REVIEW OF APPLICATION FOR LIHI CERTIFICATION
OF THE
MELDAHL HYDROELECTRIC PROJECT

(FERC No. 12667)

American Municipal Power, Inc.

Ohio River, Augusta, Kentucky

December 8, 2022
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REVIEW OF APPLICATION FOR CERTIFICATION BY THE LOW IMPACT HYDROPOWER INSTITUTE OF THE MELDAHL HYDROELECTRIC PROJECT

1. INTRODUCTION

This report provides a review of findings and recommendations related to the certification application submitted to the Low Impact Hydropower Institute (LIHI) by American Municipal Power, Inc. (AMP or Applicant) for the Meldahl Hydroelectric Project (FERC No. 12667). The Project is a run-of-river project on the Ohio River in Ohio and Kentucky. It has an installed capacity of 105 megawatts (MW). The complete certification application package was filed on September 21, 2022. The reviewer used the current 2nd Edition LIHI Handbook (Revision 2.05) in this review.

CERTIFICATION PROCESS AND MATERIAL CHANGE REVIEW

Under the 2nd Edition LIHI Handbook, reviews are a two-phase process starting with a limited review of a completed LIHI application, focused on three questions:

(1) Is there any missing information from the application?
(2) Has there been a material change in the operation of the certified facility since the previous certificate term?
(3) Has there been a change in LIHI criteria since the Certificate was issued?

An intake review of the application determined that the application was adequate to conduct the full review. The application was posted for public comment on September 26, 2022 and the 60-day public comment period ended on November 25, 2022. This assessment included review of the certification application package, the FERC eLibrary, and other publicly available information.

2. PROJECT LOCATION

The Meldahl Project is located on the Ohio River at the U.S. Army Corps of Engineers' (USACE) existing Captain Anthony Meldahl Lock and Dam at River Mile 436.2 as measured from its source in Pittsburgh, PA (Figure 1). According to the USACE Huntington District, construction of the lock and dam began in April 1958 and was completed and placed into operation in November 1962 and December 1964, respectively. The pool was raised to full height in March of 1965.

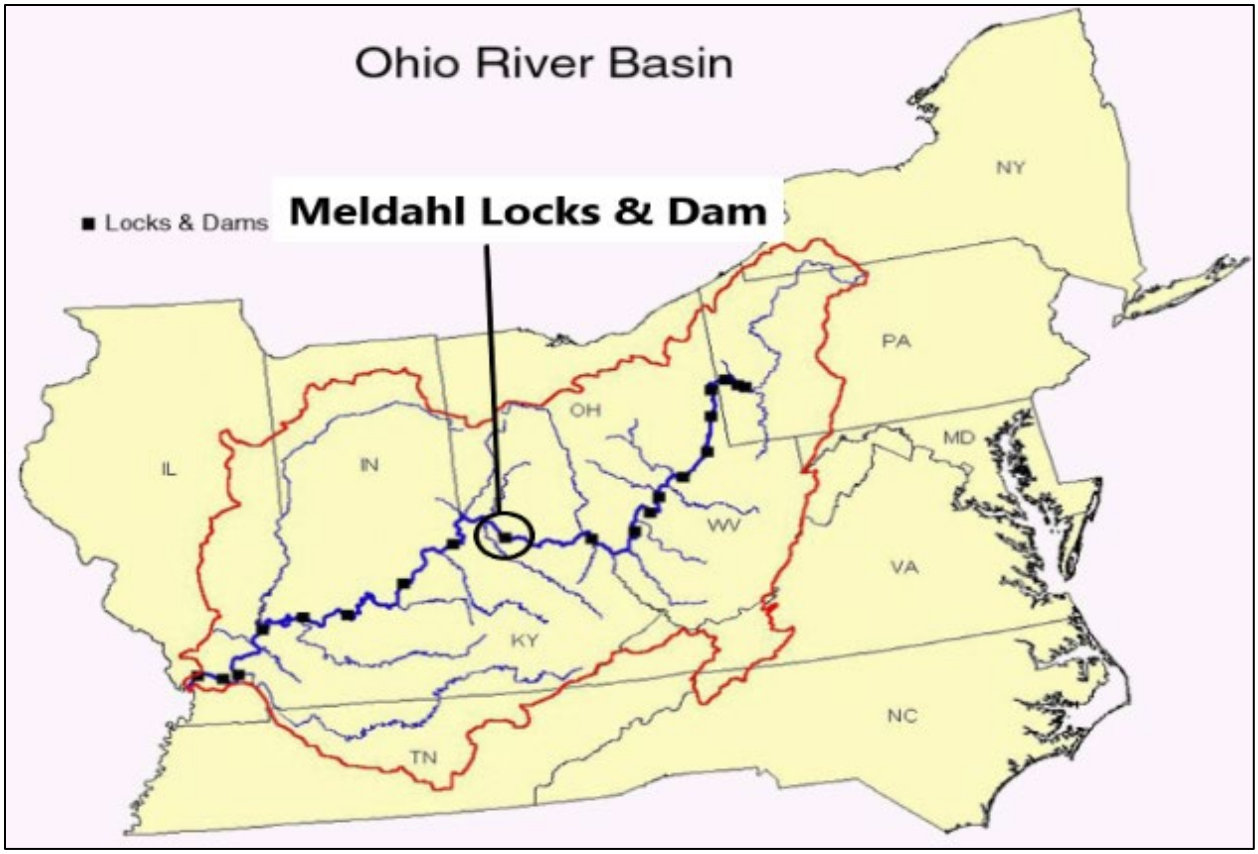

Figure 1 – Geographic Overview of Meldahl Project

In addition to the Captain Anthony Meldahl Lock and Dam, the USACE operates 19 locks and dams on the Ohio River to ensure navigation. The locks and dams also produce hydroelectric power at many of these projects under FERC licenses (Figure 2).

The ownership of these hydropower projects varies (Table 1). AMP owns or maintains four other hydroelectric projects on the Ohio River including: Willow Island (FERC Project No. 6902, LIHI #187), Belleville (FERC Project No. 6939, new LIHI application also under review), Greenup Hydroelectric Project (FERC Project No. 2614) which is just upstream of the Meldahl Project, Cannelton (FERC Project No. 10228), and Smithland (FERC Project No. 6641).

Figure 2. Ohio River Locks and Dams and USACE Districts

Table 1. List of FERC Licensees on Ohio River Locks and Dams operated by USACE located upstream and downstream of the Meldahl Project

Upstream of Meldahl Project	
1.	Emsworth Lock and Dam, river mile 6.2. FERC Project No. 13757
2.	Emsworth Back Channel Dam, river mile 6.4 FERC Project No. 13761
3.	Dashields Lock and Dam, river mile 13.3
4.	Montgomery Lock and Dam, river mile 31.7. FERC No. 13768
5.	New Cumberland Lock and Dam, river mile 54.4
6.	Pike Island Lock and Dam, river mile 84.2
7.	Hannibal Locks and Dam, river mile 126.4. FERC No. 3206
8.	Willow Island Locks and Dam, river mile 161.7 AMP owns hydroelectric Project, FERC No. 6902
9.	Belleville Locks and Dam, river mile 203.9. OMEGA JV5 owns and AMP operates FERC No. 6939
10.	Racine Locks and Dam, FERC No. 2570
11.	Robert C. Byrd Locks and Dam, FERC No. 15094
12.	Greenup Locks and Dam, FERC No. 2614
Downstream of Meldahl Project	
1.	Markland Locks and Dam, river mile 531.5. FERC No. 2211
2.	McAlpine Locks and Dam, river mile 606.8
3.	Cannelton Locks & Dam, river mile 720.7. AMP owns Cannelton Hydropower Project, FERC No. 10228
4.	Newburgh Locks and Dam, river mile 776.1. FERC No. 12962
5.	John T. Myers Locks and Dam, Owned by USACE, river mile 846
6.	Smithland Locks and Dam, river mile 918.5. AMP owns Smithland Hydropower Project
7.	Olmstead Locks and Dam, owned by USACE, river mile 964.4

3. PROJECT DESCRIPTION

FERC licensed the Meldahl Hydropower Project (Meldahl Project) in 2008. AMP and the City of Hamilton, Ohio (Hamilton) are the current licensees, and the City operates the hydro project on a day-to-day basis. The FERC project boundary is very small compared to the overall size of the Captain Anthony Meldahl Lock and Dam. Only about 82.3 acres of land and water are within the project boundary (Figure 3 and 4). The existing USACE structure, which is not a part of the FERC license, consists of a main lock, 1,200 feet long and 110 feet wide and an auxiliary lock, 600 feet long and 110 feet wide. The USACE dam is a concrete fixed weir with 12 Tainter gates, each 100 feet long and 35 feet high above the sills. The dam is 1,752 feet in length. At the southern end of the gated section of the dam, there is a 372-foot-long concrete gravity overflow weir. The weir extends to the southern end of the gated section to the south bank of the Ohio River.

Figure 3. Location of the Corps' existing Meldahl Lock and Dam facilities and facilities of the Meldahl Project

Figure 4. Meldahl powerhouse looking downstream with Kentucky on right side

FERC issued an original license on June 25, 2008 for a period of 50 years to Hamilton to construct and operate the Meldahl Project. On March 1, 2009, Hamilton, AMP, and Meldahl, LLC entered into a Purchase, Construction, and Ownership Agreement that established Meldahl, LLC as the sole owner and operator of the Meldahl Project. On June 16, 2010, FERC granted Hamilton's request to add AMP to the license as a co-licensee.

3.1 Major Project Works

The Meldahl Project is located on the Kentucky (left bank) side of the river while the USACE navigation lock is on the Ohio (right bank) of the river. The hydroelectric project consists of a 210-foot-wide reinforced concrete powerhouse containing three 35-megawatt (MW) turbine generating units for a total installed capacity of 105 MW; an 1,850-foot-long intake channel; an 1,850-foot-long tailrace channel; an approximately 5-mile-long, 138-kilovolt (kV) transmission line connecting the powerhouse to a switching station adjacent to East Kentucky Electric Cooperative, Inc.'s Boone-Spurlock transmission line; and other appurtenant facilities.

3.2 Mode of Operation for Power

The Meldahl Project uses the hydraulic head and flows of the Captain Anthony Meldahl Lock and Dam in accordance with a signed Memorandum of Agreement (MOA) with the USACE. Hence, hydroelectric energy production is secondary and subject to the USACE goals of maintaining flows for navigation. The Project also operates in run-of-river mode for protection of navigation, water quality, and aquatic resources on the Ohio River.

The Meldahl Project generates electric power with three horizontal 35-MW Kaplan Bulb turbines designed to operate between 2,300 cfs and 65,000 cfs while maintaining target upper pool levels in accordance with the MOA and its associated operating plan. For flows outside of the turbine operating range, USACE manages flows and pool levels. Each of the turbines has a trashrack with 8-inch spacing and an approach velocity of 2.1 feet per second (f/s). The Project reached full commercial operations in April 2016. Annual generation varies with the seasonal water flows of the river and fluctuates directly with the changing differential head and flow conditions. Between 2017 and 2021, the Project generated an average of 514,157 megawatt-hours (MWh) annually. There have been no notable equipment upgrades or changes in operation since the Project began operation.

The Huntington District of the USACE maintains the upstream Meldahl pool at approximately 485.0 feet above mean sea level (msl), the upper pool's length is 95.2 miles to Greenup Dam and the surface area is 21,700 acres. The normal lower (Markland) pool elevation is held at approximately 455.0 feet msl and creates 30 feet of hydraulic head for hydropower generation.

During normal operations, the Meldahl Project can generate electric power with one, two or three of the units 24 hours a day when river flows range from approximately 2,300 cubic feet per second (cfs) to about 65,000 cfs. During low flow periods when the Ohio River is being regulated for protection of Federal Interests such as navigation, all water discharged from the Meldahl Project is controlled by the Meldahl Lock and Dam Lockmaster. The Huntington District also maintains the upstream navigational pool when discharging any flow through the Meldahl Lock and Dam.

4. REGULATORY AND COMPLIANCE STATUS

4.1 Summary of Project Development and Agency Consultation Process

In 1988, FERC issued a draft environmental impact statement (EIS)[1] pursuant to the National Environmental Policy Act on the cumulative effects from proposed hydroelectric power projects at 19 sites in the Upper Ohio River Basin. The EIS, which included the Meldahl Project evaluated the cumulative effects on 1) dissolved oxygen (DO) levels in the river, 2) fish mortality from entrainment (i.e., from trash racks and passing through the turbines), and 3) disruptions to recreational sport fishing. FERC used a simulation-optimization modeling approach to design and evaluate hydro development alternatives. The models proved extremely valuable for developing a systematic understanding of cumulative impacts of hydropower development in the basin and for giving equal consideration to power and environmental quality issues.[2] FERC subsequently released a final EIS and decided to license projects at 16 of the 19 USACE locks and dams.

[1] Hydroelectric development in the upper Ohio River basin. FERC Docket No. EL85-19-114, FERC/FEIS-0051. Federal Energy Regulatory Commission, Office of Hydropower Licensing, Washington, D.C.
[2] Sale, M J, Railsback, S F, Chang, S Y, Coutant, C, Spath, R E, and Taylor, G H. 1989. "Balancing hydropower development in the Ohio River basin". United States. https://www.osti.gov/servlets/purl/5921889

After the final cumulative EIS was issued, Hamilton consulted with the USACE, federal and state agencies in Kentucky and Ohio, and other stakeholders using the FERC's Traditional Licensing Process. Hamilton filed an application for original license in 2006 and FERC then prepared an Environmental Assessment (EA) for the proposed Meldahl Project issued on April 25, 2008 which examined the Project-specific and cumulative effects of the Project with other USACE locks and dams on the Ohio River and other hydropower projects. FERC concluded its analysis with a Finding of No Significant Impact. FERC's recommended measures and conditions in Kentucky's water quality certificate ensure that the Project has minimal effects on environmental resources, including recreational access. The Meldahl Project's operation and the associated fish entrainment through the Project's turbines have resulted in some minor, long-term effects on resident fish in the Meldahl and Markland pools in the Ohio River. However, FERC found that these effects have been mitigated by installing trash racks and implementing a recommended fisheries enhancement plan for the area downstream of Meldahl Project.

Subsequent to the 2008 license order, FERC issued a license amendment on February 26, 2010 which altered the exact location of the proposed powerhouse. Another FERC license amendment dated August 23, 2012 shortened and altered the route of the proposed transmission line.

4.2 Water Quality Certification

Hamilton applied for a water quality certificate pursuant to Section 401 of the Clean Water Act. The Kentucky Department for Environmental Protection issued Water Quality Certification #2009-018-8 on May 4, 2009.[3] It includes ten conditions, related to Project construction, DO limits and monitoring requirements, and compliance with other license-related plans.

4.3 Compliance Status

Based on the LIHI application and review of the FERC elibrary, the Project is in compliance with approved state and federal plans for protection, enhancement, or mitigation of impacts to all environmental resources, including cultural and historic resources affected by the Meldahl Project.

5. PUBLIC COMMENTS RECEIVED

By email dated September 27, 2022 to LIHI staff, the US Fish and Wildlife Service (FWS) stated that there are federally listed endangered mussels below the Meldahl Project, or there had been the last time anyone was able to conduct a survey. According to FWS, USACE was reportedly having trouble with diver access to conduct periodic mussel surveys, following commencement of operations in 2017, and USACE was reportedly concerned that the mussel community has probably changed due to the increased velocities from the Meldahl Project.

[3] See pdf pp. 112-115 of the LIHI application https://lowimpacthydro.org/wp-content/uploads/2022/11/LIHI-Application-Meldahl-Hydroelectric-Project.pdf

By letter dated October 6, 2022, the Miami Tribe of Oklahoma offered no objection to the LIHI application but requested immediate consultation in the event that previously unidentified cultural or archaeological evidence is found.

6. ZONES OF EFFECTS

As shown in Figure 5, AMP presented two designated zones of effect for the Meldahl Project. Zone 1 is defined as the Impoundment from Bullskin Creek downstream of Utopia to the Captain Anthony Meldahl Lock & Dam, which is approximately between River Mile 431.6 and 436.2. Zone 1 also includes lands, waters and the facilities included in the FERC project boundary.

Zone 2 is defined as Downstream from the Captain Anthony Meldahl Lock & Dam and Meldahl Project to Big Indian Creek at Point Pleasant, which is approximately between River Mile 436.2 and 445. Zone 2 also includes lands, waters and the facilities included in the FERC project boundary.

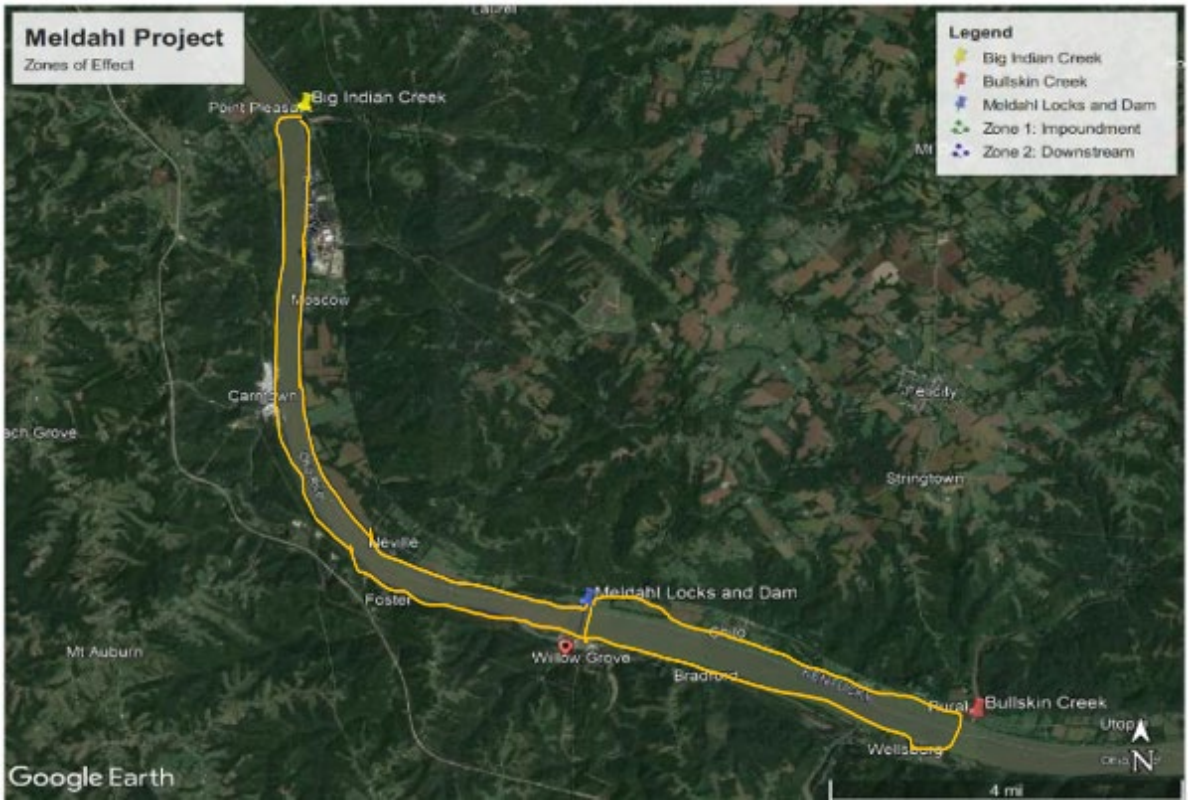

Figure 5. Zones of Effect

AMP selected alternative standards to fulfill each LIHI criterion and Zone of Effect (ZoE) in Table 2 below. This review finds those selections are appropriate.

Table 2. Summary of AMP's Criterion Standards for the Meldahl Project

	CRITERION AND STANDARD SELECTED							
Zone No. and Name	A	B	C	D	E	F	G	H
	Ecological Flows	Water Quality	Upstream Fish Passage	Downstream Fish Passage	Shoreline and Watershed Protection	Threatened and Endangered Species	Cultural and Historic Resources	Recreational Resources
1- Impoundment (RM 431.6 - 436.2)	1	3	1	1	2	2	2	2
2- Tailrace (RM 436.2 – 445)	1	3	1	1	2	2	2	2

7. DETAILED CRITERIA REVIEW

A. Ecological Flow Regimes

Goal: The flow regimes in riverine reaches that are affected by the facility support habitat and other conditions suitable for healthy fish and wildlife resources.

Assessment of Criterion: AMP selected Standard A-1, Not Applicable/De Minimis Effect for both ZoEs.

Discussion:

In 1910 Congress authorized the construction of locks and dams on the Ohio River to provide navigation. This action changed the Ohio River into a series of 20 pools. Through dredging and other means, the Ohio River is maintained to provide the proper width and a minimum 9-foot depth for navigation. In addition, the Ohio River flows, in the vicinity of the Meldahl Project, are managed for domestic and industrial water supply, flood control, cooling for power generation, water quality (wastewater release), and recreation.

The USACE maintains a normal pool elevation of 485 feet msl in the Meldahl pool, 30 feet higher than the downstream Markland pool. There is no significant storage in either the Markland or Meldahl pools, which are both approximately 95 miles in length. USGS Gage No. 03216600, Ohio River at Greenup Dam near Greenup, KY is located upstream of the Project and USFS Gage No. 03277200, Ohio River at Markland Dam near Warsaw, KY is located downstream.

The drainage area at the Project is approximately 70,800 square miles. Daily river flows on the Ohio River at Greenup Dam, which upstream of the Meldahl Project, from 2016 to October 2022 averaged 53,300 cfs over 52 years of record. River flows ranged between 10,900 and 242,000 cfs. In 2021 river flows peaked during March and were the lowest during August (Figure 6).

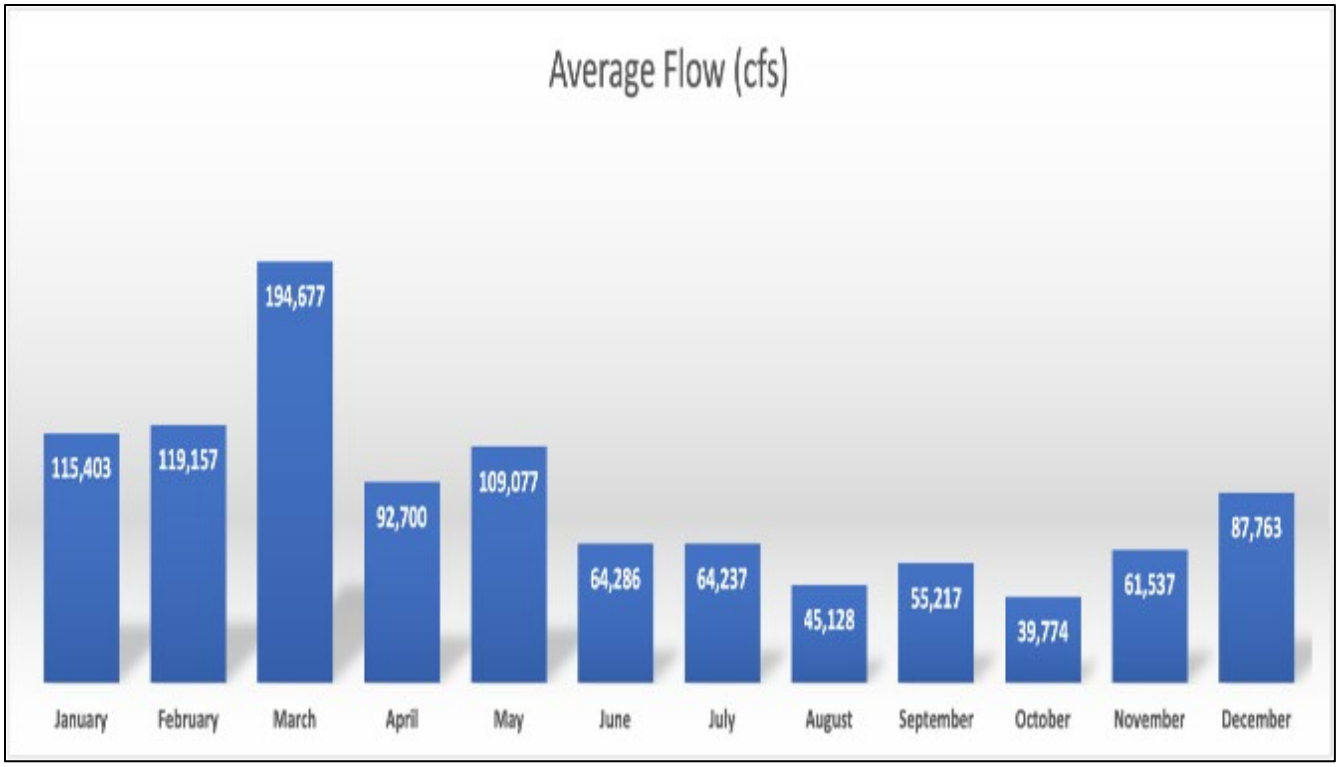

Figure 6. Average Monthly River Flows in 2021 on the Ohio River upstream of the Meldahl Project at Greenup

The Meldahl Project operates essentially as a run-of-the river project according to the MOA with the USACE and utilizes the hydraulic head provided by the Meldahl Locks and Dam. There are no bypassed reaches or water diversions associated with any of the ZOEs.

The Project license states that "The Corps will control the flows available for operation of the Meldahl Project. As such, the hydro operation is subordinate to the operation of the Meldahl Locks and Dam." Because USACE maintains the pool elevation to maintain a depth suitable for navigation, the Meldahl Project does not have any ability or authority to operate in anything but run-of-river mode. The USACE determines the total discharge flow from the dam and the Meldahl Project uses a portion of that flow for generation. There is no storage capacity in the pools.

FERC license Article 404 requires the Meldahl Project to operate in a run-of-river mode within the constraints established by the Huntington District, USACE at the Meldahl locks and dam to protect water quality, fish and aquatic resources in the Ohio River. Also, the licensee must meet the USACE's operational requirements to provide navigation on the Ohio River. Article 404 also instructs that the Project licensees shall at all times act to minimize fluctuation of the reservoir (Meldahl pool) elevation by maintaining a discharge from the Project such that, at any point in time, flows, as measured immediately downstream from the tailrace approximate the sum of inflows to the reservoir.

Based on the application, supporting documentation and other documents, this review finds that the Meldahl Project does not impact flows in the river and satisfies the Ecological Flows Regime criterion.

B: Water Quality

Goal: Water Quality is protected in waterbodies directly affected by the facility, including downstream reaches, bypassed reaches, and impoundments above dams and diversions.

Assessment of Criterion: AMP selected Standard B-3, Site-Specific Studies for both ZoEs.

Discussion:

Portions of the Ohio River Basin lie in 14 states with 6 of those directly bordering the main stem Ohio River. The river provides: 1) drinking water for over five million people, 2) a warm water habitat for aquatic life, 3) numerous recreational opportunities, 4) a major transportation route, and 5) a source of water for the manufacturing and power industries.

The Ohio River Valley Water Sanitation Commission (ORSANCO) is an interstate agency charged with abating existing pollution in the Ohio River basin and preventing future degradation of its waters. The States defer to ORSANCO with respect to evaluating water quality and whether the river is meeting all beneficial uses with respect to water quality standards and the Clean Water Act.

Designated uses for the Ohio River include aquatic life, contact recreation, public water supply, and fish consumption. According to ORSANCO, if a waterway is assessed and doesn't meet the water quality criteria established to protect its designated use, it is considered impaired. ORSANCO's 2020 Report on the Assessment of Ohio River Water Quality Conditions, which is based on data collected 2014 to 2018 concluded that the Ohio River is:

- Fully supporting of aquatic life use, public water supply use, and fish consumption use with respect to Mercury,
- Partially supporting of fish consumption use with respect to PCB/Dioxins, and
- 641.5 miles or approximately 2/3 of the Ohio River is classified as impaired for Contact Recreation use.

The Meldahl Project does not contribute negatively to any of the above beneficial uses of the river given its run-of-river operations. However, construction produced moderate, short-term increases in turbidity. Erosion of disturbed land areas and disturbance of the riverbed during cofferdam installation temporarily increased sediment levels in the Ohio River with fine silt and clay-sized particles settling in the pools immediately downstream of the Project. The Project's operation and mitigation to protect water quality is governed by the USACE, by the water quality certificate issued by the Kentucky Division of Water (Kentucky DOW) on October 6, 2006 that included erosion and sediment controls, and by special conditions in the FERC license discussed below.

Dissolved Oxygen (DO) Levels

For the first three-quarters of the twentieth century, DO concentrations in the Ohio River were depressed because of the discharge of raw or inadequately treated sewage. DO conditions have improved substantially, however, since ORSANCO[4] established standards in 1970 that require secondary treatment for all sewage. For example, the mean DO concentration in the river near Cincinnati (RM 460 to RM 470) for the period from 1961 to 1970 was 3.2 milligrams per liter (mg/l), but the mean concentration increased to 6.8 mg/l for the period from 1986 to 1995.

The Kentucky DOW's water quality recommendations were included in Articles 302 (Contract Plans and Specifications), Article 402 (DO Standards), and Article 403 (DO Monitoring Plan) of the FERC license for the Meldahl Project.

On October 27, 2011, the licensees applied to the Ohio EPA for water quality certification for a proposed transmission line amendment. On May 30, 2012, Ohio EPA issued a certification for the amendment application. The certification included: (1) best management practices (2) wildlife protection conditions and (3) other administrative and general conditions. License Article 402 requires licensees to maintain DO concentrations in the powerhouse discharge at or above the water quality standard of 5.0 mg/l averaged over a 24-hour period and 4.0 mg/l as an instantaneous reading.

License Article 403 required the licensees to file for a plan to monitor the water quality of the Ohio River downstream and upstream from the Meldahl Project and maintain DO levels for the first ten years of operation. On July 17, 2014, and supplemented on August 27, and September 25, 2014, the licensees filed a Final DO Monitoring Plan. On October 27, 2014 FERC issued an Order Modifying and Approving the Final DO Monitoring Plan.

Pursuant to the DO Monitoring Plan, the Meldahl Project has submitted annual DO reports to FERC and consulting agencies since the first year of commercial operation in 2016. From 2016-2021 (During the DO monitoring season), there were no instances when the Project was generating in which the DO measurements fell below the water quality standard established in license Article 402.

In 2012, the USACE Lakes and Rivers Division issued an Operations Order (2012-075) (OPORD) establishing water quality monitoring and reporting requirements for non-federal hydropower projects on the Ohio River. The language in the USACE Operations Order was included in the MOA between the Meldahl Project and USACE and requires DO monitoring to continue beyond the first ten years and last throughout the FERC license term. This requirement was reiterated in a letter from USACE dated May 17, 2021.

Based on the application, supporting documentation and other documents, this review finds that the Project does not adversely affect water quality and satisfies the Water Quality Regime criterion.

[4] ORSANCO is an independent agency composed of representatives from the U.S. Environmental Protection Agency and the states of Kentucky, Ohio, West Virginia, Virginia, Pennsylvania, Indiana, Illinois, and New York.

C: Upstream Fish Passage

Goal: The facility allows for the safe, timely, and effective upstream passage of migratory fish. This criterion is intended to ensure that migratory species can successfully complete their life cycles and maintain healthy populations in areas affected by the facility.

Assessment of Criterion: AMP selected Standard C-1, Not Applicable/De Minimis Effect for both ZoEs.

Discussion:

Fisheries Resources

The Ohio River in the Project vicinity supports a wide variety of warmwater fishes. Game fish include walleye, sauger, largemouth bass, smallmouth bass, spotted bass, rock bass, catfish, striped bass, hybrid striped bass, sunfish, crappie, and white bass. Nongame fish include gar, bullheads, skipjack herring, mooneye, chubs, shiners, drum, suckers, gizzard shad, and carp. The Kentucky State Nature Preserves Commission indicates that several species of special concern may occur in or near the Project site, including paddlefish, silver lamprey, and black buffalo. There are no known federally listed threatened or endangered fish species, or species proposed for listing, in the Project area.

The only diadromous species present is the American eel, although in very small numbers. Only one specimen was collected between 2010 and 2022 at the Project and two others were collected in the Ohio River more than 500 miles downstream at the Olmstead Locks and Dam located near the river mouth. Between 2000 and 2009, only five eels were collected in the river and none near the Project. For over 40 years from 1957 to 1999, a total of 116 eels were collected in the Meldahl and Markland pools.[5]

The reservoir created by the Meldahl Locks and Dam is 95 miles long and encompasses 21,809 acres, of which 1,182 acres are backwater embayments. The river bottom is predominantly sand, gravel, and silt/clay with the primary areas of spawning habitat occurring in tributary streams and backwater embayment areas unaffected by river traffic.

With the alteration of the entire Ohio River by the construction of locks and dams and channel improvements for navigation, free-flowing fishery habitat is limited primarily to areas immediately downstream of the navigation dams. Downstream of Meldahl Lock and Dam, a tailwater area exists that is approximately 1 mile long. Because of its scarcity in the Ohio River, the Kentucky Department of Fish and Wildlife Resources (Kentucky DFWR) has identified this habitat as an important resource for the Ohio River fishery. Kentucky DFWR considers the Meldahl lock and dam tailwater to be an excellent fishery.

The Ohio Division of Wildlife (2008) rated the fishing outlook for 2007 in the Meldahl tailwater as excellent for sauger; good for flathead catfish, channel catfish, and hybrid striped bass; and fair for white bass and striped bass. Additionally, the Project area supports a commercial fishery for freshwater drum, carp, and buffalo. Based on fish collection surveys conducted in the Markland and Meldahl pools, as well as in the Meldahl lock chamber, gizzard

[5] ORSANCO, Ohio River Mainstem Fish Population data. See https://www.orsanco.org/data/fish-population/

shad, freshwater drum, and emerald shiner appear to be the most abundant fish species in the vicinity of the Project (see pp. 22-23 of the 2008 FERC EA).

Results of the 2017 ORSANCO River Pool Assessment - Meldahl (Upstream Pool) and 2021 ORSANCO River Pool Assessment - Markland (Downstream Pool) indicated that the pools were in good condition for fish and in fair condition for macroinvertebrates. In the Meldahl pool in 2017, increasing numbers of non-native fish species were observed. In the Markland pool, river redhorse, an Ohio fish species of concern was found in 2021 but not in the 2009 or 2014 surveys. A high abundance of invasive zebra mussels and two species of non-biting midges were also found. The Markland pool was the only pool of the 2021 assessments to contain any stonefly specimens (Acroneuria sp.) and also contained the highest abundance of caddisflies (22.32% of individuals), which resulted in Markland scoring the highest in the EPT Taxa richness metric for the four pools surveyed that year. ORSANCO concluded that overall, results indicated that both of the pools harbored healthy aquatic communities.

Section 18 of the Federal Power Act (FPA) states that FERC 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. The FWS has not filed any fishway prescriptions pursuant to Section 18 in response to FERC's request for terms, conditions, and recommendations.

FERC's 2008 Environmental Assessment for the Meldahl Project concluded that the Project's construction would not affect the ability of fish to pass upstream via the USACE's normal lockage operations. Since the Meldahl Lock and Dam were already in place, the addition of the Meldahl Hydroelectric Project was determined to pose no further impediment to upstream fish passage.

Based on the application, supporting documentation and other documents, this review finds that the Meldahl Project does not adversely impact upstream migrating fish and satisfies the Upstream Fish Passage criterion.

D: Downstream Fish Passage

Goal: The facility allows for the safe, timely, and effective downstream passage of migratory fish. For riverine (resident) fish, the facility minimizes loss of fish from reservoirs and upstream river reaches affected by Facility operations. Migratory species can successfully complete their life cycles and maintain healthy populations in the areas affected by the Facility.

Assessment of Criterion: AMP selected Standard D-1, Not Applicable/De Minimis Effect for both ZoEs.

Discussion:

Downstream fish passage can be affected by fish being impinged on a project's trash racks or from mortality if they become entrained and travel through the turbines, particularly if there are no alternative routes of passage. At Meldahl like other lock and dam projects,

downstream passage is also facilitated through normal lock operations and via dam discharges when flows are outside of the turbine operating ranges.

At the time of licensing, no fishway prescriptions or reservations of authority were filed under FPA section 18 and no federal or state fish and wildlife agencies filed FPA Section 10(j) recommendations. No agencies have exercised authority to require downstream fish passage measures.

Some general conclusions on the size range and species composition of fish that are likely to be entrained can be drawn from the results of entrainment studies that have been conducted at other hydroelectric projects. EPRI (1997) compiled a database of entrainment information collected in studies employing large nets that sampled the entire outflow of one or more turbine units at each site. Data from these studies indicate that fish less than 4 inches typically comprised between 61 and 80 percent of the fish that were collected in the nets, and fish less than 8 inches typically comprised more than 90 percent of the fish that were collected.

Turbine-Induced Fishery Mortality

The survival rate of fish passing through turbines varies for different sizes of fish and for turbines with different design characteristics. Although the results of field tests evaluating turbine survival vary, in most cases these studies have shown that the highest survival rates have been observed for smaller fish passing through large bulb or Kaplan turbines installed at low-head dams, as at Meldahl. Aside from fish size (with larger fish being more susceptible to injury), species type (some fish species are hardier than others, can swim faster and avoid powerhouse intakes, and some species are more susceptible to entrainment), and behavior (migratory species are more likely to be entrained) also influence the percentages of fish subjected to potential injury or mortality from turbine entrainment.

In addition to having less potential for pressure-related injuries, turbines at low head dams like the Meldahl Project typically have large gaps between runner blades, a small number of blades and slow rotational speeds. These factors reduce the chances of strike-related injuries. Meldahl has three 35-MW horizontal Kaplan bulb turbines that operate at 64 rpm with four adjustable runner blades. The trash racks have clear spacing of about 8 inches, with a trash rake mounted on rails along the length of the intake to clean the trash racks.

To assess potential rates of turbine passage survival for different sizes of fish at the Project, FERC estimated survival rates for projects with similar turbines using a database of turbine survival studies compiled for the US Department of Energy's Advanced Hydropower Turbine Program (Franke et al., 1997). Headrick (1998) used survival rates from this database to develop a regression formula for estimating survival rates of different size fish passing through axial-flow turbines (this includes the bulb, Kaplan, and propeller turbines that are typically installed at low-head sites).

Because the characteristics of the Meldahl Project's turbines were not finalized when FERC prepared its EA, FERC could not apply Headrick's regression directly (specifically, revolutions per minute, and number of runner blades). Because design head is a primary factor that controls turbine design parameters, FERC used Headrick's equation to estimate mortality rates for sites with similar operating heads to the Project and provided a range of turbine passage survival estimates for three sizes of fish. The resulting ranges are provided in Table 3.

In Table 3, the turbines most similar to Meldahl are at the Racine Project which is also located on the Ohio River at a USACE lock and dam. Like Meldahl, the Racine turbines have four blades operating at 62.1 rpm. Predicted survival was calculated to be the highest of the turbines analyzed.

Table 3. Estimated survival rates for three sizes of fish passing through axial-flow turbines between 20 and 30 feet of head (from FERC EA Table 3).

Site Name	Turbine Design Discharge (cfs)	Blades	Speed (rpm)	Head (feet)	Predicted Survival (percent) using Headrick (1998) Formula[a] for Three Fish Lengths		
					6-inch	9-inch	12-inch
West Enfield, ME	5,300.7	3	89	21	98	95.9	93.9
Raymondville, NY	1,638.6	6	120	21	93.5	91.4	89.4
Craggy Dam, NC	600.3	4	229	21	90.6	88.6	86.5
Twin Branch, IN	409.7	4	241	21.3	90.1	88	86
Racine, WV	8,002.3	4	62.1	22	98.1	96.1	94
Crescent, NY	1,730.4	5	144	26.9	93.4	91.4	89.3
Lawrence, MA (Essex)	4,400.2	3	128.6	28.9	96.2	94.1	92.1
Chalk Hill, MI–WI	1,331.4	4	150	28.9	94.2	92.1	90.1
Average					**93.8**	**91.7**	**89.7**

[a] Percent Survival = 109.2 – 0.027 (length in mm) – 1.038 (number of blades) – 0.045 revolutions per minute.

FERC's licensing order and the EA concluded the following regarding downstream fish passage and fish entrainment/mortality:

1. Entrainment losses are not expected to significantly affect the populations levels of any fish species in the Meldahl or Markland pools.
2. There would be little benefit in conducting an entrainment assessment and substantial effects on fish populations are unlikely.
3. In addition to high survival rates associated with large bulb turbines at low head dams, the distance between dams on this section of the Ohio River (approximately 95 miles between dams) is considerable and only a small portion of the fish population in these large pools would be entrained.
4. The fish populations in the Markland pool do not depend on recruitment from upstream of Meldahl dam and no anadromous species, which would need to pass one or more dams in order to complete their life cycles, are present. (since the EA, it has been noted that American eel may be present in small numbers in the Ohio River).
5. Project operation and the associated fish entrainment through the turbines would result in some minor, long-term effects on resident fish in the Meldahl and Markland pools in the Ohio River that would be mitigated by implementing the recommended fisheries enhancement plan for the area downstream of Meldahl dam.

In lieu of requiring the licensee to conduct a Fishery Entrainment and Mortality Study at the Meldahl Project, FERC required habitat enhancement measures, such as the construction of artificial reefs (which also exist at other hydropower projects at USACE dams on the Ohio River).

In consideration of the fishery enhancements recommended in the Meldahl Project's EA, license Article 411 required that the licensees' recreation plan include provisions to develop and maintain fish structures that would increase habitat diversity and provide low velocity refuges during high flow periods and improve the recreational fishery and angling opportunities at the Project. FERC approved the Recreation Plan on November 20, 2009. The licensees added six structural enhancements consisting of shoreline undulations upstream, and three downstream of the fishing pier constructed at the Project. The undulations were designed based on physical hydraulic modeling required under license Article 401. They are each approximately 2 feet high and 7 feet wide and extend from the lower tailrace shoreline walking path to approximately elevation 450 feet msl, 5 feet below minimum pool elevation.

Based on the application, supporting documentation and other documents, this review finds that the Meldahl Project does not impact downstream fish passage or protection in more than a de minimis way and satisfies the Downstream Fish Passage criterion.

E: Shoreline and Watershed Protection

Goal: The facility has demonstrated that sufficient action has been taken to protect, mitigate or enhance the condition of soils, vegetation and ecosystem functions on shoreline and watershed lands associated with the facility.

Assessment of Criterion: AMP selected Standard E-2, Agency Recommendation for both ZoEs.

Discussion:

Dredging and excavation of the riverbed and other ground disturbances occurred during original construction of the lock and dam, and later during construction of the hydroelectric Project. The licensees implemented erosion and sediment control measures, consistent with the water quality certification and Kentucky's Best Management Practices for Controlling Erosion, Sediment, and Pollutant Runoff from Construction Sites.[6] The licensees also stabilized the construction site with native plants which minimized long-term effects.[7]

While there is no shoreline protection plan, several license articles required plans to restore and protect the affected lands around the Project. Article 407 of the Project's license required the licensees to develop a plan to protect wetlands that could be affected by Project construction. The licensees submitted the Wetland Survey and Protection Plan to FERC on May 21, 2009, which was subsequently approved in a July 30, 2009 FERC Order.

[6] EA at 18.
[7] EA at 18-19.

On July 31, 2009, a site restoration and aesthetics plan was filed pursuant to Article 412 of the Project license. The plan stipulated that following the completion of construction, landscaping of the area would be done, and efforts made to blend the disturbed area with the existing visual environment. The Plan was approved by FERC in the Order Modifying and Approving Site Restoration and Aesthetics Plan issued November 10, 2009, with a requirement to prepare and file a Planting Plan.

The Meldahl Project submitted the required final planting plan on February 12, 2010 which was subsequently approved in an August 2, 2010 FERC Order. The plan was prepared in coordination with consulting agencies and provided information on specific seed mixes and seeding schedules for temporary (during construction) and permanent (following completion of construction) vegetative cover, as well as a representative map of seeding areas.

On April 8, 2010, the USACE Huntington District issued authorization for a Section 404 and Section 10 permit (Permit #LRH-2009-00080-OHR) for construction of the Meldahl Project that would adversely affect the Ohio River and 0.72 acres of jurisdictional wetlands. The USACE authorization included a special condition to mitigate unavoidable losses to a bottomland hardwood forest area located upstream of the Project dam and spillway. The licensees proposed to mitigate impacts by utilizing available mitigation credits at an existing mitigation bank (Northern Kentucky Mitigation Bank) and enhancing multiple riparian areas along Banklick Creek and the Licking Creek River throughout Kenton County, Kentucky. USACE approved the proposed mitigation plan via e-mail on September 8, 2018.

Based on the application, supporting documentation and other documents, this review finds that the Project has actively managed Project lands to minimize or mitigate impacts and satisfies the Shoreline and Watershed Protection criterion.

F: Threatened and Endangered Species

Goal: The facility does not negatively impact federal, or state listed species.

Assessment of Criterion Passage: AMP selected Standard F-2, Finding of No Negative Effect for both ZoEs.

Discussion:

Federal Listed Species

At the time of licensing the Project, the FWS identified six federally listed species that may occur in the Project area, all of which are classified as endangered or threatened. The Information for Planning and Consultation (IPaC) Report generated by the FWS on June 22, 2022 includes additional federally listed species that could be affected by Project operations (Table 4).

Table 4. Federally Listed Endangered, Threatened and Candidate Species that may occur in the Meldahl Project Area.

Mussels	**Mammals**
Endangered 1. Fanshell (Cyprogenia stegaria) 2. Pink mucket (Lampsilus abrupta) 3. Ring pink (Obovaria retusa) 4. Sheepnose (Plethobasus cyphyus) 5. Orangefoot pimpleback (P. cooperianus) 6. Clubshell (Pleurobema clava) 7. Rough Pigtoe mussel (Pleurobema plenum) 8. Snuffbox mussel (Epioblasma triquetra) 9. Spectaclecase mussel (Cumberlandia monodonta) 10. Northern Riffleshell mussel (Epioblasma torulosa rangiana) **Threatened** 1. Rabbitsfoot mussel (Quadrula cylindrica)	**Endangered** 1. Gray Bat (Myotis grisecens) 2. Indiana Bat (M. sodalist) **Threatened** 1. Northern Long-eared bat (M. sepentrionalis) **Insects** **Candidate** 2. Monarch Butterfly (Danaus plexippus)

Source: FWS IPaC Report June 2022, Appendix E of the LIHI application.

The IPaC Report also listed ten birds on the FWS List of Birds of Conservation Concern (BCC) (Table 5). These bird species warrant special attention when conducting activities in the Project area during breed times.

Table 5. FWS List of Birds of Conservation Concern that may be in the Project Area.

Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Black-billed Cuckoo Coccyzus erythropthalmus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Cerulean Warbler Dendroica cerulea This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/2974	Breeds Apr 23 to Jul 20
Kentucky Warbler Oporornis formosus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
Prairie Warbler Dendroica discolor This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler Protonotaria citrea This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker Melanerpes erythrocephalus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Rusty Blackbird Euphagus carolinus This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Wood Thrush Hylocichla mustelina This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Source: FWS IPaC Report June 22, 2022, Appendix E of the LIHI application.

State Listed Species

Kentucky and Ohio also have state-listed threatened and endangered species in the Project area. Kentucky's list includes Northern long-eared bat, Indiana bat, and fanshell, sheepnose, and clubshell mussels. State listed species in Bracken County, KY can be found here.

Threatened and endangered animal species in Clermont County, Ohio include Northern harrier hawk, blue corporal dragonfly, Indiana bat, five fish species including the threatened American eel, and twelve species of mussels some of which are also federally listed. State listed animal species in Clermont County, OH can be found here. Ohio threatened and endangered

plants include 13 species, one of which is also federally listed (running buffalo clover). State listed plant species in Clermont County, OH can be found here.

When FERC issued the original license for the Project, it consulted with the FWS pursuant to the Endangered Species Act, Migratory Bird Act of 1918 and the Golden and Bald Eagle Protection Act of 1943. The following conditions were included in the FERC license to protect these species during construction and operation of the Meldahl Project.

Freshwater Mussels

Article 406 of the FERC license required the licensees to prepare a freshwater mussel survey and protection plan. As part of that requirement, AMP conducted a pre-construction freshwater mussel survey of the Ohio River upstream and downstream of the Meldahl Lock and Dam in July 2008. The survey identified 14 species of mussels. No federally or state-listed threatened or endangered mussel species were collected during the survey.

The plan was to ensure the protection of the federally and state-listed fanshell mussel; the federally listed pink mucket, ring pink, orangefoot, pimpleback, and clubshell mussels; and the sheepnose mussel, a federal-candidate species (now listed as endangered) that occur in habitat that could be affected by construction and operation of the Project. On May 21, 2009, the licensees filed a freshwater mussel survey and protection plan which was approved in a FERC Order dated July 28, 2009. The plan indicated that the Project would comply with best management practices under the Kentucky Construction Site BMP Planning and Technical Specifications Manual.

By email to LIHI staff dated September 27, 2022, the FWS indicated that they were not aware of any environmental measures for mussels required at the Project. However, the email indicated that the USACE was reportedly having difficulty conducting surveys on federally listed endangered mussels due to the flow velocities below the Meldahl Project. The FWS asserted that USACE also believes that the high flow velocities from the Project may be affecting the mussels themselves and that the mussel community has probably changed due to the increased velocities (see Appendix A). Upon inquiry, AMP reported to LIHI staff that neither they nor the City of Hamilton had received any indications from USACE about difficulties in conducting surveys or of concerns over Project operational impacts on listed mussel species.

No mussel surveys have been conducted by AMP above or below the Meldahl Project since it began operation. Under its FERC license, AMP is not required to conduct additional mussel surveys. However, FERC's 2009 order approving the freshwater mussel survey and protection plan does require AMP to protect federally endangered mussels during Project operation.

Based on comments by the FWS on the LIHI application, this reviewer believes that AMP should consult with the USACE to temporarily modify flows from the Meldahl Project if needed to facilitate USACE surveys of listed endangered and threatened mussel populations upstream and downstream of the Project. AMP should also consult with USACE, FWS, and state agencies to confirm that Project operations do not have adverse impacts on listed mussels

and, if required, determine if any temporary or permanent changes in Project operations are warranted to protect endangered mussel populations.

Indiana Bats

Article 409 required the licensees to file an Indiana Bat Survey and Protection Plan prior to any land-clearing activities associated with Project construction. The purpose of the plan was to ensure protection of the Indiana bat that may occur in habitat that could be affected by Project construction and operation. On July 28, 2009 FERC issued an Order Approving the Indiana Bat Survey and Protection Plan pursuant to Article 409. FERC agreed that since no Indiana Bats or other federally listed species were observed or heard during the survey, no additional protective measures would be required and previous restrictions regarding land clearing could be removed. FWS stated its concurrence that the Project would not likely adversely affect the Indiana Bat in a letter dated November 20, 2008.

In August 2010, summer mist net surveys were conducted for Indiana bat at the Meldahl Project. The 2010 survey concluded that the development of the proposed Project was not likely to adversely affect the Indiana bat and the Ohio Power Siting Board concurred with the findings of the survey in a November 29, 2011 license amendment application (see page 60-61).

FERC's EA for the Meldahl Project concluded that following the industry standard for raptor-friendly transmission lines would minimize the potential for avian mortality and injury due to collision or electrocution. Accordingly, Article 410 of the Project license required the design and construction of the proposed transmission line in accordance with the guidelines set forth in *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006* (APLIC *et al*., 2006).

On August 23, 2012, FERC approved a license amendment to allow for changes to the Project's proposed transmission line that would go through Kentucky and Ohio. The FWS identified Indiana bat and one federally listed endangered plant, running buffalo clover (*Trifolium stoloniferum*), that could potentially occur within the proposed transmission line corridor and substation site.

Previously, in September 2010 and February 2011, the licensees had conducted surveys for the running buffalo clover and its habitat. No running buffalo clover populations were observed within the habitats surveyed. Additional habitat information and photographs were provided to FWS in July 2011.

In response to comments expressing concerns about possible adverse effects to migratory birds and their habitat caused by the proposed transmission lines and structures, the 2012 FERC license amendment added article 416 to the original license. Article 416 required the licensees to file an avian mortality monitoring plan to assess bird mortality from power line collisions for the transmission line that spans the Ohio River. On December 24, 2012, the Project licensees filed an Avian Monitoring Plan pursuant to license article 416, which was modified and approved by FERC in a December 17, 2013 Order.

The Avian Mortality Monitoring Plan required a report to be filed within 90 days of completing a three-year monitoring effort. The report required the licensees to propose continuation or cessation of the monitoring. Due to the low number of avian interactions with the transmission lines, the licensees proposed to discontinue avian monitoring at the Project in the June 20, 2019 Avian Monitoring Report. FERC issued an Order Approving the Avian Monitoring Report on November 19, 2019 and agreed that the licensees' request to discontinue avian monitoring should be approved.

The original FERC license included conditions to protect the Virginia mallow (identified by Kentucky as a species of special concern) and any federally listed plants that could be affected by Project construction, operation, and maintenance. Construction required clearing and excavating about 62 acres of terrestrial habitat, which prompted the inclusion of Article 408 into the Project's license. Article 408 required the licensees to file for FERC approval a terrestrial plant protection plan at least 90 days before any land disturbing or land clearing activities associated with Project construction. FERC approved the plan in an Order dated July 30, 2009.

Based on the application supporting documentation, agency comments and other conditions in this review, this review finds that the Project is not likely to adversely affect listed species that may be present, given its run-of-river operations and species protection plans, and satisfies the Threatened and Endangered Species criterion with the recommended condition.

G: Cultural and Historic Resources Protection

Goal: The facility does not unnecessarily impact cultural or historic resources that are associated with the facility's lands and waters, including resources important to local indigenous populations such as Native Americans.

Assessment of Criterion: AMP selected Standard G-2, Approved Plans for both ZoEs.

Discussion:

When the Meldahl Project was licensed, FERC evaluated the potential effects on properties listed or eligible for listing on the National Register pursuant to Section 106 of the National Historic Preservation. The area of potential effects for the Meldahl Project was the proposed project boundary, which included the powerhouse, tailrace channel, and the 5-mile-long, 138-kV transmission line. At that time and afterwards, Hamilton proposed to construct a transmission line (using single wood poles along existing roads, highways, and pipeline rights-of-way) and tie into a proposed switching station on East Kentucky Power Cooperative's 138-kV transmission line, located on Eden Ridge Road near Lenoxburg.

Archaeological examinations of the area of potential effect, excluding the transmission line right-of-way, did not identify properties either listed on or eligible for listing on the National Register. No properties eligible for listing or listed in the National Register were identified in the proposed transmission line rights-of-way, although the general area is believed to be archaeologically sensitive.

Article 413 of the Meldahl Project's FERC license required the licensees to consult with the Kentucky State Historic Preservation Officer (SHPO), USACE and Tribes prior to starting any land-clearing or land-disturbing activities associated with Project construction, other than those specifically authorized by the license. Within Kentucky, archaeological surveying was performed in association with a February 2010 FERC license amendment approving relocation of the powerhouse. No significant archaeological deposits were detected within the Project area.

Subsequently, cultural resource literature reviews and field surveys were conducted by the licensees to determine if any historic properties would be affected by a 2012 FERC license amendment that revised the Project's transmission line route through Kentucky and Ohio. Survey findings are detailed below:

- One historic property, the Meldahl Locks and Dam, and one potentially eligible site (BK-432) were identified in Kentucky. The Kentucky SHPO concluded that the undertaking as proposed would not affect any qualities that made BK-432 potentially eligible for listing.

- Three archaeological sites were determined potentially eligible for inclusion in the National Register of Historic Places (NRHP) in Ohio.

Due to the potential archaeological significance of the Ohio sites, the licensees revised the proposed transmission line's route in Ohio to avoid adverse impacts to archaeological sites. No significant archeological materials were found along the adjusted route and the licensees determined the Project would have no adverse effect on historic properties or their viewsheds.

Article 413 also requires that if previously unidentified archeological or historic properties are discovered during the course of constructing, developing, or maintaining Project works or other facilities, the licensee shall stop all land-clearing and land-disturbing activities in the vicinity of the properties and consult with the SHPO, the Corps, and the Tribes; and if such properties are determined to be included in or eligible for inclusion in the National Register of Historic Places the licensee shall develop a Historic Properties Management Plan.

By letter dated October 6, 2022, the Miami Tribe of Oklahoma offered no objection to the LIHI application but requested immediate consultation in the event that previously unidentified cultural or archaeological evidence is found. The FERC license requires Tribal consultation, but this review finds that a certification condition is warranted to ensure that Tribal interests are preserved.

Based on the application, supporting documentation, agency comments and other requirements, this review finds that the Project is not likely to adversely affect cultural or historic resources and satisfies the Cultural and Historic Resources Protection criterion with the recommended condition.

H: Recreational Resources

Goal: The facility accommodates recreation activities on lands and waters controlled by the facility and provides recreational access to its associated lands and water without fee or charge.

Assessment of Criterion: AMP selected Standard H-2, Agency Recommendation for both ZoEs.

Discussion:

Prior to the construction of the Meldahl Project, recreational access to the Ohio River shoreline was provided at the Meldahl Lock and Dam, both upstream of and downstream of the dam, and at the Big Snag Creek sandbar. The Big Snag Creek sandbar, located about one-half mile downstream from the dam, was and still is a very popular recreation site used for fishing, camping, and picnicking.

Article 411 of the Meldahl Project license required development of a recreation plan. On November 20, 2009, FERC issued an order approving and modifying the recreation plan for the Meldahl Project.

The Meldahl Project's recreation area encompasses the Meldahl Project Tailrace Fishing Area and the Big Snag Creek Sandbar Area. The licensees completed construction of a new access road, parking areas, public restrooms, fishing pier, picnic areas, and multi-level walkways along the shoreline for fishing access. Also as discussed in the Downstream Fish Passage Section, the licensees installed submerged undulations in the tailrace above and below the new fishing pier to enhance fishery habitat and sport fishing (Figure 7 and 8).

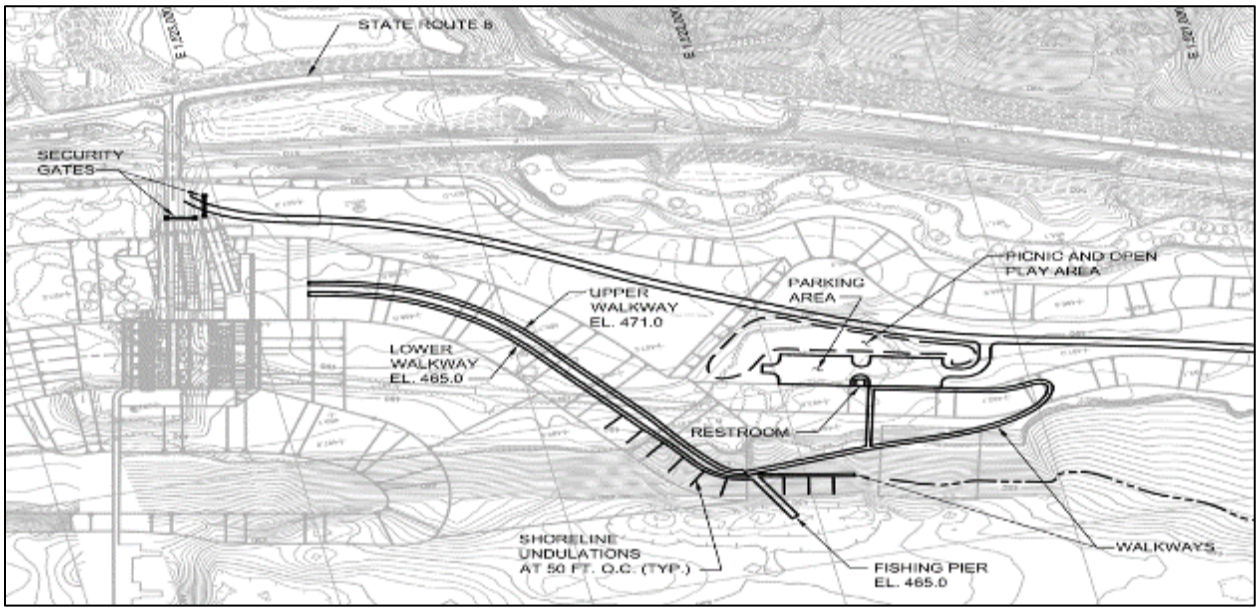

Figure 7. Map of Meldahl Project Area showing constructed Recreation Facilities and Fish Shoreline Undulations upstream and downstream of the new Fishing Pier

AMP allows recreational access to its associated lands and water without fee or charge. All facilities, except the fishing pier, are open to the public from 6:00 am until sunset daily to minimize potential vandalism. The fishing pier is open 24 hours per day, seven days a week.

Figure 8. Recreation Facilities looking downstream from Meldahl Project- A- Big Snag Creek Sand Bar, B-Multi-level walkways, C- Fishing Pier and D- Picnic Area and Tables

Based on the application, supporting documentation and other documents, this review finds that the Project provides recreational opportunities without fee or charge and satisfies the Recreational Resources criterion.

8. GENERAL CONCLUSION AND REVIEWER RECOMMENDATION

Based on my review, I believe the Project meets the requirements of Low Impact Hydropower facilities and recommend it be certified for ten-year period with the following condition:

Condition 1: Within 6 months of Certification, the facility Owner shall contact the Meldahl Lockmaster regarding facilitation of USACE mussel surveys downstream of the Project Tailrace in accordance with the existing Memorandum of Operating Agreement (MOA) between the USACE and the Project. Pursuant to the MOA, the facility Owner shall coordinate temporary operational changes with USACE Huntington District staff when provided timely notice of a USACE-planned downstream mussel survey. In annual LIHI compliance submittals to LIHI, the facility Owner shall provide:

- A summary of pertinent notifications received from the District, along with subsequent coordination with District staff;
- Any related consultation with USACE, FWS, and state resource agencies; and
- A summary of any changes made to Project facilities or operations to protect listed mussel species.

LIHI reserves the right to modify this condition based on the information provided.

Condition 2: In accordance with license Article 413 as modified herein for purposes of LIHI certification, if previously unidentified archeological evidence, Native American cultural items, human remains, or historic properties are discovered during the course of operating or maintaining the Project, the facility Owner shall stop all land-clearing and land-disturbing activities in the vicinity of the properties and immediately consult with the SHPO, USACE, the United Keetoowah Band of Cherokee, the Miami Tribe of Oklahoma, the Peoria Tribe of Indians of Oklahoma, and the Eastern Band of Cherokee Indians.

APPENDIX A – COMMENT LETTERS

Miami Tribe of Oklahoma
3410 P St. NW, Miami, OK 74354 • P.O. Box 1326, Miami, OK 74355
Ph: (918) 541-1300 • Fax: (918) 542-7260
www.miamination.com

Via email: comments@lowimpacthydro.org

October 6, 2022

Low Impact Hydropower Institute
1167 Massachusetts Avenue, Office 407
Arlington, MA 02476

Re: Meldahl Hydroelectric Project, Clermont County, Ohio & Bracken County, Kentucky– Comments of the Miami Tribe of Oklahoma

To Whom It May Concern:

Aya, kweehsitoolaani– I show you respect. The Miami Tribe of Oklahoma, a federally recognized Indian tribe with a Constitution ratified in 1939 under the Oklahoma Indian Welfare Act of 1936, respectfully submits the following comments regarding Meldahl Hydroelectric Project in Clermont County, Ohio & Bracken County, Kentucky.

The Miami Tribe offers no objection to the above-referenced project at this time, as we are not currently aware of existing documentation directly linking a specific Miami cultural or historic site to the project site. However, given the Miami Tribe's deep and enduring relationship to its historic lands and cultural property within present-day Ohio & Kentucky, if any human remains or Native American cultural items falling under the Native American Graves Protection and Repatriation Act (NAGPRA) or archaeological evidence is discovered during any phase of this project, the Miami Tribe requests immediate consultation with the entity of jurisdiction for the location of discovery. In such a case, please contact me at 918-541-8966 or by email at THPO@miamination.com to initiate consultation.

The Miami Tribe accepts the invitation to serve as a consulting party to the proposed project. In my capacity as Tribal Historic Preservation Officer I am the point of contact for consultation.

Respectfully,

Diane Hunter

Diane Hunter
Tribal Historic Preservation Officer

Miami Tribe of Oklahoma
3410 P St. NW, Miami, OK 74354 ● P.O. Box 1326, Miami, OK 74355
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The Miami Tribe accepts the invitation to serve as a consulting party to the proposed project. In my capacity as Tribal Historic Preservation Officer I am the point of contact for consultation.

Respectfully,

Diane Hunter

Diane Hunter
Tribal Historic Preservation Officer

From: McCorkle, Richard
To: mfischer@lowimpacthydro.org
Subject: Re: [EXTERNAL] FW: Pending Application: Meldahl Project, OH/KY
Date: Tuesday, September 27, 2022 10:48:08 AM

Hi Maryalice,

I have gotten a little involved in the Greenup project which is also in OH/KY, but my area of responsibility generally doesn't extend downstream on the Ohio River beyond WV. I'm not aware of any environmental measures required or implemented by AMP, so it is a bit surprising to me to see these applications (this one and the one for Belleville). I do recall a USACE biologist complaining about the velocities below Meldahl, which affected mussel surveys and may be affecting the mussels, themselves. There are federally listed endangered mussels below Meldahl - or there were the last time anyone was able to conduct a survey. The USACE was having trouble putting divers down to do their periodic mussel survey, following commencement of operations in 2017, and they are concerned that the mussel community has probably changed due to the increased velocities.

I don't know if I will have time to comment, but will at least have an intern begin researching each project.

Regards,

Rick

Richard C. McCorkle
Fish and Wildlife Biologist
U.S. Fish & Wildlife Service
Pennsylvania Field Office
110 Radnor Road, Ste 101
State College, PA 16801
Office: 814-206-7470

From: mfischer@lowimpacthydro.org <mfischer@lowimpacthydro.org>
Sent: Monday, September 26, 2022 11:30 AM
To: McCorkle, Richard <richard_mccorkle@fws.gov>
Subject: [EXTERNAL] FW: Pending Application: Meldahl Project, OH/KY

Hi there – you were not listed on the application, but my email to Lee Andrews who was listed below, bounced back. Please forward if needed.
Thanks!
Maryalice

From: mfischer@lowimpacthydro.org <mfischer@lowimpacthydro.org>
Sent: Monday, September 26, 2022 10:59 AM
To: jheath@orsanco.org; Lee.andrews@fws.gov; Mike.hardin@ky.gov; Cabrina.Pennington@ky.gov; Belinda.M.Weikle@usace.army.mil; Patrick.J.Kelley@usace.army.mil; info@ukb-nsn.gov; paulette.akers@ky.gov; craig.potts@ky.gov; Richard.Wahrer@ky.gov; dlankford@miamination.com; ebarnes@peoriatribe.com; cechohawk@peoriatribe.com; richsnee@nc-cherokee.com
Cc: Russo Tom <tom@russoonenergy.com>
Subject: FW: Pending Application: Meldahl Project, OH/KY

Good morning,
You may have already received the notice below if you are on the Low Impact Hydropower Institute (LIHI) email list (www.lowimpacthydro.org). However, you were also identified as an agency, tribal, or stakeholder contact on the LIHI recertification application recently submitted by American Municipal Power for the Meldahl Hydroelectric Project located on the Ohio River in OH and KY. The application reviewer, Tom Russo (copied here), may be in contact with you if he has questions about the project or wishes to clarify any aspects of the LIHI application. You may also provide public comments directly to LIHI as indicated below.
More information about the project and its application can be found in the link below. If you would like to receive additional notices about this project or other hydroelectric projects in your region applying for LIHI certification, please sign up for our mailing list.

Best regards,
Maryalice Fischer
Certification Program Director
Low Impact Hydropower Institute
mfischer@lowimpacthydro.org
603-664-5097

From: Low Impact Hydropower Institute <info@lowimpacthydro.org>
Sent: Monday, September 26, 2022 10:31 AM
To: mfischer@lowimpacthydro.org
Subject: Pending Application: Meldahl Project, OH/KY

Pending Application: Meldahl Project, OH/KY

Meldahl Hydroelectric Project Applies for Low Impact Certification, Public Comment Period Open

September 26, 2022: The Low Impact Hydropower Institute (LIHI) has received a complete application from American Municipal Power, Inc. for the Meldahl Project located on the Ohio River in Ohio and Kentucky.

LIHI is seeking comment on this application. Comments that are directly tied to specific LIHI criteria (flows, water quality, fish passage, etc.) will be most helpful, but all comments will be considered. Comments may be submitted to LIHI by e-mail at comments@lowimpacthydro.org with "Meldahl Project Comments" in the subject line, or by mail addressed to the Low Impact Hydropower Institute, 1167 Massachusetts Avenue, Office 407, Arlington, MA 02476. **Comments must be received at the Institute on or before 5 pm Eastern time on November 25, 2022** to be considered. All comments will be posted to the web site and the applicant will have an opportunity to respond. Any response will also be posted.

The project description and complete application can be found HERE.

Thank you for your support of Low Impact Hydropower.