US Army Corps of Engineers
Buffalo District

Buffalo District
Great Lakes and Ohio River Division

Project Title: Black Rock Lock Bulkhead and Bulkhead Slots

Authority: OPERATIONS & MAINTENANCE

P2/Project Number: 503348

Review Plan

PREPARE BY: [redacted]
Project Manager
USACE, Buffalo District (LRB)

RECOMMENDED BY: [redacted]
District Commander
USACE, Buffalo District (LRB)

ENDORSED BY: [redacted]
Review Management Organization Representative
USACE, Inland Navigation Design Center

APPROVED BY: [redacted]
Regional Business Director
USACE, Great Lakes and Ohio River Division

MSC APPROVAL DATE [redacted]

REVIEW PLAN
ENGINEERING AND DESIGN PRODUCTS

BLACK ROCK LOCK BULKHEAD AND BULKHEAD SLOTS
BUFFALO DISTRICT (LRB)

Current Version Date: 28 JULY 2022
Mandatory Revision Date: 29 JULY 2025

1. PURPOSE AND REFERENCES

a. Purpose. This review plan describes necessary quality reviews for engineering and design (E&D) products for the Black Rock Lock Bulkhead and Bulkhead Slots project (P2# 503348).

b. References.
(1) Engineering Regulation (ER) 415-1-11, Biddability, Constructability, Operability, Environmental and Sustainability (BCOES) Reviews
(2) Engineering Regulation (ER) 1165-2-217, Civil Works Review Policy
(3) Qualtrax 08504 LRD, Supplemental Quality Procedures for Civil Works (CW) Engineering and Design (E&D) Products
(4) Program Management Plan (PgMP), Black Rock Lock, JAN 2022

2. REVIEW MANAGEMENT ORGANIZATION (RMO). The RMO for this project is the U.S. Army Corps of Engineers (USACE) Inland Navigation Design Center (INDC).

3. PROJECT SCOPE AND PRODUCTS

a. Project Description and Scope of Work. With no replacement of the original miter guard gates from the lock's construction completion in 1913, the Black Rock Lock miter guard gate leaves are over 100 years old, and operate in a freshwater environment. Recent inspection reports (US Army Corps of Engineers, Buffalo District, 2017 and 2019) indicate that the gates are due for replacement. These reports have highlighted dramatic section loss of steel in multiple locations, as well as possible fatigue issues.

In May 2021, Buffalo District's project delivery team conducted a value-based design charrette in coordination with members of the Inland Navigation Design Center. The purpose of the value-based design charrette was 1) to investigate alternatives to the existing miter guard gates and all related elements and 2) develop multiple courses of action to provide a life-cycle cost-effective project to deliver a replacement closure structure with a 100-year design life. Ultimately, the team conducting the charrette recommended that Buffalo District leadership select a full chamber bulkheads and bulkhead slots, with retrofitting of the guard gate pockets and sill to accommodate. This is determined to be the most favorable option – increased safety as well as meets standardization initiatives across USACE.

The scope of the project is to design and construct a bulkhead and bulkhead slot system for the Black Rock Lock. The scope includes removal of the existing guard gates; fabrication of new bulkhead sections and appurtenances such as a lifting beam; construction of bulkhead slots in

the wet for both upstream and downstream; delivery and installation of bulkheads and appurtenances.

See Figure 1 for satellite imagery of the Black Rock Lock, with the location of the upstream and downstream miter guard gates annotated.

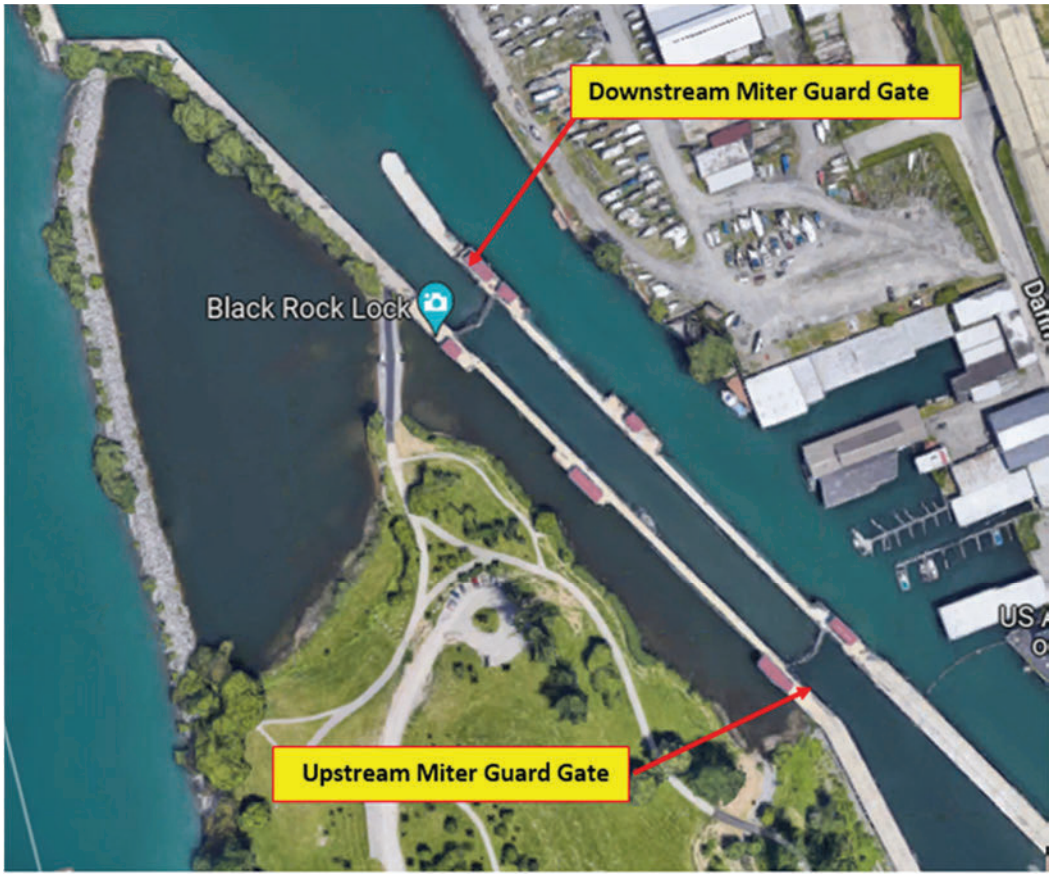

Figure 1. Black Rock Lock, with Location of Miter Guard Gates Annotated

Project Number	503348
Business Line	Operations & Maintenance
Project Type	Operations & Maintenance
Geographic Location	Black Rock Channel and Tonawanda Harbor, Buffalo, NY
Main Project Features	Continued reliable lock operations.
Key Physical Components	bulkhead and bulkhead slot system
Estimated Construction Cost	[redacted]
E&D Product Method Delivery	In-House
Construction Delivery Method	Competitive Contract Solicitation

b. Products. The E&D products to be reviewed include the following:

(1) Design Documentation Report (DDR)
(2) Plans and Specifications (P&S)
(3) Engineering Considerations and Instructions for Field Personnel (ECIFP)

4. DOCUMENTATION OF RISKS AND ISSUES

a. Life Safety Assessment: The District Chief of Engineering has reviewed the project requirements and determined there is not a significant threat to human life if the project were to fail.

(1) Life safety risks are present during the concrete removal and diving activities associated with retrofitting the monoliths and sill. As with all major heavy construction projects, there are inherent safety risks during execution of construction activities, however sound and proven engineering principles and techniques will be employed to assure life safety during construction of this project.

b. Technical Complexities and Risks. The project delivery team (PDT) performed a thorough risk analysis of the anticipated project construction and operations activities and identified the following key technical complexities and risks. Quality reviews will be focused to manage these risks.

(1) Lack of PDT Labor Resources
(2) Supply Chain Delays
(3) Poor quality construction
(4) Cost Increases
(5) Weather Delays during Construction
(6) Lack of contractor availability
(7) Uncertainty in the bedrock conditions as well as the chamber wall and sill conditions.

5. REVIEW EXECUTION

a. Project Delivery Team (PDT): PDT members are listed in Attachment 1. PDT members will work collaboratively with review team members to ensure effective execution of quality reviews.

b. District Quality Control (DQC): DQC is required for all E&D products. Follow DQC procedures in Chapter 4 of ER 1165-2-217 and District local work instructions. The Engineering Technical Lead and DQC Lead will collaborate to oversee and ensure effective DQC execution.

c. Biddability, Constructability, Operability, Environmental, Sustainability (BCOES): BCOES reviews are required for all E&D products. Follow BCOES review procedures in ER 415-1-11 and District local work instructions. The Engineering Technical Lead and DQC Lead will collaborate to oversee and ensure effective BCOES execution.

d. Agency Technical Review (ATR): ATR is required for all products and will follow ATR procedures in Chapter 5 of ER 1165-2-217. ATR will address the technical risks described in sub-section 4.b. Required senior technical disciplines and expertise needed for ATR are shown in Table 1. Assigned ATR team members are listed in Attachment 1. ATR members in engineering disciplines are verified as certified in the Corps of Engineers Review and Certification Access Program (CERCAP). PDT and review team leaders will collaborate to oversee and ensure effective execution.

Table 1. ATR Technical Discipline(s) and Required Expertise	
Technical Discipline	Expertise Required
ATR Team Leader	The ATR team lead is a senior professional outside the home MSC with extensive experience in preparing Civil Works documents and conducting ATRs. The lead has the necessary skills and experience to lead a virtual team through the ATR process. The ATR lead may also serve as a reviewer for a specific discipline.
Structural Engineer	Shall have over 15 years of experience in the field of structural engineering including design, fabrication and maintenance of hydraulic steel structures. The reviewer shall have performed design and analysis of miter gates and their associated appurtenant items (i.e. embedded anchorages, lifting beams, etc.) for inland navigation projects.
Mechanical Engineer	Shall have senior level experience in mechanical and electrical design of navigation locks and dams and machinery lubrication.
QA Engineer, Welding/Fabrication	Shall have 10 years' experience at the Corps, with level 2 certification as a Welding and Coating Inspector, and level 2 Non-Destructive Evaluation experience in MT, PT, UT, and RT.
Geotechnical Engineer	Shall have senior level experience in geotechnical design and experience in application to navigation locks and dams.
Construction & Operations	Shall have experience and knowledge in the operation and maintenance of navigation locks.
Cost Engineer	Shall have experience and knowledge in the cost estimation of bulkhead fabrication, bulkhead slot construction and general construction.

e. Safety Assurance Review (SAR): Per sub-section 4.a, an SAR is not required. When required, SAR will be performed per Chapter 6 of ER 1165-2-217. The signed SAR Risk-Informed Decision document can be found in ATTACHMENT 2.

f. Review Charge. Reviewers will refer to and perform ATR per Section 5.7 of ER 1165-2-217, Objectives, Scope and Review Criteria. Reviews shall check to confirm the design addresses the technical complexities and risks described in paragraph 4.b.

6. REVIEW SCHEDULE AND BUDGETS. The schedule and budgets for reviews are shown in Table 2.

Table 2. Review Schedule and Budgets			
Review Activities (Note 1)	Start Date	Finish Date	Budget ($)
BCOES – Concept Design	[redacted]	[redacted]	[redacted]
DQC – Concept Design			
ATR – Concept Design			
DQC – Intermediate Design			
ATR – Intermediate Design			
BCOES – Intermediate Design			
DQC – Final Design (Infill)			
ATR – Final Design (Infill)			
BCOES – Final Design (Infill)			
DQC – Final Design (Bulkhead)			
ATR – Final Design (Bulkhead)			
BCOES – Final Design (Bulkhead)			
BCOES – Backcheck (Infill)			
BCOES – Backcheck (Bulkhead)			
Notes: (1) Review activities may be scaled to project size and scope; (2) *Dates are estimated based off the expected availability of construction funds.			

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7. REVIEW DOCUMENTATION. The ATR leader will prepare an ATR report per Section 5.10 of ER 1165-2-217. The ATR report with certification form will be provided to the approval signatories, including the RMO representative. Review documents will be stored with the official project records.

8. REVIEW PLAN POINTS OF CONTACT. Questions and comments relating to this review plan can be directed to the following points of contact:

a. District Project Leaders
   (1) Project Manager: [redacted]
   (2) Engineering Technical Lead: [redacted]

b. ATR Team Leader: [redacted]

c. Review Management Organization (RMO): [redacted]

9. APPROVAL SIGNATURE: [redacted]

District Chief of Engineering

ATTACHMENT 1 – TEAM MEMBERS

PROJECT DELIVERY TEAM			
Function/Discipline	**Name (Last, First)**	**Office**	**Phone Number**
Project Manager	[redacted]	[redacted]	[redacted]
Technical Lead/Structural Engineer			
Structural Engineer			
Mechanical Engineer			
Geotechnical Engineer			
Cost Engineer			
Senior Cost Engineer			
Specifications Engineer			
Value Engineer			
CADD Technician			
CADD Technician			
Real Estate			

DQC REVIEWERS			
Function/Discipline	**Name (Last, First)**	**Office**	**Phone Number**
DQC Lead/Structural Engineer	[redacted]	[redacted]	[redacted]
Cost Engineer			
Specifications Engineer			
Mechanical Engineer			
Geotechnical Engineer			
Real Estate			

BCOES TEAM MEMBERS			
Function/Discipline	**Name (Last, First)**	**Office**	**Phone Number**
Biddability	[redacted]	[redacted]	[redacted]
Constructability			
Operability			
Environmental			
Sustainability			
NY/PA O&M			
Safety Office			
Office of Counsel			
Real Estate			
Black Rock Lock			
Black Rock Lock			

ATR TEAM MEMBERS			
Function/Discipline	**Name (Last, First)**	**Office**	**Phone Number**
ATR Leader/Geotechnical Engineer	[redacted]	[redacted]	[redacted]
Structural Engineer			
Mechanical Engineer			
Fabrication/Welding			
Cost Engineer			
Construction			
Operations			

ATTACHMENT 2 – SAFETY ASSURANCE REVIEW RISK-INFORMED DECISION

SAFETY ASSURANCE REVIEW (SAR) RISK-INFORMED DECISION
BLACK ROCK LOCK GUARD GATE REPLACEMENT WITH BULKHEADS

In accordance with ER 1165-2-217, Paragraph 7.3, "SAR is conducted on PED and construction activities for projects where potential hazards pose a significant threat to human life (public safety)." Additionally, Paragraph 7.4 states the following: "The District Chief of Engineering, as the Engineer-In-Responsible-Charge, will consider life safety implications to make a risk-informed decision whether the project would benefit from a SAR and document the rationale to conduct or not conduct a SAR in the RP."

Project Description and Scope of Work

With no replacement of the original miter guard gates since the lock's construction completion in 1913, the Black Rock Lock miter guard gate leaves are over 100 years old and operate in a freshwater environment. Recent inspection reports indicate that the gates are due for replacement. In May 2021, Buffalo District's Project Delivery Team (PDT) conducted a value-based design charrette in coordination with members of the Inland Navigation Design Center (INDC). The purpose of the value-based design charrette was to 1) investigate alternatives to the existing miter guard gates and all related elements, and 2) recommend a life-cycle cost-effective project to deliver a replacement closure structure with a 100-year design life. Ultimately, the team conducting the charrette recommended that Buffalo District leadership select full chamber bulkheads and bulkhead slots, with retrofitting of the guard gate pockets and sill to accommodate. This is determined to be the most favorable option – increased safety as well as meeting standardization initiatives across USACE.

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Risk-Informed Decision Criteria (ER 1165-2-217, Paragraph 7.4.1.1)

Criteria	Relevancy to this Project
Would the project's failure pose a significant threat to human life?	No. While failure of the proposed bulkheads of the Black Rock Lock may pose a threat to human life under certain circumstances (i.e., during the brief periods of time they are in use, there may be workers in the dewatered lock chamber), this threat is not considered to be significant. Although unlikely, the failure mode would not be sudden/catastrophic, and as such, there would be sufficient warning signs to facilitate chamber evacuation, mitigating any risks to human life. As with all major heavy construction projects, there are inherent safety risks during execution of construction activities, however sound and proven engineering principles and techniques

	will be employed to assure life safety during construction of this project.
Does the project involve the use of innovative materials or techniques where the engineering is based on novel methods, presents complex challenges for interpretations, contains precedent-setting methods or models, or presents conclusions that are likely to change prevailing practices?	No. Design work will be performed by the USACE Inland Navigation Design Center Mandatory Center of Expertise (INDC-MCX) with support by in-house Buffalo District staff. INDC has designed bulkheads similar to the bulkhead selected within the last 5 years. Consideration will be given to navigational impacts during construction.

Based upon the nature of the work involved with this project, evaluation of the risk-informed decision criteria identified above, and factoring in the technical expertise that will be utilized for performance of the design work and associated District Quality Control (DQC), Biddability, Constructability, Operability, Environmental, and Sustainability (BCOES), and Agency Technical Review (ATR) reviews, a SAR is not recommended for this project

RECOMMENDATION REGARDING SAR

Based on the above assessment, it is the risk-informed recommendation of the PDT and the Buffalo District Chief of Technical Services Division that a SAR is NOT required for this project.

[redacted]

01 April 2022

Date

[redacted]

02 April 2022

Date

Chief, Technical Services Division