



## **HAS-BRDGE-00.045 BRIDGE PRELIMINARY DESIGN REPORT**

ODOT DISTRICT 11 & THE VILLAGE OF BOWERSTON

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## **1.0 INTRODUCTION AND PROJECT BACKGROUND**

EMH&T has developed the Stage 1 plans for the HAS-Bridge St Bridge Replacement project (PID 120494), which includes the replacement of the HAS-BRDGE-00.045 bridge in the Village of Bowerston. Per the project scope, we have included this Bridge Preliminary Design Report to highlight and supplement the critical components of the bridge design and plan development.

The existing bridge, originally constructed pre-1900, carries Bridge St over Conotton Creek and is a single span prestressed box beam bridge with an asphalt wearing surface. This current superstructure was added as part of a 1997 rehabilitation and sits atop both stone and concrete abutments. The existing bridge currently has a General Appraisal of 4B and received bridge replacement funds for construction in 2026 through the Municipal Bridge Program. The project will be an Ohio Department of Transportation (ODOT) Let project and follows the ODOT plan development requirements.

## **2.0 BRIDGE HYDRAULICS**

Hydraulic calculations for the existing and proposed bridge over Conotton Creek were performed to determine if the proposed structure satisfies the headwater requirements from ODOT's L&D Vol. II Manual. Per the L&D Vol. II, the design storm for this structure is the 10-year storm and the check storm is the 100-year storm event. Based on the analysis performed, the proposed structure does meet the requirements of Section 1006.3, which requires the design and check storm headwater to be lower than existing conditions. The analysis shows the headwater design headwater matching the existing for the design and check storm, respectively. The proposed bridge low chord also clears the design storm event by 0.42 ft, an additional requirement of Section 1006.3. As Conotton Creek is a FEMA Zone AE stream with flood elevations, local floodplain administrator coordination will be performed to document the No-Rise solution.

EMH&T also performed scour calculations for the bridge abutments as part of the Hydraulic Analysis. As noted in the Geotechnical Report for the project, the rock at the bridge location is 38.5' deep at the forward abutment and 50.0' deep at the rear abutment. As such, driven piles are the recommended foundation type. Scour calculations determined the anticipated scour depth to be 12.65' at both abutments. This depth was used in the design of the piles for the abutments. See section **4.3 Foundations** for additional pile design information.

For additional information see ***Bridge Street Bridge Replacement Hydraulic Report*** included with the Stage 1 submittal.

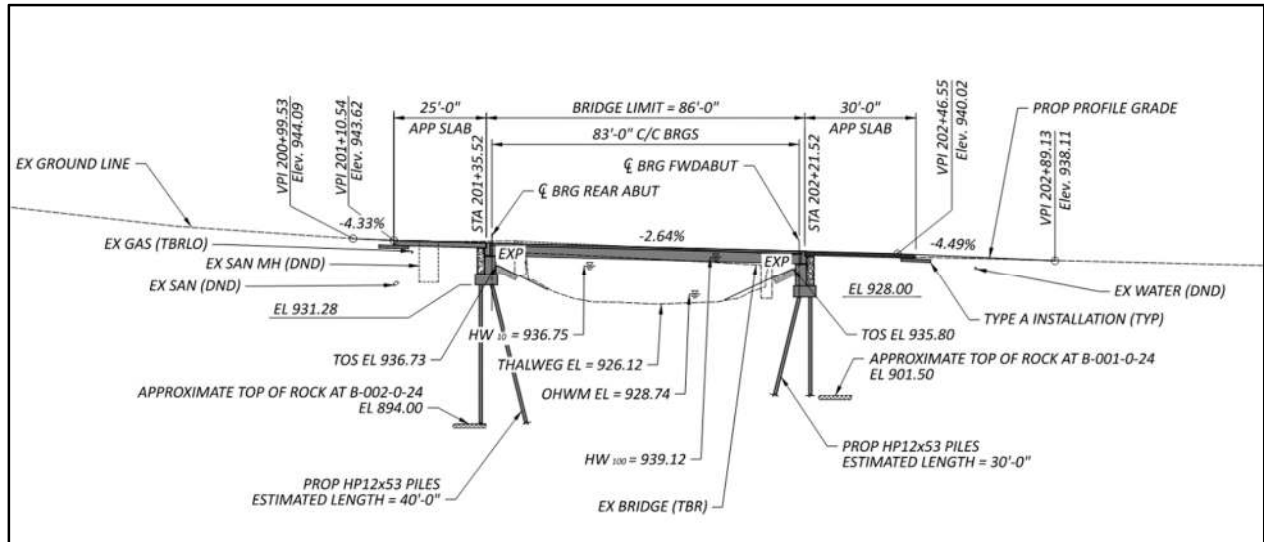
## **3.0 MAINTENANCE OF TRAFFIC**

As Bridge St is the only access point to the houses, businesses, and park on the north side of Conotton Creek the bridge will be replaced using part width construction. The plans will maintain a single 9'-6" lane of two-way traffic utilizing signals in both phases of construction. Water Alley will be closed during construction, but accessible during Phase 1 construction. All drives adjacent to the bridge will be maintained during construction.

For additional information see ***Sheet 4/21 in the Stage 1 Plans***.

## 4.0 HAS-BRIDGE-00.045 BRIDGE DESIGN

The proposed bridge span length is 15' more than the existing, to facilitate placing the proposed abutments behind the existing. The profile was set at 2.64% across the bridge to closely match the existing, thus minimizing construction off the bridge, and clearing the 10-year storm with the low chord. The existing bridge is skewed 10 degrees (left forward) but does not frame the channel well. As such, we propose a non-skewed bridge to improve hydraulic opening. We will design the proposed bridge per AASHTO LRFD and ODOT BDM guidelines for HL-93 and a 60 psf FWS.



**FIGURE 4-1**  
Bridge and Profile Layout

## 4.1 SUPERSTRUCTURE

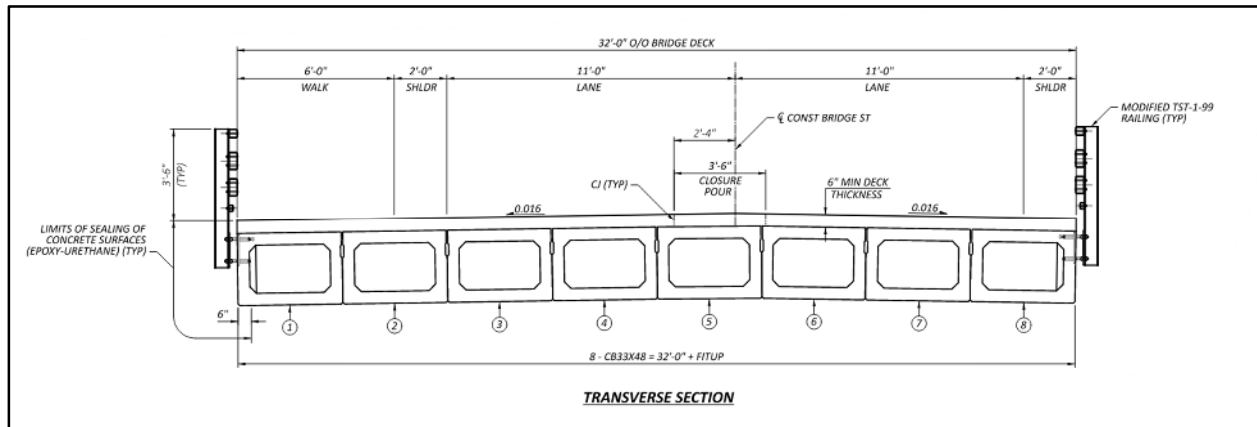
### 4.1.1 TRANSVERSE SECTION

The bridge transverse section consists of two (2) – 2 ft shoulders, two (2) – 11 ft lanes, and a 6' flush sidewalk on the west side of the bridge. This combines for a total out-to-out deck width of 32'-0". The railings on both sides of the bridge are per Standard Drawing TST-1-99, with modifications to be 3'-6" tall from the top of deck elevation to provide fall protection for pedestrians. The cross slopes on the deck are 0.016 to facilitate over-the-side drainage on both sides of the bridge.

For additional transverse section and railing details see **Sheet 15/21 in the Stage 1 Plans**.

### 4.1.2 BEAM DESIGN

The proposed bridge will utilize eight (8) – CB33x48 prestressed box beams with a composite reinforced concrete deck. The preliminary design indicates standard concrete compressive strengths of 5.0 ksi release and 7.0 ksi final are acceptable. Our preliminary design includes 34 strands per beam. This design will be finalized in Stage 2 along with additional plan details and the load rating for the bridge.



**FIGURE 4-22**  
Transverse Section

### 4.1.3 APPROACH SLABS

The excavation limits for the bridge foundations will require the use of a 25'-0" approach slab at the rear abutment and a 30'-0" approach slab at the forward abutment, which will be accompanied by Type A approach slab installations per Standard Drawing AS-2-15. The approach slab on both sides of the bridge will be slightly kinked to follow the alignment of the road and transition the alignment back to existing as quickly as possible. Additional details for the sidewalk and approach slabs will be included in the Stage 2 plans.

## 4.2 SUBSTRUCTURE

Given the height of the abutments and scour depths, two rows of piles will be needed to support the abutments creating a rigid foundation that requires the use of a semi-integral abutments. The Stage 1 plans currently show the abutment detailed per Figure 306-8 of the 2020 BDM. Abutment heights are roughly 8'-6" and 9'-0" at the rear and forward abutments, respectively. The wingwall on the southwest corner extends 20' to the west to replace an existing stacked stone wall that supports Water Alley. This wingwall will incorporate a face mounted TST-1-99 modified railing.

For abutment and wingwall cross sections see **Sheet 15/21 in the Stage 1 Plans**.

## 4.3 FOUNDATIONS

As discussed above we propose to use two rows of driven piles to rock to support the proposed foundations. We initially looked at vertical piles, but with over a 12' scour depth a p-y analysis indicated a reasonable pile size and spacing could not support the horizontal loading on the piles. As such, per BDM Section 305.3.5.8, we have shown a battered front pile to resist the horizontal loads on the abutment. We feel that since the piles are not being battered over traffic these should not be a significant challenge to install and is preferred over a significantly larger pile or drilled shaft supported foundation. Our preliminary design indicates an HP12x53 pile is capable of supporting the vertical and horizontal forces spaced at roughly 7' at each abutment.

For additional foundation information see the ***Draft Geotechnical Report*** included with the Stage 1 submittal.

#### **4.4 CONSTRUCTIBILITY AND UTILITY CONFLICTS**

As a part of the Stage 1 plans EMH&T investigated the constructability around the bridge as it relates to utilities, impacts to adjacent properties, safe removal of the existing bridge, and maintaining traffic on Bridge St.

##### **4.4.1 AEP**

There are existing AEP facilities in the vicinity of the bridge, including poles and overhead lines that parallel Bridge St just to the east of the bridge and that parallel Water Alley on the north side of the road and cross over Bridge St just south of the bridge. Both of these facilities will need relocated prior to construction to facilitate the replacement of the bridge. We have had preliminary conversations with Clarke Saunders at AEP and will provide Stage 1 plans for their review. A follow up meeting will be scheduled if needed to discuss the project.

##### **4.4.2 NORTHEAST OHIO NATURAL GAS FACILITIES**

Existing gas lines that are in Bridge St and Water Alley, south of Conotton Creek, will need relocated for the construction of the bridge. We met with Mark Wetzel on 6/4/24 to discuss the project and will provide Stage 1 plans for their review. Refer to meeting minutes from this meeting for additional information on the existing gas lines.

##### **4.4.3 VILLAGE OF BOWERSTON SANITARY AND WATER**

Based on OUPS markings and coordination with the Village there are existing Village water and sanitary facilities on both sides of the bridge. The sanitary pipes and manholes appear to be both far enough from the construction and deep enough to not need relocated. We do not have complete information on the waterline that parallels Water Alley on the south side of the bridge, but preliminarily we expect this line to be relocated with the project as it is Village owned. The locations of the Village's utilities will be confirmed in a site meeting on 7/1/24 and dispositions will be revised as needed for the Stage 2 submission.

##### **4.4.4 PART WIDTH CONSTRUCTION**

Building the bridge part width creates challenges considering the age of the existing bridge and narrow roadway. To maintain a 9'-6" lane we will construct three 4' wide box beams on the east side of the bridge, replacing the side of the bridge that is currently closed to traffic first. To facilitate this first phase of construction we are proposing to shift the bridge 1'-6" to the east to allow for temporary shoring and space for the contractor to work.

The existing abutments are a combination of stacked stone and concrete. To ensure the existing abutments are not compromised by partial removal efforts, the plans will show only enough removal of the existing abutments in the first phase as needed to set the proposed beams over the existing abutments. The existing abutments will also act as shoring for excavation on the channel side of the proposed abutments.

We are coordinating with crane suppliers to understand crane placement options with setting the proposed beams in each phase. Currently we are showing construction limits that accommodate using either a single large crane on the south side of the bridge, or two smaller cranes with one placed on the north and south side of the bridge. This will provide the contractor flexibility in construction and does not excessively encroach on adjacent properties.

See the ***Stage 1 Plans and Utility Conflicts Exhibit*** for additional information.