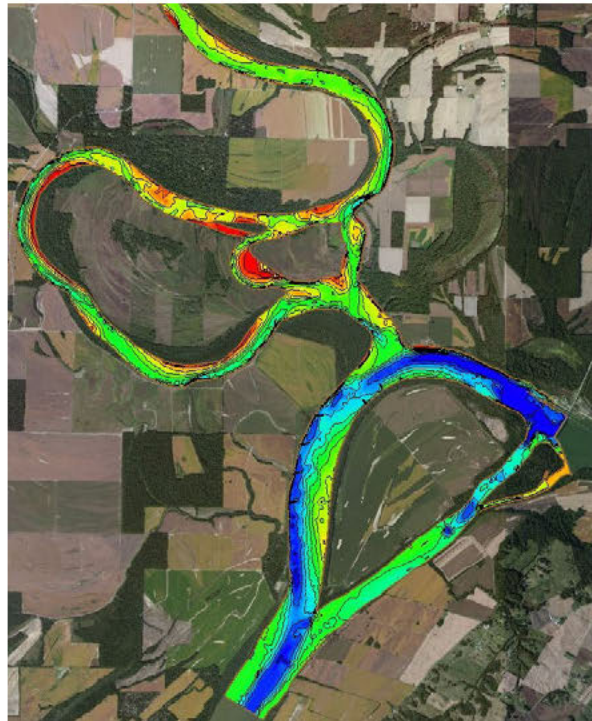




**US Army Corps
of Engineers**
Louisville District

**Draft FONSI and Environmental
Assessment
for the
Wabash and Ohio River Dikes Project,
Ohio River Mile 847.9 – 849.5**



April 2021

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**US Army Corps
of Engineers**
Louisville District

Draft:
Statement of Findings
and
Finding of No Significant Impact
for the
Ohio and Wabash Rivers Dikes Project

Ohio River (ORM 847.9 – 847.5)
Union County, Kentucky and Gallatin County, Illinois

The U.S. Army Corps of Engineers (USACE), Louisville District has conducted an Environmental Assessment (EA) in accordance with the National Environmental Policy Act of 1969, as amended (NEPA), and Engineering Regulation (ER) 200-2-2, *Policy and Procedures for Implementing the NEPA*. The EA, dated March 2021, for the Ohio and Wabash Rivers Dikes Project evaluated an alternative designed to alleviate the ongoing threat to navigation caused by shoaling in the Action Area,

The Final EA, incorporated herein by reference, evaluated an alternative that would alleviate shoaling in the study area. The recommended plan is:

- Implementation of the Ohio and Wabash River Dikes Project which entails the construction of seven flow diversion dikes on the Ohio River, near the mouth of the Wabash River.

In addition to the recommended plan, a “no action” plan was evaluated. The no action plan would entail the continuation of the existing maintenance dredging program currently conducted at the Action Area.

For both alternatives, the potential effects were evaluated, as appropriate. A summary assessment of the potential effects of the recommended plan are listed in Table 1:

Table 1: Summary of Potential Effects of the Recommended Plan.

	Insignificant effects	Insignificant effects as a result of mitigation*	Resource unaffected by action
Aesthetics	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Air quality	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Climate	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Commerce, Recreation, and River Navigation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cultural Resources	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Demographics and Environmental Justice	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Habitats	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hazardous, toxic & radioactive waste	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Listed Species/critical habitat	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Noise	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Surface Water Hydrology and Groundwater	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Topography, Geology, and Soils	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Water Quality	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

All practical means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan. Best management practices (BMPs) as detailed in the EA will be implemented during the construction of the project to minimize impacts, including the seasonal timber restrictions, sediment and erosional control procedures, and minimizing the size of the project footprint.

No compensatory mitigation is required as part of the recommended plan.

Public review of the EA was completed on *[pending]*. All comments submitted during the public comment period will be responded to in the Final EA. A 30-day state and agency review of the EA was completed on *[pending]*. Comments from state and Federal agencies will also be addressed in the final EA.

Pursuant to Section 7 of the Endangered Species Act of 1973, as amended, the USACE determined that the recommended plan will have no effect on federally listed species or their designated critical habitat.

Pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, the USACE determined that the recommended plan has no potential to cause adverse effects on historic properties.

Pursuant to the Clean Water Act of 1972, as amended, the discharge of dredged or fill material associated with the recommended plan has been found to be compliant with

section 404(b)(1) Guidelines (40 CFR 230). The Clean Water Act Section 404(b)(1) Guidelines evaluation is found in Appendix A of the EA.

A water quality certification pursuant to section 401 of the Clean Water Act will be obtained from Kentucky and Illinois prior to construction. In a letter dated [Pending], stated that the recommended plan appears to meet the requirements of the water quality certification, pending confirmation based on information to be developed during the pre-construction engineering and design phase. All conditions of the water quality certification will be implemented in order to minimize adverse impacts to water quality.

This FONSI also serves as the Statement of Findings under 33 CFR 338.2(g) that, based on the analysis in the EA and the 404(b)(1) evaluation, the proposed discharge of fill material complies with the guidelines in 33 USC 1344(b)(1).

All applicable environmental laws have been considered and coordination with appropriate agencies and officials has been [pending].

Finding and Conclusions: Technical, environmental, and cost effectiveness criteria used in the formulation of alternative plan were those specified in the Water Resources Council's 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. All applicable laws, executive orders, regulations, and local government plans were considered in evaluation of alternatives. Based on this report, the reviews by other Federal, State and local agencies, Tribes, input of the public, and the review by my staff, it is my determination that the recommended plan would not significantly affect the human environment; therefore, preparation of an Environmental Impact Statement is not required. I find that the proposed project has been adequately evaluated pursuant to NEPA, the Endangered Species Act of 1973, the Fish and Wildlife Coordination Act, and the National Historic Preservation Act of 1966.

Date

Eric D. Crispino
Colonel, U.S. Army
District Commander

Executive Summary

The U.S. Army Corps of Engineers (USACE) Louisville District has experienced ongoing concerns for the area of the Ohio River at the shoal of the mouth of the Wabash River which has caused a realignment of the navigation channel in the Ohio River and has required constant attention to maintain operational usability of the channel. The proposed Wabash and Ohio Rivers Dikes (Proposed Project) is located immediately downstream of the mouth of the Wabash River between Ohio River Miles 848 – 850. The navigation channel passes on the north side of a bar that builds off Wabash Island. This stretch of river had been relatively stable for over 30 years due to the increased pool level from Smithland Dam and because of its close proximity to John T. Myers Lock and Dam, which is a few miles upstream at ORM 846.0. The substrate in the majority of this section of river is sand, consisting of primarily of material discharged from the Wabash River, which enters the Ohio River at ORM 848. The navigation channel alignment reflects the historically deeper cross section of the river, maintained by natural river flow. However, large volumes of sand pass through this area each year, originating from the Wabash drainage basin. Due to riverbed changes in the Lower Wabash River, a significant increase in outwash material accumulation at the mouth of the Wabash River has increased the need for dredging of outwash material every year since 2008.

The USACE is Congressionally mandated to maintain a 9-foot deep channel in the Ohio River for transport of goods and services by commercial vessels. In order to maintain the navigation channel, maintenance dredging is often required and, in areas where natural deposition of river substrates threatens river navigation, is an ongoing process. Since 2008, the Wabash River has discharged above normal volumes of sand into the Ohio River resulting in the need for annual maintenance dredging and emergency dredging of the navigation channel in 2008, 2010, 2012, and 2018. The need for dredging in the area is both unpredictable and ongoing. As a result, there is often a delay between the threat to navigation in the Action Area and the USACE response because of seasonal restrictions, weather, planning, and other logistical constraints. The proposed construction of seven dikes in the Ohio River – three on the Wabash Island and four on the Illinois shore – will produce the most effective remedy to the shoaling and work to alleviate potential threats to commercial navigation in this location.

Interagency Cooperation under the Endangered Species Act of 1973 (ESA), as amended, 50 CFR Part 402 is required by Federal agencies regarding endangered or threatened species of fish, wildlife, or plants and habitat of such species that has been designated as critical. The ESA requires every Federal agency, in consultation with and with the assistance of the Secretary, to ensure that any action it authorizes, funds, or carries out, in the United States is not likely to jeopardize the continued existence of any listed species or results in the destruction or adverse modification of critical habitat. Biological Assessments (BA)—information prepared by or under the direction of the Federal agency concerning listed and proposed species and designated and proposed critical habitat that may be present in the Action Area, and the evaluation of potential effects of the action on such species and habitats—are required under Section 7(c) of the ESA. The finding in the BA is a determination of no effect to the spectaclecase (*Cumberlandia monodonta*), fanshell (*Cyprogenia stegaria*), purple catspaw (*Epioblasma obliquata*), northern

riffleshell (*Epioblasma rangiana*), ring pink (*Obovaria retusa*), orangefoot pimpleback (*Plethobasus cooperianus*), sheepnose (*Plethobasus cyphus*), clubshell (*Pleurobema clava*), rough pigtoe (*Pleurobema plenum*), fat pocketbook (*Potamilus capax*), Short's bladderpod (*Physaria globosa*), artic tern (*Sterna antillarum*), rusty patched bumble bee (*Bombus affinis*), gray bat (*Myotis grisescens*), northern long-eared bat (*Myotis septentrionalis*), Indiana bat (*Myotis sodalis*), and the federally threatened rabbitsfoot (*Theliderma cylindrica*).

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Appendix A (Biological Assessment and Supporting Documents)

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Front Cover: Before-simulation image generated during bathymetric study conducted U.S. Army Engineer Research and Development Center, Coastal and Hydraulics Laboratory (ERDC-CHL).

1 INTRODUCTION

The U.S. Army Corps of Engineers (USACE) is congressionally mandated to maintain a channel 9 feet deep in the Ohio River for transport of goods and services by barge. In order to maintain the navigation channel for commercial vessels, routine maintenance dredging is often required in areas where natural deposition of river substrates is an ongoing process. One area of concern/investigation is immediately downstream of the Wabash River between Ohio River Miles (ORM) 848 – 850 where an estimated 1,000,000 cubic yards of sediment, originating from the Wabash drainage basin, pass through the area annually (Figure 1). The substrate in much of this section of river is sand, consisting of primarily of material discharged from the Wabash River, which enters the Ohio River at ORM 848. The navigation channel passes on the north side of a bar that builds off of Wabash Island and reflects the historically deeper cross section of the river which, prior to the Wabash avulsion, would be normally maintained by natural river flow.

This stretch of river had been relatively stable for over 30 years due to the increased pool level due to impoundment by Smithland Dam and because of its close proximity to John T. Myers Lock and Dam, which is 1.8 miles upstream at ORM 846.0. Prior to 2008, relatively few dredging events were required at the mouth of the Wabash River; since 2008, dredging is required every year. This recent increase in dredging events is the result of an avulsion that cut off the lower meander loop of the Wabash River in 2008, and again in 2010. Both cutoffs formed after large rainfall events from tropical storms in the region. As a result, large amounts of sediment removed in the avulsion formation process were transported downstream, forming shoals at the confluence with the Ohio River (Figure 2). This sand transport has continued to increase over the last 5 – 6 years as the result of riverbed changes that are occurring in the lower Wabash River above the confluence with the Ohio River. The increased sand discharge began with a persistent rainfall event in early June of 2008, which resulted in an average of 8 – 10 inches of precipitation over about a 10 – 15-day period throughout a large section of the Wabash River drainage basin. Bank failures and bendway cutoffs resulted in mass movement of sand and a large outwash plume at the mouth of the Wabash River that blocked the navigation channel, which necessitated emergency dredging by USACE. The outwash plume extended across the width of the river to Wabash Island. Portions of Wabash Island were covered by the outwash material, while other sections of the island were severely eroded. The accumulation of material made the navigation channel impassable for the commercial towing industry causing an emergency shutdown of the Ohio River navigation channel near ORM 848 downstream of John T. Myers Lock and Dam.

The closure of the Ohio River navigation channel is a great economic concern for the towing industry because of shipping delays and the high expense of inactive cargo incurred during shutdowns. While measures are already in place for maintenance dredging operations conducted at the mouth of the Wabash River to deal with the shoaling, the scope and unpredictability of the problem poses an ongoing threat to navigation which has necessitated emergency dredging operations that are both complex and logistically challenging. This unpredictability also means that the USACE response is a reactionary one which is costly and

relatively inefficient and may not be the most effective long-term strategy to deal with the problem.

The objective of the proposed Wabash and Ohio Rivers Dikes Project (Wabash Dikes Project) is for flow diversion to alleviate the ongoing need for maintenance dredging in the Ohio River downstream of the mouth of the Wabash River. The USACE's proposed action is to construct seven flow diversion dikes on the Ohio River near the mouth of the Wabash River which will produce the most effective remedy to the shoaling and the ongoing threat to navigation in the area.

This Environmental Assessment (EA) was prepared by the USACE in support of the proposed Wabash Dikes Project. The purpose of this EA is to document the analysis of the environmental impacts of the proposed action and its alternatives, to support a determination of whether the proposed action would significantly affect the quality of the human environment. The EA also provides an opportunity for public involvement in the agency decision-making process.

1.1 Proposed Project Location

The proposed Wabash Dikes Project is located in Union County, Kentucky and Gallatin County, Illinois. The Action Area lies immediately downstream of the Wabash River confluence between Ohio River Miles (ORM) 848 – 850 and is located approximately 6 miles west of Uniontown, Kentucky and 10 miles east of Shawneetown, Illinois. John T. Myers Lock and Dam is located approximately three miles upstream at ORM 846.0. Figure 1 displays the Wabash Dike Project location within the tri-state Ohio River Basin area.

Because the Proposed Project lies mostly on the mainstem of the Ohio River, primary access to the project is via the waterway. The surrounding area is mostly agricultural and frequently inundated, so overland access is limited. Wabash Island is almost completely in row crops or fallow fields and is privately owned and accessible by private ferry or barge only. The closest road to the Illinois section of the project is Calico Lane which runs adjacent to the Wabash River.

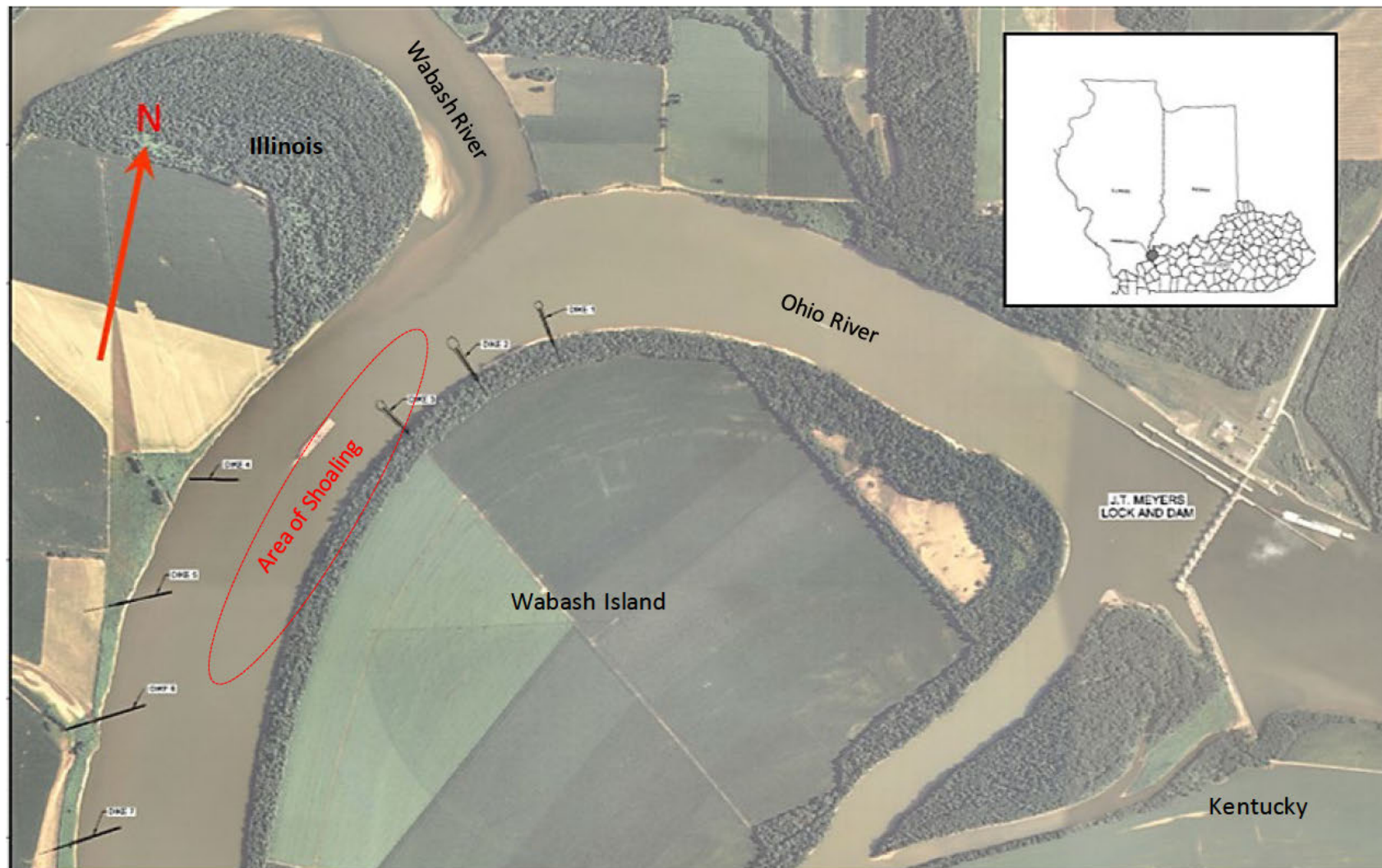


Figure 1. Location of the proposed Wabash Dikes Project (ORM 847.9 – 849.5), Gallatin County, Illinois and Union County, Kentucky.

1.2 Proposed Project Overview

A shoal at the mouth the Wabash River has caused a re-alignment of the navigation channel in the Ohio River and has required consistent dredging activities to maintain operational usability. Prior to 2008 there were nine dredging events with the first dating back to 1932. However, since 2008 dredging has been conducted every year. This recent increase in dredging events is the result of an avulsion that cut off the lower meanderloop of the Wabash River in 2008 and then again in 2010. Both cutoffs formed after rainfall events from tropical storms. As a result of this realignment, large amounts of sediment are transported downstream and released annually, forming shoals downstream at the confluence with the Ohio River. Figure 2 displays the project area and confluence of the Ohio and Wabash Rivers. Figure 3 shows the results of a 2012 bathymetric survey of the Action Area and the shoaling present there that continues to threaten commercial navigation.

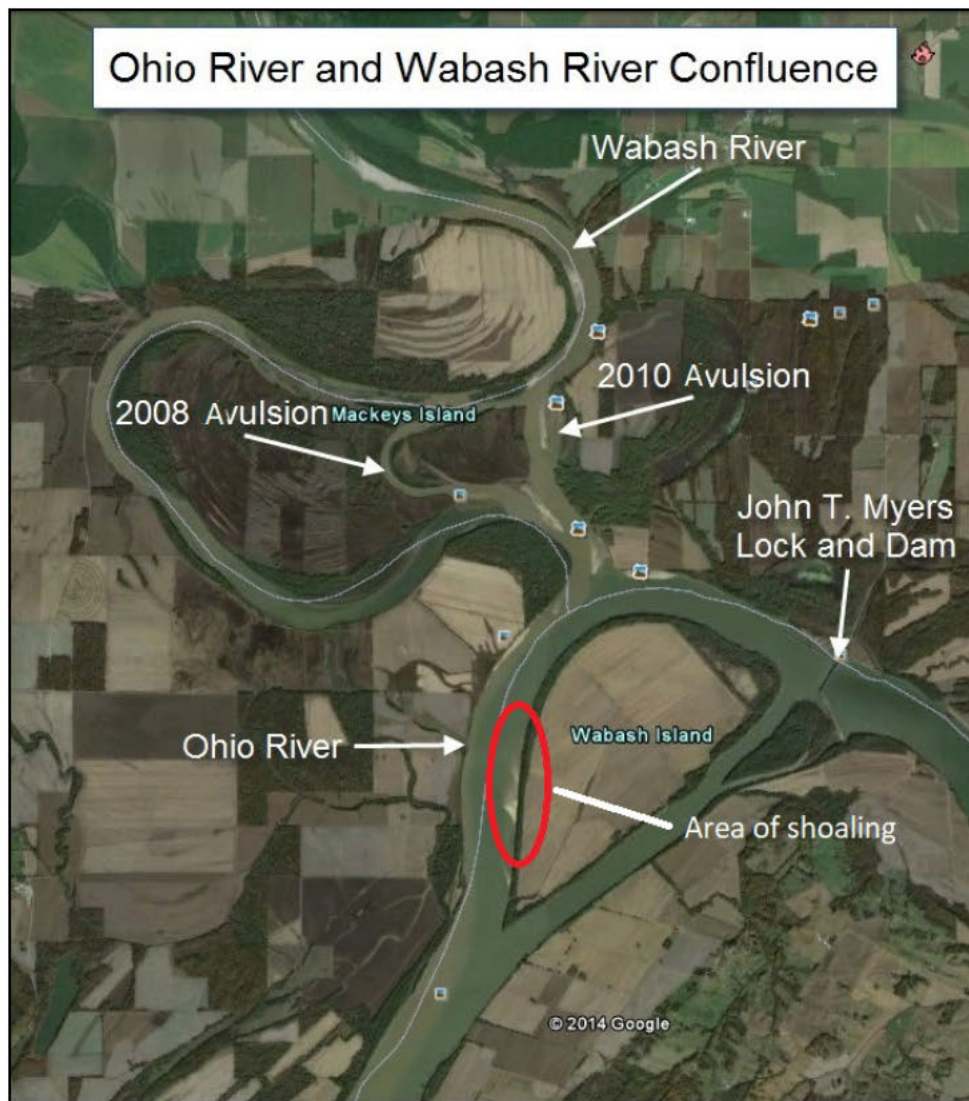


Figure 2. Overview of project area showing confluence of Ohio and Wabash rivers.

In 2014, hydrographical studies conducted by the US Army Engineer Research and Development Center, Coastal and Hydraulics Laboratory (ERDC-CHL) utilized numerical modeling to simulate multiple scenarios as solutions to these sediment issues. The current design, based on the ERDC-CHL analysis (ERDC-CHL 2015), uses seven rock dikes¹ with bank armoring (Figure 1). Three of the dikes will be constructed on the Wabash Island side of the Ohio River to control sediment coming directly out of the Wabash River. The four remaining dikes will be constructed downstream of the mouth of the Wabash River to increase the flow velocity, direct sediment, and promote scouring of the navigation channel.

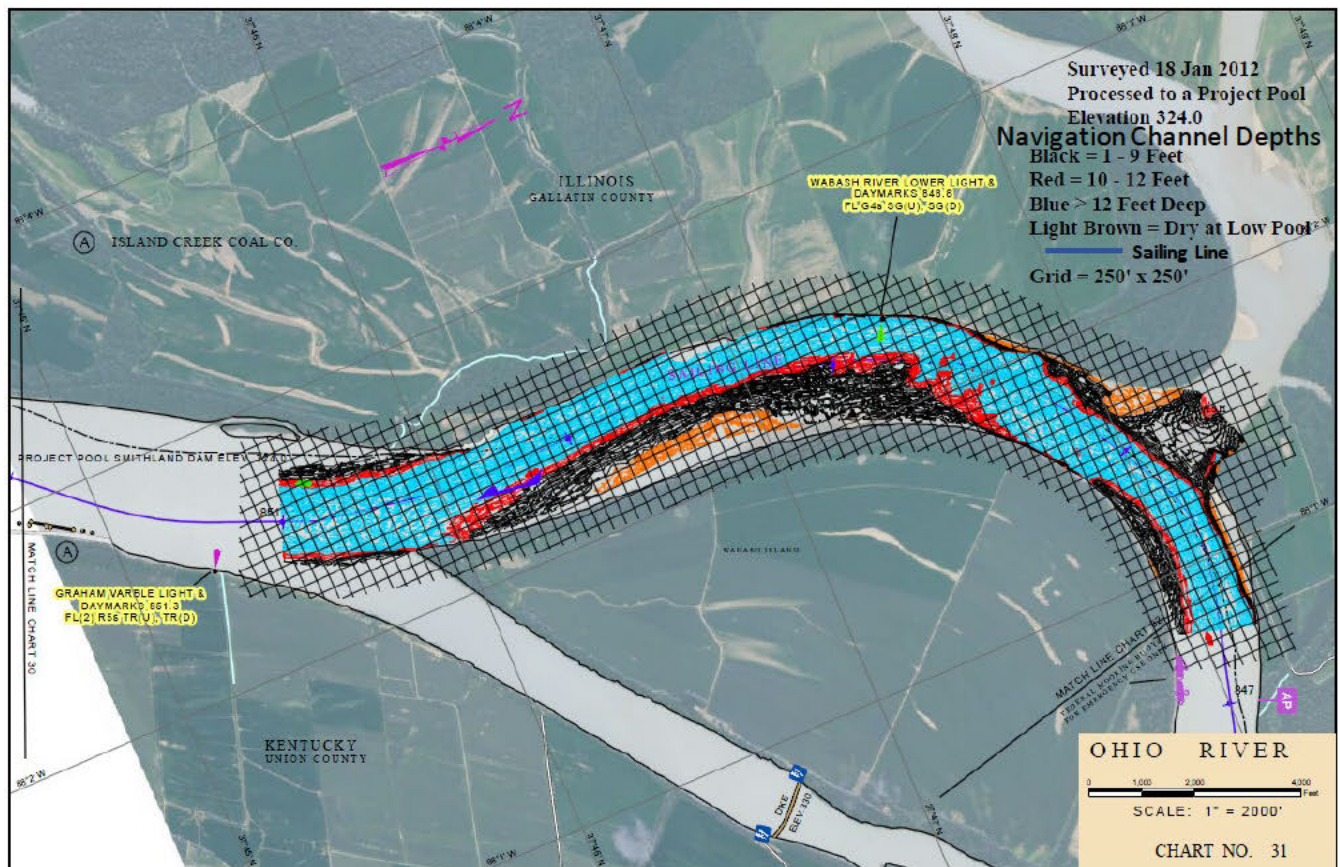


Figure 3. Results of 2012 bathymetric survey showing constriction of navigation channel at confluence of Ohio River and Wabash River (source: ERDC-CHL 2015).

1.2.1 Scope of Action Area and General Construction Plans

The Action Area consists of the footprints of the seven proposed dikes from ORM 847.9 – 849.5, three along the Wabash Island bank and extending into the river, and four on the right descending bank along the Illinois shoreline and extending into the river. The three dikes that will extend out from the Wabash Island shoreline would be located at ORM 847.9, ORM 848.1,

¹ Based on the results of a mussel survey conducted in support of the Proposed Action, plans for two additional dikes were ultimately removed from project plans. A detailed summary of the mussel survey is included in the Biological Assessment provided in Appendix A.

and ORM 848.3 and would extend out total lengths ranging between 523 – 595 feet (160 – 181 meters), of which the last 446 – 531 feet (136 – 162 meters) would be within the water. The four dikes that will extend out from the Illinois shoreline will be located at ORM 848.6, ORM 848.9, ORM 849.2, and ORM 849.5. These dikes (#4 – #7) are projected to extend out total lengths ranging between 568 – 978 feet (173 – 298 meters), of which the last 383 – 684 feet (117 – 208 meters) would be within the water (Figure 2).

The Action Area includes the footprints of the seven proposed dike footprints. The three dikes that will extend out from the Wabash Island shoreline would be located at ORM 847.9, ORM 848.1, and ORM 848.3 and would extend out total lengths ranging between 160 – 181 meters, of which 136 – 162 meters would be within the water. The structure footprints of the four dikes that will extend out from the Illinois shoreline will be located at ORM 848.6, ORM 848.9, ORM 849.2, and ORM 849.5, respectively. The Illinois shoreline dikes (#4 – #7) would extend out at lengths ranging between 173 – 298 meters, of which 117 – 208 meters would be within the water. In general, the widths of all of the proposed dike structures will be similar. The maximum disturbed in-stream width for all dikes is estimated to be 100 feet (30.5 m).

The Action Area also includes temporary fleeting areas of the river (immediately outside of the dike footprints) where the work barges will be spudded, as well as sections of shoreline extending inland corresponding to the construction and armoring of the dikes structures (Figure 8). The Action Area also includes an estimated total of 13.25 acres (5.4 hectares) of forested habitat that will be removed from the shoreline in and around each of the proposed dike structures on both sides of the river.

General Construction Plans

In an effort to prepare and stabilize the dike footprints prior to construction, an estimated 9,200 cubic yards of accumulated sediment will be excavated from the Ohio River streambed before placement of rip rap material. Because of the volatile and unpredictable nature of the streambed in the area, the depth of sediments there are in a constant state of flux. As such, the dredge volume estimate above is a worst-case value and is based on the most recent geotechnical data available. Dredged material from this pre-construction excavation of the dike footprints is expected to consist primarily of sand, with a smaller proportion of silt, clay, and gravel. Dredged material will be placed onshore nearby in a location currently used for the deposition of materials generated by the current dredge program.

During the preconstruction excavation of the dike footprints, the Contractor may use a hydraulic dredge to remove the sediment thru a piped vacuum system on one barge and empty onto another barge or directly on shore. Depending on conditions on site, the Contractor may also utilize a clamshell excavator on a barge mounted crane. In this situation, the clamshell would reach into the water, grab the material on the river floor, bring the material out of the water and onto a second material barge.

Excavated materials from the pre-construction dredging of the dike footprints will be deposited along the Kentucky shoreline in an area that is currently designated to receive materials from the ongoing dredge program, pursuant to Kentucky Section 401 Water Quality Certification (WQC) No. 2019-100-1M.

Once the construction process initiates, a work barge and material barges will be moved to the site with a standard sized towboat. One work barge will contain a clamshell crane or rip rap conveyor (at the contractor's discretion), one work barge will contain an excavator, and the material barges will contain large rip rap type limestone rock. The barges will be fleeted in the vicinity of the work locations while the dikes are being constructed. The barges will be moved around the site by a towboat. Barges will be secured in place during temporary fleeting and construction activities by spudding them into the river bottom.

At each dike footprint location, the work barge will be moved to the site with either the clamshell crane or a rip rap conveyor on it. The barge will be moved in and out of the area with a towboat typical of the size that operates in and around the fleeting areas. The crane barge will be set up at each dike location and spudded to the river bottom for stability while offloading rock. Material barges containing rock will be set up adjacent to the work barge during offloading, while the dikes are being constructed. The work barges and material barges will be moved to each dike location where the rock will be off-loaded and placed into the dike footprint. The work barge will begin placing rock at the shoreline, then work out toward the river channel while placing rock within the footprint. The rock will be piled within each dike footprint until reaching the desired top elevation of each dike. During rock placement, significant settling of rock into the river bottom is expected. Barges will be spudded into the river bottom next to the dike locations for temporary storage during the construction process of each dike.

The Contractor will be required to provide river soundings as a final submittal verifying the proper rock placement and elevation. Portions of the shoreline work will need to occur during lower water elevations; however, rock placement in the riverward sections can occur at various river stages. Rock placement accuracy will be accomplished using monuments located at the John T. Myers Lock and Dam for survey control. The survey data used for plan development are river soundings obtained from the USACE Operations Division and LIDAR obtained from public sources.

1.2.2 Wabash Island Construction

While constructing the dikes along Wabash Island, rip rap will be placed onto the existing shoreline and river bottom with no need for excavation. The work barges and material barges will be moved to each dike location where the rock will be off-loaded and placed into the dike footprint. The island shoreline around the dike will be armored with the same type rip rap rock for stability. The work barge will begin placing rock at the shoreline, then work out toward the river channel while placing rock within the footprint. The rock will be piled within each dike footprint until reaching the desired top elevation of each dike. During rock placement, significant settling of rock into the river bottom is expected. Barges will be spudded into the river bottom next to the dike locations for temporary storage during the construction process of each dike. The Contractor will be required to provide river soundings as a final submittal verifying the proper rock placement and elevation. Portions of the shoreline work will need to occur during lower water elevations; however, rock placement in the riverward sections can occur at various river stages. Rock placement accuracy will be accomplished using monuments

located at the John T. Myers Lock and Dam for survey control. The survey data used for plan development are river soundings obtained from the USACE Operations Division and LIDAR obtained from public sources.

1.2.3 Illinois Construction

While constructing the dikes along the Illinois shoreline, the dikes will be keyed into the river bank. A land-based excavator will be offloaded from a work barge onto the shoreline within the area where the dike footprint intersects the shoreline. The excavator will travel from the work barge onto the shoreline. All excavation into the river bank will be accomplished from the shore side, unless the river bank is too steep to offload the excavator. If necessary, the excavator may begin digging the trench into the existing bank from the work barge in order to build an offload ramp or slope that is navigable by the excavator. The excavator would then offload from the barge and continue excavating the trench from the shore side. No excavation will occur within the river.

The excavator will dig a trench into the shoreline approximately eight feet deep that matches the width of the dike. The excavated soil will be stored next to the trench for later use. A four feet deep layer of rip rap rock will be placed in the trench, then covered with four feet of the excavated soil. The remaining excavated soil will be spread out across the area. This keying process will effectively secure the dike structure into the steep cut river bank. Outside of the key trench, rip rap will be placed onto the existing shoreline and river bottom with no further need for excavation.

1.3 Authorization

Sections 15-20 of the River and Harbor Act of 1899 mandated that U.S. Army Corps of Engineers (USACE) maintain a 9-foot deep channel in the Ohio River for transport of goods and services by barge. In order to maintain the navigation channel for commercial vessels, routine maintenance dredging is conducted in areas where natural deposition of river substrates is an ongoing process. The objective of the Wabash Dikes Project is for flow diversion to alleviate the ongoing need for maintenance dredging in the Ohio River downstream of the mouth of the Wabash River.

The Department of the Army permit program is authorized by Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act (P.L. 95-217). These laws require permits authorizing structures and work in or affecting navigable waters of the United States and the discharge of dredged or fill material into waters of the United States.

The USACE has determined the Proposed Project to be in compliance with the Section 404(b)(1) guidelines. A 404(b)1 analysis document was completed (Appendix A) and WQCs from Kentucky and Illinois are pending.

1.4 National Environmental Policy Act Overview

This EA has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA) and the Council on Environmental Quality's (CEQ) Regulations (40 CFR Parts 1500-1508), as reflected in the Corps of Engineers' Engineering Regulation, ER 200-2-2. The Corps of Engineers' ER 200-2-2 supplements, and is used in conjunction with, the CEQ regulations. Because ER 200-2-2 is in the process of being updated to conform to the CEQ regulations (as revised effective September 14, 2020), the CEQ regulations will control in the event of a conflict between ER 200-2-2 and the CEQ regulations.

The regulations set forth a process whereby USACE assesses the environmental effects of proposed major federal actions and considers reasonable alternatives to these proposed actions. In general, federal agencies prepare an EA to evaluate whether a federal action has the potential to cause significant environmental effects. If the agency determines that the action would significantly affect the quality of the human environment, the agency prepares an Environmental Impact Statement (EIS) to evaluate the Proposed Action and the alternatives in greater detail. If an EA concludes that the action will not have significant environmental impacts, the agency will issue a Finding of No Significant Impact (FONSI) to document the basis for that conclusion.

The CEQ's NEPA Regulations do not contain a detailed discussion regarding the format and content of an EA, but an EA must briefly discuss the:

- Purpose and need for the Proposed Action;
- Proposed Action and alternatives (when there is an unresolved conflict concerning alternative uses of available resources);
- Environmental effects of the Proposed Action and alternatives; and
- Agencies and persons consulted in the preparation of the EA.

1.5 Scope of the EA

NEPA requires federal agencies to review potential environmental effects of major federal actions. This EA has been prepared to fulfill USACE's regulatory requirements under NEPA and provide USACE with the information needed to make an informed decision about the potential effects to the natural and human environment from the construction of the proposed Wabash Dikes project

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2 PURPOSE AND NEED FOR CORPS OF ENGINEERS ACTION

The USACE is congressionally mandated to maintain a 9-foot deep navigation channel in the Ohio River for transport of goods and services by barge. In order to maintain the Ohio River channel for commercial vessels it requires routine maintenance dredging in areas where natural deposition of river substrates is an ongoing process. Since 2008, the Wabash River has been discharging above normal volumes of sand into the Ohio River resulting in shoaling that has required frequent dredging of the navigation channel to maintain operational usability.

The ongoing threat to the Ohio River navigation channel is a great economic concern for the towing industry because of shipping delays and the high expense of inactive cargo incurred during shutdowns. While a maintenance dredging operation is currently in place to deal with the shoaling, the scope and unpredictability of the problem poses an ongoing threat to navigation which has necessitated emergency dredging operations that are both complex and logistically challenging. This nature of the problem also means that the USACE response is a reactionary one which is costly and relatively inefficient and may not be the most effective long-term strategy to deal with the problem.

3 ALTERNATIVES

When preparing this EA, USACE developed a range of alternatives that could reasonably achieve the need that the Proposed Action is intended to address. The alternatives to be considered in this EA are a no action alternative of continuing to operate using the current USACE maintenance dredging program within the Action Area, and the Proposed Action involving the construction of the dikes structures as outlined in the current construction plans. The preparation of an EA, with only two alternatives (continuing to operate with current dredging protocols and the construction of the Wabash dikes in the Action Area) is appropriate because there are currently no other reasonable alternatives to consider for evaluation; no other technically viable alternatives, at a feasible cost available to resolve the problem have been identified. This decision was based on numerical hydrodynamic modeling conducted by ERDC-CHL that simulated existing conditions which was then altered to simulate multiple scenarios as potential solutions to the recurring sediment issues in the Action Area. The current design, which produced the most desirable results, included a combination of 3 dikes on Wabash Island and 4 dikes on the Illinois shore with sloping crest from top of bank to an elevation of 312 feet next to the navigation channel. The results of this analysis showed the current design (detailed herein as the Proposed Action Alternative) best prevented shoaling at and just downstream of the mouth of the Wabash River and protected the outer bend of the Illinois shore from further erosion while creating a better sailing line for navigation.

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3.1 No Action

Inclusion of the No Action Alternative is required by CEQ regulations and serves as a basis for comparison against which the effects of the Proposed Action can be evaluated. Under the No Action Alternative, USACE would not complete the proposed Wabash Dikes project. Under this alternative, development and management of the Action Area would likely take the same general direction as it currently exists and would share the same environmental consequences. Therefore, the "No Action" alternative may be thought of in terms of continuing with the present course of action (i.e., dredging events potentially occurring under the existing program) until the hydromorphological conditions of the Action Area improves or otherwise makes dredging unnecessary.

Adoption of this alternative implies acceptance of the existing conditions, including the adverse effects of sediment deposition, bank erosion, and the ongoing threat to navigation and commerce in the Action Area. If adopted, this alternative would forego the bank stabilization benefits and changes to flow regimes that would result from the completed project. While the current WQC allows for normal channel maintenance activities and rapid response capabilities to resolve emergencies year-round, future actions would be conducted on a case-by-case basis which, with the concomitant delays in response, may not be the most effective strategy to deal with ongoing short- and long-term threats to navigation in the area.

3.2 Proposed Action – Approval and Construction of the Wabash Dikes

The objective of the Wabash Dikes Project is for flow diversion to alleviate the ongoing need for maintenance dredging in the Ohio River downstream of the mouth of the Wabash River. The proposed construction of seven dikes in the Action Area will produce the most effective remedy to the shoaling and will offer a long-term solution designed to alleviate potential threats to commercial navigation there.

Under this alternative, the Wabash Dike Project would be approved and implemented using the current scope and design, as developed through numerical modeling. Adoption of this alternative is expected to ameliorate localized bank erosion and sediment deposition and reduce or eliminate the ongoing threat to navigation and commerce in the proposed Action Area caused by shoaling. In addition, this alternative would reduce the need for dredging in the Action Area, thereby eliminating potential effects on the surrounding environment associated with dredging events.

Once construction of the proposed dikes is complete, no operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) will be required. Sediment build up between the dikes is not expected to require removal.

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4 AFFECTED ENVIRONMENT/ENVIRONMENTAL CONSEQUENCES

The NEPA and the Council on Environmental Quality's NEPA Implementing Regulations require that an EA identify the likely environmental effects of a Proposed Project and that the agency determine whether those impacts may be significant. Effects (or impacts) are changes to the human environment from the proposed action or alternatives that are reasonably foreseeable and have a reasonably close causal relationship to the proposed alternatives. Effects may include ecological, aesthetic, historic, cultural, economic, social, or health effects, and can be either beneficial or adverse.

The determination of whether an impact significantly affects the quality of the human environment must consider the potentially affected environment of an action and the degree of the impacts (40 CFR § 1501.3(b)).

The term "affected environment" refers to the area in which the Proposed Action or other alternatives would take place, and the potentially affected resources of that area (40 CFR § 1502.3(b)). The affected environment includes reasonably foreseeable environmental trends and planned actions in the area, if applicable (40 CFR § 1502.15). The term "degree" is not defined in the regulations, but generally refers to the magnitude of change that would result if the Proposed Action or alternatives were implemented.

All potentially relevant resource areas were initially considered for analysis in this EA. Some resource topics are not discussed, or the discussion is limited in scope, due to the lack of anticipated effect from the Proposed Action on the resource or because that resource is not located within the Project.

This Section presents the adverse and beneficial environmental effects of the Proposed Action and the No Action Alternative and is organized by resource topic, with the effects of alternatives discussed under each resource topic. Impacts are quantified whenever possible. Qualitative descriptions of impacts are explained by accompanying text where used.

Qualitative definitions/descriptions of impacts as used in this section of the EA include:

Degree:

- No Effect, or Negligible – a resource would not be affected, or the effects would be at or below the level of detection, and changes would not be of any measurable or perceptible consequence,
- Minor – effects on a resource would be detectable, although the effects would be localized, small, and of little consequence to the sustainability of the resource. Mitigation measures, if needed to offset adverse effects, would be simple and achievable,
- Moderate – effects on a resource would be readily detectable, localized, and measurable. Mitigation measures, if needed to offset adverse effects, would be extensive and likely achievable, and
- Significant – effects on a resource would be obvious and would have substantial consequences. The resource would be severely impaired so that it is no longer functional in the Action Area. Mitigation

measures to offset the adverse effects would be extensive and success of the mitigation measures would not be guaranteed.

Duration:

- Short-term – temporary effects caused by the construction and/or implementation of a selected alternative, and
- Long term – caused by an alternative and remain after the action has been completed and/or after it is in full and complete operation.

4.1 Commerce, Recreation, River Navigation, and Visitation

4.1.1 Existing Condition

The John T. Myers Locks and Dam (formerly Uniontown Locks and Dam) has been in operation since 1969 and, because of its proximity to the Proposed Project is the most accurate measure of commerce, recreation, and river navigation occurring in the Action Area. The facility lies approximately 3 miles upstream from the Action Area at ORM 846.0 and is the 17th Lock and Dam on the Ohio River. There are two locks, one for commercial barge traffic that is 1,200 feet long by 110 feet wide, and an auxiliary lock that is 600 feet long by 110 feet wide. The project was authorized as a replacement for existing Locks and Dam 48 and 49 on September 17, 1958, by Secretary of the Army under authority of Section 6 of the Rivers and Harbors Act approved March 3, 1909, as amended. The Water Resources Development Act of 2000 authorized the John T. Myers Locks Improvement Project. This work will extend the 600-foot by 110-foot auxiliary lock chamber to a 1200-foot lock. This will give the project twin 1200-foot locks for efficient movement of projected increases in tow traffic and will enable the facility to manage traffic during main lock closures without significant delays to navigation.

The Ohio River acts as a transportation highway for commercial navigation. More than 184 million tons of cargo are transported on the Ohio River each year, with coal being the most transported product (LPMS 2020); more than 58 million tons of commodities pass through the John T. Myers Locks and Dam annually. Table 1 provides the relative proportion of commodity types locking through John T. Myers Locks and Dam.

Table 1. Proportion of commodities locking through John T. Myers Lock and Dam (2013-2017)¹.

Commodity Type	Proportion of Traffic (%)
00 - All Units (Ferried Autos, Passengers, Railway Cars)	0
10 - All Coal, Lignite, and Coal Coke	37
20 - All Petroleum and Petroleum Products	10
30 - All Chemicals and Related Products	12
40 -All Crude Materials, Inedible, Except Fuels	16
50 - All Primary Manufactured Goods	8
60 - All Food and Farm Products	17
70 - All Manufactured Equipment & Machinery	0
80 - All Waste Material	0

1- Data obtained from Lock Performance Monitoring System (LPMS) 2013-2017 total traffic by commodity

Because the surrounding area is mostly agricultural and sparsely populated, recreation in the Action Area is generally limited to pleasure boating on the Ohio River and, to a lesser degree, the Wabash River. Over the period 2012 – 2019, the total number of annual visits at John T. Myers Lock and Dam is 275,256 visits. During this period, the mean number of recreational craft was 986 and recreational boaters comprised 15.1% of total visits to the facility. Table 2 provides the relative proportion of traffic traveling through the Action Area during calendar years 2012 – 2019.

Table 2. John T. Myers Lock usage by category, Calendar Years 2012-2019.

Category	CY2019	CY2018	CY2017	CY2016	CY2015	CY2014	CY2013	CY2012
Average Delay (Tows) (Hrs)	1.7	1.6	0.8	0.7	0.8	0.8	0.7	0.8
Average Processing Time (Hrs)	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7
Barges Empty(#)	15,554	17,568	14,303	14,415	14,701	18,069	16,374	20,485
Barges Loaded (#)	29,078	31,330	27,696	26,184	30,956	35,384	33,725	39,223
Commercial Vessels (#)	4,928	5,115	4,440	4,351	4,910	5,386	4,981	5,639
Commercial Flotillas (#)	4,903	5,103	4,425	4,322	4,865	5,362	4,945	5,589
Commercial Lockages/Cuts (#)	4,903	5,103	4,425	4,323	4,866	5,362	4,946	5,598
Non-Vessel Lockages (#)	4	-	-	1	5	1	-	1
Non-Commercial Vessels (#)	33	54	64	65	51	23	47	34
Non-Commercial Flotillas (#)	33	54	64	65	51	23	46	34
Non-Commercial Lockages/Cuts (#)	33	54	64	65	51	23	46	34
Percent Vessels Delayed (%)	69	68	52	45	50	56	50	48
Recreational Vessels (#)	1,050	1,000	1,557	1,653	1,598	1,521	1,878	2,131
Recreational Lockages (#)	758	600	905	1,043	943	1,027	1,188	1,452
Total Vessels (#)	6,011	6,169	6,061	6,069	6,559	6,930	6,906	7,804
Total Lockages/Cuts (#)	5,698	5,757	5,394	5,432	5,865	6,413	6,180	7,085

Source: USACE Navigation Data Center. 2020. Public Lock Usage Report Files.

4.1.2 Environmental Consequences

4.1.2.1 No Action

Under the No Action Alternative, USACE would not complete the proposed Wabash Dikes Project; the dike structures would not be constructed and the current dredge program would remain in effect and would result in “no change” from current levels and protocols.. Under the No Action alternative, development and management of the Action Area would likely take the same general direction and would share the same environmental consequences. While current WQC allows for normal channel maintenance activities and emergency response capabilities to resolve threats to navigation in Ohio River year-round, future actions conducted under the No Action Alternative would be reactionary in nature which, with the concomitant delays required to mount a response, may not be the most effective and efficient strategy to deal with ongoing short- and long-term threats to navigation in the area.

Based on the history of the area since 2008, the threat posed to commercial shipping by shoaling in the Action Area would be expected to continue. As such, remaining with the current No Action Alternative will potentially have a negative effect on commerce and river navigation, at least until the threat posed by shoaling abates. Because recreation in the area is limited to small pleasure craft of shallow draft, the potential threats to recreation in the Action Area under the No Action Alternative are negligible.

4.1.2.2 Proposed Action

The objective of the Wabash Dikes Project is for flow diversion to alleviate the ongoing need for maintenance dredging in the Ohio River downstream of the mouth of the Wabash River. Threats to navigation in the Action Area caused by the outflow of sediment from the Wabash has the potential to negatively impact commercial shipping. The net effect of the proposed construction of seven dikes in the Action Area is expected to be beneficial as they will produce the most effective remedy to the ongoing shoaling and will offer a long-term solution designed to alleviate potential threats to commerce, recreation, and river navigation there. Potential negative impacts to commerce, recreation, and river navigation are expected to be negligible and short-term in nature while barge vessels are in place and the dike structures are constructed.

4.2 Climate

4.2.1 Existing Condition

The climate of the Action Area exhibits strongly marked seasons. Winters are often cold, and summers are often hot. The transition from cold to hot weather can produce an active spring with thunderstorms and tornadoes. Oppressive humidity and high temperatures arrive in summer. Autumn is generally marked by lower humidity and mostly sunny skies.

Indiana's location within the continent highly determines this cycle of climate. The Gulf of Mexico is a major player in the region's climate. Southerly winds from the Gulf region readily transport warm, moisture laden air into the area. The warm moist air collides with continental polar air brought southward by the jet stream from central and western Canada. A third air mass source found in Indiana originates from the Pacific Ocean. Due to the obstructions posed by the Rocky Mountains, however, this third source arrives less frequently in the Action Area.

A winter may be unusually cold or a summer cool if the influence of polar air is persistent. Similarly, a summer may be unusually warm or a winter mild if air of tropical origin predominates. The interaction between these two air masses of contrasting temperature, humidity, and density favors the development of low pressure centers that move generally eastward and frequently pass over or close to the Action Area, resulting in abundant rainfall. These systems are least active in midsummer and during this season frequently pass north of the region (NCDC 1976). The mean annual temperature in nearby Mount Vernon, Illinois is 54.2°F, the mean high temperature is 64.2°F, and the mean low temperature is 44.2°F. Mount Vernon receives 43.4 inches of rain annually and 14 inches of snow a year (World Climate 2020).

4.2.2 Environmental Consequences

4.2.2.1 No Action

Under the No Action Alternative, the proposed Wabash Dikes Project would not be constructed in the foreseeable future. Under the No Action Alternative, USACE would not complete the proposed Wabash Dikes Project; the dike structures would not be constructed and the current dredge program would remain in effect which would result in “no change” from current levels and protocols. In this scenario, development and management of the Action Area would likely take the same general direction and would generally share the same environmental consequences. As such, no effect to the climate of the Action Area is expected.

4.2.2.2 Proposed Action

No effect to the climate as a result of implementing the Proposed Action. Temporary effects of the proposed construction of seven dikes in the Action Area may result in the production of exhaust emissions from machinery or fugitive dust produced during construction activities but this effect is expected to be short-term and localized in nature.

4.3 Air Quality

4.3.1 Existing Condition

The U.S. Environmental Protection Agency (USEPA) Office of Air Quality Planning and Standards has set National Ambient Air Quality Standards (NAAQS) for six principal pollutants, called “criteria” pollutants. They are carbon monoxide, nitrogen dioxide, ozone, lead, particulates of 10 microns or less in size (PM-10 and PM-2.5), and sulfur dioxide. Ozone is the only parameter not directly emitted into the air but forms in the atmosphere when three atoms of oxygen (O_3) are combined by a chemical reaction between oxides of nitrogen (NO_x) and volatile organic compounds (VOC) in the presence of sunlight. Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents are some of the major sources of NO_x and VOC, also known as ozone precursors. Strong sunlight and hot weather can cause ground-level ozone to form in harmful concentrations in the air.

As of 18 September 2020, Gallatin County, Illinois and Union County, Kentucky were in full attainment for all criteria pollutants (USEPA, 2020).

4.3.2 Environmental Consequences

4.3.2.1 No Action

Under the No Action Alternative, the proposed Wabash Dikes Project would not be constructed in the foreseeable future. Under the No Action Alternative, USACE would not complete the proposed Wabash Dikes Project; the dike structures would not be constructed and the current dredge program would remain in effect which would result in “no change” from current levels and protocols. In this scenario, development and management of the Action Area would likely take the same general direction and would generally share the same environmental consequences. Potential impacts to air quality that may occur as a result of the use of diesel engines and other equipment during dredge activities will be short-term and localized in nature. As such, potential impacts to the air quality of the Action Area is expected to be negligible.

4.3.2.2 Proposed Action

Air quality would not be predicted to change from existing conditions as the effects of implementing and construction of the Wabash Dikes Project. There would be some localized and temporary emissions associated with construction of the dike structures as equipment is moved into the area and construction is completed. Emissions from construction actions would typically include byproducts of diesel and gasoline combustion and/or fugitive dust. These emissions would be localized and would occur during constructing the dike structures and their effects on the air quality of the Action Area are expected to be negligible.

It is estimated that two low water seasons (estimated June through November) may be needed to complete the Proposed Action. Because total construction time of the Proposed Action is not expected to exceed two years, the net relative impact to local air quality may be lower, when compared to the potential long-term impact that may occur under the ongoing dredge program.

4.4 Topography, Geology, and Soils

4.4.1 Existing Condition

The Action Area of the Wabash Dikes Project is underlain with strata dating to the Pennsylvanian age—approximately 290 to 350 million years ago (Figure 4). The bedrock is of the McCleansboro Group and includes layers of sandstone, siltstone, shale, and limestone.

The proposed Wabash Dikes Project lies within the Ohio River Floodplain of the Owensboro Lowlands of Kentucky and bottomlands of the Wabash Border Natural Division of Illinois. As part of the Interior Plateau Natural Region of Kentucky, the area is an extension of the southern floodplain forests of the Coastal Plain and contains rich soil deposits created by frequent flooding which supports a wide variety of wetland and forest habitats in addition to rich agricultural lands. The Wabash Border region includes the bottomlands and the loess-covered uplands bordering the Wabash River and its major tributaries in southeastern Illinois. Lowland oak forests with beech, tulip poplar and other species are characteristic of the forested areas.

As in Kentucky, much of the area is frequently flooded and the rich soils create prime farmlands suitable for row crops.

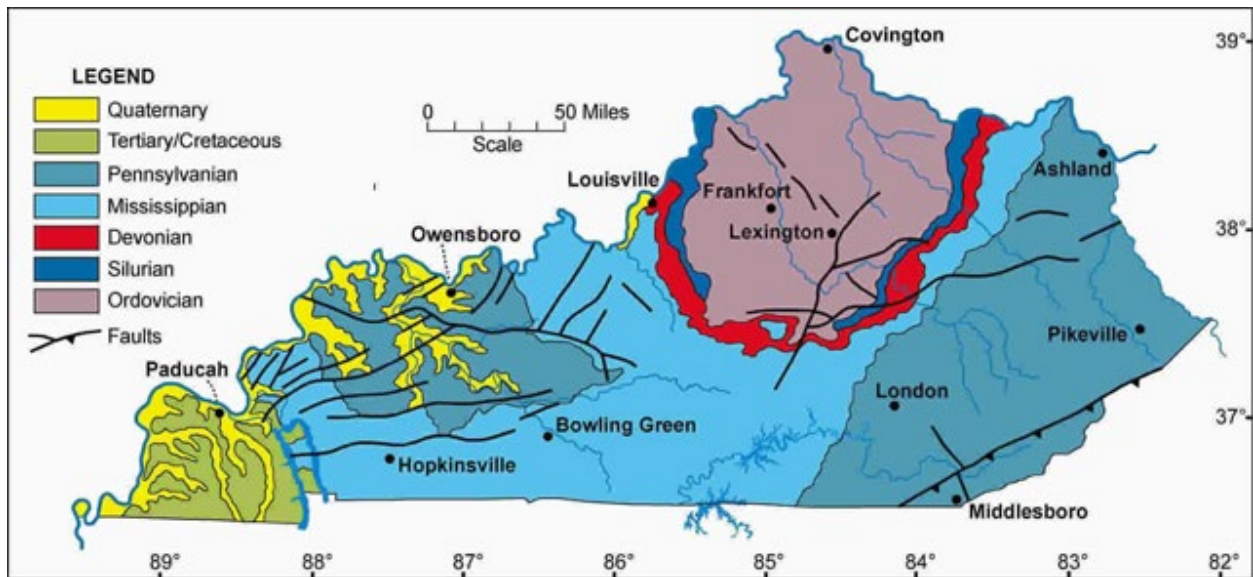


Figure 4. Geologic map of Kentucky (KGS, 2020).

An abbreviated soil report (NRCS, 2020) of the project area is included (Appendix B) to provide information about the soils present in the Action Area. This report details soil locations, properties, and limitations affecting various uses. Soils are mapped according to the boundaries of major land resource areas (MLRAs) which are geographically associated land resource units that share common characteristics shaped by local and regional physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). The objective of soil mapping is to delineate and organize the landscape into landform segments that have similar use and management requirements. Predictions about soil behavior are based on soil properties but also on abiotic and biotic variables as climate and biological activity. In this way, soils occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area (NRCS 2020). Soil conditions are predictable over long periods of time and can be used to develop resource management plans.

Chapter 2 of USACE EM-1110-1-400 recommends avoiding development on slopes greater than 15 percent unless there is no other acceptable alternative. All soil associations with the Wabash Dikes Action Area are suitable for development of this type. According to the Natural Resources Conservation Service (NRCS), three broad soil associations occur at the project site. These soil associations are listed in Table 3 and have been divided into two development suitability categories:

1. Suitable for development
2. Unsuitable for development

Table 3. Soil Associations of the Wabash Dikes Project in Order of Predominance.

Soil Association	Typical Slope (%)	Suitability Class and Soil Description
Huntington-Robinson Complex (Hu)	0 - 4	<i>Suitable</i> . Frequently flooded. Mixed fine silty alluvium. Well-drained soil found on gentle, linear slopes. Prime farmland if protected from flooding.
Beaucoup Silty Clay Loam (3070A)	0 - 2	<i>Suitable</i> . Seasonally flooded. Silty clay to loamy alluvium. Moderately well drained. Prime farmland
Tice Silty Clay Loam (3284A)	0 - 2	<i>Suitable</i> . Frequently flooded. Silty, clay to loamy alluvium. Moderately well drained. Prime farmland.

4.4.2 Environmental Consequences

4.4.2.1 No Action

Under the No Action Alternative, USACE would not complete the proposed Wabash Dikes Project; the dike structures would not be constructed, and the current dredge program would remain in effect which would result in “no change” from current levels and protocols. In this scenario, development and management of the Action Area would likely take the same general direction and would generally share the same environmental consequences. As such, no effect to the topography, geology, and soils of the Action Area would be expected.

4.4.2.2 Proposed Action

Effects to the topography, geology, and soils of the Action Area are expected to be negligible as a result of the implementation of the Proposed Action. Effects to the resource will be localized and will take the form disturbance to soils that will occur during the movement of heavy machinery and the clearing of surrounding vegetation. Topography, geology, and soils will also be impacted by the laying of rip rap stone to create the dikes and armor the surrounding area. Prior to and during construction of the Wabash Dikes Project, best management practices would be deployed (e.g., use of silt fences) to minimize erosion and soil loss, when appropriate.

4.5 Surface Water Hydrology and Groundwater

4.5.1 Existing Condition

Surface Water Hydrology

Locks and dams are installed on waterways of the U.S. by the USACE for navigation purposes. These structures regulate flow when necessary to maintain a 9 foot minimum river depth in the Ohio River, facilitating the transport of cargo on the river. The last two wickets dams in the lower river, Lock & Dam 52 and Lock & Dam 53, became obsolete in August 2018 with the completion of the Olmsted Locks & Dam. The Ohio River currently has 19 high-lift dams and no

remaining wicket dams. The river has an average depth of 24 feet with an average width of 0.5 miles (ORSANCO 2020).

When raised, each dam creates pools which are typically named for the downstream dam. Beginning on the downstream side of John T. Myers, the Smithland Pool is a 72.5-mile-long (ORM 846.0-918.5) water body bounded by J.T. Myers Locks & Dam upstream and Smithland Locks & Dam on the downstream end. The Wabash River, with a drainage area of 33,100 square miles, empties into this pool at ORM 848. Other tributaries to this navigational pool include the Saline River at mile point 867.3 with a drainage area of 1,170 square miles and the Tradewater River at mile point 873.5 with a drainage area of 1,000 square mile (ORSANCO 2020).

When necessary to maintain navigation depth, the river stage and flow conditions on this section of the Ohio River are managed by the USACE at John T. Myers Locks and Dam located at ORM 846.0, approximately 4.3 kilometers upstream from the site. This section of the Ohio River is navigable by commercial vessels and is used for both commercial and recreational purposes. Normal elevation of the Smithland Pool is 324 feet.

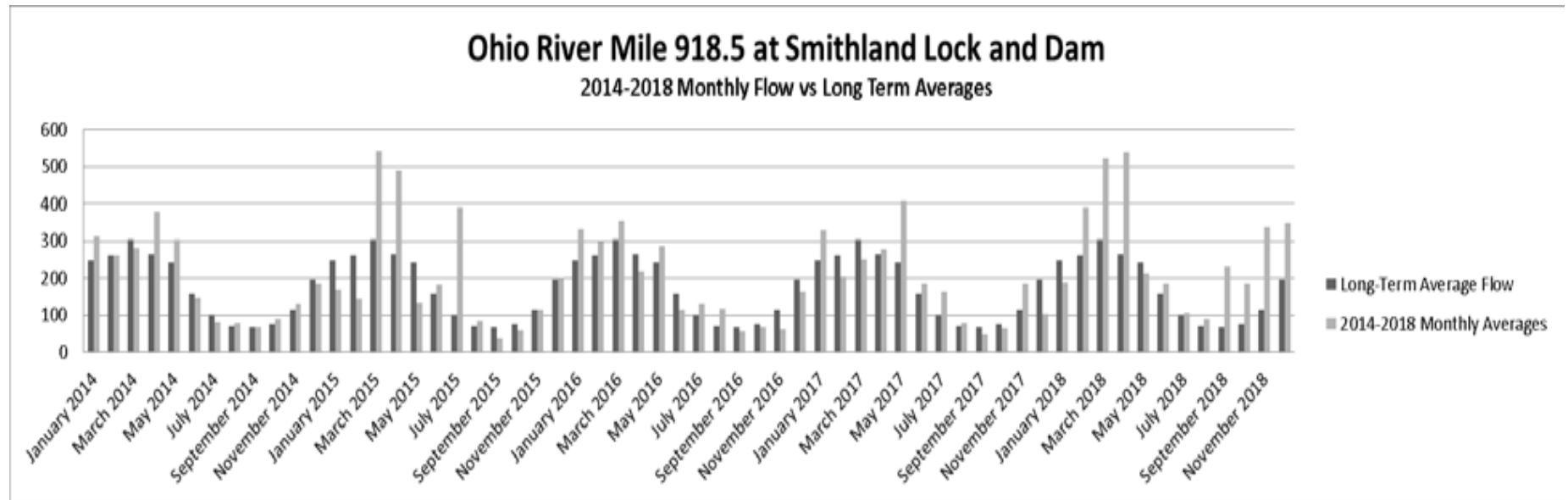


Figure 5. Comparison of recent and historic Ohio River flow data at Smithland, KY (taken from ORSANCO 2020).

Groundwater

About 1,500 people in Union County, Kentucky rely on private domestic water supplies, primarily wells. The Ohio River alluvium is the best source of groundwater in the county. Most wells yield more than 50 gallons per minute; some yield as much as 1,000 gallons per minute. In over half of Union County, most wells shallower than 300 feet penetrating sandstone are adequate for a domestic supply.

Within the project area, alluvium and glacial outwash sediments form terraces and floodplains along the Ohio River and tributaries. Valley train deposits in terraces occur along the Ohio River. These deposits may yield several hundred gallons per minute to drilled wells in the Ohio River Valley, and as much as 5,000 gallons per minute to compound horizontal wells. Nearly all wells furnish more than 500 gallons per day. Alluvium in stream valleys tributary to the Ohio River is fine grained and thin, and most wells do not yield enough for domestic use. Water is hard to very hard and may contain objectionable amounts of iron. Loess forms a thin mantle over alluvial deposits and bedrock over much of the area near the Ohio River. Loess yields practically no water to wells.

Only one known well occurs in the vicinity of the Action Area. In 2014, an agricultural well was dug on Wabash Island to a depth of 68 feet. This well is located inland of the Action Area. A copy of the Uniform Well Construction Record is included in Appendix B.

4.5.2 Environmental Consequences

4.5.2.1 No Action

Under the No Action Alternative, USACE would not complete the proposed Wabash Dikes Project; the dike structures would not be constructed and the current dredge program would remain in effect which would result in “no change” from current levels and protocols. In this scenario, development and management of the Action Area would likely take the same general direction and would generally share the same environmental consequences. Considering the recent history of shoaling in the area and the large amount of sediment that will likely continue to arrive from the Wabash River, maintenance dredging will likely be an ongoing concern. While the exact scope and frequency of future dredge events will be dependent on on-site conditions, dredging has the potential to have a minor impact on the surface water hydrology and of the Action Area.

4.5.2.2 Proposed Action

Because the overall objective of the Wabash Dikes Project is for flow diversion to alleviate the ongoing need for maintenance dredging in the Ohio River downstream of the mouth of the Wabash River, localized modification to the flow regime of the Action Area is an expected project outcome. This effect is designed to be focused and the completion of the Wabash Dikes Project is not expected to have a significant effect on the surrounding inflows to the system or water surface elevations currently present in the Smithland Pool.

4.6 Water Quality

4.6.1 Existing Condition

The water quality management authority of USACE is founded on the Federal Water Pollution Control Act (FWPCA) of 1948 and its amendments including the Clean Water Act of 1977 and the Water Quality Act of 1987. Executive Order 12088, Federal Compliance with Pollution Control Standards (1978), requires Federal facilities to comply with applicable pollution control standards in the same manner as any non-Federal entity. ER 1110-2-8154 stipulates that it is USACE policy to develop and implement a holistic, environmentally sound water quality management strategy for all projects. Furthermore, it is a goal of USACE to responsibly manage our projects to maximize environmental compliance. USACE is also mandated to comply with native State regulations and standards including the Indiana Administrative Code Title 327, Article 2 – Water Quality Standards.

The Ohio River is 981 miles long and borders or runs through six states in the eastern region of the United States; the river begins in Pittsburgh, Pennsylvania at the confluence of the Allegheny and Monongahela rivers and flows southwesterly to its confluence with the Mississippi River in Cairo, Illinois. The Ohio River basin encompasses 203,940 square miles, includes parts of New York, Maryland, Virginia, North Carolina, Tennessee, Georgia, Alabama, and Mississippi. Numerous major tributaries feed the Ohio River including the Allegheny, Cumberland, Green, Kanawha, Monongahela, Tennessee, and Wabash rivers. Approximately ten percent of the U.S. population resides in the basin, equating to more than 30 million people, with five million people relying on the river as a source of drinking water (ORSANCO 2020)

The Ohio River Valley Water Sanitation Commission (ORSANCO) is an interstate agency created to monitor and control water pollution in the Ohio River Basin. Member states and entities include Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia, West Virginia, and the federal government. ORSANCO was created in 1948 with the signing of the Ohio River Valley Water Sanitation Compact which commits each member state to, "...place and maintain the waters of the basin in a satisfactory sanitary condition, available for safe and satisfactory use by public and industrial water supplies after reasonable treatment, suitable for recreation, capable of maintaining fish and other aquatic life..." (ORSANCO 2020).

ORSANCO operates a number of monitoring programs that are used to assess water quality, including: Bimonthly Sampling (nutrients/ions), Clean Metals Sampling, temperature and dissolved Oxygen Monitoring, fish and macroinvertebrate population monitoring, contact recreation bacteria Monitoring, Longitudinal and Tributary Bacteria Surveys, Fish Tissue

Sampling, High Volume PCBs and dioxin sampling, algae, and nutrients (ORSANCO 2020). ORSANCO conducts water quality monitoring and assessments on behalf of Ohio River main stem states of Illinois, Indiana, Kentucky, Ohio, Pennsylvania, and West Virginia. ORSANCO completes an assessment and report of Ohio River water quality conditions every two years. This data is compiled into a 305b Report is then compared to water quality criteria to determine if the Ohio River meets its four intended uses that include warm water aquatic life, public water supply, contact recreation, and fish consumption. To this end, three classifications are used in ORSANCO's assessments to describe the attainment of designated uses: *Fully Supporting* (good water quality), *Partially Supporting* (fair water quality), and *Not Supporting* (poor water quality).

In summary, the entire 981 miles of the Ohio River is designated as impaired for the fish consumption life use designation (based on the presence of polychlorinated biphenyls and dioxin in fish tissue samples). Approximately two-thirds of the river (640.3 miles) is designated as impaired for contact recreation (as a result of *E. coli* or fecal coliform bacteria contamination) and the entire river is fully supporting the public water supply use and aquatic life use designation (ORSANCO 2020).

Using data more reflective of conditions in the project area, a bioassessment of the fish and macroinvertebrate assemblages conducted in the John T. Myers pool in 2015 characterized both populations as "Good". Sampling of fish populations in the Smithland Pool in 2013 resulted in a rating of "Good". Macroinvertebrate data was not available for the Smithland assessment unit (ORSANCO 2020). Table 4 includes the attainment status and miles impacted from ORM immediately up-and downstream of the Wabash Dikes Action Area.

Table 4. Summary of four designated use categories involving pertinent (i.e., near or encompassing the Wabash Dikes Action Area) impaired river miles.

State	River Mile (Total Miles)	ALU Impairment	CRU Impairment	PWSU Impairment	FCU Impairment
IN-KY	491.3-848.0 (356.7)	0.0	243.3	0.0	356.7
IL-KY	848.0-981.0 (133.0)	0.0	41.5	0.0	133.0

Source: Assessment of Ohio River Water Quality 2014- 2018; Aquatic Life (ALU), Contact Recreation (CRU), Public Water Supply (PWSU), and Fish Consumption (FSU) uses (ORSANCO 2020).

Point and Non-point Pollution

Because the Ohio River receives input from the entire basin, the list of potential sources of point and nonpoint pollution is extensive. For example, there are approximately 580 permitted discharges into the Ohio River (ORSANCO 2020). Point sources are confined and discrete conveyances such as pipes, ditches, channels, and tunnels or conduits by which pollution is transported directly to a water body. Potential point sources contributing to the water quality of the Ohio River and the Action Area include wastewater treatment plants; straight pipe systems; and sanitary sewer overflows (which may contain sediments), *Escherichia Coli* (*E. coli*), and nutrients; and regulated stormwater sources.

Nonpoint source pollution are sources of pollution that come from diffuse sources. Potential non-point pollution sources which effect overall project water quality include cropland and livestock runoff, stream bank erosion, urban stormwater runoff, and failed septic systems. While the area is not densely populated, septic systems are used almost exclusively in the region surrounding the Action Area to handle wastewater treatment. Failure of these systems can affect surrounding water quality via nutrient loading of nitrogen and phosphorus in surface waters, which results in increased microbial populations. High microbial populations in surface waters contaminated by sewage often exceed the maximum allowance under the EPA standards and may result in high levels of *E. coli* and harmful algal blooms (HABs). For example, Purdue University (2005) estimated that 15.3 million gallons of untreated sewage enter the environment each year in the state of Indiana.

Harmful Algal Blooms (HABs)

Sampling on the Ohio River has identified over 300 different species of algae (ORSANCO 2020). These algae are divided into eight taxonomic divisions with the most common being diatoms (*Bacillariophyta*), green algae (*Chlorophyta*) and blue-green algae (Cyanobacteria). Cyanobacteria can produce toxins (cyanotoxins) which can be harmful if ingested and can also cause contact dermatitis. For this reason, an algae bloom which consists primarily of Cyanobacteria which can produce toxins is defined as a HAB. These cyanotoxins can affect people and animals who ingest them, either through recreation (e.g., swimming), or in drinking water (ORSANCO 2020).

On August 2015, ORSANCO received a National Response Center (NRC) report of a paint-like green material on the Ohio River at Pike Island Locks and Dam (mile 84.2) which covered an area of 100 x 200 feet. This was quickly identified as the blue-green algae *Microcystis aeruginosa*. Within a month, this bloom expanded to cover the Ohio River from Pike Island Locks & Dam to Cannelton Locks & Dam (ORM 84.2 to 720.7). The bloom reached its peak around September and persisted until the end of October. In response to this HAB, Ohio, West Virginia, Kentucky, and Indiana issued recreation advisories; Illinois issued a precautionary statement due to concern that the bloom would reach their border.

ORSANCO collected 150 samples from the Ohio River, which were analyzed for the toxin microcystin. Finished drinking water was also sampled by either the water utilities or State personnel. Of the samples collected by ORSANCO, 15 (or 10%) were greater than 6 µg/L. The highest toxin concentration was 1900 µg/L at river mile 468.8 (Cincinnati, OH). No toxins were detected in finished drinking water.

4.6.2 Environmental Consequences

4.6.2.1 No Action

Under the No Action Alternative, USACE would not complete the proposed Wabash Dikes Project; the dike structures would not be constructed and the current dredge program would remain in effect which would result in “no change” from current levels and protocols. In this scenario, development and management of the Action Area would likely take the same general direction and would generally share the same environmental consequences. As such, no effect to the water quality of the Action Area is expected. Dredging activities that would likely

continue under the No Action Alternative could have temporary/localized effects of water quality, including increased turbidity and re-suspension of contaminants like PCBs and dioxins.

While current WQC allows for normal channel maintenance activities and emergency response capabilities to resolve threats to navigation in Ohio River year-round, future dredge actions (conducted under the No Action Alternative) would be implemented on a reactionary *ad hoc* basis which, with the concomitant delays in response, may not be the most effective strategy to deal with ongoing short- and long-term threats to navigation in the area. In addition, future actions or resource management policies would be implemented without the benefit of a comprehensive analysis (i.e., in the form of an EA) of potential effects on water quality that can be used for planning and decision making.

4.6.2.2 Proposed Action

Under the Proposed Action, future development under the proposed Wabash Dikes Project would occur with negligible effect to the water quality of the Ohio River or its tributaries. Although construction activities would result in ground-surface disturbances that could increase runoff and diminish water quality, best management practices during construction would be expected to minimize potential impacts to water quality.

The existing water quality of the Smithland Pool and the Ohio River, in general, is a result of factors substantially unrelated to the actions on Project lands and results from land use and discharges to the watershed upstream from the Project. Because the sediment load of the Ohio River is typically high even under normal conditions, improvements to turbidity levels of the watershed, as a result the construction of the dikes, would likely be minimal. As a designed outcome, the dike structures will alter stream flow in a way that limits or directs sediment deposition and prevents scouring in the Action Area. A detailed analysis of the potential of the Proposed Project to impact water quality of the Action Area has been conducted in a 404(b)(1) evaluation document located in Appendix A.

4.7 Habitats

4.7.1 Existing Condition

The proposed Wabash Dikes Project lies within the Ohio River Floodplain of the Owensboro Lowlands of Kentucky and bottomlands of the Wabash Border Natural Division of Illinois. The Wabash Border Division, stretching from Vermilion County south to Gallatin County, forms the eastern border of Illinois. This division is divided into three sections: Bottomlands, Southern Uplands, and Vermilion River. The Wisconsin glacial episode impacted the Vermilion River Section, while all three sections were influenced by the earlier Illinoian glacial episode. This division is a transition zone between forest and prairie, but lowland and upland forests dominate the landscape, containing a great diversity of tree species.

Habitats of the Wabash Dikes project area are delineated and categorized using the National Land Cover Database (NLCD) which includes land cover classification schemes and quantifies land cover change for the conterminous U.S. between the years 2001 to 2016. The NLCD provides nationwide data on land cover and land cover change at a 30m resolution with a 16-class legend based on a modified Anderson Level II classification system. A total of eight NLCD habitat types are found surrounding the Wabash Dikes Project, including cultivated crops,

deciduous forest, mixed forest, grasslands/herbaceous, scrub/shrub, woody wetlands, open water, and developed, medium degree. The most dominant habitat types are addressed below in order of prevalence.

Open Water

The majority of the project consists of open water habitat type. During a bioassessment conducted in 2013, a total of 36 species of fish were documented in the Smithland Pool including gizzard shad (*Dorosoma cepedianum*), river carpsucker (*Carpionodes carpio*), highfin carpsucker (*Carpionodes velifer*), channel catfish (*Ictalurus punctatus*), bluegill (*Lepomis macrochirus*), longear sunfish (*Lepomis megalotis*), freshwater drum (*Aplodinotus grunniens*), white bass (*Morone chrysops*), spotted bass (*Micropterus punctulatus*), spotfin shiner (*Cyprinella spiloptera*), and channel shiner (*Notropis wickliffi*; ORSANCO 2013). During this study, the overall biological condition of the Smithland Pool was characterized as *Good* (ORSANCO 2020).

Cultivated Crop/Grasslands/Herbaceous

Like most of the Midwest, states such as Illinois and western Kentucky are dominated by agriculture. Common crops of this region include corn and soybeans and much of the surrounding project area is currently in cultivated fields or currently laying fallow.

Old fields are successional habitats characterized by grasses, shrubs and trees. These habitats are typically transitioning from grasslands to young forests. Grassland/herbaceous habitats are characterized by the following plant species: poison ivy (*Toxicodendron radicans*), blackberry (*Rubus* sp.), switchgrass (*Panicum virgatum*), big bluestem (*Andropogon gerardi*) and little bluestem (*Schizachyrium scoparium*) among other grasses, as well as forbs and shrubs, e.g., hawthorne (*Crataegus* sp.). Wildlife species may include cottontail rabbit (*Sylvilagus floridanus*), white-tailed deer (*Odocoileus virginianus*), turkey (*Meleagris gallopavo*), ruffed grouse (*Bonasa umbellus*), coyotes (*Canis latrans*), and various songbirds and furbearers.

Deciduous Forest/Mixed Forest

The forest community consists of a four-layered plant structure and is highly impacted by the frequent inundation and hydric soils. Dominant tree species in the overstory are silver maple (*Acer saccharinum*), sycamore (*Platanus occidentalis*), cottonwood (*Populus deltoides*), and black willow (*Salix nigra*). Other members of canopy include slippery elm (*Ulmus rubra*), pin oak (*Quercus palustris*), river birch (*Betula nigra*), sweet gum (*Liquidambar styraciflua*), and hickories (*Carya* spp.). Representative species in the subcanopy include hackberry (*Celtis occidentalis*), black locust (*Robinia pseudoacacia*), American elm (*Ulmus americana*), green ash (*Fraxinus pennsylvanica*), box elder (*Acer negundo*), pawpaw (*Asimina triloba*), buckeye (*Aesculus* sp.), and black walnut (*Juglans nigra*). Shrubs include spice bush (*Lindera benzoin*), Virginia creeper (*Parthenocissus quinquefolia*), poison ivy, dogwoods (*Cornus* spp.), black elderberry (*Sambucus* sp.), and grape species (*Vitis* spp.). Typical ground cover includes wingstem (*Verbesina alternifolia*), touch-me-nots (*Impatiens* sp.), white snakeroot (*Ageratina altissima*), and several invasive exotic plants including Japanese knotweed (*Reynoutria japonica*), garlic mustard (*Alisaria petiolata*), and kudzu (*Pueraria* sp.).

Remote sensing and field observations of the Action Area suggest that the forest community varies considerably between the Kentucky and Illinois shorelines. In general, the forest habitat on Wabash Island is more diverse and the trees are both older and larger. Dominant members of the canopy on Wabash Island include cottonwood, sycamore, box elder, and black walnut with some individuals exceeding 100 inches dbh. By comparison, much of the forest community on the Illinois side are much younger and less diverse with many of its members considered early successional (e.g., black willow, silver maple, and river birch) with scrub/shrub dominating a large portion of the area. In this area, the riparian zone is less than 90 meters in width in the area with either active or fallow agricultural fields bordering the forested belts inland, where suitable soils are present.

Wetlands

According to the USFWS's National Wetlands Inventory (NWI), freshwater wetlands may exist on or near the Wabash Dikes Action Area including freshwater emergent wetlands and freshwater scrub/shrub wetland habitat types (Figure 5). Freshwater emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichen which are present for most of the growing season in most years. Both of these habitat types are located along the shoreline and in low lying areas that are frequently inundated by floodwaters. Some of these potential wetlands are seasonally or otherwise temporarily flooded, meaning surface water is present for brief periods (from a few days to a few weeks) during the growing season, but may recede or be absent by the end of the growing season. However, based on this cycle, they may have one or more of the prerequisite characteristics of wetland habitat, including hydric soils, hydrology, and wetland plants.

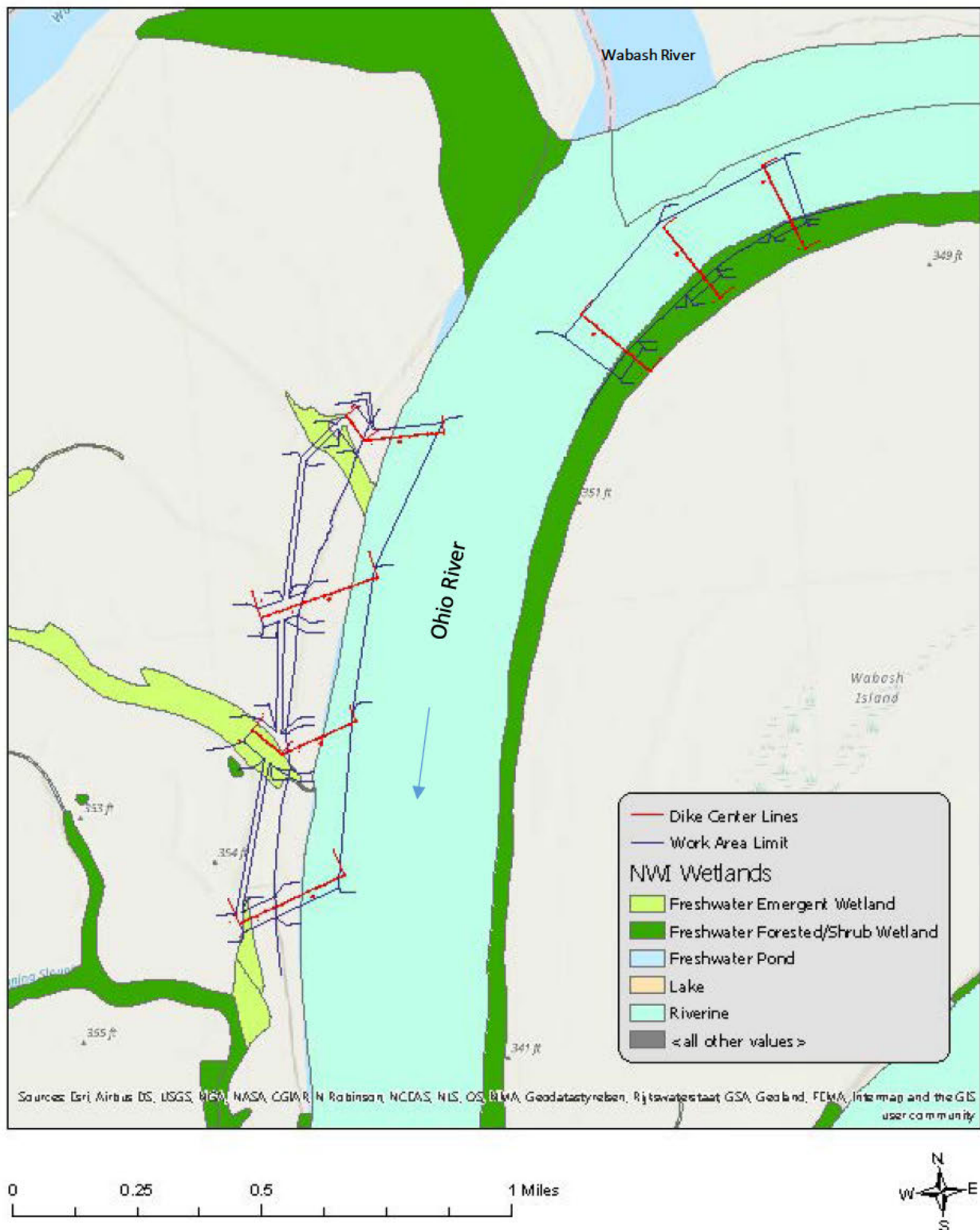


Figure 6. NWI wetland habitats present within the Wabash Dikes Action Area.

4.7.2 Environmental Consequences

4.7.2.1 No Action

Under the No Action Alternative, USACE would not complete the proposed Wabash Dikes Project; the dike structures would not be constructed and development of the Action Area would likely take the same general direction and would generally share the same environmental consequences. Because the need for maintenance dredging would likely persist in the area, continuing under the No Action Alternative has the potential to impact benthic habitats and the flora and fauna residing there. While not formally recognized in the NLCD habitat classification system, benthic habitats of the Action Area are in a constant state of flux as a result of high currents and sediment loads in the project area. A detailed analysis of the potential effects of dredging on the benthos of the Action Area is provided in Section 4.8 below and in the BA and 404(b)(1) evaluation documents provided in Appendix A.

4.7.2.2 Proposed Action

Under the Proposed Action, there is expected to be impacts to several habitat types that are minor and short-term in nature. In general, habitats currently present in the construction zone are of early successional stages as they are frequently inundated and impacted by scouring from seasonal flooding. An estimated total of 13.25 acres (5.4 hectares) of existing habitat will be removed (or otherwise altered) from the shoreline in and around each of the proposed dike structures on both sides of the river. Of this total, as estimated 6.3 acres of habitat characterized as wetland will be negatively impacted. As required for the implementation of test drilling and dike construction, all vegetation will be removed from approximately 350 feet (106.7 meters) of shoreline, upland 50 feet (15.2 meters) from the water's edge (at normal pool elevation of 324.0 feet). Vegetation, if present, may also be removed as equipment is moved overland from dike to dike. Much if this impacted habitat will recover once the project is complete. However, a relatively small area will be permanently altered as the underlying habitats covered by rip rap used in the construction of the dikes. No in-kind replacement of lost or modified forested habitat is planned.

A detailed analysis of the potential impacts to habitats of the Action Area as a result of implementing the Proposed Action is provided in Section 4.8 below and in the BA and 404(b)(1) documents provided in Appendix A.

4.8 Listed Species

Lists of threatened, endangered and species of special concern are maintained by the United States Fish and Wildlife Service (USFWS). Under ESA of 1973 (16 U.S.C. §§ 1531-1544), endangered species are generally defined as any species in danger of extinction throughout all or a significant portion of its range. A threatened species is any species likely to become endangered in the foreseeable future. The ESA defines critical habitat of the above species as a geographic area that contains the physical or biological features that are essential to the conservation of a particular species and that may need special management or protection. This section also covers birds listed under the Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C §§ 703-712) as birds of conservation concern.

4.8.1 Existing Condition

Based on data obtained from the USFWS Information for Planning and Consultation (IPaC) resource (USFWS 2020), 16 Federally listed species have been or are known to occur in this section of the Ohio River in the vicinity of the Action Area. Endangered freshwater mussel species potentially affected by activities associated with the Wabash Dikes Project include the spectaclecase (*Cumberlandia monodonta*), fanshell (*Cyprogenia stegaria*), purple catspaw (*Epioblasma obliquata*), northern riffleshell (*Epioblasma rangiana*), ring pink (*Obovaria retusa*), orangefoot pimpleback (*Plethobasus cooperianus*), sheepnose (*Plethobasus cyphus*), clubshell (*Pleurobema clava*), rough pigtoe (*Pleurobema plenum*), and the fat pocketbook (*Potamilus capax*). The threatened mussel species potentially affected by activities in this location is rabbitsfoot (*Theliderma cylindrica*). These mussel species have been experiencing decades of decline due to habitat modification or loss, over harvesting, and pollution. Although all of these species may have been historically present in this area, the majority will not be expected to be present within the proposed Action Area. Several may be extirpated from large parts of their formal ranges and others may be functionally extinct.

Based on the habitat preferences, historical occurrence records, and recent mussel survey data (Lewis Environmental Consulting, LLC 2019), the endangered fat pocketbook is the only listed mussel species that is reliably known to still occur within or near the Action Area.

Endangered mammals potentially affected by the Wabash Dikes Project include the Federally threatened northern long-eared bat (*Myotis septentrionalis*) and the endangered Indiana bat (*M. sodalis*) and the endangered gray bat (*M. grisescens*). Because both bat species have very large ranges, their presence in the project area is assumed by USFWS. A single Federally endangered bird species, the arctic tern (*Sterna antillarum*) and Short's bladderpod (*Physaria globosa*) is an endangered plant within range of the Wabash Dikes Project.

There is no known critical habitat known in Action Area.

A Biological Assessment (**Appendix A**) has been written to assess the potential effects on listed species in greater detail.

4.8.2 Environmental Consequences

4.8.2.1 No Action

Under the No Action Alternative, the proposed Wabash Dikes Project would not be constructed in the foreseeable future and there would be no comprehensive planning for the project. In this scenario, development and management of the Action Area would likely take the same general direction and would generally share the same environmental consequences.

Under the No Action Alternative, the current dredge program would remain in effect which would result in "no change" from current levels and protocols. Described in previous sections of this document, the Wabash River dredging program is an ongoing, as needed action that is conducted (under existing 401 WQC and NPDES permits) to remove and dispose of outwash material that encroaches into the Ohio River navigation channel. Dredging activities have the potential to negatively impact resident mussels. On 9 September 2002, the USFWS Bloomington Field Office provided a Biological Opinion (BO) to the USACE Louisville District in

response to formal consultation related to potential impacts to listed species caused by the maintenance dredging of the mouth of the Wabash River. Based on expert opinion and data obtained from mussel surveys, the aforementioned BO authorized the incidental take of up to 3 individual *P. capax* per dredging event. In 2016, the USFWS provided an amended BO that increased allowable take of up to 9 individual *P. capax* per dredging event, based on the results of long-term monitoring of dredge materials (USFWS, 2016).

The existing conditions in this stretch of the Ohio River has required maintenance since 2008 and there is no evidence that this situation will improve in the near future. While the USFWS (2016) determined that the dredging program would not threaten the continued existence of *P. capax*, evidence indicates that adoption of the No Action Alternative (and continuation of the current dredge actions) has the potential to negatively impact mussels that may be present in the dredge and disposal fields. In addition, the large amounts of outwash coming from the Wabash River has the potential to suffocate resident mussels suggesting that the implementation of the No Action Alternative has a negative effect on listed mussel species.

4.8.2.2 Proposed Action

Listed Species Effects Determination

The objective of the Wabash Dikes Project is for flow diversion to alleviate the ongoing need for maintenance dredging in the Ohio River downstream of the mouth of the Wabash River. While the construction of the dike structures may have short term in-stream impacts to resident mussels in the form of sedimentation, these effects would be temporary. Mussel surveys conducted in the Action Area documented no mussels in the dike footprints remaining in the current project design. In comparison to the potential impacts to mussels caused by future dredging actions, the Proposed Action is a one-time event and the footprints are relatively small, discrete areas with localized potential impacts. In addition, the high amount of deposited sediments (were the dikes not built) emanating from the Wabash River has the potential to kill mussels via suffocation (USFWS, 2016). When taking into account the possible take of mussels that may occur incidental to future dredging actions and the removal or reduction of the threats to mussels caused by the high amount of Wabash River outwash, the net effect of the Proposed Action would be expected to be beneficial to resident mussels.

A Biological Assessment (Appendix B) was written to assess the potential effects on listed species in greater detail. The finding in the BA is a determination of no effect to the spectaclecase, fanshell, purple catspaw, northern riffleshell, ring pink, orangefoot pimpleback, sheepnose, clubshell, rough pigtoe, fat pocketbook, rabbitsfoot, Short's bladderpod, rusty patched bumble bee, gray bat, Indiana bat, and northern long-eared bat. To-date, coordination with USFWS is limited to analysis occurring via the agency's iPAC system. As part of the NEPA process, this EA, the Biological Assessment, and FONSI document will be submitted for public comment and agency review.

4.9 Demographics and Environmental Justice

4.9.1 Existing Condition

The USEPA online EJScreen environmental justice mapping tool was used to assess the environmental and demographic indicators within the Area of Influence (AOI) which encompassed a 10-mile radius around the Wabash Dikes Project. The AOI encompasses approximately 314 sq. miles and contains all or portions of Gallatin County in Illinois and Union County in Kentucky. With a total population of 6,343 people (2010), the area has a population density of approximately 21 people/sq. mile. Table 5 contains select EJ Index variables within the Wabash Dikes AOI. The full EJScreen Report is located in Appendix B.

Table 5. Select environmental indicators from EJScreen Report in Wabash Dikes Area of Influence.

Selected Variables	State Percentile	EPA Region Percentile	USA Percentile
EJ Indexes			
EJ Index for PM2.5	64	46	50
EJ Index for Ozone	64	44	50
EJ Index for NATA* Diesel PM	66	47	50
EJ Index for NATA* Air Toxics Cancer Risk	67	48	50
EJ Index for NATA* Respiratory Hazard Index	68	48	50
EJ Index for Traffic Proximity and Volume	83	61	62
EJ Index for Lead Paint Indicator	49	23	36
EJ Index for Superfund Proximity	61	46	51
EJ Index for RMP Proximity	52	39	44
EJ Index for Hazardous Waste Proximity	45	33	42
EJ Index for Wastewater Discharge Indicator	27	8	13

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Population and Low-Income Populations (Executive Order, 1994), directs federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority population and low-income populations. When conducting NEPA evaluations, the Corps of Engineers incorporates Environmental Justice (EJ) considerations into both the technical analyses and the public involvement in accordance with the USEPA and the Council on Environmental Quality guidance (CEQ, 1997).

The CEQ guidance defines “minority” as individual(s) who are members of the following population groups: American Indian or Alaskan native, Asian or Pacific Islander, Black, not of Hispanic origin, and Hispanic. The Council defines these groups as minority populations when either the minority population of the affected area exceeds 50-percent of the total population, or the percentage of minority population in the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographical analysis.

Low-income populations are identified using statistical poverty thresholds from the Bureau of the Census Current Population Reports, Series P-60 on Income and Poverty (USCB, 2019). In identifying low-income populations, a community may be considered either as a group of

individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect. The 2019 poverty threshold for an individual was \$13,011 and \$26,162 for a family of four (USCB, 2019). These values represent weighted poverty thresholds based on family size in 2019.

Table 6 shows the percentage of the population that is low-income and the percentage of the population that identify as a minority/Person of Color for the AOI, the counties of the Action Area, the states of Kentucky and Illinois, and the United States. The AOI has a comparable percentage of low-income population to Gallatin and Union Counties, both of which have a higher percentage of low-income population than their respective states and the country. The minority populations within the AOI and Gallatin and Union counties form a significantly lower proportion of overall population than the Illinois and national averages, and a comparable percentage to the state of Kentucky. Because the percentage of minority population in the AOI is below 50 percent and is lower than the minority population percentage in the general population and the surrounding area, the CEQ guidance does not consider the AOI to include any “minority populations.”

Table 6. Socioeconomic, and demographic indicators within the Wabash Dikes greater Area of Influence.

Geographical Unit	Low-Income Percentage of Population ¹ (2020)	Minority/People of Color Percentage of Population ² (2020)
Area of Influence	42.0	13.0
Gallatin County	43.0	4.0
Union County	45.0	18.0
Illinois	29.0	38.0
Kentucky	38.0	15.0
United States	33.0	39.0

Source: US Census Bureau 2020, USEPA 2020.

¹ “Percent Low-Income” is defined as the percent of a block group’s population in households where the household income is less than or equal to twice the federal poverty level.

² “Percent People of Color” is defined as the percent of individuals in a block group who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino.

4.9.2 Environmental Consequences

4.9.2.1 No Action

Under the No Action Alternative, USACE would not complete the proposed Wabash Dikes Project; the dike structures would not be constructed which would result in “no change” from current demographic trends of the Action Area. In this scenario, development and

management of the Action Area would likely take the same general direction and would generally share the same environmental and socioeconomic consequences. Under the no action alternative, the population growth trends in the surrounding area would be expected to continue. No adverse effects to minority or low-income communities would be expected as a result of implementing the no action alternative.

4.9.2.2 Proposed Action

Implementing the Proposed Action alternative is expected to have no effect on the existing demographic trends of the surrounding communities. Because the area surrounding the proposed Wabash Dikes Project is lightly populated and predominantly agricultural, completion of project is expected to cause no effect to low-income or minority populations of the surrounding communities. While the Proposed Project would help reduce or eliminate the ongoing threat to navigation due to shoaling at this location, it is not anticipated that the project would induce population growth or other types of development in the area.

4.11 Cultural Resources

4.11.1 Existing Condition

A number of steps were taken to identify any historic properties within the Proposed Project footprint. The Area of Potential Effect (APE) for this project consists of the dike locations, both on land and in the river, workspaces, and access roads. Between June 29, 2020 and September 15, 2020, a review of existing literature, records, and reports was conducted to identify known historic properties that could be impacted by this project. This review included technical reports, site forms, books, articles, historical references, and online resources available through the National Park Service, the Illinois Historic Preservation Agency (IHPA), and USACE offices in Louisville, Kentucky. Results of this review identified no historic properties listed on the National Register of Historic Places (NRHP) within the APE. Four cultural resources are recorded within the APE; all were located in the state of Illinois. Specifically, they are archaeological sites 11G20 (the Galt Site), 11G160, 11G161, and 11G162. An additional archaeological site 11G15 (the Rollman Site) is located near, but outside of, the APE. All of these sites were identified by the Center for Archaeological Investigations at Southern Illinois University, Carbondale during surveys in 1972 and 1978. These resources were not formally evaluated for their eligibility to the NRHP when they were identified, however, all of the sites were reported to have elements that would make them eligible for the NRHP under Criterion D, except for site 11G162.

Consultation under Section 106 of the National Historic Preservation Act (NHPA) was initiated with the Kentucky State Historic Preservation Office, Illinois State Historic Preservation Officer, 44 federally recognized Native American tribes, local governments, non-profit historic preservation groups, and interested members of the public on April 14, 2020. The Cherokee Nation, Quapaw Tribe, Osage Nation, the Kentucky State Historic Preservation Office, and the Illinois State Historic Preservation Officer have accepted an invitation to consult on effects to historic properties determined eligible for listing to the National Register of Historic Places (NRHP). A cultural resources survey was conducted in the portion of the APE located in Gallatin County, Illinois on September 19 and September 28-30 by USACE personnel. Only one site, part of 11G20, was relocated within the APE, however, the portion of 11G20 within the APE was

determined ineligible for the NRHP. No other resources were located within the APE. A cultural resources survey was conducted in the portion of the APE located in Union County, Kentucky on 14 January and 24 February 2021.

4.11.2 Environmental Consequences

4.11.2.1 No Action

Under the No Action Alternative, identified cultural resources and/or historic properties potentially eligible for listing to the NRHP will continue to be affected by the changing hydrology of the Ohio and Wabash rivers, the extent of which will depend largely on regional rainfall, storm run-off, sediment transport, channel development, and the operation of existing USACE flood and navigation infrastructure. To date, sites 11G161 and 11G162 have been partially or completely eroded by the waters of Ohio and Wabash rivers.

4.11.2.2 Proposed Action

Implementing the proposed action is expected to have no adverse effect on cultural resources and/or historic properties that were determined eligible for listing to the NRHP and located within the APE. Concurrence from the IL SHPO, Quapaw, Cherokee, and Osage was sought on November 19, 2020 and the USACE had received concurrence from all parties. The Corps completed consultation under Section 106 of the NHPA with a formal determination of effect on 16 January 2021. As proposed in the findings document, an archaeological monitor will be present for all ground disturbing activities located within the APE near Dike 5 (USACE 2020, SHPO Log #004042220). Should unanticipated cultural resources be discovered during construction activities, work will cease immediately and follow the regulatory guidance set forth by 36 CFR part 800.13 for Post Review Discoveries and the consulting parties will be notified.

The USACE has found that no historic properties would be adversely affected by project actions. Though 11G161 was not relocated, it is mapped within the boundaries of Dike 5 and it is recommended that an archaeological monitor be present during ground disturbing activities at this location. USACE received concurrence with these findings from responding parties on 4 February 2021 (USACE 2020).

4.12 Hazardous, Toxic, and Radioactive Waste Materials (HTRW)

4.12.1 Existing Condition

There are no known permitted hazardous waste disposal facilities in immediate proximity to the Wabash Dikes Project and there are no known sites of hazardous, toxic, or radioactive materials in the Action Area.

4.12.2 Environmental Consequences

4.12.2.1 No Action

Under the no action alternative, the Wabash Dike Project would not be constructed in the foreseeable future and there would be “no change” from current levels of or risks associated with HTRW in the Action Area. Because these substances are not found near the Action Area, no effect to current levels or risks associated with HTRW is expected as a result of implementing the No Action Alternative.

4.12.2.2 Proposed Action

Implementing the Wabash Dikes Project would be expected to have no effect on HTRW materials as there are no known pre-existing sources on or near the Action Area. While the potential to create HTRW materials as a result of equipment malfunction or failure during the construction process exists (e.g., fluid leaks from heavy equipment), best management practices and regular equipment maintenance reduce these risks. The majority of construction-related work will be completed offshore; the possibility of storage, fueling, and lubrication of equipment and motor vehicles associated with the construction process (e.g., pavers, trenchers, cement trucks) would be conducted in a manner that affords the maximum protection against accidents and spills.

4.13 Aesthetics/Visual Qualities

4.13.1 Existing Condition

The Action Area includes diverse scenic and natural resources; the area surrounding the project is sparsely populated and is mostly agrarian. For reference, ordinary high water is elevation 341.5.

4.13.2 Environmental Consequences

4.13.2.1 No Action

Under the No Action Alternative, USACE would not complete the proposed Wabash Dikes Project; the dike structures would not be constructed which would result in “no change” from current aesthetics or visual qualities of the Action Area. In this scenario, development and management of the Action Area would likely take the same general direction and would generally share the same environmental consequences. The No Action Alternative will fail to address the ongoing threat of shoreline erosion in the Action Area which has the potential to negatively affect the aesthetics or visual qualities of the site.

4.13.2.2 Proposed Action

While the project area is a sparsely populated area, the construction of the Wabash Dikes Project will have a minor effect on the aesthetics/visual qualities of the Action Area, as equipment is staged and construction activities are underway. The Illinois dikes are expected to extend into the river at elevation 312.0, while the Wabash Island dikes would extend into the river at elevation 330. Except for low flow conditions, dike structures on Wabash Island will be below the water surface. The dikes constructed on the Illinois side of the project will remain under water year-round. Above the waterline, all dike structures will be exposed where the dikes tie into the shore, at least until the interstitial spaces of the rock pilings are filled in by sediment and ultimately colonized by plants.

While evidence of the dikes will persist in some sections of the Action Area, many of the areas that remain visible will be slowly covered by detritus and soil and ultimately be colonized by plants and algae, potentially limiting or obscuring their aesthetic/visual impact.

4.17 Noise

4.17.1 Existing Condition

Changes in noise are typically measured and reported in units of dBA, a weighted measure of sound level. Because the project area is sparsely populated, the primary sources of anthropogenic noise within the Action Area are limited to the movement of barges and pleasure craft up and down the Ohio River, aircraft, and the use of farm equipment. Few roads are located near the site and they are small un-improved roads generally used for access to farm fields. Noise ranging from about 10 dBA for the rustling of leaves to as much as 115 dBA (the upper limit for unprotected hearing exposure established by the Occupational Safety and Health Administration) may occur on the Ohio River via sources such as pleasure craft, barge traffic, and the use of farm machinery. The rural nature of the area also means that a relatively small number of people may be impacted by any noise generated in the Action Area.

4.17.2 Environmental Consequences

4.17.2.1 No Action

Under the No Action Alternative, USACE would not complete the proposed Wabash Dikes Project which would result in “no change” from current noise levels near the Action Area. In this scenario, development and management of the Action Area would likely take the same general direction and would generally share the same environmental consequences. Because the No Action Alternative will fail to address the ongoing need for dredging in the Action Area, this alternative has the potential to have a periodic negative affect on the soundscape of the Action Area, i.e., increased noise levels estimated to be between 60 and 100 dBA at 100 feet when dredge activities are occurring.

4.17.2.2 Proposed Action

Implementing and construction of the Wabash Dike Project would be expected to have a negligible and short-term effect on the level of background or ambient noise of the Action Area. The primary sources of noise would include the movement of barges and the use of construction equipment used during the construction of the dike structures. These impacts would be temporary localized in nature.

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6 SUMMARY OF ENVIRONMENTAL EFFECTS

If and when the Wabash Dikes Project is implemented, the loss or modification of potential habitat and other localized and temporary construction-related effects (e.g., diesel/gasoline engine emissions, noise, fugitive dust, changes in the aesthetics of the area) is expected to be the extent of the environmental consequences. None of these impacts are expected to be significant and most will be temporary in nature. Table 7 provides a summary of the potential environmental effects caused as a result of implementing the Proposed Alternative.

Table 7. Summary of Environmental Effects Caused by the Proposed Alternative (PA).

Environmental Resource	Degree of Effect caused by PA
Commerce, Recreation, and River Navigation	Beneficial
Climate	No Effect
Air Quality	Negligible
Topography, Geology, and Soils	Negligible
Surface Water Hydrology and Groundwater	No Effect
Water Quality	Negligible
Habitats	Minor, short-term
Listed Species	No Effect
Demographics and Environmental Justice	No Effect
Recreation and Visitation	No Effect
Cultural Resources	No Effect
Hazardous, Toxic and Radioactive Waste Materials	No Effect
Aesthetic/Visual Qualities	Minor, long-term
Noise	Negligible

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7 COMPLIANCE WITH ENVIRONMENTAL LAWS

Construction of the proposed Wabash Dikes Project would not commence until the proposed actions achieve environmental compliance with the applicable laws and regulations, as described below. Environmental compliance for any proposed actions would be achieved upon coordination of this Environmental Assessment with appropriate agencies, organizations, and individuals for their review and comments.

Bald and Golden Eagle Protection Act, 16 U.S.C. 668a-668d.

In compliance.

The Bald and Golden Eagle Protection Act contains requirements on Corps of Engineers projects concerning bald and golden eagles. Approval and implementation of the proposed Wabash Dikes Project would not adversely affect bald eagles or their habitat. A field survey conducted on 10 June 2020 documented no evidence that bald or golden eagles currently nest in the project area.

Clean Air Act, as amended, 42 U.S.C. 7401, et seq.

In compliance.

The purpose of this Act is to protect public health and welfare by the control of air pollution at its source, and to set forth primary and secondary National Ambient Air Quality Standards to establish criteria for States to attain or maintain. Minor and temporary releases (e.g., fugitive dust, internal combustion engine emissions) would occur in the course of construction of the Project. However, these emissions would be short term, small-scale, and the effect on air quality in the Action Area would be negligible.

Clean Water Act, as amended, (Federal Water Pollution Control Act) 33 U.S.C. 1251, et seq.

In progress.

The objective of this Act is to restore and maintain the chemical, physical and biological integrity of the Nation's waters. The USACE regulates discharges of dredge or fill material into waters of the United States pursuant to Section 404 of the Clean Water Act. This permitting authority applies to discharge of dredged or fill material into Waters of the United States. For USACE projects involving the discharge of dredged or fill material into Waters of the United States, USACE does not issue permits to itself, but evaluates proposed discharges under the same guidelines developed by the United States Environmental Protection Agency (known as the Section 404(b)(1) guidelines) that apply to non-USACE projects. Because the Proposed Project will result in the placement of fill material into the Ohio River, evaluation under Section 404 is required, and a Section 401 WQC from the states in which the discharge originates will be obtained. Section 404(b)(1) analysis for the Wabash Dikes Project has been completed and is included in Appendix A.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. 9601 et seq.

Not applicable.

CERCLA is triggered by (1) the release or substantial threat of a release of a hazardous substance into the environment; or (2) the release or substantial threat of a release of any pollutant or contaminant into the environment that presents an imminent threat to the public health and welfare. To the extent such knowledge is available, 40 CFR Part 373 requires notification of CERCLA hazardous substances in a land transfer. The implementation of the proposed Wabash Dikes Project would not involve the hazardous substances, pollutants, or contaminants.

Endangered Species Act, as amended (ESA), 16 U.S.C. 1531, *et seq.*

Pending.

Section 7 of the ESA (16 U.S.C. 1536) states that all Federal departments and agencies shall, in consultation with and with the assistance of the Secretary of the Interior (Secretary), insure that any actions authorized, funded, or carried out by them do not jeopardize the continued existence of any threatened or endangered (T&E) species, or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary to be critical.

This EA (and accompanying Biological Assessment) serves as a means with which evaluations are made regarding the potential effects on listed species as it relates to the proposed Wabash Dikes Project. This effort has resulted in a determination of no effect to the spectaclecase (*Cumberlandia monodonta*), fanshell (*Cyprogenia stegaria*), purple catspaw (*Epioblasma obliquata*), northern riffleshell (*Epioblasma rangiana*), ring pink (*Obovaria retusa*), orangefoot pimpleback (*Plethobasus cooperianus*), sheepnose (*Plethobasus cyphus*), clubshell (*Pleurobema clava*), rough pigtoe (*Pleurobema plenum*), and the fat pocketbook (*Potamilus capax*). The threatened mussel species potentially affected by activities in this location is rabbitsfoot (*Theliderma cylindrica*), artic tern (*Sterna antillarum*), Short's bladderpod (*Physaria globosa*), rusty patched bumble bee (*Bombus affinis*), gray bat (*Myotis grisescens*), Indiana bat (*M. sodalis*), and northern long-eared bat (*M. septentrionalis*).

Environmental Justice (E.O. 12898).

In compliance.

Federal agencies shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States. The Proposed Project is expected to have no effect on minority or low-income populations.

Fish and Wildlife Coordination Act, as amended (FWCA), 16 U.S.C. 661, *et seq.*

In compliance.

The FWCA requires governmental agencies, including USACE, to coordinate activities so that adverse effects on fish and wildlife would be minimized when water bodies are proposed for modification. For the Proposed Project, all modifications to the existing environment are limited in scope and, when implemented with the BMPs designed to limit potential impacts,

negative effects to the surrounding environment are expected to be short-term in nature. Once construction of the dike structures is complete, there is expected to be a net long-term benefit to fish and aquatic macroinvertebrate communities as the dike structures stabilize the area and provide slack areas in which these communities can reside.

Migratory Bird Treaty Act, 16 U.S.C. 703, et seq.

In compliance.

The Migratory Bird Treaty Act of 1918 (MBTA) is the domestic law that implements the United States' commitment to four international conventions with Canada, Japan, Mexico, and Russia for the protection of shared migratory bird resources. The MBTA governs the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts and nests. The take of all migratory birds is governed by the MBTA's regulation of taking migratory birds for educational, scientific, and recreational purposes and requiring harvest to be limited to levels that prevent overutilization. Executive Order 13186 (2001) directs agencies to take certain actions to implement the act. USACE will afford an opportunity for the USFWS (through their review of the draft EA and BA) to provide input with regard to their consideration of the effects of the Proposed Project for potential effects on migratory birds. No effects to migratory birds are anticipated.

National Historic Preservation Act (NHPA), as amended, 54 U.S.C. 300101, et seq.

In progress

The NHPA requires that federal agencies having jurisdiction over a federal or federally assisted undertaking will consider their effects to historic districts, sites, buildings, structures, or objects that are listed on, or determined eligible for inclusion to, the NRHP. The project activities were determined to have no adverse to effect (CFR 800.5(b)) for the project area located in Illinois and concurrence was reached on 4 February 2021. A formal determination of the potential to affect eligible historic properties located in Kentucky is pending.

National Environmental Policy Act (NEPA), as amended, 42 U.S.C. 4321, et seq.

Pending.

This EA and Finding of No Significant Impact (FONSI) have been prepared in accordance with the Council on Environmental Quality's NEPA Implementing Regulations (40 CFR 1500-1508). An Environmental Impact Statement (EIS) is not required.

Noise Control Act of 1972, 42 U.S.C. Sec. 4901 to 4918.*In compliance.*

This Act establishes a national policy to promote an environment for all Americans free from noise that jeopardizes their health and welfare. Federal agencies are required to limit noise emissions to within compliance levels. Noise emission levels in the Action Area would increase above current levels temporarily due to geological surveys and construction of the Project. Appropriate measures would be taken to keep the noise level within compliance levels.

Section 10 of the Rivers and Harbors Act of 1899, 33 U.S.C. 403.*In compliance.*

This law requires authorization from the Secretary of the Army, acting through USACE, for the construction of any structure in or over any navigable water of the United States, or the accomplishment of any other work affecting the course, location, condition, or physical capacity of such waters. The creation of any obstruction to the navigable capacity of any of the waters of the United States is unlawful unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army.

Floodplain Management (E.O. 11988).*In compliance.*

Section 1 requires each agency to provide leadership and take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by flood plains in carrying out its responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities. The actions occurring as a result of completing the proposed Wabash Dikes Project are not expected to affect the flood holding capacity or flood surface profiles of the Ohio River.

Protection of Wetlands (E.O. 11990).*In compliance.*

Federal agencies shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities. Each agency, to the extent permitted by law, shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction, and (2) that the Proposed Action includes all practicable measures to minimize harm to wetlands, which may result from such use. While the actions identified in the proposed Wabash Dikes Project would involve the loss or alteration of seasonally inundated wetland habitats, the total acreages involved are very low; the wetland habitats present are only seasonally inundated and may be considered to be of marginal ecological significance.

8 Public Involvement

In compliance with 40 CFR 1501.6(a)(1), this EA is being circulated for a 30-day review to concerned agencies, organizations, and the interested public. All comments received during this review period will be evaluated and appropriate changes to the EA will be implemented. All comments received will be placed in the Agency and Public Comments Appendix of the final EA.

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Appendix A

Supporting Materials

U.S. ARMY CORPS OF ENGINEERS, LOUISVILLE DISTRICT

**BIOLOGICAL ASSESSMENT FOR CONSTRUCTION OF THE OHIO AND WABASH
RIVERS DIKES PROJECT**

OHIO RIVER MILE 847.9 – 849.5

Submitted To:

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Frankfort, KY 40601**

Submitted By:

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October 2020

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EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers Louisville District has concerns for the area of the Ohio River at the shoal of the mouth of the Wabash River which has caused a realignment of the navigation channel in the Ohio River and requires constant attention to maintain operational usability of the channel. The area of concern/investigation is immediately downstream of the Wabash River between Ohio River Miles (ORM) 847.9 – 849.5. The navigation channel passes on the north side of a bar that builds off of Wabash Island. This stretch of river had been relatively stable for over 30 years due to the increased pool level from Smithland Dam and because of its close proximity to John T. Myers Lock and Dam, which is a few miles upstream at ORM 846.0. The substrate in most of that section of river is sand, consisting primarily of material discharged from the Wabash River, which enters the Ohio River at ORM 848. The navigation channel alignment reflects the historically deeper cross section of the river, maintained by natural river flow. Annually, large volumes of sand pass through this area, originating from the Wabash drainage basin. Due to river bed changes in the Lower Wabash River, an increase in outwash material accumulation at the mouth of the Wabash River has increased the need for dredging of outwash material every year since 2008. The proposed construction of seven dikes in the Ohio River – three on the Wabash Island and four on the Illinois shore – will produce the most effective remedy to ongoing shoaling problems and potential closing of the navigation channel.

The area of concern/investigation is immediately downstream of the Wabash River between Ohio River Miles (ORM) 847.9 – 849.5. The Action Area includes the footprints of the proposed dike structures. A mussel survey performed in 2019 by Lewis Environmental Consulting, LLC documented freshwater mussels, including the federally endangered species fat pocketbook (*Potamilus capax*) both upstream of the proposed dikes along the Illinois shoreline and within the Action Area. The proposed dike footprint in which individuals of this species were found has since been removed from the Project and is not a part of the Action Area. Lewis Environmental Consulting, LLC was subsequently contracted to write a Biological Assessment. A site visit was also conducted on 22 June 2020 which documented no evidence that listed species occur in the project area.

The purpose of this Biological Assessment is to assess the effects of the proposed project on federally listed species known from or potentially present near ORM 847.9 – 849.5. This effort has resulted in a determinations of no effect on the spectaclecase (*Cumberlandia monodonta*), fanshell (*Cyprogenia stegaria*), purple catspaw (*Epioblasma obliquata*), northern riffleshell (*Epioblasma rangiana*), ring pink (*Obovaria retusa*), orangefoot pimpleback (*Plethobasus cooperianus*), sheepnose (*Plethobasus cyphus*), clubshell (*Pleurobema clava*), rough pigtoe (*Pleurobema plenum*), fat pocketbook (*Potamilus capax*), rabbitsfoot (*Theliderma cylindrica*), artic tern (*Sterna antillarum*), Short's bladderpod (*Physaria globosa*), rusty patched bumble bee (*Bombus affinis*), Indiana bat (*Myotis sodalis*), and northern long-eared bat (*Myotis septentrionalis*).

INTRODUCTION

Background

This Biological Assessment was prepared for the Louisville District Corps of Engineers in support of the proposed Wabash Dikes Project. The objective of the Wabash Dikes Project is for flow diversion to alleviate the need for maintenance dredging in the Ohio River downstream of the mouth of the Wabash River and reduce the ongoing threat to commercial navigation caused by shoaling in the Action Area. The area of concern/investigation is immediately downstream of the Wabash River between Ohio River Miles (ORM) 847.9 – 849.5. The navigation channel passes on the north side of a bar that builds off of Wabash Island. This stretch of river was relatively stable for over 30 years due to the increased pool level from Smithland Dam and because of its close proximity to John T. Myers Lock and Dam, which is a few miles upstream at ORM 846.0. The substrate in most of that section of river is sand, consisting primarily of material discharged from the Wabash River, which enters the Ohio River at ORM 848. The navigation channel alignment reflects the historically deeper cross section of the river, maintained by natural river flow. Annually, large volumes of sand pass through this area, originating from the Wabash drainage basin. The USACE is authorized by Indiana WQC Permit #2010-073-15-JWR-A and Kentucky WQC Permit #2019-100-1 to perform maintenance dredging at the mouth of the Wabash River near Wabash Island.

The U.S. Army Corps of Engineers (USACE) is congressionally mandated to maintain a channel nine feet deep in the Ohio River for transport of goods and services by barge. In order to maintain the Ohio River navigation channel for commercial vessels it requires routine maintenance dredging in areas where natural deposition of river substrates is an ongoing process. Prior to 2008 there were relatively few dredging events at the mouth of the Wabash River, with the first dating back to 1949. However, since 2008, dredging has been conducted every year. This recent increase in dredging events is the result of an avulsion that cut off the lower meander loop of the Wabash River in 2008 and then again in 2010. Both cutoffs formed after rainfall events from tropical storms. Large amounts of sediment removed in the avulsion formation process were transported downstream, forming shoals at the confluence with the Ohio River. Natural sand transport in the Ohio River below the Wabash River has increased over the last 5 – 6 years. This is because of river bed changes that are occurring in the lower Wabash River above the confluence with the Ohio River. The increased sand discharge began with a persistent rainfall event in early June of 2008, which resulted in an average of 8 – 10 inches of precipitation over about a 10 – 15 day period throughout a large section of the Wabash River drainage basin. Bank failures and bendway cutoffs resulted in mass movement of sand and emergency dredging of the navigation channel that was blocked by a large outwash plume at the mouth of the Wabash River (Figures 1 – 7). The outwash plume extended across the width of the river over to Wabash Island. Portions of Wabash Island were covered by the outwash material, while other sections of the island were severely eroded. The accumulation of material made the navigation channel impassable for the commercial towing industry causing an emergency shutdown of the Ohio River navigation channel near ORM 848 downstream of John T. Myers Lock and Dam. The closure of the Ohio River navigation channel is a great economic concern for the towing industry because of the high expense of inactive cargo and shipping delays during the shutdown. The navigation channel closure initiated the need for emergency dredge activities to commence at the location. Measures were already in place for the emergency dredging operation at the mouth of the Wabash River because of previous needs for maintenance dredging at the location. The sediment

accumulation is dependent on the flow levels of both the Wabash River and the Ohio River. The high-water events in the Wabash River result in a large amount of sediment outwash into the Ohio River, but if high flows also exist in the Ohio River, it tends to wash the outwash material downstream before significant accumulations can occur. However, if a high water event is not occurring on the Ohio River, the Wabash outwash material deposits and accumulates in the Ohio River channel thus creating the need for maintenance dredging. The shoal at the mouth of the Wabash River caused a realignment of the navigation channel in the Ohio River and has required consistent attention to maintain operational usability of the channel. Since 2008, the Wabash River continues to discharge large volumes of sand as it adjusts to the changes in its geomorphology. The USACE Louisville plans to construct seven flow diversion dikes on the Ohio River near the mouth of the Wabash River. The construction of seven dikes in the Ohio River, three on the Wabash Island and four on the Illinois shore, will produce the most effective remedy to the shoaling and closing of the navigation channel.



Figure 1. Wabash River Bendway – July 2007

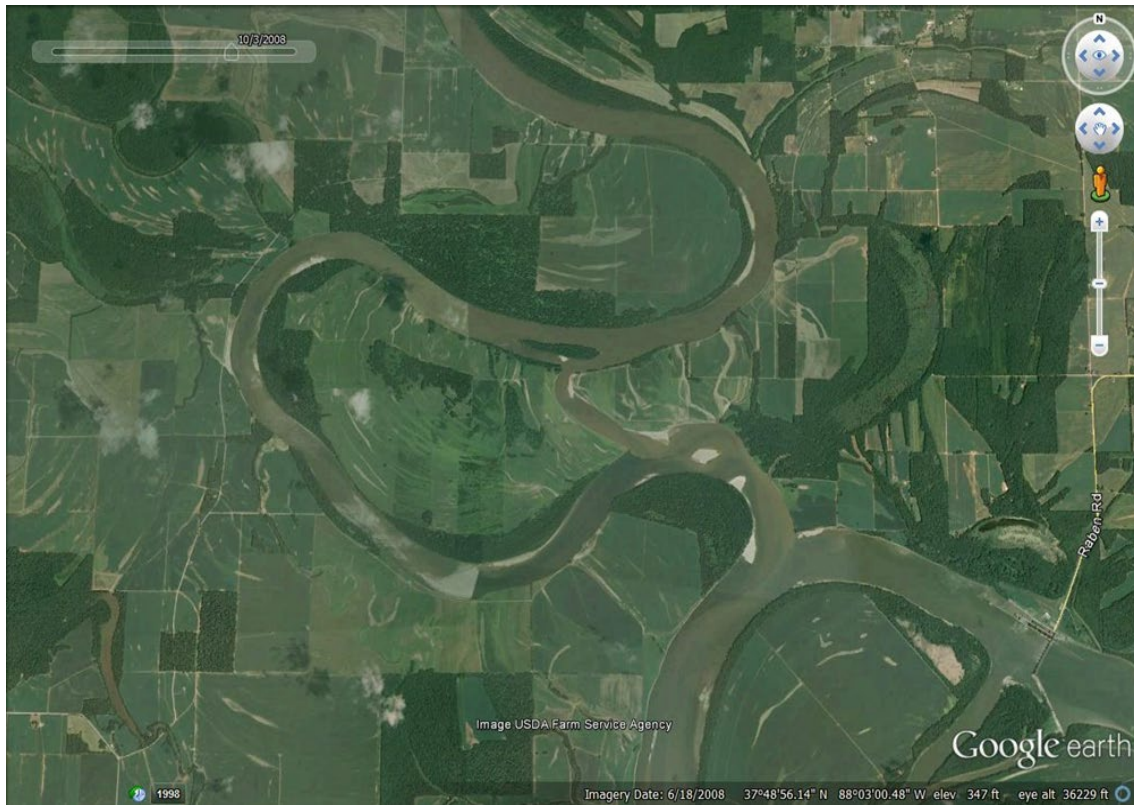


Figure 2. Wabash River Bendway – June 2008

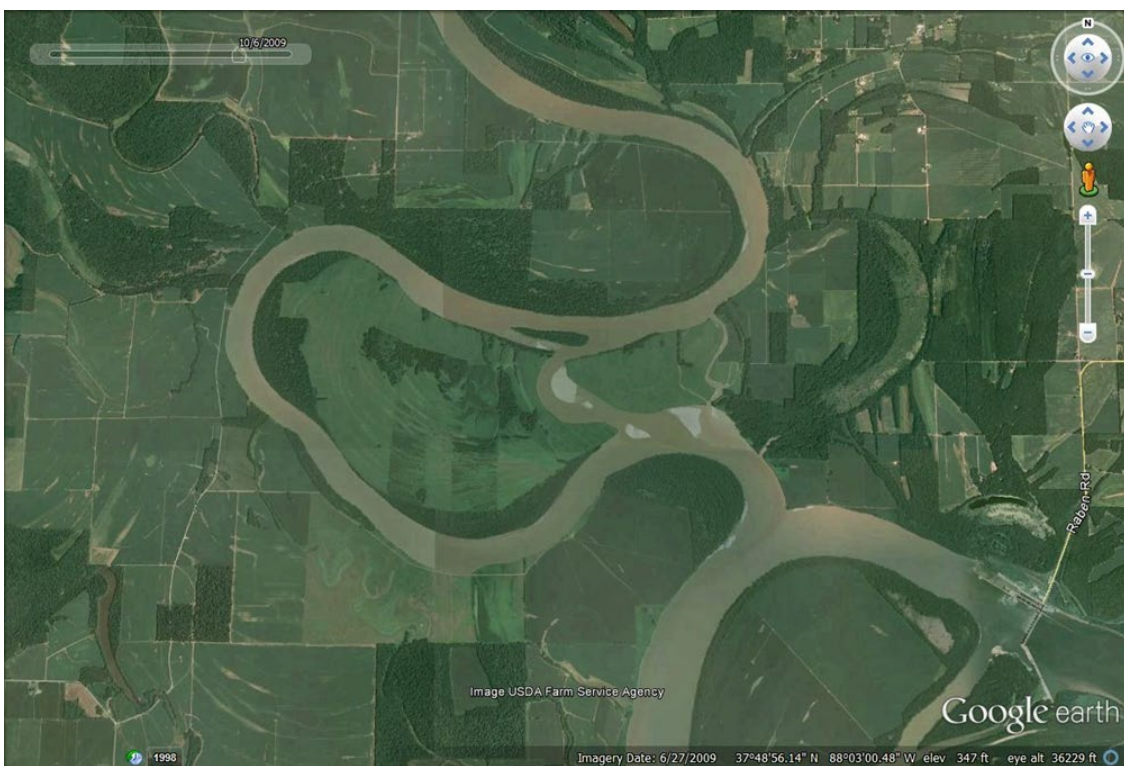


Figure 3. Wabash River Bendway – June 2009

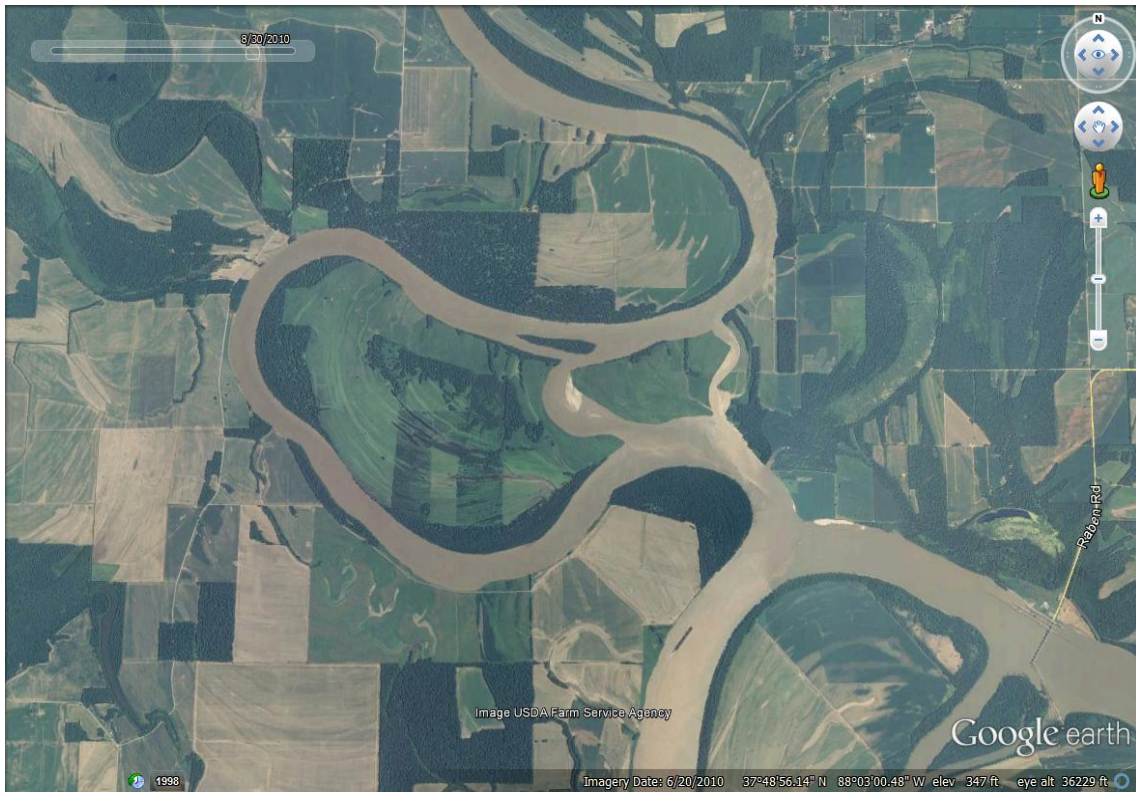


Figure 4. Wabash River Bendway – June 2010



Figure 5. Wabash River Bendway – September 2011

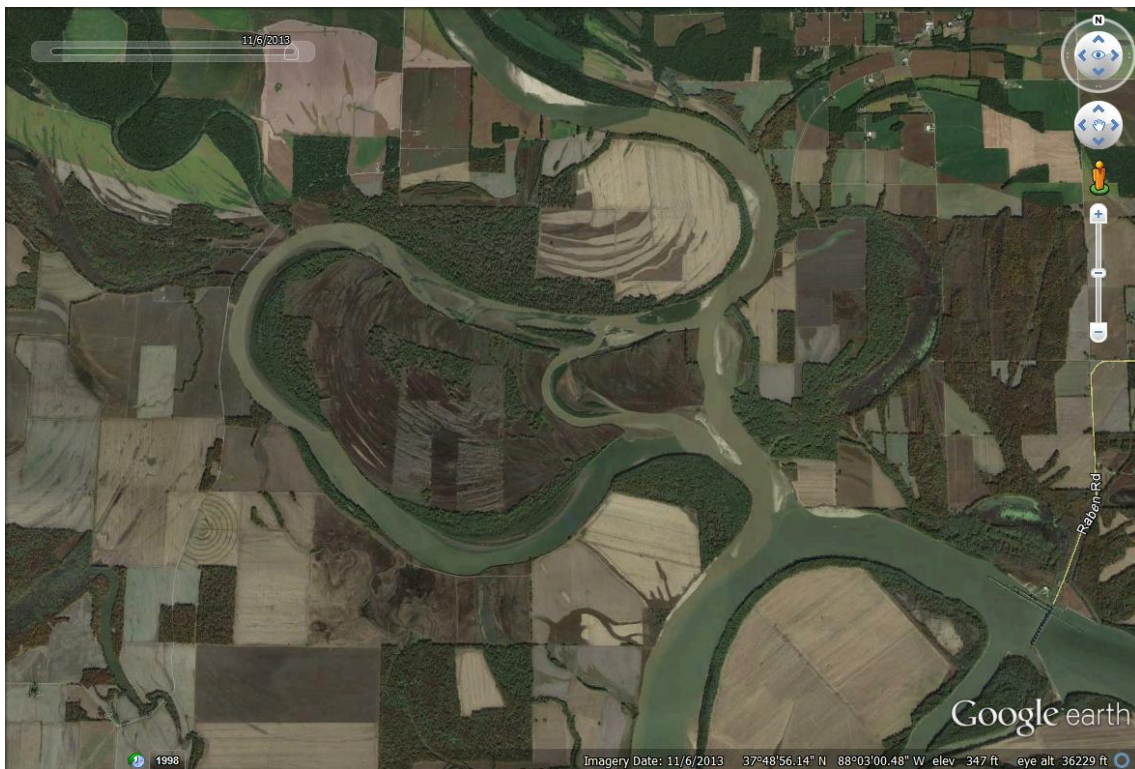


Figure 6. Wabash River Bendway – November 2013

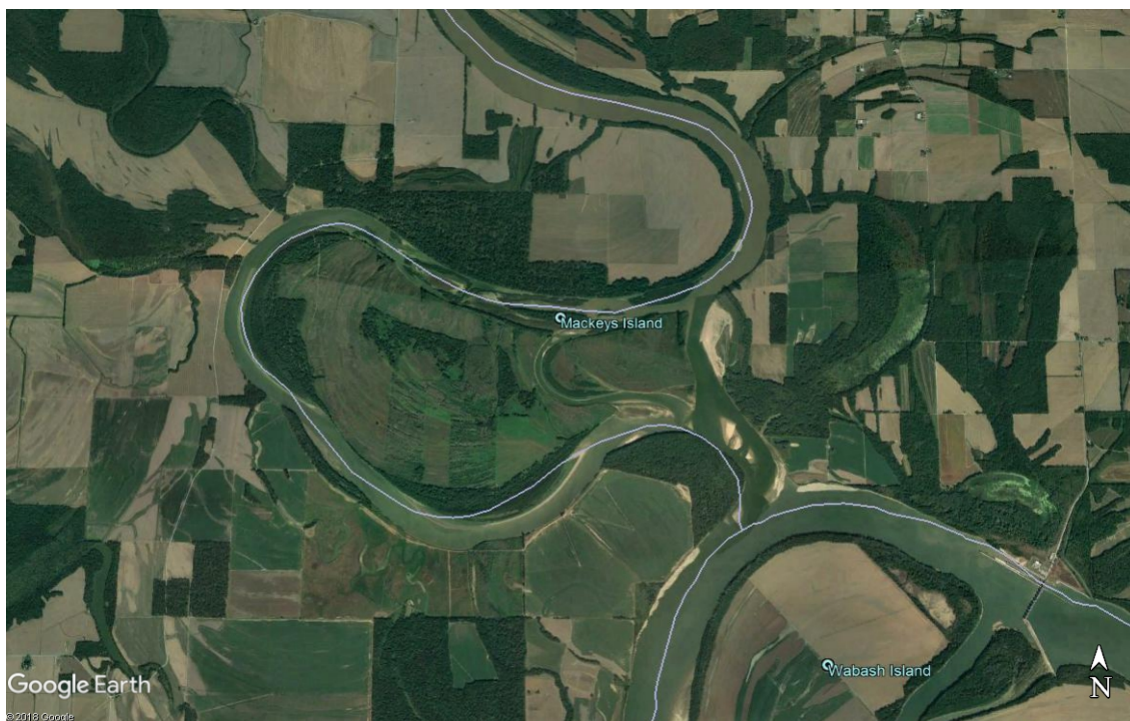


Figure 7. Wabash River Bendway – October 2015

In early 2000, during the review process of the Clean Water Act Section 401 water quality certification for the USACE maintenance dredging program in Indiana waters of the Ohio River, the U.S. Fish and Wildlife Service (USFWS) Bloomington Indiana Field Office became aware that dredging was occurring at the mouth of the Wabash River in the vicinity of current records of the federally endangered *Potamilus capax* (Fat Pocketbook pearly mussel). As a result, informal consultation was initiated between the USFWS and USACE in May 2000. During the review process, it was established that dredging was occurring in an area of unpublished reports of *Potamilus capax* occurrences in 1988 and 1994 at three sites between ORM 849.3 and 851.1. It was assumed that the individuals originated in the lower Wabash River population of *Potamilus capax*, which had washed out of the Wabash River during flood events and colonized suitable habitat in the Ohio River. The lower Wabash River has been surveyed for *Potamilus capax* on multiple occasions since the late 1980's (Cummings, et. al. 1990; Miller, 1995; Frankland, 1996). The lower Wabash population is considered to be relatively large and stable and extends as far upstream as Knox County, Indiana. *Potamilus capax* in the lower Wabash River appears to prefer sand bars and islands with smaller particle sized substrates (Cummings et. al., 1990; Schwegman, 2000). During a subsequent Ohio River mussel survey of the area for the USACE in November and December 2000, Harding ESE (2001) encountered two live individuals of *Potamilus capax* near the Wabash Island shoreline. One individual was located upstream of the maintenance dredge area at approximately ORM 847.8 and the other was located downstream of the maintenance dredge area near ORM 848.7 (Harding ESE, 2001). Harding ESE described the maintenance dredge area as difficult to survey because of the strong river currents, unconsolidated material, poor visibility, and hazardous diving conditions.

Based on available records from 1988, 1994, and 2000 in the vicinity of Wabash Island, the USFWS determined that the maintenance dredging activities had the potential to negatively affect *Potamilus capax*. Through additional informal consultation from 2000 – 2002, the USFWS further concluded that *Potamilus capax* could be present in low numbers in the outwash material that required maintenance dredging of the Ohio River navigation channel. Based on the typical physical conditions of the maintenance dredging area with respect to sediment stability and river currents, performing mussel surveys for *Potamilus capax* in the maintenance dredging area prior to dredging activities is not practical. Therefore, it was agreed by the USFWS and USACE that formal consultation should be initiated to avoid Endangered Species Act violations.

Formal consultation between the USACE Louisville District and USFWS Bloomington Field Office began on May 13, 2002 regarding the maintenance dredging activities at the mouth of the Wabash River on the Ohio River. On September 9, 2002 the USFWS Bloomington Field Office provided a Biological Opinion to the USACE Louisville District. The Biological Opinion described the proposed action as long-term, periodic maintenance dredging of the mouth of the Wabash River, where outwash material encroaches into the Ohio River navigation channel, and disposal of the dredged materials. The location of the action area was described as near Wabash Island, at the mouth the Wabash River in Posey County, Indiana, Gallatin County, Illinois and Henderson County, Kentucky. The aforementioned Biological Opinion included an Incidental Take Statement authorizing the take of up to 3 individuals per dredging event. The Biological Opinion also required the systematic visual searching of dredge material during the next dredge event for evidence of *Potamilus capax*, as live individuals, fresh dead individuals, or shell material as a means of monitoring. In 2008, a survey of the dredge materials conducted estimated that the level of take in the total dredge disposal area was at least 15 individuals of *Potamilus capax* and could have

been as high as 90 individuals (Lewis Environmental Consulting, 2008a) and in 2016, the USFWS amended their BO to increase allowable take to 9 individuals per dredging event.

The purpose of maintenance dredging is to remove newly accumulated materials from the Ohio River navigation channel. The maintenance dredging is typically conducted with a 24-inch hydraulic dredge with approximately a six-foot cutterhead. The dredge typically removes two to five feet of material on each pass and pumps approximately 1,000 cubic yards of material per hour to a disposal area. If only newly deposited materials are dredged, suitable habitat for *Potamilus capax* should not be directly affected by dredging activities; however the disposal of dredged material could directly impact live individuals or habitat. In order to minimize impacts to *Potamilus capax* from the maintenance dredging program at Wabash Island, the USACE proposed to only dredge in areas of recently deposited, unstable sediments and to use an upland disposal area, likely at a site on Wabash Island. The USFWS Biological Opinion determined that the effects of the proposed USACE maintenance dredging at the mouth of the Wabash River is not likely to jeopardize the continued existence of *Potamilus capax*. Based on the Biological Opinion, the USFWS issued an Incidental Take Statement for the USACE maintenance dredging at the mouth of the Wabash River.

Analysis of hydromorphologic conditions by USACE Engineering Research and Development Center (ERDC) estimates that the Wabash River is discharging over one million cubic yards of sand into the Ohio River on an annual basis, without significant rainfall events (ERDC 2015). In both 2008 and 2010, several million cubic yards of sand were discharged in a short period of time as a result of the large bend way avulsions. The area of the avulsions continues to contribute large sand discharge as it continues to adjust to changes in river alignment and bed gradient, while passing the normal heavy sand load from the Wabash River Basin. The normal large volume sand movement occurs during rainfall events with significantly increased river flow. The increased river flow generates sand waves in the Ohio River that move downstream along the flat bottom of the Ohio River. Sand waves have been measured from about eight inches to as much as six feet in height and given a period of normal river flow in the Ohio River, the sand waves dissipate as they travel downstream into the reservoir or more pool-like portion of the river above the dams. Later, high level flow re-suspends the benthic sands and continues their movement downstream. The deeper 'pooled' areas fill in somewhat during normal river flow. With high water events, there is added energy to re-suspend the sand when the dam is completely open and river velocity is increased. These normal high water conditions determine the bed load movement of sands deposited by normal low water conditions.

Purpose

The purpose of this biological assessment is to assess the potential effects of the USACE Ohio River Wabash Dikes Project on federally listed species potentially present in the action area.

Proposed Action

The proposed action of the Wabash Dikes Project is the construction seven flow diversion dikes on the Ohio River near the mouth of the Wabash River. Based on numerical hydrodynamic modeling conducted by ERDC to simulate existing conditions to generate multiple scenarios as solutions the ongoing sediment issues, it was determined that the construction of seven dikes in the Ohio River, three on the Wabash Island and four on the Illinois shore, will produce the most effective remedy to the shoaling and closing

of the navigation channel. The dikes are intended for flow diversion to alleviate the need for maintenance dredging in the Ohio River downstream of the mouth of the Wabash River.

Affected Species

Based on data obtained from the USFWS Information for Planning and Consultation (IPaC) resource (USFWS 2020), 17 federally listed species have been or are known to occur in this section of the Ohio River or near the vicinity of the project area. Endangered freshwater mussel species potentially affected by activities associated with the Wabash Dikes Project include the spectaclecase (*Cumberlandia monodonta*), fanshell (*Cyprogenia stegaria*), purple cat's paw (*Epioblasma obliquata obliquata*), northern riffleshell (*Epioblasma torulosa rangiana*), ring pink (*Obovaria retusa*), orangefoot pimpleback (*Plethobasus cooperianus*), sheepnose (*Plethobasus cyphus*), clubshell (*Pleurobema clava*), rough pigtoe (*Pleurobema plenum*), and the fat pocketbook (*Potamilus capax*). The threatened mussel species potentially affected by activities in this location is rabbitsfoot (*Theliderma cylindrica*). These mussel species have been experiencing decades of decline due to habitat modification or loss, over harvesting, and pollution. Although all of these species may have been historically present in this area, the majority are not expected to be present within the proposed project area. Several may be extirpated from large parts of their formal ranges and others may be functionally extinct.

Endangered mammals potentially affected by the Wabash Dikes Project include the federally endangered Indiana bat (*Myotis sodalis*), the federally endangered gray bat (*Myotis grisescens*), and the federally threatened northern long-eared bat (*Myotis septentrionalis*). A single federally endangered bird species, the interior least tern (*Sterna antillarum*), a federally endangered plant, Short's bladderpod (*Physaria globosa*), and the rusty patched bumble bee (*Bombus affinis*) are also within range of the Wabash Dikes Project.

No critical habitat has been designated in this area for the federally listed species.

CONSULTATION HISTORY

While there has been a long and ongoing consultation history between USACE and USFWS regarding the maintenance dredging program conducted in the project area (see Background section above), no consultation with USFWS has occurred for the Wabash Dikes Project to date.

PROJECT DESCRIPTION

The USACE Louisville District plans to construct seven flow diversion dikes within the Ohio River near the mouth of the Wabash River. The shoal at the mouth of the Wabash River caused a realignment of the navigation channel in the Ohio River and has required consistent attention to maintain operational usability of the channel. The construction of seven dikes in the Ohio River will produce the most effective remedy to the shoaling and closing of the navigation channel. Three of the dikes would be constructed along Wabash Island on the Kentucky side of the river. Four of the dikes would be constructed along the Illinois shoreline downstream of the mouth of the Wabash River. The dikes would be constructed of large rip-rap type limestone rock.

The three Wabash Island dikes that will extend out from the Wabash Island shoreline would be located at ORM 847.9, ORM 848.1, and ORM 848.3 are labelled Dikes 1-3, respectively (Figure 8). The Wabash Island dikes (#1 – #3) would extend out total lengths ranging between 523 – 595 feet (160 – 181 meters),

of which the last 446 – 531 feet (136 – 162 meters) would be within the water. While the Wabash Island Dikes will not be keyed into the shoreline, there will be some excavation and shaping of the bank to address the current eroded slope. For the most part, the rock will be placed on the existing grade and will be flanked by riprap slope protection. In an effort to prepare and stabilize the river bottom prior to construction, as estimated 9,200 cubic yards of accumulated sediment will be excavated from within the dike footprints. Rip rap rock will then be placed on the newly excavated river bottom.

The four Illinois Shoreline dikes that will extend out from the Illinois shoreline will be located at ORM 848.6, ORM 848.9, ORM 849.2, and ORM 849.5 are labelled Dikes 4-7, respectively (Figure 8). The Illinois shoreline dikes (#4 – #7) would extend out total lengths ranging between 568 – 978 feet (173 – 298 meters), of which the last 383 – 684 feet (117 – 208 meters) would be within the water. The Illinois shoreline dikes will be keyed into the river bank with the same type rock used to construct the dikes. The dike footprints will be excavated prior to construction and rip rap rock will be placed on the newly cleared river bottom.

In general, the widths of all of the proposed dike structures will be similar. The right of way on the bank for construction and excavation spoils at each dike is 46 meters (150 ft) offset from the centerline or 91 meters (300 ft) in total width. The crest width (shown in cross section) will be 3 meters (10 ft). The maximum disturbed in-stream width for all dikes is estimated to be 100 feet (30.5 m).

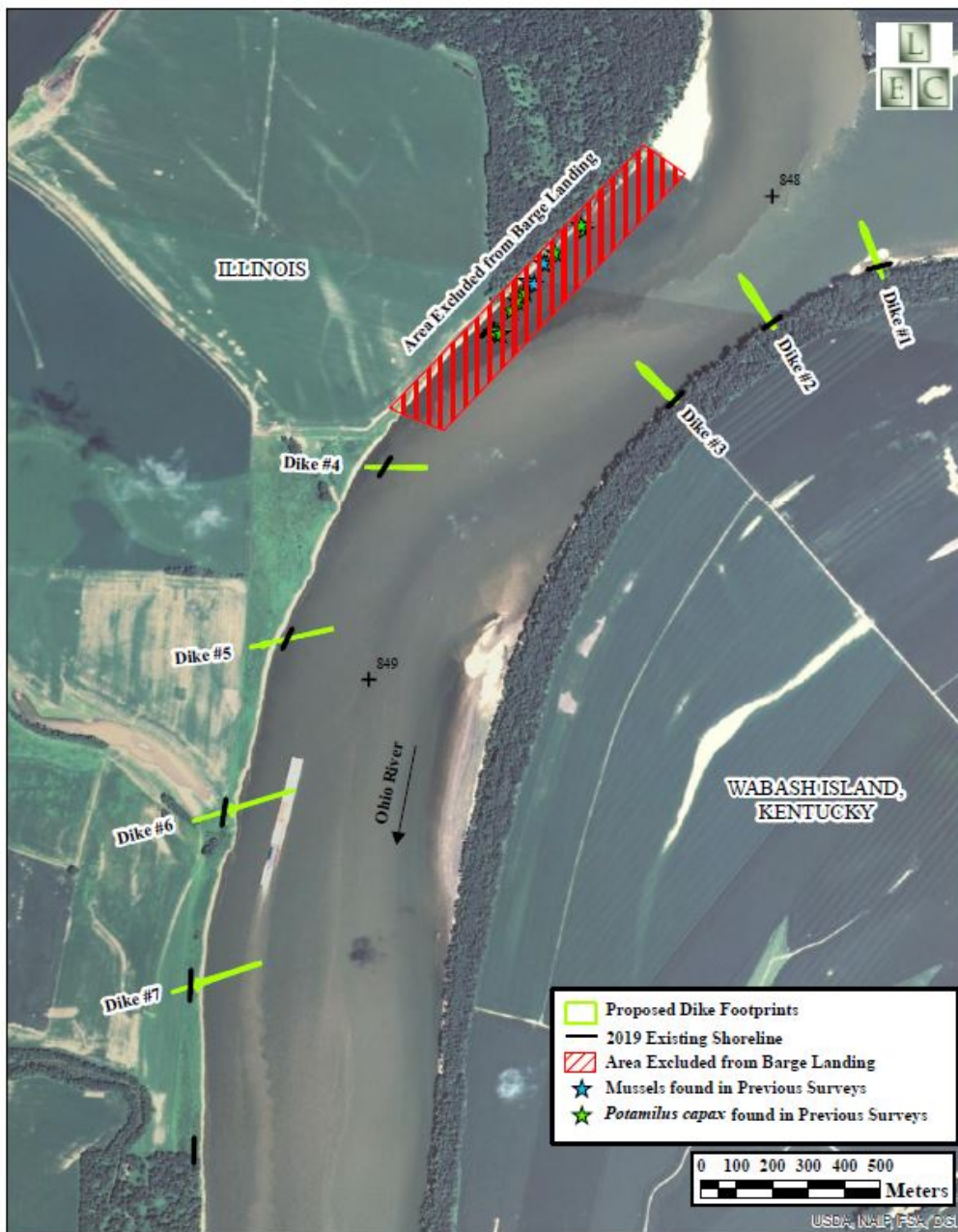


Figure 8. Location of seven proposed dikes along Wabash Island and the Illinois Shoreline from ORM 847.9 - 849.5 and the area excluded from barge landing from ORM 848.0 - 848.7 RDB.

General Construction

The means and methods for dike construction will be determined by the Contractor and reviewed by the USACE Construction Division as a pre-construction submittal. It is anticipated that a few work barges and several material barges will be moved to the site with a standard sized towboat. One work barge will contain a clamshell crane or rip rap conveyor (at the contractor's discretion), one work barge will contain an excavator, and the material barges will contain large rip rap type limestone rock. The barges will be fleeted in the vicinity of the work locations while the dikes are being constructed. The barges will be moved around the site by a towboat. Barges will be secured in place during temporary fleeting and construction activities by spudding them into the river bottom.

At each dike footprint location, the work barge will be moved to the site with either the clamshell crane or a rip rap conveyor on it. The barge will be moved in and out of the area with a towboat typical of the size that operates in and around the fleeting areas. The crane barge will be set up at each dike location and spudded to the river bottom for stability while offloading rock. Material barges containing rock will be set up adjacent to the work barge during offloading, while the dikes are being constructed.

While constructing the dikes along Wabash Island, rip rap will be placed onto the re-shaped shoreline and river bottom. The work barges and material barges will be moved to each dike location where the rock will be off-loaded and placed into the dike footprint. The island shoreline around the dike will be armored with the same type rip rap rock for stability. The work barge will begin placing rock at the shoreline, then work out toward the river channel while placing rock within the footprint. The rock will be piled within each dike footprint until reaching the desired top elevation of each dike. During rock placement, significant settling of rock into the river bottom is expected. Barges will be spudded into the river bottom next to the dike locations for temporary storage during the construction process of each dike. The Contractor will be required to provide river soundings as a final submittal verifying the proper rock placement and elevation. Portions of the shoreline work will need to occur during lower water elevations; however, rock placement in the riverward sections can occur at various river stages. Rock placement accuracy will be accomplished using monuments located at the John T. Myers Lock and Dam for survey control. The survey data used for plan development are river soundings obtained from the USACE Operations Division and LIDAR obtained from public sources.

While constructing the dikes along the Illinois shoreline the dikes will be keyed into the river bank. The keying process is necessary on the Illinois shoreline for several reasons. First, with the bend in the river, the flows on the outside bend will be greater. Second, the key-in will protect the dike from overland flows from the Wabash River. A land-based excavator will be offloaded from a work barge onto the shoreline within the area where the dike footprint intersects the shoreline. The excavator will travel from the work barge onto the shoreline. All excavation into the river bank will be accomplished from the shore side, unless the river bank is too steep to offload the excavator. If necessary, the excavator may begin digging the trench from the work barge in order to build an offload ramp or slope that is navigable by the excavator. The excavator would then offload from the barge and continue excavating the trench from the shore side. The excavator will dig a trench into the shoreline approximately eight feet deep that matches the width of the dike. The excavated soil will be stored next to the trench for later use. A four feet deep layer of rip rap rock will be placed in the trench, then covered with four feet of the excavated soil. The remaining excavated soil will be spread out across the area. This keying process will effectively secure the dike structure into the river bank. Outside of the key trench, rip rap will be placed

onto the existing shoreline and river bottom. In an effort to prepare and stabilize the river bottom prior to construction, an estimated 9,200 cubic yards of accumulated sediment will be excavated from within the dike footprints. Rip rap rock will then be placed on the newly excavated river bottom. The work barges and material barges will be moved to each dike location where the rock will be off-loaded and placed into the dike footprint. The work barge will begin placing rock at the shoreline, then work out toward the river channel while placing rock within the footprint. The rock will be piled within each dike footprint until reaching the desired top elevation of each dike. During rock placement, significant settling of rock into the river bottom is expected. Barges will be spudded into the river bottom next to the dike locations for temporary storage during the construction process of each dike. The Contractor will be required to provide river soundings as a final submittal verifying the proper rock placement and elevation. Portions of the shoreline work will need to occur during lower water elevations, however rock placement in the riverward sections can occur at various river stages. Rock placement accuracy will be accomplished using monuments located at the John T. Myers Lock and Dam for survey control. The survey data used for plan development are river soundings obtained from the USACE Operations Division and LIDAR obtained from public sources.

Subsequent analysis of potential erosion of the Illinois dike structures caused by Wabash River outflow, resulted in design modifications to the inland sections of the dike structures. On the Illinois bank, the dikes will be benched into the bank so the flow around the outside of the river bend is less likely to erode the bank connection. Dikes 5 and 7 will be keyed in on the same alignment as the dike in the river. Dikes 4 and 6, due to overland flow from the Wabash River, will be keyed in to the bank initially on the same alignment as the dike in the river, but will then be rotated and keyed in approximately another one hundred feet parallel to the Wabash River overland flow. This kink in the bank key will further protect the land end of the dike from the overland flow during high river levels.

The purpose of extending or keying-in of the dikes into the bank is to reinforce the bank to prevent erosion from occurring and scouring around that end of the dike, causing more damage and ultimately subverting the purpose of the dike. The key-ins are just an extension along the axis of the dike based upon the normal condition that is to protect against flow from the main channel of the Wabash River that the dike is being built for. During high flow conditions, this area experiences flow across the field from the former bend in the Wabash River and, based upon local topography, appears to be forming new "channels" of more concentrated flow that have the potential to negatively impact the inland sections of the dikes in that area. As designed, this concentrated flow attacking the dikes at this angle could potentially cause scour damage. To prevent this, modifying the angle of the key-in to be parallel with the overland flow from the Wabash River is intended to minimize the impact turbulence and thus scour and divert the flows toward the downstream side of the dike.

Ordinary high water at the Action Area is elevation 341.5 feet above sea level. Illinois dikes extend into the river at elevation 312.0 feet ASL and will remain permanently below the water surface past the point they extend into the water. The Wabash Island dikes extend into the river at elevation 330 feet ASL. Except for low flow conditions, the dikes will be below the water surface.

Best Management Practices

Best Management Practices (BMPs) will be utilized for all construction activities performed above the water surface. During the construction period, BMPs will be implemented and maintained throughout the project's duration. BMPs are measures used during construction activities to minimize potential impacts to aquatic environments. BMPs commonly used for construction activities include:

- Perform equipment maintenance away from streams, water bodies, and ditch lines, whenever possible. Fuel storage shall be contained/maintained in an area where leakage and spilling into the river will be avoided.
- Perform any needed maintenance to the crane and excavator prior to arriving at the work site.
- Ensure that crane and excavator has no oil or hydraulic leaks that will spill or wash off in the river water during construction.
- Operate the towboat at as low of RPM's as practicable when approaching and leaving the work site to prevent river bottom scouring.
- Avoid dropping or spilling excess construction material into the river.
- Minimize the area to be disturbed.
- Implement sediment and erosion control measures to limit instream impacts.

Action Area

The Action Area includes seven proposed dike footprints from ORM 847.9 – 849.5, three along the Wabash Island bank and extending into the river and four on the right descending bank along the Illinois shoreline and extending into the river. The structure footprints of the three dikes that will extend out from the Wabash Island shoreline would be located at ORM 847.9, ORM 848.1, and ORM 848.3 and would extend out total lengths ranging between 160 – 181 meters, of which 136 – 162 meters would be within the water (Figure 8). The structure footprints of the four dikes that will extend out from the Illinois shoreline will be located at ORM 848.6, ORM 848.9, ORM 849.2, and ORM 849.5. The Illinois shoreline dikes (#4 – #7) would extend out total lengths ranging between 173 – 298 meters, of which 117 – 208 meters would be within the water. In general, the widths of all of the proposed dike structures will be similar. The right of way on the bank for construction and excavation spoils at each dike is 46 meters (150 ft) offset from the centerline or 91 meters (300 ft) in total width. The crest width (shown in cross section) will be 3 meters (10 ft). The maximum disturbed in-stream width for all dikes is estimated to be 100 feet (30.5 m).

The Action Area also includes temporary fleeting areas of the river (immediately outside of the dike footprints) where the work barges will be spudded, as well as sections of shoreline extending inland corresponding to the construction and armoring of the dikes structures (Figure 8).

The Action Area also includes an estimated total of 13.25 acres (5.4 hectares) of forested habitat that will be removed from the shoreline in and around each of the proposed dike structures on both sides of the river. As required for the implementation of test drilling and dike construction, all vegetation will be removed from approximately 350 feet (106.7 meters) of shoreline, upland 50 feet (15.2 meters) from the water's edge (at normal pool elevation of 324.0 feet). Vegetation, if present, may also be removed as equipment is moved overland from dike to dike.

Physical Condition

Ohio River Mile 847.9 – 849.5

Within the project area at ORM 847.9 – 849.5, the substrate was fairly consistent among the transect lines in the survey conducted by Lewis Environmental Consulting in 2019 (Lewis Environmental Consulting, 2019). The 2019 survey consisted of transects surveyed through the center of each of the proposed dike footprints and extended from the bank into the river (Figure 8). An area one-meter wide was surveyed by divers along each transect.

Transect WD-01 was within the footprint of proposed Dike #1 which is the most upstream transect on the Wabash Island side of the project area. The substrate along the transect was generally 100% sand, with occasional patches of loose gravel (5 – 10%). Water depth at normal pool ranges from 0 – 12 feet within the proposed Dike #1 footprint.

Transect WD-02 was within the footprint of proposed Dike #2 which is located on the Wabash Island side of the project area. The substrate along the transect was generally 100% sand with some areas containing 5 – 20% silt. From 130 – 150 meters from the shoreline the substrate was two inches of soft silt and sand over hard packed sand. Water depth at normal pool ranges from 0 – 5.6 meters.

Transect WD-03 was within the footprint of proposed Dike #3 which is the most downstream transect on the Wabash Island side of the survey area. The substrate along the transect was primarily sand with some areas containing 5 – 20% silt, with the exception of the near shore area, which was more silt than sand. From 80 – 100 meters from the shoreline and 130 – 140 meters from the shoreline the substrate was 3 – 5 centimeters of soft silt and sand over hard packed sand. Water depth at normal pool ranges from 0 – 4 meters within the proposed dike footprint.

Transect WD-04 was within the footprint of a proposed dike that has since been removed from the project, but was the most upstream transect on the right descending bank along the Illinois shoreline. The substrate along the transect was primarily silt from 0 – 80 meters from the shoreline. From 80 – 90 meters from the shoreline, the substrate was three inches of silt over hard clay and from 90 – 100 meters from the shoreline was 90% clay and 10% silt. The remaining 80 meters of the transect was primarily sand with 10 – 20 % silt. Water depth at normal pool ranges from 0 – 6 meters.

Transect WD-05 was within the footprint of proposed Dike #4 which is now the most upstream transect located on the right descending bank. The substrate along the transect was primarily sand (75 – 95%) and was coarse sand from 0 – 70 meters from the shoreline and was fine sand from 100 – 140 meters from the shoreline. From 10 – 70 meters from the shoreline, loose small gravel made up a portion of the substrate (5 – 20%). Silt made up the remainder of the substrate (5 – 10%). Water depth at normal pool ranges from 0 – 5 meters.

Transect WD-06 was within proposed Dike #5 which is located on the right descending bank. The substrate along the transect was primarily sand with occasional patches of loose medium gravel (5%). Water depth at normal pool ranges from 0 – 4.7 meters.

Transect WD-07 was within the footprint of proposed Dike #6 which is located on the right descending bank. The substrate along the transect was primarily 100% sand. The exception to this was a clay bank, and thin layer of sand over gravel at 10 meters from the shoreline, and scattered patches of loose small

and medium gravel (5% each) with sand between 20 – 40 meters from the shoreline. Water depth at normal pool ranges from 3.5 – 5.6 meters.

Transect WD-08 was within the footprint of proposed Dike #7 which is the most downstream transect located on the right descending bank. The substrate along the transect was primarily sand, with a small amount of silt (5 – 10%) between 10 – 40 meters from the shoreline. Water depth at normal pool ranges from 0 – 6.9 meters.

Transect WD-09 was within the footprint of a proposed dike that has since been removed from the project, but was the most downstream transect on the right descending bank. The substrate from 0 – 50 meters from the shoreline was a mixture of silt and sand, or silt, clay, and sand. The remainder of the transect was 100% sand. Water depth at normal pool ranges from 4.1 – 7.5 meters. The water depths at normal pool within the footprints of the proposed dikes can be found in Table 1.

Table 1. Water depths at normal pool elevation observed during the 2019 mussel survey within the Wabash Dikes Action Area.

Distance from Shoreline	2019 Transects - Water Depth (Feet)									
	Wabash Island			Right Descending Bank						
	WD-01	WD-02	WD-03	WD-04	WD-05	WD-06	WD-07	WD-08	WD-09	
0m	0	0	0	0	0	0	0	0	0	
10m	0.5	2.5	6.5	2.5	9.5	5.5	15.5	13.5	17.5	
20m	1.5	3.5	7.5	5.5	12.5	11.5	16.5	22.5	24.5	
30m	2.5	4.5	7.5	8.5	14.5	12.5	16.5	22.5	23.5	
40m	3.5	5.5	8.5	8.5	15.5	12.5	18.5	22.5	24.5	
50m	4.5	6.5	8.5	9.5	15.5	12.5	16.5	22.5	23.5	
60m	5.5	6.5	8.5	11.5	16.5	13.5	16.5	21.5	23.5	
70m	6.5	8.5	9.5	11.5	16.5	15.5	16.5	20.5	23.5	
80m	7.5	9.5	10.5	12.5	16.5	15.5	16.5	19.5	22.5	
90m	7.5	10.5	11.5	12.5	16.5	15.5	16.5	18.5	21.5	
100m	7.5	11.5	12.5	12.5	16.5	15.5	15.5	18.5	20.5	
110m	8.5	11.5	12.5	14.5	16.5	15.5	14.5	18.5	20.5	
120m	9.5	12.5	13.5	15.5	16.5	15.5	16.5	18.5	19.5	
130m	10.5	14.5	13.5	16.5	16.5	15.5	16.5	18.5	19.5	
140m	11.5	16.5	13.5	17.5	16.5	15.5	16.5	17.5	20.5	
150m		18.5		18.5		15.5	16.5	16.5	21.5	
160m				18.5			16.5	16.5	21.5	
170m				18.5			16.5	16.5	21.5	
180m				19.5			15.5	17.5	21.5	
190m							16.5	16.5		
200m							15.5	16.5		
210m							14.5	15.5		
220m							14.5	15.5		
230m							14.5	15.5		

The forest community consists of a four-layered plant structure and is highly impacted by the frequent inundation and hydric soils. Dominant tree species in the overstory are silver maple (*Acer saccharinum*), sycamore (*Platanus occidentalis*), cottonwood (*Populus deltoides*), and black willow (*Salix nigra*). Other members of canopy include slippery elm (*Ulmus rubra*), pin oak (*Quercus palustris*), river birch (*Betula nigra*), sweet gum (*Liquidambar styraciflua*), and hickories (*Carya* spp.). Representative species in the subcanopy include hackberry (*Celtis occidentalis*), black locust (*Robinia psuedoacacia*), American elm (*Ulmus americana*), green ash (*Fraxinus pennsylvanica*), box elder (*Acer negundo*), pawpaw (*Asimina triloba*), buckeye (*Aesculus* sp.), and black walnut (*Juglans nigra*). Shrubs include spice bush (*Lindera benzoin*), Virginia creeper (*Parthenocissus quinquefolia*), poison ivy (*Toxicodendron radicans*), dogwoods (*Cornus* spp.), black elderberry (*Sambucus* sp.), and grape species (*Vitis* spp.). Typical ground cover includes wingstem (*Verbesina alternifolia*), touch-me-nots (*Impatiens* sp.), white snakeroot (*Ageratina altissima*), and several invasive exotic plants including Japanese knotweed (*Reynoutria japonica*), garlic mustard (*Alisaria petiolata*), and kudzu (*Pueraria* sp.).

Remote sensing and field observations of the Action Area suggest that the forest community varies considerably between the Kentucky and Illinois shorelines. In general, the forest habitat on Wabash Island is more diverse and the trees are both older and larger. Dominant members of the canopy on Wabash Island include cottonwood, sycamore, box elder, and black walnut with some individuals exceeding 100 inches dbh. By comparison, much of the forest community on the Illinois side are much younger and less diverse with many of its members considered early successional (e.g., black willow, silver maple, and river birch) with scrub/shrub dominating a large portion of the area.

The riparian zone is less than 90 meters in width in the area with either active or fallow agricultural fields bordering the forested belts inland, where suitable soils are present.

BIOLOGICAL CONDITION

The Ohio River was surveyed for freshwater mussels between river miles 847.8 – 849.9 in September 2019 for nine proposed dikes (Lewis Environmental Consulting, 2019). Since the survey, plans for the proposed dikes at survey locations WD-04 and WD-09 were removed from the project and seven of the nine dikes are now proposed for construction (Figure 8). The full mussel survey report is attached in Appendix A. The following excerpt is from the 2019 mussel report supplied to USACE Louisville District by Lewis Environmental Consulting, LLC.:

The Ohio River was surveyed for freshwater mussels at Ohio River Mile 847.8 – 849.9 in September 2019. The water temperature was 80° F at the time of the survey and the flow was low to moderate. Visibility was approximately a half meter during the mussel survey. The J.T. Myers gage reading varied from 13.3 – 13.5 feet (4.0 – 4.1 meters) during the survey (elevation 325.3 – 325.5 feet above mean sea level; 99.1 – 99.2 meters), which is 1.3 – 1.5 feet above the normal pool elevation (324.0 feet; 98.7 meters).

Proposed Dike #1

During the survey of Proposed Dike #1 along Wabash Island, no live mussels were encountered. A transect (WD-01) measuring 140 meters was surveyed, which covered an estimated area of 140 square meters. The substrate along the transect was generally 100% sand, with occasional patches of loose small gravel (5 – 10%). Water depth at the time of the survey ranged from 0 – 4 meters within the proposed dike footprint.

Proposed Dike #2

During the survey of Proposed Dike #2 along Wabash Island, no live mussels were encountered. A transect (WD-02) measuring 150 meters was surveyed, which covered an estimated area of 150 square meters. The substrate along the transect was generally 100% sand with some areas containing 5 – 20% silt. From 130 – 150 meters from the shoreline, the substrate was two inches of soft silt and sand over hard packed sand. Water depth at the time of the survey ranged from 0 – 6 meters within the proposed dike footprint.

Proposed Dike #3

During the survey of Proposed Dike #3 along the Wabash Island, no live mussels were encountered. A transect (WD-03) measuring 140 square meters was surveyed, which covered an estimated area of 140 square meters. The substrate along the transect was primarily sand with some areas containing 5 – 20% silt, with the exception of the near shore area, which was more silt than sand. From 80 – 100 meters from the shoreline and 130 – 140 meters from the shoreline, the substrate was 2.5 – 5.1 centimeters of soft silt and sand over hard packed sand. Water depth at the time of the survey ranged from 0 – 4.6 meters within the proposed dike footprint.

Proposed Dike #4 (Subsequently removed from project design)

During the survey of Proposed Dike #4 downstream of the Wabash River, a total of three live mussels were encountered. The species collected included *Potamilus ohioensis* and the federally endangered *Potamilus capax*. One mussel was collected in each 10 meter segment between 10 – 40 meters from the shoreline, resulting in a mussel density of 0.10 per section from 10 – 40 meters, and an overall transect density of 0.017 mussels per square meter. The mussels collected ranged in age from 2 – 8 years old. The following measurements were recorded for each of the individuals of *Potamilus capax*, respectively: lengths were 108 and 102 mm, heights were 77 and 82 mm, widths were 59 and 68 millimeters, weights were 268 and 379 grams, and ages were seven and eight years old. Neither of the mussels were gravid.

A transect (WD-04) measuring 180 meters was surveyed, which covered an estimated area of 180 square meters. The substrate along the transect was primarily silt from 0 – 80 meters from the shoreline. From 80 – 90 meters from the shoreline the substrate was three inches of silt over hard clay and from 90 – 100 meters from the shoreline was 90% clay and 10% silt. The remainder of the transect was primarily sand with 10 – 20% silt. Between 110 – 140 meters from the shore, the sand was coarse, and the sand for the remainder of the transect was fine sand. Water depth at the time of the survey ranged from 0 – 6.4 meters within the proposed dike footprint.

Proposed Dike #5 (Subsequently renamed WD-04 in updated project design)

During the survey of Proposed Dike #5 downstream of Wabash River, no live mussels were encountered. A transect (WD-05) measuring 140 meters was surveyed, which covered an estimated area of 140 square meters. The substrate along the transect was primarily sand (75 – 95%), and was coarse sand from 0 – 70 meters from the shoreline and was fine sand from 100 – 140 meters from the shoreline. From 10 – 70 meters from the shoreline, loose small gravel made up a portion of the substrate (5 – 20%). Silt made up the remainder of the substrate (5 – 10%). Water depth at the time of the survey ranged from 0 – 5.5 meters within the proposed dike footprint.

Proposed Dike #6 (Subsequently renamed WD-05 in updated project design)

During the survey of Proposed Dike #6 downstream of the Wabash River, no live mussels were encountered. A transect (WD-06) measuring 150 meters were surveyed, which covered an estimated area of 150 square meters. The substrate along the transect was primarily sand with occasional scattered patches of loose medium gravel (5%). Water depth at the time of the survey ranged from 0 – 5.2 meters within the proposed dike footprint.

Proposed Dike #7 (Subsequently renamed WD-06 in updated project design)

During the survey of Proposed Dike #7 downstream of the Wabash River, no live mussels were encountered. A transect (WD-07) measuring 230 meters was surveyed, which covered an estimated area of 230 square meters. The substrate along the transect was primarily 100% sand. The exceptions to this were a clay bank, a thin layer of sand over gravel at 10 meters from the shoreline, and scattered patches of small and medium gravel (5% each) with sand between 20 – 40 meters from the shoreline. Water depth at the time of the survey ranged from 0 – 6.1 meters within the proposed dike footprint.

Proposed Dike #8 (Subsequently renamed WD-07 in updated project design)

During the survey of Proposed Dike #8 downstream of the Wabash River, no live mussels were encountered. A transect (WD-08) measuring 230 meters was surveyed, which covered an estimated area of 230 square meters. The substrate along the transect was primarily sand, with a small amount of silt (5 – 10%) between 10 – 40 meters from the shoreline. Water depth at the time of the survey ranged from 0 – 7.3 meters within the proposed dike footprint.

Proposed Dike #9 (Subsequently removed from project design)

During the survey of Proposed Dike #9 downstream of the Wabash River, no live mussels were encountered. A transect (WD-09) measuring 180 meters was surveyed, which covered an estimated area of 180 square meters. The substrate from 0 – 50 meters from the shoreline was a mixture of silt and sand, or silt, clay, and sand. The remainder of the transect was 100% sand. Water depth at the time of the survey ranged from 0 – 7.9 meters within the proposed dike footprint.

River Management

The river stage and flow conditions on this section of the Ohio River are managed by the USACE at John T. Myers Locks and Dam located at ORM 846.0 approximately 4.3 kilometers upstream from the site. This section of the Ohio River is navigable by commercial vessels and is used for both commercial purposes and recreational purposes. Normal elevation of the Smithland Pool is 324 feet. The J.T. Myers gage reading varied from 13.3 – 13.5 feet during the survey (elevation 325.3 – 325.5 feet above mean sea level), which is 1.3 – 1.5 feet above the normal pool elevation (324.0 feet).

SPECIES AND HABITAT DESCRIPTIONS

Clubshell (*Pleurobema clava*)

Listed as endangered in 1993, clubshell (*Pleurobema clava*) prefers clean, loose sand and gravel in medium to small rivers and streams, and will bury itself in the bottom substrate to depths of up to four inches. Reproduction requires a stable, undisturbed habitat and a sufficient population of fish hosts to complete the mussel's larval development. Once found all over the eastern United States, it is now only known to occur in 13 streams. Reasons for its decline in the upper Ohio and Wabash watersheds are mainly due to pollution from agricultural run-off and industrial wastes, as well as extensive impoundments for navigation (USFWS 1997b). No clubshell have been found in mussel surveys conducted in and near the Action Area. Therefore, this species is not anticipated to be present in the Action Area.

Fanshell (*Cyprogenia stegaria*)

The fanshell (*Cyprogenia stegaria*), listed as endangered in 1990, is found in medium to large rivers. It buries itself in sand or gravel in deep water of moderate current, with only the edge of its shell and its feeding siphons exposed. Reproduction requires a stable, undisturbed habitat and a sufficient population of fish hosts to complete the mussel's larval development. The species is known to be reproducing in the Clinch River in Tennessee and Virginia, as well as the Green and Licking Rivers in Kentucky. There may be a small reproducing population in the Tennessee River. There also may be some small populations remaining in several states, but these are not reproducing (Jones and Neves, 2002). Several individuals have been placed in the Tennessee River around River Mile (RM) 17 by the Kentucky Department of Fish and Wildlife Resources for rearing. Increase regulation of rivers has degraded most of this mussel's habitat, reducing its gravel and sand habitat and affecting the distribution of its fish hosts. Dredging for channel maintenance, erosion caused by strip mining, as well as logging and farming have been known to destroy or degrade fanshell habitat. Other threats include pollution from agricultural and industrial runoff (USFWS 1997b). No fanshell have been documented in mussel surveys conducted in or near the Action Area. Therefore, this species is not anticipated to be present in the Action Area.

Purple Cat's Paw (*Epioblasma obliquata obliquata*)

The purple cat's paw (*Epioblasma obliquata obliquata*) was listed as endangered in 1990. The species is known to inhabit large river systems in sand and gravel substrates in runs and riffles and was historically widespread in the Ohio, Cumberland, and Tennessee River drainages in Ohio, Illinois, Indiana, Kentucky, Tennessee, and Alabama (USFWS 1990; Hoggarth et al. 1995; Parmalee and Bogan 1998). Cicerello and Schuster (2003) cite Kentucky distribution as formerly in a stretch of the Ohio River from the Green River to the Licking River. Now reproducing populations only exist in the Killbuck Creek in Ohio; the Cumberland River in Tennessee; and the Green River in Kentucky (Hoggarth et al. 1995). Host fish have been determined to be rock bass (*Ambloplites rupestris*), mottled sculpin (*Cottus bairdi*), greenside darter (*Etheostoma blennioides*), stonecat (*Noturus flavus*), logperch (*Percina caprodes*), and blackside darter (*Percina maculata*) (Watters et al. 1999). Many of the historic populations were lost when the river sections they inhabited were impounded. The decline in the overall range suggests that this mussel is not tolerant of poor water quality. It is sensitive to pollution, siltation, habitat perturbation, inundation, and loss of glochidial hosts. It was not found in the heavily modified portion of Killbuck Creek

that lacked wooded riparian corridors or had significant erosion problems. No purple cat's paw have been documented in mussel surveys conducted in or near the Action Area. Therefore, this species is not anticipated to be present in the Action Area.

Northern Riffleshell (*Epioblasma torulosa rangiana*)

The Northern riffleshell (*Epioblasma torulosa rangiana*) was listed as endangered in 1993 and is found in a variety of streams from large to small. It buries itself in bottoms of firmly packed sand or gravel with its feeding siphons exposed. Increased regulation of rivers, resulting in the degradation of habitat is the main cause the species impairment. Erosion, pollution, and invasives mussel species likely contribute to the species' decline (USFWS 2018). Preferred habitat requirement appears to be swiftly moving water (Clarke 1981). The high oxygen concentrations in swift streams may be necessary for survival. It is a species of riffle areas of smaller streams, and as such has fared better than larger river species, which have been heavily impacted by dredging and impoundment. The species' current distribution includes waters in Illinois, Indiana, Kentucky, Michigan, Ohio, Pennsylvania, West Virginia, and Ontario, Canada (NatureServe 2018). Based upon counts of annular growth lines, this species may reach 15+ years of age. It is not known at what ages reproductive maturity begins and ends. Because of the rarity of live material (and their enforced protection), it is not known if existing populations are reproductively active (NatureServe 2018). The Northern riffleshell has not been documented in field surveys conducted in or near the Action Area. Therefore, this species is not anticipated to be present in the Action Area.

Orangefoot Pimpleback (*Plethobasus cooperianus*)

In 1976, the orangefoot pimpleback (*Plethobasus cooperianus*) was listed as endangered by the Service. The range of the orangefoot pimpleback has been reduced to over 70% with even greater declines (likely > 80%) in occupied habitat. Long-term viability is in doubt as this species exists in small numbers in widely disjunct, localized beds. Continued human modification of the large rivers of the eastern United States and the impacts caused by zebra mussels continue to hasten the decline of this species (NatureServe 2018). This species is found in medium to large rivers in sand, gravel, and cobble substrates in riffles and shoals in deep water and steady currents as well as some shallower shoals and riffles (Gordon and Layzer 1989; Bogan and Parmalee 1983; Cummings and Mayer 1992; USFWS 1984a).

The historical range included the Ohio River from western Pennsylvania to southern Indiana, the Wabash River below Mt. Carmel, Illinois, the Cumberland River from Cumberland County, Kentucky to the vicinity of Nashville, Tennessee, the lower Clinch River in Anderson County, Tennessee, and the Tennessee River from near Knoxville to Kentucky Lake, Benton County, Tennessee. It has also been reported from the Caney Fork, Holston, and French Broad rivers in Tennessee and the Green and Rough rivers in Kentucky (USFWS 1984a, Parmalee and Bogan 1998). At present it is thought to be restricted to the lower Ohio River, middle reaches of the Cumberland River, and the lower Tennessee River in northern Alabama and western Tennessee (USFWS 1984a; Miller et al. 1986). The largest population probably exists in a short reach of the Tennessee River mainstem below Pickwick Dam, near river mile 207 (USFWS 1984a). Though considered rare, live individuals have been regularly documented in the Ohio River in the vicinity of Metropolis, Illinois (Cummings and Mayer, 1995). Cicerello and Schuster (2003) described the distribution of the species as sporadic and rare in the Ohio and Tennessee rivers. Fifteen individuals have been recorded from USACE survey efforts at the Olmsted and Post Creek mussel beds since 1983, including 9 individuals since 2003. This species has not been documented in field surveys conducted in or near the Action Area and is not anticipated to be present in the Action Area.

Rough Pigtoe (*Pleurobema plenum*)

The rough pigtoe was listed as endangered in 1987. In the 1980s, this species was confined to under 20 sites in the Tennessee, Clinch, Cumberland, Barren and Green rivers (USFWS 1984b); fewer than half are still likely extant. The species is found in medium to large rivers (20 m wide or greater) in sand, gravel, and cobble substrates in shoals. It is occasionally found on flats and muddy sand (Gordon and Layzer 1989). It is present in the Green River, Kentucky between locks 4 and 5 and in the Barren River below Lock and Dam 1 (USFWS 1984). Clarke (1983) found a single living specimen in the Green River near Glenmore, Kentucky. The impoundment, siltation, and pollution of rivers are driving factors of the species decline. The rough pigtoe has not been documented in field surveys conducted in or near the Action Area. Therefore, this species is not anticipated to be present in the Action Area.

Sheepnose (*Plethobasus cyphus*)

The sheepnose was listed as endangered in 2012. Historically, the sheepnose occurred throughout much of the Mississippi River system as well as the main stems of the Mississippi, Ohio, Cumberland, and Tennessee rivers and many tributaries of these rivers (Butler 2003a), in shallow shoal habitats with moderate to swift currents over coarse sand and gravel (Oesch 1984). Habitats with sheepnose may also have mud, cobble, and boulders and may occur at depths exceeding six meters (Williams et al. 2008). Extant populations of the sheepnose are known from 24 rivers in all 14 States of historical occurrence, however the species has been extirpated from a known 53 other streams. Historically, the sheepnose was documented from the entire length of the Ohio River (its type locality), and was first collected there in the early 1800s. Currently, the mainstem Ohio River and 10 tributary streams have extant sheepnose populations. The sheepnose is generally distributed, but rare, in most mainstem pools of the Ohio River. The population appears to be more abundant in the lower section of the river with a smaller population in the upper Ohio River pools. The population in the lower Ohio River mainstem is viable with documented recruitment, but the population overall continues to show signs of decline.

Sharp declines in population densities have been noted, and densities of 0.03 - 0.02 mussels/square meter (Jenkinson and Ahlstedt 1988) are representative of surviving populations. Very rarely are more than a few individuals found at a particular site. Increasing rarity has been noted by qualitative sampling and by absence from commercial shell harvests. This species has not been documented in field surveys conducted in or near the Action Area and is not anticipated to be present in the Action Area.

Spectaclecase (*Cumberlandia monodonta*)

The spectaclecase was listed as endangered in 2012. Historically, this species is known from 45 streams in 15 states including: upper Mississippi River system (Mississippi River); lower Missouri River system (Missouri River); Ohio River system (Ohio River); Cumberland River system (Cumberland River); Tennessee River system (Tennessee River); and lower Mississippi River system (Mulberry, Ouachita Rivers) (Butler 2003b; USFWS 2003). Ahlstedt et al. (2004) reported sporadic occurrences (two recent) from the Duck River in a reach less than 30 miles long. Spectaclecase mussels are found in large rivers where they live in areas adjacent to, but sheltered from, the main force of the river current. This species often lives in firm mud and shelters beneath rock slabs and boulders. The species is evidently absent from hundreds of river miles and from numerous reaches of habitat in which it occurred historically. Extant populations of the spectaclecase are known from 20 streams in 10 states. Of the 20 extant populations, seven are represented by only a single specimen each and are likely not viable. The status

of the Ohio River population of this species is declining. The last observation of the spectaclecase in the Ohio River came in 1994, when a single individual was recorded. Several live individuals were reported in the Green River in 2006. There are relatively strong populations in the Meramec and Gasconade Rivers in Missouri, in the St. Croix River in Minnesota/Wisconsin, and perhaps also in the Upper Clinch River in Tennessee (Butler, 2003b; USFWS, 2003).

The decline of the spectaclecase across its range is primarily the result of habitat loss and degradation. Chief among the causes of decline are impoundments, channelization, chemical contaminants, mining, and sedimentation (Neves 1993, Neves et al. 1997, Watters 2000). Less serious are disease or predation (Butler 2003b) and invasive species (Asiatic clam, zebra mussel, black carp). The immediacy of threats varies among spectaclecase populations. The spectaclecase was not documented in mussel surveys conducted in the area and it is not anticipated to be present in the Action Area.

Ring Pink (*Obovaria retusa*)

The ring pink was listed as endangered in 1989. This species is extirpated from nearly all of its formerly wide range through loss of habitat and is reduced to five populations, most of which are represented by few collected specimens and are not viable. The only extant populations are in the Green River (and possibly lower Tennessee River), Kentucky, where it is very sporadic (Cicerello and Schuster 2003), and possibly the middle reaches of Cumberland River and tailwaters of Wilson Dam, Alabama/Tennessee (Garner and McGregor 2001; Mirarchi et al. 2004). Because the species is found in such low numbers and appears to be no longer reproducing at most occurrences, artificial propagation will probably be the only way the species can survive. No ring pink have been found in surveys conducted in the area and the species is not anticipated to be present in the Action Area.

Rabbitsfoot (*Quadrula cylindrica cylindrica*)

The rabbitsfoot (*Quadrula cylindrica cylindrica*) was listed as threatened in 2013. Historically, the rabbitsfoot occurred in the lower Great Lakes sub-basin and Mississippi River Basin from 137 streams in 15 states including: the lower Great Lakes sub-basin, Ohio River system, Cumberland River system, Tennessee River system, lower Mississippi River sub-basin, White River system, Arkansas River system, Red River system. It is found throughout the Ohio River drainage from headwaters in Pennsylvania to the mouth of the Ohio River (Cummings and Mayer 1992). Based on historical and current data, the rabbitsfoot is declining range-wide and is now extant only in 46 of 137 streams of historical occurrence, representing a 66% decline. Further, in the streams where it is extant, populations with few exceptions are highly fragmented and restricted to short reaches (Butler 2005). The chief causes of this species' decline are impoundments, channelization, chemical contaminants, mining, and sedimentation. No rabbitsfoot mussels have been documented in surveys conducted in the area and the species is not anticipated to be present in the Action Area.

Fat Pocketbook (*Potamilus capax*)

Potamilus capax (Fat Pocketbook) was listed as endangered species in 1976. Its range includes Arkansas, Illinois, Indiana, Kentucky, Mississippi, and Missouri (USFWS 1976). A recovery plan for *Potamilus capax* was approved on November 14, 1989 (USFWS 1989). No critical habitat has been designated for *Potamilus capax* (USFWS 2020). A conservation plan was developed in 1989 (USFWS 1989) and it was amended in 2019 (USFWS 2019a). Five-year reviews of *Potamilus capax* were initiated on August 2, 2007 and May 7, 2018 and the species remains endangered at this time (USFWS 2020).

The historic range of the species covers Arkansas, Illinois, Indiana, Iowa, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, New York, Ohio, and Wisconsin (NatureServe, 2020). *Potamilus capax* now has the following status through its range: Arkansas (critically imperiled), Illinois (critically imperiled), Indiana (critically imperiled), Iowa (presumed extirpated), Kentucky (critically imperiled), Louisiana (critically imperiled), Minnesota (presumed extirpated), Mississippi (critically imperiled), Missouri (critically imperiled), New York (possibly extirpated), Ohio (presumed extirpated), and Wisconsin (presumed extirpated) (NatureServe, 2020).

Potamilus capax was once widely distributed in the Mississippi River drainage from the confluence of the Minnesota and St. Croix rivers downstream to the White River system and was known in Minnesota, Wisconsin, Iowa, Illinois, Indiana, Missouri, Kentucky, and Arkansas (NatureServe, 2020). Most historic records for this species are from the upper Mississippi River (above St. Louis), the Wabash River in Indiana, and the St. Francis River in Arkansas (USFWS, 1989). *Potamilus capax* is currently known to exist in approximately 200 miles of the St. Francis River system, including the Floodway and associated drainage ditches; the lower Wabash River, Indiana; the mouth of the Cumberland River, Kentucky; and the Mississippi River, Missouri (USFWS, 1989). Populations appear to be stable in the lower Wabash and Ohio Rivers and the St. Francis River drainages as well as portions of the boot heel region in Missouri (NatureServe, 2020).

Recent survey data over the past several years have shown viable populations of *Potamilus capax* in many regions of its range, particularly the man-made ditches in Arkansas, the Wabash River, and the lower Ohio River (Miller and Payne, 2005; Lewis, 2007a; Lewis, 2007b; Lewis, 2007c; EA Engineering, Science, and Technology, 2007; Fortenbery, 2008a; Fortenbery, 2008b; Lewis Environmental Consulting, 2008a; Lewis Environmental Consulting, 2019). There are several reproducing populations of *Potamilus capax* on the Ohio River between the mouth of the Wabash River at ORM 848 and Lock and Dam 52 at ORM 938.9.

Surveys from 2001 – 2019 in the lower Ohio River have resulted in the collection of approximately 300 individuals ranging in age from 0.5 - 15 years old (Harding ESE, 2001; Lewis, 2007a; Lewis 2007b; Lewis 2007c; EA Engineering, Science, and Technology, 2007; Lewis Environmental Consulting, 2008 unpublished data; Lewis Environmental Consulting, 2008a; Lewis Environmental Consulting, 2008b; EA Engineering, Science, and Technology, 2009; Lewis Environmental Consulting, 2009 unpublished data; Lewis Environmental Consulting, 2010 unpublished data; Lewis Environmental Consulting, 2010a; Lewis Environmental Consulting, 2010b; EA Engineering, Science, and Technology, 2011; Lewis Environmental Consulting, 2011 unpublished data; EA Engineering, Science, and Technology, 2012 unpublished data; Lewis Environmental Consulting, 2012a; Lewis Environmental Consulting, 2012b; Lewis Environmental Consulting, 2012 unpublished data; Lewis Environmental Consulting, 2013a; EA Engineering, Science, and Technology, 2014; EA Engineering, Science, and Technology, 2016; EA Engineering, Science, and Technology, 2017; Lewis Environmental Consulting, 2019). Recent surveys have also verified that *Potamilus capax* has extended beyond its historic range in the Ohio River system. Surveys conducted in 2008 resulted in the first record of *Potamilus capax* in the Tennessee River, which was a fresh dead shell (Lewis Environmental Consulting, 2008c). During a mussel survey for the USFWS in 2012, the first live individual of *Potamilus capax* was located in the lower Tennessee River at RM 13 along the left descending bank (Lewis Environmental Consulting, 2012 unpublished data). Also, there are new records of *Potamilus capax* in the lower Cumberland River near CRM 5 – 10 (Fortenbery, 2008a; Fortenbery 2008b; Lewis Environmental Consulting, 2016). Two individuals were collected by Lewis Environmental

Consulting in the lower 1.5 miles of the Clarks River (Lewis Environmental Consulting, 2013b). *Potamilus capax* has been historically known to occur at the mouth of the Cumberland River (Sickel, 1987), but there were previously no records of the species upstream of this in the Cumberland River. Additional mussel surveys in the Cumberland River in 2011 resulted in individuals of *Potamilus capax* being found as far up as river mile 27.9 (Chad Lewis, pers. comm., Lewis Environmental Consulting, 2011). Mussel surveys conducted from 2008 – 2010 specifically for *Potamilus capax* have resulted in range extensions upstream 105 kilometers and downstream 55 kilometers in the Ohio River (Lewis Environmental Consulting, unpublished data).

The greatest impact on the habitat of the *Potamilus capax* throughout its historic range has been from activities related to navigation and flood control (USFWS, 1989). Channel maintenance activities and impoundments remain the greatest threats to the continued existence of this species (USFWS, 1989). Other common threats to mussel species include siltation, pollution, and exotic species. All of these factors can cause habitat to become unsuitable, cause extirpation, and isolate populations. Dredging of streams has an immediate effect on existing populations by physically removing and destroying individuals. Dredging also affects the long-term recolonization abilities by destroying much of the potential habitat, making the substrates and flow rates uniform throughout the system.

Impoundments reduce currents that are necessary for basic physiological activities such as feeding, waste removal, and reproduction. In addition, reduced water flow typically results in a reduction in water oxygen levels and a settling out of suspended solids (silt, etc.), both of which are detrimental. Siltation has also been associated with reduction in populations of this species, however *Potamilus capax* has been found to be tolerant of depositional areas that are usually unfavorable to other mussel species (NatureServe, 2020; USFWS, 1989). It has been documented that man-made ditches and existing bayous, sloughs, and streams in the St. Francis watershed of Arkansas provide suitable habitat (Miller and Payne, 2005). Pollution through point (industrial and residential discharge) and non-point (siltation, herbicide and fertilizer run-off) sources is perhaps the greatest on-going threat to this species and most freshwater mussels. Lowered dissolved oxygen content and elevated ammonia levels (frequently associated with agricultural runoff and sewage discharge) have been shown to be lethal to some species of freshwater naiads (Horne and McIntosh, 1979). Residential, mineral, and industrial development also pose a significant threat. Zebra mussels, *Dreissena polymorpha*, have destroyed mussel populations in the Great Lakes and significantly reduced mussels in many of the large rivers of eastern North America. Populations of *Potamilus capax* in the lower Ohio remain threatened by zebra mussels. Other factors can be unnatural fluctuations in water temperature from cold water discharge or warming of water temperature and desiccation during drought. Natural predators include raccoons, otter, mink, muskrats, turtles and some birds (Simpson 1899, Boepple and Coker 1912, Evermann and Clark 1918, Coker et al. 1921, Parmalee 1967, Snyder and Snyder 1969). Fishes, particularly catfish, *Ictalurus* spp. and *Amiurus* spp., and freshwater drum, *Aplodinotus grunniens*, also consume large numbers of unionids.

The NatureServe (2020) shell description is as follows: The *Potamilus capax* shell is rounded, greatly inflated, thin to moderately thick, s-shaped hinge line, tan or light brown, rayless, and shiny. The shell is generally round to somewhat oblong, greatly inflated, and thin (young) to moderately thick (adults). Anterior and posterior ends rounded. Umbos greatly inflated, elevated, and turned inward. Beak sculpture consists of a few faint ridges, visible only in young shells. Small posterior wing present in young mussels. Surface usually smooth and very shiny. Periostracum rayless, yellow, yellowish tan or olive, becoming dark brown in older individuals. Length to 5 inches. *Potamilus capax* is thought to be

bradyctic (long-term brooder), which spawns in the fall of the year, hold glochidia through the winter, and releases juveniles in the spring. Preliminary results from studies by Barnhart (1996), Barnhart and Roberts (1996), Barnhart and Andrews (1997), Barnhart and Riusech (1997), and Watters (1994) found successful glochidial metamorphosis on the freshwater drum, *Aplodinotus grunniens*.

Potamilus capax is found in sand, mud, and fine gravel substrates and flowing water (Dennis, 1985). It is also found in large rivers in slow-flowing water (often near the bank) in mud or sand (Cummings et al., 1990). Recently, it has been found to be tolerant of depositional areas that are usually unfavorable to other mussel species and is in fact, not a lotic species as indicated in the Recovery Plan (USFWS, 1989) that is negatively affected by high sedimentation rates (NatureServe, 2020). It has been documented that man-made ditches and existing bayous, sloughs, and streams in the St. Francis watershed provide suitable habitat (Miller and Payne, 2005).

Based on the habitat preferences, historical occurrence records, and recent mussel survey data (Lewis Environmental Consulting, LLC 2019), the endangered fat pocketbook is the only listed mussel species that is reliably known to still occur within the project footprint. While two individual *P. capax* were documented in the footprint of a dike that has been removed from the proposed project, habitat assessments highlighted marked differences in the character of this dike and the remaining dikes. Specifically, the substrate within the footprint of the original Dike #4, which was silt over hard clay for the shoreline half of the transect and sand for the channel side of the transect. The primary substrate in all other dike footprints was sand with occasional areas of small gravel or silt mixed with the top layer of sand. This finding may suggest that the habitat present in the remaining dikes is less suitable for *P. capax*. Therefore, this species is not anticipated to be present in the Action Area.

Gray Bat (*Myotis grisescens*)

The gray bat was listed as federally endangered in 1976. Gray bats (*Myotis grisescens*) are distinguished from their congeners by the bat's wing membrane which connects to its ankle instead of at the toe; the gray bat also has notched claws. Gray bats weigh 7-16 grams. The bats eat a variety of flying aquatic and terrestrial insects present along rivers or lakes. Gray bats live in caves year-round. During the winter gray bats hibernate in deep, vertical caves. In the summer, they roost in caves which are scattered along rivers.

The gray bat occupies a limited geographic range in limestone karst areas of the southeastern United States. They are mainly found in Alabama, northern Arkansas, Kentucky, Missouri, and Tennessee. Florida, Georgia, Kansas, Indiana, Illinois, Oklahoma, Mississippi, Virginia, and North Carolina are considered the edge of their range (USFWS 2019b).

Gray bats are endangered largely because of their habit of living in very large numbers in only a few caves. As a result, they are extremely vulnerable to disturbance. Arousing bats while they are hibernating can cause them expend excessive energy, which lowers their energy reserves. If a bat runs out of reserves, it may leave the cave too soon and die. In June and July, when flightless young are present, human disturbance can lead to mortality as frightened females drop their young while fleeing from the intruder.

The gray bat has a very large range that includes the project area and the species is considered potentially present in areas in which they have not been previously documented. However, because there are no known caves occurring in the Action Area, this species is not anticipated to be present.

Indiana Bat (*Myotis sodalis*)

The Indiana bat was listed as federally endangered in 1967. Indiana bats hibernate during winter in caves. For hibernation, they require cool, humid caves with stable temperatures, under 50° F but above freezing (USFWS, 2006). Very few caves within the range of the species have these conditions. If bats are disturbed or cave temperatures increase during hibernation, more energy is needed and hibernating bats may starve.

In the spring, Indiana bats emerge from hibernation and migrate to summer roost sites where they usually roost under loose tree bark of dead or dying trees. During summer, males roost alone or in small groups, while females roost in larger groups of up to 100 bats or more. Indiana bats also forage in or along the edges of forested areas. Indiana bats are found over most of the eastern half of the United States. Almost half of all Indiana bats (207,000 in 2005) hibernate in caves in southern Indiana. The 2005 population estimate was about 457,000 Indiana bats, half as many as when the species was listed as endangered in 1967 (USFWS 2006). Loss and fragmentation of forest habitat are among the major threats to Indiana bat populations. Other threats include white-nose syndrome, winter disturbance, and environmental contaminants (USFWS 2006).

While there are no known records of roosts occurring in the project area, the species has a very large range that includes the project area and the species is considered potentially present in areas in which they have not been previously documented. However, potential impacts associated with the removal of forested habitat, which will occur during the project, will be minimized by seasonal timber harvest restrictions implemented as part of the conservation strategies detailed herein.

Northern Long-eared Bat (*Myotis grisescens*)

The northern long-eared bat was listed as a threatened in 2015 due to declines mostly associated with white-nose syndrome. The bats spend winter hibernating in caves and mines. During the summer, the bats roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags. Males and non-reproductive females may also roost in cooler places, like caves and mines. While there are no known records of roosts occurring in the project area, the species has a very large range that includes the project area and the species is considered potentially present in areas in which they have not been previously documented. However, potential impacts associated with the removal of forested habitat, which will occur during the project, will be minimized by seasonal timber harvest restrictions implemented as part of the conservation strategies detailed herein.

Rusty Patched Bumble Bee (*Bombus affinis*)

The rusty patched bumble bee was listed as endangered in 2017. The bee's habitat includes grasslands and tallgrass prairies that provide nectar and pollen from flowers, nesting sites (underground and abandoned rodent cavities or clumps of grasses), and overwintering sites for hibernating queens (undisturbed soil). The bees emerge early in spring and is one of the last species to go into hibernation. It needs a constant supply and diversity of flowers blooming throughout the colony's long life, April through September. Habitat loss and degradation, disease, pesticides, and global climate change have all been cited as reasons for the species' decline (USFWS 2017). Field surveys conducted on 22 June 2020 in the Action Area provided no evidence that the rusty patched bumble bee is present and, based on habitat preferences, the species is not expected to be present.

Interior Least Tern (*Sterna antillarum*)

The least tern breeds along almost the entire coast of North America (excluding Alaska and Canada); on the northern coast of Central America; and locally on the northern coast of South America. An interior population of the least tern also breeds inland along rivers in central North America (e.g. the Ohio River). It is highly migratory, wintering on the southern coast of Central America, and the northern and Atlantic coast of South America as far south as central Brazil. It feeds on small fish fry, shrimps, marine worms, and occasionally flying ants and other insects. Prey are usually caught by plunge-dive flights of up to 10 meters, preceded by prolonged hovering, and it also occasionally performs surface-dipping and aerial hawking. The breeding season begins between April and mid-June depending on locality, and it breeds in a large variety of habitats, from barren sandy beaches to parking lots and roof tops. Individuals form colonies usually between 5 and 200 pairs strong (BirdLife International 2016). The main factors affecting the survival of the least tern is the destruction, modification, or curtailment of its habitat or range. Specifically the impoundment and regulation of rivers play a large role in altering the process that form nesting islands. While the action area does contain potentially suitable exposed sand bars for nesting habitat, the river is used by the species primarily as a feeding area. Although this species has a large range that includes the entire reach of the Ohio River from its confluence with the Mississippi River to Smithland, no nesting colonies have been recorded in the Action Area.

Short's Bladderpod (*Physaria globosa*)

First listed as federally endangered in August 2014, Short's bladderpod is a plant in the mustard family. Critical habitat was designated in August of 2014. It grows up to 20 inches tall. Clusters of small yellow flowers top single and sometimes multiple stems from April to early June. The scientific name of the plant is derived from the globe-shaped fruits it produces (USFWS 2019c). Short's bladderpod typically grows on steep, rocky, wooded slopes and talus slopes and along tops, bases, and ledges of bluffs often near rivers or streams and on south- to west-facing slopes. Most populations are closely associated with calcareous outcrops. This habitat is not known to be in the Action Area and no individuals were documented in field surveys conducted there.

EFFECTS OF PROPOSED ACTIONS

Direct Effects

Although USACE does not anticipate listed mussels to be present in the Action Area, the following discussion explains potential effects of the action on mussels, were they to be present. The physical activity of placing the rock on the river bottom to build the dikes will have a direct impact on the river bottom within the dike footprints and mussels potentially residing there. Each of the seven dikes will impact 6,836 – 26,462 square feet ($\approx 635 - 2,458$ square meters) of the river bottom, totaling 124,115 square feet ($\approx 11,531$ square meters) of river bottom for the seven proposed dike footprints. Although not anticipated to be present, any mussels residing in the substrate at each footprint location would be directly impacted by the operation via crushing and the 124,115 square feet ($\approx 11,531$ square meters) of habitat would be permanently made unavailable for use by most mussel species.

The physical activities of mobilizing the work and material barges into position at the work site to offload the rock for the dikes as well as the excavator used to key in the dikes on the Illinois shoreline would cause a direct impact to the river bottom substrate and mussels potentially residing in this substrate. Towboat operation during construction causes prop wash, which can impact the river bottom habitat

for mussels, can dislodge substrate, and can cause downstream siltation. The towboat would be operated at low RPM's while positioning the work and material barges at each dike location and therefore would be unlikely to cause excessive prop wash that would impact the river bottom. Based on the poor habitat and lack of mussels in the dike locations, prop wash will not negatively affect mussel populations during construction.

Spudding the work barge into the river bottom causes a direct impact to the river bottom substrate at the point where the spud contacts the river bottom. Allowing the work barge to rest on the river bottom can cause destabilization of the river bank, thus increasing the potential of erosion and downstream siltation. The work barge resting on the river bottom could cause compaction of sediment and direct mortality of mussels, although no mussels are anticipated to be present. The work barge resting on the river bottom could also direct mortality of mussels if they were present in that location, although this is not anticipated.

Spudding the work barge into the river bottom would cause a direct impact to any mussels present in the substrate at the point where the spud contacts the river bottom. However, no mussels are anticipated to be present in the Action Area.

An estimated total of 13.25 acres of forested habitat will be removed from the shoreline in and around each of the proposed dike structures as required for the implementation of test drilling, and the construction and keying-in of dike structures landward. The construction of the dike structures will involve the removal of forested habitat along sections of the shoreline immediately corresponding to the structures. The removal is expected to occur up to 100 meters along the shoreline and approximately 15 meters up (inland) from the water's edge. This area will be required for the drilling rigs that will be needed to collect bedrock samples and for the construction and armoring of the dike structures themselves. While no protected bat species have been documented in the Action Area, the loss of forested habitat has the potential to impact listed bat species that utilize trees as roosts during the summer reproductive season. However, it should be noted that forested habitat is not a limiting resource in the project area. In addition, the site visit conducted on 22 June documented variation in the quality of the forested habitat available to resident bats with a significant proportion not suitable for roosting bats on both the short- and long-term.

Indirect Effects

The physical activity of constructing dikes can have an indirect impact at the site. The sediment will be disturbed at the installation site while rock is hitting the sediment. Silt will be disturbed and mobilized in the water column causing an increase in turbidity around and downstream of the dikes. However, any increase in turbidity in the Ohio River at the dike locations would be temporary and insignificant compared to the normal turbidity observed along the Ohio River shoreline during storm events.

The physical activities of mobilizing the work and material barge into position at the work site to build the dikes along the river side has the potential to cause indirect impacts to the river bottom substrate and mussels residing there. Towboat operation during construction causes prop wash, which can disturb the river bottom and lead to downstream siltation. Again, any increase in turbidity in the Ohio River at the dike locations from the work and material barges would be temporary and insignificant compared to the normal turbidity observed along the Ohio River shoreline during storm events and would be negligible compared to the daily activities already occurring at the site.

Any operations at the site that causes additional siltation can impact the life cycle of the mussels at the site. Downstream siltation can affect the respiratory and feeding efficiency of mussels, mussel habitat, and reproductive success. Mussels respire and feed through filtration. When there is higher than normal silt load suspended in the water column, more effort is required for the mussels to extract food particles during feeding and oxygen during respiration. The mussels must filter at a higher rate to extract the amount of useful particles than during normal water conditions. If silt loads become too high, mussels may stop feeding for periods of time until conditions become more suitable. Disturbance in the water column can also affect reproduction efficiency of mussels by making it more difficult for spawning females to filter adequate numbers of sperm out of the water column and can also affect the presence of the required fish host during the mussel reproduction cycle. Towboats should be operated at as low of RPM's as practicable when approaching and leaving the area to minimize river bottom scouring and downstream siltation. Downstream siltation from the proposed activities will be negligible compared to the normal turbidity of the Ohio River.

During construction activities, fuel leakage into the river can have short- and long-term effects on the mussels in the Ohio River. Fuels, oils, and detergents can be toxic to mussels and other aquatic life. To prevent this, all equipment maintenance will be conducted away from the river, whenever possible. Fuel storage shall be contained/maintained in an area where leakage and spilling into the river will be avoided.

Interrelated and Interdependent Actions

There are no other activities that are interrelated to, or interdependent with, the proposed action.

Cumulative Effects

Cumulative effects, as defined by the ESA [50 C.F.R. § 402.02], are those effects of future State or private activities, not involving federal activities, that are reasonably certain to occur within the Action Area.

Like many large rivers, the Ohio River is threatened by pollution from sedimentation, nutrients, and stormwater, habitat destruction, and invasive aquatic species. Construction of locks and dams, associated river traffic, and riverside development along much of the Ohio River have resulted in declines in many aquatic populations and extirpation of others. Sewage overflows and failing septic tanks are persistent problems in many municipalities within the Ohio River basin.

Pollution from sedimentation, nutrients, stormwater, habitat destruction, and invasive aquatic species have also had significant adverse effects on native aquatic populations. Point and non-point discharges from municipal, industrial, and agricultural sources have rendered some tributary streams uninhabitable and have likely had significant impacts on aquatic populations in the mainstem of the Ohio River. Siltation from agricultural operations, mining, timber harvest, dredging, and construction has contributed to water quality degradation and habitat alteration and has eliminated populations of both mussels and their essential fish hosts.

Population growth and development, both commercial and residential, have increased over the years and have resulted in the destruction or fragmentation of thousands of acres of quality riparian habitat to the extent that they no longer provide their original function to the watershed. All of these factors act to expedite the degradation of habitat for threatened and endangered species within the Ohio River watershed.

The primary impact to the Ohio River in this region is the operation of the Ohio River Locks and Dams. The reduction of many mussel species, particularly many of the federally endangered and extinct mussel species, has been attributed to the construction and operation of locks and dams. This is also true of the Ohio River system, as has been evidenced by the historical reduction of species numbers since construction of the series of dams. Changes in flow regime in the area of the proposed dikes may affect the deposition of sediment in the immediate area of the structures thereby contributing to the potential impacts of siltation on resident mussels. As previously discussed, siltation can affect the respiratory and feeding efficiency of mussels, mussel habitat, and overall fitness.

The overall goal of the construction of the seven proposed dikes is to reduce the amount of dredging necessary at this location and ameliorate the ongoing threat to navigation posed by shoaling at the site. The reduction of dredging would be beneficial to resident mussels on both the short- and long-term. The construction of the proposed dikes at the site has the potential to create suitable habitat for the federally endangered *Potamilus capax* as the addition of the dikes slows the river flow and increases sediment deposition. In addition, no mussels were discovered within the proposed dike footprints, so the amount of additional cumulative effects of the construction of the dikes will be negligible.

AVOIDANCE, MINIMIZATION, AND CONSERVATION MEASURES

The USACE will require their contractor to implement conservation measures during the construction process in order to minimize impacts to federally listed species in the vicinity of the project area. It is the responsibility of the USACE to educate their contractor about these conservation measures and it is the USACE's responsibility to monitor that these measures are implemented during construction.

1. Two of the original proposed dikes were removed from the project design to avoid potential impacts to mussels.
2. Seasonal timber harvest restrictions will be implemented during the Wabash Dikes Project in an effort to minimize potential impacts to listed bat species during the summer roosting season. Trees over five inches in diameter at breast height (dbh) shall not be removed from April 1 to September 30.
3. During construction activities fuel leakage into the stream can have short- and long-term effects on the mussels in the Ohio River. Fuels, oils, and detergents can be toxic to mussels and other aquatic life. To prevent this, all equipment maintenance will be conducted away from the river, whenever possible. Fuel storage shall be contained/maintained in an area where leakage and spilling into the river will be avoided.
4. Towboat operation during construction and fleeting activities causes prop wash, which can impact the river bottom habitat for mussels, can dislodge substrate, and can cause downstream siltation. Downstream siltation can affect the respiratory and feeding efficiency of mussels, mussel habitat, and reproductive success. To minimize this, the towboat will be operated at as low of RPM's as practicable when approaching and leaving the work site to minimize river bottom scouring and downstream siltation. Work and material barges will be spudded in place for stability at the construction sites and will not be pushed against the river bank or river bottom, with the exception of within the dike footprints.

5. Proactive planning will be utilized in the fleetings arrangements of work and material barges so that barges will only be fleetted in areas known to not have native freshwater communities. These areas would be located near the dike project footprints.
6. No fleetting, towboat operation, barge landing, excavation, or any other construction activities are permitted to occur along the Illinois shoreline between ORM 848.7 and the mouth of the Wabash River (ORM 848) because of the known presence of the federally endangered *Potamilus capax* in this area (Figure 8).
7. The number of times barges are required to be moved will be held to a minimum in an effort to reduce the potential effects of spudding on resident mussels.

CONCLUSIONS

The 2019 mussel survey conducted at the USACE project site resulted in the determination that a federally endangered mussel species (*Potamilus capax*) is present upstream of the proposed project area (along the Illinois shoreline) and within the footprint of a dike that was subsequently removed from the project proposal. However, no individuals were located within the Action Area of the project. Similarly, none of the other listed species that were evaluated were documented during the field visit conducted on June 22, 2019 and are otherwise not anticipated to be present within the Action Area based on site conditions and habitat preferences (Clarke, 1995; USFWS, 2002). The conservation measures incorporated into the project should reduce potential impacts to listed species associated with scoping and construction activities near the vicinity of the site, including impacts to federally endangered individuals.

While the main objective of the Wabash Dikes Project is to reduce the ongoing threat to commercial navigation caused by shoaling in the Action Area, the flow diversion created by the dike structures is expected to also eliminate the need for the maintenance dredging which poses an ongoing risk to resident mussels, including the federally endangered *Potamilus capax* (Lewis Environmental Consulting 2008; USFWS 2002, 2016). The Biological Opinion amendment issued by USFWS (2016) estimated the amount of take of *P. capax* from dredging in the area of Wabash Island from between 15 and 90 individuals. In this way, the completion of the Wabash Dikes Project has the potential to reduce take associated with dredging and can produce a long-term benefit to mussel populations in the area.

DETERMINATION OF EFFECTS

The Corps presents their determinations about each species potentially occurring within the affected area of the Project, using language recommended by USFWS:

- *No effect* – USACE determines that its proposed action will not affect a federally listed species or critical habitat;
- *May affect, but not likely to adversely affect* – USACE determines that the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial; or
- *Likely to adversely affect* – USACE determines adverse effects to listed species and/or critical habitat may occur as a direct result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or completely beneficial. Under this determination, an additional determination is made whether the action

is likely to jeopardize the continued survival and eventual recovery of the species or result in destruction or adverse modification of critical habitat.

The following effects determinations are made based on literature review, field surveys, and habitat assessment data collected in the immediate project area:

- 1) The Wabash Dikes Project will have **no effect** on the federally endangered mussel *Potamilus capax*. Although individuals of this species were previously identified in the vicinity of the project, no mussels were located in the Action Area. While two individual *P. capax* were documented in the footprint of a dike that has been removed from the proposed project, habitat assessments highlighted marked differences in the character of the substrate corresponding to this dike and the remaining dikes. The substrate in most of this section of the Ohio River is sand, consisting primarily of material discharged from the Wabash River. Within the Action Area, the substrate was fairly consistent (as documented during the mussel survey conducted in 2019). However, the substrate along the footprint of (the original and since removed) Dike #4 contained a large proportion of silt and deviated from that of the remaining dikes which were dominated by sand (Lewis Environmental Consulting 2019). Taken alone, the differences in substrate character of the dikes are subtle. However, this evidence, coupled with the low mussel densities documented in the area and the difficulties of mussel colonization and survivorship caused by the highly volatile in-stream conditions present in the Action Area, limit the potential that the project will negatively impact *P. capax*.
- 2) The Wabash Dikes Project will have **no effect** on the federally endangered mussel *Cumberlandia monodonta* that has been historically known to exist in this region of the Ohio River. No recent data exists to show that the species would likely be present near the project site. *Cumberlandia monodonta* is considered a habitat specialist and generally prefers areas with boulders or rocky areas. This type of habitat is not present at the project site. Therefore, this species is not anticipated to be present in the Action Area.
- 3) The Wabash Dikes Project will have **no effect** on the federally endangered mussel *Cyprogenia stegaria* that has been historically known to exist in this region of the Ohio River. No recent data exists to show that the species would likely be present near the project site. Therefore, this species is not anticipated to be present in the Action Area.
- 4) The Wabash Dikes Project will have **no effect** on the federally endangered mussel *Epioblasma obliquata obliquata* that has been historically known to exist in this region of the Ohio River. No recent data exists to show that the species would likely be present near the project site. Therefore, this species is not anticipated to be present in the Action Area.
- 5) The Wabash Dikes Project will have **no effect** on the federally endangered mussel *Epioblasma rangiana* that has been historically known to exist in this region of the Ohio River. No recent data exists to show that the species would likely be present near the project site. Therefore, this species is not anticipated to be present in the Action Area.
- 6) The Wabash Dikes Project will have **no effect** on the federally endangered mussel *Obovaria retusa* that has been historically known to exist in this region of the Ohio River. No recent

data exists to show that the species would likely be present near the project site. Therefore, this species is not anticipated to be present in the Action Area.

- 7) The Wabash Dikes Project will have **no effect** on the federally endangered mussel *Plethobasus cooperianus* that has been historically known to exist in this region of the Ohio River. No recent data exists to show that the species would likely be present near the project site. Therefore, this species is not anticipated to be present in the Action Area.
- 8) The Wabash Dikes Project will have **no effect** on the federally endangered mussel *Plethobasus cyphus* that has been historically known to exist in this region of the Ohio River. No recent data exists to show that the species would likely be present near the project site. Therefore, this species is not anticipated to be present in the Action Area.
- 9) The Wabash Dikes Project will have **no effect** on the federally endangered mussel *Pleurobema clava* that has been historically known to exist in this region of the Ohio River. No recent data exists to show that the species would likely be present near the project site. Therefore, this species is not anticipated to be present in the Action Area.
- 10) The Wabash Dikes Project will have **no effect** on the federally endangered mussel *Pleurobema plenum* that has been historically known to exist in this region of the Ohio River. No recent data exists to show that the species would likely be present near the project site. Therefore, this species is not anticipated to be present in the Action Area.
- 11) The Wabash Dikes Project will have **no effect** on the federally threatened mussel *Theliderma cylindrica* that has been historically known to exist in this region of the Ohio River. No recent data exists to show that the species would likely be present near the project site. Therefore, this species is not anticipated to be present in the Action Area.
- 12) The Wabash Dikes Project will have **no effect** on the federally endangered gray bat (*Myotis grisescens*). The gray bat has a very large range that includes the project area and the species is considered potentially present in areas in which they have not been previously documented. However, because there are no known caves occurring in the Action Area, this species is not anticipated to be present.
- 13) The Wabash Dikes Project will have **no effect** on the federally endangered Indiana bat (*Myotis sodalis*). While there are no known records of roosts occurring in the project area, the species has a very large range that includes the project area and the species is considered potentially present in areas in which they have not been previously documented. However, potential impacts associated with the removal of forested habitat that will occur during the project will be minimized by seasonal timber harvest restrictions implemented as part of the conservation strategies detailed herein.
- 14) The Wabash Dikes Project will have **no effect** on the federally threatened northern long-eared bat (*Myotis septentrionalis*). While there are no known records of roosts occurring in the project area, the species has a very large range that includes the project area and the species is considered potentially present in areas in which they have not been previously documented. However, potential impacts associated with the removal of forested habitat that will occur during the project will be minimized by seasonal timber harvest restrictions implemented as part of the conservation strategies detailed herein.

- 15) The Wabash Dikes Project will have no effect on the federally endangered least tern (*Sterna antillarum*). While the least tern may range over the entire Ohio River mainstem, there are no known records of the species within the project action area and no individuals were observed during field surveys conducted at the site. Therefore, this species is not anticipated to be present in the Action Area.
- 16) The Wabash Dikes Project will have no effect on the federally endangered Short's bladderpod (*Physaria globosa*). The species has specific habitat requirements not present in the project footprint and no individuals were observed during a field survey conducted at the site. Therefore, this species is not anticipated to be present in the Action Area.
- 17) The Wabash Dikes Project will have no effect on the federally endangered rusty patched bumble bee (*Bombus affinis*). No evidence that the species was present in the Action Area was documented during field surveys conducted at the site and the species is not expected to be present based on site conditions and habitat preferences.

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**US Army Corps
of Engineers**
Louisville District

**Clean Water Act Section 404(b)(1) Evaluation
Wabash and Ohio River Dikes Project
Gallatin County, Illinois and Union County, Kentucky**

Prepared by:
U.S. Army Corps of Engineers, Louisville District
May 2021

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I. Project Description

a. Location

The Wabash and Ohio River Dikes Project (Wabash Dikes Project) is located in Union County, Kentucky and Gallatin County, Illinois. The project area lies immediately downstream of the Wabash River confluence between Ohio River Miles (ORM) 847.8 – 849.5 and is located approximately 6 miles west of Uniontown, Kentucky and 10 miles east of Shawneetown, Illinois. John T. Myers Lock and Dam is located approximately three miles upstream at ORM 846.0. Figure 1 displays the Wabash Dikes Project location within the tri-state Ohio River Basin area.

Because the project lies mostly on the mainstem of the Ohio River, primary access to the proposed project is via the waterway. The surrounding area is mostly agricultural and frequently inundated, so overland access is limited. Wabash Island is almost completely in row crops or fallow fields and is privately owned and accessible by private ferry or barge only. The closest road to the Illinois section of the project is Calico Lane which runs adjacent to the Wabash River.

b. General Description

The objective of the Wabash Dikes Project is for flow diversion to alleviate the ongoing need for maintenance dredging in the Ohio River downstream of the mouth of the Wabash River. The USACE plans to construct seven flow diversion dikes on the Ohio River, near the mouth of the Wabash River, which will produce the most effective remedy to the shoaling and the ongoing threat to navigation in the area.

A shoal at the mouth the Wabash River caused a re-alignment of the navigation channel in the Ohio River and has required consistent dredging activities to maintain operational usability of the channel. Prior to 2008 there were nine dredging events in this area with the first dating back to 1932. Since 2008, dredging has been required in this section of the river every year. This recent increase in dredging events is the result of an influx of sedimentation caused by an avulsion that cut off the lower meander loop of the Wabash River in 2008 and then again in 2010. Both cutoffs formed after extreme rainfall events from tropical storms. Large amounts of sediment that were removed in the avulsion formation process were transported downstream, forming shoals at or near the confluence with the Ohio River.

In 2015, hydrographical studies conducted by the US Army Engineer Research and Development Center, Coastal and Hydraulics Laboratory (ERDC-CHL) utilized numerical modeling to simulate multiple scenarios as solutions to these sediment issues. The current design, based on the ERDC-CHL analysis, uses seven rock dikes with bank armoring (Figure 2). Three of the dikes will be constructed on the Wabash Island side of the Ohio River to control sediment coming directly out of the Wabash River. The four remaining dikes will be constructed downstream of the mouth of the Wabash River to increase the flow velocity, direct sediment downstream, and promote scouring of the navigation channel. The dikes will be constructed of large rip-rap type limestone rock

The three Wabash Island dikes that will extend out from the Wabash Island (Kentucky) shoreline would be located at ORM 847.9, ORM 848.1, and ORM 848.3 are labeled Dikes 1-3, respectively

(Figure 2). The length of the Wabash Island dikes will range between 523 – 595 feet (160 – 181 meters), of which the last 446 – 531 feet (136 – 162 meters) would be within the water. While the Wabash Island Dikes will not be keyed into the shoreline, there will be some excavation and shaping of the bank to address sections with eroded slopes. As conditions allow, fill rock will be placed on the existing grade and will be flanked by riprap slope protection.

The four dikes that will extend out from the Illinois shoreline will be located at ORM 848.6, ORM 848.9, ORM 849.2, and ORM 849.5 are labeled Dikes 4-7, respectively (Figure 2). The Illinois shoreline dikes would extend out total lengths ranging between 568 – 978 feet (173 – 298 meters), of which the last 383 – 684 feet (117 – 208 meters) would be within the water. The Illinois shoreline dikes will be keyed into the riverbank with the same type rock used to construct the dikes.

In an effort to prepare and stabilize the footprints of dikes #4 – 7 (on the Illinois side of the river) prior to construction (Figure 1), accumulated sediment will be excavated from the Ohio River streambed before placement of rip rap material. Rip rap rock will then be placed on the existing river bottom. No excavation of the dike footprints on the Kentucky side is anticipated.

In general, the widths of all the proposed dike structures will be similar. The right of way on the bank for construction and excavation spoils at each dike is 150 feet (46 meters) offset from the centerline, or 300 feet (91 meters) in total width. The crest width will be 10 feet (3 meters). The maximum disturbed in-stream width for each dike is estimated to be 100 feet (30.5 meters).

c. Authority and Purpose

The U.S. Army Corps of Engineers (USACE) is congressionally mandated to maintain a nine-foot deep navigation channel in the Ohio River for transport of goods and services by barge. In order to maintain the navigation channel for commercial vessels, routine maintenance dredging is conducted in areas where natural deposition of river substrates is an ongoing process. The purpose of the Wabash Dikes Project is to divert flow in way that alleviates the ongoing need for maintenance dredging at ORM 847.8 – 849.5.

The Department of the Army permit program is authorized by Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act (P.L. 95-217). These laws require permits authorizing structures and work in or affecting navigable waters of the United States and the discharge of dredged or fill material into waters of the United States.

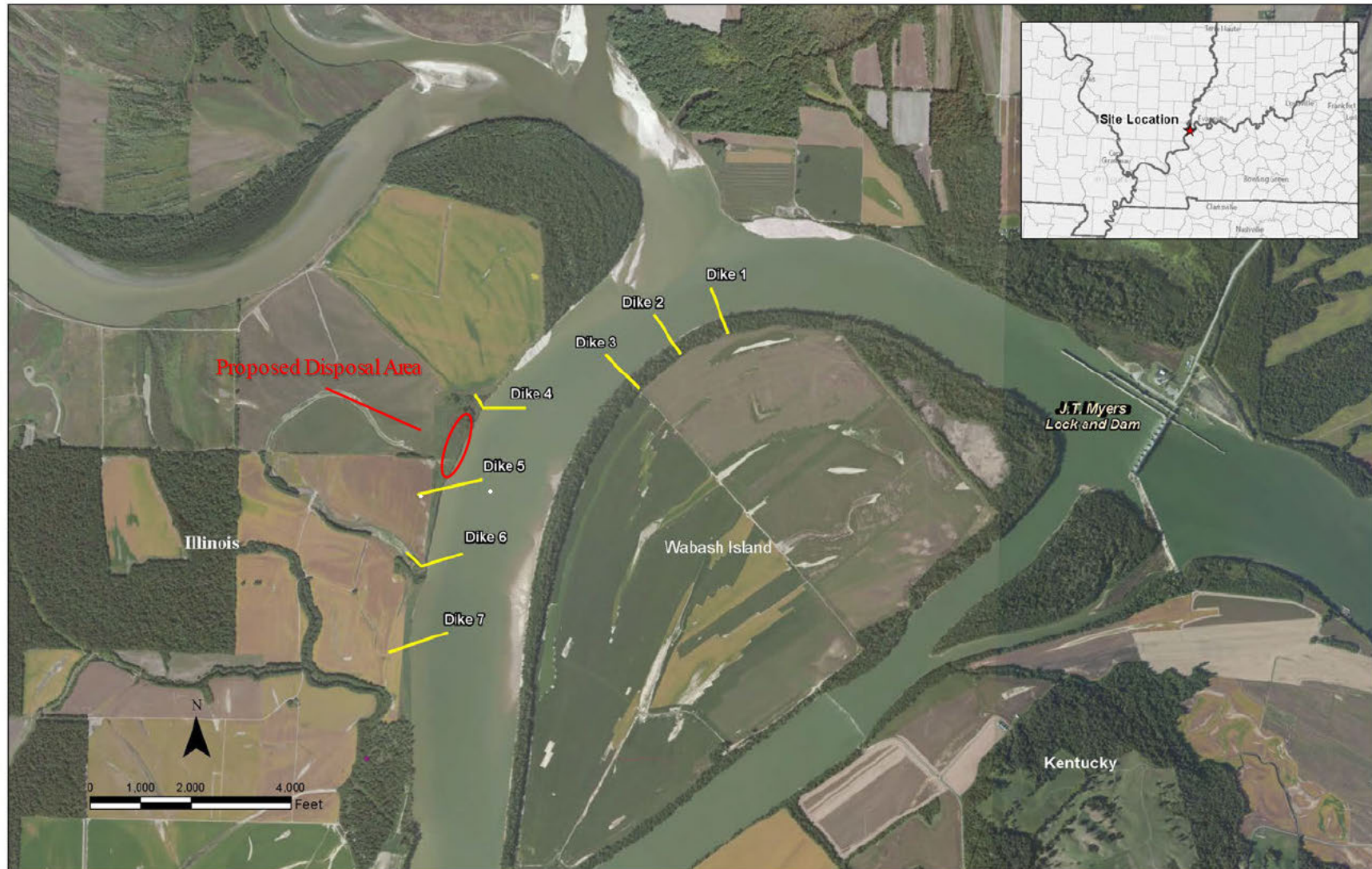


Figure 1. Location of the proposed Wabash Dikes Project on the Ohio River (ORM 847.8 - 849.5).

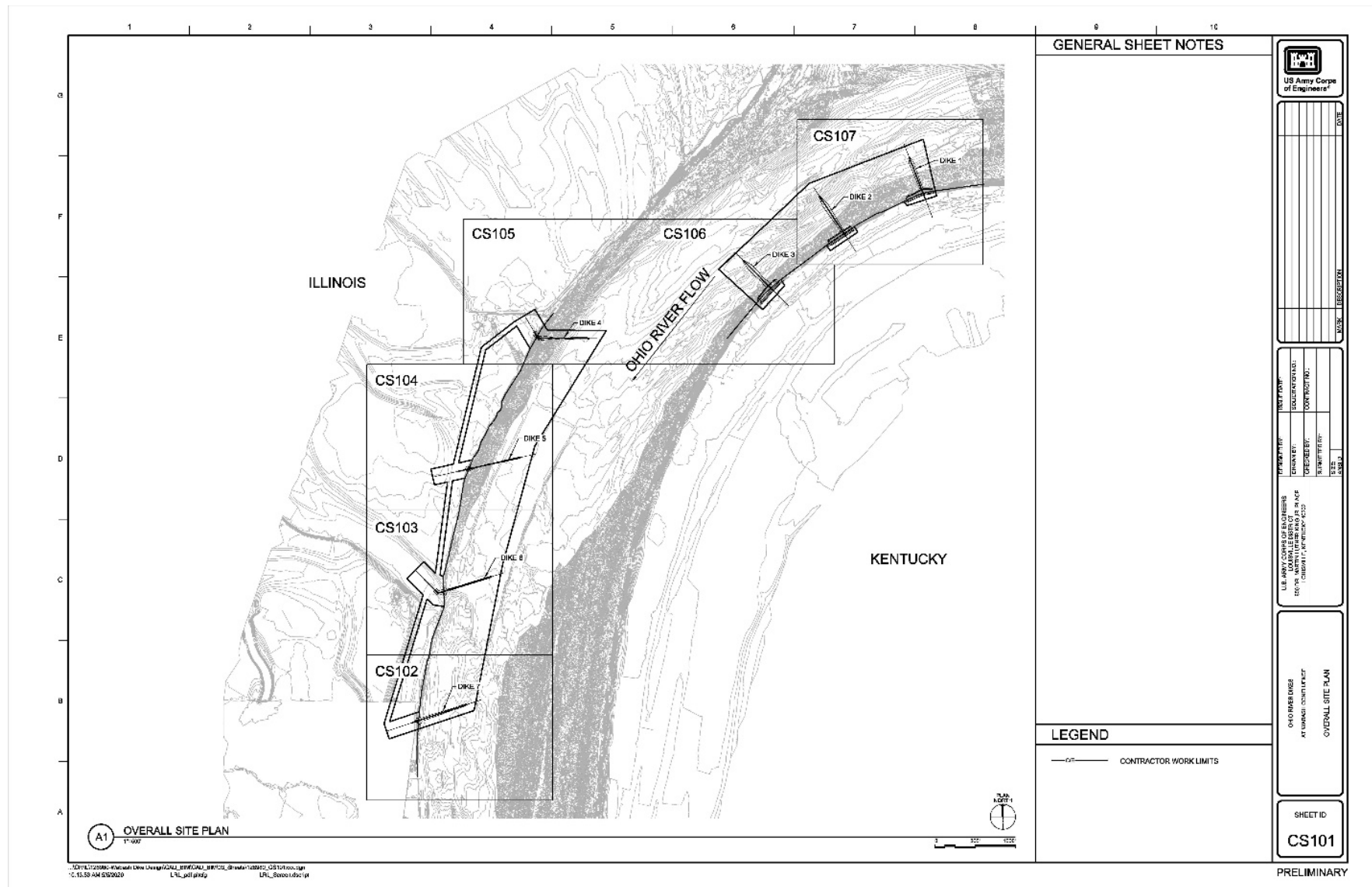


Figure 2. Overall Site Plan for the proposed Wabash Dikes Project.

d. General Description of Dredged or Fill Material**(1) General Characteristics of Material**

Fill material used for the construction of the dike structures will consist of Grade A or similar size stone. Final stone choice will be made by contractor and may be comprised of MVD Class B or C, or "Baby A" (smaller stone sizes for constructability purposes). Bank armoring stone #205 will be used for keying in of dike structures and bank protection. All fill will be durable stone and lab tested using facilities approved by USACE.

In an effort to prepare and stabilize the dike footprints prior to construction, accumulated sediment will be excavated from the Ohio River streambed before placement of rip rap material. Because of the proximity of the Action Area to the Wabash River outflow, the character of the stream bed in this section of the Ohio River is highly volatile and in a constant state of flux. This makes predicting the elemental character of the sediments removed from the dike footprints problematic. Information on the character and constituents of these sediments are based on data obtained by the mussel survey of 2019 conducted in support of this project. Dredged material (from this pre-construction excavation of the dike footprints) is expected to consist primarily of sand, with smaller proportions of silt, clay, and gravel. The average grain size of dredged material is estimated to be approximately 0.024 inches (0.6 mm).

(2) Quantity of Material

The proposed project involves the placement of an estimated 58,650 cubic yards of fill material for the seven dikes and the three areas of Kentucky bank armoring into the Ohio River. The quantity of the fill material may increase if the bank slopes need to be steeper or if the rock toe bench currently assumed needs to be increased in width.

An estimated 9,200 cubic yards of accumulated sediment will be excavated from the dike footprints prior to the placement of rip rap material. Excavated material will be limited to the loose sediment present on the stream bed and excavations are not expected to extend into bedrock. The volume estimate above represents a worst-case value and is based on the most recent geotechnical data available. The volume of material excavated (and ultimately deposited) will depend on the depth of substrates present at the time of excavation.

(3) Source of Material

The stone used during construction of the dikes will originate from a commercial source to be determined by the contractor.

As described above, some material will be excavated from the footprints of proposed dikes #4 - #7, prior to construction. Because the benthic zone of the area is under a constant state of transition and substrate turnover is high, the material removed by excavation of the dike footprints are, in large part, derived from the outflow of the Wabash River and/or are part of the normal sediment load of the Ohio River.

Materials moved onshore during construction of the terrestrial or out-of-water sections of the dike structures will be used in the construction of these sections of the dikes and no materials excavated during the terrestrial keying in and armoring phase of project will be moved beyond their immediate area of excavation for each individual dike location. In addition, the excavated material from out-of-water construction efforts will not be part of the excavated materials (removed from the dike footprints) deposited in the designated area on the Illinois shoreline (Figure 1). No materials excavated from the Kentucky shoreline will be moved to Illinois.

e. Description of the Proposed Discharge Sites

(1) Location

The Action Area includes the footprint of the seven dike structures and outlying areas along the shore where the structures will be keyed-in and equipment will be moved in place. The three Wabash Island dikes that will extend out from the Wabash Island shoreline would be located at ORM 847.9, ORM 848.1, and ORM 848.3 are labelled Dikes 1-3, respectively. The four Illinois Shoreline dikes that will extend out from the Illinois shoreline will be located at ORM 848.6, ORM 848.9, ORM 849.2, and ORM 849.5 are labelled Dikes 4-7, respectively (Figure 8). A detailed description of the size and scope of the dike structures is located in section I.(b) above.

Sediment from the pre-construction dredging of the footprints of dikes #4 - #7 will be deposited along the Illinois shoreline in the section of shoreline corresponding to the proposed dikes #4 and #5. This area is currently designated to receive materials from the ongoing dredge program (Figure 1), pursuant to Illinois Division of Water Resources Permit No. 17603 and Kentucky Section 401 Water Quality Certification permit number No. 2019-100-1M.

(2) Size

The area of deposition is estimated to encompass approximately 3,000 linear feet of shoreline corresponding to the locations of proposed dikes #4 and #5 (Figure 1).

(3) Type(s) of Sites and Habitats

The bottom of the Ohio River is dynamic and unstable, with large-scale movement of sediment (including sand waves) in the channel. The streambed at the project site offers marginal habitat quality, consisting mostly of fine sands and silt, much of which originates from the Wabash River. In addition, substrates within this stretch of the river experience disturbance from dredging and other navigation-related activities.

The site of the deposition area is one of frequent flooding and scour. Terrestrial plant communities present here consist of scrub/shrub and herbaceous plant communities of early successional stages that reflect the frequency of disturbance and hydric soils. Dominant members of the plant community include silver maple (*Acer saccharinum*), box elder (*Acer negundo*), black willow (*Salix nigra*), blackberry (*Rubus* sp.), poison ivy (*Toxicodendron radicans*), and hawthorn (*Crataegus* sp.).

(4) Time and Duration of Discharge

The total construction time of the recommended plan will not exceed two years. It is estimated that two low water seasons (June through November) may be needed to complete the work. Current project timelines include a two-phased approach with Illinois construction slated to occur during Phase 1; construction on the Wabash Island portion of the project will follow. The project construction window includes summer/fall 2021 – fall 2023.

f. Description of Demolition and Disposal Methods

No demolition will be required during the Wabash Dikes Project.

II. Factual Determinations**a. Physical Substrate Determinations****(1) Substrate**

Since 2008, inflow from the Wabash River basin contributes several million cubic yards of sediment to the Ohio River annually as it continues to adjust to changes in river alignment and bed gradient. The increased sediment generates sand waves in the Ohio River that can measure from about eight inches to as much as six feet in height as they move downstream along the flat bottom of the Ohio River. These waves dissipate as they travel downstream but high rainfall events resuspend existing sediment and continue to contribute large amounts of new sediment keeping the benthos of the Action Area in a continuous state of flux. While the goal of the Wabash Dikes Project is to remedy shoaling in the Action Area, the project will work to stabilize the highly volatile benthic environment there. While the volume of the sediment inflow to the area is a relatively recent development, the physicochemical makeup of the sediment present in the substrate of the Action Area is typical for this section of the Ohio River.

(2) Sediment Type

The substrate of the proposed construction sites is composed of medium to coarse grained alluvial sand underlain by the McCleansboro Group, interbedded and layered fine sand, silt, and clay. Close to the bank, materials are mixed due to slides, resulting in a mixture of sands, silts, and clay. Additional components include woody debris, fine pebbles, rock, fine gravel, shell debris, and flocculent mud.

(3) Dredged/Fill Material Movement

To limit the movement of fill material, all construction materials will consist of graded stone A or MVD Class B or C, or "Baby A" stone. Bank armoring stone #205 will be used for keying in of dike structures and bank protection.

(4) Physical Effects on Benthos

There will be a loss or alteration of habitat associated with the initial excavation and subsequent placement of the rock within the dike footprints. Temporary and localized impacts to benthic organisms and their habitats would also occur in the immediate areas of construction in the form of sedimentation and increased turbidity. However, because of the dynamic movement of the substrate normally present at the site coupled with large sediment outflows from the Wabash River (and the cumulative effects from dredging that is conducted to deal with it), stable benthic faunal communities in the vicinity of the project are limited. When present, the biota inhabiting these shifting sandy substrates are adapted to unstable conditions and would be expected to recolonize to baseline levels rapidly after completion of the project.

(5) Other Effects

No other effects are known.

(6) Actions Taken to Minimize Impacts

Impacts to surface water and physical substrates from construction of the Wabash Dikes Project would be minimized by using appropriate construction best management practices and limiting disturbance to the absolute minimum required. When applicable, the following list of Best Management Practices (BMPs) will be employed during construction of the Wabash Dikes Project:

- Perform equipment maintenance away from streams, water bodies, and ditch lines, whenever possible and store fuel in secure location.
- Perform any needed maintenance to the crane and excavator prior to arriving at the work site.
- Ensure that crane and excavator has no oil or hydraulic leaks that will spill or wash off in the river water during construction.
- Operate the towboat at as low of RPM's as practicable when approaching and leaving the work site to prevent river bottom scouring.
- Avoid dropping or spilling excess construction material into the river.
- Minimize the area to be disturbed.
- Implement sediment and erosion control measures to limit instream impacts from runoff.

b. Water Circulation, Fluctuation, and Salinity Determinations**(1) Water**

No long-term negative impacts would be expected to water quality of the Action Area. There may be temporary impacts associated with sedimentation that may occur as a result of construction of the dike structures but these will be local and short-term in nature.

(a) Salinity

There are no impacts expected to salinity as a result of construction of the Wabash Dikes Project.

(b) Water Chemistry

There will be no long-term changes to water chemistry expected as a result of construction of the Wabash Dikes Project.

(c) Clarity

While there may be a local and temporary decrease in water clarity during construction activities, the Ohio River is typically a turbid stream and this section of the river is further impacted by outwash from the Wabash River immediately upstream of the proposed project.

(d) Color

The water column surrounding the Action Area may become discolored temporarily due to disturbance of sediment during construction of the dike structures.

(e) Odor

Negligible amounts of hydrogen sulfide may be expected when disturbing possible anoxic sediments at the construction sites.

(f) Taste

There are no impacts to taste expected as a result of the completion of the Wabash Dikes Project.

(g) Dissolved Gas Levels

No impacts to dissolved gas levels would be expected as a result of the completion of the Wabash Dikes Project.

(h) Temperature

No impact to the instream temperature profile would be expected as a result of the completion of the Wabash Dikes Project.

(i) Nutrients

The proposed action is not expected to increase instream nutrient levels of the Ohio River.

(j) Eutrophication

The completion of the Wabash Dikes Project is not expected to lead to eutrophication of surrounding waters.

(k) Others as Appropriate

None known.

(2) Current Patterns and Circulation**(a) Current Patterns and Flow**

Project design is based hydrographical studies conducted by ERDC-CHL involving numerical modeling designed to simulate multiple design scenarios as solutions to the ongoing shoaling in the project area. The current design utilizing seven rock dikes with bank armoring will modify flow regimes, increase flow velocity, direct sediment, and promote scouring of the navigation channel. Because the overall objective of the Wabash Dikes Project is for flow diversion (to alleviate the ongoing need for maintenance dredging in the Ohio River downstream of the mouth of the Wabash River), localized modification to the flow regime of the Action Area is an expected project outcome.

The completion of the Wabash Dikes Project would not have a significant effect on inflows to the system or water surface elevations currently present in the Smithland Pool. Water surface elevation at this site is primarily determined by the operation of the Smithland Locks and Dam.

(b) Velocity

ERDC-CHL modeling predicts that the proposed seven proposed dikes that will be constructed downstream of the mouth of the Wabash River will promote scouring of the navigation channel thereby alleviating the threat to shoaling in the Action Area.

(c) Stratification

No changes in water stratification are anticipated as a result of the completion of the Wabash Dikes Project.

(d) Other Significant Changes to Hydrologic Regime

None known.

(3) Normal Water Level Fluctuations

The goal of the Wabash Dikes Project is to differentially direct flow and scour in a way that alleviates threats posed by shoaling in the Action Area. Water levels of this section of the stream will still be subject to local and regional weather patterns and dam release and no effects to normal water level fluctuations are anticipated.

(4) Salinity Gradients

There would be no change in salinity gradients as a result of the completion of the proposed Wabash Dikes Project.

(5) Actions That Would Be Taken to Minimize Impacts

The USACE will require their contractor to implement BMPs during the construction process to minimize potential impacts on the surrounding environment. A description of BMPs to be employed is included in Section II.(a)(6).

c. Suspended Particulate/Turbidity Determination**(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site**

A temporary and localized increase in suspended particulates and turbidity would likely occur onsite and immediately downstream of the site during construction. The Ohio River is typically a turbid stream and this section of the river is further impacted by outwash from the Wabash River just upstream from the Action Area. While the changes in turbidity have not been modeled, they are expected to result in only negligible, short-term impacts to water quality, aquatic organisms, or their habitats. No violations of applicable water quality standards are anticipated.

(2) Effects on Chemical and Physical Properties of the Water Column**(a) Light Penetration**

Turbidity levels would likely increase during construction activities which has the potential to reduce light penetration. These effects are expected to be temporary and will subside upon completion of the project.

(b) Dissolved Oxygen

No adverse impacts to dissolved oxygen (DO) are expected; a reduction in DO may occur at localized and temporary events during construction activities.

(c) Toxic Metals and Organics

Significant release of toxic metals or organics during the proposed construction activities would be highly unlikely to occur. Soil type plays a major role in the potential concentration and effects of many contaminants. Contaminants tend to bind and sorb to smaller soil particles like clay and silt much more readily than to

coarse soil like sand, which has looser structure of the soil particulates. Sediment composition in this section of the stream is comprised largely of loose, shifting sands. Because of this sediment composition, the likelihood of releasing contaminants during the construction of the structures is low. For these reasons, suspended particles resulting from construction of the Wabash Dikes Project are not likely to result in detrimental effects to the chemical and physical properties of the water column.

(d) Pathogens

None expected.

(e) Aesthetics

While aesthetics is a subjective concept and the project area is a sparsely populated area, the landscape immediately surrounding the project Action Area will be altered by the construction of the Wabash Dikes Project. For reference, ordinary high water is elevation 341.5 feet. The Illinois dikes are expected to extend into the river at elevation 312.0 feet and the Wabash Island dikes extend into the river at elevation 330 feet. Except for low flow conditions, dike structures on Wabash Island will be below the water surface. The dikes constructed on the Illinois side of the project will remain submerged year-round. All dike structures will be exposed where the dikes tie into the shore at least until the interstitial spaces of the rock pilings are filled in by sediments and colonized by plants.

(f) Others as Appropriate

None known.

(3) Effects on Biota

No impacts to photosynthesis, suspension/filter feeders, and sight feeders are expected, except for temporary and localized impacts associated with the construction of the dikes (e.g., burial of benthos or temporary increase of local turbidity levels).

(4) Actions Taken to Minimize Impacts

Impacts to surface water and physical substrates from construction of the dikes would be minimized by using appropriate construction BMPs and limiting disturbance of river substrates to the absolute minimum required. These measures include the following:

- During construction activities, fuel and oil leakage into the stream can have short- and long-term effects on aquatic organisms in the Ohio River. To prevent this, all equipment maintenance will be conducted away from the river, whenever possible. Fuel storage shall be contained/maintained in an area where leakage and spilling into the river will be avoided.

- Towboat operation during construction and fleeting activities causes prop wash, which can impact the river bottom habitat for benthic invertebrates, can dislodge substrate, and can cause downstream siltation. To minimize this, the towboat will be operated at as low of revolutions per minute (RPM's) as practicable when approaching and leaving the work site to minimize river bottom scouring and downstream siltation. Work and material barges will be spudded in place for stability at the construction sites and will not be pushed against the riverbank or river bottom, with the exception of within the dike footprints.
- The number of times barges are required to be moved will be held to a minimum in an effort to reduce the potential effects of spudding on benthic invertebrates.

d. Contaminant Determinations

The material proposed for discharge would not be expected to introduce, relocate, or increase contaminants. Should contamination be found, necessary steps to avoid the materials or cleanup of the area would take place. Stone used for constructions and armoring of the dikes structures will be obtained from a state-approved commercial source(s).

e. Aquatic Ecosystem and Organism Determinations

(1) Effects on Plankton

The proposed action could cause some negligible mortality because of increases in total suspended solids and turbidity and decreases in dissolved oxygen levels during the construction of the dikes. Impacts would be temporary and short-term in nature, and recolonization of the area by plankton should occur quickly after the completion of the project.

(2) Effects on Benthos

It is assumed that benthic macroinvertebrates will be affected during construction of the dike structures. The construction of the seven dikes will impact approximately 124,115 square feet ($\approx 11,531$ square meters) of the river bottom. Although not anticipated to be present, any mussels or other organisms residing in the substrate at each footprint location would be directly impacted as the habitat would be temporarily or permanently made unavailable for use or otherwise modified. However, it should be noted that the footprint of the dikes is relatively small and the stabilizing effect on the surrounding environment created by the dikes will likely benefit much of the benthic fauna over the long-term. Recolonization of the project area by the benthos community upon completion of the project is expected.

(3) Effects on Nekton

No significant impacts to the nekton of the area from the proposed construction of the proposed Wabash Dikes Project are expected.

(4) Effects on Aquatic Food Web

Reductions in primary productivity from turbidity would be temporary and localized around the immediate construction zone and would be limited to the duration of the plume at a given site.

(5) Effects on Special Aquatic Sites

Construction activities would not have detrimental effects on special aquatic sites in the study area (i.e., sanctuaries and refuges, wetlands, mudflats). A desktop analysis conducted of the project area estimated that approximately 6.3 acres (2.5 hectares) of wetlands may be affected by activities associated with the construction of the dike structures including overland movement of machinery and equipment, staging, and the laying of rock for the dike structures themselves (Figure 3). Further analysis of these wetlands using U.S. Fish and Wildlife Services' (USFWS) National Wetland Inventory (NWI) dataset characterized the potentially impacted wetland types as *freshwater emergent wetland* and *freshwater forested scrub wetland* habitat types. While the site may possess one or more of the characteristics associated with wetlands (including hydrology, hydric soils, and/or wetland plants), field reconnaissance conducted at the site on 10 June 2020 found the areas to be only seasonally inundated and of marginal ecological significance.

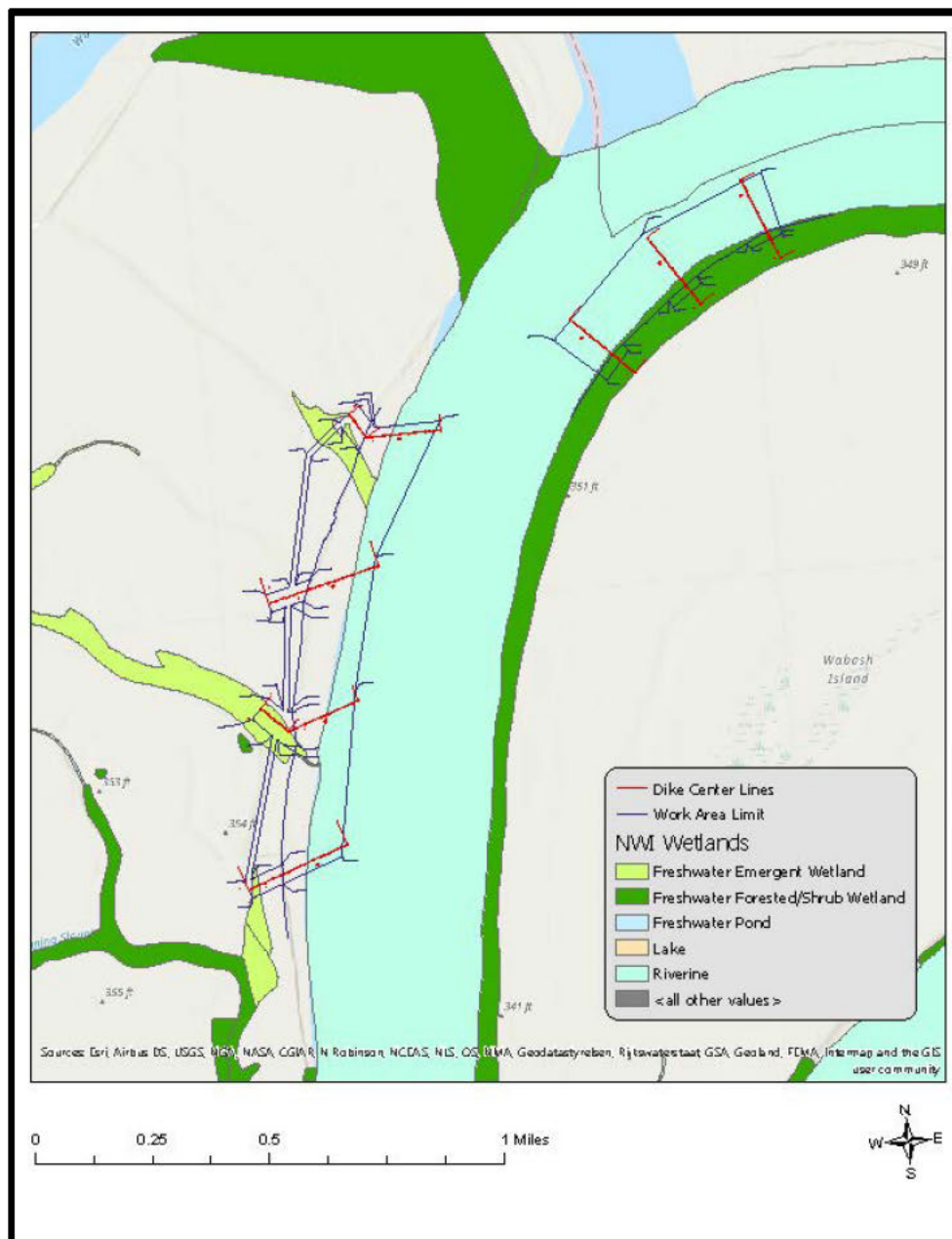


Figure 3. Wetland habitats and construction limits of the Wabash Dikes Project.

(6) Threatened and Endangered Species

Based on data obtained from the USFWS Information for Planning and Consultation (IPaC) resource (USFWS 2020), 16 federally listed species have been or are known to occur in this section of the Ohio River or near the vicinity of the project area. Endangered freshwater mussel species potentially affected by activities associated with the Wabash Dikes Project include the spectaclecase (*Cumberlandia monodonta*), fanshell (*Cyprogenia stegaria*), purple cat' paw (*Epioblasma obliquata obliquata*), northern riffleshell (*Epioblasma torulosa rangiana*), ring pink (*Obovaria retusa*), orangefoot pimpleback

(*Plethobasus cooperianus*), sheepsnose (*Plethobasus cyphus*), clubshell (*Pleurobema clava*), rough pigtoe (*Pleurobema plenum*), and the fat pocketbook (*Potamilus capax*). The threatened mussel species potentially affected by activities in this location is rabbitsfoot (*Theliderma cylindrica*). These mussel species have been experiencing decades of decline due to habitat modification or loss, over harvesting, and pollution. Although all of these species may have been historically present in this area, the majority are not expected to be present within the proposed project area. Several may be extirpated from large parts of their formal ranges and others may be functionally extinct.

Endangered mammals potentially affected by the Wabash Dikes Project include the federally endangered Indiana bat (*Myotis sodalis*), the federally endangered gray bat (*Myotis grisescens*), and the federally threatened northern long-eared bat (*Myotis septentrionalis*). A single federally endangered bird species, the interior least tern (*Sterna antillarum*), a federally endangered plant, Short's bladderpod (*Physaria globosa*), and the rusty patched bumble bee (*Bombus affinis*) are also within range of the Wabash Dikes Project.

No critical habitat has been designated in this area for the federally listed species.

The footprints of nine originally proposed dike structures (in the Ohio River between river miles 847.8 – 849.9) were surveyed for freshwater mussels in September 2019 (Lewis Environmental Consulting, 2019). During this time, a total of nine transects were surveyed covering an estimated area of 1,580 square meters resulting in the documentation of three live mussels (all within the footprint of one dike), including two federally endangered *Potamilus capax*. Based on these results, plans for two proposed dikes (including the footprint containing mussels) were subsequently removed from further consideration; seven of the nine dikes are now proposed for construction.

An estimated total of 13.3 acres of forested habitat will be removed from the shoreline in and around each of the proposed dike structures as required for the implementation of test drilling, and the construction and keying-in of dike structures landward. This number represents the maximum extent of the work limits and is a worse case estimate of potential forested habitat impacts. The construction of the dike structures will involve the removal of forested habitat along sections of the shoreline immediately corresponding to the structures. The removal is expected to occur up to 100 meters along the shoreline and approximately 15 meters up (inland) from the water's edge. This area will be required for the drilling rigs that will be needed to collect bedrock samples and for the construction and armoring of the dike structures themselves. While no protected bat species have been documented in the Action Area, the loss of forested habitat has the potential to impact listed bat species that utilize trees as roosts during the summer reproductive season. However, it should be noted that forested habitat is not a limiting resource in the project area. In addition, the site visit conducted on 10 June documented a great deal of variation in the quality of the forested habitat available to resident bats with a significant proportion not suitable for roosting bats on both short- and long-term time horizons. Field surveys

documented no evidence that the Interior least tern, Short's bladderpod, or rusty patched bumble-bee are found in the Action Area and the habitat found in the Action Area is not suitable for their use.

The Corps has made the determination that implementation of the proposed project would have no effect on any of the 17 species that have the potential to occur in the project area (Table 1). The Biological Assessment (BA) and Environmental Assessment (EA) documents will be submitted to the USFWS as part of the NEPA agency review process.

Table 1. Effects Determination for Listed Species: No Effect (NE); May Affect, Not Likely to Adversely Affect (NLAA); May Affect, Likely to Adversely Affect (LAA).

Species	Common Name	Status	Determination
<i>Physaria globosa</i>	Short's Bladderpod	Endangered	NE
<i>Bombus affinis</i>	Rusty Patched Bumble-bee	Endangered	NE
<i>Sterna antillarum</i>	Interior Least Tern	Endangered	NE
<i>Myotis grisescens</i>	Gray Bat	Endangered	NE
<i>Myotis sodalis</i>	Indiana Bat	Endangered	NE
<i>Myotis septentrionalis</i>	Northern Long-eared Bat	Threatened	NE
<i>Pleurobema clava</i>	Clubshell	Endangered	NE
<i>Cyprogenia stegaria</i>	Fanshell	Endangered	NE
<i>Potamilus capax</i>	Fat Pocketbook	Endangered	NE
<i>Epioblasma torulosa rangiana</i>	Northern Riffleshell	Endangered	NE
<i>Plethobasus cooperianus</i>	Orangefoot Pimpleback	Endangered	NE
<i>Epioblasma obliquata obliquata</i>	Purple Cat's Paw	Endangered	NE
<i>Theliderma cylindrica</i>	Rabbitsfoot	Threatened	NE
<i>Obovaria retusa</i>	Ring Pink	Endangered	NE
<i>Pleurobema plenum</i>	Rough Pigtoe	Endangered	NE
<i>Plethobasus cyphus</i>	Sheepnose Mussel	Endangered	NE
<i>Cumberlandia monodonta</i>	Spectaclecase	Endangered	NE

(7) Other Wildlife

The majority of the proposed work associated with the construction of the Wabash Dikes Project will occur within the water. The area required for the armoring of the dikes onshore is unlikely to significantly affect terrestrial resources. Some vegetation will be cleared in the process of constructing the dikes and moving equipment to and from sites and potential habitat will be temporarily or permanently modified.

(8) Actions to Minimize Impacts

- Best Management Practices will be utilized for all construction activities throughout the project's duration. A description of BMPs to be employed is included in Section II(a)(6).

All required permitting, including Clean Water Act Section 401 Water Quality Certifications, will be obtained from the Kentucky Department of Environmental Protection's Division of Water (KDEP/DOW) and Illinois Department of Natural Resources Office of Water Resources (IDNR/OWR) before commencing any work in the waters of the U.S..

f. Proposed Disposal Site Determinations**(1) Mixing Zone Determination**

Since there is no reasonable probability of chemical contamination, a mixing zone determination is not applicable.

(2) Determination of Compliance with Applicable Water Quality Standards

For the proposed project alternative, no violation of water quality standards is anticipated. A Clean Water Act Section 401 Water Quality Certification will be obtained from the KDEP/DOW and the IDNR/OWR before commencing any work in the water of the U.S.

(3) Potential Effects on Human Use Characteristics**(a) Municipal and Private Water Supply**

Construction activities would not impact municipal or private water supplies.

(b) Recreational and Commercial Fisheries

No significant impacts to recreational and commercial fishing are anticipated from implementation of the proposed project. It is possible that the slack areas rock substrate created by the dike structures could provide habitat for native fish.

(c) Water-related Recreation

No impacts to water-related recreation would occur as a result of the proposed demolition and disposal activities.

(d) Aesthetics

No significant impacts to aesthetics are expected.

(e) Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves

There are no parks, natural and historic monuments, national seashores, wilderness area, research sites, or similar preserves near the project area.

g. Determination of Cumulative Effects on the Aquatic Ecosystem

From a watershed perspective, the proposed construction of the Wabash Dikes Project is expected to have negligible adverse impacts to overall ecosystem health when considered directly, indirectly, and/or cumulatively. Adverse effects associated with the placement of rock and movement of heavy machinery used in the construction are expected to be temporary. However, there may be some long-term positive effects on aquatic life after the stabilization of the hydrological conditions of the area. The production of slack zones between dikes is expected to be favorable to benthic invertebrates and fish communities.

h. Determination of Secondary Effects on the Aquatic Ecosystem

Secondary effects are effects on an aquatic ecosystem that are associated with a discharge of fill material but do not result from the actual placement of the material. No adverse significant secondary effects on the aquatic ecosystem should occur as a result of the proposed project.

III. Findings of Compliance with Restrictions on Discharge with Section 404(b)(1) Guidelines for the Wabash Dikes Project

- a. **Adaptation of the Section 404(b)(1) Guidelines to this Evaluation:** No adaptations of the Guidelines were made relative to the evaluation for this project.
- b. **Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Ecosystem:** The proposed project is the result of thorough evaluation of two alternatives (including the No-Action Alternative) which was documented and analyzed via EA and BA documents. A number of factors are considered in the course of designing and implementing a project of this size including constructability, economics, navigation, and environmental concerns. The Preferred Alternative represents the most practicable alternative that reduces or removes threats to navigation in this section of the Ohio River and would have the least adverse impact on the aquatic ecosystem. This decision was based on numerical hydrodynamic modeling conducted by ERDC-CHL that simulated existing conditions which was then altered to simulate multiple scenarios as solutions to the recurring sediment issues in the Action Area. The current proposed design produced the most desirable results which includes a combination of three dikes on Wabash Island and four dikes on the Illinois shore with sloping crest from top of bank to an elevation of 312 feet next to the navigation channel. The results of this analysis showed the current design best prevented shoaling at

and just downstream of the mouth of the Wabash River and protected the outer bend of the Illinois shore from further erosion.

- c. **Compliance with Applicable State Water Quality Standards:** The discharges associated with the proposed project alternative are not anticipated to cause or contribute to violation of any water quality standards. A Clean Water Act Section 401 Water Quality Certification will be obtained from the commonwealth of Kentucky and state of Illinois before commencing any work in waters of the U.S.
- d. **Compliance with Applicable Toxic Effluent Standard of Prohibition Under Section 307 of the Clean Water Act:** The proposed construction of the Wabash Dikes Project would not violate Section 307 of the Clean Water Act.
- e. **Compliance with the Endangered Species Act:** The Corps has made *No Effect* determinations for 17 listed species in a BA dated October 2020. Both the BA and EA documents are in progress and will be submitted for agency/public review in April/May 2021.
- f. **Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972:** Not applicable.
- g. **Evaluation of Extent of Degradation of the Waters of the United States:** The proposed project would not result in adverse effects on human health and welfare, including municipal and private water supplies, recreation and commercial fishing, plankton, fish, wildlife, and special aquatic sites. There are no significant adverse impacts expected to the aquatic ecosystem diversity, productivity and stability, or recreational, aesthetic, and economic values.
- h. **Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the discharge on the Aquatic Ecosystem:** Appropriate steps to minimize potential adverse impacts on the aquatic system include close coordination with the state and federal resource agencies and incorporation of all valid suggestions, sound engineering design, and careful and deliberate placement of fill material. Additionally, the contractor(s) carrying out the proposed action will be governed by detailed contract specifications to prevent pollution and damage to the aquatic ecosystem as a result of excavation and fill placement. Construction best management practices would be implemented to minimize impacts to the riparian zone and riverbed and to control erosion and resuspension of soil and sediments.
- i. **Determination of Compliance:** On the basis of the EPA 404(b)(1) Guidelines, the proposed disposal site for the discharge of fill material is in compliance with requirements of these guidelines, with the inclusion of BMPs to minimize impacts to the aquatic ecosystem. In addition to BA and EA documents that formally analyze the potential environmental effects of the action, Water Quality Certifications for Illinois and Kentucky are pending.

Appendix B

Tribal Coordination



GWYB DBF
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June 19, 2020

Keith A. Keeney
United States Army Corps of Engineers
Louisville District
600 Dr. Martin Luther King, Jr. Place
Louisville, KY 40202

Re: Wasbash River Dikes Project

Mr. Keith A. Keeney:

The Cherokee Nation (Nation) is in receipt of your correspondence about **Wasbash River Dikes Project**, and appreciates the opportunity to provide comment upon this project. Please allow this letter to serve as the Nation's interest in acting as a consulting party to this proposed project.

In accordance with the National Historic Preservation Act (NHPA, 54 U.S.C. §300101 et seq.) and its implementing regulations (36 CFR Part 800), undertakings subject to the review process are referred to in 54 U.S.C. §306108, which clarifies that historic properties may have religious and cultural significance to Indian tribes. Additionally, Section 106 of NHPA requires federal agencies to consider the effects of their action on historic properties as does the National Environmental Policy Act (NEPA, 42 U.S.C. §4321 et seq.).

To assist with the review, this Office requests the previous cultural resources survey report with current comments from the Illinois and Kentucky State Historic Preservation Offices.

Additionally, the Nation requests that the United States Army Corps of Engineers conduct appropriate inquiries with other pertinent Tribal and Historic Preservation Offices regarding historic and prehistoric resources not included in the Nation's databases or records.

If you require additional information or have any questions, please contact me at your convenience. Thank you for your time and attention to this matter.

Wado,

Elizabeth Toombs, Tribal Historic Preservation Officer
Cherokee Nation Tribal Historic Preservation Office

From: [REDACTED]
To: [REDACTED]
Cc: [REDACTED]
Subject: FW: Wabash River Dikes Project - Illinois & Kentucky
Date: Tuesday, June 2, 2020 5:00:27 PM
Attachments: [image001.png](#)

Response from the Nottawaseppi Huron Band of the Potawatomi on the project.

Keith

-----Original Message-----

From: Douglas Taylor [REDACTED]
Sent: Thursday, May 21, 2020 10:57 AM
To: Keeney, Keith A CIV USARMY CELRL (USA) <[REDACTED]>
Subject: [Non-DoD Source] Wabash River Dikes Project - Illinois & Kentucky

Greetings,

Ref: Wabash River Dikes Project - Illinois & Kentucky

Thank you for including the Nottawaseppi Huron Band of the Potawatomi in your consultation process. From the description of your proposed project, it appears that this project is outside of the Tribes Historical area of interest. It does not appear as if any cultural or religious concerns of the Tribe's will be affected. We therefore have no objection to the project.

Very Respectfully

Douglas R. Taylor

Douglas R. Taylor | Tribal Historic Preservation Officer (THPO)

Pine Creek Indian Reservation

[REDACTED]

[REDACTED]

[REDACTED] | Blockedwww.nhbpi.com

[REDACTED]

Please consider the environment before printing this email. This message has been prepared on resources owned by the Nottawaseppi Huron Band of the Potawatomi located in the State of Michigan. It is subject to the Electronic Communications Policy of Nottawaseppi Huron Band of the Potawatomi. This communication may contain

From: [REDACTED]
To: [REDACTED]
Cc: [REDACTED]
Subject: FW: Wabash River Dikes in Gallatin, Illinois and Union County Kentucky
Date: Tuesday, June 2, 2020 4:56:49 PM

Response from Quapaw Tribe

-----Original Message-----

From: Everett Bandy [REDACTED]
Sent: Friday, May 22, 2020 10:22 AM
To: Keeney, Keith A CIV USARMY CELRL (USA) <[REDACTED]>
Subject: [Non-DoD Source] Wabash River Dikes in Gallatin, Illinois and Union County Kentucky

We have received the information you provided for the proposed Wabash River Dikes in Gallatin, Illinois and Union County Kentucky.

We note that this area is of historic and spiritual importance to our tribe. The Quapaw people lived near the confluence of the Ohio and Wabash at an early point in our history. This project notes archaeological sites within its APE and your correspondence indicates USACE has made a determination of potential to effect.

Our office requests additional information. Please provide the responses of the respective SHPO's for this project. Additionally please provide information [REDACTED] rding USACE plans to avoid or mitigate damage to cultural resources.

Thank you,

-Everett Bandy

Tribal Historic Preservation Officer/THPO Director

Quapaw Nation

P.O. Box 765

Quapaw, OK 74363

[REDACTED]

[REDACTED]



Illinois Department of Natural Resources

www.dnr.illinois.gov

Mailing address: State Historic Preservation Office

Gallatin County
Old Shawneetown
Confluence of the Ohio & Wabash Rivers between River mile marker
Section:30-Township:11E-Range:8S, Section:31-Township:11E-Range:8S
COELV
New construction, 7 riprap stone dikes - Wabash River Dikes Project

December 18, 2020

Montana Martin
Department of the Army
U.S. Army Engineer District, Corps of Engineers
Archaeologist, Environmental Resources
P.O. Box 59
Louisville, KY 40201-0059

Dear Mr. Martin:

We have reviewed the documentation provided for the above referenced project and have no adverse effect on sites 11G20, 160 & 161 listed on or eligible for listing defined in 36 CFR Part 800.5 (b).

Site 11G161 will need to be monitored during construction of Dike 1.

If these plans should be modified, please notify our office. Please refer to the National Historic Preservation Act of 1966, as amended.

If you have any further questions please contact Jeff Kruchten, Chief Archaeologist, Environmental Resources, at Jeffery.kruchten@illinois.gov.

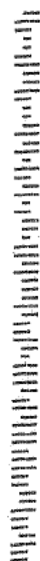
Sincerely,

[Redacted Signature]

Robert F. Appleman
Deputy State Historic
Preservation Officer

PLEASE REFER TO: S

38 JUN 2020 40201



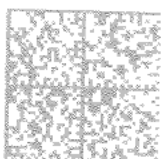
Montana Martin
Department of the Army
U.S. Army Engineer District, Corps of Engineers
Archaeologist, Environmental Resources
P.O. Box 59
Louisville, KY 40201-0059



Illinois Department of Natural Resources

Illinois State Historic Preservation Office
1 Old State Capitol Plaza, Springfield, IL 62701

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Illinois Department of Natural Resources

JB Pritzker, Governor
Colleen Callahan, Director

www.dnr.illinois.gov

Mailing address: State Historic Preservation Office, 1 Old State Capitol Plaza, Springfield, IL 62701

Gallatin County
Old Shawneetown
Confluence of the Ohio & Wabash Rivers between River mile markers 847 & 850
Section:30-Township:11E-Range:8S, Section:31-Township:11E-Range:8S
COELV
New construction, 7 riprap stone dikes - Wabash River Dikes Project

PLEASE REFER TO: SHPO Log #004042220

December 18, 2020

Montana Martin
Department of the Army
U.S. Army Engineer District, Corps of Engineers
Archaeologist, Environmental Resources
P.O. Box 59
Louisville, KY 40201-0059

Dear Mr. Martin:

We have reviewed the documentation provided for the above referenced project. In our opinion, the project as proposed will have no adverse effect on sites 11G20, 160 & 161 listed on or eligible for listing on the National Register of Historic Places as defined in 36 CFR Part 800.5 (b).

Site 11G161 will need to be monitored during construction of Dike 5 to ensure no disturbance per the proposed plans.

If these plans should be modified, please notify our office. Please retain this letter as evidence of compliance with Section 106 of the National Historic Preservation Act of 1966, as amended.

If you have any further questions please contact Jeff Kruchten, Chief Archaeologist at [REDACTED] or [REDACTED]

Sincerely,

Robert F. Appleman
Deputy State Historic
Preservation Officer