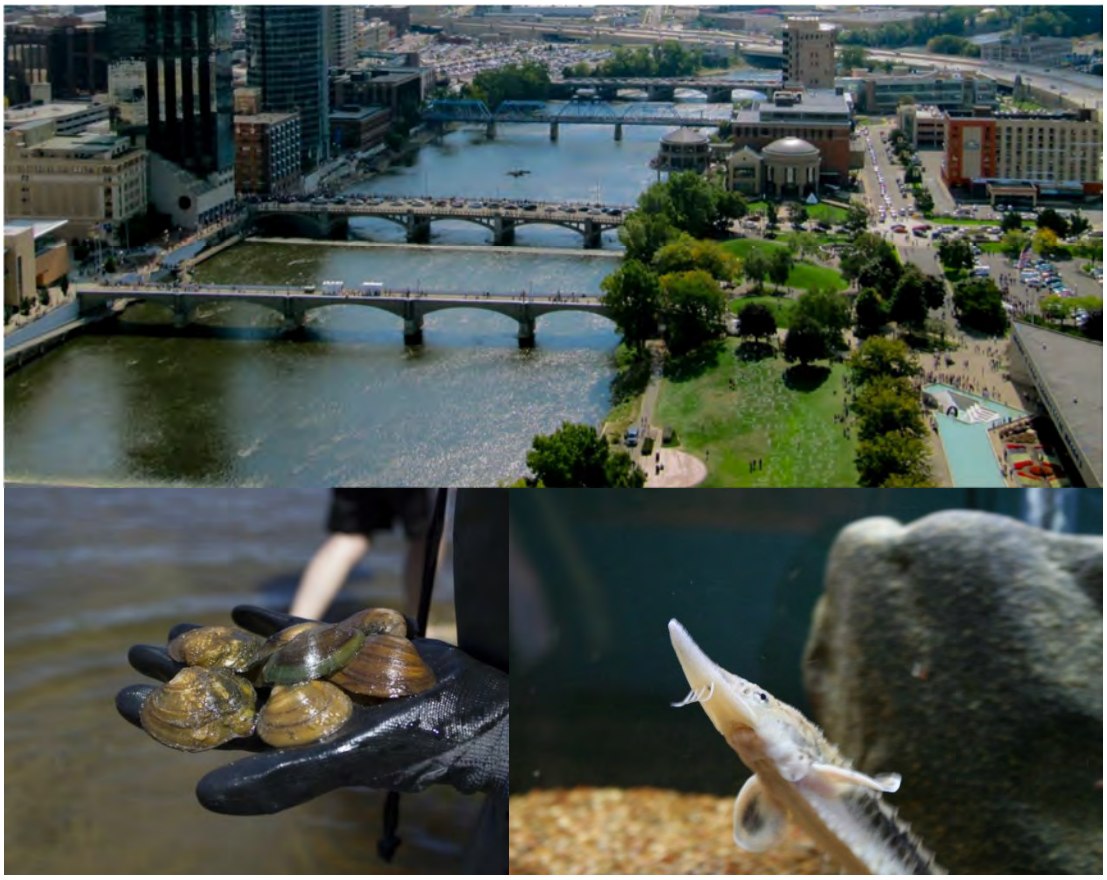
March 2025

Draft

Watershed Project Plan – Environmental Assessment for the Lower Grand River Habitat Restoration Project
Lower Grand River Watershed (HUC 04050006) in Kent County, Michigan

USDA Watershed Protection and Flood Prevention Act of 1954,
Public Law 83-566, as amended (16-USC-1001-1008)



Prepared by:

Natural Resources Conservation Service

In Cooperation with City of Grand Rapids

Abstract (Fly Sheet)

Draft
Watershed Project Plan - Environmental Assessment for the
Lower Grand River Habitat Restoration Project in the
Lower Grand River Watershed (HUC 04050006)
Kent County
City of Grand Rapids, Michigan

Lead Federal Agency:
U.S. Department of Agriculture (USDA),
Natural Resources Conservation Service (NRCS)

Sponsoring Local Organization (SLO):
City of Grand Rapids

AUTHORITY

This Watershed Project Plan – Environmental Assessment (Plan-EA) has been prepared in accordance with the Watershed Protection and Flood Prevention Act of 1954, Public Law 83-566, as amended (16-USC-1001-1008) and the U.S. Department of Agriculture National Watershed Program Manual and Handbook) and the U.S. Department of Agriculture National Watershed Program Manual and Handbook. Among other project purposes, the Natural Resources Conservation Service (NRCS) provides financial and technical assistance to states, local governments, and Tribal organizations for the implementation of watershed projects that benefit "Public Fish and Wildlife".". The Plan-EA has also been prepared in accordance with Section 102-(2)(c) of the National Environmental Policy Act of 1969 (NEPA), Public Law 91-190, as amended (42-USC-4321 et seq.).

ABSTRACT

Only 1% of the river habitat in the lower peninsula of Michigan comprises rapid-type habitat, which is important to the life cycle of many aquatic species (Daugherty et al., 2009). Rapid-type habitat is defined as a river area with a relatively steep energy gradient (6%), coarse bed substrates, and non-uniform distribution of flow velocities. The ecosystem processes of the rapids-type habitat present within the project reach have been degraded by dams, channelization, dredging, and urban development for over 150 years. High gradient areas have been eliminated and fragmented in many Michigan watersheds and their rehabilitation is highly desirable (Dodge, 1998; Wesley, 2005).

The purpose of the project is to restore the rapids, improve public safety, restore aquatic habitat diversity and suitability for native Great Lakes fish and mussel species, and enhance river access and use. Restoration of the site would require the demolition of four low-head dams located between I-196 and Fulton Street, grading of the riverbed, and installation of boulder arch structures, constructed riffles, emergent habitat boulders, and bank vanes within an area approximately 47,415 m^2 (11.7 acres) in size. Total USDA NRCS Watershed Protection and Flood Prevention Act, PL 83-566 program contribution to the project cost is $11,026,695; with the Sponsor providing $11,026,696 from public and private funding sources.

Comments:
Comments and inquiries must be received within 30 days of the date of publication of the Notice of Availability. Comments and inquiries should be submitted to the City of Grand Rapids Engineering Department at 300 Monroe Ave NW Grand Rapids, MI 49503 (616-456-4182).

Non-Discrimination Statement
In accordance with Federal civil rights law and USDA civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at How to File a Program Discrimination Complaint How to File a Program Discrimination Complaint and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer, and lender.

Table of Contents

1. INTRODUCTION AND BACKGROUND 9
1.1 Project Background 9
1.2 Project Location and Description 10
2. Purpose and Need for Action 11
3. Scope of the Plan-EA 12
3.1 Section 7 of the Endangered Species Act (ESA) 12
3.2 Section 106 National Historic Preservation Act (NHPA) 13
3.2.1 Consultation with MI SHPO 13
3.2.2 Local Organizations 14
3.3 Native American Tribal Organizations 14
3.4 EA Focus Area 15
4. AFFECTED ENVIRONMENT 15
4.1 Air Quality and Noise 15
4.1.1 Air Quality 15
4.1.2 Noise 16
4.2 Climate and Climate Change 16
4.2.1 Climate 16
4.2.2 Climate Change 16
4.3 Soils and Geology 16
4.3.1 Soils 16
4.3.2 Geology 17
4.4 Water and Riverine Resources 17
4.4.1 Existing In-stream Structures 17
4.4.2 Flow Regime 18
4.4.3 Water Quality 18
4.4.4 Groundwater 19
4.4.5 Channel Geometry 19
4.4.6 Channel Substrate 19
4.5 Wetlands 19
4.6 Terrestrial Vegetation and Wildlife 19
4.7 Aquatic Species and Habitat 20
4.7.1 Unionid Mussels 21
4.7.2 Fish 22
4.8 Floodplain Management 24
4.8.1 Existing Flood Protection System 24
4.9 Land Use, Recreation, and Visual Resources 25
4.9.1 Land Use 25
4.9.2 Recreation 26
4.9.3 Visual Resources 28
4.10 Socioeconomics 28
4.10.1 Population and Housing 28
4.10.2 Public Services 29
4.11 Cultural Resources and Historic Properties 29
4.11.1 Archaeology—Previous Surveys and Known Resources 29
4.11.2 Architecture—Previous Surveys and Known Resources 30
4.11.3 Field Reconnaissance 30
4.12 Public Health and Safety 31
4.12.1 Existing Dam Safety Concerns 31
4.13 Urban Dynamics 31
5. Alternatives 32
5.1 Alternative Formulation Process 33

5.2 Alternatives Eliminated from Detailed Study 33
5.2.1 Removal of the Low-Head Dams Only 33
5.2.2 Substrate Enhancement with No Dam Removal 33
5.2.3 Restoration of Original Rapids to Former Natural Conditions 33
5.2.4 Dam Removal with Substrate Enhancement and Whitewater Recreation 33
5.3 Proposed Action 34
5.4 No Action Alternative 35
5.5 Preferred Alternative Estimated Construction Costs 35
5.5.1 Cost Sharing 35
5.5.2 NED Account Information 35
6. Environmental consequences 35
6.1 Air Quality and Noise 36
6.1.1 Project Activities Generating Effects 36
6.1.2 Description of Effects 36
6.1.3 Mitigation Measures 37
6.1.4 Cumulative Effects 37
6.2 Climate Change 37
6.2.1 Project Activities Generating Effects 37
6.2.2 Description of Effects 37
6.2.3 Mitigation Measures 38
6.2.4 Cumulative Effects 38
6.3 Soils and Geology 38
6.3.1 Project Activities Generating Effects 38
6.3.2 Description of Effects 38
6.3.3 Mitigation Measures 39
6.3.4 Cumulative Effects 39
6.4 Water and Riverine Resources 39
6.4.1 Project Activities Generating Effects 39
6.4.2 Description of Effects 40
6.4.3 Mitigation Measures 42
6.4.4 Cumulative Effects 42
6.4.5 Regulations and Permitting 42
6.5 Wetlands 43
6.5.1 Project Activities Generating Effects 43
6.5.2 Description of Effects 43
6.5.3 Applicable Laws, Regulations, and Management Plans 43
6.5.4 Mitigation Measures 43
6.5.5 Cumulative Effects 43
6.6 Terrestrial Vegetation & Wildlife 43
6.6.1 Project Activities Generating Effects 43
6.6.2 Description of Effects 43
6.6.3 Applicable Laws, Regulations, and Management Plans 44
6.6.4 Mitigation Measures 44
6.7 Aquatic Species and Habitat 45
6.7.1 Project Activities Generating Effects 45
6.7.2 Description of Effects 45
6.7.3 Conservation and Mitigation Measures 48
6.7.4 Cumulative Effects 48
6.8 Floodplain Management 48
6.8.1 Description of Effects 48
6.8.2 Mitigation Measures 49
6.8.3 Cumulative Effects 49
6.9 Land Use, Recreation, and Visual Resources 49
6.9.1 Project Activities Generating Effects 50

6.9.2 Description of Effects 50
6.9.3 Mitigation Measures 50
6.9.4 Cumulative Effects 50
6.10 Socioeconomics 51
6.10.1 Project Activities Generating Effects 51
6.10.2 Description of Effects 51
6.10.3 Mitigation Measures 52
6.10.4 Cumulative Effects 52
6.11 Cultural and Historic Resources 52
6.11.1 Project Activities Generating Effects 52
6.11.2 Description of Effects 52
6.11.3 Mitigation Measures 53
6.11.4 Cumulative Effects 53
6.12 Public Health and Safety 54
6.12.1 Description of Effects 54
6.12.2 No Action Alternative 54
6.12.3 Mitigation measures 54
6.12.4 Cumulative Effects 54
6.13 Urban Dynamics 55
6.13.1 Description of Effects 55
6.14 Relationship between Short-Term Use and Long-Term Productivity 55
6.14.1 Short-Term Reductions, Long-Term Gains 56
6.14.2 Resources Without Long-Term Effects 56
6.15 Unavoidable Adverse Effects of the Proposed Action 56
6.16 Irreversible and Irretrievable Commitments of Resources 56
6.17 Energy and Natural or Depletable Resource Requirements 57
7. CONSULTATION, COORDINATION, AND PUBLIC PARTICIPATION 57
7.1 Consultation, Coordination, and Public Participation 57
7.2 Public Scoping 57
7.3 List of Persons and Agencies Consulted 57
7.4 Public Outreach 58
8. PREFERRED ALTERNATIVE 58
8.1 Rationale for Preferred Alternative 58
8.2 Measures to be Installed 59
8.2.1 Existing River Conditions and Proposed Alterations 59
8.2.2 Land Acquisitions, Easements, and Public Access 59
8.2.3 Land Clearing 60
8.2.4 Problems Addressed 60
8.2.5 Risk of Failure, Public Safety, and Protections 60
8.2.6 Recreational Improvements 60
8.2.7 Actions to Minimize Soil Erosion and Water, Air, and Noise Pollution During Construction 60
8.2.8 Historic and Cultural Resource Considerations 61
8.2.9 Project Timeline and Schedule 61
8.2.10 Conservation and Mitigation Measures 62
8.3 Mitigation 62
8.4 Permits and Compliance 63
8.4.1 Federal 63
8.4.2 State 63
8.5 Costs and Cost Sharing 64
8.6 Installation and Financing 64
8.6.1 Planned Sequence of Installation 64
8.6.2 Contracting 64
8.6.3 Real Property and Relocations 64

8.6.4 Other Agencies 65
8.6.5 Cultural Resources 65
8.6.6 Financing 65
8.6.7 Conditions for Providing Assistance 65
8.7 Operation, Maintenance, and Replacement 65
8.8 Economic Tables 66
DISTRIBUTION LIST 67
REFERENCES 68
List of Preparers 72

Appendices

Appendix 1 **Summary (OMB Fact Sheet)**

Appendix A **Public Outreach Plan, Summary, Comments & Presentation Tracking**
- Public Outreach Plan, Summary and Comments
- Presentations and Tours Tracking Sheet
- Memorandum for Record, June 2024
- SHPO Letter to NRCS; 1/18/2024
- RRO Response Letter to SHPO; 12/14/2023
- SHPO Letter to NRCS; 11/20/2023
- SHPO Letter to NRCS; 12/17/2020
- Tribal Consultation Outreach and Tribal Consultation Responses, 7/3/2019
- Other potential updated Cultural/Tribal documents/letters/information

Appendix B **Project Maps**
- Figure 1A – Project Site Within the Grand River Watershed
- Figure 1B – Project Map
- Figure 2 – Project Watershed Boundary
- Figure 3 – Land Use in Project Watershed Boundary

Appendix C **Supporting Maps, Figures, Photos and Tables**
- Figure 4 – Project Area, Mussel Recipient Sites
- Figure 5 – Sediment Sampling Locations
- Figure 6 – City of Grand Rapids Water Quality Sampling Sites
- Figure 7 – Existing Wetlands in Project Area
- Figure 8 – Flood Protection System
- Figure 9 – Cultural Historic Resources
- Figure 10 – Cultural Historic District
- Construction Plans: Draft Permit Planset
- Construction Plan: Ah-Nab-Awen Park
- Construction Plans: Impact Sheets
- Visual Character Photos of Analysis Area
- Groups Contacted for Consultation
- Table 3-1: Summary of Informal Scoping Issues Identified
- Table 3-2: Past, Present, and Reasonably Foreseeable Future Activities
- Table 4-1: Background Air Quality Concentrations for the Grand Rapids-Monroe Street Monitoring Station (No. 260810020)
- Table 4-2: Typical Noise Levels and Possible Human Effects
- Table 4-3: Listed Unionid Mussels Species Potentially Occurring in the Analysis Area
- Table 4-4: Population Trends in Michigan, Kent County and Grand Rapids
- Table 4-5: Demographic Composition in Michigan, Kenty County and Grand Rapids
- Table 4-6: 2022 Economic Characteristics
- Table 4-7: 2022 Industry Employment Characteristics
- Table 4-8: Previously and Newly Recorded Historic Resources in the Indirect APE
- Table 5-1: Comparison of Alternatives
- Table 6-1: Impact Analysis
- Table 6-2: Construction Equipment Noise Emission Levels

- Table 6-3: Hydraulic Characteristics of the River between the 6th Street Dam and Fulton Street
- Table 6-4: Potential Impacts and Benefits to Aquatics Species and Habitat
- Table 6-5: EGLE Flood Flow Rates
- Table 6-6: Potential Unavoidable Adverse Impacts of the Proposed Action
- Table 6-7: Irreversible and Irretrievable Commitment of Resources by Resource Area
- Table 6-8: Cumulative Effects
- Table 8-1: Project Measures to be Implemented
- Table 8-2: Anticipated Permitting and Construction Schedule
- Table 8-3: Estimated Installation Cost, Lower Grand River Watershed, Michigan ($22M)
- Table 8-4: Financing of Installation Costs
- Table 8-5: OMRRR schedule for Elements of the Grand River Habitat Restoration Project
- Table 8-6: Estimated Average Annual NED Costs Lower Grand River Watershed, MI ($22M)

Appendix D **Preliminary Investigation Report | Investigation and Analyses Report**

- Preliminary Investigation Report, 12/18/2018
- Investigation and Analyses Report, July 2020
- Basis of Design Attachment 1 – Concept Design Drawings
- Basis of Design Attachment 2 – Cost Estimates

Appendix E **Other Supporting Information**

- Biological Opinion; USFWS, 8/14/2024
- Biological Assessment Revised; EcoAnalysts Inc., March 2024
- Amendment to Biological Assessment; EcoAnalysts Inc., June 2024
- Basis of Design Report, May 2024; RiverRestoration
- Hydraulics Report, May 2024; RiverRestoration
- Temporary Conditions Hydraulics Report, May 2024; RiverRestoration
- Hydraulic Influence at the 6th Street Dam, June 2024; RiverRestoration
- Sediment Transport Report, June 2024; RiverRestoration
- Bridge Scour Evaluation, June 2024; RiverRestoration
- OMRRR Report, May 2024; RiverRestoration
- Recommended Construction Sequencing and Methods, June 2024; RiverRestoration
- Grand River Revitalization 60% GMP Bid Item Summary Cost Estimate, 4/17/2024
- Impacts to Fish Passage in the Grand River Between Bridge Street and Fulton Street, February 2024; Holtgren, Encompass
- Grand River-Lower Reach Project Monitoring Plan 4-2024
- Cumulative Impacts Analysis; City of Grand Rapids to EGLE, June 2024
- Preliminary Geotechnical Engineering Study, July 2015; Materials Testing Consultants, Inc.
- 141579 Grand River Sediment Sampling Report, March 2017; Materials Testing Consultants, Inc.
- Wetland Delineation Report; Golder Associates, 10/14/2014
- Updated Wetland Delineation Report; Fishbeck, 2/2019
- Wetland Boundary Verification; Fishbeck, 10/18/2023
- Letter to Grand Rapids Fire Department, March 2021
- Ottawa County letter 5/7/2021
- Aquatic Benefits Memo; ERM, 4/16/2021
- Grand River Water Quality
- Water Rescue Activity 2019-2023
- Cultural Resources Memorandum of Agreement, 9/30/2022
- 2020 FEMA Documents
- EGLE Notice of Authorization, Permit #WRP043093 v.1, December 20, 2024

1. INTRODUCTION AND BACKGROUND

1.1 Project Background

The United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Watershed Protection and Flood Prevention Act, PL 83-566 program funds are being pursued by the City of Grand Rapids (Project Sponsor)to improve aquatic habitat in the Lower Grand River sub-watershed, 8-digit Hydrologic Unit Code 04050006 (**Figure 1A, Appendix B**)sub-watershed, 8-digit Hydrologic Unit Code 04050006 (**Figure 1A, Appendix B**), where it flows through downtown Grand Rapids, Kent County, Michigan (GVMC 2011). (**Figure 1B, Appendix B**) shows the location of the Proposed Action in the Plan-EA sub-watershed based on 12-digit Hydrological Unit Codes, the area draining directly to the Grand River and via three small tributaries. The City of Grand Rapids is requesting funding from NRCS under PL 83-566 Small Watershed Program and the Small Watershed Program and the Public Fish and Wildlife purpose. The City has requested $11,026,695 to support instream habitat restoration of the Grand River in Grand Rapids, Michigan (**Figure 1A, Appendix B**). Specifically, PL 83-566 funding (if awarded) would be used for revitalizing the rapids in Grand Rapids from 300 feet upstream of Bridge Street to Fulton Street (the proposed Project), including the following activities:

- Demolition and removal of four low-head dams;
- Grading of the riverbed;
- Installing boulder arch structures, constructed riffles, emergent habitat boulder fields, and bank vanes.

The PL 83-566-funded instream habitat restoration in the Grand River would revitalize an approximately 2,887-foot stretch of the river flowing through the City of Grand Rapids by restoring aquatic connectivity and improving habitat for fish and aquatic life, including Michigan threatened and endangered species and the federally listed endangered mussel *Epioblasma triquetra* (Snuffbox). Once completed, conservation benefits from the Proposed Action will benefit the entire river and drainage area downstream to Lake Michigan. This downstream area is comprised of over 60% agricultural land - ensuring 20% of the total Project benefit is accrued to agricultural lands in line with program requirements. The estimated cost of the proposed Project construction is approximately $22,053,391.

NRCS has prepared this Plan-EA pursuant to its policy contained within the National Watershed Program Manual and Handbook in consideration of funding the Proposed Action under PL 83-566 regulations. As such, this Plan-EA identifies and considers potential environmental effects resulting from the proposed Project. The National Environmental Policy Act (NEPA) of 1969 requires Federal agencies to consider the environmental consequences of their proposed actions before a decision is made. This Plan-EA has been prepared to comply with the requirements of NEPA and the National Watershed Program Manual. This Plan-EA presents the proposed Project and associated alternatives and discusses potential environmental effects that may result from the implementation of the proposed Project.

In 2020, under a previous design, USFWS issued a Biological Opinion (BO) (EcoAnalysts 2020; USFWS 2020) and a Section 404 permit application was submitted by the City of Grand Rapids to the Michigan Department of Environment, Great Lakes, Energy (EGLE). Building off these efforts, a Watershed Plan-Environmental Assessment was also submitted in 2023 for the prior design. Following objections from U.S. Environmental Protection Agency (USEPA), the City of Grand Rapids (City) withdrew the permit application in March of 2023. NRCS, Grand Rapids WhiteWater (GRWW) and the City worked with EGLE and Michigan Department of Natural Resources (MDNR) to modify the previous design to further avoid and minimize effects to freshwater mussel and fish species as requested by state and federal agencies. A revised design was coordinated with EGLE and MDNR with changes incorporated to reduce construction and permanent effects. Total estimated permanent direct impact area for the project was reduced from 7.6 acres to 6.1 acres (EcoAnalysts 2024).

Additionally, construction of the new design would be performed primarily in the wet, negating the need for most of the isolation areas previously proposed for construction and reducing temporary construction impacts by 50% (EcoAnalysts 2024). The preferred design meets the project purpose while avoiding and minimizing effects to the riverbed, mussels, and fish.

Informal consultation with U.S. Fish and Wildlife Service (USFWS) was initiated in October 2023 in Table 1-1 of the Biological Assessment (BA) in **Appendix E** (EcoAnalysts 2024). A series of meetings between NRCS, GRWW, City, USFWS, MDNR, and EGLE have been held to discuss the design and to further avoid, minimize, and mitigate effects to the river, fish, and unionid mussels. The Proposed Action encompasses 127,600 m^2 (31.5 acres) of the Grand River bottomlands, of which 47,415 m^2 (11.7 acres) would be directly affected during construction (direct impact area) during installation of access, operation of construction equipment, removal of the dams, in-situ substrate grading, and substrate installation.

1.2 Project Location and Description

While the proposed project falls within the greater Lower Grand River sub-the designated sub-, the designated Plan-EA sub-watershed is defined as the area draining directly to the Grand River and three small tributaries draining to the project area, which comprises 60,480 acres (**Figure 1B, Appendix B**)**.** This Plan-EA sub-watershed boundary was specifically identified considering contributing areas and effect of the Proposed Action. This Plan-EA uses the following locational terms to describe the location of the proposed Project and its potential effects:

- Area of Potential Effects – the area used for evaluation of potential impacts to historic properties pursuant to Section 106 of the National Historic Preservation Act (same area as the Project Area defined below).
- Project Reach - the area within the wetted channel of the Grand River from approximately 300 feet upstream of the Bridge Street Bridge to the upstream edge of the Fulton Street Bridge (**Figure 1A and 2, Appendix B**);
- Project Area - the areas where the Proposed Action will impact the environment within the Plan-EA sub-watershed (**Figure 2, Appendix B**); *specifically*, portions of the land on both sides of the Grand River from the 6th Street Dam to Fulton Street (where construction access or staging areas would occur as shown on **Figure 4, Appendix C**), the wetted channel of the River from 300 feet upstream of the Bridge Street Bridge to the upstream face of the Fulton Street Bridge (the Construction Area), and three recipient sites in the River for the placement of relocated unionid mussels. The three recipient sites are as follows:

- Mussel bed near Ada, Michigan,
- Mussel bed at Riverside Park just upstream of Grand Rapids, and
- Mussel bed on the left bank, just downstream of the confluence of Plaster Creek.

Details on recipient sites can be found in Section 2.2.1 of the BA in **Appendix E** (EcoAnalysts 2024). The mussel recipient sites will be used for mussel relocations approved under the Biological Opinion issued by the U.S. Fish & Wildlife Service. However, the requested PL566 funding will not be used for mussel relocations. The Project Sponsor is paying for mussel relocations and mitigation.

Only one percent of river habitat in the lower peninsula of Michigan is rapid-type habitat, although this type is important to the life cycle of many aquatic species. Rapid-type habitat is defined as a river area with a steep energy gradient, coarse bed substrates, and non-uniform distribution of instream velocities. The historic rapids of the Grand River that ran through the City were socially and culturally important for Native Americans and were the namesake for the city. Prior to development, the channel complex through the area was historically over 1,400 feet wide but is now restricted within floodwalls to approximately 600 feet wide (Carey et al. 2016). The pre-development channel was not only significantly wider but had multiple side channels and islands and likely covered a much broader area during periods of flooding. Ecosystem processes such as hydraulic diversity, fish transport, fish passage, habitat diversity, and recreational functions of the former rapids have been degraded by channelization, dredging, and urban development.

As part of that historical development process, five dams have been constructed within the city including the 6th Street Dam and four smaller dams. These dams are not regulated by Part 315 or 307 of Michigan's Natural Resources and Environmental Protection Act due to their low height and small area of impoundment. The 6th Street Dam (occasionally called the 4th Street Dam) was constructed over 150 years ago to provide waterpower and to facilitate the floating of logs from upstream over the bedrock outcrop located upstream of Leonard Street. The last known maintenance on this dam was in 1929. Shortly after reconstruction of the 6th Street Dam, circa 1927, four low-head dams were constructed downstream of the 6th Street Dam to maintain channel width during low flow periods to prevent concentration of the raw sewage that was discharged into the river in that era. The

original purpose of these dams is no longer relevant as they affect the ability of fish and other aquatic organisms to thrive and limit fish and other aquatic organism passage. Years ago, dredging and mining of large substrate occurred in the channel downstream of the 6th Street Dam. In addition, the river is constrained between floodwalls that extend for over a mile on both sides of the channel. These modifications have together created a straight, uniform channel with little diversity in flow depth, substrate, or velocity, thus limiting natural aquatic ecosystem processes.

The City, in close collaboration with GRWW, proposes improving aquatic habitat and recreation over 2,887 feet of the Grand River from 300 feet upstream of Bridge Street downstream to Fulton Street in Kent County, Michigan (**Figure 4, Appendix C**). The improvements would be accomplished by removing the four low head dams, grading the riverbed, and installing boulder arch structures, constructed riffles, emergent habitat boulder fields, and bank vanes.

The proposed Project has been designed to require little to no maintenance over analysis period of 50 years following construction, but it is possible that minimal operations, maintenance, repair, rehabilitation, and replacement (OMRRR) activities may be required. The revitalization and enhancement of the rapids is expected to facilitate benefits such as improved aquatic habitat diversity, improved public health and safety, and expanded public use of the river. This proposed Project would simultaneously address the objectives of multiple regional planning documents, including the Lower Grand River Watershed Management Plan (Lower Grand River Organization of Watersheds (LGROW) 2011), the Grand River Assessment (Hanshue and Harrington 2017), and Michigan's Lake Sturgeon Rehabilitation Strategy (Hayes and Caroffino 2012).

The proposed Project is within the urbanized reach of the Grand River where rapids historically existed within the City boundaries. Between Ada and Lake Michigan, a distance of approximately 60 river miles, river gradient sufficient to restore rapid habitat only exists between Ann Street and Fulton Street within the City of Grand Rapids and the proposed Project Area within the City of Grand Rapids and the proposed Project Area. The area from 300 feet upstream of Bridge Street to Fulton Street is currently a homogeneous river channel due to hydraulic effects of the four dams and historic gravel harvesting. Removing the dams and creating riffles, boulder arches, emergent habitat boulder fields, and rock vanes would enhance habitat for aquatic species.

The benefits from the enhanced habitat in the Construction Area would extend to other areas in the Grand River watershed (see Section 6.7). Given these indirect benefits to aquatic species (both fish and mussel species) outside of the Construction Area, over 20% of Project benefits would accrue to agricultural areas, as approximately 60% of the Grand River watershed from the Construction Area downstream to Lake Michigan is agricultural land, and the proportion of agricultural lands in the upstream portion of the watershed is similar, if not higher (Hanshue and Harrington 2017).

The proposed Project opportunities that could be realized include:

- Improved habitat diversity and suitability over 2,887 feet and 30 acres of the Grand River;
- Increased Great Lakes native fish diversity and productivity;
- Protection of threatened and endangered fish and mussel species including the lake sturgeon, river redhorse, and snuffbox mussel;
- Improved river access and use for the public with elimination of unsafe dam hydraulics; and
- Improved public safety through elimination of unsafe low-head dams causing turbulent waters.

The proposed Project would align with multiple long-term plans and initiatives to connect the community to the river within Grand Rapids and its upstream and downstream neighbors. It would also enhance the potential for future projects to provide improved public access to the river. Reasonably foreseeable future projects are described in Chapter 3 and are assessed in Chapter 6 under the cumulative effects section of each resource potentially affected.

2. PURPOSE AND NEED FOR ACTION

The purpose of the proposed Project is to restore the rapids in the lower reach of the Grand River (300 feet upstream of Bridge Street to Fulton Street), improve public safety, restore aquatic habitat diversity and suitability

for native Great Lakes fish and mussel species, and enhance river access and use.

The need for the proposed Project action arises from the degraded condition of the river, which is an important natural resource for Grand Rapids and the State of Michigan, and several recognized safety problems associated with that degraded condition. Historic physical changes made to the Grand River as it flows through downtown Grand Rapids, including construction of four low-head dams and removal of natural substrate, have created unsafe hydraulics for the public and access issues. The modified river also impact native and listed species of fish and mussels, and altered habitat. Studies have concluded that the diversity and productivity of fish and mussel communities in the Project Area and surrounding portions of the Grand River are currently much lower than possible. For example, Hanshue and Harrington (2017) indicate that the low-head dams in the Project Area "likely represents a barrier to native fish species (e.g., Walleye *Sander vitreus*, suckers (family Catostomidae) during low flow conditions," and the authors go on to state that "Prior to their destruction, the rapids provided substantial rocky spawning habitat for several Lake Michigan species, including Cisco (*Coregonus artedi*),), Lake Whitefish (*Coregonus clupeaformis*),), Lake Trout (*Salvelinus namaycush*),), and Lake Sturgeon (*Acipenser fulvescens*)). Although lake-run populations of Cisco, Lake Whitefish and Lake Trout are no longer extant, restoring the rapids in Grand Rapids would greatly benefit Lake Sturgeon recovery efforts (Hay-Chmielewski and Whelan 1997, Aadland 2010)." Furthermore, Holtgren (2018) identified the low-head dams in the Project Area to be "One of the largest impediments to the current fish community." Finally, according to the *Lake Sturgeon Habitat* report completed by RRO in 2013, "The Grand River is one of only four rivers on the eastern shoreline of Lake Michigan where a known remnant population of Lake Sturgeon successfully reproduces (Smith, MDNR unpublished data). The availability of spawning and staging habitats in rivers is considered a major factor limiting the recovery of Lake Sturgeon in Lake Michigan (Daugherty et. al, 2009, Auer 1999)." The proposed Project would improve sturgeon access, as well as staging and spawning habitat, within the Project Area, and would remove a barrier to potential future upstream restoration efforts.

3. SCOPE OF THE PLAN-EA

This section describes the scoping process of the Plan-EA, in an effort to identify issues relevant to the Proposed Action.

The scoping process was initiated in 2009 and was conducted by GRWW, GVMC and the City in order to identify and define potentially significant issues that are being used in formulating and evaluating alternatives, as well the scope of resources to be addressed. Scoping is used to determine what is important to investigate during the planning process and allow stakeholders and technical experts to identify which concerns, actions, and effects should be addressed in the Plan-EA. This process was conducted during phase one and phase two of the project planning phases and consists of verbal and written communications with federal, state, tribal, and local agencies; formation of the Grand River Restoration Steering Committee; and solicitation of input via public/community presentations and tribal outreach. Significant issues were impact to the environment, restoration benefits and potential implications to the community. The NRCS is responsible for developing NEPA documentation but sought consultant expertise for assistance in developing the following the Plan-EA and the BA. Additional consultation, coordination, and public participation information is provided in Chapter 7, Consultation, Coordination, and Public Participation.

Information gathered through this process and related specifically to the proposed Project within the Grand River are presented in **Table 3-1, Appendix C**. Potentially significant issues relevant to the Proposed Action were used in formulating and evaluating alternatives and assessing the potential effects of the proposed Project as required by the NEPA process.

3.1 Section 7 of the Endangered Species Act (ESA)

The Endangered Species Act (ESA) represents a key protection for many of the animals and plants throughout the United States. Section 7 of the ESA mandates:

> "all Federal agencies to ensure that any action they authorize, fund, or carry-out does not jeopardize the continued existence of an endangered or threatened species or

designated or proposed critical habitat (collectively, referred to as protected resources)."

Snuffbox mussels, a federally listed endangered species, have been found within the proposed Project Area, and so consideration must be given to protecting them from harm. The anticipated funding of the proposed Project through the Watershed Protection and Flood Prevention Act PL 83-566 program is a federal action that, under Section 7, requires consultation with the USFWS to ensure this protection is adequate to meet the requirements of the ESA.

For the Lower Grand River Plan-EA, the initial consultation revolved around the presence of snuffbox mussels within the proposed Project Area and the potential effect of the proposed Project alternatives. Three alternatives were identified and presented to USFWS for evaluation of effects: a no action alternative, a removal of four low-head dams without substrate enhancements, and a removal of four low-head dams with substrate enhancements within the Project Area (the proposed Project). The determination by the USFWS was completed through review of the BA, and on October 22, 2020, the USFWS issued their BO for the preferred Alternative and design presented.

With the revised design in 2024, a BA was submitted to the USFWS and the City received the final Biological Opinion August 14, 2024 (**Appendix E)**. The USFWS only provides analysis of the preferred alternative when issuing a BO and does not offer analyses of any other project alternatives. Therefore, the Plan-EA only references the preferred alternative analysis provided to USFWS in the BA as this is the only alternative on which the agency has made a determination. The USFWS previously determined that the proposed Project would have *no effect* on the following federally listed species: northern long eared bat (*Myotis septentrionalis*); Indiana Bat (*Myotis sodalis*); eastern massasauga rattlesnake (*Sistrurus catenatus*), and karner blue butterfly (*Lycaeides melissa samuelis*). The USFWS also determined that the proposed Project design is not likely to jeopardize the continued existence of the snuffbox mussel. Accordingly, the U.S. Fish & Wildlife Service has issued a Biological Opinion to the City (see related correspondence and documentation in **Appendix E**).

3.2 Section 106 National Historic Preservation Act (NHPA)

Since the proposed Project is to be funded by NRCS under the Watershed Protection and Flood Prevention Act PL 83-566 program, it involves a federal undertaking and is subject to the requirements of Section 106 of the NHPA of 1966, as amended. Accordingly, considerations of potential effects to archaeological, historic and architectural resources (collectively referred to as cultural resources) are being taken into account, as implemented under 36 C.F.R. Part 800 Protection of Historic Properties (Effect of undertaking on historic property 54 U.S.C. § 306108). Specifically, these studies have identified significant cultural resources that exist or that may exist within the affected environment. Studies have been conducted in conformance with various statutes and regulations that govern non-renewable cultural resources, including Section 106 of the NHPA.

The methodologies selected for this project reflect the application of Section 106, state preservation guidelines of Michigan, and the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation (effective September 29, 1983). Consultation has been conducted with the Michigan State Historic Preservation Office (SHPO), the Grand Rapids Historic Preservation Commission, local organizations, and with tribes potentially interested in the proposed Project.

3.2.1 Consultation with MI SHPO

On March 4, 2021, NRCS provided MI SHPO with an evaluation of the NRHP eligibility of the four low-head dams on the Lower Grand River Habitat Restoration Project, finding that the dams are eligible and would be adversely affected. In a letter dated March 23, 2021, SHPO NRCS determined, and concurred, that the dams, historically referred to as the Beautification Dams in the Grand River, are eligible for listing on the NRHP. NRCS, in consultation with the Section 106 parties, determined the dams are eligible under Criterion A based on their role in the history of the city with the Grand River and for their role in the emergence of city planning and the development of the riverfront as a focal point of downtown Grand Rapids NRCS determined, in consultation with, and under Criterion C, as the dams may embody the distinctive characteristics of a type, period, or method of construction. The project requires removal of all four low-head dams and does not allow for avoidance or minimization of adverse effects. NRCS included input from local parties in the mitigation design, and public discussions of mitigation options and

development of a mitigation plan have been completed. A Memorandum of Agreement (MOA) was developed to document the agreed upon mitigation measures and how each would be implemented. SHPO, in a letter dated January 18, 2024, has indicated no change is necessary to this document for revisions to the preferred alternative (**Appendix A**).

3.2.2 Local Organizations

Local organizations have been included in NRCS' NHPA consultation efforts, initially to a handful of groups in 2019, and to a broader audience in 2021. The West Michigan Environmental Action Council (WMEAC) has been West Michigan's preeminent non-profit resource for environmental education and advocacy since 1968. During consultations with the Project team, WMEAC requested additional information on plans and schedule updates as the project progressed for the Preferred Alternative in the prior Plan-EA. The project team continues to engage WMEAC accordingly. WMEAC expressed no interest in historic properties under Section 106.

A public comment period on the development of the MOA included public notices and 2 public meetings held in November 2021. During the public meetings, background on the low-head dams was presented, proposed mitigation measures were discussed, and input was sought from tribal, local, professional, and historic preservation communities. 8 of 50 comments received addressed the proposed mitigation measures and all were supportive. Remaining comments were regarding the overall project and environmental issues that can be better addressed in the EA public comment period.

3.3 Native American Tribal Organizations

Tribes are recognized by the United States as sovereign nations and are thus afforded roles similar to foreign nations (EO 13175); therefore, the United States has a unique legal and political relationship with Indian tribes as provided in the Constitution of the United States, treaties, and Federal statutes, and consultation with the Tribes is a government-to-government relationship.

While the proposed Project activities are unlikely to affect intact archaeological sites, this section of land along the Grand River is sensitive for the presence of [redacted] to the area. In the event of a discovery during construction, the Inadvertent Discovery Plan within the MOA will be followed, which can be found in **Appendix E.**

[redacted]

proposed project, however, did not follow up after the NRCS made further attempts to communicate.

In April 2021, a consultation update was sent to each tribe and tribal group contacted previously, and additionally to the Miami of Oklahoma. Project information, research results and the evaluation of the low-head dams were included with an invitation to participate in the development of a MOA.

In October of 2021, another communication was sent with the proposed mitigation measures and an invitation to review, comment or meet to discuss the details, as well as an invitation to participate in the public meetings on the MOA, held in November 2021. 2 additional tribes responded that they had no comments but would also like to be contacted in case of an inadvertent discovery during construction.

3.4 EA Focus Area

This Plan-EA addresses the specific relevant concerns identified during the scoping process (**Table 3-1, Appendix C**) within chapters 4.0 Affected Environment, 6.0 Environmental Consequences of the alternatives, and 8.3 Mitigation. Affected environment elements are in **Table 3-1, Appendix C**, including cultural resources and historic properties and historic properties, urban dynamics, and public health and safety.

In addition to the relationship between short-term use and long-term productivity, unavoidable adverse effects of the proposed action, and any irreversible and irretrievable commitments of resources, the EA also considers cumulative effects. Cumulative effects are effects that accrue incrementally with time from multiple related and unrelated actions and can affect the natural, social, and/or cultural resources (such as the proposed Project) when combined with past, present, or reasonably foreseeable future actions (or other projects) regardless of what agency (federal or non-federal) or person conducts the actions or projects (CEQ 1997). **Table 3-2, Appendix C** lists the primary past, present, and reasonably foreseeable future activities considered in the Plan-EA cumulative effects assessment.

4. AFFECTED ENVIRONMENT

This chapter provides a description of those portions of the environment that could be affected by or could affect the proposed Project, as described in Chapter 1, Introduction and Background. The information presented is derived primarily from government data or reports, scientific literature, or information provided by the City and GRWW. This chapter describes the current conditions and characteristics of distinct environmental, socioeconomic, cultural, and historic resources, and that information is used in the assessment of potential effects from the proposed Project as evaluated in Chapter 6, Environmental Consequences. The level of detail in the description of each resource in this chapter corresponds to the magnitude of the potential direct, indirect, or cumulative effects of the proposed Project.

4.1 Air Quality and Noise

This section describes current conditions of air quality and noise in the analysis area including public areas, recreational facilities, and tourist attractions on and adjacent to the Grand River within the City of Grand Rapids downtown area.

4.1.1 Air Quality

Air quality is an important metric for the health of a community and for protecting vulnerable populations like the very young and the very old. **Table 4-1, Appendix C** summarizes the background air quality concentrations for the Grand Rapids-Monroe Street Monitoring Station over the most recently available 3-year period. The table also includes the US Environmental Protection Agency's National Ambient Air Quality Standards (NAAQS), which EGLE implements. The existing air pollutant concentrations are representative of air quality in urban areas (resulting from vehicle traffic, industrial activity, etc.). In summary, the air quality in the City of Grand Rapids meets all USEPA NAAQS, with some exceptions for ozone issues that fluctuate somewhat year to year. Ozone levels are monitored by air quality monitoring stations from April 1st through September 30th and dependent upon factors such as wind and precipitation. Along the Lake Michigan shoreline area, where Grand Rapids sits, shoreline weather patterns can push ozone plumes into the area. Presently, Grand Rapids ranks for having good air quality among cities worldwide based on consistent AQI and other marker indicator comparisons.

4.1.2 Noise

Noise is one of the most common environmental issues that can interfere with normal human activities and otherwise diminish the quality of the human environment[1]. Typical sources of noise that result in this type of interference, particularly in urban surroundings, include interstate and local roadway traffic, industrial activities, aircraft, and neighborhood and public space sources like lawn mowers, leaf blowers, etc. Noise baseline data are currently not available in the analysis area. In the absence of measured data, **Table 4-2, Appendix C** shows typical noise levels generated by various indoor and outdoor activities and provides possible human effects. Noise sources understood to be present within the analysis area from **Table 4-2** generally include vehicles and traffic (horns, garbage trucks, city traffic, freeway traffic), air conditioning units, and concerts. Noise levels for these activities range from 60-120 dBA.

4.2 Climate and Climate Change

This section provides a brief description of the climatic conditions in Grand Rapids, including acknowledgement of existing climate change indicators in the analysis area.

4.2.1 Climate

Local climate is heavily influenced by latitude, variation of land surface elevations, and proximity to Lake Michigan. Grand Rapids has a predominantly humid continental climate, with very warm and humid summers, cold and snowy winters, and autumn and spring seasons that are quick but mild. Mean precipitation within the Grand River watershed is approximately 31 inches, whereas annual snowfall can range from as low as 30 inches to more than 100 inches, depending on proximity to the lake (Hanshue and Harrington, 2017). Based on records obtained from 1981 to 2010, the mean annual total precipitation and mean annual temperature within Grand Rapids are 38.1 inches and 48.5 degrees Fahrenheit (°F), respectively (GLISA 2018).

4.2.2 Climate Change

Climate change is a term utilized to describe long-term changes in the average weather patterns that have come to define local, regional, and global climates. These changes have been observed since the mid-20th century and are primarily driven by human activities, raising the Earth's average surface temperature. Climate change has the potential to affect the water balance of our planet, including the Grand River given its proximity to the Great Lakes.

The City of Grand Rapids is feeling the effect of climate change (City of Grand Rapids, Climate Change (grandrapidsmi.gov)). The City, in partnership with the NOAA Great Lakes Integrated Sciences and Assessments (GLISA), created a summary of historic and projected changes in Grand Rapids climate. This summary information indicates Grand Rapids will likely see more days over 90°F in the summer and warmer days in the winter. Grand Rapids is also likely to experience more rain and extreme weather events in shorter bursts that could cause an increase in flooding and droughts. Key data points below:

- Average air temperature is projected to rise 3°F to 5°F by the mid-21st century, with summer having the greatest increases of 4°F to 7°F.
- Total annual precipitation increased by 16 from 1951 to 2017% from 1951 to 2017.
- The total volume of rainfall in extreme events (heaviest 1% of storms) has increased by 52%% between 1981 and 2010.

4.3 Soils and Geology

This section describes current conditions of soils and geology in the Project Area. The analysis area for soils and geology is the same as the Project Area (**Figure 5, Appendix C**), with the exception of the three mussel recipient sites, which would not experience any disturbance to soils and geology.

4.3.1 Soils

Soil types and textures in the Grand River watershed are variable as a result of the heterogeneity of glacial material deposited in the region thousands of years ago. Generally, soils in the watershed range from sandy and loamy to clay soils (LGROW 2011; Hanshue and Harrington 2017). A wetland delineation was performed to confirm minimal

[1] The human environment is the natural and the physical (e.g., structures) environment, and the association of people and their activities to those environments.

wetland type soils and vegetation present within the project area, see Section 6.5.2 and Wetland Delineation Report in **Appendix E**. As the soil types and textures themselves are variable within the watershed, so too are their characteristics including runoff and erosion potential, drainage class, permeability, and compaction and rutting potential. According to the NRCS Web Soil Survey, soils mapped in the analysis area are classified as *urban land*, indicating soils have been previously reworked or otherwise disturbed by human activities (NRCS 2018). Even where soils are not overlain by impervious surfaces such as roads, sidewalks, or buildings, they have little to no ability to infiltrate water and generally lack the qualities or characteristics of their natural state. No prime farmland soils are designated in the analysis area.

Review of the USDA Web Soil Survey shows there are soils classified as Farmlands of Unique Importance; Farmlands of Local Importance; and Prime Farmland in the Plan-EA sub-watershed (**Figure 1B, Appendix B**). The nearest such soils are located approximately two miles southwest of the downstream end of the Project Reach (**Figures 1A and 2, Appendix B**); approximately two miles northwest of the upstream end of the Project Reach; and approximately 0.3 and 0.75 miles downstream of the Project Reach. All of the classified farmland soils located northwest of the Project Reach are located in Richmond Park, Greenwood Cemetery, or residential neighborhoods. The soils located in Greenwood and Richmond Park are at least partially forested. The classified farmlands located southwest of the Project Reach are located in the Mines Golf Club and residential neighborhoods or land under residential development. The classified farmlands located downstream of the Project Reach include Jackson Island (owned by the Project Sponsor) and forested floodplains within the 100-year floodplain of the Grand River under private ownership and industrial land uses. None of the classified farmlands within proximity of the Project Reach are viable farmlands and would not contribute to agricultural production in the Plan-EA sub-watershed (**Figure 2, Appendix B**) or State of Michigan.

4.3.2 Geology

As alluded to above, continental glacial deposits and associated features dominate the surface geology of the Grand River watershed. Beneath the soils and glacial deposits within the analysis area lies bedrock, including the Bayport Limestone and Michigan Formation (Michigan Center for Geographic Information 2005). As its name implies, the Bayport Limestone formation is a limestone unit. This formation overlies the older Michigan Formation, which consists primarily of shale and some beds of sandstone, limestone, dolostone, and gypsum. Depth to bedrock in the analysis area, particularly in the river channel, is shallow as described below.

The City of Grand Rapids is named after the natural rapids that were once prominent features of the river. The rapids were historically described as “not of the nature of an abrupt leap or drop but have a nearly uniform decent for the distance of a little more than a mile, amounting to a fall of about eighteen feet, over a limestone bed…” (Baxter 1891 as cited in Churches and Wampler 2013). There is currently no bedrock exposure in the analysis area, but there is bedrock with no overlying sediment in a portion of the river channel upstream of the analysis area, constituting one of only three known locations where bedrock is exposed along the entire river (Eschman and Farrand 1970 as cited in Churches and Wampler 2013). No known geologic features of unique significance are present in the analysis area.

4.4 Water and Riverine Resources

This section describes current conditions of water and riverine resources in the Construction Area, as described in Chapter 1, Introduction and Background.

4.4.1 Existing In-stream Structures

Five bridges cross the Grand River within the proposed Project reach (proceeding upstream, from south to north): Fulton Street Bridge, Blue Bridge, Pearl Street Bridge, Gillett Bridge, and Bridge Street Bridge. Each of the bridges is supported by abutments on both banks along with four in-channel piers. In addition to the bridges, four low-head dams extend across the Grand River within the Construction Area. These dams were constructed in the early 1900s to keep water levels higher, particularly in the summer months, to facilitate the transport of logs from the hard and softwood forests upstream, and to reduce odors when portions of the riverbed dried up when water was low (Hager 2018, Biolchini 2017, Grand Rapids Whitewater no date). The US-131 bridge is located approximately 635 feet downstream, while the I-196 bridge is located approximately 750 feet upstream.

In addition, much of this portion of the river is constrained between floodwalls or rip rap on both sides of the channel. Other structures of note include a pedestrian access point on the right descending bank (RDB) downstream of Bridge Street, a pedestrian boardwalk on the LDB downstream of the Gillett Bridge, and four support piers in the river supporting a portion of the Grand Rapids Public Museum on the RDB between Pearl Street and the Blue Bridge.

4.4.2 Flow Regime

Flow Regime refers to the hydrology and hydraulics of flowing water in the Grand River. Hydrology refers to how much water enters the channel from direct precipitation, runoff from the watershed, and groundwater flow and determines the amount of water flowing in the river at any given time, typically expressed as volume per unit time (e.g., cubic feet per second). The amount of water in the Grand River at any given time is important because it determines the level of water and flow depth that is biologically important. For example, the habitats fish use and how they can migrate upstream and downstream is affected by the amount of flow in the river, among other factors. Hydraulics refers to how the water that reaches the river flows down gradient toward Lake Michigan, which is affected by morphology of the channel (e.g., slope, width, and depth). Hydraulics determine the depth of the flow and how fast it is moving, both factors that are important to aquatic organisms. The project will not alter hydrology but will alter hydraulics because the four dams that will be removed negatively alter hydraulics and would be removed. Therefore, flow regime is an important part of the affected environment.

Through the Construction Area, the Grand River is a homogenous channel exhibiting uniform flow with little spatial variability in depth or velocity. The average daily discharge in this reach from 1901-2005 is 3,769 cubic feet per second (cfs) (Hanshue and Harrington 2017). An important discharge for channel design is the bankfull discharge, also known as the *effective* or *dominant* discharge, which is the flow that is most responsible for defining the shape of natural channels. The bankfull discharge is essentially the flow rate that would overtop the channel banks in a natural river system. Based on hydrologic analysis from United States Geological Survey (USGS) gauging station 04119000 located at the Fulton Street bridge, bankfull discharge was determined to be 13,000 cfs for the project reach (RiverRestoration 2024), Basis of Design, **Appendix E**. However, the floodwalls and constructed berms along the project reach prevent the river from leaving its channel and entering the adjacent floodplain as normal bankfull river channels do. Normally, flow will leave a river channel and enter the adjacent floodplain at a discharge with a return interval of 1 to 2 years, referred to as the bankfull discharge. Within the Project Area, flow in the Grand River does not leave the channel at the estimated bankfull discharge of 13,000 cfs because of the flood walls and berms.. (RiverRestoration 2017). The median discharge is 3,900 cfs (exceeded 50% of the time). At the median discharge, the wetted channel width varies from approximately 450 to 600 feet through the project reach with a maximum water depth of approximately seven feet and mean flow velocity of approximately three feet per second.

The Federal Emergency Management Agency (FEMA) 100-year flood discharge is estimated at 50,000 cfs through this reach (RiverRestoration 2024), Basis of Design, **Appendix E**. According to the effective FEMA Flood Insurance Rate Maps 26081C0406D and 26081C0408D (effective February 23, 2023), the floodwall along the LDB and constructed levee along the RDB would contain the 100-year flood along the project reach (FEMA 2023). See Section 4.6 for further information on floodplain management.

4.4.3 Water Quality

The water quality in the Grand River has been degraded over time due to municipal, stormwater, and industrial discharges, Confined Animal Feeding Operations, nonpoint discharge, airborne deposition of pollutants, and localized degradation from contaminated sediments. In 2010, the Journal of Great Lakes Research classified 38.6 percent of river miles in the Grand watershed as “impaired” based on fish and invertebrate communities. Water quality within the project area has been consistently improving and was given a huge boost in 2017 when the city completed the total separation of their combined sewer system. Water quality monitoring conducted by the City of Grand Rapids shows only a slight decrease in water quality downstream of Grand Rapids, with all values in recent years indicating “Good” water quality and very few limits to recreational use. However, the Grand River in Kent County also has a TMDL designation for e. coli. Figure 6 shows the city’s water quality sampling sites to better understand locations (**Figure 6, Appendix C**).

4.4.4 Groundwater

The Grand Rapids area sits on top of thick glacial drift before reaching the Marshall Sandstone formation at approximately 550 feet above sea level. The city does not depend on subterranean aquifers to supply water to its citizens but pipes the water in from Lake Michigan instead (NARA, 2015). While the glacial drift is too thin to support a viable aquifer, many agricultural operations and residential properties in the area around Grand Rapids tap the aquifer supported by the Marshall Sandstone.

4.4.5 Channel Geometry

The channel form of the Construction Area is straight (very low sinuosity) and uniform with little diversity in width or depth. Due to the low-head dams and historical dredging that have occurred, this reach exhibits a large width-to-depth ratio at low flows. During bankfull flows, the width-to-depth ratio is less due to the encroaching human-made floodwalls, constructed rip-rap banks, and bridges. The channel width in this reach varies from 450 to 600 feet at median discharge. Although there is an overall head loss of 18 feet through the historic rapids, from upstream of 6th Street Dam to Fulton Street Bridge, through the project reach, there is approximately 8 feet of head loss that is controlled by the four low-head dams. Despite the relatively steep gradient through the historic rapids, the gradient between the four low-head dams is only 0.2 percent.

4.4.6 Channel Substrate

The substrate throughout the assessment reach consists predominantly of cobble with some gravel deposits upstream of the low-head dams and small areas of sand just upstream of Blue Bridge and Fulton Street Bridge (Holtgren 2018). Historically, approximately 300,000 cubic yards of gravel, cobble and boulder were dredged from the channel to fill the City riverfront (EcoAnalysts 2024), thus removing much of the larger native substrate in this reach. Channel bed material sediment samples in the Grand River at Riverside Park, Fulton Street, and downstream of US-131 were recently collected and analyzed. Analysis of the samples showed that the sediment upstream and downstream of the Construction Area is primarily composed of uniform sand substrates with coarser substrates (coarse gravel to fine cobble) in between (FTCH 2018) (**Figure 5, Appendix C**). Sediment sampling was also conducted at an additional twelve locations along the project reach in 2017 using a Ponar sampling device. Results indicated a median diameter grain size (D_{50}) of 48 millimeters, which corresponds to coarse gravel in Table 1 (Materials Testing Consultants, Inc. 2017), **Appendix E**.

A Phase II Environmental Site Assessment was performed immediately upstream of the Construction Area to evaluate whether contamination is present in the sediments at levels exceeding the Michigan's Part 201 Generic Residential Cleanup Criteria. The assessment revealed only one of the forty-five locations sampled contained a contaminant, arsenic, that exceeded the Part 201 Generic Residential Cleanup Criteria for Direct Contact (NTH Consultants 2012). An EGLE Permit was issued for additional sediment sampling to further classify the substrate including analyzing for potential contaminants within the Project Area, and the work was completed in the summer of 2020. Results can be found in Table 2 (Materials Testing Consultants, Inc. 2017), **Appendix E**.

4.5 Wetlands

Wetlands were delineated in 2014 (Golder, 2014) and in 2019 (Fishbeck, 2019). A wetland verification was performed in 2023 (FTCH 2023). Five wetlands have been delineated and verified within the Project reach, ranging from 0.022 to 0.182 acres and 148 to 697 feet in length. (**Figure 7, Appendix C**). Due to the presence of flood walls along both sides of the river and extensive urban development along the Project reach, wetlands are small and limited to depositional channel margins or the limited natural channel areas. Delineated wetlands occupy a total of 1,951 feet of the shoreline through the Project reach. Wetland 7 is an emergent/scrub-shrub wetland with an area of 0.128 acres. Wetlands 8 and 9 are forested floodplain wetlands with an area of 0.050 and 0.053 acres respectively. Wetland 10 is a scrub-shrub wetland with an area of 0.022 acres. Wetland 12 is a forested/emergent/scrub-shrub wetland with an area of 0.182 acres. All five wetlands are regulated by EGLE as authorized by EPA as authorized by EPA under Clean Water Act and pursuant to Michigan's Natural Resource and Environmental Protection Act.

4.6 Terrestrial Vegetation and Wildlife

There are four terrestrial animal species listed under the ESA that could occur in the Grand River watershed. These species include the federally threatened eastern Massasauga rattlesnake (*Sistrurus catenatus*), the federally

threatened northern long-eared bat (*Myotis septentrionalis*), the federally endangered Indiana bat (*Myotis sodalis*), and the federally endangered Karner blue butterfly (*Lycaeides melissa samuelis*). However, they are all highly unlikely to be present, as their preferred habitat is mostly absent from the analysis area (MNFI 2023).

The eastern Massasauga rattlesnake occurs throughout much of Michigan's Lower Peninsula, including in Kent County. This snake is active during spring, summer, and fall, but it hibernates during winter. Habitat use during the active season varies regionally, but individuals are generally found in wet areas such as wet prairies, marshes, or low areas along rivers or lakes; adjacent upland habitat may also be used (USFWS 2015b). None of the wetlands identified in Section 4.4.6, Wetlands, within the analysis area for terrestrial vegetation and wildlife exhibit these types of habitats. No habitat suitable for this species exists in the analysis area because the steep banks of this portion of the Grand River do not exhibit any low-lying areas that might be attractive to this species.

The northern long-eared bat typically roosts under bark or in cavities of live trees and snags, but may also roost in caves, mines, bridges, and buildings. Roosting habitat includes forested areas with live trees and/or snags with a diameter at breast height (DBH) of at least 3 inches, with exfoliating bark, crevices and/or cavities (USFWS 2015a), although anecdotal evidence suggests that individuals can roost in less-than-ideal habitat. This species overwinters in hibernacula such as caves and abandoned mines. In Michigan, the majority of hibernacula are found in the northern and western Upper Peninsula; none are near the analysis area. Few individuals have been recorded in southern Michigan, and those that have been seen may hibernate in neighboring states (USFWS 2015a). The Michigan Natural Features Inventory (MNFI) includes only one record of this species in Kent County, reported in 1975 (MNFI 2019). This is the only federally listed species known to occur in Kent County for which suitable habitat exists in the analysis area. Despite the presence of habitat, this species is not likely to occur in the urban setting of the analysis area.

The Indiana bat occurs in Michigan during summertime throughout the southern portion of the state. This species roosts under loose bark on dead or dying trees, typically those with DBH of at least 4 to 5 inches (USFWS 2007). Although the analysis area overlaps the range of the Indiana bat, this species has not been reported in Kent County (MNFI 2019). There does not appear to be suitable habitat for this species in the analysis area.

The Karner blue butterfly occurs in Michigan, and the USFWS species recovery plan identifies one recovery unit (Ionia Recovery Unit) near the analysis area (USFWS 2003). This species primarily occurs in oak savannas and pine barrens with sandy soil. It is dependent upon wild lupine (*Lupinus perennis*) as the exclusive food of its larvae. Although the Karner blue butterfly is known to occur in Kent County (MNFI 2019, USFWS 2003), no suitable habitat exists in the analysis area.

The Grand River watershed is also home to the state endangered plant, the Virginia bluebells (*Mertensia virginica*). This species is known to occur in seven places in Kent County, although not within the analysis area (Penskar and Crispin 2010). This species grows in floodplains, often under a canopy of silver maple, red maple, hackberry, or cottonwood. Although such habitat could be present in the analysis area, it is highly unlikely that this species would occur in such a highly disturbed and managed place. Information for Planning and Conservation (IPaC) (FWS) review identified 10 species of migratory birds potentially within the analysis area including the bald eagle (*Haliaeetus leucocephalus*), black-billed cuckoo (*Coccyzus erythropthalmus*), bobolink (*Dolichonyx oryzivorus*), golden-winged warbler (*Vermivora chrysoptera*), lesser yellowlegs (*Tringa flavipes*), red-headed woodpecker (*Melanerpes erythrocephalus*), rusty blackbird (*Euphagus carolinus*), semipalmated sandpiper (*Calidris pusilla*), willow flycatcher (*Empidonax traillii*), and wood thrush (*Hylocichla mustelina*). Excluding the bald eagle, all other migratory bird species identified as potentially present within the analysis area are included on the USFWS Birds of Conservation Concern (BCC) list.

4.7 Aquatic Species and Habitat

Aquatic species and their habitat considered in this assessment include unionid mussels and fish. Federal and state listed aquatic species and invasive species are also considered. Other aquatic animals likely present within the Project Area but not assessed include non-unionid mollusks (e.g., clams and snails), crustaceans (e.g., crayfish), macroinvertebrates, and aquatic vegetation. The continued existence of these species would not be jeopardized by the Project and effects to these species would not be significant.

A more detailed analysis of unionid mussels and fish is included in the 2024 BA (EcoAnalysts, 2024), **Appendix E**. Impacts to freshwater mussels that would be caused by the Proposed Action were evaluated for the Proposed Action under Section 7 of the Endangered Species Act in consultation with the U.S. Fish & Wildlife Service. USFWS issued a Biological Opinion authorizing relocation, impacts, and mitigation. Freshwater mussel relocation and mitigation would be funded by the City of Grand Rapids using other funding sources. Funding for mussel relocations and mitigation would not be funded under the PL566 funding request being considered under this Plan-EA. However, the Proposed Action that would be funded under this PL566 funding request would impact freshwater mussels if awarded. Therefore, they are evaluated as part of the Plan-EA alternatives, yet have been authorized under the USFWS BO issued concurrent with the development of this Plan-EA.

The analysis area for these resources is limited to the wetted channel of the Grand River including the Construction Area, the area between the 6th Street Dam and the Construction Area, and the three recipient sites for placement of the unionid mussels to be collected during relocation efforts.[2] The three recipient sites include known mussel beds near Ada, Michigan; at Riverside Park within the City of Grand Rapids; and downstream of the confluence with Plaster Creek. The habitat and in-stream conditions, which historically exhibited rapids habitat, are currently influenced by and dependent on the existing infrastructure, including confining floodwalls, multiple bridge crossings, four low-head dams, and the 6th Street Dam. The 6th Street Dam hydraulically disconnects the Grand River and is a physical barrier for many aquatic species, preventing their migration upstream.

4.7.1 Unionid Mussels

Unionid mussels are freshwater mussel species in the order Unionida. Unionid mussels are unique in that they rely on fish as a host for their young (glochidia); mussels release their glochidia, and glochidia are encapsulated in fish gills or fins as part of their reproductive life cycle. Some mussel species only use specific fish species as hosts, while others can use a wide variety fish species. Preferred habitat for unionid mussels can be species-specific, but generally includes refuge from high velocity conditions, heterogeneous substrate, stable substrate for flow conditions, loose enough substrate for interstitial flow, and limited siltation (Dunn 2017). Common substrates allowing for these preferred conditions in streams and rivers generally include cobble, gravel and sand in high energy areas and silt, sand, and clay in low energy areas.

4.7.1.1 Habitat

Unionid mussel habitat within the Construction Area is limited to pockets of softer substrate, as the high velocities encountered in the Construction Area regularly sweep away fine substrates during high flows, leaving primarily armored areas and larger boulder and cobble substrate with little sand. Modeled hydrophysical habitat (MHH based on flow characteristics and shear stress) between the 6th Street Dam and Fulton Street under existing conditions is only 1.5 acres or 4 percent of this area. Most of the MHH lies along the banks or around bridge piers. The limited areas protected from high water velocity offer the best mussel habitat and include a mixture of cobble, gravel and sand, Figure 2.3 of BA**,** EcoAnalysts 2024), **Appendix E**.

4.7.1.2 Mussel Species

The lower Grand River historically was known to support 32 mussel species. Anthropogenic effects have slowly altered habitat for these mussel species, and currently only 26 species are known within the lower Grand River. Of these species, 13 are now listed as endangered, threatened, species of special concern, or species of greatest conservation need (EcoAnalysts 2024). Moreover, the existing low head dams likely impede fish passage, which in turn affects mussel diversity and abundance to the important of host fish species during the freshwater mussel life cycle. Freshwater mussel rely on specific fish hosts important of species during the freshwater mussel life cycle. Freshwater mussel rely on specific fish hosts for reproduction during the glochidia phase of the mussel life cycle. Unionid mussels occur at a low density scattered throughout the Construction Area. Various qualitative and quantitative surveys in and near the Project Area were conducted for unionid mussel species in 2013, 2016, 2017, and 2020, including surveys covering approximately 29 acres (117,375 m^2) within the area between the 6th Street Dam and Fulton Street. Table 1-2 of BA (EcoAnalysts 2024), **Appendix E** summarizes the species composition and abundance results from these surveys (EcoAnalysts 2024). In total, 20 live unionid mussel species were observed. The mussels collected during the surveys were generally associated with in-stream vegetation (adjacent to riparian

[2] The analysis area includes the area between the 6th Street Dam and the Construction Area as these areas could experience indirect effects during and after construction activities. See Section 6.6 for a discussion of environmental consequences.

wetlands) and/or refuges from strong current, often within 30 feet of the banks. An estimated 35,778 unionid mussels are located within the area between the 6th Street Dam and Fulton Street, based on the survey results that indicated a mussel density of 0.03/feet^2 (0.3/m^2) (EcoAnalysts 2024).

Surveys of the three proposed mussel recipient sites indicated that these sites had established mussel beds. The area surveyed at the Ada recipient site was 5.8 acres (23,480 m^2). The mussel bed noted in this area spanned the left descending two-thirds of the Grand River channel. This site supported a moderately dense and species-rich mussel assemblage. Twelve (12) different species were collected live, including the federally listed snuffbox (*Epioblasma triquetra*) and several other Michigan listed mussel species. Mussel density at the Ada site was estimated at 0.26/feet^2 (2.8/m^2). A total of 37 live mussels were collected during the quantitative survey (EcoAnalysts 2024).

The area surveyed at the Riverside Park recipient site included 2.1 acres (8,650 m^2). The report noted that mussels were generally located near the bank. Unionid mussel abundance was fairly low (0.15/ft^2 [1.6/m^2]), but 10 species and 297 live mussels were collected in the quantitative and qualitative samples. No live snuffbox mussels were noted; however, a fresh dead shell specimen was found in a muskrat midden on the bank, which suggested that the snuffbox occurs at low densities at this site (EcoAnalysts 2024). The Michigan endangered species, *Toxolasma parvum*, was abundant at this site. The area surveyed for the third recipient site was located downstream of the Construction Area, downstream of Plaster Creek. The area was upstream of a shallow cobble/boulder riffle area. In total, 12 live mussels of six species were collected, including Michigan threatened *Cyclonaias tuberculata* and *Ligumia recta*, and Special Concern species *Potamilus alatus*, and *Truncilla truncata*. The mussel density was estimated at 0.01/feet^2 (0.1/m^2) (EcoAnalysts 2024).

Listed Unionid Mussel Species - One federally endangered species and 13 Michigan endangered (2), threatened (2), or special concern (9) species have been found as living specimens in or have the potential to be found in the analysis area (EcoAnalysts 2024). **Table 4-3, Appendix C**, summarizes these listed species, their state or federal status, their preferred habitat, and their known fish hosts within the analysis area. Federal and state listed endangered or threatened species are protected by law, which requires consultation with federal and state agencies prior to implementing the Project. Michigan species of special concern are not protected by law.

Invasive Mussel Species - One invasive mussel species, the zebra mussel (*Dreissena polymorpha*), is known to occur in the Construction Area and the lower Grand River. Zebra mussels were introduced to the Great Lakes through the discharge of ballast water and were spread by various means, but primarily by recreational boaters. Zebra mussels have the potential to negatively affect native unionid mussel species by competing for food and by attaching themselves to live unionid mussels, eventually impeding the ability of native mussels to feed and reproduce. Zebra mussels were noted during surveys within the Construction Area and relocation sites, but in relatively low numbers, and only a few zebra mussels were noted as attached to live unionids. The flow regimes of the mainstem river may prevent zebra mussels from becoming more established. The variable flow characteristics are not conducive to zebra mussel colonization (EcoAnalysts 2024).

4.7.2 Fish

Little is known about the historical fish assemblages of the Grand River, but some recent MDNR fish assessments within the Grand River watershed have provided information on fish distributions and species composition in the Grand River. Additionally, fish monitoring has been conducted in the Project Area and downstream to Plaster Creek as part of the project baseline monitoring (Encompass 2020). Of the species present, there are less diverse fish communities present today than historically were present, due to the anthropogenic effects of point and nonpoint source pollution, dams, logging, agriculture, and urban development (EcoAnalysts 2024, Hanshue and Harrington 2017).

The lower Grand River, as defined and analyzed in the MDNR Fisheries Assessment (2017), is an area that is defined by the mainstem river from Grand Ledge, Michigan, downstream approximately 70 miles to the Village of Lamont, near Coopersville, Michigan. Seventy-five (75) species of fish are known to occur in the lower Grand River (Hanshue and Harrington 2017; EcoAnalysts 2024). Seventy-three (73) of these have been collected in the Project

Area downstream to Plaster Creek, and 53 of these species in the lower Grand River are known hosts for unionid mussel glochidia as shown in Table 1-3 of the BA (EcoAnalysts 2024), **Appendix E**.

Prior to the urban development that now exists within the Project Area, the historic rapids that occurred in this area provided important spawning habitat for Lake Sturgeon, Lake Whitefish, and Lake Trout. The area still provides an important sport fishery for catfish, bass, suckers, Walleye, and several introduced migratory fish species (Steelhead *Oncorhynchus mykiss*, Coho Salmon *Oncorhynchus kisutch* and Chinook Salmon *Oncorhynchus tshawytscha*) (Hanshue and Harrington 2017). Other fish species in the analysis area are listed in **Table 4-3, Appendix C**.

Fish passage and host fish habitat within the Project Area were qualitatively evaluated. Fish passage generally occurs along slow-flowing stream margins with water depth greater than 1 foot. Most fish species are blocked by the 6th Street Dam, as many cannot jump the dam or utilize the fish ladder to bypass the dam. Some species, such as Steelhead, Coho Salmon, and Chinook Salmon, are strong jumpers and can either utilize the fish ladder or jump the dam during high water to access areas upstream from the dam.

Additionally, the four low-head dams present in the Construction Area are known barriers of fish passage for several small-body fish species, as the high flow velocities that occur because of the uniform flow and drop over the dams presents a physical barrier that many fish cannot overcome. Small bodied and/or weak swimming fish species present within the Construction Area likely exist because they have passed over the low-head dams during periods of low flow or have passed over the 6th Street Dam from upstream river reaches (Holtgren 2018). Fish passage is also impeded at the two upstream low-head dams during low flow, and is restricted by high flow velocity on the RDB between Blue Bridge and Fulton Street Bridge. Most of Michigan's native potamodromous native fish species are impacted by the dams. Michigan's native potamodromous fish species migrate between larger freshwater bodies and rivers that contain spawning habitat (in this case, between Lake Michigan and the Grand River).

The fish habitat within the Construction Area is monotypic in nature and is primarily defined by raceway and open water caused by the channelized nature of the river, resulting from the placement of the existing dams and the floodwalls, which caused the uniform conditions. Presently, riffle habitat is limited to small areas downstream of low-head dams, while deeper pools are limited to the LDB between I-196 and Bridge Street, near some bridge piers, and between Pearl Street and Fulton Street. High water velocities are common across the entire reach, but some deeper pools at the downstream sides of boulders, bridges, and dams can be used as refuge from the high velocities. The Construction Area substrate is uniform in nature and primarily consists of cobble atop bedrock. Minimal cover is available in the Construction Area and the cover that is available is primarily the result of the riprap present along the banks and near the low-head dams. Cover in the form of vegetation is limited and is primarily only present in submerged areas of the riparian wetlands (EcoAnalysts 2024).

Habitat for many species of fish likely exists within the mouth segment downstream of the Construction Area; however, these habitats likely lack diversity compared to the lower, middle, and upper segments of the Grand River, as the mouth segment of the Grand River exhibits low gradient, slower moving water, and finer sediments. Sections of the mouth segment do exhibit a braided channel and it is these areas that likely provide nursery habitat for several fish species, including the lake sturgeon and river redhorse (*Moxostoma carinatum*) (EcoAnalysts 2024).

4.7.2.1 Listed Fish Species

Two Michigan listed threatened fish species are known to occur in the analysis area, Lake Sturgeon and River Redhorse. Lake Sturgeon is Michigan's only native sturgeon species, and it can live more than 40 years. A small Lake Sturgeon population is known to utilize the Construction Area. However, the 6th Street Dam blocks access to potential upstream spawning grounds (EcoAnalysts 2024). A population of between 66 and 130 sturgeon greater than 36 years old is estimated to occur in the lower Grand River. During their spawning season, they would be concentrated near the Construction Area and are only currently known to utilize spawning areas located just downstream of the 6th Street Dam (approximately 0.1 mile upstream of the Construction Area) and near Plaster Creek (approximately 1.5 miles downstream of the Construction Area) (Holtgren 2018).

River Redhorse, a species of sucker that can exceed 10 pounds, is known to occur in Michigan within only 14 counties. However, the lower and mouth segments of the Grand River are areas where this species is known to be present. Like the Lake Sturgeon, this species is limited in its upstream distribution by the 6th Street Dam; however, extant populations of this species do exist upstream, where their known spawning habitat in the Flat River, Maple River, and Fish Creek are located. Recent MDNR fish surveys have noted this species during sampling events within the analysis area, and it is known to spawn in the vicinity of the Construction Area (S. Hanshue, MDNR, pers. comm, as cited in EcoAnalysts 2024).

4.7.2.2 Invasive Fish Species

Two invasive fish species are known to occur in the lower Grand River, the Round Goby *Neogobius melanostomus* and the Sea Lamprey *Petromyzon marinus*. Both species are limited in their upstream migration by either the low-head dams or the 6th Street Dam during low water events, but they have been observed upstream of these dams as well, presumably crossing the dams during extreme high-water events (EcoAnalysts 2024). There is little known of the effects on native fish populations from the invasion of the Round Goby. Some studies suggest that food competition could affect native fish populations, but other studies suggest otherwise (EcoAnalysts 2024).

Sea Lamprey are known to negatively affect native fish populations, as adult lamprey parasitize fish and feed on their body fluids, often resulting in death of the host fish. This could also affect native mussels, since if unionid fish hosts are negatively affected, so could unionid mussel species that rely on specific fish host species for their life cycle and reproduction (EcoAnalysts 2024). Sea Lamprey preferred spawning habitat includes areas of gravel, little of which currently exists within the Construction Area. Preferred habitat conditions exist in tributaries of the Grand River upstream of the 6th Street Dam; however, the 6th Street Dam currently acts as a barrier to upstream Sea Lamprey migration except during times of high water, where, if conditions are right (slower moving, high water), Sea Lamprey could theoretically cross over the dam. Besides the physical dam barrier, two other factors contribute to upstream blockage of Sea Lamprey migration: swim path velocity blockage and sustained swim path distance blockage. Swim path velocity blockage occurs when the water velocity exceeds 4.0 meters/second, while sustained swim path distance blockage occurs at a water velocity of greater than 2.5 meters/second (EcoAnalysts 2024). Currently, these additional blockage criteria are not being met along the left bank of the Grand River downstream of the 6th Street Dam. Two separate observations have noted Sea Lamprey in Lowell Creek and the Rogue River (in 1968 and 2008, respectively), upstream of the 6th Street Dam. Sea lamprey was also found in the Rogue River in 2022 (EcoAnalysts 2024). The Rogue River, located approximately 9.6 miles upstream of the Construction Area, was treated with lampricide in 2009 & 2023. Norris Creek and Crockery Creek are two tributaries of the Grand River that were treated with lampricide as recently as 2017. Both creeks are located in the lower Grand River and Crockery Creek is the closest, located approximately 28 miles downstream of the Construction Area (Sullivan and Mullet 2018).

4.8 Floodplain Management

A river, stream, lake, or drain may occasionally overflow their banks and inundate adjacent land areas. The land that is inundated by water is defined as a floodplain. In Michigan, and nationally, the term floodplain has come to mean the land area that will be inundated by the overflow of water resulting from a 100-year flood (a flood which has a 1% chance of occurring any given year). Floodplain Management is defined by FEMA as the "operation of a community program to reduce the risk of current and future flooding through preventative and corrective measures, resulting in a more resilient community. These measures take a variety of forms and generally include requirements for zoning, subdivision or building, building codes and special-purpose floodplain ordinances."

The responsibility for reducing flood losses is shared by all units of government—local, state and federal—and the private sector. Fulfilling this responsibility depends on having the knowledge and skills to plan and implement needed floodplain management measures. The fundamental floodplain management program that most others are built on is the National Flood Insurance Program (NFIP). Within the City of Grand Rapids, the NFIP requires the City take responsibility for the flood protection system.

4.8.1 Existing Flood Protection System

FEMA has mapped the 100-year floodplain of the Grand River within the City of Grand Rapids under the National Flood Insurance Program (NFIP). FEMA recently published a Flood Insurance Study on February 23, 2023 including

Flood Insurance Rate Maps. The Grand River in downtown Grand Rapids and part of the City are located in a 100-year flood Zone AE – high risk flood zone and regulated floodway with base flood elevations.

The edge of the Grand River stretches for 85,000 feet within the City Limits. The flood protection system consists of 44,000 feet of floodwalls and earthen embankments along the river as it passes through downtown Grand Rapids, including within the project reach. (**Figure 8, Appendix C**) The remaining 41,000 feet does not require flood protection due to adjacent properties being above the 100-year flood elevation. During the most recent improvements, 5,700 feet of berm and 2,300 feet of wall were raised. Additionally, the water resource recovery facility levees were improved to provide protection up to the FEMA accreditation elevation. As such, there is very little floodplain exposure within the Project Area as the existing flood protection barriers provide 100-year flood level protection throughout the proposed Project Area. (Fishbeck 2020b), **Appendix E**. Ownership of the floodwalls and embankments along the Grand River varies throughout the City and includes public and private ownership. Dockline legislation gives the City authority to construct and maintain the flood protection system, as required by the NFIP.

In 2005, FEMA revised the 1982 100-year flood profile, increasing the required floodplain management elevation downstream of the 6th Street Dam by 2.5 feet. As such, modifications to the City's existing flood protection system have been reviewed. The flood protection system functions as a system of levees that prevents the Grand River from impacting flood prone areas during extreme floods. FEMA finalized a Levee Analysis and Mapping Procedure in January 2016 and improvements to the City of Grand Rapids flood protection system have been completed accordingly. Upgrades and rehabilitation work to the flood protection system began in 2015 and were completed in 2019. This work was done in accordance with the City's Floodwall Asset Management Plan in order to meet FEMA certification requirements. On February 28, 2020, the City submitted a floodwall certification package to FEMA. The City's flood wall certification was approved by FEMA and incorporated into FEMA's Flood Insurance Study (FIS) 26081CV001A as part of FEMA's 2023 map modernization project (FEMA 2023). FEMA's modernized FIS and Flood Insurance Rate Maps were released on February 23, 2023.

4.9 Land Use, Recreation, and Visual Resources

This section describes current conditions of land use, recreation, and visual resources in the analysis area bounded by the 6th Street Dam to the north, Monroe Avenue to the east, Scribner Avenue/US-131 to the west, and Fulton Street to the south. This includes the proposed Construction Area, as well as immediately adjacent land, recreation resources, and water access locations.

4.9.1 Land Use

Within the watershed, land use includes urban (24,192 acres), forest (13,306 acres), open land (10,886 acres), agriculture (4,998 acres), wetland (4,998 acres), and water (2,100 acres). Eighty-four percent of land within the watershed is privately owned, 15% is state or locally owned, and 1% is federally owned (GVMC 2020). Land uses along both sides of the project reach are primarily urban (93.0%), open space (6.4%), and residential (0.7%) . (**Figure 3, Appendix B**)**.** The approximately 0.2-square mile analysis area is well-connected for both vehicle and pedestrian travel. Five bridges carry vehicular traffic over the river: I-196 westbound, I-196 eastbound, Bridge Street NW, Pearl Street NW, and Fulton Street W. All except the I-196 bridges have sidewalks for pedestrians. In addition, two pedestrian bridges cross the river: the Gillett Bridge connects the Ah-Nab-Awen Park and Ford Museum to DeVos Place; the Blue Bridge connects GVSU and Grand Rapids Public Museum to the mixed-use area north of Fulton Street. The city's sidewalk system connects to the Riverwalk Trail along the riverbanks.

Zoning within the analysis area supports urban, mixed-use development. Most land is in the City Center (TN-CC) zoning district, which allows a wide range of apartment, office, commercial and public uses. The parks are in the Open Space (SD-OS) special zoning district, which is intended to preserve park-like or other natural settings. River edge property is owned by the City, private investors, and public institutions such as GVSU. The Grand River Zoning District also overlays the analysis area. As Grand Rapids' most significant natural asset, the Grand River plays an important role in enhancing the quality of life of its residents. The Grand River Overlay District is intended to capitalize on the value of the Grand River as an essential economic, recreational, and environmental resource by encouraging land use changes from industrial to open space and mixed-use development. The Grand River Overlay District seeks to introduce new development practices and land use patterns that enhances the extent to which

people can view, access and enjoy the riverfront by providing opportunities for viewsheds, easements and river access and use.

The Grand Rapids Master Plan and area-specific plans are adopted by the City's Planning Commission and City Commission and serve as a guide for zoning, infrastructure, and public investment. *Plan Grand Rapids*, the city's master plan adopted in 2002, establishes city planning and land use policies and goals. The analysis area is within and on the western edge of the relatively small area designated by *Plan Grand Rapids* as the Downtown area. The adjacent area north of I-196 is within the "Mixed Use – Near Downtown" area (City of Grand Rapids 2002, Future Land Use Map), which is intended for the retention and recruitment of public, housing, retail and office uses. *Plan Grand Rapids* establishes the policy of making the Grand River a "recreational, aesthetic, economic and historic focus of the city;" the plan recommends exploring the feasibility of "returning the rapids to the Grand River" (City of Grand Rapids 2002).

The city's area specific plan for the North Monroe Area, adopted in 2010, includes the area north of I-196 on the river's LDB (City of Grand Rapids 2007; City of Grand Rapids 2018). The plan recommends that unimproved land along the LDB be used for an extension of the riverfront park system. A 3.7-acre site at 555 Monroe Avenue was acquired by the City in 2018 and conceptual plans were developed as part of the *River for All* public engagement process for a future park providing access to the river and a variety of water-based recreational activities. The plan recommends that privately developed land in this area incorporate retail, restaurant and entertainment uses on the ground floor, a "human" scale and pedestrian interest along Monroe Avenue, and multiple opportunities for access to and views of the river.

The 2015 area specific plan for the Michigan Street Corridor foresees a potential transit node for the land bounded by Michigan Street, Monroe Avenue, I-196 and the Grand River, incorporating mixed-use development and stations for the existing Bus Rapid Transit service and a potential streetcar route along Monroe Avenue (City of Grand Rapids 2015).

Plans by other entities have goals that relate to the land uses along the Grand River:

- **River for All** was a planning effort undertaken by the City, Downtown Grand Rapids Incorporated and GRWW. Major goals include implementing the vision and direction outlined in earlier plans by designing opportunity sites and a 7.5-mile connected trail network flanking the riverfront and continuing to work with community partners to restore the Grand River, ensuring it remains a healthy, safe and vibrant resource for all to enjoy for generations to come (River For All no date). The River for All as a concept has been adopted by and is being implemented by a team of city, regional, and national partners working together to restore the Grand River and waterfront. This concept has been incorporated into the City of Grand Rapids Parks and Recreation Strategic Master Plan, amended and approved by the City Commission on January 21, 2020 (City of Grand Rapids 2020).
- **GR Forward**, a plan for downtown Grand Rapids (2015): The first goal of GR Forward is to "Reestablish the Grand River as the draw to the city and region" (Downtown Grand Rapids Inc. 2018). Downtown Grand Rapids Inc. is the management entity for the operations of the Downtown Development Authority, the Downtown Improvement District, and the Monroe North Tax Increment Finance Authority.
- **Lower Grand River Watershed Management Plan (LGRWMP)** establishes watershed goals including the improvement of sport fisheries through habitat restoration; provision of aesthetic viewscapes; and restoration of natural stream morphology and floodplains (LGROW 2011).

4.9.2 Recreation

Recreation facilities within and near the analysis area include trails for walking, running and bicycling; picnic facilities; community gathering areas; and access to the Grand River for viewing, fishing and paddle sports. The Riverwalk Trail system on both sides of the river described in Section 4.7.1 passes through and connects the parks within the analysis area. The Ah-Nab-Awen Park is a 6.5-acre park with access to the water's edge on a site once occupied by a Native American village. Ah-Nab-Awen Park contains art and interpretive markers, and hosts community-wide festivals, including July 4th fireworks and many other events. Fish Ladder Park is a public park focused on an existing fish ladder, which allows migrating fish to circumvent the powerful water flows over the 6th Street Dam. Visitors are able to watch fish jump up the "ladder" in a seasonal migration in the spring and late

summer, and the ladder is considered a piece of functional artwork. The park has a concrete emergency boat ramp and is also a popular site for fishing from the shore (Morello 2018). GVSU's Lacks Park, lies between the Grand Rapids Public Museum and the Blue Bridge. Finally, the former parking lot at 555 Monroe Avenue is used as an open space public park and special events venue. Other recreation facilities outside the analysis area provide recreational connectivity for the parks listed above. These include:

- Sixth Street Bridge Park: This park has picnic tables and provides convenient access to the river and the Riverwalk Trail system. While most of the water's edge is fenced, the park provides a water access point that is popular for fishing and boat launching (City of Grand Rapids 2017).
- Canal Street Park, immediately north of Sixth Street Bridge Park, provides access to the river's edge and contains the northernmost extension of the Riverwalk Trail system to Leonard Street (although the City's aim is to extend it further north).
- Riverside Park: two miles north of the I--196 Bridge is the largest park in the City at 180 acres; this park has three boat launches that serve as the primary launch site for Grand River access within the city of Grand Rapids.

The following city and state recreation planning documents and goals describe the current fishing and paddling sport opportunities and recommendations for future improvement.

- **2017 City of Grand Rapids Parks and Recreation Strategic Master Plan** recommends that riverfront parks be improved through "additional opportunities for water access, water-based recreation, and ecological restoration and naturalization" (City of Grand Rapids 2017).
- **Michigan Statewide Outdoor Recreation Plan 2018 – 2022**, prepared by MDNR, provides high-level guidance and recommendations for outdoor recreation and parks throughout the state. (MDNR 2018)
- **Grand River Fisheries Assessment**, from the MDNR lists options to improve fisheries including restoration of waterway functionality through dam removal and improvements to waterway access. (Hanshue and Harrington 2017).

The Lower Grand River (which includes the analysis area) supports a variety of game fish and a significant recreational fishery. As noted above, access to the river for fishing from shore is available at Fish Ladder Park and Sixth Street Park. Anglers may also fish from bridges or wade into the water from shore access locations, and boaters may access the water at the Sixth Street Bridge Park or the public boat launch at Kent County's Johnson Park (about 5 miles downstream from the Fulton Street Bridge) to fish from boats.

Areas near the fish ladder and dams where hydraulics have created deeper pools in which fish congregate provide popular locations for fishing, and the river reach immediately downstream of the 6th Street Dam is a popular fishing location. Coho and Chinook salmon migrate from Lake Michigan upstream through the Construction Area and use the fish ladder to access upper reaches of the river (ECT 2018). In addition to the popular spring and fall runs of migrating fishes, recreational fisheries exist for channel catfish, flathead catfish, smallmouth bass, largemouth bass, walleye, northern pike, and sunfishes. Angler surveys for the Grand Rapids metropolitan area, conducted by the MDNR in the spring and fall of 2003 and 2004, estimated over 46,000 angler trips to the river with a catch of 1,228 coho salmon, 5,948 Chinook salmon, 15,852 rainbow trout (steelhead), 791 brown trout, 80 lake trout, 2,473 walleye, and 2,880 smallmouth bass (Hanshue and Harrington, 2017). Section 4.5.2 provides additional information about fish species found in the Grand River in and near the analysis area.

Recreational paddling opportunities are available to a limited degree within the analysis area, and to a greater degree along other stretches of the river, although existing dams prevent safe navigation between the upper and lower reaches of the river. Hydraulic conditions created by dams are significant safety hazards that can trap or capsize boats and waders caught up in the dam hydraulics (ECT 2018), **Appendix D**. There are currently no formal river access points or amenities that encourage or promote river access from the shoreline, though public park lands and boardwalks do exist immediately adjacent to the river. Currently, the public at large can access the river via park lands in downtown Grand Rapids and enter the river with a kayak, canoe, small boat, or by foot (wading). Entering the river near a dam or navigating the river by vessel of foot to a location near a dam presents public safety hazards. To the extent members of the public know about the dangers associated with the dam, the dams likely discourage river access and use to some degree, though the exact impact is unknown.

4.9.3 Visual Resources

While the Grand River is the dominant visual element in the analysis area, the visual character of the analysis area is predominantly urban, characterized by a more or less continuous mix of transportation infrastructure, moderate to dense development, urban open space, and concrete flood walls. **Appendix C** provides photographs of the river and riverbank conditions. The 0.7-mile length of river between 6th Street Dam and Fulton Street is crossed by five vehicular bridges and two pedestrian bridges. Buildings on the riverfront vary in style, height, and bulk. While most are between two and four stories tall, the tallest structures within the analysis area, including an apartment building, hotels and mixed-use buildings, are between 20 and 35 stories tall. Architecture ranges from historic mill structures to modern office buildings and older industrial structures. Views of the river are available from the Riverwalk Trail system and riverfront parks; from open space and landscaped areas associated with the museums, university campus, and commercial buildings; from bridges that cross the river; and from upper floor, river-facing windows in surrounding buildings. Intervening development, topography, and vegetation generally block views of the river from roads that parallel the river. Parks and landscaped areas along the river provide lawns, trails, trees, parking areas and picnic facilities. The river's edge has varying landscape treatments, including vegetated banks, fencing, pathways, riprap, dense brush and trees, retaining walls, and ramps for public access.

The visual character of the river's edge is different on either riverbank. On the LDB, between I-196 and Fulton St., commercial structures are located within 30 feet of the water's edge, with concrete walkways, riprap and narrow vegetated banks occupying the riverbank. Public access to the water is generally not available, except at a paved public plaza where Lyons Street NW terminates at the river and at the Blue Bridge, which connects GVSU and the Grand Rapids Public Museum to the mixed-use area north of Fulton Street. North of I-196 to Sixth Street Bridge, the river's LDB is open land that includes surface parking, unimproved land, an electrical substation, and the Sixth Street Park. Within the analysis area, the RDB provides substantially more public open space. The landscaped areas of the Grand Rapids Public Museum, Ah-Nab-Awen Park, and Fish Ladder Park provide continuous green space along the river. Other lands on the RDB, including the GVSU campus north of Fulton Street and the mixed-use office building south of I-196, have structures and parking set back more than 60 feet from the water's edge, with vegetated banks (including walkways) 30 to 50 feet wide.

4.10 Socioeconomics

Social and economic effects of the proposed Project would occur beyond the boundaries of the proposed Project, due to the potential for job creation, river access and use, and enhanced visitor attractions. To assess these potential effects, the analysis area used for social and economic analysis is the City of Grand Rapids. For context, this section also provides information on population and economic characteristics of Kent County and the State of Michigan.

4.10.1 Population and Housing

Tables 4-4 and 4-5, Appendix C, summarize demographic data for Grand Rapids, Kent County, and the State of Michigan. Grand Rapids is the second largest city in Michigan, with an estimated 2022 population of 196,904. The city population declined by five percent between 2000 and 2010 but has increased since 2010 to its current population. The city in 2022 had 88,725 housing units and a housing vacancy rate of 5 percent. Grand Rapids is within the Grand Rapids-Wyoming Metropolitan Statistical Area, which had a total population of 1,094,198 in 2022, about 10 percent of Michigan's population (U.S. Census Bureau 2022). Within the Plan analysis watershed, the population is approximately 182,463, of which 49% are male and 51% are female; 83% are Caucasian, 10% African American, and 7% other nationalities; 90% are educated at a high school or college level; and 90% of those over the age of 16 years are employed (GVMC 2020).

Kent County, which contains the cities of Grand Rapids and Wyoming, has experienced steady population growth with an increase of 11 percent since 2000, and had a 6 percent housing vacancy rate. Michigan as a whole has had a stable population, with a net decrease of 0.1 percent between 2000 and 2017. Statewide vacancy rates (15 percent) were higher than in Kent County and Grand Rapids. Grand Rapids has a more racially and ethnically diverse population than Kent County, with about 40 percent of the population identifying themselves as minority (non-white) and/or Hispanic, compared to 26 percent in Kent County and 25 percent in Michigan. Both Grand Rapids and Kent County have a lower median age and lower proportion of residents over 65 than Michigan as a whole.

4.10.1.1 Economy

Compared with Kent County and Michigan, Grand Rapids had a lower median income and a higher proportion of people below the poverty level. In 2022, 16 percent of Grand Rapids' population had income below the federal poverty level, compared to 10 percent and 13 percent, respectively, in Kent County and Michigan. The unemployment rate in Grand Rapids was 3.1 percent, the same as the Kent County rate, but lower than the statewide rate of 4.9 percent. **Table 4-6, Appendix C,** depicts income and employment data from the 2022 American Community Survey (U.S. Census Bureau 2022).

Table 4-7, Appendix C, depicts industry employment data from the 2022 American Community Survey (U.S. Census Bureau 2022). For the employed population 16 years and older, the top industry sector in Michigan and Kent County is educational services/health care/social assistance. Other leading industries in Michigan are manufacturing and retail trade. Grand Rapids had a similar industry sector profile, except that the city had a higher proportion of residents working in education/health care/social assistance and a lower proportion of employment in entertainment, manufacturing, construction, and public administration (U.S. Census Bureau 2022).

At-place employment in the City of Grand Rapids is described as jobs located in the city, as opposed to the jobs held by city residents, who may work within or commute outside the city. In 2015, an estimated 58,000 people commuted into the city for work, with a net inflow of people to the downtown area of over 43,000 workers. Employment in the city's downtown area was dominated by two sectors: education/health services/social assistance and business/professional services. The next two largest sectors were other services and leisure/ hospitality. The Grand Rapids-Wyoming Metropolitan Statistical Area (MSA) is experiencing sustained economic growth, with a 4.1 percent increase in the MSA's Gross Regional Product between 2022 and 2023 (Bureau of Economic Analysis 2023).

Institutions important to the economic activity in downtown Grand Rapids include seven colleges and universities with combined enrollment of approximately 25,000 students; three event centers (the Van Andel Arena, DeVos Place Convention Center, and DeVos Performance Hall) that accommodate conferences, conventions, shows and performances; four museums located along or near the Grand River; as well as riverfront parkland that adds to the attractions of the downtown.

4.10.2 Public Services

The City of Grand Rapids provides water, wastewater treatment, and solid waste disposal services, as well as police, firefighting, and emergency services. Natural gas is provided by DTE Energy, while electric service is provided by Consumers Energy.

4.11 Cultural Resources and Historic Properties

Defining the Area of Potential Effect (APE) for direct and indirect effects is the first step in considering potential effects to cultural resources. The proposed Project's APE is defined for direct effects as the Construction Area and Project Area (see 1.2, Project Location and Description), and for indirect effects as areas immediately adjacent to the Construction Area within 200 feet of the streambanks, either side of the river. Indirect effects, primarily visual, were only considered for properties from which the channel modifications would be visible.

As part of the early phases of Section 106 activities, a background search for previous cultural resources surveys and reported cultural resources was conducted for the APE, on February 21, 2018 and again on December 14, 2023, , including a one-mile buffer for archaeological resources, and a 2,000-foot buffer for historic and architectural resources (**Figures 9 and 10, Appendix C**). Background research is based on information provided by the SHPO, including the Michigan Archaeological Site File. Section 7 provides a discussion of Section 106 consultations with SHPO.

4.11.1 Archaeology—Previous Surveys and Known Resources

Prior archaeological surveys and a number of previously recorded archaeological sites were identified within the 1-mile buffer. One site is partially within the updated direct APE; however, the mapped location is based on historical reports and has not been field verified. The NRHP eligibility of the other sites noted below has not been determined. The potential for isolated human burials and undocumented cemeteries was also considered.

According to the site files, none of these sites are located in the direct APE. Given the location within an urban center, the upland portions of the Project Area have been developed, resulting in extensive soil disturbance; however, additional (unrecorded) archaeological resources could be present beneath historic or modern constructed surfaces and fill. Consultation with SHPO, the public, and federally recognized tribes has determined that NRCS' unanticipated discovery plan would address this potential within the direct APE, should ground-disturbing activities for the proposed Project reach a depth that could disturb intact archaeological deposits. Consultation with federally recognized tribes has been undertaken by NRCS and is summarized in Section 3.3 (Scoping) and Section 7.

4.11.2 Architecture—Previous Surveys and Known Resources

Seven architectural reconnaissance surveys and nine intensive architectural surveys have been completed near the proposed Project. A total of 39 architectural resources that are listed in the NRHP, recommended as eligible for listing, or have achieved status as a locally designated landmark with national significance are within the indirect APE and/or the 2,000-foot buffer, including six historic districts or extensions of historic districts (**Figure 10, Appendix C**). GRWW and the City have been considering community input throughout their project design.

4.11.3 Field Reconnaissance

On November 6, 2018, Eric Scuoteguazza (ERM archaeologist) and Danielle McKissic (ERM architectural historian) accompanied Duane Quates (NRCS State Archaeologist) on a scoping field view of the Project Area to gain an understanding of the project's potential to effect significant cultural resources, including known resources.

The field view identified previously recorded resources as well as new resources and noted that numerous known cultural resources are located within the indirect APE, including structures and districts that are potentially eligible for listing on the NRHP. Based on the nature of the proposed Project, relatively little viewshed change is expected as a result of the undertaking. For these reasons, resources under consideration to be potentially affected by the proposed Project were restricted to those immediately adjacent to and abutting the proposed Project. Both previously recorded and as yet unrecorded resources that met the age threshold (50 years or older) within this potential visual effect area during survey were considered. During the field view, the properties below were considered to fall within the parameters described above (**Table 4-8, Figure 10; Appendix C**).

The November 2018 field view included an above-ground reconnaissance-level architectural resource survey. The field view team attempted to locate and photograph all previously recorded historic properties adjacent to the proposed Project to validate the reported location and condition and to determine whether the Construction Area was visible. The above-ground survey also included documentation of newly identified above-ground resources. For the resources recommended as eligible or ineligible in **Table 4-8, Appendix C**, evaluation of eligibility is based on field survey observations and subsequent research.

Three previously recorded resources (P23718, P23733, and P51124) were identified within the indirect APE prior to the field survey. The three previously identified resources were re-located, documented, evaluated, and found to be significant under NRHP criteria. These consist of one hotel (P23733), one commercial building (P23718), and one bridge (P51124). Of these resources, P23718 is listed on the NRHP. Resource P23733 is recommended eligible for listing on the NRHP. Field observations support that P51124 is eligible for listing on the NRHP, as per SHPO staff recommendation. While these resources are adjacent to the proposed Project, SHPO concurred that there would be no adverse effects on these resources due to a lack of visual change, as well as to a lack of physical changes that could affect resource integrity.

Sixteen new resources were identified during the field view (**Table 4-8, Appendix C**). These resources consist of six buildings (DM 1, DM 2, DM 3, DM 4, DM 7, DM 8), four bridges (DM 9, DM 11, DM 12, DM 13) one historic resource associated with the Grand River (DM 14), one riverwalk (DM 15), and four low-head dams (DM 16, DM 17, DM 18, DM 19). Of these resources, SHPO concurs that ten are considered ineligible for listing on the NRHP. Resources DM 11 and DM 12 are recommended eligible for inclusion on the NRHP; however, due to lack of visual change from the Proposed Action, SHPO has concurred that there would be no adverse effects on these two resources. Any visual effects of the proposed Project are limited to the Grand River channel and properties adjacent to the Project Area. NRCS determination of NRHP eligibility.

On December 17, 2020, SHPO requested a formal eligibility study of the four low-head dams to be removed by the proposed Project (DM 16 through DM 19) (**Appendix E**)**.** NRCS provided the requested study to SHPO on March 4, 2021, with the finding that the four low-head dams are eligible for listing on the NRHP, and that their removal is an adverse effect. A letter from SHPO accepting this finding and clarifying the applicable eligibility criteria was provided on March 23, 2021. In discussion with NRCS, SHPO requested that NRCS incorporate local input into mitigation plans. NRCS developed and executed a MOA in September 2022, describing the chosen mitigation and how it would be implemented. NRCS, SHPO, Michigan Strategic Fund, City of Grand Rapids, GVMC, and GRWW are signatories of the MOA.

NRCS submitted additional updated information in 2023 (**Appendix A**) to reflect updates to the plans for the proposed Project alternative. The most recent January 18, 2024 letter from SHPO provided concurrence of no archaeological properties affected in the APE of this undertaking and restated earlier concurrence provided March 23, 2021.

4.12 Public Health and Safety

This section describes existing public health and safety conditions within the Project Area.

4.12.1 Existing Dam Safety Concerns

Existing conditions at the low-head dams located in the Project Area contain a high degree of safety concerns in the form of "recirculating hydraulics and deep holes that are not visible due to uniform hydraulics." (EcoAnalysts 2024). Recirculating hydraulics created by low-head dams can trap recreators and large debris in their currents. Because these dams span the entire width of the river, there is no nearby still water that could provide refuge, making it more difficult for a person caught up in the current to break free; rescuing people trapped in the low-head dam hydraulics is dangerous and often unsuccessful. (ODNR, 2019).

Across the country low-head dams have earned the moniker "drowning machines" because of the significant risks they pose to boaters and water users. The Ohio Department of Natural Recourses (ODNR) specifically says these dams are dangerous to boaters because:

- Dams are difficult to spot from upstream and often are not marked by signs or buoys.
- Dam hydraulics are unpredictable.
- Dams can deceive even experienced boaters.
- The concrete walls at the side of the dam face block the exit route for individuals trying to escape.
- Areas immediately downstream also present risk as the water is flowing upstream.
- Rescuing trapped individuals is dangerous and often unsuccessful.

Hydraulics created by the four low-head dams have contributed to multiple rescue and recovery operations over the years. Due to strong currents found at the base of each of the dams, safety risks are present to boaters and anglers. The Grand Rapids Fire Department responds to an average of 15.6 water rescue incidents per year within its jurisdiction along the Grand River (**Appendix E**). Records do not identify which of the incidents are related to the dams but the dams present the most hazardous conditions in the river aside from deep water.

From 2019-2023, there has been a steady increase in the number of water rescues recorded in the Grand River; from 11 to 20 annually (**Appendix E**). During the same timeframe, the Grand Rapids Fire Department recorded the following water-related incidents within the region:

- 78 reported incidents, including:
    - 11 non-issue incidents, 20 civilian injuries, 43 rescues, and 4 civilian deaths

4.13 Urban Dynamics

According to the United States Census Bureau 2022 population estimate, the City of Grand Rapids is characterized by a population of just under 200,000 residents. The City of Grand Rapids is central to the Grand Rapids-Wyoming MSA, with a population of nearly one million people. The City has been growing at an accelerated rate relative to West Michigan as a whole, with the population increasing annually over the last 5 years, compared to just 0.7 percent for West Michigan.

Forces that formulate and reshape cities over time happen as gradual and natural processes or as coordinated government actions. The first people, Native Americans, used the river for transportation and a source for food. Over the course of the last 200 years, the landscape and focus of the City of Grand Rapids changed dramatically through its evolution into a settled logging community, a renowned producer of furniture and other industrial operations, and more recently as a service-oriented economy. The original Grand River rapids were removed, and the 6th Street Dam and subsequent low-head dams were installed to facilitate the City's evolution and needs over time. However, these needs have changed, and the aging low-head dams no longer provide the City or community a service, therefore rendering them unnecessary. While its uses have changed over time, the River remains an integral part of the psyche and personality of the City of Grand Rapids.

In 2015, after an extensive and inclusive public engagement process, which included input from more than 4,400 citizens, businesses, institutions, developers and other stakeholders, the strategic GR Forward Downtown & River Action Plan (Plan) for downtown Grand Rapids and the Grand River corridor was released. The implementation of this Plan is managed in conjunction by the City of Grand Rapids, Downtown Grand Rapids Inc., and the Grand Rapids Public Schools; its intent is to guide strategic and tactical decisions over the next decade to transform Grand Rapids. (GR Forward, 2015). The two areas of focus are the downtown area encompassing the commercial and residential neighborhoods nearby to the Project Area, and the River corridor. The River corridor portion of the Plan "reimagines the lands along the river front and how [the public] interacts with the Grand River itself." (GR Forward, 2015). The area immediately surrounding the Project Area is mixed-use combining residential, commercial, and industrial uses. People gather in public parks and a recreational path along the banks of the Grand River to participate in public events, run, walk, bike, fish, and picnic. Patrons visiting the museums and restaurants located adjacent to the River appreciate the ambience and view provided by the flowing water. The Plan identifies the need to invest in local K-12 schools, retain and grow job opportunities, support community diversity, and provide a mixture of housing options, including affordable housing.

The community today better understands the need to protect this valuable water resource and is a driving force behind public support for restoration of the River to improve habitats and water quality; and the public desires the integration of the River as a natural resource available for locals and visitors alike. Regional, state, and national entities have teamed up to form the partnership, River for All, and are working together to restore the Grand River and waterfront, ensuring that it remains a healthy, safe, and vibrant resource for all to enjoy; a natural asset, public space, equitable neighborhood connector, and healthy ecological system, connecting and uniting current and future generations.

Today, the river is used as an educational tool through programs offered by local schools and non-profits, such as LGROW Environmental Education programs, GRWW's Summer Science & Leadership Program, GRPS's Grand Paddle Experience, and the Grand Rapids Public Museum's Summer Camps.. Stewardship events like WMEAC's Annual Mayors' Grand River Cleanup have been happening for almost 20 years. Along the banks of the river, Downtown Grand Rapids, Inc. has hosted Movies in the Park at Ah-Nab-Awen Park for three years and recently moved to 555 Monroe, an under-utilized lot and future community park location. Grand Rapids Art Museum features exhibits inspired by the Grand River, including the past exhibit "Flow" by Maya Lin. The Annual ArtPrize event, which draws thousands of people to downtown Grand Rapids , has frequently staged art exhibits in and along the River. The central location of the Project Area within the urban core affords the convenience of walkability and readily available bus lines and parking areas. The city has already begun work along the Riverwalk installing permanent exercise equipment and expanding bike lanes to connect to regional trails.

5. ALTERNATIVES

Alternatives considered for detailed study included the Proposed Action and a No Action Alternative. Several other alternatives were initially considered but subsequently eliminated from further study as described in Section 5.2. As stated in Section 2, the purpose of the proposed Project is to restore the rapids, improve public safety, restore aquatic habitat diversity and suitability for native Great lakes fish, and enhance river access and use in the Grand River. Under PL 83-566, the project is intended to provide benefits to Public Fish & Wildlife. The alternatives have been assessed regarding their alignment with that defined Project purpose.

5.1 Alternative Formulation Process

The proposed Project location places constraints on the complete restoration of the river to pre-development conditions due to existing infrastructure and public uses and limits the number of alternatives that would meet the project purpose. Multiple project alternatives were considered and vetted with agencies to determine if they were feasible and prudent. The primary considerations included project purpose, flooding, scale of effects, threatened and endangered species, and fish passage. Alternatives were evaluated to determine the relative benefits and detriments of removing the dams and enhancing the rapids habitat and function within the existing planform, see **Table 5-1, Appendix C**. The alternatives considered represent different channel configurations that result in varying degrees of effects to the riverbed, infrastructure, fish, and mussels.

5.2 Alternatives Eliminated from Detailed Study

Alternatives that did not align with the proposed Project purpose and need, would not likely meet fish passage requirements, involved other unacceptable environmental effects that would have prevented permitting, or were not feasible due to site constraints have been eliminated from detailed study and are not carried forward. An overview of these alternatives is provided below.

5.2.1 Removal of the Low-Head Dams Only

One alternative considered but subsequently eliminated from detailed study consisted of removing the low-head dams only and not adding any substrate to enhance habitat or distribute the hydraulic gradient otherwise controlled by the four dams. Removal of the four low-head dams would reduce or eliminate public safety hazards related to these features and result in the minimum area of aquatic habitat that would be directly affected; however, without substrate enhancement, the removal of these features alone would not distribute the gradient of the reach along the project reach in a controlled manner. Bedrock and glacial boulder that remain in the Project Area could be exposed; however, much of the boulder material was removed and some of the bedrock mined in the 1800s. Existing habitat and infrastructure could be negatively affected by excess scour and bed erosion. Due to the decrease in wetted surface and increased current velocity, the area of suitable mussel habitat would likely be substantially reduced. Due to high flow velocities not otherwise controlled by grade adjustments, fish passage and water-based recreation could be limited or negatively affected. Because this alternative would degrade existing habitat, impede fish passage, and potentially damage infrastructure it would not meet the proposed Project purpose and was not considered further.

5.2.2 Substrate Enhancement with No Dam Removal

Another alternative considered was to perform substrate enhancement within the Construction Area but not remove the low-head dams. Substrates could be used to increase tailwater downstream of the dams to create fish passage by submerging the dams and to improve habitat diversity between the dams. This alternative would not fully meet the purpose of enhancing habitat diversity, as the natural flow regimes altered by the existing low-head dams would remain disrupted (i.e., decreased channel slope and habitat diversity between the dams). It would also fail to meet the purpose of reducing public safety hazards. It would likely increase the 100-year Base Flood Elevation set by FEMA and increase tailwater elevation at the 6th Street Dam thereby decreasing its effectiveness at preventing Sea Lamprey passage. Because the existing dams are the primary cause of habitat degradation, safety concerns, and fish passage blockage, any alternative not involving dam removal could not fully meet the purpose of this project and may have unacceptable negative consequences. Therefore, this alternative was eliminated from further detailed study.

5.2.3 Restoration of Original Rapids to Former Natural Conditions

Restoration of the rapids to historic conditions was considered but subsequently eliminated from further detailed study. The river in downtown Grand Rapids is currently confined to an armored channel and is approximately half of its estimated natural width. In addition, major developments along both sides of the riverfront render an expansion of the current channel width or restoration of a natural planform infeasible. As such, this alternative is not feasible and was eliminated from further detailed study.

5.2.4 Dam Removal with Substrate Enhancement and Whitewater Recreation

Under this alternative, a series of four boulder drop structures with connected riffles were considered to control the hydraulic grade after dam removal with substrate enhancements between them. In addition, rock vanes along

the edge of the channel would protect river access points. Of the total 31.5-acre project area, this option would affect 22 acres, nearly two-times the area of the preferred alternative (EcoAnalysts 2024). This alternative was vetted with the Michigan Department of Environment, Great Lakes, and Energy (EGLE) under a Joint Permit Application that has since been withdrawn by the City. EGLE indicated during the preliminary JPA review and meetings with the City that the alternative was not acceptable due to fish passage concerns and the extensive disturbance to bottomlands of the Grand River. Therefore, it was not considered further under this Plan-EA.

5.3 Proposed Action

The Proposed Action was developed to avoid and minimize environmental effects during multiple consultations with EGLE and MDNR intended to ensure fish passage goals are met, while, while also ensuring the project would not indirectly affect effective blockage of Sea Lamprey (*P. marinus*) at the 6th Street Dam by raising the tailwater elevation (the Proposed Action and PL566 funding would not directly alter or address Sea Lamprey blockage at 6th Street Dam otherwise). Under the Proposed Action, the four dams would be removed. Hydraulic gradient would be controlled, fish passage improved, and aquatic habitat enhanced. Specific restoration activities include riverbed grading, installation of boulder arch structures, constructed riffles, emergent habitat boulder fields, and bank vanes. Specifically, these features would be used to restore habitat in conjunction with dam removal as summarized below.

- Downstream of Pearl St. – Install emergent habitat boulders and bank boulder vane structures;
- Dam 1 (upstream Pearl Street)– remove Dam 1, install a constructed riffle, and install emergent habitat boulders;
- Dam 2 (upstream Gillette Street) – remove Dam 2, install three boulder arches, and install a constructed riffle on west side, constructed riffle east side, and emergent habitat boulders;
- Dam 3 (downstream Bridge Street) – remove Dam 3, grade the existing bed, and install emergent habitat boulders between the former dam and Bridge Street; and
- Dam 4 (upstream Bridge Street) – remove Dam 4, grade the existing bed to maximum 184 feet upstream.

The Proposed Action would meet the project need and purpose of benefiting Public Fish & Wildlife by accomplishing the following objectives.

1) Would allow native riverine and potamodromous fish species to migrate freely between the reach of the grand River downstream of Fulton Street and the 6th Street Dam.
2) Would increase habitat diversity and suitability and abundance and diversity of macroinvertebrates and freshwater mussels.
3) Would ensure the conservation of freshwater mussels by improving habitat and increasing abundance of their fish hosts.
4) Would improve recreational fishing due to increased fish stocks.
5) Would remove the recirculating hydraulics at the four dam structures by removing the dams above the existing streambed.
6) Would allow users to freely navigate upstream and downstream via kayak, canoe, small boat, or wading with the physical obstacles or hazards the dam presents.
7) Would accomplish the purpose of improving Public Fish &Wildlife while not increasing flood risk; not indirectly impacting the effectiveness of the 6th Street Dam as a sea lamprey barrier; not impacting existing infrastructure; and while minimizing environmental impacts.

Eleven acres of the 31.5-acre Construction Area (**Figure 2, Appendix C**) from approximately 300 feet upstream of Bridge Street to the upstream edge of Fulton Street would be directly disturbed by temporary construction activities (EcoAnalysts 2023). Temporary construction activities would consist of aggregate causeways constructed along the banks and across the channel for construction equipment access to the dams and habitat improvement areas and a flow isolation area at Dam 2. Additionally, temporary scour protection would be installed at the Gillett Bridge pilings while the isolation measures at Dam 2 are in place. All of the temporary access causeways, isolation measures, and bridge scour protection would be removed once construction is complete. A total of 6.1 acres of the bed would be affected and altered by dam removal, bed grading, and installation of habitat features above. Predicted effects of the Proposed Action on mussels and their habitat are quantified in Table 5-4 of the BA, **Appendix E**. Collaboration with agencies has resulted in a project that improves aquatic habitat and river access

and use, while minimizing direct effects to the river bottom, fish, and mussels; ensuring fish passage; and maintaining tailwater at 6th Street Dam for effective Sea Lamprey blockage.

5.4 No Action Alternative

The No Action Alternative provides a baseline perspective for comparing the effects of the Proposed Action alternative against existing conditions. The No Action alternative would not accomplish the project purpose but also does not affect the environment. It is a fundamental consideration when evaluating alternatives. The current conditions would persist, including the four low-head dams and associated fish passage barriers and public safety issues. Habitats degraded by the dams due to scour or backwater would remain degraded and habitat improvements would not be realized. Likewise, the recreational improvements would not be realized. No mussels, aquatic habitat, or fish would be directly or indirectly affected by construction activities or installed works. The existing dams would continue to deteriorate, and partial failures of the structures could lead to unintended and uncontrolled sediment mobilization, further habitat degradation, and eventual removal or repairs.

5.5 Preferred Alternative Estimated Construction Costs

Estimated installation cost is $22,053,391 as summarized in **Table 8-3, Appendix C** Estimated Installation Cost. This table also includes a further breakdown of costs by major work type. These costs include all direct expenditures on construction including low-head dam removal and construction of aquatic habitat features.

5.5.1 Cost Sharing

As shown in **Table 8-4, Appendix C**, Sponsor and partner contributions include $11,026,696 of cost sharing. This includes both public and private funds.

5.5.2 NED Account Information

As defined in the National Watershed Program Manual, 501.11 B. (2), “non-water-resource project plans must be formulated in accordance with Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G) procedures, but a National Economic Development (NED) alternative is not required. The recommended alternative plan must be the least costly socially and environmentally acceptable method of achieving the agreed-upon level of resource protection.”

6. ENVIRONMENTAL CONSEQUENCES

An impact analysis of the alternatives was conducted to evaluate the environmental consequences. Environmental outcomes were evaluated for positive and negative consequences. Environmental were evaluated for positive and negative consequences. The impact analysis was conducted in accordance with the Watershed Program Manual using significance criteria. as shown in **Table 6-1, Appendix C**. To determine significance, the magnitude and probability of effects were considered. As part of that evaluation, the magnitude (or intensity), duration, and extent of positive and negative effects were considered. Magnitude considered the degree of the impact on the resource, its functions, and the services it provides to users and society. Probability considered whether an effect would be realized and how probable it would be. For some resources, probability of effects is definite. Duration considered the length of the effect on the resources, its functions, and its services to users and society. Construction-related impacts, for example, would most likely be temporary as they would only occur during construction.

The cumulative effects assessment in this Plan-EA considers such actions that have already resulted in or would likely result in meaningful effects to the same resources that would be affected by the proposed Project. Since past actions are primarily considered in the aggregate to have led to the current conditions of each resource, the effects of past projects/actions near the Project Area have been taken into consideration in describing the affected environment of each resource. As a result, specific past projects are not described in the cumulative effects assessment, except for very recent past projects to which the environment is still responding (CEQ 2005). The geographic area included in the cumulative effects assessment varies depending on the resource potentially affected. For example, the Project Area effects related to air or noise effects extends a short distance beyond the Project Area; however, the Analysis Area of potential effects on aquatic species includes a larger geographic area in the Grand River, including the mussel recipient sites and their immediate surroundings.

The cumulative effects assessment presented in this Plan-EA considers as reasonably foreseeable any proposed future actions that meet one or more of the following criteria: funding is in place, a NEPA analysis is underway, permit applications have already been submitted, or discussions with associated governmental agencies indicate that the project is likely to occur. Various sources including local, state, and federal agency websites and city and county staff were consulted to obtain information about current and potential future development in the geographic analysis area for cumulative effects. This is a standalone project and is not dependent on any of cumulative actions described in **Table 6-8, Appendix C** in order for it to be successful. The environmental consequences of each resource identified in Section 4.0 are so evaluated in the following sub-sections, describe expected effects to the resources based on duration, extent, and magnitude of the effect, whether positive or negative.

6.1 Air Quality and Noise

6.1.1 Project Activities Generating Effects

Once constructed, the project would not affect air quality or noise as it is a natural, self-maintaining river system with minimal operation and maintenance requirements aside from routine inspections,, which would generate noise and emissions similar to the current urban environment. The Proposed Actions would not alter the river in a way that causes it to affect air quality or generate more noise than existing conditions. Construction activities could cause temporary effects to air quality and noise and are discussed below.

6.1.2 Description of Effects

This section describes how construction of the proposed Project would temporarily affect ambient air quality and noise during construction and compares those impacts for the No Action and Preferred Alternative.

6.1.2.1 No Action Alternative

No construction activities would occur under the No Action alternative. Therefore, the No Action alternative would not have any temporary effects on air quality or noise from construction activities. If one or more of the dams were to fail in the future or have a partial uncontrolled breech, the City may need to take actions to temporarily stabilize, repair them, or protect other infrastructure. Those activities would require construction and generate construction related noise and emissions. However, the degree would be negligible compared to the Proposed Action and not substantially different than construction projects and vehicular traffic that are routine in the urban environment of Grand Rapids.

6.1.2.2 Proposed Action

This section examines effects of the Proposed Action on ambient air quality and the noise environment within the Project Area.

Air Quality - During construction, fugitive dust may be generated from offloading aggregates, operating equipment in staging areas and on access routes/causeways, and moving aggregate materials from stockpiles to construction areas. Stone aggregates are typically lightly coated in rock flour or silt. The coating can be disturbed, dispersed into the air, and distributed by wind. **Tables 6-6** and **6-7, Appendix C**, outline any potential impacts under the Proposed Action.

During construction, operation of construction equipment using diesel fuel and gasoline will intermittently create emissions for a period of approximately eight months. Use of construction equipment that consumes fuel is unavoidable for a large-scale construction project of this nature. The emissions generated would be similar to any other construction of a similar scale including highway and building construction projects in the City. Air emissions would be temporary with negligible contribution to atmospheric air pollution locally. Therefore, the effect would be negligible.

Noise - Operation of construction equipment and offloading of aggregates would generate noise during construction. **Table 6-2, Appendix C**, provides a list of typical construction equipment and their typical noise levels at 50 feet. Increased noise would only occur during active construction hours in accordance with the City's noise ordinance. Noise generated by construction would be similar to ambient noise levels caused by road traffic and other construction projects in the City that may be running concurrently. They would also be intermittent during

those active construction times. **Tables 6-6** and **6-7, Appendix C**, outline any potential impacts under the Proposed Action. Construction will generate noise. The noise impact would be temporary with negligible magnitude. Therefore, the effect on ambient noise levels would be negligible.

6.1.3 Mitigation Measures

During construction, the construction contractor would be required to apply water to stockpiles, staging areas, and access routes. Applying water would increase adhesion of dust particles with the surface of aggregates and minimize fugitive dust during loading and unloading aggregates and operating equipment over aggregate surfaces. This Best Management Practice would minimize air quality effects. The effect of construction noise would be minimized and mitigated by limiting construction hours pursuant to the City's noise ordinance. While there is no effective way of reducing the noise associated with operation of construction equipment and handling of aggregates, the City's noise ordinance would minimize and mitigate its effect on people.

Emissions from burning fossil fuels can be minimized with the use of construction equipment that is properly maintained and in good working order. Emissions can also be minimized by using some smaller construction equipment and generators that operate on propane.

6.1.4 Cumulative Effects

Because the air quality and noise effects only occur during construction, they only contribute to cumulative effects associated with other projects occurring simultaneously that also affect air quality and increase noise in the urban environment. Reasonably foreseeable future projects and activities are listed in **Table 3-2, Appendix C**. It is not currently known if any of those projects would affect air quality or noise simultaneously with construction of the Proposed Action. However, if one more did occur simultaneously, it would be similar to the current urban Grand Rapids environment in that there are typically multiple commercial development or road and highway improvement projects ongoing during a typical construction season. Therefore, the Proposed Action, in conjunction with any reasonably foreseeable future projects with simultaneous construction activities, would result in minimal degradation of air quality or noise compared to the existing urban environment of Grand Rapids and it would be temporary.

6.2 Climate Change

6.2.1 Project Activities Generating Effects

Once completed, the Project would not cause changes in climate as it does not contribute to greenhouse gas emissions and the river would continue to cycle nutrients, carbon, and gasses as it does under existing conditions, if not more effectively as natural river systems do. During construction, greenhouse gas emissions would increase during the six months of construction due to the use of construction equipment that burns fossil fuels. The effect of construction activities on climate change is discussed in this Section.

6.2.2 Description of Effects

6.2.2.1 No Action Alternative

No construction activities would occur under the no-action alternative. Therefore, the No Action alternative does not involve construction activities that would contribute to climate change. Given the four dams are deteriorating, it is ;possible one or more could partially fail or breach. If one or more partially failed or breached, the City may have to repair or protect infrastructure, which would require use of equipment that burns fossil fuel. However, effects would be very temporary, magnitude negligible, and probability low. Therefore, the effect would be negligible.

6.2.2.2 Proposed Action

Operation of construction equipment during construction would require burning of fossil fuels and emission of greenhouse gases. The effect would be permanent and highly probable (CO_2 emissions will occur during construction), but the magnitude negligible (overall contribution to CO_2 in the atmosphere would be immeasurable and imperceptible). Despite the potential global extent, the significance would be negligible given the negligible magnitude of the change in atmospheric CO_2.negligible magnitude the change in atmospheric CO_2

6.2.3 Mitigation Measures

There are currently no feasible alternatives for powering construction equipment for large scale construction projects other than diesel fuel. Therefore, greenhouse gas emission during construction is unavoidable. However, it can be minimized by equipment manufacturing regulations and proper equipment maintenance.

6.2.4 Cumulative Effects

Reasonably foreseeable future projects and activities considered in this analysis are listed in **Table 3-2, Appendix C** The effects of noise are not cumulative except to the extent they occur in the same space and increase noise volume or duration. Other reasonably foreseeable future projects that occur concurrently and in close proximity are likely to generate a similar noise level and occur on the same day of the week and time of the day. Therefore, they would not likely generate a greater noise volume or duration. Construction projects generate noise during operation of equipment and handling of materials. Once that activity stops, the noise no longer exists and does not add to other reasonably foreseeable future projects that are not occurring at the same time or in the same space. Emissions of CO_2 during construction due to burning fossil fuels could contribute to climate change as the total CO_2 in Earth's atmosphere is cumulative. However, the greenhouse gas emissions would be unavoidable and, minimized and magnitude negligible. Therefore, cumulative effects would be negligible.

6.3 Soils and Geology

6.3.1 Project Activities Generating Effects

The Proposed Activities will mostly occur within the channel of the Grand River where terrestrial soils are not present, but fluvial sediments are present. Fluvial sediments are the sediments that make up the bed of the Grand River and are normally or periodically transported and stored along and on the riverbed. Soils adjacent to the channel where construction staging and access are proposed would be disturbed. The project would not affect soils or geology as discussed below, but would affect fluvial sediments.

6.3.2 Description of Effects

6.3.2.1 No Action Alternative

The No Action alternative would not involve construction activities or any alteration to the existing channel or riparian zone along the Project reach. Therefore, the No Action alternative would not affect soils or geology.

Fluvial Sediments - Sediments stored on the bed of the Grand River include sand, gravel, cobble, and silt. Rivers normally store these materials on their beds and they are intermittently transported, especially during high-flow events. Therefore, fluvial sediments are not stable – they are ever changing, though portions of rivers beds are typically compromised of one type or the other based on predominant hydraulics. The No Action alternative would not change the type of sediment present in some portions of the riverbed or how fluvial sediments are transported because the channel morphology and flow regime will not be altered. However, a potential failure or partial breach of one or more the dams, would alter sediment transport potential and the type of sediment stored on the bed upstream and downstream of the failure/breach. A failure and/or breach of one or more of the dams would cause an uncontrolled change in sediment transport potential compared to the Proposed Action, which plans and directs those changes in a predetermined and stable manner to improve habitat. A failure and/or breach could cause erosion of the bed upstream and downstream and deposition on the bed downstream. Such changes could affect infrastructure if they occurred along a flood control wall or near a bridge.

6.3.2.2 Proposed Action

Soils - The only land-based activities associated with the Proposed Action that would affect soils are staging and river access immediately adjacent to the river. Materials would be stored and equipment operated over those surfaces, which poses the potential to cause soil tracking, soil erosion, and soil compaction. Soils and geology in the project reach, including the riparian zone, are highly altered by more than a century of urban development and infrastructure development. Therefore, such effects would not affect the soil value with the exception of landscaping. It is possible that growing trees, grass, and plants could be negatively affected if soils are compacted. This is not desirable given the staging and access routes are located in open park spaces where landscaping is desirable.

None of the soils classified as Farmland of Unique Importance, Farmlands of Local Importance, or Prime Farmland within proximity of the Project Reach (**Figures 1B and Figure 2, Appendix B**) are viable farmlands that would contribute to agricultural production in the Plan-EA sub-watershed or State of Michigan. Furthermore, the Proposed Action will not impact those classified farmlands because all direct impacts will occur within the channel of the Grand River or immediately adjacent to it (staging and access) where no classified farmlands exist. The classified farmlands located downstream of the Project Reach on Jackson Island and the floodplain of the Grand River are not viable farmland. However, impacts were evaluated nonetheless given they are exposed to flow from the Grand River. The Proposed Action will not alter the hydraulics of the Grand River downstream of Fulton Street and does not alter the hydrology of the Grand River. Therefore, the Proposed Acton will not increase the potential for increased flooding or erosion of the classified farmlands downstream of the Project Reach.

Fluvial Sediments - Sediments stored on the bed of the Grand River include sand, gravel, cobble, and silt. Rivers normally store these bed materials and they are intermittently transported, especially during high-flow events. Therefore, fluvial sediments are not stable – they are ever changing, though portions of rivers beds are typically compromised of one type or the other based on predominant hydraulics. The Proposed Action will change the type of sediment present in some portions of the riverbed and how fluvial sediments are transported. Removal of the dams will increase bed and water surface slope, which increases sediment transport potential. In addition, cobble and boulders will be added to the bed to create riffles and boulder arches intended to control riverbed grade and create stable sediment transport hydraulics. These changes, however, are not an impact. Instead, they are designed to improve habitat diversity and create hydraulics that are conducive to fish passage. Once implemented, the changes in fluvial sediment storage and transport would create stable bed forms, allow fish passage, and create more diverse aquatic habitat. Such changes would improve aquatic habitat in the Grand River.

Geology - While some of the dam removal, arched boulder installation, riffle construction, and riverbed grading may result in contact with the underlying exposed bedrock during construction by either placed materials or construction equipment, those construction activities would not destabilize or unearth bed rock. The Proposed Action does not include removal or excavation of bed rock. Therefore, impacts to bedrock geology are negligible or unearth bed rock. The Proposed Action does not include removal or excavation of bed rock. Therefore, impacts to bedrock geology are negligible Staging and access adjacent to the river (i.e., land-based activities) would) would only have surficial soil effects and would not alter underlying soil strata or glacial deposits.

6.3.3 Mitigation Measures

Effects to soils would be minimized and mitigated by applying aggregates over the existing soil surface within land-based staging areas and access routes. An aggregate base would distribute loads, thereby reducing soil compaction, prevent soil erosion, and minimize soil tracking on equipment tires and tracks. Following construction, aggregates would be removed, soil returned to the original grade, and turf grass reseeded to stabilize soils and so that landscaping can be restored and future park improvements would be successful.

6.3.4 Cumulative Effects

Table 3-2, Appendix C, lists reasonably foreseeable future projects that could also affect soils and geology along the Project reach. Given the Proposed Action would not affect geology, it would not contribute to potential cumulative effects on geology even if other projects may. Given potential soil effects would be very localized, the only way cumulative effects could occur to soils within the land-based staging and access areas would be for a foreseeable future project to effect those same soils. The City of Grand Rapids does have some park improvements planned. However, landscaping associated with those projects would likely improve soils conditions due to deep rooted native trees and plants that improve aeration and soil microbe health. In addition, soil effects associated with the Proposed Action are minimal and would be mitigated. Therefore, cumulative effects to soils in the land-based staging and access areas are not expected, see **Tables 6-6 and 6-7, Appendix C**.

6.4 Water and Riverine Resources

6.4.1 Project Activities Generating Effects

The Proposed Action includes the removal of four low-head dams that are located in the Grand River, grading of the riverbed, and installation of boulder arch structures, constructed riffles, emergent habitat boulders, and bank vanes. These components of the project would all result in modifications of the water environment and river

resources of the Grand River. In addition, temporary causeways, isolation measures at Dam 2, and scour protection at Gillett Bridge would be installed to allow construction equipment access into the river and work areas and protect the bridge pilings during construction. These temporary construction activities would impact the bed of the river during construction but would be removed following construction and would not have permanent impacts on the water environment or riverine resources.

6.4.2 Description of Effects

6.4.2.1 No Action Alternative

Under the No Action alternative, the Grand River would not be altered or modified and there would be no temporary effects associated with construction. The four low-head dams would not be removed but are in various states of deterioration. Without removal, repairs, or reconstruction, the dams would continue to deteriorate. Their continued deterioration and eventual failure could negatively affect habitat quality due to bed scour or sediment deposition. Furthermore, an uncontrolled failure or partial breach of one or more dams could impact one or more of the bridges that cross the Grand River, requiring measures to protect infrastructure, repair the dams, or temporarily stabilize the dams, activities that would negatively affect habitat and aquatic organisms.

6.4.2.2 Proposed Action

The Proposed Action would likely affect the water environment and riverine resources. Most effects would be temporary and related to construction activities. However, permanent changes to the bed and water surface profile would occur, though those changes represent an overall improvement in habitat quality and river resources. These changes and effects are discussed below, and outlined in **Tables 6-6 and 6-7, Appendix C**.

Existing In-stream Structures - In addition to the four dams, there are five bridges that cross the Grand River within and immediately upstream and downstream of the Project Reach. The Proposed Action includes removal of the four dams above the riverbed from bank-to-bank. The dams are impacting river habitat and fish passage and causing public safety concerns due to their hydraulics. The dams do not have a useful purpose and are in a state of disrepair. The dams are in various stages of degradation and failure and could fail resulting in partial breaches. Failures of the structures could cause bed erosion and sedimentation, leading to habitat impacts, and could damage infrastructure. Their removal as part of the Proposed Action would improve the Grand River and protect the existing bridges whereas a failure could damage infrastructure. The placement of temporary flow isolation measures at the west end of Dam 2 will cause an increase in flow velocity at Gillett Bridge, which could increase scour at the piling footings.

Flow Regime - In terms of discharge and flow frequencies, the Proposed Action would not alter flow regime. Hydraulics would be altered temporarily during construction by the installation of access causeways and isolation measures at Dam 2. Once removed, those temporary construction access activities would not impact or alter hydraulics. After the dams have been removed and boulder arches, riffles, emergent habitat boulders, and bank vanes are installed, channel hydraulics would be permanently altered. **Table 6-3, Appendix C** compares the hydraulic characteristics of the river between the 6th Street Dam and Fulton Street pre- and post- construction. However, alteration of channel hydraulics is a goal of the project to improve habitat diversity and fish passage. Removal of the dams will increase the water surface slope between the dams and along the Project Reach from Bridge Street to Fulton Street. The increased slope will increase flow velocity. Under the existing conditions, the flattened water surface slope between the dams reduces flow velocity and leads to deposition of the bed, finer bed materials, and homogenous habitat conditions. Increasing flow velocity by removing the dams will improve sediment transport and reduce deposition, increase bed coarseness, and increase habitat diversity. Therefore, the changes in hydraulics caused by the Proposed Action are intended and will improve aquatic habitat.

Water Quality - The potential for water quality effects would only occur during the construction phase and would be in the form of increased turbidity. Turbidity would be increased during installation and removal of aggregate access causeways, isolation measures, and scour protection; removal of the dams (especially excavation of foundations below grade); bed grading; and installation of boulder arch structures, constructed riffles, emergent habitat boulders, and bank vanes while aggregates are being added to the river and graded to design grades. Aggregates contain a fine coating of dust that would be washed off when placed in the water. Disturbing the bed during dam removal, bed grading, and placement of aggregates would generate additional turbidity by the

resuspension of fin particulates. Once the Project is constructed, it would not negatively affect water quality. If anything, the Project Action would likely increase dissolved oxygen concentration at low summer flows when water temperatures are at their maximum because removing the dams will create will create better water circulation, mixing, and aeration (Aquatics Benefit Memo, ERM 2021.

Ground Water - Low-head dam demolition can potentially result in effects to groundwater recharge due to the decreased impoundment areas and depths. Whether changes would occur and the degree of those changes is dependent on the magnitude of the drawdown, substrate conditions of the specific site, and the impoundment's effect on ground water recharge to the formerly impounded area (ICF Consulting 2005). However, the Proposed Action would use grade control to maintain a similar water surface profile to existing; therefore, ; therefore, the ground water discharge and recharge rates over the project length will be the same as existing will be the same as existing.. In addition, the limited length of the Construction Area, small impoundment area and depth, bedrock presence in and beneath the channel bed, high ground water flow rates in this area, would minimize effect on ground water resources.

Channel Geometry - Due to the presence of the vertical concrete flood walls and revetments along most of the Project reach, the planform of the Grand River is fairly straight and would remain straight after the Proposed Action is implemented. It is likely the historic channel was relatively straight through the historic rapids as that is a normal condition for high-slope channels that are confined by bedrock outcrops. The largest change to the channel geometry would be to the bed profile. The existing bed profile has been highly altered by historic aggregate mining and installation of the four low-head dams, which decrease water surface slope and simplify habitat between them. Restoring habitat diversity by naturalizing the bed profile is the primary goal of the Proposed Action. While the historic bedform cannot be precisely known, the design is based on current science and understanding of fluvial geomorphology and natural channel design principles. Furthermore, hydraulic modeling has been used to evaluate resulting hydraulics and water surface profile over the Project Reach (RiverRestoration 2024a). The bed form is currently altered from a natural condition and results in homogeneous habitat with low diversity for aquatic organisms. Restoration of a natural bed profile with natural bed forms (e.g., riffles and boulder cascades) will increase habitat diversity including diversity of water depth, substrate coarseness, and flow velocity would be to the bed profile.

Channel Substrates - Approximately 5.6 acres of the Grand River bottomlands not permanently affected by the Proposed Action would be temporarily affected by aggregate access causeways, Dam 2 isolation measures, and Gillett Bridge scour protection needed for construction. Those temporary construction measures would be removed when construction is complete, but some remnants of the materials not recovered would permanently but negligibly alter the bed material in those locations, though the grain size distribution is unlikely to change. The impacts of temporary construction access measures required to construct the project will have medium intensity, short-term negative impacts on benthic substrates that provide aquatic habitat. Given the substrates will essentially be the same as existing after construction, aquatic organisms will be able to continue using the habitat shortly after construction is complete and no permanent impacts will occur. that provide aquatic habitat.

Proposed removal of the four dams, bed grading, and installation of boulder arches, constructed riffles, emergent habitat boulders, and bank vanes would definitely and permanently alter substrates over 6.1 acres of the riverbed where they are proposed as shown in the proposed Drawings . However, these changes are intended to diversify habitat and will have a positive impact because the existing substrates have been altered by historic dredging and sediment deposition caused by the dams will have a positive impact because the existing substrates have been altered by historic dredging and sediment deposition caused by the dams.. However, those permanent changes to the bed are positive, resulting in greater aquatic habitat diversity and better fish passage. While the historic substrate composition and size distribution of the rapids cannot be precisely known, the design is based on current science and understanding of fluvial geomorphology and natural channel design principles. Furthermore, hydraulic modeling has been used to evaluate resulting hydraulics and sediment transport characteristics to ensure a stable bed (RiverRestoration 2024a). The substrates are currently altered from a natural condition due to historic dredging and sedimentation caused by the dams. Restoration of natural, stable substrate types will increase habitat diversity.

6.4.3 Mitigation Measures

Temporary effects on water quality due to increased turbidity during construction would be minimized by installing turbidity curtains downstream of work areas. The flow isolation measures at Dam 2 would also control turbidity. Turbidity would be monitored during construction to determine if turbidity is excessive, requiring the need for additional Best Management Practices and controls.

Effects to channel hydraulics associated with construction activities are unavoidable, have been minimized through planning and construction methods, and are temporary. Bridge pier protection would be added at Gillett Bridge to address increased flow velocity and bed shear stress caused by the Dam 2 flow isolation measures. Otherwise, , the impact are positive and no mitigation measures are necessary. Effects to channel hydraulics and geometry are intended as a goal of the Project and have been designed to increase habitat diversity and fish passage. Impacts will be positive. Therefore, no mitigating measures are necessary.

6.4.4 Cumulative Effects

The Proposed Action could have cumulative effects in conjunction with potential, past, present, and reasonably foreseeable future projects and activities if similar foreseeable future projects affecting water quality and riverine resources were implemented simultaneously with the Proposed Actions. Such projects would increase turbidity in the same reach of the Grand River or effect the riverbed in the same Project. Specific projects and activities that may contribute to cumulative effects on water and riverine resources are indicated in **Table 6-8, Appendix C**. It is unknown if any of those projects would occur simultaneously and contribute to increased turbidity. It is unlikely any of those projects would increase riverbed effects within the Project Reach. Though cumulative effects are possible, they are unlikely or would be minimal. More importantly, the overall long-term improvements to aquatic habitat derived from the Proposed Actions would more than offset any cumulative effects to the water environment and riverine resources.

6.4.5 Regulations and Permitting

USACE maintains jurisdiction over the Grand River from Lake Michigan upstream to the Fulton Street Bridge as a navigable Waters of the United States regulated under Section 10 of Rivers and Harbors Act and Section 404 of Clean Water Act. USACE jurisdiction does not extend upstream of the Fulton Street Bridge into the Project reach. Therefore, a permit would not be required from the USACE under Section 404.

In Michigan, based on a memorandum of agreement between the USEPA and EGLE, EGLE administers Section 404 of the Federal Water Pollution Control Act of 1972 (Clean Water Act) for interior waters in Michigan. Although EGLE administers Section 404 for interior waters, USEPA maintains oversight of projects that surpass established criteria. Under the state-assumed permitting program, when a permit applicant seeks to engage in activities involving the discharge of dredged or fill material into Waters of the United States (WOTUS), the state will transmit a copy of the permit application to the appropriate agencies. EGLE may not issue a proposed permit until after it receives USEPA's comments, or until 90 days have passed after the state transmitted a copy of the application or proposed permit to USEPA. If USEPA objects to issuance of the permit, the state may not issue the permit until the objection has been resolved.

Under the CWA, Congress provided for USACE to retain permitting authority and required the EPA to approve or deny state and tribal requests to assume permit responsibility. USACE does not authorize states to assume permitting responsibilities. States request assumption, and the EPA approves or denies. In Michigan, USACE maintains jurisdiction over the CWA Section 404 permitting from the mouth of the Grand River upstream to Fulton Street, because this reach is covered by Section 10 of the Rivers and Harbors Act. CWA Section 404 permitting for the Grand River upstream of Fulton Street, including the Project Reach, is carried out by EGLE under Michigan's Natural Resource and Environmental Protection Act (NREPA) The Proposed Action would require a Water Resource permit from EGLE under the NREPA.

EGLE issued a draft permit to the City of Grand Rapids for counter signature on December 20, 2024, **Appendix E**. Once counter-signed by the City of Grand Rapids, the proposed action that would be funded under this Plan-EA would have all necessary permits to move forward.

6.5 Wetlands

6.5.1 Project Activities Generating Effects

Small, regulated wetlands are present along the project reach. Effects would be primarily temporary and associated with construction access. This section discusses the nature of temporary effects to wetlands.

6.5.2 Description of Effects

6.5.2.1 No Action Alternative

The No Action alternative would not alter the river channel or require construction activities. Therefore, it would not result in temporary or permanent wetland effects.

6.5.2.2 Proposed Action

Effects to wetlands have been avoided and minimized to the extent practicable and have been limited to temporary effects associated with construction access. Access roads would have to be constructed through wetlands but would be removed following construction and the wetland grades and vegetation restored. Minor adverse impacts are detailed in **Table 6-6, Appendix C**.

6.5.3 Applicable Laws, Regulations, and Management Plans

Existing wetlands in the Project Area are protected under Section 404 of the Clean Water Act and under Part 303 of Michigan's NREPA (Public Act 451 of 1994). In Michigan, Section 404 permit authority has been delegated to EGLE under the Water Resource permitting program. These statutes require the avoidance, minimization, and mitigation of impacts to existing wetlands. Two local management plans mention the goal of wetland protection and restoration (LGROW 2011, Hanshue and Harrington 2017). The Proposed Action would result in minimal permanent impacts to wetlands and is consistent with the goals of local management plans result in minimal permanent impacts and is consistent with the goals of local management plans

6.5.4 Mitigation Measures

Where construction access routes would be constructed through wetlands, equipment mats would be used to avoid soil compression and minimize disturbance of existing grades and vegetation. Following construction, the access routes would be removed, grades restored, and supplemental vegetation planted to restore the temporary wetland effects. A de minimis permanent reduction in wetland area of 0.01 acres would result from the Proposed Action. Therefore, no further mitigation measures are necessary.

6.5.5 Cumulative Effects

Table 3-2, Appendix C, contains past, present, and reasonably foreseeable future projects and activities. Some of those foreseeable future projects could result in additional wetland effects within the Project reach. The quantity of wetlands along the Grand River in the urbanized Project reach is low and cumulative wetland effects are not expected to be great given few wetlands exist and effects can be avoided, minimized, or mitigated. Wetland mitigation could be used to offset any cumulative wetland effects. However, as stated above, the wetland impacts associated with the Proposed Action are primarily temporary and wetland loss has been minimized to 0.01 acres of wetland. Therefore, the Proposed Action would not contribute to cumulative wetland loss.

6.6 Terrestrial Vegetation & Wildlife

6.6.1 Project Activities Generating Effects

The land-based portion of the Proposed Action are limited to construction staging and access. Those activities are planned in current open spaces and would result in minimal effects to terrestrial vegetation or wildlife habitat as discussed below.

6.6.2 Description of Effects

6.6.2.1 No Action Alternative

The No Action alternative would not result in any terrestrial vegetation or wildlife habitat effects. Terrestrial wildlife habitat is currently limited. The habitat limitations that are present will remain. Terrestrial habitat would not have been improved as part of the proposed action if funding were provided.

6.6.2.2 Proposed Action

Vegetation Clearing - Land-based construction access and staging is planned in existing open spaces along the Project reach. Therefore, only minimal vegetation clearing would be required in current urbanized areas with minimal wildlife habitat. Once constructed, the Project would not result in permanent alteration of terrestrial vegetation or wildlife habitat along the Project reach, see **Tables 6-6 and 6-7, Appendix C.**

Construction Traffic - Operation of construction equipment within the staging areas and along access routes has the potential to effect wildlife. This risk is limited to less-mobile wildlife species, such as reptiles and amphibians. However, since the Project Area is highly urbanized, reptiles and amphibians are not likely to occur in the Project Area. Furthermore, construction fence and silt fence would be used to isolate the staging areas and access routes from public use areas and those measures would further reduce the likelihood of less-mobile wildlife being struck by construction equipment.

Construction Noise and Vibration - Construction noise and vibration could temporarily disturb and/or displace a variety of wildlife. Mobile wildlife, such as birds, bats, and flying insects, would likely vacate the area temporarily and move to other suitable habitats in other parts of the Grand River corridor. Less mobile species may be unable to traverse the urbanized areas surrounding the analysis area and may simply move to a less noisy part of the analysis area. In these cases, repeated exposure could cause repeated stresses, potentially causing increased energy expenditure and increased vulnerability to predation or other causes of mortality. However, wildlife abundance in the analysis area is low and acclimated to the existing urbanized environment with associated noise levels and disturbances. Therefore, the Proposed Action is not likely to affect wildlife populations in the staging and access areas during construction.

Federally Protected Species - The analysis area does not include any suitable habitat for the eastern Massasauga rattlesnake or for the Karner blue butterfly. Therefore. the Proposed Action is not Lilley to affect those species.

The northern long-eared bat, which can roost in trees, bridges, and buildings, is the only federally protected species known to occur in Kent County for which suitable habitat exists in the Plan-EA sub-watershed. The last documented occurrence in Kent County is from 1975. Direct effects could occur if any of the trees removed as part of the Proposed Action were actively being used by northern long-eared bat at the time of clearing. However, potential bat roost trees. In addition, northern long-eared bat is rare in southern Michigan, and the analysis area is within an urban setting not likely to harbor this species due to a lack of suitable habitat. Given that this species is unlikely to occur in the analysis area, the Proposed Action is not likely to adversely affect Northern long-eared bat.

Potentially suitable habitat for the Indiana bat may exist in the analysis area as well. However, Indiana bat has not been documented in Kent County, Michigan. Therefore, it is not likely to be affected by the Proposed Action.

State Listed Species

Northern long-eared and Indiana bats are also state-listed species. As noted above, the Proposed Action likely will not affect those state-listed species. Virgina bluebells is not federally-listed but is listed as Threatened by the State of Michigan. It was last documented in Kent County in 2018. While suitable habitat exists in Kent County and in the vicinity, suitable habitat does not exist in the access and staging areas where terrestrial impacts will occur from the Proposed Action. Therefore, the Proposed Acton will likely not impact Virgina bluebells.

6.6.3 Applicable Laws, Regulations, and Management Plans

The following measures would be implemented to avoid, reduce, or eliminate potential effects to terrestrial vegetation and wildlife resources:

- Refining construction plans to avoid tree removal to the greatest extent practicable and
- Restoring disturbed vegetation at the end of construction.

6.6.4 Mitigation Measures

Due to the need for only limited vegetation clearing, lack of wildlife habitat, and unsuitable habitat for protected terrestrial wildlife species, mitigation measures are not necessary. However, the use of construction fencing and silt fence along staging areas and access routes would further minimize the potential for wildlife effects in general. In

addition, trees would be cleared during the non-roosting season (November 1 through March 31, USFWS 2023). If tree clearing is required during the roost season (April 1 through October 31) trees can be cleared by observing for bat emergence to avoid direct impacts to all bats that could potentially be using the trees as roosting habitat at the time of clearing.

6.7 Aquatic Species and Habitat

6.7.1 Project Activities Generating Effects

The Proposed Action would include the demolition of four low-head dams; bed grading, installing boulder arches, constructed riffles, and emergent habitat boulders. The specific construction activities that could potentially generate direct or indirect effects on aquatic species and habitat include the activities associated with installation of the emergent habitat boulder, constructed riffles, and boulder arches, and the demolition of the four low-head dams. The machinery required to complete these construction activities generally includes tracked excavators, loaders, cranes, and haul trucks, which would have the potential to cause effects within the wetted channel during establishment of causeways and demolition of the low-head dams. The installation of temporary access causeways, flow isolation at Dam 2, and scour protection at Gillett Bridge would have the potential to cause direct effects to habitat and aquatic species. OMRRR activities, if necessary, may involve activities similar to those of construction.

6.7.2 Description of Effects

NRCS has consulted with the USFWS under Section 7 of the Endangered Species Act. Given the aquatic nature of the Proposed Action and direct impacts on aquatic habitat in the Grand River, the USFWS evaluated impacts to listed freshwater mussels, Lake Sturgeon, and River Redhorse under a Biological Assessment. In its Biological Opinion, USFWS determined the Proposed Action would be "likely to adversely affect" Snuffbox and negatively affect thirteen state-listed freshwater mussels. USFWS determined that Lake Sturgeon and River Redhorse would "not suffer any direct impacts" from the Proposed Action. USFWS did not evaluate impacts to other aquatic species.

6.7.2.1 No Action Alternative

Aquatic habitat is currently impaired by the four low-head dams and would remain impaired under the No Action alternative. Limited fish passage would also remain, which negatively affects Lake Sturgeon, River Redhorse, and other fish species or the Grand River system. Fish, macroinvertebrates, and mussel populations would still be affected by the degraded aquatic habitat. However, Snuffbox and state-listed mussel species would not experience the moderate-duration, low intensity impact caused by the Proposed Action. Because aquatic habitat is currently degraded and aquatic organisms affected by those degraded habitat conditions, the No Action alternative results in permanent, long-term, negative impacts of low intensity. Potential failure of one or more of the dams, or partial breaches of one or more of the dams, could further degrade habitat, though the extent would be minimal. Despite the minimal extent of potential future habitat degradation due to dam failures, it would increase the intensity of impacts.

6.7.2.2 Proposed Action

This section examines effects of the Proposed Action on aquatic and wildlife species and habitat within the analysis area discussed in Section 4.6. Specifically, it addresses unionid mussel species (including listed species) and their habitat, fish species (including listed species and unionid mussel host fish species) and their habitat, and invasive species (including Sea Lamprey). The potential effects of the proposed construction activities and the potential benefits of the restored river conditions are summarized in **Tables 6-4, 6-6 and 6-7** in **Appendix C**. OMRRR activities may also lead to additional temporary effects similar to those of the proposed construction activities, but to a much lesser degree, because the expected frequency, intensity, and duration of OMRRR activities are less than those of construction. The analysis and discussion in this section is derived from and supported by EcoAnalysts 2024 and Holtgren 2024 unless otherwise noted.

Unionid Mussel Species Effects - EcoAnalysts 2024 documents mussel surveys and estimated mussel abundance. Federally endangered, state threatened, and common mussel species are distributed throughout the Project construction area at a low density of 0.3 mussels per square meter. Approximately 128 *E. triquetra* (federally endangered), 1,878 Michigan TES, and 12,219 other unionid species are located in the direct impact area and could be directly impacted during construction Table 2-1 of BA (**Appendix C**). Mussel effects could result from

construction of temporary access causeways, Dam 2 isolation measures, scour protection at Gillett Bridge, removal of the dams, grading of the riverbed, and installation of aggregate and boulders to construct boulder arches, riffles, emergent habitat boulder fields, and bank vanes. As many mussels as possible will be relocated prior to construction, at least within the isolation area using other funding sources (not paid for using PL566 funding requested under this Plan-EA). The minimum number that will be relocated is 830. It is estimated a maximum of 13, 394 mussels could be harmed during construction unless relocated.

Federal and State-Listed Unionid Mussel Species Effects - The Project may affect and is likely to adversely affect the federally listed snuffbox mussel and 12 Michigan TES species, including, the round pigtoe, purple wartyback, black sandshell, pink heelsplitter, creek heelsplitter, lilliput, deertoe, ellipse, elktoe, slippershell, fluted shell, and paper pondshell (EcoAnalysts 2024). Unavoidable take of mussels has been authorized under a Biological Opinion (BO) issued by the USFWS (**Appendix C**).

Fish Species Effects - **Table 6-4, Appendix C,** summarizes the estimated effects to fish species from construction-related activities. Generally, the direct effects would result from physically crushing the fish that are not able to easily escape during construction activities. These fish would generally include minnows, darters, and juvenile fish of many species with limited mobility compared to larger fish (EcoAnalysts 2024). Mortality of fish within the Dam 2 isolation area would be minimized by removing trapped fish and releasing them outside of the isolation measures.

Another direct effect associated with construction activities would be displacement to new areas of the river upstream or downstream of active construction activities. Effects may include interruption of feeding behavior and stress but are expected to be minimal. Indirect effects to fish would likely be slight but could result from increases in turbidity and the temporary loss of areas normally used for spawning for the duration of the construction phase. Generally, fish are mobile and would seek areas of less turbidity. However, increased suspended sediment can result in short-term physiological and behavioral effects such as displacement (Kjelland et al. 2015). Most fish within the Construction Area would likely move out of the area during construction, and BMPs would be used to reduce turbidity. Turbidity would be monitored and a plan to reduce any unanticipated turbidity would be in place. Any effects would be temporary. Flow rates suggest minimal impact as shown in Table 6-5 (**Table 6-5, Appendix C**). The fish species that would otherwise utilize the Construction Area for spawning may be unable to reproduce during construction but would likely be able to utilize other spawning areas downstream of the Construction Area (EcoAnalysts 2024).

Temporary construction activities have been modeled and could result in slight increases in tailwater elevation at 6th Street Dam of less than 0.4 feet. Post project conditions have been modeled to result in slight decreases in tailwater elevations of less than 0.4 feet at some flow rates. These changes are not anticipated to have adverse effects on fish passage through the existing fish ladder (Biological Assessment, EcoAnalysts 2024, Appendix E).

Beneficial effects from the creation of suitable fish habitat (including habitat for unionid mussel host species) would likely be realized within a few years. This timeframe would primarily depend on recolonization of the habitat by macroinvertebrates and other food sources. Colonization by mobile fish species would occur quickly, as many fish species presently occur both upstream and downstream of the Construction Area and would move into the area after construction is complete. Colonization by sedentary species, like Logperch, could take longer based on their tendency to be less mobile (EcoAnalysts 2024).

Beneficial effects from the creation of riffles and boulder drop structures, bank vane structures, and creating emergent habitat boulder fields habitats would increase the fish passage potential for migratory and small-bodied fish species through the Construction Area once the low-head dams are demolished and the hydraulic diversity is realized from the addition of multiple introduced substrates. The increased habitat diversity would allow fish areas of refuge and reduced velocity swim paths so that they could migrate upstream to previously inaccessible areas (EcoAnalysts 2024, Holtgren 2024).

Indirect beneficial effects would also occur to areas downstream of the Construction Area. Due to increased fish reproduction and productivity within the Construction Area, population increases for fish species downstream of

the Construction Area are anticipated. Specifically, the largest benefit to downstream populations would occur for both the lake sturgeon and river redhorse, as these species would experience an increase in available spawning habitat within the Construction Area, and these species are known to utilize habitats downstream of the Construction Area. This is especially true for juvenile lake sturgeon, as sections of the mouth segment of the river exhibit a braided channel, which provides nursery habitat for juvenile lake sturgeon (EcoAnalysts 2024).

Overall, the Proposed Action would have only temporary minimal effects to aquatic habitat and biological communities and those would only occur during active in-water construction work. Otherwise, the Proposal Action results in long-term improvements to aquatic habitat that would benefit biological communities including T&E species.

State Listed Fish Species Effects - The proposed Project would have temporary effects on the two Michigan threatened fish species in the analysis area, lake sturgeon and river redhorse. The proposed Project would prevent these fish from using areas of the river under active construction for feeding. Indirect effects from increased turbidity would be minimized using the conservation and mitigation measures identified in Section 6.4.3. Indirect effects from increased turbidity would be minimized to the extent practical by using the conservation and mitigation measures identified in Section 6.4.3 and by using a turbidity monitoring and adaptive management plan.

The River Redhorse currently spawns in the Construction Area. Construction would not take place in the river during the Michigan fish spawning closure season. Therefore, construction activities would not disrupt spawning or destroy eggs. Lake Sturgeon and River Redhorse spawn near the mouth of Plaster Creek (EcoAnalysts 2024). Both species spawn in the spring when turbidity levels are typically higher. Any increase in turbidity that far downstream of the Construction Area (1.6 miles) would likely be minimal. Furthermore, construction activities would not take place during the Michigan spawning closure season.

Beneficial effects from the removal of four dams and installation of boulder arches, constructed riffles, emergent habitat boulders, and bank vanes would be realized for both species, as much of the Construction Area would contain greater habitat diversity and would likely be considered ideal feeding and spawning habitat after restoration. The increased habitat diversity would also allow greater fish passage and movements between habitats (Holtgren 2024). Overall, the Proposed Action would have negative effects to all fish species of the Grand River, of the Grand River, but the negative effects would be temporary, short-term effects with low intensity during construction. Once constructed, the Proposed Action would improve habitat and benefit. fish. Benefits would result in permanent, long-term positive impacts on fish with moderate intensity.

Invasive Fish Species - The 6th Street Dam currently presents a barrier to upstream migration of invasive species, as well as many non-jumping native species. Similarly, the existing four low-head dams block fish passage by small-bodied fish and other fish species that cannot swim upstream against high water velocities. Removal of the four low-head dams would allow invasive fish species, along with all native desirable fish species, to move more freely from downstream of the Fulton Street Bridge upstream to the 6th Street Dam. However, the 6th Street Dam would continue to act as a barrier to further upstream migration of invasive species.

Under existing conditions, the 6th Street Dam is currently considered an effective block to Sea Lamprey migration (except during times of high water). Extensive modeling and consultations with state and federal agencies were carried out during design to evaluate the effectiveness of the 6th Street Dam as a barrier to Sea Lamprey. Once constructed, the Project would not change the tailwater condition at 6th Street Dam or the effectiveness of the dam as a Sea Lamprey barrier. A small tailwater increase of less than 0.1 feet is possible during construction while the isolation measures at Dam 2 are in place. However, this temporary and minimal increase would occur outside of the Sea Lamprey migration season. Therefore, the 6th Street Dam would continue to be an effective barrier to upstream migration of Sea Lamprey and other invasive fish species.

The habitat changes in the Proposed Action are not expected to provide preferred habitat for Sea Lamprey larvae or spawning (EcoAnalysts 2024). Physical factors essential for successful *P. marinus* spawning include steady, unidirectional water flow, and suitable gravel substrates with minimal sand (0.9 to 5.1 cm diameter; 0.4 to 2 inches), water velocity (0.5 to 1.5 m/sec; 1.6 to 4.9 feet/sec), depth (13 to 170 cm; 5 to 67 inches), and temperature

(10.0 to 26.1 °C; 50 to 79 °F) (Manion and Hanson 1980; SLCB, 2017). Changes in the river are not expected to provide preferred habitat for Sea Lamprey larvae or spawning.

Based on the project design, extensive modeling, and consultations with state and federal agencies during design, the Project would not cause an increase in Sea Lamprey populations and resulting need for increased treatment due to decreased effectiveness of 6th Street Dam as a barrier or due to increased spawning habitat suitability within the project reach. Overall, the Proposed Action would not likely result in an increase in the spread of invasive fish species upstream into the Grand River watershed above the 6th Street Dam.

6.7.3 Conservation and Mitigation Measures

All fish species including listed fish species would be removed for the Dam 2 isolation area and released to the river outside of the isolation measures to prevent mortality. During dewatering of the Dam 2 isolation area, pump intakes would be screened to prevent entrainment and concentrated fish would be removed. Otherwise, effects on fish would be temporary and minimal. More importantly, the Proposed Actions would result in greater habitat diversity and suitability for lotic fish species of the Grand River and Lake Michigan anadromous species. Benefits to fish populations associated with the Proposed Action would far outweigh any temporary or short-term effects. Therefore, no additional mitigation is warranted.

To minimize mussel take, mussels will be relocated in 2024 prior to the start of construction in 2025. The relocation plan detailed in EcoAnalysts 2024 has targeted relocation of as many mussels as possible to three recipient sites. Relocation effectiveness will be affected by discharge and river conditions during the relocation efforts. Any mussels not relocated from the direct impact areas would be part of the take authorized by the BO. Mussel take authorized under the USFWS BO will be mitigated by a mitigation fund established by the Sponsor (not PL566 funds). The fund will be funded with a maximum of $456,743. If more mussels are relocated and the take reduced, the fund will be decreased accordingly. The fund will be used by USFWS for mussel conservation efforts. These mitigation measures will minimize take to the extent practicable and ensure continued survival of the mussel populations and species affected.

6.7.4 Cumulative Effects

The Proposed Action could have cumulative effects in conjunction with past, present, and reasonably foreseeable projects and activities that also effect mussels and fish (**Table 3-2, Appendix C**). Other construction projects upstream and downstream of the Project reach have resulted in the need to relocate mussels. Continued effects to those mussel species and populations in this reach of the Grand River could lead to stress and elevated mortality. However, when applicable regulations are followed, agency consultations occur, effects are minimized, and mitigation is used to offset unavoidable take, cumulative effects are minimized and the Proposed Action is not likely to prevent continuation of the species and populations affected.

6.8 Floodplain Management

In recognition of the significant value of floodplains and management thereof, FEMA requires Federal agencies to consider the public benefit that would be realized from restoring and preserving them. Under FEMA's Environmental Planning and Historic Preservation Program, Executive Order 11988 (signed May 24, 1977) has the following objectives:

- avoidance of direct and indirect support of development in the base floodplain wherever there is a practical alternative, and
- avoidance of long and short-term adverse effects associated with the occupancy and modification of the base floodplain.

The Preferred Alternative is consistent with the objectives and requirements of Executive Order 11988 and is designed to minimize adverse effects to the floodplain, humans, and environment.

6.8.1 Description of Effects

EGLE guidelines require that the project cannot cause harmful interference, defined by EGLE (2019) as causing an increased stage or change in the direction of flow that causes, or is likely to cause: damage to property, a threat to life, pollution, impairment, or destruction of water or other natural resources."

6.8.1.1 No Action Alternative

The No Action alternative does not alter the four dams or channel of the Grand River. It does not alter the floodwalls or any other aspect of the 100-year floodplain. Therefore, it would not affect flooding or flood management. However, all four dams are in a state of disrepair and partial dam failures or breaches at all four dams is possible in the future under the No Action alternative. It is not likely that a partial failure or breach of one or more of the dams would affect the 100-year flood stage. In fact, it is likely that a partial failure or breech could decrease the 100-year flood stage along a portion of the river, though the extent would not be great and the affect would be negligible.

6.8.1.2 Preferred Alternative

The Preferred Alternative is designed to create a waterway that more closely resembles the original condition of the section of the Grand River that passes through the City of Grand Rapids. However, due to years of human alterations to the river channel, installation of floodwalls, and development within the natural floodplain, the ability to recreate natural conditions is necessarily constrained. Hydraulic modeling was conducted to evaluate potential effects of the Preferred Alternative on the FEMA 100-year base flood elevation. (RiverRestoration2024a), **Appendix E**. Proposed modifications to the Grand River within the project reach include removal of four concrete low-head dams, grading of the riverbed, and installation of approximately 16,000 cubic yards of boulder and alluvium to construct boulder arches, constructed riffles, emergent habitat boulders, and bank vanes.

The Preferred Alternative proposes modifications to the channel from 300 feet upstream of Bridge Street to upstream face of Fulton Street Bridge. The hydraulic influence of the proposed project terminates upstream to the 6th Street Dam and downstream immediately above Fulton Street. The evaluation considered proposed changes to the channel geometry and hydraulic roughness characteristics in the Project Reach and analyzed the potential to increase the water surface profile water surface profile during the 100-year flood frequency event. The water surface profile calculated by the hydraulic modeling for the Proposed Action simulation was compared toto the existing 100-year water surface profile 100-year water surface profile to assess effects. (RiverRestoration 2024a). The Hydraulics Report for the project area is available in **Appendix E**.

Modeling hydraulic results for the proposed project area indicate there may be localized increases in calculated 100-year water levels within the project reach. Modeled, localized, increases of up to 0.07 ft above the Effective FEMA 100-year profile were calculated by the model. All modeled increases remain within the flood protection system, and do not extend upstream or downstream of the project. The increases have been evaluated to not cause harmful interference as defined by EGLE and are being incorporated into a CLOMR request to FEMA.

Temporary effects during construction were also modeled as described above. The increases caused by construction activities have been minimized to the greatest extent practicable and would remain within the flood protection system in (RiverRestoration 2024b), **Appendix E**). Furthermore, construction would occur during months of the year when a 100-year flood event is unlikely.

6.8.2 Mitigation Measures

The project meets all state and federal regulatory requirements for floodplain management and will not cause a harmful interference by raising the 100-year flood water surface profile. Therefore, not mitigation measures are required.

6.8.3 Cumulative Effects

The likelihood that the 100-year flood stage and the risk of flooding along the Grand River would be increased due to cumulative effects is negligible. Impacts in mapped floodplains are regulated by FEMA, the State of Michigan, and local units of government. All projects that impact floodplains must demonstrate no-rise. The Proposed Action will require a water resource permit from EGLE (State of Michigan) and the Project Sponsor (also the applicant for the State of Michigan permit) has had to demonstrate no-rise. Given all such projects must demonstrate no-rise on the 100-year flood stage, there will be zero cumulative impact or rise.

6.9 Land Use, Recreation, and Visual Resources

6.9.1 Project Activities Generating Effects

Once constructed, the Project would not affect land use, recreation, or visual resources. However, the Project would ultimately improve recreation by improving access and making the river safer for users. Land use would not be changed either positively or negatively. Recreation and visual resources would be temporarily affected during construction. This section discusses the temporary effects to recreation and visual resources during construction and visual effects associated with permanent changes in the river channel, which are all positive.

6.9.2 Description of Effects

6.9.2.1 No Action Alternative

The No Action alternative would not change or affect any aspect of land use, recreation, or visual resources. However, the dams do affect river access and use due to the associated safety hazards and those effects would remain. Further open space development and river access improvements may also be limited due to the dam safety hazards that would remain.

6.9.2.2 Proposed Action

Land Use - The Proposed Action would not physically change existing or proposed commercial, residential, and open space land uses within the analysis area. Open space uses would be enhanced through improved habitat quality for aquatic life, and improved public safety (see Recreation, below). Implementation of the Proposed Action would align with the goals and objectives of local, regional and state land use planning documents, including the City of Grand Rapids Master Plan; *GR Forward*, a plan for economic development in downtown Grand Rapids; and the *Lower Grand River Watershed Management Plan*, a federally-approved planning document (see Section 4.7.1 for additional information on the plan policies).

A future indirect effects of the Proposed Action on land use would include increased demand for businesses that support recreational use, such as restaurants, accommodations, and retail businesses. Demand for these commercial uses within the analysis area is compatible with the city master plan's designation of this area for urban commercial and mixed-use development.

Recreation - The recreational benefits of the Proposed Action would align with the goals and objectives of the city's 2017 Parks and Recreation Strategic Master Plan, as amended on January 21, 2020, as well as the state's Grand River Fisheries Assessment and the state's Comprehensive Outdoor Recreation Plan, as described in Section 4.7.2.

During construction, the Proposed Action would interfere with existing recreational fishing and paddle sports in the Construction Area and with recreational uses of the land used as staging areas at Ah-Nab-Awen Park and 555 Monroe Avenue. The City of Grand Rapids may temporarily restrict or prohibit boat travel through the Construction Area during one or more periods of construction. These effects on recreation would be temporary.

Visual Resources - The effect of a project on visual resources can be estimated as the difference between the visual quality of the landscape before and after implementation. The visual nature of the river channel would be changed by the Project as the dams would no longer be present and new habitat features would be present. However, the river channel between the concrete flood walls would generally look more natural to the public and more visually appealing. Above the normal water surface, the Project would not change visual character of the river. During construction, the visual quality of the river would be affected due to the presence of construction equipment and various states of construction activities that appear incomplete. However, this effect on the visual resource would be temporary.

6.9.3 Mitigation Measures

Anticipated effects of the Proposed Action are beneficial, with the exception of minimal, temporary effects on recreation opportunities and decreased aesthetics of the river during construction. Therefore, no mitigation measures are recommended.

6.9.4 Cumulative Effects

Past, present, and reasonably foreseeable projects could contribute to cumulative effects in combination with the Proposed Action. Specific projects and activities that may contribute to cumulative effects on land use, recreation, and visual resources in the analysis area are indicated in **Table 6-8, Appendix C**. Most, if not all, of the other

projects and activities would involve temporary effects to land use, recreation, and/or visual resources, consistent with the types of effects that occur periodically in any urban environment.

Some of these projects could also contribute alongside the Proposed Action to beneficial cumulative effects. Efforts to enhance the river, river access, and riverside parks, including the Ann Street to Bridge Street Grand River Project, the *River for All* conceptual site plans, river edge walkway repairs, and the Ah-Nab-Awen Park redevelopment. The Proposed Action would offer synergistic benefits with these other projects, leading to greater benefits to land use, recreation, and visual resources.

6.10 Socioeconomics

This section describes the potential socioeconomic effects of the proposed Project, including the effects of construction and the planned alterations to the Grand River.

6.10.1 Project Activities Generating Effects

All project activities would be within the Grand River, except construction staging areas along the riverbanks. The proposed Project is within the most urbanized reach of the Grand River in central Grand Rapids, in the core of the downtown business area.

6.10.2 Description of Effects

6.10.2.1 No Action Alternative

No construction or alteration to or within the Grand River associated with the Proposed Action would occur under the No Action Alternative; therefore, socioeconomics within the analysis area would generally remain in their current state, although they would be affected by other projects (**Table 6-8, Appendix C**). In particular, residential and commercial development would generally result in beneficial socioeconomic effects depending on the nature of the specific project. Consequently, the No Action alternative would not contribute to direct, indirect, or cumulative adverse effects on socioeconomics from the Proposed Action.

6.10.2.2 Proposed Action

Demographics and Housing - The Proposed Action would not affect population or housing in Grand Rapids. Existing or proposed commercial or residential land uses would not be affected by the Proposed Action, and open space uses would be enhanced.

The construction workforce needed to implement the Proposed Action could be drawn from the available workforce in Grand Rapids and Kent County. In 2017, construction employed an estimated 3,700 Grand Rapids residents, as well as a larger number in Kent County. Project construction would not require workers to relocate to Grand Rapids or Kent County. Upon completion, the Proposed Action would provide an additional attraction for downtown Grand Rapids. The Proposed Action would change the river views for residents of riverfront structures Section 4.7. Nearby residents of downtown apartments or condominiums, as well as the residential neighborhoods that begin several blocks from the river, would benefit from increased local opportunities for recreation and physical activity, removal of dam-related hazards for boaters, and increase in security of the riverfront areas.

Economic Effects - Construction and operation of the Proposed Action would have beneficial effects on the economy of Grand Rapids. The construction cost is estimated at $22,053,391. The construction project would result in construction wage earnings and benefits to area businesses and material suppliers.

During construction, the temporary hindrances to river activities such as fishing and visiting waterfront parks could potentially result in fewer customers for businesses that serve visitors, such as restaurants and recreation-oriented retailers. However, these effects would be temporary and are anticipated to be slight to nonexistent. Although this aspect cannot be quantified, increased visitation and economic output associated with the Proposed Action could also encourage entrepreneurship in Grand Rapids, raise the city's national profile, and help the city to compete successfully in attracting businesses.

No negative economic effects are anticipated from the Proposed Action. Based on the economic effects described above, the Proposed Action would have beneficial economic effects on Grand Rapids.

6.10.3 Mitigation Measures
No mitigation measures are recommended.

6.10.4 Cumulative Effects
Past, present, and reasonably foreseeable projects could contribute to cumulative effects in combination with the Proposed Action. Specific projects and activities that may contribute to cumulative effects on socioeconomics in the analysis area are indicated in **Table 3-2, Appendix C**.

The future development of enhanced connectivity of parks and increased opportunities for water-based recreation would attract visitors to area businesses and increase river access and use for city residents. As a result, the Proposed Action, in conjunction with past, present, and reasonably foreseeable activities, would result in beneficial cumulative socioeconomic effects.

6.11 Cultural and Historic Resources
Federal agencies are required by the NHPA to consider potential effects of proposed actions on "historic properties," defined as cultural resources that are listed or eligible for listing on the NRHP, which is maintained by the National Park Service. These include prehistoric and historic archaeological sites, districts, buildings, structures, and objects, as well as locations of important historic events that may lack material evidence. To be included or considered eligible for inclusion in the NRHP, a historic property must possess integrity of location, design, setting, materials, workmanship, feeling, and association. It must also be associated with important historical events; or be associated with the lives of significant historic persons; or embody distinctive characteristics of a type, period, or method of construction or represent the work of a master or have high artistic value; or yield information important in history or prehistory.

NEPA's implementing regulations also require federal agencies to consider the degree to which a proposed action "may cause loss or destruction of significant scientific, cultural, or historical resources" (40 CFR § 1508.27(b)(8)). The appropriate measure of significance for cultural and historic resources is NRHP eligibility. The historic properties considered in this EA are considered NRHP eligible or are NRHP listed.

6.11.1 Project Activities Generating Effects
Potential effects may result from removal of four low-head dams, grading of the existing riverbed, and installation of boulder arches, constructed riffles, emergent habitat boulders, and bank vanes and development and use of staging areas. Proposed earth disturbance is not planned beyond the confines of the active river channel except for construction access points and temporary staging areas on the banks. Temporary access ramps leading from the bank into the river are anticipated to be placed on the existing land surface. There would be little to no alteration or grading and the sites of the temporary ramps would be restored to original conditions upon completion; therefore, no effects to historic properties from these temporary access points, staging areas and ramps are expected.

6.11.2 Description of Effects
This section describes how construction and operation of the proposed Project would potentially affect historic properties.

6.11.2.1 No Action Alternative
No construction or alteration to or within the river associated with the Proposed Action would occur under the No Action Alternative; therefore, the Grand River and its surrounding cultural resources would generally remain in their current state, although they would be affected by other projects (**Table 6-8, Appendix C**). In particular, the Ann Street to Bridge Street Grand River Project, various River for All initiatives, and government development/redevelopment would result in minor and permanent effects to cultural resources due to changes to the Grand River (including the 6th Street dam) and resulting affects to cultural resources in the area. Consequently, the No Action alternative would not contribute to direct, indirect, or cumulative effects on cultural resources from the Proposed Action but would result in impacts from other projects.

6.11.2.2 Proposed Action

This section examines effects of the Proposed Action on historic properties within the APE identified in Section 4.9. Both archaeological and historic architectural resources were evaluated. While a number of archaeological resources are known to exist within the Project Area and vicinity, earth disturbance is not planned beyond the confines of the active river channel except for construction access points and staging areas. The NRCS field view supported the fact that the Project Area has been heavily urbanized and occurs within a portion of the Grand River that has been historically channelized for flood control purposes. Given the extensive existing land disturbance, and the fact that the majority of the planned activities are limited to the stream channel and some upland areas (for temporary staging, access, etc.), the Proposed Action is unlikely to result in effect to stratigraphically intact portions of the soil profile or therefore significant archaeological sites or potential culture-bearing soil horizons. See summary in **Table 6-6, Appendix C**.

However, if the proposed Project design would change to include grading or significant earth disturbance in upland areas (and to depths) that may contain culture-bearing soil horizons, further archaeological and/or geomorphological evaluation, and possibly testing, may be required prior to construction to avoid areas possibly maintaining deeply buried precontact or urban (historic) archaeological remains. SHPO would be consulted if plans were to change to include such earthmoving or grading, and a qualified archaeological monitor may be recommended.

Additional study and SHPO consultation have determined that the four low-head dams (DM16-19) are eligible for NRHP listing and would be adversely affected by the proposed Project through removal of the dams. NRCS hosted two public meetings to receive comments on the mitigation measures included in the MOA, as requested by SHPO. The mitigation plan is documented in the MOA and has been agreed to by all parties. Because NRHP eligible properties would be adversely affected, NRCS notified the ACHP, who responded that they believed their participation in the consultation to resolve adverse effects was not needed.

The proposed Project would have no effect on the remaining previously recorded and newly recorded resources adjacent to the Project Area. Given that the proposed Project would include the removal of low-head dams whose structures are not currently visible above the water surface, and the restoration of rapids that are historic to the natural landscape of the area, there would be no adverse change in the historic viewshed of the identified resources. Additionally, any proposed staging areas for the Project would not directly affect the resources identified within the viewshed, nor would they cause permanent effect on the immediate surroundings which may tie into the significance of that resource. For the reasons listed above, the proposed Project is not anticipated to cause the loss or destruction of significant cultural or historical resources, other than the four low-head dams scheduled for removal. This adverse effect would be mitigated as described in the existing MOA (**Appendix E**) and is unavoidable if the proposed Project is to proceed. If additional resources may be affected by Project changes that may propose earthmoving, tree-clearing, terracing, etc., such viewshed changes may need to be reevaluated in consultation with SHPO, tribes, and consulting parties.

6.11.3 Mitigation Measures

The Project as currently proposed requires removal of four low-head dams and does not allow for avoidance or minimization of adverse effects. Per SHPO request, NRCS has included input from local parties in their mitigation design. An MOA has been executed to document the selected mitigation and its implementation (**Appendix E**). Mitigation measures described in the Memorandum of Agreement include:

- monitoring and documenting dam removal by an architectural historian; and
- presentation of interpretive materials.

6.11.4 Cumulative Effects

The NRCS has considered the possibility of cumulative effects to historic properties and has found that the Proposed Action will have no cumulative effects on these resources. The SHPO letter to the NRCS dated March 23, 2021, alludes to the potential that the 4 low-head dams could be "… contributing of a larger historic district associated with the total design of Harland Bartholomew..." if such a district even existed. The NRCS's identification and evaluation efforts found that the three previously recorded historic properties and the 16 newly recorded resources, listed in Table 4-10 of Appendix C of this document, predate the construction of the 4 low-head dams

and the publication date of Bartholomew's City Plan and, therefore, are not associated with his overall design for the Grand River or the City of Grand Rapids. Furthermore, the SHPO has concurred with the NRCS's findings that there are no direct or indirect effects to these properties from the Proposed Action. Moreover, Bartholomew's philosophy of city planning was one of urban renewal, which was not concerned with the construction of buildings, but, rather, emphasized the removal of buildings to create longer and larger vistas of parks and natural areas. The NRCS's identification and evaluation efforts failed to find any intact vistas or elements of Bartholomew's design, largely due to the abundance of mid to late 20th-century urban development within the City of Grand Rapids, especially along the waterfront. If a historic district associated with his 1925 City Plan ever existed, it is no longer intact.

The Proposed Action would have an adverse effect on the four low-head dams (DM16-19) which are eligible for NRHP listing and would be removed as part of the proposed Project. Specific projects and activities that may contribute to cumulative effects on cultural resources in the analysis area are indicated in **Table 6-8, Appendix C**. Other projects and activities could require coordination with SHPO. Most, if not all, of the other projects and activities would be consistent with those that occur periodically in any urban environment. Enhanced connectivity of parks and increased opportunities for water-based recreation would attract visitors to downtown Grand Rapids, possibly leading to increased visitation and appreciation of its cultural and historical resources. The Proposed Action, in conjunction with past, present, and reasonably foreseeable future activities, will have no adverse effects on historic properties.

6.12 Public Health and Safety

This section describes any potential effect to public health and safety the project alternatives may have.

6.12.1 Description of Effects

Effects on public safety are expected to be positive as removing the dams will remove public safety hazards. Users of the river would no longer be exposed to those hazards. There is a negligible, though improbable risk to the public due to construction activities.

6.12.2 No Action Alternative

No construction or alteration to the river associated with the Proposed Action would occur under the No Action Alternative; therefore, the public health and safety hazards would generally remain in their current state. The dams would remain in place and associated safety hazards would continue to exist.

6.12.2.1 Preferred Action Alternative

The existing dams present public safety hazards due to the associated hydraulics. Removal of the dams would eliminate those associated public safety hazards. All river systems where flowing water is present have some inherent safety risks for users. The Proposed Action would not change that nor remove all safety risks. The Proposed Action would likely encourage more use of the river and users would be subject to those safety risks inherent with all rivers.

6.12.2.2 Mitigation Measures

Safety signage would be installed at new access points and at strategic locations along the Project Reach to alert and inform users about the inherent safety risks associated with rivers.

6.12.3 Mitigation measures

Once completed, the Proposed Action would have a positive effect on public safety by eliminating hazards associated with the dams. Though construction activities due pose some public safety risks, the effect on public safety during construction is improbable and negligible. Therefore, no mitigation measures are required. Normal precautions would be taken during construction to manage construction traffic on public road surfaces, including ingress and egress, and exclude the public from construction zones.

6.12.4 Cumulative Effects

Public safety effects would not be cumulative as the project reduces hazards and improves public safety.

6.13 Urban Dynamics

This section describes the effect on urban dynamics that the proposed project alternatives may have.

6.13.1 Description of Effects

Urban dynamics includes local governance and how society interacts within the urban environment. This can include transportation, recreation, housing development, business development, employment, and population changes. The preferred alternative could affect one or more of those characteristics of the City by changing the urban environment. The Proposed Action will change the urban environment by changing the appearance of the Grand River and experience of its users. Specific effects of the No Action and Preferred Alternative are discussed below.

6.13.1.1 No Action Alternative

No construction or alteration to the river associated with the Proposed Action would occur under the No Action Alternative; therefore, urban dynamics would generally remain in their current state, although they would be affected by other projects (**Table 6-8, Appendix C**). In particular, the Ann Street to Bridge Street Grand River Project and government redevelopment projects would result in minor and permanent effects to urban dynamics. Consequently, the No Action alternative would not contribute to direct, indirect, or cumulative effects on urban dynamics from the Proposed Action but would result in impacts from other projects.

6.13.1.2 Preferred Alternative

The opportunities created by the Preferred Alternative are anticipated to generate an influx of new businesses. The City has engaged a River Equity Analyst supported through funding from the W.K. Kellogg Foundation to develop an equitable business development strategy for those businesses to participate in the construction and for the businesses would develop along the river's edge upon completion of construction. Part of the pre-construction work will include recruiting more local construction-related businesses to be part of the City's Micro-Local Business Enterprise program. Certified Micro-Local Business Enterprises are prioritized businesses that the City of Grand Rapids looks to for all spending needs. Building up the businesses listed in this program will have several benefits for the City including potentially keeping more river project funding and other future capital project funding in the hands of local businesses. The post-construction equitable business development strategy will include finding and producing inclusive opportunities for multiple business types along the Grand River's edge that will represent the various cultures represented within our City via resources such as incubation and or rental subsidies for commercial space, grants for new business development, and community partnerships. River restoration activities will also improve the aesthetics of the river and would make it a more desirable area in which to work, visit, and live. These improvements, plus new business offerings, could potentially increase interest in urban renewal through renovation of old and under-utilized buildings in the immediate area for mixed-use and/or residential use to accommodate greater desire to live in the heart of the City near the river.

Potential adverse effects of the Preferred Alternative are not due to OMRRR, but rather to increased visitation and population growth resulting in an increase in air pollution and automobile congestion from additional cars in the area. With this foresight in mind, the City of Grand Rapids has been working to mitigate these potential risks through expanded public transit and pedestrian / non-motorized travel options. The Downtown Area Shuttle (DASH) routes have been expanded to emphasize a north/south route along the river and western route with hopes of helping to relieve downtown parking congestion. The DASH North route was specifically modified to parallel the river and provide a way for visitors to access it from elsewhere in Downtown where there is plenty of available parking nights and weekends for visitor parking. Visitors will utilize designated off-site parking areas and take advantage of public shuttle routes running at less than 10-minute frequency. The City has also expanded its environmentally friendly transportation options for visitors, including the bikeshare and e-scooter services launched in late summer 2020. The hope is to expand upon recreational modes of transportation as a way to reduce air pollution and traffic congestion into and out of the area. Overall, effects to urban dynamics would not be significant, see summary in **Tables 6-6 and 6-7, Appendix C**.

6.14 Relationship between Short-Term Use and Long-Term Productivity

Some actions can affect long-term productivity or use of some resources in favor of short-term uses. Such effects could occur as a result of the approval and implementation of an action that could reduce the flexibility of pursuing

other options in the future, or from assigning a specific area or resource to a certain use that would not allow other uses, particularly beneficial uses, to occur at a later date.

The Proposed Action would not result in any sacrifice of long-term productivity in favor of short-term uses. On the contrary, under the Proposed Action, some resources would experience reductions in short-term usability, but subsequent increases in long-term productivity. Other resources would not be subject to any such tradeoff, either because the effects of the Proposed Action on those resources would be negligible or because there would be no effect on long-term productivity.

6.14.1 Short-Term Reductions, Long-Term Gains

Short-term consequences would occur during the construction phase, which would last approximately 2 years. The Proposed Action would reduce the short-term usability but improve the long-term productivity of the following resources: water and riverine resources; aquatic species and habitat; land use, recreation, and visual resources; socioeconomics; and urban dynamics. Water and riverine resources (Section 6.4) would experience temporary effects on water quality, sediment transport, and substrate, but long-term benefits to substrate, flow regime, and channel morphology. Aquatic species and habitat (Section 6.7) would experience temporary effects on unionid mussel species, federal and state listed unionid mussel species, and fish species, but long-term benefits are anticipated to all of the aforementioned elements, as well as to fish passage within the Project Area. Land use, recreation, and visual resources (Section 6.9) would experience temporary minor effects but long-term benefits. Socioeconomics and urban dynamics (Sections 6.10 and 6.13) would experience temporary minor effects on the economies of riverside and river-oriented businesses and organizations, but long-term benefits to the same.

6.14.2 Resources Without Long-Term Effects

The Proposed Action would have no effect on the relationship between short-term use and long-term productivity for the following resources: air quality and noise (Section 6.1), soils and geology (Section 6.3), wetlands (Section 6.5), terrestrial vegetation and wildlife (Section 6.6), floodplain management (Section 6.8), cultural resources (Section 6.11), and public health and safety (Section 6.12). For each of these resources, the Proposed Action is likely to cause minimal short-term effect and not likely to cause a long-term effect. Any short-term or temporary effects would be more than offset by overall habitat improvements that would be achieved by the Proposed Action.

6.15 Unavoidable Adverse Effects of the Proposed Action

The National Watershed Program Manual, Title 390 Part 500, requires that an EA under Part 501.38 evaluate the potential unavoidable adverse effects associated with a proposed action. Adverse effects that can be reduced by mitigation measures but not eliminated are considered unavoidable. **Table 6-6, Appendix C** provides a listing of such effects. Most potential unavoidable adverse effects associated with the Proposed Action would occur during the construction phase only, would be minimal, and would be temporary or short-term. Sections 6.1 through 6.13 provide additional information on the effects listed in **Table 6-7, Appendix C**.

6.16 Irreversible and Irretrievable Commitments of Resources

The National Watershed Program Manual, Title 390 Part 500, requires that an EA prepared pursuant to Part 501.38 review the irreversible or irretrievable commitments of resources resulting from implementation of a proposed action. The White House Council on Environmental Quality considers a commitment of a resource irreversible when the primary or secondary effects from its use limit the future options for its use. The irreversible commitment of resources occurs due to the use or destruction of a specific resource. An irretrievable commitment refers to the use or consumption of a resource that is neither renewable nor recoverable for use by future generations. In other words, the resource cannot be replaced, recovered, or reversed and results in the loss of production or use of natural or human resources.

Table 6-7, Appendix C provides a listing of potential irreversible and irretrievable effects by resource area. Other sections of Chapter 6 provide additional information on the effects summarized. The Proposed Action would involve no irreversible commitment of resources except for the demolition of the four-existing low-head dams and would involve no irretrievable commitment of resources other than the temporary loss of use of the Construction Area and the potential reproductive failure of aquatic species during construction.

6.17 Energy and Natural or Depletable Resource Requirements

This section is intended to capture the requirements for the proposed project actions. Energy and natural or depletable resource requirements are not applicable due to the project's designation as a non-water-resource project. This project does not interfere with, affect, or involve the generation of energy (e.g. hydropower) or depletion of natural resources.

7. CONSULTATION, COORDINATION, AND PUBLIC PARTICIPATION

7.1 Consultation, Coordination, and Public Participation

Multiple coordination and public involvement activities were planned and conducted throughout the course of the project scoping and planning. These activities included public meetings, information workshops, status reports, presentations, site visits/tours, and numerous other correspondence with Federal, state and local resource agencies, agriculture interests, drainage districts, and other interest groups and individuals. Input in the identification of problems, needs, and opportunities; planning and development of the project to include design of the rapids and water features, fish and wildlife features, conservation measures, and flood control design considerations; and assistance in conducting planning and engineering field activities was provided by numerous interests. The USFWS participated in coordination meetings, in-progress reviews, issue resolution conferences, site visits, data collection and analyses. Coordination with state and local agencies has been ongoing since project inception.

7.2 Public Scoping

The Project Scoping period was from fall 2019 through March 7, 2020. Public outreach was conducted throughout this time period and included presentations to a variety of groups and organizations. The full list of presentations and tours is included in **Appendix A**. In addition, several events set up at multiple community and city-wide venues offered information booths with SLOs agents present to discuss the project and answer public questions.

7.3 List of Persons and Agencies Consulted

A list of all persons and agencies with a vested interest in the Plan-EA and those consulted during the planning process, can be found in **Appendix C**. This includes agencies included in the Scoping process (See Section 3) and those that provided formal comments or required consultation and state agencies that had been coordinated with since the project inception.

State Historic Preservation Office (SHPO) - ERM submitted a Section 106 initial application for review to SHPO on December 20, 2018. On June 7, 2019, ERM, on behalf of NRCS, re-sent a consultation request via email with a copy of the original request attached. On June 19, 2020, NRCS submitted an updated Application for Section 106 review to SHPO, who acknowledged receipt that day. Prior to the initial application, NRCS worked with the SHPO State Archaeologist to determine the APE. The June 19, 2020, application found that the proposed Project would have no effect or no adverse effect on identified historic properties, although the NRHP eligibility status of the four low-head dams to be demolished had not been determined.

On December 17, 2020, SHPO requested a formal evaluation of eligibility of the four low-head dams to be removed from the Grand River by the proposed Project (DM 16 through DM 19). On March 4, 2021, NRCS provided MI SHPO with the evaluation of NRHP eligibility, finding that the dams are eligible for listing and that their removal is an adverse effect. A letter from SHPO dated March 23, 2021, concurs with this finding under Criterion A based on their role in the history of the city and the emergence of city planning. In addition, SHPO finds that the dams are also eligible under Criterion C, as the dams may embody the distinctive characteristics of a type, period, or method of construction. The Project as currently proposed requires removal of all four low head dams and does not allow for avoidance or minimization of adverse effects.

The ACHP was notified of the finding of adverse effect and responded that they do not wish to participate in the consultation. NRCS and the Project partners developed draft mitigation measures, provided them to the tribes, and then to the public through a public comment period and 2 online public meetings in November 2021. Comments received on the proposed measures communicated that the plans were appropriate to mitigate the effects. An MOA was developed cooperatively to document the plans and how they would be implemented. NRCS,

SHPO, Michigan Strategic Fund, GRWW, GVMC and the City of Grand Rapids are signatories with the Grand Rapids Public Museum as a concurring party.

USFWS Consultation - Pursuant to Section 12 of PL83-566, NRCS and the Project Sponsor initiated informal consultations with USFWS in 2020 under Section 7 of the Endangered Species Act. NRCS, in cooperation with the Project Sponsor, prepared a Biological Assessment (BA, **Appendix C**) describing project impacts and submitted the BA to USFWS During informal consultations and development of the BANRCS worked closely with .NRCS initiated formal consultations with USFWS with submittal of the BA. Former NRCS, in cooperation with the Project Sponsor, prepared a Biological Assessment (BA, **Appendix C**) describing project impacts and submitted the BA to USFWS on April 23, 2024. During informal consultations and development of the BA, NRCS worked closely with USFWS staff.. Former consultations continued during development of the Biological Opinion, which was issued by USFWS on August 14, 2024 (**Appendix E**).

Tribal Consultation - Tribal Consultation was initiated in accordance with the NHPA of 1966, as amended, and Executive Order 13007, Executive Order 13175, Secretarial Order 3206, and Presidential Memoranda (April 29, 1994, and November 5, 2009). NRCS sent invitations to participate in the planning process to Native American tribal organizations. Seven tribes/tribal organizations responded to NRCS' consultation efforts. The tribes and responses are summarized in section 3.3.

7.4 Public Outreach

The project team continued to engage the public throughout the entire process of the proposed project development (**Appendix A**). Specific efforts in collecting input, information and feedback about the project are summarized in **Appendix A**.

8. PREFERRED ALTERNATIVE

The selected revised design included in the BA is the Preferred Alternative because it maximizes the restoration potential and increases habitat diversity for freshwater mussels and native Great Lakes fish, while minimizing environmental effects. The Preferred Alternative - Removal of Low Head Dams with Substrate Improvements - involves the removal of all four low-head dams and creation of diverse bed features using substrate enhancements: constructing riffles and boulder drop structures, bank vane structures, and creating emergent habitat boulder fields. The Preferred Alternative enhances habitat for Federal Endangered and State Threatened fish and mussel species, while simultaneously removing existing safety hazards created by low-head dams.

8.1 Rationale for Preferred Alternative

Primary factors in the selection of the Preferred Alternative were that it met the project's purpose and needs by addressing river and habitat degradation, restoring beneficial habitat to TES species, and removing or reducing dam safety concerns, while minimizing effects. Once constructed, the Project would have positive effects on regulated resources

A BA was previously submitted, and a BO obtained on a previous design in 2020 (EcoAnalysts 2020; USFWS 2020). The previously approved BA evaluated metrics for three alternatives, the no action alternative (Alternative 1), removal of four dams without substrate enhancements (Alternate 2), and removal of four dams with substrate enhancements (Alternative 3a, the prior Preferred Alternative). The removal of four dams without substrate enhancements was not considered in the Plan-EA as discussed in Section 5.2 because it did not meet the project purpose. The current BA (EcoAnalysts 2024) evaluates two alternatives; the removal of four dams with substrate enhancements and the current re-design. Based on the previous Alternatives Analysis and issuance of the BO, completing the Alternative Analysis of these two designs revealed that the revised design further reduces effects from implementation of the proposed Project. Removing the four dams with re-designed substrate enhancements is the Preferred Alternative because it meets the project Purpose and Need and reduces permanent effects compared to the no action alternative. Under the Preferred Alternative, demolition of the four low head dams would improve fish habitat, as well as eliminate the public health and safety issues caused by dangerous dam hydraulics.

The Proposed Action includes dam removal, bed grading, and installation of boulder arches, constructed riffles, emergent habitat boulder fields, and bank vanes that would create more diverse habitat similar to the historic rapids and provide fish passage. Improved habitat and fish passage would benefit fish and mussel populations including TES species. Project outcomes include the following:

Improved habitat diversity and suitability over 6.1 acres of the Grand River;
Increased Great Lakes native fish and mussel diversity and productivity;
Conservation of threatened and endangered fish and mussel species including the Lake Sturgeon, River Redhorse, and Snuffbox Mussel.

8.2 Measures to be Installed

Measures to be installed include removal of the four low-head dams, riverbed grading, and installation of boulder arches, constructed riffles, emergent habitat boulder fields, and bank vanes. All the measures under the Preferred Alternative would meet the project objectives and are eligible for funding under PL83-566 (Section 8.5) and would benefit Public Fish & Wildlife. The overall construction costs are $22,053,391, as discussed and are further broken down in Section 8.5 and 8.8. Table 8.1, Appendix C, summarizes the quantity of installed measures under the Proposed Action.

8.2.1 Existing River Conditions and Proposed Alterations

River conditions along the Project Area from just upstream of Bridge Street to the upstream side of the Fulton Street Bridge are similar from segment to segment between bridges. Mean annual flow in Grand Rapids from 1901-2005 was 3,775 cfs (Hanshue and Harrington, 2017). Low flow is approximately 890 cfs. Bankfull flow (1.5-year flood) is 13,000 cfs. At 23,000 cfs, the 6th Street Dam becomes submerged. Ten (10), 25, and 100-year flood levels are 33,000 cfs, 42,000 cfs, and 55,000 cfs, respectively. The 2013 flood peaked at 35,100 cfs in Grand Rapids.

Anthropogenic alterations in the Project Area over the last two centuries include narrowing the river, building floodwalls, quarrying bedrock, removing glacial boulders, dredging the channel, and installing a series of low-head dams. The Grand River within Grand Rapids was estimated to be 1,400 feet wide before modification. The width is currently approximately 450 to 600 feet (Hanshue and Harrington, 2017). Floodwalls are present on both banks throughout most of the Project Area.

Approximately 300,000 cubic yards of gravel, cobble, and boulder were dredged to fill the city riverfront. The 6th Street Dam was constructed at its present location in 1849 for water power in the canal around the rapids and to facilitate log flotation over the upstream bedrock shelf. It is presently classified as a grade control structure and maintains approximately 8 feet of head. Four low-head dams were constructed downstream of the 6th Street Dam as part of a project to provide and maintain dilution water for raw sewage that was being discharged into the river. These dams maintain an average of 2 feet of head each. The detailed construction sequencing presented in the BA (EcoAnalysts 2024) shall serve as a recommendation to the contractor; all final staging and care of water methods and procedures shall be the sole responsibility of the contractor.

8.2.2 Land Acquisitions, Easements, and Public Access

Construction of the installed measures does not require purchase of land or conservation easements. All the installed measures would be installed within the channel of the Grand River, which is a public waterway managed by the State of Michigan on behalf of the citizens of the State of Michigan. Once the measures are installed, the Grand River would be unchanged in terms of its status as a public waterway. The river and all installed measures would remain as accessible to the public as it currently is. River access would be improved by proposed measures being pursued by other parties and with other funding.

Construction of the installed measures does not require purchase of land or conservation easements. All the installed measures would be installed within the channel of the Grand River, which is a public waterway managed by the State of Michigan on behalf of the citizens of the State of Michigan. Once the measures are installed, the Grand River would be unchanged in terms of its status as a public waterway. The river and all installed measures would remain as accessible to the public as it currently is. River access would be improved by proposed measures being pursued by other parties and with other funding.

The City of Grand Rapids owns the majority of the property adjoining the proposed Project Area. However, a temporary construction easement has been acquired to install the proposed measures. The City of Grand Rapids has previously acquired approximately 16 easements along the Grand River to gain access to the construction area. Maps of the construction easements obtained by the City of Grand Rapids are provided in the Construction Plans (**Appendix C**) with easements shown on sheets G02-G04. PL83-566 funds would not be used to purchase any land or acquire any easements.

8.2.3 Land Clearing

The riparian area along both sides of the Grand River within the Project Area is urbanized. Forested areas are not present. Only minimal and selective tree removal is required to provide construction access and staging areas along the Grand River.

8.2.4 Problems Addressed

The four low-head dams alter hydraulics, sediment transport, and fish passage between Bridge Street and Fulton Street (31.5 acres of riverbed). Previous alterations of these natural processes have degraded habitat quality. In particular, the substrates between the dams are finer and more uniform than the substrates that would naturally exist and flow velocity and depth are more uniform. Installation of the substrate enhancements to create the project features would substantially increase habitat diversity over the entire 31.5 acres of riverbed within the Project Area.

8.2.5 Risk of Failure, Public Safety, and Protections

The Preferred Alternative measures proposed have a low risk of failure and would reduce public safety hazards. The dams are already in various states of degradation, and demolishing the four dams would eliminate their potential for failure. The dams also present public safety hazards and cause multiple life-saving rescues every year. The substrate enhancements that are proposed as part of the Preferred Alternative would create a natural bed form that has been designed to be stable under the current flow regime. They would not impound the river and would allow the existing bed slope to be naturally transitioned following demolition of the low-head dams. The installed measures would be constructed of natural glacial materials and bedrock obtained from quarries or redistribution of such materials within the river channel. To contain sediment within isolation measures, Soil Erosion and Sediment Control (SESC) measures would be provided and maintained as required (**Appendix C for Construction Plans**). Scouring of the existing riverbed outside of direct impact areas is not anticipated during construction, however, scour protection for bridge piers and/or floodwalls may be necessary during construction. These measures would take the form of riprap or similarly engineered countermeasure solutions. Location and extent of channel scour protection would vary based on monitoring during construction.

8.2.6 Recreational Improvements

All measures installed are intended to improve aquatic habitat and restore the historic rapids within the Grand River which is likely to increase recreational uses. The overall restoration goals, including demolishing the four low-head dams and creating a diverse bed would remove safety hazards associated with the dams, improve aquatic habitat, and help restore the historical rapids within the Grand River. This would likely draw both locals and tourists alike to enjoy.

8.2.7 Actions to Minimize Soil Erosion and Water, Air, and Noise Pollution During Construction

Several BMPs would be used during construction to minimize soil erosion and water, air, and noise pollution. As discussed in Chapter 6.1, the proposed Project includes dam demolition, riverbed grading, and installation of habitat features. These restoration activities require use of heavy construction equipment such as excavators, loaders, cranes, dump trucks, and other common earthmoving equipment. Construction equipment would access the Construction Area using aggregate causeways that would be installed along the banks and across the riverbed and flow isolation measures at Dam 2. However, changes to the riverbed and terrestrial habitats from construction activities are temporary and have been minimized to the extent practicable. Due to minimal, temporary effects on noise and air quality, no mitigation measures are recommended.

All areas affected by construction (direct impact areas) that would be affected by causeways built to access and work in the dam removal were considered. Temporary effects during construction were reduced by eliminating

large flow isolation areas relying on large cofferdams. Instead, temporary aggregate causeways would be installed to access work areas and only one small flow isolation area is required at Dam 2. Additionally, temporary scour protection would be placed at the Gillett Bridge pilings while the Dam 2 isolation measures are in place. Temporary causeways within the Dam 2 isolation would not be used so that the entire area could be unimpacted during fish removals and mussel relocation. Construction staging areas have been identified outside of the channel, above the Ordinary High-Water Mark (OHWM). Because of the developed downtown area, construction access options are limited. Therefore, all access to the river would be from Ah-Nab-Awen Park.

Staging areas would not be placed in environmentally sensitive locations. In all cases, equipment and material would access the in-stream work areas adjacent to the designated staging area via designated access ramps and bridges down to the channel bed. Most wetlands would be avoided. Small areas of wetlands that cannot be avoided would be crossed on temporary construction mats. Overall SESC practices are shown in the Construction Plans in Appendix C. Silt fence, straw bales, and other similar BMPs would be used to control soil erosion and runoff from disturbed areas of the construction staging areas and access routes. Crushed aggregate would be used on access routes and equipment operating areas of staging areas to clean equipment tires and tracks and minimize soil erosion.

Prior to entering the watercourse, all equipment would be washed under high-pressure water with a non-harmful and biodegradable degreaser. Once in the watercourse, equipment would be inspected frequently and maintained properly to ensure no grease, oils, or chemicals are entering the watercourse. If equipment is leaking such fluids, it would be removed from the water course and repaired prior to re-entering. Equipment regularly traversing in and out of the watercourse would be cleaned under high-pressure water (i.e., wheel washing station) at a minimum 1x per week. Biodiesel hydraulic oil would be used in any equipment entering the water. Some of the work would have to be completed in the wet, within an actively flowing portion of the channel. A turbidity monitoring and adaptive management plan would be prepared to limit downstream turbidity, and turbidity would be actively monitored throughout construction to detect problems and identify the need for additional or different BMPs (EcoAnalysts 2024).

8.2.8 Historic and Cultural Resource Considerations

Federal agencies are required by the NHPA to consider potential effects of Proposed Actions on "historic properties," defined as cultural resources that are listed or eligible for listing on the NRHP. As such, the project team consulted numerous federal, state, and local agencies, as well as tribal and public interest groups. The list of persons and agencies consulted can be found in Section 7.3. As discussed in Section 6.11, the proposed Project is unlikely to affect significant archaeological sites or potential culture-bearing soil horizons. The only NRHP-eligible historic properties that would be adversely affected are the four low-head dams proposed for removal. Mitigation measures for this adverse effect are documented in an MOA (Appendix E). OMRRR activities are not anticipated to have any effect on cultural or historic resources.

8.2.9 Project Timeline and Schedule

Permitting for this Project is expected to be completed in 2024 (**Table 8-2, Appendix C**). Once the EGLE permit is granted and funding is secured, the mobilization and construction can begin, proposed for summer 2025. Mussels that were not collected and translocated in 2024 and not in areas under construction may also be translocated in 2025 if river conditions permit. Due to safety concerns with relocating mussels, mussels may not be able to be relocated from all direct impact areas. If mussels cannot be salvaged from any one or multiple isolation measures, NRCS would coordinate with USFWS and MDNR to discuss options Tables 2-13 & 2-14 (EcoAnalysts 2024), **Appendix C**.

Mussels would be translocated from the isolated area in the Dam 2 construction area in 2025, once the area is isolated and water drawn down. Construction is expected to take up to two construction seasons; however, construction is highly dependent on safe river levels. All construction activities would work around seasonal limitations as required. Project construction would require approximately 3-4 months of active construction, requiring a minimum of one construction season, but may need additional construction seasons pending river conditions

8.2.10 Conservation and Mitigation Measures

Project modifications have been made throughout the design period in consultation with agencies to reduce effects associated with construction activities and reduce overall effects to natural resources, including soil, water, wetlands, fish and mussels. Measures to avoid, minimize, and mitigate wetland impacts are identified in Section 6.5 and would primarily include protecting most wetlands with sediment control devices, and utilizing temporary timber matting to cross unavoidable wetlands.

As discussed in Section 6.7, the Proposed Action is designed to restore and maintain substrate, potentially leading to increased productivity of mussels, fishes, and other aquatic organisms. Relevant to fish and mussel species effects, conservation and mitigation measures are planned to reduce the Proposed Action effects during construction and increase aquatic habitat for fish and unionid mussels during the operations phase of the Project, with details as shown in the BA (EcoAnalysts 2024). A Mitigation Fund (The Fund) would be established for conservation measures that have significant benefits to the lower Grand River mussels, see Section 8.3 below.

8.3 Mitigation

The project includes 0.01 acres of unavoidable wetland loss. This loss impact area is minimal and under the threshold typically requiring wetland mitigation.

The construction area spans from 300 ft upstream of Bridge Street downstream to the upstream face of Fulton Street Bridge, covering 127,600 m2 (31.5 acres). Within the construction area, aggregate causeways, flow isolation measures at Dam 2, scour protection at Gillett Bridge, constructed riffles, boulder arches, emergent habitat boulder fields, and bank vanes would be installed. Construction causeways, scour protection and Dam 2 flow isolation measures would be removed once construction is complete. Of the total 31.5-acre construction area, 47,415 m2 (11.7 acres) would be directly affected during construction. The areas between direct impact areas (82,155 m2; 19.8 acres) would be indirectly impacted by temporary increases in turbidity and changes in flow patterns associated with causeways and features constructed in the river. The low flow wetted area, flow diversity, and habitat diversity would be positively affected as a result of the Project. The project would result in more habitat; therefore, mitigation for instream impacts is not required.

State and federal TES mussel species would be directly and indirectly affected along with other species of mussels not listed as threatened or endangered. Mussels would have been collected and relocated from as much of the direct impact area within the construction areas as practicable prior to the start of construction and translocated to recipient sites within the Grand River with suitable habitat. The salvage target is 80% of individuals present with less than 5% mortality. Not all mussels can be salvaged, and some would perish after being translocated. The project team anticipates a maximum take of 13,394 mussels. The number of mussels that were safely relocated was 11,485 due to unsafe dam hydraulics and fast flow velocity.

As part of the proposed conservation measures, a mitigation fund will be established to offset the take for the mussels that were unable to be translocated under the USFWS Project. The maximum mitigation fund contribution would be based on $34.10/mussel and would not exceed $456,743. This fund would be reduced by the amount of mussels that are translocated multiplied by the cost per mussel as stated above. The objective of the mitigation fund would be to fund projects that provide a direct benefit to mussels to achieve the USFWS “no net loss” policy and offset any potential effects from mussels that were unable to be translocated. The work performed through the mitigation fund would help inform future conservation and habitat restoration efforts.

An initial deposit would be made to the mitigation fund following the completion of the 2024 mussel translocation efforts based on the collection efficiency. A second and final deposit to the fund covering the balance of the required mitigation fund would be made following any mussel translocation activities that occur during the 2025 construction season. Any excess funds of the initial deposit would be returned if the mussel translocation exceeds the estimated collection efficiency. The financial assurance shall take the form of proof of funding deposited into an escrow account, City of Grand Rapids Commission Resolution, proof of deposit and an executed agreement with a Non-Government Organization, or another agreed upon form of financial assurance documentation. All mussel mitigation will be funded by other funding sources and are not included in the PL566 funding request under this Plan-EA

8.4 Permits and Compliance

Compliance with all applicable Federal, State, Tribal, and local laws and regulations would be documented, and applicable regulatory permits and official project authorizations obtained before project implementation. These permits and authorizations include the NEPA, NHPA, ESA, NFIP, and the Michigan Natural Resources and Environmental Protection Act (NREPA).

8.4.1 Federal

Project activities would be implemented in accordance with the following Federal regulations. Endangered Species Act - As indicated in the BA, a listed species—the snuffbox mussel—is present in the Project Area and would be affected by the Project, therefore, approval from FWS under the ESA is necessary for carrying out Project activities.

NEPA/NHPA - Because the Project would involve at least one federal action, the project would be subject to the NEPA and the NHPA. The NHPA requires federal agencies issuing permits to consider whether the permitted federal undertaking would adversely affect a historic property. If the agency determines that the undertaking would adversely affect a historic property, the agency must consider ways to avoid, minimize, or mitigate those adverse effects. Under NEPA, a federal agency must prepare an Environmental Impact Statement ("EIS") for any major federal action that significantly affects the quality of the human environment. The question whether a federal action is a major federal action that significantly affects the quality of the human environment is answered by preparing an EA. If the EA concludes that a major federal action significantly affects the quality of the human environment, then the agency must prepare an EIS. If, on the other hand, the EA concludes that there is no major federal action significantly affecting the quality of the human environment, then the agency memorializes that conclusion by issuing a FONSI.

Section 404 of the Clean Water Act - In Michigan, based on a memorandum of agreement between the USEPA and EGLE, EGLE administers Section 404 of the Federal Water Pollution Control Act of 1972 (Clean Water Act) for interior waters in Michigan. Although EGLE administers Section 404 for interior waters in Michigan, USEPA maintains oversight of projects that surpass established criteria. Under the assumed state permitting program, when a permit applicant seeks to engage in activities involving the discharge of dredged or fill material into Waters of the United States (WOTUS), the state will transmit a copy of the permit application to the appropriate agencies. For example, when a project requires federal oversight, EGLE has the opportunity to forward the permit application to federal agencies such as the USEPA, USACE and the USFWS for review and comment. USACE maintains jurisdiction over WOTUS maintained under Section 10 of the federal Rivers and Harbors Act of 1899 and their adjacent wetlands. The state may not issue a proposed permit until after it receives USEPA's comments, or until 90 days have passed after the state transmitted a copy of the application or proposed permit to USEPA. But if USEPA objects to issuance of the permit, the state may not issue the permit until the objection has been resolved.

FEMA

A Conditional Letter of Map Revisions (CLOMR) is a letter from FEMA commenting on whether a proposed project, or any potential hydrology changes, would meet the minimum National Flood Insurance Program standards. The Project CLOMR reviews the minimal difference between the pre- and post- proposed project conditions.

8.4.2 State

NREPA

Completion of the Project will also require several permits under Michigan's NREPA.

- Part 301, Inland Lakes and Streams, of NREPA - Part 301 of NREPA governs inland lakes and streams in Michigan. A part 301 permit is required to dredge or fill bottomland; construct, enlarge, extend , remove, or place a structure on bottomland; or structurally interfere with the natural flow of an inland lake or stream. Under current Project designs, a permit under Part 301 will be required to complete Project activities.
- Part 303, Wetland Protection, of NREPA - Part 303 prohibits depositing fill material in a wetland; dredging or removing soil or minerals from a wetland; constructing, operating, or maintaining any use or development in a wetland; and draining surface water from a wetland without a permit. If Project construction activities will occur in a wetland, a Part 303 permit will be required for that construction.

- Part 31, Water Resources Protection, of NREPA - Under Part 31, a person may not alter a floodplain or engage in filling or grading in a floodplain, stream bed, or channel of stream without obtaining a floodplain permit. Under current Project designs, a permit under Part 31 will be required to complete Project activities. In addition, because it is anticipated that Project activities will disturb more than five acres of soil, the Project will also likely require submission of a notice of coverage to be covered under the National Pollutant Discharge Elimination System (NPDES) permit for storm water discharge from a construction site.
- Part 91, Soil Erosion and Sedimentation Control, of NREPA - Under Part 91, a person may not maintain or undertake an earth change except in accordance with Part 91 and the rules promulgated under Part 91, or with the applicable local ordinance, and except as authorized by a permit issued by the appropriate municipal or county enforcing agency. The Project will likely require a soil and erosion permit under Part 91.

8.5 Costs and Cost Sharing

The totals for the works of improvement by major type are itemized in **Table 8-3, Appendix C**.

8.6 Installation and Financing

This section describes the planned sequence of installation, along with the responsibilities of NRCS and the City of Grand Rapids (SLO), and other agencies and partners for installing and financing the project.

8.6.1 Planned Sequence of Installation

No real property would need to be acquired prior to installation of practices. All easements necessary have been secured by the City and summary maps included in **Appendix B**. No specific land treatments are required to be installed before structural or nonstructural measures are implemented. Some OMRRR may be required, but the project was designed to morph as a natural river and OMRRR would only be required to address public safety or infrastructure concerns (EcoAnalysts 2024). The detailed construction sequence can be seen as proposed in the BA (EcoAnalysts 2024), **Appendix E**.

Specific responsibilities of each the City of Grand Rapids and NRCS are listed below:
The City of Grand Rapids has the authority and has agreed to exercise those authorities to implement the installation plan. The City has the authority under its charter, statutes, and the Michigan Constitution to regulate the Grand River. Under the Home Rule provision of the Michigan Constitution, implemented through the Home Rule City Act, home rule cities have broad authority to govern local concerns. Specifically, the Michigan Home Rule City Act provides that home rule cities may enact charter provisions that regulate the "streams, waters, and water courses" within the city. The Grand Rapids City Charter grants the City the authority to regulate its waterways, subject to State and Federal limitations.

The City of Grand Rapids has also acquired the legal property rights to perform this work. The City maintains existing dam easements and owns a significant portion of the property along this reach of the river. In addition, construction easements were acquired with all private property owners for the purpose of surveying, designing, constructing, inspecting, repairing, improving, altering, rehabilitating, monitoring, removing, using, operating, and maintaining improvement in, over, under, and through the Grand River including, without limitation, its banks, bottomlands, and adjacent subsurface lands. **Appendix C** contains maps and a table of legal property rights for each parcel along the river. NRCS would be responsible for reviewing invoices sent by the City of Grand Rapids for the construction and reimbursing the City directly out of PL83-566 funding, if approved.

8.6.2 Contracting

The City has full responsibility to contract out the work and follow all policies and procedures the City has in place. The City would communicate directly with NRCS during installation. No long-term contracts (LTCs) for cost-shared land treatment are necessary for this project.

8.6.3 Real Property and Relocations

No real property acquisitions or relocations are needed for the implementation of the measures, nor would any relocations result from the proposed action.

8.6.4 Other Agencies

Several other Federal agencies, besides NRCS, are involved in accomplishing the project. USFWS is responsible for issuing the BO, which has been included in the EGLE permit application. USFWS Sea Lamprey control program has been consulted with, along with members of the Great Lakes Fishery Commission to ensure the project design and related construction activities do not negatively affect the functionality of the existing 6th Street Dam as a barrier to invasive Sea Lamprey. Upon submission of the Joint Permit Application to EGLE, EGLE has provided a copy to USEPA for review and comment. USEPA will coordinate with USACE and USFWS to funnel their comments back to EGLE.

State agencies involved in accomplishing this project include EGLE and MDNR. EGLE will review the project documents for compliance with permit requirements derived from state and federal rules and regulations for construction activities where the land meets the water. MDNR has participated in a number of project related discussions regarding fish passage, fish habitat, recreational use/access, angler concerns, and endangered/invasive species. MDNR will review all plans and documents submitted to EGLE and will provide additional comments or objections. MDNR has also coordinated with the USFWS to incorporate the inclusion of state listed species into the BO. When the project is public noticed, DNR Fish, DNR Wildlife, the townships, county, health department, local postmaster, and soil erosion agents will also be noticed.

8.6.5 Cultural Resources

Other than removal of the low-head dams, NRCS does not anticipate that the Proposed Action would result in adverse effects to historic properties or require any mitigation measures. Removal of the low-head dams has been addressed in a mitigation plan reviewed by the public and approved by SHPO and incorporated into an MOA. If it becomes apparent that the Proposed Action may result in additional adverse effects, the proposed Project would incorporate additional measures to avoid, minimize, or otherwise mitigate effects in consultation with SHPO and/or the Advisory Council on Historic Preservation. Examples of potential mitigation measures are described in Section 6.11, Cultural Resources. If cultural resources are discovered during construction, construction would be halted and the procedures of the Inadvertent Discovery Plan (included in Appendix E of the MOA) would be followed.

8.6.6 Financing

The City of Grand Rapids is responsible for financing the installation costs of the project through a combination of public and private funds acquired through an ongoing partnership with Grand Rapids Whitewater**.** If approved, t he NRCS PL83-566 funding for construction, $11,026,695 would, be reimbursed directly to the City for the items essential for the construction of the habitat improvements. Other activities will be financed through the following allocation of funding commitments to GRWW. The breakdown of installation funding is included in **Table 8-4, Appendix C**. The costs presented are planning level estimates and do not reflect final costs. Detailed designs and construction cost estimates will be completed prior to initiating the project. Final construction costs would only reflect the time and materials to perform the work.

GRWW and project partners continue to raise additional funds from a variety of sources to cover additional or unanticipated construction costs with the intention of paying for project costs as they occur. The City has analyzed its financial needs in relation to the scheduled installation requirements for the works of improvement. Some OMRRR may be required, but the project was designed to morph as a natural river and OMRRR would only be required to address public safety or infrastructure concerns (EcoAnalysts 2024). Therefore, no ongoing operations and maintenance costs are expected at this time.

8.6.7 Conditions for Providing Assistance

Financial and other assistance by NRCS would be made available to the City once the EGLE permit is secured for the project.

8.7 Operation, Maintenance, and Replacement

The City of Grand Rapids, as the SLO, is responsible for using its powers and authority to ensure the installation, operation, and maintenance of the project occurs as planned (Public Law 83-566 Section 1004 (3)). Conservation measures would be implemented during construction and are calculated to ensure substrate and construction feature stability, with the intent of avoiding the need for ongoing maintenance. Once project installation is

complete there would be minimal operations to be managed or anticipated need for substrate replacement. Should maintenance activity become a necessity and involve the construction of isolation measures and/or tracking in the river channel, MDNR and EGLE would be sought prior to any work performance.

The OMRRR (**Appendix E**), explains the unique current and future conditions of the river and the project's sustainability. The proposed grading is anticipated to adjust to post-construction hydraulics and some localized scour and deposition may result, along with slight shifts in boulder and riprap. Changes that may require action include those that threaten public safety or infrastructure. Development of OMRRR cost estimates account for expected upkeep of project features for as long as the project exists. For this project, a 50-year lifetime, plus 2 years implementation period, was assumed. OMRRR is expected as described below:

- **Operation** includes regular monitoring, inspections, data collection and reporting. These procedures would be conducted regularly at a maximum interval of 5 years to evaluate design goals and constraints throughout the life of the project. Operational procedures are recommended to be performed during and after larger floods, significant droughts, ice jams, and other processes outside of average annual hydrologic events.
- **Maintenance** is for routine, planned and scheduled upkeep of project features, equipment, or supplies necessary to maintain proper functionality of project elements. Maintenance is not anticipated to be required for the design elements of this project.
- **Repair** is for unscheduled correction resulting from unforeseen circumstances that are outside of the design assumptions for the project. These include but are not limited to environmental events and vandalism.
- **Rehabilitation** is to correct anticipated shifting, wear and tear, weathering, or materials degradation by resetting features, augmenting features with additional materials,
- replacing protective coatings or refurbishing features or components.
- **Replacement** includes the removal, demolition and disposal, and replacement of project features or components that cannot be repaired or rehabilitated.

In-stream OMRRR may require design, permitting, temporary access to the channel, and temporary care of water. **Table 8-5, Appendix C** outlines the schedule for elements of the project. The City of Grand Rapids, as the SLO is responsible for following the OMRRR schedule and ensuring the financing of these actions is in place. The BA describes the specific provisions and responsibilities for OMRRR that minimize harm to TES. Several monitoring programs, such as stream substrate digitization, macroinvertebrate surveys, and fish population studies, have been established and are included in **Appendix E**. Agencies involved in conducting and evaluating the OMRRR include the City of Grand Rapids, Grand Rapids Whitewater, and several consultants with expertise in the various components. An operation and maintenance agreement would be entered into before any construction begins and would address each installation measure. The City's emergency action plans will be updated as necessary by the City's Emergency Manager.

8.8 Economic Tables

The estimated installation cost of construction, which is based on the 60% completed design, is provided by Rockford-Walsh Grand River JV, the Construction Management Advisor hired by the City of Grand Rapids. The estimated project costs, totaling $22,053,391, covers the removal of the four low-head dams and enhancement of the substrate in the Project Area**, Table 8-3 (Economic Table 1), Appendix C**. The costs of future OMRRR maintenance are likely to be negligible as discussed in Section 8.7 Operation, Maintenance, and Replacement.

Project outlay costs would be covered entirely by a combination of NRCS and Sponsor funding from public and private sources as expenses occur. As such, no financing for this project is anticipated. Measures used for evaluation purposes, associated costs, and implementation year for each, are listed in **Table 2-3** (EcoAnalysts 2024). Each evaluation unit includes costs for all items regardless of whether benefits can be evaluated monetarily. **Table 8-6 (Economic Table 4), Appendix C,** includes additional itemized breakdown of the Project Outlay construction categories. The uneconomical or unevaluated increments are included since the benefits can be valued using standards used in the industry.

DISTRIBUTION LIST

This is a listing of the agencies, organizations, and persons to whom the watershed project plan-EA is sent. (Sent to when published)

- John Weiss, Executive Director, Grand Valley Metropolitan Council
- Matt Chapman, President & CEO, Grand Rapids Whitewater
- Mark Washington, City Manager, City of Grand Rapids
- Tim Kelly, President & CEO, Downtown Grand Rapids, Inc.
- Gloria Lara, Interim Executive Director, West Michigan Environmental Action Council
- Erin Sloan-Turner, Administrator, Kent Conservation District
- Al Vandenburg, Administrator, Kent County
- Liz Pelloso, United States Environmental Protection Agency
- Ken Westlake, United States Environmental Protection Agency
- Scott Hicks, United States Fish and Wildlife Service
- M. Scott Bowen, Director, Michigan Department of Natural Resources
- Tammy Newcomb, Michigan Department of Natural Resources
- Luke Trumble, Michigan Department of Environment, Great Lakes & Energy
- Jerrod Sanders, Michigan Department of Environment, Great Lakes & Energy
- Lisa Walter, Great Lakes Fisheries Commission
- James Lange, National Park Service

REFERENCES

501.41 References
This section provides the sources of the information contained in the document. If supporting data are incorporated by reference, then the material being referenced must be briefly summarized for the reader to understand the context of the material being incorporated. This section also includes information on how the reader can arrange to obtain and review the material being referenced. Material based on proprietary data that are not available for review may not be incorporated by reference (40 CFR Section 1502.21).

Biolchini, Amy. 2017. Historic Grand River Photos Show How Quickly its Rapids Disappeared. Accessed March 21, 2019. Available online at https://www.mlive.com/news/grand-rapids/2017/12/grand_river_rapids.html.

Bureau of Economic Analysis. 2023. *Table 2. Real Gross Domestic Product (GDP) by Metropolitan Area, 2012-2023.* December, 2023. Available online at https://www.bea.gov/data/gdp/gdp-metropolitan-area.

CEQ. 2005. Memorandum: Guidance on the Considerations of Past Actions in Cumulative Effects Analysis. Retrieved from https://www.energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/G-CEQPastActsCumulEffects.pdf

Churches and Wampler. 2013. Geomorphic History of the Grand River and Grand River Valley: Natural and Anthropomorphic Hydraulic Controls. Student Summer Scholars. 105. Available online at https://scholarworks.gvsu.edu/cgi/viewcontent.cgi?article=1107&context=sss. Accessed February 2019.

City of Grand Rapids. 2002. Plan Grand Rapids (Master Plan). Available online at https://www.grandrapidsmi.gov/Directory/Programs-and-Initiatives/Master-Plan/Full-Plan. Accessed December 2018.

City of Grand Rapids. 2007. Monroe North Area Specific Plan Final Report. Available online at https://www.grandrapidsmi.gov/files/assets/public/departments/planning-department/files/master-plan/neighborhood-plans-and-projects/monroe-north/monroe-north-asp.pdf. Accessed December 2018.

City of Grand Rapids. 2015. Michigan Street Corridor Plan. Available online at https://www.grandrapidsmi.gov/files/assets/public/departments/planning-department/files/master-plan/neighborhood-plans-and-projects/area-specific-plans/michigan-street-corridor-plan.pdf. Accessed December 2018.

City of Grand Rapids. 2017. Grand Rapids Parks and Recreation Strategic Master Plan. Available online at https://www.grandrapidsmi.gov/Government/Departments/Parks-and-Recreation/Parks-and-Recreation-Strategic-Master-Plan. Accessed December 2018.

City of Grand Rapids. 2018. Detailed Zoning Maps and Zoning Ordinance. Available online at https://www.grandrapidsmi.gov/Directory/Programs-and-Initiatives/Zoning-Ordinance. Accessed December 2018.

City of Grand Rapids. 2020. Parks and Recreation Strategic Master Plan. Available online at https://www.grandrapidsmi.gov/Government/Departments/Parks-and-Recreation/Parks-and-Recreation-Strategic-Master-Plan. Accessed July 2020.

Downtown Grand Rapids Inc. 2018. GR Forward Implementation Update - Q1 2018. Available online at http://downtowngr.org/announcements/2018/03/gr-fwd-update-q1-2018. Accessed December 2018.

Dunn 2017. Overview of North American Freshwater Mussels: Conservation Challenges and Opportunities. Heidi Dunn November 2017

ECT 2018. Grand River Revitalization Project: Preliminary Investigation Report. Environmental Consulting & Technology, December 21, 2018

EcoAnalysts 2020. Revised Biological Assessment February 2020: Impacts to federal and state threatened and endangered species from rehabilitation of the Grand River between Bridge and Fulton Streets in Grand Rapids, Kent County, Michigan

EcoAnalysts 2024. Biological Assessment Revised March 2024: Impacts to federal and state threatened and endangered species from rehabilitation of the Grand River between Bridge and Fulton Streets in Grand Rapids, Kenty County, Michigan Revision 1

EGLE 2019. Michigan Department of Environmental Great Lakes and Energy (EGLE). 2019. Michigan Final Wetlands Inventory. Available online at: https://www.mcgi.state.mi.us/wetlands/mcgiMap.html# Accessed January 25, 2019.

Federal Emergency Management Agency (FEMA). 2023. Flood Insurance Study 26081CV001A, Kent County, Volumes 1-4, Version 2.6.30. Effective February 23, 2023.

40 CFR, Part 50. 40 Code of Federal Regulation, Part 50. Available online at https://www.law.cornell.edu/cfr/text/40/part-50. Assessed January 24, 2019.

FTCH 2018. Technical Memo: Grand Rapids White Water Regional Conservation Partnership Program Channel Stability and Sediment Transport.

FTCH 2019. Fishbeck, Thompson, Carr & Huber, Inc. 2019. Updated Wetland Delineation. Grand River Whitewater Restoration Project, City of Grand Rapids, Kent County, Michigan. February 26, 2019.

FTCH 2023. Fishbeck, Thompson, Carr & Huber, Inc. 2023. Wetland Boundary Verification. Grand River Whitewater Restoration Project, City of Grand Rapids, Kent County, Michigan. October 18, 2023.

Golder Associates, Inc. October 14, 2014. Wetland Delineation, Grand River Whitewater Restoration Project, City of Grand Rapids, Kent County, Michigan, Draft Report.

Grand Rapids Whitewater. No date. History of the Grand River. Available online at https://grandrapidswhitewater.org/public-process/history-of-the-grand-river/ . Accessed March 21, 2019.

Great Lakes Integrated Sciences Assessments (GLISA). 2018. Historical Climatology: Grand Rapids, Michigan. Available online at http://glisa.msu.edu/media/files/GrandRapidsMI_Climatology.pdf. Accessed January 24, 2019.

GVMC 2020. 2010 Census Tracts, NLCD_2016 Land Cover Maps, RCPP Watershed Maps

Hager, Jim. 2018. How They'll Bring the Rapids Back to the Grand River Beginning in 2019. Available online at https://www.mlive.com/business/west-michigan/2018/05/how_theyll_bring_the_rapids_ba.html. Accessed March 21, 2019.

Hanshue, S. K., and A. H. Harrington. 2017. Grand River Assessment. Michigan Department of Natural Resources Fisheries Report 20, Lansing. Available online at https://www.michigan.gov/documents/dnr/FR20_text_576206_7.pdf. Assessed January 24, 2019.

Hanshue, S. K., and A. H. Harrington. 2017. Grand River Assessment. Michigan Department of Natural Resources Fisheries Report 20, Lansing. Available online at http://www.michigandnr.com/PUBLICATIONS/PDFS/ifr/ifrlibra/Fisheries/reports/FR20.pdf. Accessed February 2019.

Hanshue, S. K., and A. H. Harrington. 2017. Grand River Assessment. Michigan Department of Natural Resources Fisheries Report 20, Lansing. Available online

at http://www.michigandnr.com/PUBLICATIONS/PDFS/ifr/ifrlibra/Fisheries/reports/FR20.pdf. Accessed December 2018.

Holtgren, Marty. 2018. Impacts to Fish Passage in the Grand River between I-196 and Fulton Street in Grand Rapids, Michigan. Prepared for Grand Rapids Whitewater. August 2018.

Holtgren. M.J. 2024. Impacts to Fish Passage in the Grand River between Bridge Street and Fulton Street in Grand Rapids, Michigan. Encompass Socio-ecological Consulting, 456 5the Street, Manistee MI 49660. February 2024.

ICF Consulting. 2005. A Summary of Existing Research on Low-Head Dam Removal Projects. Prepared for American Association of State Highway and Transportation Officials (AASHTO) Standing Committee on the Environment. https://www.latitudegeography.org/urban-dynamics.html

Kjelland, M. E., C. M. Woodley, T. M. Swannack, and D. L. Smith. 2015. A review of the potential effects of suspended sediment on fishes: potential dredging-related physiological, behavioral, and transgenerational implications. Environ. Syst. Cecis. 35:334-350.

Lower Grand River Organization of Watersheds. 2011. Lower Grand River Watershed Management Plan Chapter 3. Available online at https://www.lgrow.org/lgrwmp/. Accessed December 2018.

LGROW 2011. Lower Grand River Organization of Watersheds. 2011. Lower Grand River Watershed Management Plan. Michigan's Nonpoint Source Program. MDEQ Tracking Code 2007-0137. Available online at https://www.lgrow.org/lgrwmp/

LGROW 2011. Lower Grand River Watershed Management Plan. August 2011. Available online at www.LGROW.org/lgrwmp. Accessed February 2019.

LGROW 2011. Lower Grand River Organization of Watersheds. 2011. Lower Grand River Watershed Management Plan. Michigan's Nonpoint Source Program. MDEQ Tracking Code 2007-0137. Available online at https://www.lgrow.org/lgrwmp/

Materials Testing Consultants, Inc. 2017. Summary of Grand River Sediment Sampling Grand River Rapids Restoration.

Michigan Center for Geographic Information. 2005. Bedrock Geology of Michigan. Compiled from *Bedrock Geology of Michigan, 1987.*

Michigan Department of Natural Resources (MDNR). Michigan Statewide Outdoor Recreation Plan 2018 – 2022. Available online at https://www.michigan.gov/documents/dnr/SCORP2018-2022_Final2_609032_7.pdf. Accessed June 2020.

MNFI 2019. Michigan Natural Features Inventory (MNFI). 2019. Available online at https://mnfi.anr.msu.edu Accessed January 29, 2019.

MNFI 2023. Michigan Natural Features Inventory (MNFI). 2019. Available online at https://mnfi.anr.msu.edu Accessed January 29, 2023.

Modesto, V., Ilarri, M., Souza, A. T., Lopes-Lima, M., Douda, K., Clavero, M., & Sousa, R. (2018). Fish and mussels: Importance of fish for freshwater mussel conservation. *Fish and Fisheries*, *19*(2), 244–259. https://doi.org/10.1111/faf.12252

Morello, Kirsetin. 2018. Beginners Guide to Fishing in Grand Rapids (online article). September 3, 2018. Available online at https://www.experiencegr.com/blog/post/beginners-guide-to-fishing-in-grand-rapids/. Accessed December 2018.

NRCS. 2018. Custom Soil Resource Report for Kent County, Michigan. Available online at https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm. Accessed February 2019.

NTH Consultants. 2012. Phase II Environmental Site Assessment, 1.5 Mile Long Stretch of Grand River. Grand Rapids, Michigan.

Ohio Department of Natural Resources (ODNR) Division of State Parks and Watercraft. 2019. Lowhead Dam Safety. Available online at http://watercraft.ohiodnr.gov/lowheaddams. Accessed October 2019.

Penskar, MR and SR Crispin. 2010. Special Plant Abstract for *Mertensia virginica* (Virginia bluebells). Michigan Natural Features Inventory. Lansing, MI. 3 pp. Available online at https://mnfi.anr.msu.edu/abstracts/botany/Mertensia_virginica.pdf Accessed January 29, 2019.

River For All. No date. http://riverforall.com/about/. Accessed April 14, 2020.

RiverRestoration 2017. Appendix I-3-A - Sediment Transport Analysis – Supplemental Analysis A.

RiverRestoration 2024. Basis of Design Report; Grand River Revitalization Project Grand River, Grand Rapids, MI.

RiverRestoration 2024a. Hydraulics Report; Grand River Revitalization Project Grand River, Grand Rapids, MI.

RiverRestoration 2024b. Temporary Conditions Hydraulics Report; Grand River Revitalization Lower Reach Project, Grand Rapids, Michigan. May 2024

RiverRestoration 2018. Grand River Rapids Revitalization Project. *Regional Conservation Partnership Program Reach.* Flood Analysis Technical Memorandum.

Sullivan, P. and K. Mullet. Sea Lamprey Control in the Great Lakes 2017. Great Lakes Fisheries Commission Annual Meeting. Toronto, Ontario. May 9-10, 2018.

Sullivan, P. and K. Mullet. Sea Lamprey Control in the Great Lakes 2017. Great Lakes Fisheries Commission Annual Meeting. Toronto, Ontario. May 9-10, 2018.

U.S. Census Bureau. 2000. 2000 Census. Available online at https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml. Accessed January 2019.

U.S. Census Bureau. 2010. 2010 Census. Available online at https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml. Accessed January 2019.

U.S. Census Bureau. 2018. American Community Survey 5 year 2012-2017. Available online at https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml. Accessed January 2019.

U.S. Census Bureau. 2022. 2022 Census. Available online at https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml. Accessed January 2024.

U.S. EPA. 2021. Overview of Demographic Indicators in EJSCREEN. Available online at https://www.epa.gov/ejscreen/overview-demographic-indicators-ejscreen. Accessed February 2021.

U. S. Fish and Wildlife Service (USFWS). 2020. Biological Opinion. Effects to the Snuffbox, Epioblasma triquetra from the Grand River Revitalization Project, U.S. Department of Agriculture Natural Resources Conservation Service, Grand Rapids, Kent County, Michigan. Prepared by: U.S. Fish and Wildlife Services Field Office, East Lansing, Michigan. Log # TAILS 20-R3-MIFO-09. October 22, 2020.

U. S. Fish and Wildlife Service (USFWS). 2018. National Wetlands Inventory website. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Available online at http://www.fws.gov/wetlands/ Accessed January 25, 2019.

U. S. Fish and Wildlife Service (USFWS). 2015. Threatened species status for the northern long-eared bat with 4(d) rule. 80 FR 17974-18033.

U.S. Fish and Wildlife Service (USFWS). 2003. Final Recovery Plan for the Karner Blue Butterfly (*Lycaeides melissa samuelis*). U.S. Fish and Wildlife Service, Fort Snelling, Minnesota. 273 pp. Available online at https://www.fws.gov/midwest/endangered/insects/kbb/pdf/kbb-final-rp2.pdf

U. S. Fish and Wildlife Service (USFWS). 2007. Indiana bat summer life history information for Michigan. Available online at http://www.fws.gov/midwest/Endangered/section7/s7process/mammals/inba/inbaMIlifehist.pdf

U. S. Fish and Wildlife Service (USFWS). 2015a. Threatened species status for the northern long-eared bat with 4(d) rule. 80 FR 17974-18033.

U. S. Fish and Wildlife Service (USFWS). 2015b. Eastern massasauga rattlesnake (Sistrurus catenatus) fact sheet. Available online at http://www.fws.gov/midwest/endangered/reptiles/eama/eama-fct-sht.html

U. S. Fish and Wildlife Service (USFWS). 2023. Project Design Guidelines for Federally Listed Bats in Michigan.

U.S. Geological Survey 2020. Nonindigenous Aquatic Species point map for Neogobius melanostomus (Round Goby). Available online at https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=713. Accessed on June 9, 2020.

LIST OF PREPARERS

Name/Contact Info	Role	Resource Area	Education	Experience (years)
Natural Resources Conservation Service (NRCS) – Michigan State Office				
Garry Lee	State Conservationist	Conservation		
Rick Woodford, P.E.	NRCS State Engineer	Engineering Practices		
Duane Quates	State Archaeologist	Archaeology		
Melissa Gutierrez	Cartographer	Tribal and Historical Consultation		
Ruth Schaffer	Water Quality Specialist	Project Management		
Environmental Resources Management (ERM)				
Project Management				
Steven Koster, P.E.	Partner In Charge	Air & Noise; Soils & Geology; Water & Riverine Resources; Wetlands; Terrestrial Vegetation & Wildlife; Aquatic Species & Habitat; Land Use, Recreation, & Visual Resources; Socioeconomics; Cultural Resources; Alternatives	M.S., Environmental Engineering; B.S., Civil Engineering	34
Heather Heater	Senior Project Manager	Air & Noise; Soils & Geology; Water & Riverine Resources; Wetlands; Terrestrial Vegetation & Wildlife; Aquatic Species & Habitat; Land Use, Recreation, & Visual Resources; Socioeconomics; Cultural Resources; Alternatives	M.S., Environmental Resource Management; B.S., Marine Biology	21
Andrew DeWitt	Deputy Project Manager	Air & Noise; Soils & Geology; Water & Riverine Resources; Wetlands; Terrestrial Vegetation & Wildlife; Aquatic Species & Habitat; Land Use, Recreation, & Visual Resources;; Cultural Resources; Alternatives	M.S., Geology and Geography; B.S., Geology	9
Subject Matter Experts				
Monika Thorpe	GIS Professional	Figure Development for Plan-EA	M.S., Engineering GIS, B.S., Meteorology and Geography	11

Name/Contact Info	Role	Resource Area	Education	Experience (years)
Adeyinka Afon, P.E.	Senior Consultant	Air & Noise	M.S., Environmental Process Engineering; B.S., Chemical Engineering	15
Joseph Kmetz	Water Resource Engineer	Water & Riverine Resources	B.S., Geohydrology	19
Jeff Williams	Senior Scientist	Aquatic Species & Habitat	B.S., Fisheries and Wildlife	20
Jacquie Payette	Technical Director	Cultural Resources	M.S., Anthropology, English Literature, and English	30
Eric Scuoteguazza	Senior Consultant	Cultural Resources	M.S., Anthropology; B.S., Anthropology	29
Ben Sussman	Principal Consultant	Land Use, Recreation, & Visual Resources; Socioeconomics	M.C.R.P., City and Regional Planning; B.S., Science, Technology, and Society	20
Jenifer Huff	Consultant	Land Use, Recreation, & Visual Resources; Socioeconomics	B.S., Urban and Regional Planning	31
Samuel Guffey	Environmental Scientist	Wetlands; Terrestrial Vegetation & Wildlife; Aquatic Species & Habitat	M.S., Biological Sciences; B.S., Marine Science	7
James Smit	Environmental Scientist	Alternatives	M.S., Biology and Aquatic Science; B.S., Biology	5
Grand Valley Metro Council (GVMC)				
Project Management				
Wendy Ogilvie	Project Manager	Compliance Review	M.S., Resource Development; B.S., Forestry	30
Subject Matter Experts				
Carlos Calderon	Ecological Consultant	Urban Dynamics & Biological Assessment review	M.S. Aquatic Biology; B.S. Biology	5
Steven Musch	Figure Development	GIS	BA Geography, MS GIS (Expected ’25)	11
Environmental Consulting & Technology, Inc. (ECT)				
Project Management				
Tonya Lewandowski, PE	Project Manager and Senior Engineer	Abstract; Summary; Purpose & Need For Action; Scope of EA; Public Health & Safety; Urban Dynamics; Floodplain Management; Summary & Comparison of Alternatives; Energy & Natural or Depletable Resource Requirements; Consultation, Coordination, & Public Participation; Preferred Alternative; Rationale for Preferred Alternative; Measures to be Installed; Mitigation; Permits & Compliance; Costs & Cost Sharing; Installation & Financing; Operation Maintenance & Replacement; Economic Tables	B.S., Civil Engineering	18
Subject Matter Experts				
Marty Boote, CERP	Senior Ecologist and Scientist	Floodplain Management; Summary & Comparison of Alternatives; Energy & Natural or Depletable Resource Requirements; Preferred Alternative; Rationale for Preferred Alternative; Measures to be Installed; Mitigation; Permits and Compliance	B.S., Biology/Fisheries; A.S., Architectural Drafting and Design	28

Name/Contact Info	Role	Resource Area	Education	Experience (years)
Anne Power	Associate Scientist, Environmental Law & Regulation	Abstract; Summary; Purpose & Need For Action; Scope of EA; Public Health & Safety; Urban Dynamics; Floodplain Management; Summary & Comparison of Alternatives; Energy & Natural or Depletable Resource Requirements; Consultation, Coordination, & Public Participation; Preferred Alternative; Rationale for Preferred Alternative; Measures to be Installed; Mitigation; Permits & Compliance; Costs & Cost Sharing; Installation & Financing; Operation Maintenance & Replacement; Economic Tables	B.A., Environmental Studies	5
Elizabeth Theile, PWS	Senior Associate Scientist	Floodplain Management; Permits & Compliance	B.S. Environmental Sciences	10
Guadalupe Cummins	Senior Associate Scientist	Permits & Compliance	M.S. Biological Sciences; B.S. Environmental Sciences	12
Robert Pettit	Associate Scientist	Public Participation Mapping; Preliminary Investigation	B.S. Environmental Studies	10
Tennille Newsome	Technical Administrative Coordinator	Technical Formatting Lead		15
Grand Rapids Whitewater (GRWW)				
Project Management				
Matt Chapman	Project Coordinator	All	B.S. Advertising & Public Relations; Graduate Certificate in Nonprofit Leadership	5
Steve Heacock	President/CEO	All	Juris Doctor; CPA	30
City of Grand Rapids				
Subject Matter Experts				
Tim Burkman, P.E.	City Engineer	Engineering	B.S., Civil Engineering	17
Michael Staal, P.E.	Compliance to City Engineering	Engineering	B.S., Civil Engineering	10
Jay Steffen, PLA	Compliance to City Planning	Planning	B.S., Landscape Architecture	34