ENVIRONMENTAL ASSESSMENT

FOR HYDROPOWER LICENSE

Allegheny Lock and Dam 2 Hydroelectric Project, FERC Project No. 13755-002

Pennsylvania

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
Washington, D.C. 20426

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ACRONYMS AND ABBREVIATIONS

Advisory Council	Advisory Council on Historic Preservation
Allegheny Project	Allegheny Lock and Dam 2 Hydroelectric Project
APE	area of potential effects
APLIC	Avian Power Line Interaction Committee
BMP	best management practices
certification	water quality certification
CFR	Code of Federal Regulations
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission or FERC
Corps	U.S. Army Corps of Engineers
DO	dissolved oxygen
EA	environmental assessment
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FFP Missouri 12	FFP Missouri 12, LLC
FPA	Federal Power Act
fps	feet per second
FWS	U.S. Fish and Wildlife Service
HPMP	historic properties management plan
Interior	U.S. Department of the Interior
mg/L	milligram per liter
MW	megawatt
MWh	megawatt-hour
National Register	National Register of Historic Places
NERC	North American Electric Reliability Corporation
NGVD 29	National Geodetic Vertical Datum of 1929
NHPA	National Historic Preservation Act
ORSANCO	Ohio River Valley Water Sanitation Commission
PA	Programmatic Agreement
PAH	polycyclic aromatic hydrocarbon
Pennsylvania DCNR	Pennsylvania Department of Conservation and Natural Resources
Pennsylvania DEP	Pennsylvania Department of Environmental Protection
Pennsylvania FBC	Pennsylvania Fish and Boat Commission
Pennsylvania SHPO	Pennsylvania Bureau for Historic Preservation
PJM	PJM Interconnection LLC
PM&E	protection, mitigation, and enhancement
PNDI	Pennsylvania Natural Diversity Index
RM	river mile

ROW	right-of-way
USGS	U.S. Geological Survey
WUA	weighted useable area

EXECUTIVE SUMMARY

Proposed Action

On February 3, 2014, FFP Missouri 12, LLC (FFP Missouri 12 or applicant),[1] filed an application with the Federal Energy Regulatory Commission (Commission or FERC) for the construction and operation of the Allegheny Lock and Dam 2 Hydroelectric Project No. 13755 (Allegheny Project). The proposed 17-megawatt (MW) project would be located at the U.S. Army Corps of Engineers' (Corps') dam at river mile 6.7 on the Allegheny River in Allegheny County, Pennsylvania. The project would occupy 3.23 acres of federal land owned by the Corps.

Existing Corps Facilities

The Monongahela and Allegheny Rivers join to form the Ohio River in Pittsburgh, Pennsylvania. The Corps owns 38 locks and dams on these rivers—9 locks and dams on the Monongahela River, 8 on the Allegheny River, and 21 on the Ohio River. The Corps operates these locks and dams for commercial and recreational navigation. The proposed project would be located on the Allegheny River at the Allegheny Lock and Dam 2.

Allegheny Lock and Dam 2 consists of a 1,380-foot-long, 52-foot-high fixed-crest concrete dam and a 360-foot-long, 56-foot-wide navigational lock. The entire length of the dam crest functions as an uncontrolled spillway. The normal water surface elevation of the pool upstream of the dam is at elevation 721 feet National Geodetic Vertical Datum of 1929 (NGVD 29).[2]

Proposed Hydropower Facilities

The Allegheny Project would consist of a new 230-foot-long, 160-foot-wide intake channel to be excavated into the riverbed, replacing part of the north end of the existing dam crest[3] and leading to a 120-foot-long, 170-foot-wide, 70-foot-high reinforced concrete intake structure that would convey flows past a trash rack with 5-inch clear bar spacing to a new 180-foot-long, 170-foot-wide, 70-foot-high powerhouse along

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[1] The applicant is a subsidiary of FFP New Hydro, LLC. Rye Development, LLC is acting as an agent for the applicant.

[2] All elevations are provided in NGVD 29 datum unless otherwise noted.

[3] In total, about 280 feet of the existing dam crest would be removed to accommodate the proposed powerhouse and spill gates.

the north bank of the river, housing three equally sized Kaplan turbine-generator units with a combined installed capacity of 17 MW. Flows would exit the powerhouse into a 170-foot-long, 155-foot-wide tailrace excavated into the riverbed. Two 45-foot-wide, 40-foot-high spill gates would be constructed within the intake channel to pass flow equivalent to the portion of the dam crest that would be removed, and an 1,100-foot-long series of 2.5-foot-high adjustable crest gates would be installed on top of the remaining dam crest to maintain the water surface elevation of the upstream pool. Project power would be transmitted from the powerhouse to a new project substation with a 330-foot-long, medium-voltage, buried cable, and from there to an existing distribution line with a 1,265-foot-long, single overhead, 69-kilovolt transmission line. The project would also include an 850-foot-long, 28-foot-wide access road with a parking area and the following new recreational facilities: an accessible ramp and walkway leading from a designated parking area to an accessible fishing platform on the right bank (north side) approximately 180 feet downstream of the proposed powerhouse, and a portable, accessible restroom.

Project Operation

The project would operate in run-of-release mode, using flows made available by the Corps that would normally be released over the dam.[4] The existing water surface elevation of the upstream pool would be raised slightly when river flow is less than 42,000 cubic feet per second (cfs) and would be maintained in accordance with the Corps' management practices when river flow is about 42,000 cfs or more.

When river flows available after the Corps' lockage requirements are less than the minimum hydraulic capacity required to operate a single unit, or when river flow exceeds the hydraulic capacity of the powerhouse and head is reduced to less than 7 feet, the project would cease generating and all flows would be passed in accordance with existing Corps' practices. The applicant proposes a minimum bypass flow of 900 cfs from June through September and 250 cfs from October through May. This would be the minimum flow volume released over the dam, bypassing the proposed turbines.

When river flows are less than 18,000 cfs, the proposed crest gates would be in the full up position, holding the upstream pool at elevation 723.5 feet, which is generally up to about 1.5 feet higher than under existing conditions. When river flows are between 18,000 and 21,800 cfs, the proposed crest gates would be in the full up position, and the upstream pool would range between an elevation of 723.5 and 724.5 feet, which is

[4] Although the applicant describes its proposed operating mode as run-of-river, it is better defined as run-of-release because the project would generate from flows "released" (i.e., made available) to the project by the Corps.

generally up to about 1 foot higher than under existing conditions. When river flows are between 21,800 and 42,000 cfs, the crest gates would be incrementally lowered to achieve an elevation of 724.5 feet, which is generally up to about 0.5 foot higher than under existing conditions. When river flows exceed 42,000 cfs, the crest gates would be fully lowered, and the proposed spill gates would be opened incrementally to match the upstream pool elevations that occur currently at those flow conditions.

The Allegheny Project would produce an annual average of 84,324 megawatt-hours (MWh) of electricity.

Proposed Environmental Measures

The applicant proposes to construct and operate the project with the environmental protection, mitigation, and enhancement measures described below.

Geology and Soil Resources

- Develop an erosion and sedimentation control plan in consultation with the Corps and the Pennsylvania Department of Environmental Protection (Pennsylvania DEP) that includes procedures and best management practices to reduce runoff and sedimentation during construction and final stabilization and monitoring for scour during project operation.

Aquatic Resources

- Develop a detailed soil disposal plan to ensure excavated sediment is handled and disposed of appropriately.

- Operate in a run-of-release mode to avoid project-related impacts on the Corps' operation of its facilities.

- Conduct 3 years of post-construction water quality monitoring from June through September to monitor for project effects on water quality.

- Ensure that at least 900 cfs (June–September) and 250 cfs (October–May) passes over the dam crest during project operation to provide aeration and protect water quality downstream of the project.

- Install a trash rack at the project intake with a 5-inch clear bar spacing, and provide an approach velocity of less than 2 feet per second (fps) to mitigate for the entrainment and impingement of fish.

- When warranted and to the extent feasible, coordinate the timing of any construction-related hydraulic changes, such as changes in flow direction, to minimize effects on spawning fish and other aquatic organisms downstream of the project.

Terrestrial Resources

- Develop an avian protection plan consistent with Avian Power Line Interaction Committee (APLIC) and U.S. Fish and Wildlife Service (FWS) guidelines that includes provisions for protecting bald eagles and other raptors from project-related effects.

- Develop a transmission line corridor management plan that includes provisions for protecting botanical resources from project-related effects and controlling invasive species along the transmission line right-of-way.

Recreation and Land Use

- Implement a recreation resource management plan with provisions for installing a tailrace fishing platform; designated parking; a portable, accessible restroom; and an accessible ramp and walkway that leads from the designated parking area to the fishing platform.

Aesthetics

- Restore areas temporarily affected by construction activities to protect the site's aesthetics.

- Remove and properly dispose of any non-organic debris or trash that is collected during trash rack cleaning.

Cultural Resources

- Prepare a historic properties management plan (HPMP) in accordance with an anticipated Programmatic Agreement (PA) between the Commission and the Pennsylvania Bureau for Historic Preservation (Pennsylvania SHPO).

Public Involvement

Before filing its license application, the applicant conducted pre-filing consultation under the traditional licensing process. The intent of the Commission's pre-filing process is to initiate public involvement early in the project planning process and to encourage citizens, governmental entities, tribes, and other interested parties to identify and resolve issues prior to an application being formally filed with the Commission.

After the application was filed, we conducted scoping to determine what issues and alternatives should be addressed. We issued a scoping document for the Allegheny Project on September 2, 2014; conducted an environmental site review on October 8, 2014; and conducted scoping meetings on October 8 and 9, 2014. Based on discussions during the site review and scoping meetings and written comments received during the comment period, we issued a revised scoping document on December 17, 2015. On the same date, we issued notice that the application was ready for environmental analysis and requested terms and conditions, comments, and recommendations for the project.

Alternatives Considered

This environmental assessment (EA) analyzes the effects of the proposed action and recommends conditions for any original license that may be issued for the project. This EA considers the following alternatives: (1) the applicant's proposal, as outlined above; (2) the applicant's proposal with staff modifications (staff alternative); and (3) no action or license denial, meaning the project would not be constructed and there would be no change to the existing environment.

Staff Alternative

Under the staff alternative, the project would be constructed, operated, and maintained as proposed by the applicant with the exception of the proposal to ensure certain minimum flows pass over the dam and with the following additional staff-recommended measures.

- A contaminated sediment testing and disposal plan that includes the applicant's soil disposal plan, as well as provisions for testing sediment from the river bed to ensure sediment is handled and disposed consistent with state standards and to ensure minimal impacts of contaminated sediment on aquatic species and their habitat.

- An operation compliance monitoring plan to document compliance with the operating requirements of any license issued for the project.

- A stand-alone spill prevention, containment, and countermeasures plan to guide the handling of hazardous substances and protect water quality and aquatic biota during project construction and operation.

- A water quality monitoring plan that includes the applicant's proposal to monitor water quality for 3 years post-construction and an additional provision to monitor water quality during construction.

- A vegetation management plan that would apply the measures included in the applicant's transmission line corridor management plan to all project lands.

- A debris management plan that includes the applicant's proposed measure to remove and dispose of trash that accumulates upstream of the proposed project's trash rack, as well as procedures that describe how debris would be sorted, stored, and disposed to minimize the effect of floating debris on local recreation and aesthetics.

- Execution and implementation of a PA that requires revision of the draft HPMP to address the management of historic properties and unevaluated cultural resources.

Environmental Impacts and Measures of the Staff Alternative

The primary issues associated with licensing the proposed project are the potential effects of the project on dissolved oxygen (DO) concentrations and aquatic habitat downstream of the proposed project, fish entrainment, and terrestrial, recreation, aesthetics, and cultural resources. The environmental effects of the staff alternative are described below.

Geology and Soil Resources

Ground-disturbing activities associated with constructing the proposed project would involve excavation of the riverbed, disturbance to shorelines, and installation/removal of cofferdams which could cause erosion, and a temporary increase in suspended sediment and turbidity in the Allegheny River. The staff-recommended erosion and sedimentation control plan that includes provisions for the placement of turbidity curtains upstream and downstream of cofferdams, silt fencing, stabilization of temporarily disturbed soils, and final site stabilization would minimize soil erosion and sedimentation and protect water quality.

Aquatic Resources

Polycyclic aromatic hydrocarbons (PAHs) have been reported in river sediment samples collected by the applicant. The staff-recommended contaminated sediment testing and disposal plan would specify sampling methodologies, locations, and frequency of testing and describe how to remove, handle, and dispose of any contaminated sediments within the construction area. These measures would ensure excavated sediment is tested, stored, and disposed of appropriately, ensuring that aquatic resources and human health are protected during project construction.

Construction of the proposed project would require the use of an assortment of heavy equipment. This equipment would require gasoline or diesel fuel, motor oil, or hydraulic fluid. On-site fuel storage facilities for a project of this type commonly are in the range of several hundred to several thousand gallons of fuel. Staff's recommended spill prevention, containment, and countermeasures plan would protect freshwater organisms as well as mammals, insects, microorganisms, and vegetation susceptible to the effects of spilled hydrocarbons.

Construction activities may also affect flow patterns downstream of the dam and suspend sediment or cause erosion that could increase turbidity and affect aquatic habitat. Under the staff alternative, coordination of construction timing to avoid the spring spawning season, would protect spawning habitat downstream of the dam from construction-related effects.

Under the staff alternative, operating the project in a run-of-release mode would minimize effects on flow and water levels upstream and downstream of the dam and protect aquatic habitat. Although crest gate operation under the staff alternative would increase the water surface elevation in the upstream pool when flow is less than 42,000 cfs, the increased elevation would maintain safe navigation depths, stabilize water levels in the upstream pool, and improve aquatic habitat suitability for mussels and some fish. Developing an operation compliance monitoring plan, as recommended by staff, would provide a means to verify compliance with the operational requirements of any license issued for the project and ensure aquatic resources are protected.

During project operation, river flows that currently discharge over the existing dam would be diverted through the proposed turbines, potentially reducing aeration at the dam and lowering DO concentrations downstream of the project. The staff-recommended water quality monitoring plan that includes provisions for turbidity, temperature, and DO monitoring during construction, and water temperature and DO monitoring from June 1 to September 30 during the first 3 years of operation, would provide information to make adjustments to construction and project operation if needed to protect water quality, fish, and other aquatic organisms.

Operation of the project would also result in some unavoidable fish impingement and entrainment-related mortality as fish pass through the turbines. However, limiting intake velocities at the project trash rack to under 2 fps, and installing a trash rack with 5-inch clear bar spacing, would allow most adults and juveniles of nearly all species to avoid both impingement and entrainment. Verifying intake velocities at the trash rack, as part of the staff-recommended operation and compliance monitoring plan, would ensure that intake velocities are sufficiently low to prevent impingement and minimize fish entrainment.

Terrestrial Resources

Construction of the project's generation facilities, access road, parking area, and transmission line would disturb a total of 1.92 acres of upland habitat in the proposed project boundary and could potentially lead to the spread of invasive plants. The staff-recommended vegetation management plan would incorporate the applicant's proposed revegetation and invasive species control measures for the transmission line corridor, but would expand the scope of these measures to the entire project boundary to protect botanical resources in all areas affected by construction. The vegetation management plan would also include monitoring to ensure that revegetation and invasive species control measures are successful.

Construction of the project may also disturb or remove habitat for bald eagles and other raptors if trees are removed. In addition, raptors may be electrocuted by the project's transmission line or other electrical equipment. Development of an avian protection plan in accordance with APLIC and FWS guidelines would protect raptors from habitat disturbance and electrical equipment.

Threatened and Endangered Species

Six federally listed freshwater mussel species (northern riffleshell, clubshell, rayed bean, snuffbox, sheepnose and rabbitsfoot) and two federally listed terrestrial species (Indiana bat and northern long-eared bat) have historically occurred or may occur in Allegheny County, where the project would be located.

Mussel surveys conducted by the applicant indicate that no federally listed mussel species occur in the vicinity of the proposed project. In addition, no federally listed mussel species were collected during surveys at the Hulton Bridge, 6 miles upstream of Allegheny Lock and Dam 2, or during surveys on the lower Monongahela River. In its letter filed on April 20, 2015, FWS states that listed mussels are not found to inhabit the project area. As such, construction and operation of the project would have no effect on federally listed mussels.

FWS' Species Search web page indicates that Indiana and northern long-eared bats may occur in Allegheny County. However, the species have not been documented in the immediate project area, habitat in the project area is unlikely to support either bat species, and the project is more than 10 miles from known hibernaculum and not near any known maternity roosts or summer detection sites. The Pennsylvania Natural Diversity Index reports and agency consultation records filed September 15, 2015, do not identify any known effects for either bat species and indicate that no further review is required. Because neither bat is known to inhabit the project area, and the construction, operation, and maintenance of the proposed project would not substantially alter the existing environment or any potential bat roosting habitat, construction and operation of the project would have no effect on the Indiana bat or northern long-eared bat or their habitat.

Recreation

Construction of the Allegheny Project would permanently affect public access to informal shoreline fishing areas on the north river bank immediately downstream of the dam. The staff-recommended recreation amenities, including the applicant's proposed recreation facilities downstream of the project, would mitigate for the permanent loss of shoreline fishing access. Specifically, the applicant's proposal includes construction of an accessible fishing platform, a designated parking area with six parking spaces, accessible restroom facilities, and an accessible walkway that leads from the parking area to the fishing platform that would be located in the project tailrace. The fishing platform would mitigate for the loss of informal fishing areas caused by project construction; and the addition of parking and restroom facilities would encourage greater recreational use of the site.

Land Use and Aesthetic Resources

Construction activity could cause a temporary, localized disruption of existing land use in the immediate vicinity of the project and for visitors along the Three Rivers Heritage Trail. Short-term, unavoidable effects during construction would include increased traffic, noise, and activity. Restoring areas after construction by clearing construction debris and revegetating the landscape would protect existing aesthetics and historic properties at the site. The staff-recommended HPMP also includes a provision to visually blend the powerhouse with the lock and dam, to ensure that new project facilities are not obtrusive to viewers.

Debris and trash, which can affect the visual character of the river, accumulate behind the existing dam and would concentrate upstream of the project trash rack during operation. The staff-recommended debris management plan would include the applicant's proposal to remove trash from the river as well as procedures that describe how debris would be sorted, stored, and disposed of to ensure trash is removed appropriately and visual resources are protected.

Cultural Resources

Construction of the proposed project has the potential to affect historic properties associated with the existing Corps' lock and dam and also the Allegheny River Navigation System, which are eligible for listing in the National Register of Historic Places (National Register). The proposed project could also adversely affect other cultural resources located within the project's area of potential effects. However, revision of the filed HPMP to contain FFP Missouri 12's proposal to restore areas temporarily affected by construction and additional staff-recommended measures (listed in section 3.3.7.2, *Management of Historic Properties*), including specific management measures to resolve project-related adverse effects in consultation with the Pennsylvania

SHPO and the Corps would avoid, lessen, or mitigate any adverse effects on these historic properties.

No-action Alternative

Under the no-action alternative, a license would not be issued, and the proposed project would not be constructed. Environmental conditions would remain the same.

Conclusions

Based on our analysis, we recommend licensing the project under the staff alternative.

In section 4.2 of the EA, we estimate the likely cost of alternative power for the three alternatives identified above. For the Allegheny Project, our analysis shows that, during the first year of operation under the proposed action, project power would cost $3,990,250, or $47.32/MWh, more than the likely alternative cost of power. Under the staff alternative, project power would cost $4,004,110, or $47.48/MWh, more than the likely alternative cost of power.

We chose the staff alternative as the preferred alternative for the project because: (1) the project would provide a dependable source of electrical energy for the region (84,324 MWh annually); (2) the 17 MW of electric capacity comes from a renewable resource that does not contribute to atmospheric pollution, including greenhouse gases; and (3) the recommended environmental measures would adequately protect and enhance environmental resources affected by the project. The overall benefits of the staff alternative would be worth the cost of the recommended environmental measures.

We conclude that issuing an original license for the project with the environmental measures we recommend would not be a major federal action significantly affecting the quality of the human environment.

ENVIRONMENTAL ASSESSMENT

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, D.C.

Allegheny Lock and Dam 2 Hydroelectric Project, FERC Project No. 13755-002

Pennsylvania

1.0 INTRODUCTION

1.1 APPLICATION

On February 3, 2014, FFP Missouri 12, LLC (FFP Missouri 12 or applicant), filed an application for an original license with the Federal Energy Regulatory Commission (Commission or FERC) to construct and operate its proposed Allegheny Lock and Dam 2 Hydroelectric Project No. 13755 (Allegheny Project). The project is one of 10 hydroelectric projects proposed by subsidiary companies of FFP New Hydro, LLC, at existing navigation dams on the Ohio, Allegheny, and Monongahela Rivers (figure 1-1). Rye Development, LLC, is acting as agent on behalf of FFP New Hydro, LLC and its subsidiary companies for the projects. The Allegheny Project would be located on the Allegheny River at river mile (RM) 6.7 in Allegheny County, Pennsylvania, at the existing Allegheny Lock and Dam 2 owned and operated by the U.S. Army Corps of Engineers (Corps) (figures 1-1 and 1-2). The proposed project would consist of constructing an intake, forebay, powerhouse, tailrace, crest gates, substation, and transmission line. A portion of the dam crest would be removed to accommodate the proposed project. The project would have an installed capacity of 17 megawatts (MW) and an estimated annual generation of 84,324 megawatt-hours (MWh). The project would occupy 3.23 acres of federal land owned by the Corps.

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The purpose of the proposed Allegheny Project is to provide a new source of hydroelectric power. Therefore, under the provisions of the Federal Power Act (FPA), the Commission must decide whether to issue a license to FFP Missouri 12 for the project and what conditions should be placed on any license issued. In deciding whether to issue a license for any hydroelectric project, the Commission must determine that the project will be best adapted to a comprehensive plan for improving or developing a waterway. In

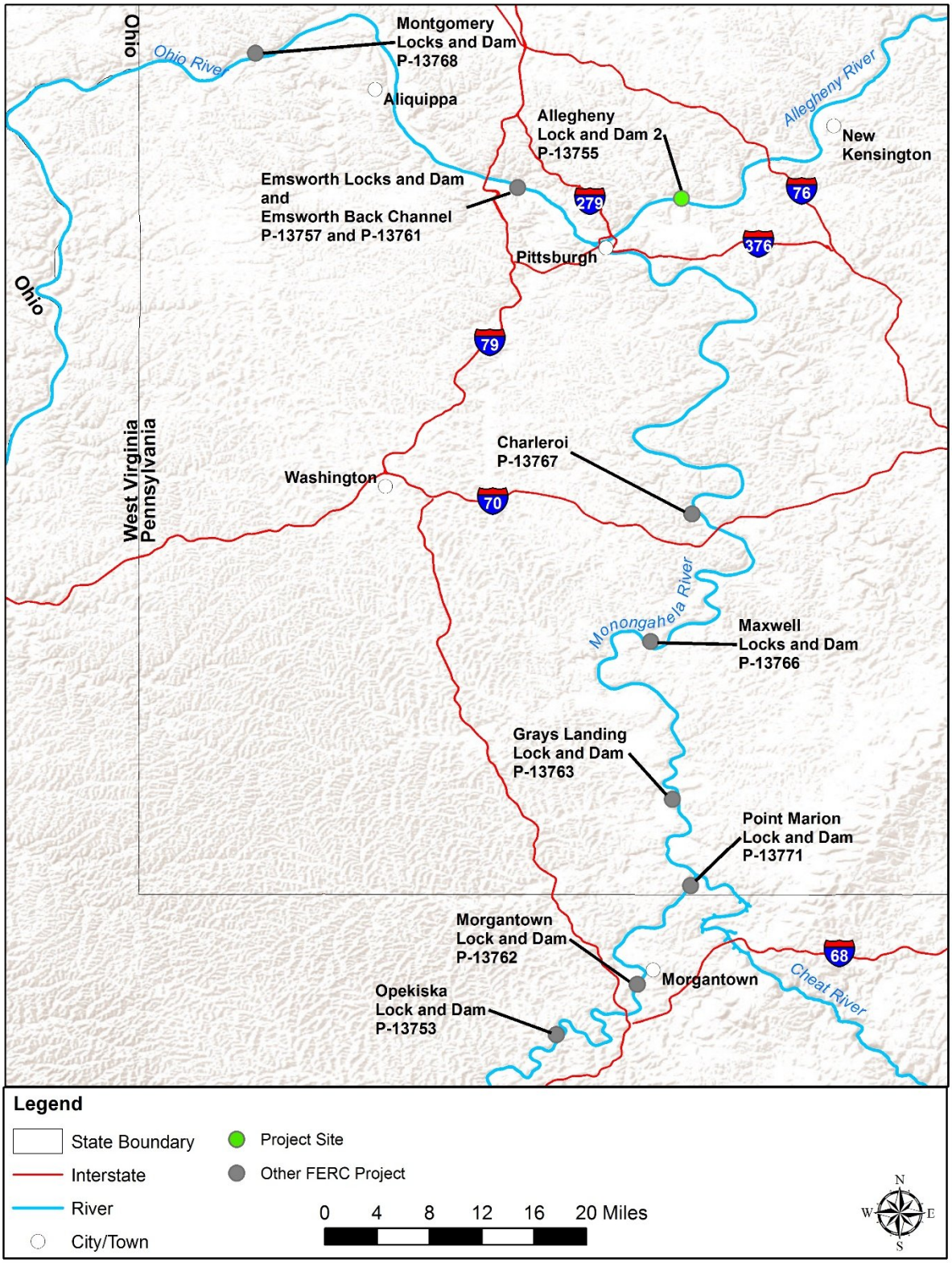

Figure 1-1. Location map of hydroelectric projects proposed by subsidiary companies of FFP New Hydro, LLC, in the Upper Ohio River Basin (Source: staff).

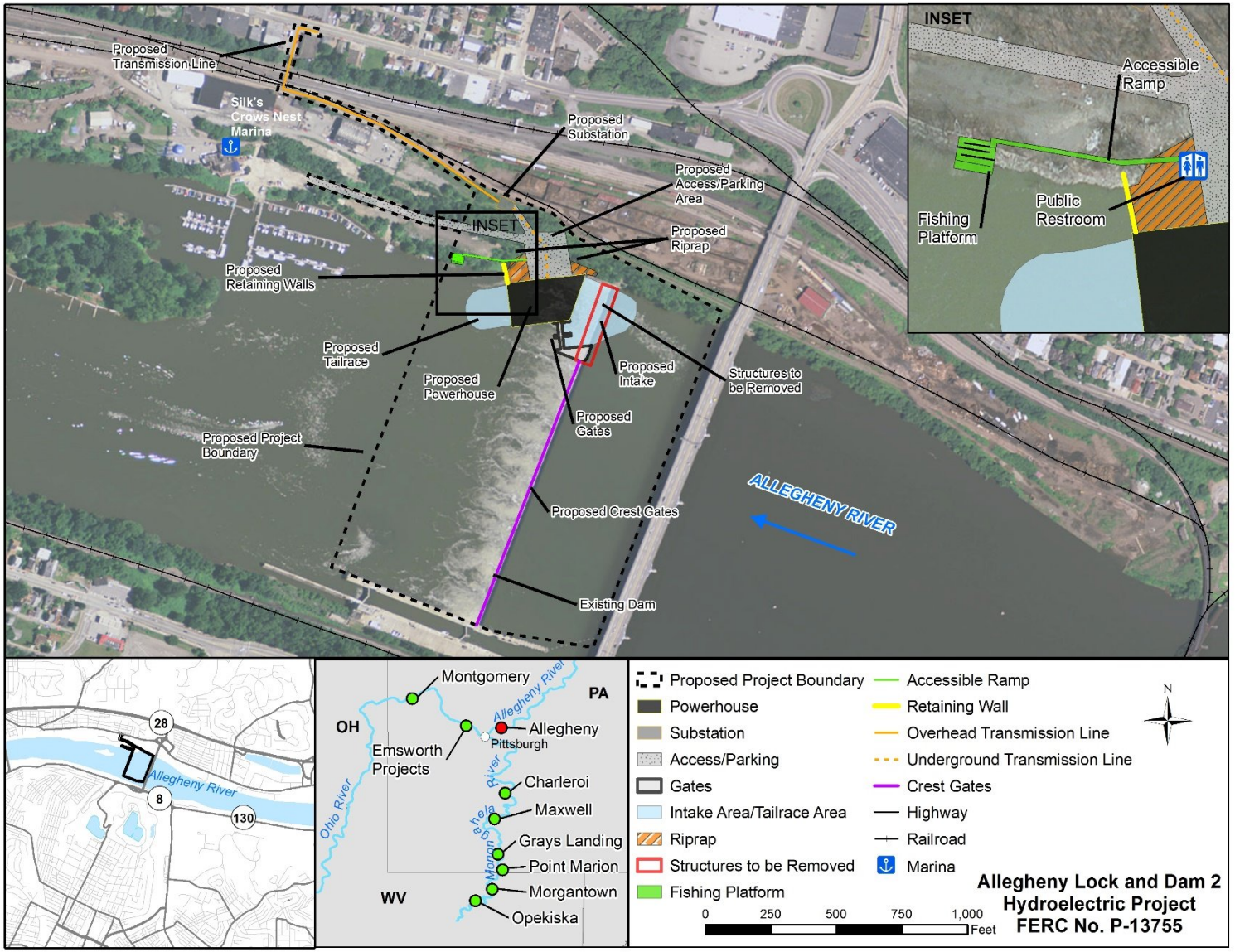

Figure 1-2. Location map of the Allegheny Project (Source: staff).

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 license for the proposed Allegheny Project would allow the applicant to generate electricity for the term of a license, making electric power from a renewable resource available to its customers.

This environmental assessment (EA) has been prepared in compliance with the National Environmental Policy Act of 1969 to assess the environmental and economic effects associated with construction and operation of the Allegheny Project and alternatives to the proposed project, and makes recommendations to the Commission on whether to issue a license, and if so, recommends terms and conditions to become a part of any license issued for the project.

In this EA, we assess the environmental and economic effects of constructing, operating, and maintaining the Allegheny Project: (1) as proposed by the applicant (proposed action); and (2) with our recommended measures (staff alternative). We also consider the effects of the no-action alternative. Important issues that are addressed include the potential effects of project construction on soils and sedimentation, effects of project operation on dissolved oxygen (DO) concentrations and aquatic habitat downstream of the Corps' dam; fish entrainment; vegetation and wildlife; and recreation, aesthetic, and cultural resources.

1.2.2 Need for Power

The Allegheny Project would provide hydroelectric generation to meet part of Pennsylvania's power requirements, resource diversity, and capacity needs. The project would have an installed capacity of 17 MW and over the term of the license would generate an average of about 84,324 MWh per year.

The North American Electric Reliability Corporation (NERC) annually forecasts electrical supply and demand nationally and regionally for a 10-year period. The Allegheny Project is located within the jurisdiction of the PJM Interconnection LLC (PJM), a subregion of the Reliability First Corporation, a region of the NERC. PJM is a regional transmission organization that coordinates the movement of wholesale electricity in all or parts of 13 states and the District of Columbia. According to NERC's most recent (2015) forecast, the total internal demand is expected to grow at a compound annual rate of 0.93 percent in summer and 0.82 percent in winter over the next 10 years (NERC, 2015).

We conclude that power from the Allegheny Project would help meet a need for power in the PJM subregion in both the short and long term. The project would provide power that could displace non-renewable, fossil-fired generation and contribute to a diversified generation mix. Displacing the operation of non-renewable facilities may avoid some power plant emissions and create an environmental benefit.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

A license for the proposed project would be subject to numerous requirements under the FPA and other applicable statutes. The major regulatory and statutory requirements are described in the following sections.

1.3.1 Federal Power Act

1.3.1.1 Section 18 Fishway Prescriptions

Section 18 of the 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 the U.S. Department of Commerce or the U.S. Department of the Interior (Interior). Interior, by letter filed on February 11, 2016, requests a reservation of authority to prescribe fishways for the project under section 18t.

1.3.1.2 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.

Interior timely filed, on February 11, 2016, recommendations under section 10(j), as summarized in table 5-1, in section 5.3, *Fish and Wildlife Agency Recommendations.* In section 5.3, we also discuss how we address agency recommendations and comply with section 10(j).

1.3.2 Clean Water Act

Under section 401(a)(1) of the Clean Water Act (CWA), a license applicant must obtain either water quality certification (certification) from the appropriate state pollution control agency verifying that any discharge from a project would comply with applicable

provisions of the CWA or a waiver of certification by the appropriate state agency. The failure to act on a request for certification within a reasonable period of time, not to exceed one year, after receipt of such request constitutes a waiver.

On December 21, 2015, FFP Missouri 12 mailed its application to the Pennsylvania Department of Environmental Protection (Pennsylvania DEP) for a section 401 certification for licensing the Allegheny Project. Pennsylvania DEP received the application on December 22, 2015.[5] Pennsylvania DEP has not yet acted on the certification request.[6] The water quality certification is due by December 22, 2016.

1.3.3 Endangered Species Act

Section 7 of the Endangered Species Act (ESA) 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.

Based on staff's review of information available through the U.S. Fish and Wildlife Service (FWS) records and the Pennsylvania Natural Heritage Program, six federally listed freshwater mussel species (northern riffleshell, clubshell, rayed bean, snuffbox, sheepnose, and rabbitsfoot) and two federally listed terrestrial species (Indiana bat and northern long-eared bat) have historically occurred or may occur in Allegheny County. No designated or proposed critical habitat for these species is presently found within the proposed project boundary. Our analysis of project impacts on threatened and endangered species is presented in section 3.3.4, *Threatened and Endangered Species.*

No federally listed mussel species were documented in the project vicinity during the applicant's 2013 mussel surveys. In addition, no federally listed mussel species were collected during surveys at the Hulton Bridge, 6 miles upstream of the Corps' dam (Enviroscience, 2008), or during Hart's (2012) surveys on the lower Monongahela River. The applicant's Pennsylvania Natural Diversity Index (PNDI) review on March 4, 2015 (filed on September 15, 2015), indicated further review with FWS was required. In a letter filed on April 20, 2015, FWS indicated that it reviewed the applicant's PNDI results as well as the applicant's mussel survey report and concluded that implementation of the

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[5] The applicant filed a copy of the certification request and receipt of delivery to Pennsylvania DEP on February 12, 2016.

[6] In a letter filed on April 5, 2016, Pennsylvania DEP determined that the application for the Allegheny Project is incomplete and requested that the applicant submit additional information.

proposed Allegheny Project was not likely to affect federally listed mussels because they are not found to inhabit the project area. Therefore, we conclude that construction and operation of the project would have no effect on federally listed threatened or endangered mussel species, and no further coordination with the agencies would be required.

FWS' Species Search website indicates that Indiana bats and northern long-eared bats may occur in the county where the project is located. Neither bat species was observed during general habitat surveys at the project. Further, the PNDI report correspondence from FWS filed by the applicant on September 15, 2015, does not identify any known effects for either bat species and indicated that no further review was required.

The project would disturb less than 1 acre of limited quality riparian forest, which considering the highly disturbed condition of the project area, is not likely to support either bat species. The project is also more than 10 miles from known hibernaculum and not near any known maternity roosts or summer detection sites. Given the small footprint of the project and the disturbed condition and limited quality of the riparian forest available in the project area, construction and operation of the project would have no effect on the Indiana bat or northern long-eared bat or their habitat.

1.3.4 Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 United States Code (U.S.C.) § 1456(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification.

In its letter, filed June 22, 2011, Pennsylvania DEP indicates that the proposed Allegheny Project would be located outside Pennsylvania's designated coastal zone. Therefore, the project is not subject to the Pennsylvania coastal zone program review, and no consistency certification is needed for the action.

1.3.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA)[7] requires that every federal agency "take into account" how its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties,

[7] 54 U.S.C. § 306108 (2014).

and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

On October 2, 2012, the Commission designated FFP Missouri 12 as its non-federal representative for the purposes of conducting section 106 consultation under the NHPA. Pursuant to section 106, and as the Commission's designated non-federal representative, the applicant consulted with the Pennsylvania Bureau for Historic Preservation (Pennsylvania SHPO) to identify historic properties, determine National Register-eligibility, and assess potential adverse effects on historic properties within the project's area of potential effects (APE). This consultation and other investigations concluded that the project would adversely affect the lock and dam, which is a contributing element of the historic Allegheny River Navigation System. The dam and the Allegheny River Navigation System are listed in the National Register. The Pennsylvania SHPO has not commented on potential effects on other cultural resources that were identified within the project's APE.

To meet the requirements of section 106 of the NHPA, we intend to execute a Programmatic Agreement (PA) with the Pennsylvania SHPO for the protection of historic properties from the effects of construction, operation, and maintenance of the Allegheny Project. The terms of the PA would ensure that the applicant addresses and treats all historic properties identified within the project's APE through the finalization of a historic properties management plan (HPMP).

1.4 PUBLIC REVIEW AND COMMENT

The Commission's regulations (18 Code of Federal Regulations [CFR], section 4.38) 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 ESA, the 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. A scoping document was distributed to interested agencies and others on September 2, 2014. The document was noticed in the Federal Register on September 30, 2014. An environmental site review was held at the project on October 9, 2014. Scoping meetings were held in Pittsburgh, Pennsylvania, on October 9 and 10, 2014, to request oral comments on the project. A court reporter recorded all comments and statements made at the scoping meetings, and these are part of the Commission's public record for the project. In addition to comments provided at the scoping meetings, the following entities provided written comments:

Commenting Entity	Date Filed
U.S. Army Corps of Engineers	November 6, 2014
Pennsylvania Fish and Boat Commission	November 7, 2014
John Stephen	November 10, 2014

A revised scoping document was issued on December 17, 2015.

1.4.2 Interventions

On July 18, 2014, the Commission issued a notice accepting the application. The notice set September 16, 2014, as the deadline for filing motions to intervene and protests and requests for cooperating agency status. On July 22, 2014, Azcon Corp intervened in the licensing proceedings for the Allegheny Project.

On January 29, 2016, Interior filed a late intervention. On February 16, 2016, the Commission granted late intervention to Interior.

1.4.3 Comments on the License Applications

The Commission issued a Ready for Environmental Analysis notice for the project on December 17, 2015, and requested comments, recommendations, terms and conditions, and fishway prescriptions. The following entities filed comments, terms and conditions, recommendations, or prescriptions:

Commenting Agency and Other Entity	Date Filed
U.S. Department of the Interior	February 11, 2016
Ecosophic Strategies, LLC	February 16, 2016
Lafe Metz-Riverfront 47, LP	February 16, 2016
Pennsylvania Fish and Boat Commission	February 19, 2016
U.S. Army Corps of Engineers	March 4, 2016

1.4.4 U.S. Army Corps of Engineers – Terms and Conditions

Pursuant to the Memorandum of Understanding between the Commission and the Department of the Army,[8] licensed hydropower facilities that would be an integral part of or that could affect the structural integrity or operation of Corps' projects shall be designed and constructed in consultation with and subject to the review and approval of the appropriate Corps' District Engineer. Consistent with the Memorandum of Understanding, the Commission routinely includes special license articles that do the following:

- require the licensee to submit final plans and specifications for cofferdams and deep excavations to the Corps and Commission for review and approval;

- require the licensee to enter into a comprehensive agreement with the Corps within 90 days after a license is issued to coordinate its plans for access to and site activities on lands and property administered by the Corps, so that the authorized purposes, including operation of the federal facilities, are protected;

- authorize the Corps to (a) inspect the construction, operation, and maintenance of any licensed facilities that may affect the structural integrity or operation of the Corps' project, and (b) order the licensee to stop any activity that may endanger the structural integrity or safety of the Corps' project;

- require the licensee to submit a regulating (or operating) plan to the Corps for approval at least 60 days prior to the start of construction, and to enter into an operating Memorandum of Agreement (MOA) with the Corps describing the detailed operation of the power facilities acceptable to the Corps;

- provide that the licensee shall have no claim under the license against the United States arising from the effect of any changes made in the operation or reservoir levels of the Corps' project; and

- require the licensee to provide the Commission's Regional Director two copies of all correspondence between the licensee and the Corps and provide that the Commission's Regional Director shall not authorize construction until the Corps provides final written approval of the project.

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[8] See *Memorandum of Understanding between the United States Army Corps of Engineers and The Federal Energy Regulatory Commission on Non-federal Hydropower Projects,* March 2011. http://www.ferc.gov/legal/maj-ord-reg/mou/mou-asace.pdf.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

The no-action alternative is license denial. Under the no-action alternative, the project would not be built, and the environmental resources in the project area would not be affected.

2.2 APPLICANT'S PROPOSAL

2.2.1 Existing Corps Facilities

The Monongahela and Allegheny Rivers join to form the Ohio River in Pittsburgh, Pennsylvania. The Corps owns a total of 38 locks and dams on these rivers, including 9 locks and dams on the Monongahela River, 8 locks and dams on the Allegheny River, and 21 locks and dams on the Ohio River. The Corps operates the locks and dams for commercial and recreational navigation.

The proposed project would be located at the existing lock and dam on the Allegheny River (Allegheny Lock and Dam 2).

Allegheny Lock and Dam 2 is located at RM 6.7 on the Allegheny River between Aspinwall and Sharpsburg, Pennsylvania.[9] The lock and dam consists of a 1,380-foot-long,[10] 52-foot-high fixed-crest concrete dam and a 360-foot-long, 56-foot-wide navigational lock. The normal water surface elevation of the upper pool is at elevation 721 feet National Geodetic Vertical Datum of 1929 (NGVD 29).[11] At that elevation, the upper pool has a surface area of 1,120 acres and a volume of 14,500 acre-feet.

2.2.2 Existing Corps Operations

The Corps' operation of the Allegheny Lock and Dam 2 is integrated with its operation of the other locks and dams on the river to maintain the navigation channel.

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[9] Measured from the confluence of the Monongahela and Allegheny Rivers at Pittsburgh, Pennsylvania.

[10] Values for the length of the dam crest differ between the final license application and supporting documents. The 1,380-foot-long value was obtained from page 54 of the applicant's response to the Commission's June 12, 2014, additional information request, filed on September 15, 2015.

[11] All elevations are provided in NGVD 29 datum unless otherwise noted.

The dam crest functions as an uncontrolled spillway. There are no gates to control upstream water elevations or regulate outflows, and the upstream pool water surface elevation varies with inflow, from about 721.5 feet at the lowest river flows up to about 731 feet at the highest river flows (figure 2-1). The average leakage flow through the locks, not including flow used for lockage operations, is 190 cubic feet per second (cfs).

2.2.3 Proposed Project Facilities

The proposed hydroelectric facilities would include an intake channel, intake structure, powerhouse, tailrace, substation, transmission line, and access road and would involve modifications to, or removal of, a portion of the dam crest. The transmission line would connect to existing distribution lines of nearby local utilities. The proposed project boundary, shown in figure 1-2, would enclose the facilities described below, including transmission line right-of-way (ROW).

The proposed Allegheny Project would be located on the north end of Allegheny Lock and Dam 2 and would consist of the following new facilities: (1) a 230-foot-long, 160-foot-wide intake channel excavated into the riverbed replacing part of the north end of the dam crest;[12] (2) two 45-foot-wide, 40-foot-high spill gates to pass flow equivalent to the portion of the dam crest that would be removed; (3) a 1,100-foot-long series of 2.5-foot-high, adjustable crest gates on top of the remaining dam crest to maintain the water surface elevation of the upper pool; (4) a 120-foot-long, 170-foot-wide, 70-foot-high reinforced concrete intake structure and trash rack with 5-inch clear bar spacing; (5) a 180-foot-long, 170-foot-wide, 70-foot-high powerhouse along the east side of the river; (6) three equally sized Kaplan turbine-generator units with a combined installed capacity of 17 megawatts; (7) a 155-foot-long, 170-foot-wide tailrace excavated into the riverbed to discharge water from the powerhouse; (8) an approximately 330-foot-long, medium-voltage, buried cable from the powerhouse to the substation; (9) a 50-foot-wide by 60-foot-long substation; (10) a 1,265-foot-long, single overhead, 69-kilovolt transmission line to connect the project substation to an existing distribution line owned by Duquesne Light Company; (11) an 850-foot-long, 28-foot-wide access road with a parking area; and (12) appurtenant facilities.

The project would also include a new tailrace fishing platform on the right river bank; six vehicle parking spaces for recreational users; an asphalt walkway connecting the parking area with the fishing platform; and restroom facilities.

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[12] In total, approximately 280 feet of the dam crest would be removed to accommodate the proposed powerhouse and spill gates.

The proposed project boundary would include the new hydroelectric facilities listed above, the entire length of the Corps' dam, and a portion of the river upstream and downstream of the project. In section 3.3.5.2, *Recreation and Land Use, Environmental Effects,* we discuss potential modifications to the proposed project boundary.

2.2.4 Project Safety

Under an original hydropower license, the proposed project would be subject to the Commission's project safety requirements. As part of the licensing process, Commission staff would evaluate the adequacy of the proposed project facilities. Special articles would be included in any license issued, as appropriate. Before the project is constructed, engineers from the Commission's New York Regional Office would review the designs, plans, and specifications of the proposed generating structures. During construction, engineers from the Commission would frequently inspect the project to ensure adherence to approved plans and specifications; special license articles relating to construction, operation, and maintenance; and accepted engineering practices and procedures. Once construction is complete and the project enters the operation phase, Commission engineers would inspect it on a regular basis. Because the Corps maintains and operates the lock and dam, the Commission would coordinate with the Corps to fulfill its obligation to ensure that project safety requirements are met.

2.2.5 Proposed Project Operation

The project would operate in run-of-release mode, using only the flows made available by the Corps that would normally be released over the dam. The existing water surface elevation of the upstream pool would be raised slightly when river flow is less than 42,000 cfs and would be maintained in accordance with the Corps' management practices when river flow is about 42,000 cfs or more. The project would include three turbine-generator units, with a minimum discharge of 600 cfs (with one unit operating) and a maximum discharge of 18,000 cfs with all three units operating. The applicant proposes a bypass flow of 900 cfs from June through September and 250 cfs from October through May. When the available river flow (after meeting minimum flow and lockage requirements) is less than the minimum hydraulic capacity required to operate one unit, or when river flow exceeds the powerhouse and head is reduced to less than 7 feet, the powerhouse would be shut down, and all flows would be passed in accordance with the Corps' existing practices.

Figure 2-1 shows the applicant's headwater and tailwater rating curves for normal operation in the existing and proposed conditions.[13] When river flows are less than 18,000 cfs, the proposed crest gates would be in the full up position, holding the upstream pool at elevation 723.5 feet, which is generally up to about 1.5 feet higher than under existing conditions. When river flows are between 18,000 and 21,800 cfs, the proposed crest gates would be in the full up position, and the upstream pool would range between an elevation of 723.5 and 724.5 feet, which is generally up to about 1 foot higher than under existing conditions. When river flows are between 21,800 and 42,000 cfs, the crest gates would be incrementally lowered to achieve an elevation of 724.5 feet, which is generally up to about 0.5 foot higher than under existing conditions. When river flows exceed 42,000 cfs, the crest gates would be fully lowered, and the proposed spill gates would be opened incrementally to match the upstream pool elevations that occur currently at those flow conditions.

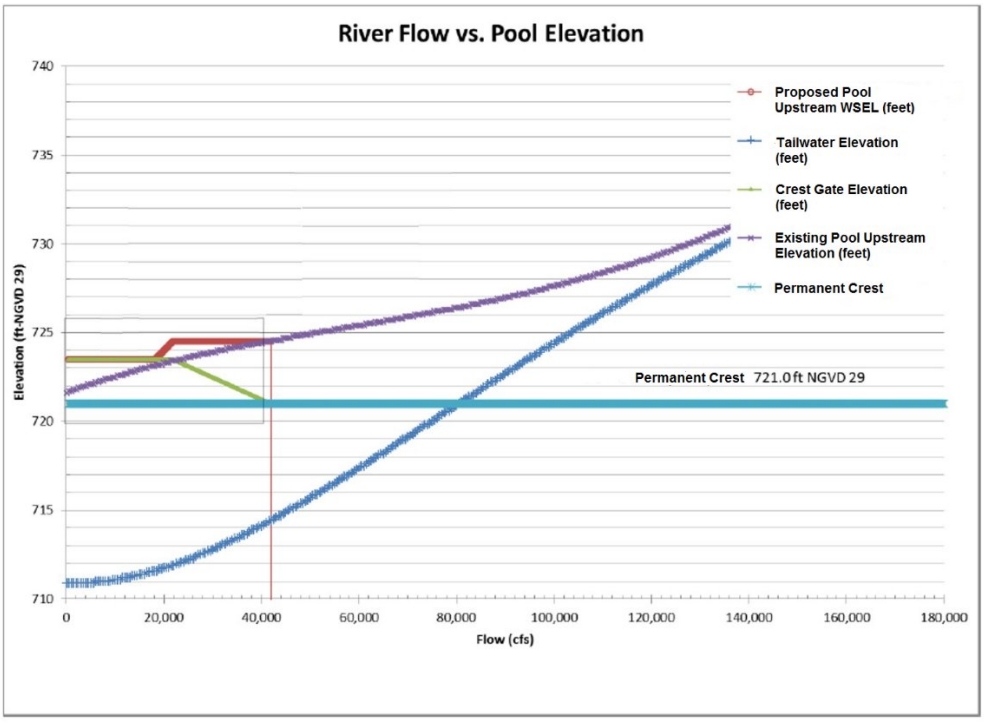

Figure 2-1. Allegheny Project headwater and tailwater rating curves for normal operation (Source: FFP Missouri 12, LLC, 2014; staff).

[13] The applicant's headwater rating curve in figure 2-1 does not align with the Corps' rating curve in figure B.1.1-1 of the license application). For example, at a flow of 42,000 cfs, the applicant's rating curve shows a pool elevation of 724.5 feet, while the Corps' rating curve shows a pool elevation of 725.4 feet. Such differences between the two rating curves, however, do not substantially affect our environmental analysis.

2.2.6 Proposed Environmental Measures

In addition to the project design and operational measures described in the previous section, the applicant proposes the following protection, mitigation, and enhancement (PM&E) measures to protect or enhance environmental resources and improve recreational opportunities.

Geology and Soil Resources

- Develop an erosion and sedimentation control plan in consultation with the Corps and Pennsylvania DEP that includes procedures and best management practices (BMPs) to reduce runoff and sedimentation during construction and final stabilization and monitoring for scour during project operation.

Aquatic Resources

- Develop a detailed soil disposal plan to ensure excavated sediment is handled and disposed of appropriately.

- Operate in a run-of-release mode to avoid project-related impacts on the Corps' operation of its facilities.

- Conduct 3 years of post-construction water quality monitoring from June through September to monitor for project effects on water quality.

- Ensure that at least 900 cfs (June–September) and 250 cfs (October–May) passes over the dam crest during project operation to provide aeration and protect water quality downstream of the project.

- Install a trash rack with a 5-inch clear bar spacing, and provide an approach velocity of less than 2 feet per second (fps) to mitigate the entrainment and impingement of fish.

- When warranted and to the extent feasible, coordinate the timing of any construction-related hydraulic changes, such as changes in flow direction, to minimize effects on spawning fish and other aquatic organisms downstream of the project.

Terrestrial Resources

- Develop an avian protection plan consistent with Avian Power Line Interaction Committee (APLIC) and U.S. Fish and Wildlife Service (FWS)

guidelines that includes provisions for protecting bald eagles and other raptors from project-related effects.

- Develop a transmission line corridor management plan that includes provisions for protecting botanical resources from project-related effects and controlling invasive species along the transmission line ROW.

Recreation and Land Use

- Implement a recreation resource management plan with provisions for installing a tailrace fishing platform; designated parking; a portable, accessible restroom; and an accessible ramp and walkway that leads from the designated parking area to the fishing platform.

Aesthetics

- Restore areas temporarily affected by construction activities to protect the site's aesthetics.

- Remove and properly dispose of any non-organic debris or trash that is collected during trash rack cleaning.

Cultural Resources

- Prepare an HPMP in accordance with an anticipated PA between the Commission and the Pennsylvania SHPO.

2.3 STAFF ALTERNATIVE

Under the staff alternative, the project would be constructed, operated, and maintained as proposed by the applicant, with the exception of the proposal to ensure certain minimum flows pass over the dam and with the following additional staff-recommended measures.

- A contaminated sediment testing and disposal plan that includes the applicant's soil disposal plan, as well as provisions for testing sediment from the river bed to ensure sediment is handled and disposed consistent with state standards and to ensure minimal impacts of contaminated sediment on aquatic species and their habitat.

- An operation compliance monitoring plan to document compliance with the operating requirements of any license issued for the project.

- A stand-alone spill prevention, containment, and countermeasures plan to guide the handling of hazardous substances and protect water quality and aquatic biota during project construction and operation.

- A water quality monitoring plan that includes the applicant's proposal to monitor water quality for 3 years post-construction and an additional provision to monitor water quality during construction.

- A vegetation management plan that would apply the measures included in the applicant's transmission line corridor management plan to all project lands.

- A debris management plan that includes the applicant's proposed measure to remove and dispose of trash that accumulates upstream of the proposed project's trash rack, as well as procedures that describe how debris would be sorted, stored, and disposed to minimize the effect of floating debris on local recreation and aesthetics.

- Execution and implementation of a PA that requires revision of the draft HPMP to address the management of historic properties and unevaluated cultural resources.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

In the final license application, the applicant evaluates several alternative project configurations, including: (1) no crest gates; (2) turbines in the lock chamber; (3) a large single turbine unit; and (4) optimized unit selection and operation to conform to existing pool elevation management. Developing the project without crest gates was eliminated from further consideration due to potential impacts on upper pool navigability. Placement of turbines in the lock chambers was eliminated from further consideration because of potential impacts on navigation and recreation. The use of a single large turbine was eliminated because of the depth of excavation that would be required near the dam, and because a single turbine unit configuration would offer less operational and maintenance flexibility than a multiple unit configuration. Although the applicant did not state why conforming to the existing pool elevation management was eliminated from further consideration, staff assume this alternative was eliminated because the proposed alternative would provide greater depths for navigation and higher head for generation relative to existing pool elevation.

In addition, the Corps indicated that developing the Allegheny Project, along with other proposed projects on the Monongahela and Ohio Rivers, may not be "environmentally sustainable."[14] In its March 4, 2016 letter, the Corps recommends that the Commission prioritize a subset of the 10 proposed projects for exclusion or license denial. Specifically, the Corps recommends that projects that support unique biological resources, provide greater aeration benefits (fixed-crest dams), and require substantial alteration of Corps facilities (i.e., projects that require in-river powerhouses and/or crest gates) should be prioritized for exclusion.

At least one or more of the Corps' exclusion criteria would apply to some degree at the Allegheny Project and other proposed projects on the Monongahela and Ohio Rivers. Based on the license application, scoping comments, and other comments on the license application, we have not identified any environmental issues that would preclude development of the proposed project prior to our analysis. As such, we consider the proposed action, the staff alternative, and the no-action alternative (license denial) for the Allegheny Project in section 3.0, *Environmental Analysis,* of this document.

[14] Rye Development's other related projects in the Upper Ohio Basin include: Opekiska Lock and Dam (P-13753), Morgantown Lock and Dam (P-13762), Point Marion Lock and Dam (P-13771), Grays Landing Lock and Dam (P-13763), Maxwell Locks and Dam (P-13766), and Charleroi Locks and Dam (P-13767) on the Monongahela River; and Emsworth Locks and Dam (P-13757), Emsworth Back Channel Dam (P-13761), and Montgomery Locks and Dam (P-13768) on the Ohio River.

3.0 ENVIRONMENTAL ANALYSIS

In this section, we present: (1) a general description of the project vicinity; (2) an explanation of the scope of our cumulative effects analysis; and (3) our analysis of the proposed action and other recommended environmental measures. Sections are organized by resource area. Under each resource area, historic and existing conditions are first described. 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 PM&E measures, and any potential cumulative effects of the proposed action and alternatives. Staff conclusions and recommended measures are discussed in section 5.1, *Comprehensive Development and Recommended Alternative*, of this EA.[15]

3.1 GENERAL DESCRIPTION OF THE RIVER BASIN

The proposed Allegheny Project would be located on the Allegheny River in southern Pennsylvania. The Allegheny River Basin has a total drainage area of 11,800 square miles. The Allegheny and Monongahela Rivers are the primary tributaries of the Upper Ohio River with a total drainage area of 19,184 square miles. The Ohio River Basin has a total drainage area of 203,940 square miles; however, most of that drainage is located downstream of the proposed project.

The Allegheny River flows into the Pittsburgh Low Plateau section of the Appalachian Plateau province, where the proposed project is located. Flood events are common in the rivers of the Appalachian Plateau because of the region's extreme dissection, high local relief, precipitous slopes, and narrow and discontinuous floodplains. This physiographic region is known as mostly unglaciated uplands with many streams forming a dendritic pattern (Pennsylvania FBC, 2011).

The dominant land use in the Upper Ohio River Basin is forest cover (Pennsylvania FBC, 2011). Most of the forest area comprises deciduous trees, whereas evergreen forests make up about 8 percent of the land cover. Agriculture, including both pasture and row crops, is the second highest land use. About 7 percent of the land is developed for residential and commercial uses. Most of the developed areas, and areas with more impervious surfaces, are concentrated in communities situated where the three rivers converge in Pittsburgh, Pennsylvania. The greater Pittsburgh metropolitan area has a history of extractive mining; major industries include mining of coal, sand, and

[15] Unless otherwise indicated, our information is taken from the application for license for the project (FFP Missouri 12, LLC, 2014) and additional information filed by the applicant as noted in section 7.0, *Literature Cited*.

limestone and extraction of oil and natural gas, evidence of which can be seen along the river valleys (Pennsylvania FBC, 2011).

The Upper Ohio River Basin maintains a temperate climate pattern with a mean average temperature of 52 degrees Fahrenheit (°F), with average maximum temperatures ranging from 82.9°F in July to 17.3°F in February. Precipitation averages 38.2 inches per year, with most rain falling in the late spring and early summer. Snowfall in the area averages 35.2 inches per year, with the highest amount of snow falling in December and January.

3.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

According to the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (40 CFR § 1508.7), a cumulative effect is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions taking place over time, including hydropower and other land and water development activities.

Based on our review of the license application and agency and public comments, we identified aquatic resources (water quality, habitat, and aquatic species) as having the potential to be cumulatively affected by the proposed project, in combination with other past, present, and foreseeable future activities. Aquatic resources were selected because construction and operation of the project may affect water quality, especially DO concentrations, within and downstream of the project area; and may affect aquatic species such as mussels, fish, and their habitat downstream, within, and upstream of the project area. Other activities, in combination with the proposed action, such as additional hydropower development, water withdrawals, wastewater discharges, and existing management of flows and water levels in the Allegheny River and adjacent waterways may collectively affect aquatic resources in a portion of the Upper Ohio River Basin.

3.2.1 Geographic Scope

Our geographic scope of analysis for cumulatively affected resources is defined by the physical limits or boundaries of the proposed action’s effect on the resources, and contributing effects from other hydropower and non-hydropower activities within the Allegheny River Basin.

The geographic scope for aquatic resources would include a portion of the Upper Ohio River Basin; specifically, the most upstream 33 miles of the Ohio River, the most downstream 17 miles of the Allegheny River and the entire 128 miles of the Monongahela River. We chose this geographic scope because effects of the proposed

project in combination with other activities including proposed hydropower development in the basin would be limited to these areas. Any project-related effects on aquatic resources would not be discernable upstream or downstream of the defined geographic scope because potential effects would attenuate with increasing distance from the existing dams and any contribution to cumulative effects would be immeasurable.

3.2.2 Temporal Scope

The temporal scope of our cumulative effects analysis in the EA will include a discussion of past, present, and reasonably foreseeable future actions and their effects on each resource that could be cumulatively affected. Based on the potential term of an original license issued at a federal dam, the temporal scope will look 50 years into the future, concentrating on the effect on the resources from reasonably foreseeable future actions. The historical discussion will, by necessity, be limited to the amount of available information for each resource. The quality and quantity of information, however, diminishes as we analyze resources further away in time from the present.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

In this section, we discuss the effect 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 specific cumulative and site-specific environmental issues.

Only the resources that would be affected, or about which comments have been received, are addressed in detail in this EA. We present our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative.*

3.3.1 Geology and Soil Resources

3.3.1.1 Affected Environment

Geology

The Allegheny River flows through the Appalachian Plateau Physiographic Province, a region that stretches from Alabama to New York. The Allegheny Project would be located in the unglaciated regions of Pennsylvania, specifically, in the Pittsburgh Low Plateau Section of the province. This section is characterized by smooth hills and steep-sloped, narrow valleys. Within the narrow valleys, gradients of 45 degrees are common, and some may be as high as 600 feet between valley bottoms and upland surfaces. Elevation ranges from 660 feet to 1,700 feet.

Bedrock in the project area consists of Upper Paleozoic (Pennsylvanian and Permian) sedimentary rocks (sandstone, siltstone, shale, claystone, and limestone).

Sedimentary beds deposited during the Pennsylvanian age contain large bituminous coal seams in the western half of Pennsylvania, which includes the project area. Deep mining is prevalent throughout the area, while strip mining is concentrated in areas south and west of the Allegheny Lock and Dam 2. Rock and gravel are also mined in the area.

The seismic hazard in the area is very low, with a peak horizontal ground acceleration of 2 percent g (percent of gravitational acceleration with a 10 percent probability of exceedance in 50 years).

Soils

Surface soils at the project site are urban lands, which are highly disturbed from past industrial practices including mining, agriculture, and commercial industry. The surface soils are underlain predominantly by colluvium of Holocene and late and middle Pleistocene age. In addition, there are limited channel and floodplain alluvium and pre-Illinoian age deposits bordering the Allegheny River. Disturbed soils in the project area have highly varied composition and fill content (e.g., brick, rubbish, cinders). In general, soils in the vicinity of the project are moderately to well-drained, but are susceptible to erosion and exhibit a high incidence of landslides. However, the riverbanks in most areas are protected by riprap and varying amounts of vegetation. Bank steepness varies, with slopes ranging from 0 percent to 8 percent.

Sediment

Instream sediment types vary depending on streambed location. Main channel instream sediments predominantly consist of poorly graded gravel with sand, poorly graded gravel with silt and sand, and well graded gravel with sand. Scour and deposition occur immediately upstream and downstream of the Corps' dam during intermittent peak flow events.

In its January 9, 2014, comments on the draft license application for the Allegheny Project, the Corps states that fine-grained sediments upstream and downstream of its dam are likely to contain heavy metals, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and volatile organic compounds. The applicant collected and analyzed sediment core samples in 2013 from the proposed construction locations upstream and downstream of the existing dam at the project site. Instream sediments in the vicinity of the proposed intake channel, powerhouse, and tailrace predominantly consist of gravel mixed with fine sediments (clay and silt) (table 3-1). One sample contained a PAH (phenanthrene) at a concentration above the U.S. Environmental Protection Agency (EPA) sediment screening criterion.

Table 3-1. Grain size of instream sediments from core samples at proposed project site (Source: CDM Smith, 2014a).

	Grain Size (in percent)						
	Gravel		Sand			Fines	
Location	Coarse	Fine	Coarse	Medium	Sand	Silt+Clay	Total
Upstream	11.7	42.0	10.4	17.0	15.1	3.8	100
Downstream	27.7	38.0	10.0	11.7	4.0	8.6	100

3.3.1.2 Environmental Effects

Construction Effects on Geology and Soils

Construction activities at the Allegheny Project would generally consist of constructing an intake channel, powerhouse, tailrace, substation, access road/parking lot, and transmission line. Additionally, a 280-foot portion of the dam crest would be removed to accommodate the installation of the proposed powerhouse. Construction of the project would require excavation and disturbance of instream sediment and upland soils and would likely cause localized soil erosion, sedimentation, and streambed material transport. Sediment from the river bottom and upland construction sites could adversely affect water quality, resident aquatic species, and instream habitats and is discussed in section 3.3.2.2, *Aquatic Resources, Construction Effects on Water Quality*.

To reduce potential erosion and sedimentation impacts, the applicant proposes to develop and implement an erosion and sedimentation control plan for the project, in consultation with the Corps and Pennsylvania DEP, that includes procedures and BMPs to address sediment and erosion control during construction and final stabilization. The plan would include placement of turbidity curtains upstream and downstream of cofferdams, silt fencing, protection of temporarily disturbed ground, final stabilization, and measures to address the prevention and cleanup of spills of hazardous substances.

Our Analysis

The volume of material that would be excavated during construction of the intake channel and structure, powerhouse, and tailrace would be 53,700, 22,300, and 20,000 cubic yards, respectively. Excavation of the riverbed, disturbance to shorelines, and installation/removal of cofferdams would likely cause erosion, resulting in a temporary increase in suspended sediment and turbidity in the Allegheny River. High-flow events during construction could result in additional scour and suspended sediment in and downstream of the construction area. In addition, construction of the parking lot, access road, substation, and transmission line would disturb upland areas and potentially lead to erosion and additional sediment inputs to the river. Potential effects of suspended

sediment and turbidity on aquatic resources and measures to address the prevention and cleanup of spills of hazardous substances are also discussed in section 3.3.2.2, *Construction Effects on Water Quality*.

Installation of cofferdams and turbidity curtains would greatly reduce turbidity and sediment transport caused by in-river excavation activities. These structures would isolate the construction area from the river and minimize sediment and turbidity impacts throughout the construction phase. In upland areas, the applicant's proposed project design incorporates the use of existing access roads and transmission line corridors to the extent possible. As described previously, much of the area that would be affected by construction consists of previously disturbed areas with urban soil types. However, some land-clearing and disturbance of upland soils would occur during construction of the parking lot, access road, substation, and transmission line corridor. Developing and implementing an erosion and sedimentation control plan in consultation with the Corps and Pennsylvania DEP, as the applicant proposes, would minimize erosion and sedimentation during in-water and upland construction activities.

Operational Effects on Geology and Soils

Under existing conditions, inflow to the Corps' facility is released over the dam or through the lock. Flows over the dam are uncontrolled. Under the proposed project operation, water would be diverted through the powerhouse located downstream of the dam at the end opposite the existing lock.[16] This proposed operation would modify discharge patterns and hydrodynamics of the Allegheny River upstream and downstream of the dam. Operation of the proposed project could cause scour in the streambed immediately upstream of the intake and downstream from the proposed tailrace, change existing sediment patterns by redistributing lateral water velocities both upstream and downstream of the dam, and redistribute streambed materials to new locations.

As part of the erosion and sedimentation control plan described previously, the applicant proposes to monitor the project for scour and deposition after operation begins.

Our Analysis

Based on data developed from the applicant's hydraulic modeling (CDM Smith, 2014b) and channel substrate survey (CDM Smith, 2014a), project operation would result in increased water velocities within the immediate vicinities of the project intake and tailrace. The greatest change in water velocities, relative to existing conditions, would

[16] A detailed description of the project's proposed operation is provided in section 2.2.5, *Proposed Project Operation*.

occur when most or all river flow is discharged through the powerhouse (i.e., when river flow matches the hydraulic capacity of the project). This effect would be attenuated as river flow increases beyond the hydraulic capacity of the project as more flow is released over the dam crest and discharge patterns similar to existing conditions would be restored. Overall, scour in the tailrace would occur primarily during initial operation of the powerhouse, and would diminish after the powerhouse has been operated at its maximum hydraulic capacity for a short period.

Bed scour could also increase in the main channel during peak flow events because the proposed project (i.e., powerhouse constructed in the river channel) would reduce channel width. Channel width would decrease by about 12 percent (170 feet) at the Allegheny Project immediately downstream of the dam, not considering the channel width for the lock at the project. The proposed spill gates at the project would be designed to pass flow equal to the capacity of the obstructed portion of the dam crest, but scour could increase because of the decreased channel width, especially downstream of the portion of the dam crest that is immediately adjacent to the proposed spill gates. The maximum scour of the existing streambed sediments would occur during the largest peak flow event. Once the riverbed has equilibrated to the new flow regime, scour of existing sediment would no longer occur, although scoured areas may temporarily fill in again with sediment during low-flow periods. As such, the effect of resuspended sediment on turbidity levels in the river would be minor and short in duration.

Overall, changes to the existing scour and deposition patterns associated with operation of the project are expected to be minor. Sediments scoured in the immediate vicinity of the project intake and tailrace, as well as in the main channel during a peak flow event, are not expected to be transported for long distances in the river considering that the existing river bottom consists primarily of gravel with larger substrate (cobble and boulder) near the dam as described in section 3.3.2.1, *Aquatic Resources, Affected Environment*. Monitoring scour and deposition patterns, as the applicant proposes, would ensure that unexpected scour does not occur.

Sediments near the project contained a PAH at a concentration slightly above the EPA sediment screening criterion. Potential impacts of project operation on the river sediment quality, however, are expected to be minimal because: (1) the river is expected to contain similar contaminants throughout its bed given the long industrial history of the area; (2) scoured sediment would generally be expected to resettle rapidly as described above; and (3) scour of existing sediments would be limited to the startup phase of the project (intake and tailrace scour) or to a peak flow event (main channel scour).

3.3.2 Aquatic Resources

3.3.2.1 Affected Environment

Water Quantity

The Allegheny River rises in central Potter County, Pennsylvania, 10 miles south of the New York border. It then flows north and west through southern Cattaraugus County, New York, and through Seneca Indian Nation lands, before re-entering northwestern Pennsylvania, 20 miles southeast of Jamestown, New York. It enters Allegheny and Westmoreland Counties from the northeast, flowing to the City of Pittsburgh, 325 miles from its headwaters. The Allegheny and Monongahela Rivers join in Pittsburgh, forming the Ohio River. The Allegheny River has a drainage area of 11,748 square miles. A portion of the Allegheny River is controlled and maintained for navigation by a series of eight locks and dams owned and operated by the Corps.

Table 3-2 shows the locations (river miles) of the existing locks and dams on the Allegheny River. The proposed Allegheny Project would be located at Allegheny Lock and Dam 2. Table 3-3 shows the drainage area and daily flow (minimum, mean, and maximum) at the proposed project site, table 3-4 shows 10-, 50-, and 90-percentile flows for the proposed project location, and table 3-5 shows the monthly flow (mean) at the project. Flow data were developed using Corps' flow data at the existing Allegheny Lock and Dam 2.

The Corps' operation of Allegheny Lock and Dam 2 is integrated with its operation of the other locks and dams on the Allegheny River to maintain the navigation channel depth of 9 feet. River flows not passing through the lock are spread evenly across the fixed-crest concrete dam. Table 3-6 summarizes the existing median water surface elevation, surface area, and volume of the pool upstream of Allegheny Lock and Dam 2. Based on the Corps' rating curve and a maximum flow event of 169,288 cfs (table 3-3), water depth in the Allegheny Lock and Dam 2 pool can vary by 10 feet or more as a result of changes in river flow.[17]

[17] The Corps' published rating curves for the Allegheny Lock and Dam 2 pool are available in the applicant's final license application, as well as in appendix J to CDM Smith (2014b).

Table 3-2. Existing locks and dams on the Allegheny River (Source: staff).

Name	River	River Mile
Allegheny Lock and Dam 9	Allegheny	62.2
Allegheny Lock and Dam 8	Allegheny	52.6
Allegheny Lock and Dam 7	Allegheny	45.7
Allegheny Lock and Dam 6	Allegheny	36.3
Allegheny Lock and Dam 5	Allegheny	30.4
Allegheny Lock and Dam 4	Allegheny	24.2
Allegheny Lock and Dam 3	Allegheny	14.5
Allegheny Lock and Dam 2	Allegheny	6.7

Table 3-3. Drainage area and minimum, mean, and maximum flows at the proposed Allegheny Project, based on Corps' stream gage data (Source: FFP Missouri 12, LLC, 2014).

Drainage Area (square miles)	Lowest Daily Mean Flow (cfs)	Mean Daily Flow (cfs)	Highest Daily Flow (cfs)	Period of Record
11,636	1,795 (01/02/1999)	20,349	169,288 (01/20/1996)	(1995–2011)

Table 3-4. 10-, 50-, and 90-percentile flows (cfs) at the proposed project (Source: CDM Smith, 2014b).

Project Location	10-Percentile	50-Percentile	90-Percentile
Allegheny Lock and Dam 2	4,110	14,889	44,362

Note: The percentile flows are defined as follows: (1) 10-percentile flow (low flow - the flow that is equaled or exceeded 90 percent of the time); (2) 50-percentile flow (moderate flow - the flow that is equaled or exceeded 50 percent of the time); and (3) 90-percentile flow (high flow - the flow that is equaled or exceeded 10 percent of the time).

Table 3-5. Mean monthly flow data (in cfs) at the proposed Allegheny Project based on Corps' stream gage data (Source: FFP Missouri 12, 2014).

Period of Record	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.
(1995-2011)	28,665	25,450	33,956	28,824	22,438	13,585	9,369	8,619	10,564	11,318	18,059	27,567

Table 3-6. Upstream pool characteristics of the Allegheny Lock and Dam 2 (Source: FFP Missouri12, LLC, 2014).

Existing Normal Water Surface Elevation (feet)	Surface Area of Upstream Pool at Normal Elevation (acres)	Volume of Upstream Pool at Normal Elevation (acre-feet)
721	1,120	14,500
730	1,300	20,840
740	1,430	28,770
750	2,150	46,670

Note: Elevation 721 feet is the existing dam crest elevation.

Water Quality

By the early 1900s, the Upper Ohio River Basin was experiencing widespread habitat devastation and water quality degradation. Up until the 1970s, the convenience of using the Monongahela, Allegheny, and Ohio Rivers as a sink for decades of municipal and industrial wastes trumped requirements for potable water in western Pennsylvania. Through the 1970s, numerous fish kills were reported on the Allegheny River that made national news. Mining has been identified as having the single greatest impact on surface water quality of any single land use in the Monongahela, Allegheny, and Ohio Rivers (Anderson et al., 2000; Pennsylvania FBC, 2011). Concerted state and federal efforts since the 1970s, including reductions in industrial discharge, improvements in wastewater treatment, improvements in mine drainage treatment and low-flow augmentation, eventually led to substantial improvement in river water quality (Anderson et al., 2000). Improved river water quality culminated in a recovery of fisheries, expressed as range expansions of native species, increases in fish population abundances, and a revival of angling opportunities within historically affected river reaches (Pennsylvania FBC, 2011).

Tables 3-7 and 3-8 present water quality standards and maximum allowable water temperature standards for the project area. Table 3-9 lists the Pennsylvania-designated uses for the Allegheny River in the vicinity of the proposed project.

The lower Allegheny River is listed as impaired for potable water supply because of pathogens and currently has a fish consumption advisory because of PCB contamination that extends from the Allegheny Lock and Dam 2 downstream to the Montgomery Locks and Dam on the Ohio River (Pennsylvania DEP, 2014, 2016). Pennsylvania DEP has a water quality non-degradation policy that requires water quality to be sufficient to maintain and protect the existing uses of all surface waters (Commonwealth of Pennsylvania, 2016).

Table 3-7. Pennsylvania water quality standards applicable to the waters within the vicinity of the proposed Allegheny Project (Source: Commonwealth of Pennsylvania, 2016).

Parameter	Pennsylvania Criteria
Water temperature	See table 3-8
Dissolved oxygen	7-day average 5.5 milligrams per liter (mg/L); minimum 5.0 mg/L
Suspended solids and floating debris	Floating materials and substances that produce turbidity should be controlled
pH	From 6.0 to 9.0 inclusive

Table 3-8. Pennsylvania maximum allowable water temperature standards applicable to project waters (Source: Commonwealth of Pennsylvania, 2016).

	Maximum Allowable Temperature			Maximum Allowable Temperature	
Period	**°F**	**°C**	**Period**	**°F**	**°C**
January 1–31	40	4.4	Aug 1–15	87	30.5
February 1–29	40	4.4	Aug 16–31	87	30.5
March 1–31	46	7.8	Sept 1–15	84	28.9
April 1–15	52	11.1	Sept 16–30	78	25.6
April 16–30	58	14.4	Oct 1–15	72	22.2
May 1–15	64	17.8	Oct 16–31	66	18.9
May 16–31	72	22.2	Nov 1–15	58	14.4
June 1–15	80	26.7	Nov 16–30	50	10.0
June 16–30	84	28.9	Dec 1–31	42	5.6
July 1–31	87	30.5			

Table 3-9. Beneficial uses designated for the Allegheny River near the proposed project in Pennsylvania (Source: Commonwealth of Pennsylvania, 2016).

Category	**Use Designation**
Aquatic life	Warmwater fishes
Water supply	Potable water supply, industrial water supply, livestock water supply, wildlife water supply, irrigation
Recreation and fish consumption	Boating, fishing, water contact sports, aesthetics
Other	Navigation

The applicant conducted a water quality monitoring study that included collection of continuous temperature, DO concentration, and conductivity data at constant depths in the upstream pool, in the area immediately downstream of the lock and dam, and an upstream background site from May to October 2013. The background site was located about 6 miles upstream of the proposed project. In the upstream pool near the dam, two continuous meters were deployed at about 12 and 14 feet deep. The applicant collected monthly nutrient samples at the water surface in the same locations from April to October 2013.

In addition to continuous water quality monitoring, the applicant collected depth profile data (temperature, DO concentration and percent saturation, and specific conductivity) biweekly in the Corps' upstream pool, and biweekly instantaneous water quality sampling (temperature, DO concentration and percent saturation, pH, specific conductivity, and turbidity) immediately upstream and downstream of the dam, throughout the study season.

The applicant also modeled water quality (temperature and DO concentration) upstream and downstream of the dam with and without operation of the proposed project for three different water years based on analysis of U.S. Geological Survey (USGS) flow data from 1939 to 2013: (1) dry year (1999); (2) average year (2009); and (3) wet year (2013). The modeling effort examined the proposed project's effects on water quality, including cumulative effects, and the effects of various bypass flows[18] on DO concentration downstream of the dam.

Dissolved Oxygen

Average DO concentrations at all sampling sites over the duration of the 2013 monitoring study at the Allegheny Project ranged from 9.3 to 10.7 milligrams per liter (mg/L); the lowest concentration was 7.5 mg/L. A small aeration effect downstream of the Corps' dam was observed, with downstream average DO concentrations about 1 mg/L higher than upstream average DO concentrations. Minor diel patterns were observed between June and August, with DO concentrations fluctuating 0.5 to 1 mg/L between night and day. Downstream DO concentrations displayed a typical seasonal pattern, being somewhat higher during the colder months and lower during the summer. The Allegheny pool did not stratify during the 2013 monitoring study.

DO data collected by Pennsylvania DEP from October 2010 to March 2015 near the Allegheny Lock and Dam 2 are available in the EPA STORET database (EPA, 2016). Samples were collected about 6 miles upstream of the Allegheny Lock and Dam 2 in the middle of the river channel; measured DO concentrations were always above 8.0 mg/L.

The applicant's water quality modeling, which is discussed in more detail in section 3.3.2.2, *Operational Effects on Water Quality*, reflects the above field collection results. The modeled DO concentrations at the Allegheny Project using existing hydrologic conditions were always at levels that met those established under the state standards. DO concentrations were overall slightly lower during the average water year than during the wet year, and lowest during the dry year.

[18] Water that would normally be used by the proposed hydroelectric project, but is instead passed over the dam, is the bypass flow.

Water Temperature

Water temperatures at the monitoring locations in the Allegheny River were almost always below the maximum levels established under the state standards, with the exception of a few readings in early May that were slightly above the 64°F standard. The pool at the Allegheny Lock and Dam 2 did not stratify during 2013.

Nutrients

In general, nitrate+nitrite concentrations ranged from 0.34 to 0.75 mg/L over all sampling sites. Total Kjeldahl nitrogen concentrations ranged from below the detection limit of 0.42 mg/L to 1.1 mg/L. Total phosphorus concentrations typically ranged between the detection limit of 0.014 and 0.084 mg/L. Chlorophyll-*a* concentrations overall were low in the spring and increased throughout the summer, ranging between 1.0 to 8.8 micrograms per liter.

Total suspended solids concentrations were highest in July, ranging between the detection limit of 4 mg/L and 130 mg/L over all sampling sites. Turbidity levels at the Corps' Allegheny Lock and Dam 2, based on biweekly field measurements, were typically less than 20 nephelometric turbidity units, with the exception of occasional elevated levels above 50 nephelometric turbidity units during the summer, conceivably a result of rainfall events.

pH

The pH values measured near the proposed project were always within state standards during the 2013 monitoring period, ranging from 6.2 to 7.9 during biweekly field measurements. Pennsylvania DEP measured similar values (range of 6.1 to 8.6) near the Allegheny Lock and Dam 2 between 1998 and 2015 (EPA, 2016).

Aquatic Habitat

The Allegheny River in the vicinity of the proposed project is a low-gradient river impounded by a series of locks and dams. A short stretch of fast-moving water occurs immediately downstream of the dam and near obstructions such as channel islands. Shallow water habitats include river shorelines, tributary mouths, and embayments, typically containing sand, gravel, and some cobble substrates. A small stream (Guyasuta Run) enters the Allegheny River via a culvert, "the 23rd Street tunnel," about 300 feet downstream of the dam on the north shore. In addition to the lock and dam, other manmade structures in the river include bridges, piers, and other hardened shoreline features (e.g., riprap). Gravel, cobble, and boulder are the predominant substrates upstream and downstream of the Allegheny Project dam with some silt present along the north and south shores of Sixmile Island just downstream of the dam.

Deep-fast aquatic habitats[19] are prevalent upstream and downstream of the Allegheny Project. Shallow-fast habitat is primarily located immediately below the dam, but often consists of habitat with excessive turbulence and high velocities, which is not suitable for most fish. However, riverine fish are generally attracted to areas near the turbulent habitat downstream of the dam because much of the adjacent area still provides suitable velocities and depths for these species. Consequently, many fish species, including important game fish such as walleye and smallmouth bass, often use the deep-water habitat near the proposed project. Deep-slow habitat also occurs both upstream and downstream of the dam, and is commonly used by several fish species that prefer deep-slow habitat (such as gizzard shad).

Fish Community

Decades of mining, agricultural, commercial, and industrial practices have affected the aquatic resources in the Allegheny River, with a nearly total loss of fish and invertebrate communities by the mid-twentieth century (Anderson et al., 2000; Pennsylvania FBC, 2011). Substantial water quality improvement over the past 50 years, however, has improved aquatic community composition such that the Allegheny River now supports a diverse, warmwater fish community. Lock chamber and nighttime pool electrofishing surveys, as well as other fishery sampling conducted by the Pennsylvania Fish and Boat Commission (Pennsylvania FBC), and available data in the Ohio River Valley Water Sanitation Commission (ORSANCO)[20] database from 1967 to 2010 show a steady recovery of fish assemblages (ORSANCO, 2016a; Pennsylvania FBC, 2011).

The Allegheny River currently supports at least 100 species of fish in Pennsylvania, including seven state-listed as endangered (spotted gar, gravel chub, river shiner, mountain madtom, tadpole madtom, northern madtom, and burbot) and four state-listed as candidate (Ohio lamprey, bowfin, hornyhead chub, and central mudminnow) (Pennsylvania FBC, 2011). According to the electrofishing data collected by ORSANCO and Pennsylvania FBC, and provided by the applicant, the fish community near the Allegheny Project can be characterized as a warmwater assemblage where gizzard shad,

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[19] Deep habitat refers to water depths greater than 9 feet, and fast habitat refers to water velocities at or greater than 1 foot per second. Similarly, shallow habitat refers to water depths less than 9 feet, and slow habitat refers to water velocities less than 1 foot per second.

[20] The Commonwealth of Pennsylvania is a member of ORSANCO, which is an interstate commission that was congressionally established in 1948 to coordinate the control and abatement of pollution in the Ohio River Basin. Other member states include: New York, West Virginia, Virginia, Ohio, Kentucky, Indiana, and Illinois.

silver redhorse, emerald shiner, smallmouth bass, and mimic shiner are the most common species. Thirty-one fish species have been documented in the Allegheny Project area (HDR, 2013), including 10 designated as remarkable species[21] by Pennsylvania FBC (smallmouth redhorse, smallmouth bass, spotted bass, mimic shiner, mooneye, channel darter, logperch, sauger, saugeye, and walleye).

Pennsylvania FBC manages the popular sport fishery in the Upper Ohio River Basin which includes targeted fish species such as smallmouth bass, walleye, and catfish. Pennsylvania FBC stocks hybrid striped bass, tiger muskellunge and muskellunge, and paddlefish in the basin. There are no anadromous or catadromous fish present in the Upper Ohio River Basin. Some resident freshwater fish may migrate between pools and between the river and tributaries or lakes for spawning, foraging, or overwintering. Movement of fish is partially restricted by the lock and dam structures, but fish movement between pools can occur via the locks and gate releases.

Mussels

Mussels, like fish species, have historically suffered from degraded water quality and habitat in the Allegheny River. In the early 1900s, freshwater mussels were rare or absent, and this population status persisted up to the 1960s, with some improvements in the 1970s and 1980s, and significant improvements over the past two decades (Anderson et al., 2000). Since 1960, 34 species have been found in the Allegheny River in Pennsylvania (including 27 species in the upper 126-mile free-flowing reach, and 30 species in the lower 72-mile impounded reach [Pennsylvania FBC, 2011]).

Despite suffering historical depletions, the mussel fauna of the Allegheny River seem to be recovering (Ecological Specialists, Inc., 2015). The upper Allegheny River supports some of the best communities in Pennsylvania, including populations of the federally listed endangered clubshell (pool 7), northern riffleshell (pool 8), and rayed bean (pool 6) (Smith and Meyer, 2010, as cited by Ecological Specialists, Inc., 2015); the endangered sheepnose and snuffbox; and the threatened rabbitsfoot (Enviroscience, 2008). In its letter filed February 11, 2016, FWS notes that the longsolid and green floater mussels were found dead in the Lower Allegheny River in 2010. The closest known study to Allegheny Lock and Dam 2 was a recent survey for Hulton Bridge

[21] Pennsylvania FBC considers remarkable species to be fish species that are: (1) previously or currently protected under 58 Pennsylvania Code Chapter 75; (2) sport fish maintained by natural reproduction; (3) classified as pollution intolerant by ORSANCO; or (4) collected for the first time in Pennsylvania or not typically collected with any regularity (Pennsylvania FBC, 2011).

(Enviroscience, 2008), about 6 RMs upstream, which yielded 15 live mussel species, but no federally or Pennsylvania state-listed species.

The applicant conducted semi-quantitative mussel surveys in the summer of 2013 upstream and downstream of the proposed project (Ecological Specialists, Inc., 2015). Specifically, biologists conducted surveys by scuba diving along transects in a defined sampling area, approximately 1,100 feet upstream of the dam to 3,000 feet downstream. Seven transects were placed downstream of the dam and typically spanned the width of the river, except near the dam where hydraulic conditions precluded bank-to-bank transects. Two 100-meter-long transects perpendicular to the bank were placed upstream of the dam and proposed project facilities.

Table 3-10 shows the abundance of live native mussel species collected during these surveys. Species abundance and diversity were higher downstream of the lock and dam than upstream. The invasive zebra mussels were observed at every site. No federally listed or Pennsylvania state-listed species were collected.

Macroinvertebrates

Benthic macroinvertebrates are a diverse and typically abundant group of organisms with specific habitat preferences. Many species are sensitive to environmental conditions and stresses and are intolerant of specific pollution sources. Therefore, benthic communities are excellent indicators of both water quality and biological integrity.

Review of a database maintained by ORSANCO (2016b) shows that 15 species of macroinvertebrates were collected from the pool of Allegheny Lock and Dam 2, 3 to 7 RM upstream of the dam, in 1991, using Hester-Dendy samplers[22] attached to cinderblocks. Midges of the genus *Dicrotendipes* dominated samples, accounting for 55 percent of the total abundance. *Dicrotendipes* species, like all Chironomids, are pollutant-tolerant species, and typically dominate samples from impaired waters. Pennsylvania DEP and EPA collected more recent macroinvertebrate samples in 2008 and 2009 from the first 75 RMs of the Allegheny River upstream from the Ohio River. The macroinvertebrate data will help Pennsylvania DEP develop an index to assess water quality conditions in large rivers (Pennsylvania DEP, 2010). Although the applicant has

[22] A Hester-Dendy sampler consists of several thin (typically 1/8-inch thick) square or round plates secured onto an eyebolt and individually separated by spacers. Multiple samplers are secured to a weighted block and deployed in the water, to provide a substrate for colonization by resident macroinvertebrates.

requested a copy of the collection data from Pennsylvania DEP, data are not yet available (Rye Development, 2015a).

Table 3-10. Native mussel species collected in the vicinity of the proposed Allegheny Project during mussel surveys conducted in 2013 (Source: Ecological Specialists, Inc., 2015, as modified by staff).

Species	Number
Lampsilinae	
Pink heelsplitter	46
Pocketbook	17
Fatmucket	8
Threehorn wartyback	6
Mucket	3
Black sandshell	14
Fawnsfoot	2
Ambleminae	
Mapleleaf	86
Spike	3
Wabash pigtoe	1
Anodontinae	
Flutedshell	4
Giant floater	1
Total abundance	191
Total species	12
Percent ≥ 5 years old	4

3.3.2.2 Environmental Effects

Water Quantity

Construction Effects on Water Quantity

Construction would involve temporary placement of cofferdams upstream and downstream of the proposed intake channel and powerhouse site, and along portions of the dam during installation of the crest gates, which would be installed in four segments. Cofferdams would obstruct flows and temporarily alter hydraulic conditions (e.g.,

discharge location, water surface elevation, and flow velocity and direction) upstream and downstream of the dam. Specifically, the applicant proposes to install two new spill gates in the project intake channel to compensate for the loss in spill capacity from the removal of a 280-foot-long section of the dam crest to accommodate the powerhouse. A cofferdam would be installed upstream of this section of the dam prior to removal of the dam crest section, would remain in place during construction of the intake channel, and would be removed after the new spill gates are operational. The applicant indicates that the schedule for use of the two proposed spill gates during the remainder of the construction period would be prepared in consultation with the Corps.

After construction of the spill gates, the applicant proposes to install 2.5-foot-high crest gates on top of the dam crest. The crest gates would be 45 feet wide and separated by 10-foot-wide concrete piers. Installation would be divided into four segments with the first segment, consisting of five crest gates and piers, beginning at the lock. A temporary upstream cofferdam would be installed upstream of each segment while the five gates and piers in the segment are installed, and the cofferdam would be removed before work begins on the next segment. The final segment would be at the abutment adjacent to the two proposed spill gates in the powerhouse intake channel (forebay). During installation of the crest gates, the two new spill gates would be operational except for any restrictions on one spill gate during installation of the last segment of crest gates. The cofferdams that would be in place during construction of the crest gates would be limited to the footprint of the crest gate segment. Newly installed crest gates would be in the down position until powerhouse construction is completed.

Our Analysis

At the Allegheny Project, all flow that is not used to operate the lock is currently passed over the fixed crest concrete dam. During the period when the cofferdam upstream of the powerhouse is in place, the effective length of the dam crest would be reduced by 280 feet from 1,380 feet to 1,100 feet. This 20 percent reduction in the effective length of the dam crest would shift some flow toward the middle of the river and the lock side of the Corps' facility, and would cause the average water velocities upstream and downstream of the unobstructed portion of the dam to increase 1 to 3 fps (depending on river flow), which could have minor effects on fish habitat and river conditions for navigation (i.e., velocities near the lock). This change in flow velocity, however, would be well within the range that occurs due to natural variations in river flow that occur under existing conditions.

Flow obstruction by the upstream cofferdam could also cause the average water surface elevations in the upstream pool to increase (0.1 foot) during construction until the cofferdam is removed and the new spill gates are operational. Considering the range of upstream pool elevations that occur at different river flows, any slight changes in pool elevation during construction would not likely affect aquatic or shoreline habitat

upstream of the dam. Ultimately, the Corps would determine both the timing of construction and allowable pool elevations during construction of the proposed project.

Once the new spill gates are operational, the combined flow capacity of the new spill and crest gates would be sufficient to maintain existing upper pool elevations (i.e., no increase in elevation) up to a river flow of 120,000 cfs. At the Allegheny Project, a river flow of 120,000 cfs is rarely reached, and flows equal to or exceeding 120,000 cfs occur less than 1 percent of the time on an annual basis. However, when flows would exceed 120,000 cfs, there would be a slight increase (0.1 foot) in upstream pool levels (CDM Smith, 2014c).[23]

Operational Effects on Water Quantity

Operation of the project in run-of-release mode[24] as proposed would not alter the quantity or timing of flows that pass the dam, but project operation would alter hydraulic conditions (e.g., discharge location, water surface elevations, and flow velocity and direction) in some areas close to the dam. To maintain the existing hydraulic capacity at the dam, the applicant proposes to install two spill gates in the intake channel (forebay) of the proposed powerhouse. These gates would discharge flow at a 45-degree downstream angle and would be designed to pass the full hydraulic capacity of the portion of the dam crest removed during construction of the proposed powerhouse. To ensure pool water surface elevations could be maintained as close as possible to current levels after the project is constructed, the applicant would install 2.5-foot-high adjustable crest gates on the dam crest. When river flow is less than the minimum hydraulic capacity required to operate one unit, or when high water levels preclude project operation, the powerhouse would be shut down, and all flows would be passed over the new crest gates on the dam and through the proposed spill gates, as directed by the Corps. During project operation, the applicant proposes to pass a minimum bypass flow of 900 cfs from June through September, and 250 cfs from October through May, over the dam crest.

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[23] In other words, at any given flow exceeding 120,000 cfs, the applicant would be unable to operate the project in such a way as to prevent the pool surface elevation from rising about 0.1 foot (i.e., about 1.2 inches) above that of the current pool elevation at the given flow. Because the elevation change of 0.1 foot is very minor and would occur infrequently during a flooding condition, we expect the effects of this elevation change on aquatic and riparian resources to be inconsequential.

[24] Although the applicant describes its proposed operation mode as run-of-river, it is better defined as run-of-release because the Corps would determine how much water is made available to the project.

In its comments filed on March 4, 2016, the Corps states that the proposed project operation must not impact the navigation channel, pool elevation, or operation of the lock and dam. The Corps also expressed concerns over maintaining minimum bypass flows at the project site during operation and the loss of spill capacity due to the crest gate piers. In addition, Interior (10(j) recommendation 1) recommends that the project operate in a run-of-river mode, and provide minimum bypass flows over the dam crest during all months of the year. Pennsylvania FBC also recommends the proposed project operate in run-of-river mode to avoid impacts on water levels and protect fish and wildlife habitat.

Our Analysis

At the Allegheny Lock and Dam 2, under existing low and moderate flow conditions (low, moderate, and high flow conditions are defined for the dam in table 3-4 above), flows passing the dam that are not used for lock operation are distributed evenly across the width of the dam crest. When river flows are within the hydraulic capacity of the proposed project (600 to 18,000 cfs), under the proposed operation most or all of the flow would typically pass through the powerhouse, all of which would be discharged on the opposite side of the river from the lock. The proposed powerhouse tailrace would discharge flow at a slight angle from the shoreline. When the spill gates installed in the project intake channel are in use, they would discharge flow toward the center of the river.

Two-dimensional hydraulic modeling software, ADH,[25] developed by the Corps' Coastal and Hydraulics Laboratory, was used to simulate the effects of project operation on the velocity distribution upstream and downstream of the dam (CDM Smith, 2014c). Under existing conditions, water velocities upstream of the dam typically ranged between 0.5 and 1.0 fps. Existing velocities were between 0.5 and 3.0 fps downstream of the dam. When the proposed project is operating, areas of localized high velocities would form upstream of the proposed intake, in and downstream of the proposed tailrace, and upstream and downstream of the proposed spill gates. Velocities in these areas are predicted to increase by 1.0 to 5.0 fps during moderate to high flow conditions (14,889 to 44,362 cfs). Model results indicate that velocity changes in excess of 0.1 fps caused by project operation would extend no more than 1,600 feet upstream of the dam and no more than 4,700 feet downstream of the dam. Effects of these changes on aquatic organisms and habitat are discussed in this section below in *Operational Effects on Aquatic Organisms and Habitat*.

[25] ADH is a state-of-the-art adaptive hydraulic modeling system and is capable of handling both saturated and unsaturated groundwater, overland flow, and two- or three-dimensional shallow water problems. ADH uses adaptive numerical meshes that can be employed to improve model accuracy without sacrificing efficiency.

Although the proposed crest gates would be 2.5 feet high, the gates would not typically raise the pool by 2.5 feet when in the full up position because some low flow or base flow and corresponding water surface elevation of about 722 feet would expected. Under the proposed operation, upstream pool levels would be increased by about 1.5 feet when river flows are less than 18,000 cfs, up to 1.0 foot when flows are between 18,000 and 42,000 cfs, and remain similar to existing conditions at flows higher than 42,000 cfs. These proposed changes in upstream water levels would remain within the existing pool elevation range that occurs under different flow conditions (see figure 2-1), except that, as noted above, when flows exceed 120,000 cfs, the upstream pool level would be about 0.1 foot higher than it is currently. The increase in upstream pool levels at flows less than 42,000 cfs is proposed to ensure that the proposed project operation does not negatively impact navigability upstream of the Allegheny Project. Based on data developed from the applicant's hydraulic modeling (CDM Smith, 2014c), project operation would not result in increases in water surface elevations downstream.

Generally, a Commission license for a non-federal project at a Corps dam requires a licensee to develop an operating plan and Memorandum of Agreement (MOA) with the Corps. Such an operating plan would describe the mode of hydropower operation, pool and flow regulation requirements for the Corps' project, and integration of operation of the hydroelectric facility into the Corps' emergency action plan. The MOA would describe the detailed operation of the project acceptable to the Corps and any restrictions needed to protect the purposes of the Corps' project for navigation. Development of an operation compliance monitoring plan would incorporate this MOA, include provisions for documenting compliance with any Corps' operating requirements, and establish a schedule for reporting project compliance/non-compliance during normal operation and emergencies. Operation of the Allegheny Project in accordance with an MOA with the Corps, and implementation of an operation compliance monitoring plan would ensure run-of-release operation and minimize impacts on pool levels, navigation, water quality, and aquatic resources.

Water Quality

Construction Effects on Water Quality

Proposed project facilities would require both in-water construction (cofferdam installation and removal, the placement of fill or other materials, and excavation of an intake channel and tailrace) associated with powerhouse construction and installation of 2.5-foot-high crest gates on top of the existing dam, and some land disturbance (construction of the project access road, parking lot, substation, and transmission line). Both in-water and ground (near water) construction activities may increase turbidity levels near the proposed project, depending on the effectiveness of proposed erosion and sedimentation control measures.

Installation and removal of the temporary cofferdams and dredging activities at the proposed project could result in disturbance of contaminated sediment, including suspending sediment and redistributing contaminants to downstream locations. River sediment samples collected by the applicant in the vicinity of the proposed project contained a PAH at a concentration above the EPA sediment screening criterion. As such, construction activities may result in redistribution of contaminated river sediment during cofferdam installation, excavation, or spoil disposal.

Construction of the proposed project would also require the use of an assortment of heavy equipment (e.g., bulldozers, dump trucks, and tractors). This equipment would require fuel (diesel and gasoline), motor oil, hydraulic fluid, and other lubricants. The construction contractor(s) may also wish to store fuels and other hydrocarbons on site and may elect to perform some routine maintenance in the general project area. On-site fuel storage facilities for a project of this type commonly are in the range of several hundred to several thousand gallons of capacity, along with lesser amounts of motor oil, hydraulic fluid, and lubricants. The presence of these materials would create a risk of accidental release of hydrocarbons, with the potential for contamination of area waterways. In addition, the turbine units and transformers used at the project may contain petroleum-based oils or other substances that could be released into the river in the event of catastrophic equipment failure. All types of freshwater organisms as well as mammals, insects, microorganisms, and vegetation are susceptible to the effects of spilled hydrocarbons. In addition, the effects of spilled hydrocarbons on freshwater microorganisms, invertebrates, and algae tend to move up the food chain and affect other organisms. Depending on the nature of a spill, the potential contaminant may also be toxic to the water supply of local communities.

The applicant proposes several measures as part of an erosion and sedimentation control plan to be developed in consultation with the Corps and Pennsylvania DEP that includes procedures and BMPs to prevent pollution, minimize erosion, contain sediment, minimize the potential for spills of hazardous substances, and stabilize soils after construction is complete, as well as to provide for adequate storage of potential pollutants (e.g., gasoline, oil) on the construction site. In addition, the applicant proposes to develop a detailed soil disposal plan and dispose of excavated sediment at a designated disposal site.

In its comments filed on March 4, 2016, the Corps states that it would require continuously recorded water quality monitoring downstream and possibly upstream of the project during construction and operation. The Corps also states that all water quality monitoring data would be required to be available in real-time on the same website and web server, to ensure continual, real-time compliance with non-degradation criteria.

Our Analysis

During project construction, most or all of the river flow would continue to be passed over the dam crest, less any flow that is passed through the new spill gates once they are operational. If the proposed spill gates are used to pass flow during construction, then the depth of withdrawal would change as the new gates would open from the bottom. Under existing conditions, only water at the surface passes over the dam crest. As described previously, the applicant's 2013 water quality monitoring study, including biweekly DO and temperature profile samples upstream of the dam, did not identify any stratification patterns. However, stratification may be possible under extremely hot and/or dry conditions, and if it occurs, operation of the new spill gates could release cooler, less oxygenated water downstream of the dam relative to existing conditions.

Construction would likely temporarily increase turbidity because of cofferdam installation and removal. These effects, however, would be minimized by turbidity curtains and would be minor and limited to the period and area of construction. Disturbance to adjacent lands along the shoreline, including road and parking lot construction, could also result in increased runoff and sedimentation. BMPs and measures such as silt fencing and final site stabilization, as proposed by the applicant's erosion and sedimentation control plan, would minimize these effects. If barges are used during construction, sediments could be disturbed because of the areas of sand that occur near the proposed tailrace area. Existing barge traffic through the Corps' lock routinely causes sediment resuspension and temporary increases in turbidity, so Allegheny River aquatic resources in the vicinity of the lock and dam should be accustomed to these short-term effects.

As described previously in section 3.3.1.2, *Construction Effects on Geology and Soils*, an erosion and sedimentation control plan, developed in consultation with the agencies, as the applicant proposes, would minimize construction-related effects on water quality. In addition, implementing a water quality monitoring plan during construction would allow for immediate identification of water quality deviations and would inform any actions needed to minimize effects on water quality. Appropriate monitoring parameters would include turbidity, water temperature, and DO. In addition, collection of temperature and DO data during construction would provide additional baseline data for comparison to data collected during project operation.

Construction and operation of the proposed project could result in the release of lubricants or other toxic substances into the Allegheny River, adversely affecting water quality, and aquatic and terrestrial resources. The use of commonly accepted and approved BMPs during construction would likely minimize risks to these resources, and would result in compliance with current regulations applicable to the use of construction equipment near flowing waters.

For example, these BMPs could include: (1) intercepting and controlling accidental oil, gas, or electrical component releases through daily inspections and placing barriers around all mechanical and electrical equipment when not mobile; (2) removing and disposing of any spilled material in accordance with appropriate regulations; (3) storing fuel and other hydrocarbons in areas away from waterways; (4) appropriate primary and secondary containment for all fuel and hydrocarbons stored on site to reduce the likelihood of accidental releases that would directly or indirectly contaminate drainage ways; (5) treatment and infiltration of construction-associated wastewater back into the Allegheny River only if adequate pretreatment results in water quality consistent with existing state water quality standards; and (6) provisions for emergency response, agency notification procedures, and the availability of onsite equipment to contain spills.

While there still would be some risk for accidental introduction of hydrocarbons into the Allegheny River during the construction of the proposed project, the potential adverse effects that spills could have on water quality would be greatly reduced by implementing an appropriate plan, independent of the proposed erosion and sedimentation control plan, for handling hazardous substances. The plan could also serve as a reference for procedures to be followed in the event of a hazardous materials spill, further minimizing the effects on water quality.

Disposing of contaminated sediment at a designated site, as the applicant proposes, should limit potential effects of contaminated sediment; however, the applicant indicated that some excavated material may be used on site during construction.[26] In addition, the applicant did not indicate how a designated disposal site would be chosen, whether temporary on-site storage is needed, or how contaminated sediments would be identified. Developing a contaminated sediment testing and disposal plan, in consultation with the Corps and Pennsylvania DEP, which includes the applicant's soil disposal plan measures as well as a requirement for testing sediment from the river bed, would ensure proper handling and disposal of contaminated excavated materials. An appropriate contaminated sediment testing and soil disposal plan would include: (1) a description of proposed sampling sites and sampling frequency; (2) a description of sampling methodologies and the types of contaminants to be tested for; (3) a description of the measures to be implemented to minimize suspension of contaminated sediments; (4) a description of the process for removing, handling, and disposing of contaminated soils/sediments; (5) a provision to provide all testing results to Pennsylvania DEP; and (6) an implementation schedule. Any sediment testing should be representative of the

[26] *See* page 21 of the applicant's letter in response to the Commission's request for additional information filed on September 15, 2015.

excavation area, excavation depth, and contaminants observed in the watershed during sampling for the project's final license application.

Operational Effects on Water Quality

The applicant proposes to divert a portion of the river flow that currently spills over the dam crest through the proposed powerhouse. Current spillage provides some aeration, and redirecting flow into the powerhouse would reduce the amount of aeration that occurs at the dam, potentially reducing downstream DO concentrations. Decreased DO concentrations could, in turn, adversely affect aquatic species, including fish and freshwater mussels (e.g., reduced growth and spawning success).

To reduce effects on downstream water quality, the applicant proposes seasonal bypass flows[27] to provide some aeration benefits during project operation, and for aesthetics. In addition, the applicant would develop a post-construction water quality monitoring plan to assess the project effects on water quality. Monitoring is proposed for June through September for 3 years after project operation begins.

Interior (10(j) recommendation 1) recommends year-round bypass flows to protect fish and wildlife habitat. In addition, Interior recommends post construction water quality monitoring, but does not specify how many years the monitoring should be performed. Pennsylvania FBC also recommends water quality monitoring and that the project adheres to a non-degradation DO standard determined by the Corps. Pennsylvania FBC also states that, if the DO standard recommended by the Corps is not met, measures to increase DO (such as increasing bypass flows) must be implemented immediately. Ecosophic Strategies, LLC, recommends a DO non-degradation standard of 6.5 mg/L or higher, if the agencies recommend a higher standard.

The Corps states that continuously recorded, water quality monitoring would be required downstream and possibly upstream during construction and operation. The Corps states that it would require monitoring throughout the term of the license; year-round during the first 3 years of operation, and possibly reduced to a May through November period afterwards, based on the monitoring results. The Corps also states that all water quality monitoring data from the 10 hydroelectric projects proposed by the applicants on the Allegheny, Ohio, and Monongahela Rivers would be required to be available in real-time on the same website and web server, to ensure continual, real-time compliance with non-degradation criteria. Finally, the Corps states that an adaptive management approach to maintaining existing water quality and aquatic life conditions

[27] The proposed bypass flows would be 900 cfs from June through September and 250 cfs from October through May.

would be required, which would include compliance with non-degradation water quality and aquatic life criteria and higher bypass flows if/when criteria are not being met.

Our Analysis

To evaluate the effects of the proposed Allegheny Project on water quality downstream of the Corps' dam, the applicant conducted water quality modeling as part of its *Water Quality, Hydraulics, and Aquatic Habitat Study* (CDM Smith, 2014b). The study used a two-dimensional (longitudinal-vertical) CE-QUAL-W2 model[28] to simulate DO concentrations downstream of the proposed project from March 1 through October, with focus on the June 15 through October 15 period, during a wet year (2013), average year (2009), and a dry year (1999). The model did not include the period of November through February because DO concentrations are typically near saturation in rivers of temperate climates during the winter period.

Figure 3-1 shows modeled DO concentrations for the baseline condition (no project), and project operation under three bypass flow scenarios (no bypass flow, 300 cfs, 600 cfs, and 900 cfs) during an average year (2009) and dry year (1999). The model results indicate that project operation would cause DO concentrations downstream of the project to decrease compared to pre-project conditions, but in both average and dry years, concentrations would remain well above the state standard of 5 mg/L under each of the bypass flow scenarios. For the average year (2009), bypass flows of 300 cfs or 600 cfs show little if any detectable effect on DO concentrations compared to the no bypass flow scenario. For the dry year (1999), modeling results show an increase in DO concentrations with increasing bypass flows, but even with no bypass flows the modeled DO concentrations exceeded 8 mg/L, except for a brief period in mid-August.

[28] The Corps, EPA, and USGS commonly use the CE-QUAL-W2 model to simulate hydrodynamics, water temperature, and water quality constituents, including DO, nutrients, organic matter, and suspended solids, in rivers, lakes, reservoirs, estuaries, and combinations thereof.

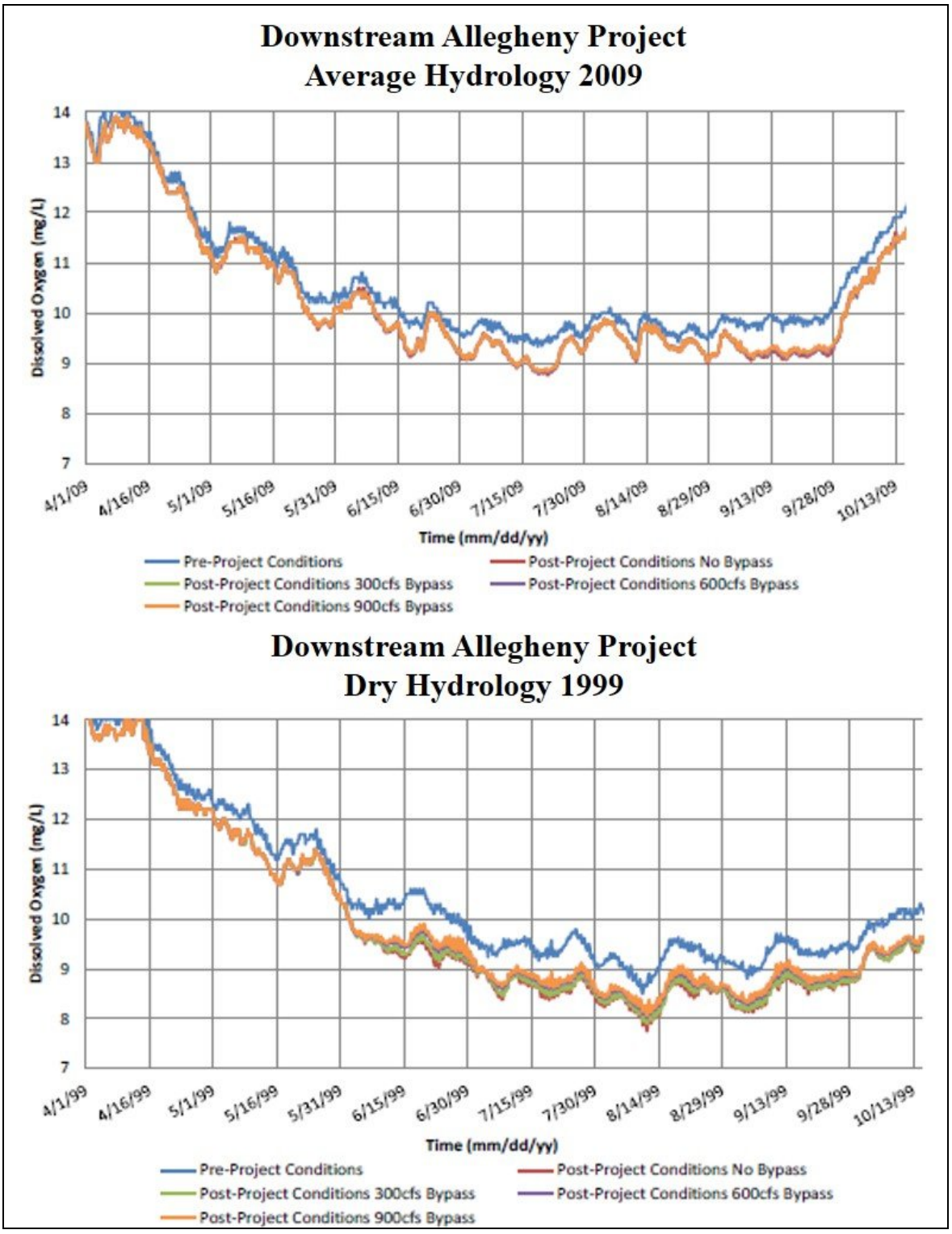

Figure 3-1. Modeled DO concentrations downstream of the Allegheny Project during an average year (2009) and dry year (1999) (Source: CDM Smith, 2014b).

Simulation of the applicant's proposed bypass flows[29] indicates that proposed project operations would decrease minimum DO concentrations downstream of the project (0.59 mg/L in a wet year, 0.57 mg/L in an average year, and 0.76 mg/L in a dry year) relative to baseline conditions (table 3-11).[30] However, DO levels with the project operating would always remain above those specified by state standards. The minimum DO concentration modeled without bypass flows was 7.74 mg/L, which occurred in mid-August in the dry year simulation (table 3-11; figure 3-1).

In addition, the applicant's 2013 monitoring study indicates that diel DO patterns could occur, resulting in lower DO concentrations at night. However, diel changes in concentrations were typically minor (0.5 mg/L), and nighttime DO concentrations are not expected to decrease much below 7.7 mg/L. Nevertheless, monitoring water temperature and DO concentrations from June 1 to September 30 for 3 years, as proposed by the applicant, should be sufficient to verify that project operation affects DO concentrations as predicted by the modeling, and would provide feedback to the Corps so that it could make any necessary decisions regarding the flows it makes available to the project. Based on 3 years of operational water quality monitoring, additional monitoring could be required if needed (e.g., if dry hydrologic summer conditions do not occur during the first 3 years of operations). Also, making real-time monitoring data available on a website would provide stakeholders with a means to access and review the data. Furthermore, developing a water quality monitoring plan in consultation with the Corps, Interior, Pennsylvania FBC, and Pennsylvania DEP would help to ensure that the plan includes appropriate monitoring locations, sampling frequency and duration, and reporting requirements to verify that water quality is consistent with state and other applicable standards.

[29] The applicant's proposed bypass flows are 900 cfs from June through September and 250 cfs from October through May. However, the applicant only performed bypass flow simulations of 0 cfs, 300 cfs, 600 cfs, and 900 cfs. Therefore, the analysis in table 3-11 uses the results of the 300-cfs bypass flow simulation for the period of October 1 through October 15.

[30] The Corps expressed concern regarding the applicant's water quality model and indicated that it would conduct a separate study to describe potential effects of hydropower operation on DO concentrations in the Allegheny River. However, the Corps has not yet provided additional water quality modeling results.

Table 3-11. Modeled DO concentrations (mg/L) downstream of the proposed Allegheny Project for a wet year (2013), average year (2009), and dry year (1999) under pre- and post-project operating conditions, with and without bypass flows from June 15 to October 15 (Source: Rye Development, 2015a, 2014, as modified by staff).

	Minimum Instantaneous DO Concentration (mg/L)			Percent Frequency of DO Concentrations (< 5.0 mg/L)[b]		
Hydrology	**Pre-Project**	**Post-Project without Bypass Flow**	**Post-Project with Bypass Flow**	**Pre-Project**	**Post-Project without Bypass Flow**	**Post-Project with Bypass Flow**
Wet year (2013)	9.08	8.49	8.57	0.0	0.0	0.0
Average year (2009)	9.33	8.76	8.99	0.0	0.0	0.0
Dry year (1999)	8.50	7.74	8.85	0.0	0.0	0.0

[a] Bypass flow rates used in this analysis are as follows: 900 cfs from June 15 through September 30, 300 cfs from October 1 through October 15.

[b] Based on modeled continuous data in 3-hour intervals from June 15 to October 15.

Although the project is expected to have a minimal effect on downstream DO levels, the applicant proposes to release year-round bypass flows over the proposed crest gates while the project is operating, with higher bypass flows during the summer to enhance aeration, and maintain aesthetics downstream of the dam. The proposed higher bypass flows during the summer low-flow period would provide some additional aeration and could protect water quality when lower DO concentrations are more likely to occur. Interior also recommends year-round bypass flows at the project, and Pennsylvania FBC recommends implementing measures to increase DO concentrations immediately if the DO standard recommended by the Corps is not met. The applicant's modeling data suggests that bypass flows provide little benefit to downstream DO concentration relative to no bypass flow; although, during hot, low-flow periods, some bypass flow may be needed to provide a DO concentration consistent with levels established understate and other applicable water quality standards. Developing and implementing a water quality monitoring plan as described would help identify any adverse water quality effects that may occur. It would inform any necessary actions, such as release of bypass flows by the Corps prior to the Corps making flows available to the applicant for generation,[31] that could be needed to provide water quality consistent with water quality standards in certain conditions (i.e., hot, dry summers).

Pennsylvania FBC and Ecosophic Strategies, LLC, recommend the project meet a non-degradation standard for DO to support riverine water quality and the aquatic community. However, Pennsylvania FBC did not specify a standard or provide data to indicate that a non-degradation standard would provide a greater level of protection to water quality and the aquatic community than the minimum state standards. The Corps also indicates that an adaptive management approach to project operations would be required to meet a non-degradation DO standard. Based on the available data, project operation effects on DO concentrations would be minor, and DO concentrations would continue to exceed levels that have been established as state standards. The existing state minimum water quality standard (5.0 mg/L) was determined as adequate to protect fish and wildlife species, particularly the warmwater fish community in the Allegheny River. It is unclear how adherence to an undefined non-degradation standard would be evaluated or how non-degradation standards, generally, would benefit aquatic resources. However, the operation compliance monitoring plan, as described above, would include provisions to monitor compliance with the operational requirements of any license issued for the project, and would provide information to adapt operations as needed.

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[31] As a run-of-release project, the project would only be able to operate off of flows made available to it by the Corps. Any flows that are "bypassed" through the spill gates or over the dam crest would be at the sole discretion of the Corps and could not be imposed by a license requirement.

Construction Effects on Aquatic Organisms and Habitat

Cofferdam Construction and Excavation

Construction activities could adversely affect resident fish, mussels, and macroinvertebrates through temporary displacement and mortality associated with cofferdam construction and dewatering, excavation and dredging in the river channel, and erosion and runoff from adjacent disturbed areas. Increases in suspended sediment could reduce aquatic habitat suitability downstream of the construction area, bury juvenile mussels and fish eggs, and clog the gills of freshwater mussels and macroinvertebrates.

As described in detail in section 3.3.1.2, *Construction Effects on Geology and Soils*, the applicant proposes to develop an erosion and sedimentation control plan to minimize effects of in-water excavation and runoff from adjacent lands. Cofferdams would isolate the section of the river to be dewatered, to facilitate excavation of the intake and tailrace as well as construction of the powerhouse. In addition, cofferdams would be used immediately upstream of the dam for crest gate installation. Crest gates would be installed in sections, and cofferdams would only be placed upstream of one section at a time. Turbidity curtains would be installed around cofferdams to minimize potential effects of suspended sediment during construction.

Pennsylvania FBC recommends evaluating the impacts of dredging during construction on mussels and aquatic life at the Allegheny Project.

Our Analysis

Based on the applicant's substrate data from the mussel survey (Ecological Specialists, Inc., 2015), substrate within the construction footprint for the Allegheny Project is almost entirely cobble. This suggests that existing flows over the dam scour away fine sediments, leaving larger, more stable substrate behind. Some sand is present just downstream of the proposed tailrace footprint. Because the construction footprint would be close to the dam, there is little potential for in-river construction to suspend and redistribute large amounts of sediment. Furthermore, cofferdams and turbidity curtains would isolate and dewater the in-river areas where the intake channel, powerhouse, tailrace, and crest gates would be constructed. Therefore, while some sediment may be suspended during cofferdam installation and removal, the cofferdams themselves and turbidity curtains would isolate much of the excavation activity and potentially contaminated sediment from the river. As discussed previously in section 3.3.2.2 *Construction Effects on Water Quality*, implementing a water quality monitoring plan during construction would allow for immediate identification of any turbidity level increases within the immediate area, and implementation of any actions needed to minimize erosion and sedimentation impacts.

Fish species in the construction areas may be displaced by cofferdam construction; boat and barge traffic associated with construction; and/or increased turbidity associated with cofferdam installation, dewatering of the construction area, and excavation of the riverbed. However, any displacement would be temporary and unlikely to have long-term effects on aquatic organisms. Some fish stranding and mortality within the cofferdam construction area is possible, but would be minimal because most fish would likely avoid the affected area during cofferdam installation, prior to cofferdam closure, because of noise and vibrations associated with in-water construction activities.

During mussel surveys at the Allegheny Project, the applicant documented few mussels inside or immediately adjacent to the proposed construction area footprint relative to other areas further downstream, and these mussels would likely be affected by cofferdam placement. Mapleleaf and pink heelsplitter were the most common species collected at the Allegheny Project, accounting for 45 and 25 percent of the total collection, respectively. These species are common in the Upper Ohio River Basin, however, and while project construction could result in the displacement or mortality of some individual mussels in the construction footprint, this displacement or mortality would not have a major, adverse effect on the overall local mussel population. Mussels outside of the construction footprint would be protected from dredged sediments through the use of cofferdams and turbidity curtains. Therefore, additional evaluation or surveys to determine the potential impacts of dredging during construction would provide little, if any, benefit to the local mussel community.

Some macroinvertebrate habitat would be permanently lost within the construction footprint, but, given the small amount of area and the availability of similar substrate outside of the construction footprint, it is unlikely that this small loss of macroinvertebrate habitat would adversely affect the macroinvertebrate community.

Overall, the applicant's proposed construction activities would only affect a few individual fish, mussels, and macroinvertebrates and would not adversely affect local populations. The applicant would use cofferdams and turbidity curtains to minimize effects of sediment suspension and redistribution during construction. In addition, implementing a water quality monitoring plan, as described previously, would further ensure waters remain suitable for aquatic biota during construction. If monitoring identifies potential adverse effects on water quality, construction activities could be stopped or adjusted to ensure the protection of aquatic resources. As such, use of turbidity curtains and monitoring water quality during project construction should provide adequate protection to the local aquatic community.

Flow Distribution during Construction

Installation of cofferdams could cause some hydraulic changes downstream of the dam, including a change in flow patterns and increases in velocity because of constriction

in river channel width. Additionally, the applicant proposes to install 2.5-foot-high adjustable crest gates on the existing Allegheny dam, requiring upstream cofferdams. The applicant proposes to coordinate the timing of construction to avoid impacts on spawning fish and other aquatic organisms, when warranted and to the extent feasible.

Our Analysis

In the hydraulics study report (CDM Smith, 2014b), the applicant estimates that, during construction of the Allegheny Project, water depth could increase by 0.1 foot immediately upstream of the project, and velocity could increase up to 3 fps in an isolated area immediately below the proposed spill gates. Upstream of the dam, velocities would increase slightly relative to existing conditions as described previously in *Construction Effects on Water Quantity*. Potential depth and velocity changes estimated for the project are based on an estimated extreme high river discharge of 120,000 cfs during construction, which is a worst-case scenario hydraulically. Actual hydraulic changes during construction would likely be less pronounced than described above because extreme flow occurs rarely (annually less than 1 percent of the time), and most construction activity would likely occur during typical moderate- to low-flow periods when high-flow events would be rare. Additionally, any temporary changes in flow patterns and velocities immediately upstream and downstream of the dam would not be unusual; current flow patterns change depending on the river hydrology and amount of spillage. Furthermore, the applicant's hydraulic modeling suggests that any construction-related changes in velocities and flow patterns would rapidly attenuate downstream. Effects on flow during operation, discussed below, would have a greater effect on hydraulic conditions than construction effects, yet any hydraulic changes during operation would occur within 4,700 feet downstream of the project dam.

While these hydraulic changes during construction could create unsuitable conditions for certain life stages of some fish, most fish would be able to move to more preferred habitat. Fish habitat below the dam is already somewhat dynamic under existing conditions, so temporary changes in hydraulic conditions should not have a measurable effect on fish populations. If fish spawning habitat occurs downstream of the proposed cofferdams, spawning adults or incubating eggs could be disturbed by a reduction in flow velocity. If the applicant could commence construction after the spring spawning and incubation period is complete for most species, this would minimize effects on any spawning habitat downstream of the dam.

Mussels would likely not be affected by minor changes in depths (0.1 foot) during construction. While velocity increases of 3 fps would be more of a concern, these changes would be relatively localized, and would not result in a major adverse effect on the mussel population near the Allegheny Project. The majority of mussels are present in areas farther downstream from the proposed project and not in the proposed construction footprint or near the dam. Any mussels present downstream of the proposed cofferdams could be affected by changes in flow. Low velocities in these areas may lead to

unsuitable conditions for mussels downstream of cofferdams because sediment may settle out of suspension, smothering any mussels that are present. In addition, success of spawning or release of glochidia could be affected by decreases in velocity and increases in sedimentation. However, these effects would likely be limited to a small area, directly downstream of the cofferdams, where few mussels occur and would attenuate downstream as flow patterns normalize. Mussels typically spawn and release glochidia in spring through early-summer; therefore, limiting construction activities during this time could provide some benefits to the mussel community.

Although some macroinvertebrate habitat outside the construction footprint could be affected by increased and decreased velocities during project construction, affected areas would likely be relatively small, and similar macroinvertebrate habitat would not be affected in other locations. Therefore, hydraulic changes during project construction are not likely to cause a measurable effect on the overall macroinvertebrate population.

In summary, expected hydraulic changes during construction would likely have a minor and temporary effect on individual fish and mussels, but would not likely have a discernable effect on these populations or the macroinvertebrate community. Coordinating the timing of construction to minimize impacts on spawning fish and other organisms, as the applicant proposes, would likely provide some benefit to aquatic species. We note that coordination with the Corps would be required per the standard special articles described in the 2011 MOU between the Commission and the Corps. As such, the Corps would retain control of flow distribution at the dam and would ultimately determine when construction would begin.

Guyasuta Run Outfall Relocation

Guyasuta Run is a small stream that enters the Allegheny River via a culvert (the 23rd Street tunnel) approximately 300 feet downstream of the dam on the north shore. The existing outfall would be buried beneath the proposed parking lot and fill needed to construct the powerhouse and other project facilities. The applicant has not proposed a new location for the Guyasuta Run outfall.

Our Analysis

In its mid to upper watershed, Guyasuta Run flows above ground behind residential homes in a forested valley. In its April 15, 2015, letter, FWS notes that 75 percent of the watershed is forested in the mid to upper reaches, and that Guyasuta Run provides habitat for warmwater fish, salamanders, and a diverse macroinvertebrate

community. Near Camp Guyasuta,[32] the stream enters a culvert and flows underground, re-emerges near some industrial lands, and then enters another culvert that conveys flow to the Allegheny River. The stream flows underground for a total of about 3,200 feet (Google Earth, 2015). Considering that the stream runs underground and is constricted by a series of culverts before entering the Allegheny River, habitat in the stream near the Allegheny River is expected to be poor.

Although the applicant did not specifically identify a new outfall, it would be necessary to construct a new outfall to accommodate existing stream flow into the Allegheny River. Relocating the outfall should not affect aquatic species or habitat in the stream because habitat within the culvert and at the outfall is likely poor. As such, any project effects on habitat in Guyasuta Run would be minor.

Operational Effects on Aquatic Organisms and Habitat

Modification of river flows by hydropower operations can negatively affect aquatic organisms and their habitats. Diverting a portion of the river flow through the project powerhouse, instead of over the dam crest, would alter the existing discharge patterns and the hydrodynamics upstream and downstream of the dam. These changes may affect existing aquatic habitat by changing hydraulic conditions, associated scour and deposition patterns, and DO concentrations.

Fish Habitat

To minimize impacts on water levels in the pool and maintain existing river flows, the applicant proposes to install crest gates and operate the project in a run-of-release mode. In addition, the applicant proposes year-round bypass flows to provide aeration and protect water quality and fish habitat downstream of the dam.[33] Interior (10(j) recommendation 1) recommends operating the project in a run-of-river mode and providing minimum bypass flows over the dam crest during all months of the year. Pennsylvania FBC also recommends run-of-river operation at the proposed project to protect and enhance fish and wildlife habitat and prevent undesirable river fluctuations.

[32] Camp Guyasuta is a 175-acre Boy Scouts of America camp located along the banks of Guyasuta Run.

[33] The applicant proposes a bypass flow of 900 cfs from June through September and 250 cfs from October through May.

In addition, the Corps expresses concern regarding operational impacts on tailwater habitat because this area provides riverine habitat features that tend to support higher productivity and greater diversity than other habitats in the Allegheny River.

Our Analysis

Under the applicant's proposal, water levels in the pool upstream of the dam would be increased by about 2.0 feet under low-flow conditions. The proposed 2.5-foot-high crest gates would maintain the pool higher than under current operations where the pool elevation is maintained by the fixed crest of the dam (no gates). The volume of downstream flow releases would not change because the project would operate in a run-of-release mode. However, project operations would cause flow patterns to change immediately downstream of the dam because more flow would be discharged through the proposed powerhouse instead of over the dam crest.

The applicant assessed the effects of operation of the proposed Allegheny Project on fish habitat in the upstream and downstream potentially affected areas by modeling and comparing the weighted useable area (WUA)[34] for multiple life stages of target species under existing and proposed conditions during different flow regimes (CDM Smith, 2014b). The project's potentially affected area was defined through the applicant's hydraulics study[35] as the area where the change in simulated river velocities resulting from turbine operations would be greater than 0.1 fps. The target species used in this assessment were gizzard shad (to represent species that use deep-slow habitat, i.e., deep-slow guild), channel catfish (shallow-slow guild), and smallmouth bass and walleye (deep-fast guild). These species were selected based on their abundance in the project area, availability of habitat suitability index curves, ecological importance (act as fish hosts for mussels), and recreational importance (game species). A species representative of the shallow-fast guild was not included because such habitat is not common near the proposed project, and, if present, would only occur directly below the lock and dam. These areas are turbulent, and while they may present temporary foraging opportunities, they are largely unsuitable for most fish species. Changes in velocity, depth, and substrate that would be caused by project operation were considered in the assessment. The three flow regimes used in this assessment include low (10-percentile or 4,110 cfs), moderate (50-percentile or 14,889 cfs), and high (90-percentile or 44,362 cfs) flows as described in table 3-4.

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[34] WUA is an index that describes overall habitat quality within a study area.

[35] The hydraulics study is a component of the Water Quality, Hydraulics, and Aquatic Habitat Study Report (CDM Smith, 2014b).

Notable decreases in WUA occurred for spawning gizzard shad during high flows (23 percent), smallmouth bass fry during low flows (19 percent), and juvenile walleye during low flows (9 percent). During high flows, habitat suitability for spawning gizzard shad would decrease upstream of the proposed powerhouse and extending upstream toward the mid-channel for about 1,500 feet. Habitat suitability would, however, increase under the same flow conditions immediately downstream of the dam. Habitat suitability for smallmouth bass fry would decrease on the right descending bank[36] immediately upstream and downstream of the proposed intake and tailrace channels. Changes in WUA for the remaining species/life stages under low, moderate, and high flows were less than 5 percent. During low flows, habitat suitability for adult walleye would decrease in the immediate vicinity of the proposed intake and tailrace areas. During moderate flows, habitat suitability for adult walleye would also be reduced near the proposed intake area, and also downstream of the proposed tailrace for about 2,000 feet. During high flows, habitat suitability would decrease upstream of the dam along the right descending bank for adult walleye. Downstream of the dam, habitat suitability would decrease immediately downstream of the proposed tailrace extending along the south shore of Sixmile Island.

In general, results from the habitat suitability analysis indicate that relatively small decreases (less than 10 percent) in WUA for the modeled guilds would occur for most fish species and life stages under all flow conditions. Most of the decreases in habitat suitability would occur within and downstream of the proposed project tailrace because this area would be exposed to higher velocities than under current conditions. However, habitat suitability typically would remain the same outside the tailrace flow trajectory and increase immediately below the dam under some flow conditions.

Changes in flow release patterns and velocities could also affect fish habitat conditions through changes in benthic scour and depositional patterns. Based on hydraulic modeling during high-flow conditions (90-percentile flow) conducted by the applicant (CDM Smith, 2014b), changes to the location and total area of potential streambed scouring after project operation commences would be minor. Most bed scour would occur during high-flow periods, similar to existing conditions.

Based on our analysis, some changes to scour, depositional patterns, and benthic fish habitat would occur due to project operation, but these changes would be minor. High flows (90 percentile or greater) would continue to have the largest effect on patterns of bed scour and deposition, which would result in a similar substrate and habitat

[36] The right descending bank refers to the river bank on the right side of the river channel when viewed looking downstream. Similarly, the left descending bank refers to the river bank on the left side of the river channel when viewed looking downstream.

distribution compared to existing conditions. Although changes in the velocity distribution downstream of the dam would alter the locations that provide optimal water depths and velocities for different species of fish, downstream habitat is variable under existing conditions because of changing river flows through the year. Considering that overall changes in fish habitat suitability would be limited, and that substantial scour is unlikely, the proposed run-of-release operation would only lead to minor changes in fish habitat downstream of the dam.

Although the overall volume of river flow passing Allegheny Lock and Dam 2 would remain the same, the proposed project may influence water quality as described previously in *Operational Effects on Water Quality*. In general, reduced DO concentrations could occur downstream of the proposed project because little or no aeration would occur when water is routed through the powerhouse, that may result in the episodic displacement of species that are sensitive to reduced DO concentrations. These events would most likely occur in the summer months during periods of low flow in dry water years. The applicant's water quality study (CDM Smith, 2014b) indicates that operation of the proposed project would not result in DO concentrations lower than about 7.7 mg/L downstream of the project. Post-project DO concentrations would likely remain above state standards and would be within or greater than the optimal growth range for target fish species such as channel catfish, smallmouth bass, and walleye (5 to 7 mg/L). USGS data from the upstream Allegheny Lock and Dam 3 (USGS, 2016) verify that Allegheny River DO concentrations consistently exceed state standards, although they may reach 5 to 6 mg/L in some years under summer low-flow conditions.

The applicant also proposes year-round minimum bypass flows, which is consistent with Interior's recommendation. Year-round bypass flows would act to maintain aeration at the project; however, DO concentrations at the site currently exceed state standards, such that the benefits to aquatic biota from the aeration provided by bypass flows may be negligible. The applicant's modeling data suggests that bypass flows provide little benefit to downstream DO concentration relative to no bypass flow; although, during hot, low-flow periods, some bypass flow may be necessary to ensure water quality is consistent with state and other applicable water quality standards.[37] We note, however, that the Corps would have sole discretion over any bypass flows over the dam and flows made available to the project for generation. As such, the Corps would determine the timing, amount, and location for any bypass flows it deems necessary. Bypass flows may provide additional habitat diversity relative to proposed operating conditions, because bypass flows would provide some turbulent and fast-moving water

[37] The applicant's modeling, while it did include a dry water year, did not model conditions during critical low-flow, high-temperature periods.

downstream of the Corps' dam during low and moderate river flows. However, the applicant's habitat modeling suggests that there would be ample habitat diversity, including areas of fast-moving water, under the proposed operating conditions.

The Corps expressed concern about the potential effects of an increase in pool elevation as a result of proposed project operation. However, the proposed crest gates would stabilize the pool at a higher elevation,[38] which would in turn stabilize shoreline habitat, and facilitate access to any tributaries for fishes. Under existing conditions, water elevations can fluctuate depending on the river hydrology, potentially allowing the dewatering of shoreline fish spawning areas. Under proposed conditions, stabilized water levels could increase the overall reproductive success of nest building fishes. Stabilized shoreline habitat would also provide more foraging opportunity and cover for resident fishes. Furthermore, an increased pool elevation would not have a measurable effect on DO concentrations, which are expected to remain well above state standards during project operation, as discussed previously in *Operational Effects on Water Quality*. Although few, and mostly beneficial, changes in upstream habitat would occur under the proposed crest gate operation, we note that the Corps would determine suitable crest gate operation and pool elevations in its operation plan and MOA with the applicant.

Overall, run-of-release operations as proposed by the applicant may alter fish habitat conditions through changes in velocity and scour patterns downstream of the dam, but only small changes in available suitable habitat for most species and life stages would occur. Fish would likely move into areas with suitable depths, flows, and substrate during project operation. In addition, implementation of a water quality monitoring plan, discussed previously in *Operational Effects on Water Quality*, would provide information to the Corps so that it can make decisions on how much flow to make available to the project and how much flow must be released over the proposed project's crest gates to protect fish from any adverse project-related effects on DO concentrations.

Mussels and Macroinvertebrates

Similar to the previous discussion, mussels, macroinvertebrates, and their habitat may be affected by project-related changes in hydraulic conditions, scour and deposition patterns, and DO concentrations.

In its letter filed February 11, 2016, Interior recommends the applicant coordinate with FWS regarding potential impacts on species that are under review for potential

[38] The pool would be about 1.5 feet higher at flows less than 18,000 cfs, and up to 1.0 foot higher at flows between 18,000 cfs and 42,000 cfs. At flows above 42,000 cfs, pool elevations would be maintained similar to existing conditions (see figure 2-1 above).

listing under the ESA, including longsolid (*Fusconaia subrotunda*) and green floater (*Lasmigona subviridis*). Pennsylvania FBC recommends evaluation of the impacts of the proposed adjustable, 2.5-foot-high crest gates at the Allegheny Project on mussels.

Our Analysis

As described previously, mussel surveys conducted by the applicant identified 12 species of mussels during surveys conducted upstream and downstream of the dam, but no federally or Pennsylvania state-listed species were collected. Downstream, many mussels were located farther than 900 feet downstream of the dam along the right descending bank near Sixmile Island and Silky's Crows Nest Marina (see figure 1-2). Some patches of mussels were also documented in the mid-channel, and few mussels were observed along the left descending bank. Upstream of the dam near the proposed project intake, some mussels were documented in both transects (within 1,100 feet of the dam).

To evaluate potential operational effects on mussels, the applicant modeled the change in velocities between existing and proposed operational conditions at 50 percent exceedance (median) flows and compared the hydraulic modeling results to the mussel distribution results from their surveys at the Allegheny Project (CDM Smith, 2014b; Ecological Specialists, Inc., 2015). Velocities would be altered throughout much of the study area where mussels were observed. Downstream of the dam, the majority of flow would be concentrated in the middle of the river, while velocities within about 1,500 feet along the left descending bank would be reduced. Within 1,500 feet upstream of the dam, flow velocities would increase or decrease slightly (less than 1 fps) in the mid-channel. Near the proposed intake, flow could increase up to 6.5 fps relative to existing conditions, while flows on the left bank, opposite the intake, could decrease by 6.5 fps relative to existing conditions.

While individual mussels near the Allegheny Project could be affected by changes in the velocity distribution caused by project operation, effects on the population would likely be limited. Water velocity and habitat suitability downstream of the dam may decrease along the left descending bank, but velocity would remain similar to existing conditions, and suitability should not be affected along the right descending bank near Silky's Crows Nest Marina and Sixmile Island, where many mussels were documented. In the mid-channel, where most discharge from the powerhouse would be directed, velocity would increase, and habitat suitability would likely decrease; however, this effect would attenuate downstream as flows disperse across the channel. Upstream of the dam, the draw of water through the powerhouse may decrease habitat suitability near the intake while other mussel habitat farther upstream (1,500 feet or more) may improve with a slight increase in velocity. The project would likely have little effect on mid-channel mussel habitat where velocities would remain similar to existing conditions. On the left bank, opposite the intake, water velocity would decrease substantially in a small area near

the dam (within 300 feet upstream), but would remain similar to existing conditions farther upstream.

Overall, while some mussel habitat may be lost, additional habitat would be created because of the change in flow patterns associated with the operation of the proposed project. We also note that the most substantial changes in mussel habitat would occur downstream of and close to the dam, where few mussels occur. Based on the mussels collected near the Allegheny Project during the 2013 surveys, mapleleaf and pink heelsplitter accounted for 45 and 25 percent of the total abundance, respectively, and are the most likely species to be affected. These species are common in the Upper Ohio River Basin, and any affected individuals would not likely cause a measurable effect on the local mussel population.

FWS recommends coordination regarding potential impacts on the longsolid and green floater mussels, which are under review for potential listing under the ESA. FWS notes in its February 11, 2016, letter that both species were found dead in the lower Allegheny River in 2010. However, neither of these species was collected during the applicant's surveys in 2013, during surveys at the Hulton Bridge 6 miles upstream of the Corps' dam (Enviroscience, 2008), or during Hart's (2012) surveys on the lower Monongahela River. Based on these surveys, it is unlikely that the longsolid or the green floater are present within the project area, and therefore would not be affected by operation of the proposed project.

Pennsylvania FBC requested an evaluation of the potential effects of the proposed adjustable crest gates on mussels at the Allegheny Project. The proposed crest gates would increase the pool elevation at flows less than 42,000 cfs, would ensure that depths are maintained for navigation during project operation, and would provide the Corps better control of upstream water levels. The proposed change in depth could affect suitable mussel habitat for some mussels, but species present in the project vicinity already occur at a wide range of depths (1.6 to 20 feet; Ecological Specialists, Inc., 2015) and experience depth changes of 10 feet or more as flow conditions change. Mussels and mussel habitat near the river margins upstream of the dam would be subjected to fewer reductions in water levels and stranding, because crest gate operation would maintain a higher pool elevation during low flow conditions. The proposed operation of the crest gates would raise the pool level when flow is less than 42,000 cfs, but would have little effect on water velocity upstream of the dam as the project would operate in run-of-release mode. Conditions downstream of the dam would be minimally affected by the proposed crest gates because any flows that are passed over the crest gates would be distributed along the downstream face of the dam, similar to existing conditions.

The DO thresholds for mussels are not well known, but monitoring water quality and adhering to state standards, or any additional, more restrictive standards determined by the Corps, would minimize potential effects of the proposed project on DO

concentrations and mussels. As discussed previously for fish, seasonal bypass flows could provide some additional aeration and protect mussels from low DO conditions during critical summer periods of low river flows and high temperatures. Year-round bypass flows, as the applicant proposes and Interior recommends, would also provide a velocity component for aquatic habitat downstream of the dam which could benefit mussels in areas with suitable substrate. However, the Corps would ultimately determine the schedule and volume of bypass flows it releases at the dam before making flows available to the applicant for generation, in conjunction with their navigation operations.

Some macroinvertebrate habitat would likely be adversely affected during project operations, especially near the proposed tailrace area where depths would be increased and velocities would be higher. However, given the availability of suitable habitat elsewhere in the project area, it is unlikely that any loss of macroinvertebrate habitat would adversely affect the macroinvertebrate community. In addition, macroinvertebrates in the vicinity of the proposed project generally consist of midges of the genus *Dicrotendipes*, which are common in the Allegheny River.

In summary, run-of-release operation, as the applicant proposes may alter mussel and macroinvertebrate habitat conditions through changes in velocity and scour patterns downstream of the dam, but some habitat would be improved by the more stable flow releases from the powerhouse. The proposed crest gates would maintain upstream pool elevations and increase the amount of wetted habitat along the shorelines during low-flow periods. In addition, the implementation of measures to protect water quality, discussed previously in *Operational Effects on Water Quality*, would provide information to the Corps so that it can make decisions on how much flow to make available to the project and how much flow must be passed over the crest gates and through the proposed project's spill gates to protect water quality and aquatic habitat.

Fish Stranding Surveys

Interior recommends the applicant design and implement post-construction fish stranding studies for the proposed tailrace, extending downstream to the point where the turbine discharge enters the river.

Our Analysis

Although project operation could result in some changes in flow and velocity patterns downstream of the dam, project operation would not cause dewatering of habitat downstream of the dam, with little if any risk of fish stranding. Because the project is located at one of a series of existing locks and dams used for navigation, the downstream pools backwater to the base of the next upstream dam, and shallow habitat susceptible to dewatering is limited below the dam. The tailrace of the proposed project would be excavated into the bed of the existing river channel and would be continuously

submerged whether the project is operating or not. As such, fish stranding studies would not benefit fish or fish habitat in the vicinity of the project.

Fish Impingement, Entrainment, and Passage

Operation of the proposed project has the potential to result in some fish losses from impingement on the proposed trash rack and injuries caused by entrainment through the proposed turbines. To minimize fish mortality related to project operation, the applicant proposes to: (1) design the project so that the intake has a maximum approach velocity of less than 2 fps; (2) install a trash rack with 5-inch clear bar spacing; and (3) use "fish friendly" Kaplan turbines.

Pennsylvania FBC and Interior recommend that the applicant design and implement post-project construction fish impingement and entrainment studies. Based on the results of these studies, Interior may recommend that the licensee consult with the resource agencies to determine appropriate trash rack vertical bar spacing and approach velocity, and make project modifications where necessary to ensure protection of all fish species and life stages in the project area. Pennsylvania FBC recommends mitigation of fish impingement and entrainment losses.

Our Analysis

At the existing dam, fish can pass downstream over the dam crest or through the lock chambers, and fish can pass upstream through the lock chambers only. Some downstream fish passage now occurring over the dam crest would be diverted through the proposed powerhouse, and is the primary concern regarding downstream fish passage and potential entrainment mortality. Diadromous species (includes both anadromous and catadromous species) do not occur in the Upper Ohio River Basin, so there are no species that require passage to complete their life history requirements. Some resident species, such as walleye and gizzard shad, may exhibit some migratory characteristics during the spawning (move upstream to spawn) and post-spawning periods, but there is no information to indicate that sufficient spawning areas are not available between the dams.

Entrainment would occur when fish are unable to overcome the approach velocity at the trash rack and pass through the turbines during project operation, or if they volitionally pass downstream through the trash rack. The proposed 5-inch trash rack clear bar spacing would allow all but the largest fish to pass through the trash rack, which limits the potential for fish to become impinged on the trash rack. Table 3-12 summarizes the site-specific trash rack and turbine features at the Allegheny Project.

Table 3-12. Trash rack and turbine characteristics at the proposed Allegheny Project (Source: HDR, 2013).

Trash Rack Characteristics		Turbine Characteristics			
Trash Rack Bar Spacing (inches)	**Modeled Maximum Approach Velocity (fps)**	**Number of Units**	**Runner Diameter (feet)**	**Rated Speed (revolutions per minute)**	**Rated Head (feet)**
5	1.89	3	17.1	71.9	12.1

To further evaluate the effects of the proposed project on downstream fish passage, the applicant conducted a desktop entrainment and turbine survival study (HDR, 2013) to estimate the number of fish that would be entrained and suffer mortality during project operations. The calculated maximum intake velocity at the project's trash rack would be about 1.9 fps. Burst swim speed data for seven of the target species and nine surrogate species[39] show that almost all species in their adult life stage and many in their juvenile life stage can swim faster than the maximum intake velocity, and could avoid being swept into the trash rack (table 3-13). Therefore, we expect that impingement of fish on the trash rack would only occur rarely.

Table 3-13. Average burst swim speeds and fish sizes for representative species (Source: HDR, 2013).

Species	**Life Stage**	**Total Length (inches)[a]**	**Burst Swim Speed (feet per second)**
American shad[b]	Juvenile	1.0–3.0	1.75–2.5
Emerald shiner	Adult	2.5	4
	Juvenile	2.01–2.13	1.84
Bluegill	Adult	3.94–5.91	2.44
	Adult	6.02	4.3
Blue sucker[b]	Adult	26.2	19.51
Herring[b]	Fry	0.4-0.8	0.0-1.0

[39] Surrogate species are species that are similar in body shape and size (may be of the same genus or family) to target species in the Allegheny River, and that have better data available than for the target species in the Allegheny River. Surrogate species are assumed to have the same swimming ability as the target species.

Species	Life Stage	Total Length (inches)[a]	Burst Swim Speed (feet per second)
	Juvenile/Adult	6.0–11.0	5.0–7.0
Hybrid catfish[b]	Juvenile	6.30–9.06	7.88
Ghost shiner[b]	Adult	1.39	2.93
Greenside darter[b]	Adult	4.0–6.8	1.02–2.64
	Fry	0.79–0.87	1.56–2.04
Largemouth bass[b]	Juvenile	2.05–5.04	1.84–3.28
	Juvenile	5.91–10.63	3.02–4.34
Longnose sucker[b]	Juvenile/Adult	3.9–16.0	4.0–8.0
Mimic shiner	Adult	1.39	2.86
Paddlefish	Juvenile	3.54	1.87–2.46
	Adult	47.2	32.8
Smallmouth bass	Fry	0.55–0.98	<1.78
	Juvenile	3.58–3.66	2.6–3.6
	Adult	10.3–14.9	3.2–7.8
Striped bass[b]	Fry	0.5–1.0	0.4–1.0
	Juvenile	2.0–5.0	1.0–5.0
Walleye[b]	Juvenile	3.15–6.30 (F)	2.48–6.02
	Adult	13.78–22.44 (F)	5.48–8.57
White crappie	Juvenile	3.03	0.36–1.04

[a] (F) equals fork length; otherwise, length measurements are total length.

[b] Surrogate species used to represent target species in the Allegheny River. Some target species such as walleye and largemouth bass, representative of sauger and spotted bass respectively, were also used as surrogate species.

The applicant estimated entrainment rates based on seasonal entrainment densities at 43 hydroelectric projects in the Electric Power Research Institute (EPRI) (1997) database, then adjusted rates for each target species by their percent relative composition in the project vicinity based on specific fish survey data from Pennsylvania FBC and ORSANCO databases. Estimated annual entrainment at the proposed project is 1,117,366 fish, primarily small fish less than 6 inches in length, with gizzard shad accounting for 90 percent of total annual entrainment (table 3-14). Emerald shiner, channel catfish, and mooneye account for an additional 6.4 percent. Seasonally, the

summer/fall period was estimated to have the greatest entrainment, and the winter/spring period (December through May) has the lowest entrainment. Larger game species represented a small percentage of the projected entrainment; both smallmouth bass and walleye entrainment was estimated at less than 0.01 percent of total annual entrainment.

Table 3-14. Annual entrainment estimates (number of individuals) for the Allegheny Project, based on a 1995 to 2011 period of record (Source: HDR, 2013, as modified by staff).

Species	**Entrainment Estimate**
Bluegill	1,138
Brook silverside	262
Channel catfish	29,531
Emerald shiner	19,966
Flathead catfish	984
Freshwater drum	1,653
Gizzard shad	1,006,052
Logperch	745
Mimic shiner	7,057
Mooneye	22,486
Paddlefish	3
Rock bass	6,252
Smallmouth bass	5,266
Smallmouth redhorse	2,364
Spotted bass	3,203
Walleye	122
White bass	9,905
Black crappie	376
Total	1,117,366

The applicant's desktop study (HDR, 2013) also estimated the number of entrained fish that would be killed during turbine passage using the blade strike probability equation developed by Franke et al. (1997). Mortality estimates by species reflected the entrainment estimates, with gizzard shad comprising most of the fish killed. Larger fish were estimated to suffer the highest mortality, but few large fish were projected to be entrained. The average turbine passage survival estimate for all fish

lengths is 94 percent. This estimate is consistent with the results of turbine passage survival tests conducted at other projects with similar types of turbines, as summarized in EPRI (1997). Slow-speed, large-diameter Kaplan turbines, similar to those proposed by the applicant, also typically showed the highest survival rates.

Pennsylvania FBC and Interior recommend that the applicant design and implement post-construction fish impingement and entrainment studies at the project. Based on the study results, Interior may then recommend that the applicant modify trash rack bar spacing or approach velocities, as necessary, to reduce fish impingement and entrainment. Based on the results of the applicant's calculated intake velocities, trash rack bar spacing and results of the desktop entrainment mortality study, it appears that potential effects of impingement and entrainment would be minor (i.e., no impingement mortality and approximately 5 percent entrainment mortality rate). While only a desktop study was conducted, the applicant relied on well-known field studies (EPRI, 1997) and information on blade strike probability (Franke et al., 1997) for Kaplan turbines.

Considering the expected low entrainment mortality and the relatively high fecundity of most warmwater fish species that would be entrained (e.g., gizzard shad, minnows, and sunfish species), the project would not likely affect the composition of the existing fish community or fish species populations. Consequently, an entrainment study at the project would likely only confirm that large Kaplan turbines at relatively low-head projects achieve low entrainment mortality rates. In addition, given the known information on the relationship between trash rack bar spacing, intake velocities, entrainment, and mortality at hydroelectric projects, entrainment studies are not needed to inform trash rack design or determine appropriate intake velocities. However, verifying intake velocities at a range of flows, as part of the operation compliance monitoring plan discussed previously in *Operational Effects on Water Quantity*, would ensure that intake velocities meet design objectives and are adequate to protect fish.

In addition to its recommendation to quantify fish losses through entrainment studies discussed above, Pennsylvania FBC recommends that fish impingement and entrainment losses should be mitigated. However, it does not specifically describe any mitigation measures, and, therefore, we cannot fully evaluate Pennsylvania FBC's request. Based on the applicant's fish entrainment study, measurable population-level effects on fish are not anticipated; thus, it is unlikely that any mitigation would be needed to protect the existing fish community in the vicinity of the project.

In summary, the applicant's desktop entrainment study (HDR, 2013) and other published entrainment studies suggest the applicant's proposed trash rack spacing, intake velocities, and turbine type would adequately protect fish passing downstream through the project. Therefore, we do not expect any measurable impacts on fish populations in the vicinity of the Allegheny Project.

Special Status Fish

Aquatic state-listed and species of concern would be vulnerable to the same potential construction and operation-related effects as non-listed species discussed previously. Potential effects could change the habitat suitability for some state-listed species if they are present.

Our Analysis

Fish databases compiled by HDR (2013) for the Allegheny Project entrainment assessment do not include any state-listed fishes. Although paddlefish are not a state-listed species, Pennsylvania FBC has stocked the species in the lower 30 miles of the Allegheny River and the upper 40 miles of the Ohio River since 1991 (Argent et al., n.d.). In 2011 and 2012, Pennsylvania FBC collected four sub-adult paddlefish downstream of the Allegheny Project, and a larval paddlefish downstream of Allegheny Lock and Dam 3. While some paddlefish may occur in the Allegheny River, most paddlefish should be able to avoid the proposed intake velocity of 1.89 fps (maximum), and there is little potential for individual paddlefish to be entrained. According to the applicant's entrainment study discussed above, a total of three paddlefish were estimated to be entrained through the project annually.

Aquatic Organism Monitoring

The Corps indicates that it would require a variety of post-construction monitoring studies at regular intervals to document local and cumulative effects on aquatic habitats and communities. Specifically, the Corps would require: (1) multi-method fish surveys to document any project-related changes in the fish community; (2) fish impingement, entrainment, and mortality surveys to address impacts on all species and sizes of fish; (3) macroinvertebrate surveys; (4) mussel surveys; (5) an assessment of biological integrity for macroinvertebrate and fish assemblages; and (6) tracking of mussel bed and tailwater habitat during construction and operation throughout the term of the license. In addition, the Corps specifically expresses concern regarding potential project effects on darters (small benthic-dwelling fish) and their habitat in the dam tailwaters, because these fish can provide important ecological functions, such as serving as a host fish for mussels.

Our Analysis

As described previously, construction and operation of the project would have some effects on aquatic species and their habitats. In general, effects of construction could temporarily displace organisms or decrease habitat suitability near the construction area. Once operation begins, some habitat would become less suitable for fish and other organisms, while other areas would see an increase in habitat suitability. Overall, a small reduction in suitable habitat for most aquatic species would occur at low and moderate flows, while conditions at high flows would remain relatively unchanged. In addition,

fish entrained through the project may suffer turbine-induced mortality, but the entrainment mortality rate would be low.

Under existing conditions, changes in river flow alter and shift aquatic habitat suitability on a regular basis (e.g., daily, weekly, or annually, depending on river flow). We note that, based on Corps' rating curves, water depth in the Allegheny Lock and Dam 2 pool can vary by 10 feet or more as a result of changes in river flow under existing conditions. As such, the existing aquatic community would be adapted to variation in flows and habitat suitability within and near the dam tailwater. Some entrainment mortality would occur, but it would not likely have an effect on the existing fish communities. Therefore, fish, mussel, and macroinvertebrate surveys, entrainment surveys, and habitat surveys are not likely needed to document project effects.

As for darters, these species are small benthic-dwelling species with short home ranges that are often found in the tailwater habitats. The swift current and cobble substrate found in tailwaters can provide protection for darter species because most predatory fish generally do not tolerate this habitat (Pennsylvania FBC, 2016). Because darters typically use tailwater habitat and do not exhibit migratory behavior, we expect that the risk of darter entrainment would be low. If darters were entrained by the project, few would be killed (probably less than 5 percent) because these small fish would attain higher survival rates than other, larger species. Furthermore, as described above for other species, the availability of suitable habitat for darters is unlikely to change significantly, and darters would seek out suitable habitat in the tailwaters with or without operation of the proposed project.

3.3.2.3 Cumulative Effects

Water Quality

By the early 1900s, the Upper Ohio Basin was experiencing widespread habitat devastation and water quality degradation. Up until the 1970s, the convenience of using the Monongahela, Allegheny, and Ohio Rivers as a sink for decades of municipal and industrial wastes trumped requirements for potable water in western Pennsylvania. Mining has been identified as having the single greatest impact on surface water quality of any single land use in the Monongahela, Allegheny, and Ohio Rivers (Anderson et al., 2000; Pennsylvania FBC, 2011). Concerted state and federal efforts since the 1970s, including reductions in industrial discharge, improvements in wastewater treatment, and improvements in mine drainage treatment and low-flow augmentation, eventually led to substantial improvement in river water quality (Anderson et al., 2000).

Construction and operation of multiple hydropower projects proposed on the Allegheny, Monongahela, and Ohio Rivers could cumulatively affect water quality throughout the Upper Ohio River Basin,[40] both in the short term (construction effects) and long term (operational effects). Construction of the proposed projects on each river may disturb and suspend sediments, potentially resulting in increased turbidity levels within the affected reaches of each river. However, most disturbed sediment would likely settle out in the downstream pools, and developing and implementing erosion and sedimentation control plans at the other proposed projects, similar to the plan proposed for the Allegheny Project by the applicant, and monitoring water quality during construction would limit the project's construction contribution to cumulative effects on turbidity levels in the Upper Ohio River Basin.

Operation of the proposed hydroelectric project would reduce aeration by reducing the volume of water that passes over the dam crest, which may contribute to cumulative effects on DO levels in the reaches downstream of the dam. The Allegheny Project would be the downstream-most hydroelectric facility on the Allegheny River, only 6.7 RM upstream of the river's confluence with the Monongahela River. Therefore, any effects of the proposed project on water quality could affect the downstream facilities on the Ohio River, but would not affect DO concentrations in the Monongahela River. However, the applicant's DO modeling indicated that DO concentrations within 1,600 feet upstream and 4,700 feet downstream of the proposed Allegheny Project are not predicted to decrease below 7.74 mg/L at any time. Thus, DO concentrations should remain above those levels established as state standards in the lower Allegheny River to its confluence with the Monongahela River.

The applicants for the six projects proposed on the Monongahela River analyzed the cumulative effects of operating those projects on DO concentrations in the Monongahela River under a range of flow conditions. Figures 3-2 and 3-3 show the modeled minimum DO concentrations along the Monongahela River from June 15 to September 30 during average and dry water years during project operations (but without bypass flows). During these operations, modeling predicts that DO concentrations would be lower immediately below each dam than above the dam, often below state standards,

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[40] Rye Development's other related projects that could contribute to cumulative effects throughout the Upper Ohio Basin include: Opekiska Lock and Dam (P-13753), Morgantown Lock and Dam (P-13762), Point Marion Lock and Dam (P-13771), Grays Landing Lock and Dam (P-13763), Maxwell Locks and Dam (P-13766), and the Charleroi Locks and Dam (P-13767) on the Monongahela River; and the Emsworth Locks and Dam (P-13757), Emsworth Back Channel Dam (P-13761), and Montgomery Locks and Dam (P-13768) on the Ohio River.

likely because: (1) less water is spilled over the dam as more water is drawn through the turbines, so less aeration occurs at the dam; and (2) the powerhouses would withdraw water from the entire upstream water column, including deeper water that may contain lower DO concentrations because of pool stratification in the summer. However, DO concentrations are predicted to recover relatively quickly below each dam and return to levels well above state standards. In addition, DO concentrations in the lower river are predicted to generally increase to levels well above state standards at the confluence with the Youghiogheny River, upstream of the Braddock Locks and Dam, and at the confluence with the Ohio River. This modeling was conducted for worst-case conditions (without any bypass flows). Other modeling conducted by the applicants showed that implementing bypass flows[41] at the projects could improve DO concentrations below each dam during operation relative to operation without bypass flows. Although modeling predicts some reductions in DO concentrations at worst-case conditions below some of the dams, overall cumulative effects on DO concentrations in the Monongahela River would be minimal if bypass flows were used to reduce project-related impacts on DO concentrations.

The Braddock Project (FERC Project No. 13739-002) is about 30 miles downstream of Charleroi Locks and Dam and about 11 miles upstream of the confluence of the Monongahela and Allegheny Rivers in Pittsburgh, Pennsylvania. The recently licensed Braddock Project will operate in a run-of-release mode similarly to the currently proposed projects on the Monongahela River (FERC, 2014). DO concentrations entering the Braddock pool during operation of all proposed Monongahela River Projects are predicted to be similar to existing conditions regardless of water year. Operation of the Braddock Project was predicted to result in only small decreases in DO concentrations downstream of the Corps' gates (0.07 to 0.32 mg/L) and in the turbine discharge (0.14 to 0.35 mg/L) relative to simulated baseline conditions, based on hydrodynamic and water quality models (FERC, 2014). Lock+ Hydro Friends Fund XLII, LLC, the licensee for the Braddock Project, will also conduct DO monitoring for 5 years following the construction of the hydroelectric project, and for an additional 5 years at such time as the normal elevation of the Braddock pool increases during the term of the license as a result

[41] Because the projects would only be able to operate with flows made available to them by the Corps (run-of-release), any flows released through dam gates or newly constructed spill gates (bypass flows) would be at the sole discretion of the Corps. The Commission has no authority to require the release of these flows.

of the Corps' Lower Monongahela Project.[42] As such, cumulative effects on DO concentrations in the Monongahela River as a result of the proposed projects, in conjunction with the recently licensed Braddock Project, would be minimal.

The applicants for the three Ohio River Projects (Emsworth Locks and Dam, Emsworth Back Channel Dam, and Montgomery Locks and Dam) modeled the potential cumulative effects of operations of the six proposed projects on the Monongahela River and the Allegheny Project on DO levels on the Upper Ohio River and found that those effects would be minimal (CDM Smith, 2014c). Figure 3-4 shows the predicted differences in DO concentrations on the Ohio River upstream of the Ohio River Projects for different water years, with and without the operation of the proposed Monongahela and Allegheny Projects. The maximum decrease in DO concentration with all seven projects operating was predicted to be 0.6 mg/L during a dry year, with most predicted decreases generally between 0.0 and 0.4 mg/L. Modeling results also indicated that operation of the three proposed Ohio River Projects would have only minor effects on DO, causing no more than a 0.92 mg/L decrease in DO concentrations downstream of the dam, and DO concentrations would remain well above state standards. Furthermore, figure 3-5 shows the modeled DO concentrations downstream of the Montgomery Project during an average and dry year. In developing the modeled data shown in figure 3-5, the applicant incorporated the impacts of the other upstream projects currently being proposed. Therefore, when all proposed hydropower facilities are operating, simulated DO concentrations did not decrease below 8 mg/L even during a dry (low flow) year. Overall, cumulative effects on DO concentrations in the Upper Ohio River Basin would be minimal.

[42] The Corps' Lower Monongahela Locks and Dams 2, 3, & 4 Project (Lower Mon Project) was authorized by Congress in 1992 to address conditions at the Corps' three navigation facilities on the Lower Monongahela River. The remaining work includes: (1) removal of Locks and Dam 3; (2) replacement of Locks and Dam 4; (3) pool level changes; (4) substantial dredging; and (5) relocation of multiple shore-side facilities. Although the project was initially scheduled for completion in 2004, the Corps' current estimate for completion of the project is 2030.

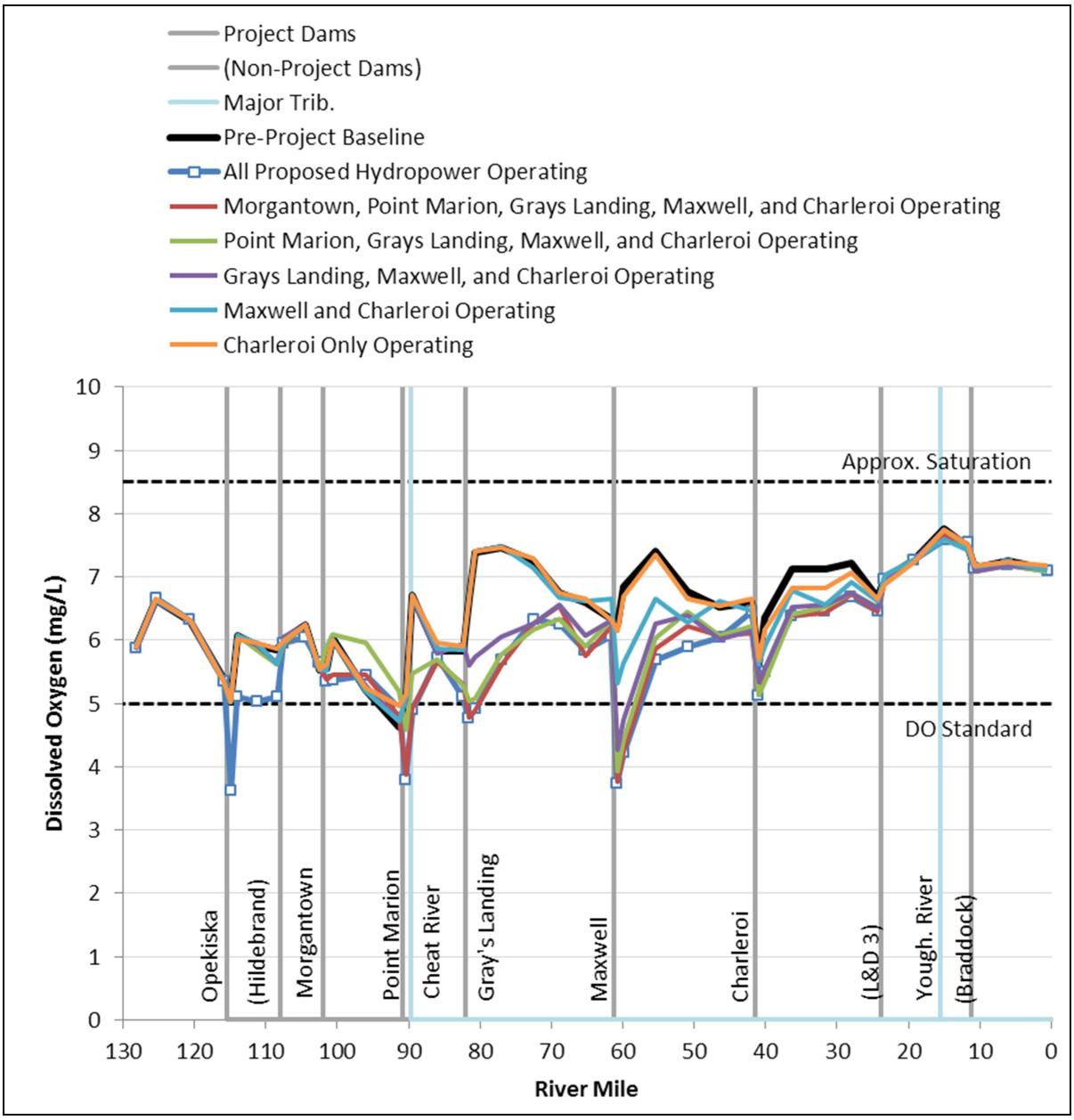

Figure 3-2. Modeled minimum DO concentrations along the Monongahela River between June 15 to September 30, 2009 (average year) (Source: Rye Development, 2015b).

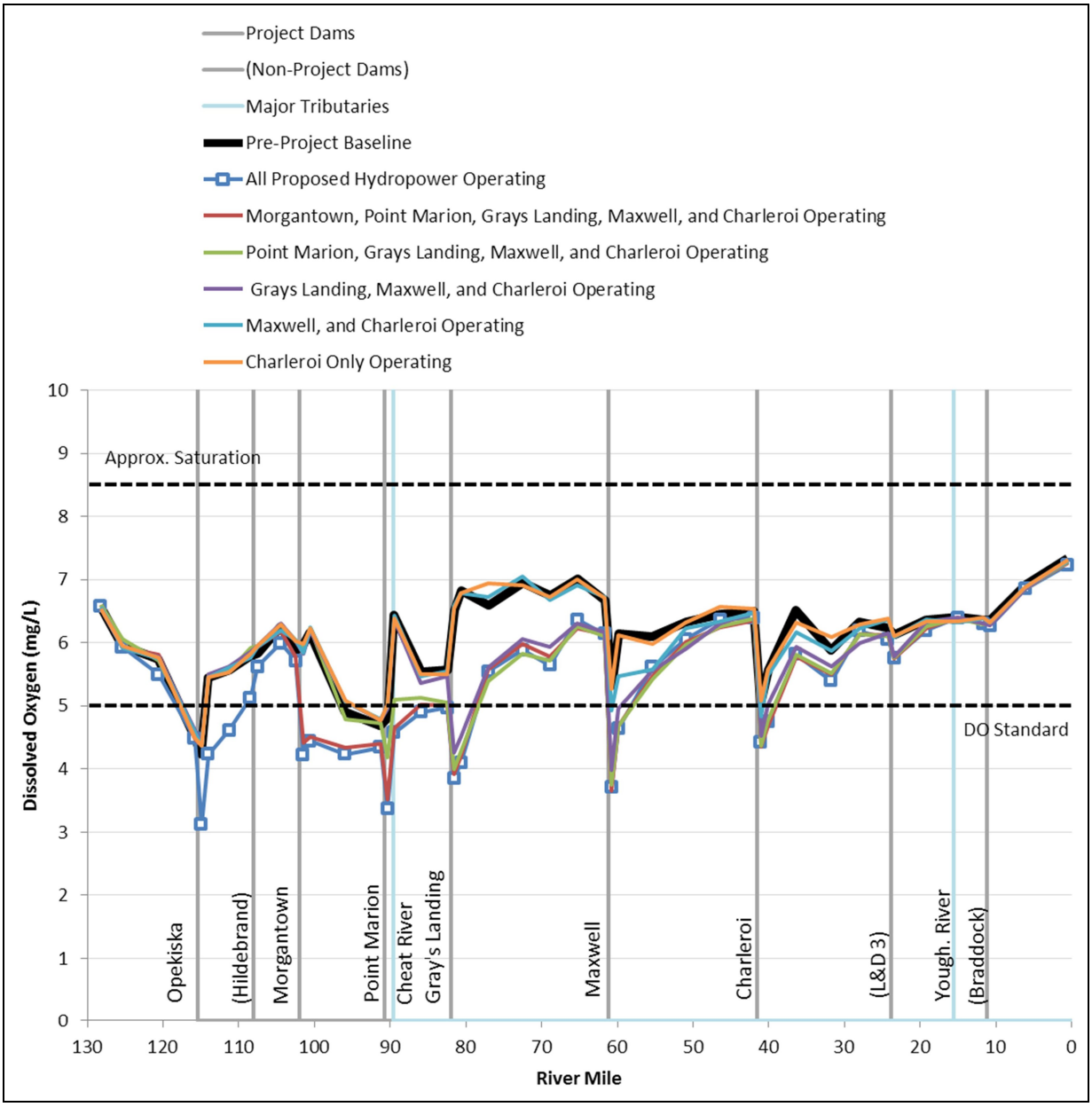

Figure 3-3. Modeled minimum DO concentrations along the Monongahela River between June 15 to September 30, 1999 (dry year) (Source: Rye Development, 2015b).

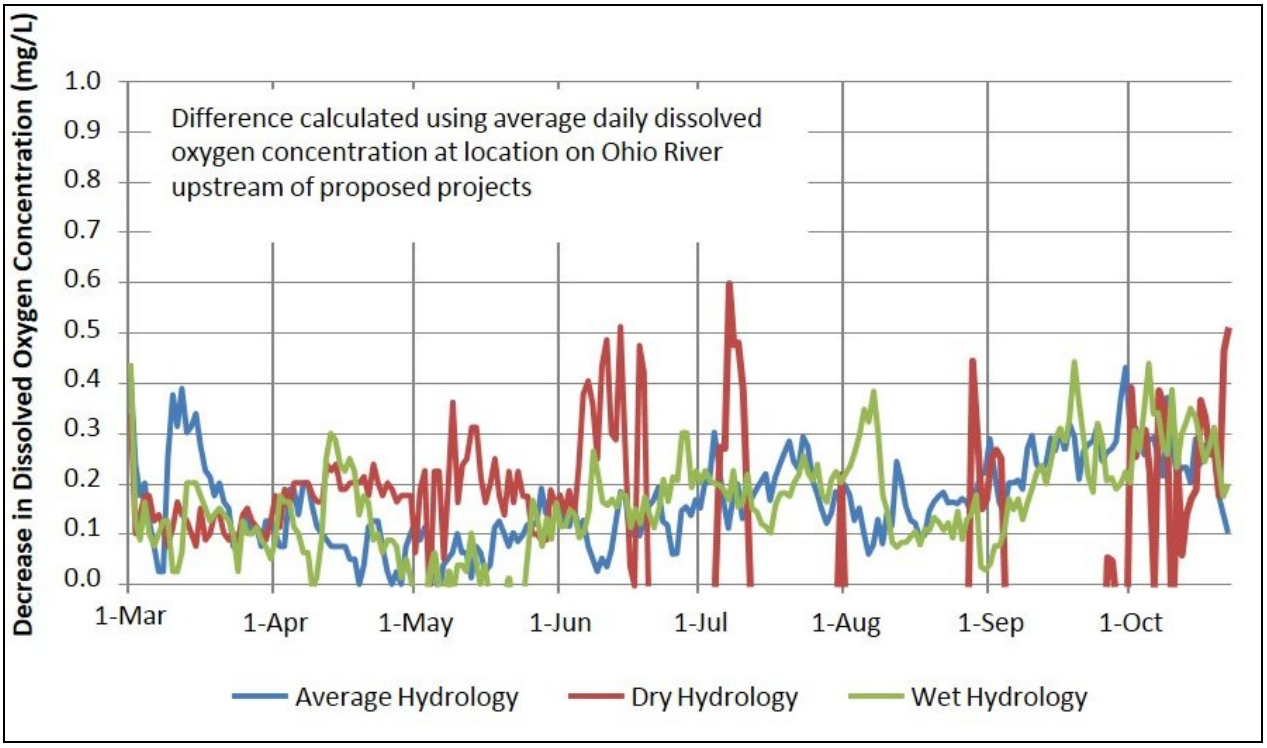

Figure 3-4. Difference in DO concentrations upstream of the Ohio River Projects, with and without the Monongahela and Allegheny Projects (Source: CDM Smith, 2014c).

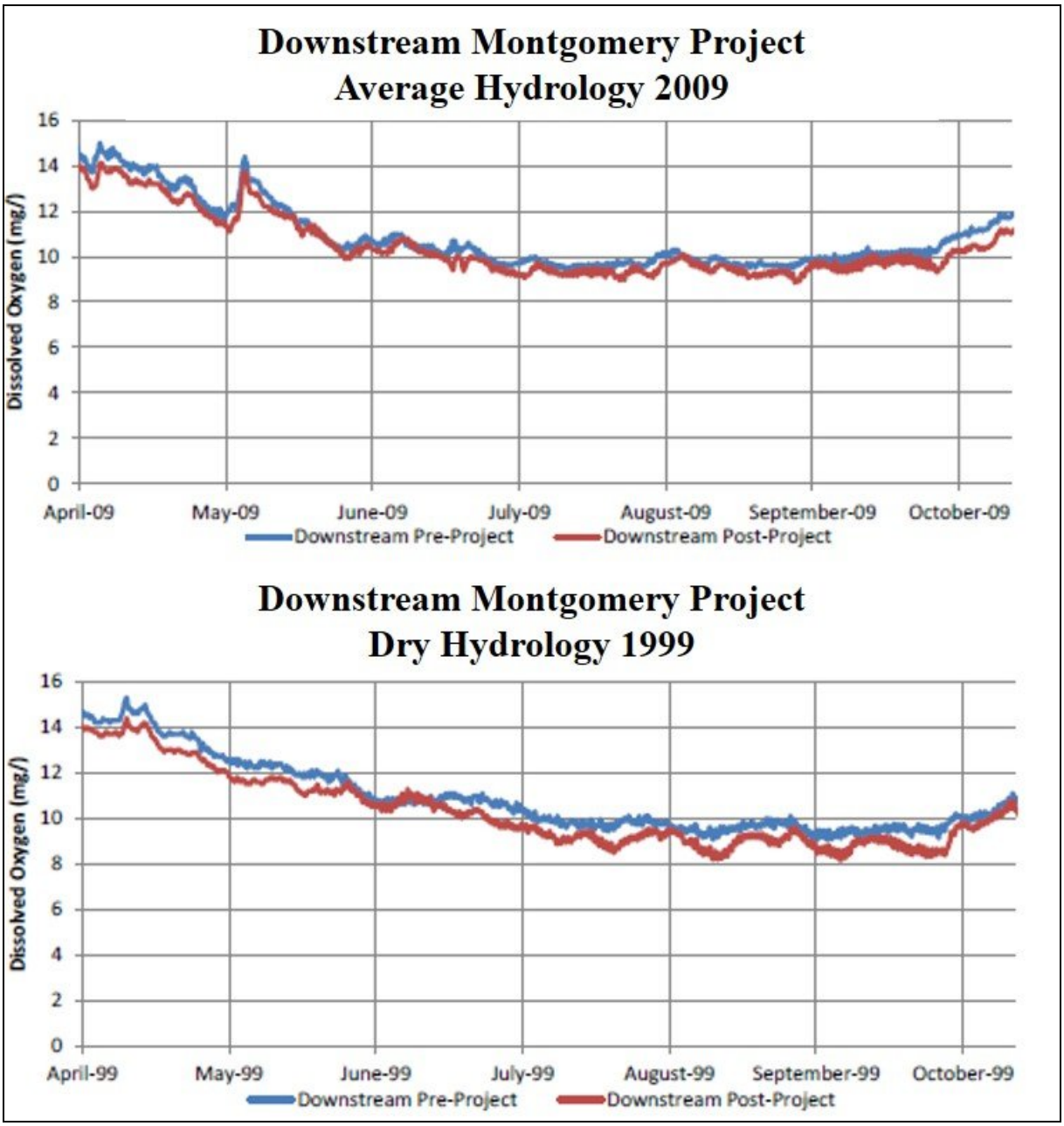

Figure 3-5. Modeled DO concentrations downstream of the Montgomery Project during an average year (2009) and dry year (1999) (Source: CDM Smith, 2014c).

Fisheries

The flow distribution in aquatic habitat downstream of the proposed project would be altered by project operation, and some decreases in habitat suitability could contribute to cumulative effects on fishery resources. However, under existing conditions the depth and water velocity downstream of the dam can change dramatically with changes in river flow. Therefore, aquatic organisms are likely adapted to changes in hydraulic conditions

downstream of Allegheny Lock and Dam 2 and other Corps' dams on the Monongahela and Ohio Rivers, and any effects of project-related modified flow patterns would be limited. While some fish species may lose some suitable habitat in certain parts of the proposed project area, losses would be relatively small, and the majority of suitable habitat would still be available. Because the proposed project would have minimal effects on fish passage on the Allegheny River, resident fish populations would maintain their current distribution, with some upstream passage available through the locks, and downstream passage available via spillage over the dam, through the locks, or through the proposed project turbines. Freshwater mussels would still have fish hosts available to complete their life cycle. While mussels near the Allegheny Project could be affected by changes in the velocity distribution caused by project operation, effects on the population would be limited. Habitat suitability may decrease along the left descending bank, but suitability would remain stable or improve in other areas. Based on the mussels collected near the Allegheny Project during the 2013 surveys, mapleleaf and pink heelsplitter accounted for 45 and 25 percent of the total abundance, and therefore are the most likely species to be affected. These species were typically the most abundant species collected at other locks and dams surveyed in 2013. Any individual mussels that may be affected by habitat modifications would not likely contribute to a cumulative adverse effect on the overall Upper Ohio River mussel population because they are likely present throughout the river system.

Turbine-related injuries and mortality associated with the operation of the proposed project could contribute to cumulative effects on fishery resources. While some fish entrainment would occur, most fish entrained would be juvenile or smaller fish of the most common species that occur in the Upper Ohio River Basin. In addition, the fish-friendly characteristics of the proposed turbines (large, low-speed Kaplan turbines with low head), would result in relatively low entrainment-related mortality rates at the project. The high fecundities of most of the warmwater fish species that would be subject to entrainment would compensate for any mortality, reducing any population-level effects on resident species. The applicants' proposals to install trash racks with 3-inch clear bar spacing at the Monongahela River Projects and 5-inch clear bar spacing at the Allegheny and Ohio River Projects, with intake approach velocities of less than 2.0 fps, would also limit entrainment and impingement on project trash racks. Most fish would be able to avoid being drawn into the trash racks, and those that are drawn in would likely pass through the racks, with high survival rates through the turbines. Overall effects of any entrainment and impingement of resident fishes that may occur would not contribute to a cumulative adverse effect on the Upper Ohio River Basin fish populations.

3.3.3 Terrestrial Resources

3.3.3.1 Affected Environment

Botanical Resources

Much of the original forested land in Allegheny County has been cut down. Some areas have reverted back to woodland, although a substantial portion remains dominated by intensive municipal and industrial development. Woodlands areas are small in size with many situated on steep slopes or in valleys that are inaccessible. Dominant tree species include oaks, maples, birch, and hemlock.

Vegetation within the proposed project boundary is primarily deciduous riparian forest. Dominant tree species observed in the study area include silver maple, sycamore, and black locust. A population of water-willow and lizard's tail is present along the shoreline, upstream of the dam. The immediate shoreline in the area of the proposed powerhouse is undeveloped, with forest buffer between the shoreline and railroad tracks. The proposed transmission line corridor is contained within the industrial area inland of the western shore of the river.

The applicant consulted the U.S. Department of Agriculture plant database map of recorded occurrences of invasive species to identify invasive populations near the proposed project. Additionally, site visits for biological studies in 2013 noted occurrences of invasive species in the vicinity of the proposed project to identify species with potential to colonize disturbed areas. Invasive species either encountered during these surveys, or known to occur in the vicinity, include crown vetch, garlic-mustard, Japanese barberry, Japanese honeysuckle, Japanese knotweed, jimsonweed, multiflora rose, Norway maple, Oriental bittersweet, purple loosestrife, spotted knapweed, tatarian honeysuckle, tree-of-heaven, and white mulberry.

The applicant found no wetlands in its wetland delineation covering the proposed Allegheny Project boundary in July 2013. However, the National Wetlands Inventory dataset (FWS, 2015a) identifies two wetlands upstream of the proposed project and downstream of C.W. Bill Young Lock and Dam (Allegheny Lock and Dam 3), outside the wetland delineation area. The closest of these wetlands is a palustrine forested wetland at an inlet adjacent to the Fox Chapel Yacht Club, about 2 miles upstream of the proposed project. The second wetland is a palustrine emergent wetland on the upstream tip of Sycamore Island, about 3.5 miles upstream of the proposed project.

Sensitive Plant Species and Communities

The applicant consulted the PNDI Environmental Review Tool[43] to identify sensitive species potentially occurring in the project areas. In Pennsylvania, sensitive species are managed by several agencies. The Pennsylvania Game Commission manages state-listed birds and mammals; Pennsylvania FBC manages state-listed fish and aquatic organisms (discussed in section 3.3.2, *Aquatic Resources*), reptiles, and amphibians; Pennsylvania Department of Conservation and Natural Resources (DCNR) manages state-listed plants, natural communities, and terrestrial invertebrates; and FWS manages federally listed species (discussed in section 3.3.4, *Threatened and Endangered Species*).

The PNDI system coordinates the review of these agencies for specific projects and identifies species that could be affected by the proposed project. As part of the review process, each agency determines whether further review or species-specific surveys are warranted. Table 3-15 presents the results of the PNDI consultation.

Table 3-15. Sensitive plant species and communities with potential to occur in the Allegheny Project vicinity (Source: Rye Development, 2015a).

Common Name	Scientific Name	Status	Habitat	Project Specific Survey Results
Common hop tree	*Ptelea trifoliata*	PAT	Found in old fields, stream banks, and alluvial thickets.	The applicant surveyed the Allegheny Project for this species and found suitable habitat but no occurrences.
Fringe tree	*Chionanthus virginicus*	PASCS	Found in moist deciduous forests.	The applicant surveyed the Allegheny Project for this species and found suitable habitat but no occurrences.

[43] The PNDI is a web-mapping tool used to determine the location of sensitive plants, animals, and their habitats, including state and federally listed threatened and endangered species.

Common Name	Scientific Name	Status	Habitat	Project Specific Survey Results
Northern water-milfoil	*Myriophyllum sibiricum*	PAE	Found in aquatic habitats at depths of 3-10.5 feet in low-energy waters of streams, rivers, lakes, and ponds	Pennsylvania DCNR identified potential impacts associated with the Allegheny Project, but determined no surveys were needed for this species.

Notes: PAE – Pennsylvania state-endangered; PAT – Pennsylvania state-threatened; PASCS – Pennsylvania special concern species; highlighted species were identified within proposed project boundaries.

Wildlife and Species of Special Concern

Birds within the project area are characteristic of deciduous forests of the south central and eastern region of the United States. The proposed project site provides nesting and feeding habitat for avian species including the American robin, mourning dove, northern mockingbird, red-winged blackbird, northern cardinal, tufted titmouse, warblers, eastern towhee, sparrows, Carolina and black-capped chickadee, vireo, flycatchers, and swallows. Waterfowl and shorebirds common to the project area include American black duck, mallard duck, green-winged teal, merganser, grebe, heron, gulls, and pipers. Birds of prey such as owls, turkey vultures, kestrel, hawks (e.g., buteos, accipiters, and harriers), and bald eagles may also be present.

Other wildlife species expected to use the edge habitat available within the immediate project area would be those tolerant of human development and activity (e.g., common raccoon, Virginia opossum, eastern gray squirrel, eastern chipmunk, and small rodents) and those that would use aquatic habitat within the rivers (e.g., muskrat, beaver, reptiles, and amphibians). Larger mammals such as red fox, coyote, striped skunk, and white-tailed deer may also occur in the project area.

Bald Eagle

Bald eagles (*Haliaeetus leucocephalus*) were removed from the federal list of threatened and endangered species in 2007. This species, however, is still protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act, which prohibit the "take" of bald eagle eggs, nests, and offspring, except as permitted by regulation. Bald eagles migrate throughout North America and nest near large, open bodies of water where tall trees and cliffs are available. The diet of bald eagles consists of dying or dead fish, birds, and mammal carcasses, including large herbivores such as

livestock and deer. Bald eagles will also scavenge food from other fish-eating birds such as osprey, mergansers, herons, or other eagles.

In Pennsylvania, the bald eagle is generally a year-round resident, although immature birds may migrate in the spring and fall. Typically, these eagles stop and forage along reservoirs and rivers, especially where shallow water is present. The status of Pennsylvania bald eagles is unknown, as the population is not marked by leg bands or other markings. It is assumed that most pairs remain close to their nesting territories throughout the year. In Pennsylvania, nesting and fledging activities occur from December through August (FWS, 2007). Some immature bald eagles can be nomadic for several years while others demonstrate natal fidelity in their second year (Buehler, 2000).

Bald eagles have been observed around the project area (eBird, 2015). While no bald eagle nests have been observed at the project site, potential nesting and roosting habitat is likely available in trees located near open water in the project vicinity.

3.3.3.2 Environmental Effects

Effects of Project Construction and Operation on Wetlands

Water level in the Allegheny Lock and Dam 2 pool fluctuates with river flow, causing riparian habitat and adjacent wetlands to become inundated at higher flows. The applicant would install adjustable crest gates on the dam crest to maintain the water surface elevation of the pool upstream of the dam when the project is operating, which would change the normal pool elevation, as described in section 2.2.5, *Proposed Project Operation*. In its response to the Ready for Environmental Analysis notice, the Corps expresses concern that changes in upper pool levels could adversely affect wetlands.

Our Analysis

As described previously, the applicant would operate the project in run-of-release mode which would not affect water elevations downstream of the dam. As such, any wetland or riparian habitat downstream of the dam would not be affected by the project. Upstream of the dam, the proposed operation of the crest gates would increase the pool elevation immediately upstream of the dam to a maximum elevation of 724.5 feet NGVD 29 when total river flow is less than 42,000 cfs. Under these conditions, water surface elevation at the farthest upstream point within the pool (near the tailwater of C.W. Bill Young Lock and Dam 7.8 miles upstream of Allegheny Lock and Dam 2) would be

726.0 feet or less based on our review of existing gage data.[44] As such, maintaining a pool level of 724.5 feet upstream of the project could inundate any wetlands and riparian habitat depending on the elevation and location of the wetland within the pool. At flows greater than 42,000 cfs, the crest gates would be lowered completely, pool elevation would match existing conditions, and wetland/riparian habitat would be submerged as they are now.

The palustrine forested wetland adjacent to the Fox Chapel Yacht Club is 2 miles upstream of the proposed project and is at an elevation of about 725.5 feet.[45] Considering this wetland's proximity to the proposed project, this wetland would not be inundated if the crest gates maintained a pool level of 724.5 feet at flows less than 42,000 cfs. The palustrine emergent wetland on Sycamore Island is at an elevation of 731.5 feet and would be well above any water surface elevation changes caused by the proposed operation of the crest gates. Because the crest gates would be fully lowered at higher flows (figure 2-1), the applicant's proposed operation of the crest gates should not change the frequency or duration of inundation of wetland habitat in the Allegheny Lock and Dam 2 pool. Therefore, any effects of changes in pool elevations should not affect wetlands upstream of the Allegheny Project.

Effects of Project Construction, Operation, and Maintenance on Botanical Resources

The applicant would construct a powerhouse, access road, parking lot, substation, and transmission line. Some areas in and adjacent to these proposed facilities would be temporarily disturbed by the staging of materials and equipment, as well as from construction activities such as excavation and road construction. These construction activities would involve removal of existing vegetation which could allow invasive plant species to spread or become introduced in disturbed areas. Invasive plant and noxious weed species are able to out-compete native species and displace them, thereby reducing biodiversity and altering compositions of existing native plant and animal communities.

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[44] When water surface elevation at USGS gage 03049680, immediately upstream of Allegheny Lock and Dam 2, is equal to 724.5 feet NGVD 29, water surface elevation at USGS gage 03049641 immediately downstream of C.W. Bill Young Lock and Dam is approximately 1.5-foot higher or 726.0 feet NGVD 29.

[45] Staff identified the elevation of this wetland from GoogleEarth and converted to the project elevation datum using the NOAA online NAVG 88 to NGVD 29 converter available at http://www.ngs.noaa.gov/cgi-bin/VERTCON/vert_con.pri.

To mitigate effects on existing plant communities, the applicant proposes to develop a transmission line corridor management plan that would: (1) include a protocol for trimming and removing vegetation in accordance with timing restrictions to protect sensitive wildlife species; (2) establish practices to prevent the establishment and spread of noxious or invasive weeds; (3) establish guidelines for revegetation activities in temporarily disturbed areas using native seeds; and (4) develop a protocol to train utility personnel about potential avian, terrestrial, and sensitive wildlife issues The applicant proposes to develop these plans after construction of the transmission line is complete.

Our Analysis

In total, about 1.92 acres of predominantly previously disturbed shoreline and deciduous forest habitats in the area of the proposed substation and parking areas would be disturbed. Construction of the project transmission line would disturb up to 0.15 acre of deciduous forest habitat along the proposed transmission line route (table 3-16).

Table 3-16. Areas of vegetation disturbance at Allegheny Lock and Dam 2 (Source: Rye Development, 2015a, staff).

Facility	Acres (length x width)	Riparian Forest	Grass	Disturbed	Water
Transmission line	1.02 acres (1,265 feet x 35 feet)	0.15	0.00	0.87	0.00
Access road	0.55 acre (850 feet x 28 feet)	0.28	0.00	0.27	0.00
Parking area	0.67	0.28	0.00	0.00	0.39
Rip rap	0.22	0.00	0.00	0.00	0.22
Substation	0.07	0.07	0.00	0.00	0.00
Powerhouse	1.02	0.00	0.00	0.00	1.02
Total	3.55	0.78	0.00	1.14	1.63

The establishment of early successional native vegetation, as part of the applicant's proposed transmission line corridor management plan, would help reintroduce native herbaceous forage and cover. Additionally, the applicant's proposal to incorporate BMPs to prevent the spread of invasive species into the transmission line corridor management plan would reduce effects of invasive plants in the corridor.

However, the areas surrounding the proposed powerhouse, substation, and access road would also be temporarily disturbed by the staging of materials and equipment, as well as from construction activities such as excavation and road construction. Vegetation

removal could allow invasive or noxious plant species to become established in all areas where construction activities occur. The applicant's plan would be more effective at minimizing impacts to botanical resources if it was expanded to include the entire project areas rather than just the transmission line corridor. Additionally, development of the plan prior to construction of the project would allow implementation of preventive measures to reduce impacts to botanical resources.

The applicant's proposal does not include a mechanism to monitor the effectiveness of the plan, or what actions to take if the plan is not successful. Further, the applicant's proposal does not include a schedule for reporting monitoring results to Pennsylvania DCNR, Pennsylvania Game Commission, FWS, the Corps, and the Commission, or a schedule for implementing the plan. To further reduce potential effects on botanical resources, an effective plan would include a monitoring program to evaluate the success of revegetation and invasive plant control efforts, including criteria that define when the measures are successful, a reporting schedule for filing monitoring results and progress reports with Pennsylvania DCNR, the Pennsylvania Game Commission, FWS, the Corps, and the Commission, and an implementation schedule.

The applicant's proposed measures to revegetate the transmission line corridor and control invasive plants, expanded into a project-wide vegetation management plan, developed prior to construction of the project, with the inclusion of a monitoring program to evaluate the success of revegetation and invasive plant control efforts, including criteria that define when the measures are successful and a reporting and implementation schedule, would reduce impacts to botanical resources, including the spread or introduction of invasive plants.

Effects of Project Construction, Operation, and Maintenance on Wildlife and Species of Special Concern

Construction of the proposed project facilities would primarily occur in previously disturbed areas, thereby limiting construction-related effects on terrestrial habitat. Land uses close to the proposed project, including the transmission line, are medium-density urban residential and industrial, and the proposed powerhouse would be established on lands managed and maintained by the Corps.

Our Analysis

The applicant would use heavy machinery to clear existing vegetation in preparation for construction of the powerhouse and other project-related facilities. Construction would also result in increased human presence within the project boundary as well as increased levels of noise and artificial lighting. The increase of activity in the project area could disturb local wildlife, resulting in an increased risk of nest and den abandonment for birds and small mammals depending on the season and interference with foraging. However, most of the habitat in the project area has previously been

disturbed or is currently developed, and much of the existing wildlife is tolerant of disturbance. Further, disturbance to most terrestrial habitats during operation of the proposed project would likely be minimal.

Avian Protection Plan

There are currently no known bald eagle nests in the proposed construction area; however, there are suitable trees for bald eagles or other raptors to use while foraging or roosting at the project. The proposed project would require some clearing of riparian trees along the Allegheny River, which could impact bald eagle habitat. Additionally, bald eagle and other raptors can come into contact with transmission lines and associated electrical structures during flight, foraging, roosting, and nesting. Mortality due to interaction with transmission lines and electrical structures has been noted since the 1900s. Raptors and other large-bodied birds may be at higher risk for collision or electrocution due to their large size, hunting strategies, and nesting preferences (APLIC, 2006).

To protect raptors from electrocution and collision with project power lines, the applicant proposes to develop an avian protection plan in consultation with the Pennsylvania Game Commission and FWS. Specifically, the applicant's proposed plan would be developed in accordance with the APLIC and FWS guidelines.[46] Measures to address future transmission facility maintenance activities would also be addressed in the plan. The avian protection plan would include the following provisions: (1) if a bald eagle or other target species is discovered within the project boundary, the applicant would notify the Pennsylvania Game Commission and FWS within 30 days of discovery; and (2) prior to any tree clearing within the project boundary or areas immediately adjacent to the project boundary, the area to be cleared would be surveyed for target species nests by project staff. If any such nests are discovered, the Pennsylvania Game Commission and FWS would be consulted prior to tree-clearing activities.

Our Analysis

The applicant's proposal to develop an avian protection plan following APLIC and FWS' National Bald Eagle Management guidelines would reduce potential effects on species of special concern such as bald eagles and other raptors during construction and operation of the proposed project.

[46] Staff assumes that the applicants are referring to the FWS's *National Bald Eagle Management Guidelines* (FWS, 2007).

Preparing the plan in accordance with the guidelines would also help to protect raptors from switchyard equipment interactions by ensuring: (1) adequate separation of energized conductors, ground wires, and other metal hardware; and (2) adequate insulation. In accordance with the guidelines, the plan would include a mechanism to monitor the effectiveness of the plan, or what actions to take if the plan is not successful; a schedule for reporting monitoring results to the Pennsylvania Game Commission, FWS, the Corps, and the Commission; and a schedule for implementing the plan.

Implementation of the proposed avian protection plan would ensure that adverse effects on bald eagles and other raptors would be avoided or minimized during construction, operation, and maintenance of the project.

3.3.4 Threatened and Endangered Species

3.3.4.1 Affected Environment

Aquatic Resources

In its letters filed April 20, 2015, and February 11, 2016, FWS indicates that the Allegheny River is inhabited by five mussel species federally listed as endangered—the northern riffleshell (*Epioblasma torulosa rangiana)*, the clubshell (*Pleurobema calva)*, the rayed bean (*Villosa fabalis)*, the snuffbox (*Epioblasma triquetra*), and the sheepnose (*Plethobasus cyphyus*)—and one federally listed as threatened, the rabbitsfoot (*Quadrula cylindrical cylindrica*).

Mussel surveys in the vicinity of the proposed project did not document any threatened or endangered species (Ecological Specialists, Inc., 2015). Furthermore, consultations with FWS indicate that no federally listed species occur in the vicinity of the project, given the nature of the existing habitat. In its letter filed April 20, 2015, FWS indicates that, based on a review of the survey data collected by Ecological Specialists, Inc. and their knowledge of mussel habitat in the Allegheny River reach near the proposed project, no federally listed mussels are found to inhabit the project area. Although no listed species likely occur in the vicinity of the project, we provide information on the above-listed species' habitat and occurrence, including in the Upper Ohio River drainage.

Northern Riffleshell

Northern riffleshell was federally listed as endangered wherever found on January 22, 1993, and FWS finalized a recovery plan on September 21, 1994 (Watters, 1994). No critical habitat has been designated for this species. Habitat requirements include packed sand and gravel in riffles and runs. The historical range of northern riffleshell included a more widespread distribution throughout the Ohio River drainage, and farther north in Michigan and Ontario, Canada, in the tributaries of Lake Erie, Lake St. Clair, and the

Detroit and St. Clair Rivers (Watters, 1994). Smith and Meyer (2010, as cited by Ecological Specialists, Inc., 2015) collected live northern riffleshell in the pool of Allegheny Lock and Dam 8, which is about 50 RM upstream of the proposed Allegheny Project. Known hosts include brown trout, mottled sculpin, banded darter, and bluebreast darter (FWS, 2008).

Clubshell

Clubshell was federally listed as endangered on January 22, 1993, and FWS finalized a recovery plan on September 21, 1994 (Watters, 1994). No critical habitat has been designated for this species. Habitat requirements include clean, coarse sand and gravel in runs, often just downstream of riffles. The species does not tolerate mud or slackwater and is very susceptible to siltation. Clubshell were historically common throughout the Ohio and Maumee River Valleys, but now are reduced to 21 streams and 7 reproducing populations (Roley, 2012). Smith and Meyer (2010, as cited by Ecological Specialists, Inc., 2015) collected live clubshell in the pool of Allegheny Lock and Dam 7, which is about 40 RM upstream of the proposed Allegheny Project. Weathered dead shells of clubshell have been reported from the Monongahela River (Clayton, 2012, as cited by Ecological Specialists, Inc., 2015). Host fish species include the central stoneroller, striped shiner, blackside darter, and logperch.

Rayed Bean

Rayed bean was federally listed as endangered wherever found on March 15, 2012. No recovery plan has been finalized or critical habitat designated for this species. Rayed bean are usually found in or near shoal or riffle areas, and in the shallow wave-washed areas of glacial lakes, including Lake Erie (FWS, 2012a). Rayed bean were historically distributed in more than 100 rivers, lakes, and streams across 10 states and Ontario, Canada. This species' range has been reduced to 31 streams and 1 lake across 7 states and Ontario. Smith and Meyer (2010, as cited by Ecological Specialists, Inc., 2015) collected live rayed bean in the pool of Allegheny Lock and Dam 6, which is about 30 RMs upstream of the proposed Allegheny Project. Potential fish hosts may include greenside darter, rainbow darter, mottled sculpin, and largemouth bass (FWS, 2012a).

Snuffbox

Snuffbox was federally listed as endangered wherever found on March 15, 2012. No recovery plan has been finalized or critical habitat designated for this species. Snuffbox was historically distributed across 210 streams and lakes in 18 states and Ontario, Canada. Current distribution is reduced to 79 streams in 14 states and Ontario, Canada. The species occurs in swift currents of riffles and shoals and wave-washed shores of lakes over gravel and sand with occasional cobble and boulders (FWS, 2012a). French Creek, a tributary that joins the Allegheny River in Franklin, Pennsylvania, about 115 RMs upstream of the proposed project, is known to support a snuffbox population

(Smith, 2004; Pennsylvania FBC, 2008). Juvenile snuffbox have successfully transformed on logperch, blackside darter, rainbow darter, Iowa darter, blackspotted topminnow, mottled sculpin, banded sculpin, Ozark sculpin, largemouth bass, and brook stickleback in laboratory tests (FWS, 2012a).

Sheepnose

Sheepnose was listed as endangered on March 13, 2012. Critical habitat has not been proposed or designated for this species, and no recovery plan has been published to date. Sheepnose occur in large rivers in shallow shoal habitat with moderate to swift currents over coarse sand, gravel, and mud, cobble, and boulder substrate. Historically, sheepnose occurred in the Mississippi, Ohio, Cumberland, and Tennessee River Systems and their tributaries. However, its current distribution is only approximately one-third of its historical range. In the Allegheny River, this species has historically been found in the pools of Locks and Dams 5 through 8, and more recently near Oil City, Pennsylvania (Pennsylvania FBC, 2008). The historic populations in pools 5 through 8 have been extirpated (FWS, 2012b). Population declines are primarily the result of habitat loss and degradation due to impoundment, channelization, chemical contaminants, mining, and sedimentation. Hatchery tests for fish hosts have successfully transformed sheepnose glochidia on fathead minnow, creek chub, central stoneroller, and brook stickleback. Sauger is also suspected to be a host species based on field observations (FWS, 2012b).

Rabbitsfoot

Rabbitsfoot was federally listed as threatened wherever found on October 17, 2013. No recovery plan has been published yet. FWS proposed critical habitat that includes a portion of the Allegheny River from the Interstate-80 bridge in Emlenton, Pennsylvania, upstream to the mouth of the French Creek tributary, on October 16, 2012 (FWS, 2012c); this habitat was finalized on April 30, 2015 (FWS, 2015b). This designated critical habitat in the Allegheny River is approximately 80 RM upstream of the proposed Allegheny Project. The historic range of rabbitsfoot included 140 streams within the lower Great Lakes Subbasin and the Mississippi River Basin. Rabbitsfoot primarily inhabit small to medium-sized streams and some larger rivers. It usually occurs in shallow water areas along the bank and adjacent runs and shoals with reduced water velocity. Specimens also may occupy deep water runs, having been reported in 2.7 to 3.7 m (9 to 12 feet) of water. FWS estimates that the species has been extirpated from 64 percent of its historic range and that only 22 percent of the extant population is viable (FWS, 2012c). Blacktail shiner, cardinal shiner, red shiner, spotfin shiner, bluntface shiner, rosyface shiner, striped shiner, emerald shiner, and rainbow darter are host species for rabbitsfoot (FWS, 2013; Fobian, 2007).

Terrestrial Species

FWS' Species Search website indicated that the Indiana bat (*Myotis sodalis*) and the northern long-eared bat (*Myotis septentrionalis*), are known to occur in Allegheny County where the project is located. Neither bat species was observed during general habitat surveys at the project.

Indiana Bat

The Indiana bat is a migratory species found throughout much of the midwestern United States, hibernating colonially in caves, mines, and other underground areas (hibernacula) through the winter. The non-hibernation season (April 1 through November 15) includes spring emergence and migration, summer reproduction in maternity roosts, and fall migration, swarming, and mating. Summer foraging habitats are generally defined as riparian, bottomland or upland forest, old fields or pastures with scattered trees, and small ponds or streams. Roosting/maternity habitat consists primarily of live or dead hardwood tree species which have exfoliating bark that provides space for bats to roost between the bark and the bole of the tree. Tree cavities, crevices, splits, or hollow portions of tree boles and limbs also provide roost sites for this species.

The Indiana bat was federally listed in 1967 and classified as an endangered species in 1973. Threats to Indiana bats include human disturbance in hibernacula, such as gates or other structures that exclude people from caves and mines, and summer habitat loss and degradation (FWS, 2013). FWS designated critical habitat for the Indiana bat on September 24, 1976. It consists of 11 caves and two mines in six states: Illinois, Indiana, Kentucky, Missouri, Tennessee, and West Virginia. There is no designated critical habitat for the Indiana bat in Pennsylvania.

Northern Long-Eared Bat

The northern long-eared bat was listed as federally threatened on April 2, 2015. It is distinguished by its long ears, is a medium-sized nocturnal bat ranging from 3 to 3.7 inches in length and possessing shades of brown fur. Traditional ranges include most of the central and eastern United States, as well as the southern and central provinces of Canada, coinciding with the greatest abundance of forested areas. Similar to the Indiana bat, northern long-eared bat foraging habitat includes forested hillsides and ridges and small ponds or streams, and it typically feeds on moths, flies, and other insects. Northern long-eared bats are typically associated with large tracts of mature, upland forests with more canopy cover than is preferred by Indiana bats. Northern long-eared bats seem to be flexible in selecting roosts, choosing roost trees based on suitability to retain bark or provide cavities or crevices, and this species is known to use a wider variety of roost types than the Indiana bat. Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat has also occasionally been found roosting in structures like barns and sheds.

As with Indiana bats, northern long-eared bats use caves or mine portals for winter hibernation between November 15 and March 31. These species also use the hibernacula and the areas around them for fall-swarming and spring-staging (August 15 to November 14 and April 1 to May 14, respectively). Some males have been known to stay close to the hibernacula during the summer and may use the hibernacula as summer roosts. There may be other landscape features bats use during the winter that have yet to be documented. No critical habitat has been designated for the northern long-eared bat.

The northern long-eared bat incurs a process of delayed fertilization. Reproduction is limited to one pup a year in late spring, and as such, bat populations can be slow to rebound from anthropogenic and naturally occurring mortality events. Historically, some bat populations have been negatively affected by degradation or loss of habitat, and exclusion from caves and related human disturbance affecting hibernacula. Most recently, white-nose syndrome has caused the dramatic decline of the northern long-eared bat population with death rates for infected bats reaching 90 to 100 percent (FWS, 2014, 2016).[47]

White-nose syndrome was first observed in New York in 2006 and has since spread throughout the Northeast to the Midwest. Within the past several years, federal and state wildlife agencies have taken measures to protect hibernacula through signage, closures, and other means. FWS most recently finalized 4(d) rules for this species in January 2016, focusing on preventing effects on bats in hibernacula associated with the spread of white-nose syndrome and effects of tree removal on roosting bats or maternity colonies (FWS, 2016). In the recent rule, FWS proposes that take incidental to certain activities conducted in accordance with the following habitat conservation measures, as applicable, would not be prohibited (i.e., excepted from the prohibitions): (1) occurs more than 0.25 mile (0.4 kilometer) from a known, occupied hibernacula; (2) avoids cutting or destroying known, occupied maternity roost trees during the pup season (June 1–July 31); and (3) avoids clearcuts within 0.25 mile (0.4 kilometer) of known, occupied maternity roost trees during the pup season (June 1–July 31).

3.3.4.2 Environmental Effects

Freshwater Mussels

Currently, no populations of listed mussel species are known to occur in the project area. As with the non-listed mussels, potential construction-related effects

[47] White-nose syndrome is a fungal infection that agitates hibernating bats, causing them to rouse prematurely and burn fat supplies. Mortality results from starvation or, in some cases, exposure.

include direct mortality during cofferdam placement and excavation, elevated turbidity from erosion and sedimentation, and disturbances to substrate from the construction of a new discharge point for the project tailrace. Potential operational effects include changes to the cross-sectional flow pattern, which could redistribute substrate and decrease habitat suitability. Also, diverting flow that now passes over the dam crest to the turbines could reduce DO concentrations immediately downstream during operations.

The applicant does not propose any specific measure to mitigate potential effects on federally listed mussel species.

The Corps states that, prior to any construction or drawdown activities, the footprint of the powerhouse and any dewatered areas in the cofferdam footprint should be surveyed to determine the presence or absence of federally listed species. The Corps also states that a contingency plan to either relocate or avoid federally listed mussel species would be necessary to avoid impacts if any are identified. In Interior's letter filed February 11, 2016, FWS recommends consultation regarding potential impacts on federally listed freshwater mussel species at any project where such species are documented as occurring within the project's potentially affected area.

Our Analysis

In its letters filed April 20, 2015, and February 11, 2016, FWS indicates that the Allegheny River is inhabited by five federally listed endangered and one threatened species of mussels. However, no federally listed mussel species were encountered at the proposed project during the applicant's 2013 mussel surveys (Ecological Specialists, Inc., 2015) that were conducted in the immediate vicinity of the proposed construction footprint. The applicant's PNDI review on March 4, 2015 (filed on September 15, 2015), indicates further review with FWS was required. In a letter filed on April 20, 2015, FWS indicates that it reviewed the applicant's PNDI results as well as the applicant's mussel survey report and concluded that implementation of the proposed Allegheny Project was not likely to affect federally listed mussels because they are not found to inhabit the project area. Hart (2012) also did not find federally listed mussels during surveys of the Ohio River's Emsworth pool, which extends upstream into the lower Allegheny and Monongahela Rivers. A recent survey near Hulton Bridge in the pool about 6 RMs upstream of Allegheny Lock and Dam 2 yielded 15 live mussel species, but no federally or Pennsylvania state-listed species (Enviroscience, 2008). Other studies reported the occurrence of listed species farther upstream in the Allegheny River in pools 6, 7, and 8 (Smith and Meyer, 2010, as cited by Ecological Specialists, Inc., 2015), but these species occur a minimum of 30 to 50 RMs upstream from the proposed project. As such, it would be unnecessary to conduct additional mussel surveys or to prepare a contingency plan, as recommended by the Corps, because no federally listed species have been documented in the vicinity of the project. Based on the above, we conclude that

construction and operation of the project would have no effect on federally listed endangered or threatened mussels.

Indiana Bat and Northern Long-eared Bat

Project construction and operation could affect the Indiana and northern long-eared bats if the authorized actions resulted in the removal of suitable roosting and foraging habitat or the disturbance of bat hibernacula.

Our Analysis

Neither bat species was observed during general habitat surveys at the project. Further, the PNDI report correspondence from FWS does not identify any known effects for either bat species and indicates that no further review is required.

The project would disturb less than 1 acre of poor quality riparian forest. However, because the project site is highly industrialized and disturbed, the riparian forest adjacent to the project is unlikely to support roosting or foraging habitat for either species. The project is also more than 10 miles from known hibernaculum and not near any known maternity roosts or summer detection sites. Therefore, construction and operation of the project would have no effect on the Indiana bat or northern long-eared bat or their habitat.

3.3.5 Recreation and Land Use Resources

3.3.5.1 Affected Environment

Regional Recreation

Recreational opportunities in the region include powered and non-powered boating, fishing, swimming, camping, hiking, biking, hunting, and wildlife watching. Tributaries and nearby lakes provide water-based opportunities similar to those available on the Allegheny River. Land-based opportunities exist at 24 state parks, 4 state forests, 2 state game lands, and 3 wildlife areas located in the southwestern Pennsylvania region (Google Earth, 2015). There are also two large county parks within Allegheny County: Hartwood Acres Park, approximately 5.5 miles north of the project, and Boyce Park, approximately 9 miles east of the project. Both parks provide recreational amenities which include a summer concert series, mansion tours, an off-leash dog area, cross-country skiing, walking, hiking and bridle trails at Hartwood Acres Park; and skiing and snowtubing, ballfields, a wave pool, trails, a skate park, archery range, shelters and a nature center at Boyce Park (Allegheny County, 2016a, b).

There are five water trails and two major walking and biking trails in the southwestern Pennsylvania region (Pennsylvania FBC, 2011). Water trails include:

Clarion River Water Trail at the Confluence of East and West Branch Clarion Rivers to Parker Bridge in Pennsylvania; Kiski-Conemaugh River Water Trail from Johnstown, Pennsylvania, to Freeport, Pennsylvania; Middle Allegheny River Water Trail from Kinzua Dam to Emlenton, Pennsylvania; Three Rivers Water Trail from Freeport, Pennsylvania, to Pittsburgh, Pennsylvania; and Youghiogheny River Water Trail from Connellsville, Pennsylvania, to McKeesport, Pennsylvania. Multi-use trails near the project include the Three Rivers Heritage Trail and the Highland Park Trail. Federal lands in the region include Allegheny National Forest, approximately 80 miles northeast of the project in Pennsylvania; and Friendship Hill National Historic Site, approximately 50 miles south of the project in Pennsylvania.

The numerous locks and dams of the Allegheny River ensure its navigability from Raymond, Pennsylvania, to its confluence with the Monongahela River in Pittsburgh, Pennsylvania. Locks along the Allegheny River are designed and operated for year-round commercial navigation, and recreational boaters may lock through each of its locks; however, there are some seasonal restrictions.

The Allegheny River provides opportunities for recreational boating without the horsepower restrictions that occur on sections of its tributaries (e.g., speed limits that limit opportunities such as water skiing). For the past ten years, Allegheny County has had the highest number of registered boats in Pennsylvania, averaging about 27,000 registered boats per year (Pennsylvania FBC, 2011). The Allegheny River is also recognized for its recreational fishing opportunities, both from shore and from boats. Allegheny County, located at the confluence of the Allegheny and Monongahela Rivers, and the beginning of the Ohio River, repeatedly has the highest number of fishing license sales in the state (Pennsylvania FBC, 2011). Smallmouth bass, walleye, catfish, carp, and sauger are commonly sought within Allegheny County (ORSANCO, 2015).

Recreation at the Project

Recreational facilities and use within the proposed project boundary are limited to informal shoreline angling opportunities along the retaining wall in the tailwater of the existing dam, primarily because of the industrialized nature of the surrounding land use (i.e., active railroad infrastructure), which limits public access to the shoreline in the general area. However, recreational use in the project vicinity also includes recreational boating, which consists of fishing and water skiing.

The Allegheny Lock and Dam 2 is located at RM 6.7 on the Allegheny River between the boroughs of Sharpsburg and Aspinwall, Pennsylvania (see figure 1-1) and is bisected by the Three Rivers Water Trail. The Corps operates the lock on the south side of the dam, and recreational boaters may lock through year-round, although seasonal hourly restrictions apply. The Corps reports approximately 5,000 to 6,000 total lockages per year.

Sections of the mixed-use Three Rivers Heritage Trail could be constructed along both shorelines adjacent to Allegheny Lock and Dam 2; however, no sections of trail currently exist at the dam. The closest section of the Three Rivers Heritage Trail exists on the north side of the river approximately 0.75 mile upstream of the dam (Friends of the Riverfront, 2016). Highland Park, a nearby public park located to the south of the Corps' lock facilities, offers various recreation amenities including walking trails, swimming pool, bicycle track, volleyball courts, and playground equipment (Pittsburgh Parks Conservancy, 2016).

Although boating and other recreational activity is popular in the area, recreational use in the immediate vicinity of the proposed project consists primarily of shoreline fishing near the dam, occurring most frequently in the summer when walleye, smallmouth bass, and sauger are prominent. Formal fishing access is provided on the southern shore, immediately upstream of the lock facilities. An informal fishing area exists downstream of the locks on the south shore. This informal fishing area is connected to the Corps' parking lot via an informal access path around the Corps' gated facilities. Informal fishing is also popular downstream of the dam at a small gravel bar on the north bank and is accessed via the 23rd Street tunnel.[48] In addition, some anglers could access the informal fishing area through the Silky's Crows Nest Marina, which is located about 0.2 mile downstream of the dam and the informal fishing area on the north bank of the river.

Silky's Crows Nest Marina offers a fee-accessed boat ramp and docks and is the closest formal recreation access point to the proposed project. There are three other private and fee-accessed boat ramp and shoreline fishing facilities nearby, located at Sharpsburg Islands Marina (approximately 0.86 mile downstream on the north bank), Aspinwall Marina (approximately 0.5 mile upstream on the north bank), and Brilliant Boat Club (approximately 0.64 mile upstream on the south bank) (Google Earth, 2015). The private Allegheny River Boat Club is approximately 4 miles upstream of the proposed project, and offers similar facilities as the nearby marinas. Designated parking for shoreline anglers exists on the south side of the Allegheny River along the access road to the Corps' lock house. Picnicking occurs on the north shore near the dam, although no formal picnic structures are present. Campground facilities are not present in the vicinity of the proposed project.

[48] The 23rd Street tunnel is a culvert that passes flow of a nearby stream (Guyasuta Run) under the existing railway line and into the Allegheny River approximately 300 feet downstream of the dam.

Land Use

Land use in the lower Allegheny River Basin is predominantly forestland. Deciduous forests comprise 57 percent of all land cover, followed by agricultural lands at approximately 18 percent, and urban at just over 7 percent (Homer et al., 2015). The dominant land use in proximity to the proposed project, including the transmission line, however, is urban with medium-intensity residential and industrial development with vacant lands along the north shore near the dam abutment.

The proposed project site is located along the north shore of the Allegheny River where the dam abutment meets the shoreline. This area is at the toe of a vegetated slope, above which is now a vacant industrial site and a double set of railroad tracks; both of which separate the community of Sharpsburg from the river. Recently, Riverfront 47, LP, a property development group, acquired the lands on the north shore of the river with a goal to develop a mixed-use waterfront complex that would include public green space and other amenities.

No portion of the lower Allegheny River Basin is included in the list of wild and scenic rivers. However, Interior named the Three Rivers Water Trail a National Recreation Trail in 2010.

3.3.5.2 Environmental Effects

Effects of Project Construction and Operation on Recreation

The applicant filed a recreation resource management plan for the Allegheny Project on September 15, 2015 (Rye Development, 2015c) that characterizes recreational opportunities in the vicinity of the dam. The plan contains provisions to minimize or mitigate project-related construction effects on recreational resources during construction and over the term of a future license. The applicant proposes to construct: (1) a 42-foot-long, 10-foot-wide, concrete fishing platform adjacent to the project's tailrace on the north river bank; (2) a 5-foot-wide accessible ramp with an asphalt surface leading from the fishing platform to a parking area with six parking spaces designated for recreational users; and (3) a portable, accessible restroom on top of an 8-x-8-foot concrete pad adjacent to the parking area and ramp. During project construction, shoreline access would be restricted at the site of the proposed powerhouse.

In its letter filed March 4, 2016, the Corps states that the applicant does not adequately address effects on recreation and does not provide sufficient mitigation measures. The Corps requests that the applicant assess recreational effects and propose mitigation measures that include alternatives for boating, hiking, and fishing. In its letter filed February 19, 2016, Pennsylvania FBC states that access to the shore near the powerhouse would be significantly reduced with power development, and requests a study of the potential loss of angler access and use with the addition of power facilities,

recommending mitigation if angler use is diminished. In its letter filed February 15, 2016, Riverfront 47, LP expresses concern regarding the proposed project's effects on its plans for developing the riverfront and suggests that the effects on aesthetic, recreational, and cultural resources be fully evaluated.

Our Analysis

During project construction, shoreline access would be restricted at the site of the proposed powerhouse. The existing informal shoreline angling area at the informal fishing area (gravel bar on the north bank) would be lost with construction of the powerhouse and parking area. However, the applicant's proposed measures, illustrated in figure 3-6, would enhance the existing recreational opportunities available at the project. The proposed tailrace fishing platform would be an improvement over the existing informal access through the 23rd Street tunnel, and an accessible/barrier-free design would allow a greater number of users to recreate on site. Parking facilities and accessible restrooms would increase recreational access and public enjoyment of the area.

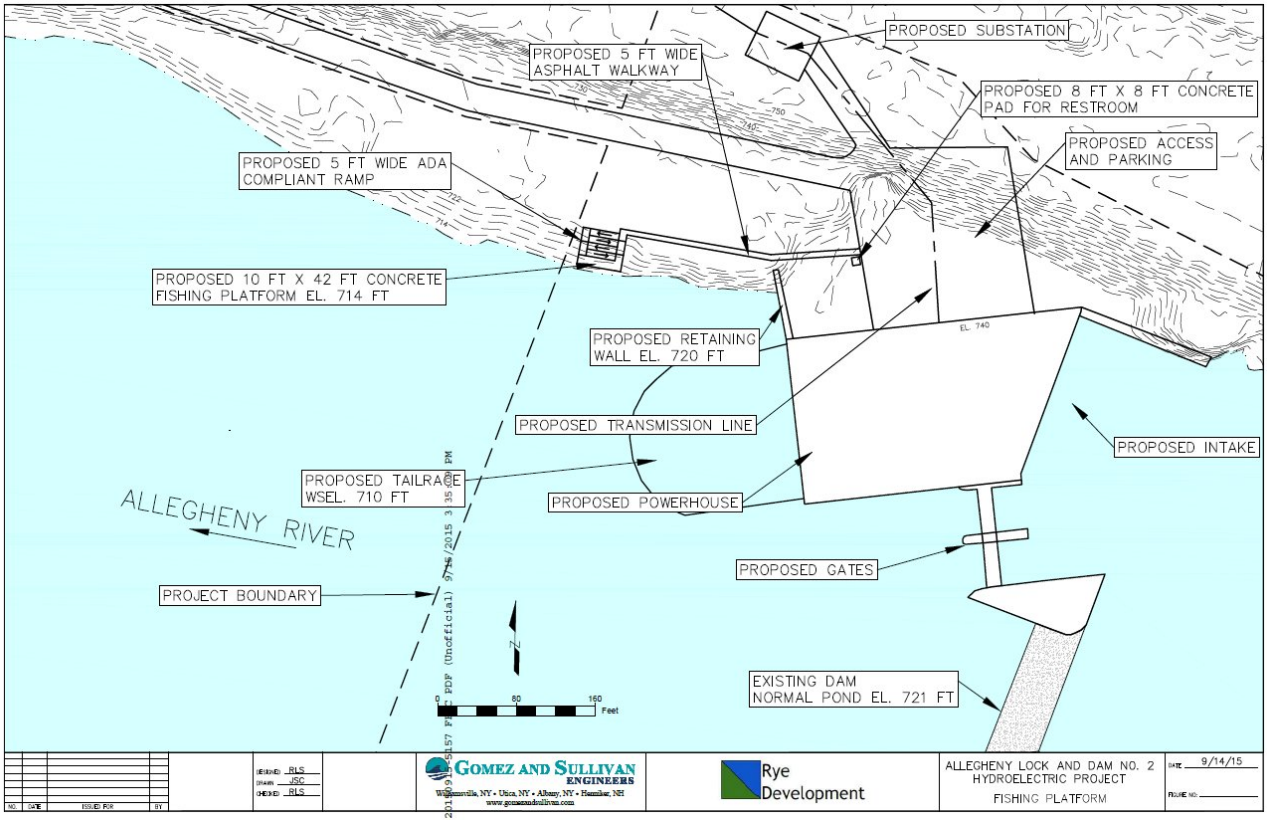

Figure 3-6. Recreation enhancement conceptual design plans (Rye Development, 2015c).

Along the southern shore of the Allegheny River, project construction activities would not directly impact existing shoreline angling or other developed recreational resources (e.g., Highland Park), because these recreational facilities are outside the

proposed area of disturbance. The existing shoreline angling opportunities including the shoreline fishing areas upstream and downstream of the lock, the docks at Silky's Crows Nest Marina, and other nearby marinas would be available to meet any angling demand temporarily displaced during project construction. In addition, boaters using the Three Rivers Water Trail would continue to have unrestricted access to lock through the dam during project construction. Informal picnicking near the dam would be permanently displaced by project construction because picnicking occurs within the construction footprint of the project. Considering the applicant's proposed recreation measures and the availability of nearby recreation facilities, no further study of angler access or recreation use, as requested by the agencies, would be required to mitigate project-related effects.

Riverfront 47, LP's mixed-use development, the 47 Acres Project, is a plan for the vacant lands adjacent to the proposed powerhouse area that could improve existing recreation amenities and use in the area, but Riverfront 47 LP has not filed specific plans to date. Therefore, we are unable to evaluate potential project-related effects on the 47 Acres Project.

Project operation would not directly affect any existing public access to shoreline fishing or other developed recreational resources on the southern shore of the Allegheny River. However, during regular operation, a portion of the water that previously passed over the dam crest would now pass through the project turbines. The outflow of the proposed tailrace may improve the quality of angling in this area, as fish tend to be attracted to the moving water from hydropower tailraces. The change in hydraulic flow patterns is not likely to have a significant impact on recreational boating immediately downstream of the dam, because the downstream Emsworth Locks and Dam holds the river elevation stable for navigation. Although flow patterns immediately downstream of the dam and powerhouse would change, these changes are likely to be modest and boaters are not likely to experience changes in river depth or a reduction in boat angling opportunities.

Land Use

The project would require construction of a new powerhouse and transmission line that connects the proposed substation to the local utility distribution lines. Construction could cause a temporary, localized disruption of existing land use in the immediate vicinity of the project.

The applicant proposes to incorporate measures to minimize disruptions to existing land use into their final construction plans, but have not specifically described any PM&E measures related to land use.

In its letter filed March 4, 2016, the Corps expresses concern that the proposed pool elevation change, caused by the operation of the crest gates, could have an effect on

property along the pool upstream of Allegheny Lock and Dam 2. As described previously, Riverfront 47 LP also expresses a general concern that construction of the project would impact its potential development plans for adjacent lands.

In email correspondence filed June 29, 2016, the Corps expresses concern regarding potential project effects on the ordinary high water mark and riparian land use.

Our Analysis

Construction of the Allegheny Project would occur on or adjacent to industrial lands, most of which are currently vacant. A portion of the transmission line would cross the existing railroad tracks at 19th Street and extend into a small portion of urban land where it would connect to an existing distribution line. Given the industrial/urbanized nature of the surrounding land use, construction of the proposed project would be consistent with existing use in the surrounding area.

Active construction and staging of materials would likely block access to recreational opportunities in the immediate area of the proposed project during the construction period. However, construction of a new fishing platform at the tailrace and parking spaces for recreational users would improve recreational use after construction is complete.

Although we acknowledge Riverfront 47 LP's concerns, its potential plans for development and land use in or adjacent to the project area are unclear. Similar to our previous analysis, we are unable to evaluate potential project-related effects on Riverfront 47, LP's land use as no plans have been filed with the Commission.

Operation of the project, including the proposed crest gate operation, would raise water levels in the pool upstream of the dam up to about 1.5 feet relative to existing conditions when river flow is less than 42,000 cfs, and to a much lesser extent (i.e., about 0.1 foot) at flows above 120,000 cfs. As discussed in sections 3.3.2.2, *Aquatic Resources*, and 3.3.4.2, *Terrestrial Resources*, additional lands along the dam's pool would become inundated at lower flows relative to current conditions, but water levels would not be substantially affected by the project at higher flows (i.e., above 42,000 cfs). The existing ordinary high water mark in the Allegheny Lock and Dam 2 pool occurs at 727.7 to 732.0 feet depending on the location within the pool (Corps, 2004). Although some additional lands would be inundated at lower flows relative to existing conditions, the overall change in water level is within the normal water level fluctuations that now occur, and existing properties are likely designed to accommodate pool levels within the applicant's proposed normal operating range (up to elevation 724.5 feet at flows less than 42,000 cfs). Thus, the ordinary high water mark, property, and infrastructure that exists along the shoreline of the dam's pool, including boat docks and industrial sites, would not be affected by the pool level changes.

The project boundary shown in the Exhibit G drawings filed with the license application incorporate more land and Corps' facilities than needed to operate and maintain the project, thereby potentially affecting land use in an area that is larger than necessary. Exhibit G drawings should include only the principal project works necessary for operation and maintenance of the project, including any recreational facilities.

3.3.6 Aesthetic Resources

3.3.6.1 Affected Environment

The proposed project would be constructed on lands owned and maintained by the Corps. The dam is located on the Allegheny River in a developed area, bordered on its south bank by Pittsburgh, Pennsylvania, and on its north bank by Sharpsburg, Pennsylvania. Railroad tracks separate the shoreline from the urban environment. The visual landscape in the project area is defined by the former industrial developments of Pittsburgh. The main aesthetic features within the vicinity of the proposed project are the existing lock and dam (built in 1932-1934), the Highland Park Bridge, and the neighboring deciduous forests of Highland Park located about 0.15 mile south of the Corps' lockhouse. Allegheny Lock and Dam 2 is near a collection of islands that offer some additional forestland, wildlife viewing, and an array of recreational opportunities in the project area. Islands closest to the project area are Sixmile Island, located about 0.25 mile downstream of the dam, and Sycamore Island, located about 3 miles upstream of the dam.

3.3.6.2 Environmental Effects

Construction effects are likely to be visible to the majority of viewers at Silky's Crows Nest Marina, from the Highland Park Bridge, and across the river on the shoreline near the lock facilities; viewers farther from these locations would not experience significant visual effects. Following project construction, facilities including the powerhouse and transmission conveyance system, as well as the new crest gates, would be visible to recreational boaters and shore-based recreationists. The applicant proposes to conduct post-construction site restoration to preserve the current aesthetics at those areas temporarily affected by construction.

Both man-made trash and organic debris would continue to pass over the Corps' dam during construction. However, during regular operation, water would be drawn through the powerhouse, and debris would concentrate and build up against the trash rack. The applicant proposes to remove and properly dispose of any non-organic debris or trash that is collected during trash rack cleaning.

Riverfront 47, LP expresses concern that the proposed project would have an adverse effect on neighboring aesthetics, both during and after project construction. The

47 Acres Project is currently in the process of designing recreational facilities along the waterfront area.

The applicant proposes to provide year-round bypass flows over the dam to provide aeration and to preserve aesthetic conditions.

Our Analysis

Project construction would require the use of machinery and equipment and would increase vehicular traffic at the site. Increased truck traffic, the presence of construction equipment, and the production of dust would create visible nuisances for people in proximity to the site. Proposed construction equipment would produce noise levels between 84 and 90 decibels within 50 feet. The noise associated with powerhouse, transmission line, and associated facilities construction would likely increase noise levels at the adjacent Silky's Crows Nest Marina located only 0.2 mile from the project. Although construction may disrupt both audio and visual resources in the project vicinity, these effects would be temporary and minimal, because project-related construction activities would be comparable to ongoing industrial activities in the vicinity of the project. Restoring the landscape after construction is complete, as the applicant proposes, would ensure that the existing visual character is maintained and/or improved.

Aesthetics of the project area would be altered by diversion of flow through the powerhouse, which would reduce the volume of flow spilling over the dam, and by operation of the crest gates, which would increase the elevation of the upstream pool elevation when river flows are less than 42,000 cfs, which occurs about 88 percent of the time. The greatest change in the upstream pool elevation, generally up to a 1.5-foot increase, would occur at flows less than 21,800 cfs, when the crest gates would be in the full upright position. As flows increase from 21,800 to 42,000 cfs, the crest gates would be incrementally lowered, reducing the effect on upstream pool levels. The proposed increase in water levels upstream of the dam may cause the upstream river flow to appear greater relative to existing conditions, but water levels would still be well below the ordinary high water line and would not be substantially different than existing water levels.

When the powerhouse is operating, the volume of flow passing over the dam would be reduced by up to 18,000 cfs, which is the maximum flow that would be diverted through the powerhouse. The applicant's proposal to provide year-round bypass flows would maintain a veil of water passing over the crest gates, which would minimize aesthetic effects to people viewing the dam from downstream. If no bypass flows are provided, no water would pass over the crest gates when flows are less than the hydraulic capacity of the powerhouse. These conditions would typically occur from June through October. The lack of flow over the dam would eliminate the visual appeal of having a

veil of water passing over the dam, which would cause the dam and crest gates to be visible from locations downstream of the dam.

The volume of water that would be required to maintain an aesthetically appealing veil of water over the dam could be determined by conducting an aesthetic flow study, in which participants would judge the aesthetic appeal of a range of flow volumes passing over the dam. Such a study could be used to establish a bypass flow that would minimize any adverse effects associated with the operation of the project. However, we note that the project would only operate off of flows made available to it by the Corps (i.e., run-of-release). Any flows that are "bypassed" through the spill gates or over the dam crest would be at the sole discretion of the Corps and could not be enforced by a license requirement.

The river elevation and shoreline conditions associated with the operation of the proposed project would not be altered significantly from current conditions but could have an adverse impact on the waterfront views near the 47 Acres Project. The applicant's continued consultation with Riverfront 47, LP would ensure that project operation has minimal effect on views from facilities at the 47 Acres Project. The new powerline connecting to the new switchyard would be present, but would largely be placed along existing structures, which would minimize any significant contrasts with the existing utility poles and train tracks at the site.

In addition, in its HPMP, the applicant proposes to design project facilities with low profiles and to blend any new facilities with their surroundings to the extent possible (as discussed in the following section); however, the applicant has not provided details on how this would be accomplished. Revising the HPMP, in consultation with the Corps and the Pennsylvania SHPO, would minimize effects on the surrounding landscape and reduce the visual effect of project facilities on adjacent recreation sites. Also, constructing the proposed powerhouses and other project facilities with materials that blend with the existing architecture and colors would make the project structures less visually and aesthetically disruptive to viewers including Riverfront 47, LP. Furthermore, the applicant's proposal to restore the landscape after construction would ensure effects on aesthetics and historic properties are minimized and could be included in the HPMP.

The presence of trash and other debris, especially when concentrated behind dams, can affect the visual character of the river. Disposing of trash collected during trash rack cleaning would improve the existing visual conditions. However, it is unclear what specific kinds of debris would be passed downstream or removed from the river, whether the applicant intends to temporarily store trash on-site, or how often debris would be removed from the project. Therefore, development of a debris management plan, in consultation with the Corps and Pennsylvania FBC that includes the applicant's proposed measure to separate and remove trash from the river would ensure that debris is sorted,

stored, and disposed of appropriately. A debris management plan could include, but not be limited to, the following provisions: (1) procedures for separation of organic and inorganic trash; (2) procedures for any storage and off-site disposal of inorganic material; (3) procedures for reintroducing organic debris collected on the trash rack to the Allegheny River downstream of the dam, as appropriate; and (4) an implementation schedule.

3.3.7 Cultural Resources

3.3.7.1 Affected Environment

Section 106 of the NHPA requires the Commission to evaluate potential effects on properties listed or eligible for listing in the National Register prior to an undertaking. In this case, the undertaking is the issuance of an original license for the proposed project. Project-related effects could be associated with the construction, operation, and maintenance of the proposed project.

Historic properties are defined as any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. Traditional cultural properties are a type of historic property eligible for the National Register because of their association with cultural practices or beliefs of a living community that are: (1) rooted in that community's history, or (2) important in maintaining the continuing cultural identity of the community. In this EA, we also use the term cultural resources to include properties that have not been evaluated for eligibility for listing in the National Register. In most cases, cultural resources less than 50 years old are not considered eligible for the National Register.

Section 106 also requires that the Commission seek concurrence with the Pennsylvania SHPO on any finding involving effects or no effects on historic properties and allow the Advisory Council on Historic Preservation (Advisory Council) an opportunity to comment on any finding of effects on historic properties. If Native American properties have been identified, section 106 requires that the Commission consult with interested Native American tribes that might attach religious or cultural significance to such properties.

On October 2, 2012, the Commission designated FFP Missouri 12 as the non-federal representative for carrying out day-to-day consultation regarding the licensing efforts pursuant to section 106 of the NHPA. However, the Commission remains largely responsible for all findings and determinations regarding the effects of the proposed project on any historic property, pursuant to section 106.

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 license for the proposed Allegheny Project within the project's APE. According to the Advisory Council's regulations, an APE 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" (36 CFR § 800.16(d)) (2014).

The APE for the project includes: (1) all lands within the proposed project boundary (as described in section 2.2.3, *Proposed Project Facilities*, and depicted in figure 1-2); and (2) lands outside the project boundary where project construction and/or operation may affect historic properties. FFP Missouri 12's HPMP filed on September 29, 2015, contains a brief description and map of the project APE. In the description, two APEs are identified: one for above-ground structures and one for archaeological resources where project-related ground disturbance would occur. As discussed in the HPMP, the APE for above-ground structures extends beyond the proposed project boundary, while the APE for archaeological resources is described or depicted as contained within the project boundary. In a letter attached to the HPMP,[49] the Pennsylvania SHPO concurs with the definition of the APE for the project.

Cultural History Overview

The following discussion of the cultural context of the project is adapted from the HPMP for the proposed project (Barrett and Burr, 2015).

Prehistoric occupation of the Allegheny River Basin is generally divided into four temporal periods: (1) the Paleoindian period (prior to 8,000 B.C.); (2) the Archaic period (8,000-1,000 B.C.); (3) the Woodland period (1,000-1,600 A.D.); and (4) the Protohistoric period (1,600-contact). The Archaic and Woodland periods are commonly subdivided into early, middle, and late periods. The Paleoindian period is characterized by highly mobile bands of hunter-gatherers traversing the landscape in search of food and high-quality stone tool material. Paleoindian archaeological sites are often identified by the presence of distinctive fluted projectile points called Clovis points. In the Upper Ohio Valley, the Paleoindian period begins with Clovis points, but projectile points change over the course of the period. Archaeological sites from this period are generally rare because of their age and ephemeral nature. The Meadowcroft Rockshelter in

[49] The May 18, 2015, correspondence was included in the HPMP filed on September 29, 2015.

Washington County, Pennsylvania, not only dates to the Paleoindian period but may be the earliest documented occupation of North America.

The Archaic period is characterized by a change in subsistence strategy as people began relying on smaller game and increased their reliance on plant materials. This shift is often considered a response to changes in climate and environmental conditions. Changes in subsistence sources required different tool technologies; projectile points became smaller, and tools associated with plant collection and processing begin to appear in the archaeological record. Although the Archaic period is not well understood in this region, archaeological sites dating to this period have been found in the Ohio River Basin. Archaeological evidence indicates that population increased as people moved to exploit different resources.

The shift to the Woodland period is commonly marked by the development of horticulture and appearance of ceramics. Woodland peoples used uplands and smaller streams more frequently than their Archaic ancestors, and their habitation sites, commonly located along floodplains, tended to be more permanent. Increasing sedentism went hand in hand with the adoption of horticulture, which required people to tend their growing plants. However, hunting and gathering subsistence activities continued, and in some areas may have increased. By the end of the Woodland period, people were predominantly relying on agriculture, including maize cultivation, supplemented by hunting and gathering. Changes in burial patterns, the construction of mounds, and material culture suggest developments in ceremonialism and social complexity during this period.

Little is known about the Protohistoric period (seventeenth century) in southwestern Pennsylvania. Captain Henry Fleet commanded an expedition to the headwaters of the Potomac and encountered indigenous settlements, but the expedition did not enter the project APE. Archaeological evidence indicates that much of the area was abandoned during this time, and it appears that the indigenous peoples were displaced into the Allegheny River Valley and adjacent Susquehanna and Ohio River Valleys. Populations in these areas were mixed, and included people affiliated with the Delaware, Shawnee, Iroquois, Seneca, and other tribes. Glass trade beads have been recovered from several villages, indicating that these communities persisted into the seventeenth century and had contact, probably indirectly, with Europeans.

The French and British began to settle along the rivers west of the Allegheny Mountains around 1730. This settlement led to increased tension among the British, French and Native Americans as they sought control over land and economic opportunities. The tensions in the Ohio River area and northeastern North America in general led to the French and Indian War in the 1750s. The British gained control of the Allegheny River in the 1763 Treaty of Paris, and permanent settlements were established. The Ohio River and its tributaries were again a pivotal battle location during the

Revolutionary War as the Americans held this position and used it to launch an offensive against the British and their Native American allies for control of the Allegheny River area.

After the Revolutionary War, settlement increased in western Pennsylvania. The Allegheny River was integral to transporting resources throughout the area. Although coal was the most common resource transported along the river, other commercial products moved along the river included crops, timber, limestone, sandstone, clay, and iron ore. Railroads were constructed along the river during the nineteenth century, but the river continued to be important for transporting commercial products.

Problems such as snags and sandbars created some difficulties in navigating the river, and, beginning in the nineteenth century, Congress appropriated funds to address safe navigation along the Ohio River. By the mid-nineteenth century, the Corps decided to construct a lock and dam on the Ohio River to aid navigation. Davis Island Lock and Dam was completed in 1885 and led to the construction of additional locks and dams, including the construction of dams along the Allegheny River. The recent reduction in coal production in the area has impacted the amount of traffic on the river.

The history of construction and modification of the lock and dam considered in this EA begins with construction of the Allegheny Lock and Dam 2, initiated in 1932–1935. In 1949, the upper guard wall was repaired/replaced; in 1965, the heating system was converted from coal to gas; and a new air compressor was installed in 1969.

Prehistoric and Historic Resources

FFP Missouri 12 completed Phase I cultural resource surveys in 2013 for the proposed project. The survey for archaeological resources was initiated with a background search to identify previously documented resources within the APE. Additionally, a pedestrian field reconnaissance of the portion of the APE that could be affected by direct ground disturbance was completed to confirm areas of prior disturbance and to identify any additional archaeological resources. A portion of a proposed access road was not surveyed. The survey was documented on a Pennsylvania Record of Disturbance form (Schumer and Gundy, 2014). No prehistoric archaeological sites were identified.

A survey of above-ground resources was also completed for the proposed project (Kuncio and Ricketts, 2014). The survey documented all of the architectural structures located within the APE for the project, regardless of the age of the structure.

The Allegheny River Navigation System was listed in the National Register in 2000; in a letter attached to the HPMP,[50] the Pennsylvania SHPO confirmed the system's significance. The Allegheny River Navigation System is eligible for the National Register under Criterion A for its long-term maritime and transportation history and illustration of turn-of-the-century response to the continuing importance of the river as a transportation corridor (Barrett and Burr, 2015). It is also listed under Criterion C as a "representative example of early-twentieth-century slackwater engineering and construction with the extant resources representing the practical use of building materials and mechanical equipment available during their period of construction" (Barrett and Burr, 2015). The Allegheny Lock and Dam 2 is a contributing element to the Allegheny River Navigation System. Additionally, the lock and dam was individually listed in the National Register in 2000 and is eligible under Criterion A for its contribution to the long-term maritime history of the Allegheny River and under Criterion C as a representative example of lock and dam construction between 1932 and 1934.

In addition to the Allegheny River Navigation System and existing lock and dam, four more cultural resources were identified in the APE for the proposed project: two railroad segments, the Highland Park Bridge (circa 1940) over the Allegheny River, and Highland Park. Highland Park dates to 1889 and is contained within the Highland Park Historic District south of the APE. All four of these resources were previously determined eligible for listing in the National Register. No additional resources were located during the archaeological or architectural surveys of the APE. Table 3-17 lists all known cultural resources identified at the Allegheny Project.

Table 3-17. Allegheny Project cultural resources (Source: Barrett and Burr, 2015).

Resource Name	National Register Eligibility	Project-Related Effects	Determination/ Recommendation
Allegheny River Navigation System	Listed (2000)	Construction of the proposed project on the Allegheny River would alter character-defining features of the Allegheny River Navigation System that contribute to its National Register eligibility	Direct adverse effect; mitigation proposed

[50] See letter dated December 30, 2013, in Appendix A of the HPMP.

Resource Name	National Register Eligibility	Project-Related Effects	Determination/ Recommendation
Allegheny River Lock and Dam 2	Listed (2000)	Alterations to the historic lock and dam. Potential inadvertent damage during construction.	Direct adverse effect; mitigation proposed
Allegheny Valley Railroad	Eligible (2002)	Limited visual impacts	Recommended no adverse effect; consult with the Pennsylvania SHPO if there are changes that would result in other effects
Western Pennsylvania Railroad	Eligible (1999)	Limited visual impacts	Recommended no adverse effect; consult with the Pennsylvania SHPO if there are changes that would result in other effects
Highland Park Bridge	Eligible (2008)	Limited visual impacts	Recommended no adverse effect; consult with the Pennsylvania SHPO if there are changes that would result in other effects
Highland Park	Eligible (2003)	Limited visual impacts	Recommended no adverse effect; consult with the Pennsylvania SHPO if there are changes that would result in other effects

Traditional Cultural Properties

By letter issued September 28, 2012, the Commission initiated consultation with the Tonawanda Band of Seneca Indians of New York, Seneca Nation of New York, Saint Regis Mohawk Tribe, Oneida Nation of New York, Tuscarora Nation of New York, Onondaga Nation of New York, and Cayuga Nation of New York on the proposed Allegheny Project.

No response to the letter was received, and no consulted tribes have reported any known traditional cultural properties within the proposed project's APE.

3.3.7.2 Environmental Effects

Effects on Historic Properties

Construction, operation, and use of the proposed Allegheny Project would adversely affect the historic lock and dam and the Allegheny River Navigation System. Project maintenance, use, and maintenance of project roads, recreation, vandalism, and mitigation measures associated with other resources could also affect other cultural resources within the APE. Project effects are adverse when an activity directly or indirectly alters the characteristics of a historic property that qualifies it for inclusion in the National Register. Any adverse effects must be resolved in consultation with the Pennsylvania SHPO and other parties.

Identified effects for the proposed project located on the Allegheny River are summarized in table 3-17. In a letter dated December 30, 2013,[51] the Pennsylvania SHPO determined that the construction of the proposed project would have an adverse effect on the Corps' lock and dam that make the property eligible for the National Register by affecting the historic and architectural qualities that make the property eligible. The letter did not address potential effects on the Allegheny River Navigation System However, in its HPMP, FFP Missouri 12 recommends a finding that the project would result in adverse effects on the navigation system.

In its HPMP for the proposed Allegheny Project, FFP Missouri 12 recommends a finding that construction of the project would have visual effects on four historic-period structures: the Allegheny Valley Railroad, Western Pennsylvania Railroad, Highland Park Bridge, and Highland Park. While these resources are all eligible for listing in the National Register, FFP Missouri 12 recommends a finding that the visual effects would

[51] The December 30, 2013, correspondence was included in the HPMP filed by FFP Missouri 12 on September 29, 2015.

not be adverse. The Pennsylvania SHPO has not yet concurred with FFP Missouri 12's effect assessments and recommendations for resources found within the APE for the proposed project.

Management of Historic Properties

To address project-related effects, FFP Missouri 12 proposes to implement an HPMP for the project. FFP Missouri 12 filed a draft HPMP on September 29, 2015, that was developed in accordance with the *Guidelines for the Development of Historic Property Management Plans for FERC Hydroelectric Projects* (Advisory Council and FERC, 2002). The HPMP contains general procedures and requirements for: (1) designation of a Cultural Resources Coordinator,[52] (2) employee training, (3) internal decision-making, (4) consultation requirements, (5) unanticipated discoveries, (6) procedures for emergency situations, (7) Native American consultation, (8) the discovery of human remains and/or funerary objects, (9) curation of any recovered cultural materials, (10) public interpretation, (11) annual reporting, (12) a plan for review and revisions to the HPMP, and (13) dispute resolution.

In addition to the proposed general procedures and requirements identified previously, the HPMP provides specific procedures and requirements to resolve direct adverse effects on the eligible properties located within the project APE. For direct adverse effects on the eligible Allegheny River Navigation System and affected lock and dam, FFP Missouri 12 proposes to: (1) document the lock and dam structures using the Secretary of the Interior's standards for documenting historic engineering resources; (2) design new facilities with low profiles to blend with the surrounding area to the greatest extent practicable and allow the Pennsylvania SHPO and Corps opportunity to comment; (3) consult with the Pennsylvania SHPO and the Corps about any changes or modifications to the project; and (4) install interpretive signage.

The HPMP also calls for further consultation with the Pennsylvania SHPO regarding properties identified with non-adverse visual effects where potential changes in project activities could result in a change to an "adverse" effect recommendation. Comments from the Pennsylvania SHPO on the HPMP for the proposed Allegheny Project have not yet been filed with the Commission.

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[52] The Cultural Resources Coordinator would ensure compliance with the expected Programmatic Agreements and implementation of the HPMPs. This would include review of project activities, consultation with the SHPO, coordination of personnel training, maintenance of cultural resources records, and public outreach.

On April 6, 2016, Commission staff initiated a conference call with Rye Development, the Corps, and the Pennsylvania SHPO to discuss issues related to the proposed project. Several topics were discussed, including but not limited to: (1) the project APE, (2) tribal consultation, and (3) additional consultation with the Pennsylvania SHPO regarding project effects on historic properties and the resolution of those effects. These issues are discussed in detail in the following section. In the call, Rye Development agreed to revise the HPMP to satisfy the Commission's comments. Meeting notes for the call were submitted to all participants for review and were filed on April 27, 2016.

Our Analysis

FFP Missouri 12's HPMP provides measures that are consistent with the Advisory Council and Commission's 2002 guidelines. However, the final HPMP would need to include more detail as explained below. Continued consultation with the Pennsylvania SHPO and Corps is needed to finalize the document.

The HPMP contains a brief description and map of the project APE. In the description, two APEs are identified: one for above-ground structures and one for archaeological resources where project-related ground disturbance would occur. In the HPMP, the APE for above-ground structures extends beyond the proposed project boundary while the APE for archaeological resources is contained within the project boundary. Licensing of a hydroelectric project is a single section 106 undertaking and Commission staff recognizes a single APE that would encompass land both directly and indirectly affected by the project. For this project, the APE would coincide with the larger APE that FFP Missouri 12 identified for structures that extend beyond the proposed project boundary. However, while the HPMP refers to additional information related to the determination of the APE,[53] no detailed discussion of exactly how the APE was defined for the project was provided (e.g., distance from project boundary, extent of viewshed). Additionally, the APE and resource location maps in the HPMP do not depict the proposed project boundary in relation to the APE. Inclusion in the HPMP of (1) a discussion related to how the APE beyond the project boundary for the project was defined, and (2) a revised APE and resource location maps that include the proposed project boundary, would provide clarity regarding the location of resources and project effects, both within and outside the project boundary.

The HPMP does not include a plan for cultural resources monitoring during construction because no prehistoric archaeological sites have been identified at the

[53] See chapter II, section D, subsection 2 of the HPMP.

project. However, inclusion in the HPMP of a discussion on the circumstances under which monitoring might be required would help protect cultural resources.

In accordance with the Advisory Council and Commission 2002 guidelines, HPMPs for hydroelectric projects must contain a list of activities that are exempt from further section 106 consultation. In its HPMP, FFP Missouri 12 states that a PA with the Pennsylvania SHPO would be established that would specify the types of activities that would be exempt from SHPO review. Including a list of exempted activities in the HPMP would comply with the Advisory Council and Commission guidelines and would ensure that the listed activities are considered during project planning.

As mentioned above in section 3.3.7.1, *Cultural Resources Affected Environment*, the Commission initiated consultation with a number of Native American tribes regarding the proposed project. No tribal organizations responded to the Commission's invitation to consult regarding the proposed project. In the HPMP for the proposed project, FFP Missouri 12 states that any tribal correspondence should be directed to the Seneca Nation and the Tonawanda Band of Seneca. In the initial consultation letter, seven tribes were identified by the Commission; it is not clear why only two of these tribes are identified by FFP Missouri 12 for the purposes of consultation. In additional information filed with the Commission on May 11, 2016, in response to the issues discussed during the April 6, 2016, technical call, Rye Development explained that these two tribes were those identified in the National Park Service Native American Consultation Database. In a June 1, 2016, technical call, the Commission, Rye Development, the Corps, the Pennsylvania SHPO, and the West Virginia SHPO discussed issues related to the proposed projects on the Monongahela River.[54] In the call, Commission staff asked Rye Development to consult with the tribes previously contacted by the Commission for all of Rye Development's proposed projects, including those on the Allegheny and Ohio Rivers. Rye Development agreed to do so. The HPMP would need to describe Native American consultation efforts undertaken by FFP Missouri 12 to date, a justification for the selection of tribes to be consulted for the project, and include appropriate tribes as consulting parties regarding prehistoric archaeological resources and human remains. These measures would ensure that Native American concerns are appropriately considered in accordance with section 106, the Native American Graves Protection and Repatriation Act, and the Advisory Council's Policy Statement Regarding Treatment of Human Remains and Grave Goods.

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[54] Notes for this call were filed on June 28, 2016, for the six Monongahela River Projects (Opekiska Lock and Dam [P-13753], Morgantown Lock and Dam [P-13762], Point Marion Lock and Dam [P-13771], Grays Landing Lock and Dam [P-13763], Maxwell Locks and Dam [P-13766], and Charleroi Locks and Dam [P-13767]).

We also note that FFP Missouri 12's HPMP for the proposed project only identifies the Commission and the Pennsylvania SHPO as consulting parties. Given that the proposed facilities would be located on the Corps' existing structures, FFP Missouri 12 would need to include the Corps as a consulting party in the HPMP, and delineate the roles and responsibilities of each party.

In accordance with section 106 and its implementing regulations found at 36 CFR 800, the Pennsylvania SHPO must be consulted regarding any recommendations of effect to properties that are eligible for listing on the National Register and also regarding the resolution of adverse effects. The Allegheny River Navigation System and the Corps' Allegheny Lock and Dam 2 are both listed on the National Register. The proposed construction would have an adverse effect on these historic resources. All other resources identified within the APE to date (Allegheny Valley Railroad, Western Pennsylvania Railroad, Highland Park, and Highland Park Bridge) have also been determined to be eligible for listing in the National Register. However, the Pennsylvania SHPO has not concurred with the applicant's effect recommendations for these other resources. In its HPMP, FFP Missouri 12 only proposes to consult with the Pennsylvania SHPO in the future if there are changes in project activities that could result in new effects, other than visual effects, to these resources. Further consultation with the Pennsylvania SHPO regarding these recommendations of effect, and the ultimate resolution of effects found to be adverse, is needed to complete section 106 consultation

Finally, inclusion in the HPMP of a detailed schedule for completion of the activities required under the HPMP (e.g., further consultation regarding assessment of effects and implementation of mitigation measures) would ensure that these activities are completed in a timely manner.

Revision of the HPMP in consultation with the Pennsylvania SHPO and the Corps to include the following measures would ensure that the HPMP is compliant with section 106 and with the Advisory Council and Commission (2002) guidelines: (1) a discussion regarding how the APE was defined and a revised APE map and resource location map that delineate both the APE and the project boundary; (2) a discussion on the circumstances under which cultural resources monitoring, by either the Cultural Resources Coordinator or by a qualified cultural resources professional, would be required; (3) a list of activities that are exempt from further section 106 consultation; (4) a description of Native American consultation efforts undertaken by FFP Missouri 12 to date, justification for the selection of tribes to be consulted for the project, and the inclusion of appropriate tribes as consulting parties regarding prehistoric archaeological resources and human remains; (5) inclusion of the Corps as a consulting party in the HPMP; (6) a discussion of all project-related effects on historic properties, and specific management measures to resolve project-related adverse effects (all to be completed in consultation with the Pennsylvania SHPO); and (7) inclusion in the consultation appendix all correspondences and comments related to the HPMP and a discussion of how those

comments are addressed in the HPMP. In addition, the HPMP could include FFP Missouri 12's proposal to restore the landscape after construction to protect aesthetics as described in section 3.3.6.2, *Aesthetic Resources, Environmental Effects*. Revision of the HPMP to include these requirements in consultation with the Pennsylvania SHPO and the Corps, and submittal to consulting parties (for a minimum of 30 days) for their review and comments, would ensure that project effects on historic properties within the project's APE are appropriately addressed.

To meet the section 106 requirements, the Commission intends to execute a PA with the Pennsylvania SHPO for the proposed project for the protection of historic properties that would be affected by the construction and operation of the project. The terms of the PA would require FFP Missouri 12 to address all historic properties identified within the project's APE through the revision of the existing HPMP.

3.4 NO-ACTION ALTERNATIVE

The no-action alternative is license denial. Under the no-action alternative, the proposed Allegheny Project would not be constructed, and the environmental resources in the project area would not be affected. The power that would have been developed from renewable resources would have to be replaced by nonrenewable fuels.

4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the project's use of the river for hydropower purposes to see what effect various environmental measures would have on the project's costs and power generation. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp*.,[55] the Commission compares the current project cost to an estimate of the cost of obtaining the same amount of energy and capacity using a likely alternative source of power for the region (cost of alternative power). In keeping with Commission policy as described in *Mead Corp.*, our economic analysis is based on current electric power cost conditions and does not consider future escalation of fuel prices in valuing the hydropower project's power benefits.

For the licensing alternatives, our analysis includes an estimate of: (1) the cost of individual measures considered in the EA for the protection, mitigation and enhancement of environmental resources affected by the project; (2) the cost of alternative power; (3) the total project cost (i.e., for construction, operation, maintenance, and environmental measures); and (4) the difference between the cost of alternative power and total project cost. If the difference between the cost of alternative power and total project cost is positive, the project produces power for less than the cost of alternative power. If the difference between the cost of alternative power and total project cost is negative, the project produces power for more than the cost of alternative power. This estimate helps to 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 some of the general assumptions and economic information we use in our analysis.

We find that the values provided by the applicant are reasonable for the purposes of our analyses. Cost items common to all alternatives except the no-action alternative include: taxes and insurance costs; estimated future capital investment required to maintain and extend the life of plant equipment and facilities; cost to prepare the license application; normal operation and maintenance cost; and Commission fees. The no-

[55] *See Mead Corporation, Publishing Paper Division,* 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.

action alternative only includes the cost to prepare the license application. All dollars are year 2016, unless specified otherwise.

Table 4-1. Parameters for the economic analysis of the Allegheny River Project (Source: FFP Missouri 12, LLC, 2014, staff).

Economic Parameter	Value	Source
Period of economic analysis	30 years	Staff
Term of financing	20 years	Staff
Cost of capital (Long-term interest rate)	9 percent[a]	Applicant
Short-term interest rate (during construction)	9 percent	Staff
Discount rate	8 percent	Staff
Federal tax rate	35 percent	Staff
Local tax rate	3 percent	Staff
Energy rate	$37.83/MWh[b]	Staff
Capacity rate	$190/kWh-year[c]	Staff
Proposed capacity	17.0 MW[d]	Applicant
Proposed average annual generation	84,324 MWh[e]	Applicant
Construction cost	$62,881,570[f]	Applicant
Annual operating and maintenance cost	$934,930/year[g]	Applicant
Cost to prepare license application	$1,327,510[h]	Applicant
Insurance	$84,880	Applicant
Dependable capacity	1.75 MW[i]	Applicant

[a] FFP Missouri 12, 2014, page D-2.

[b] The applicant provided a 2012 energy rate of $40.86/MWh. Staff used values from the 2015 PJM State of the Market Report (Monitoring Analytics, 2016). On-peak rate of $41.50/MWh for 16 hours and off-peak rate of $30.48/MWh for 8 hours; average rate $37.83/MWh.

[c] The capacity rate is based on the Energy Information Administration's 2016 Annual Energy Outlook (EIA, 2016).

[d] FFP Missouri 12, 2014, pages A-4, B-10.

[e] FFP Missouri 12, 2014, pages A-4, B-9.

[f] FFP Missouri 12, 2014, page D-2, table D.3-1, escalated to 2016 dollars.

[g] FFP Missouri 12, 2014, page D-2, table D.4-1. This value includes operation and maintenance expenses, transmission charges, the Corps' electric bill, land lease fees, and headwater benefits fees, escalated to 2016 dollars.

[h] FFP Missouri 12, 2014, page D-4, escalated to 2016 dollars. Cost includes the cost to develop the recreation plan ($10,000 in 2013 dollars).

[i] FFP Missouri 12, 2014, page B-10.

4.2 COMPARISON OF ALTERNATIVES

Table 4-2 compares the installed capacity, annual generation, cost of alternative power, estimated total project cost, and difference between the cost of alternative power and total project cost for the applicant's proposal and staff alternative. In this table, a number in parentheses denotes that the difference between the cost of alternative power and project cost is negative, thus the project cost is greater than the cost of alternative power.

Table 4-2. Summary of the annual cost of alternative power and annual project costs for alternatives for the Allegheny Project (Source: staff).

	Applicant's Proposal[a]	**Staff Alternative[a]**
Installed capacity (MW)	17	17
Annual generation (MWh)	84,324[b]	84,324
Annual cost of alternative power	$3,522,210	$3,522,210
($/MWh)	41.77	41.77
Annual project cost	$7,512,460	$7,526,320
($/MWh)	89.09	89.25
Difference between cost of alternative power and project cost	($3,990,250)	($4,004,110)
($/MWh)	(47.32)	(47.48)

[a] A number in parentheses indicates that the annual project cost is greater than the cost of alternative power.

[b] The applicant's original estimate included a loss of 2,374 MWh for bypass flows. Staff does not include the energy loss associated with the minimum flow because the Commission cannot enforce a flow requirement at the Corps' dam. Rather, the project would only be able to operate off of flows that are made available to it by the Corps (run-of-release) so we assume that each alternative would have the same annual generation.

4.2.1 No-action Alternative

Under the no-action alternative, the project would not be constructed and would not produce any electricity. None of the environmental enhancements would be implemented. The only cost associated with this alternative would be the cost to prepare the license application.

4.2.2 Applicant's Proposal

Under FFP Missouri 12's proposal, the Allegheny Project would have an installed capacity of 17.0 MW and generate an average of 84,324 MWh of electricity annually. The average annual cost of alternative power would be $3,522,210, or $41.77/MWh. In total, the average annual project cost would be $7,512,460, or $89.09/MWh. Overall, the project would produce power at a cost that is $3,990,250, or $47.32/MWh, more than the cost of alternative power.

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. For the Allegheny Project, table 4-3 shows the staff-recommended additions, deletions, and modifications to the proposed environmental protection and enhancement measures and the estimated cost of each.

Under the staff alternative for the Allegheny Project, based on the same capacity and energy attributes as the proposed project, the cost of alternative power would be $3,522,210, or $41.77/MWh. The average annual project cost would be $7,526,320, or $89.25/MWh. Overall, the project would produce power at a cost which is $4,004,110, or $47.48/MWh, more than the cost of alternative power.

4.3 COST OF ENVIRONMENTAL MEASURES

Table 4-3 provides the cost of the environmental measures for the project considered in our analysis. 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. All costs are from the applicant unless otherwise noted. All costs are presented in 2016 dollars.

Table 4-3. Cost of environmental mitigation and enhancement measures considered in assessing the environmental effects of constructing and operating the Allegheny Project (Source: FFP Missouri 12, LLC, 2014, staff).

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2016$)	Annual Cost[a,c] (2016$)	Levelized Annual Cost (2016$)
Geologic and Soil Resources				
1. Develop and implement an erosion and sedimentation control plan.	Applicant, Staff	$10,130[d]	$1,050[d]	$1,550
Aquatic Resources				
2. Develop and implement a soil disposal plan.	Applicant	$0[e]	$0	$0
3. Develop and implement a contaminated sediment testing and disposal plan that adds a provision for testing soils to the applicant's soil disposal plan in measure 2 above.	Staff	$25,000[f]	$0	$2,130
4. Operate the project in a run-of-release mode.	Applicant, Pennsylvania FBC, Staff	$0	$0[g]	$0
5. Develop and implement an operation compliance monitoring plan.	Staff	$10,000[h]	$5,000[h]	$4,100

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2016$)	Annual Cost[a,c] (2016$)	Levelized Annual Cost (2016$)
6. Develop and implement a spill prevention, containment, and countermeasures plan independent of the erosion and sediment control plan in measure 1 above.	Staff	$10,000[i]	$0	$850
7. Conduct water quality monitoring during the months of June through September for 3 years after the commencement of project operations.	Applicant	$0	$1,620[j]	$1,050
8. Develop and implement a detailed water quality monitoring plan in consultation with the Corps, Pennsylvania DEP, and Pennsylvania FBC that includes the applicant's proposal in measure 7 above and adds water quality monitoring during construction.	Staff	$10,000[k]	$8,860[k]	$6,610
9. Conduct post-project construction DO monitoring.	Pennsylvania FBC, Interior	$0	$18,890[l]	$12,280
10. Conduct continuous water quality monitoring during project construction and operation, for the life of the project.	Corps	$0	$25,190[m]	$16,380

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2016$)	Annual Cost[a,c] (2016$)	Levelized Annual Cost (2016$)
11. Provide a minimum bypass flow of 900 cfs during the months of June through September and 250 cfs during the months of October through May.	Applicant	$0	$0[n]	$0
12. Operate the project in a run-of-river mode and provide minimum bypass flows through dam gates or over dam spillway during all months of the year to protect fish and wildlife habitat.	Interior	$0	$0[n]	$0
13. Comply with the Corps' non-degradation standard for DO and implement measures, such as increasing bypass flow, if the standard is not met.	Pennsylvania FBC, Ecosophic Strategies	$0	$0[o]	$0
14. Provide an adaptive management approach to maintain existing water quality and aquatic life, including compliance with non-degradation water quality and aquatic life criteria and higher bypass flows if/when criteria are not being met.	Corps	$0	$0[o]	$0

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2016$)	Annual Cost[a,c] (2016$)	Levelized Annual Cost (2016$)
15. Coordinate the timing of construction-related hydraulic changes to minimize potential effects on spawning fish and other aquatic organisms.	Applicant, Staff	$0[p]	$0	$0
16. Evaluate the impacts of the proposed crest gates on mussels. If dredging is to occur during construction or operation, evaluate the effect on mussels and aquatic life.	Pennsylvania FBC	$20,000[q]	$0	$1,700
17. Install a trash rack with a 5-inch clear bar spacing and provide approach velocities of less than 2 fps to reduce impingement or entrainment of fish.	Applicant, Staff	$0[e]	$0	$0
18. Design and implement post-construction fish impingement and entrainment studies, including turbine mortality studies, and if necessary modify the trash rack spacing and approach velocities based on the results.	Interior, Pennsylvania FBC	$250,000[r]	$0	$21,270

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2016$)	Annual Cost[a,c] (2016$)	Levelized Annual Cost (2016$)
19. Design and implement post-construction fish stranding studies for the dam tailrace, extending downstream to the point where the turbine discharge enters the river.	Interior	$10,000[s]	$0	$850
20. Conduct biotic monitoring at regular intervals to document local and cumulative effects on aquatic habitats and communities.	Corps	$10,000[t]	$108,730[t]	$71,530
21. Survey for federally listed mussels in the construction footprint and relocate any listed mussels that are found.	Corps	$20,000[u]	$0	$1,700
Terrestrial Resources				
22. Develop and implement an avian protection plan consistent with APLIC and FWS guidelines to protect bald eagle and other raptors.	Applicant, Staff	$5,070	$5,070	$3,730
23. Develop and implement a transmission line corridor management plan to protect botanical resources along the transmission line.	Applicant	$5,070	$5,070	$3,730

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2016$)	Annual Cost[a,c] (2016$)	Levelized Annual Cost (2016$)
24. Develop a vegetation management plan, which incorporates the applicant's measures from item 23 above to reestablish native vegetation at disturbed sites and manage noxious and invasive plants, expanded to cover all project lands.	Staff	$10,000[v]	$5,000[v]	$4,100
Recreation Resources				
25. Implement the measures described in the recreation resource management plan, including constructing a tailrace fishing platform with an accessible ramp and walkway, accessible restrooms, and six designated parking spaces for recreational users.	Applicant, Staff	$186,000[w]	$3,000[w]	$17,800
Land Use and Aesthetic Resources				
26. Remove and properly dispose of any non-organic debris or trash that is collected during trash rack cleaning.	Applicant	$0	$0[x]	$0

Enhancement/Mitigation Measure	Entity	Capital Cost[a,b] (2016$)	Annual Cost[a,c] (2016$)	Levelized Annual Cost (2016$)
27. Develop and implement a debris management plan, in consultation with the Corps and Pennsylvania FBC that includes the applicants' proposal in measure 26 above and adds provisions to ensure trash is sorted, stored, and disposed of appropriately.	Staff	$5,000[y]	$0	$430
Cultural Resources				
28. Prepare an HPMP in accordance with an anticipated PA between the Commission and the Pennsylvania SHPO.	Applicant, Pennsylvania SHPO	$15,130	$0	$1,290
29. Execute and implement a PA that requires revision of the draft HPMP to address the management of historic properties and unevaluated cultural resources including staff recommendations described in this EA.	Staff	$20,130[z]	$0	$1,710

[a] Costs provided by the applicant unless otherwise noted.

[b] Capital costs typically include equipment, construction, permitting, and contingency costs.

[c] Annual costs typically include operation and maintenance costs and any other costs that occur on a yearly basis.

[d] Proposed cost includes $10,000 for plan development (2013 dollars) and $5,000 (2013 dollars) per year during 3 years of project construction.

[e] Cost included in the overall construction cost.

[f] Cost of plan would be the same as for the proposed plan, which is included in the overall construction cost, but staff added $25,000 for specific testing requirements.

[g] There is no cost for "run-of-river operation" because the project is designed to operate in this manner. Although the applicant and Pennsylvania FBC used the term run-of-river," we interpret their use of run-of-river to mean "run-of-release." In other words, the project would operate from flows made available (i.e., released) by the Corps.

[h] Staff estimated $10,000 for development of the plan and $5,000 per year for implementation of the plan.

[i] Staff estimated $10,000 for development of the plan.

[j] Cost provided by applicant; $10,000 per year for 3 years in 2013 dollars. Cost was updated to 2016 dollars by staff.

[k] Cost includes $10,000 for plan development, $35,000 per year during 3 years of construction, including turbidity monitoring, and $10,000 per year (2013 dollars) monitoring June 1 to September 30 during operation for 3 years.

[l] Cost prorated to year-round water quality monitoring based on the cost of the applicant's proposed monitoring.

[m] Cost assumes year-round water quality monitoring during construction (3 years) and operation. Cost prorated based on the cost of the applicant's proposed monitoring.

[n] Staff does not assign a cost to a bypass flow regardless of the magnitude because the release or spill of any quantity of water prior to it being made available to the project for generation (run-of-release) would be at the sole discretion of the Corps, and therefore, could not be imposed on the Corps by a license.

[o] DO concentrations in the Allegheny River should remain high and similar to existing conditions after project operation begins based on the applicant's modeling results. As such, generation likely would not need to be curtailed to comply with a non-degradation standard. Nevertheless, compliance with a non-degradation standard through the release of bypass flows would not result in a project cost for the reason stated in the previous footnote.

[p] Staff estimated the cost would be negligible.

[q] Staff estimated $20,000 for the evaluations.

[r] Staff estimated $250,000 to conduct the studies.

[s] Staff estimated $10,000 to conduct the studies.

[t] Staff estimated $10,000 for plan development and $300,000 in year 1 and every 3 years thereafter to conduct the studies.

[u] Staff estimated $20,000 to conduct the survey.

[v] Staff estimated $10,000 to develop the plan and $5,000 per year to implement the plan.

[w] The applicant estimated $186,000 to construct the proposed recreational facilities and $3,000 per year for routine maintenance.

[x] Cost would be part of routine operation and maintenance costs.

[y] Staff estimated $5,000 to develop the plan.

[z] Staff estimated that our recommendations would increase the cost of the proposed plan by $5,000. The plan would also include the applicant's proposal to restore areas temporarily affected by construction to preserve resources. Staff assumes the cost for restoring areas after construction is included in the overall construction cost.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a) 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 Allegheny 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 the project and our review of the environmental and economic effects of the proposed project and alternatives, we selected the staff alternative as the preferred alternative. The staff alternative includes elements of the applicant's proposal with some additional staff-recommended measures. We recommend this alternative because: (1) issuance of an original license would allow the applicant to operate the Allegheny Project as an economically beneficial and dependable source of electrical energy; (2) the 17 MW of electric capacity comes from a renewable resource that does not contribute to atmospheric pollution; (3) the public benefits of this alternative would exceed those of the no-action alternative; and (4) the recommended measures would protect and enhance environmental resources affected by the proposed project.

In the following section, we make recommendations as to which environmental measures proposed by FFP Missouri 12 or recommended by agencies or other entities should be included in any license issued for the project. In addition to the applicant's proposed environmental measures listed below, we recommend additional staff-recommended environmental measures to be included in any license issued for the project.

5.1.1 Measures Proposed by the Applicant

Based on our environmental analysis of the applicant's proposals in section 3, and the costs presented in section 4, we recommend the following environmental measures proposed by the applicant to protect and enhance environmental resources and believe these measures would be worth their cost.

- Develop an erosion and sedimentation control plan in consultation with the Corps and Pennsylvania DEP that includes procedures and BMPs to reduce

runoff and sedimentation during construction and final stabilization, and monitoring for scour during project operation.

- Develop a detailed soil disposal plan to ensure excavated sediment is handled and disposed of appropriately.

- Operate in a run-of-release mode to avoid project-related impacts on the Corps' operation of its facilities.

- Conduct 3 years of post-construction water quality monitoring from June through September to monitor for project effects on water quality.

- Install a trash rack with a 5-inch clear bar spacing, and provide an approach velocity of less than 2 fps to mitigate for the entrainment and impingement of fish.

- When warranted and to the extent feasible, coordinate the timing of any construction-related hydraulic changes, such as changes in flow direction, to minimize effects on spawning fish and other aquatic organisms downstream of the project.

- Develop an avian protection plan consistent with APLIC and FWS guidelines that includes provisions for protecting bald eagles and other raptors from project-related effects.

- Develop a transmission line corridor management plan that includes provisions for protecting botanical resources from project-related effects and controlling invasive species along the transmission line ROW.

- Implement a recreation resource management plan with provisions for installing a tailrace fishing platform; designated parking; a portable, accessible restroom; and an accessible ramp and walkway that leads from the designated parking area to the fishing platform.

- Restore areas temporarily affected by construction activities to protect the site's aesthetics.

- Remove and properly dispose of any non-organic debris or trash that is collected during trash rack cleaning.

- Prepare an HPMP for the project in accordance with an anticipated PA between the Commission and the Pennsylvania SHPO.

5.1.2 Additional Staff-recommended Measures

The additional staff-recommended measures are described below.

- A contaminated sediment testing and disposal plan that includes the applicant's soil disposal plan, as well as provisions for testing sediment from the river bed to ensure sediment is handled and disposed consistent with state standards and to ensure minimal impacts of contaminated sediment on aquatic species and their habitat.

- An operation compliance monitoring plan to document compliance with the operating requirements of any license issued for the project.

- A stand-alone spill prevention, containment, and countermeasures plan to guide the handling of hazardous substances and protect water quality and aquatic biota during project construction and operation.

- A water quality monitoring plan that includes the applicant's proposal to monitor water quality for 3 years post-construction and an additional provision to monitor water quality during construction.

- A vegetation management plan that would apply the measures included in the applicant's transmission line corridor management plan to all project lands.

- A debris management plan that includes the applicant's proposed measure to remove and dispose of trash that accumulates upstream of the proposed project's trash rack, as well as procedures that describe how debris would be sorted, stored, and disposed to minimize the effect of floating debris on local recreation and aesthetics.

- Execution and implementation of a PA that requires revision of the draft HPMP to address the management of historic properties and unevaluated cultural resources.

We discuss the rationale for the measures we are recommending or not recommending below.

Erosion and Sedimentation Control Plan

Construction of the proposed project would require shoreline and riverbed disturbance, which could result in sediment (including potentially contaminated sediment) reaching or suspending within the Allegheny River. The applicant proposes to develop and implement an erosion and sedimentation control plan, in consultation with

the Corps and Pennsylvania DEP, which would include placement of turbidity curtains; siltation fencing; stabilization of temporarily disturbed soil; final site stabilization; monitoring for scour during operation; and, to the extent necessary, measures to prevent spills and guide cleanup of hazardous substances. Implementing erosion and sedimentation control measures would help to minimize erosion and sedimentation which would help protect water quality in the river and protect fish and other aquatic life, and we recommend these measures. We estimate that the levelized annual cost to develop an erosion and sedimentation control plan would be $1,550 and conclude that the benefits of the measure would outweigh the costs.

Contaminated Soil Testing and Disposal Plan

In-water construction activities would include the installation of temporary cofferdams and localized dredging. These activities would disturb river sediments, potentially suspending contaminated sediments into the water column, which could lead to bioaccumulation of toxic substances in aquatic and terrestrial organisms. The applicant collected and analyzed sediment core samples in 2013 from the proposed construction location and confirmed the site contained PAH concentrations exceeding the EPA sediment screening criteria. The applicant proposes to develop a detailed soil disposal plan to ensure excavated soil and sediment are handled and disposed of appropriately.

Depending on the type and level of contamination, disposal methods could vary. As such, some sediment sampling within the construction area prior to the start of construction would determine if measures are needed to ensure proper disposal of any contaminated sediment and to minimize suspension and transport of contaminated sediments into the Allegheny River. To ensure that contaminated sediment is identified and handled properly, we recommend that the applicant modify the proposed plan to include sediment testing. A contaminated sediment testing and disposal plan should describe the specific locations and frequency for testing river-bottom sediments; a description of the sampling and testing methodologies; a description of measures that would minimize suspension of contaminated sediments, a description of how any contaminated sediments would be removed, handled, and disposed of; and an implementation schedule. The plan should be developed in consultation with the Corps and Pennsylvania DEP to ensure appropriate measures are implemented to dispose of contaminated sediments. We estimate that the levelized annual cost of developing and implementing a contaminated sediment testing and disposal plan for the project would be $2,130 and conclude that the benefits of the measure outweigh the cost.

Spill Prevention, Containment, and Countermeasures Plan

As discussed in section 3.3.2.2, *Aquatic Resources*, *Environmental Effects*, construction, operation, and maintenance of the proposed Allegheny Project would

require the use of equipment in and adjacent to the Allegheny River. Therefore, there is the potential for accidental spills of oil, gasoline, and other hazardous materials, which could degrade water quality and negatively affect aquatic resources in the project area. The applicant states that its proposed erosion and sedimentation control plan would include measures "to the extent necessary" to address the prevention and cleanup of spills of hazardous substances. However, we recommend that the applicant develop and implement a separate spill prevention, containment, and countermeasures plan.

Developing a separate plan would facilitate plan review during development, and specifying emergency procedures in a separate plan would simplify prompt access to the information needed to address any hazardous materials spills that may occur. To maximize the effectiveness of a spill prevention, containment, and countermeasures plan, we recommend that the plan be developed in consultation with the Corps and Pennsylvania DEP, and contain, at a minimum: (1) a detailed description of how to transport, store, handle and dispose of oil, fuels, lubricant products, and other hazardous liquid substances in a safe and environmentally acceptable manner; (2) procedures that would be implemented in the event of a spill to ensure the proper containment and cleanup of any hazardous substances to minimize adverse effects on water quality and aquatic resources in the project area; (3) a provision to provide immediate notification to the Commission, Corps, and Pennsylvania DEP upon discovering an accidental spill of hazardous substances; and (4) a provision to file a report with the Commission within 10 days of a hazardous substance spill that identifies: (a) the location of the spill; (b) the type and quantity of hazardous material spilled; (c) any corrective actions that have been undertaken to clean up the spill; and (d) any measures taken to ensure similar spills do not occur in the future. These notification procedures would provide the Commission, Corps, and appropriate resource agencies an opportunity to visit the site, assess the effects of any hazardous material spills, and quickly recommend an appropriate response action(s) in consultation with the applicant.

We estimate that the levelized annual cost of developing a spill prevention, containment, and countermeasures plan for the project would be $850 and conclude that the benefits of the measure outweigh the cost.

Run-of-release Operation

The applicant proposes to operate the project in run-of-release mode,[56] meaning that the project would operate using flows established by and made available by the

[56] Although the applicant, Interior, and Pennsylvania FBC used the term "run-of-river," we interpret their use of run-of-river to mean "run-of-release" because the Corps would determine how much flow to make available (release) to the proposed project.

Corps. In addition, the applicant proposes to provide a minimum bypass flow of 900 cfs during the months of June through September and 250 cfs the rest of the year. Interior recommends that the applicant operate the project in run-of-release mode and provide a year-round minimum bypass flow. Pennsylvania FBC also recommends run-of-release operation. In addition, the Corps noted that the project must not impact the navigation channel, pool elevations, or operation of the lock and dam.

Operating the project in run-of-release mode would limit effects on pool elevations and protect fish and mussel habitat upstream and downstream of the dam. Only small (0.5 foot change or less), localized effects immediately upstream or downstream of the dam would likely occur with run-of-release operation. No changes to the quantity of flow releases would occur, and navigation should not be affected. The applicant proposes to construct 2.5-foot-high crest gates on the dam, to maintain upstream pool elevations for navigation, which would also benefit aquatic habitat by maintaining a more stable pool. The crest gates would be operated in coordination with the Corps, so that as river flows change, the gates would be manipulated to maintain a stable pool elevation during normal operating flows.[57] Relative to existing conditions, there would be no cost associated with operating the project in a run-of-release mode. Therefore, staff recommends run-of-release operation. Under this mode of operation, the project would only be able to generate using flows made available to it by the Corps.

Because any bypass flow releases over the dam or through the proposed spill gates would be at the sole discretion of the Corps, the applicant's proposed minimum flows over the dam could not be imposed on the applicant or the Corps through a license. For this reason, the staff alternative does not include the applicant's proposal to allow certain minimum flows to pass over the dam.

Operation Compliance Monitoring Plan

As described above, the applicant proposes to operate the project in run-of-release mode. The applicant's proposal, however, does not specify how it would document compliance with the run-of-release operation or how it would coordinate its operations with the Corps.

[57] Under high-flow conditions (i.e., flows greater than 42,000 cfs), the crest gates would be lowered, flows would pass over the lowered crest gates, and pool elevation would be similar to existing conditions.

Generally, a Commission license for a non-federal project at a Corps dam requires the licensee to develop an operating plan and an MOA with the Corps.[58] The operating plan describes the mode of hydropower operation, pool flow diversion, regulation requirements for the Corps' project, and integration of operation of the hydroelectric facility in the Corps' emergency action plan. The MOA describes the detailed operation of the project acceptable to the Corps and any restrictions needed to protect the purposes of the Corps' project.

Therefore, we recommend that any license issued for the project requires the applicant to develop an operation compliance monitoring plan in consultation with the Corps, and enter into an operating MOA with the Corps. The plan should include provisions for documenting compliance with the Corps' operating requirements and establish a schedule for reporting project compliance/non-compliance during normal operation and emergencies. The plan should also include provisions for measuring intake velocities at a range of flows to ensure that intake velocities are sufficiently low to protect fish from impingement on the trash rack and to minimize fish entrainment. An operation compliance monitoring plan would also ensure run-of-release operation and minimization of impacts on aquatic resources that could otherwise occur due to changes in flow, pool elevations, or water quality caused by project operations. We estimate that the levelized annual cost of developing an operation compliance monitoring plan would be $4,100 and conclude that the benefits of this measure outweigh the costs.

Water Quality Monitoring Plan

Project operations could alter existing DO concentrations in the Allegheny River downstream of the proposed project, because water that passes through the project turbines would not be subject to the turbulence and aeration that currently occurs when water passes over the existing dam. Also, construction of the proposed project would likely result in moderate, short-term increases in turbidity levels within the Allegheny River.

The applicant proposes to conduct post-construction water quality monitoring to assess project-related effects on water quality. Monitoring is proposed for June through September for 3 years after project operation begins. However, the applicant does not provide specific details about what parameters would be monitored; the locations where monitoring would occur; or what parties, if any, would be consulted to develop a monitoring strategy.

[58] *See* Memorandum of Understanding between the Commission and the Corps of Engineers on Non-federal Hydropower Projects, dated March 2011.

The Corps states that real-time, continuously recorded, water quality monitoring would be required downstream and possibly upstream of the project during construction and operation. The Corps also states that it would require monitoring throughout the term of the license, year-round during the first 3 years of operation, with the potential to reduce the duration of monitoring to May through November after 3 years. In addition, the Corps states that an adaptive management approach to maintaining existing water quality and aquatic life conditions would be required, which would include compliance with non-degradation water quality and aquatic life criteria and higher bypass flows if/when criteria are not being met.

Pennsylvania FBC recommends post-construction continuous DO monitoring at the project, that the project adhere to a non-degradation standard, and that measures be implemented to increase DO concentrations immediately if any DO standard recommended by the Corps is not met. In addition, Interior recommends post-construction DO monitoring at the project. Ecosophic Strategies, LLC, recommends a DO non-degradation standard of 6.5 mg/L or higher if the agencies recommend a higher standard.

The applicant's water quality modeling study and our analysis in section 3.3.2.2, *Operational Effects on Water Quality*, indicate that operation of the proposed project may have some small effects on DO concentrations downstream of the dam. DO concentrations, the primary parameter of concern to the Corps, agencies, and Ecosophic Strategies, are typically much higher from October through May than during the summer months in temperate climates, and the applicant's DO modeling suggests DO concentrations during the summer months would consistently be much higher than the state standard (5 mg/L). Thus, year-round continuous monitoring would not be needed or be worth the cost. Furthermore, monitoring for the life of the license may not be necessary if monitoring during the first 3 years of project operation demonstrates that the project is not affecting downstream DO concentrations and the 3 years include a range of environmental conditions, including a hot, dry summer. As such, a requirement to monitor throughout the life of the license is premature and is not justified. However, monitoring water quality during construction, as recommended by the Corps, and implementing any needed corrective measures would protect water quality during project construction and would provide additional baseline data. Therefore, we recommend the applicant monitor water quality, including turbidity, temperature, and DO concentration during construction.

The existing state minimum water quality standard was determined by Pennsylvania DEP as adequate to protect aquatic life in the Allegheny River. At this time, it is unclear how adherence to an undefined non-degradation standard would benefit aquatic resources relative to the state standard. Nevertheless, because the project could only be licensed to operate with flows made available to it by the Corps, i.e., run-of-release, the Corps could choose to spill any quantity of water it decides would be

necessary to meet its water quality standards. The project could not be licensed to provide specific bypass flows because the decision to release flows downstream of the Corps' dam prior to being made available for generation at the project lies solely with the Corps. As for any adaptive management measures aimed at addressing the Corps' non-degradation requirements, we note that the Corps would enter into an operating plan and MOA with the applicant that would specify any restrictions needed to protect the primary purposes of the Corps' project, including water quality.

Overall, developing and implementing a water quality monitoring plan for the project would allow for quick identification of adverse effects on water quality during construction and operation of the project and allow the Corps or the applicant to change operations, if necessary. Accordingly, we recommend that the applicant develop, in consultation with the Corps, FWS, Pennsylvania FBC, and Pennsylvania DEP, a water quality monitoring plan for the project that contains, at a minimum, the following provisions: (1) identifying the exact locations of monitoring sites; (2) the type of instruments that would be used to monitor water quality; (3) a schedule for monitoring turbidity levels, water temperature, and DO concentrations during project construction; (4) continuous, real-time monitoring of water temperature and DO concentration downstream of the project from June 1 through September 30 each year for 3 years following the commencement of project operation; (5) the filing of annual summary reports for each year that monitoring is conducted; and (6) if monitoring indicates deviations from the water quality requirements of any license issued for the project occur during project construction or operation, filing a report with the Commission within 10 days describing the deviation and implementation of any corrective actions.

Development of a water quality monitoring plan with our recommended additions would result in an annualized cost of $6,610, which would be a reasonable cost to ensure that construction and operation of the project does not adversely affect water quality and aquatic resources downstream of the project.

Vegetation Management Plan

Construction and maintenance of the proposed project would disturb some existing vegetation, potentially leading to the introduction or spread of invasive plants. Land surrounding the project likely has numerous invasive plant species that could spread along the transmission line corridor and access road and potentially to the construction site. The applicant proposes to develop a transmission line corridor management plan, after construction of the transmission line, to limit impacts from project construction and maintenance on plant communities within the project transmission line ROW. The proposed plan would include measures to revegetate disturbed areas and BMPs to prevent the spread of invasive species into the transmission line corridor.

However, the areas surrounding the proposed powerhouse, substation, and access road would require vegetation removal that could allow invasive or noxious plant species

to become established in all areas where construction activities occur. Therefore, staff recommends that the applicant prepare a vegetation management plan that would incorporate the revegetation and invasive species control measures specified in its transmission line corridor management plan but apply the measures to the entire project area rather than just the transmission line corridor. Additionally, development of the plan prior to construction of the project would allow implementation of preventive measures to reduce impacts on botanical resources. To further reduce potential effects on botanical resources, staff recommends that the plan includes a monitoring program to evaluate the success of revegetation and invasive plant control efforts, including criteria that define when the measures are successful; a reporting schedule for filing monitoring results and progress reports with Pennsylvania DCNR, Pennsylvania Game Commission, FWS, the Corps, and the Commission; and an implementation schedule.

A vegetation management plan that applies to the entire project area, with measures for monitoring revegetation and invasive species control, would reduce impacts on native vegetation, including the spread or introduction of invasive plants. We estimate that the levelized annual cost of developing a vegetation management plan would be $4,100 and conclude that the benefits of this measure outweigh the costs.

Avian Protection Plan

Bald eagles and other raptors may collide with and be electrocuted by transmission lines or other electrical equipment. Further, construction of the project transmission line could disturb or remove bald eagle roosting or nesting habitat. To protect bald eagles and other raptors from potential habitat disturbance or electrocution and collision with project power lines, the applicant proposes to develop an avian protection plan in consultation with the Pennsylvania Game Commission and FWS. Specifically, the applicant's proposed plan would be developed in accordance with the APLIC and FWS' National Bald Eagle Management guidelines. Measures to address future transmission facility maintenance activities would also be addressed in the plan. The avian protection plan would include the following provisions: (1) if a bald eagle or other target species is discovered within the project boundary, the applicant would notify the Pennsylvania Game Commission and FWS within 30 days of discovery; and (2) prior to any tree clearing within the project boundary or areas immediately adjacent to the project boundary, the area to be cleared would be surveyed for target species nests by project staff. If any such nests are discovered, the Pennsylvania Game Commission and FWS would be consulted prior to tree-clearing activities.

Preparing the plan in accordance with the guidelines would also help to protect raptors from switchyard equipment interactions by ensuring: (1) adequate separation of energized conductors, ground wires, and other metal hardware; and (2) adequate insulation. In accordance with the guidelines, the plan would include a mechanism to monitor the effectiveness of the plan, or what actions to take if the plan is not successful;

a schedule for reporting monitoring results to the Pennsylvania Game Commission, FWS, the Corps, and the Commission; and a schedule for implementing the plan. As such, staff recommends the proposed avian protection plan.

We estimate that developing the avian protection plan in accordance with the above specified guidelines would have an annualized cost of $3,730 and would be a reasonable cost to minimize the risk to bald eagle and other raptors from electrocution, collision, and nest disturbance at the project's facilities.

Recreation Amenities

The applicant filed a recreation resource management plan that evaluates access and amenities during project construction and operation. As discussed in section 3.3.5.2, *Recreation and Land Use Resources, Environmental Effect*s, the applicant proposes to construct an accessible/barrier-free tailrace fishing platform, accessible restroom facilities, and six designated parking spaces for recreational users.

The scale of the proposed recreation amenities does not perpetuate the need for a revised recreation resource management plan. Implementing the fishing platform, restroom facilities, and parking area measures proposed at the Allegheny Project would contribute to the enhancement of recreation facilities and would mitigate for the loss of recreation access while addressing the needs of the disabled. We recommend these proposed measures because they would enhance the existing recreation opportunities available at the Allegheny Project. Use of the facilities would be monitored through reporting requirements of the FERC Form 80.

In addition to the applicant's proposal, The Corps requests that the applicant assess recreational effects and propose mitigation measures that include alternatives for boating, hiking, and fishing. Pennsylvania FBC recommends a study of the potential loss of angler access and use after the installation of the power facilities and mitigation should a loss of angler use occur. Considering the applicant's proposed recreation measures and the availability of nearby recreation facilities, no further study of angler access or recreation use would be needed to mitigate project-related effects, and we do not recommend these studies. We estimate that constructing, operating, and maintaining the applicant's proposed facilities would have a levelized annual cost of $17,800. We conclude that the benefits justify this cost.

Debris Management Plan

The presence of trash and other debris, especially when concentrated behind dams, can affect the visual character of the river. The applicant proposes to remove and properly dispose of any non-organic debris or trash that is collected during trash rack cleaning.

Disposing of trash collected during trash rack cleaning would improve the existing visual conditions. However, it is unclear what specific kinds of debris would be passed downstream or removed from the river, whether the applicant intends to temporarily store trash on-site, or how often debris would be removed from the project. Therefore, we recommend the applicant develop a debris management plan in consultation with the Corps and Pennsylvania FBC, which includes the applicant's proposed measure to separate and remove trash from the river and ensure that debris is sorted, stored, and disposed of appropriately. A debris management plan should include, but not be limited to, the following provisions: (1) procedures for separation of organic and inorganic trash; (2) procedures for any storage and off-site disposal of inorganic material; (3) procedures for reintroducing organic debris collected on the trash rack to the Allegheny River downstream of the dam, as appropriate; and (4) an implementation schedule. We estimate that the levelized annual cost of developing a debris management plan would be $430 and conclude that the benefits of this measure outweigh the costs.

Historic Properties Management Plan

Construction of the proposed Allegheny Project would result in adverse effects on the Corps' existing lock and dam. The applicant recommends a finding that the Allegheny River Navigation System would also be adversely affected. Both of these structures are listed on the National Register. The proposed project could also affect other historic properties within the project APE, including two historic railroads, the Highland Park Bridge, and Highland Park that all have been determined to be eligible for listing. Therefore, we recommend FFP Missouri 12 revise the HPMP to contain additional staff-recommended measures, listed in section 3.3.7.2, *Cultural Resources, Environmental Effects*, in consultation with the Pennsylvania SHPO and the Corps to avoid, lessen, or mitigate the adverse effects on these historic properties. In addition, the HPMP should include the applicant's proposal to conduct post-construction site restoration at the project site to ensure the landscape is cleared of construction debris and restored to a managed landscape, because these measures would protect aesthetics and historic properties.

To satisfy the requirements of section 106, the Commission intends to execute a PA for the project that would include stipulations for the protection of historic resources, including revision of the HPMP in consultation with the Pennsylvania SHPO and the Corps. The HPMP would describe the treatment measures necessary for managing properties included in, or eligible for inclusion in, the National Register that could be affected by issuance of a license for the proposed project. Specifically, the HPMP would include, but not be limited to, a discussion of all cultural resources identified within the APE of the proposed project, their National Register eligibility status, project-related effects, and specific management measures to resolve project-related adverse effects (all to be completed in consultation with the Pennsylvania SHPO). We conclude that the

benefits are worth the levelized annual cost of $1,710 to revise and implement a final HPMP.

5.1.3 Measures Not Recommended by Staff

Fish Stranding Surveys

Interior recommends the applicant design and implement post-construction fish stranding studies for the proposed tailrace, extending downstream to the point where the turbine discharge enters the river.

Although project operation could result in some changes in flow and velocity patterns downstream of the dam, project operation would not dewater any aquatic habitat. On the Allegheny River, each Corps dam creates a pool that backwaters to the base of the next upstream dam. Project operation should not strand fish in the project tailrace, or in any other area of the river, because the tailrace would be excavated into the bed of the existing river channel and would be continuously submerged whether the project is operating or not. Therefore, we do not recommend fish stranding surveys and conclude that the levelized annual cost of $850 is not justified.

Post-construction Fish Impingement and Entrainment Studies

Project operation has the potential to result in some fish impingement on the project trash rack and entrainment-related mortality of fish that are entrained through the turbines. To minimize fish mortality related to project operations, the applicant proposes to design the project so that the intake has a maximum approach velocity of less than 2 fps and install a trash rack with 5-inch clear bar spacing. Pennsylvania FBC and Interior recommend that the applicant design and implement post-project construction fish impingement and entrainment studies at the project. Based on the results of the post-project construction studies, Interior may then recommend the applicant consult with the resource agencies to determine appropriate trash rack vertical bar spacing and approach velocities, and make project modifications where necessary to ensure protection of all fish species and life stages in the project area. Pennsylvania FBC recommends that fish impingement and entrainment losses should be mitigated, but does not specifically describe any mitigation measures.

As discussed in section 3.3.3.2, *Aquatic Resources*, *Environmental Effects*, the applicant conducted a desktop entrainment and turbine survival study to evaluate the risk of impingement and to estimate the number and survival rates of fish that would be entrained through the project turbines during project operation. Analysis of burst swim speeds for representative species indicates that the low approach velocity and relatively wide bar spacing of the trash rack would pose a very low risk of impingement. The study also indicates that most entrained fish would be less than 6 inches in length, with gizzard shad accounting for about 75 to 96 percent of the total entrainment. Average survival

rates for fish entrained through the turbines were estimated to be 94 percent. We conclude that there is little basis for recommending additional field entrainment and impingement studies because it is likely that any such studies would show results similar to the studies that have been conducted at other projects, which have consistently shown that most of the fish entrained and killed during turbine passage are young fish of highly prolific species, whose populations can compensate for such losses. Accordingly, we do not recommend that the applicant be required to conduct post-construction fish impingement and entrainment studies, which we estimate would have a levelized annual cost of $21,270.

Corps' Biotic Monitoring Requirements

As described in section 3.3.2.2, *Aquatic Resources, Environmental Effects*, construction and operation of the project would have some effects on aquatic species and their habitats. In general, effects of construction could temporarily displace organisms or decrease habitat suitability near the construction area. Once operation begins, some habitat would become less suitable for fish and other organisms, while other areas would see an increase in habitat suitability. Overall, a small reduction in suitable habitat for most aquatic species would occur at low and moderate flows, while conditions at high flows would remain relatively unchanged. In addition, fish entrained through the project may suffer turbine-induced mortality, but the entrainment mortality rate would be low.

The Corps indicates that it would require the applicant to conduct post-construction monitoring studies at regular intervals to document local and cumulative effects on aquatic habitats and communities. Specifically, the Corps indicates that it would require: (1) multi-method fish surveys to document any project-related changes in the fish community, (2) fish impingement, entrainment, and mortality surveys to address impacts on all species and sizes of fish; (3) macroinvertebrate surveys; (4) mussel surveys; (5) an assessment of biological integrity for macroinvertebrate and fish assemblages, and (6) tracking of mussel bed and tailwater habitat during construction and operation throughout the term of the license.

Under existing conditions, changes in river flow alter and shift aquatic habitat suitability on a regular basis (e.g., daily, weekly, or annually, depending on river flow). We note that, based on the Corps' rating curves, water depth in the Allegheny Lock and Dam 2 pool can vary by more than 10 feet as a result of changes in river flow under existing conditions. As such, the existing aquatic community would be adapted to variation in the flows and habitat suitability within and near the dam tailwater and project-related changes in habitat suitability would be minor. Some entrainment mortality would occur, but it would not likely have an effect on the existing fish community. Therefore, fish, mussel, and macroinvertebrate surveys, entrainment surveys, and habitat surveys are not likely needed to document project effects, and we do not recommend these surveys. We estimate that the biotic monitoring studies

recommended by the Corps would have a levelized annual cost of $71,530, and conclude that the benefits of the studies would not justify the cost.

Pre-construction Federally Listed Mussel Surveys

The Corps recommends that, prior to any construction or drawdown activities, the footprint of the powerhouse and any dewatered areas in the cofferdam footprint at the project should be surveyed to determine the presence/absence of federally listed mussel species. The Corps also states that a contingency plan to either relocate or avoid federally listed mussels would be necessary to avoid impacts if such species are found.

Conducting surveys within the proposed dewatered areas, as recommended by the Corps, would provide further assurance on the presence/absence of federally listed mussels within the construction footprint of the project. However, the applicant's PNDI results and correspondence with FWS indicate that no individuals or populations of listed mussels are known to currently occur in this area. Furthermore, as discussed in section 3.3.2.1, *Aquatic Resources, Affected Environment*, the applicant's 2013 mussel survey did not document any federally listed species in the vicinity of the proposed project. The applicant surveyed within and near the proposed construction footprint of the Allegheny Project in 2013 and did not find any federally listed species. Additionally, no live or dead federally listed mussels were observed in the project pool at the Hulton Bridge, approximately 6 RMs upstream of Allegheny Lock and Dam 2, during surveys in 2008. As such, it would be unnecessary to conduct additional mussel surveys because surveys already conducted within and just outside the construction footprint did not document any federally listed mussel species.

Similarly, a contingency plan as recommended by the Corps, would not be necessary because additional mussel surveys would not be required. Therefore, we do not recommend that the applicant conduct pre-construction surveys for federally listed mussel species, which we estimate would have a levelized annual cost of $1,700, because the benefits would not justify the cost.

Dredging and Crest Gate Impact Assessments on Mussels

Pennsylvania FBC recommends evaluation of the impact of dredging during construction and the operation of the proposed, adjustable, 2.5-foot-high crest gates at the Allegheny Project on mussels. In section 3.3.2.2, *Aquatic Resources, Environmental Effects*, we assess the effects of the project, including dredging and the operation of the proposed crest gates, on mussels and conclude that mussel populations would not be adversely affected. Dredging may cause direct mortality of some individuals, but few mussels are expected to occur close to the dam where dredging would occur because habitat near the dam consists mainly of coarser substrate (i.e., cobble). Crest gate operation would raise the pool upstream of the dam, which may alter habitat suitability for some species and provide additional wetted habitat at lower flows relative to existing

conditions. Conditions downstream of the dam would be minimally affected by the proposed crest gates because any flows in excess of the proposed powerhouse hydraulic capacity, and any bypass flows, would be passed over the dam and crest gates, similar to current conditions.

Pennsylvania FBC does not specify a methodology for evaluating the effects of dredging or operation of the crest gates on mussels, but pre- and post-construction mussel surveys would be a likely monitoring strategy. However, because it is unlikely that mussel populations would be negatively affected by the proposed project, there appears to be little basis for requiring pre- and post-construction mussel surveys. We estimate that such surveys would have a levelized annual cost of $1,700, and conclude that the benefits of the surveys would not justify the cost.

5.2 UNAVOIDABLE ADVERSE EFFECTS

Construction and initial operation of the Allegheny Project may cause unavoidable short-term increases in erosion and sedimentation within the Allegheny River in locations immediately upstream and downstream of the project. Construction of the proposed project also has the potential to result in the suspension and downstream distribution of contaminated sediments present within the Allegheny River. However, implementation of an erosion and sedimentation control plan, as proposed by the applicant, would minimize the potential for negative effects, and no long-term effects from erosion are expected. Implementing a soil disposal plan, with staff-recommended measures, would minimize the potential for suspending and distributing contaminated sediments by ensuring proper procedures are in place during contaminated sediment removal and disposal activities. Lastly, implementing a spill prevention, containment and countermeasures plan with staff-recommended measures would further protect water quality in the Allegheny River.

A temporary loss of aquatic habitat would occur within portions of the river enclosed by cofferdams. Construction activities such as cofferdam placement and removal, excavation, and boat traffic in the immediate project area could displace aquatic organisms, representing a minor, short-term effect during construction. Any mussels currently present within or near the proposed construction footprint could be permanently impacted, but because few mussels were found within the construction footprint, the overall effects of project construction on the mussel community should be minor.

Operation of the proposed project may result in lower DO concentrations downstream of the project under some critical river flow conditions, compared to existing conditions. However, monitoring DO concentrations upstream and downstream of the proposed project from June through September for the first 3 years of project operations would help to determine to what extent project operations are affecting DO

concentrations downstream of the project, and what adaptive measures, if any, would be needed.

Operation of the project would result in some unavoidable fish entrainment-related mortality as fish pass through the turbines. However, the applicant's proposal to install a trash rack at the powerhouse intake with a 5-inch clear bar spacing and to limit maximum intake velocity to no more than 2 fps would help to limit any entrainment- and impingement-related fish mortality. Most of the fish entrained by the project would be juveniles and, with expected high survival rates during turbine passage, any resulting mortality is not likely to result in any measurable impact on resident fish populations in the Allegheny River.

Construction of the proposed facilities would permanently disturb shoreline vegetation and some vegetation along the transmission line corridor and access road. Some trees that could serve as potential bald eagle roosting or nesting habitat would be cleared. Vegetation clearing may also reset plant succession, consequently removing saplings that may develop into the types of mature forest essential for avian species. However, loss of vegetation would be mitigated by implementing the staff-recommended vegetation management plan. Lastly, implementing the applicant's proposed avian protection plan with staff modifications would minimize project impacts on the avian community.

Construction of the proposed Allegheny Project would result in the temporary loss of public recreational fishing areas. Additionally, some debris would periodically accumulate near the project during construction and operation. This debris could decrease the recreational value of the Allegheny River in the vicinity of the proposed project. However, the applicant-proposed and staff-recommended recreation facilities and implementation of a debris management plan would minimize the effects on recreational use.

The construction of the Allegheny Project would result in a short-term degradation of the visual qualities and noise levels in the vicinity of the dam. The disturbances would be localized, with the surrounding commercial and residential areas being most affected by the visual effects of construction, along with noise and dust. The decreased visual quality and increased noise levels are unavoidable, but temporary, adverse effects of project construction. These effects would be minimized by implementing the staff-recommended aesthetics management plan.

Construction of the proposed Allegheny Project would result in adverse effects on the Corps' existing lock and dam and also the Allegheny River Navigation System, all of which are eligible for listing in the National Register. The proposed project could also adversely affect other historic properties located within the project APE. Revision of the HPMP to contain additional staff-recommended measures in consultation with the

Pennsylvania SHPO and the Corps would avoid or mitigate the adverse effects on these historic properties.

5.3 FISH AND WILDLIFE AGENCY RECOMMENDATIONS

Under the provisions of section 10(j) of the FPA, a hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for protection, mitigation, or 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.

In response to the Commission's Ready for Environmental Analysis notice, two fish and wildlife agencies submitted recommendations for the project: Interior (timely filed letter on February 11, 2016) and Pennsylvania FBC (untimely filed letter on February 19, 2016).[59] Table 5-1 lists Interior's recommendation and whether it is adopted under the staff alternative. Environmental recommendations that we consider outside the scope of section 10(j) are considered under section 10(a) and addressed in the specific resource sections of this document and the previous section.

[59] Pennsylvania FBC filed recommendations but did not specify if the recommendations were submitted under section 10(a) or 10(j). Therefore, these recommendations are considered under 10(a) and discussed by resource area in section 3 of this EA.

Table 5-1. Fish and wildlife agency recommendation for the Allegheny Project (Source: staff).

Recommendation	Agency	Within the Scope of Section 10(j)	Annual Cost	Adopted?
Operate the project in a run-of-river mode, and provide minimum bypass flows through dam gates or over dam spillways during all months of the year	Interior	No[a]	$0	Not Adopted.

[a] The measure is outside the scope of section 10(j) because it is not within the Commission's authority to enforce. The applicant would only be able to operate off of flows made available to it by the Corps. Flow releases over the dam or through the proposed spill gates are at the sole discretion of the Corps.

5.4 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2)(A) 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 qualifying comprehensive plans that are applicable to the Allegheny Project. No inconsistencies were found.

The following is a list of qualifying comprehensive plans relevant to the Allegheny Project:

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Pennsylvania Department of Environmental Resources. 1983. Pennsylvania State water plan. Harrisburg, Pennsylvania. January 1983. 20 volumes.

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U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. Environment Canada. May 1986.

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6.0 FINDING OF NO SIGNIFICANT IMPACT

If the Allegheny Project is licensed as proposed with the additional staff-recommended measures, the project would operate while providing protective measures for aquatic, terrestrial, recreation, aesthetic, and cultural resources in the project area.

Based on our independent analysis, issuance of a license for the project, as proposed with additional staff-recommended measures, would not constitute a major federal action significantly affecting the quality of the human environment.

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