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SUBJECT: Floodwall Seepage Evaluation

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Introduction

The Illinois Department of Transportation (Department) – District One in Schaumburg, Illinois, in cooperation with the Federal Highway Administration (FHWA) is designing a 16-mile section of I-80 from Ridge Road to US Route 30 that spans three counties (Kendall, Grundy, and Will) and six municipalities, including the City of Joliet. As part of the corridor improvements, the Department is proposing the reconstruction of the existing truss bridges on I-80 spanning the Des Plaines River, a designated navigable waters of the U.S. (WOUS) and a designated Public Water located in the City of Joliet, Will County, Illinois at River Mile 287.0, approximately 1 mile north of the U.S. Army Corps of Engineers (USACE) Civil Works project, the Brandon Road Lock and Dam (41.511805°N, - 88.91769°W). Floodwalls connected to the Brandon Road Lock and Dam and managed by the USACE – Rock Island District are located along the Des Plaines River and on either side of the proposed bridge structures. A Section 408 Permission Request is required by the USACE due to the proximity of the proposed bridge improvement project site in relation to the Brandon Road Lock and Dam. The Section 408 review will verify that the proposed bridge improvement project will not impair the usefulness of USACE Civil Works project nor be considered injurious to the public interest.

Purpose

The purpose of this Technical Memorandum is to demonstrate that the proposed Des Plaines River Bridge reconstruction project would not impact the existing floodwalls nor result in through-seepage and/or under-seepage - to the existing floodwalls. First, a description is provided with the type of design used to construct the existing floodwall. Next, an explanation is given to demonstrate how the proposed bridge improvement project will be designed practicable as to not impair the usefulness of the Brandon Road Lock and Dam Civil Works project and therefore will not be considered injurious to the public interest.

As-built Record Plans of Existing Floodwalls

Based on as-built plans of the Brandon Road Lock and Dam prepared in 1934 and received from the USACE Rock Island District on January 25, 2024, the drawings show typical sections of mass concrete gravity floodwalls with a concrete shear key embedded into bedrock are present along the west floodwall of the Des Plaines River and within the area for the proposed bridge structures. Section A-A from the as-built plans is shown below in **Figure 1**.

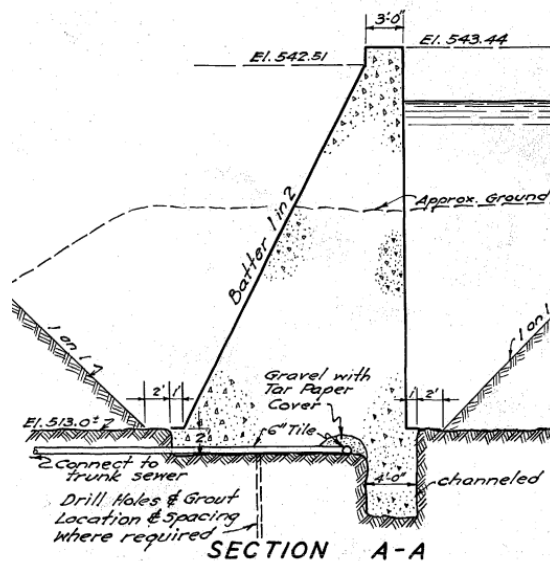


Figure 1. As-Built Mass Concrete Gravity Floodwall with a Shear Key within Vicinity of the existing I-80 Des Plaines River Bridge

In addition, **Figure 2** shown below is an exhibit of a Mass Concrete Gravity Floodwall from the USACE Engineer Manual for Floodwalls and Hydraulic Retaining Walls.

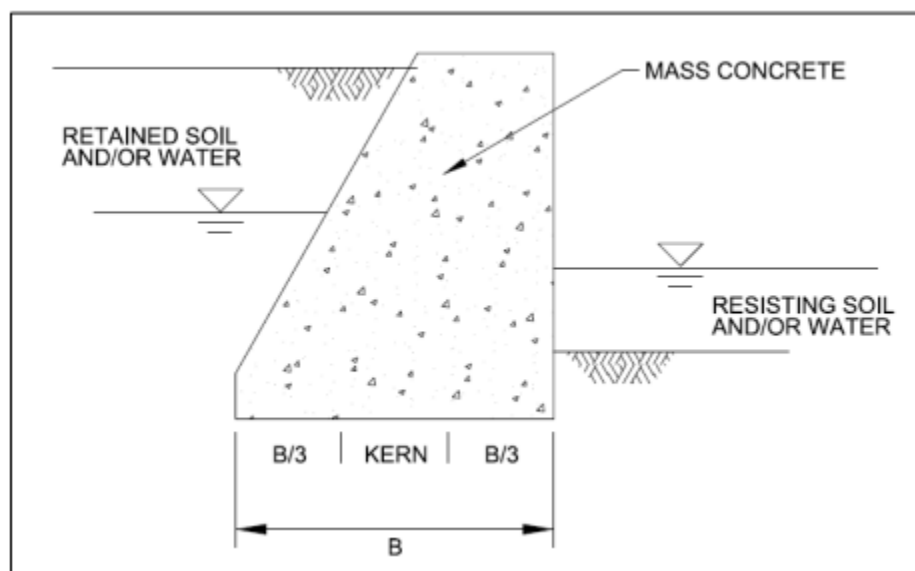


Figure 2. Typical Section of a Mass Concrete Gravity Wall

Floodwall - Mass Gravity Wall with Shear Key

The type of floodwall as part of Brandon Road Lock and Dam flanking the Des Plaines River is known as a mass concrete gravity wall with an extended shear key embedded into an impervious foundation. As the name implies, a gravity floodwall is a solid concrete structure that maintains stability through its' geometric shape, strength of the concrete material and the mass of the wall at its base. The existing floodwalls are effectively positioned on a sound foundation of limestone bedrock. Overall, this type of floodwall has a high resistance to sliding, overturning, and bearing pressure. It is simply too heavy to be overturned by a lateral flood load. In addition, the floodwall has a concrete shear key embedded into bedrock to anchor the floodwall in place and provide a seal at the bedrock bottom to deter seepage from the river to the surrounding land adjacent to the river.

The photos below show images of the existing floodwalls located within the proposed project site and near the Ozinga property.



Photo 1. General photo of floodwall (at Ozinga property), looking south.



Photo 2. Close up photo of floodwall (at Ozinga property), looking northeast.

Proposed Permanent Bridge Structures and Temporary Construction Works

The proposed fixed bridge structures will consist of two separate bridge structures, SN 099-8325 (EB) and SN 099-8309 (WB) will utilize steel plate girder bridges over the river and prestressed concrete beams on the east approaches with a total length of approximately 2,173 feet (ft.) measured from back-to-back of abutments, 74.83 ft. wide over the river. The new I-80 Des Plaines River Bridge will provide three through lanes and one auxiliary lane with full shoulders on each side to accommodate future year 2050 projected travel demand. The new permanent bridge foundations (18 piers) will be designed to be constructed directly on bedrock.

During construction, it is proposed that two temporary causeways would be placed on either side of the Des Plaines River within the work zone and outside of the navigational channel. The toe of the slope of each causeway will be comprised of clean Stone Class A4 Riprap and the contractor will place the material on bedrock with an approximate 5-foot set-back from the existing floodwall to avoid impact. After construction, the contractor will remove the material from the work zone within the Des Plaines River channel. Refer to **Figure 3** shown below that illustrates the temporary construction methods

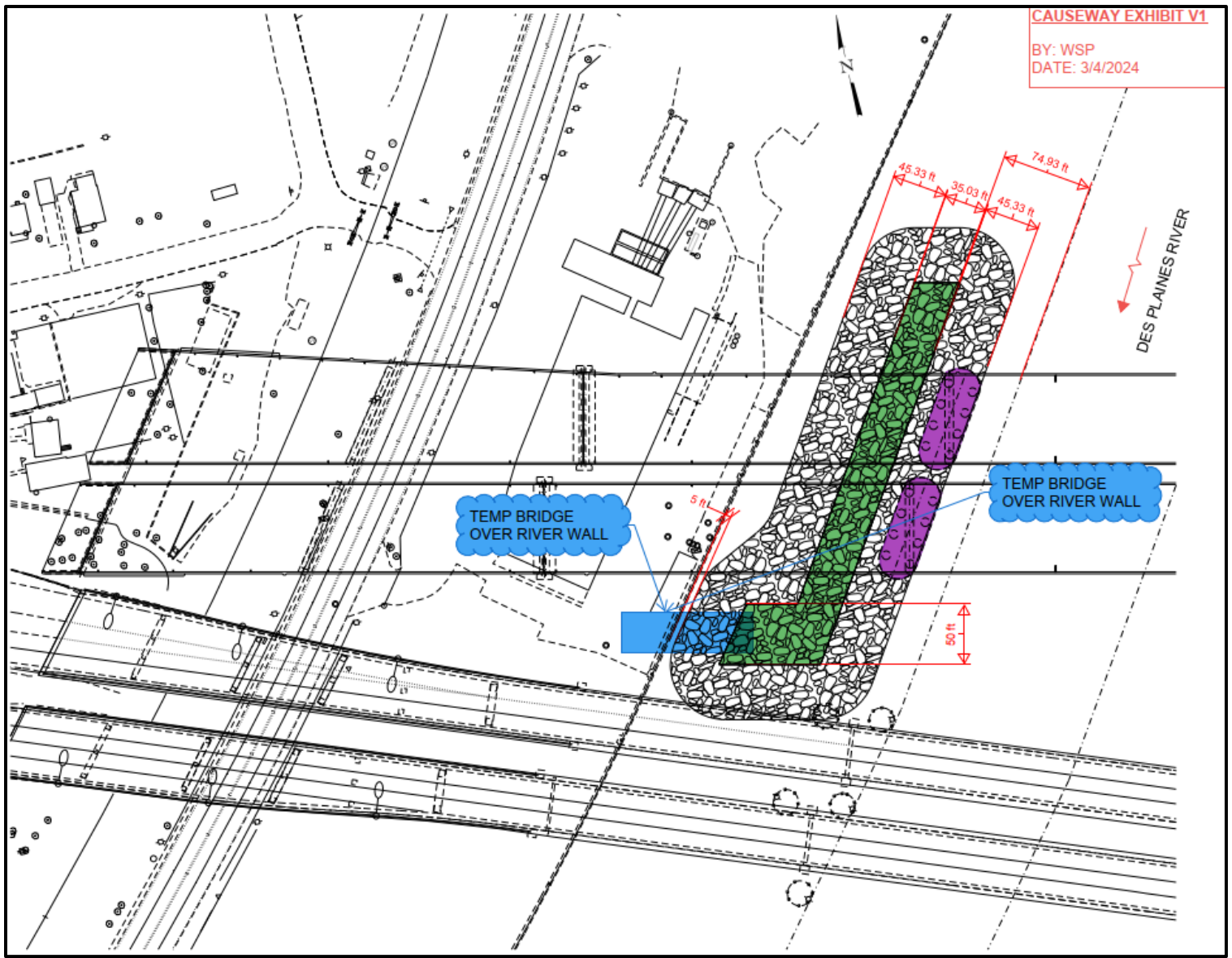


Figure 3. Temporary Construction Methods for the proposed I-80 Des Plaines River Bridge

No Anticipated Impacts on Floodwalls from Proposed Design or Construction

Given that the existing floodwalls along the Des Plaines River are keyed into limestone bedrock and the engineering plans for the proposed I-80 Des Plaines River Bridges do not include construction on or adjacent to the floodwalls which would apply surcharge loads, it is not anticipated that existing floodwalls will not be affected by any surface affects due to the construction of the permanent or temporary works.

Conclusion

The following items were reviewed during this evaluation:

1. The existing mass concrete floodwall design positioned firmly on limestone bedrock with an embedded shear key would deter seepage (both through and under the existing floodwalls)
2. The permanent bridge foundations for the proposed I-80 Des Plaines River Bridge structures is designed to be constructed directly on limestone bedrock.
3. The specifications direct the contractor to use a 5-foot set-back between the existing floodwall and the temporary causeways to avoid impact.

After evaluating the items above, it was determined that it is highly unlikely that the permanent new I-80 Des Plaines River Bridge or the temporary construction methods utilized to construct the bridge would result in an impact to the USACE Civil Works Project, Brandon Road Lock and Dam.

Resource:

U.S. Army Corps of Engineers. August 1, 2022. Engineer Manual No. 1110-2-2502. Floodwalls and Other Hydraulic Retaining Walls. Department of the Army.