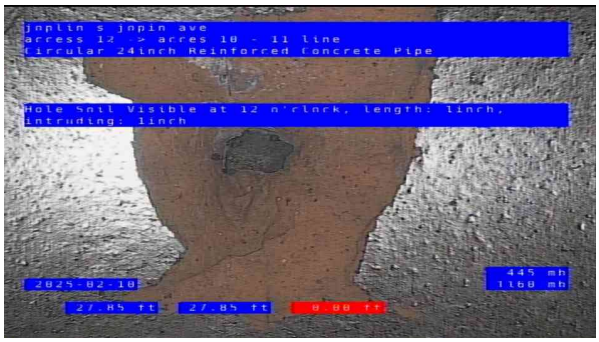
WINCAN

Section Pictures - 2/10/2025 - 2/10/2025 12:15:40 PM

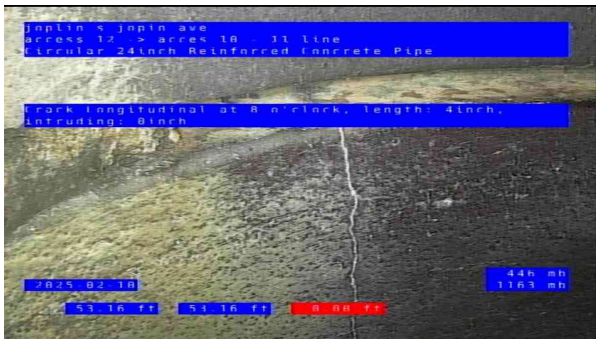
City	Street	Date	Lateral Segment Reference	Section No.
joplin	**s jopin ave**	**2/10/2025**	**2/10/2025 12:15:40 PM**	**4**



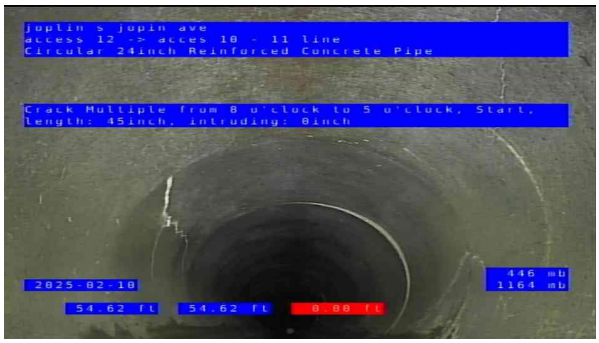
2_10_2025 12_15_40
PM_a5f7ea94-ff90-4781-b31c-80827db40395_20250210_121804_563.jpg, 00:00:34, 16.15ft
Tap Factory Activity at 11 o'clock, dia/height: 8inch / tap 44



2_10_2025 12_15_40
PM_0ce332c8-3750-42db-b254-d240c67d62f8_20250210_121850_841.jpg, 00:00:58, 27.85ft
Hole Soil Visible at 12 o'clock, length: 1inch, intruding: 1inch



2_10_2025 12_15_40
PM_b1d5f5aa-fbdc-4422-b417-6a8a48973fa5_20250210_122002_800.jpg, 00:01:44, 53.16ft
Crack Longitudinal at 8 o'clock, length: 4inch, intruding: 0inch

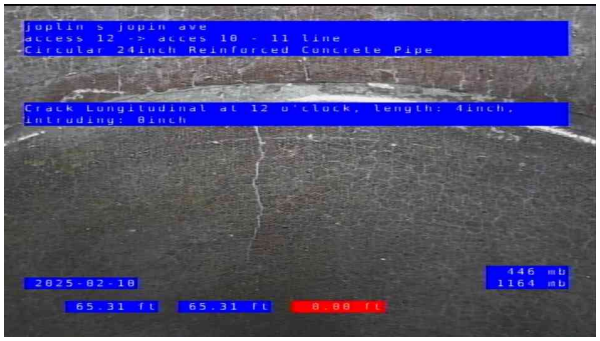


2_10_2025 12_15_40
PM_05795b71-0d0d-49ed-b9c8-ee115fa6b70e_20250210_122044_694.jpg, 00:01:56, 54.62ft
Crack Multiple from 8 o'clock to 5 o'clock, Start, length: 45inch, intruding: 0inch

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Section Pictures - 2/10/2025 - 2/10/2025 12:15:40 PM

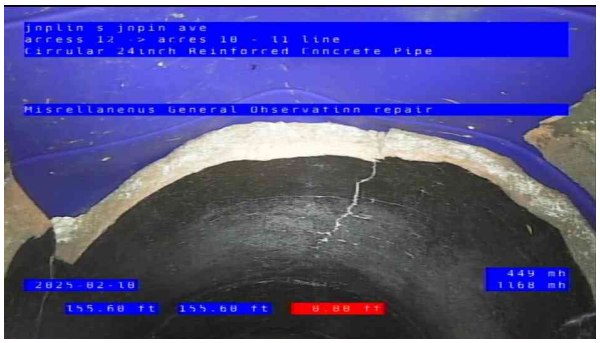
City	Street	Date	Lateral Segment Reference	Section No.
joplin	**s jopin ave**	**2/10/2025**	**2/10/2025 12:15:40 PM**	**4**



2_10_2025 12_15_40
PM_f55a709b-3e7c-4fca-b393-ff3a830c0908_20250210_122159_281.jpg, 00:02:31, 65.31ft
Crack Longitudinal at 12 o'clock, length: 4inch, intruding: 0inch



2_10_2025 12_15_40
PM_e0b5d4f8-fcd9-4f39-90d7-03b357c653f1_20250210_122404_239.jpg, 00:04:10, 135.04ft
Crack Multiple from 12 o'clock to 12 o'clock, Start, length: 99inch, intruding: 0inch



2_10_2025 12_15_40
PM_9801c71b-8cb8-4845-9a56-d6a8bc388f30_20250210_122512_473.jpg, 00:05:11, 155.60ft
Miscellaneous General Observation / repair

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/5/2025			**Brendan Koziol**	**P0044090-092023**	**2/9/2025 2:38:34 PM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Downstream**	Pipe Joint Length:	Total Length: **27.0 '**	Length Surveyed: **27.0 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 2**
Street:	**7th st**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**west end of moffet st**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Rectangular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**48 x 60 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			

Additional Info:



1:204	Distance	Code	Observation	Counter	Photo	Grade
	0.0	AMH	Manhole / access 2	00:00:00		
	0.0	MWL	Water Level, 10% of the vertical dimension	00:00:01		
	15.0	SMW	Surface Damage Missing Wall from 10 o'clock to 2 o'clock	00:01:44	2_9_2025 2_38_34 PM_1944d	S5
	27.0	AMH	Manhole / west end of moffet st	00:02:25		

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
5100	0000	5100	5.0	0.0	5.0	5.0	0.0	5.0

WINCAN

Section Pictures - 2/5/2025 - 2/9/2025 2:38:34 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/5/2025**	**2/9/2025 2:38:34 PM**	**5**



2_9_2025 2_38_34
PM_1944d605-c2f2-4aa2-814a-f1ed5936d700_20250212_093026_574.jpg, 00:01:44, 15.00ft
Surface Damage Missing Wall from 10 o'clock to 2 o'clock



2_9_2025 2_38_34
PM_e2d2bc41-6377-487d-9f5a-c4b9548599a4_20250212_093029_760.jpg, 00:01:44, 15.00ft
Surface Damage Missing Wall from 10 o'clock to 2 o'clock

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/10/2025			**Brendan koziol**	**P0044090-09223**	**2/10/2025 12:44:56 PM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Downstream**	Pipe Joint Length:	Total Length: **351.7 '**	Length Surveyed: **351.7 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 12**
Street:	**s jopin ave**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**access 13**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Circular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**24 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					



1:2655	Distance		Code	Observation	Counter	Photo	Grade
access 12							
	0.0		AMH	Manhole / access 12	00:00:00		
	0.0		MWL	Water Level, 10% of the vertical dimension	00:00:02		
	1.0	S01	DAE	Deposits Attached Encrustation, 25% of cross sectional area from 4 o'clock to 8 o'clock, Start	00:01:51	2_10_2025 12_44_56 PM_a705c	
	10.2		TFA	Tap Factory Activity at 10 o'clock, dia/height: 10inch / tap 43	00:02:14	2_10_2025 12_44_56 PM_76ccf	
	99.5		CM	Crack Multiple from 7 o'clock to 5 o'clock, length: 30inch, intruding: 0inch	00:04:31		S3
	133.6		TFD	Tap Factory Made Defective at 1 o'clock, dia/height: 6inch, length: 6inch / tap 42	00:06:00	2_10_2025 12_44_56 PM_cbc12	M3
	150.7		DAE	Deposits Attached Encrustation, 20% of cross sectional area from 12 o'clock to 12 o'clock	00:06:39	2_10_2025 12_44_56 PM_f538d	M3
	153.8		TFA	Tap Factory Activity at 12 o'clock, dia/height: 3inch / tap 41	00:07:05	2_10_2025 12_44_56 PM_10b76	
	257.1	F01	DAE	Deposits Attached Encrustation, 25% of cross sectional area from 4 o'clock to 8 o'clock, Finish	00:09:07		M4
	257.1		TFA	Tap Factory Activity at 12 o'clock, dia/height: 4inch / tap 40	00:09:05	2_10_2025 12_44_56 PM_991bb	
	314.3		IW	Infiltration Weeper from 12 o'clock to 1 o'clock	00:10:12	2_10_2025 12_44_56 PM_2d0e5	M2
	351.7		AMH	Manhole / access 13	00:11:15		
access 13							

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
3100	4I32	4I33	3.0	212.0	215.0	3.0	3.9	3.9

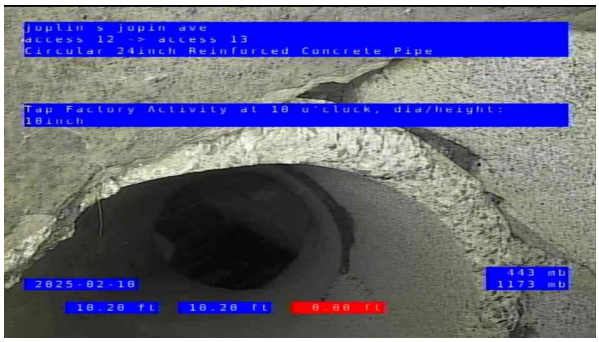
WINCAN

Section Pictures - 2/10/2025 - 2/10/2025 12:44:56 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**s jopin ave**	**2/10/2025**	**2/10/2025 12:44:56 PM**	**5**



2_10_2025 12_44_56
PM_a705ced8-30c8-4225-a9fe-ea19eac4df07_20250213_132844_839.jpg, 00:01:51, 1.00ft
Deposits Attached Encrustation, 25% of cross sectional area from 4 o'clock to 8 o'clock, Start



2_10_2025 12_44_56
PM_76ccf0e0-863c-4346-8b7a-4d15a6a84b35_20250210_124810_552.jpg, 00:02:14, 10.20ft
Tap Factory Activity at 10 o'clock, dia/height: 10inch / tap 43



2_10_2025 12_44_56
PM_cbc12a84-6d1e-4df4-85ee-268bc4152ed3_20250210_125306_142.jpg, 00:06:00, 133.56ft
Tap Factory Made Defective at 1 o'clock, dia/height: 6inch, length: 6inch / tap 42



2_10_2025 12_44_56
PM_f538d51f-c3eb-4ce4-aaf7-d5246d11151a_20250210_125410_008.jpg, 00:06:39, 150.66ft
Deposits Attached Encrustation, 20% of cross sectional area from 12 o'clock to 12 o'clock

WINCAN

Section Pictures - 2/10/2025 - 2/10/2025 12:44:56 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**s jopin ave**	**2/10/2025**	**2/10/2025 12:44:56 PM**	**5**



2_10_2025 12_44_56
PM_64bb1a70-3138-40aa-af32-72caa813bd20_20250210_125414_937.jpg, 00:06:39, 150.66ft
Deposits Attached Encrustation, 20% of cross sectional area from 12 o'clock to 12 o'clock



2_10_2025 12_44_56
PM_10b76e56-0781-404f-b41a-f9727987dc72_20250210_125517_865.jpg, 00:07:05, 153.76ft
Tap Factory Activity at 12 o'clock, dia/height: 3inch / tap 41



2_10_2025 12_44_56
PM_991bb835-d788-40e0-ae5f-c8320de1cdab_20250210_125728_247.jpg, 00:09:05, 257.14ft
Tap Factory Activity at 12 o'clock, dia/height: 4inch / tap 40



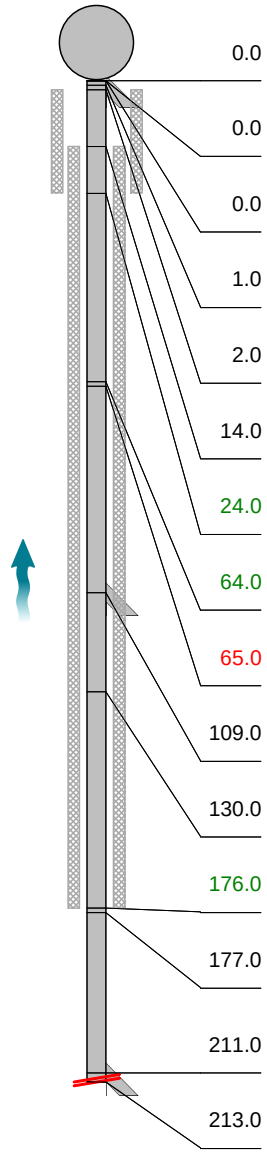
2_10_2025 12_44_56
PM_2d0e580b-7292-4f3f-a56e-fed178c49b37_20250210_125851_013.jpg, 00:10:12, 314.34ft
Infiltration Weeper from 12 o'clock to 1 o'clock

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/5/2025			**Brendan Koziol**	**P0044090-092023**	**2/9/2025 2:41:30 PM**
Year laid:	Pre-cleaning:	Direction:	Pipe Joint Length:	Total Length:	Length Surveyed:
	No Pre-Cleaning	**Upstream**		**213.0 '**	**213.0 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 2**
Street:	**7th st**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**access 3**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Rectangular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**48 x 60 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					



1:1608 Distance		Code	Observation	Counter	Photo	Grade
0.0		AMH	Manhole / access 2	00:00:00		
0.0		MWL	Water Level, 0% of the vertical dimension	00:00:12		
0.0		MGO	Miscellaneous General Observation / conduit	00:03:40	2_9_2025 2_41_30 PM_1afab	
1.0		TFA	Tap Factory Activity at 7 o'clock, dia/height: 20inch / tap 10	00:05:24	2_9_2025 2_41_30 PM_d1c03	
2.0	S01	DSC	Deposits Settled Compacted, 15% of cross sectional area at 6 o'clock, Start	00:05:34	2_9_2025 2_41_30 PM_c610b	
14.0	S02	DSC	Deposits Settled Compacted, 20% of cross sectional area from 5 o'clock to 7 o'clock, Start / rocks, sediment, leafs	00:06:05	2_9_2025 2_41_30 PM_8163a	
24.0	F01	DSC	Deposits Settled Compacted, 15% of cross sectional area at 6 o'clock, Finish	00:06:05		M3
64.0		IS	Infiltration Stain from 11 o'clock to 1 o'clock	00:09:22	2_9_2025 2_41_30 PM_0f0d8	M1
65.0		SRP	Surface Damage Reinforcement Projecting from 10 o'clock to 2 o'clock	00:09:34	2_9_2025 2_41_30 PM_20685	S5
109.0		TFA	Tap Factory Activity at 7 o'clock, dia/height: 16inch / tap 9	00:12:25	2_9_2025 2_41_30 PM_79bb1	
130.0		MGO	Miscellaneous General Observation / hose	00:14:17	2_9_2025 2_41_30 PM_97aed	
176.0	F02	DSC	Deposits Settled Compacted, 20% of cross sectional area from 5 o'clock to 7 o'clock, Finish / rocks, sediment, leafs	00:17:59		M3
177.0		MGO	Miscellaneous General Observation / manhole	00:18:00	2_9_2025 2_41_30 PM_d62e4	
211.0		TFA	Tap Factory Activity at 7 o'clock, dia/height: 16inch / tap 8	00:19:08	2_9_2025 2_41_30 PM_ed525	
213.0		MSA	Miscellaneous Survey Abandoned / meeting point from moffet st	00:19:26		

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
5100	3F11	513F	5.0	109.0	114.0	5.0	2.9	3.0

WINCAN

Section Pictures - 2/5/2025 - 2/9/2025 2:41:30 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/5/2025**	**2/9/2025 2:41:30 PM**	**6**



2_9_2025 2_41_30
PM_1afab1e8-685e-430b-ba4c-6accd7fe890a_20250209_144850_884.jpg, 00:03:40, 0.00ft
Miscellaneous General Observation / conduit



2_9_2025 2_41_30
PM_5f581bb9-f5ee-4eee-b731-e621d43cddaa_20250209_144922_670.jpg, 00:03:40, 0.00ft
Miscellaneous General Observation / conduit



2_9_2025 2_41_30
PM_d1c03ee7-4a8f-4433-983a-35d83f6801dc_20250209_145016_721.jpg, 00:05:24, 1.00ft
Tap Factory Activity at 7 o'clock, dia/height: 20inch / tap 10



2_9_2025 2_41_30
PM_c610bcc4-fbf1-4a5f-ac96-5a83d41b74a0_20250212_084539_597.jpg, 00:05:34, 2.00ft
Deposits Settled Compacted, 15% of cross sectional area at 6 o'clock, Start

WINCAN

Section Pictures - 2/5/2025 - 2/9/2025 2:41:30 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/5/2025**	**2/9/2025 2:41:30 PM**	**6**



2_9_2025 2_41_30
PM_8163ace7-d1eb-4071-bcc7-6720261ea795_20250212_084811_150.jpg, 00:06:05, 14.00ft
Deposits Settled Compacted, 20% of cross sectional area from 5 o'clock to 7 o'clock, Start / rocks, sediment, leafs



2_9_2025 2_41_30
PM_0f0d862e-560b-462c-91b7-731449ae51be_20250212_085303_399.jpg, 00:09:22, 64.00ft
Infiltration Stain from 11 o'clock to 1 o'clock



2_9_2025 2_41_30
PM_206858ea-6003-4c39-a3f6-4159af9313fb_20250212_085350_109.jpg, 00:09:34, 65.00ft
Surface Damage Reinforcement Projecting from 10 o'clock to 2 o'clock



2_9_2025 2_41_30
PM_79bb1d31-b117-4898-8c2a-cd322eee75c3_20250209_145348_496.jpg, 00:12:25, 109.00ft
Tap Factory Activity at 7 o'clock, dia/height: 16inch / tap 9

WINCAN

Section Pictures - 2/5/2025 - 2/9/2025 2:41:30 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/5/2025**	**2/9/2025 2:41:30 PM**	**6**



2_9_2025 2_41_30
PM_97aed3a0-67bb-414f-8523-30b355af4359_20250209_145656_524.jpg, 00:14:17, 130.00ft
Miscellaneous General Observation / hose



2_9_2025 2_41_30
PM_d62e4745-8299-4c66-b9bb-9d4236eb3880_20250209_145654_833.jpg, 00:18:00, 177.00ft
Miscellaneous General Observation / manhole



2_9_2025 2_41_30
PM_ed52533e-1890-4f4c-9c0b-806d8ccc7d57_20250209_145753_202.jpg, 00:19:08, 211.00ft
Tap Factory Activity at 7 o'clock, dia/height: 16inch / tap 8

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/5/2025			**Brendan Koziol**	**P0044090-092023**	**2/12/2025 10:18:33 AM**
Year laid:	Pre-cleaning:	Direction:	Pipe Joint Length:	Total Length:	Length Surveyed:
	No Pre-Cleaning	**Downstream**		**142.0 '**	**142.0 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 1**
Street:	**7th st**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**access 4**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Rectangular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**48 x 60 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			

Additional Info:



1:1072 Distance		Code	Observation	Counter	Photo	Grade
0.0		AMH	Manhole / access 1	00:00:00		
0.0		MWL	Water Level, 4% of the vertical dimension	00:00:09		
1.0	S01	DSC	Deposits Settled Compacted, 10% of cross sectional area from 5 o'clock to 7 o'clock, Start / rocks, sediment, leafs	00:00:12	2_12_2025 10_18_33 AM_f6f710	
19.0		TFA	Tap Factory Activity at 7 o'clock, dia/height: 16inch / tap 7	00:01:26	2_12_2025 10_18_33 AM_8936c	
30.0		IS	Infiltration Stain from 7 o'clock to 12 o'clock	00:01:47	2_12_2025 10_18_33 AM_7f82d	M1
76.0		TFA	Tap Factory Activity at 7 o'clock, dia/height: 20inch / tap 6	00:07:05	2_12_2025 10_18_33 AM_3a16b	
76.0		IS	Infiltration Stain at 12 o'clock, within 8 inch	00:07:21	2_12_2025 10_18_33 AM_0c35e	M1
86.0		MGO	Miscellaneous General Observation / supporting wall ending. east line on other side	00:07:54	2_12_2025 10_18_33 AM_4d153	
86.2	F01	DSC	Deposits Settled Compacted, 10% of cross sectional area from 5 o'clock to 7 o'clock, Finish / rocks, sediment, leafs	00:07:56		M2
95.0		MMC	Miscellaneous Material Change, Brick / reinforced concrete to brick	00:08:27	2_12_2025 10_18_33 AM_c7c6f	
127.0		MGO	Miscellaneous General Observation / utility	00:10:01	2_12_2025 10_18_33 AM_270a1	
142.0		MSA	Miscellaneous Survey Abandoned / cannot continue, will complete from access 6	00:13:17		

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	2B12	2B12	0.0	36.0	36.0	0.0	1.9	1.9

WINCAN

Section Pictures - 2/5/2025 - 2/12/2025 10:18:33 AM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/5/2025**	**2/12/2025 10:18:33 AM**	**7**



2_12_2025 10_18_33
AM_f6f710cc-c0f8-4b4b-999d-faefd6844669_20250212_102148_334.jpg, 00:00:12, 1.00ft
Deposits Settled Compacted, 10% of cross sectional area from 5 o'clock to 7 o'clock, Start / rocks, sediment, leafs



2_12_2025 10_18_33
AM_8936ced4-acbc-45f3-871e-309b5a5dca23_20250212_102350_731.jpg, 00:01:26, 19.00ft
Tap Factory Activity at 7 o'clock, dia/height: 16inch / tap 7



2_12_2025 10_18_33
AM_7f82d2c3-ab18-4ad2-8de5-79e08f77f6b5_20250212_102535_132.jpg, 00:01:47, 30.00ft
Infiltration Stain from 7 o'clock to 12 o'clock



2_12_2025 10_18_33
AM_1a53056e-4513-43a3-9a21-f9371cccffa6_20250212_102540_038.jpg, 00:01:47, 30.00ft
Infiltration Stain from 7 o'clock to 12 o'clock

WINCAN

Section Pictures - 2/5/2025 - 2/12/2025 10:18:33 AM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/5/2025**	**2/12/2025 10:18:33 AM**	**7**



2_12_2025 10_18_33
AM_3a16b548-2d9e-45da-9637-b86bfdf5dce0_20250212_103346_188.jpg, 00:07:05, 76.00ft
Tap Factory Activity at 7 o'clock, dia/height: 20inch / tap 6



2_12_2025 10_18_33
AM_0c35e868-23b9-4963-8a5e-a49b29b701c2_20250212_102820_073.jpg, 00:07:21, 76.00ft
Infiltration Stain at 12 o'clock, within 8 inch



2_12_2025 10_18_33
AM_4d15350a-f379-4ebe-9274-62463a3ca275_20250212_103057_630.jpg, 00:07:54, 86.00ft
Miscellaneous General Observation / supporting wall ending. east line on other side



2_12_2025 10_18_33
AM_c7c6f48b-b27d-4806-80b2-431ce4f0d086_20250212_103224_819.jpg, 00:08:27, 95.00ft
Miscellaneous Material Change, Brick / reinforced concrete to brick

WINCAN

Section Pictures - 2/5/2025 - 2/12/2025 10:18:33 AM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/5/2025**	**2/12/2025 10:18:33 AM**	**7**



2_12_2025 10_18_33
AM_0790d1d8-0a03-48bd-b354-850f6a2a718b_20250212_103227_633.jpg, 00:08:27, 95.00ft
Miscellaneous Material Change, Brick / reinforced concrete to brick



2_12_2025 10_18_33
AM_270a1e83-c3d5-4eaf-b65f-6dcfc6e3b964_20250212_103525_618.jpg, 00:10:01, 127.00ft
Miscellaneous General Observation / utility



2_12_2025 10_18_33
AM_52cd06c4-8981-4e8d-a00e-0b4aa5271cec_20250212_103538_792.jpg, 00:10:01, 127.00ft
Miscellaneous General Observation / utility

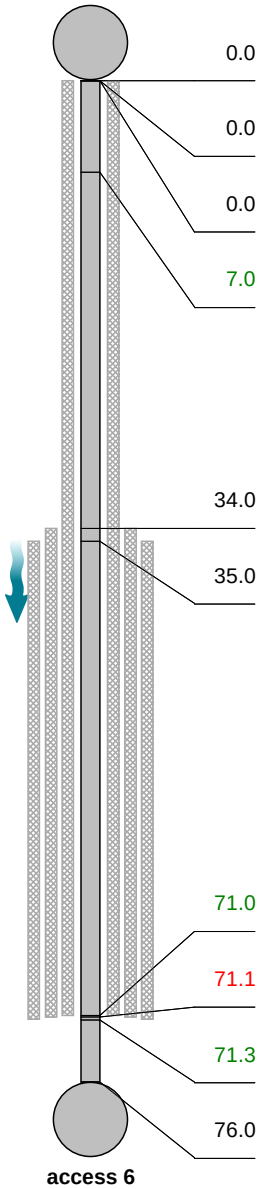
WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/9/2025			**Brendan Koziol**	**P0044090-092023**	**2/12/2025 11:30:13 AM**
Year laid:	Pre-cleaning:	Direction:	Pipe Joint Length:	Total Length:	Length Surveyed:
	No Pre-Cleaning	**Downstream**		**76.0 '**	**76.0 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 4**
Street:	**7th st**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**access 6**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Rectangular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**48 x 60 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			

Additional Info:



1:574 Distance		Code	Observation	Counter	Photo	Grade
0.0		AMH	Manhole / access 4	00:00:00		
0.0		MWL	Water Level, 0% of the vertical dimension	00:00:02		
0.0	S01	DSC	Deposits Settled Compacted, 10% of cross sectional area at 6 o'clock, Start / rocks, leafs, sediment	00:00:08	2_12_2025 11_30_13 AM_07c3b	
7.0		IS	Infiltration Stain from 6 o'clock to 12 o'clock	00:00:25	2_12_2025 11_30_13 AM_7ae2f	M1
34.0	S02	SMW	Surface Damage Missing Wall from 10 o'clock to 2 o'clock, Start	00:02:01	2_12_2025 11_30_13 AM_a2a7b	
35.0	S03	IS	Infiltration Stain from 12 o'clock to 12 o'clock, Start	00:02:01	2_12_2025 11_30_13 AM_e1480	
71.0	F01	DSC	Deposits Settled Compacted, 10% of cross sectional area at 6 o'clock, Finish / rocks, leafs, sediment	00:02:56		M2
71.1	F02	SMW	Surface Damage Missing Wall from 10 o'clock to 2 o'clock, Finish	00:02:56		S5
71.3	F03	IS	Infiltration Stain from 12 o'clock to 12 o'clock, Finish	00:02:56		M1
76.0		AMH	Manhole / access 6	00:03:19		

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
5700	2A18	572A	35.0	36.0	71.0	5.0	1.6	2.4

WINCAN

Section Pictures - 2/9/2025 - 2/12/2025 11:30:13 AM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 11:30:13 AM**	**8**



2_12_2025 11_30_13
AM_07c3bd2d-c0fe-4224-bebe-d54aa9b4358d_20250212_113913_683.jpg, 00:00:08, 0.00ft
Deposits Settled Compacted, 10% of cross sectional area at 6 o'clock, Start / rocks, leafs, sediment



2_12_2025 11_30_13
AM_7ae2fafa-6d63-4eba-a9db-334068a68850_20250212_113823_531.jpg, 00:00:25, 7.00ft
Infiltration Stain from 6 o'clock to 12 o'clock



2_12_2025 11_30_13
AM_c44209f1-9f97-4cd6-8b1f-b2e5a6dd8885_20250212_113858_753.jpg, 00:00:25, 7.00ft
Infiltration Stain from 6 o'clock to 12 o'clock



2_12_2025 11_30_13
AM_a2a7bb77-3dad-4768-b2ea-5ec7cf219983_20250212_114021_305.jpg, 00:02:01, 34.00ft
Surface Damage Missing Wall from 10 o'clock to 2 o'clock, Start

WINCAN

Section Pictures - 2/9/2025 - 2/12/2025 11:30:13 AM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 11:30:13 AM**	**8**



2_12_2025 11_30_13
AM_e1480b8e-047b-431d-819c-2e4ed0e87382_20250212_114058_136.jpg, 00:02:01, 35.00ft
Infiltration Stain from 12 o'clock to 12 o'clock, Start

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/9/2025			**Brendan Koziol**	**P0044090-092023**	**2/12/2025 11:43:38 AM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Downstream**	Pipe Joint Length:	Total Length: **93.0 '**	Length Surveyed: **93.0 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 4**
Street:	**7th st**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**access 5**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Rectangular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**48 x 60 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			

Additional Info:



1:702 Distance		Code	Observation	Counter	Photo	Grade
access 4						
0.0		AMH	Manhole / access 4	00:00:00		
0.0		MWL	Water Level, 5% of the vertical dimension	00:00:01		
1.0	S01	DSC	Deposits Settled Compacted, 10% of cross sectional area at 6 o'clock, Start / sediment, roks	00:00:04	2_12_2025 11_43_38 AM_ae284	
10.0	F01	DSC	Deposits Settled Compacted, 10% of cross sectional area at 6 o'clock, Finish / sediment, roks	00:02:10		M2
22.0	S02	IS	Infiltration Stain from 9 o'clock to 5 o'clock, Start	00:03:02	2_12_2025 11_43_38 AM_5f51f9	
93.0	F02	IS	Infiltration Stain from 9 o'clock to 5 o'clock, Finish	00:05:44		M1
93.0		AMH	Manhole / access 5	00:05:47		
access 5						

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	221A	221A	0.0	18.0	18.0	0.0	1.1	1.1

WINCAN

Section Pictures - 2/9/2025 - 2/12/2025 11:43:38 AM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 11:43:38 AM**	**9**



2_12_2025 11_43_38
AM_ae284782-f110-47df-ba22-53603e3ccf1b_20250212_114836_766.jpg, 00:00:04, 1.00ft
Deposits Settled Compacted, 10% of cross sectional area at 6 o'clock, Start / sediment, roks



2_12_2025 11_43_38
AM_5f51f99b-f912-49fd-977e-fb0838164b4e_20250212_115226_577.jpg, 00:03:02, 22.00ft
Infiltration Stain from 9 o'clock to 5 o'clock, Start



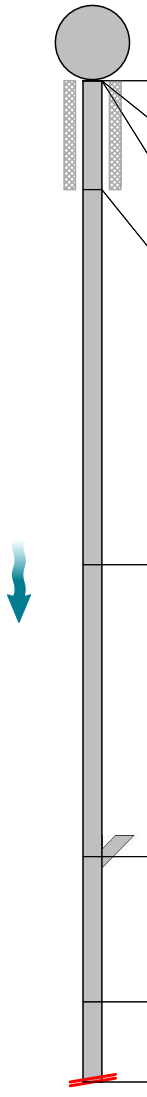
2_12_2025 11_43_38
AM_235f9482-1ea0-478a-a036-4d2e20db00d4_20250212_115235_335.jpg, 00:03:02, 22.00ft
Infiltration Stain from 9 o'clock to 5 o'clock, Start

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/9/2025			**Brendan Koziol**	**P0044090-092023**	**2/12/2025 11:54:11 AM**
Year laid:	Pre-cleaning:	Direction:	Pipe Joint Length:	Total Length:	Length Surveyed:
	No Pre-Cleaning	**Downstream**		**275.0 '**	**275.0 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 6**
Street:	**7th st**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**access 1**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Rectangular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**48 x 60 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					



1:2076 Distance		Code	Observation	Counter	Photo	Grade
0.0		AMH	Manhole / access 6	00:00:00		
0.0		MWL	Water Level, 5% of the vertical dimension	00:00:02		
0.0	S01	DSC	Deposits Settled Compacted, 5% of cross sectional area at 6 o'clock, Start / sediment	00:00:06	2_12_2025 11_54_11 AM_bdca9	
30.0	F01	DSC	Deposits Settled Compacted, 5% of cross sectional area at 6 o'clock, Finish / sediment	00:01:28		M2
133.0		IS	Infiltration Stain from 11 o'clock to 1 o'clock	00:04:24	2_12_2025 11_54_11 AM_87573	M1
213.0		TFA	Tap Factory Activity at 7 o'clock, dia/height: 12inch / tap 27	00:09:20	2_12_2025 11_54_11 AM_37308	
253.0		MGO	Miscellaneous General Observation / covered from surface. old cutout	00:10:20	2_12_2025 11_54_11 AM_d1b2a	
275.0		MSA	Miscellaneous Survey Abandoned / footage complete from run 1-4	00:11:03		

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
0000	2611	2611	0.0	13.0	13.0	0.0	1.9	1.9

WINCAN

Section Pictures - 2/9/2025 - 2/12/2025 11:54:11 AM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 11:54:11 AM**	**10**



2_12_2025 11_54_11
AM_bdca9398-2109-4ed8-83ab-f6fc19953073_20250212_115747_543.jpg, 00:00:06, 0.00ft
Deposits Settled Compacted, 5% of cross sectional area at 6 o'clock, Start / sediment



2_12_2025 11_54_11
AM_87573545-ebb5-4136-b501-4755884a8145_20250212_115915_749.jpg, 00:04:24, 133.00ft
Infiltration Stain from 11 o'clock to 1 o'clock



2_12_2025 11_54_11
AM_373089a6-8239-4f59-9e96-30143506d240_20250212_120233_189.jpg, 00:09:20, 213.00ft
Tap Factory Activity at 7 o'clock, dia/height: 12inch / tap 27



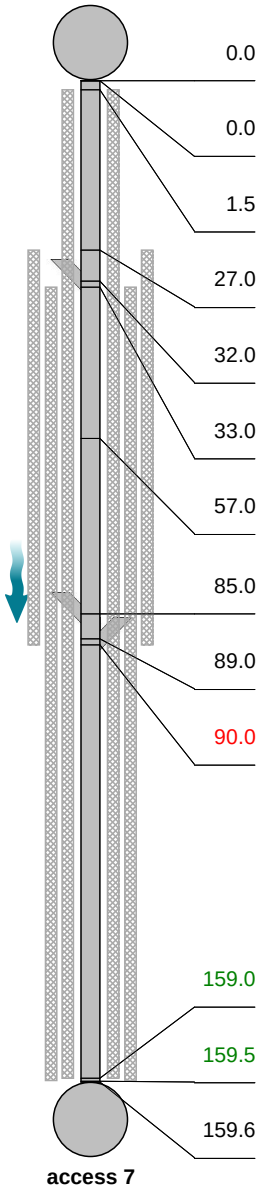
2_12_2025 11_54_11
AM_d1b2af06-1850-45e9-bb10-1d3bc23d4749_20250212_120336_857.jpg, 00:10:20, 253.00ft
Miscellaneous General Observation / covered from surface. old cutout

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/9/2025			**Brendan Koziol**	**P0044090-092023**	**2/12/2025 12:06:55 PM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Downstream**	Pipe Joint Length:	Total Length: **159.6 '**	Length Surveyed: **159.6 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 5**
Street:	**7th st**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**access 7**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Rectangular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**48 x 60 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					



1:1205 Distance		Code	Observation	Counter	Photo	Grade
0.0		AMH	Manhole / access 5	00:00:00		
0.0		MWL	Water Level, 5% of the vertical dimension	00:00:07		
1.5	S01	IS	Infiltration Stain from 10 o'clock to 2 o'clock, Start	00:00:18	2_12_2025 12_06_55 PM_d678d	
27.0	S02	SRP	Surface Damage Reinforcement Projecting from 10 o'clock to 2 o'clock, Start	00:00:49	2_12_2025 12_06_55 PM_fe3ac	
32.0		TFA	Tap Factory Activity at 3 o'clock, dia/height: 12inch / tap 13	00:01:14	2_12_2025 12_06_55 PM_3f29d	
33.0	S03	DSC	Deposits Settled Compacted, 10% of cross sectional area from 5 o'clock to 7 o'clock, Start / rocks, sediment, debries	00:01:16	2_12_2025 12_06_55 PM_31df7	
57.0		MGO	Miscellaneous General Observation / utility	00:02:28	2_12_2025 12_06_55 PM_1f22e	
85.0		TFA	Tap Factory Activity at 5 o'clock, dia/height: 12inch / tap 12	00:05:36	2_12_2025 12_06_55 PM_972d3	
89.0		TFA	Tap Factory Activity at 10 o'clock, dia/height: 10inch / tap 11	00:06:20	2_12_2025 12_06_55 PM_262fe	
90.0	F02	SRP	Surface Damage Reinforcement Projecting from 10 o'clock to 2 o'clock, Finish	00:07:05		S5
159.0	F01	IS	Infiltration Stain from 10 o'clock to 2 o'clock, Finish	00:10:22		M1
159.5	F03	DSC	Deposits Settled Compacted, 10% of cross sectional area from 5 o'clock to 7 o'clock, Finish / rocks, sediment, debries	00:10:23		M2
159.6		AMH	Manhole / access 7	00:10:24		

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
5A00	2D1E	5A2D	65.0	82.0	147.0	5.0	1.4	2.1

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Section Pictures - 2/9/2025 - 2/12/2025 12:06:55 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 12:06:55 PM**	**11**



2_12_2025 12_06_55
PM_d678d983-5dc8-4c5c-8086-df99f88e5012_20250212_134306_019.jpg, 00:00:18, 1.50ft
Infiltration Stain from 10 o'clock to 2 o'clock, Start



2_12_2025 12_06_55
PM_4e881548-1586-4603-b323-0ce7552e03a9_20250212_134310_281.jpg, 00:00:18, 1.50ft
Infiltration Stain from 10 o'clock to 2 o'clock, Start



2_12_2025 12_06_55
PM_fe3ac0aa-48fe-4d21-b803-81d05de4e442_20250212_134459_621.jpg, 00:00:49, 27.00ft
Surface Damage Reinforcement Projecting from 10 o'clock to 2 o'clock, Start



2_12_2025 12_06_55
PM_970acd5b-c72b-4f8c-8f4e-5311b7109fa5_20250212_134503_989.jpg, 00:00:49, 27.00ft
Surface Damage Reinforcement Projecting from 10 o'clock to 2 o'clock, Start

WINCAN

Section Pictures - 2/9/2025 - 2/12/2025 12:06:55 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 12:06:55 PM**	**11**



2_12_2025 12_06_55
PM_3f29d2e1-b0d7-420c-a498-a283cfb69505_20250212_135152_486.jpg, 00:01:14, 32.00ft
Tap Factory Activity at 3 o'clock, dia/height: 12inch / tap 13



2_12_2025 12_06_55
PM_31df7a00-f330-4f00-a585-ad4de4e7c19c_20250212_134638_339.jpg, 00:01:16, 33.00ft
Deposits Settled Compacted, 10% of cross sectional area from 5 o'clock to 7 o'clock, Start / rocks, sediment, debries



2_12_2025 12_06_55
PM_1f22e110-c8bb-4f2b-b4bc-49afc72948e1_20250212_134810_137.jpg, 00:02:28, 57.00ft
Miscellaneous General Observation / utility



2_12_2025 12_06_55
PM_972d3929-05bf-4c21-ade7-34567ed53b54_20250212_135336_949.jpg, 00:05:36, 85.00ft
Tap Factory Activity at 5 o'clock, dia/height: 12inch / tap 12

WINCAN

Section Pictures - 2/9/2025 - 2/12/2025 12:06:55 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 12:06:55 PM**	**11**



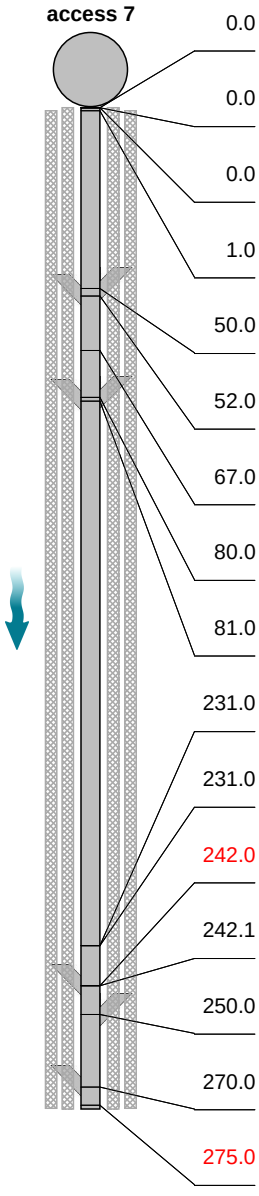
2_12_2025 12_06_55
PM_262fe401-b97e-4dcc-8ce7-66c1ea23ef59_20250212_135439_852.jpg, 00:06:20, 89.00ft
Tap Factory Activity at 10 o'clock, dia/height: 10inch / tap 11

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/9/2025			**Brendan Koziol**	**P0044090-092023**	**2/12/2025 1:58:23 PM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Downstream**	Pipe Joint Length:	Total Length: **440.2 '**	Length Surveyed: **440.2 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 7**
Street:	**7th st**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**access 8**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Rectangular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**48 x 60 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					



1:2084 Distance		Code	Observation	Counter	Photo	Grade
0.0		AMH	Manhole / access 7	00:00:00		
0.0		MWL	Water Level, 0% of the vertical dimension	00:00:02		
0.0	S01	DSC	Deposits Settled Compacted, 5% of cross sectional area at 6 o'clock, Start	00:00:05	2_12_2025 1_58_23 PM_db1cb	
1.0	S02	IS	Infiltration Stain from 10 o'clock to 2 o'clock, Start	00:00:09	2_12_2025 1_58_23 PM_c142c	
50.0		TB	Tap Break-in/Hammer at 8 o'clock, dia/height: 8inch / tap 14	00:01:47	2_12_2025 1_58_23 PM_88051	
52.0		TB	Tap Break-in/Hammer at 5 o'clock, dia/height: 24inch / tap 26	00:01:58	2_12_2025 1_58_23 PM_66bf5	
67.0		MGO	Miscellaneous General Observation / supporting wall	00:02:33		
80.0		TFA	Tap Factory Activity at 9 o'clock, dia/height: 20inch / tap 16	00:02:31	2_12_2025 1_58_23 PM_96e6c	
81.0		TFA	Tap Factory Activity at 3 o'clock, dia/height: 20inch / tap 15	00:03:00	2_12_2025 1_58_23 PM_cfdd7	
231.0		MGO	Miscellaneous General Observation / utility	00:07:46	2_12_2025 1_58_23 PM_9e3e3	
231.0		MGO	Miscellaneous General Observation / supporting wall	00:08:40	2_12_2025 1_58_23 PM_d90b1	
242.0		SRP	Surface Damage Reinforcement Projecting from 10 o'clock to 2 o'clock	00:09:25	2_12_2025 1_58_23 PM_791c6	S5
242.1		TFA	Tap Factory Activity at 5 o'clock, dia/height: 24inch / tap 17	00:09:35	2_12_2025 1_58_23 PM_fa14f9	
250.0		TFA	Tap Factory Activity at 11 o'clock, dia/height: 18inch / tap 18	00:09:35		
270.0		TFA	Tap Factory Activity at 4 o'clock, dia/height: 24inch / tap 19	00:11:16	2_12_2025 1_58_23 PM_41faa	
275.0		SRP	Surface Damage Reinforcement Projecting at 12 o'clock	00:10:51	2_12_2025 1_58_23 PM_ddb37	S5

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/9/2025			**Brendan Koziol**	**P0044090-092023**	**2/12/2025 1:58:23 PM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Downstream**	Pipe Joint Length:	Total Length: **440.2 '**	Length Surveyed: **440.2 '**



1:2084 Distance		Code	Observation	Counter	Photo	Grade
277.0		TFA	Tap Factory Activity at 1 o'clock, dia/height: 16inch / tap 20	00:11:36		
281.0		TFA	Tap Factory Activity at 11 o'clock, dia/height: 24inch / tap 21	00:12:14	2_12_2025 1_58_23 PM_27438	
319.0		TFA	Tap Factory Activity at 1 o'clock, dia/height: 8inch / tap 22	00:14:20	2_12_2025 1_58_23 PM_0d078	
374.0		TFA	Tap Factory Activity at 5 o'clock, dia/height: 24inch / tap 25	00:17:08	2_12_2025 1_58_23 PM_60b28	
375.1		TFA	Tap Factory Activity at 1 o'clock, dia/height: 8inch / tap 24	00:17:13	2_12_2025 1_58_23 PM_1919e	
440.0	F02	IS	Infiltration Stain from 10 o'clock to 2 o'clock, Finish	00:23:48		M1
440.1	F01	DSC	Deposits Settled Compacted, 5% of cross sectional area at 6 o'clock, Finish	00:23:51		M2
440.2		MSA	Miscellaneous Survey Abandoned / cannot proceed due to friction	00:23:55		

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
5200	2P1P	522P	10.0	264.0	274.0	5.0	1.5	1.5

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Section Pictures - 2/9/2025 - 2/12/2025 1:58:23 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 1:58:23 PM**	**12**



2_12_2025 1_58_23
PM_db1cbe00-0091-4802-86b9-7f14e8b71e7d_20250212_145414_735.jpg, 00:00:05, 0.00ft
Deposits Settled Compacted, 5% of cross sectional area at 6 o'clock, Start



2_12_2025 1_58_23
PM_c142cf75-a3d8-4cc4-9728-fb229d27f5d8_20250212_144559_903.jpg, 00:00:09, 1.00ft
Infiltration Stain from 10 o'clock to 2 o'clock, Start



2_12_2025 1_58_23
PM_00b0a958-dff7-4ae8-a04d-ecb604229b9c_20250212_144612_648.jpg, 00:00:09, 1.00ft
Infiltration Stain from 10 o'clock to 2 o'clock, Start



2_12_2025 1_58_23
PM_88051e53-6e12-4adc-8f38-ee5bc6d02f4a_20250212_144816_850.jpg, 00:01:47, 50.00ft
Tap Break-in/Hammer at 8 o'clock, dia/height: 8inch / tap 14

WINCAN

Section Pictures - 2/9/2025 - 2/12/2025 1:58:23 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 1:58:23 PM**	**12**



2_12_2025 1_58_23
PM_66bf511a-789d-4e04-99ae-cc4c0121ecb4_20250212_144914_634.jpg, 00:01:58, 52.00ft
Tap Break-in/Hammer at 5 o'clock, dia/height: 24inch / tap 26



2_12_2025 1_58_23
PM_96e6c2e7-6537-45c3-9e18-624be4b1112f_20250212_145123_774.jpg, 00:02:31, 80.00ft
Tap Factory Activity at 9 o'clock, dia/height: 20inch / tap 16



2_12_2025 1_58_23
PM_cfdd78c3-0648-466b-9480-706d05f90e1f_20250212_145607_697.jpg, 00:03:00, 81.00ft
Tap Factory Activity at 3 o'clock, dia/height: 20inch / tap 15



2_12_2025 1_58_23
PM_9e3e3837-03b4-499f-a42c-7cd56cd72acf_20250212_145604_553.jpg, 00:07:46, 231.00ft
Miscellaneous General Observation / utility

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Section Pictures - 2/9/2025 - 2/12/2025 1:58:23 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 1:58:23 PM**	**12**



2_12_2025 1_58_23
PM_d90b1c44-ef04-4e18-9dc6-ce29752846c7_20250212_145649_436.jpg, 00:08:40, 231.00ft
Miscellaneous General Observation / supporting wall



2_12_2025 1_58_23
PM_791c6e6e-ea96-4090-a2dd-b0d3647e34a9_20250212_145839_892.jpg, 00:09:25, 242.00ft
Surface Damage Reinforcement Projecting from 10 o'clock to 2 o'clock



2_12_2025 1_58_23
PM_2b0cd026-1fd3-4806-965e-20a745436723_20250212_145847_892.jpg, 00:09:25, 242.00ft
Surface Damage Reinforcement Projecting from 10 o'clock to 2 o'clock



2_12_2025 1_58_23
PM_fa14f971-3b8a-46e4-8d83-ab79a8c019b4_20250212_145941_980.jpg, 00:09:35, 242.10ft
Tap Factory Activity at 5 o'clock, dia/height: 24inch / tap 17

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Section Pictures - 2/9/2025 - 2/12/2025 1:58:23 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 1:58:23 PM**	**12**



2_12_2025 1_58_23
PM_41faad6a-ddad-42ee-a94e-09cc0e336406_20250212_150414_280.jpg, 00:11:16, 270.00ft
Tap Factory Activity at 4 o'clock, dia/height: 24inch / tap 19



2_12_2025 1_58_23
PM_ddb373d5-2e2f-4100-aa7a-fc3ffefd8f4f_20250212_150248_060.jpg, 00:10:51, 275.00ft
Surface Damage Reinforcement Projecting at 12 o'clock



2_12_2025 1_58_23
PM_2743866b-4561-4570-81da-8567e747ae82_20250212_150636_764.jpg, 00:12:14, 281.00ft
Tap Factory Activity at 11 o'clock, dia/height: 24inch / tap 21



2_12_2025 1_58_23
PM_0d078ede-93f5-4c1c-a041-424776480422_20250212_151554_591.jpg, 00:14:20, 319.00ft
Tap Factory Activity at 1 o'clock, dia/height: 8inch / tap 22

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Section Pictures - 2/9/2025 - 2/12/2025 1:58:23 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 1:58:23 PM**	**12**



2_12_2025 1_58_23
PM_60b28aeb-c12b-4a26-af24-c8acd3566617_20250212_152040_875.jpg, 00:17:08, 374.00ft
Tap Factory Activity at 5 o'clock, dia/height: 24inch / tap 25



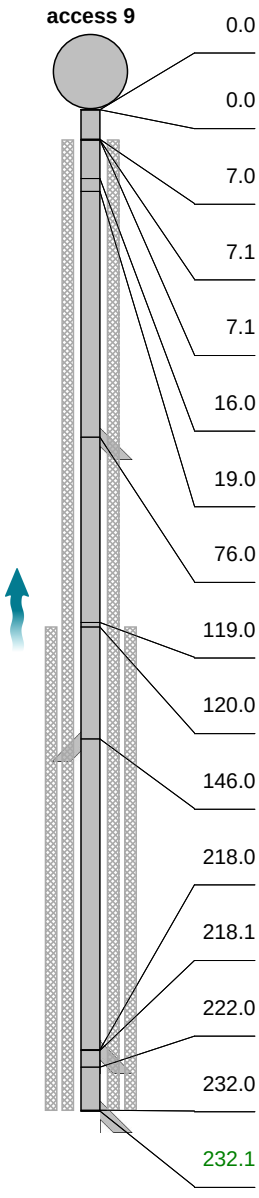
2_12_2025 1_58_23
PM_1919ebbd-dafc-4ddc-ad53-97a38445110e_20250212_152122_331.jpg, 00:17:13, 375.10ft
Tap Factory Activity at 1 o'clock, dia/height: 8inch / tap 24

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/9/2025			**Brendan Koziol**	**P0044090-092023**	**2/12/2025 3:26:40 PM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Upstream**	Pipe Joint Length:	Total Length: **238.0 '**	Length Surveyed: **232.5 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 10**
Street:	**7th st**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**access 9**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Rectangular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**48 x 60 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					

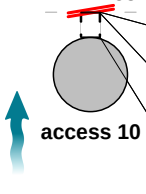


1:1753	Distance		Code	Observation	Counter	Photo	Grade
access 9	0.0		AMH	Manhole / access 9	00:00:00		
	0.0		MWL	Water Level, 0% of the vertical dimension	00:00:09		
	7.0		MGO	Miscellaneous General Observation / gallery 2	00:00:51	2_12_2025 3_26_40 PM_0d157	
	7.1		MGO	Miscellaneous General Observation / access 8 outfall	00:00:55	2_12_2025 3_26_40 PM_fa321	
	7.1	S01	DSC	Deposits Settled Compacted, 15% of cross sectional area from 5 o'clock to 7 o'clock, Start / soil, rocks	00:02:29	2_12_2025 3_26_40 PM_79f1cf	
	16.0		MGO	Miscellaneous General Observation / roof drain 1	00:02:44	2_12_2025 3_26_40 PM_21383	
	19.0		MGO	Miscellaneous General Observation / hole in supporting wall	00:04:09	2_12_2025 3_26_40 PM_ffa50d	
	76.0		TFA	Tap Factory Activity at 9 o'clock, dia/height: 18inch / tap 29	00:07:07	2_12_2025 3_26_40 PM_00569	
	119.0		MGO	Miscellaneous General Observation / possible roof drain	00:09:01	2_12_2025 3_26_40 PM_932e8	
	120.0	S02	SRP	Surface Damage Reinforcement Projecting from 10 o'clock to 2 o'clock, Start	00:09:07	2_12_2025 3_26_40 PM_22681	
	146.0		TFA	Tap Factory Activity at 1 o'clock, dia/height: 4inch / possible roof drain 2	00:12:20	2_12_2025 3_26_40 PM_0c0a6	
	218.0		TFA	Tap Factory Activity at 7 o'clock, dia/height: 4inch / possible roof drain 3	00:15:47	2_12_2025 3_26_40 PM_42f29	
	218.1		TFA	Tap Factory Activity at 7 o'clock, dia/height: 4inch / possible roof drain 4	00:15:54	2_12_2025 3_26_40 PM_0524c	
	222.0		MGO	Miscellaneous General Observation / utilities	00:18:10	2_12_2025 3_26_40 PM_deb1d	
	232.0		TFA	Tap Factory Activity at 10 o'clock, dia/height: 4inch / possile roof drain 5	00:18:33	2_12_2025 3_26_40 PM_74711	
	232.1	F01	DSC	Deposits Settled Compacted, 15% of cross sectional area from 5 o'clock to 7 o'clock, Finish / soil, rocks	00:19:30		M3

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Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/9/2025			**Brendan Koziol**	**P0044090-092023**	**2/12/2025 3:26:40 PM**
Year laid:	Pre-cleaning:	Direction:	Pipe Joint Length:	Total Length:	Length Surveyed:
	No Pre-Cleaning	**Upstream**		**238.0 '**	**232.5 '**



1:1753	Distance		Code	Observation	Counter	Photo	Grade
	232.2	F02	SRP	Surface Damage Reinforcement Projecting from 10 o'clock to 2 o'clock, Finish	00:19:30		S5
	232.5		MSA	Miscellaneous Survey Abandoned / cannot proceed. will recive rest of footage from access 10	00:19:30		
	238.0			End of pipe			

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
5C00	3H00	5C3H	110.0	135.0	245.0	5.0	3.0	3.7

WINCAN

Section Pictures - 2/9/2025 - 2/12/2025 3:26:40 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 3:26:40 PM**	**13**



2_12_2025 3_26_40
PM_0d157876-dfae-452e-bfcc-033c8951a3a3_20250212_153450_512.jpg, 00:00:51, 7.00ft
Miscellaneous General Observation / gallery 2



2_12_2025 3_26_40
PM_fa32112c-b21c-4b43-8f9a-2da655a1cf2e_20250212_153523_238.jpg, 00:00:55, 7.10ft
Miscellaneous General Observation / access 8 outfall



2_12_2025 3_26_40
PM_79f1cf53-f7f9-4b7b-8a6c-0c1aaf38907f_20250212_153625_029.jpg, 00:02:29, 7.14ft
Deposits Settled Compacted, 15% of cross sectional area from 5 o'clock to 7 o'clock, Start / soil, rocks



2_12_2025 3_26_40
PM_21383c77-6ce9-4335-ad12-f383883f7939_20250212_153728_149.jpg, 00:02:44, 16.00ft
Miscellaneous General Observation / roof drain 1

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Section Pictures - 2/9/2025 - 2/12/2025 3:26:40 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 3:26:40 PM**	**13**



2_12_2025 3_26_40
PM_ffa50d06-ce54-4520-8e1c-afc415d0853d_20250212_153833_090.jpg, 00:04:09, 19.00ft
Miscellaneous General Observation / hole in supporting wall



2_12_2025 3_26_40
PM_0056920c-8dfe-4384-b467-1d4be6aede1d_20250212_154123_583.jpg, 00:07:07, 76.00ft
Tap Factory Activity at 9 o'clock, dia/height: 18inch / tap 29



2_12_2025 3_26_40
PM_932e8769-1ce0-4cfe-97f6-99967cab2337_20250212_154558_560.jpg, 00:09:01, 119.00ft
Miscellaneous General Observation / possible roof drain



2_12_2025 3_26_40
PM_22681c23-1c39-400e-81b6-c566208fb8a4_20250212_154627_862.jpg, 00:09:07, 120.00ft
Surface Damage Reinforcement Projecting from 10 o'clock to 2 o'clock, Start

WINCAN

Section Pictures - 2/9/2025 - 2/12/2025 3:26:40 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 3:26:40 PM**	**13**



2_12_2025 3_26_40
PM_236c79d3-97b0-4309-8a4e-54b32f1c690e_20250212_154837_836.jpg, 00:09:07, 120.00ft
Surface Damage Reinforcement Projecting from 10 o'clock to 2 o'clock, Start



2_12_2025 3_26_40
PM_0c0a6e06-a7b8-459c-8422-5812b2b658ba_20250212_155039_482.jpg, 00:12:20, 146.00ft
Tap Factory Activity at 1 o'clock, dia/height: 4inch / possible roof drain 2



2_12_2025 3_26_40
PM_42f297c5-1658-494b-b7af-59a8b68113d5_20250212_155537_735.jpg, 00:15:47, 218.00ft
Tap Factory Activity at 7 o'clock, dia/height: 4inch / possible roof drain 3



2_12_2025 3_26_40
PM_0524c84f-a9dc-45b5-b5bc-adab7f45d563_20250212_155713_984.jpg, 00:15:54, 218.10ft
Tap Factory Activity at 7 o'clock, dia/height: 4inch / possible roof drain 4

WINCAN

Section Pictures - 2/9/2025 - 2/12/2025 3:26:40 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 3:26:40 PM**	**13**



2_12_2025 3_26_40
PM_deb1da06-c430-40bd-a3a2-865270fcc542_20250212_155855_954.jpg, 00:18:10, 222.00ft
Miscellaneous General Observation / utilities



2_12_2025 3_26_40
PM_08f83cdb-24a9-4710-acc3-38bc5d751878_20250212_155902_014.jpg, 00:18:10, 222.00ft
Miscellaneous General Observation / utilities



2_12_2025 3_26_40
PM_74711c9f-f50c-4ca4-bdc1-749b435e0f2f_20250212_160047_850.jpg, 00:18:33, 232.00ft
Tap Factory Activity at 10 o'clock, dia/height: 4inch / possile roof drain 5

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/9/2025			**Brendan Koziol**	**P0044090-092023**	**2/12/2025 4:04:45 PM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Downstream**	Pipe Joint Length:	Total Length: **72.3 '**	Length Surveyed: **72.3 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 11**
Street:	**7th st**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**gallery 2**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Rectangular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**48 x 60 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			

Additional Info:



1:546	Distance		Code	Observation	Counter	Photo	Grade
access 11							
	0.0		AMH	Manhole / access 11	00:00:00		
	0.0		MWL	Water Level, 0% of the vertical dimension / '	00:00:02		
	0.0	S01	DSC	Deposits Settled Compacted, 10% of cross sectional area from 5 o'clock to 7 o'clock, Start	00:01:21	2_12_2025 4_04_45 PM_cf463f	
	6.0	S02	IS	Infiltration Stain from 8 o'clock to 4 o'clock, Start	00:01:50	2_12_2025 4_04_45 PM_8c9a9	
	6.9		H	Hole at 1 o'clock, length: 12inch, intruding: 5inch / moisture working thrugh this hole	00:02:09	2_12_2025 4_04_45 PM_d136d	S4
	64.0		TFA	Tap Factory Activity at 1 o'clock, dia/height: 8inch / tap 28	00:03:56		
	72.0	F01	DSC	Deposits Settled Compacted, 10% of cross sectional area from 5 o'clock to 7 o'clock, Finish	00:04:33		M2
	72.1	F02	IS	Infiltration Stain from 8 o'clock to 4 o'clock, Finish	00:04:36		M1
	72.3		AMH	Manhole / gallery 2	00:04:36	2_12_2025 4_04_45 PM_5d5e9	
gallery 2							

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
4100	2A1A	412A	4.0	41.0	45.0	4.0	1.5	1.6

WINCAN

Section Pictures - 2/9/2025 - 2/12/2025 4:04:45 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 4:04:45 PM**	**14**



2_12_2025 4_04_45
PM_cf463f45-863a-4716-bb6d-c4b5677d9785_20250212_161224_059.jpg, 00:01:21, 0.00ft
Deposits Settled Compacted, 10% of cross sectional area from 5 o'clock to 7 o'clock, Start



2_12_2025 4_04_45
PM_8c9a9f31-50a7-4b21-a232-7c13a8eb17f6_20250212_161430_956.jpg, 00:01:50, 6.00ft
Infiltration Stain from 8 o'clock to 4 o'clock, Start



2_12_2025 4_04_45
PM_d136da79-46cc-452e-a453-ecff67f8a626_20250212_161653_360.jpg, 00:02:09, 6.90ft
Hole at 1 o'clock, length: 12inch, intruding: 5inch / moisture working thrugh this hole



2_12_2025 4_04_45
PM_5d5e9e7f-d75b-468b-9596-383f399fc61c_20250212_162058_467.jpg, 00:04:36, 72.30ft
Manhole / gallery 2

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/9/2025			**Brendan Koziol**	**P0044090-092023**	**2/12/2025 4:24:19 PM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Downstream**	Pipe Joint Length:	Total Length: **133.0 '**	Length Surveyed: **113.0 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 8**
Street:	**7th st**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**access 7**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Rectangular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**48 x 60 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					



1:1004	Distance	Code	Observation	Counter	Photo	Grade
access 8						
	0.0	AMH	Manhole / access 8	00:00:00		
	0.0	MWL	Water Level, 1% of the vertical dimension	00:00:05		
	1.0	MGO	Miscellaneous General Observation / driving towards outfall	00:00:14	2_12_2025 4_24_19 PM_59705	
	1.0	MGO	Miscellaneous General Observation / gallery 2	00:01:17	2_12_2025 4_24_19 PM_e3e1a	
	60.0	TFA	Tap Factory Activity at 11 o'clock, dia/height: 8inch / tap 30	00:03:11	2_12_2025 4_24_19 PM_079b2	
	75.0	SMW	Surface Damage Missing Wall at 10 o'clock	00:05:15	2_12_2025 4_24_19 PM_d3f55	S5
	113.0	MSA	Miscellaneous Survey Abandoned / pipe line full footage.	00:06:04		
	133.0		End of pipe			
access 7						

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
5100	0000	5100	5.0	0.0	5.0	5.0	0.0	5.0

WINCAN

Section Pictures - 2/9/2025 - 2/12/2025 4:24:19 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 4:24:19 PM**	**15**



2_12_2025 4_24_19
PM_597051e0-956e-4449-ade9-115c06083da6_20250212_162614_655.jpg, 00:00:14, 1.00ft
Miscellaneous General Observation / driving towards outfall



2_12_2025 4_24_19
PM_e3e1a22f-a220-4238-81da-44425fa234b9_20250212_162731_267.jpg, 00:01:17, 1.00ft
Miscellaneous General Observation / gallery 2



2_12_2025 4_24_19
PM_079b22e1-90f2-493f-881b-9fac7b693dbb_20250212_162937_732.jpg, 00:03:11, 60.00ft
Tap Factory Activity at 11 o'clock, dia/height: 8inch / tap 30



2_12_2025 4_24_19
PM_d3f55779-620c-4008-8f7c-4bdc59d677d2_20250212_163110_154.jpg, 00:05:15, 75.00ft
Surface Damage Missing Wall at 10 o'clock

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/9/2025			**Brendan Koziol**	**P0044090-092023**	**2/12/2025 4:32:40 PM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Downstream**	Pipe Joint Length:	Total Length: **200.0 '**	Length Surveyed: **200.0 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 8 west wall**
Street:	**7th st**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**access 7**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Rectangular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**48 x 60 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					

access 8 west wall



1:1510 Distance		Code	Observation	Counter	Photo	Grade
0.0		AMH	Manhole / access 8 west wall	00:00:00		
0.0		MWL	Water Level, 10% of the vertical dimension	00:00:01		
5.0		TFA	Tap Factory Activity at 1 o'clock, dia/height: 18inch / tap 32	00:00:24	2_12_2025 4_32_40 PM_162ee	
20.0		TFB	Tap Factory Made Abandoned at 1 o'clock, dia/height: 2inch	00:00:47	2_12_2025 4_32_40 PM_e3198	
31.0		SRP	Surface Damage Reinforcement Projecting from 10 o'clock to 2 o'clock	00:01:35	2_12_2025 4_32_40 PM_b0626	S5
51.0		TFA	Tap Factory Activity at 1 o'clock, dia/height: 8inch / tap 31	00:02:30	2_12_2025 4_32_40 PM_b9285	
99.0		TFB	Tap Factory Made Abandoned at 2 o'clock, dia/height: 16inch / tap 33	00:03:08		
112.0	S01	DSC	Deposits Settled Compacted, 15% of cross sectional area from 5 o'clock to 7 o'clock, Start	00:03:35	2_12_2025 4_32_40 PM_963d2	
199.0	F01	DSC	Deposits Settled Compacted, 15% of cross sectional area from 5 o'clock to 7 o'clock, Finish	00:06:39	2_12_2025 4_32_40 PM_2182e	M3
200.0		MSA	Miscellaneous Survey Abandoned / 80% of west wall has been videod. cannot drive further	00:06:52		

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
5100	3B00	513B	5.0	51.0	56.0	5.0	3.0	3.1

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Section Pictures - 2/9/2025 - 2/12/2025 4:32:40 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 4:32:40 PM**	**16**



2_12_2025 4_32_40
PM_162ee5cc-fb84-4365-b84e-622f050e5da0_20250212_163552_807.jpg, 00:00:24, 5.00ft
Tap Factory Activity at 1 o'clock, dia/height: 18inch / tap 32



2_12_2025 4_32_40
PM_e3198189-e835-4732-99ad-0802186b4f4b_20250212_163933_157.jpg, 00:00:47, 20.00ft
Tap Factory Made Abandoned at 1 o'clock, dia/height: 2inch



2_12_2025 4_32_40
PM_dae75acd-c135-400d-926e-077b42de22e0_20250212_164004_785.jpg, 00:00:47, 20.00ft
Tap Factory Made Abandoned at 1 o'clock, dia/height: 2inch



2_12_2025 4_32_40
PM_b062693c-8772-4ee7-8321-cee67d0783da_20250212_164124_237.jpg, 00:01:35, 31.00ft
Surface Damage Reinforcement Projecting from 10 o'clock to 2 o'clock

Section Pictures - 2/9/2025 - 2/12/2025 4:32:40 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 4:32:40 PM**	**16**



2_12_2025 4_32_40
PM_b92857cb-f254-42c7-b7f7-0c5a377928ab_20250212_164310_439.jpg, 00:02:30, 51.00ft
Tap Factory Activity at 1 o'clock, dia/height: 8inch / tap 31



2_12_2025 4_32_40
PM_963d20d3-db39-4d6b-8068-ec9b6d2204d4_20250212_164947_069.jpg, 00:03:35, 112.00ft
Deposits Settled Compacted, 15% of cross sectional area from 5 o'clock to 7 o'clock, Start



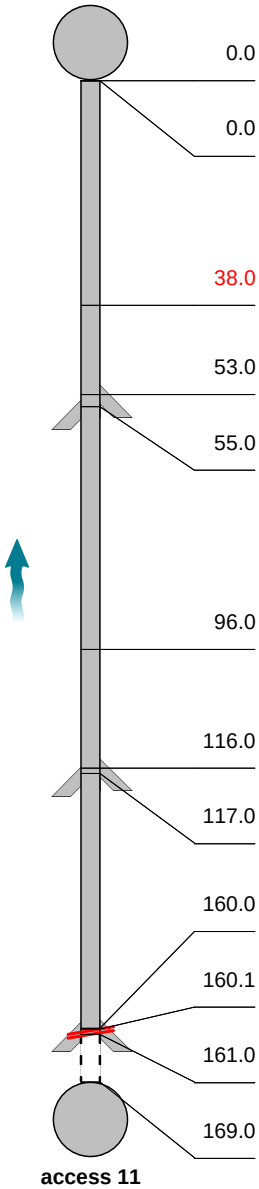
2_12_2025 4_32_40
PM_2182e62d-2b30-4e65-a465-0f553c5f56dd_20250212_164949_746.jpg, 00:06:39, 199.00ft
Deposits Settled Compacted, 15% of cross sectional area from 5 o'clock to 7 o'clock, Finish

WINCAN

Inspection report

Date:	Work Order:	Weather:	Surveyed By:	Certificate Number:	Pipe Segment Ref.:
2/9/2025			**Brendan Koziol**	**P0044090-092023**	**2/12/2025 4:52:43 PM**
Year laid:	Pre-cleaning: **No Pre-Cleaning**	Direction: **Upstream**	Pipe Joint Length:	Total Length: **169.0 '**	Length Surveyed: **161.0 '**

City:	**joplin**	Drainage Area:		Upstream MH:	**access 11**
Street:	**7th st**	Media Label:		Up Rim to Invert:	
Location Code:		Flow Control:		Downstream MH:	**access 10**
Location Details:		Sheet Number:		Down Rim to Invert:	
Pipe shape:	**Rectangular**	Sewer Use:	**Stormwater Pipe**	Total gallons used:	**0.0**
Pipe size:	**48 x 60 "**	Sewer Category:	**SEC**	Joints passed:	**0**
Pipe material:	**Reinforced Concrete Pipe**	Purpose:		Joints failed:	**0**
Lining Method:		Owner:			
Additional Info:					



1:1276 Distance	Code	Observation	Counter	Photo	Grade
0.0	AMH	Manhole / access 10	00:00:00		
0.0	MWL	Water Level, 2% of the vertical dimension	00:00:03		
38.0	CC	Crack Circumferential from 9 o'clock to 3 o'clock, length: 66inch, intruding: 0inch	00:02:16	2_12_2025 4_52_43 PM_c5cde	S1
53.0	TFA	Tap Factory Activity at 9 o'clock, dia/height: 16inch / tap 35	00:02:44	2_12_2025 4_52_43 PM_0c7c6	
55.0	TFA	Tap Factory Activity at 2 o'clock, dia/height: 12inch / tap 34	00:02:55	2_12_2025 4_52_43 PM_171f7	
96.0	MGO	Miscellaneous General Observation / access asphalted over	00:04:25	2_12_2025 4_52_43 PM_ee964	
116.0	TFA	Tap Factory Activity at 10 o'clock, dia/height: 8inch / tap 37	00:05:07	2_12_2025 4_52_43 PM_b5aa0	
117.0	TFA	Tap Factory Activity at 3 o'clock, dia/height: 8inch / tap 36	00:05:18	2_12_2025 4_52_43 PM_6dfdcf	
160.0	TFA	Tap Factory Activity at 5 o'clock, dia/height: 10inch / tap 39	00:06:49	2_12_2025 4_52_43 PM_fe2de	
160.1	TFA	Tap Factory Activity at 7 o'clock, dia/height: 18inch / tap 38	00:08:25	2_12_2025 4_52_43 PM_a3736	
161.0	MSA	Miscellaneous Survey Abandoned / pipe fully videod	00:08:48		
169.0		End of pipe			

QSR	QMR	QOR	SPR	MPR	OPR	SPRI	MPRI	OPRI
1100	0000	1100	1.0	0.0	1.0	1.0	0.0	1.0

WINCAN

Section Pictures - 2/9/2025 - 2/12/2025 4:52:43 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 4:52:43 PM**	**17**



2_12_2025 4_52_43
PM_c5cde824-5150-4a3a-976c-ece64e8f6757_20250212_170111_170.jpg, 00:02:16, 38.00ft
Crack Circumferential from 9 o'clock to 3 o'clock, length: 66inch, intruding: 0inch



2_12_2025 4_52_43
PM_0c7c6240-edf2-4fb8-87fe-da47590670e5_20250212_170247_506.jpg, 00:02:44, 53.00ft
Tap Factory Activity at 9 o'clock, dia/height: 16inch / tap 35



2_12_2025 4_52_43
PM_171f7608-3e4d-457c-9a92-150e28ec450b_20250212_171742_356.jpg, 00:02:55, 55.00ft
Tap Factory Activity at 2 o'clock, dia/height: 12inch / tap 34



2_12_2025 4_52_43
PM_ee9641ed-48d3-433a-be08-beae2ca2fd95_20250212_171938_411.jpg, 00:04:25, 96.00ft
Miscellaneous General Observation / access asphalted over

WINCAN

Section Pictures - 2/9/2025 - 2/12/2025 4:52:43 PM

City	Street	Date	Lateral Segment Reference	Section No.
joplin	**7th st**	**2/9/2025**	**2/12/2025 4:52:43 PM**	**17**



2_12_2025 4_52_43
PM_b5aa0406-3d65-4b7e-b468-6011a706fa3f_20250212_172213_748.jpg, 00:05:07, 116.00ft
Tap Factory Activity at 10 o'clock, dia/height: 8inch / tap 37



2_12_2025 4_52_43
PM_6dfdcf22-c8b2-4eb9-b39c-4a03e7709653_20250212_172212_003.jpg, 00:05:18, 117.00ft
Tap Factory Activity at 3 o'clock, dia/height: 8inch / tap 36



2_12_2025 4_52_43
PM_fe2de2bb-cead-4b90-992e-70fd02721091_20250212_172328_030.jpg, 00:06:49, 160.00ft
Tap Factory Activity at 5 o'clock, dia/height: 10inch / tap 39



2_12_2025 4_52_43
PM_a3736176-7d33-4cee-b435-e26a29299759_20250212_172546_448.jpg, 00:08:25, 160.10ft
Tap Factory Activity at 7 o'clock, dia/height: 18inch / tap 38

APPENDIX H

New Willow Branch Construction Plans

NOTES:
1. PROPOSED BOX LOCATION SHALL BE GENERALY AS SHOWN ON PLANS (APPROXIMATELY 5' SOUTH OF NORTH CURB ALONG 6th STREET). MINOR DEVIATIONS ARE EXPECTED TO FIT EXISTING CONDITIONS. FIELD STAKING SHALL BE ACCOMPLISHED BY SCALING OFF OF DRAWING AND EXISTING IMPROVEMENTS.

2. INLET LOCATIONS SHALL BE AS SHOWN ON DRAWINGS. EXACT POSITIONING SHALL FIT WITHIN EXISTING IMPROVEMENTS.

NOTES:
1. UTILITIES SHOWN WERE AS LOCATED PRIOR TO JUNE, 2002. UTILITIES SHALL BE RELOCATED PRIOR TO CONSTRUCTION. CONTRACTOR WILL BE ALLOWED TO TRENCH AS PROPOSED IN SPECIFICATIONS, AND WILL NOT BE RESPONSIBLE FOR DAMAGE TO UTILITIES, WITH THE EXCEPTION OF SANITARY SEWER AND UNDERGROUND STREET LIGHT SERVICE, LOCATED WITHIN TRENCH BOX FROM GROUND ELEVATION TO 12 INCHES BELOW FLOWLINE OF BOX. CONTRACTOR WILL BE RESPONSIBLE FOR ALL DAMAGE DURING CONSTRUCTION IN AREAS OUTSIDE OF PROPOSED BOX CULVERTS. CLOSE COORDINATION WITH UTILITY COMPANIES WILL BE REQUIRED.

2. CONTRACTOR WILL NOT BE REQUIRED TO RESTORE TRAFFIC SIGNAL LOOPS IN PAVEMENT. CITY WILL BE RESPONSIBLE FOR REPAIRS.

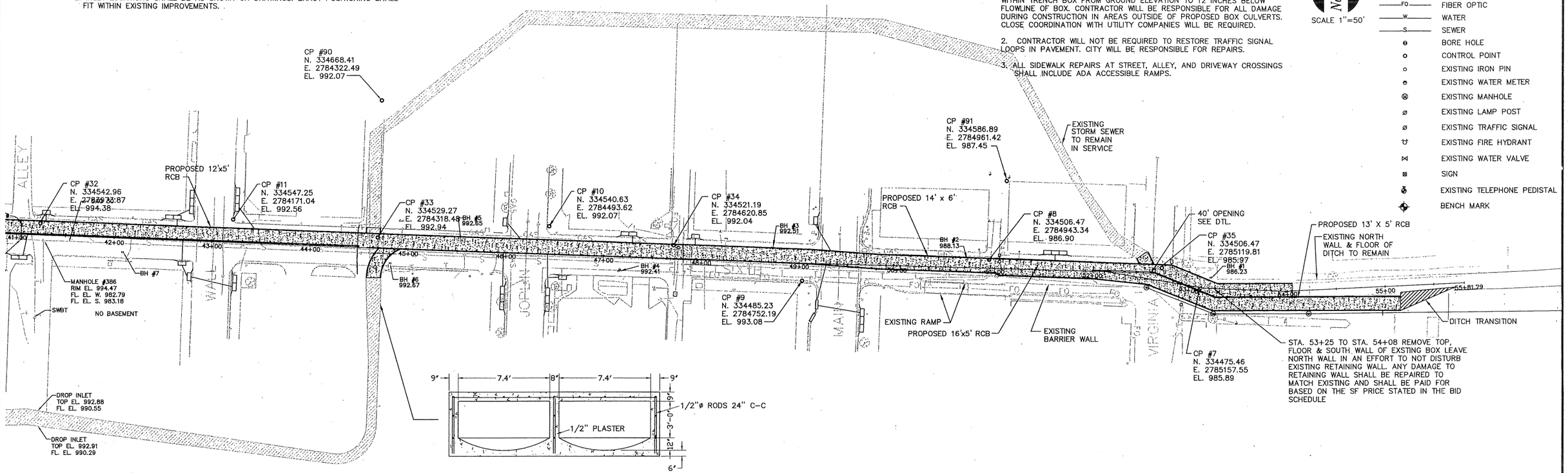
3. ALL SIDEWALK REPAIRS AT STREET, ALLEY, AND DRIVEWAY CROSSINGS SHALL INCLUDE ADA ACCESSIBLE RAMPS.

North

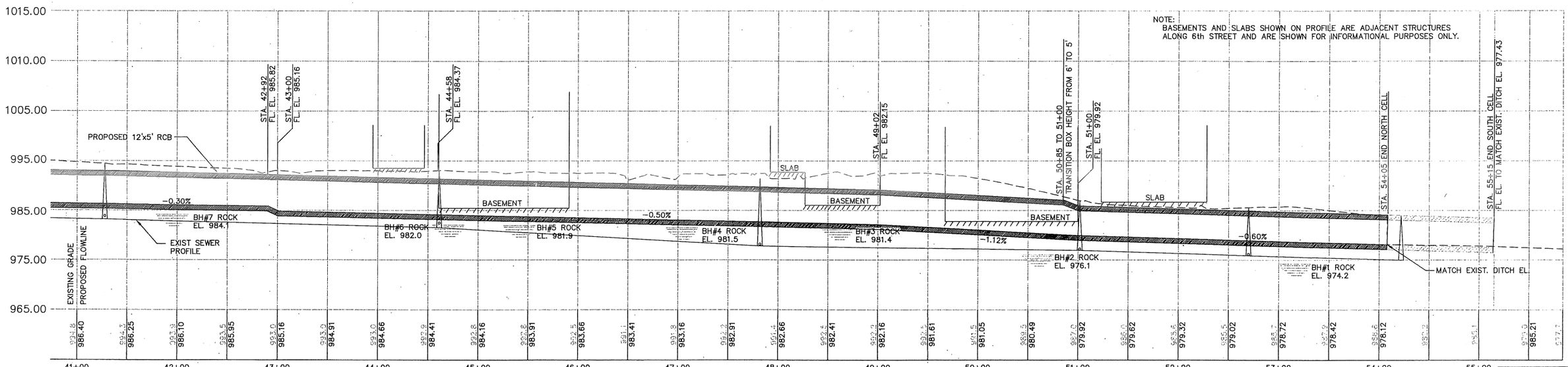
SCALE 1"=50'

LEGEND

- UG — UNDERGROUND ELECTRIC
- GAS — GAS LINE
- T — TELEPHONE
- FO — FIBER OPTIC
- W — WATER
- S — SEWER
- BORE HOLE
- CONTROL POINT
- EXISTING IRON PIN
- EXISTING WATER METER
- EXISTING MANHOLE
- EXISTING LAMP POST
- EXISTING TRAFFIC SIGNAL
- EXISTING FIRE HYDRANT
- EXISTING WATER VALVE
- SIGN
- EXISTING TELEPHONE PEDISTAL
- BENCH MARK



EXISTING BOX SECTION
N.T.S.



ALLGEIER, MARTIN & ASSOCIATES, INC.
CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

THIS DRAWING IS A DOCUMENT OF SERVICE AND IS THE "PROPERTY OF ALLGEIER, MARTIN & ASSOCIATES, INC. THIS DOCUMENT SHALL NOT BE USED ON THIS OR OTHER PROJECTS WITHOUT THE WRITTEN CONSENT OF ALLGEIER, MARTIN & ASSOCIATES, INC.

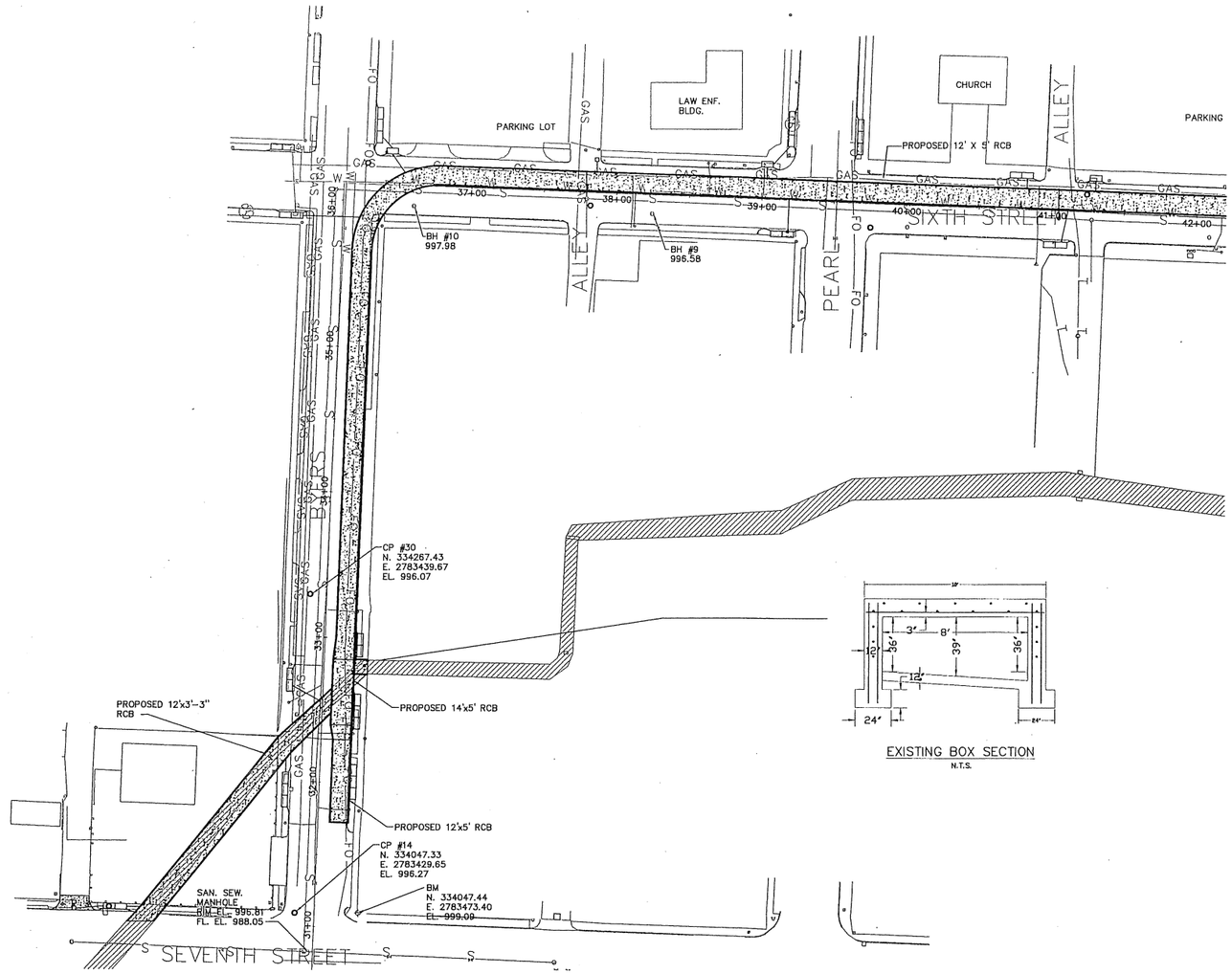
DATE	REVISION
11/8/02	INCREASE BOX HEIGHT - STA. 43+00

DWN. BY:	EMC
CKD. BY:	KEH
APPD. BY:	KEH
DATE:	SEPT, 2002

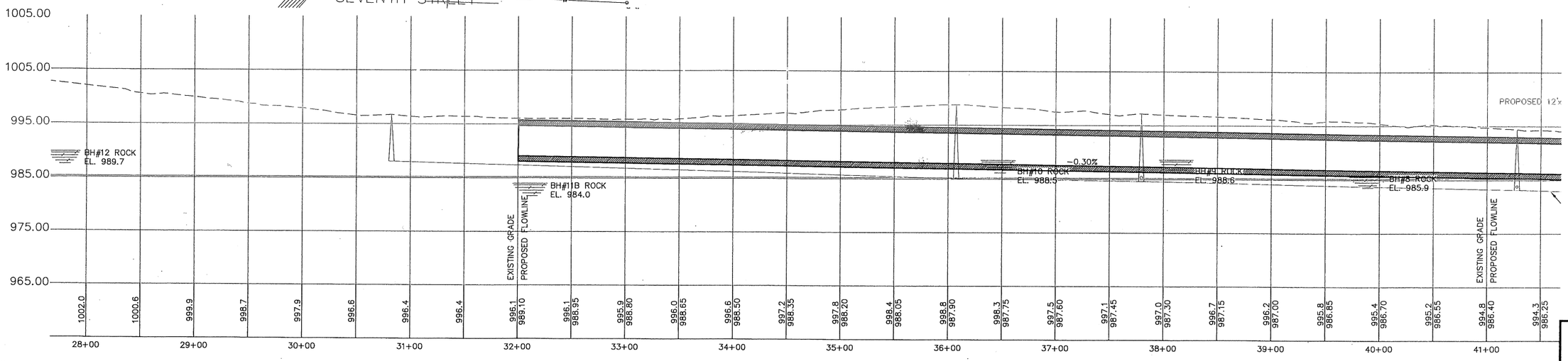
PLAN & PROFILE - STREET
WILLOW BRANCH
JOPLIN, MISSOURI

DWG. NO. C1.R

STATE OF MISSOURI
KURT E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
11-8-02



EXISTING BOX SECTION
N.T.S.



LEGEND

North

SCALE 1"=50'

- UG — UNDERGROUND ELECTRIC
- GAS — GAS LINE
- T — TELEPHONE
- FO — FIBER OPTIC
- W — WATER
- S — SEWER
- BORE HOLE
- CONTROL POINT
- EXISTING IRON PIN
- EXISTING WATER METER
- EXISTING MANHOLE
- EXISTING LAMP POST
- EXISTING TRAFFIC SIGNAL
- EXISTING FIRE HYDRANT
- EXISTING WATER VALVE
- SIGN
- EXISTING TELEPHONE PEDISTAL
- BENCH MARK

NOTES:

1. UTILITIES SHOWN WERE AS LOCATED PRIOR TO JUNE, 2002. UTILITIES SHALL BE RELOCATED PRIOR TO CONSTRUCTION. CONTRACTOR WILL BE ALLOWED TO TRENCH AS PROPOSED IN SPECIFICATIONS, AND WILL NOT BE RESPONSIBLE FOR DAMAGE TO UTILITIES, WITH THE EXCEPTION OF SANITARY SEWER AND UNDERGROUND STREET LIGHT SERVICE, LOCATED WITHIN TRENCH BOX FROM GROUND ELEVATION TO 12 INCHES BELOW FLOWLINE OF BOX. CONTRACTOR WILL BE RESPONSIBLE FOR ALL DAMAGE DURING CONSTRUCTION IN AREAS OUTSIDE OF PROPOSED BOX CULVERTS. CLOSE COORDINATION WITH UTILITY COMPANIES WILL BE REQUIRED.

2. CONTRACTOR WILL NOT BE REQUIRED TO RESTORE TRAFFIC SIGNAL LOOPS IN PAVEMENT. CITY WILL BE RESPONSIBLE FOR REPAIRS.

3. ALL SIDEWALK REPAIRS AT STREET, ALLEY, AND DRIVEWAY CROSSINGS SHALL INCLUDE ADA ACCESSIBLE RAMPS.

ALLGEIER, MARTIN & ASSOCIATES, INC.
CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

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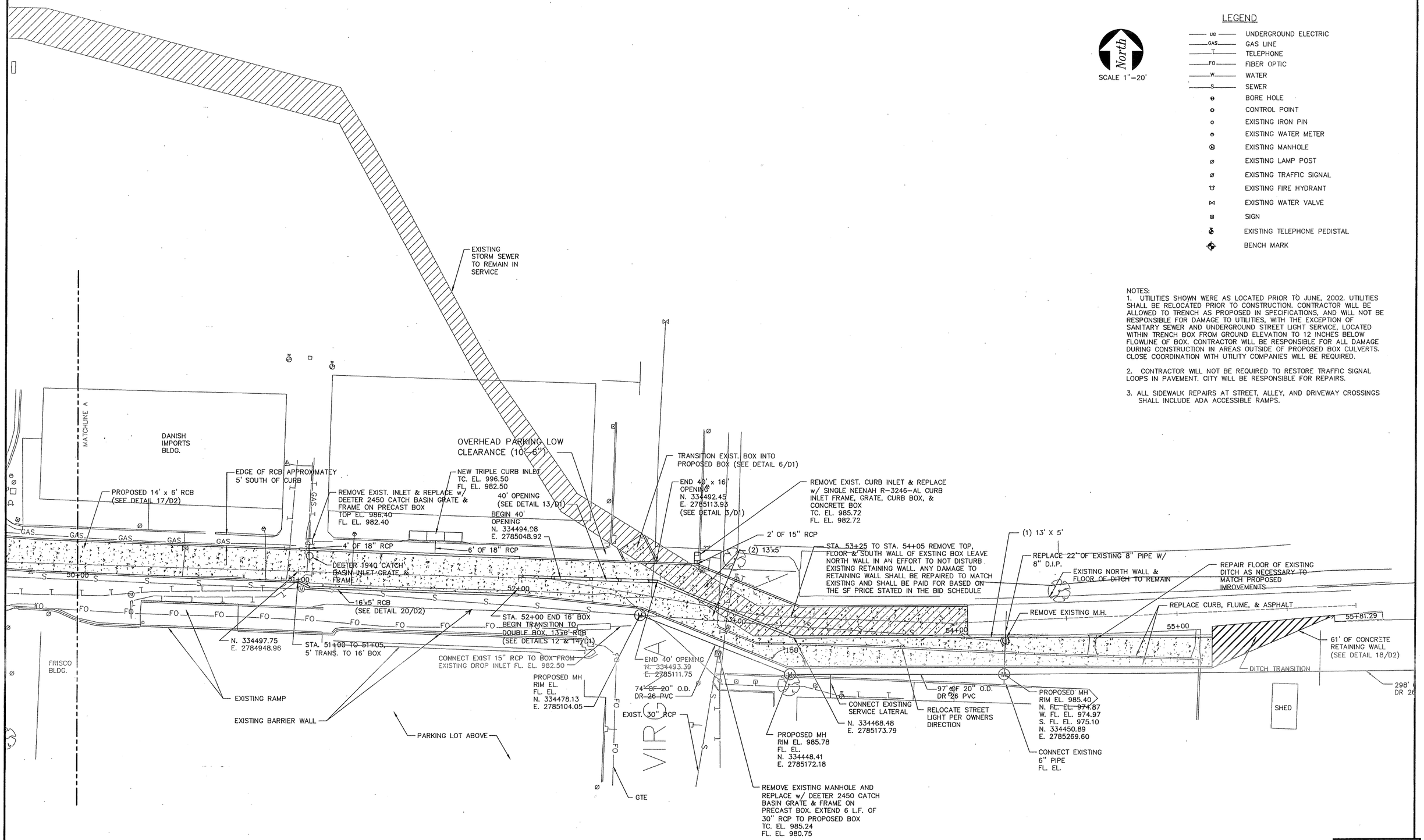
DATE	REVISION

DWN. BY:	EMC
CKD. BY:	KEH
APPD. BY:	KEH
DATE:	SEPT,2002

PLAN & PROFILE - EXISTING BOX AT SIXTH STREET
WILLOW BRANCH
JOPLIN, MISSOURI

DWG. NO. C2

STATE OF MISSOURI
KYLE HIGGINS NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
10-08-02



North

SCALE 1"=20'

LEGEND

- UG — UNDERGROUND ELECTRIC
- GAS — GAS LINE
- T — TELEPHONE
- FO — FIBER OPTIC
- W — WATER
- S — SEWER
- BORE HOLE
- CONTROL POINT
- EXISTING IRON PIN
- EXISTING WATER METER
- EXISTING MANHOLE
- EXISTING LAMP POST
- EXISTING TRAFFIC SIGNAL
- EXISTING FIRE HYDRANT
- EXISTING WATER VALVE
- SIGN
- EXISTING TELEPHONE PEDISTAL
- BENCH MARK

NOTES:

1. UTILITIES SHOWN WERE AS LOCATED PRIOR TO JUNE, 2002. UTILITIES SHALL BE RELOCATED PRIOR TO CONSTRUCTION. CONTRACTOR WILL BE ALLOWED TO TRENCH AS PROPOSED IN SPECIFICATIONS, AND WILL NOT BE RESPONSIBLE FOR DAMAGE TO UTILITIES, WITH THE EXCEPTION OF SANITARY SEWER AND UNDERGROUND STREET LIGHT SERVICE, LOCATED WITHIN TRENCH BOX FROM GROUND ELEVATION TO 12 INCHES BELOW FLOWLINE OF BOX. CONTRACTOR WILL BE RESPONSIBLE FOR ALL DAMAGE DURING CONSTRUCTION IN AREAS OUTSIDE OF PROPOSED BOX CULVERTS. CLOSE COORDINATION WITH UTILITY COMPANIES WILL BE REQUIRED.
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ALLGEIER, MARTIN & ASSOCIATES, INC.
CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

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DATE	REVISION

DWN. BY:	EMC
CKD. BY:	KEH
APPD. BY:	KEH
DATE:	SEPT, 2002

ENLARGED PLAN
WILLOW BRANCH
JOPLIN, MISSOURI

DWG. NO. C3

STATE OF MISSOURI
KURT E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
10-01-02

NOTES:

1. UTILITIES SHOWN ARE BASED ON DATA PRIOR TO JUNE, 2002. UTILITIES SHALL BE VERIFIED PRIOR TO CONSTRUCTION. CONTRACTOR WILL BE RESPONSIBLE TO TRENCH AS PROPOSED IN SPECIFICATIONS, AND WILL NOT BE RESPONSIBLE FOR DAMAGE TO UTILITIES, WITH THE EXCEPTION OF SANITARY SEWER AND UNDERGROUND STREET LIGHT SERVICE, LOCATED WITHIN TRENCH BOX FROM GROUND ELEVATION TO 12 INCHES BELOW FLOWLINE OF BOX. CONTRACTOR WILL BE RESPONSIBLE FOR ALL DAMAGE DURING CONSTRUCTION IN AREAS OUTSIDE OF PROPOSED BOX CULVERTS. CLOSE COORDINATION WITH UTILITY COMPANIES WILL BE REQUIRED.

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North

SCALE 1"=20'

LEGEND

- UG — UNDERGROUND ELECTRIC
- GAS — GAS LINE
- T — TELEPHONE
- FO — FIBER OPTIC
- W — WATER
- S — SEWER
- BORE HOLE
- CONTROL POINT
- EXISTING IRON PIN
- EXISTING WATER METER
- EXISTING MANHOLE
- EXISTING LAMP POST
- EXISTING TRAFFIC SIGNAL
- EXISTING FIRE HYDRANT
- EXISTING WATER VALVE
- SIGN
- EXISTING TELEPHONE PEDISTAL
- BENCH MARK

MATCHLINE B

RCP

STA. 44+50 TO 44+58 TRANSITION FROM 12'x5' TO 14'x6' RCB.

CONNECT EXIST. (2) 6' x 3.5' RCB TO PROPOSED 14' x 6' RCB (SEE DETAIL 7 & 4/D1)

NEW SINGLE CURB INLET
TC. EL. 992.12
FL. EL. 987.12

20' OF 18" RCP

44+00

45+00

46+00

47+00

48+00

49+00

50+00

DEETER 1940 CATCH BASIN GRATE & FRAME

REPLACE 26' OF EXIST. 12" SANITARY SEWER VCP w/ 12" D.I.P. FROM EAST

CONNECT EXIST. (2) 6' x 3.5' RCB TO PROPOSED 14' x 6' RCB (SEE DETAIL 11 & 15/D1)

EMPIRE DISTRICT ELECTRIC BLDG.

NEW DOUBLE CURB INLET
TC. EL. 993.01
FL. IN EL. 988.60
FL. OUT EL. 988.01

33' OF 18" RCP

34' OF 18" RCP

12' OF 18" RCP w/ 18"x18"x18" TEE

REMOVE EXISTING DROP INLET AND PLUG EXISTING RCP

REPLACE EXIST INLET w/ NEW SINGLE CURB INLET
TC. EL. 992.38
FL. IN. 992.30
FL. OUT 989.30

CONNECT EXISTING 15" LINE

REMOVE EXIST. CURB INLET & PLUG EXIST. RCP

NEW TRIPLE CURB INLET
TC. EL. 992.80
FL. EL. 987.80

NEW DOUBLE CURB INLET
TC. EL. 991.63
FL. EL. 986.63

CONNECT EXISTING 24" LINE

6' OF 18" RCP

DEETER 1940 CATCH BASIN GRATE & FRAME

NEW SINGLE CURB INLET
TC. EL. 992.20
FL. EL. 987.20

14'x6' (SEE DETAIL 16/D2)

6' OF 18" RCP

REPLACE 22' OF 8" VCP w/ 10" D.I.P.

REPLACE 40' OF EXISTING SANITARY SEWER 12" VCP w/ 12" D.I.P. FROM MANHOLE EAST

ADD NEW DEETER 2450 CATCH BASIN GRATE & FRAME ON PRECAST BOX ON NORTH SIDE OF EXIST. INLET. USE EXIST. 18" RCP.
TOP EL. 992.64
FL EL. 987.95

NEWMANS BLDG.

EXIST. UNDERGROUND ELECTRIC SERVES MAIN STREET STREET LIGHTS. CONTRACTOR SHALL ONLY DISTURB SERVICE ONE AT A TIME. CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR OF ELECTRIC LINES.

NEW SINGLE CURB INLET
TC. EL. 991.78
FL. EL. 986.78

30' OF 18" RCP

37' OF 24" RCP

(2) TRIPLE NEENAH R-3246-AL CURB INLET FRAME, GRATE, CURB BOX, & CONCRETE BOX

43' OF 18" RCP

8' OF 18" RCP

NEW TRIPLE CURB INLET
TC. EL. 994.13
FL. EL. 988.13

FRISCO BLDG.

MATCHLINE A

SIXTH

JOPLIN

LET

ALLGEIER, MARTIN & ASSOCIATES, INC.
CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

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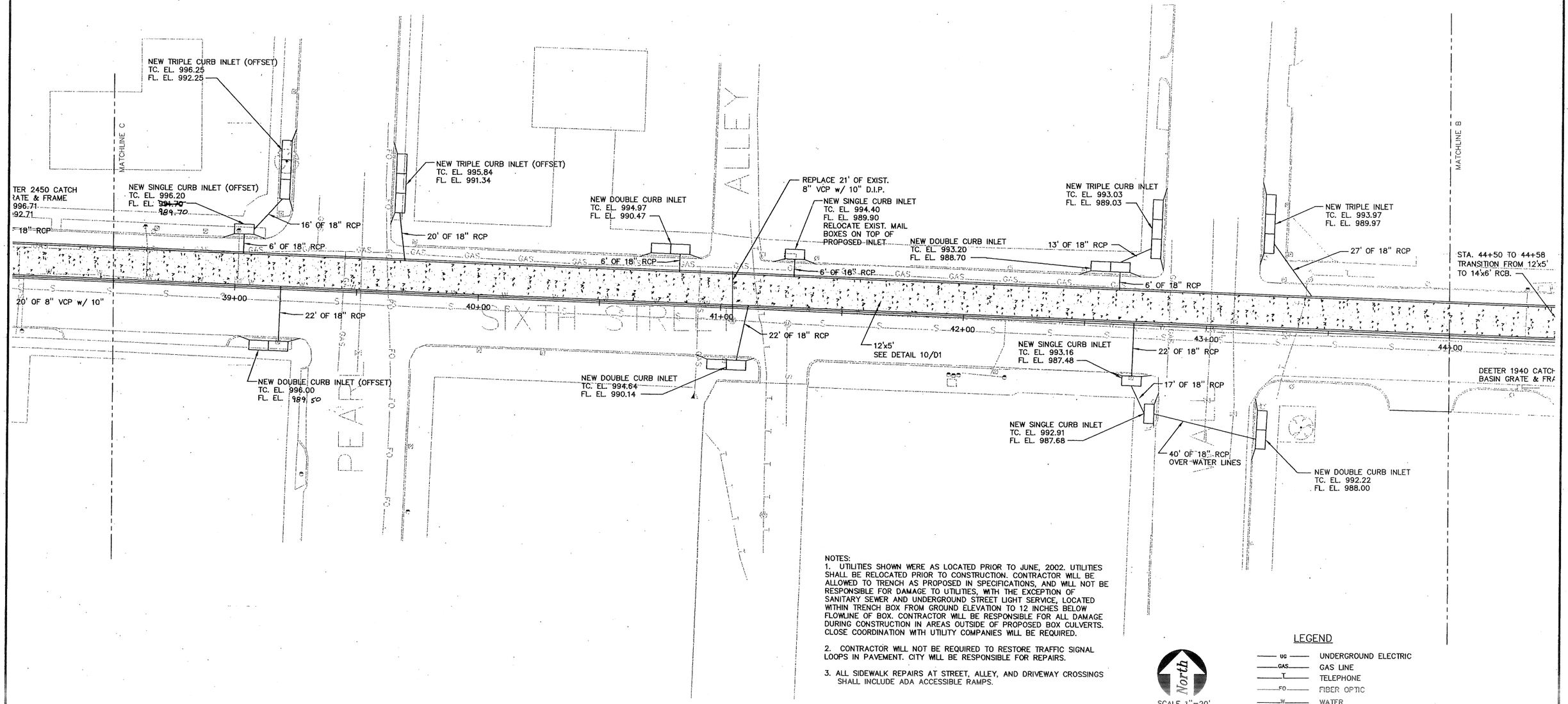
DATE	REVISION

DWN. BY:	EMC
CKD. BY:	KEH
APPD. BY:	KEH
DATE:	SEPT, 2002

ENLARGED PLAN
WILLOW BRANCH
JOPLIN, MISSOURI

DWG. NO. C4

STATE OF MISSOURI
KURT E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
10-01-02



NOTES:
1. UTILITIES SHOWN WERE AS LOCATED PRIOR TO JUNE, 2002. UTILITIES SHALL BE RELOCATED PRIOR TO CONSTRUCTION. CONTRACTOR WILL BE ALLOWED TO TRENCH AS PROPOSED IN SPECIFICATIONS, AND WILL NOT BE RESPONSIBLE FOR DAMAGE TO UTILITIES, WITH THE EXCEPTION OF SANITARY SEWER AND UNDERGROUND STREET LIGHT SERVICE, LOCATED WITHIN TRENCH BOX FROM GROUND ELEVATION TO 12 INCHES BELOW FLOWLINE OF BOX. CONTRACTOR WILL BE RESPONSIBLE FOR ALL DAMAGE DURING CONSTRUCTION IN AREAS OUTSIDE OF PROPOSED BOX CULVERTS. CLOSE COORDINATION WITH UTILITY COMPANIES WILL BE REQUIRED.

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North

SCALE 1"=20'

LEGEND

UG	UNDERGROUND ELECTRIC
GAS	GAS LINE
T	TELEPHONE
FO	FIBER OPTIC
W	WATER
S	SEWER
	BORE HOLE
	CONTROL POINT
	EXISTING IRON PIN
	EXISTING WATER METER
	EXISTING MANHOLE
	EXISTING LAMP POST
	EXISTING TRAFFIC SIGNAL
	EXISTING FIRE HYDRANT
	EXISTING WATER VALVE
	SIGN
	EXISTING TELEPHONE PEDISTAL
	BENCH MARK

ALLGEIER, MARTIN & ASSOCIATES, INC.
CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

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DATE	REVISION
11/8/02	Inlet FL. EL. Changes

DWN. BY:	EMC
CKD. BY:	KEH
APPD. BY:	KEH
DATE:	SEPT, 2002

ENLARGED PLAN
WILLOW BRANCH
JOPLIN, MISSOURI

DWG. NO. C5.R

STATE OF MISSOURI
KURT E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
11-08-02

North

SCALE 1"=20'

LEGEND

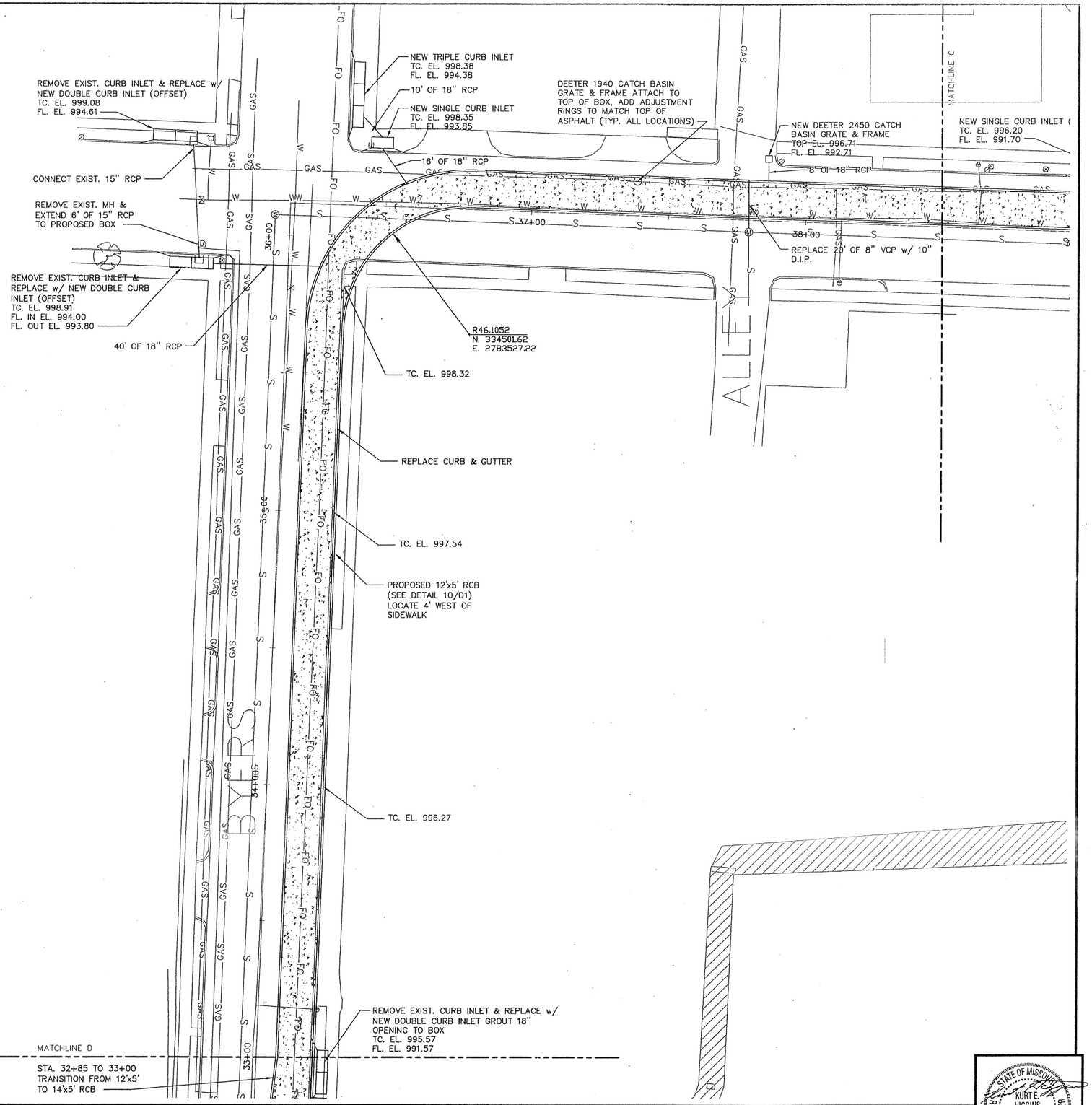
- UG — UNDERGROUND ELECTRIC
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- BORE HOLE
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ALLGEIER, MARTIN & ASSOCIATES, INC.
CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

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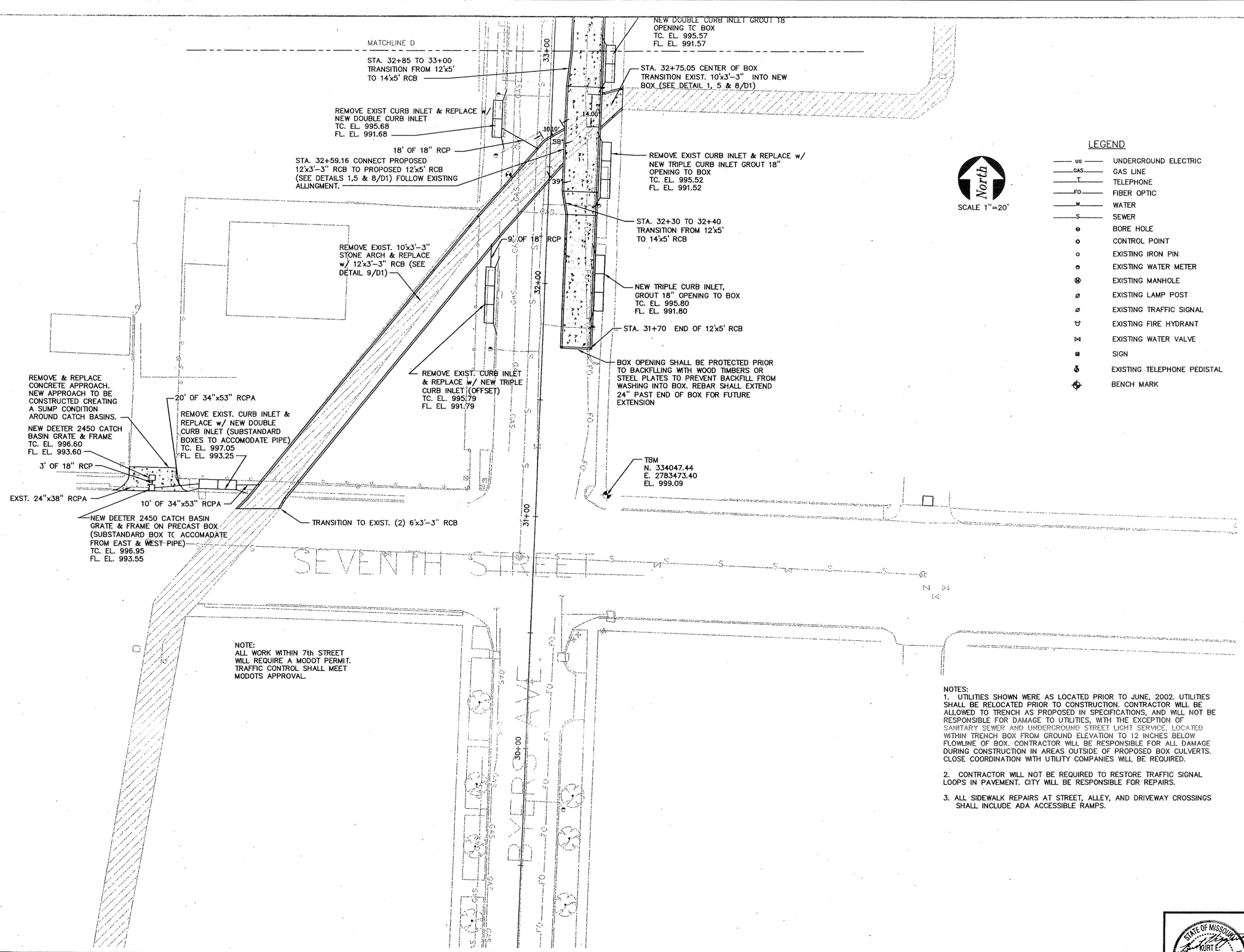
DATE	REVISION

DWN. BY:	EMC
CKD. BY:	KEH
APPD. BY:	KEH
DATE:	SEPT, 2002

ENLARGED PLAN
WILLOW BRANCH
JOPLIN, MISSOURI

DWG. NO. C6

STATE OF MISSOURI
KURT E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
10-01-02



NOTE:
ALL WORK WITHIN 7th STREET
WILL REQUIRE A MODOT PERMIT.
TRAFFIC CONTROL SHALL MEET
MODOTS APPROVAL.

NOTES:
1. UTILITIES SHOWN WERE AS LOCATED PRIOR TO JUNE, 2002. UTILITIES SHALL BE RELOCATED PRIOR TO CONSTRUCTION. CONTRACTOR WILL BE ALLOWED TO TRENCH AS PROPOSED IN SPECIFICATIONS, AND WILL NOT BE RESPONSIBLE FOR DAMAGE TO UTILITIES, WITH THE EXCEPTION OF SANITARY SEWER AND UNDERGROUND STREET LIGHT SERVICE, LOCATED WITHIN TRENCH BOX FROM GROUND ELEVATION TO 12 INCHES BELOW FLOWLINE OF BOX. CONTRACTOR WILL BE RESPONSIBLE FOR ALL DAMAGE DURING CONSTRUCTION IN AREAS OUTSIDE OF PROPOSED BOX CULVERTS. CLOSE COORDINATION WITH UTILITY COMPANIES WILL BE REQUIRED.

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ALLGEIER, MARTIN & ASSOCIATES, INC.
CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

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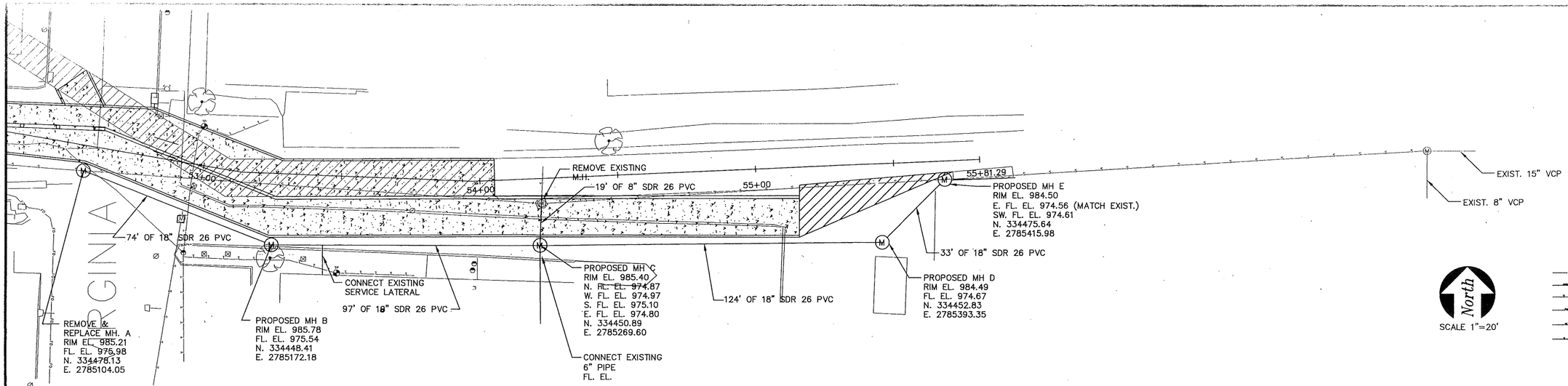
DATE	REVISION
10/18/02	Box Alignment Change

DWN. BY:	EMC
CKD. BY:	KEH
APPD. BY:	KEH
DATE:	SEPT, 2002

ENLARGED PLAN
WILLOW BRANCH
JOPLIN, MISSOURI

DWG. NO. C7R

STATE OF MISSOURI
KURT E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
11-08-02



ALLGEIER, MARTIN & ASSOCIATES, INC.
CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

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DATE	REVISION
1/7/03	SEWER LOCATION (C.O. #1)
1/10/03	SLOPES

DWN. BY:	EMC
CKD. BY:	KEH
APPD. BY:	KEH
DATE:	SEPT, 2002

SANITARY SEWER PLAN & PROFILE
WILLOW BRANCH
JOPLIN, MISSOURI

DWG. NO.
C8R

STATE OF MISSOURI
KURT E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
1-13-03

P:\Willow Branch\Phase II\C1-CxlPHASE II.dwg, 5/16/2005 11:38:41 AM, Galuck

CENTERLINE ROAD STATIONING & COORDINATES		
STA.	NORTHING	EASTING
18+00	N. 333593.01	E. 2782601.35
20+00	N. 333585.49	E. 2782801.21
22+00	N. 333578.07	E. 2783001.07
24+00	N. 333570.73	E. 2783200.94
26+00	N. 333563.90	E. 2783400.82
28+00	N. 333738.19	E. 2783431.70
30+00	N. 333938.05	E. 2783439.06
32+00	N. 334137.92	E. 2783446.45

NOTES:
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2. ALL SIDEWALK REPAIRS AT STREET, ALLEY, AND DRIVEWAY CROSSINGS SHALL INCLUDE ADA ACCESSIBLE RAMPS MEETING THE CITY OF JOPLIN'S STANDARD SPECIFICATIONS.

3. PROPOSED INLET LOCATIONS & ELEVATIONS SHALL BE ADJUSTED TO MATCH SURROUNDING CONDITIONS. ADJUSTMENTS TO INLET FLOWLINES SHALL BE EXPECTED TO AVOID CONFLICTS WITH UTILITIES. NO ADDITIONAL COMPENSATION WILL BE GIVEN FOR MINOR ADJUSTMENTS (± ONE FOOT).

4. PIPE PENETRATIONS FOR PROPOSED STORM WATER SHALL HAVE FLOWLINE ELEVATIONS 1' ABOVE BOX FLOWLINE ELEVATIONS. STATIONING OF SIDE OPENINGS CAN BE MOVED TO NEAREST ½ SECTION OF PRECAST BOX TO MAINTAIN PRODUCT INTEGRITY.

5. ALL ASPHALT AND CONCRETE ROAD, CURB, GUTTER, & SIDEWALK
SHALL BE CONSTRUCTED TO PROVIDE POSITIVE DRAINAGE TO EXISTING AND PROPOSED INLETS.

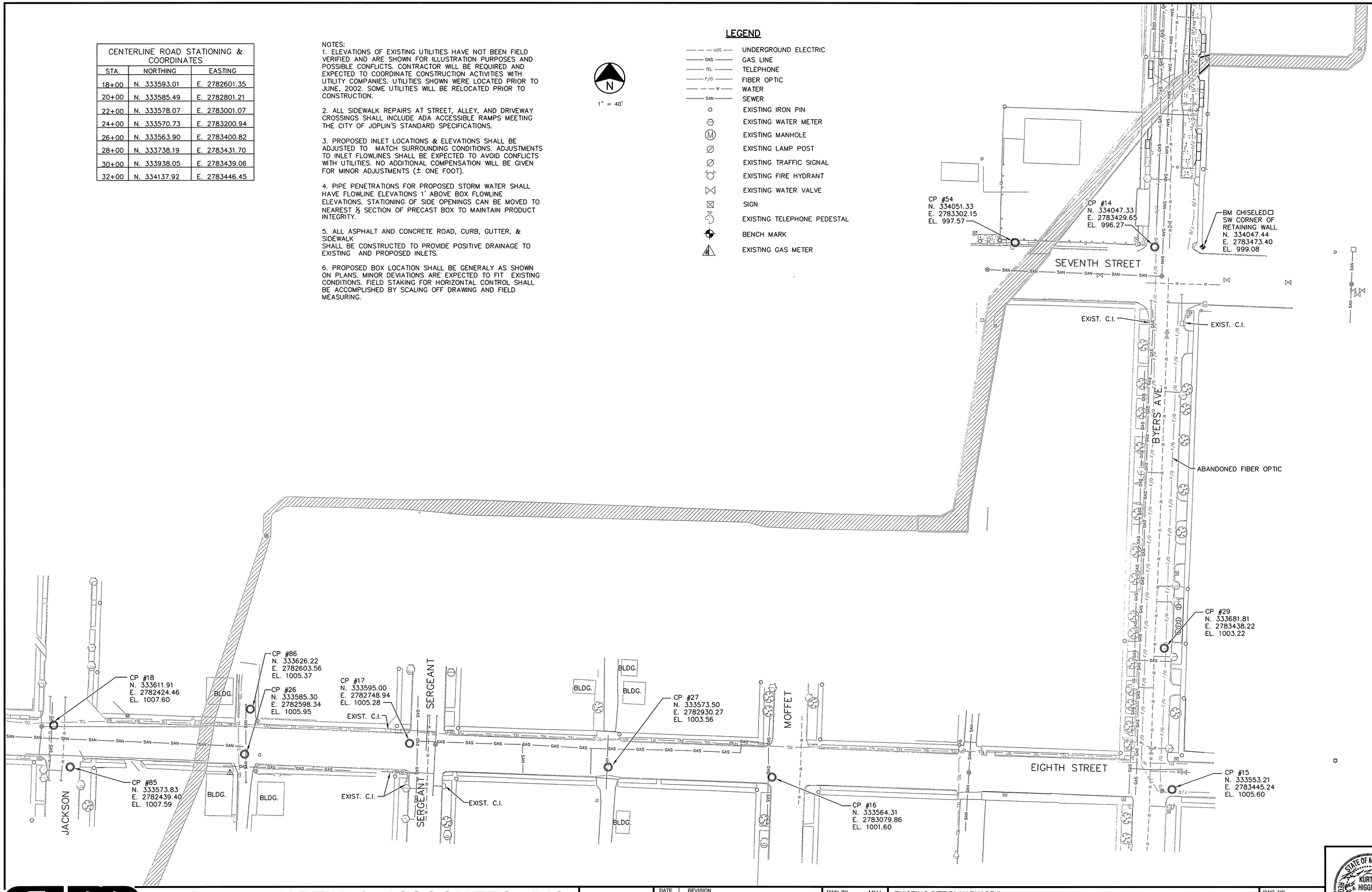
6. PROPOSED BOX LOCATION SHALL BE GENERALY AS SHOWN ON PLANS. MINOR DEVIATIONS ARE EXPECTED TO FIT EXISTING CONDITIONS. FIELD STAKING FOR HORIZONTAL CONTROL SHALL BE ACCOMPLISHED BY SCALING OFF DRAWING AND FIELD MEASURING.

N

1" = 40'

LEGEND

- UCE — UNDERGROUND ELECTRIC
- GAS — GAS LINE
- TEL — TELEPHONE
- F/O — FIBER OPTIC
- W — WATER
- SAN — SEWER
- EXISTING IRON PIN
- EXISTING WATER METER
- EXISTING MANHOLE
- EXISTING LAMP POST
- EXISTING TRAFFIC SIGNAL
- EXISTING FIRE HYDRANT
- EXISTING WATER VALVE
- SIGN
- TP — EXISTING TELEPHONE PEDESTAL
- BENCH MARK
- EXISTING GAS METER



ALLGEIER, MARTIN & ASSOCIATES, INC.
CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

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DATE	REVISION

DWN BY	MHJ
CKD BY	JED
APPD. BY.	KEH
DATE	JAN., 2003

EXISTING SITE PLAN PHASE II
WILLOW BRANCH
JOPLIN, MISSOURI

DWG NO
C1

STATE OF MISSOURI
KURT E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
05-04-04

P:\Willow Branch\Phase III\C1-C4\PHASE II.dwg, 5/16/2005 11:37:33 AM, Gluck

EXISTING 12'x5' RCB

STA. 31+66 TO STA. 31+74 TRANSITION FROM 12'x4' TO EXIST. 12'x5' RCB (TRANSITION LENGTH MAY BE VARIED TO ACCOMODATE PRECAST SECTOIN)

ABANDONED FIBER OPTIC

SEVENTH STREET

EXISTING FIBER OPTIC

BM CHISELED SW CORNER OF RETAINING WALL
N. 334047.44
E. 2783473.40
EL. 999.08

BYERS AVE.

PROPOSED 12' x 4' RCB

(2) 6'x3'-4" RCB

8'x3'-8"

8'x3'-8"

14'x3'-8"

BH #12

EXIST. SAN. SEW. MANHOLE
RIM EL. 1005.95
FL. EL. 995.45

STA. 18+11 PROPOSED 30" RISER w/ MANHOLE RING AND 30" MIN. GRATED COVER. RIM EL. TO MATCH EXIST. GRADE.

PROPOSED 60" RCP

PROPOSED 10' x 4' RCB

EXIST MANHOLE
RIM EL. 1005.56
FL. EL. 994.20

EXIST. STORM SEWER MANHOLE
RIM EL. 1005.33
FL. EL. 1000.63

SERGEANT

EXIST. SAN. SEWER MANHOLE
RIM EL. 1003.64
FL. EL. 994.1

MOFFET

EXIST SAN. SEWER MANHOLE
RIM EL. 1003.40
FL. EL. 997.60

STA. 24+59 TO 24+65 TRANSITION FROM 12' x 4' TO 10' x 4' RCB

ABANDONED FIBER OPTIC

EXISTING FIBER OPTIC

PROPOSED BOX TO GO UNDER EXISTING UTILITIES IN THIS AREA

BLDG.

BH #15

CP #85
N. 333573.83
E. 2782439.40
EL. 1007.59

CURB INLET
TOP EL. 1005.42
FL. EL. 1003.25

CURB INLET
TOP EL. 1005.57
FL. EL. 1003.40

CURB INLET
TOP EL. 1005.25
FL. EL. 1003.08

BH #14

STA. 18+11 PROPOSED 30" RISER w/ MANHOLE RING AND 30" MIN. GRATED COVER. RIM EL. TO MATCH EXIST. GRADE.

BH #13

ATT MH

17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00 25+00 26+00 27+00 28+00 29+00 30+00 31+00

12" 8" 8" 8

P:\Willow Branch\Phase II\IC1-C4\PHASE II.dwg, 5/16/2005 11:38:29 AM, Gaiuck

N

1" = 30'

LEGEND

UGE	UNDERGROUND ELECTRIC
GAS	GAS LINE
TEL	TELEPHONE
F/O	FIBER OPTIC
W	WATER
SAN	SEWER
	EXISTING IRON PIN
	EXISTING WATER METER
M	EXISTING MANHOLE
	EXISTING LAMP POST
	EXISTING TRAFFIC SIGNAL
	EXISTING FIRE HYDRANT
	EXISTING WATER VALVE
	SIGN
TP	EXISTING TELEPHONE PEDESTAL
	BENCH MARK

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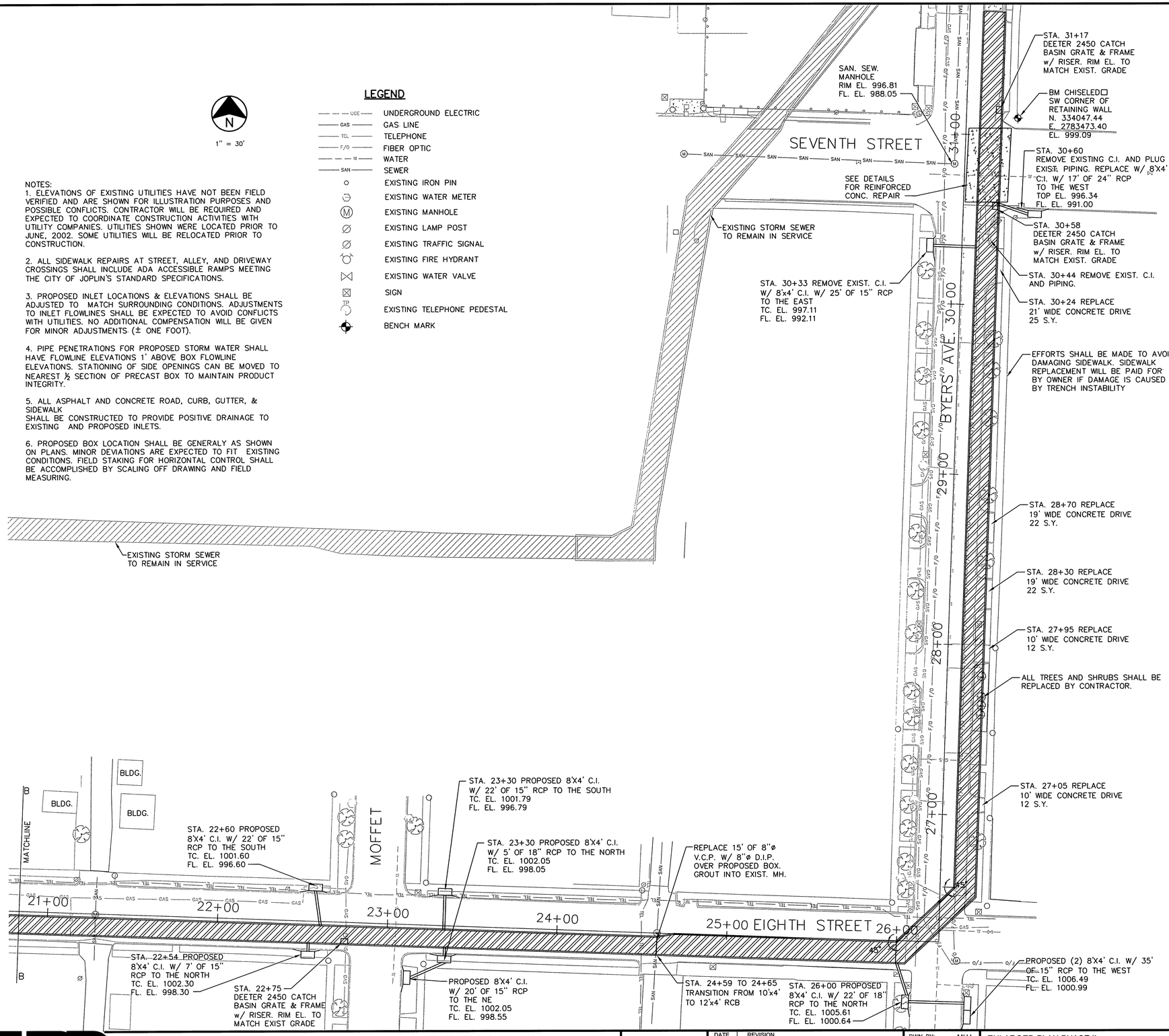
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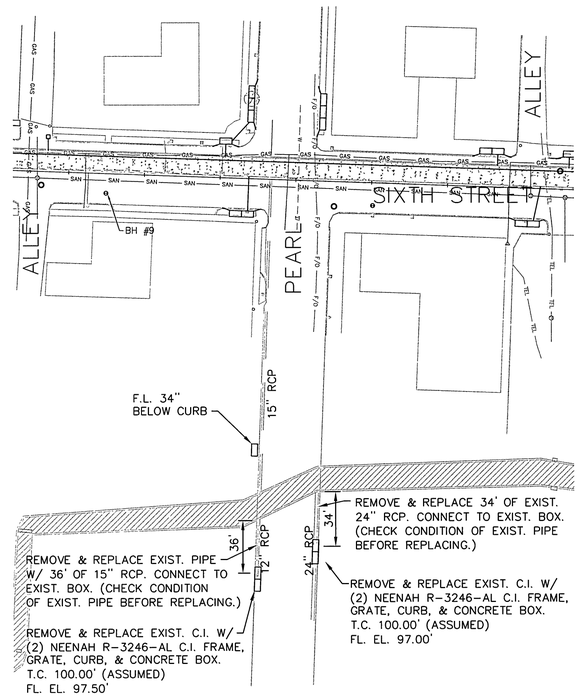
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5. ALL ASPHALT AND CONCRETE ROAD, CURB, GUTTER, & SIDEWALK
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6. PROPOSED BOX LOCATION SHALL BE GENERALY AS SHOWN ON PLANS. MINOR DEVIATIONS ARE EXPECTED TO FIT EXISTING CONDITIONS. FIELD STAKING FOR HORIZONTAL CONTROL SHALL BE ACCOMPLISHED BY SCALING OFF DRAWING AND FIELD MEASURING.





PEARL AVE. CURB INLET REPLACEMENT
1" = 50'

ALLGEIER, MARTIN & ASSOCIATES, INC.
CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

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DATE	REVISION

DWN. BY:	MHJ
CKD. BY	JED
APPD BY	KEH
DATE	JAN., 2003

ENLARGED PLAN PHASE II
WILLOW BRANCH
JOPLIN, MISSOURI

DWG NO
C3

STATE OF MISSOURI
KURT E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
02-04-04

P:\Willow Branch\Phase III\C1-C4\PHASE II.dwg, 5/16/2005 11:35:31 AM, Gduck

LEGEND

UGE	UNDERGROUND ELECTRIC
GAS	GAS LINE
TEL	TELEPHONE
F/O	FIBER OPTIC
W	WATER
SAN	SEWER
	EXISTING IRON PIN
	EXISTING WATER METER
M	EXISTING MANHOLE
	EXISTING LAMP POST
	EXISTING TRAFFIC SIGNAL
	EXISTING FIRE HYDRANT
	EXISTING WATER VALVE
	SIGN
TP	EXISTING TELEPHONE PEDESTAL

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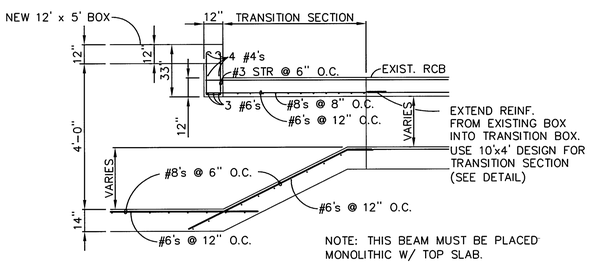
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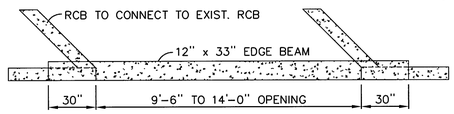
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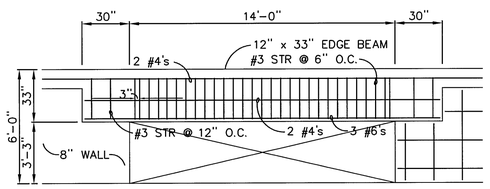
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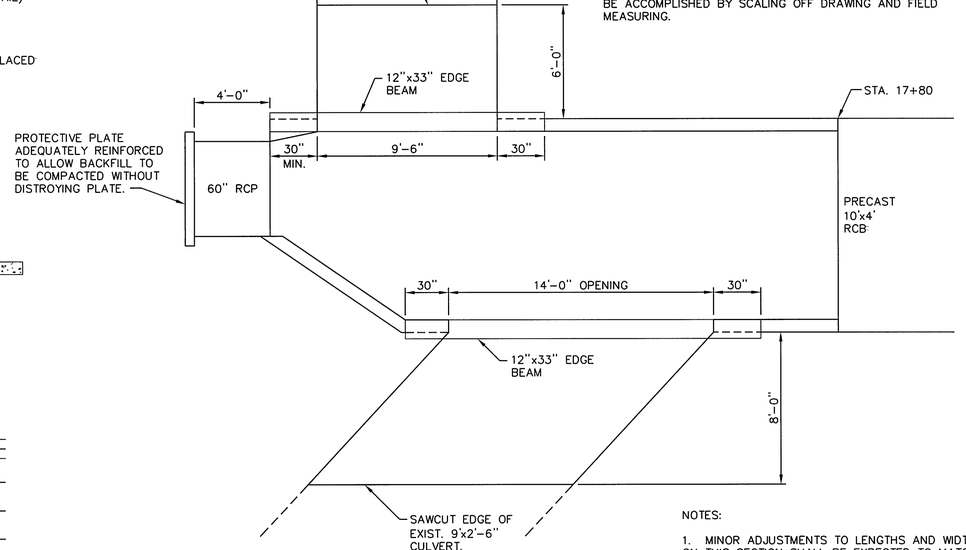
SECTION
N.T.S.



PLAN
N.T.S.



ELEVATION
N.T.S.



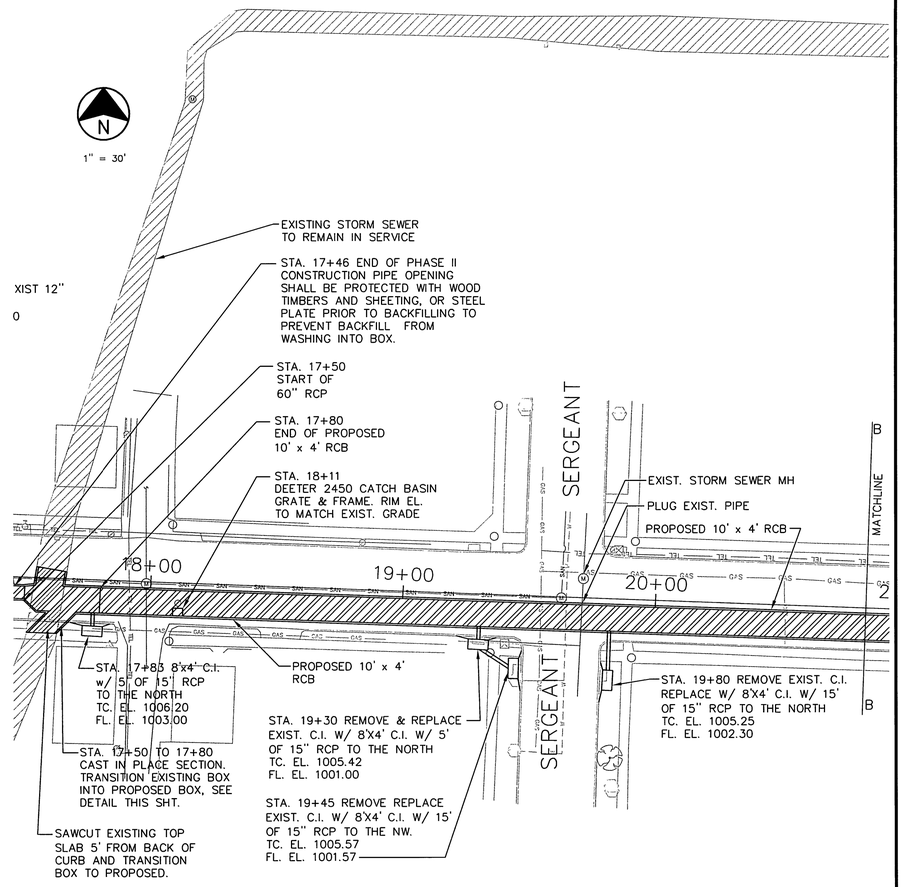
PLAN @ STA. 17+46 TO 17+80
N.T.S.

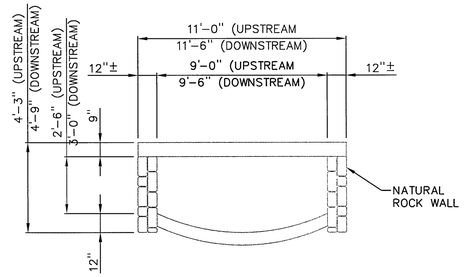
NOTES:

1. MINOR ADJUSTMENTS TO LENGTHS AND WIDTHS ON THIS SECTION SHALL BE EXPECTED TO MATCH EXISTING CONDITIONS. NO ADDITIONAL COMPENSATION WILL BE MADE FOR ADJUSTMENTS.

2. WHEN REMOVING SECTION OF EXISTING BOX CULVERT, CAREFULLY CUT CONCRETE, CLEAN AND PRESERVE REINFORCING STEEL TO EMBED IN NEW CONCRETE

3. ALL TOP SLAB REIFORCEMENT SLAB BE EPOXY COATED.





EXISTING CROSS SECTION ON EIGHTH STREET
1/4" = 1'-0"

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JOPLIN, MISSOURI

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DATE	REVISION

DWN BY	MHJ
CKD BY.	JED
APPD BY.	KEH
DATE	JAN., 2003

ENLARGED PLAN PHASE II
WILLOW BRANCH
JOPLIN, MISSOURI

DWG NO
C4

STATE OF MISSOURI
KURT E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
05-04-04



ALLGEIER, MARTIN & ASSOCIATES, INC.
CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

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DATE	REVISION

DWN. BY: MHJ/RCP
CKD. BY: JED
APPD. BY: KEH
DATE : SEPT., 2004

ENLARGED PLAN PHASE III
WILLOW BRANCH
JOPLIN, MISSOURI

DWG. NO. C1

STATE OF MISSOURI
KURT E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
9-27-04

F:\JOPLIN MO\CITY OF JOPLIN\STORMWATER\WILLOW BRANCH PHASE 3\DRAWINGS\SEALED 09-27-04\(C1-C4)PHASE III WITH PHOTO.DWG, 10/6/2015 9:45:37 AM

LEGEND

— — — UGE — —	UNDERGROUND ELECTRIC
—— GAS ——	GAS LINE
—— TEL ——	TELEPHONE
—— F/O ——	FIBER OPTIC
— — — W — —	WATER
—— SAN ——	SEWER
—— SS ——	STORM SEWER
○	EXISTING IRON PIN
	EXISTING WATER METER
Ⓜ	EXISTING MANHOLE
	EXISTING LAMP POST
	EXISTING TRAFFIC SIGNAL
	EXISTING FIRE HYDRANT
	EXISTING WATER VALVE
	SIGN
TP	EXISTING TELEPHONE PEDESTAL

NOTES:
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CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

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DATE	REVISION

DWN. BY:	MHJ/RCP
CKD. BY:	JED
APPD. BY:	KEH
DATE :	SEPT., 2004

ENLARGED PLAN PHASE III
WILLOW BRANCH
JOPLIN, MISSOURI

DWG. NO. C2

STATE OF MISSOURI
KURT E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
9-27-04

F:\JOPLIN MO\CITY OF JOPLIN\STORMWATER\WILLOW BRANCH PHASE 3\DRAWINGS\SEALED 09-27-04\C1-C4\PHASE III WITH PHOTO.DWG, 10/6/2015 9:46:38 AM



LEGEND

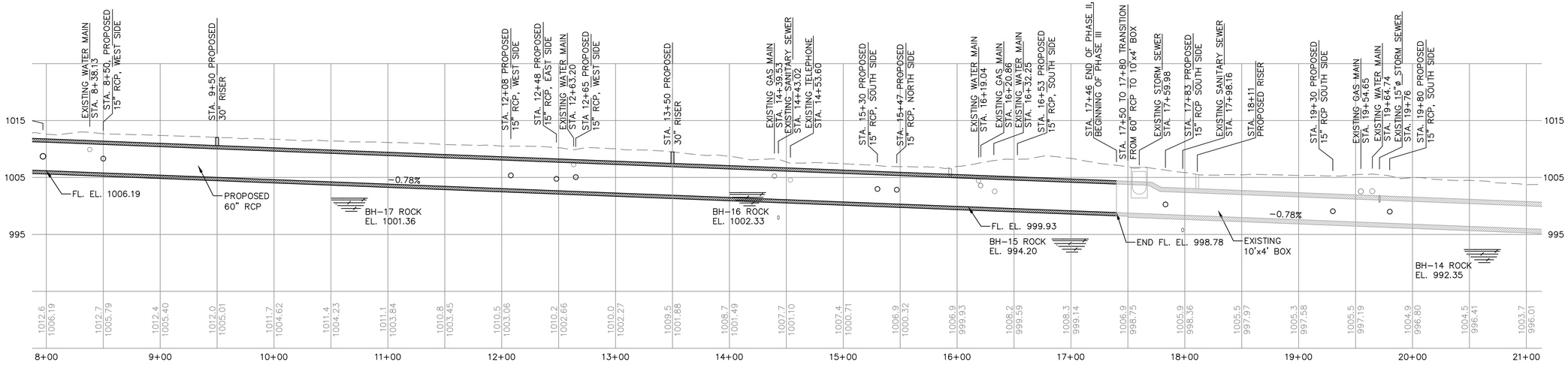
- UGE — UNDERGROUND ELECTRIC
- GAS — GAS LINE
- TEL — TELEPHONE
- F/O — FIBER OPTIC
- W — WATER
- SAN — SEWER
- SS — STORM SEWER
- BORE HOLE
- CONTROL POINT
- EXISTING IRON PIN
- EXISTING WATER METER
- EXISTING MANHOLE
- EXISTING LAMP POST
- EXISTING TRAFFIC SIGNAL
- EXISTING FIRE HYDRANT
- EXISTING WATER VALVE
- EXISTING GAS METER
- EXISTING SIGN
- EXISTING TELEPHONE PEDESTAL
- BENCH MARK

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CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

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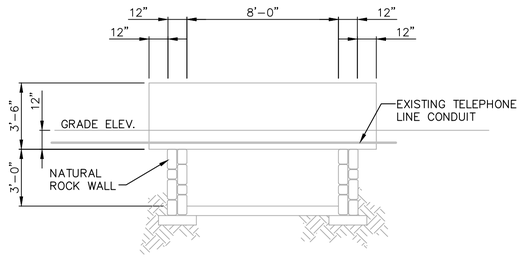
DWN. BY: MHJ/RCP
CKD. BY: JED
APPD. BY: KEH
DATE : SEPT., 2004

PLAN AND PROFILE PHASE III
WILLOW BRANCH
JOPLIN, MISSOURI

DWG. NO. C3

STATE OF MISSOURI
KURT E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
9-27-04

F:\JOPLIN MO\CITY OF JOPLIN\STORMWATER\WILLOW BRANCH PHASE 3\DRAWINGS\SEALED 09-27-04\(C1-C4)PHASE III WITH PHOTO.DWG, 10/6/2015 9:47:26 AM



EXISTING BOX CROSS SECTION AT OPEN CHANNEL STA. 0+20

1/4" = 1'-0"

LEGEND

- UGE — UNDERGROUND ELECTRIC
- GAS — GAS LINE
- TEL — TELEPHONE
- F/O — FIBER OPTIC
- W — WATER
- SAN — SEWER
- SS — STORM SEWER
- BORE HOLE
- CONTROL POINT
- EXISTING IRON PIN
- EXISTING WATER METER
- EXISTING MANHOLE
- EXISTING LAMP POST
- EXISTING TRAFFIC SIGNAL
- EXISTING FIRE HYDRANT
- EXISTING WATER VALVE
- SIGN
- EXISTING TELEPHONE PEDESTAL
- BENCH MARK

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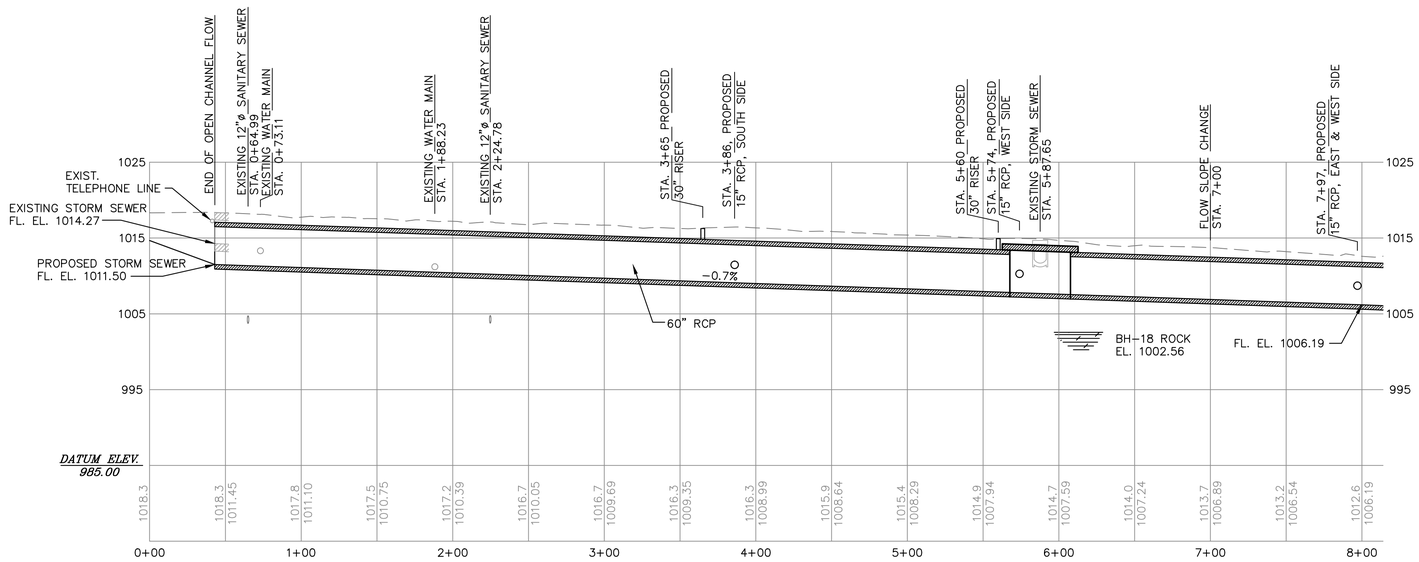
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CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

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DATE	REVISION

DWN. BY:	MHJ/RCP
CKD. BY:	JED
APPD. BY:	KEH
DATE :	SEPT., 2004

PLAN AND PROFILE PHASE III
WILLOW BRANCH
JOPLIN, MISSOURI

DWG. NO. C4

STATE OF MISSOURI
KURT E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
9-27-04

F:\JOPLIN MO\CITY OF JOPLIN\STORMWATER\WILLOW BRANCH PHASE 3\DRAWINGS\SEALED 09-27-04\(C1-C4)PHASE III WITH PHOTO.DWG, 10/6/2015 9:48:12 AM

MATCH LINE A

MATCH LINE A

MH
RIM–1023.24'
INV.–1012.68'

MH
RIM–1020.66'
INV.–1011.21'

ROCK LINED DITCH

ROCK LINED DITCH

EXISTING 4'x 2.4' RCB
UNDER SIDEWALK

EXISTING 9'x 3.8' RCB
w/ STEEL CASING THROUGH BOX
℄ 1016.35'
TOP EL. 1021.07'

EXISTING 9'x 3.8' RCB
w/ STEEL CASING THROUGH BOX
℄ 1016.66'
TOP EL. 1021.07'

GARAGE

HOUSE

11TH STREET

RETAINING WALL

48" TRIPLE TREE

48" TRIPLE TREE

F/L
1016.08'

EXISTING 9'x 3.4' RCB
℄ 1014.87'
TOP EL. 1020.54'

14" R.C.P.

14" R.C.P.

D.I.
TOP–1020.36'
INV.–1017.26'

D.I.
TOP
INV.

MURPHY AVENUE
(ASPHALT ROAD)

12" RCP

C.I.
TOP–1020.13'
INV.–1016.98'

24" CONCRETE
BOX

D.I.
TOP
INV.

C.I.
TOP–1020.17
INV.–1017.20

C.I.
TOP–1020.33'
INV.–1017.69'

EXISTING 9'x 3.4' RCB
℄ 1015.87'
TOP EL. 1019.84'

RETAINING WALL

ROCK LINED DITCH

RETAINING WALL

RETAINING WALL

36" TREE

F/L–
1016.89'

24" TREE

24" TREE

ROCK RET. WALL

ROCK RET. WALL

10TH STREET

LEGEND

- FH — FIRE HYDRANT
- PP — POWER POLE
- GUY WIRE ANCHOR
- LIGHT POLE
- WM — WATER METER
- WATER VALVE
- M — MANHOLE
- CO — CLEAN OUT
- TP — TELEPHONE PEDISTAL
- FND. I.P. — FOUND IRON PIN
- GAS — GAS LINE
- TEL — OVERHEAD TELEPHONE LINE
- OHE — OVERHEAD ELECTRICAL LINE
- UGE — UNDER GROUND ELECTRICAL LINE
- STORM — STORM SEWER LINE
- SAN — SANITARY SEWER LINE
- W — WATER LINE
- 1020 — INDEX CONTOURS
- 1019 — INTERMEDIATE CONTOURS
- EXISTING TREE

NORTH

GRAPHIC SCALE

30 0 15 30 60 120

1 INCH = 30 FEET

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JOPLIN, MISSOURI

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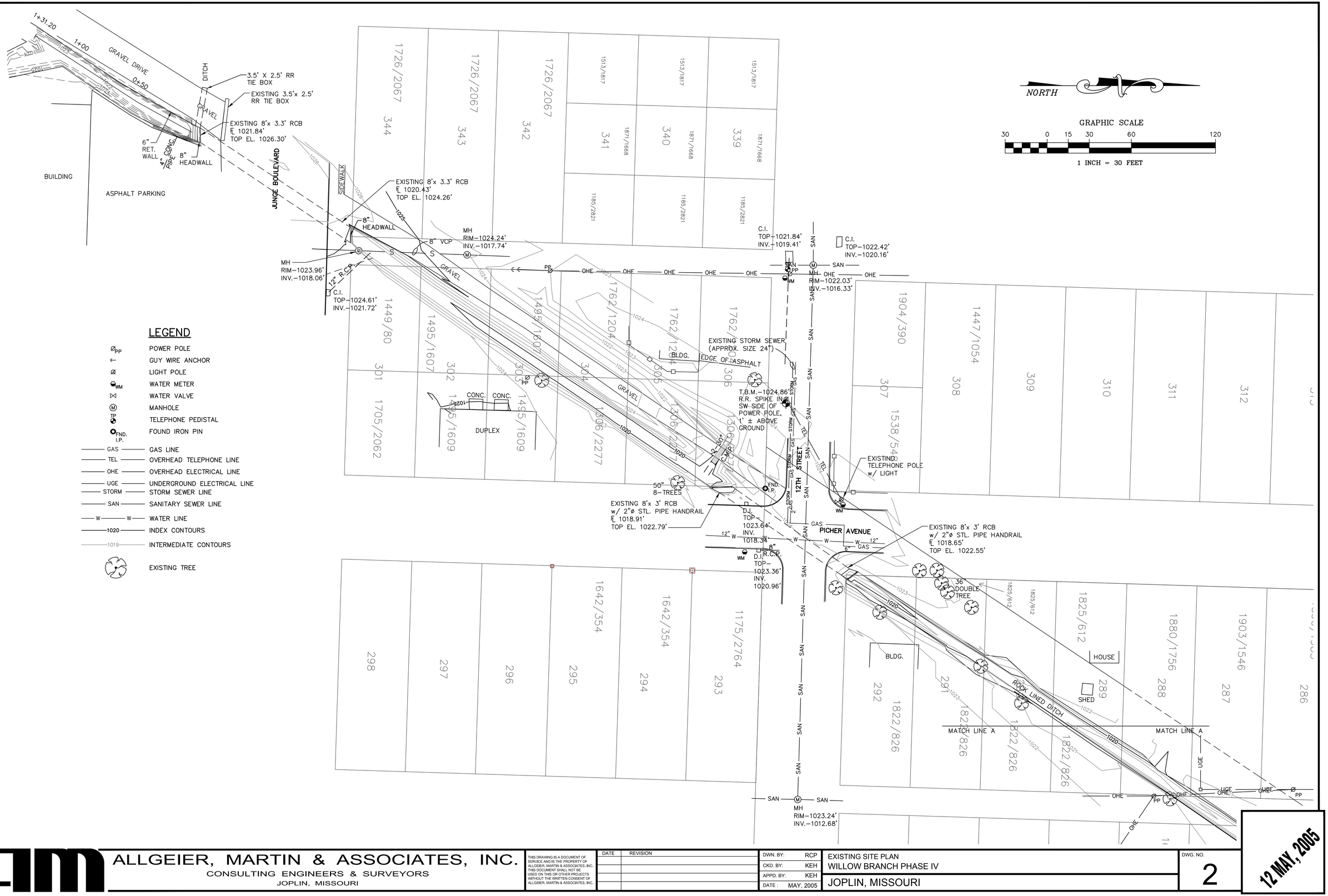
DATE	REVISION

DWN. BY:	RCP
CKD. BY:	KEH
APPD. BY:	KEH
DATE :	MAY, 2005

EXISTING SITE PLAN
WILLOW BRANCH PHASE IV
JOPLIN, MISSOURI

DWG. NO. 1

F:\JOPLIN MO\CITY OF JOPLIN\STORMWATER\WILLOW BRANCH PHASE 4\DRAWINGS\1&2(PROPOSED SITE).DWG, 10/6/2015 10:58:44 AM



LEGEND

- POWER POLE
- GUY WIRE ANCHOR
- LIGHT POLE
- WATER METER
- WATER VALVE
- MANHOLE
- TELEPHONE PEDISTAL
- FOUND IRON PIN
- GAS — GAS LINE
- TEL — OVERHEAD TELEPHONE LINE
- OHE — OVERHEAD ELECTRICAL LINE
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- 1019 — INTERMEDIATE CONTOURS
- EXISTING TREE

ALLGEIER, MARTIN & ASSOCIATES, INC.
CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

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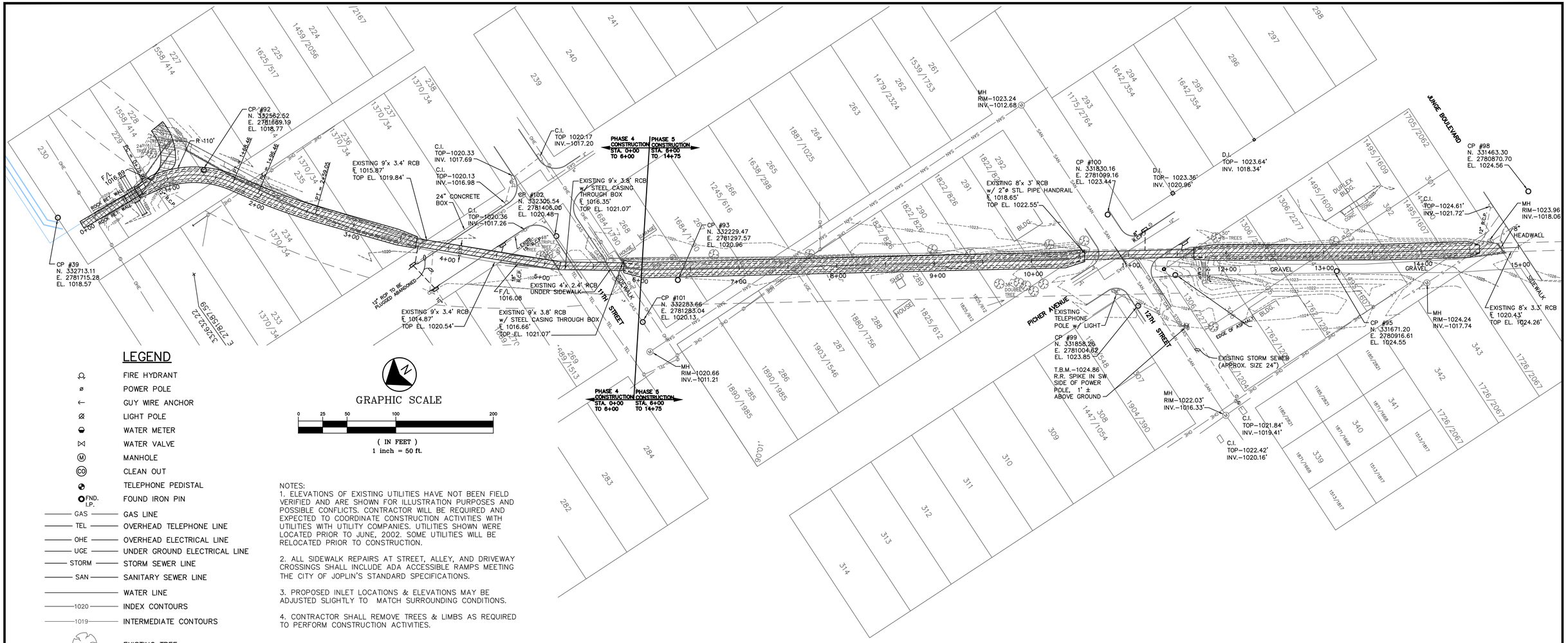
DWN. BY:	RCP
CKD. BY:	KEH
APPD. BY:	KEH
DATE :	MAY, 2005

EXISTING SITE PLAN
WILLOW BRANCH PHASE IV
JOPLIN, MISSOURI

DWG. NO. 2

12 MAY, 2005

F:\JOPLIN MO\CITY OF JOPLIN\STORMWATER\WILLOW BRANCH PHASE 4\DRAWINGS\1&2(PROPOSED SITE).DWG, 10/6/2015 10:59:11 AM



LEGEND

- FIRE HYDRANT
- POWER POLE
- GUY WIRE ANCHOR
- LIGHT POLE
- WATER METER
- WATER VALVE
- MANHOLE
- CLEAN OUT
- TELEPHONE PEDISTAL
- FND. I.P. FOUND IRON PIN
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- 1019 — INTERMEDIATE CONTOURS
- EXISTING TREE

GRAPHIC SCALE

0 25 50 100 200

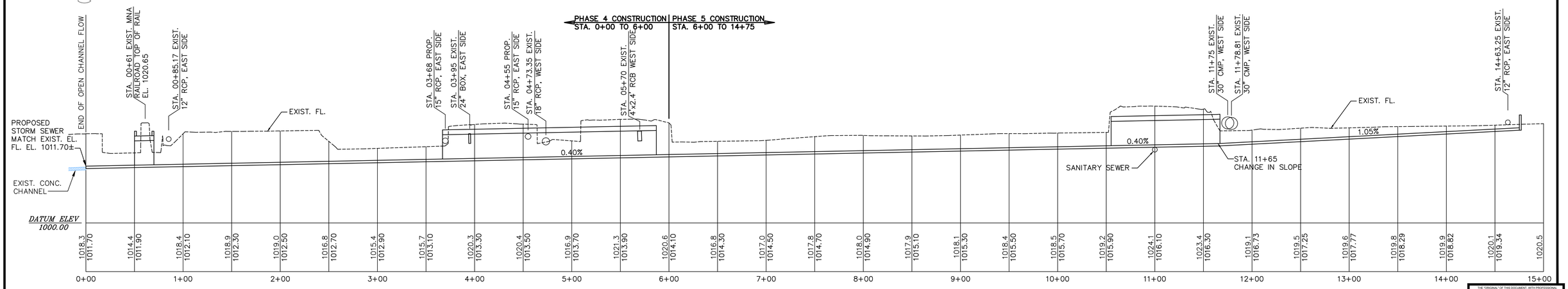
(IN FEET)
1 inch = 50 ft.

NOTES:
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2. ALL SIDEWALK REPAIRS AT STREET, ALLEY, AND DRIVEWAY CROSSINGS SHALL INCLUDE ADA ACCESSIBLE RAMPS MEETING THE CITY OF JOPLIN'S STANDARD SPECIFICATIONS.

3. PROPOSED INLET LOCATIONS & ELEVATIONS MAY BE ADJUSTED SLIGHTLY TO MATCH SURROUNDING CONDITIONS.

4. CONTRACTOR SHALL REMOVE TREES & LIMBS AS REQUIRED TO PERFORM CONSTRUCTION ACTIVITIES.



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STATE OF MISSOURI
KURT E. HIGGINS, P.E.
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
10-5-05

ALLGEIER, MARTIN & ASSOCIATES, INC.
CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

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11/7/05	EXIST. FL.

DWN. BY:	EMC
CKD. BY:	KEH
APPD. BY:	KEH
DATE :	NOV., 2005

PLAN & PROFILE - (STA. 0+00 TO STA. 6+00)
WILLOW BRANCH PHASE IV

CITY OF JOPLIN

DWG. NO.
C3

F:\JOPLIN MO\CITY OF JOPLIN\STORM\WATER\WILLOW BRANCH PHASE 4\DRAWINGS\LAND DEVELOPMENT\WILLOWBRANCHPH4TOPO\DWG\P&P CONST 4.DWG, 10/6/2015 10:56:13 AM

GRAPHIC SCALE

30 15 0 30 60

(IN FEET)
1 inch = 30 ft.

LEGEND

- FH — FIRE HYDRANT
- PP — POWER POLE
- GUY WIRE ANCHOR
- LIGHT POLE
- WM — WATER METER
- WATER VALVE
- M — MANHOLE
- CO — CLEAN OUT
- TP — TELEPHONE PEDISTAL
- FND. I.P. — FOUND IRON PIN
- GAS — GAS LINE
- TEL — OVERHEAD TELEPHONE LINE
- OHE — OVERHEAD ELECTRICAL LINE
- UGE — UNDER GROUND ELECTRICAL LINE
- STORM — STORM SEWER LINE
- SAN — SANITARY SEWER LINE
- WATER LINE
- 1020 — INDEX CONTOURS
- 1019 — INTERMEDIATE CONTOURS
- EXISTING TREE

10TH STREET
11TH STREET
(ASPHALT ROAD)
MURPHY AVENUE
ROCK RET. WALL
ROCK RET. WALL
18" R.C.P.
RETAINING WALL
ROCK LINED DITCH
RETAINING WALL
12" RCP
CONC.
CURB
14" R.C.P.
RET. WALL
RET. WALL
SIDEWALK
HOUSE
GARAGE
ROCK LINED DITCH
ROCK LINED DITCH
SHED
MATCHLINE A
MATCHLINE A
OHE
GAS
TEL
UGE
SAN
STORM

ALLGEIER, MARTIN & ASSOCIATES, INC.
CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

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APPD. BY:	KEH
DATE :	NOV., 2005

EXISTING SITE PLAN
WILLOW BRANCH PHASE IV
JOPLIN, MISSOURI

DWG. NO. C1

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STATE OF MISSOURI
KURT E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
3-5-05

F:\JOPLIN MO\CITY OF JOPLIN\STORMWATER\WILLOW BRANCH PHASE 4\DRAWINGS\LAND DEVELOPMENT\WILLOWBRANCHPH4TOPO\DWG\PHASE 4 - EXIST- ENLRGD.DWG, 10/6/2015 10:54:47 AM

50 L.F. OF 8'x5' IMPROVED CHANNEL WITH 6.5' VERTICAL WALLS AND 4' CHAINLINK FENCE ON BOTH SIDES

CP #39
N. 332713.11
E. 2781715.28
EL. 1018.57

MATCH EXISTING IMPROVEMENTS

STA. 0+50 TO STA. 0+70
20 L.F. OF 8'x5' PRECST RCB W/ HEADWALLS AND COMPLIES W/ COOPER E-80 LIVE LOAD. EACH SECTION SHALL BE CONNECTED W/ STEEL PLATE PIN SYSTEM
U.F.L. EL. 1011.98
L.F.L. EL. 1011.90

CONTRACTOR SHALL CORDINATE ACTIVITIES WITH MISSOURI & NORTHERN ARKANSAS RAILROAD (MNA). MNA SHALL BE RESPONSIBLE FOR DISCONNECTING/REMOVING RAIL AND REPLACEMENT OF BALLAST AND RAILS.
CONTRACTOR SHALL BACKFILL BOX W/ ¾" CLEAN ROCK, WORK MUST BE COMPLETED ON A TUE., WED., OR THURS. BETWEEN 10:00 AM AND 5:00 P.M.
(MONTE GARRENS – ROADMASTER 417-359-3114)

EXISTING DITCH DRAINING FROM THE EAST SHALL EXTENDED TO PROPOSED DITCH. APPROXIMATE DITCH CROSS SECTION TO HAVE 3' FLAT BOTTOM WITH 4:1 SIDE SLOPES. RIP RAP BOTTOM AND 1' OF SIDE SLOPE.

MODIFY PROPOSED WALL TO ACCOMODATE NEW DITCH TO THE EAST.

FILL EXISTING DITCH WITH COMPACTED FILL

CP #92
N. 332562.52
E. 2781669.19
EL. 1018.77

STA. 0+70 TO 0+90 TRANSITION VERTICAL WALLS TO TYP DITCH SECTION

STA. 3+67 TO STA. 5+87
220 L.F. OF 8'x5' RCB (BOX 1)
U.F.L. 1014.05
L.F.L. 1013.17

REMOVE EXISTING 9'x 3.4' RCB
F/L 1015.87'
TOP EL. 1019.84'

STA. 3+95
CONNECT TO PROPOSED RCB (APPROX FL. EL. 1016.00)

18' TRANSITION TO TYP DITCH SECTION

STA. 3+68 PROPOSED 8'x4' CURB INLET W/ 18' OF 15" RCP
TOP 1020.95
FL. IN 1015.60
FL. OUT 1015.40

C.I.
TOP-1020.13
INV.-1016.98

24" CONCRETE BOX

12" RCP TO BE PLUGGED ABANDONED

STA. 3+68 PROPOSED 8'x4' CURB INLET W/ 32' OF 15" RCP
TOP 1020.98
FL. IN 1016.52
FL. OUT 1016.00

EXIST. 15" R.C.P.

REMOVE EXISTING 9' x 3.4' RCB
F/L 1016.10

STA. 4+73
CONNECT EXIST. 18" RCP TO PROPOSED BOX

STA. 5+70 CONNECT EXISTING 4'x 2.4' RCB UNDER SIDEWALK TO BOX (APPROX FL. EL. 1016.30)

18' TRANSITION TO TYP DITCH SECTION

C.I.
TOP-1020.33
INV. 1017.69

C.I.
TOP 1020.17
INV.-1017.20

STA. 4+55 PROPOSED CURB INLET W/ 10' OF 15" RCP
TOP 1020.36
FL. IN 1016.00 (15" TO THE SOUTH)
FL. OUT 1015.86

C.I.
TOP-1020.36
INV.-1017.26

CP #102
N. 332305.54
E. 2781406.00
EL. 1020.48

REMOVE EXISTING 9'x 3.8' RCB w/ STEEL CASING THROUGH BOX
F/L 1016.35'
TOP EL. 1021.07'

PHASE 4 CONSTRUCTION STA. 0+00 TO 6+00

PHASE 5 CONSTRUCTION STA. 6+00 TO 15+00

PHASE 4 CONSTRUCTION SAHLL TRANSITION EXISTING DITCH INTO PROPOSED DITCH WITH GROUTED RIP RAP.

CP #93
N. 332229.47
E. 2781297.57
EL. 1020.96

CP #101
N. 332283.66
E. 2781283.04
EL. 1020.13

MH
RIM-1020.66
INV.-1011.21

MH
RIM-1023.24
INV.-1012.68

MATCHLINE A — MATCHLINE A

PC = 0+75.93
P/L 1016.89
R 110'
12" R.C.P.
PT = 1+68.46
PC = 1+96.46
PT = 2+59.05
18" R.C.P.
10" R.C.P.
ROCK RET. WALL
0+00
1+00
2+00
3+00
4+00
5+00
6+00
7+00
8+00
10TH STREET
11TH STREET
N 332632.22
E 2781587.59
(ASPHALT ROAD)
MURPHY AVENUE
SIDEWALK
HOUSE
GARAGE
SHED

GRAPHIC SCALE
30 15 0 30 60
(IN FEET)
1 inch = 30 ft.

LEGEND

- FIRE HYDRANT
- POWER POLE
- GUY WIRE ANCHOR
- LIGHT POLE
- WATER METER
- WATER VALVE
- MANHOLE
- CLEAN OUT
- TELEPHONE PEDISTAL
- FOUND IRON PIN
- GAS — GAS LINE
- TEL — OVERHEAD TELEPHONE LINE
- OHE — OVERHEAD ELECTRICAL LINE
- UGE — UNDER GROUND ELECTRICAL LINE
- STORM — STORM SEWER LINE
- SAN — SANITARY SEWER LINE
- WATER LINE
- EXISTING TREE

NOTE:
1. ALL EXISTING IMPROVEMENTS REMOVED AND/OR DAMAGED DURING CONSTRUCTION SHALL BE REPLACED.

ALLGEIER, MARTIN & ASSOCIATES, INC.
CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

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APPD. BY:	KEH
DATE :	NOV., 2005

ENLARGED SITE PLAN
WILLOW BRANCH PHASE IV
JOPLIN, MISSOURI

DWG. NO.
C2

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STATE OF MISSOURI
KURT E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
11-3-05

F:\JOPLIN MO\CITY OF JOPLIN\STORMWATER\WILLOW BRANCH PHASE 4\DRAWINGS\LAND DEVELOPMENT\WILLOWBRANCHPH4TOPO\DWG\PHASE 4 ENLARGED.DWG, 10/6/2015 10:57:10 AM

GRAPHIC SCALE

30 15 0 30 60

(IN FEET)
1 inch = 30 ft.

LEGEND

- FIRE HYDRANT
- POWER POLE
- GUY WIRE ANCHOR
- LIGHT POLE
- WATER METER
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- MANHOLE
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- SAN — SANITARY SEWER LINE
- WATER LINE
- 1020 — INDEX CONTOURS
- 1019 — INTERMEDIATE CONTOURS
- EXISTING TREE

11TH STREET
12TH STREET
PICHER AVENUE
JUNGE BOULEVARD
ROCK LINED DITCH
ROCK LINED DITCH
GRAVEL
GRAVEL
EDGE OF ASPHALT
SIDEWALK
RET. WALL
HOUSE
GARAGE
SHED
BLDG.
HOUSE
DUPLEX BLDG.
BLDG.
CONC.
CONC.
EXISTING TELEPHONE POLE w/ LIGHT
END I.P.
6" R.C.P.
12" R.C.P.
8" VCP
5+00
6+00
7+00
8+00
9+00
10+00
11+00
12+00
13+00
14+00
15+00

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EXISTING SITE PLAN
WILLOW BRANCH PHASE V
JOPLIN, MISSOURI

DWG. NO. C1

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STATE OF MISSOURI
KURT E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
10-31-06

F:\JOPLIN MO\CITY OF JOPLIN\STORM\WATER\WILLOW BRANCH PHASE 5\DRAWINGS\WILLOWBRANCH PH 5 DESIGN\DWG\PHASE 5 - EXIST- ENLRGD.DWG, 10/6/2015 10:32:32 AM

LEGEND

- FIRE HYDRANT
- POWER POLE
- GUY WIRE ANCHOR
- LIGHT POLE
- WATER METER
- WATER VALVE
- MANHOLE
- CLEAN OUT
- TELEPHONE PEDESTAL
- FOUND IRON PIN
- GAS — GAS LINE
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- OHE — OVERHEAD ELECTRICAL LINE
- UGE — UNDER GROUND ELECTRICAL LINE
- STORM — STORM SEWER LINE
- SAN — SANITARY SEWER LINE
- WATER LINE
- EXISTING TREE

GRAPHIC SCALE

30 15 0 30 60

(IN FEET)
1 inch = 30 ft.

CONSTRUCTION SIGNAGE:
CONTRACTOR SHALL SUBMIT A TRAFFIC CONTROL PLAN TO THE CITY OF JOPLIN FOR APPROVAL PRIOR TO CLOSING ANY STREETS.

11TH STREET

PHASE 5 CONSTRUCTION STA. 6+00 TO 15+00

CP #93
N. 332229.47
E. 2781297.57
EL. 1020.96

CP #101
N. 332283.66
E. 2781283.04
EL. 1020.13

MH
RIM–1020.66
INV.–1011.21

MH
RIM–1023.24
INV.–1012.68

STA. 10+55 TO 11+67 PROPOSED
112 L.F. OF 8'x5' RCB
U.F.L. EL. 1016.37
L.F.L. EL. 1015.92
(ELEVATIONS MAY REQUIRE FIELD ADJUSTMENT TO GET OVER SANITARY SEWER.)

REMOVE EXISTING 8'x 3' RCB
℄ 1018.65'
TOP EL. 1022.55'

CP #100
N. 331830.16
E. 2781099.16
EL. 1023.44

STA. 11+17 REPLACE EXIST.
D.I. W/ 8'x4' CURB INLET
W/ 22' OF 15" RCP
TOP– 1023.36
INV. 1018.86

REPLACE 20' OF 10" VCP W/ 10" D.I.P. FIELD VERIFY SIZE.

12" WATER LINE

8" R.C.P.

D.I.
TOP– 1023.64'
INV. 1018.34'

18' TRANSITION TO TYP DITCH SECTION

STA. 11+10 CONNECT EXIST. 24" RCP TO PROPOSED BOX APPROX. EL. 1018.80

STA. 11+50 PROPOSED 8'x4' CURB INLET
W/ 5' OF 15" RCP
TOP– 1023.65
INV. 1019.15

18' TRANSITION TO TYP DITCH SECTION

PICHER AVENUE

12TH STREET

JUNGE BOULEVARD

CP #99
N. 331858.26
E. 2781004.62
EL. 1023.85

CP #94
N. 331808.98
E. 2781008.51
EL. 1023.94

T.B.M.–1024.86
R.R. SPIKE IN SW SIDE OF POWER POLE, 1' ± ABOVE GROUND

EXISTING STORM SEWER (APPROX. SIZE 24")

CP #95
N. 331671.20
E. 2780916.61
EL. 1024.55

MH
RIM–1022.03'
INV.–1016.33'

C.I.
TOP–1022.42'
INV.–1020.16'

C.I.
TOP–1021.84'
INV.–1019.41'

MH
RIM–1024.24
INV.–1017.74

STA. 14+50 END TYPICAL PROPOSED DITCH IMPROVEMENTS TRANSITION PROPOSED DITCH TO EXISTING DITCH BETWEEN 14+50 TO 14+60 WITH RIP RAP AND CONCRETE BLOCKS (NO CONCRETE FLOOR)

C.I.
TOP–1024.61'
INV.–1021.72'

CP #98
N. 331463.30
E. 2780870.70
EL. 1024.56

MH
RIM–1023.96
INV.–1018.06

12" R.C.P.

8" HEADWALL

EXISTING 8'x 3.3' RCB
℄ 1020.43'
TOP EL. 1024.26'

SHED

BLDG.

DUPLEX BLDG.

EDGE OF ASPHALT

GRAVEL

CONC.

284 | 285 1890/1985 | 286 1890/1985 | 287 1903/1546 | 288 1880/1756 | 289 1825/612 | 290 1822/826 | 291 1822/826 | 292 1822/826 | 293 1175/27 | 294 1642/354

268 1684/1790 | 267 1684/1790 | 266 1245/616 | 265 1638/298 | 264 1887/1025 | 263 | 262 1479/2324 | 261 1539/1753

314 | 313 | 312 | 311 | 310 | 309 | 308 1447/1054 | 307 1538/548

306 1762/1204 | 305 1762/1204 | 303 1495/1607 | 302 1495/1609 | 301 1449/80 | 1306/2277 | 1306/2277 | 1495/1609 | 1705/2062

1185/2821 | 1185/2821 | 1185/2821

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CONSULTING ENGINEERS & SURVEYORS
JOPLIN, MISSOURI

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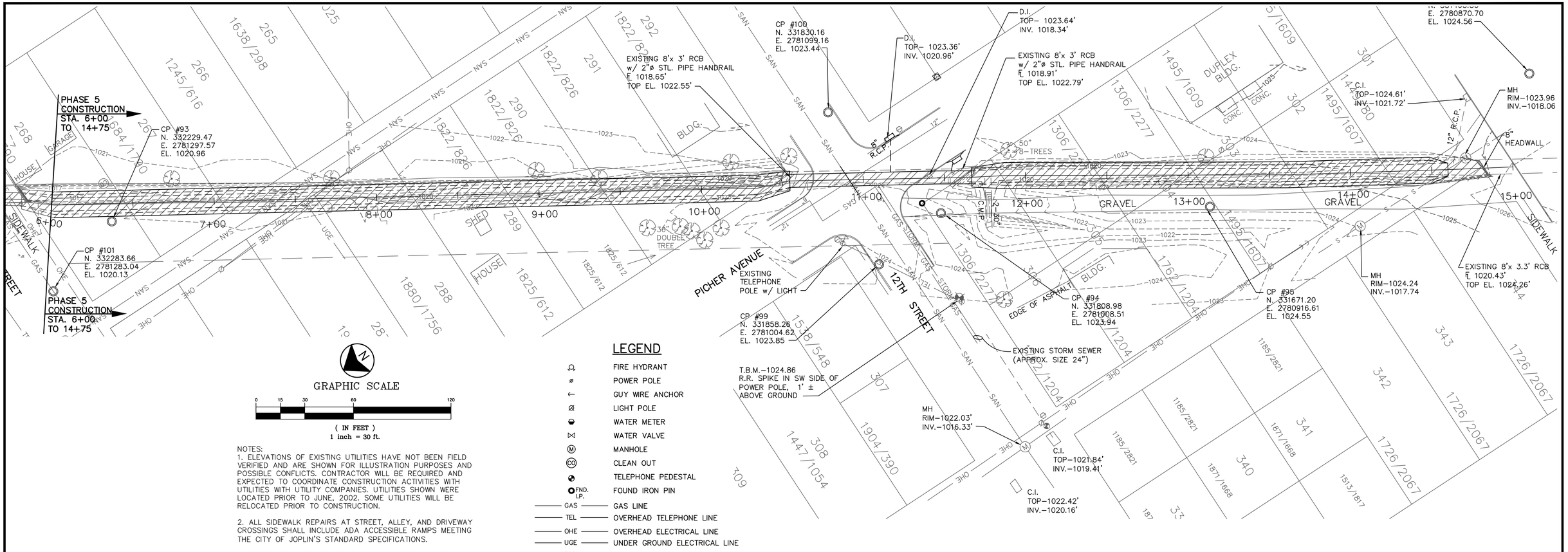
ENLARGED SITE PLAN (STA. 6+00 TO 14+60)
WILLOW BRANCH PHASE V
JOPLIN, MISSOURI

DWG. NO. C2

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STATE OF MISSOURI
KURTIS E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
10-31-06

F:\JOPLIN MO\CITY OF JOPLIN\STORMWATER\WILLOW BRANCH PHASE 5\DRAWINGS\WILLOWBRANCH PH 5 DESIGN\DWG\PHASE 5 ENLARGED.DWG, 10/6/2015 10:33:25 AM



GRAPHIC SCALE

0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

NOTES:
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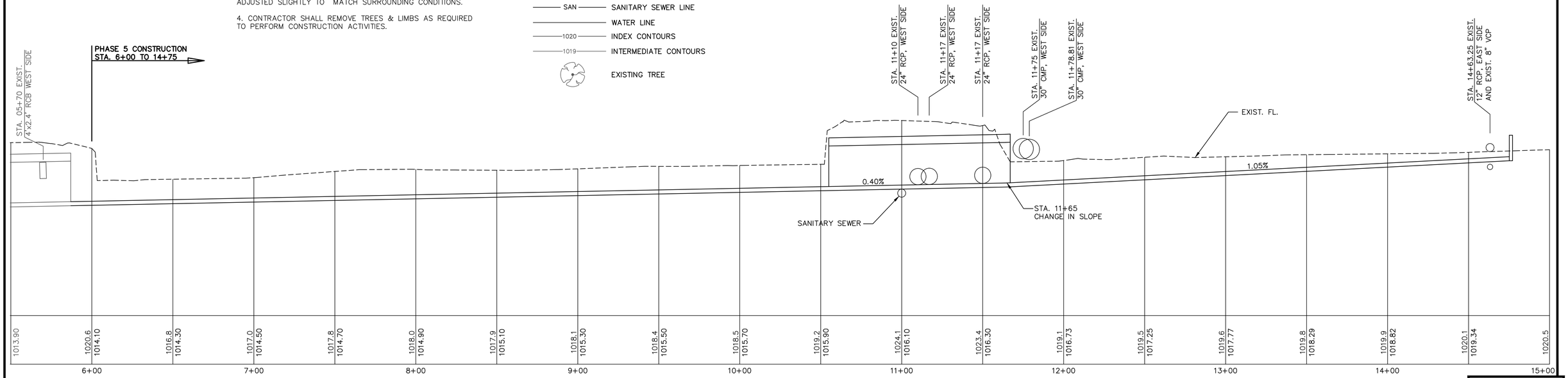
2. ALL SIDEWALK REPAIRS AT STREET, ALLEY, AND DRIVEWAY CROSSINGS SHALL INCLUDE ADA ACCESSIBLE RAMPS MEETING THE CITY OF JOPLIN'S STANDARD SPECIFICATIONS.

3. PROPOSED INLET LOCATIONS & ELEVATIONS MAY BE ADJUSTED SLIGHTLY TO MATCH SURROUNDING CONDITIONS.

4. CONTRACTOR SHALL REMOVE TREES & LIMBS AS REQUIRED TO PERFORM CONSTRUCTION ACTIVITIES.

LEGEND

- FIRE HYDRANT
- POWER POLE
- GUY WIRE ANCHOR
- LIGHT POLE
- WATER METER
- WATER VALVE
- MANHOLE
- CLEAN OUT
- TELEPHONE PEDESTAL
- FND. I.P. — FOUND IRON PIN
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- EXISTING TREE



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PLAN & PROFILE - (STA. 6+00 TO STA. 14+60)
WILLOW BRANCH PHASE V
CITY OF JOPLIN

DWG. NO. C3

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STATE OF MISSOURI
KURT E. HIGGINS
NUMBER E-30041
REGISTERED PROFESSIONAL ENGINEER
12-31-06

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APPENDIX I

Opinion of Probable Construction Costs

Willow Branch Culvert Replacement - Phase 1b
Opinion of Probable Cost

olsson

Client Name: Joplin, MO	
Project Name: Willow Branch Stormwater Improvements	
Olsson Project Number: C24-04647	

Date	Index
10/28/2025	

	Item	Unit	Quantity	Unit Cost $	Cost $
	Percentage Bid Items				
COJ-1700.4.2	PAVEMENT REPAIR	LF	24	$175.00	$4,200.00
COJ-2200.4	ASPHALTIC CONCRETE BASE	SY	1458	$62.00	$90,396.00
COJ-2200.4	ASHALTIC CONCRETE SURFACE	SY	1458	$28.00	$40,824.00
COJ-2305.7.2	MAINTENANCE OF TRAFFIC	LS	1	$10,000.00	$10,000.00
COJ-2306.12	PAVEMENT MARKINGS	LS	1	$2,000.00	$2,000.00
COJ-3200.5.2	CURB AND GUTTER	LF	455	$40.00	$18,200.00
COJ-3300.5	SIDEWALK CONSTRUCTION	SY	364	$60.00	$21,840.00
COJ-3400.9.2	DRIVEWAY CONSTRUCTION	SY	133	$75.00	$9,975.00
COJ-4200.5.1.18	18" RCP STORM SEWER PIPE	LF	54	$80.00	$4,320.00
COJ-4200.5.144.48	12'X4' RCB STORM SEWER	LF	441	$1,400.00	$617,400.00
COJ-4400.5	STORM SEWER INLET, 'TYPE C' CURB INLET	EA	4	$8,000.00	$32,000.00
COJ-4400.5	JUNCTION BOX, 3'X3' I.D.	EA	1	$7,500.00	$7,500.00
JSP-0400-02	MOBILIZATION	LS	1	$70,000.00	$70,000.00
JSP	DEMOLITION	LS	1	$30,000.00	$30,000.00
JSP	UTILITY COORDINATION	LS	1	$20,000.00	$20,000.00
JSP	EROSION CONTROL	LS	1	$35,000.00	$35,000.00
JSP	REMOVE & RELOCATE SIGNS	LS	1	$5,000.00	$5,000.00
JSP	CHANGEABLE MESSAGE SIGN	EA	2	$6,500.00	$13,000.00
JSP	CONCRETE ADA SIDEWALK RAMP	EA	1	$500.00	$500.00
JSP	CLASS B-1 CONCRETE (CULVERT)	CY	90	$2,200.00	$196,900.00
JSP	FLOWABLE FILL	CY	3	$600.00	$1,980.00

Subtotal		$1,231,035
Construction Contingency	10.0 %	$123,104
Opinion of Probable Cost		$1,354,139

Design Status (Check One)

	Conceptual Design
X	Preliminary Design
	Final Design

olsson

The Engineer, using his or her professional judgement, has developed this stated Opinion of Probable Construction Cost based upon the design status identified above. Development of this Opinion has included consideration of design input level; however, the circumstances under which the work is expected to be undertaken, the cost and availability of materials, labor and services, probable bidder response and the economic conditions at the time of bid solicitation are beyond the control of the Engineer and will impact actual bid costs. Should bidding be delayed, these costs should be reviewed and, if necessary, adjusted to a more applicable *Engineering News Record* Construction Cost Index.

Willow Branch Culvert Replacement - Phase 1c
Opinion of Probable Cost

Client Name: Joplin, MO	
Project Name: Willow Branch Stormwater Improvements	
Olsson Project Number: B24-04647	

Date	Index
1/19/2026	

	Item	Unit	Quantity	Unit Cost $	Cost $
	MOBILIZATION AND BONDS	LS	1	$ 5,000.00	$5,000.00
	EROSION CONTROL	LS	1	$ 2,000.00	$2,000.00
	DEMOLITION	LS	1	$ 12,000.00	$12,000.00
	GRATE INLET	EA	1	$8,000.00	$8,000.00
	36" RCP	LF	184	$150.00	$27,600.00
	SURFACE REPAIR (8' WIDE)	SY	165	$200.00	$33,000.00
	STORMWATER CUTOFF WALL	EA	1	$3,500.00	$3,500.00

Subtotal	$91,100
Utility Relocation (20%)	$18,220
Engineering, Permitting, Construction Observation, Construction Administration	$45,000
Right of Way & Easements (5%)	$4,555
Construction Contingency (25%)	$22,775
2026 OPINION OF PROBABLE COST	**$181,650**
2028 OPINION OF PROBABLE COST	**$196,473**

Design Status (Check One)

X	Conceptual Design
	Preliminary Design
	Final Design

The Engineer, using his or her professional judgement, has developed this stated Opinion of Probable Construction Cost based upon the design status identified above. Development of this Opinion has included consideration of design input level; however, the circumstances under which the work is expected to be undertaken, the cost and availability of materials, labor and services, probable bidder response and the economic conditions at the time of bid solicitation are beyond the control of the Engineer and will impact actual bid costs. Should bidding be delayed, these costs should be reviewed and, if necessary, adjusted to a more applicable *Engineering News Record* Construction Cost Index.

Willow Branch Culvert Replacement - Phase 2a
Opinion of Probable Cost

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Client Name: Joplin, MO	
Project Name: Willow Branch Stormwater Improvements	
Olsson Project Number: B24-04647	

Date	Index
1/19/2026	

	Item	Unit	Quantity	Unit Cost $	Cost $
	MOBILZATION AND BONDS	LS	1	$ 250,000.00	$250,000.00
	EROSION CONTROL	LS	1	$ 100,000.00	$100,000.00
	DEMOLITION	LS	1	$ 125,000.00	$125,000.00
	10' X 5' RCBC	LF	1808	$1,500.00	$2,712,000.00
	TEMPORARY SHORING NEAR BUILDINGS	LF	200	$350.00	$70,000.00
	CONCRETE STRUCTURES AND CONNECTIONS	LS	1	$125,000.00	$125,000.00
	15" RCP	LF	53	$70.00	$3,710.00
	24" RCP	LF	33	$120.00	$3,960.00
	CURB INLET	EA	2	$8,500.00	$17,000.00
	GRATE INLET	EA	5	$8,000.00	$40,000.00
	SURFACE REPAIR (28' WIDE)	SY	5625	$220.00	$1,237,500.00
	EXCAVATION (FIRST 10' DEEP)	CY	7366	$25.00	$184,148.15
	ROCK EXCAVATION (10' AND DEEPER)	CY	1183	$120.00	$142,000.00

Subtotal	$5,010,318
Utility Relocation	$300,000
Engineering Costs	$650,000
Construction Phase Services	$450,000
Right of Way	$50,000
Construction Contingency (25%)	$1,252,580
2026 OPINION OF PROBABLE CONSTRUCTION COST	**$7,712,898**
2028 OPINION OF PROBABLE CONSTRUCTION COST	**$8,342,270**

Design Status (Check One)

X	Conceptual Design
	Preliminary Design
	Final Design

olsson

The Engineer, using his or her professional judgement, has developed this stated Opinion of Probable Construction Cost based upon the design status identified above. Development of this Opinion has included consideration of design input level; however, the circumstances under which the work is expected to be undertaken, the cost and availability of materials, labor and services, probable bidder response and the economic conditions at the time of bid solicitation are beyond the control of the Engineer and will impact actual bid costs. Should bidding be delayed, these costs should be reviewed and, if necessary, adjusted to a more applicable *Engineering News Record* Construction Cost Index.

Willow Branch Culvert Replacement - Phase 2b
Opinion of Probable Cost

olsson

Client Name: Joplin, MO	
Project Name: Willow Branch Stormwater Improvements	
Olsson Project Number: B24-04647	

Date	Index
1/19/2026	

	Item	Unit	Quantity	Unit Cost $	Cost $
	MOBILIZATION AND BONDS	LS	1	$ 60,000.00	$60,000.00
	EROSION CONTROL	LS	1	$ 25,000.00	$25,000.00
	DEMOLITION	LS	1	$ 150,000.00	$150,000.00
	15" RCP	LF	351	$70.00	$24,570.00
	18" RCP	LF	175	$100.00	$17,500.00
	24" RCP	LF	795	$120.00	$95,400.00
	30" RCP	LF	20	$140.00	$2,800.00
	36" RCP	LF	956	$150.00	$143,400.00
	CURB INLET	EA	5	$8,500.00	$42,500.00
	GRATE INLET	EA	9	$8,000.00	$72,000.00
	JUNCTION BOX	EA	16	$8,500.00	$136,000.00
	SURFACE REPAIR (6' WIDE)	SY	1531	$220.00	$336,820.00
	STORMWATER CUTOFF WALL	EA	11	$3,500.00	$38,500.00
	ADDITIONAL FILL	CY	675	$20.00	$13,500.00

Subtotal	**$1,157,990**
Utility Relocation (20%)	**$231,598**
Survey, Engineering, Permitting, Construction Observation, Construction Administration	**$325,000**
Right of Way & Easements (10%)	**$115,799**
Construction Contingency (25%)	**$289,498**
2026 OPINION OF PROBABLE COST	**$2,119,885**
2028 OPINION OF PROBABLE COST	**$2,292,867**

Design Status (Check One)

X	Conceptual Design
	Preliminary Design
	Final Design

olsson

The Engineer, using his or her professional judgement, has developed this stated Opinion of Probable Construction Cost based upon the design status identified above. Development of this Opinion has included consideration of design input level; however, the circumstances under which the work is expected to be undertaken, the cost and availability of materials, labor and services, probable bidder response and the economic conditions at the time of bid solicitation are beyond the control of the Engineer and will impact actual bid costs. Should bidding be delayed, these costs should be reviewed and, if necessary, adjusted to a more applicable *Engineering News Record* Construction Cost Index.

WILLOW BRANCH REPLACEMENT CULVERT – CONCEPTUAL STORMWATER REPORT

City of Joplin, Missouri

January 2026

Olsson Project No. B24-04647