GRE-68-12.58 (PID 115388)
Separated and At-Grade Connection
Xenia Township, Greene County, Ohio

Feasibility Study | January 2, 2024

fishbeck
Engineers | Architects | Scientists | Constructors

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List of Acronyms/Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
ADA	American with Disabilities Act
BMP	Best Management Practices
BDM	Bridge Design Manual
CLOMR	Conditional Letter of Map Revision
DBT	Design-Build Team
EDA	Earth Disturbed Area
FEMA	Federal Emergency Management Agency
FS	Feasibility Study
HEC-2	Hydrologic Engineering Center Water Surface Profiles Program
HEC-RAS	Hydrologic Engineering Center's River Analysis System
KSI	Thousand Pounds Per Square Inch
L&D	Location and Design
LMST	Little Miami Scenic Trail
LOMR	Letter of Map Revision
MDG	Multimodal Design Guide
MPH	Miles Per Hour

MSE	Mechanically Stabilized Earth
NRHP	National Register of Historic Places
ODNR	Ohio Department of Natural Resources
ODOT	Ohio Department of Transportation
OES	Ohio Department of Transportation Office of Environmental Services
OHWM	Ordinary High-Water Mark
OMUTCD	Ohio Manual of Uniform Traffic Control Devices
ORPS	Ohio Regulated Properties Search
PED/NMV	Pedestrians and non-motorized vehicles
PHB	Pedestrian Hybrid Beacon
PSF	Pounds per Square Foot
ROW	Right-of-Way
RRFB	Rectangular Rapid Flashing Beacon
SCD	Standard Construction Drawing
SHPO	State Historic Preservation Offices
SFN	Structure File Number
SUP	Shared-Use Path
TWLTL	Two Way Left Turn Lane
VPF	Vandal Protection Fence

1.0 Introduction

The Ohio Department of Natural Resources (ODNR) and the Ohio Department of Transportation (ODOT) have partnered together to investigate how to best provide safe access for patrons visiting the facilities being constructed at the new Great Council State Park and Shawnee Interpretive Center, located at 1575 US-68, within Oldtown, Ohio. This report serves to present the analysis of the options being proposed.

The focus of these improvements is to safely connect the Little Miami Scenic Trail (LMST) and the new Shawnee Interpretive Center with a grade-separated crossing. Additional at-grade crossing improvements are proposed at the US-68 and Brush Row Road intersection, located approximately 400 feet north of the Interpretive Center. The pedestrian facilities within the US-68 corridor will also be upgraded to provide safer passage.

1.1 Project Location

The project study area encompasses the US-68 roadway corridor through the village of Oldtown and extends eastward to the section of the LMST that runs along the eastern side of Oldtown proper. A map of the study area is provided in Appendix A.

1.2 Existing Conditions

US-68 is a heavily traveled roadway that carries vehicular traffic between western Kentucky to northwest Ohio, and passes through Oldtown, in Xenia Township, Greene County, Ohio. The section of US-68 within the project area is categorized as an urban principal arterial, with one through lane in each direction, an average daily traffic count of 8,854 vehicles per day, and a legal speed of 45 mph. The overall topography is flat. There is a slight horizontal curve at the southern approach into Oldtown which straightens into a tangent section in front of the new Interpretive Center, then continues straight through to the north end of Oldtown.

The LMST is the longest single trail within southwest Ohio, covering 78 miles of paved shared-use path (SUP), and networking through five counties. It runs parallel to US-68 for 10 miles, from its intersection with the Ohio to Erie Trail (OTET) in Xenia, located 3.4 miles south of Oldtown, to its intersection with US-68 in Yellow Springs. Within the project area the LMST runs parallel with US-68, with Oldtown Creek running between US-68 and the LMST. Oldtown Creek runs south to north converging with the Little Miami River, approximately 0.8 miles north of the project area. This section of the LMST sees approximately 10 pedestrians and 130 bicyclists on a standard weekend day, demonstrating that this resource is regularly utilized by Ohio patrons. Refer to pedestrian and bicyclist volumes provided in Appendix E.

1.3 Project History

Governor Mike DeWine, in partnership with ODNR, envisioned a new state park to tell the story of the Shawnee tribes, as well as other tribes in Ohio circa 1775, between Yellow Springs and Xenia. The location along US-68 in Oldtown was a logical location as Oldtown is commonly considered to be the oldest settlement in Greene County and was once a village of the Shawnee tribe. The planning process began in late 2020 by identifying the need to investigate the archeological importance of the site, propose long-term strategic goals, provide design and permitting services, and construction administration for the development of a new historic education center and park facility. Over the next eighteen months, the Governor and ODNR coordinated with the Shawnee tribes to refine the design of the Interpretive Center. Construction began in June 2022.

With construction of the Interpretive Center underway, the focus turned to engaging a consultant to investigate potential US-68 streetscape, traffic calming countermeasures, and connections to LMST. Stakeholders expressed a strong desire for a grade separated pedestrian crossing over US-68 as well as other safety improvements along the

corridor. ODNR contracted with OHM Advisors to provide draft concepts for the improvements in January 2023. Consultation with the Shawnee tribes continued and in May 2023, concepts for the layout and aesthetic appearance had been developed.

In July 2023, ODNR met with ODOT to discuss plans to complete the desired roadway and trail improvements. At this time, ODOT District 8 assumed the lead role for procuring a design consultant to study the impacts and costs of the proposed improvements. ODOT elected to utilize their general engineering services contract consultant, Fishbeck, to prepare this feasibility study. The contract was authorized in October 2023.

2.0 Purpose and Need Summary

2.1 Purpose

The purpose of the project is to improve safety for pedestrians and non-motorized vehicles (PED/NMV) crossing US-68 and to improve their connection between the Interpretive Center and the LMST.

2.2 Need Elements

The project is intended to:

- Provide safe and efficient PED/NMV access from the LMST to the Interpretive Center.
- Provide safe and efficient PED/NMV access along the US-68 corridor.
- Consider gateway features which may be incorporated through ODNR's discussions with the Shawnee tribe stakeholders.

2.3 Logical Termini and Independent Utility

The logical termini are established based upon the need to provide connections for PED/NMV as listed in Section 2.2. Therefore, the termini include the SUP at the Interpretive Center on the southern end of the project and Brush Row Road on the north end. The project has an independent utility and reasonable expenditure even if no additional improvements are made in the project area.

2.4 Key Issues

In addition to the need elements above, the project alternatives will be evaluated with respect to the following key issues:

- Impacts to the Oldtown Creek Floodway and Floodplain
- Right-of-Way impacts
- Utility Conflicts
- Project Cost

3.0 Alternatives Considered

The proposed alternatives have been designed in accordance with the most recent ODOT Location and Design (L&D) Manuals, the ODOT Multimodal Design Guide (MDG), the ODOT Bridge Design Manual (BDM), and the American Association of State Highway and Transportation Officials (AASHTO) Load Resistance Factor Design (LRFD) Bridge Design Specifications, 9th Edition.

As part of analyzing the crossing alternatives, the required roadway width had to be reviewed for consideration of a future two-way-left-turn lane (TWLTL). Currently, US-68 is a two-lane facility with intermittent sections of curb along both sides of the roadway. The existing pavement width does accommodate a future TWLTL.

A summary of the roadway and geometric design criteria is provided below in Table 1.

Table 1 – Roadway and Geometric Design Criteria Summary

Criteria	Dimension	Reference
Design/Posted Speed	45 mph	Posted speed limit in field
Minimum Thru Lane	12'	L&D Vol. 1, Section 300, Fig. 301-4E
Minimum TWLTL	Minimum 10'	L&D Vol. 1, Section 402.3
Minimum Turn Lane	11'	L&D Vol. 1, Section 401.6
SUP	Minimum 11'	MDG Section 5.3
Buffer Width for SUP	Minimum 5'	MDG Section 4.3
Sidewalk Widths	5', Minimum 4'	MDG Section 4.3.2
Calculations for Horizontal Pavement Tapers	L (length of taper) = (Width*Speed^2)/60	L&D Vol. 1, Section 301.1.4
Stopping Sight Distance	45 mph – 360', 55 mph – 495'	L&D Vol. 1, Section 200, Fig. 201-1
Intersection Sight Distance	Right turning vehicles – 430' Left turning vehicles – 500'	L&D Vol. 1, Section 200, Fig. 201-5
ADA Compliant Slopes for Crosswalks	At intersection with Stop/Yield control – 2% max. cross slope; At intersection with no Stop/Yield control – 5% max. cross slope; Midblock Pedestrian Street Crossings – Cross slope equal to roadway grade	Public Rights-of-Way Accessibility Guidelines (PROWAG), Section R302.6.1, Advisory R302.6.1, Section R302.6.2 respectively
ADA Compliant Longitudinal Slopes	5% max. longitudinal slope; 8% slopes allowable for 35' lengths with 2% landings	Public Rights-of-Way Accessibility Guidelines (PROWAG), Section R302.6.1, Advisory R302.6.1
Vertical Clearance Under Bridge	17'-6"	L&D Vol. 1 Fig. 302-1 and BDM Section 310.8
Bridge Width	12'-0"	MDG Section 5.4
Min. Horizontal Clearance from Bridge to Roadway	19'-0"	L&D Vol. 1 Fig. 600-1

There are four build alternatives covered in this report and discussed in further detail below. These alternatives include:

- Two grade-separated crossing structure types:
  - Alternative 2A – Prefabricated truss bridge for all spans.
  - Alternative 2B – Single span prefabricated truss over US-68 and Oldtown Creek with remaining interior spans composed of steel or precast concrete beams.
- Two at-grade crossing types:
  - Rectangular Rapid Flashing Beacon (RRFB)
    It should be noted that during the course of developing this study a RRFB was installed at the US-68 and Brush Row Road intersection as a safety precaution until the final grade separated crossing is complete.

A relocated RRFB would be installed to accommodate the improved sidewalk, SUP, and wider intersection radii for turning movements.
    - Pedestrian Hybrid Beacon (PHB)
- A traffic signal warrant analysis was previously performed which determined a traffic signal is not warranted at the US-68 and Brush Row Road intersection, therefore this alternative was not further considered.

3.1 Alternative Descriptions

3.1.1 Alternative 1 – No Build

This alternative maintains the existing sidewalks on either side of US-68 with no connection at Brush Row Road. All PED/NMV traffic would cross US-68 at the existing at-grade intersection with Brush Row Road which has an existing RRFB. There is currently no connection between LMST and the US-68 and Brush Row Road intersection. The major challenges of this alternative are:

- Higher pedestrian and driver conflict
- Traffic delays along US-68
- Increased potential for non-compliant users
- Lower cyclist user experience

This alternative does not meet any of the objectives of the project's Purpose and Need and therefore has been dismissed from further consideration.

3.1.2 Alternative 2 – Various Safety Improvements Along US-68 and Crossing US-68

This alternative includes new sidewalks along the northbound side of US-68 to Brush Row Road and a new SUP along the southbound side of US-68 to Brush Row Road from the existing SUP at the Interpretive Center. A new sidewalk along the north side of Brush Row Road will be installed between US-68 and the first entrance drive into the Xenia Township building. Access from the Interpretive Center to the LMST will be provided by a grade separated crossing which will span over US-68 and Oldtown Creek. Stairs from US-68 will lead pedestrians to the overhead structure crossing over the roadway.

This study considers variations of Alternative 2 consisting of different types of structures spanning over US-68 and Oldtown Creek as well as two at-grade crossings at the US-68 and Brush Row Road intersection. The structure alternatives to be studied were limited by the following constraints:

- Portions of the project are located in a Federal Emergency Management Agency (FEMA) designated Special Flood Hazard Area Zone AE, with Floodway. FEMA requires a Conditional Letter of Map Revision (CLOMR)/Letter of Map Revision (LOMR) if there are any changes to the 100-year Base Flood Elevation (BFE). The process to obtain the CLOMR can take up to 18 months from the date of filing with FEMA so the goal is to eliminate the need for a CLOMR/LOMR to adhere to the project schedule.
- A controlling profile location of the new bridge alignment is the crossing at Oldtown Creek. In order to avoid a CLOMR/LOMR, the bridge needs to span the Oldtown Creek Floodway and the low chord of the structure needs to be above the 100-year BFE. Additionally, to limit the amount of new fill required in the floodplain, employing the shallowest superstructure that spans Oldtown Creek is the most logical solution. The shallowest superstructure depth that limits these impacts is a truss and therefore all variations of this alternative include a truss over the Oldtown Creek.
- To obtain the required vertical clearance over US-68 an elevated approach ramp must be utilized that meets the maximum ADA permissible grade within the available ROW. To minimize the required clearance of the new profile over US-68, a shallow superstructure is again desirable. For this other controlling profile location, a truss is recommended over the section spanning US-68 and will be used on all variations to this alternative as well.

Structure type variations to be evaluated are described below.

- Variation 2A – Prefabricated truss bridge for all spans.
- Variation 2B – Single span prefabricated truss over US-68 and Oldtown Creek with remaining interior spans composed of steel or precast concrete beams.

At-grade crossing type to be evaluated are described below.

- Rectangular Rapid Flashing Beacon (RRFB)
- Pedestrian Hybrid Beacon (PHB)

Note: These two at-grade crossing types at the intersection of US-68 and Brush Row Road intersection are evaluated and described further in Section 4.4.

4.0 Key Issues

The key issues identified with this project include site constraints, hydraulics, economics, constructability, maintenance of traffic, intersection maneuverability, aesthetics, and maintainability.

4.1 Roadway

The US-68 corridor improvements focus on upgrading PED/NMV connections while maintaining the existing roadway widths of US-68 and Brush Row Road. Refer to Appendix B for the proposed roadway plan sheets. A new 11' wide path will be provided along the west side of US-68 with an adjacent 5' buffer between the back of the new roadway curb. This path will taper down to meet the existing 10' wide path at the Interpretive Center. The 11' wide path will continue further north to the intersection with Brush Row Road, aligned with the new curb ramp locations. The existing sidewalk along the west side of US-68 will be replaced with new 5' wide sidewalk between the new curb ramp and the driveway at property address 1655 US-68. A new 5' wide sidewalk will be provided along the east side of US-68, with a similar 5' buffer, and extend to the south to property address 1590 US-68 and to the north to the end of the existing sidewalk across from the property at 1655 US-68. A new 5' wide sidewalk will also be provided along the north side of Brush Row Road within the existing right-of-way (ROW), between US-68 and the first entrance drive into the Xenia Township building. To accommodate minimum turning movements for a single unit box truck or school bus, intersection improvements at Brush Row Road include new 30' radii curb returns.

The new path and sidewalk shall comply with ADA guidelines. The path design criteria followed is shown below in Table 2.

Table 2 – Path Design Criteria

Criteria	Preferred	Proposed	Reference
Path Cross Slope	1%	1.56% maximum	MDG Section 3.6.4
Path Profile Grade	5%± maximum	5% maximum	MDG Section 5.3.6
Path Shoulders	2'	2’	MDG Section 5.3.1
Railing	3’ Tall	3.5’ Tall	Standard Construction Drawing (SCD) RM-5.2
Design Speed	12 MPH	12 MPH	MDG Section 5.3.3
Stopping Sight Distance	90' minimum	217' minimum	MDG Section 5.3.8
Vertical Curve Length	50' minimum	200'	MDG Section 5.3.8

The west approach ramp will start near the northern limit of the Interpretive Center path. The alignment and length of the path, within the available ROW, were established to gain the required vertical clearance of 17.5’ over US-68 while not exceeding the maximum permissible grade. The new alignment of this portion of the path is restricted to ODNR purchased property, which includes three parcels north of the Interpretive Center. A switch back style ramp was initially considered for the new ramp alignment, but ultimately eliminated due to restrictions for bicyclists and emergency vehicles. The path’s recommended horizontal curves at each approach have been designed to accommodate the turning movements of an ambulance, providing unrestricted PED/NMV access across the new connection. The west and east approach ramp sections leading up to the bridge will include railing per SCD RM-5.2 and a 2’ shoulder on each side of the 11’ wide path. Retaining walls are required along each approach ramp where 2:1 maximum slopes cannot be accommodated.

The recommended vertical profile achieves the required vertical clearance over US-68 with a main 200’ long crest curve centered over the approximate centerline of US-68. At the other end of the path where it ties into the LMST, a raise in profile grade on the LMST is required to accommodate this maximum 5% path profile grade. A 100’ long crest vertical curve along the LMST is used at this east tie-location to minimize the impacts. The north and south approaches leading up to the crest curve along the LMST require a tangent section and sag curve, with a total new profile length of approximately 275’.

All drainage features within the project limits are to be replaced, which includes pavement drainage, curbs, curb inlets, catch basins, and storm sewer pipe. All existing curb along US-68 will be replaced with ODOT Type 6 curb, including new curb inlets. Existing catch basins and storm sewer pipes placed as part of the Interpretive Center construction will not be replaced. The earth disturbed area (EDA) for this project is approximately 2.24 acres. An EDA greater than 1 acre requires implementation of Best Management Practices (BMPs). The proposed SUP west ramp and bridge structure require an estimated 0.36 acres of new impervious area in the recently acquired ROW. This results in a treatment calculation of approximately 31% or 0.70 acres of water quality treatment required for the project. BMP treatments will be made within the project’s construction limits and available existing ROW. The DBT will be responsible for determining the final design EDA, BMP treatment requirements, and subsequent BMP installations. All pavement markings and raised pavement markings will be replaced within the project limits. All existing driveway aprons impacted will be replaced in kind as well.

Intersection and driveway sight distance was evaluated for the new improvements throughout the corridor and the available line of sight for each potential conflict is provided in Appendix C Sight Distance Exhibits. It is assumed that clearing and grubbing will be performed to facilitate these improvements within the existing ROW along US-68. Sufficient sight distance is achieved for vehicles within the new corridor and there are no conflicts.

Alternative access is required to be provided to the new connection from US-68. A pedestrian staircase structure is recommended that promotes the shortest route from the path to the overhead bridge. The desired locations of these structures are within the available ROW and meet clear zone requirements, refer to Appendix B for these locations.

4.2 Structural

The new bridge (SFN 2926107) will be designed to accommodate a 90 PSF pedestrian loading for the available width and a H15-44 vehicle without impact, although loading is not concurrent. A future wearing surface load will not be applied to this new bridge. Both bridge alternatives will provide a minimum bridge width of 15’ from toe-to-toe of curbs. Concrete curbs will provide anchorage for the pedestrian rail posts throughout the bridge length. Deck drainage calculations for a 2-year storm event produce a maximum spread of approximately 5’. For Alternative 2A, scuppers shall be placed near the end of each span to minimize spread and flow over the bridge expansion joints. The interior beam spans in Alternative 2B do not allow the placement of scuppers; therefore, drainage will utilize the full spread and storm water will drain to the ends of the structure. Note for both alternatives, storm water is not permitted to outlet into the floodway.

Prefabricated truss bridge manufacturers have confirmed the desired deck width is conventional for pedestrian bridges, allowing standard member sizes. Truss members shall primarily consist of H-section members and utilize bolted connections. This deck width may require a lateral floor beam field splice, requiring the truss to be shipped in additional sections. For the Alternative 2B portion of the bridge that is not a truss span, three beam lines will be used to promote superstructure redundancy and comply with conventional beam spacings.

The span arrangement for each bridge alternative was established based on the following minimum criteria:

- 19’ minimum horizontal clearance from US-68 edge-of-traveled way to a bridge support
- Sufficient intersection and driveway sight distances
- Substructure units prohibited in the Oldtown Creek Zone AE floodway
- East tie-location adjacent to the existing LMST
- Substructure units located in the available ODNR ROW

A four span arrangement is recommended for each bridge alternative to economize the beam sizes, eliminate substructure units in the floodway, and exceed the minimum criteria above. The recommended span arrangement from west to east is 95’-0; 117’-6”; 117’-6”; 150’-0”. Refer to Appendix B for the proposed bridge alternatives plan sheets.

A zero-degree skew will be used on the substructure units to maximize sight distance along the US-68 corridor and minimize the length of pier impacts in the floodplain. A 7” thick reinforced concrete deck, without stay-in-place forms, will be used for each bridge alternative. A mesh fabric fence will be mounted to the inside face of the truss and follow SCD VPF-1-90 for the full limit of Span 1 over US-68. The fence will begin at the top of the deck and continue to the top of the truss components. All spans will use a 3.5’ tall pedestrian railing anchored into the curbs on each bridge fascia. Expansion joints will be provided at each substructure location, as the truss superstructure prohibits the use of the preferred semi-integral or integral abutments. The fixity of the substructure units will be determined based on the superstructure type. The truss spans require one fixed and one expansion bearing at each support. The interior spans for Alternative 2B will match each truss fixity for these shared piers. Steel reinforced elastomeric bearing pads will support each truss or beam line, providing the minimum expansion/contraction movements of the bearings with sufficient seat width. Traditional vehicular approach slabs are not required by ODOT beyond the bridge limits. The design-build team (DBT) will be responsible for ensuring seismic design requirements are met during final design.

Alternative 2B compared two superstructure types for the continuous 117'-6" long interior spans: structural steel beams and precast prestressed concrete beams. Structural steel rolled beams and plate girders were evaluated, both with 50 KSI grade steel. 36" deep steel plate girders with variable flange thickness were selected for this comparison based on the limited availability for a heavier steel rolled beam section and savings in steel weight versus a rolled section.

The following prestressed concrete beams were evaluated:

- Three AASHTO Type 4 prestressed concrete beams
- Three WF42-49 prestressed concrete beams
- Four CB42-48 prestressed concrete box beams

The box beams were eliminated, as they did not provide sufficient capacity for the design loads and required an additional beam line in comparison to the two other beam types. The AASHTO Type 4 beams provide a similar capacity to the WF42-49 beams, but are 1' deeper than the WF42-49 beams. The WF42-49 prestressed concrete beams were selected based on the desire to match the truss superstructure depth as closely as possible, prioritizing the shallower beam depth. However, because the depth of the W42-49 beams and truss do not match, a step in the pier cap will be required to accommodate the difference in superstructure depth.

The comparison of the steel and prestressed concrete beams considers the cost of the beams only and assumes all other secondary elements are negligible to the cost per foot of the beam for this Feasibility Study (FS). Secondary elements that were not considered include: protective coating of structural steel, sealing on concrete beams, type and number of diaphragms and/or cross frames, deck haunch areas, bearing pads, and the size of cranes to install each beam type. The costs for each beam material were obtained from ODOT's 2023 Bid Data and the following is a cost comparison of the two different superstructure types:

- WF42-49 Prestressed Concrete Beam Cost $395 per linear foot of beam
- 36" Deep Plate Girder Cost $485 per linear foot of beam

Alternative 2B will utilize the more cost effective WF42-49 precast concrete beams for the superstructure type between the truss end spans. A precast concrete beam manufacturer has confirmed the 117'-6" beam length will be able to be shipped to the project location.

The piers and abutments were designed for the controlling 150'-0" long span configuration with the truss superstructure. The piers will have a uniform thickness, with a 20' pier cap length that tapers to an 8' wide column. Preliminary design shows a 3' thick pile capped footing with six 12" diameter cast-in-place reinforced concrete piles will support each pier. The abutments are traditional stub abutments supported by two rows of 12" diameter cast-in-place reinforced concrete piles, with the front row of piles battered at the east abutment. All piles are assumed to be friction type piles. The west abutment does not require wingwalls since turn back retaining walls are used to contain the new fill of the elevated ramp. Mechanically Stabilized Earth (MSE) walls are recommended for these west approach ramp retaining walls. The MSE wall limits have been established based on potential grading and the geometrics of the new alignment, but additional engineering will need performed to finalize this area. The east abutment will utilize turn back concrete wingwalls leading up to the LMST. A modular block retaining wall is recommended along both sides of the LMST at the east approach as well to accommodate the required raise in profile grade to the LMST.

Ownership and maintenance will be established in an agreement between ODOT and ODNR for the bridge and MSE walls. The superstructure and substructure, including MSE walls, shall be sealed per the limits shown in the BDM. The truss H-section components shall be hot dipped galvanized.

4.3 Hydraulics

FEMA floodplain requirements are locally managed and this portion of Oldtown Creek is under the jurisdiction of Greene County Unincorporated Areas. FEMA only regulates the 100-year water surface elevations within a floodplain. According to FEMA policies, if bridge substructure units are located outside the limits of the floodway and no work is to take place within the floodway, both a CLOMR/LOMR and hydrologic and hydraulic analysis are not required. ODOT follows a Self-Compliance Process which requires thorough documentation to ensure the project is in compliance with federal, state, and local floodplain standards. In addition to the FEMA policies, ODOT requires specific notifications to the Local Floodplain Coordinator and hydrologic and hydraulic calculations. ODOT also employs guidelines for temporary work within floodways, ensuring the temporary access fill includes a hydraulic opening which will allow an unimpeded discharge equal to twice the highest monthly flow without producing a rise in backwater above the Ordinary High Water Mark (OHWM).

Following ODOT requirements for a project within a Zone AE floodplain, a complete Hydraulics Report was prepared. Refer to Appendix D for this standalone report. BFEs have been previously determined by FEMA and limited information from the existing hydraulic model was available from FEMA's engineering library. The existing hydraulic model was previously performed in the Hydrologic Engineering Center Water Surface Profiles Program (HEC-2) program, with information only available in a pdf format. A new Hydrologic Engineering Center's River Analysis System (HEC-RAS) model was developed using HEC-2 cross sections and available Light Detection and Ranging (LiDAR) data was used in between these cross sections. FEMA Flood Insurance Study values were used for the new HEC-RAS model discharges, starting water surface elevations, and channel roughness values. The proposed bridge alternatives were incorporated into the model to compare water surface elevations and velocities between the existing conditions and the proposed structure for Annual Exceedance Probability (AEP) events of 20% (design) and 1% (check). A CLOMR/LOMR will not be required since the substructure units for both bridge alternatives are located outside the floodway and the low chord of the structure is above the 100-year BFE. A scour analysis has not been performed and will be required during final design.

Due to the time constraints on the project schedule, the DBT must design the structure to avoid a CLOMR/LOMR. Following ODOT requirements, a final hydrologic and hydraulic analysis is required for the proposed bridge. The DBT will be required to follow L&D Volume 2, Section 1005.1.4 Self-Compliance Process for a Zone AE with floodway. ODOT Letter LD-52 has already been sent to the Local Floodplain Coordinator. Following completion of the hydrologic and hydraulic calculations, the DBT will need to submit ODOT Letter LD-51.

If the contractor will need to cross the stream in order to construct the project, ODOT standards require the DBT to design the temporary access fill with a hydraulic opening which will allow an unimpeded discharge equal to twice the highest monthly flow without producing a rise in backwater above the OHWM. Since the crossing is with a Zone AE with floodway the nearby homes, additional requirements will be imposed by ODOT to reduce risk of nearby flooding with the temporary access fill in place. ODOT's requirements will be determined after preliminary hydrologic and hydraulic analysis of the temporary access fill has been completed, which is currently in process.

4.4 Traffic

US-68 is classified as an urban principal arterial with a posted and legal speed limit of 45 mph. Brush Row Road is classified as an urban minor collector with a legal speed limit of 55 mph. Certified vehicular traffic data was not provided by ODOT for this project. Design designations and traffic used for analysis is included in Appendix E. The project's anticipated corridor improvements prompted ODOT to perform applicable traffic studies. A speed study along US-68 concluded that the 45-mph zone is acceptable. A crash study was evaluated at the intersection of US-68 and Brush Row Road. The study encompassed data from 2020 to 2022, excluding induced animal crashes. The study

concluded the only trend was four southbound US-68 rear end collisions at the intersection, refer to Appendix F for the generated Crash Diagram.

ODOT investigated the need for a traffic signal at this intersection, refer to Appendix G for the Traffic Signal Warrant Analysis Summary. A traffic signal is not warranted for either of eight-hour vehicular volume, four-hour vehicular volume, or peak hour warrants. A RRFB, curb ramps, and crosswalk markings were installed on the north side of Brush Road to cross US-68. As a safety countermeasure and to account for a potential increase in pedestrian traffic upon opening of the Interpretive Center, these improvements were placed at the current intersection until the improvements of this project are incorporated. The existing RRFB will be reinstalled as part of the improvements of this project.

A pedestrian traffic analysis was performed at the US-68 and Brush Row Road intersection to determine if the installation of a RRFB or PHB was warranted for the proposed crossing for a 20-year horizon period. It was assumed for this analysis that the Interpretive Center would be open and fully operational in 2025. Additional key assumptions include a background growth rate, design designated traffic volumes, and the Traffic Signal Warrant Analysis Summary per Appendix G. A growth rate of 0.2% was used for vehicular traffic along Brush Row Road. For the pedestrian traffic, StreetLight Data counted a daily pedestrian volume in 2021, in which it was conservatively assumed 50% would cross in the peak hour with pedestrians being concentrated around evening peak hours. A continual increase of 5% pedestrian traffic was used for the opening year (2026) and the design year (2046). Bicycle volumes were also collected in 2021 using StreetLight Data, however these volumes were for northbound and southbound bicycle traffic on US-68 and are not representative of crossing at Brush Row Road. Some of these bicyclists might cross at the proposed crossing in the future, however there is not enough data to quantify the small number of bicyclists that may cross. The pedestrian and bicycle traffic data is available in Appendix E.

Per Table 4-6 of the MDG, a RRFB or a PHB are applicable pedestrian safety countermeasures for project improvements for a two-lane facility under 9,000 AADT and greater than 40 mph speed limit.

At the Brush Row Road intersection a RRFB is an appropriate pedestrian safety countermeasure for the existing 2-lane facility, however it should be noted that a RRFB is not an appropriate countermeasure for a 3-lane facility, the potential future condition, per Table 4-6 of the MDG.

A PHB warrant was completed at the intersection in accordance with the Ohio Manual of Uniform Traffic Control Devices (OMUTCD), Figure 4F-2 Guidelines for the Installation of Pedestrian Hybrid Beacons on High-Speed Roadways. The results of the PHB analysis revealed the warrant is not met for either the opening year or design year. For a roadway speed of more than 35 mph and given a crosswalk length of 34 feet, the pedestrian volume would need to increase to approximately 50 pedestrians per hour to warrant a PHB. See Appendix H the PHB Warrant Analysis which consists of a plot of the 2026 and 2046 peak hour pedestrian traffic on Figure 4F-2.

4.5 Maintenance of Traffic

The improvements to the roadway sections can be constructed utilizing temporary shoulder closures while maintaining one lane of traffic in each direction for most of the project schedule. These temporary shoulder closures shall provide proper sight distance at the intersection of US-68 and Brush Row Road, as well as for the adjacent property driveways to remain in service. Temporary lane closures will be required for the mill and fill operations along US-68 and Brush Row Road, removal and reinstallation of the RRFB at the US-68 and Brush Row Road intersection, installation of the truss spanning over US-68, and other miscellaneous activities. A TWLTL along US-68 has been included into the roadway typical sections for future considerations if a TWLTL becomes warranted but will not be implemented with the construction of this project.

Pedestrian traffic along US-68 will be impacted during the construction. Short term closures of the existing sidewalks may be required during certain construction operations such as setting of the bridge superstructure over US-68. Construction of the new SUP and sidewalk will be phased in such a way to maintain pedestrian traffic along US-68.

During construction of the LMST improvements, LMST PED/NMV traffic will be detoured. This traffic will temporarily use Brush Row Road to US-68 to Old Springfield Pike to the at-grade intersection of the LMST at Old Springfield Pike. Detour signage will be required to inform the traffic along LMST, north of the Brush Row Road and south of the Old Springfield Pike at-grade intersections. This PED/NMV traffic should be detoured after the construction of the new US-68 path and sidewalk and use the existing US-68 roadway shoulders available. Temporary pavement may be required at isolated locations and temporary crossing signage is recommended at the intersection of US-68 and Old Springfield Pike.

4.6 Right-of-Way

No new ROW is required for the project. The existing ROW width along US-68 varies from 80’ to 90’ wide, which will be sufficient for the roadway improvements in this corridor. ODNR has obtained adjacent properties in the study area to facilitate the construction of the new bridge and the approach ramp on the west side of US-68 that ties into the Interpretive Center. The portion of the bridge that ties into the LMST on the east end, and additional improvements for the raise in the profile of the LMST, will require consent legislation from the City of Xenia.

It is unknown at this stage if the AES Ohio owned overhead electric lines that run between US-68 and Oldtown Creek are within an existing dedicated easement. ROW impacts to accommodate for the relocation of this specific line could not be identified but efforts are still ongoing.

4.7 Geotechnical

ODNR provided a geotechnical investigations report performed by Resource International, Inc. dated March 2022, that was used for the construction of the new Interpretive Center. Their report includes four boring logs up to a depth of 40’ in which bedrock was not encountered. Shallow foundations at the Interpretive Center are recommended not to exceed a maximum allowable bearing pressure of 4,000 PSF per these investigations.

ODOT provided historic boring logs used for the construction of the GRE-68-13.40 bridge (SFN 2901498) over Massies Creek, which is approximately 0.40 miles north along US-68 from this project location. These historic borings were taken up to approximately 60’ in depth and bedrock was not encountered there either. The GRE-68-13.40 bridge plans utilized friction type steel H-piles with an estimated average pay length of 37’ for the abutments and piers. Refer to Appendix I for these historic boring logs.

The new deep foundations for the two bridge alternatives in this FS assume 50’ long friction type piles. It was assumed for the new retaining walls used at the west approach ramp that MSE walls are the most economical wall type. Modular block retaining walls were assumed for the new retaining walls at the LMST east tie-in location due to economics as well. Vibration monitoring is recommended for construction of the new bridge foundations adjacent to property owner houses, the new Interpretive Center, and buried utilities.

ODOT will obtain four borings and include these boring logs in the design-build scope. These borings will be taken at the approximate new bridge substructure unit locations. These findings along with additional borings obtained by the DBT as required per the ODOT Specifications for Geotechnical Explorations (SGE) will be utilized by the DBT to evaluate the final deep foundation recommendations for the structure and the proposed retaining walls.

4.8 Utilities

Initial Occupational Safety and Health Administration (OUPS) coordination was performed to determine the existing utilities in the area. New utilities to be installed from the adjacent Interpretive Center construction were also incorporated into the roadway plans based on plan information available. Existing public utilities are shown below in Table 3.

Table 3 – Public Utilities

Utility Type	Owner	Aerial	Buried
Electric	AES Ohio	Yes	No
Communication	AT&T Ohio	Yes	Yes
Communication	Charter Communications	No Response	No Response
Water	Greene County	N/A	Yes
Water	City of Xenia	N/A	Yes
Storm Sewer	Unknown	N/A	Yes

Overhead electric runs parallel to US-68 along the west side of the roadway, with service lines that branch to the east over US-68 and to the west as well. These overhead utility lines will be relocated to the east side of US-68. Coordination with AES is ongoing for relocation and potential reimbursement. An additional overhead electric line runs parallel to US-68, further to the east, located between US-68 and Oldtown Creek. This overhead line runs north towards Brush Row Road and turns to the east prior to Brush Row Road, crossing the LMST and Brush Row Road within the project limits. At a minimum, portions of the overhead electric lines will have to be relocated to facilitate the location of the new bridge and the west approach ramp. New electric service will be required in the final gateway design, at the US-68 and Brush Row Road intersection and along the new bridge. It will also be necessary to maintain proper construction clearance from the electric lines during construction. Occupational Safety and Health Administration (OSHA) clearance limits will need to be determined during future utility coordination efforts.

Underground copper communication lines run parallel to US-68 along the east side of the roadway. Overhead fiber and copper communication lines run parallel to US-68 along the west side of the roadway and parallel to Brush Row Road along the north side of the roadway. Service lines branch off from these lines as well. At a minimum, portions of these overhead communication lines will have to be relocated to facilitate construction.

Greene County owns a 20” diameter ductile water main that runs along Brush Row Road, starting west of the intersection with US-68 and continuing along Brush Row Road to the east. Another 20” diameter ductile water main runs parallel and within the path limits of the LMST, starting from Brush Row Road and continuing north. These waterlines are outside the new bridge construction limits and should not be impacted by improvements.

The City of Xenia owns a 20” diameter ductile water main that runs parallel to US-68 along the west side of the roadway, located approximately 6’ outside the edge of pavement. If relocation is not required, vibration monitoring may be warranted during construction based on the available clearance from the water main. It is assumed service lines purchased within the ODNR obtained parcels will be abandoned in place.

There are two curb inlets near the intersection of US-68 and Brush Row Road and two additional ones staggered further south along US-68. All existing drainage features within the project limits are scoped to be replaced, except for the new manholes and catch basins that were recently installed along the west side of US-68 for the Interpretive Center.

An abandoned septic tank system has been identified within the ODNR parcels. The septic tank is located approximately 5’ from the nearest bridge pier pile and conflict is not anticipated.

4.9 Environmental

The project was evaluated for potential environmental issues based upon existing data sources and a conservative study area developed by ODOT. The findings are summarized below based upon the categories in EnviroNet. For issues that may impact the design or the schedule, refer to documents included in Appendix J. Additional supporting materials that will be used for the NEPA document have been uploaded to EnviroNet under PID 115388.

4.9.1 Cultural Resources

The project area is within the boundaries of the Oldtown (Old Chillicothe) prehistoric archaeological district (OAI GR0082) that is listed on the National Register of Historic Places (NRHP) (#75001410). ODNR broke ground in May of 2022 on the Interpretive Center focused on Ohio’s Native Peoples. As part of the ODNR acquisition of the site, a Phase I Cultural Resources Survey was performed in April 2021. In addition to the Tecumseh Motel Property (proposed center of the site), the Phase I also evaluated 11 residences, a commercial building, and the Oldtown Historical Monument Group (a collection of monuments in front of the motel) that commemorates the historic Shawnee Village and its inhabitants that were present in this location in the late 1700’s. State Historic Preservation Offices (SHPO) concurred on June 22, 2021, that these 14 history-architecture resources were not eligible for the NRHP, either individually or as a district. SHPO concluded that they were not contributing elements to the Oldtown (Old Chillicothe) Site Historic District. The Phase I report and SHPO concurrence letter are uploaded in EnviroNet. Figure 6 from the 2021 report included in Appendix J shows previously recorded resources from the SHPO database and the area surveyed.

Phase I Archaeological Surveys were conducted for subsequent ODNR acquisitions of properties at 1587 US-68, 1603 US-68, 1616 US-68, and 1597 US-68. No significant archaeological resources were found. SHPO provided coordination letters concurring that no additional archaeological testing was recommended. Archaeological monitoring was performed during excavations for construction of the Interpretive Center on an on-call basis from August 2022 through May 2023. A report of findings was prepared in September 2023 and is available if requested. Once the project limits are established by the DBT, it is anticipated that Ohio Department of Transportation Office of Environmental Services (OES) will review the proposed impact areas, compare to areas covered by previous studies and address the need for any further archaeological studies, with OES potentially completing this work.

4.9.2 Parks and Recreation

The Great Council State Park and Interpretive Center are under the jurisdiction of ODNR, see Great Council State Park Fact sheet in Appendix J. Since the project does not involve federal transportation funds, Section 4(f) does not apply. According to discussions with ODOT, Section 6(f) also does not apply to these properties. Regardless, ODOT will coordinate with the Officials with Jurisdiction to obtain their feedback and determine any commitments that would be appropriate. The LMST will require temporary closure during construction. The duration of the closure of the LMST will be established by the DBT.

4.9.3 Ecological Resources and Waterway Permits

The potential for ecological resources was assessed based upon aerial photography, United States Geological Survey (USGS) Streamstats, available site photography, and ODOT mapping. The project may impact one known stream, Oldtown Creek. The only potential work within the channel and below the OHWM would occur if the DBT places temporary access fill in the creek. No known wetlands are mapped in this area; however, the area is a floodplain and wetlands may be present, particularly in the flatter wooded areas. Ecological fieldwork will need conducted to

identify wetlands, allow for avoidance and minimization efforts, and to aide in planning for permitting efforts. The final acreage of stream impacts and quantity of fill will be determined by the DBT, but have been estimated in this FS.

Oldtown Creek is an unlisted stream, per the Ohio Mussel Survey Protocol (OMSP) with a drainage area of 9.63 square miles, requiring evaluation for potential state-listed mussel species. ODOT has indicated that OES will commit to completing a mussel survey/relocation prior to construction.

Based upon a review of Threatened & Endangered species, the Tonguetied minnow is reported within one mile of the project and Oldtown Creek is a suitable habitat for the minnow. In-stream work will be prohibited from April 15 to July 1, according to a review by ODOT, for additional information refer to Appendix J.

The project will impact several acres of trees that would be a suitable wooded habitat for Indiana bat and Northern long-eared bat, including areas that are within 50' of Oldtown Creek. Some clearing is required for cranes to operate during construction of the bridge over Oldtown Creek. ODOT indicated that studies will assume removal of all trees within the impact area and reduce the impacts, and associated mitigation, once determined by the DBT. All necessary tree removal shall occur from October 1 through March 31 to avoid impacts to these species.

4.9.4 Regulated Materials

The Ohio Regulated Properties Search (ORPS) Tool shows one Bureau of Underground Storage Tank Regulations (BUSTR) Leaking Underground Storage Tank (LUST) location within the study area at 12 Brush Row Road. There are no recorded landfills in the project area, according to ORPS and ODOT mapping. Refer to Appendix J for the ORPS report. A Regulated Materials Review Screening will be required by the DBT following ODOT requirements. No substantial concerns are anticipated based upon available data. Environmental Site Assessments was performed for properties in the project area acquired by ODNR. The following studies are available as supporting documentation upon request:

- 1587 US-68 (former Brakeall's Body Shop) – *Limited Phase II ESA*, October 2021
- 1603 US-68 (residence) – *Phase I ESA*, August 2022
- 1616 US-68 (residence) – *Phase I ESA*, January 2023
- 1597 US-68 (residence) – *Phase I ESA*, June 2023

Pre-demolition Hazardous Materials Assessments were conducted for these four properties on behalf of ODNR. All buildings have been removed except for the garage on the western property, which is slated for removal before this project is sold.

4.9.5 Air Quality

OES provides flowcharts for ease in evaluating whether additional air quality studies or coordination are required. Based upon the project type, no air quality studies are required. The flowcharts for Ozone, Mobile Source Air Toxics, and PM 2.5, and supporting data, have been uploaded to EnviroNet.

4.9.6 Noise

A noise analysis is not required and the flowchart for determining when a noise analysis is required has been uploaded to EnviroNet.

4.9.7 Farmlands

According to the TIGERweb census mapping, the portion of the project area east of US-68 and south of Brush Row Road is within the urbanized area. The portion west of US-68 and north of Brush Row Road is outside the urbanized area. Project characteristics will be evaluated and compared to the Farmland Memorandum of Understanding. There are no apparent impacts to farmed properties or agricultural districts.

4.9.8 Drinking Water

The project is within a Drinking Water Source Water Protection Zone and a Sole Source Aquifer. Plan notes will be required by the DBT for source water protection. There are no recorded karst areas within the limits and the Drinking Water Source Protection Map is included in Appendix J.

4.9.9 Environmental Justice and Traditionally Underrepresented Populations

The project is located within the Xenia Community City School District. Based upon a review of ODOT data, the census tract west of US-68 is 8% minority, 25% low income, 2% limited English proficiency, and 26% older adults. East of US-68 is 9% minority, 5% low income, 0% limited English proficiency, and 34% older adults. Environmental justice impacts are not anticipated.

4.9.10 Storm Water Permits

Best management practices for stormwater management will be determined by the DBT. It is anticipated that the project will require more than one acre of disturbance and will be subject to the requirements of the National Pollutant Discharge Elimination System (NPDES).

4.10 Construction

The project schedule and limited ROW to construct the new bridge and approach ramps are two driving challenges for all stakeholders. The project is slated to begin construction on October 1, 2024, and end construction 24 months later on October 1, 2026.

The existing ROW available to construct the new bridge from US-68 to the LMST is approximately 50' wide. The west approach ramp MSE wall has been established near the northern property line. The bridge has been located at the northern limit within the ROW and the available clearance to the southern property line has been maximized. Regardless of the method of construction, there should be sufficient space between the new substructure units located outside of the floodway for contractor staging throughout construction and assembly of the delivered truss units. It is typical for two erection cranes to be utilized to construct each alternative's superstructure. The new superstructure over Oldtown Creek may have to be installed with restricted swing patterns due to the future constructed substructure units, although environmental clearance assumed conservative clearing limits and that all trees would be removed.

Recent correspondence with manufacturers has provided insight into potential lead times for some of the main structural components. The lead time for a prefabricated truss to be delivered to the site for installation is approximately 15 months from the time of approval. For the prestressed concrete beams and potentially tapered bearing assemblies it is approximately 3 months. The 24-month allowable construction schedule should permit the construction of both alternative types. Shipping of construction materials to the project will not be a concern.

Lighting fixtures and pedestrian traffic control devices present a challenge with current industry lead times and the design-built team will have to address this concern based on the required design-build scope requirements.

4.11 Aesthetics

Preliminary discussions between ODOT, ODNR, and the Shawnee tribe stakeholders have yielded conceptual gateway and bridge enhancements. These considerations shall be further prescribed in the ODOT design-build

scope. This FS accounts for ODOT's baseline aesthetics only and offers opportunities to where additional features may be incorporated into the final design. Overall, ODOT intends to preserve private landscaping where possible.

In general, the gateway aesthetics shall compliment the aesthetic treatments applied to the Interpretive Center. These elements may include color, texture, landscaping, lighting, signature elements, and Shawnee tribe insignia. The following identified project elements offer future consideration for enhancements within the ROW:

- Roadway
  - Landscaping
  - Pedestrian railing on ramp approaches
  - Overhead lighting
  - Modular retaining wall along LMST
- Bridge
  - Geometry/layout of MSE walls to promote overlook or gaze areas
  - MSE wall or pier form liners
  - Sealing of concrete and MSE wall surface colors
  - Fence material, colors, and finish
  - Railing material, colors, and finish
  - Lighting

Alternative 2A offers a consistent bridge type across all four spans, whereas Alternative 2B utilizes a different superstructure type for the interior spans. The prestressed concrete beam superstructure type for Alternative 2B will be approximately 1.5' deeper than the steel truss superstructure depth. Alternative 2A offers an aesthetic advantage over Alternative 2B, due to this uniform superstructure type, and this will be reflected in the comparison of alternatives.

4.12 Cost Estimates

A summary of the construction cost estimates is shown in Table 4 below. All major pay items and unit prices are provided in further detail in the Construction Cost Estimates in Appendix K. Roadway costs are similar for each alternative and can be seen in Appendix K. The initial construction cost estimate was calculated using the 2022 ODOT Summary of Contracts Awarded and ODOT Estimator software with a 25% contingency to account for any unanticipated work that may potentially be determined during final design. The contingency also accounts for some uncertainty in quantities and minor items not identified at this stage that will be provided during final design. An inflation rate of 10% was determined using ODOT's Business Plan Calculator, refer to Appendix K.

A life cycle cost analysis was not performed to assess the economics of the two different superstructure types for the interior spans, as both alternatives will utilize the same truss superstructure for the end spans. The only life cycle cost difference between the alternatives will be between repainting the structural steel for the truss versus resealing the concrete beams. There is a slight economic advantage to Alternative 2B since resealing concrete beams is more cost effective and this will be reflected in the comparison of alternatives. Deck overlays and replacements are assumed not to be required with pedestrian bridges. An exact cost of painting the structural steel members cannot be quantified at this time. Utility reimbursable costs and aesthetics are also unknown for this FS.

Table 4 – Summary of Construction Costs

Alternative	Structure Type	Total Construction Cost
2A	4-Span Prefabricated Truss Bridge	$9,798,400
2B	2-Span Prefabricated Truss & 2-Span P/S Concrete Beam Bridge	$8,443,900

5.0 Comparison of Alternatives

Project drivers such as available ROW, geometric design criteria, and FEMA policy compliance narrowed the number of feasible bridge build alternatives to two total, both which meet the project needs. The project footprint for both of these alternatives is similar. The notable difference between these two alternatives involves the following summarized below in Table 5.

Table 5 – Bridge Alternative Comparison

	No Build	Alternative 2A	Alternative 2B
Primary Needs			
Provide safe and efficient PED/NMV access from the Interpretive Center to LMST	No	Yes, connects Interpretive Center to LMST with a separated grade crossing, but with only staircase access to one side of US-68	Yes, connects Interpretive Center to LMST with a separated grade crossing, with staircase access on each side of US-68
Provide safe and efficient PED/NMV access along US-68 corridor	No	Yes, connects existing sidewalk on Brush Row Road to sidewalks on US-68	Yes, connects existing sidewalk on Brush Row Road to sidewalks on US-68
Consider Stakeholder Gateway Features	No	Yes	Yes
Key Issues			
Avoid impacts to the Oldtown Creek Floodway	Yes	Yes	Yes
Avoid ROW impacts	Yes	Yes	Yes
Avoid utility conflicts	Yes	No	No

Three intersection traffic alternatives were evaluated at US-68 and Brush Row Road as part of this FS and summarized below in Table 6.

Table 6 – At-Grade Alternative Comparison

	PHB	RRFB
At-Grade Improvement Warranted/Recommended	Not warranted	Yes recommended

6.0 Conclusion

With the construction of the new Shawnee Interpretive Center, as part of developing the Great Council State Park, providing safe connection to these resources is key to their success. This study focused on four new pedestrian and bicycle crossing options, including two types of grade-separated crossings and two at-grade crossings located at the US-68 and Brush Row Road intersection.

The grade-separated crossings are:

- Alternative 2A – Prefabricated truss bridge for all spans
- Alternative 2B – Single span truss over US-68 and Oldtown Creek, with the interior spans composed of steel or pre-cast concrete beams.

The US-68 and Brush Row Road intersection improvement, at-grade crossing options include:

- Pedestrian Hybrid Beacon
- Relocation of the Rectangular Rapid Flashing Beacon

Grade-Separated Crossing:

Table 5 provides for a comparative summary of the proposed options based upon the primary needs and key issues. Analysis contained herein illustrates that the grade-separated crossing options are close contenders in all areas of consideration, except cost; where Alternative 2A is approximately 15% more costly. Aesthetic design, maintenance and constructability will be the driving factors in determining the final preferred alternative.

At-Grade Crossing:

During the interim time between the completion of the Shawnee Interpretive Center and the provision of a bridge crossing, and while this study was being completed, a RRFB was installed to facilitate improved safety for PED/NMV seeking to visit this new resource. A PHB was given consideration; however, does not meet OMUTCD criteria for installation, and therefore is not warranted. The recommended alternative is to construct a new RRFB.

7.0 Next Steps

To adhere to the aggressive project schedule, ODOT determined that the project shall be advertised using a design-build process. All project stages are fully funded by ODOT and the design-build scope is to be developed by ODOT and complete by February 15, 2024. The project is to be advertised August 1, 2024 with an anticipated sale date of September 12, 2024. The project aesthetics will be specified in the design-build scope of services.

Appendix A – Area of Study

Study Area Location Map

Legend:
= Project Study Area
= Proposed Pedestrian Bridge
= Proposed Roadway Improvements

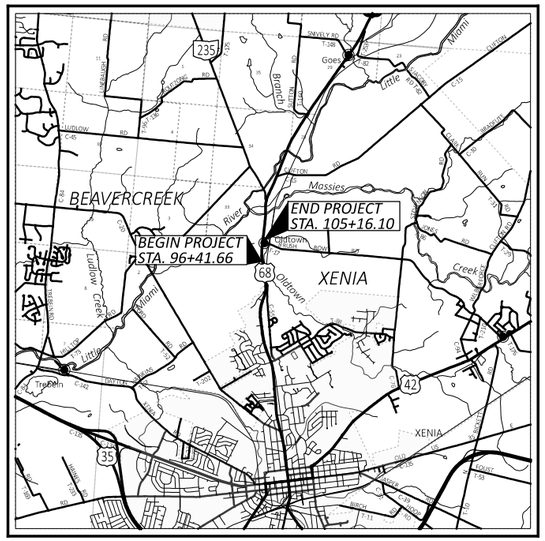
HORIZONTAL
SCALE IN FEET
0 10 20 40

N

GRE-68-12.65 (PID 115388)
SEPARATED AND AT-GRADE CONNECTION
XENIA TOWNSHIP, GREENE COUNTY, OHIO

DESIGN AGENCY

Appendix B – Preliminary Proposed Plan Sheets



LOCATION MAP

LATITUDE: 39°43'49" LONGITUDE: -83°56'12"
SCALE: 1" = 1 MILE

PORTION TO BE IMPROVED
INTERSTATE HIGHWAY
FEDERAL ROUTES
STATE ROUTES
COUNTY & TOWNSHIP ROADS
OTHER ROADS

DESIGN DESIGNATION

	US-68	BRUSH ROW RD.
CURRENT ADT (2026)	8,600	1,400
DESIGN YEAR ADT (2046)	8,800	1,460
DESIGN HOURLY VOLUME (2026)	1,200	180
DIRECTIONAL DISTRIBUTION	50%	57%
TRUCKS (24 HOUR B&C)	7%	2%
DESIGN SPEED	45 MPH	55 MPH
LEGAL SPEED	45 MPH	55 MPH
DESIGN FUNCTIONAL CLASSIFICATION:	PRINCIPAL ARTERIAL	MINOR COLLECTOR
NHS PROJECT	YES	NO

DESIGN EXCEPTIONS

NONE REQUIRED

ADA DESIGN WAIVERS

NONE REQUIRED

UNDERGROUND UTILITIES
Contact Two Working Days Before You Dig
OHIO811.org Before You Dig
OHIO811, 8-1-1, or 1-800-362-2764
(Non members must be called directly)

PLAN PREPARED BY:
FISHBECK
10856 REED HARTMAN HIGHWAY
SUITE 175
CINCINATTI, OHIO 45242

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION

GRE-68-12.65

XENIA TOWNSHIP

GREENE COUNTY

INDEX OF SHEETS:

FEASIBILITY STUDY PLANS NOT FOR CONSTRUCTION

STANDARD CONSTRUCTION DRAWINGS	*SUPPLEMENTAL SPECIFICATIONS*	*SPECIAL PROVISIONS*

FEDERAL PROJECT NUMBER

N/A

RAILROAD INVOLVEMENT

NONE

PROJECT DESCRIPTION

THIS PROJECT WILL CONSTRUCT PEDESTRIAN AND BICYCLE FACILITIES CONNECTING THE LITTLE MIAMI SCENIC TRAIL AND THE NEW SHAWNEE INTERPRETIVE EDUCATION CENTER.

EARTH DISTURBED AREAS

PROJECT EARTH DISTURBED AREA:	*3.13 ACRES*
ESTIMATED CONTRACTOR EARTH DISTURBED AREA:	*0.25 ACRES*
NOTICE OF INTENT EARTH DISTURBED AREA:	*2.49 ACRES*

2023 SPECIFICATIONS

THE STANDARD SPECIFICATIONS OF THE STATE OF OHIO, DEPARTMENT OF TRANSPORTATION, INCLUDING SUPPLEMENTAL SPECIFICATIONS LISTED IN THE PLANS, CHANGES LISTED IN THE PROPOSAL, AND THE SUPPLEMENTAL SPECIFICATION 800 VERSION INDICATED ON THE PROPOSAL SHALL GOVERN THIS IMPROVEMENT.

Tammy K Campbell
Tammy K. Campbell, P.E.
District 08 Deputy Director

Jack Marchbanks, PhD
Director, Department of Transportation

TITLE SHEET

DESIGN AGENCY
fishbeck

DESIGNER
JBT

REVIEWER
JAH 11/20/23

PROJECT ID
115388

SHEET P.01 TOTAL 22

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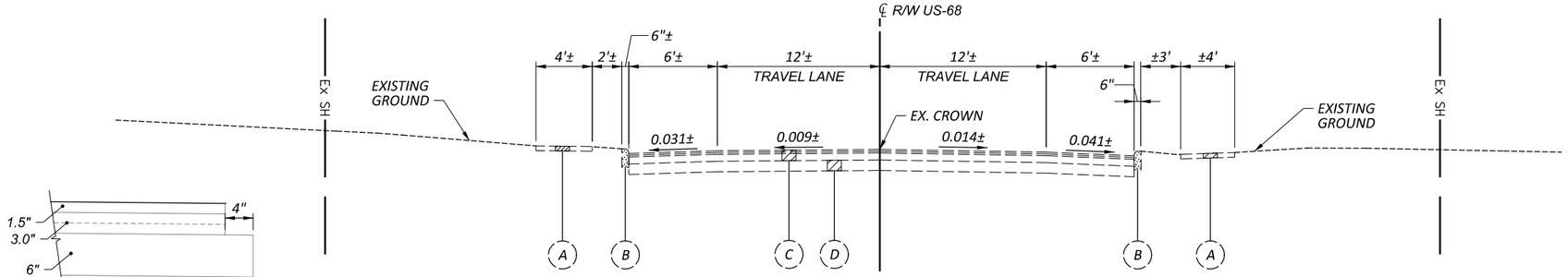
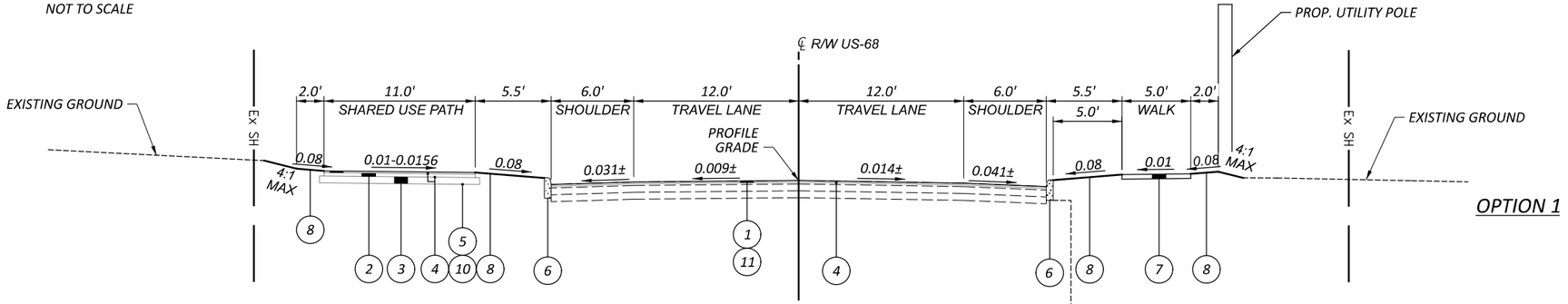


PAVEMENT STEP DETAIL - SHARED USE PATH

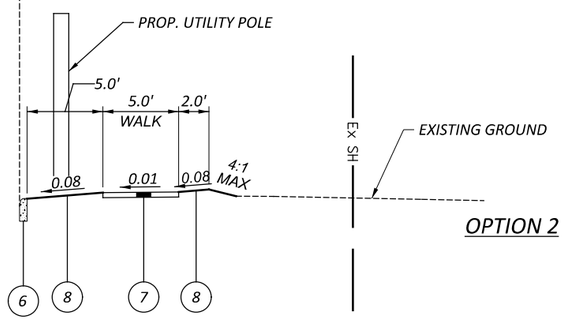
NOT TO SCALE

EXISTING SECTION - US-68



OPTION 1

PROPOSED SECTION - US-68



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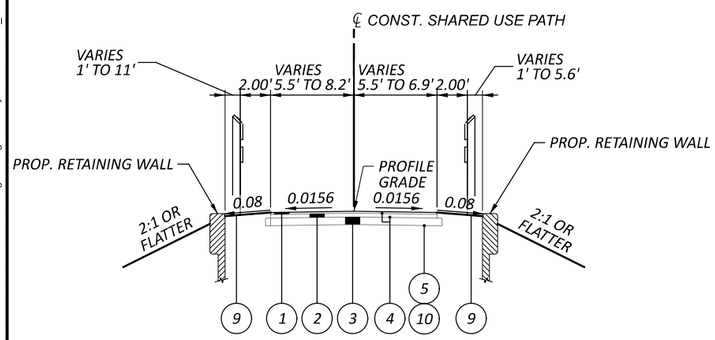
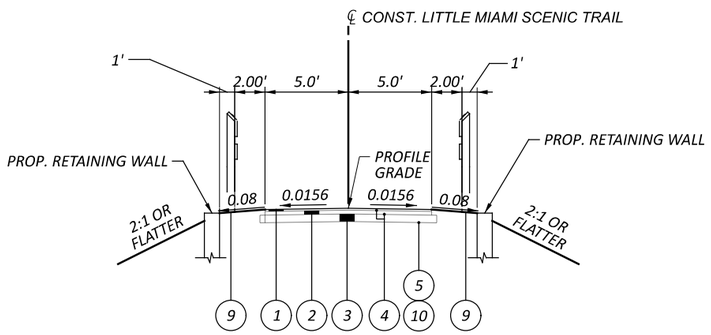


PROPOSED SECTION - SHARED USE PATH
US-68 RAMP



PROPOSED SECTION - SHARED USE PATH
LITTLE MIAMI SCENIC TRAIL

LEGEND

1. ITEM 441 - 1½" ASPHALT CONCRETE SURFACE COURSE, TYPE 1, (448), PG64-22
2. ITEM 441 - 3" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 2, (448), (TWO LIFTS)
3. ITEM 304 - 6" AGGREGATE BASE
4. ITEM 407 - NON-TRACKING TACK COAT
5. ITEM 204 - PROOF ROLLING
6. ITEM 609 - CURB, TYPE 6
7. ITEM 608 - 4" CONCRETE WALK
8. ITEM 659 - SEEDING AND MULCHING
9. ITEM 607 - FENCE, MISC: WOOD FENCE
10. ITEM 204 - SUBGRADE COMPACTION
11. ITEM 254 - PAVEMENT PLANING

- A EX. CONCRETE SIDEWALK
- B EX. CURB
- C EX. ASPHALT CONCRETE
- D EX. AGGREGATE BASE

NOTES

1. EXISTING PAVEMENT BUILD-UP ASSUMED.
2. EXISTING PAVEMENT CROSS SLOPE OBTAINED FROM SURVEY DATA.

TYPICAL SECTIONS

DESIGN AGENCY
fishbeck

DESIGNER
AJV

REVIEWER
JAH 11/20/23

PROJECT ID
115388

SHEET P.02 | TOTAL 22

GRE-68-12.65

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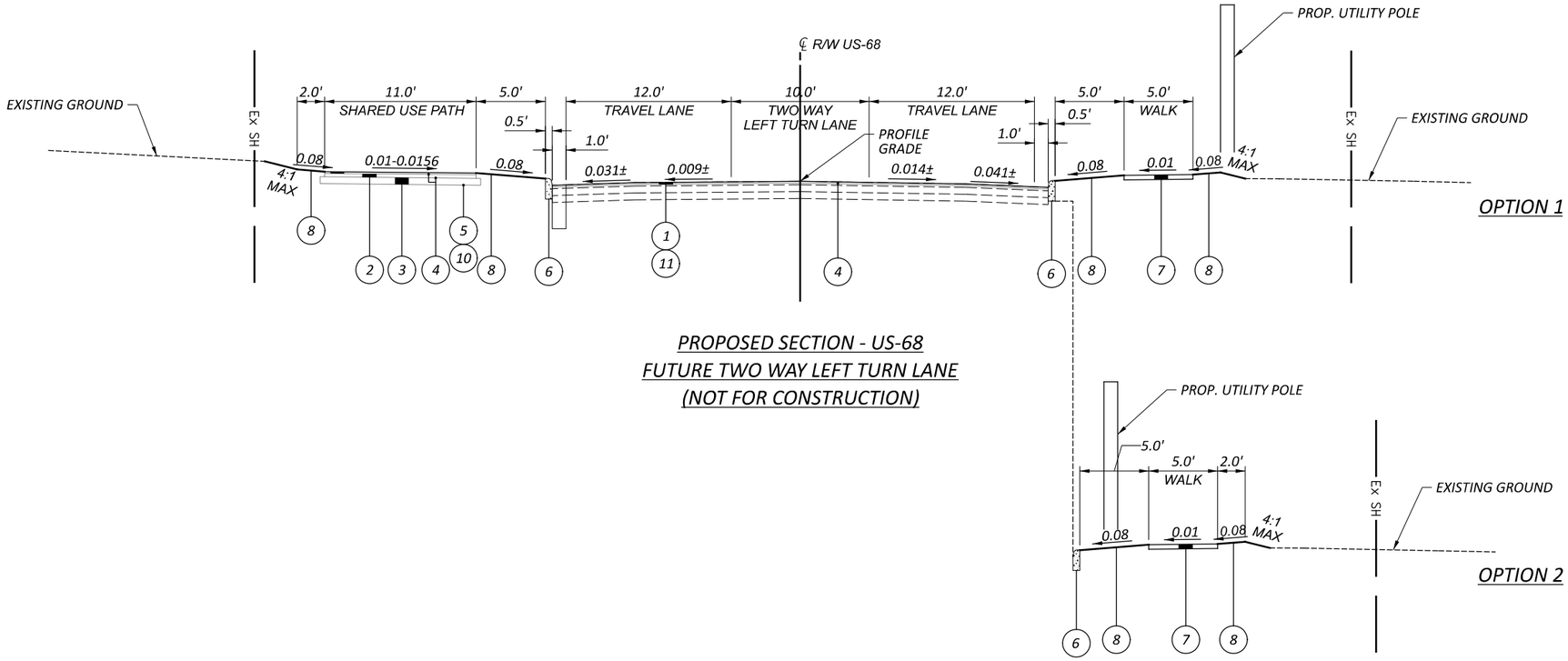

OPTION 1

PROPOSED SECTION - US-68
FUTURE TWO WAY LEFT TURN LANE
(NOT FOR CONSTRUCTION)

OPTION 2

TYPICAL SECTIONS

GRE-68-12.65

MODEL: Sheet 2 PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:27 PM USER: jpcarroll
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DESIGN AGENCY
fishbeck

DESIGNER
AJV

REVIEWER
JAH 11/20/23

PROJECT ID
115388

SHEET P.03 TOTAL 22

SHARED USE PATH CURVE DATA

C1
P.I. = STA. 0+47.44
Δ = 106°27'53" RT
Dc = 279°29'30"
R = 20.50'
T = 27.44'
L = 38.09'
E = 13.75'

C3
P.I. = STA. 5+46.17
Δ = 190°39'10" RT
Dc = 212°12'24"
R = 27.00'
T = 289.6'
L = 89.84'
E = 263.86'

C2
P.I. = STA. 2+30.46
Δ = 203°49'04" LT
Dc = 229°10'59"
R = 25.00'
T = 118.54'
L = 88.93'
E = 96.15'

C4
P.I. = STA. 4+60.85
Δ = 86°02'29" RT
Dc = 161°23'48"
R = 35.50'
T = 33.13'
L = 53.31'
E = 13.06'

LEGEND:

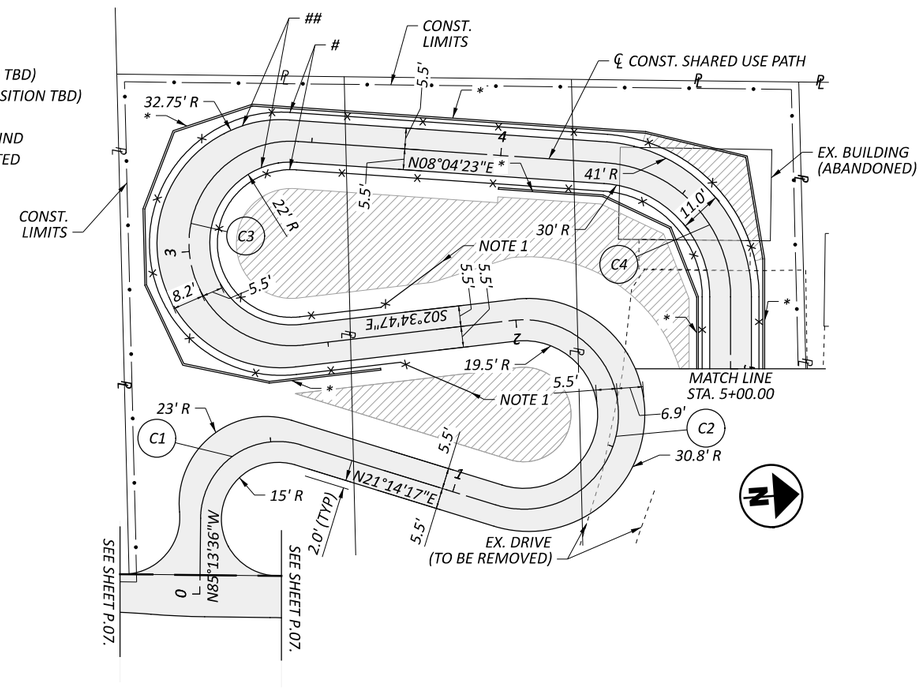
#	PROP. BIKEWAY RAILING	**	EX. WATER (DISPOSITION TBD)
##	PROP. SHARED USE PATH	WV	EX. WATER VALVE (DISPOSITION TBD)
###	PROP. WALK	CI	CURB INLET
####	PROP. CURB, TYPE 6	DW	REPLACE DRIVEWAY IN-KIND
*	PROP. RETAINING WALL	POLE	EX. POLE, TO BE RELOCATED

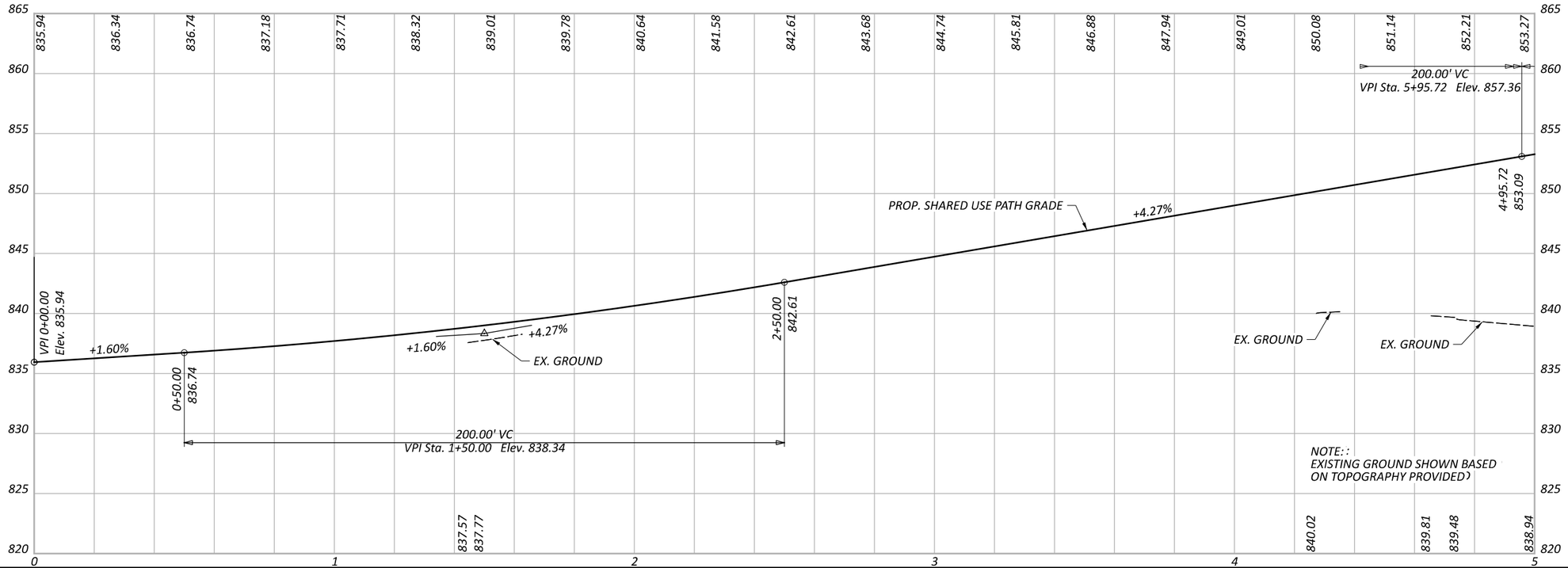
POTENTIAL AESTHETIC / LANDSCAPING IMPROVEMENT AREAS (FINAL DRAINAGE DESIGN BY DBT)

PROP. SHARED USE PATH

NOTES

1. BEGIN BIKEWAY RAILING, STA. 2+40 (SEE SCD RM-5.2) (BIKEWAY RAILING EXACT LOCATION AND EXTENTS TO BE DETERMINED BY DESIGN-BUILD ENGINEER)
2. DRAINAGE AND GRADING DETAILS TO BE DESIGNED BY DESIGN-BUILD ENGINEER.
3. ALL KNOWN SEPTIC TANKS WITHIN R/W LIMITS ARE SHOWN. SEPTIC TANKS OUTSIDE OF R/W LIMITS ARE UNKNOWN.
4. FOR FLOODWAY DETAILS, SEE SHEET P.09.





PLAN AND PROFILE - SHARED USE PATH BEGIN PATH TO STA. 5+00

DESIGN AGENCY: fishbeck

DESIGNER	JAL
REVIEWER	JAH 11/20/23
PROJECT ID	115388
SHEET	P.04
TOTAL	22

GRE-68-12.65

MODEL: SHEET 1 - SUP PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:32 PM USER: jpcarroll
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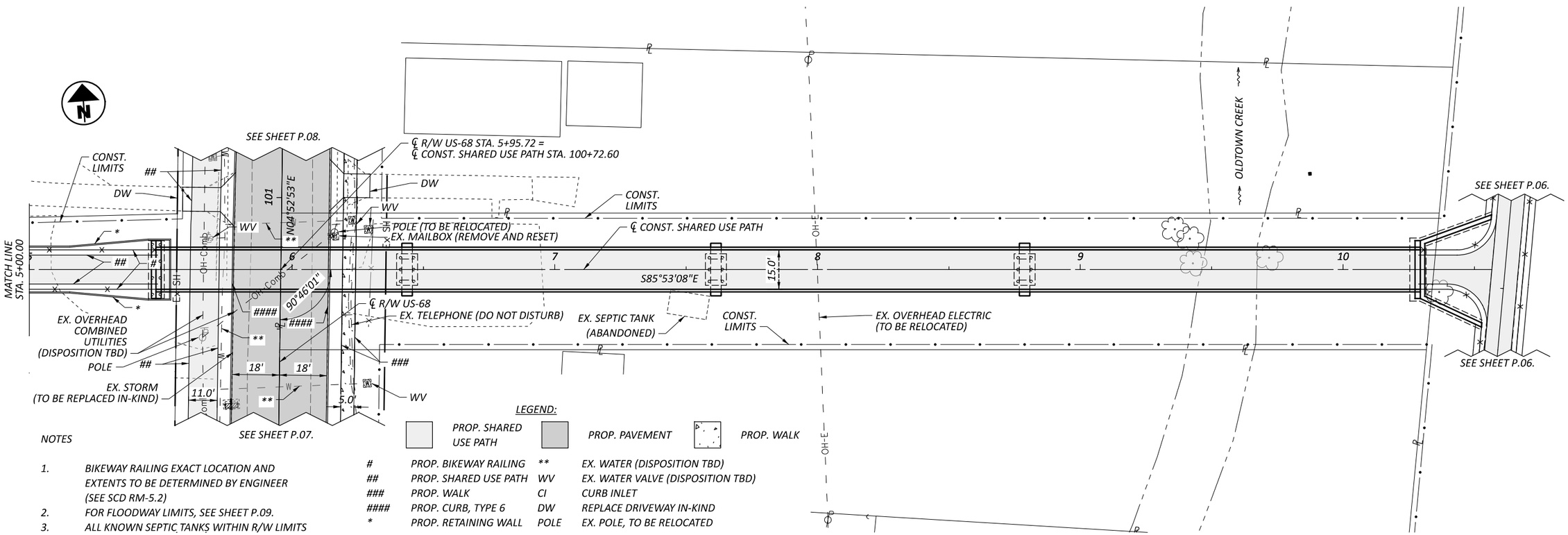


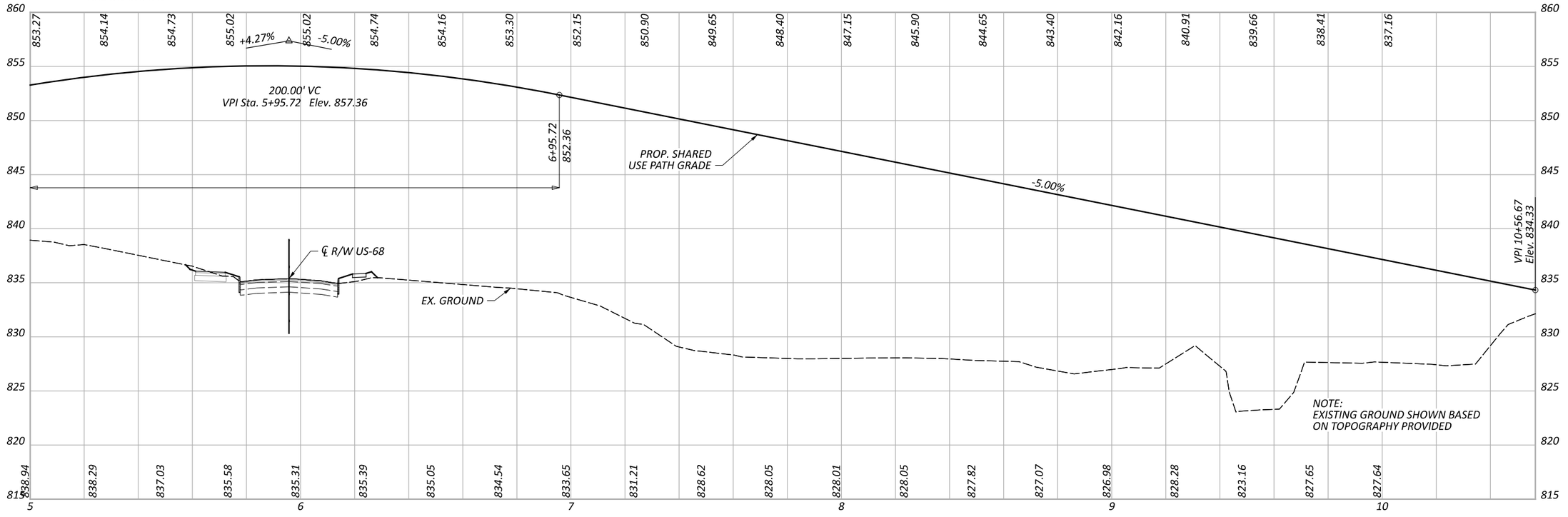
NOTES

1. *BIKEWAY RAILING EXACT LOCATION AND EXTENTS TO BE DETERMINED BY ENGINEER (SEE SCD RM-5.2)*
2. *FOR FLOODWAY LIMITS, SEE SHEET P.09.*
3. *ALL KNOWN SEPTIC TANKS WITHIN R/W LIMITS ARE SHOWN. SEPTIC TANKS OUTSIDE OF R/W LIMITS ARE UNKNOWN*

LEGEND:

PROP. SHARED USE PATH | *PROP. PAVEMENT* | *PROP. WALK*

#	PROP. BIKEWAY RAILING	**	EX. WATER (DISPOSITION TBD)
##	PROP. SHARED USE PATH	WV	EX. WATER VALVE (DISPOSITION TBD)
###	PROP. WALK	CI	CURB INLET
####	PROP. CURB, TYPE 6	DW	REPLACE DRIVEWAY IN-KIND
*	PROP. RETAINING WALL	POLE	EX. POLE, TO BE RELOCATED



HORIZONTAL SCALE IN FEET
0 10 20 40

PLAN AND PROFILE - SHARED USE PATH STA. 5+00 TO STA. 10+00

DESIGN AGENCY
fishbeck

DESIGNER	JAL
REVIEWER	JAH 11/20/23
PROJECT ID	115388
SHEET	P.05
TOTAL	22

GRE-68-12.65

MODEL: SHEET 2 - SUP PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:34 PM USER: jpcarroll
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LEGEND:

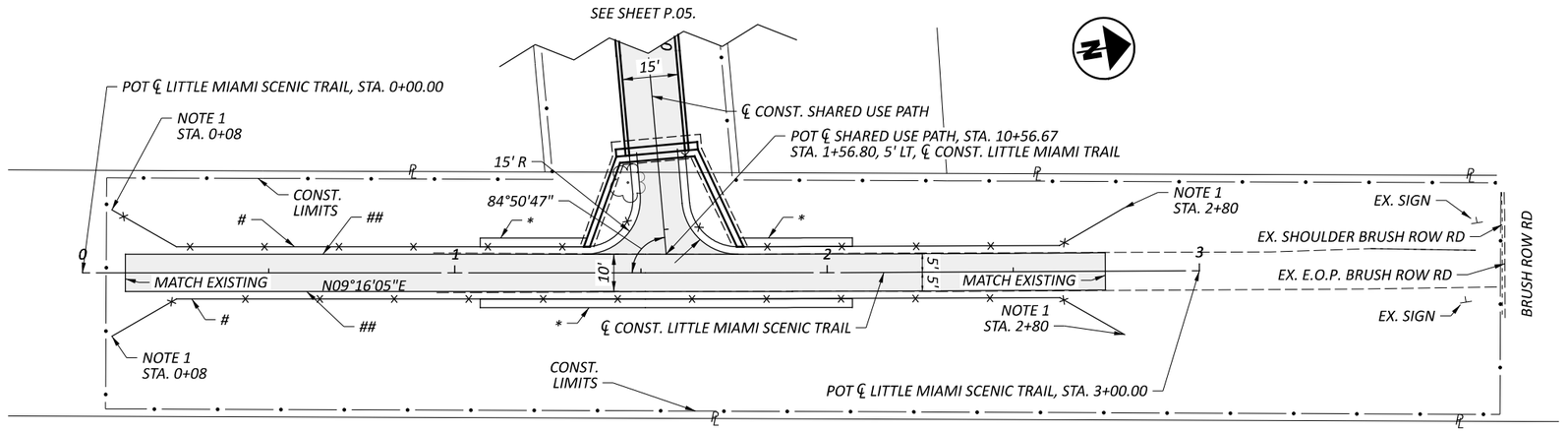
#	PROP. BIKEWAY RAILING	**	EX. WATER (DISPOSITION TBD)
##	PROP. SHARED USE PATH	WV	EX. WATER VALVE (DISPOSITION TBD)
###	PROP. WALK	CI	CURB INLET
####	PROP. CURB, TYPE 6	DW	REPLACE DRIVEWAY IN-KIND
*	PROP. RETAINING WALL	POLE	EX. POLE, TO BE RELOCATED

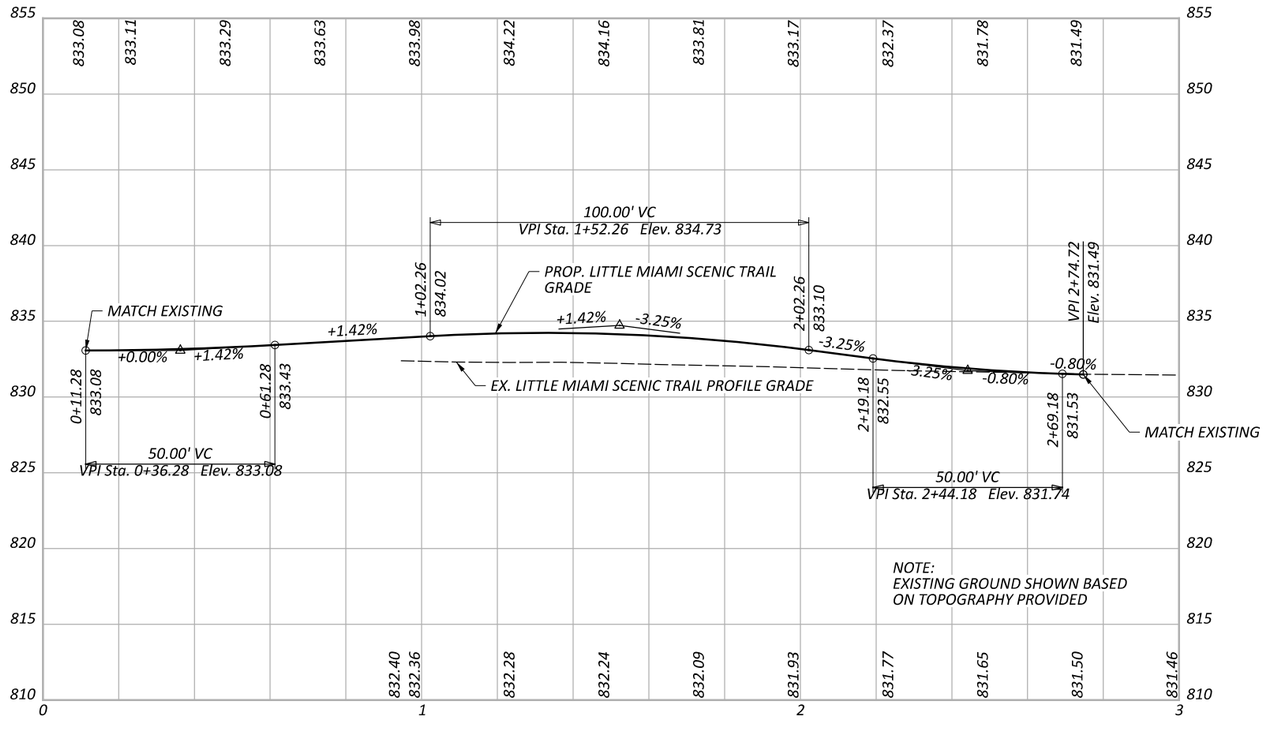
PROP. SHARED USE PATH

LITTLE MIAMI TRAIL CURVE DATA
P.I. = STA. 2+25.58
Δ = 00°27'06" LT
Dc = 00°18'13"
R = 18,875.00'
T = 74.42'
L = 148.83'
E = 0.15'

NOTES

1. END BIKEWAY RAILING (SEE SCD RM-5.2) (BIKEWAY RAILING EXACT LOCATION AND EXTENTS TO BE DETERMINED BY ENGINEER)
2. FOR FLOODWAY DETAILS, SEE SHEET P.09.





HORIZONTAL SCALE IN FEET
0 10 20 40

PLAN AND PROFILE - LITTLE MIAMI SCENIC TRAIL
STA. 10+00 (SHARED USE PATH) TO END PATH (LITTLE MIAMI SCENIC TRAIL)

DESIGN AGENCY
fishbeck

DESIGNER	JAL
REVIEWER	JAH 11/20/23
PROJECT ID	115388
SHEET	P.06
TOTAL	22

GRE-68-12.65

MODEL: SHEET 3 - SUP PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:35 PM USER: jpcarroll
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LEGEND:

#	PROP. BIKEWAY RAILING
##	PROP. SHARED USE PATH
###	PROP. WALK
####	PROP. CURB, TYPE 6
*	PROP. RETAINING WALL
MB	EX. MAILBOX (REMOVE & RESET)
**	EX. WATER (DISPOSITION TBD)
WV	EX. WATER VALVE (DISPOSITION TBD)
CI	CURB INLET
DW	REPLACE DRIVEWAY IN-KIND
POLE	EX. POLE, TO BE RELOCATED

PROP. SHARED USE PATH

PROP. PAVEMENT

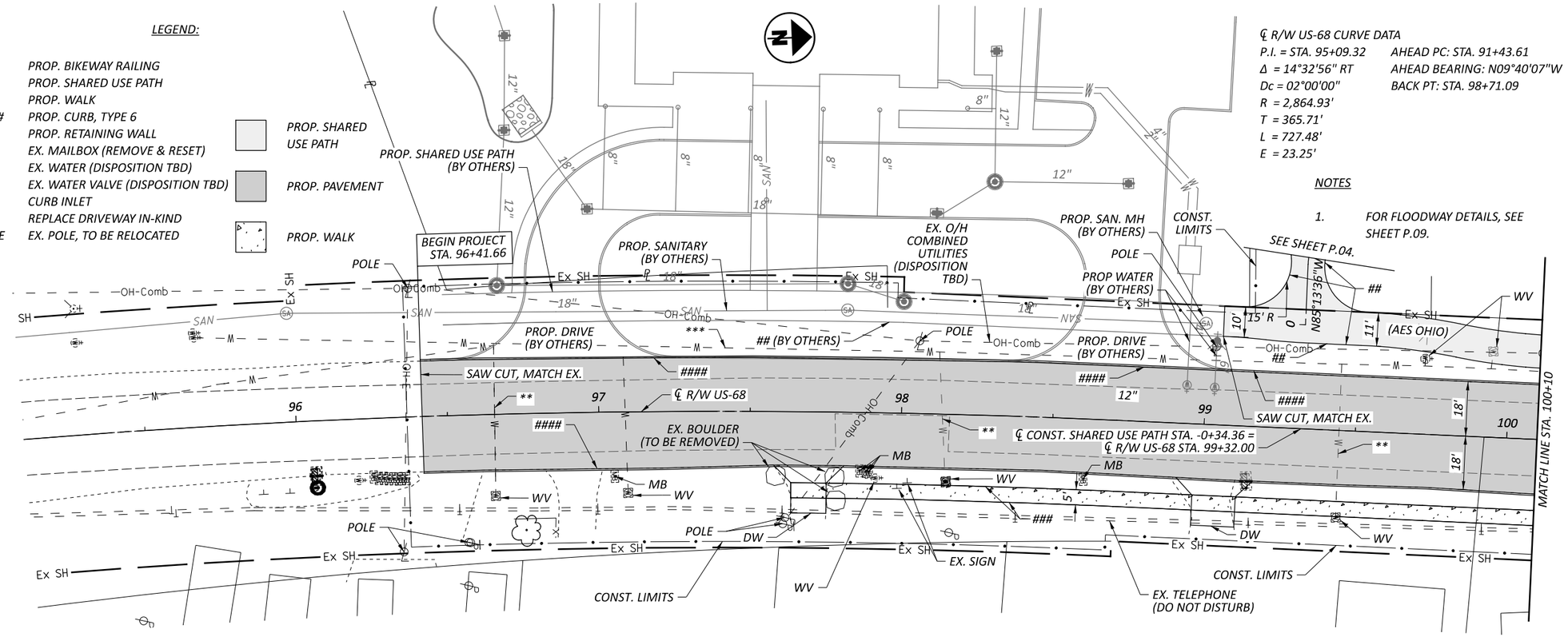
PROP. WALK

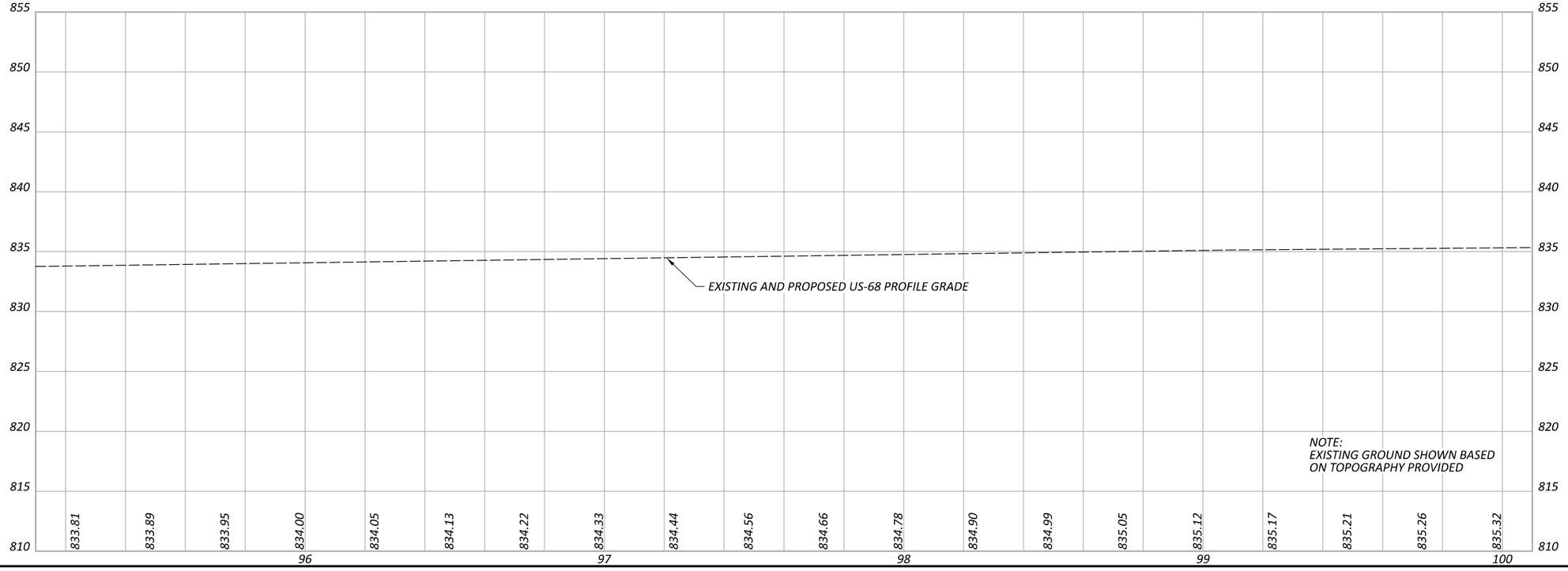
℄ R/W US-68 CURVE DATA
P.I. = STA. 95+09.32
Δ = 14°32'56" RT
Dc = 02°00'00"
R = 2,864.93'
T = 365.71'
L = 727.48'
E = 23.25'

AHEAD PC: STA. 91+43.61
AHEAD BEARING: N09°40'07"W
BACK PT: STA. 98+71.09

NOTES

1. FOR FLOODWAY DETAILS, SEE SHEET P.09.





HORIZONTAL SCALE IN FEET
0 10 20 40

PLAN AND PROFILE - US-68
BEGIN PROJECT TO STA. 100+10

DESIGN AGENCY
fishbeck

DESIGNER JAL
REVIEWER JAH 11/20/23
PROJECT ID 115388
SHEET P.07 TOTAL 22

GRE-68-12.65

MODEL: SHEET6-US68-Plan 3 PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:36 PM USER: jpcarroll
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NOTES

1. FOR FLOODWAY DETAILS, SEE SHEET P.09.

℄ R/W US-68 CURVE DATA
P.I. = STA. 104+18.10
Δ = 01°53'59" RT
Dc = 01°00'00"
R = 5,729.65'
T = 95'
L = 189.98'
E = .79'

AHEAD PC: STA. 103+23.10
BACK PT: STA. 105+13.09
BACK BEARING: N06°46'53"E

LEGEND:

#	PROP. BIKEWAY RAILING	**	EX. WATER (DISPOSITION TBD)
##	PROP. SHARED USE PATH	WV	EX. WATER VALVE (DISPOSITION TBD)
###	PROP. WALK	CI	CURB INLET
####	PROP. CURB, TYPE 6	DW	REPLACE DRIVEWAY IN-KIND
*	PROP. RETAINING WALL	POLE	EX. POLE, TO BE RELOCATED
MB	EX. MAILBOX (REMOVE & RESET)		TREE (TO BE REMOVED)
	PROP. SHARED USE PATH		PROP. WALK
	PROP. PAVEMENT		

HORIZONTAL SCALE IN FEET
0 10 20 40

SEE SHEET P.04.

℄ R/W US-68 STA. 5+95.72 =
℄ CONST. SHARED USE PATH STA. 100+72.60

MATCH LINE STA. 100+10

EX. CI
EX. FENCE
WV
EX. O/H COMBINED (TO BE RELOCATED)
POLE
EX. TELEPHONE (DO NOT DISTURB)
EX. PULL BOX (DO NOT DISTURB)
CONST. LIMITS
EX. SIGN (DND)
EX. OVERHEAD COMBINED UTILITIES (DISPOSITION TBD)
CONST. LIMITS
END 11' SUP
BEGIN 5' WALK
STA. 103+48.62
PROP. CURB RAMP
END PROJECT
STA. 105+16.10
(AES OHIO)
SAW CUT
N04°52'53"E
90°46'01"
91°47'36"
30' R
℄ R/W US-68
℄ R/W US-68 STA. 103+09.63 =
℄ R/W BRUSH ROW RD STA 0+00.00
℄ R/W BRUSH ROW RD
ALIGNMENT BEARING: S86°54'44"E
EX. STORM MH
EX. FENCE (TO BE REMOVED)
SAW CUT
STA. +50, ℄ BRUSH ROW RD
℄ R/W BRUSH ROW RD
EX. BOLLARD (TO BE REMOVED)

101 102 103 104 105

EXISTING AND PROPOSED US-68 PROFILE GRADE

101	102	103	104	105
835.37	835.38	835.38	835.41	835.39
835.32	835.25	835.15	835.02	834.87
834.71	834.53	834.32	834.06	833.74
833.40	833.04	832.68	832.28	831.85

NOTE:
EXISTING GROUND SHOWN BASED ON TOPOGRAPHY PROVIDED

PLAN AND PROFILE - US-68 STA. 100+10 TO END PROJECT

DESIGN AGENCY: fishbeck
DESIGNER: JAL
REVIEWER: JAH 11/20/23
PROJECT ID: 115388
SHEET: P.08 TOTAL: 22

GRE-68-12.65

MODEL: SHEET7-US68-Plan 4 PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:37 PM USER: jpcarroll
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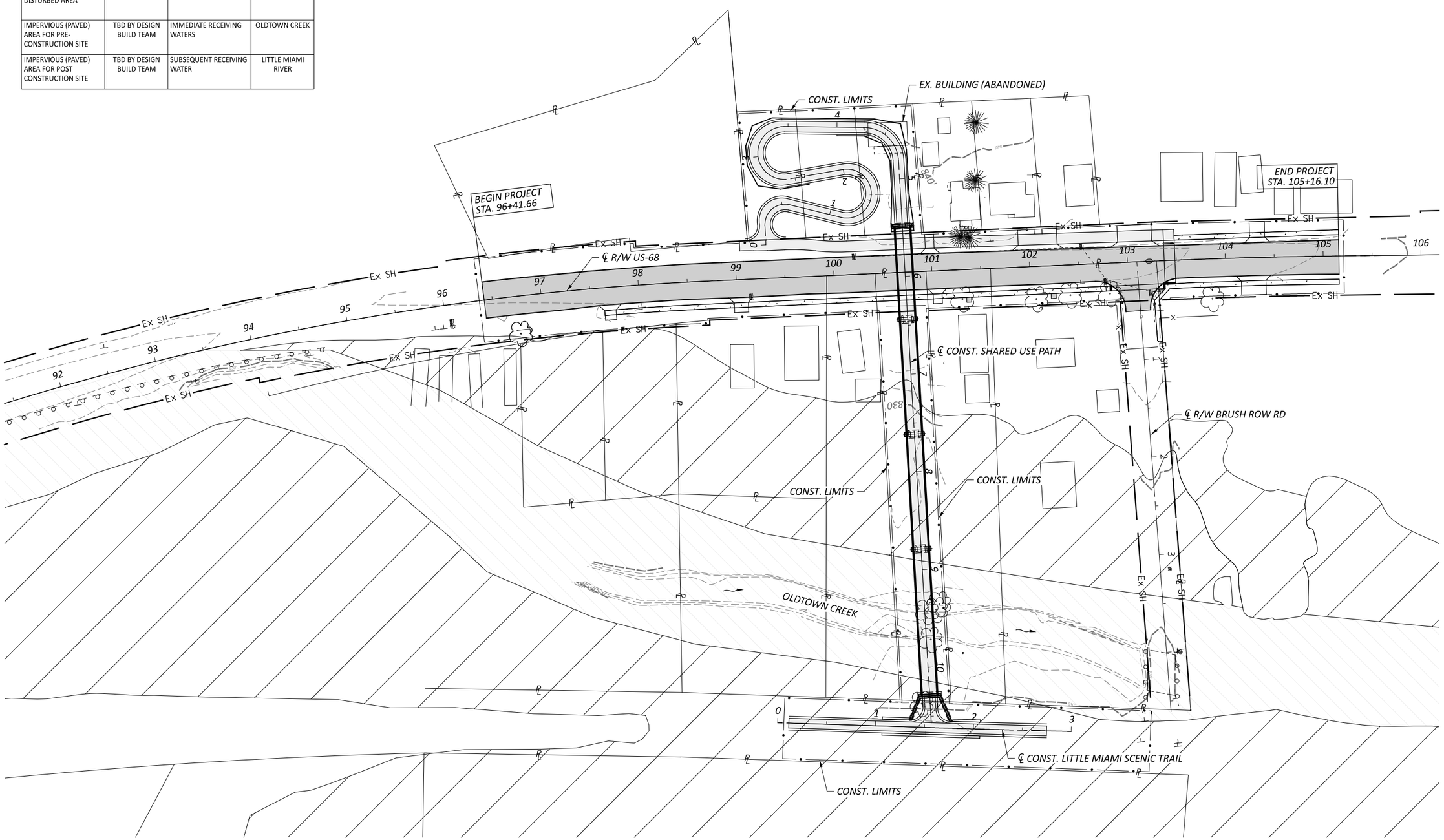
PROJECT DATA			
TOTAL AREA RIGHT OF WAY	TBD BY DESIGN BUILD TEAM	RUNOFF COEFFICIENT FOR PRE-CONSTRUCTION SITE	0.5-0.9
PROJECT EARTH DISTURBED AREA	2.24 ACRES	RUNOFF COEFFICIENT FOR POST CONSTRUCTION SITE	TBD BY DESIGN BUILD TEAM
ESTIMATED CONTRACTOR EARTH DISTURBED AREA	0.25 ACRES	POST CONSTRUCTION BMP	Required
NOTICE OF INTENT EARTH DISTURBED AREA	2.49 ACRES		
IMPERVIOUS (PAVED) AREA FOR PRE-CONSTRUCTION SITE	TBD BY DESIGN BUILD TEAM	IMMEDIATE RECEIVING WATERS	OLDTOWN CREEK
IMPERVIOUS (PAVED) AREA FOR POST CONSTRUCTION SITE	TBD BY DESIGN BUILD TEAM	SUBSEQUENT RECEIVING WATER	LITTLE MIAMI RIVER

LEGEND

FLOODPLAIN

ZONE AE REGULATORY FLOODWAY



HORIZONTAL SCALE IN FEET
0 25 50 100

PROJECT SITE PLAN

DESIGN AGENCY
fishbeck

DESIGNER	JBT
REVIEWER	JAH 11/20/23
PROJECT ID	115388
SHEET	P.09
TOTAL	22

GRE-68-12.65

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:39 PM USER: jpcarroll
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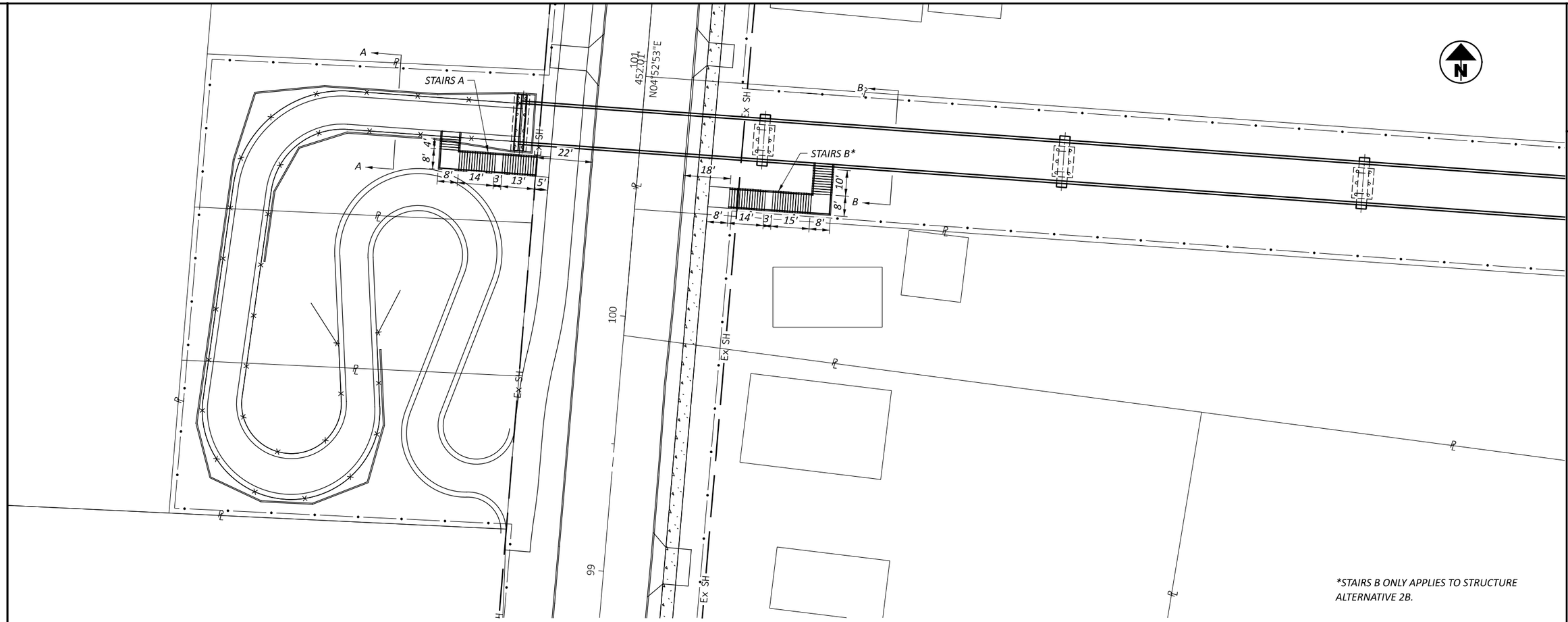
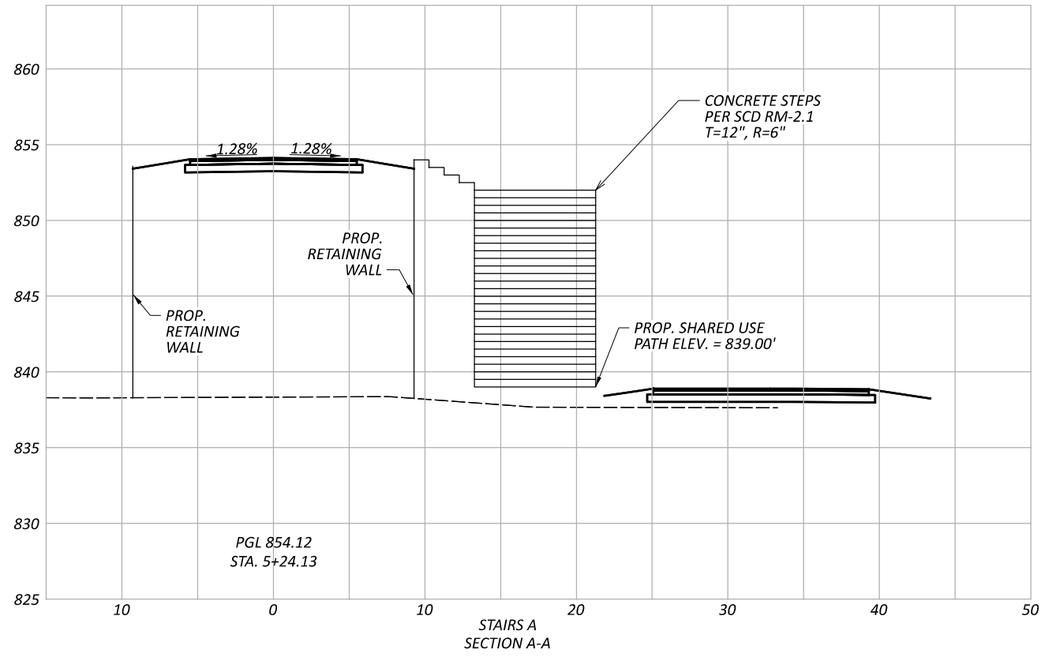
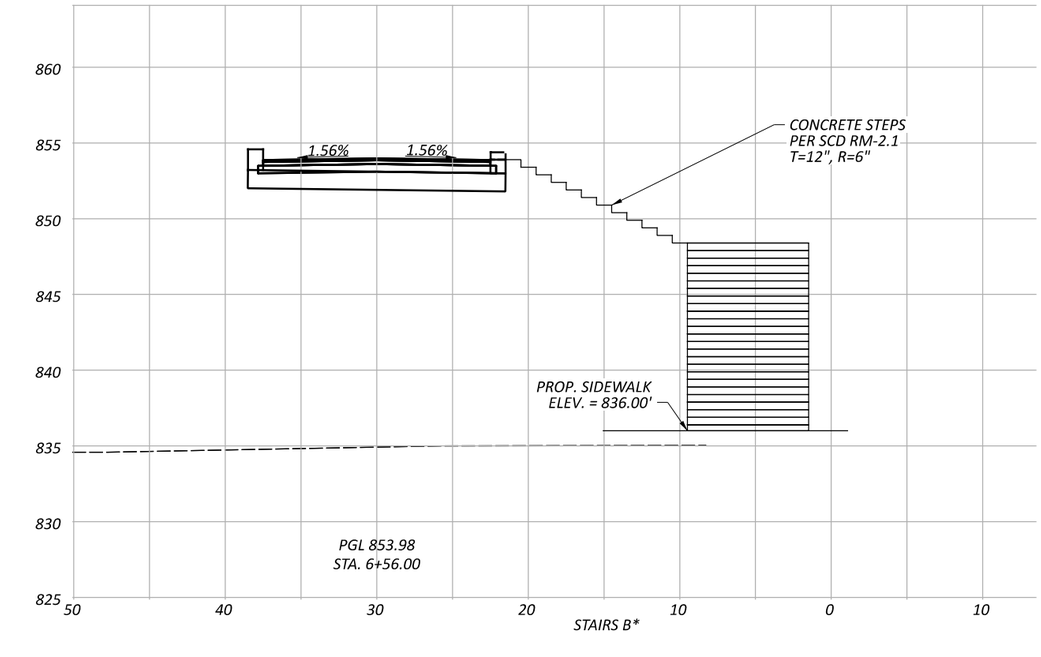


*STAIRS B ONLY APPLIES TO STRUCTURE ALTERNATIVE 2B.



STAIRS A
SECTION A-A



STAIRS B*

PLAN AND SECTION
STAIRS DETAIL

DESIGN AGENCY
fishbeck

DESIGNER	JBT
REVIEWER	JAH 11/20/23
PROJECT ID	115388
SHEET	P.10
TOTAL	22

GRE-68-12.65

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:41 PM USER: jpcarroll
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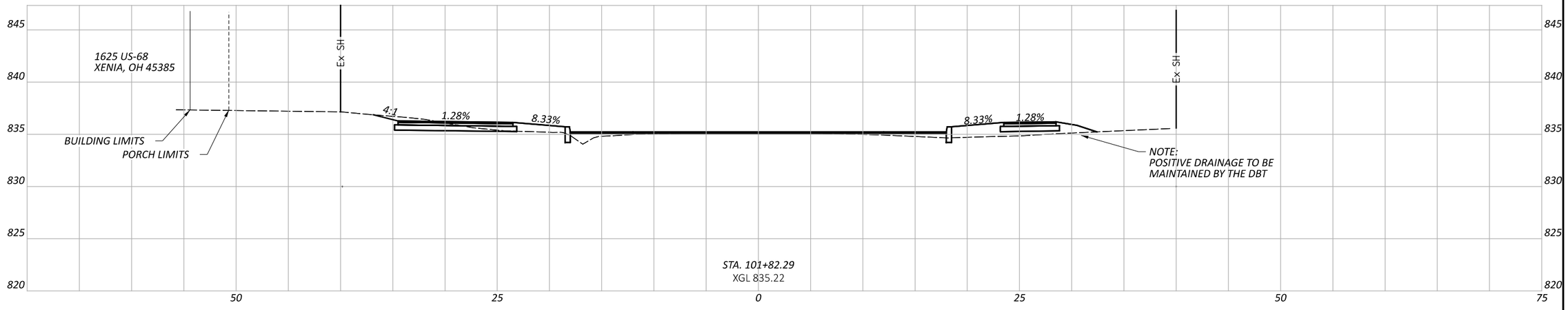

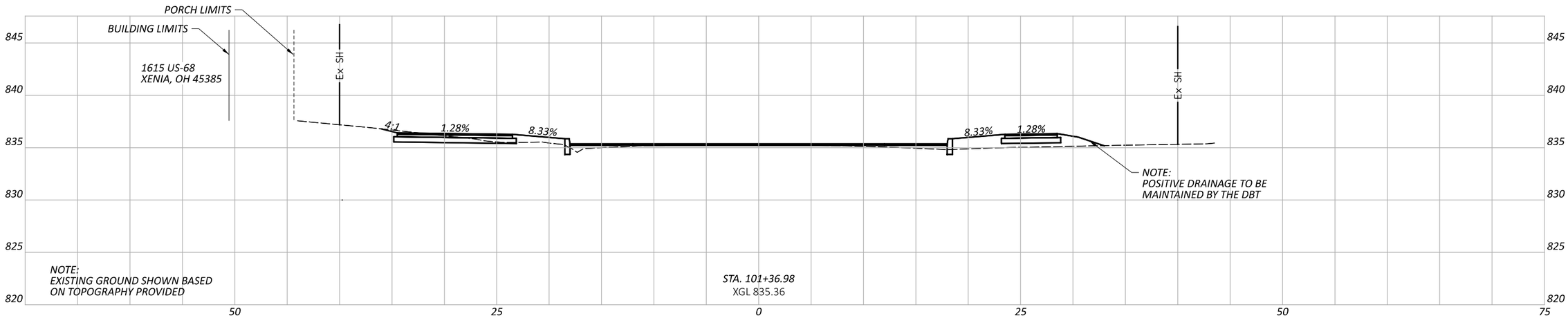

CROSS SECTIONS - US-68
STA. 101+36.98 TO STA. 101+82.29

DESIGN AGENCY
fishbeck

DESIGNER
JBT

REVIEWER
JAH 11/20/23

PROJECT ID
115388

SHEET P.11 TOTAL 22

GRE-68-12.65

MODEL: CLP_US69 - 101+36.98 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:43 PM USER: jpcarroll
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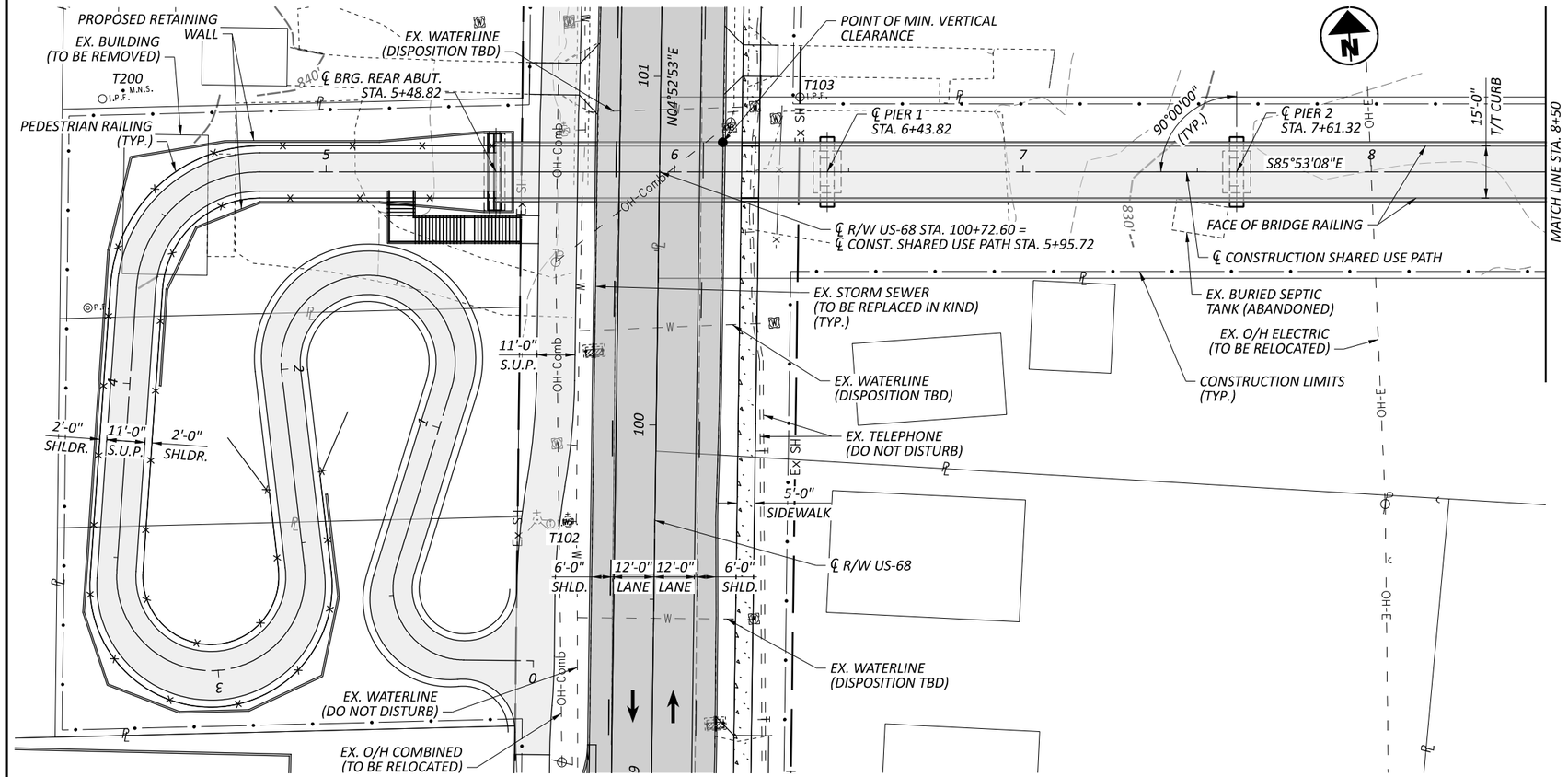
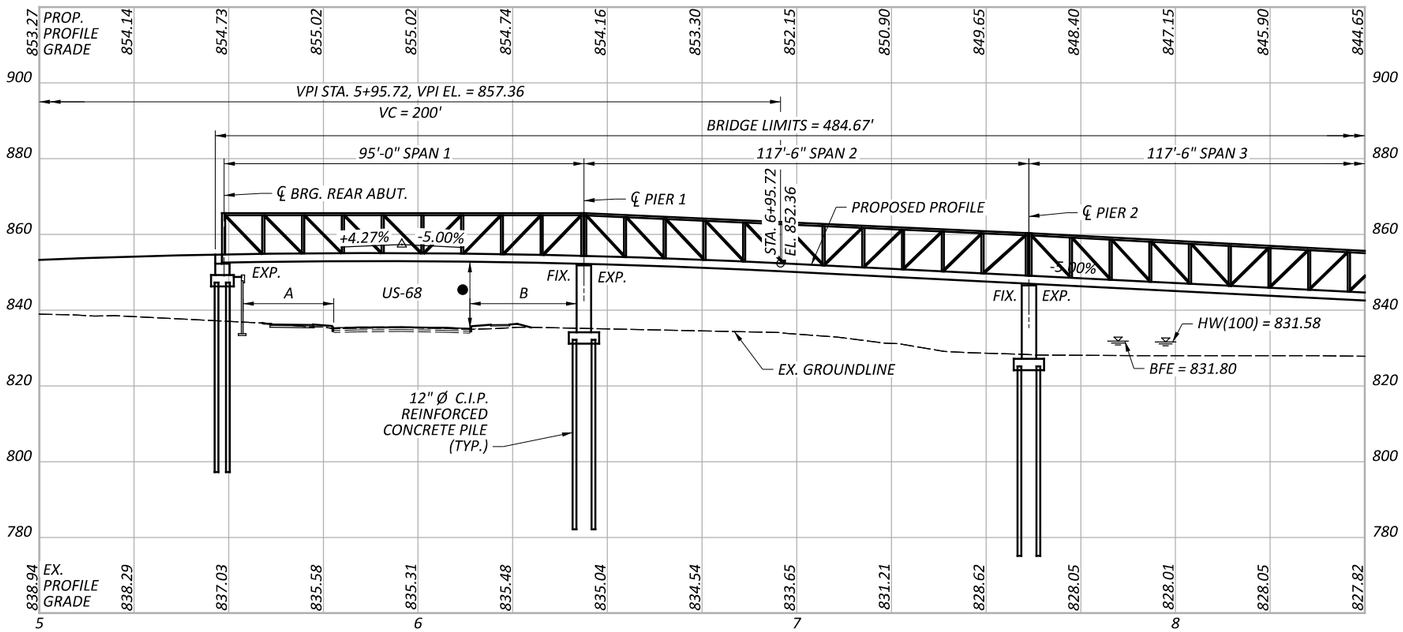


PLAN



PROFILE ALONG ℄ CONSTRUCTION SHARED USE PATH

BENCHMARK DATA

T102 STA. 99+71.31, EL. 835.661, OFFSET 29.95' LT., IRON PIN FOUND
T103 STA. 100+94.64, EL. 835.180, OFFSET 40.01' RT., IRON PIN FOUND
T110 STA. 100+72.99, EL. 831.871, OFFSET 457.01' RT., IRON PIN SET
T200 STA. 100+93.88, EL. 840.801, OFFSET 154.24' LT., MAG NAIL SET

HORIZONTAL SCALE IN FEET
0 10 20 40

NOTES:

1. *EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.*
2. *SEE ROADWAY PLANS FOR ADDITIONAL SHARED USE PATH HORIZONTAL AND VERTICAL CURVE INFORMATION.*
3. *CONCEPTUAL TRUSS STYLE SHOWN IN THE PROFILE VIEW.*
4. *FRICTION PILES WERE THE ASSUMED FOUNDATION TYPE BASED ON GEOTECHNICAL INFORMATION FOR THE NEARBY INTERPRETIVE CENTER AND HISTORIC BORING LOGS FOR GRE-68-13.40 BRIDGE OVER MASSIES CREEK NORTH OF THE PROJECT LOCATION.*

US-68 DESIGN TRAFFIC:
2026 ADT = 8,600 *2026 ADTT = 602*
2046 ADT = 8,800 *2046 ADTT = 616*
DIRECTIONAL DISTRIBUTION = 0.50

LEGEND:

- *17'-6" REQUIRED MINIMUM VERTICAL CLEARANCE*
  17'-10¼" ACTUAL MINIMUM VERTICAL CLEARANCE

A - REQUIRED HORIZONTAL CLEARANCE = 19'-0"
MIN. HORIZONTAL CLEARANCE = 23'-9½"

B - REQUIRED HORIZONTAL CLEARANCE = 19'-0"
MIN. HORIZONTAL CLEARANCE = 27'-11¾"

PROP. SHARED USE PATH
PROP. PAVEMENT
PROP. WALK

HYDRAULIC DATA:

DRAINAGE AREA = 10.6 SQ. MILES
Q (100) = 2000 CFS *V (100) = 1.7 FT/S*
STRUCTURE CLEARS THE 100 YEAR DESIGN HW BY 2.09 FEET.

EXISTING STRUCTURE - NONE

PROPOSED STRUCTURE

TYPE: FOUR SPAN PREFABRICATED PAINTED STEEL TRUSS SUPERSTRUCTURE WITH REINFORCED CONCRETE DECK ON REINFORCED CONCRETE ABUTMENTS AND PIERS SUPPORTED ON CAST-IN-PLACE REINFORCED CONCRETE PILES

SPANS: 95'-0", 117'-6", 117'-6", 150'-0" (SEE PLAN)
ROADWAY: 15'-0" TOE/TOE CURB
LOADING: 0.090 KSF PEDESTRIAN LOAD AND H15-44 VEHICULAR LOAD
SKEW: NONE
WEARING SURFACE: 1" MONOLITHIC CONCRETE
APPROACH SLABS: NONE
ALIGNMENT: TANGENT
CROWN: 0.0156 FT/FT
DECK AREA: 8,180 SF

COORDINATES: LATITUDE N39°43'46.65"
LONGITUDE W83°56'12.36"

ALTERNATIVE 2A - SITE PLAN (1 OF 2)
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

SFN	2926107
DESIGN AGENCY	fishbeck
DESIGNER	BMG
CHECKER	TLC
REVIEWER	JPC 11/27/23
PROJECT ID	115388
SUBSET	S1.1
TOTAL	5
SHEET	P.12
TOTAL	22

GRE-68-12.65

MODEL: CLP_SUP_MAIN-1 - Plan 1 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:45 PM USER: jpcarroll
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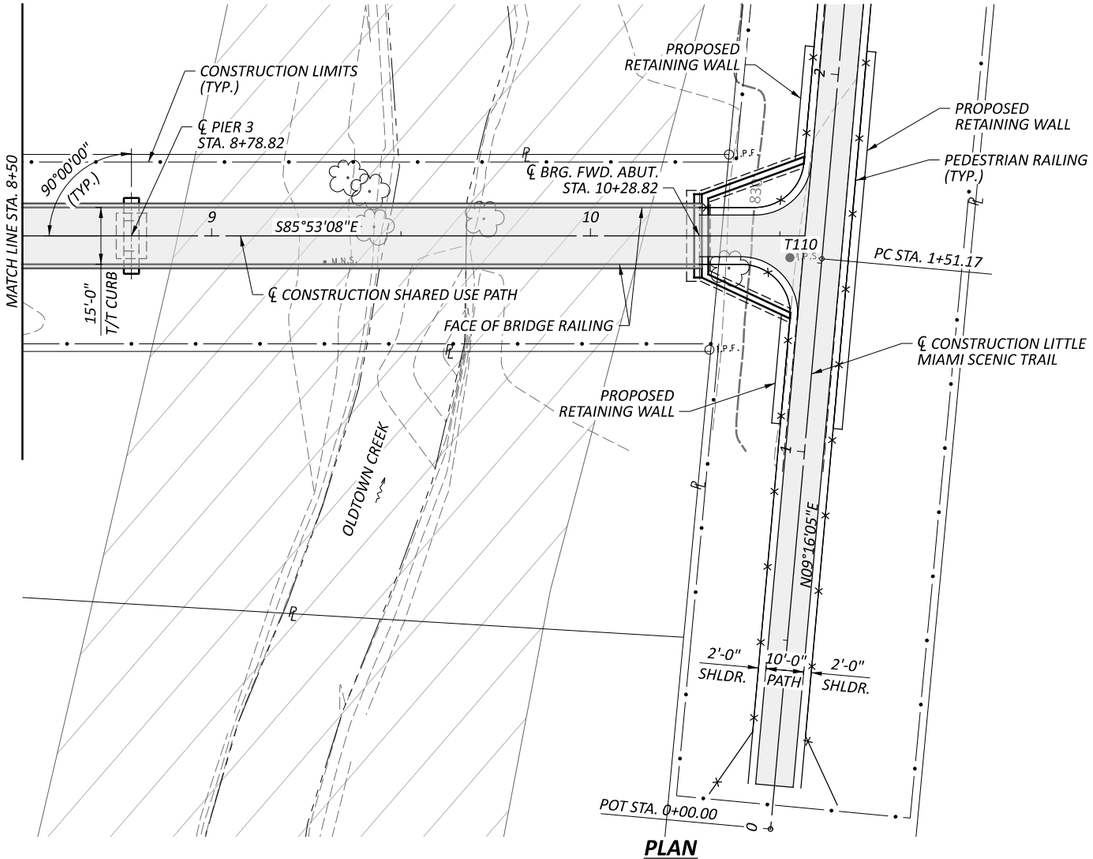
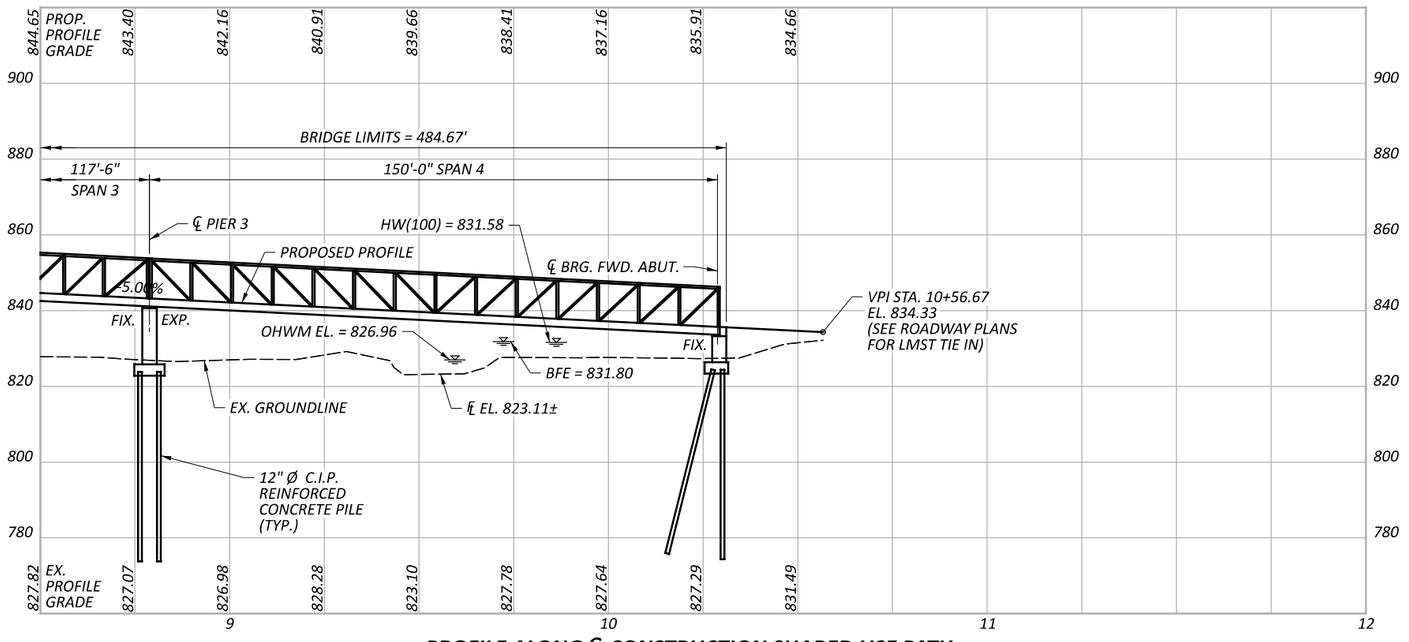


PLAN



PROFILE ALONG ℄ CONSTRUCTION SHARED USE PATH

LEGEND:

- LIMITS OF FLOODWAY
- PROP. SHARED USE PATH

NOTES:

1. FOR ADDITIONAL NOTES AND INFORMATION, SEE SHEET S1.1 / 5 .

HORIZONTAL SCALE IN FEET
0 10 20 40

ALTERNATIVE 2A - SITE PLAN (2 OF 2)
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

SFN	2926107
DESIGN AGENCY	fishbeck
DESIGNER	BMG
CHECKER	TLC
REVIEWER	JPC 11/27/23
PROJECT ID	115388
SUBSET	S1.2
TOTAL	5
SHEET	P.13
TOTAL	22

GRE-68-12.65

MODEL: CLP_SUP_MAIN-1 - Plan 2 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:47 PM USER: jpcarroll
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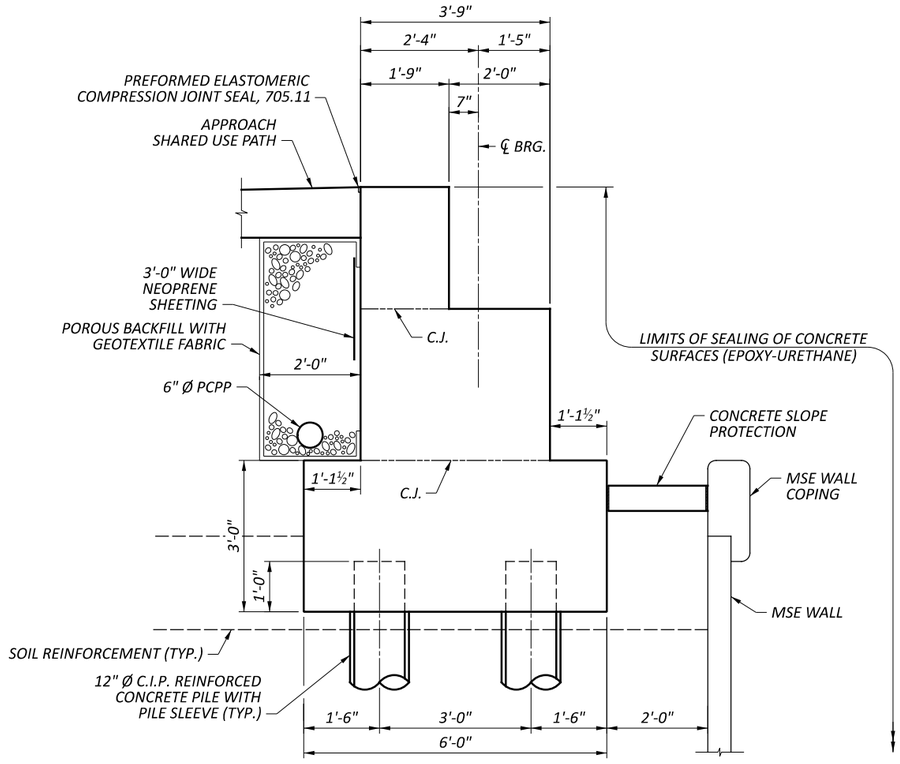
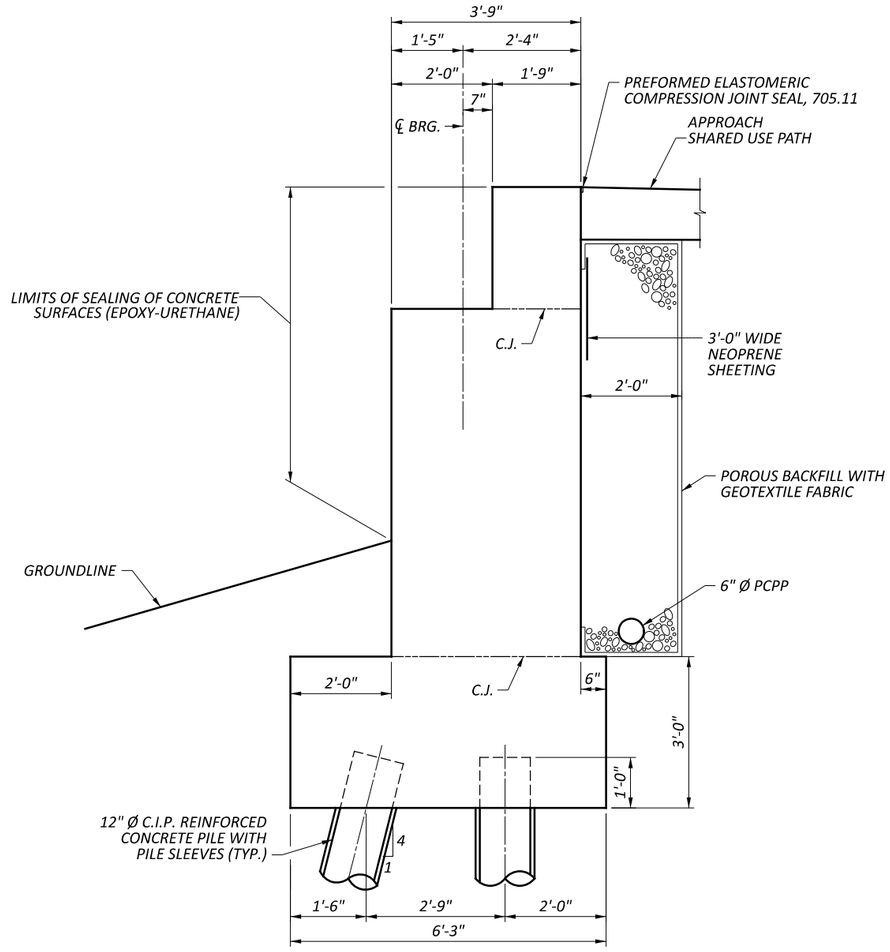


REAR ABUTMENT SECTION



FORWARD ABUTMENT SECTION

NOTES:

1. *SUPERSTRUCTURE NOT SHOWN, INCLUDING STRIP SEAL EXPANSION JOINTS AND ELASTOMERIC BEARING ASSEMBLIES.*

ALTERNATIVE 2A- ABUTMENT DETAILS
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US 68 AND OLD TOWN CREEK

SFN 2926107
DESIGN AGENCY fishbeck
DESIGNER TLC | CHECKER BMG
REVIEWER JPC 11/27/23
PROJECT ID 115388
SUBSET S1.3 | TOTAL 5
SHEET P.14 | TOTAL 22

GRE-68-12.65

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:48 PM USER: jpcarroll
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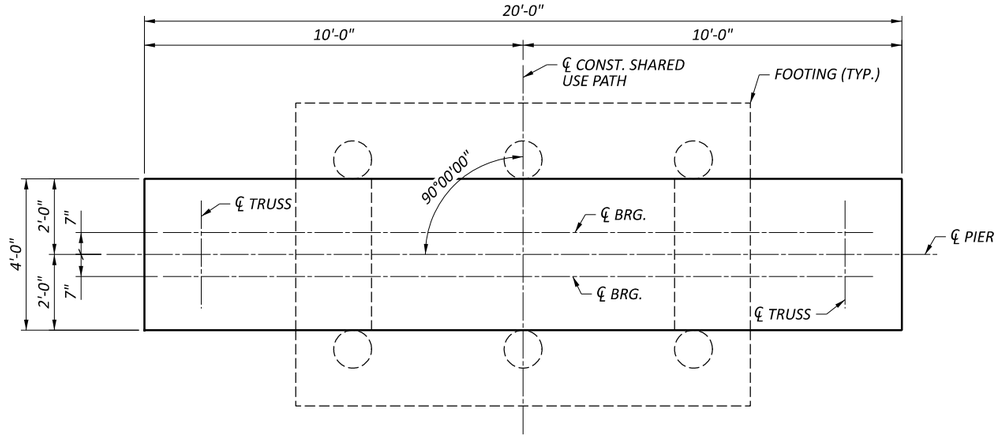
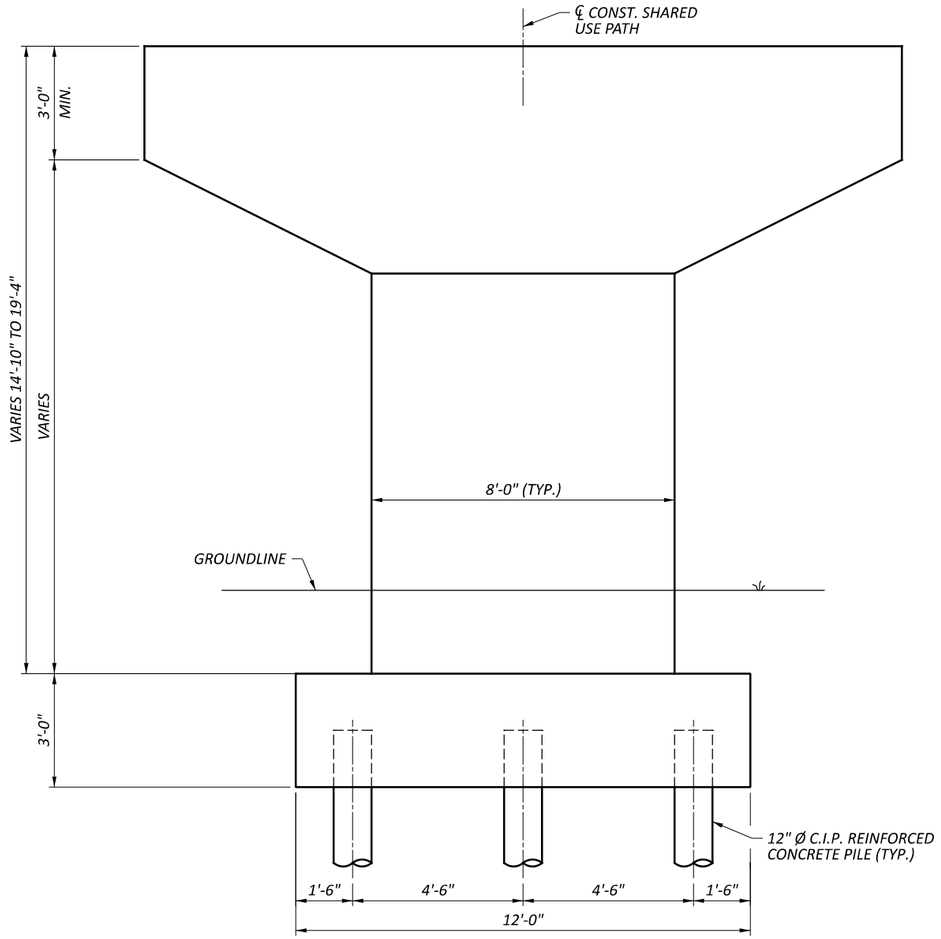
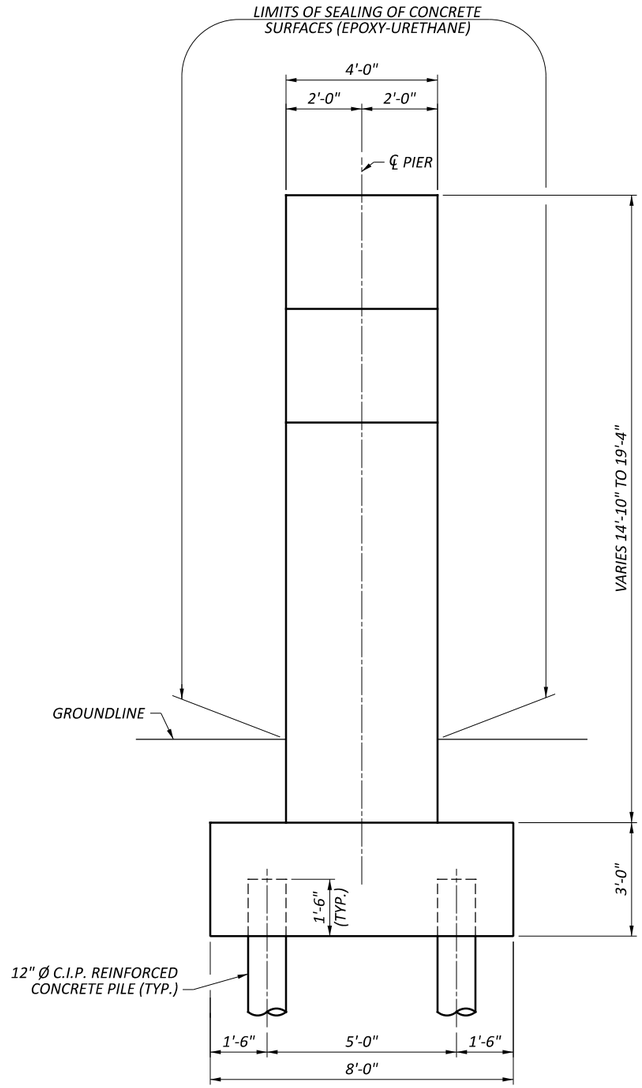


PLAN



ELEVATION



PIER SECTION

NOTES:

1. *SUPERSTRUCTURE NOT SHOWN, INCLUDING STRIP SEAL EXPANSION JOINTS AND ELASTOMERIC BEARING ASSEMBLIES.*

ALTERNATIVE 2A - PIER DETAILS
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

SFN	2926107
DESIGN AGENCY	fishbeck
DESIGNER	TLC
CHECKER	BMG
REVIEWER	JPC 11/27/23
PROJECT ID	115388
SUBSET	S1.4
TOTAL	5
SHEET	P.15
TOTAL	22

GRE-68-12.65

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:48 PM USER: jpcarroll
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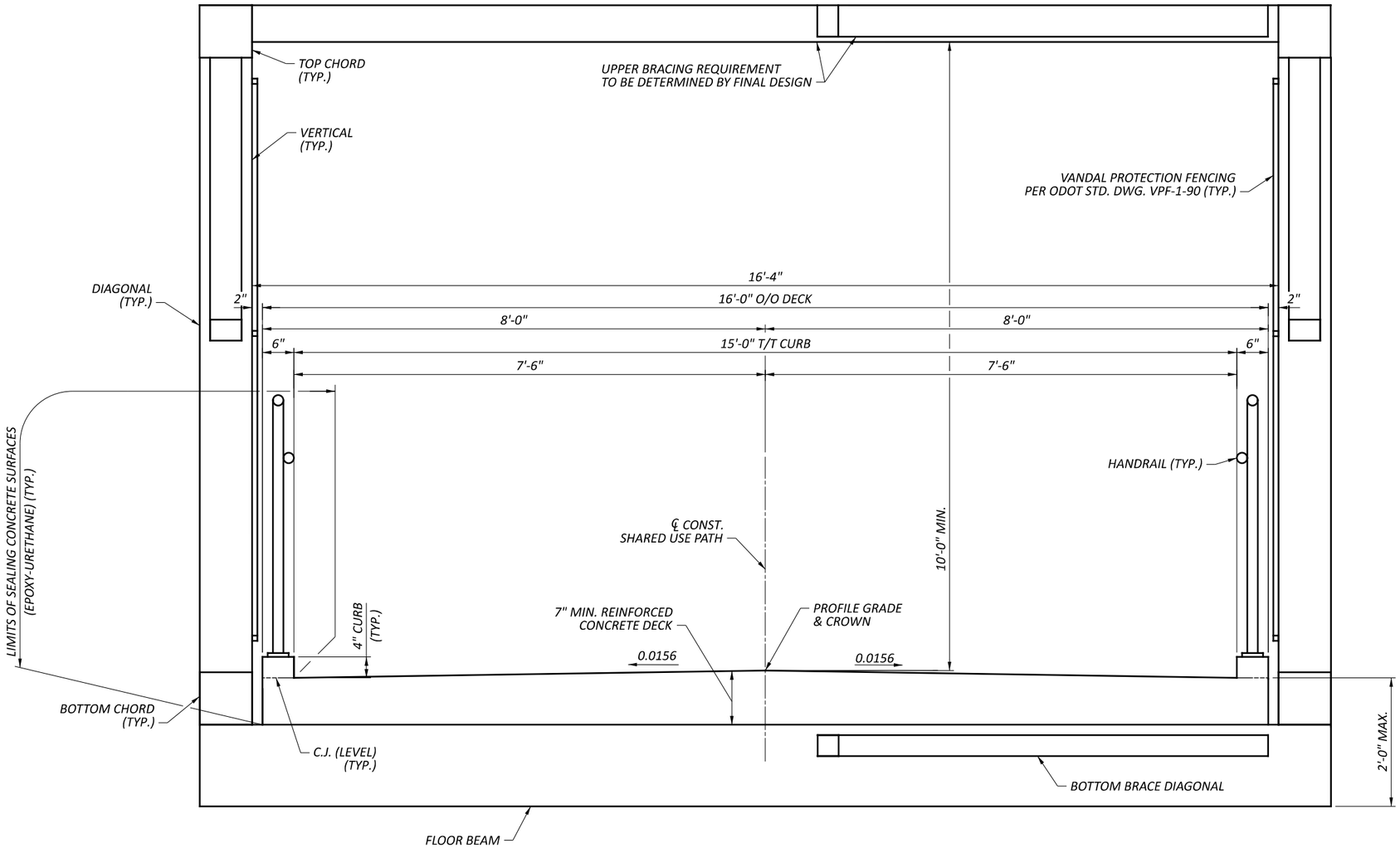

TRANSVERSE SECTION

(PREFABRICATED PAINTED STEEL TRUSS DESIGNED BY OTHERS)
(VANDAL PROTECTION FENCING EXCLUDED ON SPANS 2, 3 & 4)

NOTES:

1. *CONCEPTUAL TRUSS STYLE SHOWN IN THE TRANSVERSE SECTION.*

ALTERNATIVE 2A- TRANSVERSE SECTION
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

SFN	2926107
DESIGN AGENCY	fishbeck
DESIGNER / CHECKER	NCS / BMG
REVIEWER	JPC 11/27/23
PROJECT ID	115388
SUBSET / TOTAL	S1.5 / 5
SHEET / TOTAL	P.16 / 22

GRE-68-12.65

MODEL: Sheet PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:49 PM USER: jpcarroll
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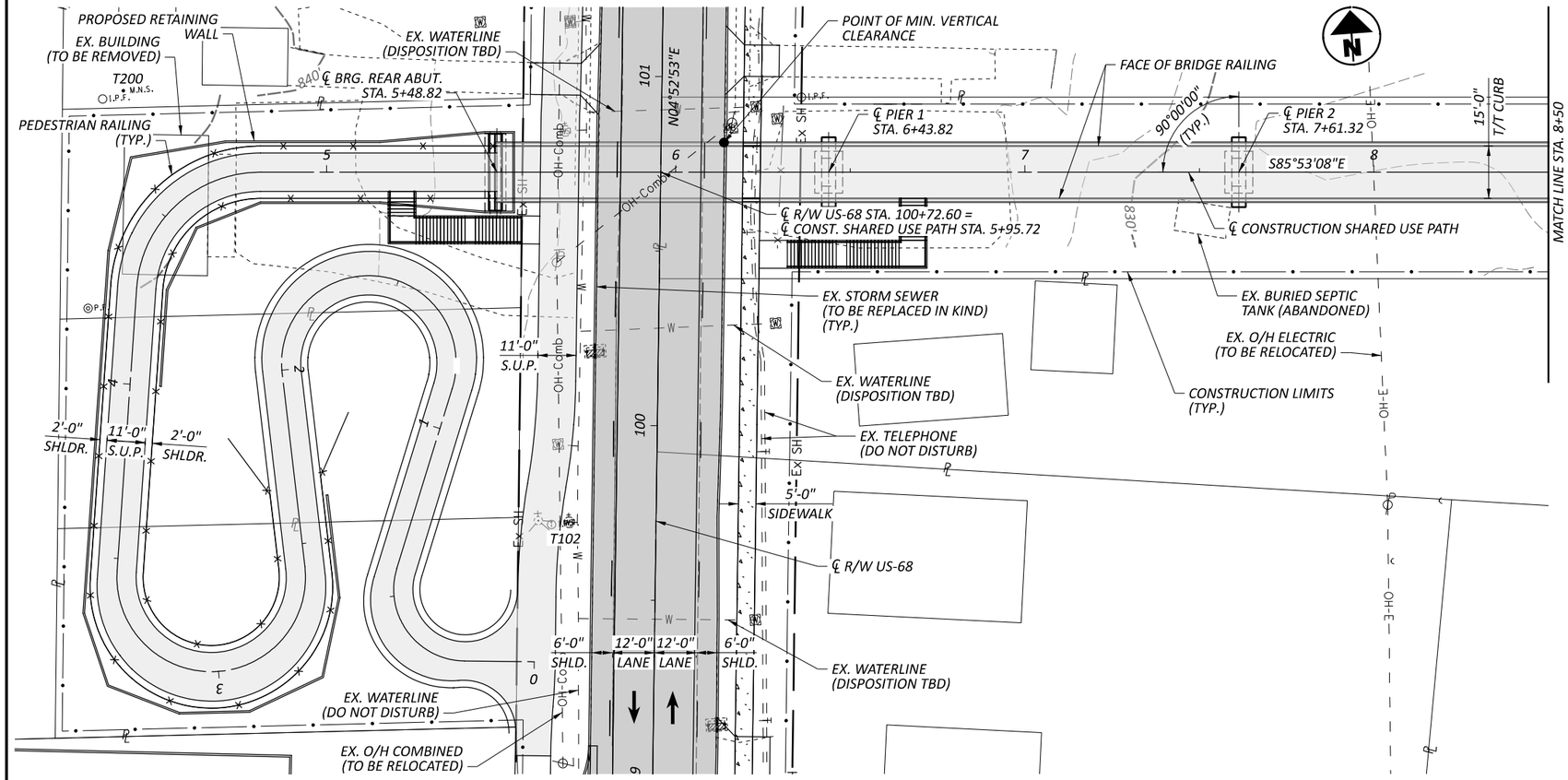
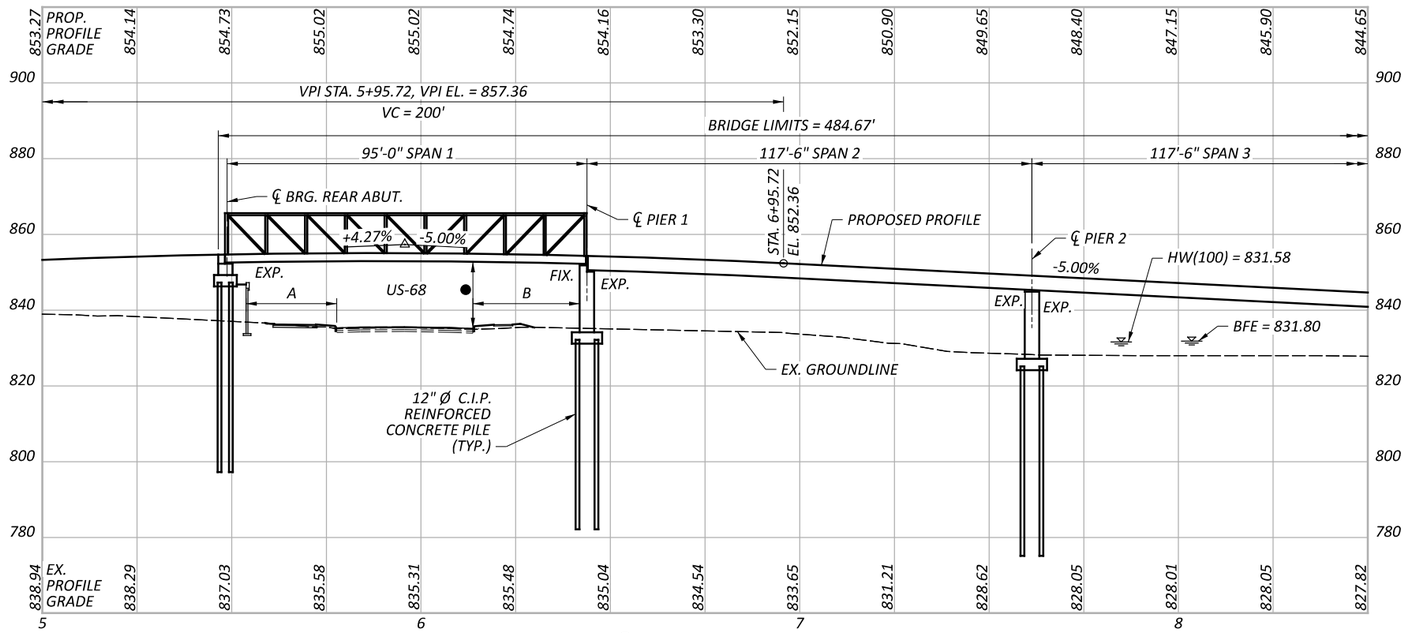


PLAN



PROFILE ALONG ℄ CONSTRUCTION SHARED USE PATH

BENCHMARK DATA

T102 STA. 99+71.31, EL. 835.661, OFFSET 29.95' LT., IRON PIN FOUND
T103 STA. 100+94.64, EL. 835.180, OFFSET 40.01' RT., IRON PIN FOUND
T110 STA. 100+72.99, EL. 831.871, OFFSET 457.01' RT., IRON PIN SET
T200 STA. 100+93.88, EL. 840.801, OFFSET 154.24' LT., MAG NAIL SET

HORIZONTAL SCALE IN FEET
0 10 20 40

NOTES:

1. EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.
2. SEE ROADWAY PLANS FOR ADDITIONAL SHARED USE PATH HORIZONTAL AND VERTICAL CURVE INFORMATION.
3. CONCEPTUAL TRUSS STYLE SHOWN IN THE PROFILE VIEW.
4. FRICTION PILES WERE THE ASSUMED FOUNDATION TYPE BASED ON GEOTECHNICAL INFORMATION FOR THE NEARBY INTERPRETIVE CENTER AND HISTORIC BORING LOGS FOR GRE-68-13.40 BRIDGE OVER MASSIES CREEK NORTH OF THE PROJECT LOCATION.

US-68 DESIGN TRAFFIC:
2026 ADT = 8,600 2026 ADTT = 602
2046 ADT = 8,800 2046 ADTT = 616
DIRECTIONAL DISTRIBUTION = 0.50

LEGEND:

● 17'-6" REQUIRED MINIMUM VERTICAL CLEARANCE
17'-10¼" ACTUAL MINIMUM VERTICAL CLEARANCE

A - REQUIRED HORIZONTAL CLEARANCE = 19'-0"
MIN. HORIZONTAL CLEARANCE = 23'-9½"

B - REQUIRED HORIZONTAL CLEARANCE = 19'-0"
MIN. HORIZONTAL CLEARANCE = 27'-11¾"

PROP. SHARED USE PATH
PROP. PAVEMENT
PROP. WALK

HYDRAULIC DATA:

DRAINAGE AREA = 10.6 SQ. MILES
Q (100) = 2000 CFS V (100) = 1.7 FT/S
STRUCTURE CLEARS THE 100 YEAR DESIGN HW BY 2.09 FEET.

EXISTING STRUCTURE - NONE

PROPOSED STRUCTURE

TYPE: FOUR SPAN PREFABRICATED PAINTED STEEL TRUSS AND WIDE FLANGE BEAM SUPERSTRUCTURE WITH REINFORCED CONCRETE DECK ON REINFORCED CONCRETE ABUTMENTS AND PIERS SUPPORTED ON CAST-IN-PLACE REINFORCED CONCRETE PILES

SPANS: 95'-0", 117'-6", 117'-6", 150'-0" (SEE PLAN)
ROADWAY: 15'-0" TOE/TOE CURB
LOADING: 0.090 KSF PEDESTRIAN LOAD AND H15-44 VEHICULAR LOAD
SKEW: NONE
WEARING SURFACE: 1" MONOLITHIC CONCRETE
APPROACH SLABS: NONE
ALIGNMENT: TANGENT
CROWN: 0.0156 FT/FT
DECK AREA: 8,180 SF

COORDINATES: LATITUDE N39°43'46.65"
LONGITUDE W83°56'12.36"

ALTERNATIVE 2B - SITE PLAN (1 OF 2)
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

SFN	2926107
DESIGN AGENCY	fishbeck
DESIGNER	BMG
CHECKER	TLC
REVIEWER	JPC 11/27/23
PROJECT ID	115388
SUBSET	S2.1
TOTAL	6
SHEET	P.17
TOTAL	22

GRE-68-12.65

MODEL: CLP_SUP_MAIN-1 - Plan 1 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:52 PM USER: jpcarroll
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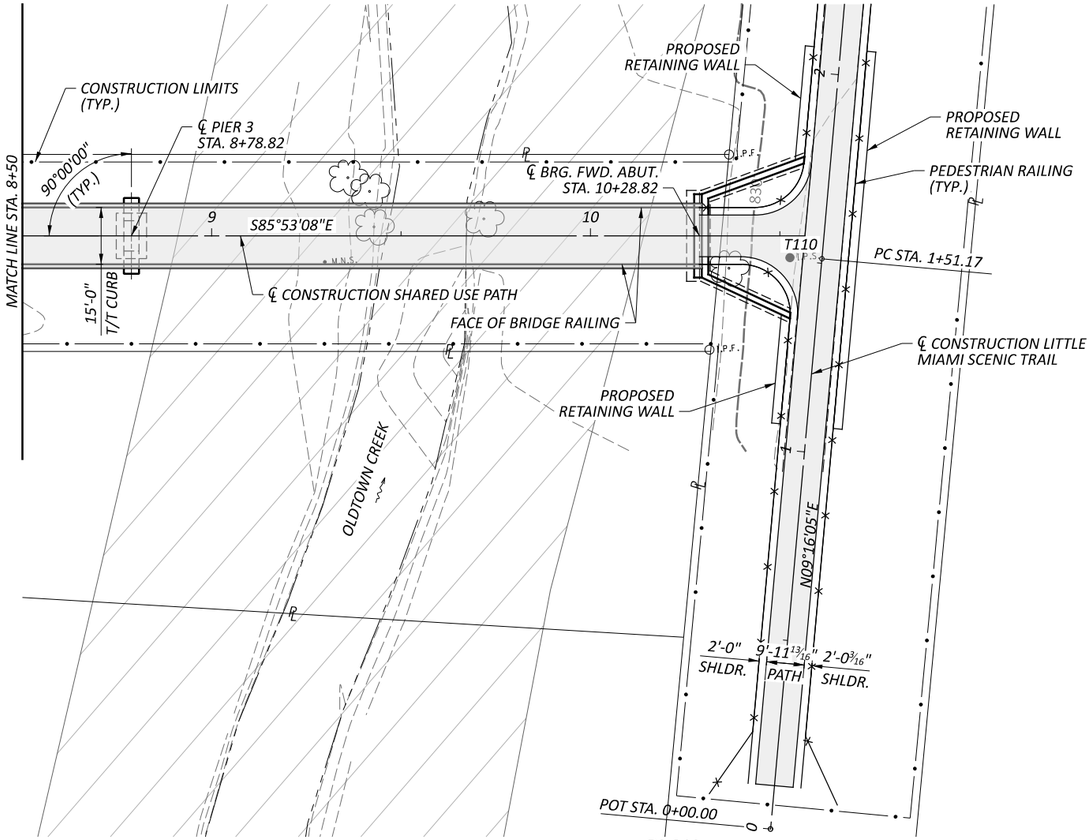
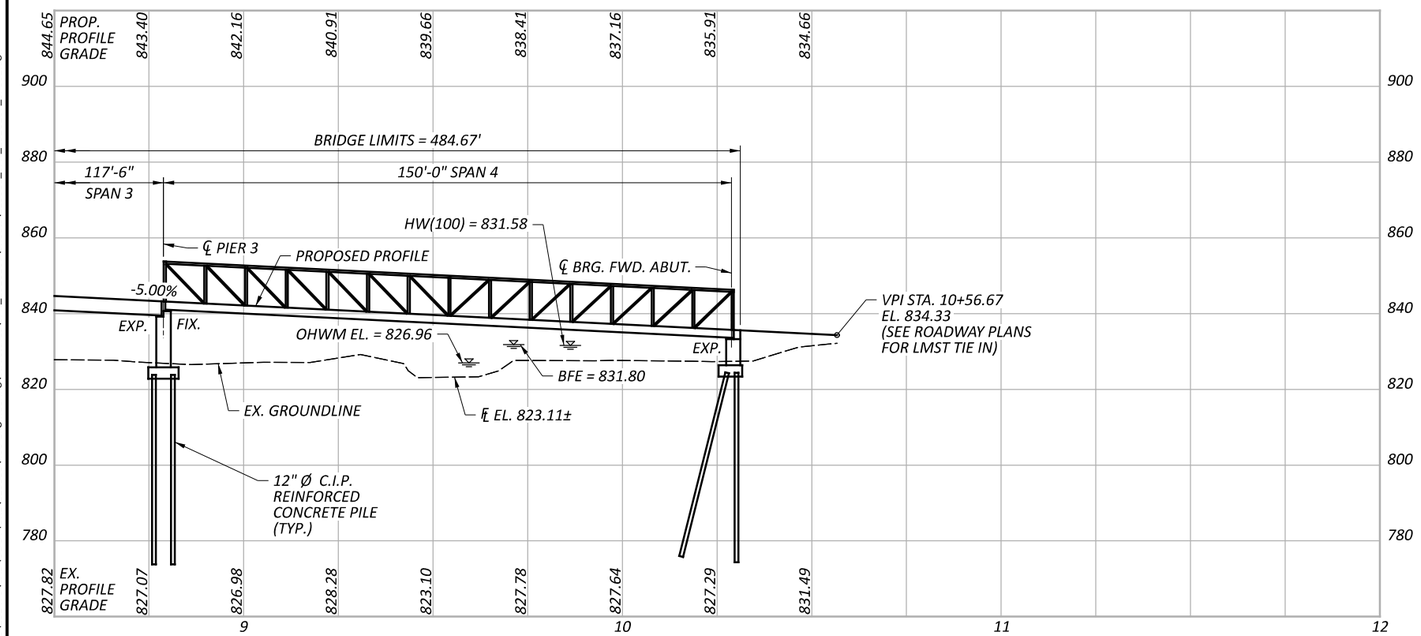


PLAN



PROFILE ALONG ℄ CONSTRUCTION SHARED USE PATH

LEGEND:

- LIMITS OF FLOODWAY
- PROP. SHARED USE PATH

NOTES:

1. FOR ADDITIONAL NOTES AND INFORMATION, SEE SHEET S2.1 / 6 .

HORIZONTAL SCALE IN FEET
0 10 20 40

ALTERNATIVE 2B - SITE PLAN (2 OF 2)
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

SFN 2926107
DESIGN AGENCY fishbeck
DESIGNER BMG | CHECKER TLC
REVIEWER JPC 11/27/23
PROJECT ID 115388
SUBSET S2.2 | TOTAL 6
SHEET P.18 | TOTAL 22

GRE-68-12.65

MODEL: CLP_SUP_MAIN-1 - Plan 2 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:53 PM USER: jpcarroll
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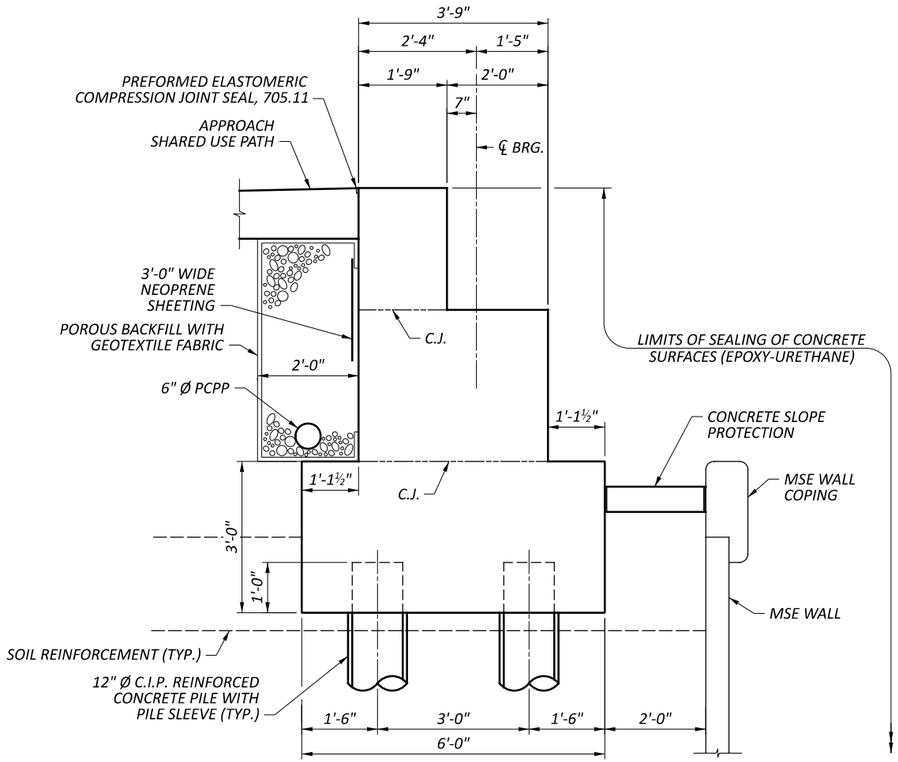
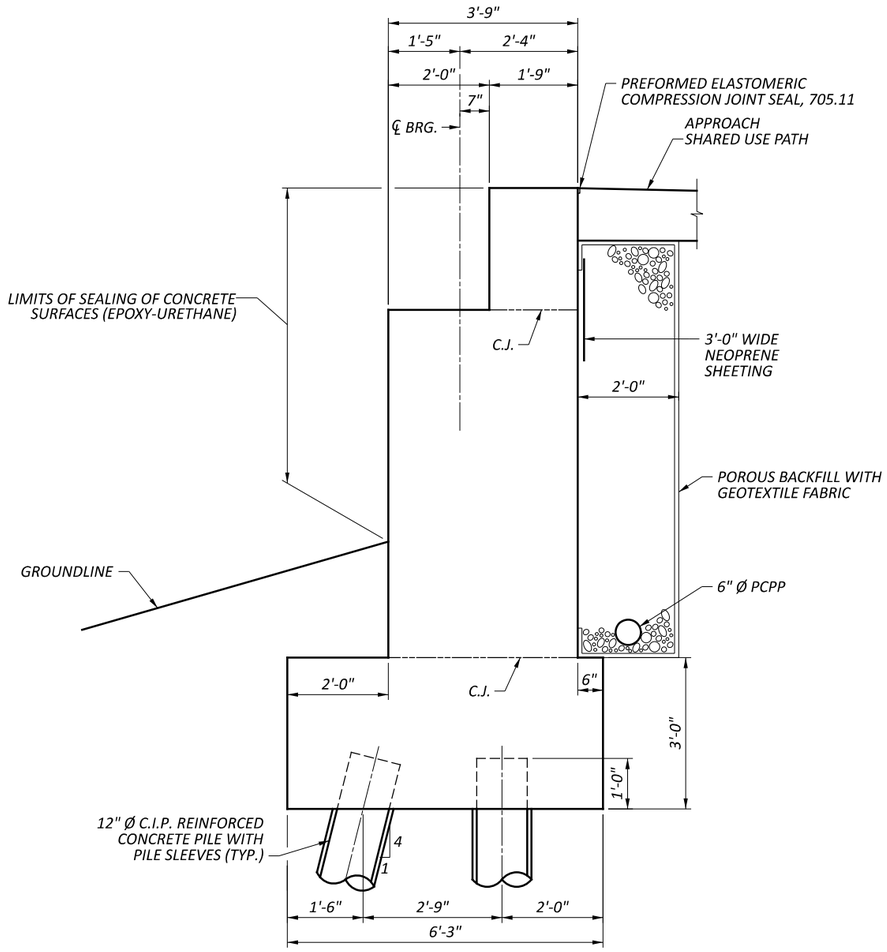


REAR ABUTMENT SECTION



FORWARD ABUTMENT SECTION

NOTES:

1. *SUPERSTRUCTURE NOT SHOWN, INCLUDING STRIP SEAL EXPANSION JOINTS AND ELASTOMERIC BEARING ASSEMBLIES.*

ALTERNATIVE 2B - ABUTMENT DETAILS
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US 68 AND OLD TOWN CREEK

SFN 2926107
DESIGN AGENCY fishbeck
DESIGNER TLC | CHECKER BMG
REVIEWER JPC 11/27/23
PROJECT ID 115388
SUBSET S2.3 | TOTAL 6
SHEET P.19 | TOTAL 22

GRE-68-12.65

MODEL: Sheet - ALT 2 PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:54 PM USER: jpcarroll
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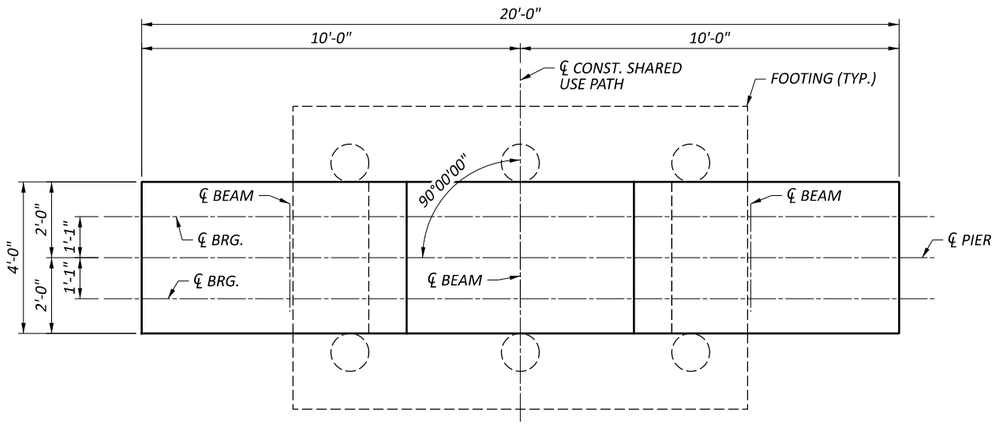
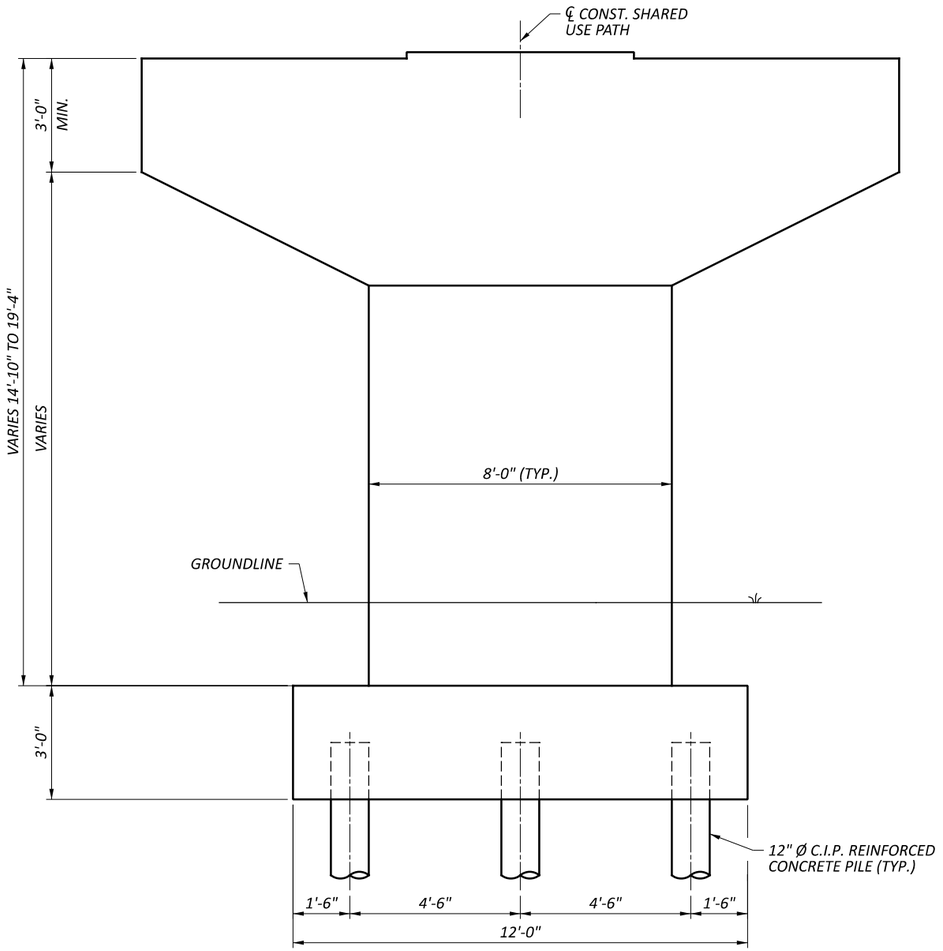
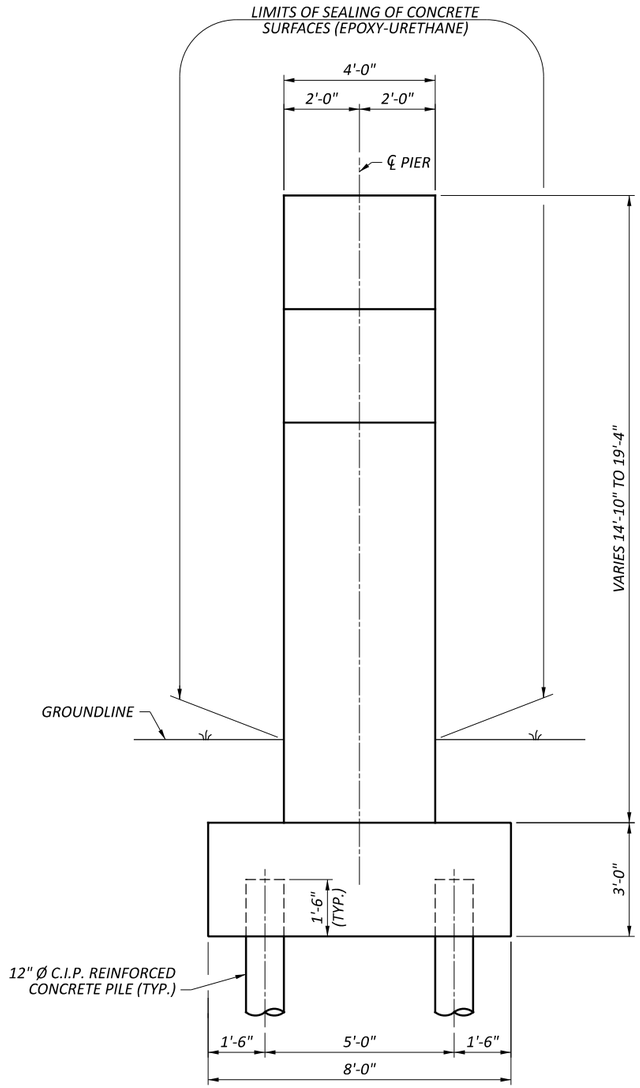


PLAN
(PIER 2 SHOWN)



ELEVATION
(PIER 2 SHOWN)



PIER SECTION

NOTES:

1. *SUPERSTRUCTURE NOT SHOWN, INCLUDING STRIP SEAL EXPANSION JOINTS AND ELASTOMERIC BEARING ASSEMBLIES.*
2. *PIERS 1 AND 3 SHALL HAVE A STEP IN THE CAP TO ACCOMMODATE DIFFERENCE IN SUPERSTRUCTURE DEPTH.*

ALTERNATIVE 2B - PIER DETAILS
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

SFN	2926107
DESIGN AGENCY	fishbeck
DESIGNER	TLC
CHECKER	BMG
REVIEWER	JPC 11/27/23
PROJECT ID	115388
SUBSET	S2.4
TOTAL	6
SHEET	P.20
TOTAL	22

GRE-68-12.65

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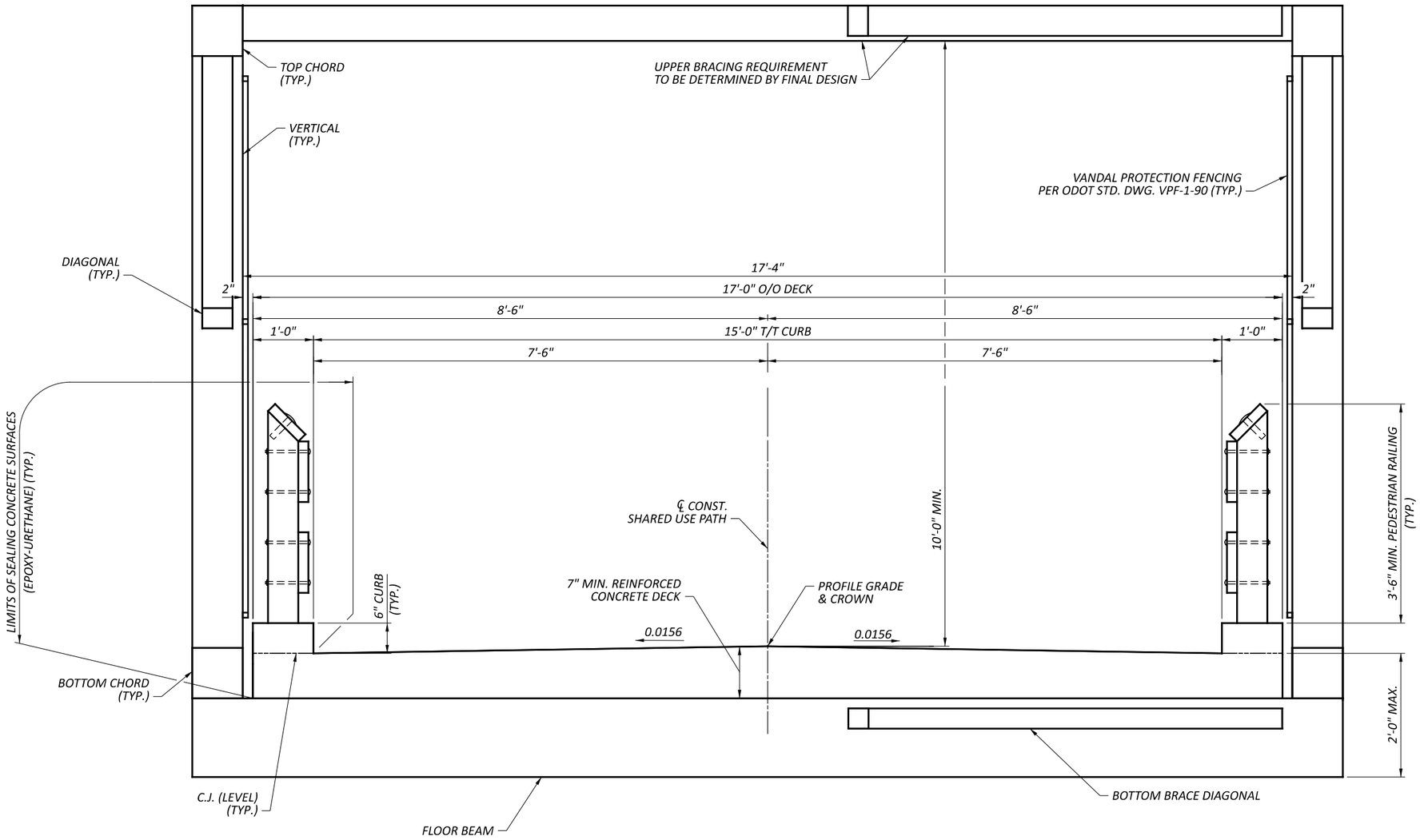

TRANSVERSE SECTION

(PREFABRICATED PAINTED STEEL TRUSS DESIGNED BY OTHERS)
(SPANS 1 AND 4)
(VANDAL PROTECTION FENCING EXCLUDED ON SPANS 2, 3, & 4)

NOTES:

1. CONCEPTUAL TRUSS STYLE SHOWN IN THE TRANSVERSE SECTION.

ALTERNATIVE 2B - TRANSVERSE SECTION (1 OF 2)
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US 68 AND OLD TOWN CREEK

SFN	2926107
DESIGN AGENCY	fishbeck
DESIGNER	NCS
CHECKER	BMG
REVIEWER	JPC 11/27/23
PROJECT ID	115388
SUBSET	S2.5
TOTAL	6
SHEET	P.21
TOTAL	22

GRE-68-12.65

MODEL: Truss Sheet PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:55 PM USER: jpcarroll
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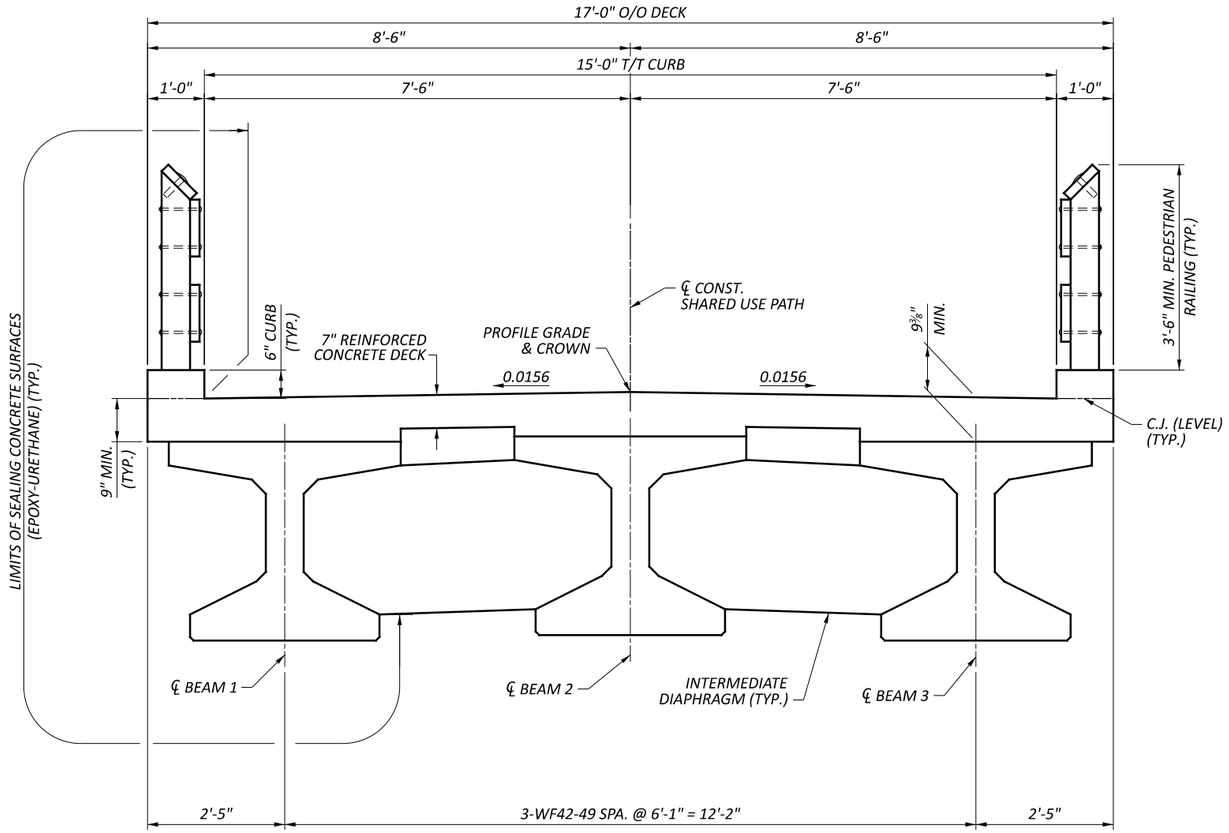

TRANSVERSE SECTION

(SPANS 2 AND 3)

GRE-68-12.65

MODEL: Transverse Sheet PAPERSIZE: 17x11 (in.) DATE: 1/2/2024 TIME: 2:10:56 PM USER: jpcarroll
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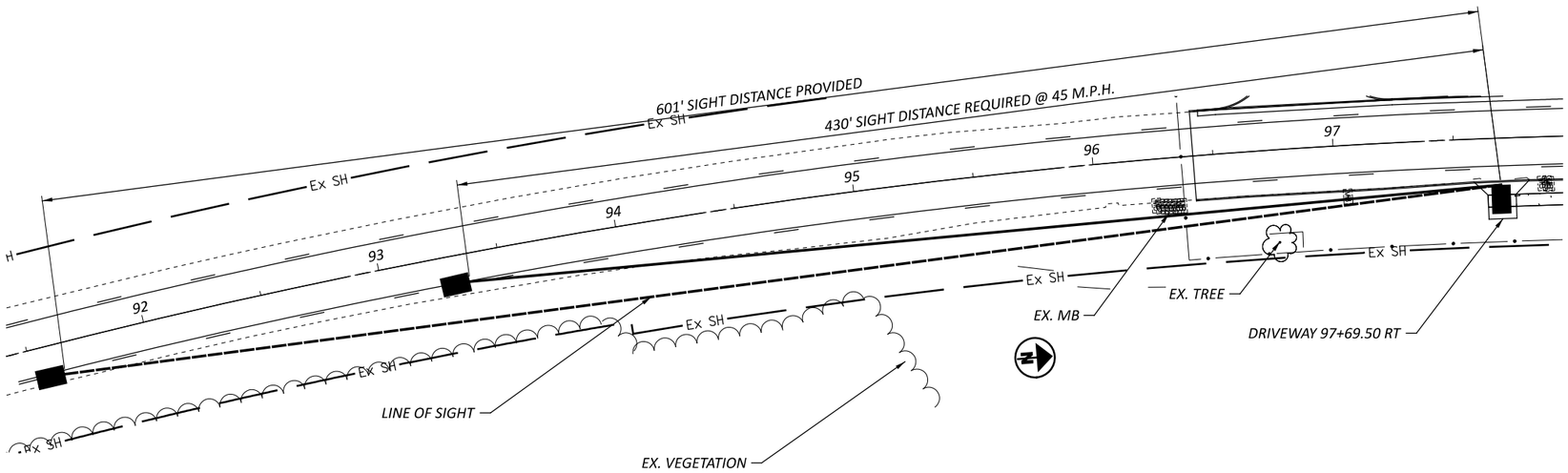
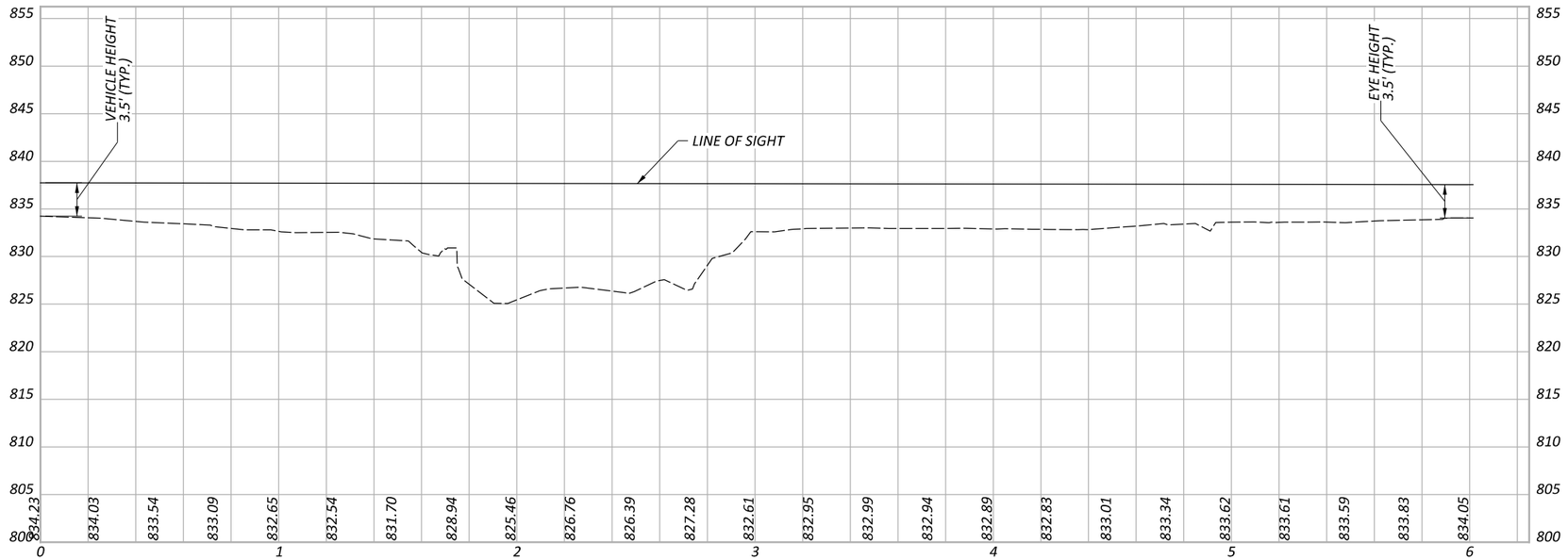
ALTERNATIVE 2B - TRANSVERSE SECTION (2 OF 2)
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US 68 AND OLD TOWN CREEK

SFN	2926107
DESIGN AGENCY	fishbeck
DESIGNER	NCS
CHECKER	BMG
REVIEWER	JPC 11/27/23
PROJECT ID	115388
SUBSET	S2.6
TOTAL	6
SHEET	P.22
TOTAL	22

Appendix C – Sight Distance Exhibits





NOTE: FUTURE TWO WAY LEFT TURN LANE SHOWN FOR ALL PROPOSED EXHIBITS

GRE-US68-12.65

MODEL: DWPLAN - 97+69.50RT [Sheet] PAPERSIZE: 17x11 (in.) DATE: 12/28/2023 TIME: 4:02:50 PM USER: jlight
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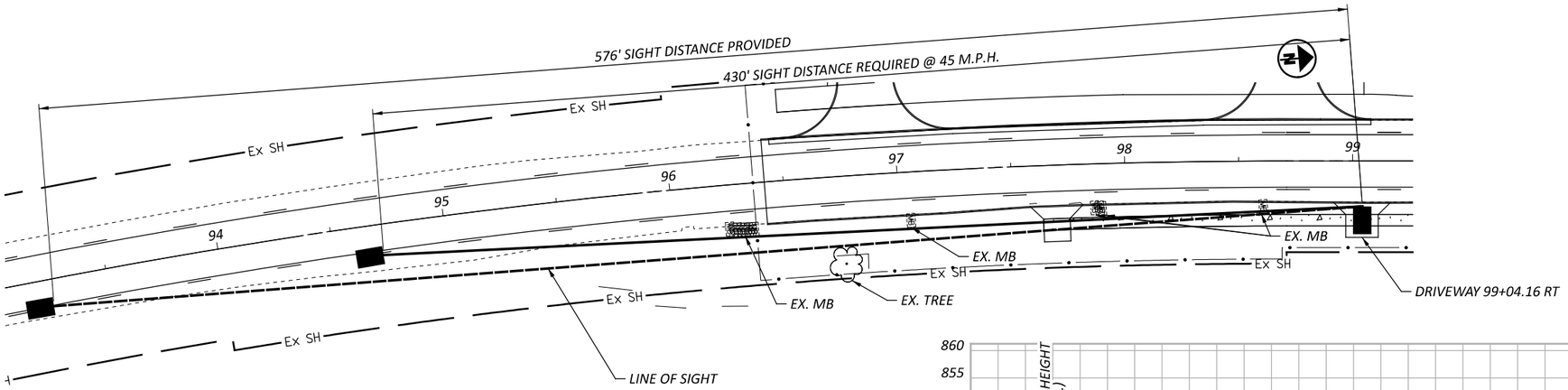
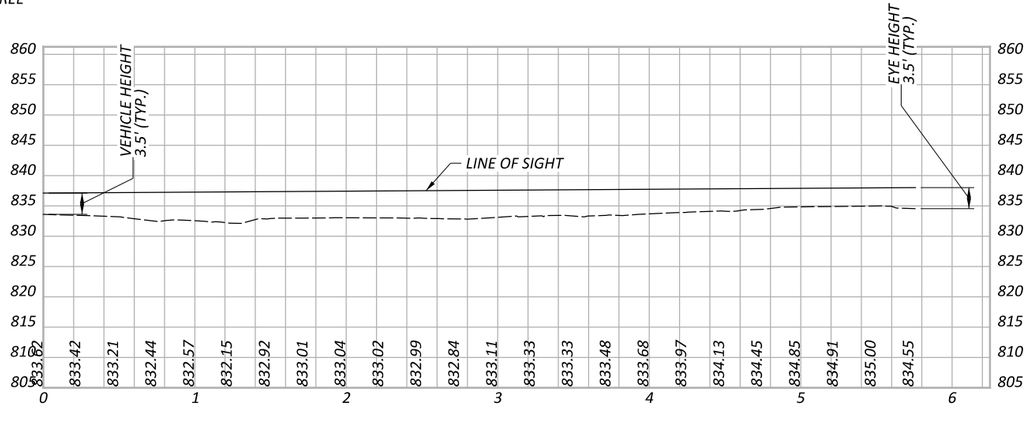
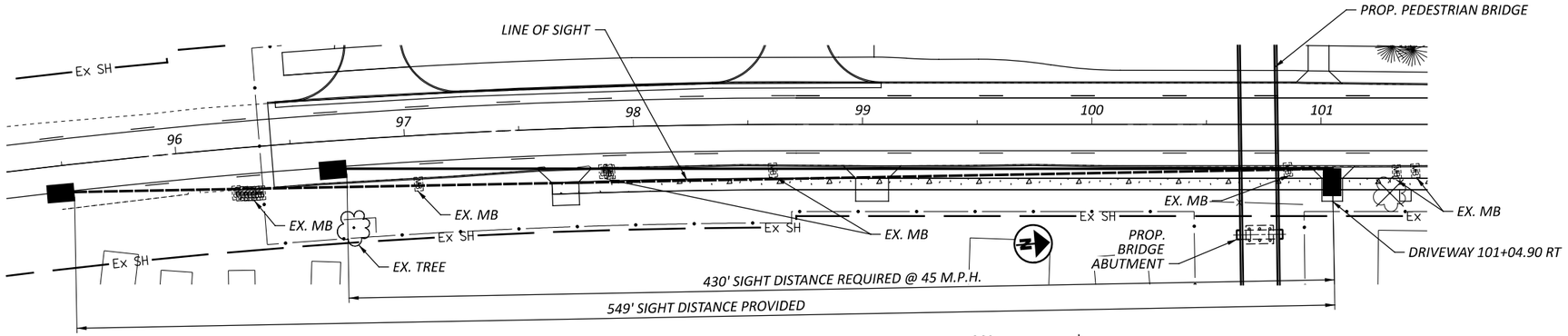
GRE-68 SSD EXHIBIT 97+69.50 RT

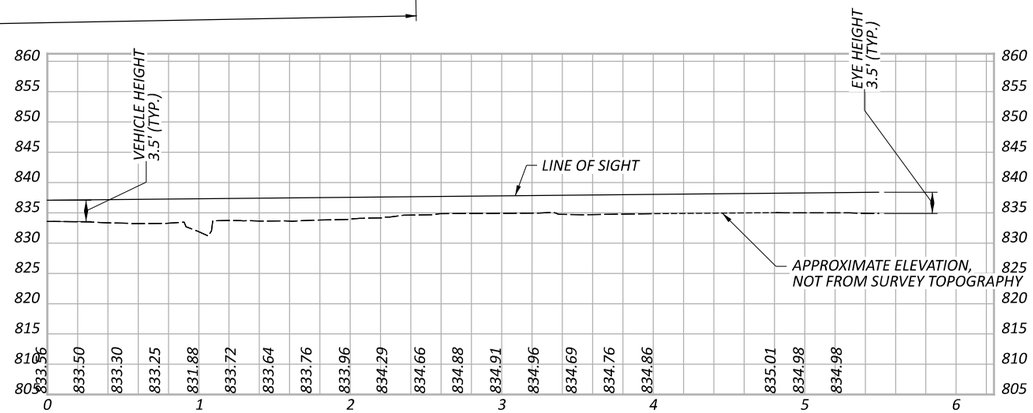
DESIGN AGENCY
fishbeck

DESIGNER	AJV
REVIEWER	JAH 11/20/23
PROJECT ID	115388
SHEET	P.1
TOTAL	8









GRE-68 SSD EXHIBIT
99+04.16 RT, 101+04.90 RT

DESIGN AGENCY
fishbeck

DESIGNER
AJV

REVIEWER
JAH 11/20/23

PROJECT ID
115388

SHEET P.2 | TOTAL 8

GRE-68-12.65

MODEL: DWPLAN - 99+04.16RT [Sheet] PAPERSIZE: 17x11 (in.) DATE: 12/28/2023 TIME: 4:02:51 PM USER: jlight
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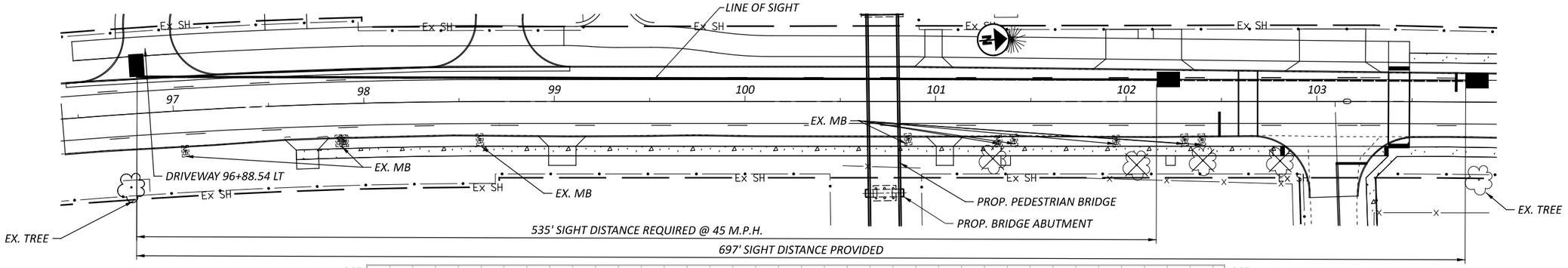

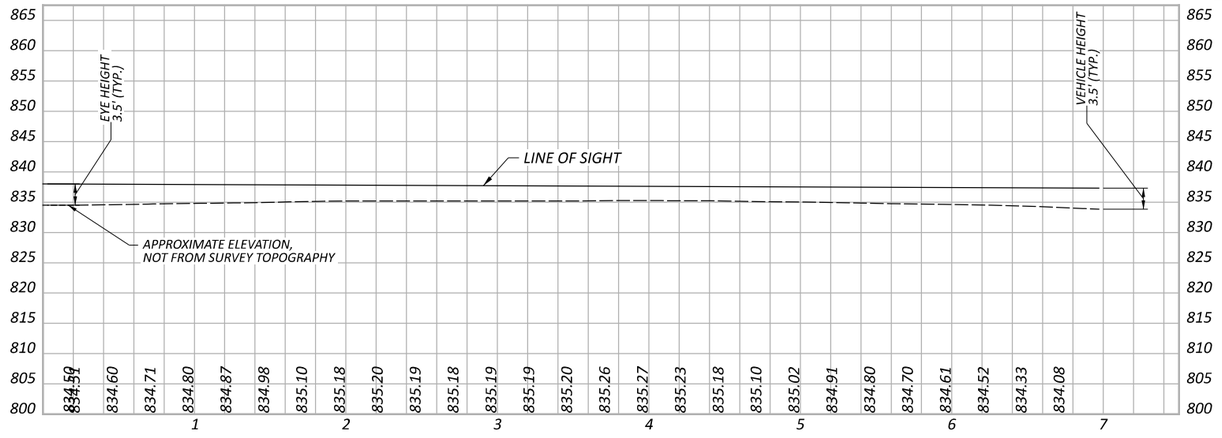

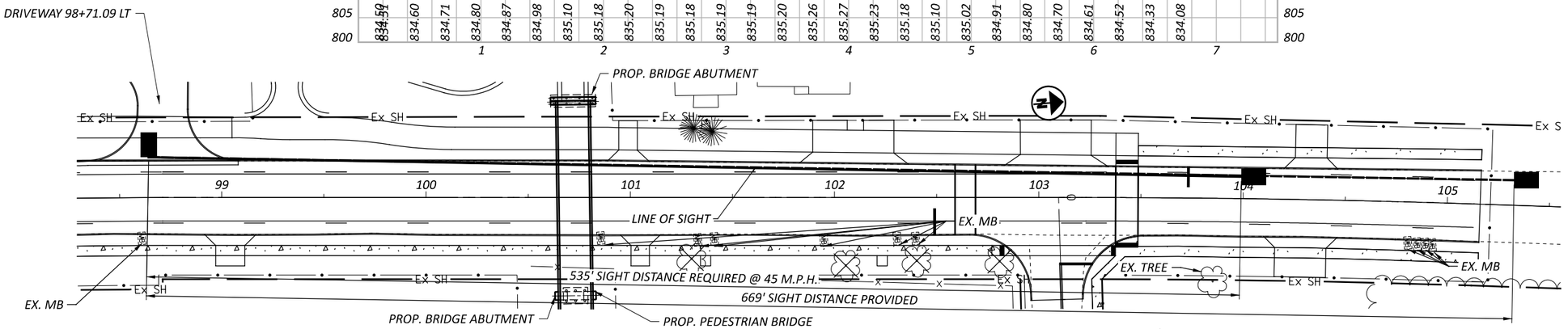

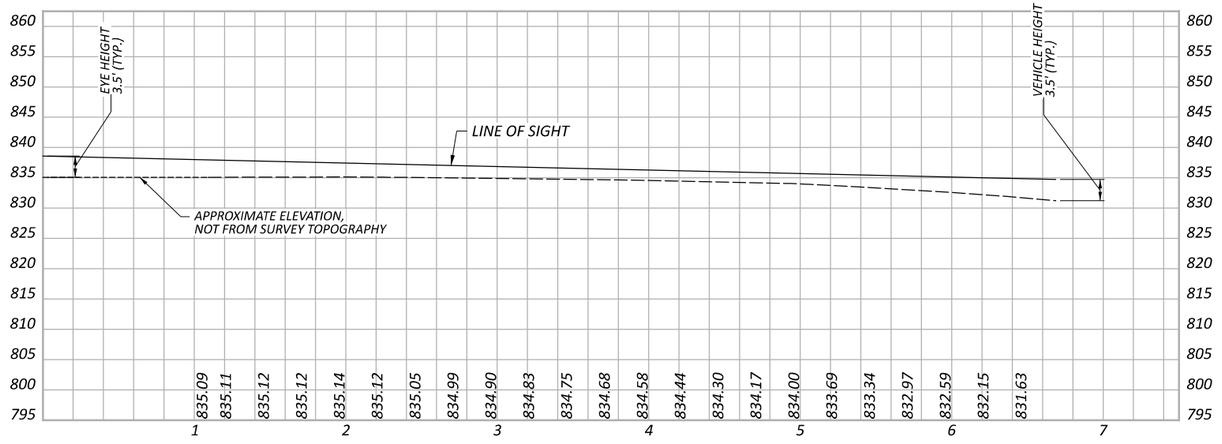

GRE-68 SSD EXHIBIT
96+88.54 LT, 98+71.09 LT

GRE-68-12.65

MODEL: DWPLAN - 96+88.54LT [Sheet] PAPERSIZE: 17x11 (in.) DATE: 12/28/2023 TIME: 4:02:52 PM USER: jlight
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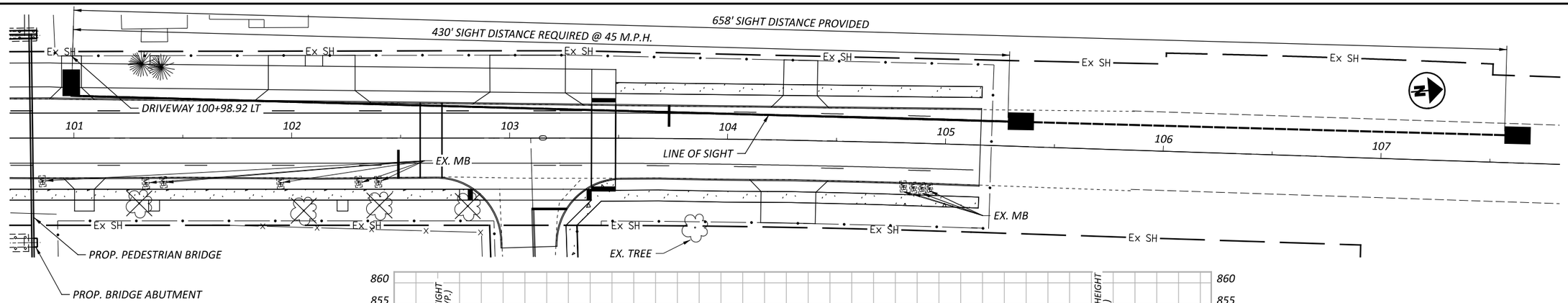
DESIGN AGENCY
fishbeck

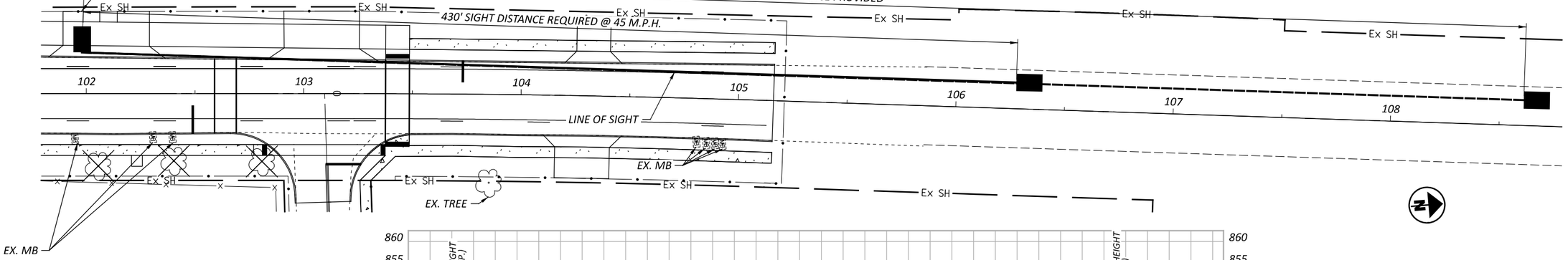
DESIGNER
AJV

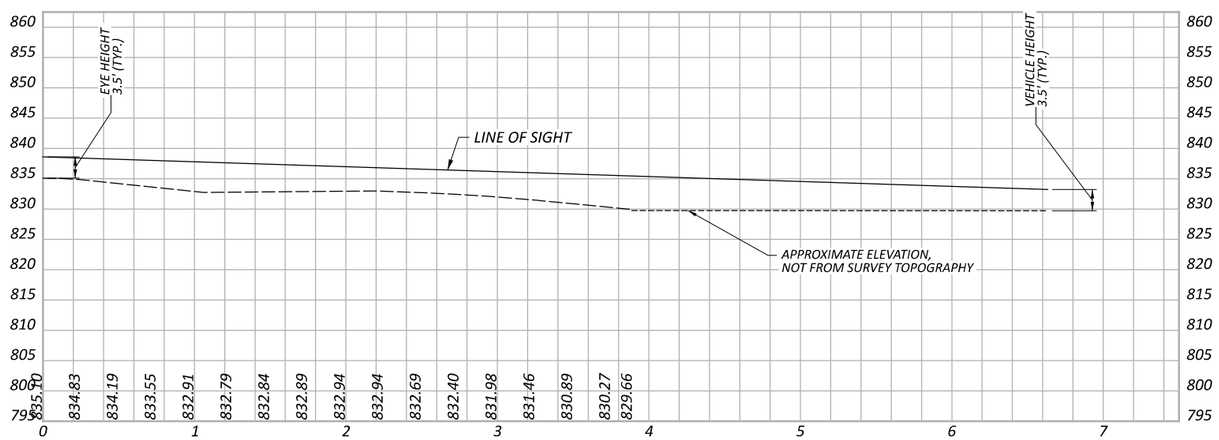
REVIEWER
JAH 11/20/23

PROJECT ID
115388

SHEET P.3 | TOTAL 8







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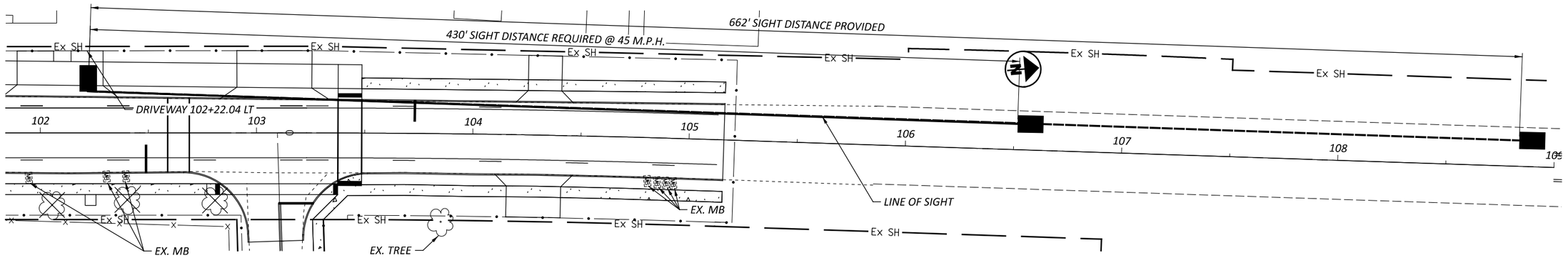
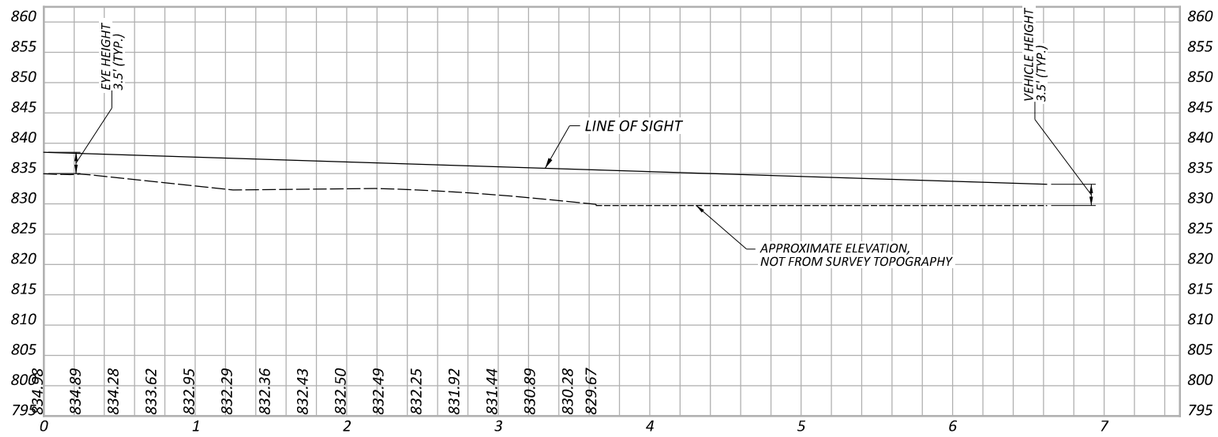
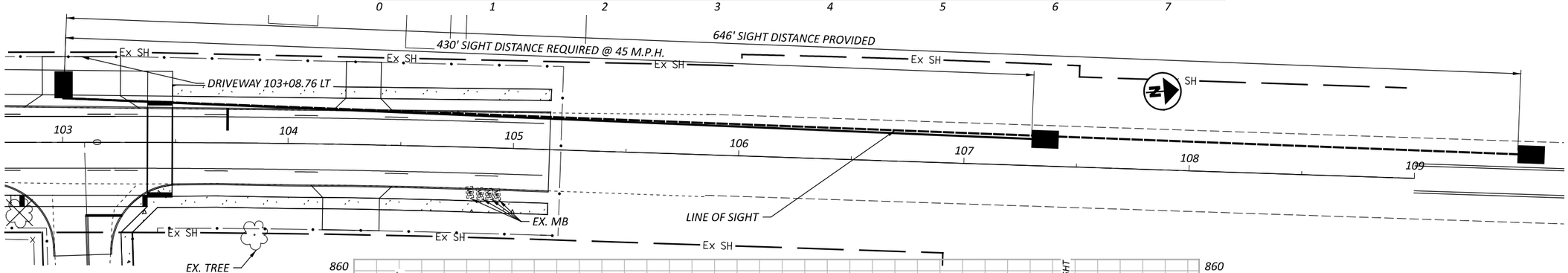
GRE-68 SSD EXHIBIT
100+98.92 LT, 101+97.76 LT

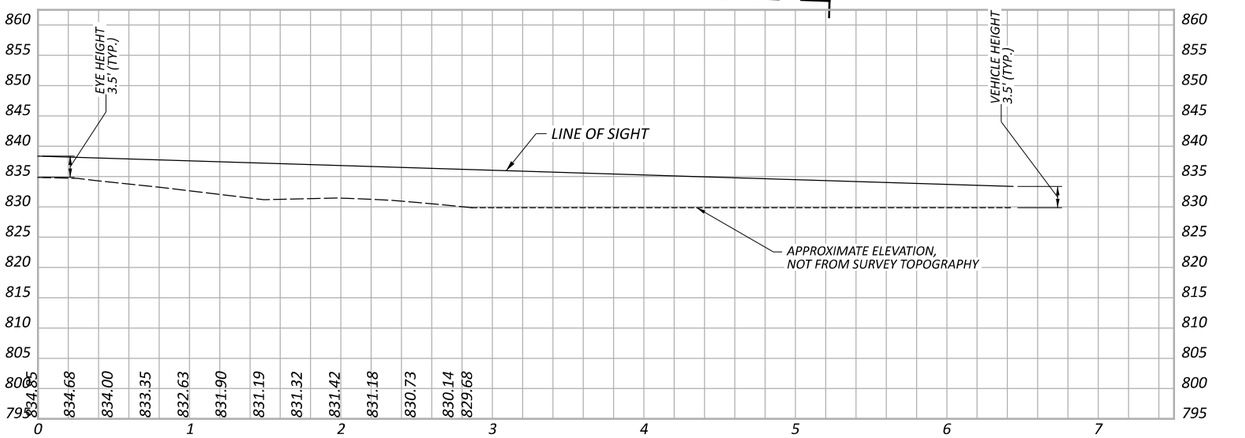
DESIGN AGENCY
fishbeck

DESIGNER	AJV
REVIEWER	JAH 11/20/23
PROJECT ID	115388
SHEET	P.4
TOTAL	8









GRE-68 SSD EXHIBIT
102+22.04 LT, 103+08.76 LT

DESIGN AGENCY
fishbeck

DESIGNER
AJV

REVIEWER
JAH 11/20/23

PROJECT ID
115388

SHEET P.5 TOTAL 8

GRE-68-12.65

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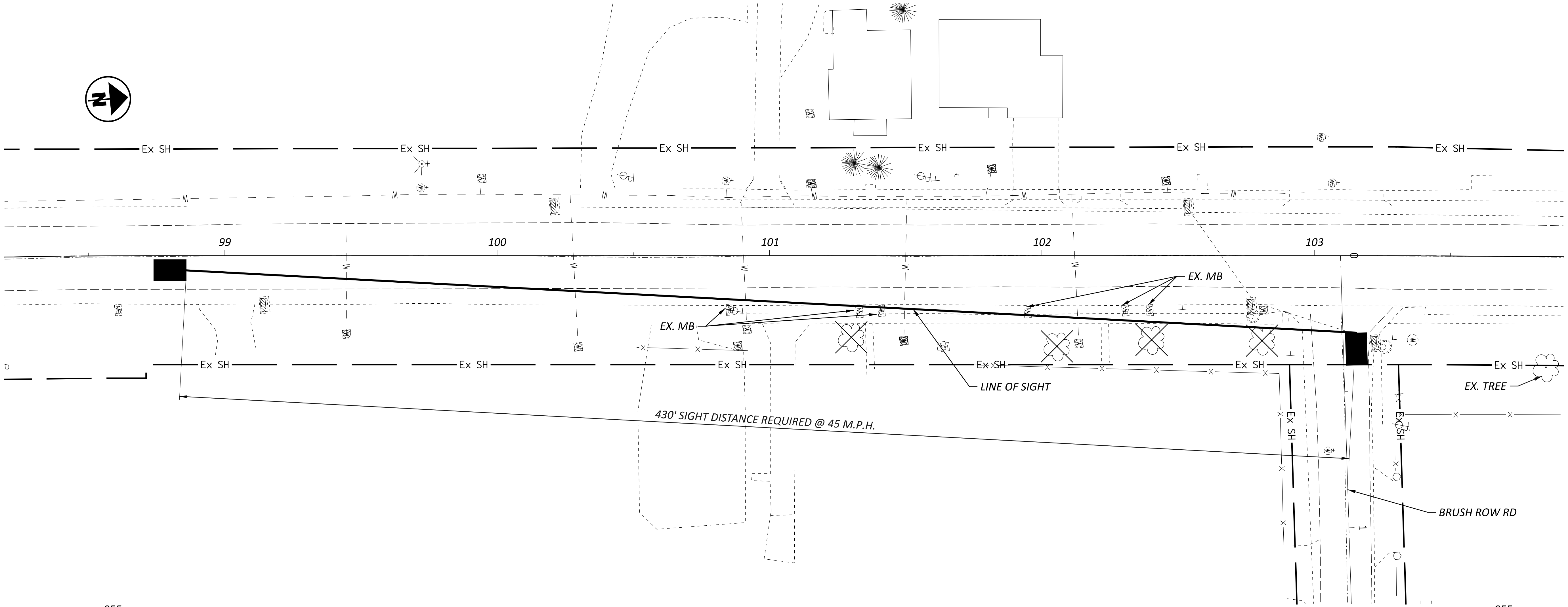

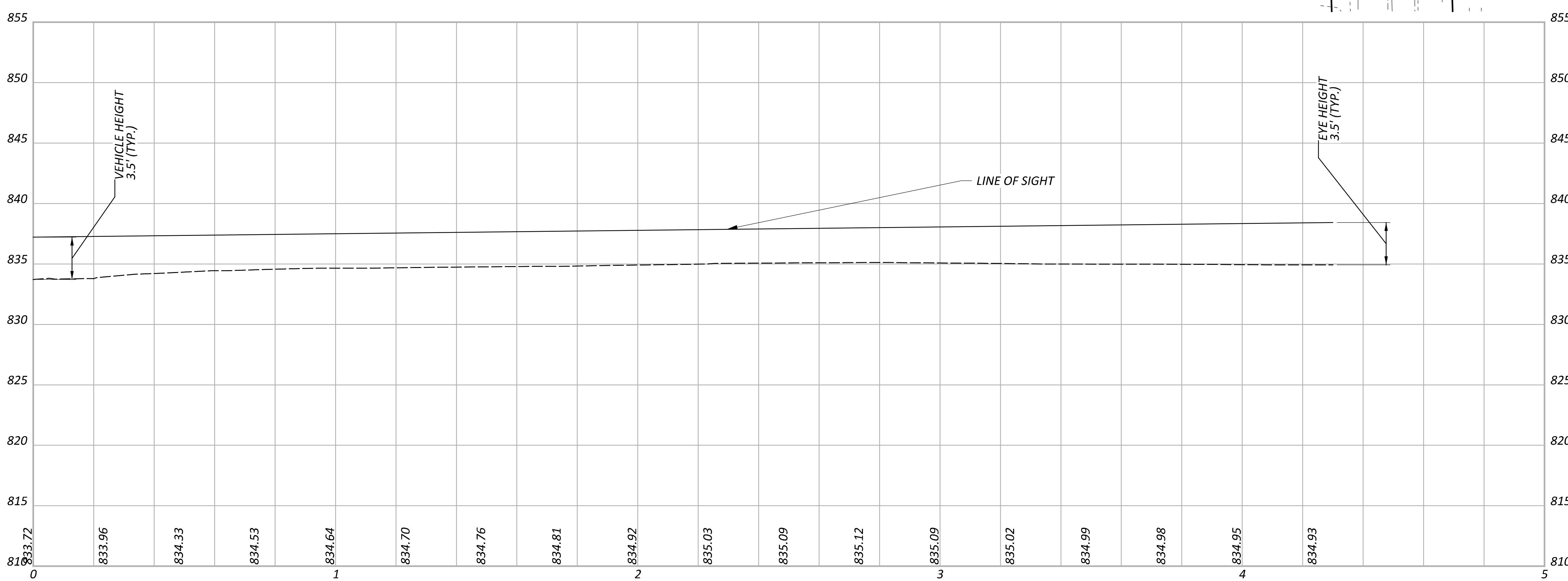

GRE-68 SSD EXHIBIT
BRUSH ROW RD - EXISTING

DESIGN AGENCY
fishbeck

DESIGNER
AJV

REVIEWER
JAH 11/20/23

PROJECT ID
115388

SHEET P.6 | TOTAL 8

GRE-68-12.65

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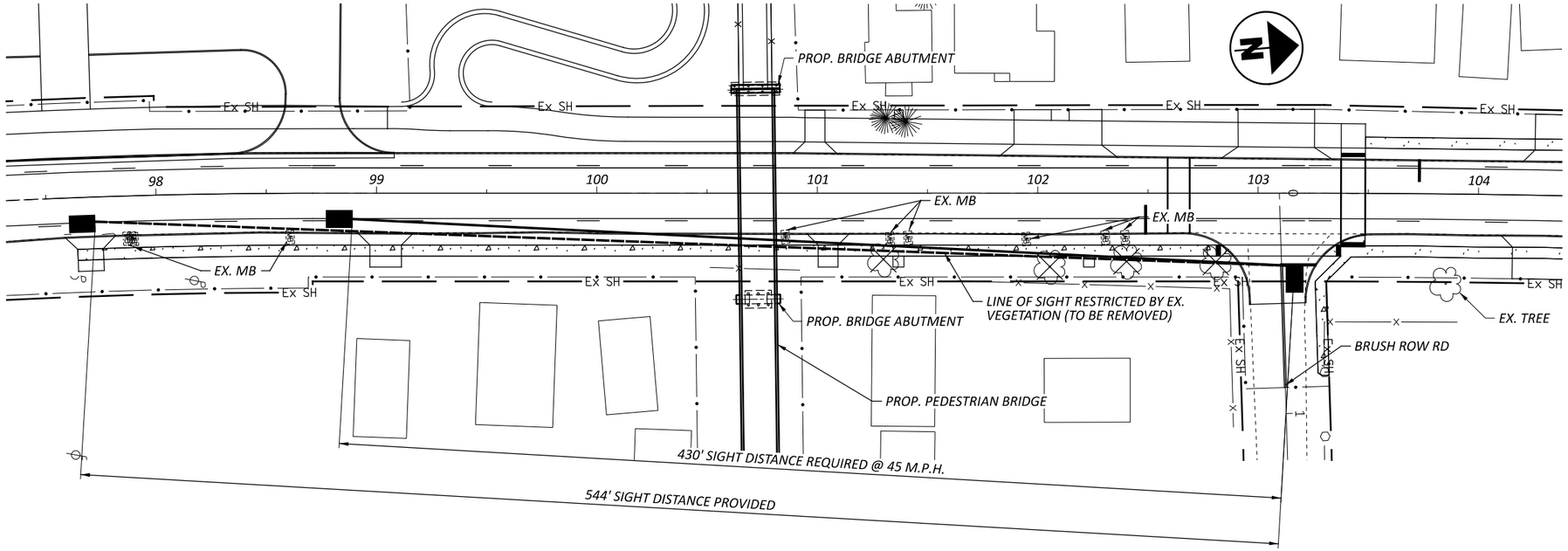

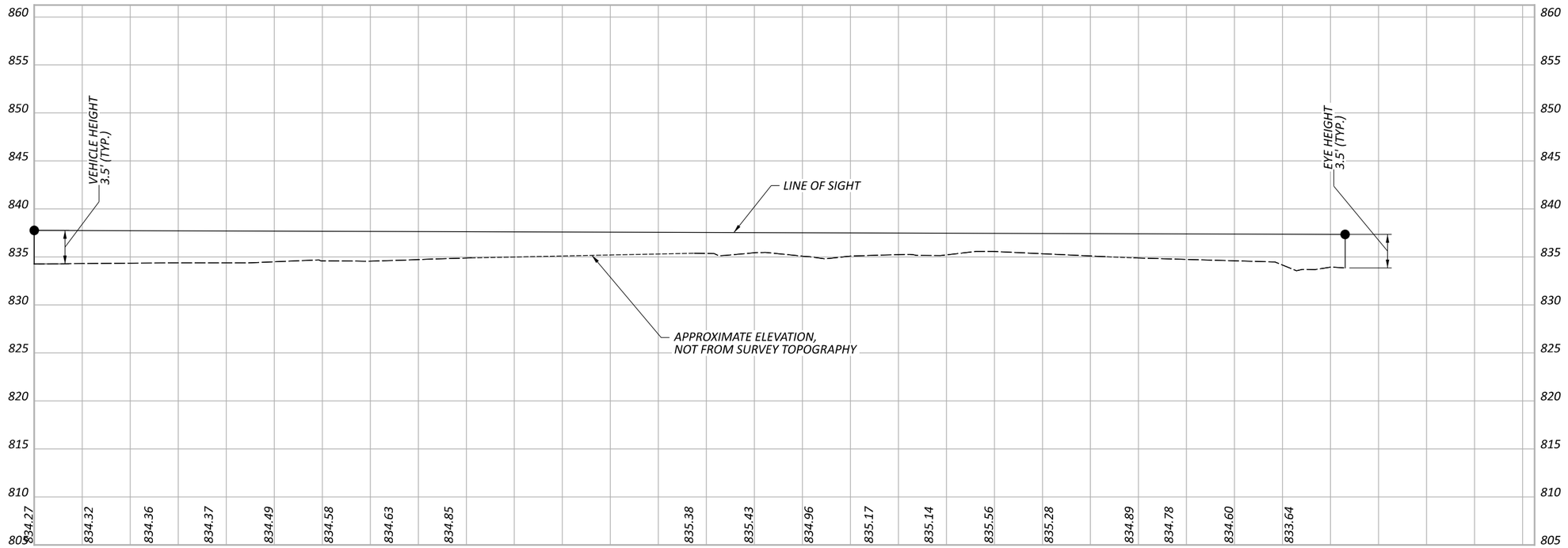

GRE-68 SSD EXHIBIT
BRUSH ROW RD - PROPOSED

GRE-68-12.65

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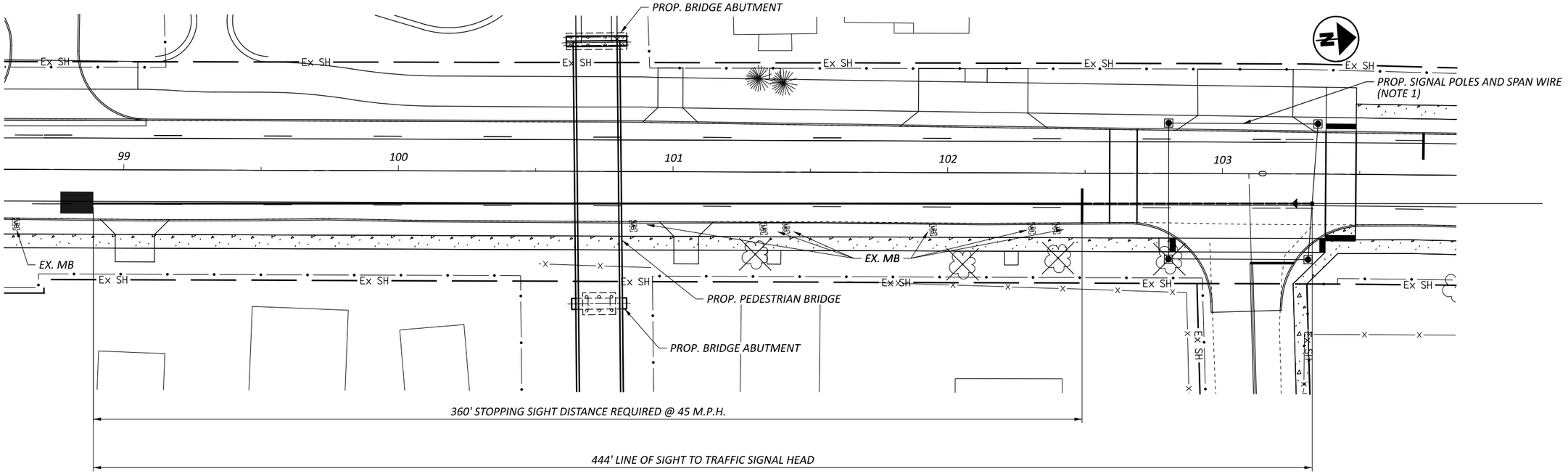
DESIGN AGENCY
fishbeck

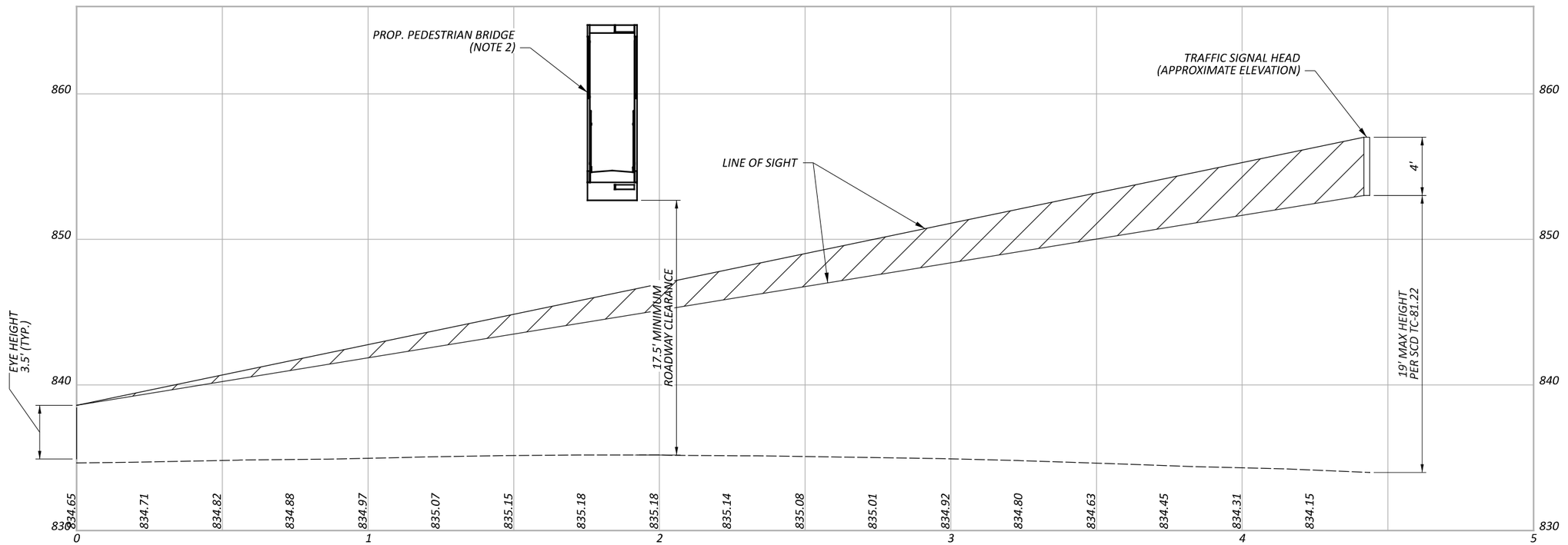
DESIGNER
AJV

REVIEWER
JAH 11/20/23

PROJECT ID
115388

SHEET P.7 TOTAL 8





NOTES:

1. *PROPOSED TRAFFIC SIGNAL POLES AND SPAN WIRE DO NOT REFLECT A FINAL DESIGN LAYOUT AND ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY.*
2. *BRIDGE ALTERNATIVE 2A TRANVERSE SECTION SHOWN, CLEARANCE TO ROADWAY IDENTICAL FOR BRIDGE ALTERNATIVE 2B.*

GRE-68-12.65

MODEL: BRUSH ROW RD PR - TRAFFIC SIGNAL [Sheet] PAPERSIZE: 17x11 (in.) DATE: 12/28/2023 TIME: 4:02:55 PM USER: jlight
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GRE-68 SSD EXHIBIT

BRUSH ROW RD - PROPOSED TRAFFIC SIGNAL

DESIGN AGENCY
fishbeck

DESIGNER AJV

REVIEWER JAH 11/20/23

PROJECT ID 115388

SHEET P.8 | TOTAL 8

Appendix D – Hydraulic Report

GRE-68-12.85 PID 115388

Hydraulic Report

Bridge No. GRE-BK80020-0.492 SFN 2926107

Pedestrian Bridge over US-68 and Oldtown Creek

The environmental review, consultation, and other actions required by applicable federal environmental laws for these projects are being, or have been, carried out by ODOT pursuant to 23 U.S.C. 327 and a memorandum of understanding dated December 11, 2015, and executed by FHWA and ODOT.

Submitted to *Ohio Department of Transportation District 8*
December 2023

Prepared by

WOOLPERT

OHIO DEPARTMENT OF TRANSPORTATION

TABLE OF CONTENTS

APPENDICES

INTRODUCTION AND PROJECT DESCRIPTION

Woolpert has prepared a hydraulic model and report for the Ohio Department of Transportation (ODOT) and Fishbeck in support of the GRE-68-12.65 PID 115388. The project involves the construction of a shared use path bridge over US 68 and Oldtown Creek and re-grading of a portion of the existing Little Miami Scenic Trail.

The purpose of this hydraulic report is to determine the impacts of the proposed improvements on the water surface elevations of Oldtown Creek, determine the hydraulic adequacy of the proposed structure, and evaluate the flood hazard potential of the proposed alternatives. A separate report has been prepared to address the temporary conditions during construction with a Temporary Access Fill (TAF) in place.

This hydraulic report was prepared in conjunction with the Feasibility Study, dated December 1, 2023, and included hydraulic models for the existing conditions and the proposed four-span structure with column/discrete element piers.

Oldtown Creek is a perennial, low sinuous waterway with a sinuosity of approximately 1.01 in the region near the site, shown in Figure 1. The channel bottom is a mixture of silty sand and gravel. The banks of the channels are steeply sloped with vegetation. Oldtown Creek has a nearby confluence with Massies Creek and outlets to the Little Miami River.

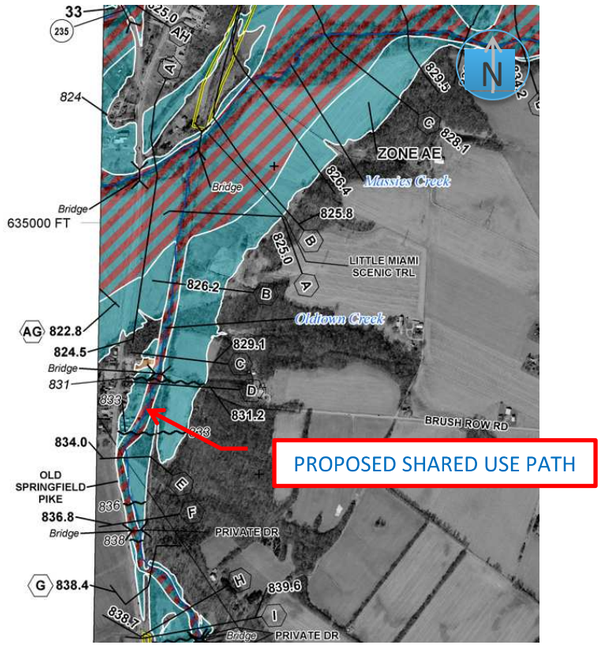


Figure 1: FEMA Floodplain

Existing Conditions – The proposed shared use path bridge is located over Oldtown Creek within a Federal Emergency Management Agency (FEMA) regulated floodplain (Zone AE) with a regulatory flood elevation of approximately 831.8 at the proposed structure. The proposed crossing is close to an existing

structure on Brush Row Road and upstream of the confluence with Massies Creek. The Flood Insurance Rate Map (FIRM) and portions of the FIS can be seen in Figure 1 and in Appendix 3 of this report.

Proposed Conditions - The project will consist of the construction of a shared use path connecting the existing Little Miami Scenic Trail to the Great Council State Park Interpretive Center. The path will consist of a 17-ft out-to-out four-span bridge with hammerhead piers and stub abutments. Two bridge alternatives have been investigated as part of the Feasibility Study and this Hydraulic Report.

DESIGN CRITERIA

The proposed crossing is in a FEMA regulated floodplain (Zone AE) and the requirements of the National Flood Insurance Program (NFIP) will apply. The FEMA Engineering Library was consulted for electronic files and it was determined that no files for the effective model were available. Therefore, the existing conditions model is used for determining if the proposed conditions result in an increase in water surface elevations and impacts to other parameters such as velocity.

Scour shall be addressed by the design build team in accordance with ODOT L&D Manual Volume 2.

HYDROLOGIC ANALYSIS

Peak discharge rates used in the analysis were obtained from the FEMA Flood Insurance Study (FIS) for Oldtown Creek for the 100-yr design frequency. The FIS has a drainage basin area of 10.6 square miles which corresponds for the flow used in the modeling. The USGS StreamStats report showed similar peak-flow statistics, with a drainage basin of 9.62 square miles and approximately 9.02-percent forest. An aerial view of the drainage basin is shown in Figure 2. Flood volumetric flow rates used for this report are given in Table 1.

Table 1: Flood Flow Rates

Frequency	StreamStats Peak-Flow Statistics (cfs)	FIS Peak Discharge from mouth at Oldtown Creek (cfs)
5 Year	1,070	---
100 Year	2,840 *	2,000

* The FIS discharge used in accordance with L&D 1003.1.2

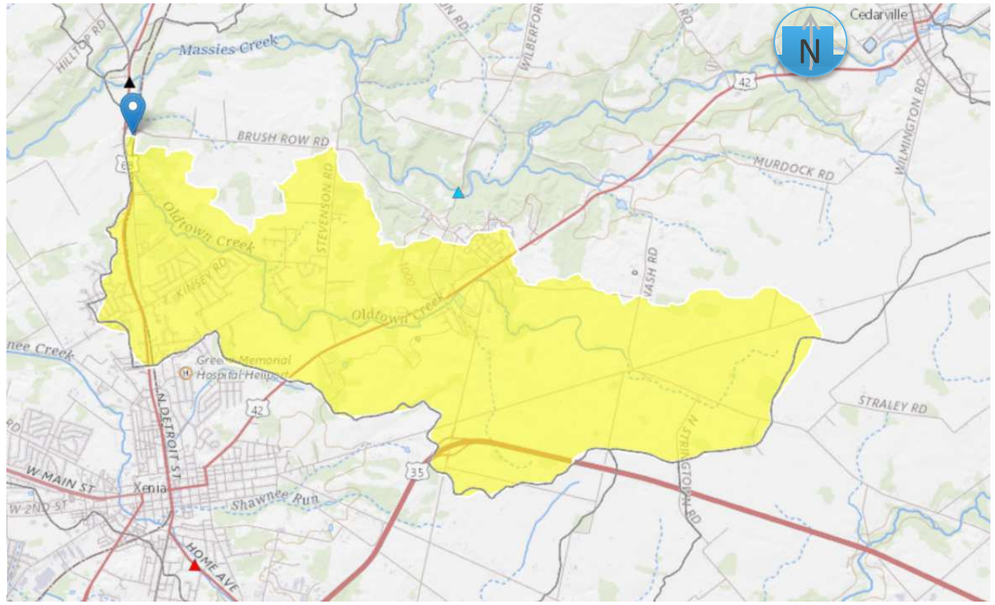


Figure 2: Drainage Basin from USGS StreamStats

HYDRAULIC ANALYSIS - EXISTING CONDITIONS

Structure hydraulics for the existing conditions have been calculated using HEC-RAS. The crossing is within a FEMA floodplain with a base flood elevation of 829.1 at Section C-C and 834.0 at Section E-E as seen in Figure 1 and from the Floodway Data (Table 23) in the FIS. The hydraulic model has been built using lidar scans. The existing conditions lidar surface can be seen in Figure 3. One boundary condition was used for each of the profiles to analyze steady flow data. The 100-yr profile used the known FIS water surface elevation boundary condition for the FIS C-C crossing and the FIS volumetric flow rate. For the 5-yr profile, the use of a normal depth boundary condition was used with the StreamStats volumetric flow rate. Due to the nature of the existing stream conditions and importance of meeting FEMA floodway requirements, the calculated energy grade slope for the downstream most section from the 100-yr model was used for the 5-yr boundary condition.

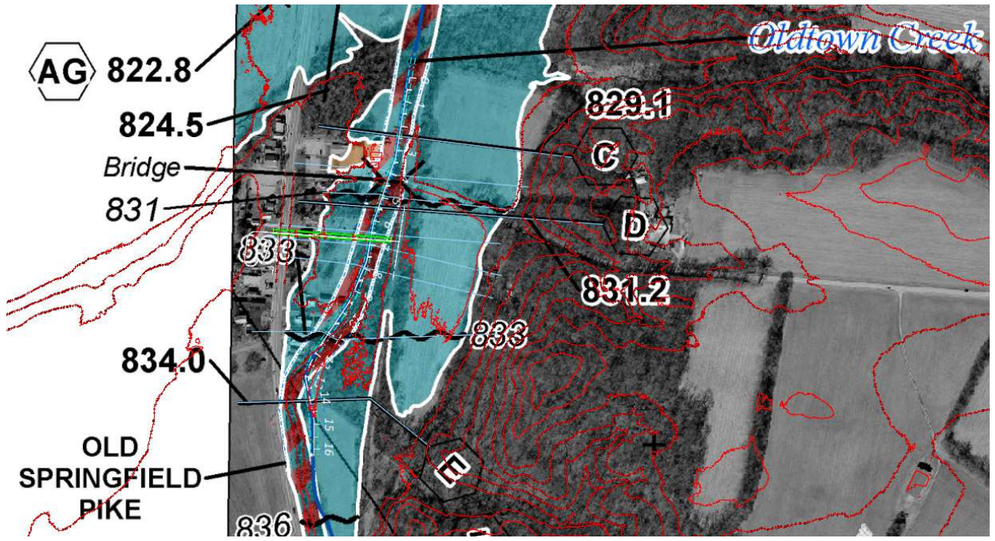


Figure 3: Existing Conditions Lidar Surface

OpenRoads Designer (ORD) was used to create a complex terrain from OSIP imagery and lidar data. This created the most accurate representation of the waterway and overbanks. Slope break lines were placed to match the 100-year base flood cross sections C-C, D-D, E-E, two known water surface elevations from the FEMA floodplain as shown in Figure 1, and additional cross sections upstream and downstream of the bridges. The ORD model was exported to HEC-RAS to create the geometric data. The existing bridge geometry for the Brush Row Road was added to the geometric data in the existing model. The HEC-RAS geometry plan view can be seen in Figure 4.

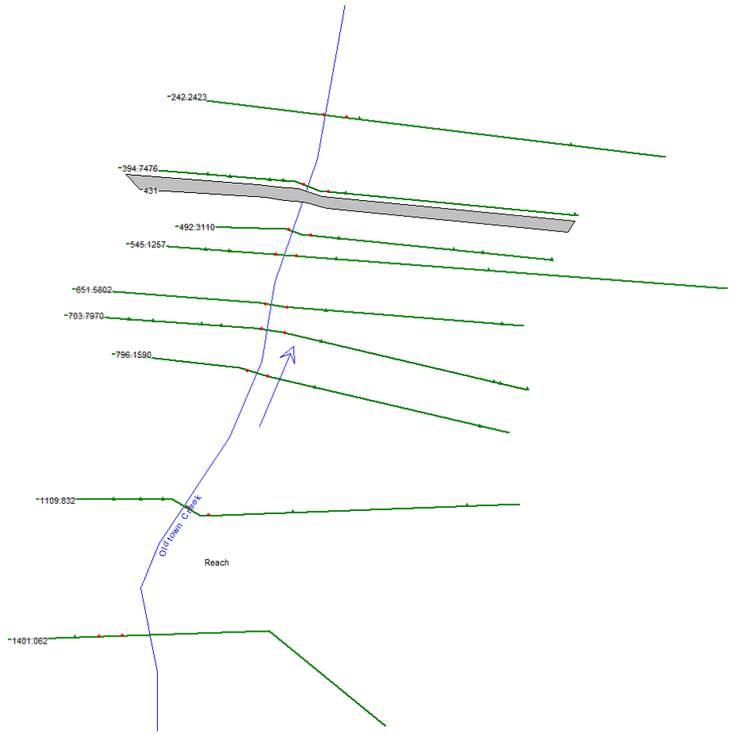


Figure 4: Existing Conditions HEC-RAS Geometry

Manning's "n" values for channel roughness were determined from the FIS for Oldtown Creek. These values ranged from 0.06 at the channel bottom to 0.07 at the left and right overbanks. Additional Manning's values were also used for asphalt pavement (0.031), low grass (0.03), and crops (0.035) as needed per the aerial imagery.

Once the existing condition model was completed, it was then used for comparison with the proposed condition model. The proposed condition model for the alternatives can be seen in Figure 5.

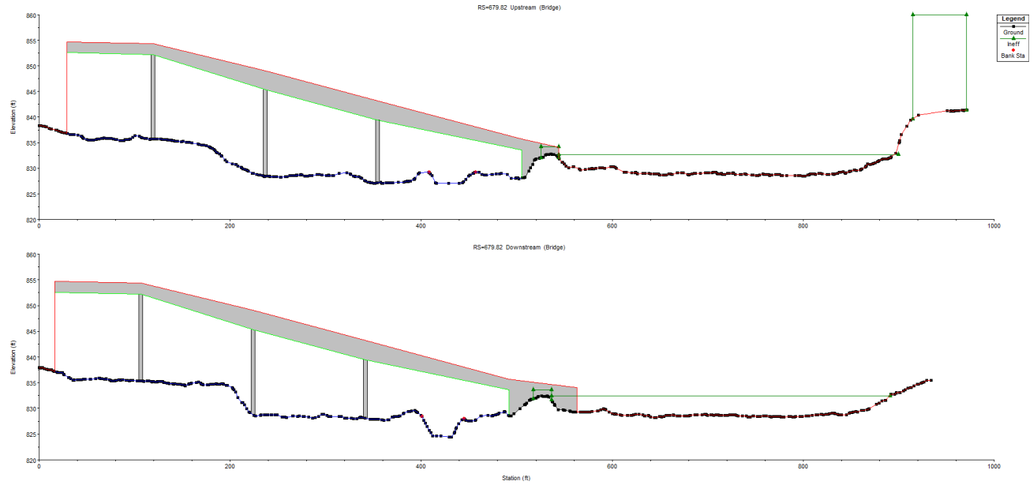


Figure 5: Proposed Four-Span Bridge Cross Section

HYDRAULIC ANALYSIS - PROPOSED CONDITIONS

The Structure Type Study investigates the following two bridge alternatives:

- Alternative 2A: Four-Span Prefabricated Truss Bridge
- Alternative 2B: Two-Span Prefabricated Truss and Two-Span Prestressed Concrete Beam Bridge

Both bridge alternatives used the same profile with the proposed condition of the superstructure being located completely above the 100-yr FIS flood water surface elevation. This resulted in the need for a single proposed model which used the conservative superstructure depth of the two alternatives.

In accordance with ODOT L&D Manual 1006.3, the proposed structure alternatives are compared to existing conditions and preferred to match existing conditions to the maximum extent practical.

Proposed Condition - Four-Span Bridge

Proposed Alternatives 2A and 2B are four-span structures with identical varying spans length between 95-ft and 150-ft. The substructure consists of hammerhead piers and stub abutments. A portion of the existing Little Miami Scenic Trail will be raised to meet one end of the bridge and a proposed walkway will be added to the other. These trail modifications were modeled with the use of permanent ineffective flow regions.

The only differences between the existing and proposed models are the addition of the proposed structure and modifications to the ineffective flow regions. The same steady flow data and boundary conditions were used for both models.

HEC-RAS results showing water surface elevations and velocities have been tabulated in Table 2 (FIS C-C), Table 3 (FIS D-D), and Table 5 (FIS E-E) below. Table 4 includes the results in the cross section upstream of the proposed bridge. The results indicate the same water surface elevations in the proposed conditions as in the existing. Velocities through the bridge opening increased slightly in the proposed conditions, but reduced back to the existing by FIS E-E. Minor increases in the water surface of up to 0.04-ft occur in the model upstream of the bridge before meeting existing at FIS E-E.

Table 2 : Hydraulic Results - FIS C-C

Location	Storm Event	WS Elev (ft)	Vel. Channel (ft/s)
FIS Floodway Table	100-yr	829.1	5.8
Existing Conditions	100-Yr	829.10	3.11
	5-Yr	828.17	2.74
Proposed Conditions	100-Yr	829.10	3.11
	5-Yr	828.17	2.74

Table 3: Hydraulic Results - FIS D-D

Location	Storm Event	WS Elev (ft)	Vel. Channel (ft/s
FIS Floodway Table	100-yr	831.2	3.3
Existing Conditions	100-Yr	831.34	3.93
	5-Yr	830.28	2.92
Proposed Conditions	100-Yr	831.34	3.93
	5-Yr	830.28	2.92

Table 4: Hydraulic Results - Upstream of Bridge RS 7+03

Location	Storm Event	WS Elev (ft)	Vel. Channel (ft/s
Existing Conditions	100-Yr	831.58	1.63
	5-Yr	830.48	1.31
Proposed Conditions	100-Yr	831.58	1.68
	5-Yr	830.47	1.39

Table 5: Hydraulic Results - FIS E-E

Location	Storm Event	WS Elev (ft)	Vel. Channel (ft/s
FIS Floodway Table	100-yr	834	6.8
Existing Conditions	100-Yr	833.28	1.99
	5-Yr	832.20	1.95
Proposed Conditions	100-Yr	833.28	2.00
	5-Yr	832.20	1.95

FLOOD HAZARD EVALUATION

The Flood Insurance Rate Map (FIRM) indicates that some inhabitable structures are inside of the floodplain limits. The hydraulic modeling of the existing and proposed conditions indicates that the modifications associated with the structure construction will not have an adverse effect on the water surface elevations within the study area. Additional analysis of the temporary conditions during construction are currently underway and will be addressed under separate cover.

RISK ASSESSMENT

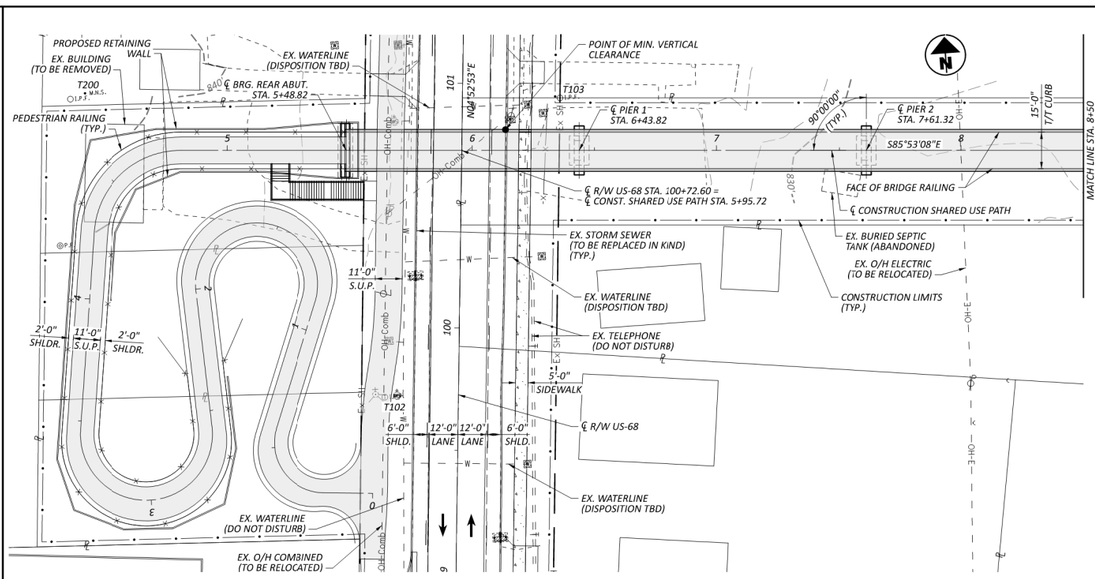
Risks of flooding have been defined by the FEMA assessment previously completed, and this project will has no permanent construction within the floodway and the low chord of the proposed bridge is above the 100yr BFE. The shared use path is of minor risk as a bicycle pathway, however none of the water profiles cause inundation of the structure, including the 100-year. If fully inundated during large storm events the proposed structures will be structurally sound due to deep foundations.

Resiliency of structures due to changing climatic conditions has been assessed. The 2014 “Climate Change Impacts in the United States”, regional impacts of the Third National Climate Assessment indicates a 60-100% increase in number of days exceeding 1.25” of precipitation per year and 20% increase in total precipitation and 32% increase in the number of heavy precipitation events in the 1951-2012 assessment period. If this continues at the same rate as the past 60 years, the likelihood of larger storms will impact the structure by reducing the return period of the storm currently considered as the 100-year event, and correspondingly increasing the flow rates that should be considered for each event. While this will have impacts, given the fact that the 100-year event does not overtop the bridge, the design consideration for scour, and the deep foundations, the risk to human life and for capital costs due to this structure replacement is limited.

SCOUR ANALYSES

Scour shall be addressed by the design build team in accordance with ODOT L&D Manual Volume 2. Preliminary geotechnical testing is ongoing and will be provided to the design build teams for use.

APPENDIX 1: STRUCTURE PLANS



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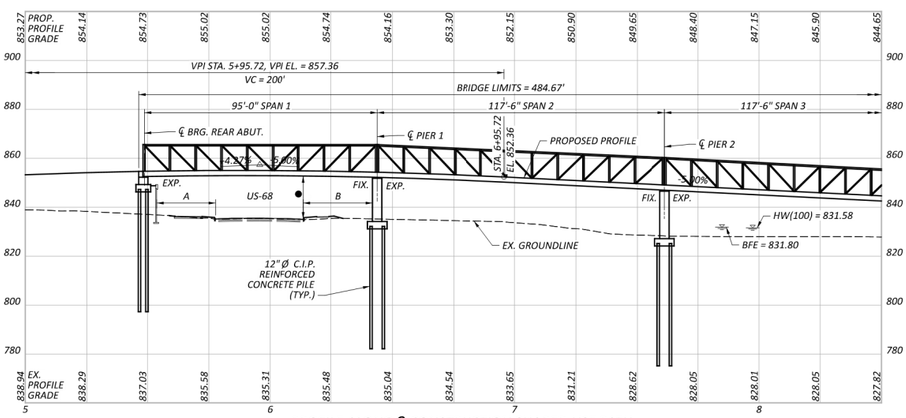

PROFILE ALONG ℄ CONSTRUCTION SHARED USE PATH

BENCHMARK DATA

T102 STA. 99+71.31, EL. 835.661, OFFSET 29.95' LT., IRON PIN FOUND
T103 STA. 100+94.64, EL. 835.180, OFFSET 40.01' RT., IRON PIN FOUND
T110 STA. 100+72.99, EL. 831.871, OFFSET 457.01' RT., IRON PIN SET
T200 STA. 100+93.88, EL. 840.801, OFFSET 154.24' LT., MAG NAIL SET

NOTES:

1. *EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.*
2. *SEE ROADWAY PLANS FOR ADDITIONAL SHARED USE PATH HORIZONTAL AND VERTICAL CURVE INFORMATION.*
3. *CONCEPTUAL TRUSS STYLE SHOWN IN THE PROFILE VIEW.*
4. *FRICTION PILES WERE THE ASSUMED FOUNDATION TYPE BASED ON GEOTECHNICAL INFORMATION FOR THE NEARBY INTERPRETIVE CENTER AND HISTORIC BORING LOGS FOR GRE-68-13.40 BRIDGE OVER MASSIES CREEK NORTH OF THE PROJECT LOCATION.*

US-68 DESIGN TRAFFIC:
2026 ADT = 8,600 *2026 ADTT = 602*
2046 ADT = 8,800 *2046 ADTT = 616*
DIRECTIONAL DISTRIBUTION = 0.50

LEGEND:

- ● *17'-6" REQUIRED MINIMUM VERTICAL CLEARANCE*
  17'-10½" ACTUAL MINIMUM VERTICAL CLEARANCE

A - REQUIRED HORIZONTAL CLEARANCE = 19'-0"
MIN. HORIZONTAL CLEARANCE = 23'-9½"

B - REQUIRED HORIZONTAL CLEARANCE = 19'-0"
MIN. HORIZONTAL CLEARANCE = 27'-11⅝"

PROP. SHARED USE PATH
PROP. PAVEMENT
PROP. WALK

HYDRAULIC DATA:

DRAINAGE AREA = 10.6 SQ. MILES
Q (100) = 2000 CFS *V (100) = 1.7 FT/S*
STRUCTURE CLEARS THE 100 YEAR DESIGN HW BY 2.09 FEET.

EXISTING STRUCTURE - NONE

PROPOSED STRUCTURE

TYPE: FOUR SPAN PREFABRICATED PAINTED STEEL TRUSS SUPERSTRUCTURE WITH REINFORCED CONCRETE DECK ON REINFORCED CONCRETE ABUTMENTS AND PIERS SUPPORTED ON CAST-IN-PLACE REINFORCED CONCRETE PILES

SPANS: 95'-0", 117'-6", 117'-6", 150'-0" (SEE PLAN)
ROADWAY: 15'-0" TOE/TOE CURB
LOADING: 0.090 KSF PEDESTRIAN LOAD AND H15-44 VEHICULAR LOAD
SKEW: NONE
WEARING SURFACE: 1" MONOLITHIC CONCRETE
APPROACH SLABS: NONE
ALIGNMENT: TANGENT
CROWN: 0.0156 FT/FT
DECK AREA: 8,180 SF

COORDINATES: LATITUDE N39°43'46.65"
LONGITUDE W83°56'12.36"

HORIZONTAL SCALE IN FEET 0 10 20 40

ALTERNATIVE 2A - SITE PLAN (1 OF 2)
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

SFN 2926107
DESIGN AGENCY fishbeck
DESIGNER BMG | CHECKER TLC
REVIEWER JPC 11/27/23
PROJECT ID 115388
SUBSET S1.1 | TOTAL 5
SHEET P.12 | TOTAL 22

GRE-68-12.65

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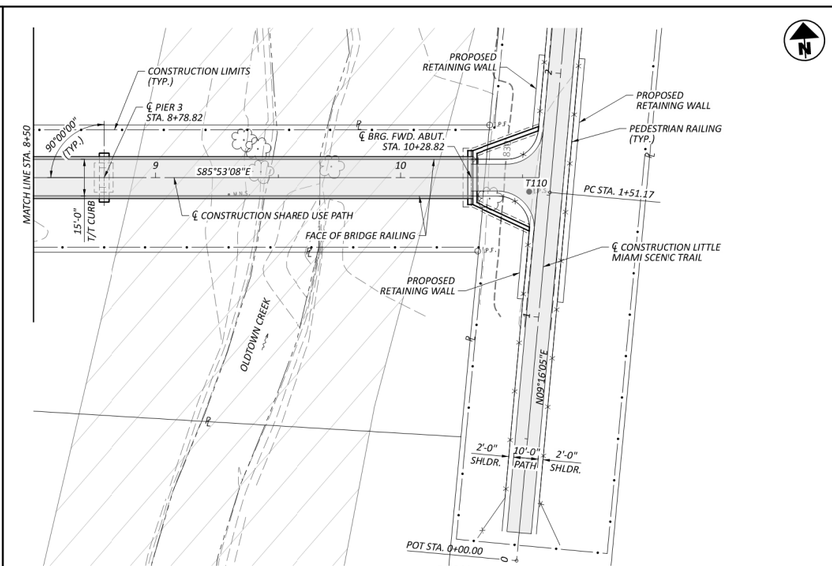
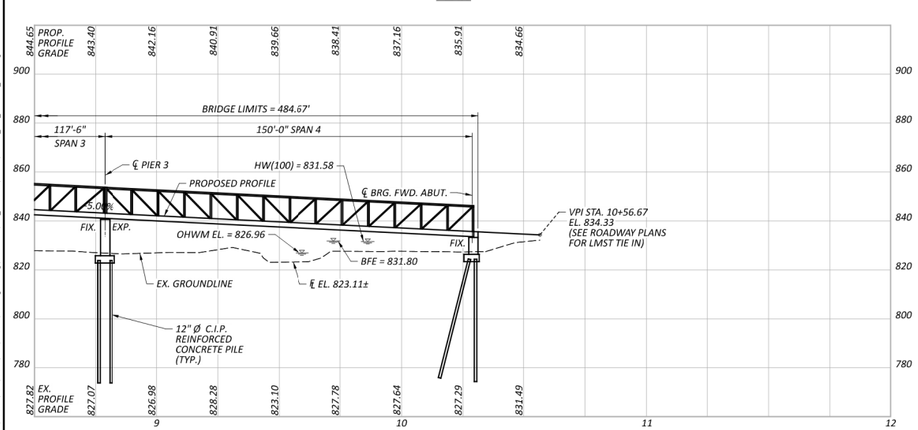


PLAN



PROFILE ALONG ℄ CONSTRUCTION SHARED USE PATH

LEGEND:

LIMITS OF FLOODWAY
PROP. SHARED USE PATH

NOTES:

1. *FOR ADDITIONAL NOTES AND INFORMATION, SEE SHEET* S1.1 / 5 .

HORIZONTAL SCALE IN FEET 0 10 20 40

ALTERNATIVE 2A - SITE PLAN (2 OF 2)
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

SFN 2926107
DESIGN AGENCY fishbeck
DESIGNER BMG | CHECKER TLC
REVIEWER JPC 11/27/23
PROJECT ID 115388
SUBSET S1.2 | TOTAL 5
SHEET P.13 | TOTAL 22

GRE-68-12.65

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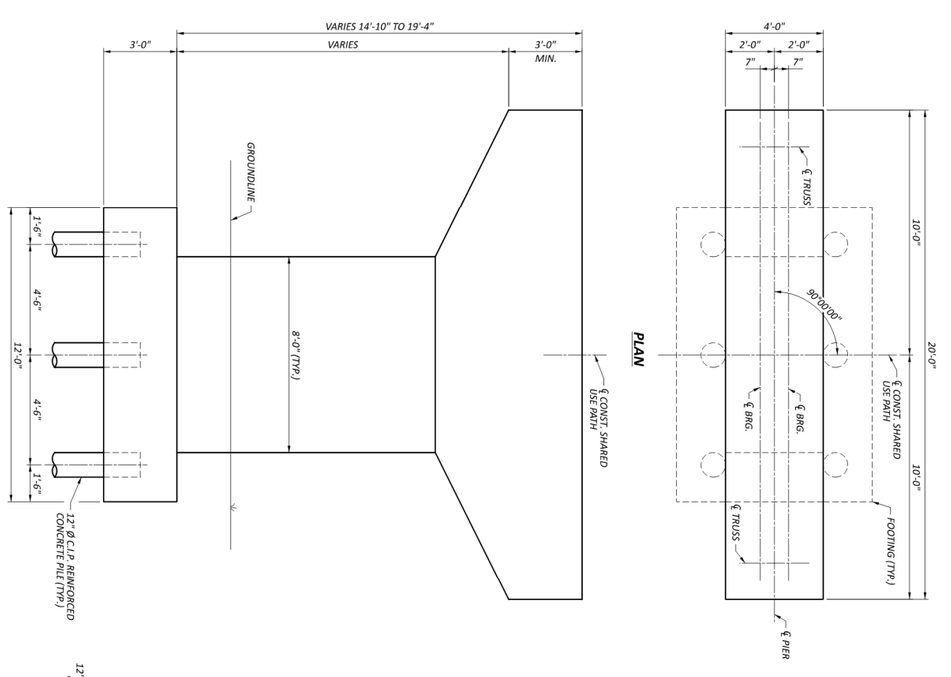

NOTES:

1. SUPERSTRUCTURE NOT SHOWN, INCLUDING STRIP SEAL EXPANSION JOINTS AND ELASTOMERIC BEARING ASSEMBLIES.

ALTERNATIVE 2A - PIER DETAILS
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

DESIGNED	CHECKED	SFN	2926107
TLC	BMG	DESIGN AGENCY	
REVIEWED			
JPC	11/27/23		
PROJECT NO.		SHEET NO.	TOTAL SHEETS
115388		S1.4	5
SHEET NO.	TOTAL SHEETS		
P.15	22		

fishbeck

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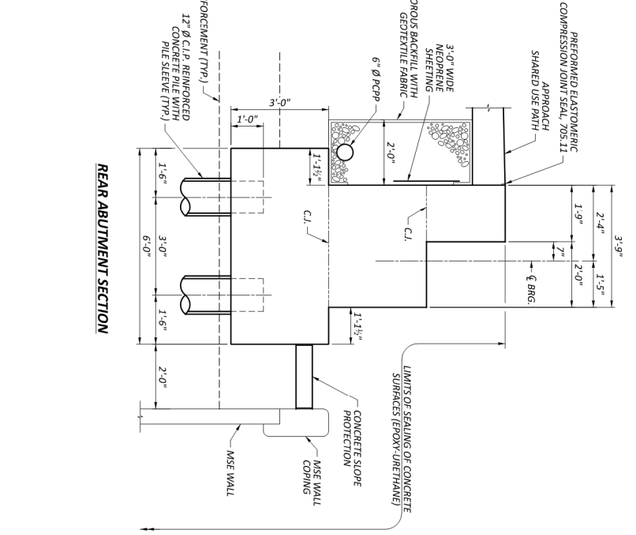

NOTES:

1. SUPERSTRUCTURE NOT SHOWN, INCLUDING STRIP SEAL EXPANSION JOINTS AND ELASTOMERIC BEARING ASSEMBLIES.

ALTERNATIVE 2A- ABUTMENT DETAILS
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US 68 AND OLD TOWN CREEK

DESIGNED	CHECKED	SFN	2926107
TLC	BMG	DESIGN AGENCY	
REVIEWED			
JPC	11/27/23		
PROJECT NO.		SHEET NO.	TOTAL SHEETS
115388		S1.3	5
SHEET NO.	TOTAL SHEETS		
P.14	22		

fishbeck

MODEL: CLP_SUP_MAIN-1 - Plan 1 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 12/28/2023 TIME: 4:00:29 PM USER: jlight
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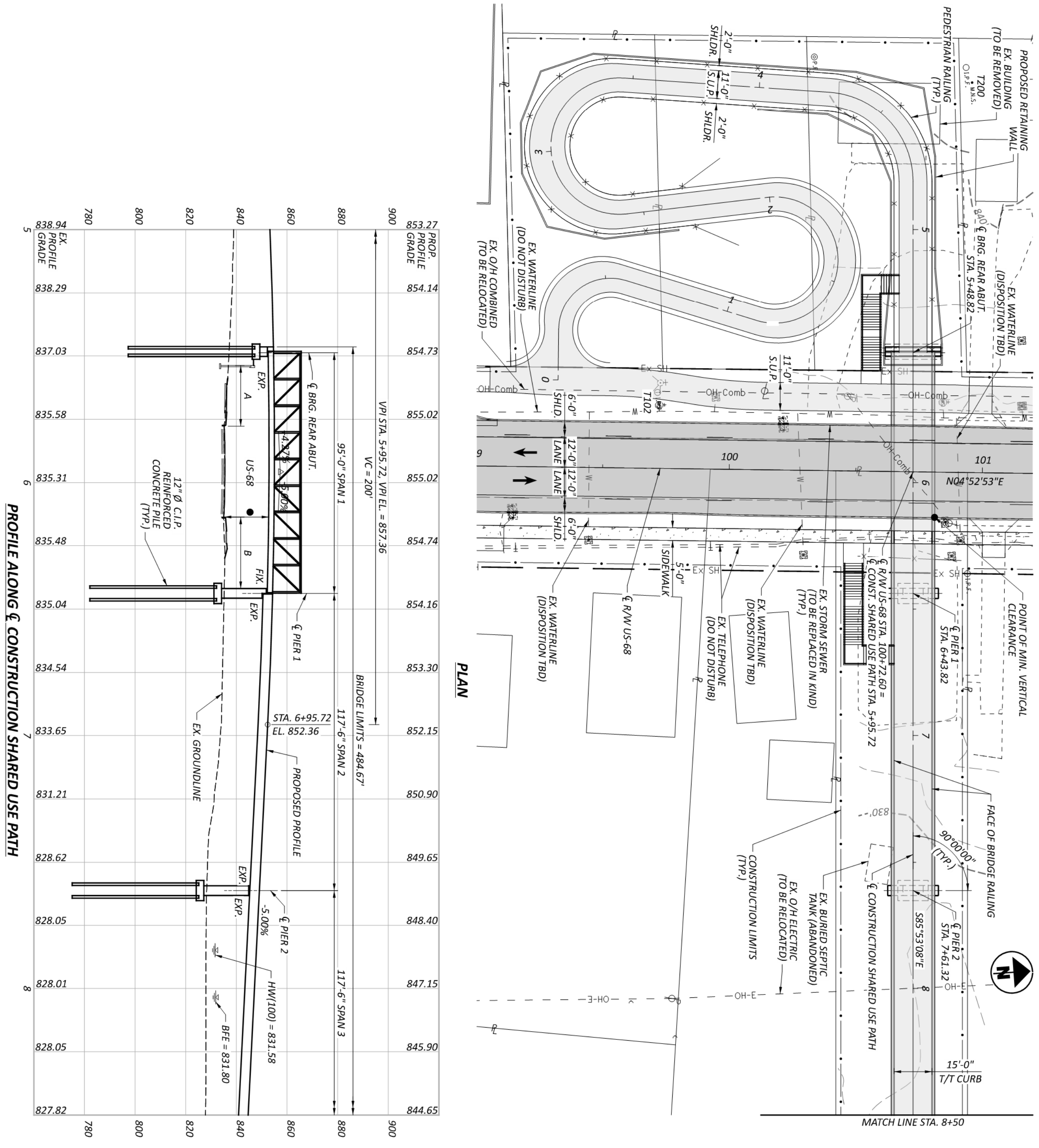

PROP. PROFILE GRADE	853.27	854.14	854.73	855.02	855.02	854.74	854.16	853.30	852.15	850.90	849.65	848.40	847.15	845.90	844.65
EX. PROFILE GRADE	838.94	838.29	837.03	835.58	835.31	835.48	835.04	834.54	833.65	831.21	828.62	828.05	828.01	828.05	827.82

BENCHMARK DATA

T102 STA. 99+71.31, EL. 835.661, OFFSET 29.95' LT., IRON PIN FOUND
T103 STA. 100+94.64, EL. 835.180, OFFSET 40.01' RT., IRON PIN FOUND
T110 STA. 100+72.99, EL. 831.871, OFFSET 457.01' RT., IRON PIN SET
T200 STA. 100+93.88, EL. 840.801, OFFSET 154.24' LT., MAG NAIL SET

NOTES:

1. EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.
2. SEE ROADWAY PLANS FOR ADDITIONAL SHARED USE PATH HORIZONTAL AND VERTICAL CURVE INFORMATION.
3. CONCEPTUAL TRUSS STYLE SHOWN IN THE PROFILE VIEW.
4. FRICTION PILES WERE THE ASSUMED FOUNDATION TYPE BASED ON GEOTECHNICAL INFORMATION FOR THE NEARBY INTERPRETIVE CENTER AND HISTORIC BORING LOGS FOR GRE-68-13.40 BRIDGE OVER MASSIES CREEK NORTH OF THE PROJECT LOCATION.

US-68 DESIGN TRAFFIC:
2026 ADT = 8,600 2026 ADTT = 602
2046 ADT = 8,800 2046 ADTT = 616
DIRECTIONAL DISTRIBUTION = 0.50

LEGEND:

● 17'-6" REQUIRED MINIMUM VERTICAL CLEARANCE
17'-10¼" ACTUAL MINIMUM VERTICAL CLEARANCE
A - REQUIRED HORIZONTAL CLEARANCE = 19'-0"
MIN. HORIZONTAL CLEARANCE = 23'-9½"
B - REQUIRED HORIZONTAL CLEARANCE = 19'-0"
MIN. HORIZONTAL CLEARANCE = 27'-11¾"

PROP. SHARED USE PATH
PROP. PAVEMENT
PROP. WALK

HYDRAULIC DATA:

DRAINAGE AREA = 10.6 SQ. MILES
Q (100) = 2000 CFS V (100) = 1.7 FT/S
STRUCTURE CLEARS THE 100 YEAR DESIGN HW BY 2.09 FEET.

EXISTING STRUCTURE - NONE

PROPOSED STRUCTURE

TYPE: FOUR SPAN PREFABRICATED PAINTED STEEL TRUSS AND WIDE FLANGE BEAM SUPERSTRUCTURE WITH REINFORCED CONCRETE DECK ON REINFORCED CONCRETE ABUTMENTS AND PIERS SUPPORTED ON CAST-IN-PLACE REINFORCED CONCRETE PILES
SPANS: 95'-0", 117'-6", 117'-6", 150'-0" (SEE PLAN)
ROADWAY: 15'-0" TOE/TOE CURB
LOADING: 0.090 KSF PEDESTRIAN LOAD AND H15-44 VEHICULAR LOAD
SKEW: NONE
WEARING SURFACE: 1" MONOLITHIC CONCRETE
APPROACH SLABS: NONE
ALIGNMENT: TANGENT
CROWN: 0.0156 FT/FT
DECK AREA: 8,180 SF
COORDINATES: LATITUDE N39°43'46.65"
LONGITUDE W83°56'12.36"

HORIZONTAL SCALE IN FEET 0 10 20 40

ALTERNATIVE 2B - SITE PLAN (1 OF 2)
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

SFN	DESIGN AGENCY	DESIGNER	CHECKER	REVIEWER	PROJECT ID	SUBSET	TOTAL	SHEET	TOTAL
2926107	fishbeck	BMG	TLC	JPC 11/27/23	115388	S2.1	6	P.17	22

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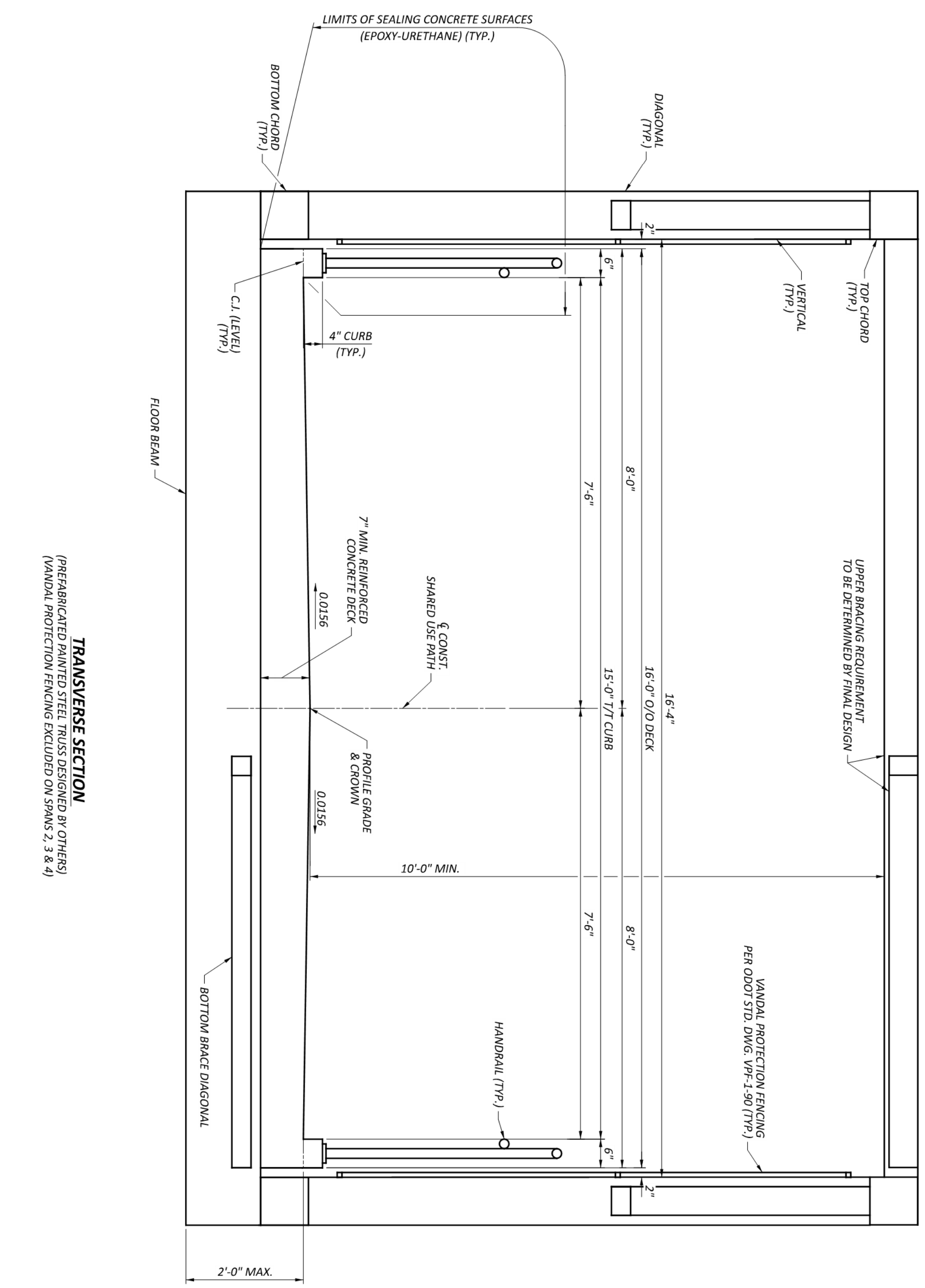

TRANSVERSE SECTION
(PREFABRICATED PAINTED STEEL TRUSS DESIGNED BY OTHERS)
(VANDAL PROTECTION FENCING EXCLUDED ON SPANS 2, 3 & 4)

NOTES:

1. CONCEPTUAL TRUSS STYLE SHOWN IN THE TRANSVERSE SECTION.

ALTERNATIVE 2A- TRANSVERSE SECTION
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

SFN	DESIGN AGENCY	DESIGNER	CHECKER	REVIEWER	PROJECT ID	SUBSET	TOTAL	SHEET	TOTAL
2926107	fishbeck	NCS	BMG	JPC 11/27/23	115388	S1.5	5	P.16	22

GRE-68-12.65

MODEL: Sheet - ALT 2 PAPERSIZE: 17x11 (in.) DATE: 12/28/2023 TIME: 4:00:32 PM USER: jlight
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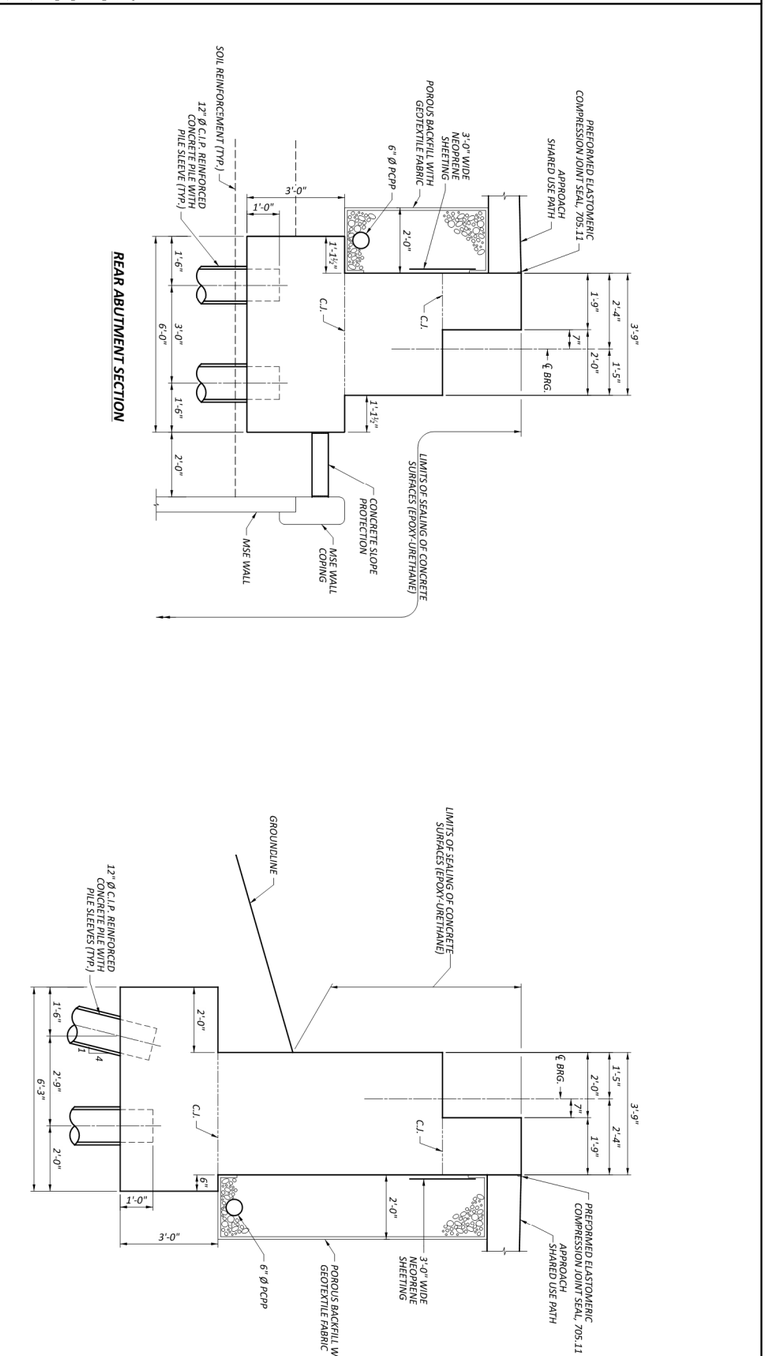

NOTES:

1. SUPERSTRUCTURE NOT SHOWN, INCLUDING STRIP SEAL EXPANSION JOINTS AND ELASTOMERIC BEARING ASSEMBLIES.

ALTERNATIVE 2B - ABUTMENT DETAILS
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US 68 AND OLD TOWN CREEK

SFN 2926107	DESIGN AGENCY fishbeck		
DESIGNED TLC	CHECKED BMG		
PROJECT MGR. JPC	REVIEWER 11/27/23		
PROJECT NO. 115388			
SHEET NO. S2.3	TOTAL SHEETS 6		
PLOT DATE P:19	TOTAL SHEETS 22		

GRE-68-12.65

MODEL: CLP_SUP_MAIN-1 - Plan 2 [Sheet] PAPERSIZE: 17x11 (in.) DATE: 12/28/2023 TIME: 4:00:30 PM USER: jlight
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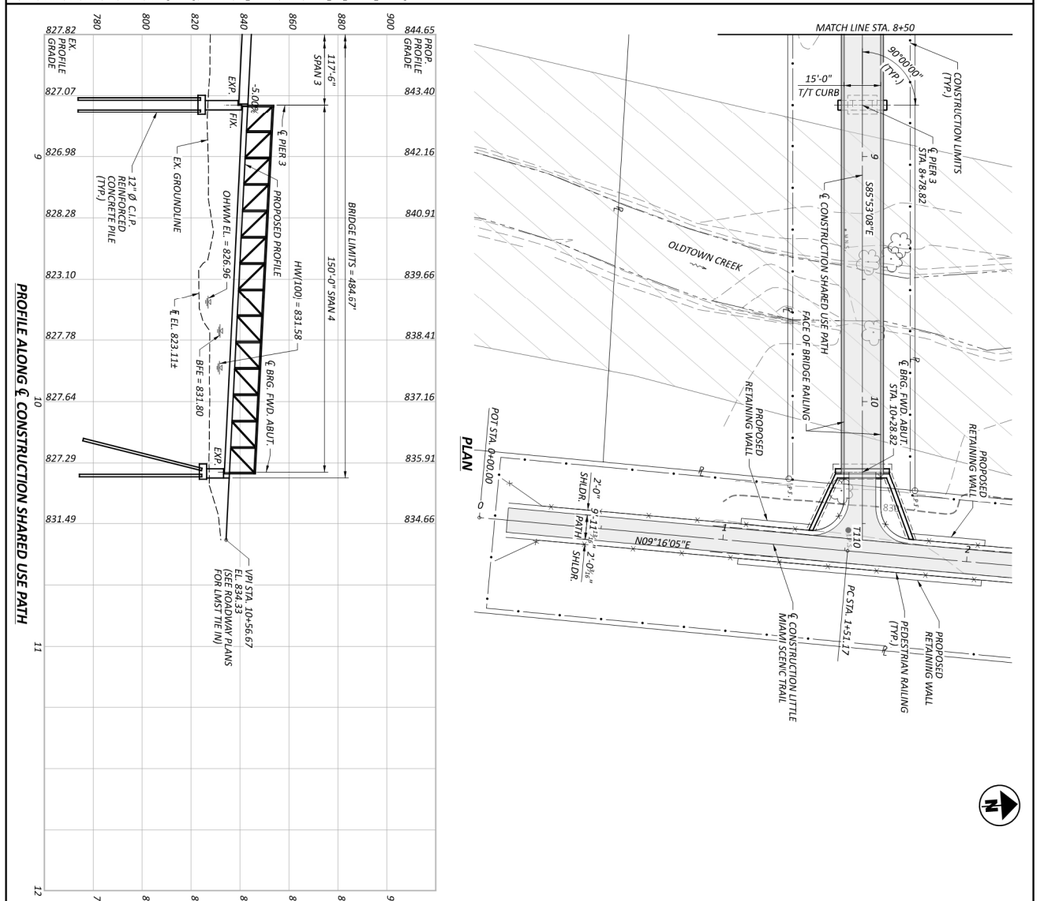

LEGEND:

LIMITS OF FLOODWAY

PROP. SHARED USE PATH

NOTES:

1. FOR ADDITIONAL NOTES AND INFORMATION, SEE SHEET S2.1 / 6 .

ALTERNATIVE 2B - SITE PLAN (2 OF 2)
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

HORIZONTAL SCALE IN FEET
0 20
10 40

SFN 2926107	DESIGN AGENCY fishbeck		
DESIGNED BMG	CHECKED TLC		
PROJECT MGR. JPC	REVIEWER 11/27/23		
PROJECT NO. 115388			
SHEET NO. S2.2	TOTAL SHEETS 6		
PLOT DATE P:18	TOTAL SHEETS 22		

GRE-68-12.65

MODEL: Truss Sheet PAPERSIZE: 17x11 (in.) DATE: 12/28/2023 TIME: 4:00:33 PM USER: jlight
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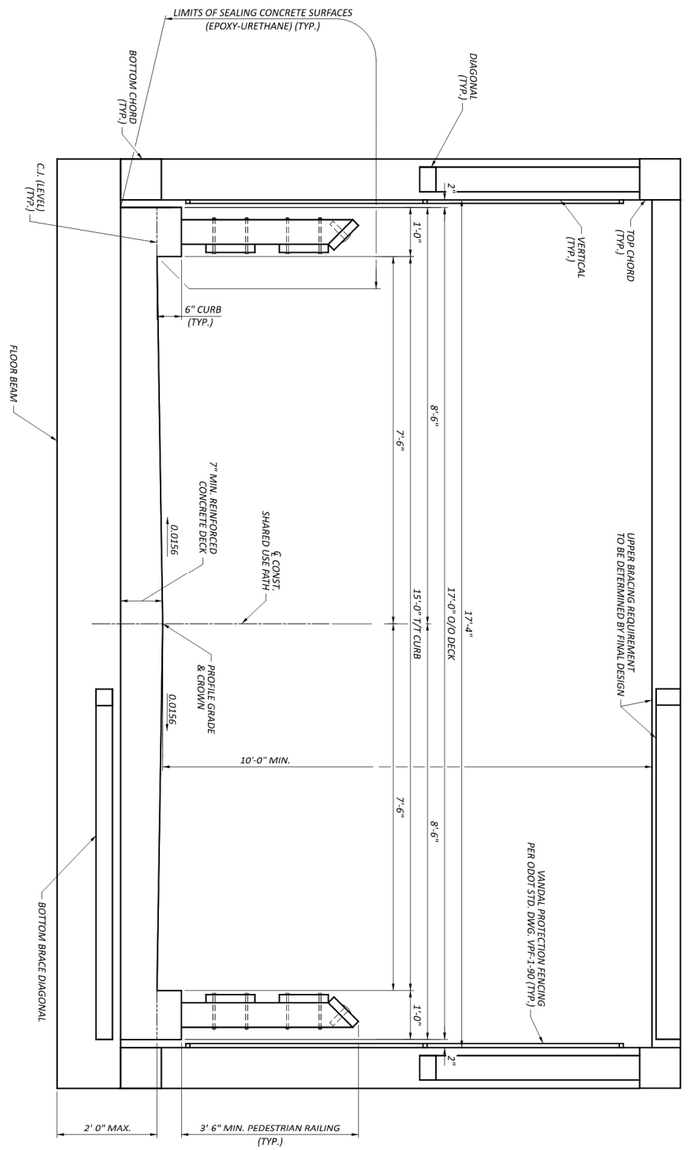

TRANSVERSE SECTION
(PREFABRICATED PAINTED STEEL TRUSS DESIGNED BY OTHERS)
(SPANS 1 AND 4)
(VANDAL PROTECTION FENCING EXCLUDED ON SPANS 2, 3, & 4)

NOTES:
1. CONCEPTUAL TRUSS STYLE SHOWN IN THE TRANSVERSE SECTION.

DESIGNED	CHECKED	SFN	2926107
NCS	BMG	DESIGN AGENCY	
REVIEWED			
JPC	11/27/23		
PROJECT NO.			
115388			
SHEET NO.	TOTAL SHEETS		
S2.5	6		
PHASE NO.	TOTAL PHASES		
P.21	22		

fishbeck

ALTERNATIVE 2B - TRANSVERSE SECTION (1 OF 2)
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US 68 AND OLD TOWN CREEK

GRE-68-12.65

MODEL: Sheet - ALT 2 PAPERSIZE: 17x11 (in.) DATE: 12/28/2023 TIME: 4:00:32 PM USER: jlight
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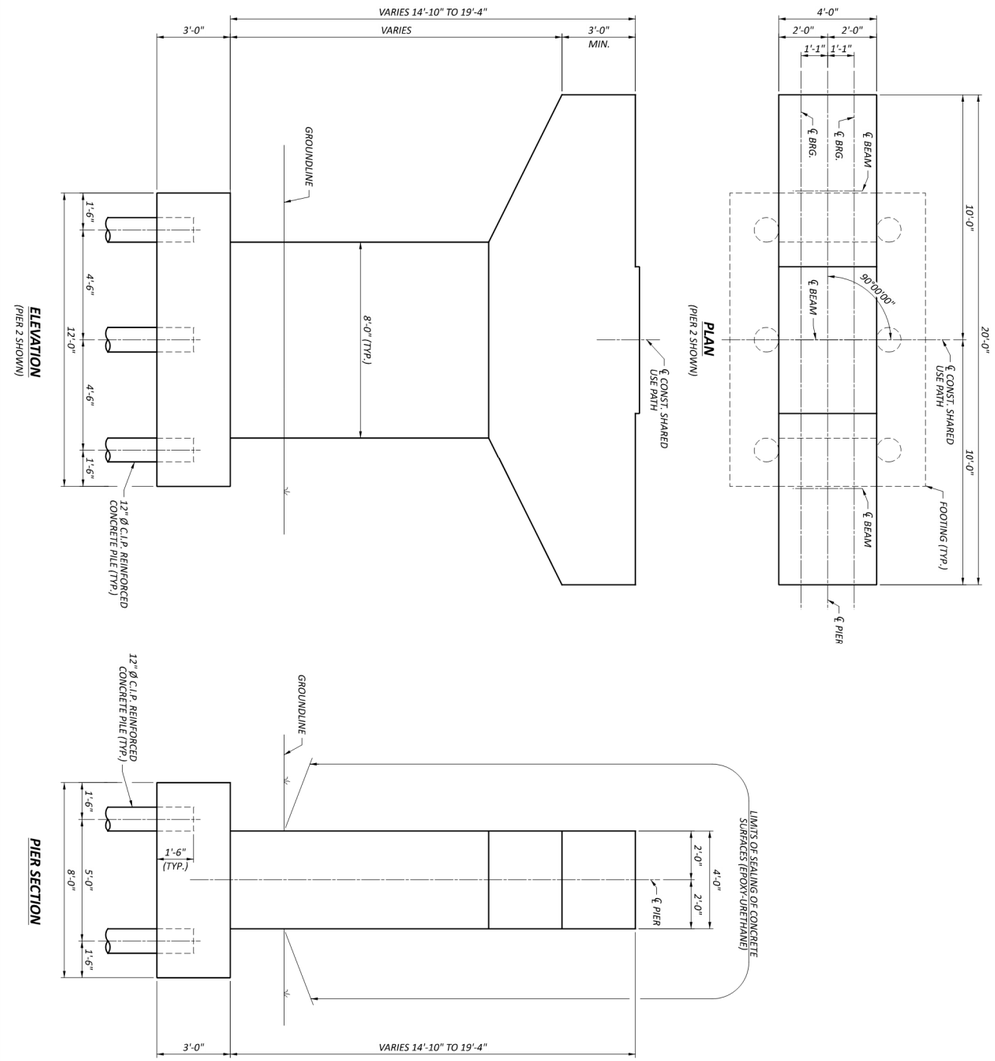
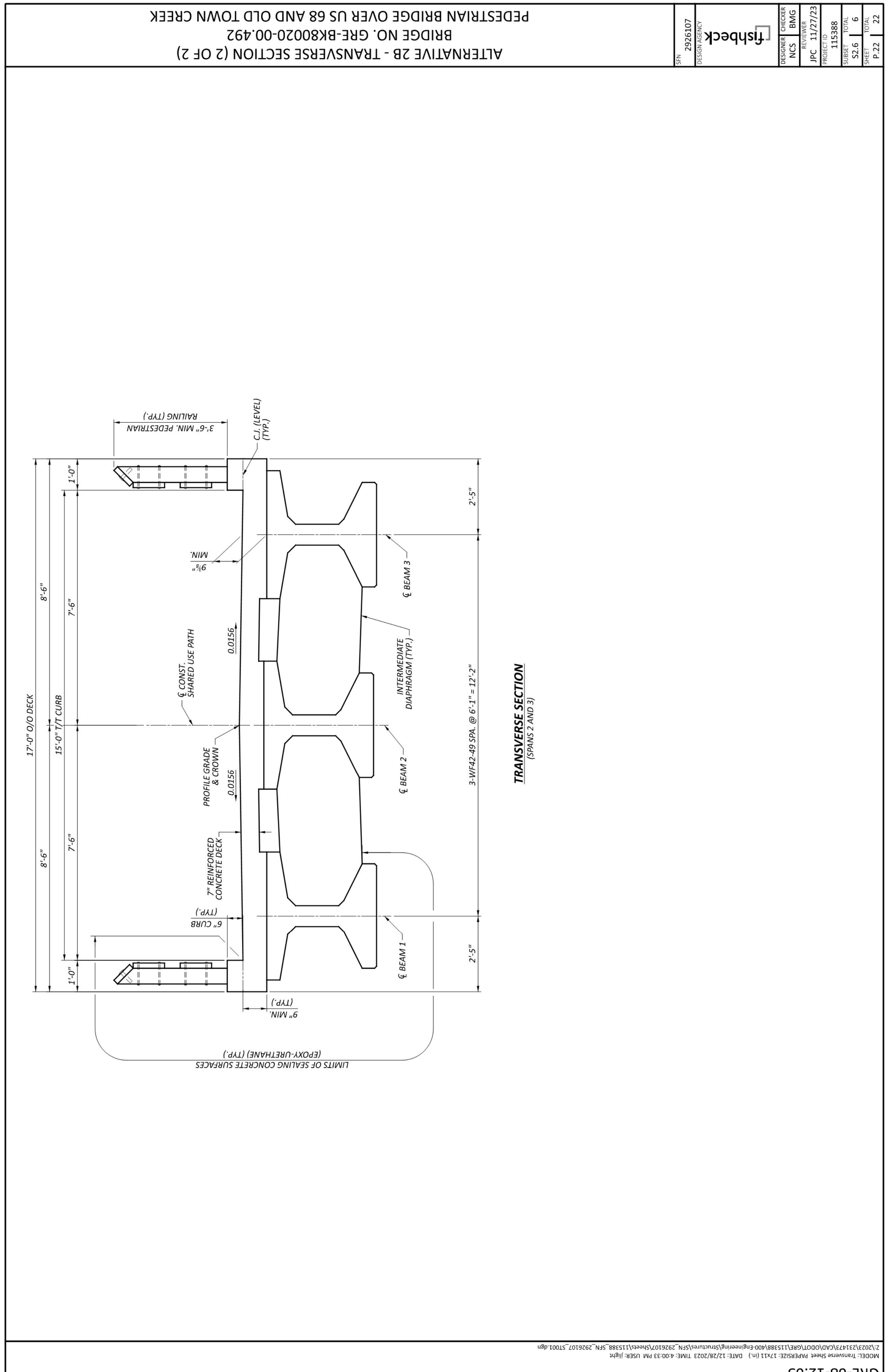


NOTES:
1. SUPERSTRUCTURE NOT SHOWN. INCLUDING STRIP SEAL EXPANSION JOINTS AND ELASTOMERIC BEARING ASSEMBLIES.
2. PIERS 1 AND 3 SHALL HAVE A STEP IN THE CAP TO ACCOMMODATE DIFFERENCE IN SUPERSTRUCTURE DEPTH.

DESIGNED	CHECKED	SFN	2926107
TLC	BMG	DESIGN AGENCY	
REVIEWED			
JPC	11/27/23		
PROJECT NO.			
115388			
SHEET NO.	TOTAL SHEETS		
S2.4	6		
PHASE NO.	TOTAL PHASES		
P.20	22		

fishbeck

ALTERNATIVE 2B - PIER DETAILS
BRIDGE NO. GRE-BK80020-00.492
PEDESTRIAN BRIDGE OVER US-68 AND OLD TOWN CREEK

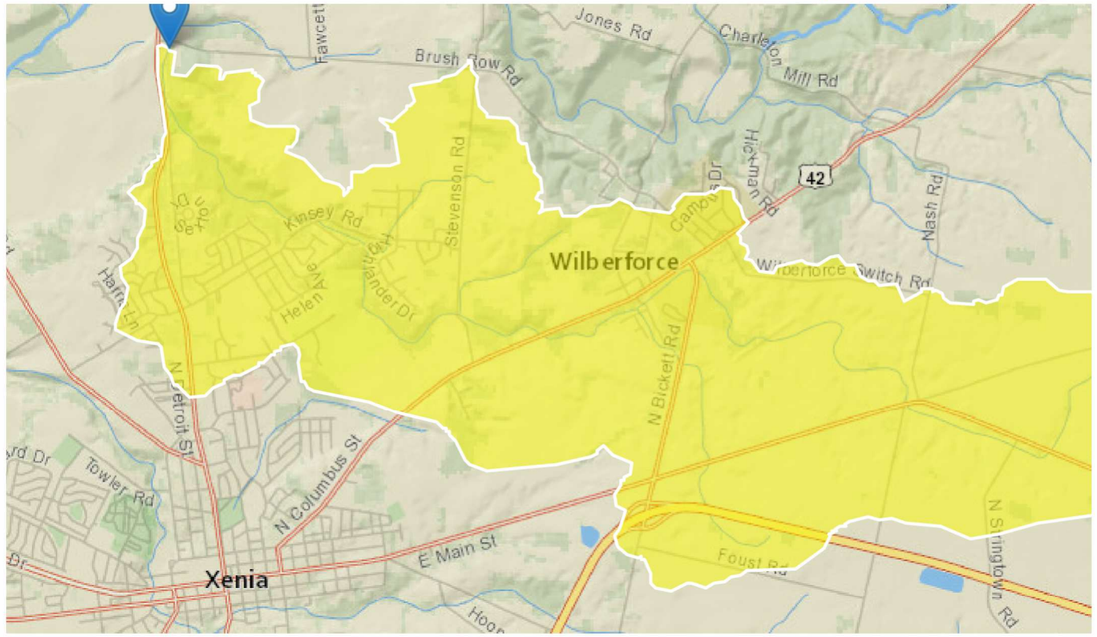


APPENDIX 2: USGS STREAMSTATS OUTPUT

GRE-68 StreamStats Report

Region ID: OH
Workspace ID: OH20231128174939768000
Clicked Point (Latitude, Longitude): 39.72957, -83.93561
Time: 2023-11-28 12:50:04 -0500

SEE PAGE 7 FOR IMAGE OF FULL BASIN



GRE-68 Shared Use Path

Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
CSL1085LFP	Change in elevation divided by length between points 10 and 85 percent of distance along the longest flow path to the basin divide, LFP from 2D grid	29.7	feet per mi
DRNAREA	Area that drains to a point on a stream	9.62	square miles

Parameter Code	Parameter Description	Value	Unit
FOREST	Percentage of area covered by forest	9.02	percent
LAT_CENT	Latitude of Basin Centroid	39.7052	decimal degrees
LC92STOR	Percentage of water bodies and wetlands determined from the NLCD	0.18	percent
LONG_CENT	Longitude Basin Centroid	83.8849	decimal degrees
OHREGA	Ohio Region A Indicator	1	dimensionless
OHREGC	Ohio Region C Indicator	0	dimensionless
PRECIPCENT	Mean Annual Precip at Basin Centroid	39	inches
STREAM_VARG	Streamflow variability index as defined in WRIR 02-4068, computed from regional grid	0.44	dimensionless

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Peak Flow Full Model Reg A SIR2019 5018]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	9.62	square miles	0.04	5989
OHREGC	Ohio Region C Indicator 1 if in C else 0	0	dimensionless	0	1
OHREGA	Ohio Region A Indicator 1 if in A else 0	1	dimensionless	0	1
CSL1085LFP	Stream Slope 10 and 85 Longest Flow Path	29.7	feet per mi	1.53	516
LC92STOR	Percent Storage from NLCD1992	0.18	percent	0	25.35

Peak-Flow Statistics Flow Report [Peak Flow Full Model Reg A SIR2019 5018]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIL	PIU	ASEp
50-percent AEP flood	620	ft^3/s	328	1170	40.1
20-percent AEP flood	1070	ft^3/s	592	1930	37.2
10-percent AEP flood	1430	ft^3/s	786	2600	37.6
4-percent AEP flood	1950	ft^3/s	1070	3570	38.1
2-percent AEP flood	2380	ft^3/s	1290	4400	37.8
1-percent AEP flood	2840	ft^3/s	1520	5310	39.6
0.2-percent AEP flood	4040	ft^3/s	2140	7630	40.3

Peak-Flow Statistics Citations

Koltun, G.F.,2019, Flood-frequency estimates for Ohio streamgages based on data through water year 2015 and techniques for estimating flood-frequency characteristics of rural, unregulated Ohio streams: U.S. Geological Survey Scientific Investigations Report 2019–5018, 25 p. (https://dx.doi.org/10.3133/sir20195018)

Monthly Flow Statistics

Monthly Flow Statistics Parameters [Low Flow LatLE 41.2 wri02 4068]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	9.62	square miles	0.12	7422
LC92STOR	Percent Storage from NLCD1992	0.18	percent	0	19
PRECIPCENT	Mean Annual Precip at Basin Centroid	39	inches	34	43.2
FOREST	Percent Forest	9.02	percent	0	99.1
LAT_CENT	Latitude of Basin Centroid	39.7052	decimal degrees	38.68	41.2
STREAM_VARG	Streamflow Variability Index from Grid	0.44	dimensionless	0.25	1.13

Monthly Flow Statistics Flow Report [Low Flow LatLE 41.2 wri02 4068]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	ASEp
January Mean Flow	14.1	ft^3/s	16.6	16.6
February Mean Flow	17.1	ft^3/s	11.9	11.9
March Mean Flow	19.3	ft^3/s	14	14
April Mean Flow	17.6	ft^3/s	11.2	11.2
May Mean Flow	12	ft^3/s	19.5	19.5
June Mean Flow	8.5	ft^3/s	27	27
July Mean Flow	5.32	ft^3/s	28.2	28.2
August Mean Flow	4.16	ft^3/s	36.8	36.8
September Mean Flow	2.52	ft^3/s	43.6	43.6
October Mean Flow	2.5	ft^3/s	50.8	50.8
November Mean Flow	5.02	ft^3/s	37.5	37.5
December Mean Flow	9.83	ft^3/s	21.8	21.8

Monthly Flow Statistics Citations

Koltun, G. F., and Whitehead, M. T.,2002, Techniques for Estimating Selected Streamflow Characteristics of Rural, Unregulated Streams in Ohio: U. S. Geological Survey Water-Resources Investigations Report 02-4068, 50 p (https://pubs.er.usgs.gov/publication/wri024068)

General Flow Statistics

General Flow Statistics Parameters [Low Flow LatLE 41.2 wri02 4068]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	9.62	square miles	0.12	7422
LC92STOR	Percent Storage from NLCD1992	0.18	percent	0	19
STREAM_VARG	Streamflow Variability Index from Grid	0.44	dimensionless	0.25	1.13
LAT_CENT	Latitude of Basin Centroid	39.7052	decimal degrees	38.68	41.2

General Flow Statistics Flow Report [Low Flow LatLE 41.2 wri02 4068]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	ASEp
Harmonic Mean Streamflow	2.27	ft^3/s	65.9	65.9

General Flow Statistics Citations

Koltun, G. F., and Whitehead, M. T.,2002, Techniques for Estimating Selected Streamflow Characteristics of Rural, Unregulated Streams in Ohio: U. S. Geological Survey Water-Resources Investigations Report 02-4068, 50 p (https://pubs.er.usgs.gov/publication/wri024068)

Bankfull Statistics

Bankfull Statistics Parameters [Interior Plains D Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	9.62	square miles	0.19305	59927.7393

Bankfull Statistics Parameters [Central Lowland P Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	9.62	square miles	0.200772	59927.66594

Bankfull Statistics Parameters [USA Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	9.62	square miles	0.07722	59927.7393

Bankfull Statistics Flow Report [Interior Plains D Bieger 2015]

Statistic	Value	Unit
Bieger_D_channel_width	26	ft
Bieger_D_channel_depth	2.3	ft
Bieger_D_channel_cross_sectional_area	62.8	ft^2

Bankfull Statistics Flow Report [Central Lowland P Bieger 2015]

Statistic	Value	Unit
Bieger_P_channel_width	29.2	ft
Bieger_P_channel_depth	2.72	ft
Bieger_P_channel_cross_sectional_area	59	ft^2

Bankfull Statistics Flow Report [USA Bieger 2015]

Statistic	Value	Unit
Bieger_USA_channel_width	27.5	ft
Bieger_USA_channel_depth	1.95	ft
Bieger_USA_channel_cross_sectional_area	58	ft^2

Bankfull Statistics Flow Report [Area-Averaged]

Statistic	Value	Unit
Bieger_D_channel_width	26	ft
Bieger_D_channel_depth	2.3	ft
Bieger_D_channel_cross_sectional_area	62.8	ft^2
Bieger_P_channel_width	29.2	ft
Bieger_P_channel_depth	2.72	ft
Bieger_P_channel_cross_sectional_area	59	ft^2
Bieger_USA_channel_width	27.5	ft
Bieger_USA_channel_depth	1.95	ft
Bieger_USA_channel_cross_sectional_area	58	ft^2

Bankfull Statistics Citations

Bieger, Katrin; Rathjens, Hendrik; Allen, Peter M.; and Arnold, Jeffrey G.,2015, Development and Evaluation of Bankfull Hydraulic Geometry Relationships for the Physiographic Regions of the United States, Publications from USDA-ARS / UNL Faculty, 17p. (https://digitalcommons.unl.edu/usdaarsfacpub/1515?utm_source=digitalcommons.unl.edu%2Fusdaarsfacpub%2F1515&utm_medium=PDF&utm_

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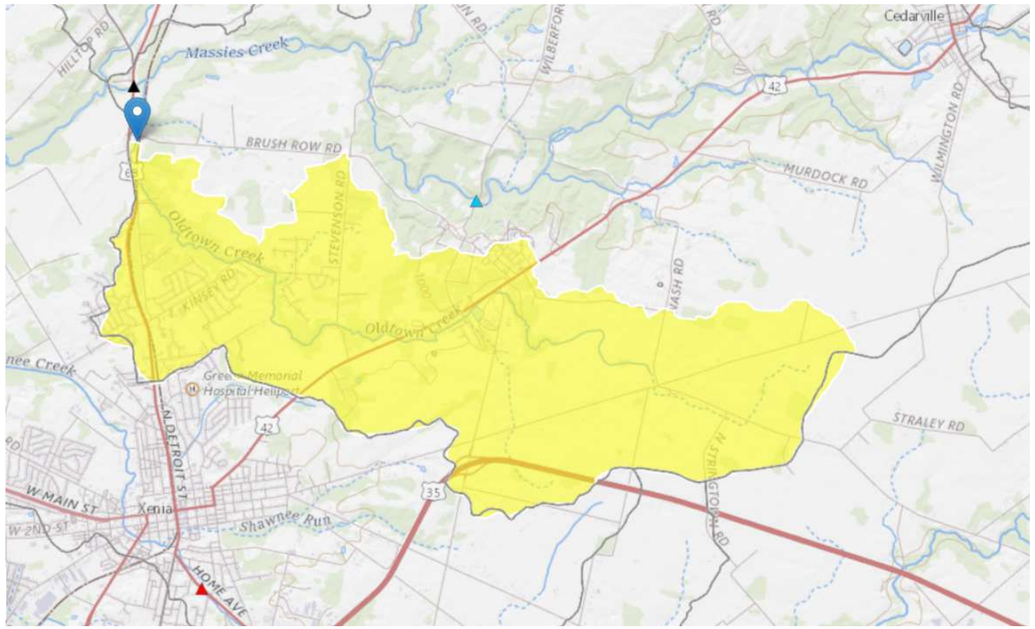
Application Version: 4.18.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1



APPENDIX 3: FIRM DATA

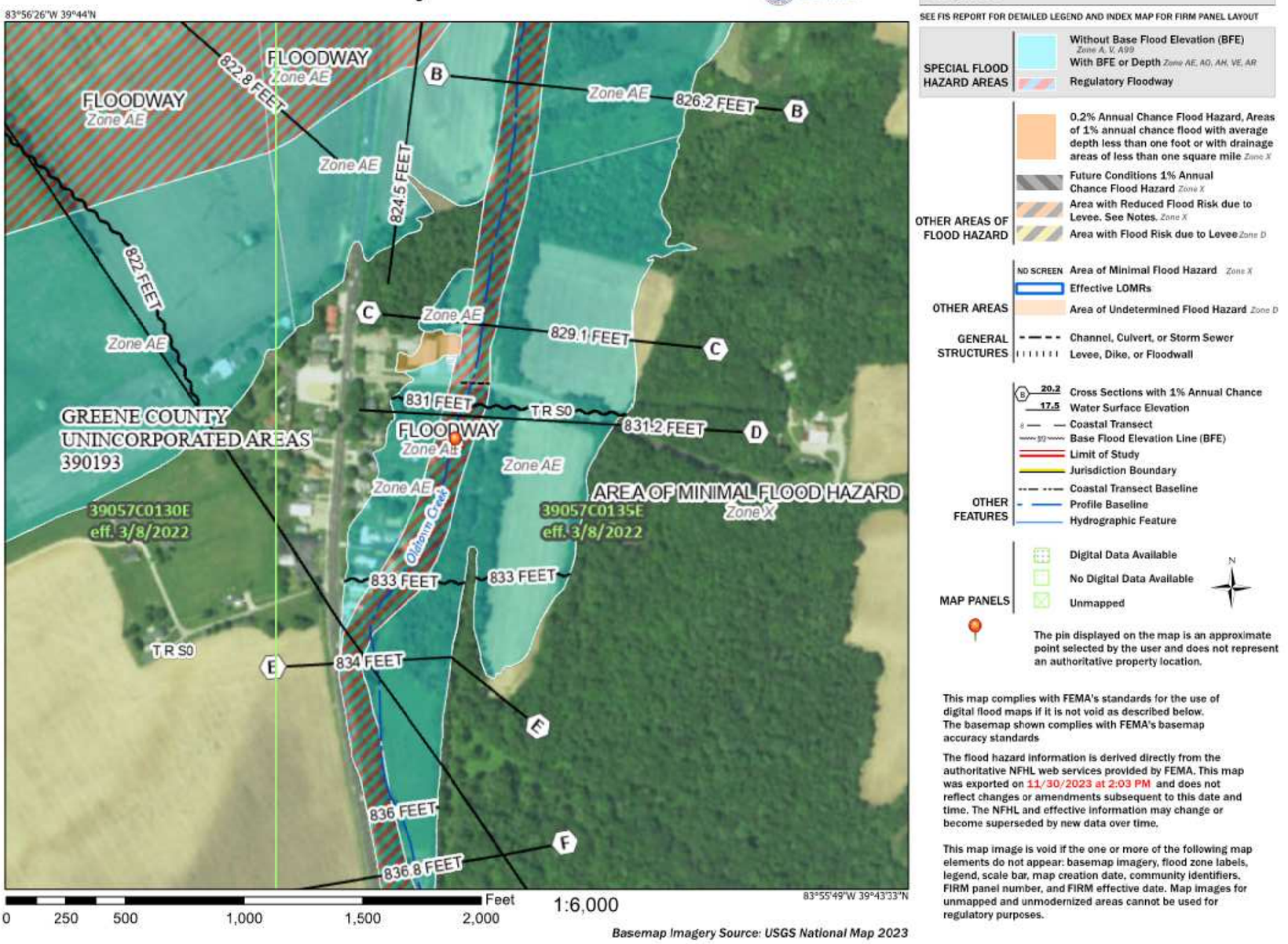
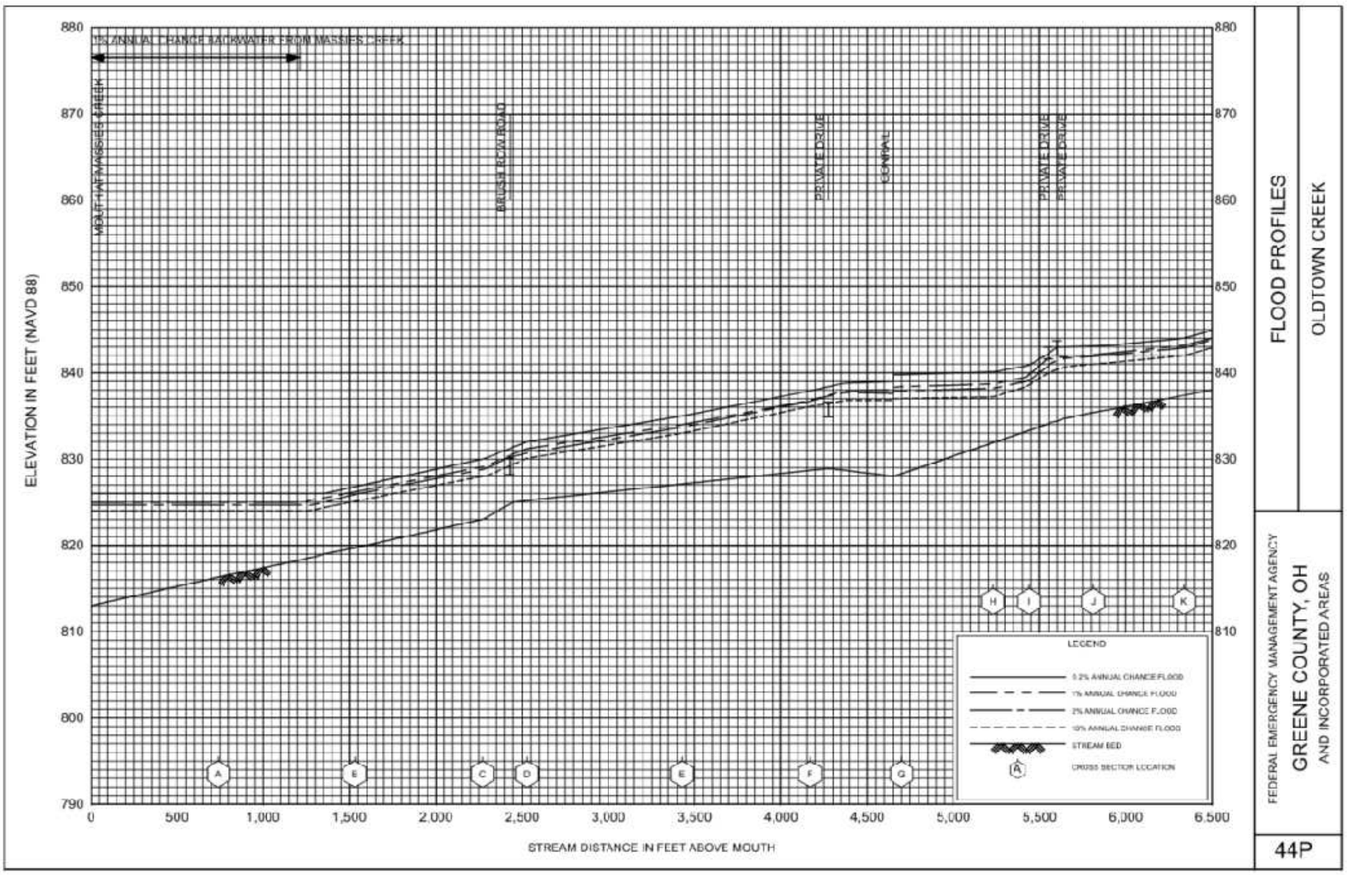


Table 9: Summary of Discharges (*continued*)

Flooding Source	Location	Drainage Area (Square Miles)	Peak Discharge (cfs)					
			10% Annual Chance	4% Annual Chance	2% Annual Chance	1% Annual Chance Existing	1% Annual Chance Future	0.2% Annual Chance
North Fork Massies Creek	At mouth	30.4	2,100	*	3,360	4,150	*	6,300
North Wilberforce Brook	At mouth	3.8	835	*	1,245	1,420	*	1,880
Oldtown Creek	At mouth	10.6	1,180	*	1,740	2,000	*	2,980
Oldtown Creek	Approximately 600 feet downstream of Kinsey Road	7.9	1,060	*	1,550	1,790	*	2,550
Painters Creek	Approximately 400 feet upstream of Spring Valley Paintersville Road	5.8	955	*	1,420	1,630	*	2,240
Possum Run	At mouth	2.4	400[1]	*	600[1]	700[1]	*	2,000[1]
Possum Run	Approximately 200 feet upstream of Belleview Drive	1.4	300	*	400	450	*	1,300
Ripple Road Brook	At mouth	3.8	820	*	1,220	1,400	*	1,830
Shawnee Creek	At confluence with Little Miami River	11.5	1,205	1,535	1,805	2,105	*	2,865
Shawnee Creek	Approximatley 1,100 feet downstream of Towler Road	9.0	1,475	1,985	2,455	2,935	*	4,090
Shawnee Creek	Approximatley 170 feet downstream of the confluence with Shawnee Creek Park Tributary	8.6	1,455	1,960	2,405	2,875	*	4,015

[1] Discharge values for Possum Creek were estimated from Figure 7 which was taken from the 1976 City of Bellbrook Flood Insurance Study

* Data not available



LOCATION		FLOODWAY			1% ANNUAL CHANCE FLOOD WATER SURFACE ELEVATION (FEET NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/ SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
A	740	66	343	5.8	825.6	823.2 [2]	824.0	0.8
B	1,530	106	488	4.1	826.2	826.2	827.1	0.9
C	2,270	85	343	5.8	829.1	829.1	829.9	0.8
D	2,530	120	605	3.3	831.2	831.2	832.0	0.8
E	3,430	62	293	6.8	834.0	834.0	834.8	0.8
F	4,170	105	595	3.4	836.8	836.8	837.8	1.0
G	4,700	122	887	2.3	838.4	838.4	839.3	0.9
H	5,230	70	417	4.8	838.7	838.7	839.6	0.9
I	5,440	56	234	8.5	839.6	839.6	840.2	0.6
J	5,810	65	421	4.7	842.0	842.0	842.5	0.5
K	6,340	65	382	5.2	843.2	843.2	843.9	0.7
L	6,860	45	248	8.1	845.7	845.7	846.4	0.7
M	8,180	46	305	6.5	851.8	851.8	852.8	1.0
N	9,080	44	237	8.4	859.9	859.9	860.4	0.5
O	11,040	54	247	7.5	878.4	878.4	879.2	0.8
P	11,190	38	188	9.5	882.3	882.3	882.3	0.0
Q	14,470	55	279	6.4	907.9	907.9	908.7	0.8
R	18,220	60	266	6.1	932.4	932.4	932.4	0.0
S	18,320	63	351	4.6	933.1	933.1	933.9	0.8
T	18,900	65	228	7.1	936.6	936.6	936.7	0.1
U	21,170	40	185	8.8	969.6	969.6	969.8	0.2
V	21,810	42	266	6.1	978.9	978.9	979.7	0.8
W	21,960	118	465	3.5	980.0	980.0	980.8	0.8
X	24,600	113	431	3.2	987.0	987.0	987.9	0.9
Y	24,760	68	358	3.9	987.4	987.4	988.3	0.9
Z	26,660	46	237	5.9	994.9	994.9	995.9	1.0

[1] FEET ABOVE MOUTH
[2] WATER SURFACE ELEVATION COMPUTED WITHOUT CONSIDERATION OF 1% ANNUAL CHANCE BACKWATER FROM MASSIES CREEK

TABLE 23

FEDERAL EMERGENCY MANAGEMENT AGENCY

GREENE COUNTY, OHIO

AND INCORPORATED AREAS

FLOODWAY DATA

FLOODING SOURCE: OLDTOWN CREEK

Table 13: Roughness Coefficients

Flooding Source	Channel "n"	Overbank "n"
Anderson Fork	0.035	0.06-0.8
Beaver Creek	0.04-0.06	0.05-0.07
Brewsters Run	0.03-0.06	0.025-0.15
Caesar Creek	0.06	0.045-0.14
Caesar Creek	0.03-0.06	0.03-0.15
Caeser Creek Tributary No. 2	0.055	0.08-0.15
Estate Brook	0.04	0.06
Fairbrook School Tributary	0.05	0.06
Fairgrounds Road Tributary	0.05	0.06
Glady Run	0.05	0.07
Little Beaver Creek	0.04-0.06	0.06-0.07
Little Miami River	0.045-0.055	0.08-0.12
Little Miami River	0.02-0.07	0.03-0.08
Little Sugar Creek	0.03-0.06	0.025-0.15
Ludlow Creek	0.05-0.06	0.06-0.07
Massies Creek	0.03-0.06	0.025-0.15
New Germany Branch	0.045-0.05	0.05-0.06
North Fork Massies Creek	0.05	0.07
North Wilberforce Brook	0.05	0.07
Oldtown Creek	0.05-0.06	0.06-0.07
Painters Creek	0.03-0.05	0.05-0.07
Possum Run	0.025-0.06	0.035-0.075
Ripple Road Brook	0.05	0.07
Shawnee Creek	0.045-0.07	0.03-0.14
Shawnee Creek Tributary	0.04-0.06	0.04-0.14
Shawnee Park Tributary	0.05-0.07	0.03-0.12
Shawnee Park Tributary	0.035	0.07-0.08
South Branch Caesar Creek	0.035	0.06-0.1
South Branch Caesar Creek	0.045-0.05	0.07
South Fork Massies Creek	0.035	0.06
South Fork Massies Creek	0.05	0.07
South Fork Massies Creek Tributary	0.035	0.06

APPENDIX 4: HEC-RAS OUTPUT – EXISTING CONDITIONS

HEC-RAS HEC-RAS 6.4.1 June 2023
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: GRE-68-12.65
Project File : GRE-68-12.prj
Run Date and Time: 11/28/2023 2:34:30 PM

Project in English units

PLAN DATA

Plan Title: OldtownCreekExisting
Plan File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hydraulics\HEC-RAS\GRE-68-12.p01

Geometry Title: OldtownCreekExisting
Geometry File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hydraulics\HEC-RAS\GRE-68-12.g01

Flow Title : OldtownCreekFIS
Flow File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hydraulics\HEC-RAS\GRE-68-12.f01

Plan Summary Information:
Number of: Cross Sections = 9 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 1 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: OldtownCreekFIS
Flow File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hydraulics\HEC-RAS\GRE-68-12.f01

Flow Data (cfs)

River	Reach	RS	100 yr	5 yr
Oldtown Creek	Reach	1401.062	2000	1070

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Oldtown Creek	Reach	100 yr	Known WS = 829.1	
Oldtown Creek	Reach	5 yr	Normal S = 0.002156	

GEOMETRY DATA

Geometry Title: OldtownCreekExisting
Geometry File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hydraulic

s\HEC-RAS\GRE-68-12.g01

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach RS: 1401.062

INPUT
Description: FIS E-E
Station Elevation Data num= 426

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	830.99	.07	830.99	.54	831	2.19	830.98	4.69	830.94
5.59	830.97	6.19	830.93	7.92	830.89	11.29	830.89	12.14	830.93
13.58	830.94	16.1	830.89	18.28	830.83	19.25	830.86	21.48	830.82
22.71	830.86	23.26	830.85	24.86	830.87	28.06	830.75	28.43	830.75
30.07	830.72	30.58	830.71	33.66	830.86	33.99	830.84	34.54	830.81
36.15	830.73	39.51	830.49	39.53	830.49	41.95	830.68	44.12	830.82
45.19	830.87	46.28	830.9	47.62	830.89	48.1	830.9	50.94	830.9
52.09	830.93	53.37	830.92	56.6	830.85	56.77	830.85	58.94	830.76
59.63	830.79	62.48	830.91	64.58	830.93	64.61	830.93	68.09	830.74
69.73	830.6	70.17	830.6	71.82	830.72	73.72	830.83	75.13	830.78
75.95	830.73	76.51	830.76	79.36	830.96	80.48	830.91	81.65	830.86
85.14	830.93	85.2	830.93	87.34	830.91	88.11	830.93	90.7	831.06
91.54	831.04	92.97	831.03	95.51	831.05	96.32	831.06	98.48	831.15
98.55	831.15	101.93	831.07	102.93	831.04	104.29	831	104.8	830.98
109.77	830.77	109.98	830.79	110.53	830.83	113.25	831.19	115.57	831.19
116.75	831.25	118.89	831.26	120.68	831.45	121.14	831.47	122.5	831.56
124.6	831.66	125.36	831.65	126.7	831.64	129.24	831.82	130.24	831.86
130.8	831.88	132.49	831.95	135.42	832.63	135.92	832.74	136.08	832.77
138.16	833.09	140.68	833.49	141.55	833.59	143.76	833.7	143.85	833.71
144.63	833.75	149.06	833.99	149.49	834.03	150.13	834.05	152.88	834.24
153.46	834.28	155.29	834.3	158.56	834.21	164.39	834.25	164.6	834.26
166.75	834.3	167.06	834.29	169.59	834.19	170.09	834.17	170.63	834.16
172.49	834.16	174.07	834.11	175.95	834.05	177.45	834	180.35	833.95
181.63	833.92	183.03	833.86	184.03	833.82	184.92	833.78	187.46	833.65
194.72	830.85	198.71	829.13	199.73	828.46	201.04	827.66	203.13	826.65
203.93	826.35	208.58	827.26	228.96	831.83	230.13	832.09	230.32	832.13
230.37	832.13	233.69	832.27	234.75	832.3	236.42	832.5	241.26	832.54
243.15	832.3	247.69	831.7	250.42	831.49	251.02	831.45	251.44	831.38
253.44	831.17	254.56	831.12	256.26	830.95	259.17	830.84	261.73	830.85
262.73	830.8	264.23	830.66	264.82	830.63	266.06	830.64	269.59	830.6
270.69	830.57	273.06	830.44	274.14	830.4	274.79	830.37	276.51	830.31
278.86	830.32	279.59	830.33	279.88	830.31	280.88	830.24	282.28	830.13
285.57	830.13	287.22	829.87	287.87	829.8	289.27	829.83	291.37	829.89
292.11	829.79	293.5	829.66	296.43	829.85	297.54	829.83	299.28	829.61
302.67	829.62	302.7	829.62	305.08	829.8	306.61	829.87	307.99	829.91
308.67	829.93	310.1	829.93	310.85	829.93	311	829.94	314.13	829.96
315.43	829.92	316.47	829.84	317.91	829.94	319.92	830.1	321.49	830.14
322.07	830.16	322.83	830.19	325.64	830.24	327.65	830.12	327.82	830.11
328.34	830.12	331.38	830.29	333.55	830.49	333.66	830.5	336.9	830.72
338.06	830.77	338.15	830.77	339.18	830.81	339.9	830.85	340.98	830.84
348.57	831	351.54	830.93	355.56	830.43	356.52	830.42	358.85	830.45
363.98	831.02	366.26	830.68	367.94	830.63	371.36	830.58	371.44	830.58
375.09	830.49	379.93	830.41	387.06	830.28	390.01	830.27	390.84	830.22
393.3	830.66	394.38	830.74	404.71	830.51	405.27	830.53	406.16	830.53
408.35	830.44	410.09	830.49	411.74	830.52	413.94	830.48	418.68	830.55
419.52	830.44	420.93	830.55	423.68	830.77	425.4	830.53	429.2	830.52
434.76	830.45	438.39	830.45	440.65	830.39	441.47	830.44	444.21	830.42
449.58	830.39	455.37	830.54	456.27	830.48	460.61	830.49	463.34	830.61
463.97	830.66	464.59	830.65	468.04	830.41	470.15	830.36	483.48	830.59
484.12	830.61	484.74	830.61	488.54	830.55	491.11	830.76	493.56	830.99
498.29	830.58	499.45	830.52	500.73	830.52	501.55	830.54	502.38	830.52
507.68	830.29	508.55	830.27	511.29	830.18	513.16	830.2	513.59	830.22
514.35	830.23	517.06	830.3	517.98	830.32	519.2	830.34	520.44	830.57
524.62	830.86	525.14	830.82	528.32	831.17	528.74	831.18	528.96	831.22
531.11	831.31	531.24	831.36	534.68	832.39	538.02	833.76	539.24	834.31
540.99	834.97	541.26	835	541.99	835.04	547.98	835.69	548.45	835.7
550.28	835.78	551.2	835.92	553.26	836.07	554.16	836.13	555.02	836.19
557.28	836.28	560.65	836.42	561.28	836.42	562.13	836.45	564.11	836.44
565.04	836.42	568.21	836.41	568.3	836.42	568.7	836.41	570.48	836.32
570.89	836.33	574.63	836.43	575.53	836.42	577.68	836.39	578.92	836.35
584.45	836.5	585.46	836.5	587.92	836.54	588.61	836.56	591.4	836.94
595.58	836.93	597.58	836.91	599.91	836.79	600.52	836.81	612.15	836.62
614.8	836.51	618.86	836.97	622.11	837.1	623.58	837.61	624.74	837.62
628.68	837.33	635.46	836.82	635.77	836.86	636.91	836.76	637.95	836.75
641.26	836.64	642.82	836.87	644.67	837.06	646.45	836.87	649.11	836.41
650.67	836.27	654.46	836.02	657.58	835.74	657.85	835.71	658.45	835.71
664.56	835.54	666.3	835.5	667.21	835.49	670.81	835.44	671.41	835.45
672.47	835.44	674.27	835.4	675.09	835.41	678.38	835.55	678.78	835.54
681.25	835.17	682.48	835.11	685.38	835.3	685.77	835.24	687.96	835.14
688.54	835.17	689.98	835.15	691.64	835.08	692.31	835.09	694.18	834.83
695.08	834.75	697.99	834.92	699.27	834.94	701.81	834.96	702.23	834.94
707.24	834.9	708.51	834.92	709.18	834.89	711.44	834.86	713.4	834.85
715.24	834.66	716.01	834.68	720.13	835.02	720.41	835.02	720.65	835
722.96	834.81	724.7	834.95	727.29	835.35	728.66	835.37	730.14	835.33
732.42	835.37	734.32	835.54	736.23	835.66	737.09	835.63	739.44	835.67
741.16	835.84	743.4	835.76	744.12	835.74	748.47	835.88	750.99	836
751.38	835.99	752.51	836.11	756.76	836.6	757.97	836.58	763.66	836.72
764.58	836.82	765.15	836.87	768.35	837.35	769.23	837.4	771.29	837.42
772.2	837.5	774.34	837.86	776.3	838.18	778.91	838.86	779.57	838.96
783.37	839.32	785.21	839.63	786.26	839.75	787	839.86	793.02	840.63
793.64	840.72	797.45	841.13	798.29	841.31	800.38	841.79	802.41	842.1
811.06	843.51	811.42	843.57	811.55	843.59	811.61	843.61	814.56	844.22
816.5	844.69	818.57	844.95	821.62	845.38	824.07	845.72	828.4	847.03
828.59	847.08	828.84	847.14	834.53	848.34	835.69	848.62	837.1	848.97
840.05	850.07	841.43	850.26	846.98	851.19	847.17	851.24	847.64	851.4
850.27	852.05								

Manning's n Values num= 11

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	150.13	.013	187.46	.07	201.04	.06	208.58	.07
236.42	.1	250.42	.035	348.57	.1	554.16	.013	565.04	.1
850.27	.1								

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
187.46	236.42	293.81	291.23	319.49	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	138	835	F

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	833.35	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.07	Wt. n-Val.	0.035	0.068
0.059				
W.S. Elev (ft)	833.28	Reach Len. (ft)	293.81	291.23
319.49				
Crit W.S. (ft)	831.44	Flow Area (sq ft)	0.15	164.74
812.82				
E.G. Slope (ft/ft)	0.001731	Area (sq ft)	310.70	164.74
812.82				
Q Total (cfs)	2000.00	Flow (cfs)	0.06	328.61
1671.33				
Top Width (ft)	487.82	Top Width (ft)	139.38	48.01
300.44				
Vel Total (ft/s)	2.05	Avg. Vel. (ft/s)	0.40	1.99
2.06				
Max Chl Dpth (ft)	6.93	Hydr. Depth (ft)	0.11	3.43
2.71				
Conv. Total (cfs)	48067.2	Conv. (cfs)	1.4	7897.7
40168.1				
Length Wtd. (ft)	307.38	Wetted Per. (ft)	1.39	50.17
301.31				
Min Ch El (ft)	826.35	Shear (lb/sq ft)	0.01	0.35
0.29				
Alpha	1.00	Stream Power (lb/ft s)	0.00	0.71
0.60				
Frctn Loss (ft)	0.92	Cum Volume (acre-ft)	9.37	6.30
23.62				
C & E Loss (ft)	0.03	Cum SA (acres)	4.19	1.24
10.56				

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #5 yr

E.G. Elev (ft)	832.25	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.		0.068
0.058				
W.S. Elev (ft)	832.20	Reach Len. (ft)	293.81	291.23
319.49				
Crit W.S. (ft)	831.09	Flow Area (sq ft)		114.92
492.17				
E.G. Slope (ft/ft)	0.002150	Area (sq ft)	163.79	114.92
492.17				
Q Total (cfs)	1070.00	Flow (cfs)		223.97
846.03				
Top Width (ft)	464.71	Top Width (ft)	133.59	40.93
290.19				
Vel Total (ft/s)	1.76	Avg. Vel. (ft/s)		1.95
1.72				
Max Chl Dpth (ft)	5.85	Hydr. Depth (ft)		2.81
1.70				
Conv. Total (cfs)	23078.6	Conv. (cfs)		4830.7
18247.9				
Length Wtd. (ft)	304.62	Wetted Per. (ft)		42.88
290.84				
Min Ch El (ft)	826.35	Shear (lb/sq ft)		0.36
0.23				
Alpha	1.01	Stream Power (lb/ft s)		0.70
0.39				
Frctn Loss (ft)	0.98	Cum Volume (acre-ft)	5.65	5.02
13.12				
C & E Loss (ft)	0.02	Cum SA (acres)	3.21	1.18
9.55				

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach RS: 1109.832

INPUT
Description: 11+10
Station Elevation Data num= 477

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	835.57	1.08	835.55	7.37	835.49	10.99	835.52	13	835.39
13.72	835.39	17.34	835.35	18.52	835.36	23.26	835.26	24.29	835.25
29.91	835.16	31.86	835.2	33.41	835.21	35.16	835.22	36.44	835.22
39.12	835.2	41.1	835.2	41.7	835.22	44.85	835.18	45.13	835.18
46.68	835.07	47.84	835.09	50.42	835.15	51.52	835.16	52.28	835.09
54.55	835.12	55.98	835.08	57	835.05	57.98	835.03	58.87	835.01
61.54	834.88	62.64	834.85	66.99	834.87	67.31	834.88	67.39	834.89
69.23	835.04	71.12	835.06	72.79	835.06	74.66	835	74.8	835
75.13	834.99	78.35	834.9	79.49	834.88	80.3	834.83	82.73	834.73
84.54	834.73	86.01	834.65	89.5	834.81	91.65	834.75	93.73	834.71
95.11	834.74	97.17	834.78	97.72	834.76	100.71	834.7	102.66	834.6
103.05	834.61	106.33	834.65	107.38	834.57	108.21	834.5	111.89	834.37
112.87	834.37	113.9	834.36	116.14	834.25	117.48	834.18	117.74	834.17
119.47	834.08	121.76	833.95	123.05	833.91	125.85	834.19	129.31	834.48
130.66	834.3	131.33	834.19	134.25	833.9	134.89	833.87	136.39	833.54
137.47	833.35	139.83	833.17	142.03	833.12	142.14	833.11	145.56	832.62
147.13	832.55	147.69	832.5	148.17	832.48	151.24	832.26	152.38	832.24
153.35	832.22	156.65	832.18	157.04	832.19	157.29	832.15	159.12	832.07
162.49	832.21	162.76	832.22	164.82	832.09	166.34	832.19	167.23	832.24
173.58	832.04	181.58	831.88	184.84	831.88	186.31	831.81	190.73	831.81
196.07	831.8	199.28	831.85	201.61	831.71	202.72	831.75	204.43	831.91
207.16	831.98	209.5	832.08	210.67	832.04	213.62	831.85	214.52	831.88
216.01	831.89	216.34	831.9	216.49	831.89	216.62	831.89	222.1	832.03
223.3	832.11	225.76	832.27	227.6	832.21	227.96	832.18	228.36	832.17
233.31	832.39	233.65	832.42	236.06	832.51	237.34	832.54	237.52	832.54
239.34	832.43	240.24	832.43	244.86	832.33	244.96	832.32	247.68	832.33
248.7	832.32	250.78	832.32	251.17	832.31	254.41	832.2	256.14	832.17
256.56	832.16	258.25	832.1	260.09	832.05	261.96	832.16	262.27	832.16
263.1	832.14	265.76	832.02	266.81	831.97	267.78	831.93	269.81	831.93
271.5	831.95	272.95	831.88	273.39	831.86	274.01	831.83	277.06	831.9
277.37	831.92	279.11	831.86	281.55	831.75	281.7	831.74	282.78	831.74
284.17	831.81	285.08	831.78	286.78	831.8	288.79	831.8	289.45	831.78
291.2	831.71	294.39	831.8	294.88	831.82	294.97	831.82	295.06	831.81
297.87	831.78	299.23	831.76	301.13	831.77	303	831.64	304.84	831.7
308.92	831.85	309.65	831.88	310.45	831.9	314.14	831.84	315.54	831.8
319.29	831.21	319.46	831.21	319.67	831.17	321.57	830.76	321.75	830.67
325.11	829.02	325.46	828.86	325.58	828.78	328.1	827.82	331.35	826.75
331.46	826.71	331.48	826.7	331.5	826.7	333.7	825.98	335	825.64
337.42	824.72	338.3	824.61	339.7	824.62	341.63	824.44	343.46	824.36
345.51	824.46	346.29	824.46	349.64	824.38	349.65	824.38	353.51	824.51
355.45	824.63	358.65	826.57	360.3	827.51	365.41	830.55	367.8	830.73
368.86	830.8	369.83	830.73	374.77	830.66	379.37	830.85	384.29	830.86
385.66	830.7	387.44	830.85	392.88	830.4	393.58	830.34	395.64	830.32
397.06	830.62	398.32	830.75	401.38	830.43	403.14	830.26	403.83	830.19
408.06	830.15	410.35	830.15	412.91	830.36	414.08	830.3	416.39	830.29
420.92	830.62	421.81	830.62	430.25	830.49	430.49	830.5	430.71	830.5
432.31	830.47	442.16	830.24	446.47	830.07	450.55	829.87	453.84	830.01
455.75	829.94	458.09	829.78	462.19	829.5	467.47	829.82	467.84	829.71
470.14	829.9	471.19	829.94	473.42	829.97	473.63	829.95	474	829.94
476.91	829.62	479.25	829.35	479.81	829.33	485.47	829.5	490.31	829.61
491.41	829.51	494.49	829.07	497.13	828.81	497.33	828.78	497.57	828.77
500.97	828.59	501.48	828.57	502.88	828.51	505.63	828.49	507.23	828.5
508.82	828.7	509.6	828.8	512.61	829.08	514.21	829.08	514.79	829.1
520.02	830.97	520.62	831.16	520.72	831.22	524.38	832.79	524.63	832.9
525.15	833.02	530.67	834.27	532	834.4	532.45	834.46	532.84	834.45
536.33	834.67	537.01	834.74	538.5	834.81	540.18	834.85	542.12	834.89
542.76	834.88	544.35	834.85	545.47	834.78	548.07	834.66	549.99	834.32
550.17	834.29	550.33	834.28	554.01	834.15	555.14	833.92	558.02	833.96
559.83	834.07	561.98	833.91	564.64	833.98	566.61	833.95	570.35	833.58
572.05	833.42	573.75	833.6	574.28	833.54	578.9	833.29	580.85	833.08
581.56	833.09	585.28	832.92	591.48	832.23	594.34	832.1	595.31	831.98
597.25	831.89	597.37	831.9	598.15	831.86	600.95	831.78	601.22	831.8
602.53	831.76	603.33	831.76	603.7	831.75	610.15	831.69	614.31	831.56
615.91	831.46	619.16	831.4	619.54	831.4	621.17	831.17	622.31	831.06
625.11	830.81	626.03	830.82	627.21	830.77	630.01	831.05	631.14	831.14
631.53	831.13	633.18	831.02	635.17	831	637.09	831	637.7	830.93
639.26	830.76	641.4	830.77	645.29	830.61	647.39	830.72	654.75	830.71
655.17	830.69	655.57	830.65	657.3	830.4	660.1	830.56	661.17	830.62
661.63	830.65	667.53	830.63	669.43	830.58	672.94	830.65	675.33	830.59
677.72	830.69	679.46	830.75	680.73	830.67	681.41	830.64	687.43	830.51
687.65	830.51	692.98	830.57	693.57	830.53	696.61	830.51	697.4	830.46
697.83	830.52	699.62	830.54	703.4	830.82	703.51	830.83	703.54	830.83
705.54	830.81	707.86	830.72	709.46	830.76	711.62	830.59	715.52	830.76
717.63	830.84	717.81	830.84	718.08	830.83	719.4	830.74	723.86	830.46
725.06	830.42	727.76	830.39	729.35	830.35	730.74	830.35	733.12	830.32
736.54	830.31	741.75	830.33	742.04	830.33	742.89	830.38	745.99	830.6
747.58	830.4	748.17	830.37	752.67	830.25	754.31	830.09	756.8	830.23
758.17	830.26	758.63	830.27	760.36	830.18	763.11	830.4	764.23	830.47
766.01	830.33	766.44	830.3	767.39	830.3	770.28	830.27	771.7	830.05
772.51	830.02	775.69	830.16	778.58	830.37	780.32	830.37	783.53	830.31
784.78	830.18	788.44	830.2	788.81	830.2	794.47	829.9	797.03	829.87
798.13	829.9	803.2	829.92	805.65	829.98	807.25	829.99	813.48	830.01
815.64	829.95	817.82	830.03	821.77	830.13	824.99	830.33	826.18	830.36
827.77	830.24	833.4	830.33	834.01	830.36	834.43	830.39	839.14	830.76
840.25	830.69	843.97	831.05	860.6	831.87	863.22	832.28	866.18	832.44
869.91	832.03	870.35	832.02	873.91	832.25	874.18	832.28	875.28	832.47
879.07	833.26	882.12	833.95	882.28	834	882.79	834.16	885.56	835.11

886.3	835.2	892.01	835.9	895.69	836.58	898.62	836.9	901.65	837.27
909.58	838.76	914.09	839.6	916.85	840.69	917.1	840.76	919.27	841.2
922.77	841.74	926.65	842.08	930.3	842.74	939.06	843.76	940.08	843.89
940.54	844.04	943.09	844.38	948.65	845.31	950.81	845.65	953.13	846.16
956.61	846.87	960.99	847.28	962.36	847.49	970.89	848.63	972.78	849.06
974.09	849.19	976.29	849.96	979.34	850.89	983.16	851.72	984.46	851.93
985.48	852.26	989.77	853.55	991.28	853.93	998.96	854.95	999.23	854.97
999.49	854.98	1001.3	854.93	1004.05	855.28	1004.69	855.34	1004.84	855.36
1008.28	856.02	1008.38	856.04						

Manning's n Values num= 13

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.013	121.76	.03	216.01	.013	315.54	.1	319.29	.07
337.42	.06	355.45	.07	365.41	.1	538.5	.013	548.07	.1
603.7	.035	827.77	.1	1008.38	.1				

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
319.29	365.41	308.79	313.67	310.72	.1	.3

Ineffective Flow num= 3

Sta L	Sta R	Elev	Permanent
160	216	855	T
261	316	855	T
540	900	835	F

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	832.40	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.33	Wt. n-Val.	0.057	0.066
0.100				
W.S. Elev (ft)	832.08	Reach Len. (ft)	308.79	313.67
310.72				
Crit W.S. (ft)	830.75	Flow Area (sq ft)	2.78	256.59
322.59				
E.G. Slope (ft/ft)	0.006363	Area (sq ft)	24.02	256.59
705.14				
Q Total (cfs)	2000.00	Flow (cfs)	3.32	1381.78
614.90				
Top Width (ft)	579.14	Top Width (ft)	106.61	46.12
426.41				
Vel Total (ft/s)	3.44	Avg. Vel. (ft/s)	1.19	5.39
1.91				
Max Chl Dpth (ft)	7.72	Hydr. Depth (ft)	0.24	5.56
2.05				
Conv. Total (cfs)	25072.5	Conv. (cfs)	41.6	17322.3
7708.6				
Length Wtd. (ft)	311.46	Wetted Per. (ft)	11.81	48.97
158.19				
Min Ch El (ft)	824.36	Shear (lb/sq ft)	0.09	2.08
0.81				
Alpha	1.79	Stream Power (lb/ft s)	0.11	11.21
1.54				
Frctn Loss (ft)	0.56	Cum Volume (acre-ft)	8.24	4.89
18.05				
C & E Loss (ft)	0.08	Cum SA (acres)	3.36	0.93
7.89				

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #5 yr

E.G. Elev (ft)	831.25	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.25	Wt. n-Val.		0.066
0.100				
W.S. Elev (ft)	831.00	Reach Len. (ft)	308.79	313.67
310.72				
Crit W.S. (ft)	828.60	Flow Area (sq ft)		207.23
155.11				
E.G. Slope (ft/ft)	0.005334	Area (sq ft)		207.23
277.80				
Q Total (cfs)	1070.00	Flow (cfs)		901.85
168.15				
Top Width (ft)	414.86	Top Width (ft)		44.97
369.89				
Vel Total (ft/s)	2.95	Avg. Vel. (ft/s)		4.35
1.08				
Max Chl Dpth (ft)	6.64	Hydr. Depth (ft)		4.61
1.00				
Conv. Total (cfs)	14650.2	Conv. (cfs)		12348.0
2302.2				
Length Wtd. (ft)	311.87	Wetted Per. (ft)		47.79
155.38				
Min Ch El (ft)	824.36	Shear (lb/sq ft)		1.44
0.33				
Alpha	1.85	Stream Power (lb/ft s)		6.28
0.36				
Frctn Loss (ft)	0.57	Cum Volume (acre-ft)	5.10	3.94
10.29				
C & E Loss (ft)	0.06	Cum SA (acres)	2.76	0.90

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach RS: 796.1590

INPUT
Description: 7+96
Station Elevation Data num= 421

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	836.01	1.45	836.07	2.69	836	3.2	835.99	6.46	836.1
7.7	836.01	8.73	835.91	10.73	836.09	12.12	836.25	12.72	836.27
14.25	836.26	15.61	836.29	18.8	836.08	20.26	836.05	24.07	836.11
27.45	836.21	36.65	836.08	38.65	836.12	43.25	835.87	47.57	836.07
50.18	836.08	62.2	835.63	63.21	835.5	66.04	835.32	67.52	835.15
72.05	834.6	73.39	834.48	74.27	834.32	74.99	834.29	76.28	834.22
79.4	833.75	79.91	833.69	80.29	833.54	81.87	833.07	85.04	831.89
85.44	831.76	85.6	831.72	87.41	831.45	90.35	831.1	91.17	831.01
91.51	830.99	93	830.86	95.35	830.53	98.65	830.04	101.16	829.86
102.53	829.86	103.13	829.76	104.27	829.69	107.27	829.69	108.09	829.65
108.53	829.61	110.04	829.36	112.22	829.42	114.32	829.3	115.62	829.21
117.99	829.15	119.49	829.05	120.88	829.09	121.2	829.11	121.97	829.1
125.2	829.04	126.64	828.97	130.7	829.02	132.48	829.04	132.69	829.04
138.23	829.01	139.81	828.98	141.93	828.94	142.96	828.94	143.86	828.93
146.49	828.94	147.55	828.93	148.97	828.95	149.27	828.95	150.04	828.93
153.19	828.93	154.68	829.14	154.86	829.15	157.28	829.12	158.66	829.1
158.73	829.09	160.48	828.77	161.95	828.86	164.21	828.93	165.63	828.94
166.11	828.9	166.81	828.93	169.73	829.1	171.68	829.14	171.72	829.15
171.81	829.14	177.2	828.42	177.77	828.43	181.06	828.58	181.4	828.58
182.74	828.51	184.17	828.51	186.63	828.52	187.65	828.42	190.82	828.41
192.23	828.38	192.53	828.35	194.04	828.27	197.24	828.37	197.86	828.34
199.42	828.12	199.57	828.12	200.11	828.14	203.47	828.19	204.95	828.04
205.1	828.03	205.31	828.03	207.07	828.06	210.7	828.16	210.87	828.15
211.29	828.15	214.54	828.18	215.31	828.17	216.42	828.23	217.69	828.14
220.1	828.15	221.35	828.01	222	828.02	225.45	827.9	226.18	827.9
227.54	827.97	228.37	828.02	231.44	828.2	231.49	828.2	232.68	828.24
233.03	828.22	234.79	828.13	237.74	828.09	238.94	828.12	241.14	827.9
242.45	827.87	243.93	827.87	244.44	827.85	247.35	827.82	248.08	827.84
249.75	827.92	249.98	827.94	251.03	827.97	253.85	828.07	254.46	828.1
255.56	828.03	260.86	828.29	261.34	828.3	262.29	828.32	264.03	828.36
269.19	828.5	270.84	828.64	272.62	828.79	272.63	828.79	276.57	829.85
277.23	829.88	278.33	830	280.67	829.59	282.37	829.49	284.05	828.92
284.11	828.9	284.25	828.82	287.22	826.93	290.56	825.43	291.12	825.18
309.41	824.86	311.22	824.79	311.34	824.8	311.59	824.98	311.82	825.04
312.07	825.11	326.57	829.05	327.07	829.19	328.71	829.18	330.77	829.09
338.31	829.33	341.05	829.38	342.33	829.19	345.83	828.86	351.07	828.5
351.16	828.49	352.09	828.44	353.87	828.42	357.9	828.31	358.86	828.22
359.77	828.16	362.84	828.22	365.64	828.27	370.99	828.96	371.65	829.01
371.79	829.01	377.07	828.82	377.48	828.84	381.11	829.14	381.65	829.12
384	829.15	393.33	828.95	397.1	829.11	398.65	829.25	399.44	829.47
400.22	829.58	402.19	830.19	404.65	830.84	406.18	831.49	406.23	831.52
406.7	831.62	409.71	832.3	411.42	832.54	412.23	832.6	412.78	832.62
417.56	832.65	418	832.69	420.47	833.11	421.91	833.34	422.64	833.35
423.82	833.29	427.54	833.42	427.79	833.43	427.95	833.42	429.57	833.28
433.37	832.75	433.59	832.71	433.88	832.64	435.51	832.23	436.59	832.03
439.31	831.4	440.83	830.96	441.32	830.83	444.18	830.59	444.97	830.53
445.19	830.51	445.83	830.52	447.82	830.52	456.36	830.61	457.07	830.51
458.72	830.45	458.95	830.44	462.01	830.61	468.44	830.47	468.8	830.48
470.64	830.67	472.4	830.53	475.19	830.37	479.22	830.47	487.09	830.65
488.27	830.57	491.08	830.47	492.79	830.45	494.23	830.35	495.46	830.21
498.31	830.01	499.03	829.94	500.2	829.96	502.52	829.92	505.08	829.8
506.1	829.7	508.44	829.79	510.16	829.85	511.83	829.84	512.13	829.85
512.83	829.83	516.21	829.73	517.08	829.68	518.13	829.67	520.59	829.6
522.2	829.54	523.11	829.58	523.97	829.61	525.22	829.59	529.74	829.35
530.05	829.34	530.12	829.34	531.02	829.33	535.96	829.3	536.14	829.29
539.57	829.5	540.12	829.5	541.15	829.35	542.06	829.22	544.88	829.19
547.62	829.18	547.92	829.16	548.6	829.18	549.33	829.2	554	829.42
557.62	829.33	560.09	829.29	561.54	829.4	564.12	829.51	565.65	829.63
566.04	829.58	566.97	829.59	570.01	829.52	571.01	829.54	572.05	829.54
575.19	829.49	576.08	829.52	576.62	829.5	577.92	829.44	581.55	829.47
581.98	829.5	582.17	829.49	583.97	829.55	585.16	829.52	588	829.61
589.43	829.58	590.09	829.56	593.62	829.57	594.14	829.56	596.1	829.7
599.55	829.6	600.13	829.6	600.67	829.54	602.12	829.31	604.34	829.35
606.2	829.36	607.23	829.26	608.12	829.17	612	829.37	612.12	829.38
612.17	829.38	614.16	829.46	614.62	829.43	618.23	829.38	619.34	829.3
620.23	829.18	620.99	829.15	621.79	829.18	626.34	829.21	630.03	829.04
632.32	828.96	636.34	828.94	638.39	828.94	641.03	829.17	643.22	829.13
644.41	829.07	648.19	829.02	650.41	829.06	654.3	828.98	656.57	828.92
657.3	828.95	660.64	829.07	662.31	829.03	662.67	829.03	663.36	829
666.64	828.98	667.26	828.91	668.76	828.91	670.39	828.9	674.89	828.85
676.79	828.9	680.05	828.84	681.09	828.77	685.03	829.08	685.1	829.08
685.16	829.07	687.22	828.88	690.44	828.93	691.22	828.95	692.29	828.9
693.28	828.88	693.94	828.91	695.9	828.89	699.27	828.91	703.92	828.9
705.45	828.91	705.82	828.9	711.63	829.1	712.01	829.12	716.65	829.18
717.59	829.21	721.68	829.24	723.48	829.31	727.29	829.29	727.54	829.3
727.68	829.29	729.55	829.34	733.42	829.42	733.62	829.42	735.58	829.58
738.61	829.66	739.51	829.69	741.12	829.82	741.5	829.88	742.41	829.9
745.42	830.07	747.72	830.44	752.27	831.04	755.93	831.3	758.41	831.59

764.71	832.06	768.01	832.68	770.53	833.31	773.95	833.75	780.53	834.76
784.11	835.13	785.35	835.34	786.34	835.58	787.38	835.73	789.58	836.24
796.26	837.31	799.36	838.14	800.54	838.34	811.87	839.81	814.27	840.22
814.97	840.22	816.1	840.37	820.41	840.88	821.37	840.84	822.2	840.83
823.27	841.04	825.87	841.62	827.33	841.74	827.68	841.8	829.27	842.1
832.13	842.53	833.19	842.6	836.52	843.34	837.05	843.43	837.44	843.4
837.81	843.38								

Manning's n Values num= 11

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.03	237.74	.1	282.37	.07	290.56	.06	311.59	.07
326.57	.1	418	.013	427.95	.1	492.79	.035	727.29	.1
837.81	.1								

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
282.37	326.57	96.02	92.36	85.26	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
20	73	855	T
425	775	833.5	F

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	831.77	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.07	Wt. n-Val.	0.037	0.065
0.100				
W.S. Elev (ft)	831.69	Reach Len. (ft)	96.02	92.36
85.26				
Crit W.S. (ft)	829.55	Flow Area (sq ft)	566.30	245.13
214.49				
E.G. Slope (ft/ft)	0.000839	Area (sq ft)	566.30	245.13
885.36				
Q Total (cfs)	2000.00	Flow (cfs)	1330.64	492.63
176.73				
Top Width (ft)	642.96	Top Width (ft)	196.58	44.20
402.18				
Vel Total (ft/s)	1.95	Avg. Vel. (ft/s)	2.35	2.01
0.82				
Max Chl Dpth (ft)	6.90	Hydr. Depth (ft)	2.88	5.55
2.67				
Conv. Total (cfs)	69045.3	Conv. (cfs)	45937.2	17006.8
6101.3				
Length Wtd. (ft)	94.43	Wetted Per. (ft)	197.15	45.85
80.98				
Min Ch El (ft)	824.79	Shear (lb/sq ft)	0.15	0.28
0.14				
Alpha	1.24	Stream Power (lb/ft s)	0.35	0.56
0.11				
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	6.15	3.09
12.38				
C & E Loss (ft)	0.00	Cum SA (acres)	2.29	0.60
4.94				

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #5 yr

E.G. Elev (ft)	830.63	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.05	Wt. n-Val.	0.038	0.065
0.100				
W.S. Elev (ft)	830.58	Reach Len. (ft)	96.02	92.36
85.26				
Crit W.S. (ft)	828.91	Flow Area (sq ft)	352.51	195.93
126.83				
E.G. Slope (ft/ft)	0.000904	Area (sq ft)	352.51	195.93
449.19				
Q Total (cfs)	1070.00	Flow (cfs)	639.19	352.06
78.75				
Top Width (ft)	601.85	Top Width (ft)	187.37	44.20
370.28				
Vel Total (ft/s)	1.58	Avg. Vel. (ft/s)	1.81	1.80
0.62				
Max Chl Dpth (ft)	5.79	Hydr. Depth (ft)	1.88	4.43
1.65				
Conv. Total (cfs)	35584.2	Conv. (cfs)	21256.9	11708.3
2618.9				
Length Wtd. (ft)	94.39	Wetted Per. (ft)	187.87	45.85
77.43				
Min Ch El (ft)	824.79	Shear (lb/sq ft)	0.11	0.24
0.09				
Alpha	1.22	Stream Power (lb/ft s)	0.19	0.43
0.06				
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	3.85	2.49
7.70				
C & E Loss (ft)	0.00	Cum SA (acres)	2.10	0.58
4.49				

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach RS: 703.7970

INPUT
Description: 7+04
Station Elevation Data num= 492

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	838.34	.56	838.32	1.61	838.29	3.85	838.22	5.42	838.18
6.94	838.11	7.12	838.09	7.53	838.09	10.43	837.83	12.4	837.66
12.57	837.65	12.87	837.64	17.5	837.49	18.31	837.46	20	837.28
22.81	837.12	23.84	837.06	25.9	836.94	27.55	836.96	28.94	836.84
29.41	836.78	32.45	836.62	33.15	836.6	33.74	836.59	34.82	836.6
36.58	836.57	40.35	836.52	44.28	836.21	44.34	836.21	45.01	836.08
45.87	835.91	45.89	835.91	46.56	835.86	49.79	835.63	49.97	835.61
51.49	835.5	54.24	835.52	55.27	835.53	56.32	835.51	57.02	835.51
59.42	835.63	60.94	835.72	61.67	835.73	62.56	835.75	65.19	835.78
66.38	835.79	66.48	835.8	68.07	835.89	70.38	835.83	72.25	835.81
75.47	835.8	77.58	835.7	79.76	835.64	80.95	835.58	84.67	835.38
86.58	835.38	88.36	835.44	89.68	835.62	90.13	835.63	91.3	835.66
93.94	835.6	95.02	835.74	95.6	835.77	97.94	836.03	100.37	836.37
104.95	836.22	104.99	836.22	106.69	836.05	107.62	835.98	110.47	835.82
112.24	835.82	115.97	835.66	116.63	835.68	117.7	835.75	119.68	835.76
121.62	835.77	122.96	835.72	123.23	835.7	126.62	835.69	127.06	835.69
127.29	835.68	128.91	835.65	130.29	835.61	132.57	835.57	133.68	835.56
134.5	835.53	135.65	835.48	138.23	835.53	139.07	835.35	140.64	835.37
141.85	835.29	145.01	835.28	148.71	835.19	150.65	835.25	153.99	835.12
156.97	835.11	159.9	834.96	166.36	834.71	167.19	834.68	170.48	834.57
171.99	834.48	174.87	834.37	177.71	834.2	179.18	834.04	179.52	833.97
181.06	833.85	183.34	833.63	184.36	833.4	185.28	833.15	186.31	833.05
188.97	832.74	190.81	832.42	190.88	832.41	191.14	832.35	194.87	831.62
196.38	831.29	196.43	831.28	201.92	830.87	202.02	830.86	202.11	830.86
205.91	830.7	206.08	830.68	207.71	830.45	211.25	830.17	211.63	830.15
211.78	830.13	213.33	829.9	215.57	829.75	217.2	829.6	217.82	829.58
219.08	829.41	222.98	829.03	224.19	828.96	227.64	828.83	230.24	828.69
231.2	828.68	234.3	828.51	235.03	828.44	235.86	828.38	238.38	828.45
239.8	828.42	240.87	828.42	241.58	828.39	245.15	828.37	245.42	828.39
245.81	828.36	247.27	828.33	248.28	828.34	252.34	828.27	252.9	828.24
257.72	828.31	258.31	828.33	259.41	828.38	262.31	828.55	262.65	828.53
263.91	828.52	266.59	828.54	267.78	828.57	269.25	828.6	269.55	828.62
269.79	828.63	273.34	828.71	273.99	828.73	275.17	828.72	278.21	828.44
278.84	828.46	279.26	828.46	280.76	828.47	283.29	828.57	284.56	828.58
285.47	828.56	290.6	828.74	292.63	828.76	293.19	828.75	296.11	828.69
300.52	828.54	301.38	828.56	302.89	828.61	303.14	828.62	303.65	828.6
307.01	828.52	307.52	828.53	308.42	828.61	314.27	828.96	321.86	829.07
325.55	828.86	326.23	828.78	329.27	828.5	330.85	828.41	331.11	828.4
334.35	828.35	334.91	828.33	334.96	828.33	336.65	828.14	337.7	828.04
340.6	827.64	341.74	827.5	342.12	827.44	344.04	827.3	346.13	827.22
346.83	827.16	348.02	827.16	350.57	827.05	351.61	827.05	353.27	827.18
353.99	827.18	357.23	827.22	358.92	827	359.07	827	359.61	827.02
363.01	827.14	364.64	827.14	367.03	827.18	369.17	827.2	370.32	827.2
375.8	827.23	376.22	827.23	381.61	827.22	383.36	827.32	385.55	827.43
386.58	827.41	387.22	827.44	388.64	827.53	392.05	827.77	392.77	827.82
392.98	827.84	393.54	828.02	396.95	828.85	397.87	829.1	407.84	829.21
408.35	829.2	408.54	829.17	408.61	829.15	409.74	828.89	411.16	828.56
414.98	827.13	415.86	827	428.51	827.04	439.88	827.08	443.15	827.17
444.13	827.33	446.55	827.78	449.6	828.41	450.6	828.62	451.57	828.62
454.49	829.01	454.6	829.02	454.68	829.03	456.13	829.18	457.14	829.25
460.48	829.23	463.26	828.82	466.27	828.63	468.37	828.63	474.13	828.8
474.33	828.81	478.71	828.93	482.14	828.85	483.56	828.98	490.08	828.83
493.92	828.04	498.66	828.07	499.62	828.1	500.97	828.1	502.37	827.96
506.01	828.11	506.94	828.12	507.78	828.17	508.44	828.2	512.94	829.45
512.96	829.45	514.47	830.05	516.52	830.74	518.6	831.55	519.77	831.73
520.47	831.84	523.79	831.95	524.31	831.98	524.55	832.01	526.24	832
527.53	832.16	530.23	832.6	531.35	832.65	532.05	832.68	533.46	832.71
536.14	832.77	537.22	832.73	537.8	832.73	539.09	832.66	541.92	832.47
542.94	832.28	543.76	832.12	544.89	831.82	547.63	831.16	548.2	831.12
549.58	830.89	551.56	830.4	554.39	830.1	559.1	830.27	559.56	830.29
559.73	830.27	565.39	829.85	566.53	829.64	572.13	829.72	575.67	829.89
577.49	829.9	578.84	829.94	580.71	829.83	582.93	830	587.17	830.12
589.85	830.12	592.29	830.01	598.55	830.25	601.4	830.34	603.33	830.22
604.06	830	612.3	829.18	612.58	829.19	614.31	829.2	614.61	829.2
620.38	829.12	623.85	829.15	624.56	829.16	626.32	828.96	626.39	828.95
626.52	828.94	631.96	828.98	634.34	829.01	638.33	829.01	640.14	828.94
643.42	828.88	644.41	828.93	646.79	828.89	648.46	828.93	649.44	828.72
650.33	828.62	653.5	828.63	654.6	828.67	654.85	828.67	656.21	828.65
659.59	828.85	660.85	828.88	662.28	828.78	662.52	828.8	667.91	829.11
668.39	829.07	672.39	829.07	672.49	829.06	672.55	829.07	674.34	829.06
679.27	828.73	680.11	828.7	680.33	828.69	681.02	828.75	683.51	828.88
686.23	829.05	686.95	829.05	692.28	829.03	697.4	829.06	698.4	829.08
699.4	829.09	700.87	829.1	704.41	829.13	705.39	829.2	708.52	829.26
709.68	829.02	710.43	828.94	712.35	828.9	714.6	828.95	715.37	828.82
716.45	828.74	718.03	828.78	720.52	828.95	721.69	828.98	722.49	829.01
725.74	829.05	726.65	829.06	727.28	828.96	728.57	828.73	733.79	828.75
734.67	828.77	735.22	828.8	738.73	828.85	739.3	828.85	740.4	828.8
746.51	828.71	746.75	828.7	747.27	828.65	750.78	828.57	752.13	828.6
752.77	828.61	754.3	828.64	758.04	828.86	758.78	828.78	761.18	828.79
763.07	828.81	763.49	828.77	764.93	828.59	765.99	828.64	767.2	828.68
771.05	828.82	773.74	828.81	775.1	828.74	776.74	828.54	777.15	828.53
778.1	828.52	782.98	828.54	791.56	828.54	795.12	828.53	795.63	828.52
796.37	828.53	799.69	828.42	800.55	828.41	801.69	828.46	804.76	828.66
805.91	828.72	806.64	828.81	807.7	828.86	809.06	828.89	811.85	828.85
812.75	828.81	816.34	828.98	818.29	829	820.06	828.85	825.31	828.81
825.93	828.82	826.02	828.82	826.61	828.83	830.95	828.88	831.91	828.81
833.17	828.84	836.07	828.95	837.67	829.17	838.01	829.16	838.92	829.22

842.11	829.27	843.63	829.08	844.03	829.04	844.63	829.08	848.05	829.36
848.6	829.42	849.97	829.48	853.55	829.61	853.96	829.61	854.2	829.63
855.87	829.55	859.66	829.69	860.11	829.72	861.77	829.89	865.02	830.22
865.72	830.41	866.11	830.45	867.61	830.79	870	830.71	872.38	830.84
873.44	830.98	875.3	831.04	877.47	831.25	878.63	831.38	879.32	831.46
882.6	831.74	883.31	831.79	883.8	831.81	885.14	831.83	888.1	831.85
889.08	831.87	890.43	831.99	891.48	832.08	892.5	832.26	896.83	832.94
900.24	834.95	900.65	835.23	900.94	835.44	902.53	836.57	908.38	838.21
912.51	839.35	914.83	839.6	920.35	840.33	950.62	841.26	954.03	841.1
954.85	841.2	956.48	841.09	957.87	841.17	958.1	841.2	959.55	841.21
961.58	841.21	962.32	841.22	963.07	841.22	966.13	841.33	968.09	841.29
968.91	841.33	971.47	841.33						

Manning's n Values num= 12

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.013	184.36	.03	392.98	.1	408.35	.07	414.98	.06
443.15	.07	457.14	.1	530.23	.013	539.09	.1	601.4	.035
848.05	.1	971.47	.1						

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
408.54	457.14	56.86	52.22	53.96	.1	.3

Ineffective Flow num= 4

Sta L	Sta R	Elev	Permanent
133	184	855	T
284	325	850	T
535	900	832.73	F
915	971	860	T

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	831.69	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.10	Wt. n-Val.	0.031	0.064
0.100				
W.S. Elev (ft)	831.58	Reach Len. (ft)	56.86	52.22
53.96				
Crit W.S. (ft)	829.50	Flow Area (sq ft)	540.77	194.10
170.70				
E.G. Slope (ft/ft)	0.000797	Area (sq ft)	656.77	194.10
953.82				
Q Total (cfs)	2000.00	Flow (cfs)	1543.55	316.29
140.16				
Top Width (ft)	658.59	Top Width (ft)	213.49	48.60
396.50				
Vel Total (ft/s)	2.21	Avg. Vel. (ft/s)	2.85	1.63
0.82				
Max Chl Dpth (ft)	4.58	Hydr. Depth (ft)	3.14	3.99
2.77				
Conv. Total (cfs)	70833.2	Conv. (cfs)	54667.4	11201.7
4964.0				
Length Wtd. (ft)	55.66	Wetted Per. (ft)	172.98	49.12
62.35				
Min Ch El (ft)	827.00	Shear (lb/sq ft)	0.16	0.20
0.14				
Alpha	1.38	Stream Power (lb/ft s)	0.44	0.32
0.11				
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	4.80	2.62
10.58				
C & E Loss (ft)	0.01	Cum SA (acres)	1.84	0.50
4.16				

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #5 yr

E.G. Elev (ft)	830.54	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.07	Wt. n-Val.	0.031	0.064
0.100				
W.S. Elev (ft)	830.48	Reach Len. (ft)	56.86	52.22
53.96				
Crit W.S. (ft)	828.95	Flow Area (sq ft)	356.33	140.44
104.33				
E.G. Slope (ft/ft)	0.000795	Area (sq ft)	427.05	140.44
528.32				
Q Total (cfs)	1070.00	Flow (cfs)	821.93	184.21
63.87				
Top Width (ft)	623.18	Top Width (ft)	201.01	48.60
373.57				
Vel Total (ft/s)	1.78	Avg. Vel. (ft/s)	2.31	1.31
0.61				
Max Chl Dpth (ft)	3.48	Hydr. Depth (ft)	2.23	2.89
1.78				
Conv. Total (cfs)	37941.8	Conv. (cfs)	29145.2	6532.0
2264.7				
Length Wtd. (ft)	55.47	Wetted Per. (ft)	160.44	49.12
59.09				
Min Ch El (ft)	827.00	Shear (lb/sq ft)	0.11	0.14
0.09				
Alpha	1.39	Stream Power (lb/ft s)	0.25	0.19
0.05				
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	2.99	2.14
6.74				

C & E Loss (ft)	0.01	Cum SA (acres)	1.67	0.48	3.76				

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach RS: 651.5802

INPUT
Description: 6+52
Station Elevation Data num= 492

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	837.96	1.96	837.88	2.47	837.9	3.46	837.91	5.36	837.76
7.39	837.64	7.99	837.58	9.18	837.53	11.78	837.51	12.88	837.49
14.37	837.33	14.71	837.28	15.53	837.2	18.46	837.07	19.32	836.98
20.28	837.02	22.4	837	24.05	836.99	25.34	836.69	25.66	836.62
26.34	836.58	30.89	836.04	31.18	835.97	32.87	835.74	35.19	835.45
36.5	835.53	36.71	835.51	39.95	835.58	40.66	835.58	41.28	835.6
42.32	835.55	43.97	835.58	46.14	835.63	47.68	835.68	47.85	835.68
48.17	835.69	53.26	835.71	53.92	835.71	58.88	835.81	62.55	835.86
62.72	835.86	62.88	835.85	64.33	835.78	65.46	835.73	68.17	835.68
69.83	835.72	69.94	835.73	70.24	835.71	73.61	835.54	74.63	835.46
75.46	835.36	76.77	835.39	79.17	835.39	80.06	835.48	80.89	835.51
83.15	835.52	85.16	835.47	86.36	835.52	87.42	835.55	91.15	835.43
91.84	835.45	94.65	835.38	95.76	835.45	96.12	835.44	97.94	835.43
102.43	835.36	102.9	835.38	103.43	835.37	106.52	835.3	108.43	835.3
109.61	835.29	112.95	835.37	113.77	835.31	114.84	835.32	117.82	835.25
118.25	835.18	119.63	835.22	121.52	835.18	123.32	835.15	124.2	835.19
126.81	835.23	128.97	835.2	130.33	835.08	130.76	835.06	134.1	834.97
134.58	834.94	134.82	834.94	136.31	834.85	139.48	834.78	140.34	834.79
140.83	834.75	142.06	834.77	144.71	834.75	145.87	834.75	146.59	834.7
147.65	834.72	149.39	834.64	151.51	834.57	152.23	834.48	153.19	834.38
156.64	834.73	157.09	834.77	157.79	834.76	158.81	834.77	159.51	834.87
164.44	835.06	166.79	835.1	168.89	834.88	170.03	834.7	170.74	834.65
171.38	834.63	175.99	834.58	177.45	834.63	179.72	834.75	181.44	834.74
181.61	834.74	182.56	834.75	185.3	834.76	186.21	834.73	187.18	834.69
188.63	834.72	191.05	834.76	192.25	834.76	192.78	834.74	196.11	834.46
196.87	834.44	202.06	834.04	202.74	833.88	204.07	833.57	205.77	833.18
207.94	832.15	212.3	831.14	213.49	831.1	214.81	830.66	217.27	829.97
219.65	829.27	220.96	829.18	224.95	828.67	226.73	828.54	232	828.69
232.18	828.73	235.83	828.81	236.35	828.81	237.87	828.74	239.1	828.72
242.82	828.77	243.48	828.75	246.98	828.74	247.35	828.74	248.89	828.73
249.04	828.74	254.47	828.34	257.06	828.37	259.18	828.23	265.14	828.52
265.42	828.53	265.95	828.53	270.85	828.45	272.32	828.49	276.52	828.46
277.47	828.45	282.21	828.36	282.35	828.36	286.25	828.16	286.43	828.15
289	828.18	292.51	828.45	296.15	828.84	297.56	828.82	297.93	828.87
301.25	828.65	303.17	828.46	305.22	828.48	314.23	828.42	315.96	828.45
316.02	828.45	316.25	828.43	319.78	828.12	321.19	828.07	321.58	828.07
321.86	828.08	326.54	828.13	329.33	828.02	332.6	827.99	335.55	828.2
336.66	828.3	337.04	828.27	338.52	828.24	340.98	828.08	346.63	827.91
348.27	827.85	349.54	827.92	351.43	827.89	351.82	827.89	353.51	827.93
354.14	827.93	355.1	827.84	358.59	827.79	359.28	827.77	360.77	827.72
360.83	827.72	364.75	827.78	364.86	827.79	366.39	827.82	369.89	828.28
370.42	828.3	370.76	828.35	372.08	828.47	374.6	828.43	376.04	828.48
377.41	828.55	377.67	828.57	380.99	828.94	382.07	829.04	386.46	829.4
387.32	829.42	388.04	829.44	390.01	829.49	393.2	829.63	394.67	829.39
394.95	829.33	396.11	829.17	399.66	828.63	400.71	828.4	402.89	827.71
404.56	827.18	404.6	827.16	406.27	826.47	408.73	825.73	410.25	825.28
412.04	824.68	412.07	824.67	415.83	824.69	420.78	824.61	429.59	824.47
431.51	824.42	434.78	825.14	435.21	825.38	436.49	826.02	436.99	826.23
439.23	827.08	442.92	827.79	445.03	828	445.64	827.93	446.81	827.7
449.71	827.62	450.88	827.61	451.84	827.6	452.6	827.62	456.27	827.64
456.91	827.74	462.58	828.54	462.72	828.54	470.07	828.6	474.05	828.53
474.08	828.53	474.26	828.54	475.29	828.61	478	828.78	479.78	828.88
480.13	828.9	481.48	829.12	486.85	829.35	487.34	829.38	487.66	829.32
491.27	828.68	492.51	828.52	493.92	828.54	496.92	828.95	503.74	829.97
508.14	830.7	508.81	830.67	509.25	830.79	510.62	831.06	513.42	831.56
514.5	831.72	514.89	831.73	516.38	831.75	517.88	831.89	520.38	832
521.78	832.22	522.16	832.27	522.79	832.28	526.29	832.46	527.76	832.34
527.89	832.33	530.75	832.37	532.06	832.39	532.28	832.37	533.85	832.24
537.35	831.4	537.75	831.28	539.31	830.77	539.63	830.65	539.75	830.63
543.58	829.76	548.77	829.68	549.57	829.63	550.39	829.6	555.43	829.49
556.24	829.37	559.28	829.35	561.88	829.33	566.53	829.29	568.55	829.34
571.23	829.29	574.41	829.27	576.46	829.31	578.84	829.39	584.31	829.54
584.64	829.54	584.91	829.55	587.97	829.74	590.68	829.91	591.37	829.87
592.54	829.79	593.47	829.69	596.92	829.33	599.98	829	602.47	828.88
603.39	828.96	604.17	828.86	608.15	828.73	608.35	828.72	608.4	828.72
610.18	828.69	615.74	828.63	616.19	828.62	620.16	828.69	620.39	828.68
620.52	828.68	622.02	828.75	624.51	828.82	628.08	828.83	628.12	828.83
632.22	828.75	634.09	828.52	634.15	828.51	638.02	828.62	638.4	828.58
640.03	828.32	644.17	828.23	645.91	828.23	649.41	828.38	650.66	828.38
651.97	828.31	654.12	828.48	656.21	828.63	656.77	828.65	658.05	828.63
660.47	828.68	663.68	828.71	663.98	828.69	664.5	828.66	668.07	828.54
669.53	828.51	669.95	828.51	671.14	828.49	675.83	828.49	677.47	828.58
680.03	828.58	681.21	828.66	681.87	828.67	686.62	828.72	687.97	828.73
688.9	828.76	693.96	828.81	697.01	828.84	698.13	828.87	698.85	828.78
699.96	828.62	703.26	828.77	704.59	828.76	705.98	828.64	708.57	828.73
710.12	828.77	711.03	828.73	712	828.7	714.56	828.65	718.07	828.62
720.83	828.61	723.09	828.71	724.15	828.73	726.94	828.8	728.28	828.77
728.69	828.79	730.13	828.66	731.78	828.59	736.2	828.51	740.35	828.51
742.2	828.34	744.69	828.36	747.31	828.5	748.2	828.52	752.15	828.43
752.54	828.42	754.22	828.43	754.33	828.44	754.64	828.44	758.56	828.56

759.79	828.54	760.43	828.53	761.5	828.52	764.57	828.45	765.29	828.43
766.53	828.37	768.86	828.4	772	828.4	772.66	828.42	775.62	828.38
776.97	828.36	778.19	828.33	778.84	828.31	779.23	828.31	779.88	828.34
784.96	828.41	786.94	828.41	789.1	828.35	790.77	828.37	791.01	828.37
791.92	828.38	796.5	828.43	797.02	828.43	798.94	828.45	803.18	828.5
805.92	828.56	809.34	828.65	813.32	828.74	814.95	828.77	815.3	828.78
818.53	828.87	819.4	828.87	821.16	828.73	823.93	828.82	825.42	828.88
826.05	828.85	827.27	828.93	830.2	829.07	831.44	829.08	832.35	829.05
833.28	828.96	835.98	828.84	837.36	828.78	838.99	828.78	839.18	828.79
840.08	828.77	845.06	828.8	848.27	829.12	849.17	829.18	850.17	829.22
850.96	829.23	852.4	829.29	855	829.37	856.66	829.32	856.79	829.31
856.87	829.31	860.84	829.57	861.89	829.62	862.6	829.63	863.2	829.64
866.7	829.75	868.18	829.86	868.46	829.89	869.03	829.96	876.83	830.82
879.25	831.01	882.65	831.45	885.84	831.57	885.96	831.57	886.17	831.6
891.58	832.72	891.97	832.75	895.61	832.71	897.18	833.01	897.65	833.05
901.18	833.05	901.31	833.06	904.82	833.4	906.6	833.66	909.57	833.91
912.42	834.04	912.93	834.1	916.04	834.39	919.4	834.66	919.75	834.7
920.57	834.7	923.55	834.88	924.87	834.98	926.38	835.13	929.49	835.43
933.8	835.46	934.24	835.46						

Manning's n Values num= 12

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.013	191.05	.03	349.54	.1	400.71	.07	410.25	.06
435.21	.07	445.03	.1	520.38	.013	530.75	.1	584.31	.035
850.17	.1	934.24	.1						

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

400.71	445.03	111.44	106.45	103.86	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
526	891	832.46	F

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	831.63	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.07	Wt. n-Val.	0.037	0.065
0.100				
W.S. Elev (ft)	831.56	Reach Len. (ft)	111.44	106.45
103.86				
Crit W.S. (ft)	829.31	Flow Area (sq ft)	570.54	261.81
182.68				
E.G. Slope (ft/ft)	0.000772	Area (sq ft)	570.54	261.81
1092.61				
Q Total (cfs)	2000.00	Flow (cfs)	1317.92	537.54
144.53				
Top Width (ft)	651.78	Top Width (ft)	190.22	44.32
417.25				
Vel Total (ft/s)	1.97	Avg. Vel. (ft/s)	2.31	2.05
0.79				
Max Chl Dpth (ft)	7.14	Hydr. Depth (ft)	3.00	5.91
2.67				
Conv. Total (cfs)	72002.4	Conv. (cfs)	47446.8	19352.2
5203.4				
Length Wtd. (ft)	108.46	Wetted Per. (ft)	190.91	45.49
68.84				
Min Ch El (ft)	824.42	Shear (lb/sq ft)	0.14	0.28
0.13				
Alpha	1.21	Stream Power (lb/ft s)	0.33	0.57
0.10				
Frctn Loss (ft)	0.14	Cum Volume (acre-ft)	4.00	2.35
9.31				
C & E Loss (ft)	0.01	Cum SA (acres)	1.57	0.45
3.65				

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #5 yr

E.G. Elev (ft)	830.49	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.04	Wt. n-Val.	0.037	0.065
0.100				
W.S. Elev (ft)	830.45	Reach Len. (ft)	111.44	106.45
103.86				
Crit W.S. (ft)	828.77	Flow Area (sq ft)	362.58	212.64
110.34				
E.G. Slope (ft/ft)	0.000755	Area (sq ft)	362.58	212.64
642.80				
Q Total (cfs)	1070.00	Flow (cfs)	627.72	376.06
66.22				
Top Width (ft)	624.00	Top Width (ft)	185.15	44.32
394.53				
Vel Total (ft/s)	1.56	Avg. Vel. (ft/s)	1.73	1.77
0.60				
Max Chl Dpth (ft)	6.03	Hydr. Depth (ft)	1.96	4.80
1.79				
Conv. Total (cfs)	38929.8	Conv. (cfs)	22838.2	13682.3
2409.3				
Length Wtd. (ft)	108.14	Wetted Per. (ft)	185.69	45.49

61.94				
Min Ch El (ft)	824.42	Shear (lb/sq ft)	0.09	0.22
0.08				
Alpha	1.18	Stream Power (lb/ft s)	0.16	0.39
0.05				
Frctn Loss (ft)	0.12	Cum Volume (acre-ft)	2.47	1.92
6.02				
C & E Loss (ft)	0.00	Cum SA (acres)	1.42	0.42
3.29				

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach RS: 545.1257

INPUT
Description: FIS D-D
Station Elevation Data num= 491

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	835.78	.3	835.78	5.33	835.8	6.09	835.82	9.68	836.03
11.23	835.92	11.42	835.92	15.34	835.98	16.58	835.97	16.84	835.99
17.43	835.98	23.72	835.97	26.24	835.87	27.16	835.83	29.76	835.72
31.87	835.51	32.39	835.39	33.55	835.25	35.21	834.95	44.67	834.27
52.73	833.03	58.36	833.52	64.24	833.57	66.35	833.49	67.14	833.47
68.68	833.39	71.23	833.13	72.73	833.15	72.92	833.13	73.92	833.07
76.84	832.84	77.68	832.78	78.67	832.73	80.05	832.69	82.46	832.58
84	832.52	84.25	832.5	84.62	832.52	88.02	832.47	88.17	832.45
95.4	832.16	95.42	832.16	98.91	832.25	100.56	832.33	105.52	832.65
110	832.22	110.71	832.15	110.74	832.14	110.8	832.14	122.04	831.57
122.79	831.55	123.28	831.41	124.78	831.32	127.77	831	128.53	830.86
129.2	830.74	132.7	830.04	133.21	829.97	133.53	829.92	134.47	829.78
138.42	829.18	138.79	829.19	144.74	829.26	148.31	829.04	151.37	828.89
157.09	828.73	157.74	828.83	162.72	829.36	167.47	828.69	175.72	829.06
183.28	829.09	185.13	829	189.83	829.12	193.49	829.18	198.71	828.8
200.86	828.63	204.93	828.77	208.82	828.42	210.45	828.19	214.95	827.75
218.14	827.88	218.7	827.89	220.06	827.95	223.94	828.08	224.48	828.07
227.99	828.36	228.82	828.45	234.55	828.18	237.68	827.88	239.21	827.94
239.69	828	241.96	828.1	244.68	828.32	246.12	828.5	246.49	828.5
247.28	828.56	253.43	828.5	258.72	828.59	262.73	828.49	263.26	828.49
267.22	828.35	267.29	828.35	267.37	828.34	268.85	828.15	269.36	828.16
272.75	828.21	273.03	828.21	274.51	828.12	276.73	828.11	278.54	828.13
279.85	828.08	280.08	828.06	282.61	828.02	285.29	827.9	285.8	827.92
286.89	828.01	289.89	828.15	290.52	828.21	291.54	828.18	294.26	828.11
295.65	828.14	296.48	828.01	297.32	827.94	300.96	828.18	301.42	828.18
301.87	828.2	302.77	828.18	305.32	828.49	308.77	827.99	310.39	827.76
318.56	825.89	324.18	824.59	324.7	824.44	326.02	824.45	334.93	823.88
336.33	823.67	337.71	823.47	339.02	823.31	345.49	823.43	348.58	824.29
353.25	827.19	353.34	827.24	354.98	827.33	358.17	827.3	359.61	827.29
360.79	827.12	364.23	827.64	365.01	827.71	365.26	827.72	366.63	827.78
368.32	827.86	375.82	828.12	376.53	828.11	376.8	828.1	381.99	827.16
382.23	827.13	387.01	827.34	391.63	828.07	394.48	827.59	395.11	827.62
396.76	827.53	399.61	827.78	400.16	827.91	402.33	828.29	402.91	828.39
406.98	828.06	409.73	828.62	412.15	829.15	412.93	829.34	417.82	830.99
418.53	831.25	418.72	831.28	419.33	831.3	422.8	831.38	424.31	831.43
424.5	831.43	430.19	831.74	430.31	831.74	434.5	831.9	436.11	831.94
436.2	831.94	436.49	831.9	440.2	831.37	441.64	831.03	443.59	830.75
445.87	830.14	446.95	830.17	447.74	829.95	448.81	829.8	452.72	829.35
458.11	829.32	460.23	829.32	463.78	828.76	465.92	828.81	470.92	828.88
471.14	828.89	471.18	828.89	471.66	828.86	473.04	828.79	475.75	828.66
479.08	828.79	484.11	828.9	487.44	828.98	488.48	828.98	488.79	828.99
489.83	828.97	493.13	828.79	498.75	828.5	499	828.49	499.17	828.49
501.22	828.38	503.42	828.41	504.94	828.49	506.22	828.37	506.55	828.33
507.98	828.39	511.66	828.54	512.57	828.56	518.33	828.28	518.59	828.12
519.93	828.13	526.38	828.17	528.79	828.12	528.92	828.12	531.91	827.95
535.98	827.99	536.56	828.01	540.73	828.02	541.65	828.01	547.38	827.93
548.34	827.91	550.74	828.17	553.62	828.32	554.41	828.28	557.56	828.38
558.74	828.44	559.29	828.44	560.49	828.34	564.35	828.18	566.41	828.13
571.37	828.23	572.39	828.27	573.52	828.31	576.7	828.38	578.24	828.39
578.3	828.38	584.24	828.43	584.46	828.43	588.59	828.68	589.35	828.74
590.44	828.78	596.43	828.56	599.62	828.61	600.69	828.63	600.82	828.61
604.97	828.38	606.8	828.48	607.47	828.52	612.71	828.66	614.51	828.63
614.73	828.63	618.81	828.75	620.42	828.75	620.58	828.76	622.2	828.74
628.75	828.6	632.45	828.59	632.65	828.59	633.09	828.61	639.08	828.63
642.94	828.75	644.6	828.62	644.75	828.62	648.95	828.87	649.09	828.87
651.83	828.82	662.2	828.97	663	829.1	667.26	829.13	668.88	829.18
669.13	829.19	675.27	829.36	676.71	829.34	680.06	829.39	686.58	829.56
687.6	829.61	688.31	829.65	692.93	829.95	697.65	830.11	698.58	830.15
701.27	830.26	705.32	830.43	705.85	830.48	707.32	830.49	710.31	830.5
711.66	830.5	712.03	830.58	712.24	830.57	717.33	831.1	724.29	831.17
729.99	831.08	734.83	831.36	736.49	831.37	740.2	831.84	740.78	831.91
743.21	832.02	748.44	832.32	751.44	832.29	752.02	832.34	757.35	832.09
759.43	832.36	764.66	832.82	772.42	833.15	775.43	833.35	776.38	833.45
777.1	833.47	778.24	833.53	783.03	833.93	784.04	834.07	787.36	834.16
792.35	834.41	792.72	834.42	792.89	834.45	801.15	834.69	802.11	834.77
805.31	834.81	805.73	834.78	809.51	835	809.78	835.01	810.04	835.02
817.06	835.22	817.87	835.24	822.59	835.35	826.47	835.44	826.92	835.44
828.04	835.42	832.07	835.56	832.08	835.56	834.27	835.66	839.13	835.64
839.38	835.64	843.55	835.79	844.77	835.83	847.03	835.74	853.74	835.91
853.92	835.9	853.95	835.9	855.39	835.67	860.68	835.31	866.27	835.01

867.12	834.97	869.86	835.12	871.07	835.04	871.56	835.06	872.48	835.14
877.16	835.54	880.76	835.76	887.24	836.15	891	836.66	891.65	836.73
892.93	836.73	894.11	836.71	899.88	837.22	903.02	837.06	904.63	837.33
908.16	838.3	911.11	839.19	914.63	839.76	917.57	840.34	918.74	840.56
920.77	840.98	923.76	841.61	924.61	841.87	927.25	842.43	928.57	842.55
929.34	842.63	930.93	842.89	935.09	843.84	935.25	843.87	935.64	843.97
943.39	845.24	944.76	845.46	947.38	846.14	950.58	846.96	952.6	847.33
954.93	847.48	958.98	848.08	960.27	848.35	961.27	848.76	964.68	849.51
968.21	850.33	971.36	850.93	972.27	851.14	976.07	852.19	979.1	853.34
981.36	854.03	987.45	855.56	988.13	855.71	988.54	855.77	997.19	855.93
1001.29	856.29	1003.73	856.55	1005.44	856.71	1010.65	857.34	1012.64	857.73
1012.95	857.73	1015.91	857.95	1018.25	858.24	1018.81	858.28	1019.34	858.34
1021.43	858.49	1028.17	859.26	1033.42	860.18	1033.5	860.19	1033.63	860.19
1039.29	860.12	1040.84	860.27	1043.84	860.34	1044.53	860.39	1047.23	860.9
1049.42	861.29	1056.54	862.07	1059.7	862.22	1062.34	862.48	1064.34	862.6
1065.08	862.64	1065.78	862.71	1067.83	862.81	1072.41	863.36	1073.17	863.5
1078.67	864.41	1086.37	864.91	1088.04	865.27	1096.42	866.65	1098.47	867.02
1101.79	867.97	1105.76	868.51	1111.15	868.65	1111.41	868.66	1111.74	868.66
1111.77	868.67	1117.24	869.26	1119.57	869.64	1125.88	869.82	1128.02	869.96
1134.92	870.86	1138.91	870.94	1140.89	870.57	1142.19	870.68	1142.53	870.73
1150.67	871.72	1152.27	871.87	1155.83	872.07	1156.94	872.17	1158	872.17
1165.26	872.37	1166.27	872.47	1167.48	872.44	1170.87	872.42	1180.28	873.33
1180.6	873.38	1180.65	873.38	1181.05	873.44	1182.27	873.73	1186.23	874.08
1187.59	874.22	1192.03	874.6	1194.54	874.7	1200.28	874.8	1201.12	874.79
1204.43	874.65	1205.34	874.63	1207.24	874.67	1209.01	874.68	1211.51	874.91
1214.4	874.96	1216.03	875	1216.92	875.32	1219.67	875.27	1221.93	875.15
1225.51	874.39	1228.48	874.15	1229.55	874.13	1230.46	874.05	1230.71	874.02
1236.29	874.02	1237.86	874.28	1240.34	874.22	1240.6	874.1	1243.11	874.25
1244.72	874.37								

Manning's n Values num= 13

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.03	68.68	.1	310.39	.07	324.7	.06	348.58	.07
353.34	.1	424.5	.013	436.49	.1	489.83	.035	688.31	.1
792.35	.013	860.68	.1	1244.72	.1				

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
310.39	353.25	46.6	52.81	53.82	.1	.3

Ineffective Flow num= 3

Sta L	Sta R	Elev	Permanent
34	68	855	T
165	214	850	T
435	750	831.9	F

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	831.49	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	Wt. n-Val.	0.100	0.065	0.100
W.S. Elev (ft)	831.34	Reach Len. (ft)	46.60	52.81	53.82
Crit W.S. (ft)	829.14	Flow Area (sq ft)	377.53	280.23	217.91
E.G. Slope (ft/ft)	0.002493	Area (sq ft)	500.07	280.23	902.05
Q Total (cfs)	2000.00	Flow (cfs)	549.52	1100.67	349.81
Top Width (ft)	590.63	Top Width (ft)	185.91	42.86	361.86
Vel Total (ft/s)	2.28	Avg. Vel. (ft/s)	1.46	3.93	1.61
Max Chl Dpth (ft)	8.03	Hydr. Depth (ft)	2.76	6.54	3.22
Conv. Total (cfs)	40058.6	Conv. (cfs)	11006.5	22045.6	7006.5
Length Wtd. (ft)	49.82	Wetted Per. (ft)	137.37	44.24	68.54
Min Ch El (ft)	823.31	Shear (lb/sq ft)	0.43	0.99	0.49
Alpha	1.83	Stream Power (lb/ft s)	0.62	3.87	0.79
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	2.63	1.69	6.93
C & E Loss (ft)	0.03	Cum SA (acres)	1.09	0.34	2.72

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #5 yr

E.G. Elev (ft)	830.37	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.09	Wt. n-Val.	0.100	0.065	0.100
W.S. Elev (ft)	830.28	Reach Len. (ft)	46.60	52.81	53.82
Crit W.S. (ft)	827.56	Flow Area (sq ft)	237.04	234.90	150.14
E.G. Slope (ft/ft)	0.001739	Area (sq ft)	307.76	234.90	

545.47				
Q Total (cfs)	1070.00	Flow (cfs)	218.94	685.12
165.94				
Top Width (ft)	540.64	Top Width (ft)	178.89	42.86
318.88				
Vel Total (ft/s)	1.72	Avg. Vel. (ft/s)	0.92	2.92
1.11				
Max Chl Dpth (ft)	6.97	Hydr. Depth (ft)	1.82	5.48
2.40				
Conv. Total (cfs)	25657.9	Conv. (cfs)	5250.0	16428.7
3979.1				
Length Wtd. (ft)	50.19	Wetted Per. (ft)	130.26	44.24
63.11				
Min Ch El (ft)	823.31	Shear (lb/sq ft)	0.20	0.58
0.26				
Alpha	1.96	Stream Power (lb/ft s)	0.18	1.68
0.29				
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	1.61	1.38
4.60				
C & E Loss (ft)	0.02	Cum SA (acres)	0.95	0.32
2.43				

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach RS: 492.3110

INPUT
Description: 4+92
Station Elevation Data num= 409

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	832.23	.86	832.23	4.82	831.86	5.64	831.85	7.34	831.45
10.5	831.05	11.25	830.79	21.31	830.59	25.08	830.39	26.64	829.95
27.92	829.6	28.69	829.55	30.56	829.28	33.79	828.88	34.87	828.71
39.47	828.29	40.33	828.27	43.46	828.13	44.04	828.06	45.16	827.95
47.72	827.74	49.6	827.66	50.77	827.64	52.71	827.65	54.66	827.68
55.14	827.68	56.2	827.61	57.75	827.64	60.34	827.55	61.63	827.43
61.79	827.44	62.04	827.45	65.8	827.69	66.39	827.68	67.42	827.78
68.71	827.82	72.84	827.59	73.02	827.59	75.42	827.64	76.85	827.69
76.96	827.71	78.62	827.97	81.47	828.13	83.65	827.9	84.33	827.89
89.61	828.2	90.35	828.14	93.81	827.88	94.78	827.93	96.05	827.97
99.59	828.08	101.03	828.09	101.28	828.09	105.73	827.99	108.62	828.08
110.67	828.13	111.95	828.15	112.14	828.16	112.5	828.17	116.3	828.28
117	828.26	117.89	828.24	121.71	828.21	121.78	828.2	121.87	828.21
127.33	828.13	130.58	828	132.97	827.95	137.08	827.94	138.66	827.88
138.97	827.87	142.6	827.79	144.39	827.73	145.97	827.68	151.47	827.68
153.49	827.79	156.04	827.83	157.01	827.86	160.15	827.81	161.45	827.8
162.59	827.94	166.73	827.83	166.9	827.84	167.14	827.85	168.31	827.91
168.77	827.91	172.41	827.89	172.55	827.89	173.93	827.92	177.75	827.77
178.06	827.76	178.35	827.76	180.3	827.78	182.21	827.82	184.27	827.86
184.94	827.83	185.2	827.84	185.83	827.85	189.45	828.06	190.72	828.01
190.94	828	191.42	827.99	195.94	827.86	196.69	827.78	200.26	827.85
200.85	827.86	201.03	827.85	202.5	827.84	204.99	827.85	206.64	827.88
208.21	828	208.3	828.01	209.08	827.98	212.34	827.9	212.87	827.93
216.96	827.76	219.79	827.68	220.67	827.7	224.79	827.93	225.64	827.95
228.26	828.16	229.6	828.26	230.05	828.32	231.25	828.5	233.51	827.74
234.86	827.26	240.35	825.29	243.27	824.77	245.18	824.46	251.67	824.85
262.92	825.54	266.58	825.79	271.07	825.42	272.1	825.5	272.66	825.63
276.05	826.66	278.3	826.88	280.01	827.07	282.61	827.31	283.55	827.24
285.71	827.26	287.43	827.33	289.66	827.54	291.02	827.38	301.28	826.6
302.66	826.61	305.65	826.67	306.13	826.74	311.52	827.37	311.72	827.39
313	827.48	315.59	828.38	317.26	828.75	317.69	828.9	320.04	829.72
321.11	830.07	322.97	830.68	324.55	831.14	326.48	831.34	328.86	831.54
329.43	831.55	330.51	831.58	334.59	831.75	334.79	831.75	336.26	831.69
336.62	831.71	340.54	831.83	342.03	831.83	342.2	831.82	342.61	831.79
346.24	831.46	347.49	831.31	348	831.26	350.26	830.73	352.07	830.36
352.83	830.04	353.73	829.9	357.07	829.73	358.03	829.69	359.25	829.52
359.54	829.51	359.97	829.49	364.46	829.22	365.52	829.06	367.85	828.73
370.21	828.26	371.28	827.76	376.33	828.19	381.34	828.62	382.17	828.55
383.02	828.52	384.58	828.56	387.26	828.61	388.52	828.6	388.97	828.58
393.22	828.6	393.28	828.59	393.53	828.58	394.74	828.55	396.18	828.48
399.09	828.36	399.72	828.29	400.66	828.23	401.34	828.24	404.97	828.33
405.72	828.25	406.61	828.19	407.72	828.23	410.89	828.37	411.62	828.4
412.48	828.32	416.05	828.4	416.78	828.39	416.98	828.38	418.48	828.3
422.37	828.45	422.84	828.48	423.8	828.47	424.42	828.48	424.81	828.49
428.85	828.6	428.87	828.6	430.36	828.63	432.34	828.81	434.76	829.01
436.24	828.96	436.82	828.97	440.68	829.14	440.69	829.14	442.49	829.26
446.36	829.27	447.14	829.21	448.37	829.11	450.67	829.15	452.82	829.21
454.19	829.19	454.28	829.18	454.5	829.17	458.81	829.19	460.29	829.21
460.49	829.21	464.67	829.05	466.33	829.21	466.39	829.22	466.9	829.24
470.66	829.36	471.18	829.42	472.33	829.4	474.44	829.45	476.54	829.46
477.38	829.47	478.29	829.48	481.98	829.72	482.63	829.73	483	829.74
484.21	829.8	488.16	830.03	488.58	829.97	488.86	829.97	495.12	829.72
496.33	829.8	499.15	829.71	503.22	829.45	509.26	829.99	512.71	830.01
514.11	830.17	515.58	830.25	518.53	830.57	520.24	830.66	521.47	830.84
524.73	830.89	528.83	831.14	530.87	831.17	531.83	831.26	532.56	831.26
535.75	830.57	538.24	830.06	538.5	830	542.34	829.52	542.84	829.51
544.58	829.56	544.6	829.56	548.83	830.01	550.5	829.83	550.6	829.85
550.7	829.85	554.88	830.35	554.95	830.33	556.6	830.43	558.02	830.61

561.08	830.88	561.88	830.95	562.76	831.07	564.95	831.19	567.11	831.24
570.73	831.39	573.15	831.55	574.44	831.65	574.99	831.71	578.99	831.96
579.48	831.99	581.12	832.02	581.14	832.02	585.56	832.08	586.92	832.21
587.32	832.24	591.22	832.31	591.61	832.32	593.44	832.32	596.83	832.47
597.71	832.5	599.41	832.64	599.83	832.65	603.93	832.73	605.45	832.81
605.53	832.81	606.21	832.82	609.87	832.83	610.26	832.83	611.68	832.82
615.76	832.9	615.94	832.9	616.08	832.89	617.85	832.84	620.27	832.92
621.94	833.02	622.38	833	623.8	833.02	627.65	833.03	627.87	833.04
627.98	833.02	629.69	832.87	632.22	832.99	634.06	833.03	634.83	833.1
637.34	833.12	640.09	833.19	641.02	833.14	641.81	833.06	644.57	833.15
646.01	833.13	647.7	833.07	647.72	833.07	647.74	833.06	653.58	832.84
657.63	832.95	657.8	832.95	657.93	832.92	659.49	832.48	662.47	832.51
663.64	832.45	664.36	832.41	665.31	832.26	666.17	832.21	669.46	831.85
670.82	831.51	673.73	831.32	675.31	831.29	675.97	831.08	676.94	830.88
677.47	830.83	681.12	831.13	681.57	831.06	682.76	830.93	685.18	830.89
688.05	830.49	688.67	830.36	691.08	830.27	692.69	830.28	694.31	830.28
697.09	830.26	700	829.94	702.54	829.88	704.71	829.77	705.77	829.77
707.3	829.7	709.7	829.61	711.17	829.51	711.52	829.51	716.34	829.8
721.11	829.49	732.03	829.8	732.05	829.8	733.59	829.66	735.22	829.74
737.64	829.73	738.81	829.7	739.07	829.72	741.84	829.77	743.22	829.8
744.73	829.8	749.7	829.72	750.16	829.7	750.3	829.71	750.68	829.75
754.01	830.06	754.75	829.99	755.46	829.97	759.75	830.13	760.78	830.2
760.92	830.23	761.15	830.22	766.15	830.34	768.74	831.17	769.54	831.14
773.1	831.25	776.36	831.56	778.07	831.63	782.82	831.79		

Manning's n Values num= 13

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.03	202.5	.1	234.86	.07	240.35	.06	272.66	.07
282.61	.1	330.51	.013	346.24	.1	388.97	.035	524.73	.1
578.99	.013	657.93	.1	782.82	.1				

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
234.86	282.61	95.23	97.56	102.88	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
340	580	831.8	F
640	782.82	833.2	F

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	831.41	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.	0.034	0.063	0.100
W.S. Elev (ft)	831.36	Reach Len. (ft)	61.00	61.00	61.00
Crit W.S. (ft)	828.71	Flow Area (sq ft)	718.24	274.44	154.28
E.G. Slope (ft/ft)	0.000457	Area (sq ft)	718.24	274.44	702.52
Q Total (cfs)	2000.00	Flow (cfs)	1450.80	437.36	111.83
Top Width (ft)	642.63	Top Width (ft)	226.80	47.75	368.08
Vel Total (ft/s)	1.74	Avg. Vel. (ft/s)	2.02	1.59	0.72
Max Chl Dpth (ft)	6.90	Hydr. Depth (ft)	3.17	5.75	3.50
Conv. Total (cfs)	93521.2	Conv. (cfs)	67840.3	20451.4	5229.5
Length Wtd. (ft)	61.00	Wetted Per. (ft)	227.48	48.42	44.78
Min Ch El (ft)	824.46	Shear (lb/sq ft)	0.09	0.16	0.10
Alpha	1.17	Stream Power (lb/ft s)	0.18	0.26	0.07
Frctn Loss (ft)		Cum Volume (acre-ft)	1.98	1.35	5.94
C & E Loss (ft)		Cum SA (acres)	0.87	0.29	2.27

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #5 yr

E.G. Elev (ft)	830.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.034	0.063	0.100
W.S. Elev (ft)	830.29	Reach Len. (ft)	61.00	61.00	61.00
Crit W.S. (ft)	828.32	Flow Area (sq ft)	482.72	223.26	110.32
E.G. Slope (ft/ft)	0.000383	Area (sq ft)	482.72	223.26	352.77
Q Total (cfs)	1070.00	Flow (cfs)	722.81	283.78	63.40
Top Width (ft)	550.52	Top Width (ft)	209.41	47.75	293.36
Vel Total (ft/s)	1.31	Avg. Vel. (ft/s)	1.50	1.27	0.57
Max Chl Dpth (ft)	5.83	Hydr. Depth (ft)	2.31	4.68	2.82
Conv. Total (cfs)	54668.6	Conv. (cfs)	36930.1	14499.0	3239.5

Length Wtd. (ft)	61.00	Wetted Per. (ft)	210.01	48.42
39.71				
Min Ch El (ft)	824.46	Shear (lb/sq ft)	0.05	0.11
0.07				
Alpha	1.14	Stream Power (lb/ft s)	0.08	0.14
0.04				
Frctn Loss (ft)		Cum Volume (acre-ft)	1.19	1.10
4.05				
C & E Loss (ft)		Cum SA (acres)	0.74	0.26
2.06				

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE

RIVER: Oldtown Creek
REACH: Reach RS: 431

INPUT
Description:
Distance from Upstream XS = 61
Deck/Roadway Width = 24.3
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 6

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
231	828.5	820	243.4	830.2	820	243.5	830.2	828.2
285	830.2	828.2	285.1	830.2	820	330	831.5	820

Upstream Bridge Cross Section Data
Station Elevation Data num= 409

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	832.23	.86	832.23	4.82	831.86	5.64	831.85	7.34	831.45
10.5	831.05	11.25	830.79	21.31	830.59	25.08	830.39	26.64	829.95
27.92	829.6	28.69	829.55	30.56	829.28	33.79	828.88	34.87	828.71
39.47	828.29	40.33	828.27	43.46	828.13	44.04	828.06	45.16	827.95
47.72	827.74	49.6	827.66	50.77	827.64	52.71	827.65	54.66	827.68
55.14	827.68	56.2	827.61	57.75	827.64	60.34	827.55	61.63	827.43
61.79	827.44	62.04	827.45	65.8	827.69	66.39	827.68	67.42	827.78
68.71	827.82	72.84	827.59	73.02	827.59	75.42	827.64	76.85	827.69
76.96	827.71	78.62	827.97	81.47	828.13	83.65	827.9	84.33	827.89
89.61	828.2	90.35	828.14	93.81	827.88	94.78	827.93	96.05	827.97
99.59	828.08	101.03	828.09	101.28	828.09	105.73	827.99	108.62	828.08
110.67	828.13	111.95	828.15	112.14	828.16	112.5	828.17	116.3	828.28
117	828.26	117.89	828.24	121.71	828.21	121.78	828.2	121.87	828.21
127.33	828.13	130.58	828	132.97	827.95	137.08	827.94	138.66	827.88
138.97	827.87	142.6	827.79	144.39	827.73	145.97	827.68	151.47	827.68
153.49	827.79	156.04	827.83	157.01	827.86	160.15	827.81	161.45	827.8
162.59	827.94	166.73	827.83	166.9	827.84	167.14	827.85	168.31	827.91
168.77	827.91	172.41	827.89	172.55	827.89	173.93	827.92	177.75	827.77
178.06	827.76	178.35	827.76	180.3	827.78	182.21	827.82	184.27	827.86
184.94	827.83	185.2	827.84	185.83	827.85	189.45	828.06	190.72	828.01
190.94	828	191.42	827.99	195.94	827.86	196.69	827.78	200.26	827.85
200.85	827.86	201.03	827.85	202.5	827.84	204.99	827.85	206.64	827.88
208.21	828	208.3	828.01	209.08	827.98	212.34	827.9	212.87	827.93
216.96	827.76	219.79	827.68	220.67	827.7	224.79	827.93	225.64	827.95
228.26	828.16	229.6	828.26	230.05	828.32	231.25	828.5	233.51	827.74
234.86	827.26	240.35	825.29	243.27	824.77	245.18	824.46	251.67	824.85
262.92	825.54	266.58	825.79	271.07	825.42	272.1	825.5	272.66	825.63
276.05	826.66	278.3	826.88	280.01	827.07	282.61	827.31	283.55	827.24
285.71	827.26	287.43	827.33	289.66	827.54	291.02	827.38	301.28	826.6
302.66	826.61	305.65	826.67	306.13	826.74	311.52	827.37	311.72	827.39
313	827.48	315.59	828.38	317.26	828.75	317.69	828.9	320.04	829.72
321.11	830.07	322.97	830.68	324.55	831.14	326.48	831.34	328.86	831.54
329.43	831.55	330.51	831.58	334.59	831.75	334.79	831.75	336.26	831.69
336.62	831.71	340.54	831.83	342.03	831.83	342.2	831.82	342.61	831.79
346.24	831.46	347.49	831.31	348	831.26	350.26	830.73	352.07	830.36
352.83	830.04	353.73	829.9	357.07	829.73	358.03	829.69	359.25	829.52
359.54	829.51	359.97	829.49	364.46	829.22	365.52	829.06	367.85	828.73
370.21	828.26	371.28	827.76	376.33	828.19	381.34	828.62	382.17	828.55
383.02	828.52	384.58	828.56	387.26	828.61	388.52	828.6	388.97	828.58
393.22	828.6	393.28	828.59	393.53	828.58	394.74	828.55	396.18	828.48
399.09	828.36	399.72	828.29	400.66	828.23	401.34	828.24	404.97	828.33
405.72	828.25	406.61	828.19	407.72	828.23	410.89	828.37	411.62	828.4
412.48	828.32	416.05	828.4	416.78	828.39	416.98	828.38	418.48	828.3
422.37	828.45	422.84	828.48	423.8	828.47	424.42	828.48	424.81	828.49
428.85	828.6	428.87	828.6	430.36	828.63	432.34	828.81	434.76	829.01
436.24	828.96	436.82	828.97	440.68	829.14	440.69	829.14	442.49	829.26
446.36	829.27	447.14	829.21	448.37	829.11	450.67	829.15	452.82	829.21
454.19	829.19	454.28	829.18	454.5	829.17	458.81	829.19	460.29	829.21
460.49	829.21	464.67	829.05	466.33	829.21	466.39	829.22	466.9	829.24
470.66	829.36	471.18	829.42	472.33	829.4	474.44	829.45	476.54	829.46
477.38	829.47	478.29	829.48	481.98	829.72	482.63	829.73	483	829.74
484.21	829.8	488.16	830.03	488.58	829.97	488.86	829.97	495.12	829.72
496.33	829.8	499.15	829.71	503.22	829.45	509.26	829.99	512.71	830.01
514.11	830.17	515.58	830.25	518.53	830.57	520.24	830.66	521.47	830.84
524.73	830.89	528.83	831.14	530.87	831.17	531.83	831.26	532.56	831.26
535.75	830.57	538.24	830.06	538.5	830	542.34	829.52	542.84	829.51
544.58	829.56	544.6	829.56	548.83	830.01	550.5	829.83	550.6	829.85
550.7	829.85	554.88	830.35	554.95	830.33	556.6	830.43	558.02	830.61
561.08	830.88	561.88	830.95	562.76	831.07	564.95	831.19	567.11	831.24
570.73	831.39	573.15	831.55	574.44	831.65	574.99	831.71	578.99	831.96
579.48	831.99	581.12	832.02	581.14	832.02	585.56	832.08	586.92	832.21
587.32	832.24	591.22	832.31	591.61	832.32	593.44	832.32	596.83	832.47
597.71	832.5	599.41	832.64	599.83	832.65	603.93	832.73	605.45	832.81
605.53	832.81	606.21	832.82	609.87	832.83	610.26	832.83	611.68	832.82

615.76	832.9	615.94	832.9	616.08	832.89	617.85	832.84	620.27	832.92
621.94	833.02	622.38	833	623.8	833.02	627.65	833.03	627.87	833.04
627.98	833.02	629.69	832.87	632.22	832.99	634.06	833.03	634.83	833.1
637.34	833.12	640.09	833.19	641.02	833.14	641.81	833.06	644.57	833.15
646.01	833.13	647.7	833.07	647.72	833.07	647.74	833.06	653.58	832.84
657.63	832.95	657.8	832.95	657.93	832.92	659.49	832.48	662.47	832.51
663.64	832.45	664.36	832.41	665.31	832.26	666.17	832.21	669.46	831.85
670.82	831.51	673.73	831.32	675.31	831.29	675.97	831.08	676.94	830.88
677.47	830.83	681.12	831.13	681.57	831.06	682.76	830.93	685.18	830.89
688.05	830.49	688.67	830.36	691.08	830.27	692.69	830.28	694.31	830.28
697.09	830.26	700	829.94	702.54	829.88	704.71	829.77	705.77	829.77
707.3	829.7	709.7	829.61	711.17	829.51	711.52	829.51	716.34	829.8
721.11	829.49	732.03	829.8	732.05	829.8	733.59	829.66	735.22	829.74
737.64	829.73	738.81	829.7	739.07	829.72	741.84	829.77	743.22	829.8
744.73	829.8	749.7	829.72	750.16	829.7	750.3	829.71	750.68	829.75
754.01	830.06	754.75	829.99	755.46	829.97	759.75	830.13	760.78	830.2
760.92	830.23	761.15	830.22	766.15	830.34	768.74	831.17	769.54	831.14
773.1	831.25	776.36	831.56	778.07	831.63	782.82	831.79		

Manning's n Values num= 13

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.03	202.5	.1	234.86	.07	240.35	.06	272.66	.07
282.61	.1	330.51	.013	346.24	.1	388.97	.035	524.73	.1
578.99	.013	657.93	.1	782.82	.1				

Bank Sta: Left Right Coeff Contr. Expan.
234.86 282.61 .1 .3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
340	580	831.8	F
640	782.82	833.2	F

Downstream Deck/Roadway Coordinates
num= 6

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
380	829.21	820	391.9	830.2	820	392	830.2	828.2
433.5	830.2	828.2	433.6	830.2	820	442	830.4	820

Downstream Bridge Cross Section Data
Station Elevation Data num= 487

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	834.02	1.12	833.95	2.93	833.84	3.16	833.82	4.34	833.79
6.93	833.84	8.34	833.87	9.18	833.95	9.92	834.01	11.66	834.29
13.79	834.64	14.93	834.7	15.43	834.7	20.67	835.04	20.84	835.05
21.04	835.05	25.86	834.71	26.31	834.63	27.67	834.57	30.38	834.49
31.64	834.4	31.75	834.39	31.96	834.39	35.84	834.14	37.27	833.87
37.31	833.87	41.91	833.82	42.72	833.7	46.41	833.6	46.73	833.6
46.89	833.57	48.21	833.4	50.02	833.44	53.77	833.67	57.34	833.69
57.79	833.7	59.29	833.58	59.39	833.57	59.76	833.57	64.92	833.54
66.04	833.53	70.45	833.53	71.74	833.54	74.45	833.48	75.32	833.39
75.98	833.36	80.2	833.34	81.73	833.24	85.57	833.19	85.71	833.19
85.95	833.17	88.09	833.07	91.3	833.04	92.61	833.06	92.8	833.07
94.52	833.04	96.85	833.01	97.09	833	98.16	832.96	103.64	832.76
103.97	832.75	105.79	832.76	108.62	832.86	109.75	832.93	111.7	832.82
113.77	832.37	114.98	832.16	115.45	832.05	121.02	831.77	122.81	831.83
124.89	831.89	126.55	831.75	127.57	831.77	131.34	831.74	132.14	831.68
137.33	831.77	137.73	831.76	137.82	831.76	138.01	831.77	141.97	831.74
142.11	831.74	143.43	831.6	144.69	831.49	147.5	831.23	149.14	831.23
153.04	831.02	153.75	830.92	154.66	830.87	158.79	830.81	159.93	830.69
160.24	830.61	164.38	830.28	164.72	830.28	165.84	830.23	166.73	830.24
171.21	830.33	171.52	830.35	172.2	830.38	173.9	830.47	177.18	830.68
182.45	830.49	182.78	830.63	183.79	830.94	191.18	830.98	196.86	830.94
197.65	830.97	197.99	831.01	201.44	830.83	201.57	830.83	206.6	830.72
209.15	830.69	219.33	830.76	223.44	830.46	227.12	830.31	227.78	830.26
231.18	830	232.34	830	232.68	829.98	233.9	830.01	236.76	830.02
237.66	829.99	238.17	829.95	240.5	829.91	242.34	829.89	243.07	829.94
243.74	830.02	244.9	830.03	248.87	830.04	249.45	830.01	252.02	829.97
253.39	829.93	253.73	829.92	254.96	829.91	259.44	829.96	260.5	829.95
261.67	829.97	264.51	829.95	265.79	829.94	266.01	829.93	266.47	829.94
270.18	830	271.5	829.93	271.53	829.93	275.74	829.85	276.03	829.85
277.38	829.92	279.24	829.95	282.4	829.93	282.85	829.92	286.75	829.86
288.01	829.87	288.35	829.87	288.6	829.86	292.5	829.87	293.94	829.81
298.26	829.83	298.89	829.81	299.59	829.78	301.34	829.8	303.74	829.83
304.99	829.78	305.18	829.76	305.73	829.76	310.54	829.69	311.42	829.69
311.5	829.7	315.76	829.97	328.13	830	339.19	830.02	343.23	829.61
343.4	829.6	343.61	829.6	344.94	829.64	347.85	829.55	349.15	829.53
350.35	829.56	350.79	829.57	351.14	829.59	355.01	829.58	356.07	829.63
356.61	829.61	358.23	829.61	360.62	829.57	361.84	829.46	362.41	829.44
363.41	829.39	365.71	829.3	366.38	829.28	368.03	829.19	368.12	829.19
368.35	829.18	372.29	829.15	373.58	829.06	374.02	829.04	375.79	829.06
378.28	829.1	379.04	829	381.34	829.21	382.16	829.2	383.3	829.15
385.08	829.05	385.25	829.06	385.83	829.08	388.77	828.4	390.16	828.08
390.91	827.85	391.71	827.6	393.14	827.08	393.39	826.95	395.97	825.1
397.24	824.59	397.56	824.46	399.55	824.24	401.28	824	401.95	823.91
402.28	823.95	403.3	824.07	406.53	824.04	409.43	824.07	410.3	824.12
413.73	824.18	414.37	824.06	415.14	823.89	417.96	822.8	419.48	822.29
419.66	822.29	420.36	822.26	420.98	822.24	422.37	822.3	425.19	822.39
430.66	822.88	430.96	822.93	431.24	823.03	432.57	823.69	433.57	824.5
435.56	826.68	439.06	828.47	442.61	830.4	443.28	830.68	444.37	830.78
446.54	830.96	448.61	831.05	449.87	831.05	450.28	831.07	452.14	831.14
454.32	831.16	455.53	831.17	455.99	831.15	459.38	831.27	460.44	831.3
465.8	831.83	466.07	831.87	466.19	831.87	467.53	831.75	469.35	831.81
471.88	831.89	473.15	831.88	473.47	831.86	474.25	831.86	477.58	831.88
479	831.72	479.27	831.68	480.72	831.52	483.42	831.24	484.52	831.16
485.02	831.11	485.55	831.06	489.39	830.65	490.15	830.5	492.31	830.17
495.96	829.92	496.82	829.75	501.73	827.73	502.36	827.5	502.55	827.45
505.64	826.92	507.08	826.47	510.03	826.6	512.98	826.73	514.24	826.65
520.14	826.97	520.25	826.97	524.64	826.96	526.64	826.96	530.42	826.99
530.7	826.97	533.13	826.97	537.23	826.85	537.82	826.84	537.87	826.84
538.19	826.82	542.75	826.89	543.73	826.96	547.34	826.8	548.11	826.83

```
 549.5  826.75  550.31  826.75  554.17  826.72  554.54  826.67  555.78  826.53
560.14  826.68  560.28  826.68  561.62  826.64  563.26  826.64  566.08  826.66
567.45   826.7  567.69   826.7  571.98  826.67  572.02  826.67  573.74   826.8
577.56  826.75  578.01  826.75  578.67  826.65  579.61  826.51  582.19  826.66
585.55  826.83  591.39   826.9  591.61   826.9  591.81  826.91  596.03  826.99
597.38  826.86  597.67  826.86  599.52  826.87  606.28  826.87  608.71  826.88
609.57  826.91  613.98  827.05  614.36  827.01   615.5  826.88  616.42  826.87
621.26  826.72  621.52  826.72  623.28  826.78  626.38  826.89  627.61  826.85
629.35  826.86  631.89  826.77   633.6  826.74  633.96  826.73  635.08  826.73
639.62  826.74  641.04  826.74  644.07   826.7  644.95  826.68  645.67  826.65
 651.1  826.69  651.69  826.65  652.86  826.71  657.31  826.83  657.76  826.81
658.34  826.81  663.84  826.68   665.1  826.66  669.55  826.59  669.84  826.59
670.41  826.58  674.26  826.71   675.6  826.62  676.38  826.59  681.79   826.4
681.94  826.39  683.49  826.41  686.28  826.46  686.68  826.42  687.92  826.28
689.01  826.24  689.88  826.19  694.07  825.95  696.14  825.94  698.94  826.06
700.18  826.07  701.66  826.06  705.01  825.96  706.31  825.94  711.79  825.91
712.37  825.91  712.44   825.9  712.77  825.92  716.97  826.18   718.2  826.14
721.89  826.11   723.3  826.11  724.77  825.97  728.66  825.93  729.23  825.93
730.84     826  737.36     826  743.02  826.01  747.01  826.02  749.19  826.05
753.37  826.13  754.47  826.06  755.16  826.07  758.78  826.08  760.51  825.97
761.07  825.99  764.98  826.16  767.18  826.16  771.09   826.3   773.2  826.27
774.96  826.32   779.1  826.34  783.36   826.4  783.48  826.41  784.99  826.47
790.93  826.55  792.95  826.62   796.5  826.72  796.77  826.73  800.85  826.83
801.01  826.82  802.55  826.61  802.81  826.61  804.32   826.6  808.44  826.59
809.13  826.59  814.27  826.63  815.82   826.7   820.1  826.66  820.21  826.65
 820.58  826.66  825.32  826.78  825.97  826.76  827.97  826.79  829.99  826.86
 830.77  826.89  831.58  826.96  836.31  826.91  837.35  826.91  840.06  826.89
 841.36  826.95  842.05  826.85   842.9  826.83   845.8  827.01  847.05  827.06
 847.77  826.99  848.71  826.92  853.81  827.13  854.23  827.14  854.46  827.14
 859.77  827.09  861.12  827.17  864.55  827.24  868.01  827.47  869.59   827.5
 870.72  827.52  871.27  827.56  874.94  827.75  876.37  827.64  876.56  827.64
 881.97   827.8  884.17  827.93  887.14  828.06  892.28   828.1   892.6  828.03
 894.11  828.03  897.39  828.15   897.9  828.18  900.94  828.12  903.51  828.09
 904.44  828.23  908.58  828.53   908.8  828.54  909.42  828.56  912.57  828.84
 913.62  829.06  914.04  829.14  915.23  829.25  919.09  829.43  919.36  829.42
 923.15  830.03  923.45  830.06  924.05   830.1  924.76  830.14  925.08  830.16
 930.21  830.98  931.02  831.09  938.26  831.54  938.57  831.56  939.31  831.76
 939.56  831.79  941.13  831.87  944.63  832.43  945.89  832.51  949.92  833.94
 953.67  835.19  955.91  836.27

Manning's n Values        num=      13
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0     .03   48.21    .013   111.7     .03  232.34    .013  385.25     .07
  401.28     .06  433.57     .07  439.06     .03  466.07    .013  477.58      .1
  533.13    .035  923.15      .1  955.91      .1

Bank Sta: Left   Right    Coeff Contr.   Expan.
        385.25  439.06             .1       .3
Ineffective Flow     num=       3
   Sta L   Sta R    Elev  Permanent
      186     232     850       T
      313     342     845       T
      475     950  831.88       F

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =       1
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Pressure and Weir flow
           Submerged Inlet Cd          =
           Submerged Inlet + Outlet Cd =      .8
           Max Low Cord                =

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

BRIDGE OUTPUT  Profile #100 yr


  E.G. US. (ft)                831.41    Element                  Inside BR US
Inside BR DS
  W.S. US. (ft)                831.36    E.G. Elev (ft)                831.41
831.41
  Q Total (cfs)               2000.00    W.S. Elev (ft)                831.36
830.96
  Q Bridge (cfs)              1000.42    Crit W.S. (ft)                828.83
827.93
  Q Weir (cfs)                 999.58    Max Chl Dpth (ft)              6.90
 8.72
  Weir Sta Lft (ft)            145.52    Vel Total (ft/s)               2.21
 5.07
  Weir Sta Rgt (ft)            461.59    Flow Area (sq ft)             906.72
394.86
  Weir Submerg                   0.01    Froude # Chl                   0.17
```

0.46			
Weir Max Depth (ft)	2.41	Specif Force (cu ft)	1888.99
1507.57			
Min El Weir Flow (ft)	829.01	Hydr Depth (ft)	2.86
1.81			
Min El Prs (ft)	828.20	W.P. Total (ft)	405.44
308.00			
Delta EG (ft)	1.17	Conv. Total (cfs)	
Delta WS (ft)	2.13	Top Width (ft)	641.04
727.37			
BR Open Area (sq ft)	105.33	Frctn Loss (ft)	
BR Open Vel (ft/s)	9.50	C & E Loss (ft)	
BR Sluice Coef		Shear Total (lb/sq ft)	
BR Sel Method	Press/Weir	Power Total (lb/ft s)	

Note: Momentum answer is not valid if the water surface is above the low chord or if there is weir flow. The momentum answer has been disregarded.
Note: The downstream water surface is above the minimum elevation required for orifice flow. The orifice flow equation was used for pressure flow.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Note: For the cross section inside the bridge at the upstream end, the water surface and energy have been projected from the upstream cross section. The selected bridge modeling method does not compute answers inside the bridge.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Note: For the cross section inside the bridge at the downstream end, the water surface is based on critical depth over the weir. The energy has been projected.

BRIDGE OUTPUT Profile #5 yr

E.G. US. (ft)	830.32	Element	Inside BR US
Inside BR DS			
W.S. US. (ft)	830.29	E.G. Elev (ft)	830.32
830.30			
Q Total (cfs)	1070.00	W.S. Elev (ft)	830.29
830.11			
Q Bridge (cfs)	902.98	Crit W.S. (ft)	828.37
826.43			
Q Weir (cfs)	167.02	Max Chl Dpth (ft)	5.83
7.87			
Weir Sta Lft (ft)	163.91	Vel Total (ft/s)	1.80
4.59			
Weir Sta Rgt (ft)	442.46	Flow Area (sq ft)	594.30
233.25			
Weir Submerg	0.00	Froude # Chl	0.15
0.31			
Weir Max Depth (ft)	1.32	Specif Force (cu ft)	1002.16
963.75			
Min El Weir Flow (ft)	829.01	Hydr Depth (ft)	2.26
1.80			
Min El Prs (ft)	828.20	W.P. Total (ft)	350.94
219.34			
Delta EG (ft)	1.38	Conv. Total (cfs)	
Delta WS (ft)	1.75	Top Width (ft)	516.85
592.27			
BR Open Area (sq ft)	105.33	Frctn Loss (ft)	
BR Open Vel (ft/s)	8.57	C & E Loss (ft)	
BR Sluice Coef		Shear Total (lb/sq ft)	
BR Sel Method	Press/Weir	Power Total (lb/ft s)	

Note: Momentum answer is not valid if the water surface is above the low chord or if there is weir flow. The momentum answer has been disregarded.
Note: The downstream water surface is above the minimum elevation required for orifice flow. The orifice flow equation was used for pressure flow.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Note: For the cross section inside the bridge at the upstream end, the water surface and energy have been projected from the upstream cross section. The selected bridge modeling method does not compute answers inside the bridge.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Note: For the cross section inside the bridge at the downstream end, the water surface and energy are based on critical depth over the weir.

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach RS: 394.7476

INPUT
Description: 3+95
Station Elevation Data num= 487

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	834.02	1.12	833.95	2.93	833.84	3.16	833.82	4.34	833.79
6.93	833.84	8.34	833.87	9.18	833.95	9.92	834.01	11.66	834.29
13.79	834.64	14.93	834.7	15.43	834.7	20.67	835.04	20.84	835.05
21.04	835.05	25.86	834.71	26.31	834.63	27.67	834.57	30.38	834.49
31.64	834.4	31.75	834.39	31.96	834.39	35.84	834.14	37.27	833.87
37.31	833.87	41.91	833.82	42.72	833.7	46.41	833.6	46.73	833.6
46.89	833.57	48.21	833.4	50.02	833.44	53.77	833.67	57.34	833.69
57.79	833.7	59.29	833.58	59.39	833.57	59.76	833.57	64.92	833.54
66.04	833.53	70.45	833.53	71.74	833.54	74.45	833.48	75.32	833.39
75.98	833.36	80.2	833.34	81.73	833.24	85.57	833.19	85.71	833.19
85.95	833.17	88.09	833.07	91.3	833.04	92.61	833.06	92.8	833.07
94.52	833.04	96.85	833.01	97.09	833	98.16	832.96	103.64	832.76
103.97	832.75	105.79	832.76	108.62	832.86	109.75	832.93	111.7	832.82
113.77	832.37	114.98	832.16	115.45	832.05	121.02	831.77	122.81	831.83
124.89	831.89	126.55	831.75	127.57	831.77	131.34	831.74	132.14	831.68
137.33	831.77	137.73	831.76	137.82	831.76	138.01	831.77	141.97	831.74
142.11	831.74	143.43	831.6	144.69	831.49	147.5	831.23	149.14	831.23
153.04	831.02	153.75	830.92	154.66	830.87	158.79	830.81	159.93	830.69
160.24	830.61	164.38	830.28	164.72	830.28	165.84	830.23	166.73	830.24
171.21	830.33	171.52	830.35	172.2	830.38	173.9	830.47	177.18	830.68
182.45	830.49	182.78	830.63	183.79	830.94	191.18	830.98	196.86	830.94
197.65	830.97	197.99	831.01	201.44	830.83	201.57	830.83	206.6	830.72
209.15	830.69	219.33	830.76	223.44	830.46	227.12	830.31	227.78	830.26
231.18	830	232.34	830	232.68	829.98	233.9	830.01	236.76	830.02
237.66	829.99	238.17	829.95	240.5	829.91	242.34	829.89	243.07	829.94
243.74	830.02	244.9	830.03	248.87	830.04	249.45	830.01	252.02	829.97
253.39	829.93	253.73	829.92	254.96	829.91	259.44	829.96	260.5	829.95
261.67	829.97	264.51	829.95	265.79	829.94	266.01	829.93	266.47	829.94
270.18	830	271.5	829.93	271.53	829.93	275.74	829.85	276.03	829.85
277.38	829.92	279.24	829.95	282.4	829.93	282.85	829.92	286.75	829.86
288.01	829.87	288.35	829.87	288.6	829.86	292.5	829.87	293.94	829.81
298.26	829.83	298.89	829.81	299.59	829.78	301.34	829.8	303.74	829.83
304.99	829.78	305.18	829.76	305.73	829.76	310.54	829.69	311.42	829.69
311.5	829.7	315.76	829.97	328.13	830	339.19	830.02	343.23	829.61
343.4	829.6	343.61	829.6	344.94	829.64	347.85	829.55	349.15	829.53
350.35	829.56	350.79	829.57	351.14	829.59	355.01	829.58	356.07	829.63
356.61	829.61	358.23	829.61	360.62	829.57	361.84	829.46	362.41	829.44
363.41	829.39	365.71	829.3	366.38	829.28	368.03	829.19	368.12	829.19
368.35	829.18	372.29	829.15	373.58	829.06	374.02	829.04	375.79	829.06
378.28	829.1	379.04	829	381.34	829.21	382.16	829.2	383.3	829.15
385.08	829.05	385.25	829.06	385.83	829.08	388.77	828.4	390.16	828.08
390.91	827.85	391.71	827.6	393.14	827.08	393.39	826.95	395.97	825.1
397.24	824.59	397.56	824.46	399.55	824.24	401.28	824	401.95	823.91
402.28	823.95	403.3	824.07	406.53	824.04	409.43	824.07	410.3	824.12
413.73	824.18	414.37	824.06	415.14	823.89	417.96	822.8	419.48	822.29
419.66	822.29	420.36	822.26	420.98	822.24	422.37	822.3	425.19	822.39
430.66	822.88	430.96	822.93	431.24	823.03	432.57	823.69	433.57	824.5
435.56	826.68	439.06	828.47	442.61	830.4	443.28	830.68	444.37	830.78
446.54	830.96	448.61	831.05	449.87	831.05	450.28	831.07	452.14	831.14
454.32	831.16	455.53	831.17	455.99	831.15	459.38	831.27	460.44	831.3
465.8	831.83	466.07	831.87	466.19	831.87	467.53	831.75	469.35	831.81
471.88	831.89	473.15	831.88	473.47	831.86	474.25	831.86	477.58	831.88
479	831.72	479.27	831.68	480.72	831.52	483.42	831.24	484.52	831.16
485.02	831.11	485.55	831.06	489.39	830.65	490.15	830.5	492.31	830.17
495.96	829.92	496.82	829.75	501.73	827.73	502.36	827.5	502.55	827.45
505.64	826.92	507.08	826.47	510.03	826.6	512.98	826.73	514.24	826.65
520.14	826.97	520.25	826.97	524.64	826.96	526.64	826.96	530.42	826.99
530.7	826.97	533.13	826.97	537.23	826.85	537.82	826.84	537.87	826.84
538.19	826.82	542.75	826.89	543.73	826.96	547.34	826.8	548.11	826.83
549.5	826.75	550.31	826.75	554.17	826.72	554.54	826.67	555.78	826.53
560.14	826.68	560.28	826.68	561.62	826.64	563.26	826.64	566.08	826.66
567.45	826.7	567.69	826.7	571.98	826.67	572.02	826.67	573.74	826.8
577.56	826.75	578.01	826.75	578.67	826.65	579.61	826.51	582.19	826.66
585.55	826.83	591.39	826.9	591.61	826.9	591.81	826.91	596.03	826.99
597.38	826.86	597.67	826.86	599.52	826.87	606.28	826.87	608.71	826.88
609.57	826.91	613.98	827.05	614.36	827.01	615.5	826.88	616.42	826.87
621.26	826.72	621.52	826.72	623.28	826.78	626.38	826.89	627.61	826.85
629.35	826.86	631.89	826.77	633.6	826.74	633.96	826.73	635.08	826.73
639.62	826.74	641.04	826.74	644.07	826.7	644.95	826.68	645.67	826.65
651.1	826.69	651.69	826.65	652.86	826.71	657.31	826.83	657.76	826.81
658.34	826.81	663.84	826.68	665.1	826.66	669.55	826.59	669.84	826.59
670.41	826.58	674.26	826.71	675.6	826.62	676.38	826.59	681.79	826.4
681.94	826.39	683.49	826.41	686.28	826.46	686.68	826.42	687.92	826.28
689.01	826.24	689.88	826.19	694.07	825.95	696.14	825.94	698.94	826.06
700.18	826.07	701.66	826.06	705.01	825.96	706.31	825.94	711.79	825.91
712.37	825.91	712.44	825.9	712.77	825.92	716.97	826.18	718.2	826.14
721.89	826.11	723.3	826.11	724.77	825.97	728.66	825.93	729.23	825.93
730.84	826	737.36	826	743.02	826.01	747.01	826.02	749.19	826.05
753.37	826.13	754.47	826.06	755.16	826.07	758.78	826.08	760.51	825.97
761.07	825.99	764.98	826.16	767.18	826.16	771.09	826.3	773.2	826.27
774.96	826.32	779.1	826.34	783.36	826.4	783.48	826.41	784.99	826.47
790.93	826.55	792.95	826.62	796.5	826.72	796.77	826.73	800.85	826.83
801.01	826.82	802.55	826.61	802.81	826.61	804.32	826.6	808.44	826.59
809.13	826.59	814.27	826.63	815.82	826.7	820.1	826.66	820.21	826.65
820.58	826.66	825.32	826.78	825.97	826.76	827.97	826.79	829.99	826.86
830.77	826.89	831.58	826.96	836.31	826.91	837.35	826.91	840.06	826.89
841.36	826.95	842.05	826.85	842.9	826.83	845.8	827.01	847.05	827.06
847.77	826.99	848.71	826.92	853.81	827.13	854.23	827.14	854.46	827.14
859.77	827.09	861.12	827.17	864.55	827.24	868.01	827.47	869.59	827.5
870.72	827.52	871.27	827.56	874.94	827.75	876.37	827.64	876.56	827.64
881.97	827.8	884.17	827.93	887.14	828.06	892.28	828.1	892.6	828.03
894.11	828.03	897.39	828.15	897.9	828.18	900.94	828.12	903.51	828.09

904.44	828.23	908.58	828.53	908.8	828.54	909.42	828.56	912.57	828.84
913.62	829.06	914.04	829.14	915.23	829.25	919.09	829.43	919.36	829.42
923.15	830.03	923.45	830.06	924.05	830.1	924.76	830.14	925.08	830.16
930.21	830.98	931.02	831.09	938.26	831.54	938.57	831.56	939.31	831.76
939.56	831.79	941.13	831.87	944.63	832.43	945.89	832.51	949.92	833.94
953.67	835.19	955.91	836.27						

Manning's n Values num= 13

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.03	48.21	.013	111.7	.03	232.34	.013	385.25	.07
401.28	.06	433.57	.07	439.06	.03	466.07	.013	477.58	.1
533.13	.035	923.15	.1	955.91	.1				

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
385.25	439.06	158.45	152.51	147.17	.1	.3

Ineffective Flow num= 3

Sta L	Sta R	Elev	Permanent
186	232	850	T
313	342	845	T
475	950	831.88	F

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	830.25	Element	Left OB	Channel
Right OB				
Vel Head (ft)	1.02	Wt. n-Val.	0.013	0.064
0.030				
W.S. Elev (ft)	829.23	Reach Len. (ft)	158.45	152.51
147.17				
Crit W.S. (ft)	827.95	Flow Area (sq ft)	1.96	245.68
0.53				
E.G. Slope (ft/ft)	0.017572	Area (sq ft)	1.96	245.68
1019.23				
Q Total (cfs)	2000.00	Flow (cfs)	6.81	1991.52
1.67				
Top Width (ft)	490.05	Top Width (ft)	17.93	53.81
418.31				
Vel Total (ft/s)	8.06	Avg. Vel. (ft/s)	3.47	8.11
3.16				
Max Chl Dpth (ft)	6.99	Hydr. Depth (ft)	0.11	4.57
0.38				
Conv. Total (cfs)	15087.7	Conv. (cfs)	51.4	15023.7
12.6				
Length Wtd. (ft)	154.33	Wetted Per. (ft)	17.96	57.08
1.59				
Min Ch El (ft)	822.24	Shear (lb/sq ft)	0.12	4.72
0.37				
Alpha	1.01	Stream Power (lb/ft s)	0.42	38.27
1.15				
Frctn Loss (ft)	0.73	Cum Volume (acre-ft)	0.69	0.87
4.00				
C & E Loss (ft)	0.26	Cum SA (acres)	0.39	0.18
1.41				

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #5 yr

E.G. Elev (ft)	828.94	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.41	Wt. n-Val.		0.064
0.030				
W.S. Elev (ft)	828.53	Reach Len. (ft)	158.45	152.51
147.17				
Crit W.S. (ft)	826.43	Flow Area (sq ft)		209.19
0.00				
E.G. Slope (ft/ft)	0.007984	Area (sq ft)		209.19
730.96				
Q Total (cfs)	1070.00	Flow (cfs)		1070.00
0.00				
Top Width (ft)	459.84	Top Width (ft)		50.86
408.98				
Vel Total (ft/s)	5.11	Avg. Vel. (ft/s)		5.11
0.40				
Max Chl Dpth (ft)	6.29	Hydr. Depth (ft)		4.11
0.03				
Conv. Total (cfs)	11974.7	Conv. (cfs)		11974.7
0.0				
Length Wtd. (ft)	153.91	Wetted Per. (ft)		54.07
0.13				
Min Ch El (ft)	822.24	Shear (lb/sq ft)		1.93
0.01				
Alpha	1.00	Stream Power (lb/ft s)		9.86
0.01				
Frctn Loss (ft)	0.58	Cum Volume (acre-ft)	0.36	0.73
2.87				
C & E Loss (ft)	0.09	Cum SA (acres)	0.33	0.17

1.36

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach RS: 242.2423

INPUT
Description: FIS C-C
Station Elevation Data num= 476

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	833.58	.02	833.58	.65	833.53	2.08	833.64	4.52	833.79
5.87	833.75	6.9	833.68	12.39	833.03	13.72	833.22	14.29	833.25
15.25	833.22	18.34	832.98	23.95	833.19	24.16	833.24	26.05	833.2
34.35	832.99	35.29	833.02	40.93	832.99	45.1	832.72	46.17	832.61
46.41	832.61	50.67	832.5	52.98	832.46	56.2	832.45	56.49	832.45
62.16	832.57	65.18	832.37	67.33	832.48	67.43	832.47	67.63	832.49
72.38	832.32	74.33	832.02	77.74	831.5	79.87	831.45	79.95	831.44
80.08	831.46	84.09	831.65	85.81	831.62	87.33	831.54	91.62	831.03
96.6	830.91	96.72	830.91	96.87	830.89	97.32	830.9	100.9	830.94
107.18	830.59	107.8	830.56	108.1	830.54	113.76	830.33	118.57	830.13
118.86	830.09	119.76	829.98	121.67	829.52	122.18	829.4	126.44	829.16
129.59	828.81	130.66	828.84	135.38	828.67	137.54	828.62	139.62	828.57
140.41	828.44	140.88	828.4	144.63	828.22	145.32	828.18	151.29	828.07
152.06	828.1	156.81	828.11	158.85	827.91	161.79	827.94	167.85	827.92
170.26	827.97	172.04	827.98	172.81	827.95	176.08	827.86	178.27	827.5
178.46	827.48	178.6	827.47	182.98	827.17	185.15	826.74	185.22	826.72
185.26	826.72	188.71	826.75	191.28	826.59	195.47	826.52	196.57	826.56
197.76	826.56	201.59	826.59	202.01	826.6	205.95	826.26	206.04	826.26
212.19	826.27	215.27	826.33	217.47	826.28	218.46	826.31	218.72	826.33
220.33	826.24	223.94	826.13	224.28	826.12	227.78	826.35	228.56	826.36
229.52	826.45	231.85	826.37	234.13	826.33	235.04	826.34	237.15	826.56
241.16	826.54	245.42	826.69	246.3	826.85	246.95	826.76	256.19	826.87
256.93	826.88	257.19	826.86	258.38	826.88	263.12	826.88	263.93	826.81
264.44	826.83	268.09	826.95	269.46	827.01	269.79	827.05	274.11	827.23
275.6	827.09	277.74	827.27	279.72	827.29	285.08	827.29	285.45	827.27
286.1	827.26	287.14	827.4	288.79	827.46	291.21	827.24	291.48	827.24
292.78	827.23	293.57	827.24	297.05	827.23	297.31	827.21	298.51	827.18
299.71	827.21	302.82	827.24	303.87	827.22	304.3	827.19	305.13	827.18
308.68	827.23	310.85	827.32	314.43	827.49	315.83	827.54	316.66	827.53
318.56	827.46	320.29	827.31	321.5	827.33	321.67	827.31	321.83	827.3
322.49	827.25	324.47	827.07	326.06	826.96	331.24	823.77	332.31	823.1
332.89	822.79	333.5	822.64	334.15	822.59	337.38	822.12	338.25	822
341.72	821.85	342.79	821.89	343.6	821.9	345.65	822.11	345.91	822.14
348.25	822.49	353.13	822.81	355.07	823.12	356.92	823.77	358.48	823.92
359.86	824.1	361.18	824.23	361.83	824.24	364.07	825.38	366.79	826.07
369.33	826.36	371.63	826.62	371.94	826.69	373.05	827.16	376.28	828.71
378.56	829.46	379.32	829.55	384.86	829.6	385.1	829.6	385.23	829.61
389.57	829.99	390.13	830.13	391.05	830.38	394.31	830.41	395.27	830.42
395.55	830.41	398.48	830.53	400.29	830.5	401.55	830.23	402.59	830.02
404.48	830	404.82	829.99	408	829.62	408.78	829.54	412.27	828.6
412.91	828.37	413.06	828.31	414.38	827.69	419.74	825.81	419.81	825.78
419.89	825.75	420.3	825.57	423.76	825.36	425.07	825.3	425.79	825.15
425.91	825.13	431.74	826.08	431.83	826.08	431.9	826.09	432	826.09
432.11	826.1	434.71	826.09	437.17	826.04	438.03	826.06	438.25	826.05
441.77	825.64	442.78	825.54	443.56	825.49	446.1	825.45	448.66	825.38
449.49	825.43	454.66	825.58	455.44	825.58	456.79	825.61	461.28	825.59
462.71	825.6	467.28	825.51	467.62	825.51	471.86	825.57	472.34	825.59
473.37	825.54	479.21	825.74	479.46	825.74	484.95	825.67	489.63	825.57
489.73	825.57	491.32	825.87	496	825.81	497.21	825.8	503.15	825.82
505.79	825.88	508.81	826	509.21	825.97	510.75	825.99	513.75	825.96
514.56	826.01	515.27	826.06	519.69	826.16	519.75	826.16	521.2	826.02
525.98	825.91	527.18	825.83	533.11	825.92	534.46	825.91	539.14	825.98
541.48	826.05	542.03	825.96	545	825.62	545.65	825.65	549.98	825.72
551.21	825.74	555.69	825.76	557.24	825.58	561.9	825.56	565.34	825.51
567.75	825.56	568.18	825.5	569.31	825.44	574.41	825.47	575.38	825.42
580.8	825.41	581.47	825.4	582.95	825.39	585.9	825.37	586.44	825.35
587.49	825.38	593.53	825.47	593.69	825.47	599.49	825.57	599.6	825.58
599.77	825.58	602.27	825.62	604.06	825.53	605.21	825.33	605.57	825.28
616.3	825.25	617.41	825.09	617.87	825.02	622.04	825.14	622.34	825.14
622.45	825.12	623.99	824.95	628.7	825.1	630.09	825.09	630.14	825.08
630.53	825.09	634.78	825.06	636.19	824.83	636.34	824.81	636.49	824.82
641.89	824.87	642.47	824.96	648.56	825.03	653.63	825.24	654.6	825.2
655.44	825.25	657.57	825.15	659.15	825.08	659.41	825.1	660.75	825.05
666.91	825.08	671.87	825.05	672.68	825.03	672.88	825.04	673.25	825.05
675.72	825.04	678.69	825.06	678.83	825.06	679.73	825.09	683.38	825.28
684.46	825.24	684.94	825.24	689.84	825.17	690.25	825.16	692.65	825.12
695.56	825.06	695.83	825.05	701.23	825.4	702.25	825.26	702.75	825.23
706.08	825.32	708.71	825.48	708.9	825.48	714.56	825.54	716.74	825.58
718.92	825.58	719.69	825.57	720.39	825.53	726.25	825.55	732.02	825.58
732.1	825.58	737.23	825.66	737.7	825.66	738.05	825.65	742.09	825.56
743.4	825.57	743.65	825.56	743.79	825.57	749.4	825.71	750.14	825.81
751.09	825.94	751.38	825.96	759.33	825.92	760.75	826.03	766.58	826.15
770.97	826.37	771.93	826.43	772.11	826.44	772.85	826.44	779.51	826.79
785.1	827.16	788.59	827.23	788.62	827.23	794.62	827.46	799.08	827.66
803.8	828.11	805.08	828.12	810.33	828.32	810.54	828.32	811.71	828.42
818.43	828.91	824.39	829.29	828.6	829.87	829.21	829.91	829.46	829.9
831.42	829.83	832	829.87	836.16	830.38	836.58	830.44	837.33	830.63
839.72	831.19	841.54	831.24	842.76	831.32	848.19	831.58	849.1	831.81

851.77	832.52	853.11	832.64	853.52	832.62	857.43	833.14	857.91	833.21
862.73	833.93	862.88	833.93	864.16	833.98	867.44	834.5	869.33	834.76
873.57	835.54	874.67	835.54	879.88	836.08	881.52	836.35	884.01	836.91
884.75	836.95	885.28	836.98	889.71	837.3	893.59	837.89	894.53	838.05
899.4	838.84	899.86	838.93	901.87	839.52	904.25	840.15	906.43	840.69
909.97	841.57	910.25	841.67	910.46	841.73	910.65	841.76	911.67	842.01
915.43	842.9	916.35	842.99	916.69	843.02	916.71	843.02	916.95	843.06
917.6	843.17	920.92	843.79	921.18	843.92	924.61	844.53	927.48	844.61
931.44	845.48	932.04	845.73	935.67	846.9	936.69	847.16	937.11	847.2
939.67	847.44	941.88	847.98	944.36	848.78	947.58	849.65	947.77	849.75
951.75	850.53	952.96	850.89	954.76	851.24	958.36	852.15	961.19	852.64
968.87	853.89	969	853.91	969.07	853.92	969.17	853.94	969.35	853.97
975.35	855.13	978.86	855.89	979.67	856.06	985.08	856.94	990.07	858.23
995.26	858.98	996.82	859.44	1000.27	860.49	1000.68	860.49	1005.76	861.32
1005.78	861.32	1006.35	861.36	1013.88	862.02	1014.64	862.11	1017.57	862.58
1019.04	862.8	1019.76	862.85	1026.25	862.9	1027.48	862.86	1028.17	862.89
1029.3	862.88	1033.6	862.3	1034.86	862.23	1035.15	862.24	1035.8	862.18
1037.25	862.11								

Manning's n Values num= 12

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.1	182.98	.03	302.82	.1	326.06	.07	333.5	.06
355.07	.07	373.05	.1	389.57	.013	400.29	.1	434.71	.035
879.88	.1	1037.25	.1						

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
326.06	373.05	0	0	0 .1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
400	840	830.53	F

CROSS SECTION OUTPUT Profile #100 yr

E.G. Elev (ft)	829.26	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.16	Wt. n-Val.	0.035	0.066
0.100				
W.S. Elev (ft)	829.10	Reach Len. (ft)		
Crit W.S. (ft)	827.67	Flow Area (sq ft)	376.83	249.73
3.99				
E.G. Slope (ft/ft)	0.002156	Area (sq ft)	376.83	249.73
1348.09				
Q Total (cfs)	2000.00	Flow (cfs)	1219.80	777.77
2.43				
Top Width (ft)	661.48	Top Width (ft)	199.08	46.99
415.41				
Vel Total (ft/s)	3.17	Avg. Vel. (ft/s)	3.24	3.11
0.61				
Max Chl Dpth (ft)	7.25	Hydr. Depth (ft)	1.89	5.31
0.90				
Conv. Total (cfs)	43077.8	Conv. (cfs)	26273.1	16752.4
52.3				
Length Wtd. (ft)		Wetted Per. (ft)	199.38	48.93
4.83				
Min Ch El (ft)	821.85	Shear (lb/sq ft)	0.25	0.69
0.11				
Alpha	1.01	Stream Power (lb/ft s)	0.82	2.14
0.07				
Frctn Loss (ft)		Cum Volume (acre-ft)		
C & E Loss (ft)		Cum SA (acres)		

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #5 yr

E.G. Elev (ft)	828.28	Element	Left OB	Channel
Right OB				
Vel Head (ft)	0.11	Wt. n-Val.	0.032	0.066
0.100				
W.S. Elev (ft)	828.17	Reach Len. (ft)		
Crit W.S. (ft)	826.11	Flow Area (sq ft)	199.37	205.86
1.06				
E.G. Slope (ft/ft)	0.002158	Area (sq ft)	199.37	205.86
969.35				
Q Total (cfs)	1070.00	Flow (cfs)	505.64	563.93
0.43				
Top Width (ft)	622.01	Top Width (ft)	179.99	46.99
395.03				
Vel Total (ft/s)	2.63	Avg. Vel. (ft/s)	2.54	2.74
0.41				
Max Chl Dpth (ft)	6.32	Hydr. Depth (ft)	1.11	4.38
0.50				
Conv. Total (cfs)	23035.1	Conv. (cfs)	10885.5	12140.3
9.3				
Length Wtd. (ft)		Wetted Per. (ft)	180.25	48.93
2.33				
Min Ch El (ft)	821.85	Shear (lb/sq ft)	0.15	0.57
0.06				
Alpha	1.01	Stream Power (lb/ft s)	0.38	1.55

0.02
Frctn Loss (ft) Cum Volume (acre-ft)

C & E Loss (ft) Cum SA (acres)

Warning: Divided flow computed for this cross-section.
Note: Manning's n values were composited to a single value in the main channel.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

SUMMARY OF MANNING'S N VALUES

River:Oldtown Creek

Reach	River Sta.	n1	n2	n3	n4	n5	n6	n7	n8	n9	n10	n11	n12	n13
Reach	1401.062	.035	.013	.07	.06	.07	.1	.035	.1	.013	.1	.1		
Reach	1109.832	.013	.03	.013	.1	.07	.06	.07	.1	.013	.1	.035	.1	.1
Reach	796.1590	.03	.1	.07	.06	.07	.1	.013	.1	.035	.1	.1		
Reach	703.7970	.013	.03	.1	.07	.06	.07	.1	.013	.1	.035	.1	.1	
Reach	651.5802	.013	.03	.1	.07	.06	.07	.1	.013	.1	.035	.1	.1	
Reach	545.1257	.03	.1	.07	.06	.07	.1	.013	.1	.035	.1	.013	.1	.1
Reach	492.3110	.03	.1	.07	.06	.07	.1	.013	.1	.035	.1	.013	.1	.1
Reach	431	Bridge												
Reach	394.7476	.03	.013	.03	.013	.07	.06	.07	.03	.013	.1	.035	.1	.1
Reach	242.2423	.1	.03	.1	.07	.06	.07	.1	.013	.1	.035	.1	.1	

SUMMARY OF REACH LENGTHS

River: Oldtown Creek

Reach	River Sta.	Left	Channel	Right
Reach	1401.062	293.81	291.23	319.49
Reach	1109.832	308.79	313.67	310.72
Reach	796.1590	96.02	92.36	85.26
Reach	703.7970	56.86	52.22	53.96
Reach	651.5802	111.44	106.45	103.86
Reach	545.1257	46.6	52.81	53.82
Reach	492.3110	95.23	97.56	102.88
Reach	431	Bridge		
Reach	394.7476	158.45	152.51	147.17
Reach	242.2423	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Oldtown Creek

Reach	River Sta.	Contr.	Expan.
Reach	1401.062	.1	.3
Reach	1109.832	.1	.3
Reach	796.1590	.1	.3
Reach	703.7970	.1	.3
Reach	651.5802	.1	.3
Reach	545.1257	.1	.3
Reach	492.3110	.1	.3
Reach	431	Bridge	
Reach	394.7476	.1	.3
Reach	242.2423	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		
Reach	1401.062	100 yr	2000.00	826.35	833.28	831.44	833.35	0.001731	1.99	977.71	487.82	0.19	
Reach	1401.062	5 yr	1070.00	826.35	832.20	831.09	832.25	0.002150	1.95	607.09	464.71	0.21	

Reach	1109.832	100 yr	2000.00	824.36	832.08	830.75
832.40	0.006363	5.39	581.97	579.14	0.40	
Reach	1109.832	5 yr	1070.00	824.36	831.00	828.60
831.25	0.005334	4.35	362.35	414.86	0.36	
Reach	796.1590	100 yr	2000.00	824.79	831.69	829.55
831.77	0.000839	2.01	1025.91	642.96	0.15	
Reach	796.1590	5 yr	1070.00	824.79	830.58	828.91
830.63	0.000904	1.80	675.28	601.85	0.15	
Reach	703.7970	100 yr	2000.00	827.00	831.58	829.50
831.69	0.000797	1.63	905.58	658.59	0.14	
Reach	703.7970	5 yr	1070.00	827.00	830.48	828.95
830.54	0.000795	1.31	601.10	623.18	0.14	
Reach	651.5802	100 yr	2000.00	824.42	831.56	829.31
831.63	0.000772	2.05	1015.03	651.78	0.15	
Reach	651.5802	5 yr	1070.00	824.42	830.45	828.77
830.49	0.000755	1.77	685.56	624.00	0.14	
Reach	545.1257	100 yr	2000.00	823.31	831.34	829.14
831.49	0.002493	3.93	875.67	590.63	0.27	
Reach	545.1257	5 yr	1070.00	823.31	830.28	827.56
830.37	0.001739	2.92	622.08	540.64	0.22	
Reach	492.3110	100 yr	2000.00	824.46	831.36	828.71
831.41	0.000457	1.59	1146.96	642.63	0.12	
Reach	492.3110	5 yr	1070.00	824.46	830.29	828.32
830.32	0.000383	1.27	816.30	550.52	0.10	
Reach	431		Bridge			
Reach	394.7476	100 yr	2000.00	822.24	829.23	827.95
830.25	0.017572	8.11	248.18	490.05	0.67	
Reach	394.7476	5 yr	1070.00	822.24	828.53	826.43
828.94	0.007984	5.11	209.19	459.84	0.44	
Reach	242.2423	100 yr	2000.00	821.85	829.10	827.67
829.26	0.002156	3.11	630.56	661.48	0.24	
Reach	242.2423	5 yr	1070.00	821.85	828.17	826.11
828.28	0.002158	2.74	406.28	622.01	0.23	

Profile Output Table - Bridge Only

Reach	River Sta	Profile	E.G. US.	Min El Prs	BR Open Area	Prs O
WS	Q Total	Min El Weir Flow	Q Weir	Delta EG	BR Sluice Coef	
				(ft)	(sq ft)	
(ft)	(cfs)	(ft)	(cfs)	(ft)		
Reach	431	100 yr	831.41	828.20	105.33	
2000.00		829.01	999.58	1.17		
Reach	431	5 yr	830.32	828.20	105.33	
1070.00		829.01	167.02	1.38		

APPENDIX 5: HEC-RAS OUTPUT – PROPOSED CONDITIONS

WOOLPERT
ARCHITECTURE | ENGINEERING | GEOSPATIAL

GRE-68-12-Prop.rep

HEC-RAS HEC-RAS 6.4.1 June 2023
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: GRE-68-12.65
Project File : GRE-68-12.prj
Run Date and Time: 12/27/2023 9:31:02 AM

Project in English units

PLAN DATA

Plan Title: OldtownCreekProp
Plan File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hydraulics\HEC-RAS\GRE-68-12.p02

Geometry Title: OldtownCreekProposed
Geometry File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hydraulics\HEC-RAS\GRE-68-12.g02

Flow Title : OldtownCreekFIS
Flow File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hydraulics\HEC-RAS\GRE-68-12.f01

Plan Summary Information:

```
Number of:  Cross Sections =    9    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    2    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow



FLOW DATA

Flow Title: OldtownCreekFIS
Flow File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hyd
raulics\HEC-RAS\GRE-68-12.f01

Flow Data (cfs)


  River           Reach           RS                100 yr            5 yr
        2 yr2xMonthlyMeanMax
  Oldtown Creek   Reach           1401.062            2000            1070
         620            38.6



Boundary Conditions


  River           Reach           Profile                     Upstream
          Downstream


  Oldtown Creek   Reach           100 yr
       Known WS = 829.1
  Oldtown Creek   Reach           5 yr
```



```
    Normal S = 0.002156



GEOMETRY DATA

Geometry Title: OldtownCreekProposed
Geometry File :
g:\DE\Clients\ODOT\10017182_GRE-68-12.65\115388\400-Engineering\Structures\Hyd
raulics\HEC-RAS\GRE-68-12.g02

CROSS SECTION


RIVER: Oldtown Creek
REACH: Reach             RS: 1401.062

INPUT
Description: FIS E-E
Station Elevation Data    num=     426
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  830.99     .07  830.99     .54     831    2.19  830.98    4.69
830.94
    5.59  830.97    6.19  830.93    7.92  830.89   11.29  830.89   12.14
830.93
   13.58  830.94    16.1  830.89   18.28  830.83   19.25  830.86   21.48
830.82
   22.71  830.86   23.26  830.85   24.86  830.87   28.06  830.75   28.43
830.75
   30.07  830.72   30.58  830.71   33.66  830.86   33.99  830.84   34.54
830.81
   36.15  830.73   39.51  830.49   39.53  830.49   41.95  830.68   44.12
830.82
   45.19  830.87   46.28   830.9   47.62  830.89    48.1   830.9   50.94
830.9
   52.09  830.93   53.37  830.92    56.6  830.85   56.77  830.85   58.94
830.76
   59.63  830.79   62.48  830.91   64.58  830.93   64.61  830.93   68.09
830.74
   69.73   830.6   70.17   830.6   71.82  830.72   73.72  830.83   75.13
830.78
   75.95  830.73   76.51  830.76   79.36  830.96   80.48  830.91   81.65
830.86
   85.14  830.93    85.2  830.93   87.34  830.91   88.11  830.93    90.7
```

831.06								
91.54	831.04	92.97	831.03	95.51	831.05	96.32	831.06	98.48
831.15								
98.55	831.15	101.93	831.07	102.93	831.04	104.29	831	104.8
830.98								
109.77	830.77	109.98	830.79	110.53	830.83	113.25	831.19	115.57
831.19								
116.75	831.25	118.89	831.26	120.68	831.45	121.14	831.47	122.5
831.56								
124.6	831.66	125.36	831.65	126.7	831.64	129.24	831.82	130.24
831.86								
130.8	831.88	132.49	831.95	135.42	832.63	135.92	832.74	136.08
832.77								
138.16	833.09	140.68	833.49	141.55	833.59	143.76	833.7	143.85
833.71								
144.63	833.75	149.06	833.99	149.49	834.03	150.13	834.05	152.88
834.24								
153.46	834.28	155.29	834.3	158.56	834.21	164.39	834.25	164.6
834.26								
166.75	834.3	167.06	834.29	169.59	834.19	170.09	834.17	170.63
834.16								
172.49	834.16	174.07	834.11	175.95	834.05	177.45	834	180.35
833.95								
181.63	833.92	183.03	833.86	184.03	833.82	184.92	833.78	187.46
833.65								
194.72	830.85	198.71	829.13	199.73	828.46	201.04	827.66	203.13
826.65								
203.93	826.35	208.58	827.26	228.96	831.83	230.13	832.09	230.32
832.13								
230.37	832.13	233.69	832.27	234.75	832.3	236.42	832.5	241.26
832.54								
243.15	832.3	247.69	831.7	250.42	831.49	251.02	831.45	251.44
831.38								
253.44	831.17	254.56	831.12	256.26	830.95	259.17	830.84	261.73
830.85								
262.73	830.8	264.23	830.66	264.82	830.63	266.06	830.64	269.59
830.6								
270.69	830.57	273.06	830.44	274.14	830.4	274.79	830.37	276.51
830.31								
278.86	830.32	279.59	830.33	279.88	830.31	280.88	830.24	282.28
830.13								
285.57	830.13	287.22	829.87	287.87	829.8	289.27	829.83	291.37
829.89								
292.11	829.79	293.5	829.66	296.43	829.85	297.54	829.83	299.28
829.61								
302.67	829.62	302.7	829.62	305.08	829.8	306.61	829.87	307.99
829.91								
308.67	829.93	310.1	829.93	310.85	829.93	311	829.94	314.13

829.96								
315.43	829.92	316.47	829.84	317.91	829.94	319.92	830.1	321.49
830.14								
322.07	830.16	322.83	830.19	325.64	830.24	327.65	830.12	327.82
830.11								
328.34	830.12	331.38	830.29	333.55	830.49	333.66	830.5	336.9
830.72								
338.06	830.77	338.15	830.77	339.18	830.81	339.9	830.85	340.98
830.84								
348.57	831	351.54	830.93	355.56	830.43	356.52	830.42	358.85
830.45								
363.98	831.02	366.26	830.68	367.94	830.63	371.36	830.58	371.44
830.58								
375.09	830.49	379.93	830.41	387.06	830.28	390.01	830.27	390.84
830.22								
393.3	830.66	394.38	830.74	404.71	830.51	405.27	830.53	406.16
830.53								
408.35	830.44	410.09	830.49	411.74	830.52	413.94	830.48	418.68
830.55								
419.52	830.44	420.93	830.55	423.68	830.77	425.4	830.53	429.2
830.52								
434.76	830.45	438.39	830.45	440.65	830.39	441.47	830.44	444.21
830.42								
449.58	830.39	455.37	830.54	456.27	830.48	460.61	830.49	463.34
830.61								
463.97	830.66	464.59	830.65	468.04	830.41	470.15	830.36	483.48
830.59								
484.12	830.61	484.74	830.61	488.54	830.55	491.11	830.76	493.56
830.99								
498.29	830.58	499.45	830.52	500.73	830.52	501.55	830.54	502.38
830.52								
507.68	830.29	508.55	830.27	511.29	830.18	513.16	830.2	513.59
830.22								
514.35	830.23	517.06	830.3	517.98	830.32	519.2	830.34	520.44
830.57								
524.62	830.86	525.14	830.82	528.32	831.17	528.74	831.18	528.96
831.22								
531.11	831.31	531.24	831.36	534.68	832.39	538.02	833.76	539.24
834.31								
540.99	834.97	541.26	835	541.99	835.04	547.98	835.69	548.45
835.7								
550.28	835.78	551.2	835.92	553.26	836.07	554.16	836.13	555.02
836.19								
557.28	836.28	560.65	836.42	561.28	836.42	562.13	836.45	564.11
836.44								
565.04	836.42	568.21	836.41	568.3	836.42	568.7	836.41	570.48
836.32								
570.89	836.33	574.63	836.43	575.53	836.42	577.68	836.39	578.92

```
836.35
  584.45   836.5  585.46   836.5  587.92  836.54  588.61  836.56   591.4
836.94
  595.58  836.93  597.58  836.91  599.91  836.79  600.52  836.81  612.15
836.62
   614.8  836.51  618.86  836.97  622.11   837.1  623.58  837.61  624.74
837.62
  628.68  837.33  635.46  836.82  635.77  836.86  636.91  836.76  637.95
836.75
  641.26  836.64  642.82  836.87  644.67  837.06  646.45  836.87  649.11
836.41
  650.67  836.27  654.46  836.02  657.58  835.74  657.85  835.71  658.45
835.71
  664.56  835.54   666.3   835.5  667.21  835.49  670.81  835.44  671.41
835.45
  672.47  835.44  674.27   835.4  675.09  835.41  678.38  835.55  678.78
835.54
  681.25  835.17  682.48  835.11  685.38   835.3  685.77  835.24  687.96
835.14
  688.54  835.17  689.98  835.15  691.64  835.08  692.31  835.09  694.18
834.83
  695.08  834.75  697.99  834.92  699.27  834.94  701.81  834.96  702.23
834.94
  707.24   834.9  708.51  834.92  709.18  834.89  711.44  834.86   713.4
834.85
  715.24  834.66  716.01  834.68  720.13  835.02  720.41  835.02  720.65
835
  722.96  834.81   724.7  834.95  727.29  835.35  728.66  835.37  730.14
835.33
  732.42  835.37  734.32  835.54  736.23  835.66  737.09  835.63  739.44
835.67
  741.16  835.84   743.4  835.76  744.12  835.74  748.47  835.88  750.99
836
  751.38  835.99  752.51  836.11  756.76   836.6  757.97  836.58  763.66
836.72
  764.58  836.82  765.15  836.87  768.35  837.35  769.23   837.4  771.29
837.42
   772.2   837.5  774.34  837.86   776.3  838.18  778.91  838.86  779.57
838.96
  783.37  839.32  785.21  839.63  786.26  839.75     787  839.86  793.02
840.63
  793.64  840.72  797.45  841.13  798.29  841.31  800.38  841.79  802.41
842.1
  811.06  843.51  811.42  843.57  811.55  843.59  811.61  843.61  814.56
844.22
   816.5  844.69  818.57  844.95  821.62  845.38  824.07  845.72   828.4
847.03
  828.59  847.08  828.84  847.14  834.53  848.34  835.69  848.62   837.1
```



```
848.97
  840.05  850.07  841.43  850.26  846.98  851.19  847.17  851.24  847.64
851.4
  850.27  852.05

Manning's n Values        num=      11
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0    .035  150.13    .013  187.46     .07  201.04     .06  208.58
.07
  236.42      .1  250.42    .035  348.57      .1  554.16    .013  565.04
.1
  850.27      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
       187.46  236.42           293.81  291.23  319.49             .1
.3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0     138     835       F

CROSS SECTION

RIVER: Oldtown Creek
REACH: Reach              RS: 1109.832

INPUT
Description: 11+10
Station Elevation Data    num=     477
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  835.57    1.08  835.55    7.37  835.49   10.99  835.52      13
835.39
   13.72  835.39   17.34  835.35   18.52  835.36   23.26  835.26   24.29
835.25
   29.91  835.16   31.86   835.2   33.41  835.21   35.16  835.22   36.44
835.22
   39.12   835.2    41.1   835.2    41.7  835.22   44.85  835.18   45.13
835.18
   46.68  835.07   47.84  835.09   50.42  835.15   51.52  835.16   52.28
835.09
   54.55  835.12   55.98  835.08      57  835.05   57.98  835.03   58.87
835.01
   61.54  834.88   62.64  834.85   66.99  834.87   67.31  834.88   67.39
834.89
   69.23  835.04   71.12  835.06   72.79  835.06   74.66     835    74.8
```

```
835
   75.13  834.99   78.35   834.9   79.49  834.88    80.3  834.83   82.73
834.73
   84.54  834.73   86.01  834.65    89.5  834.81   91.65  834.75   93.73
834.71
   95.11  834.74   97.17  834.78   97.72  834.76  100.71   834.7  102.66
834.6
  103.05  834.61  106.33  834.65  107.38  834.57  108.21   834.5  111.89
834.37
  112.87  834.37   113.9  834.36  116.14  834.25  117.48  834.18  117.74
834.17
  119.47  834.08  121.76  833.95  123.05  833.91  125.85  834.19  129.31
834.48
  130.66   834.3  131.33  834.19  134.25   833.9  134.89  833.87  136.39
833.54
  137.47  833.35  139.83  833.17  142.03  833.12  142.14  833.11  145.56
832.62
  147.13  832.55  147.69   832.5  148.17  832.48  151.24  832.26  152.38
832.24
  153.35  832.22  156.65  832.18  157.04  832.19  157.29  832.15  159.12
832.07
  162.49  832.21  162.76  832.22  164.82  832.09  166.34  832.19  167.23
832.24
  173.58  832.04  181.58  831.88  184.84  831.88  186.31  831.81  190.73
831.81
  196.07   831.8  199.28  831.85  201.61  831.71  202.72  831.75  204.43
831.91
  207.16  831.98   209.5  832.08  210.67  832.04  213.62  831.85  214.52
831.88
  216.01  831.89  216.34   831.9  216.49  831.89  216.62  831.89   222.1
832.03
   223.3  832.11  225.76  832.27   227.6  832.21  227.96  832.18  228.36
832.17
  233.31  832.39  233.65  832.42  236.06  832.51  237.34  832.54  237.52
832.54
  239.34  832.43  240.24  832.43  244.86  832.33  244.96  832.32  247.68
832.33
   248.7  832.32  250.78  832.32  251.17  832.31  254.41   832.2  256.14
832.17
  256.56  832.16  258.25   832.1  260.09  832.05  261.96  832.16  262.27
832.16
   263.1  832.14  265.76  832.02  266.81  831.97  267.78  831.93  269.81
831.93
   271.5  831.95  272.95  831.88  273.39  831.86  274.01  831.83  277.06
831.9
  277.37  831.92  279.11  831.86  281.55  831.75   281.7  831.74  282.78
831.74
  284.17  831.81  285.08  831.78  286.78   831.8  288.79   831.8  289.45
```



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831.78
   291.2  831.71  294.39   831.8  294.88  831.82  294.97  831.82  295.06
831.81
  297.87  831.78  299.23  831.76  301.13  831.77     303  831.64  304.84
831.7
  308.92  831.85  309.65  831.88  310.45   831.9  314.14  831.84  315.54
831.8
  319.29  831.21  319.46  831.21  319.67  831.17  321.57  830.76  321.75
830.67
  325.11  829.02  325.46  828.86  325.58  828.78   328.1  827.82  331.35
826.75
  331.46  826.71  331.48   826.7   331.5   826.7   333.7  825.98     335
825.64
  337.42  824.72   338.3  824.61   339.7  824.62  341.63  824.44  343.46
824.36
  345.51  824.46  346.29  824.46  349.64  824.38  349.65  824.38  353.51
824.51
  355.45  824.63  358.65  826.57   360.3  827.51  365.41  830.55   367.8
830.73
  368.86   830.8  369.83  830.73  374.77  830.66  379.37  830.85  384.29
830.86
  385.66   830.7  387.44  830.85  392.88   830.4  393.58  830.34  395.64
830.32
  397.06  830.62  398.32  830.75  401.38  830.43  403.14  830.26  403.83
830.19
  408.06  830.15  410.35  830.15  412.91  830.36  414.08   830.3  416.39
830.29
  420.92  830.62  421.81  830.62  430.25  830.49  430.49   830.5  430.71
830.5
  432.31  830.47  442.16  830.24  446.47  830.07  450.55  829.87  453.84
830.01
  455.75  829.94  458.09  829.78  462.19   829.5  467.47  829.82  467.84
829.71
  470.14   829.9  471.19  829.94  473.42  829.97  473.63  829.95     474
829.94
  476.91  829.62  479.25  829.35  479.81  829.33  485.47   829.5  490.31
829.61
  491.41  829.51  494.49  829.07  497.13  828.81  497.33  828.78  497.57
828.77
  500.97  828.59  501.48  828.57  502.88  828.51  505.63  828.49  507.23
828.5
  508.82   828.7   509.6   828.8  512.61  829.08  514.21  829.08  514.79
829.1
  520.02  830.97  520.62  831.16  520.72  831.22  524.38  832.79  524.63
832.9
  525.15  833.02  530.67  834.27     532   834.4  532.45  834.46  532.84
834.45
  536.33  834.67  537.01  834.74   538.5  834.81  540.18  834.85  542.12
```

```
834.89
  542.76  834.88  544.35  834.85  545.47  834.78  548.07  834.66  549.99
834.32
  550.17  834.29  550.33  834.28  554.01  834.15  555.14  833.92  558.02
833.96
  559.83  834.07  561.98  833.91  564.64  833.98  566.61  833.95  570.35
833.58
  572.05  833.42  573.75   833.6  574.28  833.54   578.9  833.29  580.85
833.08
  581.56  833.09  585.28  832.92  591.48  832.23  594.34   832.1  595.31
831.98
  597.25  831.89  597.37   831.9  598.15  831.86  600.95  831.78  601.22
831.8
  602.53  831.76  603.33  831.76   603.7  831.75  610.15  831.69  614.31
831.56
  615.91  831.46  619.16   831.4  619.54   831.4  621.17  831.17  622.31
831.06
  625.11  830.81  626.03  830.82  627.21  830.77  630.01  831.05  631.14
831.14
  631.53  831.13  633.18  831.02  635.17     831  637.09     831   637.7
830.93
  639.26  830.76   641.4  830.77  645.29  830.61  647.39  830.72  654.75
830.71
  655.17  830.69  655.57  830.65   657.3   830.4   660.1  830.56  661.17
830.62
  661.63  830.65  667.53  830.63  669.43  830.58  672.94  830.65  675.33
830.59
  677.72  830.69  679.46  830.75  680.73  830.67  681.41  830.64  687.43
830.51
  687.65  830.51  692.98  830.57  693.57  830.53  696.61  830.51   697.4
830.46
  697.83  830.52  699.62  830.54   703.4  830.82  703.51  830.83  703.54
830.83
  705.54  830.81  707.86  830.72  709.46  830.76  711.62  830.59  715.52
830.76
  717.63  830.84  717.81  830.84  718.08  830.83   719.4  830.74  723.86
830.46
  725.06  830.42  727.76  830.39  729.35  830.35  730.74  830.35  733.12
830.32
  736.54  830.31  741.75  830.33  742.04  830.33  742.89  830.38  745.99
830.6
  747.58   830.4  748.17  830.37  752.67  830.25  754.31  830.09   756.8
830.23
  758.17  830.26  758.63  830.27  760.36  830.18  763.11   830.4  764.23
830.47
  766.01  830.33  766.44   830.3  767.39   830.3  770.28  830.27   771.7
830.05
  772.51  830.02  775.69  830.16  778.58  830.37  780.32  830.37  783.53
```



```
830.31
  784.78  830.18  788.44   830.2  788.81   830.2  794.47   829.9  797.03
829.87
  798.13   829.9   803.2  829.92  805.65  829.98  807.25  829.99  813.48
830.01
  815.64  829.95  817.82  830.03  821.77  830.13  824.99  830.33  826.18
830.36
  827.77  830.24   833.4  830.33  834.01  830.36  834.43  830.39  839.14
830.76
  840.25  830.69  843.97  831.05   860.6  831.87  863.22  832.28  866.18
832.44
  869.91  832.03  870.35  832.02  873.91  832.25  874.18  832.28  875.28
832.47
  879.07  833.26  882.12  833.95  882.28     834  882.79  834.16  885.56
835.11
   886.3   835.2  892.01   835.9  895.69  836.58  898.62   836.9  901.65
837.27
  909.58  838.76  914.09   839.6  916.85  840.69   917.1  840.76  919.27
841.2
  922.77  841.74  926.65  842.08   930.3  842.74  939.06  843.76  940.08
843.89
  940.54  844.04  943.09  844.38  948.65  845.31  950.81  845.65  953.13
846.16
  956.61  846.87  960.99  847.28  962.36  847.49  970.89  848.63  972.78
849.06
  974.09  849.19  976.29  849.96  979.34  850.89  983.16  851.72  984.46
851.93
  985.48  852.26  989.77  853.55  991.28  853.93  998.96  854.95  999.23
854.97
  999.49  854.98  1001.3  854.93 1004.05  855.28 1004.69  855.34 1004.84
855.36
 1008.28  856.02 1008.38  856.04

Manning's n Values        num=      13
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0    .013  121.76     .03  216.01    .013  315.54      .1  319.29
.07
  337.42     .06  355.45     .07  365.41      .1   538.5    .013  548.07
.1
   603.7    .035  827.77      .1 1008.38      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        319.29  365.41           308.79  313.67  310.72             .1
.3
Ineffective Flow     num=       3
   Sta L   Sta R    Elev  Permanent
```

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     160     216     855       T
     261     316     855       T
     540     900     835       F

CROSS SECTION


RIVER: Oldtown Creek
REACH: Reach              RS: 796.1590

INPUT
Description: 7+96
Station Elevation Data    num=     421
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  836.01    1.45  836.07    2.69     836     3.2  835.99    6.46
836.1
     7.7  836.01    8.73  835.91   10.73  836.09   12.12  836.25   12.72
836.27
   14.25  836.26   15.61  836.29    18.8  836.08   20.26  836.05   24.07
836.11
   27.45  836.21   36.65  836.08   38.65  836.12   43.25  835.87   47.57
836.07
   50.18  836.08    62.2  835.63   63.21   835.5   66.04  835.32   67.52
835.15
   72.05   834.6   73.39  834.48   74.27  834.32   74.99  834.29   76.28
834.22
    79.4  833.75   79.91  833.69   80.29  833.54   81.87  833.07   85.04
831.89
   85.44  831.76    85.6  831.72   87.41  831.45   90.35   831.1   91.17
831.01
   91.51  830.99      93  830.86   95.35  830.53   98.65  830.04  101.16
829.86
  102.53  829.86  103.13  829.76  104.27  829.69  107.27  829.69  108.09
829.65
  108.53  829.61  110.04  829.36  112.22  829.42  114.32   829.3  115.62
829.21
  117.99  829.15  119.49  829.05  120.88  829.09   121.2  829.11  121.97
829.1
   125.2  829.04  126.64  828.97   130.7  829.02  132.48  829.04  132.69
829.04
  138.23  829.01  139.81  828.98  141.93  828.94  142.96  828.94  143.86
828.93
  146.49  828.94  147.55  828.93  148.97  828.95  149.27  828.95  150.04
828.93
  153.19  828.93  154.68  829.14  154.86  829.15  157.28  829.12  158.66
829.1
  158.73  829.09  160.48  828.77  161.95  828.86  164.21  828.93  165.63
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828.94
  166.11   828.9  166.81  828.93  169.73   829.1  171.68  829.14  171.72
829.15
  171.81  829.14   177.2  828.42  177.77  828.43  181.06  828.58   181.4
828.58
  182.74  828.51  184.17  828.51  186.63  828.52  187.65  828.42  190.82
828.41
  192.23  828.38  192.53  828.35  194.04  828.27  197.24  828.37  197.86
828.34
  199.42  828.12  199.57  828.12  200.11  828.14  203.47  828.19  204.95
828.04
   205.1  828.03  205.31  828.03  207.07  828.06   210.7  828.16  210.87
828.15
  211.29  828.15  214.54  828.18  215.31  828.17  216.42  828.23  217.69
828.14
   220.1  828.15  221.35  828.01     222  828.02  225.45   827.9  226.18
827.9
  227.54  827.97  228.37  828.02  231.44   828.2  231.49   828.2  232.68
828.24
  233.03  828.22  234.79  828.13  237.74  828.09  238.94  828.12  241.14
827.9
  242.45  827.87  243.93  827.87  244.44  827.85  247.35  827.82  248.08
827.84
  249.75  827.92  249.98  827.94  251.03  827.97  253.85  828.07  254.46
828.1
  255.56  828.03  260.86  828.29  261.34   828.3  262.29  828.32  264.03
828.36
  269.19   828.5  270.84  828.64  272.62  828.79  272.63  828.79  276.57
829.85
  277.23  829.88  278.33     830  280.67  829.59  282.37  829.49  284.05
828.92
  284.11   828.9  284.25  828.82  287.22  826.93  290.56  825.43  291.12
825.18
  309.41  824.86  311.22  824.79  311.34   824.8  311.59  824.98  311.82
825.04
  312.07  825.11  326.57  829.05  327.07  829.19  328.71  829.18  330.77
829.09
  338.31  829.33  341.05  829.38  342.33  829.19  345.83  828.86  351.07
828.5
  351.16  828.49  352.09  828.44  353.87  828.42   357.9  828.31  358.86
828.22
  359.77  828.16  362.84  828.22  365.64  828.27  370.99  828.96  371.65
829.01
  371.79  829.01  377.07  828.82  377.48  828.84  381.11  829.14  381.65
829.12
     384  829.15  393.33  828.95   397.1  829.11  398.65  829.25  399.44
829.47
  400.22  829.58  402.19  830.19  404.65  830.84  406.18  831.49  406.23
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831.52
   406.7  831.62  409.71   832.3  411.42  832.54  412.23   832.6  412.78
832.62
  417.56  832.65     418  832.69  420.47  833.11  421.91  833.34  422.64
833.35
  423.82  833.29  427.54  833.42  427.79  833.43  427.95  833.42  429.57
833.28
  433.37  832.75  433.59  832.71  433.88  832.64  435.51  832.23  436.59
832.03
  439.31   831.4  440.83  830.96  441.32  830.83  444.18  830.59  444.97
830.53
  445.19  830.51  445.83  830.52  447.82  830.52  456.36  830.61  457.07
830.51
  458.72  830.45  458.95  830.44  462.01  830.61  468.44  830.47   468.8
830.48
  470.64  830.67   472.4  830.53  475.19  830.37  479.22  830.47  487.09
830.65
  488.27  830.57  491.08  830.47  492.79  830.45  494.23  830.35  495.46
830.21
  498.31  830.01  499.03  829.94   500.2  829.96  502.52  829.92  505.08
829.8
   506.1   829.7  508.44  829.79  510.16  829.85  511.83  829.84  512.13
829.85
  512.83  829.83  516.21  829.73  517.08  829.68  518.13  829.67  520.59
829.6
   522.2  829.54  523.11  829.58  523.97  829.61  525.22  829.59  529.74
829.35
  530.05  829.34  530.12  829.34  531.02  829.33  535.96   829.3  536.14
829.29
  539.57   829.5  540.12   829.5  541.15  829.35  542.06  829.22  544.88
829.19
  547.62  829.18  547.92  829.16   548.6  829.18  549.33   829.2     554
829.42
  557.62  829.33  560.09  829.29  561.54   829.4  564.12  829.51  565.65
829.63
  566.04  829.58  566.97  829.59  570.01  829.52  571.01  829.54  572.05
829.54
  575.19  829.49  576.08  829.52  576.62   829.5  577.92  829.44  581.55
829.47
  581.98   829.5  582.17  829.49  583.97  829.55  585.16  829.52     588
829.61
  589.43  829.58  590.09  829.56  593.62  829.57  594.14  829.56   596.1
829.7
  599.55   829.6  600.13   829.6  600.67  829.54  602.12  829.31  604.34
829.35
   606.2  829.36  607.23  829.26  608.12  829.17     612  829.37  612.12
829.38
  612.17  829.38  614.16  829.46  614.62  829.43  618.23  829.38  619.34
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829.3
  620.23  829.18  620.99  829.15  621.79  829.18  626.34  829.21  630.03
829.04
  632.32  828.96  636.34  828.94  638.39  828.94  641.03  829.17  643.22
829.13
  644.41  829.07  648.19  829.02  650.41  829.06   654.3  828.98  656.57
828.92
   657.3  828.95  660.64  829.07  662.31  829.03  662.67  829.03  663.36
829
  666.64  828.98  667.26  828.91  668.76  828.91  670.39   828.9  674.89
828.85
  676.79   828.9  680.05  828.84  681.09  828.77  685.03  829.08   685.1
829.08
  685.16  829.07  687.22  828.88  690.44  828.93  691.22  828.95  692.29
828.9
  693.28  828.88  693.94  828.91   695.9  828.89  699.27  828.91  703.92
828.9
  705.45  828.91  705.82   828.9  711.63   829.1  712.01  829.12  716.65
829.18
  717.59  829.21  721.68  829.24  723.48  829.31  727.29  829.29  727.54
829.3
  727.68  829.29  729.55  829.34  733.42  829.42  733.62  829.42  735.58
829.58
  738.61  829.66  739.51  829.69  741.12  829.82   741.5  829.88  742.41
829.9
  745.42  830.07  747.72  830.44  752.27  831.04  755.93   831.3  758.41
831.59
  764.71  832.06  768.01  832.68  770.53  833.31  773.95  833.75  780.53
834.76
  784.11  835.13  785.35  835.34  786.34  835.58  787.38  835.73  789.58
836.24
  796.26  837.31  799.36  838.14  800.54  838.34  811.87  839.81  814.27
840.22
  814.97  840.22   816.1  840.37  820.41  840.88  821.37  840.84   822.2
840.83
  823.27  841.04  825.87  841.62  827.33  841.74  827.68   841.8  829.27
842.1
  832.13  842.53  833.19   842.6  836.52  843.34  837.05  843.43  837.44
843.4
  837.81  843.38

Manning's n Values        num=      11
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0     .03  237.74      .1  282.37     .07  290.56     .06  311.59
.07
  326.57      .1     418    .013  427.95      .1  492.79    .035  727.29
.1
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  837.81      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        282.37  326.57            96.02   92.36   85.26             .1
.3
Ineffective Flow     num=       3
   Sta L   Sta R    Elev  Permanent
      20      73     855       T
  418.43  428.45   833.1       T
  428.45     775   833.5       F

CROSS SECTION


RIVER: Oldtown Creek
REACH: Reach              RS: 703.7970

INPUT
Description: 7+04
Station Elevation Data    num=     492
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  838.34     .56  838.32    1.61  838.29    3.85  838.22    5.42
838.18
    6.94  838.11    7.12  838.09    7.53  838.09   10.43  837.83    12.4
837.66
   12.57  837.65   12.87  837.64    17.5  837.49   18.31  837.46      20
837.28
   22.81  837.12   23.84  837.06    25.9  836.94   27.55  836.96   28.94
836.84
   29.41  836.78   32.45  836.62   33.15   836.6   33.74  836.59   34.82
836.6
   36.58  836.57   40.35  836.52   44.28  836.21   44.34  836.21   45.01
836.08
   45.87  835.91   45.89  835.91   46.56  835.86   49.79  835.63   49.97
835.61
   51.49   835.5   54.24  835.52   55.27  835.53   56.32  835.51   57.02
835.51
   59.42  835.63   60.94  835.72   61.67  835.73   62.56  835.75   65.19
835.78
   66.38  835.79   66.48   835.8   68.07  835.89   70.38  835.83   72.25
835.81
   75.47   835.8   77.58   835.7   79.76  835.64   80.95  835.58   84.67
835.38
   86.58  835.38   88.36  835.44   89.68  835.62   90.13  835.63    91.3
835.66
   93.94   835.6   95.02  835.74    95.6  835.77   97.94  836.03  100.37
```



```
836.37
  104.95  836.22  104.99  836.22  106.69  836.05  107.62  835.98  110.47
835.82
  112.24  835.82  115.97  835.66  116.63  835.68   117.7  835.75  119.68
835.76
  121.62  835.77  122.96  835.72  123.23   835.7  126.62  835.69  127.06
835.69
  127.29  835.68  128.91  835.65  130.29  835.61  132.57  835.57  133.68
835.56
   134.5  835.53  135.65  835.48  138.23  835.53  139.07  835.35  140.64
835.37
  141.85  835.29  145.01  835.28  148.71  835.19  150.65  835.25  153.99
835.12
  156.97  835.11   159.9  834.96  166.36  834.71  167.19  834.68  170.48
834.57
  171.99  834.48  174.87  834.37  177.71   834.2  179.18  834.04  179.52
833.97
  181.06  833.85  183.34  833.63  184.36   833.4  185.28  833.15  186.31
833.05
  188.97  832.74  190.81  832.42  190.88  832.41  191.14  832.35  194.87
831.62
  196.38  831.29  196.43  831.28  201.92  830.87  202.02  830.86  202.11
830.86
  205.91   830.7  206.08  830.68  207.71  830.45  211.25  830.17  211.63
830.15
  211.78  830.13  213.33   829.9  215.57  829.75   217.2   829.6  217.82
829.58
  219.08  829.41  222.98  829.03  224.19  828.96  227.64  828.83  230.24
828.69
   231.2  828.68   234.3  828.51  235.03  828.44  235.86  828.38  238.38
828.45
   239.8  828.42  240.87  828.42  241.58  828.39  245.15  828.37  245.42
828.39
  245.81  828.36  247.27  828.33  248.28  828.34  252.34  828.27   252.9
828.24
  257.72  828.31  258.31  828.33  259.41  828.38  262.31  828.55  262.65
828.53
  263.91  828.52  266.59  828.54  267.78  828.57  269.25   828.6  269.55
828.62
  269.79  828.63  273.34  828.71  273.99  828.73  275.17  828.72  278.21
828.44
  278.84  828.46  279.26  828.46  280.76  828.47  283.29  828.57  284.56
828.58
  285.47  828.56   290.6  828.74  292.63  828.76  293.19  828.75  296.11
828.69
  300.52  828.54  301.38  828.56  302.89  828.61  303.14  828.62  303.65
828.6
  307.01  828.52  307.52  828.53  308.42  828.61  314.27  828.96  321.86
```

```
829.07
  325.55  828.86  326.23  828.78  329.27   828.5  330.85  828.41  331.11
828.4
  334.35  828.35  334.91  828.33  334.96  828.33  336.65  828.14   337.7
828.04
   340.6  827.64  341.74   827.5  342.12  827.44  344.04   827.3  346.13
827.22
  346.83  827.16  348.02  827.16  350.57  827.05  351.61  827.05  353.27
827.18
  353.99  827.18  357.23  827.22  358.92     827  359.07     827  359.61
827.02
  363.01  827.14  364.64  827.14  367.03  827.18  369.17   827.2  370.32
827.2
   375.8  827.23  376.22  827.23  381.61  827.22  383.36  827.32  385.55
827.43
  386.58  827.41  387.22  827.44  388.64  827.53  392.05  827.77  392.77
827.82
  392.98  827.84  393.54  828.02  396.95  828.85  397.87   829.1  407.84
829.21
  408.35   829.2  408.54  829.17  408.61  829.15  409.74  828.89  411.16
828.56
  414.98  827.13  415.86     827  428.51  827.04  439.88  827.08  443.15
827.17
  444.13  827.33  446.55  827.78   449.6  828.41   450.6  828.62  451.57
828.62
  454.49  829.01   454.6  829.02  454.68  829.03  456.13  829.18  457.14
829.25
  460.48  829.23  463.26  828.82  466.27  828.63  468.37  828.63  474.13
828.8
  474.33  828.81  478.71  828.93  482.14  828.85  483.56  828.98  490.08
828.83
  493.92  828.04  498.66  828.07  499.62   828.1  500.97   828.1  502.37
827.96
  506.01  828.11  506.94  828.12  507.78  828.17  508.44   828.2  512.94
829.45
  512.96  829.45  514.47  830.05  516.52  830.74   518.6  831.55  519.77
831.73
  520.47  831.84  523.79  831.95  524.31  831.98  524.55  832.01  526.24
832
  527.53  832.16  530.23   832.6  531.35  832.65  532.05  832.68  533.46
832.71
  536.14  832.77  537.22  832.73   537.8  832.73  539.09  832.66  541.92
832.47
  542.94  832.28  543.76  832.12  544.89  831.82  547.63  831.16   548.2
831.12
  549.58  830.89  551.56   830.4  554.39   830.1   559.1  830.27  559.56
830.29
  559.73  830.27  565.39  829.85  566.53  829.64  572.13  829.72  575.67
```



```
829.89
  577.49   829.9  578.84  829.94  580.71  829.83  582.93     830  587.17
830.12
  589.85  830.12  592.29  830.01  598.55  830.25   601.4  830.34  603.33
830.22
  604.06     830   612.3  829.18  612.58  829.19  614.31   829.2  614.61
829.2
  620.38  829.12  623.85  829.15  624.56  829.16  626.32  828.96  626.39
828.95
  626.52  828.94  631.96  828.98  634.34  829.01  638.33  829.01  640.14
828.94
  643.42  828.88  644.41  828.93  646.79  828.89  648.46  828.93  649.44
828.72
  650.33  828.62   653.5  828.63   654.6  828.67  654.85  828.67  656.21
828.65
  659.59  828.85  660.85  828.88  662.28  828.78  662.52   828.8  667.91
829.11
  668.39  829.07  672.39  829.07  672.49  829.06  672.55  829.07  674.34
829.06
  679.27  828.73  680.11   828.7  680.33  828.69  681.02  828.75  683.51
828.88
  686.23  829.05  686.95  829.05  692.28  829.03   697.4  829.06   698.4
829.08
   699.4  829.09  700.87   829.1  704.41  829.13  705.39   829.2  708.52
829.26
  709.68  829.02  710.43  828.94  712.35   828.9   714.6  828.95  715.37
828.82
  716.45  828.74  718.03  828.78  720.52  828.95  721.69  828.98  722.49
829.01
  725.74  829.05  726.65  829.06  727.28  828.96  728.57  828.73  733.79
828.75
  734.67  828.77  735.22   828.8  738.73  828.85   739.3  828.85   740.4
828.8
  746.51  828.71  746.75   828.7  747.27  828.65  750.78  828.57  752.13
828.6
  752.77  828.61   754.3  828.64  758.04  828.86  758.78  828.78  761.18
828.79
  763.07  828.81  763.49  828.77  764.93  828.59  765.99  828.64   767.2
828.68
  771.05  828.82  773.74  828.81   775.1  828.74  776.74  828.54  777.15
828.53
   778.1  828.52  782.98  828.54  791.56  828.54  795.12  828.53  795.63
828.52
  796.37  828.53  799.69  828.42  800.55  828.41  801.69  828.46  804.76
828.66
  805.91  828.72  806.64  828.81   807.7  828.86  809.06  828.89  811.85
828.85
  812.75  828.81  816.34  828.98  818.29     829  820.06  828.85  825.31
```

```
828.81
  825.93  828.82  826.02  828.82  826.61  828.83  830.95  828.88  831.91
828.81
  833.17  828.84  836.07  828.95  837.67  829.17  838.01  829.16  838.92
829.22
  842.11  829.27  843.63  829.08  844.03  829.04  844.63  829.08  848.05
829.36
   848.6  829.42  849.97  829.48  853.55  829.61  853.96  829.61   854.2
829.63
  855.87  829.55  859.66  829.69  860.11  829.72  861.77  829.89  865.02
830.22
  865.72  830.41  866.11  830.45  867.61  830.79     870  830.71  872.38
830.84
  873.44  830.98   875.3  831.04  877.47  831.25  878.63  831.38  879.32
831.46
   882.6  831.74  883.31  831.79   883.8  831.81  885.14  831.83   888.1
831.85
  889.08  831.87  890.43  831.99  891.48  832.08   892.5  832.26  896.83
832.94
  900.24  834.95  900.65  835.23  900.94  835.44  902.53  836.57  908.38
838.21
  912.51  839.35  914.83   839.6  920.35  840.33  950.62  841.26  954.03
841.1
  954.85   841.2  956.48  841.09  957.87  841.17   958.1   841.2  959.55
841.21
  961.58  841.21  962.32  841.22  963.07  841.22  966.13  841.33  968.09
841.29
  968.91  841.33  971.47  841.33

Manning's n Values        num=      12
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0    .013  184.36     .03  392.98      .1  408.35     .06  414.98
.06
  443.15     .06  457.14      .1  530.23    .013  539.09      .1   601.4
.035
  848.05      .1  971.47      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
       408.54  457.14            56.86   52.22   53.96             .1
.3
Ineffective Flow     num=       3
   Sta L   Sta R    Elev  Permanent
  525.38  544.09  834.17       T
  544.09     900  832.73       F
     915     971     860       T
```



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BRIDGE


RIVER: Oldtown Creek
REACH: Reach              RS: 679.82

INPUT
Description:
Distance from Upstream XS =    19.3
Deck/Roadway Width        =      17
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       8
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   29.21  854.71  852.59  119.21  854.33  852.21  236.71  849.09  845.32
  354.21  843.21  839.45  505.06  835.72   833.6  505.07  835.72     820
  544.09  834.09     820   544.1  834.09     820

Upstream Bridge Cross Section Data
Station Elevation Data    num=     492
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  838.34     .56  838.32    1.61  838.29    3.85  838.22    5.42
838.18
    6.94  838.11    7.12  838.09    7.53  838.09   10.43  837.83    12.4
837.66
   12.57  837.65   12.87  837.64    17.5  837.49   18.31  837.46      20
837.28
   22.81  837.12   23.84  837.06    25.9  836.94   27.55  836.96   28.94
836.84
   29.41  836.78   32.45  836.62   33.15   836.6   33.74  836.59   34.82
836.6
   36.58  836.57   40.35  836.52   44.28  836.21   44.34  836.21   45.01
836.08
   45.87  835.91   45.89  835.91   46.56  835.86   49.79  835.63   49.97
835.61
   51.49   835.5   54.24  835.52   55.27  835.53   56.32  835.51   57.02
835.51
   59.42  835.63   60.94  835.72   61.67  835.73   62.56  835.75   65.19
835.78
   66.38  835.79   66.48   835.8   68.07  835.89   70.38  835.83   72.25
835.81
   75.47   835.8   77.58   835.7   79.76  835.64   80.95  835.58   84.67
835.38
   86.58  835.38   88.36  835.44   89.68  835.62   90.13  835.63    91.3
835.66
   93.94   835.6   95.02  835.74    95.6  835.77   97.94  836.03  100.37
836.37
```

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  104.95  836.22  104.99  836.22  106.69  836.05  107.62  835.98  110.47
835.82
  112.24  835.82  115.97  835.66  116.63  835.68   117.7  835.75  119.68
835.76
  121.62  835.77  122.96  835.72  123.23   835.7  126.62  835.69  127.06
835.69
  127.29  835.68  128.91  835.65  130.29  835.61  132.57  835.57  133.68
835.56
   134.5  835.53  135.65  835.48  138.23  835.53  139.07  835.35  140.64
835.37
  141.85  835.29  145.01  835.28  148.71  835.19  150.65  835.25  153.99
835.12
  156.97  835.11   159.9  834.96  166.36  834.71  167.19  834.68  170.48
834.57
  171.99  834.48  174.87  834.37  177.71   834.2  179.18  834.04  179.52
833.97
  181.06  833.85  183.34  833.63  184.36   833.4  185.28  833.15  186.31
833.05
  188.97  832.74  190.81  832.42  190.88  832.41  191.14  832.35  194.87
831.62
  196.38  831.29  196.43  831.28  201.92  830.87  202.02  830.86  202.11
830.86
  205.91   830.7  206.08  830.68  207.71  830.45  211.25  830.17  211.63
830.15
  211.78  830.13  213.33   829.9  215.57  829.75   217.2   829.6  217.82
829.58
  219.08  829.41  222.98  829.03  224.19  828.96  227.64  828.83  230.24
828.69
   231.2  828.68   234.3  828.51  235.03  828.44  235.86  828.38  238.38
828.45
   239.8  828.42  240.87  828.42  241.58  828.39  245.15  828.37  245.42
828.39
  245.81  828.36  247.27  828.33  248.28  828.34  252.34  828.27   252.9
828.24
  257.72  828.31  258.31  828.33  259.41  828.38  262.31  828.55  262.65
828.53
  263.91  828.52  266.59  828.54  267.78  828.57  269.25   828.6  269.55
828.62
  269.79  828.63  273.34  828.71  273.99  828.73  275.17  828.72  278.21
828.44
  278.84  828.46  279.26  828.46  280.76  828.47  283.29  828.57  284.56
828.58
  285.47  828.56   290.6  828.74  292.63  828.76  293.19  828.75  296.11
828.69
  300.52  828.54  301.38  828.56  302.89  828.61  303.14  828.62  303.65
828.6
  307.01  828.52  307.52  828.53  308.42  828.61  314.27  828.96  321.86
829.07
```



```
  325.55  828.86  326.23  828.78  329.27   828.5  330.85  828.41  331.11
828.4
  334.35  828.35  334.91  828.33  334.96  828.33  336.65  828.14   337.7
828.04
   340.6  827.64  341.74   827.5  342.12  827.44  344.04   827.3  346.13
827.22
  346.83  827.16  348.02  827.16  350.57  827.05  351.61  827.05  353.27
827.18
  353.99  827.18  357.23  827.22  358.92     827  359.07     827  359.61
827.02
  363.01  827.14  364.64  827.14  367.03  827.18  369.17   827.2  370.32
827.2
   375.8  827.23  376.22  827.23  381.61  827.22  383.36  827.32  385.55
827.43
  386.58  827.41  387.22  827.44  388.64  827.53  392.05  827.77  392.77
827.82
  392.98  827.84  393.54  828.02  396.95  828.85  397.87   829.1  407.84
829.21
  408.35   829.2  408.54  829.17  408.61  829.15  409.74  828.89  411.16
828.56
  414.98  827.13  415.86     827  428.51  827.04  439.88  827.08  443.15
827.17
  444.13  827.33  446.55  827.78   449.6  828.41   450.6  828.62  451.57
828.62
  454.49  829.01   454.6  829.02  454.68  829.03  456.13  829.18  457.14
829.25
  460.48  829.23  463.26  828.82  466.27  828.63  468.37  828.63  474.13
828.8
  474.33  828.81  478.71  828.93  482.14  828.85  483.56  828.98  490.08
828.83
  493.92  828.04  498.66  828.07  499.62   828.1  500.97   828.1  502.37
827.96
  506.01  828.11  506.94  828.12  507.78  828.17  508.44   828.2  512.94
829.45
  512.96  829.45  514.47  830.05  516.52  830.74   518.6  831.55  519.77
831.73
  520.47  831.84  523.79  831.95  524.31  831.98  524.55  832.01  526.24
832
  527.53  832.16  530.23   832.6  531.35  832.65  532.05  832.68  533.46
832.71
  536.14  832.77  537.22  832.73   537.8  832.73  539.09  832.66  541.92
832.47
  542.94  832.28  543.76  832.12  544.89  831.82  547.63  831.16   548.2
831.12
  549.58  830.89  551.56   830.4  554.39   830.1   559.1  830.27  559.56
830.29
  559.73  830.27  565.39  829.85  566.53  829.64  572.13  829.72  575.67
829.89
```

```
  577.49   829.9  578.84  829.94  580.71  829.83  582.93     830  587.17
830.12
  589.85  830.12  592.29  830.01  598.55  830.25   601.4  830.34  603.33
830.22
  604.06     830   612.3  829.18  612.58  829.19  614.31   829.2  614.61
829.2
  620.38  829.12  623.85  829.15  624.56  829.16  626.32  828.96  626.39
828.95
  626.52  828.94  631.96  828.98  634.34  829.01  638.33  829.01  640.14
828.94
  643.42  828.88  644.41  828.93  646.79  828.89  648.46  828.93  649.44
828.72
  650.33  828.62   653.5  828.63   654.6  828.67  654.85  828.67  656.21
828.65
  659.59  828.85  660.85  828.88  662.28  828.78  662.52   828.8  667.91
829.11
  668.39  829.07  672.39  829.07  672.49  829.06  672.55  829.07  674.34
829.06
  679.27  828.73  680.11   828.7  680.33  828.69  681.02  828.75  683.51
828.88
  686.23  829.05  686.95  829.05  692.28  829.03   697.4  829.06   698.4
829.08
   699.4  829.09  700.87   829.1  704.41  829.13  705.39   829.2  708.52
829.26
  709.68  829.02  710.43  828.94  712.35   828.9   714.6  828.95  715.37
828.82
  716.45  828.74  718.03  828.78  720.52  828.95  721.69  828.98  722.49
829.01
  725.74  829.05  726.65  829.06  727.28  828.96  728.57  828.73  733.79
828.75
  734.67  828.77  735.22   828.8  738.73  828.85   739.3  828.85   740.4
828.8
  746.51  828.71  746.75   828.7  747.27  828.65  750.78  828.57  752.13
828.6
  752.77  828.61   754.3  828.64  758.04  828.86  758.78  828.78  761.18
828.79
  763.07  828.81  763.49  828.77  764.93  828.59  765.99  828.64   767.2
828.68
  771.05  828.82  773.74  828.81   775.1  828.74  776.74  828.54  777.15
828.53
   778.1  828.52  782.98  828.54  791.56  828.54  795.12  828.53  795.63
828.52
  796.37  828.53  799.69  828.42  800.55  828.41  801.69  828.46  804.76
828.66
  805.91  828.72  806.64  828.81   807.7  828.86  809.06  828.89  811.85
828.85
  812.75  828.81  816.34  828.98  818.29     829  820.06  828.85  825.31
828.81
```



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  825.93  828.82  826.02  828.82  826.61  828.83  830.95  828.88  831.91
828.81
  833.17  828.84  836.07  828.95  837.67  829.17  838.01  829.16  838.92
829.22
  842.11  829.27  843.63  829.08  844.03  829.04  844.63  829.08  848.05
829.36
   848.6  829.42  849.97  829.48  853.55  829.61  853.96  829.61   854.2
829.63
  855.87  829.55  859.66  829.69  860.11  829.72  861.77  829.89  865.02
830.22
  865.72  830.41  866.11  830.45  867.61  830.79     870  830.71  872.38
830.84
  873.44  830.98   875.3  831.04  877.47  831.25  878.63  831.38  879.32
831.46
   882.6  831.74  883.31  831.79   883.8  831.81  885.14  831.83   888.1
831.85
  889.08  831.87  890.43  831.99  891.48  832.08   892.5  832.26  896.83
832.94
  900.24  834.95  900.65  835.23  900.94  835.44  902.53  836.57  908.38
838.21
  912.51  839.35  914.83   839.6  920.35  840.33  950.62  841.26  954.03
841.1
  954.85   841.2  956.48  841.09  957.87  841.17   958.1   841.2  959.55
841.21
  961.58  841.21  962.32  841.22  963.07  841.22  966.13  841.33  968.09
841.29
  968.91  841.33  971.47  841.33

Manning's n Values        num=      12
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0    .013  184.36     .03  392.98      .1  408.35     .06  414.98
.06
  443.15     .06  457.14      .1  530.23    .013  539.09      .1   601.4
.035
  848.05      .1  971.47      .1

Bank Sta: Left   Right    Coeff Contr.   Expan.
        408.54  457.14            .1       .3
Ineffective Flow     num=       3
   Sta L   Sta R    Elev  Permanent
  525.38  544.09  834.17       T
  544.09     900  832.73       F
     915     971     860       T

Downstream  Deck/Roadway Coordinates
    num=       8
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
```

```
  16.49  854.71  852.59  106.49  854.33  852.21  223.99  849.09  845.32
 341.49  843.21  839.45  491.78  835.72   833.6  491.79  835.72     820
 563.22  834.09     820  563.23  834.09     820

Downstream Bridge Cross Section Data
Station Elevation Data    num=     492
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  837.96    1.96  837.88    2.47   837.9    3.46  837.91    5.36
837.76
    7.39  837.64    7.99  837.58    9.18  837.53   11.78  837.51   12.88
837.49
   14.37  837.33   14.71  837.28   15.53   837.2   18.46  837.07   19.32
836.98
   20.28  837.02    22.4     837   24.05  836.99   25.34  836.69   25.66
836.62
   26.34  836.58   30.89  836.04   31.18  835.97   32.87  835.74   35.19
835.45
    36.5  835.53   36.71  835.51   39.95  835.58   40.66  835.58   41.28
835.6
   42.32  835.55   43.97  835.58   46.14  835.63   47.68  835.68   47.85
835.68
   48.17  835.69   53.26  835.71   53.92  835.71   58.88  835.81   62.55
835.86
   62.72  835.86   62.88  835.85   64.33  835.78   65.46  835.73   68.17
835.68
   69.83  835.72   69.94  835.73   70.24  835.71   73.61  835.54   74.63
835.46
   75.46  835.36   76.77  835.39   79.17  835.39   80.06  835.48   80.89
835.51
   83.15  835.52   85.16  835.47   86.36  835.52   87.42  835.55   91.15
835.43
   91.84  835.45   94.65  835.38   95.76  835.45   96.12  835.44   97.94
835.43
  102.43  835.36   102.9  835.38  103.43  835.37  106.52   835.3  108.43
835.3
  109.61  835.29  112.95  835.37  113.77  835.31  114.84  835.32  117.82
835.25
  118.25  835.18  119.63  835.22  121.52  835.18  123.32  835.15   124.2
835.19
  126.81  835.23  128.97   835.2  130.33  835.08  130.76  835.06   134.1
834.97
  134.58  834.94  134.82  834.94  136.31  834.85  139.48  834.78  140.34
834.79
  140.83  834.75  142.06  834.77  144.71  834.75  145.87  834.75  146.59
834.7
  147.65  834.72  149.39  834.64  151.51  834.57  152.23  834.48  153.19
834.38
```



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  156.64  834.73  157.09  834.77  157.79  834.76  158.81  834.77  159.51
834.87
  164.44  835.06  166.79   835.1  168.89  834.88  170.03   834.7  170.74
834.65
  171.38  834.63  175.99  834.58  177.45  834.63  179.72  834.75  181.44
834.74
  181.61  834.74  182.56  834.75   185.3  834.76  186.21  834.73  187.18
834.69
  188.63  834.72  191.05  834.76  192.25  834.76  192.78  834.74  196.11
834.46
  196.87  834.44  202.06  834.04  202.74  833.88  204.07  833.57  205.77
833.18
  207.94  832.15   212.3  831.14  213.49   831.1  214.81  830.66  217.27
829.97
  219.65  829.27  220.96  829.18  224.95  828.67  226.73  828.54     232
828.69
  232.18  828.73  235.83  828.81  236.35  828.81  237.87  828.74   239.1
828.72
  242.82  828.77  243.48  828.75  246.98  828.74  247.35  828.74  248.89
828.73
  249.04  828.74  254.47  828.34  257.06  828.37  259.18  828.23  265.14
828.52
  265.42  828.53  265.95  828.53  270.85  828.45  272.32  828.49  276.52
828.46
  277.47  828.45  282.21  828.36  282.35  828.36  286.25  828.16  286.43
828.15
     289  828.18  292.51  828.45  296.15  828.84  297.56  828.82  297.93
828.87
  301.25  828.65  303.17  828.46  305.22  828.48  314.23  828.42  315.96
828.45
  316.02  828.45  316.25  828.43  319.78  828.12  321.19  828.07  321.58
828.07
  321.86  828.08  326.54  828.13  329.33  828.02   332.6  827.99  335.55
828.2
  336.66   828.3  337.04  828.27  338.52  828.24  340.98  828.08  346.63
827.91
  348.27  827.85  349.54  827.92  351.43  827.89  351.82  827.89  353.51
827.93
  354.14  827.93   355.1  827.84  358.59  827.79  359.28  827.77  360.77
827.72
  360.83  827.72  364.75  827.78  364.86  827.79  366.39  827.82  369.89
828.28
  370.42   828.3  370.76  828.35  372.08  828.47   374.6  828.43  376.04
828.48
  377.41  828.55  377.67  828.57  380.99  828.94  382.07  829.04  386.46
829.4
  387.32  829.42  388.04  829.44  390.01  829.49   393.2  829.63  394.67
829.39
```

394.95	829.33	396.11	829.17	399.66	828.63	400.71	828.4	402.89
827.71								
404.56	827.18	404.6	827.16	406.27	826.47	408.73	825.73	410.25
825.28								
412.04	824.68	412.07	824.67	415.83	824.69	420.78	824.61	429.59
824.47								
431.51	824.42	434.78	825.14	435.21	825.38	436.49	826.02	436.99
826.23								
439.23	827.08	442.92	827.79	445.03	828	445.64	827.93	446.81
827.7								
449.71	827.62	450.88	827.61	451.84	827.6	452.6	827.62	456.27
827.64								
456.91	827.74	462.58	828.54	462.72	828.54	470.07	828.6	474.05
828.53								
474.08	828.53	474.26	828.54	475.29	828.61	478	828.78	479.78
828.88								
480.13	828.9	481.48	829.12	486.85	829.35	487.34	829.38	487.66
829.32								
491.27	828.68	492.51	828.52	493.92	828.54	496.92	828.95	503.74
829.97								
508.14	830.7	508.81	830.67	509.25	830.79	510.62	831.06	513.42
831.56								
514.5	831.72	514.89	831.73	516.38	831.75	517.88	831.89	520.38
832								
521.78	832.22	522.16	832.27	522.79	832.28	526.29	832.46	527.76
832.34								
527.89	832.33	530.75	832.37	532.06	832.39	532.28	832.37	533.85
832.24								
537.35	831.4	537.75	831.28	539.31	830.77	539.63	830.65	539.75
830.63								
543.58	829.76	548.77	829.68	549.57	829.63	550.39	829.6	555.43
829.49								
556.24	829.37	559.28	829.35	561.88	829.33	566.53	829.29	568.55
829.34								
571.23	829.29	574.41	829.27	576.46	829.31	578.84	829.39	584.31
829.54								
584.64	829.54	584.91	829.55	587.97	829.74	590.68	829.91	591.37
829.87								
592.54	829.79	593.47	829.69	596.92	829.33	599.98	829	602.47
828.88								
603.39	828.96	604.17	828.86	608.15	828.73	608.35	828.72	608.4
828.72								
610.18	828.69	615.74	828.63	616.19	828.62	620.16	828.69	620.39
828.68								
620.52	828.68	622.02	828.75	624.51	828.82	628.08	828.83	628.12
828.83								
632.22	828.75	634.09	828.52	634.15	828.51	638.02	828.62	638.4
828.58								

640.03	828.32	644.17	828.23	645.91	828.23	649.41	828.38	650.66
828.38								
651.97	828.31	654.12	828.48	656.21	828.63	656.77	828.65	658.05
828.63								
660.47	828.68	663.68	828.71	663.98	828.69	664.5	828.66	668.07
828.54								
669.53	828.51	669.95	828.51	671.14	828.49	675.83	828.49	677.47
828.58								
680.03	828.58	681.21	828.66	681.87	828.67	686.62	828.72	687.97
828.73								
688.9	828.76	693.96	828.81	697.01	828.84	698.13	828.87	698.85
828.78								
699.96	828.62	703.26	828.77	704.59	828.76	705.98	828.64	708.57
828.73								
710.12	828.77	711.03	828.73	712	828.7	714.56	828.65	718.07
828.62								
720.83	828.61	723.09	828.71	724.15	828.73	726.94	828.8	728.28
828.77								
728.69	828.79	730.13	828.66	731.78	828.59	736.2	828.51	740.35
828.51								
742.2	828.34	744.69	828.36	747.31	828.5	748.2	828.52	752.15
828.43								
752.54	828.42	754.22	828.43	754.33	828.44	754.64	828.44	758.56
828.56								
759.79	828.54	760.43	828.53	761.5	828.52	764.57	828.45	765.29
828.43								
766.53	828.37	768.86	828.4	772	828.4	772.66	828.42	775.62
828.38								
776.97	828.36	778.19	828.33	778.84	828.31	779.23	828.31	779.88
828.34								
784.96	828.41	786.94	828.41	789.1	828.35	790.77	828.37	791.01
828.37								
791.92	828.38	796.5	828.43	797.02	828.43	798.94	828.45	803.18
828.5								
805.92	828.56	809.34	828.65	813.32	828.74	814.95	828.77	815.3
828.78								
818.53	828.87	819.4	828.87	821.16	828.73	823.93	828.82	825.42
828.88								
826.05	828.85	827.27	828.93	830.2	829.07	831.44	829.08	832.35
829.05								
833.28	828.96	835.98	828.84	837.36	828.78	838.99	828.78	839.18
828.79								
840.08	828.77	845.06	828.8	848.27	829.12	849.17	829.18	850.17
829.22								
850.96	829.23	852.4	829.29	855	829.37	856.66	829.32	856.79
829.31								
856.87	829.31	860.84	829.57	861.89	829.62	862.6	829.63	863.2
829.64								

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   866.7  829.75  868.18  829.86  868.46  829.89  869.03  829.96  876.83
830.82
  879.25  831.01  882.65  831.45  885.84  831.57  885.96  831.57  886.17
831.6
  891.58  832.72  891.97  832.75  895.61  832.71  897.18  833.01  897.65
833.05
  901.18  833.05  901.31  833.06  904.82   833.4   906.6  833.66  909.57
833.91
  912.42  834.04  912.93   834.1  916.04  834.39   919.4  834.66  919.75
834.7
  920.57   834.7  923.55  834.88  924.87  834.98  926.38  835.13  929.49
835.43
   933.8  835.46  934.24  835.46

Manning's n Values        num=      12
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0    .013  191.05     .03  349.54      .1  400.71     .06  410.25
.06
  435.21     .06  445.03      .1  520.38    .013  530.75      .1  584.31
.035
  850.17      .1  934.24      .1

Bank Sta: Left   Right    Coeff Contr.   Expan.
        400.71  445.03             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  517.49  536.22  833.66       T
  536.22     891  832.46       F

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Piers =  3

Pier Data
Pier Station     Upstream= 119.208    Downstream=  106.49
Upstream     num=       2
    Width   Elev    Width   Elev
       4     820       4     854
Downstream     num=       2
    Width   Elev    Width   Elev
       4     820       4     854
```



```
Pier Data
Pier Station     Upstream= 236.708    Downstream=  223.99
Upstream     num=       2
    Width   Elev    Width   Elev
       4     820       4     848
Downstream     num=       2
    Width   Elev    Width   Elev
       4     820       4     848

Pier Data
Pier Station     Upstream= 354.209    Downstream=  341.49
Upstream     num=       2
    Width   Elev    Width   Elev
       4     820       4     842
Downstream     num=       2
    Width   Elev    Width   Elev
       4     820       4     842

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =       2
       Yarnell                KVal =    1.25
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Oldtown Creek
REACH: Reach              RS: 651.5802

INPUT
Description: 6+52
Station Elevation Data    num=     492
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
```

```
      0  837.96    1.96  837.88    2.47   837.9    3.46  837.91    5.36
837.76
    7.39  837.64    7.99  837.58    9.18  837.53   11.78  837.51   12.88
837.49
   14.37  837.33   14.71  837.28   15.53   837.2   18.46  837.07   19.32
836.98
   20.28  837.02    22.4     837   24.05  836.99   25.34  836.69   25.66
836.62
   26.34  836.58   30.89  836.04   31.18  835.97   32.87  835.74   35.19
835.45
    36.5  835.53   36.71  835.51   39.95  835.58   40.66  835.58   41.28
835.6
   42.32  835.55   43.97  835.58   46.14  835.63   47.68  835.68   47.85
835.68
   48.17  835.69   53.26  835.71   53.92  835.71   58.88  835.81   62.55
835.86
   62.72  835.86   62.88  835.85   64.33  835.78   65.46  835.73   68.17
835.68
   69.83  835.72   69.94  835.73   70.24  835.71   73.61  835.54   74.63
835.46
   75.46  835.36   76.77  835.39   79.17  835.39   80.06  835.48   80.89
835.51
   83.15  835.52   85.16  835.47   86.36  835.52   87.42  835.55   91.15
835.43
   91.84  835.45   94.65  835.38   95.76  835.45   96.12  835.44   97.94
835.43
  102.43  835.36   102.9  835.38  103.43  835.37  106.52   835.3  108.43
835.3
  109.61  835.29  112.95  835.37  113.77  835.31  114.84  835.32  117.82
835.25
  118.25  835.18  119.63  835.22  121.52  835.18  123.32  835.15   124.2
835.19
  126.81  835.23  128.97   835.2  130.33  835.08  130.76  835.06   134.1
834.97
  134.58  834.94  134.82  834.94  136.31  834.85  139.48  834.78  140.34
834.79
  140.83  834.75  142.06  834.77  144.71  834.75  145.87  834.75  146.59
834.7
  147.65  834.72  149.39  834.64  151.51  834.57  152.23  834.48  153.19
834.38
  156.64  834.73  157.09  834.77  157.79  834.76  158.81  834.77  159.51
834.87
  164.44  835.06  166.79   835.1  168.89  834.88  170.03   834.7  170.74
834.65
  171.38  834.63  175.99  834.58  177.45  834.63  179.72  834.75  181.44
834.74
  181.61  834.74  182.56  834.75   185.3  834.76  186.21  834.73  187.18
834.69
```



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  188.63  834.72  191.05  834.76  192.25  834.76  192.78  834.74  196.11
834.46
  196.87  834.44  202.06  834.04  202.74  833.88  204.07  833.57  205.77
833.18
  207.94  832.15   212.3  831.14  213.49   831.1  214.81  830.66  217.27
829.97
  219.65  829.27  220.96  829.18  224.95  828.67  226.73  828.54     232
828.69
  232.18  828.73  235.83  828.81  236.35  828.81  237.87  828.74   239.1
828.72
  242.82  828.77  243.48  828.75  246.98  828.74  247.35  828.74  248.89
828.73
  249.04  828.74  254.47  828.34  257.06  828.37  259.18  828.23  265.14
828.52
  265.42  828.53  265.95  828.53  270.85  828.45  272.32  828.49  276.52
828.46
  277.47  828.45  282.21  828.36  282.35  828.36  286.25  828.16  286.43
828.15
     289  828.18  292.51  828.45  296.15  828.84  297.56  828.82  297.93
828.87
  301.25  828.65  303.17  828.46  305.22  828.48  314.23  828.42  315.96
828.45
  316.02  828.45  316.25  828.43  319.78  828.12  321.19  828.07  321.58
828.07
  321.86  828.08  326.54  828.13  329.33  828.02   332.6  827.99  335.55
828.2
  336.66   828.3  337.04  828.27  338.52  828.24  340.98  828.08  346.63
827.91
  348.27  827.85  349.54  827.92  351.43  827.89  351.82  827.89  353.51
827.93
  354.14  827.93   355.1  827.84  358.59  827.79  359.28  827.77  360.77
827.72
  360.83  827.72  364.75  827.78  364.86  827.79  366.39  827.82  369.89
828.28
  370.42   828.3  370.76  828.35  372.08  828.47   374.6  828.43  376.04
828.48
  377.41  828.55  377.67  828.57  380.99  828.94  382.07  829.04  386.46
829.4
  387.32  829.42  388.04  829.44  390.01  829.49   393.2  829.63  394.67
829.39
  394.95  829.33  396.11  829.17  399.66  828.63  400.71   828.4  402.89
827.71
  404.56  827.18   404.6  827.16  406.27  826.47  408.73  825.73  410.25
825.28
  412.04  824.68  412.07  824.67  415.83  824.69  420.78  824.61  429.59
824.47
  431.51  824.42  434.78  825.14  435.21  825.38  436.49  826.02  436.99
826.23
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827.7								
449.71	827.62	450.88	827.61	451.84	827.6	452.6	827.62	456.27
827.64								
456.91	827.74	462.58	828.54	462.72	828.54	470.07	828.6	474.05
828.53								
474.08	828.53	474.26	828.54	475.29	828.61	478	828.78	479.78
828.88								
480.13	828.9	481.48	829.12	486.85	829.35	487.34	829.38	487.66
829.32								
491.27	828.68	492.51	828.52	493.92	828.54	496.92	828.95	503.74
829.97								
508.14	830.7	508.81	830.67	509.25	830.79	510.62	831.06	513.42
831.56								
514.5	831.72	514.89	831.73	516.38	831.75	517.88	831.89	520.38
832								
521.78	832.22	522.16	832.27	522.79	832.28	526.29	832.46	527.76
832.34								
527.89	832.33	530.75	832.37	532.06	832.39	532.28	832.37	533.85
832.24								
537.35	831.4	537.75	831.28	539.31	830.77	539.63	830.65	539.75
830.63								
543.58	829.76	548.77	829.68	549.57	829.63	550.39	829.6	555.43
829.49								
556.24	829.37	559.28	829.35	561.88	829.33	566.53	829.29	568.55
829.34								
571.23	829.29	574.41	829.27	576.46	829.31	578.84	829.39	584.31
829.54								
584.64	829.54	584.91	829.55	587.97	829.74	590.68	829.91	591.37
829.87								
592.54	829.79	593.47	829.69	596.92	829.33	599.98	829	602.47
828.88								
603.39	828.96	604.17	828.86	608.15	828.73	608.35	828.72	608.4
828.72								
610.18	828.69	615.74	828.63	616.19	828.62	620.16	828.69	620.39
828.68								
620.52	828.68	622.02	828.75	624.51	828.82	628.08	828.83	628.12
828.83								
632.22	828.75	634.09	828.52	634.15	828.51	638.02	828.62	638.4
828.58								
640.03	828.32	644.17	828.23	645.91	828.23	649.41	828.38	650.66
828.38								
651.97	828.31	654.12	828.48	656.21	828.63	656.77	828.65	658.05
828.63								
660.47	828.68	663.68	828.71	663.98	828.69	664.5	828.66	668.07
828.54								
669.53	828.51	669.95	828.51	671.14	828.49	675.83	828.49	677.47
828.58								

680.03	828.58	681.21	828.66	681.87	828.67	686.62	828.72	687.97
828.73								
688.9	828.76	693.96	828.81	697.01	828.84	698.13	828.87	698.85
828.78								
699.96	828.62	703.26	828.77	704.59	828.76	705.98	828.64	708.57
828.73								
710.12	828.77	711.03	828.73	712	828.7	714.56	828.65	718.07
828.62								
720.83	828.61	723.09	828.71	724.15	828.73	726.94	828.8	728.28
828.77								
728.69	828.79	730.13	828.66	731.78	828.59	736.2	828.51	740.35
828.51								
742.2	828.34	744.69	828.36	747.31	828.5	748.2	828.52	752.15
828.43								
752.54	828.42	754.22	828.43	754.33	828.44	754.64	828.44	758.56
828.56								
759.79	828.54	760.43	828.53	761.5	828.52	764.57	828.45	765.29
828.43								
766.53	828.37	768.86	828.4	772	828.4	772.66	828.42	775.62
828.38								
776.97	828.36	778.19	828.33	778.84	828.31	779.23	828.31	779.88
828.34								
784.96	828.41	786.94	828.41	789.1	828.35	790.77	828.37	791.01
828.37								
791.92	828.38	796.5	828.43	797.02	828.43	798.94	828.45	803.18
828.5								
805.92	828.56	809.34	828.65	813.32	828.74	814.95	828.77	815.3
828.78								
818.53	828.87	819.4	828.87	821.16	828.73	823.93	828.82	825.42
828.88								
826.05	828.85	827.27	828.93	830.2	829.07	831.44	829.08	832.35
829.05								
833.28	828.96	835.98	828.84	837.36	828.78	838.99	828.78	839.18
828.79								
840.08	828.77	845.06	828.8	848.27	829.12	849.17	829.18	850.17
829.22								
850.96	829.23	852.4	829.29	855	829.37	856.66	829.32	856.79
829.31								
856.87	829.31	860.84	829.57	861.89	829.62	862.6	829.63	863.2
829.64								
866.7	829.75	868.18	829.86	868.46	829.89	869.03	829.96	876.83
830.82								
879.25	831.01	882.65	831.45	885.84	831.57	885.96	831.57	886.17
831.6								
891.58	832.72	891.97	832.75	895.61	832.71	897.18	833.01	897.65
833.05								
901.18	833.05	901.31	833.06	904.82	833.4	906.6	833.66	909.57
833.91								

```
  912.42  834.04  912.93   834.1  916.04  834.39   919.4  834.66  919.75
834.7
  920.57   834.7  923.55  834.88  924.87  834.98  926.38  835.13  929.49
835.43
   933.8  835.46  934.24  835.46

Manning's n Values        num=      12
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0    .013  191.05     .03  349.54      .1  400.71     .06  410.25
.06
  435.21     .06  445.03      .1  520.38    .013  530.75      .1  584.31
.035
  850.17      .1  934.24      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
       400.71  445.03           111.44  106.45  103.86             .1
.3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  517.49  536.22  833.66       T
  536.22     891  832.46       F

CROSS SECTION


RIVER: Oldtown Creek
REACH: Reach              RS: 545.1257

INPUT
Description: FIS D-D
Station Elevation Data    num=     491
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  835.78      .3  835.78    5.33   835.8    6.09  835.82    9.68
836.03
   11.23  835.92   11.42  835.92   15.34  835.98   16.58  835.97   16.84
835.99
   17.43  835.98   23.72  835.97   26.24  835.87   27.16  835.83   29.76
835.72
   31.87  835.51   32.39  835.39   33.55  835.25   35.21  834.95   44.67
834.27
   52.73  833.03   58.36  833.52   64.24  833.57   66.35  833.49   67.14
833.47
   68.68  833.39   71.23  833.13   72.73  833.15   72.92  833.13   73.92
833.07
   76.84  832.84   77.68  832.78   78.67  832.73   80.05  832.69   82.46
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832.58
      84  832.52   84.25   832.5   84.62  832.52   88.02  832.47   88.17
832.45
    95.4  832.16   95.42  832.16   98.91  832.25  100.56  832.33  105.52
832.65
     110  832.22  110.71  832.15  110.74  832.14   110.8  832.14  122.04
831.57
  122.79  831.55  123.28  831.41  124.78  831.32  127.77     831  128.53
830.86
   129.2  830.74   132.7  830.04  133.21  829.97  133.53  829.92  134.47
829.78
  138.42  829.18  138.79  829.19  144.74  829.26  148.31  829.04  151.37
828.89
  157.09  828.73  157.74  828.83  162.72  829.36  167.47  828.69  175.72
829.06
  183.28  829.09  185.13     829  189.83  829.12  193.49  829.18  198.71
828.8
  200.86  828.63  204.93  828.77  208.82  828.42  210.45  828.19  214.95
827.75
  218.14  827.88   218.7  827.89  220.06  827.95  223.94  828.08  224.48
828.07
  227.99  828.36  228.82  828.45  234.55  828.18  237.68  827.88  239.21
827.94
  239.69     828  241.96   828.1  244.68  828.32  246.12   828.5  246.49
828.5
  247.28  828.56  253.43   828.5  258.72  828.59  262.73  828.49  263.26
828.49
  267.22  828.35  267.29  828.35  267.37  828.34  268.85  828.15  269.36
828.16
  272.75  828.21  273.03  828.21  274.51  828.12  276.73  828.11  278.54
828.13
  279.85  828.08  280.08  828.06  282.61  828.02  285.29   827.9   285.8
827.92
  286.89  828.01  289.89  828.15  290.52  828.21  291.54  828.18  294.26
828.11
  295.65  828.14  296.48  828.01  297.32  827.94  300.96  828.18  301.42
828.18
  301.87   828.2  302.77  828.18  305.32  828.49  308.77  827.99  310.39
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  318.56  825.89  324.18  824.59   324.7  824.44  326.02  824.45  334.93
823.88
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  353.25  827.19  353.34  827.24  354.98  827.33  358.17   827.3  359.61
827.29
  360.79  827.12  364.23  827.64  365.01  827.71  365.26  827.72  366.63
827.78
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 1021.43  858.49 1028.17  859.26 1033.42  860.18  1033.5  860.19 1033.63
860.19
 1039.29  860.12 1040.84  860.27 1043.84  860.34 1044.53  860.39 1047.23
860.9
 1049.42  861.29 1056.54  862.07  1059.7  862.22 1062.34  862.48 1064.34
862.6
 1065.08  862.64 1065.78  862.71 1067.83  862.81 1072.41  863.36 1073.17
863.5
 1078.67  864.41 1086.37  864.91 1088.04  865.27 1096.42  866.65 1098.47
867.02
 1101.79  867.97 1105.76  868.51 1111.15  868.65 1111.41  868.66 1111.74
868.66
 1111.77  868.67 1117.24  869.26 1119.57  869.64 1125.88  869.82 1128.02
869.96
 1134.92  870.86 1138.91  870.94 1140.89  870.57 1142.19  870.68 1142.53
870.73
 1150.67  871.72 1152.27  871.87 1155.83  872.07 1156.94  872.17    1158
872.17
 1165.26  872.37 1166.27  872.47 1167.48  872.44 1170.87  872.42 1180.28
873.33
  1180.6  873.38 1180.65  873.38 1181.05  873.44 1182.27  873.73 1186.23
874.08
 1187.59  874.22 1192.03   874.6 1194.54   874.7 1200.28   874.8 1201.12
874.79
 1204.43  874.65 1205.34  874.63 1207.24  874.67 1209.01  874.68 1211.51
874.91
  1214.4  874.96 1216.03     875 1216.92  875.32 1219.67  875.27 1221.93
875.15
 1225.51  874.39 1228.48  874.15 1229.55  874.13 1230.46  874.05 1230.71
874.02
 1236.29  874.02 1237.86  874.28 1240.34  874.22  1240.6   874.1 1243.11
874.25
 1244.72  874.37

Manning's n Values        num=      13
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0     .03   68.68      .1  310.39     .07   324.7     .06  348.58
.07
  353.34      .1   424.5    .013  436.49      .1  489.83    .035  688.31
.1
```



```
  792.35    .013  860.68      .1 1244.72      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
       310.39  353.25             46.6   52.81   53.82             .1
.3
Ineffective Flow     num=       3
   Sta L   Sta R    Elev  Permanent
      34      68     855       T
     165     214     850       T
     435     750   831.9       F

CROSS SECTION


RIVER: Oldtown Creek
REACH: Reach              RS: 492.3110

INPUT
Description: 4+92
Station Elevation Data    num=     409
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  832.23     .86  832.23    4.82  831.86    5.64  831.85    7.34
831.45
    10.5  831.05   11.25  830.79   21.31  830.59   25.08  830.39   26.64
829.95
   27.92   829.6   28.69  829.55   30.56  829.28   33.79  828.88   34.87
828.71
   39.47  828.29   40.33  828.27   43.46  828.13   44.04  828.06   45.16
827.95
   47.72  827.74    49.6  827.66   50.77  827.64   52.71  827.65   54.66
827.68
   55.14  827.68    56.2  827.61   57.75  827.64   60.34  827.55   61.63
827.43
   61.79  827.44   62.04  827.45    65.8  827.69   66.39  827.68   67.42
827.78
   68.71  827.82   72.84  827.59   73.02  827.59   75.42  827.64   76.85
827.69
   76.96  827.71   78.62  827.97   81.47  828.13   83.65   827.9   84.33
827.89
   89.61   828.2   90.35  828.14   93.81  827.88   94.78  827.93   96.05
827.97
   99.59  828.08  101.03  828.09  101.28  828.09  105.73  827.99  108.62
828.08
  110.67  828.13  111.95  828.15  112.14  828.16   112.5  828.17   116.3
828.28
     117  828.26  117.89  828.24  121.71  828.21  121.78   828.2  121.87
```

828.21
127.33 828.13 130.58 828 132.97 827.95 137.08 827.94 138.66
827.88
138.97 827.87 142.6 827.79 144.39 827.73 145.97 827.68 151.47
827.68
153.49 827.79 156.04 827.83 157.01 827.86 160.15 827.81 161.45
827.8
162.59 827.94 166.73 827.83 166.9 827.84 167.14 827.85 168.31
827.91
168.77 827.91 172.41 827.89 172.55 827.89 173.93 827.92 177.75
827.77
178.06 827.76 178.35 827.76 180.3 827.78 182.21 827.82 184.27
827.86
184.94 827.83 185.2 827.84 185.83 827.85 189.45 828.06 190.72
828.01
190.94 828 191.42 827.99 195.94 827.86 196.69 827.78 200.26
827.85
200.85 827.86 201.03 827.85 202.5 827.84 204.99 827.85 206.64
827.88
208.21 828 208.3 828.01 209.08 827.98 212.34 827.9 212.87
827.93
216.96 827.76 219.79 827.68 220.67 827.7 224.79 827.93 225.64
827.95
228.26 828.16 229.6 828.26 230.05 828.32 231.25 828.5 233.51
827.74
234.86 827.26 240.35 825.29 243.27 824.77 245.18 824.46 251.67
824.85
262.92 825.54 266.58 825.79 271.07 825.42 272.1 825.5 272.66
825.63
276.05 826.66 278.3 826.88 280.01 827.07 282.61 827.31 283.55
827.24
285.71 827.26 287.43 827.33 289.66 827.54 291.02 827.38 301.28
826.6
302.66 826.61 305.65 826.67 306.13 826.74 311.52 827.37 311.72
827.39
313 827.48 315.59 828.38 317.26 828.75 317.69 828.9 320.04
829.72
321.11 830.07 322.97 830.68 324.55 831.14 326.48 831.34 328.86
831.54
329.43 831.55 330.51 831.58 334.59 831.75 334.79 831.75 336.26
831.69
336.62 831.71 340.54 831.83 342.03 831.83 342.2 831.82 342.61
831.79
346.24 831.46 347.49 831.31 348 831.26 350.26 830.73 352.07
830.36
352.83 830.04 353.73 829.9 357.07 829.73 358.03 829.69 359.25
829.52
359.54 829.51 359.97 829.49 364.46 829.22 365.52 829.06 367.85

828.73
370.21 828.26 371.28 827.76 376.33 828.19 381.34 828.62 382.17
828.55
383.02 828.52 384.58 828.56 387.26 828.61 388.52 828.6 388.97
828.58
393.22 828.6 393.28 828.59 393.53 828.58 394.74 828.55 396.18
828.48
399.09 828.36 399.72 828.29 400.66 828.23 401.34 828.24 404.97
828.33
405.72 828.25 406.61 828.19 407.72 828.23 410.89 828.37 411.62
828.4
412.48 828.32 416.05 828.4 416.78 828.39 416.98 828.38 418.48
828.3
422.37 828.45 422.84 828.48 423.8 828.47 424.42 828.48 424.81
828.49
428.85 828.6 428.87 828.6 430.36 828.63 432.34 828.81 434.76
829.01
436.24 828.96 436.82 828.97 440.68 829.14 440.69 829.14 442.49
829.26
446.36 829.27 447.14 829.21 448.37 829.11 450.67 829.15 452.82
829.21
454.19 829.19 454.28 829.18 454.5 829.17 458.81 829.19 460.29
829.21
460.49 829.21 464.67 829.05 466.33 829.21 466.39 829.22 466.9
829.24
470.66 829.36 471.18 829.42 472.33 829.4 474.44 829.45 476.54
829.46
477.38 829.47 478.29 829.48 481.98 829.72 482.63 829.73 483
829.74
484.21 829.8 488.16 830.03 488.58 829.97 488.86 829.97 495.12
829.72
496.33 829.8 499.15 829.71 503.22 829.45 509.26 829.99 512.71
830.01
514.11 830.17 515.58 830.25 518.53 830.57 520.24 830.66 521.47
830.84
524.73 830.89 528.83 831.14 530.87 831.17 531.83 831.26 532.56
831.26
535.75 830.57 538.24 830.06 538.5 830 542.34 829.52 542.84
829.51
544.58 829.56 544.6 829.56 548.83 830.01 550.5 829.83 550.6
829.85
550.7 829.85 554.88 830.35 554.95 830.33 556.6 830.43 558.02
830.61
561.08 830.88 561.88 830.95 562.76 831.07 564.95 831.19 567.11
831.24
570.73 831.39 573.15 831.55 574.44 831.65 574.99 831.71 578.99
831.96
579.48 831.99 581.12 832.02 581.14 832.02 585.56 832.08 586.92

```
832.21
  587.32  832.24  591.22  832.31  591.61  832.32  593.44  832.32  596.83
832.47
  597.71   832.5  599.41  832.64  599.83  832.65  603.93  832.73  605.45
832.81
  605.53  832.81  606.21  832.82  609.87  832.83  610.26  832.83  611.68
832.82
  615.76   832.9  615.94   832.9  616.08  832.89  617.85  832.84  620.27
832.92
  621.94  833.02  622.38     833   623.8  833.02  627.65  833.03  627.87
833.04
  627.98  833.02  629.69  832.87  632.22  832.99  634.06  833.03  634.83
833.1
  637.34  833.12  640.09  833.19  641.02  833.14  641.81  833.06  644.57
833.15
  646.01  833.13   647.7  833.07  647.72  833.07  647.74  833.06  653.58
832.84
  657.63  832.95   657.8  832.95  657.93  832.92  659.49  832.48  662.47
832.51
  663.64  832.45  664.36  832.41  665.31  832.26  666.17  832.21  669.46
831.85
  670.82  831.51  673.73  831.32  675.31  831.29  675.97  831.08  676.94
830.88
  677.47  830.83  681.12  831.13  681.57  831.06  682.76  830.93  685.18
830.89
  688.05  830.49  688.67  830.36  691.08  830.27  692.69  830.28  694.31
830.28
  697.09  830.26     700  829.94  702.54  829.88  704.71  829.77  705.77
829.77
   707.3   829.7   709.7  829.61  711.17  829.51  711.52  829.51  716.34
829.8
  721.11  829.49  732.03   829.8  732.05   829.8  733.59  829.66  735.22
829.74
  737.64  829.73  738.81   829.7  739.07  829.72  741.84  829.77  743.22
829.8
  744.73   829.8   749.7  829.72  750.16   829.7   750.3  829.71  750.68
829.75
  754.01  830.06  754.75  829.99  755.46  829.97  759.75  830.13  760.78
830.2
  760.92  830.23  761.15  830.22  766.15  830.34  768.74  831.17  769.54
831.14
   773.1  831.25  776.36  831.56  778.07  831.63  782.82  831.79

Manning's n Values        num=      13
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0     .03   202.5      .1  234.86     .07  240.35     .06  272.66
.07
```



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  282.61      .1  330.51    .013  346.24      .1  388.97    .035  524.73
.1
  578.99    .013  657.93      .1  782.82      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        234.86  282.61            95.23   97.56  102.88             .1
.3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     340     580   831.8       F
     640  782.82   833.2       F

BRIDGE


RIVER: Oldtown Creek
REACH: Reach              RS: 431

INPUT
Description:
Distance from Upstream XS =      61
Deck/Roadway Width        =    24.3
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       6
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
     231   828.5     820   243.4   830.2     820   243.5   830.2   828.2
     285   830.2   828.2   285.1   830.2     820     330   831.5     820

Upstream Bridge Cross Section Data
Station Elevation Data    num=     409
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  832.23     .86  832.23    4.82  831.86    5.64  831.85    7.34
831.45
    10.5  831.05   11.25  830.79   21.31  830.59   25.08  830.39   26.64
829.95
   27.92   829.6   28.69  829.55   30.56  829.28   33.79  828.88   34.87
828.71
   39.47  828.29   40.33  828.27   43.46  828.13   44.04  828.06   45.16
827.95
   47.72  827.74    49.6  827.66   50.77  827.64   52.71  827.65   54.66
827.68
   55.14  827.68    56.2  827.61   57.75  827.64   60.34  827.55   61.63
827.43
   61.79  827.44   62.04  827.45    65.8  827.69   66.39  827.68   67.42
827.78
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   68.71  827.82   72.84  827.59   73.02  827.59   75.42  827.64   76.85
827.69
   76.96  827.71   78.62  827.97   81.47  828.13   83.65   827.9   84.33
827.89
   89.61   828.2   90.35  828.14   93.81  827.88   94.78  827.93   96.05
827.97
   99.59  828.08  101.03  828.09  101.28  828.09  105.73  827.99  108.62
828.08
  110.67  828.13  111.95  828.15  112.14  828.16   112.5  828.17   116.3
828.28
     117  828.26  117.89  828.24  121.71  828.21  121.78   828.2  121.87
828.21
  127.33  828.13  130.58     828  132.97  827.95  137.08  827.94  138.66
827.88
  138.97  827.87   142.6  827.79  144.39  827.73  145.97  827.68  151.47
827.68
  153.49  827.79  156.04  827.83  157.01  827.86  160.15  827.81  161.45
827.8
  162.59  827.94  166.73  827.83   166.9  827.84  167.14  827.85  168.31
827.91
  168.77  827.91  172.41  827.89  172.55  827.89  173.93  827.92  177.75
827.77
  178.06  827.76  178.35  827.76   180.3  827.78  182.21  827.82  184.27
827.86
  184.94  827.83   185.2  827.84  185.83  827.85  189.45  828.06  190.72
828.01
  190.94     828  191.42  827.99  195.94  827.86  196.69  827.78  200.26
827.85
  200.85  827.86  201.03  827.85   202.5  827.84  204.99  827.85  206.64
827.88
  208.21     828   208.3  828.01  209.08  827.98  212.34   827.9  212.87
827.93
  216.96  827.76  219.79  827.68  220.67   827.7  224.79  827.93  225.64
827.95
  228.26  828.16   229.6  828.26  230.05  828.32  231.25   828.5  233.51
827.74
  234.86  827.26  240.35  825.29  243.27  824.77  245.18  824.46  251.67
824.85
  262.92  825.54  266.58  825.79  271.07  825.42   272.1   825.5  272.66
825.63
  276.05  826.66   278.3  826.88  280.01  827.07  282.61  827.31  283.55
827.24
  285.71  827.26  287.43  827.33  289.66  827.54  291.02  827.38  301.28
826.6
  302.66  826.61  305.65  826.67  306.13  826.74  311.52  827.37  311.72
827.39
     313  827.48  315.59  828.38  317.26  828.75  317.69   828.9  320.04
829.72
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  321.11  830.07  322.97  830.68  324.55  831.14  326.48  831.34  328.86
831.54
  329.43  831.55  330.51  831.58  334.59  831.75  334.79  831.75  336.26
831.69
  336.62  831.71  340.54  831.83  342.03  831.83   342.2  831.82  342.61
831.79
  346.24  831.46  347.49  831.31     348  831.26  350.26  830.73  352.07
830.36
  352.83  830.04  353.73   829.9  357.07  829.73  358.03  829.69  359.25
829.52
  359.54  829.51  359.97  829.49  364.46  829.22  365.52  829.06  367.85
828.73
  370.21  828.26  371.28  827.76  376.33  828.19  381.34  828.62  382.17
828.55
  383.02  828.52  384.58  828.56  387.26  828.61  388.52   828.6  388.97
828.58
  393.22   828.6  393.28  828.59  393.53  828.58  394.74  828.55  396.18
828.48
  399.09  828.36  399.72  828.29  400.66  828.23  401.34  828.24  404.97
828.33
  405.72  828.25  406.61  828.19  407.72  828.23  410.89  828.37  411.62
828.4
  412.48  828.32  416.05   828.4  416.78  828.39  416.98  828.38  418.48
828.3
  422.37  828.45  422.84  828.48   423.8  828.47  424.42  828.48  424.81
828.49
  428.85   828.6  428.87   828.6  430.36  828.63  432.34  828.81  434.76
829.01
  436.24  828.96  436.82  828.97  440.68  829.14  440.69  829.14  442.49
829.26
  446.36  829.27  447.14  829.21  448.37  829.11  450.67  829.15  452.82
829.21
  454.19  829.19  454.28  829.18   454.5  829.17  458.81  829.19  460.29
829.21
  460.49  829.21  464.67  829.05  466.33  829.21  466.39  829.22   466.9
829.24
  470.66  829.36  471.18  829.42  472.33   829.4  474.44  829.45  476.54
829.46
  477.38  829.47  478.29  829.48  481.98  829.72  482.63  829.73     483
829.74
  484.21   829.8  488.16  830.03  488.58  829.97  488.86  829.97  495.12
829.72
  496.33   829.8  499.15  829.71  503.22  829.45  509.26  829.99  512.71
830.01
  514.11  830.17  515.58  830.25  518.53  830.57  520.24  830.66  521.47
830.84
  524.73  830.89  528.83  831.14  530.87  831.17  531.83  831.26  532.56
831.26
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  535.75  830.57  538.24  830.06   538.5     830  542.34  829.52  542.84
829.51
  544.58  829.56   544.6  829.56  548.83  830.01   550.5  829.83   550.6
829.85
   550.7  829.85  554.88  830.35  554.95  830.33   556.6  830.43  558.02
830.61
  561.08  830.88  561.88  830.95  562.76  831.07  564.95  831.19  567.11
831.24
  570.73  831.39  573.15  831.55  574.44  831.65  574.99  831.71  578.99
831.96
  579.48  831.99  581.12  832.02  581.14  832.02  585.56  832.08  586.92
832.21
  587.32  832.24  591.22  832.31  591.61  832.32  593.44  832.32  596.83
832.47
  597.71   832.5  599.41  832.64  599.83  832.65  603.93  832.73  605.45
832.81
  605.53  832.81  606.21  832.82  609.87  832.83  610.26  832.83  611.68
832.82
  615.76   832.9  615.94   832.9  616.08  832.89  617.85  832.84  620.27
832.92
  621.94  833.02  622.38     833   623.8  833.02  627.65  833.03  627.87
833.04
  627.98  833.02  629.69  832.87  632.22  832.99  634.06  833.03  634.83
833.1
  637.34  833.12  640.09  833.19  641.02  833.14  641.81  833.06  644.57
833.15
  646.01  833.13   647.7  833.07  647.72  833.07  647.74  833.06  653.58
832.84
  657.63  832.95   657.8  832.95  657.93  832.92  659.49  832.48  662.47
832.51
  663.64  832.45  664.36  832.41  665.31  832.26  666.17  832.21  669.46
831.85
  670.82  831.51  673.73  831.32  675.31  831.29  675.97  831.08  676.94
830.88
  677.47  830.83  681.12  831.13  681.57  831.06  682.76  830.93  685.18
830.89
  688.05  830.49  688.67  830.36  691.08  830.27  692.69  830.28  694.31
830.28
  697.09  830.26     700  829.94  702.54  829.88  704.71  829.77  705.77
829.77
   707.3   829.7   709.7  829.61  711.17  829.51  711.52  829.51  716.34
829.8
  721.11  829.49  732.03   829.8  732.05   829.8  733.59  829.66  735.22
829.74
  737.64  829.73  738.81   829.7  739.07  829.72  741.84  829.77  743.22
829.8
  744.73   829.8   749.7  829.72  750.16   829.7   750.3  829.71  750.68
829.75
```



```
  754.01  830.06  754.75  829.99  755.46  829.97  759.75  830.13  760.78
830.2
  760.92  830.23  761.15  830.22  766.15  830.34  768.74  831.17  769.54
831.14
   773.1  831.25  776.36  831.56  778.07  831.63  782.82  831.79

Manning's n Values        num=      13
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0     .03   202.5      .1  234.86     .07  240.35     .06  272.66
.07
  282.61      .1  330.51    .013  346.24      .1  388.97    .035  524.73
.1
  578.99    .013  657.93      .1  782.82      .1

Bank Sta: Left   Right    Coeff Contr.   Expan.
        234.86  282.61            .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     340     580   831.8       F
     640  782.82   833.2       F

Downstream  Deck/Roadway Coordinates
    num=       6
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
     380  829.21     820   391.9   830.2     820     392   830.2   828.2
   433.5   830.2   828.2   433.6   830.2     820     442   830.4     820

Downstream Bridge Cross Section Data
Station Elevation Data    num=     487
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  834.02    1.12  833.95    2.93  833.84    3.16  833.82    4.34
833.79
    6.93  833.84    8.34  833.87    9.18  833.95    9.92  834.01   11.66
834.29
   13.79  834.64   14.93   834.7   15.43   834.7   20.67  835.04   20.84
835.05
   21.04  835.05   25.86  834.71   26.31  834.63   27.67  834.57   30.38
834.49
   31.64   834.4   31.75  834.39   31.96  834.39   35.84  834.14   37.27
833.87
   37.31  833.87   41.91  833.82   42.72   833.7   46.41   833.6   46.73
833.6
   46.89  833.57   48.21   833.4   50.02  833.44   53.77  833.67   57.34
833.69
   57.79   833.7   59.29  833.58   59.39  833.57   59.76  833.57   64.92
833.54
```

```
   66.04  833.53   70.45  833.53   71.74  833.54   74.45  833.48   75.32
833.39
   75.98  833.36    80.2  833.34   81.73  833.24   85.57  833.19   85.71
833.19
   85.95  833.17   88.09  833.07    91.3  833.04   92.61  833.06    92.8
833.07
   94.52  833.04   96.85  833.01   97.09     833   98.16  832.96  103.64
832.76
  103.97  832.75  105.79  832.76  108.62  832.86  109.75  832.93   111.7
832.82
  113.77  832.37  114.98  832.16  115.45  832.05  121.02  831.77  122.81
831.83
  124.89  831.89  126.55  831.75  127.57  831.77  131.34  831.74  132.14
831.68
  137.33  831.77  137.73  831.76  137.82  831.76  138.01  831.77  141.97
831.74
  142.11  831.74  143.43   831.6  144.69  831.49   147.5  831.23  149.14
831.23
  153.04  831.02  153.75  830.92  154.66  830.87  158.79  830.81  159.93
830.69
  160.24  830.61  164.38  830.28  164.72  830.28  165.84  830.23  166.73
830.24
  171.21  830.33  171.52  830.35   172.2  830.38   173.9  830.47  177.18
830.68
  182.45  830.49  182.78  830.63  183.79  830.94  191.18  830.98  196.86
830.94
  197.65  830.97  197.99  831.01  201.44  830.83  201.57  830.83   206.6
830.72
  209.15  830.69  219.33  830.76  223.44  830.46  227.12  830.31  227.78
830.26
  231.18     830  232.34     830  232.68  829.98   233.9  830.01  236.76
830.02
  237.66  829.99  238.17  829.95   240.5  829.91  242.34  829.89  243.07
829.94
  243.74  830.02   244.9  830.03  248.87  830.04  249.45  830.01  252.02
829.97
  253.39  829.93  253.73  829.92  254.96  829.91  259.44  829.96   260.5
829.95
  261.67  829.97  264.51  829.95  265.79  829.94  266.01  829.93  266.47
829.94
  270.18     830   271.5  829.93  271.53  829.93  275.74  829.85  276.03
829.85
  277.38  829.92  279.24  829.95   282.4  829.93  282.85  829.92  286.75
829.86
  288.01  829.87  288.35  829.87   288.6  829.86   292.5  829.87  293.94
829.81
  298.26  829.83  298.89  829.81  299.59  829.78  301.34   829.8  303.74
829.83
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  304.99  829.78  305.18  829.76  305.73  829.76  310.54  829.69  311.42
829.69
   311.5   829.7  315.76  829.97  328.13     830  339.19  830.02  343.23
829.61
   343.4   829.6  343.61   829.6  344.94  829.64  347.85  829.55  349.15
829.53
  350.35  829.56  350.79  829.57  351.14  829.59  355.01  829.58  356.07
829.63
  356.61  829.61  358.23  829.61  360.62  829.57  361.84  829.46  362.41
829.44
  363.41  829.39  365.71   829.3  366.38  829.28  368.03  829.19  368.12
829.19
  368.35  829.18  372.29  829.15  373.58  829.06  374.02  829.04  375.79
829.06
  378.28   829.1  379.04     829  381.34  829.21  382.16   829.2   383.3
829.15
  385.08  829.05  385.25  829.06  385.83  829.08  388.77   828.4  390.16
828.08
  390.91  827.85  391.71   827.6  393.14  827.08  393.39  826.95  395.97
825.1
  397.24  824.59  397.56  824.46  399.55  824.24  401.28     824  401.95
823.91
  402.28  823.95   403.3  824.07  406.53  824.04  409.43  824.07   410.3
824.12
  413.73  824.18  414.37  824.06  415.14  823.89  417.96   822.8  419.48
822.29
  419.66  822.29  420.36  822.26  420.98  822.24  422.37   822.3  425.19
822.39
  430.66  822.88  430.96  822.93  431.24  823.03  432.57  823.69  433.57
824.5
  435.56  826.68  439.06  828.47  442.61   830.4  443.28  830.68  444.37
830.78
  446.54  830.96  448.61  831.05  449.87  831.05  450.28  831.07  452.14
831.14
  454.32  831.16  455.53  831.17  455.99  831.15  459.38  831.27  460.44
831.3
   465.8  831.83  466.07  831.87  466.19  831.87  467.53  831.75  469.35
831.81
  471.88  831.89  473.15  831.88  473.47  831.86  474.25  831.86  477.58
831.88
     479  831.72  479.27  831.68  480.72  831.52  483.42  831.24  484.52
831.16
  485.02  831.11  485.55  831.06  489.39  830.65  490.15   830.5  492.31
830.17
  495.96  829.92  496.82  829.75  501.73  827.73  502.36   827.5  502.55
827.45
  505.64  826.92  507.08  826.47  510.03   826.6  512.98  826.73  514.24
826.65
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  520.14  826.97  520.25  826.97  524.64  826.96  526.64  826.96  530.42
826.99
   530.7  826.97  533.13  826.97  537.23  826.85  537.82  826.84  537.87
826.84
  538.19  826.82  542.75  826.89  543.73  826.96  547.34   826.8  548.11
826.83
   549.5  826.75  550.31  826.75  554.17  826.72  554.54  826.67  555.78
826.53
  560.14  826.68  560.28  826.68  561.62  826.64  563.26  826.64  566.08
826.66
  567.45   826.7  567.69   826.7  571.98  826.67  572.02  826.67  573.74
826.8
  577.56  826.75  578.01  826.75  578.67  826.65  579.61  826.51  582.19
826.66
  585.55  826.83  591.39   826.9  591.61   826.9  591.81  826.91  596.03
826.99
  597.38  826.86  597.67  826.86  599.52  826.87  606.28  826.87  608.71
826.88
  609.57  826.91  613.98  827.05  614.36  827.01   615.5  826.88  616.42
826.87
  621.26  826.72  621.52  826.72  623.28  826.78  626.38  826.89  627.61
826.85
  629.35  826.86  631.89  826.77   633.6  826.74  633.96  826.73  635.08
826.73
  639.62  826.74  641.04  826.74  644.07   826.7  644.95  826.68  645.67
826.65
   651.1  826.69  651.69  826.65  652.86  826.71  657.31  826.83  657.76
826.81
  658.34  826.81  663.84  826.68   665.1  826.66  669.55  826.59  669.84
826.59
  670.41  826.58  674.26  826.71   675.6  826.62  676.38  826.59  681.79
826.4
  681.94  826.39  683.49  826.41  686.28  826.46  686.68  826.42  687.92
826.28
  689.01  826.24  689.88  826.19  694.07  825.95  696.14  825.94  698.94
826.06
  700.18  826.07  701.66  826.06  705.01  825.96  706.31  825.94  711.79
825.91
  712.37  825.91  712.44   825.9  712.77  825.92  716.97  826.18   718.2
826.14
  721.89  826.11   723.3  826.11  724.77  825.97  728.66  825.93  729.23
825.93
  730.84     826  737.36     826  743.02  826.01  747.01  826.02  749.19
826.05
  753.37  826.13  754.47  826.06  755.16  826.07  758.78  826.08  760.51
825.97
  761.07  825.99  764.98  826.16  767.18  826.16  771.09   826.3   773.2
826.27
```



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  774.96  826.32   779.1  826.34  783.36   826.4  783.48  826.41  784.99
826.47
  790.93  826.55  792.95  826.62   796.5  826.72  796.77  826.73  800.85
826.83
  801.01  826.82  802.55  826.61  802.81  826.61  804.32   826.6  808.44
826.59
  809.13  826.59  814.27  826.63  815.82   826.7   820.1  826.66  820.21
826.65
  820.58  826.66  825.32  826.78  825.97  826.76  827.97  826.79  829.99
826.86
  830.77  826.89  831.58  826.96  836.31  826.91  837.35  826.91  840.06
826.89
  841.36  826.95  842.05  826.85   842.9  826.83   845.8  827.01  847.05
827.06
  847.77  826.99  848.71  826.92  853.81  827.13  854.23  827.14  854.46
827.14
  859.77  827.09  861.12  827.17  864.55  827.24  868.01  827.47  869.59
827.5
  870.72  827.52  871.27  827.56  874.94  827.75  876.37  827.64  876.56
827.64
  881.97   827.8  884.17  827.93  887.14  828.06  892.28   828.1   892.6
828.03
  894.11  828.03  897.39  828.15   897.9  828.18  900.94  828.12  903.51
828.09
  904.44  828.23  908.58  828.53   908.8  828.54  909.42  828.56  912.57
828.84
  913.62  829.06  914.04  829.14  915.23  829.25  919.09  829.43  919.36
829.42
  923.15  830.03  923.45  830.06  924.05   830.1  924.76  830.14  925.08
830.16
  930.21  830.98  931.02  831.09  938.26  831.54  938.57  831.56  939.31
831.76
  939.56  831.79  941.13  831.87  944.63  832.43  945.89  832.51  949.92
833.94
  953.67  835.19  955.91  836.27

Manning's n Values        num=      13
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0     .03   48.21    .013   111.7     .03  232.34    .013  385.25
.07
  401.28     .06  433.57     .07  439.06     .03  466.07    .013  477.58
.1
  533.13    .035  923.15      .1  955.91      .1

Bank Sta: Left   Right    Coeff Contr.   Expan.
        385.25  439.06             .1       .3
Ineffective Flow     num=       3
```

Sta L	Sta R	Elev	Permanent
186	232	850	T
313	342	845	T
475	950	831.88	F

```
Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =       1
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Pressure and Weir flow
           Submerged Inlet Cd          =
           Submerged Inlet + Outlet Cd =      .8
           Max Low Cord                =

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Oldtown Creek
REACH: Reach              RS: 394.7476

INPUT
Description: 3+95
Station Elevation Data    num=     487
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  834.02    1.12  833.95    2.93  833.84    3.16  833.82    4.34
833.79
    6.93  833.84    8.34  833.87    9.18  833.95    9.92  834.01   11.66
834.29
```



```
   13.79  834.64   14.93   834.7   15.43   834.7   20.67  835.04   20.84
835.05
   21.04  835.05   25.86  834.71   26.31  834.63   27.67  834.57   30.38
834.49
   31.64   834.4   31.75  834.39   31.96  834.39   35.84  834.14   37.27
833.87
   37.31  833.87   41.91  833.82   42.72   833.7   46.41   833.6   46.73
833.6
   46.89  833.57   48.21   833.4   50.02  833.44   53.77  833.67   57.34
833.69
   57.79   833.7   59.29  833.58   59.39  833.57   59.76  833.57   64.92
833.54
   66.04  833.53   70.45  833.53   71.74  833.54   74.45  833.48   75.32
833.39
   75.98  833.36    80.2  833.34   81.73  833.24   85.57  833.19   85.71
833.19
   85.95  833.17   88.09  833.07    91.3  833.04   92.61  833.06    92.8
833.07
   94.52  833.04   96.85  833.01   97.09     833   98.16  832.96  103.64
832.76
  103.97  832.75  105.79  832.76  108.62  832.86  109.75  832.93   111.7
832.82
  113.77  832.37  114.98  832.16  115.45  832.05  121.02  831.77  122.81
831.83
  124.89  831.89  126.55  831.75  127.57  831.77  131.34  831.74  132.14
831.68
  137.33  831.77  137.73  831.76  137.82  831.76  138.01  831.77  141.97
831.74
  142.11  831.74  143.43   831.6  144.69  831.49   147.5  831.23  149.14
831.23
  153.04  831.02  153.75  830.92  154.66  830.87  158.79  830.81  159.93
830.69
  160.24  830.61  164.38  830.28  164.72  830.28  165.84  830.23  166.73
830.24
  171.21  830.33  171.52  830.35   172.2  830.38   173.9  830.47  177.18
830.68
  182.45  830.49  182.78  830.63  183.79  830.94  191.18  830.98  196.86
830.94
  197.65  830.97  197.99  831.01  201.44  830.83  201.57  830.83   206.6
830.72
  209.15  830.69  219.33  830.76  223.44  830.46  227.12  830.31  227.78
830.26
  231.18     830  232.34     830  232.68  829.98   233.9  830.01  236.76
830.02
  237.66  829.99  238.17  829.95   240.5  829.91  242.34  829.89  243.07
829.94
  243.74  830.02   244.9  830.03  248.87  830.04  249.45  830.01  252.02
829.97
```

253.39 829.93 253.73 829.92 254.96 829.91 259.44 829.96 260.5 829.95
261.67 829.97 264.51 829.95 265.79 829.94 266.01 829.93 266.47 829.94
270.18 830 271.5 829.93 271.53 829.93 275.74 829.85 276.03 829.85
277.38 829.92 279.24 829.95 282.4 829.93 282.85 829.92 286.75 829.86
288.01 829.87 288.35 829.87 288.6 829.86 292.5 829.87 293.94 829.81
298.26 829.83 298.89 829.81 299.59 829.78 301.34 829.8 303.74 829.83
304.99 829.78 305.18 829.76 305.73 829.76 310.54 829.69 311.42 829.69
311.5 829.7 315.76 829.97 328.13 830 339.19 830.02 343.23 829.61
343.4 829.6 343.61 829.6 344.94 829.64 347.85 829.55 349.15 829.53
350.35 829.56 350.79 829.57 351.14 829.59 355.01 829.58 356.07 829.63
356.61 829.61 358.23 829.61 360.62 829.57 361.84 829.46 362.41 829.44
363.41 829.39 365.71 829.3 366.38 829.28 368.03 829.19 368.12 829.19
368.35 829.18 372.29 829.15 373.58 829.06 374.02 829.04 375.79 829.06
378.28 829.1 379.04 829 381.34 829.21 382.16 829.2 383.3 829.15
385.08 829.05 385.25 829.06 385.83 829.08 388.77 828.4 390.16 828.08
390.91 827.85 391.71 827.6 393.14 827.08 393.39 826.95 395.97 825.1
397.24 824.59 397.56 824.46 399.55 824.24 401.28 824 401.95 823.91
402.28 823.95 403.3 824.07 406.53 824.04 409.43 824.07 410.3 824.12
413.73 824.18 414.37 824.06 415.14 823.89 417.96 822.8 419.48 822.29
419.66 822.29 420.36 822.26 420.98 822.24 422.37 822.3 425.19 822.39
430.66 822.88 430.96 822.93 431.24 823.03 432.57 823.69 433.57 824.5
435.56 826.68 439.06 828.47 442.61 830.4 443.28 830.68 444.37 830.78
446.54 830.96 448.61 831.05 449.87 831.05 450.28 831.07 452.14 831.14
454.32 831.16 455.53 831.17 455.99 831.15 459.38 831.27 460.44 831.3

465.8 831.83 466.07 831.87 466.19 831.87 467.53 831.75 469.35 831.81
471.88 831.89 473.15 831.88 473.47 831.86 474.25 831.86 477.58 831.88
479 831.72 479.27 831.68 480.72 831.52 483.42 831.24 484.52 831.16
485.02 831.11 485.55 831.06 489.39 830.65 490.15 830.5 492.31 830.17
495.96 829.92 496.82 829.75 501.73 827.73 502.36 827.5 502.55 827.45
505.64 826.92 507.08 826.47 510.03 826.6 512.98 826.73 514.24 826.65
520.14 826.97 520.25 826.97 524.64 826.96 526.64 826.96 530.42 826.99
530.7 826.97 533.13 826.97 537.23 826.85 537.82 826.84 537.87 826.84
538.19 826.82 542.75 826.89 543.73 826.96 547.34 826.8 548.11 826.83
549.5 826.75 550.31 826.75 554.17 826.72 554.54 826.67 555.78 826.53
560.14 826.68 560.28 826.68 561.62 826.64 563.26 826.64 566.08 826.66
567.45 826.7 567.69 826.7 571.98 826.67 572.02 826.67 573.74 826.8
577.56 826.75 578.01 826.75 578.67 826.65 579.61 826.51 582.19 826.66
585.55 826.83 591.39 826.9 591.61 826.9 591.81 826.91 596.03 826.99
597.38 826.86 597.67 826.86 599.52 826.87 606.28 826.87 608.71 826.88
609.57 826.91 613.98 827.05 614.36 827.01 615.5 826.88 616.42 826.87
621.26 826.72 621.52 826.72 623.28 826.78 626.38 826.89 627.61 826.85
629.35 826.86 631.89 826.77 633.6 826.74 633.96 826.73 635.08 826.73
639.62 826.74 641.04 826.74 644.07 826.7 644.95 826.68 645.67 826.65
651.1 826.69 651.69 826.65 652.86 826.71 657.31 826.83 657.76 826.81
658.34 826.81 663.84 826.68 665.1 826.66 669.55 826.59 669.84 826.59
670.41 826.58 674.26 826.71 675.6 826.62 676.38 826.59 681.79 826.4
681.94 826.39 683.49 826.41 686.28 826.46 686.68 826.42 687.92 826.28
689.01 826.24 689.88 826.19 694.07 825.95 696.14 825.94 698.94 826.06

```
  700.18  826.07  701.66  826.06  705.01  825.96  706.31  825.94  711.79
825.91
  712.37  825.91  712.44   825.9  712.77  825.92  716.97  826.18   718.2
826.14
  721.89  826.11   723.3  826.11  724.77  825.97  728.66  825.93  729.23
825.93
  730.84     826  737.36     826  743.02  826.01  747.01  826.02  749.19
826.05
  753.37  826.13  754.47  826.06  755.16  826.07  758.78  826.08  760.51
825.97
  761.07  825.99  764.98  826.16  767.18  826.16  771.09   826.3   773.2
826.27
  774.96  826.32   779.1  826.34  783.36   826.4  783.48  826.41  784.99
826.47
  790.93  826.55  792.95  826.62   796.5  826.72  796.77  826.73  800.85
826.83
  801.01  826.82  802.55  826.61  802.81  826.61  804.32   826.6  808.44
826.59
  809.13  826.59  814.27  826.63  815.82   826.7   820.1  826.66  820.21
826.65
  820.58  826.66  825.32  826.78  825.97  826.76  827.97  826.79  829.99
826.86
  830.77  826.89  831.58  826.96  836.31  826.91  837.35  826.91  840.06
826.89
  841.36  826.95  842.05  826.85   842.9  826.83   845.8  827.01  847.05
827.06
  847.77  826.99  848.71  826.92  853.81  827.13  854.23  827.14  854.46
827.14
  859.77  827.09  861.12  827.17  864.55  827.24  868.01  827.47  869.59
827.5
  870.72  827.52  871.27  827.56  874.94  827.75  876.37  827.64  876.56
827.64
  881.97   827.8  884.17  827.93  887.14  828.06  892.28   828.1   892.6
828.03
  894.11  828.03  897.39  828.15   897.9  828.18  900.94  828.12  903.51
828.09
  904.44  828.23  908.58  828.53   908.8  828.54  909.42  828.56  912.57
828.84
  913.62  829.06  914.04  829.14  915.23  829.25  919.09  829.43  919.36
829.42
  923.15  830.03  923.45  830.06  924.05   830.1  924.76  830.14  925.08
830.16
  930.21  830.98  931.02  831.09  938.26  831.54  938.57  831.56  939.31
831.76
  939.56  831.79  941.13  831.87  944.63  832.43  945.89  832.51  949.92
833.94
  953.67  835.19  955.91  836.27
```



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Manning's n Values        num=      13
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0     .03   48.21    .013   111.7     .03  232.34    .013  385.25
.07
  401.28     .06  433.57     .07  439.06     .03  466.07    .013  477.58
.1
  533.13    .035  923.15      .1  955.91      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        385.25  439.06           158.45  152.51  147.17             .1
.3
Ineffective Flow     num=       3
   Sta L   Sta R    Elev  Permanent
     186     232     850       T
     313     342     845       T
     475     950  831.88       F

CROSS SECTION


RIVER: Oldtown Creek
REACH: Reach              RS: 242.2423

INPUT
Description: FIS C-C
Station Elevation Data    num=     476
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  833.58     .02  833.58     .65  833.53    2.08  833.64    4.52
833.79
    5.87  833.75     6.9  833.68   12.39  833.03   13.72  833.22   14.29
833.25
   15.25  833.22   18.34  832.98   23.95  833.19   24.16  833.24   26.05
833.2
   34.35  832.99   35.29  833.02   40.93  832.99    45.1  832.72   46.17
832.61
   46.41  832.61   50.67   832.5   52.98  832.46    56.2  832.45   56.49
832.45
   62.16  832.57   65.18  832.37   67.33  832.48   67.43  832.47   67.63
832.49
   72.38  832.32   74.33  832.02   77.74   831.5   79.87  831.45   79.95
831.44
   80.08  831.46   84.09  831.65   85.81  831.62   87.33  831.54   91.62
831.03
    96.6  830.91   96.72  830.91   96.87  830.89   97.32   830.9   100.9
830.94
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  107.18  830.59   107.8  830.56   108.1  830.54  113.76  830.33  118.57
830.13
  118.86  830.09  119.76  829.98  121.67  829.52  122.18   829.4  126.44
829.16
  129.59  828.81  130.66  828.84  135.38  828.67  137.54  828.62  139.62
828.57
  140.41  828.44  140.88   828.4  144.63  828.22  145.32  828.18  151.29
828.07
  152.06   828.1  156.81  828.11  158.85  827.91  161.79  827.94  167.85
827.92
  170.26  827.97  172.04  827.98  172.81  827.95  176.08  827.86  178.27
827.5
  178.46  827.48   178.6  827.47  182.98  827.17  185.15  826.74  185.22
826.72
  185.26  826.72  188.71  826.75  191.28  826.59  195.47  826.52  196.57
826.56
  197.76  826.56  201.59  826.59  202.01   826.6  205.95  826.26  206.04
826.26
  212.19  826.27  215.27  826.33  217.47  826.28  218.46  826.31  218.72
826.33
  220.33  826.24  223.94  826.13  224.28  826.12  227.78  826.35  228.56
826.36
  229.52  826.45  231.85  826.37  234.13  826.33  235.04  826.34  237.15
826.56
  241.16  826.54  245.42  826.69   246.3  826.85  246.95  826.76  256.19
826.87
  256.93  826.88  257.19  826.86  258.38  826.88  263.12  826.88  263.93
826.81
  264.44  826.83  268.09  826.95  269.46  827.01  269.79  827.05  274.11
827.23
   275.6  827.09  277.74  827.27  279.72  827.29  285.08  827.29  285.45
827.27
   286.1  827.26  287.14   827.4  288.79  827.46  291.21  827.24  291.48
827.24
  292.78  827.23  293.57  827.24  297.05  827.23  297.31  827.21  298.51
827.18
  299.71  827.21  302.82  827.24  303.87  827.22   304.3  827.19  305.13
827.18
  308.68  827.23  310.85  827.32  314.43  827.49  315.83  827.54  316.66
827.53
  318.56  827.46  320.29  827.31   321.5  827.33  321.67  827.31  321.83
827.3
  322.49  827.25  324.47  827.07  326.06  826.96  331.24  823.77  332.31
823.1
  332.89  822.79   333.5  822.64  334.15  822.59  337.38  822.12  338.25
822
  341.72  821.85  342.79  821.89   343.6   821.9  345.65  822.11  345.91
822.14
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  348.25  822.49  353.13  822.81  355.07  823.12  356.92  823.77  358.48
823.92
  359.86   824.1  361.18  824.23  361.83  824.24  364.07  825.38  366.79
826.07
  369.33  826.36  371.63  826.62  371.94  826.69  373.05  827.16  376.28
828.71
  378.56  829.46  379.32  829.55  384.86   829.6   385.1   829.6  385.23
829.61
  389.57  829.99  390.13  830.13  391.05  830.38  394.31  830.41  395.27
830.42
  395.55  830.41  398.48  830.53  400.29   830.5  401.55  830.23  402.59
830.02
  404.48     830  404.82  829.99     408  829.62  408.78  829.54  412.27
828.6
  412.91  828.37  413.06  828.31  414.38  827.69  419.74  825.81  419.81
825.78
  419.89  825.75   420.3  825.57  423.76  825.36  425.07   825.3  425.79
825.15
  425.91  825.13  431.74  826.08  431.83  826.08   431.9  826.09     432
826.09
  432.11   826.1  434.71  826.09  437.17  826.04  438.03  826.06  438.25
826.05
  441.77  825.64  442.78  825.54  443.56  825.49   446.1  825.45  448.66
825.38
  449.49  825.43  454.66  825.58  455.44  825.58  456.79  825.61  461.28
825.59
  462.71   825.6  467.28  825.51  467.62  825.51  471.86  825.57  472.34
825.59
  473.37  825.54  479.21  825.74  479.46  825.74  484.95  825.67  489.63
825.57
  489.73  825.57  491.32  825.87     496  825.81  497.21   825.8  503.15
825.82
  505.79  825.88  508.81     826  509.21  825.97  510.75  825.99  513.75
825.96
  514.56  826.01  515.27  826.06  519.69  826.16  519.75  826.16   521.2
826.02
  525.98  825.91  527.18  825.83  533.11  825.92  534.46  825.91  539.14
825.98
  541.48  826.05  542.03  825.96     545  825.62  545.65  825.65  549.98
825.72
  551.21  825.74  555.69  825.76  557.24  825.58   561.9  825.56  565.34
825.51
  567.75  825.56  568.18   825.5  569.31  825.44  574.41  825.47  575.38
825.42
   580.8  825.41  581.47   825.4  582.95  825.39   585.9  825.37  586.44
825.35
  587.49  825.38  593.53  825.47  593.69  825.47  599.49  825.57   599.6
825.58
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  599.77  825.58  602.27  825.62  604.06  825.53  605.21  825.33  605.57
825.28
   616.3  825.25  617.41  825.09  617.87  825.02  622.04  825.14  622.34
825.14
  622.45  825.12  623.99  824.95   628.7   825.1  630.09  825.09  630.14
825.08
  630.53  825.09  634.78  825.06  636.19  824.83  636.34  824.81  636.49
824.82
  641.89  824.87  642.47  824.96  648.56  825.03  653.63  825.24   654.6
825.2
  655.44  825.25  657.57  825.15  659.15  825.08  659.41   825.1  660.75
825.05
  666.91  825.08  671.87  825.05  672.68  825.03  672.88  825.04  673.25
825.05
  675.72  825.04  678.69  825.06  678.83  825.06  679.73  825.09  683.38
825.28
  684.46  825.24  684.94  825.24  689.84  825.17  690.25  825.16  692.65
825.12
  695.56  825.06  695.83  825.05  701.23   825.4  702.25  825.26  702.75
825.23
  706.08  825.32  708.71  825.48   708.9  825.48  714.56  825.54  716.74
825.58
  718.92  825.58  719.69  825.57  720.39  825.53  726.25  825.55  732.02
825.58
   732.1  825.58  737.23  825.66   737.7  825.66  738.05  825.65  742.09
825.56
   743.4  825.57  743.65  825.56  743.79  825.57   749.4  825.71  750.14
825.81
  751.09  825.94  751.38  825.96  759.33  825.92  760.75  826.03  766.58
826.15
  770.97  826.37  771.93  826.43  772.11  826.44  772.85  826.44  779.51
826.79
   785.1  827.16  788.59  827.23  788.62  827.23  794.62  827.46  799.08
827.66
   803.8  828.11  805.08  828.12  810.33  828.32  810.54  828.32  811.71
828.42
  818.43  828.91  824.39  829.29   828.6  829.87  829.21  829.91  829.46
829.9
  831.42  829.83     832  829.87  836.16  830.38  836.58  830.44  837.33
830.63
  839.72  831.19  841.54  831.24  842.76  831.32  848.19  831.58   849.1
831.81
  851.77  832.52  853.11  832.64  853.52  832.62  857.43  833.14  857.91
833.21
  862.73  833.93  862.88  833.93  864.16  833.98  867.44   834.5  869.33
834.76
  873.57  835.54  874.67  835.54  879.88  836.08  881.52  836.35  884.01
836.91
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  884.75  836.95  885.28  836.98  889.71   837.3  893.59  837.89  894.53
838.05
   899.4  838.84  899.86  838.93  901.87  839.52  904.25  840.15  906.43
840.69
  909.97  841.57  910.25  841.67  910.46  841.73  910.65  841.76  911.67
842.01
  915.43   842.9  916.35  842.99  916.69  843.02  916.71  843.02  916.95
843.06
   917.6  843.17  920.92  843.79  921.18  843.92  924.61  844.53  927.48
844.61
  931.44  845.48  932.04  845.73  935.67   846.9  936.69  847.16  937.11
847.2
  939.67  847.44  941.88  847.98  944.36  848.78  947.58  849.65  947.77
849.75
  951.75  850.53  952.96  850.89  954.76  851.24  958.36  852.15  961.19
852.64
  968.87  853.89     969  853.91  969.07  853.92  969.17  853.94  969.35
853.97
  975.35  855.13  978.86  855.89  979.67  856.06  985.08  856.94  990.07
858.23
  995.26  858.98  996.82  859.44 1000.27  860.49 1000.68  860.49 1005.76
861.32
 1005.78  861.32 1006.35  861.36 1013.88  862.02 1014.64  862.11 1017.57
862.58
 1019.04   862.8 1019.76  862.85 1026.25   862.9 1027.48  862.86 1028.17
862.89
  1029.3  862.88  1033.6   862.3 1034.86  862.23 1035.15  862.24  1035.8
862.18
 1037.25  862.11

Manning's n Values        num=      12
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0      .1  182.98     .03  302.82      .1  326.06     .07   333.5
.06
  355.07     .07  373.05      .1  389.57    .013  400.29      .1  434.71
.035
  879.88      .1 1037.25      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
       326.06  373.05                0       0       0             .1
.3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
     400     840  830.53       F
```

SUMMARY OF MANNING'S N VALUES

River:Oldtown Creek

Reach	River Sta.	n1	n2	n3	n4	n5	n6	n7	n8	n9	n10	n11	n12	n13
Reach	1401.062	.035	.013	.07	.06	.07	.1	.035	.1	.013	.1	.1		
Reach	1109.832	.013	.03	.013	.1	.07	.06	.07	.1	.013	.1	.035	.1	.1
Reach	796.1590	.03	.1	.07	.06	.07	.1	.013	.1	.035	.1	.1		
Reach	703.7970	.013	.03	.1	.06	.06	.06	.1	.013	.1	.035	.1	.1	
Reach	679.82	Bridge												
Reach	651.5802	.013	.03	.1	.06	.06	.06	.1	.013	.1	.035	.1	.1	
Reach	545.1257	.03	.1	.07	.06	.07	.1	.013	.1	.035	.1	.013	.1	.1
Reach	492.3110	.03	.1	.07	.06	.07	.1	.013	.1	.035	.1	.013	.1	.1
Reach	431	Bridge												
Reach	394.7476	.03	.013	.03	.013	.07	.06	.07	.03	.013	.1	.035	.1	.1
Reach	242.2423	.1	.03	.1	.07	.06	.07	.1	.013	.1	.035	.1	.1	

SUMMARY OF REACH LENGTHS

River: Oldtown Creek

Reach	River Sta.	Left	Channel	Right
Reach	1401.062	293.81	291.23	319.49
Reach	1109.832	308.79	313.67	310.72
Reach	796.1590	96.02	92.36	85.26
Reach	703.7970	56.86	52.22	53.96
Reach	679.82	Bridge		
Reach	651.5802	111.44	106.45	103.86
Reach	545.1257	46.6	52.81	53.82
Reach	492.3110	95.23	97.56	102.88
Reach	431	Bridge		
Reach	394.7476	158.45	152.51	147.17
Reach	242.2423	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Oldtown Creek

Reach	River Sta.	Contr.	Expan.
Reach	1401.062	.1	.3
Reach	1109.832	.1	.3
Reach	796.1590	.1	.3
Reach	703.7970	.1	.3
Reach	679.82	Bridge	
Reach	651.5802	.1	.3
Reach	545.1257	.1	.3
Reach	492.3110	.1	.3
Reach	431	Bridge	
Reach	394.7476	.1	.3
Reach	242.2423	.1	.3

Profile Output Table - Bridge Only

Reach	River Sta	Profile	E.G. US. (ft)	Min El Prs (ft)	BR Open Area (sq ft)	Prs O WS (ft)	Q Total (cfs)	Min El Weir Flow (ft)	Q Weir (cfs)	Delta EG (ft)	BR Sluice Coef
Reach	679.82	100 yr	831.66	852.59	6010.63						
	2000.00		832.74							0.04	
Reach	431	100 yr	831.41	828.20	105.33						
	2000.00		829.01					999.58		1.17	

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach	1401.062	100 yr	2000.00	826.35	833.28	831.44	833.34	0.001744	2.00	975.43	487.75	0.19
Reach	1109.832	100 yr	2000.00	824.36	832.05	830.75	832.39	0.006510	5.43	576.73	573.55	0.41
Reach	796.1590	100 yr	2000.00	824.79	831.65	829.55	831.72	0.000876	2.04	1012.12	641.72	0.15
Reach	703.7970	100 yr	2000.00	827.00	831.58	829.41	831.66	0.000552	1.68	1022.92	658.70	0.15
Reach	679.82	Bridge										
Reach	651.5802	100 yr	2000.00	824.42	831.55	829.37	831.62	0.000684	2.42	1011.37	651.29	0.18
Reach	545.1257	100 yr	2000.00	823.31	831.34	829.14	831.49	0.002493	3.93	875.67	590.63	0.27
Reach	492.3110	100 yr	2000.00	824.46	831.36	828.71	831.41	0.000457	1.59	1146.96	642.63	0.12
Reach	431	Bridge										
Reach	394.7476	100 yr	2000.00	822.24	829.23	827.95	830.25	0.017572	8.11	248.18	490.05	0.67
Reach	242.2423	100 yr	2000.00	821.85	829.10	827.67	829.26	0.002156	3.11	630.56	661.48	0.24

APPENDIX 6: ODOT LD-52 FLOODPLAIN LETTER OF NOTIFICATION

WOOLPERT
ARCHITECTURE | ENGINEERING | GEOSPATIAL

November 30, 2023

Al Kuzma
Chief Building Official
Greene County Dept. of Building Regulation
667 Dayton-Xenia Rd
Xenia, OH 45385

RE: GRE-68-12.65 (PID 115388)
Oldtown Ck. Crossing

Dear Al Kuzma, Chief Building Official:

The Ohio Department of Transportation project GRE-68-12.65 (PID 115388) encroaches upon a Special Flood Hazard Area Zone AE within your community.

The proposed project will construct a new pedestrian crossing over Old Town Creek and US 68 located between the Brush Row Rd. and ODNR's Great Council State Park Interpretive Center in Xenia Township.

Please provide your community's flood zone regulations if they differ from FEMA requirements and forward any questions you may have about the project. Future correspondence will include hydraulic calculations and required documentation for compliance. We will move forward with this project if no concerns are brought to our attention.

If you need additional information please contact me at 937.531.1392 or pat.plews@woolpert.com

Respectfully,

Patrick Plews, PE
Woolpert, Inc.

pjp Plews, Pat

Woolpert, Inc.
4454 Idea Center Boulevard
Dayton, OH 45430-1500
937.461.5660

Appendix E – Design Designations

Brush Row Road Vehicle Growth Rate 0.20%

Pedestrian Growth Rate 5%

Vehicular Design Designations

Location		US 68 (TFMS 2022)	Brush Row Road (TIMS 2022)
Current ADT (2022)	2022	8554	1386
Opening Year ADT (2026)	2026	8600	1400
Design Year ADT (2046)	2046	8800	1460
DHV (2019)	2019		166
DHV (2022)	2022	906	
DHV (2026)	2026	1200	170
DHV (2046)	2046	1200	180
Directional Distribution		50%	57%
Trucks (24 Hour B&C)		7%	2%
Td		5%	TBD

LMST Bicycle Volumes *

Bicycle Volume ADT			
		Weekday	Weekend
LMST North of Brush Row Rd		60	130
LMST South of Brush Row Rd		40	120

US 68 Pedestrian Volumes *

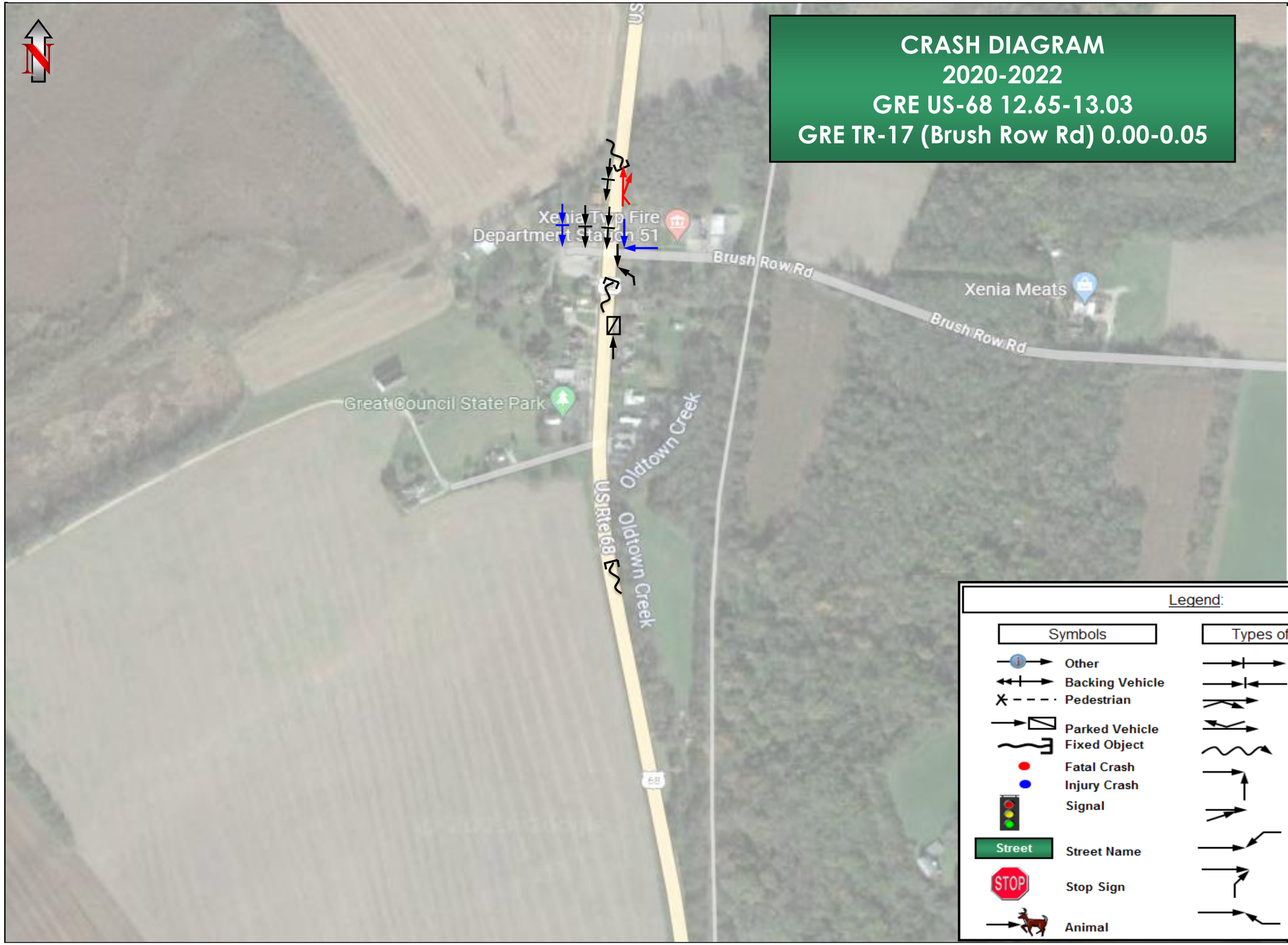
Pedestrian Volume ADT			
US 68 South of Brush Row Road		Weekday	Weekend
Current ADT (2021)	2021	12	10
Opening Year ADT (2026)	2026	15	13
Design Year ADT (2046)	2046	27	26
DHV (2021)	2021	6	5
DHV (2026)	2026	8	7
DHV (2046)	2046	14	14

*Asumed 50% of pedestrian ADT are in the peak hour

* Traffic Data obtained from 2021 StreetLight Data

Appendix F – Crash Diagram

CRASH DIAGRAM
2020-2022
GRE US-68 12.65-13.03
GRE TR-17 (Brush Row Rd) 0.00-0.05



Legend:

Symbols	Types of Collisions
Other	Rear End
Backing Vehicle	Head On
Pedestrian	Side-Swipe Passing
Parked Vehicle	Side-Swipe Meeting
Fixed Object	Out-of-Control
Fatal Crash	Angle
Injury Crash	Angle
Signal	Left Turn
Street Name	Right Turn
Stop Sign	Right Turn
Animal	

Appendix G – Traffic Signal Warrant Analysis Summary

STUDY AND ANALYSIS INFORMATION

Municipality:	Xenia Twp	**Traffic Volumes Obtained By:**	ODOT District 8
County:	Greene	**Analysis Date:**	10/23/2023
ODOT Engineering District:	8	**Agency/ Company Name Performing Warrant Analysis:**	Odot District 8
Google map link:	Map		

Analysis Information

Data Collection Date: 10/19/2023

Day of the Week: Thursday

Is the intersection in a built-up area of an isolated community of <10,000 population? Yes

Existing Traffic Signal at intersection: No

Total Number of Approaches at Intersection: 3

Major Street Information

Major Street Name and Route Number: US 68

Major Street Approach Direction: N-Bound / S-Bound

Number of Thru Lanes on Each Major Street Approach: 1 **LANE(S)**

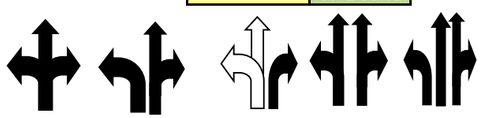
Speed Limit or 85th Percentile Speed on the Major Street*: 45 **MPH**

*Unknown assumes below 45 mph

Minor Street Information

Minor Street Name and Route Number: Brush Row Road

Minor Street Approach Configuration: E-Bound / W-Bound



1 2 3 4 5

Number of Thru Lanes on Each Minor Street Approach: 1 **LANE(S)**

Apply Right Turn Lane Reduction*: Yes

*Right Turn Lane Reduction Shall be used for Warrants 1, 2, & 3 for New ODOT Signals. Please refer to TEM 402-3.2 for clarification and criteria under which Right Turn Reduction is not required.

GRE US 68 Brush Row Rd 09-26-23 Final.xlsx

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Applicable?	Warrant Satisfied?	Notes and Comments:	
Warrant 1, Eight-Hour Vehicular Volume	Yes	**No**		
Warrant 2, Four-Hour Vehicular Volume	Yes	**No**		
Warrant 3, Peak Hour	Yes	**No**	Signals installed under Warrant 3 should be traffic actuated.	**Peak Hour**: 3:45 PM, 4:45 PM
For Warrants 1-3, new ODOT signals must be based off of 100% volume thresholds (TEM 402-3.2)				
Warrant 4, Pedestrian Volume	No		If this warrant is met, and a traffic control signal is justified by an engineering study, the traffic control signal shall be equipped with pedestrian signal heads complying with the provisions set forth in Chapter 4E of the OMUTCD.	**Peak Hour**: 3:30 PM, 4:30 PM
Warrant 5, School Crossing	No		N/A	
Warrant 6, Coordinated Signal System	No		(Shall not be used as the sole warrant in the analysis)	
Warrant 7, Crash Experience	No		If this is the sole warrant, signal must be semi-actuated with control devices which provide proper coordination if installed at an intersection within a coordinated system and normally should be fully traffic actuated if installed at an isolated intersection.	
Warrant 8, Roadway Network	No		(Shall not be used as the sole warrant in the analysis)	
Warrant 9, Intersection Near a Grade Crossing	No		Figure 4C-9	
Multi-Way Stop Warrant	No		May be used as an interim measure if traffic signal warrants are satisfied.	

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

If no warrants are satisfied, additional options may be considered:

1. An engineering study, performed by a firm prequalified by ODOT for signal design, if approved by the ODOT district, may be used to justify a new signal installation or retention of an existing signal that otherwise does not meet the published warrants. An example of such an instance is a traffic signal in proximity to a railroad crossing that serves to reduce queuing across the tracks.
2. According to TEM 402-2, If the actual turning movement counts fail to satisfy a signal warrant, it may be acceptable to use traffic volumes projected to the second year after project completion. The **Modeling and Forecasting Section** should provide the projected traffic volumes.
3. A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants (see Chapter 4C of TEM) or at a location that meets traffic signal warrants under Sections 4C.05 and/or 4C.06 but a decision is made to not install a traffic control signal. **Please fill inputs on PHB Score Sheet and submit to ODOT.**

Considerations such as geometrics and lack of sight distance generally have not been accepted in lieu of satisfying signal warrants. These considerations may allow an otherwise unwarranted traffic signal to be retained at **100 percent** local cost. Please review TEM 402-4 for details.

Conclusion:

Notes:

Appendix H – Pedestrian Hybrid Beacon Warrant Analysis

Figure 4F-1. Guidelines for the Installation of Pedestrian Hybrid Beacons on Low-Speed Roadways

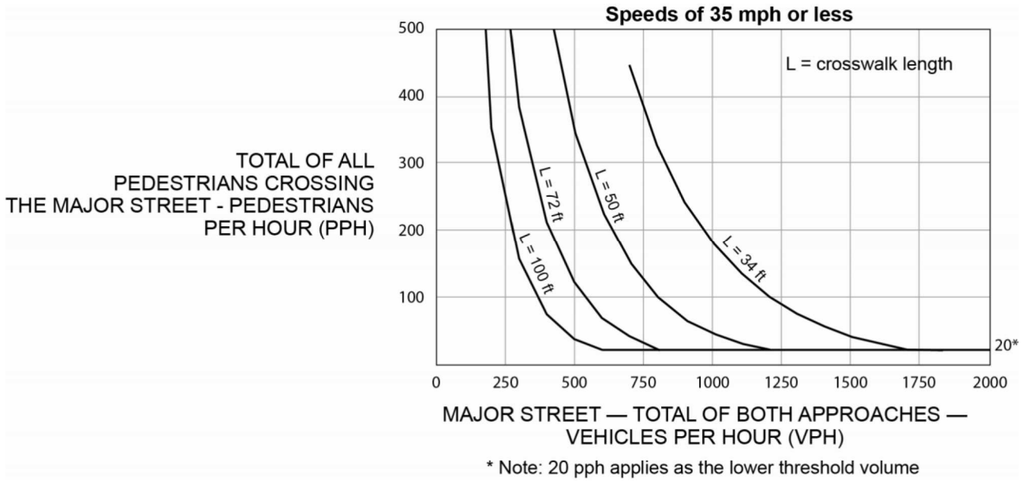
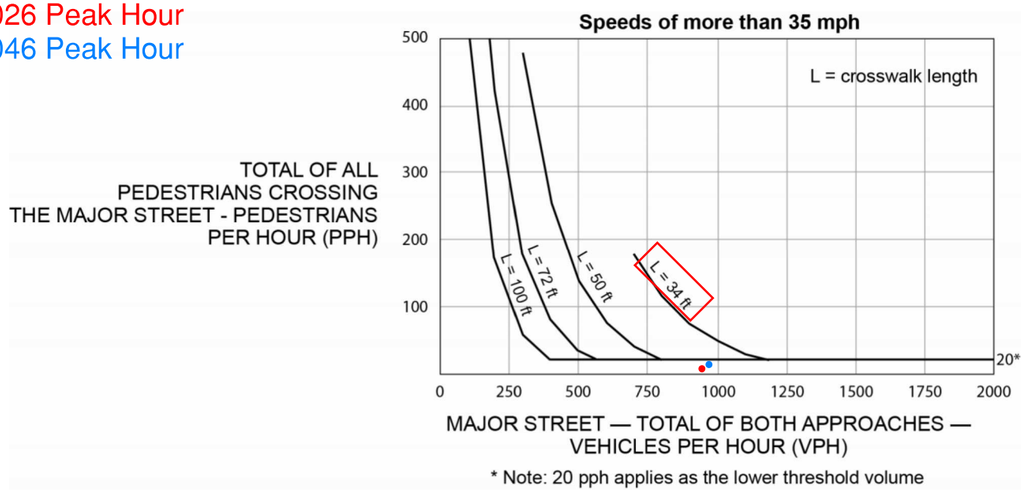


Figure 4F-2. Guidelines for the Installation of Pedestrian Hybrid Beacons on High-Speed Roadways

2026 Peak Hour
2046 Peak Hour



TFMS - Segment Forecast Report

Username	Email	Script Import Date	Script Version	Model Version
Alexander.Genbauffe	Alexander.Genbauffe@dot.ohio.gov	4/14/2020 5:30:19 PM	2020.001	2023.1900

Forecast Summary

Project ID	Project Name	Opening Year	Design Year
115388	GRE US 68 12.65	2026	2046

Project Description

Develop a Feasibility Study to analyze the construction of safe pedestrian and bicycle connections between the Ohio-To-Erie Trail (OTET)/ Little Miami Scenic Trail (LMST) and the new Shawnee Interpretive Education Center (currently under construction). C

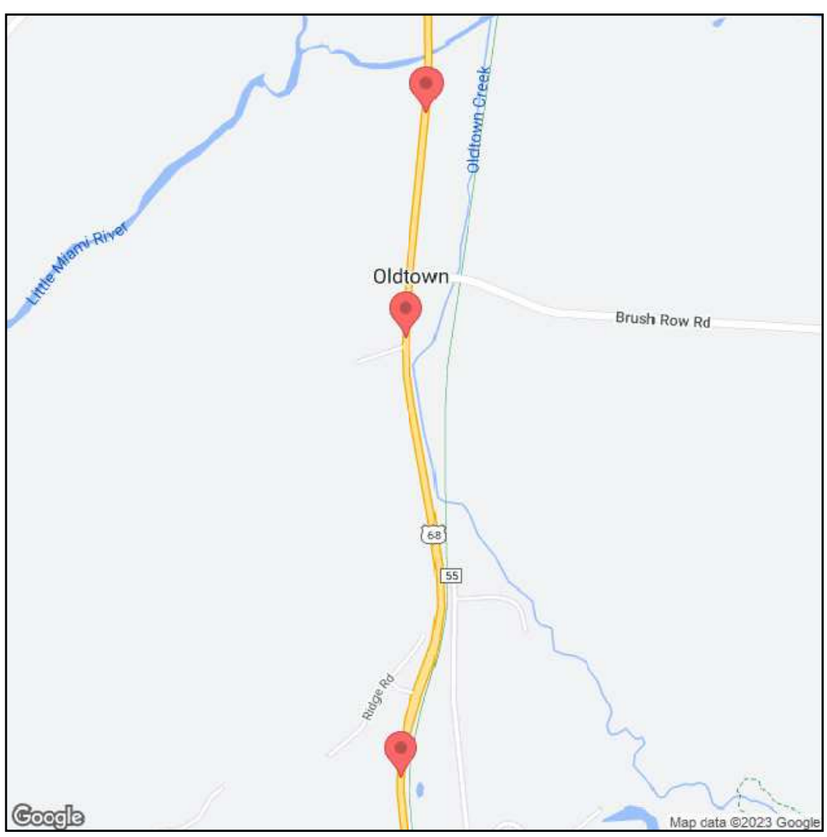
*Users of this data need to be aware that there are limitations to the forecasts generated by this product that make it suitable only for roadway design projects which are low risk.

Segment Information

Segment ID	LRS ID	BMP	EMP	Length	Latitude	Longitude
1839298	SGREUS00068**C	11.389	12.760	1.371	-83.9369998599716	39.7173092182249
1839304	SGREUS00068**C	12.760	12.985	0.225	-83.9368295125383	39.7286716065882
1839306	SGREUS00068**C	12.985	13.564	0.579	-83.9361586252628	39.7344738185758

Forecast Information

Segment ID	2026 AADT	2046 AADT	DHV-30	K%	D%	T24%	TD%
1839298	8,600	8,800	1,200	13.2	50.4	7	4
1839304	8,600	8,800	1,200	13.2	50.4	7	5
1839306	8,600	8,800	1,200	13.2	50.4	7	5



Definitions:

- AADT – Annual Average Daily Traffic
- DHV30 – Design Hour Volume for 30th highest hour of the year
- DHV30 – K * AADT
- K % – Design Hour Factor
- D % – Peak Direction Factor
- T24 % – Percent Daily Trucks
- TD % – Percent Design Hour Trucks

Forecast Segment ID	Route	BMP	EMP
1839298	SGREUS00068**C	11.389	12.760

Forecast

Year	K%	T24 % (Existing)	PA AADT	PA Method	PA Growth Rate %	PA Calculated Rate %
2050	◆ 13.2	5	8,200	Average	● -1.100	0.000
AADT	**D%**	**TD % (Existing)**	**BC AADT**	**BC Method**	**BC Growth Rate %**	**BC Calculated Rate %**
8,870	◆ 50.4	3	670	Model	2.500	2.500

● Warning: The growth rate was negative and was capped.

◆ K/D factors from TCDS were used.

Regression

Method Number	PA AADT	BC AADT	AADT
4	3,548	-454	3,094

95% Confidence Min/Max

PA Min	PA Max	BC Min	BC Max	Year
-43880	26479	-1339	1502	2050

Method Number	PA Growth %	BC Growth %	PA Drop Count	BC Drop Count	PA AADT	BC AADT	PA Adjustment	PA Adjustment
1	-3.61	-3.60	0	0	315	-41	-81	-3
2	-0.86	-4.35	2	3	6,560	-114	6,189	-87
3	-8.97	-4.34	0	0	-13,672	-135	-12,337	-86
4	-2.02	-7.63	2	3	3,606	-523	3,548	-454
5	-2.02	-0.20	0	0	3,606	369	3,548	378
6	-1.96	1.34	4	4	3,728	523	3,685	550

Adjustment Info

ID	Adjustment Methods Name	Model vs Count AADT	Adjusted AADT	Model vs Count BC	Adjusted BC	PA Growth Rate %	BC Growth Rate %
1	DIF	-6,994	8,007	-1,425	1,047	-0.52	5.78
2	RAT	0.55	8,253	0.22	542	-0.19	1.27
3	MRAT	0.96	8,253	1.35	674	-0.25	2.45
4	RAF		8,130		860	-0.39	4.11

Adjust Method AADT	Adjust Method BC	Selected PA Growth Rate %	Selected BC Growth Rate %
Ratio	Model Ratio	-0.300	2.500

Method 1 - 4 Volume

PA Min Volume	PA Max Volume	BC Min Volume	BC Max Volume	Total Min Volume	Total MaxVolume
6960	7711	542	1047	7502	8758

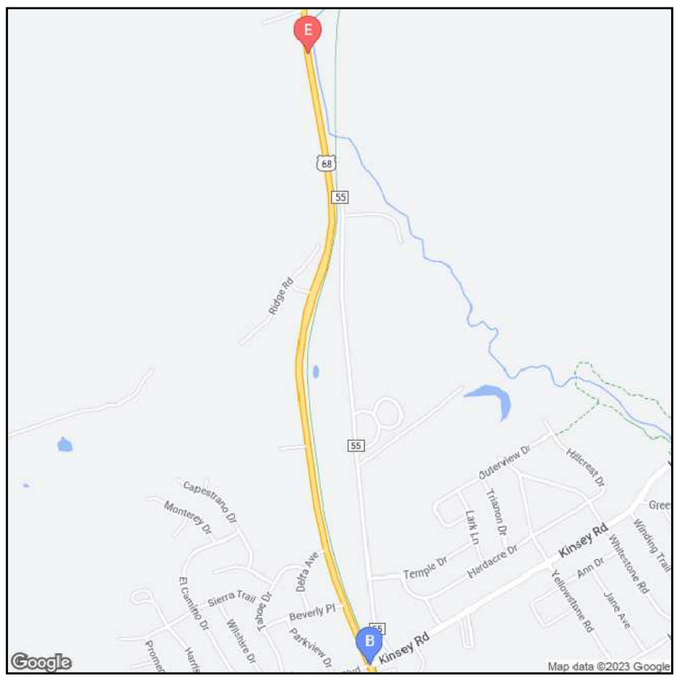
Process Flag: Adjusted model to counts with process per ODOT 255 spreadsheet

Comment: No Comment

Historical Count

Year	All	Cars	Trucks
2008	9,600	9,060	540
2012	19,440	18,780	660
2013	9,950	9,612	338
2016	9,829	9,302	526
2019	9,057	8,741	316
* 2022	8,554	8,154	400

* Pivot Point



Segment ID	LRS ID	BMP	EMP	Length	Yr 2026 AADT	Yr 2046 AADT	DHV30	K %	D %	T24 %	TD %
1839298	SGREUS00068**C	11.389	12.760	1.371	8,600	8,800	1200	13.2	50.4	7	4

Forecast Segment ID	Route	BMP	EMP
1839304	SGREUS00068**C	12.760	12.985

Forecast

Year	K%	T24 % (Existing)	PA AADT	PA Method	PA Growth Rate %	PA Calculated Rate %
2050	◆ 13.2	5	8,200	Average	⬟ -1.100	0.000
AADT	**D%**	**TD % (Existing)**	**BC AADT**	**BC Method**	**BC Growth Rate %**	**BC Calculated Rate %**
8,880	◆ 50.4	3	680	Model	2.500	2.500

⬟ Warning: The growth rate was negative and was capped.

◆ K/D factors from TCDS were used.

Regression

Method Number	PA AADT	BC AADT	AADT
4	3,548	-454	3,094

95% Confidence Min/Max

PA Min	PA Max	BC Min	BC Max	Year
-43880	26479	-1339	1502	2050

Method Number	PA Growth %	BC Growth %	PA Drop Count	BC Drop Count	PA AADT	BC AADT	PA Adjustment	PA Adjustment
1	-3.61	-3.60	0	0	315	-41	-81	-3
2	-0.86	-4.35	2	3	6,560	-114	6,189	-87
3	-8.97	-4.34	0	0	-13,672	-135	-12,337	-86
4	-2.02	-7.63	2	3	3,606	-523	3,548	-454
5	-2.02	-0.20	0	0	3,606	369	3,548	378
6	-1.96	1.34	4	4	3,728	523	3,685	550

Adjustment Info

ID	Adjustment Methods Name	Model vs Count AADT	Adjusted AADT	Model vs Count BC	Adjusted BC	PA Growth Rate %	BC Growth Rate %
1	DIF	-9,121	8,058	-1,465	1,065	-0.51	5.94
2	RAT	0.48	8,314	0.21	543	-0.17	1.28
3	MRAT	0.97	8,314	1.36	680	-0.23	2.50
4	RAF		8,186		873	-0.37	4.22

Adjust Method AADT	Adjust Method BC	Selected PA Growth Rate %	Selected BC Growth Rate %
Ratio	Model Ratio	-0.200	2.500

Method 1 - 4 Volume

PA Min Volume	PA Max Volume	BC Min Volume	BC Max Volume	Total Min Volume	Total MaxVolume
6993	7771	543	1065	7536	8836

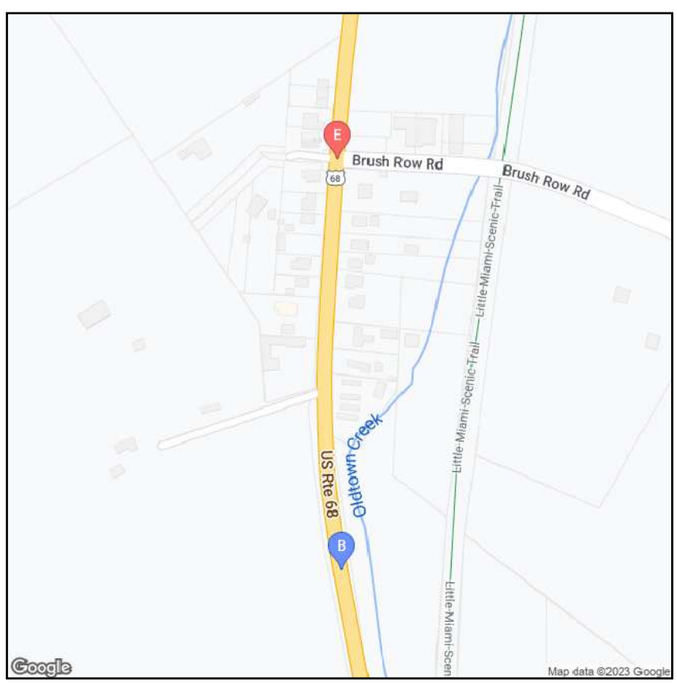
Process Flag: Adjusted model to counts with process per ODOT 255 spreadsheet

Comment: No Comment

Historical Count

Year	All	Cars	Trucks
2008	9,600	9,060	540
2012	19,440	18,780	660
2013	9,950	9,612	338
2016	9,829	9,302	526
2019	9,057	8,741	316
* 2022	8,554	8,154	400

* Pivot Point



Segment ID	LRS ID	BMP	EMP	Length	Yr 2026 AADT	Yr 2046 AADT	DHV30	K %	D %	T24 %	TD %
1839304	SGREUS00068**C	12.760	12.985	0.225	8,600	8,800	1200	13.2	50.4	7	5

Forecast Segment ID	Route	BMP	EMP
1839306	SGREUS00068**C	12.985	13.564

Forecast

Year	K%	T24 % (Existing)	PA AADT	PA Method	PA Growth Rate %	PA Calculated Rate %
2050	13.2	5	8,200	Average	-1.100	0.000
AADT	**D%**	**TD % (Existing)**	**BC AADT**	**BC Method**	**BC Growth Rate %**	**BC Calculated Rate %**
8,880	50.4	3	680	Model	2.500	2.500

Warning: The growth rate was negative and was capped.

K/D factors from TCDS were used.

Regression

Method Number	PA AADT	BC AADT	AADT
4	3,548	-454	3,094

95% Confidence Min/Max

PA Min	PA Max	BC Min	BC Max	Year
-43880	26479	-1339	1502	2050

Method Number	PA Growth %	BC Growth %	PA Drop Count	BC Drop Count	PA AADT	BC AADT	PA Adjustment	PA Adjustment
1	-3.61	-3.60	0	0	315	-41	-81	-3
2	-0.86	-4.35	2	3	6,560	-114	6,189	-87
3	-8.97	-4.34	0	0	-13,672	-135	-12,337	-86
4	-2.02	-7.63	2	3	3,606	-523	3,548	-454
5	-2.02	-0.20	0	0	3,606	369	3,548	378
6	-1.96	1.34	4	4	3,728	523	3,685	550

Adjustment Info

ID	Adjustment Methods Name	Model vs Count AADT	Adjusted AADT	Model vs Count BC	Adjusted BC	PA Growth Rate %	BC Growth Rate %
1	DIF	-10,682	8,477	-1,468	1,067	-0.33	5.96
2	RAT	0.44	8,520	0.21	543	-0.08	1.28
3	MRAT	1.00	8,520	1.36	681	-0.14	2.51
4	RAF		8,499		874	-0.23	4.23

Adjust Method AADT	Adjust Method BC	Selected PA Growth Rate %	Selected BC Growth Rate %
Ratio	Model Ratio	-0.100	2.500

Method 1 - 4 Volume

PA Min Volume	PA Max Volume	BC Min Volume	BC Max Volume	Total Min Volume	Total MaxVolume
7410	7977	543	1067	7953	9044

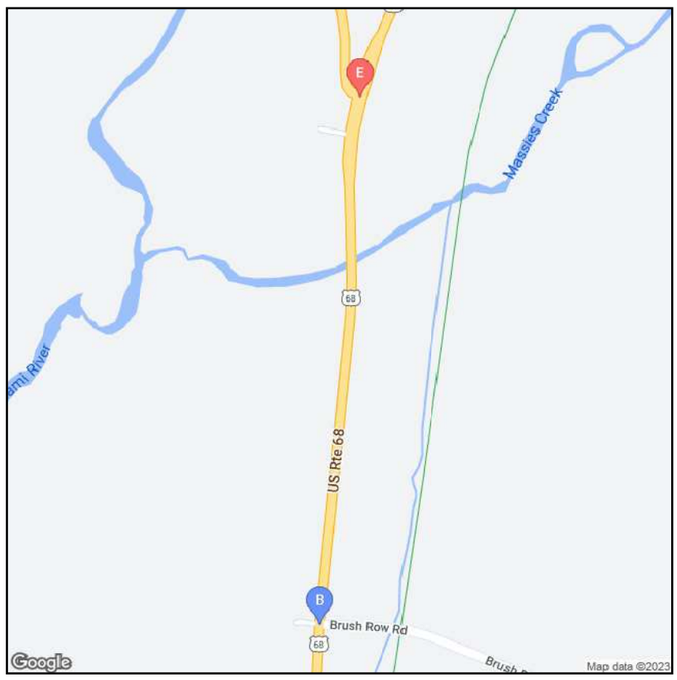
Process Flag: Adjusted model to counts with process per ODOT 255 spreadsheet

Comment: No Comment

Historical Count

Year	All	Cars	Trucks
2008	9,600	9,060	540
2012	19,440	18,780	660
2013	9,950	9,612	338
2016	9,829	9,302	526
2019	9,057	8,741	316
* 2022	8,554	8,154	400

* Pivot Point



Segment ID	LRS ID	BMP	EMP	Length	Yr 2026 AADT	Yr 2046 AADT	DHV30	K %	D %	T24 %	TD %
1839306	SGREUS00068**C	12.985	13.564	0.579	8,600	8,800	1200	13.2	50.4	7	5

Appendix I – Historic Boring Logs

FED. RD. DIVISION	STATE	PROJECT		2
5	OHIO			

GREENE COUNTY
GRE. - 68-13.40
4 MI. NORTH OF XENIA

EXIST. CURVE DATA U.S.R 68
Δ = 8°21'00" LT.
R = 429.728'
ARC = 626.25'
TAN. = 313.69'
CHORD = 625.71'

PROP. CURVE DATA U.S.R. 68
Δ = 8°21'00" LT.
R = 429.728'
Dc = 1°20'
L = 626.26'
P.I. = 122+71.99
E = 11.43'
T = 313.69'

℄ U.S.R. 68

RADIAL DIMENSION 10'-0" 12'-0" 12'-0" 5'-0" 5'-0" ROUNDING 2'-6 2/3"

0.031 ft. SUPERELEVATION

1/2 FT.

TYPICAL SECTION

HEAVILY WOODED AREA

℄ GRADE OF TEMP. RUNAROUND IS THE SAME AS THE EXIST. PAV'T.

EXIST. FENCE

HEAVILY WOODED AREA

EDGE OF PAVEMENT

TO XENIA

TEST HOLE No. 7

TEST HOLE No. 2

TEST HOLE No. 3

TEST HOLE No. 4

TEST HOLE No. 5

TEST HOLE No. 6

TEST HOLE No. 8

END APPROACH SLAB STA. 123+18.16

BEGIN APPROACH SLAB STA. 124+37.32

REFERENCE LINE (CHORD BETWEEN ABUT. FACES)

SKEW 20°

* DIMENSION TO FACE OF GUARD RAIL

4-41/2" GUARD RAIL (ON DECK)

MASSIES CREEK

EX. 14" W.M.

EX. WELL

BLACKTOP DR.

EX. 1 1/2" W.M.

EX. 20" W.M.

EX. 12" W.M.

EXIST. FENCE

PT. STA. 125+84.52 (CHORD DEFINITION)
= STA. 125+84.56 (ARC DEFINITION)

℄ TEMPORARY ROAD

EX. HOUSE SERVICE

FLOW

EXISTING STRUCTURE

STRUCTURE FILE NO.: 2901471
STRUCTURE TYPE: STEEL TRUSS
SPAN: 130' 0 1/2" C/C PINS
ROADWAY WIDTH: 25'
LOADING: H 15-33
SKEW: NONE
WEARING SURFACE: ARMORED COMPOSITE STEEL AND CONCRETE ROADWAY SLAB.
APPROACH SLABS: 10" X 20'
ALIGNMENT: 1° 20' LT. CURVE
SUPERELEVATION: 0.031'/FT.

1998 DESIGN TRAFFIC = 15040 ADT
DRAINAGE AREA = 83.5 SQ. MI.
DESIGN DISCHARGE = 7,910 CFS. = Q_{25} *

Q_{10}	= 5,770 C.F.S.	ELEV. = 823.5	V = 8.1' / SEC.
Q_{25}	= 7,910 C.F.S.	ELEV. = 824.1	V = 5.8' / SEC.
Q_{50}	= 9,610 C.F.S.	ELEV. = 824.8	V = 4.0' / SEC.
Q_{100}	= 11,400 C.F.S.	ELEV. = 824.9	V = 3.2' / SEC.

CLEARS ASSUMED 25 YR. H.W. ELEV. BY 1.4 Ft.
EARTHWORK LIMITS SHOWN ARE APPROXIMATE.
ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.
* NOTE: SEE SUPPLEMENTAL SITE PLAN FOR ACTUAL FLOWS THROUGH BRIDGE WATERWAY OPENING

PROPOSED STRUCTURE

TYPE: 3-SPAN CONTINUOUS CONCRETE SLAB WITH CAPPED PILE ABUTMENTS
SPANS: 42-52.5-42 MEASURED ALONG CHORD BETWEEN ABUTMENT FACES
ROADWAY: 44' F/F GUARDRAIL
SKEW: 20° RIGHT FORWARD
LOADING: HS 20-44 AND THE ALTERNATE MILITARY LOADING
WEARING SURFACE: MONOLITHIC CONCRETE
APPROACH SLABS: AS-1-72 (25' LONG)
ALIGNMENT: 1° 20' CURVE LEFT
SUPERELEVATION: 0.031'/FT.

STA. 123+18.16 BRIDGE LIMITS = 130.6' STA. 124+51.32

EXISTING TRUSS

50-YR. H.W. ELEV. 824.3

25-YR. H.W. ELEV. 824.1

100-YR. H.W. ELEV. 824.5

MAX. FLOOD OF RECORD - JAN. 1959 ELEV. 824.0

NORMAL WATER ELEV. 814.5

TOP OF SLOPE ELEV. 823.89
FOOTING ELEV. 815.84

TOP OF SLOPE ELEV. 822.64
FOOTING ELEV. 810.60

+0.51% ℄ EXIST PROFILE

30" ROCK CHANNEL PROT. TYPE B WITHOUT BEDDING

HP 12x53 PILES ESTIMATED AVG. PAY LENGTH 37' ABUTMENTS AND PIERS

STAND BY ELEVATIONS

840 830 820 810 800 790 780

825.09 825.44 825.73 826.06 826.34 826.45 826.47 826.77 827.12 827.43 827.84 828.06

121+00 50 122+00 50 123+00 18.70 50 124+00 50 125+00 50 126+00

PILES MAY VARY IF THEY DON'T HIT POINTS

SITE PLAN

BRIDGE NO. GRE-68-13.40
OVER
MASSIES CREEK
STA. 121+00 TO 127+00

PRESENT TOPOGRAPHY		PROPOSED WORK			
SURVEYED	DRAWN	DESIGNED	DRAWN	CHECKED	REVIEWED
		J.A.B.	J.J.E.	J.L.B.	

SITE PLAN STA. 121+00 TO STA. 127+00

MASON, SANDEFUR & de VERTEUIL, INC. 6035 Huntley Road, Columbus, Ohio 43229, 614/888-0576

Client: JOHN DAVID JONES AND ASSOCIATES, INC. | Project: BRIDGE REPLACEMENT, GRE - 68 - 13.40 | M,S&V 81 - Job No. 86

BORING LOG

Boring No. 2 | Location: Sta. 123 +13 , 7.5' Lt. | Date Drilled: 7-21, 22 - 81

WATER OBSERVATIONS: Water seepage at: 16.5' ; Water level at completion: ; Drilling Water level at completion: **

STANDARD PENETRATION (N) Blows per foot — 10 20 30 40

MOISTURE CONTENT - % PL Natural LL — 10 20 30 40

DEPTH in feet	ELEVATION in feet	PENETRATION Blows per 6"	RECOVERY in inches	SAMPLE NO. DRIVE	SAMPLE NO. PRESS.	DESCRIPTION	Soil Classification	GRADATION % Agg.	% C.S.	% M.S.	% F.S.	% Silt	% Clay	Remarks
0	826.5													
0.4	826.1					ASPHALT								
						REINFORCED CONCRETE								
2.0	824.5	7 6	12	1		Moist FILL: SAND & GRAVEL, some Silt & Clay Brown								
		5 6 8	18	2			A-1-b	50	16	–	12	17	5	
5		3 10 13	18	3										
		7 8 8	18	4			A-1-b	44	18	–	16	17	5	
		2 4 5	18	5										
10	816.4	2 3 3	18	6										
10.1	816.0					Possible Fill: Sandy Clayey Silt, trace Gravel Dark Brown								
10.5		5 10 13	5	7*		Damp SAND and GRAVEL, little Silt and Clay with Sandy Clayey Silt seam Light Gray & Brown								
		18 12 8	12	8										
		11 12 14	12	9*		Saturated Brown	A-1-a	68	10	–	8	11	3	NON-PLASTIC
15														
		30 50	10	10*		Saturated SAND and GRAVEL, little Silt and Clay Brown								50+
				11*		Saturated Like Sample No. 10 Brown								50+
20		50	1											
						BOULDERS 21.0' - 37.0'								
		23 50/3	10	12		Saturated SAND and GRAVEL, trace to little Silt and Clay Gray & Brown	A-1-a	54	30	–	6	7	3	NON-PLASTIC 50+
25	801.5													

MASON, SANDEFUR & de VERTEUIL, INC. 6035 Huntley Road, Columbus, Ohio 43229, 614/888-0576

Client: JOHN DAVID JONES AND ASSOCIATES, INC. | Project: BRIDGE REPLACEMENT, GRE - 68 - 13.40 | M, S & V Job No. 81-86

BORING LOG

Boring No. 2 | Location: Sta. 123 + 13, 7.5' Lt | Date Drilled: 7-21, 22-81

WATER OBSERVATIONS: Water seepage at: 16.5' | Water level at completion: | Drilling Water level at completion: * *

DEPTH in feet	ELEVATION in feet	PENETRATION Blows per 6"	RECOVERY in inches	SAMPLE NO. DRIVE	SAMPLE NO. PRESS	DESCRIPTION	Soil Classification	GRADATION % Agg.	% C.S.	% M.S.	% F.S.	% Silt	% Clay	STANDARD PENETRATION (N) Blows per foot	MOISTURE CONTENT - % PL / Natural / LL
25	801.5													10 20 30 40	PL Natural LL 10 20 30 40
		31/50		13		Saturated SAND and GRAVEL, trace to little Silt and Clay — Gray & Brown								50+	
		50	0												
30						(BOULDERS 21.0'-37.0')									
		50	1	19		Moist SILT CLAY, trace Sand, with boulder — Gray								50+	
35															
		50@	3	15		Saturated Silty SAND and GRAVEL — Gray								50+	
40															
42.0	789.5														
		50@	4	16		Damp Sandy CLAY SILT, trace Gravel — Gray								50+	
45															
		21/50@	10	17		Damp Like Sample No. 16 — Gray	A-4a	9	14	10	-	20	36	20	50+
50	776.5														

MASON, SANDEFUR & de VERTEUIL, INC. 8035 Huntley Road, Columbus, Ohio 43229, 614/888-0576

Client: JOHN DAVID JONES AND ASSOCIATES, INC. | Project: BRIDGE REPLACEMENT, GRE - 68 - 13.40 | M, S & V 81 - Job No. 86

BORING LOG

Boring No. 2 | Location: Sta. 123 + 13, 7.5' Lt. | Date Drilled: 7- 21, 22 - 81

WATER OBSERVATIONS: Water seepage at: 16.5' ; Water level at completion: ; Drilling Water level at completion: * *

STANDARD PENETRATION (N) Blows per foot — 10 20 30 40

MOISTURE CONTENT - % — PL Natural LL — 10 20 30 40

DEPTH in feet	ELEVATION in feet	PENETRATION Blows per 6"	RECOVERY in inches	SAMPLE NO. DRIVE	SAMPLE NO. PRESS	DESCRIPTION	Soil Classification	GRADATION % Agg.	% C.S.	% M.S.	% F.S.	% Silt	% Clay
50	776.5												
		30 50④	10	18		Damp Sandy CLAY SILT, trace Gravel	Gray						
55													
59.4	767.1	25 50④		19		Moist Like Sample No. 18, with trace Shale fragments	Gray	A-4a	15	10	–	19	34	22

50+ 50+

Bottom of Boring – 59.4'

Note:

* Gravel broken in driving

** 23.5' (before pulling casing)
21.0' (after pulling casing)

$50^{①}$ 50 blows for 0.1' penetration

$50^{③}$ 50 blows for 0.3'

$50^{④}$ 50 blows for 0.4'

MASON, SANDEFUR & de VERTEUIL, INC. 6035 Huntley Road, Columbus, Ohio 43229, 614/888-0576

Client: JOHN DAVID JONES AND ASSOCIATES, INC.

Project: BRIDGE REPLACEMENT, GRE-68-13.40

M.S&V Job No. 81-86

BORING LOG

Boring No. 5 | Location: Sta. 124+62.5, 7.5' Rt. | Date Drilled: 7-23-81

WATER OBSERVATIONS: Water seepage at: 20.9'; Water level at completion:; Drilling Water level at completion: 21.5' (in casing)

STANDARD PENETRATION (N) Blows per foot: 10 20 30 40

MOISTURE CONTENT - %: PL Natural LL; 10 20 30 40

DEPTH in feet	ELEVATION in feet	PENETRATION Blows per 6"	RECOVERY in inches	SAMPLE NO. DRIVE	SAMPLE NO. PRESS	DESCRIPTION	Soil Classification	GRADATION % Agg.	% C.S.	% M.S.	% F.S.	% Silt	% Clay	Plasticity
0	827.1					6" ASPHALT 12" REINFORCED CONCRETE 2.5" COARSE GRAVEL								
1.7	825.4	6 4 3	16	1		Moist — FILL: Clayey Silty SAND, trace Gravel — Brown								
		4 5 4	18	2		Damp — Dark Brown	A-4a	13	17	-	32	31	7	NON-PLASTIC
5		2 2 3	16	3		Moist — Very Sandy CLAY SILT, trace Gravel, trace brick fragments								
6.5	820.6	4 4 6	12	4		Damp — POSSIBLE FILL: SILT CLAY, little Sand, trace organic — Brown								
		3 4 4	17	5		Moist								
9.7	817.4	4 9 9	18	6		Clayey Fine Sandy SILT, trace Gravel, trace Shells								
10		4 8 8	16	7		Damp — Peaty Clayey Fine Sandy SILT, SAND and Shells — Dark Brown								
		3 4 4	18	8		Moist — Peaty Clayey Silty Fine SAND — Dark Gray	A-3a	0	12	-	53	27	8	NON-PLASTIC
14.3	812.8				1		A-4a	2	3	-	55	31	9	NON-PLASTIC
15		11 27 18	17	9*		Moist — SAND and GRAVEL, little Silt and Clay — Light Brown & Gray								
20		15 27 22	16	10*		Moist — Like Sample No. 9 — Light Brown & Gray	A-1a*	65	14	-	7	11	3	NEM
						(BOULDERS 18.0'-33.5')								
		19 22 25	18	11*		Saturated Like Sample No. 9 — Brown								
25	802.1													

MASON, SANDEFUR & de VERTEUIL, INC. 6035 Huntley Road, Columbus, Ohio 43229, 614/866-0576

Client: JOHN DAVID JONES AND ASSOCIATES, INC. | Project: BRIDGE REPLACEMENT, GRE -68- 13.40 | M, S & V 81-86 Job No.

BORING LOG

Boring No. 5 | Location: Sta. 124 + 62.5, 7.5' Rt. | Date Drilled: 7-23-81

WATER OBSERVATIONS: Water seepage at: 20.9' | Water level at completion: | Drilling Water level at completion: 21.5' (in casing)

DEPTH in feet	ELEVATION in feet	PENETRATION Blows per 6"	RECOVERY in inches	SAMPLE NO. DRIVE	SAMPLE NO. PRESS	DESCRIPTION	Soil Classification	GRADATION % Agg.	% C.S.	% M.S.	% F.S.	% Silt	% Clay	STANDARD PENETRATION (N) Blows per foot	MOISTURE CONTENT - % PL / Natural / LL
25	802.1														
		26 28 21	15	12X		Saturated SAND and GRAVEL, little Silt and Clay, Brown	A-1-b**	62	20	-	7	8	3	N=49	
		30 50(3)	10	13X		Saturated Like Sample No. 12, Brown								50+	
30															
		27 32 27	12	14X		Moist SAND and GRAVEL, little Silt and Clay, with Silt seams, Grey & Brown								59	
37.5	789.6														
		23 50	12	15		Damp Sandy CLAY Silt, little Gravel, Gray	A-4b	16	3	-	5	54	22	50+	
40															
		30 50	12	16		Damp Sandy Clayey Silt, trace Gravel, Gray	A-4a	11	11	-	21	34	23	50+	
45															
		31 50(3)	11	17		Damp Like Sample No. 16, Gray								50+	
50	777.1														

MASON, SANDEFUR & de VERTEUIL, INC. 6035 Huntley Road, Columbus, Ohio 43229, 614/888-0576

Client: JOHN DAVID JONES AND ASSOCIATES, INC. | Project: BRIDGE REPLACEMENT, GRE -68 - 13.40 | M, S & V 81 - Job No. 86

BORING LOG | Boring No. 5 | Location: Sta 124 + 62.5, 7.5' Rt. | Date Drilled: 7-23-81

WATER OBSERVATIONS: Water seepage at: 20.9' | Water level at completion: | Drilling Water level at completion: 21.5' (in casing)

DEPTH in feet	ELEVATION in feet	PENETRATION Blows per 6"	RECOVERY in inches	SAMPLE NO. DRIVE	SAMPLE NO. PRESS	DESCRIPTION	Soil Classification	GRADATION % Agg.	% C.S.	% M.S.	% F.S.	% Silt	% Clay
50	777.1												
55		30 50	12	18		Damp Sandy CLAY SILT, trace Gravel Gray	A-4a	15	10	-	20	33	22
59.4	767.7	35 50@	10	19		Damp Like Sample No. 18 Gray							

Bottom of Boring — 59.4'

Note:

* Gravel broken in driving

** Drove Gravel ahead of sampler

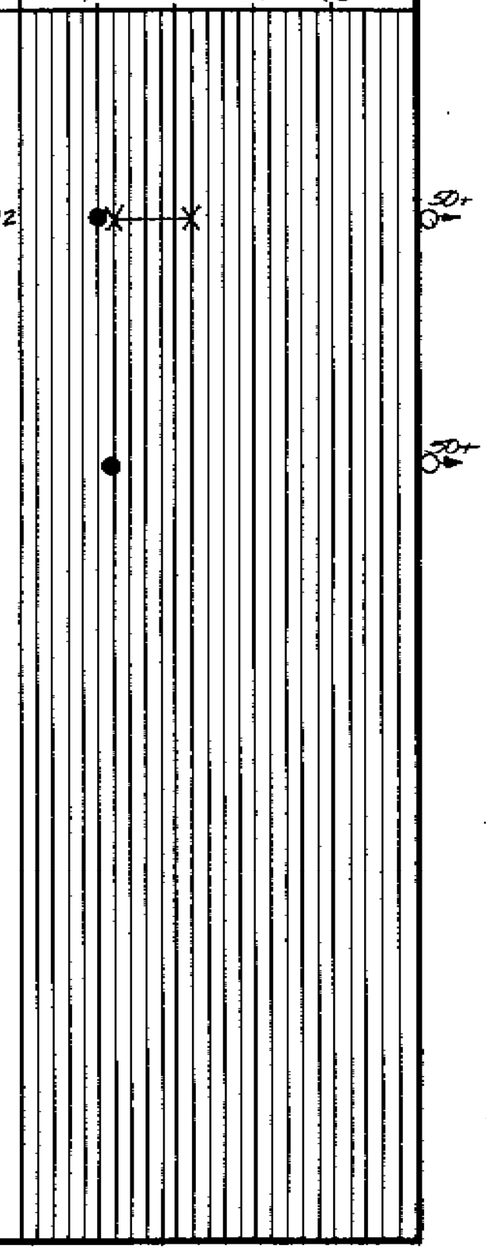
50@ 50 blows for 0.4' penetration

NEM - Not Enough Material to run Liquid Limit and Plastic Limit tests.

*** Based on Plasticity Index being NON-PLASTIC.

STANDARD PENETRATION (N) Blows per foot — 10 20 30 40

MOISTURE CONTENT - % — PL Natural LL — 10 20 30 40



MASON, SANDEFUR & de VERTEUIL, INC. 6035 Huntley Road, Columbus, Ohio 43229, 614/888-0576

Client: JOHN DAVID JONES AND ASSOCIATES, INC. | Project: BRIDGE REPLACEMENT, GRE-68-13.40 | M,S&V Job No. 81-86

BORING LOG

Boring No. 6 | Location: Sta 124+60, 22.0' Lt. | Date Drilled: 7-22,23-81

WATER OBSERVATIONS: Water seepage at: 7.6', 16.5' | Water level at completion: | Drilling Water level at completion: 20.0' (in casing)

STANDARD PENETRATION (N) Blows per foot — 10 20 30 40

MOISTURE CONTENT - % — PL Natural LL — 10 20 30 40

DEPTH in feet	ELEVATION in feet	PENETRATION Blows per 6"	RECOVERY in inches	SAMPLE NO. DRIVE	SAMPLE NO. PRESS	DESCRIPTION		Soil Classification	GRADATION % Agg.	% C.S.	% M.S.	% F.S.	% Silt	% Clay
0	827.0													
0.4	826.6	1 7 7	13	1		Sod & Topsoil								
1.4	825.6	W O R	6	2		Sandy CLAY SILT, trace Gravel, trace root fibers	Brown to Black							
		1 1 0	12	3		Damp — Silty SAND & CINDERS & COAL Fragments	Black	A-1-b**	52	22	-	12	11	3
5		1 1 2	4	4		FILL:								
		2 1 3	3	5		Moist								
		3 2 3	18	6		Clayey Silty SAND, little Gravel, trace Coal fragment	Brown							
9.7	BLT. S	2 2	5	7		Saturated — POSSIBLE FILL: Clayey, silty SAND and Sandy Clayey SILT, little Gravel, trace shell fragments	Black							
10		1					Brown & Black							
10.5	B16.5	3 4 4	3	8		Clayey Fine Sandy SILT, trace Shells	Brown							
		7 7 7	16	9		Very Moist to Saturated — SILT CLAY, trace Sand & Gravel to Silty Clayey SAND & GRAVEL trace Shells	Brown to Brown & Gray	A-1-b**	52	9	-	15	18	6
		3 5 11	5	10										
15														
16.5	B10.5	9 12 18	14	11		Saturated — SAND and GRAVEL, little to some Silt and Clay	Light Brown Gray	A-1-b	54	20	-	10	12	4
20		18 25 22	16	12		Moist — SAND and GRAVEL, little Silt and Clay	Light Brown Gray							
						BOULDERS 22.5' – 30.5'								
		50/2"	1	13*		Saturated — Like Sample No. 12	Brown							
25	B02.0													

50+

MASON, SANDEFUR & de VERTEUIL, INC. 6035 Huntley Road, Columbus, Ohio 43229, 614/888-0576

Client: JOHN DAVID JONES AND ASSOCIATES, INC. | Project: BRIDGE REPLACEMENT, GRE - 68 - 13.40 | M, S & V Job No. 81-86

BORING LOG | Boring No. 6 | Location: Sta. 129+60, 22.0' Lt. | Date Drilled: 7-22, 23-81

WATER OBSERVATIONS: Water seepage at: 7.6', 16.5' | Water level at completion: | Drilling Water level at completion: 20.0' (in casing)

STANDARD PENETRATION (N) Blows per foot: 10 20 30 40

MOISTURE CONTENT - %: PL Natural LL; 10 20 30 40

DEPTH in feet	ELEVATION in feet	PENETRATION Blows per 6"	RECOVERY in inches	SAMPLE NO. DRIVE	SAMPLE NO. PRESS	DESCRIPTION	Soil Classification	GRADATION % Agg.	% C.S.	% M.S.	% F.S.	% Silt	% Clay
25	802.0	5 5 6											
		15 21 30	17	14		Saturated SAND & GRAVEL, little Silt & Clay Brown							
30													
33.0	797.0												
		25 30 50	18	15		Damp Silty CLAY Gray	A-6a	1	1	-	1	44	53
35													
37.0	790.0												
						SAND							
39.0	788.0	35 35 @ 58	18	16		Damp Sandy Clayey Silt, trace Gravel, Sand seam Gray	A-4a	22	10	-	18	30	20
40													
		32 50 @ 9"	11	17		Damp Sandy Clayey Silt, trace Gravel Gray							
45													
		33 50	12	18		Damp Like Sample No. 17 Gray							
50	777.0												

50+ 51 80+ 35+ 50+ 50+

MASON, SANDEFUR & de VERTEUIL, INC. 6035 Huntley Road, Columbus, Ohio 43229, 614/888-0576

Client: JOHN DAVID JONES AND ASSOCIATES, INC. | Project: BRIDGE REPLACEMENT, GRE-68-13.40 | M, S & V Job No. 81-86

BORING LOG | Boring No. 6 | Location: Sta. 124+60, 22.0' Lt. | Date Drilled: 7-22, 23-81

WATER OBSERVATIONS: Water seepage at: 7.6', 16.5' | Water level at completion: | Drilling Water level at completion: 20.0' (in casing)

STANDARD PENETRATION (N) Blows per foot: 10 20 30 40

MOISTURE CONTENT - % PL Natural LL: 10 20 30 40

DEPTH in feet	ELEVATION in feet	PENETRATION Blows per 6"	RECOVERY in inches	SAMPLE NO. DRIVE	SAMPLE NO. PRESS	DESCRIPTION	Soil Classification	GRADATION % Agg.	% C.S.	% M.S.	% F.S.	% Silt	% Clay
50.0	777.0					(BOULDER 51'-51.8')							
55		35 50	12	19		Damp Sandy Clayey SILT, trace Gravel Gray							
59.4	767.6	34 50⑤	10	20		Damp Like Sample No. 19 Gray	A-4a	25	12	-	18	28	17

Bottom of Boring - 59.4'

NOTE:

- 50⑤ 50 blows for no penetration.
- 50① 50 blows for 0.1' penetration.
- 50④ 50 blows for 0.4'.
- * Gravel broken in driving.
- WOR Sampler advanced by Static Weight of Rod.
- ** Based on Plasticity Index being less than 6
- NM No Material to run Liquid Limit and Plastic Limit tests.

MASON, SANDEFUR & de VERTEUIL, INC. 6035 Hunley Road, Columbus, Ohio 43228, 614/866-0578

Client: JOHN DAVID JONES AND ASSOCIATES, INC. | Project: BRIDGE REPLACEMENT, GRE-68-13.40 | M, S & V Job No. 81-86

BORING LOG

Boring No. 7 | Location: Sta 122.50, 10' Rt. | Date Drilled: 7-22-81

WATER OBSERVATIONS: Water seepage at: NONE; Water level at completion: NONE; Drilling Water level at completion:

STANDARD PENETRATION (N) Blows per foot

MOISTURE CONTENT - % PL Natural LL

DEPTH in feet	ELEVATION in feet	PENETRATION Blows per 6"	RECOVERY in inches	SAMPLE NO. DRIVE	SAMPLE NO. PRESS	DESCRIPTION	Soil Classification	GRADATION % Agg.	% C.S.	% M.S.	% F.S.	% Silt	% Clay
0	826.0					0.4' ASPHALT							
1.5	824.5					1.1' CONCRETE							
		13 22 22	18	1		Damp — FILL: Silty SAND, some Gravel, trace Clay, (Crushed Limestone) — Gray	A-2-4	22	27	-	22	22	7
3.7	822.3	15 8 8	18	2		Fine Sandy Clayey SILT, to Clayey Fine Sandy SILT,							
5		5 7 5	18	3		Moist — Clayey Fine Silty SAND (Peaty) — trace Shells — Brown	A-2-4	19	21	-	24	28	8
		3 5 5	12	4		trace Gravel — Clayey Sandy SILT, — Gray Brown							
7.5	818.5												
		3 3 5	16	5		Damp — Peaty Organic Clayey Fine Sandy SILT, — trace shells — Dark Brown - Black	A6a	0	2	-	34	57	7
10		4 5 7		6		Fine Sandy Clayey SILT, — Dark Brown to Light Gray Brown							
10.5	815.5					Bottom of Boring - 10.5'							

MOISTURE CONTENT - % PL Natural LL — May - Plastic

MASON, SANDEFUR & de VERTEUIL, INC. 8035 Huntley Road, Columbus, Ohio 43229, 614/885-0576

Client: JOHN DAVID JONES AND ASSOCIATES, INC. | Project: BRIDGE REPLACEMENT, GRE 68-13.40 | M,S&V Job No. 81-86

BORING LOG

Boring No. 8 | Location: Sta. 125+50, 8' Lt. | Date Drilled: 7-22-81

WATER OBSERVATIONS: Water seepage at: NONE; Water level at completion: NONE; Drilling Water level at completion:

STANDARD PENETRATION (N) Blows per foot — 10 20 30 40

MOISTURE CONTENT - % — PL Natural LL — 10 20 30 40

DEPTH in feet	ELEVATION in feet	PENETRATION Blows per 6"	RECOVERY in inches	SAMPLE NO. DRIVE	SAMPLE NO. PRESS	DESCRIPTION	Soil Classification	GRADATION % Agg.	% C.S.	% M.S.	% F.S.	% Silt	% Clay
0	827.8												
						0.3' ASPHALT 1.1' CONCRETE							
1.4	826.4	13 50	12	1		Damp — Clayey Silty SAND, trace Gravel — Brown	A-4a	15	19	-	28	26	12
		50④		2		Dry — FILL: Silty SAND, trace Gravel, Crushed Stone — Light Brown							
5.0	822.8	8 4 6		3		Possible FILL: Sandy CLAY SILT, little Gravel — Black/Brown	A-4a	15	6	-	15	46	18
6.0	821.8	6 5 5	16	4		Fine Sandy Clayey SILT, — trace Shells — Brown	A-4b	2	3	-	12	62	21
		2 2 2	18	5		Moist							
10		2 1 2	18	6		Peaty, Organic Clayey SILT, trace fine Sand, — decomposed wood & Shells							
		2 2 2	18	7		layered decomposed wood & vegetation — Dark Gray							
12.8	815.0	4 7 8		8									
13.5	814.3					Damp — Silty SAND, little Gravel — Brown							

Bottom of Boring - 13.5'

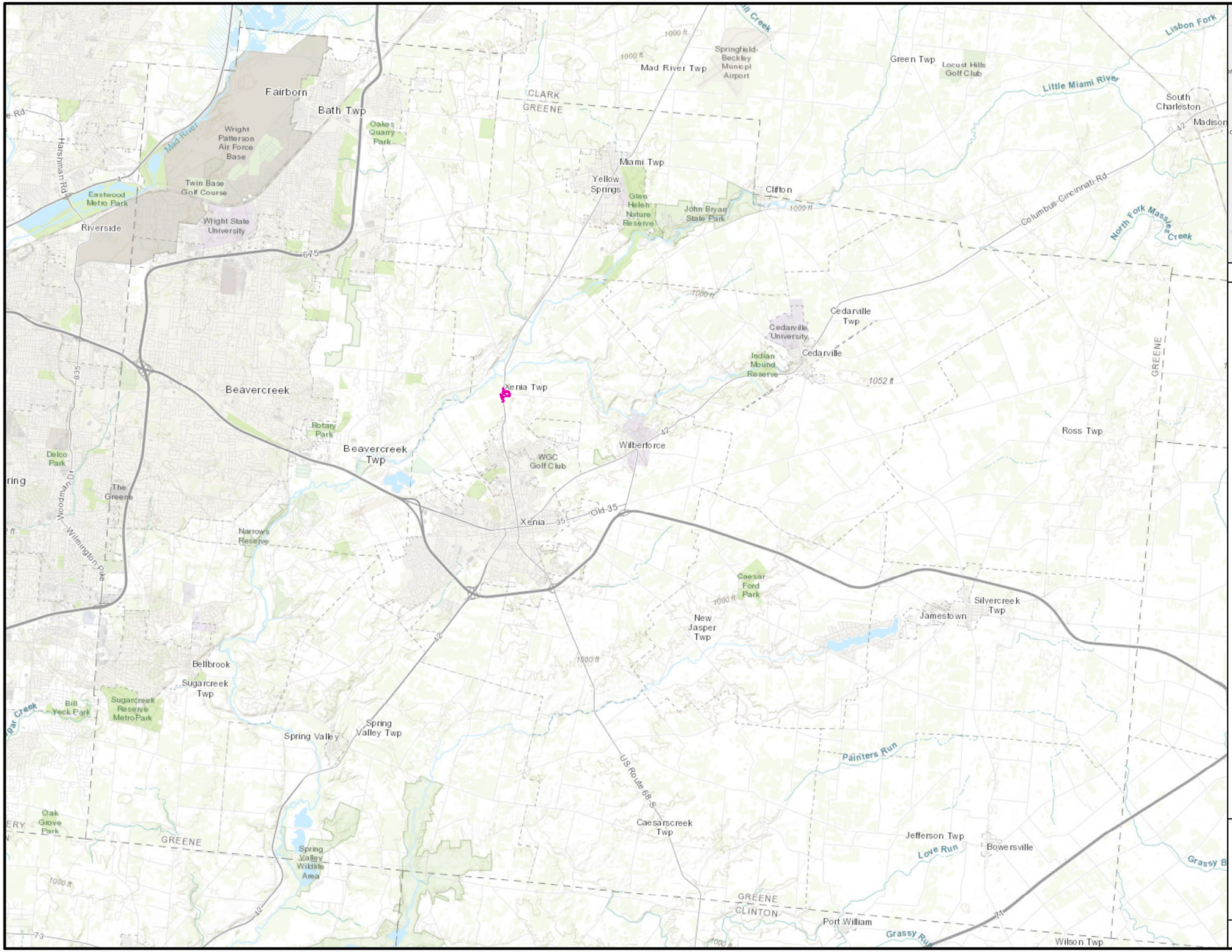
NOTE:
50④ 50 blows for 0.4' penetration.

20+

68

83

Appendix J – Environmental Support Documents



Site Location Map

Legend

Study Area

N

0 1 2 4 Miles

GRE-US68-12.64
PID 115388

County Map

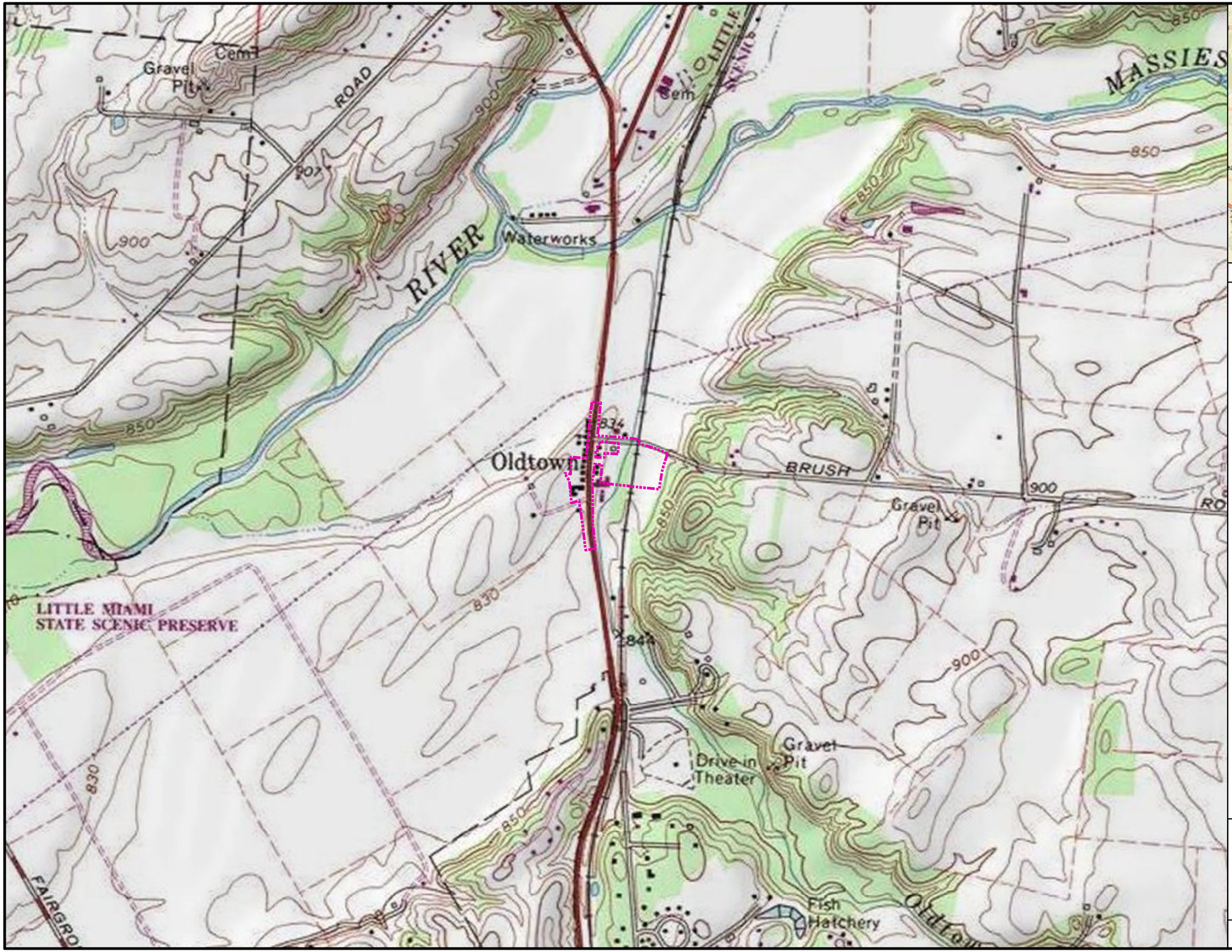
Lawhon & Associates, Inc.

Date:	Approved by:	L&A No.	Figure
Nov. 2023	CM	23-0445	1

Source:

File Name: County.mxd

Edited: 11/20/2023 By: afraley



Site Location Map

Legend

Study Area

N

0 500 1,000 2,000 Feet

GRE-US68-12.64
PID 115388

Topographic Map

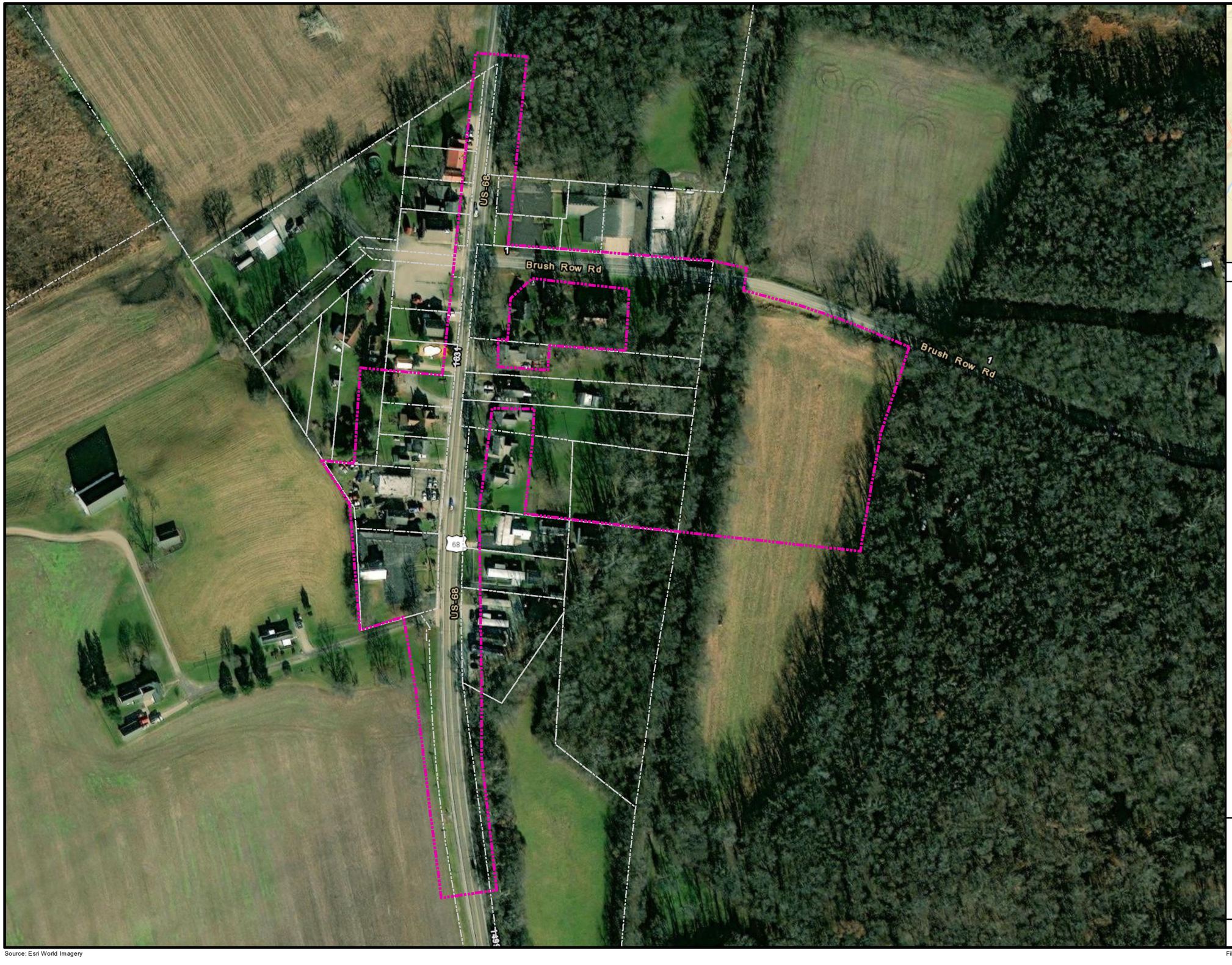
Lawhon & Associates, Inc.

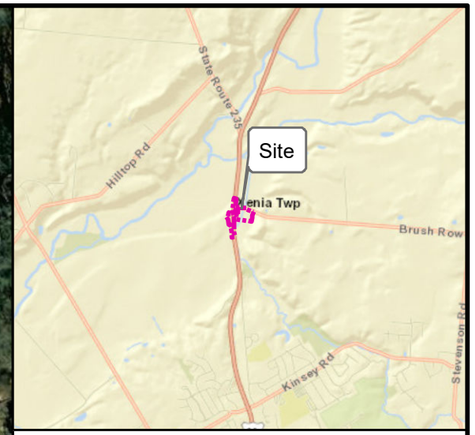
Date:	Approved by:	L&A No.	Figure
Nov. 2023	CM	23-0445	2

Source:

File Name: Topo.mxd

Edited: 11/20/2023 By: afraley





Site Location Map

Legend

- Ecological Study Area
- Parcels

N

0 50 100 200 300 400 Feet

GRE-US68-12.64
PID: 115388

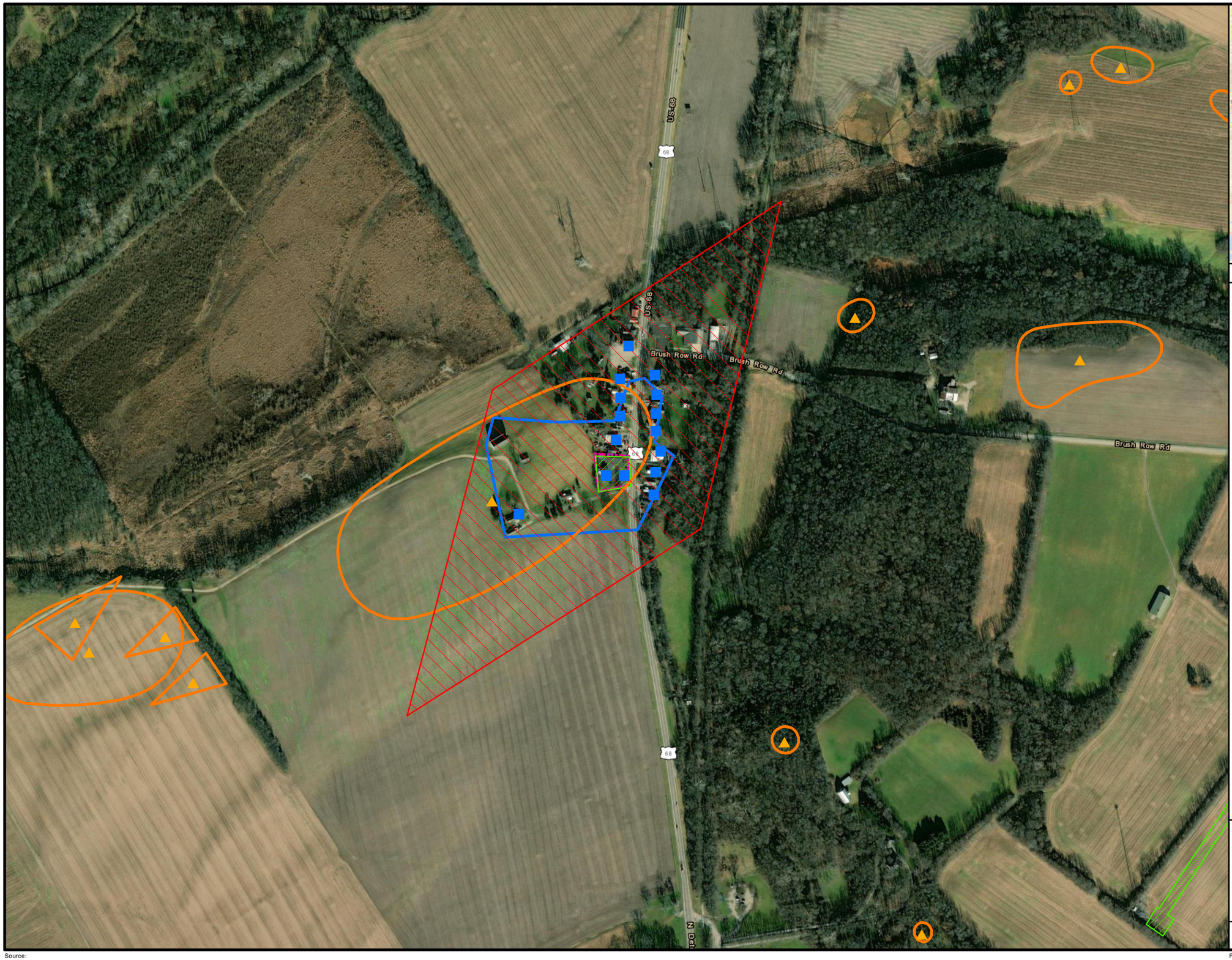
Study Area Map

Lawhon & Associates, Inc.

Date:	Approved by:	L&A No.	Figure
Dec 2023	CM	23-0445	1

Source: Esri World Imagery

File Name: Prelim Study Area.mxd Edited: 12/22/2023 By: afraley



Site Location Map

Legend

N

- Project Area
- APE
- NR Boundaries
- Archaeological Sites
- OAI Site Boundaries
- Historic Structures
- Phase 1

0 200 400 800 Feet

Historic Oldtown

Previously Identified Cultural Resources and Surveys

Lawhon & Associates, Inc.

Date:	Approved by:	L&A No.	Figure
April 2021	JZ	21-0087	6

Source:

File Name: 06-SHPO.mxd

Edited: 7/27/2022 By: afraley

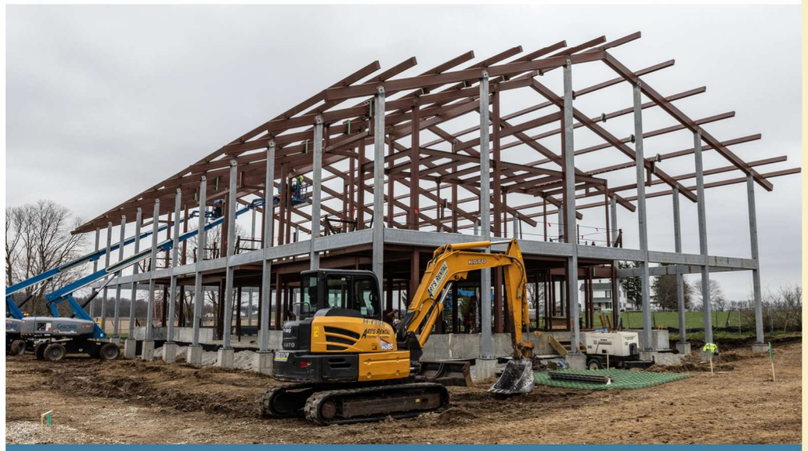
OHIO DEPARTMENT OF NATURAL RESOURCES

GREAT COUNCIL STATE PARK

Mission – *To ensure a balance between wise use and protection of our natural resources for the benefit of all.*

Located on State Route 68, between Xenia and Yellow Springs, in Oldtown, the park will feature a cultural interpretive center focused on Ohio's Native Peoples, their history in their Ohio homeland, and their lives today.

The 12,000 square foot interpretive center will be a three-story structure, designed to pay tribute to the Shawnee longhouse, the traditional dwelling of the Shawnee people. A living stream will be the signature display on the main floor. Also on this entry level is a theater, exhibits, welcome desk, gift area, and restrooms.



"This is an exciting step toward preserving an important piece of Ohio's history. This project gives us the unique opportunity to connect future generations with the past, while protecting the legacy of the Shawnee and inviting them to share their story." – Mike DeWine, Governor

The second floor will feature displays documenting a historical timeline of the Shawnee People in Ohio prior to European settlement to current day. The timeline is punctuated with interesting stories about people of historical importance, bringing history to life in a way that is relatable and memorable.

The lower level of the building will be dedicated to temporary exhibits about the history, culture, art, and modern-day Shawnee Tribe.

Preserving the site at Oldtown gives us the opportunity to connect future generations of Ohioans with the past, to preserve the legacy of the Shawnee and allow them to share their story, and to share the experience of the pioneers, settlers and frontiersmen in the area.

TIMELINE

- **Completion**
- **Construction**
- **Design**
- **Planning**
- **Proposed**

ODNR broke ground on the facility in May of 2022. It is expected to open in early 2024.

Dev. 6/23

OHIO DEPARTMENT OF NATURAL RESOURCES

GREAT COUNCIL STATE PARK

The building is a 12,000 square foot modern interpretation of a council house, a central component of the Shawnee village, which would have been used as a primary gathering place.

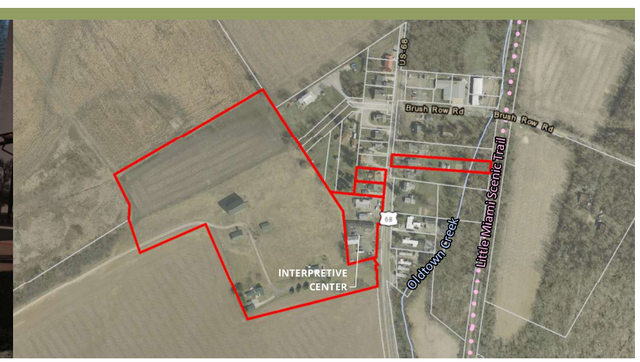
The building includes a second floor balcony which allows for a view from where the Shawnee village would have been located at the end of the 1700s, including the presumed location of the original council house on site.

The basement gallery has been designed to meet museum-grade curation standards, providing strict environmental and security controls, to allow the facility to house specialized curated and traveling exhibits, displays, and artifacts. Because of the sensitive nature of these exhibits, additional security requirements have been designed into the project as a whole.

The site is developed in an effort to recreate the look and feel of the oak savannah that would have existed in the last 1700s when the Shawnee had established their village at this location, using native grasses as the foreground and wood inspired elements on the building as the backdrop.

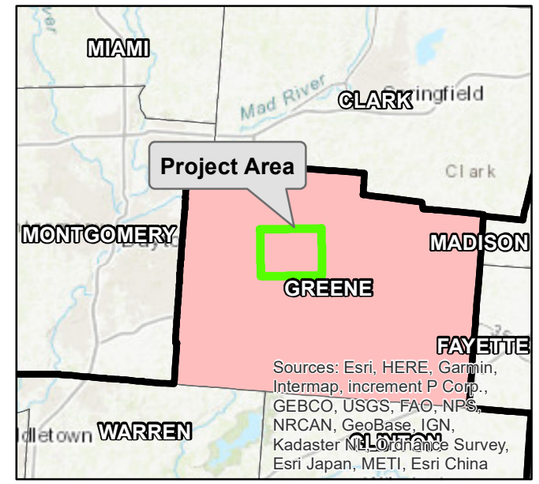
The variation of opaque wood-look walls, mixed with clear curtain-wall glazing, mimic the depth of the woodlands that would have existing on site in the late 1700s. This provides for a balanced mix of solid walls for exhibits and displays on the inside and open views to the exterior to create a more direct connection to the site, even while inside the building.

With the acquisition of an additional 14 acres adjacent to the building site, a native prairie with half a mile loop trail will be established.



GRE US-68 12.64
PID 115388

Figure 1: Federal T&E



Legend

Study Area

Indiana Bat & Northern Long-eared Bat Buffers

- INDIANA BAT HIBERNACULUM
- NORTHERN LONG-EARED BAT HIBERNACULU
- INDIANA BAT SWARMING LOCATIONS
- INDIANA BAT ACOUSTIC DETECTION
- INDIANA BAT MATERNITY COLONY
- NORTHERN LONG-EARED BAT KNOWN MATER
- MALE OR NON-REPRODUCTIVE FEMALE INDIA
- Eastern Massasauga Range Hexagons
- Bald Eagle Nest - 0.5 Mile Buffer

ROUTE TYPE

- IR (or ramp)
- US
- SR

OHIO DEPARTMENT OF TRANSPORTATION

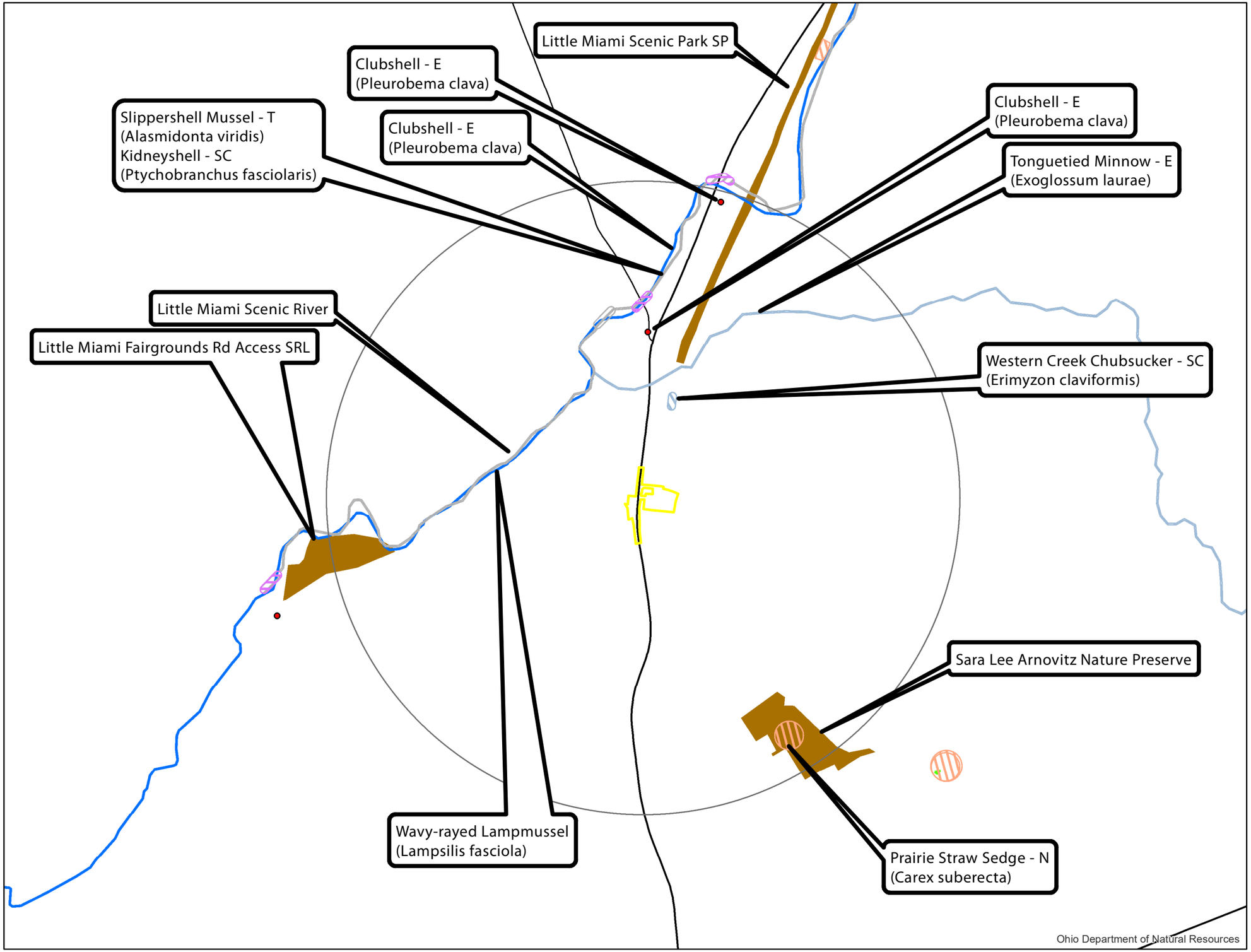
THE OHIO DEPARTMENT OF TRANSPORTATION
OFFICE OF ENVIRONMENTAL SERVICES
1980 W. BROAD ST.
COLUMBUS, OH 43223
PRODUCED WITH ARC GIS SOFTWARE
DATE CREATED: 11/20/2023

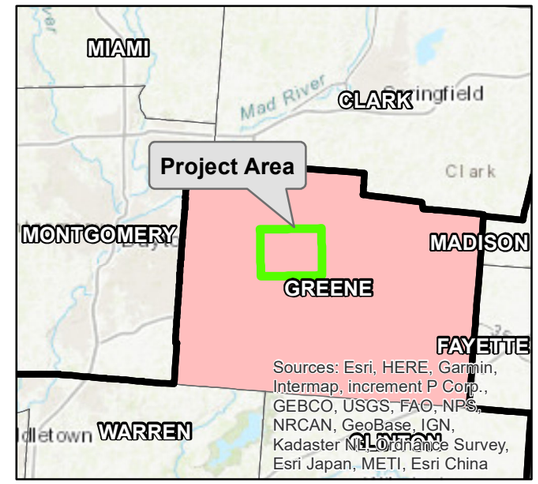
0.35 0.175 0 0.35 0.7 Miles

N

GRE US-68 12.64
PID 115388

Figure 2: State T&E





Legend

- Study Area
- Barn Owl
- Blanding's Turtle
- Blue-spotted Salamander
- Cliff-green
- Eastern Hellbender
- Eastern Massasauga
- Indiana Myotis
- Prairie Fringed Orchid
- Purple Pitcher-plant
- Showy Lady's-slipper
- Small Yellow Lady's-slipper
- Snake Hibernaculum
- Spotted Turtle
- Timber Rattlesnake
- Yellow Fringed Orchid
- Animal Assemblage
- Fungus

OHIO DEPARTMENT OF TRANSPORTATION

THE OHIO DEPARTMENT OF TRANSPORTATION
OFFICE OF ENVIRONMENTAL SERVICES
1980 W. BROAD ST.
COLUMBUS, OH 43223

PRODUCED WITH ARC GIS SOFTWARE
DATE CREATED: 11/20/2023

0.35 0.175 0 0.35 0.7 Miles

N

ORPS Summary Report GRE-US68-12.65 PID 115388

Area of Interest (AOI) Information

Area : 12.58 acres

Nov 21 2023 8:41:07 Eastern Standard Time

National Flood Hazard Layer FIRMette

FEMA

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

Legend

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) — Zone A, V, A99
- With BFE or Depth — Zone AE, AO, AH, VE, AR
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile — Zone X
- Future Conditions 1% Annual Chance Flood Hazard — Zone X
- Area with Reduced Flood Risk due to Levee. See Notes. — Zone X
- Area with Flood Risk due to Levee — Zone D

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard — Zone X
- Effective LOMRs
- Area of Undetermined Flood Hazard — Zone D

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 — Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/21/2023 at 8:56 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Summary

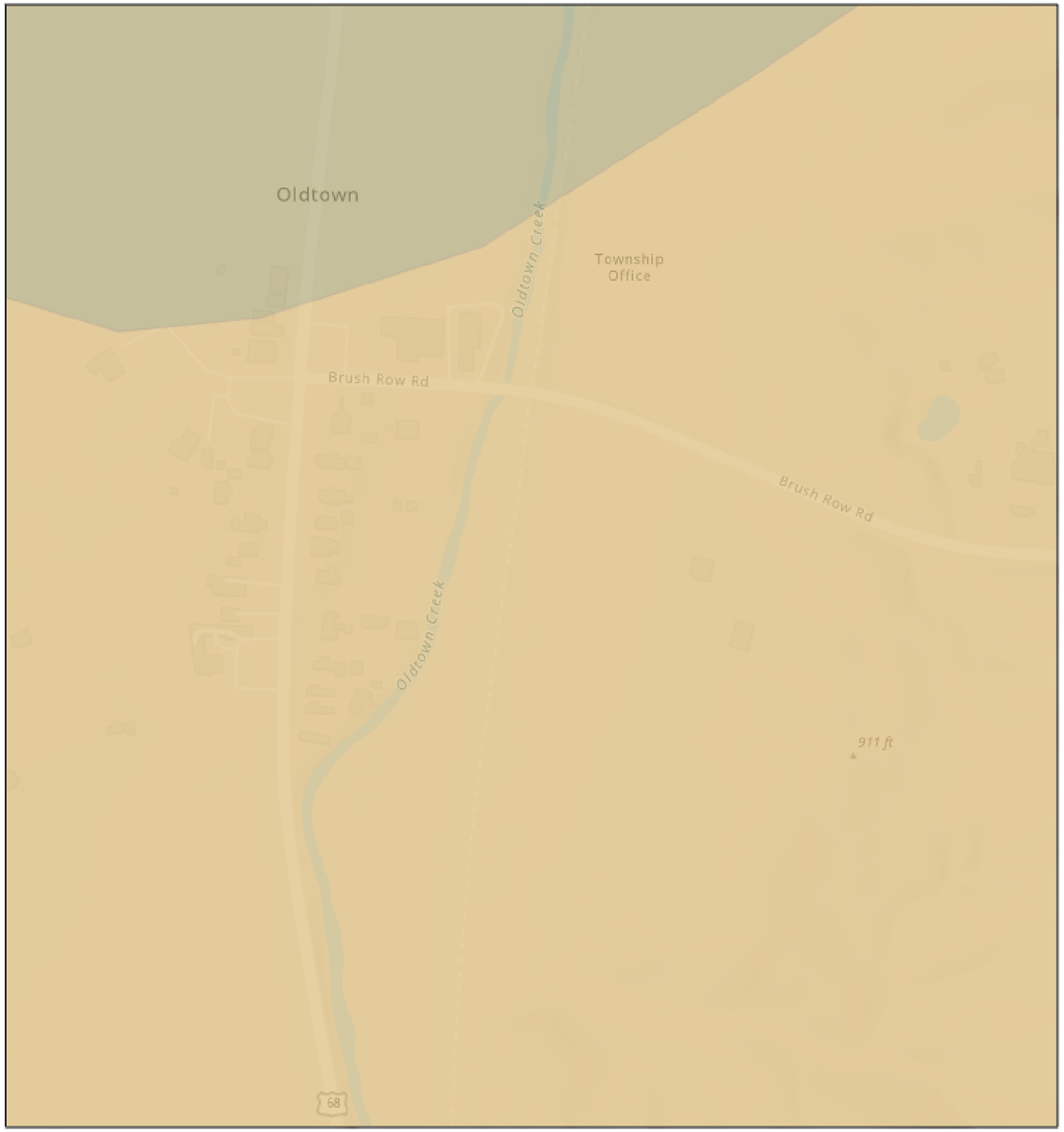
Name	Count	Area(acres)	Length(ft)
SEMS - Non-NPL Sites w/buffer (US EPA)	0	0	N/A
SEMS - NPL Sites w/buffer (US EPA)	0	0	N/A
RCRA (US EPA)	0	N/A	N/A
RCRA - TSD Sites w/buffer (US EPA)	0	0	N/A
Federal Engineering Controls (US EPA)	0	N/A	N/A
Federal Institutional Controls (US EPA)	0	N/A	N/A
BUSTR - UST Locations (BUSTR/OGRIP)	0	N/A	N/A
BUSTR - LUST Locations (BUSTR/OGRIP)	1	N/A	N/A
Coal Gas Generators (OEPA-DERR)	0	N/A	N/A
DERR Database (OEPA-DERR)	0	N/A	N/A
Impoundment Sites (OEPA-DERR)	0	N/A	N/A
Landfills - Active Solid Waste Facilities w/buffer (OEPA-DMWM)	0	0	N/A
Landfills - Historic/Abandoned Facilities w/buffer (OEPA-DMWM/DERR)	0	0	N/A
Landfills - Solid Waste Facility Polygons (OEPA-DMWM)	0	0	N/A
Projects With Engineering Controls (OEPA-DERR)	0	N/A	N/A
Projects With Institutional Controls (OEPA-DERR)	0	N/A	N/A
Spills Database (OEPA)	0	N/A	N/A
VAP Sites (OEPA-DERR)	0	N/A	N/A
Potential Areas of Concern (ODOT-OES)	0	0	N/A

BUSTR - LUST Locations (BUSTR/OGRIP)

#	FACILITY_ID	CURRENT_FACILITY_NAME	ADDRESS	CITY	ZIP
1	*No Data*	XENIA TOWNSHIP ROAD DEPT	12 BRUSHROW RD	XENIA	45385

#	INCIDENT_ID	LTF	STATUS	FACILITY_STATUS	Count
1	*No Data*	6 Closure of regulated UST	NFA: No Further Action	Inactive	1

Drinking Water Source Protection Areas



11/21/2023, 10:11:37 AM

1:4,514

0 0.03 0.06 0.11 mi

0 0.04 0.09 0.18 km

Sole Source Aquifers

Source Water Protection Area

Inner Management Zone

Ohio EPA
Division of Drinking and Ground Waters

Appendix K – Construction Cost Estimates

Estimate GRE-68-12.65

Estimated Cost:$7,258,008.26

Contingency: 35.00%

Estimated Total: $9,798,311.15

Variation 2A Construction Cost Estimate
10% Inflation + 25% Contingency = 35% Contingency

Base Date: 09/12/24

Spec Year: 23

Unit System: E

Work Type: BRIDGE REPLACEMENT

Highway Type:

Urban/Rural Type: RURAL CLASS

Season: FALL

County: GREENE

Latitude of Midpoint: 394343

Longitude of Midpoint: -835656

District: 08

Federal/State Project Number: PID 115388

Estimate Type: Feasibility

Prepared by BMV on 11/09/23
Checked by TLC on 11/17/23
Approved by JPC on 11/17/23

Line #	Item Number / Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
Group 0001: Variation 2A - Full Truss					
0005	503E21300 UNCLASSIFIED EXCAVATION	1.000	LS	$10,000.00000	$10,000.00
0006	505E11100 PILE DRIVING EQUIPMENT MOBILIZATION	1.000	LS	$20,000.00000	$20,000.00
0007	507E00500 12" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN	1,800.000	FT	$13.50000	$24,300.00
0008	507E00550 12" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED	1,980.000	FT	$58.50000	$115,830.00
0010	509E10000 EPOXY COATED STEEL REINFORCEMENT	83,800.000	LB	$1.76629	$148,015.10
0011	511E34446 CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK	193.000	CY	$1,128.26019	$217,754.22
0012	511E42010 CLASS QC1 CONCRETE, PIER ABOVE FOOTINGS	93.000	CY	$1,375.00000	$127,875.00
0013	511E43510 CLASS QC1 CONCRETE, ABUTMENT INCLUDING FOOTING	121.000	CY	$645.00000	$78,045.00
0014	511E46510 CLASS QC1 CONCRETE, FOOTING	32.000	CY	$1,050.00000	$33,600.00
0016	512E10100 SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	1,164.000	SY	$27.50000	$32,010.00
0017	513E10121 STRUCTURAL STEEL MEMBERS, LEVEL 6, AS PER PLAN *Prefabricated Truss (4 Units)*	1.000	LS	$3,201,800.00000	$3,201,800.00
0018	517E76300 RAILING, MISC.: *Pedestrian Railing*	969.000	FT	$150.00000	$145,350.00
0019	518E21200 POROUS BACKFILL WITH GEOTEXTILE FABRIC	81.000	CY	$116.83751	$9,463.84
0020	607E98300 FENCE, MISC.: *Truss mounted chain link mesh*	1,900.000	SF	$175.00000	$332,500.00
0021	625E33000 STRUCTURE GROUNDING SYSTEM	1.000	EACH	$9,104.37515	$9,104.38
0022	840E20000 MECHANICALLY STABILIZED EARTH WALL	8,033.000	SF	$125.00000	$1,004,125.00
0023	870E10000 PREFABRICATED MODULAR RETAINING WALL	712.000	SF	$75.00000	$53,400.00

Line #	Item Number	Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
0024	870E11000	WALL EXCAVATION	58.000	CY	$45.00000	$2,610.00
0025	870E14000	ON-SITE ASSISTANCE	2.000	DAY	$1,000.00000	$2,000.00
0026	507E92200	PREBORED HOLES	400.000	FT	$47.00000	$18,800.00
0073	503E11100	COFFERDAMS AND EXCAVATION BRACING	1.000	LS	$10,000.00000	$10,000.00

Total for Group 0001:$5,596,582.54

Group 0010: Roadway

Line #	Item Number	Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
0000	630E89816	REMOVAL OF WOOD POLE AND REERECTION	9.000	EACH	$1,500.00000	$13,500.00
0027	201E11000	CLEARING AND GRUBBING	1.000	LS	$25,000.00000	$25,000.00
0028	202E23000	PAVEMENT REMOVED	550.000	SY	$21.82000	$12,001.00
0029	202E30000	WALK REMOVED	5,762.000	SF	$6.61000	$38,086.82
0030	202E32000	CURB REMOVED	1,681.000	FT	$14.32000	$24,071.92
0031	203E10000	EXCAVATION	2,878.000	CY	$23.01000	$66,222.78
0032	203E20000	EMBANKMENT	2,075.000	CY	$18.49000	$38,366.75
0033	204E45000	PROOF ROLLING	5.000	HOUR	$262.63000	$1,313.15
0034	607E98000	FENCE, MISC.: *PEDESTRIAN RAILING*	1,257.000	FT	$66.50000	$83,590.50
0035	608E10000	4" CONCRETE WALK	4,911.000	SF	$9.21000	$45,230.31
0036	608E40001	CONCRETE STEPS, TYPE A, AS PER PLAN	264.000	FT	$225.00000	$59,400.00
0037	608E52000	CURB RAMP	52.000	SF	$50.41000	$2,621.32
0038	608E53020		20.000	SF	$56.61000	$1,132.20

Line #	Item Number	Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
		DETECTABLE WARNING				
0074	690E50350	SPECIAL - MAILBOX REMOVED AND RESET	15.000	EACH	$184.06000	$2,760.90
0075	204E10000	SUBGRADE COMPACTION	2,022.000	SY	$3.37000	$6,814.14
0076	609E26000	CURB, TYPE 6	5,110.000	FT	$33.01000	$168,681.10
0077	530E99040	SPECIAL - STRUCTURES *CONSULTANT FOR CONCRETE QUALITY CONTROL INCLUDING TESTING AND INSPECTION*	1.000	LS	$10,000.00000	$10,000.00

Total for Group 0010:$598,792.89

Group 0020: Erosion Control

Line #	Item Number	Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
0040	659E00100	SOIL ANALYSIS TEST	1.000	EACH	$97.56000	$97.56
0041	659E00300	TOPSOIL	193.000	CY	$44.60000	$8,607.80
0042	659E10000	SEEDING AND MULCHING	1,738.000	SY	$3.21000	$5,578.98
0043	659E14000	REPAIR SEEDING AND MULCHING	87.000	SY	$1.19000	$103.53
0044	659E15000	INTER-SEEDING	87.000	SY	$0.95000	$82.65
0045	659E20000	COMMERCIAL FERTILIZER	0.390	TON	$981.67000	$382.85
0046	659E31000	LIME	0.360	ACRE	$155.98000	$56.15
0047	659E35000	WATER	14.080	MGAL	$2.01000	$28.30
0048	832E30000	EROSION CONTROL	40,000.000	EACH	$1.00000	$40,000.00
0049	832E15000	STORM WATER POLLUTION PREVENTION PLAN	1.000	LS	$15,000.00000	$15,000.00
0050	832E15002	STORM WATER POLLUTION PREVENTION INSPECTIONS	1.000	LS	$20,000.00000	$20,000.00
0051	832E15010		1.000	LS	$20,000.00000	$20,000.00

Line #	Item Number	Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
		STORM WATER POLLUTION PREVENTION INSPECTION SOFTWARE				

Total for Group 0020:$109,937.82

Group 0040: Drainage

Line #	Item Number	Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
0052	611E98150	CATCH BASIN, NO. 3	5.000	EACH	$5,000.00000	$25,000.00
0053	611E99574	MANHOLE, NO. 3	3.000	EACH	$5,400.00000	$16,200.00

Total for Group 0040:$41,200.00

Group 0050: Pavement

Line #	Item Number	Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
0054	254E01000	PAVEMENT PLANING, ASPHALT CONCRETE	3,466.000	SY	$5.07000	$17,572.62
0055	255E20000	FULL DEPTH PAVEMENT SAWING	100.000	FT	$8.91000	$891.00
0056	304E20000	AGGREGATE BASE	1,366.000	CY	$69.56000	$95,018.96
0057	407E20000	NON-TRACKING TACK COAT	650.000	GAL	$3.92000	$2,548.00
0058	441E50000	ASPHALT CONCRETE SURFACE COURSE, TYPE 1, (448), PG64-22	236.000	CY	$332.04000	$78,361.44
0059	441E50300	ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 2, (448)	374.000	CY	$257.59000	$96,338.66
0060	452E10010	6" NON-REINFORCED CONCRETE PAVEMENT, CLASS QC 1P	460.000	SY	$85.77000	$39,454.20
0078	878E25000	INSPECTION AND COMPACTION TESTING OF UNBOUND MATERIALS	1.000	LS	$30,000.00000	$30,000.00

Total for Group 0050:$360,184.88

Group 0060: Traffic Control

Line #	Item Number	Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
0061	621E00100	RPM	38.000	EACH	$55.58000	$2,112.04
0062	630E03100	GROUND MOUNTED SUPPORT, NO. 3 POST	200.000	FT	$14.81000	$2,962.00
0063	630E80100	SIGN, FLAT SHEET	150.000	SF	$24.48000	$3,672.00

Line #	Item Number	Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
0064	644E00104	EDGE LINE, 6"	1.770	MILE	$4,545.76000	$8,046.00
0065	644E00300	CENTER LINE	0.880	MILE	$6,256.68000	$5,505.88
0066	644E00500	STOP LINE	36.000	FT	$10.57000	$380.52
0067	644E00630	CROSSWALK LINE, 24"	187.000	FT	$5.55000	$1,037.85
0068	630E97700	SIGNING, MISC.: *SOLAR-POWERED RECTANGULAR RAPID FLASHING BEACON (RRFB) SIGN ASSEMBLY*	1.000	EACH	$20,000.00000	$20,000.00

Total for Group 0060:$43,716.29

Group 0090: Incidentals

Line #	Item Number	Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
0069	614E11000	MAINTAINING TRAFFIC	1.000	LS	$100,000.00000	$100,000.00
0070	619E16010	FIELD OFFICE, TYPE B	8.000	MNTH	$2,199.23000	$17,593.84
0071	623E10000	CONSTRUCTION LAYOUT STAKES AND SURVEYING	1.000	LS	$30,000.00000	$30,000.00
0072	624E10000	MOBILIZATION	1.000	LS	$360,000.00000	$360,000.00

Total for Group 0090:$507,593.84

Estimate GRE-68-12.65

Estimated Cost:$6,254,704.40

Contingency: 35.00%

Estimated Total: $8,443,850.94

Variation 2B Construction Cost Estimate
10% Inflation+ 25% Contingency = 35% Contingency

Base Date: 09/12/24

Spec Year: 23

Unit System: E

Work Type: BRIDGE REPLACEMENT

Highway Type:

Urban/Rural Type: RURAL CLASS

Season: FALL

County: GREENE

Latitude of Midpoint: 394343

Longitude of Midpoint: -835656

District: 08

Federal/State Project Number: PID 115388

Estimate Type: Feasibility

Prepared by BMV on 11/09/23
Checked by TLC on 11/17/23
Approved by JPC on 11/17/23

Line #	Item Number	Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
Group 0001: Variation 2B - Truss and P/S Concrete Beams						
0005	503E21300	UNCLASSIFIED EXCAVATION	1.000	LS	$10,000.00000	$10,000.00
0006	505E11100	PILE DRIVING EQUIPMENT MOBILIZATION	1.000	LS	$20,000.00000	$20,000.00
0007	507E00500	12" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN	1,800.000	FT	$13.50000	$24,300.00
0008	507E00550	12" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED	1,980.000	FT	$58.50000	$115,830.00
0010	509E10000	EPOXY COATED STEEL REINFORCEMENT	90,250.000	LB	$1.75532	$158,417.63
0011	511E34446	CLASS QC2 CONCRETE WITH QC/QA, BRIDGE DECK	217.000	CY	$1,105.67456	$239,931.38
0012	511E42010	CLASS QC1 CONCRETE, PIER ABOVE FOOTINGS	93.000	CY	$1,375.00000	$127,875.00
0013	511E43510	CLASS QC1 CONCRETE, ABUTMENT INCLUDING FOOTING	121.000	CY	$645.00000	$78,045.00
0014	511E46510	CLASS QC1 CONCRETE, FOOTING	32.000	CY	$1,050.00000	$33,600.00
0016	512E10100	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	2,279.000	SY	$27.50000	$62,672.50
0017	513E10121	STRUCTURAL STEEL MEMBERS, LEVEL 6, AS PER PLAN Prefabricated Truss (first and last span)	1.000	LS	$1,630,000.00000	$1,630,000.00
0018	517E76300	RAILING, MISC.: *42" tall pedestrian railing*	969.000	FT	$250.00000	$242,250.00
0019	518E21200	POROUS BACKFILL WITH GEOTEXTILE FABRIC	81.000	CY	$116.83751	$9,463.84
0020	607E98300	FENCE, MISC.: *Truss mounted chain link mesh*	1,900.000	SF	$175.00000	$332,500.00
0021	625E33000	STRUCTURE GROUNDING SYSTEM	1.000	EACH	$9,104.37515	$9,104.38
0022	840E20000	MECHANICALLY STABILIZED EARTH WALL	8,033.000	SF	$125.00000	$1,004,125.00
0023	870E10000	PREFABRICATED MODULAR RETAINING WALL	712.000	SF	$75.00000	$53,400.00
0024	870E11000	WALL EXCAVATION	58.000	CY	$45.00000	$2,610.00
0025	870E14000	ON-SITE ASSISTANCE	2.000	DAY	$1,000.00000	$2,000.00

Line #	Item Number	Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
0026	515E15080	DRAPED STRAND PRESTRESSED CONCRETE BRIDGE I-BEAM MEMBERS, LE VEL 3, TYPE WF42-49	6.000	EACH	$48,000.00000	$288,000.00
0027	515E20000	INTERMEDIATE DIAPHRAGMS	12.000	EACH	$2,329.49619	$27,953.95
0028	516E44200	ELASTOMERIC BEARING WITH INTERNAL LAMINATES AND LOAD PLATE (NEOPRENE)	12.000	EACH	$2,750.00000	$33,000.00
0029	507E92200	PREBORED HOLES	400.000	FT	$47.00000	$18,800.00
0076	503E11100	COFFERDAMS AND EXCAVATION BRACING	1.000	LS	$10,000.00000	$10,000.00

Total for Group 0001:$4,533,878.68

Group 0010: Roadway

Line #	Item Number	Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
0030	201E11000	CLEARING AND GRUBBING	1.000	LS	$25,000.00000	$25,000.00
0031	202E23000	PAVEMENT REMOVED	550.000	SY	$21.82000	$12,001.00
0032	202E30000	WALK REMOVED	5,762.000	SF	$6.61000	$38,086.82
0033	202E32000	CURB REMOVED	1,681.000	FT	$14.32000	$24,071.92
0034	203E10000	EXCAVATION	2,878.000	CY	$23.01000	$66,222.78
0035	203E20000	EMBANKMENT	2,075.000	CY	$18.49000	$38,366.75
0036	204E45000	PROOF ROLLING	5.000	HOUR	$262.63000	$1,313.15
0037	607E98000	FENCE, MISC.: PEDESTRIAN RAILING	1,257.000	FT	$66.50000	$83,590.50
0038	608E10000	4" CONCRETE WALK	4,911.000	SF	$9.21000	$45,230.31
0039	608E40001	CONCRETE STEPS, TYPE A, AS PER PLAN	528.000	FT	$225.00000	$118,800.00
0040	608E52000	CURB RAMP	52.000	SF	$50.41000	$2,621.32
0041	608E53020		20.000	SF	$56.61000	$1,132.20

Line #	Item Number	Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
		DETECTABLE WARNING				
0078	630E89816	REMOVAL OF WOOD POLE AND REERECTION	9.000	EACH	$1,500.00000	$13,500.00
0079	690E50350	SPECIAL - MAILBOX REMOVED AND RESET	15.000	EACH	$184.06000	$2,760.90
0080	204E10000	SUBGRADE COMPACTION	2,022.000	SY	$3.37000	$6,814.14
0081	609E26000	CURB, TYPE 6	5,110.000	FT	$33.01000	$168,681.10
0082	530E99040	SPECIAL - STRUCTURES *CONSULTANT FOR CONCRETE QUALITY CONTROL INCLUDING TESTING AND INSPECTION*	1.000	LS	$10,000.00000	$10,000.00

Total for Group 0010:$658,192.89

Group 0020: Erosion Control

Line #	Item Number	Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
0043	659E00100	SOIL ANALYSIS TEST	1.000	EACH	$97.56000	$97.56
0044	659E00300	TOPSOIL	193.000	CY	$44.60000	$8,607.80
0045	659E10000	SEEDING AND MULCHING	1,738.000	SY	$3.21000	$5,578.98
0046	659E14000	REPAIR SEEDING AND MULCHING	87.000	SY	$1.19000	$103.53
0047	659E15000	INTER-SEEDING	87.000	SY	$0.95000	$82.65
0048	659E20000	COMMERCIAL FERTILIZER	0.390	TON	$981.67000	$382.85
0049	659E31000	LIME	0.360	ACRE	$155.98000	$56.15
0050	659E35000	WATER	14.080	MGAL	$2.01000	$28.30
0051	832E30000	EROSION CONTROL	40,000.000	EACH	$1.00000	$40,000.00
0052	832E15000	STORM WATER POLLUTION PREVENTION PLAN	1.000	LS	$15,000.00000	$15,000.00
0053	832E15002		1.000	LS	$20,000.00000	$20,000.00

Line #	Item Number	Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
		STORM WATER POLLUTION PREVENTION INSPECTIONS				
0054	832E15010	STORM WATER POLLUTION PREVENTION INSPECTION SOFTWARE	1.000	LS	$20,000.00000	$20,000.00

Total for Group 0020:$109,937.82

Group 0040: Drainage

0055	611E98150	CATCH BASIN, NO. 3	5.000	EACH	$5,000.00000	$25,000.00
0056	611E99574	MANHOLE, NO. 3	3.000	EACH	$5,400.00000	$16,200.00

Total for Group 0040:$41,200.00

Group 0050: Pavement

0057	254E01000	PAVEMENT PLANING, ASPHALT CONCRETE	3,466.000	SY	$5.07000	$17,572.62
0058	255E20000	FULL DEPTH PAVEMENT SAWING	100.000	FT	$8.91000	$891.00
0059	304E20000	AGGREGATE BASE	1,366.000	CY	$69.56000	$95,018.96
0060	407E20000	NON-TRACKING TACK COAT	650.000	GAL	$3.92000	$2,548.00
0061	441E50000	ASPHALT CONCRETE SURFACE COURSE, TYPE 1, (448), PG64-22	236.000	CY	$332.04000	$78,361.44
0062	441E50300	ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 2, (448)	374.000	CY	$257.59000	$96,338.66
0063	452E10010	6" NON-REINFORCED CONCRETE PAVEMENT, CLASS QC 1P	460.000	SY	$85.77000	$39,454.20
0083	878E25000	INSPECTION AND COMPACTION TESTING OF UNBOUND MATERIALS	1.000	LS	$30,000.00000	$30,000.00

Total for Group 0050:$360,184.88

Group 0060: Traffic Control

0064	621E00100	RPM	38.000	EACH	$55.58000	$2,112.04
0065	630E03100	GROUND MOUNTED SUPPORT, NO. 3 POST	200.000	FT	$14.81000	$2,962.00

Line #	Item Number	Description / *Supplemental Description*	Quantity	Units	Unit Price	Extension
0066	630E80100	SIGN, FLAT SHEET	150.000	SF	$24.48000	$3,672.00
0067	644E00104	EDGE LINE, 6"	1.770	MILE	$4,545.76000	$8,046.00
0068	644E00300	CENTER LINE	0.880	MILE	$6,256.68000	$5,505.88
0069	644E00500	STOP LINE	36.000	FT	$10.57000	$380.52
0070	644E00630	CROSSWALK LINE, 24"	187.000	FT	$5.55000	$1,037.85
0071	630E97700	SIGNING, MISC.: SOLAR-POWERED RECTANGULAR RAPID FLASHING BEACON (RRFB) SIGN ASSEMBLY	1.000	EACH	$20,000.00000	$20,000.00

Total for Group 0060:$43,716.29

Group 0090: Incidentals

0072	614E11000	MAINTAINING TRAFFIC	1.000	LS	$100,000.00000	$100,000.00
0073	619E16010	FIELD OFFICE, TYPE B	8.000	MNTH	$2,199.23000	$17,593.84
0074	623E10000	CONSTRUCTION LAYOUT STAKES AND SURVEYING	1.000	LS	$30,000.00000	$30,000.00
0075	624E10000	MOBILIZATION	1.000	LS	$360,000.00000	$360,000.00

Total for Group 0090:$507,593.84

FY 2024-2028 Business Plan Inflation Calculator:

Not sure if you have the latest calculator? Click here.

Last Modified: 7/20/2023

Today's Date:
December 28, 2023

Please Enter Values in the Yellow Areas Only:

Estimation Start Date:
Less than or Equal to Today's Date
(mm/dd/yyyy)

12/28/2023
Start Date:

Enter Construction Mid-Point Date:
(cannot exceed 12/28/2048)
(mm/dd/yyyy)

10/1/2025
Construction Mid-Point Date:

Present-Day Estimated Cost:

$9,072,510.00
Estimated Dollar Amount:

Estimate Start Date to Construction Mid-Point Date: **22** **Months**

Inflation - Start to Mid-Point of Construction:

	(compounded growth rate)	Inflated Dollar Amount:
Business Plan	**10.0%**	**$9,979,673.62**

Estimator's Name:

County - Route - Section:

PID:

Estimator's Notes:
Use Alternative 2A Estimated Cost, apply 10% inflation rate for sell date of September 2024.