SECTION 206 CONTINUING AUTHORITIES PROGRAM (CAP)
FEASIBILITY REPORT WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

KINNICKINNIC RIVER
AQUATIC ECOSYSTEM RESTORATION
PROJECT

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Draft Version

US Army Corps of Engineers ®

City of River Falls

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EXECUTIVE SUMMARY

This Feasibility Report with Integrated Environmental Assessment (FR/EA) investigates the feasibility of aquatic ecosystem restoration to address problems and opportunities on the Kinnickinnic River, River Falls, Wisconsin. Planning, design, and implementation of the Kinnickinnic River Aquatic Ecosystem Restoration Project (Project) is authorized under Section 206 of the Water Resources Development Act of 1996 (Public Law (P.L.) 104-303), as amended (33 USC 2230), part of the Continuing Authorities Program (CAP). The City of River Falls, as the non-federal sponsor of the project.

The Kinnickinnic River near River Falls, WI has experienced loss and degradation of stream and riparian habitat primarily due to the establishment of two impoundments: Junction Falls Dam and Powell Falls Dam. Powell Falls Dam is currently drained. The River Falls dams have degraded water quality including temperature, and fish habitat along the river, limiting trout angling and paddling opportunities and creating potential safety hazards. The Kinnickinnic is designated as a Class 1 trout stream by the Wisconsin Department of Natural Resources (WI DNR).

The objectives of the Project are to:

1. Restore natural hydrothermal/hydrogeomorphic dynamics within the stream to support native coldwater species.
2. Increase riffle and pool geomorphic sequence to increase the use and availability of coldwater habitat.

The Project Delivery Team (PDT) identified a variety of measures that could be undertaken to achieve Project objectives, including dam removal, waterfall restoration, creating rock arch rapids, cross vanes, and riffle pools within the restored section of stream, and undertaking natural waterfall bank protection, native seeding, emergent wetland creation, and forest restoration within restored riparian habitat. The measures were combined in various logical combinations to form alternative Project plans. The Tentatively Selected Plan (TSP) – Alternative 7, shown in Figure ES-1, includes all of these features and addresses all project objectives.

The estimated project first cost of the TSP based on October 2024 price levels is $21,916,007. The TSP would contribute 34.7 Average Annual Habitat Units (AAHU) for 4 habitat types over the 50-year period of analysis, at an annual cost of $25,290 per AAHU. The estimated total project cost inflated through midpoint of construction is $24,138,860. The federal per-project cost is limited to $15,000,000. Accounting for the sunk planning costs, the remaining federal share for design and implementation would be $14,575,000 and the non-federal share is estimated to be $9,563,857. The annual operation, maintenance, repair, replacement and rehabilitation costs are estimated to be $6,880.

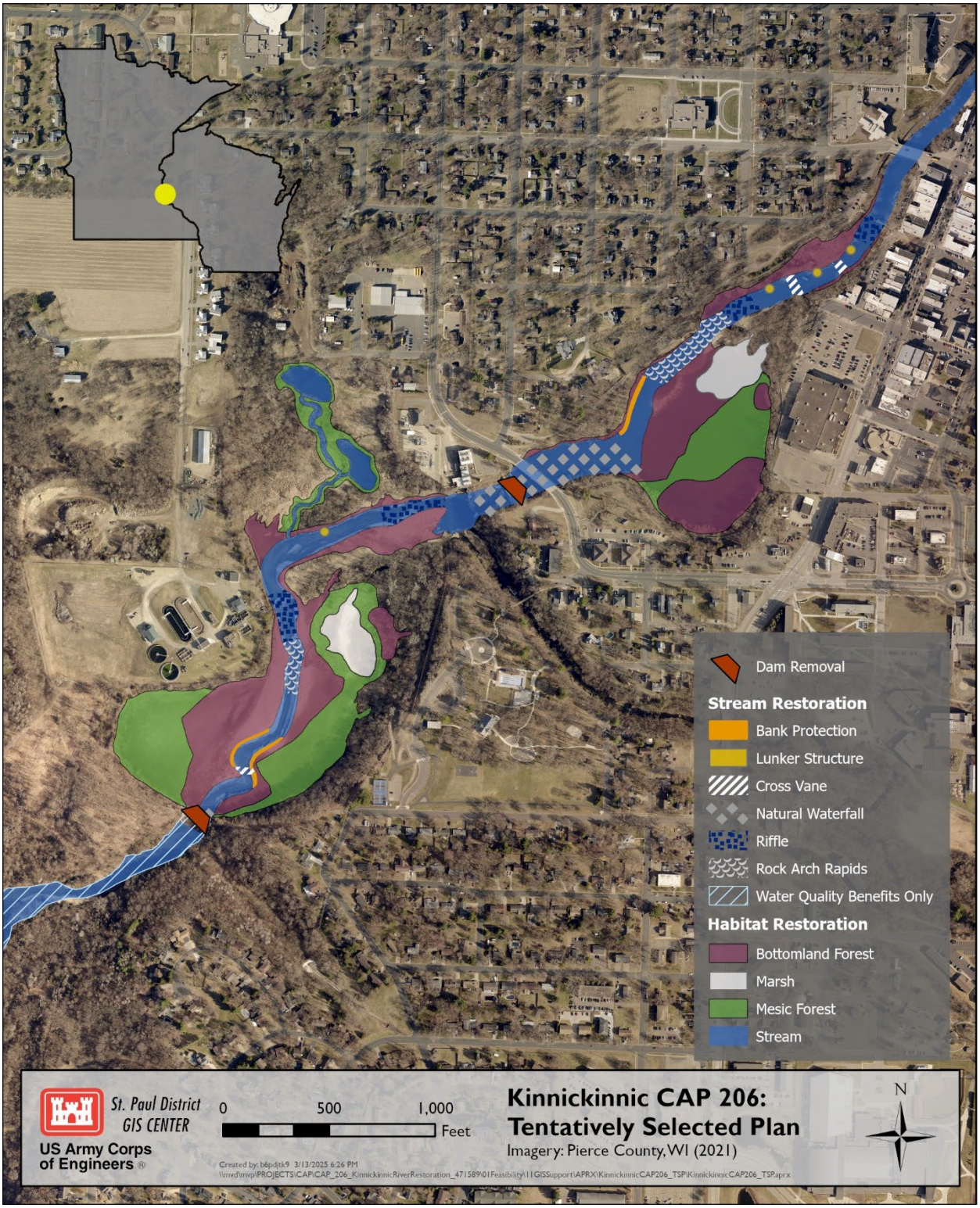

Figure ES – 1 Kinnickinnic CAP Tentatively Selected Plan – Alternative 7

ACRONYMS

Average Annual Habitat Unit	AAHU	Information for Planning and Consultation	IPaC
Cost Effectiveness & Incremental Cost Analyses	CE/ICA	USACE, Mississippi Valley Division	MVD
St. Paul/Rock Island/St. Louis District	District	North American Vertical Datum of 1988	NAVD 88
Engineering Circular	EC	National Environmental Policy Act	NEPA
Engineer Regulation	ER	National Register of Historic Places	NRHP
Endangered Species Act	ESA	Operation and Maintenance	O&M
Feasibility Report with Integrated Environmental Assessment	FR/EA	Plans & Specifications	P&S
Federal Energy Regulatory Commission	FERC	Project Delivery Team	PDT
Fish and Wildlife Coordination Act	FWCA	State Historic Preservation Office	SHPO
Habitat Evaluation Procedures	HEP	Tentatively Selected Plan	TSP
Habitat Suitability Index	HSI	U.S. Fish and Wildlife Service	USFWS
Hazardous, Toxic, and Radioactive Waste	HTRW	Water Resources Development Act	WRDA
Habitat Unit	HU		

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1 Introduction

The U.S. Army Corps of Engineers (USACE), St. Paul District (District), has prepared this Feasibility Report with Integrated Environmental Assessment (FR/EA) to present a detailed account of the planning, engineering, construction, and environmental considerations that resulted in the Tentatively Selected Plan (TSP) for the Kinnickinnic River Continuing Authorities Program (CAP) Section 206 Aquatic Ecosystem Restoration Project.

1.1 Study Authority

The CAP Section 206 is authorized under the Water Resources Development Act (WRDA) of 1996 (P.L.104-303), as amended. Under Section 206 of the CAP, the U.S. Army Corps of Engineers (USACE) is authorized to undertake aquatic ecosystem restoration and protection projects. This includes dam removal initiatives that enhance fish passage, restore habitat connectivity, and support native fish populations—provided the project improves environmental quality, serves the public interest, and is cost-effective. As amended by WRDA 2024, the Federal share of the planning, design and implementation costs for any one Section 206 project may not exceed $15,000,000.

The District completed a Federal Interest Determination (FID) to perform a preliminary analysis, at federal expense, to determine if the potential project meets justification for federal participation. The determination identified that there is a Federal Interest in addressing the degraded ecosystem along the Kinnickinnic River in River Falls, WI. The Mississippi Valley Division (MVD) approved the Fact Sheet on 01 March 2022. The Corps and City of River Falls entered into a Feasibility Cost Sharing Agreement on 18 March 2023.

During planning of the project, the Corps identified that the cost of planning, design and implementation of the project could result in the federal share exceeding the federal participation per project limit. (See *Engineer Pamphlet 1105-2-58, Continuing Authorities Program*, 10(b)(1)). The non-federal sponsor offered to contribute funds for any costs that would normally be part of the federal share but are over the federal per project participation limit. The Assistant Secretary of the Army for Civil Works approved a policy deviation on November 4, 2024, that allows the non-Federal sponsor for this project to pay all costs that exceed the statutory federal per project participation limit for the Section 206 authority. A copy of the approval memo can be found in Appendix A – Correspondence and Coordination. Subsequently, WRDA 2024 raised the federal per project participation limit from $10 million to $15 million.

1.2 Agency Participants and Coordination

Participants in the planning of the Project included the Corps and the City of River Falls. Development of this FR/EA was actively coordinated with the participants during team meetings, phone conversations, and on-site visits to the Project area. The planning of the project was also coordinated with various resource agencies and stakeholders, further described in Appendices A and C.

U.S. Army Corps of Engineers, St. Paul District. The District is responsible for Project management and coordination with the Sponsor and other affected agencies. The District will submit the FR/EA, program funds, finalize Plans & Specifications (P&S), complete all National Environmental Policy Act (NEPA) requirements, advertise and award a construction contract, and perform construction contract supervision and administration. Feasibility study costs in

excess of the first $100,000 are cost-shared at 50 percent Federal and 50 percent non-Federal. Design and construction costs are shared at 65 percent Federal and 35 percent non-Federal.

Sponsor. The City of River Falls is the non-Federal sponsor for the project. The non-Federal sponsor is responsible for 35 percent of total project costs during the design and implementation, along with any costs exceeding the federal per-project participation limit. The non-Federal sponsor must provide all lands, easements, rights of way, and disposal sites (LERRD) required for the project, perform required non-Federal audits, and perform investigations necessary to identify the existence and extent of hazardous substances on LER required for the project. The non-federal sponsor is responsible for operation, maintenance, repair, rehabilitation, and replacement (OMRR&R).

1.3 Study Area

The Kinnikinnic River is a coldwater trout stream that drains an area of approximately 172 square miles. The river begins its journey as the culmination of flows from several intermittent, spring-fed streams, approximately 16 miles northeast of River Falls, WI. The Kinnikinnic River then flows 26 miles southwest, through the center of River Falls, discharging as the last major tributary to the St. Croix River at Kinnickinnic State Park, approximately halfway between Prescott, WI and Hudson, WI. Powell Falls and Junction Falls dams impound the Kinnikinnic River within the City of River Falls, Wisconsin (“the City”, “River Falls”), (National Hydrology Dataset, 2015, Figure 1-1). The watershed is home to more than 50% of the bird species and 40% of the plant species found in Wisconsin.

Junction Falls Dam is a run-of-river concrete gravity dam built between two waterfalls and immediately upstream of the mainstem Kinnickinnic River’s junction with its south fork. The dam was originally constructed by the City in 1920 to replace a rock-filled timber dam constructed in the late 1800s. The dam’s spillway is approximately 32 feet high, 115 feet long, and has a 21-foot-wide base. The spillway elevation and normal pool elevation is 865.41 feet NAVD88. The design head is approximately 42 feet. The dam is currently operated as a run-of-the-river hydropower facility. A single, active turbine, with a power generation capacity of 250 kW, is housed in a power station. At Junction Falls Dam, the Kinni drains approximately 90 square miles. The dam creates Lake George, an approximate 16-acre impoundment with a storage capacity of 142 acre-feet at the top of the dam. Based on the 2015 Lake George Sediment Assessment Report, Junction Falls Dam has less than 10% of its original storage capacity, as approximately 103 acre-feet of sediment is trapped within the impoundment.

Powell Falls Dam is a concrete gravity dam located approximately 0.5 miles downstream from Junction Falls. The dam was built by the City in 1966 to replace a previously damaged timber dam. Previously capable of producing hydropower, the single turbine was removed following a flood in June 2020 that damaged the equipment beyond repair. The dam is 22 feet high with an uncontrolled spillway at an elevation of 821.91 feet above sea level (NAVD88), with a 108.25-foot long crest, and a 21-foot wide base. The dam sits on bedrock within an existing sandstone gorge. Powell Falls Dam is a run-of-the-river dam with a normal pool elevation of 821.91 feet. Flows are controlled by three hydraulic devices including an ogee spillway, a 39-inch direct intake with a 6-foot by 6-foot outlet, and a 6-square foot gated water opening used to control excess flows. The Kinnickinnic River drains approximately 110 square miles upstream, which includes the South Fork Kinnickinnic River subwatershed. The associated impoundment, Lake Louise, once covered roughly 15 acres, but was drawn down in 2021 with the removal of the dam’s hydropower equipment. Based on the 2015 Lake Louise Sediment Assessment Report,

approximately 101.5 acre-feet of sediment is currently stored within the Lake Louise impoundment.

Figure 1-1. General Kinnickinnic CAP 206 project location

The Spring Ponds area is located Southwest of Junction Falls Dam. It is a small tributary channel from a spring pond to the north and enters the Kinnickinnic at the upper end of Lake Louise. It is not a significant source of water or sediment.

1.4 Purpose and Need for Federal Action

This section describes the purpose of the study and the "purpose and need for the proposed agency action" for purposes of NEPA (42 USC 4321 et seq). For planning purposes, the period of analysis was established as 50 years starting in 2029. The period of analysis is the period of time that an alternative would have significant beneficial effects.

Section 206 of WRDA 1996 authorizes the Corps to develop aquatic ecosystem restoration projects that improve the quality of the environment, are in the public interest, and are cost-effective, consistent with current policies and procedures. This Feasibility Study (Study) is in response to the request from the City of River Falls, Wisconsin to investigate measures that can help restore the Kinnickinnic River to similar conditions pre-impoundment.

The purpose of this FR/EA is to study water resource solutions to address identified problems that threaten the resources of the Kinnickinnic River and Kinnickinnic Project Area. The need for restoration and rehabilitation actions within the study area is based on the following factors, which are further described in Problems, below:

- The Project Area encompasses a section of river that is a world-renowned trout stream with high densities of brown and brook trout.
- Altered hydrology because of the two impoundments has created hydrologic conditions that has and will continue to degrade coldwater stream habitat.
- Prolonged water levels within the Lake George and Lake Louise areas have severely impacted the floodplain and forest habitat, habitat diversity, and limited shade for trout species and habitat for a variety of wildlife species.

The study objectives identified below provide the purpose in response to the need. The study with Environmental Assessment (EA) including the Finding of No Significant Impact (FONSI) assesses the environmental effects of a reasonable range of potential alternatives or actions evaluated by the USACE, including the No Action Alternative, prior to decision-making. The study aims to provide enough information to federal decisionmakers to determine whether the implementation of a proposed plan is a wise investment decision to address the aquatic ecosystem degradation. The purpose of this EA is to determine whether the preparation of an Environmental Impact Statement (EIS) is necessary based on the impacts associated with the Project within the Continuing Authorities Program (CAP). If an EIS is not necessary, this decision is documented through the preparation of a FONSI. The FR/EA meets USACE planning guidance and meets NEPA requirements.

1.5 Study Scope

The District proposes to rehabilitate and enhance the Project area through restoration of the river corridor to mimic pre-impoundment conditions by providing natural hydrothermal and hydrogeomorphic dynamics within the river, and restoring adjacent riparian habitat and connectivity.

The USACE developed this report with the City of River Falls serving as the non-Federal sponsor. This report provides planning, engineering, and sufficient construction details of the TSP to allow for final design and construction to proceed subsequent to document approval.

The report will include detailed analyses on the various alternatives proposed and their respective benefits.

The purpose of the main report is to summarize the multidisciplinary efforts of USACE and the City of River Falls that led to the study recommendation. USACE organized the report to follow a general problem-solving format.

- Review existing conditions and anticipated future conditions;
- Identify project goals and objectives;
- Review existing reports and data that the City of River Falls provided;
- Formulate restoration alternatives to address the objectives;
- Identify costs and benefits of the restoration alternatives;
- Compare the alternatives on the costs and benefits;
- Recommend a single restoration plan for implementation; and
- Present a detailed analysis on the plan.

The detailed analysis includes considerations of design, construction, operation, and maintenance; a detailed cost estimate; a monitoring plan to gage restoration performance; real estate requirements; environmental effects; and a detailed schedule for implementation. Supporting documentation is provided in the appendices of this report.

1.6 Resource Significance

Resource significance is considered from a public, institutional, technical, and indigenous standpoint, as described in ER 1105-2-103. These four categories are used to determine if the ecosystem within the study area is significant enough to warrant Federal investment. The three categories include institutional, technical, and public significance.

1.6.1 Institutional Recognition

Institutional recognition means that the importance of an environmental resource is recognized and acknowledged in the laws, plans, and policies of government agencies, tribes, or private groups. Institutional significance of the Kinnickinnic River and its ecosystem have been recognized as a significant resource by a number of public agencies, non-profits, and private organizations. Institutional recognition is also documented in the following acts: the Clean Water Act, the Fish and Wildlife Conservations Act of 1980, and the Fish and Wildlife Coordination Act. The Wisconsin Legislature established the Kinnickinnic State Park in 1972. The Kinnickinnic State Park encompasses a 1,242-acre area where the Kinnickinnic River joins the St. Croix River. State parks are established to provide ecosystem services, protect the land, encourage a sense of stewardship, and stimulate public involvement around environmental issues. The State Park establishment also attracts tourists to the study area to experience the recreational opportunities the Kinnickinnic provides.

According to the Wisconsin Department of Natural Resources, the Kinnickinnic River and the South Fork of the Kinnickinnic River are considered outstanding Class I trout waters. The Kinnickinnic River, outside of the impounded areas is designated as an Area of Special Natural Resource Interest (ASNRI). The state of Wisconsin values the unique resource of the trout stream and has classified it as ASNRI. This designation ensures there is adequate protection and proper management of this unique resource.

1.6.2 Technical Recognition

Technical recognition means the resource qualifies as significant based on scientific knowledge or judgment of critical resource characteristics. Scarcity, representativeness, status and trends, connectivity, limiting habitat, and biodiversity describe technical significance. Differences across geographical areas and spatial scales may also determine whether a resource is significant. The Kinnickinnic River has been elected as a “high quality” trout stream, producing a unique and sustainable resource in the area. The Kinnickinnic River has been identified as a Class 1 trout stream. This classification is rooted in key factors that define technical significance, including scarcity, as high-quality trout streams are rare; representativeness, as it serves as a model of sustainable coldwater ecosystems; biodiversity, since it supports a complex web of aquatic and riparian life; and habitat connectivity, contributing to broader ecological networks. The water is of high-quality and has sufficient natural reproduction to sustain populations of wild trout. The Kinnickinnic is specifically important due to being of critical temperature for trout habitat.

1.6.3 Public Significance

Public recognition means some segment of the general public recognizes the importance of an environmental resource, as evidenced by people engaged in activities reflecting an interest or concern for that resource. The public recognizes the Kinnickinnic River as a nationally, regionally, and locally significant resource. American Rivers, a non-governmental organization dedicated to protecting and restoring healthy, natural rivers, listed the Kinnickinnic River in America’s Top Ten Endangered Rivers for 2007 at #7. Non-profit and private organizations recognize the significance of the resources in the Kinnickinnic study area through active engagement in supporting restoration efforts. The City of River Falls has funded numerous studies to evaluate the river, the two dams, and potential removal and restoration actions that would positively impact the city, residents, and the environment. Some of the public services the Kinnickinnic River provides include aesthetics, recreation (trout fishing and kayaking), education, history, and flood regulation.

In addition, the PDT held a scoping meeting with the public on August 15, 2023 as part of the planning process. Approximately 150 members of the public attended the meeting, reflecting a high level of community engagement and interest in the outcome of the feasibility study. Attendees expressed enthusiasm for either the hope to restore the study area to a more natural waterway or to keep the impoundments in place for the purpose of hydropower.

1.7 Problems and Opportunities

Both existing and future conditions expected to occur without a project must be characterized to clearly define the problems and opportunities for a study. The future without-project condition (FWOP) forms the basis from which alternative plans are formulated and impacts are assessed. The Kinnickinnic Study Area is the footprint within which direct and secondary impacts associated with any USACE project are evaluated on physical, ecological, and cultural resources.

1.7.1 Problem Identification

USACE’s planning process starts with identifying problems and associated opportunities within the geographic scope of the study area. From the list of problems and opportunities, and in collaboration with the project Sponsor, USACE drafts specific objectives for the project. USACE determines the success of project planning by the fulfillment of the objectives through identified measures. The following documents the major problems within the study area.

The construction of the Junction Falls and Powell Falls dams to generate hydropower led to the creation of two impoundments that transformed the Kinnickinnic River from a naturally flowing system into two lake-like reservoirs. These impoundments expanded the water surface area, creating new shallow habitat for certain waterfowl and fish species, but also disrupted the natural riverine processes and exacerbated conditions that have degraded other critical habitats. The Kinnickinnic is designated as a Class 1 trout stream by the Wisconsin Department of Natural Resources (WI DNR), meaning it is a high-quality waterway with sufficient natural reproduction to sustain wild trout populations, at or near carrying capacity. This designation highlights the pristine condition of the stream, making it a prime destination for angles and a vital habitat for the ecosystem. Over time, the impoundments have caused a rise in overall temperature in the project area sections of the Kinnickinnic River (Ayres, 2021). Brown and brook trout habitat, dependent on cold river temperatures, has declined from historic levels and is likely to continue to do so. Without an adjustment to the dams, the Kinnickinnic River and study area are likely to continue to degrade.

Aquatic habitat within the study area has further degraded due to changes in water flow dynamics. The impoundments have created stagnant water areas, resulting in poor dissolved oxygen (DO) levels and the loss of suitable habitat for native fish and other aquatic organisms. In particular, overwintering habitat for fish, such as brown trout and other desirable species, has been lost or diminished when DO levels decrease. Without intervention, the conditions that contribute to poor water quality and reduced aquatic habitat are likely to persist and worsen over time.

Riparian habitat and floodplain connectivity have also been negatively affected by the presence of the dams. Alternations to the natural hydrologic regime have resulted in the loss of riparian vegetation and the encroachment of invasive and unwanted species, such as reed canary grass and stinging nettle, which outcompete native plant communities. The degradation of riparian zones reduces their ability to provide critical ecological functions, such as shading to regulate water temperature and stabilizing riverbanks to prevent erosion.

A variety of physical, chemical, and biological stressors have individually and cumulatively affected the quantity and quality of habitat for biota. The problems within the study area can be summarized in the bullet points below:

1. Reduced and threatened coldwater species habitat due to altered hydrothermal processes.
2. Reduced riparian habitat due to altered hydraulic regime and loss of connectivity.
3. Altered sediment regime resulting in unstable geomorphic conditions and reduced quality of riffle pool habitat.
4. Altered aquatic flora and fauna communities due to altered hydrologic regime.
5. Reduced upstream connectivity.
6. Water quality degradation associated with the impoundment (i.e., increased water temperatures, decreased dissolved oxygen) could continue to degrade due further sedimentation and warmer temperatures, jeopardizing the trout population of the Kinnickinnic River.
7. Powell Falls Dam was damaged during a flood event in 2020 and is not currently impounding water due to dam safety concerns, leaving an incised stream with unstable banks where Lake Louise was.

1.7.2 Opportunities

Opportunities are often ancillary to the identified problems. Opportunities are not the inverse of the problems but refer to additional ways the ecosystem/habitat can be improved by addressing the problems and act as supplemental positive impacts. The following opportunities were identified for this study.

a. Create or restore marsh and wetland habitats to improve habitat diversity within the Study area.
b. Improve recreation opportunities (public education, safety, etc.) for the public use within the Project area.
c. Create or restore riparian habitat in the formerly impounded areas, for example mesic forest and bottomland forest in support of achieving the project objectives.

Restoring forest would provide opportunity to use excavated sediment and provide shading and habitat. While recreation was identified as an opportunity, no formulation for recreation was proposed or implemented in this study.

1.8 Planning Objectives

Based on the identified problems affecting the Project's natural resources, the goals for the project are to restore and enhance natural hydrothermal and hydrogeomorphic dynamics to support habitat suitable for native and desirable, aquatic and terrestrial flora and fauna. The Kinnickinnic River CAP 206 project objectives identified to meet these goals over the period of analysis are to:

- Restore natural hydrothermal dynamics to support native coldwater species that were present prior to impoundment.
- Increase riffle and pool geomorphic sequencing to increase the use and availability of coldwater habitat species.

1.9 Planning Constraints and Considerations

Compliance and coordination emphasize the importance of environmental impacts to be minimized and avoided, as much as possible. The following constraints and considerations were included in the plan formulation:

1. Institutional constraints: Measures may not induce flooding outside project lands. Avoid adverse impacts to cultural resources.
2. Environmental constraints: Construct measures consistent with federal, state, and local laws. Avoid impacts to threatened and endangered species. Avoid actions that would introduce, promote, or spread invasive species.

In addition to institutional and environmental constraints, there are also considerations that were considered throughout the planning process. The specific considerations used for this study area are as follows:

- Critical infrastructure in the Study area.
- Restoration measures should be designed for resilience and sustainability, which can minimize operation and maintenance.

1.10 Prior Reports, Existing Water Projects, and Ongoing Programs

Table 1 summarizes prior reports, existing water projects, and ongoing programs which provided valuable information, experience, or guidance in the planning of the Project. Additional literature cited can be found in Section 10 and at the end of each Appendix.

Table 1. Prior Reports, Projects, and Programs

Year	Study/Report/Environmental Document Title	Project Relevance
1995	City of River Falls Water Management Plan for the Kinnickinnic River and Its Tributaries	Long-term plan for managing the river and helped inform on current and future habitat conditions.
1998	Kinnickinnic River Priority Watershed Surface Water Resource Appraisal Report	Document summarizes conditions of surface water resources and discuss water resource goals.
2003	Kinnickinnic River at River Falls, Wisconsin Thermal Study	Thermal modeling study that evaluated the efficacy of different storm runoff management plans.
2005	Lake George Area Stormwater Treatment Concept Plan Final Report	Information provided in this document helps inform on the potential impacts of stormwater outfalls to the project area.
2009	Powell Dam Inspection Report	Document includes site inspection for Powell Falls Dam.
2009	Junction Falls Dam Inspection Report	Document includes site inspection for Junction Falls Dam.
2011	Eklutna River Aquatic Ecosystem Restoration Technical Report	Lessons learned from this project were used during the plan formulation for this study.
2016	Lake George and Lake Louise Sediment Assessment	Document includes site inspections and assessments of Lake George and Lake Louise.
2017	Restoration of the Kinnickinnic River through Dam Removal Feasibility Report	Document used in informing the planning objectives, measures, and desired future habitat conditions.
2019	River Falls Hydroelectric Project Wetland, Riparian, and Terrestrial Resources Survey	Document includes reconnaissance level surveys to document various resources in the Project boundaries.
2021	Phase 1 Archaeological Survey at the Powell Falls Development, River Falls Hydroelectric Project	Document includes cultural site inspections of Powell Falls and surrounding area.

Year	Study/Report/Environmental Document Title	Project Relevance
2021	Phase 1 Archaeological Survey of the Shoreline at the Junction Falls Development, River Falls Hydroelectric Project	Document includes cultural site inspections of Junction Falls and surrounding area.
2024	Kinnickinnic River Moody Project	River restoration project geared towards stabilizing eroding banks and enhancing instream habitat. Instream habitat included root wads, rock deflectors, riffle and pools enhancement, a refuge area for young of year trout and instream boulders. Located within the Upper Kinnickinnic River.

2 Existing Condition and Future without Project Condition

Both the existing and Future Without Project (FWOP) condition are expected to occur without a project and must be characterized to clearly define the problems and opportunities for a study. In the absence of measures such as impoundment removal, sediment management, and floodplain restoration, the following adverse effects are likely to occur in the study area: increased water temperature throughout the whole of the Kinnickinnic River; increased loss of riparian habitat due to changes in hydrology; increased loss in river connectivity; increased variability in geomorphic conditions which can lead to habitat degradation, and an; increase in cumulative adverse impacts on ecosystem services.

This section describes the existing and FWOP conditions that are specifically relevant to this study and are within the Kinnickinnic Project Area. The FWOP forms the basis from which alternative plans are formulated and impacts are assessed. The FWOP condition is the forecasted condition of the study area for the next 50 years (2029-2079), assuming no significant action is taken to address the resource problems identified above. In this case, the FWOP assumes that Junction Falls and Powell Falls Dams will remain in their same states. This is because dual dam removal is likely not achievable without further planning and financial and assistance. Powell Falls Dam is decommissioned and could be removed more easily, but this may occur later in time than compared to the action alternatives in this study and is too speculative to be considered part of the FWOP. If Powell Falls Dam is removed, the FWOP condition would not change noticeably as there is currently no impoundment. Under the FWOP Lake Louise is anticipated to stay drained. The dam with ongoing hydropower operations is anticipated to remain in such operations at least until the end of its Federal Energy Regulatory Commission (FERC) license if no federal project is undertaken. If FWOP conditions are not explicitly mentioned in the sections below, it is assumed conditions would be similar to the described existing condition or that the FWOP condition is uncertain to the point that projecting the future would be speculative. Section 6, Environmental Consequences, analyzes the effects of the existing and FWOP conditions under a No-Action Alternative and the TSP.

2.1 Natural Resources

2.1.1 Hydrology and Hydraulics

Existing Condition: The Kinnickinnic River watershed lies in western Wisconsin in the St. Croix River basin and drains approximately 172 mi^2 across Pierce and St. Croix Counties and

encompasses the entirety of the USGS's Hydrologic Unit Code-10 watershed (0703000511). The watershed is located 30 miles east of the Minneapolis-St. Paul Metro area, just east across from the Minnesota-Wisconsin border. The watershed is dominated by agriculture (57%), grassland (22%), and forest (17%), with approximately 2% of the watershed consisting of wetlands and lakes. The Kinnickinnic River begins its journey as the culmination of flows from several intermittent, spring-fed streams, approximately 16 miles northeast of River Falls, WI. The Kinnickinnic then flows 26 miles southwest, through the center of River Falls, where the river becomes impounded by Junction Falls Dam (Lake George), then discharging as the last major tributary to the St. Croix River at Kinnickinnic State Park, approximately halfway between Prescott, WI and Hudson, WI. The average slope of the Kinnickinnic is approximately 10 feet/mile with middle portions of the river being flatter. Elevations in the watershed vary from 1,205 feet above mean sea level, North American Vertical Datum of 1988 (NAVD 88), in the upper portions of the watershed, to 680 feet NAVD 88 above mean sea level at its confluence with the St. Croix.

2.1.2 Water Quality

Existing Condition: The Kinnickinnic River is viewed as an exceptional natural resource and world class trout stream, but like other midwestern streams, there are several water quality concerns. With much of the land classification of the watershed being agricultural (57%), there are concerns with sediment loading, turbidity, and high levels of phosphorus. Water quality concerns from agriculture can negatively impact trout species, as they require clean, cold water with high levels of dissolved oxygen.

Another major concern around water quality within the Kinnickinnic Project Area is elevated water temperatures from stagnation associated with dam impoundment. Impoundment results in increased water surface area and solar exposure, which can increase water temperature and decrease dissolved oxygen, a problem that can escalate during summer months and periods of extreme air temperatures and drought. Elevated water temperatures in coldwater streams can directly impact biota to the point where physiological tolerances are exceeded, making the stream intolerable for trout species and other biota. Thermal data for the area (1994-2020) showed that water temperatures in July below Powell Falls Dam, on average, were 4.4 °F higher than temperatures taken at Division Street, where the Kinnickinnic River is upstream of Lake George and not yet impounded (Kiap-TU-Wish 2023). Since the draining of Lake Louise in 2020, this thermal difference decreased to 1.8°F to 2.3°F, indicating that the draining of Lake Louise has had a positive impact on thermal impacts on stream biota. However, even with this decrease in temperature throughout the Kinnickinnic Project Area, there are times when water temperatures are above the optimal temperature range for brown and brook trout species (66.2°F, Kiap-TU-Wish 2023).

FWOP Condition: Recent trends have shown that air temperatures in the Midwest region have become higher throughout the year, with this being more evident in the summer months (See Appendix M for more details). This trend is expected to continue into the FWOP, resulting in elevated water temperatures within the Kinnickinnic Project Area. This trend is anticipated to impact impounded areas (i.e., Lake George) that are already subject to increased solar exposure and decreased oxygen levels. For this reason, water quality is expected to decrease under the FWOP condition.

2.1.3 Wetlands and Aquatic Habitat

Existing Condition: A majority of the Kinnickinnic Project Area from an aquatic classification standpoint is either riverine or lake/impoundment, with some bordering wetlands. Lake George contains several palustrine emergent wetlands near the northern section of the impoundment (Figure 2-1). The project area below Junction Falls Dam is no longer impounded and is now a mix of riverine and wetland aquatic habitat types. The Spring Ponds are classified as emergent wetlands, surrounded by a mixture of forested and shrub wetlands. The northeastern area of Lake Louise contains a mixture of forested and emergent wetlands (Figure 2-1).

2.1.4 Soil, River Substrate, and Sediment

Existing Condition: The surficial soil deposits within the Kinnickinnic River Valley consist of incised and eroded bedrock mixed with rounded glacial outwash gravels and cobbles. Much of the soils within the Kinnickinnic River and Lake George floodplain are classified as a mixture of wet sands, wet loamy clay or sandy floodplains. As elevation increases around the project area, the soil regime changes to a mixture of dry upland, dry mollic or umbric upland, and loamy-silty upland soils. These soil types are porous and drain quicker than finer soils (i.e., clays). The riverine substate within the Kinnickinnic Project Area can be broken up into two distinct areas. The river north of the Lake George impoundment and area below Junction Falls, which has substrate comprised of boulders, cobble, gravel, and sands. The section of the river within the once Lake Louise impoundment has incised and unstable, sandy banks following its drainage. The river bottom in this section is now primarily gravel and cobbles. The substrate of Lake George is a mixture of medium to coarse sands, fine sands and silt/clay. Impoundment from Junction Falls Dam has created a large sediment deposition area within Lake George that has covered up gravel, cobble and boulder bed material within the remnant channel of the Kinnickinnic River, and soils from the old riparian floodplain.

2.1.5 Land Use

Existing Condition: The greater Kinnickinnic watershed is dominated by agriculture (57%), grassland (22%), and forest (17%), with approximately 2% of the watershed consisting of wetlands and lakes. Apart from the dams themselves, the entirety of the Kinnickinnic Project Area is owned by the City of River Falls and is public land that can be used for recreation. The area specifically impacted by this project, is dominated by stream or open water (51%), followed by grasses or grasslands (34%), (Figure 2-2). Most of the grassland within the project area reside within the drained Lake Louise, much of which is occupied by invasive or unwanted plant species that took over following the draining of the lake. Other less represented land classes within the Kinnickinnic Project Area include grasses and shrubs (5%), deciduous forest (4%), forest and shrubs (4%), shrubs (2%) and wetlands (1%). Landcover classification was delineated based on Pierce County aerial imagery from 2021 and does not include the Lower Kinnickinnic River that is depicted in Figure 1-1.

2.1.6 Terrestrial Habitat

Existing Condition: Terrestrial habitat throughout the Kinnickinnic Project Area is highly variable depending on the sub-area of the project. The terrestrial habitat above Junction Falls Dam (Lake George) is rather limited within the project area footprint with a mixture of forest, shrubs and grasses. The riparian zone around Lake George and the northern section of the Kinnickinnic turns into a mixture of high and low intensity developed land. Below Junction Falls there is more terrestrial habitat present, most of which is classified as uninhabited grasses, shrubs, and a mixture of both (Figure 2-2). The Lake Louise sub-area was once impounded, so proper restoration has not taken place since the lake was drained in 2021 and much of the area

does not represent favorable terrestrial habitat for wildlife. Other terrestrial areas within the Kinnickinnic Project Area includes the habitat surrounding Spring Ponds, which is primarily a mixture of deciduous forest and forest shrub mixtures.

2.1.7 Hazardous, Toxic and Radioactive Waste (HTRW)

Existing Conditions: Sediment analysis was completed in 2016 by Inter-Fluve (samples taken in 2015) to assess the chemical properties of sediments within Lake Louise and Lake George as part of 2017 Dam Removal Feasibility Report. The study conducted sediment sampling at 12 locations using vibrating coring and grab sample devices. These results indicated there were levels of contaminants of concern present at a few locations, including a higher concentration of arsenic within sample LL-C1 from Lake Louise (35.4 mg.kg, see Appendix D for more details). Only the arsenic was identified as requiring further sampling during the study phase.

In 2023, USACE conducted 5 hand augured borings to verify the HTRW concerns surrounding the LL-C1 site and consider the need for avoidance. The 2023 sediment results indicated lower levels of arsenic that were at background levels for the region as compared to the higher concentrations of arsenic discovered in 2015 (See Attachment D-3 and D-4 of Appendix D The Phase I HTRW Environmental Site Assessment can be found in Appendix D, Phase 1 ESA.

The Phase I also identified closed sites on adjoining properties upstream of Junction Falls Dam, outside the project area.

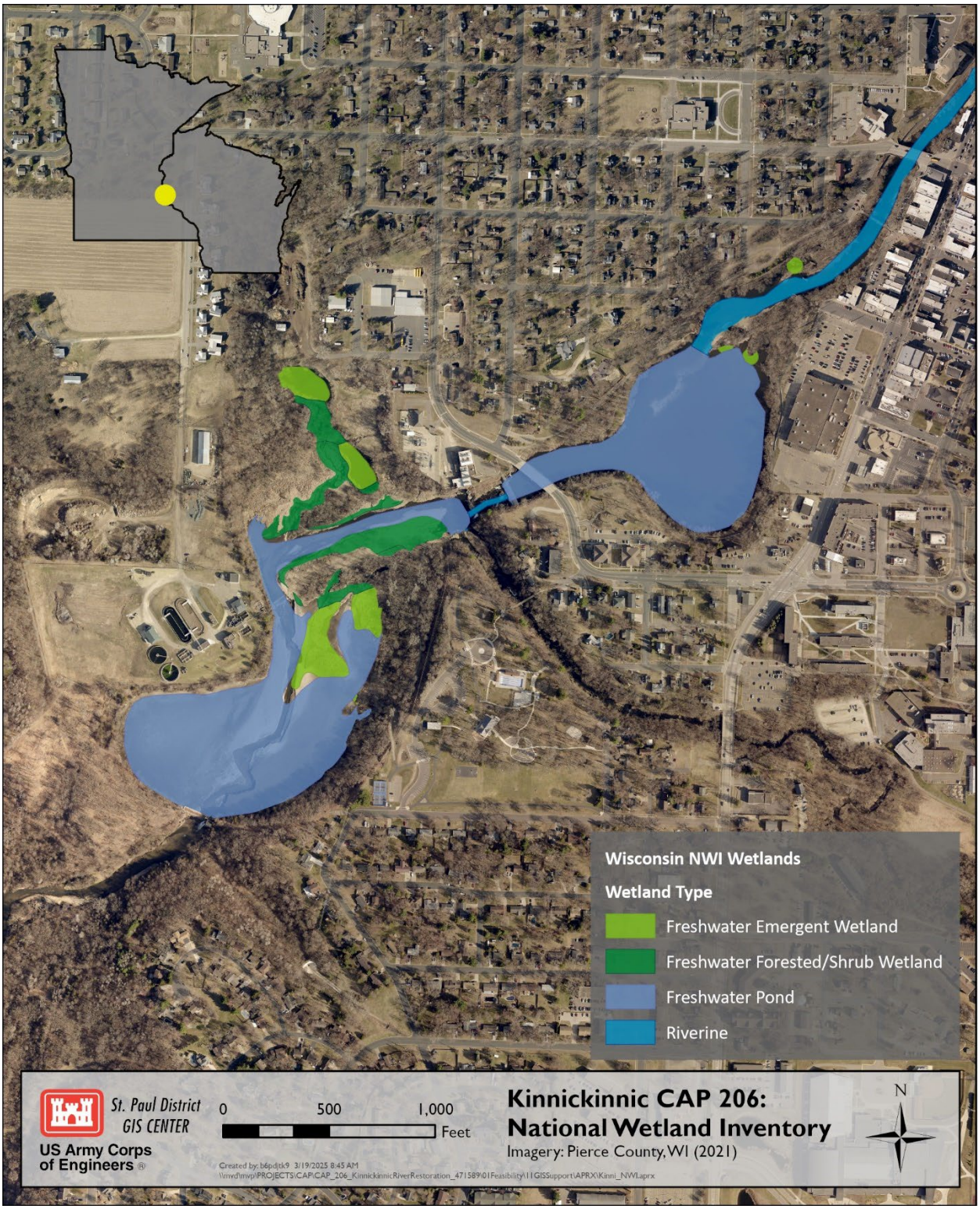

Figure 2-1. Kinnickinnic River Wetland Inventory

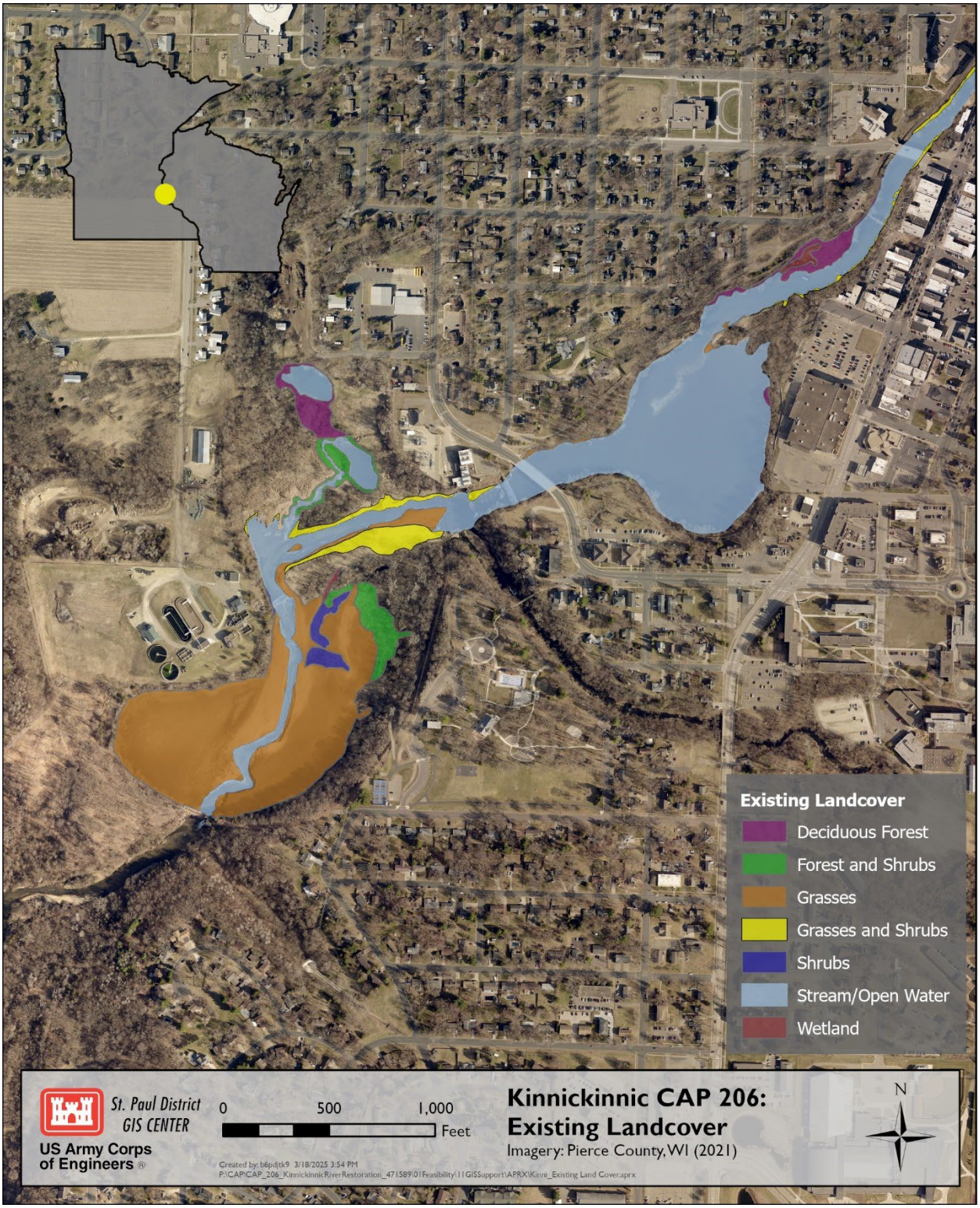

Figure 2-2. Kinnickinnic River Landcover Map

2.1.8 Air Quality

The U.S. Environmental Protection Agency (EPA) is required by the Clean Air Act to establish air quality standards that primarily protect human health. These National Ambient Air Quality

Standards regulate six major air contaminants across the U.S. When an area meets criteria for each of the six contaminants, it is called an “attainment area” for the contaminant; those areas that do not meet the criteria are called “nonattainment areas.” The Kinnickinnic Project Area is classified as an attainment area for each of the six contaminants and is therefore not located in a region of impaired ambient air quality (U.S. EPA, 2025). This designation means that the Project area has relatively few air pollution sources of concern and is expected to remain that way into the future.

2.1.9 Fisheries

Existing Condition: The Kinnickinnic River includes 25 miles of Class 1 trout water and is listed as an Outstanding Resource Water by the WI DNR. Class 1 trout water signifies the highest quality possible trout waters that have sufficient natural reproduction to sustain wild trout populations that are at or near carrying capacity. As such, these streams do not require stocking of hatchery trout. To maintain this status, the WI DNR have completed trout restoration projects on sections of the Kinnickinnic River. One such project, the Moody Project was completed in 2024, which stabilized an eroding bank and providing instream habitat for trout. Fish species that inhabit the Kinnickinnic River include brook trout, brown trout, smallmouth bass, brook stickleback, fathead minnow, mottled sculpin, and white sucker. The Kinnickinnic River contains an exceptionally high density and quality brown trout population, making it one of the best brown trout fisheries in the country. Native brook trout are found within certain stretches of the Kinnickinnic River, with brook trout representing the main trout species within the South Fork of the Kinnickinnic River. Since Lake Louise was lowered indefinitely in 2021, brook trout numbers have increased within the river stretch from Junction Falls to Powell Falls Dam. In general, trout numbers within the Kinnickinnic Project Area are slightly lower than the Upper and Lower section of the Kinnickinnic River, especially in Lake George. Lake George is not listed as a trout water as the temperature and substrate within the lake is not suitable for coldwater trout species and is not providing habitat for these species. Other fish species within the Lake George reservoir include panfish and largemouth bass. Junction and Powell Falls Dams impacts downstream passage of fish and other wildlife; however, the natural falls behind Junction Falls likely prohibited upstream fish passage prior to dam construction.

FWOP Condition: Water temperature is a key component to trout reproduction and overall vitality. Water temperatures below 59°F during the warmest time of year are optimal for fry, while optimal temperature range for juvenile and adult trout extends to 66°F. In general, water temperatures below approximately 79°F are necessary for the survival of both age classes. With Junction Falls Dam remaining and inundating the Lake George area under the FWOP condition, there is concern that thermal pollution associated with impoundment could negatively impact the trout population downstream of Lake George. Stream impoundment results in higher water temperatures due to stagnation, especially in shallow reservoirs that are subject to increased sedimentation. Projected increases in air temperature into the future could increase an already concerning problem for the project area (see Appendix M, Long-Term Assessment of Hydrometeorological Conditions). The concern of impoundment and degradation of trout suitability within the area under the FWOP was analyzed through Habitat Evaluation Procedures (Appendix K).

2.1.10 Aquatic Invertebrates

Existing Condition: The Kinnickinnic River, especially within the Project Area has a low likelihood to contain mussels or mussel beds because coldwater streams are low in nutrients and lack the food sources necessary to sustain mussels. In the summer of 2020, the USACE

completed a 120-minute timed search mussel survey within the Lower Kinnickinnic that yielded zero mussels collected. The section of the St. Croix River, at the Kinnickinnic River's confluence, contains several diverse mussel beds. During the 2020 mussel survey, the three sites closest to the confluence yielded 318 mussels encompassing 14 species during 180 minutes of timed searching. Though the mussels within the St. Croix do not reside within the Kinnickinnic Project Area, they could be impacted by water quality impacts associated with a project. Other aquatic invertebrates within the project area include aquatic larvae insects that provide food for trout and are vital for a coldwater stream food web.

2.1.11 Wildlife

Existing Condition: The Kinnickinnic River and its surrounding floodplain provides habitat for a variety of terrestrial wildlife and birds. Terrestrial wildlife surrounding Lake George is rather limited, as it resides within a more heavily populated area; however, there are several herptile species and small mammals present. Lake Louise, being more remote and secluded, has a better chance of containing higher number of herptile species and terrestrial wildlife such as white-tailed deer, racoons, beavers and other small mammals. The Kinnickinnic Project Area is home to many bird species, including songbirds, raptors and waterfowl that utilize Lake George and the Kinnickinnic River. According to the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) website, the project has the potential to contain nine species of migratory birds identified by the USFWS as Birds of Conservation Concern and protected under the Migratory Bird Treaty Act (Table 2).

Table 2. Migratory Bird Species Act within or near the Kinnickinnic Project Area.

Common Name	Scientific Name	Breeding Season
Bald Eagle	*Halieaeetus leucocephalus*	Oct 15 - Aug 31
Black-billed Cuckoo	*Coccyzus erythropthalmus*	May 15 - Oct 10
Bobolink	*Dolichonyx orzivorus*	May 20 - Jul 31
Chimney Swift	*Chaetura pelagica*	Mar 14 - Aug 25
Grasshopper Sparrow	*Ammodramus savannarum perpallidus*	Jun 1 - Aug 20
Henslow's Sparrow	*Centronyx henslowii*	May 1 - Aug 31
Red-headed Woodpecker	*Melanerpes erythrocephalus*	May 10 - Sep 10
Rusty Blackbird	*Euphagus carolinus*	breeds elsewhere
Wood Thrush	*Hylocichla mustelina*	May 10 - Aug 31

2.1.12 Federally-Listed Threatened and Endangered Species and Species Proposed for Listing

Existing Condition: The USFWS IPaC website was consulted on March 14, 2025, to identify the potential presence of Federally-listed threatened and endangered species that may occur within the Project area and be affected by the Project. Specific quantities or number of individuals for a given species are not generated as part of this analysis, rather species are generated based on the potential to reside within an analysis area. Seven species listed as threatened, endangered, or proposed threatened or endangered by USFWS may be found in the analysis area (Table 3). The species generated from IPAC are described in further detail below. Additionally, the IPAC generated a list of 9 migratory bird species that occur on the USFWS Birds of Conservation Concern list or warrant special attention within the Kinnickinnic Project Area. This can be found with in Appendix C, Environmental Coordination.

Tricolored Bat

The tricolored bat (*Perimyotis subflavus*) is a small insectivorous bat that is distinguished by its unique tricolor fur that often appears yellowish to nearly orange. The tricolored bat tends to hibernate in caves, mines, and tunnels, specifically in deeper portions of the hibernacula where temperatures and humidity are higher (Hazard 1982). This species was once common throughout central and eastern United States but has recently been heavily impacted by white-nose syndrome, resulting in an estimated 90% decline in species numbers. To combat this steady decline the USFWS proposed the tricolored bat for listing on 14 September 2022, giving the species a proposed endangered status under the Endangered Species Act of 1973, as amended (ESA).

Whooping Crane

This avian species is one of North America's tallest, with males approaching five feet when standing (USFWS 2011). Whooping cranes within the Project area are part of a non-essential experimental population, which means the population is not essential for the continued existence of the species. This non-essential population is known to reside within Pierce County, WI. Non-essential experimental populations are treated as proposed for listing for purposes of the ESA.

Higgins eye

Suitable habitat for Higgins eye (*Lampsilis higginsii*) includes deep water areas of various stable substrates in large streams and rivers with moderate current. Fish hosts for this species include sauger, walleye, yellow perch, largemouth bass, smallmouth bass and freshwater drum (USFWS 2012). Higgins eye are most commonly associated with diverse, high-density mussel beds. The Kinnickinnic River, especially within the Project Area has a low likelihood to contain mussel beds or Higgins eye, because coldwater streams are low in nutrients and food sources needed for mussels. A 2020 mussel survey conducted by the USACE within the Lower Kinnickinnic River did not find any live mussels or remnant shells (Kelner 2020). This same survey indicated that Higgins eye reside within the Lower St. Croix River where the Kinnickinnic River empties. The Higgins eye is listed under the ESA.

Salamander Mussel

The salamander mussel is a small, thin-shelled mussel that inhabits swift-flowing rivers and streams with areas of shelter under rocks or in crevices. This mussel species is the only one in North America that requires a non-fish host (mudmuppy). Based on the same rationale above for Higgin eye, the likelihood of salamander mussels existing in within the Kinnickinnic River is low. Like Higgins eye, Salamander mussels are considered rare within the Lower St. Croix River and could be impacted by water quality changes within the Kinnickinnic River. (Kelner 2023). The USFWS proposed the salamander mussel for listing on 22 August 2023, giving the species a proposed endangered status under ESA. Based on a 12-month finding petition, the species could then be listed as endangered if the review deems it necessary.

Monarch Butterfly

This North American insect species is known for long-distance migrations based on the presence of milkweed (their larval host plant, USFWS 2020). This species overwintering sites in Mexico and California have indicated a decline, which has led to the USFWS to propose the species for listing as threatened under the ESA on 10 December 2024. With the project area potentially having milkweed present, it acts as a potential summer breeding area for this species.

Rusty Patched Bumble Bee

This insect was once widespread across the eastern United States, upper Midwest and parts of southern Canada. Prior to the species being listed, it experienced a widespread and steep decline that was somewhat unknown. Rusty patched bumble bees have been observed in a variety of habitats, including prairies, woodlands, marshes, agricultural landscapes and gardens. Nests are primarily found in upland and shrublands that contain forage areas during the summer and fall. The Kinnickinnic Project Area resides within an area of proposed critical habitat for the species, but not critical habitat. This area is also considered a high potential zone. Rusty patched bumble bee is listed under the ESA.

Prairie Bush Clover

Prairie bush-clover is a threatened plant species found only in the tallgrass prairie region of Wisconsin, Minnesota, Illinois, and Iowa. It is a member of the bean family and holds a unique niche within the tallgrass prairie ecosystem. Prairie bush-clover provides habitat for tiny predatory insects that are specialized to live within seeds (USFWS 2009). There are no known populations of this species within the Project area footprint. The tallgrass prairie habitat that this species requires is not known to exist within the direct Project area or footprint. Prairie bush clover is listed under the ESA.

Table 3. Species with potential to occur in the study area listed or proposed for listing under the Endangered Species Act

Common Name	***Type***	**Scientific Name**	**Status**
Tricolored Bat	Mammal	*Perimyotis subflavus*	Proposed Endangered
Whooping Crane	Bird	*Grus americana*	Experimental Population
Higgins Eye	Mussel	*Lampsilis higginsii*	Endangered
Salamander Mussel	Mussel	*Simpsonaias ambigua*	Proposed Threatened
Monarch Butterfly	Insect	*Danaus plexippus*	Proposed Threatened
Rusty Patched Bumble Bee	Insect	*Bombus affinis*	Endangered
Prairie Bush Clover	Plant	*Lespedeza leptostachya*	Threatened

2.1.13 State-listed Threatened and Endangered Species

Existing Condition: In addition to Federally-listed species, there are several state-listed species that have the potential to reside within the Kinnickinnic Project Area. The Wisconsin Department of Natural Resources Natural Heritage Inventory was used to generate a list of state-listed species that could reside within the project area footprint and a two-mile buffer. In total, there are 12 potential species, mostly consisting of plants, and 4 distinct community types that make up the Kinnickinnic Valley.

Table 4. State Listed Species within or near the Lake Traverse Project.

Common Name	*Type*	Scientific Name	Wisc. Status
Prairie Turnip	Plant	*Pediomelum esculentum*	Special Concern
Prairie False-dandelion	Plant	*Nothocalais cuspidata*	Special Concern
Louisiana Broomrape	Plant	*Orobanche ludoviciana*	Endangered
Yellow Evening Primrose	Plant	*Oenothera serrulata*	Special Concern
Carolina Anemone	Plant	*Anemone caroliniana*	Endangered
Ground-plum	Plant	*Astragalus crassicarpus*	Endangered
Kitten Tails	Plant	*Synthyris bullii*	Threatened
Wild Licorice	Plant	*Glycyrrhiza lepidota*	Special Concern
Prairie Bush Clover	Plant	*Lespedeza leptostachya*	Endangered
Silky Prairie-clover	Plant	*Dalea villosa var. villosa*	Special Concern
Hill's Thistle	Plant	*Cirsium hillii*	Threatened
Yellow-banded Bumble Bee	Insect	*Bombus terricola*	Special Concern
Southern Dry-mesic Forest	Community	NA	NA
Dry Cliff	Community	NA	NA
Moist Cliff	Community	NA	NA
Pine Relict	Community	NA	NA

2.1.14 Invasive Species

Existing Condition: Invasive species can rapidly disrupt land and water resources if not aggressively managed. Over time, native species can be replaced, and the ecology altered. Additionally, the interdependence and connectivity between the flora and fauna will be out of balance, and the fauna may relocate to find habitat required for preferred food, shelter, or habitat structure. In addition to their negative effects on native ecosystems, invasive species also cost natural resource managers' time and money as they work to control the spread of these species. Exotic and invasive species are a part of the existing ecosystem within the Kinnickinnic Project Area. Invasive plant species in the area include buckthorn, garlic mustard, wild parsnip, Japanese knotweed, reed canary grass, stinging nettle, and non-native phragmites. Since Lake Louise was drained indefinitely in spring of 2021, the area has become vegetated with many non-native or undesirable plants (i.e., stinging nettle).

2.2 Socio-Economic Resources

2.2.1 Recreation

Existing Condition: River Falls and the Kinnickinnic Project Area is a well-known recreation destination within the local area. The area has ample opportunities for hiking, biking, kayaking and fishing geared for outdoor enthusiasts. Local parks include Glen and Heritage Parks, which lead to many walking paths and access to both the Lake George Reservoir and Lake Louise subarea. Both Junction and Powell Falls Dams act as hazards for kayakers and other paddlers, requiring portage/take-out above both dams. The Kinnickinnic River is one of Wisconsin's most popular trout fishing streams, due to its world-class brown trout. Greater than average stream width and high trout populations make it a fly-fishing destination. From a fishing standpoint, Lake George is typically not targeted over the flowing sections of the river.

FWOP Condition: Many of the recreation opportunities are expected to remain the same under a FWOP condition. There is concern that increased water temperatures associated with the

Lake George impoundment could negatively impact downstream trout populations under the FWOP as sedimentation continues and the lake becomes shallower, thus impacting fishing opportunities below Junction Falls Dam.

2.2.2 Noise

Existing Condition: Noise levels in and around the vicinity of the Kinnickinnic Project Area are commensurate with that of other small cities. The immediate project footprint is within a river valley with many natural areas, resulting in lower noise levels. Noise levels increase on the exterior edges of the project area, as they are closer to populated areas. In general, the Lake George subarea has higher noise levels because it is closer to South Main Street and downtown River Falls. Lake Louise is further isolated from the densely populated areas of the city and has more natural areas and parks. In general, the Kinnickinnic Project Area experiences higher noise levels during daylight hours while business and recreational usage is typically higher.

2.2.3 Aesthetic Values

Existing Condition: The Kinnickinnic Project Area is unique in that it includes a coldwater trout stream and its floodplain is within the middle of an urban setting. Both Junction and Powell Falls dams have been part of the project area for generations and have shaped the way residents interact with their unique natural resources. Aesthetic values are subjective and therefore, individuals may view the dams and impoundment of Lake George differently. Some may view the dams as an eyesore and want to see the Kinnickinnic River restored to its natural state, while other may view the reservoir as aesthetically pleasing. Lake Louise is in a drained condition. The project area has drastic topographical changes with bedrock outcrops and natural cascades as the river moves from the Lake George to the Lake Louise subarea. This project area also contains the confluence of the South Fork of the Kinnickinnic River, which has several waterfalls that can be viewed from the Swinging Bridge. Most of the Lake Louise subarea is undeveloped, with a mixture forests and prairie.

2.2.4 Hydroelectric Power

Existing Condition: The hydroelectric power capabilities at Powell Falls Dam are no longer functional, with the dam being decommissioned under FERC on 24 February 2022. Junction Falls Dam has a FERC agreement that covers the use and regulation of the dam until 2040. Junction Falls has an installed capacity of 250 kilowatts (kW) and an average annual net generation of approximately 1,220,000 kilowatt hours (kWh, 2014-2020, River Falls 2021). Power generated by Junction Falls is used to offset the amount of energy and capacity purchased from WPPI Energy, directly benefitting the community of River Falls. As of 2021 the wholesale energy rate offset by hydroelectric production varied from $0.02421 to $0.05189 per kWh, which was dependent on time of day, day of week and month of the year (River Falls 2021). This equates to a yearly average energy benefit between $29,536 and $63,306. Junction Falls Dam has an annual maintenance cost (capital cost) of $60,600, meaning the dam nets between -$31,064 and $2,706 annually based on the 2021 energy rate. It is assumed that in the absence of any removal project, the City of River Falls would maintain and utilize Junction Falls for hydroelectric power until through the 2040 FERC agreement.

2.3 Cultural Resources

Existing Condition: In January of 2020, archaeological contractor TRC completed an Architectural Resources Survey for the River Falls Hydroelectric Project (FERC No. 10489), Pierce County, Wisconsin, which completed an architectural inventory and evaluation of

Junction Falls Architecture and History Inventory (AHI) 25348 and Powell Falls dams AHI 240830. The report recommended that neither structure was eligible for the National Register of Historic Places (NRHP).

The Wisconsin Architecture and History Inventory (AHI) includes several structures that are within the viewshed of the Project. However, the AHI indicates that these structures are not eligible for inclusion in the NRHP. Two historic cemeteries are near, but not within the limits of the proposed project area. One is the Greenwood Cemetery, a historic cemetery dating to the late 1800's, and the other is Foster Cemetery, which was once used as the burial grounds for the Trinity Episcopal Church of River Falls.

Phase I archaeological surveys conducted in 2021 around Junction and Powell Falls did not locate any artifacts or archaeological sites. The Corps also consulted with the Wisconsin SHPO and tribes as described in Section 7 below, and no additional historic properties were identified. No historic properties are known to occur within the area of potential effect for project alternatives.

3 Plan Formulation

Plan formulation for the CAP 206 Kinnickinnic River Aquatic Ecosystem Project has been conducted in accordance with the six-step planning process described in *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (1983) and *Planning Policy for Conducting Civil Works Planning Studies* (ER 1105-2-103). The six steps in the iterative plan formulation process are: 1) Specify the water and related land resources problems and opportunities of the study area; 2) Inventory and forecast existing conditions; 3) Formulate alternative plans; 4) Evaluate alternative plans; 5) Compare alternative plans; and 6) Select a plan.

This section documents the measures that were developed and the alternatives that we developed from those measures.

3.1 Restoration Measures

A management measure is a feature or an activity that can be implemented at a specific geographic site to address one or more planning objectives. Management measures are the building blocks of alternative plans and are categorized as structural and nonstructural. Restoration measures were developed to address study area problems, meet study objectives, and to capitalize upon study area opportunities. Measures can be classified as structural, nonstructural, and natural and nature-based. Restoration measures were derived from a variety of sources including prior studies, the public scoping process, and the multidisciplinary Project Delivery Team (PDT). General descriptions of proposed restoration measures are as follows.

3.1.1 Stream Restoration and Dam Removal

3.1.1.1 Complete Dam Removal

The complete removal of dams in the project area is a structural measure and could serve a variety of ecological and hydrological purposes. Complete dam removal would involve demolishing and excavating the entire width of the dam up to the embankment walls and restoring the river to its natural, free-flowing state. Complete dam removal would include the removal of all physical components of the dam, including the spillway, gates, and any other infrastructure that impedes water flow. By dismantling these barriers, a more natural river flow is restored and promotes the recovery of aquatic and terrestrial habitats both within the riverbed

and surrounding area, as shown in Figure 3-1. Dam removal also facilitates the natural transport of sediment, helping rebuild downstream habitats that have been sediment starved since the dams were built. The reestablished river reduces stagnant water zones, increasing dissolved oxygen levels and decreasing water temperatures, both of which are critical for coldwater aquatic life. There are two dams within the study area, Powell Falls and Junction Falls.

Figure 3-1. Dam removal process example

3.1.1.2 Natural Waterfall Restoration

Junction Falls and Powell Falls dams are both built on natural waterfalls. Additionally, Junction Falls drowns another waterfall that is currently submerged under Lake George. Removing the dams would restore these natural features and promote aeration of the stream as water flows over the cascades. A natural waterfall restoration would be a nature and natural-like feature.

3.1.1.3 Channel Restoration

The natural channel that once flowed through both the Lake George and Lake Louise areas is now buried by sediment that has been trapped by the dams. Channel restoration would be a structural measure that would involve excavating excess sediment from the original channel and the adjacent overbank areas to create a channel-form similar in character to the Kinnickinnic River as it exists both upstream and downstream of the project area. Such a measure would promote hydrogeomorphic stability while reconnecting the river to its riparian corridor, promoting the ecological health of the system the overall resiliency of the project throughout its lifespan.

3.1.1.4 Bank protection

Bank protection is a structural measure and could be accomplished for this project through placement of rock (riprap) placed directly on existing grade. This measure would reduce erosion on existing shorelines where it may be needed to protect critical infrastructure, such as the City's wastewater treatment plant. The measure will also protect the various restoration measures implemented for the project. The team did consider nature-based bank stabilization

but determined it was not feasible due to the slopes of the banks and erosion concerns in the areas where bank protection would be placed. An example of shoreline stabilization using riprap is shown in Figure 3-2.

Figure 3-2. Shoreline stabilization example

3.1.1.5 Cross Vanes

Cross vanes are channel-spanning structures that provide grade control, dissipate energy, deflect stream flow to the center of the channel, and create pools. A grade control structure stabilizes the stream channel by preventing changes in bed elevation at that point. It can also protect a streambank from undesirable erosion or migration when the erosion is caused by flows impacting the bank face.

The regular cross vane is configured as two single-arm vanes on opposite banks connected across the center of the stream by a straight or semicircular crosspiece called the “sill” section. A cross vane can be more ecologically beneficial alternative to traditional bank armor, such as riprap. They can also increase flow diversity and fish passage in uniform channels. An example of cross vanes is shown in Figure 3-3.

Figure 3-3. Cross vanes example

3.1.1.6 Riffles

A riffle is a structural measure and a shallow landform in a flowing channel. Riffles are naturally occurring features that create shallow and fast water moving over top the landform. They are normally larger than other in-channel landforms. Riffles provide important habitat for a variety of aquatic organisms.

3.1.1.7 Lunker Structures

Little Underwater Neighborhood Keepers Encompassing Rheotactic Salmonids (LUNKERS or lunkers) are a structural technique to provide both streambank stability and edge cover aquatic habitat. Their primarily use is to provide habitat for trout. Lunker structures are normally prefabricated wooden boxes that are built into an existing stream bank.

3.1.1.8 Rock Arch Rapids

This measure utilizes naturally occurring riffle and rapid features to assist in function, stability, fluid dynamics, habitat, and passability. Rock arch rapids are composed of a rock ramp base that replaces the abrupt drop in water level with a gentle slope. The rock arches, or weirs, would be nested within the ramp are made of large boulders positioned in an arch with the top of the arch facing upstream and set lower than the ‘legs’ of the arch.

Figure 3-4. Example of Rock Arch Rapids

3.1.2 Floodplain Forest Restoration

3.1.2.1 Tree Planting

This measure consists of planting a diverse suite of tree species throughout the study area. Common species employed in the site area include swamp white oak, silver maple, cottonwood, hackberry, white pine, and black walnut. The measure provides benefit by increasing ecosystem resiliency through the various functional traits of the selected species which facilitates higher productivity in riparian communities. Increased near stream tree cover would also improve shading over sections of the stream, which would cool water temperatures by decreasing thermal exposure, creating better coldwater fish habitat.

3.1.2.2 Native Seeding

Native seeding consists of spreading seeds to restore and enhance native plant vegetation throughout the project area. Utilizing native seeding helps provide critical environmental benefits such as lessening the impacts of droughts, floods, or other adverse weather events. The selection of locally adapted seed mixes and appropriate seeding techniques increases the likelihood of restoration success.

3.1.3 Marsh Restoration

Marsh restoration would involve material removal and earthwork to reach enough depth to get to the water table. Doing this would allow the constructed depression to fill with water, allowing emergent vegetation to naturally colonize the area. Ideal water depths ranging from 6 inches to 3 feet would allow for emergent vegetation including arrowhead, bulrush, cattail, and rice cutgrass. Emergent vegetation and marsh habitat, in general, would provide habitat to a variety of fish and wildlife species and provide water quality benefits and groundwater recharge or discharge.

3.1.4 Spring Ponds Restoration

This restoration would involve replacing the existing culvert outlets at the outlets of the Spring Ponds with weir-like rock structures. This would improve outflows from the ponds by reducing

debris clogs, consequentially reducing water stagnation and algal growth. This is anticipated to improve water clarity, improving emergent and submergent plant abundance and the overall ecosystem health. Replacing the culvert structures will also improve overall connectivity between the ponds and the river and will improve the use of the ponds as a rearing area for aquatic vertebrates. This would improve the ecological health of the overall system. Restoring connection to Spring Ponds would provide 1.6 acres of stream habitat restoration.

3.2 Measures Screening

After reviewing the full array of measures, there were no measures screened. The measures retained for further consideration were derived from the planning objectives for the project, and are considered to be the most complete, effective, efficient, and acceptable within the range of measures considered. Increments and scales of the retained measures were developed and combinations of the different scales and increments of the measures were used to formulate alternative plans. All measures were found to be effective and were retained for further evaluation.

3.3 Development of Alternatives

Alternative plans are different combinations of various sizes and scales of restoration measures that would contribute to attaining the planning objectives. A measure may stand alone as an alternative plan that can be implemented independently of other measures, resulting in some achievement of the planning objectives.

The alternatives were developed through a multi-step process. The first step included reviewing previous studies and findings provided by the City of River Falls.

1. Review of historic images: Historic images were used to place specific measures, review where the original riverbed was situated, and other past ecological features. This review allowed the team to gather more detailed information on potential features that would match the pre-impoundment locations.
2. Review of available data: Various data sources, including topography, bathymetry, and land cover information, were analyzed to inform the siting of specific measures and the alternatives development. This comprehensive data review ensured an informed approach to the alternative planning. This helped inform the team on if there was additional data needed.
3. Review of city proposed alternatives: The City of River Falls had completed their own feasibility study back in 2016. In the report, they discuss a variety of alternatives and measures including their suggested progression of alternatives. The team reviewed this report and related reports to extract valuable insights, integrating them into the development of the alternatives array. The team utilized the methodology the City used to help inform the main areas of focus.
4. Identify potential features: The team utilized the project objectives and constraints with past information to develop a list of potential features throughout the study area. Features included dam removal, forestry restoration, and various others. The features that were brought forward aligned with the scope of the project.
5. Alternative variations: The team reviewed all the proposed features and worked to combine them in a logical manner. The team focused on combining features that were near one another to improve the total potential benefits in the area. The viability of alternatives was also associated with each impoundment. To achieve aquatic ecosystem restoration, impoundment removal was critical in the success of the project. Restoration

included the removal of each impoundment (Junction Falls Dam and Powell Falls Dam) and associated in-stream restoration actions.

6. Full array of alternatives: Once all the variations in alternatives were developed, the PDT developed a range of alternatives that would provide different types and levels of habitat benefits. The primary habitat focus for all action alternatives was stream habitat based on the project objectives. Other habitat types such as forestry and marsh would also be affected based on proposed restoration measures and methods. The PDT utilized City and agency expertise along with logical progression to build incremental plans.

The majority of measures are not dependent on one another for constructability. Measures that are dependent on one another are (1) dam removal and the restoration of the natural waterfalls, and (2) channel restoration and the inclusion of instream features (e.g. riffles and rapids). Table 5 summarizes these alternatives.

The team did not formulate for recreation or include specific recreational features. There are ancillary benefits expected from implementation of any action alternatives, such as increased opportunities for fishing and non-motorized watercraft. Additional recreational features could be included outside the project footprint that would complement the Kinnickinnic project. The National Park Service (NPS) is providing conceptual designs to the City of River Falls through the Rivers, Trails and Conservation Assistance Program. Recreation features could be designed to highlight ecosystem restoration and nature. These features include, but are not limited to, hiking trails, interpretative overlooks, watercraft launches, pedestrian bridges, single track snowshoe trails, nature-based interpretative and gathering spaces, designated fishing areas, mountain bike trails, and contemplative spaces. These are outside the scope of this feasibility study and would have to be undertaken by entities other than the Corps.

Alternative plan development resulted in the formulation of the following alternatives:

- Alternative 1 (No Action) would not provide any habitat gains and no federal dollars would be expended.
- Alternative 2 is an action alternative that would include the removal of the Junction Falls Dam and restoration actions in the Lake George area. These restoration actions include stream restoration (86.0 acres), marsh habitat restoration (1.3 acres), and floodplain forest habitat restoration (10.5 acres). Stream restoration includes one segment of bank protection, two natural waterfalls, one section of rock arch rapids, two sections of riffles, and two cross vanes. Reference Figure 3-5 below.
- Alternative 3 is an action alternative that would include the removal of the Powell Falls Dam and restoration actions in the Lake Louise area. These restoration actions include stream restoration (87.5 acres), marsh habitat restoration (2.7 acres), and forest habitat restoration (27.9 acres). Stream restoration includes two segments of bank protection, a small natural waterfall where Powell Falls currently resides, one segment of rock arch rapids, two segments of riffles, and one cross vane. Reference Figure 3-6 below.
- Alternative 4 is an action alternative that would include the removal of both the Junction Falls Dam and Powell Falls Dam and restoration actions in both the Lake Louise and Lake George areas. These restoration actions include stream restoration (6.5 acres), marsh habitat restoration (1.3 acres), and forest habitat restoration (19.1 acres). Stream restoration includes three segments of bank protection, natural

waterfalls where Junction and Powell Falls currently reside, two segments of rock arch rapids, four segments of riffles, and two cross vanes. Reference Figure 3-7 below.

- Alternative 5 is an action alternative that would include the removal of the Junction Falls Dam, restoration actions in the Lake George area and Spring Ponds. These restoration actions include stream restoration (5.0 acres), marsh habitat restoration (1.3 acres), and forest habitat restoration (17.4 acres). Stream restoration includes one segment of bank protection, two natural waterfalls, one section of rock arch rapids, two sections of riffles, and two cross vanes. The two Spring Ponds would also receive stream restoration and minimal forest restoration. Reference Figure 3-8 below.
- Alternative 6 is an action alternative that would include the removal of the Powell Falls Dam, restoration actions in the Lake Louise area and Spring Ponds. These restoration actions include stream restoration (87.5 acres), marsh habitat restoration (1.3 acres), and forest habitat restoration (12.2 acres). Stream restoration includes two segments of bank protection, a small natural waterfall where Powell Falls currently resides, one segment of rock arch rapids, two segments of riffles, and one cross vane. The two Spring Ponds would also receive stream restoration and minimal forest restoration. Reference Figure 3-9 below.
- Alternative 7 is an action alternative that would include the removal of both the Junction Falls Dam and Powell Falls Dam, restoration actions in both the Lake Louise and Lake George areas and Spring Ponds. These restoration actions include stream restoration (88.9 acres), marsh habitat restoration (2.7 acres), and forest habitat restoration (29.6 acres). Stream restoration includes three segments of bank protection, natural waterfalls where Junction and Powell Falls currently reside, two segments of rock arch rapids, four segments of riffles, and two cross vanes. The two Spring Ponds would also receive stream restoration and minimal forest restoration. Reference Figure 3-10 below.

Table 5. Alternatives Summary

Alternative	Junction Falls Dam Removal and Lake George Restoration	Powell Falls Dam Removal and Lake Louise Restoration	Spring Ponds Restoration
1			
2	X		
3		X	
4	X	X	
5	X		X
6		X	X
7	X	X	X

Figure 3-5. Alternative 2 Junction Falls Removal & Restoration

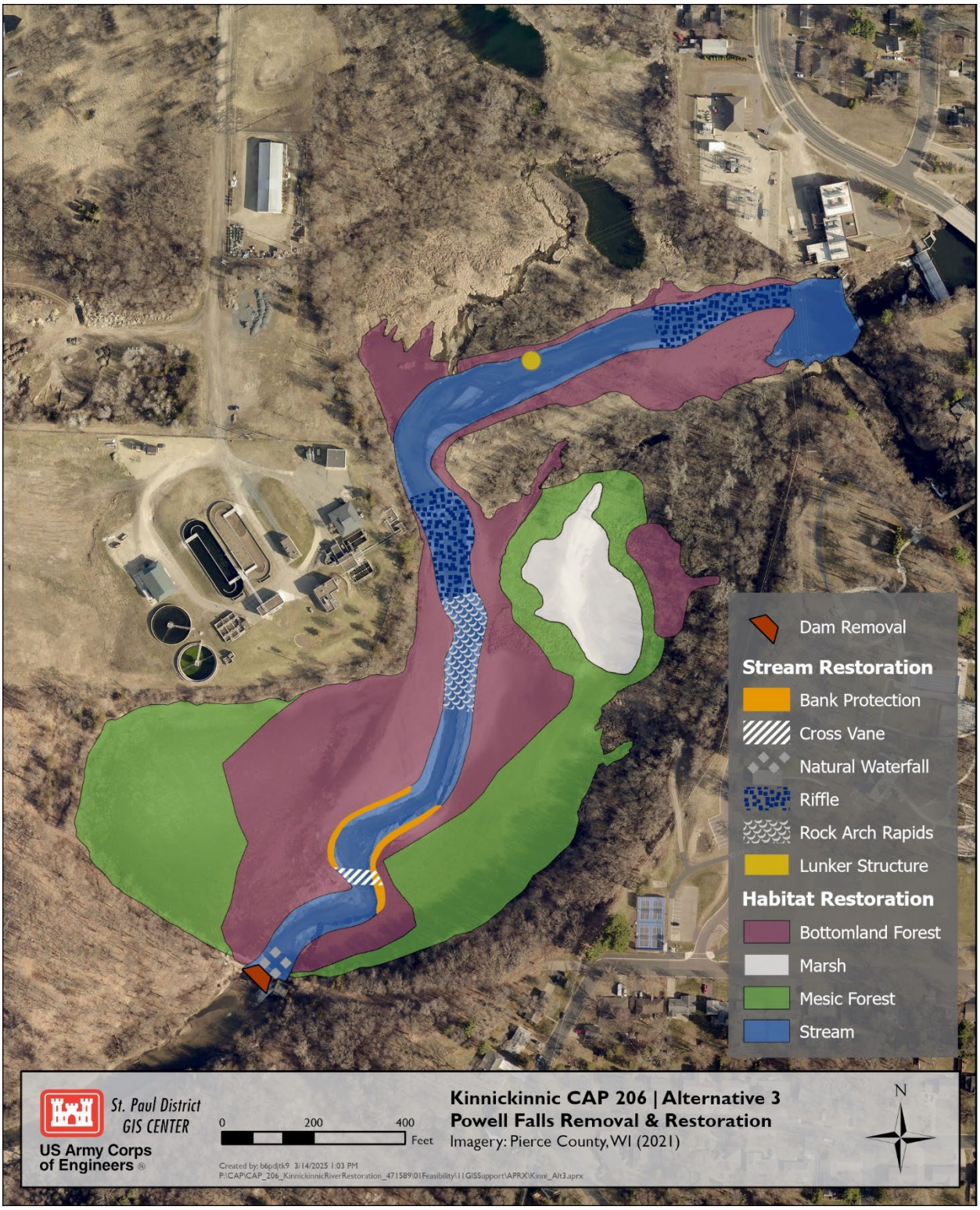

Figure 3-6. Alternative 3 Powell Falls Removal and Restoration

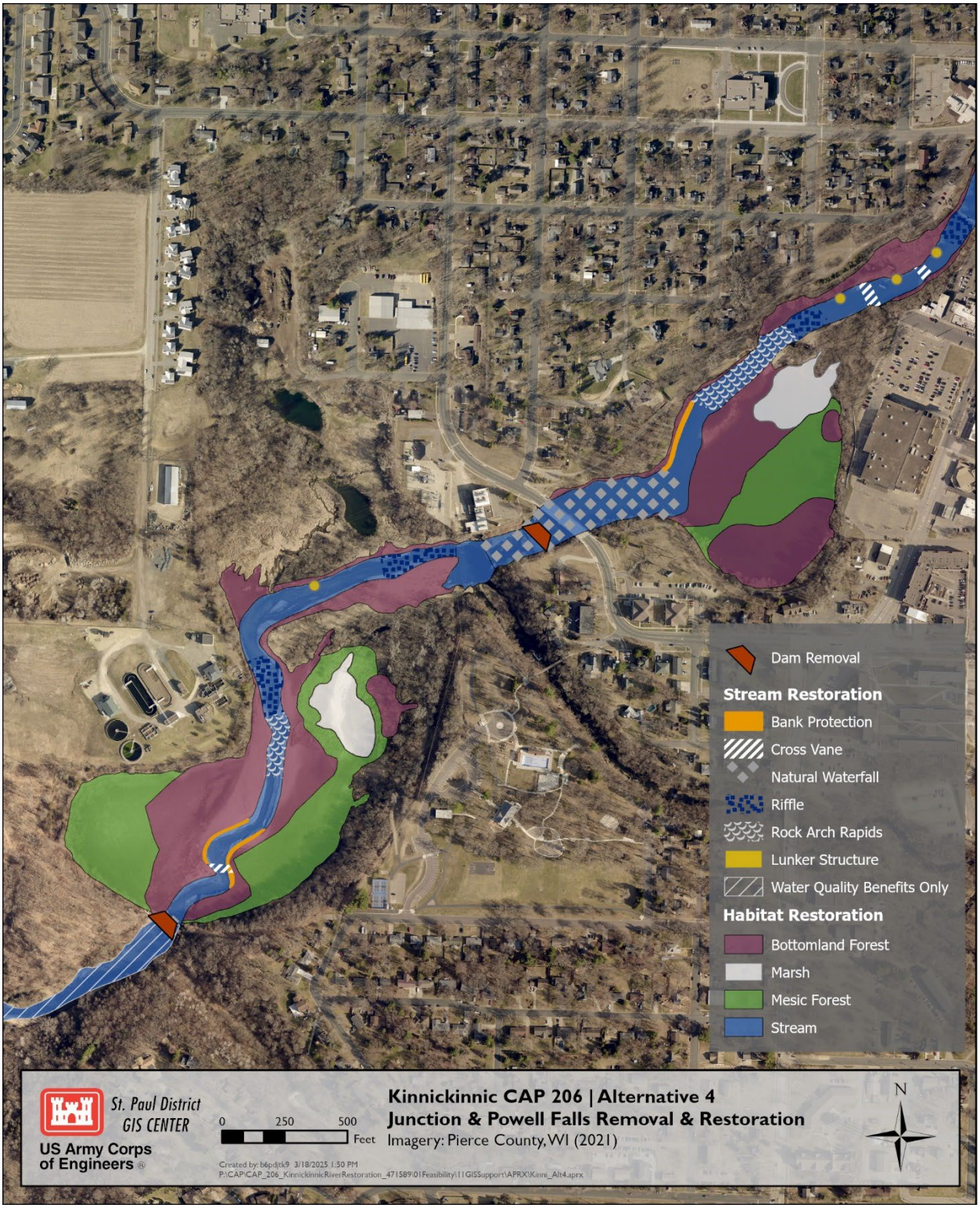

Figure 3-7. Alternative 4 Junction and Powell Falls Removal and Restoration

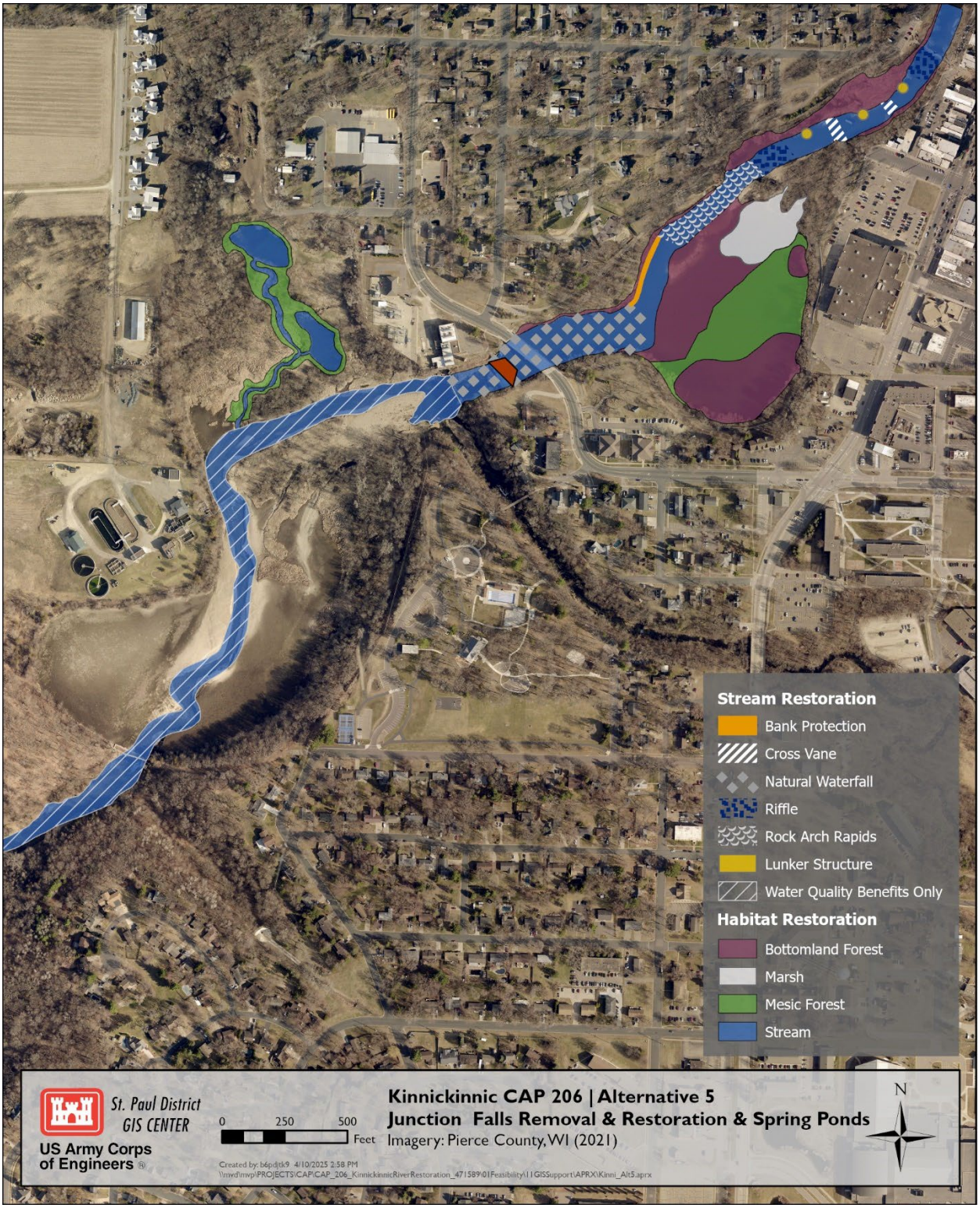

Figure 3-8. Alternative 5 Junction Falls Removal, Restoration, and Spring Ponds

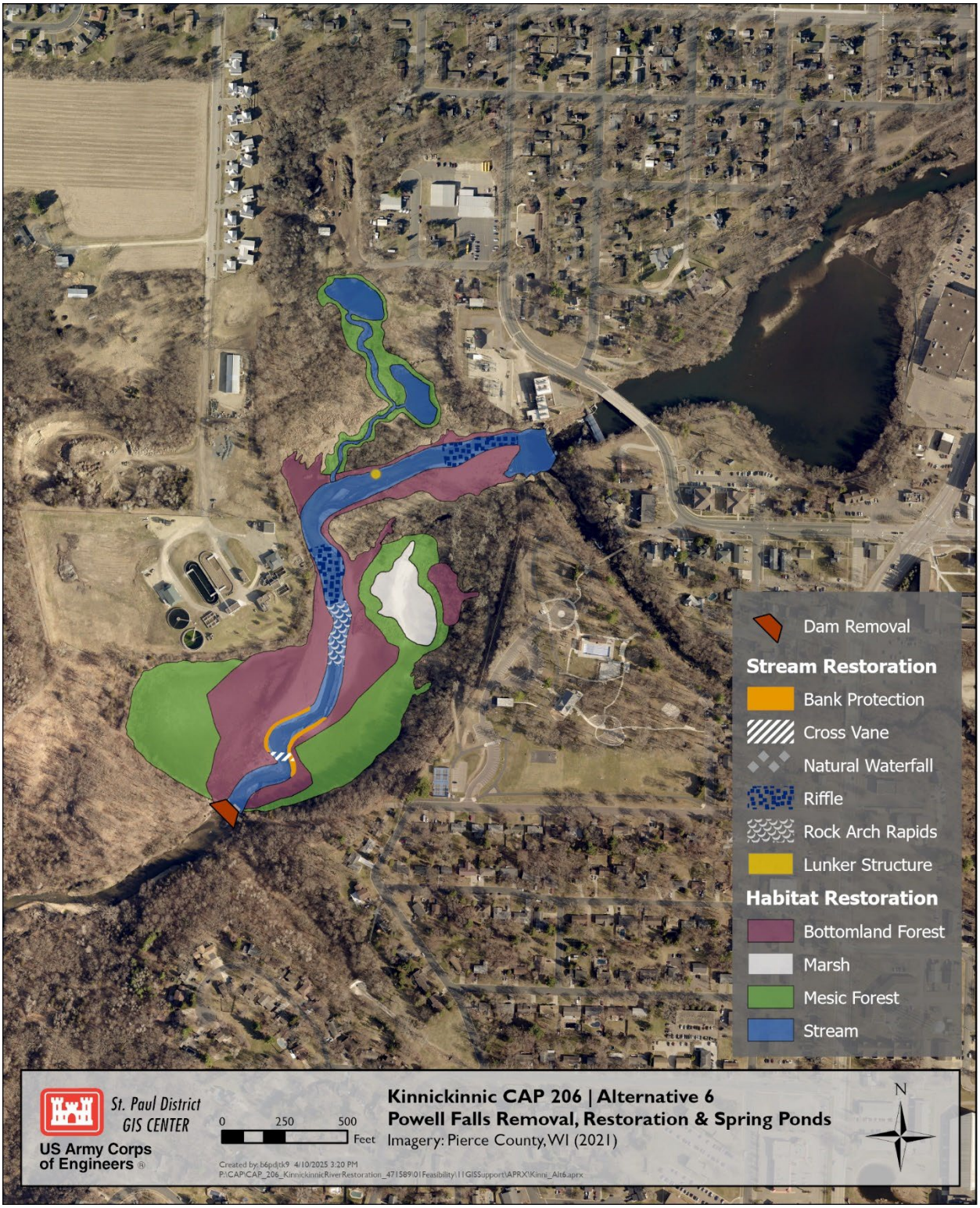

Figure 3-9 Alternative 6 Powell Falls Removal, Restoration, and Spring Ponds.

Figure 3-10. Alternative 7 Junction and Powell Falls removal and restoration and Spring Ponds

4 Evaluation and Comparison of Alternatives

4.1 Evaluation of Alternatives

This section documents the process used to determine the habitat benefits and estimated costs for each alternative. The benefits and costs were used in the evaluation and comparison of alternatives.

4.1.1 Habitat Benefits

USACE is committed to spending the nation's dollars wisely by investing in ecosystem restoration projects that provide the greatest benefits for the investment. As such, a national ecosystem benefits analysis is completed on restoration projects to help determine if projects are warranted and if so, which combination of proposed features provide the greatest benefit for the money.

Habitat benefits derived from Habitat Evaluation Procedures (HEP) were used to evaluate the potential benefits of alternative habitat improvement features (trout stream, forest, and wetland marsh restoration) for the Project.

The U.S. Fish and Wildlife Service's 1980 version of HEP was used to quantify and evaluate the potential project effects and benefits. The HEP methodology utilizes a Habitat Suitability Index (HSI) to rate habitat quality on a scale of 0 to 1 (1 being optimum). The HSI is multiplied by the number of acres of available habitat to obtain Habitat Units (HUs). One HU is defined as one acre of optimum habitat. Benefits of different alternatives can be quantified by comparing the projected HUs available without a proposed action to projected HUs with a proposed action or alternative. HSIs and HUs were calculated for the baseline (existing) conditions, future conditions under the No Action Alternative and future conditions under each project alternative.

Changes in HUs occur as a habitat matures naturally or is influenced by development. These changes include the cumulative HUs derived over the period of analysis (50 years). HUs are calculated for select target years and annualized using the IWR Planning Suite II tool annualizer over the period of analysis to derive a net Average Annual Habitat Unit (AAHU) quantity. By using target years, AAHUs were annualized using a linear interpolation approach, essentially drawing a straight line between target years and then calculating the area under the curve for the resulting planning horizon benefit curve. Resulting net AAHUs are used as the output measurement to compare alternatives for the proposed Project.

Four HSI models were used to quantify the benefits of the action alternatives; they included: Habitat Suitability Index Models and Instream Flow Suitability Curves: Brown Trout (Raleigh et al. 1986), Habitat Suitability Index Models: Veery (Sousa 1982), Habitat Suitability Index Models: Black-Capped Chickadee (Schroeder 1983), and Habitat Suitability Index Models: Marsh Wren (Gutzwiller and Anderson 1987). The brown trout model was used to assess the existing Lake George/Kinnickinnic River and any stream restoration, the veery and black-capped chickadee models were used to assess forestry restoration, and the marsh wren model was used to evaluate wetland marsh restoration.

All models and spreadsheets used to assess benefits for the Project have been certified or approved for use through the Corps – Environmental Planning Center of Expertise (ECO- PCX). The annualization calculator in IWR Planning Suite II was used to verify average annual habitat units for the habitat modeling results.

A summary of the habitat benefits gained (AAHUs) from each project alternative over the No Action Alternative are provided in Table 6. Complete documentation of the habitat benefits analysis is provided in Appendix K, Habitat Evaluation Procedure.

Table 6. Net Average Annual Habitat Units (AAHUs) for each project alternative.

	Net AAHUs Per Habitat Type			
Alternative	Brown Trout	Veery/Chickadee	Marsh Wren	Net Habitat Gain
Alternative 2	12.6	7.9	0.8	21.3
Alternative 3	1.1	9.1	1.0	11.3
Alternative 4	14.7	17.1	1.9	33.5
Alternative 5	13.1	8.5	0.8	22.5
Alternative 6	1.8	9.6	1.0	12.4
Alternative 7	15.2	17.6	1.9	34.7

*Note – net AAHU are rounded to the tenth decimal place for display purposes, but are technically more exact, resulting in visible rounding errors in this table.

4.1.2 Cost Estimates

Table 7 shows the estimated project first, or present value, cost of all Project alternatives. These costs were used in the comparison of alternatives, prior to selection of a TSP and subsequent design and cost refinement. Costs shown in Table 7 include rough estimates of construction, planning engineering and design (including adaptive management and monitoring costs), and construction and supervision costs. Cost estimates for alternative comparison were prepared using October 2023 price levels, which were the most up-to-date levels when the calculations on the alternatives array were completed. Any escalation due to inflation or increases in price levels would be equal across all alternatives.

The last column of Table 7 also presents average annualized costs. Annual costs for each alternative were calculated based on a FY 2023 discount rate of 2.5% over a 50-year period of analysis. Average annual costs include interest during construction (IDC) costs and alternative first costs (as presented in Table 7). Interest During Construction (IDC) was calculated using mid-year compounding based on a 2-year period of construction.

A full description of the cost estimates, including all related elements, can be found in Appendix F, Cost Engineering

Table 7. Alternatives Cost Estimates

Alternative	Estimated Construction Cost[1]	PED[2]	CM[3]	Project First Cost	Average Annual Costs
Alternative 1 (No Action)	$0	$0	$0	$0	$0
Alternative 2 (Junction Falls Dam Removal and Lake George Restoration)	$9,076,500	$1,000,430	$533,830	$10,610,760	$402,300
Alternative 3 (Powell Falls Dam Removal and Lake Louise Restoration)	$7,696,210	$848,290	$452,650	$8,997,150	$341,200
Alternative 4 (Junction Falls Dam Removal, Lake George Restoration, Powell Falls Dam Removal, and Lake Louise Restoration)	$16,772,700	$1,848,730	$986,480	$19,607,910	$743,500
Alternative 5 (Junction Falls Dam Removal, Lake George Restoration, and Spring Ponds Restoration)	$9,212,790	$1,015,450	$541,850	$10,770,090	$408,400
Alternative 6 (Powell Falls Dam Removal, Lake Louise Restoration, and Spring Ponds Restoration)	$7,832,500	$863,310	$460,670	$9,156,480	$347,200
Alternative 7 (Junction Falls Dam Removal, Lake George Restoration, Powell Falls Dam Removal, Lake Louise Restoration, and Spring Ponds Restoration)	$16,909,000	$1,863,740	$994,500	$19,767,240	$749,500

[1] Estimated Construction Costs include assumed 35% contingency.
[2] PED – Preconstruction Engineering and Design, 14.88% of construction cost.
[3] CM– Construction Management, 7.94% of construction cost.
* Note - All values have been rounded, estimates are Class 4.

4.1.3 Cost Effectiveness and Incremental Cost Analysis

IWR Planning was used to complete a Cost Effective and Incremental Cost Analysis (CE/ICA) for the various alternatives (including the No Action Alternative). Net AAHUs and average annualized costs were used to calculate a total annual cost per average annual habitat unit (column 5 of Table 8).

CE/ICA is used when project benefits are not measured in dollars and is used to ensure the least cost alternative is identified for each possible level of environmental output and the maximum level of output is identified for any level of investment.

A Cost Effectiveness evaluation is used to identify the least costly solution to achieve a range of project benefits. The Incremental Cost Analysis identifies the subset of cost-effective alternatives that are superior financial investments, called “Best Buys,” through analysis of the preliminary incremental costs. Best Buys are the alternatives that are the most efficient at producing the output variable or provide the greatest increase in AAHUs for the least increase in preliminary cost. The first Best Buy is the most efficient alternative, producing output at the lowest incremental cost per unit. If a higher level of output is desired than that provided by the first Best Buy, the second Best Buy is the most efficient plan for producing additional output, and so on.

Figure 4-1 and Table 8 show the alternatives differentiated by cost effectiveness. From this list of seven alternatives, four cost effective alternatives and three Best Buy alternatives were identified.

Table 8. Alternative Cost Effectiveness

Alternative	Net AAHUs	Project First Costs	Average Annual Cost	Average Annual Cost / AAHU	Cost Effectiveness
Alt 1 No Action	0.0	$0	$0	$0	Best Buy
Alt 2	21.3	$10,610,800	$402,300	$18,887	Cost Effective
Alt 3	11.3	$8,997,200	$341,200	$30,195	Cost Effective
Alt 4	33.5	$19,607,900	$743,500	$22,194	Cost Effective
Alt 5	22.5	$10,770,100	$408,400	$18,232	Best Buy
Alt 6	12.4	$9,156,500	$347,200	$28,000	Cost Effective
Alt 7	34.7	$19,767,200	$749,500	$21,662	Best Buy

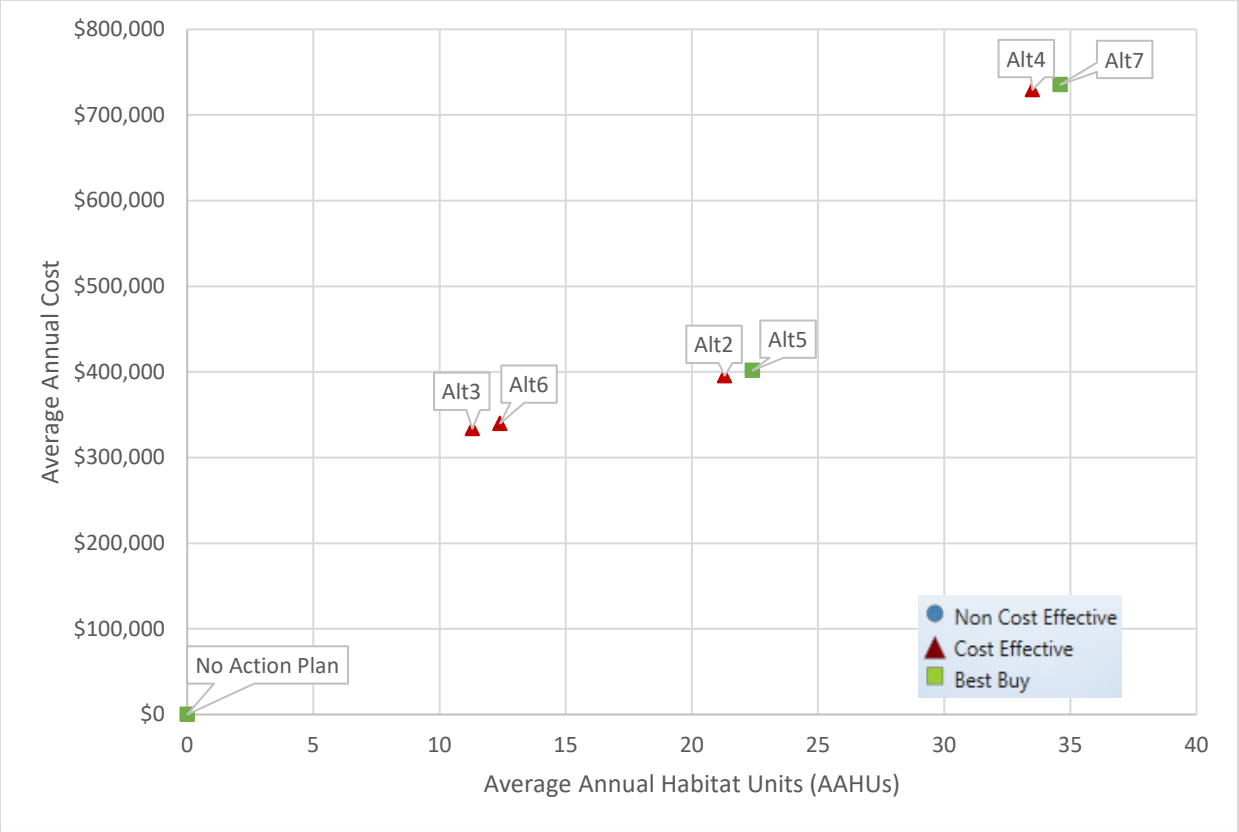

Figure 4-1. Alternative Plans Differentiated by Cost Effectiveness

For further analysis, the three Best Buy alternatives were analyzed to determine which had the lowest incremental cost for each additional increment of output. Figure 4-2 and Table 9 presents the Best Buy alternatives' differentiated by incremental cost and incremental benefit. Note that Alternative 1 (No Action) is not shown on the figure, it would appear at 0 on the X and Y axis.

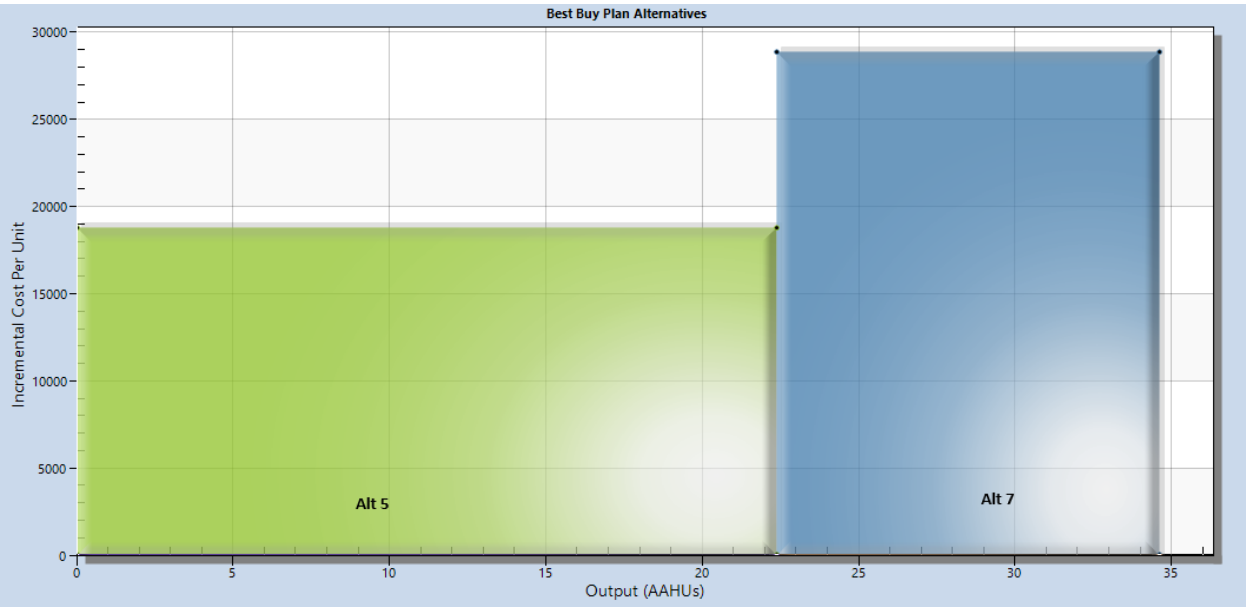

Figure 4-2. Incremental Cost and Incremental Output for Best Buy Alternatives

Table 9: Incremental Cost Analysis of Best Buy Alternatives

Alternative	Output (AAHUs)	Average Annual Cost	Incremental Cost ($)	Incremental Output (AAHU)	Incremental Cost per Output
1	NA	$0	$0	NA	$0
5	22.5	$18,151	$408,400	22.5	$18,151
7	34.7	$21,599	$341,100	12.2	$27,959

4.1.4 Alternative Screening

All alternatives developed meet the purpose and need of the project and are compliant with environmental regulations. Based on those factors, all alternatives were originally retained as the final array. Subsequently, after reviewing the results of the CE/ICA analysis, all cost-effective alternatives were screened from further consideration, and the Best Buy alternatives were retained as the updated final array. It was determined that the action Best Buy alternatives would help achieve the project objectives and the Cost Effective alternatives should be screened. While these screened alternatives were cost effective, they were not the most cost effective nor did they give the greatest increase in outputs for the least increase in cost. The screened alternatives include Alternative 2, 3, 4, and 6. The Best Buy alternatives, the final array, were retained for further consideration and are further discussed in the following sections.

4.2 Comparison of Final Array of Alternatives

The final array of alternatives includes Alternative 1, 5, and 7. The array of alternatives provides the information necessary to make well-informed decisions regarding the desired scale of features. Progressing through the increasing levels of output for the alternatives helps determine whether the increase in output is worth an additional cost. If decision makers consider a level of output to be “worth it”, subsequent levels of output could be determined as “not worth it” due to costs exceeding acceptable levels or the additional output does not justify the expense. Identification of such break points can be subjective. For this study, break points were identified between all the alternatives. The following paragraphs documents the accomplishments of the final alternatives array.

- Alternative 1 (No Action) would not provide any habitat gains and no federal dollars would be expended.
- Alternative 5 would result in a net of 22.5 AAHUs at an average annual cost of $18,151. This alternative has an incremental cost of $18,151 and incremental benefit of 22.5 compared to Alternative 1. Alternative 5 would include the removal of the Powell Falls Dam, restoration actions in the Lake Louise area and Spring Ponds. These restoration actions include stream restoration (87.6 acres), marsh habitat restoration (1.3 acres), and forest habitat restoration (17.4 acres). Stream restoration includes two segments of bank protection, a small natural waterfall where Powell Falls currently resides, one segment of rock arch rapids, two segments of riffles, and one cross vane. The two Spring Ponds would also receive stream restoration and minimal forest restoration. This alternative would meet the Project objectives for a reasonable cost.
- Alternative 7 would result in a net of 34.7 AAHUs at an average annual cost of $21,599. This alternative has an incremental cost of $27,959 and an incremental benefit of 12.2

compared to Alternative 5. Alternative 7 would include the removal of both the Junction Falls dam and Powell Falls Dams, restoration actions in both the Lake Louise and Lake George areas and Spring Ponds. These restoration actions include stream restoration (88.9 acres), marsh habitat restoration (2.7 acres), and forest habitat restoration (29.6 acres). Stream restoration includes three segments of bank protection, natural waterfalls where Junction and Powell Falls currently reside, two segments of rock arch rapids, four segments of riffles, and two cross vanes. The two Spring Ponds would also receive stream restoration and minimal forest restoration. This alternative would meet the Project objectives for a reasonable cost.

4.2.1 Ability to Meet Project Objectives

The following Table 10 documents the Best Buy alternatives and how each met or did not meet the project objectives. “High” was used to describe when the measures significantly contributed to meeting the objective, “Moderate” was used to describe alternatives when the objective was met but other alternatives provided additional habitat benefits, “None” was used to describe where the objective was not met.

Table 10: Best Buy Alternatives Ability to Meet Project Objectives

Alternative	Objective 1: Restore natural hydrothermal dynamics to support native coldwater species that were present prior to impoundment.	Objective 2: Increase riffle and pool geomorphic sequencing to increase the use and availability of coldwater habitat species.
1	None	None
5	High – Would improve ~87 acres of stream habitat and would add multiple riverine features designed to assist in the creation of natural hydrothermal dynamics, similar to pre-impoundment conditions.	Moderate – would improve geomorphic sequencing with the addition of 2 riffles, 1 cross vane, and one segment of rock arch rapids. These measures would only be located in the Lake George area. While Powell Dam would be removed, Junction Falls Dam would remain in place.
7	High – Would improve ~89 acres of stream habitat and would add multiple riverine features designed to assist in the creation of natural hydrothermal dynamics, similar to pre-impoundment conditions.	High – would improve geomorphic sequencing with the addition of 4 riffles, 2 cross vanes, and 2 segment of rock arch rapids. These measures would be located in the Lake George and Lake Louise areas.

4.2.2 Principles and Guidelines

Evaluation of the final array of alternatives was also based on the Economic and Environmental Principles and Guidelines (P&G) For Water And Related Land Resources Implementation. The P&G criteria include:

- **Completeness** is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. Completeness must consider the sustainability and long-term aspects of the plans and whether all resource requirements are included. This may require relating the plan to other types of public or private plans if the other plans are crucial to realization of the contributions to the objective.

- **Effectiveness** is the extent to which an alternative plan contributes to achieving the planning objectives.
- **Efficiency** is the extent to which an alternative plan is the most cost-effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the Nation's environment. Efficiency is determined through a comparison of the costs and benefits of each alternative.
- **Acceptability** is the extent to which the alternative plans are acceptable in terms of applicable laws, regulations, and public policies. Acceptability can also consider the sponsor, partners, and public acceptance of the alternative. Acceptability has two dimensions – implementability and satisfaction. Implementability means the extent to which the alternative is feasible from a technical, financial, and legal perspective. Satisfaction is the extent to which the plan is welcome from a political or preferential perspective.

Completeness: All alternatives were determined to be complete. Alternative 1 (No Action) would need no other action needed from others to realize benefits. Alternative 5 would be complete because there is action taken to address the objectives of the project and there would be no additional action needed from others to realize benefits. Alternative 7, similar to Alternative 5, would be complete because there is action taken to address the objectives of the project and there would be no additional action needed from others to realize benefits.

Effectiveness: Alternative 1 is not effective due to the fact that no restoration actions would be taken and no problems would be addressed. Alternative 5 would be moderately effective due to restoration actions throughout the Lake George area to address problems, but no restoration actions would be done in the Lake Louise area. Alternative 7 would be highly effective due to the restoration actions throughout the full Project area. Unlike Alternatives 3 and 5, Alternative 7 would restore the full riparian corridor throughout the project area by restoring both subbasins. This action would provide ecological connection between both Lake George and Lake Louise subbasins. Both the Lake George and Lake Louise areas have restoration actions that would address all identified problems in the Study.

Efficiency: The metrics used to evaluate efficiency is cost per AAHU and project first cost. All alternatives are considered highly efficient from a cost/AHHU perspective, as they are all Best Buy alternatives. Alternative 1 is highly efficient since there would be no expenditure on the project. There would be a $0 per AAHU and a Project first cost of $0. Both Alternatives 5 and 7's cost /AAHU is considered reasonable and highly efficient considering restoration projects with a similar objective and similar scale. Alternative 5 has a cost per AAHU of $18,151/AAHU and a Project first cost of $10,770,000. Alternative 7 has a cost per AAHU of $21,599/AAHU and a Project first cost of $19,767,000.

Acceptability: Alternative 1 is acceptable from the standpoint of no potential violations laws and regulations, but falls low in terms of satisfaction from the Sponsor and public. Alternative 5 would be moderately acceptable since it does not violate laws or regulations but is moderately acceptable to the Sponsor and public since there is a large section of the Project area that would not receive any restoration actions. Alternative 7 is highly acceptable since it does not violate any laws or regulations and is highly acceptable to the Sponsor and public.

4.2.3 Comprehensive Benefits

Per *Planning Policy for Conducting Civil Works Planning Studies* (ER-1105-2-103), USACE is required to comprehensively evaluate and provide a complete accounting consideration, and documentation of the total benefits of alternatives over a full array of benefit categories: National

Ecosystem Restoration (NER), Regional Economic Development (RED), Environmental Quality (EQ) and Other Social Effects (OSE). The final array of alternatives was assessed to determine if they have net benefits in total and in each benefit category.

The final array of alternatives includes Alternative 1, 5, and 7, all of which are Best Buy alternatives.

National Economic Development

The National Economic Development (NED) account displays changes in the economic value of the national output of goods and services. The quantified NED effects are total project costs and O&M. The alternatives first project costs ranged from $0 to $19,767,200. Alternative 1 (No Action Alternative) would result in no project expenditure associated and would have no positive or negative impact on national output of goods and services. Alternative 5 has a Project first cost of $10,770,100. Alternative 7 has a Project first cost of $19,767,200.

Regional Economic Development

The Regional Economic Development (RED) account registers changes in the distribution of regional economic activity that result from each alternative plan. RED benefits impact a region, not the nation as a whole. The Regional ECONomic System (RECONS) model was used to model regional economic impacts which provides estimates of jobs supported by USACE programs, projects, and activities. RECONS was run for every alternative developed during the project. Economic impact and contribution estimate the change (impact) or existence (contribution) in economic activity (output, labor income, value added, and employment) associated with the new or already occurring economic stimulus to an economy. Gross Regional Product, which is also known as value added, is equal to the sum of employee compensation, proprietor income, other property type income, and indirect business taxes. Gross Regional Product is also defined as gross industry output (i.e., sales or gross revenues) less the cost of intermediate inputs (i.e., the consumption of goods and services purchased from other US industries or imported). Jobs are defined as the work in which one is engaged an occupation by which a person earns income. Jobs are presented in full-time equivalents (FTEs). All cost-effective action alternatives would have a positive impact on the regional economy. Impact information surrounding the RECONS analysis can be found in Appendix I, RECONS.

Alternative 1 would have no impact to the regional economy, with $0 gross regional product and 0 FTE. Alternative 5 would have a gross regional product impact of $19,908,000 and 276.7 FTE. Alternative 7 would have a gross regional product impact of $29,859,000 and 415.0 FTE.

Environmental Quality

The EQ account displays non-monetary effects on significant natural, cultural resources, and aesthetic resources including the positive and adverse effects of ecosystem restoration plans. For ecosystem restoration projects such as this one, contributions to the EQ account are detailed both through NEPA compliance and through calculation of net ecosystem benefits.

Single purpose ecosystem restoration projects are evaluated in by their net increases in ecosystem value. These contributions are related to National Ecosystem Restoration (NER) benefit category and are defined by increases in the net quantity and/or quality of desired ecosystem resources. The quantified effects on this account can be shown through the ratio of average annual cost to average annual habitat AAHUs. The No Action Alternative does not have any costs or habitat units associated with it and therefore has no impact to NER. Alternative 1 would have 0 AAHUs created/restored and $0 cost per AAHU. Alternative 5 would create 22.5

AAHUs at a cost of $18,151 per AAHU. Alternative 7 would create 34.7 AAHUs at a cost of $21,599 per AAHU.

Full riparian corridor restoration offers significant ecological advantages over partial restoration by addressing the entirety of the corridor, ensuring connectivity and resilience across the system. By reestablishing the full length of the riparian corridor, this approach more effectively supports the health and sustainability of aquatic ecosystems while maximizing environmental and hydrological benefits.

Alternative 7 proposes a complete restoration of the Kinnickinnic River's riparian corridor, involving the removal of both dams to achieve the full ecological restoration. Restoring the river's natural processes and promoting hydrogeomorphic stability would enhance resilience against extreme weather events and promote riparian connectivity, creating a more thriving and, self-sustaining ecosystem. The full corridor restoration would improve the riparian corridor's ability to support natural sediment transport and support biodiversity.

In contrast, Alternative 5 would retain Powell Falls Dam and not restore the Lake Louise sub-basin, preventing the full reconnection of the riparian corridor and limiting the overall benefits. The presence of this dam would disrupt natural sediment transport processes, leaving portions of the ecosystem fragmented. Consequently, Alternative 5 would constrain the potential ecological and hydrological improvements achievable throughout the study area.

Other Social Effects

The Other Social Effects (OSE) account includes urban and community impacts; life, heath, and safety factors; displacement; long-term productivity; and energy requirements and energy conservation. The OSE account addresses plan effects from perspectives that are relevant to the planning process but are not reflected in the other three accounts. The main impacts to OSE that the project would impact include recreation potential, viewshed impact, and community cohesion.

Alternative 1 would have a null impact on the community and recreation in the area, if not a slightly negative impact. Without performing any restoration work in the area, the impoundments would not provide any additional recreational opportunities (i.e. kayaking, hiking, etc). The viewshed would remain as is. There would be no anticipated impact on community cohesion.

Alternative 5 is expected to have a positive impact on the community and recreation in the area. In the restoration actions and removal of the Junction Falls impoundment within Alternative 5, there would be positive recreational benefits. Since the Junction Falls impoundment would be removed, there would be more opportunities for recreational activities such as kayaking and hiking with how the alternative would be constructed. The viewshed would improve via the restoration of the natural flow of a river. This creates more scenic landscapes that were previously covered by the cement dam. These new unobstructed views and surrounding greenery can enrich the overall aesthetic and ecological value of the area.

Alternative 7 is expected to have a positive impact on the community and recreation in the area. While Alternative 5 would yield positive impacts on recreation and for the community, Alternative 7 expands those benefits and presents a more transformative opportunity in the removal of both impoundments. Alternative 7 would expand the recreational opportunity potential in the full hydrologic connection, expanding hiking and kayaking path potential. By restoring the full

natural river flow within the Project Area, Alternative 7 would reveal an expansive view of natural features replacing the previous viewshed of two cement dams.

Comprehensive Benefits Summary. NED was evaluated using Total Project Cost. RED was evaluated using gross regional product, which is also known as value added. EQ was evaluated using the number of restored or enhanced acres and the average annual cost per AAHU. OSE was evaluated using incidental recreation benefits. Generally, the larger the project, the greater the benefits across the categories. Alternative 7 has the largest impact on the project area and surrounding community. It has the highest benefits compared to all other alternatives, including unique benefits to the community and viewshed. The Alternative 7 benefits also have the largest benefit to the area's social effects.

4.3 Summary of Evaluation and Comparison of Final Array of Alternatives

ER 1105-2-103 requires the planning studies to display the evaluation process of the effects, both positive and negative, to objectively describe the contributions of each alternative, to the Federal Objectives and the Guiding Principles. The Federal Objective that is most applicable to this project is "maximizing sustainable economic development". The Guiding Principles that are most applicable to this Project is "Healthy and Sustainable Ecosystem". The documentation will also include a summary of each alternatives performance against the four formulation and evaluation criteria (completeness, effectiveness, efficiency, and acceptability), and the four P&G accounts (NED, RED, OSE, and EQ).

Table 10 summarizes the evaluation of the final array of alternatives using the criteria described in Section 4 of this report.

Table 11. Comprehensive Benefits Summary for Best Buy Alternatives.

GUIDING PRINCIPLES	Sustainable Economic Development		Floodplains	Healthy & Resilient Ecosystems		Healthy & Resilient Ecosystems	Social Effects		
P&G ACCOUNTS	**NED**	**RED**	**EQ**			**OSE**			
PLANNING OBJECTIVES			Restore natural hydrothermal dynamics to support native coldwater species that were present prior to impoundment, Increase riffle and pool geomorphic sequencing to increase the use and availability of coldwater habitat species.						
DECISION CRITERIA		Effectiveness	Effectiveness	Efficiency	Effectiveness	Effectiveness	Effectiveness	Acceptability Implementation & Satisfaction	Completeness
METRICS QAUNTITATIVE & QAULITATIVE	Project First Cost with Contingency & Cost Effectiveness	RECONS Total "Value Added" to Local Economy & Total "Jobs" for Local Economy	Habitat Types Improved within the Project Area	Annualized Cost ($) / AAHU	Net AAHUs	Study Objectives Met	Local Community Benefits	Yes, No, Partial	Complete, Incomplete, Partially Complete
No Action	$0.00 Best Buy	$0 0 FTE	None	$0	0	0 of 2, no improvement or creation of habitat	None, no change to existing condition.	No	Complete, no other action needed from others to realize benefits
Alternative 5	$10,770,100 Best Buy	$19,908,000 276.7 FTE	Floodplain Forest, Stream, Mesic Forest, Marsh	$18,151	22.5	2 of 2, improvement to all habitat types within Project area, partial riparian corridor restoration	Yes, anticipate that restoration would improve certain recreation opportunities for community, have positive impact on resident's quality of life and positive impact on local business resiliency.	Yes, does not violate any laws or regulations, is acceptable to sponsor	Complete, action taken to address the objectives; no other action needed from others to realize benefits
Alternative 7	$19,767,200, Best Buy	$29,859,000 415.0 FTE	Floodplain Forest, Stream, Mesic Forest, Marsh	$21,599	34.7	2 of 2, improvement to all habitat types within Project area, full riparian corridor restoration	Yes, anticipate that restoration would improve recreation opportunities for community via full corridor restoration, has largest positive impact on resident's quality of life and impact on local business resiliency.	Yes, does not violate any laws or regulations, is highly acceptable to sponsor	Complete, action taken to address the objectives; no other action needed from others to realize benefits

4.4 Plan Identification

Planning guidance also requires planning studies to include, at a minimum, the following plans for evaluation, the same plan may be identified to meet more than one of the required plans: (a) the "no action" alternative, (b) National Ecosystem Restoration (NER) plan, (c) a plan that reasonably maximizes total net benefit categories including monetized and non-monetized benefits, and (d) the least environmentally damaging practicable alternative (LEDPA), as required by Section 404 of the Clean Water Act (33 USC 1344).

The USACE objective in ecosystem restoration is to contribute to NER via increases in the net quality and or quantity of desired ecosystem resources. Selecting the NER plan requires consideration of the plan that meets the planning objective, avoids the constraints, and reasonably maximizes environmental benefits while passing the test of cost effectiveness and incremental cost analyses, significance of outputs, completeness, effectiveness, efficiency, and acceptability. The alternative that maximizes the benefits in relations to costs and meet the overall study objective is Alternative 7. Alternative 7 has also been identified as the Total Net Benefits Plan as it offers the highest overall benefits to the Project Area. Alternative 7 has a net of 34.7 average annual habitat units (AAHUs).

For the Kinnickinnic CAP 206 alternatives, all alternatives are anticipated to result in a lift of ecosystem benefits throughout the project area following construction. The amount of ecosystem lift varies based on size of the project and the different measures that are incorporated into the alternatives and is generally commensurate with the impact to Waters of the U.S. (WOTUS). Appendix B illustrates that the Alternative 7 meets the requirements to be identified as the Least Environmentally Damaging Practicable Alternative (LEDPA) as specified in ER 1105-2-103. Alternative 7 is identified as the LEDPA.

4.5 Selection of the Tentatively Selected Plan

Federal planning for water resources development was conducted in accordance with the U.S. Water Resources Council's P&G.

> "For ecosystem restoration projects, a plan that reasonably maximizes ecosystem restoration benefits compared to costs, consistent with the Federal objective, shall be selected. The selected plan must be shown to be cost effective and justified to achieve the desired level of output. This plan shall be identified as the National Ecosystem Restoration (NER) Plan."

The Project is consistent with city management goals of improvement of water quality, fish habitat, public safety, aesthetics, protection of infrastructure, and historic, cultural and recreational values. Project planning considered benefits to resident and migratory birds, fish, and other wildlife.

Based on the evaluation and comparison of alternatives across the habitat benefits gained compared to costs, the alternatives ability to meet the objectives, the comparison using the P&G criteria, and across all benefit categories, Alternative 7 is the alternative that best meets the project objectives and reasonably maximizes benefits compared to cost. Alternative 7 is recommended as the National Ecosystem Restoration Plan and the Tentatively Selected Plan.

5 Tentatively Selected Plan

5.1 Description of the Tentatively Selected Plan

The following describes the features of Alternative 7, the TSP. Additional details on design assumptions for the TSP are included in technical appendices. The TSP is shown on Figure 5-1. Figure 5-2 shows the TSP and proposed methods for each measure implementation.

The project datum is NAVD 88, so all elevations in this report (unless noted otherwise) will utilize that datum.

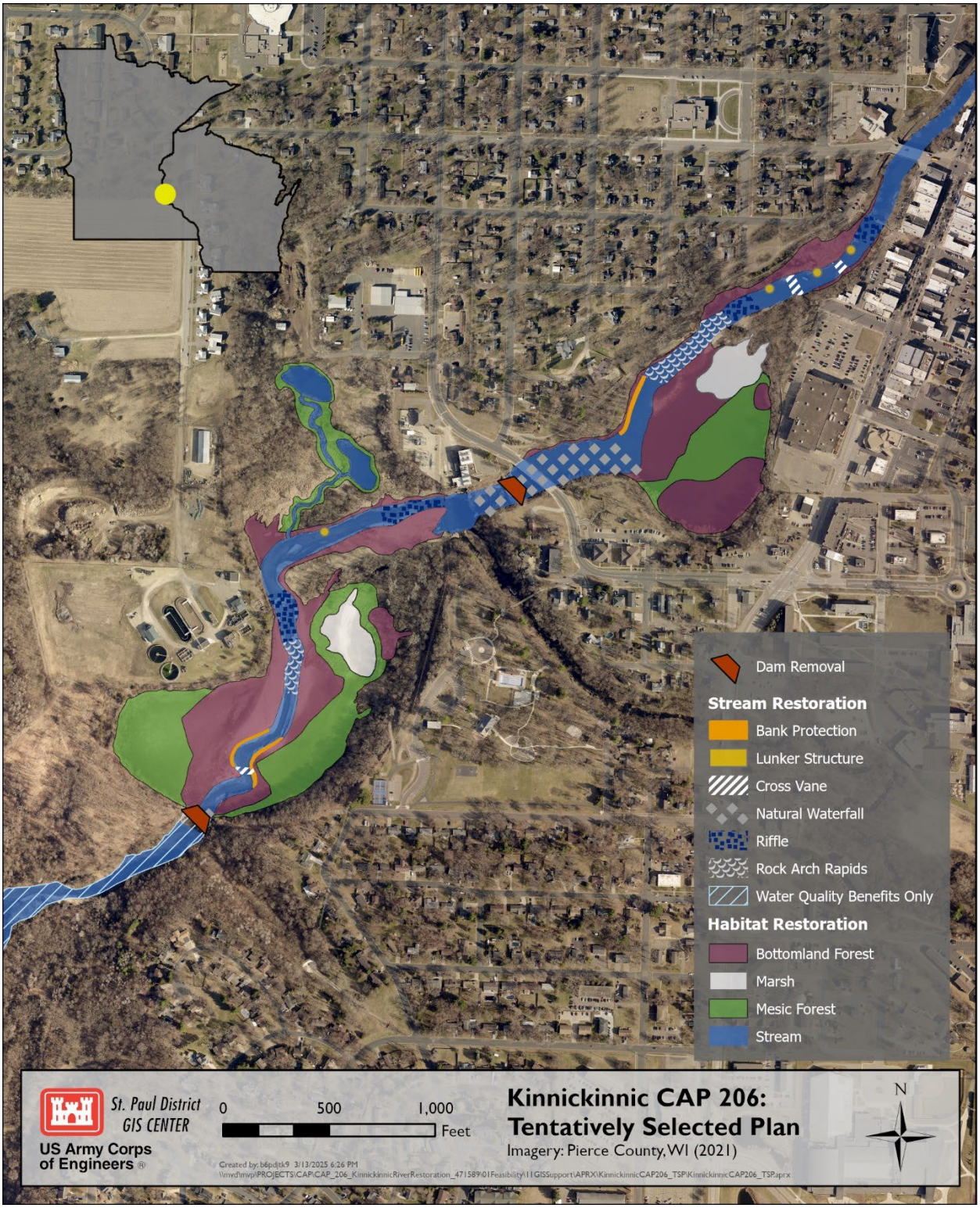

Figure 5-1. Tentatively Selected Plan

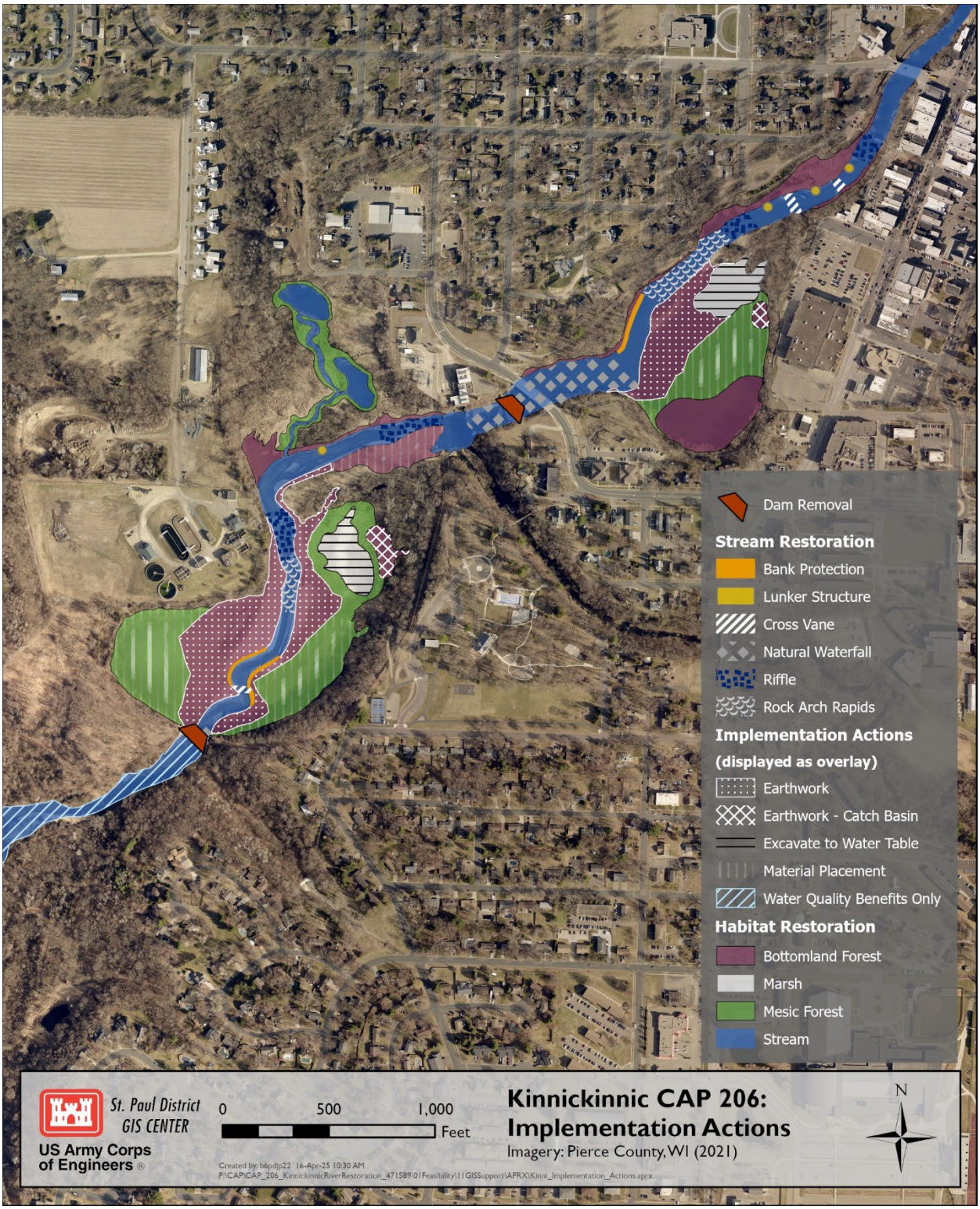

Figure 5-2. All Restoration Features Mapped

5.1.1 Dam Removal

Alternative 7 includes the removal of both the Junction Falls Dam and the Powell Falls Dam. This action aims to restore the natural flow of the river and improve connectivity, thereby promoting the rehabilitation of the river ecosystem.

For Junction Falls, structural removal quantities were estimated at ~3,500 cubic yards of concrete, ~470 tons of steel reinforcing, and ~20 cubic yards of masonry. These quantities encompass the spillway, abutments, wingwalls, parapet walls, the penstock, and the powerhouse. Figure 5-3 shows a plan view of Junction Falls with the primary features to be removed outlined and labeled.

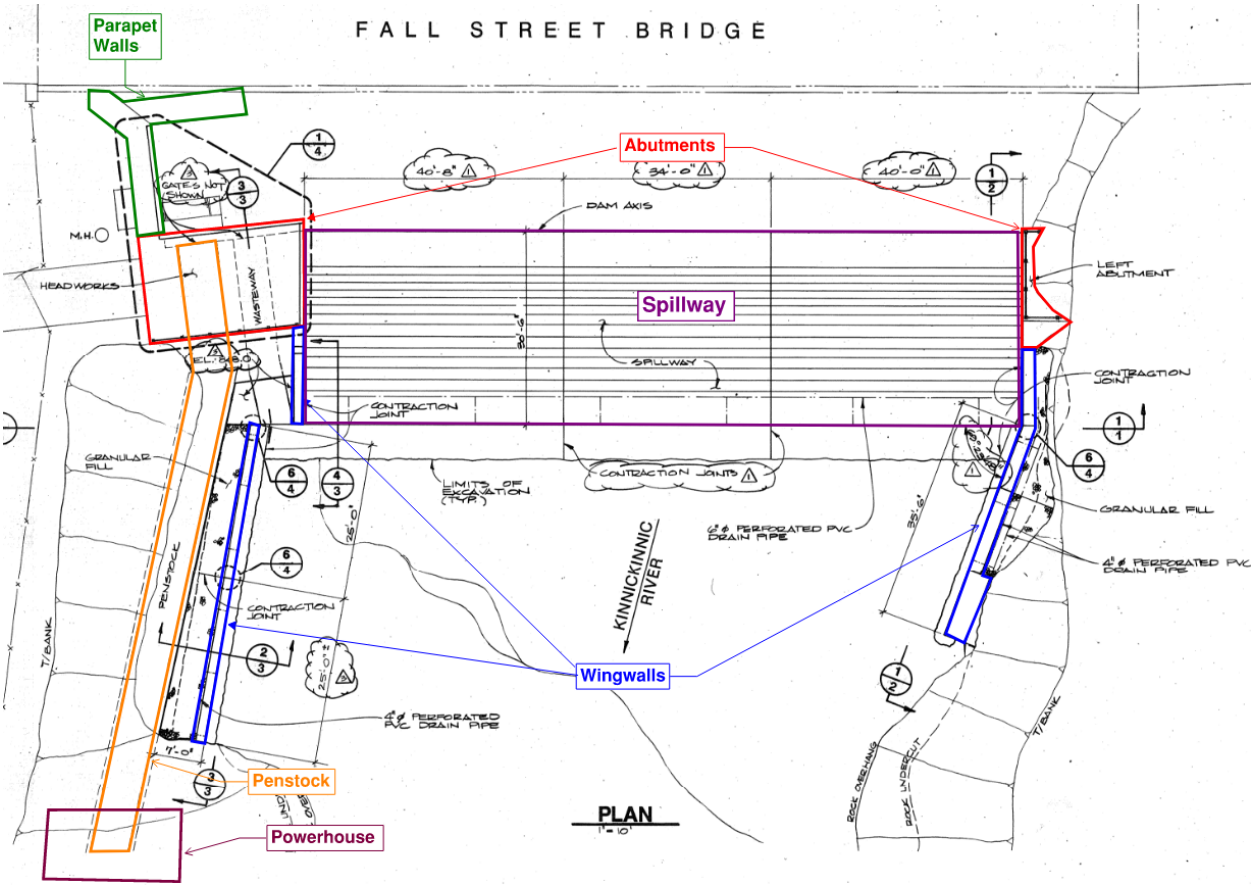

Figure 5-3: Plan View of Junction Falls with Labeled Features to be Removed

For Powell Falls, structural removal quantities were estimated at ~1,340 cubic yards of concrete, 178 tons of steel reinforcing, and 14 cubic yards of masonry. These quantities encompass the spillway, abutments, wingwalls, piers, wasteway, intake bay, tailrace, powerhouse, and other miscellaneous additional concrete items. Figure 5-4 shows a plan view of Powell Falls with the primary features to be removed outlined and labeled.

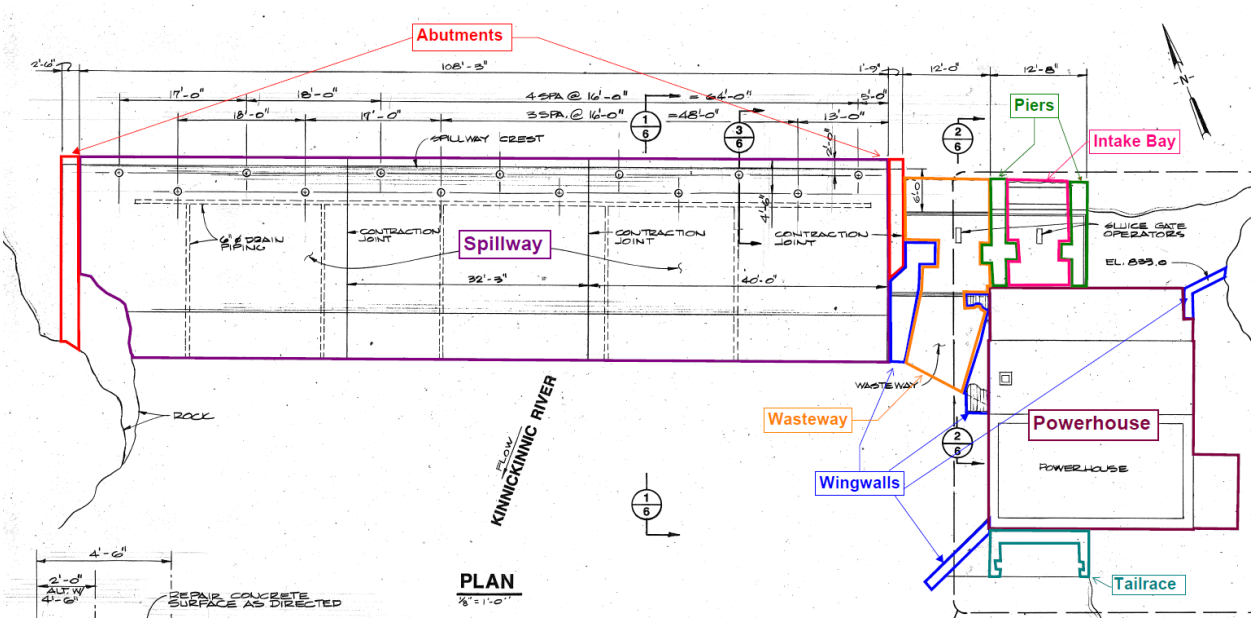

Figure 5-4: Plan View of Junction Falls with Labeled Features to be Removed

See Appendix I for further details on structural removal quantity estimates, including additional drawings. Material from the dam removal would go to an approved construction landfill.

5.1.2 Stream and Riparian Hydrogeomorphic Restoration

Approximately 86,000 and 55,000 cubic yards of sediment have accumulated in the impoundments created by Junction Falls and Powell Falls, respectively, due to their calmer waters relative to a free-flowing Kinnickinnic River. Alternative 7 includes sediment excavation and earthwork to intentionally shape a hydrogeomorphologically stable stream channel through a restored Lake George and Lake Louise. This reshaped stream is designed to include a main channel that can accommodate a 50% annual exceedance event (bank-full conditions) and has a minimum depth of approximately 6 inches in low-flow conditions to maintain habitat for aquatic organisms. It also includes an overbank area designed to flood during events rarer than the 50% AEP event and that is capable of accommodating flows up to the 0.2% AEP event. Such a design is generally considered geomorphologically stable, and limit potential erosion from the project area to levels matching the natural channel upstream and downstream of the project site, (Charlton, 2008). The intentional excavation, removal, and reshaping of sediment would also minimize the volume of sediment transported downstream by the river during the restoration and dam removal process. (See Appendix E for additional detail on channel design).

Sediment excavated from the stream channel and overbank area is planned to be placed on site in the restored forest habitat area, where feasible, while the remaining sediment volume will be transported to a disposal site adjacent to the city's wastewater treatment plant. Approximately 48,000 cubic yards from Lake George would need to be hauled off and disposed of while all sediment excavated from Lake Louise could remain on site. (See Appendix H for sediment volume calculations, sediment quantities, and the location of the disposal site).

5.1.3 Natural Waterfalls

Alternative 7 would include the restoration of two natural waterfall features where the Junction Falls and Powell Falls dams currently reside, achieved through the removal of the dams located on them as described in 5.1.1. The re-exposed waterfall cascades on the southern end of Lake

George is estimated to be around 2.9 acres. The re-exposed waterfall on the southern end of Lake Louise is estimated to be around 0.2 acres. These numbers are estimates, as the extent of the natural waterfalls behind both dams are not fully known.

5.1.4 Riffle and Pool Sequences

Creation of riffles would promote habitat diversity and facilitate natural water flow. Two riffles would be constructed above Junction Falls, covering a total area of approximately 0.6 acres. Two riffles would be constructed below Junction Falls, covering an area of approximately 1.0 acre. Riffles were designed to target velocities of 1.3-2.3 ft/s in low flows to provide sufficient oxygen to trout eggs and other aquatic organisms that may inhabit them. The riffles vary in length from 78 ft to 255 ft with mild slopes ranging from 0.2% to 1.5%. All riffles were designed to use rounded rock. Three use rock gradation R45, and the other uses gradation R140. Each are underlain with a layer of gradation B2 bedding. An extra layer thickness of 6 inches of bedding was included in the quantities for each to be used for chinking within the larger rock. The total estimated quantities related to the riffles are as follows: ~2,400 cu. yd of rounded R45, ~1,500 cu. yd of rounded R140, and ~3,200 cu. yd of B2 bedding. Riffles are generally designed to have pools, deeper and calmer sections of the river, immediately upstream and downstream to provide resting areas and refugia for adult trout, with the exception of couple riffles that are followed by rock arch rapids. Table 12 summarizes riprap sizing and gradation. Appendix E discusses this feature in greater detail.

Table 12. Riprap Sizing and Gradation (D = Diameter, W = Weight)

	R20				R30				R45			
	Max		Min		Max		Min		Max		Min	
	W	D	W	D	W	D	W	D	W	D	W	D
% Finer	(lb.)	(ft)	(lb.)	(ft)	(lb.)	(ft)	(lb.)	(ft)	(lb.)	(ft)	(lb.)	(ft)
100	85	1	40	0.8	140	1.2	60	0.9	205	1.3	90	1
50	35	0.7	20	0.6	60	0.9	30	0.7	85	1	45	0.8
15	20	0.6	5	0.4	30	0.7	10	0.5	40	0.8	15	0.6
5	15	0.6	2	0.3	25	0.7	5	0.4	35	0.7	8	0.5
	R80				R140				R270			
	Max		Min		Max		Min		Max		Min	
	W	D	W	D	W	D	W	D	W	D	W	D
% Finer	(lb.)	(ft)	(lb.)	(ft)	(lb.)	(ft)	(lb.)	(ft)	(lb.)	(ft)	(lb.)	(ft)
100	400	1.7	160	1.2	690	2	280	1.5	1350	2.5	550	1.9
50	170	1.3	80	1	290	1.5	140	1.2	570	1.9	270	1.5
15	80	1	25	0.7	150	1.2	45	0.8	260	1.4	85	1
5	65	0.9	15	0.6	130	1.1	25	0.7	220	1.4	50	0.8

5.1.5 Rock Arch Rapids

Rock arch rapids would be constructed in the restored section of the stream within the existing Lake George and Lake Louise subareas. The rock arch rapids section above Junction Falls would be roughly 0.9 acres and the one below would be roughly 0.4 aces. Rock arch rapids were designed to target river velocities of 1.3-2.3 ft/s in low flows and with a maximum velocity of 10.7 ft/s during the 1% AEP event. The rock arch rapids vary in dimensions. The one above Junction Falls would have approximately 12 steps, with each step 25 ft in length and a vertical elevation difference of 0.5 ft between each step. The one above Powell Falls would have

approximately 9 steps, each 30 ft in length with a vertical elevation difference between each step of 0.5 ft. The overall slope of both rapids structures is to be roughly 2%. Both use a base rock gradation R270. Each are underlain with a layer of gradation B3 bedding. An extra layer thickness of 6 inches of bedding was included in the quantities for each to be used for chinking within the larger rock. Additionally, boulders will be needed to create the weirs at each step. The total estimated quantities related to the rock arch rapids are as follows: ~9,100 cu. yd of angular R270, ~3,600 cu. yd of B3 bedding, and ~930 cu. yd of boulders. Appendix E discusses this feature in greater detail.

5.1.6 Cross Vanes

Alternative 7 includes three cross vane structures to stabilize the streambed and improve water flow dynamics. Two cross vanes would be implemented above Junction Falls covering an area of approximately 0.2 acres. One cross vane with a step would be placed below Junction Falls covering approximately 0.1 acre. Cross vanes were designed to target velocities of 1.3-2.3 ft/s in low flows and with a maximum velocity of 10.7 ft/s during the 1% AEP event. The cross vanes vary in dimensions. There are two above Junction Falls, both roughly 40 ft in length and using gradation R270 riprap. They each have a step of roughly 0.5 ft. Each are underlain with a layer of gradation B3 bedding and geotextile. The cross vane with a step is to be located upstream of Powell Falls. It is roughly 80 ft in length (40 ft per step). It drops the channel a total of 1.9 ft in elevation and uses a base of R80 riprap, underlain with B2 bedding and geotextile. An extra layer thickness of 6 inches of bedding was included in the quantities for each to be used for chinking within the larger rock. Additionally, boulders will be needed to create the vane. The total estimated quantities related to the cross vanes are as follows: ~1,300 cu. yd of angular R270, ~1,300 cu. yd of angular R80, ~530 cu. yd of B3 bedding, ~670 cu. yard of B2 bedding, ~100 cu. yd of boulders and 24,000 sq. ft of geotextile fabric. Appendix E discusses this feature in greater detail.

5.1.7 Lunker Structures

Four lunker structures are included in Alternative 7. These consist of prefabricated wooden boxes that are built into an existing stream bank and covered with boulders and rock slabs. These structures provide cover for trout and other aquatic organisms. Appendix E discusses these structures in greater detail.

5.1.8 Cobble Apron

The cobble apron is located downstream of the rock arch rapids that is downstream of Junction Falls, in the Lake Louise area. The purpose of this apron is to protect the streambed from higher velocities as the flow comes off of the rock arch rapids. The cobble apron is roughly 200 ft long (220 ft on the outside of the left bank curve). The apron consists of rounded R30 rock, underlain by B1 bedding. An extra 6-inch layer thickness of bedding was included in the quantities, to be used for chinking. The total estimated quantities related to the cobble apron are as follows: ~700 cu. yd of rounded R30 and ~600 cu. yd of B1 bedding. Appendix E discusses this feature in greater detail.

5.1.9 Bank Protection

Alternative 7 includes the construction of four bank protection sections – one on the west bank of the river channel of Lake George to protect a portion of the Riverwalk Pathway, one on the west bank through the straight section of the cobble apron, one on the east bank of the curve at the downstream end of the cobble apron, and another on the east bank through the meander ~100 feet before Powell Falls. Each of these banks is expected to be graded to a slope of

~25%. On the west bank through Lake George, the riprap is assumed to be a 12-inch thick layer of angular R20, underlain by 6 inches of B1 bedding. This bank protection is added to protect the shoreline, given the increased velocities in the proposed channel. The west bank of the cobble apron is assumed to be 14 inches of angular R30, underlain by 6 inches of B1 bedding. This is added to protect against velocity increases from flows coming out of the proposed rock arch rapids. The east bank covering the downstream curve of the cobble apron and the east bank through the downstream meander is assumed to be 30 inches of R270, underlain by 12 inches of B3 bedding. Each of these banks appears to be experiencing erosion in the existing conditions, since the draining of Lake Louise. The bank protection is added to maintain the channel shape and protect the proposed project features. In total, there would be roughly 1,085 feet of bank protection within Alternative 7.

5.1.10 Riparian Forest Habitat Restoration

There are two forest restoration actions included in Alternative 7 – bottomland forest restoration and mesic forest restoration, both of which are within the Kinnickinnic River floodplain. These features are assumed to include material placement, seeding with native plants, and planting of native tree species. Common species employed in these features would include but are not limited to swamp white oak, silver maple, cottonwood, hackberry, river birch, and black walnut. Spacing of trees for all forest habitats would vary between a 7’ by 7’ and a 10’ by 10’. The native seeding mix would be variable depending on the forest restoration type and be determined during Planning, Engineering, and Design (PED).

5.1.10.1 Bottomland Forest Restoration

Alternative 7 includes the restoration of 17.0 acres of bottomland forest. Bottomland forest areas adjacent to the restored river would be at a lower elevation and act as a natural floodplain bench for the Kinnickinnic River. These floodplain benches are designed to be inundated approximately once every 2 years. Soils within this habitat type would be close to the water table and mostly saturated. Tree species placed in this habitat would be those that can tolerate wetter soils. In general, this habitat type would revitalize floodplain habitats and enhance the ecological integrity of the area. Portions of this habitat would act as detention basins to hold and filter storm and rain runoff to prevent erosion from city outlets that discharge into the project area. Water would be held in these areas due to their lower elevation and higher surrounding elevation. Tree plantings and natural vegetation in these areas would allow water to naturally filter through the soil before reaching the water table. For more information on the city stormwater outlets and these detention basins see Appendix E, Hydraulics & Hydrology, Section 10.

5.1.10.2 Mesic Forest Restoration

Alternative 7 includes the restoration of 12.6 acres of mesic forest. Earthwork for remnant sediments from the impoundment of both dams would be moved to areas of mesic forest habitat to increase topographic diversity through increased elevation. This habitat would be inundated far less than the bottomland forest and have dryer soils due to a higher elevation. Tree species placed in this habitat would be those that prefer drier soils. This would assist in improving the health and resilience of more moist forest ecosystems.

5.1.11 Stream Habitat Restoration

Alternative 7 would restoration to 14.7 acres of stream habitat, improving aquatic habitats throughout the study area. Stream restoration features used to provide benefits to trout species are discussed in Sections 3.1.1, 5.1.2, and 5.1.4, and include the creation of a

hydrogeomorphologically stable stream channel, lunker structures, and riffle and pool sequences. Stream habitat restoration would provide benefits to water quality, ecological health and provide habitat for trout. Alternative 7 would also provide water quality benefits of decreased water temperature and increased dissolved oxygen through the Lower Kinnickinnic River, affecting approximately 74.2 acres.

5.1.12 Emergent Wetland Restoration (Marsh)

Alternative 7 includes the restoration of 2.7 acres of emergent wetlands. Marsh habitat would be designed as a type 3 wetland or shallow marsh. Marsh habitat vegetation would include grasses, bulrushes, cattails and arrowheads and provide habitat for waterfowl, herptiles small mammals, and fish. Marsh restoration would improve water filtration and provide a larger diversity of habitat types within the study area. Marsh areas would be excavated to the elevation of the bottom of the main channel, which would allow the area to fall below the water table. Excavating these areas to the water table would keep the area saturated and maintained as wetlands.

5.1.13 Spring Ponds Outlet Improvement

Alternative 7 includes replacing the existing culverts at the outlets of the Spring Ponds with weir-like rock structures. This will improve outflows from the ponds by reducing debris clogs, consequentially reducing water stagnation and algal growth. This is anticipated to improve water clarity, improving emergent and submergent plant abundance and the overall ecosystem health. Replacing the culvert structures will also improve overall connectivity between the ponds and the river and will improve the use of the ponds as a rearing area for aquatic vertebrates. This would improve the ecological health of the overall system. Restoring connection to Spring Ponds would provide 1.6 acres of stream habitat restoration.

5.2 Cost Estimate

After Alternative 7 was selected as the TSP, the cost was updated and prepared using FY25 price levels. Annualized cost includes construction cost, including contingency and adaptive management cost, and O&M costs. The team completed an Abbreviated Risk Analysis (ARA) to evaluate the remaining risks of the project and developed a TSP contingency of 29%. Table 13 presents the Project first cost, updated after comparison of alternatives. Quantities and costs may vary during final design. A full description of the cost estimate, including all related elements, can be found in Appendix F, Cost Engineering.

Table 13. Project First Cost

Account	Measure	Project First Cost
01	Lands and Damages	$328,125
06	Fish and Wildlife Facilities	$17,584,005
30	Planning, Engineering and Design	$2,607,702
31	Construction Management	$1,396,170
	Total	$21,916,007

Costs were annualized using the FY25 discount rate of 3.0% and a 50-year period of analysis. Interest During Construction (IDC) was computed using a 3-year period of construction and 3.0% (FY25) discount rate. The annualized costs and AAHUs were used to calculate a total annual cost per average annual habitat unit (Table 14). The total annual cost per AAHU is

$25,290. The costs used for analysis purposes include total Project first costs, IDC, and annualized O&M.

Table 14. Total Annual Cost per Average Annual Habitat Unit ($)

Analysis Element	Present Cost	Annual Cost Total
Project First Cost ($)	$21,916,007	
IDC ($)	$486,885	
Total Project Costs ($)	$22,402,905	
Annual Construction Cost ($)		$870,700
Annual O&M ($)		$6,880
Total Annual Costs ($)		$877,580
Net AAHUs		34.7
Total Annual Cost/AAHU ($)		$25,290

Table 15 documents the cost apportionment of total project cost (fully funded and escalated to the midpoint of construction) between the non-federal sponsor and the federal government for the entire project, including the feasibility phase, assuming a federal limit of $15,000,000.

Table 15. Cost Apportionment Based on Total Project Cost

Description	Federal Share	Non-Federal Share	Total
Sunk Planning Costs			
Federal Interest Report (sunk)	$100,000	$0	$100,000
Feasibility Report (sunk)	$325,000	$325,000	$650,000
Subtotal Sunk Costs	$425,000	$325,000	$750,000
Design & Implementation Costs			
Lands and Damages	$0	$341,366	$341,366
Design and Construction	$ 15,690,257	$ 8,107,234	$23,797,491
Total Design & Implementation Costs Prior to Adjustment for Federal Per Project Participation Limit (65% Federal/35% Non-Federal)	$15,690,257	$8,448,600	$24,138,857
Adjustment Amount	($1,135,220)	$1,135,220	$0
Total Design & Implementation Costs	$14,575,000	$9,563,857	$24,138,857
Total	$15,000,000	$9,888,857	$24,888,857

The fully funded total project cost with escalation through the midpoint of construction is currently estimated at $24,138,857. The fully funded total project cost would be used for cost sharing in the Project Partnership Agreement. The federal share based on the fully funded total project cost is estimated at $14,575,000 and the non-federal share is estimated at $9,563,857.

5.3 Construction Considerations

This section and subsequent sub-sections depict how USACE and the City of River Falls intend to construct Alternative 7. This involves the preferred construction methods, construction sequencing, dewatering process, dam removal, restoration and general construction access at the time of feasibility. Construction of Alternative 7 is expected to take two to three construction seasons, potentially from 2027 through 2029. Stream restoration construction would generally occur from January through September and avoid spawning impacts to brook and brown trout eggs during the designated spawning window of October through December. Other construction activities outside of the river could take place year-round but would be dependent on weather. See Appendix I: Structural Engineering for more detailed concepts regarding construction.

5.3.1 Construction Sequence

The most likely construction sequence would be to lower Lake George through the Junction Falls wasteway. This would allow the newly exposed riparian zone above Junction Falls to dry out, so that earthwork and stream restoration actions could take place in the Lake George sub-area. To limit sediment movement and other water quality concerns associated with the lowering of Lake George, the Lake Louise sub-area could be refilled to act as a settling basin. Section 5.4.2 covers dam dewatering and other options if the preferred approach is not possible. Once Lake George is drained, dam removal of Junction Falls can begin. Section 5.4.3 covers the dam removal process and the different options available for both dams. Lake Louise can be lowered once the concerns behind sediment movement from Lake George are alleviated. Restoration of the Lake Louise sub-basin and the removal of Powell Falls Dam can happen after Lake Louise is lowered and the functionality of the dam and settling basin are no longer needed. Section 5.4.4 covers the general restoration process of the stream and riparian corridor of the project. Section 5.4.5 covers construction access to the overall project site and each sub-basin. Figure 5-5 shows the different staging areas and site access for the project. Construction sequencing will be refined during PED.

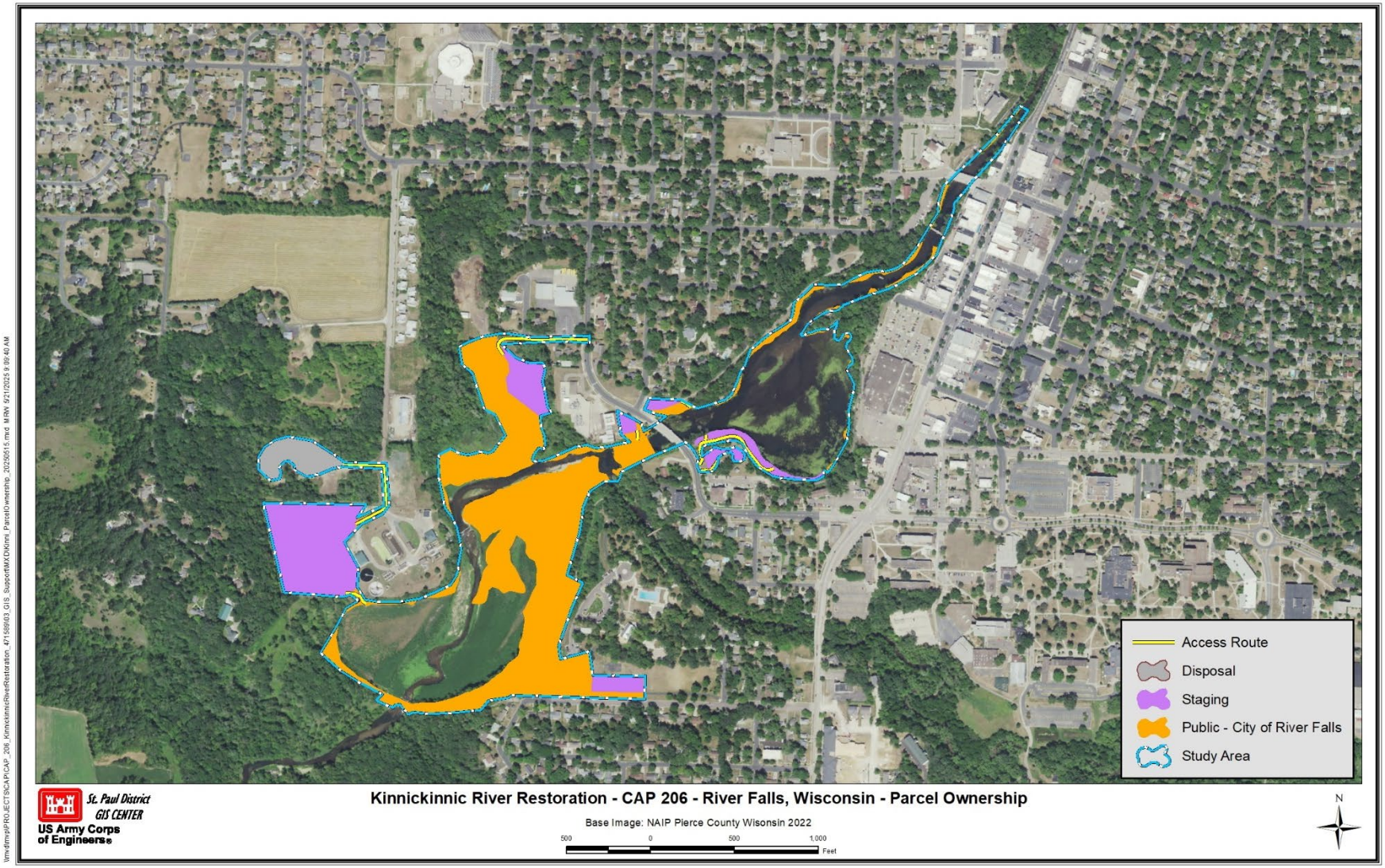

Figure 5-5: Staging Areas and Site Access

5.3.2 Dam Dewatering

Dewatering of the impoundments (Lake George and once Lake Louise) is possible due to the inclusion of wasteways in the existing dams. At Junction Falls Dam, this outlet is controlled by a gate and has been used in the past for maintenance purposes. At Powell Falls Dam, the wasteway gate is also operable by a control gate and the sluice gate for the wasteway is already open. The preferred method for dewatering would be to close the sluice gate at Powell Falls Dam so that Lake Louise could be refilled and used as a settling basin for any sediment associated with the dewatering of Lake George. Lake Louise would be raised to a level that is deemed sufficient using the current infrastructure to catch sediment and cover unwanted vegetation within the Lake Louise floodplain. Allowing Lake Louise to fill prior to dewatering Lake George would reduce downstream impacts as described below. Once filled, Lake George would be dewatered using the wasteway gate at Junction Falls Dam. I Lake George would be lowered at approximately 1 foot per day or slower to limit erosion and avoid sloughing of sediment within the drained lake areas, which may be refined during design. The process of utilizing a refilled Lake Louise as a settling basin would provide the following benefits to the project:

- Reduce sediment loads in the Lower Kinnickinnic River.
- Reduce the volume of sediment that needs to be excavated from the original river channel in Lake George to achieve stream restoration.
- Destroy invasive and other undesirable plant species within the Lake Louise floodplain.

Once the benefits associated with raising Lake Louise are no longer needed, Powell Falls Dam can be re-opened, and the lake dewatered. To reduce sedimentation movement out of Lake Louise, the lake would be lowered as slowly as possible to reduce sediment movement into the Lower Kinnickinnic River. This is the preferred method for dewatering. If this is not possible, other dewatering methods discussed below may be used in the construction process.

5.3.2.1 Other Dewatering Methods

If the above dewatering process and sequence is not possible due to infrastructure malfunctions or deterioration, other methods would be implemented to limit the movement of sediment associated with dewatering and the dam removal process. If the sluice gate at Powell Falls Dam cannot be closed due to deterioration, stoplogs or a cofferdam could be installed to mimic the functionality of the sluice gate so that Lake Louise can be refilled to act as a settling basin. Using stoplogs or a cofferdam would get the same benefits of the dewatering method described in 5.3.2. If this process is not possible, Lake George would need to be dewatered slower or incorporate a staged drawdown to greatly reduce sediment movement downstream. To reduce concerns around sediment movement, other sediment management techniques could be included with this approach (e.g., sediment traps, silt curtains). This last option would likely result in more excavation needed within Lake George to achieve stream restoration.

5.3.3 Dam Removal

Demolition of the dams should begin once the impoundment water levels have been reduced using the wasteway bypass gates. The dam removal sequence assumes removing both dams concurrently or in immediate succession, with Junction Falls starting first. Proper sediment and material management techniques would be used for both dams. This could include using silt curtains angled perpendicular to stream flow. It is assumed that dams would be removed by dam spillway notching, starting at the top of the spillway and working down using either (1) a

hydraulic hammer mounted to a track excavator, (2) sawcut equipment, or both. These two methods of removal both have pros and cons.

Hydraulic hammering would be cheaper and quicker, but would cause more debris and vibration. Saw cutting is more expensive, but would limit vibrations, noise, debris and dust. A combination of both hydraulic hammering and saw cutting could be used in dam removal. To monitor stability of nearly buildings, bridges and other infrastructure, vibration monitoring would be implemented. Both dams would need to be removed in a controlled fashion so that water flow is not interrupted and fine concrete debris washing into the river is minimized. Material removed from the dams would be transported away from the site via construction access and placed within designated disposal areas (Figure 5-5). Dam debris would be disposed in an approved construction material landfill. Sediment would be either placed in disposed at the disposal site near Staging Area 4. Additional information about dam removal and considerations is discussed in Appendix I, Structural Engineering.

5.3.4 Restoration

Once Lake George and Lake Louise are drained and dewatered through the process described in 5.3.2, restoration actions can begin within both sub-basins. The first restoration action would involve reshaping the channel and removing material where necessary to match required stream width and depth. Material removed from the stream would either be placed in the floodplain within material placement areas (see Figure 5-2) or moved to the disposal area. Within this timeframe, the necessary earthwork within the floodplain bench (bottomland forest), detention basins, and marsh areas would be completed and moved to material placement areas or the disposal area. Once the proper width and depth of the stream and floodplain bench is complete rockwork for stream restoration features would be implemented. Once stream restoration, necessary earthwork, and all other features are complete, native seeding and tree planting would be completed. Access routes that could double as future recreation paths would not be seeded or planted with trees.

5.4 Real Estate Considerations

The non-federal sponsor is required to provide all lands, easements, rights of way, and disposal sites for the project, and to perform any required utility/facility relocations. Most lands required for the project are owned in fee by the City of River Falls. Obtaining one temporary work area easement for access to private lands would be necessary if Staging Area 1 and its adjacent access were to be utilized. Additional investigation and consideration would be made during PED. There are no proposed Public Law 91-646 relocations. For more information reference Appendix G for Real Estate Plan.

5.5 Operation and Maintenance Considerations

The non-Federal sponsor is responsible for the operation, maintenance, repair, rehabilitation, and replacement of all project features (OMRR&R) in accordance with the OMRR&R manual, which USACE would provide following project construction. Upon completion of construction of each functional component of the project, the non-federal sponsor will begin OMRR&R. The total estimated annual cost of operation and maintenance for the project is $6,880. These costs include annual operation costs and maintenance costs for the rock structures. Maintenance would consist of periodic inspections and repairs to the stream restoration features, floodplain vegetation restoration, Spring Ponds restoration, and other associated project features. Maintenance of structural features would continue in perpetuity. Maintenance of non-mechanical, nonstructural features would cease after ten years. Maintenance requirements

would be further detailed in the OMRR&R manual published after construction completion and preparation of as-built drawings. Table 16 lists the major O&M components, their associated frequencies, and costs.

Table 16. O&M Responsibilities

O&M	Frequency	Annual Cost
Periodic Inspection (can include rip rap replacement as needed)	Occurs annually for years 1-10, then every 5 years or after significant flood events for years 10-50.	$6,880
Total O&M Costs		$6,880

5.6 Monitoring and Adaptive Management

The project performance assessment would allow measurement of differences from baseline conditions for key biological factors. This measurement should allow a quantitative determination whether features are functioning as intended. Adaptive management consists of contingency plans in the event monitoring shows features are not meeting objectives. Monitoring and adaptive management may extend for up to ten years following Project completion. Monitoring activities to evaluate each of the Project's goals and objectives are described in Appendix L.

5.6.1 Construction Access

Generally, a balance must be struck to provide reasonable access for construction while minimizing the environmental disturbances associated with construction. As access to the site can be difficult, easy access to the site for maintenance purposes would ensure fulfillment of Sponsor's O&M responsibilities.

5.6.1.1 Junction Falls Dam Access

Junction Falls Dam is accessible at the top of the right abutment via City property. A construction access road is proposed to provide access to the area below the dam from the right abutment. This access road would start at the utility parking area at the right abutment of the Junction Falls Dam and traverse down to the riverbed elevation with a switchback. This access route would allow for the dewatering of Lake George through the Junction Falls Dam wasteway and create a work pad to conduct the dam removal. Layout and further details of the access road is discussed in section 4.2.1 of Appendix H, Civil Engineering.

If further access to Junction Falls Dam is required to complete dam removal, access along the gated access road from Glen Park would be utilized. Using the Glen Park access route would require improving the existing paved trail to allow for vehicle clearance, adding gravel at the end of the paved trail, creating a temporary river crossing near the confluence of the South Fork of the Kinnickinnic River, and creating a temporary ramp up the approximately 6-foot-high waterfall. These improvements are not included in the current cost estimate.

The Lake George impoundment area would be accessed from the river right or left sides of the Winter Street bridge. See Figure 5-5 for more details on access to Lake George and Lake Louise sub-basins for restoration work.

5.6.1.2 Powell Falls Dam Access

Primary access to Powell Falls Dam and its removal is proposed to take place from the upstream side of the dam. Since Lake Louise has been drained, access to the dam can done through the floodplain via the River Falls Wastewater Treatment Facility property. To provide stability for heavy equipment associated with dam removal (i.e., cranes, excavators), a construction access road would be implemented to the dam if soil conditions required it, (to be explored further in PED). At this stage in the feasibility process, it is assumed that most, if not all, of the removal of Powell Falls Dam can take place from upstream side of the dam.

To allow earthwork, stream restoration and other construction necessary throughout the Lake Louise sub-area, a ford access would be implemented. This would take place within the footprint of the riffle or rock arch rapids restoration features. Rock necessary for the ford could be re-purposed into the stream restoration features when it is no longer needed. To provide access to the Powell Falls Dam powerhouse, the gravel road path branching from West Park Street and Bartosh Lane would be available for removal and construction access. If further access to the Lake Louise sub-area is necessary, the Glen Park access route depicted in section 5.3.5.1 could be used. Access, staging and disposal areas to Powell Fall Dam and the Lake Louise sub-basin are depicted in Figure 5-5.

5.7 Implementation Requirements

As discussed in section 5.4.2 Dam Dewatering, implementing the TSP in stages so that the demolition of Junction Falls Dam and restoration of the Lake George area would occur before the demolition of Powell Falls Dam and the restoration of Lake Louise would provide numerous benefits. This is because the gate in Powell Falls Dam could be closed, and Lake Louise could be temporarily refilled, to assist in trapping sediment from Lake George during the dewatering and restoration process. Additionally, undesirable and invasive plant species that have taken over the dry lakebed of Lake Louise could be drowned and buried, providing a better starting point for the planting of native species and the establishment of optimal habitat through the restoration process. Finally, this option has been discussed with the City and other stakeholders and is seen as a logical process.

5.8 Implementation Schedule

The schedule for feasibility study completion, design, and construction is documented in Table 17. Design and construction will be initiated pending funding.

Table 17. Project Implementation Schedule

Event	Scheduled Date
Public Review of Draft Report	May 2025
Submit Final FR/EA to MVD	September 2025
Approved Final FR/EA from MVD	November 2025
Execute the Memorandum of Agreement with the Sponsor	December 2025
Initiate Design	December 2025
Complete Design	Spring 2027
Initiate Construction	Summer 2027
Complete All Construction Stages	Fall 2029

5.9 Risk and Uncertainty

Areas of risk and uncertainty have been analyzed and were defined so that decisions could be made regarding the reliability of estimated benefits and the costs of alternative plans. Risk is defined as the probability or likelihood for an outcome. Uncertainty refers to the likelihood that an outcome results from a lack of knowledge about critical elements or processes that then contributes to risk or natural variability in the same elements or processes.

The PDT worked to manage risk in developing measures by expanding on and referencing similar work completed by previous CAP 206 projects and utilizing data provided from the City of River Falls. The PDT used that experience and information to identify possible risks and decrease uncertainty in plan formulation. No measures in Alternative 7 are believed to be burdened by significant risk or uncertainty regarding the eventual success of the proposed measures. Significant risk would be avoided by proper design, appropriate selection, and correct seasonal timing of applications.

Implementation risks identified for Alternative 7 include:

- Additional geotechnical sediment sampling: the team reviewed initial sediment testing data that identified the need for further arsenic sampling. Subsequent sampling concluded that arsenic was below background levels. If additional data indicates contamination of concern, locations of features can be further updated and refined to avoid it or the sponsor will be responsible for providing clean sites. Additional sampling would occur within the Engineering and Design phase of the project to assess whether conditions in impounded sediments have changed and to comply with anticipated conditions of the Section 401 certification.
- Sediment release: The team analyzed potential sediment release in relation to other dam removals, recognizing the risk of increased turbidity, downstream deposition, and potential temporary ecological impacts on water quality. Measures to minimize these effects are included in the proposed project.
- No-rise condition: The team will refine the model, potentially adjusting rock sizing and other stream/hydraulic design features, in PED. The team will also collect additional stream survey data to refine the model. Design refinement is anticipated to ensure that the project will not cause any rise (less than 0.01 ft rise) in water levels under a 1% AEP.

The ARA was conducted in December 2023 to determine the appropriate risk-based contingency for project line items, as described in the Cost Estimate (Section 5.2). The identified risks include access, construction seasons, and water levels. The ARA is part of the Cost Engineering appendix, due to the sensitivity of providing detailed cost information which could bias construction bidding, the material has been omitted in the public document.

6 Environmental Consequences

This section identifies the existing conditions of the resources for the Kinnickinnic River CAP 206 Project area and describes the environmental consequences of the alternatives considered compared to the No-Action Alternative. The depth of analysis of the alternatives corresponds to the scope and magnitude of the potential environmental impact. This section provides the basis for the comparison of alternatives and describes the probable consequences of each alternative on the selected environmental resources.

The TSP (Alternative 7) and the No-Action Alternative are evaluated in this section. As discussed above, Alternative 7 is the largest alternative and includes the same building blocks as the other alternatives, including all major features included in the other alternatives. The other alternatives would generally have similar effects to those described for the TSP for the features they share with Alternative 7. In brief, effects associated with Junction Falls Dam removal, Lake George restoration and upstream restoration would be applicable to Alternatives 2, 4, and 5. Effects associated with removal of Powell Dam and restoration of the Lake Louise area would be applicable to alternatives 3, 4, and 6. Spring pond restoration effects would be applicable to alternatives 5 and 6. None of the alternatives evaluated in this report would result in significant adverse effects for any of the resource categories discussed below, nor would those adverse effects be substantially different than those outlined for the TSP. Effects of monitoring and recurring O&M are anticipated to be minimal for all action alternatives. Effects of adaptive management, if required, would be anticipated to be similar to or less than those of construction. Table 18, located at the end of this section, describes the impacts of the No-Action Alternative and the TSP.

6.1 Short-Term Construction Effects

Construction of the TSP is expected to take two to three construction seasons, potentially from 2027 through 2029. Construction would generally occur from April through November and be dependent on weather. It would include construction restrictions to avoid adverse effects on trout streams. Access to the project area is anticipated to be via access roads. No staging on land outside of the project area is expected. Construction equipment would likely involve typical equipment such as earth moving equipment, excavators, and demolition equipment. Fill materials (sands) would be moved on-site for habitat improvement or moved to the designated placement site. Rock would come from a near-by quarry. Dam debris would be moved to a commercial landfill. Further discussion on short-term construction methods are discussed in Section 5.4.

6.2 Natural Resources

6.2.1 Hydrology and Hydraulics

Impact of the No Action Alternative

The No Action Alternative is not anticipated to change the hydrology or hydraulics within the Kinnickinnic Project Area. Under the FWOP, the hydrology and hydraulics would remain similar to the existing condition, with Lake George remaining impounded and similar flow dynamics through the Kinnickinnic River within the Lake Louise area.

Impacts of the Tentatively Selected Plan

The TSP does not impact the amount of water that comes into the system; rather, it changes how water moves through the system. Under the TSP, Lake George would be drained, the river would be restored to mimic the Kinnickinnic River channel outside the project area, and the falls buried behind Junction Falls Dam would be exposed. The removal of Powell Falls Dam would expand the width of the river in that section and allow it flow over natural falls, as it is currently constrained to width of the dam sluice gate. Through the TSP, the hydraulics of the system would mimic the rest of the Kinnickinnic River system, maintaining desired water temperatures and dissolved oxygen for trout and other coldwater riverine species. The TSP would also incorporate bottomland forest and wetland restoration features that are designed to be catch basins for any rain or storm water runoff that enters the project area. Through these features the water would filter and drain naturally through soils and wetlands before entering the restored

Kinnickinnic River. Stream restoration features such as riffles, rock arch rapids and bank protection would change the hydraulics through the river to be more suitable for coldwater trout species. These stream restoration features were designed for trout benefits, which were analyzed under the Habitat Evaluation Procedures (Appendix K). See Appendix E for discussion of no-rise criteria and current assessment. See Appendix I for discussion of reinforcement to protect a bridge footing from scour if determined necessary. Finally, under the TSP, the outlets at Spring Ponds would be restored, allowing flow and connectivity back to the Kinnickinnic River. Overall, the TSP is expected to have minor beneficial effects on hydrology and hydraulics over the No Action Alternative.

6.2.2 Water Quality

Impacts of the No Action Alternative

A major concern around water quality within the Kinnickinnic Project Area is elevated water temperatures from stagnation associated with dam impoundment. Impoundment increases water surface area and increases solar exposure, which increases water temperature and decreases dissolved oxygen. These problems can be much worse during the summer months and periods of extreme air temperatures and drought. Recent trends have shown that air temperatures in the Midwest have become higher throughout the year, with this being more evident in the summer months (See Appendix M). Under the No Action Alternative, the impoundment of Lake George would continue. If the trend of elevated air temperatures continues, water quality, specifically pertaining to increased temperature and decreased dissolved oxygen, is expected to decline under the FWOP. For this reason, the No Action Alternative would result in a minor adverse effect towards water quality compared to the existing condition.

Impacts of the Tentatively Selected Plan

The TSP would be to remove both Junction Falls and Powell Falls Dams, removing the impoundment of Lake George. The initial removal of the dams would result in a minor, temporary adverse effect on water quality associated with increased turbidity downstream of the dams. Sections 5.3.2 and 6.2.4 describe methods for minimizing the effects of sediment movement on water quality associated with dewatering Lake George and dam removal. If necessary, additional sediment and debris minimization techniques, such as sediment traps and silt curtains, would be utilized to minimize water quality concerns. Draining Lake George would remove the concern of elevated water temperature and decreased dissolved oxygen associated with impoundment throughout the Kinnickinnic Project Area. This benefit of lower water temperatures and increased dissolved oxygen levels would also benefit the Lower Kinnickinnic River downstream of the project. The TSP would also incorporate catch basin areas throughout the restored riparian area that would prevent erosion from runoff entering the project area from existing stormwater outfalls. These water quality enhancements would directly benefit trout species and other coldwater stream species (i.e., larval insects). The TSP would comply with any conditions within the Clean Water Act 401 Water Quality Certification. The implementation of the TSP would result in a minor benefit to surface water quality compared to the existing condition and No Action Alternative.

6.2.3 Wetlands and Aquatic Habitat

Impacts of the No Action Alternative

Under the No Action Alternative, the wetlands and aquatic habitats are not anticipated to change from the existing condition.

Impacts of the Tentatively Selected Plan

Existing wetland habitat within the footprint of the Kinnickinnic Project Area is limited with some sparse areas within the Lake George and Lake Louise sub-areas (Figure 2-1). As part of the TSP, marsh restoration would be incorporated within the restoration features above and below Junction Falls. Marsh habitat would be designed as a type 3 wetland or shallow marsh. Marsh habitat vegetation would include grasses, bulrushes, cattails and arrowheads and provide habitat for waterfowl, herptiles small mammals, and fish. The bottom elevation of the marsh areas would be excavated to the elevation of the bottom of the Kinnickinnic River main channel, allowing the area to fall below the water table. Excavated material would either be placed within project area footprint or the disposal site (Figure *5-2*). The TSP would create nearly three acres of wetland/marsh habitat and have a net benefit of roughly two AAHUs associated with marsh habitat (See Appendix K, Section 3.3) within the Kinnickinnic Project Area. Overall, the TSP would provide a minor benefit to wetlands compared to no action.

Under the TSP, the aquatic habitat type would be returned to its natural state. Instead of the area above Junction Falls Dam being impounded, the aquatic habitat would be returned to a coldwater stream and restored using the stream restoration features depicted in Sections 3.1.1 and 5.1 (Figure 5-1). In total, the TSP would restore 15.2 acres of stream, resulting in 8.8 AAHUs directly associated with coldwater stream habitat. Water quality benefits to the Lower Kinnickinnic associated with dam removal would result in 6.4 AAHUs associated with coldwater stream habitat (See Appendix K, Section 3.1). Restoring the Kinnickinnic River under the TSP would ensure that it remains a Class 1 trout stream into the future that can be utilized by fish, wildlife, and the public. For this reason, the TSP would provide a substantial benefit to aquatic habitat compared to the no action. Implementation actions associated with wetland and aquatic habitat (stream) restoration under the TSP would comply with any conditions within the Clean Water Act 401 Water Quality Certification.

6.2.4 Soil, River Substrate and Sediment

Impacts of the No Action Alternative

Soil composition and river substrate under the No Action Alternative are not anticipated to deviate or change from the existing condition.

Impacts of the Tentatively Selected Plan

Impoundment from Junction Falls Dam has created a large sediment deposition area within Lake George that has covered up gravel, cobble, and boulder bed material of the remnant channel of the Kinnickinnic River, and soils from the old riparian floodplain. Under the TSP, the deposition of sediment in Lake George would need to be properly managed. Prior to draining Lake George, the Lake Louise sub-area would likely be used as a catch basin by closing Powell Falls Dam and impounding the area (See Section 5.3.2). This would allow much of the sediment released from the draining of Lake George to be retained within the project area and not flushed into the lower Kinnickinnic River. Prior to draining Lake George, sediment behind the dam would be tested during PED for compliance with anticipated Section 401 requirements (See Appendix B). Once both reservoirs are drained, sediment would be excavated and placed within the project area floodplain or the designated disposal site (see *Figure 5-2* and Figure 5-5). Any sediment placed within the floodplain would be seeded and planted to promote forestry and reduce potential erosion. As part of the TSP, stream restoration features including riffles, rock arch rapids, cross vanes, lunker structures and bank stabilization would be used to mimic a natural coldwater stream throughout the Kinnickinnic Project Area.

6.2.5 Land Use

Impacts of the No Action Alternative

The No Action Alternative would have no effect on land use within the Kinnickinnic Project Area.

Impacts of the Tentatively Selected Plan

The implementation of the TSP would not change the existing land designation as public land that can be utilized for recreation. Under the TSP there would be a shift in landcover, as the selected plan is designed to restore the Kinnickinnic River and convert impoundment and grasslands to riparian forest and emergent wetland (marsh, Figure 5-1). One of the larger landcover shifts is stream/open water (51% existing) decreasing to 31% stream/open water, which can mostly be attributed to the draining of Lake George. Much of the Kinnickinnic Project Area after the TSP would be forested (63%), with a mix of bottomland (36%) and mesic (27%) forestry types, which would be a 55% increase in forested area from the existing landcover. For more information on bottomland and mesic forestry types see Section 3.1.2. Finally, emergent wetlands would account for 6% of land use, a roughly 5% increase from existing conditions. These shifts in land use would generally be considered a minor beneficial effect, because of the shifts to more desirable habitat types.

6.2.6 Terrestrial Habitat

Impacts of the No Action Alternative

The No Action Alternative would not affect terrestrial habitat within the Kinnickinnic Project Area as it is anticipated to remain similar to the existing condition.

Impacts of the Tentatively Selected Plan

As part of the TSP, Lake George would be drained, and the remnant channel of the river would be restored. This action would result in a conversion of open water to a mixture of restored riparian forest habitat through native seeding and tree planting (see section 5.1.8). Existing terrestrial habitat below Junction Falls Dam is predominantly a monoculture from a plant diversity standpoint. Bottomland and mesic forest restoration would be designed to increase habitat diversity by elevation variability and utilizing a variety of native plants and tree species. The TSP would involve restoring 29.6 acres of combined bottomland and mesic forest habitat, resulting in a net gain of 17.6 AAHUs associated with forest habitat (See Appendix K, Section 3.2). This action is anticipated to facilitate higher productivity and increase interspersion of wildlife species compared to the existing terrestrial condition, ultimately resulting in a minor benefit to habitat diversity. The transition from aquatic habitat to restored riparian forest under the TSP would result in a minor benefit for terrestrial habitat throughout Kinnickinnic Project Area compared to the existing condition.

6.2.7 Hazardous, Toxic and Radioactive Waste (HTRW)

Impacts of the No Action Alternative

The No Action Alternative would not have an impact from any hazardous, toxic or radioactive wastes within the Kinnickinnic River Aquatic Ecosystem Restoration and Protection Project Area.

Impacts of the Tentatively Selected Plan

Based on the Corps' 2023 sampling and the Corps Phase I HTRW Environmental Site Assessment, the TSP would not be anticipated to affect HTRW. The 2023 sampling concluded arsenic in Lake Louise sediments was below background levels. Sampling during PED would confirm whether conditions have changed for impounded sediments and if avoidance is

necessary for contaminants of concern. Residual contamination in adjoining properties upstream of Junction Falls Dam would not be anticipated to affect the proposed project footprint.

For compliance with anticipated conditions of certification for Section 401 of the Clean Water Act, further testing of sediment behind the dams would occur prior to placement in the project area or at the designated disposal site. If new information indicates that contaminants of concern are present, such lands would be avoided or the sponsor would be responsible for providing clean sites.

6.2.8 Air Quality

Impacts of the No Action Alternative

The No Action Alternative would have no effect on air quality within the Kinnickinnic Project Area as no associated construction would be completed.

Impacts of the Tentatively Selected Plan

Construction equipment emissions and fugitive dust from construction activities will be managed and minimized per Corps regulations. Minor, temporary increases in airborne particulates are anticipated because of mobilization and use of construction equipment. Construction equipment would likely include bulldozers, excavators, cranes, and dump trucks. Increased airborne particulates would be highest during the active construction season (i.e., April – November) each year. Frequent inspections of equipment would be done during construction to ensure equipment is properly functioning and not releasing unnecessary amounts of emissions. This minor, temporary impact to air quality is anticipated to last during the construction of the TSP. The air quality within the Kinnickinnic Project Area is relatively clean as it is considered an attainment area for the six contaminates evaluated by the USEPA. Construction activities are not drastic nor large-scale enough to impair these attainment determinations.

6.2.9 Fisheries

Impacts of the No Action Alternative

Water temperature and dissolved oxygen is a key component to trout reproduction and vitality. Impoundment results in higher water temperatures and decreased dissolved oxygen because of stagnation, especially in shallow reservoirs. With Junction Falls Dam remaining under the No Action Alternative, thermal pollution and low dissolved oxygen associated with impoundment would continue to negatively impact the trout population downstream of Lake George. Projected increases in air temperature into the future could increase an already concerning problem for the trout fishery within the project area. For this reason, the No Action Alternative would have a minor adverse effect to fisheries and biological productivity within the Kinnickinnic Project Area compared to the existing condition.

Impacts of the Tentatively Selected Plan

The TSP would involve the removal of Junction Falls Dam, which would remove the impoundment of Lake George, and the concerns associated with high water temperatures and decreased dissolved oxygen throughout the Kinnickinnic Project Area. During the dewatering of Lake George, it is assumed that most fish within the reservoir would move with the flow of water and vacate the draining basin. There is a chance that some fish would become stranded and perish as part of the dewatering process. On top of the restoration of the natural hydrothermal and hydrogeomorphic dynamics to the system, the TSP would incorporate increased riffle and pool geomorphic sequences, or habitat that benefits trout species. The measures within the TSP that would directly benefit brown trout and native trout species through stream restoration including riffles, rock arch rapids, cross vanes, and Lunker structures. These features were

modelled to promote trout spawning within the main channel and Spring Ponds and are designed to benefit all life stages of trout. The TSP would align with other restoration project on the Kinnickinnic River, such as the Moody Project, which provides a cumulative benefit to trout by increasing species density and spawning habitat. To avoid potential impacts to brook and brown trout spawning, stream restoration construction would not take place during the designated spawning window of October through December. Finally, the restoration of the riparian corridor surrounding the restored stream would provide cover for trout species, reduce thermal heating of water and provide stability to the stream bank. Overall, the restoration features under the TSP would provide a substantial benefit towards biological productivity of the fishery within the Kinnickinnic Project Area compared to the existing condition and No Action Alternative.

6.2.10 Aquatic Invertebrates

Impacts of the No Action Alternative

Aquatic invertebrates are not anticipated to be impacted under the No Action Alternative compared to the existing condition.

Impacts of the Tentatively Selected Plan

Dam removal, in general, results in acute increased turbidity downstream of the removal due to the movement of sediment behind dams into the water column. This action can negatively impact aquatic invertebrates by causing stress through reduced light penetration, food availability and potential loss of habitat. Aquatic invertebrates that could be impacted from the TSP include aquatic larval insects and mussel species. The direct Kinnickinnic Project Area contains minimal mussel species, and does not contain any mussel beds, but there are known mussels in the St. Croix River by the confluence of Kinnickinnic River that could be impacted by potential turbidity of the TSP. To minimize turbidity concerns, Powell Falls dam would be closed and Lake Louise would be filled during the draining of Lake George to act as a catch basin for any sediment that becomes mobile. Once Lake Louise is no longer needed as a catch basin, Powell Falls Dam would be re-opened, resulting in some sediment being mobilized downstream. This movement of sediment could cause minor stress to aquatic invertebrates in the St. Croix, resulting in a minor impact to aquatic invertebrates under the TSP.

6.2.11 Wildlife

Impacts of the No Action Alternative

General wildlife including mammals, birds, and herptiles are not anticipated to be impacted under the No Action Alternative compared to the existing condition.

Impacts of the Tentatively Selected Plan

The TSP would involve restoring nearly 30 acres forest habitat along the riparian corridor of Kinnickinnic River. This action would increase habitat diversity throughout the project and provide riparian habitat suitable for a wide range of mammals, birds and herptiles. The TSP would create nearly 3 acres of marsh habitat (Type 3 wetland) that would provide unique habitat for waterfowl, herptiles, and small mammals. These actions would help generate a substantial benefit to biological productivity under the TSP compared to the existing condition and No Action Alternative.

6.2.12 Federally-Listed Threatened and Endangered Species

Impacts of the No Action Alternative

The No Action Alternative would have no effect on federally-listed species within the Kinnickinnic Project Area as no direct construction or action would be completed.

Impacts of the Tentatively Selected Plan

Tricolored Bat
The TSP would involve very minimal tree cutting, as the main restoration areas are either impoundment or grassland/shrub habitat. The sections of the project area that are currently classified as forest would not be disturbed. The TSP could result in the removal of potential roost trees for construction access and general implementation of the project. To avoid direct effects to potential roost trees, trees would be removed outside of the bat nesting window (April – October). With these actions in place, construction of the TSP may affect, by is not likely to adversely affect tricolored bats. In the long-term, restoration of forest habitat would likely have a beneficial effect on bats in the project area.

Whooping Crane
Whooping cranes are designated as a non-essential experimental population in Wisconsin and are treated as a proposed species for activities outside a National Wildlife Refuge or National Park. By definition, a "nonessential experimental population" is not essential to the continued existence of the species; therefore, no proposed action impacting a population could lead to a jeopardy determination for the entire species. TSP effects to individual whooping cranes are highly unlikely because cranes would only be present during migration and would likely avoid the area during construction due to disturbance.

Higgins Eye and Salamander Mussel
As described in section 2.1.9.2 Aquatic Invertebrates, The Kinnickinnic River is a coldwater trout stream that has a low likelihood of containing mussels or mussel beds because these streams are low in nutrients and lack the food sources necessary to sustain mussels. This was confirmed during a 2020 USACE timed mussel survey in the Lower Kinnickinnic that yielded zero mussels after a 120-minute survey. There are areas within the St Croix River, near the confluence of the Kinnickinnic River that could contain endangered mussel species that could be impacted by secondary effects of the TSP (i.e., dam removal, sediment transport, increased turbidity). Prior to draining Lake George, Powell Falls Dam would be closed, and Lake Louise would be raised to act as catch basin for sediment and turbidity. This would allow much of the sediment released from the draining of Lake George to be retained within the Lake Louise sub-area and not flushed into the Lower Kinnickinnic River. With this action, secondary impacts to St. Croix mussels would be negligible. Since there are no known mussel species within the project footprint and secondary effects to mussels in the St. Croix would be minimized, construction of the TSP may affect, but is not likely to adversely affect Higgins eye and salamander mussels. In the long-term, the TSP is not expected to affect mussel species.

Monarch Butterfly
The TSP is not anticipated to negatively impact local milkweed or other diverse flowering plants that monarchs rely on, as much of the grassland areas in the Kinnickinnic Project Area are dominated by reed canary grass and other invasive species. Being that the project area has minimal suitable habitat, and the species is mobile and can avoid any construction activities, construction of the TSP would not affect monarch butterfly. In the long-term, the TSP could have a minor beneficial effect to the butterfly with increases in more diverse vegetation.

Rusty Patched Bumble Bee
The Kinnickinnic Project Area resides within an area of proposed critical habitat for the species. This area is also considered a high potential zone. However, much of this area does not contain pollinator plants and is dominated by reed canary grass and other invasive species. With few

pollinator plants being present, this area is not likely to constitute foraging habitat and the chance of nesting taking place is low. The existing project area would not constitute rusty patched overwintering habitat as it is not forested upland. But, there are several actions as part of the TSP that could impact individuals of this species if present. Stream and riparian zone restoration work would involve land disturbance through re-shaping of the stream, installation of stream restoration features, floodplain bench creation and earthwork to create topographic diversity (Figure 5-1). Other actions under the TSP that could impact rusty patched is the use of herbicide treatment for forestry work. To reduce potential negative effects, broadcast herbicide would not be used. Instead, unwanted plants would be eradicated through spot treatment herbicide. Implementing proper avoidance techniques (spot herbicide treatment) and based on the low likelihood of foraging and nesting habitat and absence of overwinter habitat within the Kinnickinnic Project area, the TSP may affect, but is not likely to adversely affect rusty patched bumble bee. While the project area is proposed as critical habitat, its current habitat value is low, and the TSP would improve the area as bumble bee habitat in the long term by providing native pollinator plants.

Prairie Bush Clover

This species requires a unique tallgrass prairie habitat type that does exist within the Kinnickinnic Project area. Much of the grassland areas within the project that have the potential to have the species are dominated by reed canary grass and other invasive species, which are not conducive for this species. For this reason, the TSP would not affect prairie bush clover.

6.2.13 State-Listed Threatened and Endangered Species

Impacts of the No Action Alternative

The No Action Alternative would have no effect on state-listed species within the Kinnickinnic Project Area as no associated construction would be completed.

Impacts of the Tentatively Selected Plan

Much of the state-listed species that were generated within the Kinnickinnic Project Area are plant species that typically require pristine prairie or grasslands to thrive (Table 4). Though the existing land use has a large percentage of grasslands, much of those areas are covered by invasive species and unwanted monoculture plants, which is not conducive for rare plant species. Once the TSP is implemented, the bottomland and mesic forested areas would be seeded with native plants and treated for invasive species. These conditions would be more favorable for state-listed plant species compared to the existing condition. For this reason, the TSP would have a minor benefit to state-listed species compared to the existing condition.

6.2.14 Bald Eagles

There are no known or active bold eagle nests within the Kinnickinnic Project Area. The project area would be evaluated on a yearly basis for the presence of bald eagle nests. If nests were to appear prior to or during the implementation of the TSP, impacts to this species would be addressed through minimization and avoidance in coordination with the USFWS. Potential work restrictions would be maintaining a 660-foot buffer from any occupied nests until eagle chicks have fledged (likely by July).

6.2.15 Invasive Species

Impacts of the No Action Alternative

Much of the invasive species within the Lake Louise sub-area are expected to remain under the FWOP. For this reason, the No Action Alternative is not anticipated to change the makeup of invasive species within the Kinnickinnic Project Area compared to the existing condition.

Impacts of the Tentatively Selected Plan

The primary invasive species concerns reside within the Lake Louise sub-area, as much of the drained basin has been covered by monoculture species (i.e., reed canary grass) and other invasive plant species (i.e., stinging nettle). To implement the TSP, Powell Falls Dam would be closed, and Lake Louise area raised to catch sediment following the draining of Lake George. This action would nourish the floodplain below Junction Falls and destroy the invasive species currently within the Lake Louise sub-area. Once Lake Louise is drained again following the removal of Junction Falls Dam, the riparian corridors for both areas would be seeded with native plants, trees and treated for invasive species. Forestry restoration throughout the Kinnickinnic Project Area under the TSP is designed to promote habitat diversity and resilience, both of which are important in preventing future invasive species. For these reasons, the TSP is anticipated to have a minor benefit towards invasive species within the Kinnickinnic Project Area compared to the existing condition.

6.3 Socio-Economic Resources

6.3.1 Recreation

Impacts of the No Action Alternative

Many of the recreation opportunities are expected to remain under the No Action Alternative. There is concern that increased water temperatures associated with the Lake George impoundment could negatively impact downstream trout populations under the No Action Alternative. As sedimentation continues and the lake becomes shallower, higher temperatures could negatively impact the fishery, thus negatively impact fishing opportunities (recreation) below Junction Falls Dam. For this reason, the No Action Alternative would result in a minor adverse effect to recreation compared to the existing condition.

Impacts of the Tentatively Selected Plan

River Falls and the Kinnickinnic Project Area is currently a well-known recreation destination within the local area. The area has ample opportunities for hiking, biking, kayaking and fishing geared for outdoor enthusiasts. Under the TSP, ecosystem restoration of the stream and riparian forest would benefit from these recreational opportunities by providing better water recreation, fishing opportunities, and terrestrial habitat to interact with. Ancillary recreational benefits would occur as a result from construction and O&M access around the existing impoundments. This additional OSE benefit would allow for continued noninvasive land access to the area for traditional or educational purposes. As access to the site can be difficult, easy access to the site for maintenance purposes would ensure fulfillment of Sponsor's O&M responsibilities. Any incidental recreation benefits gained do not detract from the restoration actions occurring. Additional recreational features could be added outside the project footprint by the Sponsor to complement the Kinnickinnic project. During the construction process of the TSP, recreation activities would be negatively impacted temporarily due to construction equipment. Once completed, the TSP would provide a substantial benefit to recreational opportunities within the Kinnickinnic Project Area Compared to the existing condition and No Action Alternative.

6.3.2 Noise

Impacts of the No Action Alternative

There is no anticipated change to noise levels in the Kinnickinnic Project area under the No Action Alternative.

Impacts of the Tentatively Selected Plan
Implementation of the TSP is anticipated to result in a minor temporary increase in noise levels where heavy equipment and construction activities are scheduled to take place. Construction equipment would likely include bulldozers, excavators, cranes, and dump trucks along with other equipment described under dam removal methods above. Of these, bulldozers are typically the loudest, ranging from 100 – 120 decibels. The closest human use areas would be those surrounding Junction Falls Dam and the Lake George sub-area. Construction activities would be limited to daytime hours and construction would not happen during typical municipal quiet hours. Trucking to the adjacent disposal site and to commercial facilities for debris disposal would also contribute to traffic noise. Increased sound levels associated with construction of the TSP could temporarily displace some wildlife and decrease recreational use. Noise levels throughout the Kinnickinnic Project Area would return to the normal condition once construction activities cease.

6.3.3 Aesthetic Values

Impacts of the No Action Alternative
The No Action Alternative would not impact the overall Kinnickinnic Project Area's aesthetic value compared to the existing condition.

Impacts of the Tentatively Selected Plan
Aesthetic value is subjective and based on individual interpretation; however, general aesthetic value can be assessed for an area. The TSP would result in short-term impacts to aesthetic value within the Kinnickinnic Project Area due to construction activity, the presence of construction equipment, and setting of an incomplete project. Following the completion of the TSP, the project area would restore the Kinnickinnic River through Lake George and Lake Louise, including the original falls behind Junction Falls Dam. Restoration features within the stream would include riffles, pools, rock arch rapids and lunker structures. These features are designed to mimic more natural sections of the Kinnickinnic River, which has a high aesthetic value. Restoration of the riparian corridor and emergent wetlands would provide increases in the aesthetic value of the Kinnickinnic Project Area. Overall, the TSP would provide benefits to the aesthetic value compared to the existing condition.

6.3.4 Hydroelectric Power

Impacts of the No Action Alternative
The No Action Alternative would not impact hydroelectric power, as the Junction Falls Hydro facility would continue to operate through 2040 under their current FERC license.

Impacts of the Tentatively Selected Plan
The TSP would be to remove both Junction Falls and Powell Falls Dams. As the FERC license associated with Powell Falls ended in 2022, there would not be an impact on hydroelectric power associated with the removal of it. Junction Falls Dam has a FERC agreement that covers the use and regulation of the dam until 2040. Junction Falls Dam generates enough supplemental energy annually to provide a gross cost savings ranging from $29,530 - $63,306. With the maintenance cost of the site averaging $60,600, the City of River Falls can lose up to $31,064 or gain $2,706 annually depending on the wholesale rate of power (2021 energy rate). Though Junction Falls Dam does not typically generate a net cost benefit from an energy perspective, removing the dam would still result in the loss of a renewable energy source for the City of River Falls. For this reason, the TSP would result in a minor adverse impact to hydroelectric power compared to the existing and FWOP condition.

6.4 Cultural Resources

Impacts of the No Action Alternative

The No Action Alternative will have no effect on historic properties.

Impacts of the Tentatively Selected Plan

No historic properties eligible for listing would be affected by the TSP. No historic properties are within the area of potential effects for the TSP. In the event of inadvertent discovery during construction, the Corps would follow all applicable laws.

Table 18. Environmental Assessment Matrix for the TSP

	No Action Alternative							Tentatively Selected Plan						
	BENEFICIAL				ADVERSE			BENEFICIAL				ADVERSE		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	NO EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT	SIGNIFICANT	SUBSTANTIAL	MINOR	NO EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
A. Social Effects														
1. Noise Levels				X								T		
2. Aesthetic Values				X						X		T		
3. Recreational Opportunities					X				X			T		
4. Transportation				X							X			
5. Public Health and Safety				X							X			
6. Community Cohesion (Sense of Unity)				X							X			
7. Community Growth and Development				X							X			
8. Business and Home Relocations				X							X			
9. Existing/Potential Land Use				X						X				
10. Controversy				X							X			
B. Economic Effects														
1. Property Values				X							X			
2. Tax Revenue				X							X			
3. Public Facilities and Services				X							X			
4. Regional Growth				X							X			
5. Employment				X							X			
6. Business Activity				X							X			
7. Farmland/Food Supply				X							X			
8. Commercial Navigation				X							X			
9. Flooding Effects				X							X			
10. Energy Needs and Resources				X								X		
C. Natural Resource Effects														
1. Air Quality				X								T		
2. Terrestrial Habitat				X						X				
3. Wetlands				X						X				
4. Aquatic Habitat				X					X					
	No Action Alternative							Tentatively Selected Plan						

	BENEFICIAL				ADVERSE			BENEFICIAL				ADVERSE		
PARAMETER	SIGNIFICANT	SUBSTANTIAL	MINOR	NO EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT	SIGNIFICANT	SUBSTANTIAL	MINOR	NO EFFECT	MINOR	SUBSTANTIAL	SIGNIFICANT
C. Natural Resource Effects Cont.														
7. Surface Water Quality					X					X		T		
8. Water Supply				X							X			
9. Groundwater				X							X			
10. Soils				X							X			
11. Threatened or Endangered Species				X						X				
D. Cultural Resource Effects				X							X			
1. Historic Architectural Values				X							X			
2. Prehistoric & Historic Archeological Values				X							X			

7 Environmental Compliance

7.1 National Environmental Policy Act

The National Environmental Policy Act (NEPA; 42 USC § 4321 et seq.) establishes the broad national framework for protecting our environment. NEPA's basic policy is to assure proper consideration of the environment prior to undertaking any major federal action. The document will be distributed to agencies, the public, and other interested parties to gather any comments or concerns. If no significant impacts to the environment are found, a Finding of No Significant Impact (FONSI) will be signed by the St. Paul District Commander (Table 19).

7.2 Endangered Species Act of 1973

The Endangered Species Act (16 USC § 1531 et seq.) provides for the conservation of threatened and endangered plants and animals and the habitats in which they are found. There are seven Federally-listed or proposed for listing species that have the potential to be within the Kinnickinnic Project Area. The Corps made no effect determinations for monarch butterfly and prairie bush clover. No effect is anticipated on the whooping crane non-essential population. A may affect, but not likely to adversely affect, determination was made for the tricolored bat, Higgins eye, salamander mussel, and rusty patched bumble bee. Through informal consultation, the USFWS concurred with the Corps' may affect, not likely to adversely affect determinations and no jeopardy determinations on 15 April 2025. ESA consultation documentation can be found in Appendix C, Environmental Coordination.

7.3 Clean Water Act of 1972

The Clean Water Act (CWA; 33 USC §1251 *et seq.*) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Section 404 of the CWA regulates the discharge of dredged or fill material into waters of the United States and is administered by the USACE. To comply with Section 404 of the CWA for this Project, the USACE completed an individual Clean Water Act

404(b)(1) evaluation for this project (Appendix B). A CWA Section 401 water quality certification is required for actions that may result in a discharge of a pollutant into waters of the United States to ensure that the discharge complies with applicable water quality standards. The WI DNR is the administering agency for water quality certification for the Project. USACE will seek a 401 certification during design.

7.4 National Historic Preservation Act of 1966

The TSP is in compliance with the NHPA. The Wisconsin SHPO concurred with the Corps' determination of no effect to historic properties on January 10, 2024, and no consulting tribes objected. The St. Croix Band of Chippewa Indians concurred with the No Effect to Historic Properties determination on 18 December 2023. Specifics on consultation under the National Historic Preservation Act can be found in Appendix C.

7.5 Fish and Wildlife Coordination Act of 1934

The Fish and Wildlife Coordination Act (FWCA; 16 USC 661–667e) requires federal agencies to coordinate with the U.S. Fish and Wildlife Service and applicable state agencies when a stream or body of water is proposed to be modified. The proposed project is being coordinated with the U.S. Fish and Wildlife Service Region 3, and Wisconsin Department of Natural Resources through the public review process of the feasibility report and integrated Environmental Assessment. Any recommendations or comments received will be addressed in the final report.

Table 19. Coverage of environmental protection statutes and other environmental requirements.

Federal Environmental Protection Statutes and Requirements	Applicability/ Compliance[1/2/3]
Clean Air Act, as amended, 42 U.S.C. 1857h-7, et seq.	Full Compliance
Clean Water Act, Sections 404 and 401	Partial Compliance
Policy for Conducting Civil Works Planning Studies (ER 1105-2-103)	Full Compliance
Endangered Species Act of 1973, as amended, 16 S.C. 1531, et seq.	Full Compliance
Executive Order 11988 – Floodplain Management	Full Compliance
Executive Order 11990 - Protection of Wetlands	Full Compliance
Executive Order 13112 - Invasive Species	Full Compliance
Farmland Protection Policy Act. 7 U.S.C. 4201, et seq.	Not Applicable
Federal Water Protection Recreation Act, 16 U.S.C. 460-(12), et seq.	Full Compliance
Fish and Wildlife Coordination Act, 16 U.S.C. 601, et seq.	Partial Compliance
National Environmental Policy Act, 42 U.S.C. 4321, et seq.	Partial Compliance
National Historic Preservation Act, 16 U.S.C. 470a, et seq.	Full Compliance
Rivers and Harbors Act, 33 U.S.C. 403, et seq.	Not Applicable
Wild and Scenic Rivers Act, 16 U.S.C. 1271, et seq.	Not Applicable

[1] Full Compliance = having met all requirements of the statute for the current stage of planning

[2] Partial Compliance = having met some requirements of the statute for the current stage of planning or anticipate full compliance at completion of planning

[3]Not Applicable = no requirements for the statute or Project does not contain resources applicable to the law

8 Public Involvement, Coordination, and Consultation

The planning for the Kinnickinnic River Restoration CAP 206 project has involved both USACE and the City of River Falls. Coordination meetings were held periodically throughout the study. Site visits to the Kinnickinnic study area near River Falls, WI were held on 19 May 2023 and 9

June 2023. Additional details on coordination are included in Appendix A, Public Involvement and Coordination.

8.1 Coordination by Correspondence

USACE initiated consultation under Section 106 of NHPA to Tribal Historic Preservation Officers on 24 Aug 2023 with the Bad River Band of Lake Superior Chippewa, Flandreau-Santee Sioux Tribe, Fond du Lac Band of Lake Superior Chippewa, Fort Belknap Indian Community, Grand Portage Band of Lake Superior Chippewa, Keweenaw Bay Indian Community, Lac Courte Oreilles Band of Lake Superior Chippewa, Lac du Flambeau Band of Lake Superior Chippewa, Leech Lake Band of Ojibwe, Lower Sioux Indian Community, Menominee Indian Tribe of Wisconsin, Miami Tribe of Oklahoma, Mille Lacs Band of Ojibwe, Prairie Island Indian Community, Red Cliff Band of Lake Superior Chippewa, Santee Sioux Nation / Santee Sioux Tribe of Nebraska, Sokaogon Chippewa Community of Wisconsin, St. Croix Band of Chippewa Indians, Upper Sioux Community, and White Earth Band of Ojibwe.

The Corps consulted on the TSP APE and its No Effect to Historic Properties determination with the Wisconsin SHPO and the above-mentioned tribes on 15 December 2023. The Wisconsin SHPO concurred on 10 January 2024. The St. Croix Band of Chippewa Indians concurred with the No Effect to Historic Properties determination on 18 December 2023. No other responses were received. Consultation is complete. Copies of these letters can be found in Appendix C – Environmental Coordination.

Consultation pursuant to the ESA and FWCA is addressed in Section 7 above.

Correspondence from elected leaders is included in Appendix A.

8.2 Public Views and Comments

A public scoping meeting was held on 15 August 2023 in River Falls, WI. Approximately 150 individuals attended the meeting. USACE staff presented a series of poster boards and a presentation ran on repeat overhead. USACE also provided handouts and received input from the public.

In general, the public is very interested in the potential work in the study area, as witnessed by the turnout at the public meeting. The public is mainly interested in the removal of both impoundments, with some of the public in favor of keeping both in place for the purpose of hydropower. Comments received during the public scoping meeting in 2023 can be seen in Appendix A – Public Involvement and Coordination.

The draft Feasibility Report and integrated Environmental Assessment will be released for a 30-day public review period and comment period on 21 May 2025. A public meeting will be held in River Falls, WI. USACE will present slides on the overall feasibility study, provide handouts, and receive input from the public. Any public comments received on the draft report will be addressed in the final report.

8.3 Views of the Sponsor

The City of River Falls is the Non-Federal Sponsor. The City of River Falls supports the Tentatively Selected Plan, and a letter of support with comments can be found in Appendix A – Correspondence and Coordination.

9 Recommendation

The Tentatively Selected Plan is Alternative 7, consisting of removal of both Junction Falls Dam and Powell Falls Dam, 89 acres of stream restoration, 29.6 acres of forest restoration, and 2.7 acres of marsh restoration throughout the study area. The measures in the plan include the removal of both the Junction Falls dam and Powell Falls dam, restoration actions in Lake Louise, Lake George areas, and Spring Ponds. Actions include the creation of two riffles, two sections of rock arch rapids, two cross vanes, four bank protection sections, and four lunker structures.

The estimated project first cost of the TSP based on October 2024 price levels is $21,916,007. The TSP would contribute 34.7 AAHU for 4 habitat types over the 50-year period of analysis, at an annual cost of $25,290 per AAHU. The estimated total project cost inflated through midpoint of construction is $24,138,857. The federal per-project cost is limited to $15,000,000. Accounting for the sunk planning costs, the remaining federal share for design and implementation would be $14,575,000 and the non-federal share is estimated to be $9,563,857. The annual operation, maintenance, repair, replacement and rehabilitation costs are estimated to be $6,880.

Federal implementation of the Tentatively Selected Plan would be subject to the non-Federal sponsor entering into a Project Partnership Agreement under which it would agree to share the costs of design and implementation, provide all real property and perform all relocations required for the project, conduct OMRR&R, and comply with other applicable federal laws and policies.

I have weighed the outputs to be obtained from the full implementation of the Kinnickinnic River Restoration CAP 206 against its estimated cost and have considered the various alternatives proposed, impacts identified, and overall scope. The St. Paul District recommends that the Kinnickinnic River Restoration CAP 206 be implemented as generally described in this report.

The recommendations herein reflect the information available at the time and current Department of the Army policies governing the formulation of individual projects. They do not reflect programming and budgeting priorities inherent in the formulation of national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are approved for implementing funding. However, prior to approval, the state, Federal agencies and other parties will be advised of any modifications and afforded the opportunity to comment.

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(District Signature Block Here)

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