US Army Corps
of Engineers
Louisville District

Clean Water Act Section 404(b)(1) Evaluation
Green River Lock and Dam No. 5 Removal

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Contents

List of Figures

1 Project Description

1.1 Location

The proposed Action involves the removal of Green River Lock and Dam 5 (GRLD5), located on the Green River at River Mile (RM) 168.1 near the confluence with Bear Creek (Figure 1).

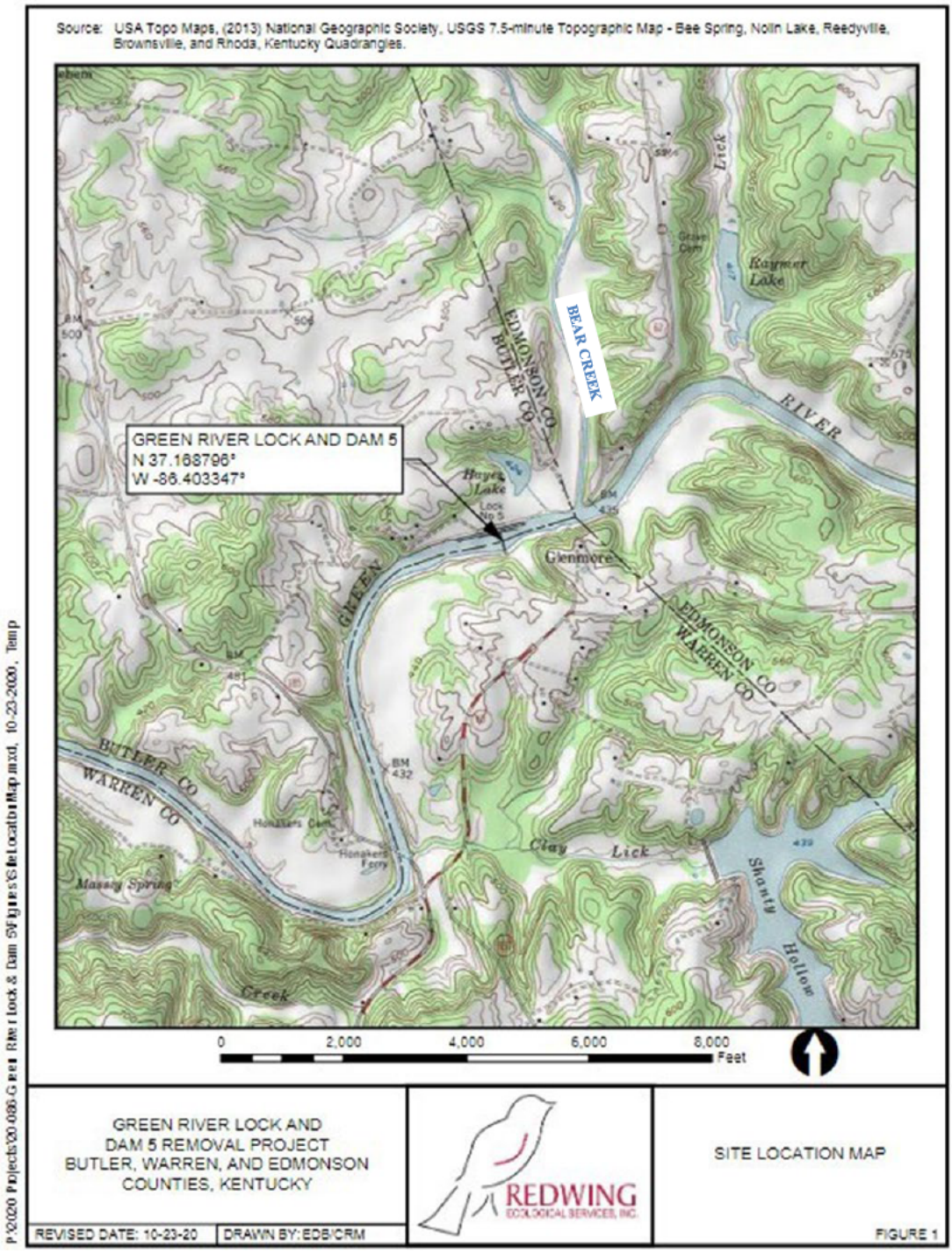

Figure 1. Site location map.

1.2 General Description

The proposed Action will be limited to the "Action Area", which encompasses the area where the effects of the Action may influence physical, chemical, or biological habitat components (Figure 2).

The proposed Action involves the removal of GRLD5. GRLD5 is located on the Green River at RM 168.1 near the confluence with Bear Creek (Figure 1). GRLD5 consists of a 301-foot long dam, a 360-foot long by 56-foot wide lock chamber along the right descending bank, two 30-foot diameter mooring cells located upstream of the lock chamber, a 266-foot long upstream guide wall, and a 300-foot long downstream guide wall (see Figure 3). A two-story concrete operations building is located adjacent to the lock chamber on the right descending bank. The pool upstream of GRLD5 (Pool 5) is 13.6 miles long, with a normal pool elevation of 411 feet above mean sea level (AMSL). The design plans for the removal of GRLD5 are included as an appendix to this evaluation.

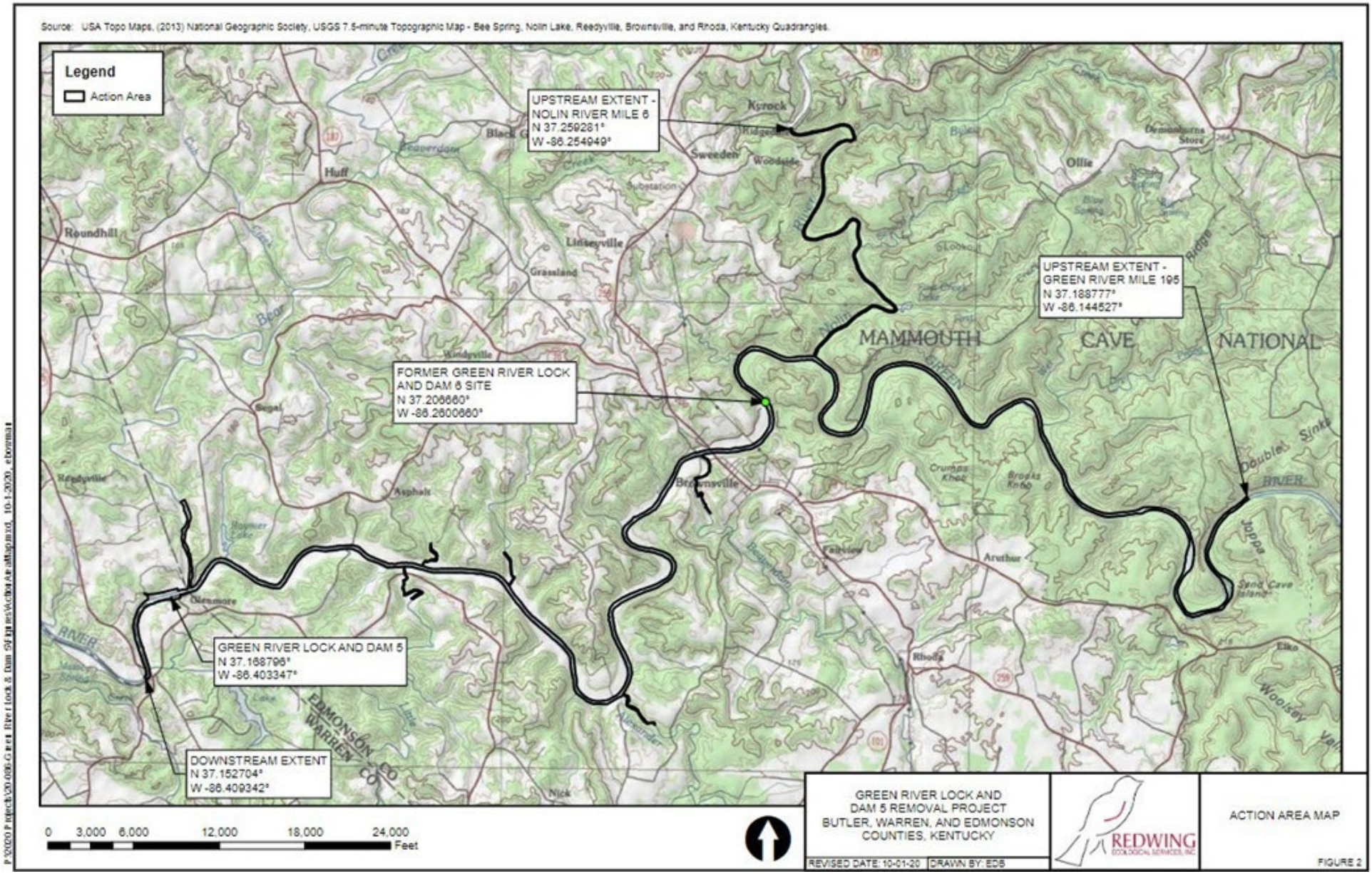

Figure 2. Action area map

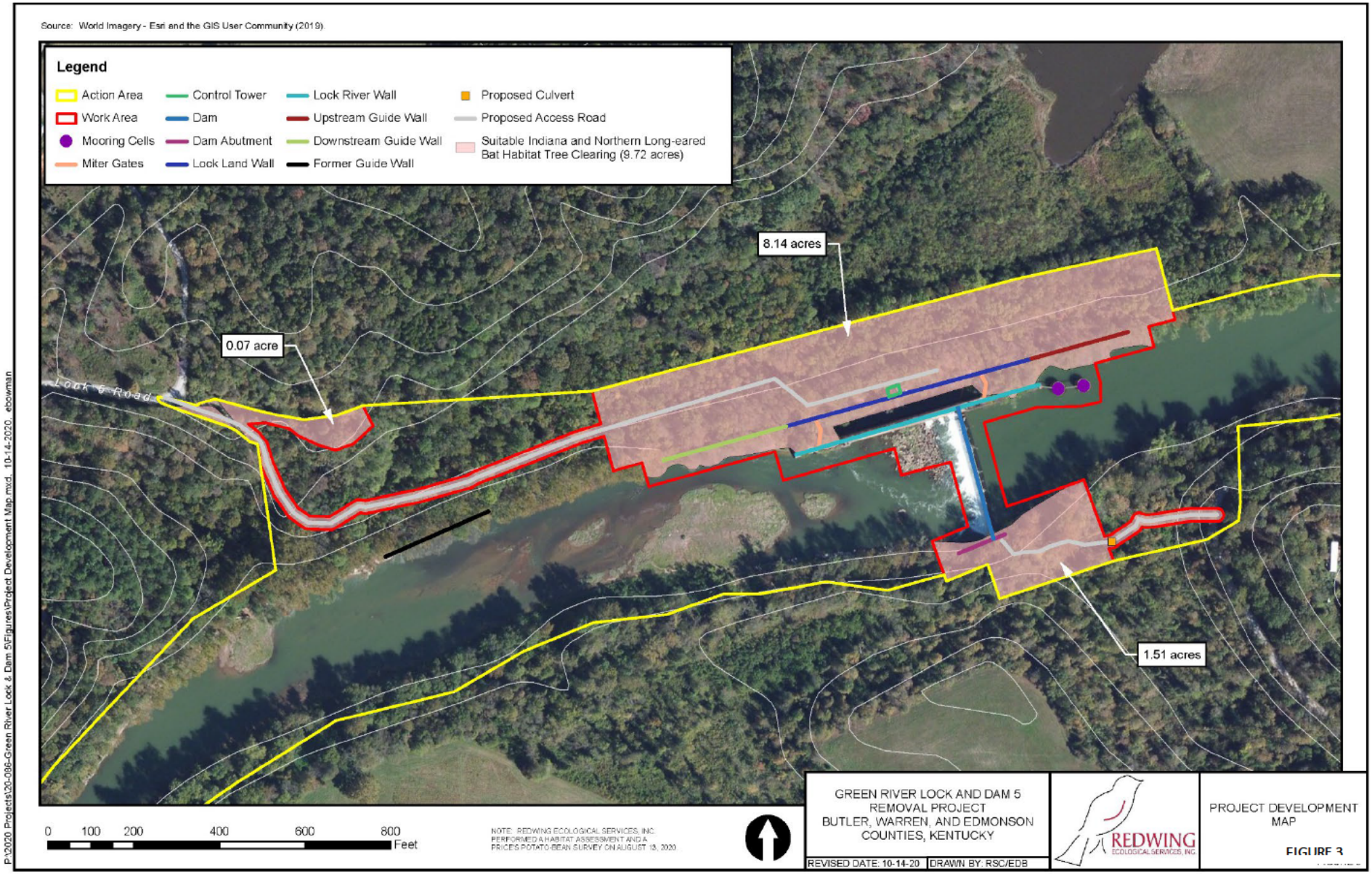

Figure 3. Project development map

1.3 Authority and Purpose

The purpose of the proposed Action is to improve passage for aquatic organisms and restore instream habitat above and below the dam for riverine fish and macroinvertebrates. The proposed Action will also alleviate safety concerns and eliminate costs associated with ownership and maintenance of the structure by the U.S. Army Corps of Engineers (USACE).

GRLD5 is one of six locks and dams on the Green River that were constructed and operated by the USACE for navigation purposes. The current lock and dam were constructed in 1933-1934 to replace the original structure installed in 1900. Operation of the current lock began in 1934 and ceased in 1951 due to a decline in navigational traffic and increasing operation and maintenance costs. Since this time, the USACE has conducted multiple investigations to assess deauthorization and disposal of the Green River Locks and Dams. The most recent study, entitled *Green River Locks and Dams 3, 4, 5 and 6 and Barren River Lock and Dam 1 Disposition Feasibility Study, Kentucky*, was performed in 2014 and reevaluated the current uses of the locks and dams, assessed potential impacts from loss of the dam pools, evaluated the condition and safety of the structures, and discussed potential disposal of the facilities in the future. The study recommended Congressional deauthorization of commercial navigation at these facilities.

In Section 1315 of the 2016 Water Infrastructure Improvements for the Nation Act (WIIN 2016), GRLD5 was deuathorized for commercial navigation and was directed to be conveyed by USACE to the Commonwealth of Kentucky or a nonprofit, non-governmental organization. This language also stated that the lock and dam should be removed at the earliest feasible time. The USACE implementation guidance for Section 1315 called for the completion of a disposal report, with associated environmental documentation, but remained silent on dam removal prior to transfer. In 2018, Section 1311 of the America's Water Infrastructure Act (AWIA) addressed the removal activities stating that the Secretary could proceed with removal if the Secretary determines that removal is necessary before conveyance, that the Secretary may us appropriated funds and that the Secretary may accept contributed funds for the removal action.

As part of the 2014 study, an Environmental Assessment was prepared to evaluate the environmental impacts associated with disposal of the Green River Locks and Dams. Although the removal of GRLD5 was not examined under the assessment, the removal of Green River Lock and Dam 6 (GRLD6) was included as one of the evaluated alternatives. The 2014 study concluded that the removal of GRLD6 would result in long-term benefits to the Green River by restoring 17 miles of river habitat upstream of the structure. Return of the impoundment to free-flowing conditions would change the species composition by allowing lotic species to return to this portion of the river, resembling the natural community upstream. Habitat for mussels and other aquatic

organisms would improve as accumulated sediment behind the dam moved downstream and exposed gravel bars and other favorable substrates. Lotic fish species would also move into the former impoundment, including fish hosts that would help recolonize this area with mussels.

The 2014 study also concluded that threatened and endangered species in Mammoth Cave National Park (MCNP) would benefit from the removal of GRLD6. Restoration of natural flow in the Green River would improve habitat for the Kentucky cave shrimp by reducing sediment accumulation in underground passages and returning pools to more natural conditions. Lowering of the water level in the river would also allow Indiana and gray bats to access cave entrances and passages that had been flooded for over 100 years. Additionally, cave-dwelling species would benefit from restoration of more natural microclimate conditions inside the cave systems. Removal of GRLD6 would increase wetlands along the riverbanks as the water level upstream of the dam receded and exposed areas adjacent to the river channel. Dormant seeds in these areas would be exposed, increasing wetland vegetation and expanding these linear wetlands. Native tree species would also grow on the newly exposed banks, helping to stabilize these areas.

On November 24, 2016 a large void developed through the timber cribbing of GRLD6. The void increased in size over a 24-hour period and by November 25, 2016 the dam lost pool. The portion of the concrete overflow weir that spanned the void remained after loss of pool but was rapidly deteriorating to the point where a full collapse was considered imminent. In order to mitigate this safety hazard, the USACE removed the dam in April 2017 as an emergency action.

The Office of Kentucky Nature Preserves (KNP), in partnership with several state and federal agencies, continue to monitor the Green River to identify any changes associated with the removal of GRLD6 and the pending removal of GRLD5. The goal of the this effort is to document and assess the biological and physical recovery of the river following the removal of the barriers. Over 60 species of fish and over 30 species of mussels have been encountered. Preliminary results indicate that the river has a relatively high biological diversity despite being impounded for many decades. Notably, four federally endangered mussels have been encountered and will likely benefit from the removal of the dams.

Based on the conclusion in the 2014 Environmental Assessment that the removal of GRLD6 would provide numerous benefits to the Green River ecosystem and the preliminary survey results conducted by KNP, the removal of GRLD5 is expected to result in similar benefits. As a result, the removal of GRLD5 will meet the purpose and need for the proposed Action.

1.4 General Description of Dredged or Fill Material

1.4.1 General Characteristics of Material

Removal of GRLD5 will include demolition and removal of all structures, including the dam, dam abutment, lock river wall, lock land wall, upstream and downstream guide walls, mooring cells, and operations building. The locations of these components are shown on Figure 3 and depicted on the demolition plans in the appendix of this evaluation. Generally, demolition activities will be initiated on the north side of the river and will extend toward the south side. Two existing structures associated with GRLD5 will not be removed as part of the proposed Action, including an area of derrick stone overlaying wood piles on the downstream side of the dam adjacent to the lock river wall and a guide wall associated with the former lock and dam located along the right descending bank approximately 400 feet downstream.

The initial step in the demolition process will be the creation of a notch at the southern end of the dam to partially drain the impoundment upstream. Equipment will access the dam from the work area on the south side the river and begin by demolishing the dam abutment to the elevation of the existing dam. Once the dam elevation has been reached, a notch extending four to five feet vertically from the top of the dam will be created. The horizontal extent of the notch will be limited by the reach of the equipment but is expected to extend approximately 15 feet from the abutment. The dam is mostly mass rebar reinforced concrete founded on piles on the lock side to about halfway across the river. The only timber cribs are along the river wall of the lock chamber to protect it from scour. Some mechanical components such as the miter gates, valves, etc. are still present. Those parts will be removed and disposed off site at an approved location, along with the steel sheet piles of the mooring cells.

Concrete will make up approximately 95 % of the demolition material. The majority of the timber piles and limestone rock fill will stay in the foundation; however, a small amount may be pulled up or broken off during demolition.

While the impoundment is draining, demolition will be initiated in the work area on the north side of the Green River (see Figure 3). All material from the demolition of the operations building, the lock land wall, and the guide walls will be placed in the lock chamber to construct a work pad to the lock river wall. These structures are made of concrete and are expected to be demolished using a hoe ram attached to an excavator or similar equipment. As presented in the demolition plans, the lock land wall will only be removed to an elevation of 406 feet AMSL to create a constant slope to the inner toe of the lock river wall. The existing bank behind the lock land wall will also be graded to create a stable slope, and the grading is expected to extend approximately 45 to 50 feet landward from the lock land wall. The upstream and downstream miter gates will be removed and placed in the bottom of the lock chamber.

Once the work pad has been constructed, demolition of the lock river wall will commence utilizing hoe ram equipped excavators. If necessary, controlled explosive charges may be utilized to rubblize the wall for more efficient removal. During this phase of demolition, the lock river wall will be removed to the elevation of the top of the dam. Material generated from removal of the lock river wall will be used to construct the initial portion of an instream work pad along the downstream face of the dam. The work pad may be installed on the upstream side of the dam if required to address safety concerns or if deemed more efficient; however, this approach is not typically used in dam removals.

Equipment will utilize the instream work pad to remove the upper portion of the dam that is exposed after partial draining of the impoundment. Material from the dam will be used to complete the instream work pad. The dam will be demolished in lifts, with the vertical extent of each lift determined by the water level to ensure that the equipment is not working in more than two feet of water for safety reasons. Depths of greater than two feet reduce the stability of the equipment and may submerge portions of the equipment engine, resulting in potential release of engine fluids or damage to equipment. Once the instream work pad has been constructed across the river, additional material generated during demolition will be placed within the lock chamber. The dam and instream work pad will be removed to an elevation of approximately 390 feet AMSL; however, the dam sills and pilings will not be removed. Steel reinforcement rods, if present in the dam, will be broken at the proposed final elevation and bent downstream to avoid snags. The dam abutment on the southern side of the river will be removed to an elevation of approximately 395 feet AMSL.

Following removal of the dam and abutment, the remainder of the lock river wall will be removed to an elevation of approximately 390 feet AMSL. The material generated from final removal of the lock river wall will be used to construct a second instream work pad to the mooring cells. The mooring cells are constructed of steel sheet piling driven into approximately 20 feet of sediment, down to bedrock. The center portion of the mooring cell is expected to be filled with sand, and the top is capped with concrete. Demolition of these structures will require that the sheet piles be pulled from the bed, and this material will be disposed of at an approved offsite location. The sand material within the mooring cells will be excavated to the extent possible and used to cover the material within the lock chamber or in other areas where erosion of the material can be avoided. Once the mooring cells have been removed, the work pad will be removed to the extent possible, and the remaining portions of the lock land wall and guide walls will be removed to an elevation of approximately 406 feet AMSL. The banks behind these walls will also be graded to create a stable slope. Soil material generated from bank grading will be used to cover the material in the lock chamber.

Demolition of the dam, lock walls, and guide walls is expected to generate material in excess of the volume of the lock chamber; therefore, the excess material will be used to stabilize the stream banks, create parking areas, dress the site access road, and for other site stabilization activities.

Potential stressors associated with removal of GRLD5 include sediment deposition, water quality degradation, changes to flow, crushing or striking of individuals, displacement of individuals, and exposure of individuals.

1.4.2 Quantity of Material

Approximately 33,000 cubic yards (CY) of material will be generated from the demolition of the GRLD5 structures. Approximately 11,000 CY of material will be placed into the lock chamber, and the remaining 22,000 CY will be placed along the right-descending streambank, where the downstream guide wall currently stands.

1.4.3 Source of Material

Clean material from the demolition of the operations building, the lock land wall, the guide walls, and the dam will be used as fill for the lock chamber and the temporary work pad. Metal components of the demolished material, such as the steel sheet piling form the mooring cells, will be removed and disposed of off-site.

1.5 Description of the Proposed Discharge Sites

1.5.1 Location

All fill material generated from the demolition of the structures will be placed within the lock chamber and along the right-descending stream bank in the same location of the downstream guide wall.

1.5.2 Size

Approximately 1,050 linear feet of stream and 122,000 square feet of stream will be directly affected by demolition activities of GRLD5. Fill will be placed in area of approximately 34,000 square feet, including the lock chamber. Temporary work pads used to gain access to the dam for demolition activities may be constructed on either side of the dam. A 50-ft buffer on both sides of the dam was used to calculate an area of 22,000 square feet in which temporary fill may be placed for the work pads. This 50-ft buffer is included in the work area depicted in Figure 3.

1.5.3 Type(s) of Sites and Habitats

While the impoundment formed by GRLD5 has adversely affected the riverine habitat of the Green River, the river still provides suitable habitat for many aquatic organisms, including threatened and endangered mussel species. Lotic conditions downstream of GRLD5 provide ample flow for many riverine fish and mussel species. Upstream of the

dam, habitat has been altered into more lentic conditions during periods of normal water levels due to impoundment. As a result, the pool of GRLD5 suffers from increased sedimentation, which has reduced habitat suitability for benthic organisms, and the fish species the rely on them as a source of food.

1.5.4 Time and Duration of Discharge

Assuming normal water level fluctuations, the total construction time of the proposed Action would be approximately eight weeks, beginning in June of 2021. Prolonged high-water periods my increase construction time.

1.6 Description of Disposal Method

The disposal of material will be accomplished mostly with hydraulic excavators. The construction activities would utilize the following vehicles:

(2) Hydraulic Excavators 4.5 CY Bucket
(1) 200 HP Dozer
(1) Front End Loader 4 CY Bucket
(2) 25 Ton Off-Road Articulating Trucks

2 Factual Determinations

2.1 Physical Substrate Determinations

2.1.1 Substrate

The substrates of the proposed demolition site are composed of various types, including sand, silt, gravel, cobble, and boulders. Substrate on the upstream side of the dam is generally more silt-laden than that immediately downstream of the dam. After removal of GRLD5, fine sediment from upstream of the dam will be transported and redistributed downstream, restoring small particles to any scour areas downstream of the dam. In addition, the movement of accumulated sediment from Pool 5 will expose gravel, cobble, and boulders that have previously been covered by silt. Although large amounts of fine sediment were not documented upstream of the dam, downstream sediment transport is expected to occur. Some of this sediment is expected to settle in any scour areas immediately downstream of the dam, restoring small particles to this area and filling the spaces between larger pieces of dam material.

2.1.2 Sediment Type

Soil maps from the Natural Resources Conservation Service (NRCS) indicated soil type within the project area is mostly comprised of Nolin and Newark silt loams that are frequently flooded and contribute to the sediments moving through the watershed.

2.1.3 Dredged/Fill Material Movement

Fill will be placed in a way to minimize movement after completion of the proposed Action. Large stones and concrete debris generated from the demolition will be used to cap fill areas to limit movement of material during high water events. Rock fill material used to build work pads will be removed simultaneously with the dam.

2.1.4 Physical Effects on Benthos

The proposed Action could expose benthic species to the following stressors: sediment disturbance and water quality degradation in the work area and the Action Area downstream of the work area during lock and dam removal; and crushing or striking of individuals in the work area during lock and dam removal. The stressors are expected to have insignificant or discountable effects on the benthos throughout the remainder of the Action Area.

While these localized impacts to benthic organisms and their habitats would occur in the immediate areas of demolition activities, removal of GRLD5 is expected to have a positive effect on benthic community of organisms throughout the Action Area by reestablishing the natural hydrologic regime and increasing interstitial spaces and abundance of periphyton in the river upstream of GRLD5. For these reasons, long-term, beneficial impacts to benthos are expected from the Proposed Action.

2.1.5 Other Effects

No other effects are known.

2.1.6 Actions Taken to Minimize Impacts

The following conservation measures are proposed to avoid and minimize impacts from the proposed Action to the physical environment and fish and wildlife habitat:

(1) Implement erosion control measures in the work area, including but not limited to:

a. Stabilization of disturbed areas as soon as practicable but no more than seven (7) days after construction activities have temporarily or permanently ceased in any portion of the work area. At a minimum, interim and permanent practices implemented to stabilize disturbed areas will include temporary and/or permanent seeding, erosion control matting, mulching, and/or sodding.

b. Structural measures will be implemented to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. These measures shall be implemented in a timely manner during the construction process to minimize erosion and sediment runoff. Structures may include silt fence or coir rolls, stone silt check dams, temporary gravel construction entrances/exits, and/or riprap.

(2) Revegetate disturbed areas immediately following completion of ground disturbing activities.
(3) Perform instream activities during periods of low flow.
(4) Use of instream work pads during lock and dam removal to minimize impacts to the river from equipment. The work pads will be located in areas that do not provide suitable habitat for mussels.
(5) Implement best management practices (BMPs) when operating machinery on the instream work pad or within the riparian area to avoid and minimize the potential for accidental spills and have a spill response plan in place should an accidental spill occur.
(6) Remove any remaining hydraulic fluid from the hydraulic piping system in the operations building and lock chamber and dispose of appropriately.
(7) Incremental removal of the dam to reduce the rate of water recession upstream of the dam.
(8) Monitoring in the upstream portion of the Action Area during dam removal to locate exposed mussels and return individuals to areas of suitable habitat.

These measures will be implemented throughout the work area during construction, as necessary and appropriate. The conservation measures are anticipated to help avoid and minimize adverse effects to substrates and fish and wildlife habitats; however, these measures are not expected to eliminate all adverse effects that may result from the proposed Action.

2.2 Water Circulation, Fluctuation, and Salinity Determinations

2.2.1 Water

Increases in turbidity would occur at the demolition areas and downstream of the areas during demolition. Temporary changes in turbidity have not been modeled; however, they are not expected to significantly impact water quality or to exceed levels experienced during typical high flow events on the river.

No significant negative impacts would be expected to water quality or sensitive organisms as a result of the Proposed Action.

Salinity

There are no impacts expected to salinity.

Water Chemistry

No significant impacts to water chemistry are expected.

Clarity
There may be a local and temporary increase in turbidity during construction activities. BMPs such as soil fences would be implemented where appropriate at the upland locations to control and reduce turbidity during construction. Water clarity is expected to return to normal background levels shortly after operations are completed.

Color
Water immediately surrounding the construction area may become discolored temporarily due to disturbance of the sediment.

Odor
Negligible amounts of hydrogen sulfide may be expected when disturbing possible anoxic sediments at the construction sites. Otherwise, there are no long-term impacts to odor.

Taste
No impacts to taste are expected.

Dissolved Gas Levels
No impacts to dissolved gas levels would be expected.

Nutrients
There are no impacts expected to nutrients.

Eutrophication
Demolition activities would not lead to eutrophication of surrounding waters.

Others as Appropriate
None known.

2.2.2 Current Patterns and Circulation

Current Patterns and Flow
Completion of the proposed action activities would reduce surface water elevations upstream of the GRLD5 and reestablish the natural flow regime of the river within the action area, which incorporates approximately 13.6 miles of the Green River.

Velocity
Removal of the dam would increase velocities within the former pool of GRLD5. Placement of material within the channel would not impact velocities.

Stratification

No change in this condition is expected**.**

Hydrologic Regime

Hydrologic regimes would be altered to the natural condition after removal of the dam. The former pool of GRLD5 would return to lotic conditions with increased water velocities at all water levels.

Changes to the hydraulic conditions in the Green River after removal of GRLD5 were analyzed by the USACE based on previous hydraulic modeling. GRLD5 is a run-of-river type dam and does not significantly impound flood water within Pool 5. The crest of the dam is located at an elevation of approximately 412 feet AMSL, and the elevation of the associated floodplain is approximately 429 feet AMSL. Due to the difference between these elevations, the hydraulic capacity over the dam is large enough to allow the inflow and outflow of Pool 5 to be effectively equal. Flow downstream of the dam is not affected by the presence of the dam; therefore, removal of the dam is not anticipated to change downstream flow from existing conditions. This lack of change is demonstrated in Figure 4.

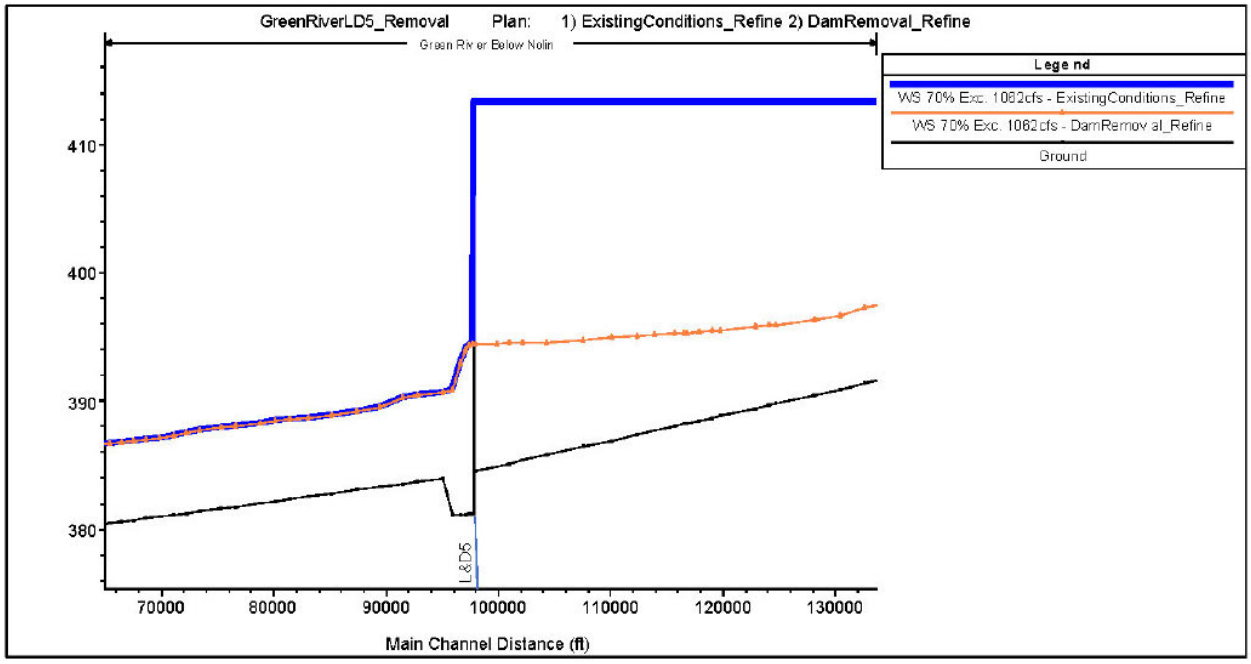

Figure 4. Model of water surface elevation changes from removal of GRLD5

2.2.3 Normal Water Level Fluctuations

The average water surface elevation within the existing pool of GRLD5 would be lowered significantly after removal of the dam (see Figure 4). Water levels downstream of the dam are not expected to be affected by dam removal.

2.2.4 Salinity Gradients

There would be no change in salinity gradients.

2.2.5 Actions That Would Be Taken to Minimize Impacts

The footprint of the placed material would be minimized to the greatest extent practicable, such that impacts to water circulation and fluctuation would be negligible in the immediate work area.

2.3 Suspended Particulate/Turbidity Determination

2.3.1 Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site

Increased turbidity typically occurs during dam removals due to the disturbance and suspension of sediment that has accumulated behind the dam. The increased turbidity from dam removal is a temporary effect that will subside as sediment is flushed through the river system.

A temporary and localized increase in suspended particulates and turbidity levels is expected during placement of material into discharge sites. Upon completion of demolition activities, suspended particulates and turbidity levels are expected to return to current levels.

2.3.2 Effects on Chemical and Physical Properties of the Water Column

Light Penetration

Turbidity levels would be temporarily increased during placement of material. Upon completion of demolition activities, light penetration is expected to return to current levels.

Dissolved Oxygen

Inputs of sediment or sediment disturbance in the Green River could result in increased turbidity and decreased dissolved oxygen (DO); a reduction in DO may occur at localized and temporary events during placement. Increases in DO above the dam may occur after removal from increased flow which would allow for improved oxygenation.

Toxic metals and organics

Sediment sampling conducted at GRLD5 by the Nature Conservancy in 2017 indicated that large amounts of fine sediment had not accumulated behind the dam, and that the substrate was relatively clean and free of silt, with no toxic metals or organics were present (sampling report in appendix) Furthermore, suspended particles resulting from placement of fill would not result in detrimental effects to chemical and physical properties of the water column.

Pathogens
None expected or found.

Aesthetics
Long-term positive impacts to aesthetics are expected from removal of GRLD5 and its associated structures. After removal, the site would revert to a more natural riverine setting as the former hydrology of the area is restored.

Others as Appropriate
None known.

2.3.3 Effects on Biota

Site preparation, lock and dam removal, and site stabilization could result in water quality degradation through suspension of fine sediment in the water column. Inputs of sediment or sediment disturbance in the Green River could result in increased turbidity and decreased DO. These conditions could result in harm or mortality of biota or cause individuals to move from an area if they persist for an extended period of time. High turbidity could affect the food supply of mussels by blocking sunlight needed by algae and phytoplankton and disrupt reproduction by reducing the visibility of mussel lures to fish hosts. Lower dissolved oxygen could affect the respiration of mussels and fish hosts.

Based on the gradual removal of the dam in stages, accumulated sediment is anticipated to move downstream in small amounts over an extended period of time. Increased suspended particulates in the work area and areas immediately downstream is expected to be temporary as sediment is moved farther downstream; however, sediment from Pool 5 will likely move into the work area with each high flow event until the accumulated sediment is redistributed throughout the river. Although mussels may be able to respond to minimal, temporary sediment deposition, the combination of the initial movement of sediment from directly upstream of the dam combined with the subsequent influx of sediment from areas farther upstream may result in deposition too substantial to allow all individuals to adjust. Sediment deposition that occurs during periods of low water temperatures and decreased mussel activity will also reduce the ability of individuals to respond to deposition events. While the initial reclamation stages of the river could increase turbidity and potentially harm biota, long-term impact of the Proposed Action is expected to result in significant benefits to the native biota.

2.3.4 Actions Taken to Minimize Impacts

The footprint of the placed material would be minimized to the greatest extent practicable, such that impacts from fill material to suspended particulates and turbidity levels would be negligible. Conservation measures listed in Section 2.1.6 will be implemented to minimize impacts to water quality from demolition activities.

2.4 Contaminant Determinations

Fill material used will be obtained onsite. Site investigations have revealed no reason to expect the fill material would be contaminated.

2.5 Aquatic Ecosystem and Organism Determinations

2.5.1 Effects on Plankton

Demolition activities and placement of fill are expected to have minor, temporary, local impacts on plankton from increased turbidity levels.

2.5.2 Effects on Benthos

The Proposed Action could expose benthic species to stressors that include sediment disturbance and water quality degradation in the work area and the Action Area downstream of the work area during lock and dam removal; and crushing or striking of individuals in the work area during lock and dam removal. The stressors are expected to have insignificant or discountable effects on the benthos throughout the remainder of the Action Area.

While these localized impacts to benthic organisms and their habitats would occur in the immediate areas of demolition activities, removal of GRLD5 is expected to have a positive effect on benthic community of organisms throughout the Action Area by reestablishing the natural hydrologic regime and increasing interstitial spaces and abundance of periphyton in the river upstream of GRLD5. For these reasons, long-term beneficial impacts to benthos are expected from the Proposed Action.

2.5.3 Effects on Nekton

No significant impacts to the nekton of the area from the Proposed Action.

2.5.4 Effects on Aquatic Food Web

Reductions in primary productivity from turbidity would be temporary and localized around the immediate area of the construction and would be limited to the duration of the plume at a given site. The removal of the dam is expected to result in long-term beneficial impacts to the aquatic food web.

2.5.5 Effects on Special Aquatic Sites

The Green River beginning immediately downstream of GRLD5 is designated as an Outstanding National Resource Water and Exceptional and Reference Reach Water by 401 KAR 10:030. The proposed Action would be expected to result in long-term beneficial impacts to the river and enhance its national significance.

2.5.6 Threatened and Endangered Species

The identification of species listed under the Endangered Species Act (ESA) for inclusion in the biological assessment was based on a review of occurrence records maintained by the U.S. Fish and Wildlife Service (USFWS). The biological assessment is included in the appendix of this evaluation.

Gray Bat

Three listed bat species have potential to occur in the project area: gray bat, Indiana bat and northern long-eared bat. Based on the lack of impacts to gray bat hibernacula and roosting habitat and minimal impacts anticipated to foraging habitat, forage supply, and commuting habitat, effects to the gray bat as a result of the proposed Action are considered insignificant.

Indiana Bat

The loss of suitable summer habitat from the tree clearing included in the proposed Action will result in adverse effects to the Indiana bat. Adverse effects will be mitigated through a payment to the Imperiled Bat Conservation Fund (IBCF), utilizing the process set forth in the *Revised Conservation Strategy for Forest-Dwelling Bats in the Commonwealth of Kentucky* (June 2016). The proposed Action is consistent with the actions evaluated in the *2015 Biological Opinion: Kentucky Field Office's Participation in Conservation Memoranda of Agreement for the Indiana Bat and/or Northern Long-eared Bat* that supports the conservation strategy.

Northern Long-eared Bat

The Action Area is located greater than 0.25 mile from the known northern long-eared bat hibernacula and 150 feet from the known maternity roost trees. These conditions are considered to be consistent with and addressed via the northern long-eared bat final 4(d) rule and the USFWS's January 5, 2016 Intra-Service Programmatic Biological Opinion on the final 4(d) rule for the northern long-eared bat. Therefore, use of the 4(d) rule is proposed to address adverse effects to the northern long-eared bat from the proposed Action.

Mussels

Seven mussel species were determined to potentially occur in the Action Area: spectaclecase, fanshell, pink mucket, ring pink, sheepnose, rough pigtoe, and rabbitsfoot. Potential impacts to these species have been minimized to the extent possible through the use of conservation measures; however, adverse effects to the mussel species are

expected as a result of the proposed Action. Therefore, the effects determination for the spectaclecase, fanshell, pink mucket, ring pink, sheepnose, rough pigtoe, and rabbitsfoot as a result of the Action is "may affect, likely to adversely affect". A biological assessment for the proposed Action has been submitted to the U.S. Fish and Wildlife Service. Issuance of a biological opinion from the USFWS is expected in March 2021.

2.5.7 Other Wildlife

No significant detrimental impacts to other wildlife species are anticipated.

2.5.8 Actions to Minimize Impacts

Several conservation measures are proposed to avoid and minimize impacts from the proposed Action in Section 2.1.6 of this evaluation.

2.6 Proposed Disposal Site Determinations

2.6.1 Mixing Zone Determination

N/A

2.6.2 Determination of Compliance with Applicable Water Quality Standards

For the proposed Action, no violation of water quality standards is anticipated. A water quality certification from the Commonwealth of Kentucky will be obtained before demolition activities begin.

2.6.3 Potential Effects on Human Use Characteristics

Municipal and Private Water Supply

The proposed Action would not impact any municipal or private water supplies. The USACE provided the Edmonson County Water District with a Planning Assistance to States study that concluded no effects are expected to water supply from the removal of GRLD5.

Recreational and Commercial Fisheries

The proposed Action would be expected to alter the fish community in the stretch of the Green River that was the former pool of GRLD5. Over time, the fish assemblages would be expected to transition back to consisting of more diverse native species that were present before the river was impounded. This may improve recreational fishing, although fishing methods may need to change to account for higher water velocities.
No impacts to commercial fishing are anticipated as the area is not utilized as a commercial fishery.

Water-related Recreation

Removal of the dam would result in greater water velocities at base flows, which has the potential to alter water-related recreation. The most popular activities on the Green River-

kayaking and canoeing- would likely be improved by the removal of the dam. This would open over 13 miles of free-flowing river and eliminate safety concerns the are inherent with low head dams.

Aesthetics

Aesthetics would be expected to improve in the Action Area as the river returns to a more natural state, and the failing infrastructure of GRLD5 is removed.

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

No special sites would be negatively impacted by the proposed Action. The removal of GRLD5 has been coordinated with the Kentucky State Historic Preservation Office.

2.7 Determination of Cumulative Effects on the Aquatic Ecosystem

The purpose of the proposed Action is to improve passage for aquatic organisms and restore instream habitat above and below the dam for riverine fish and macroinvertebrates. Future activities, such as increased residential or commercial development, agricultural practices, increased traffic, or tourism, in the area are not reasonably certain to occur as a result of the Action. Based on these factors, no adverse cumulative effects to the aquatic ecosystem are anticipated as a result of the proposed Action.

2.8 Determination of Secondary Effects on the Aquatic Ecosystem

Secondary effects are effects on an aquatic ecosystem that are associated with a discharge of dredged or 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 Action.

3 Findings of Compliance with Restrictions on Discharge with Section 404(b)(1) Guidelines

A. No significant adaptations of the Guidelines were made relative to the evaluation for this proposed Action.
B. The proposed Action represents the least environmentally damaging practicable alternative.
C. The discharges associated with the proposed Action 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 before commencing any work in waters of the U.S. Additionally, the proposed Action alternative would not violate any toxic effluent standards of Section 307 of the Clean Water Act.

D. The proposed Action would not jeopardize the continued existence of any federally-listed threatened or endangered species or their critical habitat or violate any protective measures for any sanctuary.
E. The proposed Action 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.
F. Appropriate and practicable steps will be taken to minimize potential adverse impacts of discharge on the aquatic system.

Prepared by:

[redacted]

03 MAY 2021

Date

Biologist, Planning Section
U.S. Army Corps of Engineers, Louisville District

Approved by:

[redacted]

09 MAY 2021

Date

Chief, Planning Section
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