ENVIRONMENTAL ASSESSMENT
FOR
HYDROPOWER LICENSE

Mother Ann Lee Hydroelectric Project

FERC Project No. 539-015

Kentucky

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
Washington, DC 20246

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ACRONYMS AND ABBREVIATIONS

APE	area of potential effects
APLIC	Avian Power Line Interaction Committee
BMPs	best management practices
Lock 7 Partners	Lock 7 Hydro Partners, LLC
°C	degrees Celsius
certification	water quality certification
C.F.R.	Code of Federal Regulations
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
dbh	diameter at breast height
DO	dissolved oxygen
EA	environmental assessment
EIA	Energy Information Administration
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
°F	degrees Fahrenheit
FPA	Federal Power Act
fps	feet per second
FWS	U.S. Fish and Wildlife Service
Heidelberg Project	Heidelberg Hydroelectric Project
HPMP	Historic Properties Management Plan
Interior	U.S. Department of the Interior
IPaC	Information for Planning and Conservation
KRA	Kentucky River Authority
Kentucky DEP	Kentucky Department for Environmental Protection
Kentucky DFWR	Kentucky Department of Fish and Wildlife Resources
Kentucky EPPC	Kentucky Exotic Pest Plant Council
kV	kilovolt
mg/L	milligrams per liter
Mother Ann Lee Project	Mother Ann Lee Hydroelectric Station Waterpower Project
MW	megawatt
MWh	megawatt-hour
National Register	National Register of Historic Places
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NWI	National Wetlands Inventory
O&M	Operations and Maintenance
PA	Programmatic Agreement
Matilda Hamilton Fee Project	Matilda Hamilton Fee Hydroelectric Station
RM	river mile

SERC	Southeastern Electric Reliability Council
Kentucky SHPO	State Historic Preservation Officer
T&E species	threatened and endangered species

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1.0 INTRODUCTION

1.1 APPLICATION

On April 30, 2020, Lock 7 Hydro Partners, LLC (Lock 7 Partners) filed an application for a new license with the Federal Energy Regulatory Commission (Commission) to continue to operate and maintain the Mother Ann Lee Hydroelectric Station Water Power Project No. 539-015 (Mother Ann Lee Project or project) .[1] The 2.21-megawatt (MW) project is located on the Kentucky River, in Mercer, Jessamine, and Garrard Counties, Kentucky, at the Kentucky River Lock and Dam No. 7, which is owned by the Commonwealth of Kentucky and operated by the Kentucky River Authority (KRA) (figure 1-1). The project does not occupy federal land. The project generates 9,200 megawatt-hours (MWh) annually. Lock 7 Partners proposes no changes to the project's capacity or mode of operation.

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The purpose of the Mother Ann Lee Project is to provide hydroelectric power. Therefore, under the provisions of the Federal Power Act (FPA), the Commission must decide whether to issue a new license to Lock 7 Partners for the Mother Ann Lee Project and what conditions should be placed on any license issued. In deciding whether to issue a license for a hydroelectric project, the Commission must determine that the project will be best adapted to a comprehensive plan for improving or developing a waterway. In addition to the power and developmental purposes for which licenses are issued (such as flood control, irrigation, or water supply), the Commission must give equal consideration to the purposes of: (1) energy conservation; (2) the protection of, mitigation of damage to, and enhancement of fish and wildlife resources; (3) the protection of recreational opportunities; and (4) the preservation of other aspects of environmental quality.

Issuing a new license for the project would allow Lock 7 Partners to continue to generate electricity at the project for the term of the license, making electric power from a renewable resource available to the regional electric grid.

[1] The current license for the project was issued on May 26, 1992, for a term of 30 years, and will expire April 30, 2022. *See* 59 FERC ¶ 62,186 (1992).

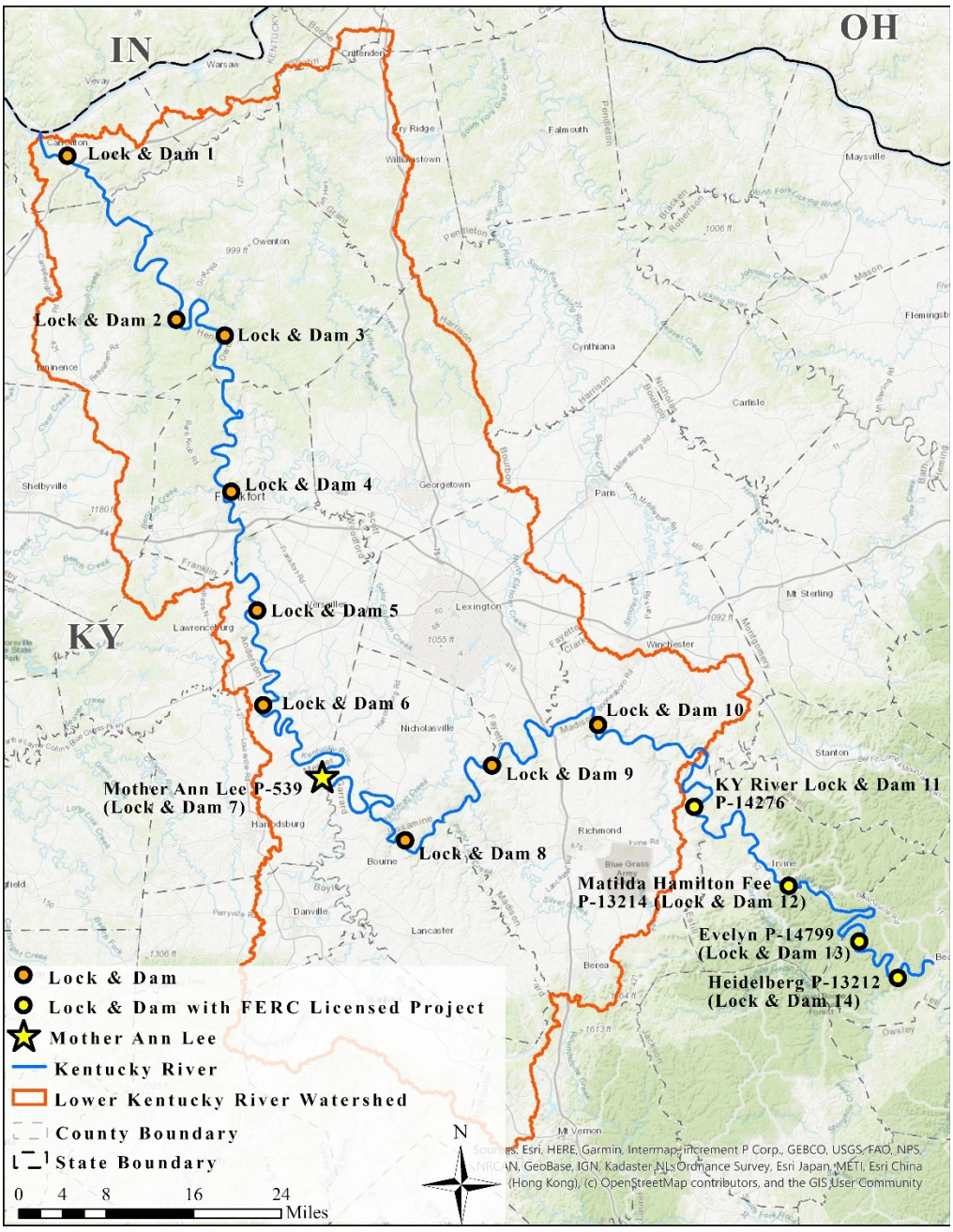

Figure 1-1. Location of the Mother Ann Lee Project (Source: Staff).

This environmental assessment (EA) has been prepared in compliance with the National Environmental Policy Act (NEPA)[2] of 1969 to assess the environmental and economic effects

[2] On July 16, 2020, the Council on Environmental Quality (CEQ) issued a final rule, *Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act* (Final Rule, 85 Fed. Reg. 43,304), which was effective as of September 14, 2020. Commission staff prepared this EA in accordance with CEQ's new regulations.

associated with the continued operation and maintenance of the project and alternatives to the proposed project. It includes a recommendation to the Commission on whether to issue a new license, and if so, recommends terms and conditions to become a part of any issued license.

In this EA, we assess the environmental and economic effects of continuing to operate the project: (1) as proposed by Lock 7 Partners (proposed action); (2) under the proposed action with our additional or modified measures (staff alternative); and (3) under the no-action alternative. The primary issues associated with relicensing the project are the effects of continued project operation and maintenance on aquatic and terrestrial resources and their habitats, and cultural and recreational resources.

1.2.2 Need for Power

To assess the need for power, we looked at the needs in the operating region in which the project is located. The North American Electric Reliability Corporation (NERC) annually forecasts electrical supply and demand nationally and regionally for a 10-year period. The Mother Ann Lee Project is located in the Central Subregion of the Southeastern Electric Reliability Council (SERC), which is one of six regional reliability councils of NERC. According to NERC's most recent forecast for the Central Subregion (2019), the total internal demand is projected to grow at an annual rate of 0.9 percent from 2020 through 2030 (NERC, 2019).

If relicensed, power from the Mother Ann Lee Project would continue to help meet the need for power in the Central Subregion for both the short- and long-term. The project would continue to provide power that can displace generation from non-renewable sources. Displacing the operation of non-renewable facilities may avoid some power plant emissions, thus creating an environmental benefit.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

Any new license for the Mother Ann Lee Project would be subject to numerous requirements under the FPA and other applicable statutes. The major regulatory and statutory requirements are described in Appendix A.

1.4 PUBLIC REVIEW AND COMMENT

The Commission's regulations (18 C.F.R. § 5.1) require that applicants consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), and other federal statutes. Pre-filing consultation must be complete and documented according to the Commission's regulations.

1.4.1 Scoping

Before preparing this EA, we conducted scoping to determine what issues and alternatives should be addressed. We distributed a scoping document to interested agencies and

others on January 26, 2021, which was noticed in the *Federal Register* on February 1, 2021.[3] The following entities provided written comments:

Commenting Entity	Date Filed
U.S. Fish and Wildlife Service (FWS)	February 17, 2021
Cherokee Nation	February 25, 2021

1.4.2 Interventions

On December 22, 2020, the Commission issued public notice accepting the license application and setting February 22, 2021, as the deadline for filing protests and motions to intervene. The notice was published in the *Federal Register* on December 30, 2020.[4] No entities filed motions to intervene or protests in response to the notice.

1.4.3 Comments on the Application

On February 26, 2021, the Commission issued a Ready for Environmental Analysis (REA) notice setting April 27, 2021, as the deadline for filing comments, recommendations, terms and conditions, and fishway prescriptions. The notice also established a deadline of June 11, 2021 for filing reply comments. The U.S. Fish and Wildlife Service filed comments on April 15, 2021. No reply comments were filed by Lock 7 Partners.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, the project would continue to operate under the terms and conditions of the existing license, and no new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives and to judge the benefits and costs of any measures that might be required under a new license.

2.1.1 Current Project Facilities

The Mother Ann Lee Project is located at river mile (RM) 117[5] of the Kentucky River in northcentral Kentucky and consists of the following existing facilities: (1) a reservoir with a surface area of 777 acres and a storage capacity of 5,828 acre-feet at an elevation of 513.12 feet National Geodetic Vertical Datum of 1929 (NGVD 29)[6]; (2) a 250-foot-long, 15.3-foot-high, timber crib dam with a concrete cap and a 62-foot-long, retired lock structure on the east side of the dam that is sealed at its downstream end; (3) a 120-foot-long, 100-foot-wide forebay; (4) a 24-foot-tall, 84-foot-wide trash rack with a clear bar spacing of 4 inches; (5) a 93-foot-long, 25-

[3] 86 Fed. Reg. 7,721-7,722 (February 1, 2021).

[4] 85 Fed. Reg. 86,551-86,552 (December 30, 2020).

[5] 117 miles is the distance between the project dam and the confluence with the Ohio River.

[6] Unless otherwise noted, all elevation data is provided in NGVD 29.

foot-wide, 16-foot-high powerhouse integral with the dam containing two 680 kilowatt (kW) units and one 850 kW with a total installed capacity of 2,210 kilowatts; (6) a 30-foot-long, 15.3-foot-high concrete spillway section that extends from the powerhouse to the west shore; (7) an 85-foot-long substation; and (8) a 34.5 kilovolt (kV), 2,310-foot-long[7] overhead transmission line (figure 2-1).

Lock 7 Partners does not currently provide developed recreation amenities at the project. Anglers use an existing road, maintained by Jessamine County, to access the shoreline for bank fishing just downstream of the dam on the east side of the Kentucky River. Anglers using this area park at a small pull-off from the County road, which is located within the project boundary.

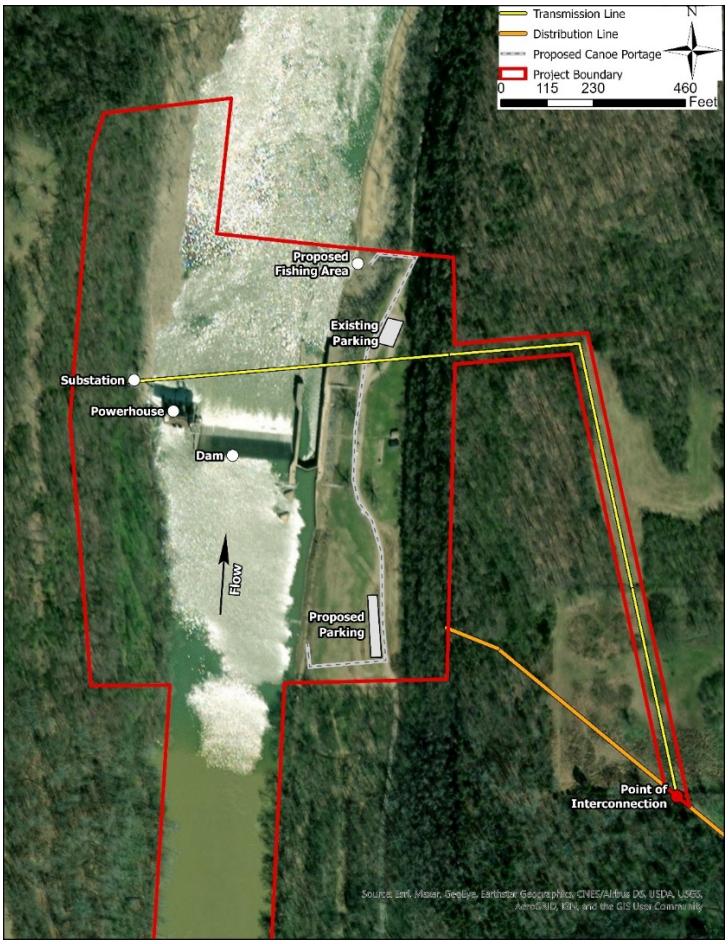

Figure 2-1. Approximate locations of the Mother Ann Lee Project facilities (Source: Staff).

[7] Lock 7 Partners indicates that the project transmission line is 4,540 feet long (*See* Lock 7 Partners' September 28, 2020 Response to Commission staff's June 29, 2020 Deficiency of License Application and Additional Information Request for the Mother Ann Lee Project P-539). However, this amount appears to include both the project's transmission line and a portion of the distribution line to which the project's transmission line interconnects. Staff estimate that the length of the project's transmission line from the project's substation to the point of interconnection with the distribution line is 2,310 feet.

2.1.2 Current Project Boundary

All project facilities, the transmission line corridor, and project reservoir are enclosed within the current project boundary.[8] The majority of lands within the project boundary are owned by KRA and leased to Lock 7 Partners. Lock 7 Partners holds easements on private lands within the transmission line corridor.

2.1.3 Project Safety

The project has been operating under the existing license since May 1992. During this time, Commission staff have conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the license, and proper maintenance.

As part of the relicensing process, Commission staff will evaluate the continued adequacy of the project's facilities under a new license. Special articles will be included in any license issued, as appropriate. Commission staff will continue to inspect the project during the term of any new license to ensure continued adherence to Commission-approved plans and specifications, special license articles relating to construction (if any), operation and maintenance, and accepted engineering practices and procedures.

2.1.4 Current Project Operation and Environmental Measures

As required by Article 401 of the 1992 license, the project currently operates in a run-of-river mode by minimizing fluctuations to the impoundment surface elevation. A Programmable Logic Controller (controller) monitors the water level in the impoundment and turns generating units on or off as needed to maintain the reservoir elevation above 513.12 feet NGVD 29, which is the height of the top of the dam. When inflow exceeds the project's maximum hydraulic capacity of 2,415 cubic feet per second (cfs), all water not passing through the project turbines spills over the top of the dam.

In addition to run-of-river operation, the project does not operate during severe droughts when flow limitations on the Kentucky River are required by the Kentucky Department for Environmental Protection (Kentucky DEP), Division of Water, or KRA and when the KRA opens a bypass valve in the dam to allow water to be released from pool 7 and passed downstream. These measures ensure that the project does not negatively affect municipal water withdrawals from the Kentucky River.

[8] Lock 7 Partners' Exhibit G-2, filed on February 19, 2021, appeared to include privately owned land within the project boundary (February 19, 2021 Response to Commission staff's December 22, 2020 Additional Information Request). By letter filed on July 2, 2021, Lock 7 Partners clarified that the project boundary includes only KRA property, the transmission line rights-of-way, and the river channel including the entirety of pool 7 (Project Boundary Clarification filed on July 2, 2021).

Lastly, animal protection guards and electrical insulation installed on the energized components of the substation help prevent bird and other wildlife mortality associated with project operation.

2.2 APPLICANT'S PROPOSAL

2.2.1 Proposed Project Facilities

Lock 7 Partners proposes no changes to the project's generation facilities. Lock 7 Partners proposes to enhance recreation access at the project by constructing and maintaining a canoe portage on the eastern side of the dam and adding a parking lot near the canoe portage take-out upstream of the dam along the eastern bank of the Kentucky River.

2.2.2 Proposed Project Boundary

Lock 7 Partners proposes no changes to the existing project boundary, which encloses the project works, impoundment, proposed recreation amenities, and lands necessary for project purposes.

2.2.3 Proposed Project Operation

Lock 7 Partners proposes to continue operating the project in a run-of-river mode.

2.2.4 Proposed Environmental Measures

Lock 7 Partners proposes the following environmental measures:

- Implement a Water Quality Monitoring Plan, filed September 28, 2020, to monitor temperature and dissolved oxygen in the project tailrace for the term of the license.

- Implement an Operation Compliance Monitoring Plan, filed April 30, 2020, to maintain and document run-of-river operations, that includes provisions to cease generation during low-flow periods as declared by the Kentucky DEP or KRA.

- Maintain the existing avian/wildlife protection devices at the project substation.

- Implement a Recreation Plan, filed September 28, 2020, that includes provisions for constructing, operating, and maintaining a canoe portage, fishing access, and parking and associated directional and safety signage.

- Implement a Historic Properties Management Plan, filed September 28, 2020, for the protection of historic properties occurring within the project's area of potential effects (APE).

2.2.5 Modifications to the Applicant's Proposal – Mandatory Conditions

Kentucky DEP issued a water quality certification (certification) pursuant to section 401 of the Clean Water Act (CWA) with 18 conditions on July 27, 2020.[9] Some conditions are administrative or general; therefore, they are not analyzed in this EA.[10] The certification is included in its entirety in Appendix B.

2.3 STAFF ALTERNATIVE

Under the staff alternative, a new license would include the applicant's proposed measures, noted above, and the certification conditions with the following additional measures:

- To identify and address project effects on birds and other wildlife, develop an Avian Protection Plan to include Lock 7 Partners' proposal to maintain the existing avian/wildlife protection devices at the project substation and the following additional provisions: (1) install and maintain protection devices such as aerial marker spheres swinging markers, and/or bird flight diverters on the transmission line to minimize avian electrocutions and collisions; (2) periodically monitor the transmission line and substation for nests, signs of adverse avian interactions, as well as the condition of all the avian/wildlife protection devices; (3) train personnel on avian/wildlife protection measures including reporting any adverse interactions; and (4) file an implementation schedule.

- Limit tree removal[11] activities to the period between November 15 and March 31 to protect summer roosting habitat for Indiana and northern long-eared bats, as well as foraging and traveling habitat for gray, Indiana, and northern long-eared bats.

- Complete the construction of the proposed recreation amenities within 2 years of license issuance.

- Modify the HPMP to: (1) consistently define the APE for the project throughout the document; (2) include consultation with the Eastern Band of Cherokee Indians; (3) describe the types of routine maintenance activities that are not subject to further consultation under section 106 of the NHPA; (4) clarify the protocol for protection of historic properties during emergencies; (5) clarify annual reporting procedures; and

[9] The certification identifies one submittal/action condition (S-1) that requires Lock 7 Partners to prepare and submit an annual monitoring report, six narrative conditions (T-1 through T-6), and 11 general conditions for Kentucky DEP certifications.

[10] S-1 (in part), T-2 through T-6, and general conditions 1 through 7, 9, and 11 are administrative or general in nature and not analyzed in this EA.

[11] Tree removal is defined herein as cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, saplings, snags, or any other form of woody vegetation likely to be used by federally listed bats, which includes live or dead trees greater than or equal to 3 inches diameter at breast height (dbh) that have cavities, peeling bark, crevices, or hollows.

(6) describe conditions under which additional section 106 consultation may be necessary.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Certain alternatives to Lock 7 Partners' proposal were considered but eliminated from further analysis because they are not reasonable in this case. These alternatives are presented in Appendix C.

3.0 ENVIRONMENTAL ANALYSIS

This section includes a general description of the project vicinity, and our analysis of the proposed action and other recommended environmental measures. Sections are organized by resource area (aquatic, recreation, etc.). Historic and current conditions are described under each resource area. The existing condition is the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed mitigation, protection, and enhancement measures. Staff conclusions and recommended measures are discussed in section 5.1, *Comprehensive Development and Recommended Alternative*.[12]

3.1 GENERAL DESCRIPTION OF THE RIVER BASIN

The Kentucky River, a tributary of the Ohio River, is located entirely within the Commonwealth of Kentucky. The Kentucky River drains an area of about 6,970 square miles, and flows approximately 265 miles northwesterly from Beattyville, Kentucky, to Carrolton, Kentucky, where it joins the Ohio River.

The Kentucky River historically was used for the transport of trade goods, with a system of 14 lock and dams. However, the relatively small dimensions of the locks limited use by commercial traffic, as barges increased in size, and the transport of trade goods on the river is largely is a thing of the past. All 14 lock and dams are operated by the KRA. Lock and Dams Nos. 1 through 4 continue to be operated as navigational locks, primarily for recreation craft. Lock and Dams Nos. 5 through 14 have been retired as active locks. When the ten upstream Lock and Dams (Nos. 5 through 14) were retired as navigational locks, the lock and dam structures were left in place and the lock chambers were sealed. Thus, at these 10 facilities, downstream flow is discharged over the dam spillway. They are managed for domestic water supply, recreation, and hydroelectric power generation.

At five of the ten upstream Kentucky River lock and dam structures, including the Mother Anne Lee Project, hydropower generation has been licensed by the Commission (for which Lock 7 Partners is seeking relicensing). The other four projects licensed by the Commission include the: (1) Kentucky River Lock and Dam No. 11 Hydroelectric Project

[12] Unless otherwise indicated, the source of our information is the license application filed on April 30, 2020, and additional information filed by Lock 7 Partners on September 28, 2020, February 19, 2021, March 10, 2021, May 14, 2021, and May 26, 2021.

No. 14276 (RM 201);[13] (2) Matilda Hamilton Fee Hydroelectric Station Hydroelectric Project No. 13214 (Matilda Hamilton Fee Project), located at Lock and Dam No. 12 (RM 220);[14] (3) Evelyn Hydroelectric Project No. 14799 (Evelyn Project), located at Lock and Dam No. 13 (RM 239.9);[15] and (4) the Heidelberg Hydroelectric Project No. 13213 (Heidelberg Project), located at Lock and Dam No. 14 (RM 249) (Figure 1-1).[16] At all five of these licensed projects further modifications to the lock and dam facilities were authorized to accommodate electric generation. In these cases, a large volume of the river flow is, or will be, discharged through the hydropower plants, with the remaining flow discharged over the spillways.

The topography in the basin varies from flat and rolling plains to mountainous. The headwaters portion of the basin lies in the Eastern Coal Field region of the Appalachian Plateau. Extensive forest cover, narrow valleys, steep stream gradients, flash floods during the rainy season, and low stream flows during the dry season are characteristic of this area. The underlying bedrock varies greatly in mineral and hydrological characteristics and because much of the basin contains karst topography,[17] caves are abundant throughout the area.

The climate in the area is temperate with abundant moisture. Average annual precipitation in the project area is 46 inches and average annual snowfall is 17 inches. Average seasonal temperatures range from 35 degrees Fahrenheit (°F) in the winter to 74 °F in the summer.

3.2 PROPOSED ACTION AND ACTION ALTERNATIVES

In this section, we discuss the effects of the project alternatives on environmental resources. For each resource, we first describe the affected environment, which is the existing condition and baseline against which we measure effects. We then discuss and analyze the environmental effects of the project alternatives.[18]

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this EA. Based on this, we have determined that threatened and endangered species, as well as aquatic, terrestrial, recreation, and cultural resources may be affected by the proposed action and action alternatives. Land use is addressed in the recreation

[13] The Commission granted an original license for the Kentucky River Lock and Dam No. 11 Hydroelectric Project on May 5, 2016. *See* 155 FERC ¶ 62,089 (2016).

[14] Formerly known as the Ravenna Hydroelectric Project.

[15] The Commission granted an original license for the Evelyn Project on June 17, 2021. *See* 175 FERC ¶ 62,183 (2021).

[16] The Commission granted original licenses for the Heidelberg Project and Matilda Hamilton Fee Project on December 21, 2015. *See* 153 FERC ¶ 62,219 (2015) and 153 FERC ¶ 62,220 (2015), respectively.

[17] Karst topography occurs where water dissolves and erodes limestone and other soft bedrocks, forming caves, sinkholes, fissures, and underground streams.

[18] Per CEQ's final rule (July 15, 2020), Commission staff consider and evaluate effects that are reasonably foreseeable and have a reasonably close causal relationship (proximate cause) to the proposed action.

and terrestrial sections. We also consider the effects of the project on environmental justice communities. We have not identified any substantive issues related to geologic and soil resources, aesthetic resources, or socioeconomics associated with the proposed action, and therefore, these resources are not assessed in the EA. We present our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative* section.

3.2.1 Aquatic Resources

3.2.1.1 Affected Environment

Water Quantity

The mainstem Kentucky River is formed at the confluence of its North, Middle, and South Forks near Beattyville, Kentucky. The Kentucky River, at the Mother Ann Lee Project, has a drainage area of 5,036 square miles. The estimated mean annual daily flow (MADF) at the project is 7,316 cfs, with flows typically greatest during the winter (December-February) and spring (March-May) months (table D-1). Flows in excess of the project's minimum hydraulic capacity of 227 cfs occur approximately 97 percent of the year.

Water Use

As discussed above in section 3.1, *General Description of the River Basin*, the Kentucky River has 14 locks and dams that are currently used for domestic water supply, recreation, and hydroelectric power. Municipal water is withdrawn from pools 3 through 11 and from pool 14. The Mother Ann Lee Project's pool 7 serves as a water source for the Harrodsburg Municipal Water Department. During low flow conditions, the KRA may request water releases from pool 7, discharged through a bypass release valve, to augment water supplies in downstream pools.

Water Quality

According to the water quality statutes for the Commonwealth of Kentucky (401 KAR 10:026), the designated uses for the Kentucky River in the vicinity of the project include: (1) warmwater aquatic life habitat; (2) primary contact recreation; (3) secondary contact recreation; and (4) domestic water supply. Relevant water use designations by the Commonwealth of Kentucky are as follows: (1) dissolved oxygen (DO) concentration must meet a minimum of 4.0 milligrams per liter (mg/L) instantaneously and 5.0 mg/L over a 24-hour average; and (2) water temperature values must never exceed 89ºF (31.7 degrees Celsius (ºC)) (401 KAR 10:031).

The Kentucky DEP's 2016 Integrated Report (Kentucky DEP, 2016) identifies impaired water bodies in the state. The Kentucky River main stem was found to be fully supporting all monitored uses except for fish consumption. Fish consumption was not supported from the confluence with the Ohio River to RM 11 and was only partially supported from RM 53 to 209, an area encompassing locks 4 through 11.

Under condition T-1 of the certification, Lock 7 Partners is required to monitor DO concentration from May 1 through October 31, when the Kentucky River is generally warmer and DO tends to be lower than in cooler months. Lock 7 Partners has monitored DO and water

temperature, year-round, in the tailrace of the Mother Ann Lee Project since 2010. From 2010 through 2019, average monthly DO concentrations ranged from 7.8 to 12.4 mg/L and the minimum monthly DO concentrations ranged from 2.3 mg/L to 9.4 mg/L (Figure 3-1).[19] During this time, project operations were stopped 47 times as a result of low DO concentrations with 72 percent of the shutdowns occurring in October (Table D-2). Average monthly water temperatures from 2010 through 2019 ranged from 41ºF (5.0ºC) to 78.1ºF (25.6ºC) and the maximum monthly temperatures ranged from 63.1ºF (17.3ºC) to 96.6ºF (35.9ºC) (Figure 3-2). During this time period, temperatures exceeded requirements of the certification on one day each in July of 2011 and 2013.

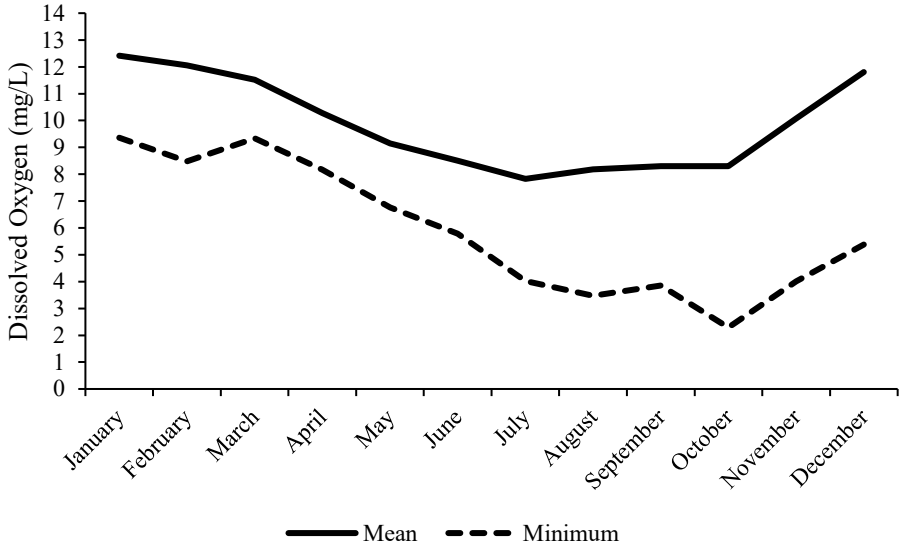

Figure 3-1. Mean and minimum monthly DO concentrations in the Mother Ann Lee Project tailrace from 2010 through 2019 (source: Staff).

[19] Periodic data gaps exist as a result of probe failure and/or maintenance events from 2010 through 2018. In 2019, a flooding limited data collection to June through August.

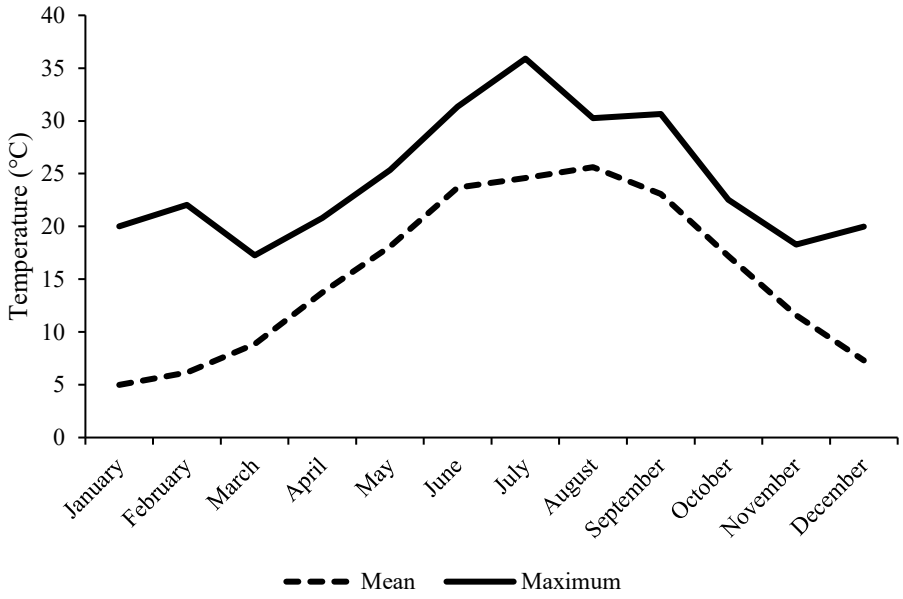

Figure 3-2. Mean and maximum monthly water temperatures in the Mother Ann Lee Project tailrace from 2010 through 2019 (source: Staff).

Dix Dam Hydroelectric Project

Water quality at the Mother Ann Lee Project may be influenced by water releases from the Dix Dam Hydroelectric Project (Dix Dam Project).[20] The Dix Dam Project impounds the Dix River (creating Herrington Lake) approximately two miles upstream of the confluence with the Kentucky River and eight miles upstream of the Mother Ann Lee Project dam. Given the depth of Herrington Lake (maximum depth of 249 feet and average depth of 78 feet), thermal and DO stratification[21] is not uncommon (Ramboll, 2019).

During project operations, the Dix Dam Project releases cool water from Herrington Lake into the downstream Dix River. The Kentucky Department of Fish and Wildlife Resources (Kentucky DFWR) designates this two-mile section of stream between the Dix Dam and confluence with the Kentucky River as cold-water aquatic habitat as a result of these cool water releases. Because of the relatively short, 8-mile distance between the Dix Dam and the mainstem Kentucky River, flows sometimes reach the Mother Ann Lee Project before fully mixing with the surrounding waters. When these flows contain low DO concentrations, the releases from the Dix Dam Project can impact operations at the Mother Ann Lee Project by contributing to turbine shutdowns required by condition T-1 of the certification in response to low DO concentrations. During these shutdowns, all inflows are passed over the spillway,

[20] The Dix Dam Project is a non-jurisdictional hydroelectric project owned and operated by the Kentucky Utilities Company.

[21] Stratification occurs when water bodies form distinct thermal layers, including a warm surface layer (epilimnion), a middle layer (metalimnion) with an abrupt change in temperature (thermocline), and a cool dense lower layer (hypolimnion). Persistent stratification can result in low DO concentrations in the lower part of the water column.

allowing for increased mixing of the flow and aeration of the water, until DO levels in the tailrace rise above 4.0 mg/L. Lock 7 Partners indicates that all (47) mandatory shutdowns from 2010 through 2019 have been in response to low DO releases from the Dix Dam Project. These shutdowns occur most often during periods of low flow when releases from the Dix Dam Project are greater than flows in the Kentucky River.

Aquatic Habitat and Fishery Resources

Aquatic Habitat

The Kentucky River is highly channelized, containing a series of 14 lock and dams, which limit fish movement through the river (Herrala, 2014). Substrate above Lock and Dam 7 contains unconsolidated sediment (e.g., sand, silt, gravel) that is typical of impoundments on the Kentucky River (United States Army Corps of Engineers, 2017). Below Lock and Dam 7, the river sediment is sorted bilaterally by the river flow such that the east bank is composed primarily of sand. The west bank is composed of cobble and gravel with particle size becoming smaller until bedrock is exposed. Small amounts of gravel substrate, surrounded by sand deposits, are found on both sides of the river further downstream (approximately 1,640 feet) of the dam.

Fish Community

Kentucky is home to approximately 244 native fish species consisting mainly of darters, minnows, suckers, madtoms, and smaller sunfish species (80% of all species) (Thomas, 2011). The mainstem of the Kentucky River has over 70 species of fish including over 20 species of gamefish, such as: muskellunge, white bass, sauger, walleye, largemouth bass, smallmouth bass, spotted bass, white crappie, and black crappie. Other fish species include mooneye, flathead catfish, channel catfish, smallmouth buffalo, bigmouth buffalo, freshwater drum, longnose gar, bowfin, green-sided darter, and common carp.

The Kentucky DFWR routinely stocks the Kentucky River with muskellunge, walleye, sauger, and hybrid striped bass, which may be present in and around the project area. Approximately 4,000 rainbow trout are stocked into the Dix River on an annual basis to provide a cool water fishery in the tailwaters of Herrington Lake.

The Kentucky DFWR conducted fish sampling in the Kentucky River, in Lock and Dam pools 9 through 14 from 1998 to 2002 using boat electrofishing.[22] A total of 59 species including 9 game fishes, 2 food fishes (channel catfish and flathead catfish), 7 panfishes, and 41 other fishes were collected (Table D-3). No anadromous or diadromous species were collected.

Special Status Species

Lock 7 Partners identified federal and state protected species and other species of concern that may occur within a one-mile buffer of the project boundary (table D-7, Appendix D).

[22] Locks and Dams 9 through 14 range from approximately 40 RM to 131 RM upstream of the Mother Ann Lee Project.

Federal candidate, proposed, and listed species are discussed further in section 3.2.3, *Threatened and Endangered Species*.

3.2.1.2 Environmental Effects

Project Operation

The operation of hydropower projects in a run-of-river mode, whereby the total outflow from a project approximates the inflow to the impoundment, generally provides a more stable upstream and downstream environment than other modes of operation. For example, compared to peaking projects and storage projects, run-of-river operation minimizes the degree of water level fluctuations, and associated erosion and temperature fluctuations in impoundment surface waters (due to shorter water residence times), and results in a downstream flow regime that is more similar in magnitude and timing to natural river flows.

Under the current license, Lock 7 Partners is required to operate the project in a run-of-river mode with outflow approximating inflow at all times to minimize reservoir surface elevation and downstream river flow fluctuations, and associated adverse effects on aquatic resources. Lock 7 Partners proposes, and the certification requires (condition T-1), continued run-of-river operation. To ensure compliance with the certification (condition T-1), Lock 7 Partners proposes to implement an Operation Compliance Monitoring Plan. The proposed plan includes provisions to monitor water surface elevations and take corrective actions to shut down generating units in order to maintain water levels in the impoundment at or above the crest of the dam, and to comply with and report, project shutdowns during periods of low-flow or drought conditions, as declared by the Kentucky Division of Water or KRA. Any deviations from run-of-river operations would be reported to the Kentucky Division of Water and KRA within 14 days and include: (1) a description of the deviation event; (2) the date or dates when the event occurred; (3) when and how the problem was resolved; and (4) what actions were taken to prevent the deviation from occurring again.

To ensure outflow from the project is protective of aquatic resources and consistent with water quality requirements of the certification (conditions S-1 and T-1) and state standards, Lock 7 Partners proposes to implement a Water Quality Monitoring Plan. The proposed Water Quality Monitoring Plan includes provisions to monitor water temperature and DO concentrations at all times (while the project is and is not operating) in the project tailrace every 15 minutes throughout the year during any new license term. If low DO concentrations are observed in the tailrace, Lock 7 Partners will shut down the project turbines, incrementally,[23] or all turbines, as needed, to release inflow over the spillway until outflows meet the state standard for DO. Any maintenance to the monitoring equipment would be completed from November through April when monitoring is not required by the certification and water temperature and DO

[23] Turbine 1 contains small openings where the turbine guide bearing holder attaches to the guide plate. These openings allow air to be entrained while the turbine is idling (not generating). During periods of low DO, Lock 7 Partners first stops generating with turbine 1 in an attempt to aerate water in the tailrace (*See* Lock 7 Partners' September 28, 2020 Response to Commission staff's June 29, 2020 Deficiency of License Application and Additional Information Request for the Mother Ann Lee Project P-539).

concentrations are likely to be consistent with the established state standards. Annual reports summarizing monthly DO concentrations, inconsistencies with levels established by the state standards, and any corrective actions that were taken would be submitted to the Kentucky Division of Water by March 31st of the following year.

No entity provided recommendations on water quantity and aquatic habitat, water quality, or fishery resources in response to the Commission's ready for environmental analysis.

Our Analysis

Water Quantity and Aquatic Habitat

Under current, and proposed, run-of-river operations, the water surface elevation in the Mother Ann Lee Project impoundment is maintained at or above the crest of the dam[24] while the project is generating and any flows in excess of the maximum hydraulic capacity of the project (2,415 cfs) are passed over the spillway. Lock 7 Partners' proposal to continue run-of-river operations is consistent with the requirements of the certification and would prevent dewatering of existing littoral habitat and project-induced flow fluctuations downstream of the dam. Maintaining stable impoundment levels and project flows would limit the potential for stranding of fish and other aquatic organisms and minimize disruptions to habitat necessary for feeding, cover, spawning, and rearing.

Although compliance monitoring measures do not directly affect environmental resources, they allow the Commission to ensure that a licensee complies with the environmental requirements of a license. Lock 7 Partners' proposed Operation Compliance Monitoring Plan would provide a mechanism for monitoring compliance with the conditions of any license issued for the project that are designed to protect aquatic resources and the municipal water supply in the project area during any new license term.

Water Quality

Under current run-of-river operations, DO concentrations in the tailrace are generally maintained above the minimum instantaneous (4.0 mg/L) and 24-hour-average (5.0 mg/L) levels established by the state standards. Similarly, water temperature in the tailrace is nearly always below the state standard (89ºF [31.7ºC]). DO concentrations above 4.0 mg/L generally reduce stress associated with low DO concentrations for freshwater fishes and invertebrates (Davis, 1975). Further, DO concentrations of 5.0 mg/L or greater and water temperatures below 90°F are generally suitable for freshwater fish and invertebrate growth, reproduction, and survival (EPA, 1986; EPA, 1973). Within the Mother Ann Lee Project impoundment, the hydraulic water

[24] When the impoundment water surface elevation lowers to the crest of the dam, the programmable logic controller (PLC) incrementally shuts down generating units to maintain the water surface elevation at the crest of the dam. If flows are not sufficient to maintain the impoundment surface elevation at the crest of the dam, then the project does not operate and all flows pass over the spillway.

residence time is approximately 9.6 hours,[25] indicating that the water in the pool is replaced quickly and is not likely to undergo water temperature and DO stratification.

As discussed in section 3.3.1.1, *Aquatic Resources, Affected Environment,* cool water releases from the Dix Dam Project may influence water quality and, therefore, project operations at the Mother Ann Lee Project. However, given the relative consistency of water temperature and DO concentrations with state standards , and infrequency of project shutdowns as a result of poor water quality under current, and proposed, operations, water quality generally remains favorable for warmwater fish and invertebrate species despite influence from the Dix Dam Project.

In summary, because Lock 7 Partners' proposes no changes to project operations, run-of-river operations would continue to provide water quality conditions that are consistent with established state standards and remain protective of the warmwater fish and invertebrate species in the project area. Lock 7 Partners' proposal to implement a Water Quality Monitoring Plan would ensure that water quality conditions remain protective of aquatic resources throughout the year by continually monitoring water quality in the project tailrace, thereby exceeding the six months of monitoring required by the certification, and formalize operating and reporting requirements of the certification during any new license term.

Fish Impingement, Entrainment, and Turbine Mortality

Water intake structures at hydropower projects can injure or kill fish that come into contact with intake screens, trash racks, or turbines. Fish that have body widths greater than the clear spacing between the trash rack bars, and/or have burst swim speeds[26] lower than approach velocities[27] or through-screen velocities, can become trapped against intake screens or bars of a trash rack. This process is known as impingement and can cause physical stress, suffocation, and death of some organisms (EPRI, 2003).

Entrainment into the intake structure occurs if fish are small enough to pass between trash rack bars, and are unable to overcome the approach velocity, or if they choose to pass downstream through the trash rack. Even if fish are small enough to fit through trash rack bars, they may be able to behaviorally avoid entrainment if their burst swim speeds exceed the approach velocity in front of the trash racks (Knapp *et al.*, 1982). If entrainment occurs, fish injury or mortality can result from collisions with turbine blades, exposure to pressure changes, shear forces in turbulent flows, or water velocity accelerations created by turbines (Rochester *et*

[25] The hydraulic residence time measures the average length of time the impoundment stores water, which can be many years for larger reservoirs. At the Mother Ann Lee Project, the calculation for residence time is 9.6 hours using 5,828 acre-feet storage capacity divided by 7,316 cfs mean annual flow.

[26] Burst swimming speed is the maximum swimming speed that can only be sustained for a few seconds. It is usually used to avoid predators, capture prey, or negotiate high flow (Beamish, 1978).

[27] Approach velocity is the calculated water flow velocity component perpendicular to the trash rack face and is the velocity experienced by a fish as it swims freely near the front of the trash rack (EPRI, 2000).

al., 1984). The number of fish entrained and at risk of turbine mortality is dependent upon site-specific factors, including the physical characteristics of the project (e.g., head, approach velocity, turbine type, turbine speed, number of runner blades, and proximity of the intake to the shore), as well as the size, age, and seasonal movement patterns of fish present within the impoundment (EPRI, 2003).

Lock 7 Partners proposes to continue operating with 24-foot-tall by 84-foot-wide trash rack located in front of the intakes for all 3 turbines with a clear bar spacing of 4 inches. A maximum approach velocity of 1.2 feet per second (fps)[28] is generated when operating at the maximum hydraulic capacity (2,415 cfs) of the project. A combination of clamshell buckets and a drag rake are operated on an as-needed basis to remove debris from the trash racks and prevent the buildup of hot spots.[29] Lock 7 Partners proposes no additional measures to reduce fish mortality as a result of impingement or entrainment.

No entity provided recommendations on fish impingement, or fish entrainment and turbine mortality in response to the Commission's notice that the application was ready for environmental analysis.

Our Analysis

Impingement

Most of the fish species in the Kentucky River that grow to a size large enough to become impinged on a trash rack with 4-inch bar spacing have sufficient burst swimming speeds to maintain their position upstream of the trash rack and avoid impingement. The swimming speed capability data presented in Bell (1991) and Electric Power Research Institute (EPRI) (2000) indicate that the fish species in the Kentucky River, including common carp, largemouth bass, and catfish species, are able to maintain swimming speeds of between 4 and 7 body lengths per second for 15 minutes or more, and are capable of higher burst speeds. Adult fish of these species commonly exceed 12 inches in length and should be able to overcome the maximum approach velocity of 1.2 fps at the trash racks. Smaller fish that do approach the trash rack are able to pass through the bars with little or no risk of impingement. As a result, impingement potential at the project is low.

Entrainment and Turbine Mortality

Lock 7 Partners conducted a desktop fish entrainment study at the upstream Heidelberg and Matilda Hamilton Fee Projects to determine the types and sizes of fish likely to be entrained at those projects and probable survival rates of entrained fish. Because of the similar turbine design, staff used data from these projects to estimate entrainment rates and entrainment mortality at the Mother Ann Lee Project.

As discussed above, smaller fish would have the potential to pass between the trash rack bars and therefore be subject to entrainment and potential turbine mortality. Studies at other

[28] Maximum estimated approach velocity was calculated using the formula: approach velocity=(intake flow)/(intake cross section area) (EPRI, 2000).

[29] Hots spots are localized areas of high approach velocity created by a buildup of debris.

projects have generally concluded that small fish (i.e., less than 4 inches) account for the majority of fish entrained (EPRI, 1997). The survival of these entrained smaller fish is expected to be relatively high compared to larger fish because they are less prone to mechanical injury from turbine passage (i.e., turbine blade strike), and less prone to injury resulting from shear stresses and rapid pressure changes created by spinning turbines. Based on estimated monthly entrainment rates as well as flow through the project turbines, the estimated total number of fish entrained at the Mother Ann Lee Project would approach 14,250 fish per year with the greatest entrainment rates occurring in the spring (46 percent) and lowest in the fall (4 percent) (Table D-4).

Applying the estimated entrainment rates for fish families likely to be present within the project area (Table D-5) to the estimated number of fish entrained each month, staff estimated that Ictaluridae (catfishes) would experience the greatest amount of entrainment (4,832 fish), followed by Centrarchidae (sunfishes) and Catostomidae (suckers) (Table D-6). Based on the estimated seasonal and annual mortality of fishes by family (Table D-5), the majority of mortalities are expected to be Centrarchidae (57 percent) and Catostomidae (16 percent) that would be killed primarily during the spring and summer (Table D-6).

Evaluating the entrainment analysis above, there is no evidence to suggest that entrainment and turbine related mortality caused by continued project operation would negatively affect fish populations in the project impoundment or the Kentucky River more generally. Species most likely to be killed at the project (i.e., sunfish) often exhibit high reproductive rates and may spawn multiple times during long spawning seasons (Neuswanger *et al*., 2015). High reproductive rates provide a mechanism to buffer against instances of high mortality and associated population declines that could otherwise be caused by turbine mortality. Additionally, the existing measures used to keep the trash rack free of debris, help to maintain low intake velocities by preventing localized areas of high approach velocity which could result in episodes of increased entrainment. For these reasons, it is unlikely that continued project operation would have an adverse effect on the fish community in the Mother Ann Lee Project impoundment or the Kentucky River.

3.2.2 Terrestrial Resources

3.2.2.1 Affected Environment

Vegetation

The Mother Ann Lee Project spans the border between regions delineated by the U.S. Environmental Protection Agency (EPA) as the Inner Bluegrass and Hills of the Bluegrass regions, both of which are within the Interior Plateau Ecoregion. The Interior Plateau includes a variety of landforms including rolling and irregular plains, karst plains, dissected plateaus and tablelands, open hills, broad ridges, and steep slopes and ravines (Wiken, 2011). Stream morphology is highly variable ranging from high gradient streams with boulder or cobble substrates to low gradient streams with sand or gravel substrate (Woods, 2002). Vegetation in the region is primarily oak-hickory forest, with some areas of bluestem prairie, cedar glades, and mixed mesophytic[30] forest. Common trees include white oak, northern red oak, black oak,

[30] Mesophytic vegetation grows in places with a moderate amount of moisture.

hickories, yellow poplar, red maple, and eastern red cedar (Wiken, 2011). Primary land uses include a mix of forest, woodlots, pasture, and cropland with some expanding urban areas. Agricultural products include hay, cattle, cotton, corn, small grains, soybeans, and tobacco.

The immediate project area is located in the Kentucky River Palisades, which is a unique ecosystem of steep limestone cliffs, deep gorges, springs, with an intricate cave system that occurs along approximately 100 miles of the Kentucky River through central Kentucky. The riparian forest is largely intact on the tops of the limestone cliffs along the river. Within the limestone cliffs, there are some narrow, intermittent flood plains and terraces.

The western side of the Kentucky River where the powerhouse and substation are located is representative of the typical flora associated with the Kentucky River Palisades. This area contains both a riparian floodplain and a steep, mid-to-late successional, slope forest with cliffs above. The low-lying floodplain is dominated by sycamore, box elder, and sugar maple. The upper slope forest is dominated by chinquapin oak, hackberry, blue ash, pawpaw, spicebush, and Kentucky coffeetree. Common herbaceous species include pale touch-me-not, hairy alumroot, and asters (*Symphyotrichum* sp.). Non-native invasive plants are also present in this area, including winter creeper and smaller amounts of Japanese stiltgrass, amur honeysuckle, and garlic mustard. The 34.5-kV project transmission line crosses the Kentucky River (perpendicular to the riparian corridor) just downstream from the powerhouse to the eastern side of the river.

The eastern side of the Kentucky River within the project area was mostly cleared of vegetation during construction of the lock and dam. It contains a large concrete esplanade[31] and open grassland maintained by the KRA, an existing access road and parking area maintained by Jessamine County, and a small amount of riparian and early-to-mid successional forest. The grassy area has a mixture of mostly non-native herbaceous species including fescue, Johnson grass, plantain, white clover, goosegrass, and Japanese stiltgrass, as well as some native herbs such as field paspalum and annual marsh elder. The wooded area is periodically flooded during high flows and dominated by sycamore, sugar maple, and silver maple. The eastern upstream bank of the project area is densely covered with non-native invasive Japanese hops.

There are three cave openings within a forested limestone cliff adjacent to the grassy area on the eastern side of the Kentucky River. Two of the cave openings are large and accessible from the grassy area. The other cave opening is small and elevated about 100 feet from the base of the cliff above the larger of the other two caves. The 2,310-foot-long project transmission line crosses the grassy area just downstream from the lock and dam and then crosses the limestone cliffs, a forested area on top of the cliff, and open fields before the point of interconnection with the distribution line.

Adjacent to the project boundary, just upstream from the confluence of the Dix River on the western side of the Kentucky River, The Nature Conservancy manages 759 acres of the Kentucky River Palisades as nature preserves (i.e., the Sally Brown Nature Preserve and

[31] Esplanades are long, level, open stretches of paved or grassy ground, usually found next to a river or large body of water and bordered by a lock wall and "training" walls at the upstream and downstream ends of the lock. At working locks and dams they provide a place for lock tenders to work, and the training walls prevent shoreline erosion around the lock.

Crutcher Preserve). Vegetation occurring in this area, including blue ash, chinquapin oak, and sugar maple, can be found on the steep limestone slopes, along with less common trees like rock elm, yellow-wood, and yellow buckeye. More acidic soils on old sandy river terraces and bluff-top ridges support beech, tulip poplar and oak/hickory forest types. The Nature Conservancy removes non-native invasive species such as bush honeysuckle and plants rough-leaved dogwoods and other native species in these areas (The Nature Conservancy, 2021).[32]

Wetlands

According to the National Wetlands Inventory (NWI), there are no wetlands within the project boundary. However, there are 14 palustrine wetlands near or adjacent to pool 7 of the Kentucky River, 13 of which are emergent wetlands and 1 scrub-shrub wetland. Freshwater emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes, with vegetation present for most of the growing season in most years. Shrub wetlands include areas dominated by woody vegetation less than 20 feet tall (e.g., shrubs, young trees [saplings], and trees or shrubs that are small or stunted because of environmental conditions).

Invasive Species

Numerous non-native invasive plant species, including trees, shrubs, vines, and herbaceous species occur in Kentucky. During Lock 7 Partners' August 2020 surveys, invasive plant species, including Japanese stiltgrass (*Microstegium vimineum*), Japanese hops (*Humulus japonicus*), garlic mustard (*Alliaria petiolate*), winter creeper (*Euonymus fortune*), and amur honeysuckle (*Lonicera maackii)* were documented within the project boundary.

The Kentucky Exotic Pest Plant Council (EPPC) classifies these species as "severe" or "significant" threats because they spread easily into native plant communities and displace native vegetation (Kentucky EPPC, 2013). Among these invasive species, Japanese stiltgrass, garlic mustard, and Japanese hops, are producers of tiny seeds (Evans et al., 2012; Kurtz and Hansen, 2017; NPS, 2009; USDA NRCS, 2002) that are commonly spread by wind, water, and/or wildlife. These seeds can also be inadvertently carried to new areas on tires, equipment, and the soles of shoes during construction, maintenance, and recreation activities (Fryer, 2011; NPS, 2009; USDA NRCS, 2002).

Wildlife

About 45 mammal species are known to occur in Mercer, Jessamine, and Garrard Counties, Kentucky, including the bobcat, white-tailed deer, coyote, gray and red fox, American mink, northern river otter, striped skunk, Virginia opossum, nine-banded armadillo, and American beaver, as well as various species of squirrels, voles, moles, shrews, and mice.

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[32] There are additional managed areas and nature preserves within one mile of the project area, including the National Park Service's Camp Nelson National Monument, Office of Kentucky Nature Preserves' Tom Dorman State Nature Preserve, and Jessamine County's Jessamine Creek Gorge Nature Preserve, among others. *See* EcoTech Consultants' Technical Memorandum on federally listed species in Lock 7 Partners' August 21, 2020 Response to Commission staff's June 29, 2020 Deficiency of License Application and Additional Information Request for the Mother Ann Lee Project P-539.

Kentucky also provides diverse terrestrial and subterranean habitats for 14 species of bats, including upland forests, riparian corridors, forested wetlands, as well as caves and sinkholes scattered throughout the state (Kentucky DFWR, 2013). Bat species potentially occurring in Mercer, Jessamine, and Garrard Counties include: the Rafinesque's big-eared bat, eastern pipistrelle, evening bat, gray bat, Indiana bat, northern long-eared bat, eastern small-footed myotis, big brown bat, eastern red bat, hoary bat, and little brown bat.[33]

Roughly 375 species of landbirds, waterbirds, shorebirds, and waterfowl have been recorded in Kentucky, with about 150 of these species regularly breeding in the state (Kentucky DFWR, 2013). Approximately 240 of these species have been documented in Mercer, Jessamine, and Garrard Counties including: the bald eagle, brown creeper, dark-eyed junco, ruby-throated hummingbird, turkey vulture, great horned owl, snowy owl, barred owl, red-tailed hawk, red-shouldered hawk, Cooper's hawk, sharp-shinned hawk, broad-winged hawk, American kestrel, pileated woodpecker, red-bellied woodpecker, downy woodpecker, hairy woodpecker, great blue heron, wood duck, mallard, wild turkey, cedar waxwing, red-winged blackbird, as well as numerous warbler, sparrow, thrush, vireo, and wren species.

Of the 55 species of amphibians (20 frogs and 35 salamanders) and 56 species of reptiles (9 lizards, 33 snakes, and 14 turtles) known to occur in Kentucky, a wide variety have been documented in Mercer, Jessamine, and Garrard Counties (Kentucky DFWR, 2013). The amphibians known to occur in these counties include 12 species of frogs and toads (e.g., northern cricket frog, Cope's gray treefrog, northern spring peeper, bullfrog, green frog, pickerel frog, wood frog, American toad, and Fowler's toad), and 15 salamander species (e.g., eastern hellbender, mudpuppy, and eastern newt, as well as spotted, marbled, green, southern two-lined, and Kentucky spring salamanders). Reptiles found in these counties include the fence lizard, five-lined skink, broadhead skink, ground skink, coal skink, eastern spiny softshell turtle, snapping turtle, common and Ouachita map turtles, musk turtle, painted turtle, eastern box turtle, and 16 snake species (e.g., copperhead, timber rattlesnake, ringneck, black rat, and Eastern hognose snake).

Special Status Species

Lock 7 Partners identified federal and state protected species and other species of concern that may occur within a one-mile buffer of the project boundary (table D-7, Appendix D). Federal candidates, proposed, and listed species are discussed further in section 3.2.3, *Threatened and Endangered Species*.

3.2.2.2 Environmental Effects

Project Operation and Maintenance

Hydropower project operation and maintenance can affect wetlands, riparian habitat, and associated wildlife by modifying the frequency and duration of downstream flows and the stability of impoundment water surface elevations. These modifications may alter the availability and quality of nearshore habitats for the species that rely on them. Vegetation

[33] Federally listed bat species are discussed in section 3.2.3, *Threatened and Endangered Species*.

management along transmission line corridors, recreation sites, and other project facilities can result in the permanent removal of terrestrial habitat or temporary disturbances to the suitability of terrestrial habitat (e.g., as a result of increased human activity). These activities may affect species composition and density, as well as the structure and function of terrestrial habitats. Additionally, transmission lines can pose electrocution and collision risks for birds and other wildlife.

As described in section 2.2.3, *Proposed Project Operation*, Lock 7 Partners proposes to continue operating the project in a run-of-river mode by maintaining the impoundment water surface elevation at or above the crest of the dam at all times. On the eastern side of the river adjacent to Lock and Dam No. 7, the KRA manages the vegetation and Jessamine County maintains the access road.[34] To prevent bird and wildlife mortality associated with project operation, Lock 7 Partners would maintain the existing animal protection guards and electrical insulation on the energized components of the substation. Lock 7 Partners also proposes to continue to manage vegetation along the project transmission line corridor.

No entity provided comments on the effects of continued project operation and maintenance on terrestrial resources in response to the Commission's public notice that the application was ready for environmental analysis.

Our Analysis

Run-of-River Operation

As discussed in section 3.2.2.1, *Affected Environment*, no wetlands are present within the project boundary. Continued run-of-river operation would maintain the existing frequency and duration of flow fluctuations at the project and would mimic the natural seasonal variation of flows in the Kentucky River. Given that no changes to the current project operation are proposed, continued run-of-river operation is expected to maintain current riparian habitat within the project boundary and surrounding area and is likely to support a variety of frogs, turtles, salamanders, ducks, heron, and snakes that are known to occur in the region.

Vegetation Management

As described above, vegetation on the eastern side of the river in the project boundary consists of mostly non-native herbaceous species including Japanese stiltgrass and Japanese hops. There are also some native herbs (field paspalum and annual marsh elder) and native trees (sycamore, sugar maple, and silver maple). Areas dominated by non-native, invasive plants reduce local biodiversity and provide lower quality wildlife habitat and foraging opportunities than areas with diverse assemblages of native plants (Swearingen et al., 2017).

The KRA's vegetation management at the project includes limited mowing, herbicide applications, and tree removal. A bushhog type mower is used to cut the open, grassy areas

[34] Staff assumes these entities would continue these maintenance activities during any new license term. *See* Lock 7 Partners' September 28, 2020 Response to Commission staff's June 29, 2020 Deficiency of License Application and Additional Information Request for the Mother Ann Lee Project P-539.

around the old Lockmaster's house and the field next to the access road every few weeks each summer. The KRA then uses a finishing type mower to cut the grassy area immediately adjacent to the esplanade and the old Lockmaster's house to keep the vegetation shorter. On the concrete esplanade, the KRA spot treats any plant growth with herbicide applications. The KRA does not trim trees and only removes trees if they fall down within the mowed areas inside the project boundary on the eastern side of the river.

Continuing the KRA's current vegetation management practices would maintain the areas adjacent to the lock and dam and access road as open fields, keep the esplanade free of vegetation that could damage the concrete slabs, and preserve the small wooded area. The non-native invasive plants established in the areas adjacent to Lock and Dam No. 7 are generally prolific seed producers and they would likely continue to dominate these areas unless they are actively managed. It is not clear whether the KRA implements any best management practices to minimize the spread of non-native invasive plants and promote growth of native vegetation. Such practices could include cleaning mowing equipment between uses, planting native or non-invasive grasses or other herbaceous species in the grassy areas, and timing mowing to allow native wildflowers to bloom and produce seeds. Removing fallen trees from the open grassy areas could eliminate potential habitat for insects and other wildlife, but there are few, widely spaced trees immediately adjacent to the grassy areas and so removal of fallen trees is likely to be infrequent.

Lock 7 Partners also hires contractors to trim trees once every three years along the existing transmission line right-of-way. The forested portions of the transmission line corridor include a segment extending east, from the edge of the developed area on the eastern shore of the river, up and across the top of the limestone cliffs for about 450 feet where another segment extends approximately 600 feet heading south, with trees along the west side. The remaining approximately 400 to 500 feet of the south-bearing transmission line passes over open fields to its point of interconnection with a distribution line. Periodic tree trimming activities could disturb wildlife along these segments of the transmission line corridor. However, these effects are expected to be temporary and limited to the footprint of the corridor.

Transmission Line

Exposed energized components at hydropower facilities can electrocute birds and other wildlife during project operation. Powerlines with voltages less than 60 kV are known to have higher risk of avian electrocution than those with higher voltages (APLIC, 2006). Power lines located between feeding and roosting areas of flocking birds, especially lines near rivers, lakes, or wetlands where fog may be common, can make lines less visible and may present an increased collision risk, as can inclement weather (APLIC, 2012; APLIC and FWS, 2005). Human activity near lines may startle and flush birds towards power lines. Collisions most often occur with the overhead static wire, which may be less visible than energized conductors due to its smaller diameter. Most bird collisions involve waterfowl, and other heavy-bodied, less agile birds (APLIC, 2012).

Lock 7 Partners indicates that the existing animal protection guards and electrical insulation on the energized components of the substation have virtually eliminated bird (e.g., turkey vulture) and other wildlife (e.g., squirrel) mortalities observed at the substation. While

Lock 7 Partners would maintain the existing avian and wildlife protection devices, the license application did not include procedures to monitor, repair, or modify them to account for damage over time and ensure that they remain protective in the future.

Lock 7 Partners' proposal also does not account for the potential effects of operating the 34.5-kV project transmission line, which poses a higher than normal risk of avian electrocution and collision because: (1) most electrocutions occur on medium-voltage distribution lines (i.e., between 4 to 34.5 kV) (APLIC and FWS, 2005); (2) attractive foraging/hunting, perching, and roosting habitat occurs around the transmission line, where it crosses the Kentucky River at the project dam between the cliffs of the Kentucky River Palisades, and continues through open fields and forested habitats before the point of interconnection;[35] (3) the transmission line could be difficult for birds to see, especially in fog and inclement weather; and (4) ongoing project operation and recreation activities could flush birds towards the transmission line. Birds that forage or hunt within, or fly thorough the project area could collide with, and/or be electrocuted by, the project transmission line or electrified components on its poles. There are no protection devices installed on the project transmission line and effects on birds and other wildlife along the transmission line are not currently monitored.

Maintenance of Lock 7 Partners' existing animal protection guards and electrical insulation on energized components would minimize the potential for electrocution of birds and other wildlife at the project substation. To ensure that these devices continue to function as intended during any new license term, the applicant could incorporate its proposal to maintain the existing animal protection guards into an Avian Protection Plan and develop specific procedures for monitoring their condition and identifying and scheduling any needed repairs or replacements. To address adverse avian/wildlife interactions with the project transmission line, the plan could also include provisions to: (1) install and maintain protection devices such as aerial marker spheres, swinging markers, and/or bird flight diverters on the transmission line, to minimize avian electrocutions and collisions; (2) periodically monitor the transmission line for nests, signs of adverse avian interactions, as well as the condition of any avian/wildlife protection devices; (3) train personnel on avian and wildlife protection measures, including reporting any adverse interactions; and (4) file an implementation schedule. Implementing such a plan would allow Lock 7 Partners to identify and address impacts to birds and other wildlife at all of the project transmission facilities in a timely manner.

Project Recreation Effects on Terrestrial Resources

Construction, operation, and maintenance of new recreational features, as well as informal recreation activities and vandalism could affect wildlife by creating noise, habitat disturbances and deterioration, and an increased human presence within the project area. Additionally, areas disturbed by the construction and maintenance of recreational facilities could create suitable conditions for the establishment of non-native invasive plants which may reduce

[35] The transmission line crosses the Kentucky River perpendicular to river flow and the Palisades corridor. The perpendicular orientation of a line relative to a topographical feature poses a greater collision risk to local and migrating birds, whereas a parallel orientation reduces risk (APLIC, 2012).

biodiversity and alter the composition of existing native plant and animal communities (Hobbs and Huenneke, 1992).

Lock 7 Partners' proposed Recreation Plan has a number of provisions that could affect terrestrial resources, including: (1) construction and maintenance of a new 1,300-foot-long canoe portage on the east bank of the Kentucky River adjacent to the lock and dam and an associated parking area (figure 2-1); (2) installation of a set of steel stairs, anchored to the bank, at the upstream and downstream access points (put-in/take-out) and downstream fishing access; and (3) installation of new signage that identifies areas that are off-limits to the public to deter unauthorized uses of project lands.[36]

No entity provided comments on the effects of recreation at the project on terrestrial resources in response to the Commission's public notice that the application was ready for environmental analysis.

Our Analysis

The proposed canoe portage and parking area would be constructed primarily over previously disturbed land, developed roads/pathways, or on the riverbanks. Approximately 970 feet of the proposed 1,300-foot-long canoe portage would use the existing Lock 7 Road while most of the remaining 330 feet would traverse open, mowed, areas or follow an existing informal pathway used for fishing access. Lock 7 Partners would install a new gravel path underlain with weed-barrier fabric where needed to connect the upstream and downstream access points. Using weed-barrier fabric would prevent vegetation from recolonizing the new paths and thereby reduce the need for future maintenance work. The proposed parking area would occur within a mowed area adjacent to the access road. About 315 square-feet of riparian habitat may be permanently cleared at the put-in and take-out locations to build steel stairs (flanked by riprap) for access from the water to the shoreline and portage. No tree removal or trimming is expected to complete construction. As a result, any effects of construction, operation, and maintenance of the proposed canoe portage with put-in and take-out steel stairs, and associated parking area on vegetation in the project area would be limited to a small footprint, be short in duration, and would not significantly impact wildlife or their habitats within the project area.

There is currently no recreation signage on the eastern side of the river because project lands adjacent to Lock and Dam No. 7 are closed to the public. However, Lock 7 Partners states that project lands on the eastern side of the project experience a lot of unauthorized public use and vandalism, including off-road vehicle use, spray painting, dumping, and burning fires inside the two large caves that are accessible from the grassy areas adjacent to Lock and Dam No. 7. Off-road vehicle use, spray painting, dumping, and burning can damage vegetation, cause soil erosion, and disturb or destroy wildlife habitats. Lock 7 Partners proposed to install signage that would identify authorized recreation activities, such as fishing and use of the canoe take-out/put-

[36] The Recreation Plan also states that Lock 7 Partners' intends to modify and expand the plan to include unspecified additional recreation amenities including a "mini-park" in consultation with Jessamine County in the future. However, these additional recreation amenities are considered speculative and not addressed here in the analysis of recreation effects on terrestrial resources.

in and portage, and areas that are off-limits to the public. Installing such signage would help deter unauthorized activities, thereby reducing the potential for vandalism and associated adverse environmental effects on vegetation and wildlife habitat.

Of the invasive plant species known to occur within the project area, the small seeds of Japanese stiltgrass, garlic mustard, and Japanese hops are the most likely to be spread during construction and maintenance of the canoe portage, and recreation activities (e.g., use of the canoe portage). However, the likelihood of recreationists coming into contact with invasive plant seeds and spreading them to new areas is reduced given that the canoe portage would mostly use an existing road and informal paths, and new gravel pathways underlain with weed-barrier fabric. As a result, the use of the proposed canoe portage and associated facilities is not expected to significantly increase the spread of non-native invasive plants.

3.2.3 Threatened and Endangered Species

3.2.3.1 Affected Environment

On June 4, 2020, Commission staff used the FWS's ECOS-Information for Planning and Conservation (IPaC) website to generate the following list of threatened and endangered (T&E) species that may be found in the project area or be affected by the Mother Ann Lee Project: the endangered gray bat, Indiana bat, sheepnose mussel, running buffalo clover, and Short's bladderpod; and the threatened northern long-eared bat. A review of the IPaC system on November 30, 2020, indicated that the endangered clubshell, fanshell, purple cat's paw; and the threatened rabbitsfoot mussel may also be present in the project area, or be affected by the project. Subsequently, the running buffalo clover was delisted due to recovery[37] and was removed from the official species list for the project. Given its recovery and delisting, the running buffalo clover is not discussed in detail herein. In addition, the monarch butterfly, a candidate species,[38] was added to the official species list.[39]

Aquatic Species

Sheepnose Mussel

Sheepnose mussels are medium-sized freshwater mussels that have smooth, shiny, and light yellow to yellowish-brown shells with dark concentric ridges (FWS, 2012). This species typically occurs in shallow areas, ranging from a few inches to two feet deep, in large rivers and streams with moderate to swift currents over coarse sand and gravel (Oesch, 1984). They are

[37] Running buffalo clover was removed from the Federal List of Endangered and Threatened Plants on September 7, 2021. 86 Fed. Reg. 43,102 (2021).

[38] On December 17, 2020, FWS found that adding the monarch butterfly to the list of threatened and endangered species is warranted, but currently precluded by work on higher-priority listing actions. *See* 85 Fed. Reg. 81,813 (2020).

[39] The initial IPaC species list for the project was generated on June 4, 2020, and filed on June 5, 2020 (FWS, 2020b). Subsequent lists were generated on November 30, 2020 (FWS, 2020a), September 16, 2021 (FWS, 2021b), December 27, 2021 (FWS, 2021a), and April 21, 2022 (FWS, 2022). While purple cat's paw is not included on the April 21, 2022 list, it appeared on previous lists and is discussed herein.

also occasionally found in areas of mud, cobble, and boulders, and in deep runs of large rivers (Parmalee and Bogan, 1998). Documented fish hosts include sauger and central stoneroller, though numerous other potential fish hosts exist (NatureServe, 2021a).

Although the sheepnose mussel's range includes the Midwest and Southeast, it has been eliminated from two-thirds of the streams from which it was historically found (FWS, 2012). Most existing populations, located in Alabama, Illinois, Indiana, Iowa, Kentucky, Minnesota, Mississippi, Missouri, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and Wisconsin, are small and geographically isolated, making this species vulnerable to catastrophic events and limiting reproductive ability without human assistance (FWS, 2012). Primary threats to this species that have been identified within its range include habitat destruction and alteration as a result of dams and channelization, reductions in water quality due to pollution, and invasive species. Critical habitat has not been designated for this species (FWS, 2021h).

Clubshell

Clubshells are small to medium-sized freshwater mussels with yellow to brown shells containing prominent green, blotchy rays (Cummings and Mayer, 1992). This species inhabits small to medium rivers in clean gravel or loose sand substrates (FWS, 1997b). Potential fish hosts known to occur in the Kentucky River include the striped shiner, blackside darter, central stoneroller, and logperch (NatureServe, 2021b).

Clubshells were historically found in Alabama, Illinois, Indiana, Kentucky, Michigan, New York, Ohio, Pennsylvania, Tennessee, and West Virginia (FWS, 2019c). Of 100 streams once known to be inhabited by this species, 19 streams are thought to contain the remaining known populations that are located in Indiana, Ohio, Michigan, Pennsylvania, West Virginia, and Kentucky (FWS, 2019c). Sedimentation as a result of land development, reduced water quality, industrial pollution, and slower velocities in, and maintenance of, extensive impoundments for navigation have been noted as the main ongoing threats to this species (FWS, 1997b). Critical habitat has not been designated for this species (FWS, 2021i).

Fanshell

Fanshells are medium-sized freshwater mussels that have light green or yellow shells and a pattern of dark green rays with numerous broken lines or dots (Cummings and Mayer, 1992). This species inhabits sand or gravel substrates in medium to large rivers and is often found in deeper waters with moderate current (FWS, 1997c). Documented fish hosts known to occur in the Kentucky River include banded sculpin, greenside darter, mottled sculpin, banded darter, blotchside logperch, and logperch (NatureServe, 2021c).

Historically, fanshells were found in the Ohio River and many of its large tributaries in Pennsylvania, West Virginia, Ohio, Indiana, Illinois, Kentucky, Tennessee, Alabama, and Virginia. Reproductively viable populations are now believed to be restricted to the Clinch River (Tennessee and Virginia), the Green River, and Licking River (Kentucky) (FWS, 2019d). Ongoing threats to this species that have been identified within its range include the construction of impoundments and navigation facilities, dredging for channel maintenance, sand and gravel mining, and water pollution (FWS, 2019d). Critical habitat has not been designated for this species (FWS, 2021j).

Purple Cat's Paw

Purple cat's paws are medium-sized freshwater mussel with smooth and shiny rectangular-shaped shells containing distinct growth lines, fine wavy green rays, with smooth and shiny yellowish green to brown surfaces (FWS, 1992). The insides of the shells are shiny and purple. This species is found in water of shallow to medium depth in large rivers with moderate current and stable, undisturbed, sand to boulder substrates (FWS, 1992). Known fish hosts that occur in the Kentucky River include rock bass, mottled sculpin, greenside darter, stonecat, logperch, and blackside darter (NatureServe, 2021d).

Purple cat's paws were historically found in the Ohio, Cumberland, and Tennessee River systems in Ohio, Illinois, Indiana, Kentucky, Tennessee, and Alabama (FWS, 2020b). Currently, this species occurs in the Ohio River, four of its tributaries (Killbuck Creek and Walhonding River in Ohio; and the Green River and Licking River in Kentucky), and one Tennessee River tributary (the Duck River, Tennessee) (FWS, 2020b). Excluding the Killbuck Creek population, all populations are the result of reintroduction efforts during 2017 (FWS, 2021n). Ongoing threats to this species survival that have been identified within its range include small, isolated population sizes, habitat destruction and alteration as a result of dams, reductions in water quality due to pollution, and invasive species. Critical habitat has not been designated for this species (FWS, 202lk).

Rabbitsfoot

Rabbitsfoot mussels are medium- to large-sized freshwater mussels with shells containing large, rounded, low bumps, and smooth and yellowish to greenish pattern with dark green, or nearly black, chevrons and triangles (FWS, 2009). This species is found in small to medium-sized rivers of moderate current with clean, shallow water and a mixture of sand and gravel substrates (USDA, 2002). Known fish hosts that occur in the Kentucky River include spotfin shiner and bigeye chub (NatureServe, 2021e).

Historically, the rabbitsfoot was a wide-ranging species, known from 139 streams in 15 states (FWS, 2009). Populations persist in Alabama, Arkansas, Illinois, Indiana, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Ohio, Oklahoma, Pennsylvania, and Tennessee. However, the total range and population have been reduced by more than 90 percent and only 10 of the remaining populations are considered to be large enough for long-term survival (FWS, 2009). The small size and isolated nature of existing populations makes this species vulnerable to catastrophic events. Ongoing threats to the rabbitsfoot that have been identified within its range include habitat destruction and alteration as a result of dams and channelization, reductions in water quality due to pollution, and invasive species. The project is located outside of the designated critical habitat for this species (FWS, 2021l).[40]

[40] *See* 80 Fed. Reg. 24,692-24,774 (April 30, 2015).

Terrestrial Species

Short's Bladderpod

Short's bladderpod is a biennial or perennial herb in the mustard family with alternate, densely hairy, grayish green leaves that decrease in size from the base to the tops of the stems. Plants grow up to 20 inches tall and contain several branching stems that give the plant a low, sprawling, bushy appearance (FWS, 2017). Flowering and fruiting from March through June, clusters of numerous, small, yellow flowers top single, and sometimes multiple, stems. Bees and flies are known to be effective pollinators of this species. Fruits are globe-shaped and typically contain 1 to 4 seeds. The methods of seed dispersal are uncertain.

Short's bladderpod historical range includes Indiana, Kentucky, and Tennessee. While the Mother Ann Lee Project is located outside of designated critical habitat for this species (FWS, 2021c), there are three known occurrences of this species within one mile of the project.[41] Specific primary constituent elements (PCEs), or essential physical or biological features that provide for this species' conservation include: (1) bedrock formations and outcrops of calcareous limestone, sometimes with interbedded shale or siltstone, in close proximity to the mainstem or tributaries of the Kentucky and Cumberland rivers and located on steeply sloped hillsides or bluffs, typically on south- to west-facing aspects; (2) shallow or rocky, well-drained soils formed from the weathering of underlying calcareous bedrock formations, which are undisturbed or subjected to minimal disturbance so as to retain habitat for ground-nesting pollinators and potential for maintenance of a soil seed bank; and (3) forest communities with no or low levels of invasive plants, and low levels of canopy closure or openings in the canopy to provide adequate sunlight for individual and population growth (FWS, 2017).

Ongoing threats to this species that have been identified within its range include the loss and degradation of habitat caused by the construction and maintenance of transportation rights-of-ways, prolonged inundation and soil erosion due to flooding and water level manipulation, canopy shading due to forest succession, and competition from invasive plant species (FWS, 2017). Almost all of the known populations of this species are considered to be small and vulnerable to extirpation (NatureServe, 2021f).

Monarch Butterfly

The monarch butterfly is a candidate for listing as a threatened or endangered species under the ESA.[42] Monarch butterflies have bright orange wings with black veins and a black border with a double row of white spots. During the breeding season, monarchs lay their eggs on milkweed plants (primarily *Asclepias* spp.),[43] and the larvae (i.e., caterpillars) emerge after two to five days. Caterpillars are initially green with black heads, and then gradually develop vivid black, yellow, and white bands as they grow by feeding on milkweed leaves and molting over a

[41] *See* EcoTech Consultants' Technical Memorandum on federally listed species in Lock 7 Partners' August 21, 2020 Response to Commission staff's June 29, 2020 Deficiency of License Application and Additional Information Request for the Mother Ann Lee Project P-539.

[42] 85 Fed. Reg. 81,813 (2020).

[43] Monarch butterfly larvae are obligate milkweed feeders. Individuals always lay their eggs on a milkweed plant, and the larvae only develop on various milkweed species.

period of 9 to 18 days before pupating into a chrysalis.[44] Adult monarch butterflies emerge from their chrysalises in 6 to 14 days. Monarchs breed year-round in many regions where they are present, and multiple generations are produced during the breeding season. Most adult butterflies live approximately two to five weeks; however, adults that migrate to overwintering sites enter into reproductive diapause (suspended reproduction) and live from six to nine months (FWS, 2021d).

During the fall, both the eastern and western North American monarch populations begin migrating to their overwintering sites in Mexico and California, respectively. This migration can last for over two months, during which monarchs may travel over 1,800 miles. In early spring (February-March), surviving monarchs break diapause and mate at the overwintering sites before dispersing. The same individuals that undertook the initial southward migration begin flying back through the breeding grounds and their offspring start the cycle of generational migration over again (FWS, 2021d).

The Mother Ann Lee Project is within the breeding range of the eastern North American migratory monarch population. Summer habitat requirements include the existence of milkweed plants for egg laying and larval feeding and development, and a variety of flowering plants for adults to feed on nectar. Given its dependence on milkweed and diverse nectar-rich plants, the loss of these plants due to herbicide use and habitat loss have been identified as contributing factors in the decline of the monarch butterfly (Fallon C. et. Al, 2016; FWS, 2021d).

Indiana Bat

Indiana bats are small with fine, fluffy grayish-chestnut fur and blackish brown wing membranes and ears. This species is semi-migratory, hibernating in mines and caves in the winter and roosting in wooded areas during the summer. Typically preying on butterflies, moths, and adult aquatic (flying) insects, Indiana bats forage in riparian areas along rivers and lakes, in upland and floodplain forest canopies, and over ponds and fields (FWS, 2007). Forested areas are the most important habitat in agricultural landscapes for this species (Menzel *et al.*, 2005).

In late summer, Indiana bats start migrating to hibernacula,[45] with the males arriving first. Suitable hibernacula include underground limestone caves and cave-like structures (e.g., abandoned mines, railroad tunnels), with a wide range of vertical structures, and cool, stable temperatures between 39.2ºF and 46.4ºF, and humidity levels above 74 percent, but below saturation (FWS, 2015; FWS, 2011). Indiana bats exhibit a fall swarming behavior, in which large numbers of bats congregate in forest habitat near winter cave entrances for several weeks from September to mid-October to feed, mate, and roost until temperatures drop to a point that forces them into hibernation. After mating, females immediately begin hibernation (usually by late October), and males generally continue swarming after mating to replenish fat reserves prior to hibernation (usually by late November). Females store sperm through hibernation and become pregnant upon emergence in late March or early April. Males emerge shortly afterward and

[44] Pupating into a chrysalis is the process of transforming between the larval and adult life stages for butterflies.

[45] Hibernacula are sheltered places, typically caves and mines for bats, that are occupied when these animals are dormant during the winter.

either remain at the hibernaculum in a bachelor colony or disperse to summer colony sites. During this spring emergence (i.e., about April 1 to May 14), Indiana bats forage in their swarming habitat and then migrate to their respective summer ranges. Primarily adult males use this swarming area year-round.

Females form maternity colonies with an average of 50 to 80 adults, roosting in hollow trees, under loose bark, or in cracks or holes in mature oaks, hickories, elms, and maples, as well as ash, cottonwood, pine, and hemlocks in riparian or upland forests (FWS, 2007). In June or early July, females give birth to a single pup, which is capable of flight within about one month of birth (NatureServe, 2021g). Suitable summer habitat includes a variety of forested/wooded areas where the bats roost, forage, and travel (FWS, 2015; FWS, 2011), like forested blocks and corridors with variable amounts of canopy closure, such as fencerows and riparian forests. Isolated live or dead trees may provide summer roosting habitat if they are 5 inches dbh or greater with exfoliating bark, crevices, or cracks. Dead or dying trees of 16 inches dbh or greater are considered optimal for maternity colony roosts. While female Indiana bats' fidelity to summer roosting trees has been documented, a tree may only provide suitable habitat for a few years. Successful maternity colonies may form in different suitable trees in subsequent years, if available (FWS, 2007).

Historically, Indiana bats ranged throughout much of the eastern half of the U.S. Large hibernating populations occur in Indiana, Virginia, Missouri, and Kentucky (FWS, 2007). On September 22, 1977, FWS designated critical habitat for Indiana bats in 11 caves and 2 mines in 6 states, including critical habitat in caves in Carter and Edmonson Counties, Kentucky.[46] The project area contains known summer habitat for Indiana bats,[47] but does not overlap with any critical habitat units for this species (FWS, 2021e).

Habitat loss and degradation, forest fragmentation, winter disturbance, and environmental contaminants are among the most significant range-wide threats to Indiana bats. More recently, white-nose syndrome,[48] non-native invasive species, climate change, and wind turbines have been identified as significant threats to the recovery of this species (FWS, 2019a). In addition, 85 percent of the total population hibernates in 7 of the caves designated as critical habitat and 50 percent in 2 caves. The concentration of the population in so few places makes this species extremely vulnerable to adverse impacts during the winter (FWS, 2007).

[46] *See* 42 Fed. Reg. 47,840-47,841 (September 22, 1977).

[47] *See* EcoTech Consultants' Technical Memorandum on federally listed species in Lock 7 Partners' August 21, 2020 Response to Commission staff's June 29, 2020 Deficiency of License Application and Additional Information Request for the Mother Ann Lee Project P-539.

[48] White-nose syndrome is a disease caused by a white fungus (i.e., *Pseudogymnoascus destructans*), which infects the muzzle and other parts of many bat species, and is associated with high mortality rates of 12 cave-hibernating bat species (FWS, 2019b).

Northern Long-Eared Bat

Northern long-eared bats are a medium-sized migratory species with longer ears (average 0.7 inches) than other *Myotis* species. They use high frequency echolocation[49] to hunt moths, beetles, spiders, flies, and leafhoppers primarily between the understory and canopy in forested areas, but also in more open areas, such as forest clearings, over water bodies, and along roads starting at dusk. During the winter, small groups of northern long-eared bats typically hibernate in cracks and crevices in the walls or ceilings of caves or abandoned mines with high humidity, cool temperatures, and no air currents, but this species also hibernates in buildings, railroad tunnels, and other human-made structures. Every two to three days during the summer, individuals or colonies switch roosts, which can include a wide variety of species and sizes of living or dead trees (i.e., typically with 3 inches dbh or greater), as well as the nooks and crannies in human-made structures (FWS, 2016). Northern long-eared bats breed from late July to October, females store sperm during hibernation, delaying fertilization (of a single egg) until ovulation during the spring. Typically born between late May and July, pups are raised in maternity colonies of 30 to 60 individuals,[50] and are most vulnerable to disturbances at maternal roosts before they learn to fly, from 18 to 21 days after birth.[51]

Although the northern long-eared bat range includes much of the eastern and north central U.S. and all Canadian provinces west to the southern Yukon Territory and eastern British Columbia, its distribution is patchy and historically has been observed more frequently in the northeastern U.S. and in Quebec and Ontario, Canada. Populations in southern Canada and east of the Mississippi River have declined sharply since the spread of white-nose syndrome. Recent surveys in upland areas indicate that this species is more common in the Tennessee, Kentucky, Arkansas, and Missouri parts of its range than previously thought (NatureServe, 2021h). The project area includes known swarming habitat, potentially suitable summer habitat[52] within 1 mile of the project area, and one known northern long-eared bat occurrence.[53]

The primary threat to northern long-eared bats is white-nose syndrome (FWS, 2014). Other identified threats to northern long-eared bats include: (1) changes to hibernacula openings that restrict movement or change the microclimate; (2) blasting, drilling, and other noises that disturb bats during hibernation; (3) clearing trees that are used for staging or swarming habitat or as maternity roosts; (4) burning that allows smoke to pass through roost trees (spring through fall) or enter hibernacula during the winter; (5) changes to water resources entering hibernacula or used for drinking or foraging habitat; and (6) exposure to pesticides and herbicides. Critical habitat has not been designated for northern long-eared bats (FWS, 2021f).

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[49] Echolocation is a technique that bats use to detect their surroundings by emitting high-pitched sounds that reflect off objects back to the animals' ears.

[50] *See* 78 Fed. Reg. 61,046 (October 2, 2013).

[51] *See* 80 Fed. Reg. 2,371 (January 16, 2015).

[52] FWS's January 30, 2018 Letter.

[53] *See* EcoTech Consultants' Technical Memorandum on federally listed species in Lock 7 Partners' August 21, 2020 Response to Commission staff's June 29, 2020 Deficiency of License Application and Additional Information Request for the Mother Ann Lee Project P-539.

Gray Bat

Gray bats are small migratory species with chestnut brown to russet dorsal fur, except after the summer molt when their fur is gray. Gray bats roost, breed, rear young, and hibernate in caves, migrating between summer and winter caves and using transient caves along the way. Hibernacula caves must have an average temperature ranging from 42 to 52°F (Kentucky DFWR, 2014) and most have deep vertical passages and large rooms that function as cold air traps. During summer, maternity colonies roost in caves with temperature ranging between about 57 and 77°F in small rooms or domes that trap the bats' body heat (Kentucky DFWR, 2014).

Similar to Indiana and northern long-eared bats, gray bats swarm and mate upon arrival at the winter caves (September through early November), females immediately begin hibernation, and males forage for several weeks longer to replenish fat reserves that must last for six to seven months during hibernation. Most juveniles and adult males are in hibernation by early November and leave hibernacula between mid-April and mid-May. Adult females become pregnant soon after emerging from hibernation in late March or early April. Each summer colony occupies a home range that often contains several roosting caves scattered along as much as about 43 miles of river, reservoir, or lake borders. Gray bats are extremely loyal to their colony home range but tend to disperse among several different caves within that area. In late May or early June, reproductively active females congregate in a maternity cave to give birth to one pup. Most pups begin to fly within 20 to 25 days after birth. Males and non-reproductive females congregate in smaller groups in nearby caves.

Gray bats eat a variety of flying insects present along streams, rivers, and lakes. Except for brief periods of inclement weather in early spring and possibly late fall, adults forage almost exclusively over water along river or reservoir/lake edges with forested riparian zones. Females in maternity colonies may forage 12 miles or more from their roost. However, summer caves, especially those used by maternity colonies, are nearly always located within about a half a mile of (and rarely more than 2.5 miles from) a river or reservoir/lake.

Gray bats range from southern Illinois and Indiana, south to north-western Florida, and from the Appalachians to eastern Oklahoma. Although there are scattered records of this species from caves across Kentucky, gray bats are known to occur primarily in the south-central portion of the state with major hibernacula located in Edmonson County (Kentucky DFWR, 2014). About 95 percent of the entire known population hibernates in 9 caves, with more than half in a single cave (Tuttle, 1979). There are maternity/ reproductive records for gray bats in Mercer, Jessamine, and Garrard Counties, Kentucky (Kentucky DFWR, 2017). There are also four known occurrences of the gray bat within one mile of the project.[54] Critical habitat has not been designated for this species (FWS, 2021g).

According to NatureServe (2021i), ongoing threats identified within the gray bat's range include human disturbances to preferred caves, white-nose syndrome, reduction in prey species

[54] *See* EcoTech Consultants' Technical Memorandum on federally listed species in Lock 7 Partners' August 21, 2020 Response to Commission staff's June 29, 2020 Deficiency of License Application and Additional Information Request for the Mother Ann Lee Project P-539.

and potential poisoning associated with insecticide and pesticide use near riparian areas where bats forage, deforestation, and impoundments that flood caves. Given their strong fidelity to particular caves, gray bats are very susceptible to disturbance (NatureServe, 2021i). Arousing bats during hibernation can deplete their energy stores before food becomes available and human disturbance of maternity colonies in June and July can lead to mortality if fleeing females drop their flightless young (FWS, 1997a).

3.2.3.2 Environmental Effects

The continued operation and maintenance of the Mother Ann Lee Project, and the construction and maintenance of the proposed canoe portage, could affect federally listed species within the project area if they are present. Hydropower operation can affect lake level fluctuations, leading to changes in littoral (nearshore) habitat in the impoundment, retention time of water in the impoundment, water temperatures and DO concentrations, and flow fluctuations downstream of the dam. Vegetation clearing could result in the removal of suitable maternity roost trees and/or disturbance of bats, and loss of adults and young if roost trees are occupied. Removal or disturbance of riparian vegetation could also increase downstream sedimentation by altering shoreline stability, which can alter water quality and aquatic habitat, creating poor conditions for the reproduction and survival freshwater mussels and their fish hosts. In addition, ongoing unauthorized access/use of, and vandalism in, the project area could disturb or damage potentially suitable habitats for listed species.

Lock 7 Partners does not propose any specific measures to protect federally listed species. However, as described in section 2.2.3, *Proposed Project Operation*, Lock 7 Partners proposes to continue operating the project in run-of-river mode by maintaining the impoundment water surface elevation at or above the crest of the dam at all times. Lock 7 Partners also proposes to construct and maintain a canoe portage and fishing access on the eastern side of the river adjacent to Lock and Dam No. 7, install signage to identify the authorized and unauthorized uses of the project area, and continue to manage vegetation along the project transmission line corridor.

In a letter filed on April 15, 2021, in response to the Commission's public notice that the application was ready for environmental analysis, FWS indicated that the Indiana bat, northern long-eared, gray bat, clubshell, fanshell, purple cat's paw, sheepnose, rabbitsfoot, running buffalo clover,[55] and Short's bladderpod (at a minimum) should be included the Commission staff's environmental analysis of the effects of relicensing the Mother Ann Lee Project.

[55] Lock 7 Partners conducted a habitat assessment for running buffalo clover within the project area and no occurrences or suitable habitat were identified. *See* Lock 7 Partners' February 19, 2021 Response to Commission staff's December 22, 2020 Additional Information Request. As stated above, the running buffalo clover was delisted and is not discussed further in this document. *See* 86 Fed. Reg. 43,102-43,117 (2021).

Our Analysis

Freshwater Mussels

Lock 7 Partners conducted a qualitative survey of freshwater mussel habitat of the river upstream and downstream of Lock and Dam No. 7 within the project area in order to evaluate potential project effects on federally listed mussels.[56] The area upstream of the dam consisted of large silt deposits and a sub-pavement of concrete slab along the right bank (eastern side) of the channel. Concrete substrate was also observed within the abandoned Lock No. 7 chamber, along the left (western) bank immediately downstream of the hydropower plant, and downstream of the dam weir where large boulders were also present. There was light to moderate scour in the center of the channel downstream from the dam, with some exposed bedrock further downstream likely due to progressively eroding streambanks from strong stormflow currents along the western bank. Sand was the predominant substrate on the eastern bank of the river channel downstream of the dam from the water's edge to the center of the channel, which is indicative of heavy aggradation and a highly unstable riverbed during storm flows. Starting at about 984 feet downstream from the dam on the western bank, the substrate particle sizes became increasingly smaller (i.e. hardpan and flocculated silt/mud) with the stream channel cutting down to bedrock.[57] The immediate project area is unlikely to be a recruitment area for federally listed mussels due to bed instability.[58] At the most downstream area surveyed (about 1,640 feet from the dam) on the eastern bank, bed materials were predominantly sand and gravel with some cobble conducive to mussel colonization.

Although mussel populations were not surveyed, two native mussel species were observed incidentally during the mussel habitat assessment. Two live plain pocketbooks (*Lampsilis cardium*) were observed actively filtering above the substrate about 1,640 feet downstream from the dam near the eastern bank of the river. In addition, one weathered shell of a threeridge (*Amblema plicata*) was found approximately 656 feet downstream from the dam. No federally listed species were found alive or dead. No suitable habitat for the sheepnose, clubshell, fanshell, purple cat's paw, or rabbitsfoot mussels was observed in the immediate upstream and downstream vicinity of Lock and Dam No. 7. The Kentucky Fish and Wildlife Information System's database has no mussel records within the last 20 years immediately

[56] The immediate area at the outflow of hydroelectric station was not surveyed due to safety concerns.

[57] *See* EcoTech Consultants' Technical Memorandum on federally listed species in Lock 7 Partners' August 21, 2020 Response to Commission staff's June 29, 2020 Deficiency of License Application and Additional Information Request for the Mother Ann Lee Project P-539; and Eco-Tech Consultants' (now ICF, Jones and Stokes, Inc.) Addendum in Lock 7 Partners' February 19, 2021 Response to Commission staff's December 22, 2020 Additional Information Request.

[58] *See* Lock 7 Partners' September 28, 2020 Response to Commission staff's June 29, 2020 Deficiency of License Application and Additional Information Request for the Mother Ann Lee Project P-539.

upstream or downstream of Lock and Dam No. 7.[59] However, suitable habitat for these species may be present within the 22.9-mile-long pool 7 and the 20.8-mile-long pool 6.[60]

Known fish hosts for sheepnose, clubshell, fanshell, purple cat's paw, and rabbitsfoot occur in the Kentucky River. These fish hosts may have dispersed listed mussel species to suitable habitat within pool 6 or 7 that were not observed during Lock 7 Partners' substrate survey. However, there is no suitable habitat for these federally listed mussel species within the immediate vicinity of Lock and Dam No. 7 upstream or downstream from the dam. As discussed in section 3.2.1.2 *Aquatic Resources, Environmental Effects,* there is no evidence to suggest that impingement, entrainment, and associated mortality adversely affect fish populations in the Kentucky River. Many of the mussels' known fish hosts are small-bodied which reduces the potential for impingement and entrainment mortality. In addition, many of these fish species have high reproductive rates, which helps serve as a buffer against population decline. As a result, ongoing run-of-river operation is not expected to reduce the populations of the mussels' known fish hosts.

Continuing to operate the project in a run-of-river mode would maintain the existing frequency, duration, and velocity of flows from the project and not change the aquatic habitat immediately upstream and downstream from the dam or within Kentucky River pools 6 and 7. Lock 7 Partners' ongoing water quality monitoring would allow for automatic shutdown of the project turbines if DO falls below state water quality standards. Such project shutdowns would allow inflows to pass over the spillway, allowing for increased mixing and aeration of outflows, until DO levels return to state standards. While project shutdowns due to low DO concentrations are relatively rare, continuing this practice would protect downstream water quality and aquatic habitat for mussels and their fish hosts and help to mitigate any low DO releases from the upstream Dix River hydropower facility. Maintaining adequate DO concentrations would continue to provide adequate water quality required for mussel survival downstream from the project. Additionally, construction of the proposed canoe portage would involve minimal to no soil disturbance, and therefore would not result in significant erosion or sedimentation in the project area.[61]

Given that no federally listed mussels or suitable habitat for these species are known to occur in the project area, and Lock 7 Partners proposes no changes to project operation, relicensing the project would have no effect on the sheepnose mussel, clubshell, fanshell, purple cat's paw, or rabbitsfoot or on the suitability of mussel habitat within the project area or in pools 6 or 7. In addition, the project would have no effect on critical habitat for the rabbitsfoot because it is located outside of the influence of the project.

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[59] *See* Lock 7 Partners' September 28, 2020 Response to Commission staff's June 29, 2020 Deficiency of License Application and Additional Information Request for the Mother Ann Lee Project P-539.

[60] *Supra* note 64.

[61] Implementation of general conditions 4, 5, 7, 8, and 10 of the water quality certification for the project would further ensure that the potential for erosion and sedimentation associated with the construction of the canoe portage would be minimized or avoided.

Short's Bladderpod

The life history and relationship between Short's bladderpod distribution and abundance and environmental factors are not well understood, but this species is found on steep, rocky wooded slopes and talus areas, along cliff tops and bases, as well as cliff ledges adjacent to rivers or streams and on south- to west-facing slopes within forests with open canopies (NatureServe, 2021f). South- and west-facing slopes receive more direct sunlight than north- and east-facing slopes, and therefore tend to have drier soils. Although there are three known occurrences of Short's bladderpod within one mile of the project, none are within the project boundary. On the western side of the Kentucky River at the project, Lock 7 Partners' habitat surveys concluded that there is a small rock face that could otherwise provide limited habitat for Short's bladderpod.[62] However, it faces east, where less direct sunlight would create a more mesic, less suitable microclimate for Short's bladderpod. In addition, the non-native invasive plants such as winter creeper, Japanese stiltgrass, garlic mustard, and bush honeysuckle that are present on ledges throughout the cliff and an upper slope forest likely shade the east-facing cliff habitat further, rendering it unsuitable for Short's bladderpod. On the eastern bank of the Kentucky River, suitable habitat for Short's bladderpod may occur on the west-facing rock cliffs adjacent to the open grassy areas because this habitat would receive more direct sunlight and create this species' preferred microclimate. However, this area is also dominated by non-native invasive plants like bush honeysuckle and Japanese honeysuckle.[63]

As noted above, Short's bladderpod occurs in undisturbed, or minimally disturbed, soils; areas with no, or few, invasive plants; and habitats with an open, or partially open, tree canopy. The only project maintenance activity that Lock 7 Partners conducts in potentially suitable habitat on the cliffs or cliff tops in the project area is tree trimming every three years within the transmission line corridor on top of the cliff on the eastern side of the project area. This activity is expected to result in little or no soil disturbance. Therefore, any existing ground-nesting pollinators and Short's bladderpod seeds within cliff or cliff top soils are unlikely to be affected by ongoing project operation and maintenance. Lack of vegetation management would allow the non-native invasive species to continue to dominate and preclude the cliff areas within the project boundary as suitable habitat for Short's bladderpod. However, the cliffs are very steep and generally inaccessible. Removal of invasive species could cause soil disturbance that could damage suitable habitat for Short's bladderpod. As described in section 3.2.2.1 *Terrestrial Resources*, *Affected Environment*, two nature preserves within the Kentucky Palisades located within one mile of the project where invasive plants are actively managed would likely provide more suitable and stable habitat for this species. Given that there are no known locations of Short's bladderpod or areas that include all of this species' habitat requirements within the project boundary, and project maintenance activities are unlikely to significantly damage any existing suitable habitat, relicensing the project is not likely to adversely affect the Short's bladderpod. In addition, there are no designated critical habitat units for this species within or

[62] See Lock 7 Partners' February 19, 2021 Response to Commission staff's December 22, 2020 Additional Information Request.

[63] *See* EcoTech Consultants' Technical Memorandum on federally listed species in Lock 7 Partners' August 21, 2020 Response to Commission staff's June 29, 2020 Deficiency of License Application and Additional Information Request for the Mother Ann Lee Project P-539.

adjacent to the project boundary and therefore relicensing the project would have no effect on Short's bladderpod critical habitat.

Monarch Butterfly

Vegetation management activities can affect milkweeds and other native nectar-rich plants upon which monarchs depend for survival. As described in section 3.2.2.2, *Terrestrial Resources, Environmental Effects*, the KRA maintains vegetation in the 10.93-acre portion of the project area on the eastern side of the Kentucky River. More specifically, the current vegetation management that could affect monarch butterflies includes mowing in an area of approximately three acres. Within the mowed area, about one acre of finish mowing occurs around the old Lockmaster house and esplanade, and two acres of bushhog mowing occurs in the grassy fields that flank Lock 7 Rd. In addition, herbicides are spot-applied on the approximately 0.25-acre concrete esplanade.[64]

The current vegetation management activities are proposed to continue in order to maintain the open grassy areas adjacent to Lock and Dam No. 7 and the proposed canoe portage in an open condition. Continued herbicide applications would not likely affect monarch habitat because they are limited to spot treatments as needed to maintain the concrete esplanade free of vegetation. The 1-acre grassy area near the old Lockmaster house and esplanade are mowed as needed with a finishing type mower to keep the grasses and other herbaceous species short, such that no stands of milkweed or nectar-rich native plants would likely be present for monarch reproduction or foraging.

The bushhog mowing in the two acres of grassy fields along Lock 7 Rd usually occurs about every three weeks during the growing season, allowing the grasses and other herbaceous species to grow higher in these fields. It is unknown if any milkweed or nectar-rich plants are present, or whether such plants can reach maturity between mowing events. Lock 7 Partners did not conduct complete vegetation inventories and their habitat surveys did not target milkweeds or other plants that are known to provide forage for monarchs. Milkweeds and nectar-rich plants that occur in the southeast region include butterfly, whorled, and swamp milkweeds, and Eastern smooth beardstongue, smooth oxeye, slender mountainmint, black-eyed Susan, blue mistflower, dense blazing star, field thistle, showy goldenrod, spotted beebalm, and wingstem (Xerces Society, 2021). Lock 7 Partners' survey results did show that non-native invasive plants are prevalent in the herbaceous layer in both managed and unmanaged portions of the project area. Non-native invasive plant communities generally degrade potential monarch habitat because they typically outcompete native species, potentially reducing or eliminating any milkweeds that may be present, and reduce the overall diversity of plants, including potential nectar sources for monarchs (Monarch Joint Venture, 2021).

Lock 7 Partners is not proposing to expand vegetation management or conduct other activities that could affect potential monarch butterfly summer breeding habitat (i.e., disturbance to milkweed plants or nectar-rich flowers). Due to the small area of routine mowing, the

[64] The KRA conducts these vegetation management activities (mowing and herbicide treatments) and staff assume it would continue these practices during any new license term. All areas were estimated using a geographic information system.

ongoing nature of these management practices, and the dominance of non-native invasive plants in the mowed areas, any project effects to monarch butterflies and their habitat would likely be insignificant and discountable.

Bats

The Office of Kentucky Nature Preserves' database documents occurrences and/or known swarming habitat for the gray, Indiana, and northern long-eared bats. Specifically, there are four occurrences of gray bats and one occurrence of a northern long-eared bat within one mile of the project area. In addition, known winter swarming habitat for the northern long-eared bat and known summer habitat for the Indiana bat occurs within one mile of the project area. None of the known occurrences or critical habitat units are located within the Mother Ann Lee Project boundary.[65]

During pre-filing, Lock 7 Partners conducted surveys to determine if suitable habitat for federally listed bat species (e.g., roost trees, cliff-line, caves, or cave-like features) occurs within the project area, and to evaluate any potential project effects on these species.[66] Two cave openings directly adjacent to Lock and Dam No. 7 on the eastern side of the Kentucky River within the project boundary were assessed. Although these features are large enough and contain characteristics consistent with winter bat use (e.g., unobstructed entrances, cool air temps, stable walls and ceilings, and water), no bats or signs of bat use (e.g., staining, guano, etc.) were observed in either cave. Additionally, multiple fire pits, trash, and graffiti within the caves indicate they are frequently visited by people and therefore bat use is unlikely. These caves are very visible and easily accessed so it can be assumed that if these features were used as winter habitat for listed bats, they would have been documented by the FWS based on their proximity to other known hibernacula.[67] A third cave within the project boundary was not assessed. While it is undetermined whether this third cave provides suitable habitat for federally listed bats, ongoing project operation and maintenance, and the construction and use of the canoe portage would not affect it because it is located over 100 feet above the ground on a cliff face, has a much smaller opening than the other two caves, and is inaccessible without specialized equipment.[68] The caves are not located at existing or proposed project recreation sites, and Lock 7 Partners does not conduct any maintenance activities in the caves, or control access to them (e.g., Lock 7 Partners does not currently address the unauthorized uses/vandalism described in section 3.2.2.2 *Terrestrial Resources, Environmental Effects*). Given that Lock 7 Partners'

[65] *See* EcoTech Consultants' Technical Memorandum on federally listed species in Lock 7 Partners' August 21, 2020 Response to Commission staff's June 29, 2020 Deficiency of License Application and Additional Information Request for the Mother Ann Lee Project P-539.

[66] Surveyors used the protocols in FWS's "*2020 Range-Wide Indiana Bat Survey Guidelines*," which are acceptable for use for the gray and northern long-eared bats.

[67] *See* EcoTech Consultants' Technical Memorandum on federally listed species in Lock 7 Partners' August 21, 2020 Response to Commission staff's June 29, 2020 Deficiency of License Application and Additional Information Request for the Mother Ann Lee Project P-539.

[68] *See* Eco-Tech Consultants' (now ICF, Jones and Stokes, Inc.) Addendum in Lock 7 Partners' February 19, 2021 Response to Commission staff's December 22, 2020 Additional Information Request.

ongoing project operation and maintenance do not occur in the caves, relicensing the project would not affect the use of these features by bats.

Summer roosting habitat for Indiana bat and northern long-eared bat was documented in forested riparian habitat on both sides of the Kentucky River within the project boundary. The majority of the live trees and shrubs were greater than 3 inches dbh and ranged from 3 inches dbh to greater than 15 inches dbh. There were also trees with dead or broken tops, and numerous dead or dying ash trees with exfoliating bark, cracks, crevices or hollows. In addition, suitable travel and foraging habitat for these bat species were identified along the riparian zone of the Kentucky River and the grassy area located along the eastern side of the Kentucky River in the project boundary.

Indiana Bat

While one of three caves within the project boundary was not assessed for suitable winter habitat for Indiana bats, there were no signs of bat use within the other two larger caves in the project boundary during Lock 7 Partners surveys. Given the accessibility and disturbances associated with the current public uses of the two caves that were surveyed, it is unlikely that they would become suitable winter habitat for Indiana bats. As discussed in section 3.2.2.2, *Terrestrial Resources, Environmental Effects*, Lock 7 Partners' proposal to install signage that identifies unauthorized activities in the project boundary could help deter vandalism and the associated disturbances to these caves in the future. The third cave, which was not assessed, is inaccessible without special equipment, and therefore is largely protected from public entry and associated disturbances. Ongoing project operation and maintenance, and canoe portage construction would not affect the caves in the project boundary because they would not occur in the caves, and would therefore not affect potential use of these features by bats.

Known Indiana bat summer habitat occurs within one mile of the project and suitable summer roost trees and foraging/traveling corridors for Indiana bats occur within the project boundary and surrounding area. Loss of trees at the project could remove habitat for summer roosting, travelling, and foraging bats. The proposed canoe portage, take-out/put-in, and parking area would be located mostly on previously cleared land, much of which has been maintained in an open condition during the current license term. Lock 7 Partners does not propose tree removal, blasting, or herbicide application as part of construction of the canoe portage and associated amenities and has therefore not proposed any bat protection measures. However, Lock 7 Partners' proposal includes ongoing vegetation management within the project transmission line corridor, which could affect suitable habitat for Indiana bats. At least every three years, Lock 7 Partners' contractor trims trees in the corridor which could disturb or modify suitable summer roost trees, or swarming, foraging, and traveling habitat.

For any regular, non-emergency tree maintenance that may be required within the transmission line corridor and the area surrounding the proposed canoe portage, Lock 7 Partners could protect suitable summer roosting, swarming, foraging, and travel habitat by limiting tree trimming and removal to the period between November 15 and March 31 when Indiana bats are inactive/hibernating. Implementing this time of year restriction on tree trimming and removal activities within the project boundary would avoid or minimize disturbing, harming, or killing Indiana bats because any summer roost trees would be unoccupied during this period. In

addition, implementing general conditions 8 (in part, to minimize disturbance to the channel, banks, or riparian vegetation if use of heavy equipment is required) and 10 (restrict removal of existing riparian vegetation to the minimum necessary during construction) of the project's water quality certification (Appendix B) would minimize disturbance of riparian vegetation throughout any new license term, thereby ensuring that project activities would have only minor and temporary effects on the bat foraging and traveling corridors that were identified within the project area. By limiting regular tree trimming and removal activities within the project boundary to outside of Indiana bats' pup-rearing and broader active season, and protecting riparian habitat at the project, relicensing the project is not likely to adversely affect this species.

Northern Long-Eared Bat

The project is located within an area identified by FWS as the "white-nose syndrome zone," which encompasses the majority of the U.S. portion of the northern long-eared bat range. In addition, Garrard County, Kentucky, is among many counties identified as having hibernacula infected with the fungus that causes white-nose syndrome (FWS, 2020n). Under FWS's January 14, 2016 final 4(d) rule for northern long-eared bats, incidental take[69] of this species within the white-nose syndrome zone is prohibited only if: (1) actions result in the incidental take of northern long-eared bats in hibernacula; (2) actions result in the incidental take of northern long-eared bats by altering a known hibernaculum's entrance or interior environment if the alteration impairs an essential behavioral pattern, including sheltering this species; or (3) tree-removal[70] results in the incidental take of this species when the activity either occurs within 0.25 mile of a known hibernaculum, or cuts or destroys known occupied maternity roost trees, or any other trees within a 150-foot radius from the maternity roost tree, during the pup season (i.e., June 1 through July 30). Incidental take attributable to removal or management of hazardous trees or the protection of human life or property is not prohibited. FWS recommends that these activities be conducted during the winter, wherever possible, to protect potential northern long-eared bat roosts. To protect known northern long-eared bat maternity roosts and hibernacula during tree-removal activities, FWS recommends the following two conservation measures: (1) apply a 0.25-mile buffer around known, occupied hibernacula; and (2) do not cut or destroy known, occupied maternity roost trees, or any other trees within a 150-foot radius around the maternity roost tree, during the pup season.[71]

There are no known occupied northern long-eared bat hibernacula within 0.25 mile of the project boundary, and there are no known maternity roost trees within 150 feet of the project

[69] "Take" is defined as to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect or attempt to engage in any such conduct." "Incidental take" is defined as "any taking otherwise prohibited, if such taking is incidental to, and not the purpose of, an otherwise lawful activity." 81 Fed. Reg. 1,900-1,922 (January 14, 2016).

[70] FWS defines "tree removal" as "cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, saplings, snags, or any other form of woody vegetation likely to be used by northern long-eared bats." *Id.*

[71] *Id.*

boundary.[72] In addition, as discussed above, there are no signs of bat use in the two larger caves at the project, and the third cave is inaccessible without special equipment and is not otherwise affected by project operation, maintenance, or other activities due to its height above the project. Lock 7 Partners proposal to install signage identifying unauthorized activities would deter vandalism in the project boundary and minimize associated disturbances to the caves. Use of the caves by bats would not be affected by ongoing project operation and maintenance; construction of the canoe portage, take-out/put-in, and parking area; or project-related recreation.

However, as mentioned above, within one mile of the project, there is one documented occurrence of a northern long-eared bat, known winter swarming habitat for the northern long-eared bat, and known summer habitat for the Indiana bat. Summer roosting habitat requirements for northern long-eared and Indiana bats are similar, with northern long-eared bats roosting in a broader range of tree sizes (i.e., typically trees of 3 inches dbh or greater) than Indiana bats. In addition, Lock 7 Partners' surveys documented suitable roost trees and foraging and traveling habitat for northern long-eared bats within the project boundary and the surrounding area on both sides of the Kentucky River. Lock 7 Partners' proposed tree trimming within the project transmission line corridor every three years could affect suitable habitat for northern long-eared bats on the eastern side of the Kentucky River by disturbing or modifying suitable summer roost trees, or swarming, foraging, and traveling habitat.

Given that no signs of bats using the caves in the project area for hibernacula were observed, and no tree removal or blasting would occur during the construction of the proposed canoe portage, take-out/put-in, and parking area, the effects on northern long-eared bats would be limited to those associated with tree trimming and removal as part of regular vegetation management at the project. As with the Indiana bat, limiting tree trimming activities to winter months, between November 15 and March 31, would avoid spring and fall swarming and maternity/summer roosting periods for the northern long-eared bat. Implementing this measure would prevent disturbing, directly harming, or killing northern long-eared bats because bats would be dormant (hibernating) during this time. Unexpected tree trimming or removal at the project would likely be limited to emergency removal of hazardous trees. Finally, implementing general conditions 8 and 10 of the project's water quality certification (Appendix B) would also minimize disturbance of riparian vegetation throughout any new license term, thereby ensuring that project activities would have only minor and temporary effects on the bat foraging and traveling corridors that were identified within the project area. Based on the above analysis, relicensing the proposed project may affect the northern-long eared bat, but would not result in prohibited incidental take of this species under the 4(d) rule.

Gray Bat

Gray bats are known to occur within 1 mile of the project area and given that they typically forage in riparian and stream corridors, they could use the project area for foraging and traveling to and from cave roosts. While suitable traveling and foraging habitat for gray bats

[72] See FWS, Kentucky Ecological Services Field Office's letter generated and filed by Commission staff on January 24, 2022, verifying that there are no known occupied northern long-eared bat hibernacula within 0.25 mile of the project boundary, and there are no known maternity roost trees within 150 feet of the project boundary.

occur within the project boundary and the two assessed caves in the project boundary contain suitable physical habitat characteristics, they show no sign of use by bats. The reason for lack of use is unclear; however, unauthorized activities within these caves could be a factor preventing use. Lock 7 Partners' proposed signage identifying unauthorized activities would deter vandalism and any associated disturbances to the caves during any new license term and could result in future bat use of the caves if there are no other factors preventing use. As discussed above, ongoing project operation and maintenance, and canoe portage construction would not affect the potential use of these caves by bats during any new license term.

The effects of canoe portage construction on riparian habitat are expected to be temporary and negligible, but they could result in minor effects to suitable travel or foraging corridors for gray bats. Implementing the general conditions 8 and 10 of the project's water quality certification would minimize disturbance of riparian vegetation and thereby ensure that project activities would have only discountable and insignificant effects on the travel or foraging corridors that were identified within the project area. Based on the above analysis, relicensing the project is not likely to adversely affect the gray bat.

3.2.4 Recreation

3.2.4.1 Affected Environment

Regional Recreation

The Kentucky River corridor is a unique recreation, scenic, and historic resource of statewide significance (Kentucky DLG, 2019). Historically managed for barge traffic, the KRA now manages the river for water supply and recreation (KRA, 2021a). Lock Nos. 1, 2, 3, and 4 are operated on a seasonal schedule for recreation, and small motorized boats, canoes, and kayaks are able to recreationally navigate the river using the locks (KRA, 2021b).

The project is located in the region of central Kentucky known as the Kentucky River Palisades. The Palisades region consists of limestone cliffs, deep gorges, springs, and caves. The remoteness and natural beauty of the area make it a destination for paddling trips, with a number of commercial outfitters providing canoe and kayak rentals in the vicinity of the project (Kentucky Tourism, 2021). Since 2012, the National Park Service (NPS), in conjunction with the Commonwealth of Kentucky, local governments, and the Kentucky Riverkeeper (collectively the Kentucky Water Trail partners), have developed plans for improving river access for recreational boating and interpreting the ecology and cultural history of the river as part of the Kentucky River Water Trail system (Interior, 2012).

The Kentucky River basin provides diverse recreational fishing opportunities, ranging from cold-water trout fishing in its tributaries to warm-water fishing in the mainstem. Anglers catch catfish, black bass, white bass, hybrid striped bass, drum, crappie, sauger, and muskellunge. Natural populations are supported by stocking. Land-based recreation opportunities, such as camping, hiking, biking, and hunting are also widely available in the region at various state parks and recreation areas. Local parks provide additional recreation resources.

Recreation at the Project

Currently, Lock 7 Partners provides no recreation amenities at the Mother Ann Lee Project, although the shoreline downstream from the lock chamber on the east side of the Kentucky River is used by anglers to access the Kentucky River. Parking for angler access is available at an informal pull-off from Lock 7 Road.[73]

A number of privately owned boat ramps provide public access to the Kentucky River in the project vicinity for nominal fees. Boat access to pool 7 is provided approximately a half mile upstream of the project on the eastern side of the Kentucky River at the privately-owned High Bridge Boat Ramp,[74] and on the western side of the river at Shaker Landing, which is part of the Shaker Village of Pleasant Hill, a National Historic Landmark. The nearest downstream boat ramp is the Palisades Adventures boat ramp, on the west side of the Kentucky River, about 2.5 river miles downstream of the project at the US 68 bridge crossing (KRA, 2014).

In 2006, the U.S. Army Corps of Engineers (Corps) permanently closed the lock structure at Lock and Dam No. 7 by constructing a concrete cut-off wall in the lock chamber (KRA, 2021c). With the lock closed, the dam at the Mother Ann Lee Project is not passable by boat, and no portage currently is provided for recreational boaters.

3.2.4.2 Environmental Effects

Lock 7 Partners proposes to implement a recreation plan, filed September 28, 2020, to guide the development, operation, and maintenance of recreation facilities at the project. The plan includes conceptual drawings for a new canoe portage, designated bank fishing area, and parking area, as well as a proposal for new signage and a discussion of how Lock 7 Partners would operate and maintain the recreation facilities at the Mother Ann Lee Project.

Under the plan, Lock 7 Partners proposes to construct a new, 1,300-foot-long canoe portage on the east bank of the Kentucky River adjacent to the lock and dam. Because of the river's steep banks, Lock 7 Partners proposes to install a set of steel stairs, anchored to the bank, with double handrails for moving canoes to and from the water at both the upstream and downstream access points (put-ins/take-outs). As much as possible, the portage path would follow the existing Lock 7 Road, with new gravel paths installed to connect the road to the upstream and downstream access points. Lock 7 Partners proposes to designate the area around the downstream access point for fishing and swimming. In addition to existing parking along Lock 7 Road near the proposed downstream access point, Lock 7 Partners proposes to install a new gravel parking area near the upstream access point. Lock 7 Partners also proposes to install directional and safety signage for the portage that would be of a style and type used at other portages along the Kentucky River Water Trail.

The recreation plan was developed in consultation with Kentucky DFWR, KRA, Jessamine County, Kentucky Riverkeeper, and the Kentucky Water Trails Alliance.

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[73] Lock 7 Road is maintained by Jessamine County.

[74] As of April 2021, the High Bridge Boat Launch was temporarily closed (JCTA, 2021).

Our Analysis

Lock 7 Partners' proposed portage facilities would improve recreational boating access to the Kentucky River, particularly through the Kentucky River Palisades. Currently, all boat launches in the project area are privately owned and subject to periodic or permanent closure by the landowners. The project's portage would provide public access, with parking, to both pools 6 and 7 for canoes and kayaks. The proposed access point stairs, with double handrails for transporting canoes would help visitors navigate the Kentucky River's steep banks near the site. The proposed signage directing users to the put-in and take-out locations would improve the visibility and accessibility of the site's recreation amenities. These measures would support the continued development of the Kentucky River Water Trail by improving connectivity at the project. Further, construction of stairs at the downstream portage access point will improve access for anglers wishing to fish below the dam by providing a safe route down steep banks to access the water. The recreation plan contains no construction schedule. Establishing a deadline to complete construction of these facilities, within 2 years of license issuance, would ensure that the recreation facilities are constructed and opened to the public in a reasonable amount of time given the current lack of developed recreation facilities at the project.

3.2.5 Cultural Resources

3.2.5.1 Affected Environment

Section 106 of the NHPA requires that the Commission take into account the effects of its actions on historic properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on the undertaking.[75] Historic properties are those that are listed or eligible for listing in the National Register. The regulations implementing Section 106 of the NHPA also require that the Commission seek concurrence with the SHPO on any finding involving effects or no effects on historic properties and consult with interested Indian tribes or Native Hawaiian organizations that attach religious or cultural significance to historic properties that may be affected by an undertaking. In this document, we also use the term "cultural resources" for properties that have not been determined eligible for listing in the National Register. Cultural resources represent things, structures, places, or archaeological sites that can be either prehistoric or historic in origin. In most cases, cultural resources less than 50 years old are not considered historic under the NHPA.

Area of Potential Effects

Pursuant to section 106, the Commission must take into account whether any historic property could be affected by the issuance of a proposed license within a project's APE. The APE is determined in consultation with the SHPO and is defined as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The APE encompasses 8.57 acres on the east

[75] An undertaking means "a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approval." 36 C.F.R. § 800.16(y) (2020). Here, the undertaking is the potential issuance of a new license for the project.

bank of the river and 6.84 acres on the west bank of the river adjacent to the Mother Ann Lee Project facilities and Kentucky River Lock and Dam No. 7. All of these lands are located within the project boundary. Given the run-of-river nature of the project, and the lack of unsubmerged lands within the project boundary along the impoundment, the APE does not extend upstream beyond the area around the powerhouse, lock, and dam. The Kentucky SHPO concurred with the APE, by letter filed March 9, 2021.

Cultural History Overview[76]

Historical Era

At the time of European colonization, the three main indigenous groups occupying eastern Kentucky were the Shawnee, Cherokee, and Iroquois. Eastern Kentucky was the traditional homeland for the Shawnee, who lived in permanent towns and villages. The Cherokee also inhabited the region at the time, living primarily in the mountainous region to the south, but claiming lands as far north as the Ohio River. The Iroquois frequented the Central Bluegrass region of Kentucky; however, their traditional lands were primarily located further north. Other smaller groups in the area include the Delaware, Miami, Mingo, Tutelo, and Wyandotte (Stallings, 2016).

The first two permanent Euroamerican settlements in Kentucky were Harrodsburg and Boonesborough, both established in 1775. Settlement rates increased dramatically after the American Revolution, with Lexington and Georgetown developing into large towns. By 1790, Kentucky began to produce agricultural surpluses and establish trade networks down the Ohio and Mississippi Rivers.

History of the Kentucky River Locks and Dams

The Kentucky River served as a major transportation route for tobacco, whiskey, and other early agricultural products down to the Ohio and Mississippi rivers and then on to markets as far away as New Orleans. The river's natural character was relatively narrow and meandering, subject to periods of both floods and low water. Pools of deep water, impounded by sand and gravel bars or rocky shoals, existed every few miles along the length of the river which impaired travel. Because river transportation became increasingly important to the state's economy, plans were made for a system of locks and dams along the river to improve river transportation. The Commonwealth of Kentucky constructed the first five locks on the river between 1836 and 1842.

As railroads pushed into the region, river transportation declined. When the Corps took over the system of locks in 1880, many of the existing structures were in poor condition and unusable. The Corps rebuilt Lock and Dam Nos. 1 through 5, and by 1917, a total of 14 locks and dams were complete and a 6-foot-deep channel stretched nearly 255 miles from Beattyville, at the confluence of the North and South Forks of the Kentucky River, to Carrollton, near the confluence with the Ohio River. The purpose of building the locks and dams was to ship coal;

[76] Unless otherwise noted, the Cultural History Overview is adapted from Crowell and Striker (2020), which is available at: https://elibrary.ferc.gov/eLibrary/filelist?document_id=14894512 .

however, by the time the system was completed, river transportation was already not able to compete with railroads, and therefore, it became obsolete.

Barges associated with logging and industrial operations on the river continued to pass through the locks before World War II, with the last coal barging ending in 1975. During the post-war period, the focus of river management became flood control, and later, water quality and supply, recreation, and fish and wildlife resources. The locks remained open for limited use until the 1970s when the Corps permanently closed locks 5 through 14 (Johnson and Parish, 1999). Subsequently, KRA assumed responsibility for all 14 lock and dam structures along the Kentucky River and now manages them for recreation and water supply.

Mother Ann Lee Hydroelectric Station

Organized in 1912, the Kentucky Utilities Company turned to Kentucky's waterways as a source to meet growing electricity demand. In 1923, the company began construction of a hydroelectric dam on the Dix River, which enters the Kentucky River just upstream of Lock and Dam No. 7. After completing the Dix Dam, Kentucky Utilities Company took options for developing hydroelectric plants at all 14 navigational dams on the Kentucky River. It exercised its only option at Lock and Dam No. 7, where releases from Dix Dam and the Kentucky River's normal flow could be converted into electric power (Johnson and Parrish, 1999). The hydropower station was designed by notable hydropower engineer Leroy Francis Harza. Completed in 1928, the hydroelectric station required removal of the western third of the original timber-crib dam. The hydroelectric station includes three major structures (substructure, forebay and substation, and one building (the powerhouse), each made primarily of reinforced, cast-in-place concrete. The substructure encloses three turbine bays and an adjoining spillway tied into the river bed and bedrock. The forebay is located upriver of the substructure and turbine intakes. The substation is built into the adjoining west bank and vertical rock face. The elevated concrete powerhouse encloses three generators and rests on three hollow concrete piers set into the hydroelectric station substructure. Over time, the turbines; generators; switching, bussing, and metering equipment; wiring, conduit, and other functional mechanisms and equipment have been replaced or modified and represent multiple time periods, from original construction to the present day.

Historic Properties

In 2018, Gray & Pape, Inc. conducted Phase I archaeological and historical/architectural surveys of the APE for the Mother Ann Lee Project (Striker and Kelly, 2021; Hussein-Wetzel and Kotlensky, 2020). The purpose of these surveys was to determine if historic properties were present within the project's APE.

The Phase I archaeological survey consisted of background research, field investigations, data collection and analysis, and reporting. One previously unrecorded archaeological resource was identified within the APE, site 15Js204. Site 15Js204 is located in a level, vegetated area on the east side of the Kentucky River just upstream of the lock chamber. Site 15Js204 is a low-density, historic artifact scatter contained entirely within the uppermost soil horizon. However, because of the extremely low density of cultural materials and absence of intact subsurface artifacts, the site is not recommended eligible for listing on the National Register (Striker and Kelly, 2021),

The Phase I historical/architectural survey consisted of background research and field investigation of the APE. The investigators also assessed the potential for the project to cause visual impacts to the nearby Shakertown Historic District, which is listed on the National Register. Background and field investigations indicated that although the project's APE encompasses a portion of the Shakertown Historic District, no contributing or non-contributing resources for the historic district are located within the project's APE or would be visually affected by relicensing the project as proposed (Hussein-Wetzel and Kotlensky, 2020).

Two additional resources within the APE were evaluated for National Register eligibility: Kentucky River Lock and Dam No. 7 (previously recorded as site JS-196) and the Mother Ann Lee Hydro Station (ME-554). Based on their investigations, Hussein-Wetzel and Kolentsky (2020) recommended Kentucky River Lock and Dam No. 7 as eligible for listing in the National Register under Criteria A and C.[77] Lock and Dam No. 7 is eligible under Criterion A as a contributing property to the larger efforts of navigation improvement in the Kentucky River basin in the nineteenth century. Lock and Dam No. 7 is also eligible under Criterion C as a representative of the brief era (ca. 1885-1900) in Corps engineering projects that featured locally-quarried stone in the construction of lock chambers and the final generation of timber crib dams in major river navigation projects. The later-added concrete coating has conserved the timber, protecting the dam from major flood events (Hussein-Wetzel and Kotlensky, 2020).

The Mother Ann Lee Hydropower Station was also recommended by Hussein-Wetzel and Kotlensky (2020) as eligible for listing in the National Register under criteria A, B,[78] and C. The Mother Ann Lee Hydropower Station is eligible under criterion A because it is representative of small-scale, local power generation in an early and expanding era for hydroelectric generation and electrical engineering design, maintains a high degree of integrity in a relatively undisturbed setting, has few extant peers elsewhere, and also because the property represents a unique and bold approach to diversifying rural electrical power generation in the years immediately before large-scale, New Deal-era hydropower development. The property is eligible under criterion B because the property was designed by early influential American hydraulic and hydropower engineer Leroy Francis Harza (1882–1953), who also designed the hydroelectric station on the nearby Dix River. The Mother Anne Lee Hydropower Station is eligible under Criterion C as a representative work of Harza, and as an example of a unique adaptation of a preexisting slack-water navigation improvement to supply electricity to the surrounding area (Hussein-Wetzel and Kotlensky, 2020).

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[77] Criterion A resources are those that have an association "with events that have made a significant contribution to the broad patterns of [U.S.] history." 36 C.F.R. § 60.4. Criterion C resources are those "that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction[.]" *Id*.

[78] Criterion B resources are those that have an association "with individuals whose specific contributions to history can be identified and documented." 36 C.F.R. § 60.4.

3.2.5.2 Environmental Effects

Lock 7 Partners proposes to continue operation and maintenance of the hydropower facilities at the Mother Ann Lee Project with no major modifications to project facilities or operations. Lock 7 Partners also proposes to construct a canoe portage and parking, and place signage on the east bank of the Kentucky River to provide access for non-motorized boating and fishing. To protect historic properties within the project's APE over the term of a licenses, including the National Register-eligible Kentucky River Lock and Dam No. 7 and Mother Ann Lee Hydropower Station, Lock 7 Partners proposes to implement an HPMP, filed September 28, 2020.

In comments filed April 19, 2017, the Eastern Band of Cherokee Indians states that no cultural resources important to the Cherokee people would be adversely impacted by the undertaking, but requests that the applicant cease work and consult with the Eastern Band of Cherokee Indians' tribal historic preservation office if unknown cultural resources or human remains are discovered at the project or if the project proposal changes. In comments filed February 25, 2021, the Cherokee Nation requests consultation if items of cultural significance are discovered at the project.

The Kentucky SHPO provided comments on the archeological and historic/architectural survey reports and HPMP in letters filed September 28, 2020, March 9, 2021, and July 1, 2021. In the comment letters, the Kentucky SHPO requests modification to the HPMP's discussion of the project's APE, activities exempt from further review, protocol for emergency response, annual reporting, and review and update procedures.

Our Analysis

Section 106 of the NHPA requires the Commission to take into account the effect of licensing a hydropower project on historic properties. Project-related effects on cultural resources within the APE may result from: (1) project construction and other ground disturbing activities, including construction of recreational enhancement measures; (2) project operations, such as reservoir and regulated river reach fluctuations; and/or (3) routine maintenance or modification to National Register-eligible properties associated with the project.

Based on the descriptions of the character-defining features and assessment of potential effects presented in Striker and Kelly (2021) and Hussein-Wetzel and Kotlensky (2020), continued operation and maintenance of the project has the potential to adversely affect the National Register-eligible Kentucky River Lock and Dam No. 7 and Mother Ann Lee Hydropower Station. Both the lock and dam and hydropower facilities are good, intact representatives of late nineteenth and early twentieth-century engineering for both river navigation and power generation. Modifications to both the lock and dam and hydro station over time have allowed the facilities to retain the characteristics that make them eligible for listing on the National Register. Treatment measures (e.g., recommended strategies for preserving extant concrete masonry associated with the lock and dam) within the HPMP would guide future operation and maintenance activities in a way that is consistent with protection of these historic properties. The HPMP also includes provisions for protection of any unknown cultural resources at the project that may be discovered during the term of a license.

To address Cherokee Nation's request for consultation, Lock 7 Partners includes, within its HPMP, provisions for continued consultation with Cherokee Nation regarding management of historic properties at the project. The HPMP does not specify continued consultation with the Eastern Band of Cherokee Indians, as requested by the tribe in its April 19, 2017 letter. However, considering that the project area has historic importance to the Eastern Band of Cherokee Indians, the HPMP could be appropriately modified to require consultation with the Eastern Band of Cherokee Indians, in addition to the Kentucky SHPO and Cherokee Nation.

The Kentucky SHPO recommends a number of changes to the HPMP to improve clarity or correct errors. For example, the Kentucky SHPO recommends that the APE be consistently defined throughout the HPMP and reflect the agreed-upon definition (as discussed above in section 3.3.5.1, *Affected Environment – Area of Potential Effects*). Revising the definition of the project's APE to reflect the agreed-upon definition throughout the HPMP would correct inconsistencies that could lead to confusion in the future.

The Kentucky SHPO requests that the discussion of activities exempted from further section 106 consultation discussed in section 6.4 of the HPMP include specific examples of exempted activities. While it is not possible to list every maintenance activity that could occur as part of Lock 7 Partners' day-to-day operations, providing examples of exempted maintenance activities in the HPMP could prove useful to clarify the intent of this exemption. For example, commonly exempted maintenance activities include maintenance of transmission structures and fixtures, maintenance of mechanical and electrical equipment, landscaping and vegetation management, trash and debris removal, placement and maintenance of signage, and placement and maintenance of security or safety alarms and systems. Further, rather than being exempted in entirety as discussed in the HPMP, safety-related activities could be exempted if they do not require major structural modification. Emergency activities could follow the procedures described in section 6.7 of the HPMP, Protocol for Emergency Response. Other activities not contemplated in the license application could require additional consultation, whether or not they occur at previously disturbed areas, and could require consultation with the Commission and Kentucky SHPO, as appropriate.

The Kentucky SHPO requests that section 6.7 of the HPMP be modified to require notification of the Commission, Kentucky SHPO, KRA, and Cherokee Nation during Step 1 of the Emergency Response Protocol, after Lock 7 Hydro Partners is notified of an emergency at the project. In the HPMP, Lock 7 Partners requests that the consulting parties opt-in to receive communication about emergencies at the project and specify the format for receiving notification. In general, the procedures used to respond to project emergencies are addressed through the Commission's Division of Dam Safety and Inspections (D2SI). The provisions within the HPMP for protection of historic properties during emergencies are supplemental to any notification procedures required by D2SI. Modifying the HPMP's Emergency Response Protocol to require immediate notification of the Commission, Kentucky SHPO, KRA, Eastern Band of Cherokee Indians, and Cherokee Nation of an emergency after Lock 7 Partners is notified has the potential to slow response during a crisis that could affect public health and safety or cause significant damage to public and private property. Alternatively, alerting the entities of the emergency, as soon as practicable but no more than 10 days from the date of the emergency would ensure that Lock 7 Partners could both address the emergency and initiate consultation regarding affected historic properties, if any, in a timely manner.

The Kentucky SHPO also requests that section 7.2.3, *Annual Reporting*, of the HPMP be modified to require annual reports for the duration of the HPMP. The Kentucky SHPO requests that the reports be inclusive of all activities associated with the project, including project operations and maintenance. Providing annual reports to the Kentucky SHPO, would assist the agency with its management role in oversight of the protection of historic properties within Kentucky. In years when no work is completed under the HPMP, a letter from the licensee to the Kentucky SHPO would suffice to satisfy this requirement.

Section 7.2.4 of the HPMP includes provisions for reviewing and updating the HPMP. These provisions allow the Kentucky SHPO, KRA, and affected tribes to propose revisions to the HPMP, in writing, at any time. The Kentucky SHPO recommends that the HPMP state clearly that if the undertaking changes, the HPMP should be updated to reflect the change. At this time, the "undertaking" addressed in the HPMP is the continued operation and maintenance of the Mother Ann Lee Project, as outlined in this EA. Any project-related activities not contemplated as part of the licensing proposal, and not exempted from consultation by section 6.4 of the HPMP, would require additional consultation with the Commission, the Kentucky SHPO, and other affected parties to determine their effects on historic properties. This consultation may result in the need to amend the HPMP. Amendments to the HPMP would require Commission approval.

To meet the requirements of section 106 of the NHPA, the Commission intends to execute a Programmatic Agreement (PA) with the Kentucky SHPO for the protection of historic properties that would be affected by the operation and maintenance of the project. The terms of the PA would require Lock 7 Partners to revise the September 28, 2020 HPMP to address the modifications described above, and file the revised HPMP with the Commission for approval.

3.2.6 Environmental Justice

3.2.6.1 Affected Environment

In conducting NEPA reviews of proposed hydropower projects, the Commission follows the instruction of Executive Order 12898, which directs federal agencies to identify and address "disproportionately high and adverse human health or environmental effects" of their actions on minority and low-income populations (i.e., environmental justice communities).[79] Executive Order 14008 also directs agencies to develop "programs, policies, and activities to address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities, as well as the accompanying economic

[79] Exec. Order No. 12,898, 59 Fed. Reg. 7629 (Feb. 16, 1994). While the Commission is not one of the specified agencies in Executive Order 12898, the Commission nonetheless addresses environmental justice in its analysis, in accordance with our governing regulations and guidance, and statutory duty to evaluate all factors bearing on the public interest.

challenges of such impacts."[80] Environmental justice is "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies" (EPA, 2021a).

Consistent with CEQ and EPA guidance, Commission staff considers: (1) whether environmental justice communities (e.g., minority or low-income populations)[81] exist in the project area; (2) whether impacts on environmental justice communities are disproportionately high and adverse; and, if so, (3) what mitigation measures might be needed (CEQ, 1997; EPA, 2016). Following the recommendations set forth in *Promising Practices*, the Commission uses the fifty-percent and the meaningfully greater analysis methods to identify minority populations (EPA, 2016 at 21-25). Using this methodology, minority populations have been defined as U.S. Census block groups within the area of study where: (1) the aggregate minority population of the block group in the affected area exceeds 50 percent; or (2) the aggregate minority population in the block group affected is 10 percent higher than the aggregate minority population percentage in the county.[82]

CEQ's *Environmental Justice Guidance* also directs low-income populations to be identified based on the annual statistical poverty thresholds from the U.S. Census Bureau (Census; CEQ, 1997). Using *Promising Practices'* low-income threshold criteria method, low-income populations are identified as block groups where the percent of low-income population in the identified block group is equal to or greater than that of the county (EPA, 2016).

To identity potential environmental justice communities for the analysis presented here, Commission staff used 2019 U.S. Census American Community Survey data for the race, ethnicity, and poverty data at the block group level (Census, 2020). For this project, staff chose a 1-mile radius around the project boundary as the area of study. A 1-mile radius is the appropriate unit of geographic analysis given the limited scope of the project's effects on the segment of the Kentucky River between Lock and Dam No. 8 and the tailwaters of Lock and Dam No. 7.

Within the study area, staff identified two census block groups in which the populations qualify as environmental justice communities with minority populations meaningfully greater

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[80] Exec. Order No. 14,008, 86 Fed. Reg. 7619 (Feb. 1, 2021). The term "environmental justice community" includes disadvantaged communities that have been historically marginalized and overburdened by pollution. *Id.* § 219, 86 Fed. Reg. 7619, 7629. The term also includes, but may not be limited to, minority populations, low-income populations, or indigenous peoples (EPA, 2021b).

[81] *See generally* Exec. Order No. 12,898, 59 Fed. Reg. 7629 (Feb. 16, 1994). Minority populations are those groups that include: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic (CEQ, 1997 at 25).

[82] Here, Commission staff selected "county" as the comparable reference community to ensure that affected environmental justice communities are properly identified. A reference community may vary according to the characteristics of the particular project and the surrounding communities.

than the minority population within their surrounding counties (see table D-8 and figure 3-3). The two identified block groups are Census Tract 9701, Block Group 2 in Garrard County, and Census Tract 9605, Block Group 1 in Mercer County. No block groups meet the threshold for environmental justice communities on the basis of low-income status.[83]

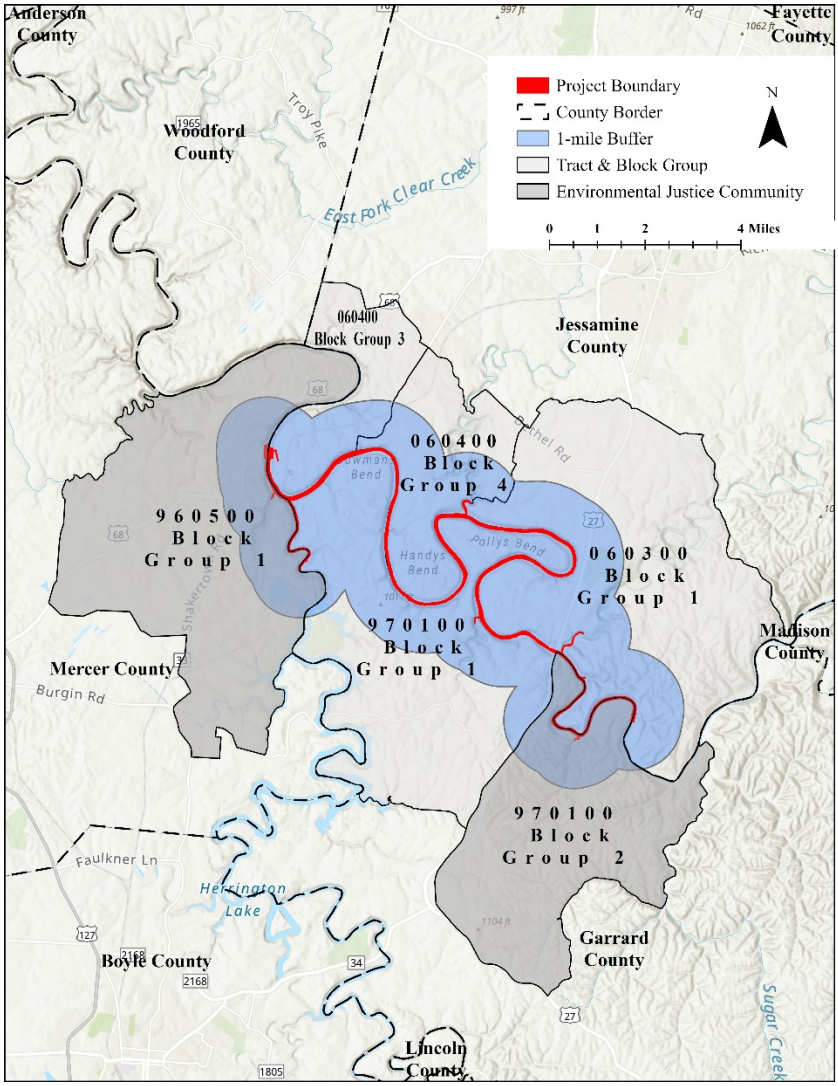

Figure 3-3. Block Groups and Environmental Justice Communities within 1-mile of the project boundary (source: Staff).

3.2.6.2 Environmental Effects

As described in section 2.2.3, *Proposed Project Operation*, Lock 7 Partners proposes to continue operating the project in a run-of-river mode by maintaining the impoundment water

[83] Data from the 2019 U.S. Census American Community Survey File # B01017 and File # B03002, the most recently available data, were used as the source for race, ethnicity, and poverty data at the census block group level (U.S. Census Bureau, 2020).

surface elevation at or above the crest of the dam at all times. As discussed in section 3.2.4, *Recreation*, Lock 7 Partners proposes to construct a canoe portage with designated bank fishing and a parking area on the east side of the Kentucky River near the lock chamber.

No entity provided comments or recommendations regarding the effects of the project on environmental justice communities in response to the Commission's notice that the application was ready for environmental analysis.

Our Analysis

The applicant proposes no change to project operation that would adversely affect environmental resources, including water supply, water quality, or fisheries. Construction of the new recreation facilities would be of a short duration and very limited scope and is unlikely to substantially affect noise, visual resources, or traffic within the two identified environmental justice communities, given their locations away from the proposed construction. One identified environmental justice community is across the river from the proposed construction, but not directly connected by roadways and screened by forested areas, and the other is at the upstream end of the project boundary over 7 miles from the proposed construction. Access to the Kentucky River for sport or subsistence fishing would be improved with the construction of the parking area and stairs providing safe access down the steep slopes on the east bank of the river. Although the concentration of recreation use at Lock and Dam No. 7 could increase with improved access and connectivity of the Kentucky River Water Trail, the site is remote and unlikely to experience large increases in usage that would adversely affect the identified communities through increases in traffic or overfishing. In summary, continuing to operate the project, as proposed with the staff-recommended measures, would not result in a disproportionately high and adverse impact on the environmental justice communities present within the project area.

3.3 NO-ACTION ALTERNATIVE

Under the no-action alternative, the Mother Ann Lee Project would continue to operate as it has in the past. None of Lock 7 Hydro Partners' proposed measures or the resource agencies' recommended measures would be required. None of the staff-recommended measures would be implemented.

4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the project's use of the Kentucky River for hydropower generation to see what effect various proposed or recommended environmental measures would have on the cost to operate and maintain the project and on the project's power generation. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp*.,[84] the Commission compares the current cost to produce project power

[84] *See Mead Corp.*, 72 FERC ¶ 61,027 (July 13, 1995). In most cases, electricity from hydropower would displace some form of fossil-fueled generation, in which fuel cost is the largest component of the cost of electricity production.

to an estimate of the cost to provide the same amount of energy and capacity[85] for the region using the most likely alternative source of power (cost of alternative power). In keeping with the policy described in *Mead Corp.*, our economic analysis is based on current electric power cost conditions and does not anticipate or estimate changes in fuel costs that could occur during a project's license term.

For each of the licensing alternatives, our analysis includes an estimate of: (1) the annualized cost of providing the individual measures considered in the EA; (2) the cost of the most likely alternative source of project power; (3) the total annual project cost (i.e., for construction, operation, maintenance, and environmental measures); and (4) the difference between the cost of the current alternative source of project power and the total annual project cost. If the difference between the cost to produce an equivalent amount of power from an alternative source and the total annual project cost is positive, the project produces power at a cost less than the cost of producing power from the most likely least-cost source of alternative power. If the difference between the alternative source of power's annual cost and the total annual project cost is negative, the project costs more to produce power than the cost to produce an equivalent amount of power from the most likely least-cost source of alternative power. This estimate helps support an informed decision concerning what is in the public interest with respect to a proposed license. However, project economics is only one of many public interest factors the Commission considers in determining whether, and under what conditions, to issue a license.

4.1 POWER AND DEVELOPMENTAL BENEFITS OF THE PROJECT

Table 4.1 summarizes the assumptions and economic information used in the analysis. Most of this information is provided by the applicant in its license application. Some is developed by Commission staff. The values provided by the applicant are typically reasonable for the purposes of our analysis. If they are not, it is noted below. Cost items common to all alternatives include taxes and insurance; estimated capital investment required to develop the project or major modifications for relicensing; licensing costs; normal operation and maintenance cost; and Commission fees. All costs are adjusted to current year dollars.

Table 4-1. Parameters for economic analysis of the Mother Ann Lee Project (Source: Lock 7 Partners, and staff).

Parameter	Value
Installed Capacity	2.21 MW
Average annual generation	9,200 MWh
Period of analysis	30 years
Local and Federal income tax rate	Included in the Operation and Maintenance (O&M) cost

[85] We use the term "capacity benefit" to describe the benefit a project receives for providing capacity to the grid, which may be in the form of a dependable capacity credit or credit for monthly capacity provided.

Parameter	Value
Insurance rate	Included in the Operation and Maintenance (O&M) cost
Interest rate	5.5 %
Remaining net investment	$195,060
Application cost	$65,000
Operation and maintenance	$242,776/yr
Estimated Commission fees [a]	Included in the Operation and Maintenance (O&M) cost
Alternative source of power's cost (2021) [b, c]	
1) Energy cost	$23.74/MWh
2) Capacity benefit cost	$146.94/kW-yr

[a] The Commission collects an annual administration charge for all licensed projects which is based on the authorized installed capacity of the project and amount of federal land occupied by the project.

[b] The alternative source of power's cost is based on the current cost of providing the same amount of generation and capacity benefit from a natural gas-fired combined cycle plant, as reported by The U.S. Energy Information Administration (EIA), Annual Energy Outlook 2021, for the East South Central Region. The alternative source of power's cost is reported in Table 4-2 and is a combination of the cost of energy and capacity benefit.

[c] The applicant provided the value of power based on a contract rate. This rate is $46.91/MWh for on-peak energy, $38.62/MWh for off-peak energy, and $5.72/KW for monthly peak demand periods. In keeping with Commission policy as articulated in Mead, staff does not use a project's contract rates in its analysis, rather, as described above, staff uses the most likely alternative source of power's cost.

4.2 COMPARISON OF ALTERNATIVES

Table 4-2 summarizes the installed capacity, annual generation, capacity benefit, alternative source of power's cost, estimated total project cost, and difference between the alternative source of power's cost and total project cost for each of the alternatives considered in this EA: no-action, the applicant's proposal, and the staff alternative.

Table 4-2. Summary of the annual cost of alternative power and annual project cost for three alternatives for the Mother Ann Lee Project (Source: staff).

	No Action	Applicant's Proposal	Staff Alternative
Installed capacity	2.21 MW	2.21 MW	2.21 MW
Annual generation	9,200 MWh	9,200 MWh	9,200 MWh
Capacity benefit [a]	1.95 MW	1.95 MW	1.95 MW

	No Action	Applicant's Proposal	Staff Alternative
Current alternative source of power's cost [b]	$504,941	$504,941	$504,941
Total annual project cost (2021) [c]	$260,804	$264,069	$273,348
Difference between the alternative source of power's cost and total annual project cost [d]	$244,137	$240,872	$231,593

[a] Staff estimated the capacity benefit based on the ratio of the mean annual flow available for generation for each of 12 months, and the hydraulic capacity of the project.

[b] The alternative source of power's cost is based on the alternative source of power in the East-South Central Region, as identified in table 4-1 above.

[c] Project costs include the cost of environmental measures listed in Appendix E with the exception of minimum flow release opportunity costs, and the costs identified in Table 4.1. All project costs were adjusted to 2021 dollars.

[d] A number in parentheses denotes that the difference between the alternative source of power's cost and the total project cost is negative; thus, the project's cost to produce power is greater than the alternative source of power cost.

4.2.1 No-Action Alternative

Under the no-action alternative, the project has an installed capacity of 2.21 MW, a capacity benefit of 1.95 MW, and an average annual generation of 9,200 MWh. The alternative source of power's current cost to produce the same amount of energy and provide the same capacity benefit is $504,941. The total annual project cost is $260,804. Subtracting the total annual project cost from the alternative source of power's current cost, the project's cost to produce power and capacity is $244,137 less than that of the alternative source of power's cost.

4.2.2 Lock 7 Partners' Proposal

Under Lock 7 Partners' proposal, the project would have a total installed capacity of 2.21 MW, a capacity benefit of 1.95 MW, and an average annual generation of 9,200 MWh. The alternative source of power's current cost to produce the same amount of energy and provide the same capacity benefit would be $504,941. The total annual project cost would be $264,069. Subtracting the total annual project cost from the alternative source of power's current cost, the project's cost to produce power and capacity would be $240,872 less than that of the alternative source of power's cost.

4.2.3 Staff Alternative

The staff alternative includes the same developmental components as the applicant's proposal and therefore, would have the same capacity and energy values described above for the applicant's proposal. Appendix E shows the applicant's proposed environmental protection and

enhancement measures, staff-recommended additions, deletions, and modifications to these measures, and the estimated cost of each.

Under the recommended staff alternative, the alternative source of power's current cost to produce the same amount of energy and provide the same capacity benefit would be $504,941. The total annual project cost would be $273,348. Subtracting the total annual project cost from the alternative source of power's current cost, the project's cost to produce power and capacity would be $231,593 less than that of the alternative source of power's cost.

4.3 COST OF ENVIRONMENTAL MEASURES

Appendix E presents the cost of each of the environmental enhancement measures considered in our analysis for the Mother Ann Lee Project. All costs are in 2021 dollars. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. This section contains the basis for, and a summary of, our recommendations for licensing the Mother Ann Lee Project. We weigh the costs and benefits of our recommended alternative against other proposed measures.

Based on our independent review of agency and public comments filed on this project and our evaluation of the environmental and economic effects of the proposed action and its alternatives, we selected the staff alternative for the Mother Ann Lee Project. We recommend this alternative because: (1) issuing a new license for the project would allow Lock 7 Partners to operate the project as a beneficial and dependable source of electrical energy; (2) the 2.21MW of electric capacity comes from a renewable resource that does not contribute to atmospheric pollution, including greenhouse gases; (3) the public benefits of the staff alternative would exceed those of the no-action alternative; and (4) the proposed and recommended measures would protect and enhance aquatic, terrestrial, and cultural resources, and improve recreation opportunities at the project.

In the following section, we make recommendations as to which environmental measures proposed by Lock 7 Partners or recommended by agencies or other entities (including staff) should be included in any new license issued for the project. We also discuss which measures we do not recommend including in the license.

5.1.1 Environmental Measures Proposed by Lock 7 Partners

Based on our environmental analysis of Lock 7 Partners' proposal in section 3, and the costs presented in section 4, we conclude that the following environmental measures proposed by the applicant would protect and enhance environmental resources and would be worth the cost. Therefore, we recommend including these measures in any license issued for the project.

- Operate the project in a run-of-river mode.

- Implement a Water Quality Monitoring Plan, filed September 28, 2020, to monitor temperature and dissolved oxygen in the project tailrace for the term of the license.

- Implement an Operation Compliance Monitoring Plan, filed April 30, 2020, to maintain and document run-of-river operations, that includes provisions to cease generation during low-flow periods as declared by the Kentucky DEP or KRA.

- Maintain existing avian/wildlife protection devices at the project substation.

- Implement a Recreation Plan, filed September 28, 2020, that includes provisions for constructing, operating, and maintaining a canoe portage, fishing access, and parking and associated directional and safety signage at the Mother Ann Lee Project.

- Implement a HPMP, filed September 28, 2020, for the protection of historic properties occurring within the project's area of potential effects (APE).

5.1.2 Additional Measures Recommended by Staff

Under the staff alternative, the project would be operated with Lock 7 Partners' proposed measures, as identified above, and the following staff-recommended additions or modifications:

- To identify and address project effects on birds and other wildlife, develop an Avian Protection Plan to include Lock 7 Partners' proposal to maintain the existing avian/wildlife protection devices at the project substation and the following additional provisions: (1) install and maintain protection devices such as aerial marker spheres swinging markers, and/or bird flight diverters on the transmission line to minimize avian electrocutions and collisions; (2) periodically monitor the transmission line and substation for nests, signs of adverse avian interactions, as well as the condition of all the avian/wildlife protection devices; (3) train personnel on avian/wildlife protection measures including reporting any adverse interactions; and (4) file an implementation schedule.

- Limit tree removal activities to the period between November 15 and March 31 to protect summer roosting habitat for Indiana and northern long-eared bats, as well as foraging and traveling habitat for gray, Indiana, and northern long-eared bats.

- Complete construction of recreation amenities within 2 years of license issuance.

- Modify the HPMP to: (1) consistently define the APE for the project throughout the document; (2) include requirements for consultation with the Eastern Band of Cherokee Indians; (3) describe the types of routine maintenance activities that are not subject to further consultation under section 106 of the NHPA; (4) clarify the protocol for protection of historic properties during emergencies; (5) clarify annual reporting procedures; and (6) describe conditions under which additional section 106 consultation may be necessary.

Avian Protection Plan

Lock 7 Partners' existing animal protection guards and electrical insulation on energized components at the project substation would continue to minimize the potential electrocution and mortality of birds and other wildlife. However, no procedures are in place to ensure that the existing avian and wildlife protection devices are properly maintained and remain protective in the future. In addition, the proposal does not take into account potential collisions and/or electrocutions of birds and other wildlife along the 2,310-foot-long, 34.5-kV project transmission line, which crosses the Kentucky River, and traverses limestone cliffs, a forested area, and fields on the eastern side of the river adjacent to Lock and Dam No. 7. As discussed in section 3.2.2, *Terrestrial Resources*, the project transmission line poses a higher than normal risk of avian electrocution and collision because: (1) most electrocutions occur on medium-voltage distribution lines (i.e., between 4 to 34.5 kV) (APLIC and FWS, 2005); (2) attractive foraging/hunting, perching, and roosting habitat occurs around the transmission line, where it crosses the Kentucky River at the project dam between the cliffs of the Kentucky River Palisades, and continues through open fields and forested habitats before the point of interconnection; (3) the transmission line could be difficult for birds to see, especially in fog and inclement weather; and (4) ongoing project operation and recreation activities could flush birds towards the transmission line. Birds that forage or hunt within, or fly thorough the project area could collide with, and/or be electrocuted by, the project transmission line or electrified components on its poles. The project transmission line does not currently have any avian protection devices installed.

We recommend that Lock 7 Partners incorporate its proposal to maintain the existing animal protection guards at the project substation in an Avian Protection Plan with a provision to develop specific procedures for monitoring the condition of the avian/wildlife protection measures installed at the project substation and identifying and scheduling any needed repairs or replacements. To address adverse avian/wildlife interactions with the project transmission line, we recommend that the plan also include provisions to: (1) install and maintain protection devices such as aerial marker spheres swinging markers, and/or bird flight diverters on the transmission line to minimize adverse avian interactions; (2) periodically monitor the transmission line for nests, signs of adverse avian interactions, as well as the condition of all the avian/wildlife protection devices; (3) train personnel on avian and wildlife protection measures; and (4) file an implementation schedule. We estimate that the levelized annual cost to develop an Avian Protection Plan would be $957. The benefits of preventing or minimizing bird electrocutions under an Avian Protection Plan would outweigh the cost.

Federally Listed Bat Protection Measures

There are four known occurrences of gray bats and one occurrence of a northern long-eared bat within 1 mile of the project. In addition, known winter swarming habitat for the northern long-eared bat and known summer habitat for the Indiana bat occurs within 1 mile of the project. During pre-filing surveys, Lock 7 Partners identified potentially suitable caves, and suitable summer roosting, foraging, and traveling riparian habitats for listed bat species within the Mother Ann Lee Project boundary. The two larger accessible caves were assessed and found to have physical conditions suitable for bat roosting. However, no signs of bat use were present and unauthorized activities within these caves could be a factor preventing use. The smaller cave habitat was not assessed, but any potentially suitable bat roosting habitat it may provide would not be affected by the project because it is located over 100 feet above the ground on a cliff face, has a much smaller opening than the other two caves, and is inaccessible without specialized equipment.

Numerous suitable summer roosting trees with dead or dying tops, exfoliating bark, cracks, crevices, and/or hollows were documented within the project boundary and in the surrounding riparian corridor. In addition, suitable travel and foraging habitat for these bat species were identified along the riparian zone of the Kentucky River and the grassy area located along the eastern side of the Kentucky River in the project boundary. While no tree removal or other effects to bats would occur during the construction of the proposed canoe portage, take-out/put-in, and parking area, ongoing vegetation management within the project transmission line corridor could affect suitable summer habitat for federally listed bats. Lock 7 Partners proposes to continue the trimming of trees in the corridor which could disturb or modify suitable summer roost trees, or swarming, foraging, and traveling habitat.

To protect suitable summer swarming, foraging, and travel habitat for federally listed bat species, we recommend that Lock 7 Partners limit any regular, non-emergency, tree maintenance (tree removal)[86] within the transmission line corridor and the area surrounding the proposed canoe portage to the period between November 15 and March 31. Implementing this time of year restriction on tree removal activities within the project boundary would avoid or minimize disturbing, harming, or killing federally listed bats because they are inactive/hibernating during this time. Also, any undocumented summer roost trees for Indiana or northern long-eared bats would not be occupied during this period. There is no additional cost associated with this measure.

Recreation Plan

Currently, there are no developed recreation facilities at the project, although anglers do access the shoreline on the eastern side of the Kentucky River for fishing below the dam. Lock 7 Partners proposes to implement a Recreation Plan, filed on September 28, 2020, to guide the

[86] As noted in section 2.3, *Staff Alternative*, tree removal is defined herein as cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, saplings, snags, or any other form of woody vegetation likely to be used by federally listed bats, which includes live or dead trees greater than or equal to 3 inches dbh that have cavities, peeling bark, crevices, or hollows.

construction, operation, and maintenance of recreation facilities at the project. Implementing the plan would improve recreation access and support development of the Kentucky River Water Trail through the construction of a formalized portage trail, including stairways at both upstream and downstream access points that that would allow safer access to the river for both boaters and anglers, and gravel parking area to accommodate visiting swimmers, anglers, or boaters. However, the plan does not include a schedule for constructing the canoe portage, gravel parking area, or associated signage. We recommend that construction of the recreation amenities be completed within 2 years of license issuance. There would be no substantial cost associated with this measure.

Historic Properties Management Plan

To ensure the protection of cultural resources at the project, Lock 7 Partners developed an HPMP that includes strategies for protection of the National Register-eligible Kentucky River Lock and Dam No. 7 and Mother Ann Lee Hydropower Station. The plan, filed September 28, 2020, requires revision to address comments filed by the Eastern Band of Cherokee Indians and the Kentucky SHPO. In order to ensure comprehensive protection of cultural resources over the term of a license, we intend to execute a PA with the Kentucky SHPO requiring Lock 7 Partners to revise the HPMP as follows: (1) consistently define the APE for the project in accordance with the definition in section 3.2.5.1, *Affected Environment – Area of Potential Effect*; (2) add requirements for consultation with the Eastern Band of Cherokee Indians in any place the HPMP references consultation with the Cherokee Nation; (3) provide a description of the types of routine maintenance activities that are not subject to further consultation under section 106 of the NHPA; (4) clarify the protocol for protection of historic properties during emergencies, including notification of the Kentucky SHPO within 10 days of an emergency event and provision of summary reports to the Commission, Eastern Band of Cherokee Indians, Cherokee Nation, and KRA; (5) require annual reporting of activities conducted under the HPMP to the Kentucky SHPO; and (6) describe conditions under which additional section 106 consultation may be necessary and the type of notice given to Commission, Kentucky SHPO, Eastern Band of Cherokee Indians, Cherokee Nation, and KRA.

A revised HPMP that includes the above measures would provide a framework for the management of historic properties within the Mother Ann Lee Project's APE. Further, it would ensure appropriate communication and consultation with the Kentucky SHPO, KRA, and affected tribes if project operation or maintenance would affect Lock and Dam No. 7 or the Mother Ann Lee Hydropower Station. We estimate that the levelized annual cost to revise the HPMP would be $363 and conclude that the benefits of plan revision outweigh the costs.

5.2 UNAVOIDABLE ADVERSE EFFECTS

Continued project operation would result in some unavoidable fish impingement and entrainment mortality. However, our analysis in section 3.2.1.2, *Environmental Effects, Fish Impingement, Entrainment, and Turbine Mortality,* indicates that the level of impingement and entrainment mortality would have minimal effects on fish populations in the Mother Ann Lee Project impoundment or Kentucky River.

5.3 FISH AND WILDLIFE AGENCY RECOMMENDATIONS

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission shall include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the project.

Section 10(j) of the FPA states that whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency will attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency. No section 10(j) recommendations were filed in response to the ready for environmental assessment notice.

5.4 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the FPA, 16 U.S.C., § 803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. We reviewed seven comprehensive plans that are applicable to the Mother Ann Lee Project, located in Kentucky.[87] No inconsistencies were found.

6.0 FINDING OF NO SIGNIFICANT IMPACT

On the basis of our independent analysis, we find that the issuance of a license for the Mother Ann Lee Project, with our recommended environmental measures, would not constitute a major federal action significantly affecting the quality of the human environment.

7.0 LITERATURE CITED

The literature cited in this EA is presented as Appendix F.

[87] (1) Kentucky Department for Local Government. 2008. Kentucky Statewide Comprehensive Outdoor Recreation Plan (SCORP). Frankfort, Kentucky. October 2008; (2) Kentucky Department for Natural Resources and Environmental Protection. 1979. Kentucky wild rivers statewide management plan. Frankfort, Kentucky. June 1979; (3) Kentucky Division of Water and National Park Service. 1992. Kentucky rivers assessment. Department of the Interior. Atlanta, Georgia; (4) National Park Service. 1993. The Nationwide Rivers Inventory. Department of the Interior. Washington, D.C.; (5) Ohio River Basin Commission. 1976. Kentucky/Licking River Basins comprehensive coordinated joint plan. Cincinnati, Ohio. October 1976; (6) U.S. Fish and Wildlife. Undated. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C.; (7) U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. Environment Canada. May 1986.

8.0 LIST OF PREPARERS

The list of preparers of this EA is presented as Appendix G.

APPENDIX A

STATUTORY AND REGULATORY REQUIREMENTS

Federal Power Act

Section 18 Fishway Prescriptions

Section 18 of the Federal Power Act (FPA) states that the Commission is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of Commerce or the U.S. Department of the Interior (Interior). Neither the Secretary of Commerce nor the Secretary of Interior filed section 18 prescriptions or requested a reservation of authority to prescribe fishways under section 18 be included in any license issued for the Mother Ann Lee Project.

Section 10(j) Recommendations

Under section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency. No section 10(j) recommendations were filed in response to the Commission's notice requesting conditions and recommendations for the Mother Ann Lee Project, issued on February 26, 2021.

Clean Water Act

Under section 401 of the Clean Water Act (CWA),[88] a license applicant must obtain certification from the appropriate state pollution control agency verifying compliance with the CWA. On July 9, 2020, Lock 7 Partners applied to the Kentucky Department for Environmental Protection (Kentucky DEP) for a section 401 water quality certification (certification) for the Mother Ann Lee Project.[89] Kentucky DEP acknowledged receipt of the application request on July 22, 2020. On July 27, 2020, Kentucky DEP issued a certification for the project. The conditions of the certification are described under section 2.2.5, *Modifications to the Applicant's Proposal - Mandatory Conditions.*

[88] 33 U.S.C. § 1341(a)(1).

[89] By letter filed on February 3, 2022, Lock 7 Partners indicated that the 401 water quality certification was requested on July 9, 2020, and that Kentucky DEP acknowledged receipt of this request on July 22, 2020 (Response to Additional Information Request for new 401 Water Quality Certification for the Mother Ann Lee Hydroelectric Station P-539 filed on February 3, 2021).

Endangered Species Act

Section 7 of the Endangered Species Act (ESA)[90] requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species.

The U.S. Fish and Wildlife Service's (FWS) Information, Planning, and Conservation (IPaC) system indicates that ten federally listed species may occur within the Mother Ann Lee Project boundary, or be affected by the project: the endangered gray bat, Indiana bat, sheepnose mussel, clubshell, fanshell, and purple cat's paw, and Short's bladderpod; the threatened northern long-eared bat and rabbitsfoot mussel; and the candidate monarch butterfly.[91] No designated critical habitat for any federally listed species occurs within the project boundary (FWS, 2020a; 2020b; 2021a; 2021b, and 2022). Our analyses of project impacts on threatened and endangered species are presented in section 3.2.3, *Threatened and Endangered Species*, and our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative*.

The Kentucky Fish and Wildlife Information System's database has no mussel records within the last 20 years immediately upstream or downstream of Lock and Dam No. 7 and no federally listed mussel species were found alive or dead during Lock 7 Partners' mussel habitat survey. Two native, living plain pocketbook mussels and one weathered shell of the native threeridge mussel were incidentally observed downstream from the dam. Suitable habitat for listed mussel species may be present within the 22.9-mile-long pool 7 and the 20.8-mile-long pool 6. However, no suitable habitat for sheepnose, clubshell, fanshell, purple cat's paw, or rabbitsfoot was observed in the immediate upstream and downstream vicinity of Lock and Dam No. 7 and this area is unlikely to provide habitat for these species due to riverbed instability unrelated to project operation. Lock 7 Partners' proposal to continue to operate the project in a run-of-river mode would maintain the existing frequency, duration, and velocity of flows from the project and not change the aquatic habitat immediately upstream and downstream from the dam or within Kentucky River pools 6 and 7. Ongoing water quality monitoring and automatic turbine shutdowns during low DO conditions would continue to protect downstream aquatic habitat for mussels and their fish hosts, by allowing inflows to aerate as they pass over the spillway. Maintaining DO concentrations above 4.0 milligrams per liter (mg/L) instantaneous and a 5.0-mg/L average over a 24-hour period would continue to provide adequate water quality required for mussel survival downstream from the project. Construction of the proposed canoe portage would involve minimal to no soil disturbance, and therefore would not result in erosion or sedimentation in the project area or associated effects to mussels or their habitats. Given that no federally listed mussels or suitable habitat for these species are known to occur at or adjacent to the project, and Lock 7 Partners proposes no changes to project operation, relicensing the

[90] 16 U.S.C. § 1536.

[91] The initial IPaC species list for the project was generated on June 4, 2020, and filed on June 5, 2020. Updated IPaC species lists were generated on November 30, 2020, September 16, 2021, December 27, 2021, and April 21, 2022. While running buffalo clover was included on the initial IPaC species list for the project, it was removed from the Federal List of Endangered and Threatened Plants on September 7, 2021 after FWS's determination that the species had recovered. *See* 86 Fed. Reg. 43,102 (2021). Given its recovery and delisting, the running buffalo clover is not discussed in detail herein.

project would have no effect on the sheepnose mussel, clubshell, fanshell, purple cat's paw mussel, or rabbitsfoot mussel or on the suitability of mussel habitat within the project area or in pools 6 or 7. In addition, the project would have no effect on critical habitat for the rabbitsfoot, because it is not located at or adjacent to the project. Therefore, no further consultation under the ESA is required for these species.

Three known occurrences of Short's bladderpod are within one mile of the project, but none are within the project boundary. Potentially suitable habitat for Short's bladderpod occurs on the steep, rocky, wooded slopes and terraces of the limestone cliffs on the western and eastern portions of the project area. However, the prevalence of non-native invasive plants that can shade, and thereby change the microclimate and outcompete native species likely precludes these areas from supporting Short's bladderpod plants. With the exception of periodic tree trimming within the transmission line corridor on the western side of the project area, ongoing project operation and maintenance activities, and the construction and use of the proposed canoe portage, would not occur in these areas and therefore would not affect these habitats. Tree trimming is not expected to result in significant soil disturbance and is not likely to damage potentially suitable Short's bladderpod habitat. In addition, there are no designated critical habitat units for this species within or adjacent to the project boundary. We conclude that relicensing the Mother Ann Lee Project, as proposed with staff-recommended measures, is not likely to adversely affect Short's bladderpod and would have no effect on its critical habitat.

Within one mile of the project, there are four recorded occurrences of gray bats, one occurrence of a northern long-eared bat, known winter swarming habitat for the northern long-eared bat, and known summer habitat for the Indiana bat. None of the known occurrences for any of these species or critical habitat units for the Indiana bat are located within the project boundary. Three caves were identified during Lock 7 Partners' survey of bat habitat at the project. While the two large caves were assessed and found to contain characteristics consistent with winter bat use (e.g., unobstructed entrances, cool air temps, stable walls and ceilings, water), no bats or signs of bats (e.g., staining, guano, etc.), were observed in either cave. Additionally, the presence of multiple fire pits, trash, and graffiti within the caves indicate they are frequently visited by people and therefore bat use is unlikely. A third smaller cave within the project boundary was not assessed because it is over 100 feet above the ground on a cliff face, has a much smaller opening than the other two caves, and is therefore inaccessible without specialized equipment. Although it is undetermined whether the third cave provides suitable habitat for federally listed bats, ongoing project operation and maintenance, and the construction and use of the canoe portage would have no effect on this cave due to the cave's 100-foot height above the ground.

Suitable summer roosting habitat for Indiana and northern long-eared bats, and suitable foraging and traveling habitat for Indiana, northern long-eared, and gray bats were identified along the riparian zone of the Kentucky River within the project boundary and surrounding areas. Loss of trees at the project would remove habitat for summer roosting, travelling, and foraging bats. Lock 7 Partners does not propose tree removal, blasting, or herbicide application as part of construction of the canoe portage and associated amenities. However, Lock 7 Partners' ongoing vegetation management within the project transmission line corridor could affect suitable habitat for Indiana, northern long-eared, and gray bats by disturbing or modifying suitable summer roost trees, or swarming, foraging, and traveling habitat. Such

affects could be avoided or minimized by limiting tree trimming and removal to the period between November 15 and March 31 when these species are inactive/hibernating. In addition, implementing general conditions 8 and 10 of the project's water quality certification would ensure that disturbance of riparian vegetation in the project area would be minimized throughout any new license term, and that project activities would have only discountable and insignificant effects on the bat foraging and traveling corridors that were identified within the project area. Therefore, we conclude that relicensing the project, as proposed, with the additional staff-recommended measure (i.e., time of year restriction on tree trimming and removal) and the certification conditions, is not likely to adversely affect Indiana bat or gray bat. In addition, the project would have no effect on the Indiana bat's designated critical habitat because it is not located at or adjacent to the project. We also conclude that although relicensing the project may affect northern long-eared bats, it would not result in the prohibited incidental take of this species under the final 4(d) rule because there are no known occupied hibernacula within 0.25-mile of the project and no known maternity roost trees within 150 feet of the project boundary. We are requesting FWS concurrence with these findings.

National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA)[92] requires that every federal agency "take into account" how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

In response to Lock 7 Partners' request filed on April 18, 2017, the Commission designated the applicant as non-federal representative for the purpose of conducting section 106 consultation under the NHPA on May 11, 2017. Pursuant to section 106, and as the Commission's designated non-federal representative, Lock 7 Partners consulted with the Kentucky Heritage Council; which acted on behalf of the Kentucky State Historic Preservation Officer (Kentucky SHPO), affected tribes, and the KRA; to locate, determine National Register eligibility, and assess potential adverse effects on historic properties associated with the project.

This consultation, and other investigations conducted to date, identified Kentucky River Lock & Dam No. 7 and the Mother Ann Lee Hydropower Station as eligible for listing on the National Register. These resources are the only known historic properties within the project's area of potential effects (APE), although the district boundary of the Shaker Village of Pleasant Hill (also known as Shakertown Historic District), a National Historic Landmark, crosses into the project's APE at its upstream extent. Despite this proximity, no contributing or non-contributing resources in the Shakertown Historic District are affected by the project. To address potential effects to historic properties identified within the project's APE, Lock 7 Partners proposes to implement a Historic Properties Management Plan (HPMP), filed September 28, 2020. The HPMP, with staff-recommended modifications, would direct the preservation and long-term management of historic properties within the APE, including

[92] 54 U.S.C. § 306108.

measures to avoid, minimize, or mitigate adverse effects on historic properties throughout the term of a new license.

To meet the requirements of section 106, staff intends to execute a Programmatic Agreement (PA) with the Kentucky SHPO for the protection of historic properties from the effects of continued operation and maintenance of the Mother Ann Lee Project. The terms of the PA would ensure that Lock 7 Partners addresses and treats all historic properties identified within the APE through it's a revised HPMP.

Executive Orders 12898 and 14008

In conducting NEPA reviews of proposed hydropower projects, the Commission follows the instruction of Executive Order 12898, which directs federal agencies to identify and address "disproportionately high and adverse human health or environmental effects" of their actions on minority and low-income populations (i.e., environmental justice communities).[93] Executive Order 14008 also directs agencies to develop "programs, policies, and activities to address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities, as well as the accompanying economic challenges of such impacts."[94] Environmental justice is "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies" (EPA, 2021a).

Staff identified two environmental justice communities within a 1-mile radius of the project boundary and considered how the communities may be affected by noise, visual, and traffic impacts of the construction of new recreation facilities, concentration of recreational activity, and the effect of project operation and recreation on subsistence fishing. Our analysis of the project's impacts on these communities are presented in section 3.2.6, *Environmental Justice*. We conclude that relicensing the project, as proposed with staff's recommended modifications, would not result in disproportionately high and adverse impacts on the identified environmental justice populations.

[93] Exec. Order No. 12,898, 59 Fed. Reg. 7629 (Feb. 16, 1994). While the Commission is not one of the specified agencies in Executive Order 12898, the Commission nonetheless addresses environmental justice in its analysis, in accordance with our governing regulations and guidance, and statutory duty to evaluate all factors bearing on the public interest.

[94] Exec. Order No. 14,008, 86 Fed. Reg. 7619 (Feb. 1, 2021). The term "environmental justice community" includes disadvantaged communities that have been historically marginalized and overburdened by pollution. *Id.* § 219, 86 Fed. Reg. 7619, 7629. The term also includes, but may not be limited to, minority populations, low-income populations, or indigenous peoples (EPA, 2021b).

APPENDIX B

Water Quality Certification Conditions for the Mother Ann Lee Project Issued by the Kentucky Department for Environmental Protection, Division of Water on July 27, 2020

S-1 Lock 7 Hydro Partners shall submit an Annual Monitoring Report for not less than 10 years to the Kentucky Division of Water by March 31st of the following year for each monitoring year as required in the Water Quality Plans for the Mother Ann Lee project FERC project No. 539. The annual report will summarize the results of the water quality monitoring for the year during the 7 months that monitoring is required, May through October,[95] and shall include the following information:

A summary for each month that dissolved oxygen (DO) levels were measured. Include in the summary the following information:

a) The average DO for each month;

b) Whether or not the average DO fell below the 5 mg/L level for a 24-hour period for each month;

c) Whether or not any DO readings fell below the 4 mg/L instantaneous level for each month;

d) Whether or not the facility shut down its operations at any point within the monitoring year and the reason(s) why it shut down; and

e) Whether any corrective actions were required during each month to improve or record DO. [Clean Water Act]

T-1 The work approved by this certification shall be limited to:

- The operation of the Kentucky Lock 7 Hydroelectric Plant (Mother Ann Lee Hydroelectric Station), as a run-of-the-river hydroelectric plant.
- Dissolved Oxygen (DO) shall be monitored between May 1st and October 31st of each year.
- Voluntary plant shut-downs shall be carried forth during automatic monitoring should the average of the DO readings over the previous 24 hour period drop below 5 mg/l until the average rises above 5 mg/l or if a single reading drops below 4 mg/l and during manual monitoring shut-down will occur if a single reading drops below 5 mg/l.

[95] Required water quality monitoring from May through October represents 6 months out of the year, not 7 months as indicated by the Kentucky Division of Water. Staff assumed that monitoring is required, as stated, from May through October.

- In the event that DO readings fall below those levels, Lock 7 Hydro Partners, LLC shall notify the WQC Section Supervisor or Project Manager by email or telephone call within 3 days of the incident.

- DO reports shall be provided to the Kentucky Division of Water, 401 Water Quality Section the following year by March 31st. Please refer to WQC #2005-0103-FM and AI No. 51793 when submitting the data. [Clean Water Act]

T-2 All work performed under this certification shall adhere to the design and specifications set forth in the:

- Application for Construction Across of Along a Stream and/or Water Quality Certification received March 23, 2005;

- Water Quality Plan, Mother Ann Lee Hydroelectric Station – FERC Project Number 539. [Clean Water Act]

T-3 This certification is valid for a period of 10 years from the date on the Water Quality Certification cover letter. A letter requesting a renewal should be submitted to the WQC office at least one month before its expiration. Include the Agency Interest (AI) number and the Water Quality Certification number in the letter. An email with this information will suffice. [Clean Water Act]

T-4 The Division of Water reserves the right to modify or revoke this certification should it be determined that the activity is in noncompliance with any condition set forth in this certification. [Clean Water Act]

T-5 If there is a transfer or conveyance of the project site prior to the completed construction of the approved activity or prior to the release from monitoring, the APPLICANT shall submit written notice to the Water Quality Certification Section Project Manager or Supervisor of the transfer or conveyance of the project site or any part of the project site at least 60 days prior to the transfer or conveyance of the project site. The notification shall include the WQC number; the Agency Interest (AI) No.; the name, mailing address, email address, and telephone number of the current owner; the name, mailing address, email address, and telephone number of the prospective transferee; the proposed effective date of transfer/conveyance; and a copy of the documentation evidencing the transfer/conveyance. Failure to comply with this condition does not negate the validity or enforceability of this certification. [Clean Water Act]

T-6 Other permits from the Division of Water may be required for this activity. If this activity occurs within a floodplain, a Permit to Construct Across a Stream may be required. Please contact the Floodplain Section Supervisor (502-782-6941) for more information. If the project will disturb one acre or more of land, or is part of a larger common plan of development or sale that will ultimately disturb one acre of more of land, a Kentucky Pollution Discharge Elimination System (KPDES) stormwater permit shall be required from the Surface Water Permits Branch. This permit requires the development of a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP must include erosion prevention and sediment control measures.

Contact: Surface Water Permits Branch (SWPB) Support at 502-782-6886 or SWPBSupport@ky.gov. [Clean Water Act]

Attachment 1

General Conditions for Water Quality Certification

1. The Kentucky Division of Water may require submission of a formal application for an Individual Certification for any project if the project has been determined to likely have a significant adverse effect upon water quality or degrade the waters of the Commonwealth so that existing uses of the water body or downstream waters are precluded.
2. Nationwide permits issued by the U.S. Army Corps of Engineers for projects in Outstanding State Resource Waters, Cold Water Aquatic Habitats, and Exceptional Waters as defined by 401 KAR 10:026 shall require individual water quality certifications.
3. Projects requiring in-stream stormwater detention/retention basins shall require individual water quality certifications.
4. Erosion and sedimentation pollution control plans and Best Management Practices must be designed, installed, and maintained in effective operating condition at all times during construction activities so that violations of state water quality standards do not occur.
5. Sediment and erosion control measures (e.g., check dams, silt fencing, or hay bales) shall not be placed within surface waters of the Commonwealth, either temporarily or permanently, without prior approval by the Kentucky Division of Water's Water Quality Certification Section. If placement of sediment and erosion control measures in surface waters is unavoidable, placement shall not be conducted in such a manner that may cause instability of streams that are adjacent to, upstream, or downstream of the structures. All sediment and erosion control measures shall be removed and the natural grade restored prior to withdrawal from the site.
6. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.
7. To the maximum extent practicable, all in-stream work under this certification shall be performed during low flow.
8. Heavy equipment (e.g., bulldozers, backhoes, draglines, etc.), if required for this project, should not be used or operated within the stream channel. In those instances where such in-stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize re-suspension of sediments and disturbance to the channel, banks, or riparian vegetation.
9. If there are water supply intakes located downstream that may be affected by increased turbidity, the permittee shall notify the operator when work will be performed.
10. Removal of existing riparian vegetation should be restricted to the minimum necessary for project construction.
11. Should stream pollution, wetland impairment, and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling 800/564-2380.

APPENDIX C

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Issuing a Non-Power License

A non-power license is a temporary license that the Commission would terminate when it determines that another governmental agency will assume regulatory authority and supervision over the land and facilities covered by the non-power license. No agency has suggested a willingness or ability to do so. No party has sought a non-power license for the project and we have no basis for concluding that the project should no longer be used to produce power.

Federal Government Takeover of the Project

We do not consider federal takeover of the project to be a reasonable alternative. Federal takeover and operation of the project would require Congressional approval. While that fact alone would not preclude further consideration of this alternative, there is currently no evidence to indicate that federal takeover should be recommended to Congress. No party has suggested a federal takeover would be appropriate, and no federal agency has expressed an interest in operating the project.

Decommissioning the Project

As the Commission has previously held, decommissioning is not a reasonable alternative to relicensing a project in most cases, when appropriate protection, mitigation, and enhancement measures are available.[96] The Commission does not speculate about possible decommissioning measures at the time of relicensing, but rather waits until an applicant actually proposes to decommission a project, or there are serious resource concerns that cannot be addressed with appropriate license measures, making decommissioning a reasonable alternative to relicensing.[97] This is consistent with NEPA and the Commission's obligation under section 10(a) of the FPA to issue licenses that balance developmental and environmental interests.

Project decommissioning could be accomplished with or without dam removal.[98] Either alternative would involve denial of the relicense application and surrender or termination of the

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[96] See, e.g., *Eagle Crest Energy Co.*, 153 FERC ¶ 61,058, at P 67 (2015); *Public Utility District No. 1 of Pend Oreille County*, 112 FERC ¶ 61,055, at P 82 (2005); *Midwest Hydro, Inc.*, 111 FERC ¶ 61,327, at PP 35-38 (2005).

[97] *See generally Project Decommissioning at Relicensing; Policy Statement*, FERC Stats. & Regs., Regulations Preambles (1991-1996), ¶ 31,011 (1994); *see also City of Tacoma, Washington*, 110 FERC ¶ 61,140 (2005) (finding that unless and until the Commission has a specific decommissioning proposal, any further environmental analysis of the effects of project decommissioning would be both premature and speculative).

[98] In the event that the Commission denies relicensing, a project or a licensee decides to surrender an existing project, the Commission must approve a surrender "upon such conditions with respect to the disposition of such works as may be determined by the Commission." 18 C.F.R. § 6.2 (2018). This can include simply shutting down the power operations, removing all or parts of the project (including the dam), or restoring the site to its pre-project condition.

existing license with appropriate conditions. No participant has recommended decommissioning, and we have no basis for recommending it.

APPENDIX D

Section 3 Tables

Table D-1. Monthly flow data from 1993 through 2020 at U.S. Geological Survey gage 03286500 at Lock 7 at Highbridge, KY (source: staff).

Month	90 percent exceedance	Mean (cfs)	10 percent exceedance	Percentage of time above minimum hydraulic capacity
January	1,847	10,691	24,230	100
February	3,280	13,277	34,700	100
March	4,033	14,112	29,360	100
April	2,862	12,040	27,540	100
May	1,540	9,379	21,660	100
June	560	5,043	13,100	99
July	514	3,217	6,687	99
August	314	2,183	5,500	95
September	140	2,284	5,239	82
October	165	2,309	5,834	86
November	431	4,325	11,400	98
December	1,040	8,762	19,810	100

Table D-2. Operational shutdowns at the Mother Ann Lee Project as a result of low DO concentrations from 2010 through 2019 (Source: Lock 7 Partners, as modified by staff).

Month	Instantaneous less than 4 mg/L	24-hour average less than 5 mg/L	Percentage of shutdowns
July	2	1	6
August	3	3	13
October	33	1	72
November	4	0	9
Total	42	5	100

Table D-3. Fish collected in Lock and Dam pools 9 through 14 from 1998 through 2002 (Source: Lock 7 Partners, as modified by staff).

Game Fish
Muskellunge
Sauger
Walleye
Smallmouth bass

Spotted bass
Largemouth bass
White crappie
Black crappie
White bass
Food Fish
Channel catfish
Flathead catfish
Panfish
Green sunfish
Bluegill
Longear sunfish
Rock bass
Hybrid sunfish
Redear sunfish
Warmouth
Other
Spotfin shiner
Steelcolor shiner
Emerald shiner
Ghost shiner
Rosyface shiner
Striped shiner
Silver shiner
Mimic shiner
Sand shiner
Brook silverside
Logperch
Blackside darter
Greenside darter
Dusky darter
Sharpnose Darter
Bluntnose minnow
Bullhead minnow
Silver redhorse
River redhorse
Golden redhorse

Shorthead redhorse
Black redhorse
River carpsucker
Quillback carpsucker
Highfin carpsucker
Norther hog sucker
Smallmouth buffalo
Spotted sucker
Common carp
Bigeye chub
River chub
Streamline chub
Silver chub
Stone Roller
Freshwater drum
Goldfish
Yellow bullhead
Ohio Lamprey
Longnose gar
Mooneye
Gizzard shad

Table D-4. Estimated monthly entrainment rates at the Mother Ann Lee Project (Source: Staff).

Season (Percent of total entrainment)	Month	Seasonal Entrainment Density[a] (fish per million cubic feet)	Mean daily flow through turbines (cfs)[b]	Number of fish entrained per month[c]
Winter (13%)	December	0.1513	2,415	979
	January	0.1082	2,415	700
	February	0.0233	2,415	136
Spring (46%)	March	0.1103	2,415	713
	April	0.5586	2,415	3,497
	May	0.3571	2,415	2,310
Summer (38%)	June	0.5415	2,415	3,390
	July	0.1865	2,415	1,206
	August	0.1392	2,183[d]	814
	September	0.0438	2,284[d]	259

Fall (4%)	October	0.0093	2,309[d]	58
	November	0.0296	2,415	185
Total				14,247

a Estimated seasonal entrainment rates from the Heidelberg (FERC Project No. 13213) and Matilda Hamilton Fee (FERC Project No. 13214) projects were used as a surrogate for the Mother Ann Lee Project.
b Mean daily flow through the turbines was estimated as the maximum hydraulic capacity of the project (2,415 cfs).
c Number of fish entrainment per month was calculated using the formula: Number of fish=((mean daily flow through turbines*seconds in month)/1,000,000)*seasonal entrainment rate.
d Mean daily flow is less than the hydraulic capacity of the project for the indicated months. Therefore, mean daily flow (rather than maximum hydraulic capacity) was used to estimate entrainment.

Table D-5. Estimated fish entrainment and mortality rates by family at the Mother Ann Lee Project (Source: Lock 7 Partners, 2020 and Staff).

Family	Season				Estimated mortality rate
	Winter	Spring	Summer	Fall	
Centrarchidae (Sunfishes)	41.88	30.15	32.59	35.55	45.42
Ictaluridae	26.71	19.28	52.46	50.19	0
Cyprinidae	3.41	3.23	5.83	3.90	80
Anguillidae	0.00	0.09	0.08	0.00	0
Catostomidae	14.17	34.42	3.35	4.37	21.57
Clupeidae	9.08	1.93	0.00	2.23	92.86
Percidae	0.78	0.41	0.19	0.00	21.28
Centrarchidae (Bass)	0.96	7.45	2.51	0.77	12.39
Salmonidae	0.00	0.04	0.00	0.00	17.65
Moronidae	1.00	1.00	1.00	1.00	12.39[a]
Esocidae	2.00	2.00	2.00	2.00	51.11
Total	100.00	100.00	100.00	100.00	

a Estimated mortality rate for Centrarchidae (bass) was used as a surrogate.

Table D-6. Estimated number of fish entrained and killed at the Mother Ann Lee Project (Source: Staff).

Family	Seasonal entrainment (Number killed)				Total entrained (Number killed)
	Winter	Spring	Summer	Fall	
Centrarchidae (Sunfishes)	760 (345)	1,966 (893)	1,763 (801)	178 (81)	4,667 (2,120)
Ictaluridae	485 (0)	1,257 (0)	2,838 (0)	252 (0)	4,832 (0)
Cyprinidae	62 (50)	211 (168)	315 (252)	20 (16)	607 (486)
Anguillidae	0 (0)	6 (0)	4 (0)	0 (0)	10 (0)
Catostomidae	257 (55)	2,244 (484)	181 (39)	22 (5)	2,704 (583)
Clupeidae	165 (153)	126 (117)	0 (0)	11 (10)	302 (280)
Percidae	14 (3)	27 (6)	10 (2)	0 (0)	51 (11)
Centrarchidae (Bass)	17 (2)	486 (60)	136 (17)	4 (0)	643 (80)
Salmonidae	0 (0)	3 (0)	0 (0)	0 (0)	3 (0)
Moronidae	18 (2)	65 (8)	54 (7)	5 (1)	142 (18)
Esocidae	36 (19)	130 (67)	108 (55)	10 (5)	285 (146)
Total	1,815 (629)	6,520 (1,803)	5,410 (1,173)	502 (118)	14,247 (3,724)

Table D-7. Special status species that may occur within one mile of the Mother Ann Lee Project boundary with their federal and state status and/or ranking(s).

Common Name (*Scientific Name*)	**Federal Status**	**State Status/ Rank [a]**	**Distribution/ Habitat Notes**
Plants			
Starry grasswort (*Cerastium velutinum var. velutinum*)	N/A	E/S1S2	Range includes Ontario, Canada, and the Great Lakes States (excluding Wisconsin) south to Tennessee. Typically found on limestone rocks, woodlands, and serpentine barrens (FNA, 1993).
Hairy willow-herb (*Epilobium ciliatum ssp. Ciliatum*)	N/A	S1S2	Widely distributed throughout much of North America, this species tends to grow in disturbed places, moist meadows, streambanks, and roadsides (Hoch, 2012).
Svenson's wildrye (*Elymus svensonii*)	N/A	T/S2S3	Endemic to central Kentucky and middle Tennessee, this species grows on limestone bluffs with shallow rocky soils, especially on rocky slopes and ledges and is often found along stream and river corridors (NatureServe, 2021j).
Plains muhly (*Muhlenbergia cuspidate*)	N/A	T/S2	Occurs from Alberta east to Manitoba and south to New Mexico, Tennessee, and Virginia; rare in Indiana, Ohio, and the Appalachians (NatureServe, 2021k). It is most abundant in short and mixed-grass prairies, mountain grasslands, shrublands, and woodlands (Fryer, 2009).
Hispid falsemallow (*Malvastrum hispidum*)	N/A	T/S2	Ranges from Kansas and Oklahoma to Alabama, Tennessee and Virginia and local in the Great Plains. Prefers dry soil in prairies and rocky and gravelly barrens, usually near limestone outcrops but occasionally in open alluvial ground in valleys and along gravel bars (NatureServe, 2021l).
Short's bladderpod (*Physaria globosa*)	E	S1	See section 3.2.3.1, *Affected Environment, Terrestrial Species.*
Starry-cleft phlox (*Phlox bifida ssp. Stellaria)*	N/A	E/S1	Ranges from southern Illinois, Indiana, and possibly Iowa, south through Kentucky into Tennessee and Missouri. Inhabits calcareous barrens, cliffs and open, sandy or gravelly slopes where sterile, sandy or rocky soils persist (NatureServe, 2021m).

Common Name (*Scientific Name*)	**Federal Status**	**State Status/ Rank [a]**	**Distribution/ Habitat Notes**
Eastern yampah (*Perideridia americana*)	N/A	T/S2	Ranges from Michigan south to Alabama and from Oklahoma east to Ohio. This species prefers low grounds, prairies, and rich woods.
Canby's mountain-lover (*Paxistima canbyi*)	N/A	T/S2	Regionally endemic to western Virginia, eastern West Virginia, western Maryland, and southern Pennsylvania, as well as central Kentucky, southern Ohio, and central Tennessee (NatureServe, 2021n). Most extant populations are in West Virginia, Virginia, and Kentucky. Found on calcareous rocks and slopes (generally near the top of cliffs or bluffs), rocky woods in the mountains, usually above major streams.
American ginseng (*Panax quinquefolius*)	N/A	E/S3S4	Occurs from Maine west to Ontario, and south to Florida, Alabama, Louisiana, and Kansas. It is most characteristic of the Appalachian and Ozark regions. Plants occur primarily in rich, cool, and moist woods under a closed canopy. Especially on slopes or ravines and often over a limestone or marble parent material on soil with a good humus component (NatureServe, 2021o).
Purple oat (*Schizachne purpurascens)*	N/A	T/S2	Found throughout the northern ranges of North America, this species prefers dry outcrops along limestone cliff lines bordering large streams and rivers.
Kentucky arrow-wood (*Viburnum molle*)	N/A	S/S3	Ranges from Oklahoma east to Maryland, and from Iowa south to Alabama (NatureServe, 2021p). Prefers rocky dry to somewhat dry woods usually at mid-slope.
Walter's violet (*Viola walteri*)	N/A	T/S2	Occurs in the Southeastern and Appalachian regions of North America. Prefers dry-mesic upland forests with thin canopies.
Eggleston's violet (*Viola egglestonii*)	N/A	S/S3	Ranges from Indiana south to Georgia. This species is found in calcareous barrens, glades and dry prairies associated with Silurian and Mississippian limestones.

Common Name (*Scientific Name*)	**Federal Status**	**State Status/ Rank [a]**	**Distribution/ Habitat Notes**
Snow trillium (*Trillium nivale*)	N/A	E/S1	Limited distribution in Iowa, Minnesota, Wisconsin, Illinois, Indiana, and Ohio with outlier occurrences in South Dakota, Nebraska, Michigan, Kentucky, Maryland, Pennsylvania, Virginia, and West Virginia. Prefers mesophytic forests with limestone derived soils, on slopes associated with large river systems.
Tufted hairgrass (*Deschampsia cespitosa*)	N/A	E/S1S2	Ranges from transcontinental Canada to North Carolina, West Virginia, the Great Lakes region, North Dakota, South Dakota, west to California (USDA, 2009). Prefers rocky limestone ledges on bluffs.
Mammals			
Allegheny woodrat *(Neotoma magister)*	N/A	S3S4	Range extends from western Connecticut, southeastern New York southwestward through western Maryland, Tennessee, Kentucky, West Virginia, and northern and western Virginia to northeastern Alabama and northwestern North Carolina, with isolated populations in southern Ohio and southern Indiana (NatureServe, 2021q). Prefers caves, cliff lines, abandoned mine portals, and abandoned buildings.
Evening bat *(Nycticeius humeralis)*	N/A	S4	Range includes much of the eastern United States, north to Nebraska, Iowa, southern Wisconsin and Michigan, Pennsylvania, and New Jersey, west to Nebraska, Kansas, and eastern Texas, south to northern Veracruz, Mexico (NatureServe, 2021r). The evening bat is a colonial species that roosts in trees and houses and migrates southward in winter.
Gray bat (*Myotis grisescens*)	E	T/S2	See section 3.2.3.1, *Affected Environment, Terrestrial Species.*
Indiana bat (*Myotis sodalist*)	E	E/S1S2	See section 3.2.3.1, *Affected Environment, Terrestrial Species.*
Northern long-eared bat (*Myotis septentrionalis*)	T	E/S1	See section 3.2.3.1, *Affected Environment, Terrestrial Species.*

Common Name (*Scientific Name*)	Federal Status	State Status/ Rank [a]	Distribution/ Habitat Notes
Tricolored bat *(Perimyotis subflavus)*	N/A	S2	Range includes much of the eastern United States, north to Nebraska, Iowa, southern Wisconsin and Michigan, Pennsylvania, and New Jersey, west to Nebraska, Kansas, and eastern Texas, and south to northern Veracruz, Mexico. Occurs in deciduous, mixed deciduous-coniferous, and pine-dominated forests, which may be interspersed with cultivated areas, and commonly found along waterways (NatureServe, 2021s).
Eastern small-footed myotis *(Myotis leibii)*	N/A	T/S2	Broad range including the U.S. and Canada from Ontario to Georgia; spring and summer roosts include human structures, hollow trees, and caves/cave-like features; hibernacula are cold, dry areas in caves.
Birds			
Sharp-shinned hawk *(Accipiter striatus)*	N/A	S3B/S4N	Range includes much of North, Central, and South America; typically found in pine, fir, and aspen forests.
Barn owl *(Tyto alba)*	N/A	S/S3	Ranges from southern Canada and the northern United States south to southern South America. Prefers open and partly open country, often around human habitation. Typically roosts in dense conifers during the winter.
Henslow's sparrow (*Centronyx henslowii)*	N/A	S3B	Occurs sporadically in Ontario and Quebec, ranging south to Texas and Florida (NatureServe, 2021t). Inhabits open fields & meadows with relatively thick/dense grass interspersed with weeds or shrubby vegetation.
Bobolink (*Dolichonyx oryzivorus)*	N/A	S2S3B	Ranges throughout North America; prefers tall grass areas, flooded meadows, prairie, deep cultivated grains, alfalfa and clover fields. During migration and in the winter it can also be found in rice fields, marshes, and open woody areas.
Peregrine falcon *(Falco peregrinus)*	N/A	S2B	Distributed throughout North America; formerly restricted to cliff lines for nest sites; now primarily found on large manmade structures, including power plants, industrial buildings, tall buildings, and bridges.
Loggerhead shrike *(Lanius ludovicianus)*	N/A	S/S3S4B, S4N	Resident throughout southern half of the United States with breeding populations in parts of Canada and the north central United States (NatureServe, 2021u). Nests in shrubs or small trees. In northern latitudes, nest sites include spruce and fir trees. During periods of cold with snow cover, this species may move from pastures to shrub and open forest habitats.

Common Name (*Scientific Name*)	Federal Status	State Status/ Rank [a]	Distribution/ Habitat Notes
Freshwater Mussels			
Sheepnose *(Plethobasus cyphyus)*	E	E/S1	See section 3.2.3.1, *Affected Environment, Terrestrial Species.*
Cracking pearlymussel *(Hemistena lata)*	N/A	X/SX	This species was once widely distributed in the Ohio, Cumberland, and Tennessee river systems but has been reduced to possibly three reproducing populations in the Tennessee River system in Virginia, and the upper Clinch River and Elk River in Tennessee (NatureServe, 2021v). Occurs in medium to large rivers in, and on, gravel shoals with swift current. Burrows deeply into mud, sand, and gravel substrates.
Longsolid *(Fusconaia subrotunda)*	N/A	S3	Historically distributed in the Ohio, Cumberland, and Tennessee river drainages, the current status is largely unknown throughout its range (NatureServe, 2021w). Found in large rivers and large to medium-sized streams on gravel bars and in deep pools
Amphibians			
Eastern hellbender *(Cryptobranchus alleganiensis alleganiensis)*	N/A	S/S2S3	Range includes the Appalachian region and parts of Illinois, Indiana, Oklahoma, and Kansas; inhabits shallow, cool, well oxygenated, and fast-flowing rocky streams and is typically found under woody debris, large flat rocks, or rock ledges.
Northern leopard frog *(Lithobates pipiens)*	N/A	S/S3	Ranges throughout much of the United States and southern Canada, this species breeds in natural and manmade ponds. Otherwise inhabits moist grassland, meadows, and margins.
Insects			
A cave obligate beetle *(Pseudanophthalmus elongatus)*	N/A	H/SH	Endemic to Kentucky, this is a cave obligate species that inhabits piles of wet, rotting wood, and damp mud banks.
Frosted elfin (*Callophrys irus)*	N/A	E/S1	Occurs in sandy areas in eastern North American, principally along the eastern seaboard from southern Maine to northern Florida, west along the Gulf states to eastern Texas, eastern Oklahoma, and Arkansas, and in the Great Lakes states in

Common Name (*Scientific Name*)	Federal Status	State Status/ Rank [a]	Distribution/ Habitat Notes
			the United States (NatureServe, 2021x). Prefers edges and fields near woods and scrubs.
Six-banded longhorn beetle *(Dryobius sexnotatus)*	N/A	T/S2	Range includes eastern United States. Inhabits hardwood forests with large, mature trees; larvae develop in dead/dying sugar maples, elms, ash, beech, and American basswood. Adults are diurnal and fly primarily June through July (Diesel *et al.*, 2017).

a – State status and rankings determined by the Kentucky State Nature Preserve Commission (2021).

E – Endangered

T – Threatened

S – Special Concern

H – Historic, indicates the species has not been observed in Kentucky since 1984 but is not considered extinct or extirpated.

X – Presumed extinct or extirpated in Kentucky.

B – Conservation status refers to the breeding population (NatureServe, 2021y).

N – Conservation status refers to the non-breeding population (NatureServe, 2021y).

M – Conservation status refers transient, migrant, population (NatureServe, 2021y).

N/A – not applicable

S1 to S5 – A scale of rareness at the state level. S1 represents the rarest classification while S5 is more common.

Table D-8. Minority and low-income populations within one mile of the project boundary (Source: U.S. Census Bureau, 2020, as modified by staff).

	Race and Ethnicity									Low-Income
State/County/Census Tract/Block Group	Percent White Alone Not Hispanic	Percent Black or African American	Percent American Indian and Alaska Native	Percent Asian	Percent Native Hawaiian and Other Pacific Islander	Percent Some Other Race	Percent Two or More Races	Percent Hispanic or Latino	Percent Total Minority	Percent Below Poverty Level
Kentucky	**84.6**	**8.0**	**0.0**	**1.5**	**0.0**	**0.0**	**2.0**	**3.7**	**15.4**	**17.0**
Garrard County	**94.2**	**1.9**	**0.2**	**0.3**	**0.0**	**0.0**	**1.2**	**2.2**	**5.8**	**14.7**
Census Tract 9701, Block Group 1	97.3	0.0	0.3	0.0	0.0	0.0	1.2	1.2	2.7	0.9
Census Tract 9701, Block Group 2	90.3	1.5	0.0	0.0	0.0	0.0	0.0	8.1	**9.7**	10.6
Jessamine County	**88.8**	**4.5**	**0.3**	**1.4**	**0.0**	**0.0**	**1.4**	**3.5**	**11.2**	**15.4**
Census Tract 603, Block Group 1	93.1	2.4	0.0	0.0	0.0	0.0	2.9	1.6	6.9	6.7
Census Tract 604, Block Group 3	95.6	0.0	0.0	0.0	0.0	0.0	4.4	0.0	4.4	8.6
Census Tract 604, Block Group 4	92.8	0.0	0.0	0.0	0.0	0.0	6.6	0.6	7.2	5.3
Mercer County	**90.8**	**4.2**	**0.0**	**0.5**	**0.1**	**0.0**	**1.5**	**2.9**	**9.2**	**15.7**
Census Tract 9605, Block Group 1	89.5	1.9	0.0	0.0	0.0	0.0	0.6	7.9	**10.5**	8.6

Note: Gray shading indicates an environmental justice community.

APPENDIX E

COST OF ENVIRONMENTAL MEASURES

Enhancement/ Mitigation Measure	Entity	Capital Cost [a] (2020$)	Annual Cost [b] (2020$)	Levelized Annual Cost [c] (2021$)
Aquatic Resources				
1. Run-of-River Operation	Applicant, Kentucky DEP, Staff	$0	$0	$0
2. Implement the Operation Compliance Monitoring Plan	Applicant, Staff	$0	$2,000[d]	$2,000
3. Implement the Water Quality Monitoring Plan[e]	Applicant, Kentucky DEP, Staff	$0	$1,000[f]	$1,054
Terrestrial Resources				
4. Continue to maintain the avian/wildlife protection guards over the bushings of the main transformer and breaker and the electrical insulation covering conductors at the project substation.	Applicant, Staff	$0	$200[f]	$211
5. Develop an Avian Protection Plan that incorporates Lock 7 Partners' proposal to maintain the existing avian/wildlife protection devices at the project substation and the following additional provisions: (1) install and maintain protection devices such	Staff	$11,000[d]	$200[d]	$957

Enhancement/ Mitigation Measure	Entity	Capital Cost [a] (2020$)	Annual Cost [b] (2020$)	Levelized Annual Cost [c] (2021$)
as aerial marker spheres swinging markers, and/or bird flight diverters on the transmission line to minimize adverse avian interactions; (2) periodically monitor the transmission line for nests, adverse avian interactions, as well as the condition of all the avian/wildlife protection devices; (3) train personnel on avian and wildlife protection measures; and (4) file an implementation schedule.				
Threatened and Endangered Species				
6. Restrict tree removal/trimming to the period between November 15 and March 31 to protect federally listed bats.	Staff	$0[d]	$0[d]	$0
Recreation				
7. Implement the Recreation Plan	Applicant, Staff	$40,000[g]	$5,000[g]	$8,170
8. Complete construction of recreation facilities within 2 years of license issuance.	Staff	$0[h]	$0	$0
Cultural Resources				
9. Implement the HPMP	Applicant, Kentucky SHPO, Staff	$10,000[d]	$500[d]	$1,252

Enhancement/ Mitigation Measure	Entity	Capital Cost [a] (2020$)	Annual Cost [b] (2020$)	Levelized Annual Cost [c] (2021$)
10. Revise the HPMP to address comments of Eastern Band of Cherokee Indians and Kentucky SHPO	Eastern Band of Cherokee Indians, Kentucky SHPO, Staff,	$5,000[d]	$0[d]	$363

[a] Capital costs include all construction and one-time costs.

[b] Annual costs typically include operational and maintenance costs and any other costs which occur on a yearly basis.

[c] All capital and annual costs are converted to equal annual costs over a 30-year period to give a uniform basis for comparing costs.

[d] Staff estimated (2021 and 2022).

[e] The certification requires measurement of DO concentration in the tailrace from May through November. Because Lock 7 Partners currently measures, and proposes to continue measuring, DO concentration and water temperature in the tailrace year-round, the estimated cost for this measure reflects year-round measurements.

[f] Cost provided by Lock 7 Partners in its April 30, 2020 license application.

[g] Cost provided by Lock 7 Partners in its September 28, 2020 Response to Commission staff's June 29, 2020 Deficiency of License Application and Additional Information Request for the Mother Ann Lee Project P-539.

[h] Staff assumes that this measure is included in the implementation of the recreation plan and there would be no additional cost.

APPENDIX F

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APPENDIX G

LIST OF PREPARERS

Joshua Dub—Project Coordinator, Water and Aquatic Resources, Environmental Justice (Fisheries Biologist; M.S. Natural Resources and Environmental Sciences; B.S., Biology)

Rachel McNamara—Recreation and Land Use, Cultural Resources, Environmental Justice (Outdoor Recreation Planner; M.C.P., Land Use and Environmental Planning; B.A., Public Policy/Environmental Studies)

Sarah Salazar—Terrestrial Resources, Threatened and Endangered Species (Environmental Biologist; M.S., Environmental Science, Applied Ecology; B.A., Environmental Studies)

Michael Spencer (Engineering)—Need for Power, Engineering and Developmental Analysis (Engineer; B.S., Civil Engineering)